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GROUND VIBRATION MONITORING FOR CONSTRUCTION BLASTING IN URBAN AREAS

F-00-OR-10

Final Report

April 2001

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STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

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Joseph Egan
Jeff Kermode
Martin Skyrman
Loren L.Turner

STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

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The primary objectives of this study were to determine a recommendation for the pre-blast area for surveys, and to obtain actual field vibrations from rock blasting operations, in populated regions within specific geologic units. The area confined within a pre- and post-construction survey covers a region where vibrations or vibration induced settlements have the potential to cause real structural damage as well as perceived damage from residents.

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TABLE OF CONTENTS

Introduction 1

Project Background 1

Origin of Caltrans Vibration Specifications 2

Instrumentation 3

Blast Records 4

Observations 5

Implementation of Results 9

Conclusion and Recommendations 10

ILLUSTRATIONS AND TABLES

Blasting Seismograph 3

Peak Particle Velocity vs. Actual Distance Plot 5

Peak Particle Velocity vs. Scaled Distance Plot 6

List of Complaints by Residents 8

Peak Particle Velocity & Complaints vs. Distance Plot 9

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INTRODUCTION

There has been a significant increase in construction blasting activity near Caltrans facilities and a concomitant increase in nearby structure density that can be detrimentally affected by Caltrans construction operations and blasting. There is a need to update Caltrans standards related to vibration monitoring programs and equipment, acceptable tolerances for vibrations for various classes of urban structures and the recommended limits for pre-blast damage surveys.

As population density increases, Caltrans construction operations, including blasting and pile driving, expose ever larger numbers of nearby facilities and individuals to what are perceived to be intolerable levels of ground vibrations. Hard data is required to develop a basis for new standards for Caltrans vibration monitoring programs. The synthesis of the gathered data will provide a basis for project Resident Engineers to confirm that on-going construction operations are staying within tolerable limits to prevent damage due to ground vibrations. These data can also be used in defense of the State for unreasonable claims of damage.

The primary objectives of this study were to determine a recommendation for the pre-blast area for surveys, and to obtain actual field vibrations from rock blasting operations, in populated regions within specific geologic units. The area confined within a pre- and post-construction survey covers a region where vibrations or vibration induced settlements have the potential to cause real structural damage as well as perceived damage from residents.

PROJECT BACKGROUND

Ground vibrations are a significant factor when considering highway construction activities such as pile driving and rock blasting operations. These activities create the potential for real damage to surrounding building structures and facilities, as well as a perceived damage from human sensitivities to detectable yet non-damaging ground motions. Caltrans practice has typically involved the use of specifications requiring the contractor to develop a vibration-monitoring plan. These plans have included requirements for photo and video surveys, crack monitoring, survey of elevations, and use of vibration monitoring equipment for nearby structures during construction operations. However, the Statewide application of vibration monitoring specifications has been inconsistent with varying degrees of equipment requirements, damage thresholds, and limits of surveys.

At the time of this study, Caltrans had recently awarded several construction contracts that required considerable amounts of blasting to excavate rock in both commercial and residential environments where the ground vibrations could not only be a nuisance, but could also cause damage to facilities if blast charges and delay timing were such as to cause ground vibrations in excess of acceptable limits. A considerable number of facilities would need to be surveyed in the pre-blast documentation. Review of existing literature and discussion with other Caltrans personnel showed consensus that the radius of surveys could be significantly reduced; however, monitoring of the blasts would be necessary to validate a reduced radius of survey. On one of the projects, Route 54 in San Diego county (11-SD-54 KP 9.7/10.8 - 18.0/19.6 Stage II, EA 11-001923), an estimated 471 structures fell within the specified 366 m radius of the area to be blasted at an estimated cost of approximately $500,000 to conduct a single survey. Multiple surveys would be likely. If the survey radius could be reduced by 50%, projected single survey costs could be reduced to $100,000. Other projects included extensions to highway corridors in San Diego county such as Route 125, Route 56, and Route 78 (11-SD-125 stage IV, 11-SD-56, and 11-SD-78) which involved the construction of new freeways or widening of an existing freeways within urban environments. On the Route 125 project an estimated 674 structures fell within the specified 366 meter radius of the area to be blasted, at an estimated cost of approximately $800,000 to conduct a single survey. As with the other projects, if the survey radius could be reduced by 50%, projected survey costs could be reduced to $200,000.

ORIGIN OF CALTRANS VIBRATION SPECIFICATIONS

In the San Diego area (District 11), Caltrans' specifications have typically required a survey of all structures within a 366 meter radius of a proposed blasting operation, a maximum of 45 days prior to the commencement of the blasting. In addition, the areas had to be resurveyed within 45 days subsequent to blasting. Due to the absence of supporting data for the establishment of these limits during design, pre- and post- blast surveys limits have typically been identified or modified by the Caltrans Construction Engineer in the construction phase of the project.

In response to the requests from Caltrans designers, this study was undertaken to investigate the history and sources of the current specification and its development. Specifications from other Caltrans districts and offices as well as other agencies were also evaluated. Finally, published literature were reviewed to evaluate the state of the practice.

The current pre and post blast specifications were developed at a time when San Diego County was predominately rural, and construction adjacent to pre-existing structures was limited. The

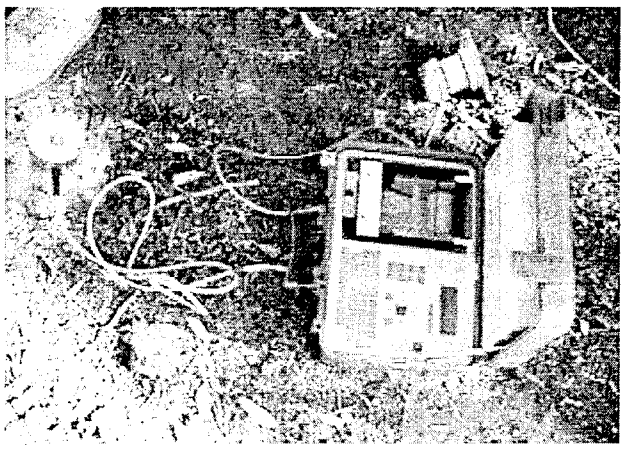
radius of the survey and specified time frames were based upon what was deemed prudent and conservative by the Office Engineer at that time. A survey of other work groups within Caltrans as well as in other agencies revealed not only the absence of a standard, but an increasing need to develop one.

The literature search revealed a plethora of papers on blasting physics and measurement techniques. Many developed relationships correlating structural damage to peak particle velocity. Most of them relied heavily upon the work and subsequent papers produced by the U.S. Bureau of Mines, as well as others produced by manufacturers of explosives, such as Dupont. In most cases the *peak particle velocity* was identified as the most useful parameter when correlating blast size to distance, with the *scaled distance* (distance from blast divided by the nth root of the weight of explosive used in the blast) as another significant parameter. Thresholds for structural damage are typically based upon peak particle velocities. Although these correlations were very useful for blast design, they did not readily lend themselves to determining pre-blast survey radii during the design phase of project development.

The current Caltrans specifications permit a peak particle velocity of 50mm (2 inches) per second[6] at a nearby receptor that is susceptible to damage from such vibrations. In order to stay within the tolerable limits, Caltrans reviews the contractor's blasting plan for a particular blast as to the likelihood of exceeding the prescribed limit of vibration. Vibration monitoring is typically required when blasting occurs in close proximity to structures.

INSTRUMENTATION

To conduct this project and collect vibration data, three blasting seismographs and analysis software were acquired. Each seismograph consisted of a 3-axis velocity transducer, an air over-pressure transducer, and a data acquisition and storage device. The blasting analysis software provided features for graphical output of the wave forms in each of the three axes and comparison of the measured peak particle velocities and



Instantel Blastmate III Vibration Monitors

frequency content with various accepted standards developed by the U.S. Bureau of Mines and others.

Each transducer measured velocities on three mutually perpendicular axes (V_x, V_y, V_z) corresponding to a radial, transverse, and vertical component. The data acquisition equipment simultaneously recorded each geophone, in digital format, time-domain data for each of the three mutually perpendicular axes at each of the four radial distances.

BLAST RECORDS

This study documents 27 blasts which occurred on the Route 54 project in San Diego county between June 18, 1999 and May 4, 2000. Blasting was performed within the Jurassic Santiago Peak Volcanic rock formation. Prior to construction, existing roadway cuts exposed foliated, welded siliceous tuff, jointed and fractured hornfels and andesite porphyry.

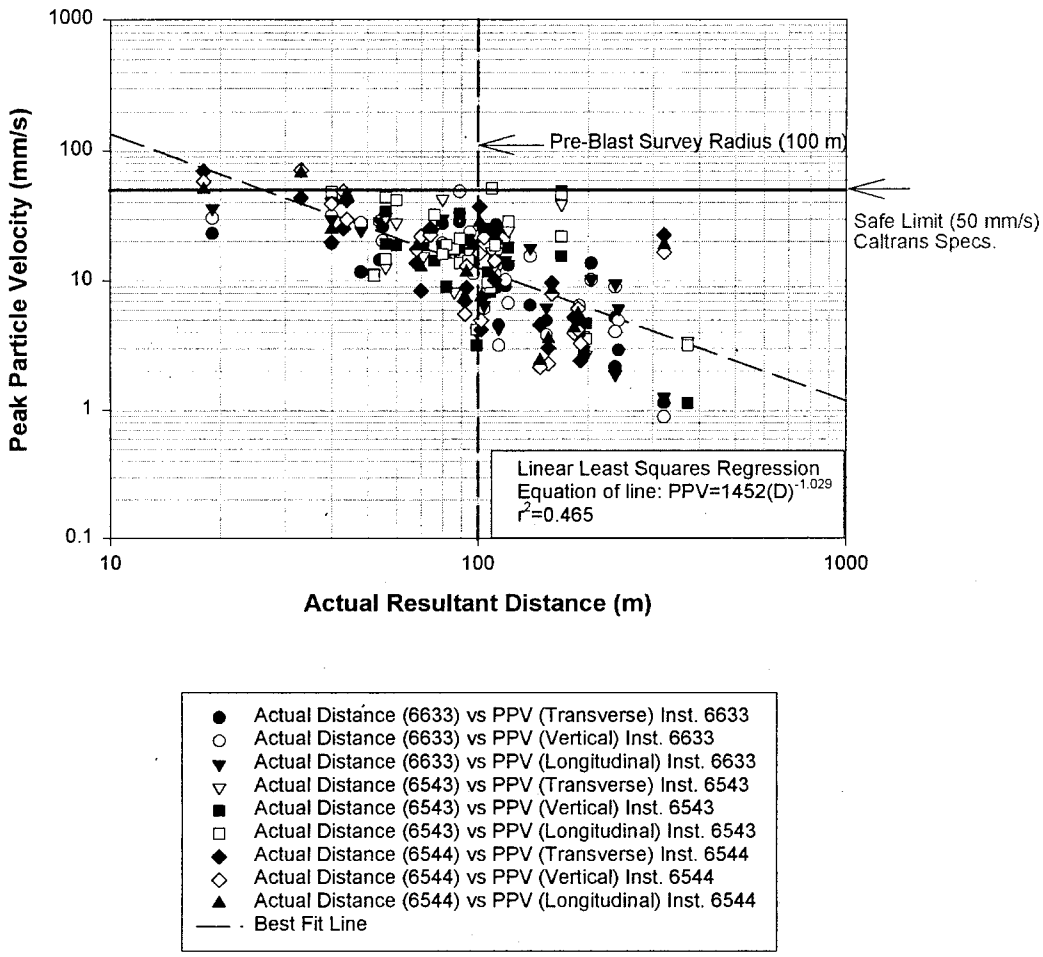
For each blast event, up to three blasting seismographs were deployed for measurements at varying distances from the blast site. The particle velocity time-history data for these 27 blasts are included in the appendix. Electronic files from the monitoring, both proprietary Instantel *Blastware* versions as well as exported ASCII text versions, are included on a compact disk with this report.

Since the commencement of monitoring on May 28, 1999, approximately 70 blasts have been recorded among three projects in San Diego county. Of that number several blasts have had reports of disturbances by nearby residents. To date, none of the blasts have caused any known damage to private or public facilities. With few exceptions, the monitoring points have not exceeded the recommended specified peak particle velocity. The continued monitoring efforts on these ongoing projects is intended to add to the body of data available for a rigorous analysis of blasting related to Caltrans projects, perhaps statewide, to further the confidence in reducing the radius and thus the cost of pre-blast surveys.

OBSERVATIONS

Vibration measurements at every distance and on every axes from the 27 recorded blasts were plotted on a single log-log plot to demonstrate the attenuation relationship for groundborne vibrations propagating through the specific subsurface materials in the area of this project.

11-SD-54/125
Construction Blasting, May 1999 through June 2000
Graph of Actual Distance versus Peak Particle Velocity



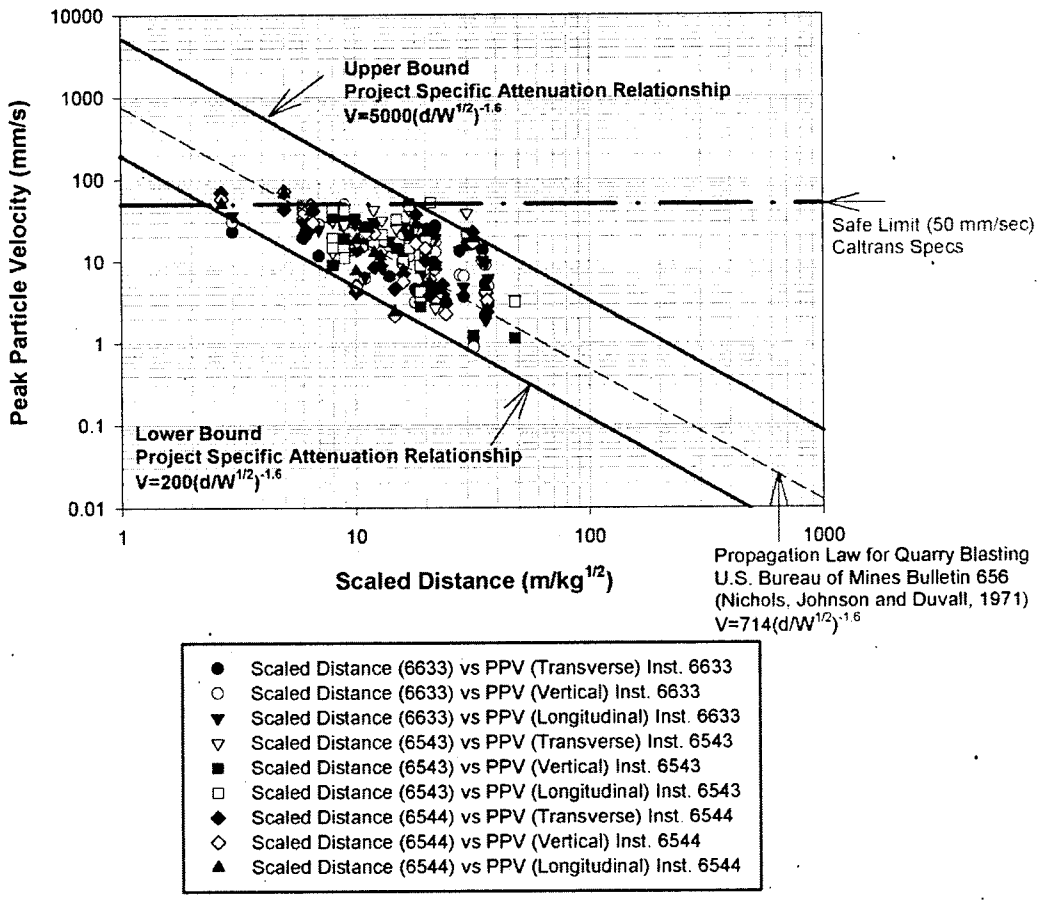
The above plot shows peak particle velocities as a function of actual distance. Significant observations resulting from the data collected in this study are as follows:

- Using Caltrans' threshold for structural damage of 2 inches per second (50 mm/sec), structures beyond approximately 35 meters from the blast location would be considered "safe" from any vibration-induced damage.

- The use of a 100 meter pre-blast survey radius appears to be a reasonable limit that would capture all structures susceptible to vibration-induced damage.

Plotting peak particle velocity normalized to charge weight, or scaled distance, yields the following plot:

11-SD-54/125
Construction Blasting, June 1999 through May 2000
Graph of Scaled Distance versus Peak Particle Velocity



Significant observations resulting from the data collected in this study are as follows:

- The attenuation relationship based upon the least squares regression analysis for this data set shows reasonably good agreement with those established by the U.S. Bureau of Mines.
  1) Data for this project is generally centered on the line (dashed) representing an upper limit of ground vibrations established by the U.S. Bureau of Mines (Bulletin 656) in 1971. This relationship was developed based on monitoring of quarry blast operations only, yet is seemingly applicable to construction blasting as well (this relationship was used by the blasting consultant on this project to predict vibrations at

nearby structures). The following equation represents this line in which the constant is the y-intercept and the exponent is the slope:

$$PPV = 714(D/\sqrt{W})^{-1.6}$$

where, D=actual distance (meters)

and W=mass of explosive (kg)

2) By inspection, approximately one-half of the data points lie above this line. Vibrations exceeding this line could be attributed to either contractor-specific blasting practices (including but not limited to blast timing, coupling and explosive properties) or site-specific characteristics including the geologic framework and directional effects. Preliminary analysis of blast data at another project site in San Diego County indicates a similar trend. Use of a cube root, rather than a square root, in the scaled distance variable may result in significantly more data points plotting below the USBM attenuation relationship line.

3) Lower and upper-bound attenuation relationships specific to this project were established such that approximately 95% of the data points fall within the lower and upper bounds. The rate of vibration decay with distance (slope of line) is maintained from the USBM equation.

Lower bound: $PPV = 200(D/\sqrt{W})^{-1.6}$

Upper bound: $PPV = 5000(D/\sqrt{W})^{-1.6}$

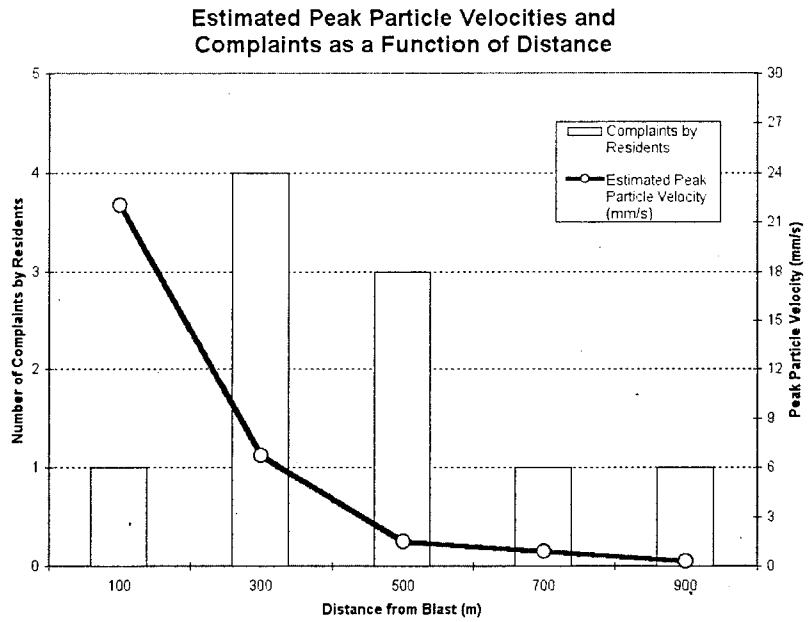
In the early stages of blast monitoring seismographs were located at points up to the 300 m radius, with very little to no energy received at that distance. Trigger velocities were set in the range of 3 mm per second at those distances to actuate the seismograph. After a few measurements at this distance, it was concluded that the possibility of damage was so slight as to not warrant further testing at these distances. The constraints set on the blast energy to be released were adequate to render no damage at the 300 m distance. As such, the subsequent pre-blast survey radius for the Route 54/125 project was reduced from 300 m to 100 m. Direct cost savings to Caltrans on this single project have been estimated to be $250,000.

Complaints by residents in the vicinity of the blasting operations were logged by the Caltrans Resident Engineer on the project. A summary of the complaints is shown in the following table:

Address	Date and Time Complaint Received	Nature of Problem	Distance to Blast(s) (m) and Corresponding Blast Number
431 Osage	6-21-99	Wall cracks	519 (3H)
8475 Avenida Angulia #28 (Sweetwater View Condos)	6-28-99 14:33	Ceiling Cracks	118 (9B)
529 Parkbrook St.	7-30-99	Newly constructed porch has shrunken post	324 (1H) 375 (3H)
8472 Avenida Angulia	07-27-99 08:02	Living Room and Driveway Cracks	162 (9B) 153 (10B)
523 Broadview St.	08-12-99 16:47	Cracks in ext. yard, back yard, hallway, crevice in garage slab	230 (1H) 277 (3H)
502 Broadview St.	09-21-99 15:28	Bedroom wall cracked	217 (1H) 271 (3H)
450 Broadview St.	11-02-99 17:54	Crack in dining room wall	302 (1H) 342 (3H)
Sweetwater Views Condos Swimming Pool Area	12-09-99 08:45	Pits in Plexiglass wall; Concrete pool apron cracks	56 (10B) 56 (22B) 71 (24B)
766 Parkbrook St.	12-27-99 10:05	One slab crack (living room, dining room, kitchen, bedroom)	870 (1H) 916 (3H)
411 Parkbrook St.	01-11-00 10:52	Cracks in ceiling/wall at kitchen, master bedroom and entry	465 (1H) 504 (3H)

Most of the complaints involved observations by the residents of cracks in walls, ceilings, and concrete slabs. Those filing complaints claimed that these cracks were not present prior to blasting operations. In general, it can often be very difficult to determine whether or not the cracks were a direct result of the construction operations. In one case, prior to the first scheduled blast for the 54/125 Route, a public notification was released to the local residents of the date of an upcoming blasting event. However, the blast was delayed for approximately a week, but a telephone call was received by the Resident Engineer on the originally scheduled blast day of cracking to the party's house.

It is well documented (Reiher 1931) that the human response to vibrations can be "disturbing," even though those same vibration levels would be considered "safe" with a low probability of damage to structures. To illustrate this, the peak particle velocities estimated at the locations of the complaints and the number of complaints were plotted as a function of actual distance from the blast. Estimates of peak particle velocity were calculated in accordance with the U. S. Bureau of Mines Bulletin 656 propagation law.



Significant observations from the combined plot are as follows:

- Measured particle velocities attenuated with distance, as did the number of complaints, as would be expected.
- 70% of the complaints came from residents located between 100 and 500 meters from the blast location.
- Within the range of distances where there were the most complaints, the majority of measured peak particle velocities in any direction were well below the Caltrans damage threshold of 50 mm/s.

IMPLEMENTATION OF RESULTS

Although this study produced significant findings, further research involving a wider range of site locations and blasting operations is warranted prior to a statewide implementation of revised pre- and post-blast survey limits and associated specifications. In addition, in urban areas the surrounding community's perception of vibrations can be equally as important as the danger of structural damage due to the vibrations. A thorough understanding of this relationship is necessary to establish a survey limit that adequately documents the impacted area without being excessive.

CONCLUSIONS AND RECOMMENDATIONS

Future research into setting pre-blast survey radius limits is justified by the fact that having a scientific basis for determining the limits can lead to considerable savings. As the population increases urban density, and the insatiable need for ever more roadways and shorter commute times, new routes are being squeezed in amongst existing developments and into more difficult terrain for construction that requires significant cost increases in construction. Every opportunity needs to be explored to maximize the public's investment in highway development.

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11-SD-54/125 BLAST MONITORING

BLAST NO.	DATE/TIME OF BLAST	STATION BEGIN (m)	STATION END (m)	ELEVATION OF BLAST (m)	CHARGE PER DELAY (kg)
1H	6/22/99 2:05 PM	6+2	6+20	82	18.2
3H	6/21/99 2:35 PM	4+59	4+86	92	60.6
9B	6/18/99 1:35 PM	121+90	122+05	135	41.0
10B	7/2/99 10:33 PM	121+85	122+05	135	41.0
11B	6/23/99 1:05 PM	123+80	124+40	115	102.0
12B	7/14/99 1:57 PM	123+20	123+80	120	102.0
13B	7/27/99 1:00 PM	122+60	123+20	120	102.0
14B	6/22/99 1:04 PM	126+23.5	126+85	92	18.3
15B	7/8/99 11:02 AM	123+75	124+40	120	27.0
17B	7/29/99 11:57 AM	122+45	123+10	120	27.0
18B	7/1/99 2:29 PM	121+80	122+45	120	27.0
19B	8/4/99 12:00 PM	122+20	122+60	115	82.0
20B	8/9/99 12:00 PM	121+80	122+20	115	82.0
21B	7/19/99 12:04 PM	121+40	121+80	122	31.0
22B	7/21/99 12:02 PM	121+40	121+80	124	31.0
24B	11/5/99 1:14 PM	120+40	121+00	124	31.0
25B1	1/6/00 1:00 PM	124+28	124+60	108	44.0
25B2	1/11/00 1:35 PM	124+28	124+60	108	44.0
26B	1/20/00 2:01 PM	123+94	124+26	111	44.0
27B	1/27/00 1:00 PM	123+63	123+92	111	44.0
28B	2/3/00 1:00 PM	123+27	123+61	111.5	44.0
39/40B Part I	2/18/00 1:00 PM	123+98	124+60	107	33.0
41B Part I	3/1/00 1:00 PM	123+64	123+96	104	33.0
41B Part II	3/20/00 1:00 PM	123+40	124+00	104	44.0
45B	4/12/00 12:00 AM	122+20	122+60	111	44.0
46/47B	5/3/00 12:00 AM	121+72	122+36	111	53.0
47/48B	5/4/00 12:00 AM	121+20	121+72	112	53.0

11-SD-54/125 BLAST MONITORING

	BLASTMATE NO. 6633				
BLAST NO.	PEAK VECTOR SUM (mm/s)	AIRBLAST(dB)(L)	MONITORING LOCATION	DISTANCE (m)	SCALED DISTANCE
1H	did not trigger	did not trigger	Quarry Rd., 250' south of Swap Meet Rd.	192	45
3H	6.56 @ 0.163sec	108 @ 0.442sec	Quarry Rd., 250' south of Swap Meet Rd.	154	20
9B	4.76 @ 0.611sec	112 @ 0.528sec	8546 Lake Bluff Circle	114	18
10B	38.2 @ 0.311sec	136.9 @ 0.980sec	86m LT 121+77 "BR" Line	19	3
11B	1.45 @ 0.542sec	111.2 @ 0.798sec	15m RT 127+35 "D" Line	321	32
12B	53.1 @ 0.174sec	130.9 @ 0.386sec	8546 Lake Bluff Circle	89	9
13B	19.7 @ 0.622sec	117.2 @ 0.719sec	8573 Lake Bluff Circle	139	14
14B	14.8 @ 0.865sec	119.9 @ 0.939sec	Quarry Rd., 250' south of Swap Meet Rd.	121	28
15B	34.7 @ 0.506sec	124.2 @ 0.551sec	8546 Lake Bluff Circle	112	22
17B	19.5 @ 0.211sec	117.9 @ 0.493sec	8573 Lake Bluff Circle	112	22
18B	28.9 @ 0.670sec	130.3 @ 0.679sec	86m LT 121+77 "BR" Line	55	11
19B	7.82 @ 0.138sec	130 @ 0.346sec	8546 Lake Bluff Circle	104	11
20B	28.8 @ 0.329sec	123 @ 1.623sec	8566 Lake Bluff Circle	95	11
21B	22.7 @ 0.758sec	122.2 @ 1.165sec	Quarry Rd., 300' north of rock/fill contact	97	17
22B	26.9 @ 0.241sec	123 @ 0.703sec	8573 Lake Bluff Circle	111	20
24B	34.1@ 0.111 sec	127 @ 0.351sec	122 m LT 120+77 "B" LIne	54	10
25B1	7.81@0.291 sec	112@0.731 sec	8573 Lake Bluff Circle	242	37
25B2	10.4@0.250sec	113@0.881sec	8573 Lake Bluff Circle	237	36
26B	28.1@1.431sec	126@0.984sec	83m LT 123+67.6 "B" Line	48	7
27B	35.3@1.008sec	133@0.186sec	83m LT 123+67.6 "B" Line	40	6
28B	34.1@0.163sec	122@0.487sec	Driveway of 8546 Lake Bluff Circle	80	12
39/40B Part I	DID NOT MONITOR				
41B Part I	15.8@2.132sec	115@2.306sec	8573 Lake Bluff Circle	204	35
41B Part II	4.53@.267sec	108@.588sec	8504 Lake Bluff Circle	237	36
45B	6.64@0.033sec	116@0.590sec	8504 Lake Bluff Circle	189	29
46/47B	28.3@0.848sec	121@0.411sec	8573 Lake Bluff Circle	118	16
47/48B	17.9@0.299sec	118@0.646sec	Entrance to Sweetwater Villas	119	16

11-SD-54/125 BLAST MONITORING

	BLASTMATE NO. 6543				
BLAST NO.	PEAK VECTOR SUM (mm/s)	PSPL (dB)(L)	MONITORING LOCATION	DISTANCE (m)	SCALED DISTANCE
1H	DID NOT MONITOR				
3H	3.96 @ 0.151sec	110 @ 0.00sec	54.3 m LT 131+55 "B" Line	372	48
9B	DID NOT MONITOR				
10B	18.7 @ 0.126sec	116 @ 0.366sec	8573 Lake Bluff Circle	86	13
11B	4.00 @ 0.591sec	20.5 pa (L) @ 0.099sec	Vacant lot on culdesac, east of Quarry Rd.	195	19
12B	57.1 @ 0.282sec	123 @ 0.567sec	8573 Lake Bluff Circle	169	17
13B	21.1 @ 0.485sec	126 @ 0.661sec	8546 Lake Bluff Circle	82	8
14B	DID NOT MONITOR				
15B	6.06 @ 0.645sec	118 @ 0.895sec	Quarry Rd., 500' south of rock/fill contact	99	19
17B	36.3 @ 0.181sec	122 @ 0.364sec	8546 Lake Bluff Circle	76	15
18B	52.5 @ 0.360sec	125 @ 0.372sec	8573 Lake Bluff Circle	109	21
19B	5.37 @ 0.053sec	119 @ 0.617sec	8504 Lake Bluff Circle	197	22
20B	33.6 @ 1.101sec	130 @ 1.474sec	Sweetwater Villas, Unit 23	89	10
21B	22.8 @ 0.689sec	31.5 pa. (L) @ 0.718sec	8566 Lake Bluff Circle	94	17
22B	20.0 @ 0.238sec	123 @ 0.737sec	8573 Lake Bluff Circle	111	20
24B	39.5 @ 0.131sec	118 @ 0.609sec	8573 Lake Bluff Circle	169	30
25B1	32.3@1.089 sec	122@0.511 sec	Oakbrook Ridge Apts-Unit 160	89	13
25B2	44.1@0.264sec	124@0.747sec	Oakbrook Ridge Apts-Unit 160	80	12
26B	25.3@0.222sec	132@0.471sec	Quarry Rd., 500' south of rock/fill contact	71	11
27B	58.3@0.886sec	133@0.186	83m LT 123+67.6 "B" Line	40	6
28B	45.2@1.185sec	128@0.290sec	slope below 8546 Lake Bluff Circle	60	9
39/40B Part I	15.3@0.536sec	123@1.708sec	83m LT 123+67.6 "B" Line	52	9
41B Part I	12.0@1.805sec	121@2.083sec	slope below 8546 Lake Bluff Circle	108	19
41B Part II	12.4@0.331sec	119@0.497sec	8546 Lake Bluff Circle, driveway	106	16
45B	34.3@0.250sec	121@0.454sec	8573 Lake Bluff Circle	121	18
46/47B	55.0@0.192sec	129@0.253sec	72m LT 122+26 "B" Line	56	8
47/48B	20.8@0.265sec	128@0.373sec	Sweetwater Villas, Unit 23	56	8

11-SD-54/125 BLAST MONITORING

	BLASTMATE NO. 6544				
BLAST NO.	PEAK VECTOR SUM (mm/s)	AIRBLAST (dB)(L)	MONITORING LOCATION	DISTANCE (m)	SCALED DISTANCE
1H	DID NOT MONITOR				
3H	5.54 @ -0.177sec	118 @ 0.458sec	13 m lt 129+70 "D" Line	183	24
9B	DID NOT MONITOR				
10B	3.67 @ 0.022sec	109 @ 0.845sec	8490 Avenida Angulia	156	24
11B	29.2 @ 1.138sec	15.3 pa. (L) @ 1.425sec	89 m LT 122+20 "B" Line	321	32
12B	7.75 @ 0.035sec	124 @ 0.544sec	Quarry Rd., 500' south of rock/fill contact	102	10
13B	4.63 @ 0.276sec	116 @ 0.342sec	Quarry Rd., 500' south of rock/fill contact	148	15
14B	DID NOT MONITOR				
15B	DID NOT TRIGGER	DID NOT TRIGGER	Vacant lot on culdesac, east of Quarry Rd.	208	40
17B	6.31 @ 0.307sec	109 @ 0.983sec	8504 Lake Bluff Circle, SE corner	187	36
18B	3.67 @ 0.031sec	111 @ 0.670sec	8490 Avenida Angulia, S62E to blast	191	37
19B	33.5 @ 0.146sec	127 @ 0.290sec	8566 Lake Bluff Circle	104	12
20B	7.34 @ 0.934sec	117 @ 0.499sec	8504 Lake Bluff Circle, SE corner	188	21
21B	30.4 @ 0.012sec	97.5 @ 2.368sec	8490 Avenida Angulia	187	34
22B	23.5 @ 0.237sec	123 @ 0.740sec	8573 Lake Bluff Circle	111	20
24B	38.7 @ 0.167sec	95.9 @0.111sec	146 m LT 120+29 "B" Line	101	18
25B1	54.6@0.289sec	129@0.468sec	Sweetwater Townhomes-Unit 57	44	7
25B2	80.5@0.316sec	131@0.312sec	Sweetwater Townhomes-Unit 57	33	5
26B	88.6@1.493sec	132@1.216sec	66 m LT 123+28	18	3
27B	43.3@1.002sec	DID NOT MONITOR AIRBLAST	83m LT 123+67.6 "B" Line	40	6
28B	51.8@0.993sec	132@0.194sec	slope below 8546 Lake Bluff Circle near R/W	43	7
39/40B Part I	11.0@1.177sec	117@1.768sec	slope below 8546 Lake Bluff Circle	92	16
41B Part I	22.7@1.179sec	125@2.148sec	83m LT 123+67.6 "B" Line	70	12
41B Part II	24.2@0.364sec	. 122@0.304	slope below 8546 Lake Bluff Circle near R/W	68	10
45B	32.2@0.050sec	129@0.227sec	8566 Lake Bluff Circle	74	11
46/47B	11.4@1.031sec	118@0.706sec	52m RT 120+24 "B" Line on Quarry Rd.	159	22
47/48B	13.9@0.118sec	123@0.503sec	Sweetwater Villas, park. Space #12 by laundry	93	13

DIST: 11	COUNTY: SAN DIEGO	ROUTE: 54/125	EA: 001923					
BLAST NO.	DATE/TIME OF BLAST	DATA FILE NAME INSTRUMENT 6633	DATA FILE NAME INSTRUMENT 6543	DATA FILE NAME INSTRUMENT 6544	BLAST ZONE STATION BEGIN (m)	BLAST ZONE STATION END (m)	ELEVATION OF BLAST (m)	CHARGE PER DELAY (kg)
1H	6/22/99 2:05 PM	H6337JW1.N80		NONE	6+2	6+20	82	18.2
3H	6/21/99 2:35 PM	H6337JUB.7I0	H5437JUB.7FO	H5447JUB.7G0	4+59	4+86	92	60.6
9B	6/18/99 1:35 PM	H6337J00.F60	NONE	NONE	121+90	122+05	135	41.0
10B	7/2/99 10:33 PM	H6337KED.BY0	H5437KED.BX0	H5447KED.C20	121+85	122+05	135	41.0
14B	6/23/99 1:05 PM	H6337JXW.D20	H5437JXW.CY0	H5447JXW.D00	123+80	124+40	115	102.0
12B	7/14/99 1:57 PM	H6337L0U.RH0	H5437LOU.RHO	H5447LOU.RR0	123+20	123+80	120	102.0
13B	7/27/99 1:00 PM	H6337LOU.Uo0	H5437LOU.UP0	H5447LOU.V40	122+60	123+20	120	102.0
14B	6/22/99 1:04 PM	H6337JW1.N80	NONE	NONE	126+23.5	126+85	92	18.3
15B	7/8/99 11:02 AM	H6337KPI.0H0	H5437KPI.0G0	NONE	123+75.	124+40	120	27.0
17B	7/29/99 11:57 AM	H6337LSH.7N0	H5437LSH.700	H5447LSH.840	122+45	123+10	120	27.0
18B	7/1/99 2:29 PM	H6337KCT.LNO	H5437KCT.LL0	H5447KCT.LR0	121+80	122+45	120	27.0
19B	8/4/99 12:00 PM	H6337M3L.CS0	H5437M3L.CU0	H5447M3L.DB0	122+20	122+60	115	82.0
20B	8/9/99 12:00 PM	H6337MCU.070	H5437MCu.o80	H5447MCU.0S0	121+80	122+20	115	82.0
21B	7/19/99 12:04 PM	H6337L9Y.VM0	H5437L9Y.VM0	MISSING	121+40	121+80	122	31.0
22B	7/21/99 12:02 PM	H6337LD0.3L0	H5347LD0.3M0	H5447LDO.3Y0	121+40	121+80	124	31.0
24B	11/5/99 1:14 PM	H6337QVW.RY0	H5437QVW.S70	H5447QVW.TO0	120+40	121+00	124	31.0
25B1	1/6/00 1:00 PM	H6337U2P.MYO	H5447U2P.PV0	H5447U2P.PV0	124+28	124+60	108	44.0
25B2	1/11/00 1:35 PM	H6337UC0.H00	H5437UCO.K30	H5447UCO.JZ0	124+28	124+60	108	44.0
26B	1/20/00 2:01 PM	H6337USP.MY0	H5437USP.Q10	H5447USP.Q10	123+94	124+26	111	44.0
27B	1/27/00 1:00 PM	H6337V5L.QV0	H5437V5L.TZO	H5447V5L.U20	123+63	123+92	111	44.0
28B	2/3/00 1:00 PM	H6337VIJ.27O	H5437VIK.2C0	H5447VIK.2H0	123+27	123+61	111.5	44.0
39/40B Part I	2/18/00 1:00 PM	NONE	H5437WAC.5N0	H5447WAC.5Y0	123+98	124+60	107	33.0
41B Part I	3/1/00 1:00 PM	H6337WWK.9P0	H5437WWK.CV0	H5447WWK.DB0	123+64	123+96	104	33.0
41B Part II	3/20/00 1:00 PM	H6337XVQ.HN0	H5437XVQ.KU0	H5447XVQ.LH0	123+40	124+00	104	44.0
45B	4/12/00 12:00 AM	H6337Z28.ZBO	H5437Z29.2K0	H5447Z29.3G0	122+20	122+60	111	44.0
46/47B	5/3/00 12:00 AM	H6337054.TBO	H5438054.WL0	H5448054.XQ0	121+72	122+36	111	53.0
47/48B	5/4/00 12:00 AM	H6338070.RX0	H5438070.V70	H5448070.WC0	121+20	121+72	112	53.0

Event Report

Date/Time	MicL at 14:35:39 June 21, 1999	**Serial Number**	BC6543 V 4.0-4.0 MiniMate Plus
Trigger Source	Geo: 10.00 mm/s	**Battery Level**	6.4 Volts
	Mic: 6.32 pa.(L)	**Calibration**	June 16, 1999 by Instantel Inc.
Range	Geo :254 mm/s	**File Name**	H5437JUB.7F0
Record Time	3.25 sec (Auto=3Sec) at 1024 sps		
Job Number:	3		

Notes
Location:
Client:
User Name:
General:

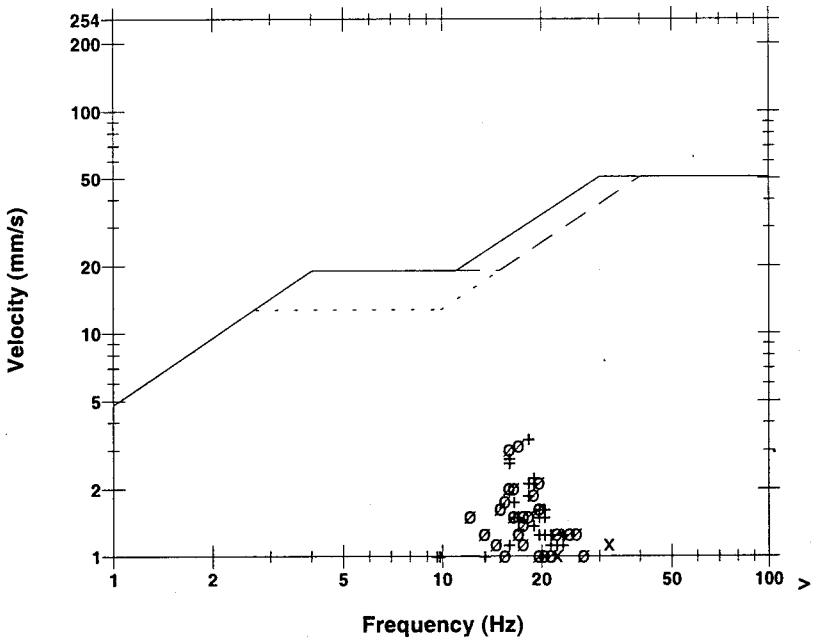
Post Event Notes
11-SD-54/125 001923
BLAST3H STATION 4 + 59 TO 4 + 86
60.6 KG ANFO PER DELAY 372 m TO 6543
54.3 M LT 131 + 55 "B" LINE

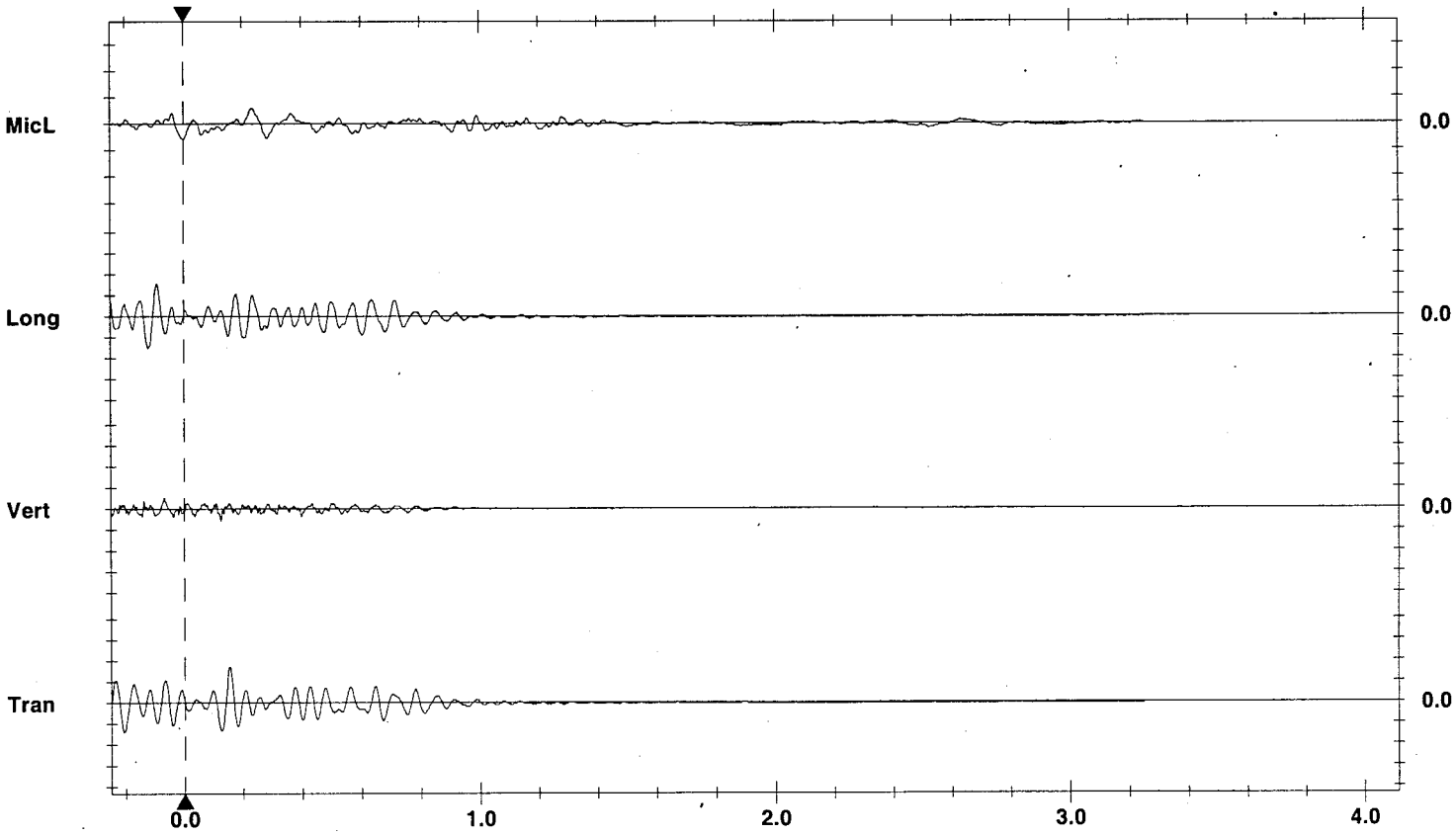
Microphone	Linear Weighting
PSPL	6.25 pa.(L) at 0.000 sec
ZC Freq	9.8 Hz
Channel Test	Passed (Freq = 20.1 Hz Amp = 687 mv)

	Tran	Vert	Long	
PPV	3.43	1.14	3.17	mm/s
ZC Freq	18	32	17	Hz
Time (Rel. to Trig)	0.151	0.124	-0.092	sec
Peak Acceleration	0.0398	0.0398	0.0398	g
Peak Displacement	0.0291	0.00664	0.0317	mm
Sensorcheck ™	Passed	Passed	Passed	

Peak Vector Sum 3.96 mm/s at 0.151 sec

USBM RI8507 And OSMRE





Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.00 mm/s/div Mic: 10.00 pa.(L)/div
Trigger = ▶— — —◀

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Event Report

Date/Time	MicL at 14:35:40 June 21, 1999	**Serial Number**	BC6544 V 4.0-4.0 MiniMate Plus
Trigger Source	Geo: 10.00 mm/s	**Battery Level**	6.4 Volts
	Mic: 6.32 pa.(L)	**Calibration**	June 16, 1999 by Instantel Inc.
Range	Geo :254 mm/s	**File Name**	H5447JUB.7G0
Record Time	4.25 sec (Auto=3Sec) at 1024 sps		
Job Number:	3		

Notes
Location:
Client:
User Name:
General:

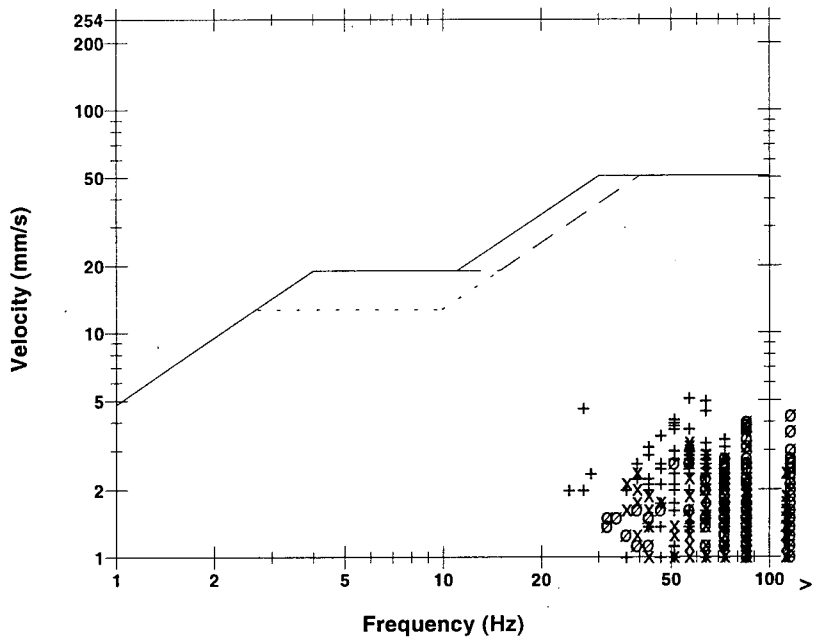
Post Event Notes
11-SD-54/125 001923
BLAST3H STATION 4 + 59 TO 4 + 86
60.6 KG ANFO PER DELAY183 m TO 6544.
13 m LT 129 + 70 "D" LINE

Microphone	Linear Weighting
PSPL	15.5 pa.(L) at 0.458 sec
ZC Freq	10 Hz
Channel Test	Passed (Freq = 19.0 Hz Amp = 719 mv)

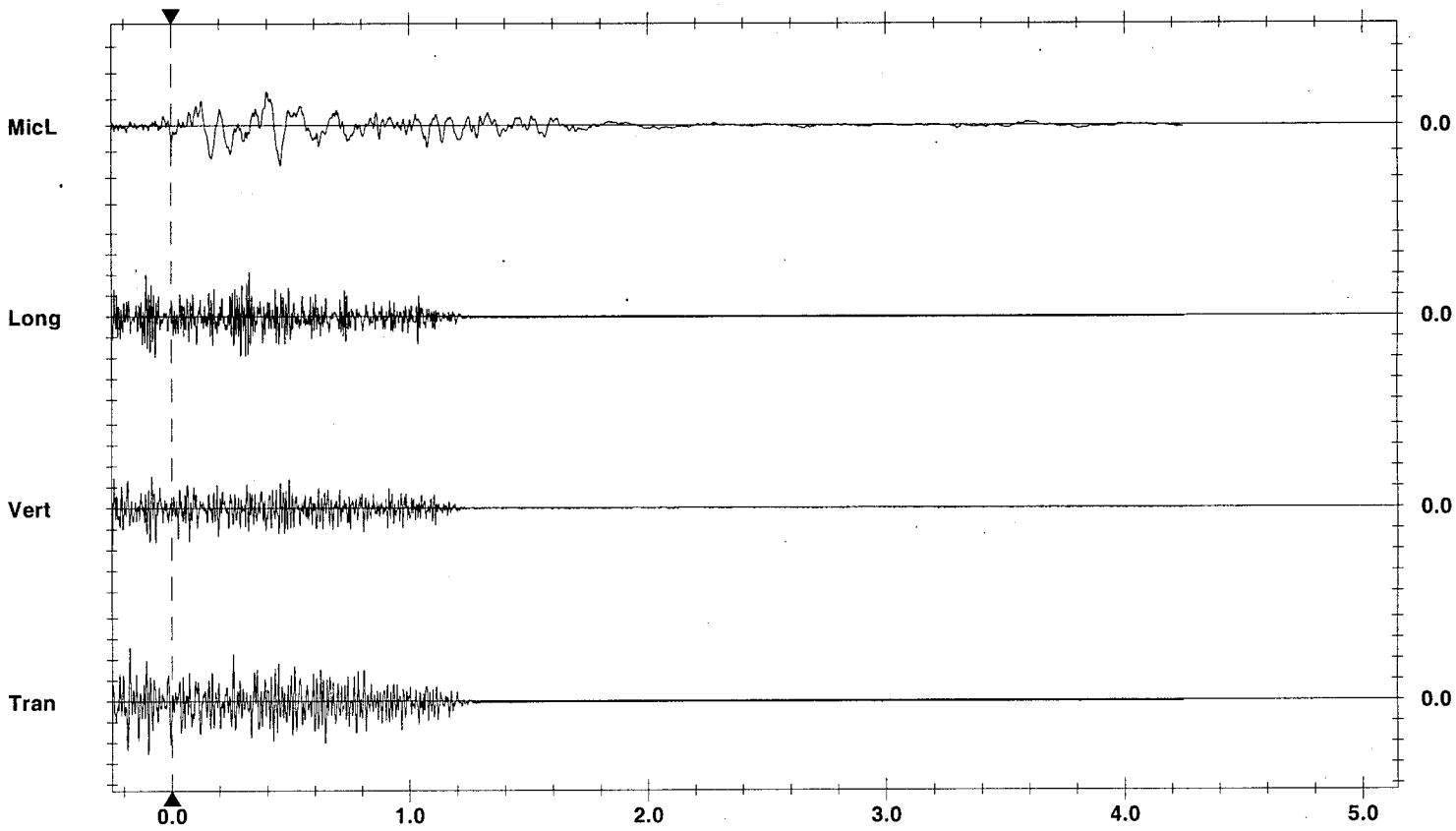
	Tran	Vert	Long	
PPV	5.21	3.94	4.32	mm/s
ZC Freq	57	85	>100	Hz
Time (Rel. to Trig)	-0.177	-0.248	0.326	sec
Peak Acceleration	0.239	0.159	0.239	g
Peak Displacement	0.0186	0.00769	0.00763	mm
Sensorcheck ™	Passed	Passed	Passed	

Peak Vector Sum 5.54 mm/s at -0.177 sec

USBM RI8507 And OSMRE



Tran: + Vert: x Long: ø



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.00 mm/s/div Mic: 10.00 pa.(L)/div
Trigger = ▶— — —◀

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Event Report

Date/Time	Tran at 14:35:42 June 21, 1999	**Serial Number**	BA6633 V 4.0-4.0 BlastMate III
Trigger Source	Geo: 3.00 mm/s	**Battery Level**	6.3 Volts
	Mic: 100.0 pa.(L)	**Calibration**	May 28, 1999 by Instantel Inc.
Range	Geo :254 mm/s	**File Name**	H6337JUB.7I0
Record Time	2.0 sec at 1024 sps		
Job Number:	1		

Notes
Location:
Client:
User Name:
General:

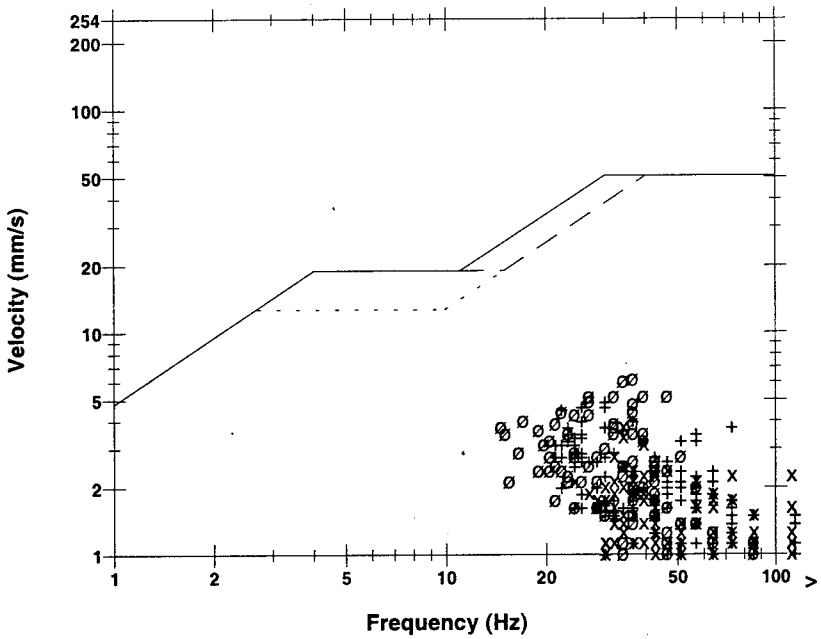
Post Event Notes
11-SD-54/125 001923
BLAST3H STATION 4 + 59 TO 4 + 86
60.6 KG ANFO PER DELAY154 m TO 6543
QUARRY ROAD 76.2 m SOUTH OF SWAPMEET RD

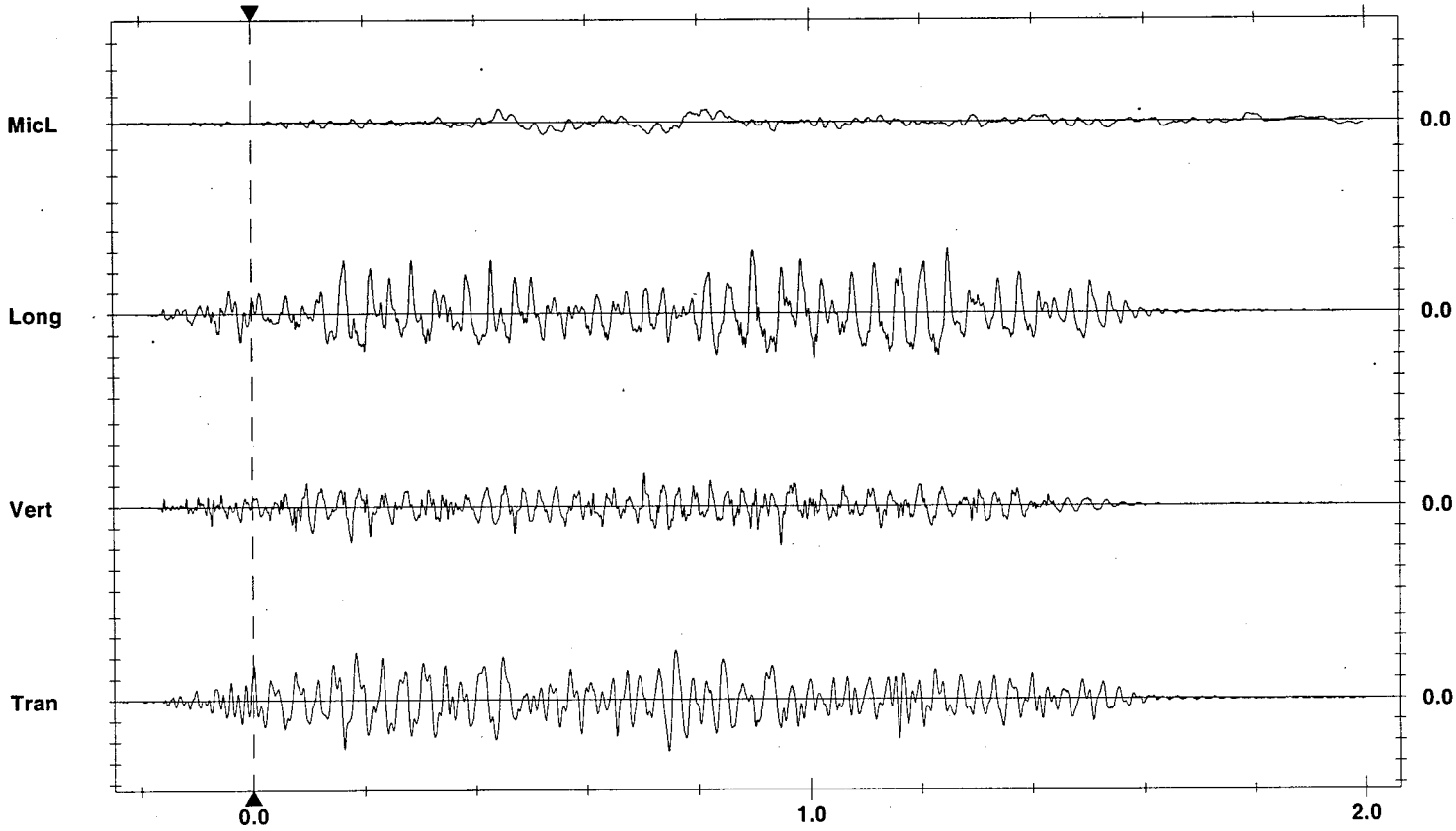
Microphone	Linear Weighting
PSPL	5.00 pa.(L) at 0.442 sec
ZC Freq	9.7 Hz
Channel Test	Passed (Freq = 19.3 Hz Amp = 690 mv)

	Tran	Vert	Long	
PPV	4.95	3.81	6.22	mm/s
ZC Freq	30	34	37	Hz
Time (Rel. to Trig)	0.746	0.947	1.248	sec
Peak Acceleration	0.146	0.186	0.186	g
Peak Displacement	0.0253	0.0138	0.0404	mm
Sensorcheck ™	Passed	Passed	Passed	

Peak Vector Sum 6.56 mm/s at 0.163 sec

USBM RI8507 And OSMRE





Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.00 mm/s/div Mic: 10.00 pa.(L)/div
Trigger = ▶— — —◀

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Event Report

Date/Time	Tran at 13:35:30 June 18, 1999	**Serial Number**	BA6633 V 4.0-4.0 BlastMate III
Trigger Source	Geo: 3.00 mm/s	**Battery Level**	6.3 Volts
	Mic: 100.0 pa.(L)	**Calibration**	May 28, 1999 by Instantel Inc.
Range	Geo :254 mm/s	**File Name**	H6337JOO.F60
Record Time	2.0 sec at 1024 sps		
Job Number:	1		

Notes
Location:
Client:
User Name:
General:

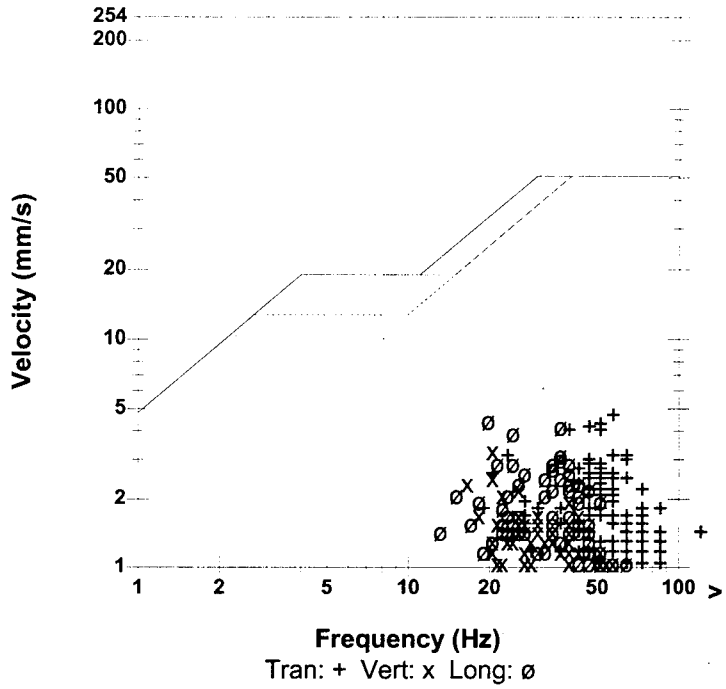
Post Event Notes
11-SD-54/125 001923
BLAST 9B STATION 121 + 90 TO 122 +05
41 KG ANFO PER DELAY 114 m TO 6633
8546 LAKE BLUFF CIRCLE

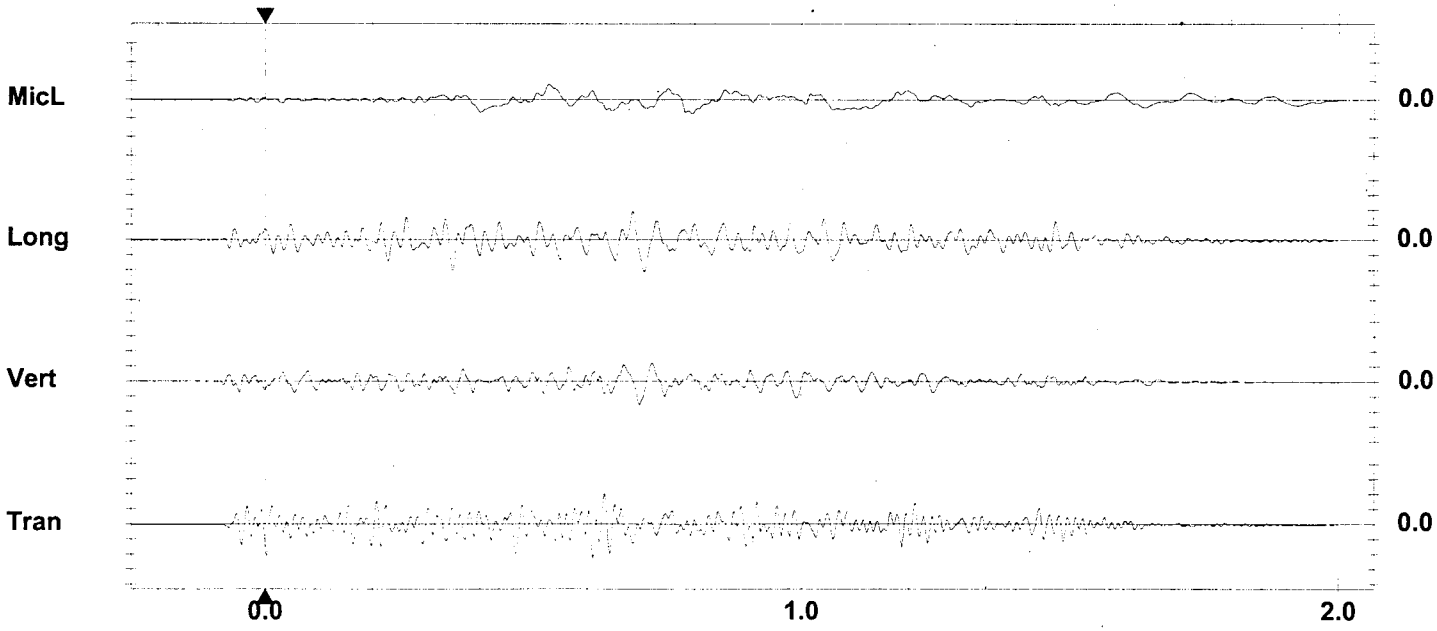
Microphone	Linear Weighting
PSPL	8.25 pa.(L) at 0.528 sec
ZC Freq	9.0 Hz
Channel Test	Passed (Freq = 19.3 Hz Amp = 786 mv)

	Tran	Vert	Long	
PPV	4.57	3.17	4.32	mm/s
ZC Freq	57	20	20	Hz
Time (Rel. to Trig)	0.610	0.698	0.707	sec
Peak Acceleration	0.146	0.0663	0.0928	g
Peak Displacement	0.0165	0.0215	0.0304	mm
Sensorcheck ™	Passed	Passed	Passed	

Peak Vector Sum 4.76 mm/s at 0.611 sec

USBM RI8507 And OSMRE





Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.00 mm/s/div Mic: 10.00 pa.(L)/div
Trigger = ▶----------◀

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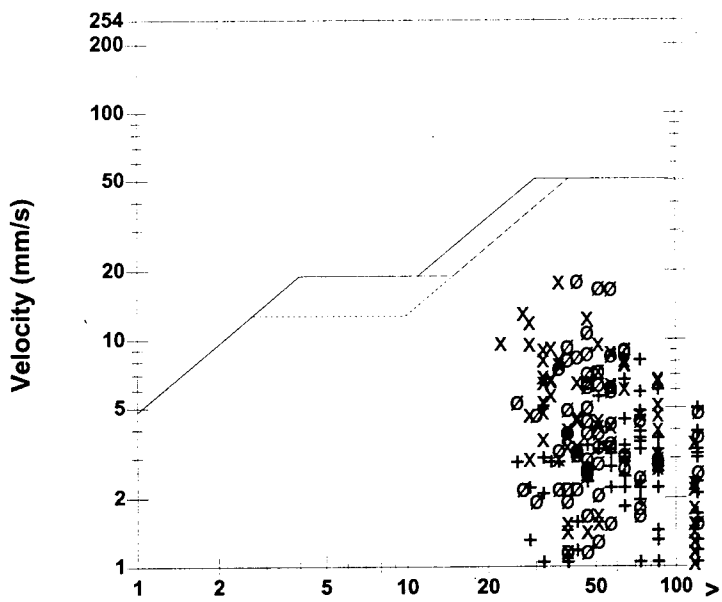
Event Report

Date/Time	Long at 10:33:33 July 2, 1999	**Serial Number**	BC6543 V 4.0-4.0 MiniMate Plus
Trigger Source	Geo: 3.00 mm/s	**Battery Level**	6.4 Volts
Range	Geo :254 mm/s	**Calibration**	June 16, 1999 by Instantel Inc.
Record Time	3.75 sec (Auto=3Sec) at 1024 sps	**File Name**	H5437KED.BX0
Job Number:	10		

Notes
EA 11-001923
SR 54/125 KP 9.7
Blast Number:
Monitoring Location:

Post Event Notes
11-SD-54/125 001923
BLAST10B STATION 121+85 TO 122+05
41 KG ANFO PER DELAY 86 m TO 6543
8573 LAKE BLUFF CIRCLE

USBM RI8507 And OSMRE

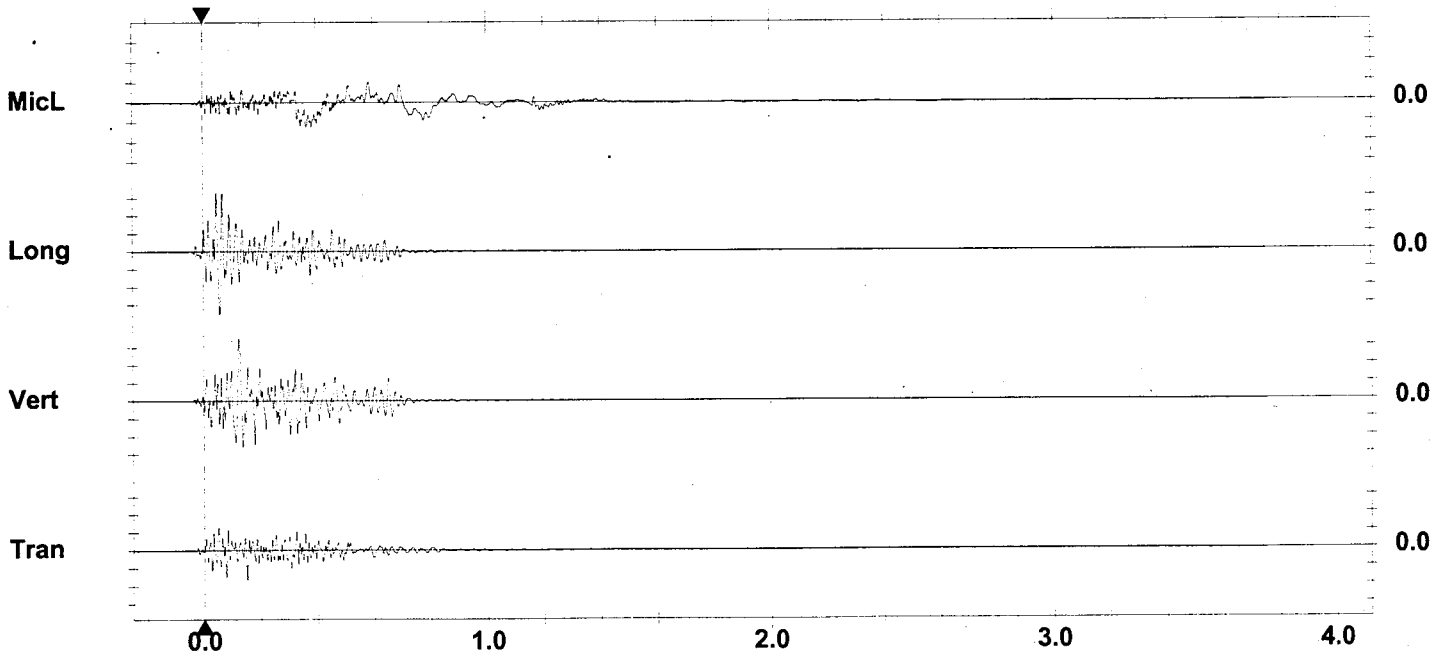


Tran: + Vert: x Long: ø

Microphone	Linear Weighting		
PSPL	12.3 pa.(L) at 0.366 sec		
ZC Freq	5.3 Hz		
Channel Test	Passed (Freq = 18.6 Hz Amp = 668 mv)		

	Tran	Vert	Long	
PPV	8.25	17.5	17.7	mm/s
ZC Freq	64	37	43	Hz
Time (Rel. to Trig)	0.150	0.125	0.059	sec
Peak Acceleration	0.305	0.451	0.663	g
Peak Displacement	0.0197	0.0770	0.0673	mm
Sensorcheck ™	Passed	Passed	Passed	

Peak Vector Sum 18.7 mm/s at 0.126 sec



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 5.00 mm/s/div Mic: 10.00 pa.(L)/div
Trigger = ▶----------◀

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Event Report

Date/Time	Vert at 10:33:34 July 2, 1999	**Serial Number**	BA6633 V 4.0-4.0 BlastMate III
Trigger Source	Geo: 3.00 mm/s	**Battery Level**	6.3 Volts
	Mic: 100 pa.(L)	**Calibration**	May 28, 1999 by Instantel Inc.
Range	Geo :254 mm/s	**File Name**	H6337KED.BY0
Record Time	3.0 sec at 4096 sps		
Job Number:	1		

Notes
Location:
Client:
User Name:
General:

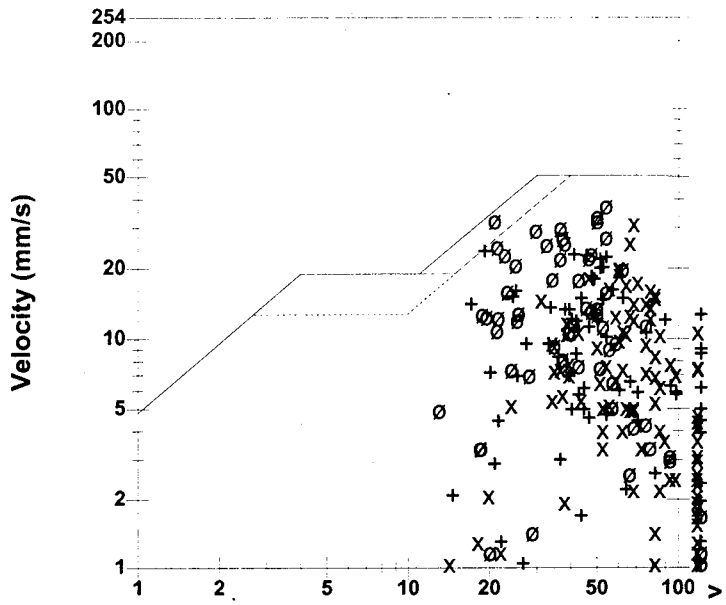
Post Event Notes
11-SD-54/125 001923
BLAST10B STATION 121+85 TO 122+05
41 KG ANFO PER DELAY 19 m TO 6633
86 M LT 121+77 "BR" LINE

Microphone	Linear Weighting
PSPL	141 pa.(L) at 0.980 sec
ZC Freq	98 Hz
Channel Test	Passed (Freq = 19.3 Hz Amp = 788 mv)

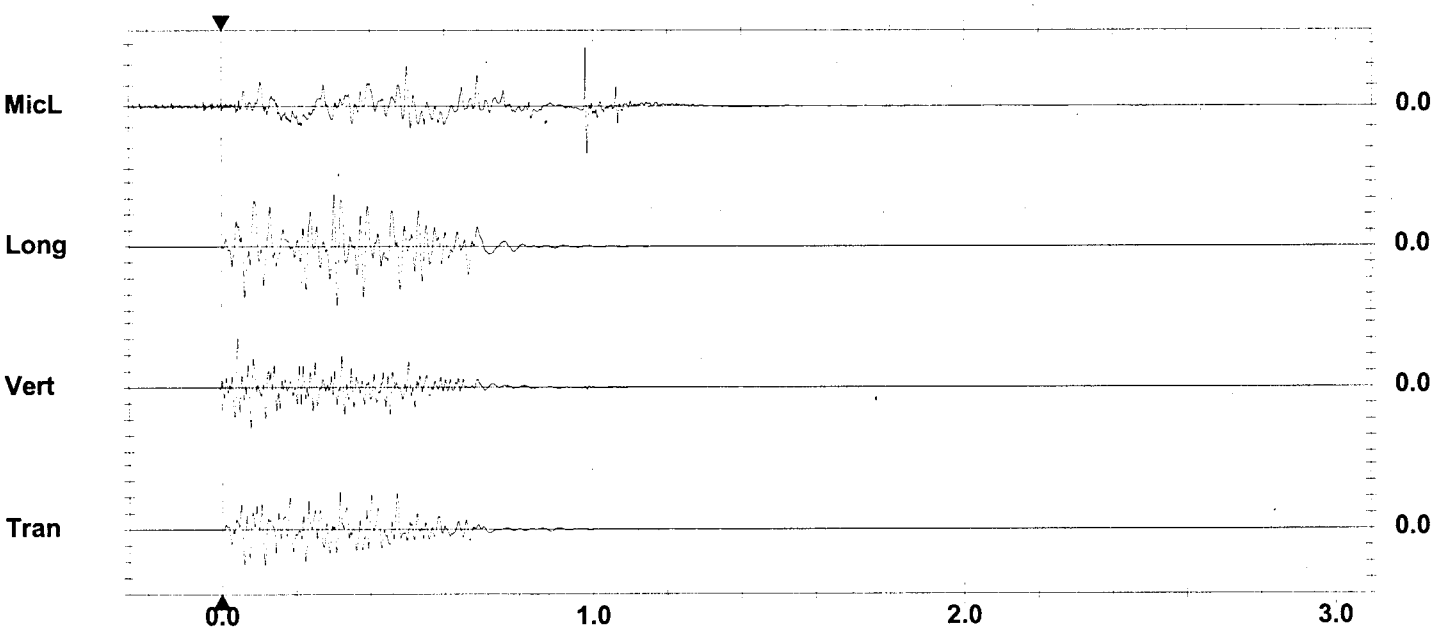
	Tran	Vert	Long	
PPV	23.1	30.5	36.4	mm/s
ZC Freq	19.1	68	54	Hz
Time (Rel. to Trig)	0.317	0.043	0.311	sec
Peak Acceleration	0.901	1.48	1.38	g
Peak Displacement	0.114	0.0679	0.159	mm
Sensorcheck ™	Passed	Passed	Passed	

Peak Vector Sum 38.2 mm/s at 0.311 sec

USBM RI8507 And OSMRE



Tran: + Vert: x Long: ø



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 10.00 mm/s/div Mic: 50.0 pa.(L)/div
Trigger = ▶----------◀

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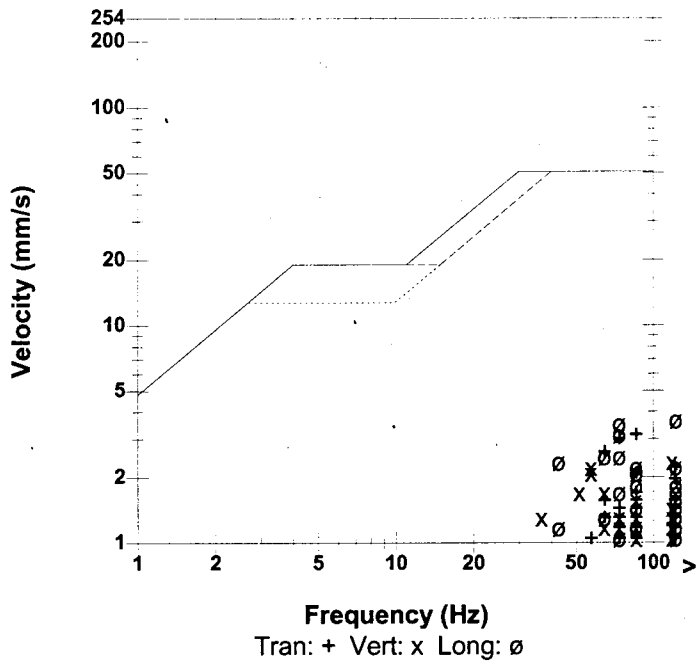
Event Report

Date/Time	Long at 10:33:38 July 2, 1999	**Serial Number**	BC6544 V 4.0-4.0 MiniMate Plus
Trigger Source	Geo: 3.00 mm/s	**Battery Level**	6.3 Volts
Range	Geo :254 mm/s	**Calibration**	June 16, 1999 by Instantel Inc.
Record Time	3.25 sec (Auto=3Sec) at 1024 sps	**File Name**	H5447KED.C20
Job Number:	10`		

Notes
Location:
Client:
User Name:
General:

Post Event Notes
11-SD-54/125 001923
BLAST10B STATION 121+85 TO 122+05
41 KG ANFO PER DELAY 156 m TO 6544
8490 AVENIDA ANGUILA

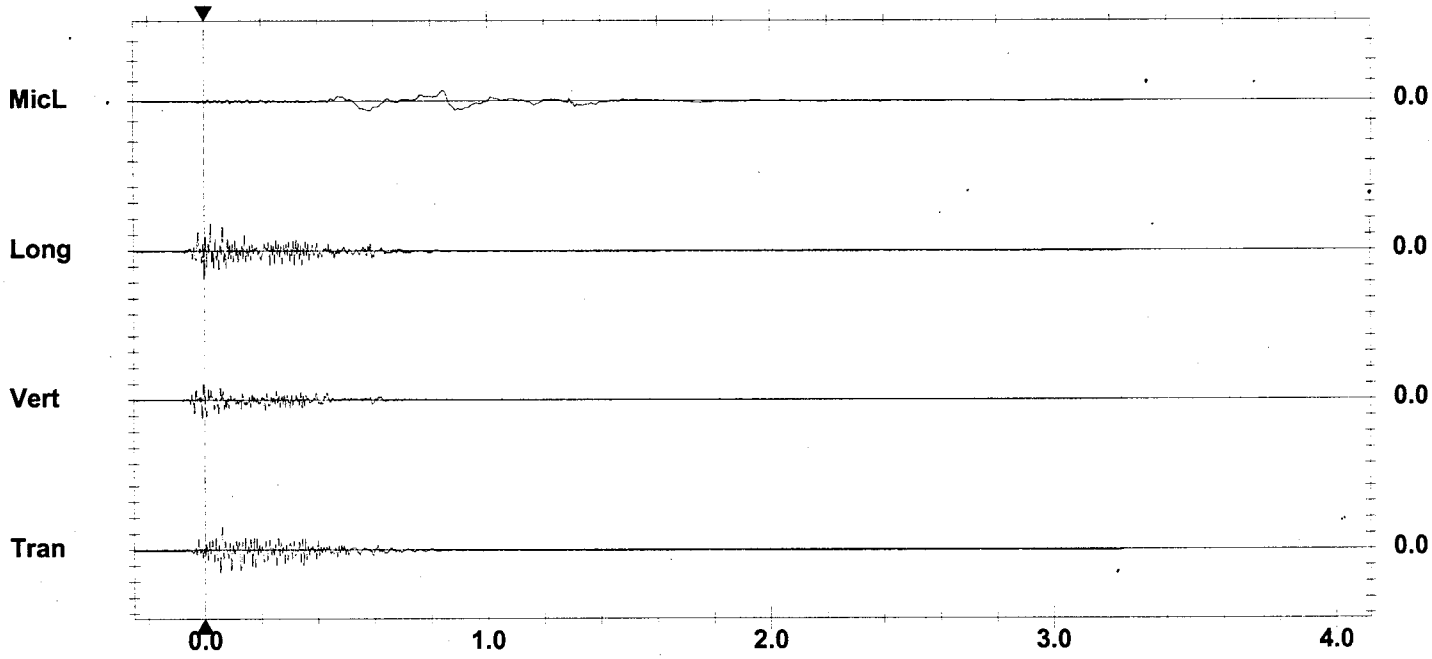
USBM RI8507 And OSMRE



Microphone	Linear Weighting
PSPL	5.50 pa.(L) at 0.845 sec
ZC Freq	3.8 Hz
Channel Test	Passed (Freq = 20.1 Hz Amp = 669 mv)

	Tran	Vert	Long	
PPV	3.05	2.29	3.56	mm/s
ZC Freq	85	>100	>100	Hz
Time (Rel. to Trig)	0.055	-0.008	0.000	sec
Peak Acceleration	0.159	0.159	0.212	g
Peak Displacement	0.00614	0.00589	0.00707	mm
Sensorcheck ™	Passed	Passed	Passed	

Peak Vector Sum 3.67 mm/s at 0.022 sec



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.00 mm/s/div Mic: 10.00 pa.(L)/div
Trigger = ▶----------◀

Format Copyrighted 1996-1998

Event Report

Date/Time	Long at 13:05:22 June 23, 1999	**Serial Number**	BC6543 V 4.0-4.0 MiniMate Plus
Trigger Source	Geo: 3.00 mm/s	**Battery Level**	6.3 Volts
Range	Geo :254 mm/s	**Calibration**	June 16, 1999 by Instantel Inc.
Record Time	3.75 sec (Auto=3Sec) at 1024 sps	**File Name**	H5437JXW.CY0
Job Number:	11		

Notes
Location:
Client:
User Name:
General:

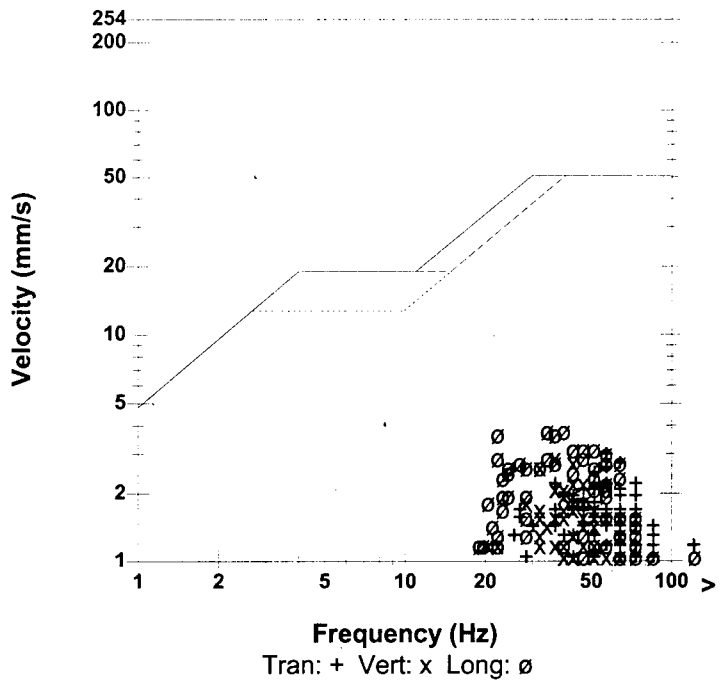
Post Event Notes
11-SD-54/125 001923
BLAST11B STATION 123 + 80 TO 124+40
102 KG ANFO PER DELAY 195 m TO 6543
VACANT LOT ON CULDESAC, EAST OF QUARRY Rd.

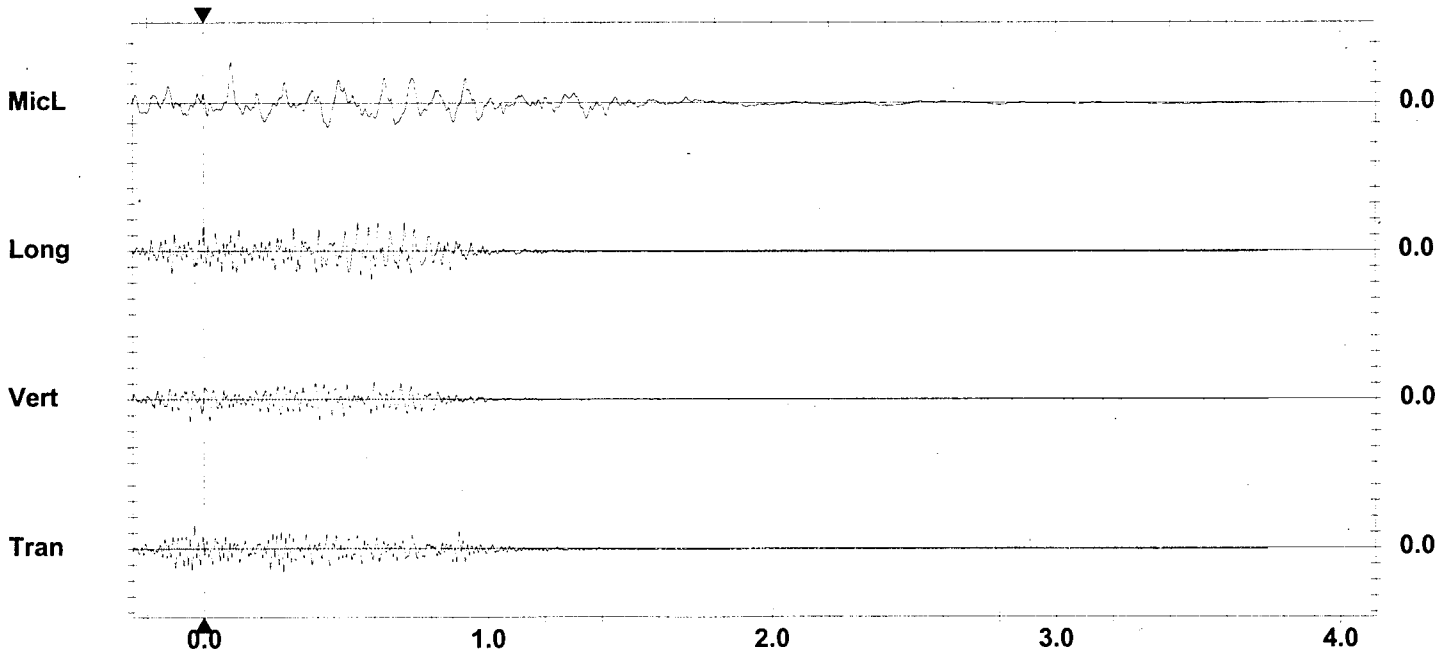
Microphone	Linear Weighting
PSPL	20.5 pa.(L) at 0.099 sec
ZC Freq	12 Hz
Channel Test	Passed (Freq = 20.1 Hz Amp = 673 mv)

	Tran	Vert	Long	
PPV	2.92	2.79	3.68	mm/s
ZC Freq	57	37	34	Hz
Time (Rel. to Trig)	-0.034	-0.048	0.543	sec
Peak Acceleration	0.106	0.0795	0.119	g
Peak Displacement	0.00943	0.0118	0.0195	mm
Sensorcheck ™	Passed	Passed	Passed	

Peak Vector Sum 4.00 mm/s at 0.591 sec

USBM RI8507 And OSMRE





Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.00 mm/s/div Mic: 10.00 pa.(L)/div
Trigger = ▶----------◀

Format Copyrighted 1996-1998

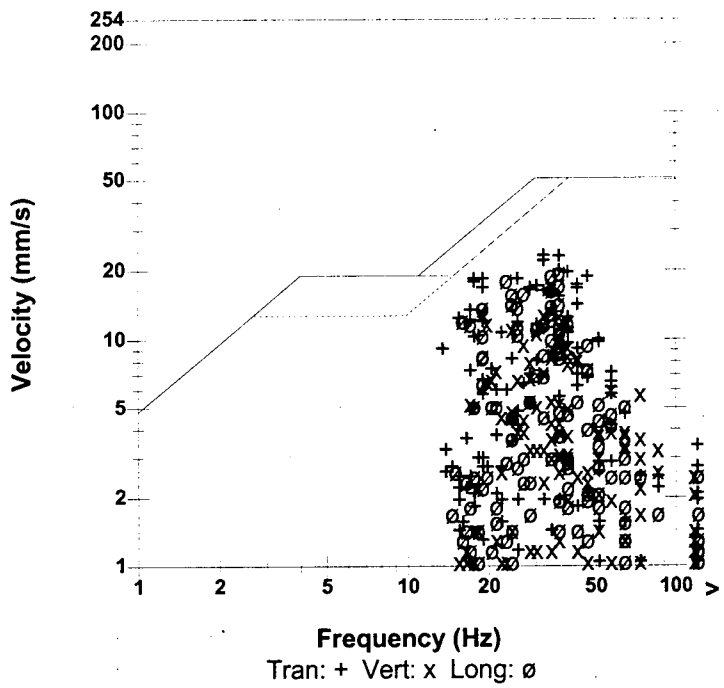
Event Report

Date/Time	Tran at 13:05:24 June 23, 1999	**Serial Number**	BC6544 V 4.0-4.0 MiniMate Plus
Trigger Source	Geo: 3.00 mm/s	**Battery Level**	6.3 Volts
Range	Geo :254 mm/s	**Calibration**	June 16, 1999 by Instantel Inc.
Record Time	4.75 sec (Auto=3Sec) at 1024 sps	**File Name**	H5447JXW.D00
Job Number:	11		

Notes
Location:
Client:
User Name:
General:

Post Event Notes
11-SD-54/125 001923
BLAST11B STATION 123 + 80 TO 124+40
102 KG ANFO PER DELAY321 m TO 6544
89 m LT 122+20 "B" LINE

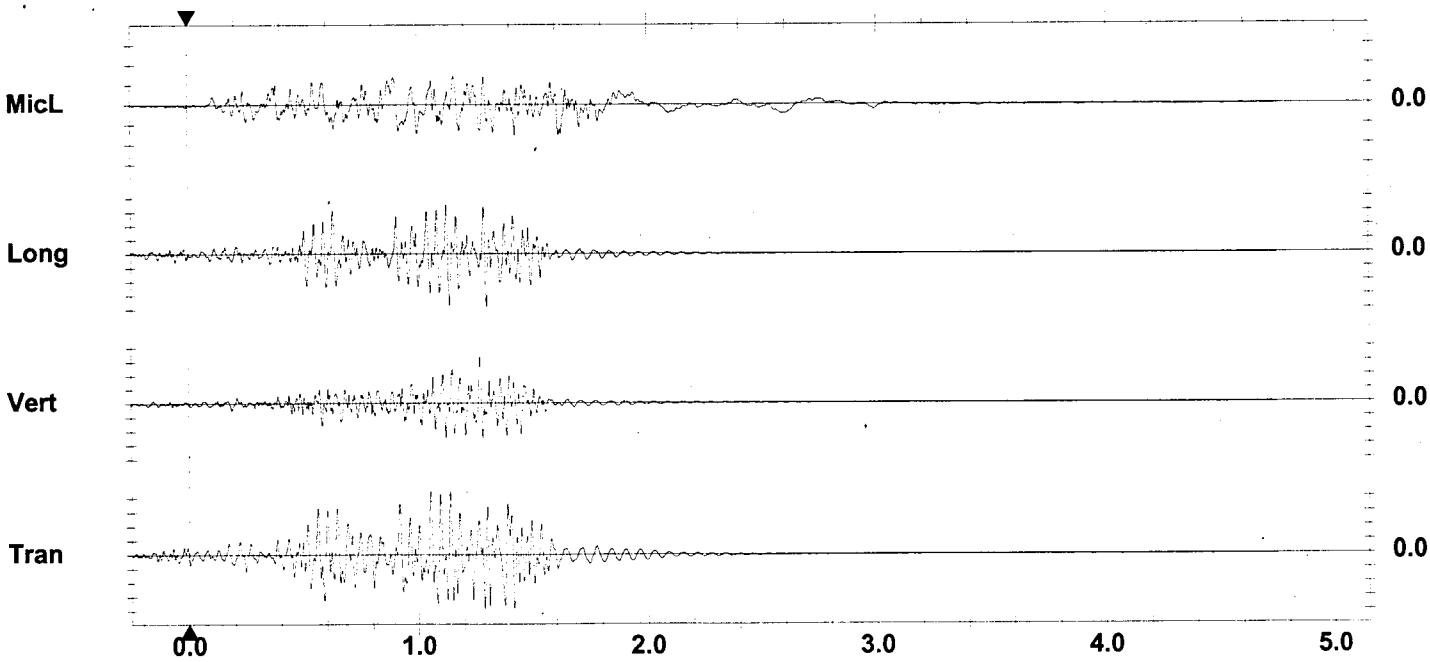
USBM RI8507 And OSMRE



Microphone	Linear Weighting
PSPL	15.3 pa.(L) at 1.425 sec
ZC Freq	22 Hz
Channel Test	Passed (Freq = 19.0 Hz Amp = 704 mv)

	Tran	Vert	Long	
PPV	22.6	16.6	19.0	mm/s
ZC Freq	32	34	37	Hz
Time (Rel. to Trig)	1.053	1.268	1.299	sec
Peak Acceleration	0.636	0.398	0.557	g
Peak Displacement	0.154	0.0694	0.0854	mm
Sensorcheck ™	Passed	Passed	Passed	

Peak Vector Sum 29.2 mm/s at 1.138 sec



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 5.00 mm/s/div Mic: 10.00 pa.(L)/div
Trigger = ▶----------◀

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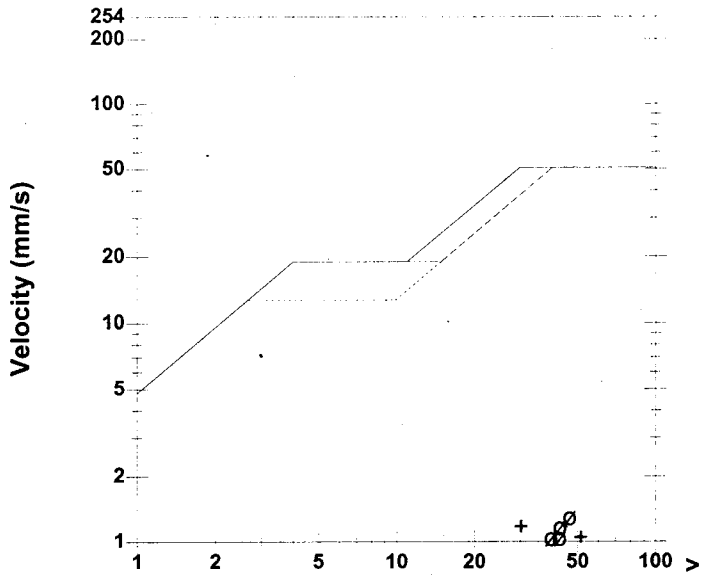
Event Report

Date/Time	Tran at 13:05:26 June 23, 1999	**Serial Number**	BA6633 V 4.0-4.0 BlastMate III
Trigger Source	Geo: 1.00 mm/s	**Battery Level**	6.3 Volts
	Mic: 100 pa.(L)	**Calibration**	May 28, 1999 by Instantel Inc.
Range	Geo :254 mm/s	**File Name**	H6337JXW.D20
Record Time	3.0 sec at 1024 sps		
Job Number:	1		

Notes
Location:
Client:
User Name:
General:

Post Event Notes
11-SD-54/125 001923
BLAST11B STATION 123 + 80 TO 124+40
102 KG ANFO PER DELAY 321 m TO 6633
15 m RT 127+35 "D" LINE

USBM RI8507 And OSMRE

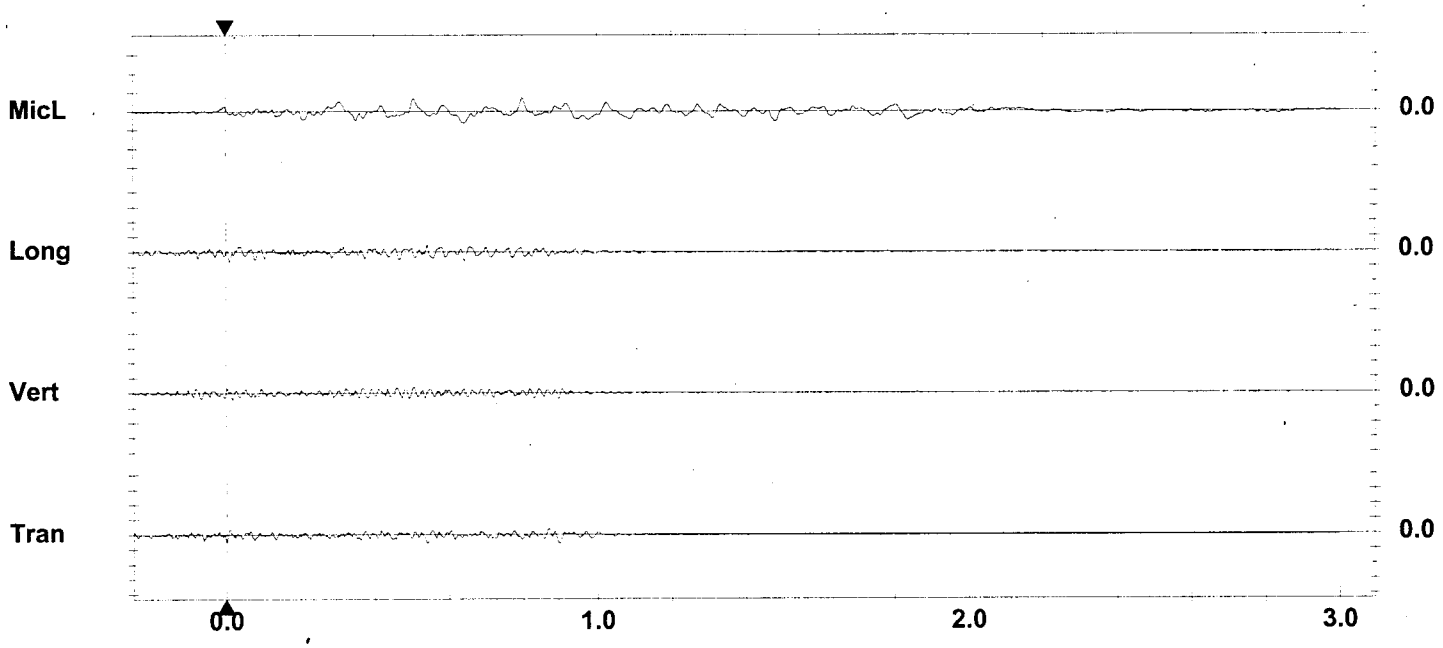


Tran: + Vert: x Long: ø

Microphone	Linear Weighting
PSPL	7.25 pa.(L) at 0.798 sec
ZC Freq	17 Hz
Channel Test	Passed (Freq = 19.3 Hz Amp = 780 mv)

	Tran	Vert	Long	
PPV	1.14	0.889	1.27	mm/s
ZC Freq	30	57	47	Hz
Time (Rel. to Trig)	0.540	0.018	0.010	sec
Peak Acceleration	0.0398	0.0398	0.0398	g
Peak Displacement	0.00651	0.00316	0.00521	mm
Sensorcheck ™	Passed	Passed	Passed	

Peak Vector Sum 1.45 mm/s at 0.542 sec



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.00 mm/s/div Mic: 10.00 pa.(L)/div
Trigger = ▶ ◀

 Format Copyrighted 1996-1998

Event Report

Date/Time	Long at 13:57:17 July 14, 1999	**Serial Number**	BC6543 V 4.0-4.0 MiniMate Plus
Trigger Source	Geo: 3.00 mm/s	**Battery Level**	6.4 Volts
Range	Geo :254 mm/s	**Calibration**	June 16, 1999 by Instantel Inc.
Record Time	4.25 sec (Auto=3Sec) at 1024 sps	**File Name**	H5437L0U.RH0
Job Number:	12		

Notes
EA 11-001923
SR 54/125 KP 9.7
Blast Number:
Monitoring Location:

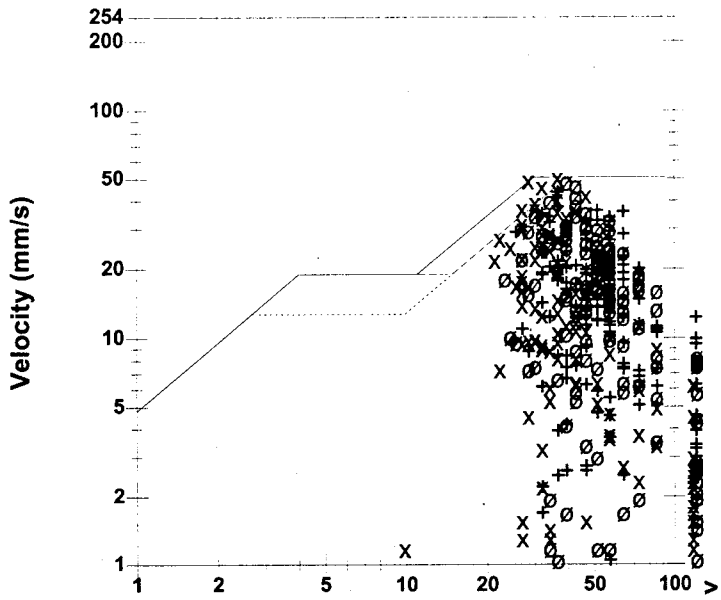
Post Event Notes
11-SD-54/125 001923
BLAST 12B STATION 123+20 TO 123+80
102 KG ANFO PER DELAY 169 m TO 6543
8573 LAKE BLUFF CIRCLE

Microphone	Linear Weighting
PSPL	28.0 pa.(L) at 0.567 sec
ZC Freq	5.2 Hz
Channel Test	Passed (Freq = 19.0 Hz Amp = 662 mv)

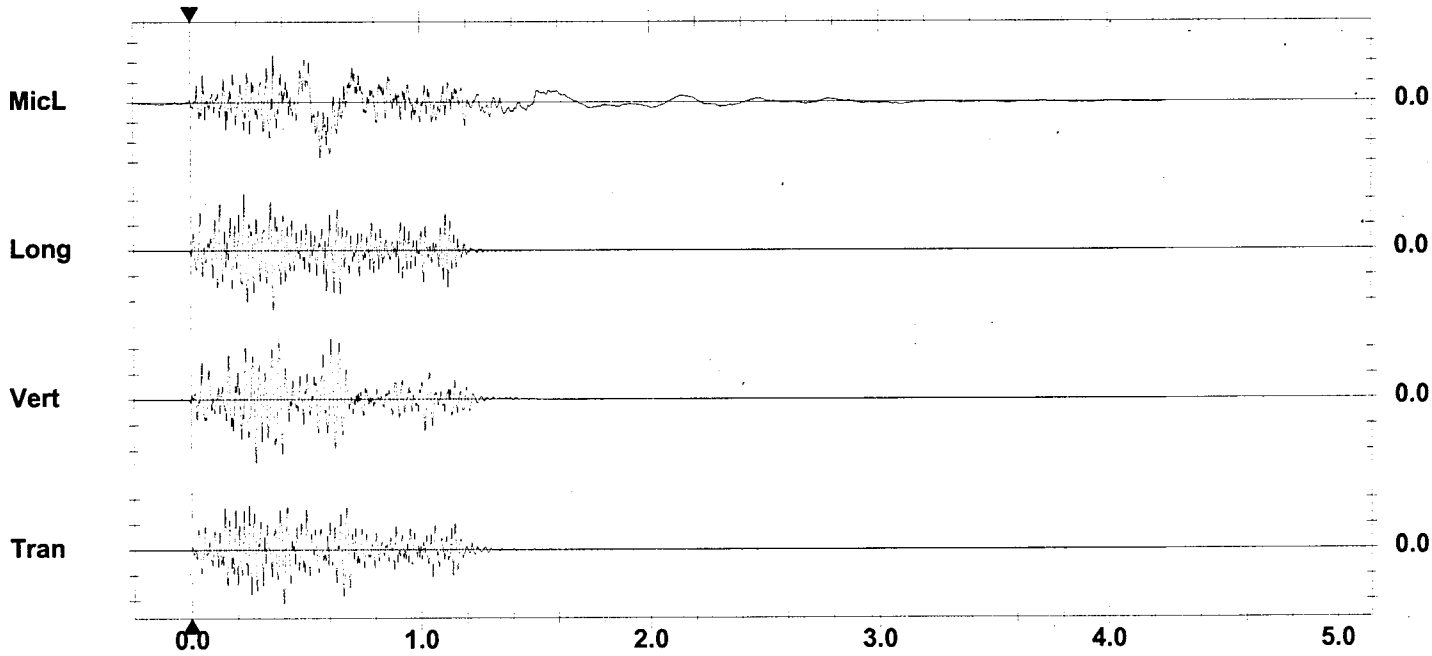
	Tran	Vert	Long	
PPV	42.4	49.3	47.0	mm/s
ZC Freq	37	37	39	Hz
Time (Rel. to Trig)	0.400	0.281	0.359	sec
Peak Acceleration	1.42	1.46	1.58	g
Peak Displacement	0.172	0.228	0.187	mm
Sensorcheck ™	Passed	Passed	Passed	

Peak Vector Sum 57.1 mm/s at 0.282 sec

USBM RI8507 And OSMRE



Tran: + Vert: x Long: ø



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 20.0 mm/s/div Mic: 10.00 pa.(L)/div
Trigger =

Format Copyrighted 1996-1998

Event Report

Date/Time	Vert at 13:57:17 July 14, 1999	**Serial Number**	BA6633 V 4.0-4.0 BlastMate III
Trigger Source	Geo: 3.00 mm/s	**Battery Level**	6.3 Volts
	Mic: 100 pa.(L)	**Calibration**	May 28, 1999 by Instantel Inc.
Range	Geo :254 mm/s	**File Name**	H6337L0U.RH0
Record Time	3.0 sec at 4096 sps		
Job Number:	1		

Notes
Location:
Client:
User Name:
General:

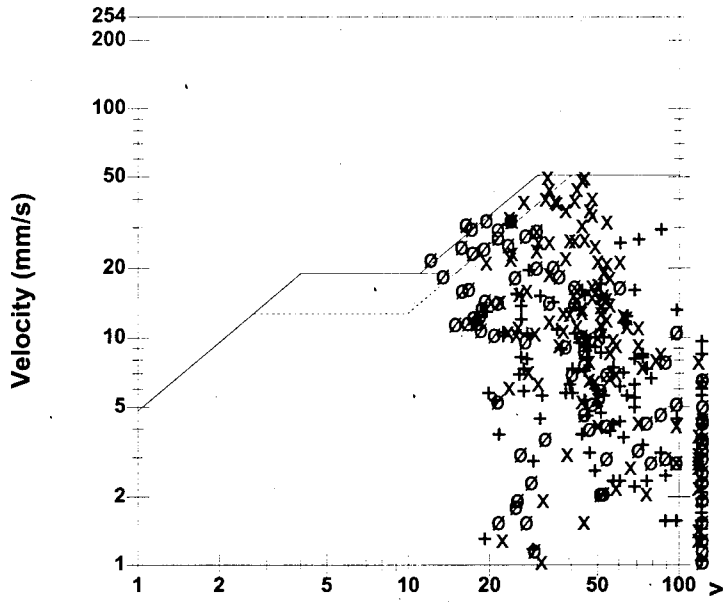
Post Event Notes
11-SD-54/125 001923
BLAST 12B STATION 123+20 TO 123+80
102 KG ANFO PER DELAY 89 m TO 6633
8546 LAKE BLUFF CIRCLE

Microphone	Linear Weighting
PSPL	69.8 pa.(L) at 0.386 sec
ZC Freq	5.2 Hz
Channel Test	Passed (Freq = 19.0 Hz Amp = 773 mv)

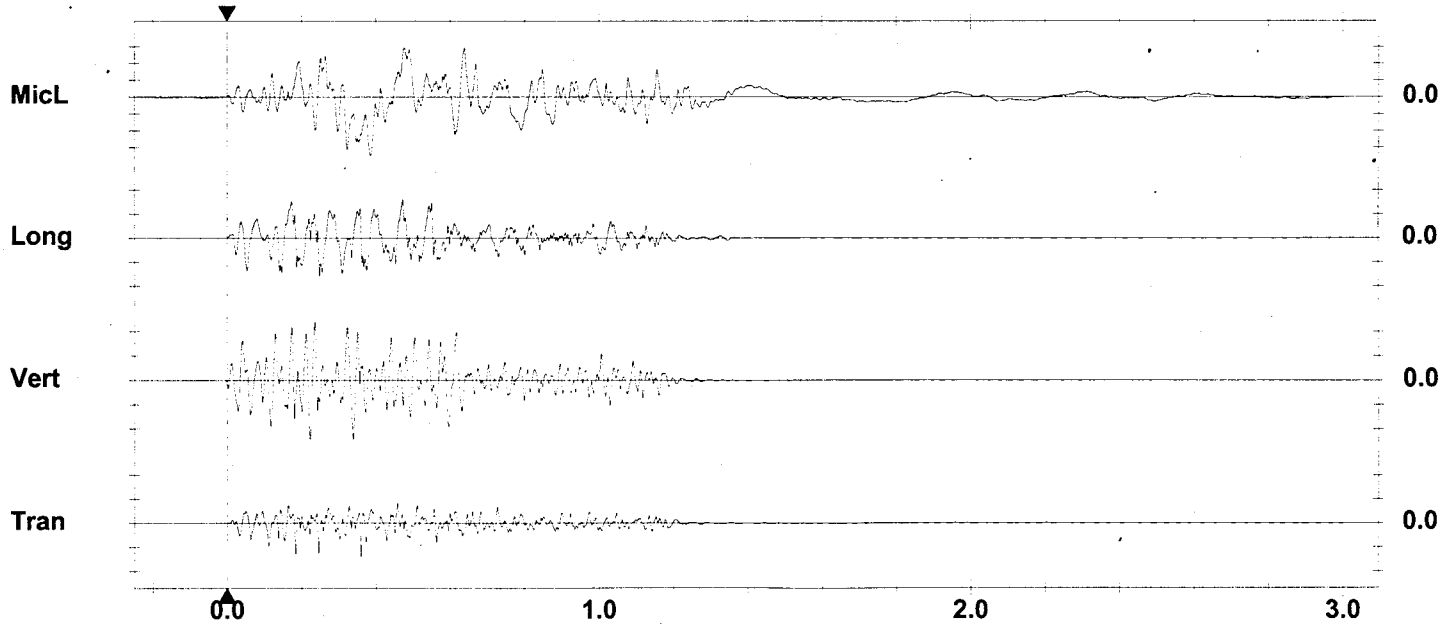
	Tran	Vert	Long	
PPV	28.6	49.0	31.9	mm/s
ZC Freq	85	32.5	19.3	Hz
Time (Rel. to Trig)	0.360	0.338	0.472	sec
Peak Acceleration	1.54	2.23	1.54	g
Peak Displacement	0.0850	0.194	0.275	mm
Sensorcheck ™	Passed	Passed	Passed	

Peak Vector Sum 53.1 mm/s at 0.174 sec

USBM RI8507 And OSMRE



Tran: + Vert: x Long: ø



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 20.0 mm/s/div Mic: 20.0 pa.(L)/div
Trigger = ▶----------◀

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Event Report

Date/Time	Vert at 13:57:27 July 14, 1999	**Serial Number**	BC6544 V 4.0-4.0 MiniMate Plus
Trigger Source	Geo: 3.00 mm/s	**Battery Level**	6.4 Volts
Range	Geo :254 mm/s	**Calibration**	June 16, 1999 by Instantel Inc.
Record Time	3.75 sec (Auto=3Sec) at 1024 sps	**File Name**	H5447L0U.RR0
Job Number:	12		

Notes
Location:
Client:
User Name:
General:

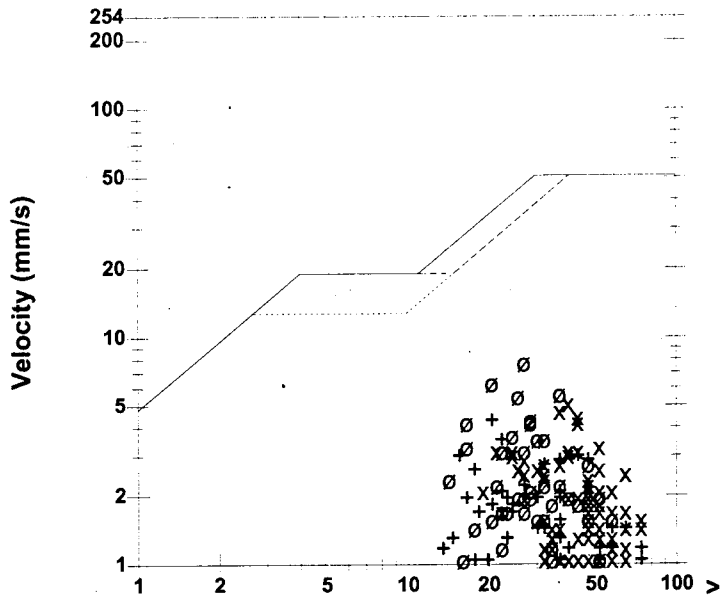
Post Event Notes
11-SD-54/125 001923
BLAST 12B STATION 123+20 TO 123+80
102 KG ANFO PER DELAY 102 m TO 6544
QUARRY RD. 152 M SOUTH OF ROCK/FILL CONTACT

Microphone Linear Weighting
PSPL 30.8 pa.(L) at 0.544 sec
ZC Freq 8.7 Hz
Channel Test Passed (Freq = 20.1 Hz Amp = 683 mv)

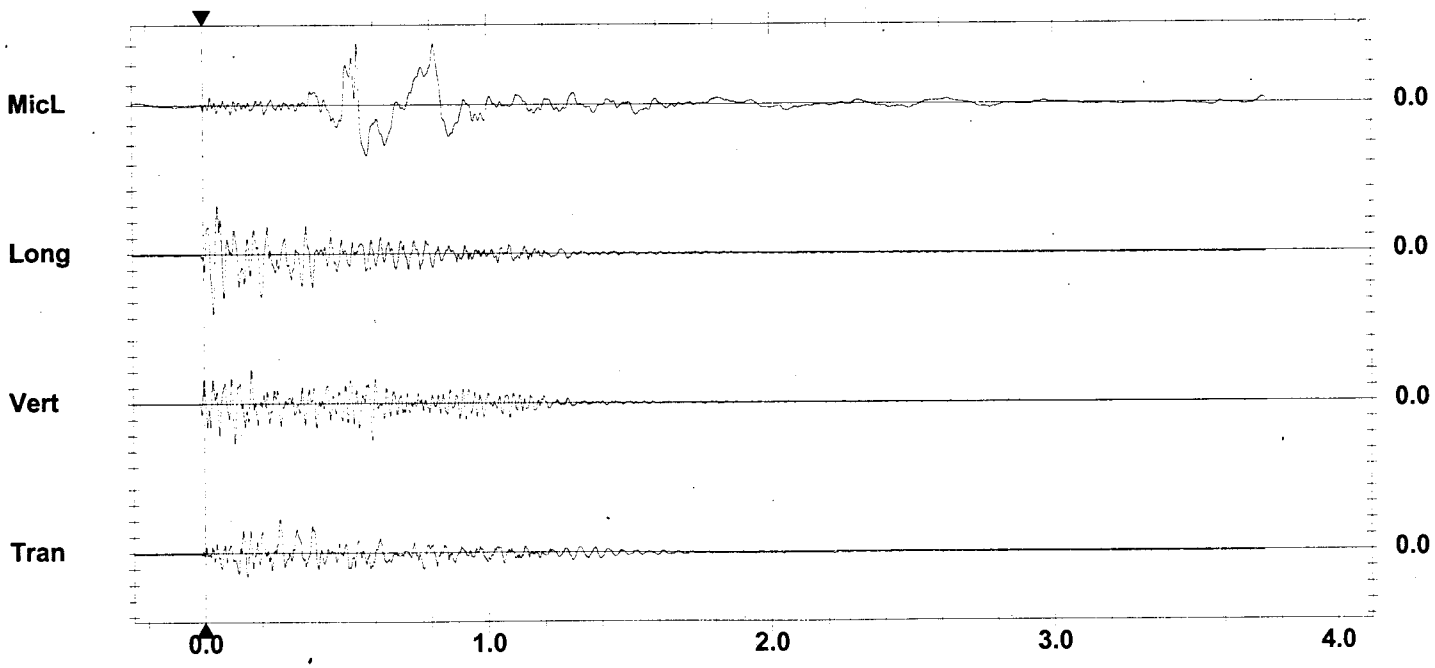
	Tran	Vert	Long	
PPV	4.19	4.95	7.49	mm/s
ZC Freq	20	39	27	Hz
Time (Rel. to Trig)	0.264	0.108	0.035	sec
Peak Acceleration	0.0928	0.133	0.159	g
Peak Displacement	0.0268	0.0203	0.0450	mm
Sensorcheck ™	Passed	Passed	Passed	

Peak Vector Sum 7.75 mm/s at 0.035 sec

USBM RI8507 And OSMRE



Tran: + Vert: x Long: ø



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.00 mm/s/div Mic: 10.00 pa.(L)/div
Trigger = ▶----------◀

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Event Report

Date/Time	Long at 13:01:36 July 27, 1999	**Serial Number**	BA6633 V 4.0-4.0 BlastMate III
Trigger Source	Geo: 2.00 mm/s	**Battery Level**	6.2 Volts
Range	Geo :254 mm/s	**Calibration**	May 28, 1999 by Instantel Inc.
Record Time	3.0 sec at 4096 sps	**File Name**	H6337LOU.UO0
Job Number:	1		

Notes
Location:
Client:
User Name:
General:

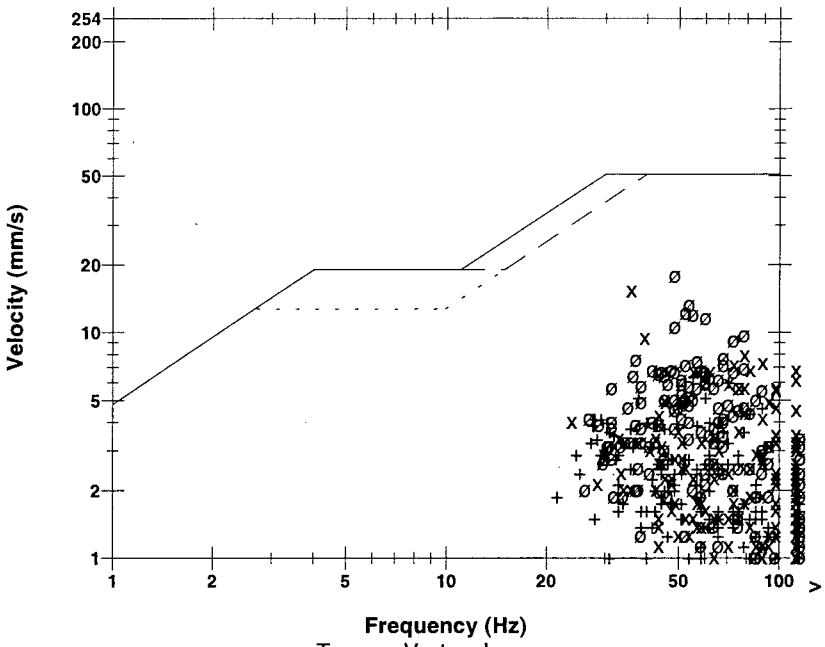
Post Event Notes
11-SD-54/125 001923
BLAST 13B STATION 122+60 TO 123+20
102 KG ANFO PER DELAY 139 m TO 6633
8573 LAKE BLUFF CIRCLE

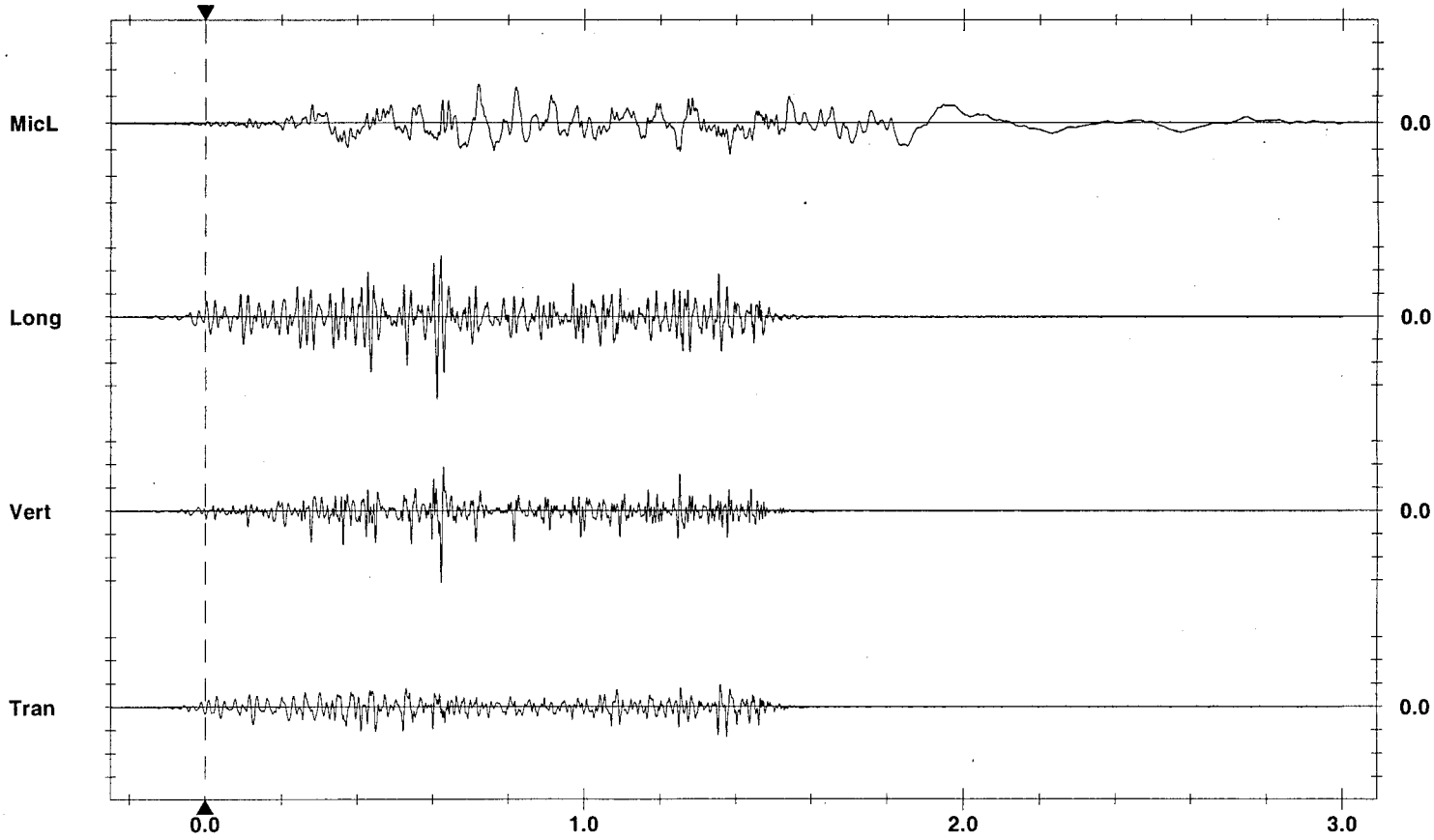
Microphone	Linear Weighting
PSPL	14.5 pa.(L) at 0.719 sec
ZC Freq	12.8 Hz
Channel Test	Passed (Freq = 19.0 Hz Amp = 775 mv)

	Tran	Vert	Long	
PPV	6.48	15.5	18.0	mm/s
ZC Freq	55	35.9	49	Hz
Time (Rel. to Trig)	1.375	0.622	0.611	sec
Peak Acceleration	0.371	0.742	0.636	g
Peak Displacement	0.0207	0.0430	0.0478	mm
Sensorcheck ™	Passed	Passed	Passed	

Peak Vector Sum 19.7 mm/s at 0.622 sec

USBM RI8507 And OSMRE





Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 5.00 mm/s/div Mic: 10.00 pa.(L)/div
Trigger = ▶— — —◀

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Event Report

Date/Time	Long at 13:01:37 July 27, 1999	**Serial Number**	BC6543 V 4.0-4.0 MiniMate Plus
Trigger Source	Geo: 3.00 mm/s	**Battery Level**	6.4 Volts
Range	Geo :254 mm/s	**Calibration**	June 16, 1999 by Instantel Inc.
Record Time	4.5 sec (Auto=3Sec) at 4096 sps	**File Name**	H5437LOU.UP0
Job Number:	13		

Notes
EA 11-001923
SR 54/125 KP 9.7
Blast Number:
Monitoring Location:

Extended Notes
TEMP: 96 F

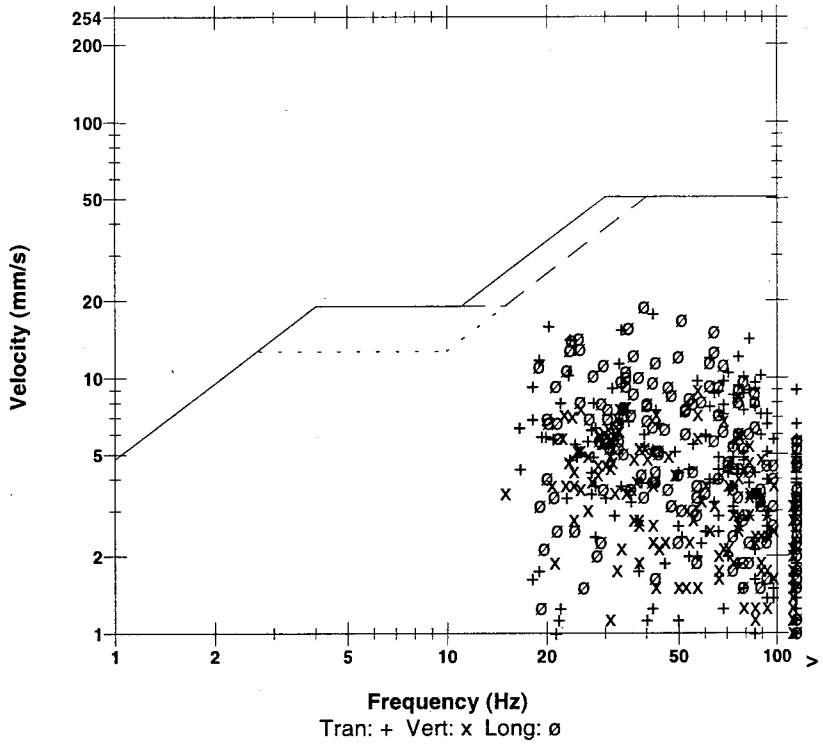
Post Event Notes
11-SD-54/125 001923
BLAST 13B STATION 122+60 TO 123+20
102 KG ANFO PER DELAY 82 m TO 6543
8546 LAKE BLUFF CIRCLE

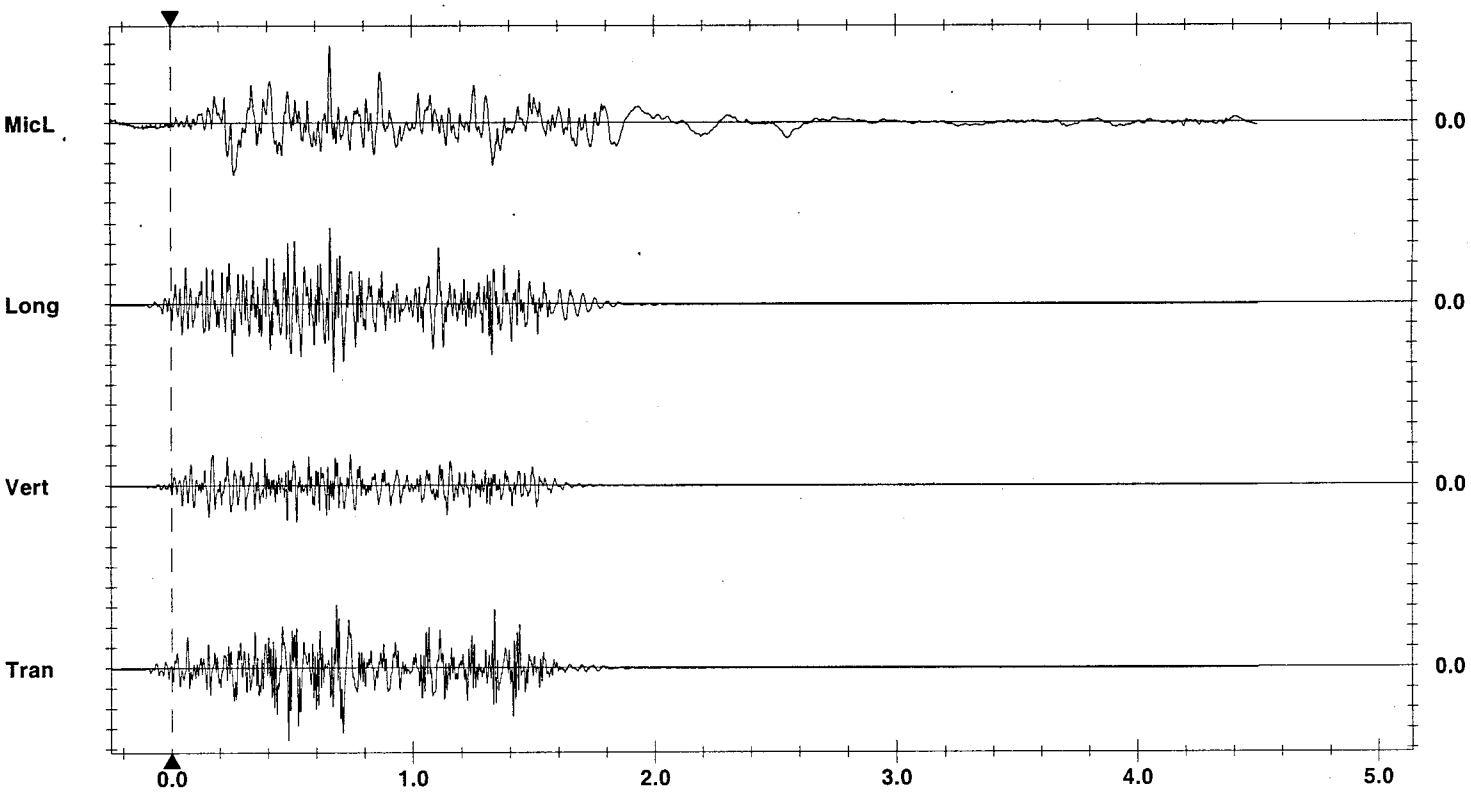
Microphone	Linear Weighting
PSPL	39.3 pa.(L) at 0.661 sec
ZC Freq	31.0 Hz
Channel Test	Passed (Freq = 19.0 Hz Amp = 681 mv)

	Tran	Vert	Long	
PPV	18.0	9.02	19.0	mm/s
ZC Freq	42	57	39.4	Hz
Time (Rel. to Trig)	0.483	0.519	0.660	sec
Peak Acceleration	0.742	0.424	0.689	g
Peak Displacement	0.106	0.0408	0.0765	mm
Sensorcheck ™	Passed	Passed	Passed	

Peak Vector Sum 21.1 mm/s at 0.485 sec

USBM RI8507 And OSMRE





Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 5.00 mm/s/div Mic: 10.00 pa.(L)/div
Trigger = ▶— — —◀

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Event Report

Date/Time	Tran at 13:01:52 July 27, 1999	**Serial Number**	BC6544 V 4.0-4.0 MiniMate Plus
Trigger Source	Geo: 3:00 mm/s	**Battery Level**	6.4 Volts
Range	Geo :254 mm/s	**Calibration**	June 16, 1999 by Instantel Inc.
Record Time	3.125 sec (Auto=3Sec) at 4096 sps	**File Name**	H5447LOU.V40
Job Number:	13		

Notes
Location:
Client:
User Name:
General:

Post Event Notes
11-SD-54/125 001923
BLAST 13B STATION 122+60 TO 123+20
102 KG ANFO PER DELAY 148 m TO 6544
QUARRY ROAD, 152 m SOUTH OF ROCK/FILL CONTACT

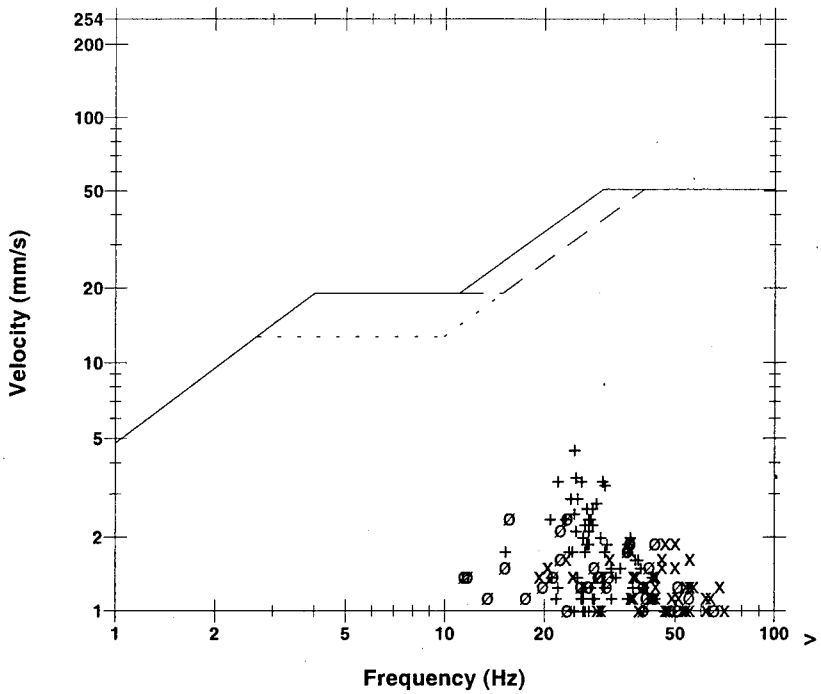
Microphone	Linear Weighting
PSPL	12.0 pa.(L) at 0.342 sec
ZC Freq	10.3 Hz
Channel Test	Passed (Freq = 20.1 Hz Amp = 621 mv)

	Tran	Vert	Long	
PPV	4.57	2.16	2.41	mm/s
ZC Freq	24.7	N/A	23.5	Hz
Time (Rel. to Trig)	0.276	-0.247	0.351	sec
Peak Acceleration	0.159	0.106	0.159	g
Peak Displacement	0.0281	0.0115	0.0208	mm
Sensorcheck ™	Passed	Passed	Passed	

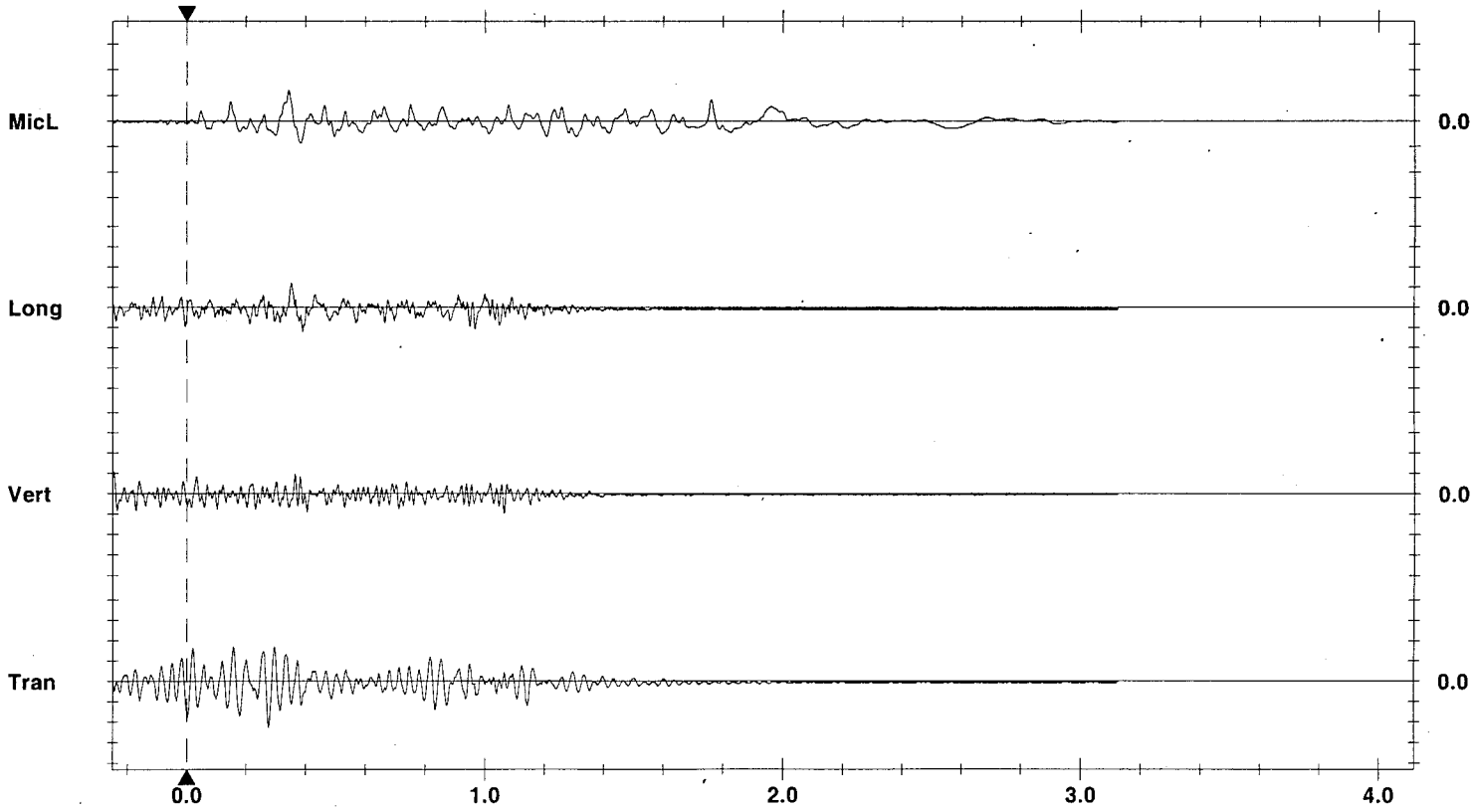
Peak Vector Sum 4.63 mm/s at 0.276 sec

N/A: Not Applicable

USBM RI8507 And OSMRE



Tran: + Vert: x Long: ø



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.00 mm/s/div Mic: 10.00 pa.(L)/div
Trigger = ▶— — —◀

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Event Report

Date/Time	Long at 13:04:20 June 22, 1999	**Serial Number**	BA6633 V 4.0-4.0 BlastMate III
Trigger Source	Geo: 3.00 mm/s	**Battery Level**	6.3 Volts
	Mic: 100.0 pa.(L)	**Calibration**	May 28, 1999 by Instantel Inc.
Range	Geo :254 mm/s	**File Name**	H6337JW1.N80
Record Time	2.0 sec at 1024 sps		
Job Number:	1		

Notes
Location:
Client:
User Name:
General:

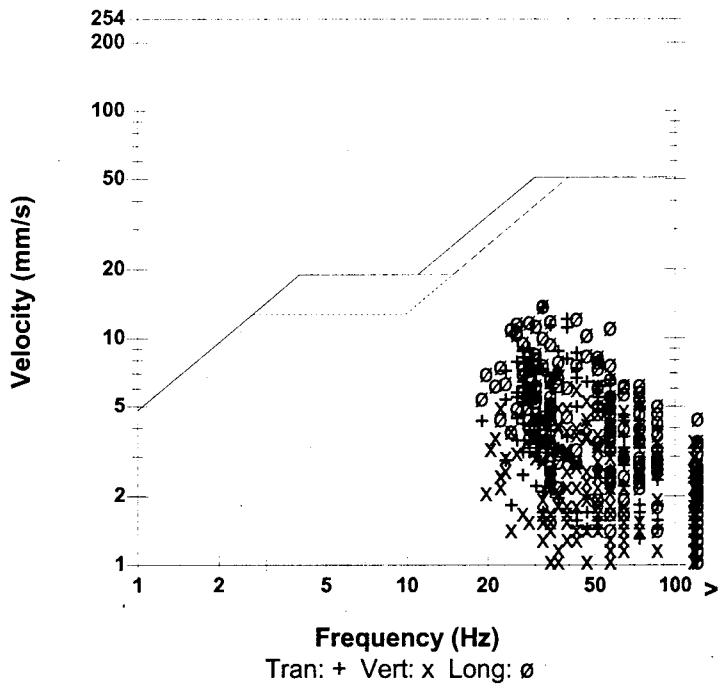
Post Event Notes
11-SD-54/125 001923
BLAST14B STATION 126+23.5 TO 126+85
18.3 KG ANFO PER DELAY192 m TO 6633
QUARRY ROAD 76.2 m SOUTH OF SWAPMEET RD

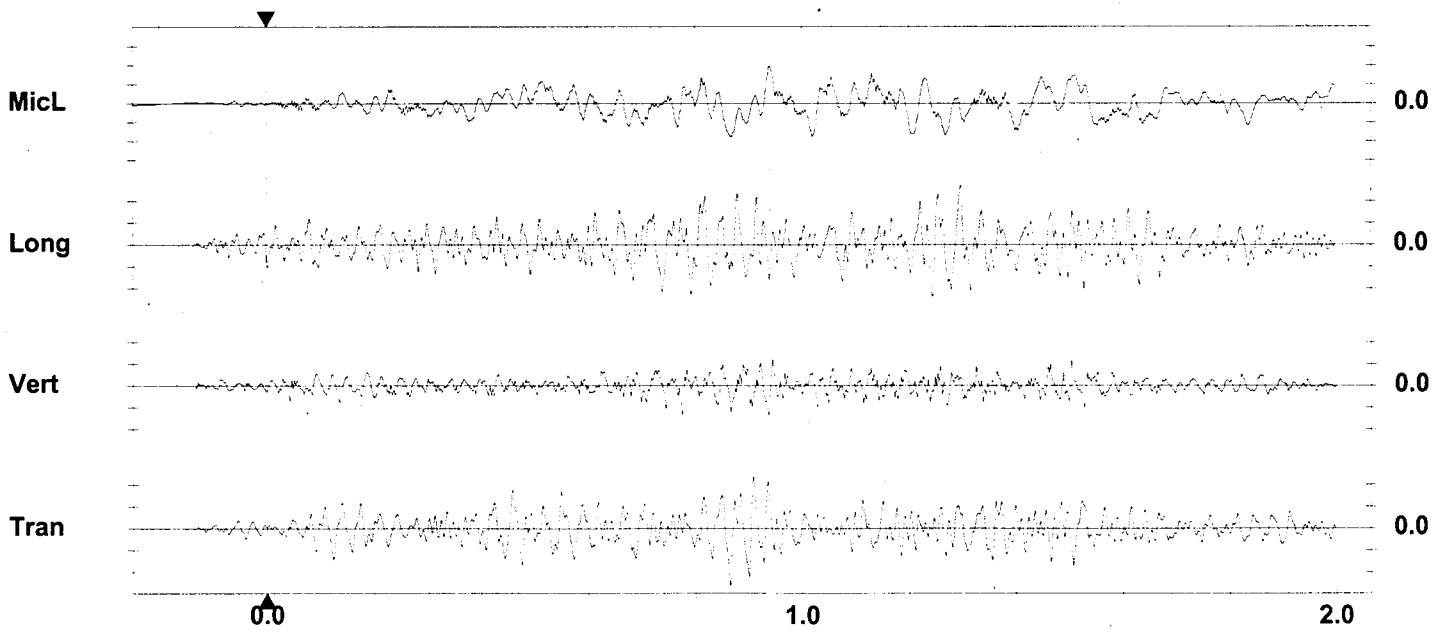
Microphone Linear Weighting
PSPL 19.8 pa.(L) at 0.939 sec
ZC Freq 13 Hz
Channel Test Passed (Freq = 19.3 Hz Amp = 788 mv)

	Tran	Vert	Long	
PPV	13.2	6.73	13.6	mm/s
ZC Freq	32	37	32	Hz
Time (Rel. to Trig)	0.865	0.938	1.297	sec
Peak Acceleration	0.490	0.331	0.437	g
Peak Displacement	0.0514	0.0278	0.0643	mm
Sensorcheck ™	Passed	Passed	Passed	

Peak Vector Sum 14.8 mm/s at 0.865 sec

USBM RI8507 And OSMRE





Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 5.00 mm/s/div Mic: 10.00 pa.(L)/div
Trigger = ▶ - - - - - - ◀

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Event Report

Date/Time	Long at 11:02:40 July 8, 1999	**Serial Number**	BC6543 V 4.0-4.0 MiniMate Plus
Trigger Source	Geo: 3.00 mm/s	**Battery Level**	6.5 Volts
Range	Geo :254 mm/s	**Calibration**	June 16, 1999 by Instantel Inc.
Record Time	3.75 sec (Auto=3Sec) at 1024 sps	**File Name**	H5437KPI.OG0
Job Number:	12		

Notes
EA 11-001923
SR 54/125 KP 9.7
Blast Number:
Monitoring Location:

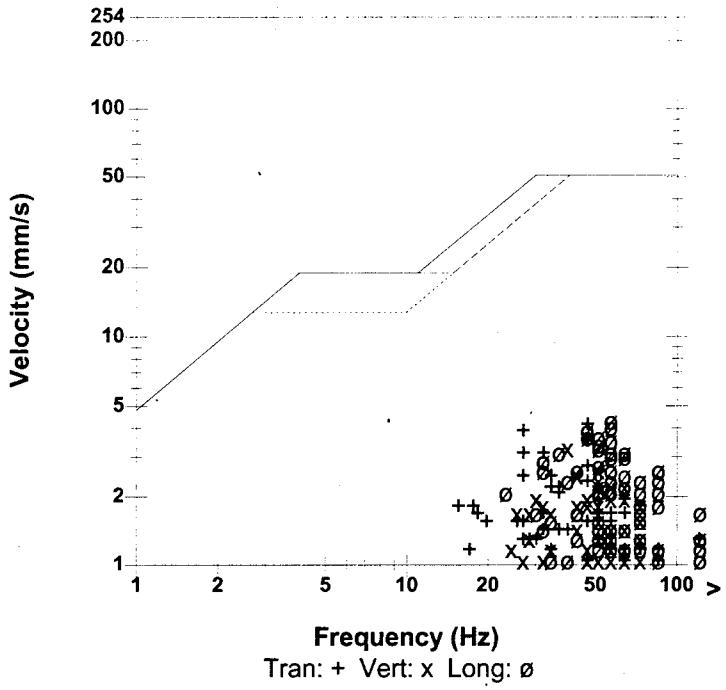
Post Event Notes
11-SD-54/125 001923
BLAST 15B STATION 123+75 TO 124+40
27 KG ANFO PER DELAY 99 m TO 6543
QUARRY RD, 152 m SOUTH OF ROCK/FILL CONTACT

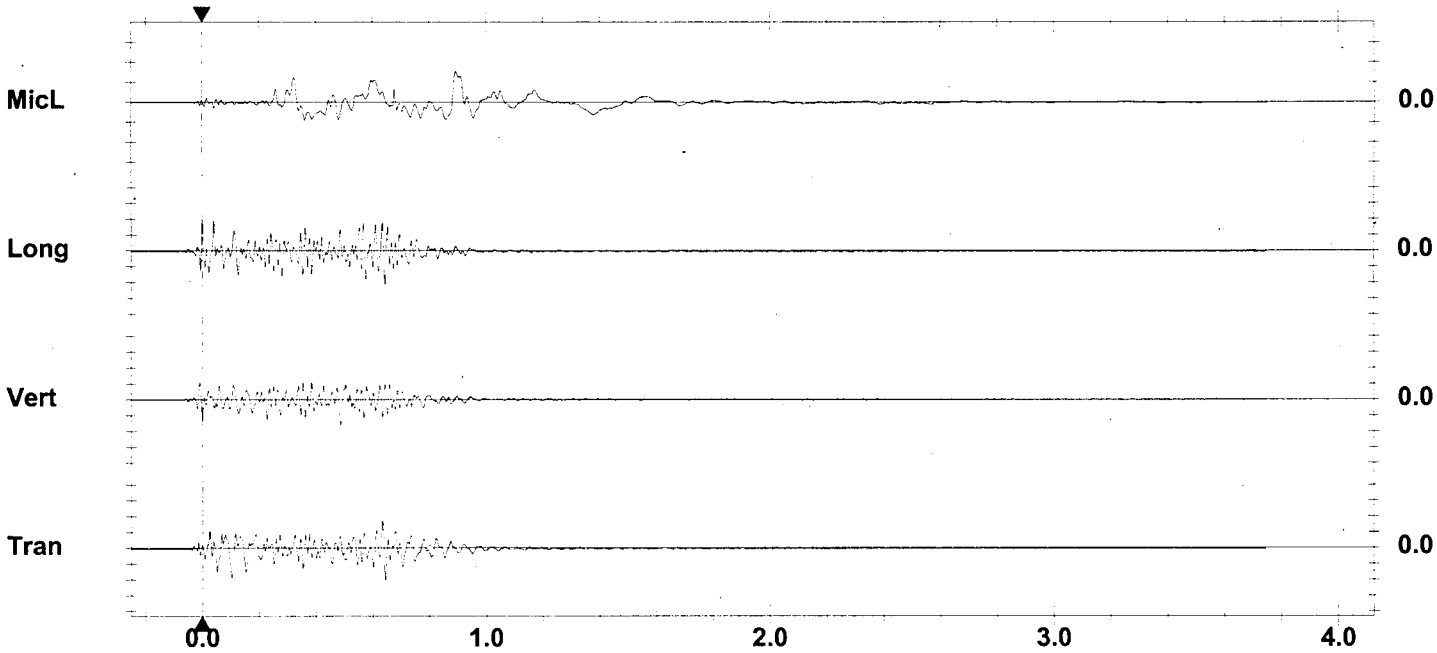
Microphone	Linear Weighting
PSPL	15.5 pa.(L) at 0.895 sec
ZC Freq	12 Hz
Channel Test	Passed (Freq = 19.0 Hz Amp = 657 mv)

	Tran	Vert	Long	
PPV	4.06	3.17	4.19	mm/s
ZC Freq	47	39	57	Hz
Time (Rel. to Trig)	0.646	0.487	0.645	sec
Peak Acceleration	0.133	0.0928	0.146	g
Peak Displacement	0.0198	0.0125	0.0126	mm
Sensorcheck ™	Passed	Passed	Passed	

Peak Vector Sum 6.06 mm/s at 0.645 sec

USBM RI8507 And OSMRE





Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.00 mm/s/div Mic: 10.00 pa.(L)/div
Trigger = ▶----------◀

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Event Report

Date/Time	Tran at 11:02:41 July 8, 1999	**Serial Number**	BA6633 V 4.0-4.0 BlastMate III
Trigger Source	Geo: 3.00 mm/s	**Battery Level**	6.3 Volts
	Mic: 100 pa.(L)	**Calibration**	May 28, 1999 by Instantel Inc.
Range	Geo :254 mm/s	**File Name**	H6337KPI.OH0
Record Time	3.0 sec at 4096 sps		
Job Number:	1		

Notes
Location:
Client:
User Name:
General:

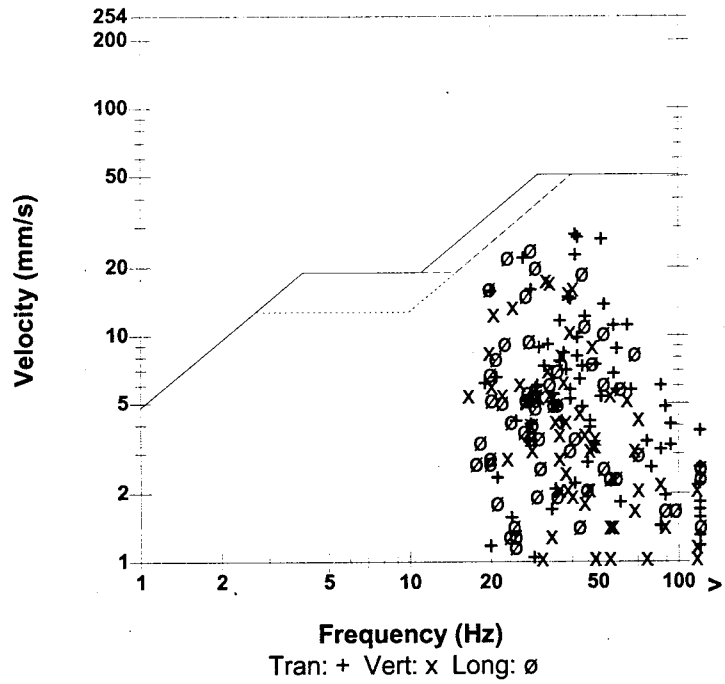
Post Event Notes
11-SD-54/125 001923
BLAST 15B STATION 123+75 TO 124+40
27 KG ANFO PER DELAY 112 m TO 6633
8546 LAKE BLUFF CIRCLE

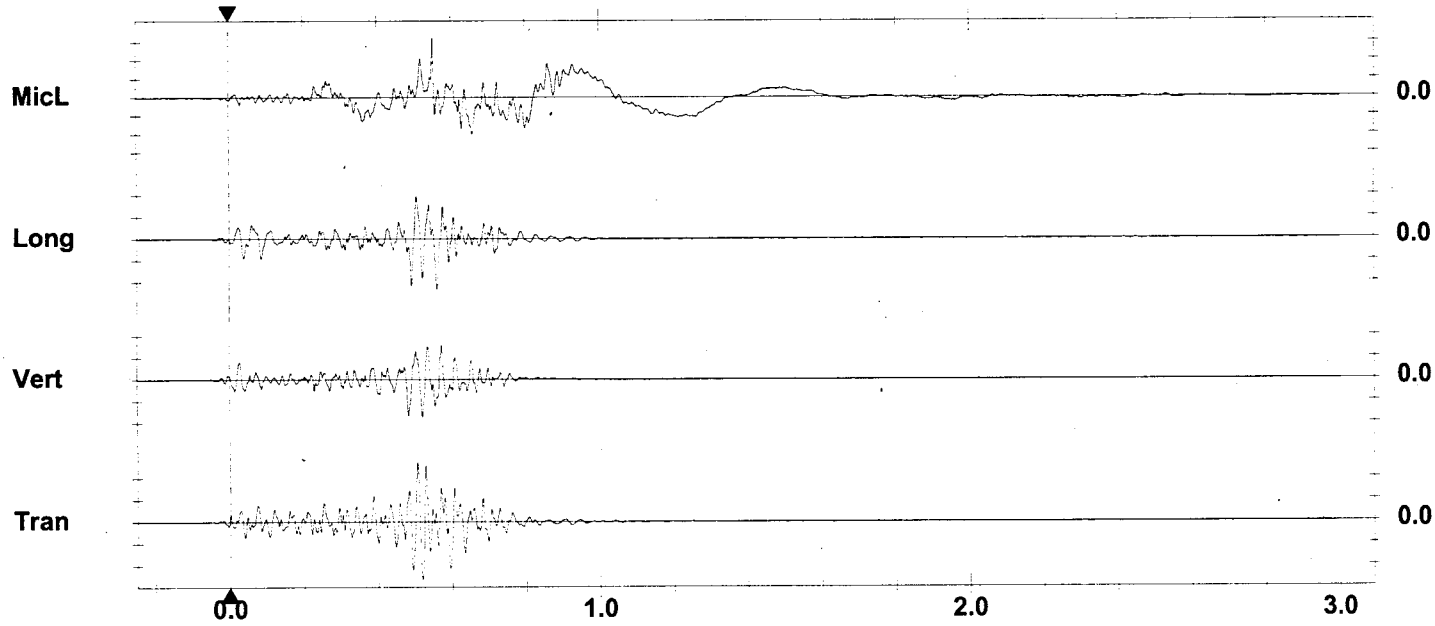
Microphone	Linear Weighting
PSPL	32.3 pa.(L) at 0.551 sec
ZC Freq	10.0 Hz
Channel Test	Passed (Freq = 19.3 Hz Amp = 732 mv)

	Tran	Vert	Long	
PPV	27.1	17.1	23.2	mm/s
ZC Freq	41	32.0	28.1	Hz
Time (Rel. to Trig)	0.506	0.520	0.561	sec
Peak Acceleration	1.11	0.583	0.530	g
Peak Displacement	0.107	0.0834	0.103	mm
Sensorcheck ™	Passed	Passed	Passed	

Peak Vector Sum 34.7 mm/s at 0.506 sec

USBM RI8507 And OSMRE





Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 10.00 mm/s/div Mic: 10.00 pa.(L)/div
Trigger = ▶----------◀

Format Copyrighted 1996-1998

Event Report

Date/Time	Long at 11:57:23 July 29, 1999	**Serial Number**	BA6633 V 4.0-4.0 BlastMate III
Trigger Source	Geo: 2.00 mm/s	**Battery Level**	6.3 Volts
Range	Geo :254 mm/s	**Calibration**	May 28, 1999 by Instantel Inc.
Record Time	3.0 sec at 4096 sps	**File Name**	H6337LSH.7N0
Job Number:	1		

Notes
Location:
Client:
User Name:
General:

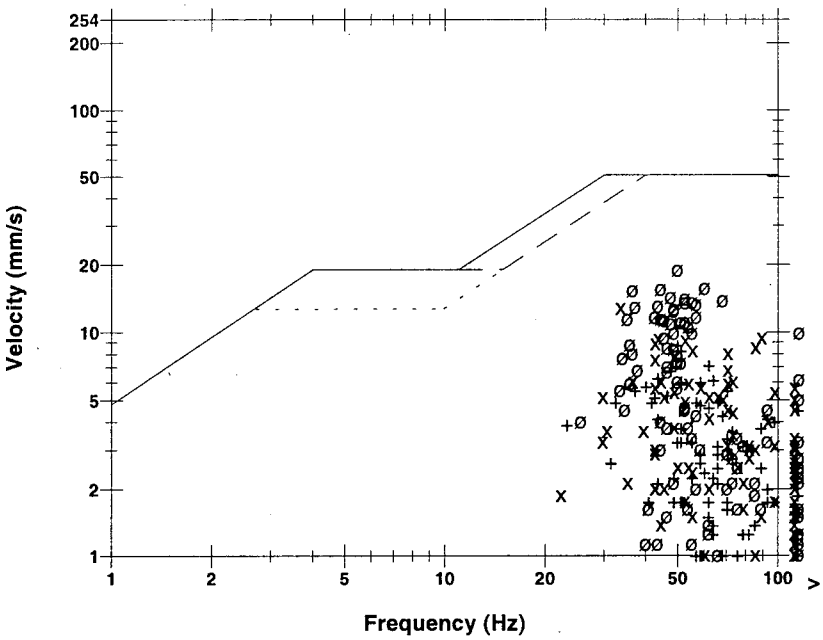
Post Event Notes
11-SD-54/125 001923
BLAST 17B STATION 122+45 TO 123+10
27 KG ANFO PER DELAY 112 m TO 6633
8573 LAKE BLUFF CIRCLE

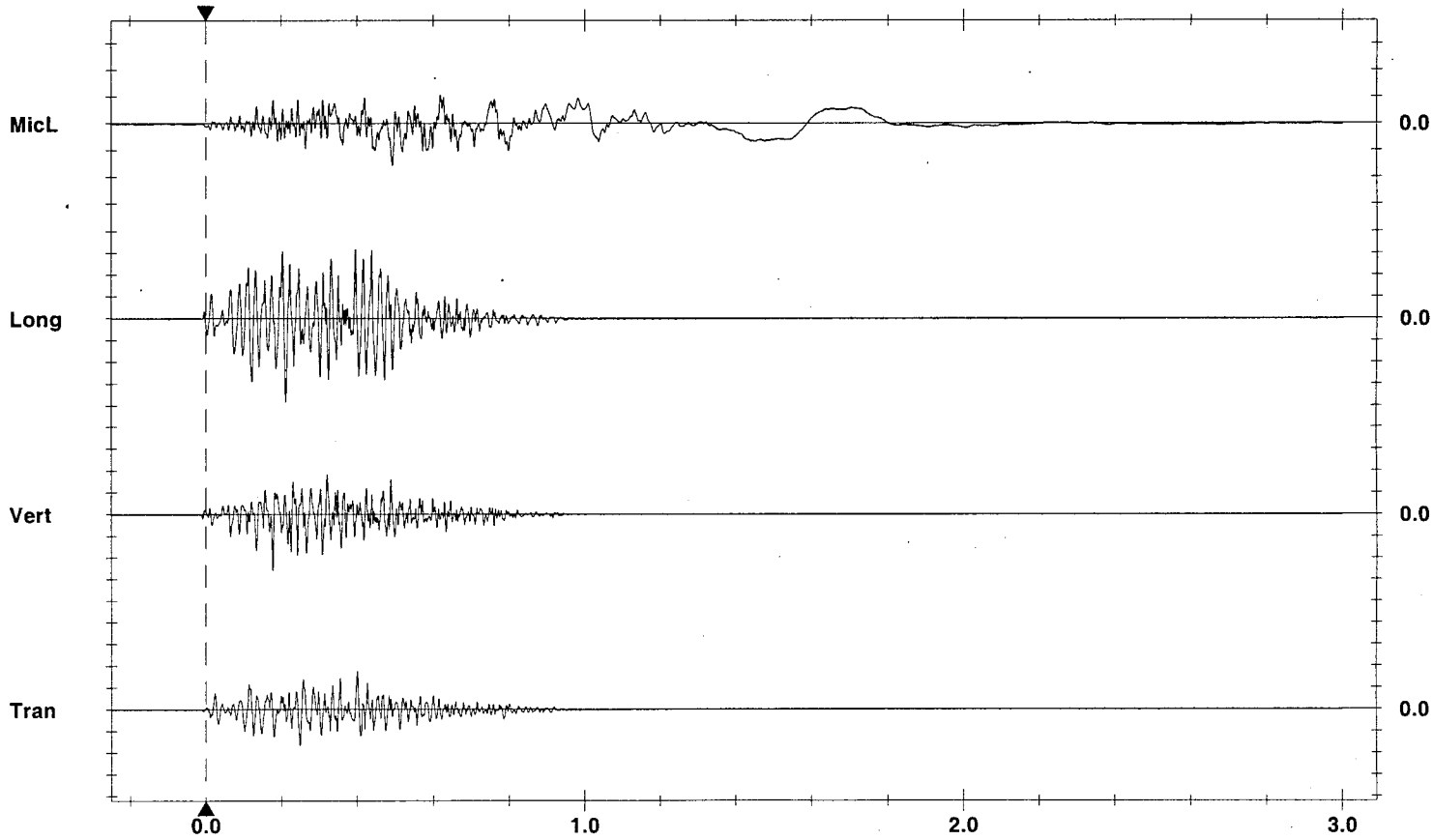
Microphone	Linear Weighting
PSPL	15.8 pa.(L) at 0.493 sec
ZC Freq	27.7 Hz
Channel Test	Passed (Freq = 19.3 Hz Amp = 747 mv)

	Tran	Vert	Long	
PPV	8.89	13.0	19.2	mm/s
ZC Freq	50	33.6	50	Hz
Time (Rel. to Trig)	0.401	0.177	0.211	sec
Peak Acceleration	0.371	0.689	0.742	g
Peak Displacement	0.0249	0.0356	0.0577	mm
Sensorcheck ™	Passed	Passed	Passed	

Peak Vector Sum 19.5 mm/s at 0.211 sec

USBM RI8507 And OSMRE





Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 5.00 mm/s/div Mic: 10.00 pa.(L)/div
Trigger = ▶— — —◀

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Event Report

Date/Time	Long at 11:57:24 July 29, 1999	**Serial Number**	BC6543 V 4.0-4.0 MiniMate Plus
Trigger Source	Geo: 3.00 mm/s	**Battery Level**	6.4 Volts
Range	Geo :254 mm/s	**Calibration**	June 16, 1999 by Instantel Inc.
Record Time	3.625 sec (Auto=3Sec) at 4096 sps	**File Name**	H5437LSH.7O0
Job Number:	17		

Notes
EA 11-001923
SR 54/125 KP 9.7
Blast Number:
Monitoring Location:

Extended Notes
TEMP: 96 F

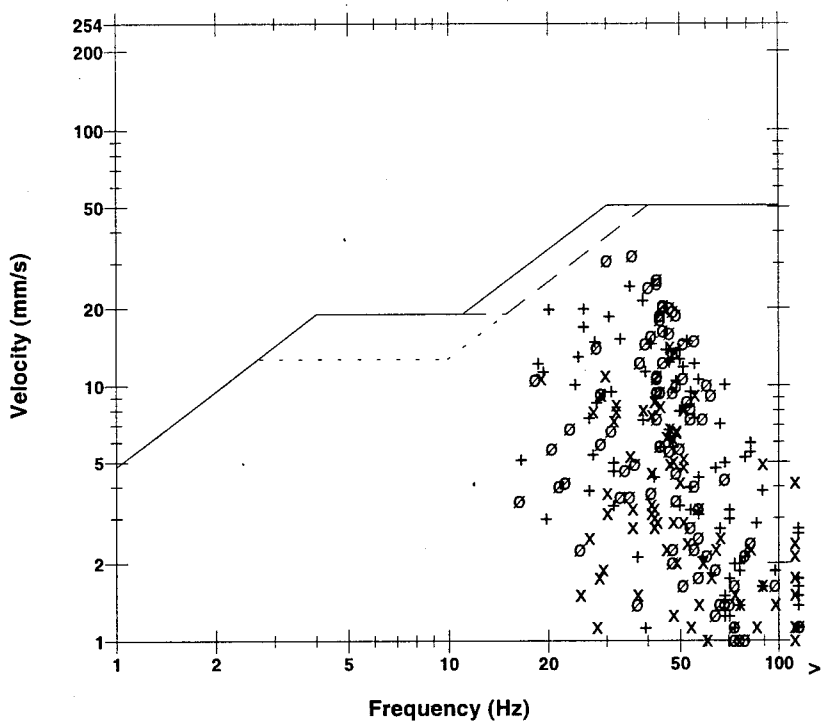
Post Event Notes
11-SD-54/125 001923
BLAST 17B STATION 122+45 TO 123+10
27 KG ANFO PER DELAY 76 m TO 6543
8546 LAKE BLUFF CIRCLE

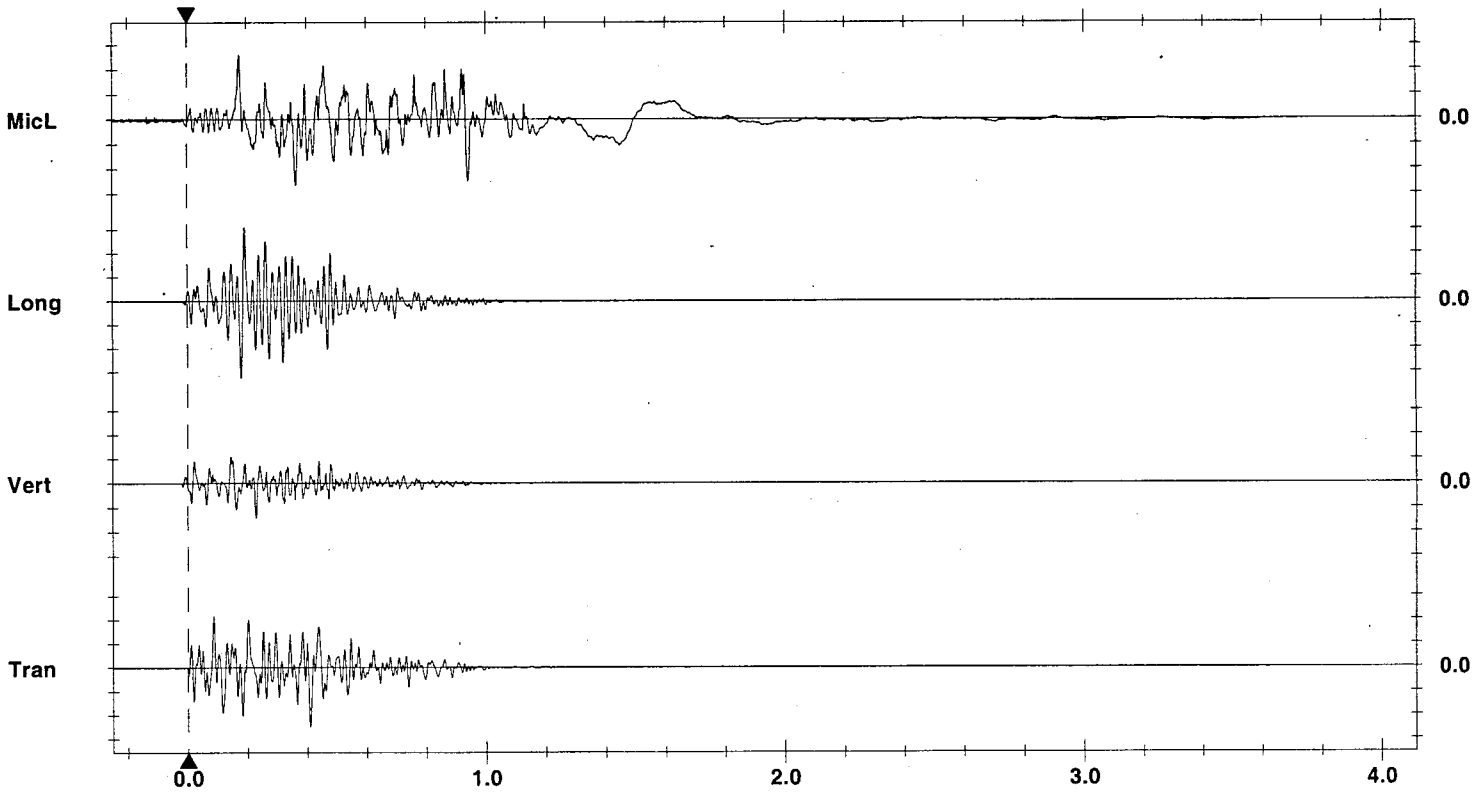
Microphone	Linear Weighting
PSPL	26.5 pa.(L) at 0.364 sec
ZC Freq	23.3 Hz
Channel Test	Passed (Freq = 19.0 Hz Amp = 674 mv)

	Tran	Vert	Long	
PPV	24.9	14.4	32.5	mm/s
ZC Freq	35.3	47	35.9	Hz
Time (Rel. to Trig)	0.408	0.228	0.180	sec
Peak Acceleration	0.583	0.477	0.901	g
Peak Displacement	0.108	0.0649	0.141	mm
Sensorcheck ™	Passed	Passed	Passed	

Peak Vector Sum 36.3 mm/s at 0.181 sec

USBM RI8507 And OSMRE





Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 10.00 mm/s/div Mic: 10.00 pa.(L)/div
Trigger = ▶— — —◀

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Event Report

Date/Time	Vert at 11:57:40 July 29, 1999	**Serial Number**	BC6544 V 4.0-4.0 MiniMate Plus
Trigger Source	Geo: 3.00 mm/s	**Battery Level**	6.3 Volts
Range	Geo :254 mm/s	**Calibration**	June 16, 1999 by Instantel Inc.
Record Time	3.125 sec (Auto=3Sec) at 4096 sps	**File Name**	H5447LSH.840
Job Number:	17		

Notes
Location:
Client:
User Name:
General:

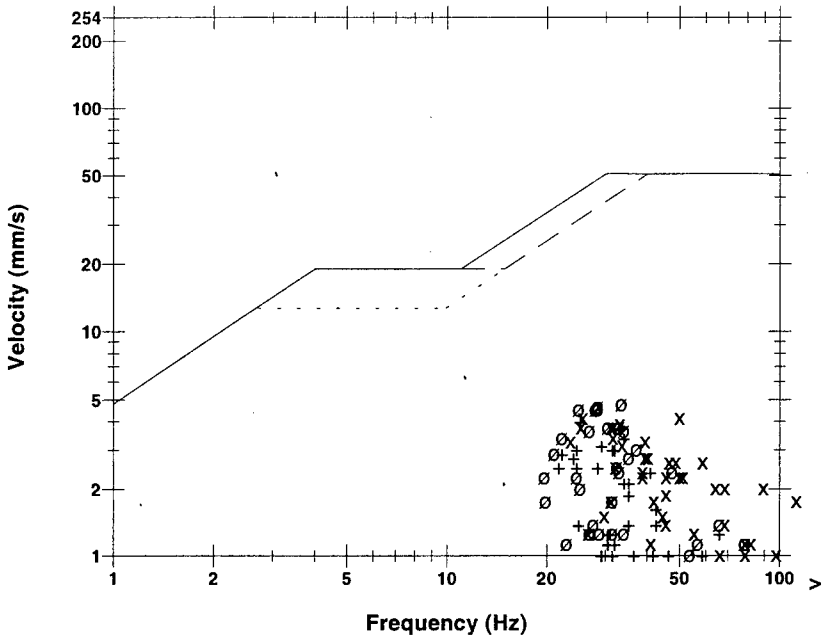
Post Event Notes
11-SD-54/125 001923
BLAST 17B STATION 122+45 TO 123+10
27 KG ANFO PER DELAY 187 m TO 6544
8504 LAKE BLUFF CIRCLE, SE CORNER

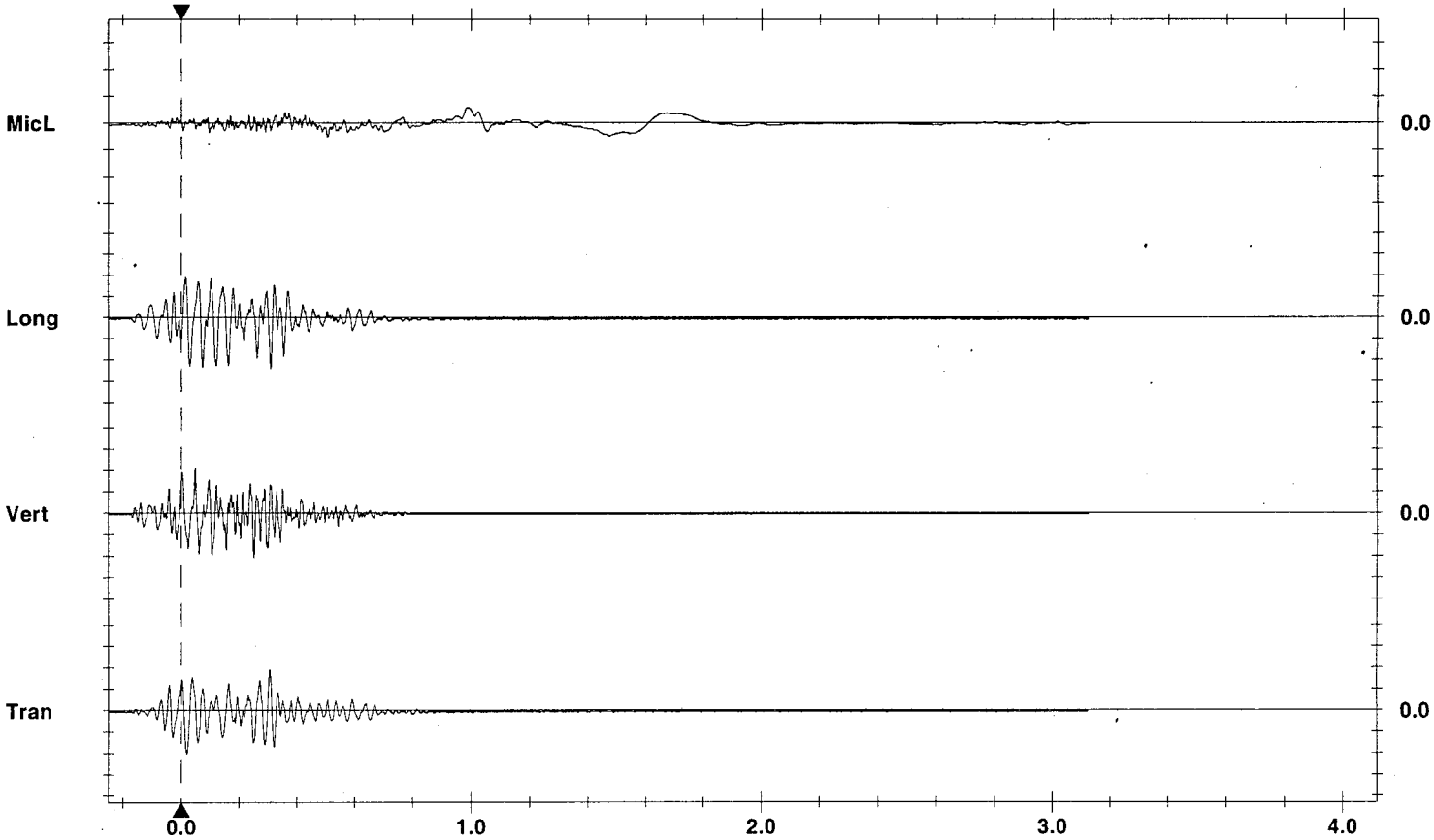
Microphone	Linear Weighting
PSPL	5.75 pa.(L) at 0.983 sec
ZC Freq	3.9 Hz
Channel Test	Passed (Freq = 20.1 Hz Amp = 656 mv)

	Tran	Vert	Long	
PPV	4.06	4.19	4.83	mm/s
ZC Freq	25.3	25.6	33.6	Hz
Time (Rel. to Trig)	0.019	0.048	0.308	sec
Peak Acceleration	0.159	0.159	0.159	g
Peak Displacement	0.0262	0.0197	0.0266	mm
Sensorcheck ™	Passed	Passed	Passed	

Peak Vector Sum 6.31 mm/s at 0.307 sec

USBM RI8507 And OSMRE





Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.00 mm/s/div Mic: 10.00 pa.(L)/div
Trigger = ▶— — —◀

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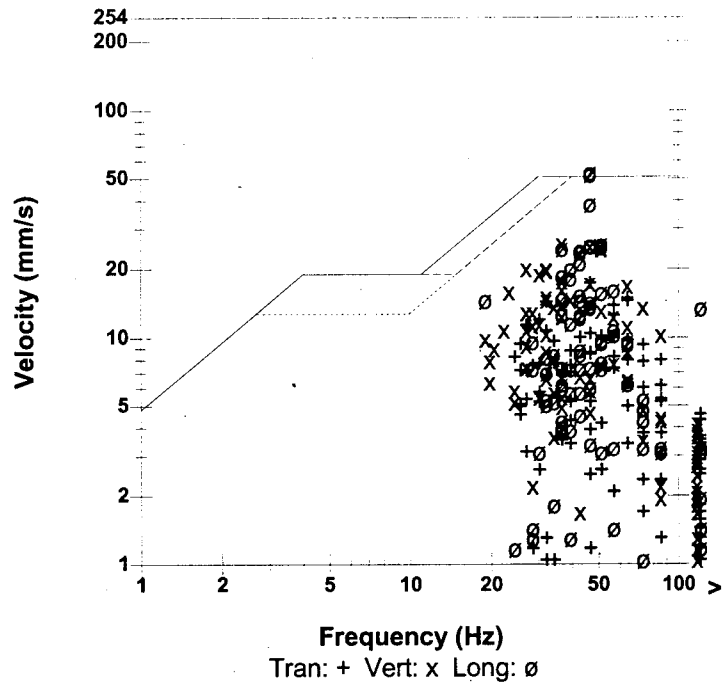
Event Report

Date/Time	Long at 14:29:45 July 1, 1999	**Serial Number**	BC6543 V 4.0-4.0 MiniMate Plus
Trigger Source	Geo: 3.00 mm/s	**Battery Level**	6.4 Volts
Range	Geo :254 mm/s	**Calibration**	June 16, 1999 by Instantel Inc.
Record Time	4.25 sec (Auto=3Sec) at 1024 sps	**File Name**	H5437KCT.LL0
Job Number:	18		

Notes
EA 11-001923
SR 54/125 KP 9.7
Blast Number:
Monitoring Location:

Post Event Notes
11-SD-54/125 001923
BLAST18B STATION 121+80 TO 122+45
27 KG ANFO PER DELAY 109 m TO 6543
8573 LAKEBLUFF CIRCLE

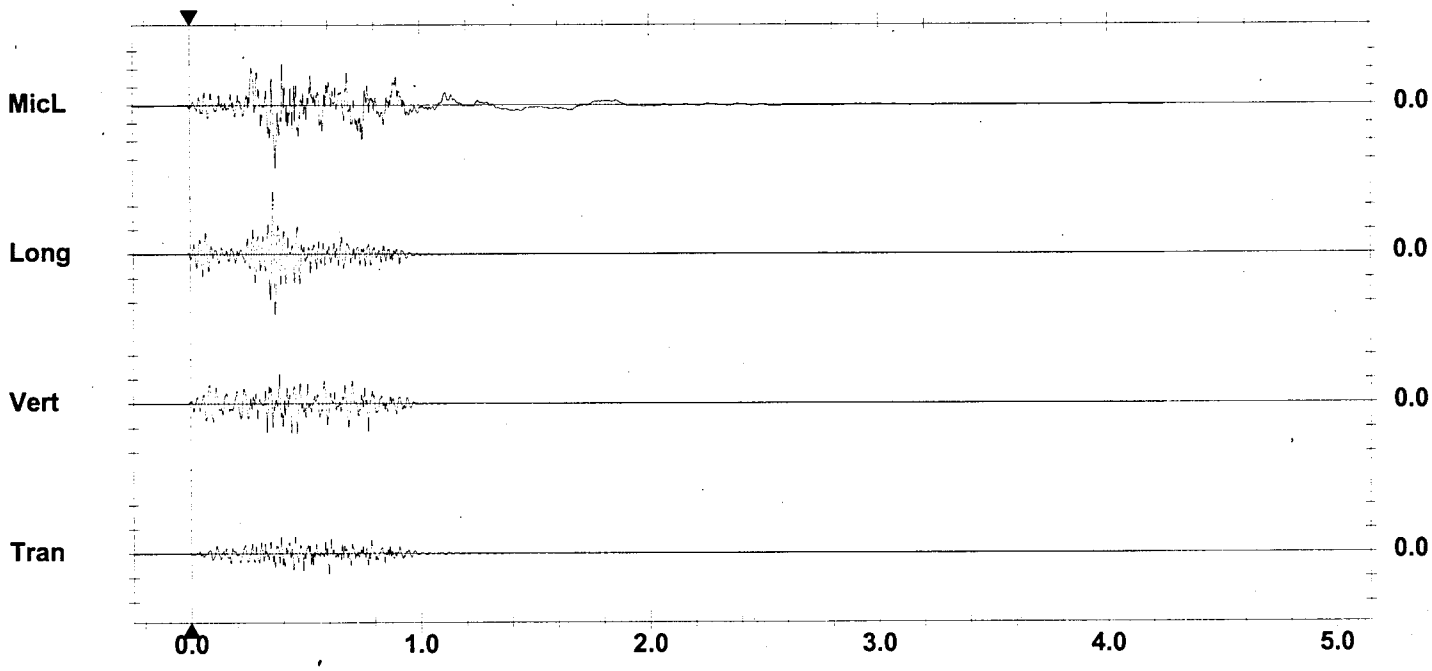
USBM RI8507 And OSMRE



Microphone	Linear Weighting			
PSPL	34.8 pa.(L) at 0.372 sec			
ZC Freq	13 Hz			
Channel Test	Passed (Freq = 20.1 Hz Amp = 659 mv)			

	Tran	Vert	Long	
PPV	16.9	25.1	51.8	mm/s
ZC Freq	47	37	47	Hz
Time (Rel. to Trig)	0.599	0.462	0.360	sec
Peak Acceleration	0.729	1.01	2.16	g
Peak Displacement	0.0506	0.0876	0.184	mm
Sensorcheck ™	Passed	Passed	Passed	

Peak Vector Sum 52.5 mm/s at 0.360 sec



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 20.0 mm/s/div Mic: 10.00 pa.(L)/div
Trigger = ▶----------◀

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Event Report

Date/Time	Tran at 14:29:47 July 1, 1999	**Serial Number**	BA6633 V 4.0-4.0 BlastMate III
Trigger Source	Geo: 3.00 mm/s	**Battery Level**	6.3 Volts
	Mic: 100 pa.(L)	**Calibration**	May 28, 1999 by Instantel Inc.
Range	Geo :254 mm/s	**File Name**	H6337KCT.LN0
Record Time	3.0 sec at 4096 sps		
Job Number:	1		

Notes
Location:
Client:
User Name:
General:

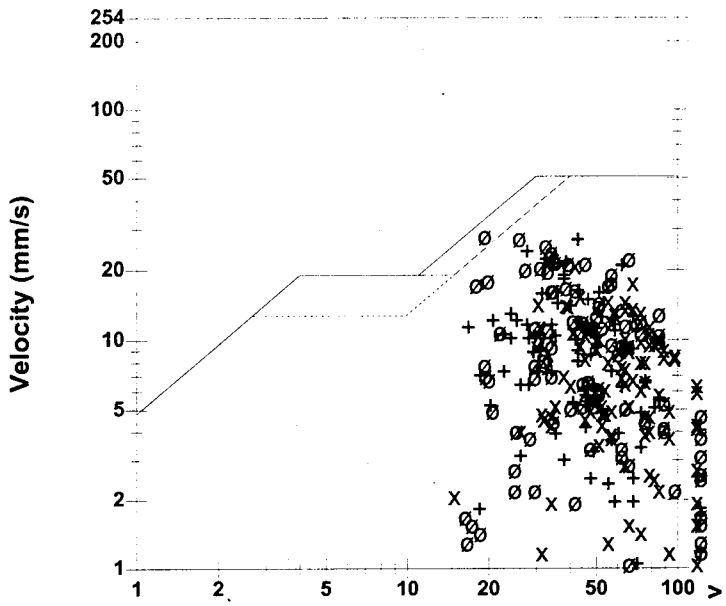
Post Event Notes
11-SD-54/125 001923
BLAST18B STATION 121+80 TO 122+45
27 KG ANFO PER DELAY 55 m TO 6633
86 m LT 121+77 "BR" LINE.

Microphone	Linear Weighting
PSPL	65.5 pa.(L) at 0.679 sec
ZC Freq	8.5 Hz
Channel Test	Passed (Freq = 19.0 Hz Amp = 750 mv)

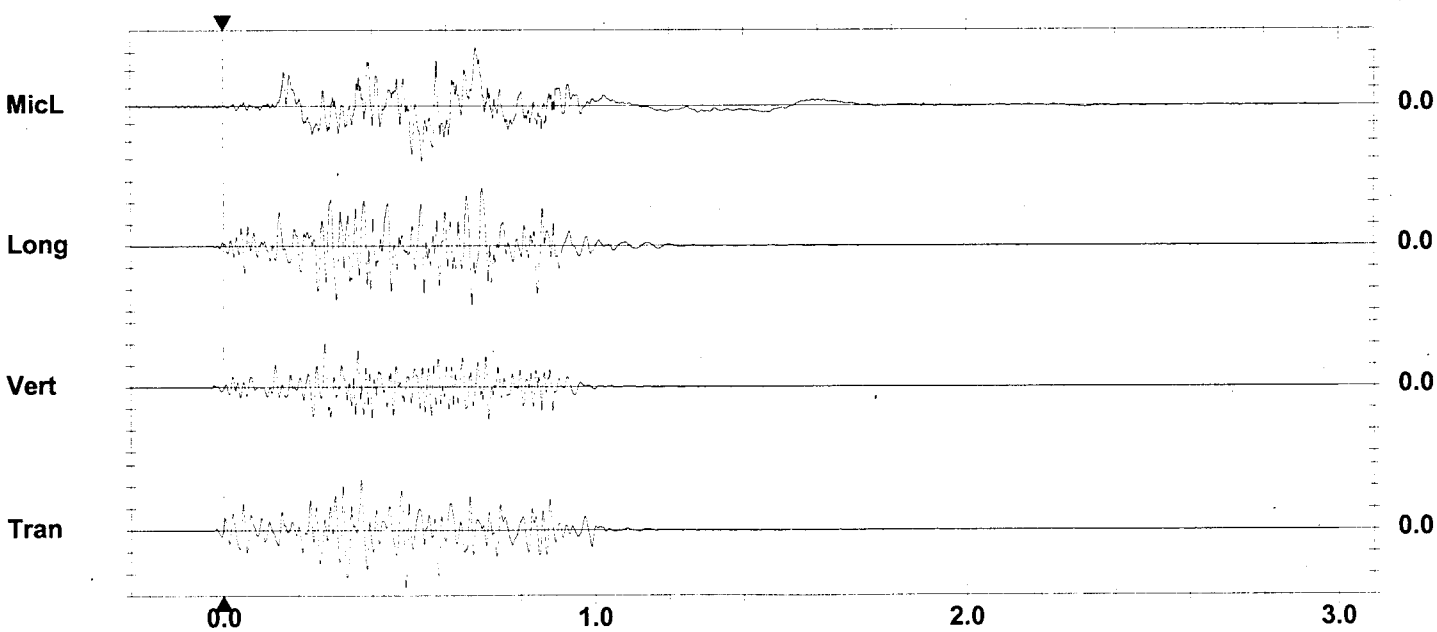
	Tran	Vert	Long	
PPV	26.3	20.3	27.3	mm/s
ZC Freq	43	42	19.3	Hz
Time (Rel. to Trig)	0.490	0.273	0.669	sec
Peak Acceleration	0.848	0.742	1.11	g
Peak Displacement	0.114	0.0742	0.162	mm
Sensorcheck ™	Passed	Passed	Passed	

Peak Vector Sum 28.9 mm/s at 0.670 sec

USBM RI8507 And OSMRE



Tran: + Vert: x Long: ø



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 10.00 mm/s/div Mic: 20.0 pa.(L)/div
Trigger = ▶ ---------- ◀

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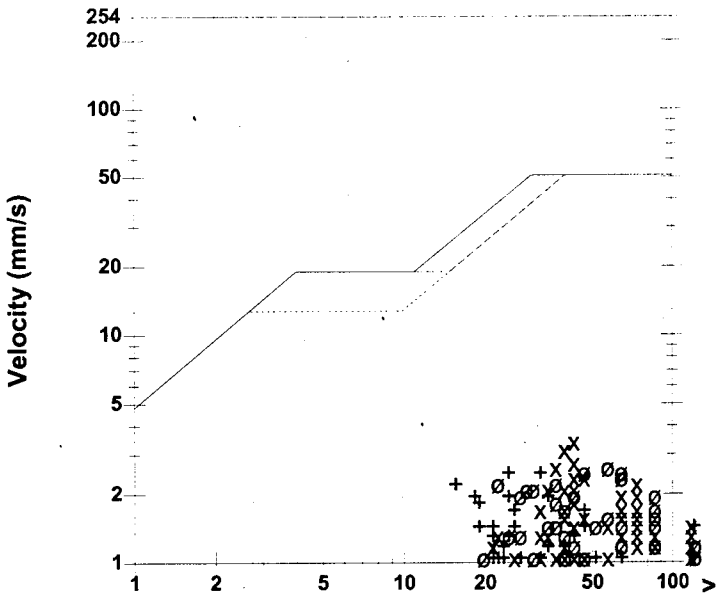
Event Report

Date/Time	Vert at 14:29:51 July 1, 1999	**Serial Number**	BC6544 V 4.0-4.0 MiniMate Plus
Trigger Source	Geo: 3.00 mm/s	**Battery Level**	6.4 Volts
Range	Geo :254 mm/s	**Calibration**	June 16, 1999 by Instantel Inc.
Record Time	3.25 sec (Auto=3Sec) at 1024 sps	**File Name**	H5447KCT.LR0
Job Number:	18		

Notes
Location:
Client:
User Name:
General:

Post Event Notes
11-SD-54/125 001923
BLAST18B STATION 121+80 TO 122+45
27 KG ANFO PER DELAY 191 m TO 6544
8490AVENIDA ANGUILA

USBM RI8507 And OSMRE

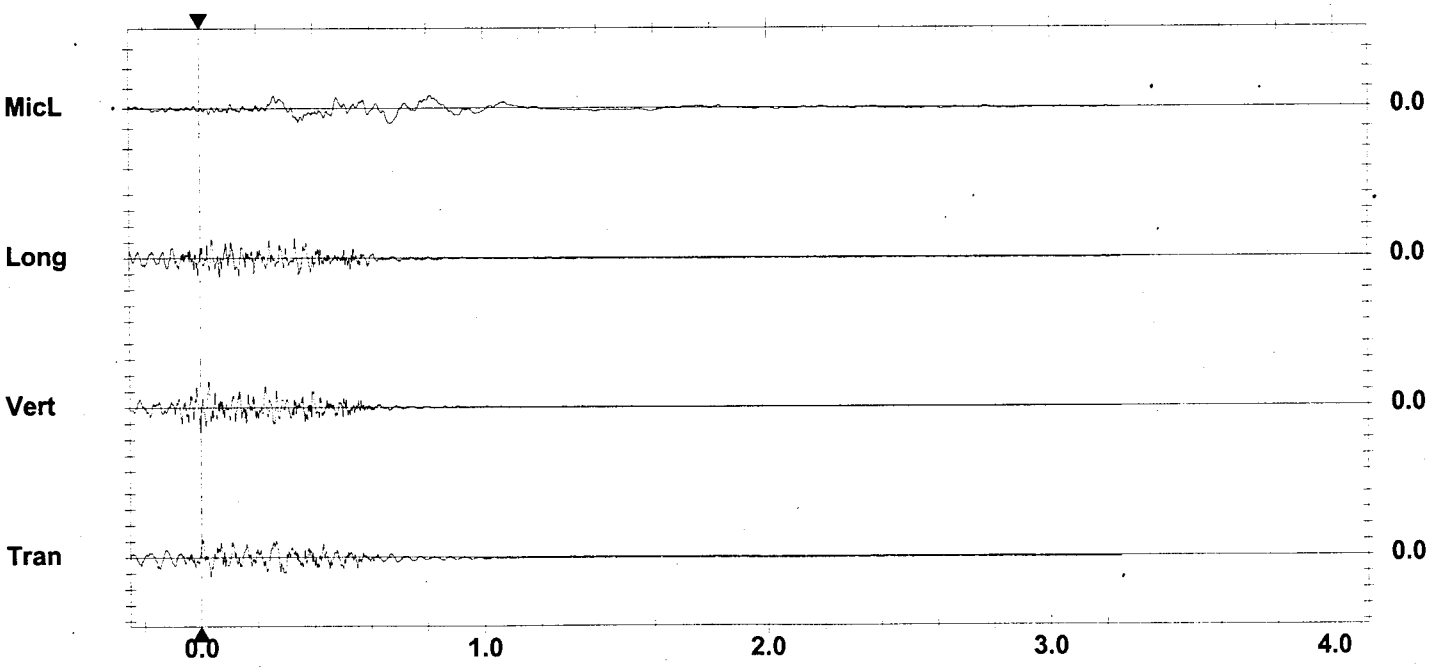


Tran: + Vert: x Long: ø

Microphone	Linear Weighting
PSPL	7.50 pa.(L) at 0.670 sec
ZC Freq	6.6 Hz
Channel Test	Passed (Freq = 19.0 Hz Amp = 724 mv)

	Tran	Vert	Long	
PPV	2.41	3.30	2.54	mm/s
ZC Freq	32	43	57	Hz
Time (Rel. to Trig)	0.002	0.029	0.335	sec
Peak Acceleration	0.119	0.146	0.119	g
Peak Displacement	0.0214	0.0114	0.0136	mm
Sensorcheck ™	Passed	Passed	Passed	

Peak Vector Sum 3.67 mm/s at 0.031 sec



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.00 mm/s/div Mic: 10.00 pa.(L)/div
Trigger = ▶----------◀

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Event Report

Date/Time	Vert at 12:00:28 August 4, 1999	**Serial Number**	BA6633 V 4.0-4.0 BlastMate III
Trigger Source	Geo: 2.00 mm/s	**Battery Level**	6.3 Volts
Range	Geo :254 mm/s	**Calibration**	May 28, 1999 by Instantel Inc.
Record Time	3.0 sec at 4096 sps	**File Name**	H6337M3L.CS0
Job Number:	19		

Notes
Location:
Client:
User Name:
General:

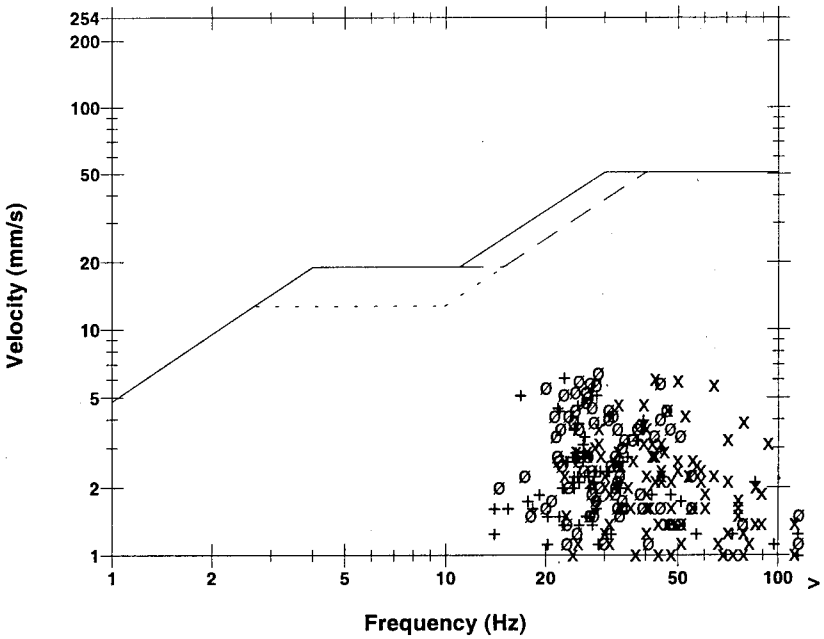
Post Event Notes
11-SD-54/125 001923
BLAST19B STATION 122+20 TO 122+60
82 kg PER DELAY, 104 m TO 6633
8546 LAKEBLUFF CIRCLE

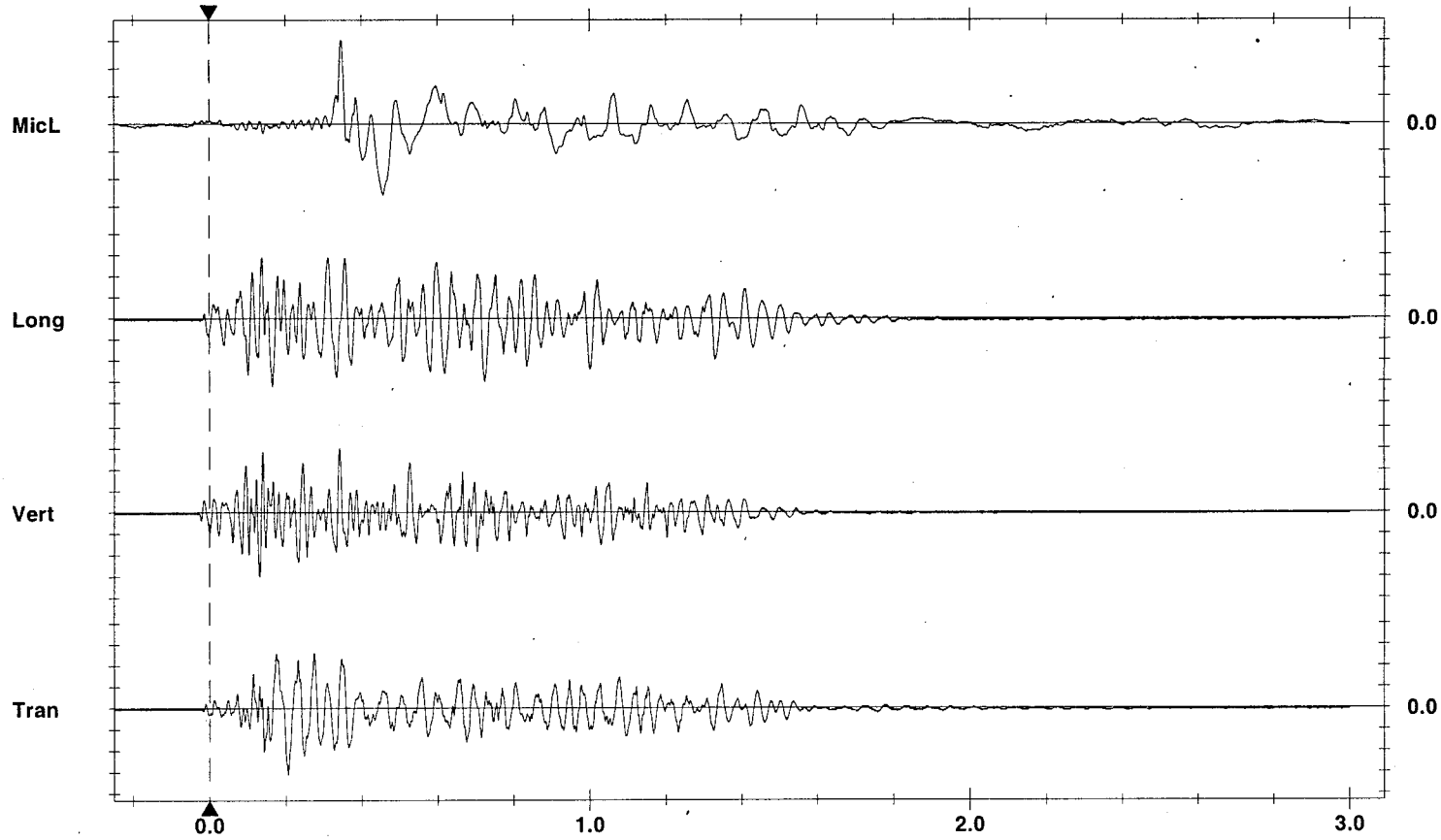
Microphone	Linear Weighting
PSPL	60.8 pa.(L) at 0.346 sec
ZC Freq	13.5 Hz
Channel Test	Passed (Freq = 19.0 Hz Amp = 735 mv)

	Tran	Vert	Long	
PPV	6.22	6.10	6.48	mm/s
ZC Freq	22.8	43	28.8	Hz
Time (Rel. to Trig)	0.206	0.342	0.165	sec
Peak Acceleration	0.212	0.318	0.212	g
Peak Displacement	0.0397	0.0229	0.0381	mm
Sensorcheck ™	Passed	Passed	Passed	

Peak Vector Sum 7.82 mm/s at 0.138 sec

USBM RI8507 And OSMRE





Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.00 mm/s/div Mic: 20.0 pa.(L)/div
Trigger = ▶— — —◀

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Event Report

Date/Time	Vert at 12:00:30 August 4, 1999	**Serial Number**	BC6543 V 4.0-4.0 MiniMate Plus
Trigger Source	Geo: 3.00 mm/s	**Battery Level**	6.3 Volts
Range	Geo :254 mm/s	**Calibration**	June 16, 1999 by Instantel Inc.
Record Time	3.875 sec (Auto=3Sec) at 4096 sps	**File Name**	H5437M3L.CU0
Job Number:	19		

Notes
EA 11-001923
SR 54/125 KP 9.7
Blast Number:
Monitoring Location:

Extended Notes
TEMP: 96 F

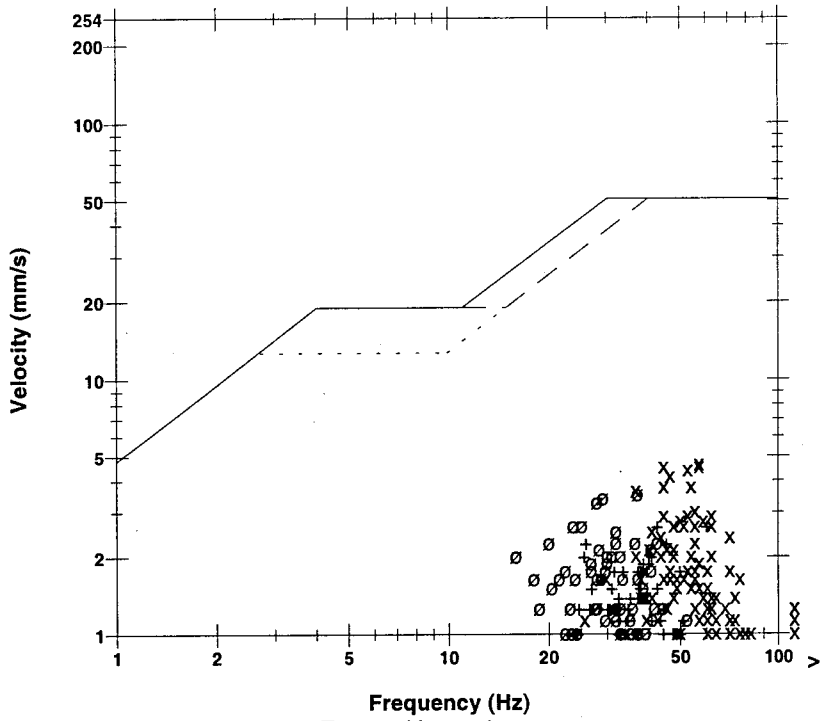
Post Event Notes
11-SD-54/125 001923
BLAST19B STATION 122+20 TO 122+60
82 kg PER DELAY,197 m TO 6543
8504 LAKE BLUFF CIRCLE

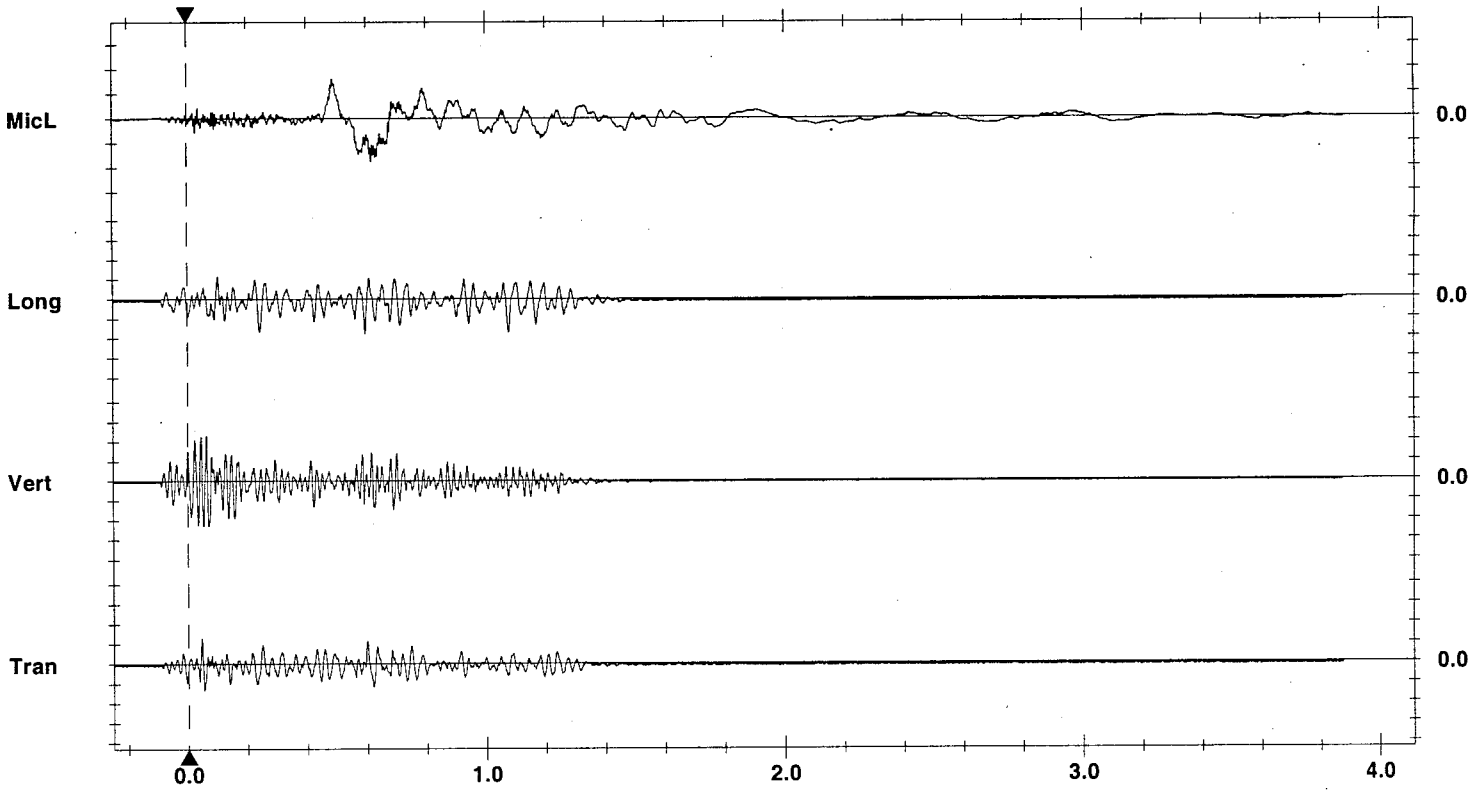
Microphone	Linear Weighting
PSPL	17.5 pa.(L) at 0.617 sec
ZC Freq	3.8 Hz
Channel Test	Passed (Freq = 19.0 Hz Amp = 712 mv)

	Tran	Vert	Long	
PPV	2.67	4.70	3.56	mm/s
ZC Freq	60	57	37.2	Hz
Time (Rel. to Trig)	0.045	0.063	0.594	sec
Peak Acceleration	0.159	0.265	0.159	g
Peak Displacement	0.0133	0.0189	0.0192	mm
Sensorcheck ™	Passed	Passed	Passed	

Peak Vector Sum 5.37 mm/s at 0.053 sec

USBM RI8507 And OSMRE





Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.00 mm/s/div Mic: 10.00 pa.(L)/div
Trigger = ▶— — —◀

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Event Report

Date/Time	Vert at 12:00:47 August 4, 1999	**Serial Number**	BC6544 V 4.0-4.0 MiniMate Plus
Trigger Source	Geo: 3.00 mm/s	**Battery Level**	6.3 Volts
Range	Geo :254 mm/s	**Calibration**	June 16, 1999 by Instantel Inc.
Record Time	4.25 sec (Auto=3Sec) at 4096 sps	**File Name**	H5447M3L.DB0
Job Number:	19		

Notes
Location:
Client:
User Name:
General:

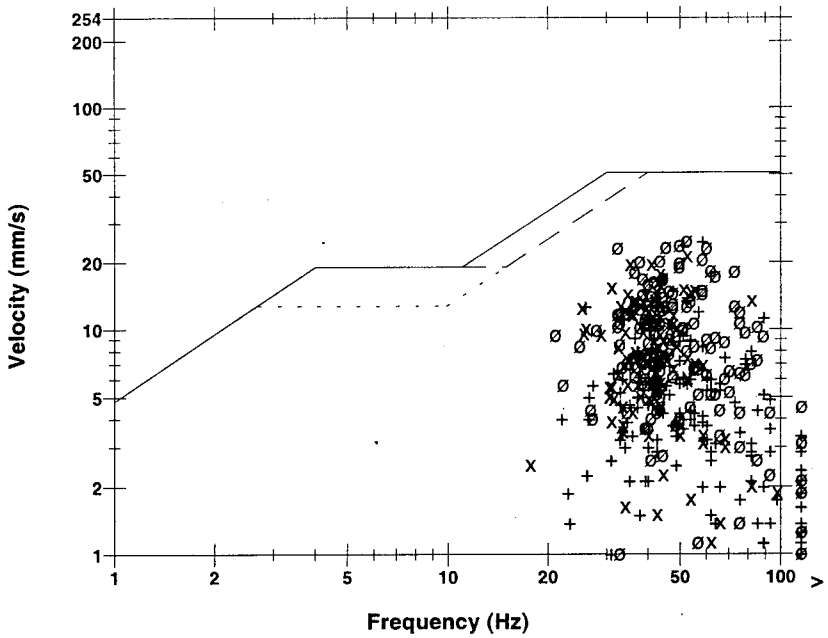
Post Event Notes
11-SD-54/125 001923
BLAST19B STATION 122+20 TO 122+60
82 kg PER DELAY, 104 m TO 6544
8566 LAKEBLUFF CIRCLE

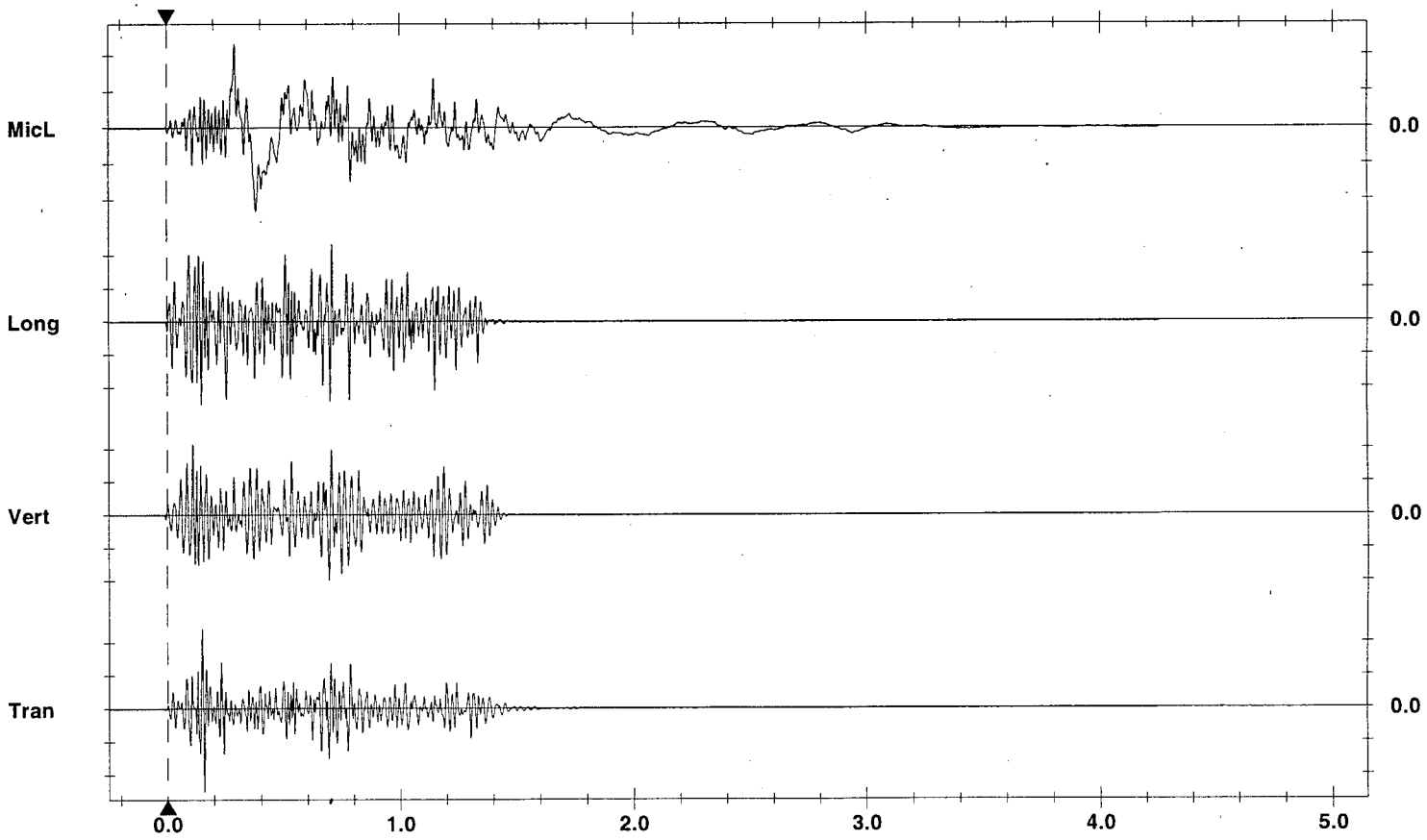
Microphone	Linear Weighting
PSPL	46.3 pa.(L) at 0.290 sec
ZC Freq	8.9 Hz
Channel Test	Passed (Freq = 20.1 Hz Amp = 706 mv)

	Tran	Vert	Long	
PPV	25.1	21.6	25.1	mm/s
ZC Freq	59	53	53	Hz
Time (Rel. to Trig)	0.157	0.108	0.146	sec
Peak Acceleration	0.954	0.742	0.954	g
Peak Displacement	0.0746	0.0748	0.0997	mm
Sensorcheck ™	Passed	Passed	Passed	

Peak Vector Sum 33.5 mm/s at 0.146 sec

USBM RI8507 And OSMRE





Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 10.00 mm/s/div Mic: 20.0 pa.(L)/div
Trigger = ▶— — —◀

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Event Report

Date/Time	Long at 12:00:07 August 9, 1999	**Serial Number**	BA6633 V 4.0-4.0 BlastMate III
Trigger Source	Geo: 2.00 mm/s	**Battery Level**	6.2 Volts
Range	Geo :254 mm/s	**Calibration**	May 28, 1999 by Instantel Inc.
Record Time	3.0 sec at 4096 sps	**File Name**	H6337MCU.O70
Job Number:	20		

Notes
Location:
Client:
User Name:
General:

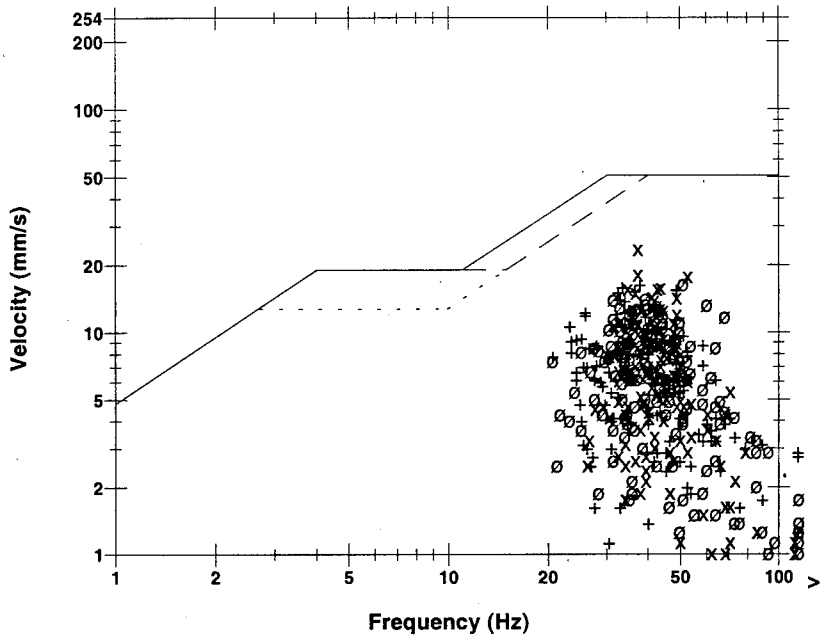
Post Event Notes
11-SD-54/125 001923
BLAST20B STATION 121 + 80 TO 122 + 20
82 kg PER DELAY, 95 m TO 6633
8566 LAKEBLUFF CIRCLE

Microphone	Linear Weighting
PSPL	29.0 pa.(L) at 1.623 sec
ZC Freq	6.8 Hz
Channel Test	Passed (Freq = 19.3 Hz Amp = 759 mv)

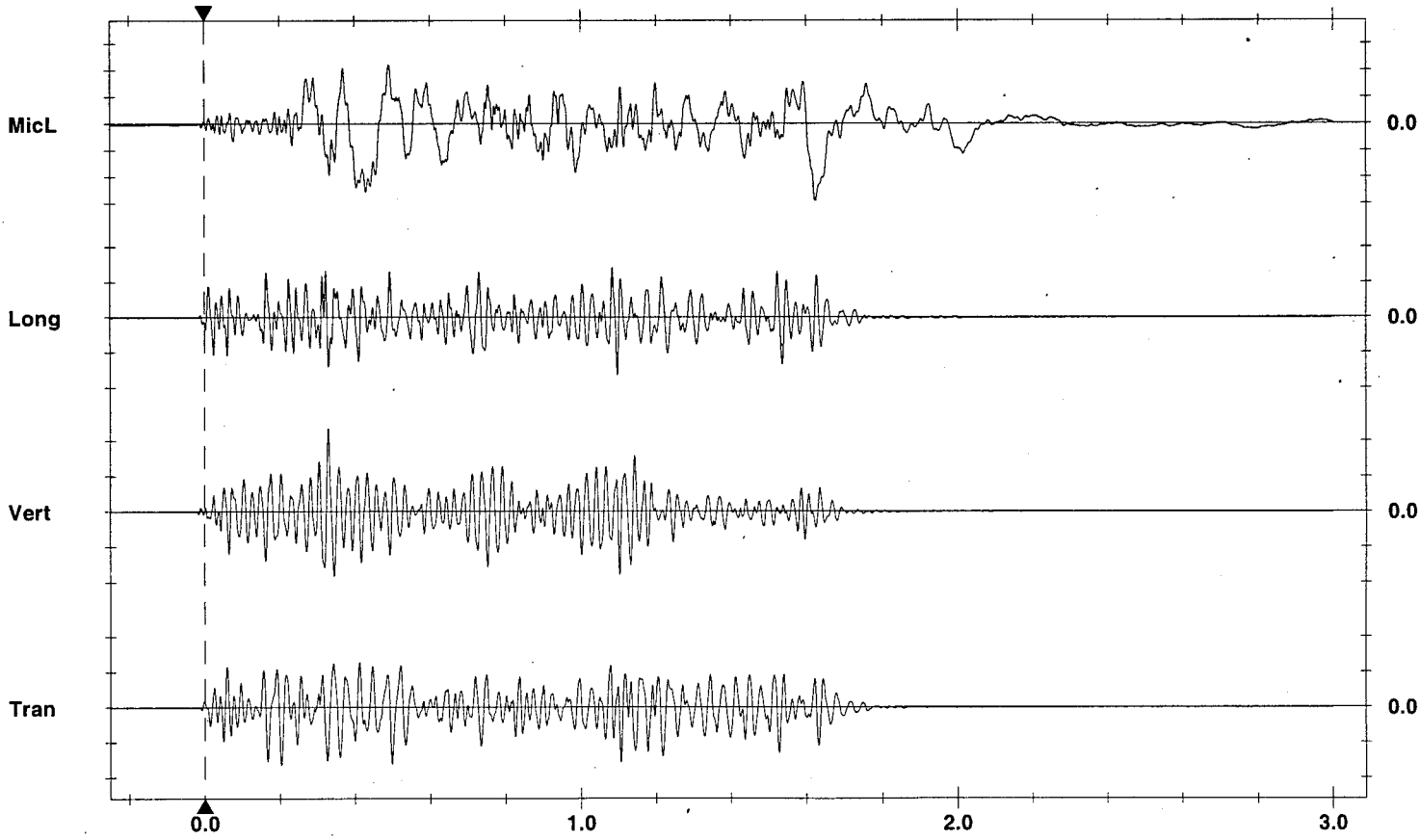
	Tran	Vert	Long	
PPV	16.5	23.7	16.5	mm/s
ZC Freq	37.9	37.2	51	Hz
Time (Rel. to Trig)	0.203	0.329	1.097	sec
Peak Acceleration	0.530	0.636	0.636	g
Peak Displacement	0.0728	0.0879	0.0637	mm
Sensorcheck ™	Passed	Passed	Passed	

Peak Vector Sum 28.8 mm/s at 0.329 sec

USBM RI8507 And OSMRE



Tran: + Vert: x Long: ø



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 10.00 mm/s/div Mic: 10.00 pa.(L)/div
Trigger = ▶— — —◀

Format Copyrighted 1996-1998

Event Report

Date/Time	Vert at 12:00:08 August 9, 1999	**Serial Number**	BC6543 V 4.0-4.0 MiniMate Plus
Trigger Source	Geo: 3.00 mm/s	**Battery Level**	6.3 Volts
Range	Geo :254 mm/s	**Calibration**	June 16, 1999 by Instantel Inc.
Record Time	4.5 sec (Auto=3Sec) at 4096 sps	**File Name**	H5437MCU.O80
Job Number:	20		

Notes
EA 11-001923
SR 54/125 KP 9.7
Blast Number:
Monitoring Location:

Extended Notes
TEMP: 96 F

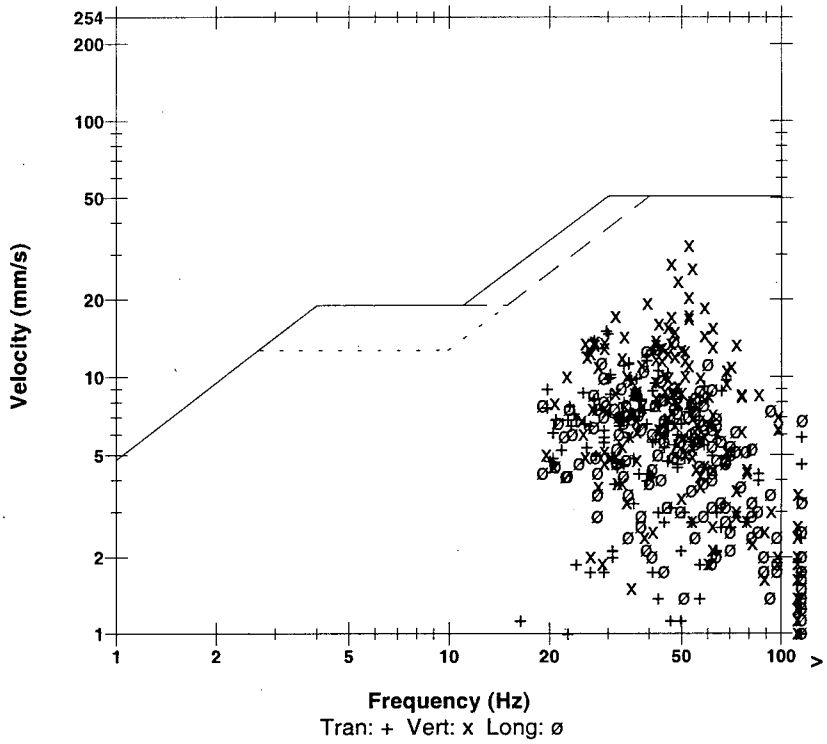
Post Event Notes
11-SD-54/125 001923
BLAST20B STATION 121 + 80 TO 122 + 20
82 kg PER DELAY, 89 m TO 6543
SWEETWATER VILLAS, UNIT 23

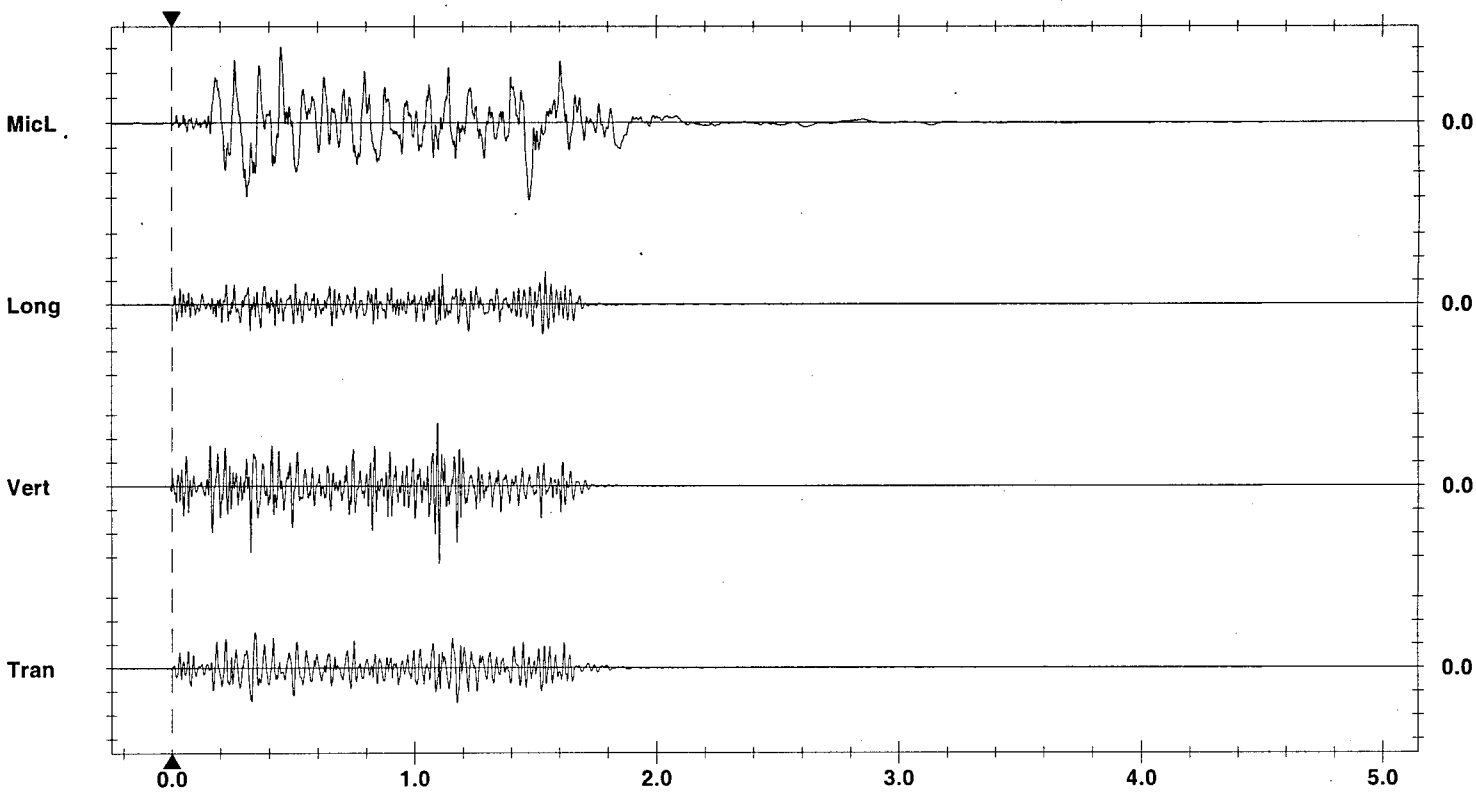
Microphone	Linear Weighting
PSPL	62.0 pa.(L) at 1.474 sec
ZC Freq	5.6 Hz
Channel Test	Passed (Freq = 19.0 Hz Amp = 701 mv)

	Tran	Vert	Long	
PPV	15.4	32.9	13.8	mm/s
ZC Freq	29.7	53	48	Hz
Time (Rel. to Trig)	0.340	1.101	1.542	sec
Peak Acceleration	0.477	1.75	0.530	g
Peak Displacement	0.0858	0.0925	0.0611	mm
Sensorcheck ™	Passed	Passed	Passed	

Peak Vector Sum 33.6 mm/s at 1.101 sec

USBM RI8507 And OSMRE





Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 10.00 mm/s/div Mic: 20.0 pa.(L)/div
Trigger = ▶— — —◀

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Event Report

Date/Time	Long at 12:00:28 August 9, 1999	**Serial Number**	BC6544 V 4.0-4.0 MiniMate Plus
Trigger Source	Geo: 3.00 mm/s	**Battery Level**	6.3 Volts
Range	Geo :254 mm/s	**Calibration**	June 16, 1999 by Instantel Inc.
Record Time	4.125 sec (Auto=3Sec) at 4096 sps	**File Name**	H5447MCU.OS0
Job Number:	20		

Notes
Location:
Client:
User Name:
General:

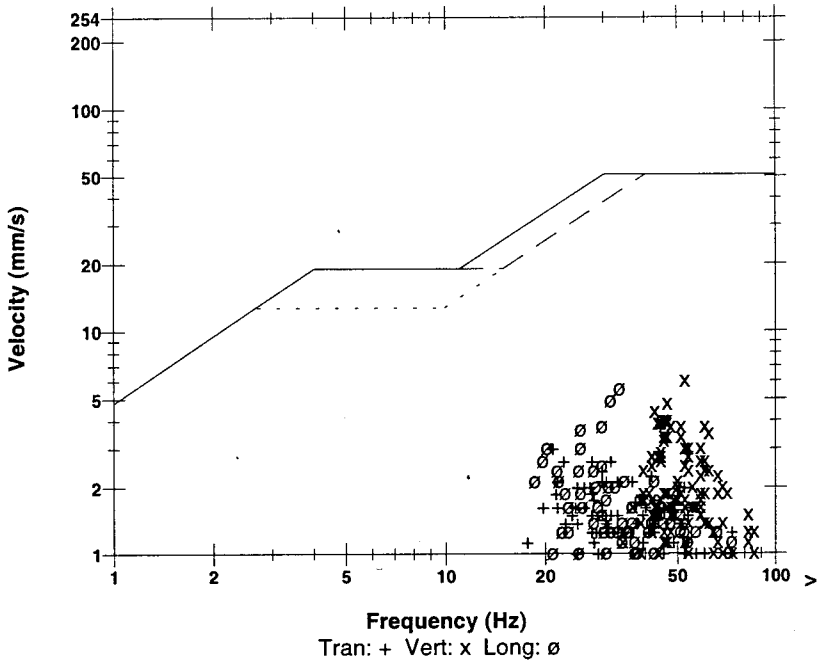
Post Event Notes
11-SD-54/125 001923
BLAST20B STATION 121 + 80 TO 122 + 20
82 kg PER DELAY, 188 m TO 6544
8504 LAKEBLUFF CIRCLE, SE CORNER

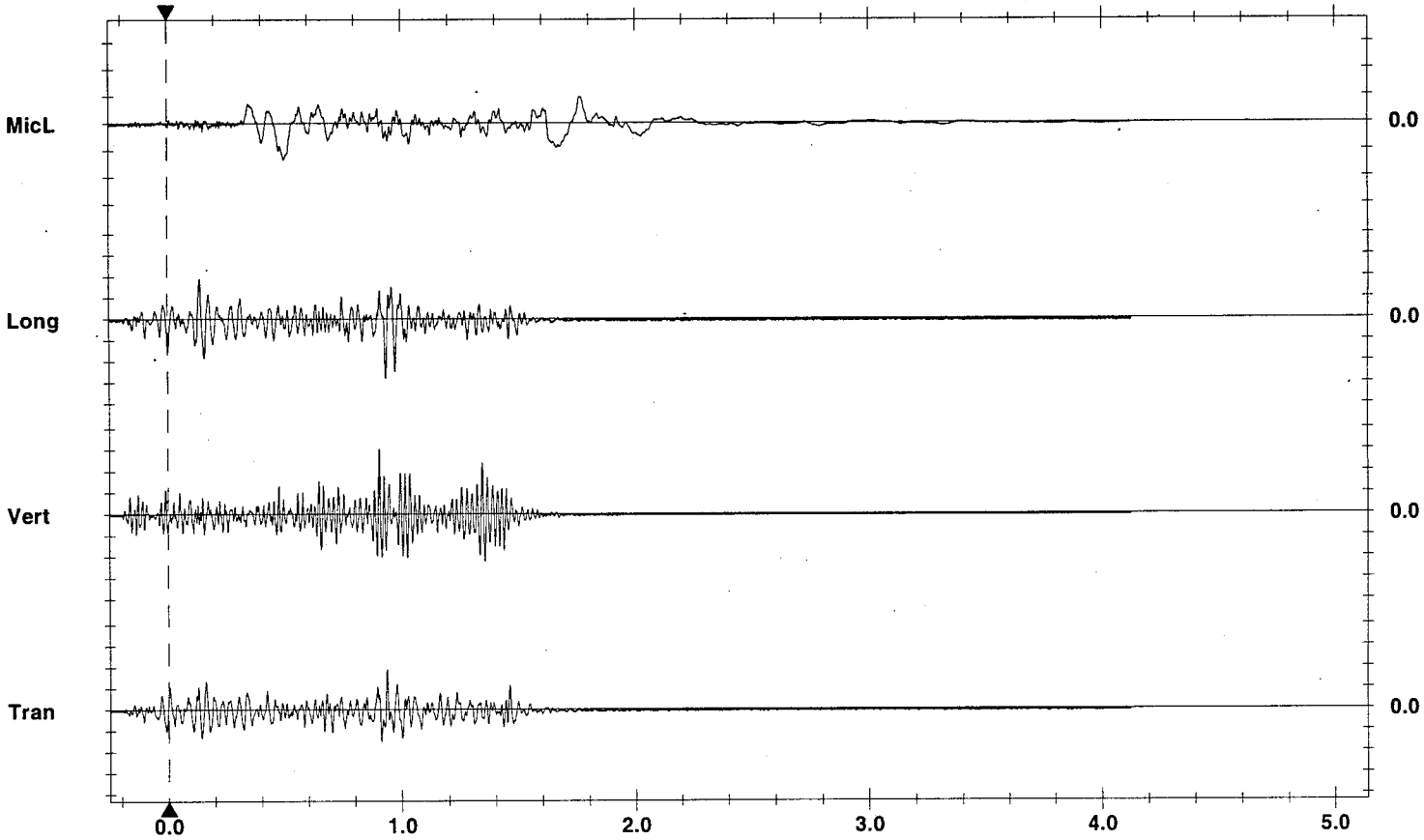
Microphone	Linear Weighting
PSPL	13.5 pa.(L) at 0.499 sec
ZC Freq	6.6 Hz
Channel Test	Passed (Freq = 20.1 Hz Amp = 705 mv)

	Tran	Vert	Long	
PPV	3.81	6.10	5.59	mm/s
ZC Freq	45	53	33.6	Hz
Time (Rel. to Trig)	0.936	0.905	0.933	sec
Peak Acceleration	0.106	0.212	0.159	g
Peak Displacement	0.0189	0.0176	0.0252	mm
Sensorcheck ™	Passed	Passed	Passed	

Peak Vector Sum 7.34 mm/s at 0.934 sec

USBM RI8507 And OSMRE





Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.00 mm/s/div Mic: 10.00 pa.(L)/div
Trigger = ▶— — —◀

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Event Report

Date/Time	Long at 12:04:34 July 19, 1999	**Serial Number**	BA6633 V 4.0-4.0 BlastMate III
Trigger Source	Geo: 3.00 mm/s	**Battery Level**	6.3 Volts
	Mic: 100 pa.(L)	**Calibration**	May 28, 1999 by Instantel Inc.
Range	Geo :254 mm/s	**File Name**	H6337L9Y.VM0
Record Time	3.0 sec at 4096 sps		
Job Number:	1		

Notes
Location:
Client:
User Name:
General:

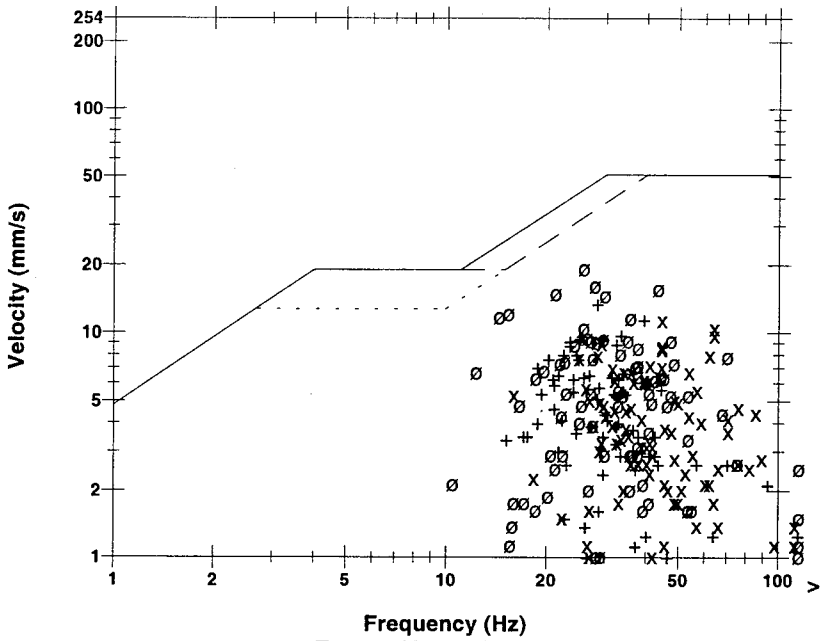
Post Event Notes
11-SD-54/125 001923
BLAST21B STATION 121 + 40 TO 121 + 80
82 kg PER DELAY, 97 m TO 6633
QUARRY RD. 91.4 m NORTH OF ROCK/FILL CONTACT

Microphone	Linear Weighting
PSPL	25.8 pa.(L) at 1.165 sec
ZC Freq	11.6 Hz
Channel Test	Passed (Freq = 19.0 Hz Amp = 741 mv)

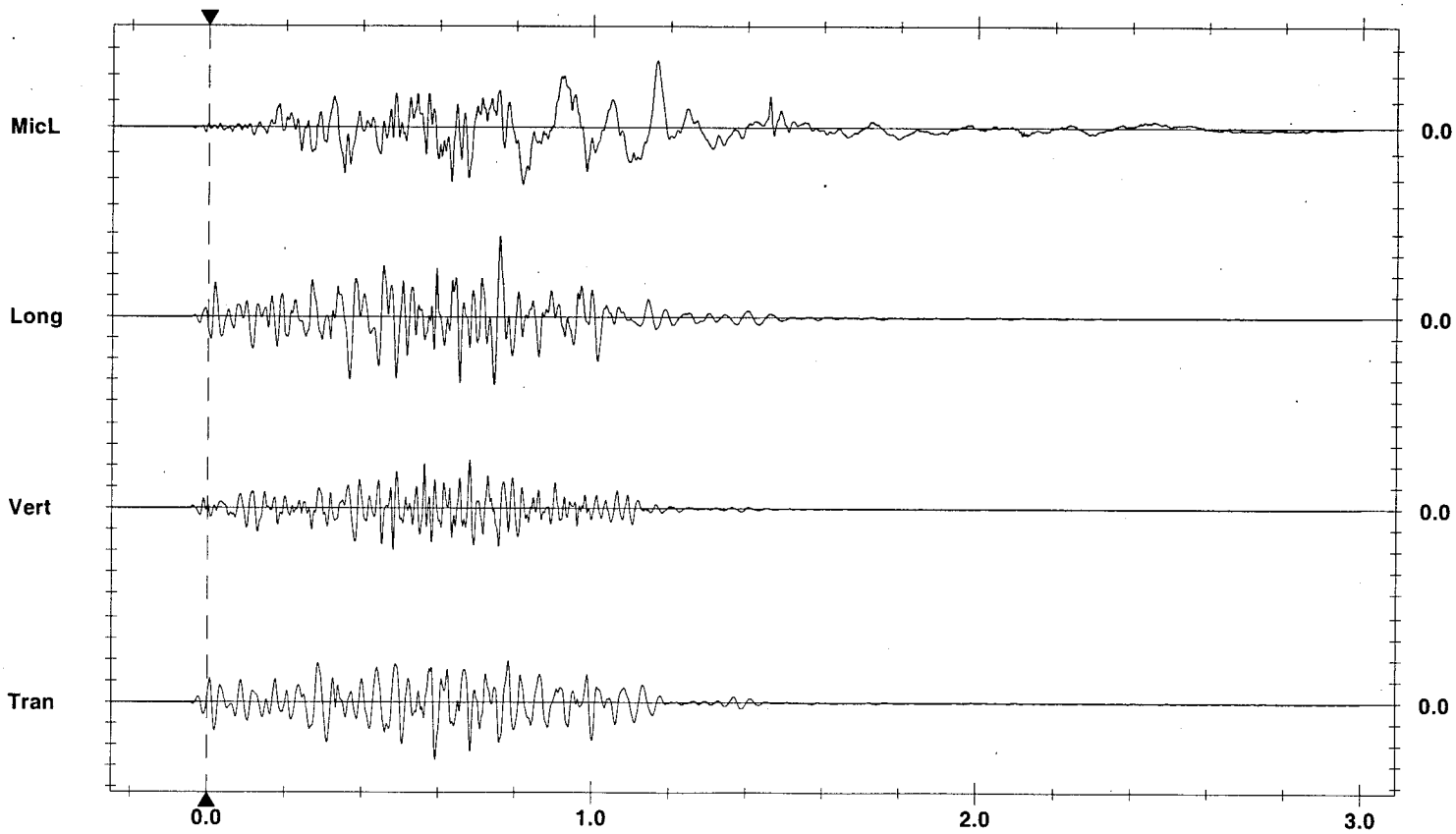
	Tran	Vert	Long	
PPV	13.6	11.4	19.4	mm/s
ZC Freq	28.4	45	25.9	Hz
Time (Rel. to Trig)	0.593	0.680	0.757	sec
Peak Acceleration	0.371	0.424	0.477	g
Peak Displacement	0.0712	0.0451	0.105	mm
Sensorcheck ™	Passed	Passed	Passed	

Peak Vector Sum 22.7 mm/s at 0.758 sec

USBM RI8507 And OSMRE



Tran: + Vert: x Long: ø



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 5.00 mm/s/div Mic: 10.00 pa.(L)/div
Trigger = ▶— — —◀

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Event Report

Date/Time	Long at 12:04:34 July 19, 1999	**Serial Number**	BC6543 V 4.0-4.0 MiniMate Plus
Trigger Source	Geo: 3.00 mm/s	**Battery Level**	6.4 Volts
Range	Geo :254 mm/s	**Calibration**	June 16, 1999 by Instantel Inc.
Record Time	4.25 sec (Auto=3Sec) at 1024 sps	**File Name**	H5437L9Y.VM0
Job Number:	21		

Notes
EA 11-001923
SR 54/125 KP 9.7
Blast Number:
Monitoring Location:

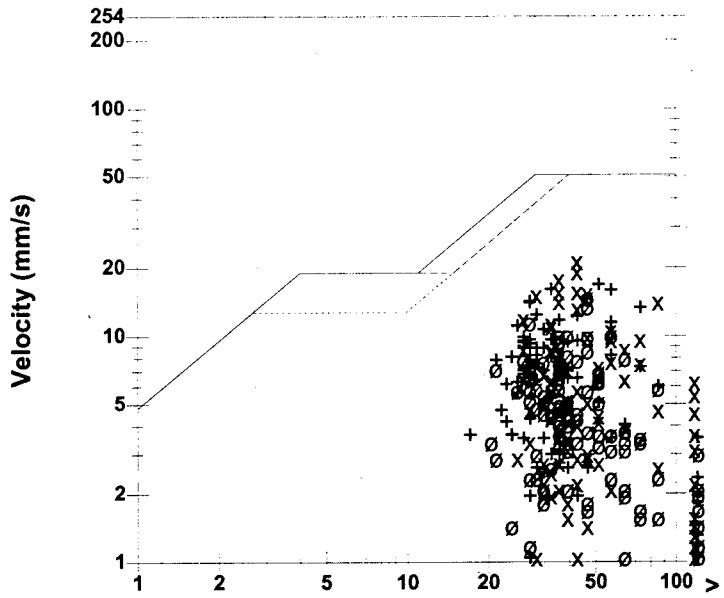
Post Event Notes
11-SD-54/125 001923
BLAST21B STATION 121 +40 TO 121+80
31 kg PER DELAY, 94 m TO 6543
8504 LAKEBLUFF CIRCLE, SE CORNER

Microphone	Linear Weighting
PSPL	31.5 pa.(L) at 0.718 sec
ZC Freq	26 Hz
Channel Test	Passed (Freq = 18.6 Hz Amp = 674 mv)

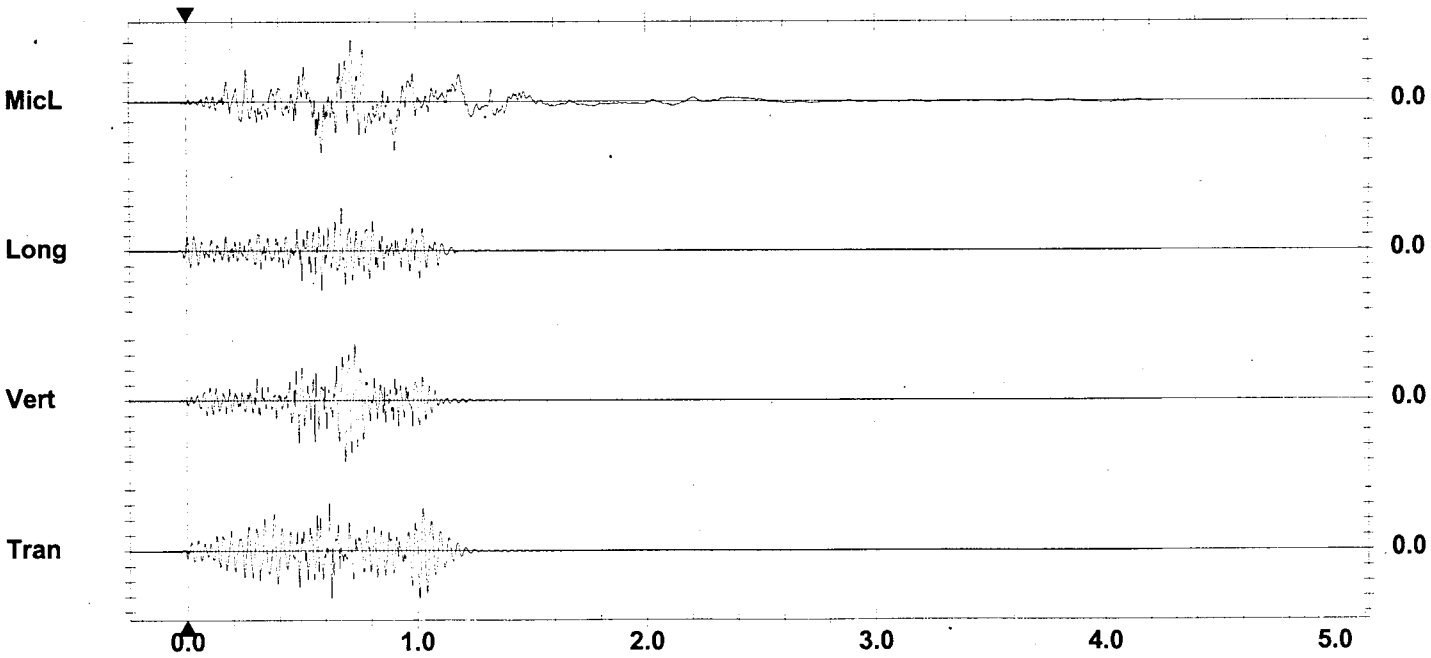
	Tran	Vert	Long	
PPV	16.4	20.7	14.4	mm/s
ZC Freq	51	43	47	Hz
Time (Rel. to Trig)	0.617	0.689	0.675	sec
Peak Acceleration	0.610	0.756	0.477	g
Peak Displacement	0.0749	0.0740	0.0473	mm
Sensorcheck ™	Passed	Passed	Passed	

Peak Vector Sum 22.8 mm/s at 0.689 sec

USBM RI8507 And OSMRE



Tran: + Vert: x Long: ø



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 5.00 mm/s/div Mic: 10.00 pa.(L)/div
Trigger = ▶----------◀

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Event Report

Date/Time	Long at 12:02:09 July 21, 1999	**Serial Number**	BA6633 V 4.0-4.0 BlastMate III
Trigger Source	Geo: 3.00 mm/s	**Battery Level**	6.3 Volts
	Mic: 100 pa.(L)	**Calibration**	May 28, 1999 by Instantel Inc.
Range	Geo :254 mm/s	**File Name**	H6337LDO.3L0
Record Time	3.0 sec at 4096 sps		
Job Number:	1		

Notes
Location:
Client:
User Name:
General:

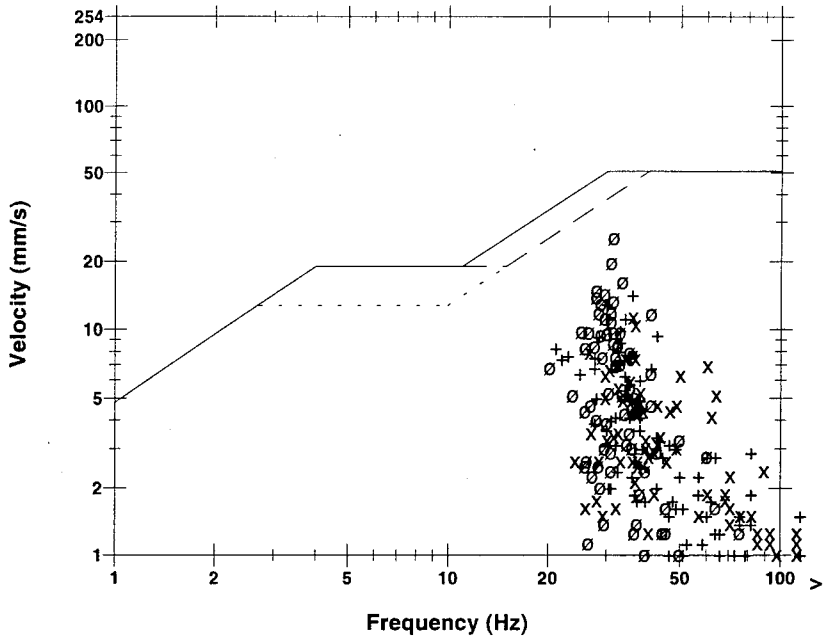
Post Event Notes
11-SD-54/125 001923
BLAST22B STATION 121+40 TO 121+80
31 kg CHARGE/DELAY; 111 m FROM 6633
8573 LAKE BLUFF CIRCLE

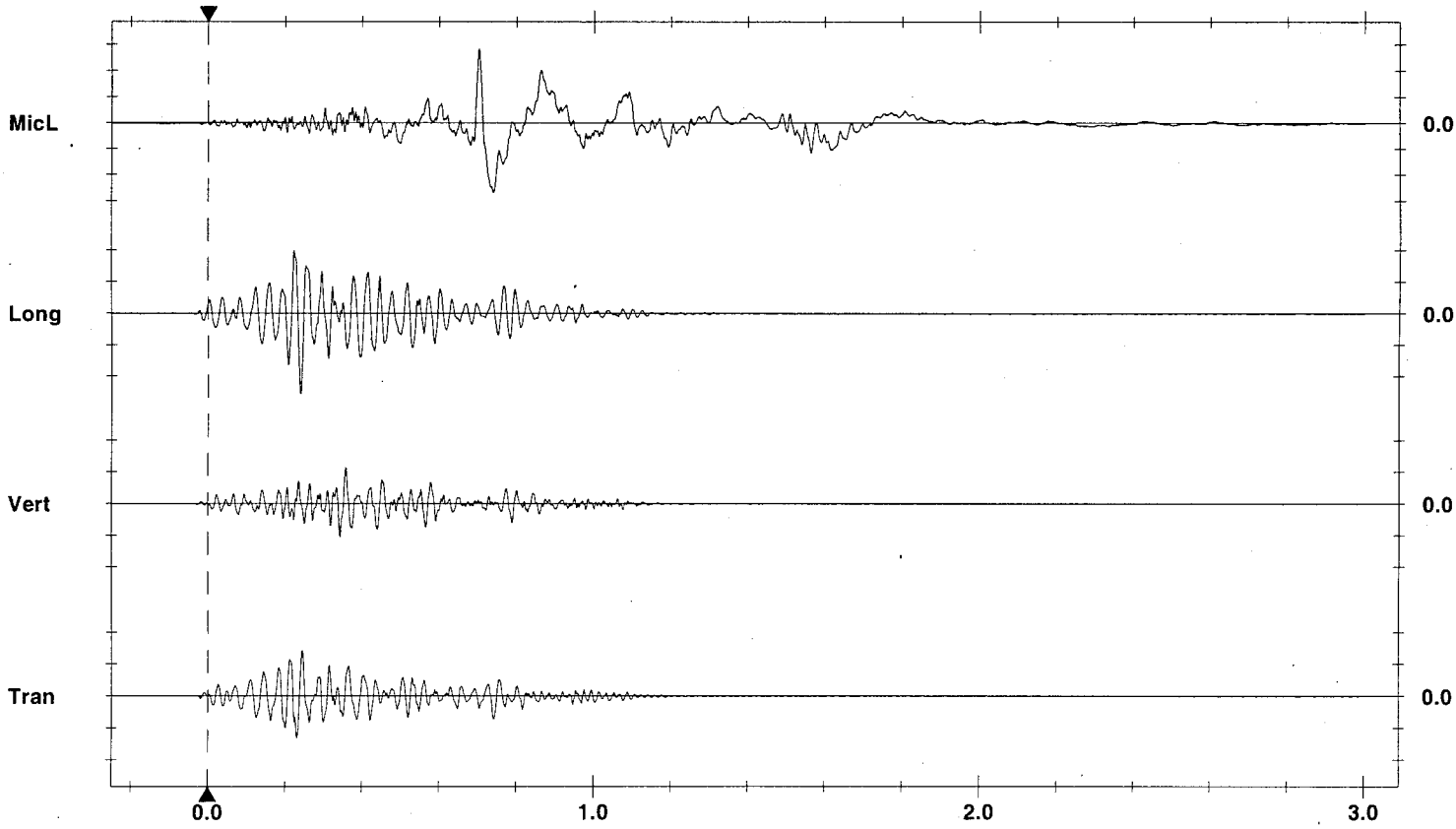
Microphone	Linear Weighting
PSPL	28.5 pa.(L) at 0.703 sec
ZC Freq	25.9 Hz
Channel Test	Passed (Freq = 19.3 Hz Amp = 756 mv)

	Tran	Vert	Long	
PPV	14.4	11.4	25.8	mm/s
ZC Freq	35.9	35.9	31.5	Hz
Time (Rel. to Trig)	0.244	0.357	0.240	sec
Peak Acceleration	0.424	0.318	0.530	g
Peak Displacement	0.0707	0.0441	0.125	mm
Sensorcheck ™	Passed	Passed	Passed	

Peak Vector Sum 26.9 mm/s at 0.241 sec

USBM RI8507 And OSMRE





Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 10.00 mm/s/div Mic: 10.00 pa.(L)/div
Trigger = ▶— — —◀

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Event Report

Date/Time	Long at 12:02:10 July 21, 1999	**Serial Number**	BC6543 V 4.0-4.0 MiniMate Plus
Trigger Source	Geo: 3.00 mm/s	**Battery Level**	6.4 Volts
Range	Geo :254 mm/s	**Calibration**	June 16, 1999 by Instantel Inc.
Record Time	3.75 sec (Auto=3Sec) at 4096 sps	**File Name**	H5437LDO.3M0
Job Number:	22		

Notes
EA 11-001923
SR 54/125 KP 9.7
Blast Number:
Monitoring Location:

Extended Notes
TEMP: 96 F

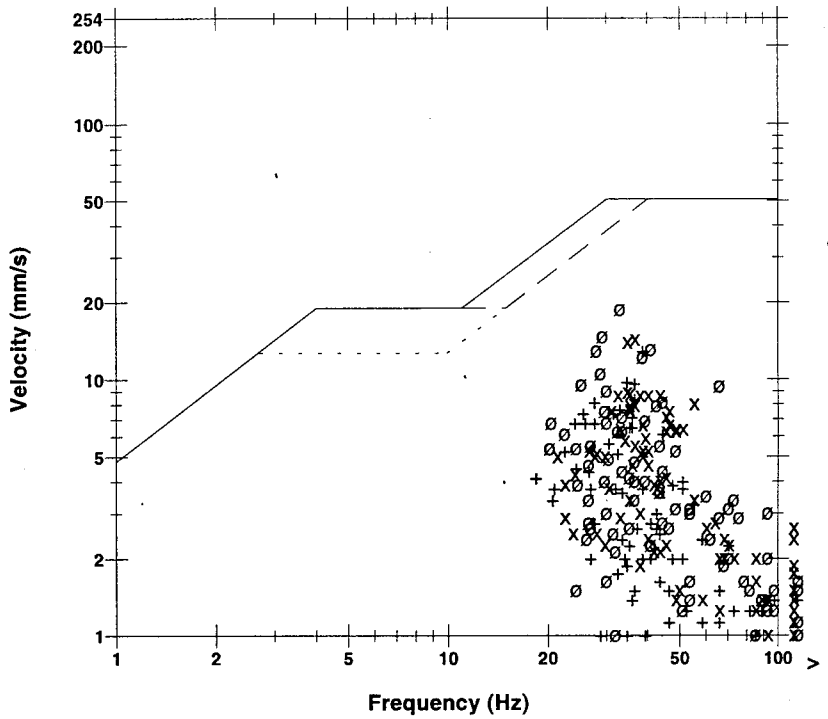
Post Event Notes
11-SD-54/125 001923
BLAST22B STATION 121+40 TO 121+80
31 kg CHARGE/DELAY; 111 m FROM 6543
8573 LAKE BLUFF CIRCLE

Microphone	Linear Weighting
PSPL	27.5 pa.(L) at 0.737 sec
ZC Freq	6.7 Hz
Channel Test	Passed (Freq = 19.0 Hz Amp = 685 mv)

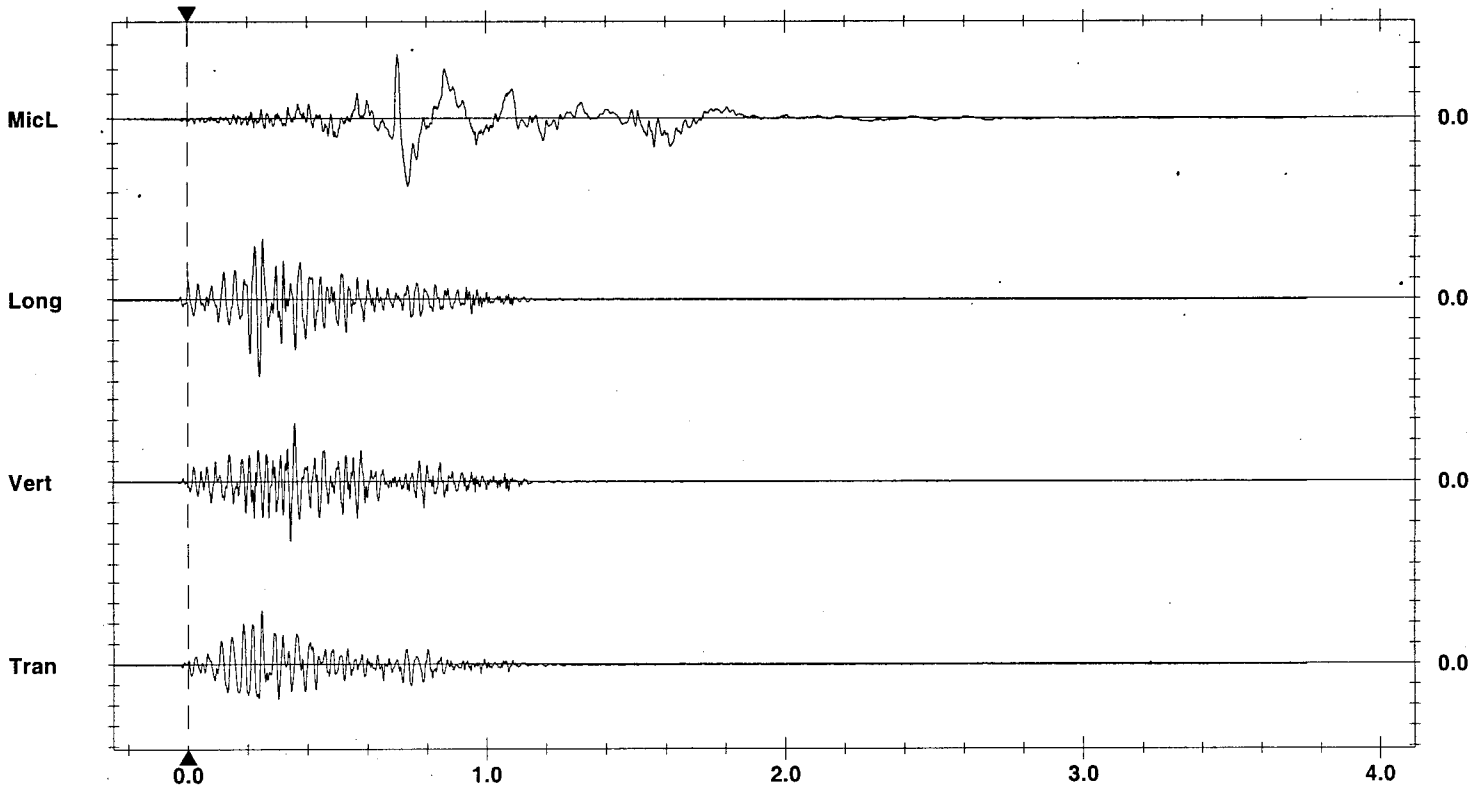
	Tran	Vert	Long	
PPV	13.1	14.5	18.9	mm/s
ZC Freq	38.6	36.6	33.0	Hz
Time (Rel. to Trig)	0.245	0.343	0.239	sec
Peak Acceleration	0.424	0.424	0.477	g
Peak Displacement	0.0573	0.0560	0.0937	mm
Sensorcheck ™	Passed	Passed	Passed	

Peak Vector Sum 20.0 mm/s at 0.238 sec

USBM RI8507 And OSMRE



Tran: + Vert: x Long: ø



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 5.00 mm/s/div Mic: 10.00 pa.(L)/div
Trigger = ▶— — —◀

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Event Report

Date/Time	Long at 12:02:22 July 21, 1999	**Serial Number**	BC6544 V 4.0-4.0 MiniMate Plus
Trigger Source	Geo: 3.00 mm/s	**Battery Level**	6.3 Volts
Range	Geo :254 mm/s	**Calibration**	June 16, 1999 by Instantel Inc.
Record Time	3.75 sec (Auto=3Sec) at 4096 sps	**File Name**	H5447LDO.3Y0
Job Number:	22		

Notes
Location:
Client:
User Name:
General:

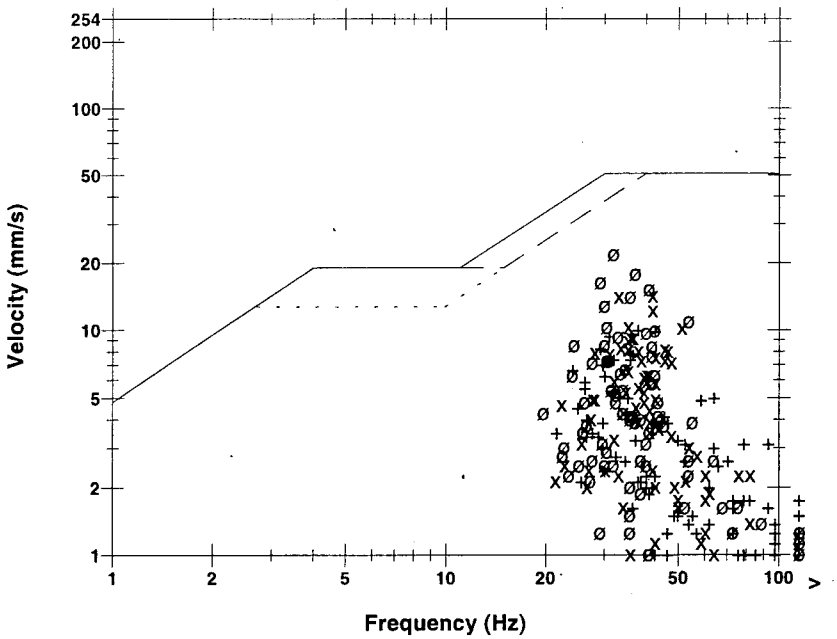
Post Event Notes
11-SD-54/125 001923
BLAST22B STATION 121+40 TO 121+80
31 kg CHARGE/DELAY; 111 m FROM 6544
8573 LAKE BLUFF CIRCLE

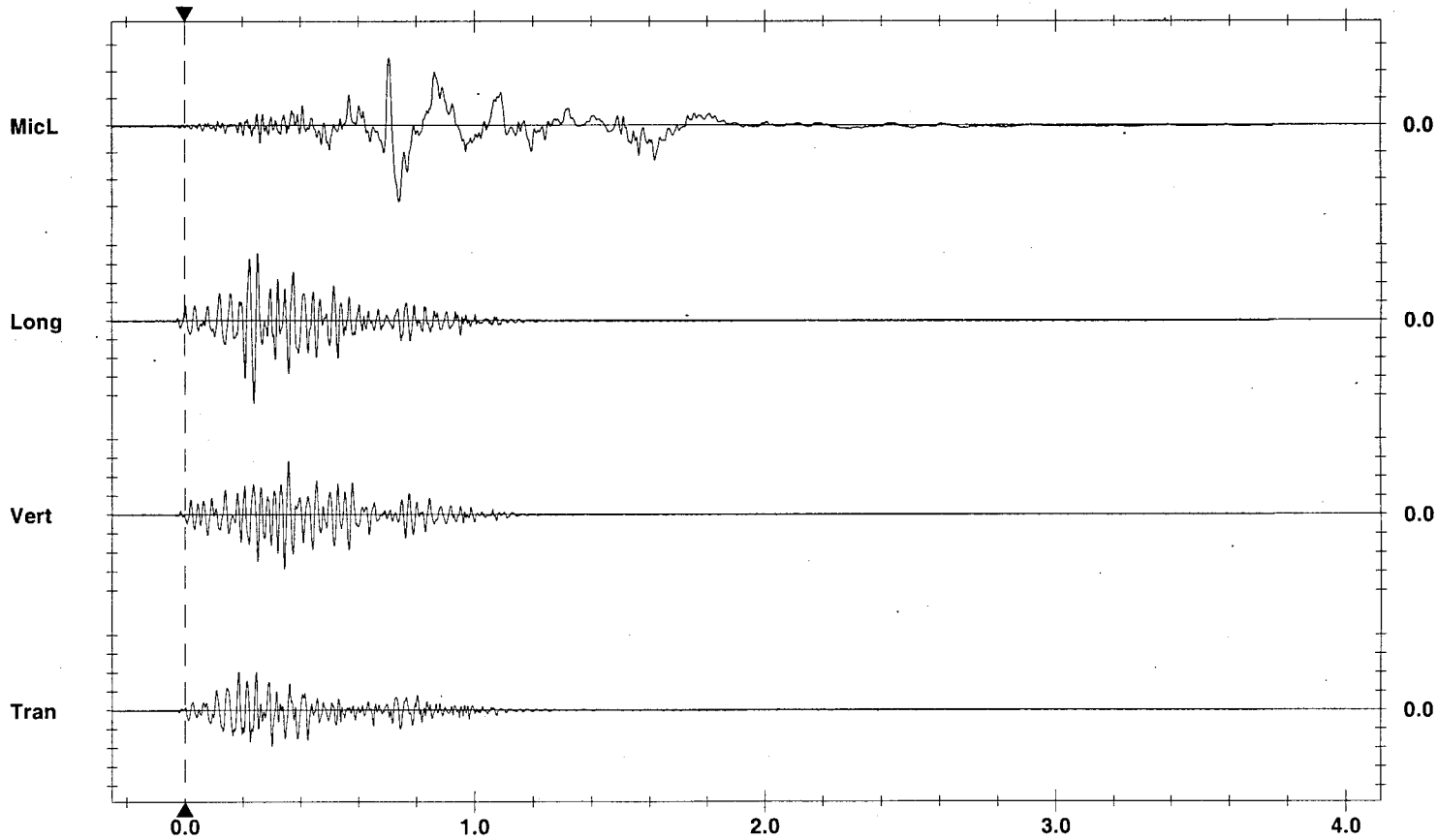
Microphone	Linear Weighting
PSPL	28.5 pa.(L) at 0.740 sec
ZC Freq	6.8 Hz
Channel Test	Passed (Freq = 20.1 Hz Amp = 631 mv)

	Tran	Vert	Long	
PPV	10.2	14.4	22.1	mm/s
ZC Freq	37.9	42	32.0	Hz
Time (Rel. to Trig)	0.184	0.343	0.237	sec
Peak Acceleration	0.371	0.424	0.530	g
Peak Displacement	0.0449	0.0619	0.104	mm
Sensorcheck ™	Passed	Passed	Passed	

Peak Vector Sum 23.5 mm/s at 0.237 sec

USBM RI8507 And OSMRE





Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 5.00 mm/s/div Mic: 10.00 pa.(L)/div
Trigger = ▶— — —◀

Format Copyrighted 1996-1998

Event Report

Date/Time	Long at 13:14:31 November 5, 1999	**Serial Number**	BC6543 V 4.0-4.0 MiniMate Plus
Trigger Source	Geo: 3.00 mm/s	**Battery Level**	6.3 Volts
Range	Geo :254 mm/s	**Calibration**	June 16, 1999 by Instantel Inc.
Record Time	3.375 sec (Auto=3Sec) at 4096 sps	**File Name**	H5437QVW.S70
Job Number:	20		

Notes
EA 11-001923
SR 54/125 KP 9.7
Blast Number:
Monitoring Location:

Extended Notes
TEMP: 96 F

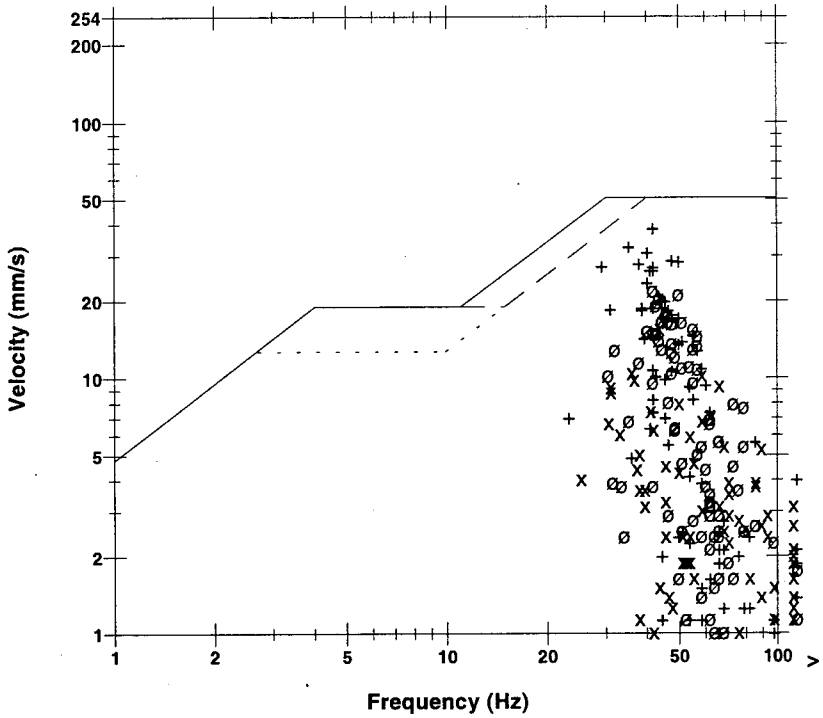
Post Event Notes
11-SD-54/125 001923
BLAST24B STATION 120+40 TO 121+00
31 kg CHARGE/DELAY; 169 m FROM 6543
8573 LAKE BLUFF CIRCLE

Microphone	Linear Weighting
PSPL	15.3 pa.(L) at 0.609 sec
ZC Freq	3.8 Hz
Channel Test	Passed (Freq = 19.0 Hz Amp = 641 mv)

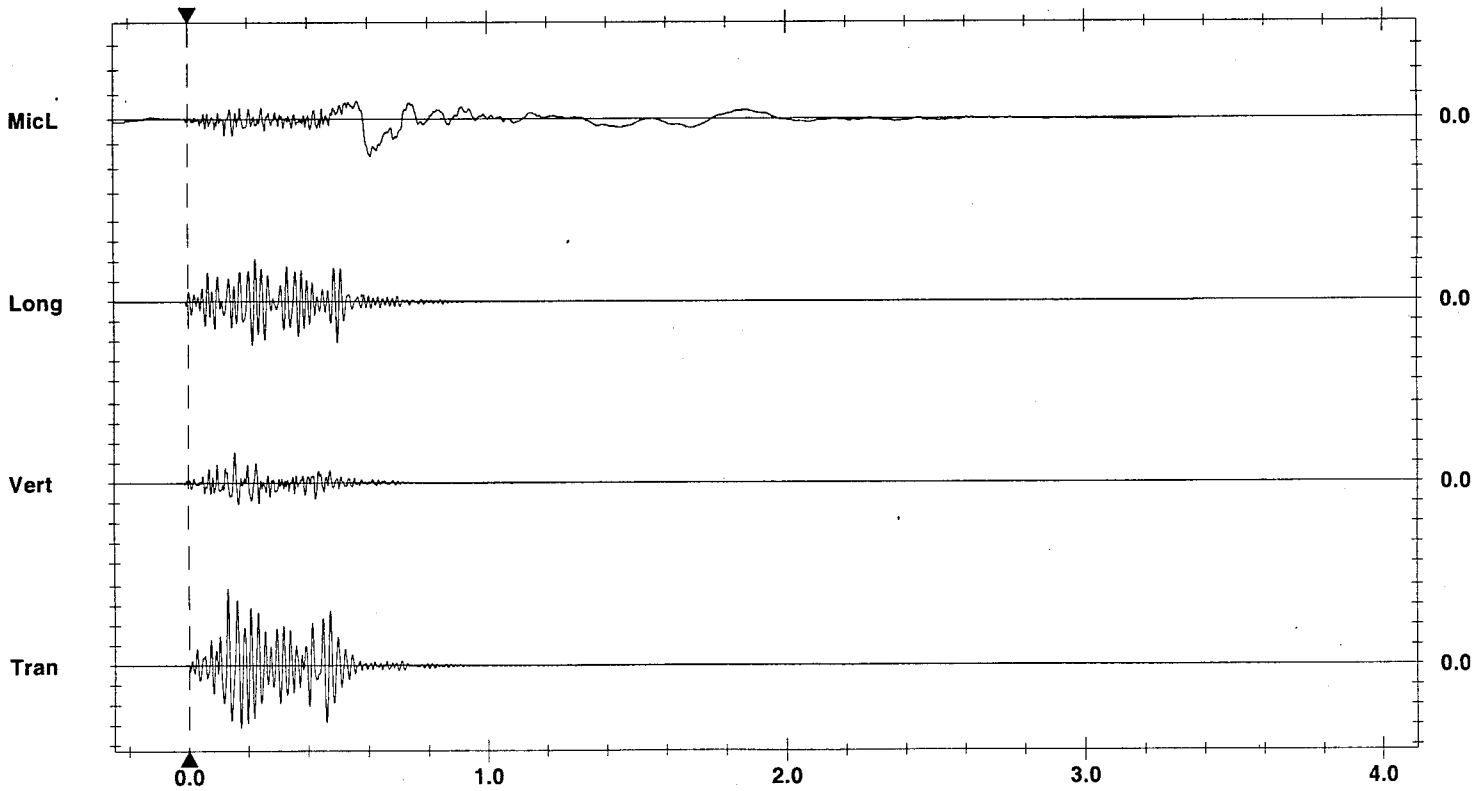
	Tran	Vert	Long	
PPV	39.0	15.6	22.1	mm/s
ZC Freq	42	44	42	Hz
Time (Rel. to Trig)	0.131	0.156	0.215	sec
Peak Acceleration	1.01	0.477	0.742	g
Peak Displacement	0.139	0.0507	0.0816	mm
Sensorcheck ™	Passed	Passed	Passed	

Peak Vector Sum 39.5 mm/s at 0.131 sec

USBM RI8507 And OSMRE



Tran: + Vert: x Long: ø



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 10.00 mm/s/div Mic: 10.00 pa.(L)/div
Trigger = ▶— — —◀

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Event Report

Date/Time	Long at 13:15:24 November 5, 1999	**Serial Number**	BC6544 V 4.0-4.0 MiniMate Plus
Trigger Source	Geo: 3.00 mm/s	**Battery Level**	6.3 Volts
Range	Geo :254 mm/s	**Calibration**	June 16, 1999 by Instantel Inc.
Record Time	3.5 sec (Auto=3Sec) at 4096 sps	**File Name**	H5447QVW.TO0
Job Number:	20		

Notes
Location:
Client:
User Name:
General:

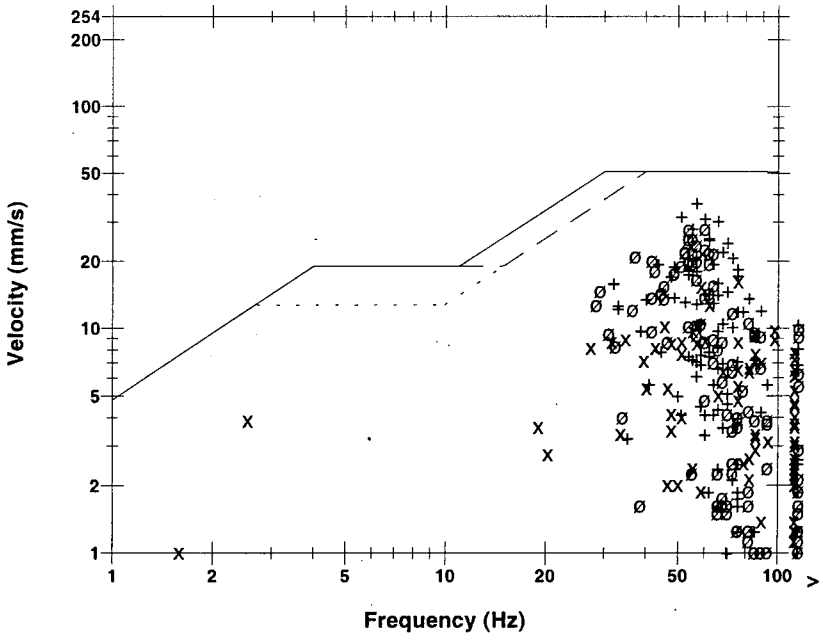
Post Event Notes
11-SD-54/125 001923
BLAST24B STATION 120+40 TO 121+00
31 kg CHARGE/DELAY; 101 m FROM 6544
120 M LT 120 +29 "B" LINE

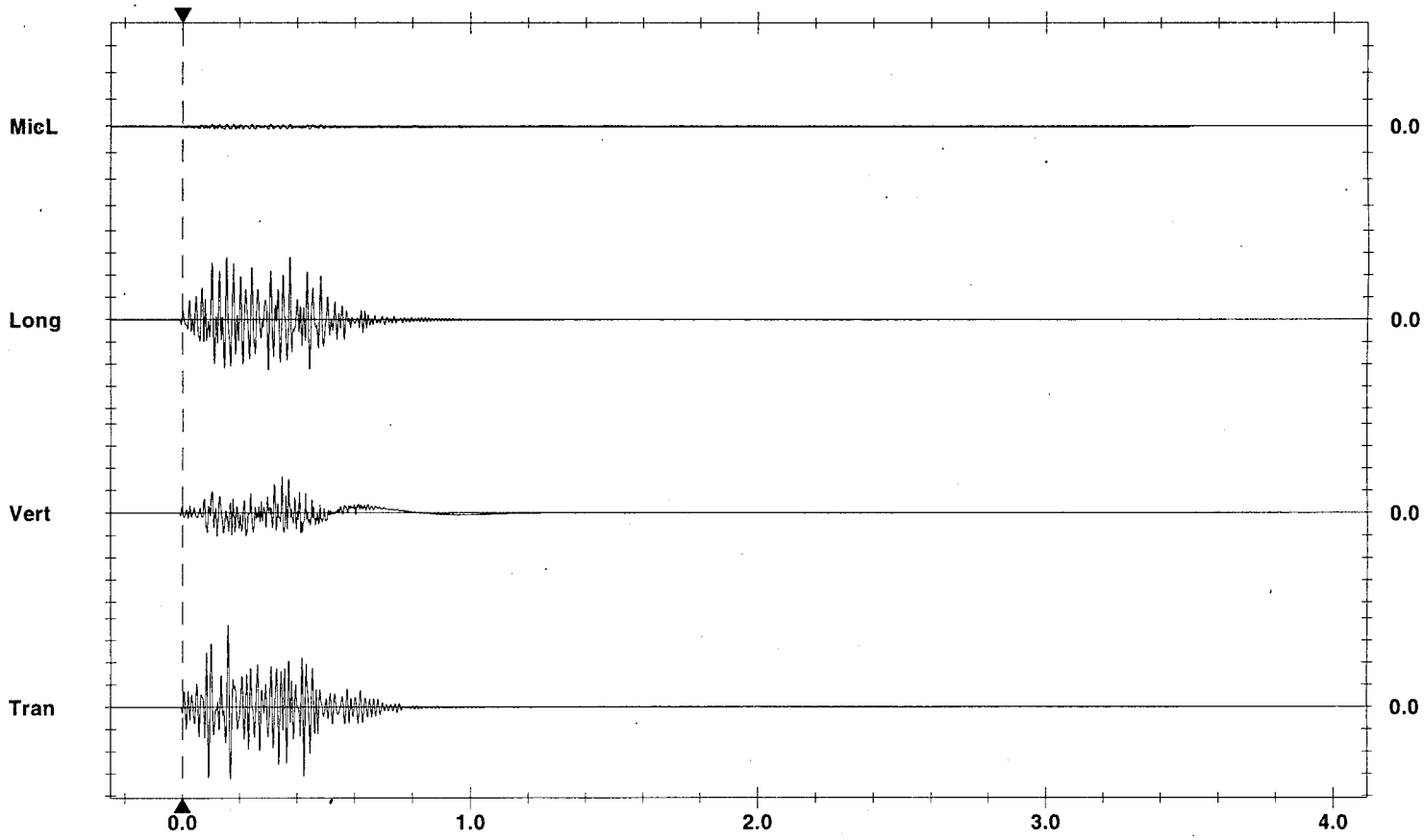
Microphone	Linear Weighting
PSPL	1.25 pa.(L) at 0.111 sec
ZC Freq	54 Hz
Channel Test	Check (Freq = 0.0 Hz Amp = 0 mv)

	Tran	Vert	Long	
PPV	37.3	16.4	28.3	mm/s
ZC Freq	57	76	60	Hz
Time (Rel. to Trig)	0.159	0.347	0.374	sec
Peak Acceleration	1.38	0.901	1.11	g
Peak Displacement	0.102	0.179	0.0765	mm
Sensorcheck ™	Passed	Passed	Passed	

Peak Vector Sum 38.7 mm/s at 0.167 sec

USBM RI8507 And OSMRE





Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 10.00 mm/s/div Mic: 10.00 pa.(L)/div
Trigger = ▶— — —◀

Format Copyrighted 1996-1998

Event Report

Date/Time	Vert at 13:05:55 January 6, 2000	**Serial Number**	BC6544 V 4.0-4.0 MiniMate Plus
Trigger Source	Geo: 3.00 mm/s	**Battery Level**	6.2 Volts
Range	Geo :254 mm/s	**Calibration**	June 16, 1999 by Instantel Inc.
Record Time	4.125 sec (Auto=3Sec) at 4096 sps	**File Name**	H5447U2P.PV0
Job Number:	20		

Notes
Location:
Client:
User Name:
General:

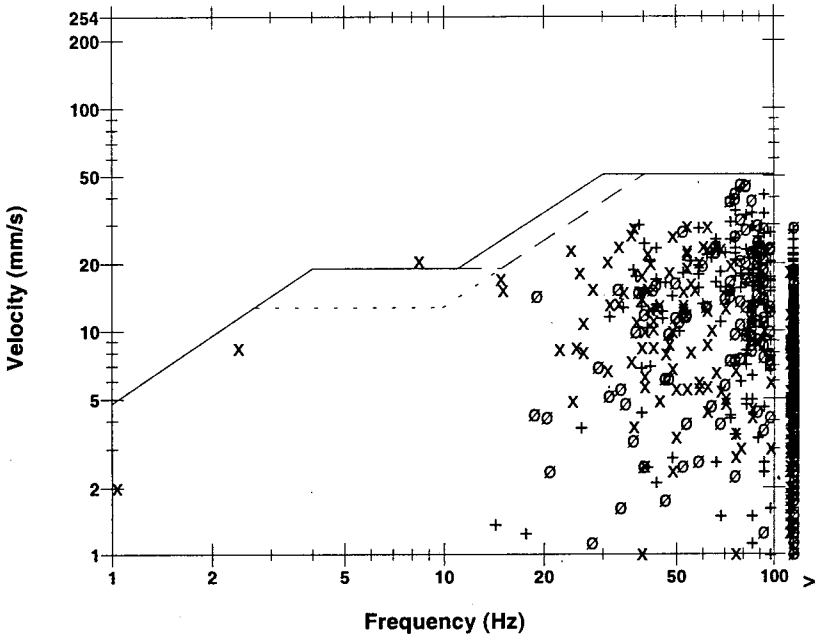
Post Event Notes
11-SD-54/125 001923
BLAST25B1 STATION 124+28 TO 124+60
44 kg CHARGE/DELAY; 44 m FROM 6544
SWEETWATER TOWN HOMES UNIT 57

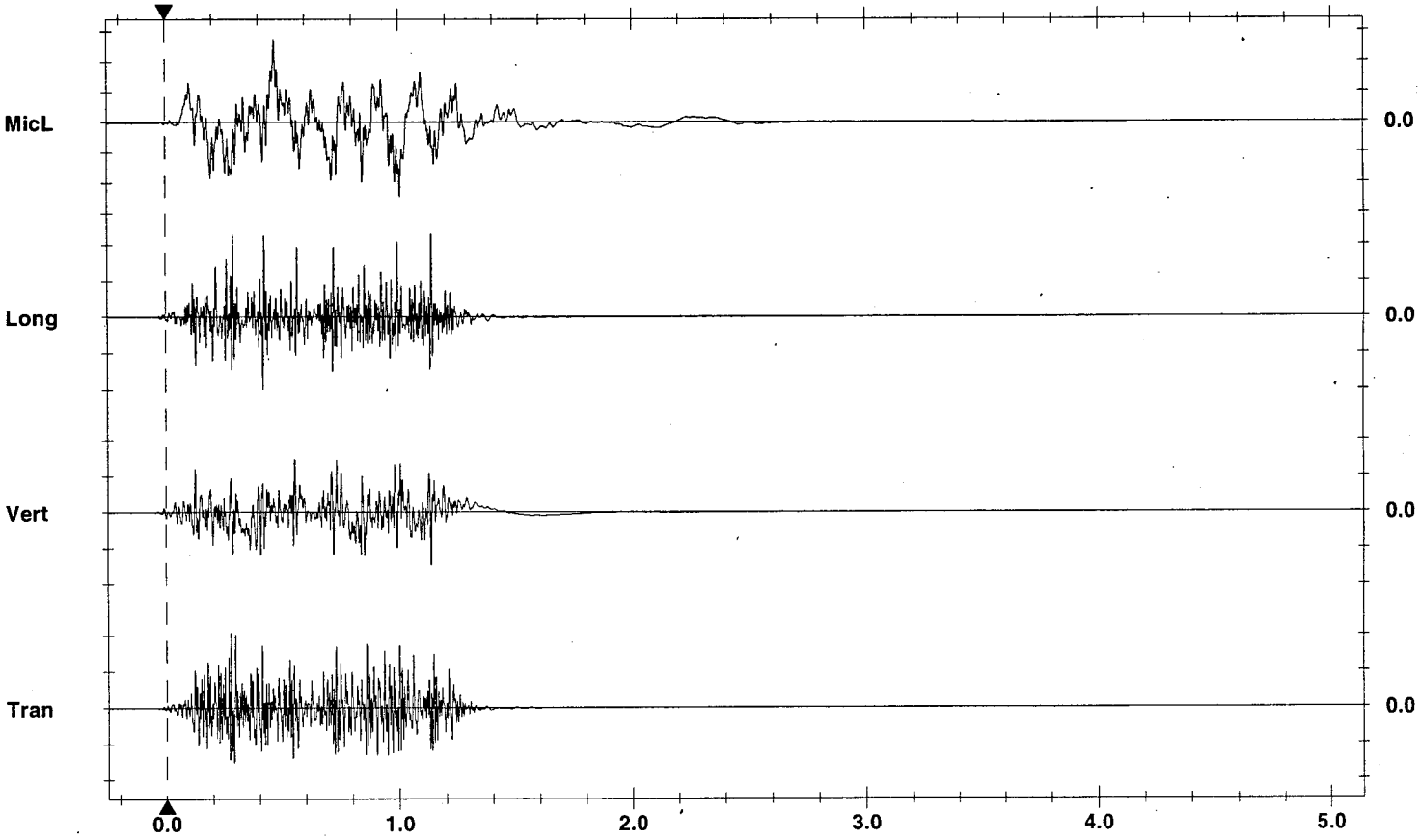
Microphone	Linear Weighting
PSPL	55.0 pa.(L) at 0.468 sec
ZC Freq	4.8 Hz
Channel Test	Passed (Freq = 20.1 Hz Amp = 684 mv)

	Tran	Vert	Long	
PPV	42.0	29.7	46.4	mm/s
ZC Freq	93	54	79	Hz
Time (Rel. to Trig)	0.276	0.553	1.139	sec
Peak Acceleration	2.44	1.86	2.39	g
Peak Displacement	0.0988	0.292	0.0912	mm
Sensorcheck ™	Passed	Passed	Passed	

Peak Vector Sum 54.6 mm/s at 0.289 sec

USBM RI8507 And OSMRE





Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 20.0 mm/s/div Mic: 20.0 pa.(L)/div
Trigger = ▶— — —◀

Format Copyrighted 1996-1998

Event Report

Date/Time	Tran at 13:06:00 January 6, 2000	**Serial Number**	BC6543 V 4.0-4.0 MiniMate Plus
Trigger Source	Geo: 3.00 mm/s	**Battery Level**	6.3 Volts
Range	Geo :254 mm/s	**Calibration**	June 16, 1999 by Instantel Inc.
Record Time	4.0 sec (Auto=3Sec) at 4096 sps	**File Name**	H5437U2P.Q00
Job Number:	1		

Notes
EA 11-001923
SR 54/125 KP 9.7
Blast Number:
Monitoring Location:

Extended Notes
TEMP: 96 F

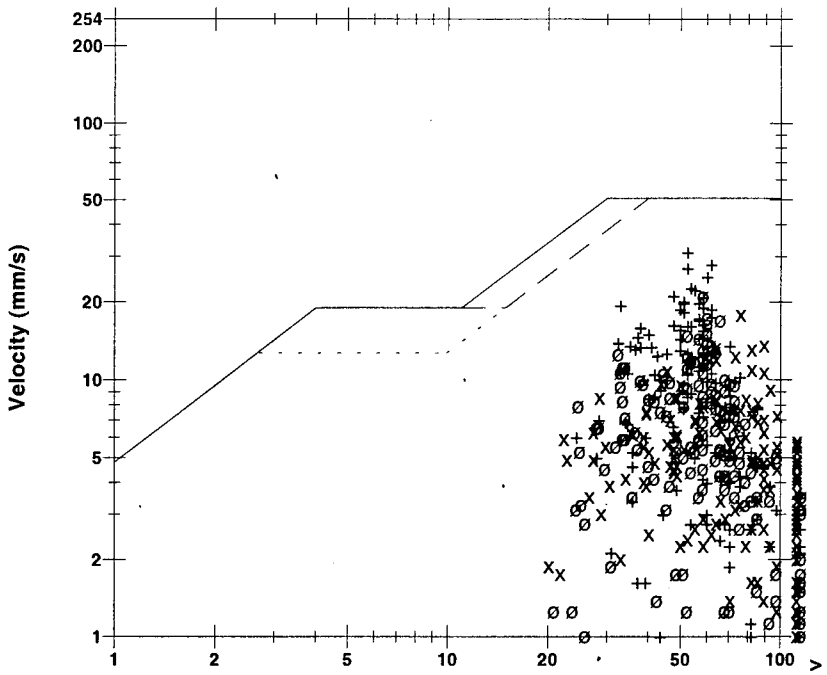
Post Event Notes
11-SD-54/125 001923
BLAST25B1 STATION 124+28 TO 124+60
44 kg CHARGE/DELAY; 89 m FROM 6543
Oakbrook Ridge Apartments Bldg 8529 Unit 160

Microphone	Linear Weighting
PSPL	25.5 pa.(L) at 0.511 sec
ZC Freq	4.7 Hz
Channel Test	Passed (Freq = 19.3 Hz Amp = 694 mv)

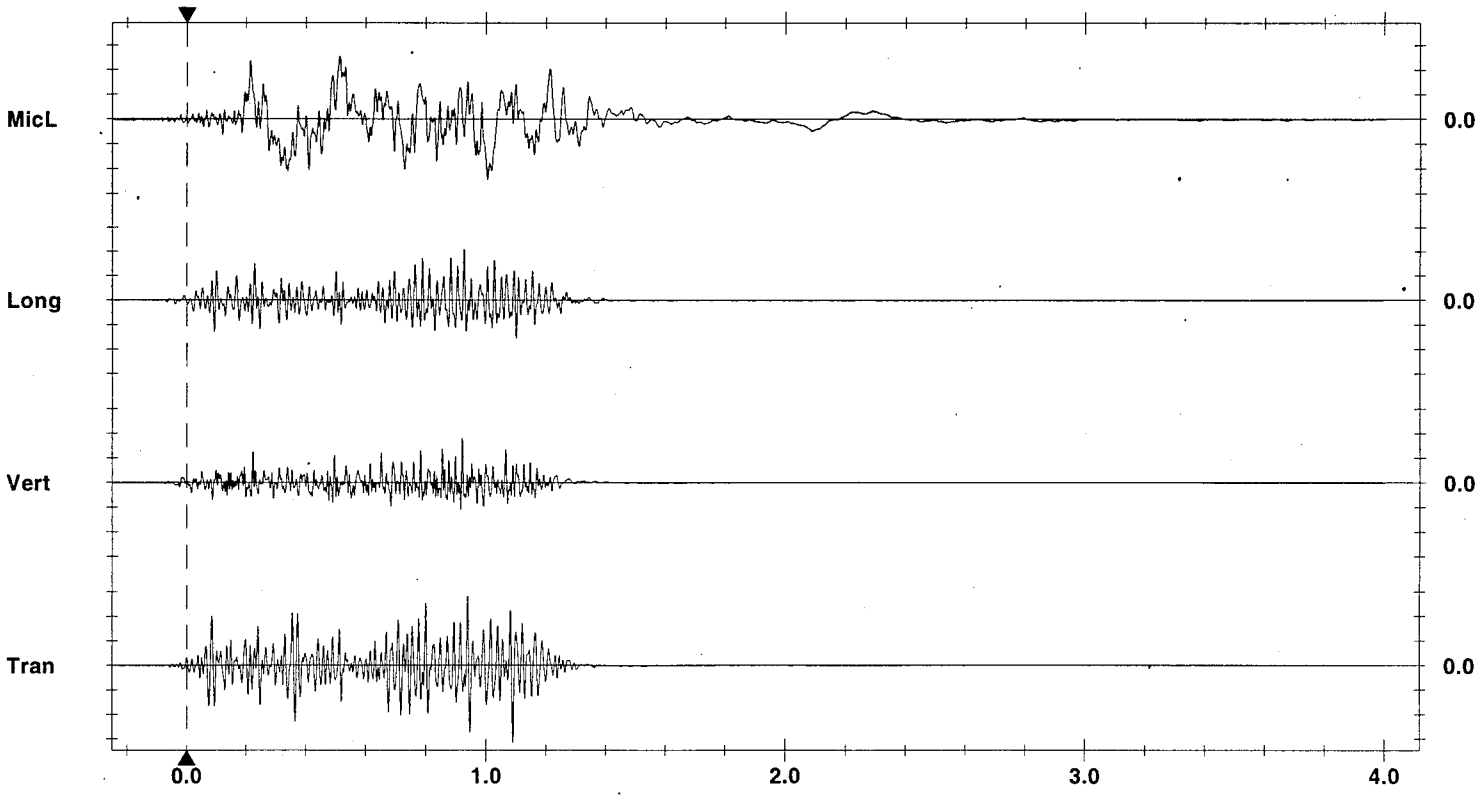
	Tran	Vert	Long	
PPV	31.6	18.0	21.2	mm/s
ZC Freq	53	76	59	Hz
Time (Rel. to Trig)	1.089	0.922	0.927	sec
Peak Acceleration	1.11	0.901	0.848	g
Peak Displacement	0.0909	0.0368	0.0551	mm
Sensorcheck ™	Passed	Passed	Passed	

Peak Vector Sum 32.3 mm/s at 1.089 sec

USBM RI8507 And OSMRE



Tran: + Vert: x Long: ø



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 10.00 mm/s/div Mic: 10.00 pa.(L)/div
Trigger = ▶— — —◀

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Event Report

Date/Time	Vert at 13:38:23 January 11, 2000	**Serial Number**	BC6544 V 4.0-4.0 MiniMate Plus
Trigger Source	Geo: 3.00 mm/s	**Battery Level**	6.3 Volts
Range	Geo :254 mm/s	**Calibration**	June 16, 1999 by Instantel Inc.
Record Time	3.75 sec (Auto=3Sec) at 4096 sps	**File Name**	H5447UC0.JZ0
Job Number:	20		

Notes
Location:
Client:
User Name:
General:

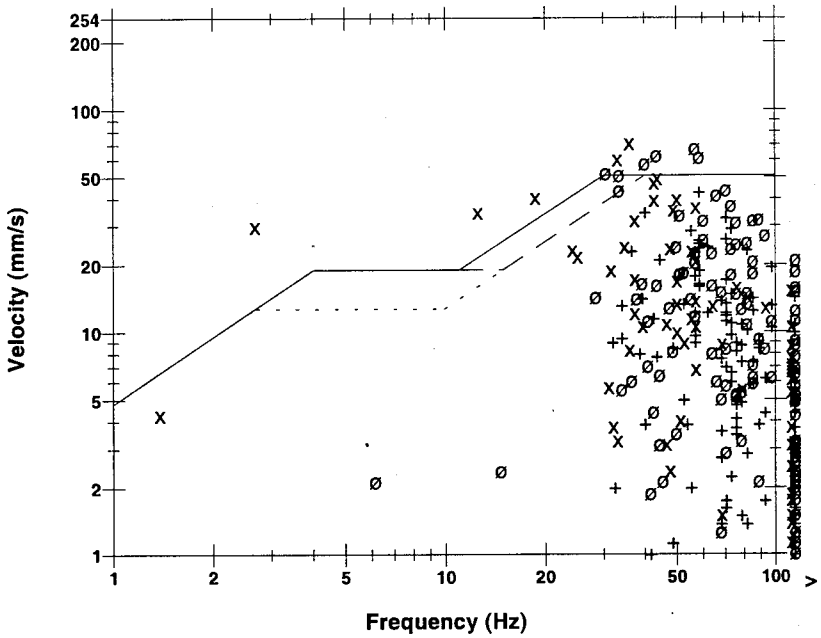
Post Event Notes
11-SD-54/125 001923
BLAST25B2 STATION 124+28 TO 124+60
44 kg CHARGE/DELAY; 33 m FROM 6544
SWEETWATER TOWNHOMES UNIT 57

Microphone	Linear Weighting
PSPL	67.3 pa.(L) at 0.312 sec
ZC Freq	37.2 Hz
Channel Test	Passed (Freq = 20.1 Hz Amp = 690 mv)

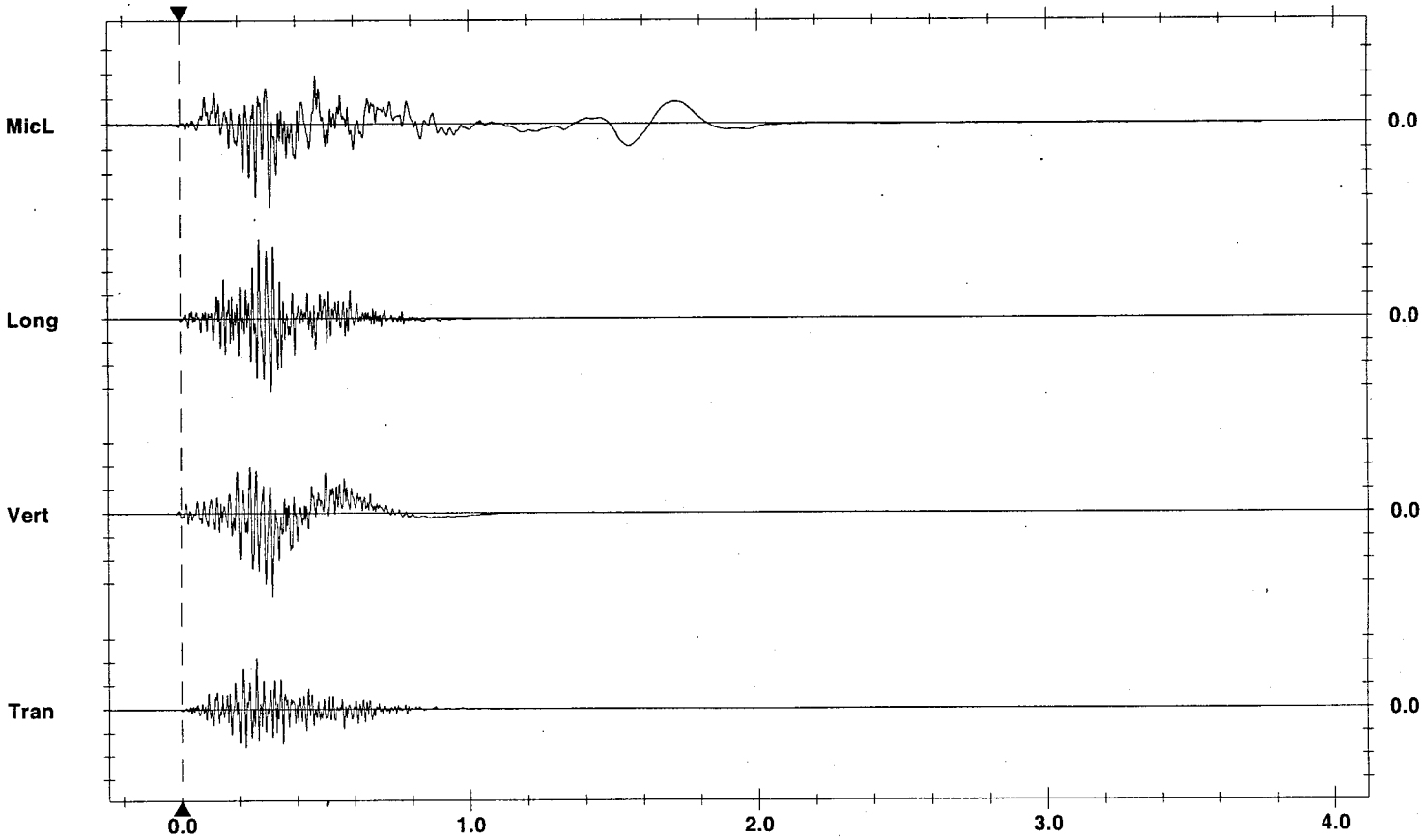
	Tran	Vert	Long	
PPV	43.6	71.5	67.7	mm/s
ZC Freq	59	35.9	57	Hz
Time (Rel. to Trig)	0.259	0.317	0.273	sec
Peak Acceleration	1.64	2.44	3.13	g
Peak Displacement	0.109	0.888	0.219	mm
Sensorcheck ™	Passed	Passed	Passed	

Peak Vector Sum 80.5 mm/s at 0.316 sec

USBM RI8507 And OSMRE



Tran: + Vert: x Long: ø



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 20.0 mm/s/div Mic: 20.0 pa.(L)/div
Trigger = ▶— — —◀

Format Copyrighted 1996-1998

Event Report

Date/Time	Tran at 13:38:27 January 11, 2000	**Serial Number**	BC6543 V 4.0-4.0 MiniMate Plus
Trigger Source	Geo: 3.00 mm/s	**Battery Level**	6.3 Volts
Range	Geo :254 mm/s	**Calibration**	June 16, 1999 by Instantel Inc.
Record Time	3.5 sec (Auto=3Sec) at 4096 sps	**File Name**	H5437UC0.K30
Job Number:	1		

Notes
EA 11-001923
SR 54/125 KP 9.7
Blast Number:
Monitoring Location:

Extended Notes
TEMP: 96 F

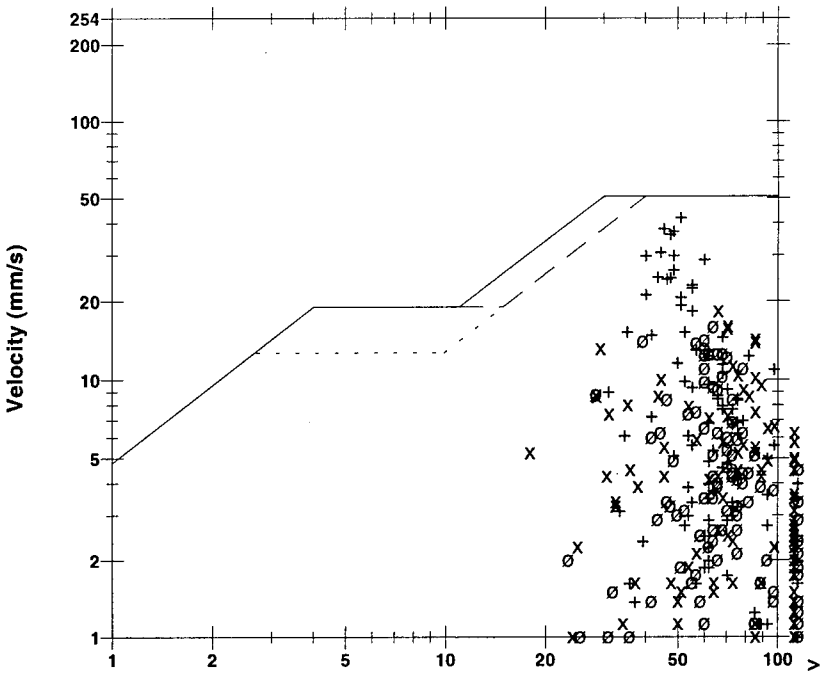
Post Event Notes
11-SD-54/125 001923
BLAST25B2 STATION 124+28 TO 124+60
44 kg CHARGE/DELAY; 80 m FROM 6543
OAKBROOK RIDGE APARTMENTS UNIT 160

Microphone	Linear Weighting
PSPL	32.0 pa.(L) at 0.747 sec
ZC Freq	9.2 Hz
Channel Test	Passed (Freq = 19.3 Hz Amp = 689 mv)

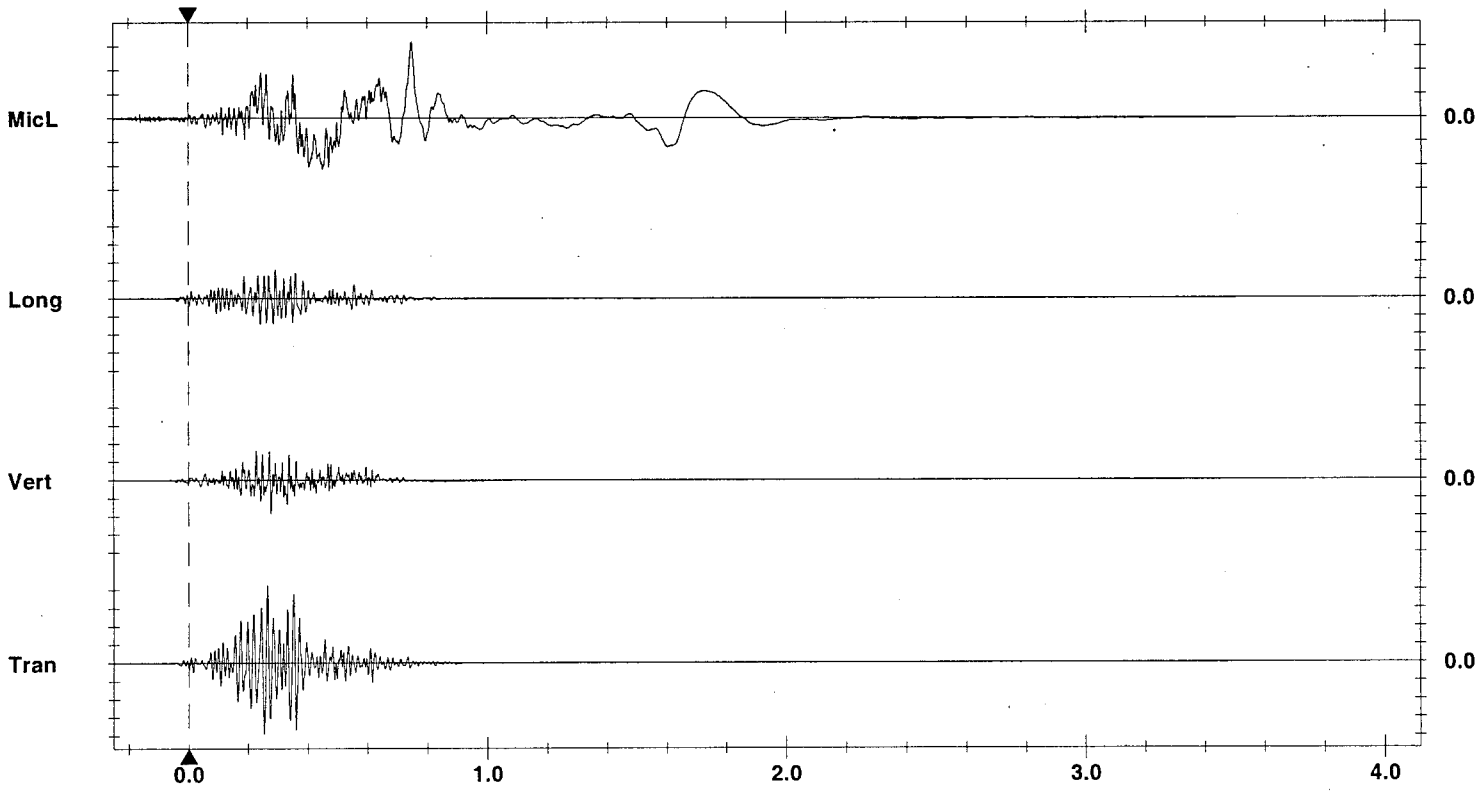
	Tran	Vert	Long	
PPV	42.8	18.5	16.1	mm/s
ZC Freq	51	66	64	Hz
Time (Rel. to Trig)	0.264	0.277	0.292	sec
Peak Acceleration	1.64	0.954	0.742	g
Peak Displacement	0.133	0.0631	0.0471	mm
Sensorcheck ™	Passed	Passed	Passed	

Peak Vector Sum 44.1 mm/s at 0.264 sec

USBM RI8507 And OSMRE



Tran: + Vert: x Long: ø



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 10.00 mm/s/div Mic: 10.00 pa.(L)/div
Trigger = ▶— — —◀

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Event Report

Date/Time	Vert at 14:03:37 January 20, 2000	**Serial Number**	BC6543 V 4.0-4.0 MiniMate Plus
Trigger Source	Geo: 3.00 mm/s	**Battery Level**	6.3 Volts
Range	Geo :254 mm/s	**Calibration**	June 16, 1999 by Instantel Inc.
Record Time	4.5 sec (Auto=3Sec) at 4096 sps	**File Name**	H5437USP.Q10
Job Number:	1		

Notes
EA 11-001923
SR 54/125 KP 9.7
Blast Number:
Monitoring Location:

Extended Notes
TEMP: 96 F

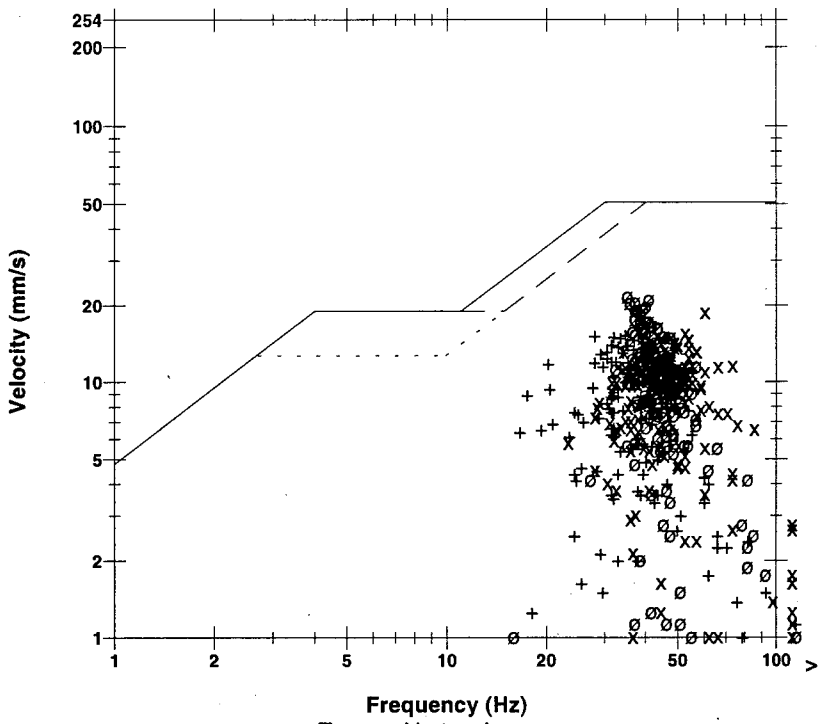
Post Event Notes
11-SD-54/125 001923
BLAST26B STATION 123+94 TO 124+26
44 kg CHARGE/DELAY; 71 m FROM 6543
QUARRY RD 152.4 M SOUTH OF ROCK/FILL CONTACT

Microphone	Linear Weighting
PSPL	80.0 pa.(L) at 0.471 sec
ZC Freq	7.6 Hz
Channel Test	Passed (Freq = 20.1 Hz Amp = 667 mv)

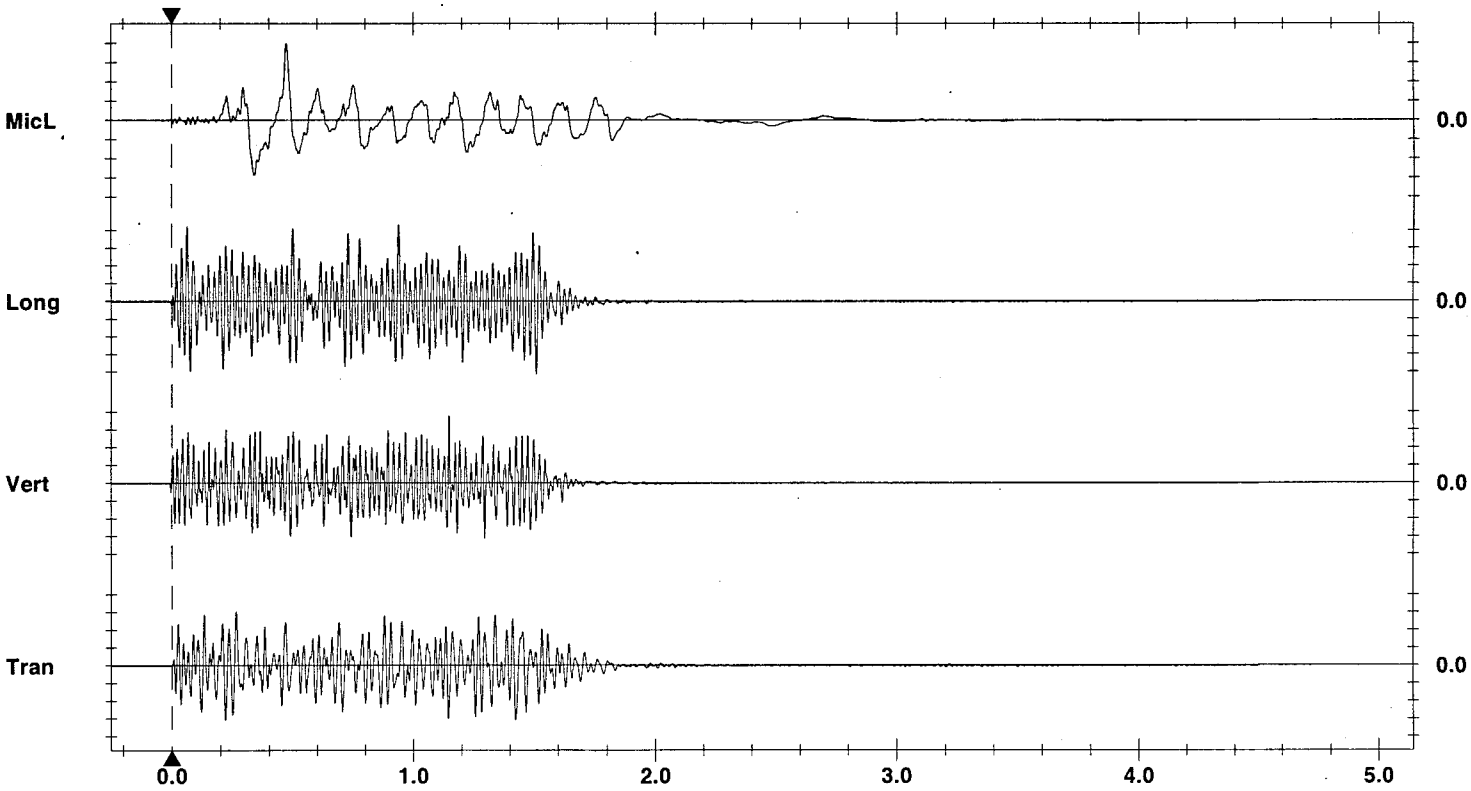
	Tran	Vert	Long	
PPV	15.5	18.9	21.8	mm/s
ZC Freq	34.7	60	35.3	Hz
Time (Rel. to Trig)	0.219	1.147	0.938	sec
Peak Acceleration	0.424	0.742	0.583	g
Peak Displacement	0.0881	0.0587	0.0961	mm
Sensorcheck ™	Passed	Passed	Passed	

Peak Vector Sum 25.3 mm/s at 0.222 sec

USBM RI8507 And OSMRE



Tran: + Vert: x Long: ø



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 5.00 mm/s/div Mic: 20.0 pa.(L)/div
Trigger = ▶— — —◀

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Event Report

Date/Time	Vert at 14:03:37 January 20, 2000	**Serial Number**	BC6544 V 4.0-4.0 MiniMate Plus
Trigger Source	Geo: 3:00 mm/s	**Battery Level**	6.3 Volts
Range	Geo :254 mm/s	**Calibration**	June 16, 1999 by Instantel Inc.
Record Time	4.5 sec (Auto=3Sec) at 4096 sps	**File Name**	H5447USP.Q10
Job Number:	26		

Notes
Location:
Client:
User Name:
General:

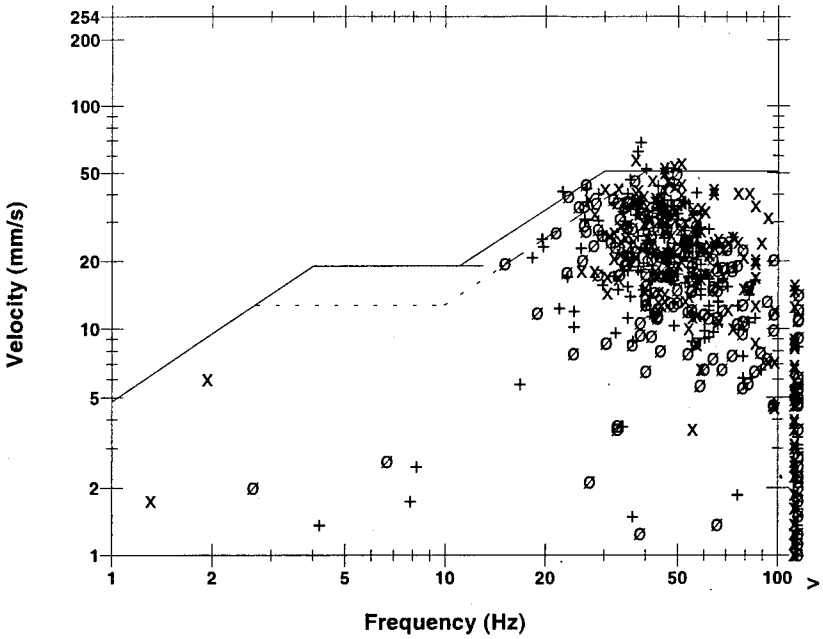
Post Event Notes
11-SD-54/125 001923
BLAST26B STATION 123+94 TO 124+26
44 kg CHARGE/DELAY; 18 m FROM 6544
66 m LT. 123+28

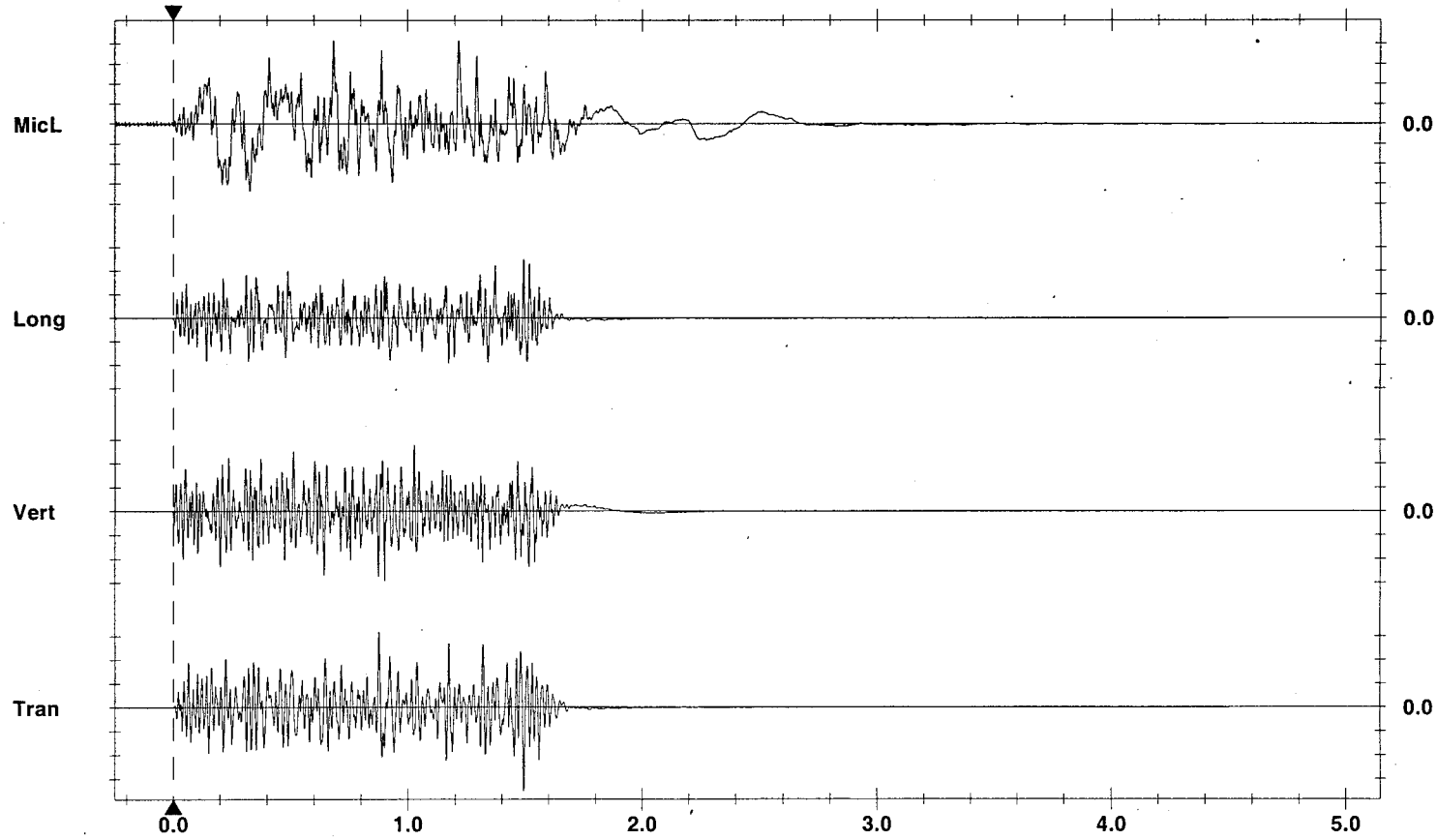
Microphone	Linear Weighting
PSPL	83.3 pa.(L) at 1.216 sec
ZC Freq	19.1 Hz
Channel Test	Passed (Freq = 19.0 Hz Amp = 632 mv)

	Tran	Vert	Long	
PPV	70.2	58.2	50.4	mm/s
ZC Freq	38.6	37.2	50	Hz
Time (Rel. to Trig)	1.493	0.900	1.493	sec
Peak Acceleration	1.59	2.39	1.64	g
Peak Displacement	0.287	0.400	0.204	mm
Sensorcheck ™	Passed	Passed	Passed	

Peak Vector Sum 88.6 mm/s at 1.493 sec

USBM RI8507 And OSMRE





Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 20.0 mm/s/div Mic: 20.0 pa.(L)/div
Trigger = ▶— — —◀

Format Copyrighted 1996-1998

Event Report

Date/Time	Vert at 13:08:23 January 27, 2000	**Serial Number**	BC6543 V 4.0-4.0 MiniMate Plus
Trigger Source	Geo: 3.00 mm/s	**Battery Level**	6.3 Volts
Range	Geo :254 mm/s	**Calibration**	June 16, 1999 by Instantel Inc.
Record Time	4.25 sec (Auto=3Sec) at 4096 sps	**File Name**	H5437V5L.TZ0
Job Number:	1		

Notes
EA 11-001923
SR 54/125 KP 9.7
Blast Number:
Monitoring Location:

Extended Notes
TEMP: 96 F

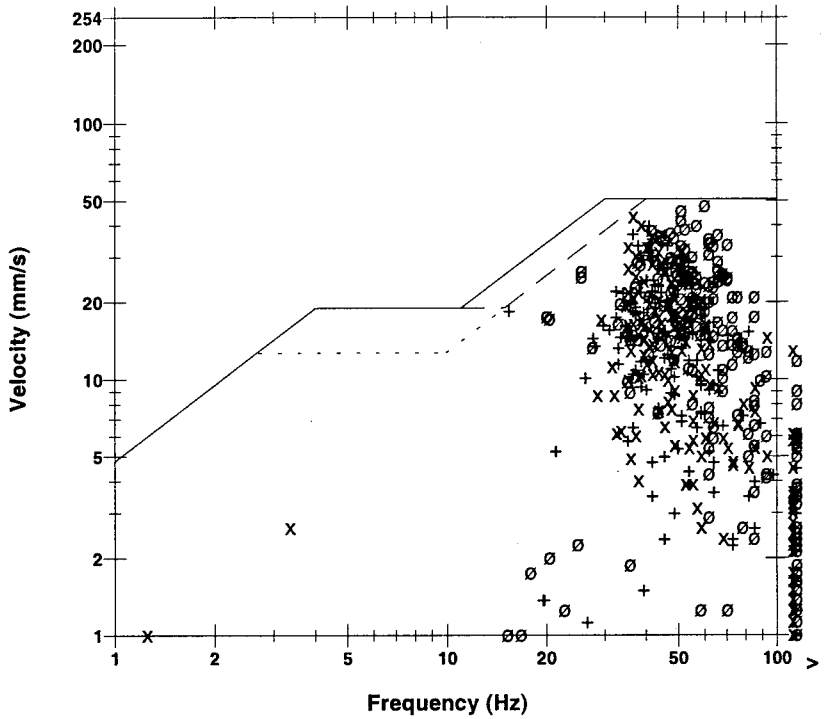
Post Event Notes
11-SD-54/125 001923
BLAST 27B STATION 123+63 TO 123+92
44 kg/DELAY 40 m FROM 6543
83 m LT 123+67.6 "B" LINE DECOUPLING EXPERIMENT

Microphone	Linear Weighting
PSPL	85.8 pa.(L) at 0.186 sec
ZC Freq	16.9 Hz
Channel Test	Passed (Freq = 20.1 Hz Amp = 698 mv)

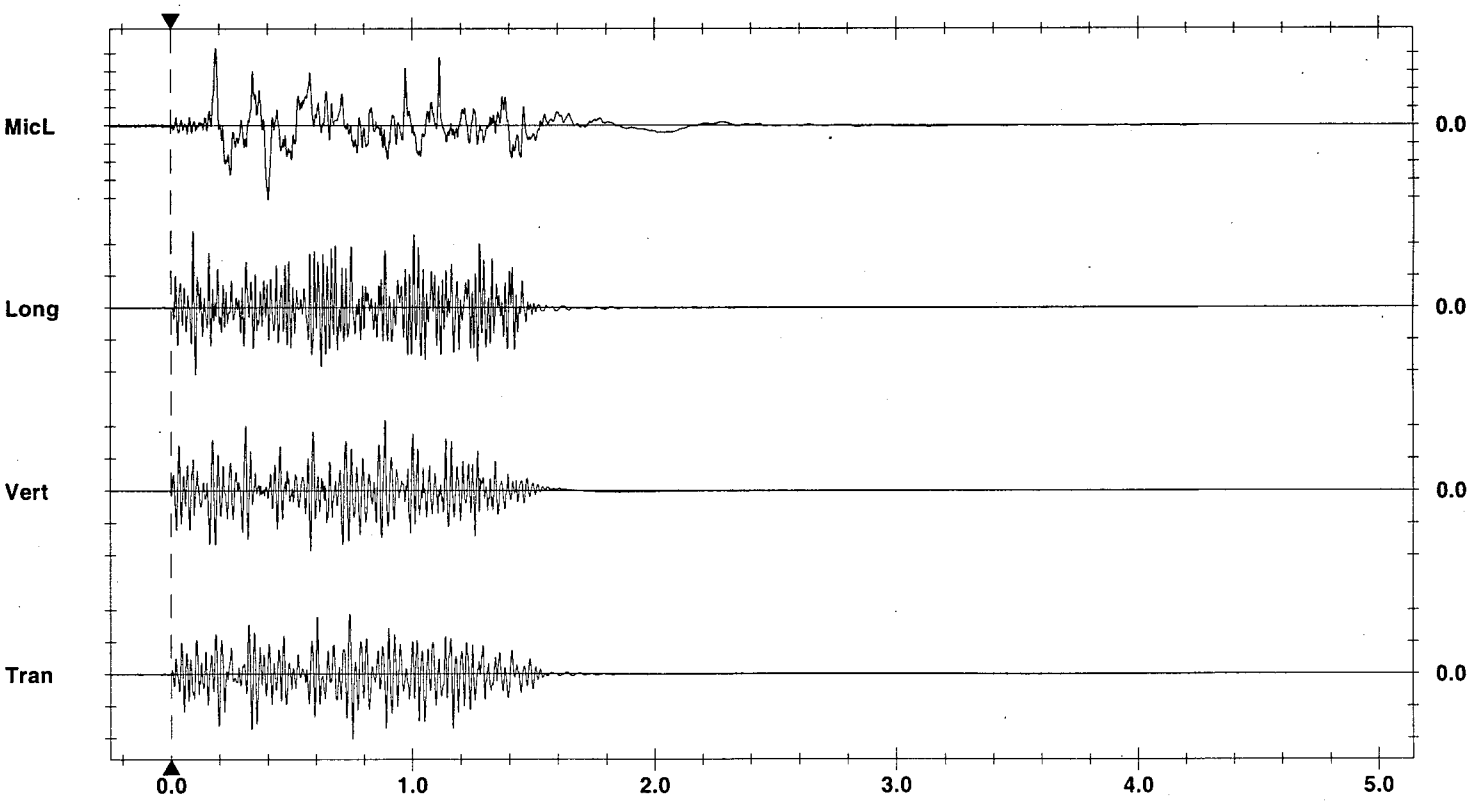
	Tran	Vert	Long	
PPV	40.5	43.7	48.4	mm/s
ZC Freq	41	36.6	60	Hz
Time (Rel. to Trig)	0.752	0.886	0.092	sec
Peak Acceleration	1.11	1.75	2.12	g
Peak Displacement	0.169	0.162	0.140	mm
Sensorcheck ™	Passed	Passed	Passed	

Peak Vector Sum 58.3 mm/s at 0.886 sec

USBM RI8507 And OSMRE



Tran: + Vert: x Long: ø



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 20.0 mm/s/div Mic: 20.0 pa.(L)/div
Trigger = ▶— — —◀

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Event Report

Date/Time	Vert at 13:08:26 January 27, 2000	**Serial Number**	BC6544 V 4.0-4.0 MiniMate Plus
Trigger Source	Geo: 3.00 mm/s	**Battery Level**	6.2 Volts
Range	Geo :254 mm/s	**Calibration**	June 16, 1999 by Instantel Inc.
Record Time	4.25 sec (Auto=3Sec) at 4096 sps	**File Name**	H5447V5L.U20
Job Number:	26		

Notes
Location:
Client:
User Name:
General:

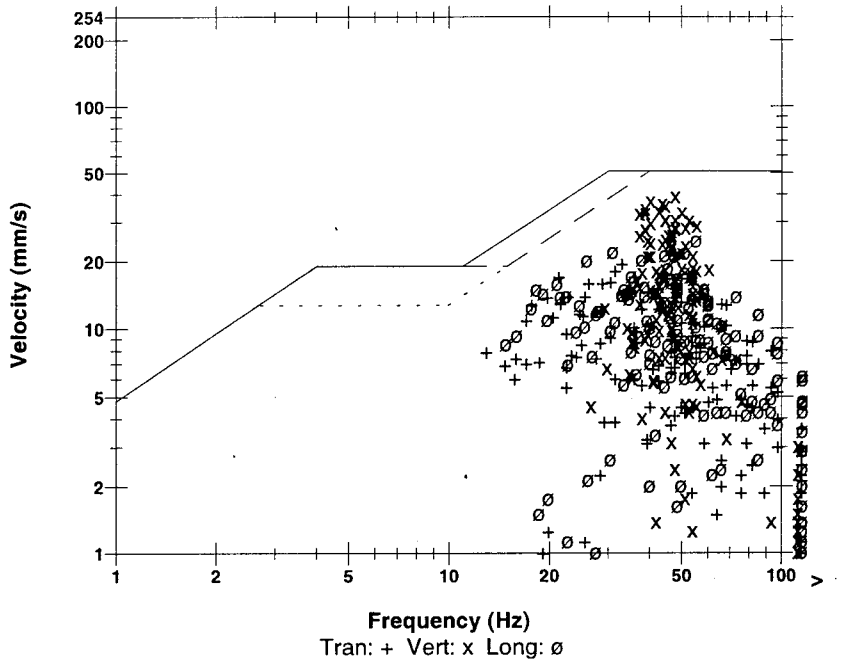
Post Event Notes
11-SD-54/125 001923
BLAST 27B STATION 123+63 TO 123+92
44 kg/DELAY 40 m FROM 6544
83 m LT 123+67.6 "B" LINE DECOUPLING EXPERIMENT

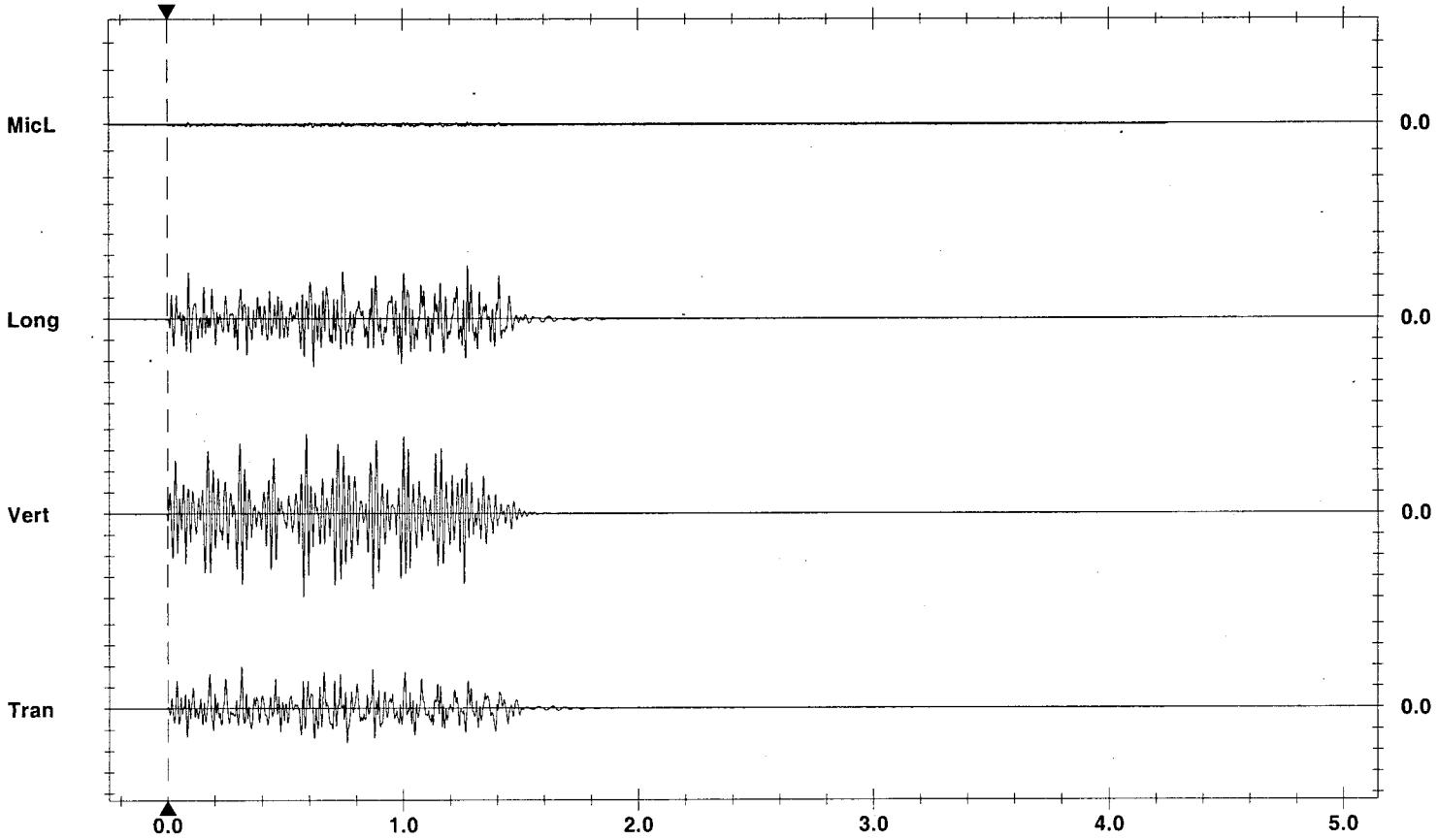
Microphone	Linear Weighting
PSPL	1.50 pa.(L) at 0.620 sec
ZC Freq	48 Hz
Channel Test	Check (Freq = 0.0 Hz Amp = 0 mv)

	Tran	Vert	Long	
PPV	19.8	39.4	24.9	mm/s
ZC Freq	33.0	48	55	Hz
Time (Rel. to Trig)	0.313	0.576	1.275	sec
Peak Acceleration	0.636	1.48	0.954	g
Peak Displacement	0.0890	0.147	0.107	mm
Sensorcheck ™	Passed	Passed	Passed	

Peak Vector Sum 43.3 mm/s at 1.002 sec

USBM RI8507 And OSMRE





Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 10.00 mm/s/div Mic: 10.00 pa.(L)/div
Trigger = ▶— — —◀

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Event Report

Date/Time	Vert at 12:59:00 February 3, 2000	**Serial Number**	BC6543 V 4.0-4.0 MiniMate Plus
Trigger Source	Geo: 3.00 mm/s	**Battery Level**	6.3 Volts
Range	Geo :254 mm/s	**Calibration**	June 16, 1999 by Instantel Inc.
Record Time	4.5 sec (Auto=3Sec) at 4096 sps	**File Name**	H5437VIK.2C0
Job Number:	1		

Notes
EA 11-001923
SR 54/125 KP 9.7
Blast Number:
Monitoring Location:

Extended Notes
TEMP: 96 F

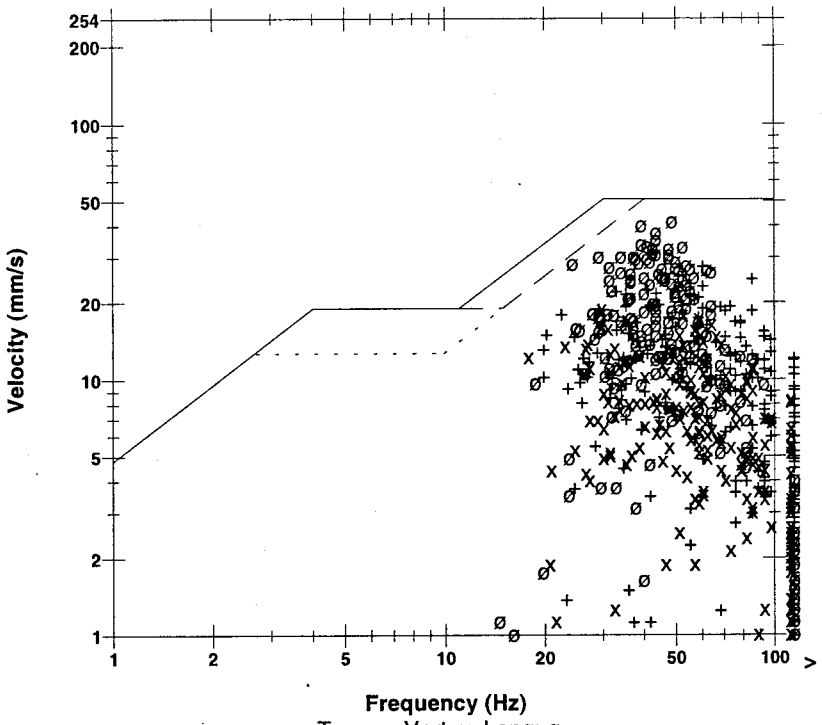
Post Event Notes
11-SD-54/125 001923
BLAST 28B STATION 123+27 TO 123 + 61
44 kg/DELAY 60 m FROM 6543
SLOPE BELOW 8546 LAKE BLUFF CIRCLE

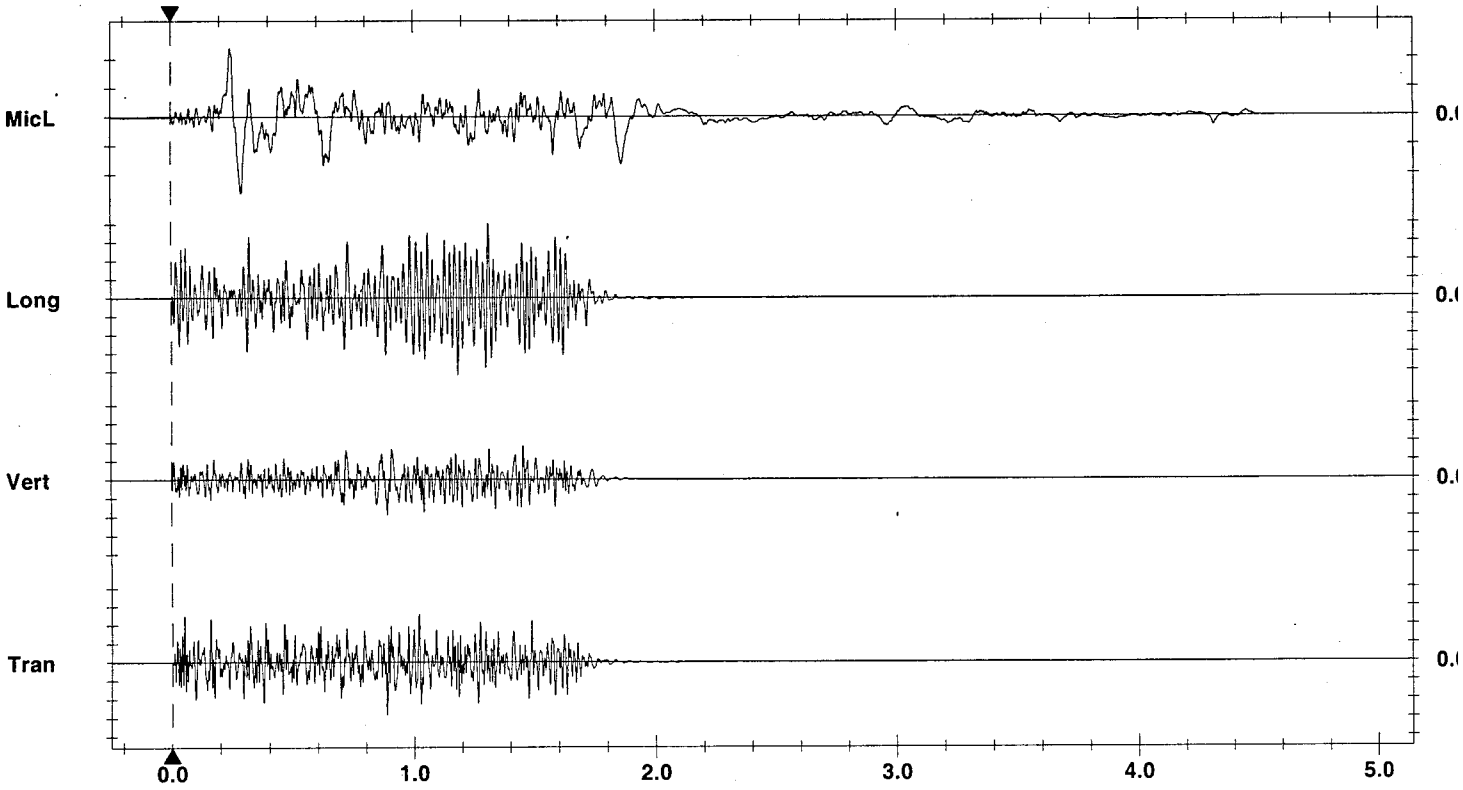
Microphone	Linear Weighting
PSPL	53.0 pa.(L) at 0.290 sec
ZC Freq	9.0 Hz
Channel Test	Passed (Freq = 20.5 Hz Amp = 690 mv)

	Tran	Vert	Long	
PPV	28.2	18.9	41.8	mm/s
ZC Freq	60	29.7	49	Hz
Time (Rel. to Trig)	0.886	0.889	1.185	sec
Peak Acceleration	1.27	0.742	1.33	g
Peak Displacement	0.0952	0.0898	0.160	mm
Sensorcheck ™	Passed	Passed	Passed	

Peak Vector Sum 45.2 mm/s at 1.185 sec

USBM RI8507 And OSMRE





Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 10.00 mm/s/div Mic: 20.0 pa.(L)/div
Trigger = ▶— — —◀

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Event Report

Date/Time	Vert at 12:59:05 February 3, 2000	**Serial Number**	BC6544 V 4.0-4.0 MiniMate Plus
Trigger Source	Geo: 3.00 mm/s	**Battery Level**	6.2 Volts
Range	Geo :254 mm/s	**Calibration**	June 16, 1999 by Instantel Inc.
Record Time	4.75 sec (Auto=3Sec) at 4096 sps	**File Name**	H5447VIK.2H0
Job Number:	26		

Notes
Location:
Client:
User Name:
General:

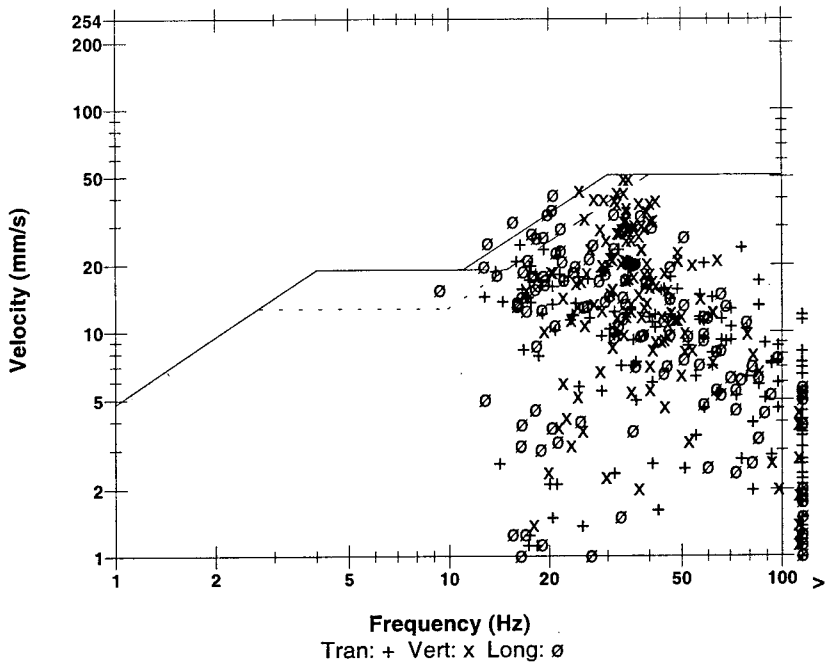
Post Event Notes
11-SD-54/125 001923
BLAST 28B STATION 123+27 TO 123 + 61
44 kg/DELAY 40 m FROM 6544
SLOPE BELOW 8546 LAKE BLUFF CIRCLE NEAR R/W

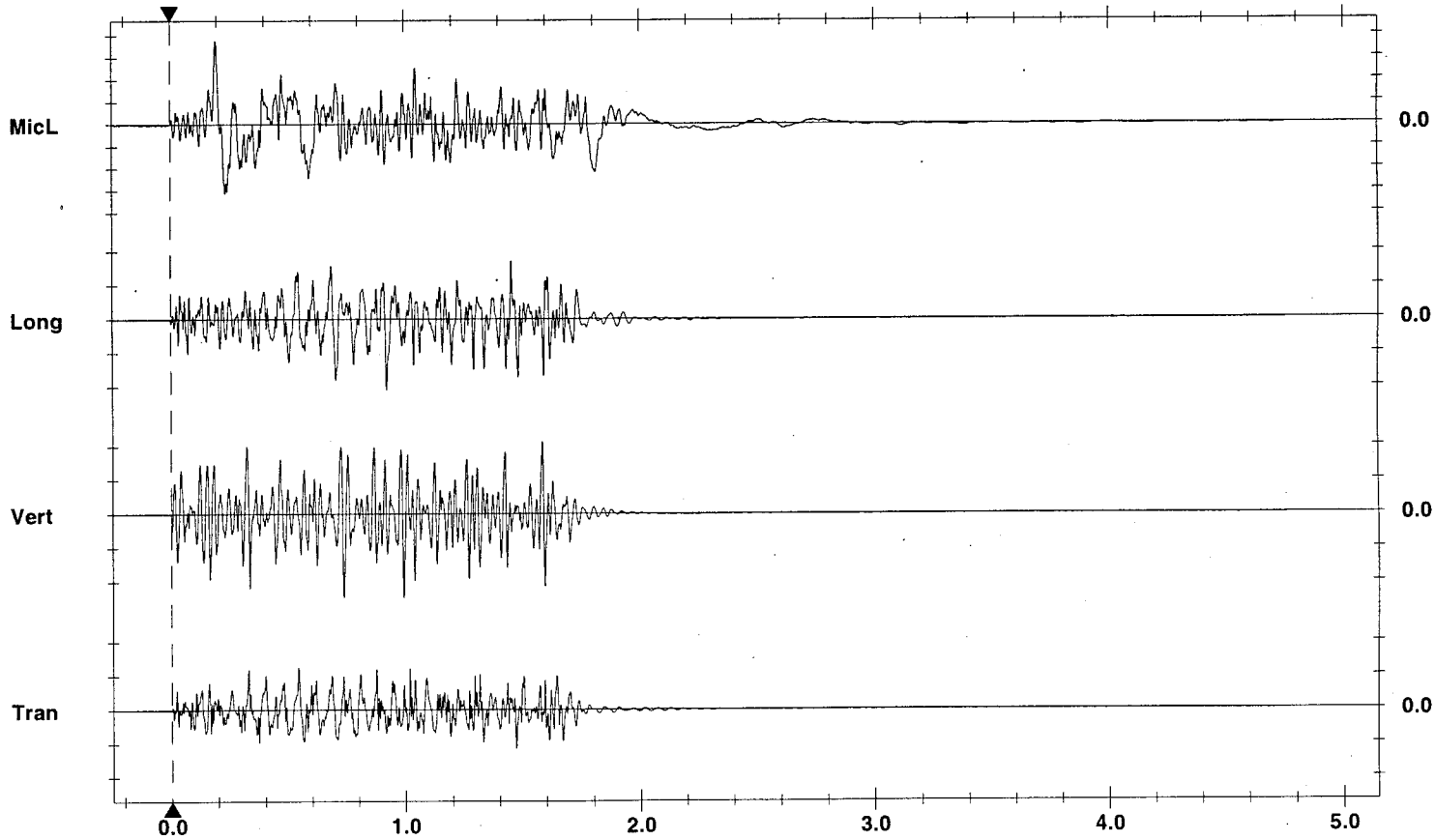
Microphone	Linear Weighting
PSPL	75.5 pa.(L) at 0.194 sec
ZC Freq	9.4 Hz
Channel Test	Passed (Freq = 19.0 Hz Amp = 733 mv)

	Tran	Vert	Long	
PPV	25.3	49.1	41.9	mm/s
ZC Freq	16.4	33.6	20.7	Hz
Time (Rel. to Trig)	0.540	0.736	0.922	sec
Peak Acceleration	1.11	1.96	1.33	g
Peak Displacement	0.161	0.234	0.265	mm
Sensorcheck ™	Passed	Passed	Passed	

Peak Vector Sum 51.8 mm/s at 0.993 sec

USBM RI8507 And OSMRE





Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 20.0 mm/s/div Mic: 20.0 pa.(L)/div
Trigger = ▶— — —◀

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Event Report

Date/Time	Vert at 13:00:59 February 18, 2000	**Serial Number**	BC6543 V 4.0-4.0 MiniMate Plus
Trigger Source	Geo: 3.00 mm/s	**Battery Level**	6.3 Volts
Range	Geo :254 mm/s	**Calibration**	June 16, 1999 by Instantel Inc.
Record Time	4.5 sec (Auto=3Sec) at 4096 sps	**File Name**	H5437WAC.5N0
Job Number:	1		

Notes
EA 11-001923
SR 54/125 KP 9.7
Blast Number:
Monitoring Location:

Extended Notes
TEMP: 96 F

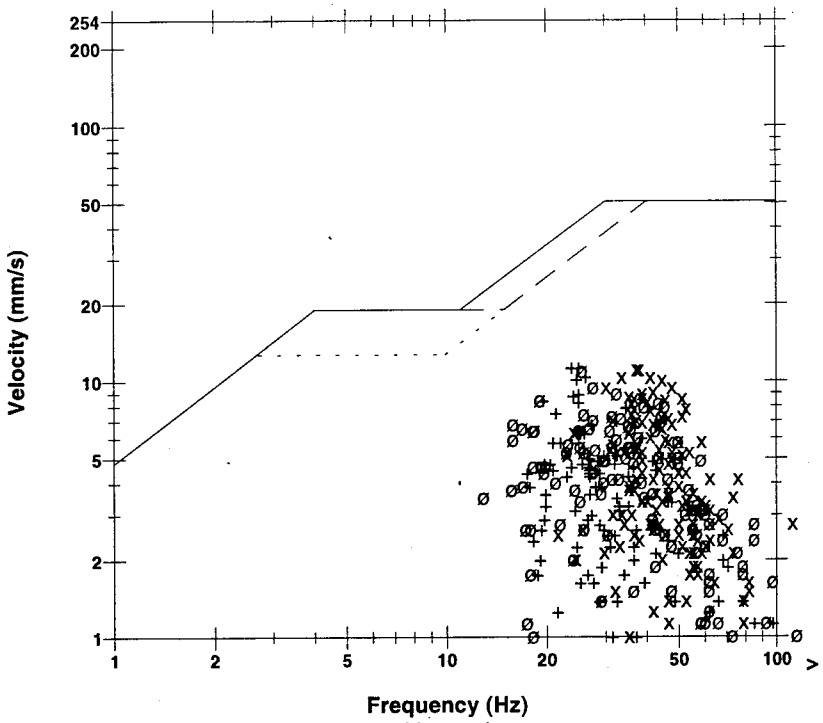
Post Event Notes
11-SD-54/125 001923
BLAST 39/40B PART 1 STATION 123+98 TO 124+60
33 kg/DELAY 52 m FROM 6543
83 m LT 123+67.6 "B" LINE

Microphone	Linear Weighting
PSPL	28.5 pa.(L) at 1.708 sec
ZC Freq	15.6 Hz
Channel Test	Passed (Freq = 19.0 Hz Amp = 710 mv)

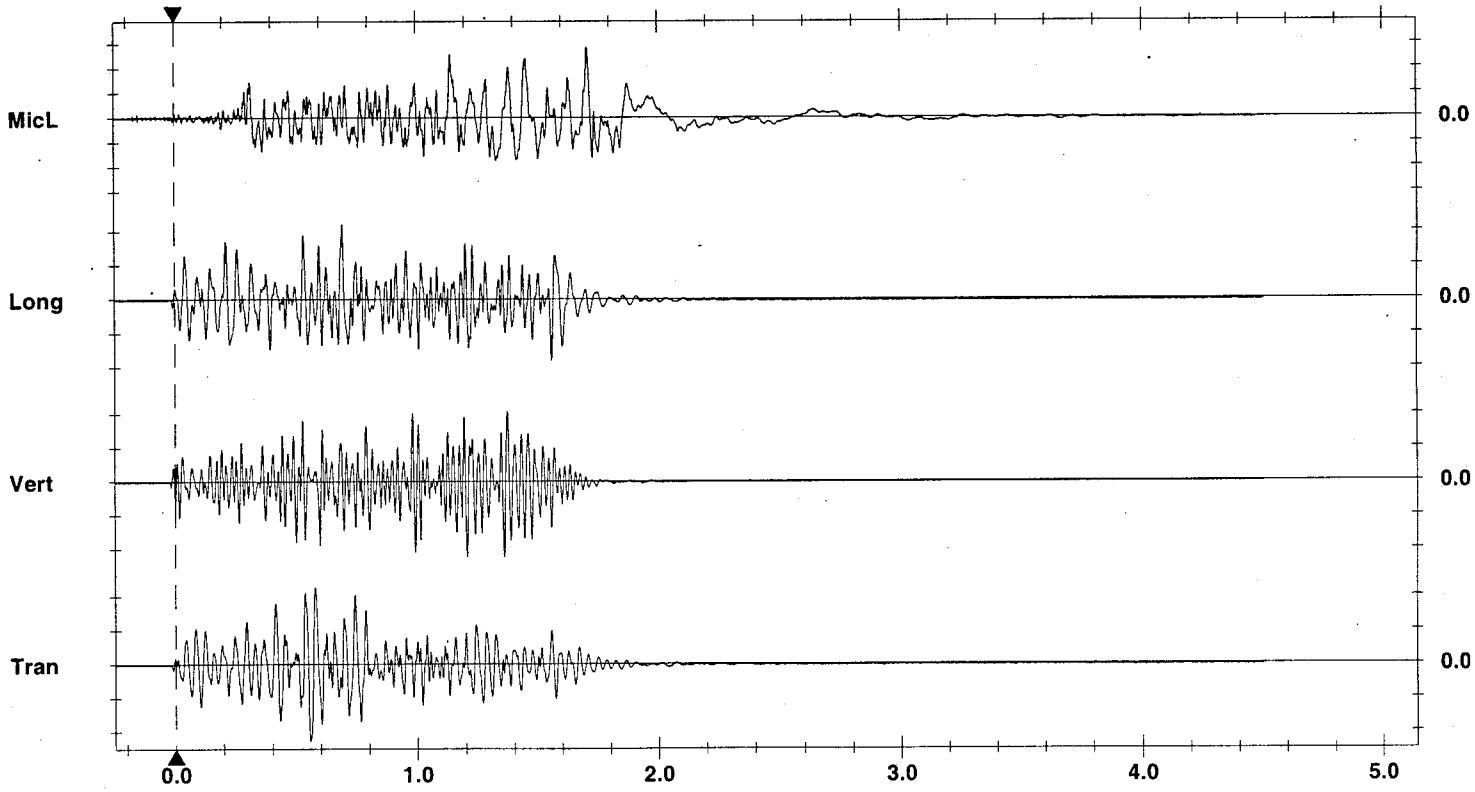
	Tran	Vert	Long	
PPV	11.4	11.2	11.0	mm/s
ZC Freq	23.8	37.9	25.6	Hz
Time (Rel. to Trig)	0.556	1.205	0.694	sec
Peak Acceleration	0.265	0.371	0.265	g
Peak Displacement	0.0866	0.0498	0.0670	mm
Sensorcheck ™	Passed	Passed	Passed	

Peak Vector Sum 15.3 mm/s at 0.536 sec

USBM RI8507 And OSMRE



Tran: + Vert: x Long: ø



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 5.00 mm/s/div Mic: 10.00 pa.(L)/div
Trigger = ▶— — —◀

Format Copyrighted 1996-1998

Event Report

Date/Time	Long at 13:01:10 February 18, 2000	**Serial Number**	BC6544 V 4.0-4.0 MiniMate Plus
Trigger Source	Geo: 3.00 mm/s	**Battery Level**	6.1 Volts
Range	Geo :254 mm/s	**Calibration**	June 16, 1999 by Instantel Inc.
Record Time	4.375 sec (Auto=3Sec) at 4096 sps	**File Name**	H5447WAC.5Y0
Job Number:	26		

Notes
Location:
Client:
User Name:
General:

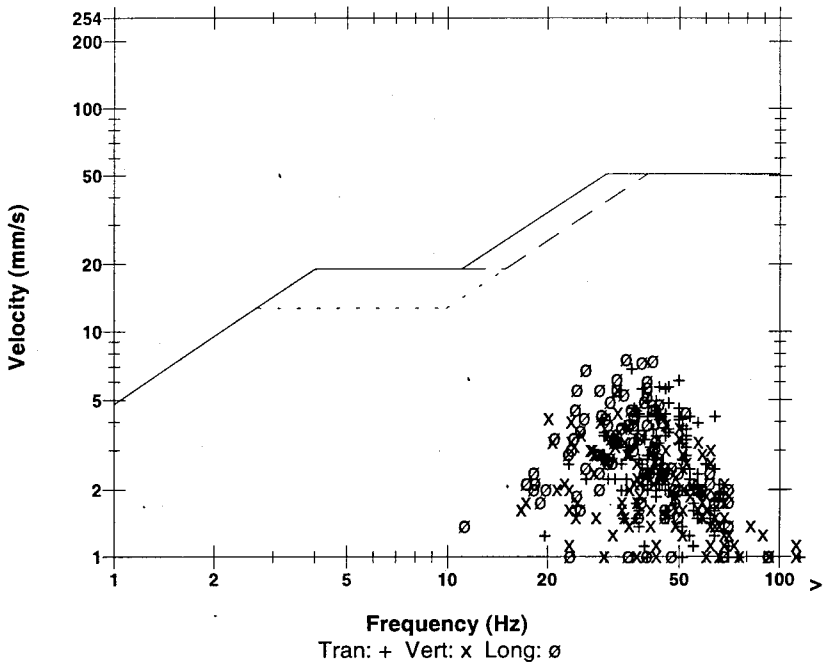
Post Event Notes
11-SD-54/125 001923
BLAST 39/40B PART 1 STATION 123+98 TO 124+60
33 kg/DELAY 92 m FROM 6544
SLOPE BELOW 8546 LAKE BLUFF CIRCLE NEAR R/W

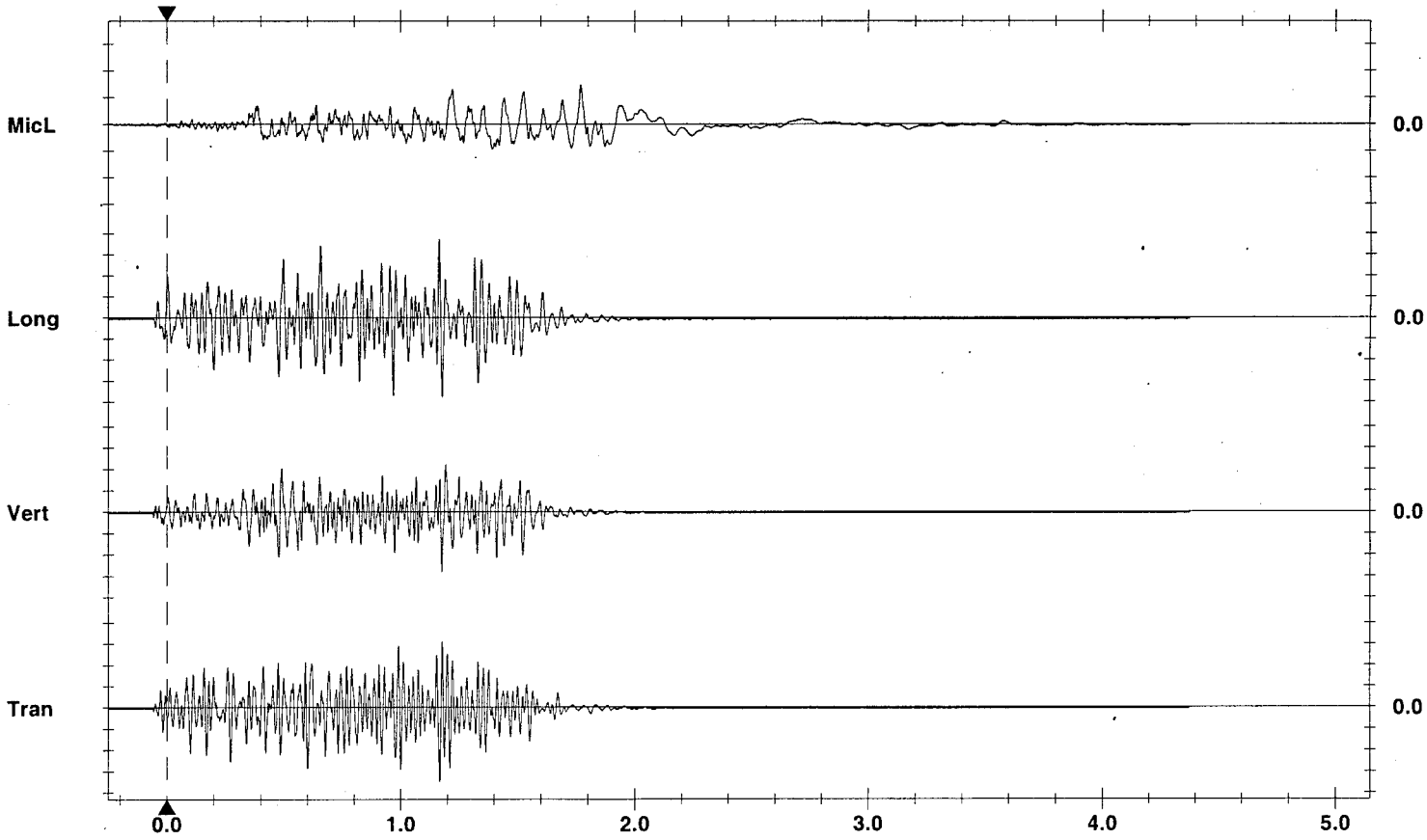
Microphone	Linear Weighting
PSPL	14.8 pa.(L) at 1.768 sec
ZC Freq	14.5 Hz
Channel Test	Passed (Freq = 20.1 Hz Amp = 641 mv)

	Tran	Vert	Long	
PPV	6.98	5.59	7.62	mm/s
ZC Freq	35.9	32.5	34.7	Hz
Time (Rel. to Trig)	1.167	1.176	1.178	sec
Peak Acceleration	0.212	0.212	0.265	g
Peak Displacement	0.0285	0.0242	0.0379	mm
Sensorcheck ™	Passed	Passed	Passed	

Peak Vector Sum 11.0 mm/s at 1.177 sec

USBM RI8507 And OSMRE





Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.00 mm/s/div Mic: 10.00 pa.(L)/div
Trigger = ▶— — —◀

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Event Report

Date/Time	Long at 13:05:19 March 1, 2000	**Serial Number**	BC6543 V 4.0-4.0 MiniMate Plus
Trigger Source	Geo: 3.00 mm/s	**Battery Level**	6.2 Volts
Range	Geo :254 mm/s	**Calibration**	June 16, 1999 by Instantel Inc.
Record Time	4.875 sec (Auto=3Sec) at 4096 sps	**File Name**	H5437WWK.CV0
Job Number:	1		

Notes
EA 11-001923
SR 54/125 KP 9.7
Blast Number:
Monitoring Location:

Extended Notes
TEMP: 96 F

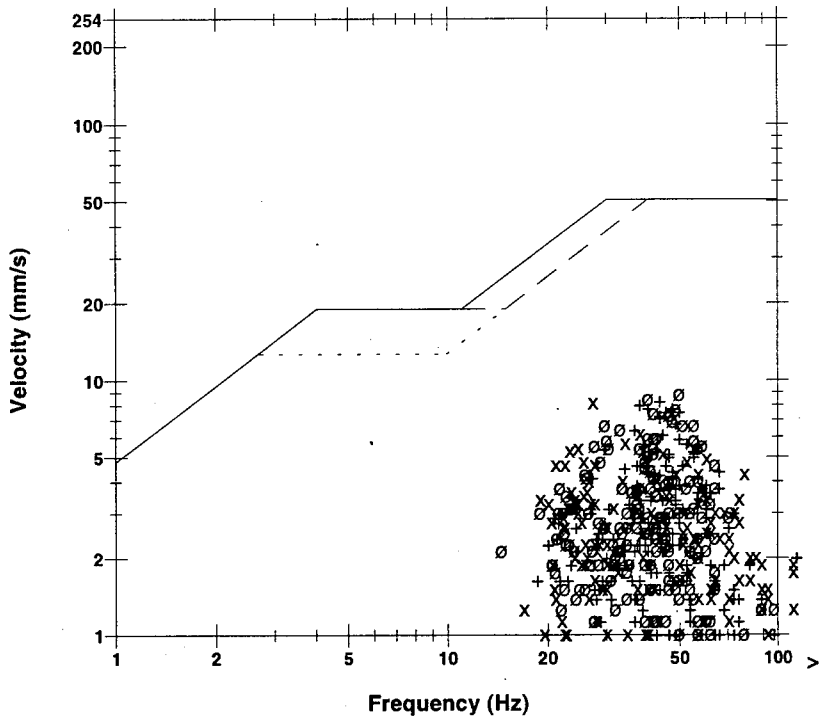
Post Event Notes
11-SD-54/125 001923
BLAST 41B PART 1 STATION 123+64 TO 123 +96
33 kg/DELAY 108 m FROM 6543
SLOPE BELOW 8546 LAKE BLUFF CIRCLE

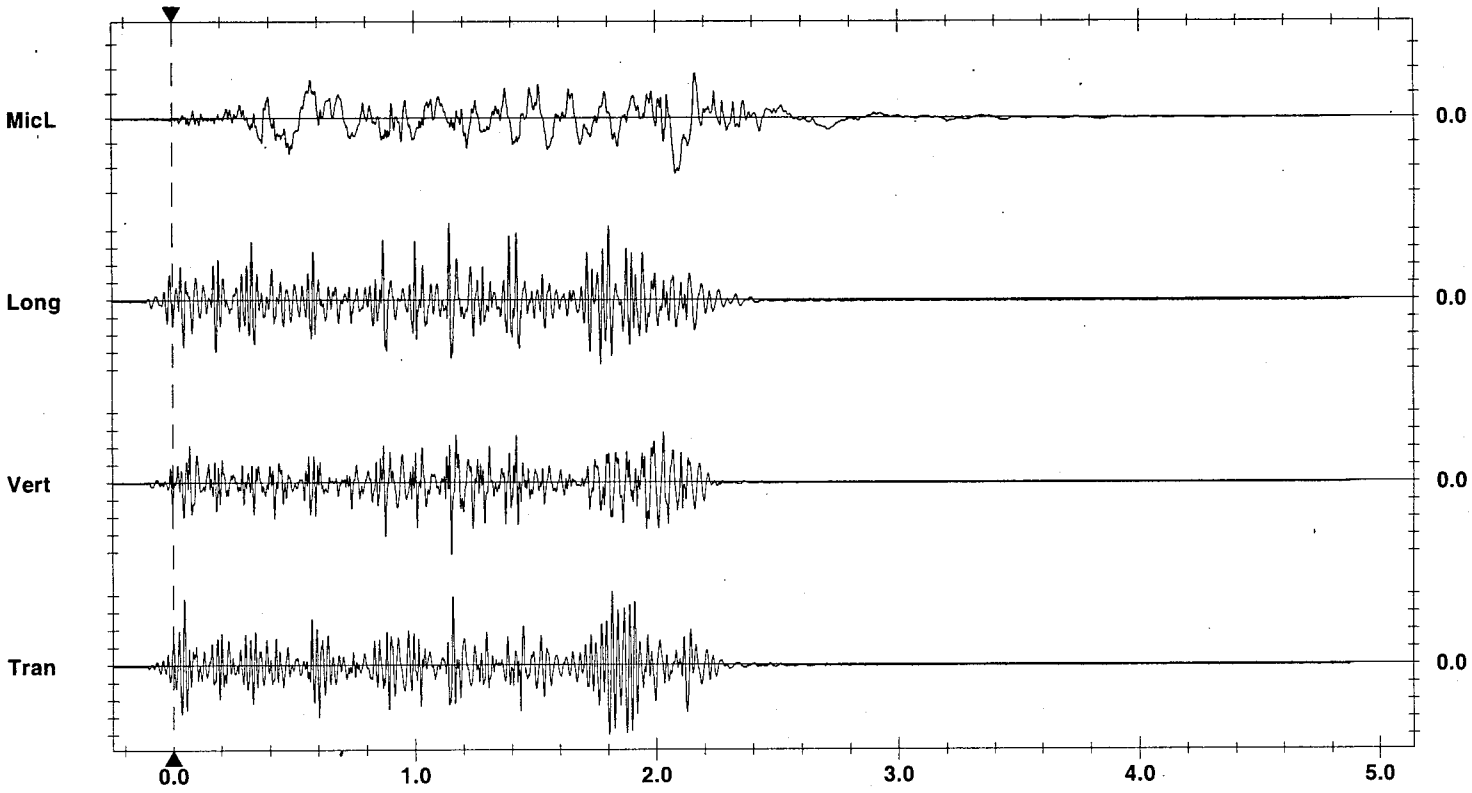
Microphone	Linear Weighting
PSPL	22.5 pa.(L) at 2.083 sec
ZC Freq	5.6 Hz
Channel Test	Passed (Freq = 20.1 Hz Amp = 646 mv)

	Tran	Vert	Long	
PPV	8.38	8.25	8.89	mm/s
ZC Freq	44	27.3	50	Hz
Time (Rel. to Trig)	1.816	1.150	1.143	sec
Peak Acceleration	0.318	0.265	0.371	g
Peak Displacement	0.0351	0.0361	0.0353	mm
Sensorcheck ™	Passed	Passed	Passed	

Peak Vector Sum 12.0 mm/s at 1.805 sec

USBM RI8507 And OSMRE





Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.00 mm/s/div Mic: 10.00 pa.(L)/div
Trigger = ▶— — —◀

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Event Report

Date/Time	Vert at 13:05:35 March 1, 2000	**Serial Number**	BC6544 V 4.0-4.0 MiniMate Plus
Trigger Source	Geo: 3.00 mm/s	**Battery Level**	6.0 Volts
Range	Geo :254 mm/s	**Calibration**	June 16, 1999 by Instantel Inc.
Record Time	5.0 sec (Auto=3Sec) at 4096 sps	**File Name**	H5447WWK.DB0
Job Number:	26		

Notes
Location:
Client:
User Name:
General:

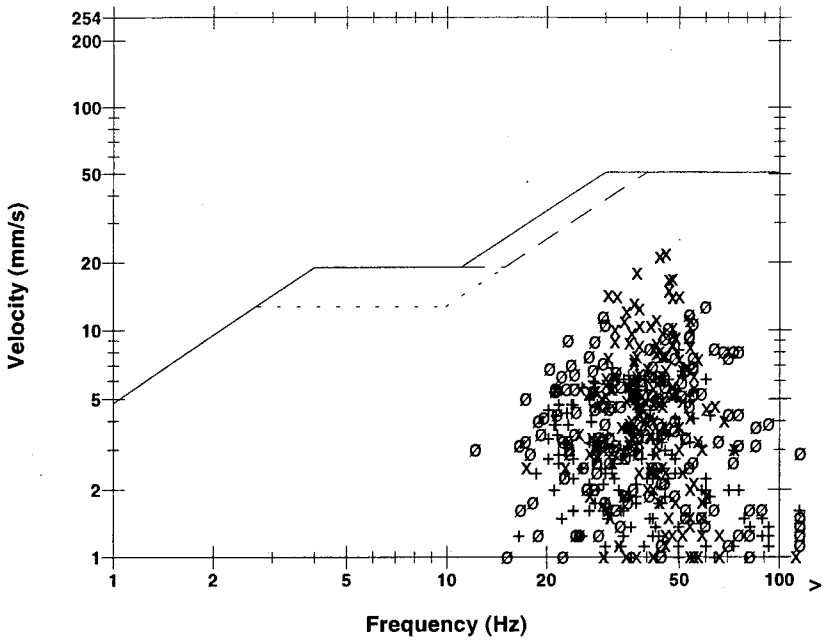
Post Event Notes
11-SD-54/125 001923
BLAST 41B PART 1 STATION 123+64 TO 123 +96
33 kg/DELAY 70 m FROM 6544
83 m LT 123+67.6 "B" LINE

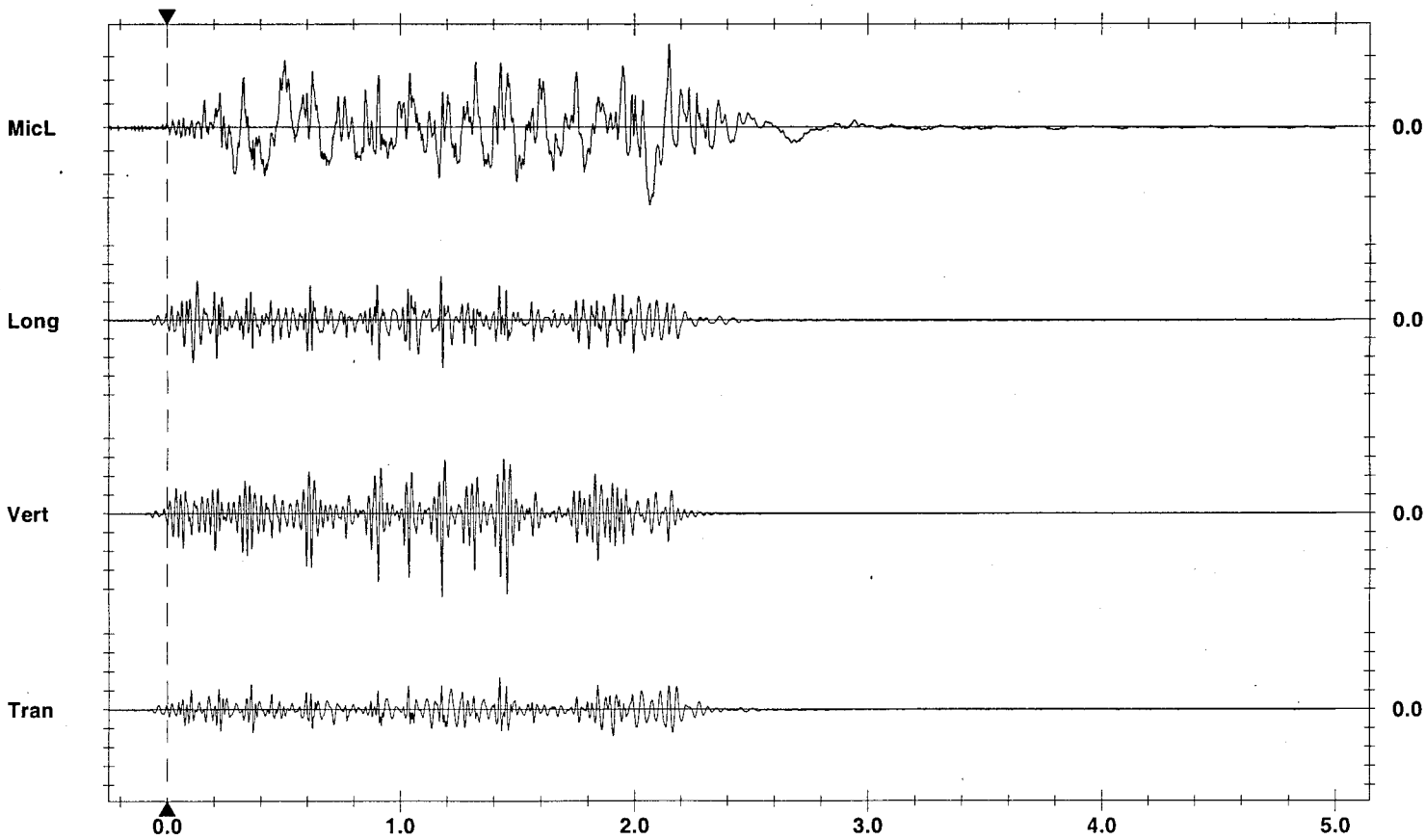
Microphone	Linear Weighting
PSPL	35.3 pa.(L) at 2.149 sec
ZC Freq	14.3 Hz
Channel Test	Passed (Freq = 19.0 Hz Amp = 687 mv)

	Tran	Vert	Long	
PPV	8.38	22.1	12.8	mm/s
ZC Freq	50	46	60	Hz
Time (Rel. to Trig)	1.424	1.179	1.182	sec
Peak Acceleration	0.318	0.636	0.530	g
Peak Displacement	0.0375	0.0749	0.0591	mm
Sensorcheck ™	Passed	Passed	Passed	

Peak Vector Sum 22.7 mm/s at 1.179 sec

USBM RI8507 And OSMRE





Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 5.00 mm/s/div Mic: 10.00 pa.(L)/div
Trigger = ▶— — —◀

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Event Report

Date/Time	Long at 12:55:42 March 20, 2000	**Serial Number**	BC6543 V 4.0-4.0 MiniMate Plus
Trigger Source	Geo: 3.00 mm/s	**Battery Level**	6.3 Volts
Range	Geo :254 mm/s	**Calibration**	June 16, 1999 by Instantel Inc.
Record Time	3.75 sec (Auto=3Sec) at 4096 sps	**File Name**	H5437XVQ.KU0
Job Number:	1		

Notes
EA 11-001923
SR 54/125 KP 9.7
Blast Number:
Monitoring Location:

Extended Notes
TEMP: 96 F

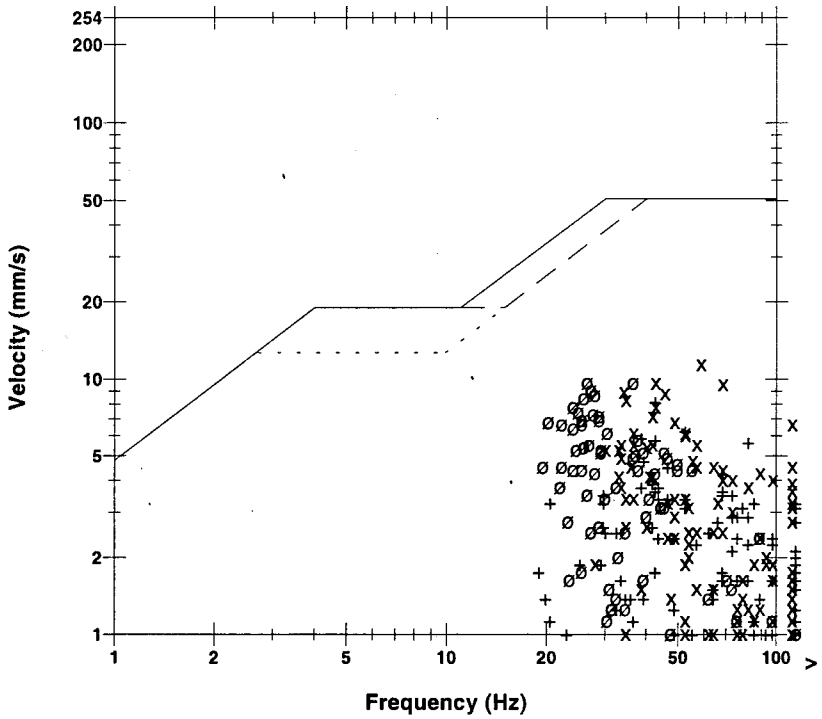
Post Event Notes
11-SD-54/125 001923
BLAST 41B PART 2 STATION 123+40 TO 124+00
44 kg/DELAY 121 m FROM 6543
8546 LAKE BLUFF CIRCLE

Microphone	Linear Weighting
PSPL	17.0 pa.(L) at 0.497 sec
ZC Freq	6.7 Hz
Channel Test	Passed (Freq = 19.0 Hz Amp = 650 mv)

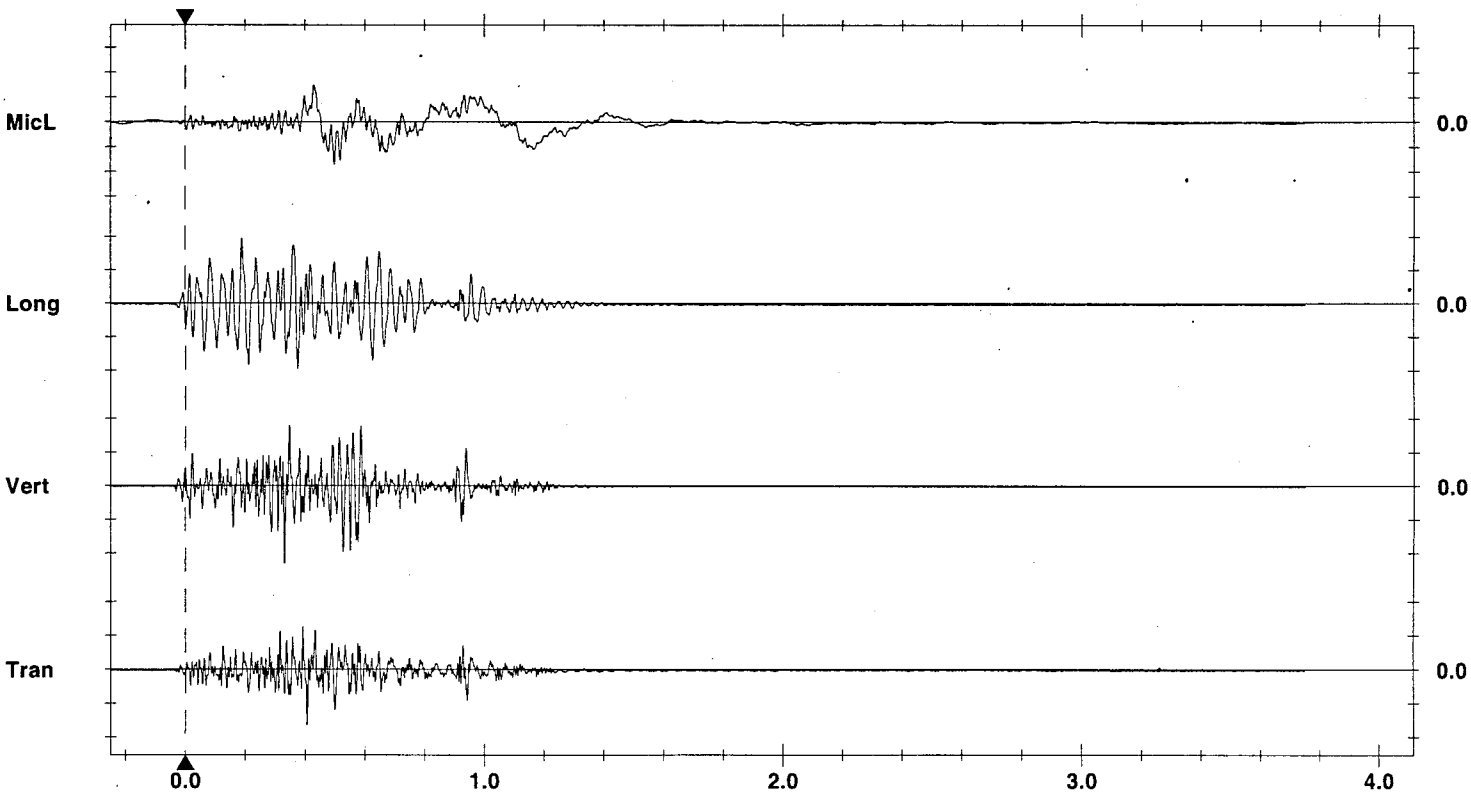
	Tran	Vert	Long	
PPV	8.25	11.6	9.78	mm/s
ZC Freq	43	59	26.6	Hz
Time (Rel. to Trig)	0.406	0.331	0.188	sec
Peak Acceleration	0.371	0.530	0.318	g
Peak Displacement	0.0222	0.0414	0.0526	mm
Sensorcheck ™	Passed	Passed	Passed	

Peak Vector Sum 12.4 mm/s at 0.331 sec

USBM RI8507 And OSMRE



Tran: + Vert: x Long: ø



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 5.00 mm/s/div Mic: 10.00 pa.(L)/div
Trigger = ▶— — —◀

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Event Report

Date/Time	Vert at 12:56:05 March 20, 2000	**Serial Number**	BC6544 V 4.0-4.0 MiniMate Plus
Trigger Source	Geo: 3.00 mm/s	**Battery Level**	6.2 Volts
Range	Geo :254 mm/s	**Calibration**	June 16, 1999 by Instantel Inc.
Record Time	3.875 sec (Auto=3Sec) at 4096 sps	**File Name**	H5447XVQ.LH0
Job Number:	26		

Notes
Location:
Client:
User Name:
General:

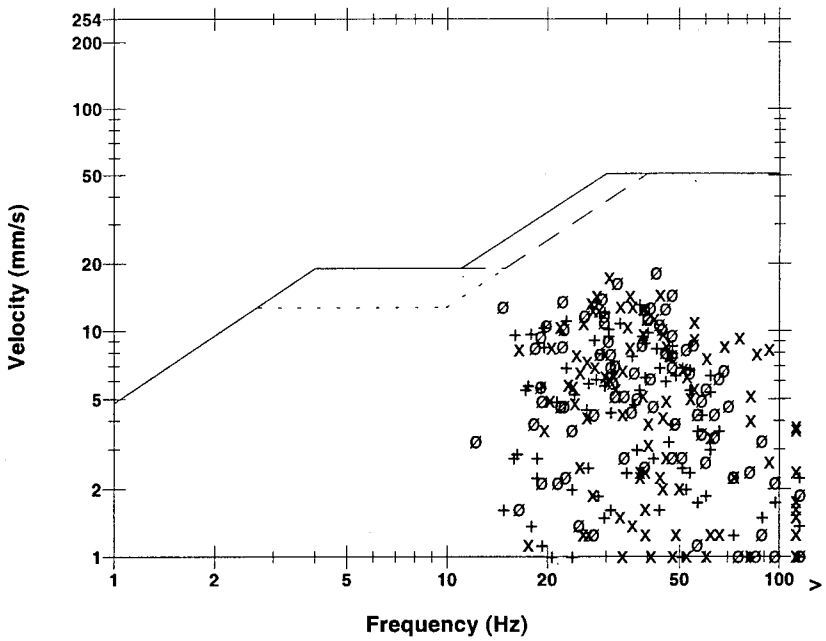
Post Event Notes
11-SD-54/125 001923
BLAST 41B PART 2 STATION 123+40 TO 124+00
44 kg/DELAY 68 m FROM 6544
SLOPE BELOW 8546 LAKE BLUFF CIRCLE NEAR R/W

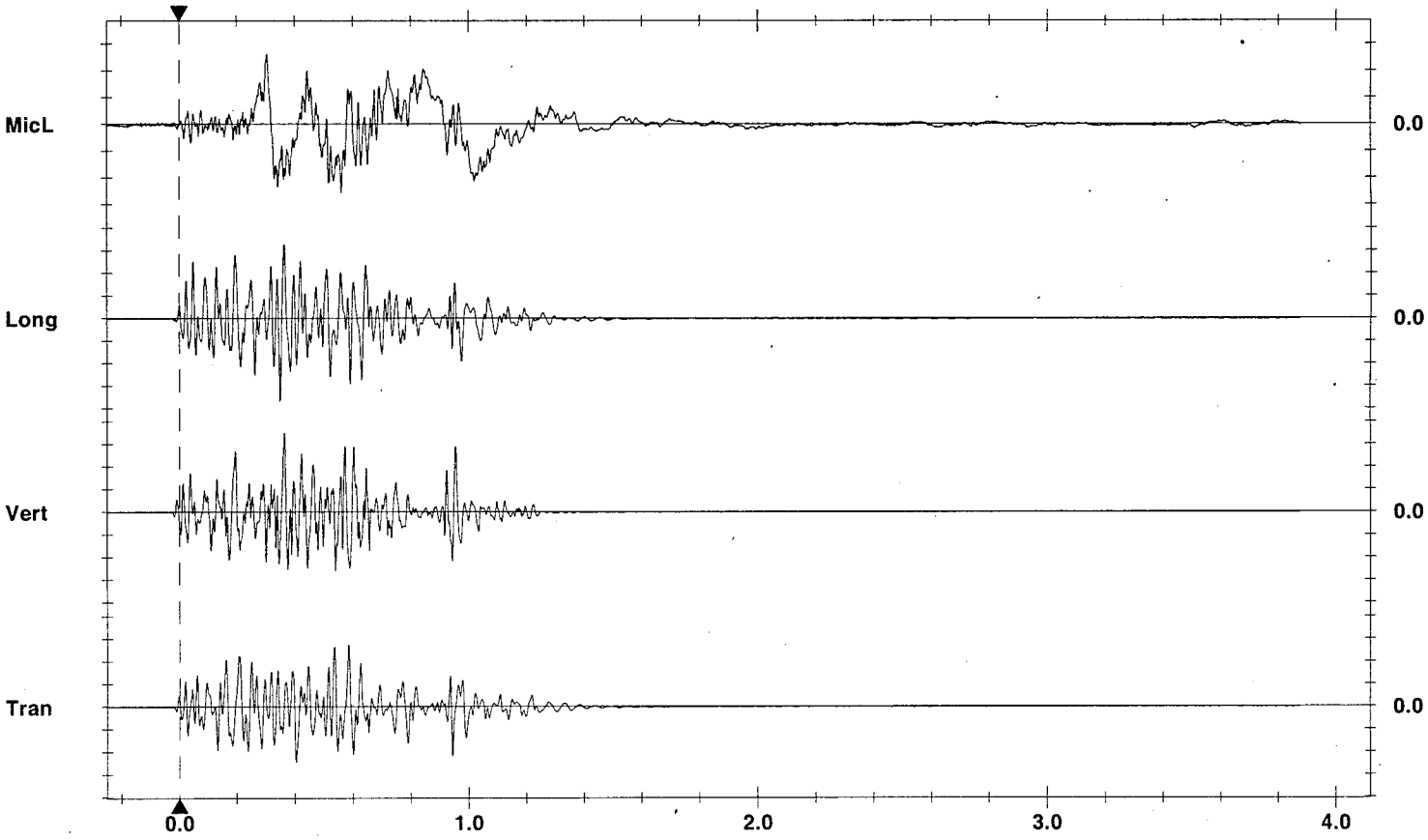
Microphone	Linear Weighting
PSPL	26.3 pa.(L) at 0.304 sec
ZC Freq	6.9 Hz
Channel Test	Passed (Freq = 20.1 Hz Amp = 710 mv)

	Tran	Vert	Long	
PPV	13.7	17.5	18.4	mm/s
ZC Freq	28.1	30.6	43	Hz
Time (Rel. to Trig)	0.584	0.363	0.349	sec
Peak Acceleration	0.424	0.530	0.530	g
Peak Displacement	0.0743	0.0810	0.0937	mm
Sensorcheck ™	Passed	Passed	Passed	

Peak Vector Sum 24.2 mm/s at 0.364 sec

USBM RI8507 And OSMRE





Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 5.00 mm/s/div Mic: 10.00 pa.(L)/div
Trigger = ▶— — —◀

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Event Report

Date/Time	Vert at 11:54:20 April 12, 2000	**Serial Number**	BC6543 V 4.0-4.0 MiniMate Plus
Trigger Source	Geo: 3.00 mm/s	**Battery Level**	6.3 Volts
Range	Geo :254 mm/s	**Calibration**	June 16, 1999 by Instantel Inc.
Record Time	4.375 sec (Auto=3Sec) at 4096 sps	**File Name**	H5437Z29.2K0
Job Number:	1		

Notes
EA 11-001923
SR 54/125 KP 9.7
Blast Number:
Monitoring Location:

Extended Notes
TEMP: 96 F

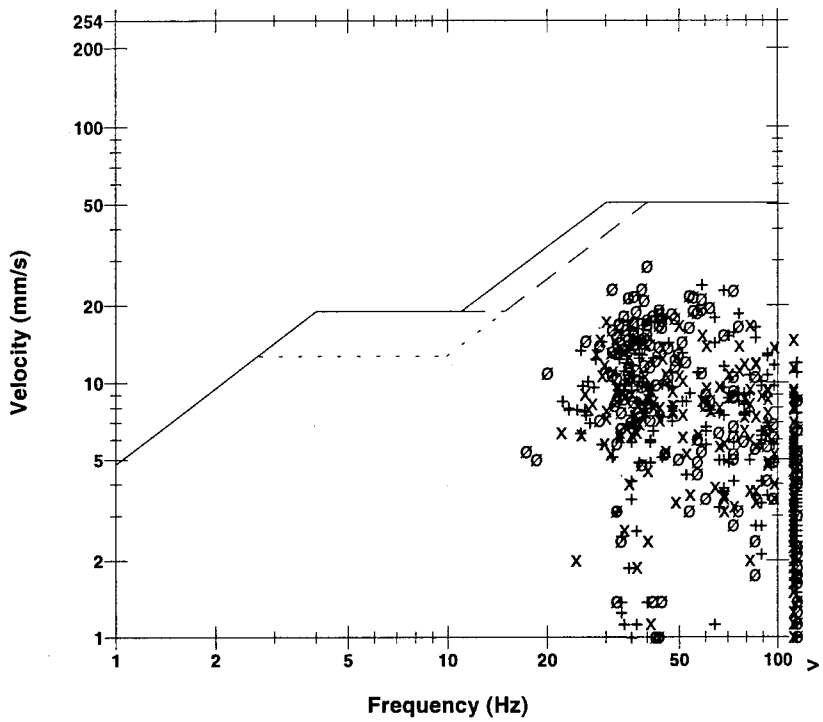
Post Event Notes
11-SD-54/125 001923
BLAST 45B STATION 122+20 TO 122+60
44 kg/DELAY 121 m FROM 6543
8573 LAKE BLUFF CIRCLE

Microphone	Linear Weighting
PSPL	22.8 pa.(L) at 0.454 sec
ZC Freq	4.0 Hz
Channel Test	Passed (Freq = 19.0 Hz Amp = 697 mv)

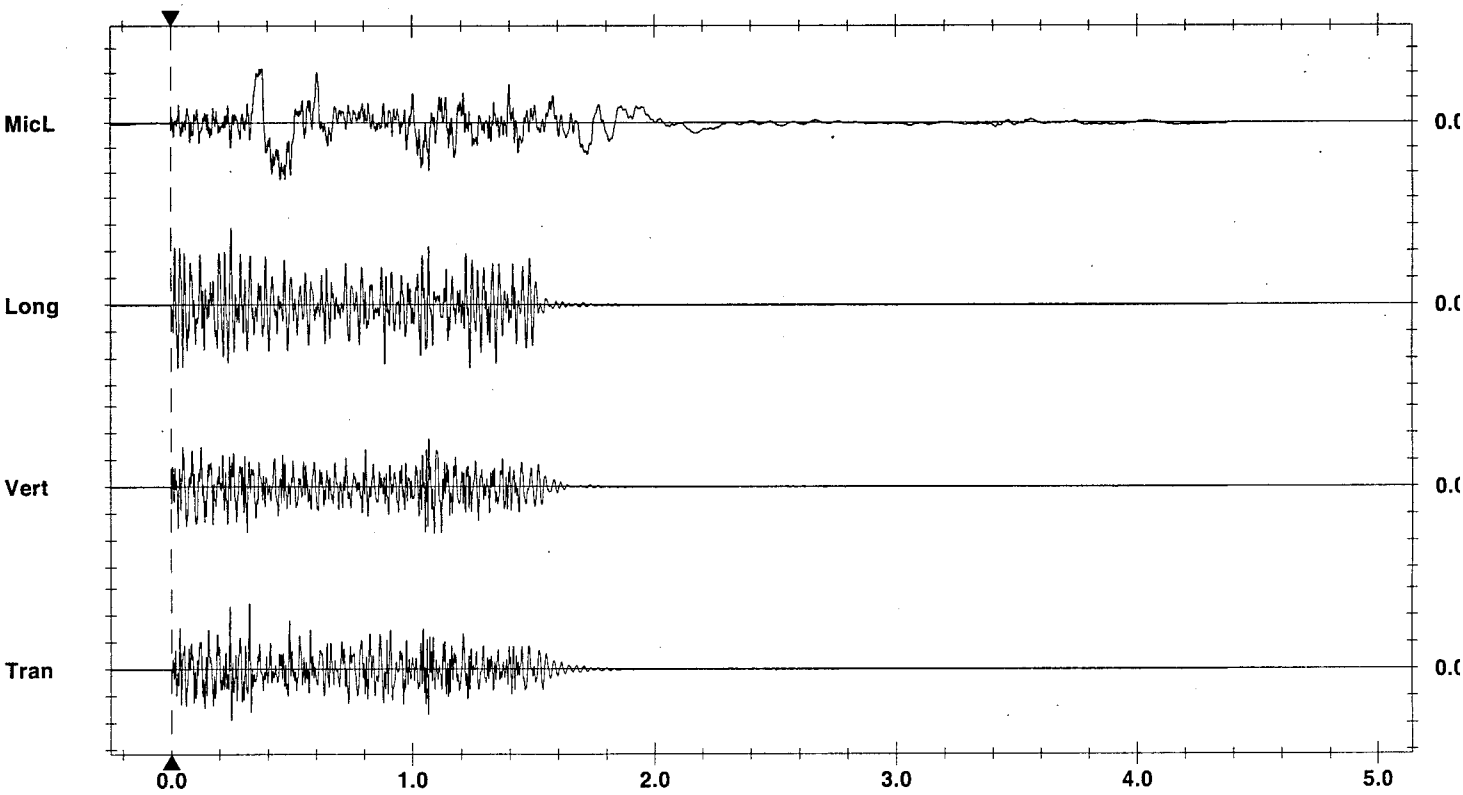
	Tran	Vert	Long	
PPV	24.5	18.0	28.8	mm/s
ZC Freq	59	45	40	Hz
Time (Rel. to Trig)	0.323	1.068	0.250	sec
Peak Acceleration	1.22	1.11	1.17	g
Peak Displacement	0.0740	0.0761	0.103	mm
Sensorcheck ™	Passed	Passed	Passed	

Peak Vector Sum 34.3 mm/s at 0.250 sec

USBM RI8507 And OSMRE



Tran: + Vert: x Long: ø



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 10.00 mm/s/div Mic: 10.00 pa.(L)/div
Trigger = ▶— — —◀

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Event Report

Date/Time	Vert at 11:54:52 April 12, 2000	**Serial Number**	BC6544 V 4.0-4.0 MiniMate Plus
Trigger Source	Geo: 3.00 mm/s	**Battery Level**	6.2 Volts
Range	Geo :254 mm/s	**Calibration**	June 16, 1999 by Instantel Inc.
Record Time	4.5 sec (Auto=3Sec) at 4096 sps	**File Name**	H5447Z29.3G0
Job Number:	26		

Notes
Location:
Client:
User Name:
General:

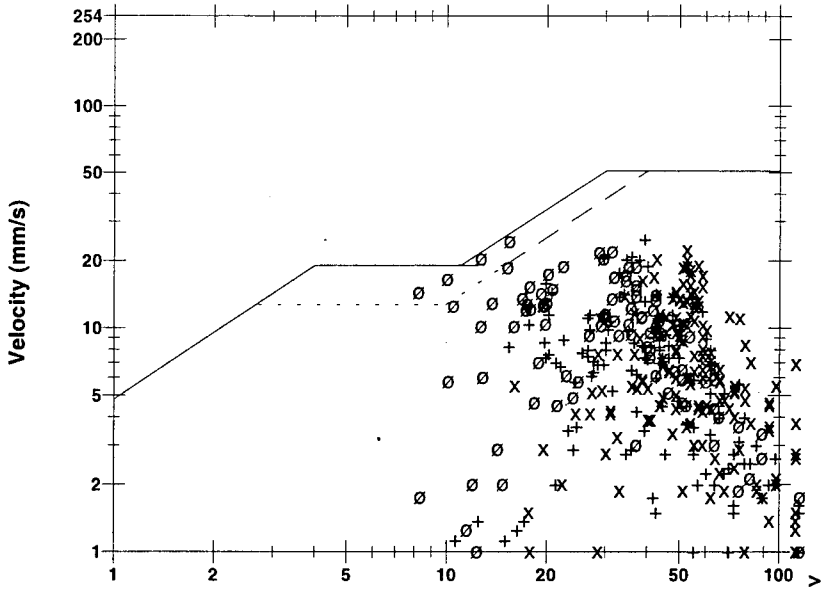
Post Event Notes
11-SD-54/125 001923
BLAST 45B STATION 122+20 TO 122+60
44 kg/DELAY 74 m FROM 6544
8566 LAKE BLUFF CIRCLE

Microphone	Linear Weighting
PSPL	59.0 pa.(L) at 0.227 sec
ZC Freq	7.8 Hz
Channel Test	Passed (Freq = 20.5 Hz Amp = 668 mv)

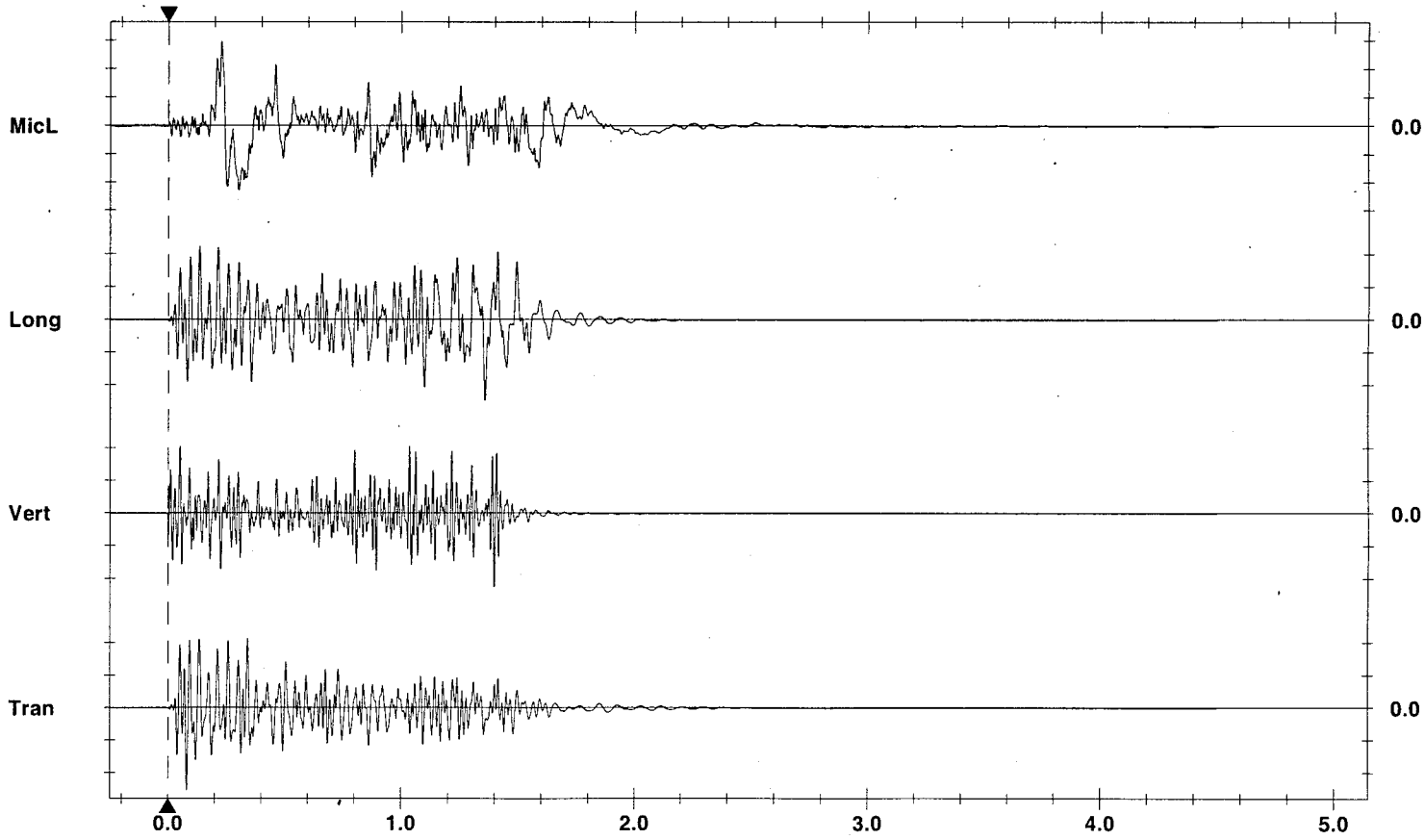
	Tran	Vert	Long	
PPV	25.4	22.6	24.8	mm/s
ZC Freq	39.4	53	15.5	Hz
Time (Rel. to Trig)	0.080	1.397	1.357	sec
Peak Acceleration	0.636	0.901	0.530	g
Peak Displacement	0.112	0.0712	0.182	mm
Sensorcheck ™	Passed	Passed	Passed	

Peak Vector Sum 32.2 mm/s at 0.050 sec

USBM RI8507 And OSMRE



Tran: + Vert: x Long: ø



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 10.00 mm/s/div Mic: 20.0 pa.(L)/div
Trigger = ▶— — —◀

Format Copyrighted 1996-1998

Event Report

Date/Time	Vert at 11:48:47 May 3, 2000	**Serial Number**	BA6633 V 4.0-4.0 BlastMate III
Trigger Source	Geo: 2.00 mm/s	**Battery Level**	6.4 Volts
Range	Geo :254 mm/s	**Calibration**	May 28, 1999 by Instantel Inc.
Record Time	4.25 sec (Auto=3Sec) at 4096 sps	**File Name**	H6338054.TB0
Job Number:	20		

Notes
Location:
Client:
User Name:
General:

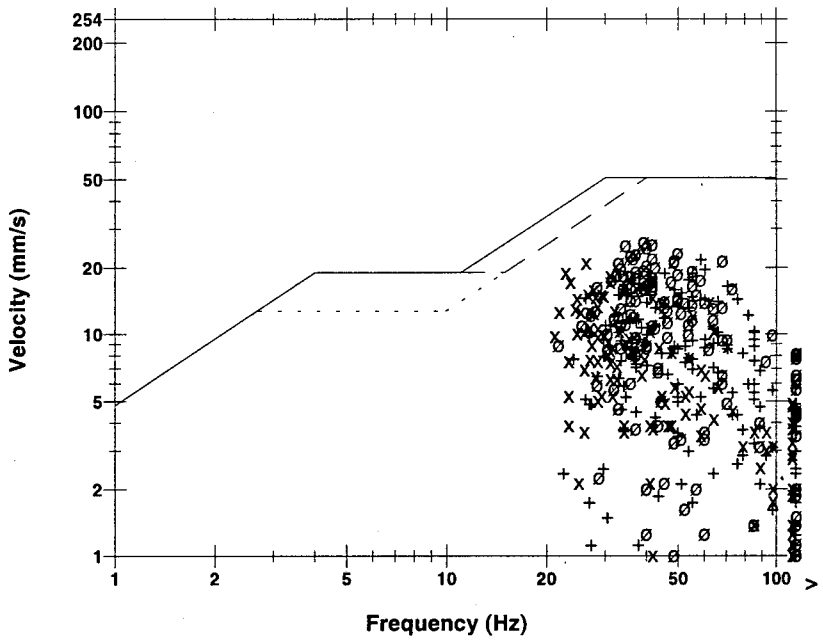
Post Event Notes
11-SD-54/125 001923
BLAST 46/47B STATION 121+72 TO 122+36
53 kg/DELAY 118 m FROM 6633
8573 LAKE BLUFF CIRCLE

Microphone	Linear Weighting
PSPL	22.0 pa.(L) at 0.411 sec
ZC Freq	6.8 Hz
Channel Test	Passed (Freq = 19.3 Hz Amp = 700 mv)

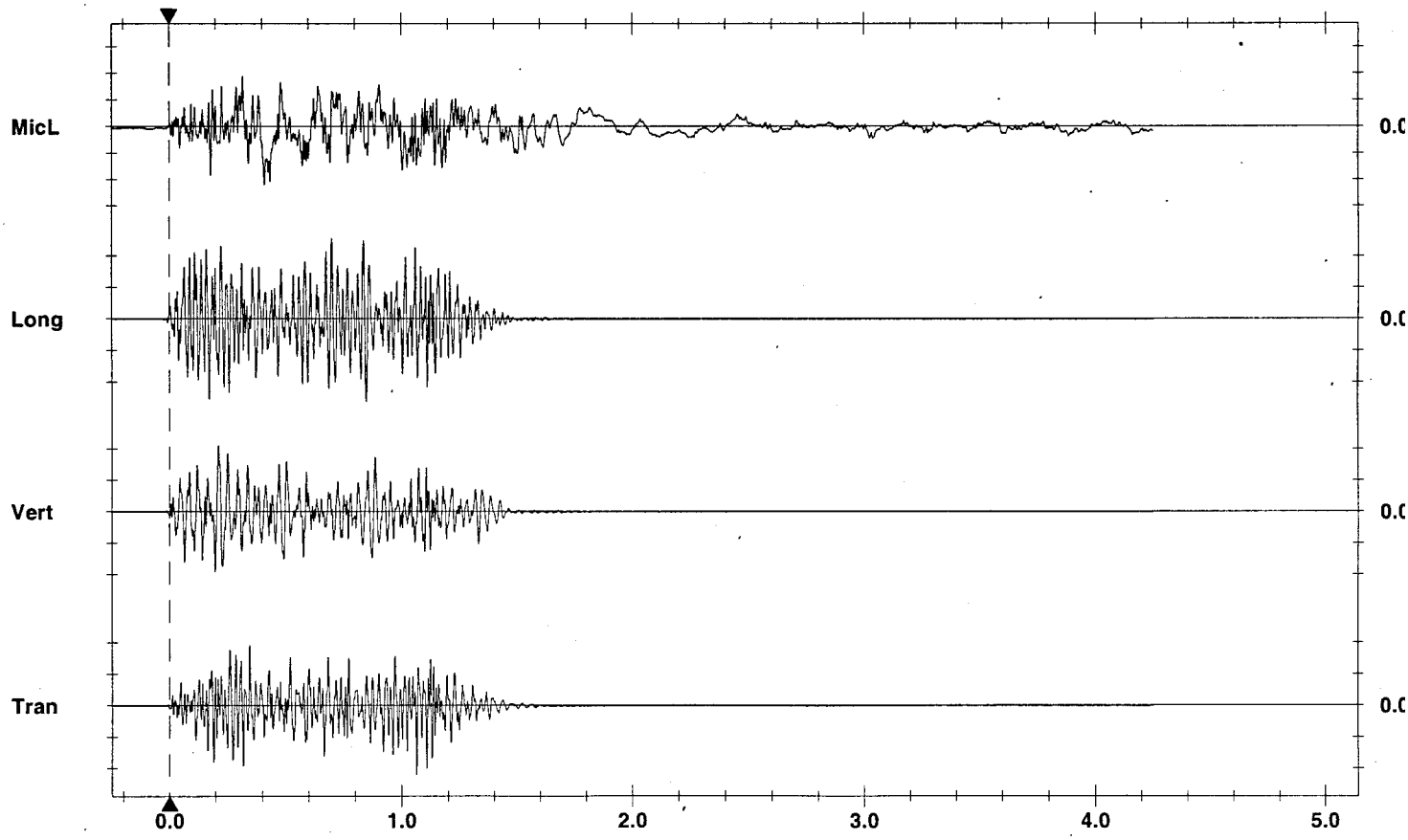
	Tran	Vert	Long	
PPV	22.2	21.2	26.4	mm/s
ZC Freq	59	26.3	39.4	Hz
Time (Rel. to Trig)	1.063	0.212	0.848	sec
Peak Acceleration	1.01	0.636	1.01	g
Peak Displacement	0.0741	0.120	0.115	mm
Sensorcheck ™	Passed	Passed	Passed	

Peak Vector Sum 28.3 mm/s at 0.848 sec

USBM RI8507 And OSMRE



Tran: + Vert: x Long: ø



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 10.00 mm/s/div Mic: 10.00 pa.(L)/div
Trigger = ▶— — —◀

Format Copyrighted 1996-1998

Event Report

Date/Time	Vert at 11:50:45 May 3, 2000	**Serial Number**	BC6543 V 4.0-4.0 MiniMate Plus
Trigger Source	Geo: 3.00 mm/s	**Battery Level**	6.3 Volts
Range	Geo :254 mm/s	**Calibration**	June 16, 1999 by Instantel Inc.
Record Time	4.125 sec (Auto=3Sec) at 4096 sps	**File Name**	H5438054.WL0
Job Number:	1		

Notes
EA 11-001923
SR 54/125 KP 9.7
Blast Number:
Monitoring Location:

Extended Notes
TEMP: 96 F

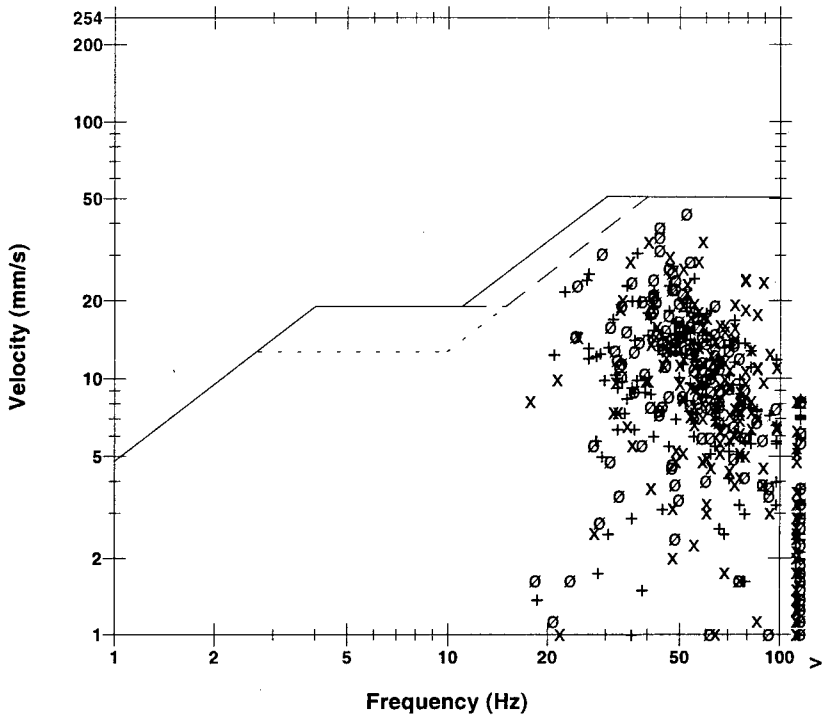
Post Event Notes
11-SD-54/125 001923
BLAST 46/47B STATION 121+72 TO 122+36
53 kg/DELAY 56 m FROM 6543
72 m LT 122 + 26 "B" LINE

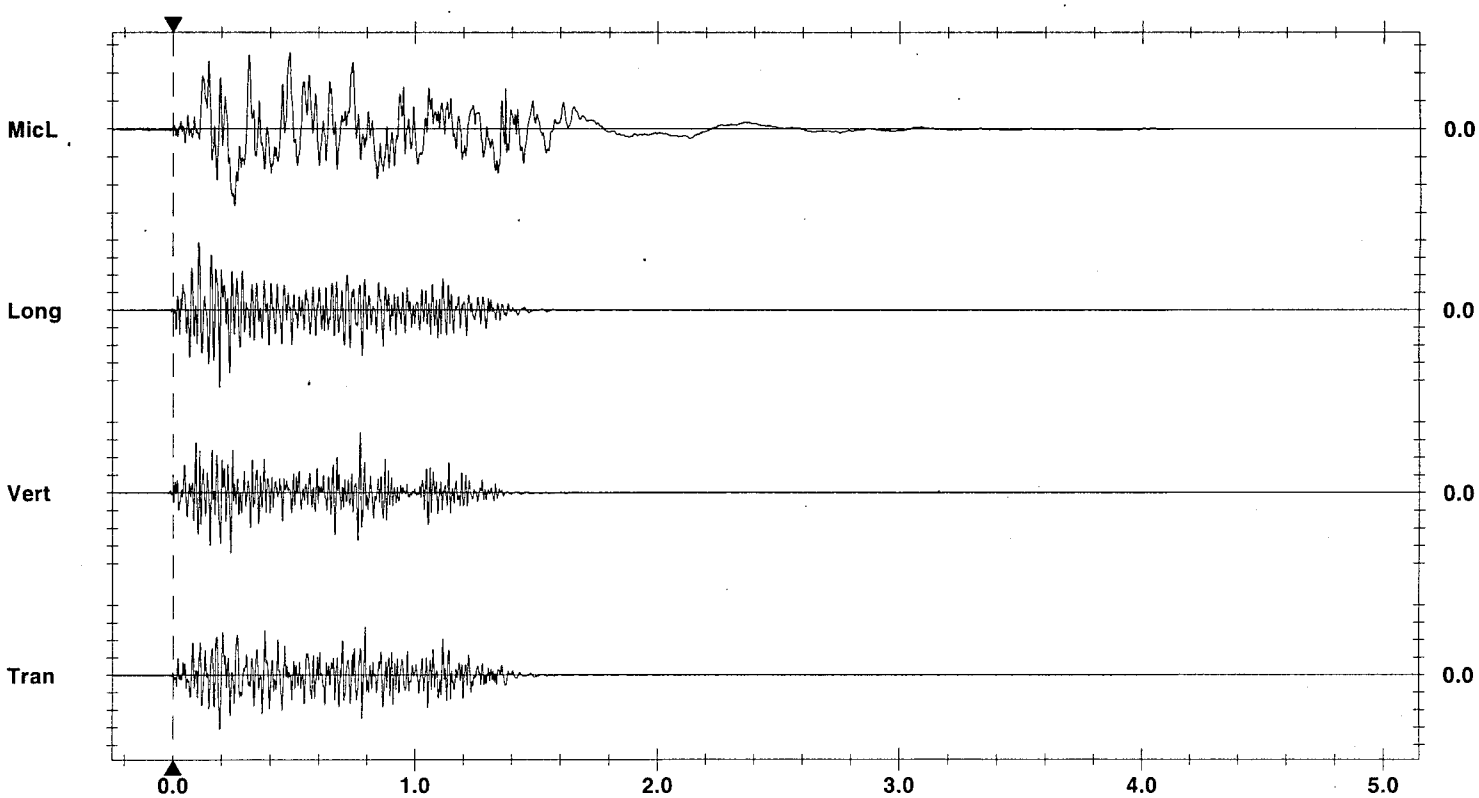
Microphone	Linear Weighting
PSPL	55.0 pa.(L) at 0.253 sec
ZC Freq	6.4 Hz
Channel Test	Passed (Freq = 20.1 Hz Amp = 725 mv)

	Tran	Vert	Long	
PPV	31.1	34.3	44.1	mm/s
ZC Freq	37.2	59	53	Hz
Time (Rel. to Trig)	0.193	0.773	0.191	sec
Peak Acceleration	1.54	1.80	1.54	g
Peak Displacement	0.127	0.115	0.150	mm
Sensorcheck ™	Passed	Passed	Passed	

Peak Vector Sum 55.0 mm/s at 0.192 sec

USBM RI8507 And OSMRE





Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 10.00 mm/s/div Mic: 20.0 pa.(L)/div
Trigger = ▶— — —◀

Format Copyrighted 1996-1998

Event Report

Date/Time	Long at 11:51:26 May 3, 2000	**Serial Number**	BC6544 V 4.0-4.0 MiniMate Plus
Trigger Source	Geo: 3.00 mm/s	**Battery Level**	6.2 Volts
Range	Geo :254 mm/s	**Calibration**	June 16, 1999 by Instantel Inc.
Record Time	4.0 sec (Auto=3Sec) at 4096 sps	**File Name**	H5448054.XQ0
Job Number:	26		

Notes
Location:
Client:
User Name:
General:

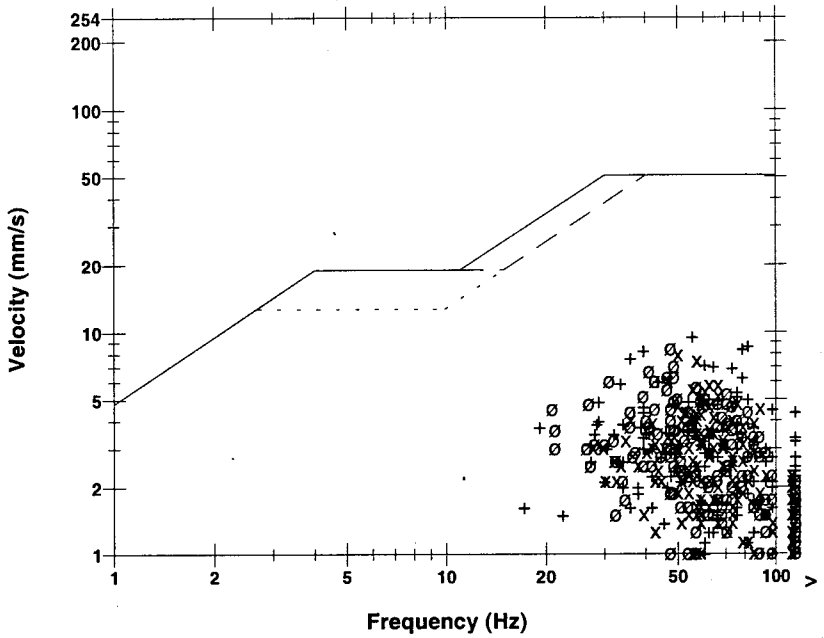
Post Event Notes
11-SD-54/125 001923
BLAST 46/47B STATION 121+72 TO 122+36
53 kg/DELAY 159 m FROM 6544
52 m RT 120 + 24 "B" LINE ON QUARRY RD

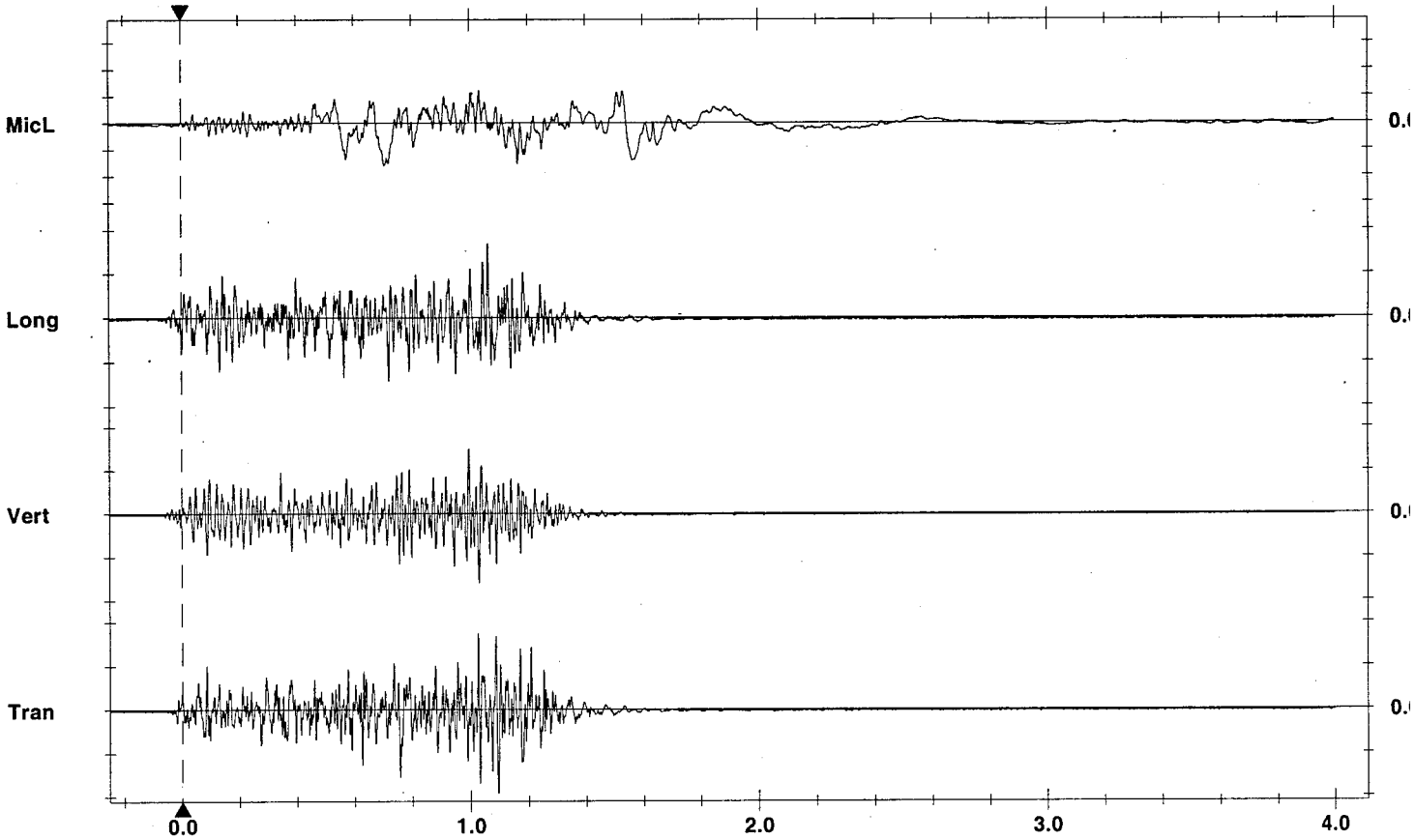
Microphone	Linear Weighting
PSPL	16.0 pa.(L) at 0.706 sec
ZC Freq	7.8 Hz
Channel Test	Passed (Freq = 19.0 Hz Amp = 706 mv)

	Tran	Vert	Long	
PPV	9.65	8.00	8.51	mm/s
ZC Freq	55	50	48	Hz
Time (Rel. to Trig)	1.094	1.030	1.062	sec
Peak Acceleration	0.530	0.371	0.371	g
Peak Displacement	0.0299	0.0240	0.0267	mm
Sensorcheck ™	Passed	Passed	Passed	

Peak Vector Sum 11.4 mm/s at 1.031 sec

USBM RI8507 And OSMRE





Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 5.00 mm/s/div Mic: 10.00 pa.(L)/div
Trigger = ▶— — —◀

Format Copyrighted 1996-1998

Event Report

Date/Time	Vert at 12:16:45 May 4, 2000	**Serial Number**	BA6633 V 4.0-4.0 BlastMate III
Trigger Source	Geo: 2.00 mm/s	**Battery Level**	6.2 Volts
Range	Geo :254 mm/s	**Calibration**	May 28, 1999 by Instantel Inc.
Record Time	4.5 sec (Auto=3Sec) at 4096 sps	**File Name**	H6338070.RX0
Job Number:	20		

Notes
Location:
Client:
User Name:
General:

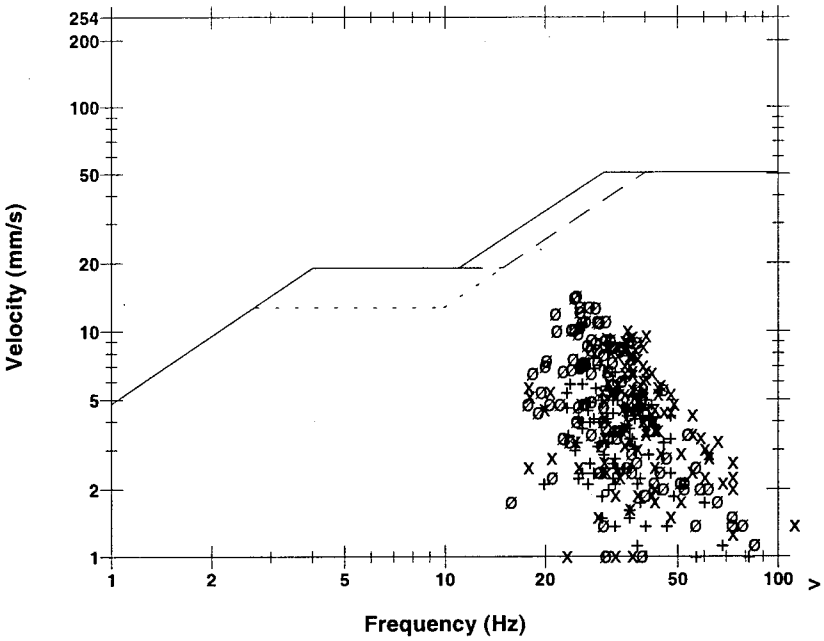
Post Event Notes
11-SD-54/125 001923
BLAST 47/48B STATION 121+20 TO 121+72
53 kg/DELAY 119 m FROM 6633
ENTRANCE TO SWEETWATER VILLAS

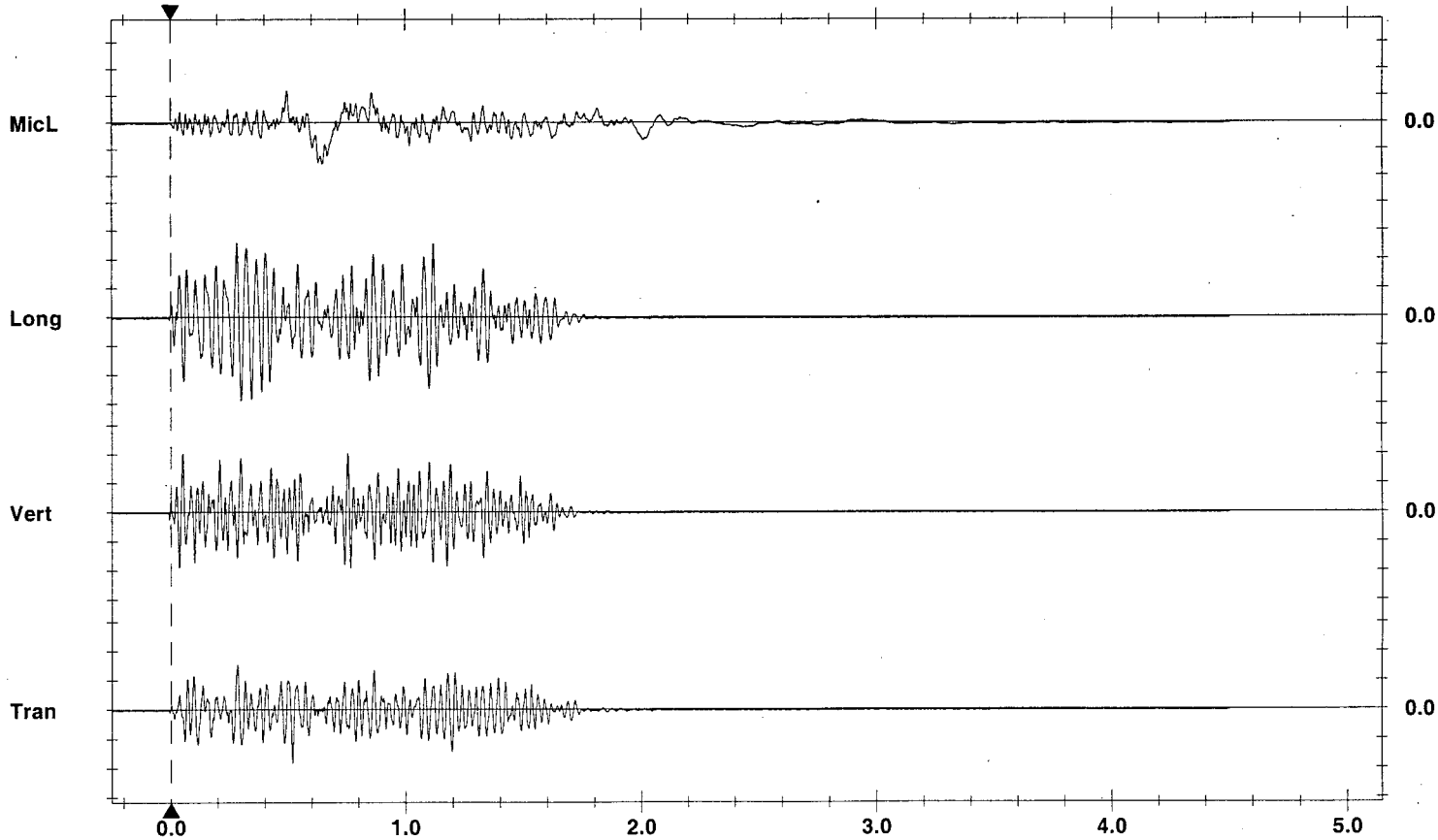
Microphone	Linear Weighting
PSPL	15.5 pa.(L) at 0.646 sec
ZC Freq	4.5 Hz
Channel Test	Passed (Freq = 19.0 Hz Amp = 756 mv)

	Tran	Vert	Long	
PPV	9.14	10.2	14.5	mm/s
ZC Freq	31.5	35.3	25.0	Hz
Time (Rel. to Trig)	0.517	0.050	0.299	sec
Peak Acceleration	0.212	0.318	0.318	g
Peak Displacement	0.0429	0.0481	0.0902	mm
Sensorcheck ™	Passed	Passed	Passed	

Peak Vector Sum 17.9 mm/s at 0.299 sec

USBM RI8507 And OSMRE





Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 5.00 mm/s/div Mic: 10.00 pa.(L)/div
Trigger = ▶— — —◀

Format Copyrighted 1996-1998

Event Report

Date/Time	Vert at 12:18:43 May 4, 2000	**Serial Number**	BC6543 V 4.0-4.0 MiniMate Plus
Trigger Source	Geo: 3.00 mm/s	**Battery Level**	6.2 Volts
Range	Geo :254 mm/s	**Calibration**	June 16, 1999 by Instantel Inc.
Record Time	4.375 sec (Auto=3Sec) at 4096 sps	**File Name**	H5438070.V70
Job Number:	1		

Notes
EA 11-001923
SR 54/125 KP 9.7
Blast Number:
Monitoring Location:

Extended Notes
TEMP: 96 F

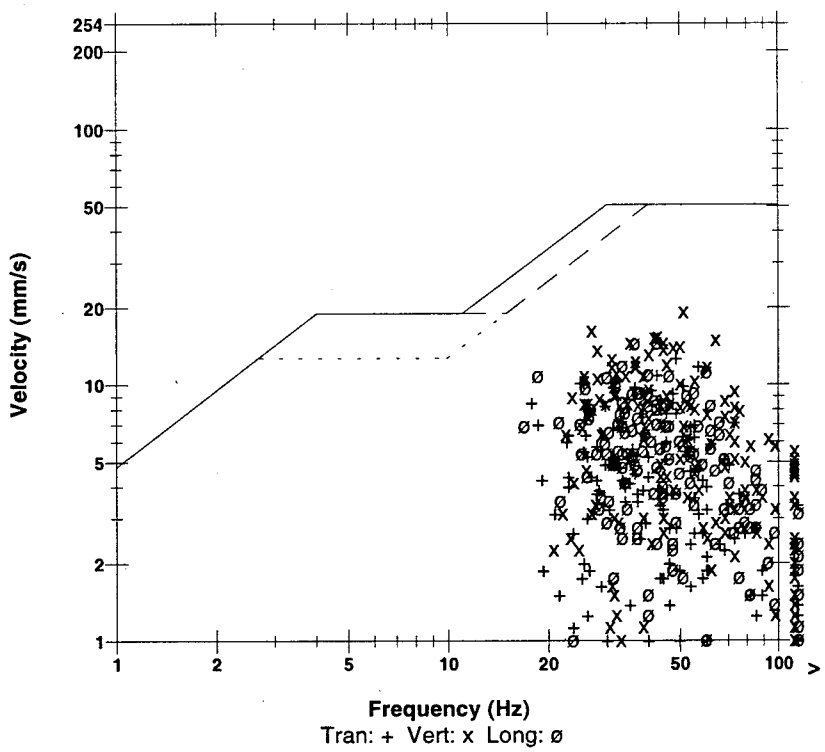
Post Event Notes
11-SD-54/125 001923
BLAST 47/48B STATION 121+20 TO 121+72
53 kg/DELAY 56 m FROM 6543
SWEETWATER VILLAS UNIT 23

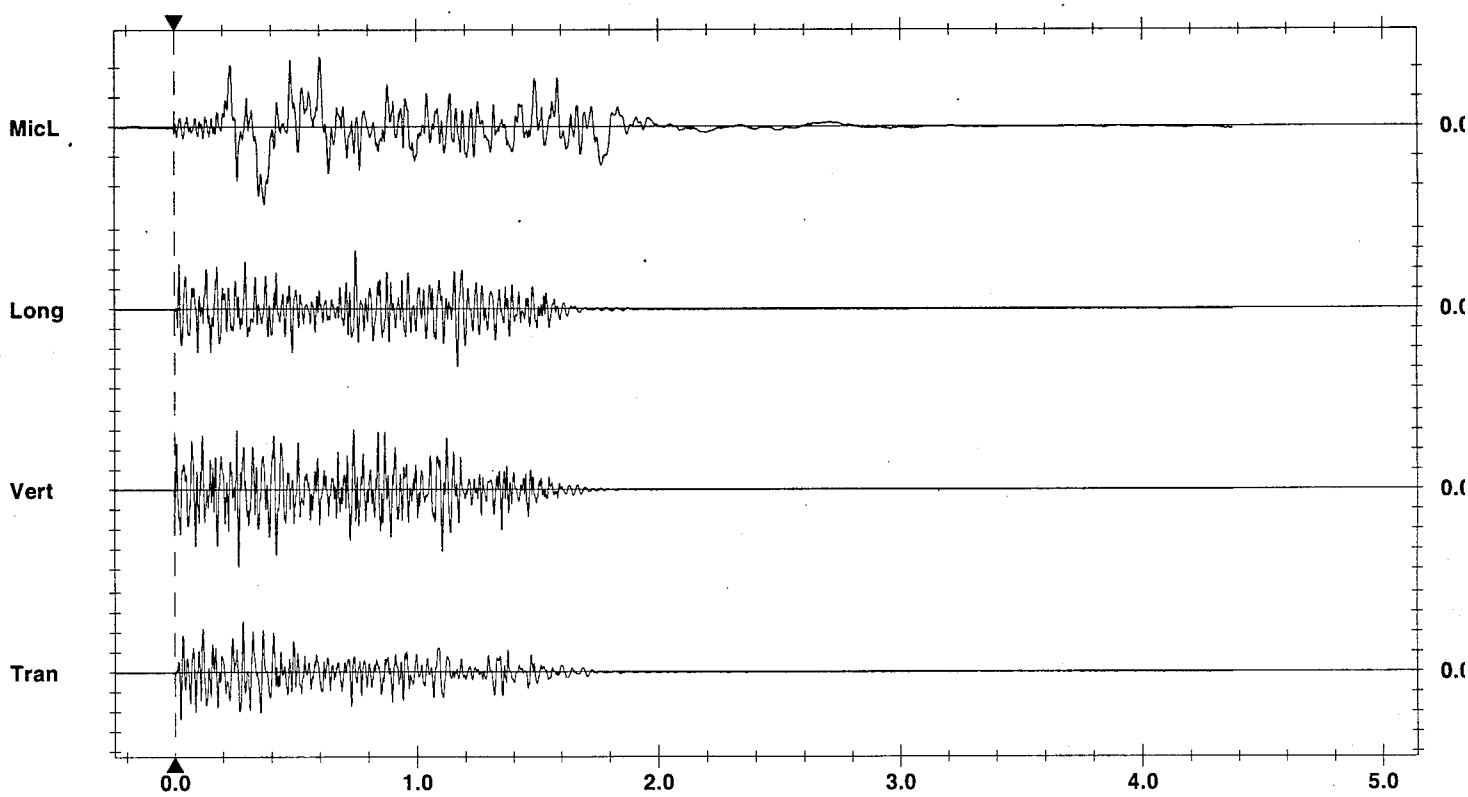
Microphone	Linear Weighting
PSPL	52.3 pa.(L) at 0.373 sec
ZC Freq	5.3 Hz
Channel Test	Passed (Freq = 20.1 Hz Amp = 668 mv)

	Tran	Vert	Long	
PPV	12.8	19.4	14.7	mm/s
ZC Freq	49	51	43	Hz
Time (Rel. to Trig)	0.281	0.264	0.748	sec
Peak Acceleration	0.583	1.01	0.477	g
Peak Displacement	0.0544	0.0777	0.0594	mm
Sensorcheck ™	Passed	Passed	Passed	

Peak Vector Sum 20.8 mm/s at 0.265 sec

USBM RI8507 And OSMRE





Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 5.00 mm/s/div Mic: 20.0 pa.(L)/div
Trigger = ▶— — —◀

Format Copyrighted 1996-1998

Event Report

Date/Time	Vert at 12:19:24 May 4, 2000	**Serial Number**	BC6544 V 4.0-4.0 MiniMate Plus
Trigger Source	Geo: 3.00 mm/s	**Battery Level**	6.1 Volts
Range	Geo :254 mm/s	**Calibration**	June 16, 1999 by Instantel Inc.
Record Time	4.375 sec (Auto=3Sec) at 4096 sps	**File Name**	H5448070.WC0
Job Number:	26		

Notes
Location:
Client:
User Name:
General:

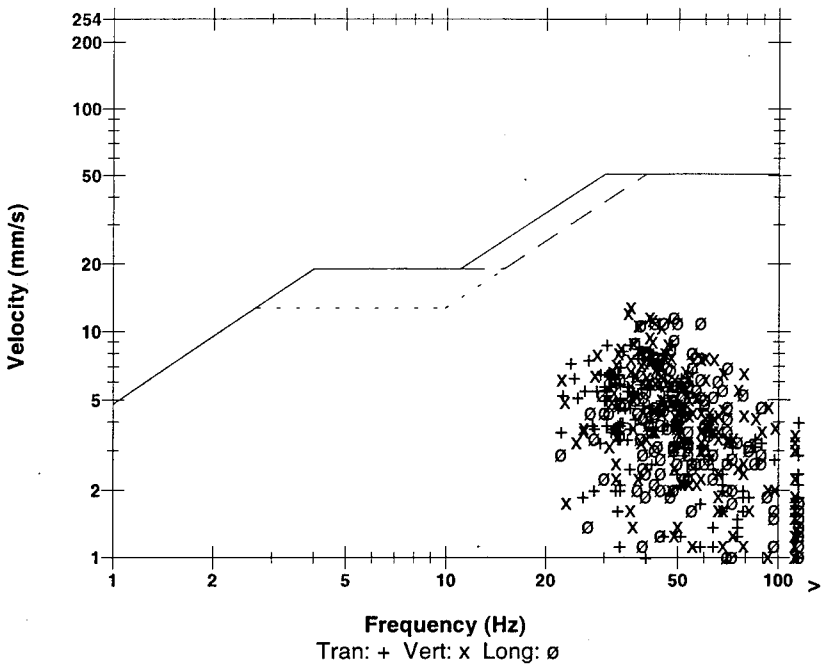
Post Event Notes
11-SD-54/125 001923
BLAST 47/48B STATION 121+20 TO 121+72
53 kg/DELAY 93 m FROM 6544
SWEETWATER VILLAS SPACE #12 BY LAUNDRY

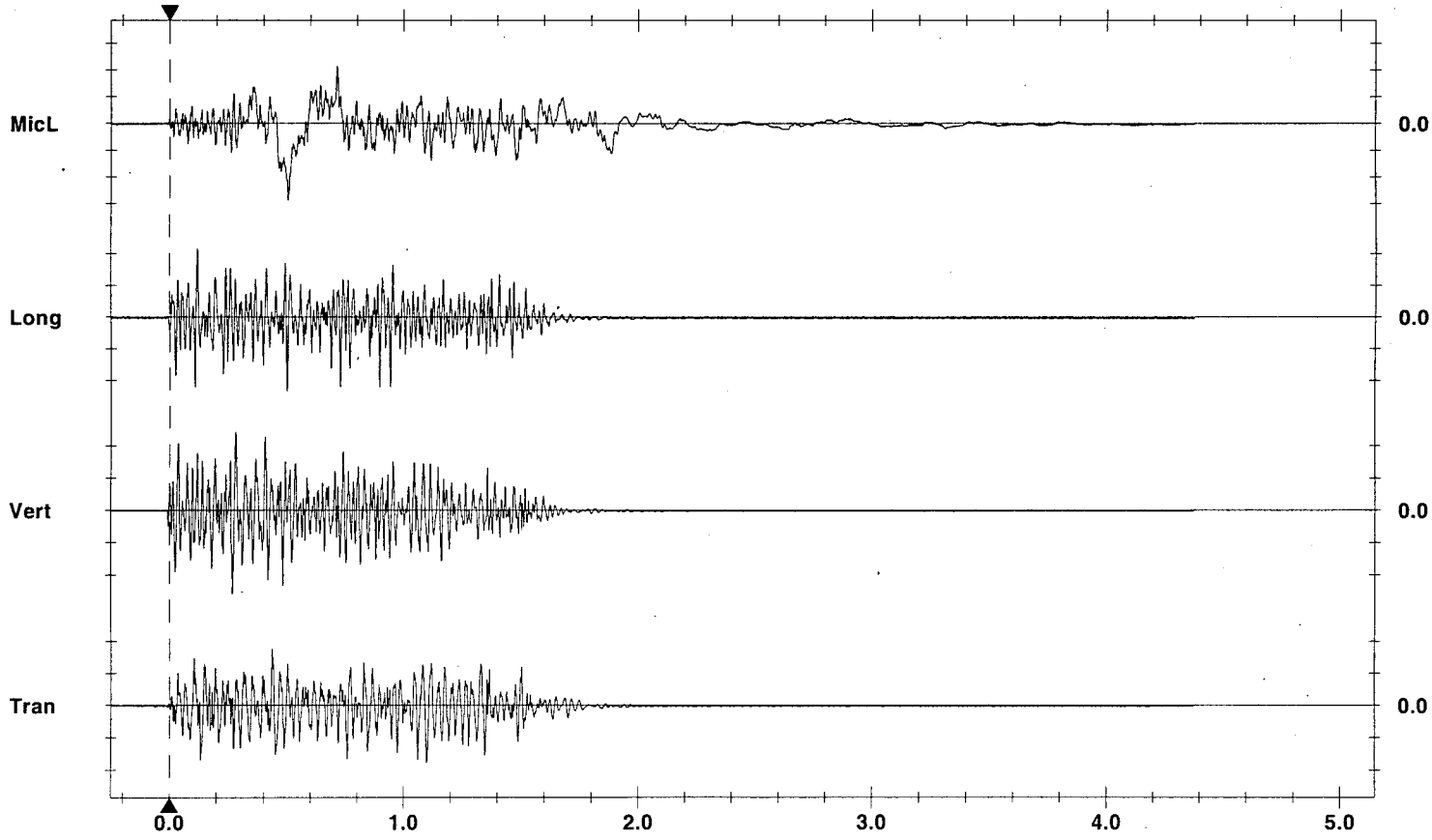
Microphone	Linear Weighting
PSPL	28.8 pa.(L) at 0.503 sec
ZC Freq	4.1 Hz
Channel Test	Passed (Freq = 19.0 Hz Amp = 699 mv)

	Tran	Vert	Long	
PPV	8.89	13.0	11.7	mm/s
ZC Freq	35.9	35.9	49	Hz
Time (Rel. to Trig)	0.437	0.268	0.500	sec
Peak Acceleration	0.371	0.583	0.477	g
Peak Displacement	0.0432	0.0523	0.0382	mm
Sensorcheck ™	Passed	Passed	Passed	

Peak Vector Sum 13.9 mm/s at 0.118 sec

USBM RI8507 And OSMRE





Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 5.00 mm/s/div Mic: 10.00 pa.(L)/div
Trigger = ▶— — —◀

Format Copyrighted 1996-1998

Att #37

RECEIVED
JUN 16 1999
LEMON GROVE #7472

BLASTING PLAN

CALTRANS CONTRACT NO. 11-001924

PRIME CONTRACTOR: MORRISON KNUDSEN CORPORATION
27400 EAST 5TH STREET
HIGHLAND, CA 92346

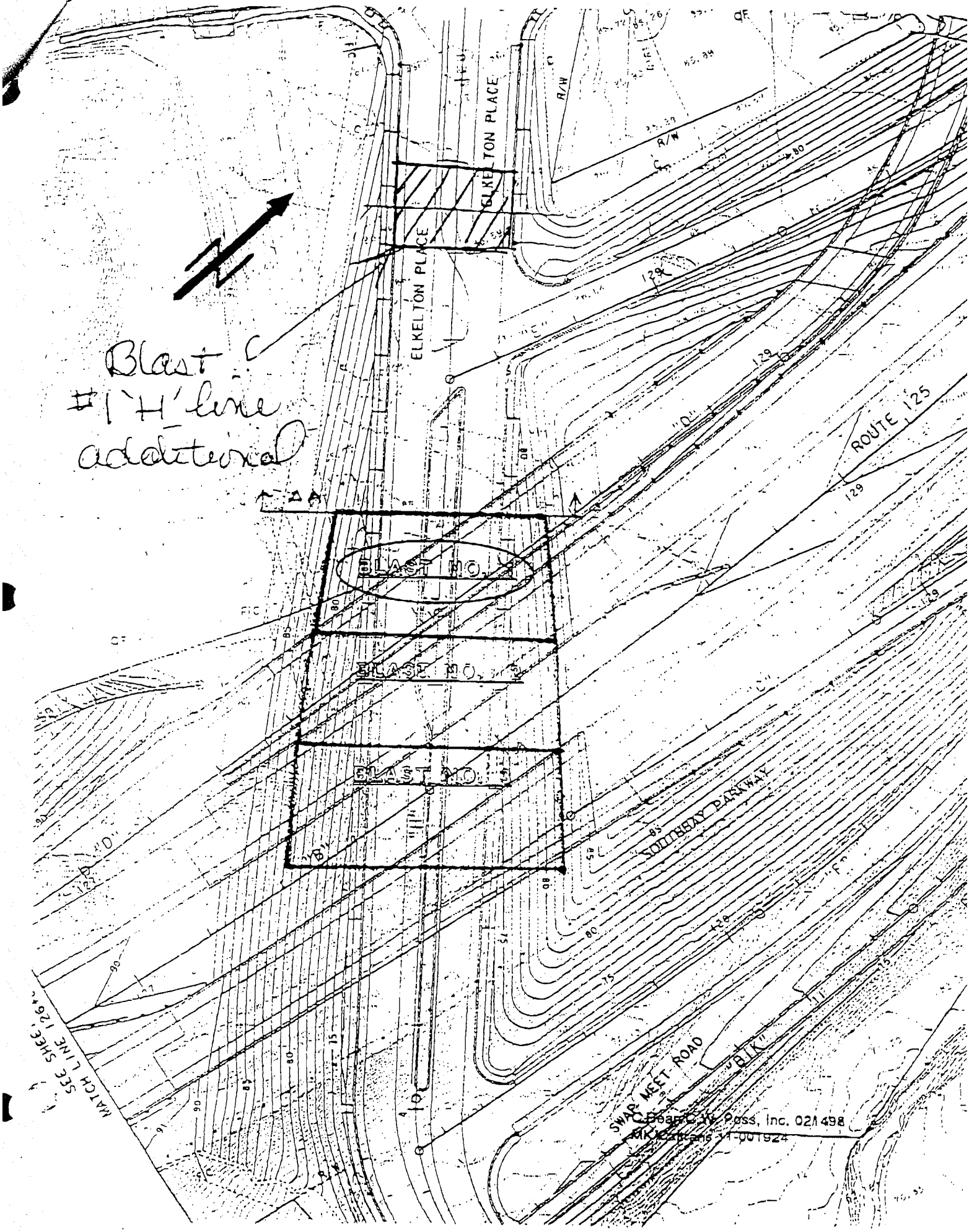
DRILLING & BLASTING CONTRACTOR: C.W. POSS, INCORPORATED
201 S. BALCOM AVENUE
FULLERTON, CA 92832
PH: 714-871-9900
FX: 714-871-3009

BLASTING PLAN SUBMITTED FOR BLAST(S) NO. 1 commenced (addition)
"H" LINE MASS, STRUCTURAL AND TRENCH EXCAVATION
ELKELTON PLASE RIGHT OF WAY

Pg no. 1 - Location
Pg no 2 - blast geometry/firing times
Pg no 3 - typical blast hole profile

nearest structures
① Morrison trlr @ 61 M South
*PPV = 2.5 mm/sec
② home West Side Paradise Valley Rd.
@ 100 M West
* PPV = 1.13 mm/sec

* $714.4 \left(\frac{D}{\sqrt{W_T}}\right)^{-1.6}$ Method of Calcs for PPV


ELKELTON PLACE
ELKELTON PLACE
R/W
R/W
Blast
#1 'H' line
additional
BLAST NO. 1
BLAST NO. 2
BLAST NO. 3
ROUTE 125
SOUTHWAY PARKWAY
SWAP MEET ROAD
"BIK"
MATCH LINE SEE SHEET 126
Copyright Pass, Inc. 021498
MK Caltrans 11-001924

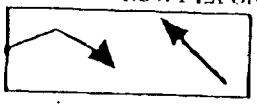
Blast #1, 'H' Line addition (ammended)

BLAST NO. 1 'H' LINE RDWY, SLOPES, STRUCTURAL AND TRENCHES STA 5+40 TO STA 80+50 PLAN VIEW BLAST HOLE LAYOUT, DETONATOR CONFIGURATION AND FIRING TIMES. ALL BLAST HOLES ARE TO BE DRILLED ON A 2.4 M X 2.4 M PATTERN

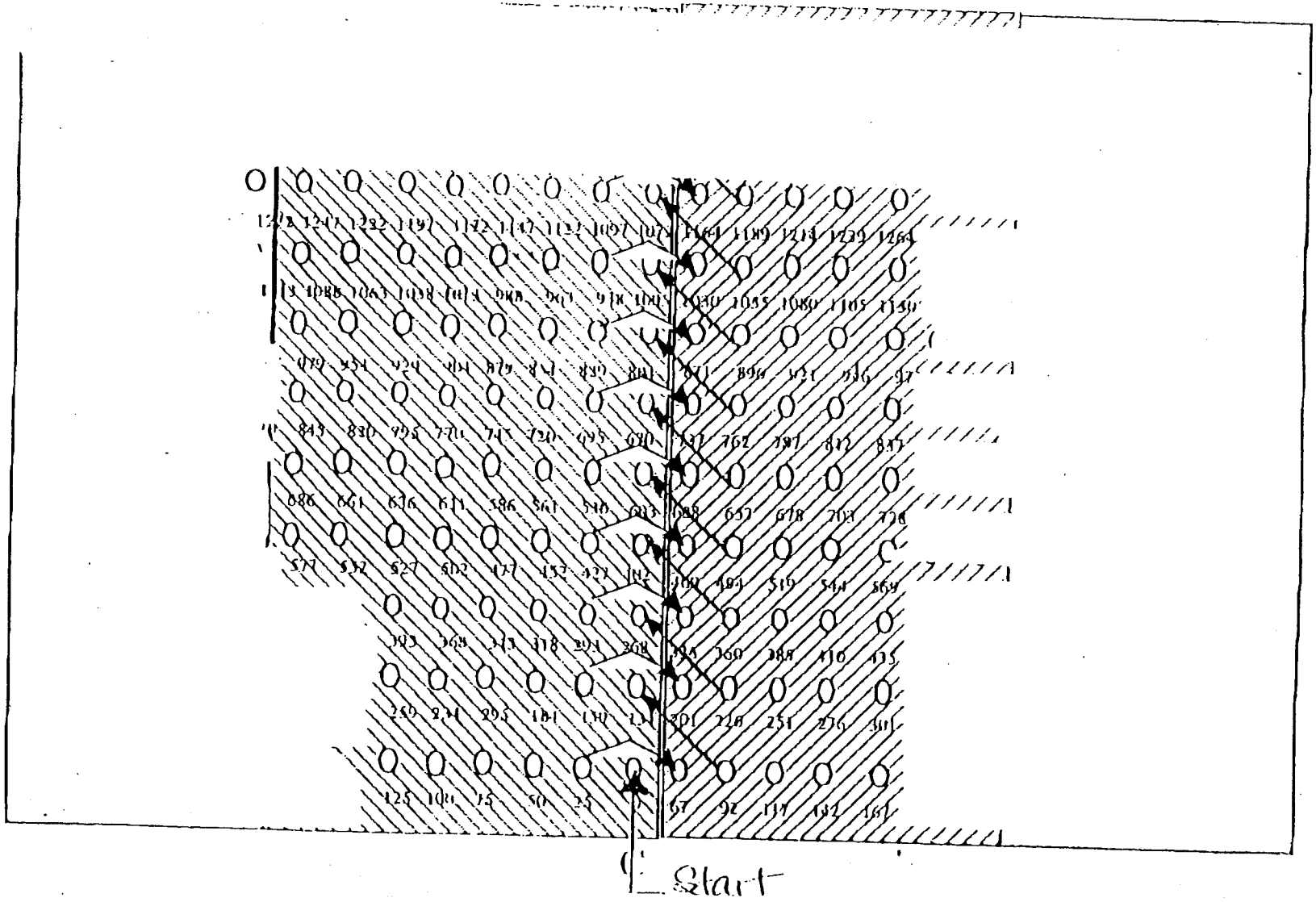
= SLOPE HOLES, NO SUB-DRILL

= RDWY EX, BENT FOOTINGS, DRAIN AND WATER TRENCHES RE-SHOT BLAST HOLES

= RDWY EX ONLY BLAST HOLES



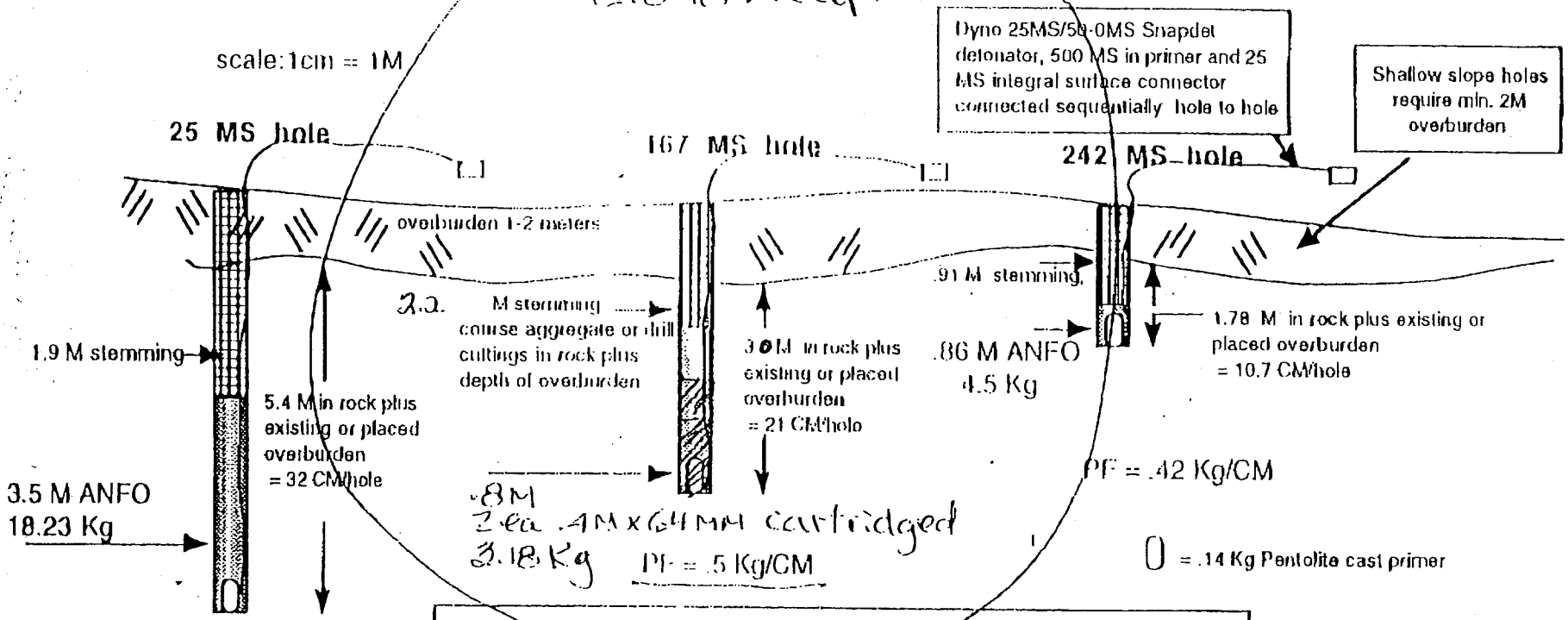
= 42MS DETONATOR SURFACE CONNECTORS. ALL HOLES ARE CONNECTED LATERALLY BY THE INTEGRAL 25MS SURFACE CONNECTORS



Blast no. 1 'H' line, typical blasthole profiles Sta 6+12 to 6+20

(additional)

All holes 3.048 M depth



All called-out stemming measurements are for the depths of rock only plus a minimum of 1M to 2M of overburden. If average, overburden is less than 1.5 M, stemming column shall be increased and blasting agent cloumn shall be reduced. Stemming shall be course aggregate, of suitable size, or drill cuttings.

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	54, 125	9.7/10.8, 18.0/19.6	142	803

Thomas S. Bouquin 10-31-97
REGISTERED CIVIL ENGINEER

4-6-98
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER TS BOUQUIN No. 48839 Exp. 9-30-00 CIVIL STATE OF CALIFORNIA

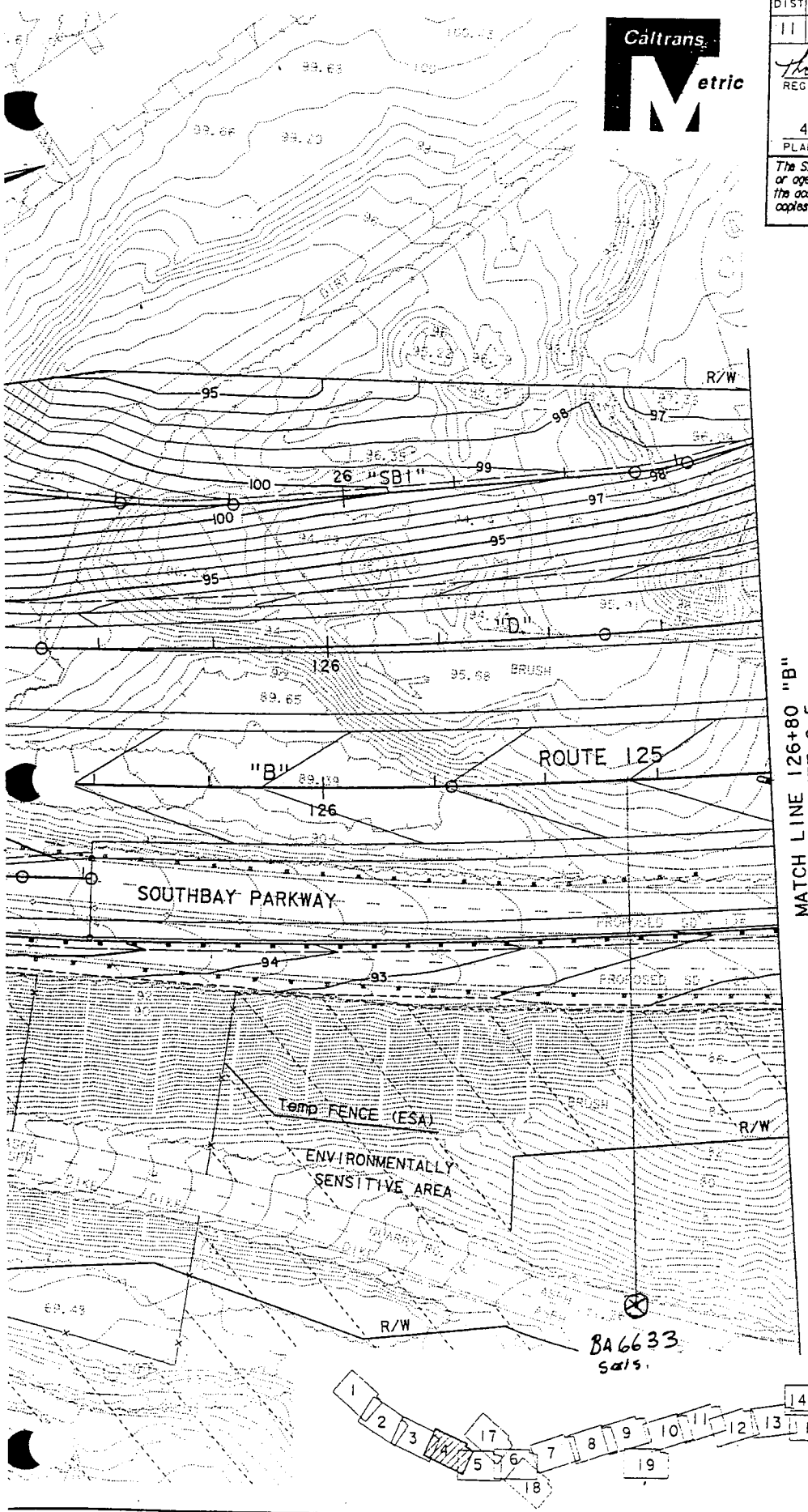
The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

Caltrans Metric

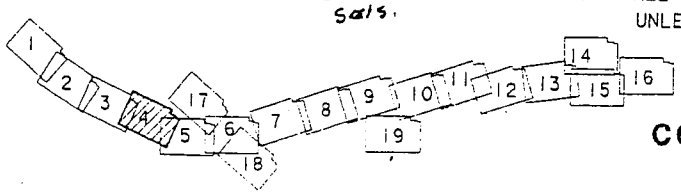
LOCATION RECORD
FOR BLAST 3B
6/21/99 14:35:42

BLAST 14B
6/22/99 13:04:20

BLAST 1H
6/22/99 @ 14:05
DID NOT TRIGGER
∴ < 3 mm/s



ALL DIMENSIONS ARE IN METERS
UNLESS OTHERWISE SHOWN



CONTOUR GRADING

SCALE: 1:500 G-4

20 40 60 80

USERNAME => troing
DGN FILE => b00192h04.cogaut

CU 11222 | EA 001921

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans PROJECT DEVELOPMENT
PROJECT ENGINEER T.S. BOUQUIN
CALCULATED BY
DESIGNED BY
CHECKED BY
DATE REVISED BY

BLASTING PLAN

CALTRANS CONTRACT NO. 11-001924

PRIME CONTRACTOR: MORRISON KNUDSEN CORPORATION
27400 EAST 5TH STREET
HIGHLAND, CA 92346

DRILLING AND BLASTING CONTRACTOR: C.W. POSS, INCORPORATED
201 S. BALCOM AVENUE
FULLERTON, CA 92832
PH: 714-871-9900
FX: 714-871-3009

ADDENDUM: BLASTING PLAN FOR BLAST NO. 3B
ROADWAY & TRENCH EXCAVATION 'H' LINE

Page no. 1 Explanatory letter, comments, modified PPV's
Page no. 2 Blast location (not to scale)
Page no. 3 Blast hole geometry, and nominal firing times
Page no. 4 Excavation cross section (not to exact scale)
Page no. 5 Typical blast hole profiles
Page no. 6 PPV's

C. Beau/CWP/3B/060999

C.W. POSS, INC.

GENERAL ENGINEERING CONTRACTOR 267502
201 S. BALCOM AVENUE, FULLERTON, CA 92805
PH: 714-871-9900 <<<>>> FAX: 714-871-3009
CHUCK BEAN 760-946-1819

Dear Sirs,

This addendum applies to previously submitted and approved blast plan no. 3 'H' Line. Morrison Knudsen deleted this area in the course of drilling and blasting for the month of May. It has now been rescheduled for blasting on approximately the 18th of June, 1999 predicated on the pouring and curing schedule of the adjacent structural foundation located twenty meters to the South of station 4+90. Modified PPV's are as follows:

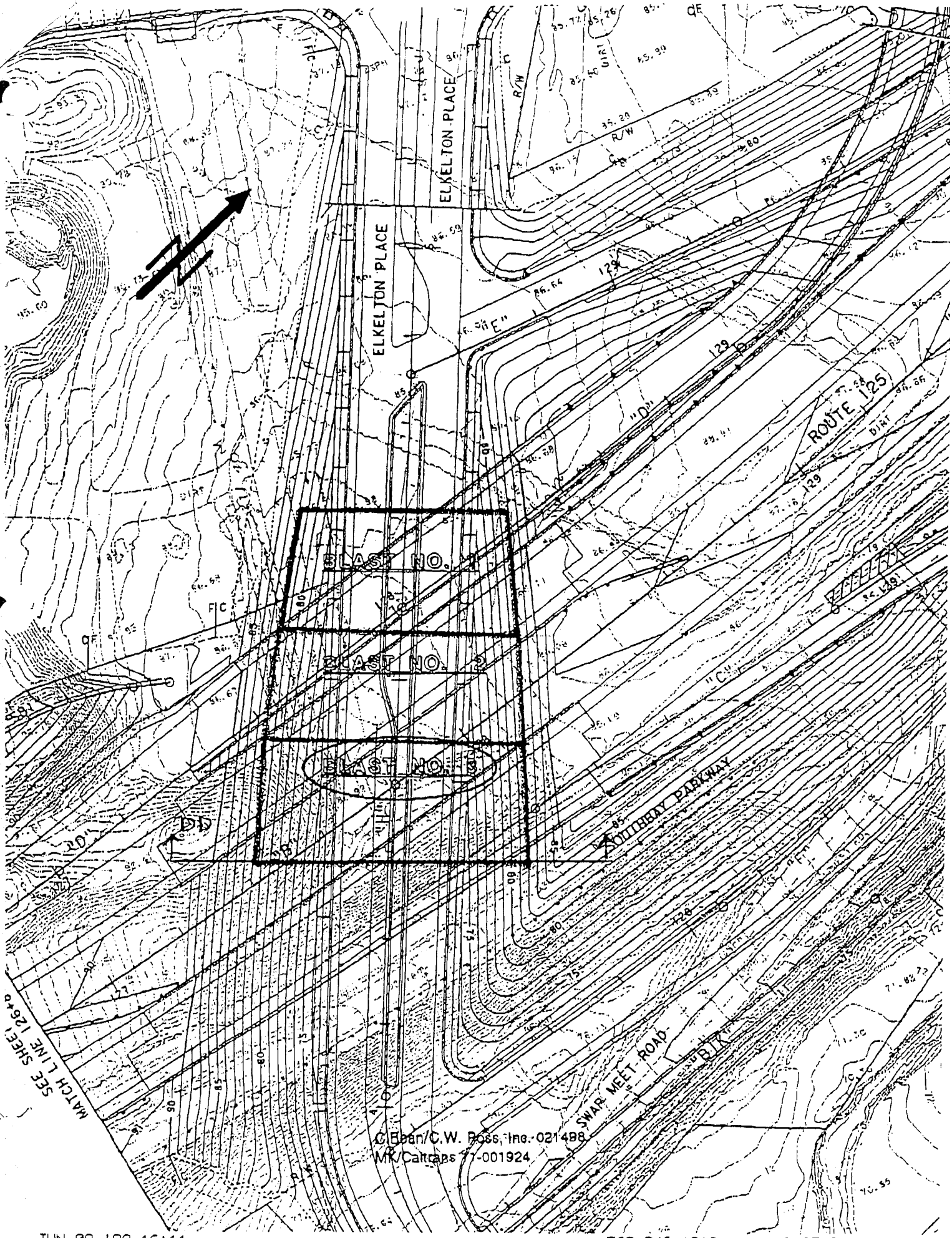
1.) Nearest blast hole to structure of concern located at Sta 4+90 Lt
Depth = 4.8 M, wt. = 11.4 Kg, D = 20 M, PPV = 41.48 mm/sec
2.) Deepest (most heavily loaded) blast hole located at Sta 4+90 Rt
Depth = 9.8 M, wt. = 38.6 Kg, D = 51.7 M, PPV = 24.07 mm/sec

C.W. Poss, Inc. has no knowledge of the design of this restrained structure or the parameters for vibration and potential hydrological loading due to the high ground water table. It is the recommendation of C.W. Poss, Inc. that a structural engineer, provided by others, determine the maximum allowable or threshold vibration limits and any other potential factors effecting this structure. Any significant modifications to the blast design would be submitted with an additional addendum for Blast no. 3 'H' Line and all work accomplished on a time and materials basis.
Because of the blasting sequence modifications beyond our control C.W. Poss, Inc. will not be responsible for any claims of damage to work in progress.

Rejected for this statement

Sincerely,

Chuck Bean


ELKELTON PLACE
ELKELTON PLACE
ROUTE 125
BLAST NO. 1
BLAST NO. 2
BLAST NO. 3
SOUTHBAY PARKWAY
SWAP MEET ROAD
SEE SHEET 126
MATCH LINE
C.Bean/C.W. Ross, Inc.-021498
MK/Caltrans 7-001924

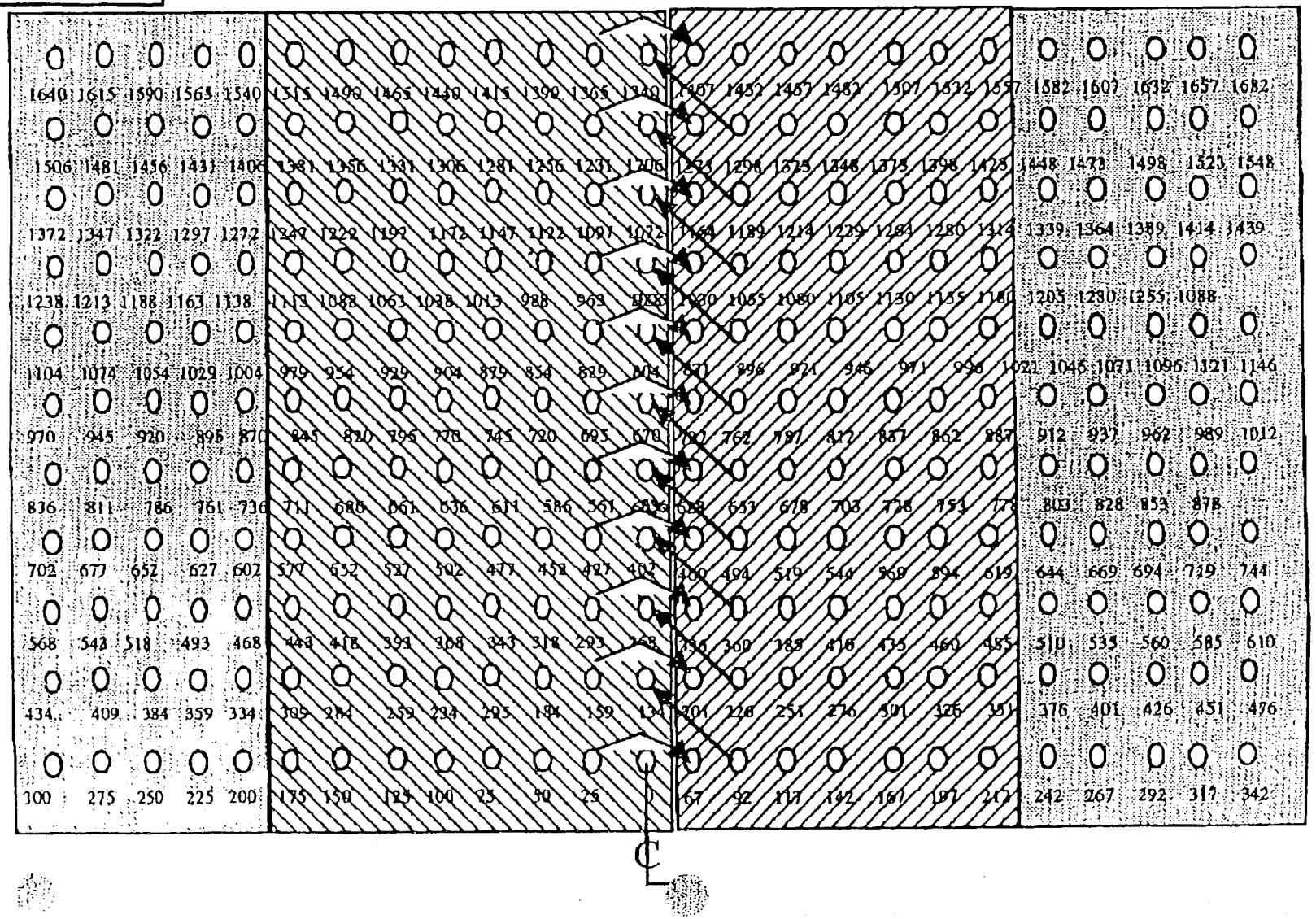
BLAST NO. 3 'H' LINE RDWY, SLOPES, STRUCTURAL AND TRENCHES STA 4+86 TO STA NO. 4+59 PLAN VIEW BLAST HOLE LAYOUT, DETONATOR CONFIGURATION AND FIRING TIMES, ALL BLAST HOLES ARE TO BE DRILLED ON A 2.4 M X 2.4 M PATTERN

= SLOPE HOLES, NO SUB-DRILL

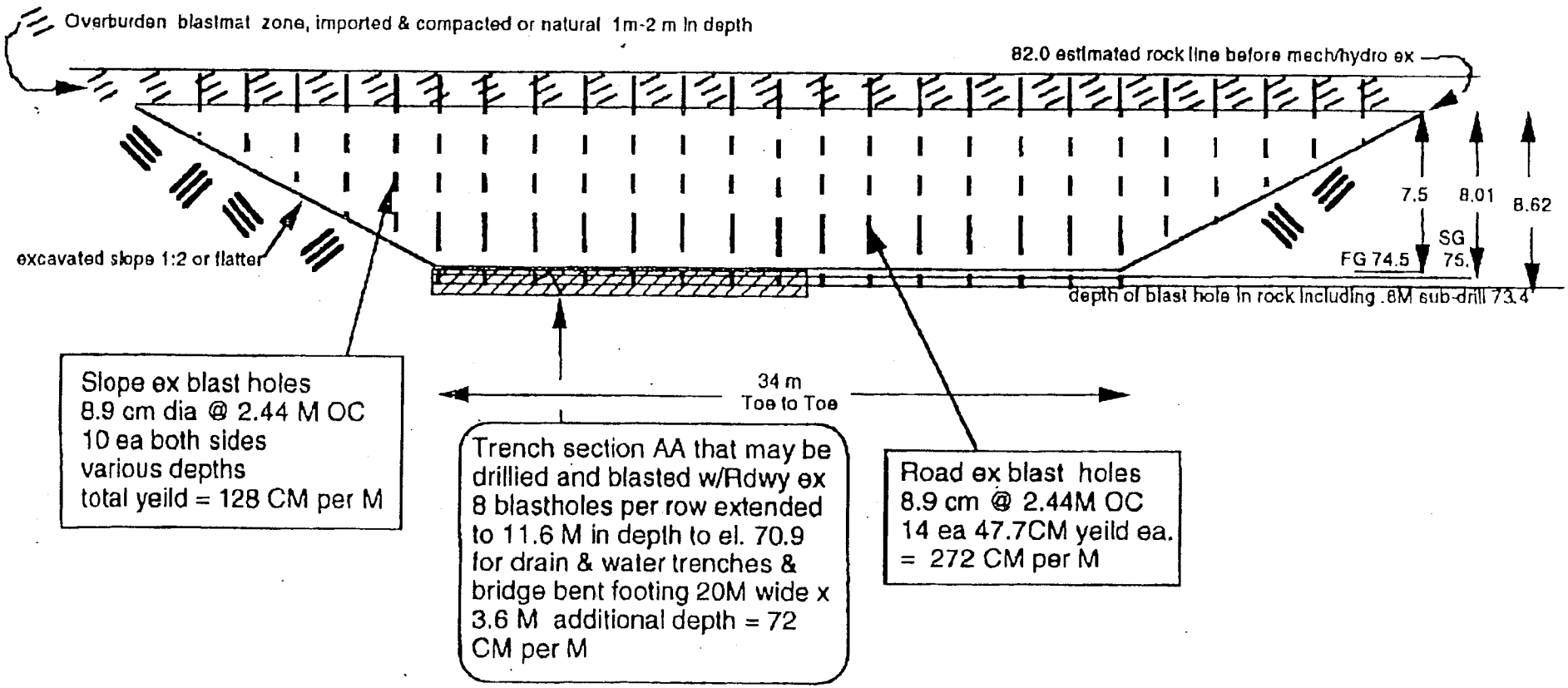
= RDWY EX, BENT FOOTINGS, DRAIN AND WATER TRENCHES RT SIDE BLAST HOLES

= RDWY EX ONLY BLAST HOLES

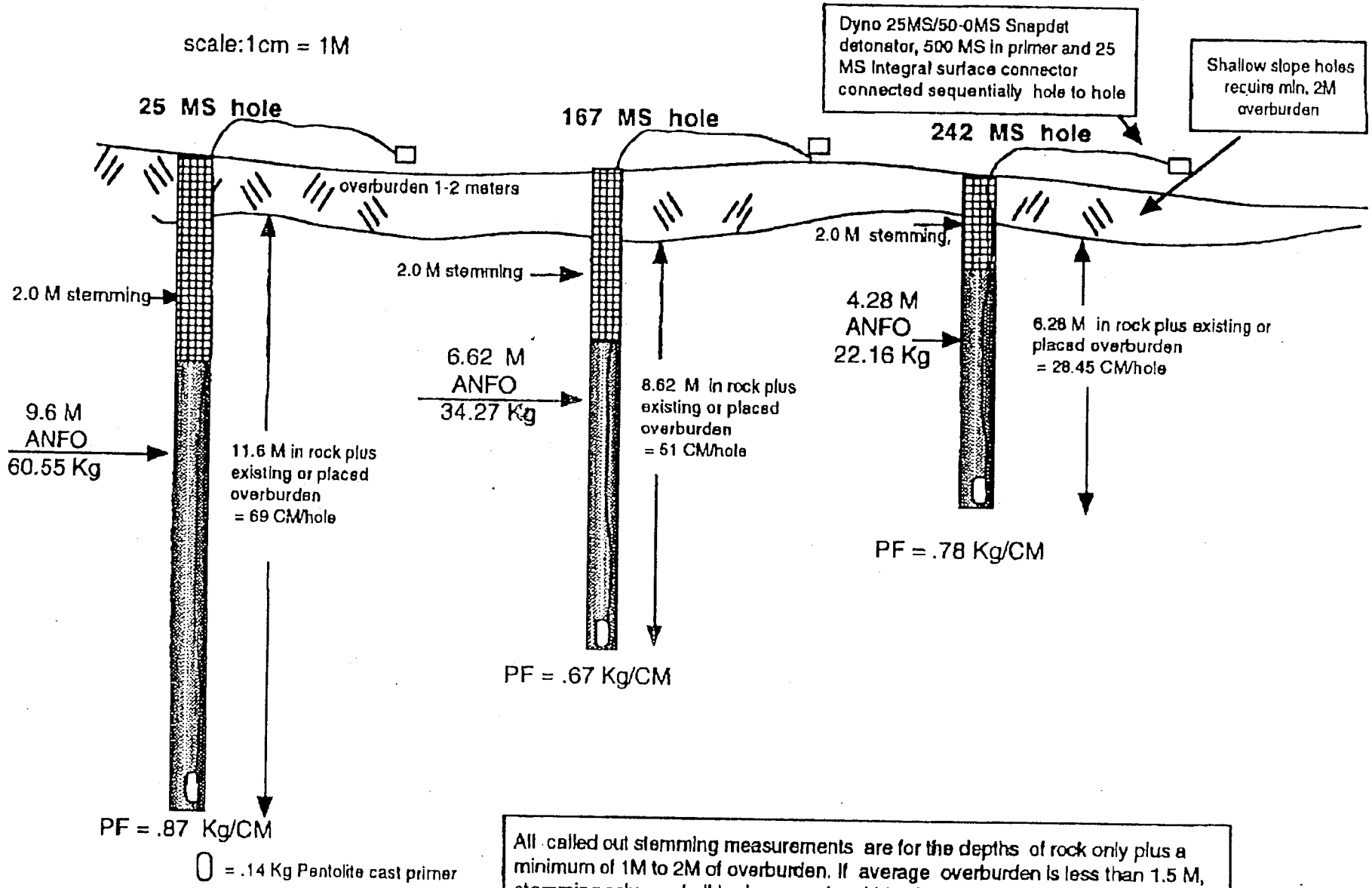
= 42MS DETONATOR SURFACE CONNECTORS ALL HOLES ARE CONNECTED LATERALLY BY THE INTEGRAL 25MS SURFACE CONNECTORS



Cross section DD at approx sta 4+60



Blast no. 3 'H' line, typical blasthole profiles Sta 4+60



All called out stemming measurements are for the depths of rock only plus a minimum of 1M to 2M of overburden. If average overburden is less than 1.5 M, stemming column shall be increased and blasting agent cloumn shall be reduced. Stemming shall be course aggregate, of suitable size, or drill cuttings.

Blast no. three 'H' Line Sta 4+86 to 4+59, Blast date and time TBA

Seismic calculations:
PPPV, projected peak particle velocity shall be calculated by using the Modified Propogation Law, U. S. Bureau of Mine Bulletin 656 (Nichols, Johnson, & Duval 1971.

$$PPPV = 714.4 \left(\frac{d}{\sqrt{W}} \right)^{-1.6}$$

Nearest structure of concern:
Mobile home located on West side of blast area (Elkelton Place), and East side of Paradise Valley Road.

PPPV's: Typical blast holes measured (scaled from plans) to the nearest structure(s) of concern from sta 4+86:

242 MS blast hole at 78.0M/22.16 Kg	= 07.99 mm/sec.
167 MS blast hole at 80.5 M/34.50Kg	= 10.84 mm/sec.
025 MS blasthole at 92.0 M/60.55Kg	= 13.72 mm/sec

C.Bean/C.W. Poss, Inc. 021498
MK/Caltrans 11-001924

BLASTING PLAN

CALTRANS CONTRACT NO. 11-001924

PRIME CONTRACTOR: MORRISON KNUDSEN CORPORATION
27400 EAST 5TH STREET
HIGHLAND, CA 92346

DRILLING AND BLASTING CONTRACTOR: C.W. POSS, INCORPORATED
201 S. BALCOM AVENUE
FULLERTON, CA 92832
PH: 714-871-9900
FX: 714-871-3009

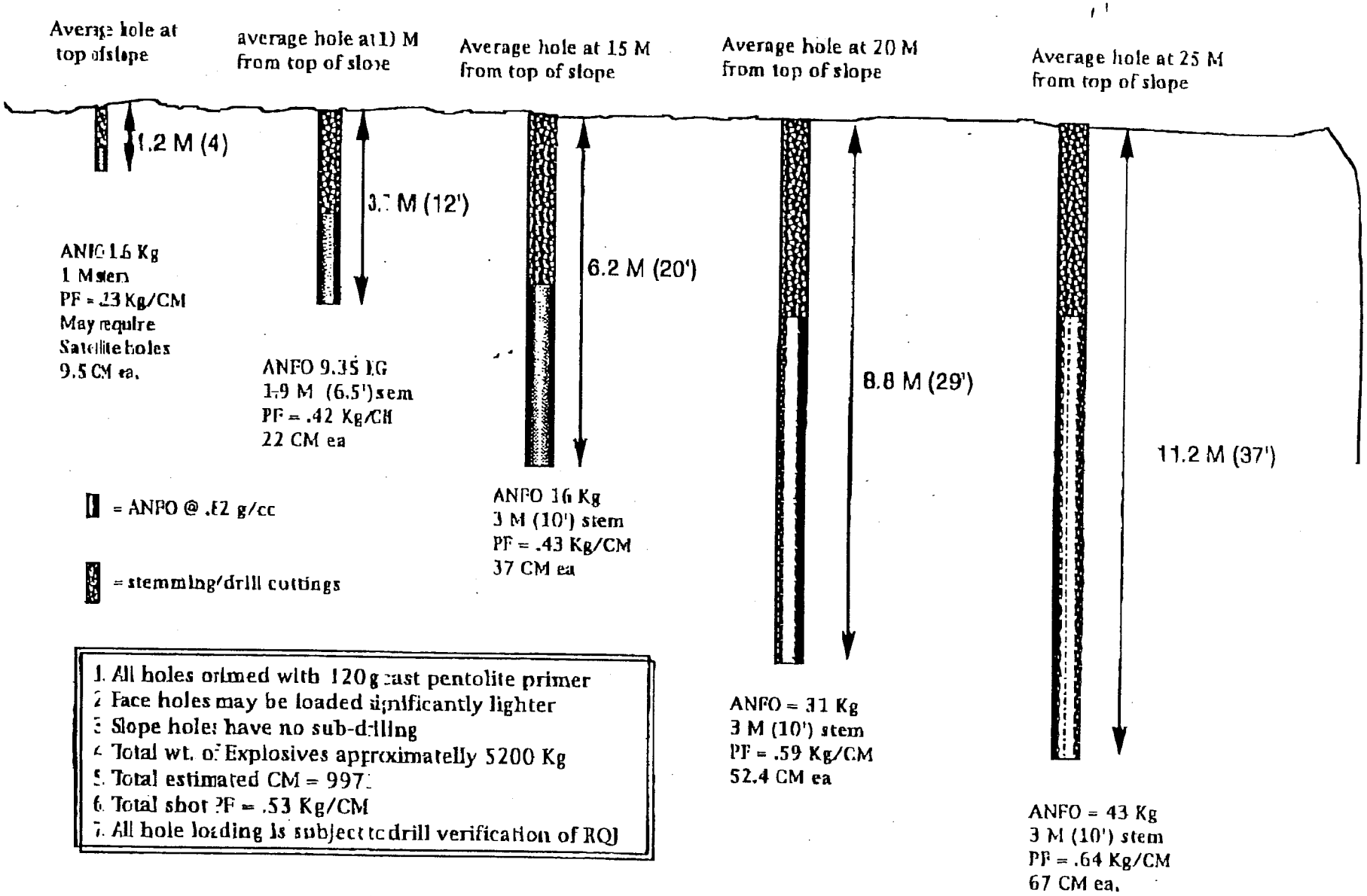
BLASTING PLAN SUBMITTAL FOR BLAST(S) NO. 6B

ROADWAY EXCAVATION 'B' LINE

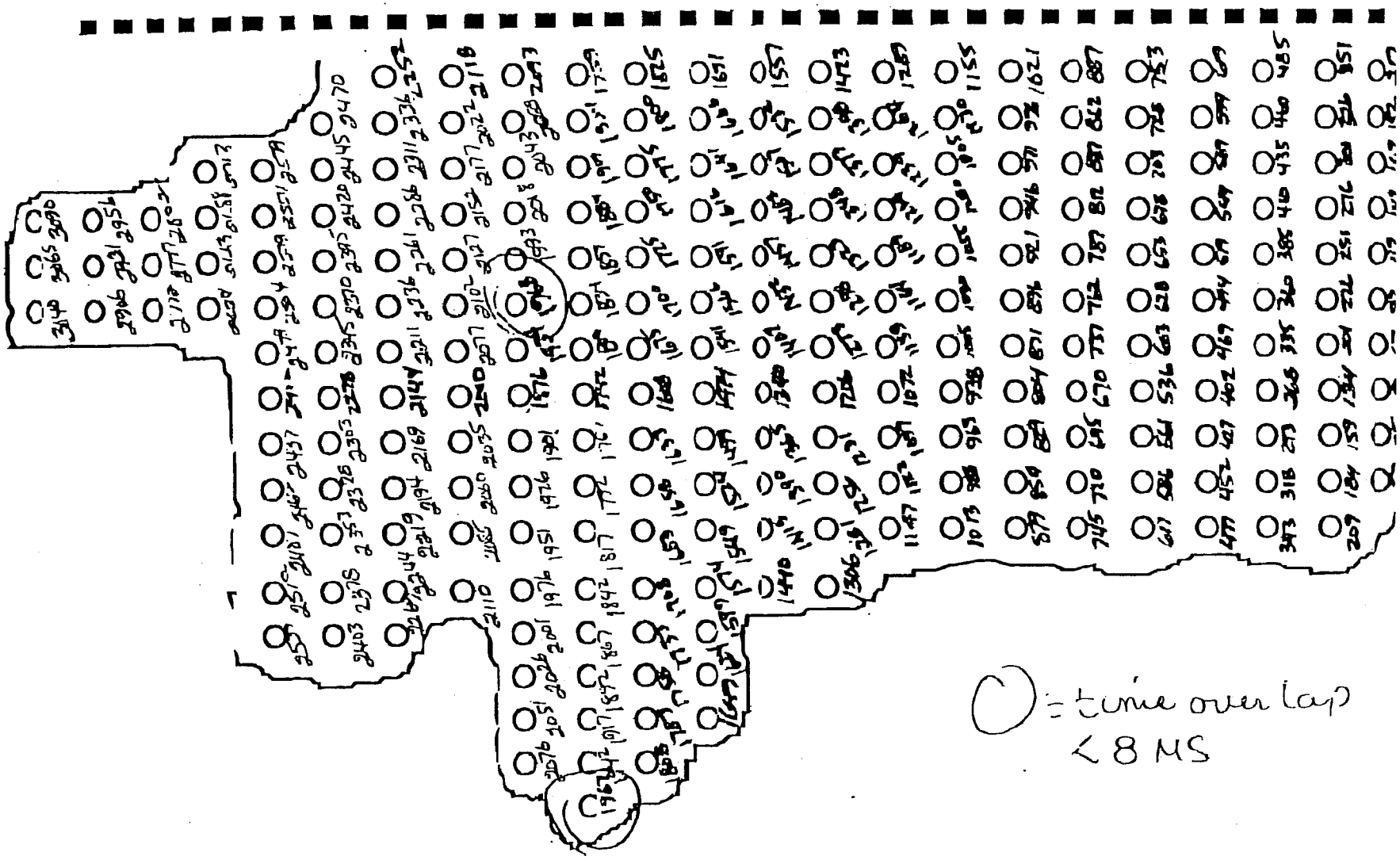
Page no. 1 Blast location map
Page no. 2 Plan view, blast hole geometry, depths of cut and PPV's
Page no. 3 Typical blast hole profile and over all blast statistics
Page no. 4 Nominal hole firing times
Page no. 5 General detonator layout and hardware

C. Bean/CWP/6B/051399

Blast no. 6B, Typical Blast hole profiles, no scale.



1. All holes primed with 120 g cast pentolite primer
2. Face holes may be loaded significantly lighter
3. Slope holes have no sub-drilling
4. Total wt. of Explosives approximatelly 5200 Kg
5. Total estimated CM = 997
6. Total shot PF = .53 Kg/CM
7. All hole loading is subject to drill verification of RQD

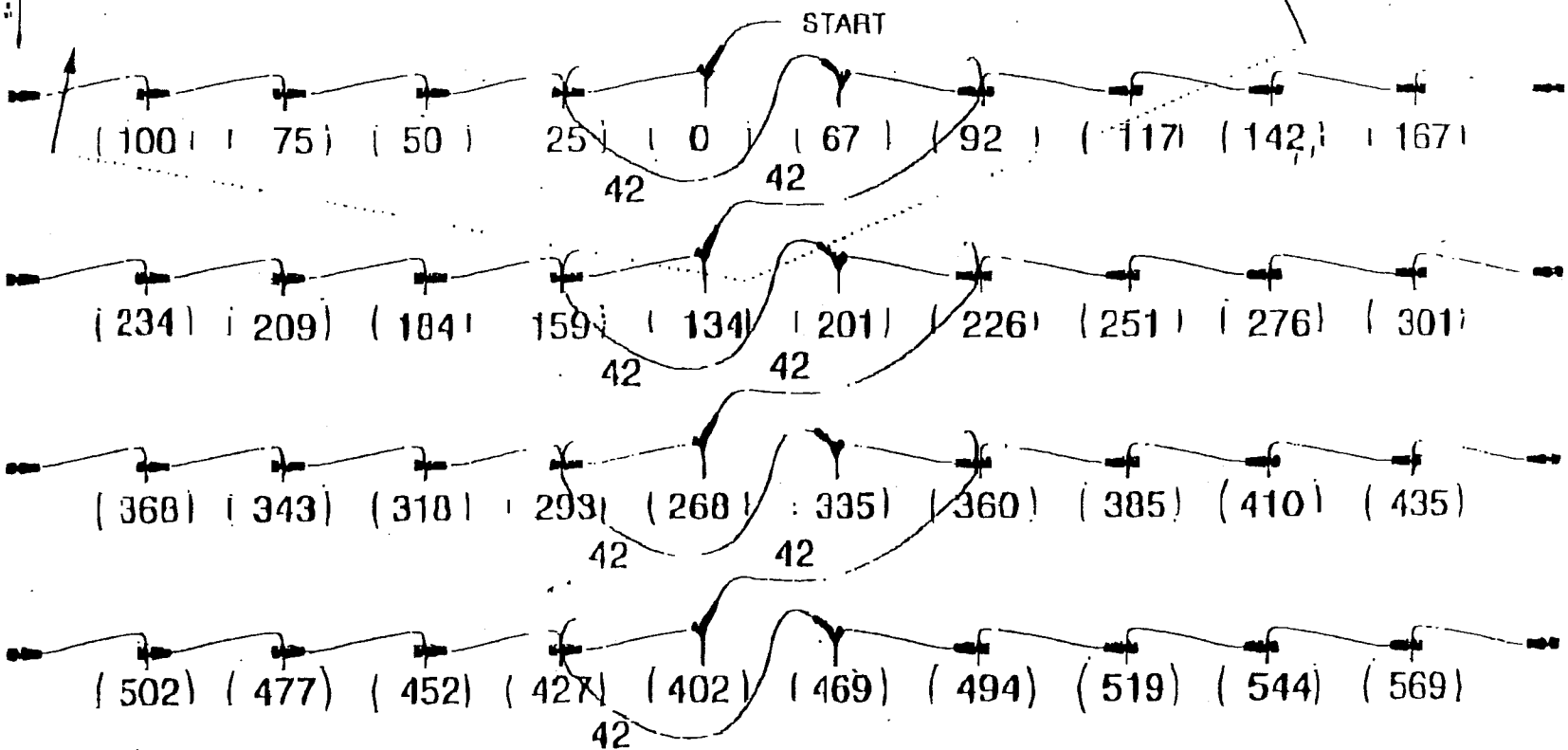


O = time over lap
< 8 MS

BLAST NO 6B RELATIVE FIRING TIMES:

134 MS BURDEN X 25 MS SPACING, (ONE INSIGNIFICANT DOUBLE, HOLE AT 1967 MS and HOLE AT 1968 MS, TOTAL WT. = 25 LBS DISTANCE = 55 M. PPV = 15MM/SEC

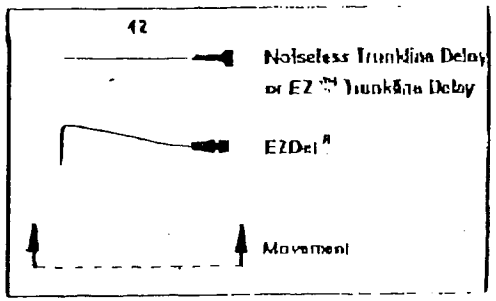
Fr( ) Face



Application
V-Cut
84 or 134 MS between rows

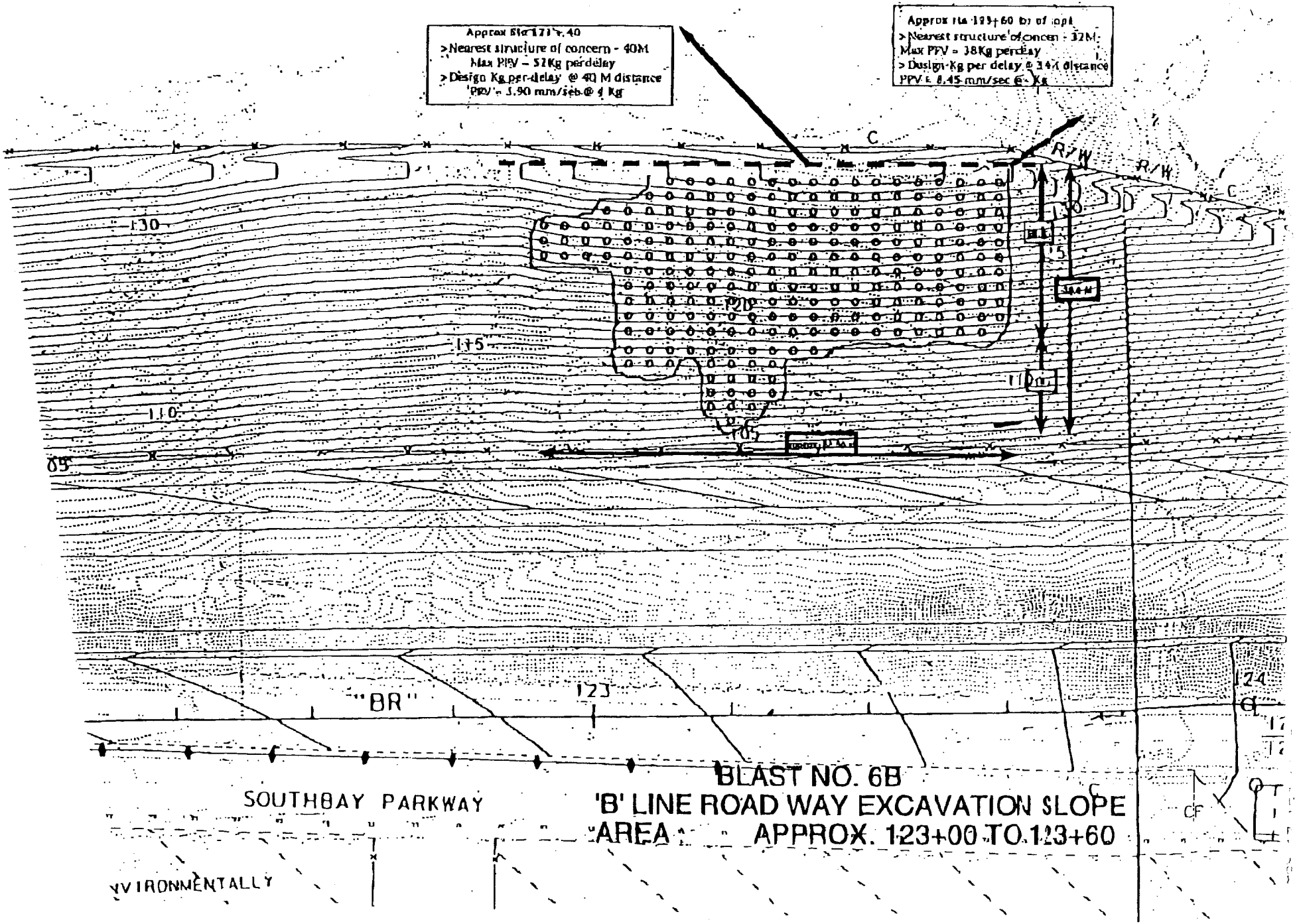
Limitations
16 holes in length & infinite in depth
or
2 rows deep & infinite in length (must have no more than 8 holes on opening side)

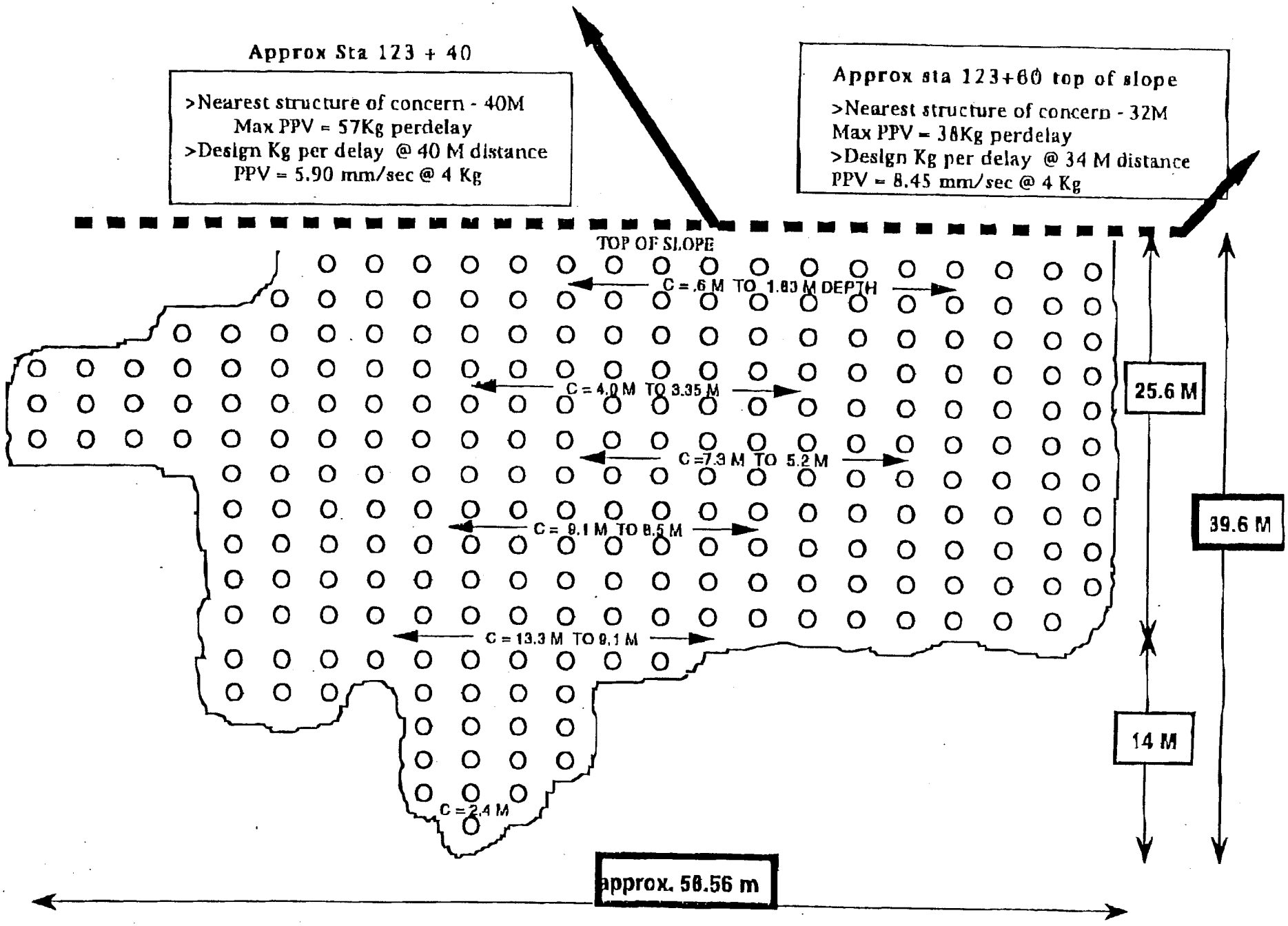
Surface Delays Required
17 MS or 42 MS



BLAST NO. 6B

METHOD AND HARDARE FOR DETONATOR HOOK UP, ALL HOLES ON 2.44M X 2.44 M CENTERS
THERE MAY BE SOME SATELITE HOLES IN EXTREMELY SHALLOW CUTS 2M<


Approx Sta 171+40
>Nearest structure of concern - 40M
Max PPV – 52Kg per delay
>Design Kg per delay @ 40 M distance
PPV = 3.90 mm/sec @ 4 Kg
Approx Sta 123+60 bz of opt
>Nearest structure of concern - 32M
Max PPV = 38Kg per delay
>Design Kg per delay @ 34M distance
PPV = 8.45 mm/sec @ Kg
C
R/W
R/W
130
125
120
115
110
105
"BR"
123
124
SOUTHBAY PARKWAY
BLAST NO. 6B
'B' LINE ROAD WAY EXCAVATION SLOPE
AREA APPROX. 123+00 TO 123+60
CF
YVIRONMENTALLY


Approx Sta 123 + 40
>Nearest structure of concern - 40M
Max PPV = 57Kg perdelay
>Design Kg per delay @ 40 M distance
PPV = 5.90 mm/sec @ 4 Kg
Approx sta 123+60 top of slope
>Nearest structure of concern - 32M
Max PPV = 38Kg perdelay
>Design Kg per delay @ 34 M distance
PPV = 8.45 mm/sec @ 4 Kg
TOP OF SLOPE
C = .6 M TO 1.83 M DEPTH
C = 4.0 M TO 3.35 M
C = 7.3 M TO 5.2 M
C = 9.1 M TO 8.5 M
C = 13.3 M TO 9.1 M
C = 2.4 M
25.6 M
39.6 M
14 M
approx. 58.56 m

MORRISON KNUDSEN CORPORATION
HEAVY CIVIL CONSTRUCTION GROUP

27400 EAST FIFTH STREET
P.O. BOX 605
HIGHLAND, CALIFORNIA U.S.A. 92346
PHONE: (909) 425-4200
FAX: (909) 864-4712

May 14, 1999

CAL-3478
Ser # 427

State of California
Department of Transportation
P.O. 2863
El Cajon, CA 92021

Attn: Randy Sanchez
Resident Engineer

RE: Blasting Plan – "B" Line

Gentlemen:

Enclosed, please find 3 copies of blasting plans for No.6B, Roadway Excavation "B" Line submitted by C.W. Poss for your review and approval.

If you have any questions, please contact me at (619)460-9809.

Sincerely,
MORRISON KNUDSEN CORPORATION

Robert Long
Project Superintendent

RL/jm

C: M.O.
Corres.
S/C File

MAY 14 1999

BLASTING PLAN

CALTRANS CONTRACT NO. 11-001924

PRIME CONTRACTOR: MORRISON KNUDSEN CORPORATION
27400 EAST 5TH STREET
HIGHLAND, CA 92346

DRILLING AND BLASTING CONTRACTOR: C.W. POSS, INCORPORATED
201 S. BALCOM AVENUE
FULLERTON, CA 92832
PH: 714-871-9900
FX: 714-871-3009

BLASTING PLAN SUBMITTAL FOR BLAST NO. 8B, 9B, & 10B
ROADWAY SLOPE EXCAVATION 'B' LINE

Page no. 1 Blast location map and PPV'S
Page no. 2 Plan view, blast hole geometry, and nominal firing times blast no. 8B
Page no. 3 Plan view, blast hole geometry, and nominal firing times blast no. 9B
Page no. 4 Plan view, blast hole geometry, and nominal firing times blast no. 10B
Page no. 5 Typical blast hole profiles
Page no. 6 General detonator layout and hardware

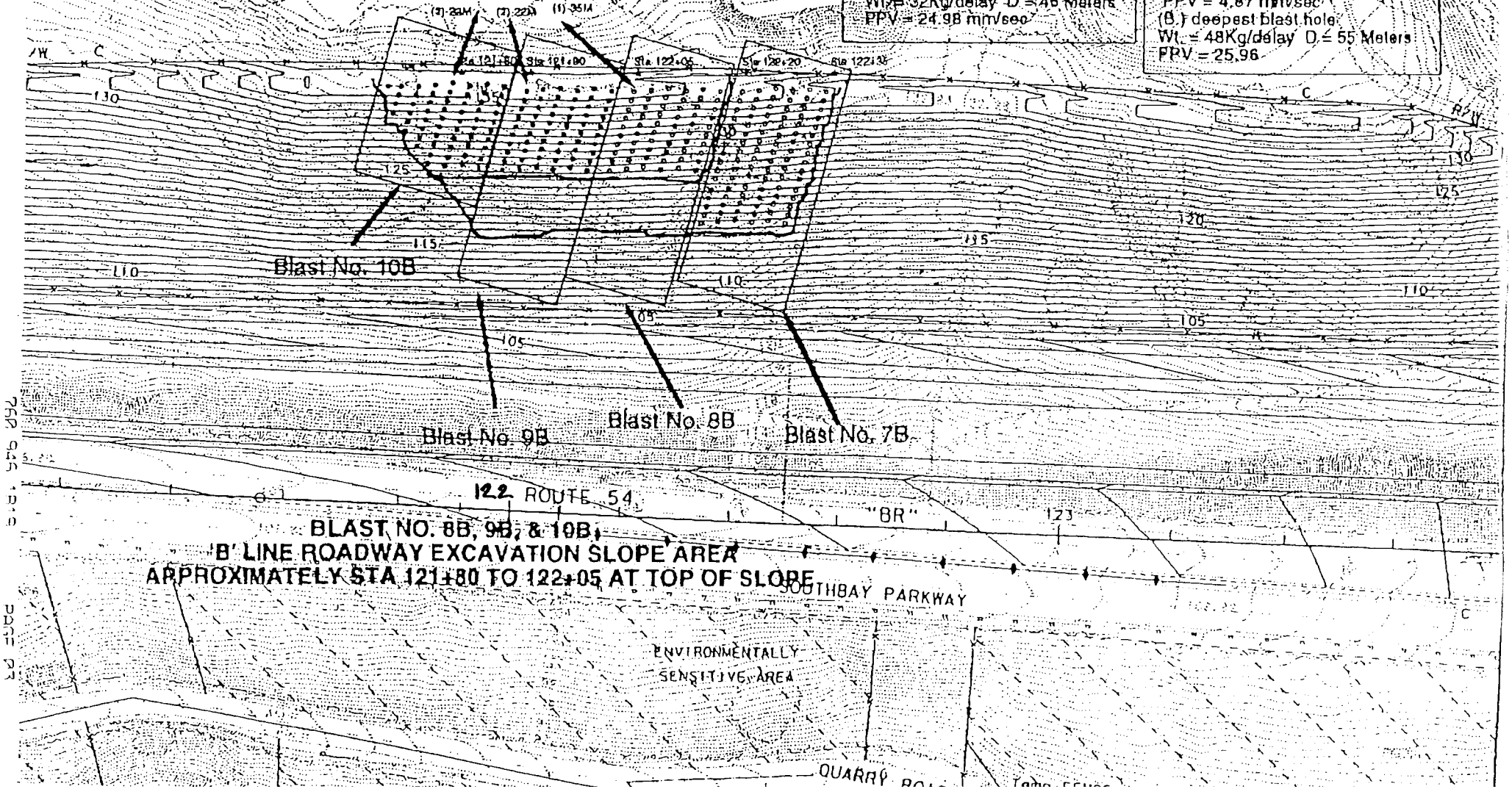
C. Bean/CWP/8B,9B, & 10B/052999

(3) Approx sta 121+80 TOS
(A.)closest blast hole
Wt. = 2.4 Kg/delay D= 22 Meters
PPV = 4.87 mm/sec
(B.) deepest blast hole
Wt. = 32Kg/delay D = 48 Meters
PPV = 24.98 mm/sec

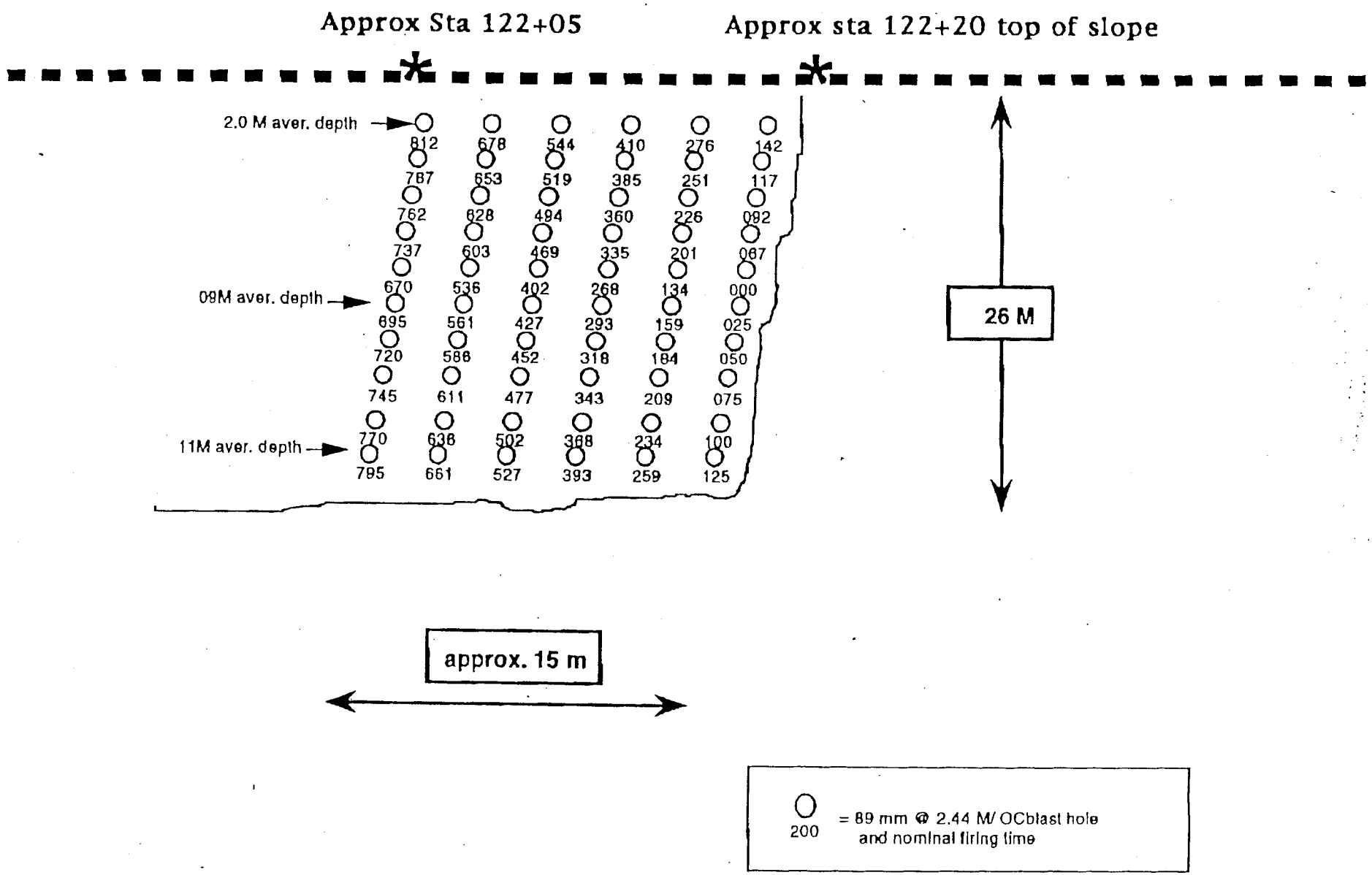
SAN DIEGO COUNTY

(2) Approx sta 121+80 TOS
(A.)closest blast hole
Wt. = 2.4 Kg/delay D= 22 Meters
PPV = 10.28 mm/sec
(B.) deepest blast hole
Wt. = 32Kg/delay D = 48 Meters
PPV = 24.98 mm/sec

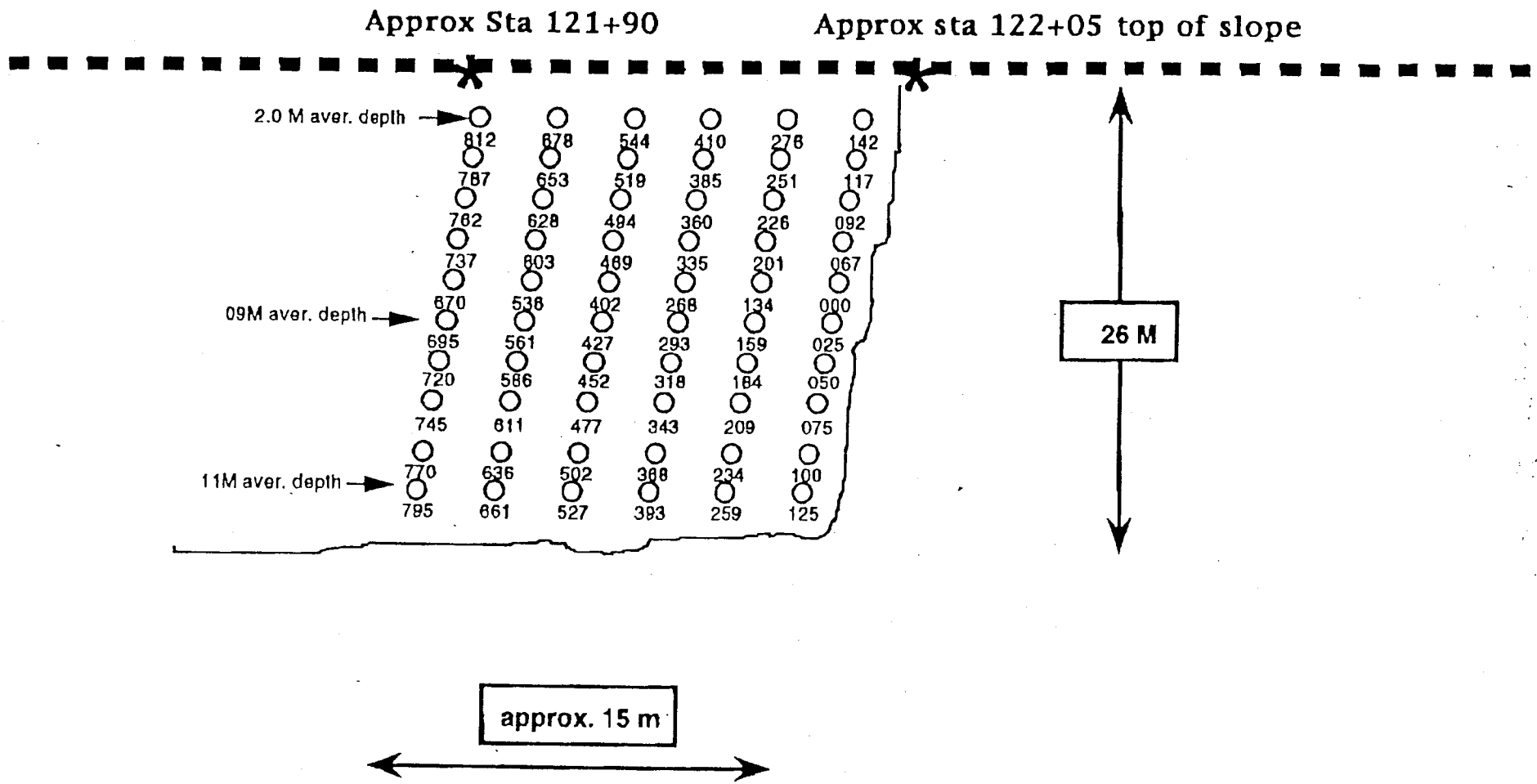
(1) Approx sta 122+05 TOS
(A.)closest blast hole
Wt. = 2.4 Kg/delay D= 35 Meters
PPV = 4.87 mm/sec
(B.) deepest blast hole
Wt. = 48Kg/delay D = 55 Meters
PPV = 25.96



BLAST NO. 8B, 9B, & 10B,
'B' LINE ROADWAY EXCAVATION SLOPE AREA
APPROXIMATELY STA 121+80 TO 122+05 AT TOP OF SLOPE

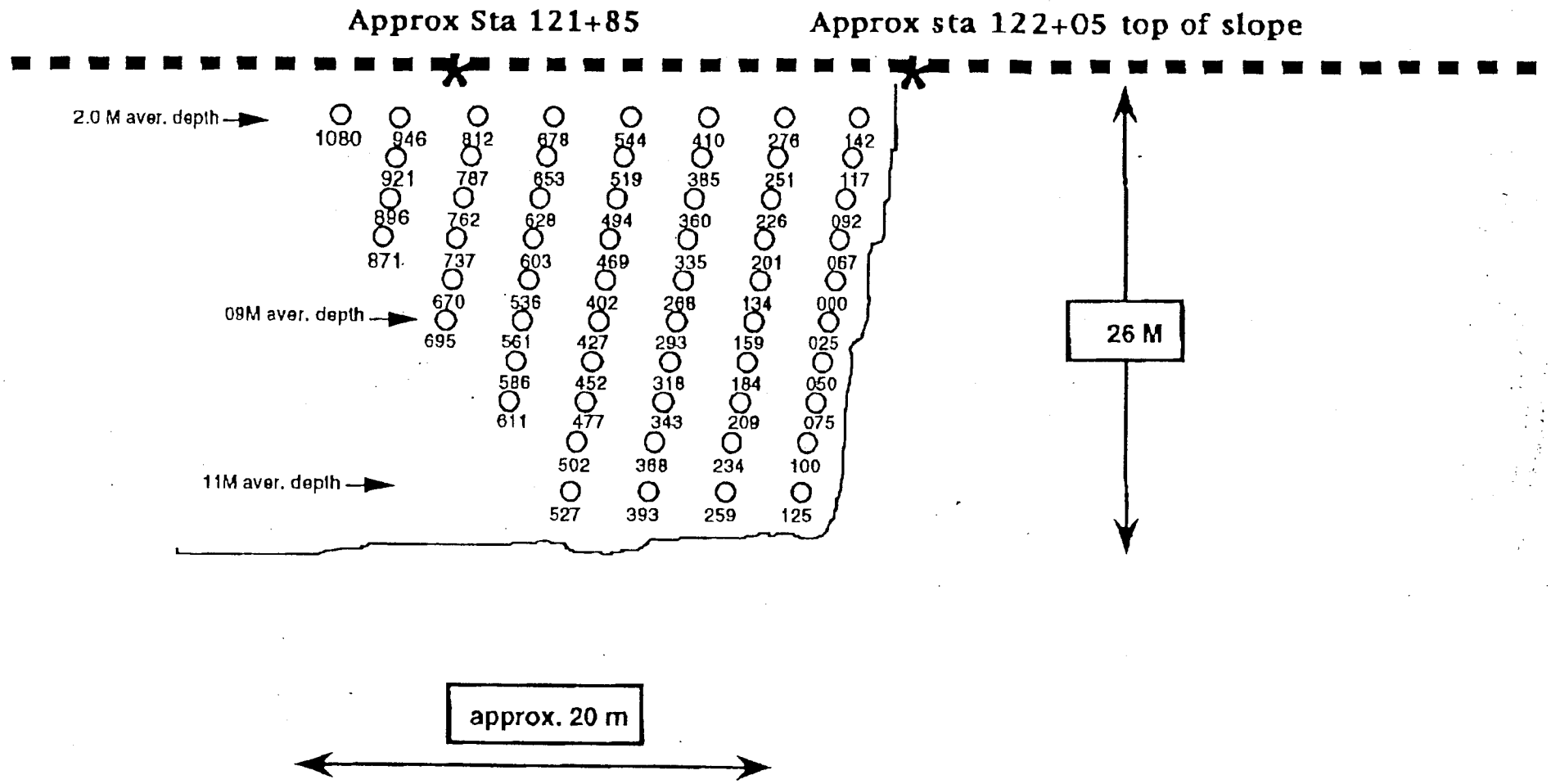


BLAST NO. 8B
'B' LINE ROAD WAY EXCAVATION SLOPE AREA : APPROX. 122+20 TO 122+05



200 = 89 mm @ 2.44 M/ OC blast hole and nominal firing time

BLAST NO. 9B
'B' LINE ROAD WAY EXCAVATION SLOPE AREA : APPROX. 121+90 TO 122+05



200 = 89 mm @ 2.44 M/ OC blast hole and nominal firing time

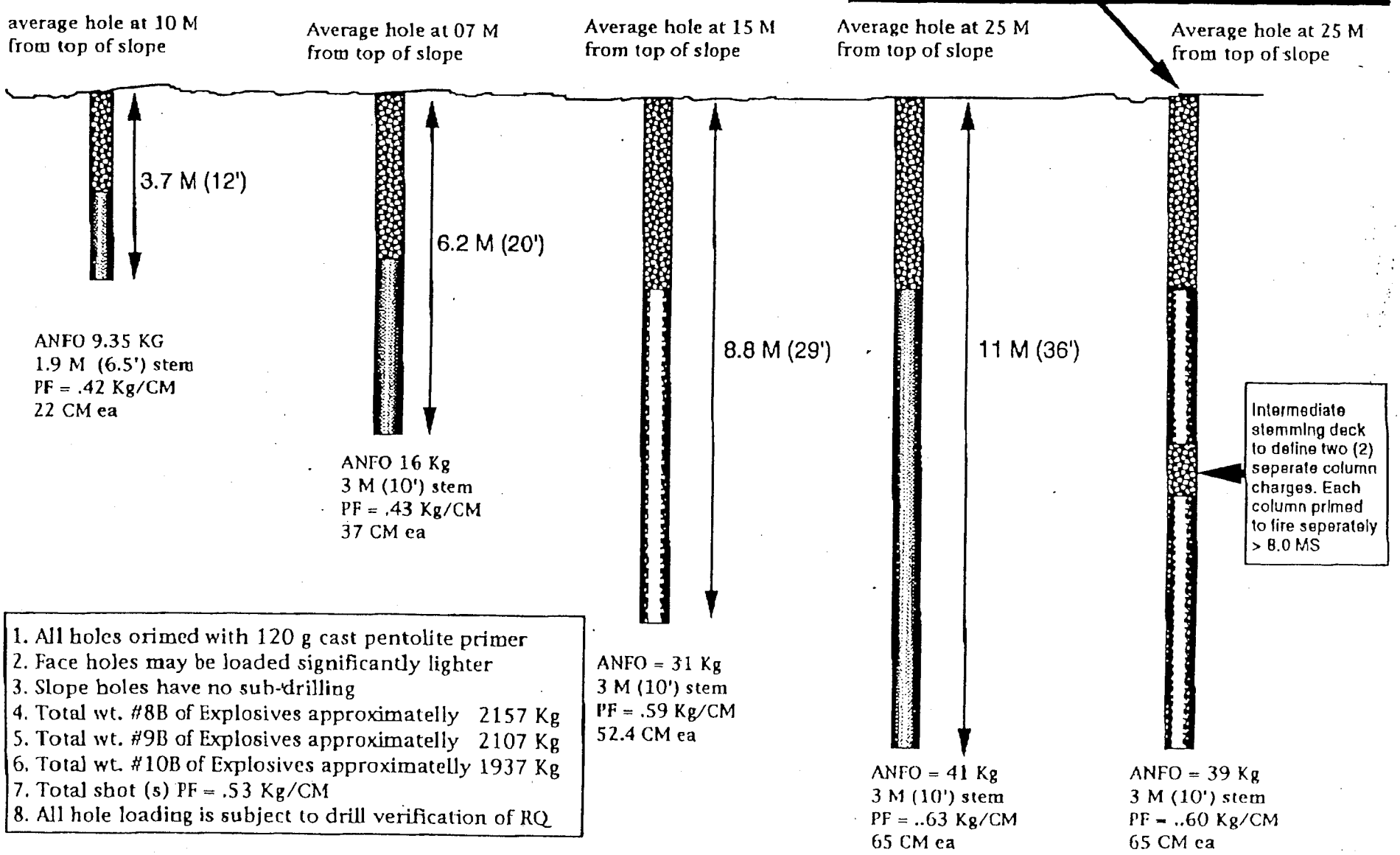
BLAST NO. 10B

'B' LINE ROAD WAY EXCAVATION SLOPE AREA : APPROX. 121+85 TO 122+05

Blast no. 8B, 9B, & 10B
Typical Blast hole profiles, no scale.

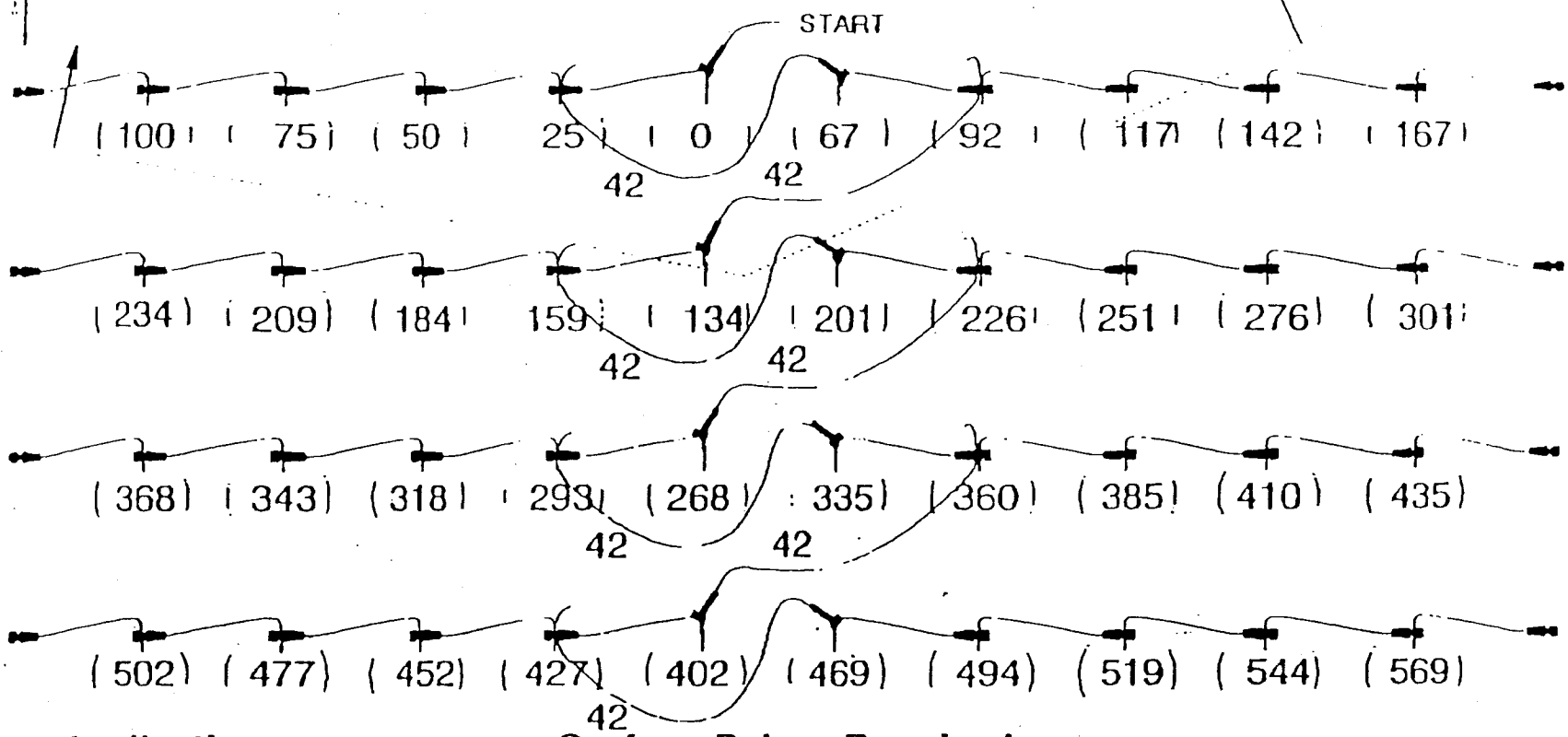
= ANFO @ .82 g/cc = stemming/drill cuttings

If RPPV exceeds theoritical projections for blast #6B by 25%+ alternate loading proceedures(decking)shall be implimeted for subsequent blast(s) to lower vibrationa responses to adjacent structures



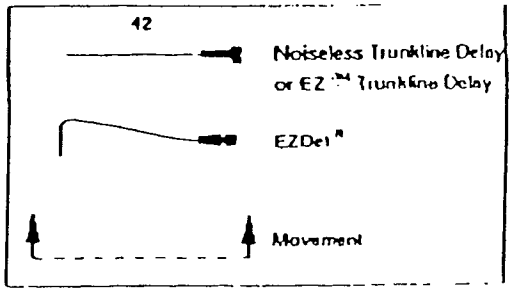
1. All holes orimed with 120 g cast pentolite primer
2. Face holes may be loaded significantly lighter
3. Slope holes have no sub-drilling
4. Total wt. #8B of Explosives approximatelly 2157 Kg
5. Total wt. #9B of Explosives approximatelly 2107 Kg
6. Total wt. #10B of Explosives approximatelly 1937 Kg
7. Total shot (s) PF = .53 Kg/CM
8. All hole loading is subject to drill verification of RQ

Free Face



Application
V-Cut
84 or 134 MS between rows

Surface Delays Required
17 MS or 42 MS



Limitations
16 holes in length & infinite in depth
or
2 rows deep & infinite in length (must have no more than 8 holes on opening side)

Blast no. 8B, 9B, & 10B Road way slope excavation 'B' line
Accessories and sequence of detonator connections. All hole @ 2.44 M grid.

BLASTING PLAN

CALTRANS CONTRACT NO. 11-001924

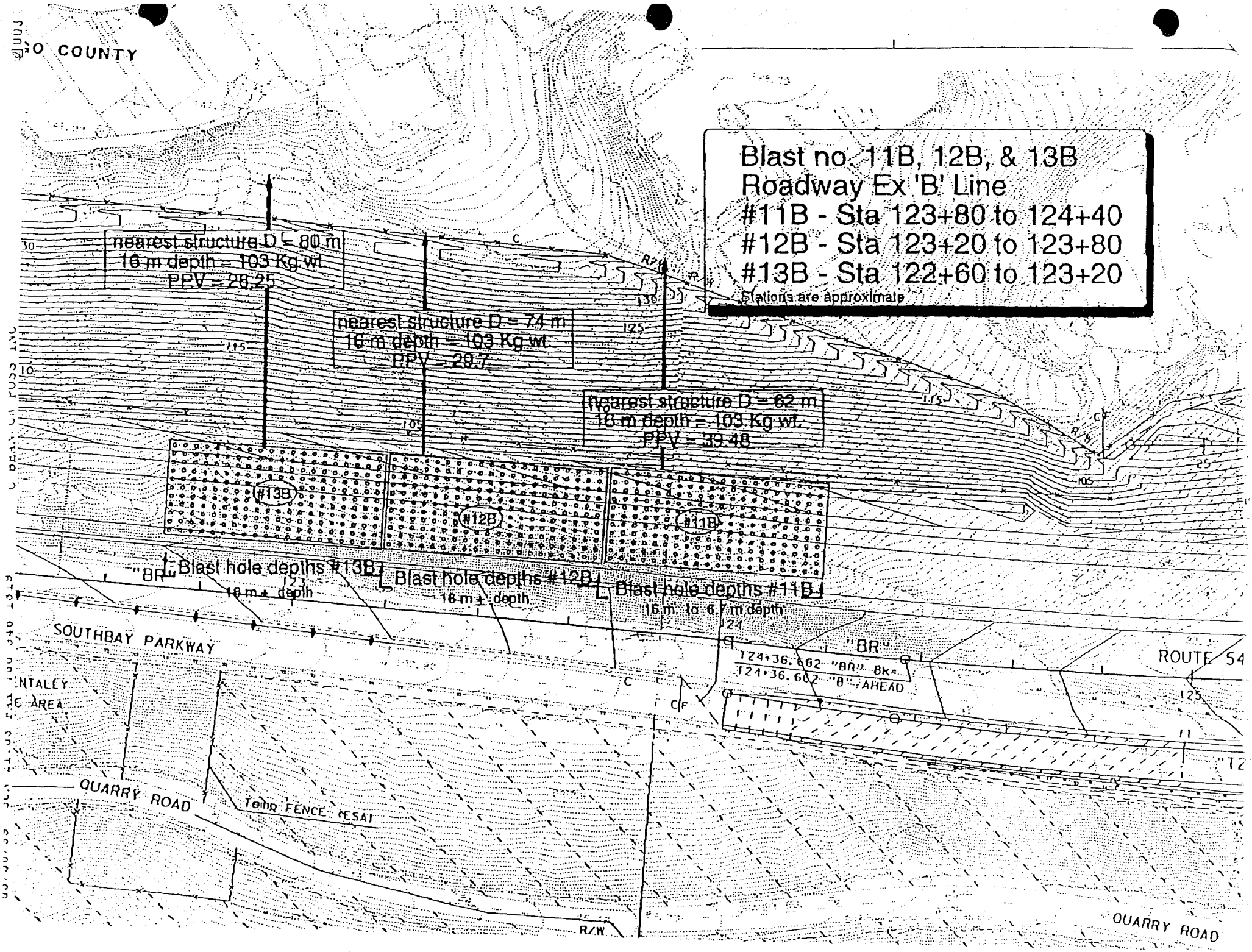
PRIME CONTRACTOR: MORRISON KNUDSEN CORPORATION
27400 EAST 5TH STREET
HIGHLAND, CA 92346

DRILLING AND BLASTING CONTRACTOR: C.W. POSS, INCORPORATED
201 S. BALCOM AVENUE
FULLERTON, CA 92832
PH: 714-871-9900
FX: 714-871-3009

BLASTING PLAN SUBMITTAL FOR BLAST NO. 11B, 12B, & 13B
ROADWAY EXCAVATION 'B' LINE

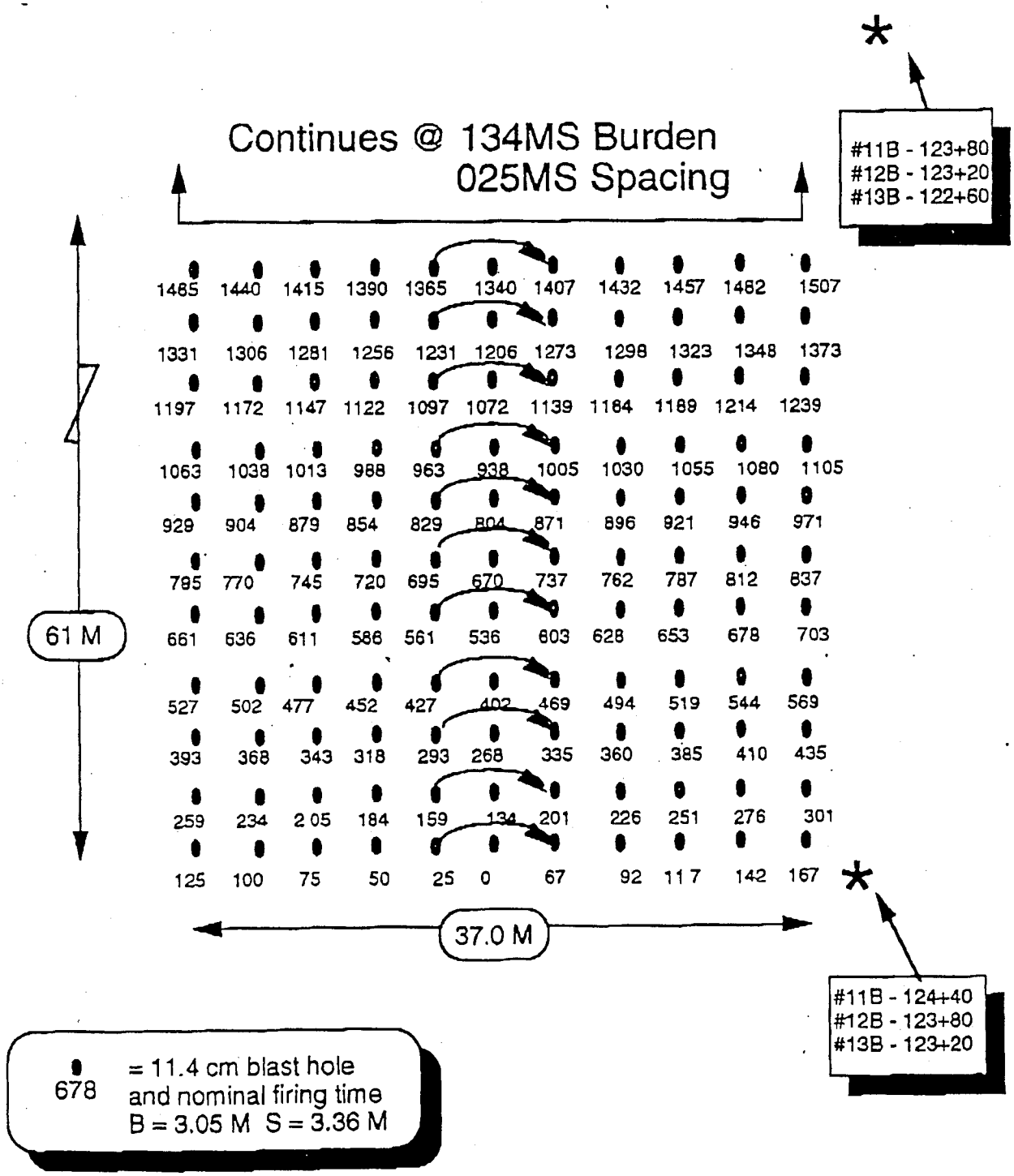
Page no. 1 Blast location map and PPV'S
Page no. 2 Plan view, blast hole geometry, and nominal firing times
Page no. 3 Typical blast hole profiles
Page no. 4 General detonator layout design and components

C. Bean/CWP/11B,12B, & 13B/053099


Blast no. 11B, 12B, & 13B
Roadway Ex 'B' Line
#11B - Sta 123+80 to 124+40
#12B - Sta 123+20 to 123+80
#13B - Sta 122+60 to 123+20
Stations are approximate
nearest structure D = 80 m
16 m depth = 103 Kg wt.
PPV = 28.25
nearest structure D = 74 m
16 m depth = 103 Kg wt.
PPV = 29.7
nearest structure D = 62 m
16 m depth = 103 Kg wt.
PPV = 39.48
(#13B)
(#12B)
(#11B)
Blast hole depths #13B
16 m ± depth
Blast hole depths #12B
16 m ± depth
Blast hole depths #11B
16 m to 6.7 m depth
SOUTHBAY PARKWAY
QUARRY ROAD
Temp FENCE (ESA)
ROUTE 54
"BR"
124+36.662 "BR" Bk=
124+36.662 "B" AHEAD
R/W
QUARRY ROAD

Blast(s) No. 11B, 12B, & 13B

Nominal blast hole firing times, approximate blast dimensions:

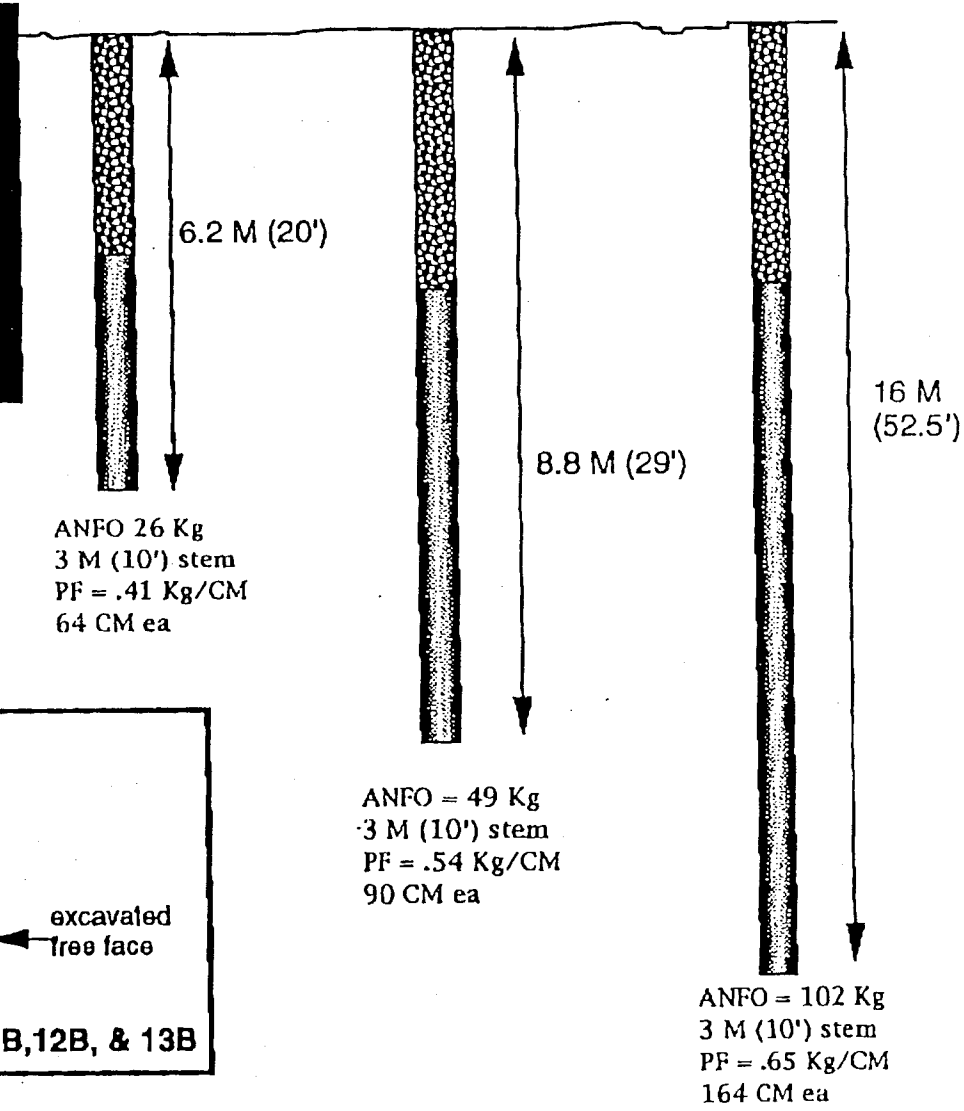


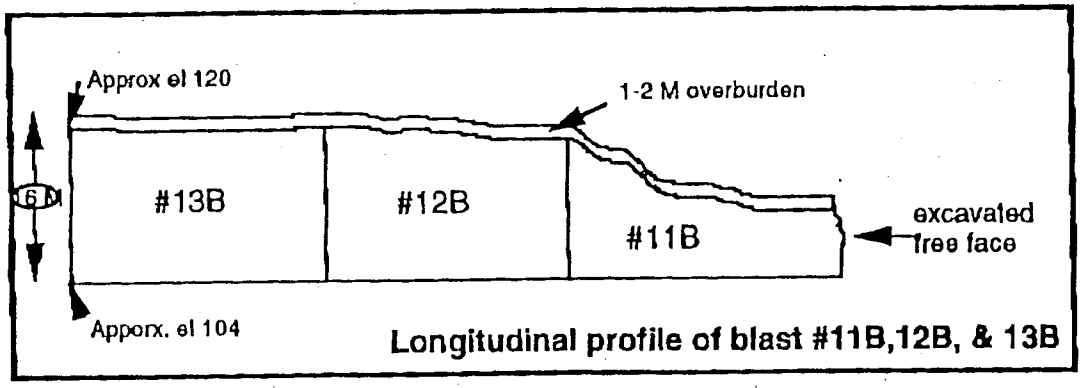
Blast No. 11B, 12B & 13B: Typical Blast hole profiles, no scale.

1. All holes primed with 120 g cast pentolite primer and 25/500 MS Dyno Snapdet detonator
2. Appprox. 220 ea. 11.4 cm holes per blast .6 M sub-drill ea. hole
3. Blast No. 11B
a) Total wt. of Explosives approximately 08,470 Kg
b) Total estimated CM = 14,085 : PF = .60 Kg/CM
4. Blast(s) No. 12B & 13B
a) Total wt. of Explosives approximatelly 14,740 Kg ea.
b) Total estimated CM = 20,171 CM : PF = .73 Kg/CM
6. All hole loading is subject to drill verification of RQ

= ANFO @ .82 g/cc

= stemming/drill cuttings

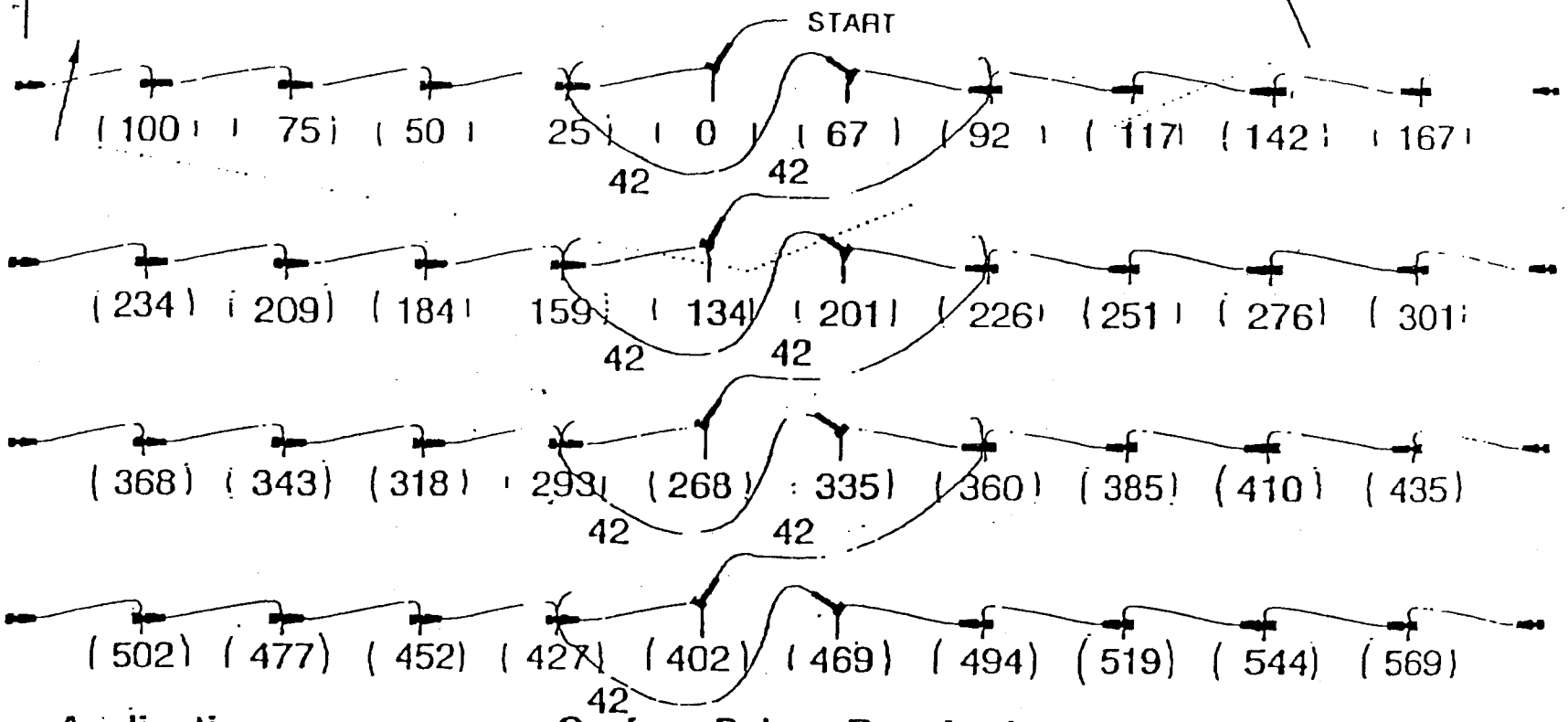




Longitudinal profile of blast #11B,12B, & 13B

MAY 30 '99 21:21 750 945 1819 PAGE 05

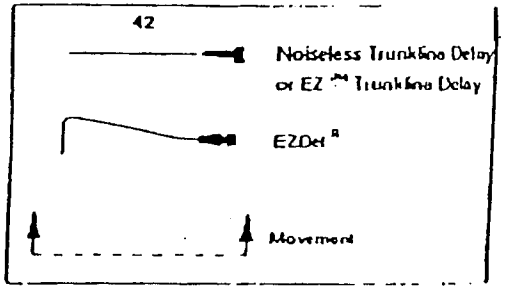
Free Face



Application
V-Cut
84 or 134 MS between rows

Surface Delays Required
17 MS or 42 MS

Limitations
16 holes in length & infinite in depth
or
2 rows deep & infinite in length (must have no more than 8 holes on opening side)



Blast no. 11B, 12B, & 13 B Roadway excavation 'B' line
Accessories and sequential detonator connections. All hole @ 2.44 M grid.

MAY 30 '99 21:21

BLASTING PLAN

CALTRANS CONTRACT NO. 11-001924

PRIME CONTRACTOR: MORRISON KNUDSEN CORPORATION
27400 EAST 5TH STREET
HIGHLAND, CA 92346

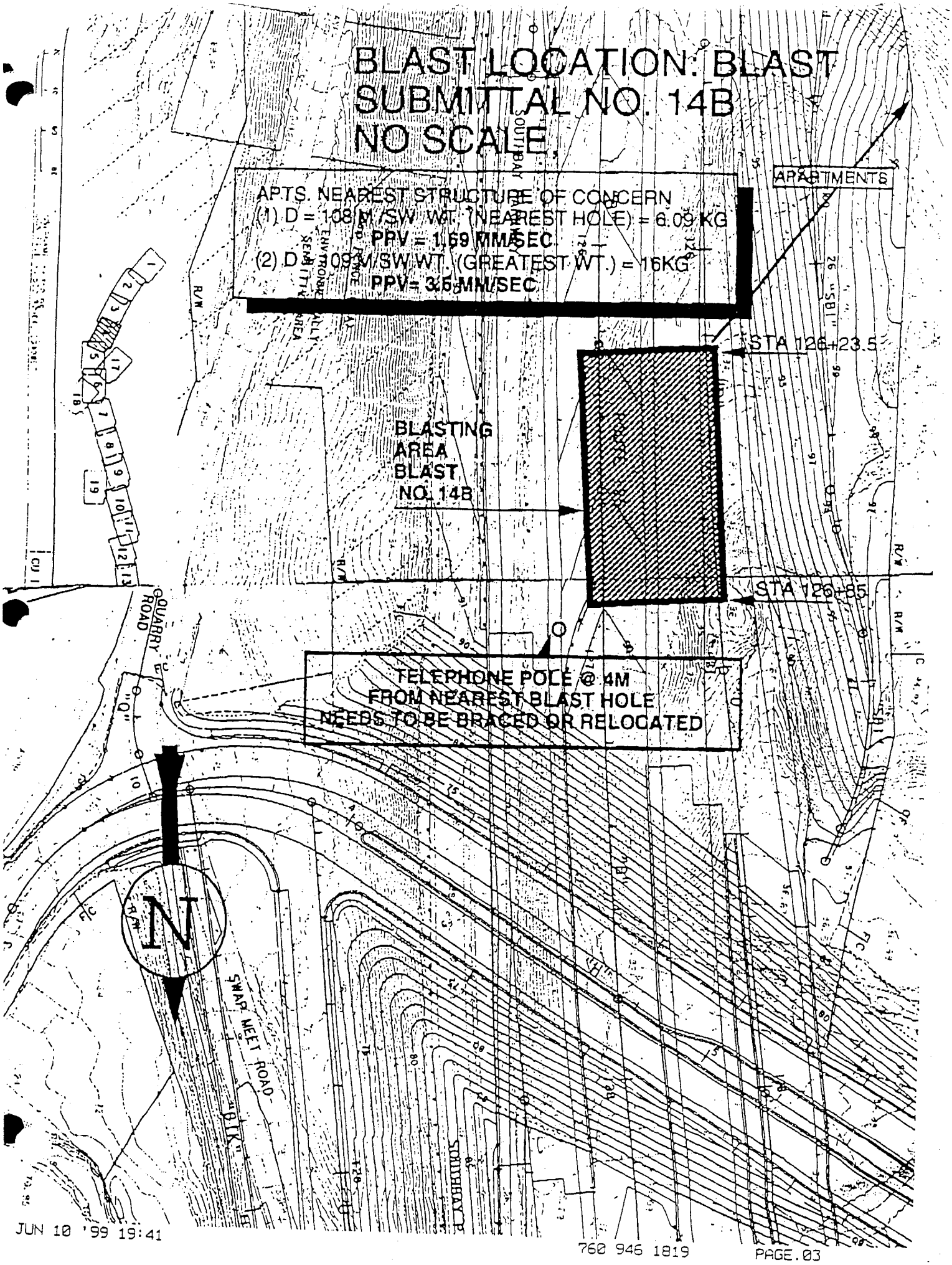
DRILLING AND BLASTING CONTRACTOR: C.W. POSS, INCORPORATED
201 S. BALCOM AVENUE
FULLERTON, CA 92832
PH: 714-871-9900
FX: 714-871-3009

ADDENDUM: BLASTING PLAN FOR BLAST NO. 14B
ROADWAY EXCAVATION 'B' LINE

Page no. 1 Blast location PPV's (not to scale)
Page no. 2 Blast hole geometry, and nominal firing times
Page no. 3 Typical blast hole profiles
Page no. 4 Typical blast hole detonator hookup

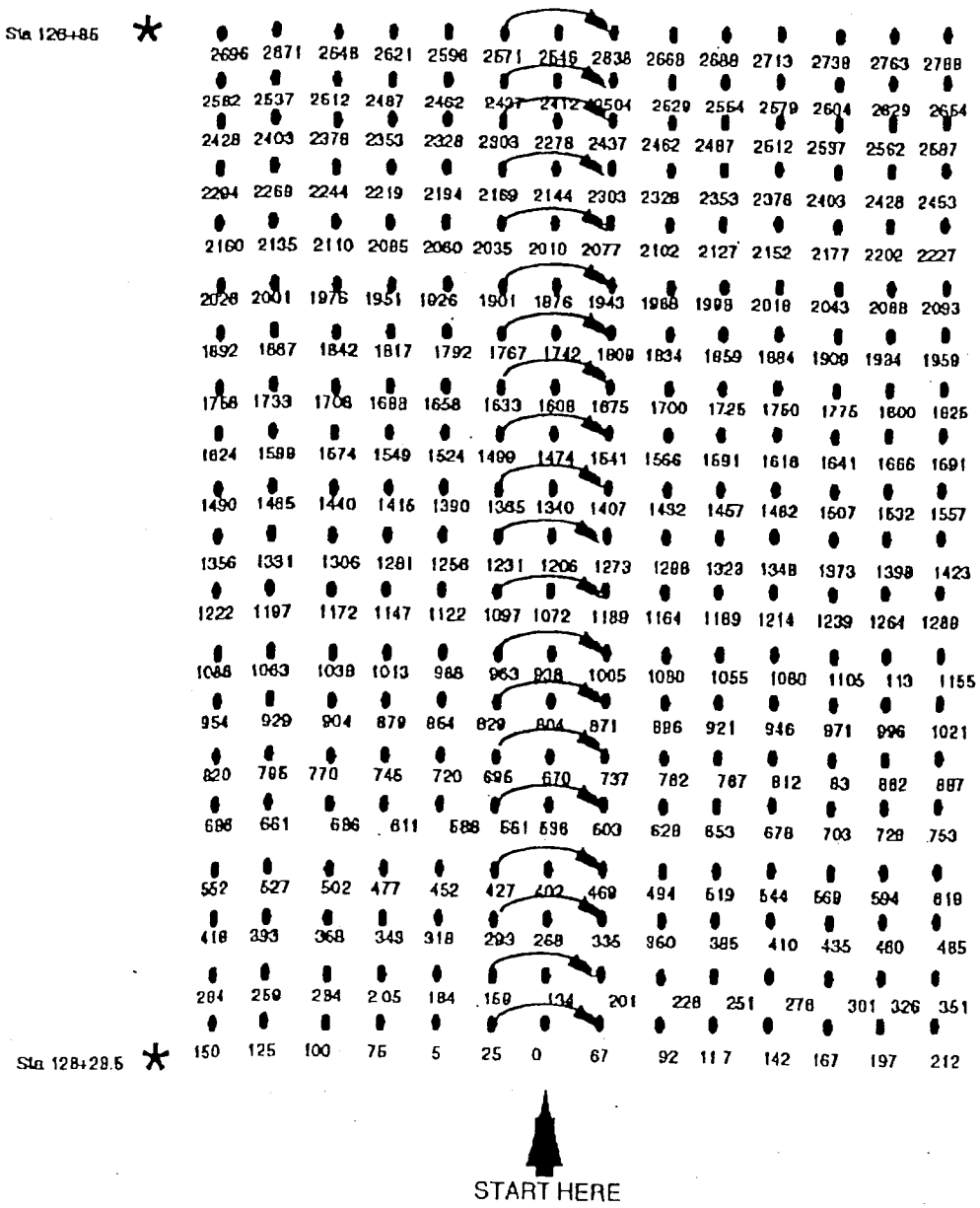
C. Bean/CWP/3H/060999

Approved 7/1/99


BLAST LOCATION: BLAST SUBMITTAL NO. 14B
NO SCALE
APTS. NEAREST STRUCTURE OF CONCERN
(1) D = 108 M/SW WT. (NEAREST HOLE) = 6.09 KG
PPV = 1.69 MM/SEC
(2) D = 109 M/SW WT. (GREATEST WT.) = 16KG
PPV = 3.5 MM/SEC
APARTMENTS
STA 126+23.5
BLASTING AREA BLAST NO. 14B
STA 126+85
TELEPHONE POLE @ 4M FROM NEAREST BLAST HOLE NEEDS TO BE BRACED OR RELOCATED
QUARRY ROAD
SWAP MEET ROAD
SOUTHBAY
N

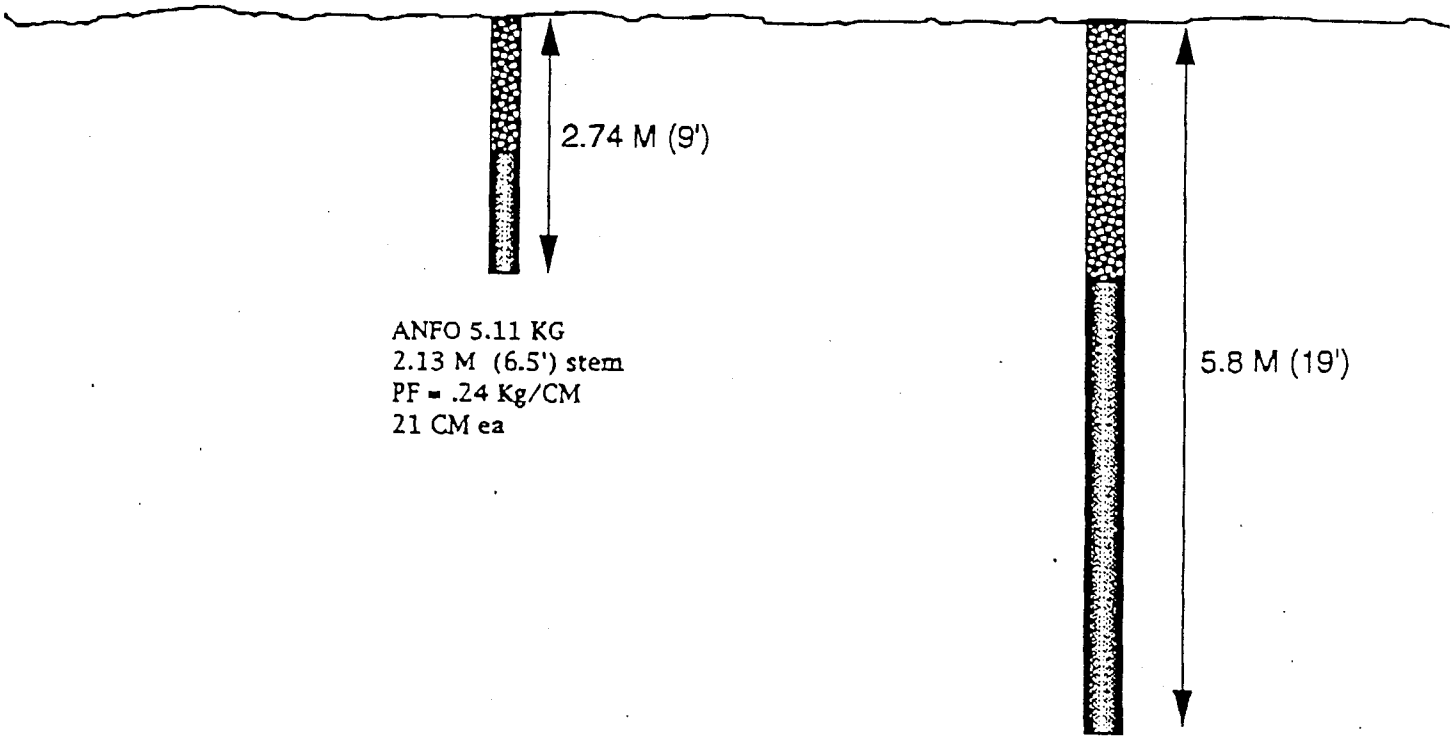
BLAST HOLE/TIMING LAYOUT BLAST SUBMITTAL 14B

NOT TO SCALE



Blast hole diameter = 115mm
Burden = 2.74 M
Spacing = 2.74 M
Total holes = 266 ea.
Depths = 2.74 M to 5.8 M incl sub-drill
Sub-drill = .9 M
Total yield = 6537 CM (excl. s/d)
Total blasting agents = 2850 Kg
Overall PF = .43 Kg/Cm

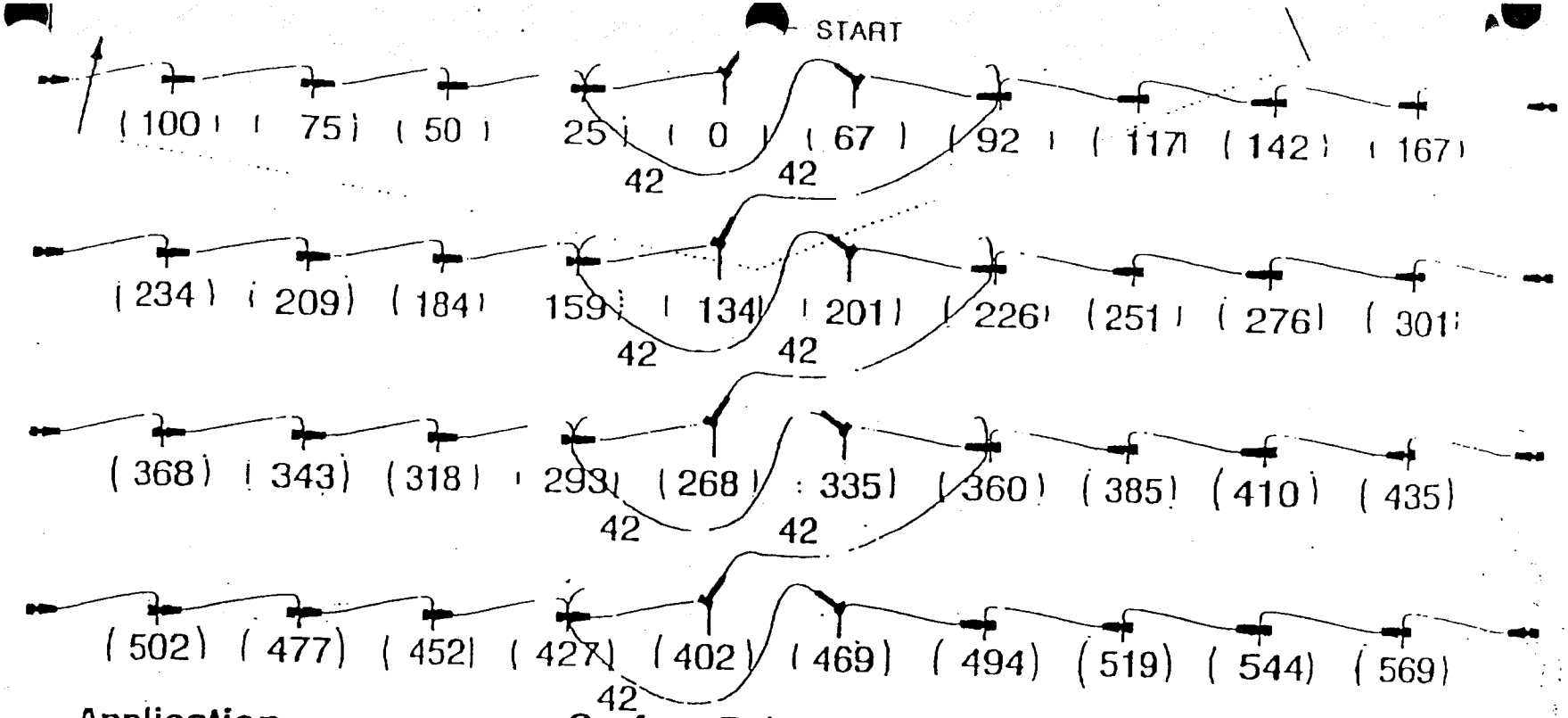
Blast no. 14B, Typical Blast hole profiles, no scale.



= ANFO @ .82 g/cc

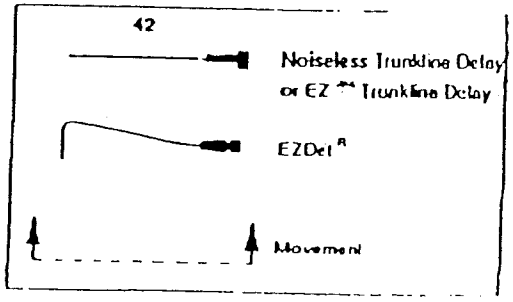
= stemming/drill cuttings

1. All holes orimed with 120 g cast pentolite primer
2. Face holes may be loaded significantly lighter
3. Slope holes have no sub-drilling
4. All hole loading is subject to drill verification of RQI



Application
V-Cut
84 or 134 MS between rows

Surface Delays Required
17 MS or 42 MS



Limitations
16 holes in length & infinite in depth
or
2 rows deep & infinite in length (must have no more than 8 holes on opening side)

Blast no. 14B Roadway excavation 'B' line
Accessories and sequential detonator connections. All hole @ 2.74 M grid.

MORRISON KNUDSEN CORPORATION
HEAVY CIVIL CONSTRUCTION GROUP

27400 EAST FIFTH STREET
P.O. BOX 600
HIGHLAND, CALIFORNIA U.S.A. 92346
PHONE: (909) 425-4200
FAX: (909) 864-4713

June 11, 1999

CAL-3478
Ser # 480

State of California
Department of Transportation
P.O. 2863
El Cajon, CA 92021

Attn: Randy Sanchez
Resident Engineer

RE: Addendum to Blasting Plan No. 14B

Gentlemen:

Enclosed, please find 3 copies of addendum blasting plan 14B Roadway "B" Line submitted by C.W. Poss for your review and approval.

If you have any questions, please contact me at (619)460-9809.

Sincerely,
MORRISON KNUDSEN CORPORATION

Robert Long
Project Superintendent

RL/jm

C: M.O.
Corres.
S/C File

JUN 14 1999

JUN 25 '99 13:25

BLASTING PLAN

CALTRANS CONTRACT NO. 11-001924

PRIME CONTRACTOR: MORRISON KNUDSEN CORPORATION
27400 EAST 5TH STREET
HIGHLAND, CA 92346

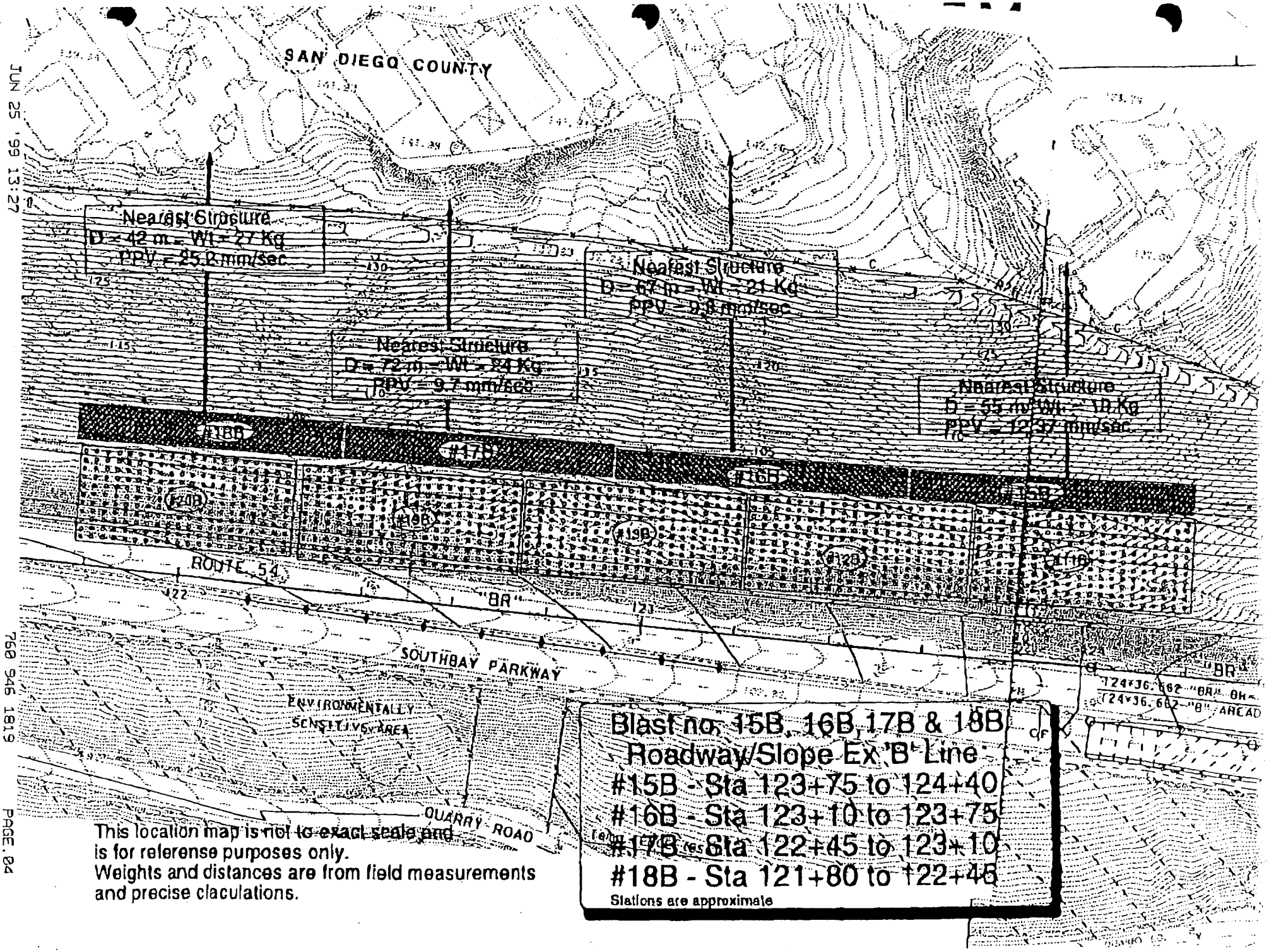
DRILLING AND BLASTING CONTRACTOR: C.W. POSS, INCORPORATED
201 S. BALCOM AVENUE
FULLERTON, CA 92832
PH: 714-871-9900
FX: 714-871-3009

ADDENDUM: BLASTING PLAN FOR BLAST NO. 15B,16B,17B, & 18B
ROADWAY EXCAVATION 'B' LINE

Page no. 1 Blast location PPV's (not to scale)
Page no. 2 Blast hole geometry, and nominal firing times
Page no. 3 Typical blast hole profiles
Page no. 4 Typical blast hole detonator hookup

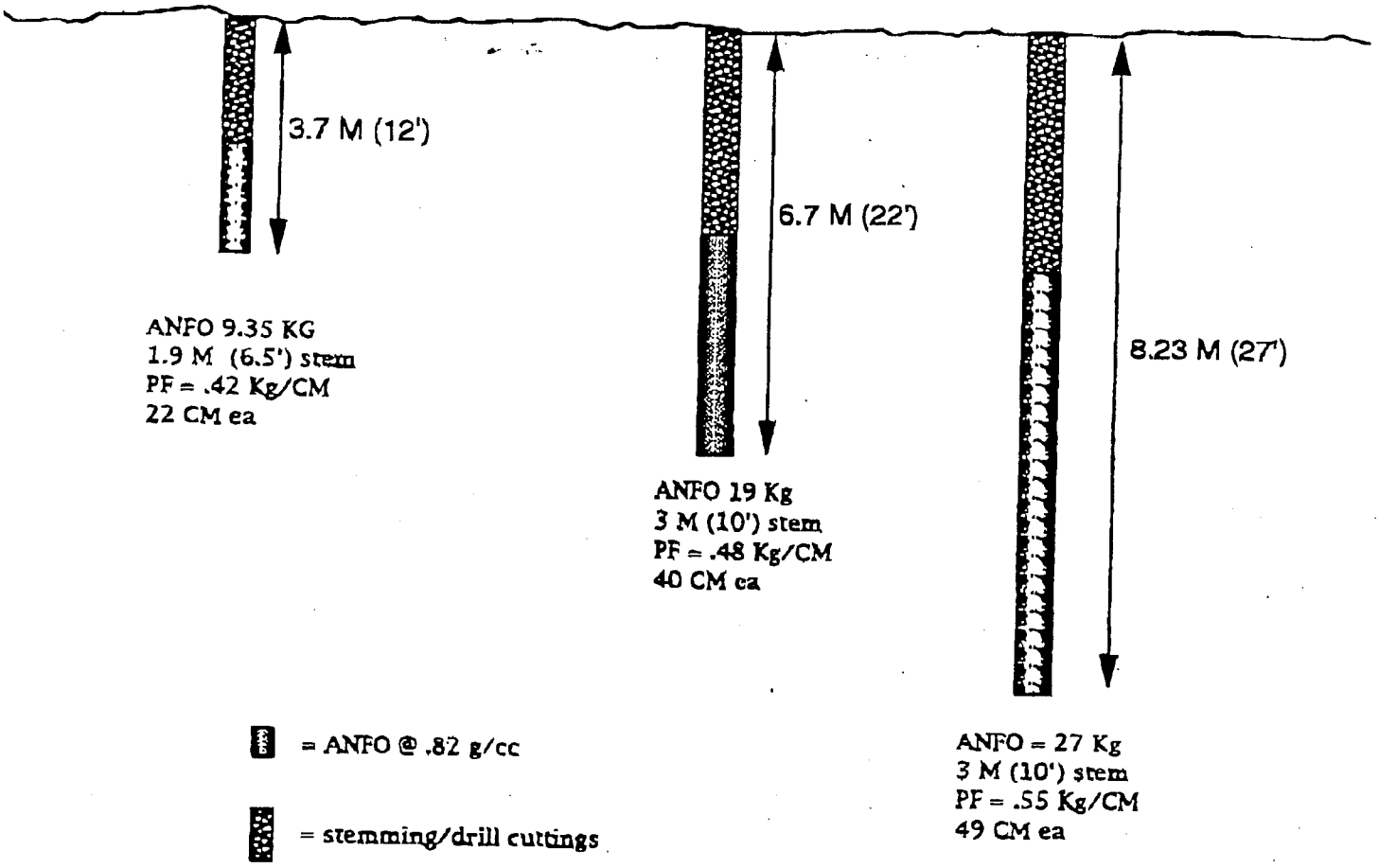
C. Bean/CWP/3H/060999

760 946 1818 PAGE 02



This location map is not to exact scale and is for reference purposes only.
Weights and distances are from field measurements and precise claculations.

Blast no. 15B,16B, 17B, & 18B
Roadway and slope excavation
Typical Blast hole profiles, no scale.



1. All holes primed with 120 g cast pentolite primer
2. Face holes may be loaded significantly lighter
3. Slope holes have no sub-drilling
4.

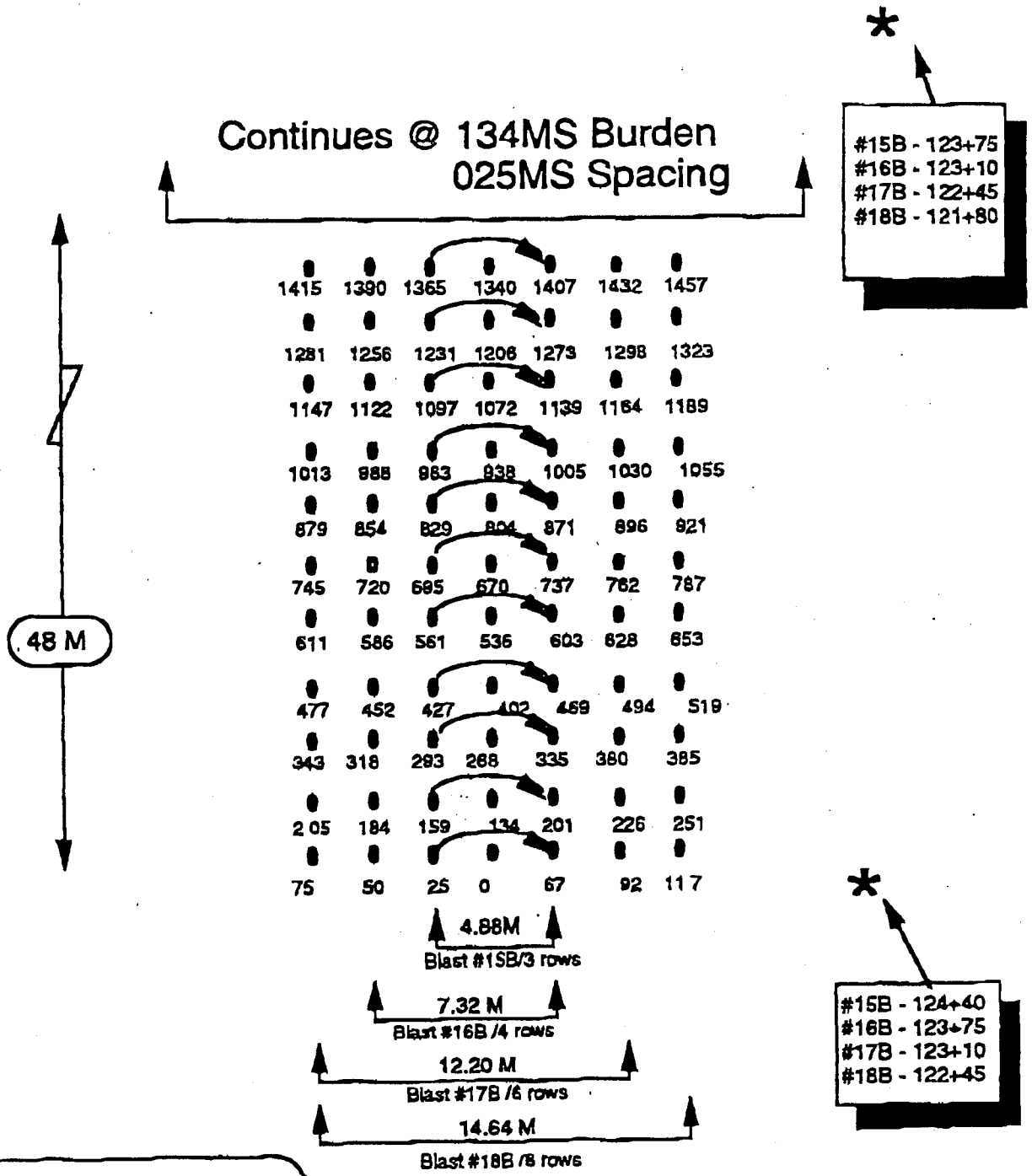
	Total wt.	CM's	PF
Blast no. 15B	= 745 Kg	2,200 CM	.34Kg/CM
Blast no. 16B	=1,324Kg	2,501 CM	.54 Kg/CM
Blast no. 17B	= 2,535 Kg	5,080 CM	.50 Kg/CM
Blast no. 18B	= 3900 Kg	7,500 CM	.52 Kg/CM

5. All hole loading is subject to drill verification of RQ. Drill hole depths and blast design subject to final construction staking.

JUN 25 '99 14:19 FR MK 3478 619 460 5632 TO 2677406 P.04/06
06/25/99 FRI 13:15 FAX 760 948 1819 C BEAN/CW POSS INC 005

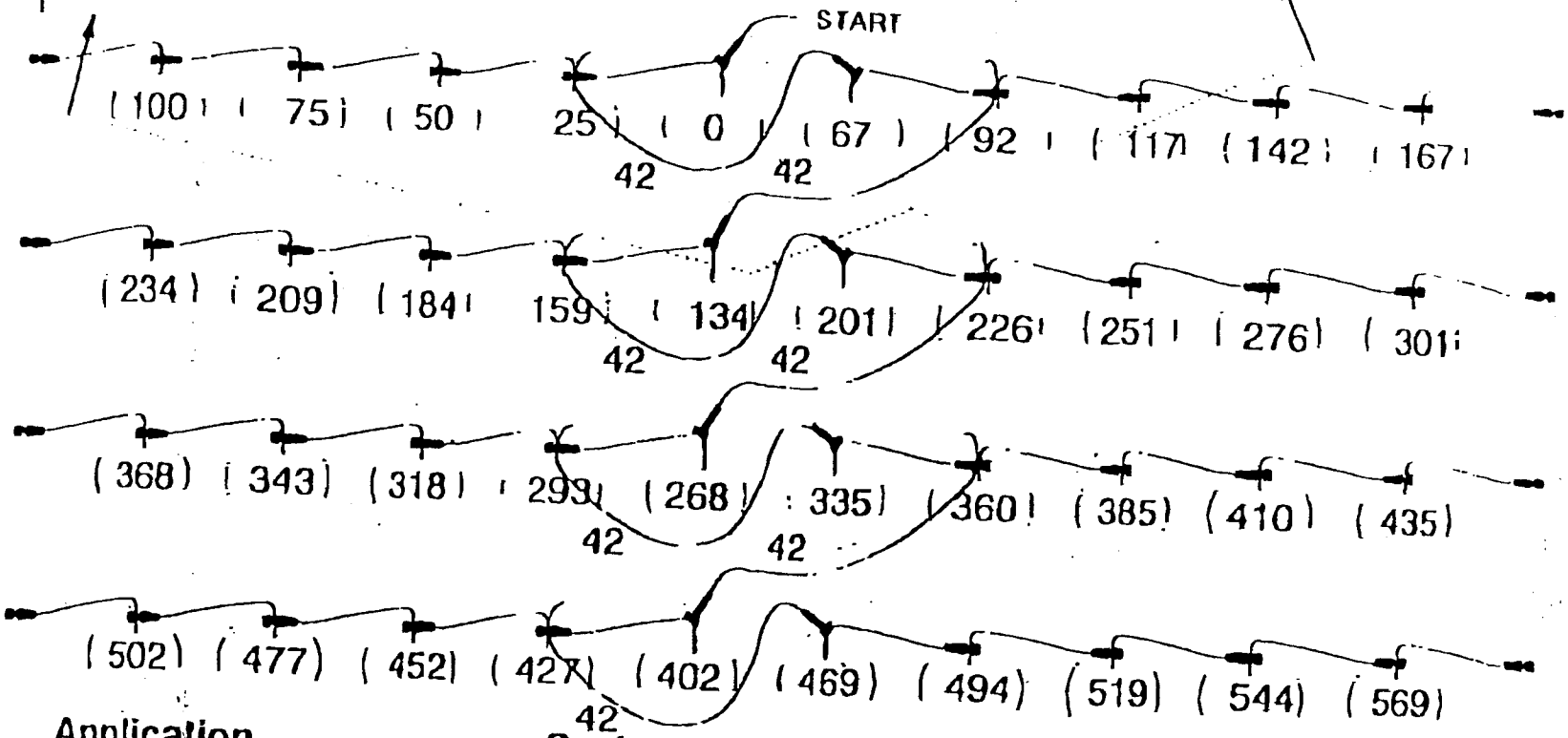
Blast(s) No. 15B, 16B,17B & 18B

Nominal blast hole firing times, approximate blast dimensions:



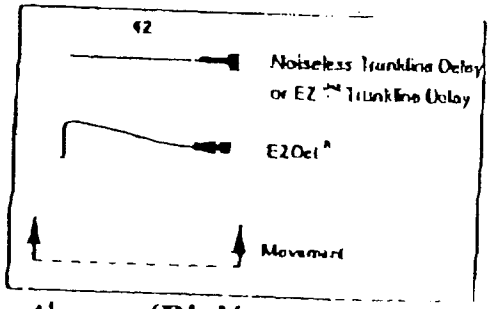
678 = 90 m blast hole and nominal firing time
B = 2.44 M S = 2.44 M

Free Face



Application
V-Cut
84 or 134 MS between rows

Surface Delays Required
17 MS or 42 MS



Limitations
16 holes in length & infinite in depth
or
2 rows deep & infinite in length (must have no more than 8 holes on opening side)

Blast No. 15B, 16B, 17B, & 18B Roadway/Slope excavation 'B' line

Accessories and sequential detonator connections. All hole @ 2.44 M grid.

BLASTING PLAN

CALTRANS CONTRACT NO. 11-001924

Approved
7/15

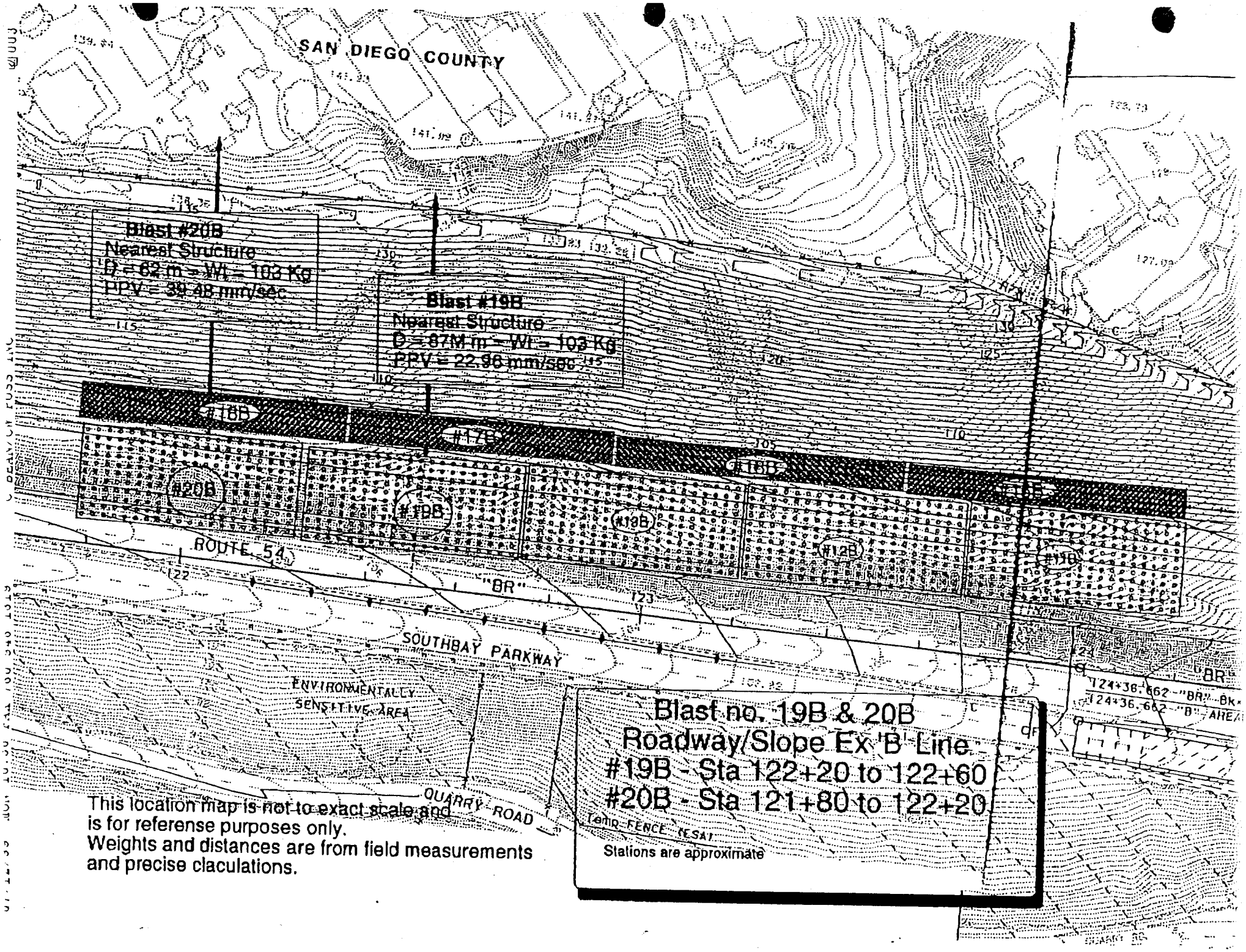
PRIME CONTRACTOR: MORRISON KNUDSEN CORPORATION
27400 EAST 5TH STREET
HIGHLAND, CA 92346

DRILLING AND BLASTING CONTRACTOR: C.W. POSS, INCORPORATED
201 S. BALCOM AVENUE
FULLERTON, CA 92832
PH: 714-871-9900
FX: 714-871-3009

ADDENDUM: BLASTING PLAN FOR BLAST NO. 19 ~~B~~ & 20B
ROADWAY EXCAVATION 'B' LINE

Page no. 1 Blast location PPV's (not to scale)
Page no. 2 Blast hole geometry, and nominal firing times
Page no. 3 Typical blast hole profiles
Page no. 4 Typical blast hole detonator hookup

C. Bean/CWP/19/20B/071299



This location map is not to exact scale and is for referense purposes only.
Weights and distances are from field measurements and precise claculations.

Blast no. 19B & 20B
Roadway and slope excavation
Typical Blast hole profiles, no scale.

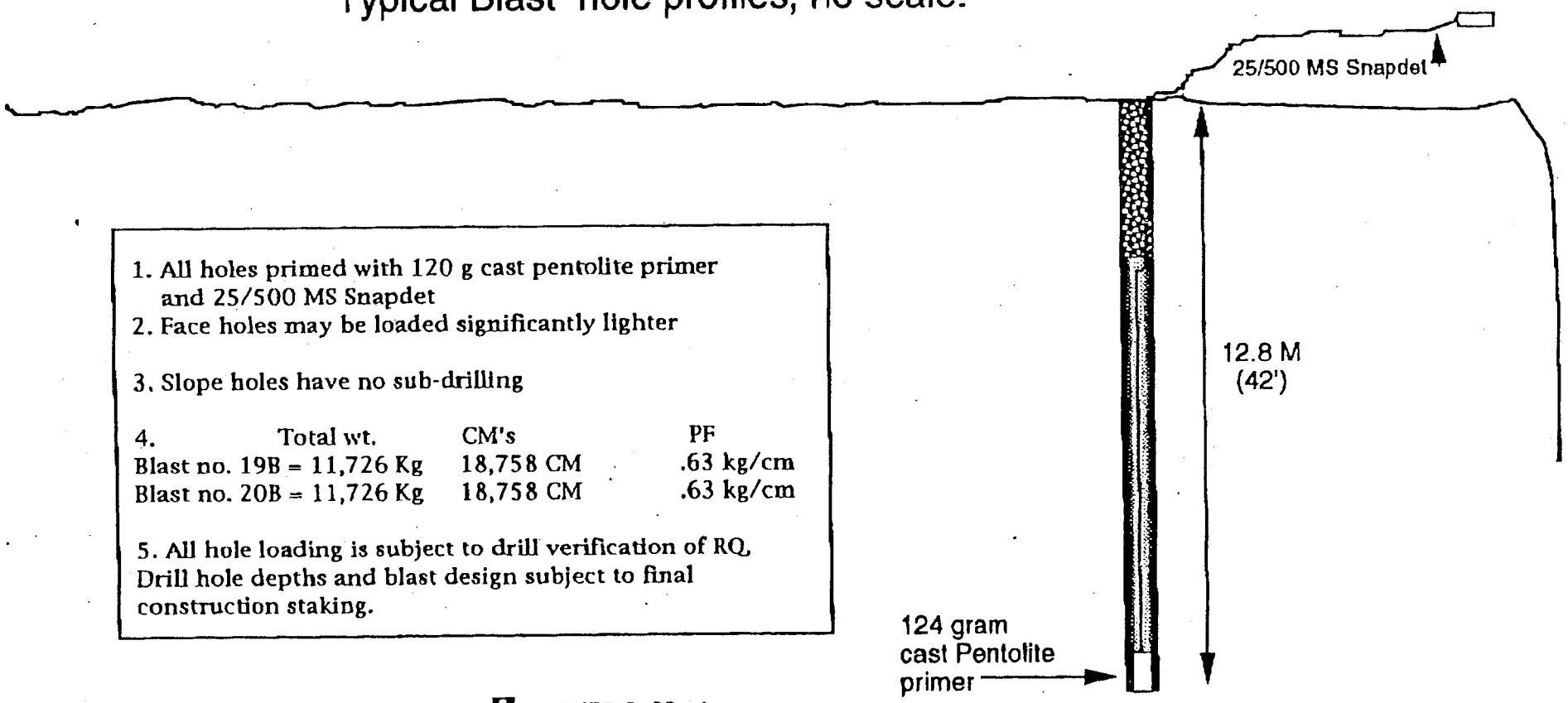
1. All holes primed with 120 g cast pentolite primer and 25/500 MS Snapdet
2. Face holes may be loaded significantly lighter
3. Slope holes have no sub-drilling
4.

	Total wt.	CM's	PF
Blast no. 19B =	11,726 Kg	18,758 CM	.63 kg/cm
Blast no. 20B =	11,726 Kg	18,758 CM	.63 kg/cm

5. All hole loading is subject to drill verification of RQ, Drill hole depths and blast design subject to final construction staking.

= ANFO @ .82 g/cc

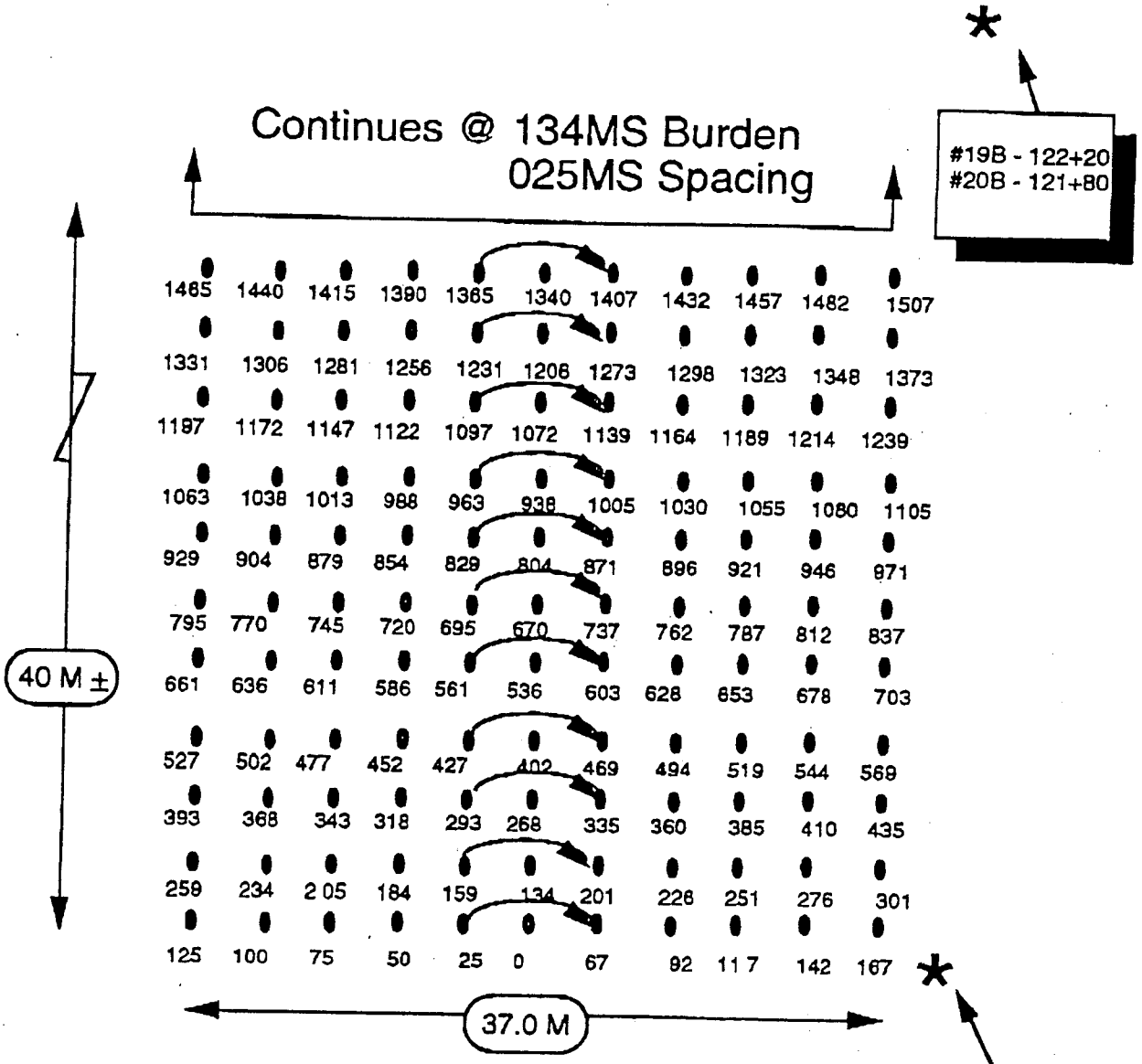
= stemming/drill cuttings



ANFO = 82 Kg
3 M (10') stemming
PF = .63 ea
Vloume = 164 CM ea

Blast(s) No. 19B & 20B

Nominal blast hole firing times, approximate blast dimensions:



678 = 11.4 cm blast hole and nominal firing time
B = 3.05 M S = 3.36 M

BLASTING PLAN

Approved 7/15

CALTRANS CONTRACT NO. 11-001924

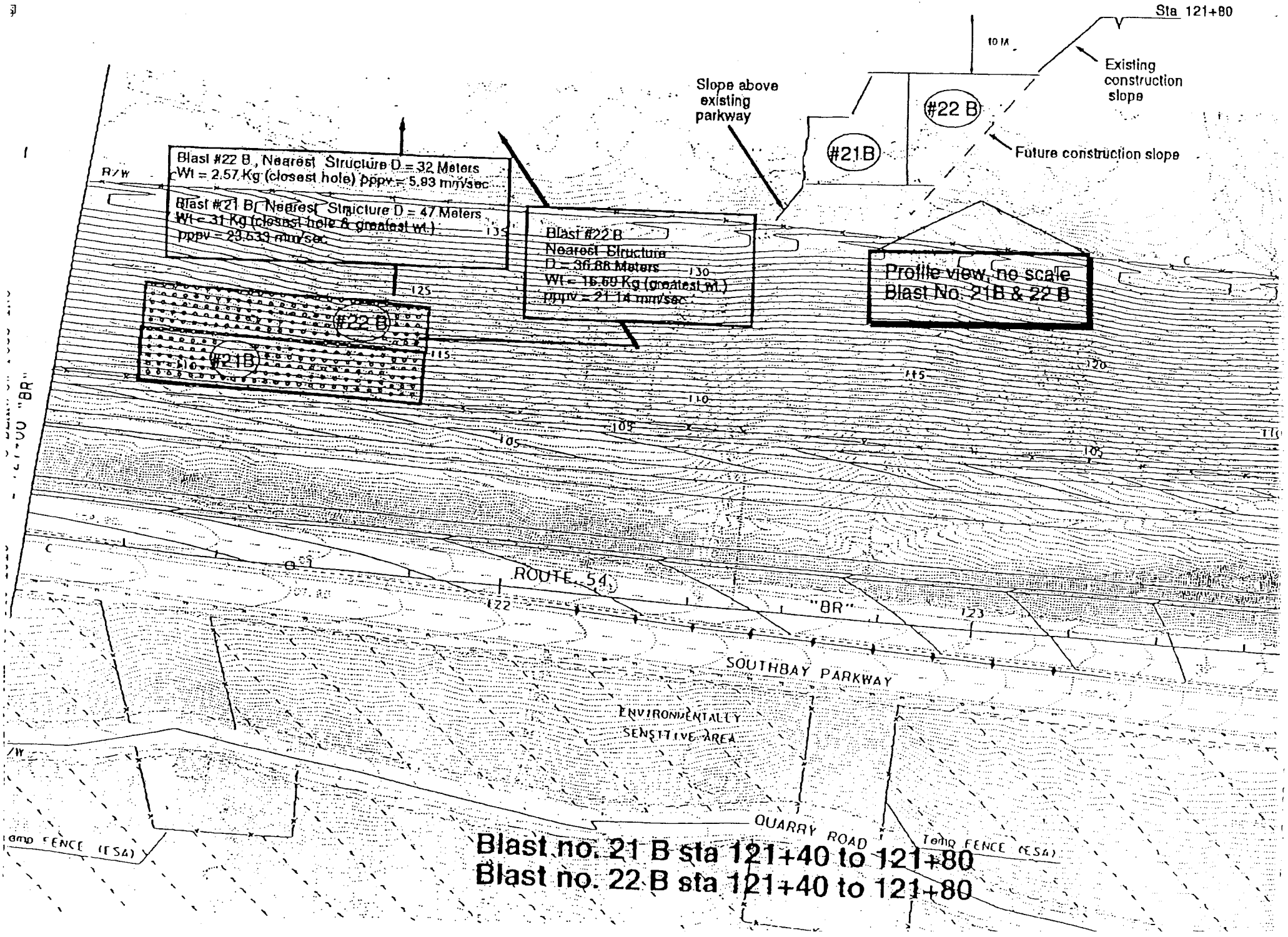
PRIME CONTRACTOR: MORRISON KNUDSEN CORPORATION
27400 EAST 5TH STREET
HIGHLAND, CA 92346

DRILLING AND BLASTING CONTRACTOR: C.W. POSS, INCORPORATED
201 S. BALCOM AVENUE
FULLERTON, CA 92832
PH: 714-871-9900
FX: 714-871-3009

ADDENDUM: BLASTING PLAN FOR BLAST NO. 21B & 22B
ROADWAY EXCAVATION 'B' LINE

Page no. 1 Blast location PPPV's (not to scale)
Page no. 2 Blast hole geometry, and nominal firing times
Page no. 3 Typical blast hole profiles
Page no. 4 Typical blast hole detonator hookup
Page no. 5 General detonator sequence design

C. Bean/CWP/21/22B/071299

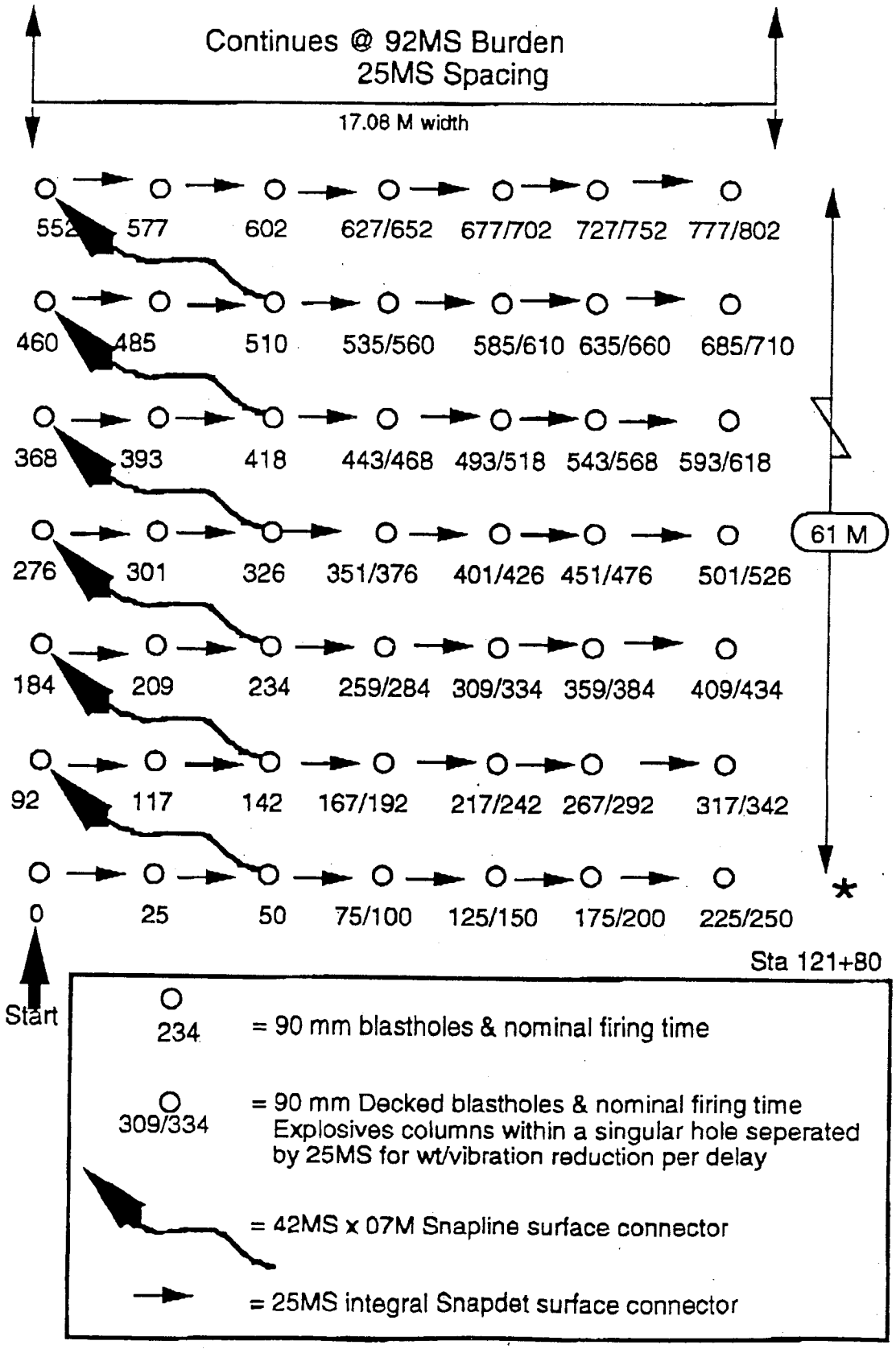


Blast no. 21 B sta 121+40 to 121+80
Blast no. 22 B sta 121+40 to 121+80

*

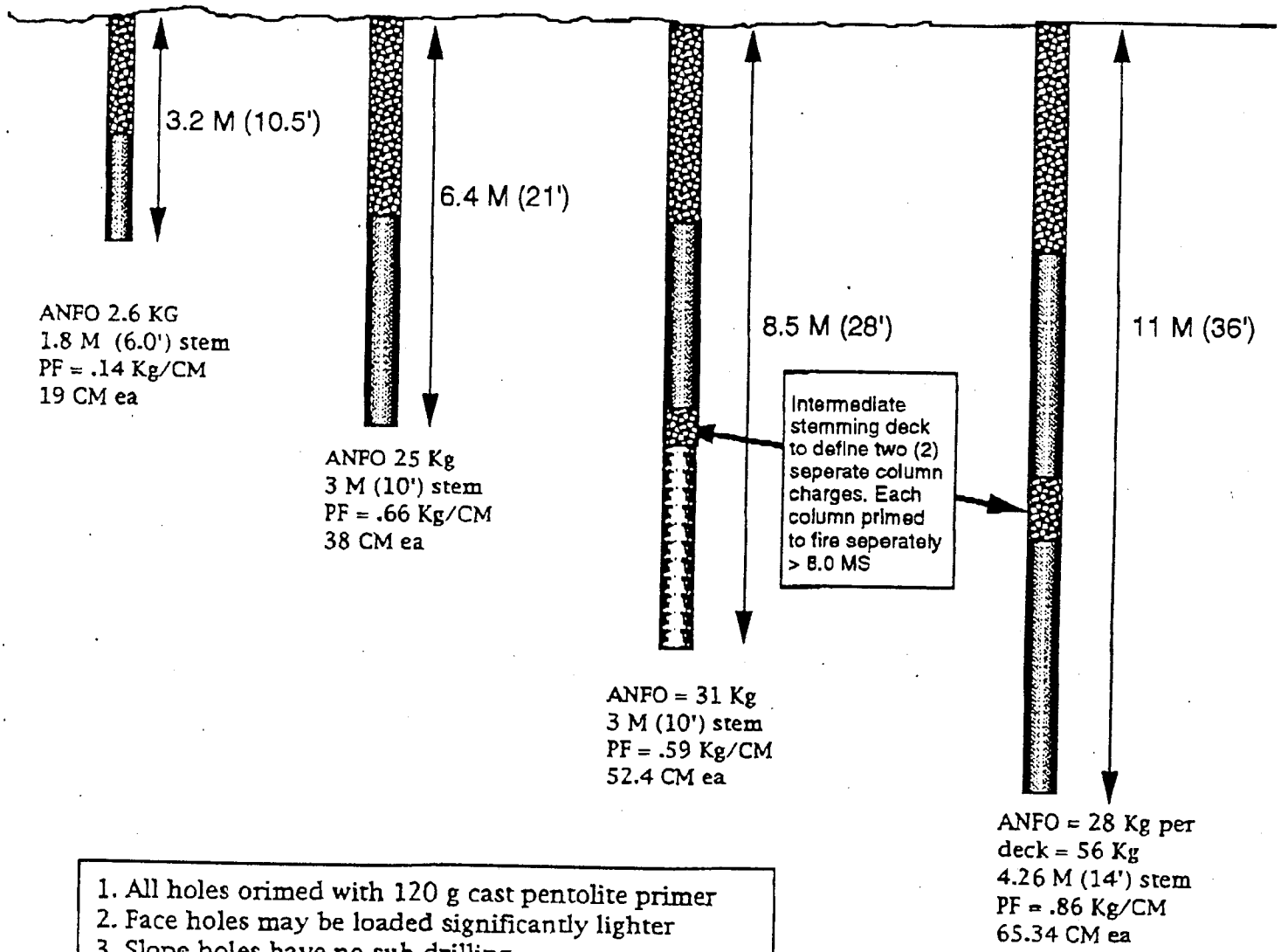
Blast no. 21B Nominal firing times and blasthole layout

Sta 121+40



Blast no. 21B & 22B
Typical Blast hole profiles, no scale.

= ANFO @ .82 g/cc = stemming/drill cuttings

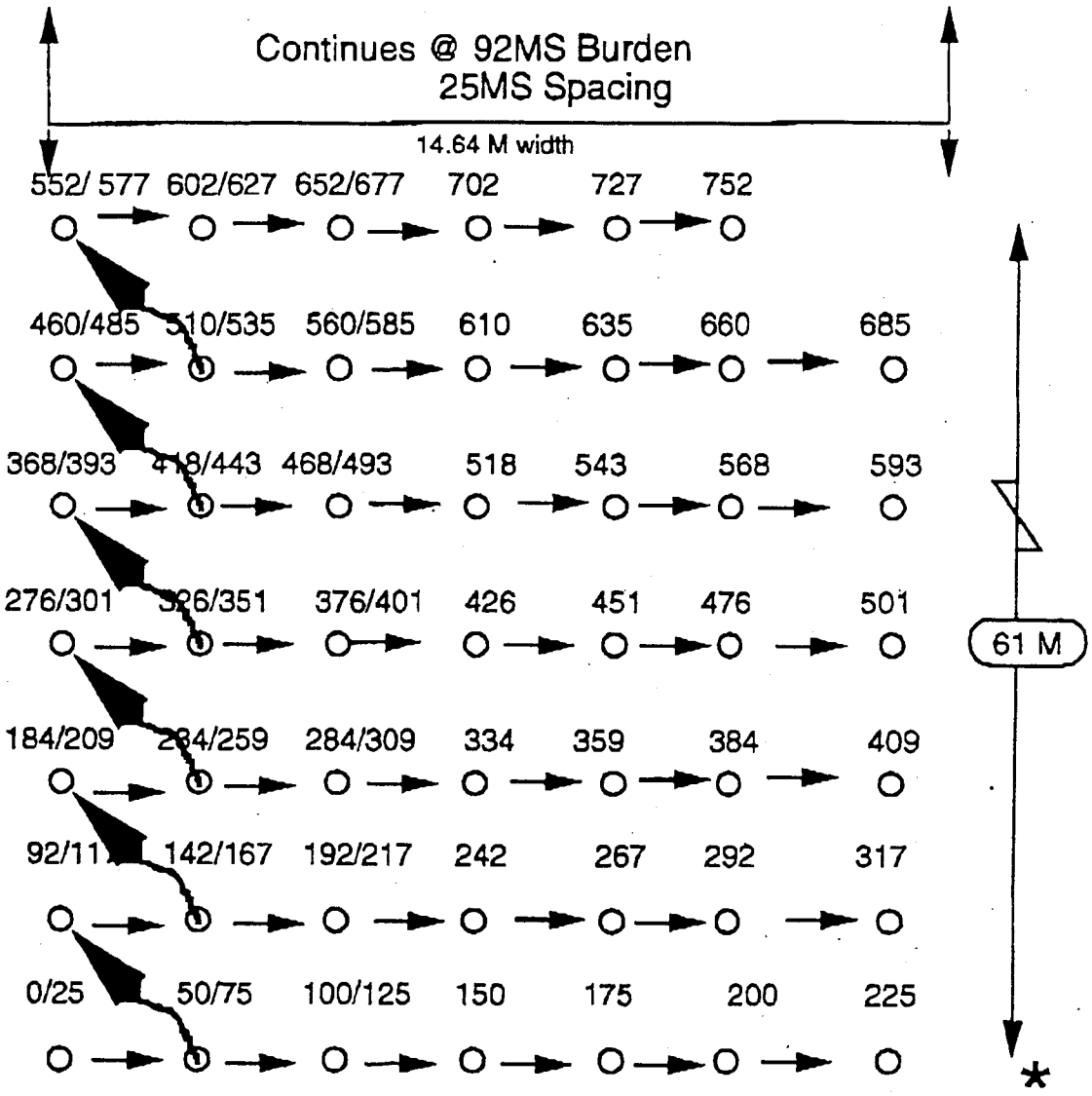


1. All holes orimed with 120 g cast pentolite primer
2. Face holes may be loaded significantly lighter
3. Slope holes have no sub-drilling
4. Blast #21
Total wt. #21B of Explosives approximatelly 5725 Kg
Total material yeild 8726 CM
PF = .66 Kg/CM
5. Blast #22
Total wt. #22B of Explosives approximatelly 5040 Kg
Total material yeild 9157 CM
PF = 55Kg/CM
6. All hole loading is subject to drill verification of RQ

*

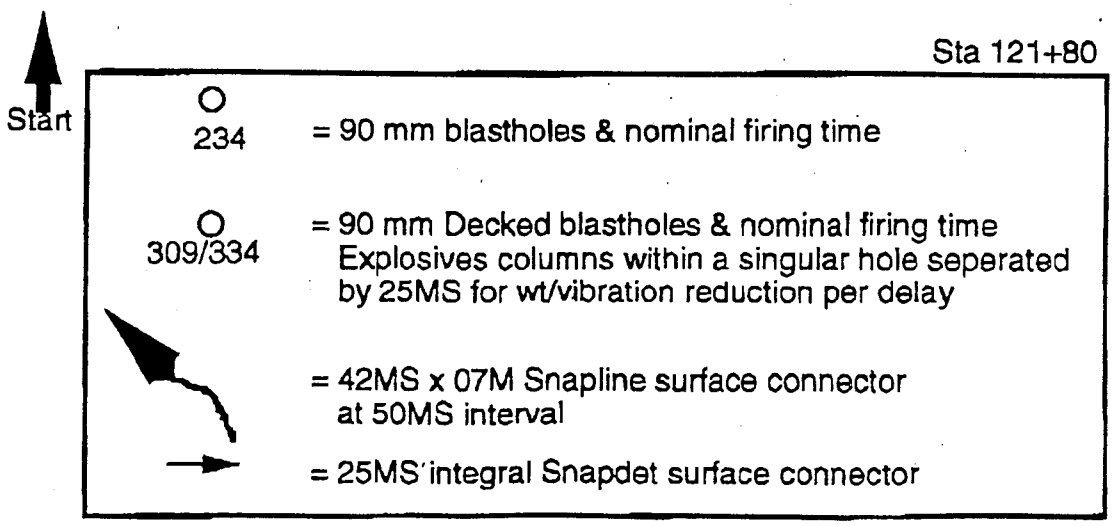
Blast no. 22B Nominal firing times and blasthole layout

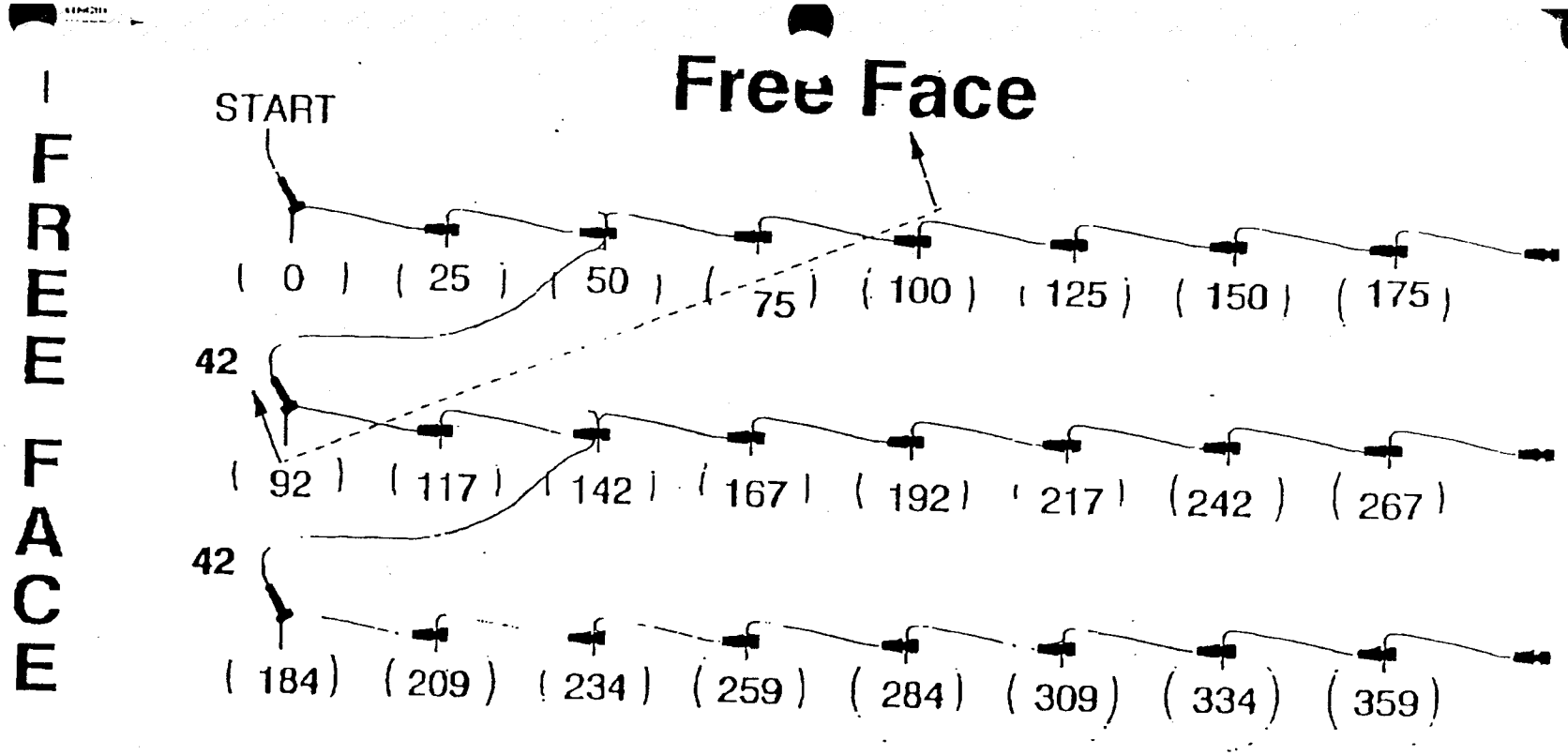
Sta 121+40



*

Sta 121+80

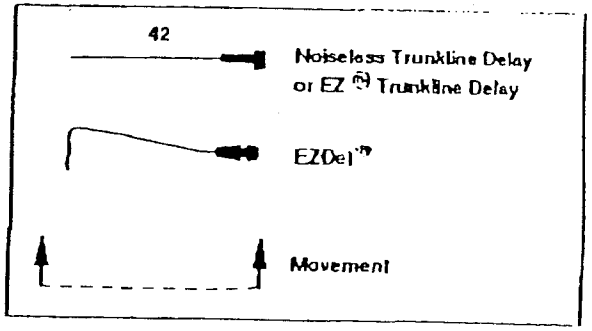




Application
End Pull
67 or 92 MS between rows

Surface Delays Required
17 MS or 42 MS

Limitations
11 holes in length and infinite in depth
or
Infinite in length and 3 rows deep



Blast No. 21 & 22 Roadway/Slope excavation 'B' line
Accessories and sequential detonator connections.
Blast Hole Pattern @ 2.44 M Burden X 2.44 M Spacing

BLASTING PLAN

CALTRANS CONTRACT NO. 11-001924

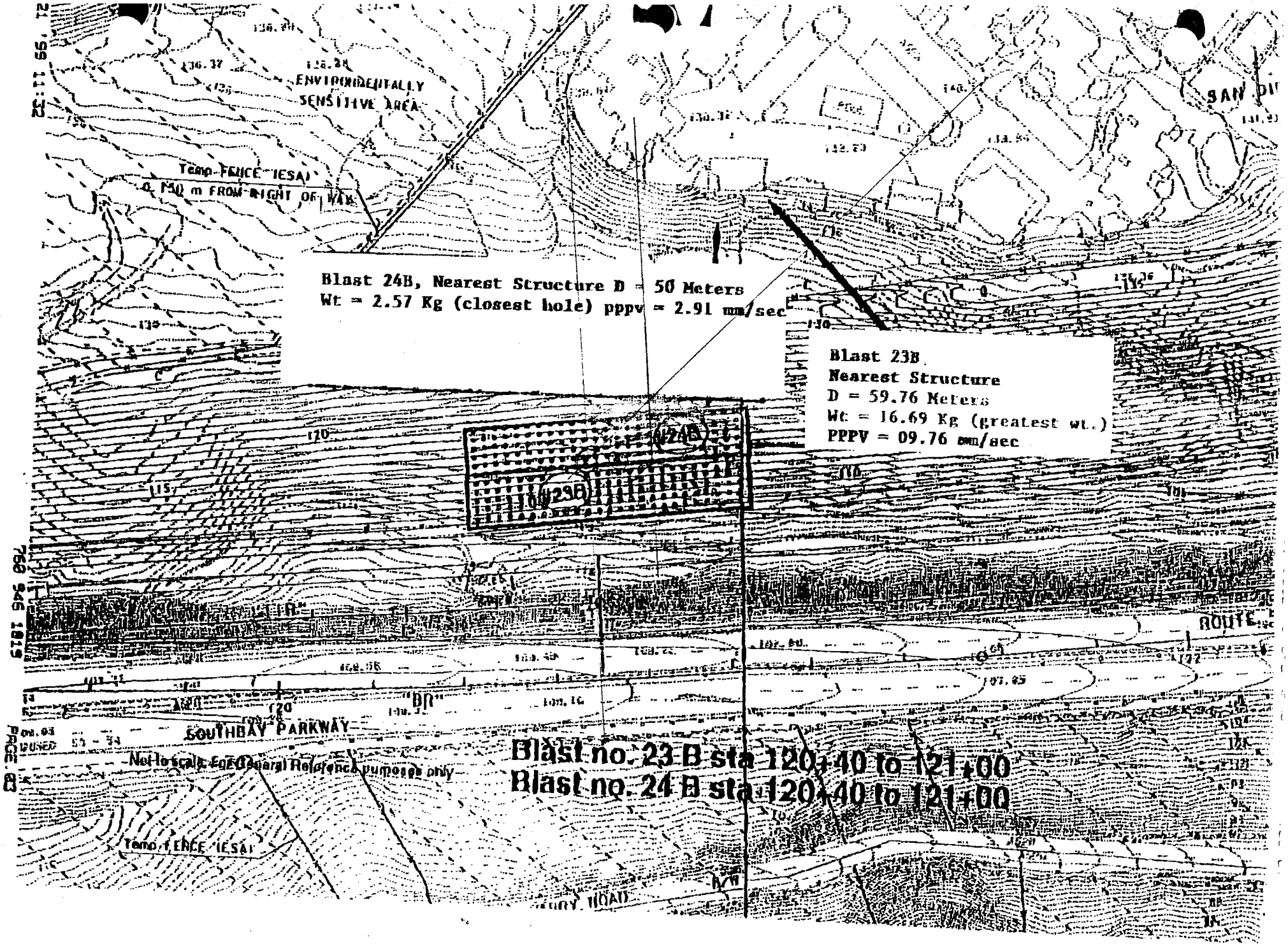
PRIME CONTRACTOR: MORRISON KNUDSEN CORPORATION
27400 EAST 5TH STREET
HIGHLAND, CA 92346

DRILLING AND BLASTING CONTRACTOR: C.W. POSS, INCORPORATED
201 S. BALCOM AVENUE
FULLERTON, CA 92832
PH: 714-871-9900
FX: 714-871-3009

BLASTING PLAN FOR BLAST NO. 23B & 24B
ROADWAY EXCAVATION 'B' LINE

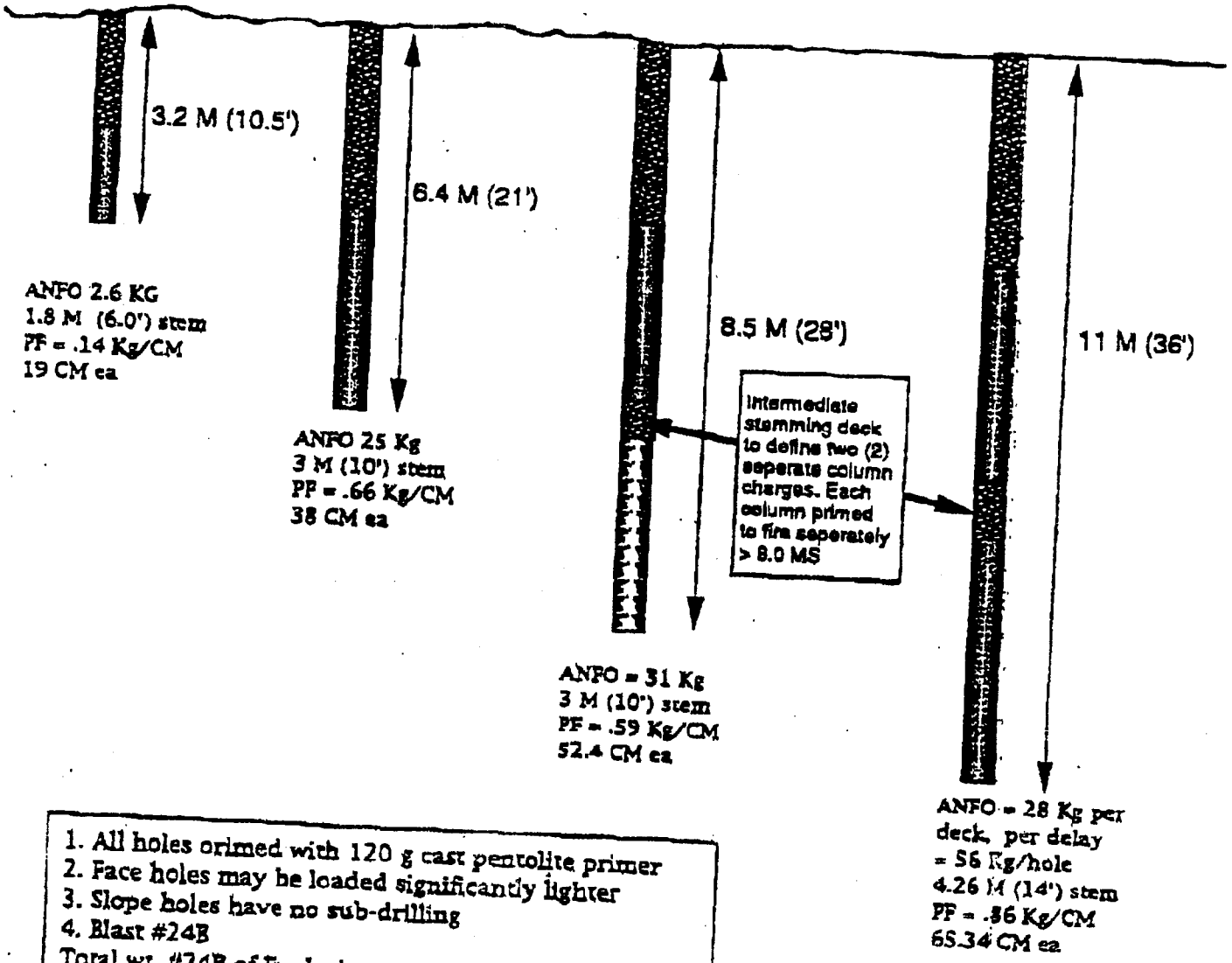
Page no. 1 Blast location PPPV's (not to scale)
Page no. 2 Blast hole geometry, and nominal firing times blast #23B
Page no. 3 Blast hole geometry, and nominal firing times blast #24B
Page no. 4 Typical blast hole profiles
Page no. 5 Typical blast hole detonator hookup & detonation sequence

C. Dcas/CWP/23/24B/072199


ENVIRONMENTALLY
SENSITIVE AREA
Temp. FENCE (ESA)
0 150 m FROM RIGHT OF WAY
Blast 24B, Nearest Structure D = 50 Meters
Wt = 2.57 Kg (closest hole) pppv = 2.91 mm/sec
Blast 23B
Nearest Structure
D = 59.76 Meters
Wt = 16.69 Kg (greatest wt.)
PPPV = 09.76 mm/sec
24B
23B
ROUTE
SOUTHBAY PARKWAY
Not to scale. For General Reference purposes only
Blast no. 23 B sta 120+40 to 121+00
Blast no. 24 B sta 120+40 to 121+00
Temp. FENCE (ESA)

Blast no. 23B & 24B
Typical Blast hole profiles, no scale.

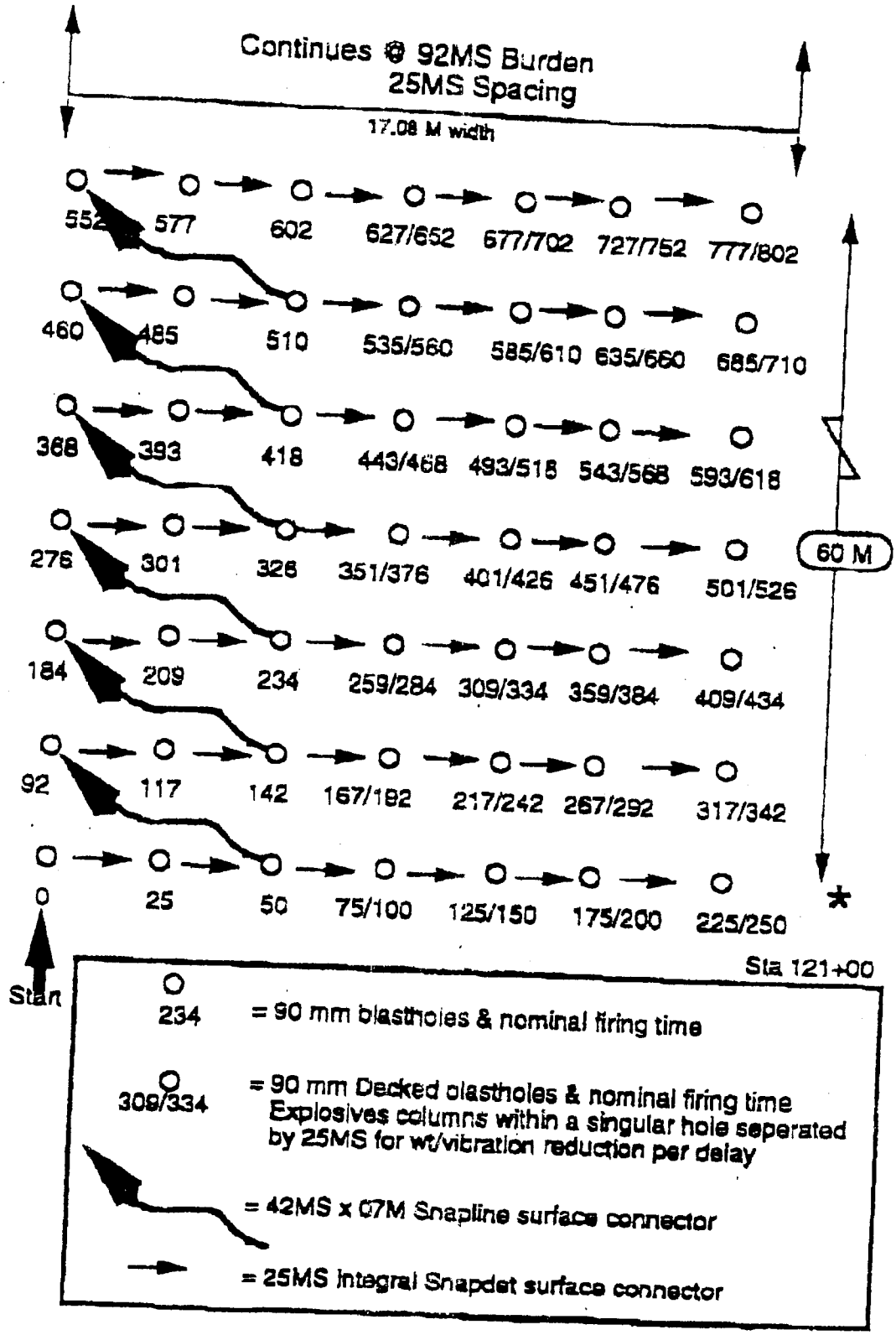
= ANFO @ .82 g/cc = stemming/drill cuttings



1. All holes orimed with 120 g cast pentolite primer
2. Face holes may be loaded significantly lighter
3. Slope holes have no sub-drilling
4. Blast #24B
   Total wt. #24B of Explosives approximatelly 5725 Kg
   Total material yeild 8726 CM
   PF = .66 Kg/CM
5. Blast #23B
   Total wt. #23B of Explosives approximatelly 5040 Kg
   Total material yeild 9157 CM
   PF = 55Kg/CM
6. All hole loading is subject to drill verification of RQ

Blast no. 23B Nominal firing times and blasthole layout

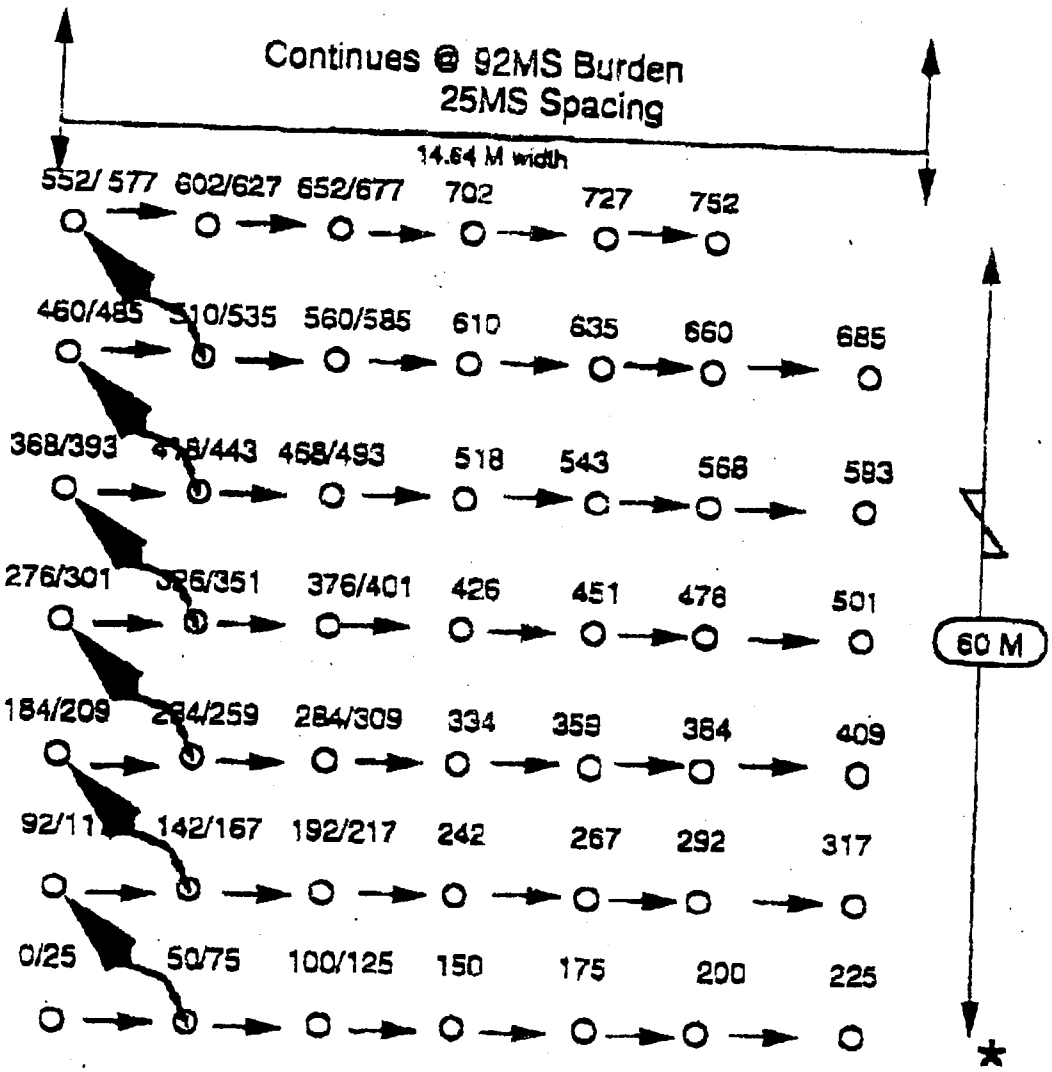
Sta 120+40



JUL-27 99(TUE) 14:34 C. W. POSS, INC. TEL:714 978 1402 P.004

Blast no. 24B Nominal firing times and blasthole layout

Sta 120+40



Sta 121+00

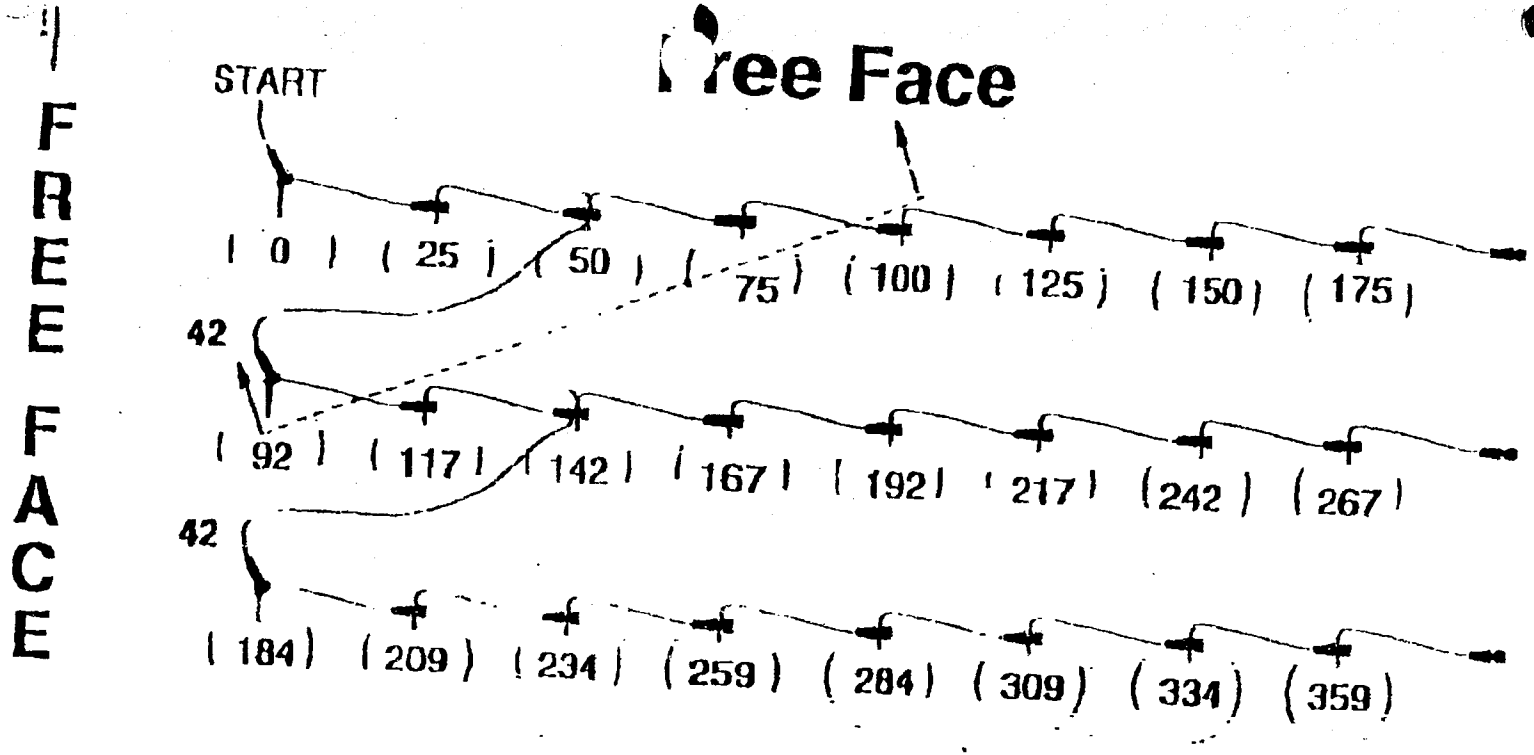
Start

234 = 90 mm blastholes & nominal firing time

309/334 = 90 mm Decked blastholes & nominal firing time
Explosives columns within a singular hole seperated by 25MS for wt/vibration reduction per delay

= 42MS x 07M Snapline surface connector at 50MS interval

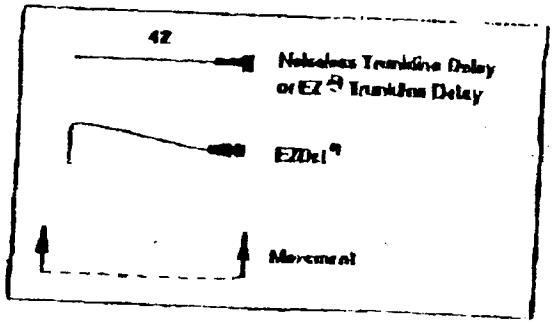
= 25MS Integral Snapdet surface connector



Application
End Pull
67 or 92 MS between rows

Surface Delays Required
17 MS or 42 MS

Limitations
11 holes in length and infinite in depth
or
Infinite in length and 3 rows deep



Blast No. 23 & 24 Roadway/Slope excavation 'B' line
Accessories and sequential detonator connections.
Blast Hole Pattern @ 2.44 M Burden X 2.44 M Spacing

MORRISON KNUDSEN CORPORATION
HEAVY CIVIL CONSTRUCTION GROUP

27400 EAST FIFTH STREET
P.O. BOX 800
HIGHLAND, CALIFORNIA U.S.A. 92346
PHONE: (909) 425-4200
FAX: (909) 862-8431

August 6, 1999

CAL-3478
Ser # 575

State of California
Department of Transportation
P.O. 2863
El Cajon, CA 92021

Attn: Randy Sanchez, Resident Engineer

RE: Revised Blast Plan for 23B and 24B

Gentlemen:

Morrison Knudsen acknowledges receipt of your letter dated 8/5/99 concerning Blast Plan 23B and 24B.

We have reviewed the corrected blast plan submitted to us by C.W. Poss for Blast 23B and 24B and believe that all the appropriate information is contained in this revised submittal.

If you have any questions, please contact me at (619)460-9809.

Sincerely,
MORRISON KNUDSEN CORPORATION

Mike Smith
Project Manager

MS/jm

C: M.O.
Corres.

Post-it® Fax Note 7671	Date 8/6/99	# of pages ▸ 7
To Randy Sanchez	From Mike Smith	
Co./Dept.	Co.	
Phone #	Phone #	
Fax #	Fax #	

JUL 27 '99 09:42 760 946 1819 PAGE.02

BLASTING PLAN

CALTRANS CONTRACT NO. 11-001924

PRIME CONTRACTOR: MORRISON KNUDSEN CORPORATION
27400 EAST 5TH STREET
HIGHLAND, CA 92346

DRILLING AND BLASTING CONTRACTOR: C.W. POSS, INCORPORATED
201 S. BALCOM AVENUE
FULLERTON, CA 92832
PH: 714-871-9900
FX: 714-871-3009

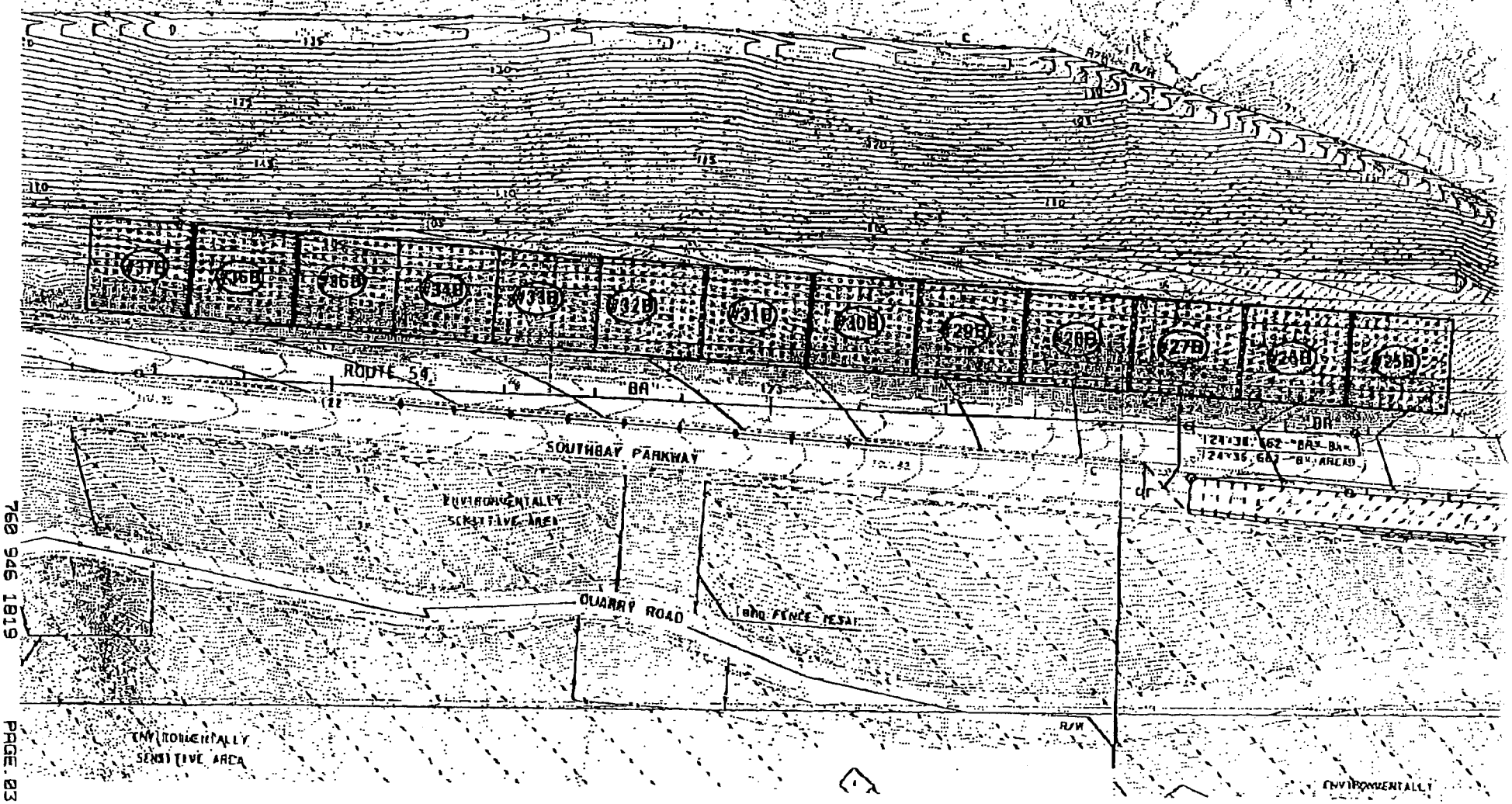
BLASTING PLAN FOR BLAST NO. 25B through 37B
ROADWAY EXCAVATION 'B' LINE

Page no. 1 Blast location (not to scale)
Page no. 2 Blast hole geometry & nominal firing times
Page no. 3 Typical blast hole detonator hookup & detonation sequence
Page no. 4 Typical blast hole profiles
Page no. 5 Vital Statistics

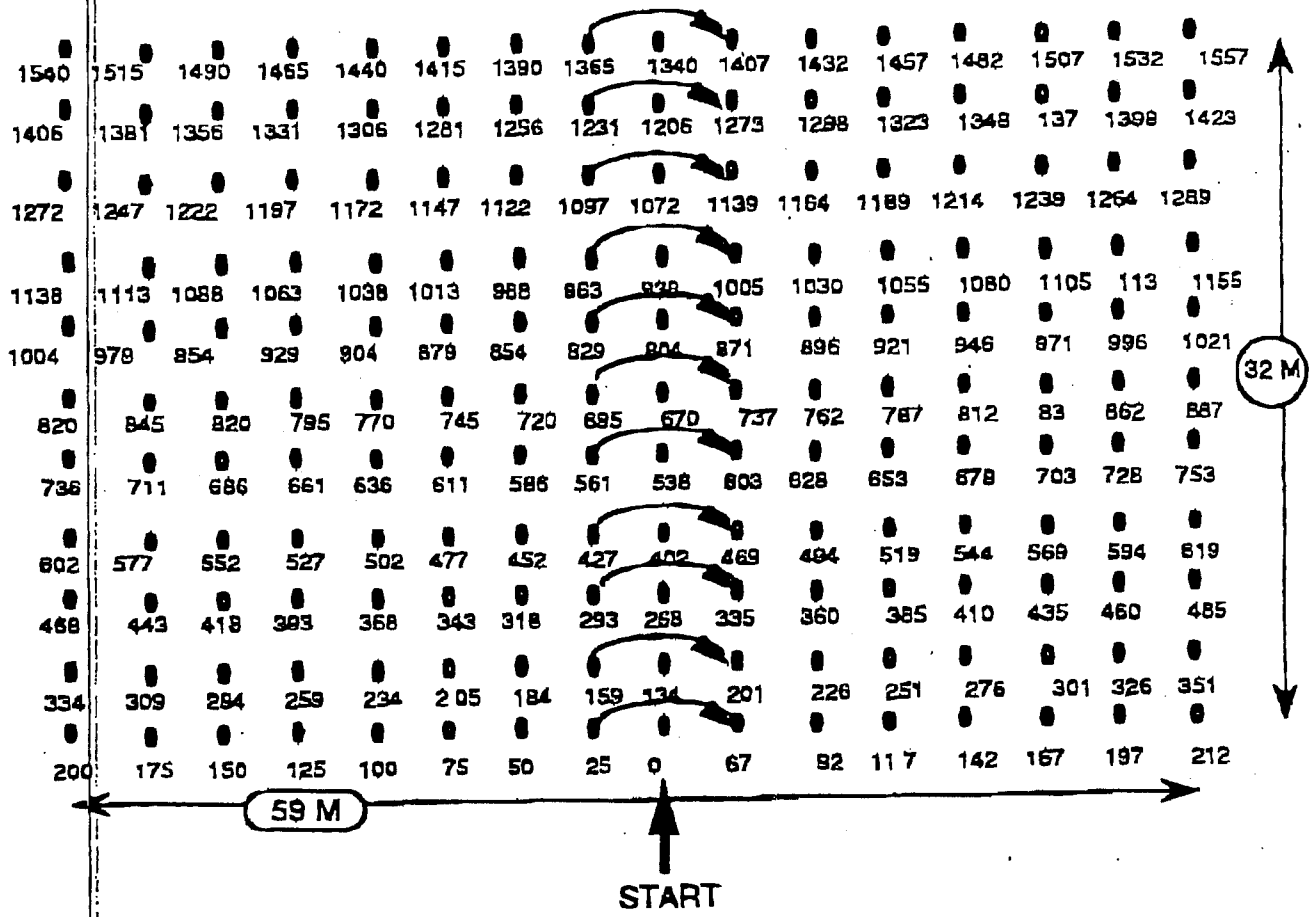
SAN DIEGO COUNTY

Blast no. 25B through 37B, Roadway Excavation

Not to scale, for reference purposes only



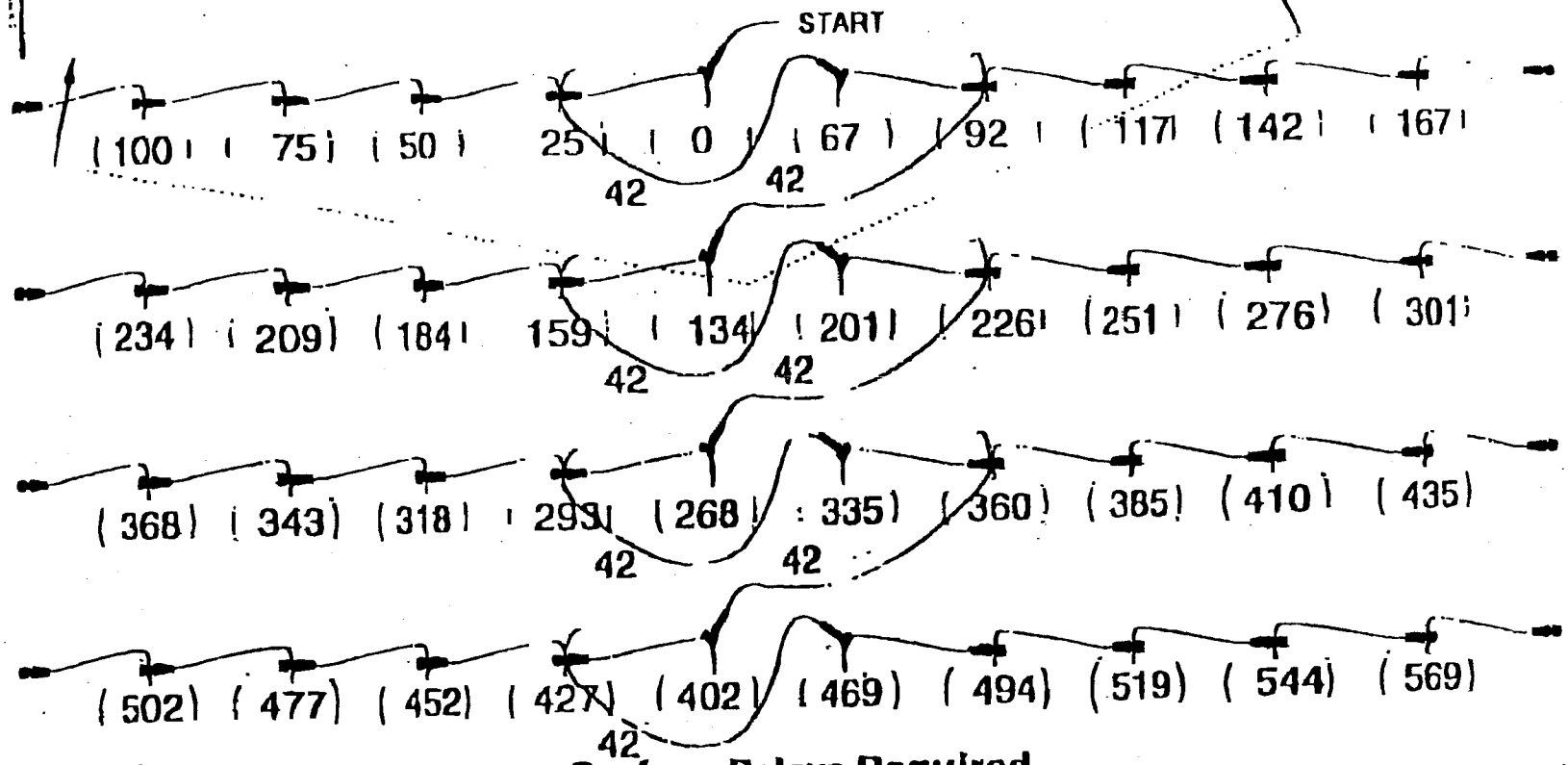
Nominal Firing Times Blast #25 - #37



= 42MS Snapline surface connector

1000 = 114mm blasthole and nominal firing time
3.05 M burden X 3.66 M spacing

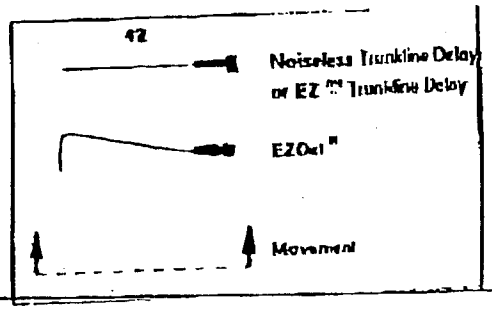
Free Face



Application
V-Cut
84 or 134 MS between rows

Limitations
16 holes in length & infinite in depth
or
2 rows deep & infinite in length (must have no more than 8 holes on opening side)

Surface Delays Required
17 MS or 42 MS



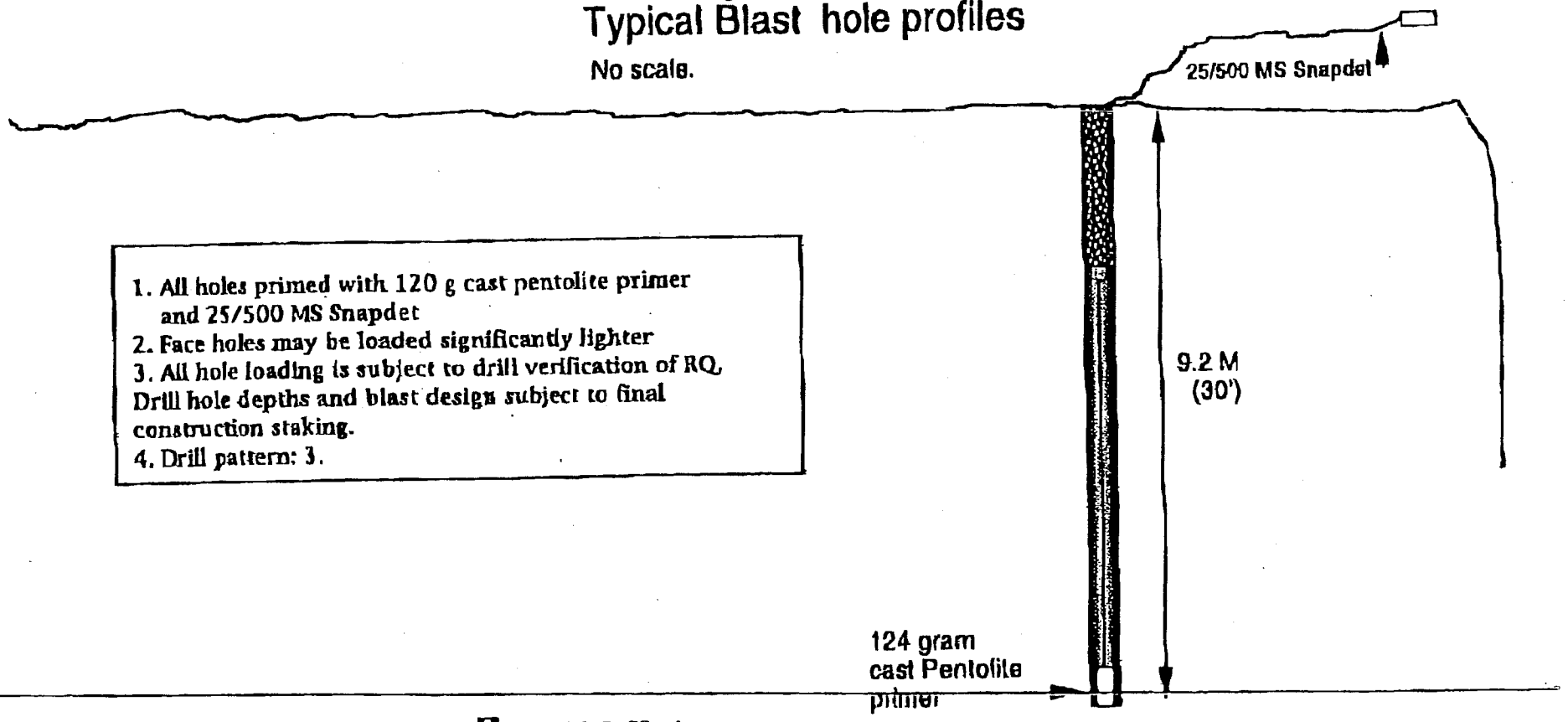
Blast No. 25B through 37B Roadway excavation 'B' line

Accessories and sequential detonator connections.

Blast Hole Pattern @ 3.05 M Burden X 3.66 M Spacing

Blast no. 25B - 37B
Roadway excavation
Typical Blast hole profiles

No scale.



1. All holes primed with 120 g cast pentolite primer and 25/500 MS Snapdet
2. Face holes may be loaded significantly lighter
3. All hole loading is subject to drill verification of RQ. Drill hole depths and blast design subject to final construction staking.
4. Drill pattern: 3.

= ANFO @ .82 g/cc

= stemming/drill cuttings

ANFO	=44.0 Kg
Stemming	=2.4 M
PF	=5 ea
Volume	= 102 CM ea

Blast no. 25B through 37B, Vital Statistics

BLAST NO.	STATION	Burden/ Spacing/ Depth /M	Rock Volume /CM	Wt/hole /Kg	Wt/shot /Kg	PF Kg/CM	*D /M	**PPPV mm/sec
25B:	124+60-124+28	3.05/3.66/9.2	16.371	44	7.040	.5	39	41.90
26B:	124+2 8-123+96	3.05/3.66/9.2	16.371	44	7.040	.5	63	19.48
27B:	123+96-123+64	3.05/3.66/9.2	16.371	44	7.040	.5	60	21.07
28B:	123+64-123+32	3.05/3.66/9.2	16.371	44	7.040	.5	73.1	15.36
29B:	123+32-123+00	3.05/3.66/9.2	16.371	44	7.040	.5	86.5	11.73
30B:	123+00-122+68	3.05/3.66/9.2	16.371	44	7.040	.5	66.9	17.70
31B:	122+68-122+36	3.05/3.66/9.2	16.371	44	7.040	.5	68.6	17.00
32B:	122+36-122+04	3.05/3.66/9.2	16.371	44	7.040	.5	58	22.24
33B:	122+04-121+72	3.05/3.66/9.2	16.371	44	7.040	.5	50.1	28.17
34B:	121+72-121+40	3.05/3.66/9.2	16.371	44	7.040	.5	55.1	24.15
35B:	121+40-121+08	3.05/3.66/9.2	16.371	44	7.040	.5	57	22.87
36B:	121+08-120+76	3.05/3.66/9.2	16.371	44	7.040	.5	59.1	21.39
37B:	120+76-120+44	3.05/3.66/9.2	16.371	44	7.040	.5	73.8	15.13

*Distance to nearest Apt's, SFR's, and Condos West of blast area ** 714.4 $(D/\sqrt{wt.}) - 1.6 = PPPV$

11-SUD-54/125
11-001923
1-6-00
SHOT 25 B
BG N 45 E
BA6633 MONITOR @ ~~MP 65 43~~
MP 73 Lava Blvd Circle

MP 65 44
~20 FT FROM FENCE
~20 FT FROM EDGE
OF BUILDING

MP 33660

12 PM

~~MP 55/65 43~~

BLASTING PLAN

CALTRANS CONTRACT NO. 11-001924

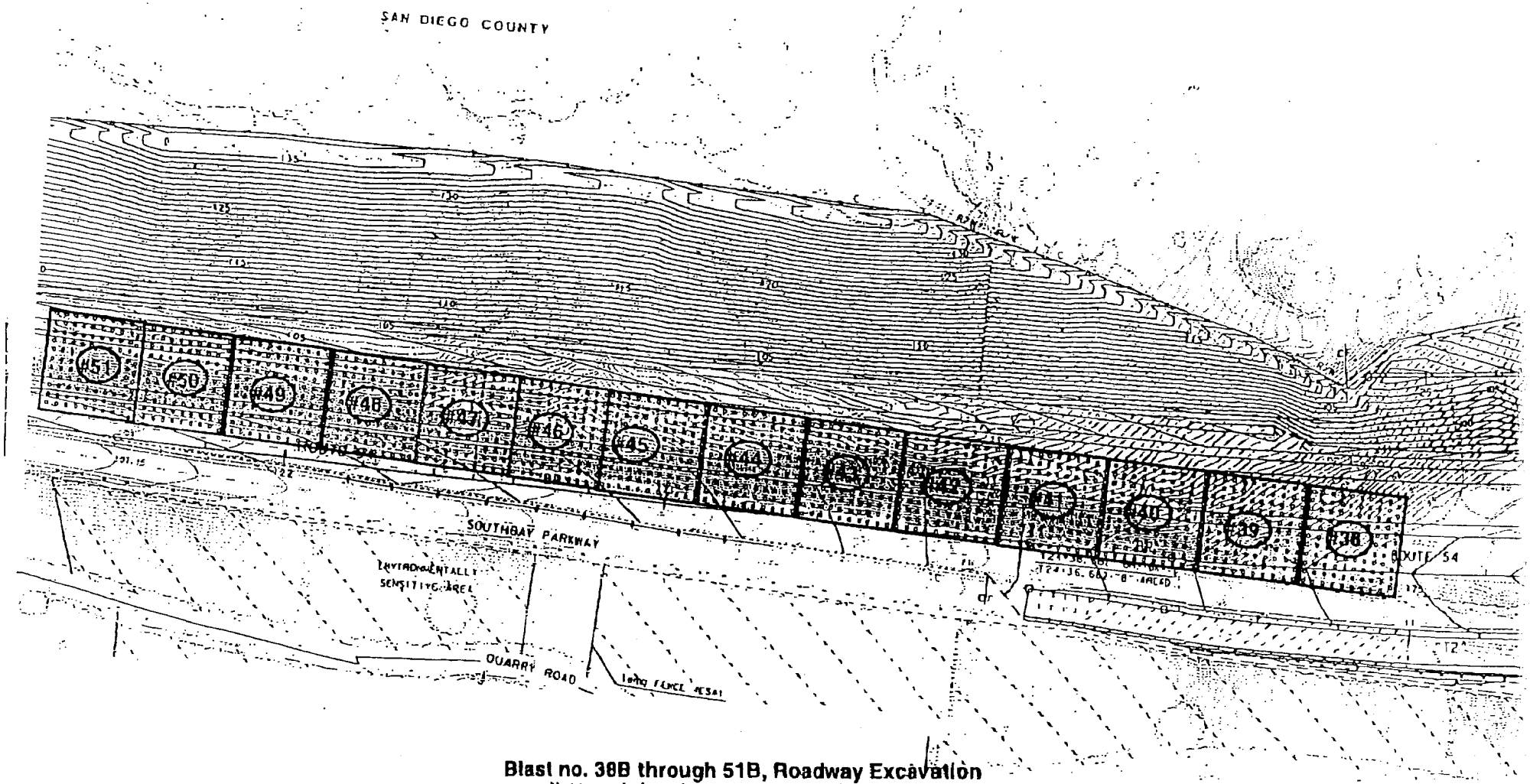
PRIME CONTRACTOR: MORRISON KNUDSEN CORPORATION
27400 EAST 5TH STREET
HIGHLAND, CA 92346

DRILLING AND BLASTING CONTRACTOR: C.W. POSS, INCORPORATED
201 S. BALCOM AVENUE
FULLERTON, CA 92832
PH: 714-871-9900
FX: 714-871-3009

BLASTING PLAN SUBMITTAL FOR BLAST(S) NO. 38B through 51B
'B' LINE RIGHT OF WAY EXCAVATION

PAGE NO. 1	PLAN VIEW, NOT TO SCALE
PAGE NO. 2	BLAST(S) #38-#51 STATS
PAGE NO. 3	TYPICAL BLAST HOLE PROFILE
PAGE NO. 4	NOMINAL DETONATOR FIRING TIMES TYPICAL DRILL PATTERN & DETONATOR LAYOUT

C.BEAN/CWP/020400



Blast no. 38B through 51B, Roadway Excavation
Not to scale for reference purrposes only

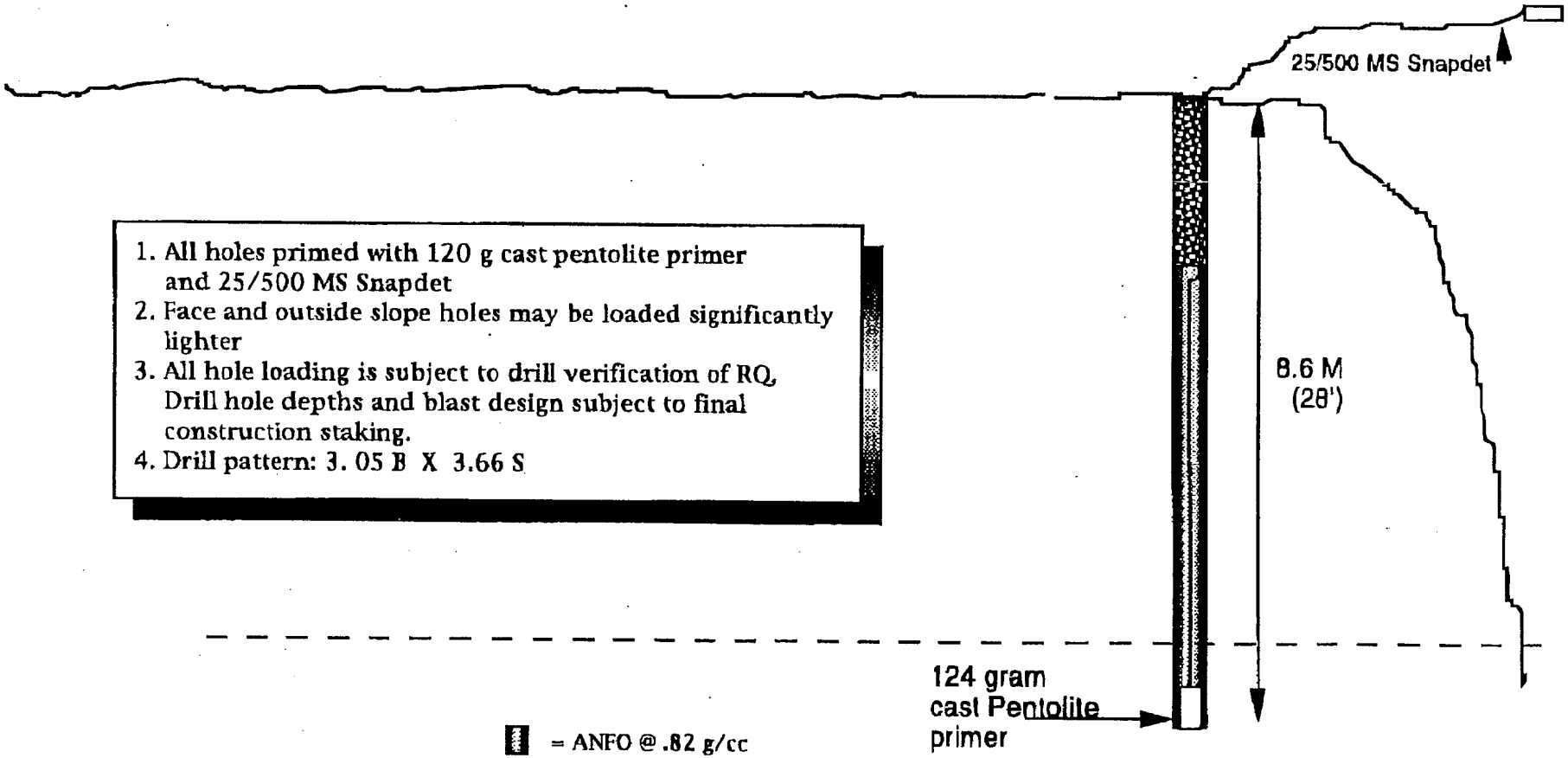
Blast no. 38B through 5 1B, Vital Statistics

Blast no.	'B' Line Stations	Burden/ Spacing/ Depth/M	Rock Volume CM	Wt/hole Kg	Wt/shot Kg	PF Kg/CM	*D M	**PPPV mm/sec	
38B:	124+92-124+60	3.05/3.66/8.6	15,408	51	8,886	.53	68	21.39	21.385
39B:	124+60-124+28	3.05/3.66/8.6	15,408	51	8,886	.53	64	21.39	21.385
40B:	124+28-123+96	3.05/3.66/8.6	15,408	51	8,886	.53	88	16.58	12.848
41B:	123+96-123+64	3.05/3.66/8.6	15,408	51	8,886	.53	85	13.58	13.581
42B:	123+64-123+32	3.05/3.66/8.6	15,408	51	8,886	.53	68	10.82	10.815
43B:	123+32-123+00	3.05/3.66/8.6	15,408	51	8,886	.53	111	08.86	8.861
44B:	123+00-122+68	3.05/3.66/8.6	15,408	51	8,886	.53	92	11.97	11.966
45B:	122+68-122+36	3.05/3.66/8.6	15,408	51	8,886	.53	90	12.39	12.394
46B:	122+36-122+04	3.05/3.66/8.6	15,408	51	8,886	.53	88	14.10	14.109
47B:	122+04-121+72	3.05/3.66/8.6	15,408	51	8,886	.53	75	16.59	16.592
48B:	121+72-121+40	3.05/3.66/8.6	15,408	51	8,886	.53	80	14.96	14.964
49B:	121+40-121+08	3.05/3.66/8.6	15,408	51	8,886	.53	82	14.38	14.384
50B:	121+08-120+76	3.05/3.66/8.6	15,408	51	8,886	.53	85	13.58	13.581
51B:	120+76-120+44	3.05/3.66/8.6	15,408	51	8,886	.53	99	10.64	10.641

*Distance to nearest Apt's, SFR's, and Condos West of blast area ** 714.4 (D/ wt.) -1.6 =PPPV

Blast no. 38B - 51B Roadway excavation Typical Blast hole profiles

No scale.



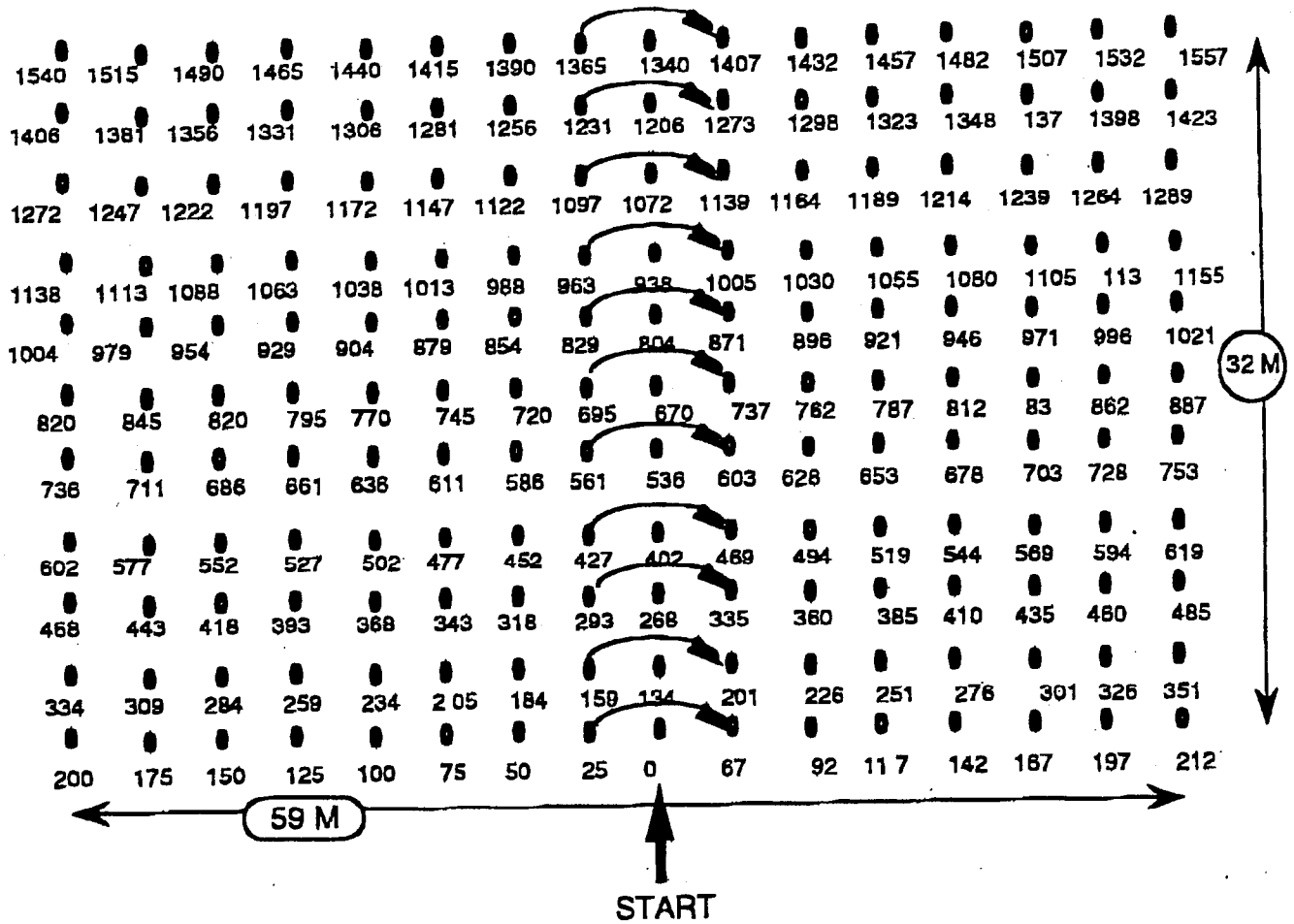
1. All holes primed with 120 g cast pentolite primer and 25/500 MS Snapdet
2. Face and outside slope holes may be loaded significantly lighter
3. All hole loading is subject to drill verification of RQ, Drill hole depths and blast design subject to final construction staking.
4. Drill pattern: 3. 05 B X 3.66 S

= ANFO @ .82 g/cc

= stemming/drill cuttings

ANFO	=51.0 Kg
Stemming	=2.5 M
PF	=.5 ea
Volume	= 096 CM ea

Nominal Firing Times Blast #38B - #51B



= 42MS Snapline surface connector

1000 = 114mm blasthole and nominal firing time
3.05 M burden X 3.66 M spacing