APR 1995
Received
Solid Waste
Section

BLASTING & ROCK REMOVAL
PHASE III, CELL 1, SUBCELLS 1 & 2
PERMIT No. 34 - 06
PIEDMONT LANDFILL & RECYCLING CENTER

RUST E&I PROJECT 32829.300

Carmen Johnson

Fac/Perm/Co ID#	Date	Doc ID#
34-06	8/9/13	DIN

FOR

PIEDMONT LANDFILL & RECYCLING CENTER
9900 FREEMAN ROAD
KERNERSVILLE, NORTH CAROLINA

MARCH 31, 1995

SUBMITTED BY

RUST ENVIRONMENT & INFRASTRUCTURE
15 BRENDAN WAY
GREENVILLE, SOUTH CAROLINA

TABLE OF CONTENTS

1.0 INTRODUCTION

2.0 EXCAVATION

3.0 BLASTING

4.0 UNDERCUTTING OF SUBGRADE

5.0 CERTIFICATION

FIGURES:

1. SUBGRADE UNDERCUT AREAS

APPENDICES:

A STATE PERMIT LETTER

B HARD ROCK REMOVAL PLAN

C BLASTING CERTIFICATION

D BLAST REPORTS

E SEISMOGRAPH REPORTS

Blasting & Rock Removal
March 31, 1995

1.0 INTRODUCTION

This report addresses the requirements for rock removal as stipulated in the Department of Environment, Health and Natural Resources' (DEHNR) letter, dated October 17, 1994 (Appendix A). A shelf rock and a pinnacle of rock was interpreted between borings P-9 and GP-1 during the hydrogeologic study at Piedmont Landfill and Recycling Center (PLRC). This study was performed by RUST Environment and Infrastructure (RUST) during 1994.

Palmetto Rock Services, Inc. (PRS) performed seventeen separate blasts to loosen all the rock which had to be removed during the construction of both subcells of Cell 1. The rock was removed according to the Hard Rock Removal Plan (Appendix B) that was approved by DEHNR. RUST personnel observed most of the blasts and a RUST geologist observed and evaluated the undercut surfaces. The following report describes the excavation, blasting, and undercutting of the rock and includes certification that this was performed in accordance with DEHNR requirements.

2.0 EXCAVATION

The contractor excavated as much as could be ripped with both pans and dozers. When the material could not be ripped any further, the contractor prepared as large an area as practical for blasting. Once this area was prepared, the licensed blaster was called in to drill and blast the rock. Only the rock that was not rippable was blasted. The loosened rock was then removed using pans and dozers.

The degree of weathering of the rock was quite variable such that the occurrence of rock could shift or even disappear both laterally and vertically within relatively short distances. The rock was interpreted as a non-continuous rock mass. The rock which was encountered was a series of shelf like lenses within dense soils. This interpretation was supported by conditions that were observed after blasts and during the excavation.

3.0 BLASTING

There were seventeen individual blast shots that were detonated during the construction of this cell. The licensed blaster has provided a letter of certification (Appendix C) that drill

hole patterns, charge weights, and delays were selected in such a manner as to minimize the amount of energy applied to the underlying rock. The individual blast reports have also been supplied by the contractor and are attached in Appendix D. The seismograph reports are included in Appendix E.

The first two blast reports were reviewed as quickly as possible by both the RUST geologist and the RUST blaster. This was mainly to confirm that controlled blasting techniques were being used. Subsequent blast reports were also reviewed to ensure that controlled blasting techniques were being used. The energy response was always towards the open face. The seismograph responses had maximum peak particle velocities less than 0.5 inches per second (ips). Most of the responses were between 0.1 and 0.3 ips with only three of the blasts measuring greater velocities. Two blasts were not recorded because of insufficient memory caused by false starts resulting from the movement of nearby construction equipment. The blast reports, however, indicated that these blasts were comparable to the other recorded blasts. The peak particle velocities generated during the blasting for Cell 1 were therefore well below the maximum velocity of 2 ips that was recommended in the plan.

4.0 UNDERCUTTING OF SUBGRADE

After the blasts, all intact rock that was observed appeared to be unfractured by the blast. This was observed both at the edge of the side wall and at the base when the undercut surface of the subgrade was observed by a RUST geologist. Five separate visits were made by a RUST geologist to observe and evaluate all undercut surfaces. The surface was inspected for blast fractures or other evidence that could indicate a change in the hydrogeologic conditions beneath the site. No evidence was observed in any of the visits that would indicate that ground-water flow regime has been impacted. There were also no additional geologic structural features discovered that we believe could influence the ground-water flow.

While each area of undercut subgrade was being geologically evaluated, the surveyor would take spot levels on selected high points within each area. This was to insure that the minimum 4 foot undercut was obtained. The areas which required undercutting are approximately shown on Figure 1 along with all surveyed locations and their undercut depths. These areas are shown to give an approximation of the amount of subgrade which had to be undercut.

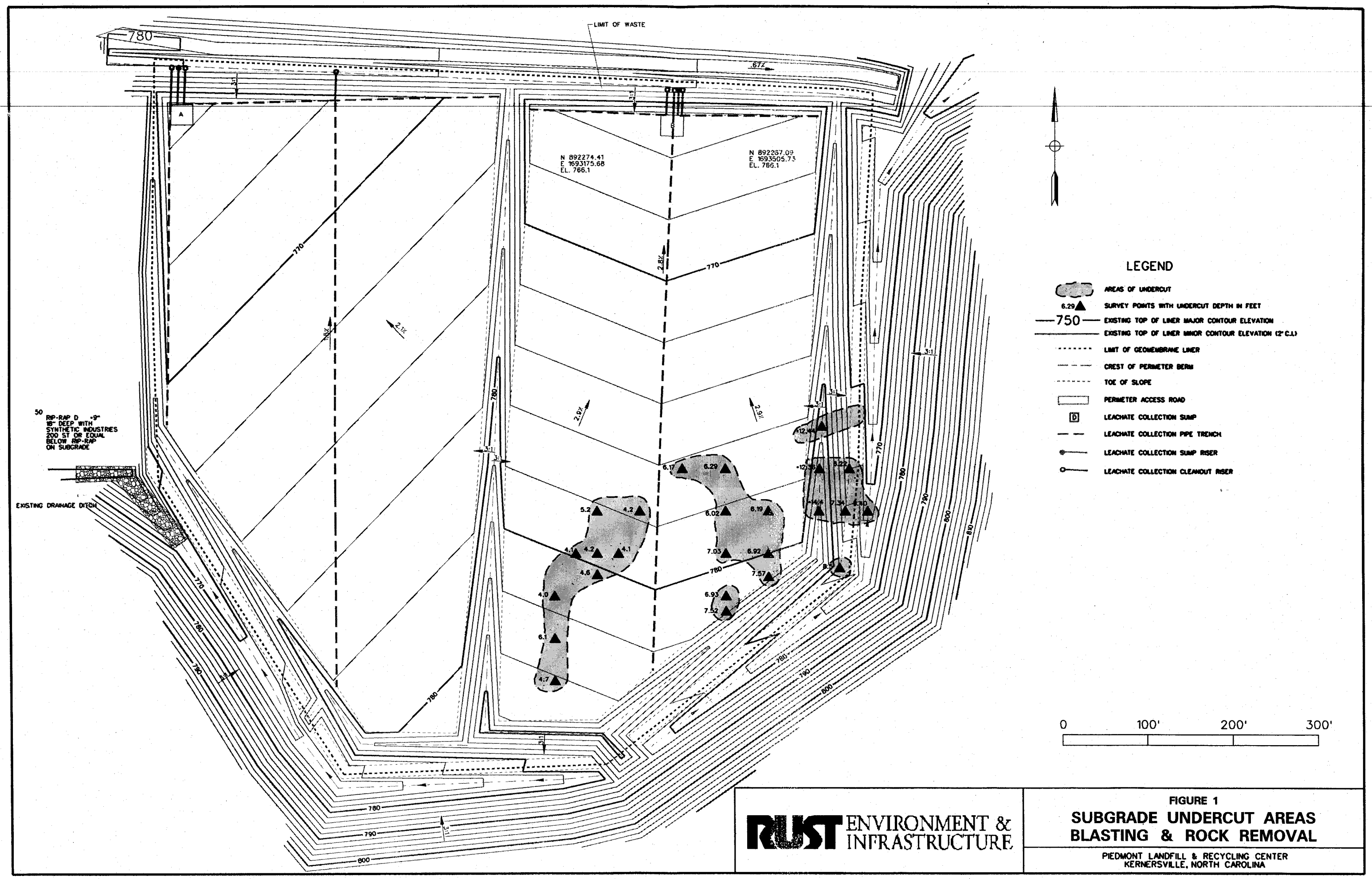
5.0 CERTIFICATION

Based on our professional judgement, our site visits and the information obtained from the contractor; rock blasting was kept to as few as blasts as possible, controlled blasting techniques were used to minimize blasting effects to underlying rock, the blasting had no apparent impact to the ground-water flow regime, and no geologic features were noted that would cause a change in our understanding of the ground-water flow pattern. The permit requirements as stipulated in DEHNR's letter of October 17, 1994 and the hard rock removal plan of July 29, 1994 have therefore been complied with during construction of Cell 1. This report represents the last item required by the permit with regard to rock removal.

RUST ENVIRONMENT & INFRASTRUCTURE

NORTH CAROLINA PROFESSIONAL SEAL 18840 ENGINEER PETER J. WALLS

Peter J. Walls, P.G., P.E.
Senior Geological Engineer



RUST ENVIRONMENT & INFRASTRUCTURE

FIGURE 1

SUBGRADE UNDERCUT AREAS BLASTING & ROCK REMOVAL

PIEDMONT LANDFILL & RECYCLING CENTER
KERNERSVILLE, NORTH CAROLINA

N:\87221\7221FIG1.DGN

APPENDIX A

STATE PERMIT LETTER

State of North Carolina
Department of Environment,
Health and Natural Resources
Division of Solid Waste Management

James B. Hunt, Jr., Governor
Jonathan B. Howes, Secretary
William L. Meyer, Director

DEHNR

October 17, 1994

Bill Lewis
9900 Freeman Road
Kernersville, N.C. 27284

RE: Rock Removal At The Piedmont Landfill And Recycling Center (Permit # 34-06)

Dear Mr. Lewis,

If rock removal is necessary at the Piedmont Landfill, the Solid Waste Section authorizes RUST Environmental and Infrastructure to proceed with rock removal according to the Hard Rock Removal Plan proposed in their letter of July 29, 1994. Efforts should be made to minimize the amount of blasting necessary and to minimize the effects of the blasting that is necessary.

Blast monitoring should be conducted as proposed in the Hard Rock Removal Plan. A full report of the blasting activities should be submitted to the Solid Waste Section within 30 days of the completion of the rock removal. The Licensed Blaster shall certify that the drill hole pattern, charge weights, and delays were selected in such a manner as to minimize the amount of energy which may impact the underlying rock. The Professional Engineer shall also certify that rock blasting was kept to a minimum and that controlled blasting techniques were used to minimize blasting effects to the underlying rock.

The report of the blasting activities shall also include a discussion by the Professional Geologist of the effect of the heavy ripping and blasting on the ground-water flow regime at the site. Additional subsurface investigation may be required to determine the effect of blasting or heavy ripping on the hydrogeology of the area. If modifications to the monitoring plan are necessary based on information gained during any additional subsurface investigation, a revised water quality monitoring plan shall be submitted to the Solid Waste Section Hydrogeologist for review.

P.O. Box 27687, Raleigh, North Carolina 27611-7687 Telephone 919-733-4996 FAX 919-715-3605
An Equal Opportunity Affirmative Action Employer 50% recycled/ 10% post-consumer paper

During and after excavation of the area and prior to backfilling with soil, the Professional Geologist shall evaluate the excavation for any evidence of structural features (fractures, dikes, pegmatites, etc.) that could influence ground-water flow. The report of the blasting activities shall also include a report of the excavation evaluation by the Professional Geologist and recommendations of any modifications that may be needed to the ground-water monitoring system based on this evaluation.

If you have any questions regarding this letter, please contact me at (919) 733-0692.

Sincerely,

Bobby Lutfy

Bobby Lutfy
Hydrogeologist
Solid Waste Section

cc: Sherri Hoyt
Brent Rockett
Peter Walls

APPENDIX B

HARD ROCK REMOVAL PLAN

RUST ENVIRONMENT & INFRASTRUCTURE

Formerly SEC Donohue

RUST Environment & Infrastructure Inc.
15 Brendan Way • Greenville, SC 29615
P.O. Box 24000 • Greenville, SC 29616
Tel. (803) 234-3000 • FAX (803) 234-3069

July 29, 1994

Mr. Bobby Lutfy
North Carolina Department of Environment, Health and Natural Resources
Solid Waste Section
401 Oberlin Road
Raleigh, NC 27605

Subject: Hard Rock Removal
Piedmont Landfill and Recycling Center
Kernersville, North Carolina
RUST Job 87221.700

Dear Mr. Lutfy:

The purpose of this letter is to address concerns that you have expressed regarding the apparent presence of bedrock above the proposed subgrade at the Piedmont Landfill in the new cell areas proposed for construction. The areas of concern are located near Golder Associates, Inc. piezometer location GP-1 and boring P-9. In this area, RUST E&I intends to remove the rock to an elevation four feet below subgrade in accordance with regulation .1624 (b) (4).

RUST E&I understands DEHNR is concerned about removing rock if blasting is required. We wish to alleviate this concern with the following discussion.

Bedrock Pinnacle at GP-1

As shown on the RUST E&I top of bedrock map (Figure 4-2 of the Report for the Design Hydrogeologic Investigation), the top of bedrock at the GP-1 location is shown to be at elevation 781. The subgrade at this location as shown on the subgrade figure (provided in our Response to DEHNR Comments dated June 15, 1994 for the Design Hydrogeologic Investigation) is at elevation 774.

RUST E&I is under the opinion that the bedrock above the current subgrade elevations in this area is limited and the rock, as indicated in the core logs, appears to be well broken. The boring log for Golder piezometer P1DD is included in Attachment A for reference. Piezometer P1DD was the deepest piezometer of the cluster that was installed at boring location GP-1. The rock coring log indicates that at least the top 12 feet (elevation 781 to 769) of what was designated as competent bedrock was highly fractured with RQD values

of 68.5% and 37.2% for the two core runs, respectively. At elevation 769, coring was discontinued and a roller-cone bit was used to complete the borehole. The log indicates that very hard rock was encountered from elevation 761 to the end of boring at elevation 754.

The presence of the highly fractured rock within at least the top 12 feet of what was designated as bedrock indicates that this material should be rippable. We therefore propose to overexcavate the rock by ripping and to backfill with suitable buffer soils in order to achieve the required four-foot buffer zone.

Rock Shelf

During the site visit on July 15, 1994, a rock shelf, which was observed in borings P-9 and GP-1, was exposed on the south side of the ridge. This shelf is located along the boundaries of Cell 1 Subcells 2 and 3. The softer material had been excavated from underneath the shelf as far as practical so that the shelf rock will loosen and drop. At present the rock is exposed as shown on the figure attached to a letter dated July 22, 1994. This letter was sent to you from Mr. Ed Gibson addressing the rock quantities. In order to efficiently remove this rock material so that excavation can continue, controlled blasting techniques are proposed to be employed. It is probable that the entire depth is not rock material, based on boring logs P-9 and GP-1.

Rock Removal Approach

If bedrock is encountered at subgrade level, then a similar approach of undercutting and replacing with suitable buffer soils is planned for these locations. Ripping will be employed where practical. If blasting is required to remove the rock, then the following procedures will be implemented.

Blasting Plan

Initially the contractor would excavate the soil from around the pinnacle. The area will be lowered enough so that adequate buffer can be placed below the designed subgrade. The rock which remains freestanding will be removed by blasting.

Controlled blasting techniques will be used to minimize blasting effects to the underlying rock. This is done by the licensed blaster selecting the drill hole pattern, charge weights, and delays for the explosives to reduce the amount of energy which may impact the underlying rock. Minimal energy will be used during the blast(s).

A blast vibration monitoring device (seismograph) will be placed in the close proximity to the pinnacle on another rock mass so that actual ground responses to the blast can be monitored. The maximum peak particle velocity allowed at the monitoring location will be 2 inches per second.

Loosely placed soil may be backfilled around the rock so that some of the blast energy may

be absorbed by the soil. Blasting mats will be used to minimize the hazard of flying rock fragments.

An appropriate soil buffer (a minimum of 4 feet) will be compacted back into this area until subgrade elevations are reached.

In support of this controlled blasting, the United States Bureau of Mines (USBM) has studied the extent of cracking in rock adjacent to "unrelieved" blast holes. Radial cracking does not extend more than 20 to 23 times the hole radii for hard rock. For a typical 2-1/4 inch diameter hole, this would translate into a radial damage of no more than 2.2 feet. Because the blast holes will not be confined, the actual radial damage should be less than 1 foot.

The explosive energy takes the path of least resistance, which is up and out in the case of the rock shelf. Because of this, the underlying rock will have negligible cracking since most of the energy generated by the blast will be dissipated upwardly rather than into the rock. The radial damage will also be into the rock which is to be removed.

In addition, ground vibrations required to crack in-situ rock are in excess of a peak particle velocity of 30 inches per second. This is much higher than the velocity levels that are anticipated to be experienced within the current landfill area (2 inches per second) during the blasting. The seismograph will measure actual velocities generated from this controlled blasting.

This blasting plan would protect the integrity of the underlying rock. A monitoring instrument will be used for each blast to verify that destructive blast velocities do not occur outside of the rock removal areas. We believe that this plan provides the safe-guards to protect your concerns for the underlying rock, and thus we seek approval for this plan.

Other Considerations

The landfill consists of a Subtitle D composite compacted clay/geosynthetic lining system. In order to design and construct this system effectively, grade uniformity is essential. In the case of the Piedmont Landfill and considering the groundwater table, the base grades were developed to impact the smallest area of bedrock possible while maintaining grade uniformity for geosynthetic placement. At the design stage, the area around GP-1 was expected to be impacted.

The rock shelf is situated at the high end of Cell 1 Subcells 2 and 3. The top of this shelf is approximately 15 feet above base grade levels. Development and construction above this shelf would be difficult. As currently designed, leachate is expected to flow away from these areas and is not anticipated to amount to appreciable levels nor pond in these locations. With the construction of a Subtitle D liner and extensive construction quality assurance program, the potential for leachate releases in these areas is minimal. Liner construction

over overexcavated bedrock is not expected to have a negative impact on the environment.

Conclusion

Minimal rock removal is anticipated in the undeveloped areas of the landfill. If bedrock is encountered at the subgrade level, this material will be overexcavated in accordance with regulation .1624 (b) (4).

If hard rock material is encountered which cannot be ripped, controlled blasting techniques will be employed in accordance with the above blasting plan.

In conclusion, controlled blasting will not compromise the integrity of the underlying geologic and hydrogeologic features at the site. In addition, considering the already fractured nature of the underlying material, positioning of the rock shelf in relation to the landfill base grade configuration, construction of a Subtitle D liner and extensive construction quality assurance, it is concluded that rock removal as discussed above will not impact a change to ground water and will not adversely effect human health and the environment.

If you should have any questions, do not hesitate to call either Tom Yanoschak at (803)234-3042 or myself at (803)234-2261.

Sincerely,

RUST ENVIRONMENT AND INFRASTRUCTURE

Peter J. Walls, PG, PE
Senior Geological Engineer

c. Ed Gibson - Piedmont
Jeff Reed - RUST E&I

ATTACHMENT A

BORING LOG FOR PIEZOMETER P1DD

Golder Associates

Field Boring Log

DEPTH HOLE 87ft	JOB NO. 863-34077	PROJECT WMT/Hydro/Hermersville				BORING NO. P:[illegible]	
DEPTH SOIL DRILL	GA INSP. Greg Richardson	DRILLING METHOD Hollow stem Augers, Roller Cone Boring				SHEET	OF
DEPTH ROCK CORE	WEATHER PC	DRILLING COMPANY ATEC				SURFACE ELEV.	
NO. DIST. SA. / UD. SA.	TEMP. 75-95	DRILL RIG B61		DRILLER Dens		DATUM	
DEPTH WL.	HRS. PROD.	WT. SAMPLER HAMMER 140 lbs		DROP 30"		STARTED / (TIME / DATE)	
TIME WL.	HRS. DELAYED	WT. CASING HAMMER		DROP		COMPLETED /	

SAMPLE TYPES

A.S.	AUGER SAMPLE	BL	BLACK
C.S.	CHUNK SAMPLE	BR	BROWN
D.O.	DRIVE OPEN	C	COARSE
D.S.	DENISON SAMPLE	CA	CASING
P.S.	PITCHER SAMPLE	CL	CLAY
R.C.	ROCK CORE	CLY	CLAYEY
S.T.	SLOTTED TUBE	F	FINE
T.O.	THIN-WALLED, OPEN	FRAG	FRAGMENTS
T.P.	THIN-WALLED, PISTON	GL	GRAVEL
W.S.	WASH SAMPLE	LYD	LAYERED
		U	LITTLE

ABBREVIATIONS

M	MEDIUM	SA	SAMPLE
MIC	MICACEOUS	SAT	SATURATED
MOT	MOTTLED	SD	SAND
NP	NON-PLASTIC	SI	SILT
OG	ORANGE	SIY	SILTY
ORG	ORGANIC	SM	SOME
PH	PRESSURE HYDRAULIC	TR	TRACE
PM	PRESSURE MANUAL	WL	WATER LEVEL
R	RED	WH	WEIGHT OF HAMMER
RES	RESIDUAL	Y	YELLOW
RX	ROCK		

SOIL DESCRIPTION - RANGE OF PROPORTION

"TRACE" - 0-5% "SOME" - 12-30%
"LITTLE" - 5-12% "AND" - 30-50%

RELATIVE DENSITY		BLOWS	CONSISTENCY		FINGER PRESSURE
VERY LOOSE	VLS	0-4	VERY SOFT	VS	EXTRUDES
LOOSE	LS	4-10	SOFT	S	MOLDS EASILY
COMPACT	CP	10-30	FIRM	FM	MOLDS
DENSE	DN	30-50	STIFF	ST	THUMBNAIL INDENTS
VERY DENSE	VDN	50	VERY STIFF	VST	THUMBNAIL INDENT
			HARD	H	RESISTS THUMBNAIL

ELEV. / DEPTH	DESCRIPTION	BLOWS / FT		SAMPLES NO.	TYPE	HAMM. BLOWS PER 6 IN (FORCE)	REC / ATT	DEPTH
	Tan Clayey Silt, Some Sand Mic. FtoC Sand, Firm to Stiff, Dry to moist (unit 3)	1/5		1A, 1B	Do	7-15-16	22/24	0-2
5	839.47	6/8		2A	Do	23 35 33 (68 blows)	17/24	3.5-5.5
10	Multi-colored Brown Mic. FtoC Sand, Some Silt Dense to V. Dense, Dry to moist (unit 4)	14/9		3A	Do	50-67-81	19/24	8.5-10.5
15		>100		4A	Do	100/4"	5/24	13.5-15.5
20		>100		5A	Do	35 100/4"	12/24	18.5-20.5
25	26							
30	815.47							
35	Alternating Layers of Rock & Partially Weathered Rock (unit 7)							
40								
45								
50								
55								
60	60							
65	787.47							
70	Competent Rock (see Rock Core Logs) (unit 8)							
75								
80								
85								
90	'87 End of Boring							

SAMPLE DESCRIPTION AND BORING NOTES

4/21/87, 3:45 PM, Hollow stem Auger 34.5 ID
(1A) Br. Silty Clay Mixed Micaceous F to C Sand, [illegible]
V St. ff, moist, Plant Material [illegible]
(1B) Tan Micaceous F to C Sand, [illegible] Trace [illegible]
Dry to Moist, Hard, Tiguous Mottles
(2A) Dk Br. Mica F to C Sand, [illegible], trace [illegible]
Moist, Hard
(3A) Tan Mic. F to C Sand, [illegible] to Some Silt
mixed w/ white (weathered Rock, moist and
(4A) Greenish Brown Mic. F to C Sand, [illegible] Some
Silt (Black specks) Hard, moist
(5A) 4" Same as sample 4A no Sample [illegible]
8" White [illegible] F to C Sand [illegible] (weathered
Rock) [illegible] Fragments of Rock [illegible]
V Dense, moist
4/21/87, 5:10 stop Auger, 22ft BGS
4/22/87, 7:50 started Roller Cone
4/22/87, 8:30 stopped Roller Cone 24ft [illegible]
Spoon unable to obtain sample [illegible]
4/22/87, 9:30 started Boring
4/22/87, 9:54 stopped Boring 25.5ft [illegible]
4/22/87 10:15 started Roller Cone [illegible]
Roller Cone to depth of 34ft
27-28 Hard, 32-34 Hard
4/22/87, 3:30 started Coring
P1D #1st Run 5'9" (34'7" to 40'4"), Return 2.5'
#2nd Run 5' (40'4" to 45'4"), Return [illegible]
#3rd Run 5' (45'4" to 50'4"), Return 0
4/23/87 set casing to 49.5' unable to continue
due to lack of Equipment need to [illegible]
a smaller casing to continue sampling

P1DD
#1 Run 59'-67 White + Black
Granitic Gneiss
#2 Run 67'-72' White + Black
Granitic Gneiss

PROJECT WMI / Hydro / Kernersville N.C. JOB NO. 863-3407.4 BORING NO. P100 DATE 5/29/87 SHEET 1 OF 1

BORING BEGAN 11:36 5/29/87 BORING COMPLETED CORE HOLE LOCATION

METHOD OF CORING DRILLING FLUID GR. ELEV. WEATHER Hot Humid

CASING USED 60' SIZE 3" None INSPECT RC OPERAT. Dave S. WATER LEVEL, TIME, DATE

DEPTH (FT.)	RUN NUMBER	RECOVERY	RQD	DISCONTINUITIES: DEPTH	TYPE	INFILLING	ANGLE W/AXIS	FREQUENCY	LITHOLOGY	COLOR	TEXTURE	WEATHERING	DESCRIPTION	POINT LOAD TEST	HARDNESS	SAMPLES-LABORATORY TESTS	DRILLING RATE MIN./FT.
59				.22	M								(Water loss 56-57) 58.5 ft				
				.7	JSIR	C	20										
60				.9	M							MW	White & Brown, Black Granitic Gneiss				
				1	FISR	A,S	30										
				1.1	M												
61				1.8	FISR	A,S	30										
				2.25	M												
62	1	5.8/8	3.7/5.4	2.0	M			15/5.4		BW	C	SW					
				2.3	M												
		67.5%	42.5%	2.4	M												
63				2.6	M			2.8					Loose water				
				4.4	M												
				4.55	M												
64				4.95	FIPR	A,S	0										
				5.2	M												
65													Last circulation				
66																	
67				.6	M												
				.75	M												
68				1.1	FIPR	C	40										
				1.75	M			13/4.3									
69				1.9	M												
	2	4.3/5	1.6/4.3	2.15	PR					BW	C	MW					
				2.3	M			3.0									
70		86%	37.2%	3.0	M								Cobble water				
				3.25	M												
				3.6	M												
71				3.7	M												
				3.8	M												
				4.05	M												
72													Changed to Rotor Core				
73																4 min	
74																6.5 min	
75													Last water				
76																15 min	
77													50 ft				
78																	
79													30 ft			6 min	
80													50 ft				
81													Drilling water turns brown with blender rock		VH		
82													Check				

NOTES: End of Boring 87 ft From 80 down the Rock was very hard and there was only to cracks 82 & 84 ft
The Depth numbers are measurements from the top of the sample.

SCALE: 1 DIVISION = FEET

DATE 5/31/87 LOGGED BY RC

Golder Associates

APPENDIX C

BLASTING CERTIFICATION

PALMETTO ROCK SERVICES, INC.
Drilling and Blasting Contractor
P.O. Box 3273 • Spartanburg, South Carolina 29304
(803) 439-4399 • Fax (803) 439-4122

March 10, 1995

Mr. Bob Wilson
Rust Environmental and Infrastructure
c/o Piedmont Landfill and Recycling Plant
9900 Freeman Road
Kernersville, North Carolina 27284

Re: Rock Blasting
Piedmont Landfill and Recycling Center

Dear Bob:

Palmetto Rock Services, Inc. has just concluded rock drilling and blasting activities for Morgan Corp. at the Piedmont Landfill and Recycling Center. Drill patterns varied from 4 by 4 on the shallowest holes (four feet deep) to 10 by 10 on the deeper holes (up to 30 feet deep). All shots were detonated with non-electric Handidets. Each handidet cap is designed for a 25 ms delay. Deep holes were deck loaded with 2 handidet caps and rows were connected with HTD-17 surface delays. This was done to minimize the pounds of explosives per delay.

In summary, our drill patterns and delay sequences for the shots were designed to minimize the likelihood of any fracturing of the underlying bedrock. Please call if you have any questions.

Sincerely,

Hase B. Broom

Hase B. Broom
Project Manager
S.C. Blaster's
License # LR88-0062-95

HBB/amv

APPENDIX D

BLAST REPORTS

3.270.00 4ds

PALMETTO ROCK SERVICES, INC. Piedmont [illegible] BLAST REPORT

Blasting permit number: NA Date 4-29-94

Company (Permitee) Palmetto Rock for Morgan Blast No. 1

Location of Blast: 275 from Scale House

Time of Blast: 11:00 am

Name of Blaster: Tim Crenshaw Blasters License # 0845

Direction and distance in feet from blast to nearest gas lines, power tramsmission lines, public roads, waterways, or structures. 250' to Scale House

Weather data: clear Temperature: 85°F

Wind direction and speed: Calm Cloud cover: Clear

Type of Material Blasted: weathered granite Sand Stone

SHOT DATA

		EXPLOSIVES		
No. Holes	106	TYPE	SIZE	WEIGHT (LBS.)
Hole Diameter	3"	Superfrac 6000	2x8	220
Hole Depth	17'	Pellite-ANFO	50 lbs	3100
Sub-Drilling	0			
Burden	7			
Spacing	7			
Type & Length-Stemming	6 of cuttings			
		Total Weight (lbs) Explosives Shot		3320

BLASTING CAPS

ELECTRIC

Brand & Type: _____

No. Delays Used: _____

No. Delays: 0 ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 ___ 8 ___ 9 ___ 10 ___ 11 ___ 12 ___ 13 ___ 14 ___ 15 ___ 16 ___ 17 ___ 18 ___ 19 ___ 20 ___

Total Electric Caps Used: _____

NON-ELECTRIC

Brand & Type: 24' Handi-Dot TCT

In Hole Caps: Delay: 25ms No. Used: 106

Surface Delay: Delay: 500ms No. Used: 106

[illegible] Delay: 42ms No. Used: 10

1 500' Roll Lead in Line

Total Non-Electric Caps Used: 116

Maximum weight of explosive detonated within any 8 - MS period: 35 lb.

Maximum number of holes detonated within any 8 - MS period: 1

Method of firing and type of circuit: nonel circuit nonel starter Mushroom shooter

Were mats or other protection used? ☐ Yes ☑ No If yes, describe: _____

Was seismograph used? ☑ Yes ☐ No

Seismic data: T ____, V 0.13, L ____, db 111

Location of seismograph: Scale House Canteen

Distance from blast: 250' feet

Name of person taking seismograph reading: Rob

Name of person and firm analyzing the seismograph record: Rob from Vibra Tech

Signed: Timothy D. Crenshaw Blaster

(over)

Indicate **NORTH** by arrow

Describe decking if any: 7' x 7' x 17' x 106 holes 3,270.00 yds

Describe in detail any misfire(s):

0	1426	0	1303	0	1186	0	1069	0	952	0	835	0	718	0	601	0	484	0	367	0	250		
0	1395	0	1278	0	1161	0	1044	0	927	0	810	0	693	0	576	0	459	0	342	0	225		
0	1370	0	1253	0	1136	0	1019	0	902	0	785	0	668	0	551	0	434	0	317	0	200		
0	1345	0	1228	0	1111	0	994	0	877	0	760	0	643	0	526	0	409	0	292	0	175		
0	1320	0	1203	0	1086	0	969	0	852	0	735	0	618	0	501	0	384	0	267	0	150		
0	1295	0	1178	0	1061	0	944	0	827	0	710	0	593	0	476	0	359	0	242	0	125		
	*42		*42		*42		*42		*42														
0	1270	0	1153	0	1036	0	919	0	802	0	685	0	568	0	451	0	334	0	217	0	100		
0	1245	0	1128	0	1011	0	894	0	777	0	660	0	543	0	426	0	309	0	192	0	75		
										0	635	0	518	0	401	0	284	0	167	0	50		
											*42		*42		*42		*42		*42				
										0	610	0	493	0	376	0	259	0	142	X	25		
										0	585	0	468	0	351	0	234	0	117	0	0		

Blasters Initials TC

Kernersville N.C. 4,474.00 yd.

PALMETTO ROCK SERVICES, INC. Piedmont Land Fill BLAST REPORT

Blasting permit number: NA Date 5-3-94

Company (Permitee) Palmetto Rock For Morgan Corp Blast No. 2

Location of Blast: 250 ft NW of Scale House

Time of Blast: 11:00

Name of Blaster: Travis Bryson Blasters License # 0336

Direction and distance in feet from blast to nearest gas lines, power tramsmission lines, public roads, waterways, or structures.

250' SE To Scale House

Weather data: P Cloudy Temperature: 65°

Wind direction and speed: SE - 5mph Cloud cover: High

Type of Material Blasted: Sand Stone

SHOT DATA

		EXPLOSIVES		
No. Holes	145	TYPE	SIZE	WEIGHT (LBS.)
Hole Diameter	3"	Superfrac 6000	2X8	275
Hole Depth	8' To 22'	ANFO - Pellite	50	3650
Sub-Drilling	0'			
Burden	7'			
Spacing	7'			
Type & Length-Stemming	Dirt - 5'			
OVER BURDEN - 0' Ave depth 17 FT.		Total Weight (lbs) Explosives Shot		3925

BLASTING CAPS

ELECTRIC

Brand & Type:

No. Delays Used:

No. Delays: 0 ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 ___ 8 ___ 9 ___ 10 ___ 11 ___ 12 ___ 13 ___ 14 ___ 15 ___ 16 ___ 17 ___ 18 ___ 19 ___ 20 ___

Total Electric Caps Used: 0

NON-ELECTRIC

Brand & Type: ICI - Handy Det 16' & 24'

In Hole Caps: Delay: 500 No. Used: 16'-64 | 24'-145

Surface Delay: Delay: 25 No. Used: 16'-64 | 24'-145

" " Delay: 17 No. Used: 10

NONEL LEAD Line - 1

Total Non-Electric Caps Used: 220

Maximum weight of explosive detonated within any 8 - MS period: 24.8 lb.

Maximum number of holes detonated within any 8 - MS period: 1

Method of firing and type of circuit: Mushroom Start - NONEL Circuit

Were mats or other protection used? ☐ Yes ☑ No If yes, describe:

Was seismograph used? ☑ Yes ☐ No

Seismic data: T 0.04, V 0.10, L 0.13, db 115

Location of seismograph: IN Scale House Canteen

Distance from blast: 250' - SE feet

Name of person taking seismograph reading: Tim Crenshaw

Name of person and firm analyzing the seismograph record: Vibra Tech Eng

Signed: Travis Bryson Blaster

Indicate **NORTH** by arrow

Describe decking if any: Build up To 10' with ANFO - 2' of Dirt To 8'
Build up To 5' with ANFO - Decked To Stay Within Safe Distance

Describe in detail any misfire(s): 7'x7' x17' x 145 holes 4,474.00 yds

						385	477	569	661	753	845
						0	0	0	0	0	0
						410	502	594	686	778	870
						0	0	0	0	0	0
						435	527	619	711	803	895
						0	0	0	0	0	0
0	92	184	276	368	460	552	644	736	828	920	
0	0	0	0	0	0	0	0	0	0	0	
25	117	209	301	393	485	577	669	761	853	945	
0	0	0	0	0	0	0	0	0	0	0	
50	142	234	326	418	510	602	694	786	878	970	
0	0	0	0	0	0	0	0	0	0	0	
75	167	259	351	443	535	627	719	811	903	995	
0	0	0	0	0	0	0	0	0	0	0	
100	192	284	376	468	560	652 677	744 769	836 861	928 953	1020 1045	
0	0	0	0	0	0	0	0	0	0	0	
125	217	309	401	493	585	702 727	794 819	886 911	978 1003	1070 1095	
0	0	0	0	0	0	0	0	0	0	0	
150	242 267	334 359	426 451	518 543	610 635	752 777	844 869	936 961	1028 1053	1120 1145	
0	0	0	0	0	0	0	0	0	0	0	
175 200	292 317	384 409	476 501	568 593	660 685	802 827	894 919	986 1011	1078 1103	1170 1195	
0	0	0	0	0	0	0	0	0	0	0	
225 250	342 367	434 459	526 551	618 643	710 735	852 877	944 969	1036 1061	1128 1153	1220 1245	
0	0	0	0	0	0	0	0	0	0	0	
275 300	392 417	484 509	576 601	668 693	760 785	902 927	994 1019	1086 1111	1178 1203	1270 1295	
0	0	0	0	0	0	0	0	0	0	0	
325 350	442 467	534 559	626 651	718 743	810 835	952 977	1044 1069	1136 1161	1228 1253	1320 1345	
0	0	0	0	0	0	0	0	0	0	0	

Blasters Initials T.B.

3,920.00 yds

PALMETTO ROCK SERVICES, INC. Kershaw, S.C. BLAST REPORT

Blasting permit number: N/A Date 5-9-94

Company (Permitee) Palmetto Rock for Morgan Blast No. 3

Location of Blast: 225' North west of Scale House

Time of Blast: 2:00

Name of Blaster: Tim Crenshaw Blasters License # 0245

Direction and distance in feet from blast to nearest gas lines, power tramsmission lines, public roads, waterways, or structures.

225' south east to scale House

Weather data: Clear Temperature: 75°F

Wind direction and speed: 5mph out of SW Cloud cover: clear

Type of Material Blasted: granite

SHOT DATA

		EXPLOSIVES		
No. Holes	135	TYPE	SIZE	WEIGHT (LBS.)
Hole Diameter	3"	SuperFrac 6000	2x8	220
Hole Depth	8'-24'	Pellite ANFO	50lbs bags	3300
Sub-Drilling	0'			
Burden	7'			
Spacing	7'			
Type & Length-Stemming	6' crush			
Overburden D: 16 FT Ave depth		Total Weight (lbs) Explosives Shot		3520

BLASTING CAPS

ELECTRIC

Brand & Type:

No. Delays Used:

No. Delays: 0 ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 ___ 8 ___ 9 ___ 10 ___ 11 ___ 12 ___ 13 ___ 14 ___ 15 ___ 16 ___ 17 ___ 18 ___ 19 ___ 20 ___

Total Electric Caps Used: 0

NON-ELECTRIC

Brand & Type: ICI 24'/16' Handi Det

In Hole Caps: Delay: 25 ms No. Used: 16'-100/29'-1

Surface Delay: Delay: 500 ms No. Used: 16'-100/29'-12

Delay: 17 ms No. Used: 9

1-500' lead in line nonel

Total Non-Electric Caps Used: 229

Maximum weight of explosive detonated within any 8 - MS period: 20 lb.

Maximum number of holes detonated within any 8 - MS period: 1

Method of firing and type of circuit: nonel circuit mushroom shooter

Were mats or other protection used? ☐ Yes ☑ No If yes, describe:

Was seismograph used? ☑ Yes ☐ No

Seismic data: T 0.13, V 0.12, L 0.11, db 115

Location of seismograph: Scale house Cartoon

Distance from blast: 225' feet

Name of person taking seismograph reading: Tim Crenshaw

Name of person and firm analyzing the seismograph record: Vibra Tech

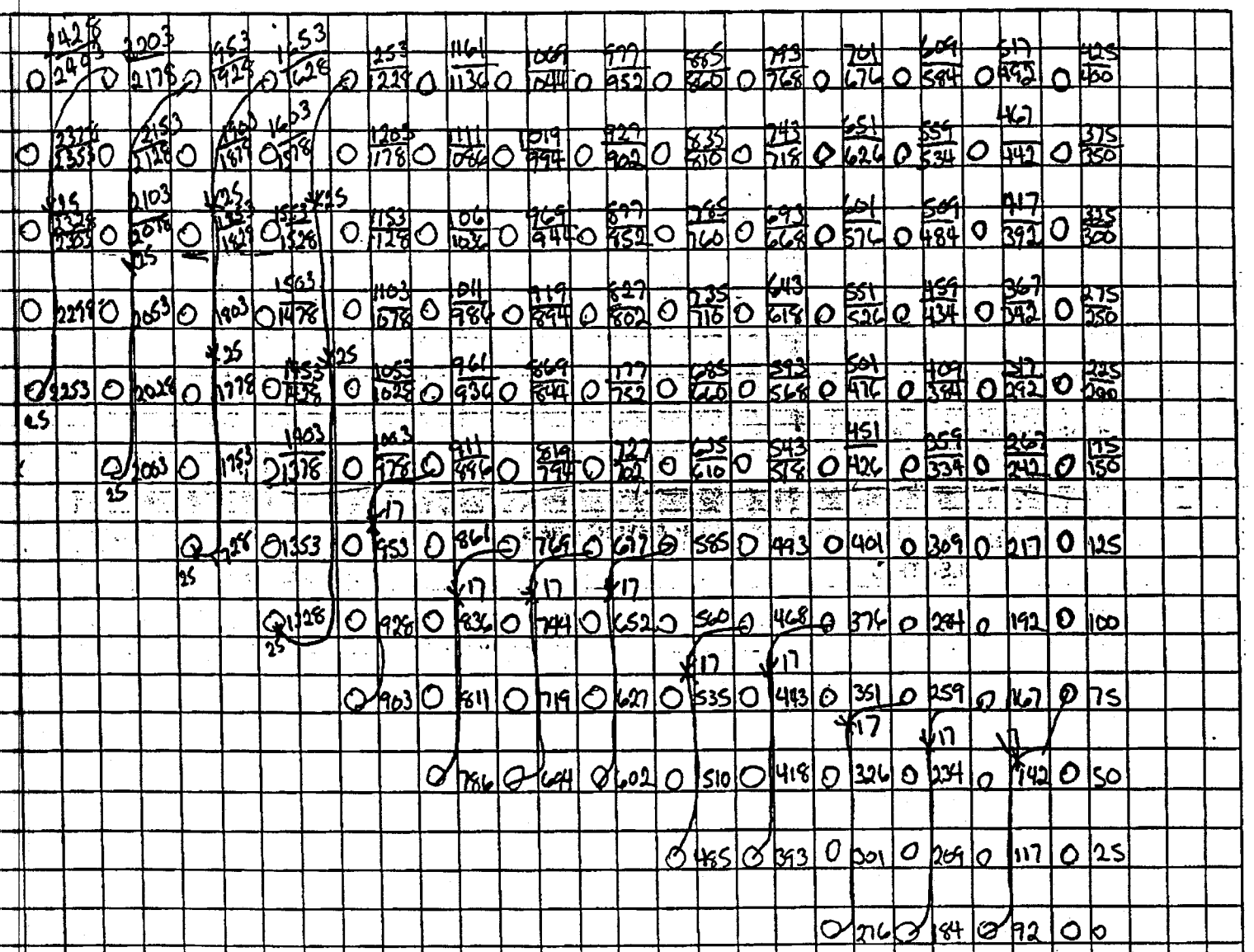
Signed: Timothy D. Crenshaw Blaster

(over)

Indicate **NORTH** by arrow

Describe decking if any: Decked deeper holes to keep scale [illegible]
Example: Deeper holes 24' - loaded 24' to 16' stemed 2' / loaded 4' to 6'

Describe in detail any misfire(s): 7' x 7' x 16' x 135 holes



Blasters Initials TC

ICI Explosives USA Inc.

BLASTING REPORT

Consumer Palmetto Rock, Operation Waste Management, Piedmont Landfill

Address Spartanburgh, SC., Job address Freeman Rd.,

Delivery ticket # 23430, Purchase order # 7907,

BLAST DATA: Shot number 04, Date 10-21-94, Time 11:24 Am.,

No. Holes 105, Diameter 3" in., Depth 12'-22' Avg 16' ft.

Burden 8 ft., Spacing 8 ft., Subdrilling NA ft., Stemming depth 5-7' ft.

Material used to stem cuttings, Type of shot Production,

Bench No. NA, Specific blast location -200 FT West of Scale House,

Material being blasted Decomposed Gniess, S.G. or Tons yd³ 2.18 - 2.6,

Blasters name Robert A. Star, Signature [signature],

Blasters license No. LLR 53, State SC (South Carolina,

Explosives used:

Pellite (A.N.F.O.)	3,000	lbs.
Powerditch ~~1000~~ 500 2"x16"	55	lbs.
Superfrac 6000 2"x8"	155	lbs.
		lbs.
		lbs.
		lbs.

Total weight of expl. 3,210 lbs.

Average load per delay 24 lbs (per deck) lbs.

Estimated tons or yds³ 3,982 cubic yards,

Powder factor — tons/lb .806 lbs./yd³ Estimated cost per _____ ton ____ yd³

Firing information:

E.B. Detonators Brand _____,

Non-electric Dets. Brand ICI Exel Handidets,

Blasting device (check one)

Conventional NA, Sequential NA,

Non-electric firing device Shot Shell Detonator,

Identification NA,

Type of series Row Shot,

No. of series 8, Interval 92 ms.

Delay connectors 25ms - 42ms,

Maximum weight of explosives detonated within any 8 millisecond period 24,

Maximum number of holes or decks detonated within any 8 millisecond period 01,

Nearest building*: Distance 200 ft, scales + office ft. Direction SE,

*Dwelling, School, Church, Hospital or commercial building, etc. (other than consumer's bldgs.)

Weather Sunny, Temp. 67°, Wind direction from SW, Velocity 7-10 mph

Scaled distance 40.89, Were mats or other protection used _____ yes ✓ no

Was seismograph used ✓ yes _____ no, Readings P.P.V. less than .10 ins., P.O.P. less than 120 db

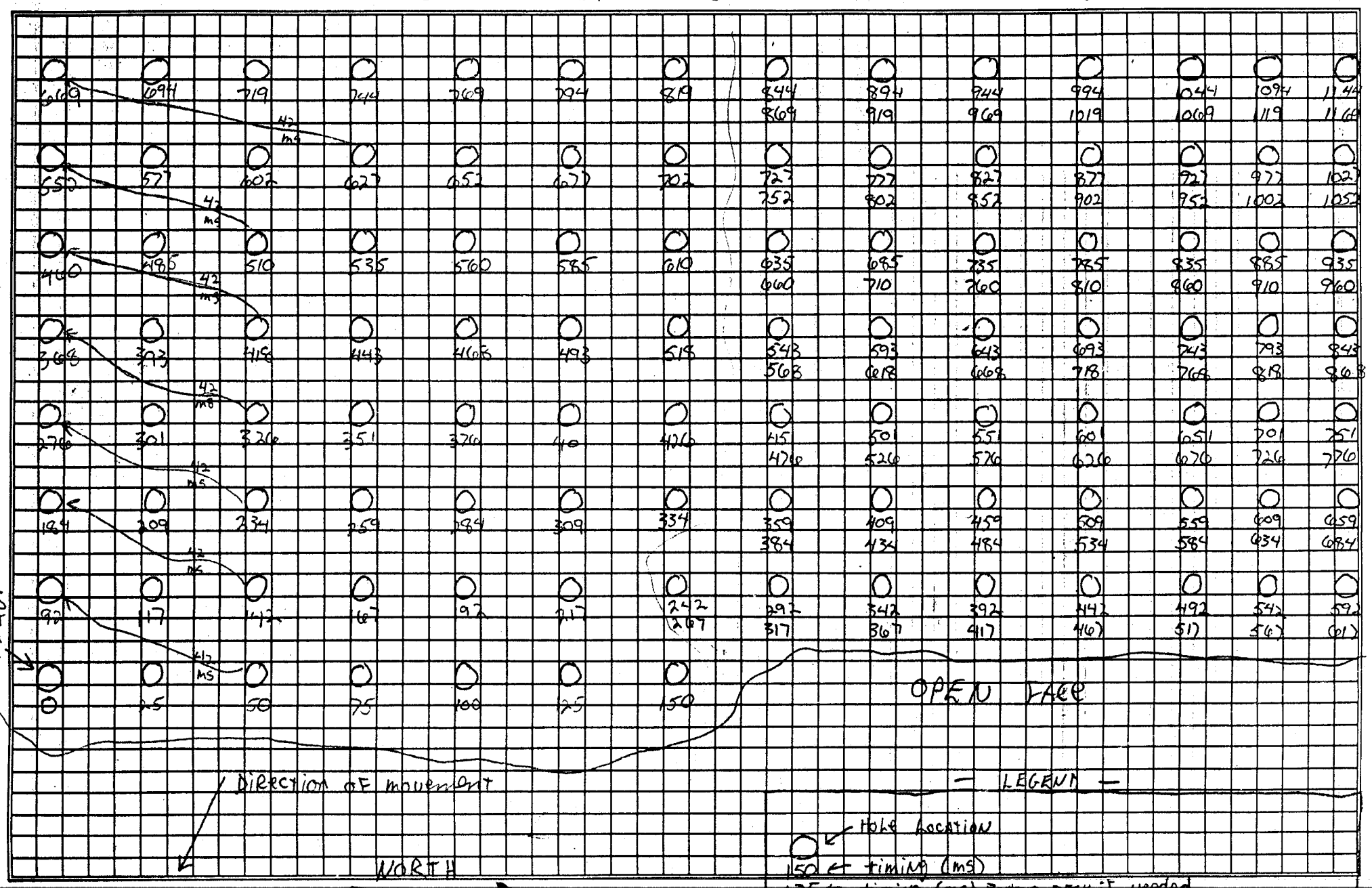
Special conditions _____

ICI Explosives USA Inc.

Blaster's Shot Layout & Product Order Sheet

Location PALMETTO ROCK, (Piedmont LANDFILL)
Date 10-21-94
Time 11:24 AM
Representative ROBERT A. STAR

No. of Holes 105
Drill Depth 8'-22'
Drill Pattern 8'X8'
Stemming 5-7 FT.



ICI Explosives USA Inc.

BLASTING REPORT

Consumer PALMETTO ROCK, Operation WASTE MANAGEMENT, Piedmont LANDFILL

Address SPARTANBURGH SC., Job address FREEMAN RD.,

Delivery ticket # 23450, Purchase order # 7907,

BLAST DATA: Shot number 05, Date 10-21-94, Time 4:00PM,

No. Holes 113, Diameter 3" in., Depth 4-10 ~~Avg. 7~~ ft.

Burden 7 ft., Spacing 7 ft., Subdrilling NA ft., Stemming depth 5 ft.

Material used to stem Cuttings, Type of shot Production,

Bench No. NA, Specific blast location 600 FT WEST OF Scale House,

Material being blasted Decomposed GNIESS, S.G. or Tons yd³ 2.18 - 2.6,

Blasters name Robert A. STAR, Signature [signature],

Blasters license No. LLR 53, State SC (SOUTH CAROLINA),

Explosives used:

Pellite (A.N.F.O)	700	lbs.
Powerditch 500 2"X16"	0	lbs.
Superfrac 6000 2"X8"	113	lbs.
		lbs.
		lbs.
		lbs.

Total weight of expl. 813 lbs.

Average load per delay 7.19 lbs.

Estimated tons or yds³ 1,435 yds-[redacted],

Powder factor _____ tons/lb .774 lbs./yd³ Estimated cost per _____ ton ____ yd³

Firing information:

E.B. Detonators Brand NA,

Non-electric Dets. Brand ICI EXEL HANDIDETS,

Blasting device (check one)

Conventional NA, Sequential NA,

Non-electric firing device SHOT SHELL DETONATOR,

Identification NA,

Type of series ROW SHOT,

No. of series _____, Interval 67-92 ms.

Delay connectors 42ms - 17ms, 25ms,

Maximum weight of explosives detonated within any 8 millisecond period 19,

Maximum number of holes or decks detonated within any 8 millisecond period 02,

Nearest building*: Distance 600 FT, SCALES-OFFICE ft. Direction SE,

*Dwelling, School, Church, Hospital or commercial building, etc. (other than consumer's bldgs.)

Weather SUNNY, CALM, Temp. 72°, Wind direction from SW, Velocity 7-10 mph

Scaled distance 137.9, Were mats or other protection used _____ yes ✓ no

Was seismograph used ✓ yes _____ no, Readings P.P.V. .42 ins., P.O.P. 123 db

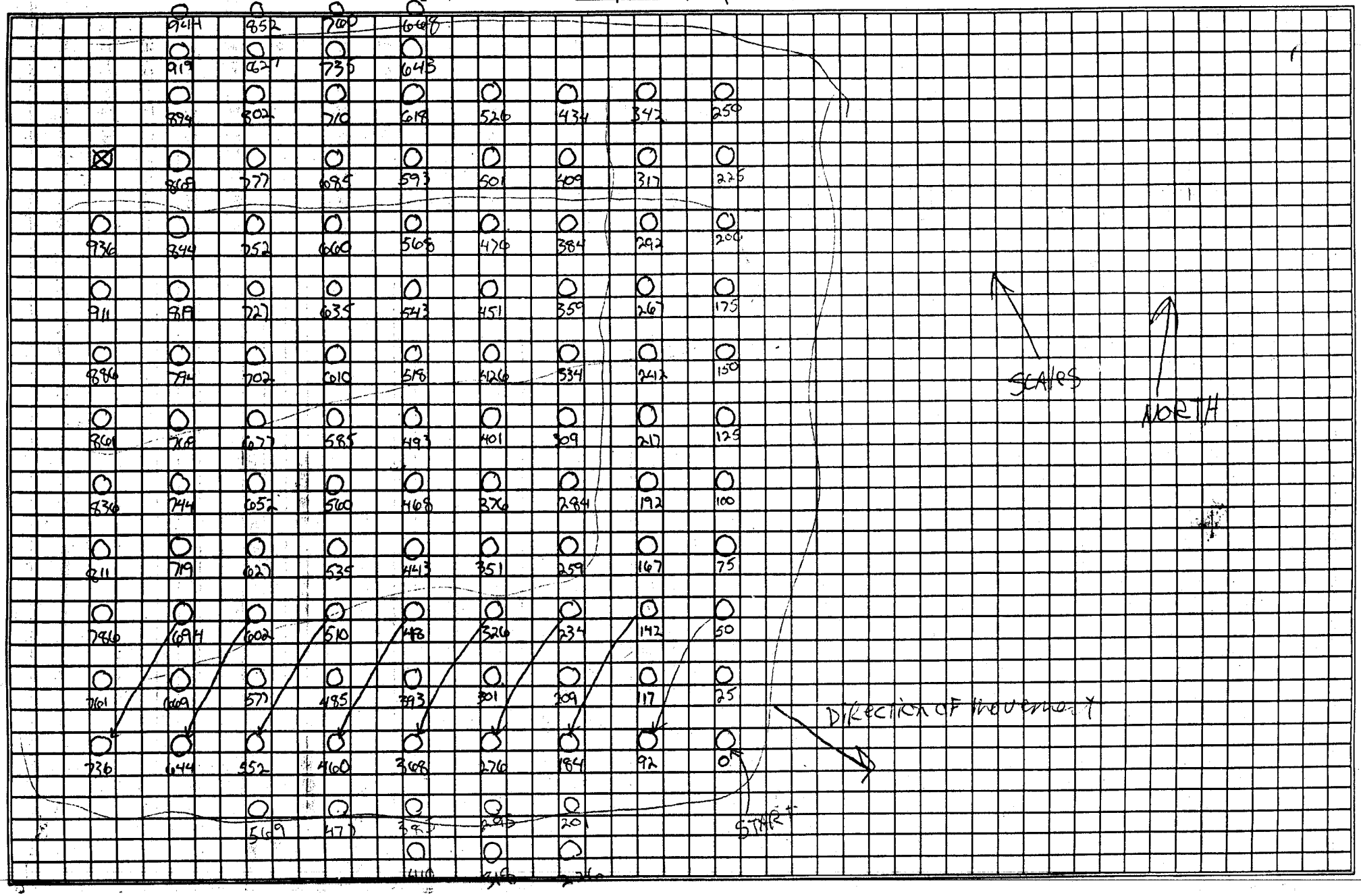
Special conditions _____

ICI Explosives USA Inc.

Blaster's Shot Layout & Product Order Sheet

Location Palmetto Rock
Date 10-21-94
Time 4:00 PM
Representative Robert A. STAR

No. of Holes 113
Drill Depth 4-12
Drill Pattern 7X7
Stemming 3-5 FT



ICI Explosives USA Inc.

BLASTING REPORT

Consumer Palmetto Rock, Operation Piedmont LANDFill,
Address Spartanburg SC, Job address Kernersville N.C,
Delivery ticket # _____, Purchase order # 7911,
BLAST DATA: Shot number 6, Date 10-28-94, Time 12:21AM,
No. Holes 159, Diameter 3" in., Depth 10 - 24 (18 AVG) ft.
Burden 8 ft., Spacing 8 ft., Subdrilling NA ft., Stemming depth 5 ft.
Material used to stem cuttings, Type of shot Production,
Bench No. 1, Specific blast location New cell,
Material being blasted Decomposed GRANITE, S.G. or Tons yd³ _____,
Blasters name Robert A. STAR, Signature [signature],
Blasters license No. LLR 53, State SOUTH CAROLINA,

Explosives used:

Pellite (ANFO)	5250	lbs.
SuperFRAC 6000 DX8	200	lbs.
		lbs.
		lbs.
		lbs.
		lbs.
		lbs.

Total weight of expl. 5450 lbs.
Average load per delay 34 lbs.
Estimated tons or yds³ 6783,
Powder factor _____ tons/lb .80 lbs./yd³ Estimated cost per _____ ton ____ yd³

Firing information:
E.B. Detonators Brand _____,
Non-electric Dets. Brand ICI,
Blasting device (check one)
Conventional ✓, Sequential _____,
Non-electric firing device EB + LIL,
Identification ✓,
Type of series 6,
No. of series 14, Interval 92 - 117 ms.
Delay connectors MS 42,

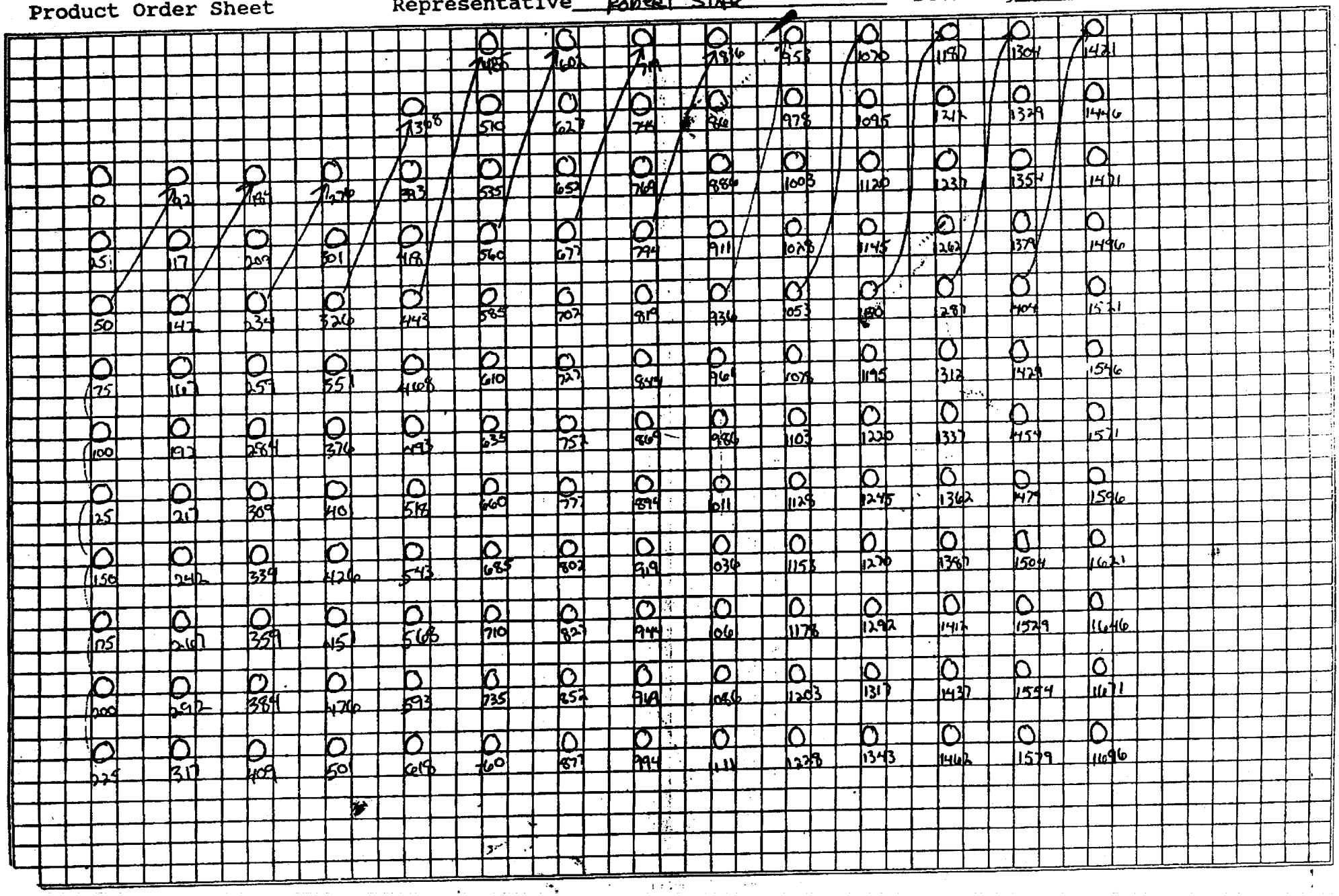
Maximum weight of explosives detonated within any 8 millisecond period 35-40#,
Maximum number of holes or decks detonated within any 8 millisecond period 01,
Nearest building*: Distance ~~NORTH~~ EAST, 500' ft. Direction (scale house),
*Dwelling, School, Church, Hospital or commercial building, etc. (other than consumer's bldgs.)
Weather Sunny + warm Temp. 67°, Wind direction NNW, Velocity 7-10 mph
Scaled distance 79, Were mats or other protection used _____ yes ✓ no
Was seismograph used ✓ yes _____ no, Readings P.P.V. _____ ins., P.O.P. _____ db
Special conditions _____

ICI Explosives USA Inc.

Blaster's Shot Layout & Product Order Sheet

Location: Piedmont LANDFILL
Date: 10-28-94
Time: 12:21 pm
Representative: Robert Stage

No. of Holes: 159 Shot # 6
Drill Depth: 10-24
Drill Pattern: 8X8
Stemming: 5'



ICI Explosives USA Inc.

BLASTING REPORT

Consumer Palmetto Rock, Operation Piedmont Landfill,
Address Spartanburg S.C., Job address Kernersville N.C.,
Delivery ticket #, Purchase order # 7911,
BLAST DATA: Shot number 7, Date 10-28-94, Time 5:32 pm,
No. Holes ~~240~~ 221, Diameter 3" in., Depth 10-24 (18' Avg) ft.
Burden 8 ft., Spacing 8 ft., Subdrilling NA ft., Stemming depth 5' ft.
Material used to stem Cuttings, Type of shot Production,
Bench No. 1, Specific blast location New cell,
Material being blasted Decomposed Granite, S.G. or Tons yd³ -,
Blasters name Robert A. Star, Signature [signature],
Blasters license No. LLR 53, State South Carolina,

Explosives used:

Pellite	7250	lbs.
Superfrac 6000 2x8	240	lbs.
Powerdich 500 2x16	500	lbs.
Apex Ultra 2¾ x 16	275	lbs.
		lbs.
		lbs.

Total weight of expl. 8265 lbs.
Average load per delay 38 lbs.
Estimated tons or (yds³) 9045,
Powder factor tons/lb .91 (lbs./yd³)

Firing information:

E.B. Detonators Brand,
Non-electric Dets. Brand ICI Exel, Handidet,
Blasting device (check one)
Conventional -, Sequential,
Non-electric firing device FB, Lil,
Identification,
Type of series,
No. of series 14, Interval 92-117 ms.
Delay connectors 42ms - 25ms,
Estimated cost per ton yd³

Maximum weight of explosives detonated within any 8 millisecond period 42,
Maximum number of holes or decks detonated within any 8 millisecond period 01,
Nearest building*: Distance 500 Feet (Scale House) ft. Direction North,
*Dwelling, School, Church, Hospital or commercial building, etc. (other than consumer's bldgs.)
Weather Sunny + warm, Temp. 67°, Wind direction NNW, Velocity 7-10 mph
Scaled distance 77, Were mats or other protection used yes no
Was seismograph used ✓ yes no, Readings P.P.V. ins., P.O.P. db
Special conditions

ICI Explosives USA Inc.

Blaster's Shot Layout & Product Order Sheet

Location Piedmont Landfill, Kernersville, NC.
Date 10-26-94
Time 5:32 pm
Representative Robert A. Starr

No. of Holes 212 #7
Drill Depth 10-24'
Drill Pattern 8x8
Stemming 5'

ICI Explosives USA Inc.

Shot #8

BLASTING REPORT

Consumer Palmetto Rock, Operation Construction

Address Spartanburg SC, Job address Yorkville NC

Delivery ticket # 23501, Purchase order # 7915

BLAST DATA: Shot number 8, Date 11/7/94, Time 12:10PM

No. Holes 170, Diameter 3 in., Depth 8-12

Burden 8 ft., Spacing 8 ft., Subdrilling 2 ft., Stemming depth 4-5

Material used to stem Cuttings, Type of shot Construction

Bench No. N/A, Specific blast location Behind Scale House

Material being blasted Sand Stone, S.G. or Tons yd³

Blasters name Greg Brown, Signature [illegible]

Blasters license No. 117-25, State SC

Explosives used: Pellet, 2500 lbs. Superfracture 25, 170 lbs.

Firing information: E.B. Detonators Brand NCI, Non-electric Dets. Brand TCS Head Det.

Blasting device (check one): Conventional ✓, Sequential ___, Non-electric firing device N/A, Identification Scorpion BM10

Total weight of expl. 2670 lbs.

Average load per delay 15.7 lbs.

Estimated tons or yds³ 3.626

Powder factor ___ tons/lb .74 lbs/yd³

Type of series N/A

No. of series N/A, Interval N/A

Delay connectors 30' HTLD #17

Estimated cost per ___ ton

Maximum weight of explosives detonated within any 8 millisecond period 15.7

Maximum number of holes or decks detonated within any 8 millisecond period 1

Nearest building*: Distance 550 FT. ft. Direction E25T

*Dwelling, School, Church, Hospital or commercial building, etc. (other than consumer's bldgs.)

Weather Clear, Temp. 70°, Wind direction SW, Velocity 10

Scaled distance ___, Were mats or other protection used ___ yes ✓

Was seismograph used ✓ yes ___ no, Readings P.P.V. ___ ins., P.O.P. ___

Special conditions ___

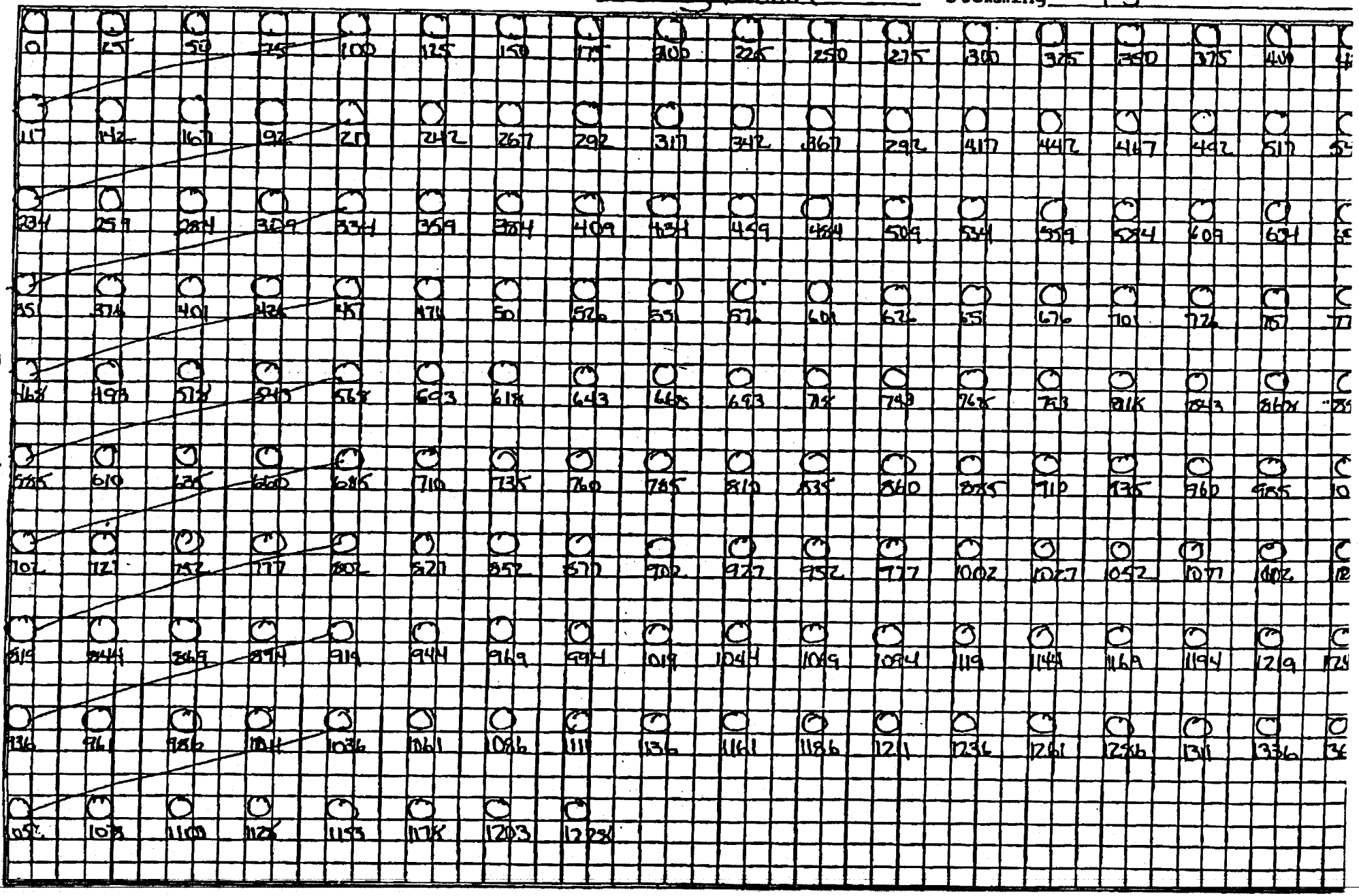
ICI Explosives USA Inc.

Blaster's Shot Layout & Product Order Sheet

Location Kernersville, NC
Date 11/7/94
Time 12:10 PM
Representative Greg Broom

No. of Holes 170
Drill Depth 8'-12'
Drill Pattern 8'x8'
Stemming 4-5'

SHOT # 8



Shot 9

ICI Explosives USA Inc.

BLASTING REPORT

Consumer Palmetto Rock, Operation Piedmont Landfill,

Address _____, Job address _____,

Delivery ticket # 23514, Purchase order # 7919,

BLAST DATA: Shot number 9, Date 11-10-94, Time 1:13 pm,

No. Holes 106, Diameter 3" in., Depth 8-24 ft.

Burden 9-10 ft., Spacing 9-10 ft., Subdrilling NA ft., Stemming depth 4-5 ft.

Material used to stem Drill cutting, Type of shot Production,

Bench No. -, Specific blast location New cell site,

Material being blasted Partially Decomposed Granite, S.G. or Tons yd³ —,

Blasters name Robert A. Star, Signature [signature],

Blasters license No. LLR 53, State S.C.,

Explosives used:

Pellite	3750	lbs.
Superfrac 6000	110	lbs.
Power Frac	55	lbs.
		lbs.
		lbs.
		lbs.

Total weight of expl. 3915 lbs.

Average load per delay 36 lbs.

Estimated tons or yds³ 5916,

Powder factor _____ tons/lb .66 lbs./yd³ Estimated cost per _____ ton ____ yd³

Firing information:

E.B. Detonators Brand ICI Mastredet,

Non-electric Dets. Brand ICI Handidet,

Blasting device (check one)

Conventional ✓, Sequential _____,

Non-electric firing device —,

Identification —,

Type of series —,

No. of series 7, Interval 67-92 ms.

Delay connectors 17 ms, 25 ms,

Maximum weight of explosives detonated within any 8 millisecond period 38,

Maximum number of holes or decks detonated within any 8 millisecond period 01,

Nearest building*: Distance 375 ft. Direction ~~North~~ East,

*Dwelling, School, Church, Hospital or commercial building, etc. (other than consumer's bldgs.)

Weather Cloudy & cool, Temp. 56, Wind direction NNW, Velocity 6-12 mph

Scaled distance 72.11, Were mats or other protection used _____ yes ✓ no

Was seismograph used _____ yes _____ no, Readings P.P.V. _____ ins., P.O.P. _____ db

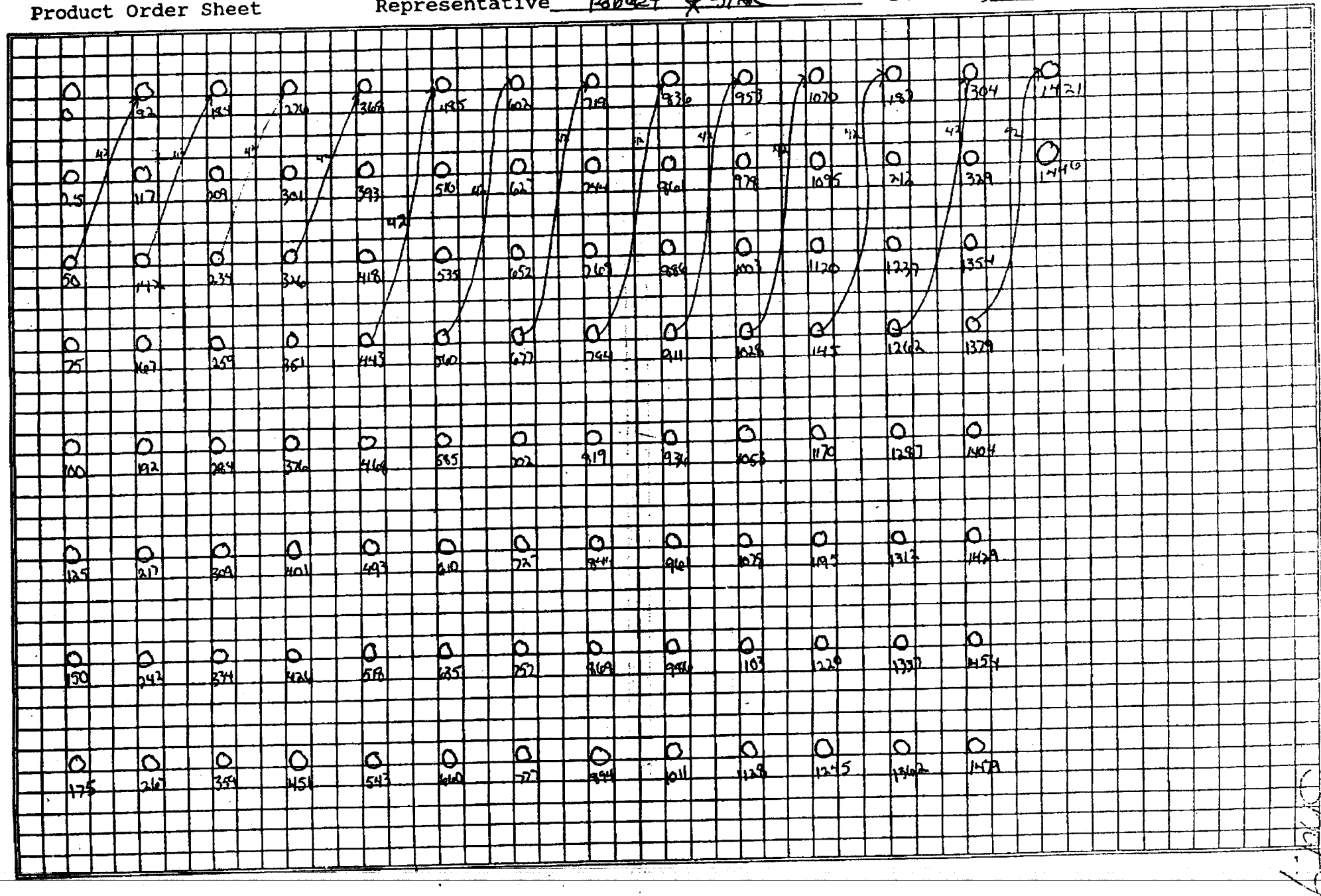
Special conditions Rainy & wet - Shot went well —

ICI Explosives USA Inc.

Blaster's Shot Layout & Product Order Sheet

Location Piedmont LANDFILL, Kernersville N.C.
Date 11-10-94
Time 1:13 pm
Representative Robert * STAR

No. of Holes 106 #9
Drill Depth 8-24
Drill Pattern 9-10 X 9-10
Stemming 4-5

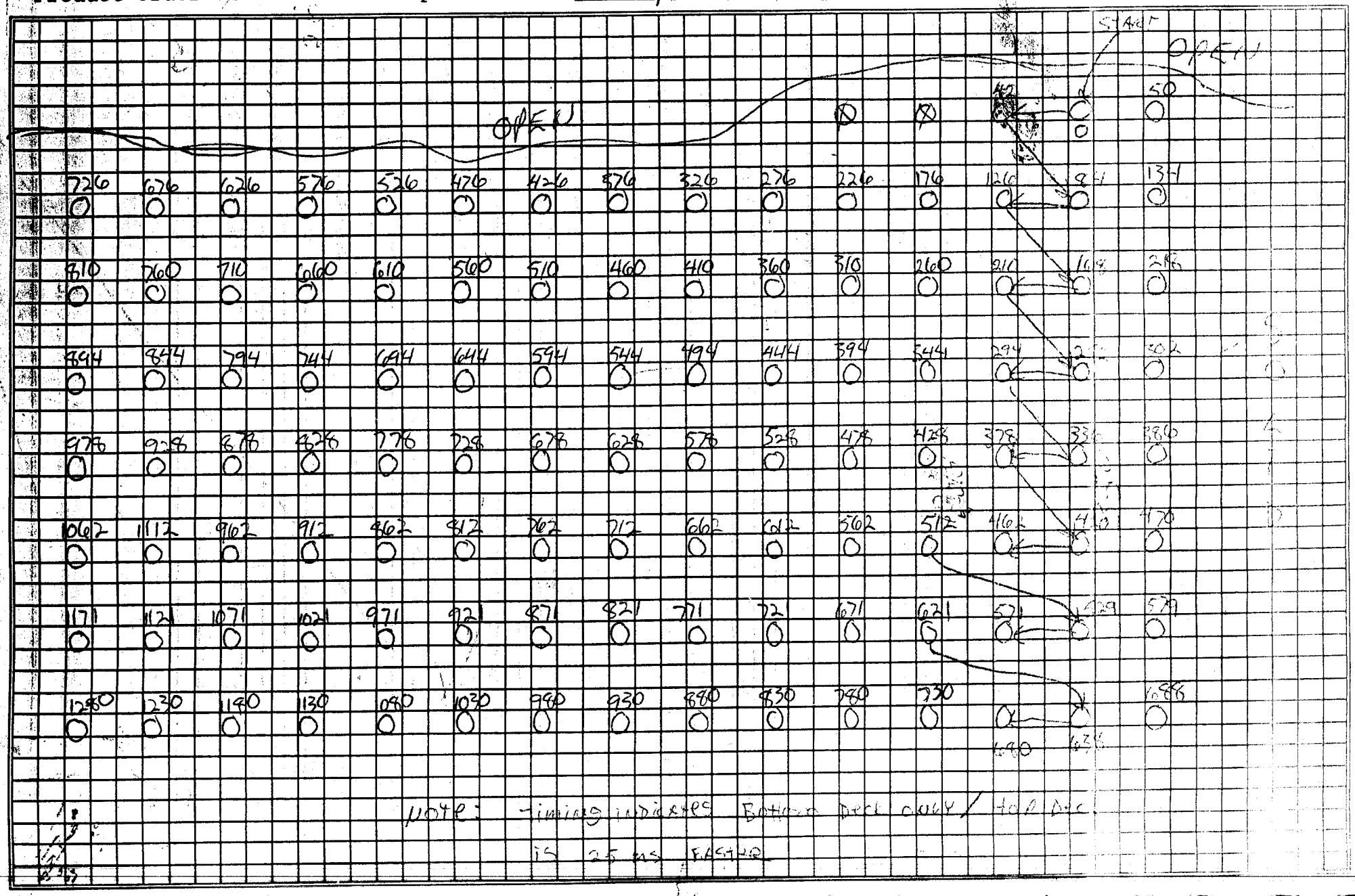


ICI Explosives USA Inc.

Blaster's Shot Layout & Product Order Sheet

Location Kernersville NC.
Date 12-28-94
Time 12:10 pm
Representative Robert STAR

No. of Holes 108
Drill Depth 27
Drill Pattern 10x10
Stemming 5-7'



note: timing indicates Bottom deck only / top deck is 25 ms faster

ICI Explosives USA Inc.

BLASTING REPORT

Consumer Palmetto Rock, Operation Piedmont LANDFILL,
Address SPARTANBURGH, SC, Job address KERNERSVILLE, NC,
Delivery ticket # 23683, Purchase order # 7949,
BLAST DATA: Shot number 11, Date 12-28-94, Time 3:52 pm,
No. Holes 80, Diameter 3" in., Depth 22-32' (28 Avg) ft.
Burden 10 ft., Spacing 10 ft., Subdrilling NA ft., Stemming depth 5-7 ft.
Material used to stem Drill cuttings, Type of shot Production,
Bench No. NA, Specific blast location New cell site,
Material being blasted WEATHERED Rock, S.G. or Tons yd³ 2.1,
Blasters name Robert A STAR, Signature [signature],
Blasters license No. LLR 53, State SOUTH CAROLINA,

Explosives used:

Pellite (ANFO)	4,200	lbs.
SuperFIAC 6000 2X8	136	lbs.
		lbs.
		lbs.
		lbs.
		lbs.

Total weight of expl. 4,336 lbs.
Average load per delay _____ lbs.
Estimated tons or yds³ 8000 ~~[illegible]~~,
Powder factor _____ tons/lb .54 lbs./yd³ Estimated cost per _____ ton ____ yd³

Firing information:
E.B. Detonators Brand _____,
Non-electric Dets. Brand ICI HANDIDET,
Blasting device (check one)
Conventional _____, Sequential _____,
Non-electric firing device NONELECTRIC STARTER,
Identification –,
Type of series _____,
No. of series –, Interval 50, 67-92-117 ms.
Delay connectors 17 ms / 25 ms,

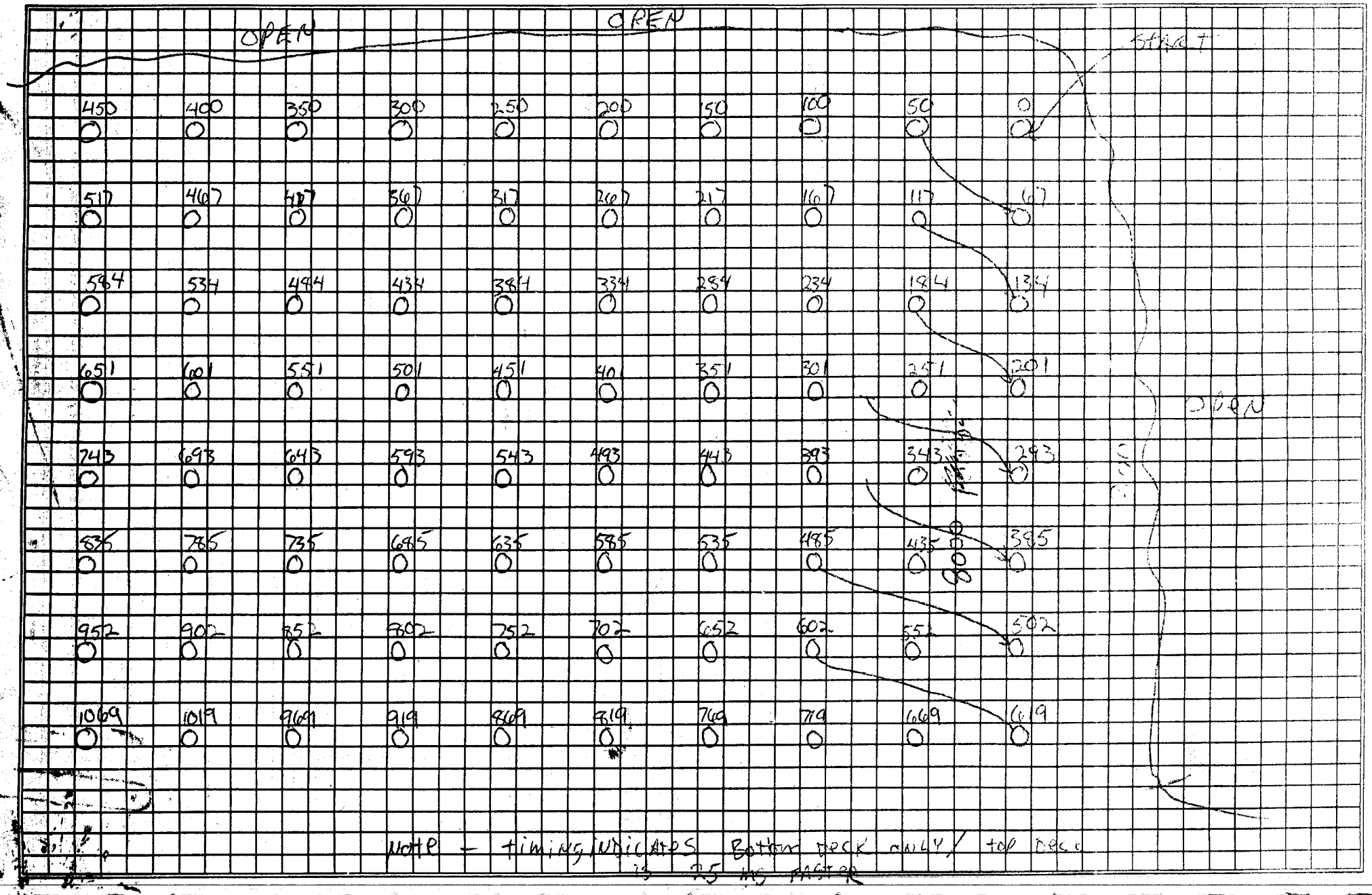
Maximum weight of explosives detonated within any 8 millisecond period 54,
Maximum number of holes or decks detonated within any 8 millisecond period 02,
Nearest building*: Distance 300 ft. Direction E - SE,
*Dwelling, School, Church, Hospital or commercial building, etc. (other than consumer's bldgs.)
Weather Sunny + mild, Temp. 58, Wind direction NW, Velocity 0-10 mph
Scaled distance 59, Were mats or other protection used _____ yes ✓ no
Was seismograph used ✓ yes _____ no, Readings P.P.V. _____ ins., P.O.P. _____ db
Special conditions _____

ICI Explosives USA Inc.

Blaster's Shot Layout & Product Order Sheet

Location: KERNERSVILLE
Date: 12-28-94
Time: 3:52 PM
Representative: ROBERT STAR

No. of Holes: 80
Drill Depth: 28
Drill Pattern: 10X10
Stemming: 5-9



ICI Explosives USA Inc.

BLASTING REPORT

Consumer Palmetto Rock, Operation Construction,
Address Spartanburg SC, Job address Kernersville, NC,
Delivery ticket # 23749, Purchase order # 1007,
BLAST DATA: Shot number 12, Date 1/23/95, Time 12:13PM,
No. Holes 135, Diameter 3" in., Depth Avg 22' ft.
Burden 10 ft., Spacing 10 ft., Subdrilling 0 ft., Stemming depth 5' ft.
Material used to stem Cuttings, Type of shot Construction,
Bench No. N/A, Specific blast location Beside Scale house,
Material being blasted Sandstone, S.G. or Tons yd³ N/A,
Blasters name Greg Broom, Signature Greg Broom,
Blasters license No. LLR-25, State SC,

Explosives used:

Bagged Pellite	6400	lbs.
Apex Ultra 2½x16	110	lbs.
Superfrac 6000 2x8	136	lbs.
		lbs.
		lbs.
		lbs.

Total weight of expl. 6646 lbs.
Average load per delay 49.2 lbs.
Estimated tons or (yds³) 11.000,
Powder factor _____ tons/lb .60 (lbs./yd³) Estimated cost per N/A ton ____ yd³

Firing information:

E.B. Detonators Brand ICI,
Non-electric Dets. Brand ICI Handidets,
Blasting device (check one)
Conventional ✓, Sequential _____,
Non-electric firing device N/A,
Identification HB-10,
Type of series N/A,
No. of series N/A, Interval 8 ms.
Delay connectors 30' HTD * 17,

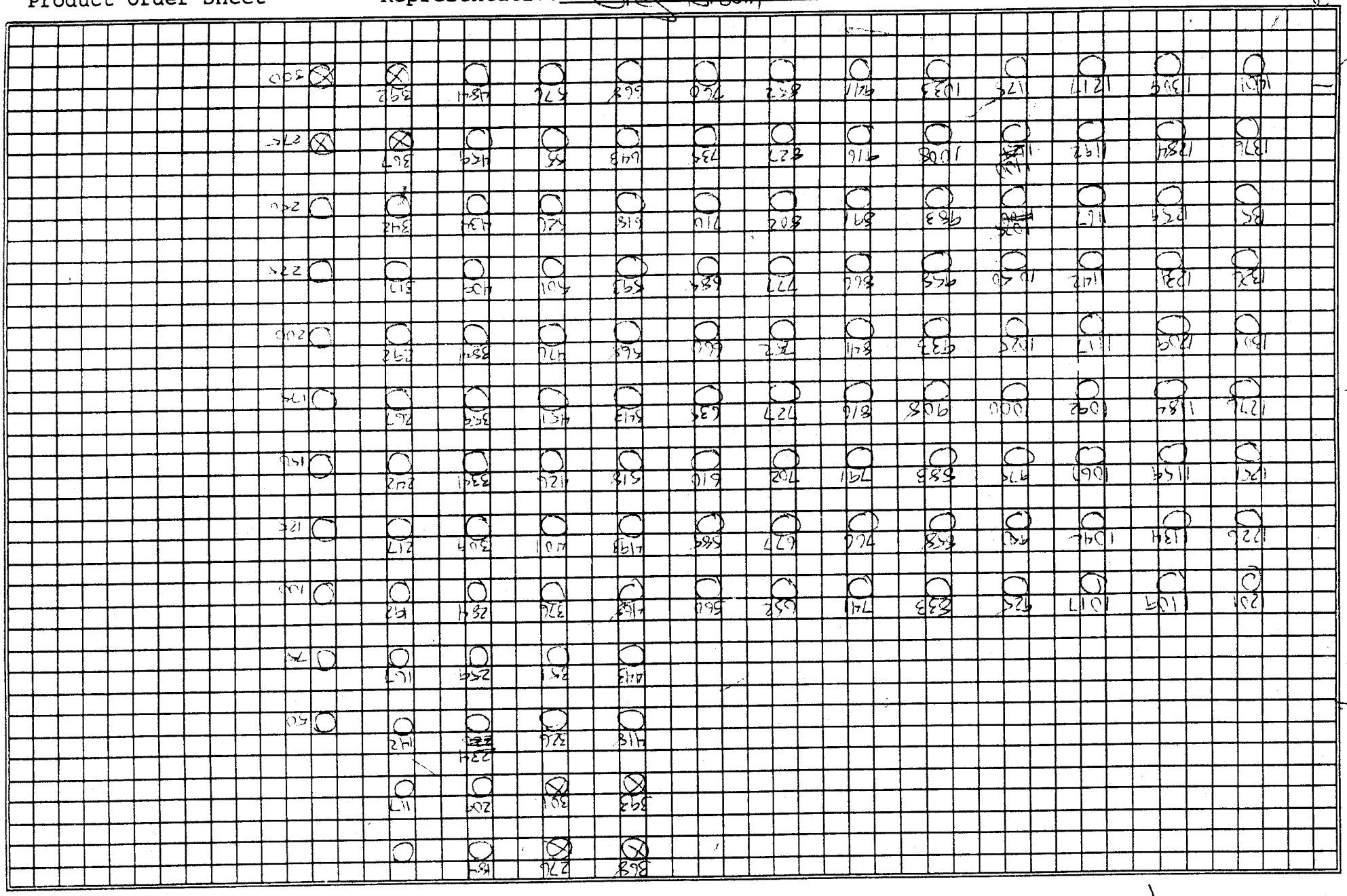
Maximum weight of explosives detonated within any 8 millisecond period 98.4,
Maximum number of holes or decks detonated within any 8 millisecond period 2,
Nearest building*: Distance 300' - 400' ft. Direction East / SE,
*Dwelling, School, Church, Hospital or commercial building, etc. (other than consumer's bldgs.)
Weather Cloudy / Snow, Temp. 35°, Wind direction S/E, Velocity 6 mph
Scaled distance 30, Were mats or other protection used _____ yes ✓ no
Was seismograph used ✓ yes _____ no, Readings P.P.V. .122 ins., P.O.P. .28 db
Special conditions _____

ICI Explosives USA Inc.

Blaster's Shot Layout & Product Order Sheet

Location Palmetto Rock / Kennesville
Date 1/23/95
Time 12:13 PM
Representative Greg Broom

No. of Holes 135
Drill Depth 24' - 26' / 16
Drill Pattern 10 X 10
Stemming 5'



doubled up

ICI Explosives USA Inc.

BLASTING REPORT

Consumer Palmetto Rock, Operation Piedmont LANDFill,
Address SPARTANBURGH, S.C., Job address Kernersville, NC.,
Delivery ticket # 23764, Purchase order # 1009,
BLAST DATA: Shot number 13, Date 01-26-95, Time 2:34pm,
No. Holes 258, Diameter 3" in., Depth 4-21 ft.
Burden 6+10 ft., Spacing 7+10 ft., Subdrilling 0-3 ft., Stemming depth 5-7 ft.
Material used to stem Drill cuttings, Type of shot Production,
Bench No. NA, Specific blast location New cell site,
Material being blasted PARTIALLY Decomposed GRANITE, S.G. or Tons yd³ 2.1,
Blasters name Robert A. STAR, Signature [signature],
Blasters license No. LLR 53-C416-95, State SOUTH CAROLINA,

Explosives used:

Pellite (ANFO)	3,750	lbs.
SuperTAC 6000 2X8	280	lbs.
—	—	lbs.
—	—	lbs.
—	—	lbs.
—	—	lbs.

Firing information:

E.B. Detonators Brand ~~ICI HANDIDET~~,
Non-electric Dets. Brand ICI HANDIDET,
Blasting device (check one)
Conventional _____, Sequential _____,
Non-electric firing device #203 shell,
Identification —,
Type of series —,
No. of series 16, Interval 67-92 ms.
Delay connectors 17ms, 25ms,

Total weight of expl. 4,030 lbs.
Average load per delay 15.62 lbs.
Estimated tons or yds³ 7,660,
Powder factor _____ tons/lb .6 lbs./yd³ Estimated cost per _____ ton ____ yd³
Maximum weight of explosives detonated within any 8 millisecond period 51,
Maximum number of holes or decks detonated within any 8 millisecond period _____,
Nearest building*: Distance ~~365'~~ 275 ft. Direction E, SE,
*Dwelling, School, Church, Hospital or commercial building, etc. (other than consumer's bldgs.)
Weather Sunny + mild, Temp. 61, Wind direction NW, Velocity _____ mph
Scaled distance 51.12, Were mats or other protection used _____ yes ✓ no
Was seismograph used _____ yes ✓ no, Readings P.P.V. _____ ins., P.O.P. _____ db
Special conditions 3 BLASTS TIED TO together (See 2 ATTACHED pages)

ICI Explosives USA Inc.

Blaster's Shot Layout & Product Order Sheet

Location [illegible]
Date 01-26-95
Time 2:34 pm
Representative [illegible]

No. of Holes 148
Drill Depth 4'
Drill Pattern (6x7)
Stemming 3.5'

0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	25	50	75	100	125	150	175	200	225	250	275	300	325	350
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
67	92	117	142	167	192	217	242	267	292	317	342	367	392	417
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
134	159	184	209	234	259	284	309	334	359	384	409	434	459	484
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201	226	251	276	301	326	351	376	401	426	451	476	501	526	551
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
268	293	318	343	368	393	418	443	468	493	518	543	568	593	618
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
335	360	385	410	435	460	485	510	535	560	585	610	635	660	685
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
402	427	452	477	502	527	552	577	602	627	652	677	702	727	752
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
469	494	519	544	569	594	619	644	669	694	719	744	769	794	819
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
536	561	586	611	636	661	686	711	736	761	786	811	836	861	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
603	628	653	678	703	728	753	778	803	828	853	878	903	929	

(6x7)x4

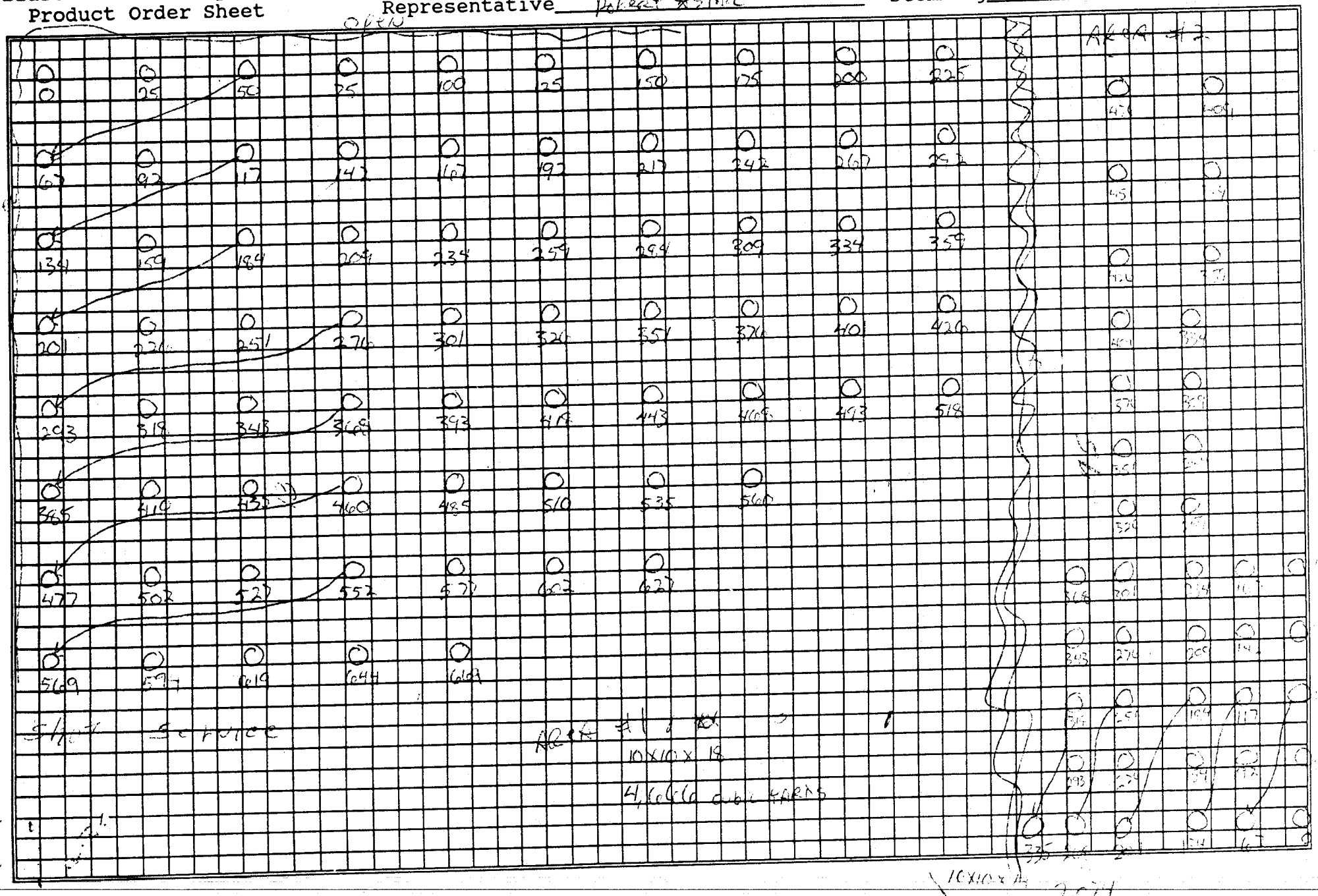
720 ea

ICI Explosives USA Inc.

Blaster's Shot Layout & Product Order Sheet

Location: Pickwick Landfill
Date: 01-26-95
Time: 2:34 pm
Representative: Pickwick & Stance

No. of Holes: 110
Drill Depth: 10x10
Drill Pattern: 14-21
Stemming: 5'



ICI Explosives USA Inc.

BLASTING REPORT

Consumer Palmetto Peek Service, Operation Piedmont LANDFill,
Address SPARTANBURGH, SC, Job address Kernersville N.C.,
Delivery ticket # 23789, Purchase order # 1014,
BLAST DATA: Shot number 14, Date 02-02-95, Time 1:12pm,
No. Holes 185, Diameter 3 in., Depth 12 - 21 ft.
Burden 8 + 10 ft., Spacing 8 + 10 ft., Subdrilling 0-2' ft., Stemming depth 5-7 ft.
Material used to stem Drill cuttings, Type of shot Production,
Bench No. LA, Specific blast location New cell site,
Material being blasted GRANITE, S.G. or Tons yd³ 2.2,
Blasters name Robert A. STAR, Signature [signature],
Blasters license No. LLR 53-0416-95, State SOUTH CAROLINA,

Explosives used:

Pellite	4850	lbs.
SuperFrac 6000 2X8	165	lbs.
		lbs.
		lbs.
		lbs.
		lbs.
		lbs.

Total weight of expl. 5015 lbs.
Average load per delay 27.1 lbs.
Estimated tons or yds³ 9,611.22,
Powder factor _____ tons/lb .52 lbs./yd³ Estimated cost per _____ ton ____ yd³

Firing information:
E.B. Detonators Brand _____,
Non-electric Dets. Brand ICI HANDIDET,
Blasting device (check one)
Conventional _____, Sequential _____,
Non-electric firing device# 209 Shell,
Identification -,
Type of series -,
No. of series 18, Interval (6)-92-25-75 ms.
Delay connectors 17ms 25 ms,

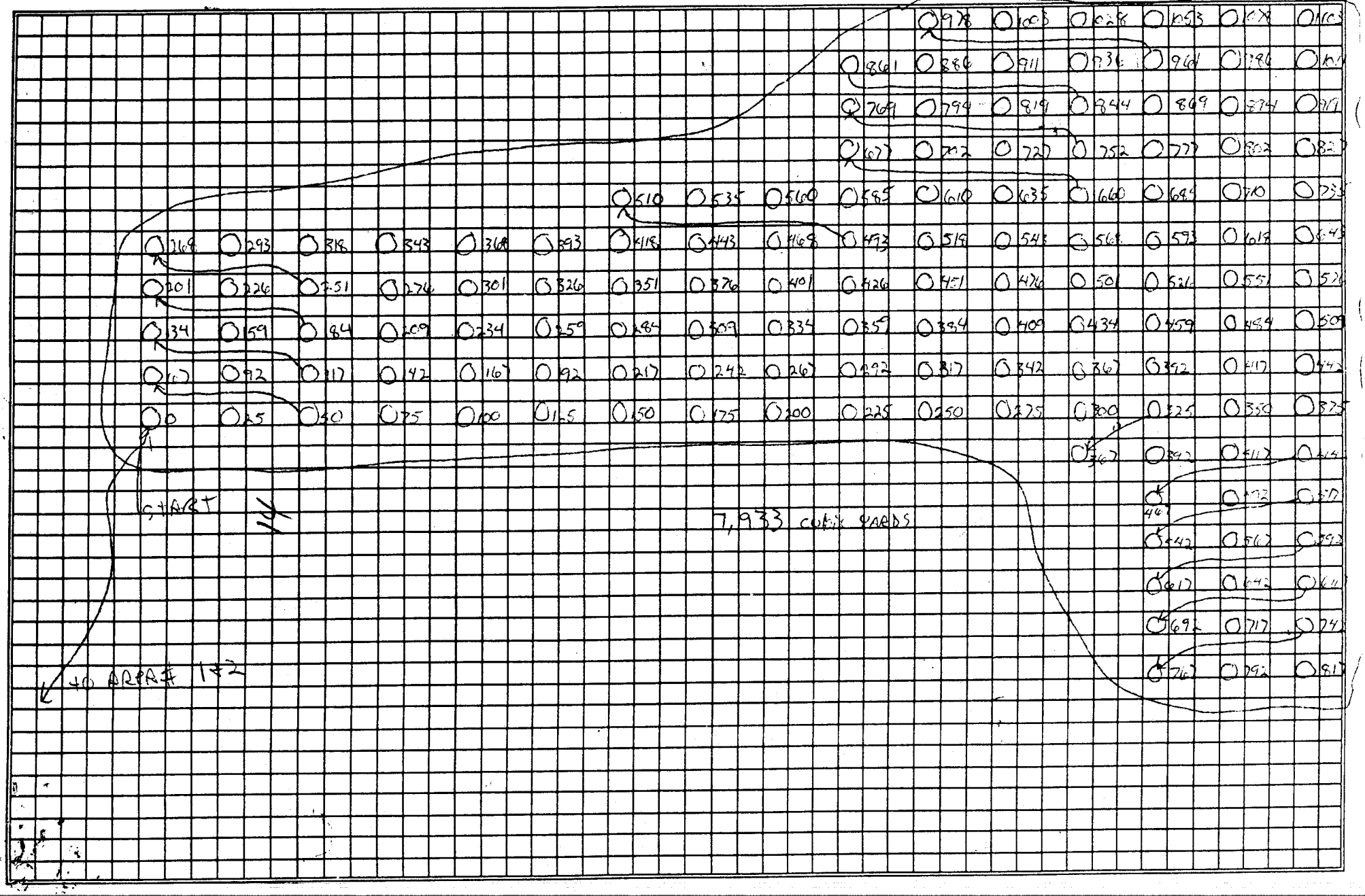
Maximum weight of explosives detonated within any 8 millisecond period 59,
Maximum number of holes or decks detonated within any 8 millisecond period 02,
Nearest building*: Distance 350' ft. Direction ESE,
*Dwelling, School, Church, Hospital or commercial building, etc. (other than consumer's bldgs.)
Weather Cloudy, RAIN, Temp. 58, Wind direction NW, Velocity 0-12 mph
Scaled distance 45.57, Were mats or other protection used _____ yes ✓ no
Was seismograph used _____ yes ✓ no, Readings P.P.V. — ins., P.O.P. — db
Special conditions _____

ICI Explosives USA Inc.

Blaster's Shot Layout & Product Order Sheet

Location: Roberts Landfill
Date: 02-03-95
Time: 1:12 pm
Representative: Robert Star

No. of Holes: 126
Drill Depth: 17-21 (19 avg)
Drill Pattern: 10X10
Stemming: 5-6'

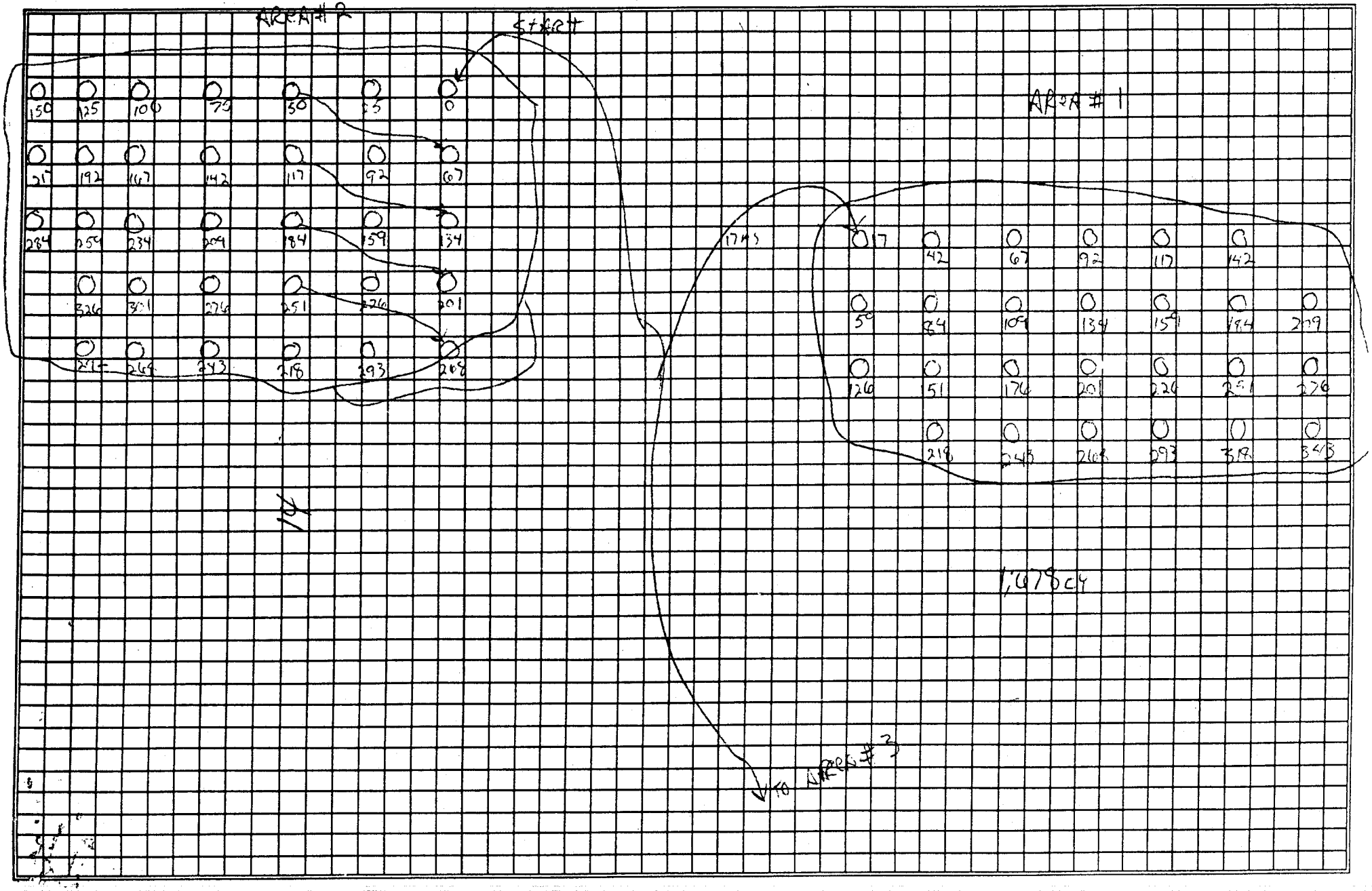


ICI Explosives USA Inc.

Blaster's Shot Layout & Product Order Sheet

Location Piedmont LANDFILL (AREA # 142)
Date 02-02-95
Time 1:12 pm
Representative ROBERT A. STAR

No. of Holes 59
Drill Depth 10-12
Drill Pattern 8X8
Stemming 5-6'



ICI Explosives USA Inc.

BLASTING REPORT

Consumer Palmetto Rock, Operation Piedmont Landfill,
Address Spartanburg, Job address Kernersville, NC,
Delivery ticket # 23830, Purchase order # 1019,
BLAST DATA: Shot number 15, Date 2-14-95, Time 1:35,
No. Holes 256, Diameter 3 in., Depth 7'-20' ft.
Burden 6 and 7 ft., Spacing 6 and 7 ft., Subdrilling 2 ft., Stemming depth 5 ft.
Material used to stem Cuttings, Type of shot Production,
Bench No. 1, Specific blast location New Cell Site,
Material being blasted Granite, S.G. or Tons yd³ 2.25,
Blasters name Robert Shaver, Signature [signature],
Blasters license No. 132-54-4100, State N.C.,

Explosives used:

Prime, 3950 lbs.
Superfrac 6000 1x5, 256 lbs.
____, ____ lbs.
____, ____ lbs.
____, ____ lbs.
____, ____ lbs.

Total weight of expl. 4206 lbs.
Average load per delay 16.4 lbs.
Estimated tons or yds³ 4208.4 yards,
Powder factor — tons/lb 1.00 lbs./yd³ Estimated cost per — ton ____ yd³

Firing information:

E.B. Detonators Brand —,
Non-electric Dets. Brand Handidet,
Blasting device (check one)
Conventional —, Sequential —,
Non-electric firing device ERC,
Identification —,
Type of series —,
No. of series —, Interval — ms.
Delay connectors HTD #17,

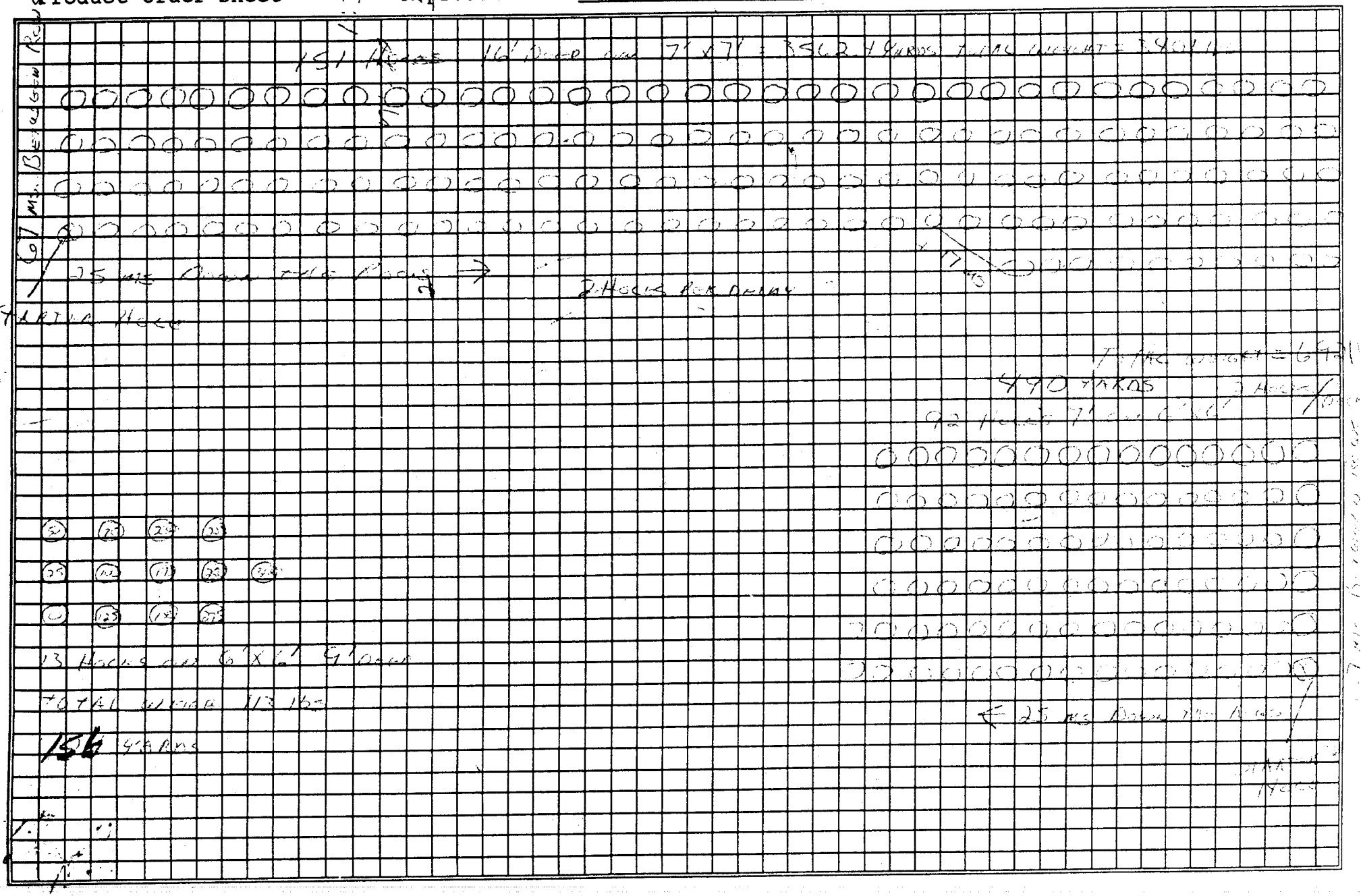
Maximum weight of explosives detonated within any 8 millisecond period 47.2,
Maximum number of holes or decks detonated within any 8 millisecond period 2,
Nearest building*: Distance 300 ft. Direction ESE,
*Dwelling, School, Church, Hospital or commercial building, etc. (other than consumer's bldgs.)
Weather Cloudy, Temp. 42°, Wind direction W, Velocity 5 mph
Scaled distance 43.5, Were mats or other protection used ____ yes ✓ no
Was seismograph used ✓ yes ____ no, Readings P.P.V. ____ ins., P.O.P. ____ db
Special conditions ____

ICI Explosives USA Inc.

Blaster's Shot Layout & Product Order Sheet

Location _____
Date _____
Time _____
Representative _____

No. of Holes _____
Drill Depth _____
Drill Pattern _____
Stemming _____

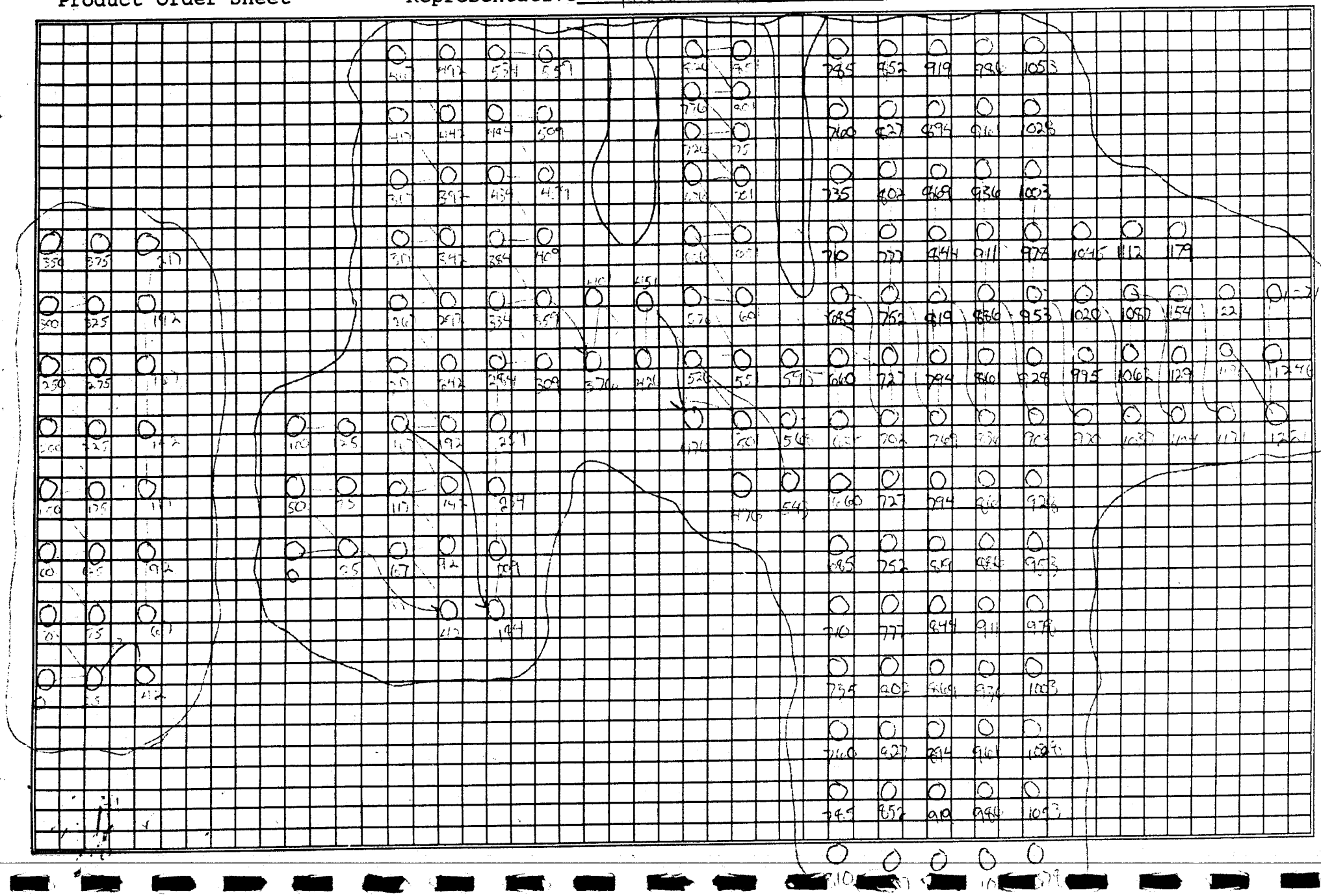


ICI Explosives USA Inc.

Blaster's Shot Layout & Product Order Sheet

Location: Redlant LANDFILL, AREA # 1+2
Date: 9-22-95
Time: 3:19 pm
Representative: Robert SIGR

No. of Holes: 178
Drill Depth: 6-16
Drill Pattern: 6x6 7x7
Stemming: 5-8

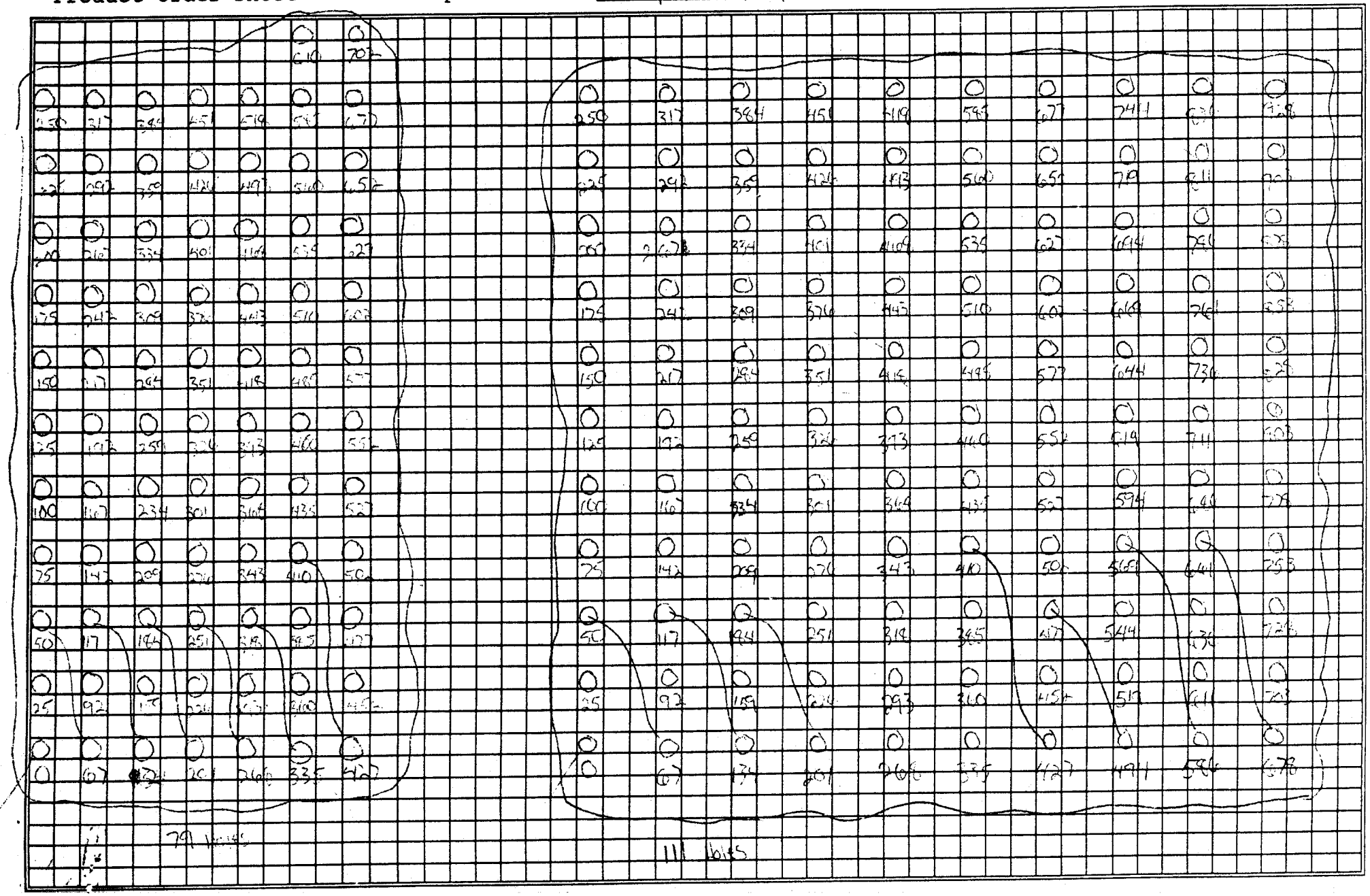


ICI Explosives USA Inc.

Blaster's Shot Layout & Product Order Sheet

Location: Piedmont Landfill Area #243
Date: 02-22-95
Time: 3:19 Pm
Representative: Robert & Co

No. of Holes: 190
Drill Depth: 5-10
Drill Pattern: 6x6 + 7x7
Stemming: 4-6



PALMETTO ROCK SERVICES, INC.

BLAST REPORT

Blasting permit number: 193 Date 3-4-95

Company (Permitee) Palmetto Rock Blast No. 17

Location of Blast: 300 FT NW OF Scale house

Time of Blast: 11:56 A.M.

Name of Blaster: Samuel Jones Blasters License # LLR 75-0063-95

Direction and distance in feet from blast to nearest gas lines, power tramsmission lines, public roads, waterways, or structures

300FT. South East

Weather data: Cloudy Temperature: 42°

Wind direction and speed: NE Cloud cover: Low

Type of Material Blasted: Sandstone

4' X 4' X 4' X 97 holes 230 yds

SHOT DATA

		EXPLOSIVES		
No. Holes	97	TYPE	SIZE	WEIGHT (LBS.)
Hole Diameter	3	Super Frac 6000	2X8	102
Hole Depth	4	Pellite	50# Bags	200
Sub-Drilling	2			
Burden	4			
Spacing	4			
Type & Length-Stemming	Cuttings 3.			
Overburden	0	Total Weight (lbs) Explosives Shot		302

BLASTING CAPS

ELECTRIC

Brand & Type: 0

No. Delays Used:

No. Delays: 0 ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 ___ 8 ___ 9 ___ 10 ___ 11 ___ 12 ___ 13 ___ 14 ___ 15 ___ 16 ___ 17 ___ 18 ___ 19 ___ 20 ___

Total Electric Caps Used: 0

NON-ELECTRIC

Brand & Type: ICI Handy Dets

In Hole Caps: Delay: 500 No. Used:

Surface Delay: Delay: 25 No. Used:

Delay: No. Used:

97 - 16FT

2 20FT 17ms 400FT Trunkline

Total Non-Electric Caps Used: 99

Maximum weight of explosive detonated within any 8 - MS period: 3.15 lb.

Maximum number of holes detonated within any 8 - MS period: 1

Method of firing and type of circuit: Nonel starter Nonel circuit

Were mats or other protection used? ☐ Yes ☒ No If yes, describe:

Was seismograph used? ☒ Yes ☐ No

Seismic data: T ____, V ____, L ____, db ____

Location of seismograph:

Distance from blast: feet

Name of person taking seismograph reading:

Name of person and firm analyzing the seismograph record:

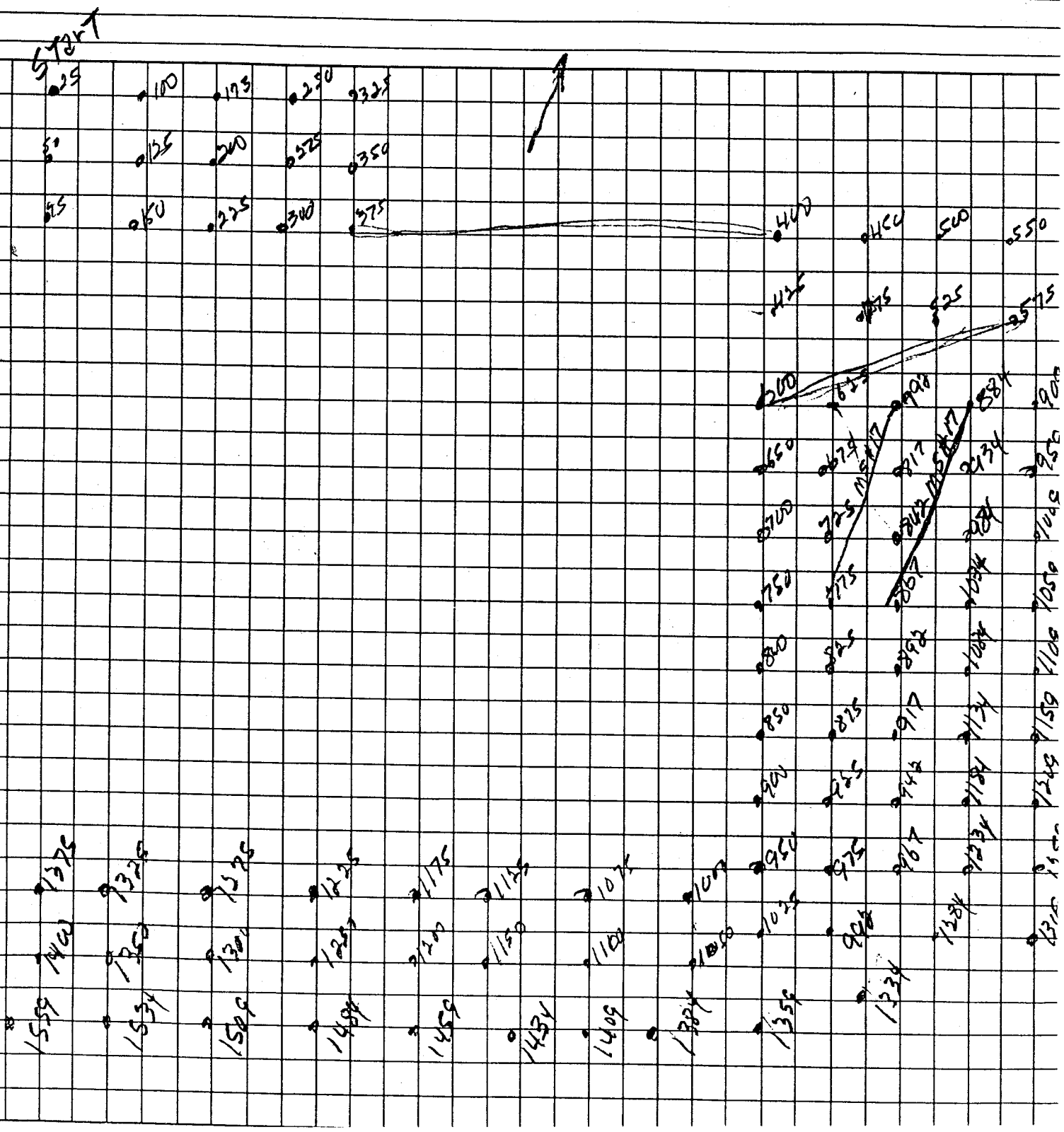
Signed: Samuel Jones Blaster

(over)

Indicate **NORTH** by arrow

Describe decking if any: _____

Describe in detail any misfire(s): _____



APPENDIX E

SEISMOGRAPH REPORTS

VIBRA-TECH
The Vibration Monitoring Experts
377 Carowinds Boulevard, Suite 112, Ft. Mill, SC 29715
803-548-3066 FAX 803-548-3083

December 6, 1994

Mr. Hase Broom
Palmetto Rock Services
Post Office Box 3273
Spartanburg, South Carolina 29304

Dear Mr. Broom:

This report contains the original seismic data from blasting associated with the Piedmont Landfill Expansion Project. Nine blasts, dated April 29, 1994 through November 10, 1994 are included.

At the request of Rust Environmental, a seismograph was installed on the floor of the cell. Vibra-Tech did not recommend that location due to the operation of heavy earth-moving equipment within 150 to 200 feet of the seismograph which would cause numerous "false" events to be recorded. As a result of this installation, sixty-seven events, some of which were actual blast events, were overwritten by the false triggers caused by the passing of the heavy equipment near the seismograph.

The maximum value of the recorded peak particle velocity for this series of blasts was 0.28 inches per second (ips), significantly below the established criteria for ground vibration as recommended by the United States Bureau of Mines (RI-8507: November, 1980). No printout of this event is included since this was one of the overwritten events mentioned above.

Recent studies into the effect of ground vibration on nearby structures has proven the correlation between particle velocity and frequency in assessing the impact of blasting. In order to properly assess the effect of the blasts included in this report, Response Spectra Velocity Profiles (RSVP) have been performed on each blast record.

The RSVP is a computer derived simulation of the response that a typical structure exhibits when exposed to the recorded vibration waveform. Response spectra analysis is a powerful analysis tool for diagnosing potential vibration problems before they actually become problematic. Response analysis, such as that utilized in the RSVP technique has been recommended by the United States Office of Surface Mining as the most effective method of assessing the impact of blast vibration on nearby properties.

Response analysis has been performed on each vibration record associated with blasting operations for this time period. A copy of the associated data is graphically represented in this report. A review of the RSVP data shows particle velocities well within the recommended limit for all frequencies between 3 Hz and 40 Hz for all blast events included in this report.

The maximum recorded air blast level for this series of blasts was 134 decibels (dB), or 0.01453 pounds per square inch (psi), for the blast dated October 28, 1994, which represents one hundred seventy eight percent of the 129 dB criteria stated in the United States Bureau of Mines (RI-8485:1980).

Should you have any questions or require additional information regarding the contents of this report, please do not hesitate to contact me at once.

Respectfully submitted,
Vibra-Tech, Inc.

Rob Pippin
Field Technician

377 Carowinds Blvd., Suite 112
Ft. Mill, SC 29715

VIBRA-TECH ENGINEERS
BLAST AND SEISMOGRAPHIC REPORT

803-548-3083
FAX: 803-548-3083

BLAST DATA

Client: PALMETTO ROCK SERVICE

Job Location: PIEDMONT LANDFILL PROJECT KERNERSVILLE, NC

Date: 4-29-94 Blast No.: 1 Time: 11:00 am

Exact Blast Location: 275' North West of Scale House

No. of Holes: 106 Diameter: 3 in. Avg. Depth: 12 ft. Subgrade: 0 ft.

Spacing: 7 ft. Burden: 7 ft. Avg. Stemming: 6 ft.

Make & Type of Explosives:

Super Frac 6000 2x8	220 lbs.
Pellite - ANFO	3100 lbs.
	lbs.
	lbs.
	lbs.

Total Explosives: 3320 lbs.

Delay Make: 24 Cylinder ICT ms

Delay Type & Nos.: nonelectric 25/500 ms

Min. Delay Period: 8 ms.

Max. Lbs./Delay Period: 35 lbs.

Blaster: Tim Crenshaw

Weather: clear

Wind Direction & Speed: calm

SEISMOGRAPH DATA

Seismograph No.: 7236 Range/Gain Setting: AUTO ips

Everfert Only Trigger Level: 0.10 ips

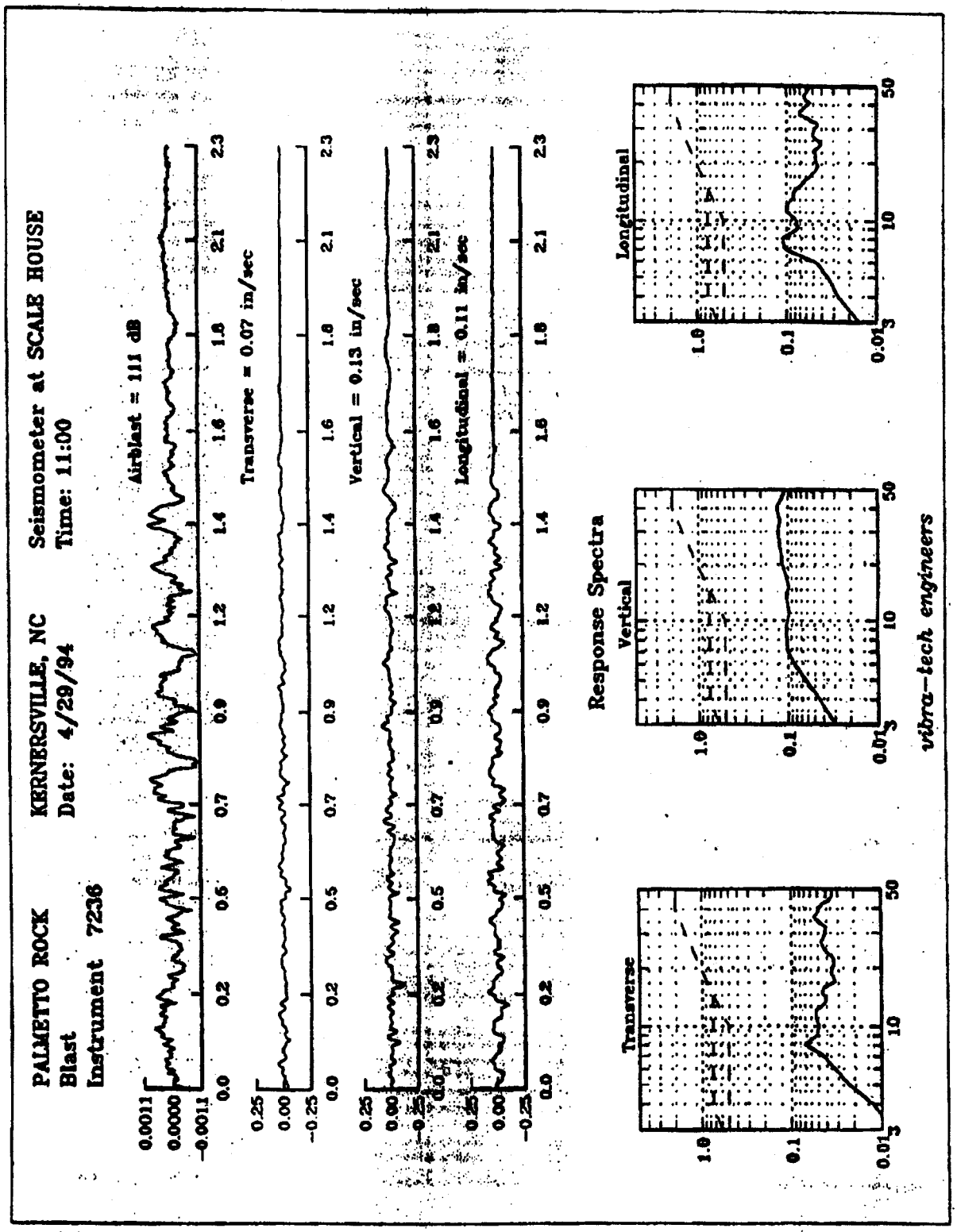
Exact Seismograph Location: SCALE HOUSE CANTEEN

Seismograph Distance & Direction from Blast: 275' South East

Meters: Peak Overpressure: 111 dB Operator:

Peak Particle Velocity: 0.13 ips Cassette No.:

Comments: TRIGGER LEVELS = 0.10 IPS (GROUND) & 130 dB (AIR)


PALMETTO ROCK
Blast
Instrument 7236
KERNERSVILLE, NC
Date: 4/29/94
Seismometer at SCALE HOUSE
Time: 11:00
Airblast = 111 dB
Transverse = 0.07 in/sec
Vertical = 0.13 in/sec
Longitudinal = 0.11 in/sec
Response Spectra
Transverse
Vertical
Longitudinal
vibra-tech engineers

2

377 Carewinds Blvd., Suite 112
Ft. Mill, SC 29715

VIBRA-TECH ENGINEERS
BLAST AND SEISMOGRAPHIC REPORT

803-548-3083
FAX: 803-548-3083

BLAST DATA

Client: Paine's Rock for Morgan

Job Location: Piedmont landfill Kernersville N.C.

Date: 5-3-94 Blast No.: 2 Time: 11:01

Exact Blast Location: 250' NW of Scale house

No. of Holes: 145 Diameter: 3 in. Avg. Depth: 8-22 ft. Subgrade: 0 ft.

Spacing: 7 ft. Burden: 7 ft. Avg. Stemming: 5 ft.

Make & Type of Explosives:

Super Frac 6000 2x8	275	lbs.
Pellite ANFO	3650	lbs.
		lbs.
		lbs.
		lbs.
		lbs.
Total Explosives	3925	lbs.

Delay Make: Hardi Det Nonel

Delay Type & Nos.: nonelectric

Min. Delay Period: 8 ms.

Max. Lbs./Delay Period: 24.8 lbs.

Blaster: Travis Bryson

Weather: clear

Wind Direction & Speed: SE 5 mph

SEISMOGRAPH DATA

Seismograph No.: 7236 Range/Gain Setting: 1 ips

Everlert Only — Trigger Level: ips

Exact Seismograph Location: Scale house Canteen

Seismograph Distance & Direction from Blast: 250' S-E

Meters: Peak Overpressure: 115 dB; Peak Particle Velocity: 0.13 ips

Operator: Tim Crenshaw

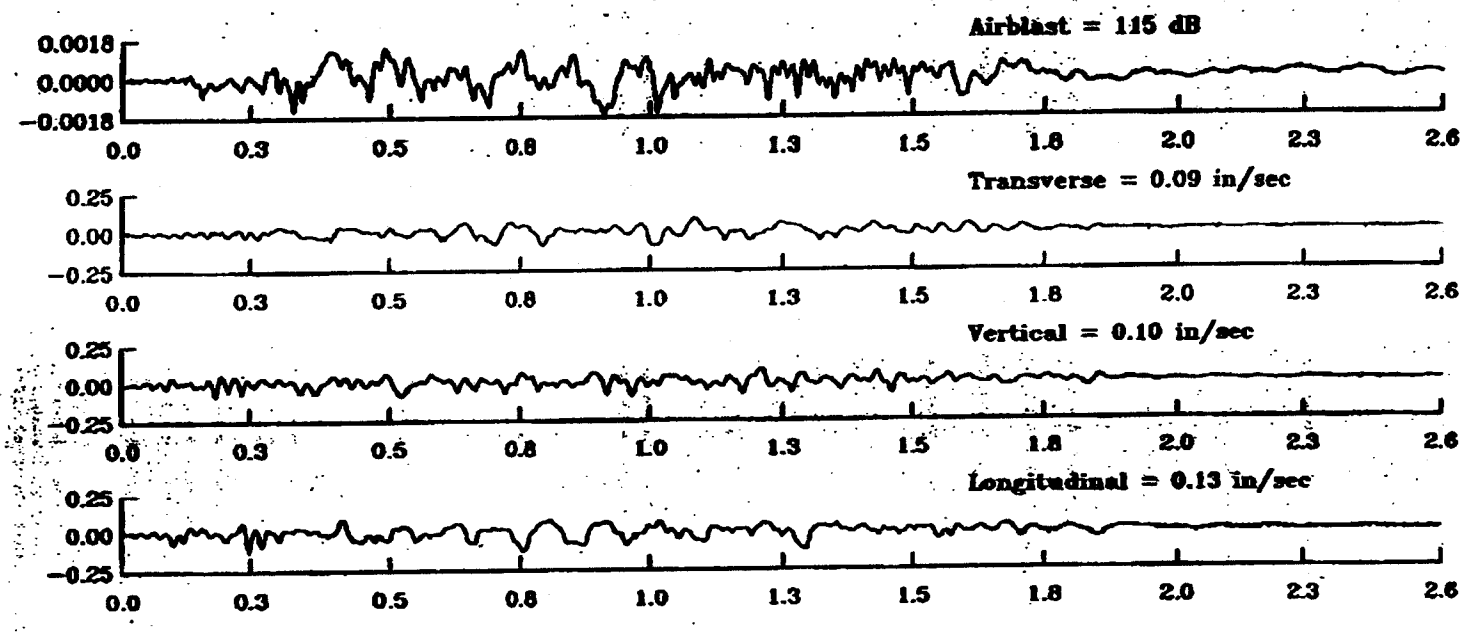
Cassette No.:

Comments:

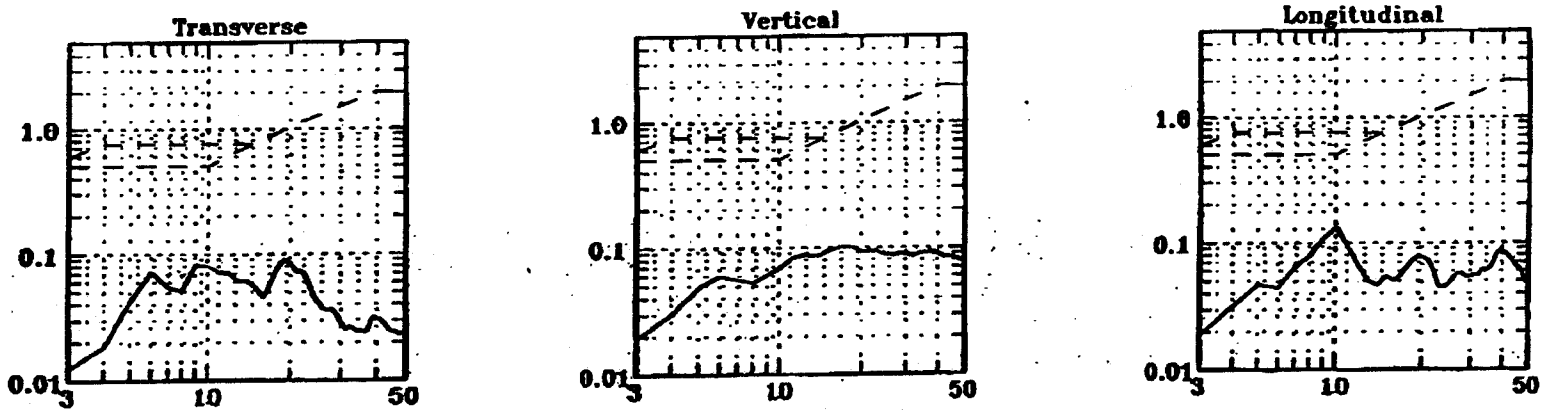
PALMETTO ROCK
Blast
Instrument 7236

KERNERSVILLE, NC
Date: 5/03/94

Seismometer at SCALE HOUSE
Time: 11:01



Response Spectra



vibra-tech engineers

3

377 Carewinds Blvd., Suite 112
Ft. Mill, SC 29715

VIBRA-TECH ENGINEERS
BLAST AND SEISMOGRAPHIC REPORT

803-548-3083
FAX: 803-548-3083

BLAST DATA

Client: Palmetto Rock for Morgan

Job Location: Piedmont Landfill Kernersville NC

Date: 5-9-94 Blast No.: 3 Time: 2:00 Pm

Exact Blast Location: 225' northwest of Scale House

No. of Holes: 135 Diameter: 3 in. Avg. Depth: 8-14 ft. Subgrade: 0 ft.

Spacing: 7 ft. Burden: 7 ft. Avg. Stemming: 6 ft.

Make & Type of Explosives:

Superfrac 6006 2x8	220 lbs.
Pellite-ANFO	3300 lbs.
	lbs.
	lbs.
	lbs.
Total Explosives	3520 lbs.

Delay Make: 24 1/16' Hardi Det caps / 17 ms surface det

Delay Type & Nos.: 25 ms-top / 500 ms Down Hole

Min. Delay Period: 8 ms.

Max. Lbs./Delay Period: 20 lbs.

Blaster: Tim Crenshaw

Weather: clear

Wind Direction & Speed: 5 mph out of SW

SEISMOGRAPH DATA

Seismograph No.: 7236 Range/Gain Setting: Auto ips

Everlert Only — Trigger Level: 0.10 ips

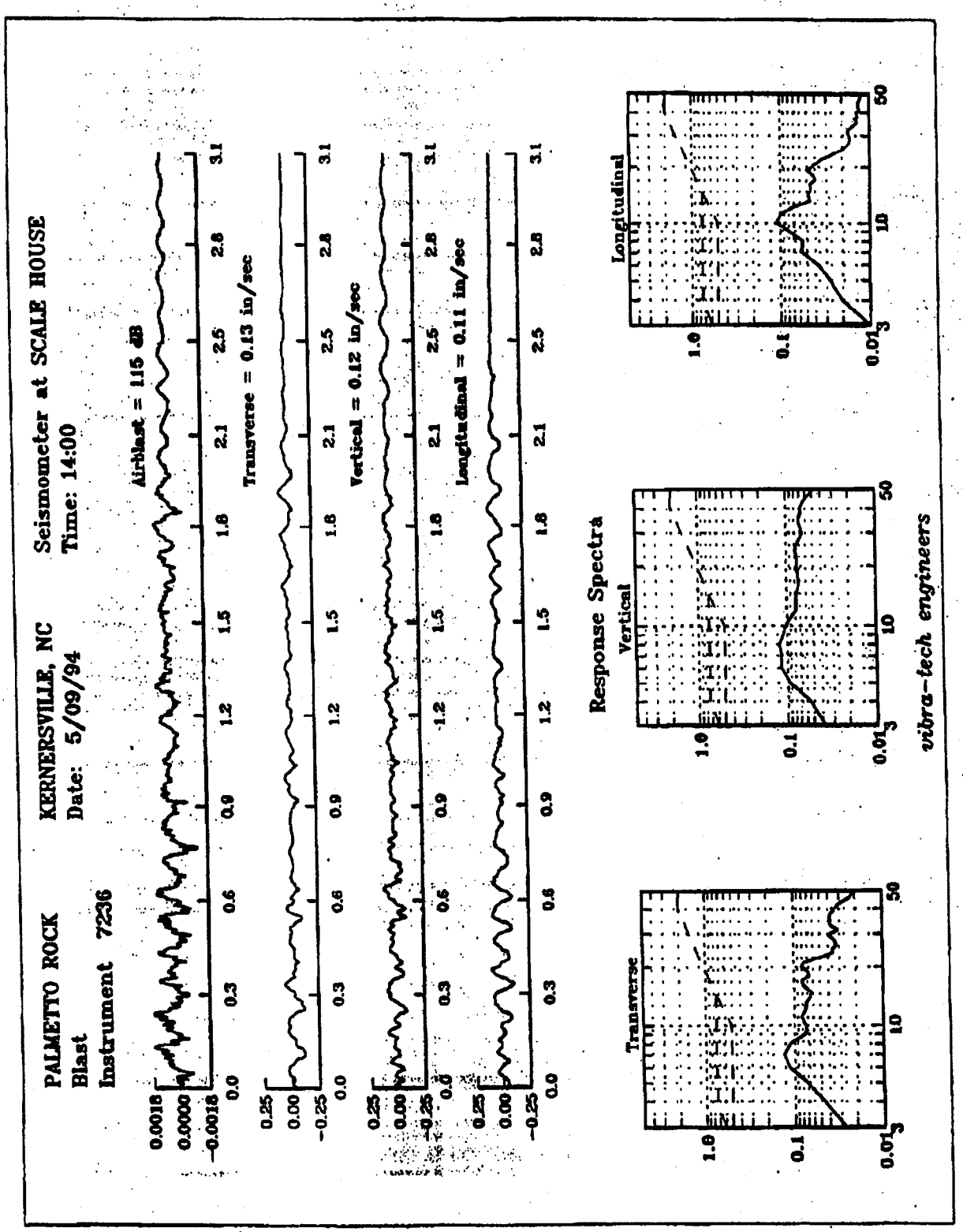
Exact Seismograph Location: Scalehouse Canteen

Seismograph Distance & Direction from Blast: 225' S-E

Meters: Peak Overpressure: 115 dB Operator:

Peak Particle Velocity: 0.13 ips Cassette No.:

Comments:


PALMETTO ROCK
Blast
Instrument 7236
KERNERSVILLE, NC
Date: 5/09/94
Seismometer at SCALE HOUSE
Time: 14:00
AirBlast = 115 dB
Transverse = 0.13 in/sec
Vertical = 0.12 in/sec
Longitudinal = 0.11 in/sec
Response Spectra
Transverse
Vertical
Longitudinal
vibra-tech engineers

4

Carowinds Blvd. Suite 112
Hill, SC 29715

VIBRA-TECH ENGINEERS BLAST AND SEISMOGRAPHIC REPORT

803-548-3088
FAX:803-548-3083

BLAST DATA

Client: Palmetto Rock Services

Job Location: Piedmont Land Fill Kennersville N.C.

Date: 10-21-94 Blast No.: 4 Time: 11:24 AM

Exact Blast Location: 200 Ft. west of scale house

No. of Holes: 105 Diameter: 3" in. Avg. Depth: 16' ft. Subgrade: 2 ft.

Spacing: 8' ft. Burden: 8' ft. Avg. Stemming: 5'-7" ft.

Make & Type of Explosives:

Pellite (ANFO)	3000	lbs.
Power ditch 500 2X16	55	lbs.
Super Fras 6000 2X8	155	lbs.
		lbs.
		lbs.

Total Explosives: 3,210 lbs.

Delay Make: ICI EXEL Handidets

Delay Type & Nos.: 25 MS. 42 MS

Min. delay period: 8 ms.

Max. lbs./delay period: 24 lbs.

Blaster: Robert Starr

Weather: Sunny

Wind Direction & Speed: From SW

SEISMOGRAPH DATA

Seismograph No.: 9018 Range/Gain Setting: Auto ips Everlert Only Trigger Level .10 ips

Exact Seismograph Location: 350' North of Shot On A Fill Area

Seismograph Distance & Direction from Blast: 350' North

Meters: Peak Overpressure: Less Than 120 dB Operator:

Peak Particle Velocity: 4 x .10 ips Cassette No.:

Seismograph No.: 7086 Range/Gain Setting: AUTO ips Everlert Only Trigger Level .10 ips

Exact Seismograph Location: Scale house

Seismograph Distance & Direction from Blast: 200 FT EAST

Meters: Peak Overpressure: Less Than 120 dB Operator:

Peak Particle Velocity: Less Than .10 ips Cassette No.:

Seismograph No.: Range/Gain Setting: ips Everlert Only Trigger Level ips

Exact Seismograph Location:

Seismograph Distance & Direction from Blast:

Meters: Peak Overpressure: dB Operator:

Peak Particle Velocity: ips Cassette No.:

Additional Seismographs: YES NO

(USE REVERSE SIDE FOR BLAST DIAGRAM)

1 2 3 4 5 6

5

arowinds Blvd. Suite 112
, SC 29715

VIBRA-TECH ENGINEERS BLAST AND SEISMOGRAPHIC REPORT

803-548-3088
FAX:803-548-3083

BLAST DATA

Client: Palmetto Rock Services

Job Location: Piedmont Land Fill Kernersville N.C

Date: 12-21-94 Blast No.: 5 Time: 4:00 PM

Exact Blast Location: 600 Ft. West of Scale house

No. of Holes: 113 Diameter: 3" in. Avg. Depth: 7' ft. Subgrade: ft.

Spacing: 7 ft. Burden: 7 ft. Avg. Stemming: 5 ft.

Make & Type of Explosives:

Pellite GA-N-F-O	700	lbs.
Powerdetch 500 2X16	0	lbs.
Superfrac 6000 2X8	113	lbs.
		lbs.
		lbs.

Total Explosives: 813 lbs.

Delay Make: ICI EXEL Handi dets

Delay Type & Nos.: #2 ms - 17 ms - 25 ms

Min. delay period: 8 ms.

Max. lbs./delay period: 19 lbs.

Blaster: Robert Stan

Weather: Sunny

Wind Direction & Speed: Farm SE

SEISMOGRAPH DATA

Seismograph No.: 9018 Range/Gain Setting: Auto ips

Everlert Only — Trigger Level: .10 ips

Exact Seismograph Location: 250 Ft North of Shot On A Fill Area

Seismograph Distance & Direction from Blast: 250 Ft North

Meters — Peak Overpressure: 123 dB Operator:

Peak Particle Velocity: .18 ips Cassette No.:

Seismograph No.: 7036 Range/Gain Setting: AUTO ips

Everlert Only — Trigger Level: .10 ips

Exact Seismograph Location: Piedmont Land Fill Scale house

Seismograph Distance & Direction from Blast: SW Ft East

Meters — Peak Overpressure: <126 dB Operator:

Peak Particle Velocity: <0.10 ips Cassette No.:

Seismograph No.: Range/Gain Setting: ips

Everlert Only — Trigger Level: ips

Exact Seismograph Location:

Seismograph Distance & Direction from Blast:

Meters — Peak Overpressure: dB Operator:

Peak Particle Velocity: ips Cassette No.:

Additional Seismographs: YES NO

(USE REVERSE SIDE FOR BLAST DIAGRAM)

MULTISEIS WAVEFORM ANALYSIS

PALMETTO ROCK
Instrument: 9018

KERNERSVILLE LANDFILL
Seismometer at CENTER OF CELL

MS Event: 1

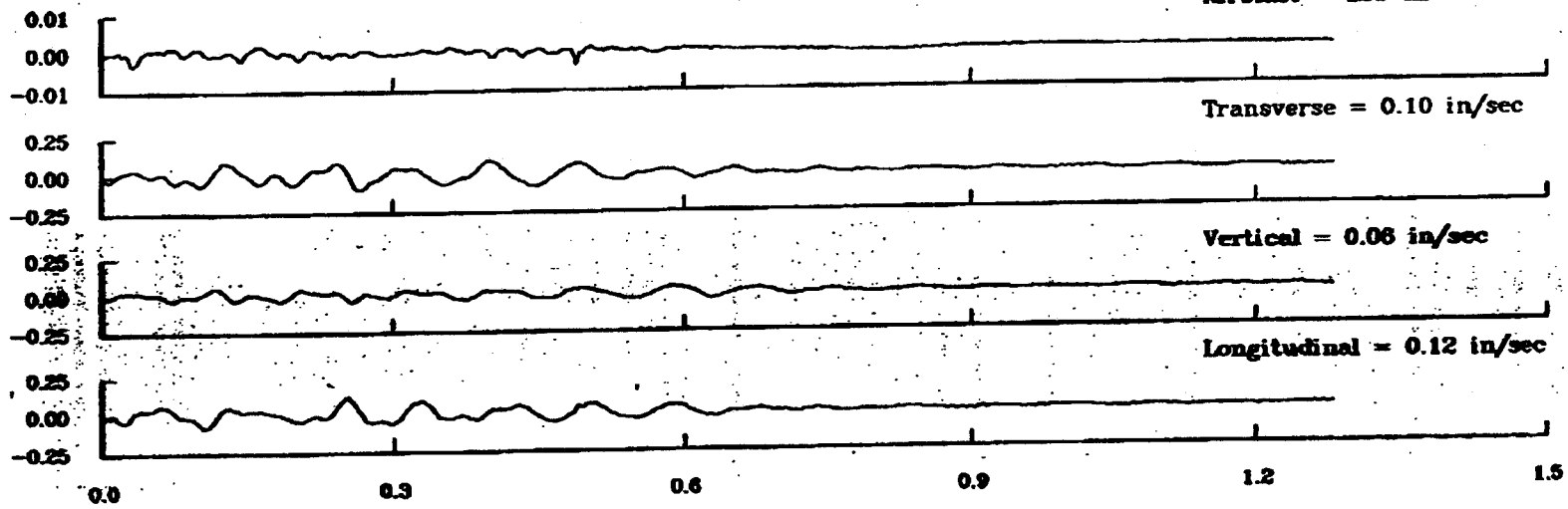
Event :

Date: 10/21/94

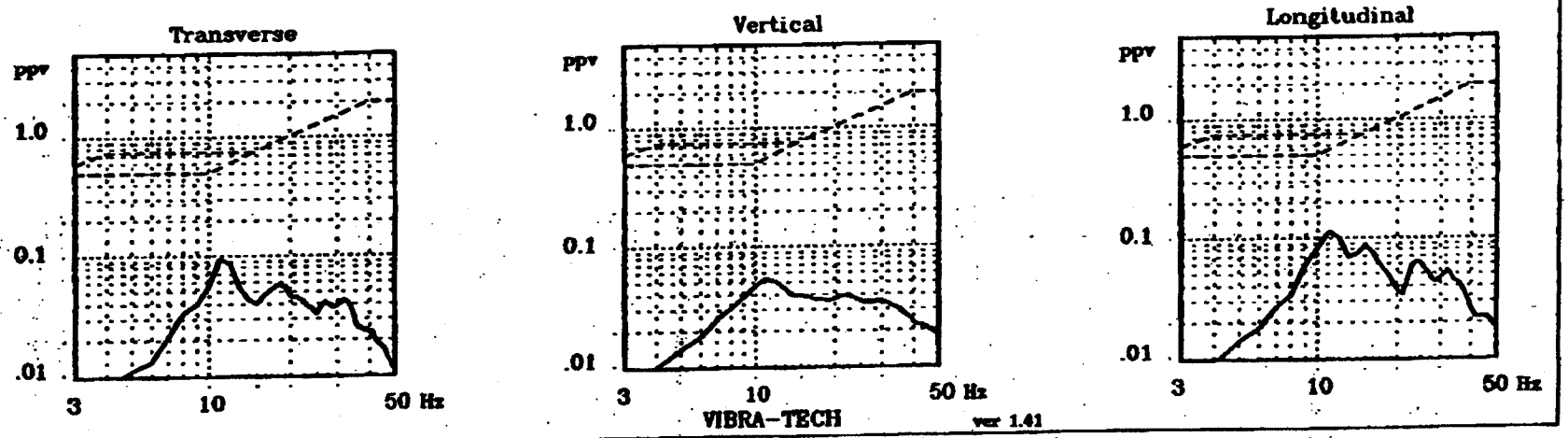
Time: 15:58

Calibrated: 05/27/93

Airblast = 123 dB



RSVP RESPONSE SPECTRA PLOT (U.S.B.M. APPENDIX 'B')



VIBRA-TECH ver 1.41

Carowinds Blvd. Suite 112
Hill, SC 29715

VIBRA-TECH ENGINEERS BLAST AND SEISMOGRAPHIC REPORT

803-548-3088
FAX:803-548-3083

BLAST DATA

Client: Palmetto Rock Services

Job Location: Piedmont Landfill Kernersville N.C.

Date: 10-28-94 Blast No.: 6 Time: 12:25 P.M.

Exact Blast Location: 500 FT. West of Scale house

No. of Holes: 159 Diameter: 3 in. Avg. Depth: 18 ft. Subgrade: 0 ft.

Spacing: 8 ft. Burden: 8 ft. Avg. Stemming: 5 ft.

Make & Type of Explosives:

Pellite	5,250	lbs.
Super Frac	200	lbs.
		lbs.
		lbs.
		lbs.
		lbs.

Total Explosives: 5,450 lbs.

Delay Make: I.C.I. Hazdi Det

Delay Type & Nos.: 25 - 42 ms. 200

Min. delay period: 8 ms.

Max. lbs./delay period: 34 lbs.

Blaster: Robert Stark

Weather: Clear

Wind Direction & Speed: NNW 7-10 mph

SEISMOGRAPH DATA

Seismograph No.: ~~4078~~ 9022 Range/Gain Setting: AUTO ips Everlert Only Trigger Level .20 ips

Exact Seismograph Location: 250 FT North of shot on A Fill area

Seismograph Distance & Direction from Blast: 250 FT North

Meters: Peak Overpressure 134 * dB; Peak Particle Velocity .28 * ips

Operator: Pete Hendryx (Vibra-Tech)

Cassette No.:

Seismograph No.: 7086 Range/Gain Setting: AUTO ips Everlert Only Trigger Level .20 ips

Exact Seismograph Location: Scale house

Seismograph Distance & Direction from Blast: 500 East

Meters: Peak Overpressure * dB; Peak Particle Velocity * ips

Operator:

Cassette No.:

Seismograph No.: Range/Gain Setting: ips Everlert Only Trigger Level ips

Exact Seismograph Location:

Seismograph Distance & Direction from Blast:

Meters: Peak Overpressure dB; Peak Particle Velocity ips

Operator:

Cassette No.:

Additional Seismographs ____ YES ____ NO

* Instrument malfunction. Unable to retrieve data for print-out.

* Instrument data disk filled to capacity. No reading available.

(USE REVERSE SIDE FOR BLAST DIAGRAM)

7

arowinds Blvd. Suite 112
, SC 29715

VIBRA-TECH ENGINEERS BLAST AND SEISMOGRAPHIC REPORT

803-548-3088
FAX:803-548-3083

BLAST DATA

Client: Palmetto Rock Services

Job Location: Piedmont Lazad Gil Kernersville N.C.

Date: 10-28-94 Blast No.: 7 Time: 5:32 p.m.

Exact Blast Location: 500 Ft. West of Scale house

No. of Holes: 221 Diameter: 3 in. Avg. Depth: 18 ft. Subgrade: 0 ft.

Spacing: 8 ft. Burden: 8 ft. Avg. Stemming: 5 ft.

Make & Type of Explosives:

Pellite	7,250	lbs.
Super Fuse 2x8	240	lbs.
Power Ditch 2x16	500	lbs.
Apex Ultra 2½x16	275	lbs.
		lbs.

Total Explosives: 8,265 lbs.

Delay Make: I.C.I Hazdi Det

Delay Type & Nos.: M.S #25 + #42 + #50

Min. delay period: 8 ms.

Max. lbs./delay period: 38 lbs.

Blaster: Robert Stark

Weather: Clear

Wind Direction & Speed: NNW 7-10 mph

SEISMOGRAPH DATA

Seismograph No.: ~~[illegible]~~ 9022 Range/Gain Setting: Auto ips

Everlert Only — Trigger Level: .120 ips

Exact Seismograph Location: 350 Ft. North of Shot on a Fill Area

Seismograph Distance & Direction from Blast: 350 North

Meters: Peak Overpressure: * dB Operator:

Peak Particle Velocity: * ips Cassette No.:

Seismograph No.: 7086 Range/Gain Setting: Auto ips

Everlert Only — Trigger Level: .120 ips

Exact Seismograph Location: Scale House

Seismograph Distance & Direction from Blast: 500 Ft East

Meters: Peak Overpressure: 112 dB Operator:

Peak Particle Velocity: 0.21 ips Cassette No.:

Seismograph No.: Range/Gain Setting: ips

Everlert Only — Trigger Level: ips

Exact Seismograph Location:

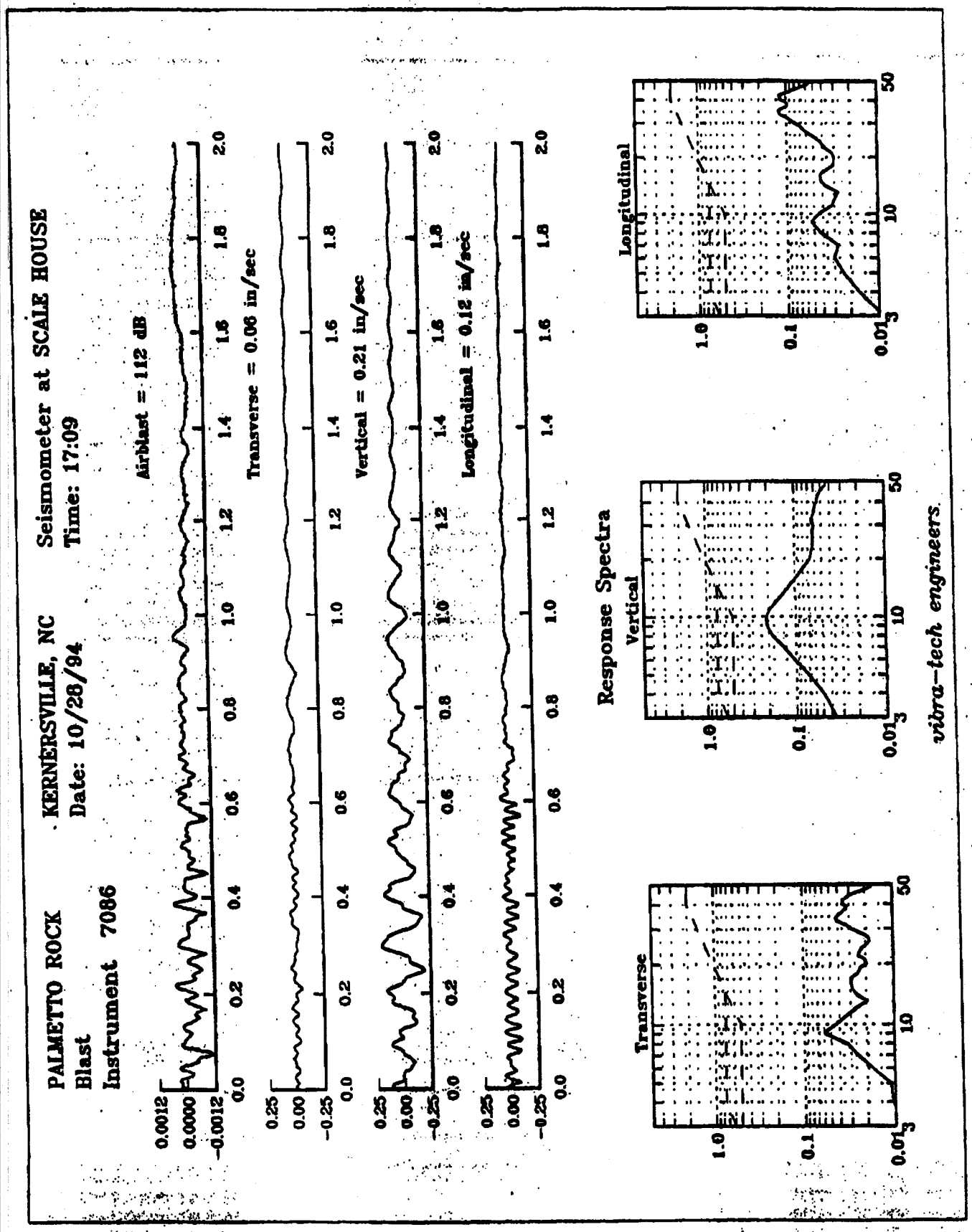
Seismograph Distance & Direction from Blast:

Meters: Peak Overpressure: dB Operator:

Peak Particle Velocity: ips Cassette No.:

Additional Seismographs: YES NO

* Instrument malfunction. Unable to retrieve data for print-out.


PALMETTO ROCK
Blast
Instrument 7086
KERNERSVILLE, NC
Date: 10/28/94
Seismometer at SCALE HOUSE
Time: 17:09
Airblast = 112 dB
Transverse = 0.06 in/sec
Vertical = 0.21 in/sec
Longitudinal = 0.12 in/sec
Response Spectra
Vertical
Transverse
Longitudinal
vibra-tech engineers

USE REVERSE SIDE FOR BLAST DIAGRAM

8

owinds Blvd. Suite 112
SC 29715

VIBRA-TECH ENGINEERS BLAST AND SEISMOGRAPHIC REPORT

803-548-3083
FAX:803-548-3083

BLAST DATA

Client: Palmetto Rock Services

Job Location: Piedmont Landfill Kernersville N.C.

Date: 11-7-94 Blast No.: 8 Time: 12:10 p.m.

Exact Blast Location: 550 FT. West of Scale house

No. of Holes: 170 Diameter: 3" in. Avg. Depth: 9 ft. Subgrade: 0 ft.

Spacing: 8 ft. Burden: 8 ft. Avg. Stemming: 4.5 ft.

Make & Type of Explosives:

Pellets	2,500	lbs.
Super Fize	170	lbs.
		lbs.
		lbs.
		lbs.
Total Explosives	2,670	lbs.

Delay Make: I.C.I. Hardi Nets

Delay Type & Nos.: MS # 25 & 17 # 500

Min. delay period: 8 ms.

Max. lbs./delay period: 15.7 lbs.

Blaster: Greg Brown

Weather: Clear

Wind Direction & Speed: S.W. 10 mph

SEISMOGRAPH DATA

Seismograph No.: ~~[illegible]~~ 9022 Range/Gain Setting: Auto ips Everlert Only Trigger Level: .20 ips

Exact Seismograph Location: 200 FT North of Shot On A Fill Area

Seismograph Distance & Direction from Blast: 200 FT North

Meters: Peak Overpressure: * dB Operator:

Peak Particle Velocity: * ips Cassette No.:

Seismograph No.: 7086 Range/Gain Setting: Auto ips Everlert Only Trigger Level: .20 ips

Exact Seismograph Location: IN The Scale House

Seismograph Distance & Direction from Blast: 550 FT. East

Meters: Peak Overpressure: * dB Operator:

Peak Particle Velocity: * ips Cassette No.:

Seismograph No.: Range/Gain Setting: ips Everlert Only Trigger Level: ips

Exact Seismograph Location:

Seismograph Distance & Direction from Blast:

Meters: Peak Overpressure: dB Operator:

Peak Particle Velocity: ips Cassette No.:

Additional Seismographs: YES NO

* Instrument malfunction unable to retrieve data

9

7 Carewinds Blvd. Suite 112
. Mill, SC 29715

VIBRA-TECH ENGINEERS BLAST AND SEISMOGRAPHIC REPORT

803-548-3086
FAX:803-548-3083

BLAST DATA

Client: Palmetto Rock Services

Job Location: Piedmont Landfill Kernersville N.C.

Date: 11-10-94 Blast No.: 9 Time: 1:13 pm

Exact Blast Location: 375 ft. west of scale house

No. of Holes: 106 Diameter: 3" in. Avg. Depth: 8-24 ft. Subgrade: 0 ft.

Spacing: 10-9 ft. Burden: 10-9 ft. Avg. Stemming: 5 ft.

Make & Type of Explosives:

Dallite	3750	lbs.
Super Frac	110	lbs.
Power Frac	55	lbs.
		lbs.
		lbs.
Total Explosives	3,915	lbs.

Delay Make: I.C.I. Hand Days

Delay Type & Nos.: MS # 17 # 25

Min. delay period: 8 ms.

Max. lbs./delay period: 36 lbs.

Blaster: Robert Stark

Weather: Rain

Wind Direction & Speed: NNW 5-12 mph

SEISMOGRAPH DATA

Seismograph No.: ~~[illegible]~~ 9022 Range/Gain Setting: Auto ips

Everiert Only — Trigger Level: .20 ips

Exact Seismograph Location: 300 ft. North of Shot on 2 Fill Area

Seismograph Distance & Direction from Blast: 300 ft North

Meters: Peak Overpressure: * dB Operator:

Peak Particle Velocity: * ips Cassette No.:

Seismograph No.: 7086 Range/Gain Setting: Auto ips

Everiert Only — Trigger Level: .20 ips

Exact Seismograph Location: In the Scale house

Seismograph Distance & Direction from Blast: 375 ft East

Meters: Peak Overpressure: * dB Operator:

Peak Particle Velocity: * ips Cassette No.:

Seismograph No.: Range/Gain Setting: ips

Everiert Only — Trigger Level: ips

Exact Seismograph Location:

Seismograph Distance & Direction from Blast:

Meters: Peak Overpressure: dB Operator:

Peak Particle Velocity: ips Cassette No.:

Additional Seismographs: ____ YES ____ NO

*Instrument malfunction unable to retrieve data for print-out.

USE REVERSE SIDE FOR BLAST DIAGRAM

Last blast # 9 on 11-10-94

Sheet 1

377 Carowinds Blvd., Suite 112
Ft. Mill, SC 29715

VIBRA-TECH ENGINEERS
BLAST AND SEISMOGRAPHIC REPORT

803-548-3066
FAX: 803-548-3083

BLAST DATA

Client: Palmetto Rock Services

Job Location: Kernersville Landfill

Date: 12/28/94 Blast No.: 18 Time: 12:09 PM

Exact Blast Location: Top of hill NW of Scale House 120 yds

No. of Holes: 108 Diameter: 3 in. Avg. Depth: 22-26-30 ft. Subgrade: 0 ft.

Spacing: 10 ft. Burden: 10 ft. Avg. Stemming: 5 ft.

Make & Type of Explosives:

115 x 50# Pellite	5550	lbs.
~~50~~		lbs.
apex	220	lbs.
Superfrac 2x8	220	lbs.
		lbs.

Total Explosives: 5990 lbs.

Delay Make: ICI Nandy Dino

Delay Type & Nos.: MS25, 17, 42

Min. Delay Period: 8 ms.

Max. Lbs./Delay Period: ~~55~~ 54.7 lbs.

Blaster: Palmetto Rock Serv. - Henry Brome Robt Star

Weather: Sunny 58°

Wind Direction & Speed: 5-10 MPH from NW

SEISMOGRAPH DATA

Seismograph No.: 2086

Range/Gain Setting: ~~.50~~ .20 ips

Everlert Only
Trigger Level ips

Exact Seismograph Location: ~~200' W~~ at base of hill

Seismograph Distance & Direction from Blast: 200' NW

Meters:
- Peak Overpressure: No reading dB
- Peak Particle Velocity: Less than .20 ips

Operator: Pete Hendryx

Cassette No.:

Comments:

377 Carowinds Blvd., Suite 112
Ft. Mill, SC 29715

VIBRA-TECH ENGINEERS
BLAST AND SEISMOGRAPHIC REPORT

Sheet 2

803-548-3066
FAX: 803-548-3083

BLAST DATA

Client Palmetto Rock Services — Same data as Sheet 1

Job Location Kernersville Landfill

Date 12-28-94 Blast No. 10 Time 12:09

Exact Blast Location

No. of Holes ____ Diameter 3" in. Avg. Depth 26 ft. Subgrade 0 ft.

Spacing 10 ft. Burden 10 ft. Avg. Stemming 5 ft.

Make & Type of Explosives:

Pellite	5,550	lbs.
Apex	280	lbs.
Super Frac	220	lbs.
		lbs.
		lbs.
Total Explosives	5,990	lbs.

Delay Make ICI Hazdet Dets

Delay Type & Nos. MS # 29 17.42

Min. Delay Period 8 ms.

Max. Lbs./Delay Period 54.7 lbs.

Blaster Robert Starr

Weather Sunny 58°

Wind Direction & Speed 5-10 mph N-W

SEISMOGRAPH DATA

Seismograph No. 7086 Range/Gain Setting .20 ips

Everlert Only — Trigger Level .50 ips

Exact Seismograph Location Scale House 350 FT. EAST

Seismograph Distance & Direction from Blast

Meters { Peak Overpressure Less than ~~150~~ 120 dB; Peak Particle Velocity " " .05 ips

Operator BHA

Cassette No.

Comments:

Shot 1

377 Carowinds Blvd., Suite 112
Ft. Mill, SC 29715

VIBRA-TECH ENGINEERS
BLAST AND SEISMOGRAPHIC REPORT

803-548-3066
FAX: 803-548-3083

BLAST DATA

Client: Palmetto Rock Services

Job Location: Kernersville Land Fill

Date: 12/28/94 Blast No.: 11 Time: 3:59P

Exact Blast Location: Top of hill - NW of Scale House 100 yds.

No. of Holes: 80 Diameter: 3 in. Avg. Depth: 27 ft. Subgrade: 0 ft.

Spacing: 10 ft. Burden: 10 ft. Avg. Stemming: 5 ft.

Make & Type of Explosives:

Pellite	4,200	lbs.
~~Gelex~~ SuperFrac	136	lbs.
~~Superfrac 28~~		lbs.
		lbs.
		lbs.
Total Explosives	4,336	lbs.

Delay Make: ICI Handi disc

Delay Type & Nos.: MS # 25 # 17 # 42

Min. Delay Period: 8 ms.

Max. Lbs./Delay Period: 54 lbs.

Blaster: Palmetto Rock Serv. - Robt Stan

Weather: Sunny 63°F

Wind Direction & Speed: 5 MPH from W

SEISMOGRAPH DATA

Seismograph No.: 2086 Range/Gain Setting: .10 ips

Everlert Only
Trigger Level
ips

Exact Seismograph Location: at base of hill

Seismograph Distance & Direction from Blast: ~~270~~ 250' NW

Meters: Peak Overpressure .00145 dB; Peak Particle Velocity .05 ips

Operator: Pete Hendrix

Cassette No.:

Comments:

377 Carowinds Blvd., Suite 112
Ft. Mill, SC 29715

VIBRA-TECH ENGINEERS
BLAST AND SEISMOGRAPHIC REPORT

sheet #2

803-548-3066
FAX: 803-548-3083

BLAST DATA

Client Palmetto Rock Services — Same data as Sheet 1

Job Location Kernersville NC Landfill

Date 12/28/94 Blast No. 11 Time 3.59 PM

Exact Blast Location Top of Hill - NW of Scale house 100 yds

No. of Holes 80 Diameter 3 in. Avg. Depth 22 ft. Subgrade 0 ft.

Spacing 10 ft. Burden 10 ft. Avg. Stemming 5 ft.

Make & Type of Explosives:

Pellite	4,200	lbs.
Super Frac	136	lbs.
		lbs.
		lbs.
		lbs.
Total Explosives	4336	lbs.

Delay Make ICI Hardi Dets

Delay Type & Nos. M.S #25 #17 #42

Min. Delay Period 8 ms.

Max. Lbs./Delay Period 54 lbs.

Blaster Robert Starr

Weather Sunny 63°

Wind Direction & Speed 5 mph West

SEISMOGRAPH DATA

Seismograph No. 7086 Range/Gain Setting .10 ips

Everlert Only
Trigger Level
.50 ips

Exact Seismograph Location Scale House

Seismograph Distance & Direction from Blast 100 yds SE

Meters { Peak Overpressure No recording dB
Peak Particle Velocity Less than .50 ips

Operator PSH

Cassette No.

Comments:

VIBRA-TECH

REPORT

TO Palmetto Rock Services
Morgan Corporation
Post Office Box 3555
Greenville, South Carolina 29304-3555

DATE March 8, 1995

SUBJECT Blasts dated January 23, 1995
through March 4, 1995

Piedmont Landfill Project
Kernersville, North Carolina

COPY NUMBER 2 OF 3

VIBRA-TECH
The Vibration Monitoring Experts
377 Carowinds Boulevard, Suite 112, Ft. Mill, SC 29715
803-548-3066 FAX 803-548-3083

March 8, 1995

Mr. Hase Broom
Palmetto Rock Services
Post Office Box 3273
Spartanburg, South Carolina 29334

Dear Mr. Broom:

This report contains the original seismic data from blasting associated with the Piedmont Landfill Project. Six blasts, dated January 23, 1995 through March 4, 1995 are included.

The maximum value of the recorded peak particle velocity for this series of blasts was 0.42 inches per second (ips). This value, recorded from the blast dated February 14, 1995, is significantly below the established criteria for ground vibration as recommended by the United States Bureau of Mines (RI-8507: November, 1980).

Recent studies into the effect of ground vibration on nearby structures has proven the correlation between particle velocity and frequency in assessing the impact of blasting. In order to properly assess the effect of the blasts included in this report, Response Spectra Velocity Profiles (RSVP) have been performed on each blast record.

The RSVP is a computer derived simulation of the response that a typical structure exhibits when exposed to the recorded vibration waveform. Response spectra analysis is a powerful analysis tool for diagnosing potential vibration problems before they actually become problematic. Response analysis, such as that utilized in the RSVP technique has been recommended by the United States Office of Surface Mining as the most effective method of assessing the impact of blast vibration on nearby properties.

Response analysis has been performed on each vibration record associated with blasting operations for this time period. A copy of the associated data is graphically represented in this report. A review of the RSVP data shows particle velocities well within the recommended limit for all frequencies between 3 Hz and 40 Hz for all blast events included in this report.

The maximum recorded air blast level for this series of blasts was 124 decibels (dB), or 0.00460 pounds per square inch (psi), for the blast dated January 26, 1995, which represents fifty-six percent of the 129 dB criteria stated in the United States Bureau of Mines (RI-8485:1980).

Should you have any questions or require additional information regarding the contents of this report, please do not hesitate to contact me at once.

Respectfully submitted,
Vibra-Tech, Inc.

Rob Pippin

Rob Pippin
Field Technician

377 Carowinds Blvd., Suite 112
Ft. Mill, SC 29715

VIBRA-TECH ENGINEERS
BLAST AND SEISMOGRAPHIC REPORT

803-548-3066
FAX: 803-548-3083

BLAST DATA

Client Palmetto Rock Serv

Job Location Kensington - Land Fill

Date 1-23-95 Blast No. 12 Time 12:13 pm

Exact Blast Location 300' NW of Scale House

No. of Holes 135 Diameter 3" in. Avg. Depth 22 ft. Subgrade 0 ft.

Spacing 10 ft. Burden 10 ft. Avg. Stemming 5 ft.

Make & Type of Explosives:

Pellitc bags	6,400	lbs.
Apex Ultra 2 2½ x 16	110	lbs.
Super Frac 6000 2 x 8	136	lbs.
		lbs.
		lbs.

Total Explosives 6,646 lbs.

Delay Make I.C.I Handi Dets

Delay Type & Nos. M.S # 25 ms # 17

Min. Delay Period 8 ms.

Max. Lbs./Delay Period 98.4 lbs.

Blaster Greg Brown

Weather Cloudy + SNOW

Wind Direction & Speed S.E 6 m.p.h

SEISMOGRAPH DATA

Seismograph No. 7131 Range/Gain Setting Auto ips

Everlert Only: Trigger Level .05 ips

Exact Seismograph Location 70' NW of Scale House

Seismograph Distance & Direction from Blast SE 230'

Meters: Peak Overpressure 122 dB; Peak Particle Velocity .28 ips

Operator Pete Hendryx

Cassette No.

Seismograph No. 7086 Range/Gain Setting AUTO ips

Everlert Only: Trigger Level .50 ips

Exact Seismograph Location Scale House

Seismograph Distance & Direction from Blast 300 FT. S.E.

Meters: Peak Overpressure * dB; Peak Particle Velocity * ips

Operator Pete Hendryx

Cassette No.

(* INSTRUMENT MALFUNCTION. READING NOT AVAILABLE)

Seismograph No. Range/Gain Setting ips

Everlert Only: Trigger Level ips

Exact Seismograph Location

Seismograph Distance & Direction from Blast

Meters: Peak Overpressure dB; Peak Particle Velocity ips

Operator

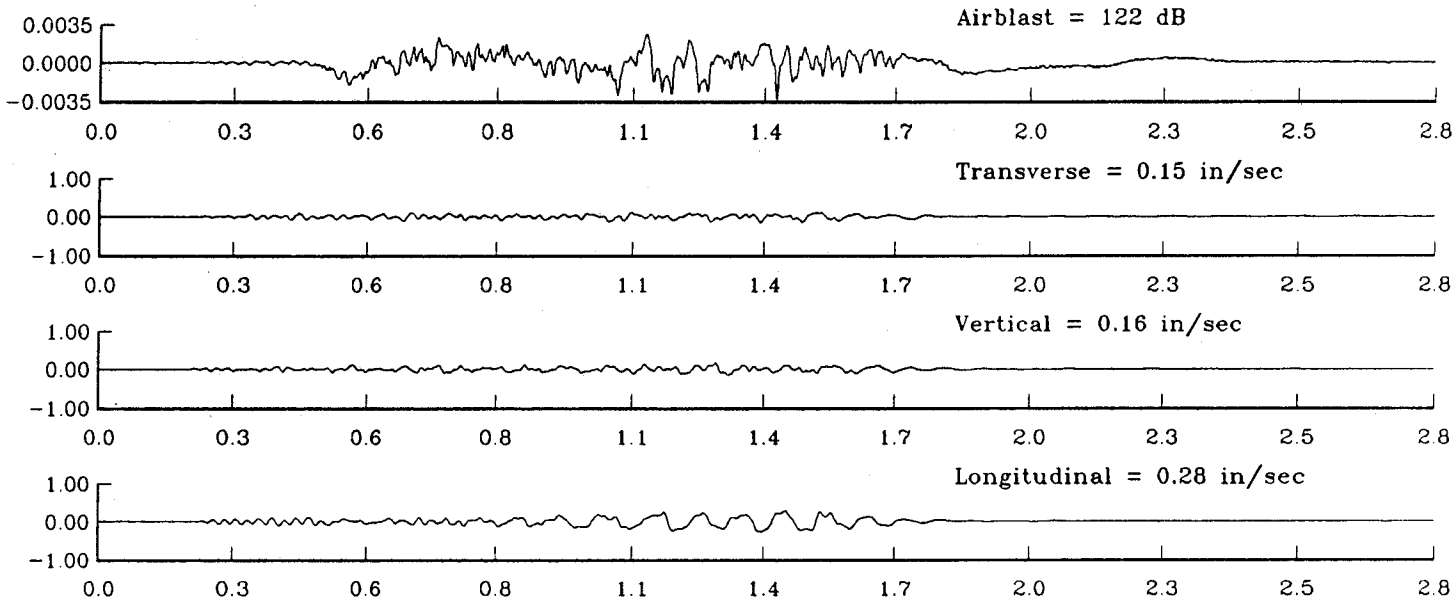
Cassette No.

Additional Seismographs ____ YES ____ NO

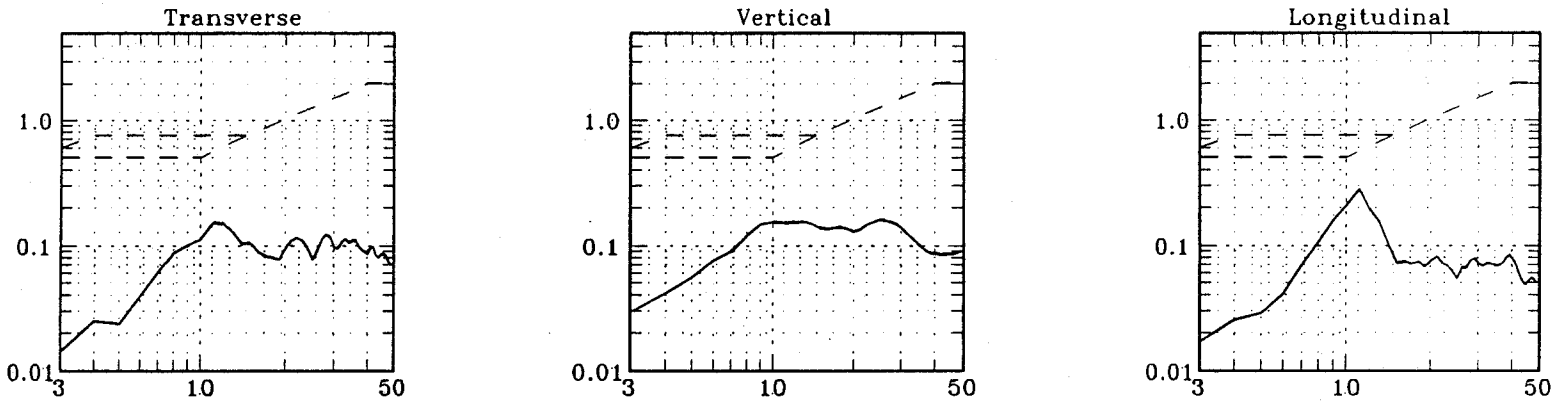
PALMETTO ROCK
Blast
Instrument 7131

KERNERSVILLE, NC
Date: 1/23/95

Seismometer at 70' NW OF SCALEHOUSE
Time: 12:12



Response Spectra



vibra-tech engineers

Carowinds Blvd. Suite 112
Mill, SC 29715

VIBRA-TECH ENGINEERS BLAST AND SEISMOGRAPHIC REPORT

803-548-3066
FAX:803-548-3083

BLAST DATA

Client: Palmetto Rock Services

Job Location: Piedmont Land Fill Kernersville N.C

Date: 1-26-95 Blast No.: 13 Time: 2:34 PM

Exact Blast Location: 275 FT N.W OF Scale house

No. of Holes: 258 Diameter: 3" in. Avg. Depth: 4-To 21 ft. Subgrade: 0 ft.

Spacing: 6 + 10 ft. Burden: 7 + 10 ft. Avg. Stemming: 6' ft.

Make & Type of Explosives:

Pellite	3,750	lbs.
Super Fuse 2x8	280	lbs.
		lbs.
		lbs.
		lbs.
Total Explosives	4,030	lbs.

Delay Make: I-C-I Hardi Dets

Delay Type & Nos.: MS #17 + MS #25

Min. delay period: 8 ms.

Max. lbs./delay period: 51 lbs.

Blaster: Robert Starr

Weather: Clear

Wind Direction & Speed: E.S.E. 5 mph

SEISMOGRAPH DATA

Seismograph No.: Range/Gain Setting: ips Everlert Only / Trigger Level ips

Exact Seismograph Location: 70' N.W OF Scale house

Seismograph Distance & Direction from Blast: S.E 200 FT.

Meters: Peak Overpressure 124 dB; Peak Particle Velocity 0.355 ips

Operator:

Cassette No.:

Seismograph No.: Range/Gain Setting: ips Everlert Only / Trigger Level ips

Exact Seismograph Location: Scale house

Seismograph Distance & Direction from Blast: 250 FT S.E

Meters: Peak Overpressure dB; Peak Particle Velocity ips

Operator:

Cassette No.:

Seismograph No.: Range/Gain Setting: ips Everlert Only / Trigger Level ips

Exact Seismograph Location:

Seismograph Distance & Direction from Blast:

Meters: Peak Overpressure dB; Peak Particle Velocity ips

Operator:

Cassette No.:

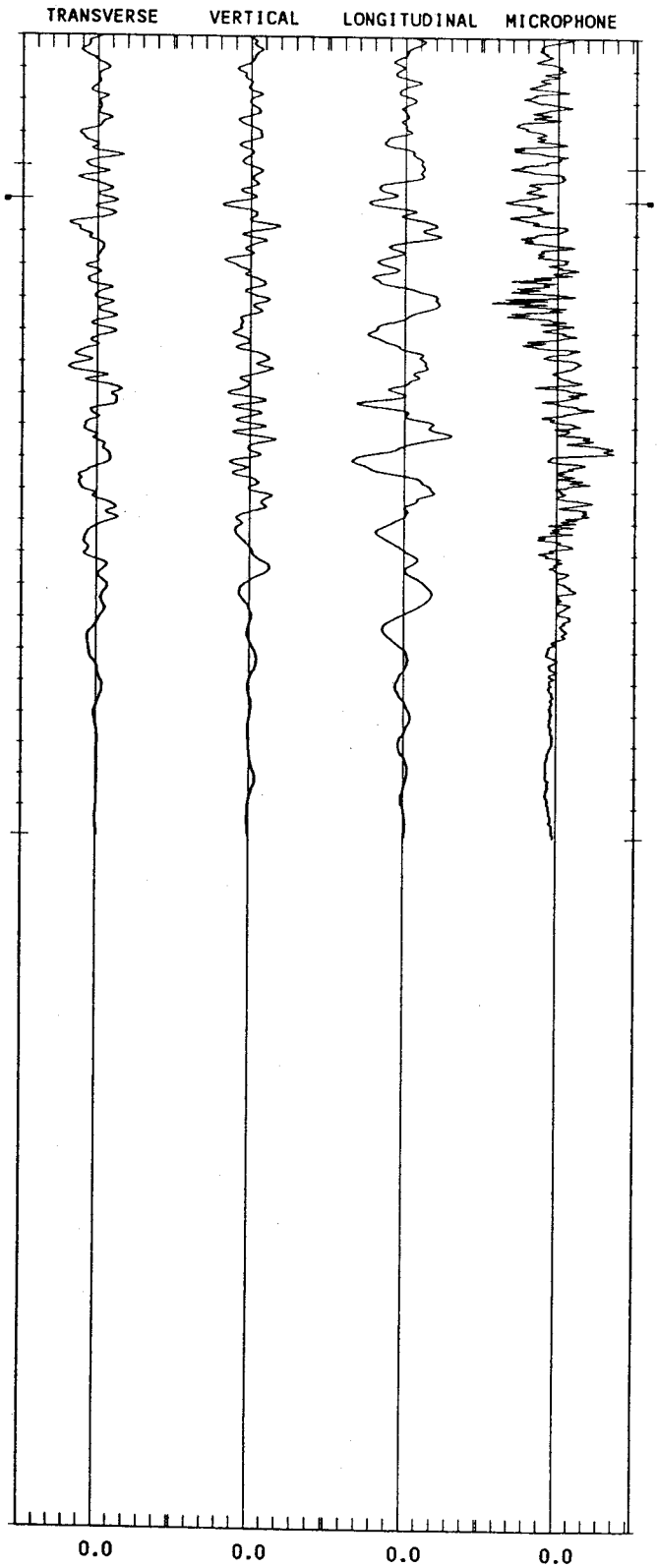
Additional Seismographs _____ YES _____ NO

(USE REVERSE SIDE FOR BLAST DIAGRAM)

1 2 3 4 5 6

SEISMOGRAPH ANALYSIS REPORT

EVENT WAVEFORMS



AMPLITUDE SCALE:GEO: 0.100 in/sec/div MIC: 0.0010 psi(L)/div
TIME SCALE: 50 msec/div 2.344 sec/page TRIGGER =

SERIAL NO.	2086 V5.3-EVVe
CODE	D0865988.XKV
TIME & DATE	Long. at 14:44:08 Jan 26, 1995
TRIGGER SOURCE	Geo 0.200 in/sec
RECORD TIME	1 sec
LOCATION	
CLIENT	
USER	
NOTES	

SCALED DISTANCE	N/A
PEAK VECTOR SUM	0.381 in/sec at 404 ms
MICROPHONE	LINEAR WEIGHTING
PK AIR	123.7 dB(L) at 154 ms
ZC FREQ	32 Hz

	TRAN	VERT	LONG	
PPV	0.195	0.190	0.355	in/sec
ZC FREQ	12	32	11	Hz
FFT FREQ	N/A	N/A	N/A	Hz
TIME(REL.TO TRIG)	259	9	404	ms
ACCEL	0.11	0.11	0.12	g
1/4 WAVE DISP	0.0023	0.0018	0.0047	in

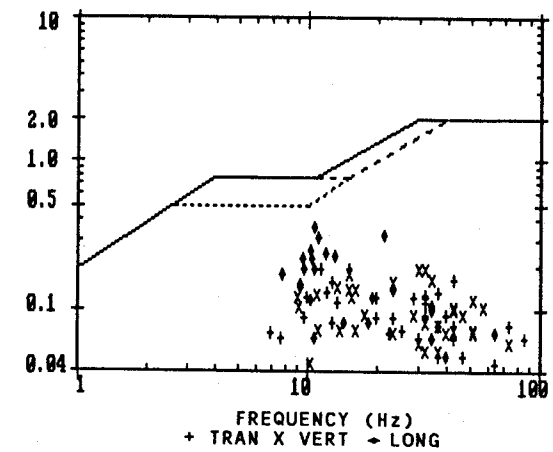
DYNAMIC GEO CAL Passed Passed Passed
INTERNAL MIC CHANNEL TEST: Passed Freq = 20 Amp = 338

BATTERY LEVEL 6.7 volts

CALIBRATED ON Sep 28, 1994 by VIBRA-TECH

(N/A) - not applicable

USBM RI8507 AND OSMRE ANALYSIS
(in/sec)



Vibra-Tech
THE VIBRATION MONITORING EXPERTS

Carowinds Blvd. Suite 112
Fort Mill, SC 29715

VIBRA-TECH ENGINEERS BLAST AND SEISMOGRAPHIC REPORT

803-548-3066
FAX:803-548-3083

BLAST DATA

Client: Palmetto Rock Services

Job Location: Piedmont Land Fill Kernersville N.C.

Date: 2-2-95 Blast No.: 14 Time: 1:12 PM

Exact Blast Location: 250 FT N.W. of scale house

No. of Holes: 185 Diameter: 3 in. Avg. Depth: 12.21 ft. Subgrade: 0 ft.

Spacing: 8 + 10 ft. Burden: 8 + 10 ft. Avg. Stemming: 5.7 ft.

Make & Type of Explosives:

Pellite	4,850	lbs.
Super Frac	165	lbs.
		lbs.
		lbs.
		lbs.

Total Explosives: 5,015 lbs.

Delay Make: 1-E-1 Hardi Dets

Delay Type & Nos.: M.S # 17 M.S # 25

Min. delay period: 8 ms.

Max. lbs./delay period: 59 lbs.

Blaster: Robert Starr

Weather: Rain

Wind Direction & Speed: EBE 8 mph.

SEISMOGRAPH DATA

Seismograph No.: Range/Gain Setting: ips

Everlert Only / Trigger Level: ips

Exact Seismograph Location: 90 FT. N.W. of Scale house

Seismograph Distance & Direction from Blast: 150 FT. South East

Meters: Peak Overpressure 105 dB; Peak Particle Velocity 0.315 ips

Operator:

Cassette No.:

Seismograph No.: Range/Gain Setting: ips

Everlert Only / Trigger Level: ips

Exact Seismograph Location: Scale house

Seismograph Distance & Direction from Blast: 250 FT. South East

Meters: Peak Overpressure dB; Peak Particle Velocity ips

Operator:

Cassette No.:

Seismograph No.: Range/Gain Setting: ips

Everlert Only / Trigger Level: ips

Exact Seismograph Location:

Seismograph Distance & Direction from Blast:

Meters: Peak Overpressure dB; Peak Particle Velocity ips

Operator:

Cassette No.:

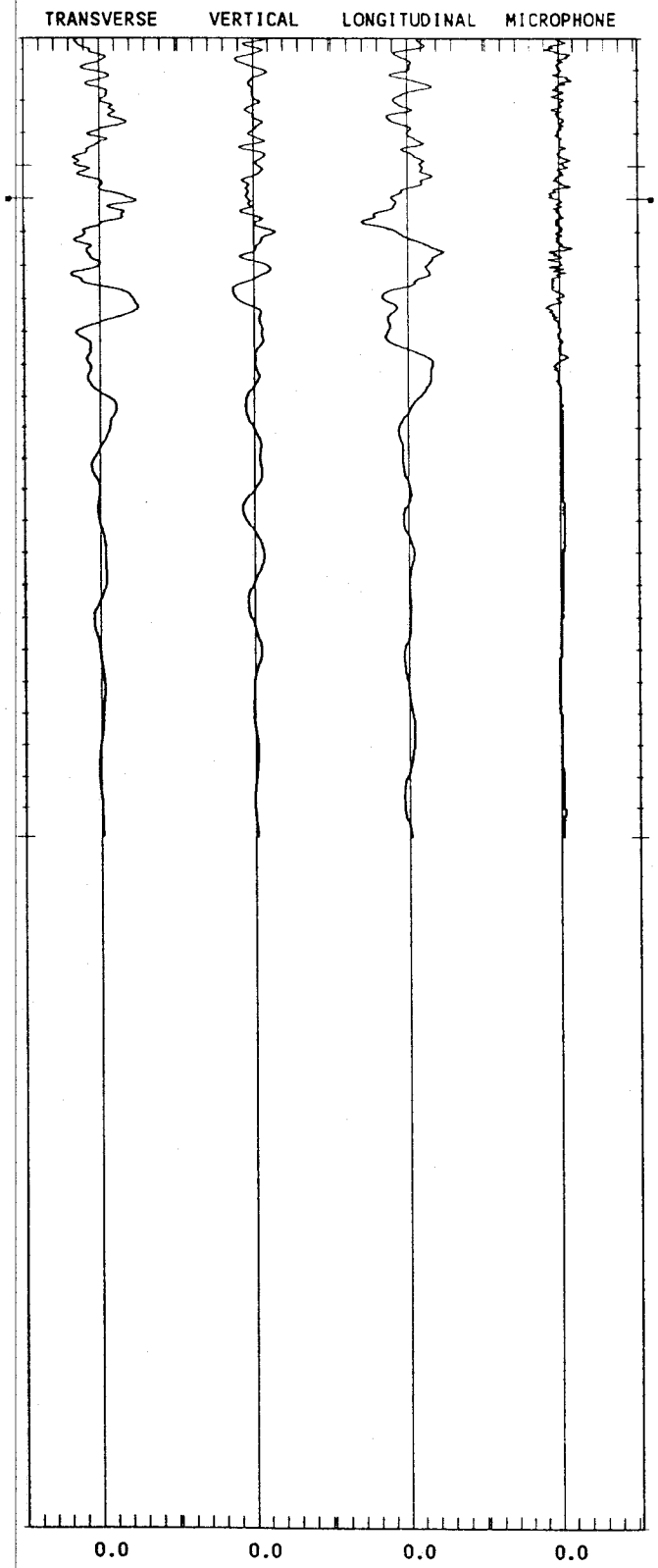
Additional Seismographs _____ YES _____ NO

(USE REVERSE SIDE FOR BLAST DIAGRAM)

1 2 3 4 5 6

SEISMOGRAPH ANALYSIS REPORT

EVENT WAVEFORMS



AMPLITUDE SCALE:GEO: 0.100 in/sec/div MIC: 0.0005 psi(L)/div
TIME SCALE: 50 msec/div 2.344 sec/page TRIGGER =

SERIAL NO.	2086 V5.3-EVVe
CODE	D08659L3.A6V
TIME & DATE	Tran. at 13:10:54 Feb 2, 1995
TRIGGER SOURCE	Geo 0.200 in/sec
RECORD TIME	1 sec
LOCATION	
CLIENT	
USER	
NOTES	

SCALED DISTANCE N/A

PEAK VECTOR SUM 0.319 in/sec at 34 ms

MICROPHONE LINEAR WEIGHTING
PK AIR 104.9 dB(L) at -232 ms
ZC FREQ 39 Hz

	TRAN	VERT	LONG	
PPV	0.250	0.145	0.315	in/sec
ZC FREQ	9	12	7	Hz
FFT FREQ	N/A	N/A	N/A	Hz
TIME(REL.TO TRIG)	162	134	35	ms
ACCEL	0.09	0.08	0.09	g
1/4 WAVE DISP	0.0048	0.0021	0.0058	in

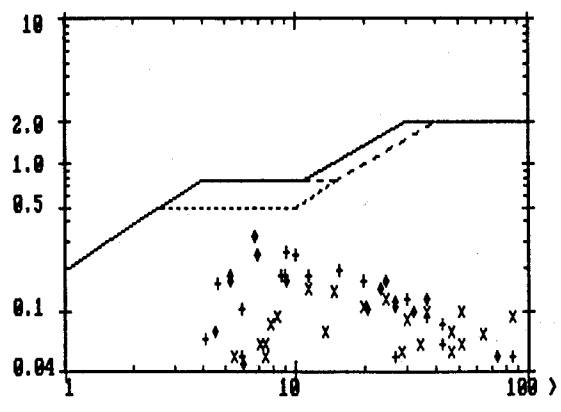
DYNAMIC GEO CAL Passed Passed Passed
INTERNAL MIC CHANNEL TEST: Passed Freq = 20 Amp = 314

BATTERY LEVEL 6.6 volts

CALIBRATED ON Sep 28, 1994 by VIBRA-TECH

(N/A) - not applicable

USBM RI8507 AND OSMRE ANALYSIS
(in/sec)



Vibra-Tech
THE VIBRATION MONITORING EXPERTS

377 Carowinds Blvd., Suite 112
Ft. Mill, SC 29715

VIBRA-TECH ENGINEERS
BLAST AND SEISMOGRAPHIC REPORT

803-548-3066
FAX: 803-548-3083

BLAST DATA

Client: Palmetto Rock Services

Job Location: Piedmont Landfill Kernersville N.C

Date: 2-14-95 Blast No.: 15 Time: 1:35 p.m

Exact Blast Location: 300 FT. N.W of Scale house

No. of Holes: 256 Diameter: 3" in. Avg. Depth: 7' to 30' ft. Subgrade: 2 ft.

Spacing: 6' and 7' ft. Burden: 6' and 7' ft. Avg. Stemming: 4' to 5' ft.

Make & Type of Explosives:

Pellite	3,950	lbs.
Super Frac 2x8	256	lbs.
		lbs.
		lbs.
		lbs.
Total Explosives	4,206	lbs.

Delay Make: I.C.I Handi Dets

Delay Type & Nos.: M.S # 25 MS# 17

Min. Delay Period: 8 ms.

Max. Lbs./Delay Period: 47.2 lbs.

Blaster: Robert Shaver

Weather: Cloudy

Wind Direction & Speed: W 5 mph

SEISMOGRAPH DATA

Seismograph No.: Range/Gain Setting: Auto ips

Everlert Only Trigger Level ips

Exact Seismograph Location: 70 FT N.W of Scale house

Seismograph Distance & Direction from Blast: 230 FT. South East

Meters: Peak Overpressure 116 dB; Peak Particle Velocity 0.42 ips

Operator:

Cassette No.:

Seismograph No.: Range/Gain Setting: Auto ips

Everlert Only Trigger Level ips

Exact Seismograph Location: Scale house

Seismograph Distance & Direction from Blast: 300 FT. South East

Meters: Peak Overpressure dB; Peak Particle Velocity ips

Operator:

Cassette No.:

Seismograph No.: Range/Gain Setting: ips

Everlert Only Trigger Level ips

Exact Seismograph Location:

Seismograph Distance & Direction from Blast:

Meters: Peak Overpressure dB; Peak Particle Velocity ips

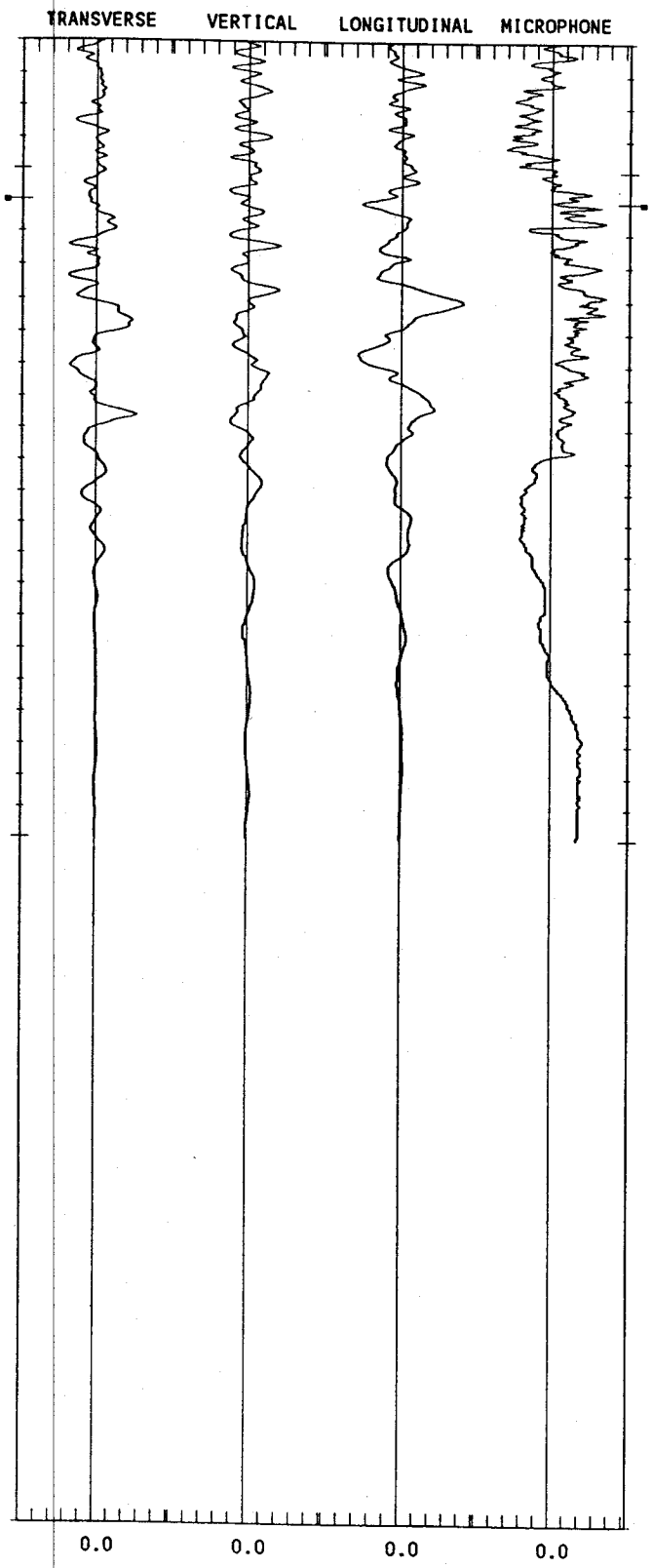
Operator:

Cassette No.:

Additional Seismographs ____ YES ____ NO

SEISMOGRAPH ANALYSIS REPORT

EVENT WAVEFORMS



AMPLITUDE SCALE:GEO: 0.100 in/sec/div MIC: 0.0005 psi(L)/div
TIME SCALE: 50 msec/div 2.344 sec/page TRIGGER = •——•

SERIAL NO.	2086 V5.3-EVVe
CODE	D0865A7C.A2V
TIME & DATE	Long. at 13:32:26 Feb 14, 1995
TRIGGER SOURCE	Geo 0.200 in/sec
RECORD TIME	1 sec
LOCATION	
CLIENT	
USER	
NOTES	

SCALED DISTANCE N/A

PEAK VECTOR SUM 0.428 in/sec at 152 ms

MICROPHONE	LINEAR WEIGHTING
PK AIR	116.0 dB(L) at 31 ms
ZC FREQ	13 Hz

	TRAN	VERT	LONG	
PPV	0.270	0.210	0.420	in/sec
ZC FREQ	13	28	7	Hz
FFT FREQ	N/A	N/A	N/A	Hz
TIME(REL.TO TRIG)	330	70	152	ms
ACCEL	0.12	0.09	0.17	g
1/4 WAVE DISP	0.0041	0.0025	0.0065	in

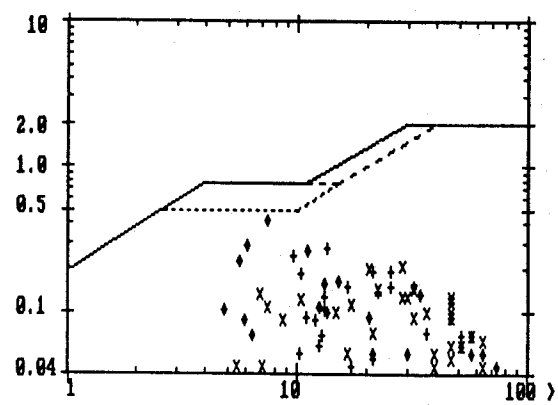
DYNAMIC GEO CAL Passed Passed Passed
INTERNAL MIC CHANNEL TEST: Passed Freq = 20 Amp = 323

BATTERY LEVEL 6.7 volts

CALIBRATED ON Sep 28, 1994 by VIBRA-TECH

(N/A) - not applicable

USBM RI8507 AND OSMRE ANALYSIS
(in/sec)



Vibra-Tech
THE VIBRATION MONITORING EXPERTS

377 Carowinds Blvd. Suite 112
Ft. Mill, SC 29715

VIBRA-TECH ENGINEERS BLAST AND SEISMOGRAPHIC REPORT

803-548-306
FAX:803-548-308

BLAST DATA

Client Palmetto Rock Services

Job Location Piedmont Landfill Kernersville N.C.

Date 9-22-95 Blast No. 16 Time 3:19

Exact Blast Location 385 FT N.W OF Scale house

No. of Holes 368 Diameter 3" in. Avg. Depth 7' ft. Subgrade 0 ft

Spacing 6 ft. Burden 6 ft. Avg. Stemming 4 ft.

Make & Type of Explosives:

Pellite	2,650 lbs.	
Apex Ultra 40 2½x16	220 lbs.	
Super Frac 2x8	385 lbs.	
	lbs.	
	lbs.	

Delay Make I.C.I. Hardi Dets

Delay Type & Nos. MS # 25 ms. #17

Min. delay period 8 ms.

Max. lbs./delay period 48 lbs.

Blaster Robert Starr

Weather Clear

Total Explosives 3,255 lbs.

Wind Direction & Speed N.E 10 mph

SEISMOGRAPH DATA

Seismograph No. _____ Range/Gain Setting AUTO ips

Everlert Only / Trigger Level ips

Exact Seismograph Location 70 FT. N.W OF Scale house

Seismograph Distance & Direction from Blast 315 FT. South East

Meters: Peak Overpressure N/A dB; Peak Particle Velocity <0.20 ips

Operator _____

Cassette No. _____

Seismograph No. _____ Range/Gain Setting AUTO ips

Everlert Only / Trigger Level ips

Exact Seismograph Location Scale house

Seismograph Distance & Direction from Blast 385 FT. South East

Meters: Peak Overpressure _____ dB; Peak Particle Velocity _____ ips

Operator _____

Cassette No. _____

Seismograph No. _____ Range/Gain Setting _____ ips

Everlert Only / Trigger Level ips

Exact Seismograph Location _____

Seismograph Distance & Direction from Blast _____

Meters: Peak Overpressure _____ dB; Peak Particle Velocity _____ ips

Operator _____

Cassette No. _____

Additional Seismographs _____ YES _____ NO

(USE REVERSE SIDE FOR BLAST DIAGRAM)

377 Carowinds Blvd., Suite 112
Ft. Mill, SC 29715

VIBRA-TECH ENGINEERS
BLAST AND SEISMOGRAPHIC REPORT

803-548-3066
FAX: 803-548-3083

BLAST DATA

Client: Palmetto Rock Services

Job Location: Piedmont Landfill Kernersville N.C

Date: 3-4-95 Blast No.: 17 Time: 11:56 A.M

Exact Blast Location: 300 FT. N.W OF Scale house

No. of Holes: 97 Diameter: 3 in. Avg. Depth: 4 ft. Subgrade: 0 ft.

Spacing: 4 ft. Burden: 4 ft. Avg. Stemming: 3.5 ft.

Make & Type of Explosives:

Super Frac 2x8	102	lbs.
Pellite	200	lbs.
		lbs.
		lbs.
		lbs.
Total Explosives	302	lbs.

Delay Make: I.E.I Hardi Gets

Delay Type & Nos.: M.S 25 + M.S # 17

Min. Delay Period: 8 ms.

Max. Lbs./Delay Period: 3.15 lbs.

Blaster: Samuel Jones

Weather: cloudy

Wind Direction & Speed: N.E 8 mph

SEISMOGRAPH DATA

Seismograph No.: Range/Gain Setting: AUTO ips

Exact Seismograph Location: 70 FT. N.W of Scale house

Everlert Only — Trigger Level ips

Seismograph Distance & Direction from Blast: 230 FT. South East

Meters: Peak Overpressure: N/A dB — Operator:

Peak Particle Velocity: <0.20 ips — Cassette No.:

Seismograph No.: Range/Gain Setting: ips

Exact Seismograph Location: Scale house

Everlert Only — Trigger Level ips

Seismograph Distance & Direction from Blast: 300 FT. South East

Meters: Peak Overpressure: dB — Operator:

Peak Particle Velocity: ips — Cassette No.:

Seismograph No.: Range/Gain Setting: ips

Exact Seismograph Location:

Everlert Only — Trigger Level ips

Seismograph Distance & Direction from Blast:

Meters: Peak Overpressure: Peak Particle Velocity:

Additional Seismographs: YES

Post-It™ brand fax transmittal memo 7671 — # of pages ▸ 6

To: Jay Rogers	From: Rose Broome
Co.: Vibra-Tech	Co.: Palmetto Rock
Dept.	Phone #: 433-8800
Fax #: 803-548-3083	Fax #

RUST ENVIRONMENT & INFRASTRUCTURE

© 1993 RUST Environment & Infrastructure Inc.
Printed with soybean-based ink