David Garrett, P.G., P.E.

Engineering and Geology

June 25, 2011

Ms. Elizabeth Werner, Hydrogeologist
NC DENR Division of Waste Management
Solid Waste Section
401 Oberlin Road
Raleigh, North Carolina, 27611

RE: Blasting Report Summary
Construction of Phase 2, Cell A
WCA Brownfield Road C&D Landfill
Wake County, NC (Permit #92-31)

Dear Ms. Werner:

On behalf of WCA, I am pleased to submit the following report of blasting activities conducted between May 20 and June 20, 2011 at the referenced site. This work was required to remove relatively isolated rocky ledges, subsurface "pinnacles" and nested boulders (not bedrock), which were identified in the Design Hydrogeologic Report completed in 2008.

Several zones containing rock-like materials were demonstrated via detailed drilling and test pit investigations to consist of distinct isolated layers of rocky materials, intercalated and surrounded by hard soil and saprolite (weathered rock), presumed to require blasting for removal. Some of these materials had been penetrated with difficulty using hollow stem augers, typically exhibiting 100+ bpf resistance; other zones exhibited "auger refusal" conditions but when cored the materials yielded very low rock quality determination (RQD) indices, often below 20%. Differential weathering with variable material hardness results in abrupt changes in excavation characteristics within short lateral and vertical distances.

Approval for blasting to permitted base grades was secured via your letter dated May 16, 2011, based in turn on the site characterization presented in the Design Hydrogeologic Report and a final blasting plan prepared May 13, 2011 by David Garrett & Associates. The materials were blasted and removed gradually in multiple shots, with seismic monitoring to ensure that ground accelerations remained within a predetermined threshold of 1 inch/sec.

The shot holes were air-drilled on 5-foot centers to depths of 3 feet below permitted base grades – blasting removed the additional foot – and surveys were conducted before and after engineered fill placement above the blasted areas to ensure a minimum 4 feet of soil cover. Survey control and soil testing were overseen by the general contractor.

5105 Harbour Towne Drive • Raleigh • North Carolina • 27604
919-418-4375 (Direct Mobile) • 919-231-1818 (Office Fax) • E-mail: david@davidgarretpe.com

The drilling and blasting was performed under the direction of licensed blaster Joe Wilhelm of Wampum Hardware Co. (a specialty contractor established ca. 1904), and under the supervision of site superintendent John Brink of Bentley Development (general contractor), and facility general manager Dennis Gehle of WCA. I was present for most of the shots. You were afforded the opportunity to observe drilling, shot loading, the actual shot, and a post-blast inspection of three blast areas on 5-20-2011. Seismograms have been forwarded to you, generally within 48 hours, via email. Driller's maps recorded the location and depth of rock, when encountered above subgrade, and a location map of each blast area was kept by the contractor's surveyor.

The blasting agent was ANFO delivered in 50-pound sacks, initiated with a percussion cap and a cast booster charge. The charges were wired together and initiated with non-electric shock cord, using a percussion device. According to Mr. Wilhelm, the charges typically varied up to 100 pounds of ANFO per boring. The borings varied in depth from 7 feet to 23 feet – shallower borings received less charge. The borings were stemmed with #78 aggregate and covered with about 2 feet of soil. The shots produced only a mildly audible report and little fly rock was observed. The harder rock broke in a clean, tight pattern with a good lift, but where more soil was present noticeable amounts of dirt and some small boulders were thrown a short distance.

The post-blast inspection revealed weathered soil zones throughout the blasted areas – generally harder materials were encountered in the higher elevations. Particle sizes varied to 4 feet in diameter, but most debris varied in the range of 0.5 to 2 feet, consistent with the low rock quality determination (RQD) values observed during permitting. No water was encountered. Seismic records indicate maximum ground accelerations less than 0.5 in/sec at the landfill perimeter and less than 0.2 in/sec at future monitoring well MW-8. These values are below the threshold considered acceptable for the facility. No damage to the subgrade or any offsite damage is anticipated based on these readings and the foregoing observations.

Please find attached the following attachments:

1. Site Map with grades, shot locations (by date) and monitoring locations
2. Seismic Records recorded by Saul's Seismograph Service
3. Driller's and Blaster's Maps provided by Wampum Hardware Co.
4. Selected Photographs (by me).

Please contact me at your earliest convenience if you have any questions or comments. Thank you for your cooperation regarding this matter.

Very Truly Yours,

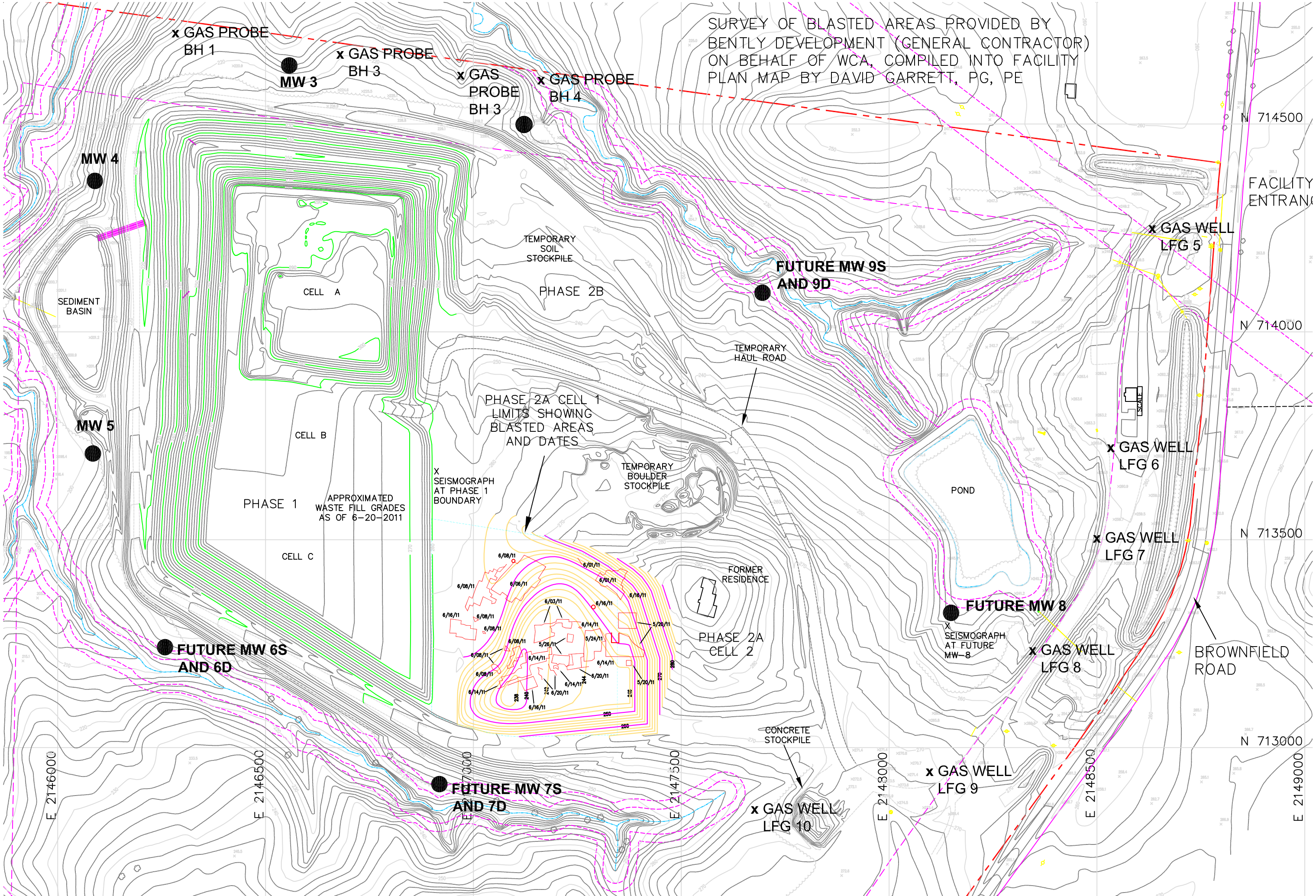
G. David Garrett, P.G., P.E.

NORTH CAROLINA PROFESSIONAL SEAL 025482 GEOLOGIST G. DAVID GARRETT

6-25-2011

cc: Nick Marotta, Dennis Gehle – WCA

Attachments


SURVEY OF BLASTED AREAS PROVIDED BY BENTLY DEVELOPMENT (GENERAL CONTRACTOR) ON BEHALF OF WCA, COMPILED INTO FACILITY PLAN MAP BY DAVID GARRETT, PG, PE
x GAS PROBE BH 1
MW 3
x GAS PROBE BH 3
x GAS PROBE BH 3
x GAS PROBE BH 4
MW 4
MW 5
SEDIMENT BASIN
CELL A
CELL B
CELL C
PHASE 1
APPROXIMATED WASTE FILL GRADES AS OF 6-20-2011
TEMPORARY SOIL STOCKPILE
PHASE 2B
FUTURE MW 9S AND 9D
TEMPORARY HAUL ROAD
PHASE 2A CELL 1 LIMITS SHOWING BLASTED AREAS AND DATES
X SEISMOGRAPH AT PHASE 1 BOUNDARY
TEMPORARY BOULDER STOCKPILE
POND
FORMER RESIDENCE
PHASE 2A CELL 2
FUTURE MW 6S AND 6D
FUTURE MW 7S AND 7D
CONCRETE STOCKPILE
x GAS WELL LFG 10
x GAS WELL LFG 9
FUTURE MW 8
X SEISMOGRAPH AT FUTURE MW-8
x GAS WELL LFG 8
x GAS WELL LFG 7
x GAS WELL LFG 6
x GAS WELL LFG 5
FACILITY ENTRANCE
BROWNFIELD ROAD
SCALE
N 714500
N 714000
N 713500
N 713000
E 2146000
E 2146500
E 2147000
E 2147500
E 2148000
E 2148500
E 2149000

Wampum Hardware: Garner Landfill Project
Seismograph Loc: Landfill Perimeter
Shot Loc: N3542530 W-7830221
Distance: 495 feet
Maximum lbs per delay: 55
Shot # 1 Operator: Rob Nicks

File Name: LDFILLPERIMETER052011154.DTA
Number: 154
Date: 5/20/2011
Time: 14:29
Serial Number: 1891
Seismic Trigger: 0.0500 in/s 1.2700 mm/s
Acoustic Trigger: 142 dB
Sample Rate: 1024
Record Duration: 5.0 Seconds
Pre-Trigger: 0.50 Seconds
Sensor Gain: 2x
Battery: 7.0

Amplitudes and Frequencies

Acoustic: 124 dB @ 42.6 Hz
(0.32Mb 0.0046psi 0.0320kPa)

Radial: 0.08in/s 2.032mm/s @ 28.4Hz

***Vertical:* 0.085in/s 2.159mm/s @ 34.1Hz**

Transverse: 0.065in/s 1.651mm/s @ 20.4Hz

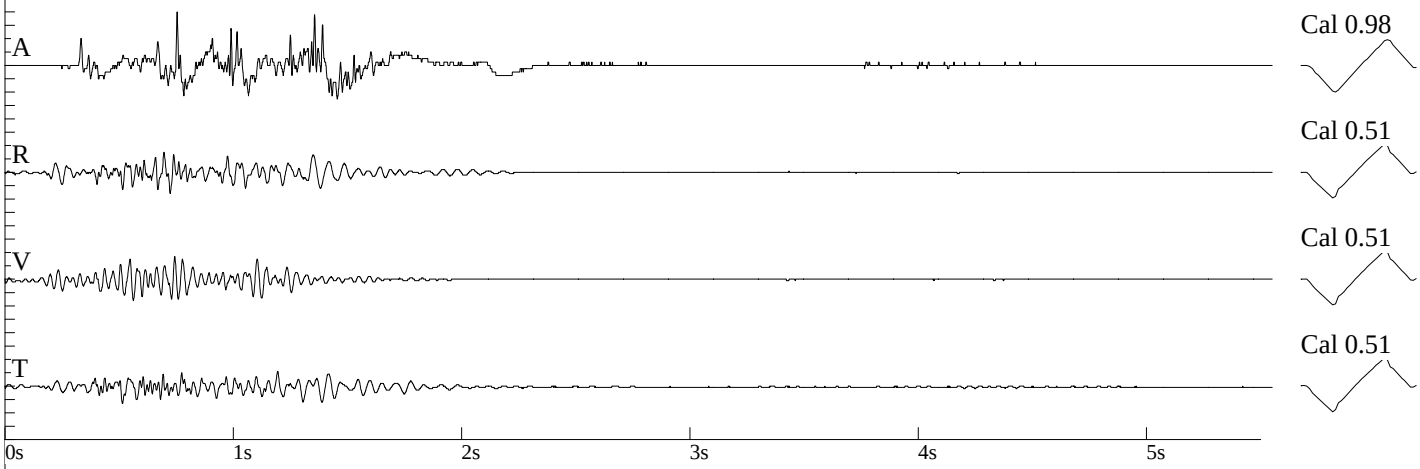
Graph Information

*Duration:*0.000s To: 5.500s

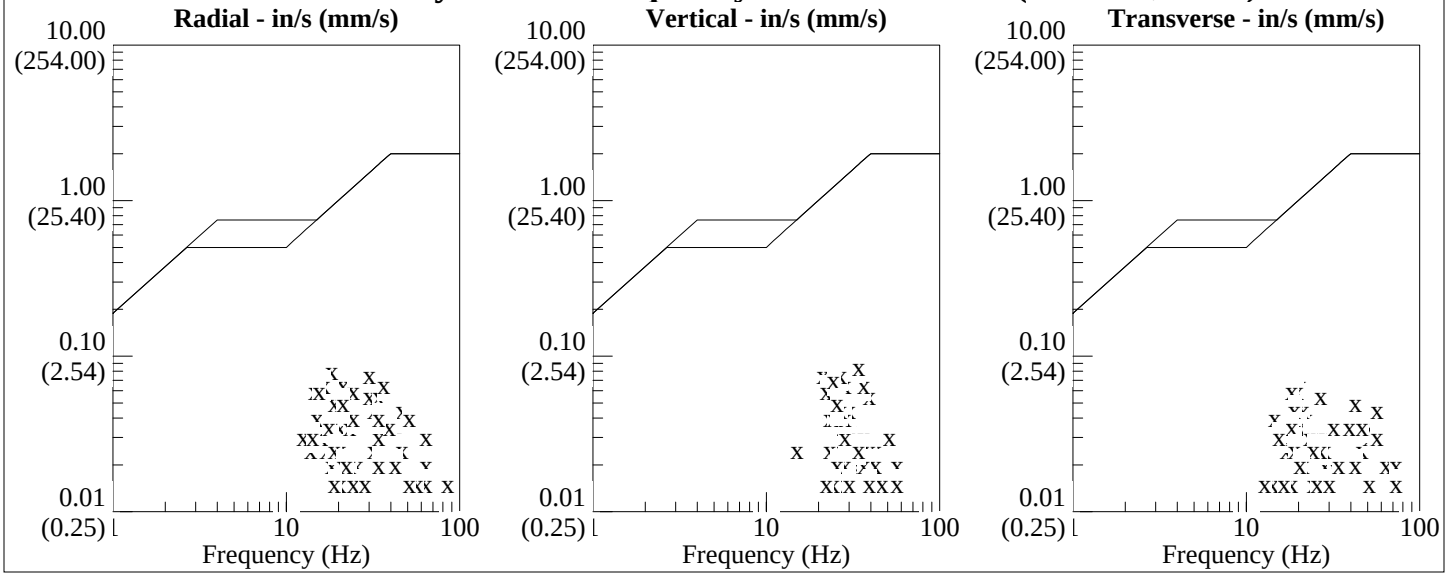
Acoustic Scale:
124dB 0.32Mb (0.079Mb/div)

Seismic Scale:
0.20in/s (0.050in/s/div) 5.08mm/s (1.270mm/s/div)

*Time Line Intervals at:*1.00 s



Particle Velocity Versus Frequency - USBM Limits (RI 8507, 1980)



Wampum Hardware: Garner Landfill Project
Seismograph Loc: Proposed Well
Shot Loc: N3542530 W-7830211
Distance: 686 feet
Maximum lbs per delay: 55
Shot # 1 Operator: Rob Nicks

File Name: PROPOSEDWELL052011182.DTA
Number: 182
Date: 5/20/2011
Time: 14:29
Serial Number: 2512
Seismic Trigger: 0.0200 in/s 0.5080 mm/s
Acoustic Trigger: 142 dB
Sample Rate: 1024
Record Duration: 5.0 Seconds
Pre-Trigger: 0.50 Seconds
Sensor Gain: 2x
Battery: 7.0

Amplitudes and Frequencies

Acoustic: 118 dB @ 26.9 Hz
(0.16Mb 0.0023psi 0.0160kPa)

***Radial:* 0.09in/s 2.286mm/s @ 56.8Hz**

Vertical: 0.08in/s 2.032mm/s @ 21.3Hz

Transverse: 0.085in/s 2.159mm/s @ 16.0Hz

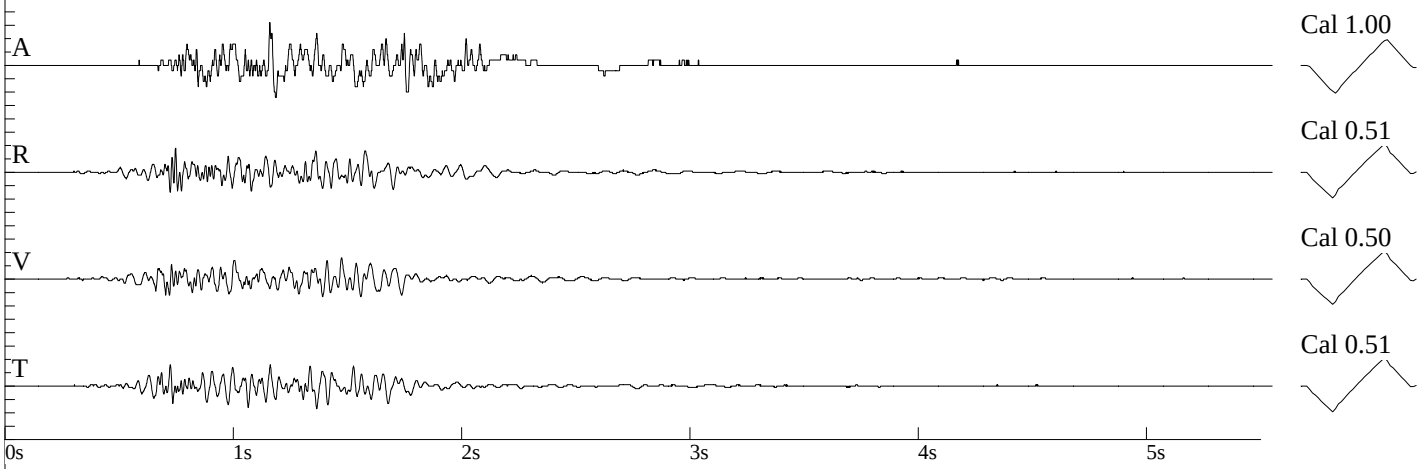
Graph Information

*Duration:*0.000s To: 5.500s

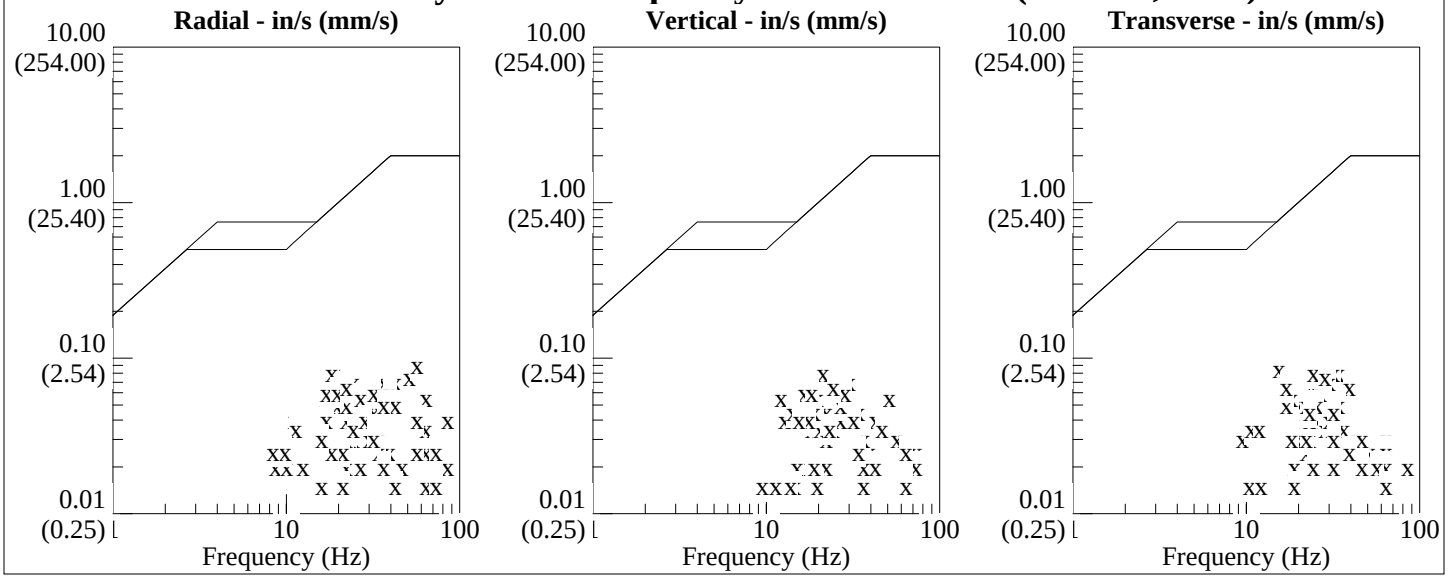
Acoustic Scale:
120dB 0.20Mb (0.050Mb/div)

Seismic Scale:
0.20in/s (0.050in/s/div) 5.08mm/s (1.270mm/s/div)

*Time Line Intervals at:*1.00 s



Particle Velocity Versus Frequency - USBM Limits (RI 8507, 1980)



Wampum Hardware: Garner Landfill Project
Seismograph Loc: Landfill Perimeter
Shot Loc: N E
Distance: feet
Maximum lbs per delay:
Shot # Operator: Rob Nicks

File Name: LDFILLPERIMETER052411155.DTA
Number: 155
Date: 5/24/2011
Time: 14:48
Serial Number: 1891
Seismic Trigger: 0.0500 in/s 1.2700 mm/s
Acoustic Trigger: 142 dB
Sample Rate: 1024
Record Duration: 5.0 Seconds
Pre-Trigger: 0.50 Seconds
Sensor Gain: 2x
Battery: 7.0

Amplitudes and Frequencies

Acoustic: 121 dB @ 8.3 Hz
(0.22Mb 0.0032psi 0.0220kPa)

Radial: 0.13in/s 3.302mm/s @ 25.6Hz

***Vertical:* 0.23in/s 5.842mm/s @ 25.6Hz**

Transverse: 0.18in/s 4.572mm/s @ 23.2Hz

*Calibration Date:*4/22/2010

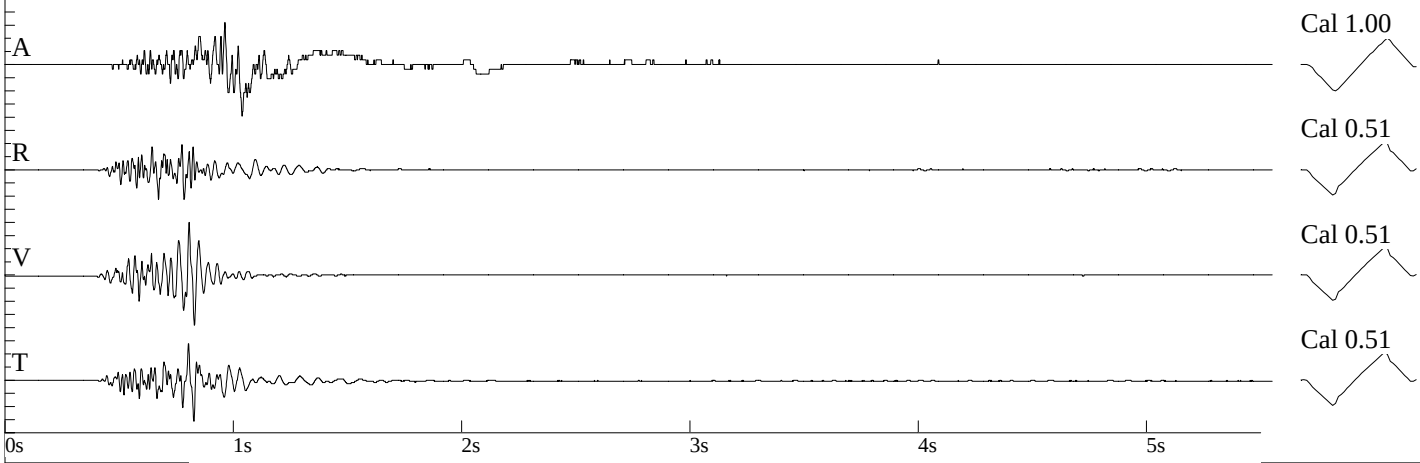
Graph Information

*Duration:*0.000s To: 5.500s

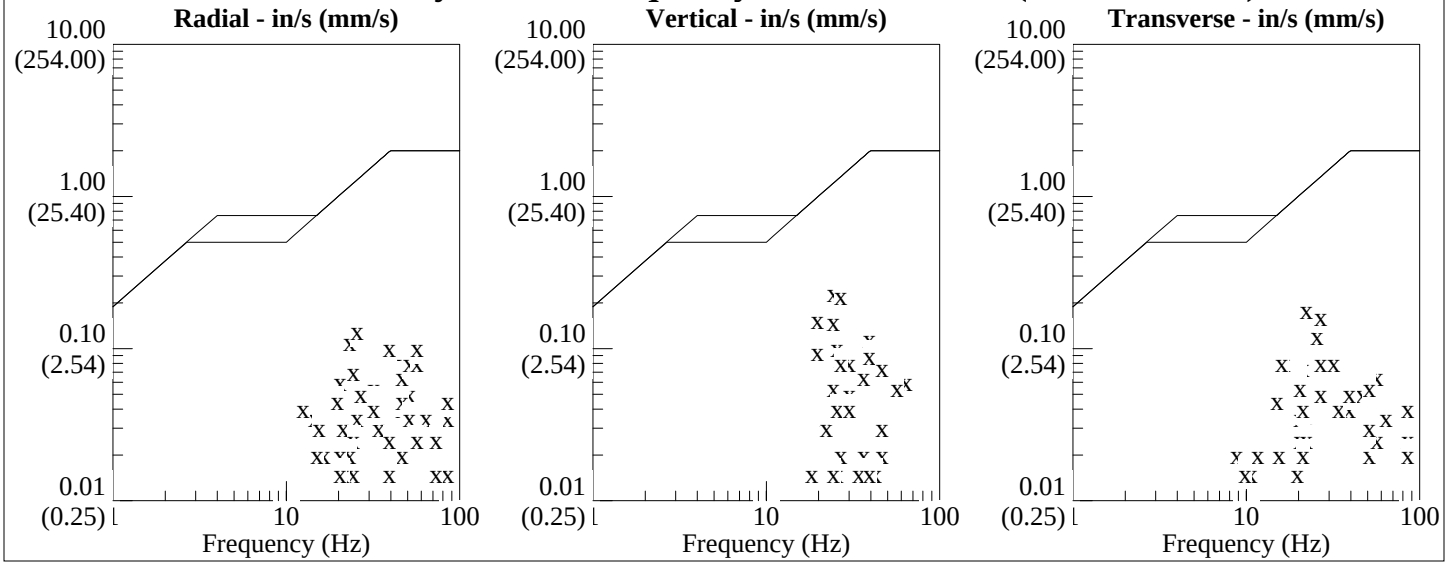
Acoustic Scale:
121dB 0.22Mb (0.056Mb/div)

Seismic Scale:
0.23in/s (0.058in/s/div) 5.84mm/s (1.461mm/s/div)

*Time Line Intervals at:*1.00 s



Particle Velocity Versus Frequency - USBM Limits (RI 8507, 1980)



Wampum Hardware: Garner Landfill Project
Seismograph Loc: Proposed Well
Shot Loc: N E
Distance: feet
Maximum lbs per delay:
Shot # Operator: Rob Nicks

File Name: PROPOSEDWELL052411191.DTA
Number: 191
Date: 5/24/2011
Time: 14:48
Serial Number: 2512
Seismic Trigger: 0.0200 in/s 0.5080 mm/s
Acoustic Trigger: 142 dB
Sample Rate: 1024
Record Duration: 5.0 Seconds
Pre-Trigger: 0.50 Seconds
Sensor Gain: 2x
Battery: 7.0

Amplitudes and Frequencies

Acoustic: 120 dB @ 39.3 Hz
(0.20Mb 0.0029psi 0.0200kPa)

Radial: 0.125in/s 3.175mm/s @ 56.8Hz

Vertical: 0.125in/s 3.175mm/s @ 18.2Hz

***Transverse:* 0.14in/s 3.556mm/s @ 30.1Hz**

*Calibration Date:*4/22/2010

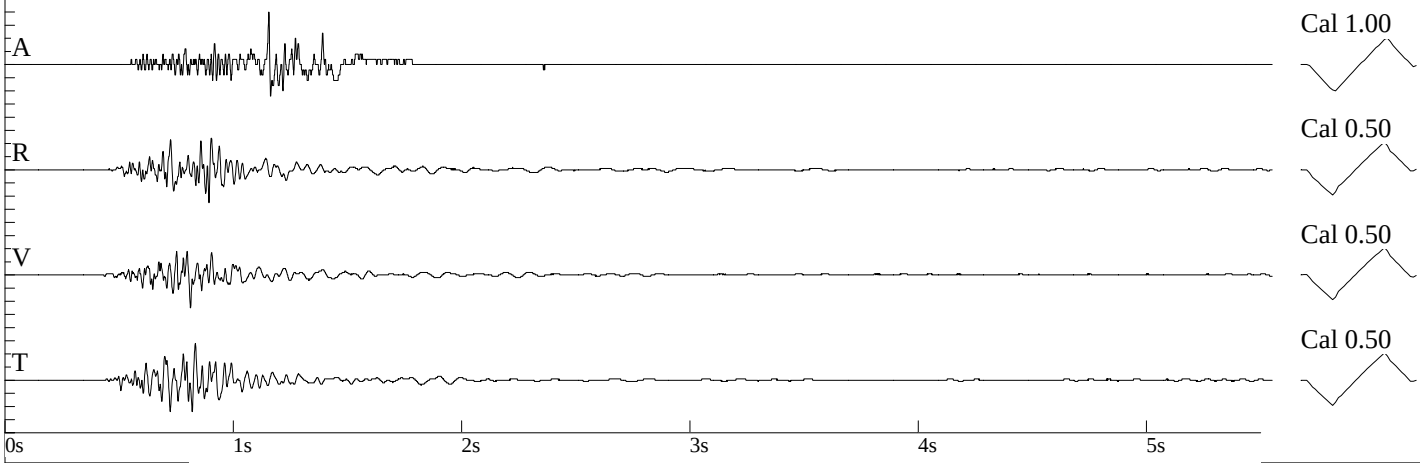
Graph Information

*Duration:*0.000s To: 5.500s

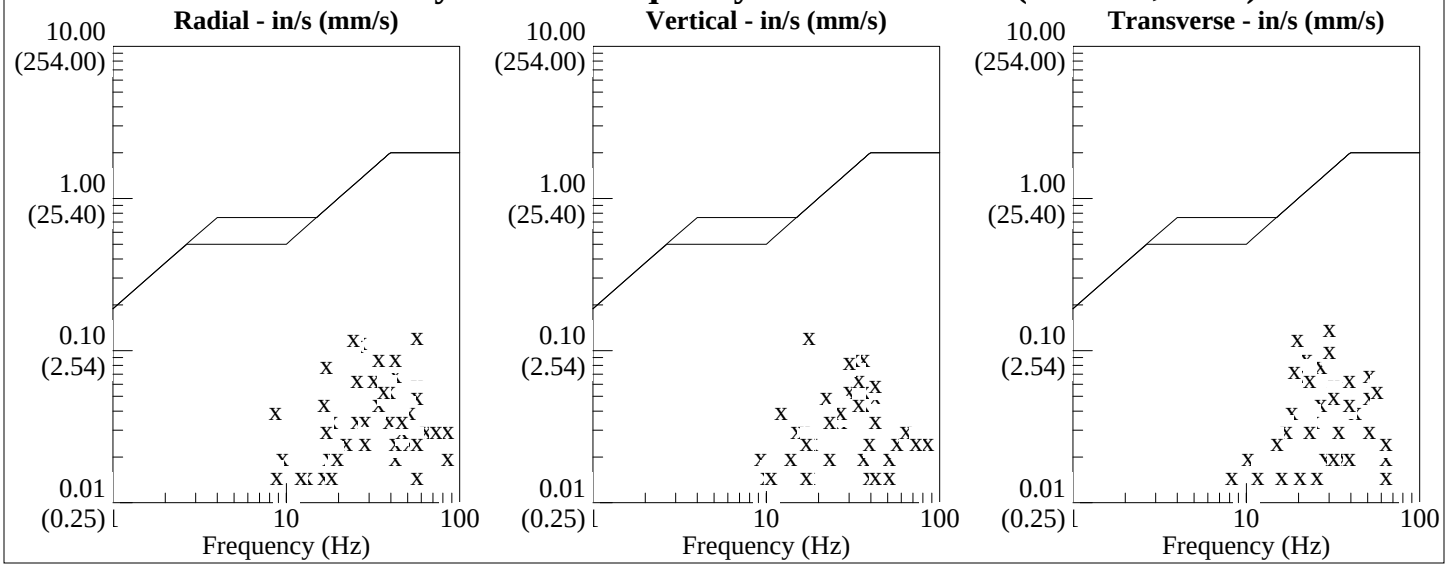
Acoustic Scale:
120dB 0.20Mb (0.050Mb/div)

Seismic Scale:
0.20in/s (0.050in/s/div) 5.08mm/s (1.270mm/s/div)

*Time Line Intervals at:*1.00 s



Particle Velocity Versus Frequency - USBM Limits (RI 8507, 1980)



Wampum Hardware: Garner Landfill Project
Seismograph Loc: Landfill Perimeter
Shot Loc: N E
Distance: feet
Maximum lbs per delay:
Shot # Operator: Rob Nicks

File Name: LDFILLPERIMETER052611157.DTA
Number: 157
Date: 5/26/2011
Time: 12:37
Serial Number: 1891
Seismic Trigger: 0.0500 in/s 1.2700 mm/s
Acoustic Trigger: 142 dB
Sample Rate: 1024
Record Duration: 5.0 Seconds
Pre-Trigger: 0.50 Seconds
Sensor Gain: 2x
Battery: 7.0

Amplitudes and Frequencies

Acoustic: 126 dB @ 23.2 Hz
(0.38Mb 0.0055psi 0.0380kPa)

Radial: 0.12in/s 3.048mm/s @ 23.2Hz

***Vertical:* 0.415in/s 10.541mm/s @ 24.3Hz**

Transverse: 0.285in/s 7.239mm/s @ 21.3Hz

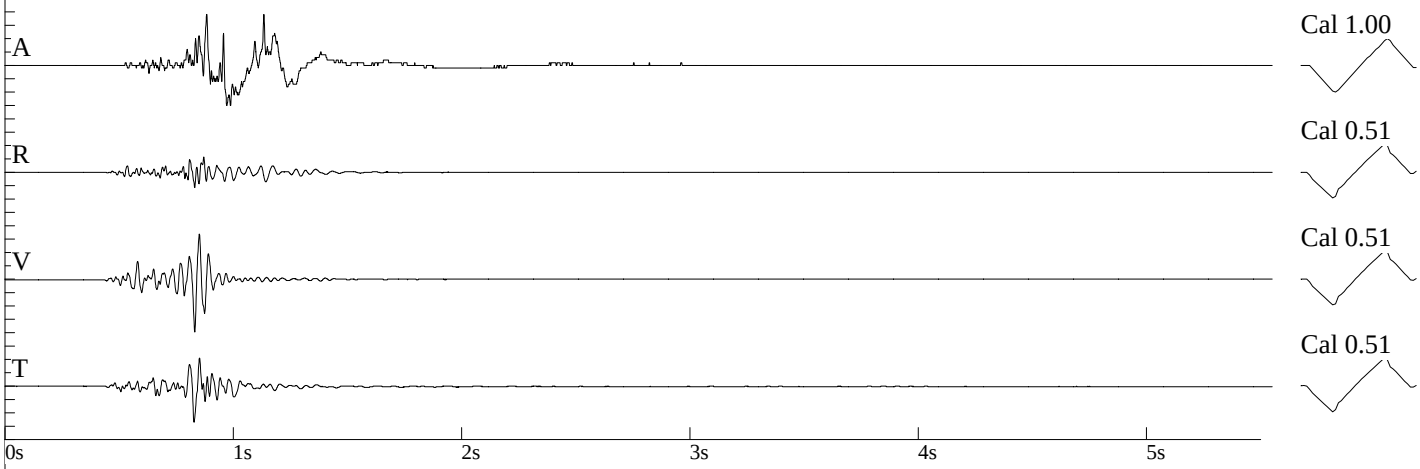
Graph Information

*Duration:*0.000s To: 5.500s

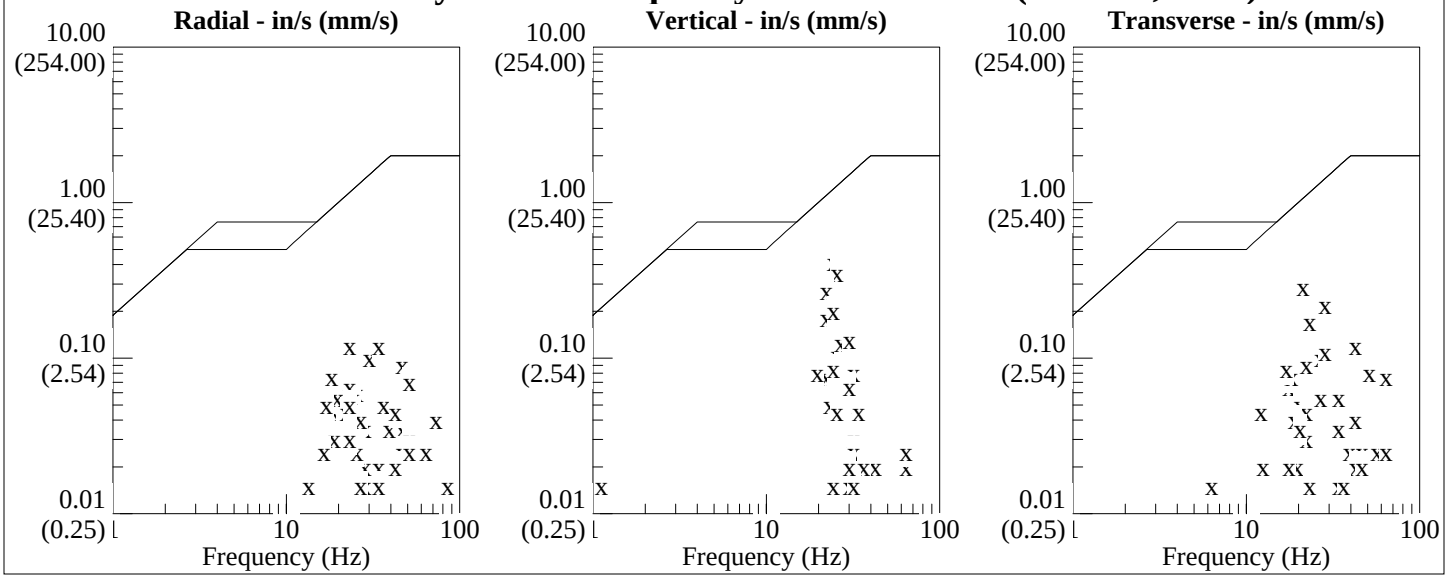
Acoustic Scale:
126dB 0.40Mb (0.100Mb/div)

Seismic Scale:
0.42in/s (0.105in/s/div) 10.67mm/s (2.667mm/s/div)

*Time Line Intervals at:*1.00 s



Particle Velocity Versus Frequency - USBM Limits (RI 8507, 1980)



Wampum Hardware: Garner Landfill Project
Seismograph Loc: Proposed Well
Shot Loc: N E
Distance: feet
Maximum lbs per delay:
Shot # Operator: Rob Nicks

File Name: PROPOSEDWELL052611192.DTA
Number: 192
Date: 5/26/2011
Time: 12:37
Serial Number: 2512
Seismic Trigger: 0.0200 in/s 0.5080 mm/s
Acoustic Trigger: 142 dB
Sample Rate: 1024
Record Duration: 5.0 Seconds
Pre-Trigger: 0.50 Seconds
Sensor Gain: 2x
Battery: 7.0

Amplitudes and Frequencies

Acoustic: 122 dB @ 10.4 Hz
(0.24Mb 0.0035psi 0.0240kPa)

Radial: 0.145in/s 3.683mm/s @ 20.4Hz

***Vertical:* 0.165in/s 4.191mm/s @ 18.2Hz**

Transverse: 0.16in/s 4.064mm/s @ 24.3Hz

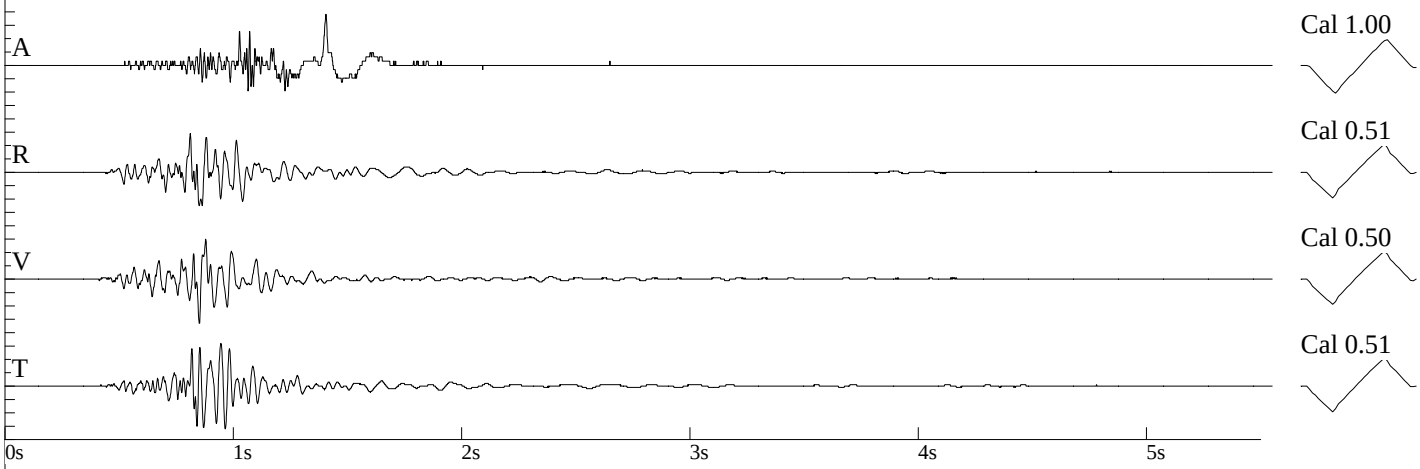
Graph Information

*Duration:*0.000s To: 5.500s

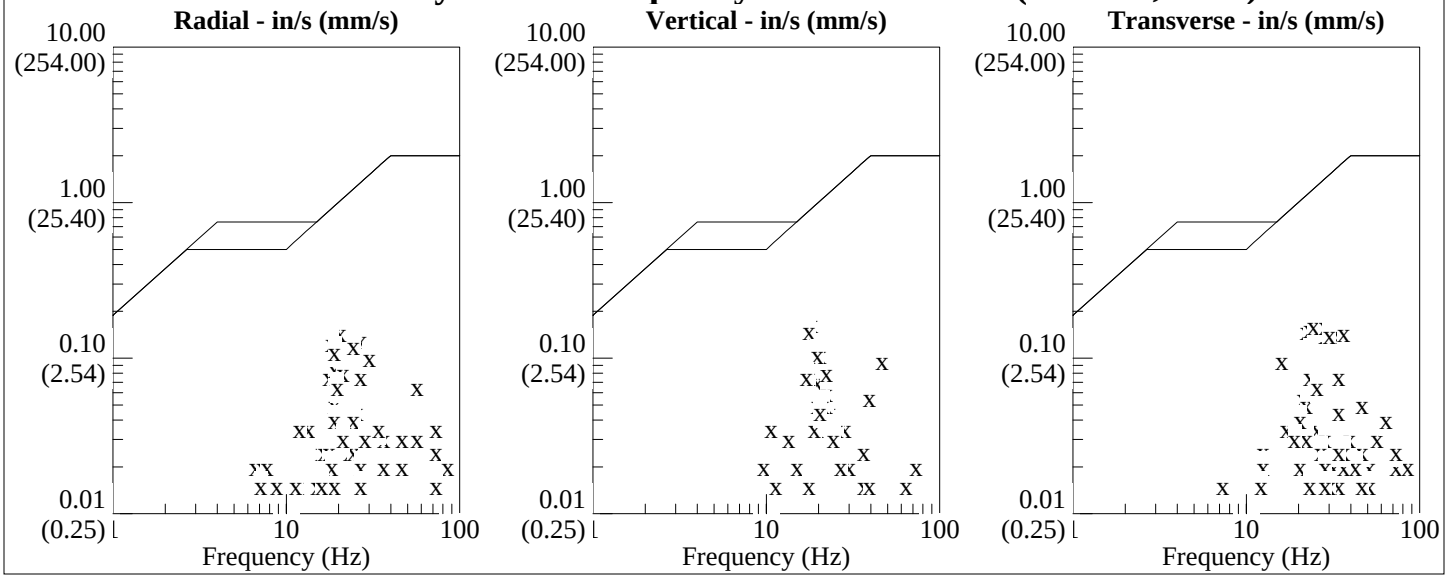
Acoustic Scale:
122dB 0.25Mb (0.063Mb/div)

Seismic Scale:
0.20in/s (0.050in/s/div) 5.08mm/s (1.270mm/s/div)

*Time Line Intervals at:*1.00 s



Particle Velocity Versus Frequency - USBM Limits (RI 8507, 1980)



Wampum Hardware: Garner Landfill Project
Seismograph Loc: Landfill Perimeter
Shot Loc: N E
Distance: feet
Maximum lbs per delay:
Shot # Operator: Rob Nicks

File Name: LDFILLPERIMETER060111159.DTA
Number: 159
Date: 6/1/2011
Time: 15:00
Serial Number: 1891
Seismic Trigger: 0.0500 in/s 1.2700 mm/s
Acoustic Trigger: 142 dB
Sample Rate: 1024
Record Duration: 5.0 Seconds
Pre-Trigger: 0.50 Seconds
Sensor Gain: 2x
Battery: 7.1

Amplitudes and Frequencies

Acoustic: 132 dB @ 24.3 Hz
(0.78Mb 0.0113psi 0.0780kPa)

***Radial:* 0.125in/s 3.175mm/s @ 20.4Hz**

Vertical: 0.105in/s 2.667mm/s @ 30.1Hz

Transverse: 0.08in/s 2.032mm/s @ 30.1Hz

*Calibration Date:*4/22/2010

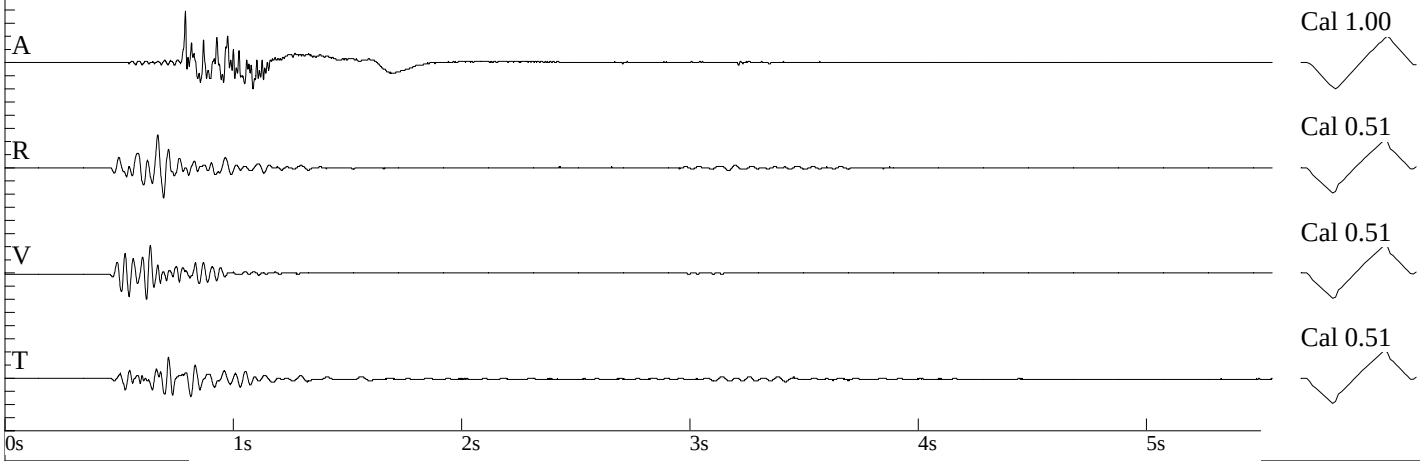
Graph Information

*Duration:*0.000s To: 5.500s

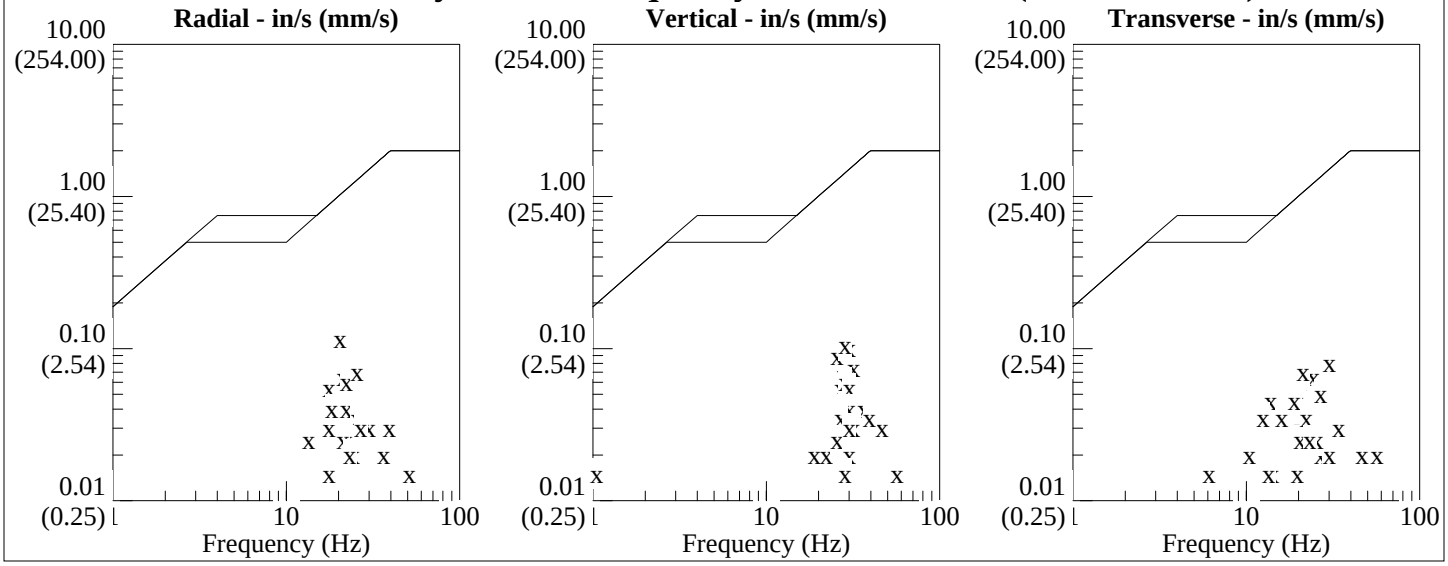
Acoustic Scale:
132dB 0.80Mb (0.199Mb/div)

Seismic Scale:
0.20in/s (0.050in/s/div) 5.08mm/s (1.270mm/s/div)

*Time Line Intervals at:*1.00 s



Particle Velocity Versus Frequency - USBM Limits (RI 8507, 1980)



Wampum Hardware: Garner Landfill Project
Seismograph Loc: Proposed Well
Shot Loc: N E
Distance: feet
Maximum lbs per delay:
Shot # Operator: Rob Nicks

File Name: PROPOSEDWELL060111199.DTA
Number: 199
Date: 6/1/2011
Time: 15:00
Serial Number: 2512
Seismic Trigger: 0.0200 in/s 0.5080 mm/s
Acoustic Trigger: 142 dB
Sample Rate: 1024
Record Duration: 5.0 Seconds
Pre-Trigger: 0.50 Seconds
Sensor Gain: 2x
Battery: 7.0

Amplitudes and Frequencies

Acoustic: 116 dB @ 15.0 Hz
(0.12Mb 0.0017psi 0.0120kPa)

Radial: 0.09in/s 2.286mm/s @ 24.3Hz

Vertical: 0.175in/s 4.445mm/s @ 17.6Hz

***Transverse:* 0.18in/s 4.572mm/s @ 23.2Hz**

*Calibration Date:*4/22/2010

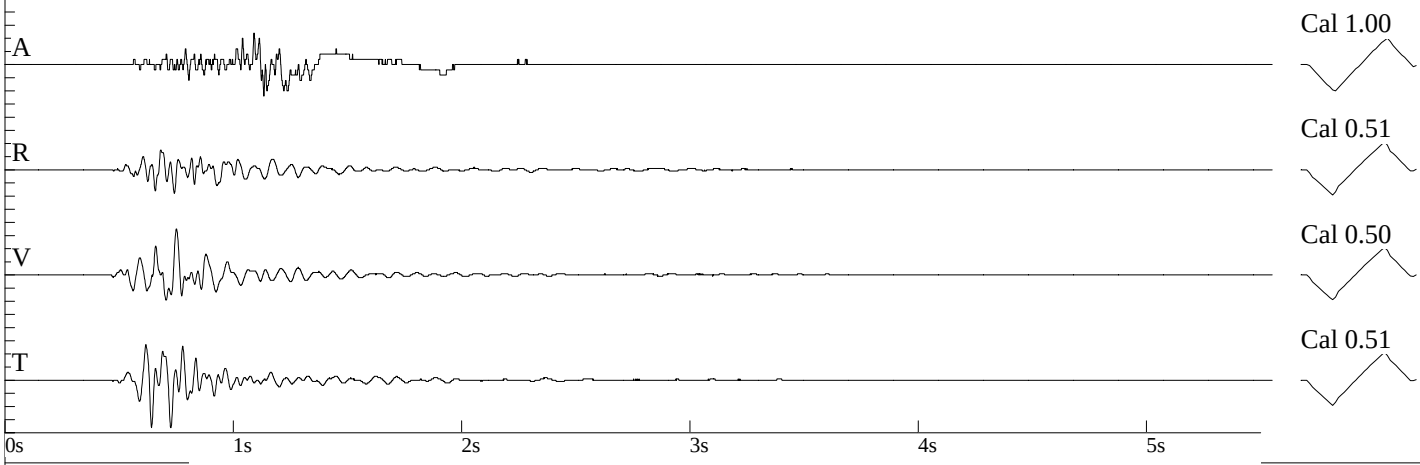
Graph Information

*Duration:*0.000s To: 5.500s

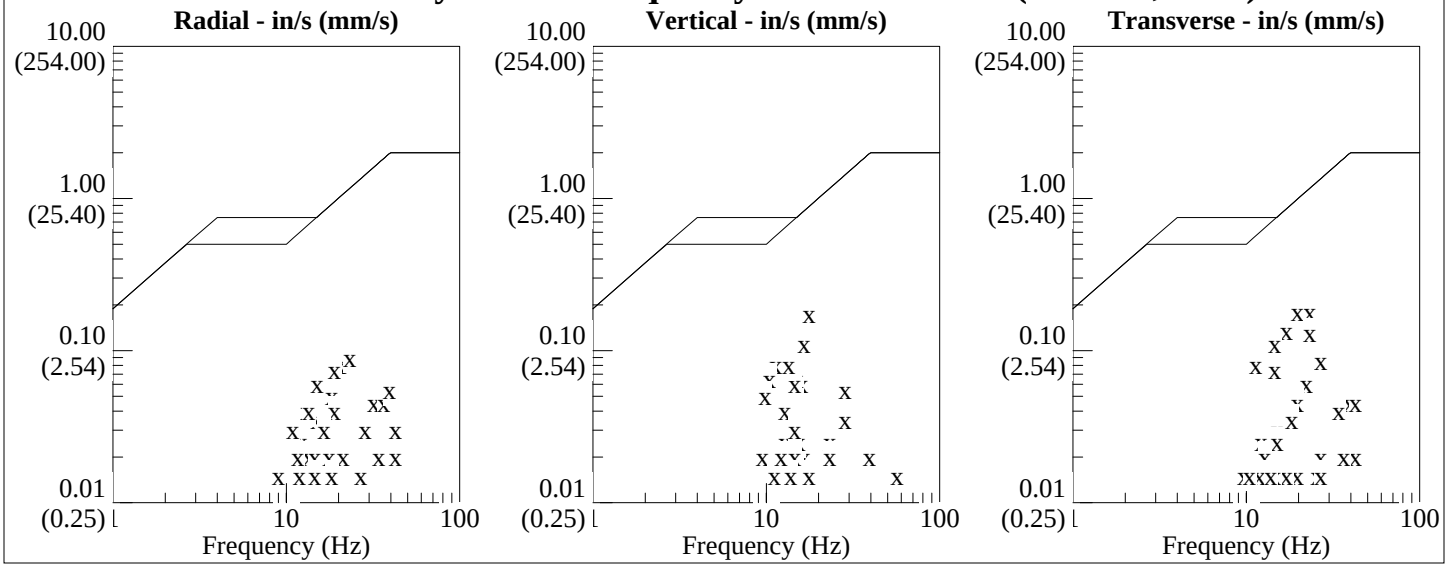
Acoustic Scale:
120dB 0.20Mb (0.050Mb/div)

Seismic Scale:
0.20in/s (0.050in/s/div) 5.08mm/s (1.270mm/s/div)

*Time Line Intervals at:*1.00 s



Particle Velocity Versus Frequency - USBM Limits (RI 8507, 1980)



Wampum Hardware: Garner Landfill Project
Seismograph Loc: Landfill Perimeter
Shot Loc: N E
Distance: feet
Maximum lbs per delay:
Shot # Operator: Rob Nicks

File Name: LDFILLPERIMETER060311162.DTA
Number: 162
Date: 6/3/2011
Time: 14:40
Serial Number: 1891
Seismic Trigger: 0.0500 in/s 1.2700 mm/s
Acoustic Trigger: 142 dB
Sample Rate: 1024
Record Duration: 5.0 Seconds
Pre-Trigger: 0.50 Seconds
Sensor Gain: 2x
Battery: 6.9

Amplitudes and Frequencies

Acoustic: 128 dB @ 10.8 Hz
(0.52Mb 0.0075psi 0.0520kPa)

Radial: 0.185in/s 4.699mm/s @ 21.3Hz

***Vertical:* 0.365in/s 9.271mm/s @ 30.1Hz**

Transverse: 0.215in/s 5.461mm/s @ 23.2Hz

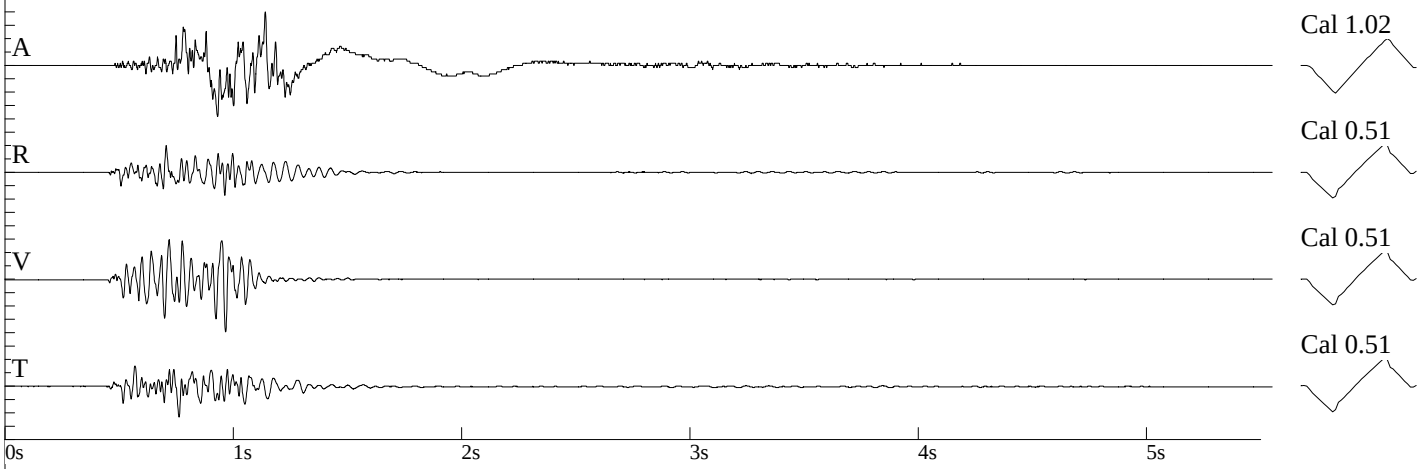
Graph Information

*Duration:*0.000s To: 5.500s

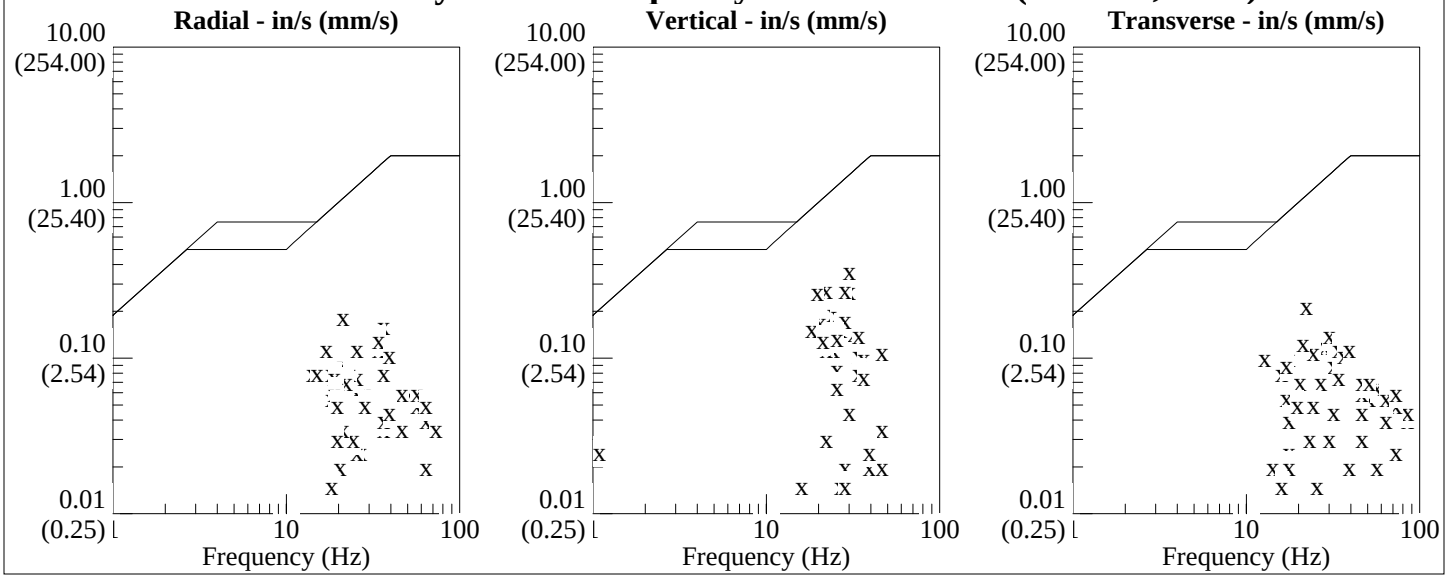
Acoustic Scale:
128dB 0.50Mb (0.126Mb/div)

Seismic Scale:
0.37in/s (0.093in/s/div) 9.40mm/s (2.350mm/s/div)

*Time Line Intervals at:*1.00 s



Particle Velocity Versus Frequency - USBM Limits (RI 8507, 1980)



Wampum Hardware: Garner Landfill Project
Seismograph Loc: Proposed Well
Shot Loc: N E
Distance: feet
Maximum lbs. per delay:
Shot # Operator: Rob Nicks

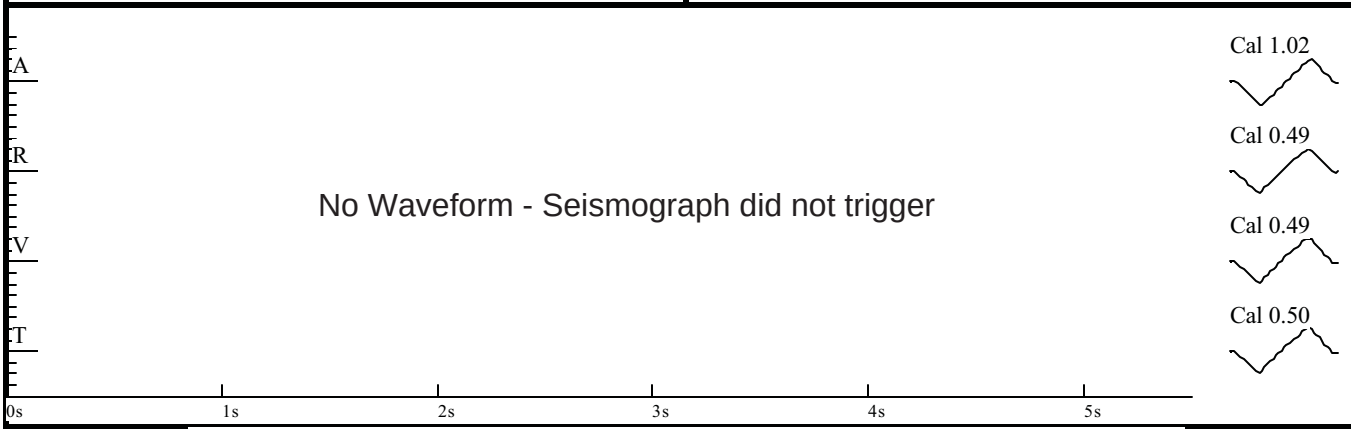
File Name: NO TRIGGER
Number: 009
Date: 6/3/11
Time: 14:40
Serial Number: 2512
Seismic Trigger: 0.0200 in/s 0.5080 mm/s
Acoustic Trigger: 142 dB
Sample Rate: 1024
Record Duration: 5.0 Seconds
Pre-Trigger: 0.50 Seconds
Sensor Gain: 2x
Battery: 7.0

Amplitudes and Frequencies

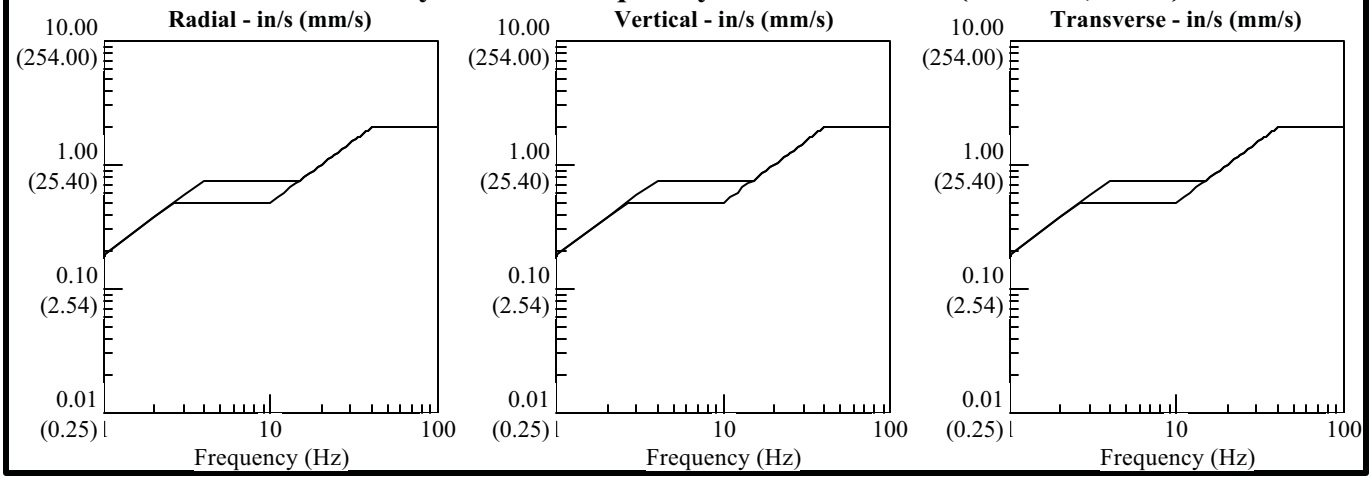
Acoustic: ----- dB @ --- Hz
(0.0Mb 0.0000psi 0.0000kPa)
Radial: <0.02in/s 0.00mm/s @ ---Hz
***Vertical:* <0.02in/s 0.000mm/s @ ---Hz**
Transverse: <0.02in/s 0.00mm/s @ ---Hz
Displacement: 0.0000in 0.0000mm
Acceleration: 0.00000g's

Graph Information

Duration: 0.000s To: 5.500s
Acoustic Scale:
120dB 0.20Mb (0.050Mb/div)
Seismic Scale:
0.02in/s (0.050in/s/div) 5.08mm/s (1.270mm/s/div)
Time Line Intervals at: 1.00 s



Particle Velocity Versus Frequency - USBM Limits (RI 8507, 1980)



Wampum Hardware: Garner Landfill Project
Seismograph Loc: Landfill Perimeter
Shot Loc: N E
Distance: feet
Maximum lbs per delay:
Shot # Operator: Rob Nicks

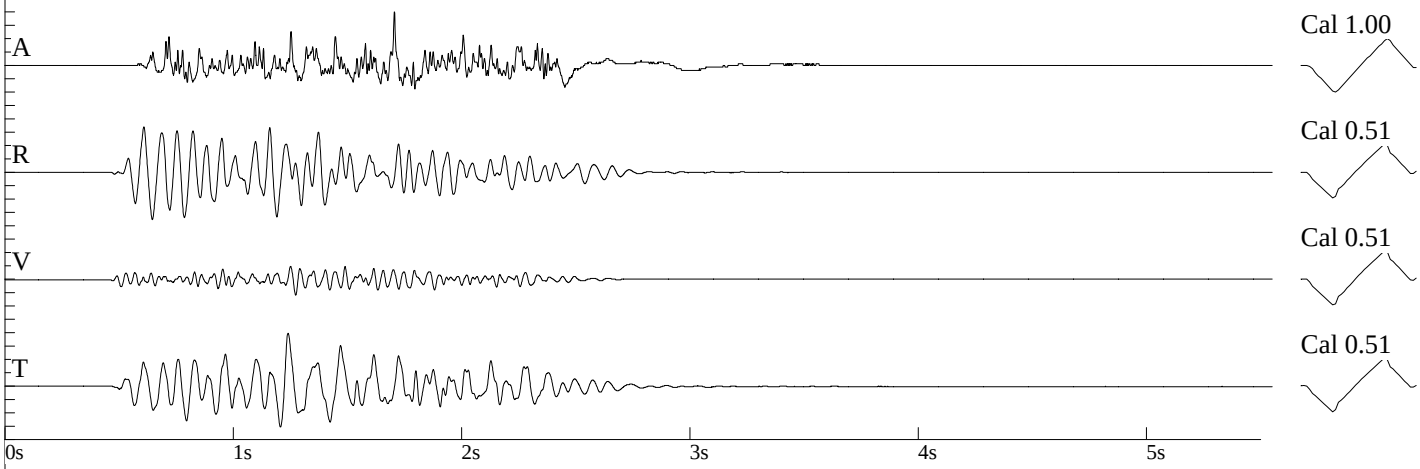
File Name: LDFILLPERIMETER060611163.DTA
Number: 163
Date: 6/6/2011
Time: 15:37
Serial Number: 1891
Seismic Trigger: 0.0500 in/s 1.2700 mm/s
Acoustic Trigger: 142 dB
Sample Rate: 1024
Record Duration: 5.0 Seconds
Pre-Trigger: 0.50 Seconds
Sensor Gain: 2x
Battery: 7.0

Amplitudes and Frequencies

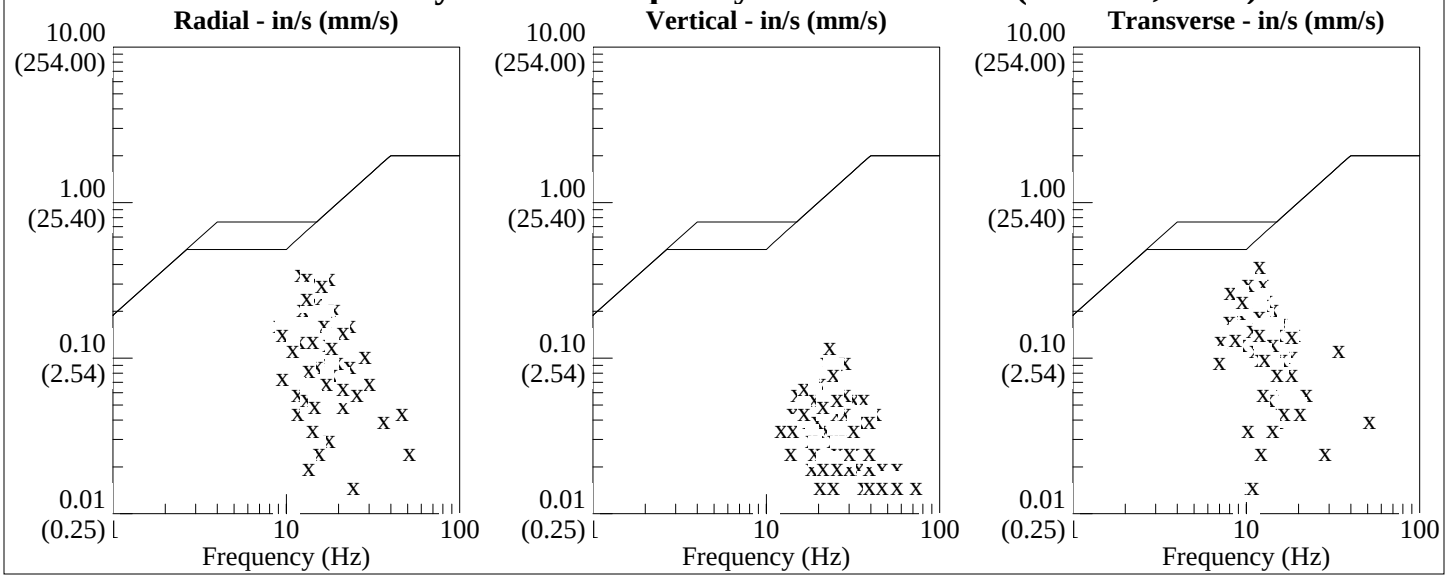
Acoustic: 130 dB @ 13.1 Hz
(0.64Mb 0.0093psi 0.0640kPa)
Radial: 0.355in/s 9.017mm/s @ 12.4Hz
Vertical: 0.12in/s 3.048mm/s @ 24.3Hz
***Transverse:* 0.395in/s 10.033mm/s @ 12.1Hz**

Graph Information

*Duration:*0.000s To: 5.500s
Acoustic Scale:
130dB 0.63Mb (0.158Mb/div)
Seismic Scale:
0.40in/s (0.100in/s/div) 10.16mm/s (2.540mm/s/div)
*Time Line Intervals at:*1.00 s



Particle Velocity Versus Frequency - USBM Limits (RI 8507, 1980)



Wampum Hardware: Garner Landfill Project
Seismograph Loc: Proposed Well
Shot Loc: N E
Distance: feet
Maximum lbs per delay:
Shot # Operator: Rob Nicks

File Name: SN20110607203.DTB
Number: 203
Date: 6/6/2011
Time: 15:37
Serial Number: 2512
Seismic Trigger: 0.0200 in/s 0.5080 mm/s
Acoustic Trigger: 142 dB
Sample Rate: 1024
Record Duration: 5.0 Seconds
Pre-Trigger: 0.50 Seconds
Sensor Gain: 2x
Battery: 7.0

Amplitudes and Frequencies

Acoustic: 112 dB @ 23.2 Hz
(0.08Mb 0.0012psi 0.0080kPa)

Radial: 0.035in/s 0.889mm/s @ 12.1Hz

***Vertical:* 0.06in/s 1.524mm/s @ 13.1Hz**

Transverse: 0.055in/s 1.397mm/s @ 16.0Hz

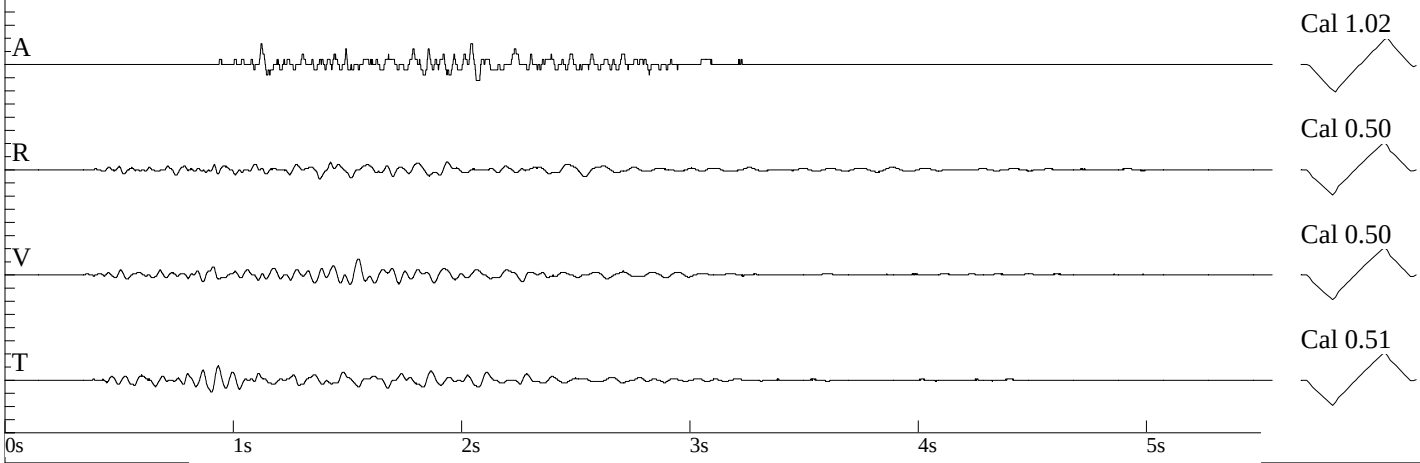
Graph Information

*Duration:*0.000s To: 5.500s

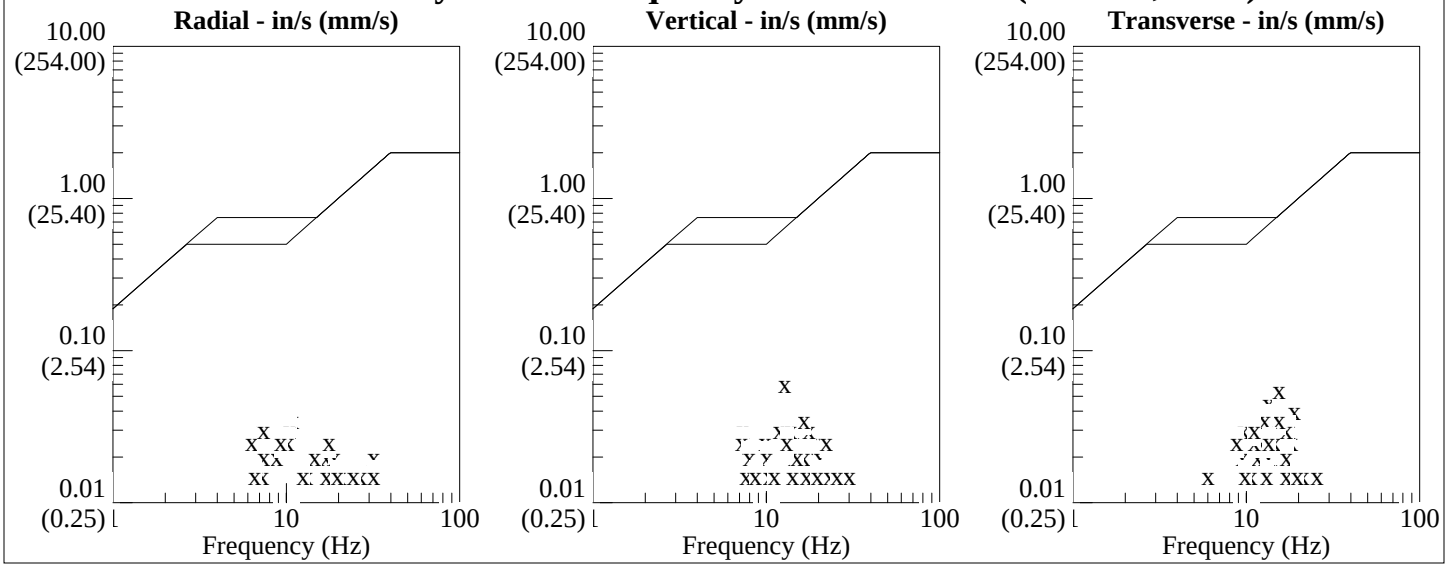
Acoustic Scale:
120dB 0.20Mb (0.050Mb/div)

Seismic Scale:
0.20in/s (0.050in/s/div) 5.08mm/s (1.270mm/s/div)

*Time Line Intervals at:*1.00 s



Particle Velocity Versus Frequency - USBM Limits (RI 8507, 1980)



Wampum Hardware: Garner Landfill Project
Seismograph Loc: Landfill Perimeter
Shot Loc: N E
Distance: feet
Maximum lbs per delay:
Shot # Operator: Rob Nicks

File Name: LDFILLPERIMETER060811165.DTA
Number: 165
Date: 6/8/2011
Time: 16:01
Serial Number: 1891
Seismic Trigger: 0.0500 in/s 1.2700 mm/s
Acoustic Trigger: 142 dB
Sample Rate: 1024
Record Duration: 5.0 Seconds
Pre-Trigger: 0.50 Seconds
Sensor Gain: 2x
Battery: 7.0

Amplitudes and Frequencies

Acoustic: 134 dB @ 26.9 Hz
(1.00Mb 0.0145psi 0.1000kPa)

***Radial:* 0.365in/s 9.271mm/s @ 19.6Hz**

Vertical: 0.175in/s 4.445mm/s @ 34.1Hz

Transverse: 0.355in/s 9.017mm/s @ 15.0Hz

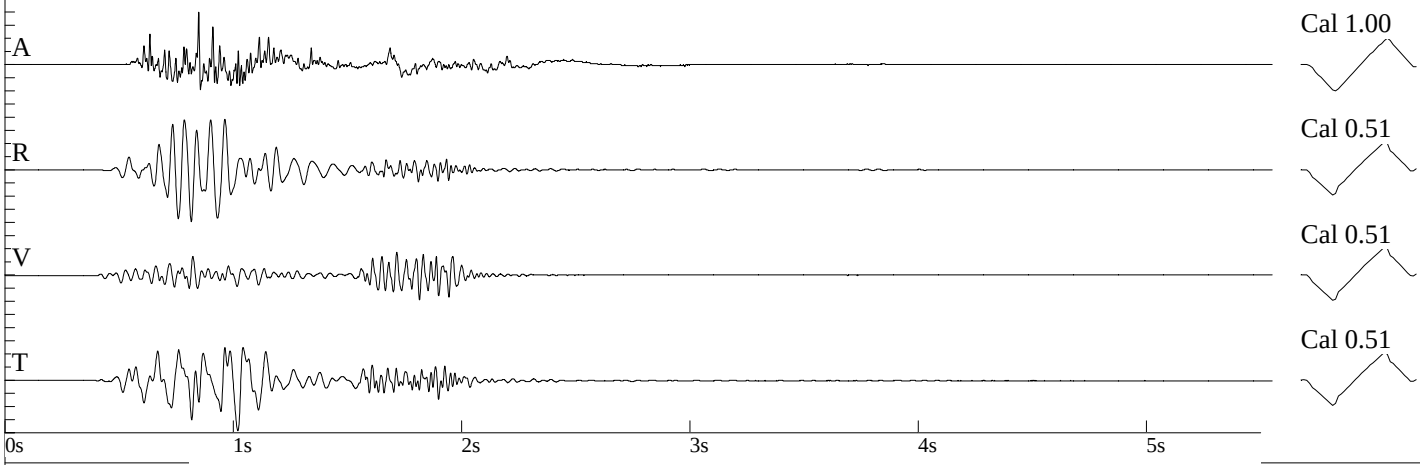
Graph Information

*Duration:*0.000s To: 5.500s

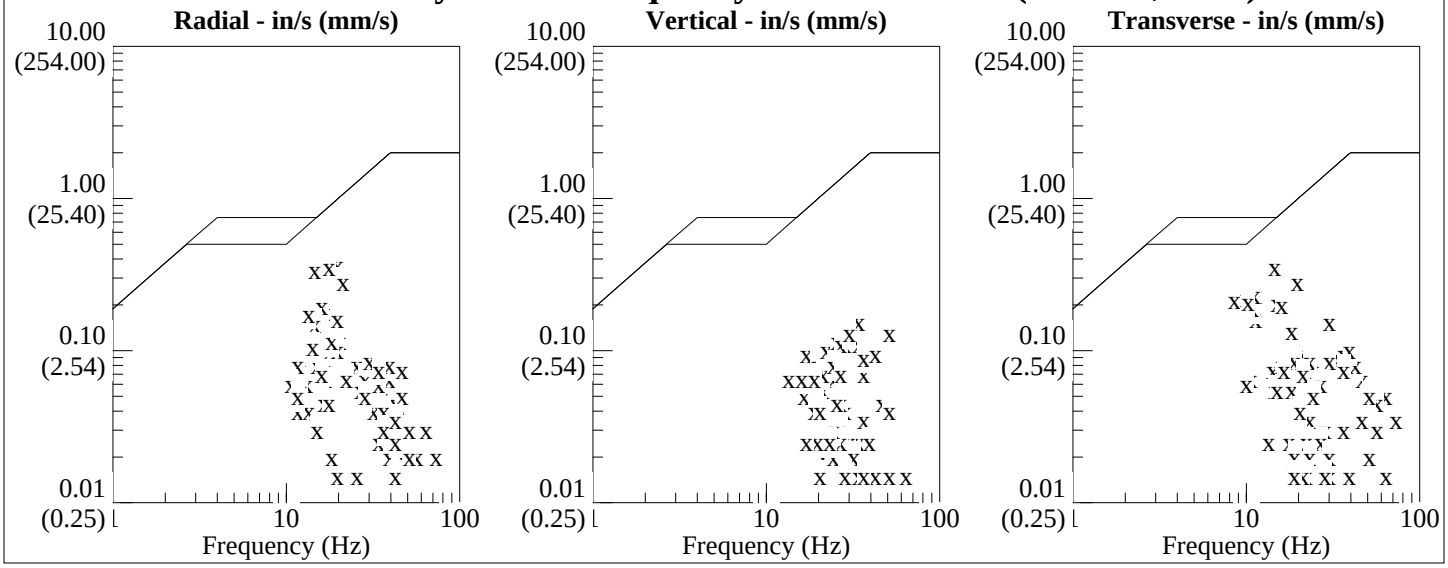
Acoustic Scale:
134dB 1.00Mb (0.251Mb/div)

Seismic Scale:
0.37in/s (0.093in/s/div) 9.40mm/s (2.350mm/s/div)

*Time Line Intervals at:*1.00 s



Particle Velocity Versus Frequency - USBM Limits (RI 8507, 1980)



Wampum Hardware: Garner Landfill Project
Seismograph Loc: Proposed Well
Shot Loc: N E
Distance: feet
Maximum lbs per delay:
Shot # Operator: Rob Nicks

File Name: PROPOSEDWELL060811210.DTA
Number: 210
Date: 6/8/2011
Time: 16:01
Serial Number: 2512
Seismic Trigger: 0.0200 in/s 0.5080 mm/s
Acoustic Trigger: 142 dB
Sample Rate: 1024
Record Duration: 5.0 Seconds
Pre-Trigger: 0.50 Seconds
Sensor Gain: 2x
Battery: 7.0

Amplitudes and Frequencies

Acoustic: 116 dB @ 46.5 Hz
(0.12Mb 0.0017psi 0.0120kPa)

Radial: 0.06in/s 1.524mm/s @ 39.3Hz

***Vertical:* 0.08in/s 2.032mm/s @ 28.4Hz**

Transverse: 0.05in/s 1.27mm/s @ 34.1Hz

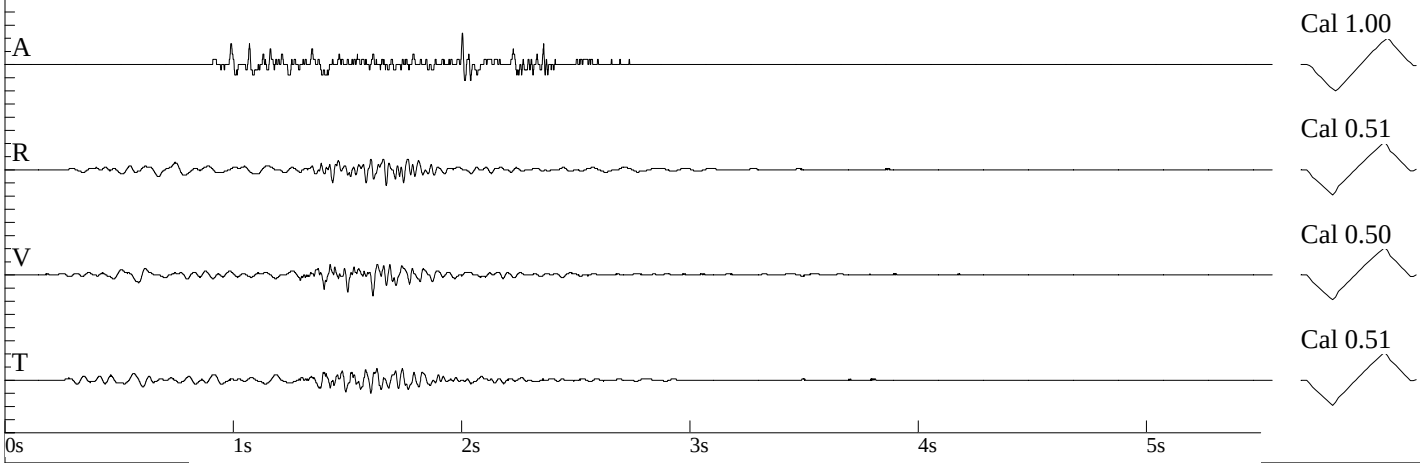
Graph Information

*Duration:*0.000s To: 5.500s

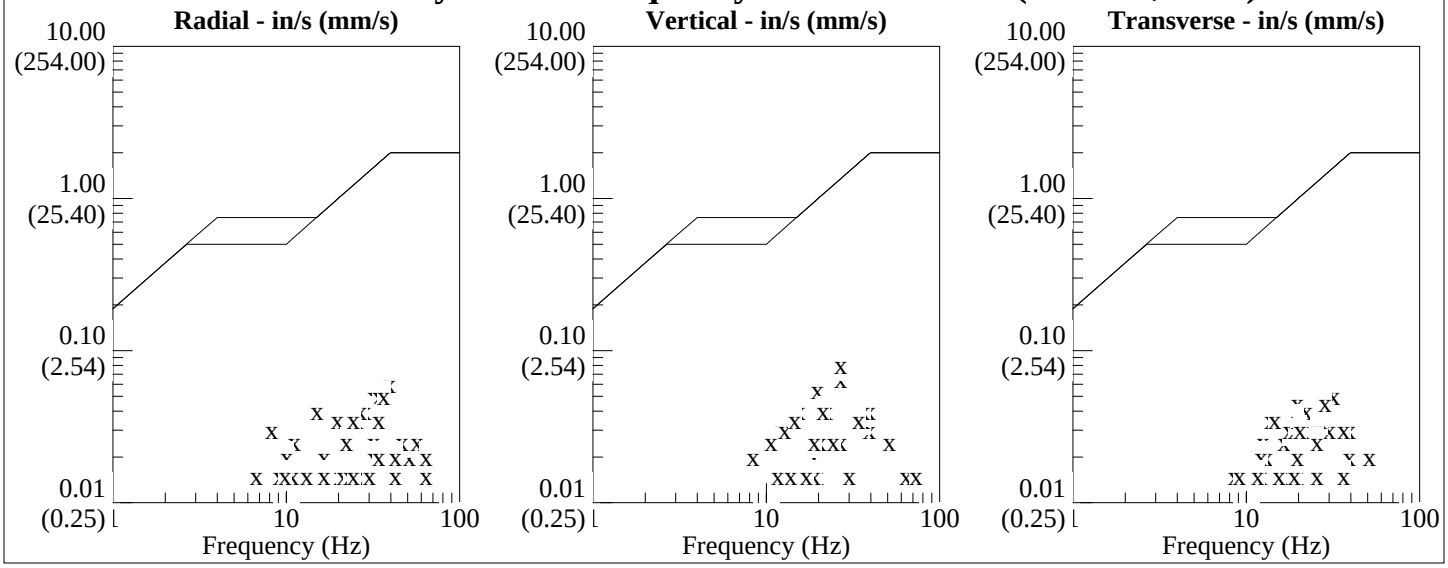
Acoustic Scale:
120dB 0.20Mb (0.050Mb/div)

Seismic Scale:
0.20in/s (0.050in/s/div) 5.08mm/s (1.270mm/s/div)

*Time Line Intervals at:*1.00 s



Particle Velocity Versus Frequency - USBM Limits (RI 8507, 1980)



Wampum Hardware: Garner Landfill Project
Seismograph Loc: Landfill Perimeter
Shot Loc: N E
Distance: feet
Maximum lbs. per delay:
Shot # Operator: Rob Nicks

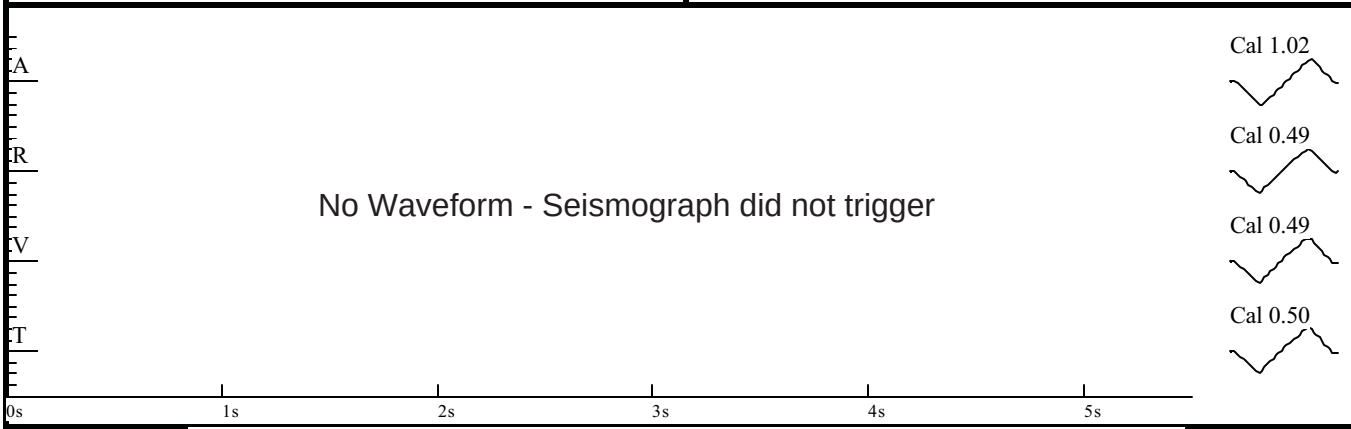
File Name: NO TRIGGER
Number: 000
Date: 6/14/11
Time: 15:28
Serial Number: 1891
Seismic Trigger: 0.0500 in/s 1.2700 mm/s
Acoustic Trigger: 142 dB
Sample Rate: 1024
Record Duration: 5.0 Seconds
Pre-Trigger: 0.50 Seconds
Sensor Gain: 2x
Battery: 7.0

Amplitudes and Frequencies

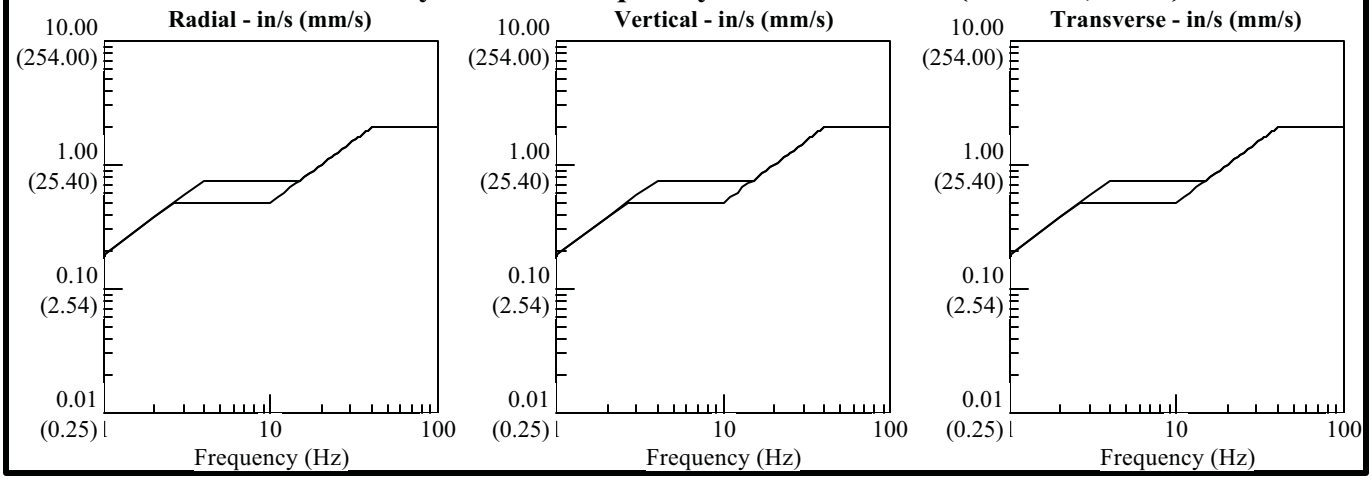
Acoustic: ----- dB @ --- Hz
(0.0Mb 0.0000psi 0.0000kPa)
Radial: <0.05in/s 0.00mm/s @ ---Hz
***Vertical:* <0.05in/s 0.000mm/s @ ---Hz**
Transverse: <0.05in/s 0.00mm/s @ ---Hz
Displacement: 0.0000in 0.0000mm
Acceleration: 0.00000g's

Graph Information

Duration: 0.000s To: 5.500s
Acoustic Scale:
120dB 0.20Mb (0.050Mb/div)
Seismic Scale:
0.05in/s (0.050in/s/div) 5.08mm/s (1.270mm/s/div)
Time Line Intervals at: 1.00 s



Particle Velocity Versus Frequency - USBM Limits (RI 8507, 1980)



Wampum Hardware: Garner Landfill Project
Seismograph Loc: Proposed Well
Shot Loc: N E
Distance: feet
Maximum lbs. per delay:
Shot # Operator: Rob Nicks

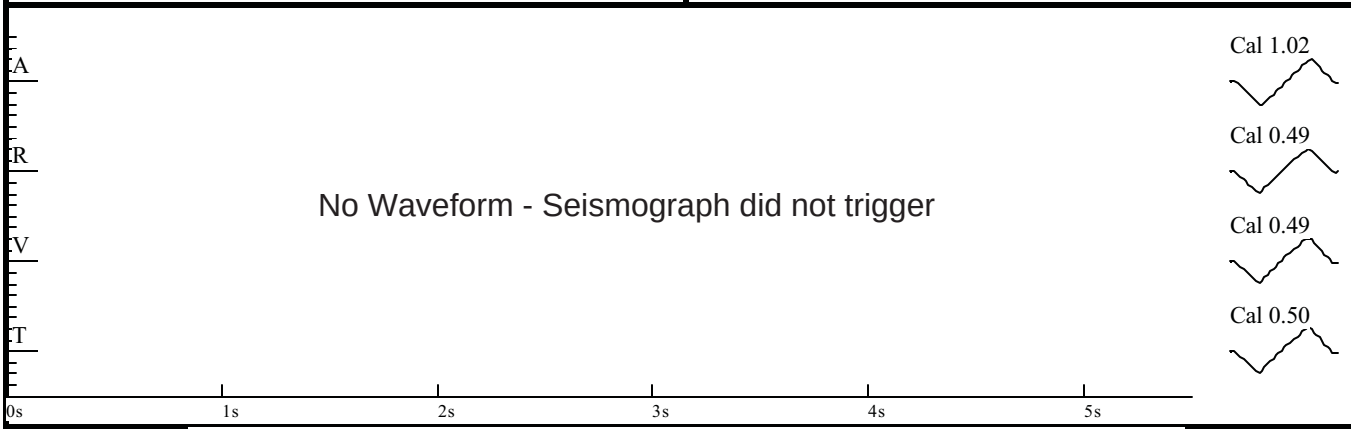
File Name: NO TRIGGER
Number: 000
Date: 6/14/11
Time: 15:28
Serial Number: 2512
Seismic Trigger: 0.0200 in/s 0.5080 mm/s
Acoustic Trigger: 142 dB
Sample Rate: 1024
Record Duration: 5.0 Seconds
Pre-Trigger: 0.50 Seconds
Sensor Gain: 2x
Battery: 7.0

Amplitudes and Frequencies

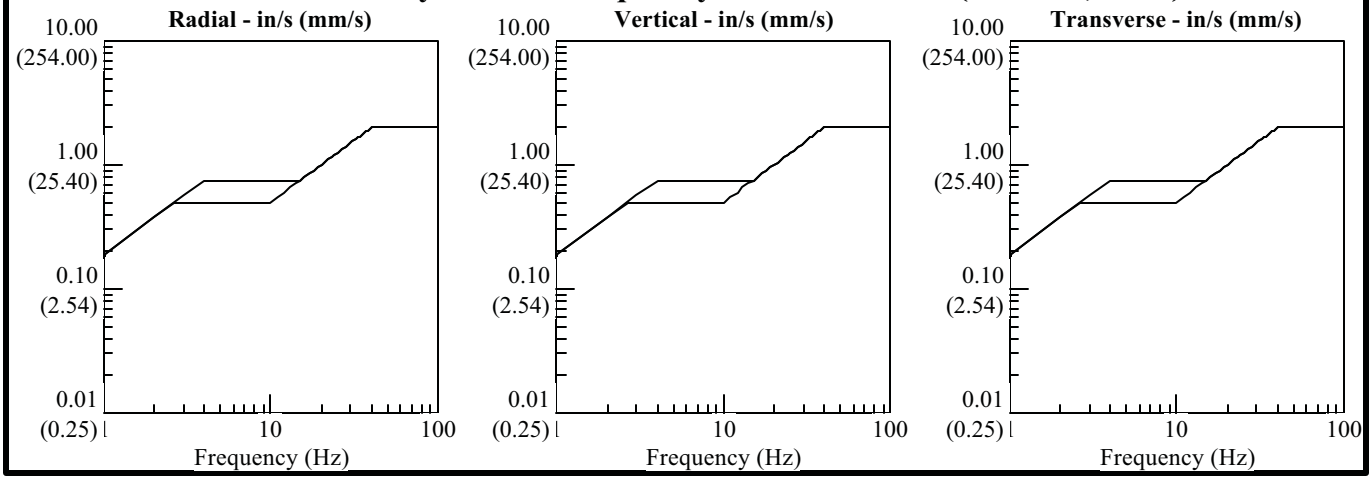
Acoustic: ----- dB @ --- Hz
(0.0Mb 0.0000psi 0.0000kPa)
Radial: <0.02in/s 0.00mm/s @ ---Hz
***Vertical:* <0.02in/s 0.000mm/s @ ---Hz**
Transverse: <0.02in/s 0.00mm/s @ ---Hz
Displacement: 0.0000in 0.0000mm
Acceleration: 0.00000g's

Graph Information

Duration: 0.000s To: 5.500s
Acoustic Scale:
120dB 0.20Mb (0.050Mb/div)
Seismic Scale:
0.02in/s (0.050in/s/div) 5.08mm/s (1.270mm/s/div)
Time Line Intervals at: 1.00 s



Particle Velocity Versus Frequency - USBM Limits (RI 8507, 1980)



Wampum Hardware: Garner Landfill Project
Seismograph Loc: Landfill Perimeter
Shot Loc: N E
Distance: feet
Maximum lbs per delay:
Shot # Operator: Rob Nicks

File Name: 1891201106161333170.DTB
Number: 170
Date: 6/16/2011
Time: 13:33
Serial Number: 1891
Seismic Trigger: 0.0500 in/s 1.2700 mm/s
Acoustic Trigger: 142 dB
Sample Rate: 1024
Record Duration: 5.0 Seconds
Pre-Trigger: 0.50 Seconds
Sensor Gain: 2x
Battery: 7.0

Amplitudes and Frequencies

Acoustic: 131 dB @ 16.5 Hz
(0.70Mb 0.0102psi 0.0700kPa)

***Radial:* 0.175in/s 4.445mm/s @ 17.0Hz**

Vertical: 0.115in/s 2.921mm/s @ 28.4Hz

Transverse: 0.12in/s 3.048mm/s @ 18.2Hz

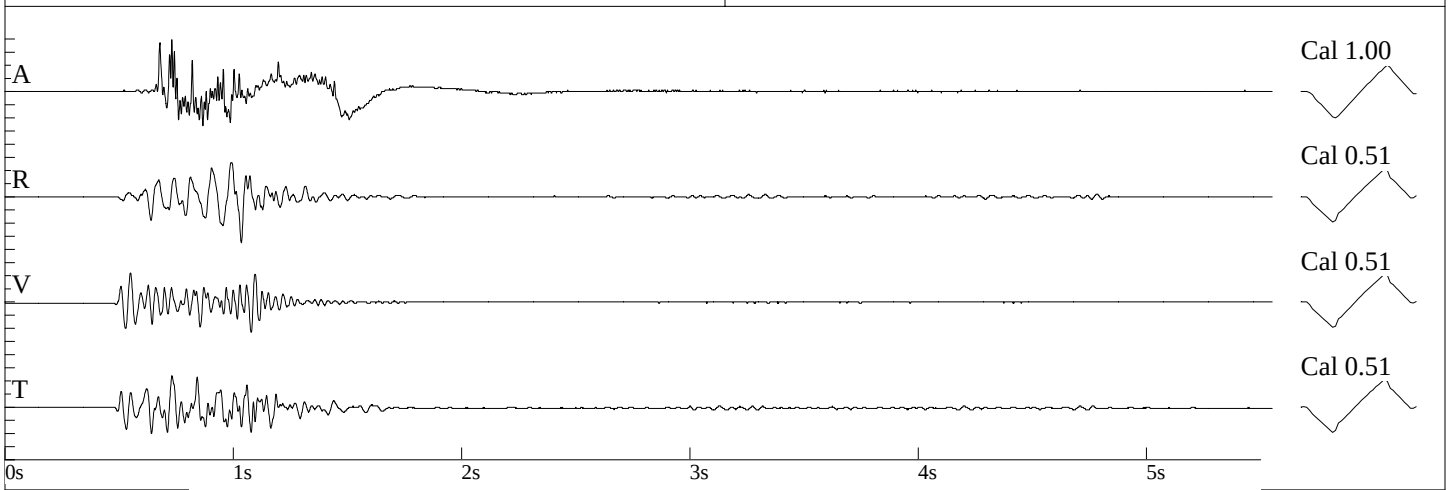
Graph Information

*Duration:*0.000s To: 5.500s

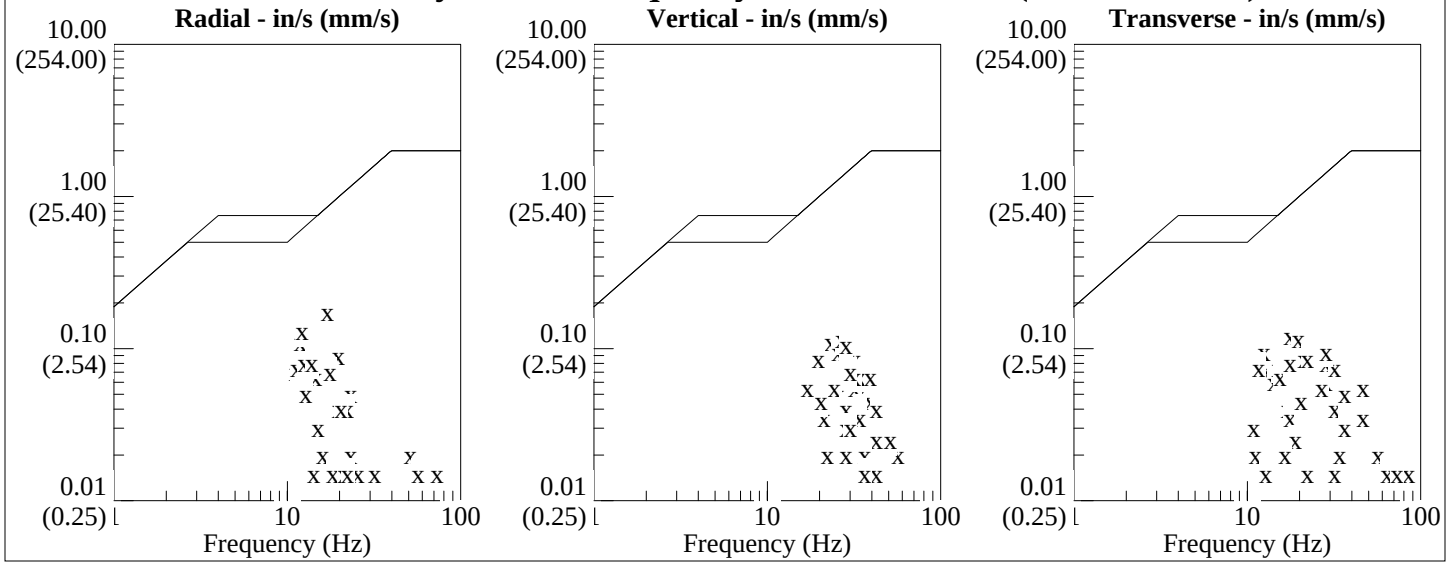
Acoustic Scale:
131dB 0.71Mb (0.177Mb/div)

Seismic Scale:
0.20in/s (0.050in/s/div) 5.08mm/s (1.270mm/s/div)

*Time Line Intervals at:*1.00 s



Particle Velocity Versus Frequency - USBM Limits (RI 8507, 1980)



Wampum Hardware: Garner Landfill Project
Seismograph Loc: Proposed Well
Shot Loc: N E
Distance: feet
Maximum lbs per delay:
Shot # Operator: Rob Nicks

File Name: 2512201106161333217.DTB
Number: 217
Date: 6/16/2011
Time: 13:33
Serial Number: 2512
Seismic Trigger: 0.0200 in/s 0.5080 mm/s
Acoustic Trigger: 142 dB
Sample Rate: 1024
Record Duration: 5.0 Seconds
Pre-Trigger: 0.50 Seconds
Sensor Gain: 2x
Battery: 7.1

Amplitudes and Frequencies

Acoustic: 121 dB @ 42.6 Hz
(0.22Mb 0.0032psi 0.0220kPa)

Radial: 0.065in/s 1.651mm/s @ 25.6Hz

Vertical: 0.06in/s 1.524mm/s @ 36.5Hz

***Transverse:* 0.085in/s 2.159mm/s @ 26.9Hz**

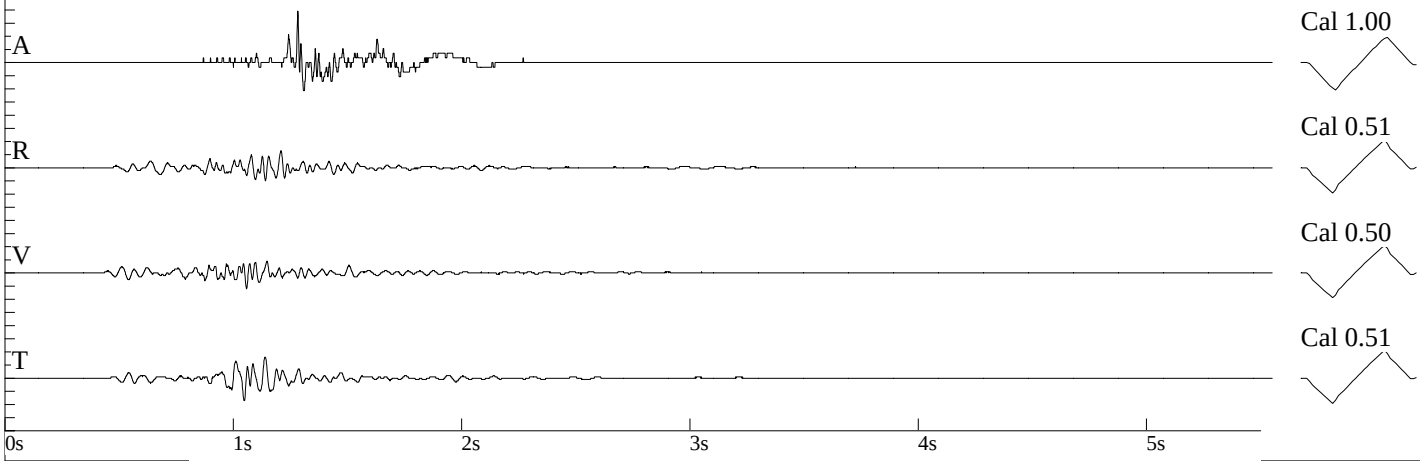
Graph Information

*Duration:*0.000s To: 5.500s

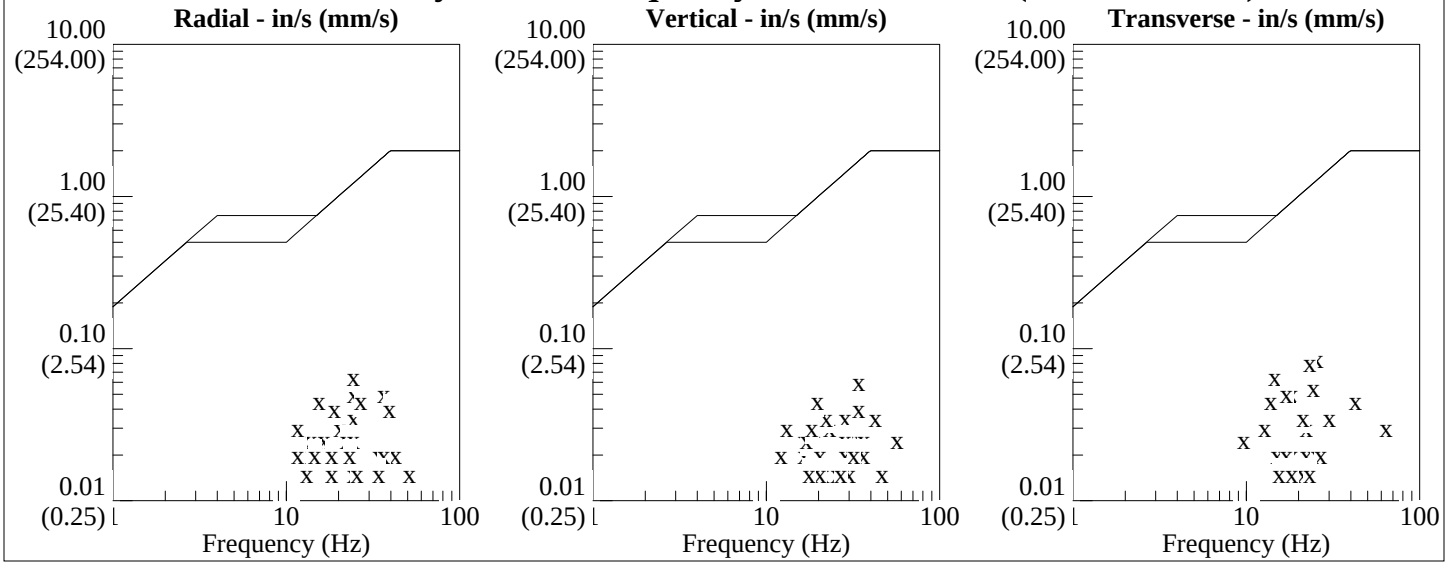
Acoustic Scale:
121dB 0.22Mb (0.056Mb/div)

Seismic Scale:
0.20in/s (0.050in/s/div) 5.08mm/s (1.270mm/s/div)

*Time Line Intervals at:*1.00 s



Particle Velocity Versus Frequency - USBM Limits (RI 8507, 1980)



Wampum Hardware: Garner Landfill Project
Seismograph Loc: Landfill Perimeter
Shot Loc: N E
Distance: feet
Maximum lbs per delay:
Shot # Operator: Rob Nicks

File Name: 1891201106201052172.DTB
Number: 172
Date: 6/20/2011
Time: 10:52
Serial Number: 1891
Seismic Trigger: 0.0500 in/s 1.2700 mm/s
Acoustic Trigger: 142 dB
Sample Rate: 1024
Record Duration: 5.0 Seconds
Pre-Trigger: 0.50 Seconds
Sensor Gain: 2x
Battery: 7.1

Amplitudes and Frequencies

Acoustic: 119 dB @ 5.5 Hz
(0.18Mb 0.0026psi 0.0180kPa)

Radial: 0.065in/s 1.651mm/s @ 34.1Hz

***Vertical:* 0.10in/s 2.54mm/s @ 42.6Hz**

Transverse: 0.07in/s 1.778mm/s @ 42.6Hz

*Calibration Date:*1/25/2011

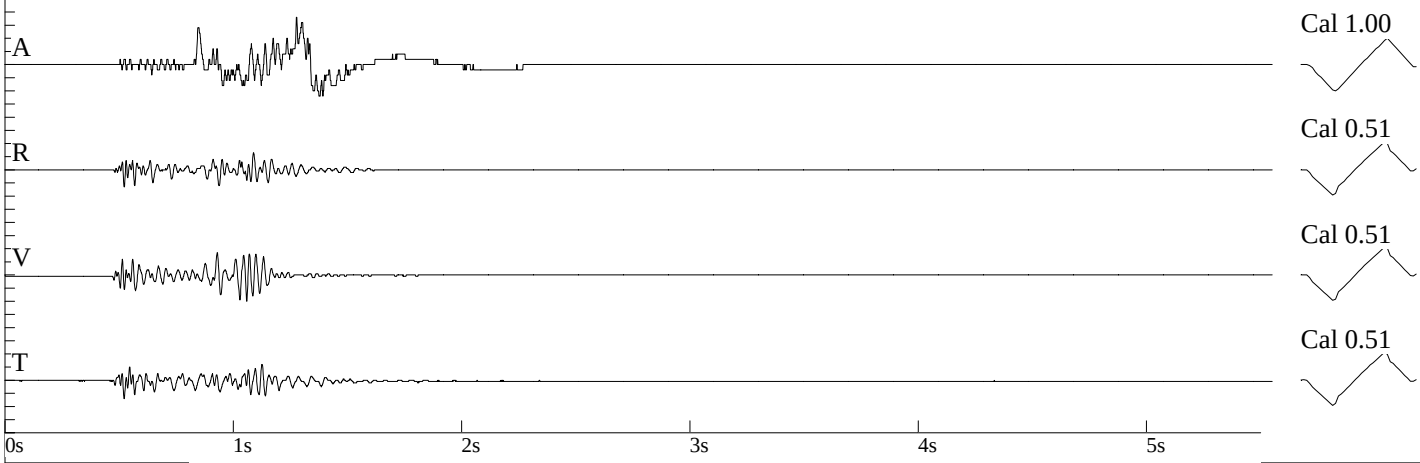
Graph Information

*Duration:*0.000s To: 5.500s

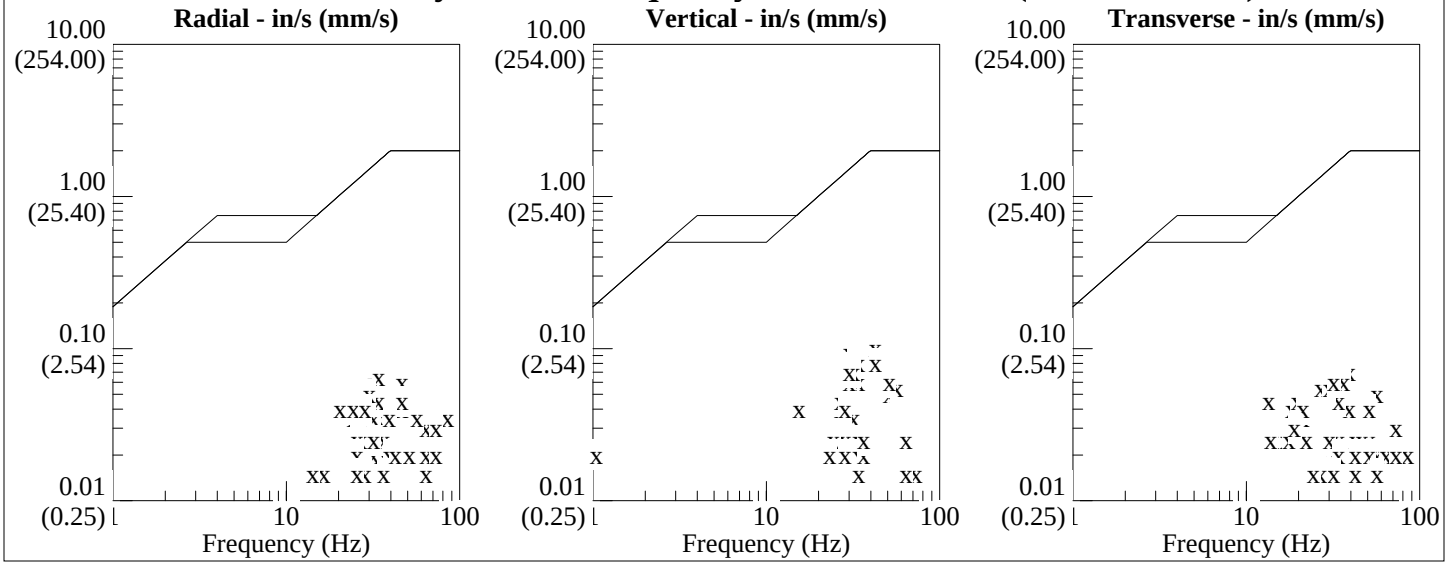
Acoustic Scale:
120dB 0.20Mb (0.050Mb/div)

Seismic Scale:
0.20in/s (0.050in/s/div) 5.08mm/s (1.270mm/s/div)

*Time Line Intervals at:*1.00 s



Particle Velocity Versus Frequency - USBM Limits (RI 8507, 1980)



Wampum Hardware: Garner Landfill Project
Seismograph Loc: Proposed Well
Shot Loc: N E
Distance: feet
Maximum lbs per delay:
Shot # Operator: Rob Nicks

File Name: 2512201106201052219.DTB
Number: 219
Date: 6/20/2011
Time: 10:52
Serial Number: 2512
Seismic Trigger: 0.0200 in/s 0.5080 mm/s
Acoustic Trigger: 142 dB
Sample Rate: 1024
Record Duration: 5.0 Seconds
Pre-Trigger: 0.50 Seconds
Sensor Gain: 2x
Battery: 7.2

Amplitudes and Frequencies

Acoustic: 114 dB @ 30.1 Hz
(0.10Mb 0.0015psi 0.0100kPa)

Radial: 0.055in/s 1.397mm/s @ 22.2Hz

Vertical: 0.05in/s 1.27mm/s @ 14.6Hz

***Transverse:* 0.075in/s 1.905mm/s @ 21.3Hz**

Calibration Date: 11/9/2009

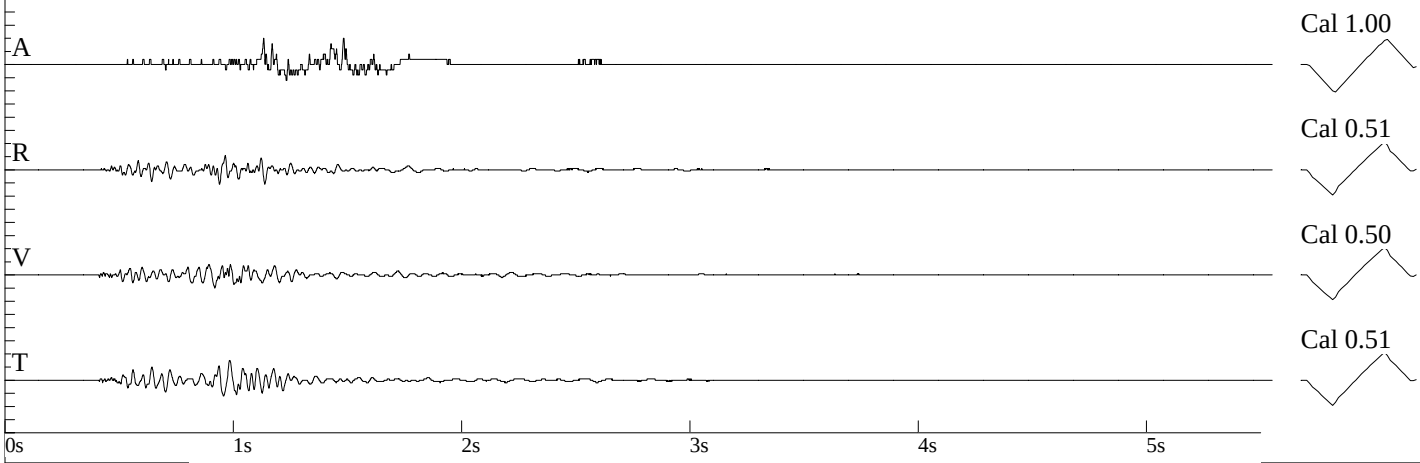
Graph Information

Duration: 0.000s To: 5.500s

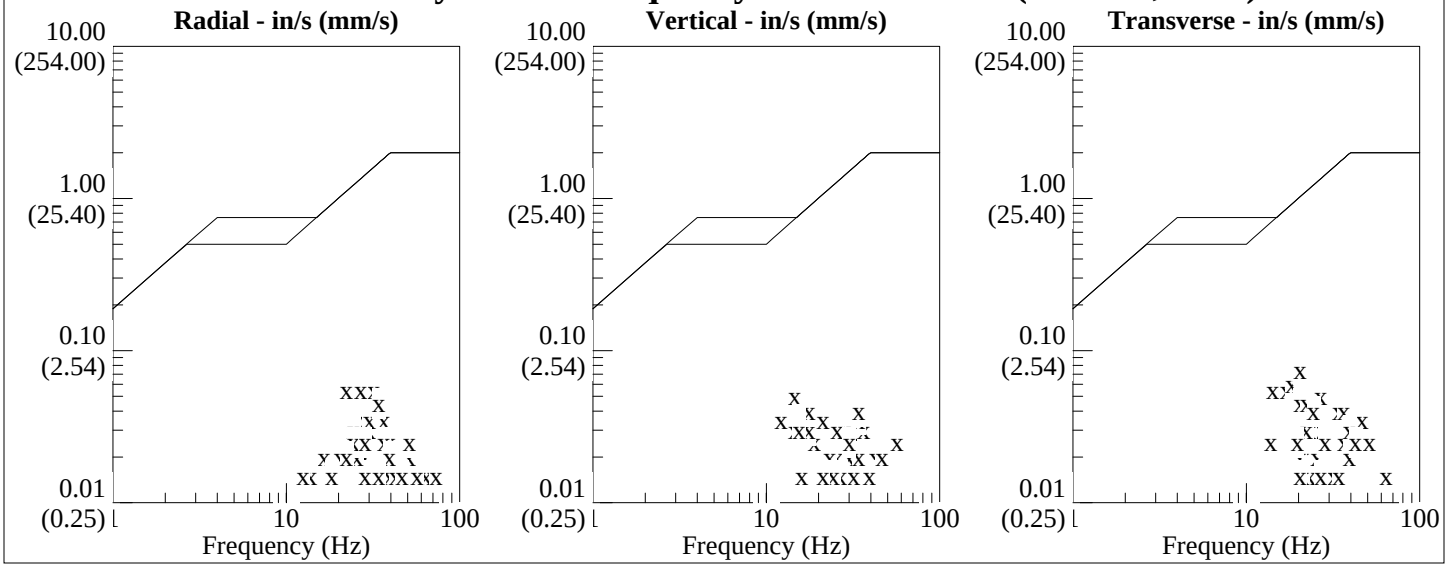
Acoustic Scale:
120dB 0.20Mb (0.050Mb/div)

Seismic Scale:
0.20in/s (0.050in/s/div) 5.08mm/s (1.270mm/s/div)

Time Line Intervals at: 1.00 s



Particle Velocity Versus Frequency - USBM Limits (RI 8507, 1980)



Permit Number 92-31

WAMPUM HARDWARE CO.
Blast Report

B.L. Number 52800

Co. Blasting for: Bentley Development/WCA Date: 5/20/11 Time: 2:29 p.m

Distance: 581' as derived from survey marker, aerial photo, map, GPS, Range Finder or direct measurement CIRCLE ONE:

Directions in Degrees: 306° to nearest occupied building NAME: Cell 634'

Directions in Degrees: 101° to nearest building NAME: MW 1

Weather: SUNNY Temperature: 80° Wind Direction: W Wind Velocity: 5mph EST.

Material Blasted: Sandrock Stemming Type: STONE 4-20 ft (top) X ft (deck)

No. of Holes: 148 Burden: 8 Spacing: 8 Diameter of holes: 4" Depth 6-28'

MATERIALS USED IN BLASTING SHOT

Manufacturer	Product & Size	Amount
DYNO	ANFO BAGS 50#	2650#
DYNO spartan	Boosters 1/2#	80#

Total Weight of Explosives: 2730#

MAX Weight of Explosives per hole: 25#

Number of Holes per delay: 2 per delay

Maximum weight of explosives detonated within 8 ms: 50#

If holes were decked lbs. per deck used: X 1 X 2 X 3 X 4 X 5

INITIATION SYSTEM Electric Sequential-- ☐ Electric, Type of BM X Non-Electric ☑

Machine Set on: X ms. No. of Circuits used: X Were mats used? NO

Scaled Distance: 82.16 Number of people on shot 2 NAMES of shot crew JOE W. Tyler W.

SEISMOGRAPH INFORMATION

Location of Seismograph: Cell / MW #1 Distance 581'/634' from blast

Name of Operator & Company Sauls Seismic Inc.

Type of Instrument: Nomis 7000 Serial NO: 1891/2512

Calibration Date: ++ Readings: T V L 124 db. 0.085

Calibration Date: ++ Readings: T V L 118 db. 0.090

Blaster in Charge: Joseph M Wilhelm (Print) Joseph M Wilhelm (Signature) 6606 (License Number)

If Blast Occurs After Scheduled Blasting Hours, PLEASE EXPLAIN:

Comments: Shot Location
N 35° 42.531'
[illegible]

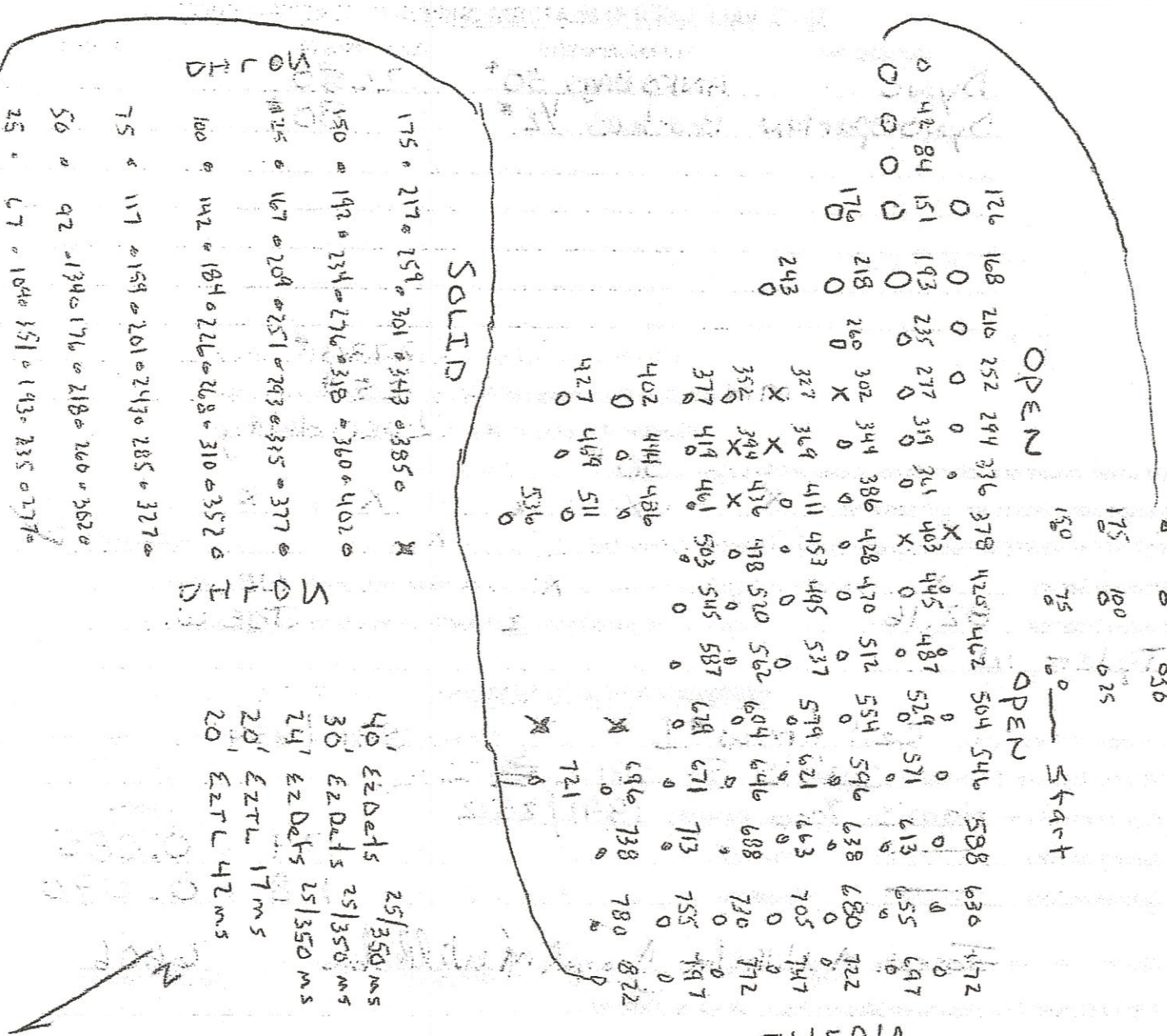
Typic Loaded

STEM | Load

Indicate All Information

1) Show all holes, number circuits and indicate cap number next to hole and hole to hole wiring. (Below)
2) Locate free faces, solid area & any previously blasted material.
3) Indicate NORTH on diagram.
4) Show how the Bore hole was loaded, indicate stemming and decks if the hole was decked.
5) List manufacture of Detonators with list of Delay No.'s and the number used of each delay.

If needing more room use another shot report.

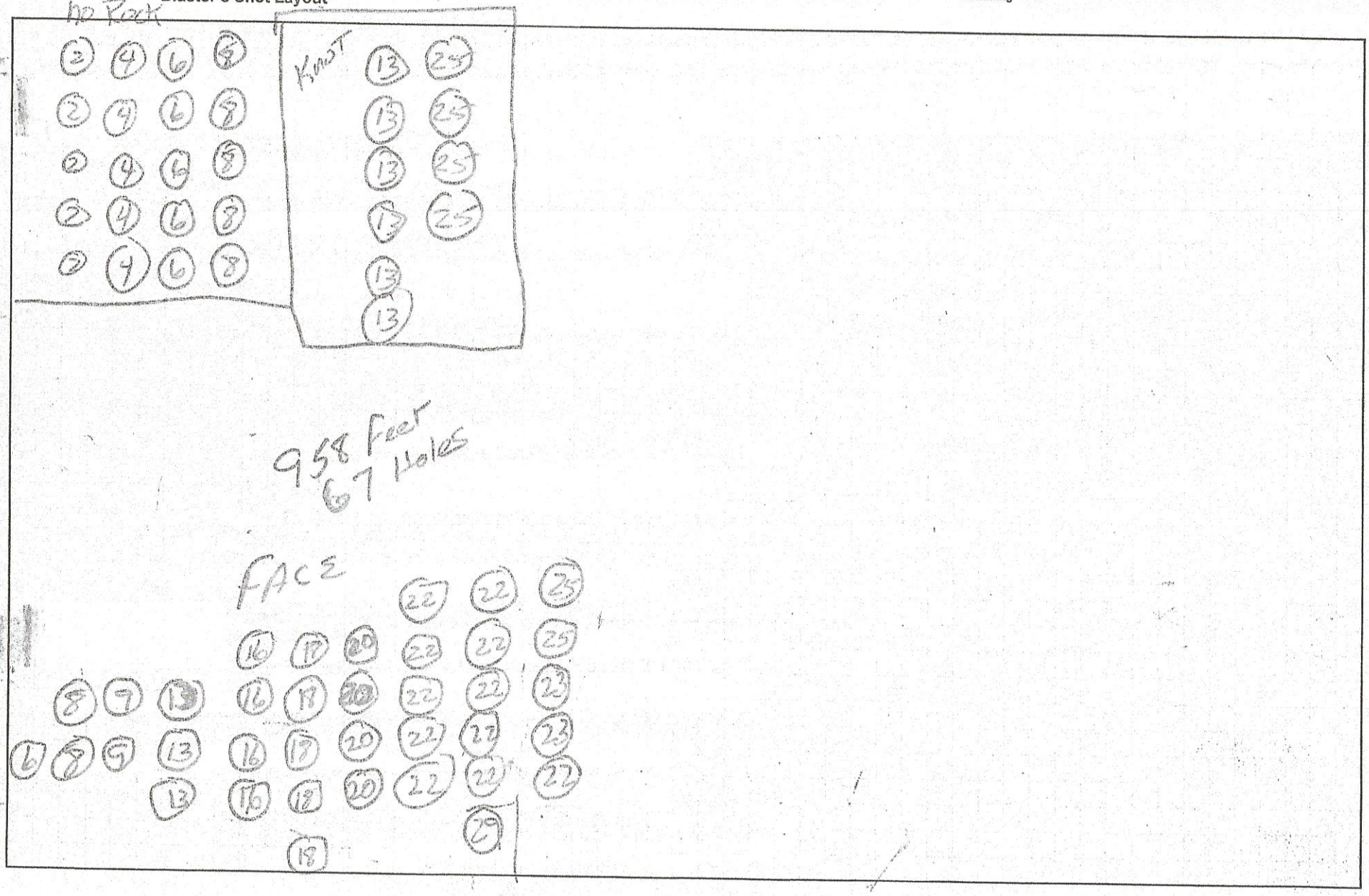


N

GEOLOGICAL TECHNOLOGIES INC.

Blaster's Shot Layout

Location	Bentley Landfill WCA	No. of Holes	Shot #1
Date	5/18/11	Drill Depth	
Time		Drill Pattern	8X8 4" Bit
Representative		Stemming	



8:30
11:00
Drill
2½ hrs.

N!

GEOLOGICAL TECHNOLOGIES INC.
Blaster's Shot Layout

Location Raleigh NC Brentley landfill

Date 5-19-11

Time

Representative

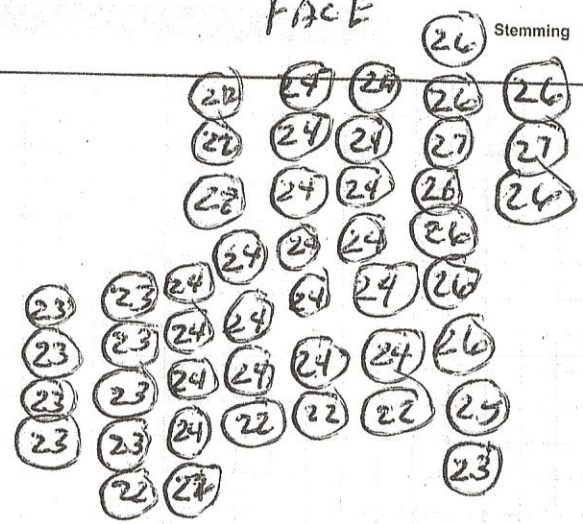
No. of Holes

Drill Depth

Drill Pattern 8x8

Stemming

FACE



47 Holes

1132 feet

GEOLOGICAL TECHNOLOGIES INC.
Blaster's Shot Layout FACE

Location WCA

Date 5/20

Time

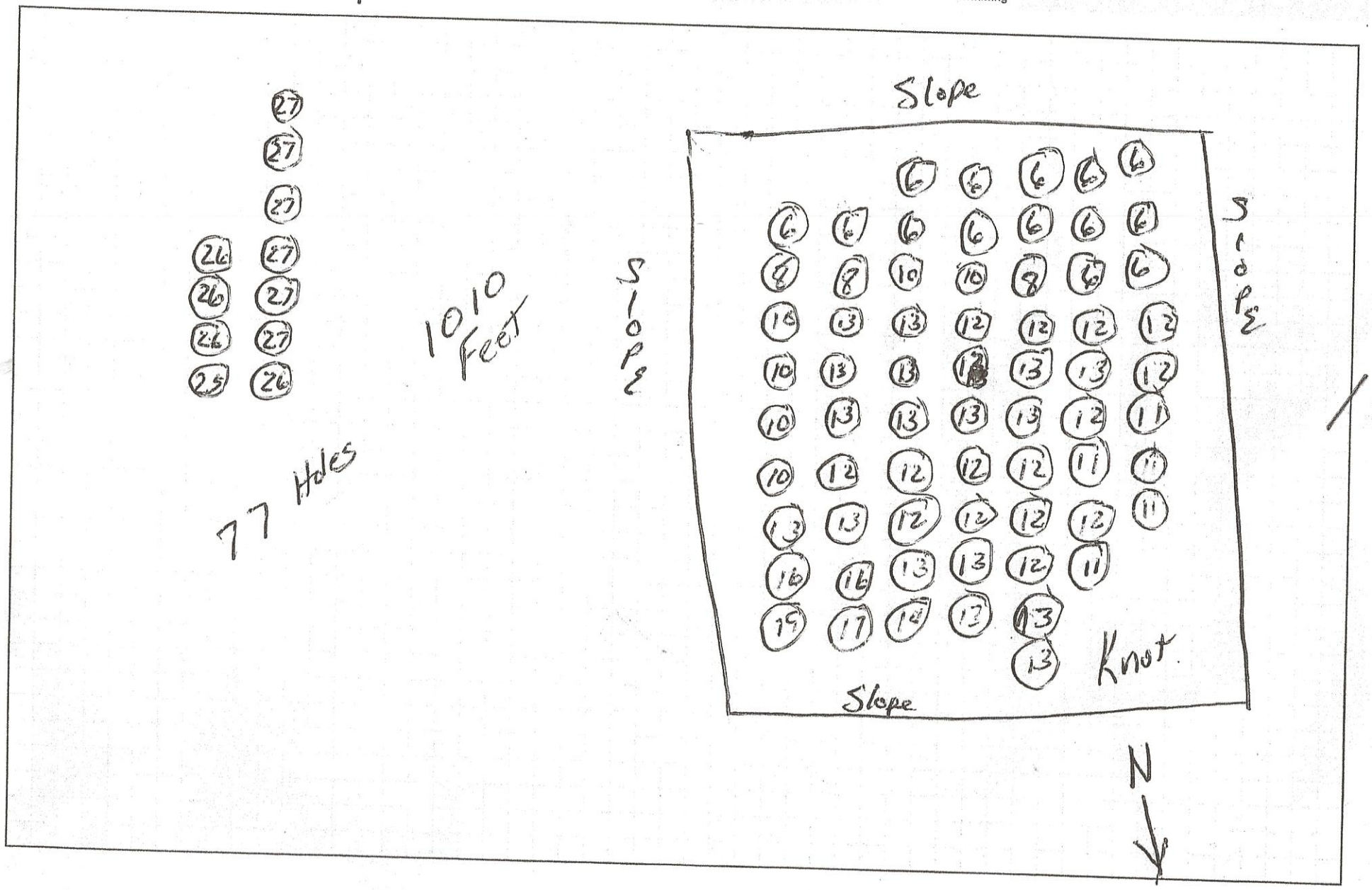
Representative

~~No. of Holes~~ Shot #1

Drill Depth

Drill Pattern 8x8 4" Bit

Stemming



Permit Number 92-31

WAMPUM HARDWARE CO.
Blast Report

B.L. Number 52801

Co. Blasting for: Bentley Development / WCA Date: 5/24/11 Time: 2:48 p.m.

Distance: 528' as derived from survey marker, aerial photo, map, GPS, Range Finder or direct measurement CIRCLE ONE:

Directions in Degrees: 318° to nearest occupied building NAME: Cell 739'

Directions in Degrees: 096° to nearest building NAME: MW #1

Weather: SUNNY Temperature: 93° Wind Direction: W Wind Velocity: 5mph EST.

Material Blasted: Sandrock Stemming Type: STONE 4-21 ft (top) X ft (deck)

No. of Holes: 69 Burden: 8 Spacing: 8 Diameter of holes: 4" Depth 27-39'

MATERIALS USED IN BLASTING SHOT

Manufacturer	Product & Size	Amount
DYNO	ANFO Bags 50#	5450#
DYNO Spartan	Booster 1/2#	59#

Total Weight of Explosives: 5509#

MAX Weight of Explosives per hole: 100#

Number of Holes per delay: 2 per delay

Maximum weight of explosives detonated within 8 ms: 200#

If holes were decked lbs. per deck used: X 1 X 2 X 3 X 4 X 5

INITIATION SYSTEM Electric Sequential-- ☐ Electric, Type of BM X Non-Electric ☑

Machine Set on: X ms. No. of Circuits used: X Were mats used? NO

Scaled Distance: 37.33 Number of people on shot 2 NAMES of shot crew JOE W. Tyler W.

SEISMOGRAPH INFORMATION

Location of Seismograph: Cell / MW #1 Distance 528'/739' from blast

Name of Operator & Company Saul's Seismic Inc.

Type of Instrument: Nomis 7000 Serial NO: 18911 2512

Calibration Date: — Readings: T V L 121 db. 0.23

Calibration Date: — Readings: T V L 120 db. 0.14

Blaster in Charge: JOSEPH M Wilhelm (Print) Joseph M Wilhelm (Signature) 6606 (License Number)

If Blast Occurs After Scheduled Blasting Hours, PLEASE EXPLAIN:

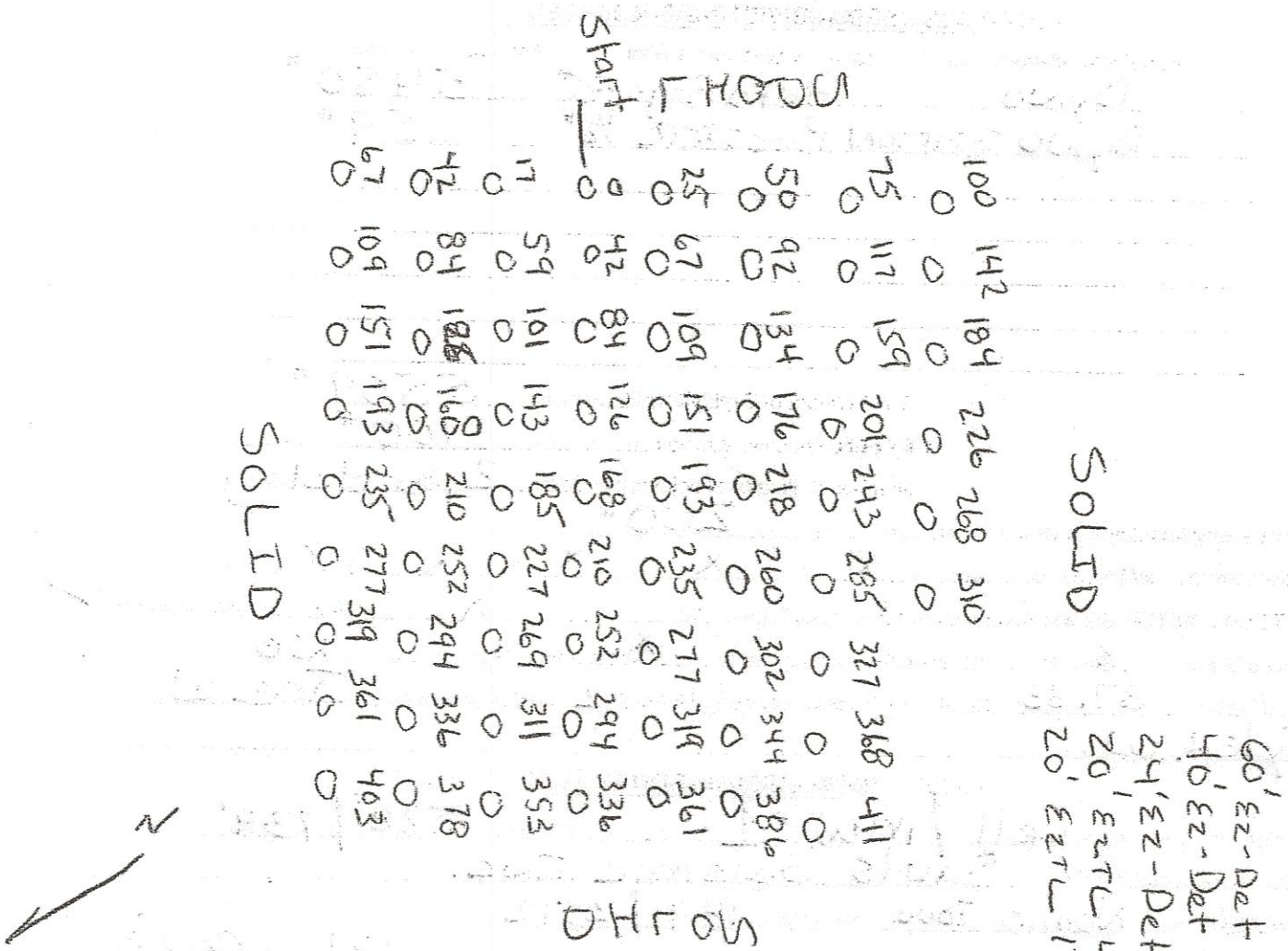
Comments: Shot Location N35° 42.525' W078° 30.226'

Typical Loaded Hole

STEM | Load

Indicate All Information

1) Show all holes, number circuits and indicate cap number next to hole and hole to hole wiring. (Below)
2) Locate free faces, solid area & any previously blasted material.
3) Indicate NORTH on diagram.
4) Show how the Bore hole was loaded, indicate stemming and decks if the hole was decked.
5) List manufacture of Detonators with list of Delay No.'s and the number used of each delay.
If needing more room use another shot report.



Permit Number 92-31

WAMPUM HARDWARE CO.
Blast Report

B.L. Number 52802

Co. Blasting for: Bentley Development/WCA Date: 5/26/11 Time: 12:37

Distance: 475' as derived from survey marker, aerial photo, map, GPS, Range Finder or direct measurement CIRCLE ONE:

Directions in Degrees: 326° to nearest occupied building NAME: Cell 792'

Directions in Degrees: 095° to nearest building NAME: MW #1

Weather: SUNNY Temperature: 95° Wind Direction: W Wind Velocity: 11mph EST.

Material Blasted: Sand Rock Stemming Type: STONE 4-17ft (top) X ft (deck)

No. of Holes: 49 Burden: 8 Spacing: 8 Diameter of holes: 4" Depth 10-40'

MATERIALS USED IN BLASTING SHOT

Manufacturer	Product & Size	Amount
DYNO	ANFO Bags 50#	3050#
DYNO Spartan	Booster 1/2#	40#

Total Weight of Explosives: 3090#

MAX Weight of Explosives per hole: 125#

Number of Holes per delay: 1 per delay

Maximum weight of explosives detonated within 8 ms: ~~[illegible]~~ 125#

If holes were decked lbs. per deck used: X 1 X 2 X 3 X 4 X 5

INITIATION SYSTEM Electric Sequential-- ☐ Electric, Type of BM X Non-Electric ☑

Machine Set on: X ms. No. of Circuits used: X Were mats used? NO

Scaled Distance: ~~[illegible]~~ Number of people on shot 2 NAMES of shot crew JOE W. TYLER W. 42.48

SEISMOGRAPH INFORMATION

Location of Seismograph: Cell/MW #1 Distance 475'/792' from blast

Name of Operator & Company Sauls Seismic INC.

Type of Instrument: Nomis 7000 Serial NO: 1891/2512

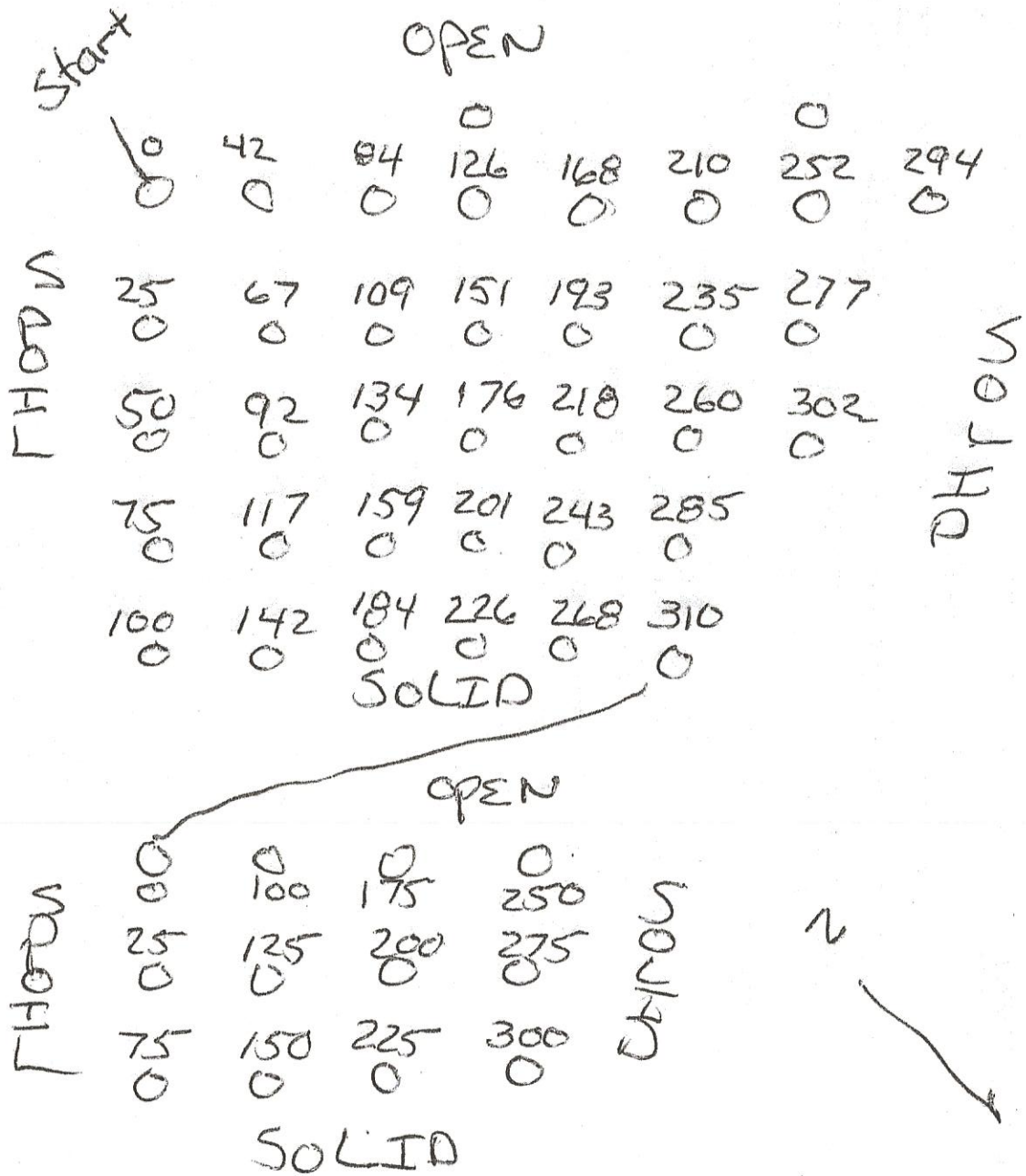
Calibration Date: —/— Readings: T V L 116 db. 0.42

Calibration Date: —/— Readings: T V L 122 db. 0.16

Blaster in Charge: Joseph M Wilhelm (Print) Joseph M Wilhelm (Signature) 6606 (License Number)

If Blast Occurs After Scheduled Blasting Hours, PLEASE EXPLAIN:

Comments: Shot Location N 35° 42.519' W078° 30.242'


Start
OPEN
0 42 84 126 168 210 252 294
25 67 109 151 193 235 277
50 92 134 176 218 260 302
75 117 159 201 243 285
100 142 184 226 268 310
SOLID
HOPS
SOLID
HOPS
OPEN
0 100 175 250
25 125 200 275
75 150 225 300
SOLID
HOPS
SOLID
N

Shot - 4

Permit Number 92-31

WAMPUM HARDWARE CO.
Blast Report

B.L. Number 52803

Co. Blasting for: Bentley Development / WCA Date: 6/1/11 Time: 3:00 p.m

Distance: 422' as derived from survey marker, aerial photo, map, (GPS) Range Finder or direct measurement CIRCLE ONE:

Directions in Degrees: 305° to nearest occupied building NAME: Cell 739'

Directions in Degrees: 106° to nearest building NAME: MW #1

Weather: Sunny Temperature: 97° Wind Direction: W Wind Velocity: 4mph EST.

Material Blasted: Sandrock Stemming Type: Stone 4-10ft (top) X ft (deck)

No. of Holes: 72 Burden: 8 Spacing: 8 Diameter of holes: 4" Depth 8-2

MATERIALS USED IN BLASTING SHOT

Manufacturer	Product & Size	Amount
Dyno	ANFO Bags 50#	2900#
Dyno Spartan	Booster 1/2#	36#

Total Weight of Explosives: 2936#

MAX Weight of Explosives per hole: 70#

Number of Holes per delay: 2 per delay

Maximum weight of explosives detonated within 8 ms: 140#

If holes were decked lbs. per deck used: X 1 X 2 X 3 X 4 X 5

INITIATION SYSTEM Electric Sequential-- ☐ Electric, Type of BM X Non-Electric ☑

Machine Set on: X ms. No. of Circuits used: X Were mats used? NO

Scaled Distance: 35.66 Number of people on shot 2 NAMES of shot crew Joe W. Tyler W.

SEISMOGRAPH INFORMATION

Location of Seismograph: Cell / MW #1 Distance 422' / 739' from blast

Name of Operator & Company Sauls Seismic Inc.

Type of Instrument: Nom. S7000 Serial NO: 1891/2512

Calibration Date: — / — / — Readings: ____ T ____ V ____ L 132 db. 0.125

Calibration Date: — / — / — Readings: ____ T ____ V ____ L 120 db. 0.180

Blaster in Charge: Joseph M Wilhelm (Print) Joseph M Wilhelm (Signature) 6606 (License Number)

If Blast Occurs After Scheduled Blasting Hours, PLEASE EXPLAIN:

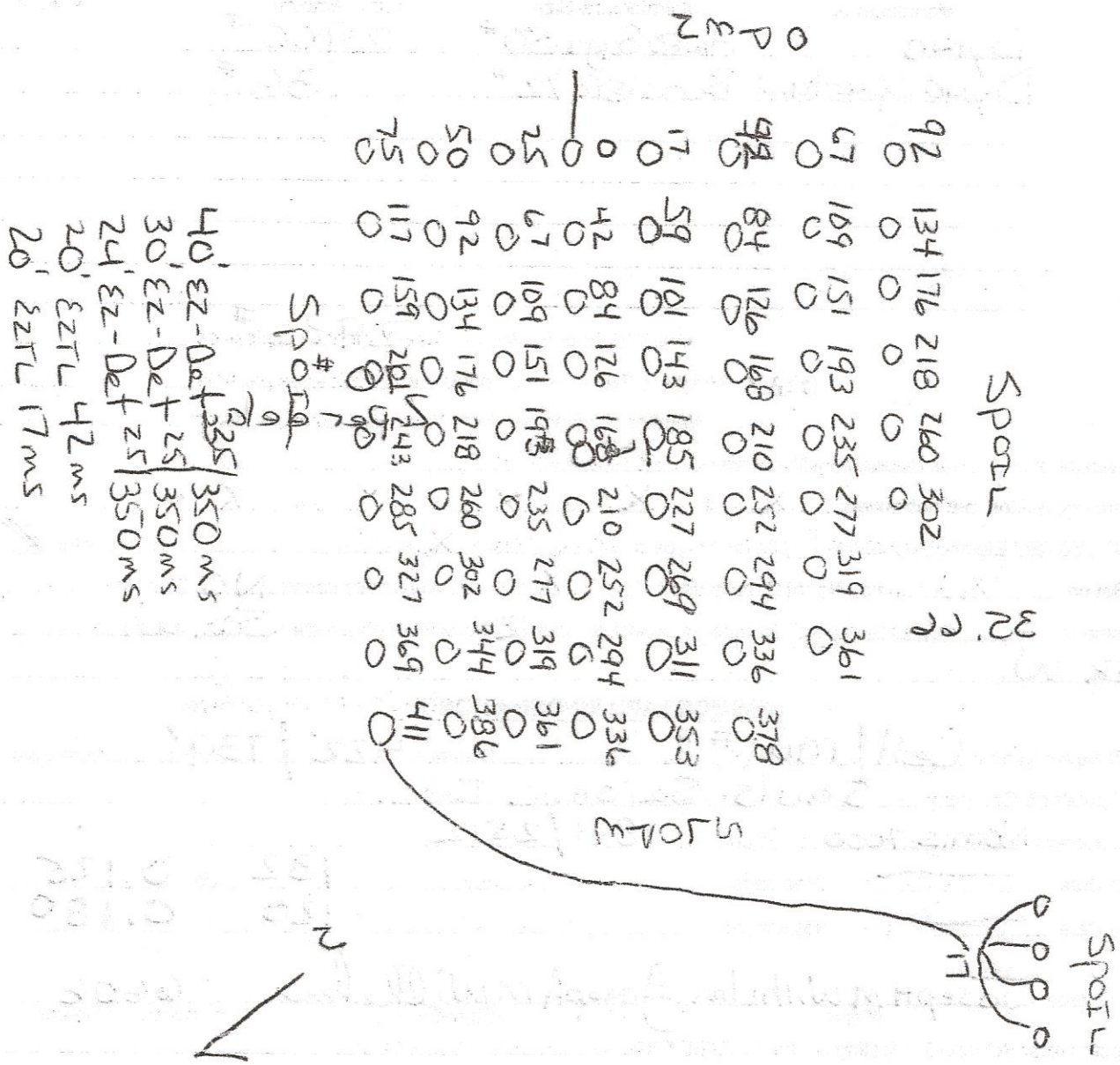
Comments: Shot Location
N35° 42.543'
W078° 30.230'

Typical Loaded Hole

STEM | Load

Indicate All Information

1) Show all holes, number circuits and indicate cap number next to hole and hole to hole wiring. (Below)
2) Locate free faces, solid area & any previously blasted material.
3) Indicate NORTH on diagram.
4) Show how the Bore hole was loaded, indicate stemming and decks if the hole was decked.
5) List manufacture of Detonators with list of Delay No.'s and the number used of each delay.
If needing more room use another shot report.



SHOT 3

Permit Number 92-31

WAMPUM HARDWARE CO.
Blast Report

B.L. Number 52804

Co. Blasting for: Bentley Development / WCA Date: 6/3/11 Time: 2:40 p.m.

Distance: 422' as derived from survey marker, aerial photo, map, GPS, Range Finder or direct measurement CIRCLE ONE:

Directions in Degrees: 314° to nearest occupied building NAME: Cell 792'

Directions in Degrees: 101° to nearest building NAME: MW #1

Weather: Sunny Temperature: 89° Wind Direction: W Wind Velocity: 11 mph EST.

Material Blasted: Sand Rock Stemming Type: Stone 4-16 ft (top) X ft (deck)

No. of Holes: 68 Burden: 8 Spacing: 8 Diameter of holes: 4" Depth 34-42'

MATERIALS USED IN BLASTING SHOT

Manufacturer	Product & Size	Amount
Dyno	AnFo Bags 50#	8050#
Dinospartan	Booster 1/2#	62#
Blast-Ex	Stick-- 2 1/2 x 16	120#

Total Weight of Explosives: 8232#

MAX Weight of Explosives per hole: 125#

Number of Holes per delay: 1 per delay

Maximum weight of explosives detonated within 8 ms: 125#

If holes were decked lbs. per deck used: X 1 X 2 X 3 X 4 X 5

INITIATION SYSTEM Electric Sequential-- ☐ Electric, Type of BM X Non-Electric ☑

Machine Set on: X ms. No. of Circuits used: X Were mats used? NO

Scaled Distance: 37.74 Number of people on shot 2 NAMES of shot crew Joe W Tyler W.

SEISMOGRAPH INFORMATION

Location of Seismograph: Cell Distance 422' from blast

Name of Operator & Company Sauls Seismic Inc.

Type of Instrument: Nomis 7000 Serial NO: 1891

Calibration Date: / / Readings: T V L 128 db. 0.36

Calibration Date: / / Readings: T V L db.

Blaster in Charge: Joseph M Wilhelm (Print) Joseph M Wilhelm (Signature) 6606 (License Number)

If Blast Occurs After Scheduled Blasting Hours, PLEASE EXPLAIN:

Comments: Shot Location / Machine # 2512 set at MW #1 N 35° 42. 534' / Did Not trigger W 078° 30. 234'

Typical Loaded Hole

STEM | Load

Indicate All Information

1) Show all holes, number circuits and indicate cap number next to hole and hole to hole wiring. (Below)
2) Locate free faces, solid area & any previously blasted material.
3) Indicate NORTH on diagram.
4) Show how the Bore hole was loaded, indicate stemming and decks if the hole was decked.
5) List manufacture of Detonators with list of Delay No.'s and the number used of each delay.
If needing more room use another shot report.

GEOLOGICAL TECHNOLOGIES INC.

Blaster's Shot Layout

Location: WCA Raleigh NC

Date: 6-1-11

Time:

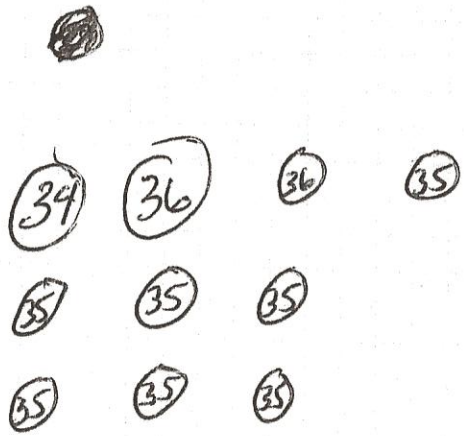
Representative:

No. of Holes: Shot #5

Drill Depth:

Drill Pattern:

Stemming:



GEOLOGICAL TECHNOLOGIES INC.
Blaster's Shot Layout

Location	WCA Raleigh NC	~~No. of Holes~~	Shot # 5
Date	6-2-11	Drill Depth	
Time	LANDFILL	Drill Pattern	
Representative		Stemming	

23 Holes
919 Feet

FACE

FACE

	39	40	40	41	40	
	40	41	42	41	40	41
39	40	40	41	40	40	39
		39	39	39	39	39

GEOLOGICAL TECHNOLOGIES INC.
Blaster's Shot Layout

Location WCA Raleigh NC

Date 6-3-11

Time

Representative

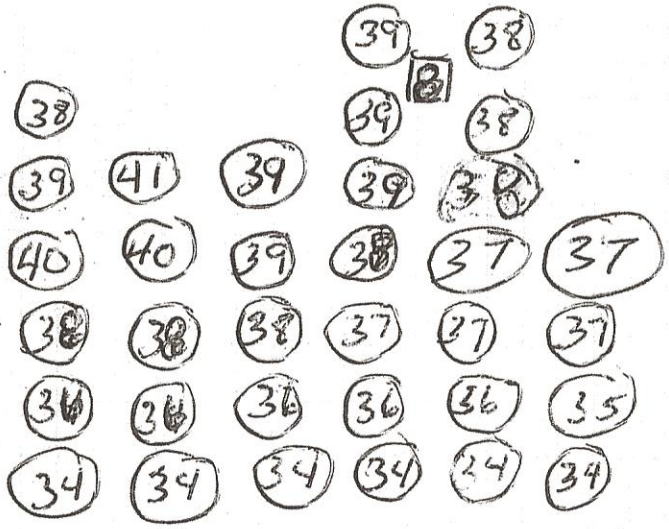
No. of Holes Shot #5

Drill Depth

Drill Pattern

Stemming

35 Holes
1271 feet



Permit Number 92-31

WAMPUM HARDWARE CO.
Blast Report

B.L. Number 52805

Co. Blasting for: Bentley Development/WCA Date: 6/6/11 Time: 3:37

Distance: 211' as derived from survey marker, aerial photo, map, GPS, Range Finder or direct measurement CIRCLE ONE:

Directions in Degrees: 316° to nearest occupied building NAME: Cell 950'

Directions in Degrees: 107° to nearest building NAME: [redacted] MW #1

Weather: SUNNY Temperature: 89° Wind Direction: W Wind Velocity: 7 mph EST.

Material Blasted: Sand Rock Stemming Type: drill cuttings 5-8 ft (top) X ft (deck)

No. of Holes: 147 Burden: 8 Spacing: 8 Diameter of holes: 4" Depth 6'-27'

MATERIALS USED IN BLASTING SHOT

Manufacturer	Product & Size	Amount
DYNO	ANFO Bags 50#	4950#
DYNO Spartan	Booster 1/2#	72#
Blast-Ex	Stick 2 1/2 x 16	80#

Total Weight of Explosives: 5102#

MAX Weight of Explosives per hole: 95#

Number of Holes per delay: 1 per delay

Maximum weight of explosives detonated within 8 ms: 95#

If holes were decked lbs. per deck used: X 1 X 2 X 3 X 4 X 5

INITIATION SYSTEM Electric Sequential-- ☐ Electric, Type of BM X Non-Electric ☑

Machine Set on: X ms. No. of Circuits used: X Were mats used? NO

Scaled Distance: 21.64 Number of people on shot 2 NAMES of shot crew JOE W. TYLER W.

SEISMOGRAPH INFORMATION

Location of Seismograph: Cell / MW1 Distance 211' / 950' from blast

Name of Operator & Company Sauls Seismic INC.

Type of Instrument: Nomis 7000 Serial NO: 1891/2512

Calibration Date: — Readings: T V L 130 db. 0.395

Calibration Date: — Readings: T V L 120 db. 0.060

Blaster in Charge: Joseph Wilhelm (Print) Joseph Wilhelm (Signature) 6606 (License Number)

If Blast Occurs After Scheduled Blasting Hours, PLEASE EXPLAIN:

Comments: Shot Location
N 35° 42. 550'
W 078° 30. 267'

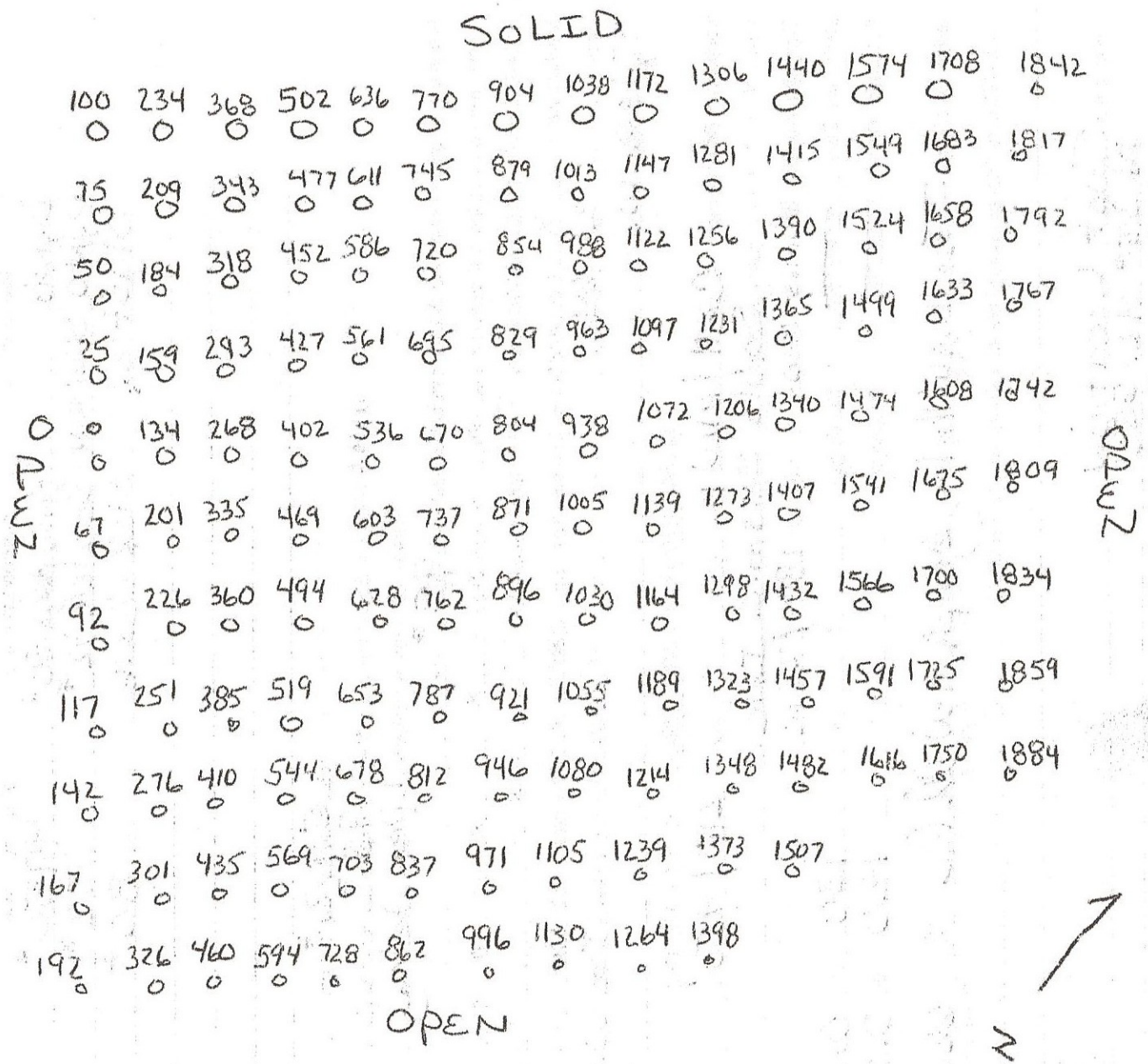
Typical Loaded Hole

STEM | Load

Indicate All Information

1) Show all holes, number circuits and indicate cap number next to hole and hole to hole wiring. (Below)
2) Locate free faces, solid area & any previously blasted material.
3) Indicate NORTH on diagram.
4) Show how the Bore hole was loaded, indicate stemming and decks if the hole was decked.
5) List manufacture of Detonators with list of Delay No.'s and the number used of each delay.

If needing more room use another shot report.



50' EZDET 25/350
24' EZDET 25/350
20' EZTL 42 ms
20' EZTL 17 ms

Shot # 1

Permit Number 92-31

WAMPUM HARDWARE CO.
Blast Report

B.L. Number 52806

Co. Blasting for: Bentley Development/WCA Date: 6/8/11 Time: 4:01

Distance: 211' as derived from survey marker, aerial photo, map, GPS, Range Finder or direct measurement CIRCLE ONE:

Directions in Degrees: 337° to nearest occupied building NAME: Cell 1003'

Directions in Degrees: 104° to nearest building NAME: MW #1

Weather: SUNNY Temperature: 88° Wind Direction: W Wind Velocity: 8mph EST.

Material Blasted: Sandrock Stemming Type: Stone 4-15ft (top) X ft (deck)

No. of Holes: 138 Burden: 8 Spacing: 8 Diameter of holes: 4" Depth 4-25

MATERIALS USED IN BLASTING SHOT

Manufacturer	Product & Size	Amount
Dyno	ANFO Bags 50#	3050#
Dyno Spartan	Booster 1/2#	70#

Total Weight of Explosives: 3170#

MAX Weight of Explosives per hole: 90#

Number of Holes per delay: 2 per delay

Maximum weight of explosives detonated within 8 ms: 100#

If holes were decked lbs. per deck used: X 1 X 2 X 3 X 4 X 5

INITIATION SYSTEM Electric Sequential-- ☐ Electric, Type of BM X Non-Electric ☑

Machine Set on: X ms. No. of Circuits used: X Were mats used? NO

Scaled Distance: 21.10 Number of people on shot 2 NAMES of shot crew JOE W. TYLER W.

SEISMOGRAPH INFORMATION

Location of Seismograph: Cell / MW #1 Distance 211'/1003' from blast

Name of Operator & Company Sauls Seismic Inc.

Type of Instrument: Nomis 7000 Serial NO: 1891/2512

Calibration Date: / / Readings: T V L 134 db. 0.365

Calibration Date: / / Readings: T V L 120 db. 0.080

Blaster in Charge: Joseph M Wilhelm (Print) Joseph M Wilhelm (Signature) 6606 (License Number)

If Blast Occurs After Scheduled Blasting Hours, PLEASE EXPLAIN:

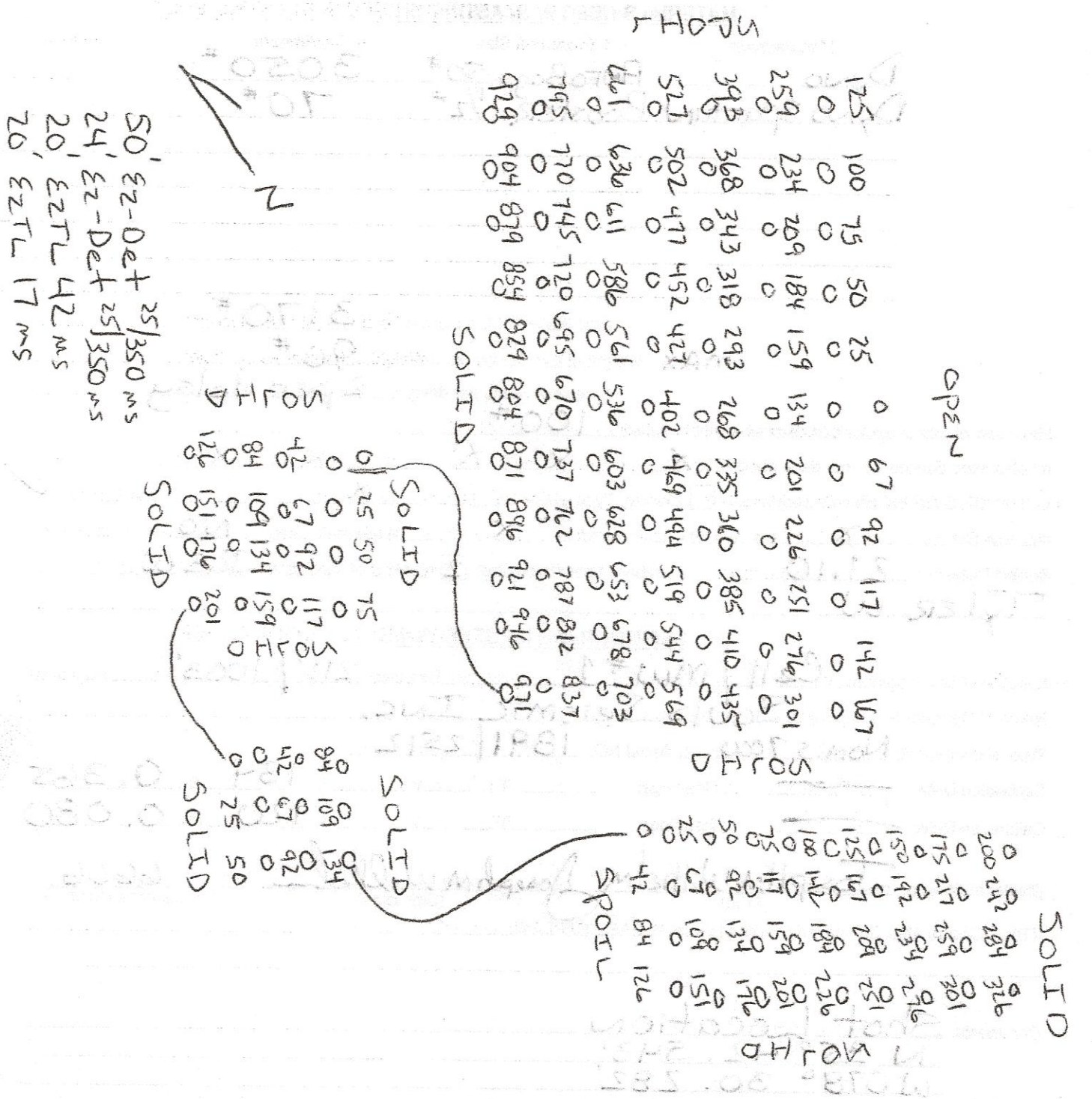
Comments: Shot Location
N 35° 42. 543'
W 078° 30. 282'

Typical Loaded Hole

STEM	Load

Indicate All Information

1) Show all holes, number circuits and indicate cap number next to hole and hole to hole wiring. (Below)
2) Locate free faces, solid area & any previously blasted material.
3) Indicate NORTH on diagram.
4) Show how the Bore hole was loaded, indicate stemming and decks if the hole was decked.
5) List manufacture of Detonators with list of Delay No.'s and the number used of each delay.
If needing more room use another shot report.



Shot # 1

Permit Number 92-31

WAMPUM HARDWARE CO.
Blast Report

B.L. Number 52806

Co. Blasting for: Bentley Development/WCA Date: 6/8/11 Time: 4:01

Distance: 211' as derived from survey marker, aerial photo, map, GPS, Range Finder or direct measurement CIRCLE ONE:

Directions in Degrees: 337° to nearest occupied building NAME: Cell 1003'

Directions in Degrees: 104° to nearest building NAME: MW #1

Weather: SUNNY Temperature: 88° Wind Direction: W Wind Velocity: 8mph EST.

Material Blasted: Sandrock Stemming Type: STONE 4-15ft (top) X ft (deck)

No. of Holes: 138 Burden: 8 Spacing: 8 Diameter of holes: 4" Depth 4-25

MATERIALS USED IN BLASTING SHOT

Manufacturer	Product & Size	Amount
DYNO	ANFOBags 50#	3050#
DYNO Spartan	Booster 1/2#	70#

Total Weight of Explosives: 3170#

MAX Weight of Explosives per hole: 90#

Number of Holes per delay: 2 per delay

Maximum weight of explosives detonated within 8 ms: 100#

If holes were decked lbs. per deck used: X 1 X 2 X 3 X 4 X 5

INITIATION SYSTEM Electric Sequential-- ☐ Electric, Type of BM X Non-Electric ☑

Machine Set on: X ms. No. of Circuits used: X Were mats used? NO

Scaled Distance: 21.10 Number of people on shot 2 NAMES of shot crew JOE W. TYLER W.

SEISMOGRAPH INFORMATION

Location of Seismograph: Cell / MW #1 Distance 211'/1003' from blast

Name of Operator & Company Saul's Seismic Inc.

Type of Instrument: Nomis 7000 Serial NO: 1891/2512

Calibration Date: —/—/— Readings: ___ T ___ V ___ L 134 db. 0.365

Calibration Date: —/—/— Readings: ___ T ___ V ___ L 120 db. 0.080

Blaster in Charge: Joseph M Wilhelm (Print) Joseph M Wilhelm (Signature) 6606 (License Number)

If Blast Occurs After Scheduled Blasting Hours, PLEASE EXPLAIN:

Comments: Shot Location
N 35° 42.543'
W 078° 30.282'

Typical Loaded Hole

STEM | Load

Indicate All Information

1) Show all holes, number circuits and indicate cap number next to hole and hole to hole wiring. (Below)
2) Locate free faces, solid area & any previously blasted material.
3) Indicate NORTH on diagram.
4) Show how the Bore hole was loaded, indicate stemming and decks if the hole was decked.
5) List manufacture of Detonators with list of Delay No.'s and the number used of each delay.
If needing more room use another shot report.

Shot 7

Permit Number 92-31

WAMPUM HARDWARE CO.
Blast Report

B.L. Number 52808

Co. Blasting for: Bentley Development/WCA Date: 6/16/11 Time: 1:33 p.m

Distance: 211' as derived from survey marker, aerial photo, map, GPS, Range Finder or direct measurement CIRCLE ONE:

Directions in Degrees: 354° to nearest occupied building NAME: Cell 1056'

Directions in Degrees: 104° to nearest building NAME: MW #1

Weather: P. Cloudy Temperature: 89° Wind Direction: W Wind Velocity: 8 mph EST.

Material Blasted: Sandrock Stemming Type: Stone 4-15 ft (top) X ft (deck)

No. of Holes: 60 Burden: 8 Spacing: 8 Diameter of holes: 4" Depth 8-19'

MATERIALS USED IN BLASTING SHOT

Manufacturer	Product & Size	Amount
Dyno	ANFO Bags 50#	2500#
Dyno spartan	Booster 1/2#	40#

Total Weight of Explosives: 2540#

MAX Weight of Explosives per hole: 65#

Number of Holes per delay: 1 per delay

Maximum weight of explosives detonated within 8 ms: 65#

If holes were decked lbs. per deck used: X 1 X 2 X 3 X 4 X 5

INITIATION SYSTEM Electric Sequential-- ☐ Electric, Type of BM X Non-Electric ☑

Machine Set on: X ms. No. of Circuits used: X Were mats used? NO

Scaled Distance: 26.17 Number of people on shot 2 NAMES of shot crew Joe W. Tyler W.

SEISMOGRAPH INFORMATION

Location of Seismograph: Cell/MW #1 Distance 211'/1056' from blast

Name of Operator & Company Sauls Seismic Inc.

Type of Instrument: Nomis 7000 Serial NO: 1891/2512

Calibration Date: / / Readings: T V L 131 db. 0.175

Calibration Date: / / Readings: T V L 121 db. 0.085

Blaster in Charge: Joseph M Wilhelm (Print) Joseph M Wilhelm (Signature) 6606 (License Number)

If Blast Occurs After Scheduled Blasting Hours, PLEASE EXPLAIN:

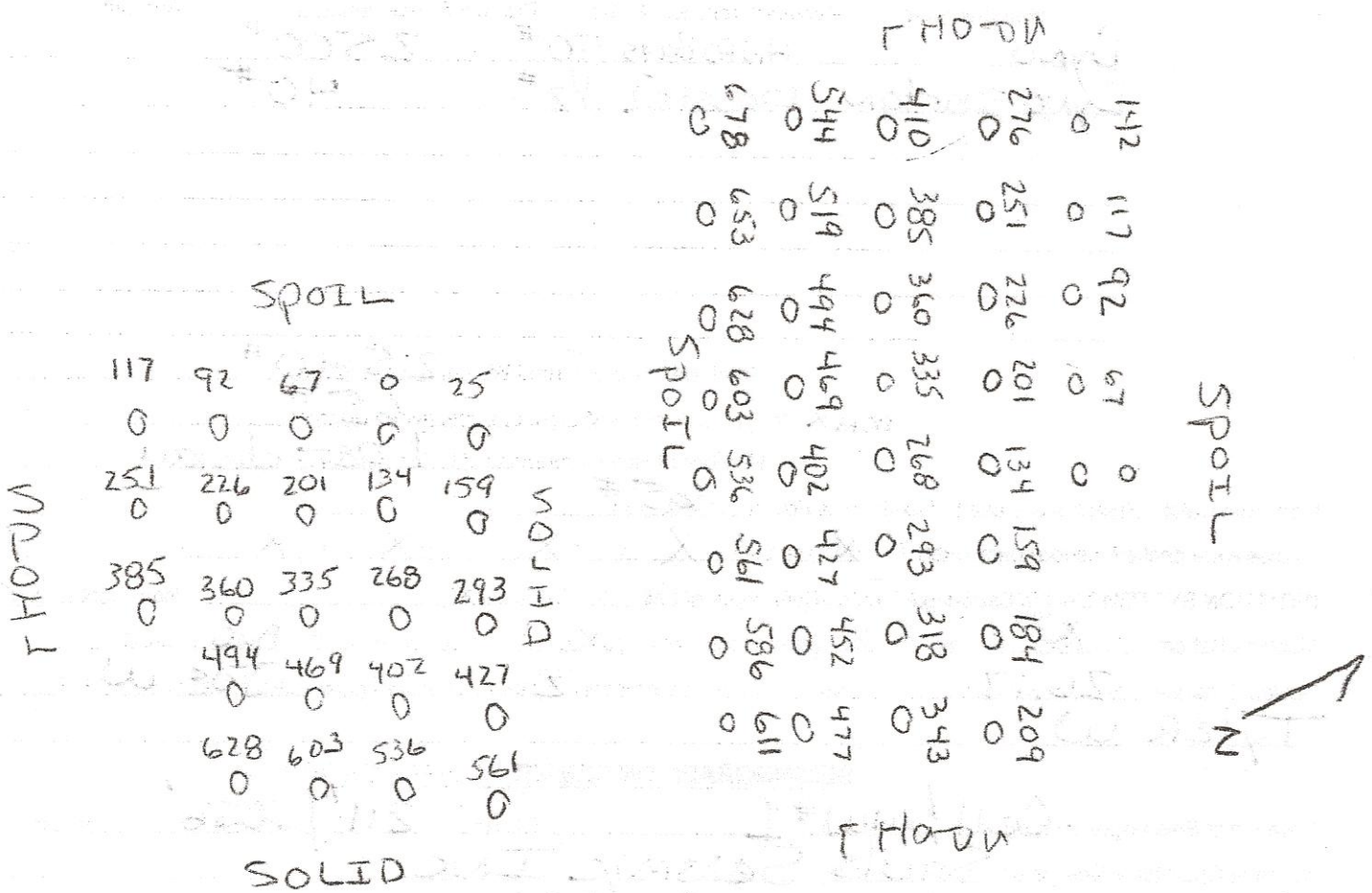
Comments: Shot Location,
N35°42.545'
W078 30.296'

Typical Loaded Hole

STEM | Load

Indicate All Information

1) Show all holes, number circuits and indicate cap number next to hole and hole to hole wiring. (Below)
2) Locate free faces, solid area & any previously blasted material.
3) Indicate NORTH on diagram.
4) Show how the Bore hole was loaded, indicate stemming and decks if the hole was decked.
5) List manufacture of Detonators with list of Delay No.'s and the number used of each delay.
If needing more room use another shot report.



24' EZ-Det 25/350 ms
20' EZTL 42 ms

Permit Number 92-31

WAMPUM HARDWARE CO.
Blast Report

B.L. Number 52809

Co. Blasting for: Bentley Development/WCA Date: 6/20/11 Time: 10:52 A.M

Distance: 475' as derived from survey marker, aerial photo, map GPS Range Finder or direct measurement CIRCLE ONE:

Directions in Degrees: 330° to nearest occupied building NAME: Cell 845'

Directions in Degrees: 092° to nearest building NAME: MW #1

Weather: Sunny Temperature: 91° Wind Direction: W Wind Velocity: 4mph EST.

Material Blasted: Sand Rock Stemming Type: Stone 5-11 ft (top) X ft (deck)

No. of Holes: 36 Burden: 8 Spacing: 8 Diameter of holes: 4" Depth 17'

MATERIALS USED IN BLASTING SHOT

Manufacturer	Product & Size	Amount
Dyno	ANFO Bags 50#	800#
Dyno Spartan	Booster 1½#	25#

Total Weight of Explosives: 825#

MAX Weight of Explosives per hole: 50#

Number of Holes per delay: 1 per delay

Maximum weight of explosives detonated within 8 ms: 50#

If holes were decked lbs. per deck used: X 1 X 2 X 3 X 4 X 5

INITIATION SYSTEM Electric Sequential ☐ Electric, Type of BM X Non-Electric ☑

Machine Set on: X ms. No. of Circuits used: X Were mats used? NO

Scaled Distance: 67.17 Number of people on shot 2 NAMES of shot crew: Joe W Tyler W.

SEISMOGRAPH INFORMATION

Location of Seismograph: Cell/MW #1 Distance 475'/845' from blast

Name of Operator & Company: Sauls Seismic Inc.

Type of Instrument: Nomis 7000 Serial NO: 1891/2512

Calibration Date: ✓ Readings: T V L 120 db. 0.10

Calibration Date: ✓ Readings: T V L 120 db. 0.075

Blaster in Charge: Joseph M. Wilhelm (Print) Joseph M. Wilhelm (Signature) 6606 (License Number)

If Blast Occurs After Scheduled Blasting Hours, PLEASE EXPLAIN:

Comments: Shot Location
N 35° 42.512'
W078° 30.244'

Typical Loaded Hole

STEM	Load

Indicate All Information

1) Show all holes, number circuits and indicate cap number next to hole and hole to hole wiring. (Below)
2) Locate free faces, solid area & any previously blasted material.
3) Indicate NORTH on diagram.
4) Show how the Bore hole was loaded, indicate stemming and decks if the hole was decked.
5) List manufacture of Detonators with list of Delay No.'s and the number used of each delay.
If needing more room use another shot report.

SPOIL

50 25 0 67 92 N

0 0 0 0 0

184 159 134 201 226

0 0 0 0 0

318 293 268 335 360

0 0 0 0 0

452 427 402 469 494

0 0 0 0 0

586 561 536 603 628

0 0 0 0 0

720 695 670 737 762

0 0 0 0 0

854 829 804 871 896

0 0 0 0 0

SPOIL 921

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SPOIL

30' EZ-Det 25/350
20' EZTL 42ms

Photo 1 – Preparing for initial shot near northeast corner of Phase 2A on 5-18-2011

Photo 2 – Conventional excavation in southern portion of Phase 2A on 5-18-2011

Photo 3 – Drilling for initial shot on 5-20-2011 with 6-foot hole spacing; Phase 1C in the background

Photo 4 – Loading shot holes with blasting agents on 5-20-2011

Photo 5 – Initial shot on 5-20-2011, viewed from Phase 1A (southernmost area visible)

Photo 6 – After initial shot on 5-20-2011, a red cloud of NO2 is visible for a few moments

Photo 7 – Aftermath of initial shot on 5-20-2011, debris is mostly hard rock (see later photos)

Photo 8 – Drilling for second shot on 5-24-2011; survey control marks for tracking grades and quantities

Photo 11 – Igniter cord connects all the shot holes and leads to actuator

Photo 12 – Blasting cap between shot holes is timed for a 25ms delay between detonations

Photo 13 – Second shot on 5-24-2011 viewed from Phase 1C; notice high volume of flying soil

Photo 14 – Post-blast inspection after “all clear” signal indicates a mix of rocks and soil matrix

Photo 15 – A shot on 6-6-2011 shows increasing soil content toward the west end of Phase 2A

Photo 16 – Isolated boulders seen in the 6-6-2011 shot; seismograph visible at toe of Phase 1B

Photo 17 – Contracted specialty drilling company kept a map of the shot holes with rock depths

Photo 18 – Blasting company (est'd ca. 1904) contracted to Bentley Development (general contractor)