# SAN RAFAEL ROCK QUARRY VIBRATION REPORT

**Location:** PB-7  
**Max. Charge Weight:** 400  
**Date of Blast:** 3-26-12  
**Northing:** 37°59'12"N  
**Time of Blast:** 11:51  
**Easting:** 122°27'14"W  
**Blast Duration:** 235ms  
**Blast Number:** 1570

<table>
<thead>
<tr>
<th>Seismograph Model</th>
<th>Serial Number</th>
<th>Last Calibration Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>2481</td>
<td>5-26-11</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Location Information</th>
<th>Mocina</th>
<th>Via Montana</th>
<th>San Mariano</th>
<th>Near Park</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northing</td>
<td>37°59'12&quot;N</td>
<td>37°59'18&quot;N</td>
<td>37°59'31&quot;N</td>
<td>37°59'30&quot;N</td>
</tr>
<tr>
<td>Easting</td>
<td>122°27'14&quot;W</td>
<td>122°27'12&quot;W</td>
<td>122°27'30&quot;W</td>
<td>122°27'12&quot;W</td>
</tr>
<tr>
<td>Distance from Blast</td>
<td>950</td>
<td>3168</td>
<td>2323</td>
<td>1795</td>
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<tr>
<td>Scaled Distance</td>
<td>47</td>
<td>158</td>
<td>116</td>
<td>89</td>
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</table>

<table>
<thead>
<tr>
<th>Vibration Information</th>
<th>Longitudinal Peak Particle Velocity (fps)</th>
<th>0.17</th>
<th>0.05</th>
<th>0.21</th>
<th>0.09</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Longitudinal Peak Frequency (Hz)</td>
<td>16.1</td>
<td>13.1</td>
<td>12.5</td>
<td>16.6</td>
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<tr>
<td></td>
<td>Transverse Peak Particle Velocity (fps)</td>
<td>0.15</td>
<td>0.06</td>
<td>0.08</td>
<td>0.06</td>
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<tr>
<td></td>
<td>Transverse Peak Frequency (Hz)</td>
<td>14.1</td>
<td>12.5</td>
<td>13.5</td>
<td>22.6</td>
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<tr>
<td></td>
<td>Vertical Peak Particle Velocity (fps)</td>
<td>0.18</td>
<td>0.03</td>
<td>0.07</td>
<td>0.09</td>
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<tr>
<td></td>
<td>Vertical Peak Frequency (Hz)</td>
<td>17.8</td>
<td>35.7</td>
<td>3.0</td>
<td>55.5</td>
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<tr>
<td></td>
<td>Peak Vector Sum (fps)</td>
<td>0.23</td>
<td>0.07</td>
<td>0.11</td>
<td>0.13</td>
</tr>
<tr>
<td></td>
<td>Peak Air Overpressure (db)</td>
<td>118</td>
<td>112</td>
<td>112</td>
<td>112</td>
</tr>
</tbody>
</table>

**Ground:** wet and spongy

Seismograph Operator: Veron Lopez  
Signature: [Signature]
SAN RAFAEL ROCK QUARRY BLAST REPORT

BASE DATA:

Location: PB-7
Designed Bench Height (ft): 40
Date: 3.26.12
Northing: 33°59'12"N
Rock Density (t/yard^3): 2.23
Easting: 122°27'14"W
Relative Rock Hardness: 7

DESIGN DATA:

Number of Holes Shot: 20
Hole Dia (in.): 6 1/4
Stemming (ft): 19
Loading Time Required (min hrs): 5
Deck Type: 

Ave. Hole Depth (ft): 43
Burden (ft): 15
Stem Type: 3/4" 1/2"
Staggered Pattern (y or n): Y
Length (ft):

Relative Confinement:
Spacing (ft): 16
Subdrill (ft): 3
Number of Lost Holes: 0
Tons Shot: 15,858

EXPLOSIVES DATA:

Bulk Explosive
Titan 1000 0.3
Weight
7.940

Booster
450 g

Units
40

Delays
80 62

Misc. Units
20

Max (lb/hole): 400

Blast Duration (sec): 235 ms

VIBRATION DATA:

Nearest Structure:

Seismograph Loc.

Temperature: 62°

Max. Charg. (lb/8ms): 400

Northing: 33°59'12"N
Sky Condition: Very Cloudy

Easting: 122°27'14"W

RPPV: 123

Distance Away: 750

Wind Direction: N

Distance Away:

Wind Speed: 5 mph

Airblast: 116

PERFORMANCE DATA:

Powder Factor (lb/ton): 5
Displacement: Good
Crushability:

lb/yard^3: 1.12
Vibration: Great
Fines:

Fragmentation: Good
Dig ability:

Comments: Holes Wet - ground at seismograph location (in.)
Blaster in Charge: VOS, local
P.O.I

Face 410

50  25  0   42  67  92  117  142
139 109 39  126 151 176 201
218 193 168 210 235

82 holes
20 = 80 ft 2 dec
20 = 50 ft 2 dec
5 = 42 ms 2 EZL
1 = 17 ms EZT
40 = 45'0 gram

Depth 413

19 stemming
400 lbs per

Main 950

Wmd 316 f
3m 23.23
mTH 179.5

37°59'12" N
122°27'14" W

7,940 lbs ton
Seismic Analysis

Velocity Waveform Analysis

Serial Number: 7257
Firmware Version: 08-03-23
Event Date: 03/26/2012 11:30:52 (UTC -07:00)
Event number: 7
Recording Time: 5 s
Client: COUNTY OF MARIN
Operation: SAN RAFAEL ROCK QUARRY
Location: 16 MARIN BAY PARK CT.
Distance:
Operator: VIBRA-TECH GSM
Comment: William Hosken Residency
Seismic Trigger: 0.03 in/s
Sound Trigger: 76 DB

Additional Info:
j-GEO-01252
N37 59.524, W122 27.373

Summary Data

<table>
<thead>
<tr>
<th>PPV (in/s)</th>
<th>L</th>
<th>T</th>
<th>V</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.048</td>
<td>0.03</td>
<td>0.058</td>
</tr>
<tr>
<td>FREQ (HZ)</td>
<td>33.3</td>
<td>41.7</td>
<td>27.8</td>
</tr>
<tr>
<td>PD (.001&quot;)</td>
<td>0.4</td>
<td>0.23</td>
<td>0.2</td>
</tr>
<tr>
<td>PPA (g)</td>
<td>0.033</td>
<td>0.02</td>
<td>0.052</td>
</tr>
</tbody>
</table>

Peak Vector Sum: 0.073 in/s
Peak Air Pressure: 112 DB
0.0012 psi @ 1.6 HZ

Shaketable Calibrated
On: 01/13/2012 (UTC -07:00)
By: Vibra-Tech, Inc.
2700 Holloway Road - Suite 113
Louisville, KY 40203 U.S.A.

Waveform Graph Scale

Time Scale: 0.1 s
Seismic Scale: +/- 0.16 in/s
Sound Scale: +/- 0.0023 psi

Velocity Waveform

SSN: 7257 Event: 7

Printed: March 27, 2012 File: 0000088070_201203.g3k (GeoSonics Inc. PDFGenerator v 1.0)
Seismic Analysis
Velocity Waveform Analysis

Serial Number: 7179
Firmware Version: 05-03-23
Event Date: 01/26/2012 11:30:52 (UTC -07:00)
Event number: 7
Recording Time: 5 s
Client: COUNTY OF MARIN
Operation: SAN RAFAEL ROCK QUARRY
Location: ON QUARRY PROPERTY
Distance: 
Operator: VIBRA-TECH GSM
Comment: 
Seismic Trigger: 0.03 in/s
Sound Trigger: 76 DB

Additional Info:
j-GEO-01253
N37 59.481, W122 27.256

Summary Data

<table>
<thead>
<tr>
<th></th>
<th>L</th>
<th>T</th>
<th>V</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPV (in/s):</td>
<td>0.05</td>
<td>0.028</td>
<td>0.083</td>
</tr>
<tr>
<td>FREQ (HZ):</td>
<td>27.8</td>
<td>41.7</td>
<td>31.3</td>
</tr>
<tr>
<td>PD (.001&quot;) :</td>
<td>0.42</td>
<td>0.29</td>
<td>0.55</td>
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<tr>
<td>PPA (g) :</td>
<td>0.039</td>
<td>0.026</td>
<td>0.059</td>
</tr>
</tbody>
</table>

Peak Vector Sum: 0.088 in/s
Peak Air Pressure: 111 DB
Shaketable Calibrated
On: 01/13/2012 (UTC -07:00)
By: Vibra-Tech, Inc.
2700 Holloway Road - Suite 113
Louisville, KY 40203 U.S.A.

Waveform Graph Scale
Time Scale: 0.1 s
Seismic Scale: +/- 0.164 in/s
Sound Scale: +/- 0.0023 psi

Velocity Waveform
SSN: 7179 Event: 7

Printed: March 27, 2012 File: 0000088061_201203.g3k (GeoSonics Inc. PDFGenerator v 1.0)
The seismograph at 114 San Marino Drive (S/N 7178) did not trigger during the shot on March 26, 2012 at approximately 11:30 indicating the ground vibrations produced were below the ground trigger level of 0.030 in/sec.