# SAN RAFAEL ROCK QUARRY VIBRATION REPORT

**Location:** PB - 7  
**Max. Charge Weight:** 400  
**Date of Blast:** 7-19-12  
**Blast Number:** 1582  
**Date of Blast:** 7-19-12  
**Time of Blast:** 12:08

<table>
<thead>
<tr>
<th>Seismograph Model</th>
<th>Unit 1</th>
<th>Unit 2</th>
<th>Unit 3</th>
<th>Unit 4</th>
<th>Unit 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>2481</td>
<td>4600</td>
<td>3040</td>
<td>6410</td>
<td></td>
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<tr>
<td>Serial Number</td>
<td>4574</td>
<td>6572</td>
<td>5572</td>
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<tr>
<td>Last Calibration Date</td>
<td>5.17.12</td>
<td>5.17.12</td>
<td>5.17.12</td>
<td>6.17.12</td>
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<tr>
<th>Location</th>
<th>Unit 1</th>
<th>Unit 2</th>
<th>Unit 3</th>
<th>Unit 4</th>
<th>Unit 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marin O.G</td>
<td>160.3</td>
<td>322.0</td>
<td>137.2</td>
<td>174.7</td>
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<tr>
<td>Northing</td>
<td>37°59'11&quot;N</td>
<td>37°59'21&quot;N</td>
<td>37°59'31&quot;N</td>
<td>37°59'41&quot;N</td>
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</tr>
<tr>
<td>Easting</td>
<td>122°27'22&quot;W</td>
<td>122°27'33&quot;W</td>
<td>122°27'44&quot;W</td>
<td>122°27'55&quot;W</td>
<td></td>
</tr>
</tbody>
</table>

| Distance from Blast | 50 | 16.1 | 116 | 87 |

**Vibration Information:**

- **Longitudinal Peak Particle Velocity (ips):** 0.12
- **Longitudinal Peak Frequency (Hz):** 3.4
- **Transverse Peak Particle Velocity (ips):** 0.11
- **Transverse Peak Frequency (Hz):** 9.2
- **Vertical Peak Particle Velocity (ips):** 0.13
- **Vertical Peak Frequency (Hz):** 9.2
- **Peak Vector Sum (ips):** 0.15
- **Peak Air Overpressure (db):** 4.9

**Seismograph Operator:** Deron Hodes  
**Signature:** [Signature]
SAN RAFAEL ROCK QUARRY BLAST REPORT

BASE DATA:

Location: 98.7
Northing: 37°59'12"W
Easting: 122°27'15"W

Designed Bench Height (ft): 40
Rock Density (yd^3): 2.23
Relative Rock Hardness: 7

Date: 7-19-12
Time: 12:08
Blast Number: 1582

DESIGN DATA:

Number of Holes Shot: 27
Hole Dia. (in.): 5 3/4
Ave. Hole Depth (ft): 43
Burden (ft): 15
Stem Type: 3/4
Staggered Pattern (y or n): N

Deck Type: __________
Length (ft): ______

Relative Confinement: __________
Spacing (ft): 15
Support or: __________
Number of Lost Holes: 0

EXPLOSIVES DATA:

Bulk: Explosive Weight Boosters Units Delays Units Misc. Units
Titan 1,000 61.38 450 54 36 62 17 __________ __________
Max. (f/ton): 410.5
Blast Duration (sec): 453

VIBRATION DATA:

Nearest Structure: __________
Seismograph Loc.: __________
Temperature: 79°
Max. Chrg. (lb/ft^3): 410.5

Northing: 37°59'19"W
Northing: __________
Sky Condition: Clear
RPPV: 15

Easting: 122°27'12"W
Easting: __________
Wind Direction: South
Frequency: 411.6

Distance Away: 1003
Distance Away: __________
Wind Speed: 0 ft.2
Airblast: 112

PERFORMANCE DATA:

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

Lb/yard^3: 1.2
Vibration: Good
Fines: __________

Fragmentation: Good
Digability: __________

Comments: __________
Blaster in Charge: __________
Face 40°

Slide area

Highwall 7°30'

Depth 43'
1st stemming
400 lbs per

27 Holes
27: 86' EZ
27: 50' EZ
9: 42 ms
1: 17 ms
54: 450 g
10,380 lbs

Main 1003
Via 3220
SM 2323
MPN 1747
30°51' 12 N
122°27' 13 W

7.17.12
PB: 7
1582
Seismic Analysis
Velocity Waveform Analysis

Serial Number: 8056
Firmware Version: 08-03.23
Event Date: 07/19/2012 12:09:26 (UTC -07:00)
Event number: 3
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 RES.
Seismic Trigger: 0.03 in/s
Sound Trigger: 75.9 DB

Additional Info:
jGrO-01252
N37 59.524, W122 27.373

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>0.035</td>
<td>0.04</td>
<td>0.05</td>
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<tr>
<td>FREQ (HZ):</td>
<td>45.5</td>
<td>35.7</td>
<td>45.5</td>
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<tr>
<td>PD (.001&quot;):</td>
<td>0.2</td>
<td>0.2175</td>
<td>0.2875</td>
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<tr>
<td>PPA (g):</td>
<td>0.03255</td>
<td>0.02604</td>
<td>0.03906</td>
</tr>
</tbody>
</table>

Peak Vector Sum: 0.055 in/s
Peak Air Pressure: 105.2 DB
Peak Air Pressure: 0.000606 psi @ 1.6 HZ

Shaketable Calibrated
On: 05/16/2012 (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: 8056 Event: 3

USBM Safe Blasting Levels
SSN: 8056 Event: 3

Printed: July 20, 2012 File: 0000065302_201207.g3k (GeoSonsics Inc. PDFGenerator v 1.0)
Seismic Analysis
Velocity Waveform Analysis

Serial Number: 8030
Firmware Version: 08-03.23
Event Date: 07/19/2012 12:09:26 (UTC -07:00)
Event number: 4
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: 75.9 DB
Additional Info:
j-GEO-01253
N37 59.481, W122 27.256

Summary Data

<table>
<thead>
<tr>
<th>L</th>
<th>T</th>
<th>V</th>
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</thead>
<tbody>
<tr>
<td>0.0775</td>
<td>0.06</td>
<td>0.095</td>
</tr>
</tbody>
</table>
FREQ (HZ): 55.6
PD (.001°): 0.3825
PPA (g): 0.07161
Peak Vector Sum: 0.1 in/s
Peak Air Pressure: 104.9 DB
0.0005881 psi @ 2.6 HZ

Shaketable Calibrated
On: 05/14/2012 (UTC -07:00)
By: Vibra-Tech, Inc.
2700 Holloway Road - Suite 113
Louisville, KY 40203 U.S.A.

Waveform Graph Scale

Velocity Waveform

Printed: July 20, 2012 File: 0000065285_201207.g3k (GeoSonic Inc. PDFGenerator v 1.0)
GeoSonics Inc. Seismic Analysis
Stop Event Report

Serial No: 8021 v3.23
Client: COUNTY OF MARIN
Operation: SAN RAFAEL ROCK QUARRY
Location: 114 SAN MARINO DRIVE
Distance: 
Operator: VIBRA-TECH GSM
Comment: VERONIQUE RASKIN*

Begin Date: 07/19/2012 06:00:50 (UTC-7)
End Date: 07/19/2012 20:00:00 (UTC-7)
Events over Trigger: 0 (15-14)
Record Time: 5.0 s
Seismic Trigger: 0.030 in/s
Sound Trigger: N/A
Battery Level: 8.9

Shaketable Calibrated: 05/11/2012
By: Vibra-Tech, Inc.
2700 Holloway Road - Suite 113
Louisville, KY 40299 U.S.A.
TEL: 502.240.9900 FAX: 502.240.9902

Dynamic Calibration Graph:

Cal Test Results:

Longitudinal: Pass
Transverse: Pass
Vertical: Pass
Sound: Pass

The seismograph at 114 San Marino Drive (S/N 8021) did not trigger during the shot on July 19, 2012 at approximately 12:09 indicating the ground vibrations produced were below the ground trigger level of 0.030 in/sec.