University of Oregon Field Geophysics 2013 (UOFG2013) Experiment Report
May 11, 2013, June 2, 2013, & October 25, 2013

Principle Investigator: Douglas R. Toomey, University of Oregon

Purpose

The purpose of the UOFG2013 experiment is to collect shallow reflection and refraction data along the Cougar Creek landslide located in the central Oregon Coast Range (44.65°, -123.82°). This data will be used to constrain landslide thickness. This dataset was collected by the University of Oregon Field Geophysics class in Spring of 2013. The UOFG2013 experiment also revisited the Vaugh landslide in Fall of 2013 to expand upon the shallow reflection/refraction dataset collected by the UOFG experiment in Spring of 2012 (see attached student report).

Experiment description

Multiple arrays of 48 vertical component geophones (Ultra-Light Exploration Seismograph system by Geometrics from IRIS PASSCAL) were deployed. Geophone spacing was 2.5 m and active source shots were spaced every 30 m. The source was a truck-mounted Elastic Wave Generator and a striker plate. Eight shots were stacked at each source location to increase the signal-to-noise ratio (see attached field sheets). Further details on this experiment are provided in *Cerovski-Darriau* [2016]. Table 1 provides details on geophone location for the Cougar Creek site.

References

[1] Cerovski-Darriau, C. R. (2016). *Landslides and Landscape Evolution over Decades to Millennia: Using Tephrochronology, Air Photos, Lidar, and Geophysical Investigations to Reconstruct Past Landscapes* (Doctoral dissertation, UNIVERSITY OF OREGON).

Field Report

Oct. 25, 2013 Vaughn, Oregon

Miles Bodmer, Author

Douglas Toomey, Eddie Berlett, Brooklyn Gose, Kevin McCartan,

Jascha Coddington, Kristin Sweeney, Corrina Cervoski-Darriau

Summary:

The University of Oregon Geology 410/510 Field Geophysics class performed a multiple approach survey of the underlying structure for a known deep-seated landslide in Vaughn, Oregon on Oct. 25, 2013. A 2012 seismic refraction study of the same site revealed that landslide depth was much smaller than previous estimates. One section of the study in particular was under resolved prompting further work to constrain the depth. This new survey performed a second, focused refraction study to supplement the 2012 data set. Additionally a new piece of equipment, the OhmMapper, was demoed and used to make resistivity measurements on a subset of the study area. A team also augured at a site within the thin landslide section to try to get a physical estimate of the depth. This work was done both as an instructional exercise for the 410/510 classes and to provide useable data for ongoing graduate geomorphology research at the University of Oregon.

Science Objectives:

The main science objectives of the 2013 survey were to expand on the data set that was obtained in 2012. Both of these studies aim to measure the depth of a known deep-seated landslide located in Vaughn on the Oregon coast range. Previous estimates of landslide depth were 10 – 20 m. Thus, in 2012 a seismic refraction study was carried out with 5 m geophone spacing and 30 m shot spacing. Analysis of the data suggested that parts of the landslide, between Site #8 and #10, had a much shallower structure than expected. As such, the array geometry was unable to resolve the landslide thickness in this area. Site #8 was also augured to try to get an estimate of the depth but bottomed out on some unidentified object at shallow depth. The 2013 study aims to repeat the refraction survey on the unresolved area with a geophone spacing of 2 m to try and capture the thin section. In addition, the OhmMapper, supplied by Geometrics, will be used on a subset of the survey length giving resistivity measurements that can be compared to the refraction data. This type of experiment is unfamiliar to all the participants involved and also will serve as a chance to demo the equipment. Based on the results of this study, the OhmMapper may be purchased and used for future studies by the University of Oregon. Additionally site #8 will be augured again to obtain a physical depth estimate that may be compared to all of the collected data.

Estimates of the depth at the Vaughn landslide site will help the geomorphology community understand the suite of landslides that are present in the region. By combining measured depth and aerial images it is possible to calculate the total mass of the landslide. This in turn will aid in the understanding of the conditions and morphology that predated the collapse event and can inform how future events will occur.

Operational Objectives:

There were three operational objectives for the 2013 Vaughn fieldwork:

1. Perform a dense seismic refraction survey to supplement the 2012 Vaughn refraction study. The survey aimed to reoccupy an area between site #8 and site # 10(Appendix Figure 2) with reduced geophone spacing. The goal was to provide enhanced resolution to a poorly resolved, thin landslide section in the 2012 data. The proposed array consists of 24 geophones with a 2m spacing (Appendix Figure 3) covering a total length of 46 m. The array was to be placed, tested, shot, and deconstructed in a single day.
2. Use the OhmMapper to measure resistivity for a subset of the Vaughn survey site, the length covered by the 2012 Study, totaling approximately 210 m. Measurements were taken every 10 m, both uphill and downhill, using a variety of rope lengths (Appendix Table 1). The rope length is proportional to the depth evaluated. This study aimed to make measurements for at minimum 3 rope lengths, starting at 5m and increasing by 2.5 m increments. With time permitting, additional measurements at larger rope length were to be made. All measurements, set up, tear down, and data quality checking were to be completed in one day.
3. An independent group (Corina and Kristin) was to auger down just off the road at site #8, near a 2012 auger site. The 2012 site bottomed out due to an undetermined material at a shallow depth. The new site was to be augured until failure and the contents of the auger were to be evaluated as it was extracted.

Field Narrative:

Friday, October 25 2013:

- 7 am all crew meet at UO, load up all of the equipment, and head to the site.
- Once on site The OhmMapper equipment was unloaded at Site #6 while the Refraction equipment was unloaded further downhill at Site #8
- Corina and Kristin broke off to begin auguring at Site #8
- The rest of the crew set up the OhmMapper in the geometry described in Appendix Figure 1
- Small surveyor flags were set up along the survey site. One color was placed in 10 m increments and represented the location where people towing the OhmMapper were to press the Mark button and obtain a measurement. Flags were placed between Sits #6 and #13, about 210 m total. A second color of flags were placed with 2 m spacing just between Sites #8 and #10 and represented the locations where geophones were to be placed.
- Eddie was hooked up to the OhmMapper tow harness and the rope length was set to 5 m. Two passes, one downhill and one uphill, were to be made for

each rope length. The OhmMapper was set to take one measurement every 1 sec then interpolate at the desired marks

- Once it was apparent that the OhmMapper measurements were going smoothly the majority of the crew began to place geophone on the side of the road and set up the geodes and field computer for the refraction survey.
- A member walked along the geophone line while others monitored the computer to make sure that all the geophones were responding.
- OhmMapper measurements continued at the next two rope lengths
- Test shots were made with the sledgehammer and strike plate. These test shot checked several things: first that the trigger inserted I the strike plate was responding properly with the software. It was necessary to insert a metal shim to hold the accelerometer in the strike plate and several times during the survey the accelerometer slid free and needed to be replaced. Second the stacking was tested and set to 8 shots. Finally the immediate data was vied to make sure that the geophone spacing could accurately see first arrivals from the thin section.
- The first 3 rope lengths of the OhmMapper survey finish and the data is exported and viewed on a field computer for data quality. A simple inversion is run giving a preliminary model. A quick analysis of the model shows that it would be beneficial to get deeper measurements and since the first three measurements went relatively quickly it is decided to measure two additional rope lengths.
- The refraction survey begins and is summarized in Appendix Table 1. The first shot location had a wrong shot location (0 instead of -10). The third shot also had a wrong shot location (-10 instead of 0). Shot 7 had double bounces of the hammer on the first two strikes.
- The auger bottomed out at a length of about 5 m.
- The refraction survey and the OhmMapper survey end. The OhmMapper data was exported again and viewed with the two new rope lengths.
- Happy with the data quality the equipment is packed up and the crew head back to UO

Data Quality:

After the geophone array was placed, a signal test was performed by having someone walk along the line of geophones. The remaining crew monitored the output on a laptop, making sure that each geophone had a response. Several test shots were then made using the sledgehammer and strike plate to determine if the thin landslide section could be resolved. A quick inspection of the first arrivals at a handful of strike sites confirmed that the geophone spacing was sufficient to resolve the thin layer. During this time the trigger and stacking was also tested over a full cycle to ensure that they were performing as expected.

OhmMapper data was evaluated after 6 runs and 3 different rope length using a field computer and software supplied by Geometrics. A simple inversion was done so that rough analysis of the data could be done on site. This process was repeated after the final 4 runs as well.

The first inch or so was removed from the auger after each new extraction to ensure that material falling into the hole did not contaminate the extract.

Appendices:

Geophone/Geode Deployment Table				
File name	Shot location	Latitude	Longitude	# of stacks
1.dat *	-10m	44.01448N	123.4862W	8
2.dat	-10m	44.01448N	123.4862W	8
3.dat **	0m	44.01445N	123.48609W	8
4.dat	10m	44.01447N	123.48593W	8
5.dat	20m	44.01438N	123.48585W	8
6.dat	30m	44.01448N	123.4858W	8
7.dat	40m	44.01453N	123.48573W	8
8.dat	46m	44.0145N	123.48559W	8
9.dat	56m	44.01452N	123.48539W	8
* shot location incorrect within file; should be at -10 meters, not 0 meters				
** shot location incorrect within file; should be at 0 meters, not -10 meters				

Table 1: Property table for seismic refraction measurement. From left to right: Filename given to the output. Location of the shot with respect to the first geophone at site #8. Latitude and Longitude of the shot location. Number of shots stacked in the output file.

Ohm Mapper Deployment Table					
Line	Marks	Direction	Rope Length*	Puller	Pace
1	22	East (downhill)	5 meters	Eddie Berlett	Fast
2	22	West (uphill)	5 meters	Eddie Berlett	Fast
3	22	East (downhill)	7.5 meters	Kevin McCartan	Normal
4	22	West (uphill)	7.5 meters	Kevin McCartan	Normal
5	22	East (downhill)	10 meters	Kevin McCartan	Normal
6	22	West (uphill)	10 meters	Kevin McCartan	Normal
7	22	East (downhill)	12.5 meters	Ben Heath	Normal
8	22	West (uphill)	12.5 meters	Ben Heath	Normal
9	22	East (downhill)	15 meters	Jascha Coddington	Normal
10	22	West (uphill)	15 meters	Jascha Coddington	Normal
*distance between transmitter and reciever = rope length plus 5 meters					

Table 2: Property table for OhmMapper measurement. From left to right: Run number, two runs for each rope length. Number of marks made corresponding to number of measurements. Direction that the apparatus was pulled. Rope length used separating the transmitter and receivers. Person who pulled the apparatus. The pace at which the pulled the apparatus.

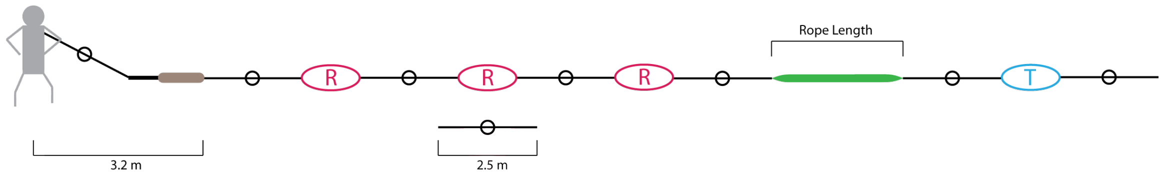


Figure 1: Diagram of the OhmMapper apparatus. From left to right: the distance between the person towing and the end of the magic wand was 3.2 m. All links with a black circle are 2.5 m. Receivers are labeled R and the transmitters are labeled T. The rope length is variable (5, 7.5, 10, 12.5, 15 m) and determines the depths that are probed

Figure 2: Near top down view of the Vaughn survey site area with approximate shot locations seen as yellow pins. Geophones were placed alongside the upper side of the road starting at shot 3 and ending at shot 8.

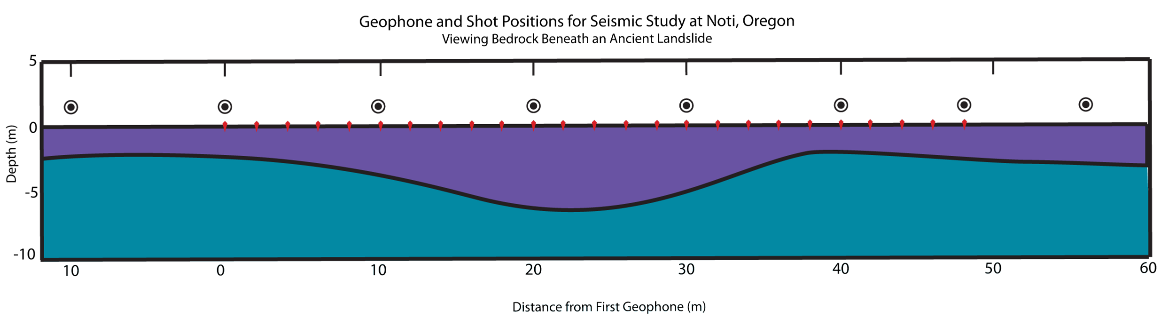


Figure 3: Seismic refraction survey array geometry. Red dots are geophones placed at 2 m intervals. Black dots with circular outline are the shot sites. Geophones are labeled in increasing order to the right starting with geophone #1 at 0 m.

Table 1
***modified from *Cerovski-Darriau* [2016]**

Geophone Locations				
Geophone	**Distance** (X_{dist}) (m)	***X*** (Easting)	***Y*** (Northing)	***Z*** (m)
20	50	434527	4944408	84.8
21	52.5	434529	4944407	84.4
22	55	434531	4944405	84.0
23	57.5	434532	4944403	83.5
24	60	434534	4944401	83.1
25	62.5	434536	4944400	82.8
26	65	434537	4944398	82.4
27	67.5	434539	4944396	82.1
28	70	434541	4944394	81.8
29	72.5	434543	4944392	81.5
30	75	434544	4944391	81.3
31	77.5	434546	4944389	81.0
32	80	434548	4944387	80.8
33	82.5	434549	4944385	80.6
34	85	434551	4944384	80.4
35	87.5	434553	4944382	80.4
36	90	434555	4944380	80.3
37	92.5	434556	4944378	80.2
38	95	434558	4944377	80.1
39	97.5	434559	4944374	79.9
40	100	434561	4944373	79.6
41	102.5	434563	4944372	79.6
42	105	434565	4944370	79.7
43	107.5	434567	4944369	79.9
44	110	434569	4944367	79.9
45	112.5	434571	4944365	80.1
46	115	434573	4944363	80.3
47	117.5	434574	4944361	80.4
48	120	434576	4944359	80.6
49	122.5	434577	4944358	80.7
50	125	434579	4944356	80.8
51	127.5	434581	4944354	81.0
52	130	434582	4944352	81.1
53	132.5	434584	4944350	81.3
54	135	434586	4944349	81.5
55	137.5	434587	4944346	81.8
56	140	434589	4944345	81.9
57	142.5	434590	4944342	82.1
58	145	434591	4944340	82.1
59	147.5	434593	4944338	82.2
60	150	434594	4944336	82.3
61	152.5	434595	4944334	82.6
62	155	434596	4944332	82.7
63	157.5	434597	4944329	82.8
64	160	434598	4944327	82.9

Table 1
***modified from *Cerovski-Darriau* [2016]**

Geophone Locations				
Geophone	**Distance** (X_{dist}) (m)	***X*** (Easting)	***Y*** (Northing)	***Z*** (m)
65	162.5	434599	4944325	83.1
66	165	434600	4944323	83.3
67	167.5	434601	4944320	83.4
68	170	434601	4944318	83.6
69	172.5	434603	4944316	83.8
70	175	434605	4944315	84.1
71	177.5	434606	4944312	84.0
72	180	434605	4944310	84.4
73	182.5	434607	4944308	85.0
74	185	434608	4944306	85.3
75	187.5	434609	4944304	85.8
76	190	434611	4944302	86.2
77	192.5	434612	4944299	86.4
78	195	434613	4944297	86.9
79	197.5	434614	4944295	87.3
80	200	434615	4944293	87.7
81	202.5	434616	4944291	88.2
82	205	434617	4944288	88.6
83	207.5	434618	4944286	89.0
84	210	434620	4944284	89.4
85	212.5	434622	4944282	89.8
86	215	434623	4944280	90.4
87	217.5	434625	4944279	90.8
88	220	434627	4944277	91.3
89	222.5	434629	4944275	91.8
90	225	434631	4944274	92.2
91	227.5	434633	4944272	92.6
92	230	434635	4944271	93.1
93	232.5	434636	4944269	93.5
94	235	434638	4944268	94.0
95	237.5	434640	4944266	94.4
96	240	434642	4944264	94.9
97	242.5	434643	4944262	95.4
98	245	434644	4944260	95.8
99	247.5	434646	4944258	96.2
100	250	434647	4944256	96.5
101	252.5	434649	4944254	96.8
102	255	434650	4944252	97.1
103	257.5	434651	4944250	97.5
104	260	434653	4944248	97.7
105	262.5	434654	4944245	97.8
106	265	434655	4944243	98.0
107	267.5	434656	4944241	98.0
108	270	434658	4944239	98.2
109	272.5	434660	4944238	98.3
110	275	434662	4944237	98.8

Table 1
***modified from *Cerovski-Darriau* [2016]**

Geophone Locations				
Geophone	**Distance** (X_{dist}) (m)	***X*** (Easting)	***Y*** (Northing)	***Z*** (m)
111	277.5	434664	4944236	99.2
112	280	434667	4944235	99.6
113	282.5	434669	4944234	99.9
114	285	434671	4944232	100.2
115	287.5	434673	4944231	100.5
116	290	434675	4944230	100.9
117	292.5	434677	4944228	101.3
118	295	434679	4944227	101.7
119	297.5	434681	4944226	102.0
120	300	434683	4944224	102.3
121	302.5	434685	4944222	102.7
122	305	434687	4944221	103.1
123	307.5	434689	4944219	103.6
124	310	434691	4944218	103.9
125	312.5	434693	4944216	104.4
126	315	434695	4944215	104.6
127	317.5	434697	4944213	104.9
128	320	434699	4944212	105.3
129	322.5	434700	4944210	105.8
130	325	434702	4944208	106.1
131	327.5	434704	4944207	106.4
132	330	434706	4944205	106.8
133	332.5	434708	4944203	107.1
134	335	434710	4944202	107.5
135	337.5	434711	4944200	107.8
136	340	434713	4944198	108.2
137	342.5	434715	4944196	108.6
138	345	434717	4944195	108.5
139	347.5	434719	4944193	108.9
140	350	434720	4944191	109.4
141	352.5	434722	4944189	109.7
142	355	434724	4944188	109.8
143	357.5	434726	4944186	110.1
144	360	434727	4944184	110.3
145	362.5	434729	4944183	110.4
146	365	434731	4944181	110.6
147	367.5	434734	4944180	110.8
148	370	434736	4944179	111.5
149	372.5	434738	4944177	111.3
150	375	434740	4944176	111.6
151	377.5	434742	4944174	112.1
152	380	434743	4944172	112.4
153	382.5	434745	4944171	112.8
154	385	434747	4944169	113.2
155	387.5	434749	4944167	113.7
156	390	434750	4944165	114.1

Table 1
***modified from *Cerovski-Darriau* [2016]**

Geophone Locations				
Geophone	**Distance** (X_{dist}) (m)	***X*** (Easting)	***Y*** (Northing)	***Z*** (m)
157	392.5	434752	4944164	114.5
158	395	434754	4944162	115.1
159	397.5	434756	4944160	115.5
160	400	434758	4944159	116.1
161	402.5	434760	4944157	116.5
162	405	434761	4944155	117.0
163	407.5	434763	4944154	117.4
164	410	434765	4944152	117.9
165	412.5	434767	4944150	118.3
166	415	434769	4944149	118.7
167	417.5	434771	4944147	119.2
168	420	434773	4944146	119.5
169	422.5	434775	4944144	119.8
170	425	434777	4944143	120.3
171	427.5	434779	4944141	120.7
172	430	434780	4944139	121.0
173	432.5	434782	4944137	121.3
174	435	434784	4944136	121.6
175	437.5	434786	4944134	121.9
176	440	434788	4944133	122.2
177	442.5	434790	4944131	122.7
178	445	434792	4944130	123.0
179	447.5	434794	4944128	123.2
180	450	434795	4944126	123.6
181	452.5	434797	4944124	123.9
182	455	434799	4944122	124.2
183	457.5	434801	4944121	124.4
184	460	434802	4944119	124.5
185	462.5	434804	4944117	124.6
186	465	434805	4944115	124.8
187	467.5	434807	4944113	124.9
188	470	434808	4944111	125.0
189	472.5	434811	4944111	125.5
190	475	434813	4944110	125.1
191	477.5	434816	4944109	125.3

Project Cougar Creek **Line**____ **Date** 05/11/2013 **Archive on**____ **Page #** 1 **of**____

Line: Location____ Station spacing 2.5 m 1st station____ Last station____

Direction W→E Topo Quad(s)____ Road name/#____ Surveyed?____

Source: Type Weight drop #____ Stack 8 **Receiver:** Type____ Gph frq 4.5 Hz

Array length/type____/____ SP Interval____ Group Interval____ Gphs/group____

Seismograph:____ Channels:____ Gph Array Length/Type____/____

Records: Length 0.4 s Sample Rate 0.5 ms **Personnel:** Observer____

below 0.5

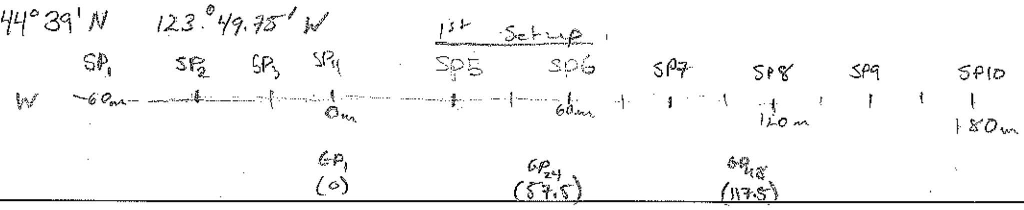
Hi cut filter____ Low cut filter____ Notch filter____ Src Chief____

Conditions: Wind____ Temp____ Cable Truck____

Traffic____ Moisture____ Surveyors____

GPS Coordinates: 44°39' N 123.°49.75' W

Sketches and Remarks



PreAmp Gains:

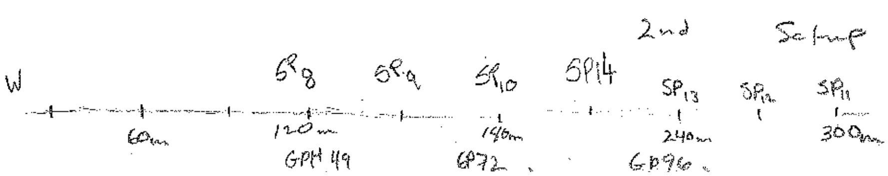
File 1 deleted BAD GPH

File no.	SP no.	RSW no.	Tr	Tr	Tr	Tr	Remarks (Bad files, skips, reshoots, time, *Powerlines*, etc.)
2	1						SP 60m W of GPH 1 Confirmed 3.0Km first arrivals (Type)
3	2						SP 30m W of GPH 1
4	2						Hammer Test @ 30m W of GPH 1
5	3						SP 15 m off the Line (west of GPH 1)
6	4						SP on the GPH 1 (Zero offset) $V_1 = 1000$ m/s, $V_2 = 1500$ m/s
7	5						SP 30 m E of GPH 1 (Obs: file "15 m")
8	6						SP 60m E of GPH 1
9	7						SP 90m E of GPH 1 V_1 ~ 800 V_2 ~ 2150 (velocity check)
10	8						SP 120m E of GPH 1 *Record length increased to 0.6 s*
11	8						SP 120 m E of GPH 1 V_1 ~ 800 V_2 ~ 4000 (velocity check)
12	9						SP 150 m E of GPH 1
13	10						SP 180 m E of GPH 1 60 m E GPH 96 (SP 13)
14	11						SP 180m E of GPH (49) 1st shot of 2nd line (Shots now moving E→W)
15	12						SP 150m E of GPH 49 → 30 m E of GPH 96
16	13						SP 120m E of GPH 49 → 2.5 m E of GPH 96
17	14						SP 90m E of GPH 49
18	10						SP 60m E of GPH 49 (GPH 73)
19	9						SP GPH 61 → 30 m E of GPH 49
20	8						SP GPH 49 V_1 ~ 770 V_2 ~ 3000
21	7						SP GPH 37
22	6						SP 60m W of GPH 49

Section 1

Record length 0.6

Section 2



Project Cougar Creek **Line**____ **Date** 06/02/2013 **Archive on**____ **Page #** 1 **of**____

Line: Location____ Station spacing 2.5 m 1st station____ Last station____
Direction E→W Topo Quad(s)____ Road name/#____ Surveyed? Yes

Source: Type Weight drop #____ Stack 8 **Receiver:** Type____ Gph frq 4.5 Hz
Array length/type____/____ SP Interval____ Group Interval____ Gphs/group____
Seismograph:____ Channels:____ Gph Array Length/Type____/____

delay 0.05 s

Records: Length 1 s Sample Rate 0.5 ms **Personnel:** Observer____
Hi cut filter____ Low cut filter____ Notch filter____ Src Chief____
Conditions: Wind____ Temp____ Cable Truck____
Traffic____ Moisture____ Surveyors____

E

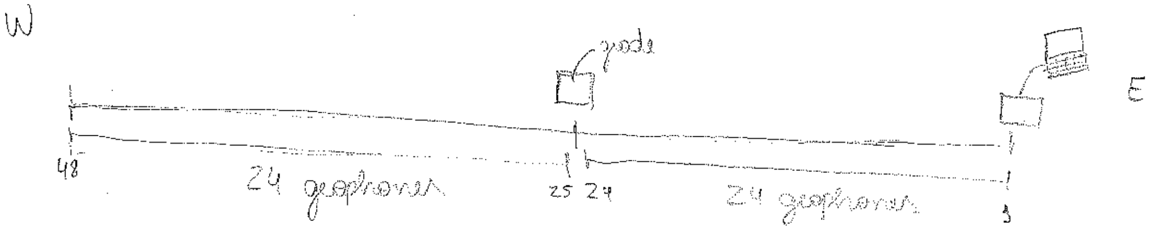
GPS Coordinates: 44°39' N 123°49.75' W

Sketches and Remarks

SP9 SP8 SP7 SP6 SP5 SP4 SP3 SP2 SP1
60m 90m 120m 150 m 180m 210m 240m 270m 300m

PreAmp Gains:____

TIME	File no.	SP no.	RSW no.	Station Location of Tr	Tr	Tr	Tr	Remarks (Bad files, skips, reshoots, time, *Powerlines*, etc.)
								Dead geophone # 32
								Geophone # 1 today is 240 m relative from last geophone position (previous experiment 05/13/2013) # back to back side #
0:47	23							300 m E of GPH 01 # TEST SHOT #
0:50	24	01						SP1 300 m E of GPH 01
1:05	25	02						SP2 270 m E of GPH 01
1:11	26	03						SP3 240 m E of GPH 01
1:18	27	04						SP4 210 m E of GPH 01
1:23	28	05						SP5 180 m E of GPH 01
1:30	29	06						SP6 150 m E of GPH 01 > Recorded at 150m both!
1:33	30	07						SP7 150 m E of GPH 01 / Fired at 120m
1:39	31	08						SP8 90 m E of GPH 01
1:43	32	09						SP9 60 m E of GPH 01
1:48	33	10						SP10 30 m E of GPH 01
1:53	34	11						SP11 0 m E of GPH 01
1:57	35	12						SP12 -30 m E of GPH 01
2:02	36	13						SP13 -60 m E of GPH 01
2:55	N/A	01						From here, gph 17 is dead. Test shot. Not saved
:03	37	01						+300 m position, i.e. 540 m from (day 1 gph 1)
:09	38	02						+270 m " 510 m " "
:12	39	03						+240 m " " 480 m " "
:17	40	04						+210 m " 450 "
:24	41	05						+180 m " 420 " Tent blew away shot twice
:28	42	06						+150 " " 390
:33	43	07						+120 " " 360
:37	44	08						+90 " " 330
:41	45	09						+60 " " 300
:47	46	10						+30 270
51	47	11						+0 (at gph 1 from first spread)
:54	48	11						+0 ← 47 looks terrible
:00	49	12						-30 } low quality
:03	50	12						-30 } low quality
	51	13						-60 Removed all the flags to try to surpress noise
								-60 [illegible] quality



geophone 1 ——→ 98
0m ——→ 237.5 m

SHOTS WRT G101	WRT G102	SEG 2	SP Today
0			
30			
60			
90			
120			
180	-60	36, 51, 52	13
210	-30	35, 49, 50	12
240	0	34, 47, 48	11
270	30	33, 46	10
300	60	32, 45	9
330	90	31, 44	8
360	120	30, 43	7
390	150	29, 42	6
420	180	28, 41	5
450	210	27, 40	4
480	240	26, 39	3
510	270	25, 38	2
540	300	23, 24, 37	1

Both recorded at 150m in the program in first space