

Supplementary Material for: The 09 December 2024 Mw5.7 Parker Butte Earthquake: Orthogonal surface fracturing and associated ground disturbances near Yerington, Nevada, central Walker Lane

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S1 Data availability

Full extent of digital surface model (DSM) and orthophoto mosaic generated from the drone survey. Shapefiles of these data are archived at the Nevada Bureau of Mines and Geology (NBMG) and can be downloaded from the NBMG Earthquake Clearinghouse webpage at <https://nevada-earthquake-clearinghouse-nbmh.hub.arcgis.com/pages/parker-butte-earthquake>. Points shown are field observation locations downloadable as KML files from the same website. Also shown is bare earth hillshade derived from the DSM in ArcPro.

S2 Calculated PGA and PGV for field observation points

Calculated median expected PGA and PGV for each of the field observation points. The calculations are for a vertical strike-slip fault with the orientation and position taken from the seismicity and based on the distance to the rupture plane, assuming a near-surface site condition of 560 m/s (site class C, very dense soil / soft rock). The median ground motions are reported in linear units: g for PGA and cm/s for PGV. The standard deviations (uncertainties) are left in ln units. Distribution of observation points is shown on Figure 2c in the manuscript. Downloadable KMZ files of the field observation point locations are available on the Nevada Bureau of Mines and Geology Earthquake Clearinghouse webpage at <https://nevada-earthquake-clearinghouse-nbmh.hub.arcgis.com/pages/parker-butte-earthquake>

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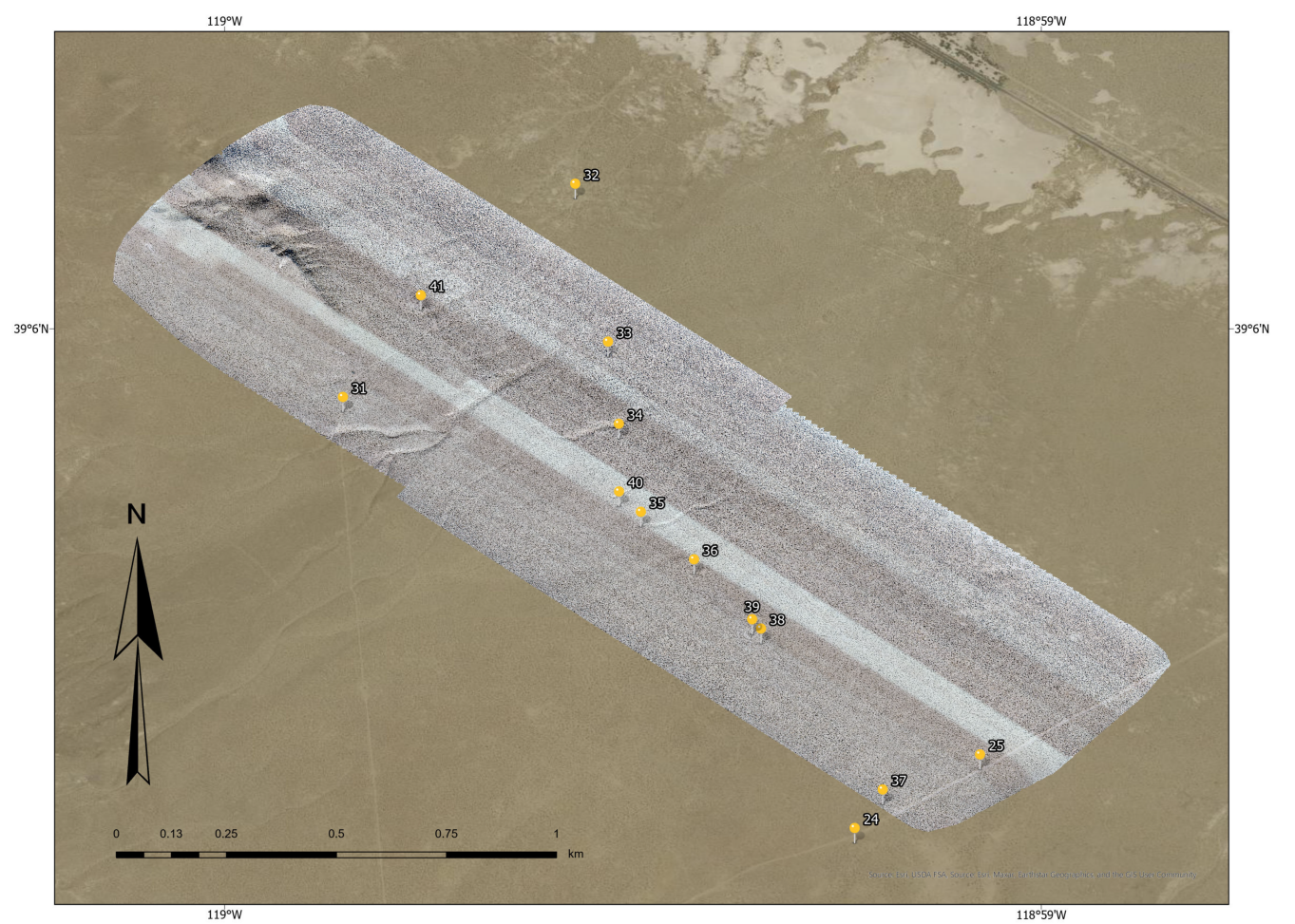


Figure S1 Orthophoto mosaic

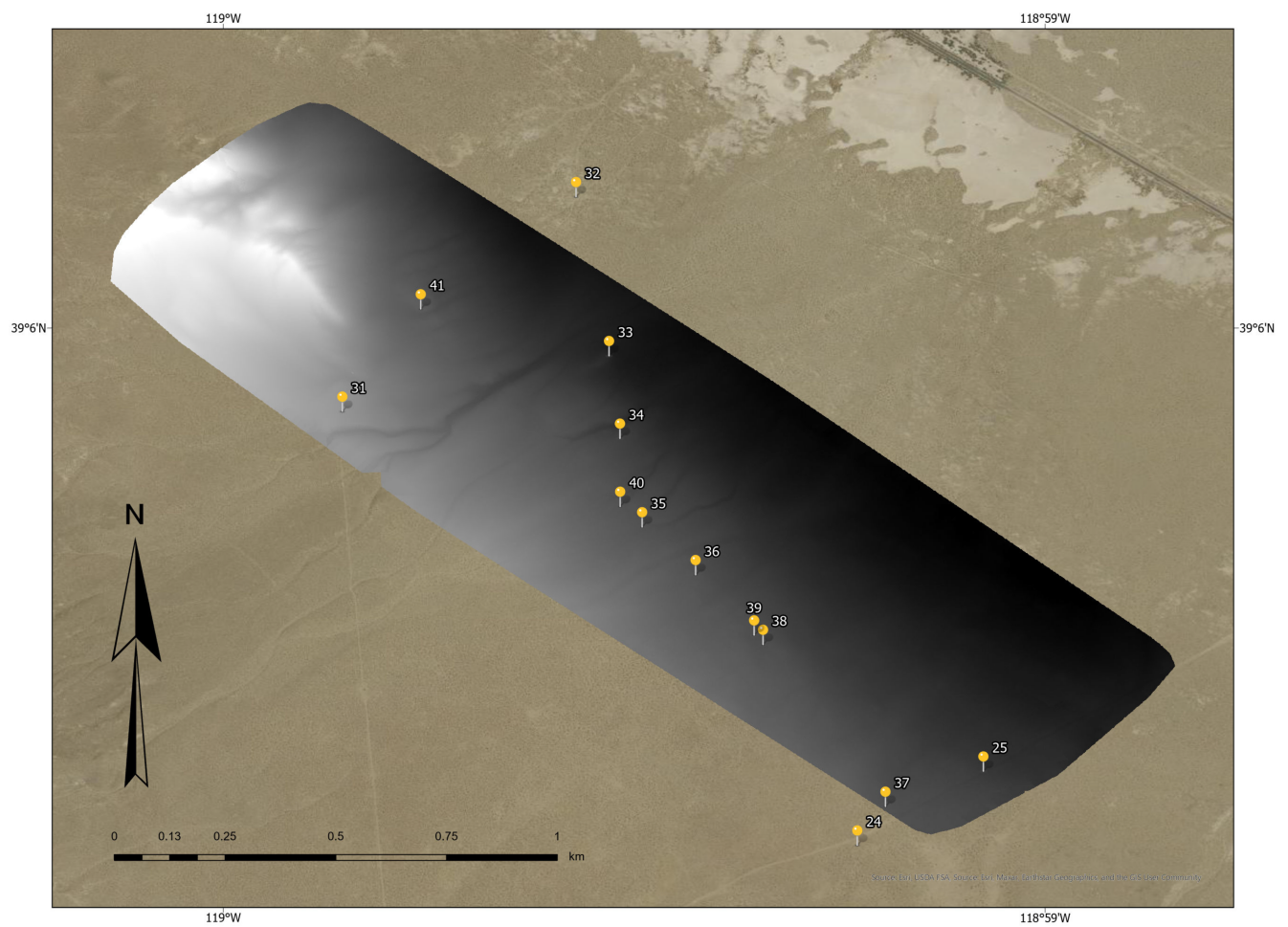


Figure S2 Digital surface model

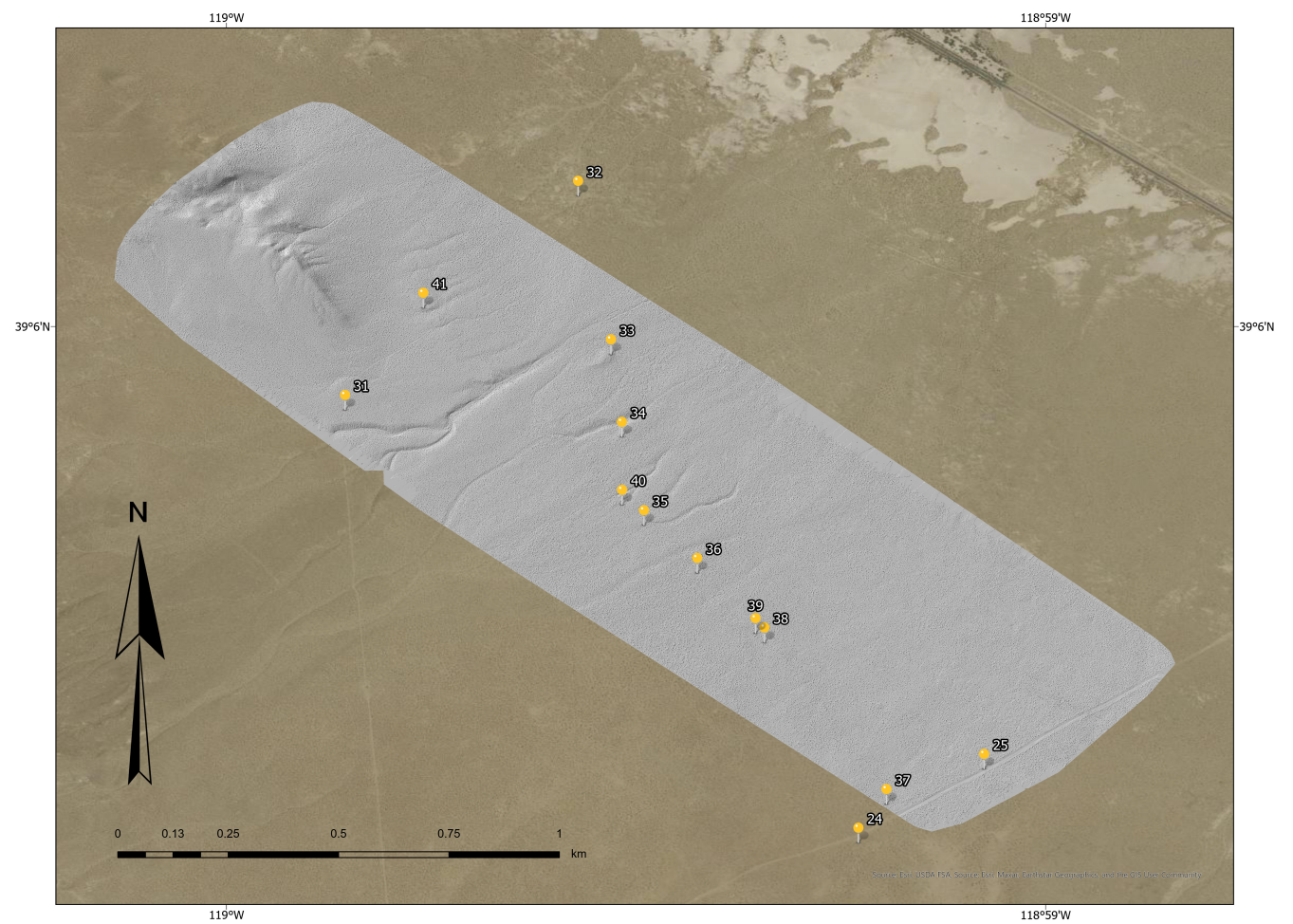


Figure S3 Bare earth hillshade

Name	description	Latitude	Longitude	median_pga [g]	ln_pga_uncert.	median_pgv [cm/s]	ln_pgv_uncert.
1	block failure	39.178183	-119.132548	0.143603	0.633494	7.728229	0.632040
2	block failure	39.178100	-119.132970	0.143091	0.633520	7.699060	0.632042
3	block fall	39.161774	-119.119065	0.163335	0.632532	8.860880	0.631989
4	bank cracks	39.151353	-119.104239	0.184548	0.631560	10.099508	0.631940
5	block failure	39.159842	-119.077819	0.250046	0.628943	14.044762	0.631820
6	block failure	39.157620	-119.042201	0.357957	0.625720	20.823926	0.631679
7	no deformation	39.164414	-119.032325	0.394844	0.624888	23.185461	0.631637
8	no deformation	39.184025	-119.017188	0.358081	0.625717	20.831806	0.631678
9	block failure	39.183184	-119.016960	0.361311	0.625638	21.037944	0.631675
10	bank cracks	39.158656	-119.051508	0.331499	0.626398	19.140506	0.631709
51	bank failure	39.156026	-119.086283	0.225338	0.629865	12.536845	0.631861
12	sand blows	39.157074	-119.086424	0.225735	0.629850	12.560906	0.631860
23	no deformation	39.082960	-118.995138	0.139771	0.633688	7.510533	0.632051
24	no deformation	39.151671	-119.026161	0.364013	0.625574	21.210501	0.631672
24a	no deformation	39.089704	-118.987143	0.147235	0.633313	7.935208	0.632030
25	no deformation	39.091206	-118.984585	0.148419	0.633254	8.002876	0.632027
26	no deformation	39.097722	-118.971913	0.151168	0.633118	8.160128	0.632020
27	no deformation	39.079271	-118.977781	0.128416	0.634274	6.869979	0.632084
28	no deformation	39.077602	-118.984017	0.128598	0.634265	6.880178	0.632084
29	no deformation	39.070236	-118.975128	0.116829	0.634893	6.223461	0.632121
30	no deformation	39.070017	-118.979469	0.117971	0.634831	6.286838	0.632117
31	no deformation	39.098505	-118.997586	0.167748	0.632324	9.116808	0.631978
32	no deformation	39.102859	-118.992846	0.174105	0.632031	9.487108	0.631963
33	open fractures	39.099635	-118.992177	0.167258	0.632347	9.088298	0.631979
34	stream rt bend	39.097958	-118.991955	0.163921	0.632504	8.894759	0.631987
35	open fractures	39.096161	-118.991506	0.160346	0.632674	8.688048	0.631996
36	open fractures	39.095190	-118.990421	0.158051	0.632784	8.555668	0.632002
37	open fractures	39.090490	-118.986571	0.148230	0.633263	7.992048	0.632028
38	open fractures	39.093776	-118.989054	0.154892	0.632937	8.373840	0.632010
39	open fractures	39.093966	-118.989234	0.155309	0.632916	8.397835	0.632009
40	open cracks	39.096577	-118.991951	0.161335	0.632627	8.745146	0.631994
41	open fractures	39.100582	-118.995996	0.171172	0.632165	9.316025	0.631970
42	no deformation	39.149304	-119.014904	0.348502	0.625954	20.221215	0.631689
43	open fracture	39.149000	-119.013347	0.345171	0.626039	20.009204	0.631693
44	block collapse	39.148419	-119.011526	0.340063	0.626171	19.684317	0.631699
45	no deformation	39.149279	-119.009875	0.340710	0.626154	19.725461	0.631699
46	open fractures	39.149903	-119.010144	0.343629	0.626078	19.911055	0.631695
47	open fractures	39.151622	-119.011277	0.352276	0.625859	20.461675	0.631685
48	no deformation	39.145593	-119.020290	0.336689	0.626259	19.469930	0.631703
49	no deformation	39.147031	-119.020811	0.343397	0.626084	19.896309	0.631695
50	open fractures	39.146740	-119.019530	0.341478	0.626134	19.774258	0.631698
Julian Ln	no deformation	39.161000	-119.192000	0.091528	0.636318	4.837649	0.632212
	sand blow	39.157415	-119.085466	0.228312	0.629750	12.717219	0.631855
	seismite	39.132361	-118.997148	0.256688	0.628707	14.453605	0.631810
	sand blows	39.150143	-119.026326	0.357407	0.625733	20.788790	0.631679
	sand blows	39.158135	-119.042754	0.357646	0.625727	20.804090	0.631679
	no deformation	39.167994	-119.033961	0.393218	0.624922	23.081049	0.631639

Table S1 Location coordinates, median PGA (g), PGV (cm/s), and uncertainties (ln units) for each field observation point.

Name	description	Latitude	Longitude	geometry	rhyp[km]	rjb[km]	rrup[km]
23	"no deformation"	39.082960	-118.995138	"POINT Z (-132.46478,169035317 4733561.8569918815 1353)"	15.615203	12.542559	12.701016
24	"no deformation"	39.151671	-119.026161	"POINT Z (-132.49931.6335882 4743420.486465824 1312.820399999999)"	9.577231	2.284816	3.036508
24a	"no deformation"	39.089704	-118.987143	"POINT Z (-132.45588.171121852 4734529.083677416 0)"	15.092196	11.885623	12.052719
25	"no deformation"	39.091206	-118.984585	"POINT Z (-132.45303.461616825 4734744.449238595 1322.33458041611)"	15.013886	11.786	11.9547
26	"no deformation"	39.097722	-118.971913	"POINT Z (-132.43892.830297062 4735679.065759358 1305)"	14.836798	11.560216	11.731948
27	"no deformation"	39.079271	-118.977781	"POINT Z (-132.44546.0410521 4733032.785121678 0)"	16.523121	13.656842	13.802512
28	"no deformation"	39.077602	-118.984017	"POINT Z (-132.45240.249715278 4732793.447821082 0)"	16.507583	13.637774	13.783645
29	"no deformation"	39.070236	-118.975128	"POINT Z (-132.44250.670256132 4731737.272377538 0)"	17.624082	14.969990	15.103000
30	"no deformation"	39.070017	-118.979469	"POINT Z (-132.44733.929801052 4731705.88162997 0)"	17.506633	14.831390	14.965632
31	"no deformation"	39.098505	-118.997586	"POINT Z (-132.46750.754435042 4735791.444585656 0)"	13.894086	10.321576	10.513559
32	"no deformation"	39.102859	-118.992846	"POINT Z (-132.46223.042905714 4736415.945736288 0)"	13.580384	9.895642	10.095728
33	"open fractures"	39.099635	-118.992177	"POINT Z (-132.46148.592483152 4735953.43930829 0)"	13.919079	10.355488	10.546854
34	"stream rt bend"	39.097958	-118.991955	"POINT Z (-132.46123.889845343 4735712.940072736 0)"	14.094603	10.590198	10.777398
35	"open fractures"	39.096161	-118.991506	"POINT Z (-132.46073.85805896 4735455.129912219 0)"	14.290816	10.849937	11.032730
36	"open fractures"	39.095190	-118.990421	"POINT Z (-132.45953.170599872 4735315.956675282 0)"	14.421469	11.021474	11.201468
37	"open fractures"	39.090490	-118.986571	"POINT Z (-132.45524.569864133 4734641.84779963 0)"	15.026391	11.801999	11.970262
38	"open fractures"	39.093776	-118.989054	"POINT Z (-132.45800.953723107 4735113.065938533 0)"	14.607706	11.264084	11.440262
39	"open fractures"	39.093966	-118.989234	"POINT Z (-132.45821.021973217 4735140.327809819 0)"	14.582665	11.231589	11.408268
40	"open cracks"	39.096577	-118.991951	"POINT Z (-132.46123.46657235 4735514.799793123 0)"	14.235694	10.777223	10.961229
41	"open fractures"	39.100582	-118.995996	"POINT Z (-132.46573.746271191 4736089.3820740385 0)"	13.722197	10.089150	10.285473
42	"no deformation"	39.149304	-119.014904	"POINT Z (-132.48678.557476819 4743080.703473793 0)"	9.710542	2.793052	3.435279
43	"open fracture"	39.149000	-119.013347	"POINT Z (-132.48505.192133877 4743037.114052586 0)"	9.741544	2.899225	3.522145
44	"block collapse"	39.148419	-119.011526	"POINT Z (-132.48302.474994564 4742953.718111568 0)"	9.790836	3.060997	3.656460
45	"no deformation"	39.149279	-119.009875	"POINT Z (-132.48118.779584814 4743077.060226907 0)"	9.784461	3.040556	3.639365
46	"open fractures"	39.149993	-119.010144	"POINT Z (-132.48148.670849688 4743166.764523538 0)"	9.756159	2.948195	3.562563
47	"open fractures"	39.151622	-119.011277	"POINT Z (-132.48274.8639955054 4743413.4824623205 0)"	9.676220	2.671785	3.337429
48	"no deformation"	39.145593	-119.020290	"POINT Z (-132.49278.079791445 4742548.013387752 0)"	9.825148	3.167373	3.745965
49	"no deformation"	39.147031	-119.020811	"POINT Z (-132.49336.160355832 4742754.381050957 0)"	9.758897	2.955544	3.568647
50	"open fractures"	39.146740	-119.019530	"POINT Z (-132.49193.485186696 4742712.739762578 0)"	9.777414	3.016297	3.619123
1	"block failure"	39.178183	-119.132548	"POINT Z (-132.61774.587695576 4747226.960198775 0)"	15.342521	12.198496	12.361363
2	"block failure"	39.178100	-119.132970	"POINT Z (-132.61821.638558469 4747215.009469116 0)"	15.378486	12.243680	12.405954
3	"block fall"	39.161774	-119.119065	"POINT Z (-132.60273.684551952 4744870.859139437 0)"	14.129023	10.632113	10.818587
4	"bank cracks"	39.151353	-119.104239	"POINT Z (-132.58623.334315673 4743374.800207078 0)"	13.116689	9.244870	9.458732
5	"block failure"	39.159842	-119.077819	"POINT Z (-132.55682.239929562 4744593.547519052 0)"	11.129247	6.108347	6.427433
6	"block failure"	39.157620	-119.042201	"POINT Z (-132.51717.292290594 4744274.439362527 0)"	9.628010	2.486735	3.191214
7	"no deformation"	39.164414	-119.032325	"POINT Z (-132.50617.825173803 4745249.966372293 0)"	9.358787	1.042338	2.255320
8	"no deformation"	39.184025	-119.017188	"POINT Z (-132.48932.827900397 4748065.919764395 0)"	9.626135	2.482671	3.188048
9	"block failure"	39.183184	-119.016960	"POINT Z (-132.48907.4003222903 4747945.211035183 0)"	9.599075	2.375627	3.105415
10	"bank cracks"	39.158656	-119.051508	"POINT Z (-132.52753.29103085 4744423.241578121 0)"	9.880096	3.330634	3.884987
51	"bank failure"	39.156026	-119.086283	"POINT Z (-132.56624.391733324 4744045.602109685 0)"	11.729622	7.143172	7.417877
12	"sand blows"	39.157074	-119.086424	"POINT Z (-132.56640.098729577 4744196.072133003 0)"	11.718773	7.125384	7.400750
"Julian Ln"	"no deformation"	39.161000	-119.192000	"POINT Z (-132.68392.74663186 4744759.7498267 1312.6)"	20.927179	18.742655	18.849062
	"sand blow"	39.157415	-119.085466	"POINT Z (-132.56533.524936603 4744245.102108542 0)"	11.649494	7.010943	7.290633
	seismite	39.132361	-118.997148	"POINT Z (-132.46701.921211813 4740648.923118957 0)"	10.987949	5.851818	6.184155
	"sand blows"	39.150143	-119.026326	"POINT Z (-132.49950.001314178 4743201.144998577 0)"	9.632152	2.504836	3.205340
	"sand blows"	39.158135	-119.042754	"POINT Z (-132.51778.757908931 4744348.4339353126 0)"	9.630665	2.496958	3.199187
	"no deformation"	39.167994	-119.033961	"POINT Z (-132.50799.925626386 4745763.919047036 0)"	9.368802	1.129083	2.296699

Table S2 Geometry and relevant distance metrics for each field observation point. These data were used as input parameters to the four “active crustal” ground motion models used in the hazard maps for the Western US to calculate average PGA and PGV (Table S2-1).