

C-2 Report on Multiple Discrete Returns

The USGS Lidar Base Specification Version 1.3 states: "Deriving and delivering multiple discrete returns is required in all conventional lidar data collection efforts. Data collection shall be capable of at least three returns per pulse. Full waveform collection is acceptable and is promoted; however, full waveform data are regarded as supplemental information."

The purpose of this section is to report on the presence and quantities of lidar returns in the LAS data. Empty return columns can indicate a collection or processing problem dealing with lidar return attribute information.

[Data Source - Y:\Mapping\Projects\65220171_USGS-TX_West_Texas\Production\Final_Client_Deliverables\Lot6_utm14\point_cloud\Swaths_MARS](#)

File	First return	Second return	Third return	Other returns	Total points
CS_00003.las	79,699,882	4,372,424	191,290	2,859	84,266,455
CS_00007.las	70,103,347	6,260,971	360,201	10,595	76,735,114
CS_00023.las	86,045,506	6,798,997	310,825	5,964	93,161,292
CS_00024.las	41,027,124	2,246,086	107,976	2,017	43,383,203
CS_00029.las	62,198,666	6,209,776	383,641	12,116	68,804,199
CS_00033.las	70,281,407	6,177,633	379,348	10,221	76,848,609
CS_00034.las	65,799,258	6,256,607	399,346	12,919	72,468,130
CS_00035.las	73,449,048	4,780,100	202,459	4,624	78,436,231
CS_00036.las	293,718,177	27,596,496	961,572	19,364	322,295,609
CS_00037.las	285,123,017	23,726,908	866,067	18,402	309,734,394
CS_00038.las	310,667,911	28,562,192	1,051,631	22,749	340,304,483
CS_00039.las	198,136,156	21,163,067	755,355	15,717	220,070,295
CS_00040.las	39,895,221	4,420,000	173,186	3,097	44,491,504
CS_00041.las	287,239,210	27,796,828	1,000,547	17,319	316,053,904
CS_00042.las	251,115,954	22,375,109	691,310	6,982	274,189,355
CS_00043.las	6,618,890	893,595	44,773	713	7,557,971
CS_00044.las	94,232,503	12,702,366	996,256	24,087	107,955,212
CS_00045.las	300,998,298	30,744,346	1,174,962	27,217	332,944,823
CS_00046.las	148,882,219	17,089,201	1,027,983	19,765	167,019,168
CS_00047.las	9,863,595	1,433,899	126,313	3,736	11,427,543
CS_00048.las	152,682,050	13,658,529	333,569	2,921	166,677,069
CS_00050.las	262,167,376	27,253,415	975,933	17,553	290,414,277
CS_00051.las	76,849,092	5,981,341	99,475	457	82,930,365
CS_00052.las	174,411,570	17,200,468	792,028	17,120	192,421,186
CS_00053.las	201,199,459	24,567,486	2,083,338	65,235	227,915,518

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File	First return	Second return	Third return	Other returns	Total points
CS_00054.las	547,109	37,287	477	00	584,873
CS_00055.las	119,787,411	14,071,880	1,339,879	42,627	135,241,797
CS_00056.las	105,096,194	9,352,326	458,692	11,899	114,919,111
CS_00057.las	53,510,770	5,688,316	222,334	11,712	59,433,132
CS_00058.las	10,675,915	1,352,936	123,282	3,214	12,155,347
CS_00059.las	237,916,914	28,387,454	1,875,060	51,822	268,231,250
CS_00060.las	250,121,111	31,457,462	1,924,622	54,229	283,557,424
CS_00061.las	37,081,245	3,739,523	164,050	6,876	40,991,694
CS_00062.las	5,893,428	764,600	63,398	1,741	6,723,167
CS_00063.las	157,497,380	14,972,237	570,697	11,765	173,052,079
CS_00064.las	35,670,132	4,410,613	349,983	8,882	40,439,610
CS_00065.las	171,060,375	15,409,812	704,409	14,618	187,189,214
CS_00066.las	184,666,033	15,992,568	431,861	7,900	201,098,362
CS_00067.las	196,068,886	16,829,834	468,748	4,447	213,371,915
CS_00068.las	87,277,565	8,939,461	430,483	10,586	96,658,095
CS_00069.las	200,221,183	17,612,315	432,053	3,506	218,269,057
CS_00070.las	86,692,716	10,160,726	826,228	22,511	97,702,181
CS_00071.las	242,711,146	20,371,266	607,336	11,096	263,700,844
CS_00072.las	31,940,438	3,552,853	287,886	9,828	35,791,005
CS_00073.las	49,209,816	5,853,594	602,838	20,508	55,686,756
CS_00074.las	13,902,554	1,305,169	36,502	1,104	15,245,329
CS_00075.las	140,925,015	13,937,212	764,575	16,486	155,643,288
CS_00078.las	84,911,685	8,632,828	219,992	5,098	93,769,603
CS_00079.las	256,761,497	29,765,510	901,857	17,888	287,446,752
CS_00080.las	258,250,912	27,990,030	672,099	8,351	286,921,392
CS_00081.las	176,830,547	19,615,294	533,701	7,480	196,987,022
CS_00083.las	62,031,863	6,740,427	191,188	2,473	68,965,951
CS_00084.las	84,232,017	8,820,843	488,470	12,259	93,553,589
CS_00085.las	202,589,958	21,404,815	672,383	12,804	224,679,960
CS_00086.las	234,380,791	24,699,892	638,842	10,504	259,730,029
CS_00087.las	273,639,333	32,507,623	787,722	10,694	306,945,372
CS_00089.las	349,312,974	43,588,262	1,097,810	13,197	394,012,243
CS_00090.las	217,911,828	24,258,595	702,880	8,915	242,882,218
CS_00091.las	285,478,226	31,288,001	815,503	10,351	317,592,081

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File	First return	Second return	Third return	Other returns	Total points
CS_00092.las	118,860,840	16,414,659	605,976	11,818	135,893,293
CS_00093.las	182,556,486	19,287,323	608,614	6,486	202,458,909
CS_00094.las	10,903,998	1,241,831	60,345	696	12,206,870
CS_00095.las	68,094,114	6,388,038	273,119	3,282	74,758,553
CS_00096.las	67,873,777	10,478,796	295,456	2,952	78,650,981
CS_00097.las	169,405,185	20,017,274	685,790	12,598	190,120,847
CS_00098.las	297,193,683	37,388,279	985,682	14,253	335,581,897
CS_00099.las	281,349,300	31,699,273	808,959	8,968	313,866,500
CS_00100.las	211,461,055	23,837,827	687,718	9,253	235,995,853
CS_00101.las	16,554,097	3,044,840	67,575	209	19,666,721
CS_00102.las	308,680	6,804	68	00	315,552
CS_00317.las	65,544,357	12,501,055	1,216,817	38,718	79,300,947
CS_00318.las	267,116,791	53,112,493	2,847,715	41,263	323,118,262
CS_00319.las	336,840,082	118,718,637	23,073,507	1,756,884	480,389,110
CS_00320.las	263,177,781	56,187,028	3,465,726	57,280	322,887,815
CS_00321.las	347,553,886	40,588,712	1,453,751	10,034	389,606,383
CS_00322.las	457,444,472	154,841,300	27,397,621	1,896,605	641,579,998
CS_00323.las	89,315,414	18,613,420	1,586,666	43,826	109,559,326
CS_00324.las	336,538,423	41,277,738	1,180,229	6,524	379,002,914
CS_00325.las	39,957,426	3,923,542	230,851	3,264	44,115,083
CS_00326.las	376,337,170	135,311,687	16,086,834	466,106	528,201,797
CS_00327.las	354,795,405	48,423,548	1,853,438	21,120	405,093,511
CS_00328.las	146,793,481	59,255,038	11,951,366	1,158,085	219,157,970
CS_00329.las	380,037,851	108,761,362	10,477,165	351,172	499,627,550
CS_00330.las	418,406,346	147,011,861	27,875,148	2,123,775	595,417,130
CS_00331.las	376,252,274	47,798,434	1,786,627	12,585	425,849,920
CS_00332.las	209,131,974	52,602,290	3,994,349	89,587	265,818,200
CS_00333.las	16,256,020	5,076,081	620,244	24,418	21,976,763
CS_00334.las	278,826,003	125,768,868	26,921,861	3,209,388	434,726,120
CS_00335.las	31,216,742	2,615,095	170,419	3,226	34,005,482
CS_00336.las	371,514,011	121,123,470	13,373,723	352,609	506,363,813
CS_00337.las	332,459,829	58,732,037	2,526,774	37,168	393,755,808
CS_00338.las	317,520,837	128,767,159	24,467,672	2,494,670	473,250,338
CS_00339.las	152,671,558	56,403,623	11,038,865	1,147,346	221,261,392

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File	First return	Second return	Third return	Other returns	Total points
CS_00340.las	236,603,809	93,498,667	17,948,548	1,783,180	349,834,204
CS_00341.las	248,725,046	55,220,167	4,037,704	86,089	308,069,006
CS_00342.las	138,913,865	37,362,997	3,307,162	94,266	179,678,290
CS_00343.las	10,733,514	3,438,167	1,008,240	149,196	15,329,117
CS_00344.las	383,839,775	136,614,120	15,967,083	472,600	536,893,578
CS_00345.las	277,128,698	57,044,174	2,876,807	38,838	337,088,517
CS_00346.las	326,736,487	135,948,554	28,342,396	3,605,940	494,633,377
CS_00347.las	347,314,828	43,042,446	1,451,559	9,681	391,818,514
CS_00348.las	267,539,047	57,016,843	2,839,385	37,246	327,432,521
CS_00349.las	353,146,695	53,569,602	1,819,278	17,788	408,553,363
CS_00350.las	349,828,487	66,772,768	2,430,251	25,221	419,056,727
CS_00351.las	4,396,669	771,350	54,817	906	5,223,742
CS_00352.las	376,621,321	147,855,105	28,471,431	3,150,283	556,098,140
CS_00353.las	109,035,184	36,360,789	8,714,512	1,078,303	155,188,788
CS_00354.las	267,464,341	54,446,065	3,294,172	58,729	325,263,307
CS_00355.las	379,547,658	133,313,255	25,892,741	1,963,019	540,716,673
CS_00356.las	369,495,358	101,053,222	9,240,894	312,455	480,101,929
CS_00357.las	370,911,194	42,592,473	1,609,021	12,715	415,125,403
CS_00358.las	2,725,982	489,832	34,178	416	3,250,408
CS_00359.las	368,579,934	122,983,107	22,270,035	1,605,203	515,438,279
CS_00360.las	290,857,314	56,373,728	2,625,744	34,412	349,891,198
CS_00361.las	100,331,020	40,141,915	7,064,521	725,970	148,263,426
CS_00362.las	134,554,272	47,069,909	9,372,103	982,804	191,979,088
CS_00363.las	346,862,862	100,910,266	10,352,958	248,485	458,374,571
CS_00364.las	391,352,757	139,982,591	16,445,460	474,502	548,255,310
CS_00365.las	112,263,869	27,196,012	2,704,078	94,605	142,258,564
CS_00366.las	364,842,264	112,076,257	12,056,733	304,697	489,279,951
CS_00367.las	390,163,311	134,298,242	14,768,138	384,965	539,614,656
CS_00368.las	311,948,760	56,868,541	2,376,139	30,809	371,224,249
CS_00369.las	319,554,611	125,600,766	26,418,527	3,190,520	474,764,424
CS_00370.las	394,232,923	132,740,960	14,247,583	361,614	541,583,080
CS_00371.las	9,458,936	997,574	65,597	696	10,522,803
CS_00372.las	385,695,832	153,166,676	29,972,393	3,642,380	572,477,281
CS_00373.las	321,818,177	123,805,887	21,159,375	1,690,895	468,474,334

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<u>File</u>	<u>First return</u>	<u>Second return</u>	<u>Third return</u>	<u>Other returns</u>	<u>Total points</u>
CS_00374.las	340,504,737	66,660,876	2,820,136	34,247	410,019,996
CS_00375.las	387,122,890	162,988,026	29,973,253	2,738,537	582,822,706
CS_00376.las	360,412,055	147,070,188	29,741,350	3,450,578	540,674,171
CS_00377.las	248,091,814	95,341,469	18,375,911	1,832,905	363,642,099
CS_00378.las	90,833,524	32,073,934	4,070,333	154,134	127,131,925
CS_00379.las	259,038,021	51,724,707	3,324,359	58,112	314,145,199
CS_00380.las	308,251,845	91,158,531	8,347,117	242,736	408,000,229
CS_00381.las	272,258,597	57,320,493	2,827,109	35,101	332,441,300
Total	27,267,217,534	5,975,960,077	707,293,025	51,423,066	34,001,893,702