

C-2 Report on Multiple Discrete Returns

The USGS Lidar Base Specification 2022 rev. A states: "Deriving and delivering multiple discrete returns are required in all conventional lidar data collection efforts. Data collection shall be capable of at least three returns per pulse."

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 - V:\Mapping\Projects\65221205_IL_MidNorth\Production\Final_Client_Deliverables\229058\IL_MidNorth_1_D22_229055\point_cloud\Swaths](#)

File	First return	Second return	Third return	Other returns	Total points
CS_01001.las	642,614,935	60,070,738	12,699,669	1,447,786	716,833,128
CS_01002.las	1,946,383	211,409	26,528	1,646	2,185,966
CS_01003.las	22,173,387	3,249,764	612,527	136,140	26,171,818
CS_01004.las	518,245,015	64,793,736	11,445,088	1,529,237	596,013,076
CS_01005.las	710,755,474	79,993,523	23,029,589	3,929,788	817,708,374
CS_01006.las	1,263,002,325	145,087,188	29,383,114	3,236,667	1,440,709,294
CS_01008.las	66,714,204	15,580,462	3,036,338	382,989	85,713,993
CS_01009.las	1,260,145,501	156,554,719	35,282,075	4,509,929	1,456,492,224
CS_01010.las	382,941,849	45,361,527	10,849,939	1,650,417	440,803,732
CS_01011.las	1,550,796,847	70,746,221	14,547,445	1,603,093	1,637,693,606
CS_01013.las	1,661,142,083	166,209,840	43,177,950	5,677,998	1,876,207,871
CS_01016.las	749,709,784	72,696,777	14,098,922	1,466,151	837,971,634
CS_01017.las	1,797,125,759	196,266,763	40,990,425	4,722,485	2,039,105,432
CS_01018.las	10,198,297	1,898,353	312,822	27,134	12,436,606
CS_01021.las	31,060,981	7,443,468	1,333,321	120,175	39,957,945
CS_01022.las	2,095,822,533	93,639,655	17,199,112	1,727,817	2,208,389,117
CS_01023.las	753,148,712	70,840,946	13,642,833	1,428,707	839,061,198
CS_01024.las	186,063,974	15,356,659	3,597,143	420,204	205,437,980
CS_01026.las	54,177,943	2,837,075	780,333	136,895	57,932,246
CS_01027.las	1,485,848,936	74,003,563	13,870,411	1,391,140	1,575,114,050
CS_01028.las	96,275,193	699,242	165,080	21,867	97,161,382
CS_01030.las	1,723,445,024	198,750,881	36,486,136	4,652,751	1,963,334,792
CS_01032.las	516,941,658	53,643,192	14,512,179	2,092,743	587,189,772
CS_01033.las	1,028,747,584	218,678,863	49,802,448	9,415,892	1,306,644,787
CS_01034.las	1,152,434,487	124,902,487	25,965,878	9,530,022	1,312,832,874
CS_01035.las	510,617,625	99,186,107	19,387,037	3,930,704	633,121,473

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File	First return	Second return	Third return	Other returns	Total points
CS_01036.las	1,529,728,563	218,884,105	57,401,371	7,364,367	1,813,378,406
CS_01037.las	438,030,864	40,667,876	7,111,468	1,027,765	486,837,973
CS_01038.las	1,122,946,560	175,764,657	46,408,654	7,061,800	1,352,181,671
CS_01039.las	291,287,749	8,412,943	1,412,839	133,004	301,246,535
CS_01041.las	130,077,417	29,490,196	8,068,605	1,250,996	168,887,214
CS_01042.las	95,686,822	15,777,207	4,471,892	684,014	116,619,935
CS_01043.las	94,278,882	1,959,978	344,716	58,792	96,642,368
CS_01044.las	1,640,287,370	97,301,415	17,241,161	1,574,906	1,756,404,852
CS_01045.las	1,551,739,398	199,693,246	43,349,624	5,260,022	1,800,042,290
CS_01047.las	434,600,810	31,704,822	7,314,636	832,923	474,453,191
CS_01048.las	108,426,478	18,567,028	3,334,963	414,645	130,743,114
CS_01049.las	1,553,943,009	107,823,797	18,717,289	1,756,766	1,682,240,861
CS_01050.las	52,615,504	87,766	8,276	946	52,712,492
CS_01051.las	1,512,654,987	184,021,985	40,131,746	4,800,684	1,741,609,402
CS_01053.las	1,494,720,934	195,310,037	42,292,547	4,981,012	1,737,304,530
CS_01054.las	814,681,019	51,692,674	10,421,224	1,168,863	877,963,780
CS_01055.las	1,445,116,751	196,205,360	49,195,470	5,991,886	1,696,509,467
CS_01057.las	300,120,811	25,485,317	5,000,682	532,800	331,139,610
CS_01058.las	1,502,056,666	184,782,055	36,110,152	3,711,406	1,726,660,279
CS_01059.las	1,723,527,185	197,187,514	43,035,147	5,223,526	1,968,973,372
CS_01060.las	607,572,164	59,894,948	10,788,427	1,061,407	679,316,946
CS_01061.las	1,594,788,981	180,229,785	33,530,930	4,118,282	1,812,667,978
CS_01063.las	339,932,841	66,024,442	12,990,317	1,786,669	420,734,269
CS_01065.las	770,277,827	104,925,603	24,313,496	3,033,095	902,550,021
CS_01068.las	1,496,741,677	74,370,095	15,314,597	1,758,790	1,588,185,159
CS_01069.las	1,944,742,476	87,025,895	17,858,682	2,021,299	2,051,648,352
CS_01070.las	1,517,847,429	208,394,412	54,891,387	8,679,051	1,789,812,279
CS_01071.las	148,573,780	18,127,813	3,393,694	331,250	170,426,537
CS_01073.las	1,507,212,026	62,771,243	12,423,014	1,387,233	1,583,793,516
CS_01074.las	90,538,268	2,567,716	649,698	74,909	93,830,591
CS_01075.las	269,032,611	99,212,445	31,446,022	5,168,010	404,859,088
CS_01076.las	1,606,654,511	163,743,105	43,985,004	6,060,067	1,820,442,687
CS_01078.las	228,369,080	46,608,093	9,385,585	1,332,846	285,695,604
CS_01079.las	2,011,061,151	93,994,093	18,483,463	2,055,189	2,125,593,896

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CS_01081.las	1,466,239,278	176,867,558	47,090,640	6,121,387	1,696,318,863
CS_01082.las	1,479,283,788	201,028,904	43,887,403	5,329,541	1,729,529,636
CS_01083.las	1,485,769,623	172,457,311	43,246,214	5,333,629	1,706,806,777
CS_01086.las	948,111,732	90,149,053	18,473,859	2,037,380	1,058,772,024
CS_01087.las	1,186,003,134	115,351,889	22,255,577	2,308,152	1,325,918,752
CS_01094.las	118,832,634	1,106,059	233,614	33,691	120,205,998
CS_01095.las	1,577,031,508	127,171,623	34,174,794	4,742,398	1,743,120,323
CS_01096.las	571,720,369	26,584,052	6,982,763	995,962	606,283,146
CS_01097.las	154,685,761	12,365,763	3,362,224	487,757	170,901,505
CS_01098.las	1,449,279,815	191,279,255	54,843,737	60,270,251	1,755,673,058
CS_01099.las	97,196,522	9,788,487	3,037,351	509,380	110,531,740
CS_01100.las	1,606,561,626	116,811,765	18,281,818	2,200,044	1,743,855,253
CS_01101.las	1,670,715,641	141,816,659	39,011,387	5,588,833	1,857,132,520
CS_01102.las	1,626,999,730	114,411,441	32,110,991	4,796,163	1,778,318,325
CS_01103.las	1,631,641,581	105,411,791	30,117,975	4,655,556	1,771,826,903
CS_01104.las	1,066,664,119	96,241,934	19,505,834	16,384,704	1,198,796,591
CS_01105.las	1,504,484,659	137,658,871	37,434,189	33,610,785	1,713,188,504
CS_01106.las	1,705,345,184	106,430,769	29,345,809	4,264,915	1,845,386,677
CS_01107.las	1,311,634,905	186,485,295	54,851,971	54,380,837	1,607,353,008
Total	74,900,170,703	7,416,831,303	1,705,309,270	371,940,962	84,394,252,238