



atlantic

Project Report

**USDA-FS Region-6, Oregon and Washington
2018 Leaf-On LiDAR Data Acquisition
Sol. No. 1205G218Q0007
Atlantic Project No. 18031**

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SECTION I: PROJECT OVERVIEW & PURPOSE

1. Aerial LiDAR Project

a. Project Overview

The United States Forest Service, Region 6, (USFS) required leaf-on airborne LiDAR surveys to be collected over approximately 4,141 square miles of national forestry in Oregon and Washington State. The following areas were requested to be covered: Fremont-Winema National Forest (FRE-WINNF) in Lakeview, Oregon; Malheur National Forest (MALNF) in John Day, Oregon; Willamette National Forest (WILNF) in Bend, Oregon; Okanogan-Wenatchee National Forest (OKA-WENNF) in Wenatchee, Washington; and Rogue River-Siskiyou National Forest (RR-SNF) in Medford, Oregon. Table 1 below details the Areas of Interest (AOIs) requested.

Aerial LiDAR data for this task order was planned, acquired, processed and produced at an aggregate nominal pulse spacing (ANPS) of 0.35 meters and in compliance with USGS National Geospatial Program LiDAR Base Specification version 1.3.

Area No.	Forest	AOI	Square Miles
AOI-1	WILBRE	Breitenbush	16
AOI-2	MTHEZO	East Zone	101
AOI-3	FREKLA	Klamath	189
AOI-4	OKAMTW	Methow Twisp	692
AOI-5	MBSMFS	Middle Fork	124
AOI-6	MALNAL	North Aldrich	121
AOI-7	MTHNCZ	North Clackamas/Zig Zag	223
AOI-8	WILNFM	NFMF	22
AOI-9	MALRAT	Rattlesnake	84
AOI-10	MTHSCL	South Clackamas	430
AOI-11	WILSCR	Staley Creek	1
AOI-12	FRESYC	Sycan Marsh	9
AOI-13	FRETCR	Thomas Creek	692
AOI-14	OKATIE	Tieton	460
AOI-15	MALUBL	Upper Bear Lake Creek	35
AOI-16	WILCMP	Willamette	942

Table 1: Areas of Interest

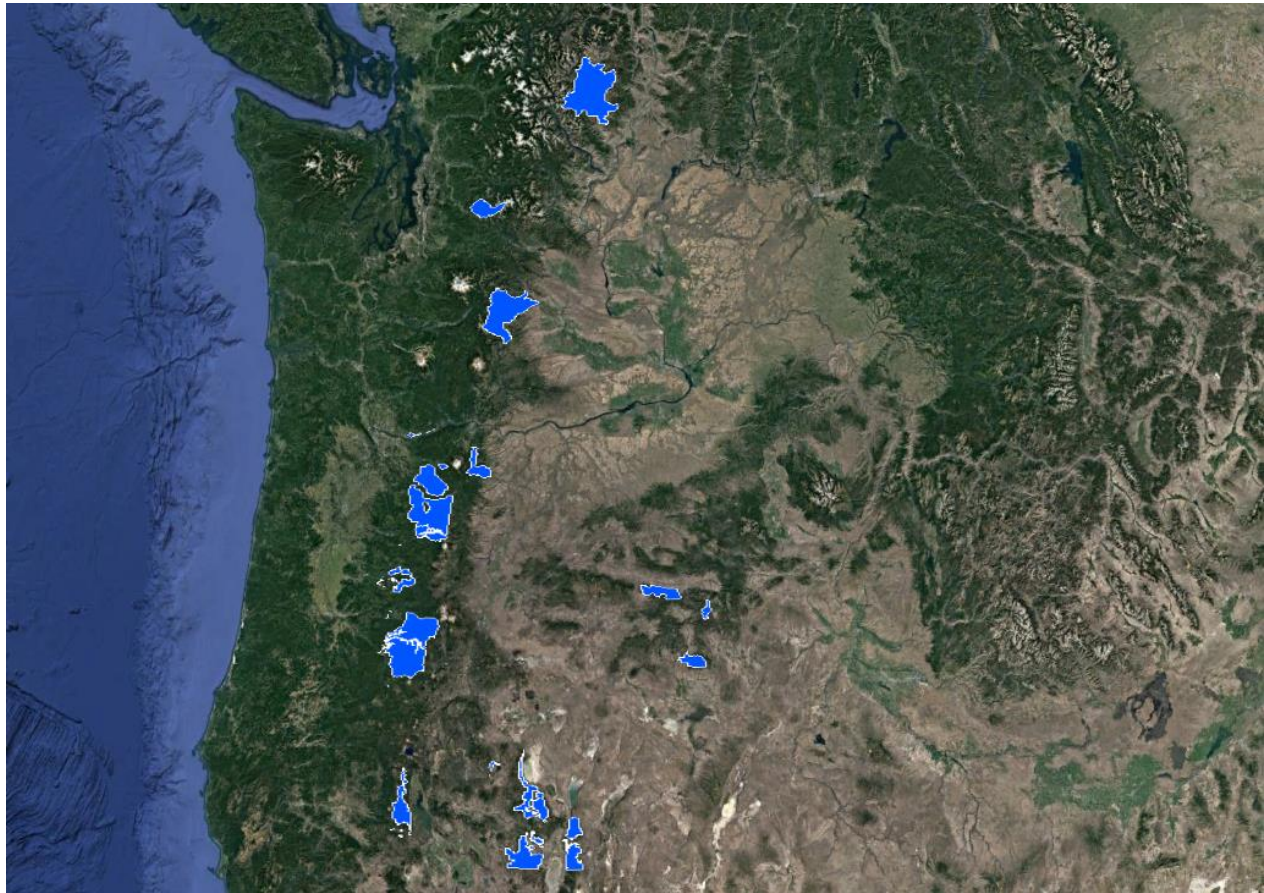


Figure 1: Aerial LiDAR Project Overview – Defined Project Area (DPA) and Associated Areas of Interest (AOIs)

b. Project Purpose

The primary goals of this project are to provide high accuracy Light Detection and Ranging (LiDAR) data to enhance project planning and implementation; identify areas for the implementation of forest restoration treatments designed to restore forest structure in young-growth stands; and to provide engineering and resource specialists more information for on-the-ground project planning. In addition, these data will be used by researchers and scientists to characterize vegetation type and structure as it currently exists on the landscape and to provide a detailed, accurate, and precise benchmark for future change detection work. The data products specified herein may also be used for vegetation mapping, road identification and mapping, hydrologic feature delineation, and landcover characterization applications including a canopy height model, understory vegetation prediction, and other stand metrics.

c. Client Contact Information

Client Contact Information	
Name of Contact	Mark Riley
Organization	Forest Service R6 Data Resources Management
Position	Remote Sensing Program Lead
Telephone	503.808.2989
E-Mail Address	markriley@fs.fed.us
Mailing Address	1220 SW 3 rd Ave
City	Portland
State or Province	Oregon
Postal Code	97208

Table 2: Aerial LiDAR Client Contact Information

d. Contract Deliverables

Item	Specification/Format
Report	PDF
Metadata	FGDC Content Standards for Digital Geospatial Metadata (FGDC-STD-001-1998)
Aircraft Trajectories	ArcGIS shapefile
All-Return Point Cloud	.laz format, LAS 1.2
Bare Earth Elevation Model (Digital Terrain Model, DTM)	Raster, Erdas .img format, 1m cell size
Intensity Image	Raster, Erdas .img format, 1m cell size
Supporting Shapefiles	.shp format
GPS Report	pdf
Quality Analysis/Quality Control	pdf

Table 3: Aerial LiDAR Contract Deliverables

SECTION II: FIELD OPERATIONS

1. Aerial Acquisition

a. Aircraft & Sensor Information

Atlantic operated a PACDV (N750DV) outfitted with an Optech Galaxy Prime LiDAR system during the collection of the project area. The specifications of this system are presented in the following table:

Parameter	Specification
Model	Galaxy Prime
Manufacturer	Optech
Performance Envelope	150 – 4700 m AGL, nominal
Absolute Horizontal Accuracy	1/10,000 x altitude
Absolute Elevation Accuracy	< 0.03 – 0.20 m RMSE from 150 – 4700 m AGL
Topographic Laser	1064-nm near-infrared
Laser Classification	Class IV
Pulse Repetition Frequency (Effective)	Programmable, 50 – 1000 kHz
Beam Divergence	0.25 mrad (1/e)
Laser Range Precision	< 0.008 m
Minimum Target Separation Distance	< 0.7 m (discrete)
Range Capture	Up to 8 range measurements, including last
Intensity Capture	Up to 8 intensity measurements, including last (12-bit)
Scan Angle (Fov)	10 – 60°
Swath Width	10 – 115% of altitude AGL
Scan Frequency	0 – 120 Hz advertised (0 – 240 scan lines/sec)
Scan Product	2000 maximum
Roll Compensation	±5° minimum
Data Storage	Internal solid-state drive (SSD)
Power Requirements	28 V; 300 W
Dimensions and Weight	Sensor: 0.34 x 0.34 x 0.25 m, 27 kg PDU: 0.42 x 0.33 x 0.10 m, 6.5 kg
Operation Temperature	0 to +35°C

Table 4: System Specifications – Galaxy Prime

b. Sensor Acquisition Information

The following table illustrates project specific system parameters for LiDAR acquisition on this project:

Parameter	Specification
System	Optech Galaxy Prime
Nominal Pulse Spacing (m)	0.35
Nominal Pulse Density (pls/m²)	8
Nominal Flight Height (AGL meters)	1500-1800
Nominal Flight Speed (kts)	130

Parameter	Specification
Pass Heading (°)	VARIABLES
Sensor Scan Angle (°)	45
Scan Frequency (Hz)	65
Pulse Rate of Scanner (kHz)	500
Line Spacing (m)	829
Central Wavelength of Sensor Laser (nm)	1064
Sensor Operated with Multiple Pulses	7
Beam Divergence (mrad)	0.25
Nominal Swath Width (m)	1491
Nominal Swath Overlap (%)	55
Scan Pattern	TRIANGLE

Table 5: Aerial LiDAR Sensor Acquisition Parameters

c. Flight Plan Execution

Atlantic acquired 1588 passes of the AOI as a series of perpendicular and/or adjacent flight-lines executed in 44 flight missions conducted between June 29, 2018 and January 24, 2019. Onboard differential Global Navigation Satellite System (GNSS) unit(s) recorded sample aircraft positions at 2 hertz (Hz) or more frequency. LiDAR data was only acquired when a minimum of six (6) satellites were in view.

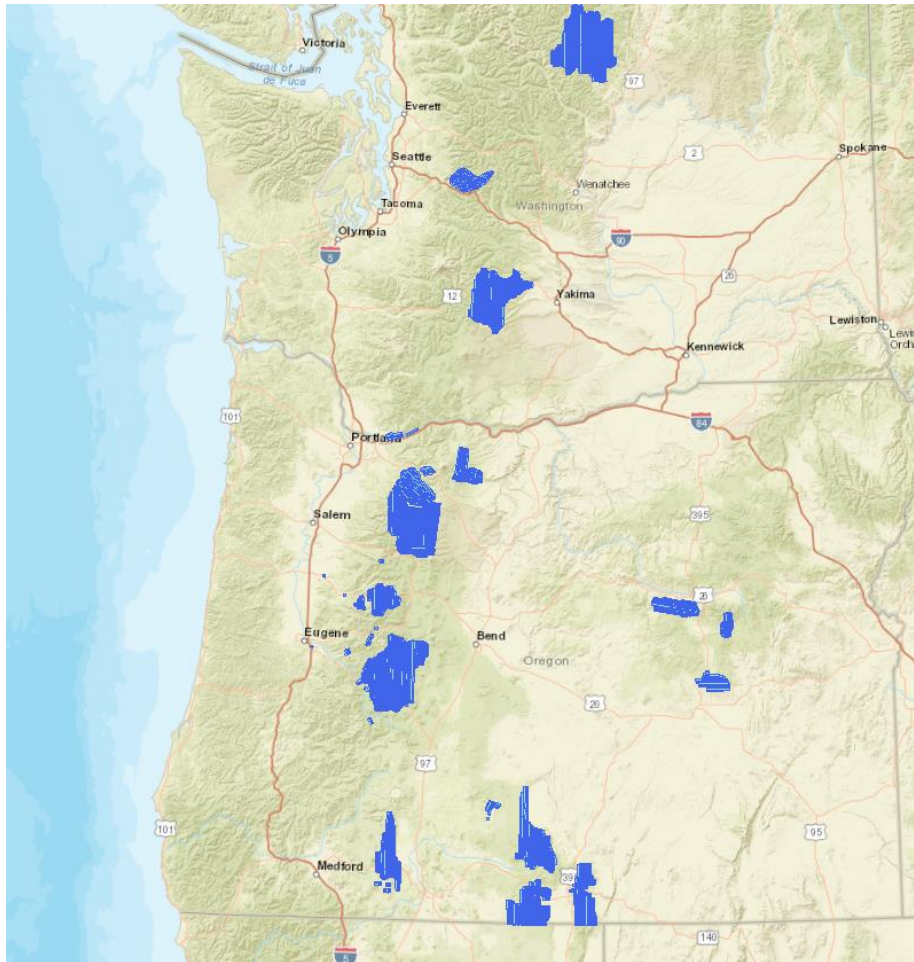


Figure 2: Orientation of Executed Flight-lines and LiDAR DPA

d. GNSS Reference Stations

Ninety (90) Continuously Operating Reference Stations (CORS) were used to control the LiDAR acquisition for the defined project area. The coordinates provided in the table below are in the specified coordinate reference system for the project, as detailed in Section III-1-b.

Designation	Type	PID	Latitude (N)	Longitude (W)	Elevation
BREW	CORS	BREW	N48°07'53.48108"	W119°40'57.48970"	238.584
BURN	CORS	BURN	N42°46'46.20065"	W117°50'36.71410"	1180.877
CORV	CORS	CORV	N44°35'07.92423"	W123°18'16.58107"	105.598
CPXX	CORS	CPXX	N46°50'24.30300"	W122°15'23.47429"	533.677
CSHQ	CORS	CSHQ	N46°52'14.61396"	W121°43'56.75830"	2882.296
CVO1	CORS	CVO1	N45°36'39.31031"	W122°29'46.08243"	66.652
DDSN	CORS	DDSN	N43°07'07.64436"	W123°14'39.27652"	953.095
DRAO	CORS	DRAO	N49°19'21.42282"	W119°37'29.94481"	541.861
GOBS	CORS	GOBS	N45°50'19.74285"	W120°48'52.84130"	621.449
GWN5	CORS	GWN5	N45°46'57.47466"	W121°19'39.23068"	732.469
GWN6	CORS	GWN6	N45°46'57.45753"	W121°19'38.12101"	733.191



Designation	Type	PID	Latitude (N)	Longitude (W)	Elevation
HAHD	CORS	HAHD	N47°17'26.87961"	W121°47'17.10507"	853.931
HUSB	CORS	HUSB	N44°07'10.29195"	W121°50'57.71020"	2038.474
JRO1	CORS	JRO1	N46°16'30.44510"	W122°13'03.42237"	1275.584
LINH	CORS	LINH	N47°00'01.20302"	W120°32'18.61238"	472.290
LKCP	CORS	LKCP	N47°56'39.76231"	W121°49'51.07628"	178.266
LPSB	CORS	LPSB	N44°03'04.42049"	W123°05'24.31260"	117.695
MCSO	CORS	MCSO	N44°58'25.71531"	W122°57'20.70181"	52.800
MDMT	CORS	MDMT	N42°25'06.02510"	W121°13'17.77130"	1710.502
MODB	CORS	MODB	N41°54'08.36720"	W120°18'10.20073"	1567.198
P018	CORS	P018	N42°58'54.13954"	W117°03'52.41615"	1424.232
P019	CORS	P019	N43°18'00.70180"	W115°18'41.99024"	1682.348
P021	CORS	P021	N48°40'28.88891"	W118°43'48.91812"	1163.150
P023	CORS	P023	N44°53'54.35608"	W116°06'10.82666"	1521.574
P062	CORS	P062	N43°06'44.58984"	W121°05'26.57677"	1350.257
P063	CORS	P063	N44°55'21.79614"	W120°56'46.15771"	965.375
P065	CORS	P065	N46°50'38.25083"	W120°55'59.13746"	1017.111
P348	CORS	P348	N40°54'19.96189"	W121°49'40.82039"	1668.051
P368	CORS	P368	N42°30'12.68583"	W123°23'00.31935"	319.431
P370	CORS	P370	N42°11'27.55035"	W122°39'22.94439"	555.032
P371	CORS	P371	N43°21'47.78208"	W123°03'28.44366"	1198.047
P373	CORS	P373	N43°37'21.06589"	W123°19'59.79400"	169.904
P374	CORS	P374	N44°22'54.93022"	W123°35'26.30934"	73.200
P375	CORS	P375	N44°41'21.31369"	W123°25'37.15701"	99.202
P376	CORS	P376	N44°56'28.32727"	W123°06'08.16393"	180.844
P377	CORS	P377	N44°03'07.62403"	W122°53'13.41459"	142.387
P378	CORS	P378	N44°32'05.93359"	W122°55'51.17850"	83.106
P381	CORS	P381	N43°00'06.39200"	W119°57'06.49878"	1567.439
P382	CORS	P382	N43°10'37.40075"	W121°46'10.47217"	1453.212
P383	CORS	P383	N44°20'31.86094"	W122°13'01.99892"	1295.565
P384	CORS	P384	N44°50'28.06702"	W122°28'58.15113"	1182.553
P385	CORS	P385	N44°26'05.45041"	W121°56'45.00808"	1120.788
P386	CORS	P386	N44°24'10.17543"	W118°58'04.14871"	1103.485
P387	CORS	P387	N44°17'48.31791"	W121°34'28.12285"	962.582
P388	CORS	P388	N42°28'07.60262"	W120°22'39.40591"	1405.723
P389	CORS	P389	N43°48'43.16855"	W120°36'12.10657"	1397.424
P390	CORS	P390	N43°02'02.42403"	W118°55'42.56943"	1554.833
P391	CORS	P391	N42°15'16.66111"	W118°24'44.91179"	1834.221
P392	CORS	P392	N43°26'48.32761"	W119°00'03.60999"	1315.507
P393	CORS	P393	N43°14'04.17949"	W117°53'31.34491"	1238.291
P394	CORS	P394	N44°50'05.56754"	W117°47'58.70337"	1010.680
P412	CORS	P412	N45°13'15.97784"	W122°35'20.76969"	53.189
P413	CORS	P413	N48°25'35.43816"	W120°08'58.50876"	501.245
P414	CORS	P414	N45°50'05.52350"	W122°41'34.21988"	63.825

Designation	Type	PID	Latitude (N)	Longitude (W)	Elevation
P416	CORS	P416	N47°02'23.78780"	W121°35'48.94769"	1576.496
P421	CORS	P421	N46°31'54.67828"	W122°25'45.23003"	220.555
P427	CORS	P427	N45°25'48.63986"	W122°20'26.27745"	149.176
P429	CORS	P429	N45°40'34.05652"	W121°52'38.50205"	25.530
P431	CORS	P431	N46°34'19.48967"	W121°59'18.43587"	1422.688
P432	CORS	P432	N46°37'22.27663"	W121°40'59.63336"	318.852
P434	CORS	P434	N47°44'24.72492"	W121°04'32.19761"	1698.015
P442	CORS	P442	N48°15'37.72383"	W121°36'55.98534"	146.868
P443	CORS	P443	N48°30'34.72758"	W121°17'08.01077"	1062.098
P444	CORS	P444	N48°43'48.78486"	W121°04'03.17878"	493.851
P445	CORS	P445	N45°35'24.43897"	W120°40'20.09276"	436.045
P447	CORS	P447	N45°27'10.15230"	W119°41'24.45536"	471.215
P448	CORS	P448	N45°54'38.07846"	W120°00'18.72785"	261.406
P449	CORS	P449	N46°15'35.24804"	W119°37'51.59488"	208.409
P452	CORS	P452	N47°24'12.77144"	W119°29'14.22314"	323.035
P454	CORS	P454	N47°57'13.73292"	W118°59'33.28914"	478.926
P655	CORS	P655	N41°17'40.14564"	W122°12'22.76752"	1542.523
P672	CORS	P672	N41°42'41.64921"	W121°30'24.98502"	1435.076
P673	CORS	P673	N41°35'08.96058"	W121°36'46.86131"	2017.830
P697	CORS	P697	N46°11'15.51189"	W122°10'35.80488"	2214.528
P735	CORS	P735	N42°41'29.79264"	W123°13'51.60264"	1577.671
P736	CORS	P736	N42°34'47.38512"	W121°52'48.46761"	1259.549
P737	CORS	P737	N42°43'37.70810"	W122°36'34.69435"	1245.747
P738	CORS	P738	N42°32'45.88776"	W119°39'31.33305"	1706.761
P739	CORS	P739	N42°01'12.71473"	W117°43'31.55512"	1351.864
P784	CORS	P784	N41°49'50.93368"	W122°25'13.64917"	802.235
PCOL	CORS	PCOL	N47°10'19.40044"	W122°34'14.90693"	79.115
PLNA	CORS	PLNA	N44°07'55.43350"	W119°58'00.44638"	1110.213
PMAR	CORS	PMAR	N43°59'26.41789"	W121°41'12.29751"	2347.718
PUPU	CORS	PUPU	N47°29'58.40911"	W122°00'29.09596"	542.416
REDM	CORS	REDM	N44°15'35.15804"	W121°08'52.37943"	919.815
RKD1	CORS	RKD1	N48°57'51.66132"	W119°24'46.90819"	313.168
SC00	CORS	SC00	N46°57'03.32434"	W120°43'28.60160"	1178.371
SHLD	CORS	SHLD	N41°52'06.11815"	W119°00'56.47267"	1457.538
STAY	CORS	STAY	N44°49'50.54414"	W122°49'15.09845"	110.845
ZSE1	CORS	ZSE1	N47°17'13.17360"	W122°11'18.14395"	81.644

Table 6: GNSS Reference Stations

2. Ground Acquisition

a. Ground Control Survey

A total of 545 ground survey points were collected in support of this project.

Point cloud data accuracy was tested against a Triangulated Irregular Network (TIN) constructed from LiDAR points in clear and open areas. A clear and open area can be characterized with respect to topographic and ground cover variation such that a minimum of five (5) times the Nominal Pulse Spacing (NPS) exists with less than 1/3 of the RMSEZ deviation from a low-slope plane. Slopes that exceed ten (10) percent were avoided.

Each land cover type representing ten (10) percent or more of the total project area were tested and reported with a GCP. In land cover categories other than dense urban areas, the tested points did not have obstructions forty-five (45) degrees above the horizon to ensure a satisfactory TIN surface. The GCP value is provided as a target. It is understood that in areas of dense vegetation, swamps, or extremely difficult terrain, this value may be exceeded.

The GCP value is a requirement that must be met, regardless of any allowed “busts” in the VVA(s) for individual land cover types within the project. Checkpoints for the assessment are required to be well-distributed throughout the land cover type, for the entire project area.

The following tables and figures outline the coordinate values and distribution of GCP points collected in support of this project:

ID	Easting	Northing	Elevation
GCP001	692885.1967	1081781.889	1765.039
GCP002	685689.3521	1078637.423	1719.183
GCP003	657500.6117	1138619.535	1590.233
GCP004	649059.0757	1143509.474	1929.761
GCP005	643740.7951	1145661.89	2098.764
GCP006	665902.8814	1137215.315	1547.093
GCP007	700559.277	1121641.744	1533.749
GCP008	704183.0127	1126557.964	1620.579
GCP009	681584.7185	1082533.438	1639.537
GCP010	582725.3416	927245.0122	2050.6
GCP011	585133.3779	900966.0263	1854.493
GCP012	522595.9577	896177.3967	1630.995
GCP013	546877.6932	886068.474	1685.309
GCP014	547624.7998	891401.2713	1785.545
GCP015	550252.3749	950116.6871	1460.161
GCP016	407336.8866	1048857.277	668.448
GCP017	408101.5664	1047496.155	700.971
GCP018	423136.5727	1092709.79	754.284
GCP019	415418.0881	1093177.596	784.011
GCP020	409123.7957	1089016.297	820.583
GCP021	438714.2054	1084221.294	1610.923
GCP022	502125.1377	975947.9131	1567.072
GCP023	506072.2079	979712.4559	1537.713



ID	Easting	Northing	Elevation
GCP024	503380.9674	967901.1501	1531.834
GCP025	503488.4626	967593.8855	1526.036
GCP026	503251.3021	967739.2528	1531.856
GCP027	503229.9696	974278.3551	1538.208
GCP028	451365.372	1195445.331	1082.535
GCP029	455412.0891	1201920.884	1125.298
GCP030	455167.6767	1211048.226	994.115
GCP031	458132.5368	1205597.098	1294.785
GCP032	451312.3457	1195505.162	1087.708
GCP033	450838.5939	1199954.331	1036.621
GCP034	452203.5951	1219838.907	1133.059
GCP035	441418.3726	1198171.062	1230.065
GCP036	451588.6197	1211878.53	765.733
GCP037	456563.2913	1218689.944	1302.133
GCP038	446131.9538	1198839.567	1395.31
GCP039	451601.1935	1211861.361	766.197
GCP040	452176.9895	1219836.644	1133.438
GCP041	456585.4242	1218706.27	1303.88
GCP042	445669.1495	1219729.361	580.305
GCP043	437504.4593	1216538.755	495.193
GCP044	433389.6761	1209421.408	1275.293
GCP045	428400.999	1204637.699	933.519
GCP046	431003.4807	1213743	716.752
GCP047	427349.803	1209109.988	1011.955
GCP048	433381.0546	1209436.856	1275.083
GCP049	441476.1653	1240571.073	1184.67
GCP050	434673.0301	1240132.406	914.719
GCP051	434181.1331	1193037.536	1141.387
GCP052	430851.5242	1194408.998	1419.624
GCP053	434679.1314	1194604.981	732.348
GCP054	443201.6895	1193052.856	701.271
GCP055	437494.7415	1193417.322	740.016
GCP056	446024.7663	1195367.202	1258.477
GCP057	439648.0055	1199489.572	972.731
GCP058	443234.4369	1193094.021	703.44
GCP059	416264.2521	1180532.288	1182.749
GCP060	397926.8913	1142888.241	435.54
GCP061	414300.4695	1151183.893	402.537
GCP062	408024.6382	1153390.266	341.91
GCP063	420796.6784	1155902.933	788.594
GCP064	423386.7857	1157291.18	1136.987
GCP065	420218.3958	1153845.971	541.823
GCP066	421629.3675	1154823.575	886.89
GCP067	424631.91	1151536.142	825.694
GCP068	426725.9073	1152819.17	1100.975



ID	Easting	Northing	Elevation
GCP069	414125.7885	1154999.292	1033.829
GCP070	423694.6573	1154720.619	1178.761
GCP071	426718.5096	1152800.108	1100.869
GCP072	412840.0677	1154294.235	947.997
GCP073	425255.4864	1101690.354	830.286
GCP074	417463.8954	1101646.755	1139.349
GCP075	421708.3983	1097053.216	1544.922
GCP076	408736.0705	1093991.431	663.743
GCP077	425570.895	1091666.418	760.07
GCP078	408269.2985	1072956.229	474.599
GCP079	425052.6875	1092960.2	916.967
GCP080	528045.0429	1417369.809	624.372
GCP081	514121.7641	1406057.165	1715.262
GCP082	513655.3707	1408467.946	1607.761
GCP083	518243.8889	1411825.312	1346.938
GCP084	522337.2496	1413094.258	1390.31
GCP085	501883.2172	1391419.136	1655.36
GCP086	502243.4427	1393873.471	1512.345
GCP087	513296.8659	1396680.435	898.416
GCP088	517864.6169	1402021.579	774.963
GCP089	506007.5643	1395714.681	1256.245
GCP090	496079.5303	1410754.601	1313.004
GCP091	498257.6483	1414623.472	1197.193
GCP092	501080.0379	1421497.283	1072.235
GCP093	581749.4131	1600209.699	737.569
GCP094	582999.0118	1597620.107	733.576
GCP095	577975.7761	1606011.375	632.08
GCP096	581418.737	1603176.154	584.046
GCP097	586081.3645	1597709.545	574.492
GCP098	580023.3562	1595476.587	1047.844
GCP099	583621.8577	1594911.554	724.012
GCP100	577255.751	1592111.43	757.446
GCP101	580076.5582	1591115.132	738.146
GCP102	682013.3627	1079259.546	1628.227
GCP103	698212.6183	1081795.505	1646.335
GCP104	672733.1686	1139242.823	1485.03
GCP105	654623.3748	1144871.181	1232.794
GCP106	656517.3114	1141845.888	1375.347
GCP107	673449.7459	1143988.819	1289.113
GCP108	655182.0951	1148188.421	940.258
GCP109	703716.3776	1135330.087	2431.692
GCP110	702726.0078	1124195.202	1622.71
GCP111	582737.6467	913029.2646	1971.214
GCP112	581708.6092	919819.2515	2153.769
GCP113	582917.3523	892665.354	1867.279



ID	Easting	Northing	Elevation
GCP114	583653.6391	886312.1038	1914.873
GCP115	580696.8282	896413.5386	1891.485
GCP116	586198.9052	886091.8837	2061.851
GCP117	533890.2122	886612.2117	1636.479
GCP118	528515.6797	885153.7767	1667.81
GCP119	541856.3241	884185.342	1759.85
GCP120	536918.8825	936906.0842	1827.683
GCP121	534042.3645	939272.5295	2038.385
GCP122	539266.0345	949327.2606	1999.515
GCP123	406228.6732	1085750.833	418.568
GCP124	404058.7546	1084751.572	373.03
GCP125	401927.5017	1083271.926	352.498
GCP126	402717.9903	1085435.603	543.904
GCP127	423189.1173	1099388.838	1165.119
GCP128	407500.9654	1092469.06	470.591
GCP129	404485.8432	1091339.17	758.599
GCP130	417918.8343	1102286.909	1219.316
GCP131	504033.3742	976674.4922	1587.508
GCP132	504601.9494	978030.8745	1558.263
GCP133	455163.7984	1211042.445	994.219
GCP134	449330.7093	1205593.428	1043.667
GCP135	442037.5903	1192146.745	652.483
GCP136	448183.1943	1193920.538	813.205
GCP137	440915.9873	1209365.62	760.311
GCP138	459432.6162	1220335.508	1314.642
GCP139	460882.5632	1224105.486	1089.952
GCP140	445822.4773	1214455.764	1287.476
GCP141	430586.647	1232453.897	352.896
GCP142	438921.1034	1222348.682	522.923
GCP143	446476.3285	1230561.96	1178.656
GCP144	441784.8449	1194269.818	1000.697
GCP145	452886.3004	1250870.716	623.072
GCP146	475853.5464	1248282.035	1657.968
GCP147	433637.4985	1190947.456	546.092
GCP148	434842.6326	1190404.729	660.423
GCP149	443393.9894	1188597.97	1073.29
GCP150	442362.3359	1190260.391	949.238
GCP151	448302.883	1187260.585	1094.395
GCP152	449870.0368	1189891.804	1132.416
GCP153	457076.2093	1190900.399	1560.923
GCP154	397921.8867	1143871.508	819.022
GCP155	399569.3124	1142779.735	793.299
GCP156	416392.8695	1143563.198	1125.853
GCP157	419036.3047	1143973.712	1226.063
GCP158	413373.1254	1140337.837	874.855



ID	Easting	Northing	Elevation
GCP159	417294.5014	1138961.765	1130.964
GCP160	415556.9921	1139760.846	889.854
GCP161	427030.4656	1144460.06	1347.364
GCP162	427367.5578	1149988.395	1160.748
GCP163	423257.6321	1143812.707	1298.561
GCP164	421826.9314	1148850.475	594.164
GCP165	414030.4698	1072032.154	971.019
GCP166	410202.4277	1082720.415	804.33
GCP167	426825.6891	1077088.436	1530.075
GCP168	414577.0071	1081447.873	1043.756
GCP169	430106.8856	1085558.318	1555.144
GCP170	427734.9661	1068543.115	1658.389
GCP171	438244.0347	1077652.209	1654.861
GCP172	425443.1482	963127.0646	1465.054
GCP173	423954.9365	961497.1241	1670.27
GCP174	516915.116	1401141.875	780.903
GCP175	518897.0716	1400221.534	958.604
GCP176	539689.1145	1408743.27	498.463
GCP177	531922.0907	1405097.685	606.957
GCP178	525571.9654	1401275.056	680.792
GCP179	503280.439	1386804.417	1132.739
GCP180	502612.4397	1384626.398	1222.458
GCP181	506954.7295	1393022.26	1017.889
GCP182	504520.4127	1390011.983	1067.14
GCP183	504193.6556	1388296.034	1100.16
GCP184	502207.9686	1397061.233	913.07
GCP185	500448.4421	1396218.621	926.458
GCP186	505783.1142	1399728.141	1302.38
GCP187	591732.2644	1608757.702	1180.881
GCP188	595069.2419	1597573.159	859.886
GCP189	582183.6924	1609268.844	879.902
GCP190	589203.9469	1604274.72	686.189
GCP191	584897.0246	1604301.956	665.258
GCP192	592503.3215	1602325.954	982.143
GCP193	572020.4002	1622891.096	1569.07
GCP194	573804.6723	1619325.844	1135.193
GCP195	589849.3705	1631127.833	775.733
GCP196	583730.5961	1625690.948	1212.479
GCP197	484241.2376	1499474.261	317.062
GCP198	482559.221	1498600.749	297.68
GCP199	484174.7824	1500195.68	345.605
GCP200	484468.6331	1500249.953	332.176
GCP201	486840.2268	1498366.873	339.317
GCP202	496672.2806	1494423.049	703.023
GCP203	497963.1119	1494973.502	803.673



ID	Easting	Northing	Elevation
GCP204	485294.7412	1499520.846	373.201
GCP205	437590.5161	1071143.653	1765.846
GCP206	429923.2696	1063587.019	1367.249
GCP207	440170.8097	1077114.345	1737.767
GCP208	417463.8954	1101646.755	1139.349
GCP209	421708.3983	1097053.216	1544.922
GCP210	425255.4864	1101690.354	830.286
GCP211	407990.2807	1093905.324	556.274
GCP212	423138.351	1092701.863	754.18
GCP213	412900.3784	913445.7047	1673.893
GCP214	419048.9946	907640.352	1930.008
GCP215	421688.5453	913432.4206	1483.571
GCP216	422394.0303	908921.5893	1561.839
GCP217	414380.588	914927.7388	1815.32
GCP218	428904.0248	908432.2514	1257.936
GCP219	422206.2285	912928.3742	1479.969
GCP220	429392.399	909320.3803	1285.018
GCP221	422298.4936	913289.4871	1503.758
GCP222	405586.6703	1116619.48	545.052
GCP223	527149.7346	1411128.328	1410.014
GCP224	530313.2248	1413804.552	1009.799
GCP225	523366.9904	1410173.667	1571.301
GCP226	528753.4986	1415254.985	919.732
GCP227	507590.9126	1393692.815	1020.546
GCP228	504733.1207	1392877.665	1489.56
GCP229	506171.537	1394552.606	1304.89
GCP230	499486.9806	1388793.324	1835.834
GCP231	606463.4258	1596008.961	1301.486
GCP232	606493.2706	1592566.183	1249.18
GCP233	597236.8036	1595280.607	790.155
GCP234	608296.9391	1592072.227	1240.528
GCP235	607375.0058	1595449.049	1359.771
GCP236	602647.0424	1589829.321	861.909
GCP237	596723.8456	1590636.134	628.464
GCP238	493562.9002	1398116.469	1365.167
GCP239	511260.6175	1394589.533	1000.336
GCP240	491365.9568	1397037.129	1254.675
GCP241	601371.5577	1617563.497	1732.291
GCP242	587875.5577	1617290.732	662.362
GCP243	601837.5526	1621310.765	1855.74
GCP244	603430.2596	1626473.737	2073.666
GCP245	593105.3779	1620409.375	1417.877
GCP246	591171.2434	1613849.518	849.91
GCP247	586864.9785	1611668.977	610.048
GCP248	598409.5069	1616531.61	1321.909



ID	Easting	Northing	Elevation
GCP249	530414.1177	1412252.127	1271.504
GCP250	459424.892	1220350.09	1312.584
GCP251	460877.4777	1224127.284	1088.746
GCP252	438923.6975	1222341.396	523.372
GCP253	430582.9316	1232443.293	353.046
GCP254	475864.122	1248286.318	1658.531
GCP255	433238.7368	1228630.024	1445.039
GCP256	433214.9937	1228638.556	1445.982
GCP257	431833.2079	1228219.324	1121.639
GCP258	431847.6442	1228247.294	1122.282
GCP259	452713.7488	1239686.836	1293.538
GCP260	452719.5782	1239705.687	1294.575
GCP261	450788.1062	1234653.817	1409.139
GCP262	450787.1233	1234658.683	1409.069
GCP263	454184.4852	1236339.095	1154.898
GCP264	452804.9166	1251785.193	841.074
GCP265	452816.3721	1251791.091	842.049
GCP266	492221.3796	1248256.845	747.026
GCP267	492255.0423	1248257.654	746.779
GCP268	493385.622	1252682.832	836.089
GCP269	493417.1439	1252652.996	831.529
GCP270	433280.4827	1188864.872	917.832
GCP271	433277.3189	1188875.09	918.18
GCP272	439126.5437	1190063.656	1153.627
GCP273	451165.3531	1192549.229	1487.304
GCP274	451177.5784	1192557.351	1487.646
GCP275	397547.8673	1146010.037	884.674
GCP276	399043.9185	1145690.495	773.869
GCP277	399052.7149	1145653.403	774.915
GCP278	400703.3158	1143920.728	929.783
GCP279	400687.1494	1143907.932	929.319
GCP280	396974.264	1145475.71	847.249
GCP281	409474.7033	1150814.651	335.847
GCP282	409466.3279	1150824.129	335.848
GCP283	413017.5895	1145894.274	1159.302
GCP284	412977.7934	1145897.172	1162.983
GCP285	411346.3232	1142604.889	569.228
GCP286	411359.148	1142592.898	569.229
GCP287	411741.5394	1144151.955	504.314
GCP288	411751.9913	1144129.949	504.379
GCP289	406625.854	1149518.996	379.574
GCP290	406653.2486	1149525.903	379.111
GCP291	422102.2921	1145044.988	1174.061
GCP292	422093.6807	1145062.235	1174.278
GCP293	444673.8725	1195371.947	1140.516



ID	Easting	Northing	Elevation
GCP294	416473.6755	1180619.548	1205.836
GCP295	416485.4107	1180631.906	1205.61
GCP296	386054.1144	1152224.659	190.552
GCP297	386049.9749	1152220.172	190.691
GCP298	386017.6391	1152284.726	190.747
GCP299	386024.93	1152283.397	190.834
GCP300	400121.4122	1150299.224	243.566
GCP301	400124.8991	1150298.573	243.532
GCP302	392106.2838	1147567.991	246.605
GCP303	400559.2031	1150258.718	244.832
GCP304	400572.2089	1150258.222	245.039
GCP305	399605.4351	1150546.559	238.107
GCP306	399605.6523	1150533.039	237.802
GCP307	398732.663	1149742.313	395.162
GCP308	398729.7759	1149735.401	395.712
GCP309	398267.1702	1149056.657	423.076
GCP310	398259.0856	1149050.368	423.84
GCP311	416059.6296	1159596.131	1236.889
GCP312	416053.1358	1159598.338	1236.786
GCP313	415128.6038	1160106.327	1189.136
GCP314	415124.2084	1160101.506	1188.815
GCP315	416523.0997	1156423.133	1161.146
GCP316	416518.2285	1156422.384	1161.347
GCP317	433654.8859	1244882.997	874.687
GCP318	433653.143	1244884.427	874.475
GCP319	437767.3733	1244649.807	1219.964
GCP320	437759.729	1244651.08	1219.898
GCP321	436509.4822	1251992.697	904.95
GCP322	436512.939	1251983.026	905.201
GCP323	423542.4162	1284230.624	282.122
GCP324	423541.1114	1284224.687	281.924
GCP325	431412.6321	1283137.938	180.13
GCP326	431408.0717	1283134.856	180.144
GCP327	440035.7347	1286143.01	97.202
GCP328	440041.0284	1286144.384	97.201
GCP329	445378.5243	1288501.962	25.594
GCP330	445373.8271	1288512.221	25.76
GCP331	481873.9255	1262959.921	1371.582
GCP332	481884.8526	1262954.673	1372.69
GCP333	481987.4036	1270946.314	1216.04
GCP334	481974.8194	1270950.054	1216.147
GCP335	486590.7761	1254504.355	1343.04
GCP336	486602.0824	1254510.383	1341.552
GCP337	551421.5017	902941.684	1567.439
GCP338	552102.7966	906187.0196	1710.596



ID	Easting	Northing	Elevation
GCP339	547173.5515	909676.4705	2357.059
GCP340	545219.221	912852.3847	1925.952
GCP341	538776.1751	914569.4734	1710.64
GCP342	544570.648	933063.3771	1633.962
GCP343	537555.1019	934197.0642	1874.166
GCP344	548084.5995	931426.6436	1591.315
GCP345	543488.3751	954658.8602	2176.527
GCP346	543575.9071	954773.2668	2159.603
GCP347	542231.8134	953059.624	1999.624
GCP348	542196.7396	953012.4855	1997.367
GCP349	397296.9159	1079946.996	316.875
GCP350	399440.3642	1080173.022	329.956
GCP351	504358.0587	972566.1931	1521.99
GCP352	504552.0911	972696.4225	1545.62
GCP353	504783.8797	972515.4291	1522.315
GCP354	504751.9452	972510.4884	1522.195
GCP355	504950.7178	972186.3823	1520.072
GCP356	504903.7226	972218.2788	1520.258
GCP357	504138.7028	975051.666	1534.852
GCP358	504174.4619	975074.6566	1534.833
GCP359	505413.3574	976382.6439	1535.324
GCP360	505388.8811	976378.8258	1535.425
GCP361	504021.2538	976705.1114	1587.822
GCP362	504385.3982	979535.3129	1646.925
GCP363	504385.4105	979535.3195	1646.925
GCP364	504385.3995	979535.3199	1646.857
GCP365	508481.9665	979937.3293	1525.581
GCP366	425191.6383	968437.1166	1696.392
GCP367	425194.5621	968432.1229	1696.177
GCP368	425182.1774	968668.503	1704.783
GCP369	426893.856	949533.7793	1419.988
GCP370	426912.1187	949529.9547	1422.73
GCP371	423755.7408	951987.9597	1825.897
GCP372	423766.4414	951989.6335	1825.467
GCP373	426792.3559	953655.0483	1728.08
GCP374	426796.0789	953640.9814	1727.839
GCP375	408156.558	1119052.461	525.983
GCP376	408162.3808	1119062.354	526.207
GCP377	406579.3424	1119579.176	288.629
GCP378	406587.4892	1119591.143	288.828
GCP379	417406.1746	1072529.912	678.171
GCP380	417408.2983	1072519.415	678.292
GCP381	417756.4505	1086539.873	1442.338
GCP382	417770.2768	1086540.545	1442.797
GCP383	421735.2324	1086249.346	1692.392



ID	Easting	Northing	Elevation
GCP384	421748.6816	1086239.139	1692.28
GCP385	403656.5145	1080864.206	584.728
GCP386	403642.6824	1080875.527	585.68
GCP387	405403.7642	1084177.579	717.943
GCP388	405421.6478	1084175.784	718.181
GCP389	407595.5915	1073443.119	469.796
GCP390	407594.9717	1073424.467	467.014
GCP391	416135.3392	1063930.216	1038.856
GCP392	416136.0572	1063919.91	1038.153
GCP393	419183.8087	1064523.781	1777.558
GCP394	419182.1809	1064519.599	1777.519
GCP395	423641.8007	1100848.552	1312.694
GCP396	423641.8152	1100843.788	1312.623
GCP397	421373.2577	1102205.171	1443.251
GCP398	421372.8185	1102201.177	1443.191
GCP399	403973.1276	1112196.26	771.099
GCP400	403983.0171	1112221.114	768.593
GCP401	404453.5521	1114224.818	577.971
GCP402	405111.5383	1114979.384	463.347
GCP403	405112.5984	1114967.473	462.95
GCP404	431402.2031	928456.0055	1263.996
GCP405	429935.4449	929575.3885	1275.578
GCP406	429946.3976	929591.4703	1275.375
GCP407	422571.4557	932324.6633	1275.752
GCP408	422550.4714	932335.5944	1275.21
GCP409	425239.695	932208.5994	1276.434
GCP410	425234.2706	932205.1277	1276.62
GCP411	422972.6386	935876.2052	1575.127
GCP412	421605.2598	935280.9329	1460.942
GCP413	421608.2351	935285.041	1461.332
GCP414	419148.0139	927912.4198	1511.992
GCP415	419145.7084	927907.627	1511.914
GCP416	415305.836	934627.7182	1750.318
GCP417	415300.9257	934615.5377	1750.798
GCP418	415285.2383	934616.8298	1750.445
GCP419	416403.4763	926925.8001	1523.211
GCP420	417545.7108	927230.9805	1511.275
GCP421	417540.2236	927231.4746	1511.273
GCP422	416299.4265	920578.6314	1685.655
GCP423	418679.2248	927946.3428	1509.651
GCP424	418665.323	927944.9321	1509.603
GCP425	426306.8676	935372.3863	1265.368
GCP426	426312.0529	935371.6475	1265.251
GCP427	423614.1942	940878.8765	2446.887
GCP428	423615.2342	940858.0141	2445.38



ID	Easting	Northing	Elevation
GCP429	576737.1069	906963.6765	1730.57
GCP430	576735.9917	906970.1125	1730.686
GCP431	587004.9884	914875.9118	2507.661
GCP432	586999.9142	914880.8411	2507.909
GCP433	573776.0217	909354.5608	1617.292
GCP434	573781.3537	909357.1114	1617.381
GCP435	579529.8905	900964.5202	1882.099
GCP436	579528.6415	900970.2126	1881.975
GCP437	577321.4431	903059.9854	1906.42
GCP438	577318.2806	903044.3025	1907.263
GCP439	586759.8136	902776.0022	1725.116
GCP440	586764.5145	902770.938	1725.158
GCP441	536048.8444	905736.7219	1543.057
GCP442	536056.7487	905743.0224	1542.987
GCP443	534369.9985	901546.8953	1572.43
GCP444	534373.3586	901554.8868	1572.545
GCP445	535927.1649	893705.9091	1615.688
GCP446	535928.2616	893713.592	1615.957
GCP447	531220.6956	895833.9026	1772.404
GCP448	531227.2117	895835.6697	1772.097
GCP449	541623.0756	891130.6428	1587.569
GCP450	541630.0739	891124.7967	1587.401
GCP451	549042.8532	888331.7712	1868.727
GCP452	549039.0985	888324.6953	1868.58
GCP453	554248.2392	931980.2959	1758.882
GCP454	554247.8095	931989.6942	1758.772
GCP455	552659.6267	936820.0989	1616.77
GCP456	552649.6776	936814.3476	1616.779
GCP457	551487.1295	939808.9374	1518.002
GCP458	551492.0743	939817.9702	1518.129
GCP459	549213.1144	942934.9502	1514.822
GCP460	549227.6901	942963.3566	1514.408
GCP461	538979.5149	960109.7436	1719.795
GCP462	538959.5347	960104.2058	1718.892
GCP463	538076.1861	962103.4681	1529.022
GCP464	538081.3197	962094.9429	1529.229
GCP465	503508.3526	968405.0879	1536.191
GCP466	503507.0093	968400.864	1536.219
GCP467	506051.8489	977162.6016	1537.974
GCP468	506058.409	977161.8923	1537.891
GCP469	474927.2807	1491717.978	236.273
GCP470	476398.8182	1493558.517	254.625
GCP471	476409.1727	1493553.949	254.733
GCP472	478904.7463	1496231.771	284.178
GCP473	478897.6569	1496235.257	284.372



ID	Easting	Northing	Elevation
GCP474	480550.8806	1497644.704	280.675
GCP475	480526.119	1497629.521	280.798
GCP476	476870.0968	1494244.543	262.922
GCP477	477880.9658	1495606.723	276.587
GCP478	492122.2032	1488146.427	986.802
GCP479	492132.0728	1488121.293	986.685
GCP480	492903.3648	1487247.695	909.084
GCP481	492901.9551	1487261.134	909.573
GCP482	474280.2936	1490967.872	238.37
GCP483	474286.1401	1490971.884	238.286
GCP484	474882.1319	1491545.425	236.314
GCP485	474895.2987	1491561.234	236.079
GCP486	476033.8961	1492841.423	244.764
GCP487	476037.783	1492845.053	244.59
GCP488	476206.861	1492999.611	256.46
GCP489	476208.2767	1492985.216	256.531
GCP490	477461.6906	1494946.914	269.976
GCP491	479441.6374	1496723.094	275.362
GCP492	575343.1795	1608887.952	597.362
GCP493	575344.964	1608866.886	597.329
GCP494	574929.0079	1608183.957	594.968
GCP495	574928.3727	1608201.826	595.146
GCP496	572768.5993	1611216.891	630.493
GCP497	572812.0338	1611227.481	627.527
GCP498	567955.9262	1615114.413	656.779
GCP499	567970.6787	1615110.285	656.764
GCP500	571533.0618	1613611.434	643.218
GCP501	571547.7867	1613620.497	643.69
GCP502	572641.2055	1615180.521	873.591
GCP503	576551.0095	1608322.289	591.313
GCP504	576546.6692	1608303.898	591.14
GCP505	591010.7365	1597846.539	671.869
GCP506	591009.6645	1597836.19	671.656
GCP507	588367.1037	1618775.205	659.245
GCP508	588366.3649	1618791.321	659.599
GCP509	590123.6896	1624250.753	706.135
GCP510	590113.3908	1624253.86	707.451
GCP511	587161.2104	1622061.178	1011.696
GCP512	590165.9286	1591821.65	492.416
GCP513	588287.2464	1595806.283	519.375
GCP514	588283.208	1595796.883	520.044
GCP515	589772.3345	1599550.937	610.561
GCP516	589744.2273	1599529.683	610.826
GCP517	587035.7435	1600533.574	535.491
GCP518	592923.7235	1587989.554	487.181



ID	Easting	Northing	Elevation
GCP519	592938.1536	1587983.188	487.511
GCP520	595743.2614	1582033.506	463.028
GCP521	595750.5917	1582028.855	462.9
GCP522	591423.4149	1576189.077	435.179
GCP523	591424.6638	1576183.256	435.173
GCP524	588311.1392	1586937.049	731.942
GCP525	588305.261	1586910.367	733.637
GCP526	589767.0917	1588336.729	604.27
GCP527	589763.5382	1588332.218	604.964
GCP528	586488.9431	1590207.868	574.317
GCP529	586482.6519	1590196.236	574.283
GCP530	582859.3926	1591024.563	613.025
GCP531	582860.8917	1591016.355	612.622
GCP532	580953.2396	1600745.532	815.858
GCP533	580947.2476	1600741.676	816.199
GCP534	574675.7429	1594342.941	981.228
GCP535	574678.1186	1594347.23	980.89
GCP536	574248.0369	1593828.955	1050.1
GCP537	574224.2136	1593802.579	1052.243
GCP538	572974.1005	1595104.753	1225.528
GCP539	572977.1113	1595109.337	1225.401
GCP540	579326.3171	1594329.06	1000.961
GCP541	579323.5267	1594328.328	1001.036
GCP542	589536.2115	1596056.782	517.919
GCP543	589525.6133	1596071.466	517.059
GCP544	586724.3954	1601257.007	532.998
GCP545	586721.4797	1601243.642	533.349

Table 7: LiDAR Control Point Coordinates

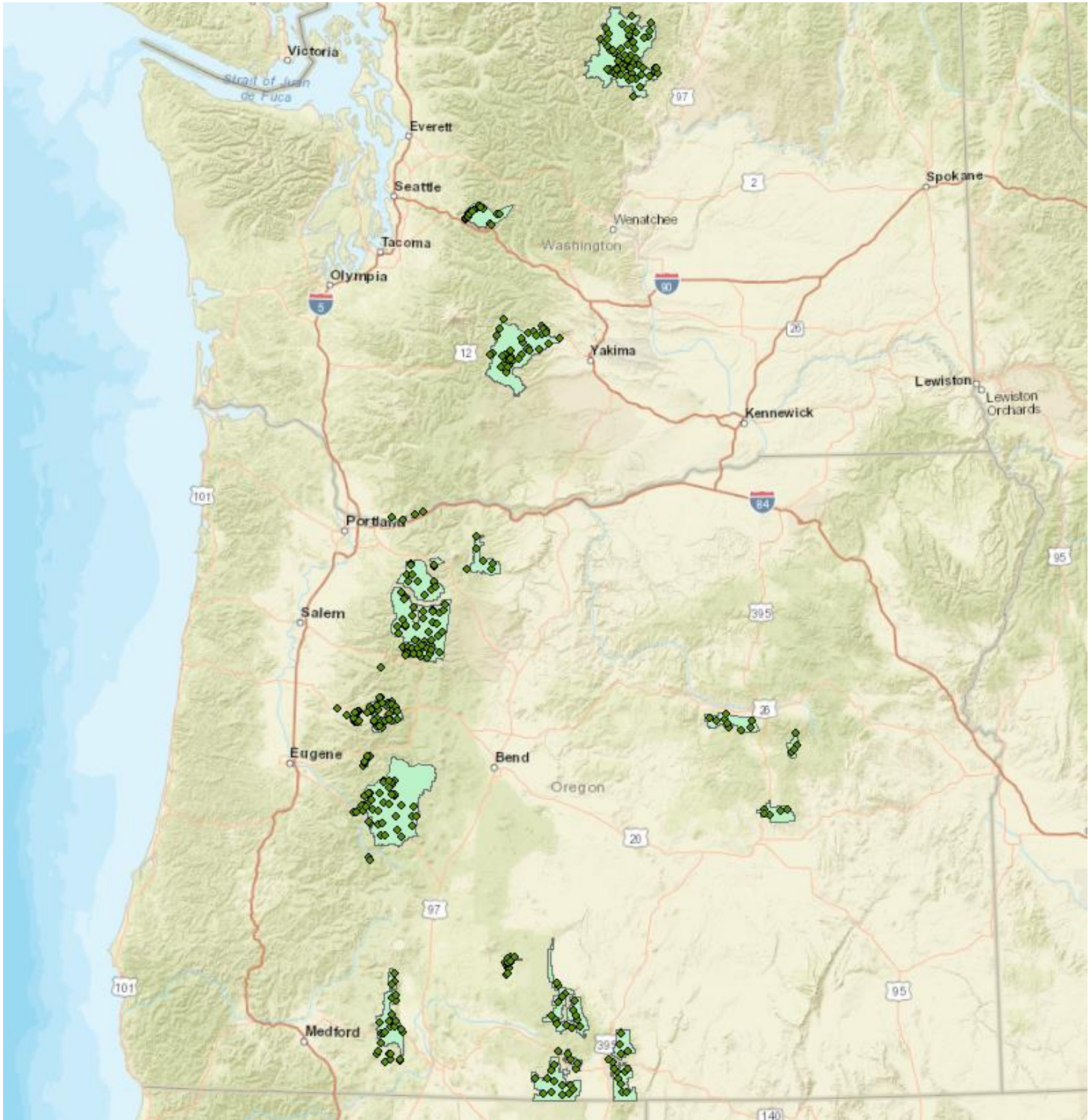


Figure 3: LiDAR Control Point Distribution

SECTION III: DATA PRODUCTION

1. Calibration/Classification

a. LiDAR Point Cloud Generation

Atlantic used Leica software products to download the IPAS ABGNSS/IMU data and raw laser scan files from the airborne system. Waypoint Inertial Explorer is used to extract the raw IPAS ABGNSS/IMU data, which is further processed in combination with controlled base stations to provide the final Smoothed Best Estimate Trajectory (SBET) for each mission. The SBETs are combined with the raw laser scan files to export the LiDAR ASCII Standard (*.las) formatted swath point clouds.

b. Coordinate Reference System

Projection: NAD 1983 Oregon Washington Albers
Horizontal Datum: NAD83
Vertical Datum: NAVD88
Spheroid: GRS1980
Horizontal Units: meters
Vertical Units: meters

c. LiDAR Point Cloud Statistics

Category	Value
Total Points (Nominal)	152,382,940,749
Nominal Pulse Spacing (M)	0.3364
Nominal Pulse Density (PLS/M²)	8.8389
Total Points (Aggregate)	122,227,260,126
Aggregate Pulse Spacing (M)	0.2306
Aggregate Pulse Density (PLS/M²)	18.7990

Table 8: LiDAR Point Cloud Statistics

d. Smooth Surface Repeatability (Interswath)

Departures from planarity of first returns within single swaths in non-vegetated areas were assessed at multiple locations with hard surface areas (parking lots or large rooftops) inside the project area. Each area was evaluated using signed difference rasters (maximum elevation – minimum elevation) at a cell size equal to 2 x ANPS, rounded to the next integer.

e. LiDAR Calibration

Using a combination of GeoCue, TerraScan and TerraMatch; overlapping swath point clouds are corrected for any orientation or linear deviations to obtain the best fit swath-to-swath calibration. Relative calibration was evaluated using advanced plane-matching analysis and parameter corrections derived. This process was repeated interactively until residual errors between overlapping swaths, across all project missions, was reduced to ≤2cm. A final analysis of the calibrated lidar is preformed using a TerraMatch tie line report for an overall statistical model of the project area. Individual control point assessments for this project can be found in Section VI of this report.

Upon completion of the data calibration, a complete set of elevation difference intensity rasters (dZ Orthos) are produced. A user-defined color ramp is applied depicting the offsets between overlapping swaths based on project specifications. The dZ orthos provide an opportunity to review the data calibration in a qualitative manner. Atlantic assigns green to all offset values that fall below the required RMSDz requirement of the project. A yellow color is assigned for offsets that fall between the RMSDz value and 1.5x of that value. Finally, red values are assigned to all values that fall beyond 1.5x of the RMSDz requirements of the project.

f. LiDAR Classification

Multiple automated filtering routines are applied to the calibrated LiDAR point cloud identifying and extracting bare-earth and above ground features. GeoCue, TerraScan, and TerraModeler software was used for the initial batch processing, visual inspection and any manual editing of the LiDAR point clouds. Classified point clouds were cut to match the tile index and its corresponding tile names and delivered in .laz format.

Code	Description
1	Unclassified
2	Ground
7	Low Point (Noise)
18	High Noise

Table 92: LiDAR Point Classification Codes and Descriptions

a. LiDAR Intensity Imagery

LiDAR intensity imagery was created from the final calibrated and classified lidar point cloud. Intensity images were produced from all classified points and posted to a 0.5-meter cell size. Intensity images were cut to match the tile index and its corresponding tile names and delivered in .img format.

b. Bare-Earth Surface – Digital Elevation Model (DEM)

Bare earth Digital Elevation Models (DEMs) were derived using the bare earth (ground) LiDAR points. All DEMs were created with a grid spacing of 1 meter. DEMs were cut to match the tile index and its corresponding tile names and delivered in .img format.

SECTION IV: ACCURACY ASSESSMENT

1. Vertical Accuracy Assessment

a. Requirements

Per the table below, the Vertical Accuracy Assessment utilized the required parameters for Vertical Data Accuracy Class IV.

Vertical Data Accuracy Class	RMSEz in Non-Vegetated Terrain (cm)	Non-Vegetated Vertical Accuracy (NVA) at 95% Confidence Level (cm)	Vegetated Vertical Accuracy (VVA) at 95th Percentile (cm)
I	1.0	2.0	2.9
II	2.5	4.9	7.4
III	5.0	9.8	14.7
IV	10.0	19.6	29.4
V	12.5	24.5	36.8
VI	20.0	39.2	58.8
VII	33.3	65.3	98.0
VIII	66.7	130.7	196.0
IX	100.0	196.0	294.0
X	333.3	653.3	980.0

Table 10: Vertical Accuracy Standards, Source: ASPRS Positional Accuracy Standards for Digital Geospatial Data v1.0 (2014)

*The terms NVA and VVA are from the American Society for Photogrammetry and Remote Sensing (ASPRS) Positional Accuracy Standards for Digital Geospatial Data v1.0 (2014). The term NVA refers to assessments in clear, open areas (which typically produce only single LiDAR returns); the term VVA refers to assessments in vegetated areas (typically characterized by multiple return LiDAR).

b. Results

An overall statistical assessment of the check points can be found in the following two tables (values provided in meters):

Broad Land Cover Type	Points (#)	RMSEz	Confidence Level (95%)	Percentile (95th)
NVA (Point Cloud)	462	0.0622	0.1219	0.1160
NVA (DEM)	462	0.0636	0.1246	0.1254

Table 11: NVA Accuracies

SECTION V: CERTIFICATION STATEMENT

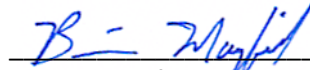
This accuracy assessment confirms that the data may be used for the intended applications stated in Section I of this document. This dataset may also be used as a topographic input for other applications, but the user should be aware that this LiDAR dataset was designed with a specific purpose and was not intended to meet specifications and/or requirements of users outside of the United States Geological Survey.

It should also be noted that LiDAR points do not represent a continuous surface model. LiDAR points are discrete measurements of the surface and any values derived within a triangle of three LiDAR points are interpolated. As such, the user should not use the resultant LiDAR dataset for vertical placement of a planimetric feature such as a headwall, building footprint or any other planimetric feature unless there is an associated LiDAR point that can be reasonably located on this structure.

Consideration should be given by the end user of this dataset to the fact that this LiDAR dataset was developed differently and separately than previous LiDAR datasets that may be available for this geographic location. It is likely that the data in this project was created using different geodetic control, a different Geoid, newer LiDAR technology and more up-to-date processing techniques. As such, any direct comparative analysis performed between this dataset and previous datasets could result in misleading or inaccurate results. Users are encouraged to proceed with caution while performing this type of comparative analysis and to completely understand the variables that make each of these datasets unique and not corollary.

It is encouraged that the user refers to the full FGDC Metadata and project reports for a complete understanding on the content of this dataset.

I, hereby, certify to the extent of my knowledge that the statements and statistics represented in this document are true and factual.



Brian J. Mayfield, ASPRS Certified Photogrammetrist #R1276





SECTION VI: CONTROL POINT ASSESSMENTS

1. Point Cloud Check Point Assessment

Point ID	Given (X)	Given (Y)	Given (Z)	Laser (Z)	Delta (Z)	Report Point Type
GCP001	692885.1967	1081781.8890	1765.0390	1764.9730	-0.0660	NVA
GCP002	685689.3521	1078637.4230	1719.1830	1719.2050	0.0220	NVA
GCP003	657500.6117	1138619.5350	1590.2330	1590.1740	-0.0590	NVA
GCP004	649059.0757	1143509.4740	1929.7610	1929.7180	-0.0430	NVA
GCP005	643740.7951	1145661.8900	2098.7640	2098.7290	-0.0350	NVA
GCP006	665902.8814	1137215.3150	1547.0930	1547.0680	-0.0250	NVA
GCP007	700559.2770	1121641.7440	1533.7490	1533.7440	-0.0055	NVA
GCP008	704183.0127	1126557.9640	1620.5790	1620.5540	-0.0250	NVA
GCP009	681584.7185	1082533.4380	1639.5370	1639.5070	-0.0300	NVA
GCP010	582725.3416	927245.0122	2050.6000	2050.6290	0.0290	NVA
GCP011	585133.3779	900966.0263	1854.4930	1854.4580	-0.0350	NVA
GCP012	522595.9577	896177.3967	1630.9950	1630.9020	-0.0930	NVA
GCP013	546877.6932	886068.4740	1685.3090	1685.3220	0.0130	NVA
GCP014	547624.7998	891401.2713	1785.5450	1785.5570	0.0120	NVA
GCP015	550252.3749	950116.6871	1460.1610	1460.3060	0.1450	NVA
GCP016	407336.8866	1048857.2770	668.4480	668.4550	0.0073	NVA
GCP017	408101.5664	1047496.1550	700.9710	700.9560	-0.0150	NVA
GCP018	423136.5727	1092709.7900	754.2840	754.3000	0.0160	NVA
GCP019	415418.0881	1093177.5960	784.0110	783.8600	-0.1510	NVA
GCP020	409123.7957	1089016.2970	820.5830	820.6100	0.0270	NVA
GCP021	438714.2054	1084221.2940	1610.9230	1610.9150	-0.0076	NVA
GCP023	506072.2079	979712.4559	1537.7130	1537.6660	-0.0470	NVA
GCP024	503380.9674	967901.1501	1531.8340	1531.8590	0.0260	NVA
GCP025	503488.4626	967593.8855	1526.0360	1526.0140	-0.0220	NVA
GCP026	503251.3021	967739.2528	1531.8560	1531.8730	0.0170	NVA
GCP028	451365.3720	1195445.3310	1082.5350	1082.5730	0.0380	NVA
GCP029	455412.0891	1201920.8840	1125.2980	1125.2170	-0.0810	NVA
GCP030	455167.6767	1211048.2260	994.1150	994.1600	0.0450	NVA
GCP031	458132.5368	1205597.0980	1294.7850	1294.6610	-0.1250	NVA
GCP032	451312.3457	1195505.1620	1087.7080	1087.7580	0.0500	NVA
GCP033	450838.5939	1199954.3310	1036.6210	1036.5990	-0.0220	NVA
GCP034	452203.5951	1219838.9070	1133.0590	1133.0390	-0.0200	NVA
GCP036	451588.6197	1211878.5300	765.7330	765.6920	-0.0410	NVA
GCP037	456563.2913	1218689.9440	1302.1330	1302.1510	0.0180	NVA
GCP038	446131.9538	1198839.5670	1395.3100	1395.3080	-0.0021	NVA
GCP039	451601.1935	1211861.3610	766.1970	766.1940	-0.0028	NVA



Point ID	Given (X)	Given (Y)	Given (Z)	Laser (Z)	Delta (Z)	Report Point Type
GCP040	452176.9895	1219836.6440	1133.4380	1133.4570	0.0190	NVA
GCP041	456585.4242	1218706.2700	1303.8800	1303.9740	0.0940	NVA
GCP042	445669.1495	1219729.3610	580.3050	580.3320	0.0270	NVA
GCP044	433389.6761	1209421.4080	1275.2930	1275.4200	0.1270	NVA
GCP045	428400.9990	1204637.6990	933.5190	933.5390	0.0200	NVA
GCP046	431003.4807	1213743.0000	716.7520	716.8350	0.0830	NVA
GCP047	427349.8030	1209109.9880	1011.9550	1012.0330	0.0780	NVA
GCP048	433381.0546	1209436.8560	1275.0830	1275.0670	-0.0160	NVA
GCP049	441476.1653	1240571.0730	1184.6700	1184.6780	0.0082	NVA
GCP050	434673.0301	1240132.4060	914.7190	914.6930	-0.0260	NVA
GCP051	434181.1331	1193037.5360	1141.3870	1141.3700	-0.0170	NVA
GCP052	430851.5242	1194408.9980	1419.6240	1419.6580	0.0340	NVA
GCP053	434679.1314	1194604.9810	732.3480	732.4120	0.0640	NVA
GCP054	443201.6895	1193052.8560	701.2710	701.2610	-0.0100	NVA
GCP055	437494.7415	1193417.3220	740.0160	740.0340	0.0180	NVA
GCP056	446024.7663	1195367.2020	1258.4770	1258.4760	-0.0007	NVA
GCP057	439648.0055	1199489.5720	972.7310	972.7800	0.0490	NVA
GCP058	443234.4369	1193094.0210	703.4400	703.5120	0.0720	NVA
GCP059	416264.2521	1180532.2880	1182.7490	1182.7520	0.0026	NVA
GCP062	408024.6382	1153390.2660	341.9100	341.8780	-0.0320	NVA
GCP063	420796.6784	1155902.9330	788.5940	788.5350	-0.0590	NVA
GCP064	423386.7857	1157291.1800	1136.9870	1136.9520	-0.0350	NVA
GCP065	420218.3958	1153845.9710	541.8230	541.8380	0.0150	NVA
GCP066	421629.3675	1154823.5750	886.8900	886.8920	0.0024	NVA
GCP068	426725.9073	1152819.1700	1100.9750	1100.9840	0.0085	NVA
GCP069	414125.7885	1154999.2920	1033.8290	1033.8090	-0.0200	NVA
GCP070	423694.6573	1154720.6190	1178.7610	1178.7340	-0.0270	NVA
GCP071	426718.5096	1152800.1080	1100.8690	1100.8910	0.0220	NVA
GCP072	412840.0677	1154294.2350	947.9970	947.9300	-0.0670	NVA
GCP073	425255.4864	1101690.3540	830.2860	830.2740	-0.0120	NVA
GCP074	417463.8954	1101646.7550	1139.3490	1139.2470	-0.1020	NVA
GCP075	421708.3983	1097053.2160	1544.9220	1544.9460	0.0240	NVA
GCP076	408736.0705	1093991.4310	663.7430	663.7240	-0.0190	NVA
GCP077	425570.8950	1091666.4180	760.0700	760.1030	0.0330	NVA
GCP079	425052.6875	1092960.2000	916.9670	916.8840	-0.0830	NVA
GCP080	528045.0429	1417369.8090	624.3720	624.4580	0.0860	NVA
GCP081	514121.7641	1406057.1650	1715.2620	1715.2500	-0.0120	NVA
GCP082	513655.3707	1408467.9460	1607.7610	1607.7270	-0.0340	NVA
GCP083	518243.8889	1411825.3120	1346.9380	1347.1350	0.1970	NVA



Point ID	Given (X)	Given (Y)	Given (Z)	Laser (Z)	Delta (Z)	Report Point Type
GCP084	522337.2496	1413094.2580	1390.3100	1390.2430	-0.0670	NVA
GCP085	501883.2172	1391419.1360	1655.3600	1655.3270	-0.0330	NVA
GCP086	502243.4427	1393873.4710	1512.3450	1512.3180	-0.0270	NVA
GCP087	513296.8659	1396680.4350	898.4160	898.4390	0.0230	NVA
GCP088	517864.6169	1402021.5790	774.9630	774.8430	-0.1200	NVA
GCP089	506007.5643	1395714.6810	1256.2450	1256.1580	-0.0870	NVA
GCP090	496079.5303	1410754.6010	1313.0040	1313.0350	0.0310	NVA
GCP091	498257.6483	1414623.4720	1197.1930	1197.1610	-0.0320	NVA
GCP093	581749.4131	1600209.6990	737.5690	737.5030	-0.0660	NVA
GCP094	582999.0118	1597620.1070	733.5760	733.5780	0.0024	NVA
GCP095	577975.7761	1606011.3750	632.0800	632.0690	-0.0110	NVA
GCP096	581418.7370	1603176.1540	584.0460	583.9960	-0.0500	NVA
GCP097	586081.3645	1597709.5450	574.4920	574.4440	-0.0480	NVA
GCP098	580023.3562	1595476.5870	1047.8440	1047.8630	0.0190	NVA
GCP099	583621.8577	1594911.5540	724.0120	724.0470	0.0350	NVA
GCP100	577255.7510	1592111.4300	757.4460	757.4280	-0.0180	NVA
GCP101	580076.5582	1591115.1320	738.1460	738.1430	-0.0028	NVA
GCP102	682013.3627	1079259.5460	1628.2270	1628.2940	0.0670	NVA
GCP103	698212.6183	1081795.5050	1646.3350	1646.3140	-0.0210	NVA
GCP104	672733.1686	1139242.8230	1485.0300	1485.0330	0.0029	NVA
GCP105	654623.3748	1144871.1810	1232.7940	1232.8230	0.0290	NVA
GCP106	656517.3114	1141845.8880	1375.3470	1375.4240	0.0770	NVA
GCP107	673449.7459	1143988.8190	1289.1130	1289.1170	0.0042	NVA
GCP108	655182.0951	1148188.4210	940.2580	940.2610	0.0034	NVA
GCP109	703716.3776	1135330.0870	2431.6920	2431.6790	-0.0130	NVA
GCP110	702726.0078	1124195.2020	1622.7100	1622.7510	0.0410	NVA
GCP111	582737.6467	913029.2646	1971.2140	1971.1320	-0.0820	NVA
GCP112	581708.6092	919819.2515	2153.7690	2153.7200	-0.0490	NVA
GCP113	582917.3523	892665.3540	1867.2790	1867.2320	-0.0470	NVA
GCP114	583653.6391	886312.1038	1914.8730	1914.9010	0.0280	NVA
GCP115	580696.8282	896413.5386	1891.4850	1891.4980	0.0130	NVA
GCP116	586198.9052	886091.8837	2061.8510	2061.8170	-0.0340	NVA
GCP117	533890.2122	886612.2117	1636.4790	1636.5060	0.0270	NVA
GCP118	528515.6797	885153.7767	1667.8100	1667.8410	0.0310	NVA
GCP119	541856.3241	884185.3420	1759.8500	1759.8000	-0.0500	NVA
GCP120	536918.8825	936906.0842	1827.6830	1827.7100	0.0270	NVA
GCP121	534042.3645	939272.5295	2038.3850	2038.4260	0.0410	NVA
GCP122	539266.0345	949327.2606	1999.5150	1999.4780	-0.0370	NVA
GCP124	404058.7546	1084751.5720	373.0300	372.9910	-0.0390	NVA



Point ID	Given (X)	Given (Y)	Given (Z)	Laser (Z)	Delta (Z)	Report Point Type
GCP126	402717.9903	1085435.6030	543.9040	543.8910	-0.0130	NVA
GCP127	423189.1173	1099388.8380	1165.1190	1165.1000	-0.0190	NVA
GCP128	407500.9654	1092469.0600	470.5910	470.7070	0.1160	NVA
GCP129	404485.8432	1091339.1700	758.5990	758.3200	-0.2790	NVA
GCP130	417918.8343	1102286.9090	1219.3160	1219.3070	-0.0089	NVA
GCP131	504033.3742	976674.4922	1587.5080	1587.4870	-0.0210	NVA
GCP132	504601.9494	978030.8745	1558.2630	1558.3000	0.0370	NVA
GCP133	455163.7984	1211042.4450	994.2190	994.2430	0.0240	NVA
GCP134	449330.7093	1205593.4280	1043.6670	1043.5220	-0.1450	NVA
GCP135	442037.5903	1192146.7450	652.4830	652.5230	0.0400	NVA
GCP136	448183.1943	1193920.5380	813.2050	813.2290	0.0240	NVA
GCP137	440915.9873	1209365.6200	760.3110	760.2860	-0.0250	NVA
GCP138	459432.6162	1220335.5080	1314.6420	1314.5410	-0.1010	NVA
GCP139	460882.5632	1224105.4860	1089.9520	1089.9730	0.0210	NVA
GCP140	445822.4773	1214455.7640	1287.4760	1287.3850	-0.0910	NVA
GCP141	430586.6470	1232453.8970	352.8960	352.8660	-0.0300	NVA
GCP142	438921.1034	1222348.6820	522.9230	522.7520	-0.1710	NVA
GCP143	446476.3285	1230561.9600	1178.6560	1178.6310	-0.0250	NVA
GCP144	441784.8449	1194269.8180	1000.6970	1000.6190	-0.0780	NVA
GCP146	475853.5464	1248282.0350	1657.9680	1657.9510	-0.0170	NVA
GCP147	433637.4985	1190947.4560	546.0920	546.1720	0.0800	NVA
GCP148	434842.6326	1190404.7290	660.4230	660.3410	-0.0820	NVA
GCP149	443393.9894	1188597.9700	1073.2900	1073.2970	0.0068	NVA
GCP150	442362.3359	1190260.3910	949.2380	949.1890	-0.0490	NVA
GCP151	448302.8830	1187260.5850	1094.3950	1094.3290	-0.0660	NVA
GCP152	449870.0368	1189891.8040	1132.4160	1132.4030	-0.0130	NVA
GCP153	457076.2093	1190900.3990	1560.9230	1560.9120	-0.0110	NVA
GCP156	416392.8695	1143563.1980	1125.8530	1125.8910	0.0380	NVA
GCP157	419036.3047	1143973.7120	1226.0630	1226.0240	-0.0390	NVA
GCP158	413373.1254	1140337.8370	874.8550	874.8300	-0.0250	NVA
GCP159	417294.5014	1138961.7650	1130.9640	1130.9100	-0.0540	NVA
GCP160	415556.9921	1139760.8460	889.8540	889.9580	0.1040	NVA
GCP161	427030.4656	1144460.0600	1347.3640	1347.2940	-0.0700	NVA
GCP162	427367.5578	1149988.3950	1160.7480	1160.7640	0.0160	NVA
GCP163	423257.6321	1143812.7070	1298.5610	1298.4820	-0.0790	NVA
GCP164	421826.9314	1148850.4750	594.1640	594.0220	-0.1420	NVA
GCP165	414030.4698	1072032.1540	971.0190	970.8700	-0.1490	NVA
GCP166	410202.4277	1082720.4150	804.3300	804.3280	-0.0023	NVA
GCP167	426825.6891	1077088.4360	1530.0750	1530.0510	-0.0240	NVA



Point ID	Given (X)	Given (Y)	Given (Z)	Laser (Z)	Delta (Z)	Report Point Type
GCP168	414577.0071	1081447.8730	1043.7560	1043.7530	-0.0026	NVA
GCP169	430106.8856	1085558.3180	1555.1440	1555.1250	-0.0200	NVA
GCP170	427734.9661	1068543.1150	1658.3890	1658.3400	-0.0490	NVA
GCP171	438244.0347	1077652.2090	1654.8610	1654.8650	0.0045	NVA
GCP174	516915.1160	1401141.8750	780.9030	780.9720	0.0690	NVA
GCP175	518897.0716	1400221.5340	958.6040	958.6430	0.0390	NVA
GCP176	539689.1145	1408743.2700	498.4630	498.5360	0.0730	NVA
GCP177	531922.0907	1405097.6850	606.9570	607.0060	0.0490	NVA
GCP178	525571.9654	1401275.0560	680.7920	680.8300	0.0380	NVA
GCP179	503280.4390	1386804.4170	1132.7390	1132.7240	-0.0160	NVA
GCP180	502612.4397	1384626.3980	1222.4580	1222.4990	0.0410	NVA
GCP181	506954.7295	1393022.2600	1017.8890	1017.8530	-0.0360	NVA
GCP182	504520.4127	1390011.9830	1067.1400	1067.1920	0.0520	NVA
GCP183	504193.6556	1388296.0340	1100.1600	1100.1450	-0.0150	NVA
GCP184	502207.9686	1397061.2330	913.0700	913.1240	0.0540	NVA
GCP185	500448.4421	1396218.6210	926.4580	926.4040	-0.0540	NVA
GCP186	505783.1142	1399728.1410	1302.3800	1302.2200	-0.1600	NVA
GCP187	591732.2644	1608757.7020	1180.8810	1180.8410	-0.0400	NVA
GCP188	595069.2419	1597573.1590	859.8860	859.9070	0.0210	NVA
GCP189	582183.6924	1609268.8440	879.9020	879.8820	-0.0200	NVA
GCP190	589203.9469	1604274.7200	686.1890	686.2110	0.0220	NVA
GCP191	584897.0246	1604301.9560	665.2580	665.2410	-0.0170	NVA
GCP192	592503.3215	1602325.9540	982.1430	982.1550	0.0120	NVA
GCP193	572020.4002	1622891.0960	1569.0700	1568.9480	-0.1220	NVA
GCP194	573804.6723	1619325.8440	1135.1930	1135.2860	0.0930	NVA
GCP195	589849.3705	1631127.8330	775.7330	775.7480	0.0150	NVA
GCP196	583730.5961	1625690.9480	1212.4790	1212.4940	0.0150	NVA
GCP197	484241.2376	1499474.2610	317.0620	317.1180	0.0560	NVA
GCP198	482559.2210	1498600.7490	297.6800	297.6750	-0.0053	NVA
GCP199	484174.7824	1500195.6800	345.6050	345.6070	0.0022	NVA
GCP200	484468.6331	1500249.9530	332.1760	332.1950	0.0190	NVA
GCP201	486840.2268	1498366.8730	339.3170	339.2000	-0.1170	NVA
GCP202	496672.2806	1494423.0490	703.0230	702.9410	-0.0820	NVA
GCP203	497963.1119	1494973.5020	803.6730	803.6500	-0.0230	NVA
GCP204	485294.7412	1499520.8460	373.2010	373.1860	-0.0150	NVA
GCP205	437590.5161	1071143.6530	1765.8460	1765.8480	0.0023	NVA
GCP206	429923.2696	1063587.0190	1367.2490	1367.2650	0.0160	NVA
GCP207	440170.8097	1077114.3450	1737.7670	1737.7580	-0.0093	NVA
GCP208	417463.8954	1101646.7550	1139.3490	1139.2470	-0.1020	NVA



Point ID	Given (X)	Given (Y)	Given (Z)	Laser (Z)	Delta (Z)	Report Point Type
GCP209	421708.3983	1097053.2160	1544.9220	1544.9460	0.0240	NVA
GCP210	425255.4864	1101690.3540	830.2860	830.2740	-0.0120	NVA
GCP211	407990.2807	1093905.3240	556.2740	556.3120	0.0380	NVA
GCP212	423138.3510	1092701.8630	754.1800	754.2100	0.0300	NVA
GCP215	421688.5453	913432.4206	1483.5710	1483.6090	0.0380	NVA
GCP216	422394.0303	908921.5893	1561.8390	1561.8330	-0.0059	NVA
GCP217	414380.5880	914927.7388	1815.3200	1815.3740	0.0540	NVA
GCP219	422206.2285	912928.3742	1479.9690	1480.0630	0.0940	NVA
GCP221	422298.4936	913289.4871	1503.7580	1503.7500	-0.0084	NVA
GCP223	527149.7346	1411128.3280	1410.0140	1410.1160	0.1020	NVA
GCP225	523366.9904	1410173.6670	1571.3010	1571.3380	0.0370	NVA
GCP226	528753.4986	1415254.9850	919.7320	919.7370	0.0052	NVA
GCP227	507590.9126	1393692.8150	1020.5460	1020.4970	-0.0490	NVA
GCP228	504733.1207	1392877.6650	1489.5600	1489.5600	-0.0002	NVA
GCP229	506171.5370	1394552.6060	1304.8900	1304.7910	-0.0990	NVA
GCP230	499486.9806	1388793.3240	1835.8340	1835.8110	-0.0230	NVA
GCP232	606493.2706	1592566.1830	1249.1800	1249.2250	0.0450	NVA
GCP233	597236.8036	1595280.6070	790.1550	790.2030	0.0480	NVA
GCP236	602647.0424	1589829.3210	861.9090	861.9690	0.0600	NVA
GCP237	596723.8456	1590636.1340	628.4640	628.5290	0.0650	NVA
GCP239	511260.6175	1394589.5330	1000.3360	1000.3720	0.0360	NVA
GCP241	601371.5577	1617563.4970	1732.2910	1732.3510	0.0600	NVA
GCP242	587875.5577	1617290.7320	662.3620	662.2940	-0.0680	NVA
GCP243	601837.5526	1621310.7650	1855.7400	1855.7720	0.0320	NVA
GCP244	603430.2596	1626473.7370	2073.6660	2073.6980	0.0320	NVA
GCP245	593105.3779	1620409.3750	1417.8770	1417.9900	0.1130	NVA
GCP246	591171.2434	1613849.5180	849.9100	849.9550	0.0450	NVA
GCP247	586864.9785	1611668.9770	610.0480	610.0800	0.0320	NVA
GCP248	598409.5069	1616531.6100	1321.9090	1321.9270	0.0180	NVA
GCP249	530414.1177	1412252.1270	1271.5040	1271.5060	0.0017	NVA
GCP250	459424.8920	1220350.0900	1312.5840	1312.5300	-0.0540	NVA
GCP251	460877.4777	1224127.2840	1088.7460	1088.7490	0.0033	NVA
GCP252	438923.6975	1222341.3960	523.3720	523.4040	0.0320	NVA
GCP253	430582.9316	1232443.2930	353.0460	353.1220	0.0760	NVA
GCP254	475864.1220	1248286.3180	1658.5310	1658.6510	0.1200	NVA
GCP255	433238.7368	1228630.0240	1445.0390	1445.2080	0.1690	NVA
GCP256	433214.9937	1228638.5560	1445.9820	1446.1340	0.1520	NVA
GCP257	431833.2079	1228219.3240	1121.6390	1121.7700	0.1310	NVA
GCP258	431847.6442	1228247.2940	1122.2820	1122.4190	0.1370	NVA



Point ID	Given (X)	Given (Y)	Given (Z)	Laser (Z)	Delta (Z)	Report Point Type
GCP259	452713.7488	1239686.8360	1293.5380	1293.5840	0.0460	NVA
GCP260	452719.5782	1239705.6870	1294.5750	1294.4960	-0.0790	NVA
GCP261	450788.1062	1234653.8170	1409.1390	1409.0540	-0.0850	NVA
GCP262	450787.1233	1234658.6830	1409.0690	1409.0120	-0.0570	NVA
GCP263	454184.4852	1236339.0950	1154.8980	1154.8800	-0.0170	NVA
GCP266	492221.3796	1248256.8450	747.0260	746.9970	-0.0290	NVA
GCP267	492255.0423	1248257.6540	746.7790	746.8550	0.0760	NVA
GCP268	493385.6220	1252682.8320	836.0890	836.1270	0.0380	NVA
GCP269	493417.1439	1252652.9960	831.5290	831.5550	0.0260	NVA
GCP270	433280.4827	1188864.8720	917.8320	917.7970	-0.0350	NVA
GCP271	433277.3189	1188875.0900	918.1800	918.1910	0.0110	NVA
GCP272	439126.5437	1190063.6560	1153.6270	1153.5220	-0.1050	NVA
GCP273	451165.3531	1192549.2290	1487.3040	1487.3040	0.0005	NVA
GCP274	451177.5784	1192557.3510	1487.6460	1487.6330	-0.0130	NVA
GCP275	397547.8673	1146010.0370	884.6740	884.7140	0.0400	NVA
GCP291	422102.2921	1145044.9880	1174.0610	1174.0550	-0.0065	NVA
GCP292	422093.6807	1145062.2350	1174.2780	1174.3260	0.0480	NVA
GCP293	444673.8725	1195371.9470	1140.5160	1140.4730	-0.0430	NVA
GCP294	416473.6755	1180619.5480	1205.8360	1205.8520	0.0160	NVA
GCP295	416485.4107	1180631.9060	1205.6100	1205.6000	-0.0100	NVA
GCP296	386054.1144	1152224.6590	190.5520	190.5290	-0.0230	NVA
GCP297	386049.9749	1152220.1720	190.6910	190.6630	-0.0280	NVA
GCP298	386017.6391	1152284.7260	190.7470	190.7130	-0.0340	NVA
GCP299	386024.9300	1152283.3970	190.8340	190.8130	-0.0210	NVA
GCP300	400121.4122	1150299.2240	243.5660	243.5240	-0.0420	NVA
GCP301	400124.8991	1150298.5730	243.5320	243.5050	-0.0270	NVA
GCP311	416059.6296	1159596.1310	1236.8890	1236.9180	0.0290	NVA
GCP312	416053.1358	1159598.3380	1236.7860	1236.8280	0.0420	NVA
GCP313	415128.6038	1160106.3270	1189.1360	1189.1400	0.0035	NVA
GCP314	415124.2084	1160101.5060	1188.8150	1188.8040	-0.0100	NVA
GCP315	416523.0997	1156423.1330	1161.1460	1161.2620	0.1160	NVA
GCP316	416518.2285	1156422.3840	1161.3470	1161.5050	0.1580	NVA
GCP317	433654.8859	1244882.9970	874.6870	874.7290	0.0420	NVA
GCP318	433653.1430	1244884.4270	874.4750	874.5630	0.0880	NVA
GCP319	437767.3733	1244649.8070	1219.9640	1220.0070	0.0430	NVA
GCP320	437759.7290	1244651.0800	1219.8980	1219.9300	0.0320	NVA
GCP321	436509.4822	1251992.6970	904.9500	904.9710	0.0210	NVA
GCP322	436512.9390	1251983.0260	905.2010	905.2150	0.0140	NVA
GCP323	423542.4162	1284230.6240	282.1220	282.3130	0.1910	NVA



Point ID	Given (X)	Given (Y)	Given (Z)	Laser (Z)	Delta (Z)	Report Point Type
GCP324	423541.1114	1284224.6870	281.9240	282.1260	0.2020	NVA
GCP325	431412.6321	1283137.9380	180.1300	180.0730	-0.0570	NVA
GCP326	431408.0717	1283134.8560	180.1440	180.1000	-0.0440	NVA
GCP327	440035.7347	1286143.0100	97.2020	97.1210	-0.0810	NVA
GCP328	440041.0284	1286144.3840	97.2010	97.1780	-0.0230	NVA
GCP329	445378.5243	1288501.9620	25.5940	25.7240	0.1300	NVA
GCP330	445373.8271	1288512.2210	25.7600	25.8970	0.1370	NVA
GCP331	481873.9255	1262959.9210	1371.5820	1371.5370	-0.0450	NVA
GCP332	481884.8526	1262954.6730	1372.6900	1372.6080	-0.0820	NVA
GCP333	481987.4036	1270946.3140	1216.0400	1215.9600	-0.0800	NVA
GCP334	481974.8194	1270950.0540	1216.1470	1216.0640	-0.0830	NVA
GCP335	486590.7761	1254504.3550	1343.0400	1343.0430	0.0031	NVA
GCP336	486602.0824	1254510.3830	1341.5520	1341.5490	-0.0033	NVA
GCP338	552102.7966	906187.0196	1710.5960	1710.6220	0.0260	NVA
GCP339	547173.5515	909676.4705	2357.0590	2357.0570	-0.0022	NVA
GCP340	545219.2210	912852.3847	1925.9520	1925.9430	-0.0092	NVA
GCP341	538776.1751	914569.4734	1710.6400	1710.7640	0.1240	NVA
GCP342	544570.6480	933063.3771	1633.9620	1633.9270	-0.0350	NVA
GCP343	537555.1019	934197.0642	1874.1660	1874.2310	0.0650	NVA
GCP344	548084.5995	931426.6436	1591.3150	1591.3590	0.0440	NVA
GCP345	543488.3751	954658.8602	2176.5270	2176.4980	-0.0290	NVA
GCP346	543575.9071	954773.2668	2159.6030	2159.6370	0.0340	NVA
GCP347	542231.8134	953059.6240	1999.6240	1999.5790	-0.0450	NVA
GCP348	542196.7396	953012.4855	1997.3670	1997.4020	0.0350	NVA
GCP349	397296.9159	1079946.9960	316.8750	316.9210	0.0460	NVA
GCP350	399440.3642	1080173.0220	329.9560	330.0220	0.0660	NVA
GCP351	504358.0587	972566.1931	1521.9900	1521.9900	-0.0002	NVA
GCP352	504552.0911	972696.4225	1545.6200	1545.6630	0.0430	NVA
GCP353	504783.8797	972515.4291	1522.3150	1522.3410	0.0260	NVA
GCP354	504751.9452	972510.4884	1522.1950	1522.2510	0.0560	NVA
GCP355	504950.7178	972186.3823	1520.0720	1520.0950	0.0230	NVA
GCP356	504903.7226	972218.2788	1520.2580	1520.2620	0.0040	NVA
GCP357	504138.7028	975051.6660	1534.8520	1534.8090	-0.0430	NVA
GCP358	504174.4619	975074.6566	1534.8330	1534.8270	-0.0059	NVA
GCP359	505413.3574	976382.6439	1535.3240	1535.3180	-0.0062	NVA
GCP360	505388.8811	976378.8258	1535.4250	1535.4380	0.0130	NVA
GCP361	504021.2538	976705.1114	1587.8220	1587.7360	-0.0860	NVA
GCP362	504385.3982	979535.3129	1646.9250	1646.8560	-0.0690	NVA
GCP363	504385.4105	979535.3195	1646.9250	1646.8560	-0.0690	NVA



Point ID	Given (X)	Given (Y)	Given (Z)	Laser (Z)	Delta (Z)	Report Point Type
GCP364	504385.3995	979535.3199	1646.8570	1646.8560	-0.0009	NVA
GCP375	408156.5580	1119052.4610	525.9830	525.9570	-0.0260	NVA
GCP376	408162.3808	1119062.3540	526.2070	526.1470	-0.0600	NVA
GCP379	417406.1746	1072529.9120	678.1710	678.1600	-0.0110	NVA
GCP380	417408.2983	1072519.4150	678.2920	678.2350	-0.0570	NVA
GCP381	417756.4505	1086539.8730	1442.3380	1442.3230	-0.0150	NVA
GCP382	417770.2768	1086540.5450	1442.7970	1442.7560	-0.0410	NVA
GCP383	421735.2324	1086249.3460	1692.3920	1692.4170	0.0250	NVA
GCP384	421748.6816	1086239.1390	1692.2800	1692.2260	-0.0540	NVA
GCP385	403656.5145	1080864.2060	584.7280	584.7210	-0.0068	NVA
GCP386	403642.6824	1080875.5270	585.6800	585.6850	0.0049	NVA
GCP387	405403.7642	1084177.5790	717.9430	718.0290	0.0860	NVA
GCP388	405421.6478	1084175.7840	718.1810	718.2930	0.1120	NVA
GCP391	416135.3392	1063930.2160	1038.8560	1038.8990	0.0430	NVA
GCP392	416136.0572	1063919.9100	1038.1530	1038.1700	0.0170	NVA
GCP393	419183.8087	1064523.7810	1777.5580	1777.6090	0.0510	NVA
GCP394	419182.1809	1064519.5990	1777.5190	1777.5910	0.0720	NVA
GCP395	423641.8007	1100848.5520	1312.6940	1312.6700	-0.0240	NVA
GCP396	423641.8152	1100843.7880	1312.6230	1312.5850	-0.0380	NVA
GCP397	421373.2577	1102205.1710	1443.2510	1443.2150	-0.0360	NVA
GCP398	421372.8185	1102201.1770	1443.1910	1443.0930	-0.0980	NVA
GCP405	429935.4449	929575.3885	1275.5780	1275.7140	0.1360	NVA
GCP406	429946.3976	929591.4703	1275.3750	1275.5020	0.1270	NVA
GCP407	422571.4557	932324.6633	1275.7520	1275.8960	0.1440	NVA
GCP408	422550.4714	932335.5944	1275.2100	1275.3250	0.1150	NVA
GCP409	425239.6950	932208.5994	1276.4340	1276.5380	0.1040	NVA
GCP410	425234.2706	932205.1277	1276.6200	1276.7390	0.1190	NVA
GCP411	422972.6386	935876.2052	1575.1270	1575.2880	0.1610	NVA
GCP412	421605.2598	935280.9329	1460.9420	1461.0120	0.0700	NVA
GCP413	421608.2351	935285.0410	1461.3320	1461.3420	0.0100	NVA
GCP414	419148.0139	927912.4198	1511.9920	1511.9720	-0.0200	NVA
GCP415	419145.7084	927907.6270	1511.9140	1511.9120	-0.0017	NVA
GCP416	415305.8360	934627.7182	1750.3180	1750.3320	0.0140	NVA
GCP417	415300.9257	934615.5377	1750.7980	1750.8030	0.0051	NVA
GCP418	415285.2383	934616.8298	1750.4450	1750.3610	-0.0840	NVA
GCP419	416403.4763	926925.8001	1523.2110	1522.9430	-0.2680	NVA
GCP420	417545.7108	927230.9805	1511.2750	1511.2390	-0.0360	NVA
GCP421	417540.2236	927231.4746	1511.2730	1511.2530	-0.0200	NVA
GCP423	418679.2248	927946.3428	1509.6510	1509.6220	-0.0290	NVA



Point ID	Given (X)	Given (Y)	Given (Z)	Laser (Z)	Delta (Z)	Report Point Type
GCP424	418665.3230	927944.9321	1509.6030	1509.5290	-0.0740	NVA
GCP425	426306.8676	935372.3863	1265.3680	1265.3280	-0.0400	NVA
GCP426	426312.0529	935371.6475	1265.2510	1265.2990	0.0480	NVA
GCP427	423614.1942	940878.8765	2446.8870	2446.8380	-0.0490	NVA
GCP428	423615.2342	940858.0141	2445.3800	2445.3410	-0.0390	NVA
GCP429	576737.1069	906963.6765	1730.5700	1730.6000	0.0300	NVA
GCP430	576735.9917	906970.1125	1730.6860	1730.7240	0.0380	NVA
GCP431	587004.9884	914875.9118	2507.6610	2507.5790	-0.0820	NVA
GCP432	586999.9142	914880.8411	2507.9090	2507.8670	-0.0420	NVA
GCP433	573776.0217	909354.5608	1617.2920	1617.2680	-0.0240	NVA
GCP434	573781.3537	909357.1114	1617.3810	1617.3910	0.0100	NVA
GCP435	579529.8905	900964.5202	1882.0990	1882.0860	-0.0130	NVA
GCP436	579528.6415	900970.2126	1881.9750	1881.9230	-0.0520	NVA
GCP437	577321.4431	903059.9854	1906.4200	1906.3990	-0.0210	NVA
GCP438	577318.2806	903044.3025	1907.2630	1907.2260	-0.0370	NVA
GCP439	586759.8136	902776.0022	1725.1160	1725.1280	0.0120	NVA
GCP440	586764.5145	902770.9380	1725.1580	1725.1020	-0.0560	NVA
GCP441	536048.8444	905736.7219	1543.0570	1543.0480	-0.0093	NVA
GCP442	536056.7487	905743.0224	1542.9870	1542.9710	-0.0160	NVA
GCP443	534369.9985	901546.8953	1572.4300	1572.3690	-0.0610	NVA
GCP444	534373.3586	901554.8868	1572.5450	1572.5000	-0.0450	NVA
GCP445	535927.1649	893705.9091	1615.6880	1615.6660	-0.0220	NVA
GCP446	535928.2616	893713.5920	1615.9570	1615.9420	-0.0150	NVA
GCP447	531220.6956	895833.9026	1772.4040	1772.3260	-0.0780	NVA
GCP448	531227.2117	895835.6697	1772.0970	1772.0000	-0.0970	NVA
GCP449	541623.0756	891130.6428	1587.5690	1587.6140	0.0450	NVA
GCP450	541630.0739	891124.7967	1587.4010	1587.3440	-0.0570	NVA
GCP451	549042.8532	888331.7712	1868.7270	1868.7390	0.0120	NVA
GCP452	549039.0985	888324.6953	1868.5800	1868.5870	0.0068	NVA
GCP453	554248.2392	931980.2959	1758.8820	1758.9690	0.0870	NVA
GCP454	554247.8095	931989.6942	1758.7720	1758.8580	0.0860	NVA
GCP455	552659.6267	936820.0989	1616.7700	1616.9410	0.1710	NVA
GCP456	552649.6776	936814.3476	1616.7790	1616.8270	0.0480	NVA
GCP457	551487.1295	939808.9374	1518.0020	1518.0170	0.0150	NVA
GCP458	551492.0743	939817.9702	1518.1290	1518.1330	0.0040	NVA
GCP459	549213.1144	942934.9502	1514.8220	1514.8580	0.0360	NVA
GCP460	549227.6901	942963.3566	1514.4080	1514.4270	0.0190	NVA
GCP461	538979.5149	960109.7436	1719.7950	1719.8020	0.0070	NVA
GCP462	538959.5347	960104.2058	1718.8920	1718.9040	0.0120	NVA



Point ID	Given (X)	Given (Y)	Given (Z)	Laser (Z)	Delta (Z)	Report Point Type
GCP463	538076.1861	962103.4681	1529.0220	1529.0400	0.0180	NVA
GCP464	538081.3197	962094.9429	1529.2290	1529.2700	0.0410	NVA
GCP467	506051.8489	977162.6016	1537.9740	1537.9660	-0.0081	NVA
GCP468	506058.4090	977161.8923	1537.8910	1537.8630	-0.0280	NVA
GCP469	474927.2807	1491717.9780	236.2730	236.1670	-0.1060	NVA
GCP470	476398.8182	1493558.5170	254.6250	254.6040	-0.0210	NVA
GCP471	476409.1727	1493553.9490	254.7330	254.6970	-0.0360	NVA
GCP472	478904.7463	1496231.7710	284.1780	284.1760	-0.0017	NVA
GCP473	478897.6569	1496235.2570	284.3720	284.3270	-0.0450	NVA
GCP474	480550.8806	1497644.7040	280.6750	280.6930	0.0180	NVA
GCP475	480526.1190	1497629.5210	280.7980	280.7470	-0.0510	NVA
GCP476	476870.0968	1494244.5430	262.9220	262.8450	-0.0770	NVA
GCP477	477880.9658	1495606.7230	276.5870	276.7920	0.2050	NVA
GCP478	492122.2032	1488146.4270	986.8020	986.8090	0.0065	NVA
GCP479	492132.0728	1488121.2930	986.6850	986.6950	0.0100	NVA
GCP484	474882.1319	1491545.4250	236.3140	236.2670	-0.0470	NVA
GCP485	474895.2987	1491561.2340	236.0790	236.0620	-0.0170	NVA
GCP486	476033.8961	1492841.4230	244.7640	244.7590	-0.0051	NVA
GCP487	476037.7830	1492845.0530	244.5900	244.6310	0.0410	NVA
GCP488	476206.8610	1492999.6110	256.4600	256.5190	0.0590	NVA
GCP489	476208.2767	1492985.2160	256.5310	256.4820	-0.0490	NVA
GCP490	477461.6906	1494946.9140	269.9760	269.9210	-0.0550	NVA
GCP491	479441.6374	1496723.0940	275.3620	275.2890	-0.0730	NVA
GCP492	575343.1795	1608887.9520	597.3620	597.4040	0.0420	NVA
GCP493	575344.9640	1608866.8860	597.3290	597.3590	0.0300	NVA
GCP494	574929.0079	1608183.9570	594.9680	595.0060	0.0380	NVA
GCP495	574928.3727	1608201.8260	595.1460	595.1510	0.0049	NVA
GCP496	572768.5993	1611216.8910	630.4930	630.4370	-0.0560	NVA
GCP497	572812.0338	1611227.4810	627.5270	627.4430	-0.0840	NVA
GCP498	567955.9262	1615114.4130	656.7790	656.7810	0.0023	NVA
GCP499	567970.6787	1615110.2850	656.7640	656.7360	-0.0280	NVA
GCP500	571533.0618	1613611.4340	643.2180	643.1150	-0.1030	NVA
GCP501	571547.7867	1613620.4970	643.6900	643.5510	-0.1390	NVA
GCP502	572641.2055	1615180.5210	873.5910	873.4970	-0.0940	NVA
GCP503	576551.0095	1608322.2890	591.3130	591.3030	-0.0100	NVA
GCP504	576546.6692	1608303.8980	591.1400	591.1600	0.0200	NVA
GCP505	591010.7365	1597846.5390	671.8690	671.8920	0.0230	NVA
GCP506	591009.6645	1597836.1900	671.6560	671.6750	0.0190	NVA
GCP507	588367.1037	1618775.2050	659.2450	659.2680	0.0230	NVA

Point ID	Given (X)	Given (Y)	Given (Z)	Laser (Z)	Delta (Z)	Report Point Type
GCP508	588366.3649	1618791.3210	659.5990	659.6140	0.0150	NVA
GCP509	590123.6896	1624250.7530	706.1350	706.1480	0.0130	NVA
GCP510	590113.3908	1624253.8600	707.4510	707.4660	0.0150	NVA
GCP511	587161.2104	1622061.1780	1011.6960	1011.6680	-0.0280	NVA
GCP512	590165.9286	1591821.6500	492.4160	492.4470	0.0310	NVA
GCP513	588287.2464	1595806.2830	519.3750	519.3540	-0.0210	NVA
GCP514	588283.2080	1595796.8830	520.0440	520.0320	-0.0120	NVA
GCP515	589772.3345	1599550.9370	610.5610	610.6440	0.0830	NVA
GCP516	589744.2273	1599529.6830	610.8260	610.8820	0.0560	NVA
GCP517	587035.7435	1600533.5740	535.4910	535.5060	0.0150	NVA
GCP518	592923.7235	1587989.5540	487.1810	487.3140	0.1330	NVA
GCP519	592938.1536	1587983.1880	487.5110	487.5750	0.0640	NVA
GCP520	595743.2614	1582033.5060	463.0280	463.0440	0.0160	NVA
GCP521	595750.5917	1582028.8550	462.9000	462.9250	0.0250	NVA
GCP524	588311.1392	1586937.0490	731.9420	731.8950	-0.0470	NVA
GCP525	588305.2610	1586910.3670	733.6370	733.5800	-0.0570	NVA
GCP526	589767.0917	1588336.7290	604.2700	604.2710	0.0005	NVA
GCP527	589763.5382	1588332.2180	604.9640	604.9570	-0.0071	NVA
GCP528	586488.9431	1590207.8680	574.3170	574.2820	-0.0350	NVA
GCP529	586482.6519	1590196.2360	574.2830	574.2320	-0.0510	NVA
GCP530	582859.3926	1591024.5630	613.0250	613.0080	-0.0170	NVA
GCP531	582860.8917	1591016.3550	612.6220	612.6160	-0.0057	NVA
GCP532	580953.2396	1600745.5320	815.8580	815.8190	-0.0390	NVA
GCP533	580947.2476	1600741.6760	816.1990	816.1470	-0.0520	NVA
GCP534	574675.7429	1594342.9410	981.2280	981.2370	0.0091	NVA
GCP535	574678.1186	1594347.2300	980.8900	980.8510	-0.0390	NVA
GCP536	574248.0369	1593828.9550	1050.1000	1050.0490	-0.0510	NVA
GCP537	574224.2136	1593802.5790	1052.2430	1052.2040	-0.0390	NVA
GCP538	572974.1005	1595104.7530	1225.5280	1225.4940	-0.0340	NVA
GCP539	572977.1113	1595109.3370	1225.4010	1225.3730	-0.0280	NVA
GCP540	579326.3171	1594329.0600	1000.9610	1000.9670	0.0058	NVA
GCP541	579323.5267	1594328.3280	1001.0360	1000.9890	-0.0470	NVA
GCP542	589536.2115	1596056.7820	517.9190	517.9140	-0.0050	NVA
GCP543	589525.6133	1596071.4660	517.0590	517.0870	0.0280	NVA
GCP544	586724.3954	1601257.0070	532.9980	533.0650	0.0670	NVA
GCP545	586721.4797	1601243.6420	533.3490	533.3340	-0.0150	NVA

Table 12: Point Cloud Check Point Assessment

2. Bare-Earth Check Point Assessment

Point ID	Given (X)	Given (Y)	Given (Z)	DEM (Z)	DEM (DZ)	Report Point Type
GCP001	692885.1967	1081781.8890	1765.0390	1764.9713	-0.0676	NVA
GCP002	685689.3521	1078637.4230	1719.1830	1719.2053	0.0223	NVA
GCP003	657500.6117	1138619.5350	1590.2330	1590.1753	-0.0577	NVA
GCP004	649059.0757	1143509.4740	1929.7610	1929.7083	-0.0527	NVA
GCP005	643740.7951	1145661.8900	2098.7640	2098.7129	-0.0510	NVA
GCP006	665902.8814	1137215.3150	1547.0930	1547.0748	-0.0182	NVA
GCP007	700559.2770	1121641.7440	1533.7490	1533.7450	-0.0040	NVA
GCP008	704183.0127	1126557.9640	1620.5790	1620.5581	-0.0209	NVA
GCP009	681584.7185	1082533.4380	1639.5370	1639.5044	-0.0326	NVA
GCP010	582725.3416	927245.0122	2050.6000	2050.6191	0.0190	NVA
GCP011	585133.3779	900966.0263	1854.4930	1854.4635	-0.0295	NVA
GCP012	522595.9577	896177.3967	1630.9950	1630.9097	-0.0853	NVA
GCP013	546877.6932	886068.4740	1685.3090	1685.3223	0.0133	NVA
GCP014	547624.7998	891401.2713	1785.5450	1785.5515	0.0065	NVA
GCP015	550252.3749	950116.6871	1460.1610	1460.3120	0.1510	NVA
GCP016	407336.8866	1048857.2770	668.4480	668.4601	0.0121	NVA
GCP017	408101.5664	1047496.1550	700.9710	700.9489	-0.0221	NVA
GCP018	423136.5727	1092709.7900	754.2840	754.2945	0.0105	NVA
GCP019	415418.0881	1093177.5960	784.0110	783.8831	-0.1279	NVA
GCP020	409123.7957	1089016.2970	820.5830	820.6127	0.0297	NVA
GCP021	438714.2054	1084221.2940	1610.9230	1610.9155	-0.0075	NVA
GCP023	506072.2079	979712.4559	1537.7130	1537.6698	-0.0432	NVA
GCP024	503380.9674	967901.1501	1531.8340	1531.8482	0.0142	NVA
GCP025	503488.4626	967593.8855	1526.0360	1526.0144	-0.0216	NVA
GCP026	503251.3021	967739.2528	1531.8560	1531.8835	0.0275	NVA
GCP028	451365.3720	1195445.3310	1082.5350	1082.5972	0.0622	NVA
GCP029	455412.0891	1201920.8840	1125.2980	1125.2068	-0.0912	NVA
GCP030	455167.6767	1211048.2260	994.1150	994.1307	0.0157	NVA
GCP031	458132.5368	1205597.0980	1294.7850	1294.6313	-0.1537	NVA
GCP032	451312.3457	1195505.1620	1087.7080	1087.8049	0.0969	NVA
GCP033	450838.5939	1199954.3310	1036.6210	1036.5950	-0.0260	NVA
GCP034	452203.5951	1219838.9070	1133.0590	1133.0736	0.0146	NVA
GCP036	451588.6197	1211878.5300	765.7330	765.6899	-0.0431	NVA
GCP037	456563.2913	1218689.9440	1302.1330	1302.1500	0.0169	NVA
GCP038	446131.9538	1198839.5670	1395.3100	1395.3071	-0.0030	NVA
GCP039	451601.1935	1211861.3610	766.1970	766.1942	-0.0028	NVA
GCP040	452176.9895	1219836.6440	1133.4380	1133.4450	0.0070	NVA



Point ID	Given (X)	Given (Y)	Given (Z)	DEM (Z)	DEM (DZ)	Report Point Type
GCP041	456585.4242	1218706.2700	1303.8800	1303.9795	0.0995	NVA
GCP042	445669.1495	1219729.3610	580.3050	580.3297	0.0247	NVA
GCP044	433389.6761	1209421.4080	1275.2930	1275.4084	0.1154	NVA
GCP045	428400.9990	1204637.6990	933.5190	933.5180	-0.0010	NVA
GCP046	431003.4807	1213743.0000	716.7520	716.8155	0.0635	NVA
GCP047	427349.8030	1209109.9880	1011.9550	1012.0147	0.0597	NVA
GCP048	433381.0546	1209436.8560	1275.0830	1275.0537	-0.0293	NVA
GCP049	441476.1653	1240571.0730	1184.6700	1184.6864	0.0164	NVA
GCP050	434673.0301	1240132.4060	914.7190	914.6833	-0.0357	NVA
GCP051	434181.1331	1193037.5360	1141.3870	1141.3707	-0.0163	NVA
GCP052	430851.5242	1194408.9980	1419.6240	1419.6585	0.0345	NVA
GCP053	434679.1314	1194604.9810	732.3480	732.4243	0.0763	NVA
GCP054	443201.6895	1193052.8560	701.2710	701.3517	0.0807	NVA
GCP055	437494.7415	1193417.3220	740.0160	740.0274	0.0114	NVA
GCP056	446024.7663	1195367.2020	1258.4770	1258.4490	-0.0281	NVA
GCP057	439648.0055	1199489.5720	972.7310	972.7817	0.0507	NVA
GCP058	443234.4369	1193094.0210	703.4400	703.5717	0.1317	NVA
GCP059	416264.2521	1180532.2880	1182.7490	1182.7559	0.0069	NVA
GCP062	408024.6382	1153390.2660	341.9100	341.8767	-0.0333	NVA
GCP063	420796.6784	1155902.9330	788.5940	788.5303	-0.0637	NVA
GCP064	423386.7857	1157291.1800	1136.9870	1136.9532	-0.0339	NVA
GCP065	420218.3958	1153845.9710	541.8230	541.8269	0.0039	NVA
GCP066	421629.3675	1154823.5750	886.8900	886.8964	0.0064	NVA
GCP068	426725.9073	1152819.1700	1100.9750	1100.9753	0.0003	NVA
GCP069	414125.7885	1154999.2920	1033.8290	1033.8024	-0.0266	NVA
GCP070	423694.6573	1154720.6190	1178.7610	1178.7239	-0.0371	NVA
GCP071	426718.5096	1152800.1080	1100.8690	1100.8943	0.0253	NVA
GCP072	412840.0677	1154294.2350	947.9970	947.9218	-0.0752	NVA
GCP073	425255.4864	1101690.3540	830.2860	830.2689	-0.0171	NVA
GCP074	417463.8954	1101646.7550	1139.3490	1139.2342	-0.1148	NVA
GCP075	421708.3983	1097053.2160	1544.9220	1544.9437	0.0217	NVA
GCP076	408736.0705	1093991.4310	663.7430	663.7291	-0.0139	NVA
GCP077	425570.8950	1091666.4180	760.0700	760.0963	0.0263	NVA
GCP079	425052.6875	1092960.2000	916.9670	916.8679	-0.0991	NVA
GCP080	528045.0429	1417369.8090	624.3720	624.4557	0.0837	NVA
GCP081	514121.7641	1406057.1650	1715.2620	1715.2711	0.0091	NVA
GCP082	513655.3707	1408467.9460	1607.7610	1607.7282	-0.0328	NVA
GCP083	518243.8889	1411825.3120	1346.9380	1347.1358	0.1978	NVA
GCP084	522337.2496	1413094.2580	1390.3100	1390.2349	-0.0752	NVA



Point ID	Given (X)	Given (Y)	Given (Z)	DEM (Z)	DEM (DZ)	Report Point Type
GCP085	501883.2172	1391419.1360	1655.3600	1655.3208	-0.0392	NVA
GCP086	502243.4427	1393873.4710	1512.3450	1512.3119	-0.0331	NVA
GCP087	513296.8659	1396680.4350	898.4160	898.4443	0.0283	NVA
GCP088	517864.6169	1402021.5790	774.9630	774.8533	-0.1097	NVA
GCP089	506007.5643	1395714.6810	1256.2450	1256.1587	-0.0863	NVA
GCP090	496079.5303	1410754.6010	1313.0040	1313.0294	0.0254	NVA
GCP091	498257.6483	1414623.4720	1197.1930	1197.1674	-0.0256	NVA
GCP093	581749.4131	1600209.6990	737.5690	737.5027	-0.0663	NVA
GCP094	582999.0118	1597620.1070	733.5760	733.5714	-0.0046	NVA
GCP095	577975.7761	1606011.3750	632.0800	632.0622	-0.0178	NVA
GCP096	581418.7370	1603176.1540	584.0460	583.9884	-0.0576	NVA
GCP097	586081.3645	1597709.5450	574.4920	574.4496	-0.0424	NVA
GCP098	580023.3562	1595476.5870	1047.8440	1047.8710	0.0270	NVA
GCP099	583621.8577	1594911.5540	724.0120	724.0450	0.0330	NVA
GCP100	577255.7510	1592111.4300	757.4460	757.4257	-0.0203	NVA
GCP101	580076.5582	1591115.1320	738.1460	738.1454	-0.0006	NVA
GCP102	682013.3627	1079259.5460	1628.2270	1628.3035	0.0764	NVA
GCP103	698212.6183	1081795.5050	1646.3350	1646.3190	-0.0160	NVA
GCP104	672733.1686	1139242.8230	1485.0300	1485.0382	0.0082	NVA
GCP105	654623.3748	1144871.1810	1232.7940	1232.8460	0.0521	NVA
GCP106	656517.3114	1141845.8880	1375.3470	1375.4689	0.1219	NVA
GCP107	673449.7459	1143988.8190	1289.1130	1289.1501	0.0371	NVA
GCP108	655182.0951	1148188.4210	940.2580	940.2533	-0.0047	NVA
GCP109	703716.3776	1135330.0870	2431.6920	2431.6715	-0.0204	NVA
GCP110	702726.0078	1124195.2020	1622.7100	1622.7292	0.0192	NVA
GCP111	582737.6467	913029.2646	1971.2140	1971.1501	-0.0639	NVA
GCP112	581708.6092	919819.2515	2153.7690	2153.7615	-0.0075	NVA
GCP113	582917.3523	892665.3540	1867.2790	1867.2466	-0.0325	NVA
GCP114	583653.6391	886312.1038	1914.8730	1914.9006	0.0276	NVA
GCP115	580696.8282	896413.5386	1891.4850	1891.5062	0.0212	NVA
GCP116	586198.9052	886091.8837	2061.8510	2061.8342	-0.0169	NVA
GCP117	533890.2122	886612.2117	1636.4790	1636.5072	0.0282	NVA
GCP118	528515.6797	885153.7767	1667.8100	1667.8325	0.0224	NVA
GCP119	541856.3241	884185.3420	1759.8500	1759.8103	-0.0397	NVA
GCP120	536918.8825	936906.0842	1827.6830	1827.7084	0.0254	NVA
GCP121	534042.3645	939272.5295	2038.3850	2038.4177	0.0327	NVA
GCP122	539266.0345	949327.2606	1999.5150	1999.4701	-0.0449	NVA
GCP124	404058.7546	1084751.5720	373.0300	373.0011	-0.0289	NVA
GCP126	402717.9903	1085435.6030	543.9040	543.8828	-0.0212	NVA

Point ID	Given (X)	Given (Y)	Given (Z)	DEM (Z)	DEM (DZ)	Report Point Type
GCP127	423189.1173	1099388.8380	1165.1190	1165.0943	-0.0247	NVA
GCP128	407500.9654	1092469.0600	470.5910	470.7259	0.1349	NVA
GCP129	404485.8432	1091339.1700	758.5990	758.3436	-0.2554	NVA
GCP130	417918.8343	1102286.9090	1219.3160	1219.3132	-0.0028	NVA
GCP131	504033.3742	976674.4922	1587.5080	1587.4801	-0.0280	NVA
GCP132	504601.9494	978030.8745	1558.2630	1558.2598	-0.0031	NVA
GCP133	455163.7984	1211042.4450	994.2190	994.2166	-0.0024	NVA
GCP134	449330.7093	1205593.4280	1043.6670	1043.5115	-0.1555	NVA
GCP135	442037.5903	1192146.7450	652.4830	652.5549	0.0719	NVA
GCP136	448183.1943	1193920.5380	813.2050	813.1953	-0.0097	NVA
GCP137	440915.9873	1209365.6200	760.3110	760.2822	-0.0288	NVA
GCP138	459432.6162	1220335.5080	1314.6420	1314.5330	-0.1090	NVA
GCP139	460882.5632	1224105.4860	1089.9520	1089.9578	0.0058	NVA
GCP140	445822.4773	1214455.7640	1287.4760	1287.3693	-0.1067	NVA
GCP141	430586.6470	1232453.8970	352.8960	352.8574	-0.0386	NVA
GCP142	438921.1034	1222348.6820	522.9230	522.7434	-0.1796	NVA
GCP143	446476.3285	1230561.9600	1178.6560	1178.6032	-0.0528	NVA
GCP144	441784.8449	1194269.8180	1000.6970	1000.6863	-0.0107	NVA
GCP146	475853.5464	1248282.0350	1657.9680	1657.9758	0.0078	NVA
GCP147	433637.4985	1190947.4560	546.0920	546.1707	0.0787	NVA
GCP148	434842.6326	1190404.7290	660.4230	660.3277	-0.0953	NVA
GCP149	443393.9894	1188597.9700	1073.2900	1073.2873	-0.0027	NVA
GCP150	442362.3359	1190260.3910	949.2380	949.1850	-0.0530	NVA
GCP151	448302.8830	1187260.5850	1094.3950	1094.3473	-0.0477	NVA
GCP152	449870.0368	1189891.8040	1132.4160	1132.3926	-0.0234	NVA
GCP153	457076.2093	1190900.3990	1560.9230	1560.8978	-0.0252	NVA
GCP156	416392.8695	1143563.1980	1125.8530	1125.8679	0.0149	NVA
GCP157	419036.3047	1143973.7120	1226.0630	1226.0342	-0.0288	NVA
GCP158	413373.1254	1140337.8370	874.8550	874.7929	-0.0621	NVA
GCP159	417294.5014	1138961.7650	1130.9640	1130.9187	-0.0453	NVA
GCP160	415556.9921	1139760.8460	889.8540	889.9497	0.0957	NVA
GCP161	427030.4656	1144460.0600	1347.3640	1347.2901	-0.0739	NVA
GCP162	427367.5578	1149988.3950	1160.7480	1160.7679	0.0199	NVA
GCP163	423257.6321	1143812.7070	1298.5610	1298.4775	-0.0835	NVA
GCP164	421826.9314	1148850.4750	594.1640	594.0258	-0.1382	NVA
GCP165	414030.4698	1072032.1540	971.0190	970.8621	-0.1569	NVA
GCP166	410202.4277	1082720.4150	804.3300	804.3301	0.0001	NVA
GCP167	426825.6891	1077088.4360	1530.0750	1530.0305	-0.0445	NVA
GCP168	414577.0071	1081447.8730	1043.7560	1043.7523	-0.0037	NVA



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GCP169	430106.8856	1085558.3180	1555.1440	1555.1301	-0.0139	NVA
GCP170	427734.9661	1068543.1150	1658.3890	1658.3383	-0.0507	NVA
GCP171	438244.0347	1077652.2090	1654.8610	1654.8614	0.0004	NVA
GCP174	516915.1160	1401141.8750	780.9030	780.9916	0.0886	NVA
GCP175	518897.0716	1400221.5340	958.6040	958.6557	0.0517	NVA
GCP176	539689.1145	1408743.2700	498.4630	498.5439	0.0809	NVA
GCP177	531922.0907	1405097.6850	606.9570	606.9917	0.0347	NVA
GCP178	525571.9654	1401275.0560	680.7920	680.8281	0.0361	NVA
GCP179	503280.4390	1386804.4170	1132.7390	1132.7235	-0.0155	NVA
GCP180	502612.4397	1384626.3980	1222.4580	1222.4993	0.0413	NVA
GCP181	506954.7295	1393022.2600	1017.8890	1017.8665	-0.0225	NVA
GCP182	504520.4127	1390011.9830	1067.1400	1067.1891	0.0491	NVA
GCP183	504193.6556	1388296.0340	1100.1600	1100.1371	-0.0229	NVA
GCP184	502207.9686	1397061.2330	913.0700	913.1665	0.0965	NVA
GCP185	500448.4421	1396218.6210	926.4580	926.4109	-0.0471	NVA
GCP186	505783.1142	1399728.1410	1302.3800	1302.2244	-0.1556	NVA
GCP187	591732.2644	1608757.7020	1180.8810	1180.8401	-0.0409	NVA
GCP188	595069.2419	1597573.1590	859.8860	859.8732	-0.0128	NVA
GCP189	582183.6924	1609268.8440	879.9020	879.8855	-0.0165	NVA
GCP190	589203.9469	1604274.7200	686.1890	686.2246	0.0356	NVA
GCP191	584897.0246	1604301.9560	665.2580	665.2485	-0.0095	NVA
GCP192	592503.3215	1602325.9540	982.1430	982.1567	0.0137	NVA
GCP193	572020.4002	1622891.0960	1569.0700	1568.9577	-0.1122	NVA
GCP194	573804.6723	1619325.8440	1135.1930	1135.2863	0.0933	NVA
GCP195	589849.3705	1631127.8330	775.7330	775.7477	0.0147	NVA
GCP196	583730.5961	1625690.9480	1212.4790	1212.5099	0.0309	NVA
GCP197	484241.2376	1499474.2610	317.0620	317.1056	0.0436	NVA
GCP198	482559.2210	1498600.7490	297.6800	297.6363	-0.0437	NVA
GCP199	484174.7824	1500195.6800	345.6050	345.5963	-0.0087	NVA
GCP200	484468.6331	1500249.9530	332.1760	332.1933	0.0173	NVA
GCP201	486840.2268	1498366.8730	339.3170	339.2097	-0.1073	NVA
GCP202	496672.2806	1494423.0490	703.0230	702.9757	-0.0473	NVA
GCP203	497963.1119	1494973.5020	803.6730	803.6587	-0.0143	NVA
GCP204	485294.7412	1499520.8460	373.2010	373.1921	-0.0089	NVA
GCP205	437590.5161	1071143.6530	1765.8460	1765.8433	-0.0026	NVA
GCP206	429923.2696	1063587.0190	1367.2490	1367.2687	0.0197	NVA
GCP207	440170.8097	1077114.3450	1737.7670	1737.7710	0.0040	NVA
GCP208	417463.8954	1101646.7550	1139.3490	1139.2342	-0.1148	NVA
GCP209	421708.3983	1097053.2160	1544.9220	1544.9437	0.0217	NVA

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GCP210	425255.4864	1101690.3540	830.2860	830.2689	-0.0171	NVA
GCP211	407990.2807	1093905.3240	556.2740	556.2936	0.0196	NVA
GCP212	423138.3510	1092701.8630	754.1800	754.2038	0.0238	NVA
GCP215	421688.5453	913432.4206	1483.5710	1483.6102	0.0392	NVA
GCP216	422394.0303	908921.5893	1561.8390	1561.8303	-0.0087	NVA
GCP217	414380.5880	914927.7388	1815.3200	1815.3416	0.0217	NVA
GCP219	422206.2285	912928.3742	1479.9690	1480.0718	0.1028	NVA
GCP221	422298.4936	913289.4871	1503.7580	1503.7413	-0.0168	NVA
GCP223	527149.7346	1411128.3280	1410.0140	1410.1066	0.0926	NVA
GCP225	523366.9904	1410173.6670	1571.3010	1571.3431	0.0421	NVA
GCP226	528753.4986	1415254.9850	919.7320	919.7375	0.0055	NVA
GCP227	507590.9126	1393692.8150	1020.5460	1020.5039	-0.0421	NVA
GCP228	504733.1207	1392877.6650	1489.5600	1489.5652	0.0051	NVA
GCP229	506171.5370	1394552.6060	1304.8900	1304.7834	-0.1066	NVA
GCP230	499486.9806	1388793.3240	1835.8340	1835.8092	-0.0248	NVA
GCP232	606493.2706	1592566.1830	1249.1800	1249.2129	0.0328	NVA
GCP233	597236.8036	1595280.6070	790.1550	790.1951	0.0401	NVA
GCP236	602647.0424	1589829.3210	861.9090	861.9743	0.0653	NVA
GCP237	596723.8456	1590636.1340	628.4640	628.5418	0.0778	NVA
GCP239	511260.6175	1394589.5330	1000.3360	1000.3807	0.0447	NVA
GCP241	601371.5577	1617563.4970	1732.2910	1732.3448	0.0538	NVA
GCP242	587875.5577	1617290.7320	662.3620	662.3015	-0.0605	NVA
GCP243	601837.5526	1621310.7650	1855.7400	1855.7373	-0.0027	NVA
GCP244	603430.2596	1626473.7370	2073.6660	2073.6987	0.0327	NVA
GCP245	593105.3779	1620409.3750	1417.8770	1418.0074	0.1304	NVA
GCP246	591171.2434	1613849.5180	849.9100	849.9619	0.0519	NVA
GCP247	586864.9785	1611668.9770	610.0480	610.0946	0.0466	NVA
GCP248	598409.5069	1616531.6100	1321.9090	1321.9192	0.0101	NVA
GCP249	530414.1177	1412252.1270	1271.5040	1271.5201	0.0161	NVA
GCP250	459424.8920	1220350.0900	1312.5840	1312.5020	-0.0820	NVA
GCP251	460877.4777	1224127.2840	1088.7460	1088.7334	-0.0126	NVA
GCP252	438923.6975	1222341.3960	523.3720	523.4139	0.0419	NVA
GCP253	430582.9316	1232443.2930	353.0460	353.1469	0.1009	NVA
GCP254	475864.1220	1248286.3180	1658.5310	1658.6737	0.1427	NVA
GCP255	433238.7368	1228630.0240	1445.0390	1445.2401	0.2012	NVA
GCP256	433214.9937	1228638.5560	1445.9820	1446.1258	0.1437	NVA
GCP257	431833.2079	1228219.3240	1121.6390	1121.7726	0.1336	NVA
GCP258	431847.6442	1228247.2940	1122.2820	1122.4197	0.1377	NVA
GCP259	452713.7488	1239686.8360	1293.5380	1293.5727	0.0347	NVA

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GCP260	452719.5782	1239705.6870	1294.5750	1294.4835	-0.0915	NVA
GCP261	450788.1062	1234653.8170	1409.1390	1409.0444	-0.0946	NVA
GCP262	450787.1233	1234658.6830	1409.0690	1408.9999	-0.0691	NVA
GCP263	454184.4852	1236339.0950	1154.8980	1154.8805	-0.0174	NVA
GCP266	492221.3796	1248256.8450	747.0260	746.9851	-0.0409	NVA
GCP267	492255.0423	1248257.6540	746.7790	746.8493	0.0703	NVA
GCP268	493385.6220	1252682.8320	836.0890	836.1075	0.0185	NVA
GCP269	493417.1439	1252652.9960	831.5290	831.5380	0.0090	NVA
GCP270	433280.4827	1188864.8720	917.8320	917.7899	-0.0421	NVA
GCP271	433277.3189	1188875.0900	918.1800	918.2082	0.0282	NVA
GCP272	439126.5437	1190063.6560	1153.6270	1153.5174	-0.1096	NVA
GCP273	451165.3531	1192549.2290	1487.3040	1487.2986	-0.0054	NVA
GCP274	451177.5784	1192557.3510	1487.6460	1487.6254	-0.0206	NVA
GCP275	397547.8673	1146010.0370	884.6740	884.7142	0.0402	NVA
GCP291	422102.2921	1145044.9880	1174.0610	1174.0552	-0.0058	NVA
GCP292	422093.6807	1145062.2350	1174.2780	1174.3142	0.0362	NVA
GCP293	444673.8725	1195371.9470	1140.5160	1140.4509	-0.0651	NVA
GCP294	416473.6755	1180619.5480	1205.8360	1205.8439	0.0078	NVA
GCP295	416485.4107	1180631.9060	1205.6100	1205.6149	0.0049	NVA
GCP296	386054.1144	1152224.6590	190.5520	190.5273	-0.0247	NVA
GCP297	386049.9749	1152220.1720	190.6910	190.6601	-0.0309	NVA
GCP298	386017.6391	1152284.7260	190.7470	190.7112	-0.0358	NVA
GCP299	386024.9300	1152283.3970	190.8340	190.8185	-0.0155	NVA
GCP300	400121.4122	1150299.2240	243.5660	243.5259	-0.0401	NVA
GCP301	400124.8991	1150298.5730	243.5320	243.5060	-0.0260	NVA
GCP311	416059.6296	1159596.1310	1236.8890	1236.9137	0.0247	NVA
GCP312	416053.1358	1159598.3380	1236.7860	1236.8217	0.0357	NVA
GCP313	415128.6038	1160106.3270	1189.1360	1189.1372	0.0012	NVA
GCP314	415124.2084	1160101.5060	1188.8150	1188.8071	-0.0078	NVA
GCP315	416523.0997	1156423.1330	1161.1460	1161.2542	0.1082	NVA
GCP316	416518.2285	1156422.3840	1161.3470	1161.5043	0.1573	NVA
GCP317	433654.8859	1244882.9970	874.6870	874.7200	0.0330	NVA
GCP318	433653.1430	1244884.4270	874.4750	874.5573	0.0823	NVA
GCP319	437767.3733	1244649.8070	1219.9640	1219.9969	0.0329	NVA
GCP320	437759.7290	1244651.0800	1219.8980	1219.9296	0.0317	NVA
GCP321	436509.4822	1251992.6970	904.9500	904.9763	0.0263	NVA
GCP322	436512.9390	1251983.0260	905.2010	905.2069	0.0059	NVA
GCP323	423542.4162	1284230.6240	282.1220	282.2994	0.1774	NVA
GCP324	423541.1114	1284224.6870	281.9240	282.1232	0.1992	NVA

Point ID	Given (X)	Given (Y)	Given (Z)	DEM (Z)	DEM (DZ)	Report Point Type
GCP325	431412.6321	1283137.9380	180.1300	180.0684	-0.0616	NVA
GCP326	431408.0717	1283134.8560	180.1440	180.0859	-0.0581	NVA
GCP327	440035.7347	1286143.0100	97.2020	97.1144	-0.0876	NVA
GCP328	440041.0284	1286144.3840	97.2010	97.1786	-0.0224	NVA
GCP329	445378.5243	1288501.9620	25.5940	25.7211	0.1271	NVA
GCP330	445373.8271	1288512.2210	25.7600	25.8928	0.1328	NVA
GCP331	481873.9255	1262959.9210	1371.5820	1371.5482	-0.0338	NVA
GCP332	481884.8526	1262954.6730	1372.6900	1372.5949	-0.0950	NVA
GCP333	481987.4036	1270946.3140	1216.0400	1215.9561	-0.0839	NVA
GCP334	481974.8194	1270950.0540	1216.1470	1216.0716	-0.0754	NVA
GCP335	486590.7761	1254504.3550	1343.0400	1343.0695	0.0295	NVA
GCP336	486602.0824	1254510.3830	1341.5520	1341.5502	-0.0018	NVA
GCP338	552102.7966	906187.0196	1710.5960	1710.6297	0.0338	NVA
GCP339	547173.5515	909676.4705	2357.0590	2357.0454	-0.0137	NVA
GCP340	545219.2210	912852.3847	1925.9520	1925.9508	-0.0012	NVA
GCP341	538776.1751	914569.4734	1710.6400	1710.7781	0.1381	NVA
GCP342	544570.6480	933063.3771	1633.9620	1633.9219	-0.0401	NVA
GCP343	537555.1019	934197.0642	1874.1660	1874.2195	0.0535	NVA
GCP344	548084.5995	931426.6436	1591.3150	1591.3551	0.0402	NVA
GCP345	543488.3751	954658.8602	2176.5270	2176.4939	-0.0332	NVA
GCP346	543575.9071	954773.2668	2159.6030	2159.6203	0.0173	NVA
GCP347	542231.8134	953059.6240	1999.6240	1999.5691	-0.0549	NVA
GCP348	542196.7396	953012.4855	1997.3670	1997.3805	0.0136	NVA
GCP349	397296.9159	1079946.9960	316.8750	316.9114	0.0364	NVA
GCP350	399440.3642	1080173.0220	329.9560	330.0141	0.0581	NVA
GCP351	504358.0587	972566.1931	1521.9900	1521.9977	0.0077	NVA
GCP352	504552.0911	972696.4225	1545.6200	1545.6712	0.0512	NVA
GCP353	504783.8797	972515.4291	1522.3150	1522.3275	0.0126	NVA
GCP354	504751.9452	972510.4884	1522.1950	1522.2376	0.0427	NVA
GCP355	504950.7178	972186.3823	1520.0720	1520.0952	0.0232	NVA
GCP356	504903.7226	972218.2788	1520.2580	1520.2617	0.0036	NVA
GCP357	504138.7028	975051.6660	1534.8520	1534.8051	-0.0470	NVA
GCP358	504174.4619	975074.6566	1534.8330	1534.8311	-0.0019	NVA
GCP359	505413.3574	976382.6439	1535.3240	1535.3246	0.0006	NVA
GCP360	505388.8811	976378.8258	1535.4250	1535.4225	-0.0025	NVA
GCP361	504021.2538	976705.1114	1587.8220	1587.7291	-0.0929	NVA
GCP362	504385.3982	979535.3129	1646.9250	1646.8694	-0.0556	NVA
GCP363	504385.4105	979535.3195	1646.9250	1646.8694	-0.0556	NVA
GCP364	504385.3995	979535.3199	1646.8570	1646.8694	0.0123	NVA



Point ID	Given (X)	Given (Y)	Given (Z)	DEM (Z)	DEM (DZ)	Report Point Type
GCP375	408156.5580	1119052.4610	525.9830	525.9583	-0.0247	NVA
GCP376	408162.3808	1119062.3540	526.2070	526.1464	-0.0606	NVA
GCP379	417406.1746	1072529.9120	678.1710	678.1498	-0.0212	NVA
GCP380	417408.2983	1072519.4150	678.2920	678.2285	-0.0635	NVA
GCP381	417756.4505	1086539.8730	1442.3380	1442.3200	-0.0180	NVA
GCP382	417770.2768	1086540.5450	1442.7970	1442.7496	-0.0474	NVA
GCP383	421735.2324	1086249.3460	1692.3920	1692.4329	0.0409	NVA
GCP384	421748.6816	1086239.1390	1692.2800	1692.2334	-0.0466	NVA
GCP385	403656.5145	1080864.2060	584.7280	584.7210	-0.0070	NVA
GCP386	403642.6824	1080875.5270	585.6800	585.6906	0.0106	NVA
GCP387	405403.7642	1084177.5790	717.9430	718.0157	0.0727	NVA
GCP388	405421.6478	1084175.7840	718.1810	718.2638	0.0828	NVA
GCP391	416135.3392	1063930.2160	1038.8560	1038.9148	0.0588	NVA
GCP392	416136.0572	1063919.9100	1038.1530	1038.1637	0.0107	NVA
GCP393	419183.8087	1064523.7810	1777.5580	1777.6147	0.0567	NVA
GCP394	419182.1809	1064519.5990	1777.5190	1777.5883	0.0693	NVA
GCP395	423641.8007	1100848.5520	1312.6940	1312.6791	-0.0149	NVA
GCP396	423641.8152	1100843.7880	1312.6230	1312.5858	-0.0372	NVA
GCP397	421373.2577	1102205.1710	1443.2510	1443.2204	-0.0306	NVA
GCP398	421372.8185	1102201.1770	1443.1910	1443.0926	-0.0984	NVA
GCP405	429935.4449	929575.3885	1275.5780	1275.7212	0.1432	NVA
GCP406	429946.3976	929591.4703	1275.3750	1275.5007	0.1257	NVA
GCP407	422571.4557	932324.6633	1275.7520	1275.9031	0.1511	NVA
GCP408	422550.4714	932335.5944	1275.2100	1275.3385	0.1285	NVA
GCP409	425239.6950	932208.5994	1276.4340	1276.5408	0.1068	NVA
GCP410	425234.2706	932205.1277	1276.6200	1276.7226	0.1026	NVA
GCP411	422972.6386	935876.2052	1575.1270	1575.2947	0.1677	NVA
GCP412	421605.2598	935280.9329	1460.9420	1461.0135	0.0715	NVA
GCP413	421608.2351	935285.0410	1461.3320	1461.3493	0.0173	NVA
GCP414	419148.0139	927912.4198	1511.9920	1511.9586	-0.0333	NVA
GCP415	419145.7084	927907.6270	1511.9140	1511.9069	-0.0070	NVA
GCP416	415305.8360	934627.7182	1750.3180	1750.3360	0.0180	NVA
GCP417	415300.9257	934615.5377	1750.7980	1750.7963	-0.0017	NVA
GCP418	415285.2383	934616.8298	1750.4450	1750.3855	-0.0594	NVA
GCP419	416403.4763	926925.8001	1523.2110	1522.9355	-0.2756	NVA
GCP420	417545.7108	927230.9805	1511.2750	1511.2362	-0.0388	NVA
GCP421	417540.2236	927231.4746	1511.2730	1511.2663	-0.0066	NVA
GCP423	418679.2248	927946.3428	1509.6510	1509.6079	-0.0431	NVA
GCP424	418665.3230	927944.9321	1509.6030	1509.5308	-0.0722	NVA

Point ID	Given (X)	Given (Y)	Given (Z)	DEM (Z)	DEM (DZ)	Report Point Type
GCP425	426306.8676	935372.3863	1265.3680	1265.3332	-0.0348	NVA
GCP426	426312.0529	935371.6475	1265.2510	1265.2911	0.0401	NVA
GCP427	423614.1942	940878.8765	2446.8870	2446.8363	-0.0507	NVA
GCP428	423615.2342	940858.0141	2445.3800	2445.3415	-0.0384	NVA
GCP429	576737.1069	906963.6765	1730.5700	1730.6091	0.0392	NVA
GCP430	576735.9917	906970.1125	1730.6860	1730.7277	0.0417	NVA
GCP431	587004.9884	914875.9118	2507.6610	2507.5935	-0.0674	NVA
GCP432	586999.9142	914880.8411	2507.9090	2507.8556	-0.0533	NVA
GCP433	573776.0217	909354.5608	1617.2920	1617.2797	-0.0123	NVA
GCP434	573781.3537	909357.1114	1617.3810	1617.3978	0.0168	NVA
GCP435	579529.8905	900964.5202	1882.0990	1882.0790	-0.0200	NVA
GCP436	579528.6415	900970.2126	1881.9750	1881.9075	-0.0675	NVA
GCP437	577321.4431	903059.9854	1906.4200	1906.4015	-0.0185	NVA
GCP438	577318.2806	903044.3025	1907.2630	1907.2041	-0.0588	NVA
GCP439	586759.8136	902776.0022	1725.1160	1725.1372	0.0212	NVA
GCP440	586764.5145	902770.9380	1725.1580	1725.1200	-0.0380	NVA
GCP441	536048.8444	905736.7219	1543.0570	1543.0489	-0.0081	NVA
GCP442	536056.7487	905743.0224	1542.9870	1542.9773	-0.0098	NVA
GCP443	534369.9985	901546.8953	1572.4300	1572.3760	-0.0541	NVA
GCP444	534373.3586	901554.8868	1572.5450	1572.4942	-0.0508	NVA
GCP445	535927.1649	893705.9091	1615.6880	1615.6583	-0.0297	NVA
GCP446	535928.2616	893713.5920	1615.9570	1615.9371	-0.0199	NVA
GCP447	531220.6956	895833.9026	1772.4040	1772.3317	-0.0724	NVA
GCP448	531227.2117	895835.6697	1772.0970	1772.0060	-0.0910	NVA
GCP449	541623.0756	891130.6428	1587.5690	1587.6061	0.0371	NVA
GCP450	541630.0739	891124.7967	1587.4010	1587.3463	-0.0547	NVA
GCP451	549042.8532	888331.7712	1868.7270	1868.7415	0.0144	NVA
GCP452	549039.0985	888324.6953	1868.5800	1868.5840	0.0040	NVA
GCP453	554248.2392	931980.2959	1758.8820	1758.9754	0.0934	NVA
GCP454	554247.8095	931989.6942	1758.7720	1758.8516	0.0796	NVA
GCP455	552659.6267	936820.0989	1616.7700	1616.9384	0.1684	NVA
GCP456	552649.6776	936814.3476	1616.7790	1616.8345	0.0554	NVA
GCP457	551487.1295	939808.9374	1518.0020	1518.0133	0.0113	NVA
GCP458	551492.0743	939817.9702	1518.1290	1518.1370	0.0080	NVA
GCP459	549213.1144	942934.9502	1514.8220	1514.8597	0.0377	NVA
GCP460	549227.6901	942963.3566	1514.4080	1514.4382	0.0302	NVA
GCP461	538979.5149	960109.7436	1719.7950	1719.7955	0.0005	NVA
GCP462	538959.5347	960104.2058	1718.8920	1718.9000	0.0080	NVA
GCP463	538076.1861	962103.4681	1529.0220	1529.0428	0.0208	NVA



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GCP464	538081.3197	962094.9429	1529.2290	1529.2707	0.0417	NVA
GCP467	506051.8489	977162.6016	1537.9740	1537.9514	-0.0226	NVA
GCP468	506058.4090	977161.8923	1537.8910	1537.8796	-0.0114	NVA
GCP469	474927.2807	1491717.9780	236.2730	236.1710	-0.1020	NVA
GCP470	476398.8182	1493558.5170	254.6250	254.5970	-0.0280	NVA
GCP471	476409.1727	1493553.9490	254.7330	254.6952	-0.0378	NVA
GCP472	478904.7463	1496231.7710	284.1780	284.1781	0.0001	NVA
GCP473	478897.6569	1496235.2570	284.3720	284.3367	-0.0353	NVA
GCP474	480550.8806	1497644.7040	280.6750	280.6840	0.0090	NVA
GCP475	480526.1190	1497629.5210	280.7980	280.7542	-0.0438	NVA
GCP476	476870.0968	1494244.5430	262.9220	262.8427	-0.0793	NVA
GCP477	477880.9658	1495606.7230	276.5870	276.8020	0.2150	NVA
GCP478	492122.2032	1488146.4270	986.8020	986.8094	0.0074	NVA
GCP479	492132.0728	1488121.2930	986.6850	986.6862	0.0012	NVA
GCP484	474882.1319	1491545.4250	236.3140	236.2748	-0.0392	NVA
GCP485	474895.2987	1491561.2340	236.0790	236.0582	-0.0208	NVA
GCP486	476033.8961	1492841.4230	244.7640	244.7729	0.0089	NVA
GCP487	476037.7830	1492845.0530	244.5900	244.6500	0.0600	NVA
GCP488	476206.8610	1492999.6110	256.4600	256.5134	0.0534	NVA
GCP489	476208.2767	1492985.2160	256.5310	256.4868	-0.0442	NVA
GCP490	477461.6906	1494946.9140	269.9760	269.9146	-0.0614	NVA
GCP491	479441.6374	1496723.0940	275.3620	275.3090	-0.0530	NVA
GCP492	575343.1795	1608887.9520	597.3620	597.4011	0.0391	NVA
GCP493	575344.9640	1608866.8860	597.3290	597.3590	0.0300	NVA
GCP494	574929.0079	1608183.9570	594.9680	595.0049	0.0369	NVA
GCP495	574928.3727	1608201.8260	595.1460	595.1774	0.0314	NVA
GCP496	572768.5993	1611216.8910	630.4930	630.4281	-0.0649	NVA
GCP497	572812.0338	1611227.4810	627.5270	627.4365	-0.0905	NVA
GCP498	567955.9262	1615114.4130	656.7790	656.7810	0.0020	NVA
GCP499	567970.6787	1615110.2850	656.7640	656.7377	-0.0263	NVA
GCP500	571533.0618	1613611.4340	643.2180	643.1352	-0.0828	NVA
GCP501	571547.7867	1613620.4970	643.6900	643.5656	-0.1244	NVA
GCP502	572641.2055	1615180.5210	873.5910	873.4934	-0.0976	NVA
GCP503	576551.0095	1608322.2890	591.3130	591.3136	0.0006	NVA
GCP504	576546.6692	1608303.8980	591.1400	591.1480	0.0080	NVA
GCP505	591010.7365	1597846.5390	671.8690	671.8815	0.0125	NVA
GCP506	591009.6645	1597836.1900	671.6560	671.6745	0.0185	NVA
GCP507	588367.1037	1618775.2050	659.2450	659.2681	0.0231	NVA
GCP508	588366.3649	1618791.3210	659.5990	659.6204	0.0214	NVA

Point ID	Given (X)	Given (Y)	Given (Z)	DEM (Z)	DEM (DZ)	Report Point Type
GCP509	590123.6896	1624250.7530	706.1350	706.1628	0.0278	NVA
GCP510	590113.3908	1624253.8600	707.4510	707.4396	-0.0114	NVA
GCP511	587161.2104	1622061.1780	1011.6960	1011.6868	-0.0092	NVA
GCP512	590165.9286	1591821.6500	492.4160	492.4427	0.0267	NVA
GCP513	588287.2464	1595806.2830	519.3750	519.3415	-0.0335	NVA
GCP514	588283.2080	1595796.8830	520.0440	520.0403	-0.0037	NVA
GCP515	589772.3345	1599550.9370	610.5610	610.6363	0.0753	NVA
GCP516	589744.2273	1599529.6830	610.8260	610.8794	0.0534	NVA
GCP517	587035.7435	1600533.5740	535.4910	535.5029	0.0119	NVA
GCP518	592923.7235	1587989.5540	487.1810	487.3066	0.1256	NVA
GCP519	592938.1536	1587983.1880	487.5110	487.5718	0.0608	NVA
GCP520	595743.2614	1582033.5060	463.0280	463.0323	0.0043	NVA
GCP521	595750.5917	1582028.8550	462.9000	462.9247	0.0247	NVA
GCP524	588311.1392	1586937.0490	731.9420	731.8819	-0.0601	NVA
GCP525	588305.2610	1586910.3670	733.6370	733.5856	-0.0514	NVA
GCP526	589767.0917	1588336.7290	604.2700	604.2801	0.0101	NVA
GCP527	589763.5382	1588332.2180	604.9640	604.9443	-0.0197	NVA
GCP528	586488.9431	1590207.8680	574.3170	574.2751	-0.0419	NVA
GCP529	586482.6519	1590196.2360	574.2830	574.2322	-0.0508	NVA
GCP530	582859.3926	1591024.5630	613.0250	613.0052	-0.0198	NVA
GCP531	582860.8917	1591016.3550	612.6220	612.6168	-0.0052	NVA
GCP532	580953.2396	1600745.5320	815.8580	815.8094	-0.0486	NVA
GCP533	580947.2476	1600741.6760	816.1990	816.1311	-0.0679	NVA
GCP534	574675.7429	1594342.9410	981.2280	981.2440	0.0160	NVA
GCP535	574678.1186	1594347.2300	980.8900	980.8264	-0.0636	NVA
GCP536	574248.0369	1593828.9550	1050.1000	1050.0535	-0.0465	NVA
GCP537	574224.2136	1593802.5790	1052.2430	1052.1874	-0.0556	NVA
GCP538	572974.1005	1595104.7530	1225.5280	1225.4608	-0.0672	NVA
GCP539	572977.1113	1595109.3370	1225.4010	1225.3465	-0.0545	NVA
GCP540	579326.3171	1594329.0600	1000.9610	1000.9653	0.0043	NVA
GCP541	579323.5267	1594328.3280	1001.0360	1001.0009	-0.0351	NVA
GCP542	589536.2115	1596056.7820	517.9190	517.9114	-0.0076	NVA
GCP543	589525.6133	1596071.4660	517.0590	517.1080	0.0490	NVA
GCP544	586724.3954	1601257.0070	532.9980	533.0636	0.0656	NVA
GCP545	586721.4797	1601243.6420	533.3490	533.3406	-0.0084	NVA

Table 13: Bare-Earth Check Point Assessment