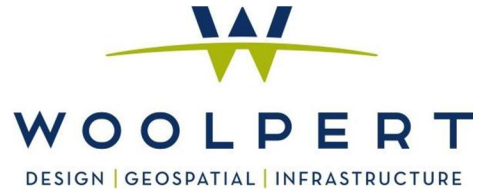


# GROUND CONTROL SURVEY REPORT



## GRAND TETON AND NATIONAL ELK REFUGE LIDAR

1/8/2015





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# SECTION 1: SURVEY REPORT

## INTRODUCTION

Report Date: 1/8/2015

Project Name: Grand Teton and National Elk Refuge Lidar  
Client Information: USGS / NGTOC  
Contract Number: G10PC00057  
Requisition/Reference Number: G14PD00775  
Date of Contract: 8/22/2014  
Delivery Date: 11/30/2014

Prepared By: David Kuxhausen, PLS  
Woolpert Project Number: 74714

This report contains a comprehensive outline of the Lidar Ground Control Survey that supported the Grand Teton and **National Elk Refuge Lidar**. All surveys were performed in such a way as to achieve ground control accuracies that meet or exceed the National Mapping Accuracy Standards.

## PROJECT AREA

The project area consists of approximately 559 square miles encompassing the Grand Teton National Park and the National Elk Refuge.

## PURPOSE

The purpose of this survey was to establish three-dimensional coordinates for 41 ground control points (GCPs) and 277 quality control (QC) points spread over each of the 4 land cover classifications Bare Earth, Brush/Trees, Forest, and Sage/Steppe.

The GCPs were located on open, bare earth surfaces with a level slope to enable effective assessment of swath-to-swath reproducibility and absolute accuracy. The QC points were collected uniformly dispersed over the project area in the appropriate land cover categories to verify fundamental, supplemental, and consolidated vertical accuracies throughout the task order AOI.

## DATE OF SURVEY

Ground control field operations took place on September 30th 2014 thru October 5th 2014.



## MONUMENTATION

Prior to aerial imagery acquisition, Woolpert field crews performed a field reconnaissance to verify the existence and suitability of pre-selected existing National Geodetic Survey (NGS) control stations. These existing bench marks were utilized as checks to ensure that quality  $x$ ,  $y$ , and  $z$  coordinate values were computed for each of the newly established photogrammetric control stations. Recovery information sheets for the existing NGS control stations can be found in Section 5 of this report. A control diagram showing the ground control stations used to support this Lidar mapping project can be found in Section 6 of this report.

## ACCURACY STANDARDS

The data collected under this task order shall meet the National Standard for spatial Database Accuracy (NSSDA) standards. The NSSDA standards specify that vertical accuracy be reported at the 95 percent confidence level for data tested by an independent source of higher accuracy.

The Fundamental Vertical Accuracy (FVA): 18.13 cm at a 95% confidence level, derived according to NSSDA, i.e., based on  $RMSE_z$  of 9.25 cm in the "open terrain" land cover category.

The Supplemental Vertical Accuracy (SVA): The SVA will be reported for each of the land cover classes within the task order AOI. The target SVA is 26.9 cm at a 95<sup>th</sup> percentile level, derived according to ASPRS Guidelines, Vertical Accuracy Reporting for Lidar Data, i.e., based on the 95<sup>th</sup> percentile error for each required land cover class.

The Consolidated Vertical Accuracy (CVA): 26.9 cm at a 95<sup>th</sup> percentile level, derived according to ASPRS Guidelines, Vertical Accuracy Reporting for Lidar Data, i.e., based on the 95<sup>th</sup> percentile error in all land cover categories combined.

Automated and manual filtering for lidar products shall use the following minimum performance for artifact/feature removal from the bare earth model: The bare earth surface model shall have a minimum of 95% of surface canopy artifacts, including buildings, vegetation, bridges or overpass structures removed.

## GPS EQUIPMENT

Woolpert utilized 2 Trimble Navigation R8 Model 4 GNSS dual-frequency GPS receivers with a Trimble TDL-450 radio as dual base stations. Additionally, Woolpert utilized 2 Trimble Navigation R8 Model 3 GNSS dual-frequency GPS receivers and 2 TSC3 data collectors as rovers for this project.

# METHODOLOGY

## REAL-TIME KINEMATIC (RTK) GPS

The field crew utilized Real-Time Kinematic (RTK) GPS surveying throughout most of the ground control data collection process. Using RTK GPS techniques, observations were performed on a total of 41 Lidar control points and 277 ground control quality check points. The survey was conducted using a 1-second epoch rate, in a fixed solution RTK mode, with each observation lasting between 60 to 180 seconds. Each station was occupied twice to insure the necessary horizontal and vertical accuracies were being met for this photogrammetric project.

## FAST-STATIC GPS

In addition to the RTK GPS techniques, the project field crew utilized Fast-static GPS surveying techniques on the two temporary survey marks that were established within the project area using a 5-second epoch collection rate.

Using Fast-Static GPS techniques, observations were performed on five (5) Temporary control points, four (4) NGS Benchmarks and two (2) NGS CORS stations. The survey was conducted at a 5-second sync rate with each observation lasting between 4-10 hours.

## GPS DATA ANALYSIS AND PROCESSING

The field crew chief processed all session baselines each day using Trimble Navigation's Trimble Business Center (TBC) Version 3.40 baseline processor with the accompanying broadcast ephemeris. Daily processing ensured the integrity of the network as it was constructed, and allowed the field crews to immediately reschedule observations of poor baselines. Once the field work was complete, the processed baselines were then run through a rigorous loop closure analysis. As a result of this analysis, unacceptable GPS vectors were removed and field blunders, if any, were detected and eliminated. Once this process was completed, both unconstrained and constrained adjustments were conducted in order to effectively incorporate the static observation data.

The GPS base stations and constrained geodetic control stations consisted of the following:

Point Designation	NGS PID	Type	Constrained
1001	TSM	TSM	3D
1002	TSM	TSM	3D
1003	TSM	TSM	3D
1004	TSM	TSM	3D
A 136	OX0163	BM	VERT.
B 312	OX0192	BM	VERT.
IDDR	DH7135	CORS	3D
K 41	OX0177	BM	VERT.
MAWY	AI5647	CORS	3D

Stations 1001, 1002, 1003 and 1004 were set within the project area at the time of the ground survey and deemed temporary control base stations. The coordinates associated with these points were established by utilizing the 5-second epoch static GPS data that was collected over a three day period. The raw GPS data was sent to the NGS Online Positioning User System "OPUS" the individual "OPUS" results were then meaned to produce the final coordinates. Stations A 136, B 312 and K 41 are NGS bench marks which were constrained vertically in the final adjustment. Stations IDDR and MAWY are NGS CORS stations and were constrained 3D in the final adjustment.

## DATUM REFERENCE AND FINAL COORDINATES

New horizontal GPS control within the Grand Teton and Elk Refuge project area was based on the UTM Coordinate System Zone 12 North, referenced to North American Datum 1983, national re-adjustment of 2011 (NAD83/2011) epoch 2010.00, expressed in meters. All vertical control was based on the North American Vertical Datum of 1988 (NAVD88), also expressed in meters. These coordinates for the Lidar control survey can be found in Section 2 of this report.

## QUALITY ASSURANCE

Existing NGS published bench marks were surveyed to assure that there were no discrepancies in the field observation data. Close examinations of the residuals showed no distortions in orientation or scale.

The ground control data meets positional accuracies necessary to support 1.0 point per 0.3 meters squared (1' GSD) data at 95% confidence level as outlined in the *Geospatial Positioning Accuracy Standards, Part 3: National Standard for Spatial Data Accuracy (NSSDA)*, published by the Federal Geographic Data Committee (FGDC-STD-007.3-1998).

# SECTION 2: GROUND/GEODETIC CONTROL COORDINATE LISTINGS

## COORDINATE SYSTEM: GRID

HORIZONTAL DATUM: NAD83 2011 UTM Zone 12-N

VERTICAL DATUM: NAVD88

ZONE: 12-North

GEOID MODEL: GEOID 12A

UNITS: Meters

### LIDAR GROUND CONTROL

Point	UTM Zone 12-North		Elevation (m)	Description
	Northing (m)	Easting (m)		
2	4827042.619	515701.461	1934.915	LIDAR CTL
3	4843089.652	533029.545	2147.429	LIDAR CTL
4	4844294.913	522430.189	2071.416	LIDAR CTL
7	4834901.371	524450.597	1988.413	LIDAR CTL
8	4849000.600	524423.537	2127.837	LIDAR CTL
9	4851975.439	530878.202	2095.089	LIDAR CTL
10	4853596.129	546042.880	2070.339	LIDAR CTL
11	4854372.600	539589.274	2057.604	LIDAR CTL
12	4864069.500	528998.734	2070.679	LIDAR CTL
13	4878863.206	524925.277	2189.312	LIDAR CTL
14	4881935.791	526113.358	2087.748	LIDAR CTL
15	4885908.838	527173.754	2114.256	LIDAR CTL
16	4885930.137	516956.903	2206.825	LIDAR CTL
17	4848290.149	521753.171	2097.702	LIDAR CTL
18	4834688.504	518752.156	2045.192	LIDAR CTL
18A	4834703.305	518643.469	2051.745	LIDAR CTL
19	4829842.61	517252.175	1958.228	LIDAR CTL
20	4826418.451	514068.852	1948.082	LIDAR CTL
21	4827362.162	511589.602	2677.658	LIDAR CTL
22	4826917.150	510093.085	3132.173	LIDAR CTL
22A	4826843.131	510062.445	3118.993	LIDAR CTL
22B	4827136.156	510434.730	3175.009	LIDAR CTL
22C	4827151.650	510386.199	3184.205	LIDAR CTL
23	4844878.275	506632.904	2124.715	LIDAR CTL
23A	4844890.488	506626.311	2124.561	LIDAR CTL
24	4853851.614	493391.212	1951.205	LIDAR CTL
24A	4853831.654	493354.078	1949.985	LIDAR CTL

Point	UTM Zone 12-North		Elevation (m)	Description
	Northing (m)	Easting (m)		
25	4826843.927	491743.074	1909.865	LIDAR CTL
25A	4826824.233	491717.946	1909.702	LIDAR CTL
26	4846204.690	523483.604	2086.946	LIDAR CTL
27	4858478.249	534313.391	2091.229	LIDAR CTL
28	4861713.528	528315.290	2069.101	LIDAR CTL
101	4823703.009	521554.936	1949.183	LIDAR CTL
102	4817481.846	519093.978	2105.232	LIDAR CTL 2 ELK
103	4814034.860	519839.547	1907.753	LIDAR CTL 3 ELK
104	4822841.907	530385.897	2073.508	LIDAR CTL
105	4829831.944	531456.119	2041.422	LIDAR CTL
106	4829314.143	526925.175	2003.265	LIDAR CTL
107	4821715.062	527217.814	1993.273	LIDAR CTL ELK
108	4818165.647	521920.175	1904.927	LIDAR CTL ELK
109	4827848.053	527438.494	2018.168	LIDAR CTL ELK

#### QUALITY CONTROL POINTS

Point	UTM Zone 12-North		Elevation (m)	Description
	Northing (m)	Easting (m)		
2002	4829948.519	531033.447	2032.675	BARE EARTH
2002A	4829940.889	531039.021	2033.085	BARE EARTH
2003	4843395.554	532965.658	2141.167	BARE EARTH
2003A	4843401.427	532965.059	2140.628	BARE EARTH
2004	4834912.480	524437.344	1988.165	BARE EARTH
2004A	4834903.910	524419.705	1988.004	BARE EARTH
2005	4852282.059	530925.388	2101.571	BARE EARTH
2005A	4852293.929	530910.099	2101.826	BARE EARTH
2006	4854376.811	539633.634	2057.374	BARE EARTH
2006A	4854376.856	539644.616	2057.337	BARE EARTH
2007	4864258.232	528971.273	2073.466	BARE EARTH
2007A	4864264.166	528966.376	2074.008	BARE EARTH
2008	4881967.357	526066.622	2084.375	BARE EARTH
2008A	4881969.695	526058.177	2084.190	BARE EARTH
2009	4886724.528	526816.291	2099.734	BARE EARTH
2010A	4885433.265	517447.910	2205.018	BARE EARTH
2011	4848327.945	521722.454	2097.576	BARE EARTH
2011A	4848304.075	521734.202	2097.622	BARE EARTH
2012	4830061.662	517192.446	1966.021	BARE EARTH

Point	UTM Zone 12-North		Elevation (m)	Description
	Northing (m)	Easting (m)		
2012A	4830070.067	517188.275	1966.571	BARE EARTH
2013	4826996.610	515614.909	1934.017	BARE EARTH
2013A	4826999.600	515611.859	1933.698	BARE EARTH
2014	4826905.457	510067.042	3131.112	BARE EARTH
2014A	4826876.104	510066.310	3126.787	BARE EARTH
2015	4846240.373	523497.010	2086.213	BARE EARTH
2015A	4846207.580	523504.685	2086.800	BARE EARTH
2016	4878863.000	524929.956	2188.790	BARE EARTH
2016A	4878871.714	524933.104	2188.414	BARE EARTH
2017	4849066.931	524473.263	2128.841	BARE EARTH
2017A	4849081.051	524455.332	2128.681	BARE EARTH
2018	4829353.317	526853.305	2004.612	BARE EARTH
2018A	4829361.031	526841.735	2004.263	BARE EARTH
2019	4844163.001	522255.112	2069.525	BARE EARTH
2019A	4844183.665	522267.764	2069.764	BARE EARTH
2020	4853581.645	546039.524	2069.907	BARE EARTH
2020A	4853577.143	546048.015	2069.887	BARE EARTH
2101	4823664.808	521546.074	1948.235	BARE EARTH
2101A	4823639.702	521545.924	1948.266	BARE EARTH
2102	4822842.314	521577.647	1952.037	BARE EARTH
2102A	4822838.901	521596.965	1952.547	BARE EARTH
2103	4821147.704	521388.998	1949.000	BARE EARTH
2103A	4821169.654	521389.613	1949.374	BARE EARTH
2104	4818529.610	520486.656	1899.608	BARE EARTH
2104A	4818535.114	520477.616	1899.980	BARE EARTH
2105	4814684.633	519275.573	1896.395	BARE EARTH
2105A	4814676.054	519276.857	1896.498	BARE EARTH
2106	4814131.376	520776.293	1916.414	BARE EARTH
2106A	4814145.064	520781.162	1916.095	BARE EARTH
2107	4815541.176	521527.895	1905.069	BARE EARTH
2107A	4815535.418	521536.146	1905.165	BARE EARTH
2108A	4816840.483	522521.821	1923.317	BARE EARTH
2109	4819158.937	524798.007	1934.542	BARE EARTH
2109A	4819170.826	524798.209	1934.698	BARE EARTH
2110	4819789.073	526827.826	1972.190	BARE EARTH
2110A	4819789.090	526817.793	1972.091	BARE EARTH
2111A	4821718.353	527193.347	1992.873	BARE EARTH
2112	4822882.597	530212.879	2069.564	BARE EARTH

Point	UTM Zone 12-North		Elevation (m)	Description
	Northing (m)	Easting (m)		
2112A	4822892.240	530211.120	2069.454	BARE EARTH
2113	4826261.349	531132.636	2059.290	BARE EARTH
2113A	4826255.986	531124.313	2058.898	BARE EARTH
2114	4829280.747	530470.998	2030.015	BARE EARTH
2114A	4829277.287	530463.916	2029.903	BARE EARTH
2115	4832076.878	533680.761	2057.927	BARE EARTH
2115A	4832059.610	533651.767	2057.004	BARE EARTH
2116	4828964.883	528613.306	2061.799	BARE EARTH
2116A	4828962.769	528620.949	2062.193	BARE EARTH
2117	4827939.042	527207.665	2017.560	BARE EARTH
2117A	4827936.633	527203.505	2017.424	BARE EARTH
2118	4827515.742	526014.111	2014.806	BARE EARTH
2118A	4827524.095	526007.829	2014.886	BARE EARTH
2119	4825909.860	524822.616	1976.109	BARE EARTH
2119A	4825926.792	524829.797	1976.266	BARE EARTH
2120	4826132.822	524678.440	1976.611	BARE EARTH
2120A	4826127.691	524679.523	1976.538	BARE EARTH
2121	4822221.155	524795.323	1941.927	BARE EARTH
2121A	4822229.573	524794.887	1941.998	BARE EARTH
2122	4826071.164	529467.685	2031.360	BARE EARTH
2122A	4826075.846	529473.033	2031.369	BARE EARTH
4002	4830069.272	531171.084	2032.189	SAGE/STEPPE
4002A	4830074.955	531168.495	2032.350	SAGE/STEPPE
4003	4843607.541	532141.767	2130.865	SAGE/STEPPE
4003A	4843609.591	532147.884	2130.843	SAGE/STEPPE
4004	4834850.205	524405.477	1988.278	SAGE/STEPPE
4004A	4834824.386	524401.445	1988.303	SAGE/STEPPE
4005	4852261.208	530986.483	2101.204	SAGE/STEPPE
4005A	4852290.731	530995.072	2101.416	SAGE/STEPPE
4006	4854320.607	539668.479	2055.355	SAGE/STEPPE
4006A	4854325.620	539671.899	2055.437	SAGE/STEPPE
4007	4864342.103	528927.456	2082.239	SAGE/TREES
4007A	4864352.858	528923.159	2082.991	SAGE/TREES
4008	4882148.920	526326.057	2089.999	SAGE/STEPPE
4008A	4882140.621	526307.566	2089.792	SAGE/STEPPE
4009	4886689.521	526840.835	2100.070	SAGE/STEPPE
4009A	4886686.864	526854.142	2100.115	SAGE/STEPPE
4010	4884931.316	517838.448	2187.077	SAGE/STEPPE



Point	UTM Zone 12-North		Elevation (m)	Description
	Northing (m)	Easting (m)		
4010A	4884936.505	517824.475	2187.039	SAGE/STEPPE
4011	4848159.782	522245.894	2102.434	SAGE/STEPPE
4011A	4848153.564	522224.009	2102.213	SAGE/STEPPE
4012	4829851.890	517262.394	1958.230	SAGE/STEPPE
4012A	4829852.756	517268.046	1958.147	SAGE/STEPPE
4013	4827047.782	515739.250	1933.827	SAGE/STEPPE
4013A	4827050.771	515748.350	1933.937	SAGE/STEPPE
4014	4826871.753	510080.758	3125.326	SAGE/STEPPE
4014A	4826859.506	510054.584	3124.733	SAGE/STEPPE
4015	4853615.818	546046.342	2069.361	SAGE/STEPPE
4015A	4853624.735	546051.897	2069.491	SAGE/STEPPE
4016	4844477.277	522687.017	2072.521	SAGE/STEPPE
4016A	4844489.573	522669.597	2072.454	SAGE/STEPPE
4017	4829443.288	526834.049	2004.610	SAGE/STEPPE
4017A	4829428.332	526814.773	2004.365	SAGE/STEPPE
4018	4881921.189	522089.364	2141.481	SAGE/STEPPE
4018A	4881925.274	522067.549	2141.302	SAGE/STEPPE
4019	4858842.516	534142.445	2098.281	SAGE/STEPPE
4019A	4858832.623	534138.953	2097.466	SAGE/STEPPE
4020	4847737.150	536785.785	2079.266	SAGE/STEPPE
4020A	4847731.482	536782.562	2079.153	SAGE/STEPPE
4101	4823606.356	521503.103	1944.769	SAGE/STEPPE
4101A	4823601.626	521488.145	1944.990	SAGE/STEPPE
4102	4822852.589	521585.641	1951.743	SAGE/STEPPE
4102A	4822848.811	521607.322	1951.923	SAGE/STEPPE
4103	4821157.310	521415.566	1949.738	SAGE/STEPPE
4103A	4821135.689	521409.679	1949.516	SAGE/STEPPE
4104	4818535.495	520517.735	1897.690	SAGE/STEPPE
4104A	4818548.893	520526.838	1897.831	SAGE/STEPPE
4105	4817142.628	519760.287	1894.890	SAGE/STEPPE
4105A	4817150.383	519770.601	1894.899	SAGE/STEPPE
4106	4814126.234	520798.427	1920.059	SAGE/STEPPE
4106A	4814133.800	520806.414	1921.889	SAGE/STEPPE
4107	4815572.704	521530.044	1902.628	SAGE/STEPPE
4107A	4815579.180	521530.983	1902.342	SAGE/STEPPE
4108	4816819.929	522573.943	1925.053	SAGE/STEPPE
4108A	4816808.174	522582.278	1925.545	SAGE/STEPPE
4109	4818723.328	523816.157	1918.280	SAGE/STEPPE



Point	UTM Zone 12-North		Elevation (m)	Description
	Northing (m)	Easting (m)		
4109A	4818713.835	523813.808	1918.189	SAGE/STEPPE
4110	4820011.472	526995.872	1977.538	SAGE/STEPPE
4110A	4820000.548	526998.053	1977.399	SAGE/STEPPE
4111	4821706.783	527067.845	1988.544	SAGE/STEPPE
4111A	4821712.735	527075.635	1989.623	SAGE/STEPPE
4112	4822907.752	530192.063	2068.964	SAGE/STEPPE
4112A	4822914.111	530184.825	2068.639	SAGE/STEPPE
4113	4826258.592	531152.418	2060.274	SAGE/STEPPE
4113A	4826252.871	531142.535	2059.551	SAGE/STEPPE
4114	4829260.087	530457.653	2029.847	SAGE/STEPPE
4114A	4829248.260	530457.440	2029.952	SAGE/STEPPE
4115	4832063.762	533603.150	2058.333	SAGE/STEPPE
4115A	4832068.652	533599.721	2058.900	SAGE/STEPPE
4116	4828903.652	528467.921	2050.760	SAGE/STEPPE
4116A	4828907.389	528475.642	2051.222	SAGE/STEPPE
4117	4827939.984	527222.251	2017.236	SAGE/STEPPE
4117A	4827944.025	527230.798	2016.655	SAGE/STEPPE
4118	4827506.051	525984.525	2015.549	SAGE/STEPPE
4118A	4827498.191	525993.820	2015.918	SAGE/STEPPE
4119	4825918.827	524811.119	1976.025	SAGE/STEPPE
4119A	4825897.151	524801.265	1976.059	SAGE/STEPPE
4120	4826123.543	524668.576	1976.599	SAGE/STEPPE
4120A	4826133.677	524668.086	1976.609	SAGE/STEPPE
4121	4822197.269	524811.803	1941.503	SAGE/STEPPE
4121A	4822201.248	524818.895	1941.576	SAGE/STEPPE
4122	4826049.512	529472.109	2030.970	SAGE/STEPPE
4122A	4826041.966	529464.275	2030.166	SAGE/STEPPE
5002	4829960.944	531022.058	2032.397	BRUSH/TREES
5002A	4829958.793	531004.636	2032.656	BRUSH/TREES
5003	4843643.875	532408.229	2132.006	BRUSH/TREES
5003A	4843648.727	532409.971	2129.244	BRUSH/TREES
5004	4834742.278	524342.470	1976.620	BRUSH/TREES
5004A	4834732.938	524376.016	1977.151	BRUSH/TREES
5005	4852304.051	531004.749	2100.780	BRUSH/TREES
5005A	4852331.577	531012.625	2101.046	BRUSH/TREES
5006	4854290.553	539642.499	2054.233	BRUSH/TREES
5006A	4854288.262	539634.092	2053.852	BRUSH/TREES
5007	4864256.774	528949.923	2074.344	BRUSH/TREES

Point	UTM Zone 12-North		Elevation (m)	Description
	Northing (m)	Easting (m)		
5007A	4864266.357	528938.359	2074.346	BRUSH/TREES
5008	4881921.618	526146.651	2086.887	BRUSH/TREES
5008A	4881913.153	526152.000	2086.926	BRUSH/TREES
5009	4886666.178	526871.707	2099.970	BRUSH/TREES
5009A	4886655.670	526852.740	2099.874	BRUSH/TREES
5010	4884947.806	517825.732	2187.369	BRUSH/TREES
5010A	4884954.717	517807.375	2187.342	BRUSH/TREES
5011	4848258.427	521778.326	2097.793	BRUSH/TREES
5011A	4848263.408	521743.202	2097.557	BRUSH/TREES
5012	4829830.702	517307.166	1953.419	BRUSH/TREES
5012A	4829825.249	517306.506	1953.435	BRUSH/TREES
5013	4827019.831	516713.423	1927.760	BRUSH/TREES
5013A	4827025.014	516723.408	1927.668	BRUSH/TREES
5014	4826852.236	510028.056	3123.383	BRUSH/TREES
5014A	4826844.183	510013.191	3121.300	BRUSH/TREES
5015	4878915.372	524913.036	2178.685	BRUSH/TREES
5015A	4878922.437	524916.142	2178.531	BRUSH/TREES
5016	4881644.228	522892.626	2098.824	BRUSH/TREES
5016A	4881653.627	522928.407	2097.466	BRUSH/TREES
5017	4861767.017	528276.780	2069.273	BRUSH/TREES
5017A	4861769.828	528280.039	2068.857	BRUSH/TREES
5018	4829388.648	527071.470	2004.185	BRUSH/TREES
5018A	4829382.995	527046.577	2003.699	BRUSH/TREES
5019	4844470.123	522408.751	2074.556	BRUSH/TREES
5019A	4844430.519	522387.725	2073.544	BRUSH/TREES
5020	4853544.281	546185.603	2068.162	BRUSH/TREES
5020A	4853540.169	546192.291	2068.297	BRUSH/TREES
5101	4823643.311	521494.304	1944.362	BRUSH/TREES
5101A	4823660.710	521520.037	1945.020	BRUSH/TREES
5102	4820431.048	520984.781	1991.553	BRUSH/TREES
5102A	4820499.019	520902.794	1981.282	BRUSH/TREES
5104	4817359.396	519903.521	1894.568	BRUSH/TREES
5104A	4817369.168	519910.500	1894.473	BRUSH/TREES
5105	4814283.474	521084.596	1972.171	BRUSH/TREES
5105A	4814281.678	521075.493	1971.786	BRUSH/TREES
5106	4814085.398	521202.957	1978.558	BRUSH/TREES
5106A	4814090.112	521213.305	1981.814	BRUSH/TREES
5107	4815374.240	521775.724	1941.846	BRUSH/TREES

Point	UTM Zone 12-North		Elevation (m)	Description
	Northing (m)	Easting (m)		
5107A	4815378.430	521784.446	1944.370	BRUSH/TREES
5108	4816514.188	522921.954	1984.434	BRUSH/TREES
5108A	4816503.644	522930.214	1987.754	BRUSH/TREES
5109	4818591.543	527013.342	2012.811	BRUSH/TREES
5109A	4818597.511	527019.273	2012.743	BRUSH/TREES
5110	4819634.727	526929.404	2000.737	BRUSH/TREES
5110A	4819628.002	526928.758	2002.885	BRUSH/TREES
5111	4821686.486	527059.550	1987.833	BRUSH/TREES
5111A	4821680.071	527053.125	1987.313	BRUSH/TREES
5112	4822824.592	530194.981	2055.502	BRUSH/TREES
5112A	4822821.276	530180.237	2054.916	BRUSH/TREES
5113	4826642.943	531301.709	2072.764	BRUSH/TREES
5113A	4826643.236	531307.601	2072.659	BRUSH/TREES
5114	4829227.206	530435.515	2030.005	BRUSH/TREES
5114A	4829223.288	530445.384	2032.809	BRUSH/TREES
5115	4832006.965	533642.413	2053.001	BRUSH/TREES
5115A	4832024.677	533649.890	2053.196	BRUSH/TREES
5116	4829029.144	528228.533	2017.810	BRUSH/TREES
5116A	4829025.563	528224.804	2018.061	BRUSH/TREES
5117	4828162.739	527217.419	2028.998	BRUSH/TREES
5117A	4828174.285	527212.228	2028.065	BRUSH/TREES
5118	4827731.112	526083.641	2008.296	BRUSH/TREES
5118A	4827739.576	526091.651	2008.031	BRUSH/TREES
5119	4826028.197	524970.891	2001.810	BRUSH/TREES
5119A	4826023.334	524978.259	2002.150	BRUSH/TREES
5120	4826146.516	524646.505	1977.646	BRUSH/TREES
5121	4822135.073	524116.579	1930.077	BRUSH/TREES
5121A	4822130.558	524122.049	1930.233	BRUSH/TREES
5122	4827088.115	529426.821	2069.511	BRUSH/TREES
5122A	4827088.118	529434.632	2070.384	BRUSH/TREES
6001	4883778.919	526661.405	2087.015	FOREST
6001A	4883771.907	526657.790	2086.931	FOREST
6002	4881872.031	521711.295	2148.961	FOREST
6002A	4881884.925	521720.300	2147.854	FOREST
6003	4876716.548	524584.060	2241.921	FOREST
6003A	4876735.842	524594.856	2242.431	FOREST
6003B	4876700.324	524553.571	2241.187	FOREST
6003C	4876711.594	524560.104	2241.313	FOREST

Point	UTM Zone 12-North		Elevation (m)	Description
	Northing (m)	Easting (m)		
6004	4872643.953	525296.253	2073.599	FOREST
6004A	4872628.510	525296.278	2073.241	FOREST
6005	4867264.926	529108.799	2087.967	FOREST
6005A	4867253.162	529128.152	2090.849	FOREST
6006	4861790.637	528306.907	2069.178	FOREST
6006A	4861788.453	528318.745	2069.806	FOREST
6007	4856145.749	538046.686	2065.096	FOREST
6007A	4856141.326	538063.549	2064.902	FOREST
6008	4854853.432	539483.040	2085.209	FOREST
6008A	4854870.747	539490.632	2085.640	FOREST
6009	4848141.936	536928.819	2077.720	FOREST
6009A	4848147.046	536929.289	2077.866	FOREST
6010	4885456.376	517449.515	2205.128	FOREST
6010A	4885427.621	517469.123	2204.639	FOREST
6011	4848196.492	521512.886	2094.211	FOREST
6011A	4848184.487	521598.441	2095.343	FOREST
6012	4852433.466	530999.536	2103.125	FOREST
6012A	4852429.014	530976.190	2101.431	FOREST
6013	4827006.256	516978.715	1927.553	FOREST
6013A	4826989.817	516980.500	1928.135	FOREST
6013B	4858809.725	534144.220	2095.245	FOREST
6013C	4858789.604	534132.148	2094.661	FOREST
6014	4864159.890	529049.192	2068.229	FOREST
6014A	4864147.875	529057.805	2070.834	FOREST
6015	4886370.902	527120.861	2099.228	FOREST
6015A	4886367.501	527132.888	2099.250	FOREST
6016	4834711.406	518749.139	2045.241	FOREST
6016A	4834707.394	518763.322	2044.530	FOREST
6017	4829808.742	517311.646	1952.942	FOREST
6017A	4829806.754	517320.863	1952.987	FOREST
6019	4830087.360	531319.560	2030.541	FOREST
6020	4854172.900	542597.685	2080.622	FOREST
6020A	4854168.739	542585.663	2080.229	FOREST
6110	4844665.036	530407.409	2107.105	FOREST
6110A	4844636.718	530433.335	2107.456	FOREST

CONTROL BASE STATIONS

Point	UTM Zone 12-North		Elevation (m)	Description
	Northing (m)	Easting (m)		
1001	4844140.161	530057.662	2102.903	TSM
1002	4857044.988	534463.861	2061.587	TSM
1003	4869845.741	527128.694	2069.088	TSM
1004	4883030.473	526575.52	2077.542	TSM
A 136	4827579.231	522109.046	1959.829	OX0163
B 312	4830291.518	529756.711	2031.217	OX0192
IDDR	4843680.527	491122.728	1874.428	DH7135
K 41	4852323.285	530944.326	2102.055	OX0177
MAWY	4980044.881	524500.259	1833.542	AI5647
U59 A	4842767.818	491492.505	1873.825	AA3684
VENTRE GPS	4824149.542	521539.928	1950.159	TSM

NGS CONTROL MINIMALLY CONSTRAINED HORIZONTAL BASE STATION CHECK POINTS

Minimum HORIZONTAL Adj. Grid Deltas				
Point	$\Delta$ North (m)	$\Delta$ East (m)	$\Delta$ Elev. (m)	Description
1001	-0.005	-0.003	0.002	TSM
1002	-0.003	0.003	0.014	TSM
1003	0.005	0.004	0.013	TSM
1004	0.010	0.003	-0.002	TSM
A 136	-0.019	0.006	0.022	OX0163
B 312	-0.020	0.005	-0.028	OX0192
IDDR	0.008	0.012	0.007	DH7135
K 41	-0.008	-0.004	-0.017	OX0177
MAWY	0.000	0.000	0.000	AI5647
U59 A	0.040	0.013	0.026	AA3684
VENTRE GPS	-0.016	0.006	0.033	TSM

	Constrained
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NGS CONTROL MINIMALLY CONSTRAINED VERTICAL BASE STATION CHECK POINTS

NSRS / OPUS Values			NAVD88 Δ Elev. (m)	MINIMUM VERT Adjustment		
NAVD88				NAVD88		
Point	Elevation (m)	Description		Point	Elevation (m)	Description
1001	2102.903	TSM	0.014	1001	2102.889	TSM
1002	2061.587	TSM	0.036	1002	2061.551	TSM
1003	2069.088	TSM	0.034	1003	2069.054	TSM
1004	2077.542	TSM	0.017	1004	2077.525	TSM
A 136	1959.829	OX0163	0.035	A 136	1959.794	OX0163
B 312	2031.217	OX0192	-0.015	B 312	2031.232	OX0192
IDDR	1874.428	DH7135	0.022	IDDR	1874.406	DH7135
K 41	2102.055	OX0177	0.000	K 41	2102.055	OX0177
MAWY	1833.542	AI5647	0.016	MAWY	1833.526	AI5647
U59 A	1873.84	AA3684	0.040	U59 A	1873.800	AA3684
VENTRE GPS	1950.198	TSM	0.046	VENTRE GPS	1950.152	TSM

COORDINATE SYSTEM: GEODETIC

HORIZONTAL DATUM: NAD83 (2011) Epoch 2010.00

VERTICAL DATUM: NAVD88

UNITS: Meters

DATE: 1/8/2015

LIDAR GROUND CONTROL

Point	NAD83 (2011) Epoch 2010.00		Ellipsoid Ht. (m)	Description
	N Latitude	W Longitude		
2	43°35'46.28707"	-110°48'19.70088"	1925.508	LIDAR CTL
3	43°44'24.39009"	-110°35'23.32935"	2138.344	LIDAR CTL
4	43°45'04.88477"	-110°43'17.01278"	2062.422	LIDAR CTL
7	43°40'00.17389"	-110°41'48.20583"	1979.159	LIDAR CTL
8	43°47'37.18553"	-110°41'47.10823"	2118.868	LIDAR CTL
9	43°49'12.74046"	-110°36'57.66642"	2086.005	LIDAR CTL
10	43°50'02.42933"	-110°25'38.31061"	2061.523	LIDAR CTL
11	43°50'28.94317"	-110°30'27.06918"	2048.656	LIDAR CTL
12	43°55'45.01576"	-110°38'19.43741"	2061.831	LIDAR CTL
13	44°03'45.04901"	-110°41'19.62148"	2180.772	LIDAR CTL
14	44°05'24.48773"	-110°40'25.67171"	2079.212	LIDAR CTL
15	44°07'33.12102"	-110°39'37.24893"	2105.739	LIDAR CTL
16	44°07'34.92117"	-110°47'16.97516"	2198.104	LIDAR CTL
17	43°47'14.45737"	-110°43'46.70281"	2088.821	LIDAR CTL

Point	NAD83 (2011) Epoch 2010.00		Ellipsoid Ht. (m)	Description
	N Latitude	W Longitude		
18	43°39'53.87039"	-110°46'02.68298"	2036.028	LIDAR CTL
18A	43°39'54.36001"	-110°46'07.53418"	2042.586	LIDAR CTL
19	43°37'16.92427"	-110°47'10.21661"	1948.911	LIDAR CTL
20	43°35'26.17225"	-110°49'32.57473"	1938.678	LIDAR CTL
21	43°35'56.91619"	-110°51'23.06815"	2668.407	LIDAR CTL
22	43°35'42.56960"	-110°52'29.84711"	3122.936	LIDAR CTL
22A	43°35'40.17178"	-110°52'31.21861"	3109.754	LIDAR CTL
22B	43°35'49.65171"	-110°52'14.59452"	3165.775	LIDAR CTL
22C	43°35'50.15637"	-110°52'16.75799"	3174.973	LIDAR CTL
23	43°45'24.90939"	-110°55'03.37586"	2115.764	LIDAR CTL
23A	43°45'25.30549"	-110°55'03.67018"	2115.610	LIDAR CTL
24	43°50'15.76979"	-111°04'55.94416"	1941.580	LIDAR CTL
24A	43°50'15.12163"	-111°04'57.60611"	1940.358	LIDAR CTL
25	43°35'40.27751"	-111°06'08.25611"	1900.080	LIDAR CTL
25A	43°35'39.63813"	-111°06'09.37570"	1899.915	LIDAR CTL
26	43°46'06.66999"	-110°42'29.60814"	2077.962	LIDAR CTL
27	43°52'42.96795"	-110°34'22.38297"	2082.233	LIDAR CTL
28	43°54'28.74860"	-110°38'50.53962"	2060.200	LIDAR CTL
101	43°33'57.50771"	-110°43'59.11144"	1939.671	LIDAR CTL
102	43°30'36.09027"	-110°45'49.60408"	2095.565	LIDAR CTL 2 ELK
103	43°28'44.28553"	-110°45'16.85108"	1897.998	LIDAR CTL 3 ELK
104	43°33'28.48825"	-110°37'25.62052"	2064.302	LIDAR CTL
105	43°37'14.90513"	-110°36'36.45721"	2032.289	LIDAR CTL
106	43°36'58.76081"	-110°39'58.71291"	1993.976	LIDAR CTL
107	43°32'52.40243"	-110°39'47.03128"	1983.912	LIDAR CTL ELK
108	43°30'57.97641"	-110°43'43.63467"	1895.321	LIDAR CTL ELK
109	43°36'11.17106"	-110°39'36.07890"	2008.888	LIDAR CTL ELK



QUALITY CONTROL POINTS

Point	NAD83 (2011) Epoch 2010.00		Ellipsoid Ht. (m)	Description
	N Latitude	W Longitude		
2002	43°37'18.74768"	-110°36'55.29197"	2023.526	BARE EARTH
2002A	43°37'18.49955"	-110°36'55.04481"	2023.936	BARE EARTH
2003	43°44'34.31563"	-110°35'26.11797"	2132.078	BARE EARTH
2003A	43°44'34.50609"	-110°35'26.14344"	2131.539	BARE EARTH
2004	43°40'00.53556"	-110°41'48.79581"	1978.912	BARE EARTH
2004A	43°40'00.25985"	-110°41'49.58482"	1978.750	BARE EARTH
2005	43°49'22.67179"	-110°36'55.49031"	2092.490	BARE EARTH
2005A	43°49'23.05884"	-110°36'56.17229"	2092.746	BARE EARTH
2006	43°50'29.07111"	-110°30'25.08153"	2048.428	BARE EARTH
2006A	43°50'29.07044"	-110°30'24.58976"	2048.391	BARE EARTH
2007	43°55'51.13689"	-110°38'20.63197"	2064.623	BARE EARTH
2007A	43°55'51.32994"	-110°38'20.85042"	2065.166	BARE EARTH
2008	44°05'25.51681"	-110°40'27.76784"	2075.838	BARE EARTH
2008A	44°05'25.59367"	-110°40'28.14718"	2075.653	BARE EARTH
2009	44°07'59.60612"	-110°39'53.18406"	2091.196	BARE EARTH
2010A	44°07'18.77512"	-110°46'54.94030"	2196.315	BARE EARTH
2011	43°47'15.68575"	-110°43'48.07163"	2088.697	BARE EARTH
2011A	43°47'14.91079"	-110°43'47.54950"	2088.741	BARE EARTH
2012	43°37'24.02971"	-110°47'12.85660"	1956.715	BARE EARTH
2012A	43°37'24.30251"	-110°47'13.04176"	1957.266	BARE EARTH
2013	43°35'44.80224"	-110°48'23.56593"	1924.609	BARE EARTH
2013A	43°35'44.89941"	-110°48'23.70164"	1924.290	BARE EARTH
2014	43°35'42.19184"	-110°52'31.00941"	3121.874	BARE EARTH
2014A	43°35'41.24041"	-110°52'31.04402"	3117.548	BARE EARTH
2015	43°46'07.82505"	-110°42'29.00291"	2077.229	BARE EARTH
2015A	43°46'06.76122"	-110°42'28.66478"	2077.815	BARE EARTH
2016	44°03'45.04177"	-110°41'19.41120"	2180.250	BARE EARTH
2016A	44°03'45.32384"	-110°41'19.26826"	2179.874	BARE EARTH
2017	43°47'39.32963"	-110°41'44.87225"	2119.871	BARE EARTH
2017A	43°47'39.78944"	-110°41'45.67231"	2119.712	BARE EARTH
2018	43°37'00.03995"	-110°40'01.91239"	1995.322	BARE EARTH
2018A	43°37'00.29150"	-110°40'02.42722"	1994.972	BARE EARTH
2019	43°45'00.62802"	-110°43'24.86113"	2060.533	BARE EARTH
2019A	43°45'01.29647"	-110°43'24.29231"	2060.772	BARE EARTH
2020	43°50'01.96066"	-110°25'38.46536"	2061.091	BARE EARTH
2020A	43°50'01.81281"	-110°25'38.08656"	2061.071	BARE EARTH
2101	43°33'56.27035"	-110°43'59.51195"	1938.722	BARE EARTH



Point	NAD83 (2011) Epoch 2010.00		Ellipsoid Ht. (m)	Description
	N Latitude	W Longitude		
2101A	43°33'55.45656"	-110°43'59.52224"	1938.754	BARE EARTH
2102	43°33'29.60610"	-110°43'58.22231"	1942.512	BARE EARTH
2102A	43°33'29.49346"	-110°43'57.36175"	1943.023	BARE EARTH
2103	43°32'34.69513"	-110°44'06.87134"	1939.443	BARE EARTH
2103A	43°32'35.40658"	-110°44'06.84079"	1939.817	BARE EARTH
2104	43°31'09.92079"	-110°44'47.43626"	1889.980	BARE EARTH
2104A	43°31'10.10010"	-110°44'47.83819"	1890.353	BARE EARTH
2105	43°29'05.40119"	-110°45'41.87315"	1886.646	BARE EARTH
2105A	43°29'05.12299"	-110°45'41.81706"	1886.749	BARE EARTH
2106	43°28'47.32256"	-110°44'35.13941"	1906.688	BARE EARTH
2106A	43°28'47.76576"	-110°44'34.92076"	1906.370	BARE EARTH
2107	43°29'32.94499"	-110°44'01.48135"	1895.401	BARE EARTH
2107A	43°29'32.75747"	-110°44'01.11481"	1895.498	BARE EARTH
2108A	43°30'14.95672"	-110°43'17.03415"	1913.710	BARE EARTH
2109	43°31'29.84979"	-110°41'35.28924"	1925.042	BARE EARTH
2109A	43°31'30.23516"	-110°41'35.27831"	1925.201	BARE EARTH
2110	43°31'50.02290"	-110°40'04.75352"	1962.783	BARE EARTH
2110A	43°31'50.02475"	-110°40'05.20052"	1962.684	BARE EARTH
2111A	43°32'52.51232"	-110°39'48.12106"	1983.511	BARE EARTH
2112	43°33'29.83250"	-110°37'33.32407"	2060.348	BARE EARTH
2112A	43°33'30.14534"	-110°37'33.40050"	2060.239	BARE EARTH
2113	43°35'19.21630"	-110°36'51.63001"	2050.133	BARE EARTH
2113A	43°35'19.04372"	-110°36'52.00225"	2049.741	BARE EARTH
2114	43°36'57.18613"	-110°37'20.52329"	2020.845	BARE EARTH
2114A	43°36'57.07502"	-110°37'20.83994"	2020.732	BARE EARTH
2115	43°38'27.32167"	-110°34'56.69454"	2048.867	BARE EARTH
2115A	43°38'26.76668"	-110°34'57.99252"	2047.942	BARE EARTH
2116	43°36'47.21308"	-110°38'43.46356"	2052.564	BARE EARTH
2116A	43°36'47.14352"	-110°38'43.12300"	2052.957	BARE EARTH
2117	43°36'14.15090"	-110°39'46.35858"	2008.273	BARE EARTH
2117A	43°36'14.07335"	-110°39'46.54459"	2008.136	BARE EARTH
2118	43°36'00.58343"	-110°40'39.67138"	2005.473	BARE EARTH
2118A	43°36'00.85498"	-110°40'39.95013"	2005.553	BARE EARTH
2119	43°35'08.67599"	-110°41'33.08088"	1966.723	BARE EARTH
2119A	43°35'09.22398"	-110°41'32.75786"	1966.880	BARE EARTH
2120	43°35'15.92046"	-110°41'39.47346"	1967.222	BARE EARTH
2120A	43°35'15.75401"	-110°41'39.42603"	1967.150	BARE EARTH
2121	43°33'09.11128"	-110°41'34.90537"	1932.482	BARE EARTH

Point	NAD83 (2011) Epoch 2010.00		Ellipsoid Ht. (m)	Description
	N Latitude	W Longitude		
2121A	43°33'09.38422"	-110°41'34.92338"	1932.553	BARE EARTH
2122	43°35'13.29536"	-110°38'05.91475"	2022.137	BARE EARTH
2122A	43°35'13.44635"	-110°38'05.67534"	2022.146	BARE EARTH
4002	43°37'22.64107"	-110°36'49.12567"	2023.045	SAGE/STEPPE
4002A	43°37'22.82567"	-110°36'49.23999"	2023.206	SAGE/STEPPE
4003	43°44'41.31713"	-110°36'02.90729"	2121.753	SAGE/STEPPE
4003A	43°44'41.38260"	-110°36'02.63335"	2121.731	SAGE/STEPPE
4004	43°39'58.52073"	-110°41'50.22889"	1979.024	SAGE/STEPPE
4004A	43°39'57.68432"	-110°41'50.41315"	1979.049	SAGE/STEPPE
4005	43°49'21.98674"	-110°36'52.75953"	2092.123	SAGE/STEPPE
4005A	43°49'22.94236"	-110°36'52.36886"	2092.335	SAGE/STEPPE
4006	43°50'27.24267"	-110°30'23.53615"	2046.408	SAGE/STEPPE
4006A	43°50'27.40448"	-110°30'23.38165"	2046.491	SAGE/STEPPE
4007	43°55'53.86155"	-110°38'22.58074"	2073.399	SAGE/TREES
4007A	43°55'54.21076"	-110°38'22.77132"	2074.152	SAGE/TREES
4008	44°05'31.36813"	-110°40'16.06846"	2081.469	SAGE/STEPPE
4008A	44°05'31.10157"	-110°40'16.90149"	2081.262	SAGE/STEPPE
4009	44°07'58.46826"	-110°39'52.08597"	2091.533	SAGE/STEPPE
4009A	44°07'58.38039"	-110°39'51.48762"	2091.578	SAGE/STEPPE
4010	44°07'02.47220"	-110°46'37.42956"	2178.391	SAGE/STEPPE
4010A	44°07'02.64159"	-110°46'38.05757"	2178.352	SAGE/STEPPE
4011	43°47'10.17901"	-110°43'24.67676"	2093.533	SAGE/STEPPE
4011A	43°47'09.97982"	-110°43'25.65683"	2093.313	SAGE/STEPPE
4012	43°37'17.22421"	-110°47'09.75961"	1948.914	SAGE/STEPPE
4012A	43°37'17.25183"	-110°47'09.50731"	1948.831	SAGE/STEPPE
4013	43°35'46.45155"	-110°48'18.01491"	1924.419	SAGE/STEPPE
4013A	43°35'46.54774"	-110°48'17.60875"	1924.529	SAGE/STEPPE
4014	43°35'41.09869"	-110°52'30.39992"	3116.087	SAGE/STEPPE
4014A	43°35'40.70295"	-110°52'31.56808"	3115.493	SAGE/STEPPE
4015	43°50'03.06674"	-110°25'38.14951"	2060.546	SAGE/STEPPE
4015A	43°50'03.35451"	-110°25'37.89799"	2060.676	SAGE/STEPPE
4016	43°45'10.76772"	-110°43'05.50086"	2063.523	SAGE/STEPPE
4016A	43°45'11.16819"	-110°43'06.27800"	2063.456	SAGE/STEPPE
4017	43°37'02.95880"	-110°40'02.75543"	1995.320	SAGE/STEPPE
4017A	43°37'02.47652"	-110°40'03.61809"	1995.074	SAGE/STEPPE
4018	44°05'24.49129"	-110°43'26.63231"	2132.877	SAGE/STEPPE
4018A	44°05'24.62607"	-110°43'27.61270"	2132.698	SAGE/STEPPE
4019	43°52'54.80328"	-110°34'29.95907"	2089.289	SAGE/STEPPE

Point	NAD83 (2011) Epoch 2010.00		Ellipsoid Ht. (m)	Description
	N Latitude	W Longitude		
4019A	43°52'54.48323"	-110°34'30.11783"	2088.473	SAGE/STEPPE
4020	43°46'54.39237"	-110°32'34.25539"	2070.238	SAGE/STEPPE
4020A	43°46'54.20924"	-110°32'34.40100"	2070.125	SAGE/STEPPE
4101	43°33'54.38011"	-110°44'01.43584"	1935.255	SAGE/STEPPE
4101A	43°33'54.22833"	-110°44'02.10329"	1935.475	SAGE/STEPPE
4102	43°33'29.93833"	-110°43'57.86453"	1942.219	SAGE/STEPPE
4102A	43°33'29.81359"	-110°43'56.89871"	1942.400	SAGE/STEPPE
4103	43°32'35.00376"	-110°44'05.68607"	1940.181	SAGE/STEPPE
4103A	43°32'34.30354"	-110°44'05.95145"	1939.959	SAGE/STEPPE
4104	43°31'10.10850"	-110°44'46.05110"	1888.064	SAGE/STEPPE
4104A	43°31'10.54189"	-110°44'45.64378"	1888.205	SAGE/STEPPE
4105	43°30'25.03210"	-110°45'19.97308"	1885.214	SAGE/STEPPE
4105A	43°30'25.28249"	-110°45'19.51269"	1885.223	SAGE/STEPPE
4106	43°28'47.15365"	-110°44'34.15484"	1910.334	SAGE/STEPPE
4106A	43°28'47.39809"	-110°44'33.79824"	1912.165	SAGE/STEPPE
4107	43°29'33.96674"	-110°44'01.38118"	1892.961	SAGE/STEPPE
4107A	43°29'34.17657"	-110°44'01.33843"	1892.675	SAGE/STEPPE
4108	43°30'14.28483"	-110°43'14.71613"	1915.447	SAGE/STEPPE
4108A	43°30'13.90287"	-110°43'14.34667"	1915.939	SAGE/STEPPE
4109	43°31'15.84462"	-110°42'19.09721"	1908.740	SAGE/STEPPE
4109A	43°31'15.53720"	-110°42'19.20333"	1908.649	SAGE/STEPPE
4110	43°31'57.21011"	-110°39'57.22697"	1968.142	SAGE/STEPPE
4110A	43°31'56.85571"	-110°39'57.13177"	1968.003	SAGE/STEPPE
4111	43°32'52.15371"	-110°39'53.71608"	1979.177	SAGE/STEPPE
4111A	43°32'52.34562"	-110°39'53.36785"	1980.256	SAGE/STEPPE
4112	43°33'30.65093"	-110°37'34.24682"	2059.748	SAGE/STEPPE
4112A	43°33'30.85811"	-110°37'34.56815"	2059.423	SAGE/STEPPE
4113	43°35'19.12398"	-110°36'50.74841"	2051.118	SAGE/STEPPE
4113A	43°35'18.94001"	-110°36'51.19033"	2050.394	SAGE/STEPPE
4114	43°36'56.51843"	-110°37'21.12283"	2020.676	SAGE/STEPPE
4114A	43°36'56.13511"	-110°37'21.13473"	2020.781	SAGE/STEPPE
4115	43°38'26.90915"	-110°35'00.16147"	2049.270	SAGE/STEPPE
4115A	43°38'27.06823"	-110°35'00.31344"	2049.837	SAGE/STEPPE
4116	43°36'45.24839"	-110°38'49.96115"	2041.519	SAGE/STEPPE
4116A	43°36'45.36846"	-110°38'49.61600"	2041.981	SAGE/STEPPE
4117	43°36'14.17951"	-110°39'45.70780"	2007.949	SAGE/STEPPE
4117A	43°36'14.30938"	-110°39'45.32581"	2007.368	SAGE/STEPPE
4118	43°36'00.27303"	-110°40'40.99268"	2006.215	SAGE/STEPPE

Point	NAD83 (2011) Epoch 2010.00		Ellipsoid Ht. (m)	Description
	N Latitude	W Longitude		
4118A	43°36'00.01709"	-110°40'40.57945"	2006.584	SAGE/STEPPE
4119	43°35'08.96804"	-110°41'33.59210"	1966.638	SAGE/STEPPE
4119A	43°35'08.26660"	-110°41'34.03506"	1966.671	SAGE/STEPPE
4120	43°35'15.62084"	-110°41'39.91486"	1967.210	SAGE/STEPPE
4120A	43°35'15.94939"	-110°41'39.93506"	1967.220	SAGE/STEPPE
4121	43°33'08.33507"	-110°41'34.17482"	1932.059	SAGE/STEPPE
4121A	43°33'08.46319"	-110°41'33.85807"	1932.131	SAGE/STEPPE
4122	43°35'12.59289"	-110°38'05.72173"	2021.747	SAGE/STEPPE
4122A	43°35'12.34940"	-110°38'06.07255"	2020.943	SAGE/STEPPE
5002	43°37'19.15216"	-110°36'55.79753"	2023.247	BRUSH/TREES
5002A	43°37'19.08505"	-110°36'56.57533"	2023.506	BRUSH/TREES
5003	43°44'42.45303"	-110°35'50.98586"	2122.900	BRUSH/TREES
5003A	43°44'42.61004"	-110°35'50.90691"	2120.137	BRUSH/TREES
5004	43°39'55.02984"	-110°41'53.05983"	1967.364	BRUSH/TREES
5004A	43°39'54.72312"	-110°41'51.56345"	1967.895	BRUSH/TREES
5005	43°49'23.37263"	-110°36'51.93285"	2091.700	BRUSH/TREES
5005A	43°49'24.26365"	-110°36'51.57448"	2091.965	BRUSH/TREES
5006	43°50'26.27358"	-110°30'24.70761"	2045.286	BRUSH/TREES
5006A	43°50'26.20094"	-110°30'25.08469"	2044.905	BRUSH/TREES
5007	43°55'51.09265"	-110°38'21.58977"	2065.502	BRUSH/TREES
5007A	43°55'51.40490"	-110°38'22.10654"	2065.504	BRUSH/TREES
5008	44°05'24.02406"	-110°40'24.17709"	2078.353	BRUSH/TREES
5008A	44°05'23.74901"	-110°40'23.93805"	2078.392	BRUSH/TREES
5009	44°07'57.70762"	-110°39'50.70093"	2091.434	BRUSH/TREES
5009A	44°07'57.36955"	-110°39'51.55643"	2091.338	BRUSH/TREES
5010	44°07'03.00778"	-110°46'37.99965"	2178.682	BRUSH/TREES
5010A	44°07'03.23337"	-110°46'38.82473"	2178.655	BRUSH/TREES
5011	43°47'13.42651"	-110°43'45.58198"	2088.909	BRUSH/TREES
5011A	43°47'13.59169"	-110°43'47.15275"	2088.675	BRUSH/TREES
5012	43°37'16.53369"	-110°47'07.76436"	1944.101	BRUSH/TREES
5012A	43°37'16.35696"	-110°47'07.79442"	1944.116	BRUSH/TREES
5013	43°35'45.46913"	-110°47'34.56927"	1918.335	BRUSH/TREES
5013A	43°35'45.63633"	-110°47'34.12336"	1918.243	BRUSH/TREES
5014	43°35'40.46859"	-110°52'32.75174"	3114.144	BRUSH/TREES
5014A	43°35'40.20828"	-110°52'33.41522"	3112.061	BRUSH/TREES
5015	44°03'46.74132"	-110°41'20.16285"	2170.145	BRUSH/TREES
5015A	44°03'46.96994"	-110°41'20.02205"	2169.991	BRUSH/TREES
5016	44°05'15.42569"	-110°42'50.55296"	2090.232	BRUSH/TREES

Point	NAD83 (2011) Epoch 2010.00		Ellipsoid Ht. (m)	Description
	N Latitude	W Longitude		
5016A	44°05'15.72629"	-110°42'48.94250"	2088.874	BRUSH/TREES
5017	43°54'30.48766"	-110°38'52.25587"	2060.374	BRUSH/TREES
5017A	43°54'30.57831"	-110°38'52.10922"	2059.959	BRUSH/TREES
5018	43°37'01.15674"	-110°39'52.17254"	1994.901	BRUSH/TREES
5018A	43°37'00.97674"	-110°39'53.28417"	1994.414	BRUSH/TREES
5019	43°45'10.56631"	-110°43'17.94510"	2065.566	BRUSH/TREES
5019A	43°45'09.28490"	-110°43'18.89123"	2064.555	BRUSH/TREES
5020	43°50'00.71679"	-110°25'31.93625"	2059.349	BRUSH/TREES
5020A	43°50'00.58200"	-110°25'31.63809"	2059.483	BRUSH/TREES
5101	43°33'55.57891"	-110°44'01.82283"	1934.848	BRUSH/TREES
5101A	43°33'56.14023"	-110°44'00.67321"	1935.507	BRUSH/TREES
5102	43°32'11.50612"	-110°44'24.98341"	1981.976	BRUSH/TREES
5102A	43°32'13.71766"	-110°44'28.62708"	1971.705	BRUSH/TREES
5104	43°30'32.04496"	-110°45'13.56561"	1884.902	BRUSH/TREES
5104A	43°30'32.36106"	-110°45'13.25352"	1884.807	BRUSH/TREES
5105	43°28'52.22179"	-110°44'21.39417"	1962.460	BRUSH/TREES
5105A	43°28'52.16448"	-110°44'21.79964"	1962.075	BRUSH/TREES
5106	43°28'45.78903"	-110°44'16.15303"	1968.848	BRUSH/TREES
5106A	43°28'45.94081"	-110°44'15.69171"	1972.104	BRUSH/TREES
5107	43°29'27.50789"	-110°43'50.47106"	1932.190	BRUSH/TREES
5107A	43°29'27.64277"	-110°43'50.08212"	1934.714	BRUSH/TREES
5108	43°30'04.33604"	-110°42'59.26472"	1974.838	BRUSH/TREES
5108A	43°30'03.99337"	-110°42'58.89851"	1978.159	BRUSH/TREES
5109	43°31'11.18113"	-110°39'56.70280"	2003.395	BRUSH/TREES
5109A	43°31'11.37383"	-110°39'56.43757"	2003.327	BRUSH/TREES
5110	43°31'45.00665"	-110°40'00.25561"	1991.332	BRUSH/TREES
5110A	43°31'44.78874"	-110°40'00.28558"	1993.480	BRUSH/TREES
5111	43°32'51.49689"	-110°39'54.08939"	1978.465	BRUSH/TREES
5111A	43°32'51.28978"	-110°39'54.37685"	1977.944	BRUSH/TREES
5112	43°33'27.95490"	-110°37'34.13344"	2046.285	BRUSH/TREES
5112A	43°33'27.84957"	-110°37'34.79127"	2045.698	BRUSH/TREES
5113	43°35'31.55987"	-110°36'44.01089"	2063.618	BRUSH/TREES
5113A	43°35'31.56847"	-110°36'43.74805"	2063.514	BRUSH/TREES
5114	43°36'55.45587"	-110°37'22.11716"	2020.833	BRUSH/TREES
5114A	43°36'55.32743"	-110°37'21.67769"	2023.638	BRUSH/TREES
5115	43°38'25.06175"	-110°34'58.42182"	2043.939	BRUSH/TREES
5115A	43°38'25.63466"	-110°34'58.08413"	2044.135	BRUSH/TREES
5116	43°36'49.34895"	-110°39'00.61719"	2008.562	BRUSH/TREES

Point	NAD83 (2011) Epoch 2010.00		Ellipsoid Ht. (m)	Description
	N Latitude	W Longitude		
5116A	43°36'49.23336"	-110°39'00.78424"	2008.813	BRUSH/TREES
5117	43°36'21.40061"	-110°39'45.88300"	2019.712	BRUSH/TREES
5117A	43°36'21.77555"	-110°39'46.11245"	2018.779	BRUSH/TREES
5118	43°36'07.55579"	-110°40'36.53277"	1998.968	BRUSH/TREES
5118A	43°36'07.82913"	-110°40'36.17399"	1998.703	BRUSH/TREES
5119	43°35'12.49400"	-110°41'26.44929"	1992.431	BRUSH/TREES
5119A	43°35'12.33548"	-110°41'26.12151"	1992.771	BRUSH/TREES
5120	43°35'16.36814"	-110°41'40.89535"	1968.257	BRUSH/TREES
5121	43°33'06.40108"	-110°42'05.16944"	1920.609	BRUSH/TREES
5121A	43°33'06.25408"	-110°42'04.92639"	1920.764	BRUSH/TREES
5122	43°35'46.26493"	-110°38'07.53804"	2060.297	BRUSH/TREES
5122A	43°35'46.26392"	-110°38'07.18968"	2061.170	BRUSH/TREES
6001	44°06'24.15522"	-110°40'00.69088"	2078.489	FOREST
6001A	44°06'23.92841"	-110°40'00.85478"	2078.405	FOREST
6002	44°05'22.93872"	-110°43'43.64130"	2140.352	FOREST
6002A	44°05'23.35565"	-110°43'43.23447"	2139.244	FOREST
6003	44°02'35.51333"	-110°41'35.31813"	2233.388	FOREST
6003A	44°02'36.13736"	-110°41'34.82979"	2233.897	FOREST
6003B	44°02'34.99113"	-110°41'36.69084"	2232.653	FOREST
6003C	44°02'35.35562"	-110°41'36.39542"	2232.779	FOREST
6004	44°00'23.42518"	-110°41'04.01673"	2065.010	FOREST
6004A	44°00'22.92462"	-110°41'04.01824"	2064.652	FOREST
6005	43°57'28.57123"	-110°38'13.87142"	2079.216	FOREST
6005A	43°57'28.18718"	-110°38'13.00538"	2082.098	FOREST
6006	43°54'31.24907"	-110°38'50.90068"	2060.279	FOREST
6006A	43°54'31.17663"	-110°38'50.37039"	2060.907	FOREST
6007	43°51'26.70707"	-110°31'35.69415"	2056.141	FOREST
6007A	43°51'26.56057"	-110°31'34.93995"	2055.947	FOREST
6008	43°50'44.54854"	-110°30'31.69863"	2076.267	FOREST
6008A	43°50'45.10831"	-110°30'31.35400"	2076.698	FOREST
6009	43°47'07.48698"	-110°32'27.75607"	2068.693	FOREST
6009A	43°47'07.65252"	-110°32'27.73377"	2068.839	FOREST
6010	44°07'19.52407"	-110°46'54.86532"	2196.424	FOREST
6010A	44°07'18.59036"	-110°46'53.98651"	2195.936	FOREST
6011	43°47'11.44692"	-110°43'57.46723"	2085.340	FOREST
6011A	43°47'11.04882"	-110°43'53.64110"	2086.468	FOREST
6012	43°49'27.56815"	-110°36'52.13923"	2094.046	FOREST
6012A	43°49'27.42738"	-110°36'53.18533"	2092.352	FOREST



Point	NAD83 (2011) Epoch 2010.00		Ellipsoid Ht. (m)	Description
	N Latitude	W Longitude		
6013	43°35'45.00750"	-110°47'22.73869"	1918.123	FOREST
6013A	43°35'44.47449"	-110°47'22.66093"	1918.705	FOREST
6013B	43°52'53.74017"	-110°34'29.88711"	2086.252	FOREST
6013C	43°52'53.09001"	-110°34'30.43268"	2085.667	FOREST
6014	43°55'47.93833"	-110°38'17.15670"	2059.383	FOREST
6014A	43°55'47.54769"	-110°38'16.77276"	2061.987	FOREST
6015	44°07'48.10420"	-110°39'39.54329"	2090.704	FOREST
6015A	44°07'47.99235"	-110°39'39.00270"	2090.728	FOREST
6016	43°39'54.61301"	-110°46'02.81484"	2036.078	FOREST
6016A	43°39'54.48166"	-110°46'02.18205"	2035.367	FOREST
6017	43°37'15.82149"	-110°47'07.56700"	1943.623	FOREST
6017A	43°37'15.75627"	-110°47'07.15596"	1943.667	FOREST
6019	43°37'23.20495"	-110°36'42.49696"	2021.403	FOREST
6020	43°50'21.86786"	-110°28'12.40595"	2071.756	FOREST
6020A	43°50'21.73548"	-110°28'12.94549"	2071.363	FOREST
6110	43°45'15.85759"	-110°37'20.23500"	2097.971	FOREST
6110A	43°45'14.93590"	-110°37'19.08145"	2098.322	FOREST

#### CONTROL BASE STATIONS

Point	NAD83 (2011) Epoch 2010.00		Ellipsoid Ht. (m)	Description
	N Latitude	W Longitude		
1001	43°44'58.89603"	-110°37'35.98052"	2093.764	TSM
1002	43°51'56.48719"	-110°34'15.97363"	2052.570	TSM
1003	43°58'52.49375"	-110°39'42.24365"	2060.427	TSM
1004	44°05'59.90818"	-110°40'04.68996"	2069.016	TSM
A 136	43°36'03.09562"	-110°43'33.84071"	1950.404	OX0163
B 312	43°37'30.05344"	-110°37'52.19058"	2022.023	OX0192
IDDR	43°44'46.00102"	-111°06'36.92106"	1864.598	DH7135
K 41	43°49'24.00519"	-110°36'54.63389"	2092.975	OX0177
MAWY	44°58'24.31920"	-110°41'21.43310"	1824.912	AI5647
U59 A	43°44'16.43203"	-111°06'20.33558"	1864.012	AA3684
VENTRE GPS	43°34'11.98352"	-110°43'59.71659"	1940.655	TSM


## SECTION 3: GROUND/GEODETIC CONTROL LOGS AND PHOTOS

This section contains the station recovery information sheets and photographs for the ground control, geodetic control and checkpoint stations established for the project. The stations appear as they are ordered in the final coordinate listing of Section 2.

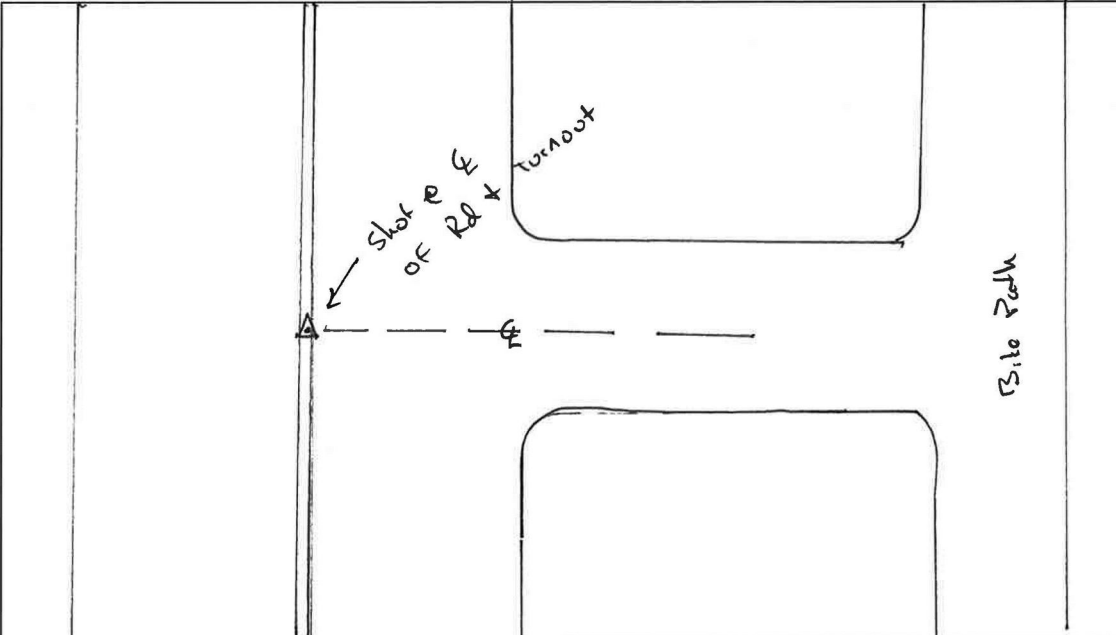
The data is assembled on the following pages.



Lidar Control Points:

Elk Refuge LiDAR Survey - LiDAR Control				
LiDAR Control point # <b>101</b>	General location <b>Jackson WY</b>		Ground Class <b>Road</b>	
Latitude <b>N 43° 33' 56"</b>	Longitude <b>W 110° 44' 00"</b>	Calendar Date <b>9/30/14</b>	Observer Initials <b>DJK</b>	

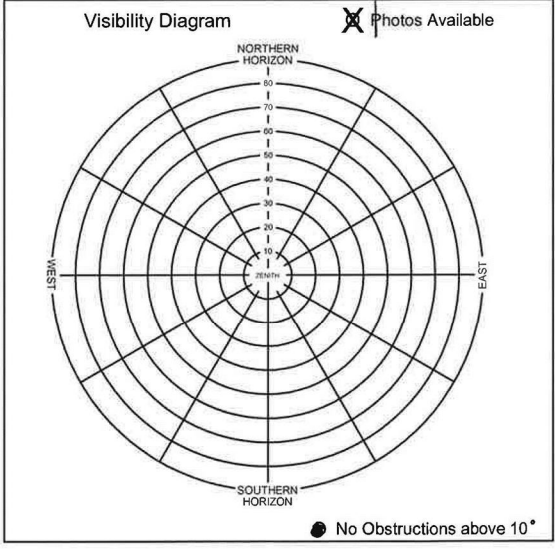


A ——— B

*Site Path*

Visibility Diagram



● No Obstructions above 10°

Photos Available

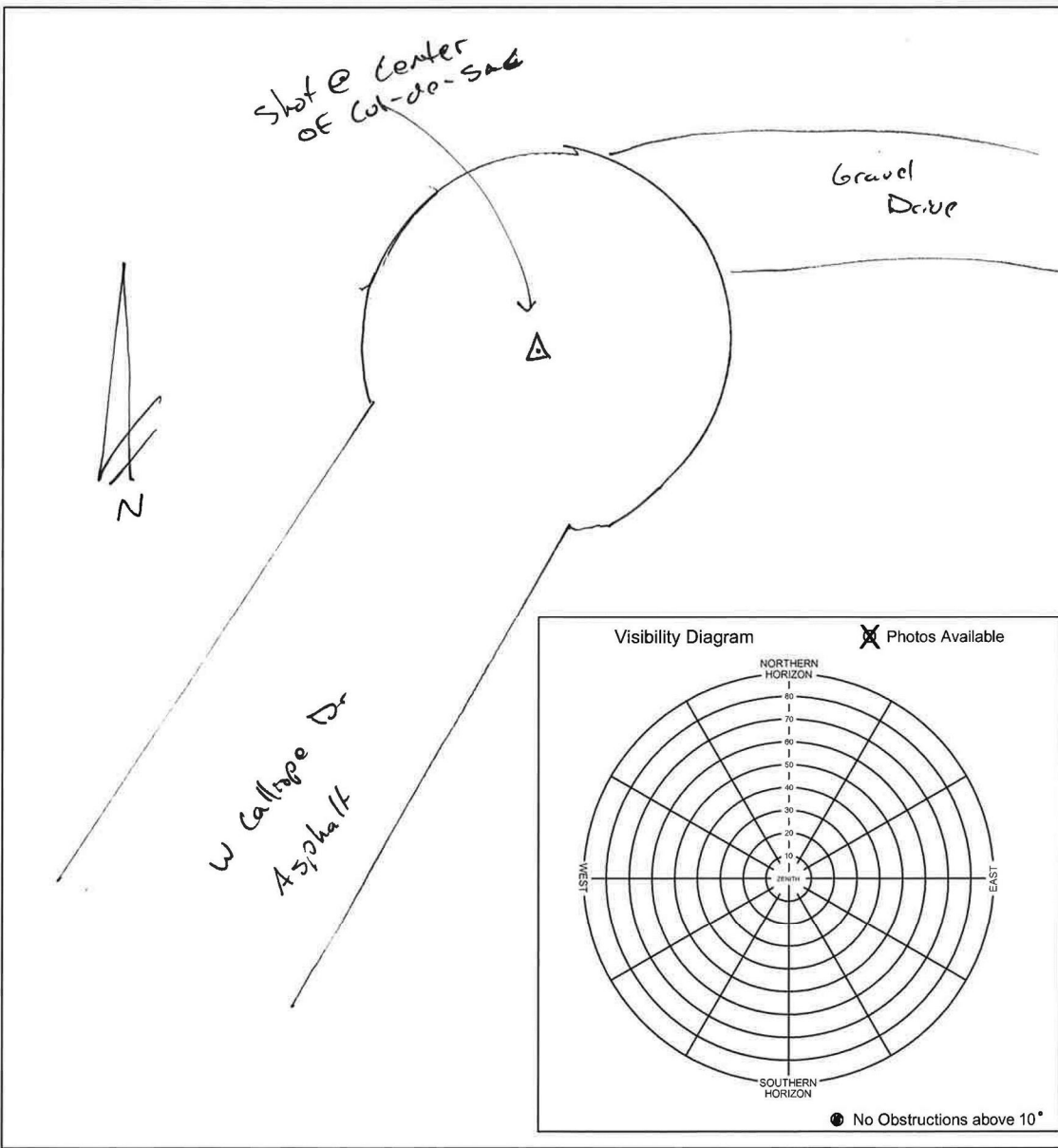


**101, ELK&TETON, 3E, 30SEPT2014**

# Elk Refuge LiDAR Survey - LiDAR Control



LiDAR Control point # 102	General location Jackson WY	Ground Class Road	
Latitude N 43° 30' 36 "	Longitude W 110° 45' 49 "	Calendar Date 9/30/14	Observer Initials DJK





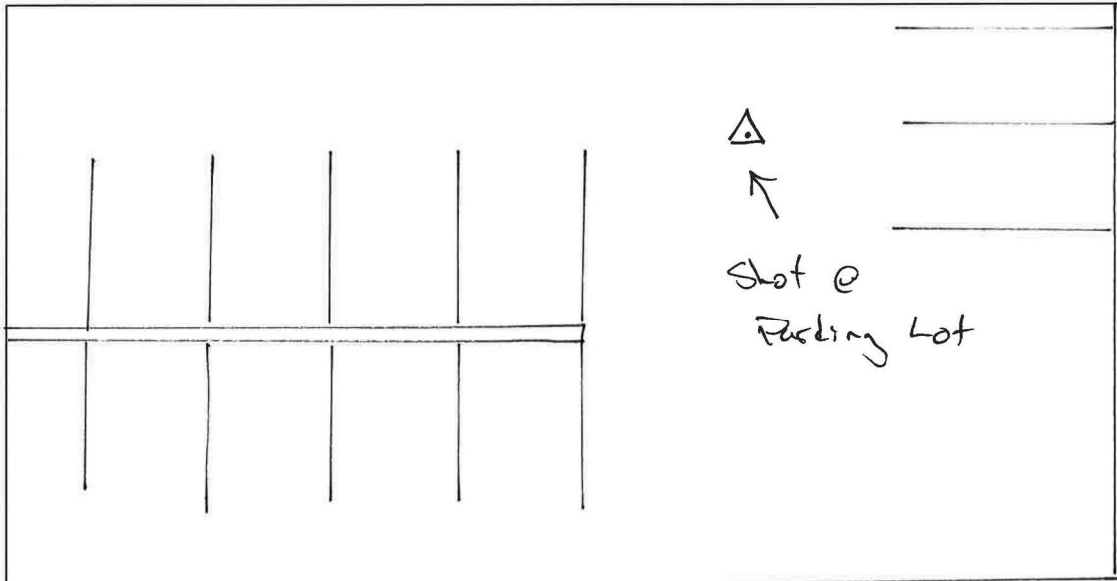


**102, ELK, 3W, 30SEPT2014**

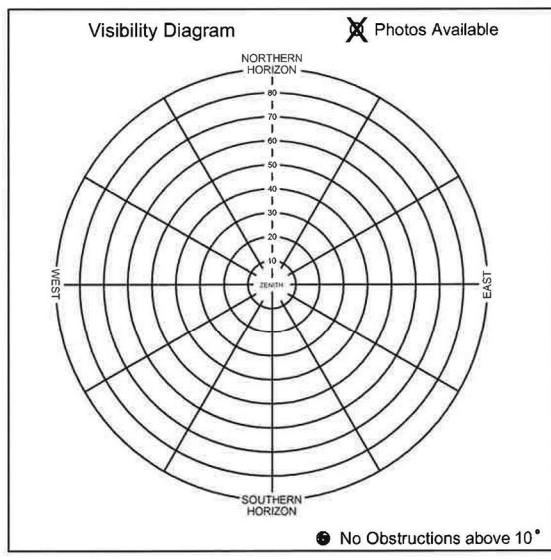
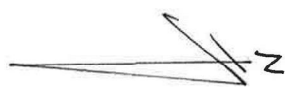
# Elk Refuge LiDAR Survey - LiDAR Control



LiDAR Control point # 103	General location Jackson WY	Ground Class Road
Latitude N 43° 28' 44" "	Longitude W 110° 45' 16" "	Calendar Date 9/30/14
		Observer Initials DJK



S Gros Ventre ST





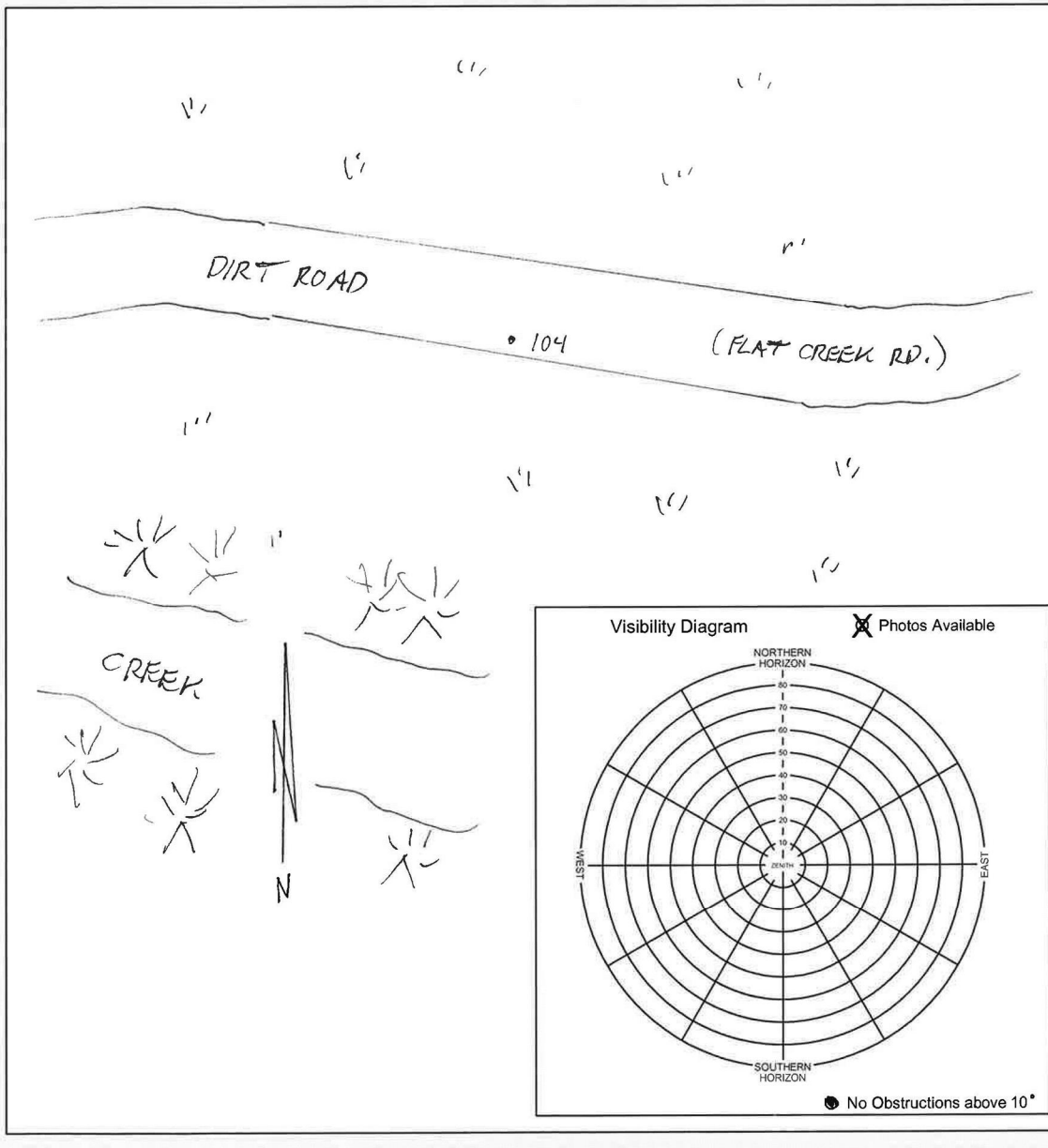
**103, ELK, 3N, 30SEPT2014**



# Elk Refuge LiDAR Survey - LiDAR Control



LiDAR Control point # 104	General location JACKSON ELK REFUGE	Ground Class	
Latitude N 43° 33' 28 "	Longitude W 110° 37' 24 "	Calendar Date 10/01/2014	Observer Initials DJK





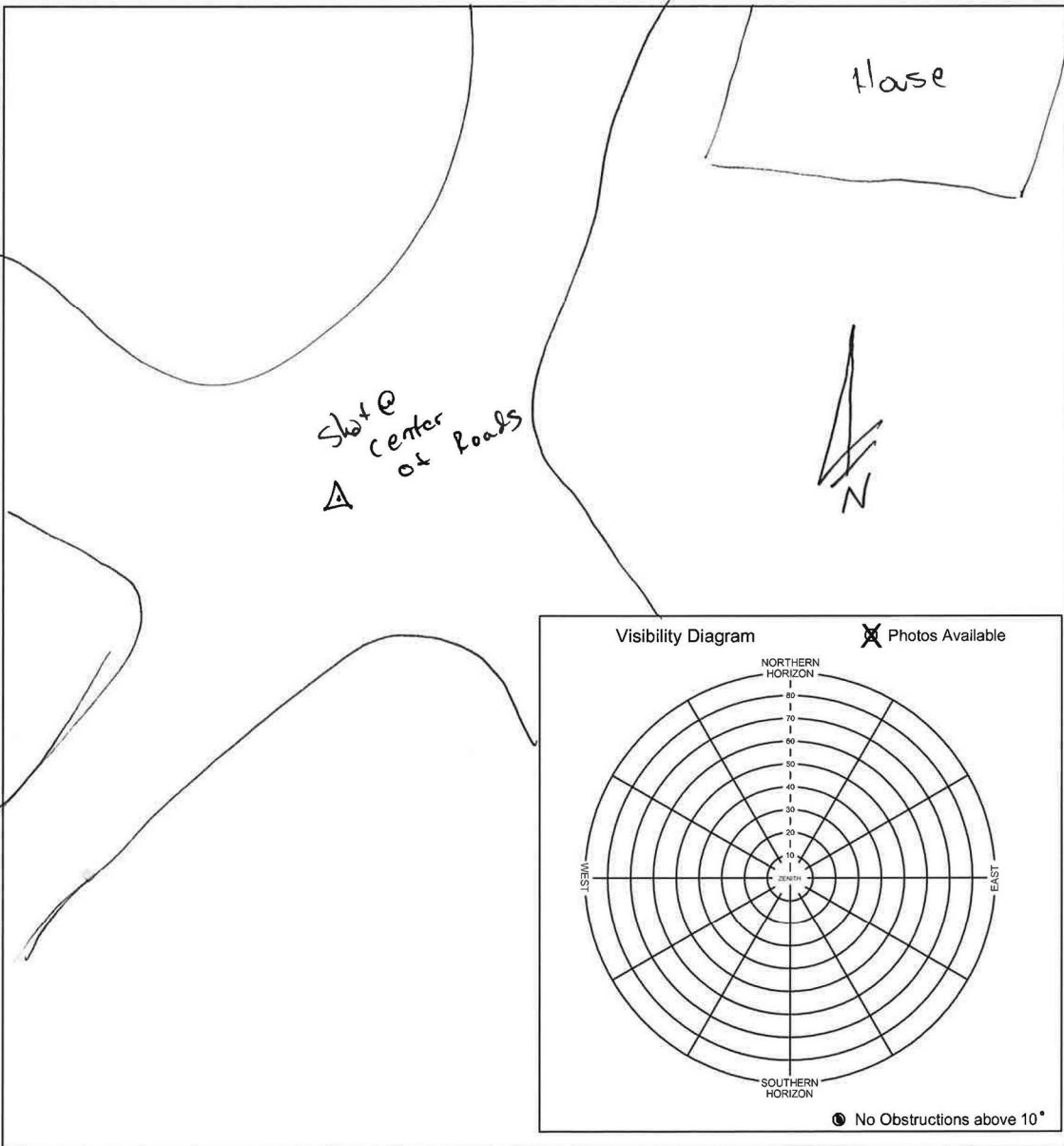
**104, ELK, 3S, 01OCT2014**



# Elk Refuge LiDAR Survey - LiDAR Control



LiDAR Control point # 105	General location Jackson WY	Ground Class Dirt Road
Latitude N 43° 37' 15"	Longitude W 110° 36' 36"	Calendar Date 9/30/14
		Observer Initials DJK



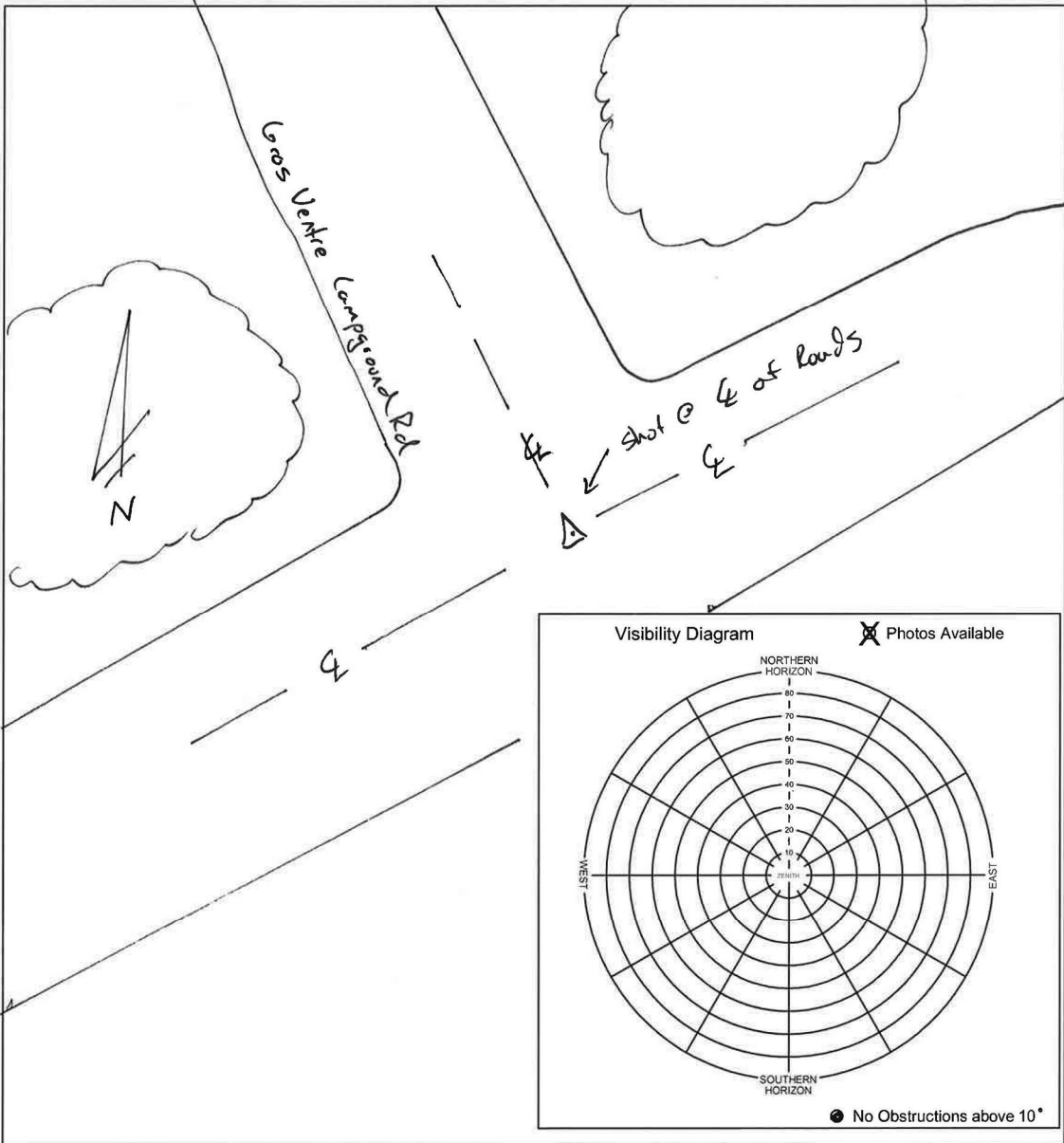


**105, ELK&TETON, 3W, 30SEPT2014**

# Elk Refuge LiDAR Survey - LiDAR Control



LiDAR Control point # 106	General location Jackson WY	Ground Class Road
Latitude N 43° 36' 58"	Longitude W 110° 39' 59"	Calendar Date 9/30/14
		Observer Initials DJK





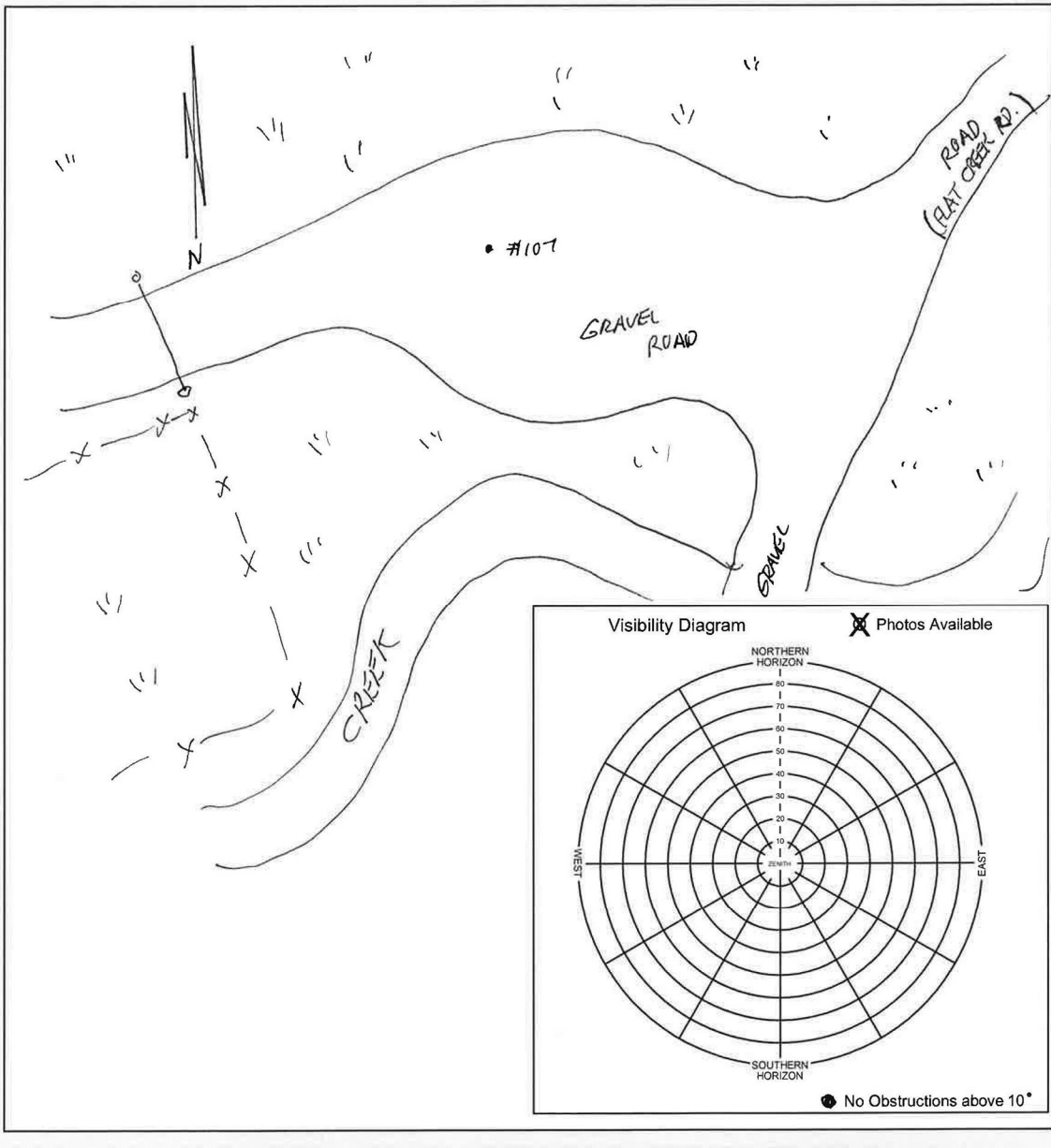


**106, ELK&TETON, 3W, 30SEPT2014**

# Elk Refuge LiDAR Survey - LiDAR Control



LiDAR Control point # 107	General location JACKSON ELK REFUGE	Ground Class
Latitude N 43° 32' 52"	Longitude W 110° 39' 47"	Calendar Date 10/10/2014
		Observer Initials DJK





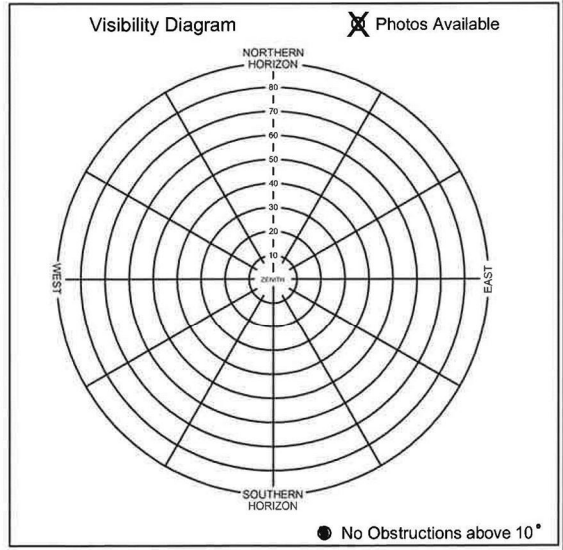
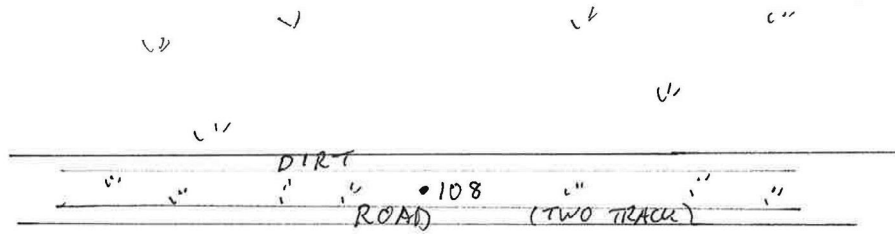


**107, ELK, 3S, 01OCT2014**

# Elk Refuge LiDAR Survey - LiDAR Control



LiDAR Control point # <b>108</b>	General location <b>JACKSON ELK REFUGE</b>	Ground Class
Latitude <b>N 43° 30' 57 "</b>	Longitude <b>W 110° 43' 43 "</b>	Calendar Date <b>09/30/2014</b>
		Observer Initials <b>DJK</b>





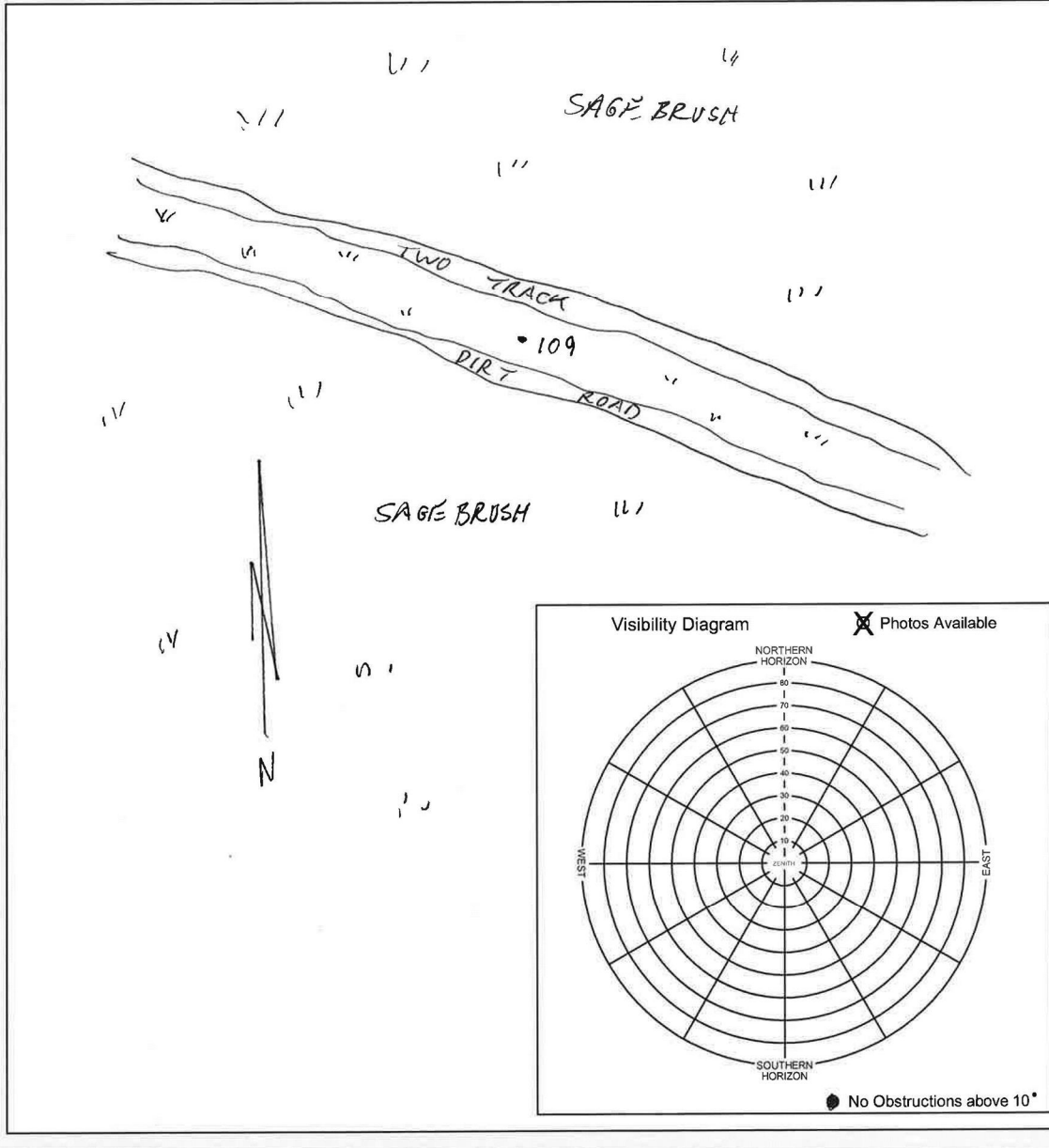


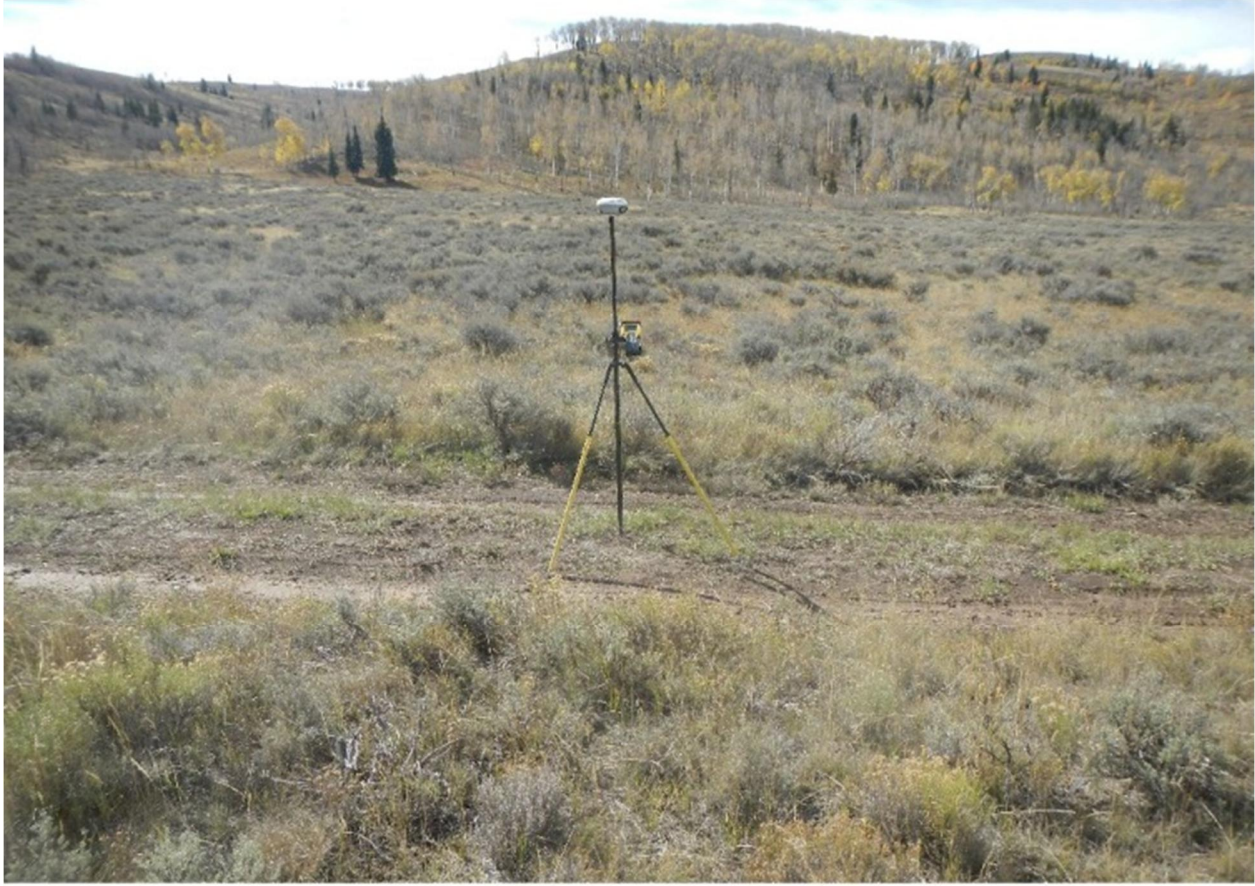
**108, ELK, 3W, 30SEP2014**

# Elk Refuge LiDAR Survey - LiDAR Control



LiDAR Control point # 109	General location JACKSON ELK REFUGE	Ground Class	
Latitude N 43° 36' 12"	Longitude W 110° 39' 37"	Calendar Date 10/02/2014	Observer Initials DJK





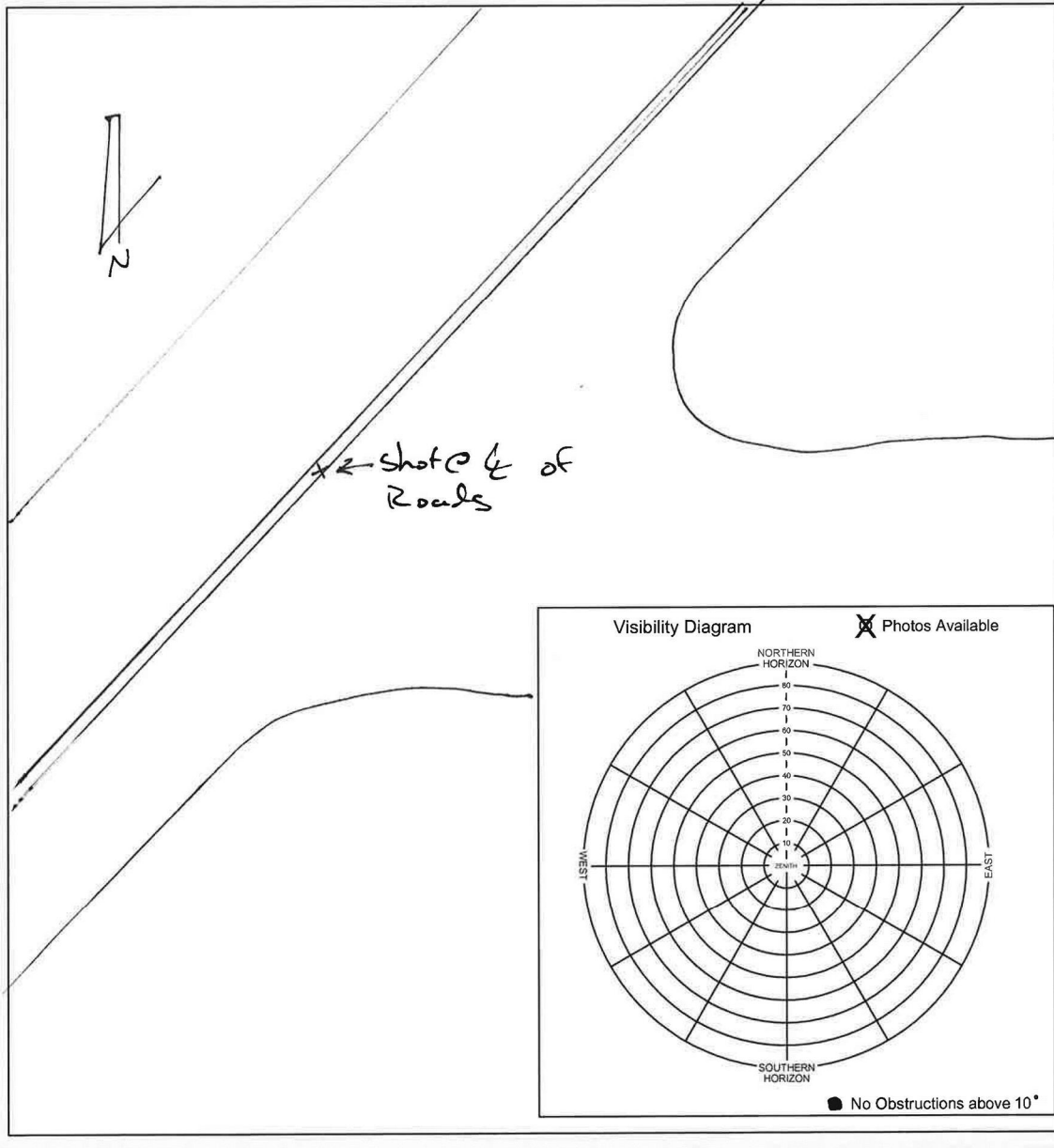
**109, ELK, 3S, 02OCT2014**



# Grand Teton LiDAR Survey - LiDAR Control



LiDAR Control point # 2	General location Teton Natl Park	Ground Class Asphalt Road
Latitude N 43° 35' 46 "	Longitude W 110° 48' 19 "	Calendar Date 10/2/14
		Observer Initials DJK



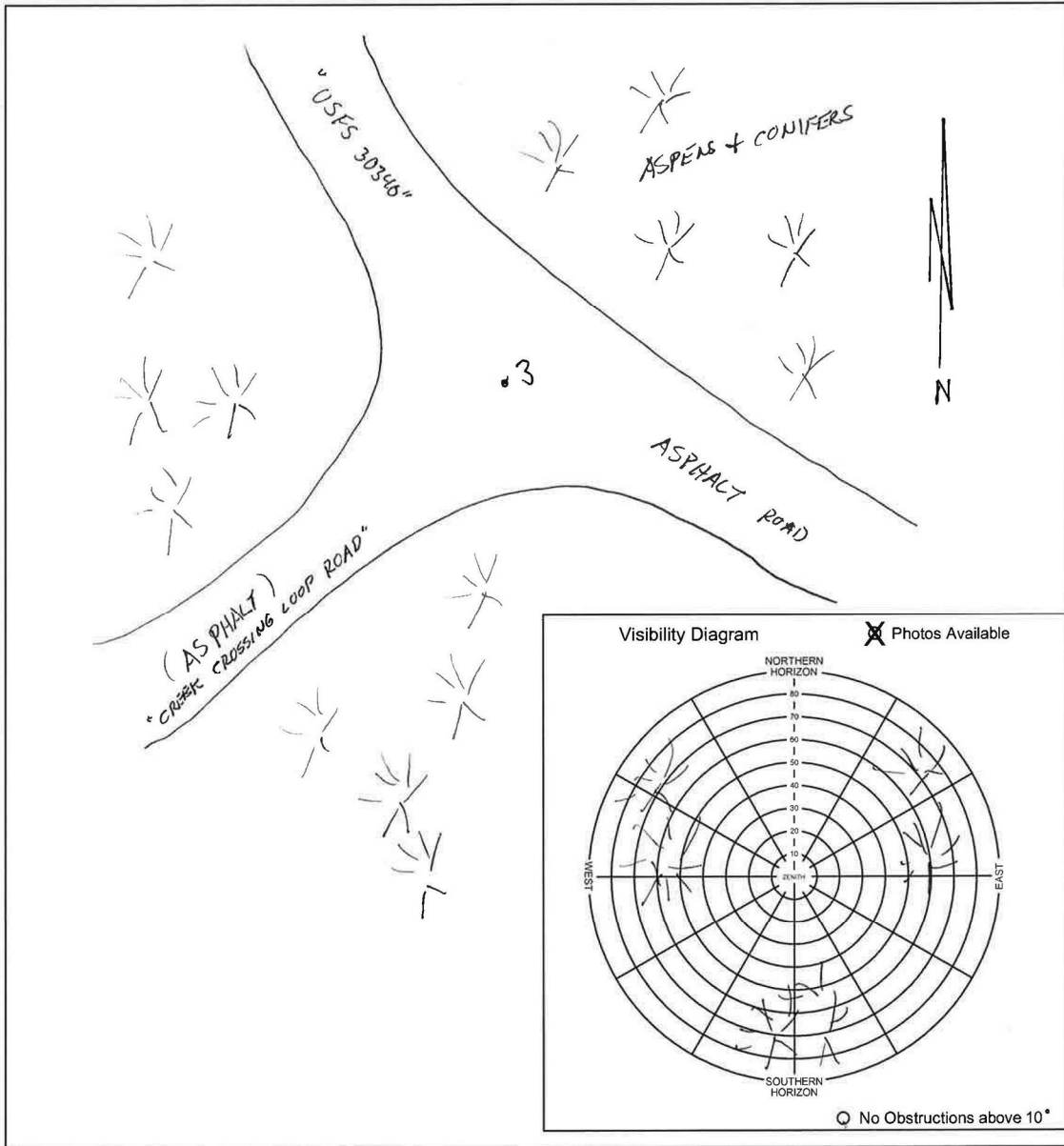


**2, TETON, 3N, 02OCT2014**

# Grand Teton LiDAR Survey - LiDAR Control



LiDAR Control point # 3	General location JACKSON WY / TETON	Ground Class
Latitude N 43° 44' 24"	Longitude W 110° 35' 23"	Calendar Date 10/03/2014
		Observer Initials DJK







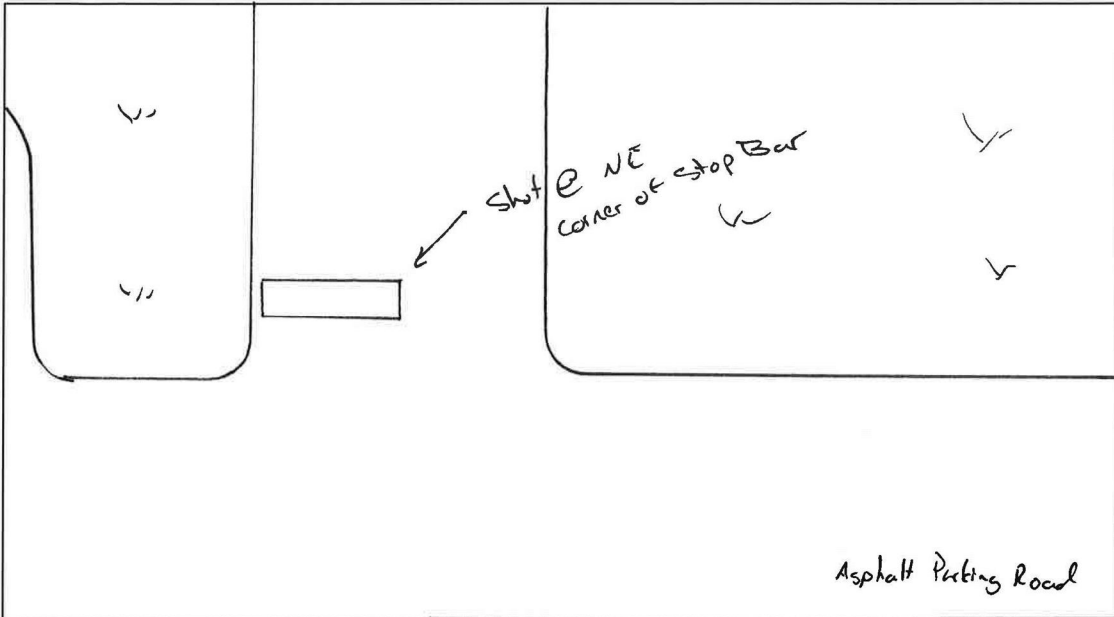
**3, TETON, 3N, 03OCT2014**



# Grand Teton LiDAR Survey - LiDAR Control



LIDAR Control point # <b>4</b>	General location <b>Moose, WY</b>	Ground Class <b>Asphalt Road</b>
Latitude <b>N 43° 45' 04" "</b>	Longitude <b>W 110° 43' 17" "</b>	Calendar Date <b>10/3/14</b>
		Observer Initials <b>DJK</b>



Hand-drawn sketch of a road layout, possibly a different view or a correction. It shows a road with a north arrow pointing downwards. There are checkmarks and some scribbles.

Visibility Diagram  Photos Available

A circular visibility diagram grid. The vertical axis is labeled "NORTHERN HORIZON" at the top and "SOUTHERN HORIZON" at the bottom. The horizontal axis is labeled "WEST" on the left and "EAST" on the right. Concentric circles are drawn at 10-foot intervals from the center (0) to 80 feet. A legend at the bottom right indicates "No Obstructions above 10'".

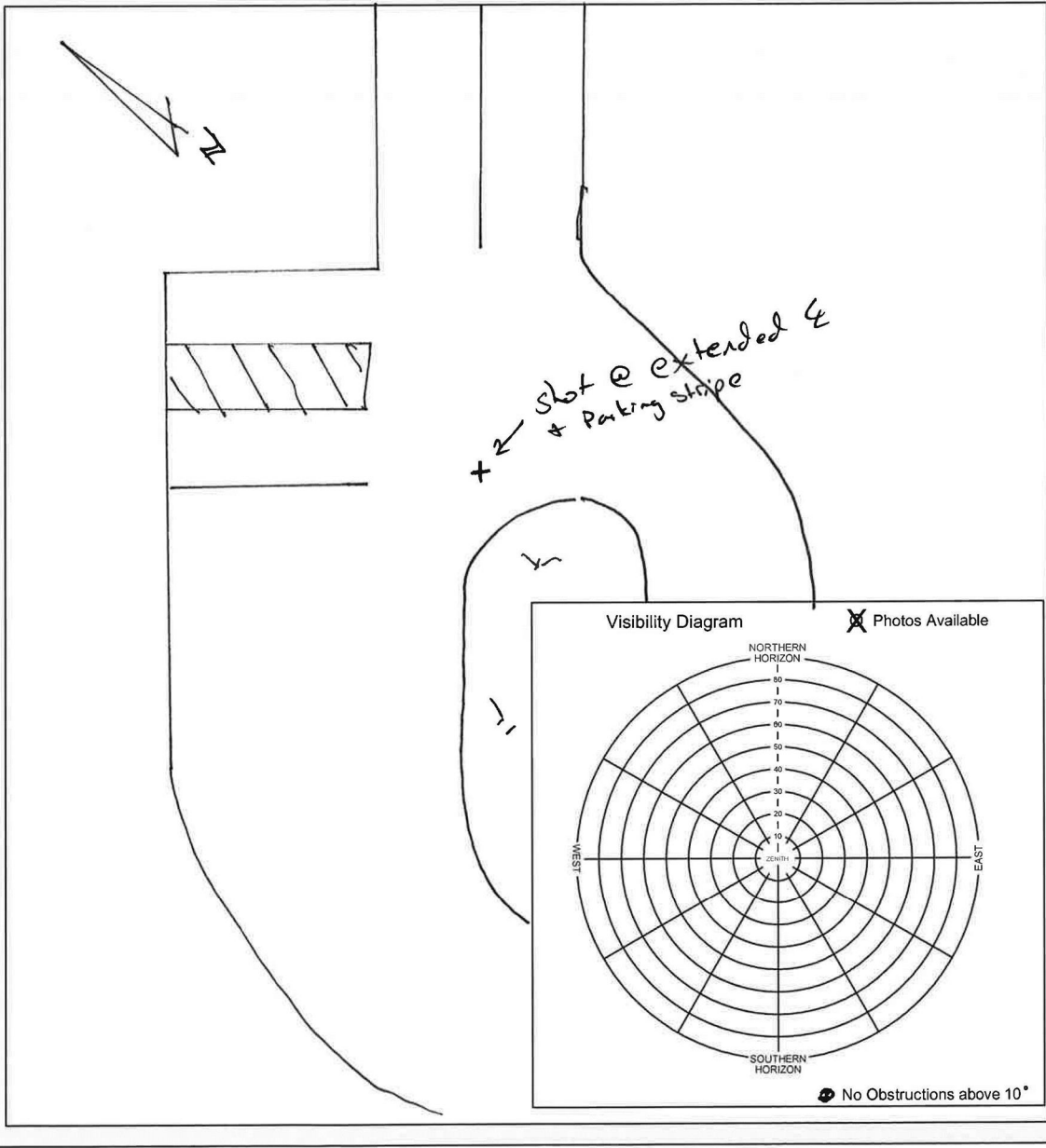


**4, TETON, 3W, 03OCT2014**

# Grand Teton LiDAR Survey - LiDAR Control



LIDAR Control point # <b>7</b>	General location <b>Moose, WY</b>	Ground Class <b>Asphalt Road</b>	
Latitude <b>N 43° 40' 00" "</b>	Longitude <b>W 110° 41' 48" "</b>	Calendar Date <b>10/2/14</b>	Observer Initials <b>DJK</b>





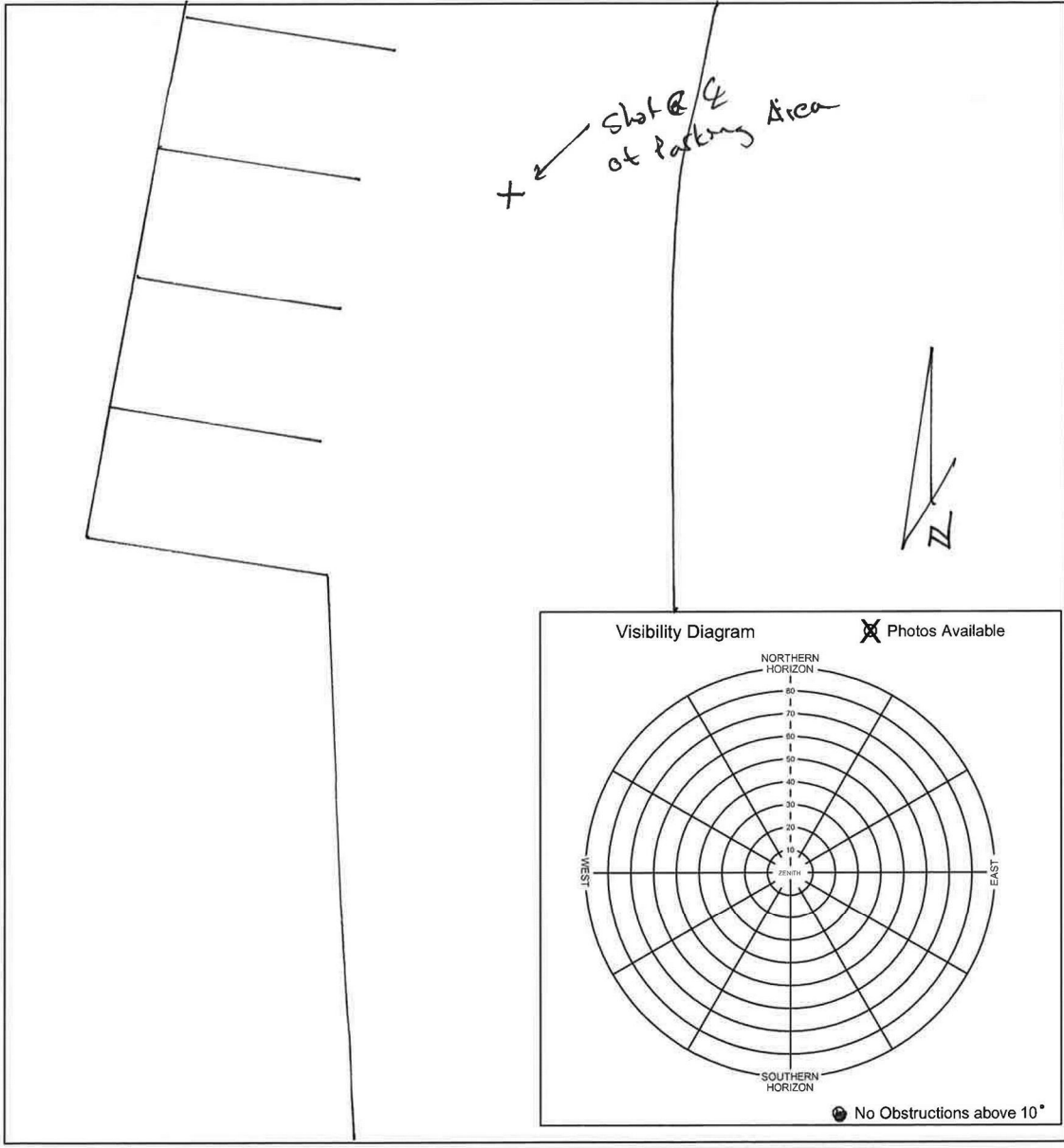


**7, TETON, 3W, 02OCT2014**

# Grand Teton LiDAR Survey - LiDAR Control



LiDAR Control point # <b>8</b>	General location <b>Teton Natl Park</b>	Ground Class <b>Asphalt Parking</b>
Latitude <b>N 43° 47' 37"</b>	Longitude <b>W 110° 41' 47"</b>	Calendar Date <b>10/3/14</b>
		Observer Initials <b>DJK</b>





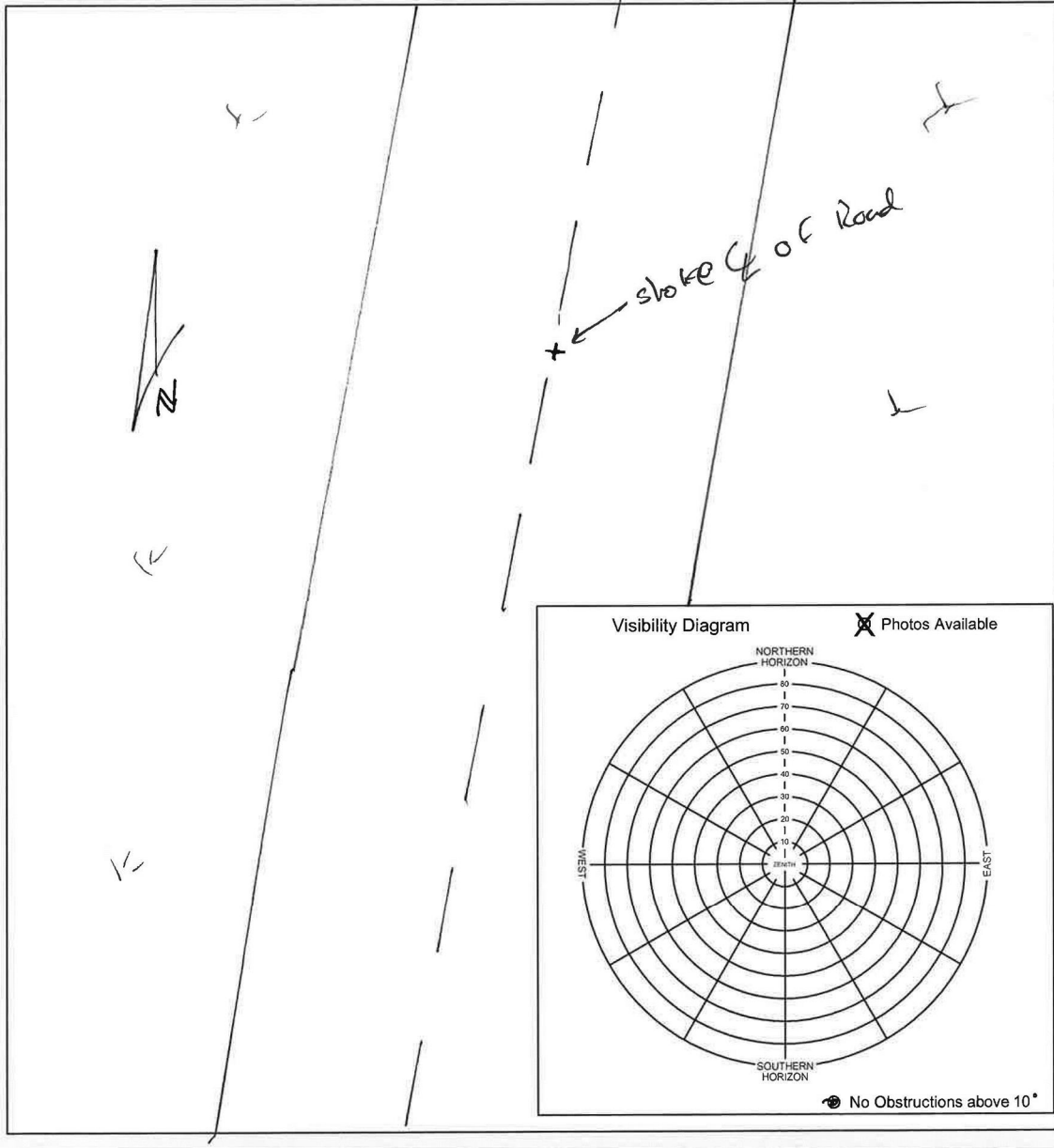
**8, TETON, 3W, 03OCT2014**



# Grand Teton LiDAR Survey - LiDAR Control



LiDAR Control point # 9	General location Teton Natl Park	Ground Class Asphalt Road	
Latitude N 43 ° 49 ' 12 "	Longitude W 110 ° 36 ' 58 "	Calendar Date 10/3/14	Observer Initials DJK





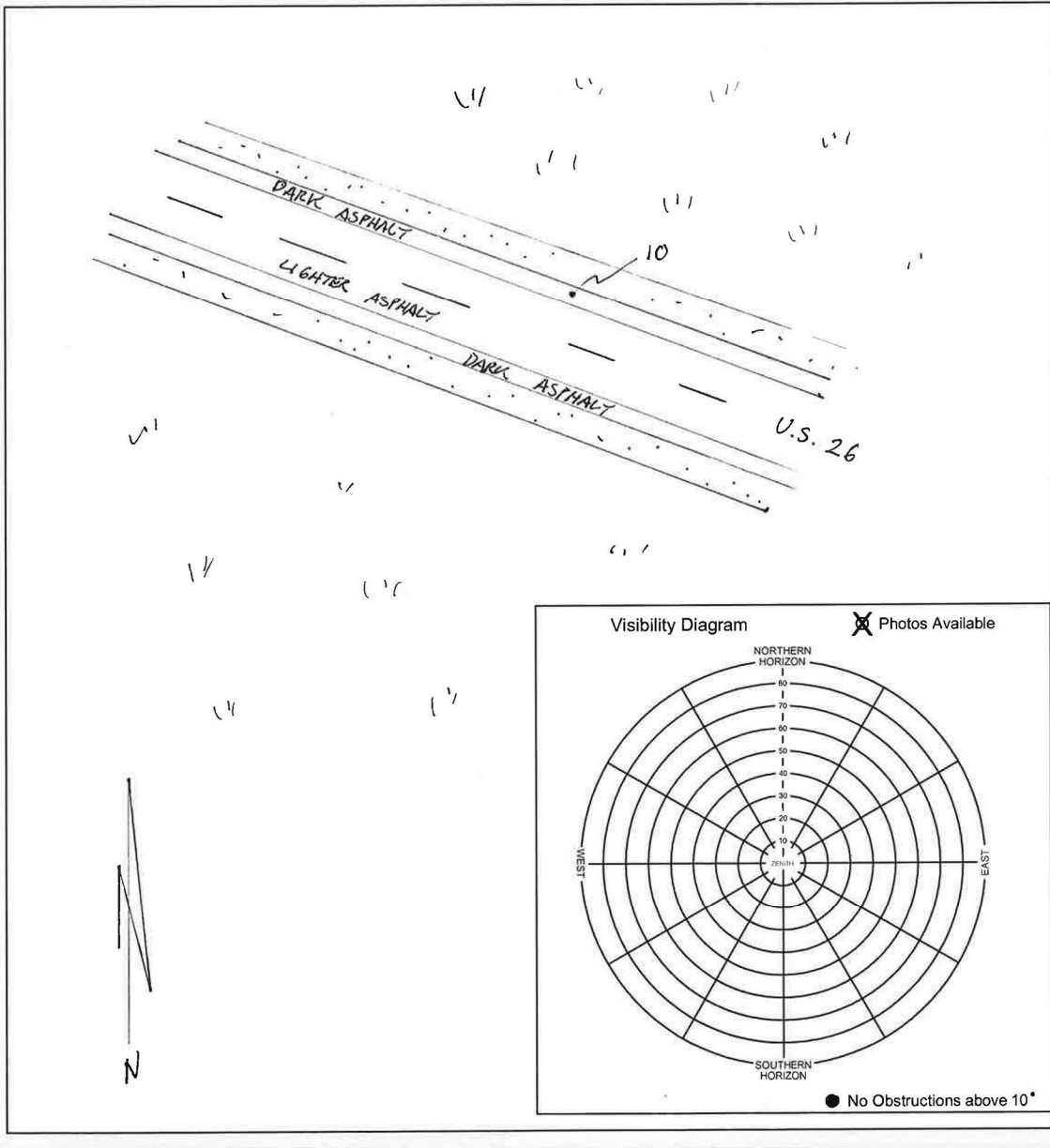


**9, TETON, 3N, 03OCT2014**

# Grand Teton LiDAR Survey - LiDAR Control



LiDAR Control point # 10	General location JACKSON WY / TETON PARK	Ground Class	
Latitude N 43° 50' 02"	Longitude W 110° 25' 38"	Calendar Date 10/03/2014	Observer Initials DJK





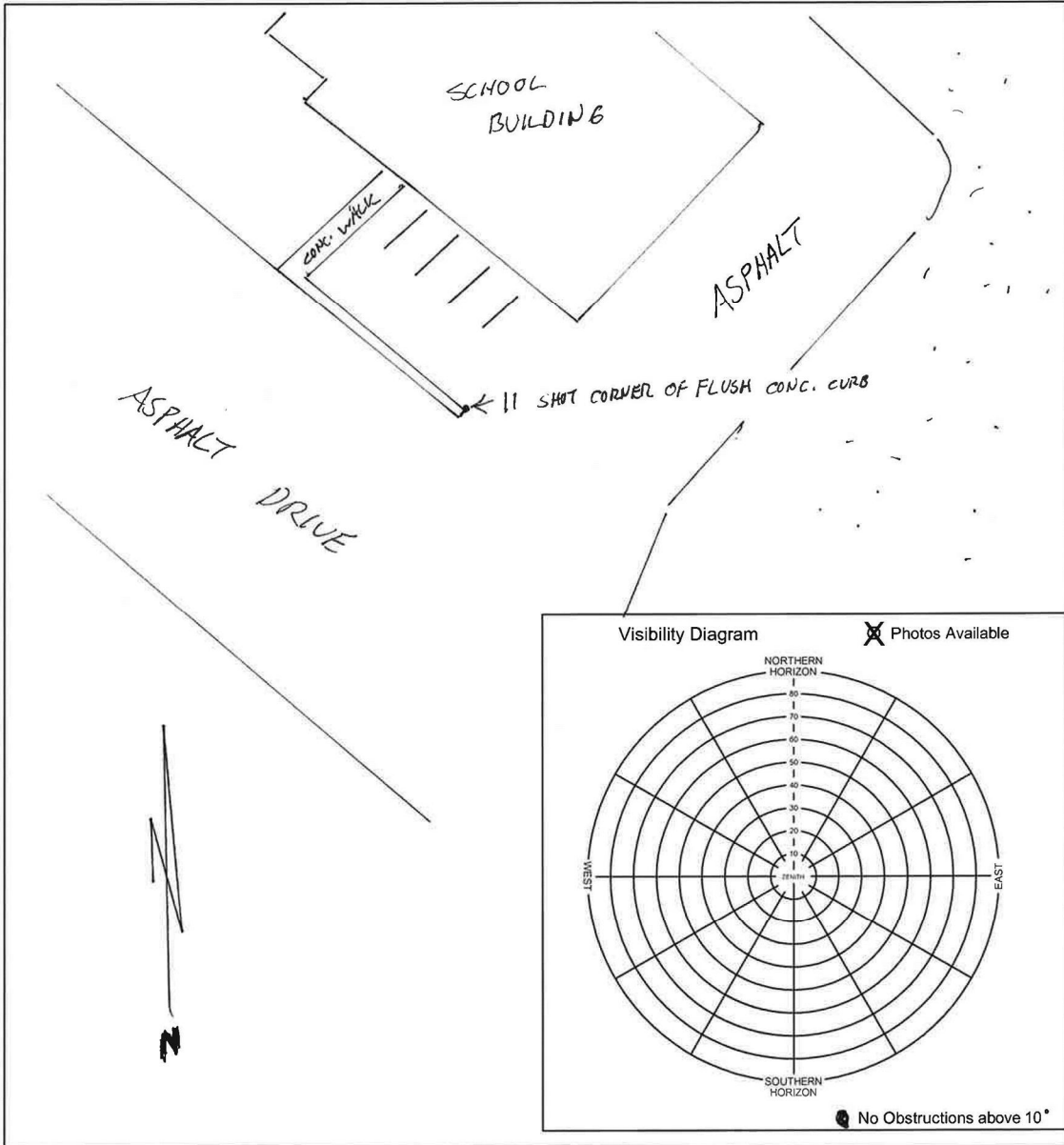
**10, TETON, 3S, 03OCT2014**



# Grand Teton LiDAR Survey - LiDAR Control



LiDAR Control point # 11	General location JACKSON WY / TETONS	Ground Class
Latitude N 43° 50' 29"	Longitude W 110° 30' 26"	Calendar Date 10/03/2014
		Observer Initials DJK



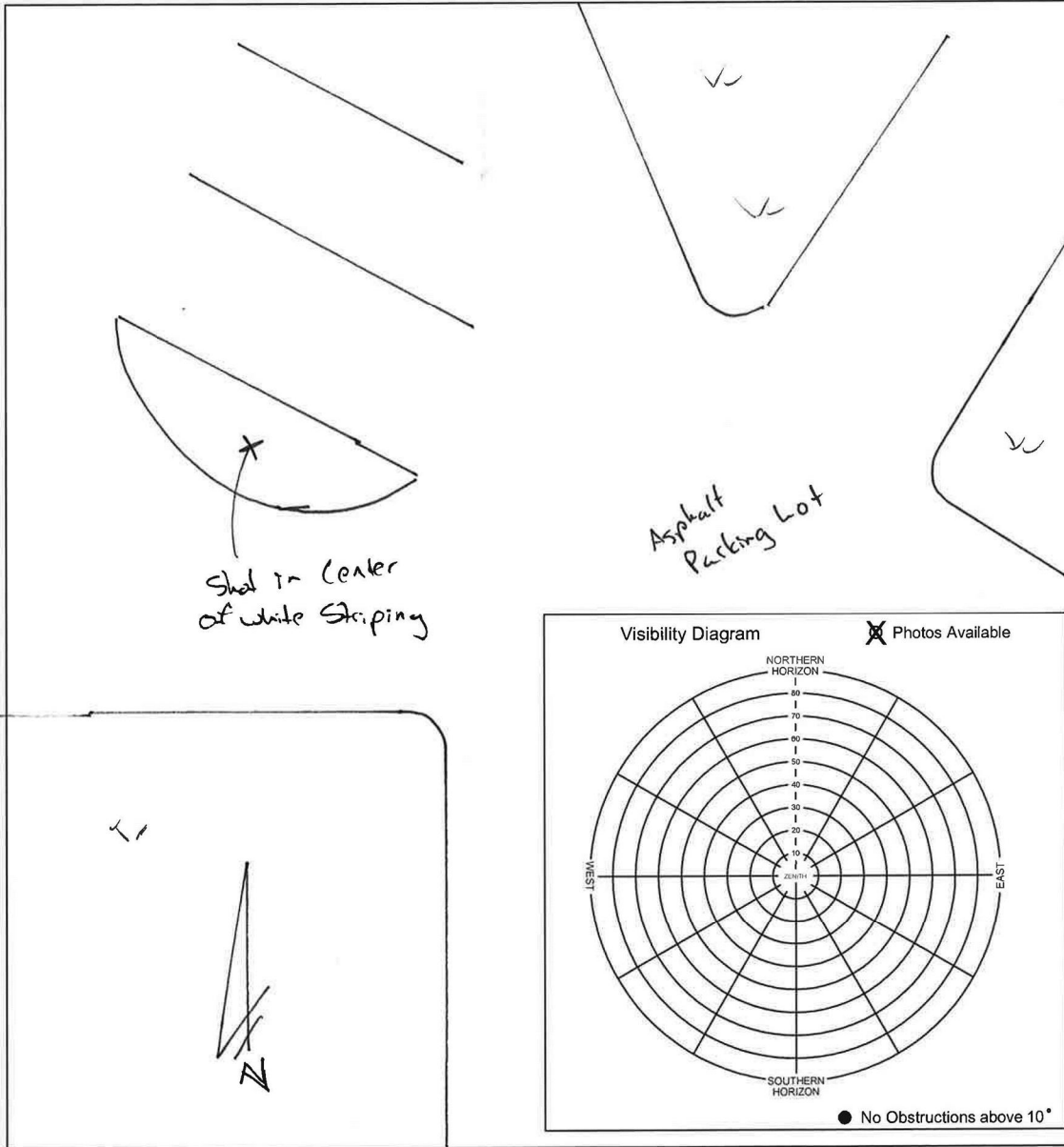


**11, TETON, 3W, 03OCT2014**

# Grand Teton LiDAR Survey - LiDAR Control



LiDAR Control point # 12	General location Teton Natl Park	Ground Class Asphalt Road
Latitude N 43° 55' 45" "	Longitude W 110° 38' 18" "	Calendar Date 10/4/14
		Observer Initials DJK





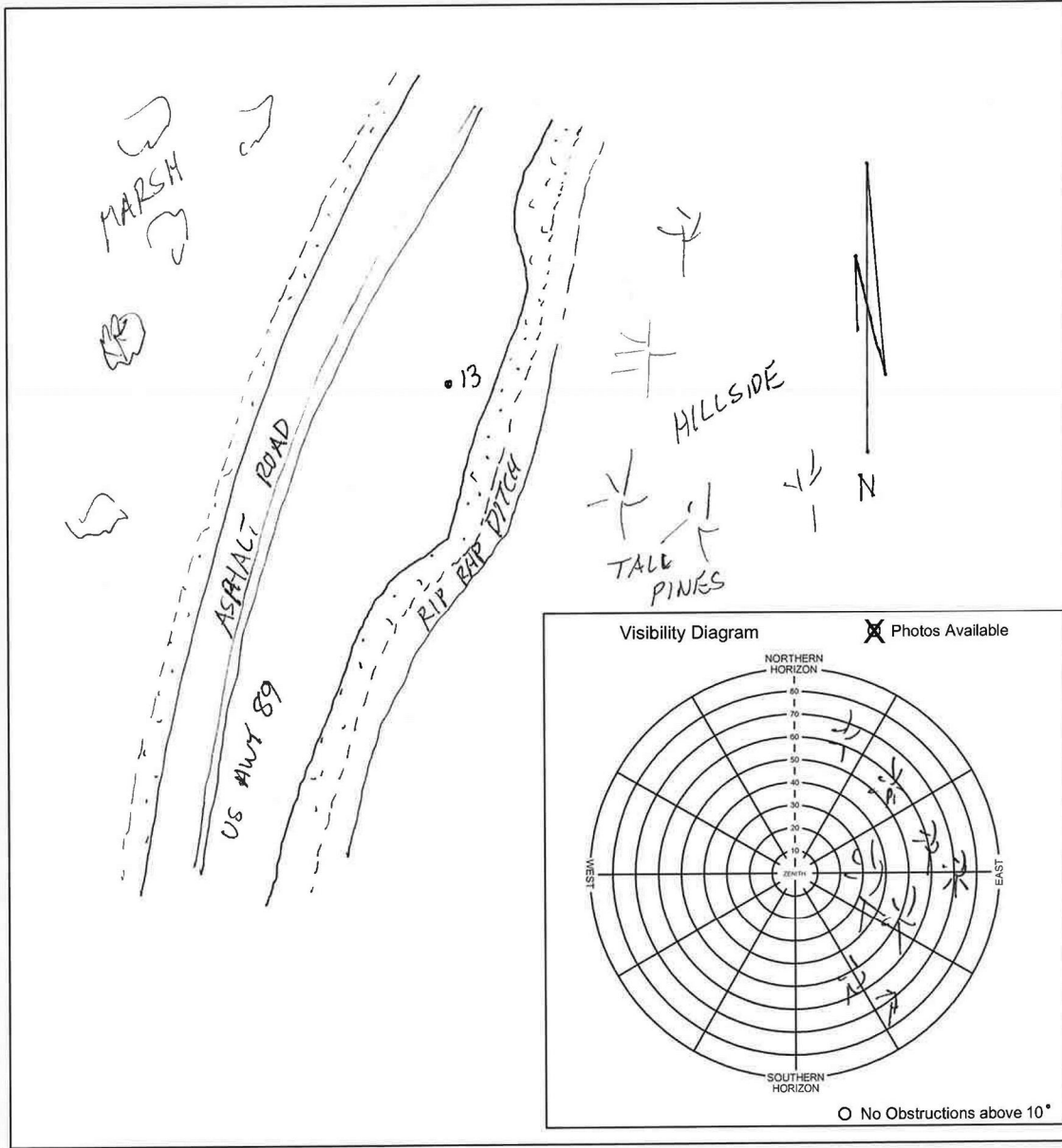


**12, TETON, 3W, 04OCT2014**

# Grand Teton LiDAR Survey - LiDAR Control



LiDAR Control point # <b>13</b>	General location <b>TETON PARK</b>	Ground Class
Latitude <b>N 44° 03' 45"</b>	Longitude <b>W 110° 41' 19"</b>	Calendar Date <b>10/05/2014</b>
		Observer Initials <b>DJK</b>





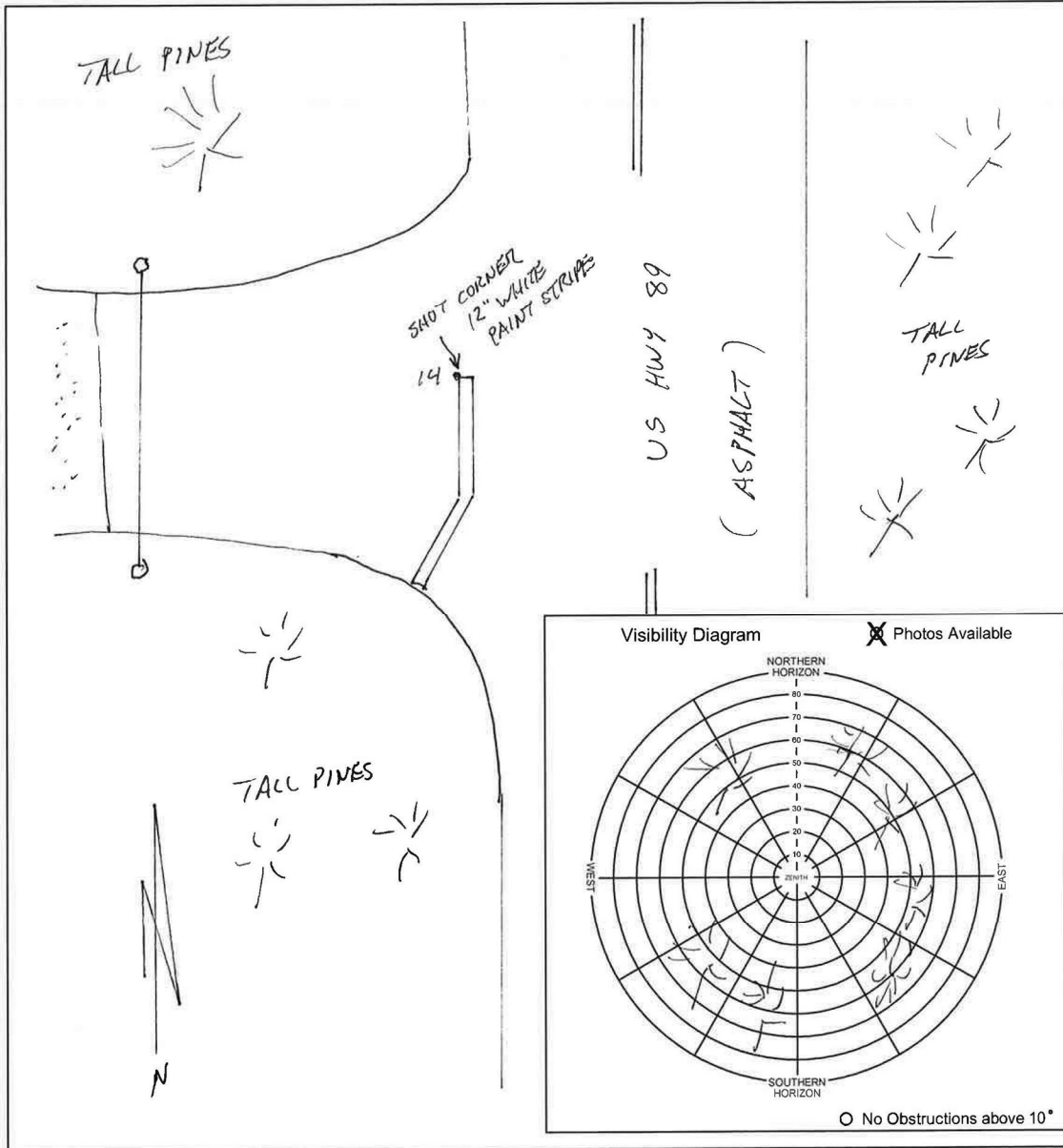
**13, TETON, 3W, 05OCT2014**



# Grand Teton LiDAR Survey - LiDAR Control



LiDAR Control point # 14	General location TETON PARK	Ground Class	
Latitude N 44° 05' 25 "	Longitude W 110° 40' 26 "	Calendar Date 10/05/2014	Observer Initials DJK





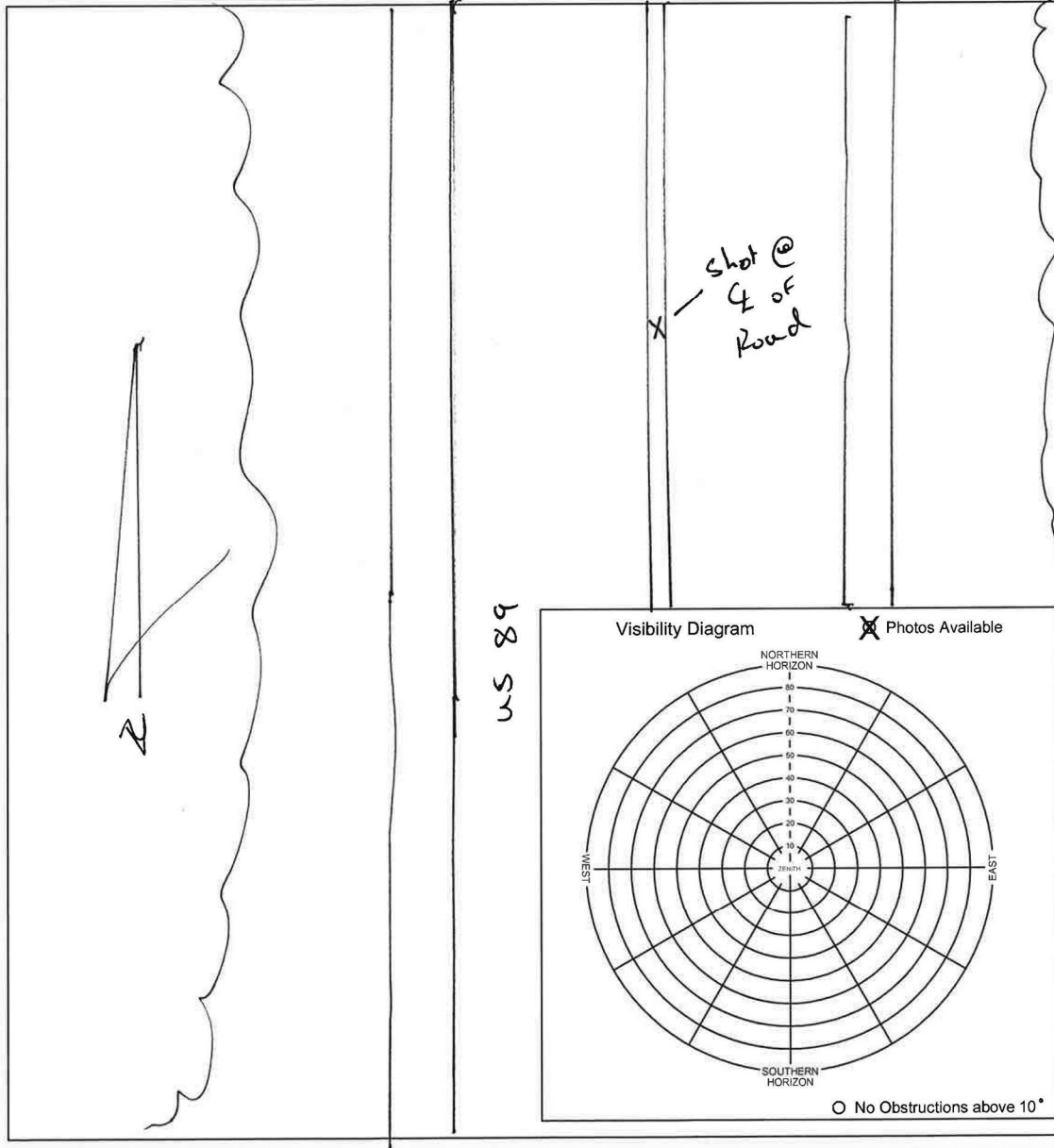
**14, TETON, 3S, 05OCT2014**



# Grand Teton LiDAR Survey - LiDAR Control



LIDAR Control point # <b>15</b>	General location <b>Teton Natl Park</b>	Ground Class <b>Asphalt Road</b>
Latitude <b>N 44° 07' 33"</b>	Longitude <b>W 110° 39' 37"</b>	Calendar Date <b>10/5/14</b>
		Observer Initials <b>DJK</b>



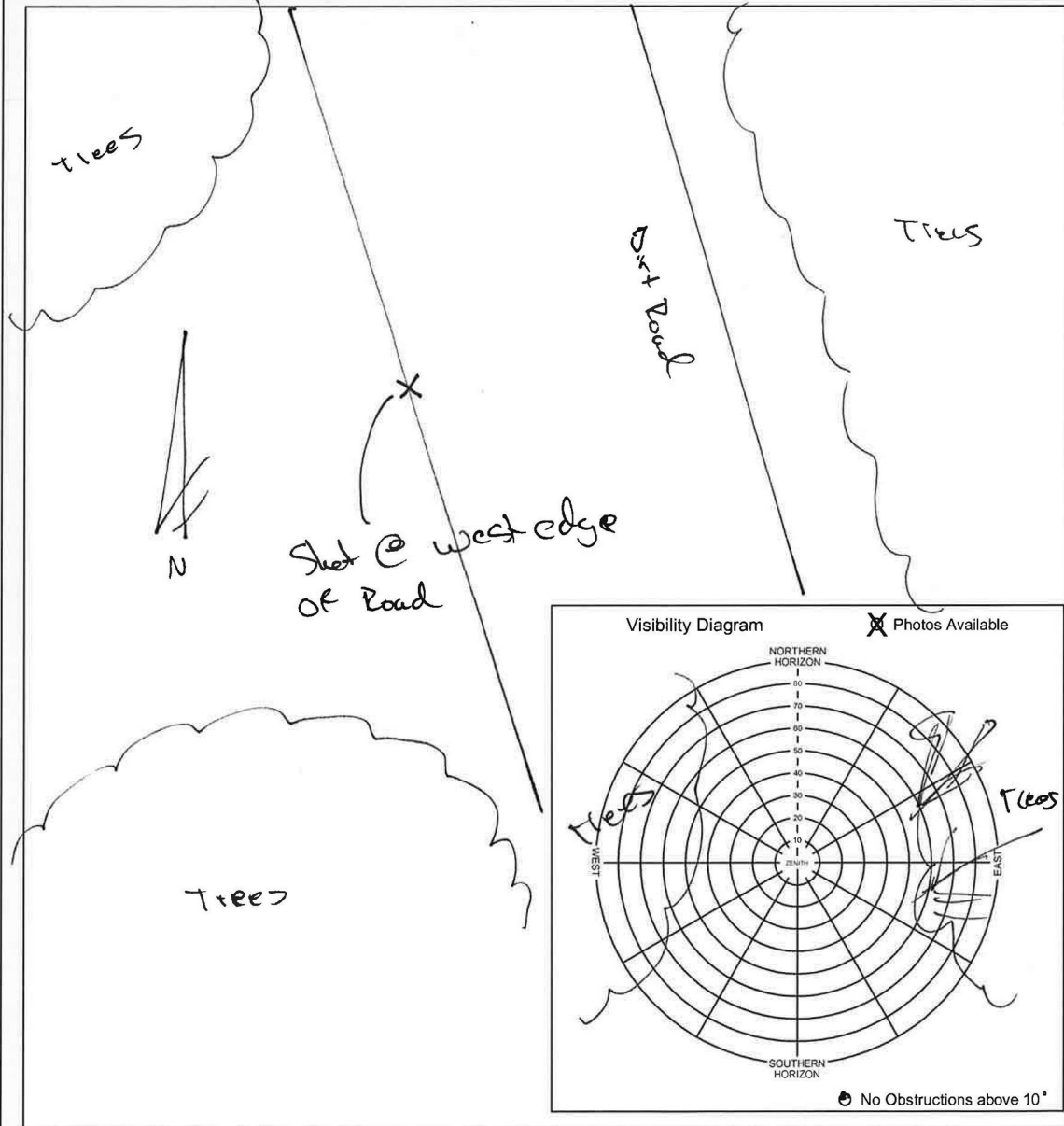


**15, TETON, 3N, 05OCT2014**

# Grand Teton LiDAR Survey - LiDAR Control



LiDAR Control point # 16 / 116	General location Teton Natl Park	Ground Class Dirt Road
Latitude N 44° 07' 35 "	Longitude W 110° 47' 17 "	Calendar Date 10/5/14
		Observer Initials DJK







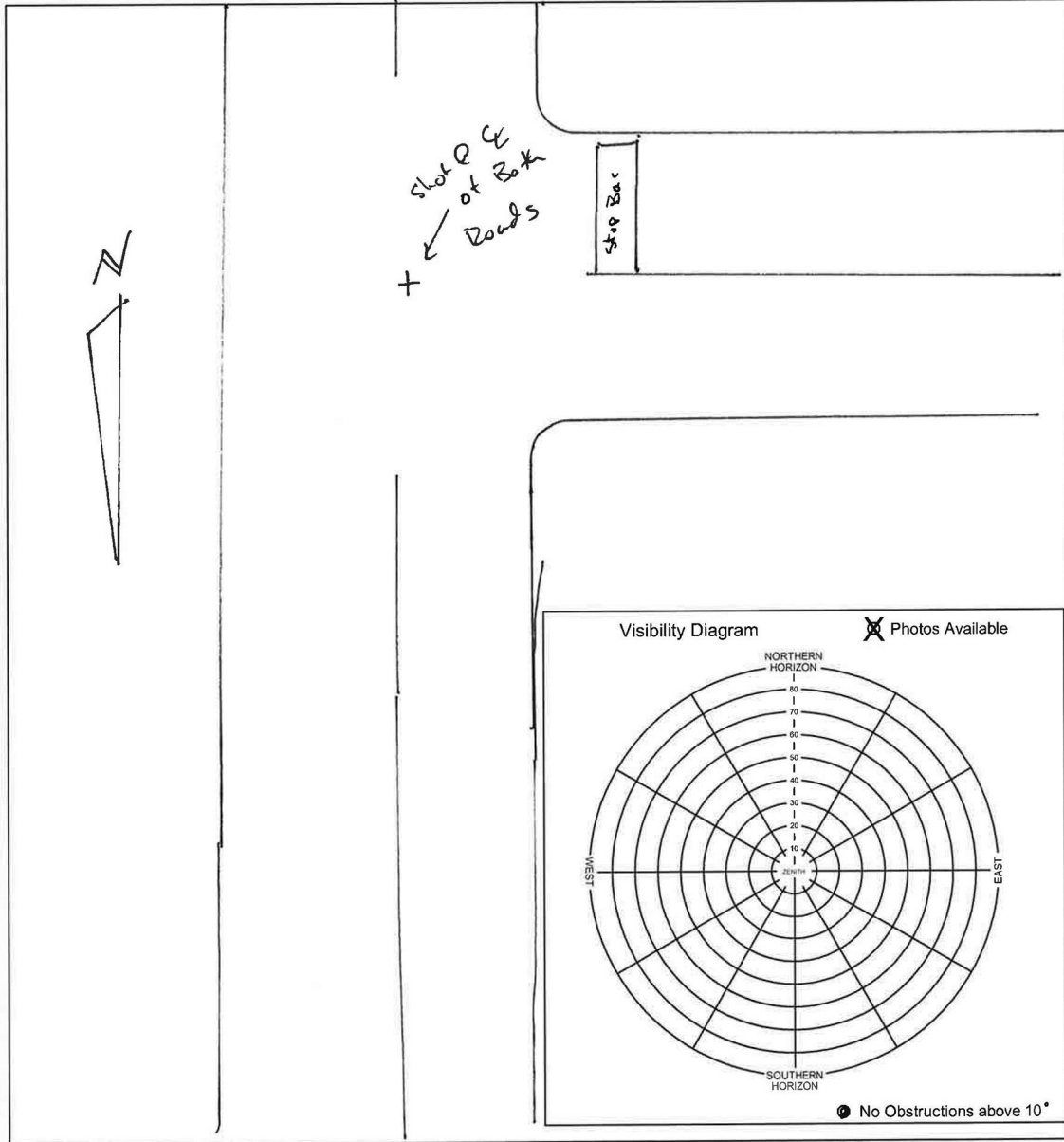
**16, TETON, 3W, 05OCT2014**



# Grand Teton LiDAR Survey - LiDAR Control



LiDAR Control point # 17	General location Teton Natl Park	Ground Class Asphalt Road
Latitude N 43° 47' 16"	Longitude W 110° 43' 48"	Calendar Date 10/3/14
		Observer Initials DJK





**17, TETON, 3W, 03OCT2014**

# Grand Teton LiDAR Survey - LiDAR Control



LiDAR Control point # 18	General location Moose, WY	Ground Class Dirt Road
Latitude N 43° 39' 54 "	Longitude W 110° 46' 03 "	Calendar Date 10/2/14
		Observer Initials DJK

Trees

← slope of Two-Track Road

Pasture

Visibility Diagram  Photos Available

N

S

WEST

EAST

NORTHERN HORIZON

SOUTHERN HORIZON

O No Obstructions above 10°





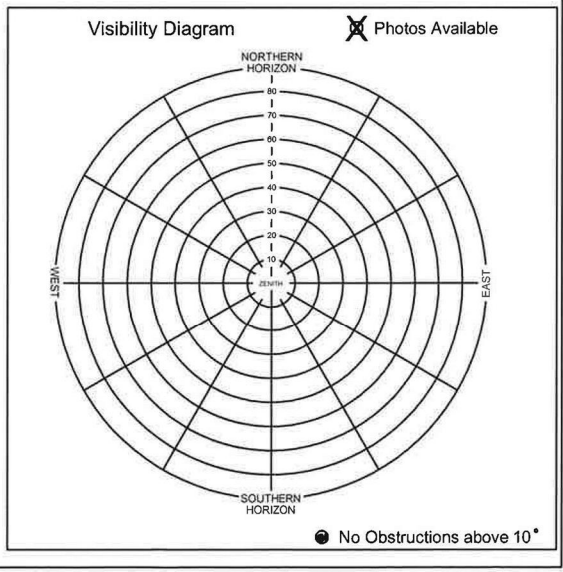
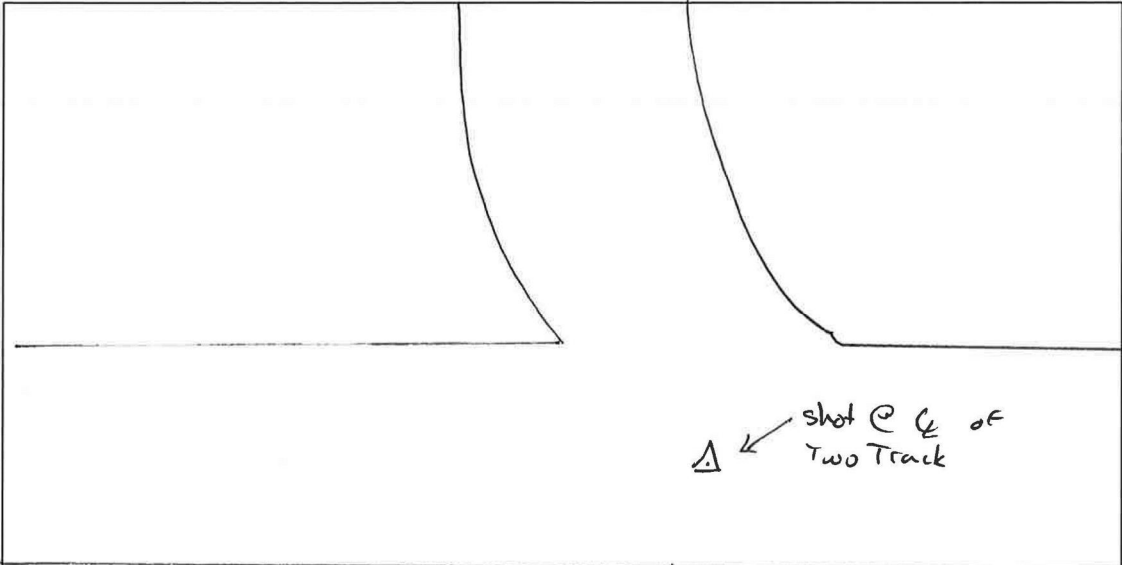
**18, TETON, 3E, 02OCT2014**



# Grand Teton LiDAR Survey - LiDAR Control



LiDAR Control point # <b>18A</b>	General location <b>Moose, WY</b>	Ground Class <b>Dirt Road</b>	
Latitude <b>N 43° 39' 54 "</b>	Longitude <b>W 110° 46 '08 "</b>	Calendar Date <b>10/2/14</b>	Observer Initials <b>DJK</b>



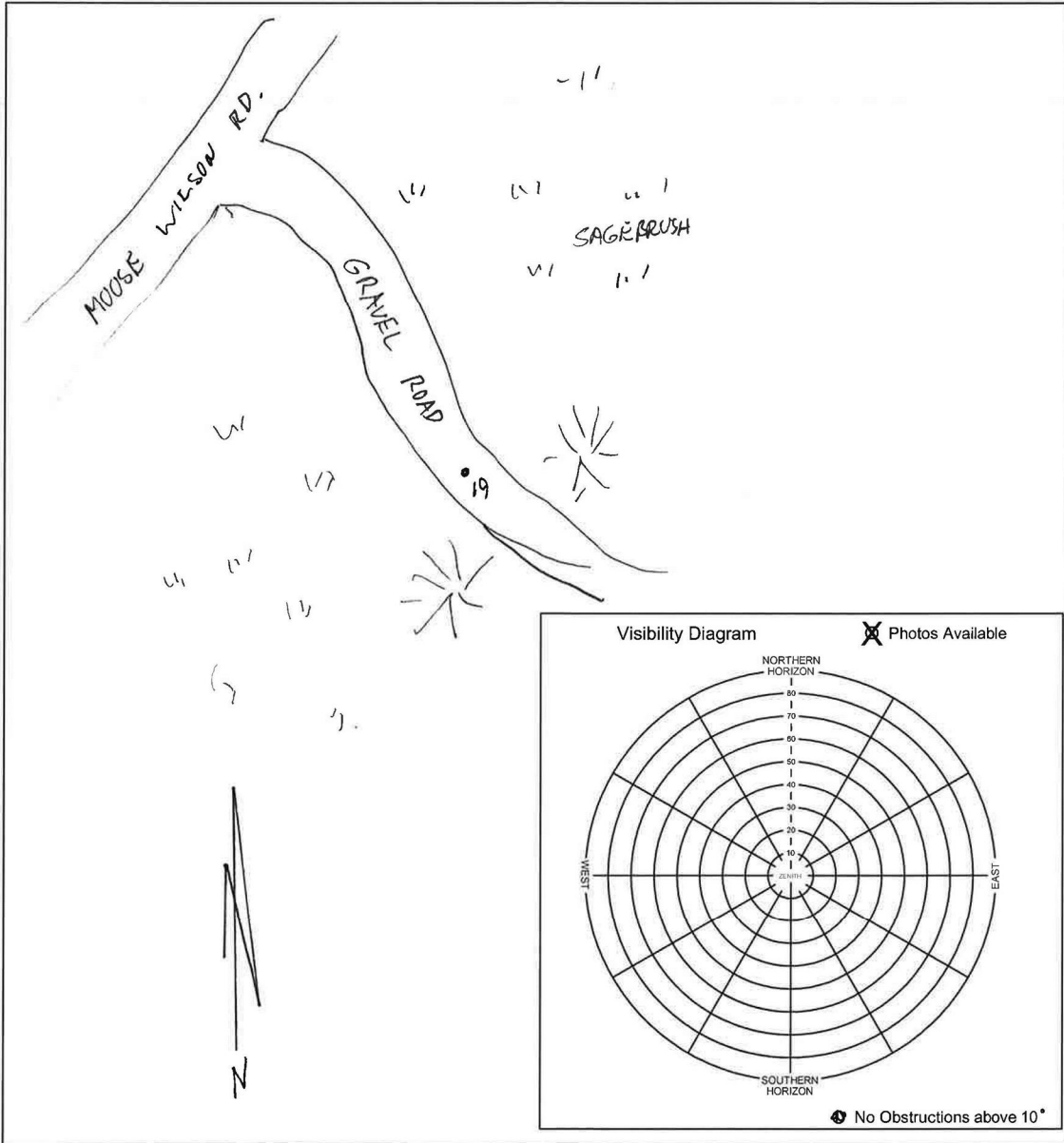


**18A, TETON, 3E, 02OCT2014**

# Elk Refuge LiDAR Survey - LiDAR Control



LiDAR Control point # 19	General location TETON NATIONAL PARK	Ground Class
Latitude N 43° 37' 17"	Longitude W 110° 47' 11"	Calendar Date 10/02/2014
		Observer Initials DJK







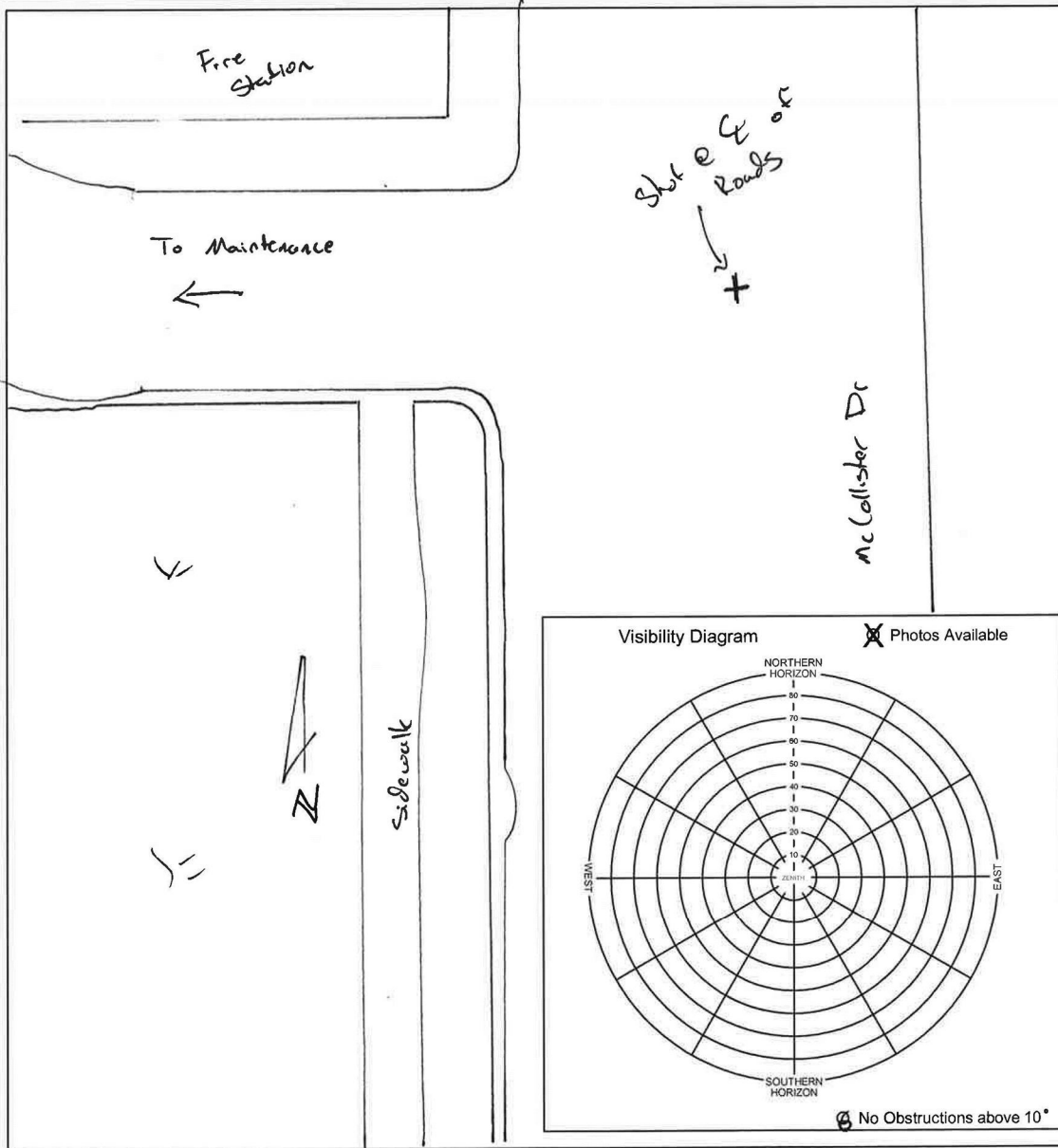
**19, TETON, 3E, 02OCT2014**



# Grand Teton LiDAR Survey - LiDAR Control



LiDAR Control point # <b>20</b>	General location <b>Teton Village, WY</b>	Ground Class <b>Asphalt Road</b>
Latitude <b>N 43° 35' 26"</b>	Longitude <b>W 110° 49' 32"</b>	Calendar Date <b>10/2/14</b>
		Observer Initials <b>DJK</b>



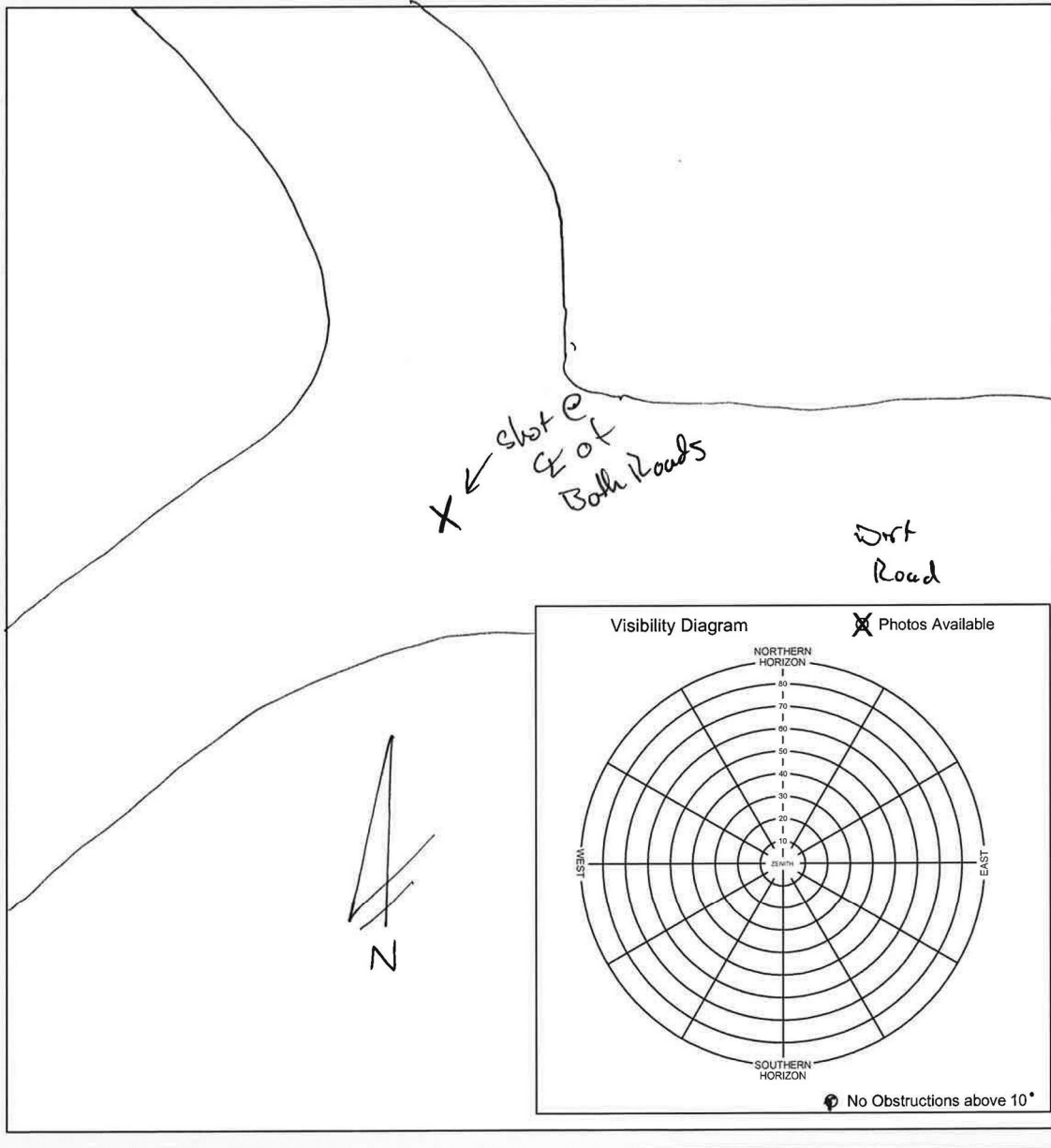


**20, TETON, 3N, 02OCT2014**

# Grand Teton LiDAR Survey - LiDAR Control



LiDAR Control point # <b>21</b>	General location <b>Teton Village, WY</b>	Ground Class <b>Dirt Road</b>	
Latitude <b>N 43° 35' 56"</b>	Longitude <b>W 110° 51' 23"</b>	Calendar Date <b>10/2/14</b>	Observer Initials <b>DJK</b>







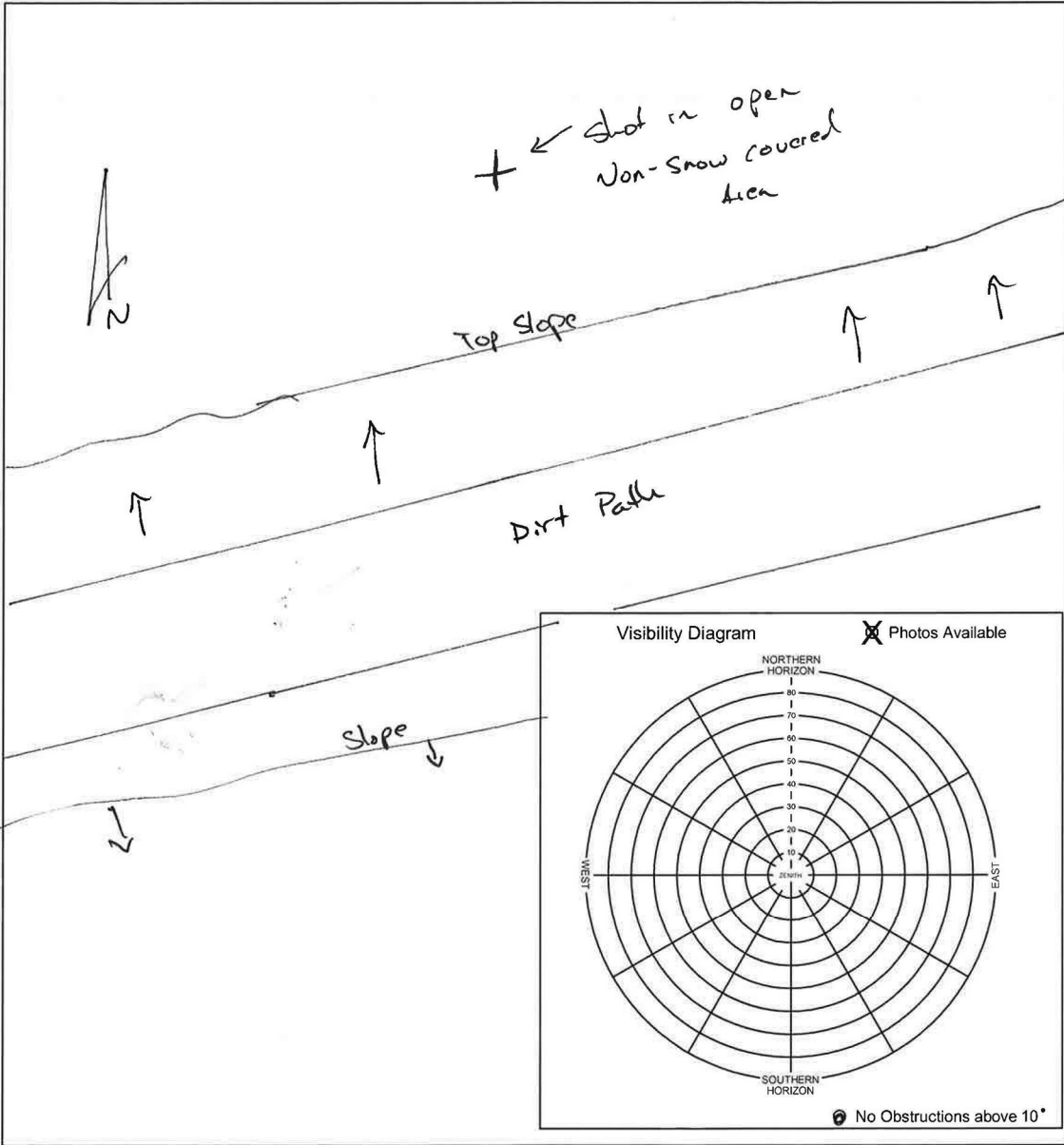
**21, TETON, 3SW, 02OCT2014**



# Grand Teton LiDAR Survey - LiDAR Control



LiDAR Control point # 22	General location Teton Village, WY	Ground Class Ground
Latitude N 43° 35' 42 "	Longitude W 110° 52' 29 "	Calendar Date 10/2/14
		Observer Initials DJK



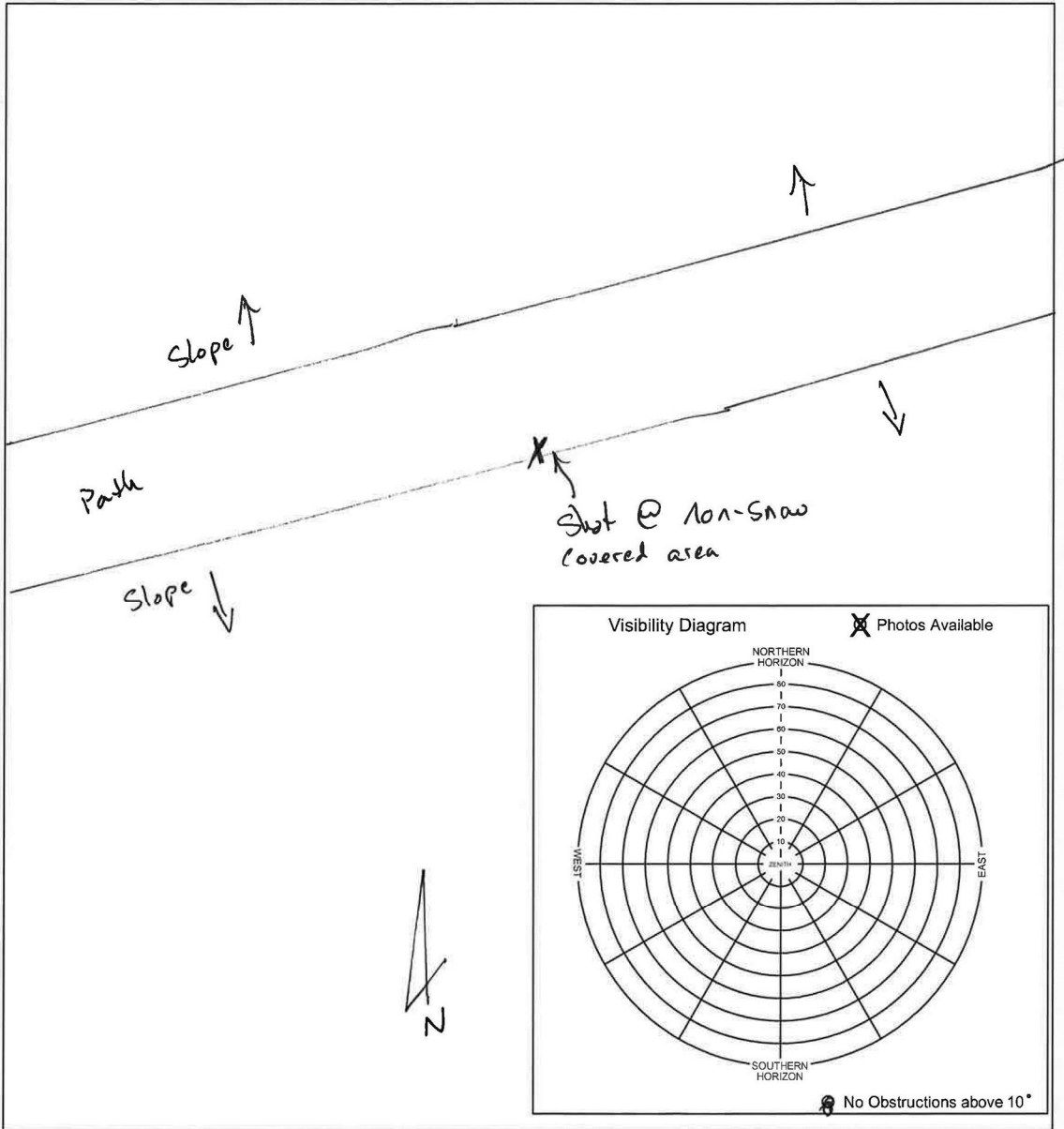


**22, TETON, 3S, 02OCT2014**

# Grand Teton LiDAR Survey - LiDAR Control



LiDAR Control point # <b>22 A</b>	General location <b>Teton Village, WY</b>	Ground Class <b>Ground</b>
Latitude <b>N 43 ° 35 ' 40 " "</b>	Longitude <b>W 110 ° 52 ' 31 " "</b>	Calendar Date <b>10/2/14</b>
		Observer Initials <b>DJK</b>







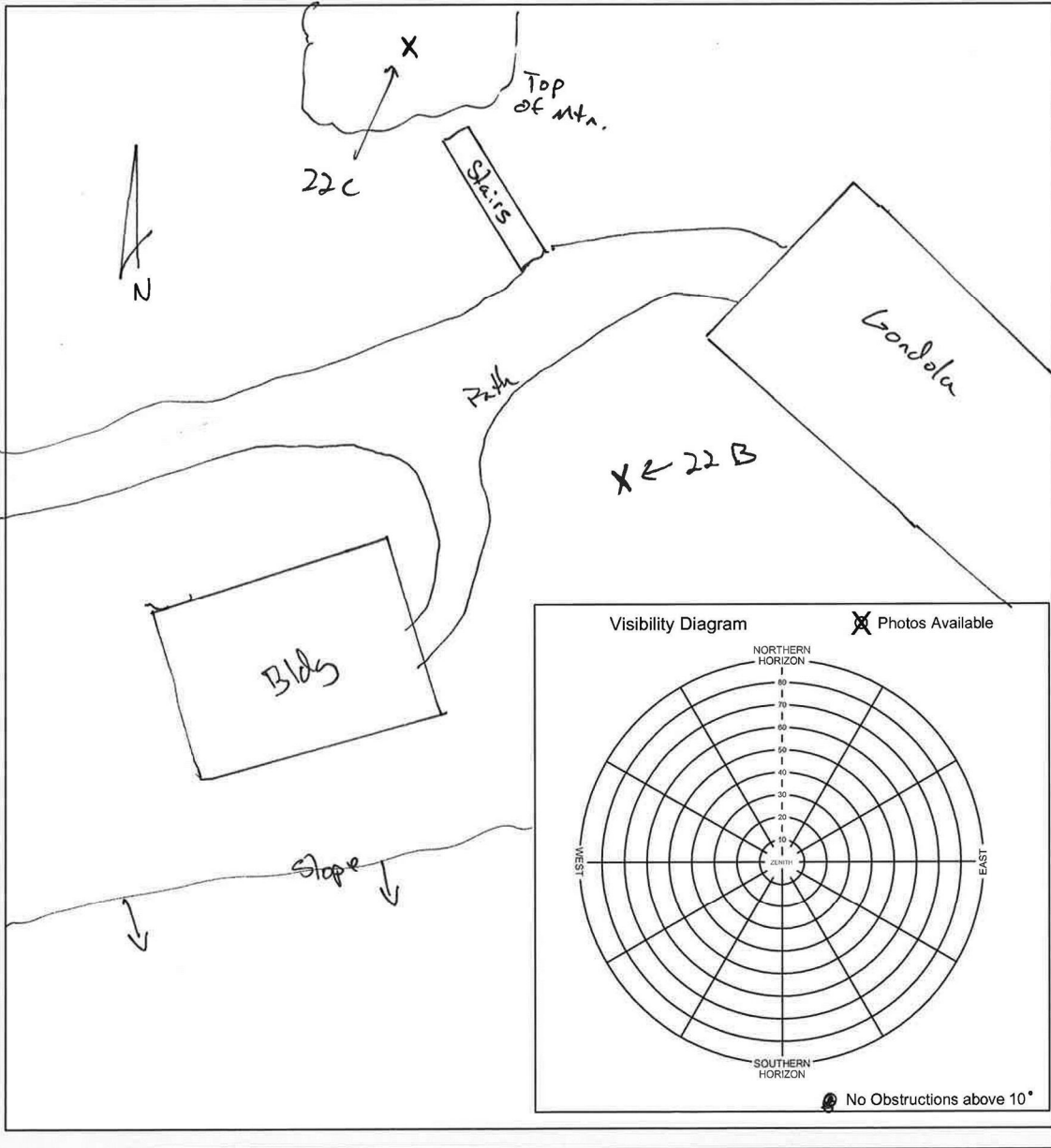
**22A, TETON, 3S, 02OCT2014**

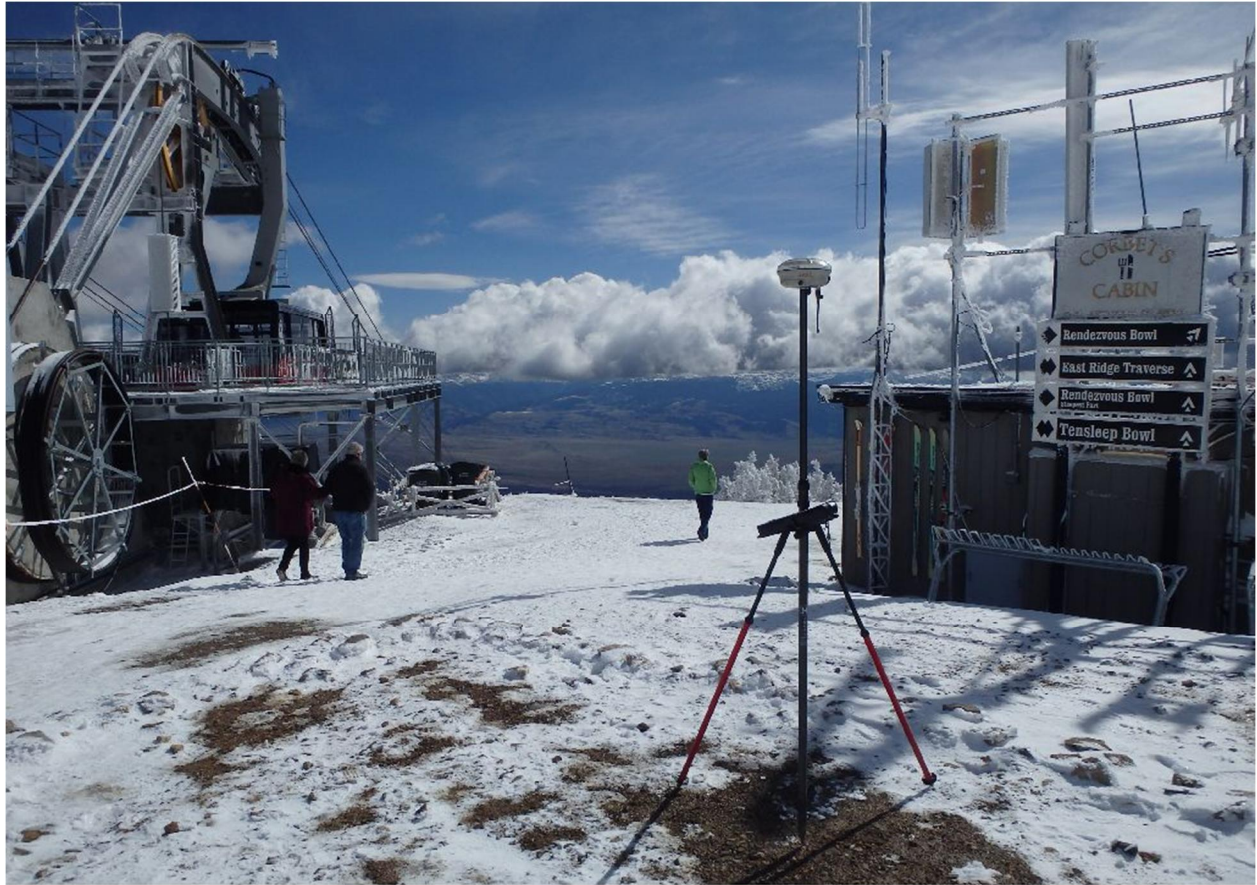


# Grand Teton LiDAR Survey - LiDAR Control



LiDAR Control point # 22B / 22C	General location Teton Village, WY	Ground Class Ground	
Latitude N 43° 35' 59"	Longitude W 110° 52' 15"	Calendar Date 10/2/14	Observer Initials DJK



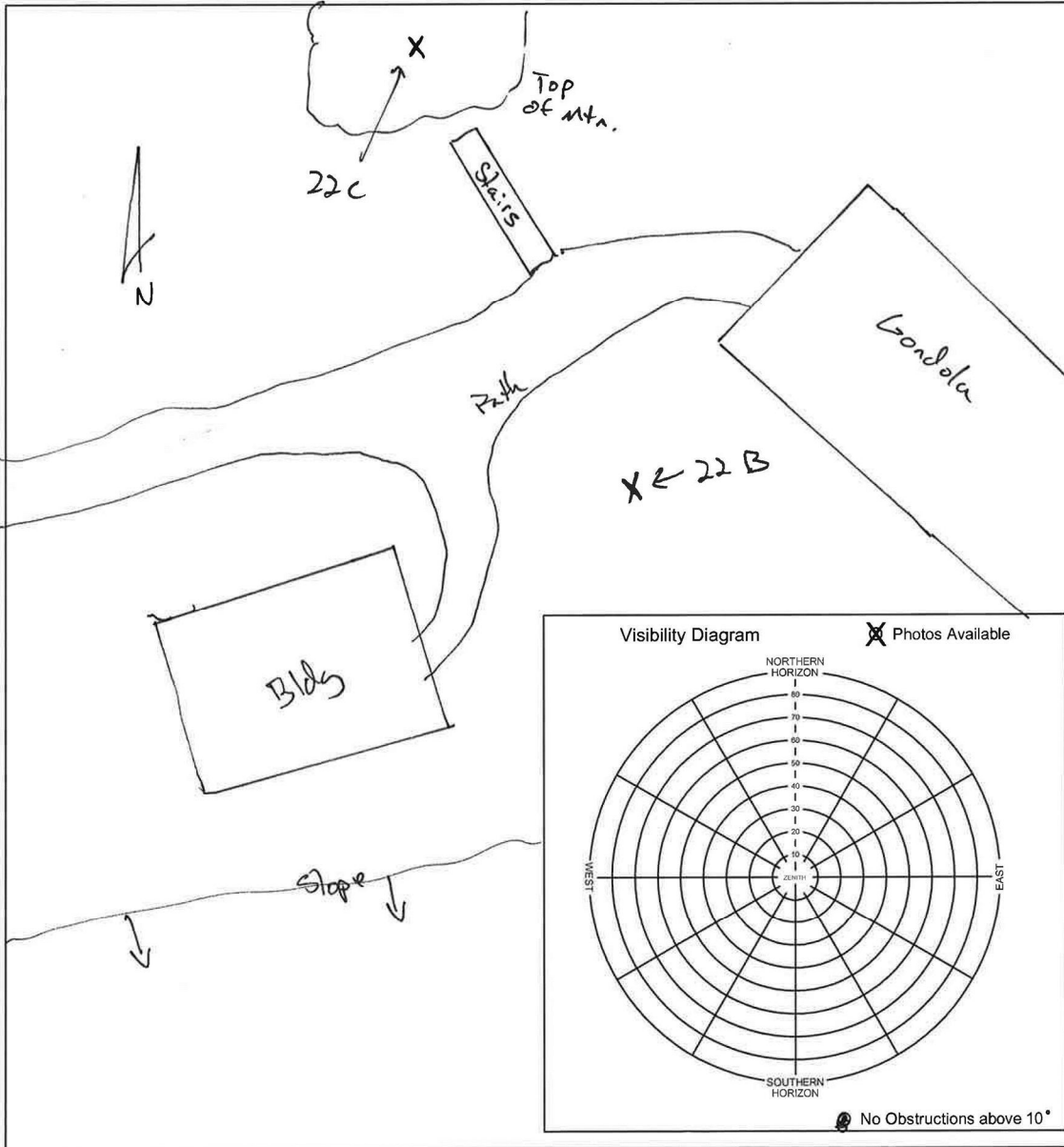


**22B, TETON, 3E, 02OCT2014**

# Grand Teton LiDAR Survey - LiDAR Control



LiDAR Control point # 22B / 22C	General location Teton Village, WY	Ground Class Ground
Latitude N 43° 35' 59" "	Longitude W 110° 52' 15" "	Calendar Date 10/2/14
		Observer Initials DJK







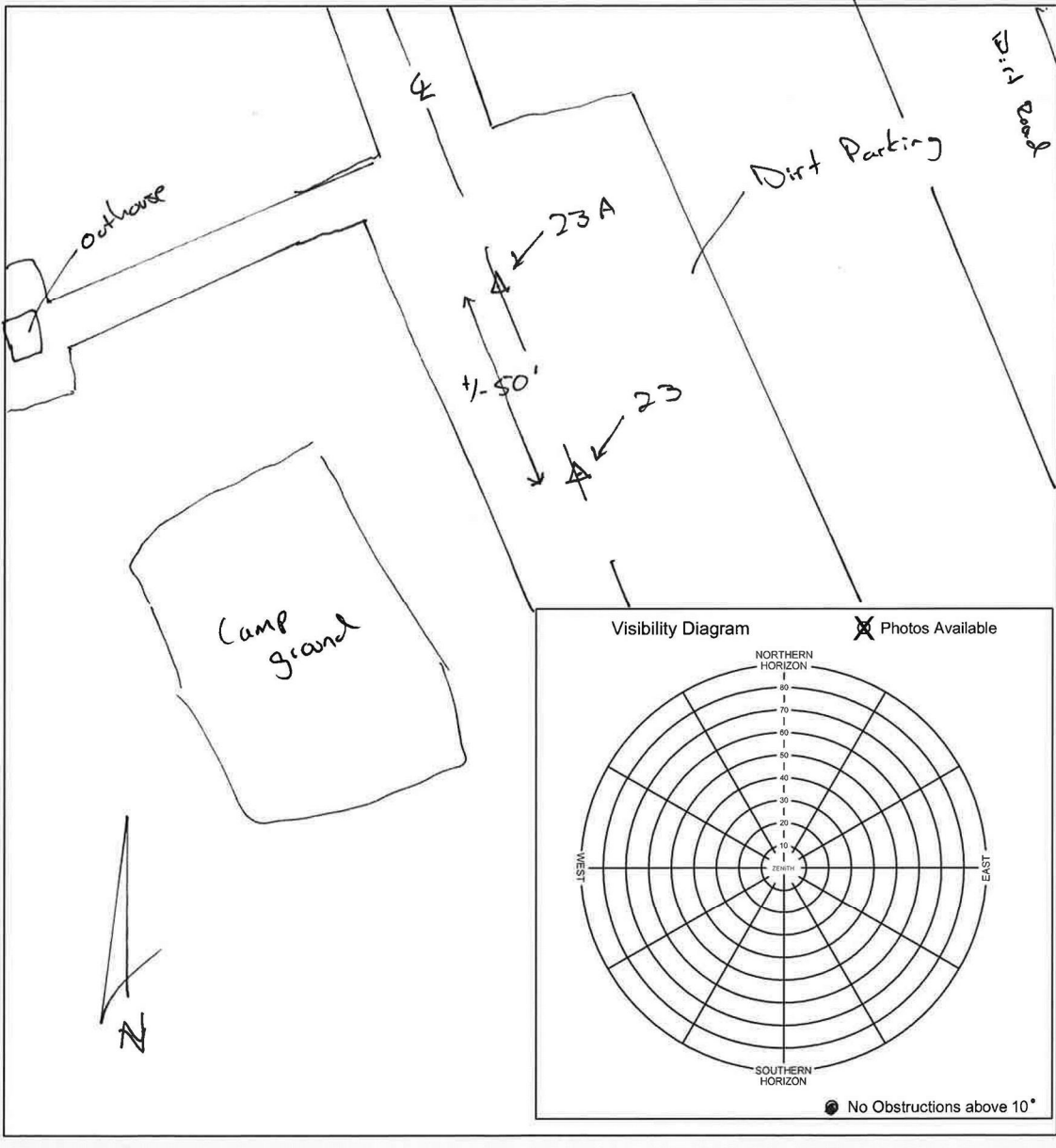
**22C, TETON, 3S, 02OCT2014**



# Grand Teton LiDAR Survey - LiDAR Control



LiDAR Control point # <b>23 A + 23</b>	General location <b>Driggs, ID</b>	Ground Class <b>Dirt Road</b>
Latitude <b>N 43° 45' 25"</b>	Longitude <b>W 110° 55' 03"</b>	Calendar Date <b>10/1/14</b>
		Observer Initials <b>DJK</b>



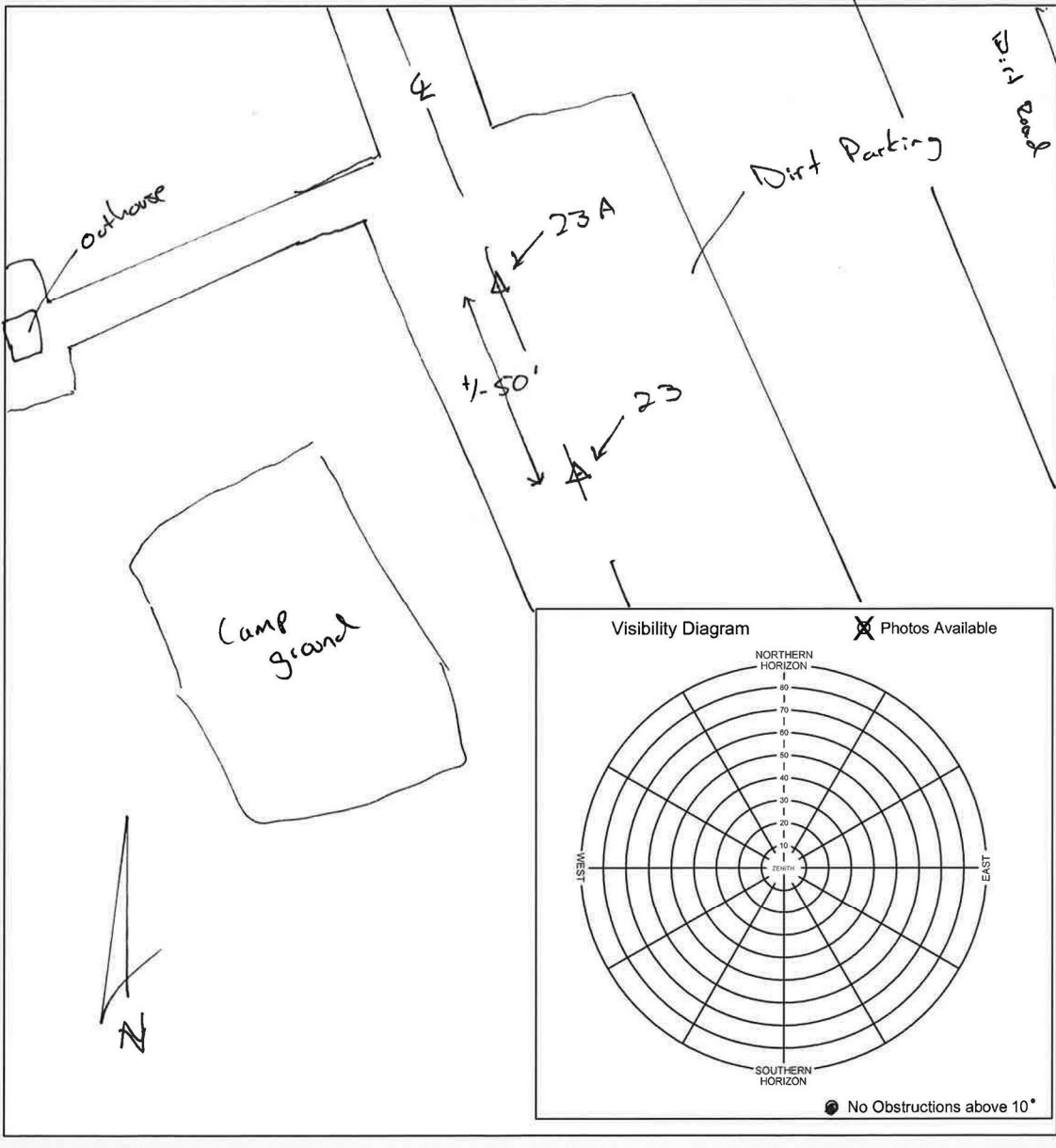


**23, TETON, 3W, 01OCT2014**

# Grand Teton LiDAR Survey - LiDAR Control



LiDAR Control point # <b>23 A + 23</b>	General location <b>Driggs, ID</b>	Ground Class <b>Dirt Road</b>
Latitude <b>N 43° 45' 25"</b>	Longitude <b>W 110° 55' 03"</b>	Calendar Date <b>10/1/14</b>
		Observer Initials <b>DJK</b>







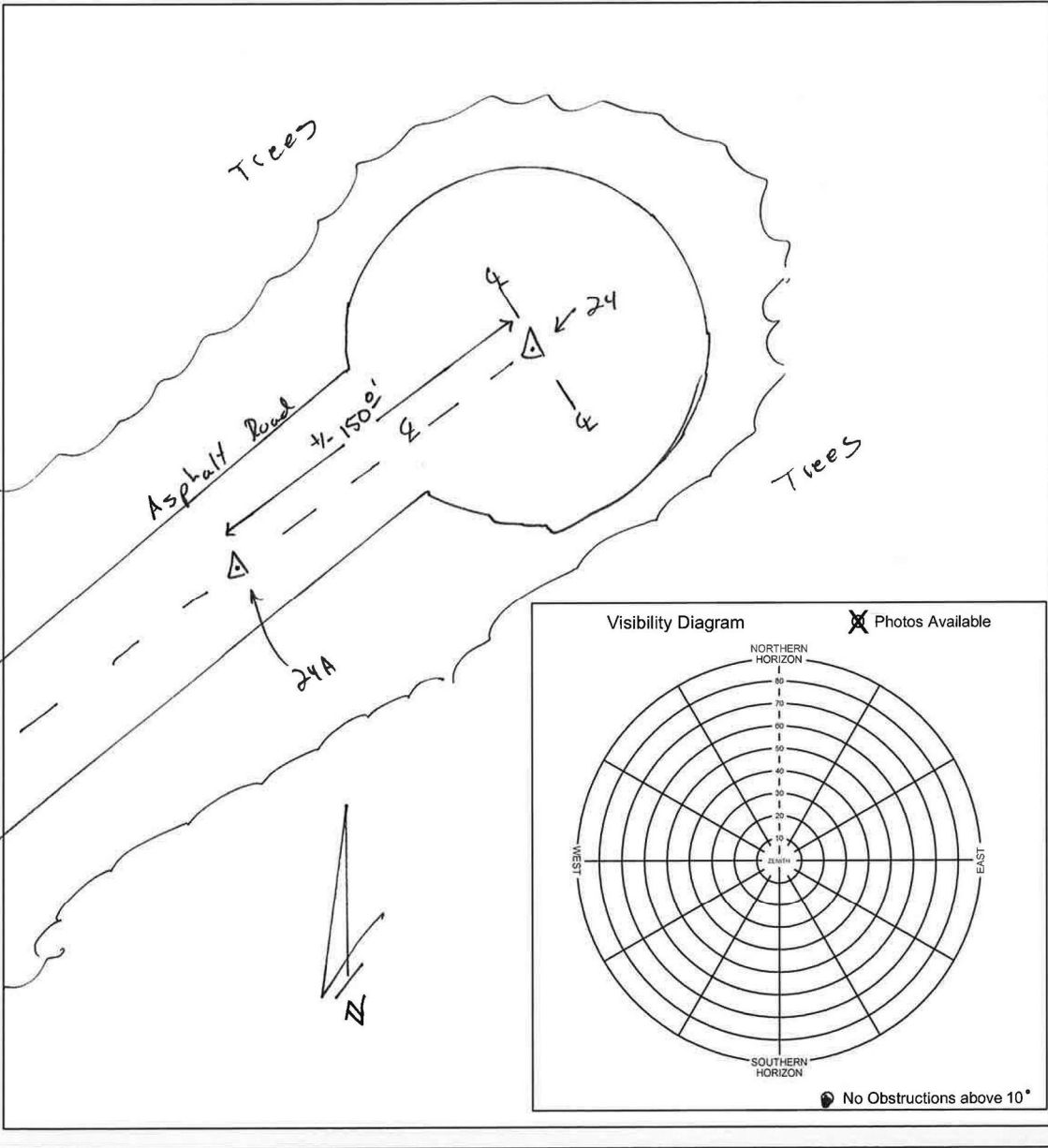
**23A, TETON, 3W, 01OCT2014**



# Grand Teton LiDAR Survey - LiDAR Control



LiDAR Control point # <b>24 + 24A</b>	General location <b>Driggs ID</b>	Ground Class <b>Asphalt Road</b>	
Latitude <b>N 43° 50' 15"</b>	Longitude <b>W 111° 04' 55"</b>	Calendar Date <b>10/1/14</b>	Observer Initials <b>DJK</b>



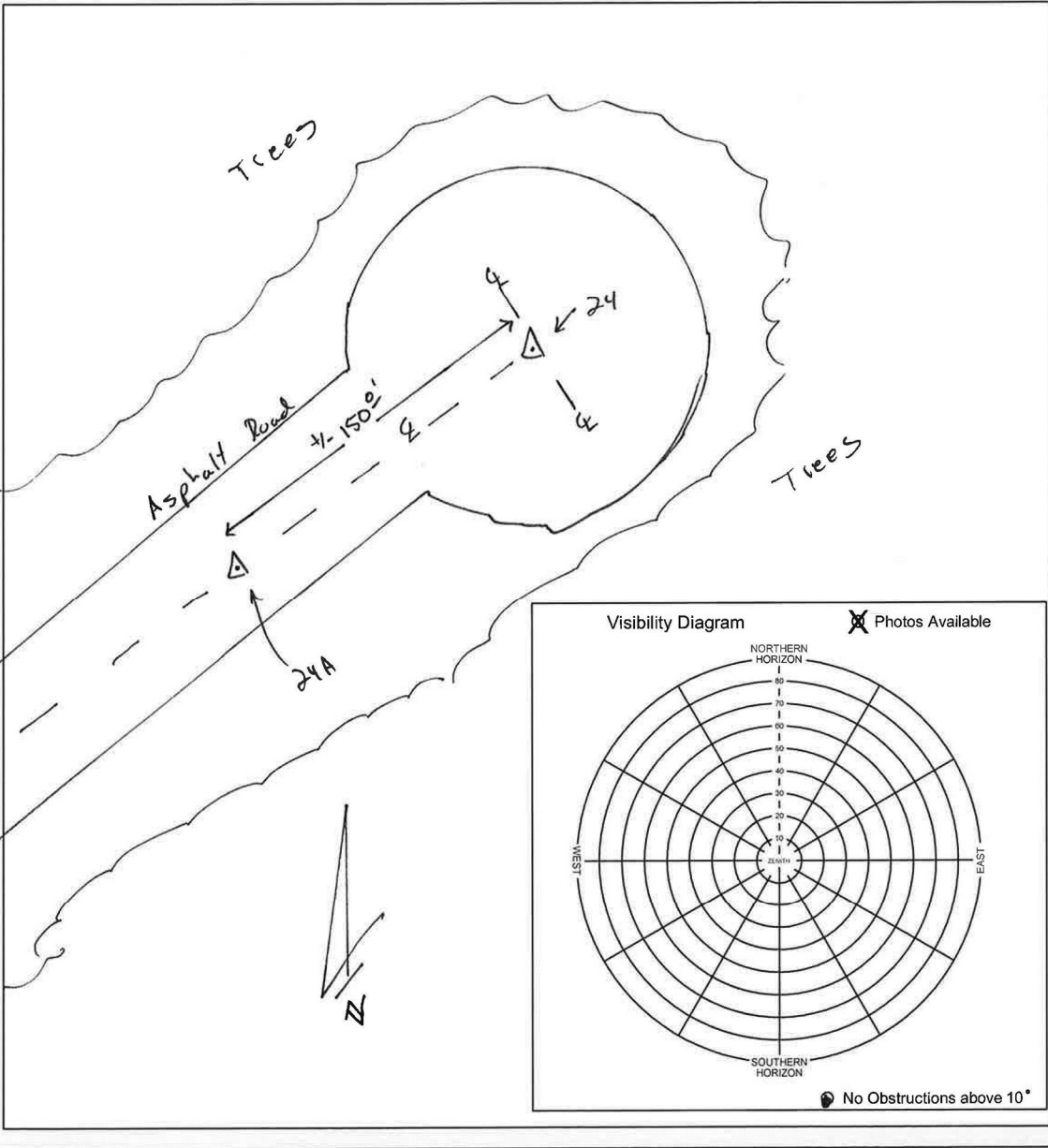


**24, TETON, 3W, 01OCT2014**

# Grand Teton LiDAR Survey - LiDAR Control



LiDAR Control point # <b>24 + 24A</b>	General location <b>Driggs ID</b>	Ground Class <b>Asphalt Road</b>	
Latitude <b>N 43° 50' 15 "</b>	Longitude <b>W 111° 04' 55 "</b>	Calendar Date <b>10/1/14</b>	Observer Initials <b>DJK</b>







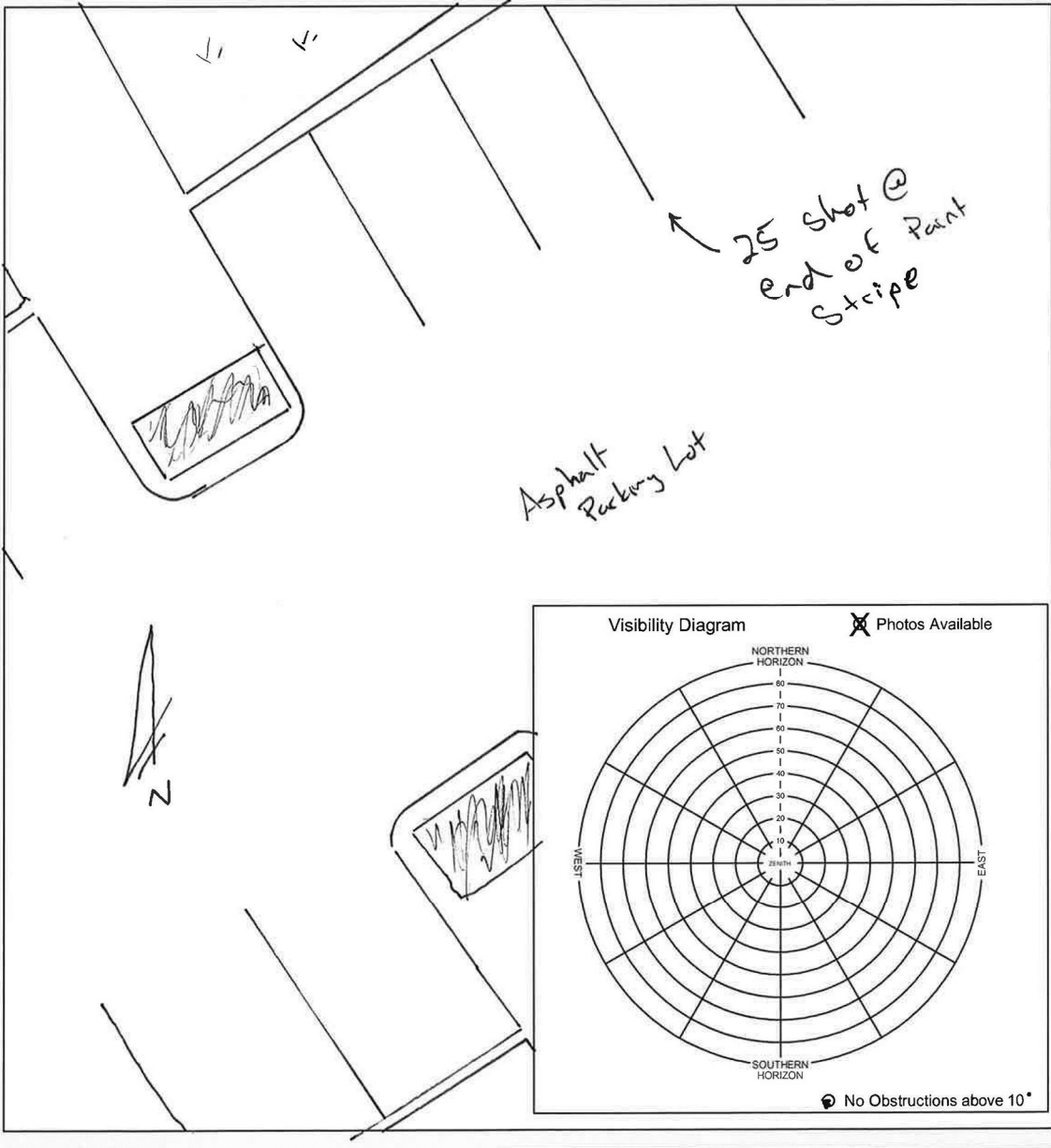
**24A, TETON, 3E, 01OCT2014**



# Grand Teton LiDAR Survey - LiDAR Control



LIDAR Control point # <b>25</b>	General location <b>Victor, ID</b>	Ground Class <b>Asphalt Road</b>
Latitude <b>N 43° 35' 40"</b>	Longitude <b>W 111° 06' 07"</b>	Calendar Date <b>10/1/14</b>
		Observer Initials <b>DJK</b>



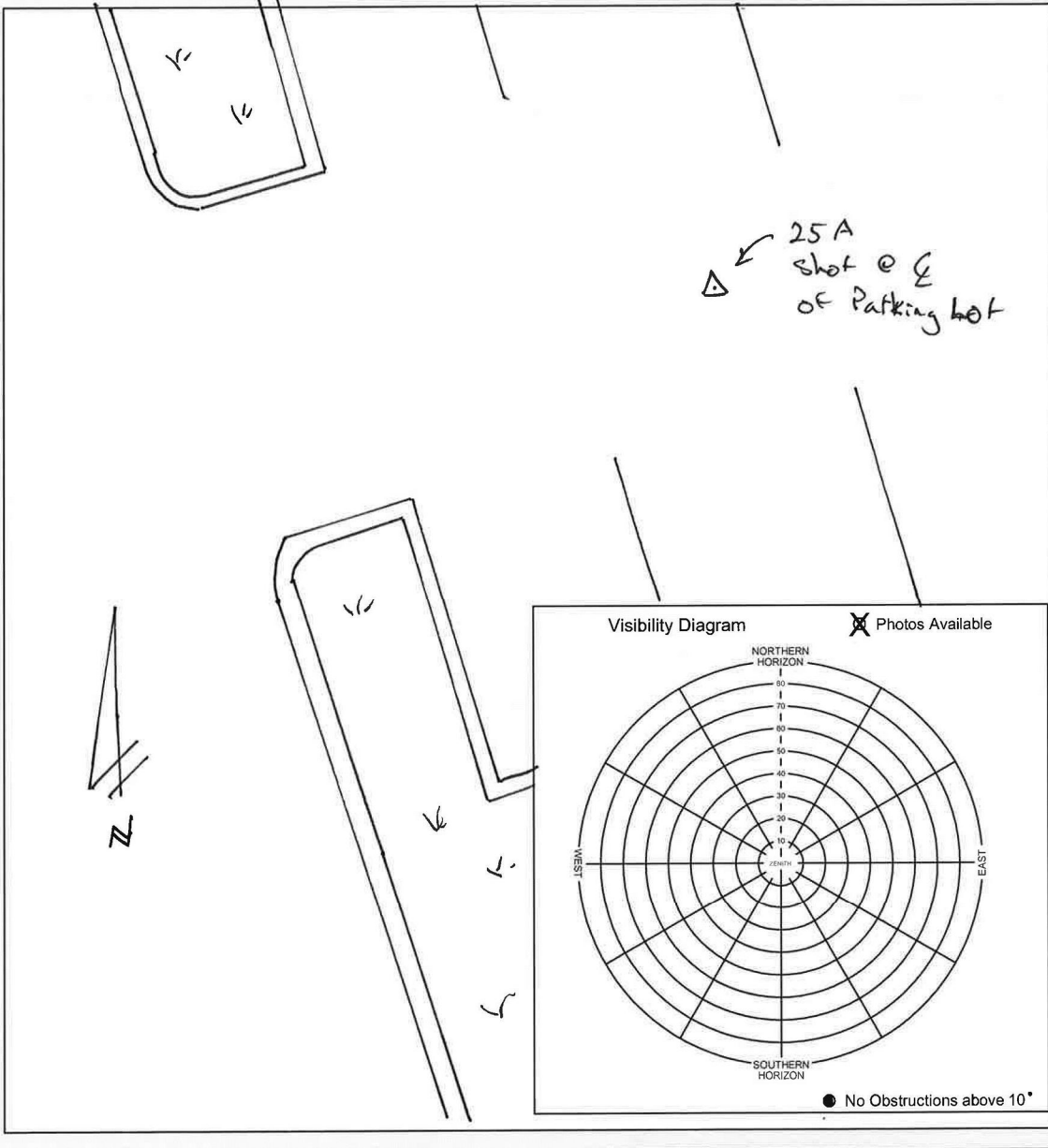


**25, TETON, 3W, 01OCT2014**

# Grand Teton LiDAR Survey - LiDAR Control



LiDAR Control point # <b>25 A</b>		General location <b>Victor, ID</b>		Ground Class <b>Asphalt Road</b>	
Latitude <b>N 43° 35' 39" "</b>		Longitude <b>W 111° 06' 09" "</b>		Calendar Date <b>10/1/14</b>	
				Observer Initials <b>DJK</b>	





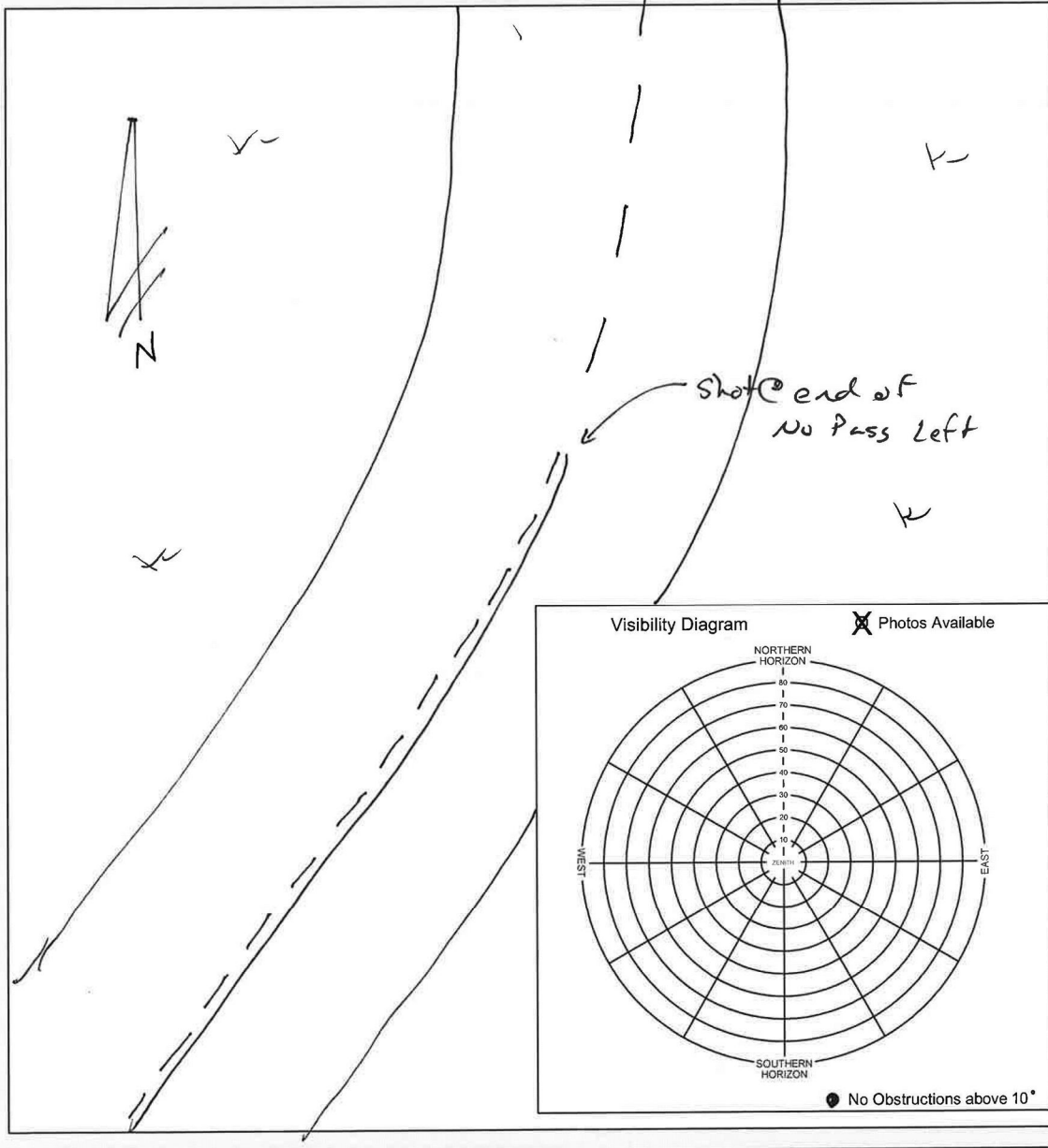
**25A, TETON, 3N, 01OCT2014**



# Grand Teton LiDAR Survey - LiDAR Control



LIDAR Control point # 26	General location Teton Natl Park	Ground Class Road Asphalt
Latitude N 43° 46' 06" "	Longitude W 110° 42' 29" "	Calendar Date 10/3/14
		Observer Initials DJK



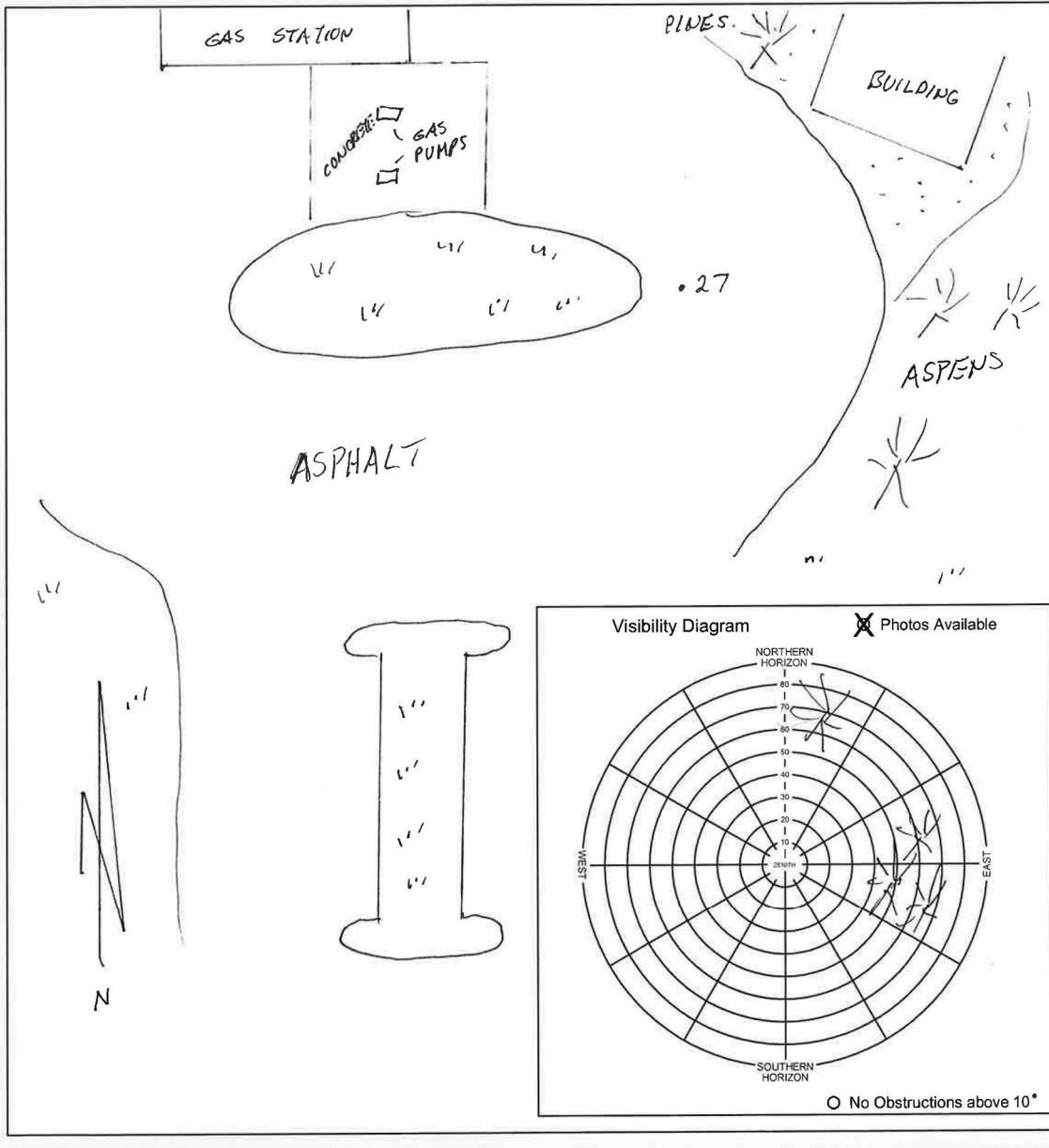


**26, TETON, 3W, 03OCT2014**

# Grand Teton LiDAR Survey - LiDAR Control



LiDAR Control point # <b>27</b>	General location <b>TETONS</b>	Ground Class	
Latitude <b>N 43° 52' 42"</b>	Longitude <b>W 110° 34' 22"</b>	Calendar Date <b>10/04/2014</b>	Observer Initials <b>DJK</b>







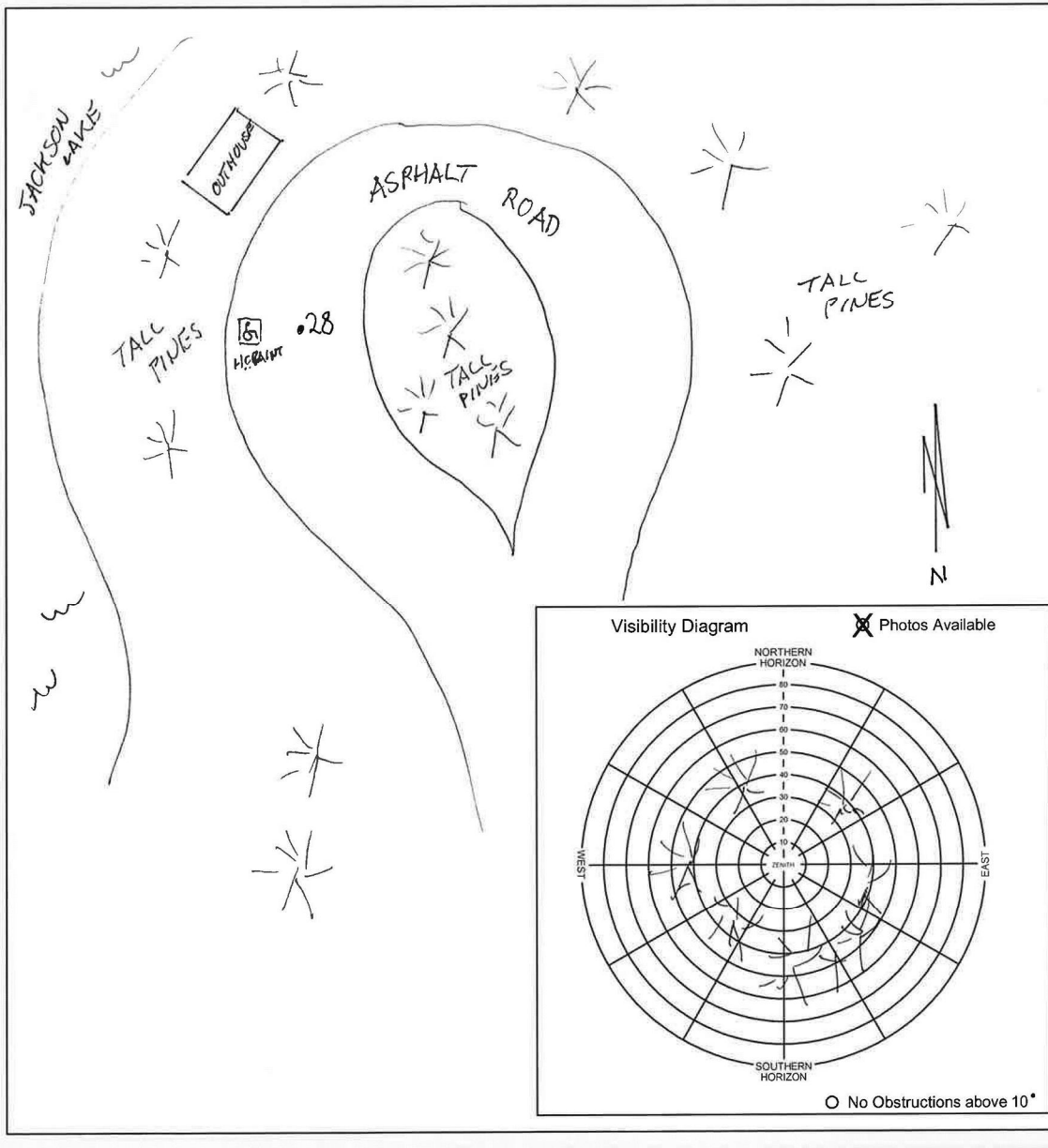
**27, TETON, 3N, 04OCT2014**



# Grand Teton LiDAR Survey - LiDAR Control



LiDAR Control point # <b>28</b>	General location <b>TETONS</b>	Ground Class	
Latitude <b>N 43° 54' 29"</b>	Longitude <b>W 110° 38' 50"</b>	Calendar Date <b>10/04/2014</b>	Observer Initials <b>DJK</b>





**28, TETON, 3S, 04OCT2014**

# SECTION 5: EXISTING NGS DATA SHEETS

This section contains the published National Geodetic Survey (NGS) Data Sheets used in the final control network for this project.

## The NGS Data Sheet

See file [dsdata.txt](#) for more information about the datasheet.

```
PROGRAM = datasheet95, VERSION = 8.5
1      National Geodetic Survey,   Retrieval Date = JANUARY  8, 2015
OX0163
*****
OX0163 DESIGNATION -  A 136
OX0163 PID          -  OX0163
OX0163 STATE/COUNTY-  WY/TETON
OX0163 COUNTRY      -  US
OX0163 USGS QUAD    -  GROS VENTRE JUNCTION (1996)
OX0163
OX0163                                *CURRENT SURVEY CONTROL
OX0163
-----
OX0163* NAD 83(2011) POSITION- 43 36 03.09614(N) 110 43 33.83985(W) NO
CHECK
OX0163* NAD 83(2011) ELLIP HT- 1950.375 (meters)          (06/27/12) NO
CHECK
OX0163* NAD 83(2011) EPOCH   - 2010.00
OX0163* NAVD 88 ORTHO HEIGHT - 1959.829 (meters)          6429.87 (feet)
ADJUSTED
OX0163
-----
OX0163 NAD 83(2011) X  - -1,637,703.741 (meters)          COMP
OX0163 NAD 83(2011) Y  - -4,328,101.147 (meters)          COMP
OX0163 NAD 83(2011) Z  -  4,377,428.482 (meters)          COMP
OX0163 LAPLACE CORR   -           2.58 (seconds)
DEFLEC12A
OX0163 GEOID HEIGHT   -           -9.43 (meters)
GEOID12A
OX0163 DYNAMIC HEIGHT -           1958.519 (meters)        6425.57 (feet) COMP
OX0163 MODELED GRAVITY -           979,881.4 (mgal)         NAVD
88
OX0163
OX0163 VERT ORDER      -  SECOND    CLASS 0
OX0163
OX0163 FGDC Geospatial Positioning Accuracy Standards (95% confidence, cm)
OX0163 Type                                     Horiz Ellip Dist(km)
OX0163 -----
OX0163 NETWORK                                           1.10  0.61
OX0163 -----
OX0163 MEDIAN LOCAL ACCURACY AND DIST (001 points) 0.53  0.02  1.09
```

OX0163 -----

OX0163 NOTE: Click [here](#) for information on individual local accuracy values and other accuracy information.

OX0163

OX0163

OX0163.This mark is at Jackson Hole Airport (JAC)

OX0163

OX0163.The horizontal coordinates were established by GPS observations and adjusted by the National Geodetic Survey in June 2012.

OX0163

OX0163.NAD 83(2011) refers to NAD 83 coordinates where the reference frame has been affixed to the stable North American tectonic plate.

See

OX0163.[NA2011](#) for more information.

OX0163

OX0163.The horizontal coordinates are valid at the epoch date displayed above

OX0163.which is a decimal equivalence of Year/Month/Day.

OX0163

OX0163.No horizontal observational check was made to the station.

OX0163.

OX0163.The orthometric height was determined by differential leveling and adjusted by the NATIONAL GEODETIC SURVEY

OX0163.in June 1991.

OX0163

OX0163.The X, Y, and Z were computed from the position and the ellipsoidal ht.

OX0163

OX0163.The Laplace correction was computed from DEFLEC12A derived deflections.

OX0163

OX0163.The ellipsoidal height was determined by GPS observations and is referenced to NAD 83.

OX0163

OX0163.The dynamic height is computed by dividing the NAVD 88 geopotential number by the normal gravity value computed on the Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45 degrees latitude (g = 980.6199 gals.).

OX0163

OX0163.The modeled gravity was interpolated from observed gravity values.

OX0163

OX0163. The following values were computed from the NAD 83(2011) position.

OX0163

OX0163;	North	East	Units	Scale Factor	Factor
Converg.					
OX0163;SPC WY W	- 444,605.038	748,107.665	MT	0.99997061	-0 26
35.7					
OX0163;SPC WY W	- 1,458,675.03	2,454,416.56	sFT	0.99997061	-0 26
35.7					
OX0163;UTM 12	- 4,827,579.247	522,109.065	MT	0.99960601	+0 11
20.1					
OX0163					
OX0163!	- Elev Factor	x	Scale Factor	=	Combined Factor
OX0163!SPC WY W	- 0.99969425	x	0.99997061	=	0.99966487
OX0163!UTM 12	- 0.99969425	x	0.99960601	=	0.99930038



OX0163  
 OX0163 SUPERSEDED SURVEY CONTROL  
 OX0163  
 OX0163 NAD 83(2007)- 43 36 03.09562(N) 110 43 33.84083(W) AD(2002.00) 0  
 OX0163 ELLIP H (02/10/07) 1950.415 (m) GP(2002.00)  
 OX0163 NAD 83(1993)- 43 36 03.09488(N) 110 43 33.84040(W) AD( ) 1  
 OX0163 ELLIP H (01/10/02) 1950.413 (m) GP( ) 3  
 1  
 OX0163 NAVD 88 (01/10/02) 1959.83 (m) 6429.9 (f) LEVELING 3  
 OX0163 NGVD 29 (??/??/92) 1958.526 (m) 6425.60 (f) ADJ UNCH 2  
 0

OX0163  
 OX0163.Superseded values are not recommended for survey control.  
 OX0163  
 OX0163.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.  
 OX0163.[See file dsdata.txt](#) to determine how the superseded data were derived.

OX0163  
 OX0163\_U.S. NATIONAL GRID SPATIAL ADDRESS: 12TWP2210927579(NAD 83)  
 OX0163  
 OX0163\_MARKER: DB = BENCH MARK DISK  
 OX0163\_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT  
 OX0163\_SP\_SET: SET IN TOP OF CONCRETE MONUMENT  
 OX0163\_STAMPING: A 136 1964  
 OX0163\_MARK LOGO: CGS  
 OX0163\_PROJECTION: PROJECTING 15 CENTIMETERS  
 OX0163\_MAGNETIC: N = NO MAGNETIC MATERIAL  
 OX0163\_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO  
 OX0163+STABILITY: SURFACE MOTION  
 OX0163\_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR  
 OX0163+SATELLITE: SATELLITE OBSERVATIONS - October 12, 2013

OX0163  

OX0163 HISTORY	- Date	Condition	Report By
OX0163 HISTORY	- 1964	MONUMENTED	CGS
OX0163 HISTORY	- 1970	GOOD	NGS
OX0163 HISTORY	- 19870705	GOOD	LOCSUR
OX0163 HISTORY	- 20010717	GOOD	NGS
OX0163 HISTORY	- 20131012	GOOD	WATER

OX0163  
 OX0163 STATION DESCRIPTION  
 OX0163  
 OX0163'DESCRIBED BY COAST AND GEODETIC SURVEY 1964  
 OX0163'8.5 MI N FROM JACKSON.  
 OX0163'TO REACH FROM THE PUBLIC SQUARE IN JACKSON, GO 8.5 MILES NORTH ON U.S.  
 OX0163'HIGHWAY 187 TO THE INTERSECTION WITH THE AIRPORT ACCESS ROAD, TURN  
 OX0163'LEFT, GO .1 MILE TO THE MARK ON THE LEFT. THE MARK IS 450 FEET WEST  
 OX0163'OF THE EDGE OF THE NEW HIGHWAY. 84 FEET WEST OF THE EDGE OF THE OLD  
 OX0163'HIGHWAY, AND 48 FEET SOUTH OF THE EDGE OF THE ACCESS ROAD. IT IS A  
 OX0163'STANDARD DISK SET IN A 12 INCH CONCRETE POST AND STAMPED A 136 1964.  
 OX0163'THE MARK PROJECTS ABOUT 6 INCHES ABOVE THE SURFACE OF THE GROUND.

OX0163  
 OX0163 STATION RECOVERY (1970)  
 OX0163  
 OX0163'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1970

OX0163'RECOVERED IN GOOD CONDITION.  
OX0163  
OX0163 STATION RECOVERY (1987)  
OX0163  
OX0163'RECOVERY NOTE BY LOCAL SURVEYOR (INDIVIDUAL OR FIRM) 1987 (PNS)  
OX0163'RECOVERED IN GOOD CONDITION.  
OX0163  
OX0163 STATION RECOVERY (2001)  
OX0163  
OX0163'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 2001 (AJL)  
OX0163'RECOVERED AS DESCRIBED.  
OX0163'  
OX0163'  
OX0163  
OX0163 STATION RECOVERY (2013)  
OX0163  
OX0163'RECOVERY NOTE BY WATERSHED SCIENCES 2013 (CA)  
OX0163'RECOVERED IN GOOD CONDITION.  
1 National Geodetic Survey, Retrieval Date = JANUARY 8, 2015  
OX0192  
\*\*\*\*\*  
OX0192 DESIGNATION - B 312  
OX0192 PID - OX0192  
OX0192 STATE/COUNTY- WY/TETON  
OX0192 COUNTRY - US  
OX0192 USGS QUAD - MOOSE (1968)  
OX0192  
OX0192 \*CURRENT SURVEY CONTROL  
OX0192

---

OX0192\* NAD 83(1993) POSITION- 43 37 30.05556(N) 110 37 52.18800(W)  
ADJUSTED  
OX0192\* [NAVD 88](#) ORTHO HEIGHT - 2031.217 (meters) 6664.08 (feet)  
ADJUSTED  
OX0192

---

OX0192 LAPLACE CORR - 6.30 (seconds)  
DEFLEC12A  
OX0192 GEOID HEIGHT - -9.19 (meters)  
GEOID12A  
OX0192 DYNAMIC HEIGHT - 2029.879 (meters) 6659.69 (feet) COMP  
OX0192 MODELED GRAVITY - 979,887.4 (mgal) NAVD  
88  
OX0192  
OX0192 HORZ ORDER - THIRD  
OX0192 VERT ORDER - SECOND CLASS 0  
OX0192  
OX0192.The horizontal coordinates were established by classical geodetic  
methods  
OX0192.and adjusted by the National Geodetic Survey in January 1997.  
OX0192.  
OX0192.The orthometric height was determined by differential leveling and  
OX0192.adjusted by the NATIONAL GEODETIC SURVEY  
OX0192.in June 1991.  
OX0192

OX0192.The Laplace correction was computed from DEFLEC12A derived deflections.

OX0192

OX0192.The dynamic height is computed by dividing the NAVD 88 OX0192.geopotential number by the normal gravity value computed on the OX0192.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45 OX0192.degrees latitude (g = 980.6199 gals.).

OX0192

OX0192.The modeled gravity was interpolated from observed gravity values.

OX0192

OX0192. The following values were computed from the NAD 83(1993) position.

OX0192

OX0192;		North	East	Units	Scale Factor	
Converg.						
OX0192;SPC WY W	-	447,233.753	755,787.581	MT	0.99996154	-0 22
40.7						
OX0192;SPC WY W	-	1,467,299.40	2,479,613.09	sFT	0.99996154	-0 22
40.7						
OX0192;UTM 12	-	4,830,291.584	529,756.768	MT	0.99961089	+0 15
16.1						

OX0192

OX0192! - Elev Factor x Scale Factor = Combined Factor

OX0192!SPC WY W - 0.99968302 x 0.99996154 = 0.99964458

OX0192!UTM 12 - 0.99968302 x 0.99961089 = 0.99929404

OX0192

OX0192:		Primary Azimuth Mark		Grid Az
OX0192:SPC WY W	-	BLACKTAIL		283 35 53.4
OX0192:UTM 12	-	BLACKTAIL		282 57 56.6

OX0192

OX0192|-----|

OX0192	PID	Reference Object	Distance	Geod. Az
OX0192				dddmmss.s
OX0192	OX0833	BLACKTAIL	APPROX. 5.1 KM	2831312.7

OX0192|-----|

OX0192

OX0192 SUPERSEDED SURVEY CONTROL

OX0192

OX0192 NAD 83(1992)- 43 37 30.04956(N) 110 37 52.18220(W) AD( ) 3

OX0192 NAD 83(1986)- 43 37 30.04563(N) 110 37 52.17435(W) AD( ) 3

OX0192 NAD 27 - 43 37 30.27872(N) 110 37 49.43377(W) AD( ) 3

OX0192 NGVD 29 (??/??/92) 2029.927 (m) 6659.85 (f) ADJ UNCH 2

0

OX0192 NGVD 29 (07/19/86) 2030.04 (m) 6660.2 (f) LEVELING 3

OX0192

OX0192.Superseded values are not recommended for survey control.

OX0192

OX0192.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.

OX0192.[See file dsdata.txt](#) to determine how the superseded data were derived.

OX0192

OX0192\_U.S. NATIONAL GRID SPATIAL ADDRESS: 12TWP2975630291 (NAD 83)

OX0192

OX0192\_MARKER: DB = BENCH MARK DISK

OX0192\_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT

OX0192\_SP\_SET: SET IN TOP OF CONCRETE MONUMENT

OX0192\_STAMPING: B 312 1946

OX0192\_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO

OX0192+STABILITY: SURFACE MOTION

OX0192\_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR

OX0192+SATELLITE: SATELLITE OBSERVATIONS - July 04, 2011

OX0192

OX0192	HISTORY	- Date	Condition	Report By
OX0192	HISTORY	- 1946	MONUMENTED	CGS
OX0192	HISTORY	- 1968	GOOD	USGS
OX0192	HISTORY	- 1968	GOOD	CGS
OX0192	HISTORY	- 20110704	GOOD	GEOCAC

OX0192

OX0192 STATION DESCRIPTION

OX0192

OX0192'DESCRIBED BY COAST AND GEODETIC SURVEY 1946

OX0192'0.35 MI W FROM KELLY.

OX0192'ALONG GRAVELED ROAD LEADING FROM U.S. HIGHWAY 187 TO KELLY, ABOUT 0.35

OX0192'MILE WEST OF KELLY POST OFFICE, SET IN CONCRETE POST 43 FEET SOUTH OF OX0192'CENTER LINE OF ROAD, 2.8 FEET NORTH OF FOURTH TELEPHONE POLE WEST OF OX0192'LOG HOUSE. STANDARD BRONZE DISK SET IN A CONCRETE POST.

OX0192

OX0192 STATION RECOVERY (1968)

OX0192

OX0192'RECOVERY NOTE BY US GEOLOGICAL SURVEY 1968

OX0192'LOCATED ABOUT 0.8 MI. W. OF KELLY POST OFFICE, 30 FT. S. OF THE MAIN OX0192'RD., 100 FT. W. OF A CULVERT WHERE IRRIGATION DITCH CROSSES RD. AND OX0192'40 FT. N. OF DITCH.

OX0192'

OX0192'RECOVERED.

OX0192'

OX0192'STATION MARK--STANDARD USC AND GS LEVEL DISK, STAMPED

OX0192'---B 312-1946---, SET IN A CONCRETE POST.

OX0192'

OX0192'REFERENCE MARK NO. 1--A LARGE PEBBLE, SET IN A CONCRETE BLOCK, 11.38 OX0192'FT. FROM THE STATION, S 70 DEG 35 MIN E.

OX0192

OX0192 STATION RECOVERY (1968)

OX0192

OX0192'RECOVERY NOTE BY COAST AND GEODETIC SURVEY 1968

OX0192'RECOVERED IN GOOD CONDITION.

OX0192

OX0192 STATION RECOVERY (2011)

OX0192

OX0192'RECOVERY NOTE BY GEOCACHING 2011 (BA)

OX0192'RECOVERED IN GOOD CONDITION.

1 National Geodetic Survey, Retrieval Date = JANUARY 8, 2015

DH7135

\*\*\*\*\*

DH7135 CORS - This is a GPS Continuously Operating Reference



Station.

DH7135 DESIGNATION - DRIGGS CORS ARP  
DH7135 CORS\_ID - IDDR  
DH7135 PID - DH7135  
DH7135 STATE/COUNTY- ID/TETON  
DH7135 COUNTRY - US  
DH7135 USGS QUAD - DRIGGS (1978)  
DH7135  
DH7135 \*CURRENT SURVEY CONTROL  
DH7135

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DH7135\* NAD 83(2011) POSITION- 43 44 46.00102(N) 111 06 36.92106(W)  
ADJUSTED  
DH7135\* NAD 83(2011) ELLIP HT- 1864.598 (meters) (08/??/11)  
ADJUSTED  
DH7135\* NAD 83(2011) EPOCH - 2010.00  
DH7135\* [NAVD 88](#) ORTHO HEIGHT - \*(meters) \*(feet)  
DH7135

---

DH7135 NAD 83(2011) X - -1,662,650.910 (meters) COMP  
DH7135 NAD 83(2011) Y - -4,306,565.184 (meters) COMP  
DH7135 NAD 83(2011) Z - 4,389,045.347 (meters) COMP  
DH7135 GEOID HEIGHT - -9.83 (meters)

GEOID12A

DH7135  
DH7135 FGDC Geospatial Positioning Accuracy Standards (95% confidence, cm)  
DH7135 Type Horiz Ellip Dist(km)  
DH7135 -----  
DH7135 NETWORK 1.62 5.09  
DH7135 -----

DH7135 NOTE: Click [here](#) for information on individual local accuracy  
DH7135 values and other accuracy information.

DH7135  
DH7135

DH7135.The coordinates were established by GPS observations  
DH7135.and adjusted by the National Geodetic Survey in August 2011.

DH7135

DH7135.NAD 83(2011) refers to NAD 83 coordinates where the reference  
DH7135.frame has been affixed to the stable North American Tectonic Plate.

DH7135

DH7135.The coordinates are valid at the epoch date displayed above  
DH7135.which is a decimal equivalence of Year/Month/Day.

DH7135

DH7135.The PID for the CORS L1 Phase Center is DK3554.

DH7135

DH7135.The XYZ, and position/ellipsoidal ht. are equivalent.

DH7135

DH7135.The ellipsoidal height was determined by GPS observations

DH7135.and is referenced to NAD 83.

DH7135

DH7135. The following values were computed from the NAD 83(2011) position.

DH7135

DH7135; North East Units Scale Factor

Converg.

DH7135;SPC ID E - 231,529.602 285,086.908 MT 1.00003638 +0 43



```

OX0177 GEOID HEIGHT      -          -9.08  (meters)
GEOID12A
OX0177 DYNAMIC HEIGHT   -          2100.636 (meters)      6891.84  (feet) COMP
OX0177 MODELED GRAVITY  -          979,868.6  (mgal)          NAVD
88
OX0177
OX0177 VERT ORDER       - SECOND CLASS 0
OX0177
OX0177.The horizontal coordinates were established by autonomous hand held
GPS
OX0177.observations and have an estimated accuracy of +/- 10 meters.
OX0177.
OX0177.The orthometric height was determined by differential leveling and
OX0177.adjusted by the NATIONAL GEODETIC SURVEY
OX0177.in June 1991.
OX0177
OX0177.The dynamic height is computed by dividing the NAVD 88
OX0177.geopotential number by the normal gravity value computed on the
OX0177.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
OX0177.degrees latitude (g = 980.6199 gals.).
OX0177
OX0177.The modeled gravity was interpolated from observed gravity values.
OX0177
OX0177;
OX0177; SPC WY W      -          North          East          Units Estimated Accuracy
OX0177; SPC WY W      -          469,255.          757,220.          MT (+/- 10 meters HH2
GPS)
OX0177
OX0177
OX0177
OX0177
OX0177 SUPERSEDED SURVEY CONTROL
OX0177
OX0177 NGVD 29 (??/??/92) 2100.738 (m)          6892.17 (f) ADJ UNCH 2
0
OX0177
OX0177.Superseded values are not recommended for survey control.
OX0177
OX0177.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
OX0177.See file dsdata.txt to determine how the superseded data were
derived.
OX0177
OX0177 U.S. NATIONAL GRID SPATIAL ADDRESS: 12TWP3094552320 (NAD 83)
OX0177
OX0177_MARKER: DB = BENCH MARK DISK
OX0177_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT
OX0177_SP SET: SET IN TOP OF CONCRETE MONUMENT
OX0177_STAMPING: K 41 1934
OX0177_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO
OX0177+STABILITY: SURFACE MOTION
OX0177
OX0177 HISTORY      - Date          Condition          Report By
OX0177 HISTORY      - 1934          MONUMENTED          CGS
OX0177
OX0177
OX0177 STATION DESCRIPTION
OX0177
OX0177'DESCRIBED BY COAST AND GEODETIC SURVEY 1934
OX0177'27.9 MI N FROM JACKSON.

```

OX0177'ABOUT 27.9 MILES NORTH ALONG U.S. HIGHWAY 187 FROM JACKSON, TETON  
 OX0177'COUNTY, ABOUT 3.3 MILES SOUTH OF THE DAM AT MORAN, AT THE SIDE OF A  
 OX0177'HILL, ABOUT 130.0 FEET NORTHWEST OF THE CENTER OF A DIM ROAD  
 CROSSING,  
 OX0177'20.0 FEET SOUTH OF THE FOOT OF THE SOUTH SIDE OF THE HILL, AND 72.0  
 OX0177'FEET WEST OF THE CENTER LINE OF THE HIGHWAY. A STANDARD DISK,  
 STAMPED  
 OX0177'K 41 1934 AND SET IN THE TOP OF A CONCRETE POST.

1 National Geodetic Survey, Retrieval Date = JANUARY 8, 2015

AI5647

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AI5647 CORS - This is a GPS Continuously Operating Reference  
 Station.

AI5647 DESIGNATION - MAMMOTH WYOMING CORS ARP

AI5647 CORS\_ID - MAWY

AI5647 PID - AI5647

AI5647 STATE/COUNTY- WY/PARK

AI5647 COUNTRY - US

AI5647 USGS QUAD - MAMMOTH (1986)

AI5647

AI5647 \*CURRENT SURVEY CONTROL

AI5647

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AI5647\* NAD 83(2011) POSITION- 44 58 24.31920(N) 110 41 21.43310(W)

ADJUSTED

AI5647\* NAD 83(2011) ELLIP HT- 1824.912 (meters) (08/??/11)

ADJUSTED

AI5647\* NAD 83(2011) EPOCH - 2010.00

AI5647\* [NAVD 88](#) ORTHO HEIGHT - \*\* (meters) \*\* (feet)

AI5647

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AI5647 NAD 83(2011) X - -1,597,258.369 (meters) COMP

AI5647 NAD 83(2011) Y - -4,229,413.078 (meters) COMP

AI5647 NAD 83(2011) Z - 4,486,549.185 (meters) COMP

AI5647 GEOID HEIGHT - -8.63 (meters)

GEOID12A

AI5647

AI5647 FGDC Geospatial Positioning Accuracy Standards (95% confidence, cm)

AI5647 Type Horiz Ellip Dist(km)

AI5647 -----

AI5647 NETWORK 1.24 3.93

AI5647 -----

AI5647 NOTE: Click [here](#) for information on individual local accuracy

AI5647 values and other accuracy information.

AI5647

AI5647

AI5647.The coordinates were established by GPS observations

AI5647.and adjusted by the National Geodetic Survey in August 2011.

AI5647

AI5647.NAD 83(2011) refers to NAD 83 coordinates where the reference

AI5647.frame has been affixed to the stable North American Tectonic Plate.

AI5647

AI5647.The coordinates are valid at the epoch date displayed above

AI5647.which is a decimal equivalence of Year/Month/Day.

AI5647





AI5647' ftp://cors.ngs.noaa.gov/cors/coord/coord\_08  
 AI5647' ftp://cors.ngs.noaa.gov/cors/station\_log  
 AI5647' http://geodesy.noaa.gov/CORS  
 1 National Geodetic Survey, Retrieval Date = JANUARY 8, 2015  
 AA3684  
 \*\*\*\*\*  
 AA3684 CBN - This is a Cooperative Base Network Control Station.  
 AA3684 PACS - This is a Primary Airport Control Station.  
 AA3684 DESIGNATION - U59 A  
 AA3684 PID - AA3684  
 AA3684 STATE/COUNTY- ID/TETON  
 AA3684 COUNTRY - US  
 AA3684 USGS QUAD - DRIGGS (1978)  
 AA3684  
 AA3684 \*CURRENT SURVEY CONTROL  
 AA3684  


---

 AA3684\* NAD 83(2011) POSITION- 43 44 16.43323(N) 111 06 20.33532(W)  
 ADJUSTED  
 AA3684\* NAD 83(2011) ELLIP HT- 1863.990 (meters) (06/27/12)  
 ADJUSTED  
 AA3684\* NAD 83(2011) EPOCH - 2010.00  
 AA3684\* [NAVD 88](#) ORTHO HEIGHT - 1873.84 (meters) 6147.8 (feet) GPS  
 OBS  
 AA3684  


---

 AA3684 NAVD 88 orthometric height was determined with geoid model  
 GEOID93  
 AA3684 GEOID HEIGHT - -9.55 (meters)  
 GEOID93  
 AA3684 GEOID HEIGHT - -9.81 (meters)  
 GEOID12A  
 AA3684 NAD 83(2011) X - -1,662,531.721 (meters) COMP  
 AA3684 NAD 83(2011) Y - -4,307,287.252 (meters) COMP  
 AA3684 NAD 83(2011) Z - 4,388,385.449 (meters) COMP  
 AA3684 LAPLACE CORR - 8.23 (seconds)  
 DEFLEC12A  
 AA3684  
 AA3684 FGDC Geospatial Positioning Accuracy Standards (95% confidence, cm)  
 AA3684 Type Horiz Ellip Dist(km)  
 AA3684 -----  
 AA3684 NETWORK 0.87 1.74  
 AA3684 -----  
 AA3684 MEDIAN LOCAL ACCURACY AND DIST (011 points) 1.01 1.90 57.38  
 AA3684 -----  
 AA3684 NOTE: Click [here](#) for information on individual local accuracy  
 AA3684 values and other accuracy information.  
 AA3684  
 AA3684  
 AA3684.This mark is at Driggs-Reed Memorial Airport (DIJ)  
 AA3684  
 AA3684.The horizontal coordinates were established by GPS observations  
 AA3684.and adjusted by the National Geodetic Survey in June 2012.  
 AA3684  
 AA3684.NAD 83(2011) refers to NAD 83 coordinates where the reference

AA3684.frame has been affixed to the stable North American tectonic plate.  
See

AA3684.[NA2011](#) for more information.

AA3684

AA3684.The horizontal coordinates are valid at the epoch date displayed  
above

AA3684.which is a decimal equivalence of Year/Month/Day.

AA3684

AA3684.The orthometric height was determined by GPS observations and a  
AA3684.high-resolution geoid model.

AA3684

AA3684.GPS derived orthometric heights for airport stations designated as  
AA3684.PACS or SACS are published to 2 decimal places. This maintains  
AA3684.centimeter relative accuracy between the PACS and SACS. It does  
AA3684.not indicate centimeter accuracy relative to other marks which are  
AA3684.part of the NAVD 88 network.

AA3684

AA3684.The X, Y, and Z were computed from the position and the ellipsoidal  
ht.

AA3684

AA3684.The Laplace correction was computed from DEFLEC12A derived  
deflections.

AA3684

AA3684.The ellipsoidal height was determined by GPS observations  
AA3684.and is referenced to NAD 83.

AA3684

AA3684. The following values were computed from the NAD 83(2011) position.

AA3684

AA3684;		North	East	Units	Scale Factor	
Converg.						
AA3684;SPC ID E	-	230,621.830	285,469.671	MT	1.00003719	+0 44
00.9						
AA3684;SPC ID E	-	756,631.79	936,578.41	sFT	1.00003719	+0 44
00.9						
AA3684;UTM 12	-	4,842,767.855	491,492.510	MT	0.99960089	-0 04
22.9						

AA3684

AA3684!  
- Elev Factor x Scale Factor = Combined Factor

AA3684!SPC ID E - 0.99970779 x 1.00003719 = 0.99974497

AA3684!UTM 12 - 0.99970779 x 0.99960089 = 0.99930880

AA3684

AA3684|-----

AA3684	PID	Reference Object	Distance	Geod. Az
AA3684				dddmms.s
AA3684	DH9227	DIJ B	327.104 METERS	20109

AA3684

AA3684|-----

AA3684

AA3684 SUPERSEDED SURVEY CONTROL

AA3684

AA3684 NAD 83(2007)- 43 44 16.43230(N) 111 06 20.33579(W) AD(2002.00) B

AA3684 ELLIP H (04/03/09) 1863.899 (m) GP(2002.00) 4  
 2  
 AA3684 NAD 83(2007)- 43 44 16.43300(N) 111 06 20.33631(W) AD(2002.00) 0  
 AA3684 ELLIP H (02/10/07) 1864.032 (m) GP(2002.00)  
 AA3684 NAD 83(1992)- 43 44 16.43277(N) 111 06 20.33612(W) AD( ) B  
 AA3684 ELLIP H (11/14/01) 1864.031 (m) GP( ) 4  
 2  
 AA3684 NAD 83(1994)- 43 44 16.43216(N) 111 06 20.33461(W) AD( ) B  
 AA3684 ELLIP H (04/21/95) 1864.122 (m) GP( ) 4

1  
 AA3684  
 AA3684.Superseded values are not recommended for survey control.  
 AA3684  
 AA3684.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.  
 AA3684.[See file dsdata.txt](#) to determine how the superseded data were derived.

AA3684  
 AA3684\_U.S. NATIONAL GRID SPATIAL ADDRESS: 12TVP9149242767(NAD 83)  
 AA3684  
 AA3684\_MARKER: F = FLANGE-ENCASED ROD  
 AA3684\_SETTING: 59 = STAINLESS STEEL ROD IN SLEEVE (10 FT.+)  
 AA3684\_STAMPING: U59 A 1993  
 AA3684\_MARK LOGO: NGS  
 AA3684\_PROJECTION: FLUSH  
 AA3684\_MAGNETIC: I = MARKER IS A STEEL ROD  
 AA3684\_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL  
 AA3684\_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR  
 AA3684+SATELLITE: SATELLITE OBSERVATIONS - September 24, 2009  
 AA3684\_ROD/PIPE-DEPTH: 2.5 meters  
 AA3684\_SLEEVE-DEPTH : 1.0 meters

AA3684  
 AA3684 HISTORY - Date Condition Report By  
 AA3684 HISTORY - 1993 MONUMENTED NGS  
 AA3684 HISTORY - 20050520 GOOD MRIVER  
 AA3684 HISTORY - 20051206 GOOD EVANS  
 AA3684 HISTORY - 20060411 GOOD EVANS  
 AA3684 HISTORY - 20090924 GOOD INDIV

AA3684  
 AA3684 STATION DESCRIPTION  
 AA3684  
 AA3684'DESCRIBED BY NATIONAL GEODETIC SURVEY 1993 (BK)  
 AA3684'STATION IS LOCATED ABOUT 1.5 KM (0.95 MI) NORTH OF DRIGGS, AT THE  
 AA3684'TETON PEAKS/DRIGGS MUNICIPAL AIRPORT, 0.35 KM (0.20 MI) NORTHEAST OF  
 AA3684'THE AIRPORT OFFICE, IN THE MEDIAN BETWEEN THE RUNWAY AND THE PARALLEL  
 AA3684'TAXI. DIAGONALLY ACROSS THE TAXI FROM THE WINDSOCK, AT A CONNECTOR.  
 AA3684'OWNERSHIP--CITY OF DRIGGS. FIXED BASE OFFICER IS ERIC SOYLAND, PHONE  
 AA3684'208-354-8131. TO REACH FROM THE POST OFFICE IN DRIGGS, GO NORTH ON  
 AA3684'STATE HIGHWAY 33 FOR 1.30 KM (0.80 MI) TO A GRADED ROAD RIGHT AND A P  
 AA3684'1 (AZIMUTH MARK) ON THE RIGHT. CONTINUE AHEAD FOR 0.29 KM (0.20 MI)  
 AA3684'TO THE AIRPORT ENTRANCE ON THE RIGHT. TURN RIGHT. EASTERLY ON DIRT  
 AA3684'ROAD FOR 0.13 KM (0.10 MI) TO AN UNLOCKED BOARD GATE. PASS THROUGH  
 AA3684'GATE, THEN TURN RIGHT FOR 0.10 KM (0.05 MI) TO THE PARALLEL TAXI.  
 AA3684'TURN LEFT, NORTHEAST, ON TAXI FOR 0.28 KM (0.15 MI) TO THE CONNECTOR  
 AA3684'AND STATION ON THE RIGHT. STATION MARK IS A PUNCH HOLE TOP CENTER ON

A



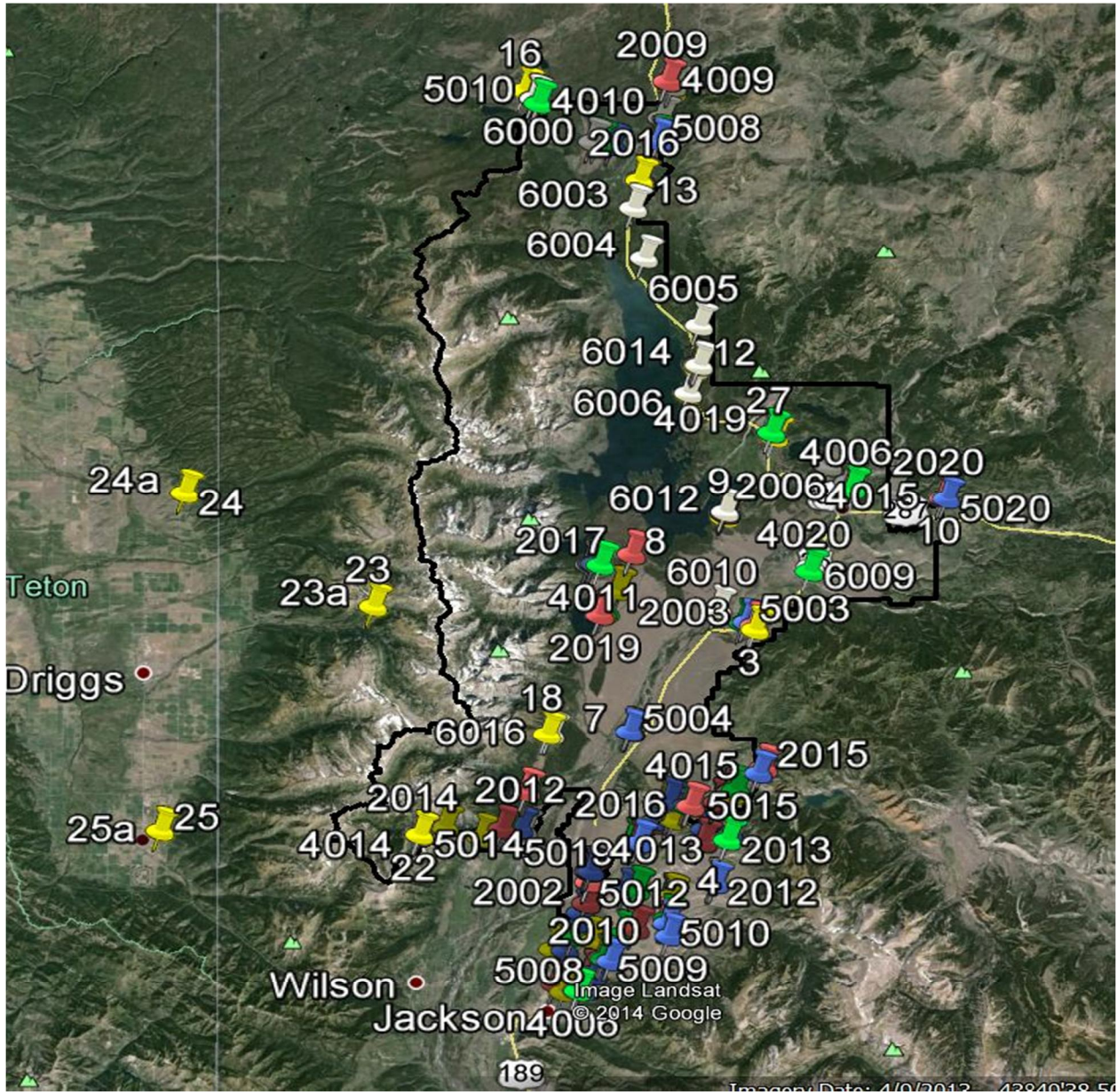
AA3684'STEEL ROD IN A GREASE SLEEVE ENCASED IN A PVC PIPE WITH LOGO CAP SET  
AA3684'IN A CONCRETE POST FLUSH WITH THE GROUND. ROD WAS DRIVEN TO REFUSAL  
AA3684'AND ANCHORED IN ROCK. IT IS 59.5 M (195.2 FT) NORTHWEST OF THE  
RUNWAY  
AA3684'CENTER, 13.4 M (44.0 FT) SOUTHEAST OF THE TAXI CENTER, 16.6 M (54.5  
AA3684'FT) SOUTHWEST OF THE CONNECTOR CENTER AT THE STOP LINE, 0.8 M (2.6  
FT)  
AA3684'SOUTHWEST OF A SHORT FIBERGLASS WITNESS POST, AND 0.7 M (2.3 FT)  
AA3684'NORTHEAST OF A SHORT FIBERGLASS WITNESS POST. DESCRIBED BY G.R.HEID  
AA3684  
AA3684 STATION RECOVERY (2005)  
AA3684  
AA3684'RECOVERY NOTE BY MOUNTAIN RIVER ENGINEERING 2005 (JLW)  
AA3684'RECOVERED AS DESCRIBED, CONTACT PETER KLEIN, AIRPORT MANAGER AT 208  
AA3684'354 3100 FOR ACCESS.  
AA3684  
AA3684 STATION RECOVERY (2005)  
AA3684  
AA3684'RECOVERY NOTE BY DAVID EVANS + ASSOC 2005  
AA3684'RECOVERED AS DESCRIBED. CONTACT KEN KOSTER, AIRPORT MANAGER,  
AA3684'(307) 576-0901  
AA3684  
AA3684 STATION RECOVERY (2006)  
AA3684  
AA3684'RECOVERY NOTE BY DAVID EVANS + ASSOC 2006 (JOA)  
AA3684'RECOVERED AS DESCRIBED  
AA3684  
AA3684 STATION RECOVERY (2009)  
AA3684  
AA3684'RECOVERY NOTE BY INDIVIDUAL CONTRIBUTORS 2009 (CMA)  
AA3684'THE STATION IS ABOUT 1.9 MI (3.1 KM) NORTHEAST OF DRIGGS, AT DRIGGS  
AA3684'REED MEMORIAL AIRPORT. OWNERSHIP--DRIGGS REED MEMORIAL AIRPORT.  
AA3684'CONTACT THE AIRPORT MANAGER AT 208- TO OBTAIN PERMISSION TO ACCESS  
THE  
AA3684'STATION.  
AA3684'  
AA3684'TO REACH THE STATION FROM THE POST OFFICE IN DRIGGS, GO NORTH ON  
STATE  
AA3684'HIGHWAY 33 FOR 2.2 KM (1.4 MI) TO THE JUNCTION OF FLYING SADDLES ROAD  
AA3684'ON THE RIGHT AND MAIN ENTRANCE TO THE TETON AVIATION/DRIGGS REED  
AA3684'MEMORIAL AIRPORT. TURN RIGHT, EAST, ON FLYING SADDLES ROAD FOR ABOUT  
AA3684'80 FT (24.4 M) TO A FORK IN THE ROAD. BEAR RIGHT, EAST-SOUTHEAST, ON  
AA3684'FLYING SADDLES ROAD FOR 0.25 MI (0.4 KM) TO A PAVED ROAD ON THE RIGHT  
AA3684'JUST BEFORE THE LARGE BUILDING. TURN RIGHT, SOUTHWEST, ON PAVED  
DRIVE  
AA3684'FOR 80 FT (24.4 M) TO A CODED AUTOMATIC GATE. (TO PROCEED, OBTAIN  
AA3684'ACCESS CODE FROM MAIN AIRPORT OFFICE). PASS THROUGH THE GATE AND GO  
AA3684'SOUTHWEST ON PAVED DRIVE PAST THE BUILDING FOR 150 FT (45.7 M) TO THE  
AA3684'STOP SIGN BEFORE THE PARKING APRON. TURN LEFT, SOUTHEAST, ON PARKING  
AA3684'APRON FOR 0.08 MI (0.1 KM) TO THE STATION ON THE RIGHT JUST PAST THE  
AA3684'TAXIWAY.  
AA3684'  
AA3684'THE STATION IS UNDER A STANDARD MANHOLE COVER AND IS A PUNCHED HOLE  
IN  
AA3684'TOP CENTER OF A STEEL ROD IN A GREASE SLEEVE ENCASED IN A PVC PIPE

AA3684'WITH LOGO CAP SET IN CONCRETE. IT IS LOCATED 43.43 FT (13.2 M)  
AA3684'SOUTHEAST FROM THE CENTERLINE OF THE PAVED TAXIWAY AND 39.34 FT (12.0  
AA3684'M) SOUTHWEST FROM THE CENTERLINE OF THE PAVE CONNECTOR NEAR THE STOP  
AA3684'LINE.

\*\*\* retrieval complete.  
Elapsed Time = 00:00:05

# SECTION 6: GPS CONTROL DIAGRAM

This section contains a graphical representation of the new and existing control stations used for the project.



Not to Scale