Coordinates of Lunar Anthropogenic Targets
LROC Science Operations Team
Arizona State University
28 July 2016

The following table lists latitude and longitude coordinates in the mean Earth/polar axis (ME) coordinate system of Soviet Union, United States, and Chinese robotic landers and rovers, craters produced by spacecraft impacts, and objects of interest at the U.S. Apollo manned landing sites that have been identified by the LROC Team.

To generate the list of observed latitudes and longitudes, we compiled a list of line and sample coordinates for the center of each object in each image. Each image was then initialized using the USGS Integrated Software for Imagers and Spectrometers software package, attaching the appropriate spacecraft position and pointing information, along with the GLD100 lunar shape model for elevation. ISIS routines were then used to compute the latitude and longitude of the spacecraft (or crater) in that image. The LRO spacecraft position was provided by the latest cross-over corrected spacecraft positioning kernels provided by the LRO LOLA team, with an orbital position uncertainty of ±15 m. Finally, temperature-corrected NAC camera kernels produced by the LROC team contributed to the high precision and accuracy. The coordinates listed in the table are the mean from multiple images acquired for a particular site. For more details, see Wagner et al. (2016) in the journal Icarus.

LROC Coordinates of Lunar Anthropogenic Features 28 July 2016				
Object	**Mean Observed Lat**	**Mean Observed Lon**	**Elevation (m)**	**Uncertainty (m)**
Apollo 11 LM	0.67416	23.47314	-1926	0.3
Apollo 11 PSE	0.67322	23.47315	-1928	0.4
Apollo 12 LM	-3.0128	336.5781	-1422	2.2
Apollo 12 ALSEP	-3.0098	336.5751	-1422	2.2
Apollo 12 PSE	-3.0099	336.5752	-1423	2.6
Apollo 14 LM	-3.64589	342.52806	-1062	0.4
Apollo 14 ALSEP	-3.64419	342.52232	-1064	0.4
Apollo 14 PSE	-3.64408	342.52233	-1064	0.4
Apollo 15 LM	26.13239	3.63330	-1931	1.0
Apollo 15 ALSEP	26.13406	3.62991	-1924	0.5
Apollo 15 PSE	26.13411	3.62980	-1924	0.3
Apollo 15 LRV	26.13174	3.63803	-1928	0.5
Apollo 16 LM	-8.9734	15.5011	8	3.0
Apollo 16 ALSEP	-8.9759	15.4986	12	3.0
Apollo 16 PSE	-8.9759	15.4986	12	2.5
Apollo 16 LRV	-8.9729	15.5037	10	3.7
Apollo 17 LM	20.1911	30.7723	-2626	3.5
Apollo 17 ALSEP	20.1923	30.7655	-2622	3.5
Apollo 17 LRV	20.1896	30.7769	-2628	3.2
Apollo 17 SEP	20.1920	30.7768	-2627	3.7

LM: Lunar Module

PSE: Passive Seismic Experiment

ALSEP: Apollo Lunar Surface Experiment Package central station

LRV: Lunar Roving Vehicle

SEP: Surface Electrical Properties experiment

LROC Coordinates of Lunar Anthropogenic Features 28 July 2016				
Object	**Mean Observed Lat**	**Mean Observed Lon**	**Elevation (m)**	**Uncertainty (m)**
Surveyor 1	-2.4745	316.6602	-1889	5.6
Surveyor 3	-3.0162	336.5820	-1433	2.6
Surveyor 5	1.4551	23.1943	-2052	11.9
Surveyor 6	0.4742	358.5725	-757	6.7
Surveyor 7	-40.9812	348.4873	81	3.5
Luna 16	-0.5137	56.3638	-2452	3.7
Luna 17	38.23764	324.99837	-2471	0.5
Lunokhod 1	38.3150	324.9919	-2471	3.8
Luna 20	3.7863	56.6242	-1780	4.3
Luna 21	25.9994	30.4076	-2680	13.4
Lunokhod 2	25.8323	30.9222	-2761	7.5
Luna 23	12.6667	62.1511	-3668	3.0
Luna 24	12.7142	62.2129	-3670	3.7
Chang'e 3	44.1214	340.4883	-2630	9.1
Yutu Rover	44.1208	340.4878	-2630	12.9
Ranger 6 impact site	9.3864	21.4806	-1996	4.4
Ranger 7 impact site	-10.6340	339.3230	-1791	6.4
Ranger 8 impact site	2.6376	24.7881	-2165	4.9
Ranger 9 impact site	-12.8281	357.6116	-1531	5.8
Apollo 13 SIVB impact site	-2.5550	332.1125	-1166	9.8
Apollo 14 SIVB impact site	-8.1810	333.9695	-1785	4.5
Apollo 15 SIVB impact site	-1.2897	348.1755	-1109	3.8
Apollo 16 SIVB impact site	1.9210	335.3770	-1104	19.2
Apollo 17 SIVB impact site	-4.1681	347.6693	-1206	5.6
GRAIL-A impact site	75.6088	333.4060	750	10.7
GRAIL-B impact site	75.6508	333.1659	1039	12.2
LADEE impact site	11.8494	266.7506	2803	6.1

SIVB: Saturn IV-B rocket stage