Selection and Evaluation of Landing Sites for the Mars Exploration Rovers. M. Golombek[1], J. Grant[2], T. Parker[1], J. Crisp[1], S. Squyres[3], R. Arvidson[4], and M. Carr[5], [1]Jet Propulsion Laboratory, Caltech, Pasadena, CA 91109, [2]Smithsonian Institution, Washington, D.C. 20560, [3]Cornell University, Ithaca, NY 14853, [4]Washington University, St. Louis, MO 63130, [5]U. S. Geological Survey, Menlo Park, CA 94025.

Engineering constraints developed for Mars Exploration Rover (MER) landing sites require that they be below -1.3 km MOLA elevation, appear hazard free in Viking image mosaics, and have low surface slopes. Rock abundance must be $<$20\% and the bulk thermal inertia must $>$200-250 SI units, to avoid extremely low temperatures. Landing ellipses vary in size with latitude from 95 km long at $15\deg$S to 165 km long at $15\deg$N (around 16 km wide). About 185 ellipses satisfy these engineering constraints and about 30 were selected for further evaluation based on science. These sites were imaged using orbiter cameras and progressively downselected at a series of open workshops on the basis of science and safety during the past two years. Presently four landing sites are being considered for selection of the final two. Three prime sites (Hematite, Gusev, and Isidis) are being carried forward following a detailed evaluation at the third landing site workshop. Because of concerns over horizontal winds during landing, an additional low-wind site has been added in Elysium Planitia.

Hematite, Gusev, and Isidis show evidence for surface processes involving water and appear capable of addressing the science objectives of the MER missions, which are to determine the aqueous, climatic, and geologic history of sites on Mars where conditions may have been favorable to the preservation of evidence of possible prebiotic or biotic processes. TES results indicate coarse grained hematite distributed across a basaltic surface at the Hematite site, suggesting precipitation from liquid water or a hydrothermal deposit. Gusev has been interpreted as a crater lake with interior sediments deposited in standing water. The Isidis Planitia ellipse is located to sample ancient Noachian rocks shed off the adjacent highlands that might record an early warm and wet environment. The Elysium Planitia ellipse is located on a Hesperian-age surface transitional between the highlands and lowlands and may preserve reworked Noachian highlands. Evaluation of science criteria at the third workshop place Hematite and Gusev as the highest priority science sites.

Comparison of the thermophysical properties of the sites with the Viking and Pathfinder landing sites allows a first order interpretation of their surface characteristics. The Hematite site has moderate thermal inertia and fine component thermal inertia and very low albedo. This site will likely look very different from the three previous landing sites in having a darker surface, few rocks and little dust. Gusev crater and Elysium Planitia have comparable thermal inertia, fine component thermal inertia and albedo to the Viking sites and so will likely be similar to these locations (dusty), but with fewer rocks. The Isidis site has high to very high thermal inertias, moderate albedo, a high red/blue ratio and high rock abundance suggesting a rocky crusty surface with some dust. Evaluation of safety criteria such as slopes, rocks and winds at the third workshop indicate that Hematite is probably the safest, followed by Elysium, Gusev and Isidis.