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CANDIDATE MARS SURVEYOR LANDING SITES NEAR APOLLINARIS PATERA. Virginia C. Gulick, MS 245-3, NASA-Ames Research Center, Moffett Field, CA 94035. Email: *vgulick@mail.arc.nasa.gov*.

Introduction: Regions near Apollinaris Patera are proposed for consideration as Mars Surveyor landing sites. Gulick (1998) proposed this region at the First Mars Surveyor Landing Site workshop; Bulmer and Gregg (1998) provided additional support.

Review of Science Rationale:

Apollinaris Patera (Fig. 1) is situated on the highlands/lowlands boundary at 8.5°S, 186°W. The volcano itself has been mapped as Hesperian in age. The regions surrounding Apollinaris show evidence for volcanism, volcano-ice interactions, and erosion by water. Numerous valleys modified by fluvial processes dissect a large fan structure emanating from the southern flank of the volcano. Sapping valleys have formed along the southern terminus of the fan structure.

Regions near Apollinaris Patera provide a unique opportunity to sample outcrop lithologies ranging from highland Noachian basement rocks, to Hesperian aged lava flows, channel and flood plain materials, to Amazonian volcanic, ash and channel deposits. The close proximity of volcanic and fluvial features strongly suggests that volcanic hydrothermal processes have had a pervasive influence in the region.

There is extensive evidence of ground water in the region. A 23-km diameter impact crater lies on the northwest flank of the volcano and exhibits a fresh lobate ejecta blanket. Gulick (1998) argues that hydrothermal systems associated with the volcano could have mobilized this ground water, discharging it along the volcano's flanks. She concludes that hydrothermal systems associated with the growth of the volcano could have lasted 10^8 years.

Numerous isolated mesas are located to the southwest and west of Apollinaris. These mesas likely formed in one of two ways. The mesas may have formed by the melting of large volumes of ground ice as a result of volcanic activity of Apollinaris (Sharp, 1973, Carr and Schaber, 1977, Robinson et al. 1993, Scott et al. 1993). Alternatively they may be dissected fluvial deposits perhaps resulting from flooding from Ma'adim vallis (Scott and Chapman, 1995, Cabrol et al. 1996). Regardless of which origin mechanism is correct, the proximity of a persistent subsurface heat source to abundant ground water or ice could have provided a favorable environment for life. Hence the mesas and surrounding deposits would be excellent locales to search for signs of past biological activity. Here I continue to support two possible landing sites in this region.

Two sites near the flanks of the volcano may provide the opportunity to sample material altered by the possible discharge of hydrothermal fluids along the volcano's basal scarp. Site 1 (8.6°S, 187.5°W) offers the opportunity to sample the ejecta of a nearby impact crater and mesa material from the nearby chaotic terrain. The mesa material would be in place while the crater material would be exhumed from depth. Because of the lack of high resolution Viking images available for this area, further high-resolution MOC images are required to fully evaluate this site.

Site 2 (12°S, 185.5°W) lies in a valley (Figure 2) near the southern edge of the fan feature where sapping processes have eroded back into the fan along fault scarps. This area was likely a locale for thermal springs as it lies at the base of the fan that is both cut by scarps and incipient valleys. The floor material of the channel is darker than the surrounding volcanic terrain and appears smooth in available 70 m/pixel Viking images.

Engineering Constraints: Based on the maps posted on the JPL Mars Surveyor '01 Landing Site web page, this region appears not to meet the engineering constraints for the '01 mission. However, values obtained from the USGS PIGWAD web site for Landing Site Selection demonstrates that this region indeed satisfies all engineering requirements for the 2001 mission. Below is a list of the values for each of the required engineering parameters.

Table 1.

Engineering parameter	Constraints for MS '01	Apollinaris Patera region
Thermal Inertia (cgs)	5-10 cgs	5.9 cgs
Rock Abundance	5-10%	5-9%
Fine Comp. TI	>4 cgs	4.5-4.8 cgs
Slopes	<10deg.	No info. Avail.
Albedo	low	0.25-0.26
Elevation	<2.5 km	0-1km

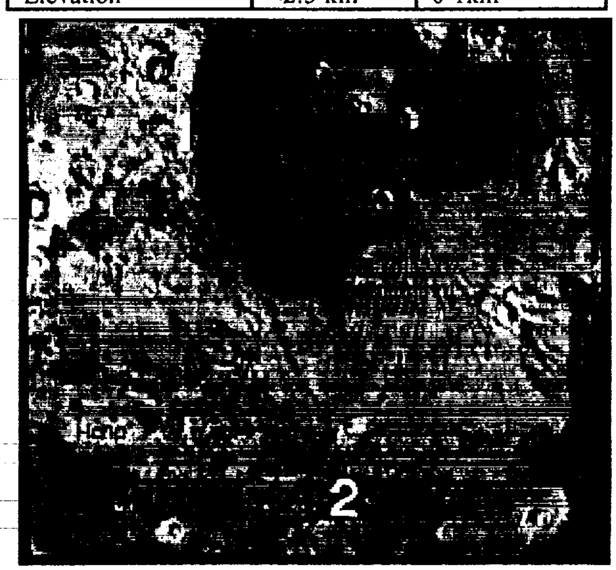

Figure 1: Regional geologic map of Apollinaris Patera region based on geologic map by Scott et al.

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(1993). Ha is a smooth fan shaped flow possibly composed of lava. Hcht is chaotic material interpreted as a melange of ancient highland rocks and Apollinaris lava flows. Landing sites both sit on Hchp material interpreted as channel and floodplain deposits.

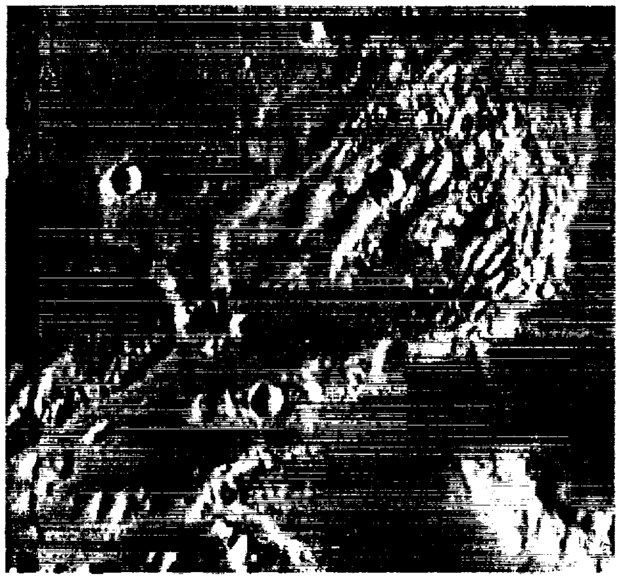

Figure 2: High-resolution (70 m/pixel) view of landing site 2 (channel floor SW of prominent crater in south-central part of image). Channel floor in this region is 15 km across.

Table 2: Other data for Site 2.

Latitude	12°S
Longitude	185.75°W
Max. elevation	1km
Min. Elevation	0 km
Hazard analysis	Channel deposits appear smooth in Viking images at 70m/px Some isolated mesas along perimeter
Slopes	No info. avail. Appears fairly flat
Unconsolidated material	Unknown; Channel material may be unconsolidated.
Site Environment	hydrothermal, fluvial, volcanic, and possible paleolacustrine or marine environments
Processes to expose or excavate subsuface materials	Isolated mesas and valley walls provide stratigraphic cross-sections; fluvial processes
Impediments to mobility	Based on Viking resolution 70m/px- the landing site appears smooth
Image #s and resolution	433S01-72m/px 434S01-73m/px

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