STATEMENT OF WORK

1. Objective/Requirements

Seven Mars landers have imaged, or attempted to image, dust lifting near their landing sites. A wide range of dust lifting frequencies have been estimated across landing sites, ranging from most frequent in Gusev and Jezero Craters, to less frequent at Meridiani and Gale Crater, and never observed (despite frequent attempts) at Elysium Planitia. Pathfinder and Phoenix also imaged dust devils, but with short mission durations. Curiosity's dust lifting imaging record is unique due to its 4.5+ Mars Year (MY) length, beginning in MY33, across a variety of surface terrains and has now motivated new science questions about dust lifting on Mars. Atmospheric dust on Mars is believed to be sourced via two primary mechanisms: globally-distributed (but locally variable) dust devils providing a steady background level of atmospheric dust opacity and seasonally variable dust storms ranging in scale from local to global. These larger dust storms are believed to lift dust through broader straight-line wind stress dust lifting as compared to the convectively-driven whirlwinds that produce dust devils.

However, Curiosity's long record of dust lifting has shown that straight-line wind stress dust lifting occurs regularly in Gale Crater but is not associated with larger-scale dust storms. Indeed, ~17% of all dust lifting events are classified as such in Gale Crater, whereas only a small handful have ever been observed at any other Mars landing site (Jezero Crater). **This provides a unique opportunity to study this globally-important process *in situ*.** To date, Curiosity's observations of straight-line wind stress dust lifting are compelling, but their rarity relative to dust devils compounds the existing observational biases in Navigation Camera (Navcam) dust lifting sequences. Curiosity's Extended Mission 5 (EM5) traverse will provide the time and consistent viewshed toward a likely reliable dust lifting location to mitigate these biases. Using Navcam and the Rover Environmental Monitoring System (REMS), the team will address two science questions regarding this type of dust lifting.

1. **What is the seasonal distribution of straight-line wind stress dust lifting in Gale Crater?**
2. **Are the observed meteorological characteristics of straight-line wind stress dust lifting distinguishable from dust devils by the Rover Environmental Monitoring Station?**

The proposed work will quantify and distinguish the two major types of dust lifting on Mars and determine why Gale Crater, alone among Mars landing sites to date, has frequent straight-line wind stress dust lifting. This work directly supports the Mars Science Laboratory Extended Mission 5 (MSL EM5) proposal science question: "How do atmospheric aerosols…vary with location and elevation?" It additionally would address Mars Exploration Program Analysis Group (MEPAG) science goals related to dust fluxes and exchange between the atmosphere and surface. The team will continue to support MSL operations as environmental science theme group leads and keepers of the plan (ESTLKs).

2. Characteristics, Scope, and Specs

The contractor shall perform the following duties:

- Participate in MSL mission operations, staffing environmental science theme group lead roles
- Participate in tactical and strategic science planning for the MSL mission, including updating and evaluating instrument sequence

- Analyze Navcam imagery for dust lifting and provide feedback to the science team on recent activity
- Analyze REMS observations for signs of dust lifting including pressure vortices and ultraviolet drops
- Present scientific results to the MSL science team, as warranted.
- Present scientific results to the broader scientific community at conferences, as warranted.
- Support the presentation of scientific results in scientific publications, including writing, data analysis, figure production, and editing, as warranted

3. **Place of Performance**
   Space Science Institute facilities in Boulder, CO, [redacted].

4. **Period of Performance**
   Work shall be performed October 1, 2026 through September 30, 2028.