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Lunar Exploration Ground Sites (LEGS) Public Private Partnership (PPP) Statement of Work

Preface

The objective of the Lunar Exploration Ground Sites (LEGS) Public Private Partnership (PPP) is to provide direct-to-earth (DTE) communication and navigation services for missions operating from 36,000 kilometers (km) in Geostationary Orbit (GEO) to cis-lunar and other orbits out to 2 million km, inclusive of lunar surface missions. The project plan is to have at minimum six (6) lunar DTE sites strategically located around the Earth to provide continuous coverage. The lunar DTE sites will provide uplink / downlink at X and Ka-band frequencies. The primary focus of these sites will be to support NASA's Artemis and Moonbase initiatives. As a part of the PPP, NASA will provide two 20-meter antennas as GFE. One of the NASA GFE antennas is installed and prepared for Site Acceptance Testing (SAT) at NASA's White Sands Complex in Las Cruces, New Mexico. The second NASA GFE antenna has been manufactured and is being placed in storage until a suitable location is determined. Installation of the second antenna subsystem, and integration of the supporting communications infrastructure for both NASA-provided antennas and all work associated with providing at minimum an additional four (4) lunar DTE sites to complete the redundant subnet will be provided by the Contractor in accordance with this contract. At minimum, three (3) lunar DTE ground sites must be fully operational by October 15, 2027, to support NASA missions, with full redundancy – six (6) antennas – operational by October 15, 2028.

The purpose of this Statement of Work (SOW) is to define the specific tasks, deliverables, and timelines associated with the PPP.

This document is under configuration control. Changes to this document will be made by change request or by complete revision. Proposed changes to this document must be submitted along with supportive material justifying the proposed change. Any proposed changes to this document shall be approved by an authorized procurement official from NASA prior to SCaN Capability Development Control Board approval.

Change Information Page

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Section 1 Introduction

1.1 Overview

The purpose of this Statement of Work (SOW) is to define the specific tasks, deliverables, and timelines associated with the PPP.

The Contractor will leverage best commercial practices for the development, integration, and test of the Lunar DTE ground stations. The NASA LEGS project does require insight into the Contractor's processes to ensure the NASA LEGS team can satisfy the NASA internal requirements for both the Agency as well as the user community. The Capability Verification Milestone (CVM) method will be used to conduct appropriate engineering reviews and project insight throughout the project lifecycle. The key points of the partnership that relate to NASA's usage of these assets are:

- NASA will be the highest priority user of these assets
- NASA will have approval authority over who uses these assets when not being used by NASA
- NASA has approval authority over where the second NASA GFE will be located

Lunar Exploration Ground Sites (LEGS) are space communication ground stations built primarily for lunar services in support of NASA's Artemis and Moonbase initiatives. These ground stations may provide DTE communications service to both Human Spaceflight (HSF) and non-HSF missions in cis-lunar space, provided the service is deemed suitable for the particular mission.

1.2 Requirements

The LEGS PPP requirements have been developed at Level 3 by NASA SCA-N and the LEGS Project team. The Level 2 parent requirements are from the SCA-N-SRD Revision 7 and Moon to Mars M2M-30002 SCA-N appendix documents. The International Communication System Interoperability Standards (ICSIS) and LunaNet Interoperability Specification (LNIS) are also referenced were applicable. These requirements define the expected common architecture for the DTE subnet created by the partnership.

The LEGS Level 3 requirements are provided in GRC-LEGS-REQ-001 LEGS PPP SRD for the subnet development, integration and test.

These requirements are configuration managed using Model Based Systems Engineering (MBSE) tools and best practices. Model Based Systems Engineering (MBSE) is covered in Section 3.2.4

1.3 Scope of Work

The LEGS subnet will include six ground stations distributed geographically to provide continuous coverage of spacecraft in both cis-lunar orbit and lunar surface operations. Each LEGS ground station will consist of a 20-meter class dual band (X/Ka) and associated back-end electronics providing signal processing as well as user data receipt and delivery. Three (3) ground stations with the ability to provide full global coverage will be fully operational by October 15, 2027 to support NASA missions; with full redundancy, six (6) antennas, operational by October 15, 2028. The lunar subnet will be designed to be extensible to support NASA's future space communication needs in the Cis-lunar region and other near space communication needs. The antenna subsystem and the supporting communications infrastructure should be – to an extent practicable – a common

architecture, design, and operations. See Section 3 “Requirements Description”, for more detail on the system design.

Below is a description of the work to be accomplished:

Base work

- Using the Government provided Level 3 system requirements and the Government furnished antennas, develop the infrastructure and ground station electronics needed to operate and maintain the antennas and provide the required services to NASA users.
- Establish subnet connectivity to the operational NASA SCan Program Operations Cloud environment (SPOC).
- Complete the integration of the LEGS 1 antenna located at the NASA White Sands Complex (WSC) in New Mexico into the LEGS subnet.
 - Install Fire suppression system in the LEGS 1 antenna structure and any support structures. This suppression system will be integrated into the site Building Monitoring System (BMS) for local monitoring.
 - Coordinate efforts needed to complete the integration of the LEGS 1 antenna located at WSC to the local infrastructure for utilities and monitoring.
- Coordinate shipping and receive the LEGS 2 antenna components at the agreed ground site location.
- Perform a functional checkout of the LEGS 2 antenna after assembly.
- Deploy the LEGS 2 antenna at location that supports the desired lunar coverage and is compliant with the environmental specifications of the antenna. This includes the construction of the foundation in accordance with the antenna vendor’s specifications.
- Integrate LEGS 2 into the LEGS subnet.
- Deploy global and full redundant LEGS subnet coverage within required timeline.
- Verify that the installed LEGS ground stations meet the applicable Level 3 system requirements.
- Validate the services to be provided to NASA using the Capability Validation Milestones (CVM) process defined by NASA.
- Provide operations and maintenance support of the LEGS subnet ground stations.
- Provide unlimited, uninterrupted, and highest priority usage of available ground stations once global coverage is achieved at the negotiated rate.

Options

There exists the possibility that the LEGS 1 antenna will not have completed SAT when the LEGS PPP is awarded. If the SAT has not been completed by the time the partnership agreement is finalized:

- Complete the LEGS 1 SAT activities at WSC (reference Section 4.1.1)

1.3.1 Facilities and Infrastructure

1.3.1.1 LEGS 1

The LEGS 1 antenna has been constructed on the WSC facility adjacent to the WSC Second Tracking and Data Relay Satellite System Ground Terminal (STGT) building. The LEGS antenna is being prepared for site acceptance testing (SAT) by the antenna Contractor.

The antenna is located on WSC property and lies within its own security boundary (fence), accessible by a controlled site access road. Adjacent to the antenna is a concrete pad that can support a small structure to house equipment supporting the antenna. The power and communication interface for the antenna and the concrete pad are located within the security boundary adjacent to the concrete pad. The WSC STGT building, within its own security perimeter fence provides power, communication lines, and deionized water for humidification to this antenna interface point via underground conduits.

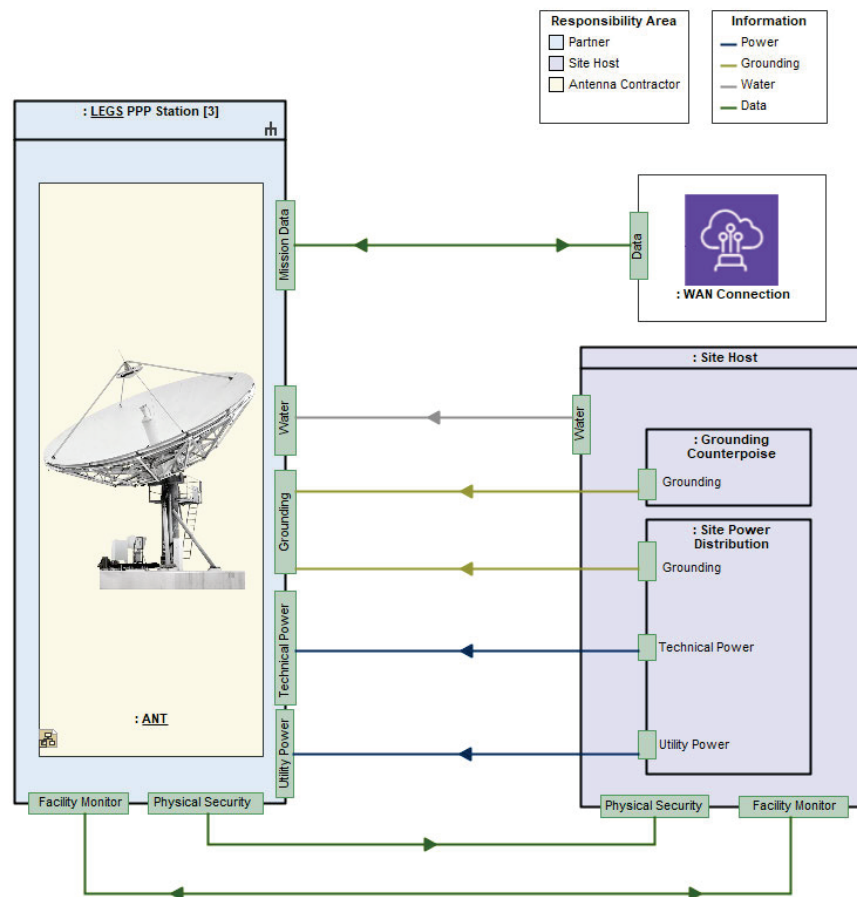


Figure 1: LEGS 1 layout

The Contractor will provide support to complete the installation of the utilities, security and facility monitoring at LEGS 1. This support could include coordination with the site host for running utilities to existing site infrastructure, installation of fire detection capabilities, and security infrastructure interface.

1.3.1.2 LEGS 2

The LEGS 2 antenna has completed subsystem-level factory acceptance testing (FAT) and is being placed in storage at the antenna vendor facility(s). Some of the larger antenna structural subcomponents were manufactured internationally. These may be stored at or near their point of

manufacture until such time that LEGS 2 ground station location is determined. The LEGS 2 antenna is under warranty while in storage.

Once the location has been agreed to with the Contractor any unique facilities and infrastructure requirements will be finalized for that location.

The Contractor shall be responsible for site design and foundation work for the antenna. The Contractor shall be responsible for working with the antenna vendor to provide transportation to the LEGS 2 location.

1.3.1.3 SCaN Program Operations Cloud (SPOC) environment

The LEGS subnet will interface and utilize SPOC for the transport of data, data storage, and hosting of some virtual machine devices. The number and type of virtual machines will be determined as part of future technical meetings between SCaN and the Contractor. The Contractor shall connect and integrate their data delivery systems with SPOC for data transit and storage.

The initial interface approach being considered is to connect to SPOC via regional Amazon Web Services (AWS) Direct Connect Point of Presence nearest the LEGS sites using AWS DX edge devices. The actual approach will be finalized as part of the technical exchange meetings between SCaN and the Contractor.

1.3.2 Deployment

The Contractor shall finish the deployment of the LEGS 1 and LEGS 2 antennas. LEGS 1 is installed at WSC. LEGS 2 is in storage.

- Phase 1 is to have three (3) lunar DTE ground sites operational by October 15, 2027.
- Phase 2 is to have six (6) antennas – operational by October 15, 2028.

The Contractor shall perform all non-recurring engineering, integration and validation to meet NASA's mission requirements.

1.3.3 Operations and Maintenance

The O&M portion of the contract will commence following successful ORR and when global lunar DTE coverage is achieved. The Contractor shall propose the fixed rate for usage of each ground station in the subnet. This will include the unlimited and uninterrupted use by NASA as defined in the ConOps.

1.3.4 Usage/Scheduling

Any usage and schedule request interfaces with the Contractor will be via a NASA Enterprise Service Management system (ESM). Scheduling of the LEGS subnet assets will be handled by SCaN Network Operations.

1.4 Execution of SOW

This SOW describes the requirements completing the installation and integration of the NASA provided LEGS-1 and LEGS-2 antennas, integration with the site facilities, deployment of additional ground stations as necessary, connection to the NASA Managing Organization and verification and validation of the services to be provided to NASA.

Text annotated with [LEGS 1] indicates language within the SOW that is specific to the LEGS 1 site or antenna.

Text annotated with **[LEGS 2]** indicates language within the SOW that is specific to the LEGS 2 site or antenna.

Section 2 of this SOW defines the Program Management aspects of the PPP contract.

Section 3 of this SOW defines the Requirements description for the design, fabrication, deployment and operation of the earth stations.

Section 4 of this SOW describes the Validation and Verification requirements for complete system at each location.

Section 2 Program Management

2.1 General

The Contractor shall perform all management functions required to execute the full scope of this SOW.

2.2 Applicable Documents

The documents listed in Table 2-1 and in each of the Appendices are applicable to the extent cited herein. The requirements cited in this document shall take precedence in the event there is a discrepancy between the listed documents and the requirements presented in this document.

Table 2-1: Applicable Documents

Document Number	Document Title	Applicability	Rev	Date
GRC-LEGS-REQ-001	LEGS System Requirements Document	LEGS 1,2	0	TBD
GRC-LEGS-REQ-003	LEGS Security Data Requirements Description	All	0	TBD
NPR 2810.1	Security of Information and Information Systems	All	F	01/03/2022
WSC-MAN-0060	WSC Safety Manual	LEGS 1		Current
WSC-DOC-0300	WSC Environmental, Health, and Safety (EHS) Contractor Safety Requirements	LEGS 1		Current
NASA-STD-8719.9	Lifting Standard	LEGS 1,2	C	08/08/2024
WSC-SOP-0009	WSC Security Standard Operating Procedures	LEGS 1		Current
NFPA 70	National Fire Protection Association	LEGS 1,2		2023
NFPA 780	National Fire Protection Association for Lightning Protection	LEGS 1,2		2023
MIL-HDBK-217F Notice 2	Reliability Prediction of Electronic Equipment	LEGS 1,2	F	02/28/1995
NIST SP 800-53	Security and Privacy Controls for Federal Information Systems and Organizations	All	5	
NIST SP 800-171	Protecting Controlled Unclassified Information in Nonfederal Systems and Organizations	All	3	

Document Number	Document Title	Applicability	Rev	Date
NPR 6000.1	Requirements for Packaging, Handling, and Transportation for Aeronautical and Space Systems, Equipment, and Associated Components	LEGS 1,2	H	11/10/2010
NPD 2570.5	NASA RF Spectrum Management Manual	LEGS 1,2	E	05/05/2022
NPR 1800.1	NASA Occupational Health Program Procedures	All	E	03/16/2023
ANSI Z 359	Fall Protection Code	All		Current
	NASA Schedule Management Handbook	All	2	2024
SP-20220009501	NASA Space Flight Program and Project Management Handbook	All		2022
SP-2016-3424	Project Planning & Control Handbook	All		2016
FIPS 199	Standards for Security Categorization of Federal Information and Information Systems	All		February 2004
NIST SP 800-60 Volume 1	Guide for Mapping Types of Information and Information Systems to Security Categories	All	1	August 2008

2.3 Reference Documents

The documents listed in Table 2-2 are provided for reference only to provide the reader with additional information. These documents are not cited within this document.

Table 2-2: Reference Documents

Document Number	Document Title
SENSE-ALLEN-SPEC-001	Lunar Exploration Ground System (LEGS) Dual Band
NPR 8715.3C	NASA General Safety Program Requirement
NFPA 70E	Standard for Electrical Safety in the Workplace
GPR 7320.1B	Facility Safety Management Process
SENSE-LEGS-SPEC-003_HDR	Lunar Exploration Ground Sites (LEGS) High Data Rate Transceiver Specification
SENSE-LEGS-SPEC-004_LDR	Lunar Exploration Ground Sites (LEGS) Low Rate Tracking, Telemetry, and Command (TT&C) Transceiver Specification
NASA/SP-2016-6105	NASA Systems Engineering Handbook
NPR 7123	NASA Systems Engineering Processes and Requirements

Document Number	Document Title
MIL-STD-461C	Electromagnetic Emission and Susceptibility Requirements for the Control of Electromagnetic Interference
NASA-STD-8739.8	Software Assurance and Software Safety Standard
NPR 7150.2D	NASA Software Engineering Requirements
80GRC026R0014-CASQ	Commercial Architecture Security Questionnaire
LNIS V005	LunaNet Interoperability Specification
M2M-30002, SCan Appendix	Moon To Mars (M2M) Artemis Requirements Document (ARD)
M2M-30202	International Communication System Interoperability Standards (ICSIS), Rev B, April 2024

2.4 Project Milestones

The Period of Performance (PoP) for this SOW is 5 years from award. Project milestones are shown in Table 2-3.

Table 2-3: Project Milestones

Milestone	Milestone Number	Acceptance Criteria
Kick-Off	Milestone 1	Kick-off meeting with NASA is completed to include delivery and NASA acceptance of kickoff deliverables
CVM Technical Exchange Meetings (TEMs)	Milestone - TBD	As agreed to by SCA and the Contractor as part of the CVM process
Capability Validation Milestones (CVM) reviews	Milestone - TBD	As agreed to by SCA and the Contractor
Initial Capability ORR	Milestone - TBD	Project defined ORR to be conducted to evaluate the readiness of the initial phase of the completed lunar subnet (3 LEGS Ground Stations).
Redundant Capability ORR	Milestone - TBD	Project defined ORR to be conducted to evaluate the readiness of the expansion of the lunar subnet (4-6 LEGS Ground Stations).

2.5 Project Schedule

An Integrated Master Schedule (IMS) shall be required and will be used to assess the Contractor's progress during the contract period. The Contractor shall maintain IMS in accordance with Appendix D.

2.6 Security Plan

The Contractor will demonstrate and/or provide representation/certification for how NASA electronic information will be protected from unauthorized modification, disclosure, or destruction consistent with the Federal Information Security Modernization (FISMA) Act of 2014 and NIST 800-53 *Security and Privacy Controls for Federal Information Systems and Organizations* Revision 5.

When the Contractor is operating a Federal Information System (FIS) on behalf of NASA or is providing a FIS in the execution of this contract, that system must have an Information System Security Plan in accordance with NIST Special Publication (SP) 800-53, "Security and Privacy Controls for Information Systems and Organizations" Revision 5. The system security plan control baseline should be set to the appropriate data impact level as defined in FIPS 199 *Standards for Security Categorization of Federal Information and Information Systems* and NIST Special Publication 800-60 Volume 1 Revision 1 *Guide for Mapping Types of Information and Information*

Systems to Security Categories to support NASA Missions. This plan and supporting documents shall be entered into the NASA cybersecurity system of record pursuant to Authorization to Operate (ATO) requirements set forth in NASA Policy Directive 2810.1, “NASA Information Security Policy” and NASA Procedural Requirement (NPR) 2810.1, “Security of Information and Information Systems.” The FIS security plan and ATO must be in place before any system may operate in the NASA environment.

When the Contractor receives, processes, stores or transmits NASA non-public information, especially Controlled Unclassified Information (CUI) including Personally Identifiable Information (PII) on a non-federal system (e.g., the Contractor’s corporate system) the Contractor must attest that the system meets the requirements for data protections detailed in NIST Special Publication 800-171, “*Protecting Controlled Unclassified Information in Nonfederal Systems and Organizations*.”

This attestation may take the form of an existing authorization to operate, third-party review/audit certifying that the non-federal system meets the requirements of NIST SP 800-171 or equivalent standard of information protection, such as the ISO 27001 standard, a certification from another federal agency such as the DOD Cybersecurity Maturity Model Certification (CMMC) Level 2, or other artifacts showing that the cybersecurity controls have been tested, and the risk posture of the information system is well understood.

2.7 Monthly Project Status Meetings

The Contractor shall host monthly project status meetings following the delivery of the Monthly Status Report. The monthly project status meeting is intended to be an open forum to communicate progress, challenges, as well as to provide scope, schedule, risk and budget updates.

2.8 Weekly Management Tag up

The Contractor shall host Weekly Management Tag ups with NASA. This meeting is intended to be a brief discussion of emerging issues, weekly achievements, and updates on topics from the Monthly Project Status meeting.

2.9 Technical Interchange Meeting (TIM)

The Contractor shall conduct TIMs as requested by the NASA or needed by the Contractor for discussion of emerging topics. The TIMs may include but are not limited to:

- a) A description of any problems or delays with the corrective actions taken or to be taken.
- b) Identification of concerns, risks, and mitigations where appropriate.
- c) An updated schedule (IMS) identifying any changes since the previous report and applicable justification for those changes. Including critical path and 30 day look ahead.
- d) A descriptive list of guidance needed from NASA.
- e) Discussion of Safety and Quality Assurance issues or concerns.
- f) Discussion of Model Based System Engineering formats or products.

2.10 Deliverables

The Contractor shall deliver all reports and administrative documents listed in Table 2-4 to the NASA Technical POCs and project Contracting Officer Representative (COR). All deliverables

shall be submitted in accordance with 52.227.14 RIGHTS IN DATA-GENERAL (MAY 2014) and applicable alternate(s) AS MODIFIED BY NASA FAR SUPPLIMENT 1852.227-14 (APR 2015). Data Item Deliverables are designated as “Approval (A),” or “Review (R),” as indicated in Table 2-4.

A –Approval: Documents in this category shall require submission to the Task Monitor within the time specified and written approval prior to Contractor implementation. NASA management will act on items requiring approval within 30 calendar days of receipt of the item.

R –Review: Documents in this category shall be submitted to the Task Monitor within the time period specified and will be subject to evaluation. These documents shall be implemented upon issuance unless otherwise noted. However, when an evaluation reveals inadequacies in a document, the Contractor shall correct the document as required.

Table 2-4: Deliverables

Proposal					
Item	Deliverable	Due Date/Frequency	Deliverable Description	Format	Type
1	WBS Dictionary	With Proposal	Section Error! Reference source not found.	Contractor Format	Review
2	Draft Data Rights Assertion Table	With Proposal	Reference RFP	Government Format	Approve
3	Capability Validation Milestones Tailoring Initial Plan	With Proposal	Section 4.1.2	Contractor Format	Review
4	Capability Validation Milestones Tailoring	At Kickoff	Section 4.1.2	Contractor Format	Approve
5	Configuration Management Plan	At Kickoff	Section 3.2.3	Contractor Format	Approve
Integrated Master Schedule (IMS)					
Item	Deliverable	Due Date/Frequency	Deliverable Description	Format	Type
3	Schedule Management Plan	14 days prior to Kickoff and Req Overview	Appendix D	native + PDF summary	Review
4	Baseline IMS	60 days after award	Appendix D	native + PDF summary	Approve
5	Basis of Schedule	Monthly	Appendix D	(native, statused)	Review
6	IMS data dictionary	Monthly	Appendix D	native + PDF summary	Review
7	Monthly IMS update, baseline change log, margin log	Monthly, within 10 business days after month end	Appendix D	native + PDF summary	Approve

8	Monthly Schedule Status and Performance Report	Monthly	Appendix D	native + PDF summary	Approve
9	SRA package	As needed per Appendix D	Appendix D	native + PDF summary	Approve
10	Working schedule file and prior baselines	As requested	Appendix D	native + PDF summary	Review

Project Management					
Item	Deliverable	Due Date/Frequency	Deliverable Description	Format	Type
11	Risk Management Plan	14 days prior to Kickoff and Req Overview	Appendix E	Contractor Format	Review
12	Monthly Risk Report	Monthly, within 10 business days after month end	Appendix E	Contractor Format	Review
13	Monthly Project Status Report	Monthly, within 10 business days after month end	Section 2.77	Contractor Format	Review
Technical					
Item	Deliverable	Due Date/Frequency	Deliverable Description	Format	Type
14	Project Kickoff and Requirements Overview Package	14 days prior to Kickoff and Req Overview	Summary package defining project structure, requirements, schedule, and onboarding status	Contractor Format	Approve
15	[LEGS 1] Facility Power Requirements	As proposed in CVM process	Section Error! Reference source not found.	Contractor Format	Approve
16	[LEGS1] ICD for power, BMS, Fire	As proposed in CVM process	Section 3.2, Appendix B	Contractor Format	Review

17	[LEGS 1] [LEGS 2] Software Maintenance Plan	As needed per Section 3.2.1	Section 3.2.1	Contractor Format	Approve
18	[LEGS 1] [LEGS 2] Software Verification Procedure	As needed per Section 3.2.1	Section 3.2.1	Contractor Format	Approve
19	[LEGS 1] [LEGS 2] Software Version Description Document	As needed per Section 3.2.1	Section 3.2.1	Contractor Format	Review
20	[LEGS 1] [LEGS 2] Software User Manual	As needed per Section 3.2.1	Section 3.2.1	Contractor Format	Review
Operations and Maintenance					
Item	Deliverable	Due Date/Frequency	Deliverable Description	Format	Type
21	LEGS Subnet ConOps	As proposed in CVM process	Section 3.2.5	Contractor Format	Review
22	[LEGS 1] Orientation Training for Site Personnel	As proposed in CVM process	Section 3.2.5	Contractor Format	Review
Environmental, Health and Safety					
Item	Deliverable	Due Date/Frequency	Deliverable Description	Format	Type
23	Safety and Mission Assurance Plan (SMAP)	To be Proposed	Section 3.2.6	Contractor Format	Review
24	Hazard Analysis	As proposed in CVM process	Appendix F	Contractor Format	Review
Security					
Item	Deliverable	Due Date/Frequency	Deliverable Description	Format	Type
25	[LEGS 1] Security Plan	Within 6 months of award	Section 2.6	Contractor Format	Approval
26	[LEGS 2] Security Plan	Within 6 months of award	Section 2.6	Contractor Format	Approval

28	LEGS Subnet Security Plan	Within 6 months of award	Section 2.6	Contractor Format	Approval
29	CASQ	With Proposal	Section 2.6 and Error! Reference source not found.	Contractor Format	Review

NOTE: All durations are calendar days

2.11 Government Furnished Equipment

2.11.1 Government Furnished Equipment (GFE) will include the following:

Comprehensive material descriptions will be provided after contract award. This will include but not limited to where applicable; manufacturer, part number, quantity/units, version.

- a) LEGS 1 and LEGS 2 Antennas as defined in SENSE-ALLEN-SPEC-001 Lunar Exploration Ground System Dual Band
 - LEGS 1 antenna as installed at WSC. Appendix B WSC Installation covers the specific services and utilities unique to [LEGS 1
 - LEGS 2: FAT completed, in storage at the vendor facilities
- b) Fiber Optic Transmission System (FOTS) panel (QTY 2 per antenna)
- c) Antenna subsystems spares provided with the original antenna purchases. A comprehensive list will be provided after contract award.

Section 3 Requirements Description

3.1 General Requirements

3.1.1 NASA

General responsibilities will be covered in the Terms and Conditions of the subcontract. Items to be considered include:

- a) NASA will provide access to work areas as required.
- b) NASA will provide coordination with host site Facilities and Operations.

3.1.2 Contractor

The Contractor shall supply all materials and services as specified in this SOW, to include:

- a) The Contractor shall supply all tools, assembly equipment, test equipment, machinery required, and heavy lift equipment for the assembly, installation, and testing of the antenna system.
- b) The Contractor shall provide requirement allocations to each antenna.
- c) The Contractor shall provide a Work Breakdown Structure (WBS) dictionary which describes the effort and products necessary to manage, design, implement, install, integrate, test, and transition the antenna to operations. The WBS shall be utilized in the IMS and delivered at kickoff.
- d) The Contractor shall identify key personnel for the execution of the contract. At a minimum, the key personnel list shall include the individual with overall project programmatic responsibility and the individual with overall technical responsibility.
- e) The Contractor shall submit a milestone payment schedule based off the milestones in Section 2.4 Table 2-3.
- f) The Contractor shall supply all materials and services required to complete this SOW other than the GFE noted in the SOW.
- g) The Contractor shall complete an updated Commercial Architecture Security Questionnaire (CASQ) and submit with the proposal. The CASQ process is fully described in the Space Communication and Navigation (SCaN) commercial Satellite Communications Requirements and Approval Process.
- h) The Contractor shall comply with the requirements identified in GRC-LEGS-REQ-003 LEGS Security Data Requirements Description.
- i) The Contractor shall use the listed Applicable Documents (Table 2.1) or equivalent standard in the country the antenna will be located in. The Contractor shall provide list of applicable standards to be used as equivalents
- j) The Contractor shall identify a primary Safety and Mission Assurance (SMA) point of contact (POC) with responsibility for leading the Contractor's SMA activities.
- k) The Contractor shall describe the tools, techniques, and processes it will utilize to develop, modify, verify, and maintain software for LEGS.

- l) [LEGS 1] [LEGS 2] The Contractor shall conduct a hazard analysis for the integrated LEGS ground system and provide it as part of the CVM process.
- m) [LEGS 1] [LEGS 2] Any software determined by NASA, to be safety critical shall meet safety critical requirements listed in NPR 7150.2D. Tailoring of specific requirements shall be approved by NASA.
- n) [LEGS 1] [LEGS 2] Any hardware determined by NASA, to be safety critical shall meet the local or site safety critical requirements.
- o) [LEGS 1] [LEGS 2] The Contractor shall provide, with adequate notice by the Government, access to the GFE antennas and their associated sites.

[LEGS 1] specific Requirements: See LEGS 1 WSC Installation for LEGS 1 specifics.

- p) [LEGS 1] The Contractor shall ensure that all on-site Contractor personnel attend all NASA or site POC safety and security briefings that are required for performance of the work effort.
- q) [LEGS 1] For work on secure sites, the Contractor shall abide by all security requirements levied by NASA and/or the organization responsible for the NASA work site.
- r) [LEGS 1] The Contractor shall conduct a brief tag-up meeting at the beginning of each workday with NASA Site Operations for situational awareness.
- s) [LEGS 1] The Contractor shall provide safety oversight of all work conducted on the sites during the installation, integration, and test of the ground station.
- t) [LEGS 1] The Contractor shall remove all post-installation waste (trash). The Contractor may provide a dumpster and locate it near the installation if desired. Dumpster size and location shall be coordinated with the NASA Technical POC. The dumpster(s) shall be removed prior to payment of the final invoice.
- u) [LEGS 1] The Contractor shall provide a portable toilet and locate it near the installation. Portable toilet locations shall be coordinated with the installation site POC.
 - a. The Contractor shall ensure the portable toilet is cleaned and serviced weekly. The portable toilet shall be removed prior to payment of the final invoice.
- v) [LEGS 1] Office space, telecommunications access, and portable storage will not be provided at the installation sites. The Contractor may provide portable office space, telecommunications, and portable storage and locate it near the installation if desired. Portable office space and portable storage space locations shall be coordinated with the installation site POC.
- w) [LEGS 2] Office space, telecommunications access, and portable storage will not be provided at the installation sites. The Contractor may provide portable office space, telecommunications, and portable storage and locate it near the installation if desired. Portable office space and portable storage space locations shall be coordinated with the installation site POC.
- x) [LEGS 2] The Contractor shall provide access to an office space for use by the Government during site visits for business calls, computer work, and meetings of up to 5 people

3.2 Technical Requirements

NASA personnel will evaluate and provide final project acceptance through a formal notification process at each review. All acceptance will be subject to NASA's written acceptance and

verification the Contractor has conformed to all SOW requirements and specifications, as well as all contract terms and conditions.

- a) The Contractor provided ground stations shall meet the requirements specified in GRC-LEGS-REQ-001 LEGS PPP SRD.
- b) The Contractor shall design the ground station infrastructure to support data delivery and station monitoring to a cloud service.

[LEGS 1] specific Requirements: See LEGS 1 WSC Installation for LEGS 1 specifics.

- c) [LEGS 1] The Contractor shall provide an interface control document (ICD) defining the interfaces with the White Sands Facility. This includes the utility and technical power, di water, and any fire, security or BMS connections. This will be used by the WSC for configuration management of the LEGS utilities. Appendix B outlines the basic interfaces with the WSC site.

3.2.1 Monitor and Control Subsystem

- a) The Contractor shall supply monitor and control capability for the LEGS 1 and 2 antennas. This is the primary interface for external users, the signal processing subsystem, and antenna subsystem.
 - i. The monitor and control subsystem receives and processes control directives, spacecraft acquisition data, deconflicted schedules, and in-service reconfigurations.
 - ii. Commands subsystem equipment such as the high power amplifiers and other forward path signal gains.
 - iii. [LEGS 1][LEGS 2] The monitor and control subsystem shall interface with the GFE antenna provided Antenna Control unit (ACU).

[LEGS 1] specific Requirements: See LEGS 1 WSC Installation for LEGS 1 specifics.

- b) [LEGS 1] The Contractor shall provide facility monitoring capabilities (environmental, security, fire, off nominal conditions) for the LEGS 1 Antenna subsystem and any support structures that can be monitored by the WSC.
- c) [LEGS 1][LEGS 2] The Contractor shall provide a Software Maintenance Plan, a Software Verification Procedure, a Software Version Description Document, and a Software User Manual if the local software configuration of the LEGS 1 and 2 antennas is modified from what was provided.

3.2.2 Signal Processing Subsystem

- a) The Contractor shall supply signal processing capability for LEGS 1 and 2.
 - i. The signal processing subsystem typically performs modulation and demodulation of the forward and return signals, provides forward error correction encoding and decoding, performs baseband data encapsulation of AOS frames into VITA-49.2 packets, distributes IF signals, converts signals between analog and digital in both directions, synchronizes symbols, performs time tagging, provides IF tuning, and supports Doppler measurement and ranging through use of low-rate modems, high-rate modems, and IF switches.

- b) The Contractor shall propose to the Government, as part of the CVM process, if the GFE FOTS will not be utilized. Government will provide concurrence on the Contractor proposal.

3.2.3 Site Installation and Integration

- a) The Contractor shall obtain spectrum authorization for each location in accordance with NPD 2570.5, NASA RF Spectrum Management Manual.
- b) The Contractor shall connect to and demonstrate the connections to the SPOC from each LEGS antenna
- c) The Contractor shall provide all required hardware and cables to connect to the Contractor furnished equipment (CFE) to the site grounding and lightning protection.

[LEGS 1] specific Requirements: See LEGS 1 WSC Installation for LEGS 1 specifics.

- d) [LEGS 1] If the Contractor uses the provided pad at LEGS 1 for a structure, the structure shall not exceed 15 feet in height.
- e) [LEGS 1] Any support structure containing the ground station systems shall be designed with equipment appropriate for the local infrastructure and environmental conditions (e.g., available power, water, local weather and site-specific conditions).
- f) [LEGS1] The Contractor shall integrate their equipment with the site infrastructure as required for operation. Appendix B outlines the basic interfaces with the WSC site.
- g) [LEGS1] The Contractor shall test the lightning protection system IAW NFPA 780 after installation.
- h) [LEGS1] The Contractor is responsible for maintenance of any facility elements added by the Contractor within the fenced area. This includes but is not limited to lighting, pavement, utilities conveyances, and any structures or systems added by the Contractor.
- i) [LEGS1] [LEGS2] The Contractor shall document and configuration manage any changes to the baseline configuration of the Government provided antennas.

3.2.4 Systems Engineering Database

- a) The Contractor shall describe the tools, techniques, and methods it will utilize to capture systems engineering design and development artifacts generated during LEGS development. The Contractor is encouraged, but not required, to utilize a Model-Based System Engineering (MBSE) tool to build the subsystem model.
- b) The Contractor shall deliver a requirements database in Excel spreadsheet format as a minimum.
- c) If the Contractor does utilize an MBSE tool, the Contractor shall coordinate with the LEGS project team regarding any plug-ins they intend to use, to ensure compatibility and availability with the LEGS project team. For reference, Table 3-1 outlines the Cameo Systems Modeler compliant file formats that are acceptable for submission, listed in order of preference for the LEGS project.
- d) If the Contractor does utilize MBSE, the Contractor model shall utilize SysML diagrams, as opposed to the older UML diagrams, when possible. The LEGS model exclusively uses SysML diagrams.

- e) After model delivery, the Contractor shall expect to support model merge and validation activities between the Contractor model and the LEGS model to ensure data is properly represented in the project-level model.
- f) The Contractor shall provide support for resolving any data integrity issues arising from the model import process, and for any rework required to integrate the model into the LEGS system model.
- g) The Contractor shall provide model documentation including a list of custom profiles, necessary plug-ins, used projects (referenced models), and the delivered model version at a minimum.

Table 3-1: Cameo Systems Modeler Compliant Formats

#	Data Formats
1	Cameo Systems Modeler File
2	MagicDraw Native XML File

- h) If MBSE models are utilized, the Contractor shall deliver the model contents to NASA at the specified CVM with final updates provided at ORR.

3.2.5 Operations, Training, and Maintenance

- a) [LEGS 1] [LEGS 2] The Contractor shall provide a LEGS ground station ConOps.
- b) The Contractor shall provide an outline of the intended LEGS subnet ConOps as part of the CVM process. This shall include maintenance of the Government supplied antennas. The Contractor shall provide location of operations center for NASA concurrence.
- c) [LEGS 1] The Contractor shall conduct training courses onsite at the installation sites to the local Operations, Emergency Services and Security personnel following completion of integration activities, and prior to departing the ground station site. The training course shall include at a minimum, an orientation of the site, applicable fire and security interfaces and emergency procedures. The Contractor shall plan on a minimum of two sessions for each course to accommodate the rotating schedules of the students. The training schedule shall be approved by NASA. Each course will be attended by approximately eight personnel.
- d) [LEGS 1] [LEGS 2] The Contractor shall provide IT Security software patches for LEGS 1 and 2 as part of the O&M process.
- e) [LEGS 1] [LEGS 2] The Contractor shall provide the IT Security software maintenance strategy as part of the CVM process.

3.2.6 Safety and Mission Assurance

- a) The Contractor shall provide to the LEGS team their Safety and Mission Assurance Plan for NASA review. If the Contractor has separate Safety and Quality Assurance Plans, that is acceptable, and both shall be provided.
- b) The Contractor shall provide monthly updates on any quality issues, anomalies, and open non-conformances for NASA to review.

- c) The Contractor shall identify and provide a Quality POC and Safety POC (if different than the Quality POC) to NASA.
- d) The Contractor shall implement and execute a continuous risk management process in accordance with Appendix E and risks shall be reported monthly.

Section 4 Verification and Validation

The Contractor shall conduct the following design, test, and gate reviews in accordance with their appropriate commercial practices. NASA's intent is to use the Contractor's practices and procedures to the fullest extent possible to satisfy NASA internal procedural requirements.

4.1.1 LEGS 1 Antenna SAT

The LEGS 1 antenna has been constructed on government owned property adjacent to the WSC Second Tracking and Data Relay Satellite System Ground Terminal (STGT) building. The LEGS 1 antenna is being prepared for site acceptance testing (SAT) by the antenna Contractor. There exists the possibility that the LEGS 1 antenna will not have completed SAT when the LEGS PPP is awarded. If the SAT has not been completed by the time the partnership agreement is finalized, the work needed to complete the antenna installation and SAT testing may become part of the scope of the partnership agreement. The expected status of the LEGS 1 antenna at time of PPP award is projected as follows:

- Factory Acceptance Testing (FAT) has been successfully completed by the antenna manufacturer.
- The antenna is installed, fully functional.
- The antenna has been installed in accordance with design specifications and is mechanically complete.
- The utilities and supporting infrastructure, including electrical power, grounding, communications, and environmental controls, required to conduct SAT are operational and available for testing.

NASA will provide a report identifying current configuration of site and SAT review readiness to the Contractor as soon as possible, but no later than October 7, 2026, or contract award date, whichever occurs later. NASA will provide timely access to the site, required approvals, and availability of designated Government personnel to support gap analysis.

Contractor shall provide gap analysis using NASA-provided SAT readiness report along with Contractor assessment of the state of the antenna.

4.1.2 Capability Validation Milestones

The Capability Validation work shall be completed in a methodical series of steps (milestones).

- a) The Contractor shall utilize a CVM process to demonstrate the completion of these activities to NASA. NASA recommends the Contractor combining CVM steps where possible. NASA recommends utilizing a 4 step process as outlined in Appendix F.
- b) The Contractor shall propose a combination of CVM steps based on previous work completed and the maturity of the systems being used. NASA reserves the right to accept or reject Contractor-proposed CVM steps as part of contract negotiation.
- c) The CVM tailoring shall be presented as part of the kickoff/ part of the proposal.

4.1.3 Operational Readiness Reviews (ORRs)

It is NASA's intention to hold an Initial Capability ORR to evaluate the readiness of the lunar subnet when the first three ground stations are brought online, and a Redundant Capability ORR to evaluate the expansion of the subnet when it expands from 4-6 ground stations. The ORRs will be a NASA led review. The ORR is covered in Appendix G.

- a) The Contractor shall assist the government in preparing for the ORRs by providing the necessary artifacts
- b) The Contractor shall participate in the ORR reviews with NASA

4.1.4 Mission support

During the mission design and testing phases, the missions will need to understand system design and will require artifacts to design and test too. These include: ICDs, ConOps, points of contact, service. Onboarding of missions to the lunar subnet will be through other contracts.

- a) The Contractor shall coordinate with the SCaN Network to facility network anomaly resolutions to assist in the resolution of the anomaly.
- b) The Contractor shall support testing with user missions for use of the lunar subnet and associated interfaces with the SCaN network.
- c) The Contractor shall coordinate with the SCaN Network to provide a means to coordinate emergency support for the mission. This includes facilitating communications to prevent the mission from loss of their platform and to return to normal operations.
- d) The Contractor shall support SCaN Mission-to-network interfaces as identified in an Interconnection Security Agreement (ISA).

Section 5 Appendices

Appendix A. Contractor Safety Program

This section applies to LEGS 1 and any other LEGS antenna that may be located on US government property.

The Contractor shall provide an overall safety program that directs activity appropriate to the risk associated with all foreseeable hazards. The safety program shall be implemented as part of the Contractor's overall occupational health and safety management system. Such a plan shall demonstrate compliance with all applicable local, NASA, and Country regulations and consensus standards. Safety plan requirements shall flow down to all sub-contractors utilized on the project.

Electrical Safety

- a) The Contractor shall provide Lock Out / Tag Out (LOTO) procedures to safe the system for maintenance and repair activities. LOTO is a fundamental requirement when working around, on, or near hazardous energy sources.
- b) Contractor personnel shall follow, use, and practice the approved LOTO policy and procedures.
- c) Contractor personnel shall communicate any concerns of the approved LOTO policy and procedures to their NASA project point of contact.
- d) Contractor personnel shall provide evidence their employees have the required training and equipment to successfully perform LOTO according to the approved LOTO policy and procedures.
- e) Energized electrical work safety is a fundamental requirement when working around, on, or near live electrical sources. A NASA approved Contractor Energized Electrical Work policy, procedure, and training shall be followed for all Contractor personnel exposed to, working on, or managing electrical sources and equipment. These policies and procedures are in place to protect and maintain a safe environment for all personnel.
- f) Contractor personnel shall follow, use, and practice the approved Energized Electrical Work policy and procedures.
- g) Contractor personnel shall communicate any concerns of the approved Energized Electrical Work policy and procedures to their NASA project point of contact.
- h) Contractor personnel shall provide evidence their employees have the required training and equipment to successfully perform Energized Electrical Work according to the approved Energized Electrical Work policy and procedures.
- i) Failure to meet any of the above requirements could result in injury and possible death for personnel working around on, or near energized electrical sources and equipment. Therefore, violations of the approved policy and procedures for Energized Electrical Work will result in a work stoppage and/or removal from site.
- j) Method of Procedure (MOP) - Shall be developed by the Contractor and approved by NASA for all energized electrical work or other high-risk work, such as switching activities.
- k) The Contractor shall provide qualified personnel to perform electrical work.

- l) The Contractor shall provide documentation affirming the qualifications of each employee that is responsible for performing energized or potentially hazardous operations such as voltage testing, troubleshooting, switching, hazard identification and LOTO.
- m) All Contractor employees performing electrical work shall be licensed journeyman/master electricians or be working under the direct supervision of a licensed journeyman/master electrician, in the case of helpers/apprentices.
- n) The Contractor shall document and upon request, provide said documents that each qualified employee has received training required by NFPA 70E to include Electrical Safety Training, Lockout/Tagout Training and Emergency Response Training.
- o) The training requirements shall apply to employees exposed to an electrical hazard when the risk associated with that hazard is not reduced to a safe level by the applicable electrical installation requirements.
- p) Such employees shall be trained to understand the specific hazards associated with electrical energy.
- q) Employees shall be trained in safety-related work practices and procedural requirements, as necessary, to provide protection from the electrical hazards associated with their respective job or task assignments.
- r) Employees shall be trained to identify and understand the relationship between electrical hazards and possible injury.

Work at Heights (Fall Protection)

Contractors performing any work at elevated heights over 4 feet (48 inches) on sites shall:

- a) Comply with current OSHA, ANSI Z359 series, and fall protection standards.
 - i. OSHA 29 CFR 1910 Subpart D.
 - ii. OSHA 29 CFR 1910.140.
 - iii. OSHA 29 CFR 1926 Subpart M Fall Protection (when applicable).
 - iv. ANSI Z359 series fall protection standards.
- b) Submit a copy of their fall protection program to NASA.
- c) Submit a site-specific hazard analysis to NASA prior to performing work where Personal Fall Arrest Systems (PFAS) will be used.
- d) Receive formal training and be qualified through their company. Contractors or other similarly affiliated teammates (e.g., universities) shall submit their fall protection qualification from their employer to the Environmental Health and Safety (EHS) POC prior to working onsite.
- e) Provide fall protection equipment needed for work on sites. The Contractor shall not utilize equipment unless approved in writing from NASA.

Lifting Devices and Equipment

Contractors using any powered lifting devices and equipment (cranes, forklifts, MEWPs, etc.) for work on sites shall:

- a) Comply with current OSHA, ANSI, and standards for training, certification, and safe use of lifting devices and equipment, including but not limited to:
 - i. OSHA 29 CFR 1910.178 Powered Industrial Trucks.
 - ii. OSHA 29 CFR 1910.179 Overhead and Gantry Cranes.

- iii. OSHA 29 CFR 1910 Subpart F Powered Platforms, Manlifts, and Vehicle-Mounted Work Platforms.
 - iv. OSHA 29 CFR 1926.453 Aerial Lifts.
 - v. ANSI/SAIA A92 Series for Mobile Elevating Work Platforms (MEWP).
 - vi. ANSI/ASSE Z359 Series for Fall Protection.
- b) Submit a copy of their relevant safe use plan to both the Primary Contractor EHS POC and the NASA EHS POC for the equipment which will be operated onsite, including but not limited to:
- i. Plans for pre-use and worksite inspections.
 - ii. Copies of current documented periodic/frequent inspections (as applicable).
 - iii. Copies of current crane certifications and load testing certificates (as applicable).
 - iv. Documented manufacturer approval for any attachments that will be used during the operation.
 - v. Environmental spill containment plan for all equipment containing fuel, oil, lubricants, and/or hydraulic fluids.
- c) Receive formal training and be qualified through their company. Contractors or other similarly affiliated teammates (e.g., universities) shall submit their LDE qualification from their employer to both the Primary Contractor EHS POC and the NASA EHS POC prior to working onsite. Qualification documentation must state the class, group, and/or type of equipment that each operator is certified to operate.
- d) Submit Lift Plan(s) to both the Primary Contractor EHS POC and the NASA EHS POC, as applicable, per NASA Lifting Standard 8719.9. Lift Plans are required 14 business days prior to lift.
- e) Comply with the work-rest cycles as noted for critical positions to maintain ground safety (NPR 1800.1, NASA Occupational Health Program Procedures, Section 2.5).
- f) Review site rescue plans and risk assessments and communicate information to workers and operators under their direction.

Appendix B. LEGS 1 WSC Installation

This Appendix is intended to give the Contractor an understanding of the physical interfaces at the WSC site for LEGS 1. The Contractor shall provide documentation to NASA documenting the final physical interfaces.

LEGS 1 GFE

The following GFE will be provided at WSC complex for support of the integration at the LEGS 1 antenna site:

Antenna

- NASA provided Antenna
- All Antenna to Ground station interfaces terminated at the Antenna demarcation panel.

Physical

- Deck Shelter foundation - a concrete pad designed to support two 40' x 10' Conex boxes with appropriate walkaround area.
- A demarcation point at the edge of the concrete pad where all utilities and conveyances terminate.
- Duct banks and conveyances connecting the Antenna demarcation to the concrete pad site demarcation for all interfaces.

Communication

- Antenna FOTS panel
- Back end electronics FOTS Panel

LEGS Facility Interfaces

Power and Grounding Interfaces

- Construction power available for antenna support structures
- The site utilities will be brought to a demarcation power fence or power panel at the antenna and concrete pad. These utilities will be brought to the demarcation in buried, concrete protected duct banks.

Electric Power and Grounding Interface

Interface	Source	Destination	Physical Conveyance	Physical Demarcation Point
Power for the Antenna-Utility and Technical power	Site Power Distribution Infrastructure	LEGS Antenna Component: TP-1, TP-2, UP-1 Electrical Panels	Cables in buried duct banks	Antenna Power panels (Power Fence)
Power for the Deck Shelter Pad- Utility and Technical power	Site Power Distribution Infrastructure	TBD	Cables in buried duct banks	Deck Shelter Pad perimeter (Power Fence)
Grounding /Lightning Protection	Grounding Counterpoise Component: Ground ring around outer perimeter of antenna	LEGS Antenna Component: Grounding stub outs Deck Shelter Pad	Cables in buried duct banks for power. Buried cables	Exothermic Welds Location: At various junctions between antenna stub outs and grounding counterpoise

Water Interface

- The HVAC systems for the support structures (TBD) and antenna, if applicable, may require a water source for humidification purposes. Deionized water is typically used for this water source.
- Deionized water line terminating at the concrete pad

Site

- Access road to the Antenna enclosure.
- Construction Access for installation of any antenna support structures
- Drainage, parking, vehicle access to the ground station location

Physical Security Interface

- Site Security force
- Antenna enclosure perimeter fence and associated access points
- Antenna perimeter lighting and cameras – TBD
- The Antenna will send physical security monitoring data collected by cameras and sensors to the Contractor for local monitoring by NASA (TBD) and for retrieval Contractor remote monitoring.

- Physical security implementation is site specific and will be the responsibility of NASA and the PPP Contractor. The table below defines the notional interface specifications. The interface details cannot be fully defined at this time, but are expected to be defined by the PPP Contractor during the development process and documented as a deliverable.

Table 5-1. Physical Security Interface Specifications

Field	Specification
Producer/Consumer	ANT to TBD
Transport Layer	TCP
Application Protocol	REST [TBR]
Endpoint	[TBD]
Payload Format	JSON [TBR]
Typical Rate / Size	≤ 4 kB [TBR]
Security and IAM	[TBD]
Error Handling	[TBD]

Appendix C. Working at WSC

The NASA White Sands Complex is a secure US Government facility. The Contractor shall comply with the requirements and procedures identified in this appendix.

Physical Security at WSC

- a) All Contractor personnel shall be citizens of the United States of America. Dual citizenship is not accepted without a valid security clearance. Foreign nationals will NOT be allowed access onto the site. Prior to entrance into the facility, the Contractor shall provide the appropriate visit request forms to the White Sands Complex (WSC) Security office at least 2 weeks in advance, faxed to 575-527-6948. No visits will be authorized until all security requirements are met. The WSC security office can be contacted at wsc-dl-security@mail.nasa.gov or 575-527-6903/6904.
- b) Contractor personnel shall possess identification documents complying with the REAL Identification (ID) Act of 2005 for access to the site. Most federal IDs such as federal employee badges, passports, and military ID cards are acceptable. Some state-issued driver's licenses and IDs are non-compliant and will not be accepted. Direct all questions to the WSC security office.
- c) No Personal Electronic Devices (PEDs), such as mobile devices are permitted inside the buildings on the site. Cell phones may be used in the parking lots and other areas exterior to the buildings. Laptops may be approved if Wi-Fi is disabled, and camera function is disabled or covered by the security force and a pass will be provided if approved.
- d) No cameras are permitted on site. Any required photographs shall be provided by WSC personnel in accordance with the WSC-SOP-0009, WSC Security Standard Operating Procedures. Cell phones with cameras are permitted outside of the buildings, however, the camera function cannot be used anywhere on the site. If photography is permitted, images shall not be posted to any web site unless approved by the WSC Facility Security Officer (FSO), the NASA Program Security Officer (PSO), and GSFC Code 240. Images shall not be used in any promotional material or advertising without the express approval of the entities.
- e) No pets or animals are permitted on site.
- f) No weapons are permitted on site.
- g) On the initial site visits the Contractor personnel shall be required to receive a Security and Safety briefing/orientation to familiarize them with the site's security and safety policies and procedures. Contractor's personnel shall comply with all site security and safety policies while working on-site.
- h) Physical Security requirements for all NASA facilities will adhere to NASA NPR 1620.3, Physical Security Requirements for NASA Facilities and Property.

Applicable Documents

The following Security documents are applicable to the extent cited herein. The most recent version of these documents takes precedence. If there are conflicts between the listed documents and the requirements presented in this Appendix, the requirements cited in this Appendix take precedence. The Contractor shall comply with the following Security standards listed in Table C-1 (please note the SOW Specific Applicable Documents listed in the SOW Section 1.4 Applicable Documents).

Table C-1. Applicable Documents

Document Number	Document Title
NASA NPR 1600.4B	<i>Identity and Credential Management</i>
NASA NPR 1620.3	<i>Physical Security Requirements for NASA Facilities and Property</i>
NPR 2810.1F	<i>Security of Information and Information Systems</i>

Access requirements

- a) Per NPR 1600.4b, the following access requirements apply to workers at the LEGS 1 site.
 - Workers who will be on site for 0-29 days – Local Badge
 - Workers who will be on site for 30-179 days in a year - Agency Smart Badge (ASB)
 - Workers who will be on site for 180 or more days in a year – Personal Identity Verification (PIV) card
- b) Specific qualifications for the above badges are contained within the NPR
- c) Uncleared workers must be escorted. Once they clear the enrollment process they may be on site without an escort.
- d) Uncleared workers may be escorted by Contractors trained as WSC Escorts
- e) Long term workers who will be coming to LEGS 1 on a regular basis (O&M functions) will be issued PIVs or ASBs once the agreement between NASA and the Contractor is finalized and identities are created for the workers.

WSC Escorts

- a) All non-cleared Contractor personnel shall be accompanied by cleared Security Escorts at all times while on WSC.
- b) The Contractor shall provide all required security escort services.
- c) The Contractor shall ensure that all personnel attend any required NASA or NASA safety and security briefings that are required for performance of the work effort.
- d) Appropriate Work Wear: The Contractor shall provide necessary Personal Protection Equipment (PPE) to all Contractor personnel, including Contractor escorts. The Contractor escort shall wear, at a minimum:
 - i. Appropriate sleeved shirt.
 - ii. Appropriate full-length trousers (covers ankles).
 - iii. Safety toed shoes.
 - iv. Hardhats.

- v. Safety Vests.

Fire Alarms

The Contractor escort shall:

- a) Escort Contractor personnel to the designated assembly area if fire alarm sounds.
- b) Report to NASA's project manager or another key project team member at the assembly area. A NASA project team member will report to the security guards for accountability.

Computer and Information Technology

- a) **IT Security is mandatory for this application. The Contractor shall strictly adhere to** guidelines specified in the current version of NPR 2810.1F, *Security of Information and Information Systems*.
- b) No Contractor data processing equipment or devices are connected to a NASA system without prior authorization and proper processes.

Appendix D. Integrated Master Schedule Description

1. Schedule Requirements

- The Contractor shall provide one authoritative Integrated Master Schedule (IMS) covering the entire contract scope, including all WBS elements, subcontracted work, Government furnished property/information (GFP/GFI) interfaces, Capability Validation Milestones, artifact deliveries, and contract milestones.
- The Contractor shall develop and submit a Schedule Management Plan identifying:
 - Responsible schedule maintaining position
 - Schedule update cadence
 - Systems used for schedule management
 - Schedule change control/approval process
 - Method for managing schedule risks
 - Contract/project milestones and deadlines
- The Contractor is responsible for full schedule integration of all sub-contractors schedules at no higher than intermediate level, including all milestones, deliveries, receivables, and interfaces.
- For the most effective IMS, The Contractor is highly encouraged to use NASA best practices as presented in the NASA Schedule Management Handbook Rev. 2 (2024), NASA Space Flight Program and Project Management Handbook SP-20220009501 (2022) and Project Planning & Control Handbook SP-2016-3424 (2016).

2. Schedule Baseline Requirements

- The Contractor shall deliver the proposed Baseline IMS + Basis of Schedule (BoS) within 30 calendar days of incorporation for the Schedule Baseline Validation Review (SBVR).
- SBVR will occur within 30 calendar days of baseline IMS delivery; The Contractor shall disposition findings within 10 business days. Rebaseline may require a delta-SBVR. Baseline is set after written Government concurrence.
- Baseline changes affecting dates, durations, logic, or scope mapping require a Baseline Change Request and appropriate Government concurrence. Changes to control milestones require modification or CO direction.

3. Schedule Maintenance and Monthly Status Requirements

- The Contractor shall maintain the IMS as the official record of planned and actual schedule performance.
- IMS must record actual dates and remaining durations for all in-progress work.
- The Contractor shall status the IMS monthly to a single month-end status date. Deliver the IMS and Monthly Status Report within 10 business days after month end.
- The Contractor shall deliver monthly:

- IMS (native file)
- IMS cumulative change log
- IMS margin log
- IMS status and performance report
- Monthly Status Report shall include:
 - Health-check against IMS acceptance criteria
 - Schedule slips impacting critical path (with cause/impact/action)
 - Critical path reporting (primary/secondary/tertiary)
 - Total float/margin burn-down
 - Required performance metrics; "Watch" breach requires narrative disposition "Corrective Action" breach requires written recovery plan
 - Milestone performance reporting (baseline/forecast/actual)
- Government may reject any nonconforming schedule deliverable within 5 working days; The Contractor shall correct and resubmit within 3 working days.
- Repeated nonconformance (2 consecutive or 3 within 12 months) requires a root-cause corrective-action plan and may affect CPARS and trigger contractual remedies.

4. IMS Acceptance Criteria Requirements

The Contractor's IMS shall meet the following criteria:

1. <5% tasks missing predecessor/successor (target 0)
2. Logic on summary tasks = 0
3. Hard constraints = 0 without concurrence; all constraints $\leq 5\%$
4. Leads = 0; lags $\leq 5\%$, each justified
5. Finish-to-start relationships $\geq 90\%$; Start-to-finish = 0
6. Negative float = 0 at baseline; any negative float in updates requires a recovery plan
7. High float (>25% of remaining duration) $\leq 5\%$, excess dispositioned
8. Out-of-sequence status = 0; invalid dates = 0
9. Near-term discrete durations ≤ 44 working days for $\geq 90\%$, exceptions documented
10. Single continuous critical path, no LOE/summary/margin misrepresentation; identifiable near-critical paths
11. All incomplete work statused; single status date; 100% margin reconciliation to log
12. All baseline fields populated; changes reconcile 100% to approved change log

6. Performance Metric Requirements

Reported monthly:

- **BEI** — Watch <0.95; Corrective <0.90
- **CEI** — Watch ≤ 0.60 ; Corrective ≤ 0.55 sustained
- **Control-milestone hit rate** — Watch <0.90; Corrective <0.80
- The Contractor shall notify Government within 3 business days of:
 - Any forecast slip >10 business days to a control milestone
 - Exhaustion of margin protecting a control milestone
 Notifications must include cause, impact, and recovery plan.

8. Schedule Risk Analysis (SRA) Requirements

The Contractor shall perform an SRA on the IMS (or analysis schedule that mirrors logic of IMS):

- At baseline (SBVR)
- Within 30 days of major contract modification
- At least every six months

SRA requirements include:

- Three-point duration uncertainty for discrete work tasks
- Mapped discrete risks with duration impact/likelihood
- Reserve/margin tasks zeroed out
- Removed/converted hard constraints
- Task duration uncertainty correlation

SRA Package shall contain:

- SRA Report (methodology, assumptions, risk register, confidence levels for contract completion and each control milestone, top risk drivers, margin-sufficiency assessment where probability for any control milestone is less than 70% confidence level)
- SRA model (updated IMS/analysis schedule with the task duration uncertainty distributions and mapped discrete risks)

Appendix E. Risk

Risk Management Requirement and Applicability

The Contractor shall implement and execute a continuous risk management process that enables proactive identification of any risks/opportunities and associated mitigations to meeting contract objectives. The Contractor shall apply risk informed decision making to evaluate, prioritize and address identified risks. The Contractor shall report the status of existing risks and newly identified risks monthly.

The Contractor shall develop a Risk Management Plan (RMP) to identify, assess, and manage risks/opportunities, detailing how each risk management process step will be carried out in accordance with technical provisions. The RMP shall include but is not limited to the following elements:

- Establishment of risk tolerance criteria, thresholds, and elevation protocols, outlining the specific conditions under which a risk management decision must be elevated through Contractor management to the next higher level, including NASA project management.
- Roles and responsibilities of Contractor team members.
- Process description of how decisions are adjudicated for the appropriate response and/or control action for each risk.
- Description of scope of project and definitions of consequences that risks and issues could impact, especially schedule, cost, requirements, safety, security.
- List of possible approaches to address each risk and definitions of those approaches (for example, watch, mitigate, close, accept, elevate).
- Process describing the notification of NASA about identified Contractor concerns that are out of scope of Contractor SOW.
- Description of documents that are outputs of this Risk Management process.
- Description of any scoring criteria and interpretations that are utilized in communicating individual risk levels and overall Contractor risk posture. (i.e. a scorecard).
- Description of risk records and retention.
- Description of process for linking risks to the Integrated Master Schedule.

Reporting

The Contractor shall status the risk registers monthly, within 10 business days after month end, including detailed information of each individual risk showing the Contractors approach to addressing each risk and an overall project risk posture.

NASA Risk Best Practices

The Contractor can reference NASA Space Flight Program and Project Management Handbook SP-20220009501 (2022) and Project Planning & Control Handbook SP-2016-3424 (2016) when establishing a Risk Management System.

- NASA defines a valid risk as one that identifies a specific threat including, but not limited to, an approved project goal, objective, project success criteria, project requirement, project safety, security, baseline schedule or budget and has a measurable probability and impact.
- Probability is defined as $0 < x < 100\%$
- All Contractor team members shall be responsible for identifying new risks. Risk identification is a continuous activity that seeks to identify risks before they become an issue.

Consequence categories include but are not limited to:

- Procurement / Supply Chain
 - Facilities / Maintenance / Availability
 - Requirements
 - Health, Safety, Environment
 - Mission Success
 - Reputation / ability for future work
 - Program/Project Management
 - Quality Assurance/Reliability
 - Information Technology
 - Security (cybersecurity / physical)
 - Staffing / Training
 - Enterprise: Strategic, Operations, Acquisition, Fraud
- Ideally, actions taken to address each valid risk will reduce the probability of occurrence/impacts to levels acceptable to The Contractor.

Appendix F. Capability Validation Milestones (CVMs)

Below are the proposed CVMs. The Contractor may propose another combination of CVMs

Milestone	Milestone Title	Proposed Milestone Description
CVM 1	Service Definition	The Contractor provides the top-level architectural details for LEGS, including allocation of Contractor requirements to architectural elements and description of all internal and external interfaces.
CVM 2	Service Design	The Contractor provides the detailed design of the LEGS ground system specified to the unit/component level, including complete interface specifications.
CVM 3	Service Test	The Contractor provides development status, status of factory testing and site installation and test activities, and detailed test plans for formal verification of all Contractor requirements.
CVM 4	Service Verification/Validation	The Contractor presents System Test and Verification results, results of any validation testing with on-orbit or equivalent assets, operations readiness plans and status,
ORR	Operational Readiness Review	Government-led working group to assess the readiness of the LEGS station functionality, performance, and supporting personnel to support mission customer operations.

CVM 1 Service Definition

Entrance Criteria	Exit Criteria
1. Signed Contractor agreement 2. Presentation package with TIM 3. Milestone schedule showing development activities with predecessors and successors/critical path 4. Reference architecture which shows the components to be developed by the Contractor, and interfaces to other elements (antenna, cloud, etc) 5. Concept of operation, including external interfaces/customer responsibilities 6. Allocation of The Contractor requirements to reference architecture, and verification method (I,A,D,T) planned for each Contractor requirement 7. Organizational structure identifying key staff members, subcontractors and their responsibilities, plans for interaction with government team outside of prescribed TIM activities. 8. Identification of long-lead development items. 9. Identification of site-specific facility and power requirements. 10. Approach to ensuring IT and physical security at each LEGS site location 11. Testing approach describing testing levels and organizational responsibilities 12. Initial list of risks and issues along with proposed mitigation plans. 13. Detailed cost estimates showing the estimated cost-to-completion for development.	1. Reference architecture clearly identifies interfaces between Contractor-developed elements and other mission/NASA supplied elements, along with any Contractor information needs from those external elements to develop/baseline an ICD. 2. Operations concept clearly describes operation of each reference architecture element, clearly demonstrates traceability to Contractor requirements, and identifies operational roles and responsibilities of the external interface providers to ensure end-end system operations. 3. Interaction plans identify clearly the expected frequency of meetings/discussions, along with required participation from external stakeholders. 4. Rationale is provided to substantiate each long-lead item, along with a preliminary schedule for completion. 5. IT and Physical security approach clearly identifies any needs/responsibilities to be satisfied by external entities 6. Risks are appropriately classified by likelihood and consequence if realized, and any cost/schedule impacts to The Contractor agreement if the risk is realized (or to mitigate the risk) is clearly identified. 7. Program approaches to cost and staffing are clear and well understood.

CVM 2 Service Design

Entrance Criteria	Exit Criteria
1. Updated concept of operations 2. Complete design description to unit level, showing data/control interfaces between design elements, and "build to print" drawings/schematics 3. Any updates to previous allocation of PPP requirements to functional design elements. Identification of lowest-level requirements where needed, and allocation of those requirements to unit-level final design elements. 4. Complete internal and external Interface Control Documents (ICDs) -- including list of TBDs and TBRs and plan for resolution. 5. Development status for all long-lead items identified 6. Updates on any identified single points of failure and effects on system operation if failures are realized. 7. Functional description of final software design. 8. Final Facility design, including physical requirements, infrastructure (power, cooling, network) requirements. Current status of construction activities and plans for commissioning 9. Final System Integration Plan 10. Final system test plan, allocating PPP requirements to test cases, risk.	1. Mature operations concept which properly reflects and incorporates design detail within the document 2. Lowest-level requirements are complete and traceable to unit design. TBDs and TBRs are presented with a clear work off plan. 3. ICDs are ready for baseline/signature, and sufficiently detailed to ensure development, integration, and test activities can begin without significant risk. 4. Design documents, drawings, and specifications are completed for all elements within the design at sufficient level of detail to enable fabrication and development activities to begin. Considerations for shipment, remote site installation and test have been factored in and properly accounted for in the design. 5. Adequate technical margins exist to allow the baselined design to be developed with a minimal amount of risk 6. The software design is sufficiently detailed, and custom software needs are clearly identified and properly characterized by appropriate metrics to demonstrate that development can be completed according to the baselined schedule with minimum risk.

identifying tools/simulators/emulators to be utilized, and identifying organizational responsibilities during system testing	7. Risk for changes to baselined facility design and construction needs is minimal and high confidence exists that activities can be completed per the baselined schedule
11. Updated description of IT security implementation plans	8. Integration and test plans are comprehensive for all levels of testing required. The system test program is completely specified, incorporates the use of tools, simulators, and emulators appropriately, and can verify all Contractor requirements per the baselined schedule
12. Updated list of risks/issues along with mitigation plans/strategies	9. Security plans and implementation approaches are complete and fully addresses any identified risks, threats, or vulnerabilities that could compromise any aspect of system operations.
13. Hazard Analysis conducted for the subnet and ground stations.	10. Hazard analysis conducted for the subnet operation and for the ground stations within the subnet.

CVM 3 Service Test

Entrance Criteria	Exit Criteria
1. Supporting evidence that all development and integration activities have been completed, to include items such as metrics to characterize "percent complete/work-to-go" for all factory testing, installation, checkout, and site testing activities. Identification of any liens/actions from site integration activities which have not yet been completed, along with plans for closure. 2. Current estimated schedule to completion, along with any deviations/changes from original plan 3. Updated list of risks/issues along with mitigation plans/strategies. 24 Final system test plan, showing Contractor requirements to be verified by each test, detailed testing schedule, and pass/fail criteria 5. Detailed test procedure to be executed for each identified system test 6. Roles and responsibilities of The Contractor organization during system test execution 7. Plans for independent validation of station performance with current or future NASA customers, identifying the approaches and supporting tools to be used to support validation activities. 8. Government's plans for independent verification and validation of test results.	1. Factory testing and Site installation and test activities have been completed to an appropriate level to allow system testing activities to begin. Remaining TBDs and TBRs to be resolved do not significantly impact the execution of the system test program per the plans and procedures provided. 2. System test plan is complete and comprehensive and fully verifies all Contractor requirements to a high degree of confidence. 3. Roles and responsibilities of the Contractor and the government during system testing and clear and agreed to by both parties, including how test results are interpreted and how non-conformances will be reported and adjudicated. Regression test criteria have been established and agreed to. 4. Appropriate resources are available to enable the system test program to be completed per the established schedule. 5. Independent validation plans are complete and comprehensive and are expected to confirm station is ready to support on-orbit customers with high confidence.

CVM 4 Service Verification/Validation

Entrance Criteria	Exit Criteria
1. Results of each system test executed, including requirements verification status, any liens or anomalies detected during testing classified by severity/criticality, and their resolution status. 2. Results of each validation test executed, along with any liens/anomalies discovered during testing classified by severity/criticality and their resolution status 3. Identification of any constraints or limitations which may apply to any aspect of service operations as a result of validation testing, and future activities to be conducted to reduce or eliminate the constraints/limitations 4. Description of operational support staff duties/responsibilities during all stages of service provisioning (scheduling, pre-service coordination, in-service operations, service termination, post-service operations) including support for customer critical events, and anomaly detection and resolution. Description of customer responsibilities during service provisioning. 5. Description of any operations training and certification activities and operations readiness exercises/tests that have been completed. 6. Spectrum filing/licensing/approval paperwork as needed	1. System test results demonstrate that the resultant ground station meets Contractor requirements to government's satisfaction, and can provide operational service to mission customers with minimal risk assuming validation activities are successful. 2. Operations support staff is appropriately trained and certified to meet customer requirements during nominal, critical, and anomalous operations. 3. Certification from NASA spectrum authorities that all certification has been obtained and the system is compliant with all applicable policies and regulations. 4. Validation test results demonstrate that NASA Lunar flight assets can utilize PPP ground stations to fully satisfy functional, performance, and reliability requirements for communications and navigation, and demonstrated that The Contractor stations can be utilized by the NASA Managing organization to support mission integration activities. 5. Constraints and limitations identified do not impose any undue hardships on mission customer flight or ground operations in the immediate term and adequate plans exist to mitigate the constraints and limitations in the longer term

Appendix G. Operational Readiness Reviews

The ORR is conducted by the NASA development organization to the NASA operating organization to formally accept that the system and all required interfacing systems, personnel, procedures, and documentation are ready to begin normal operations.

Applicability:

- Initial Capability ORR to be conducted to evaluate the readiness of the initial phase of the completed lunar subnet (3 LEGS Ground Stations).
- Redundant Capability ORR to be conducted to evaluate the readiness of the expansion of the lunar subnet (4-6 LEGS Ground Stations).

ORR	
Entrance Criteria	Success Criteria
1. All planned ground-based testing has been completed. 2. All network interfaces between NASA end points and Contractor systems have been tested 3. Test failures and anomalies from verification and validation testing have been resolved, and the results/mitigations/work-arounds have been incorporated into supporting and enabling operational products. 4. All operational supporting and enabling products (e.g., facilities, equipment, documents, software tools, databases) that are necessary for nominal and contingency operations have been tested and delivered/installed at the site(s) necessary to support operations. 5. Operations documentation (e.g., handbook, procedures) has been written, verified, and approved. 6. Users/operators have been trained on the correct operation of the system. 7. Operational contingency planning has been completed, and operations personnel have been trained on their use. 8. V&V results are ready for review. 9. Other ORR technical products have been made available to the cognizant participants prior to the review: a. Updated operational procedures. b. All requisite radio frequency authorizations are in place. 10. Stage 4 (Operational) system certification signed by NTIA. 11. Update system support requirements. 12. Updated list of all single point failures and their effects, including rationale for acceptance of any new SPFs.	1. The system, including all enabling products, is determined to be ready to be placed in an operational status. 2. All applicable lessons learned for organizational improvement and systems operations have been captured. 3. All waivers and anomalies have been closed. 4. Systems hardware, software, personnel, tools, supporting infrastructure, and procedures are in place to support operations. 5. Operations plans and schedules are consistent with mission objectives. 6. Mission risks have been identified, planned mitigations are adequate, and residual risks are accepted by the program/project manager. 7. Testing is consistent with the expected operational environment. 8. The program/project has demonstrated compliance with applicable NASA and implementing Center requirements, standards, processes, and procedures. 9. TBD and TBR items are resolved. 10. Concurrence by the responsible Center spectrum manager that all necessary spectrum certification(s) and authorization(s) have been obtained. 11. An operational Human Systems Integration capability has been established and HSI planning is in place for the remaining life-cycle phases.

Appendix H. Abbreviations and Acronyms

Acronym	Definition
ACU	Antenna Control Unit
ANSI	American National Standards Institute
AOS	Acquisition of Signal
AWS	Amazon Web Services
BEI	Baseline Execution Index
BMS	Building Monitoring System
CASQ	Commercial Architecture Security Questionnaire
CEI	Completion Execution Index
CFE	Customer Furnished Equipment
CFR	Code of Federal Regulations
CMMC	Cybersecurity Maturity Model Certification
CO	Contracting Officer
COR	Contracting Officer's Representative
CPARS	Contractor Performance Assessment Reporting
CUI	Controlled Unclassified Information
CVM	Capability Validation Milestones
DASO	Dona Ana Sheriff's Office
DHS	Department of Homeland Security
DISS	Defense Information System for Security
DTE	Direct-To-Earth

Acronym	Definition
DX	Direct Connect
EHS	Environmental, Health, and Safety
FAR	Federal Acquisition Regulations
FAT	Factory Acceptance Test
FDF	Flight Dynamics Facility
FOTS	Fiber Optic Transmission System
FSO	Facility Security Officer
GEO	Geostationary Orbit
GFE	Government Furnished Equipment
GFI	Government Furnished Information
GFP	Government Furnished Property
GRC	Glenn Research Center
GSFC	Goddard Space Flight Center
HSF	Human Spaceflight
HVAC	Heating, Ventilation, and Air Conditioning
IAW	In Accordance With
ICD	Interface Control Document
ICSIS	International Communication System Interoperability Standards
ID	Identification
IF	Intermediate Frequency
IMS	Integrated Master Schedule
ISO	Industrial Organization for Standardization
IT	Information Technology
LAC	Local Agency Check
LCB	LEGS Control Board
LCPD	Las Cruces Police Department
LDE	Lifting Device Equipment
LEGS	Lunar Exploration Ground Sites

Acronym	Definition
LOE	Level of Effort
LOTO	Lock Out / Tag Out
MBSE	Model-Based Systems Engineering
MOP	Method of Procedure
NAC	NASA Agency Check
NASA	National Aeronautics and Space Administration
NFPA	National Fire Protection Association
NIST	National Institute of Standards and Technology
NM	New Mexico
NPD	NASA Policy Directive
NPR	NASA Procedural Requirements
NSN	Near Space Network
O&M	Operations and Maintenance
ORR	Operations Readiness Review
OSHA	Occupational Safety and Health Administration
PDF	Portable Document Format
PEDs	Personal Electronic Devices
PFAS	Personal Fall Arrest Systems
PM	Project Manager
POC	Point of Contact
POP	Period of Performance
PP	Protection Profile
PPE	Personal Protection Equipment
PPP	Public Private Partnership
PSO	Program Security Officer
RF	Radio Frequency
RMP	Risk Management Plan
SAT	Site Acceptance Test

Acronym	Definition
SBVR	Schedule Baseline Validation Review
SMA	Safety and Mission Assurance
SOW	Statement of Work
SPOC	SCaN Operations Cloud
SRA	Schedule Risk Analysis
SRD	Systems Requirements Document
STGT	Second Tracking and Data Relay Satellite System Ground Terminal
STD	Standard
TBD	To Be Determined
TBR	To Be Reviewed
TEM	Technical Exchange Meeting
TIM	Technical Interchange Meeting
U.S.	United States
WBS	Work Breakdown Structure
WSC	White Sands Complex

Appendix I. Glossary

Term	Description
LEGS Subnet	The network of antennas that provide global coverage of the cis-lunar and lunar region.
Partner Provided Ground station	A ground station in the LEGS Subnet that is not one of the Government provided antennas (LEGS 1 and LEGS 2)
LEGS Ground Station	A LEGS ground station consists of a dual X- and Ka-band antenna and associated signal processing, networking, cloud environment, M&C, and power and security equipment.
Antenna Subsystem (ANT)	The Antenna Subsystem is a part of each ground station. The antenna subsystem is composed of antenna components including but not limited to the reflector, feed, pedestal, Low Noise Amplifiers (LNA), and High-Power Amplifiers (HPA). It will also feature power and signal interfaces with all power and signal lines routed to a designated demarcation point for site integration.
Partner	The Partner is responsible for the design, development, and integration of the subsystems that interface with the Antenna Subsystem and the SPOC environment. The supporting system provides signal processing, timing and frequency coordination, and local monitor and control capabilities.
Local LEGS Operators	Operators who are physically located at a LEGS ground station and directly using the systems to manage and operate the ground station.
SCaN Program Operations Cloud (SPOC)	The SCaN Program Operations Cloud (SPOC) is a cloud-based platform developed under the Space Communications and Navigation (SCaN) program to modernize and streamline network service operations for NASA missions. SPOC provides a unified, virtualized environment that facilitates data transport, data storage, and network management.

Mission Control Center	The NASA HSF Mission Control Center - Houston (MCC-H), located at Johnson Space center in Houston Texas, is a specialized facility responsible for managing and overseeing space missions from launch through completion. Staffed by flight controllers and support personnel, MCC-H monitors spacecraft telemetry, issues commands, manages the mission orbit, and ensures the safety and success of missions. The Backup Control Center (BCC) is located at Marshall Space Flight Center at Redstone Arsenal, Alabama and serves as an alternate facility capable of assuming mission control operations if the primary MCC-H becomes unavailable. Note that the MCC-H and MCC terms are synonymous and used interchangeably.
Flight Dynamics Facility (FDF)	The Flight Dynamics Facility (FDF), located at the Goddard Space Flight Center in Greenbelt, Maryland, is a multi-mission support center that provides comprehensive flight dynamics services for various NASA missions. The FDF plays a critical role in mission planning and operations by determining spacecraft trajectories, planning maneuvers, and enabling accurate navigation throughout a mission's lifecycle.
NASA Managing Organization	The NASA organization or organizations that are specifically responsible for handling the activity or data referenced. This could be NASA Glenn, NASA Goddard, SCA, or NSN. Managing Organization is being used to represent a responsibility that has not had a final disposition confirmed.
Near Space Network (NSN)	The Near Space Network provides missions within one million miles of Earth with robust communications services. Using a blend of Government and commercial assets, the network supports science, human spaceflight, and technology demonstration missions exploring our planet and the solar system. This data is gathered through global direct-to-Earth antennas systems and a fleet of relay satellites.
End Users	These are the organizations who require services from the LEGS stations and interact with those stations via the SPOC environment.