

**ORGANIC INVENTORY FORM** (<https://go.nasa.gov/4nbzjrp>)

The existing MIUL can be used as a template to capture key organic compounds and estimated size bins (if actuals are unknown).

<b>Organic Inventory</b>	<b>Mission Name:</b>
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The Mission provides an itemized list of **bulk organic materials** (defined as: carbon-containing compounds *including* payload biological materials but *excluding* carbides, carbonates, cyanides and simple oxides of carbon [i.e., CO and CO<sub>2</sub>] presented at the same level as the MIUL materials list, as used on the flight hardware, estimated actual (in kg) for organic materials present in amounts larger than 1kg: “small amounts” for organic materials present in amounts between 1kg and 0.1kg, and; “traces” for identifiable organic materials present in amounts less than 0.1kg (Add more lines as needed for each line entry).

**1) Adhesives and Potting Compounds**

e.g., RTV/Silicones (DOW, Nusil, Hysol): polyurethanes such as arathane/solothane conformal coatings; epoxies such as Scotchweld, CFRP resin.

Material Name and Usage	Actual Amount (kg)	Small Amount	Traces
	0.0	<input type="checkbox"/>	<input type="checkbox"/>
	0.0	<input type="checkbox"/>	<input type="checkbox"/>

**2) Primers, Paints and Inks**

e.g., Aeroglaze, Chemglaze etc.

Material Name and Usage	Actual Amount (kg)	Small Amount	Traces
	0.0	<input type="checkbox"/>	<input type="checkbox"/>
	0.0	<input type="checkbox"/>	<input type="checkbox"/>

**3) Thermal Control Films**

e.g., Kapton, FEP Teflon, Betacoth

Material Name and Usage	Actual Amount (kg)	Small Amount	Traces
	0.0	<input type="checkbox"/>	<input type="checkbox"/>
	0.0	<input type="checkbox"/>	<input type="checkbox"/>

**4) Lubricants**

e.g., Braycote, Molybdenum Disulfide dry film

Material Name and Usage	Actual Amount (kg)	Small Amount	Traces
	0.0	<input type="checkbox"/>	<input type="checkbox"/>
	0.0	<input type="checkbox"/>	<input type="checkbox"/>

**5) Plastics and Elastomeric Materials**

e.g., Circuit board with PTFE GI polyimide resin (PWB) or PCB); Wiring Overwraps; Silicones Kapton (polyimide); PEI (polyether imide); ETFE (tefzel); Nylon (polyamide); PTFE (teflon); Heat Shrink; Polyolefin or Polyvinylidene Fluoride types; O-rings and seals with ethyl, propyl, butyl and Vitron Rubber; Fluorosilicone Electron Tape (polyester), EMI shielding including e.g., Vespel (SP-1).

Material Name and Usage	Actual Amount (kg)	Small Amount	Traces
	0.0	<input type="checkbox"/>	<input type="checkbox"/>
	0.0	<input type="checkbox"/>	<input type="checkbox"/>

**6) Tapes**

Adhesive Tapes are principally represented by kapton (polyimide), polyester, FEP and Teflon backings with acrylic or silicone adhesives

Material Name and Usage	Actual Amount (kg)	Small Amount	Traces
	0.0	<input type="checkbox"/>	<input type="checkbox"/>
	0.0	<input type="checkbox"/>	<input type="checkbox"/>

**7) Other**

A range of other materials will need to be included, including e.g., Lacing Tape and Cards, Thread, Fibers such as Nomex, Dacron Scrim Cloth (polyester); DAP, Ultem PEI, PPS bulk castings; Nylon (Polyamide) used in structures; fiber, Velcro and vibe pads; propellant (MMH, UDMH); payload biological materials (living or dead).

Material Name and Usage	Actual Amount (kg)	Small Amount	Traces
	0.0	<input type="checkbox"/>	<input type="checkbox"/>
	0.0	<input type="checkbox"/>	<input type="checkbox"/>

**8) Commodities and Fuel**

e.g., all constituents, oxidants and reductants - MMH; MMH, UDMH, peroxide NTO, cold gas etc.

Spacecraft Total Dry Mass (kg)					
Engine Type (e.g. mono, byprop)					
Engine Quantity					
Engine Thrust / Size (N)					
Key Reaction Products					
Material Name and Usage	Starting Quantity (kg)	Orbit Insertion Quantity (kg)	Landed Quantity (kg)	Propellant Utilization 100m from Surface (kg)	End of Mission Estimate (kg)
	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0



**REPORT THIS! A QUICK GUIDE TO PLANETARY PROTECTION ON THE MOON**



Planetary Protection (PP) is not merely a constraint; it is an enabler. It preserves scientific return, ensures Earth safety and provides a framework to encourage responsible exploration. As we enter a new era of crewed deep space missions and sample return, PP is essential to maintaining the trust, integrity and safety attributes that define NASA.

PP requirements for the Moon are surprisingly simple: **reporting is all that is needed**. This guide will help you determine how and what to report for lunar projects and programs.



**“The purpose of reporting is to serve as a first step to document lunar activities that future scientists can leverage as a reference to help contextualize tomorrow’s science findings.”**

### WHY DO WE NEED PLANETARY PROTECTION ON THE MOON?

Lunar research seeks to understanding prebiotic evolution and the origin of life. Spacecraft operations can pose a potential threat of **organic contamination** of permanently shadowed regions (PSRs). PP requirements enable responsible exploration as organic contaminants could result in impurities for water, fuel extraction and more.

Spacecraft landing on the lunar surface could transfer volatile particles to polar cold traps through vacuum venting, materials off gassing and thruster-induced plume interactions.

#### Lunar experts have concluded

- The lunar surface does not support life or the proliferation of terrestrial organisms brought to the Moon.
- Biological contamination of the lunar surface is not a concern for lunar science.

In short, **there are NO PP restrictions** on design, operations, landing sites, organic types/amounts or what you can bring back.

### INVENTORY REQUIREMENTS

#### Missions in lunar orbit (Category II)

- No inventory reporting required

#### Missions to the surface of the Moon (Category IIa or IIb)

- An inventory of propulsion products released into the lunar environment
- For missions to permanently shadowed regions or the lunar poles (N of 85N or S of 79S): an inventory of organic substances since there may be water ice there

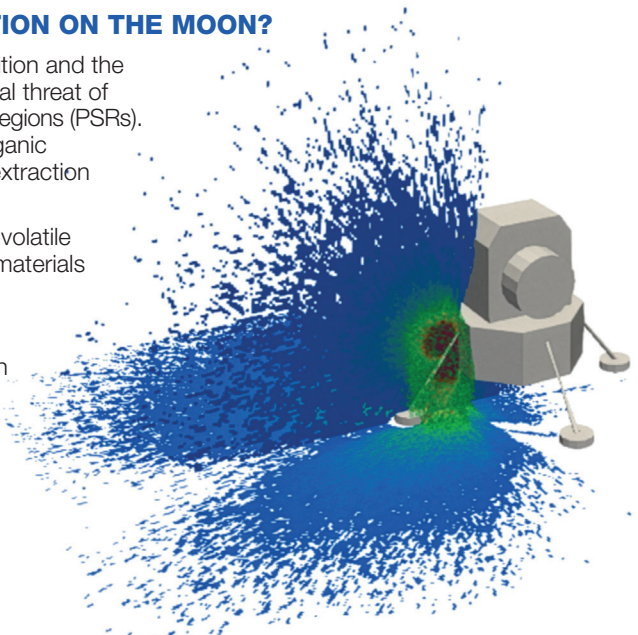
#### Missions with Earth return - Category V (unrestricted)

- No inventory reporting requirements

Category	Description	Volatiles Released by Propulsion System	Spacecraft Organic Inventory
II	Orbiter	–	–
IIa	Moon surface not IIb	Required	–
IIb	PSR and lunar poles	Required	Required

#### For all missions:

- There are no limits on the types or quantities of organics.
- Required reporting at pre-launch (estimate) and end of mission (updates or changes from pre-launch report) is sufficient.
- Programs and projects should include the end-of-mission disposition in the end-of-mission report. It is recommended that users record the location coordinates to the accuracy known, together with location images for disposal items (if available).



Example of gas venting near a landed vehicle, simulated with SPARTA/VSFP fellow Paula Gutierrez-Cascales

### REPORTING INTENT

The purpose of reporting is to serve as a first step to document lunar activities that future scientists can leverage as a reference to help contextualize tomorrow’s science findings. We cannot predict everything these scientists will need, but reporting provides a starting point.

Programs and Projects landing on the Moon must report propulsion volatile and/or organic materials used on the spacecraft depending on the targeted landing site. Reports should include an estimate of materials over 1kg. A simple template is available for use. Reports are archived for future reference with appropriate release sensitivities noted for proprietary and restricted information.

### YOU ALREADY HAVE THIS DATA!

Simplifying the reporting even further, most missions and programs likely already capture the information needed for PP purposes. This data is typically found in

- Material Usage and Information Lists (MIUL)
- Manifests
- Packing lists
- Contamination control analyses



### ADDITIONAL RESOURCES

- NASA STD 8719.27 Implementing Planetary Protection Requirements for Space Flight
- NPD 8700.1F NASA Policy for Safety and Mission Success
- NASA/SP-20240016475 Planetary Protection Handbook
- Article: New Lunar Reporting Forms Now Available to Fulfill Reporting Requirements
  - Organic inventory form (see back page)
  - Post-launch/end-of-mission template

Planetary Protection website

