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NASA Procedural Requirements

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Subject: Planetary Protection Provisions for Robotic Extraterrestrial Missions

Responsible Office: Science Mission Directorate

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CHAPTER 2. Requirements

2.1 General Mission Requirements

2.1.1 NASA Missions

a. Specific planetary protection requirements for each planned mission will be determined by the NASA PPO, in accordance with this document, and consistent with the policy and guidelines of the Committee on Space Research (COSPAR), recommendations of the Space Studies Board of the National Research Council (NRC), and advice from the NASA Advisory Council.

b. Requests for categorization of missions and associated mission requirements shall be submitted to the PPO during the mission design phase (before the completion of the draft Planetary Protection Plan) by the mission Project Manager. Such correspondence shall be accompanied by a mission description and shall include a request and justification for a specific mission categorization (a category-specific listing of target body/mission types is provided in Appendix A for guidance in preparing this request). The PPO will respond, in writing, with the appropriate categorization, conveying such explanatory information or supplemental conditions as may be appropriate. Subsequent approval of a mission's Planetary Protection Plan will constitute formal categorization of the mission.

2.1.2 Requirements for NASA Instruments on non-NASA or non-U.S. Missions

a. Planetary Protection guidelines also apply to the flight of NASA instruments and/or

experiments manifested on non-NASA or non-U.S. spacecraft. In general, NASA will approve the flight of NASA-developed instruments and/or experiments on non-U.S. planetary spacecraft only if the launching organization adheres to the COSPAR-approved planetary protection policy and its requirements.

b. For flight on non-NASA spacecraft, U.S. instruments and/or experiments will be delivered to the agency or project of the sponsoring organization or country in compliance with the applicable planetary protection requirements and in a fashion compatible with specified procedures and activities. Instrument projects anticipating flights on non-NASA spacecraft can receive preliminary guidance at any point by submitting a request to the PPO outlining the nature of the instrument(s) to be flown and details of the anticipated flight opportunity.

c. For non-U.S. spacecraft, the U.S. instrument/experiment developer shall submit a Planetary Protection Plan (consistent with the mission categorization) to the NASA PPO for approval. The plan shall define the planetary protection requirements to be implemented and outline the general procedures to be employed to meet those requirements. Instrument projects anticipating flights on non-NASA spacecraft can receive preliminary guidance by submitting a request to the PPO outlining the nature of the instrument(s) to be flown and details of the anticipated flight opportunity. During development and delivery of the instruments/experiments, monitoring of the implementation and certification of planetary protection requirements will be the sole responsibility of the agency or project of the sponsoring country. The NASA PPO may agree with the launching agency or project to share in or assume such responsibility by separate arrangement.

2.2 Implementation Requirements for U.S. Missions

A summary of implementation requirements is provided in Table 2.

Table 2. Summary of Planetary Protection Implementation Requirements by Mission Category

Mission Category	Implementation Requirements
I (Any)	Documentation only.
II (Any)	Documentation only.
III (Flyby, Orbiter)	Impact avoidance and contamination control including: cleanroom assembly, microbial reduction, trajectory biasing.
IV (Lander, Probe)	Impact avoidance and contamination control including: cleanroom assembly, microbial reduction, trajectory biasing, organics archiving.

V "Unrestricted Earth return"	As defined by appropriate outbound mission Category I-IV. No inbound planetary protection requirements.
"Restricted Earth return"	Impact avoidance and contamination control including: clean room assembly, microbial reduction, trajectory biasing, organics archiving, containment of sample, breaking chain of contact with target planet, sample containment and biohazard testing in receiving laboratory (continuing monitoring of project activities, pre-project advanced studies and research, as needed).

2.2.1 Category I Missions

Certification of a mission as Category I relieves a project of all further planetary protection requirements, including further documentation. Solar system missions/bodies classified as Category I are listed in Appendix A.

2.2.2 Category II Missions

The planetary protection requirements are for documentation only. Preparation of a brief Planetary Protection Plan is required for these flight projects in order to state intended or potential impact targets and detailing impact strategies. Projects will also provide Pre- and Post-Launch Reports and an End-of-Mission Report that will provide the location of impact, if such an event occurs. The combinations of solar system bodies and types of missions classified as Category II are listed in Appendix A.

2.2.3 Category III Missions

Planetary protection requirements will consist of documentation (more involved than Category II) and some implementing procedures, including trajectory biasing, the use of cleanrooms during spacecraft assembly and testing, and possibly microbial reduction. An inventory of bulk constituent organics is required if the probability of impact is considered significant. The combinations of solar system bodies and types of missions classified as Category III are listed in Appendix A. Detailed requirements and associated specification sheets for Category III missions to selected solar system bodies are set forth in Appendices A and B, respectively.

2.2.4 Category IV Missions

Planetary protection requirements include detailed documentation (more involved than Category III), including bioassays to enumerate the microbial burden, a probability of contamination analysis, an inventory of the bulk constituent organics, and an increased number of implementing procedures. These implementing procedures may include trajectory biasing, cleanrooms, microbial reduction, possible partial sterilization of the direct contact hardware and a bioshield for that hardware, and, in some instances,

system (lander/probe) sterilization. The combinations of solar system bodies and types of missions classified as Category IV are listed in Appendix A. Detailed requirements and associated specification sheets for Category IV missions to selected solar system bodies are set forth in Appendices A and B, respectively .

2.2.5 Category V Missions

This category comprises all Earth-return missions. The concern for these missions is the protection of the terrestrial system, the Earth and the Moon. The Moon must be protected from the potential for back contamination to retain freedom from planetary protection implementation requirements on Earth-Moon travel. For solar system bodies deemed by scientific opinion to have no indigenous life forms, a subcategory "Unrestricted Earth return" is defined. Missions in this subcategory have planetary protection requirements on the outbound phase only, corresponding to the category of that phase (typically Category I or II). Requests for categorization as "Unrestricted Earth return" must be submitted to the PPO by the Project Manager when mission categorization is requested. After discussions with the PPO, a memorandum will be submitted by the PPO to the Science Associate Administrator requesting "Unrestricted Earth return" certification for the mission. For all other Category V missions, in a subcategory defined as "Restricted Earth return," the highest degree of concern is expressed by the prohibition of destructive impact upon return, the need for containment throughout the return phase of all returned hardware which directly contacted the target body and/or any unsterilized material from the body, and the need for containment of any unsterilized sample collected and returned to Earth. After the flight mission there is a need to conduct, under strict containment and using the most effective techniques, timely analyses of the unsterilized sample collected and returned to Earth. If any sign of a non-terrestrial replicating entity is found, the returned sample must remain contained unless treated by an effective sterilizing procedure. Category V concerns are reflected in requirements that encompass those for Category IV plus the continued monitoring of related project activities, studies, and research. Documentation requirements are detailed in 2.3.1 through 2.3.6. Specific Category V requirements for selected solar system bodies are included in Appendix A.

2.3 Planning and Documentation

2.3.1 Planetary protection documents shall be prepared as part of the formal documentation for the project and shall be submitted via the applicable Program Executive to the PPO for approval. Schedules for drafts and submission of the required documentation for all mission categories are detailed in 2.6. A summary of planning and documentation requirements is presented in Table 3.

Table 3. Planning and Documentation Requirements by Mission Category

Mission Category	Planning and Documentation
I (Any)	1. Certification of Category I mission, only
II (Any)	1. Planetary Protection Plan 2. Pre-Launch Planetary Protection Report 3. Post-Launch Planetary Protection Report 4. End-of-Mission Report

III (Flyby, Orbiter)	<ol style="list-style-type: none"> 1. Planetary Protection Plan 2. Pre-Launch Planetary Protection Report 3. Post-Launch Planetary Protection Report 4. Organics Inventory 5. End-of-Mission Report
IV (Lander, Probe)	<ol style="list-style-type: none"> 1. Planetary Protection Plan 2. Pre-Launch Planetary Protection Report 3. Post-Launch Planetary Protection Report 4. End-of-Mission Report 5. Organics Inventory

Table 3. Planning and Documentation Requirements by Mission Category (cont.)

Mission Category	Planning and Documentation
V "Unrestricted Earth return" "Restricted Earth return"	<ol style="list-style-type: none"> 1. Documentation for outbound phase 2. Certification of Unrestricted Earth return <ol style="list-style-type: none"> 1. Planetary Protection Plan including outbound phase and Earth Safety Analysis Plan 2. Pre-Launch Planetary Protection Report 3. Post-Launch Planetary Protection Report 4. Earth Pre-Entry Report 5. Sample Pre-Release Report 6. End-of-Mission Report

2.3.2 In addition to the above, any mission other than Category I intending to enter an extended mission period (*beyond the mission duration approved in the Planetary Protection Plan*) must submit a Planetary Protection Extended Mission Report, analogous to a Pre-Launch Report, on a schedule per 2.6. In this document, the status of planetary protection compliance during the flight mission and the health of the spacecraft must be reviewed and summarized. The demonstration of compliance with all applicable planetary protection requirements during the extended mission and the results of any necessary analysis for the extended mission must also be provided.

2.3.3 Summary Documentation Requirements

a. Category I missions:

(1) Certification of mission as Category I relieves a project of all further planetary protection requirements.

b. Category II missions:

- (1) A Planetary Protection Plan outlining intended or potential impact targets.
- (2) Brief Pre- and Post-Launch Planetary Protection Reports detailing impact avoidance strategies.
- (3) End-of-Mission Report providing the final actual disposition of launched hardware and impact location.

c. Category III missions:

- (1) A Planetary Protection Plan that details the planned approach to compliance with planetary protection requirements, including subsidiary plans.
- (2) A Pre-Launch Planetary Protection Report which documents that all requirements have been met (note that an inventory of bulk constituent organics, if the probability of impact is significant, must be included in the Pre-Launch Planetary Protection Report).
- (3) A Post-Launch Planetary Protection Report that updates the Pre-Launch Planetary Protection Report.
- (4) An End-of-Mission Report which provides a complete report of compliance, the final actual disposition of launched hardware, and, in the case of accidental impact, the probable location of impact and its region of uncertainty.

d. Category IV missions:

- (1) A Planetary Protection Plan that details the planned approach to compliance with the implementation requirements (e.g., mission description, probability estimates, microbial burden estimates, contamination analysis plan, assay plan, microbial reduction plan).
- (2) A Pre-Launch Planetary Protection Report that documents the degree to which all requirements have been met and that must include the values of the microbial burden at launch and the organics inventory.
- (3) A Post-Launch Planetary Protection Report that updates the Pre-Launch Planetary Protection Report.
- (4) An End-of-Mission Report that provides a complete report of compliance and the final disposition of all launched hardware.
- (5) An inventory of bulk constituent organics that includes:
 - (i) Parts lists, material lists, and other program documentation containing data relevant to organic material identification that are prepared by a flight project to specify and control the materials that are included in a vehicle destined for planetary landing.
 - (ii) The locations of landings and impact points (determined and defined as accurately as mission constraints permit) of major components of space vehicles on the planet surface,
 - (iii) Estimates of the condition of each landed spacecraft to assist in calculating the spread of organic materials.

e. Category V missions. Missions categorized as "Unrestricted Earth return" have outbound phase requirements, only (see above). Missions categorized as "Restricted Earth return" require:

- (1) A Planetary Protection Plan, including outbound phase requirements, if any, and an Earth Safety Analysis Plan.
- (2) A Pre-Launch Planetary Protection Report, including outbound phase requirements, if any, that must document the degree to which all Earth-return requirements to be attained prior to launch have been met.
- (3) A Post-Launch Planetary Protection Report, including outbound phase requirements, if any, to update the Pre-Launch Planetary Protection Report with respect to Earth-return requirements.
- (4) After sample collection, a report analogous to the outbound phase launch reports: i.e., an Earth Pre-Launch Report.
- (5) An Earth Pre-Entry Report demonstrating readiness to enter the Earth's atmosphere in compliance with planetary protection requirements.
- (6) An End-of-Mission Report to address compliance with requirements for the protection of the Earth's biosphere and detailing the transfer of the samples to an appropriate containment facility.
- (7) A Sample Pre-Release Report to provide verification of sample analysis procedures subsequent to the End-of-Mission and demonstrating that any planned sample release will not harm the Earth's biosphere.

2.3.4 Planetary Protection Plan (Categories II-V)

2.3.4.1 General Outline

a. Except for Category I missions, each planetary flight project shall prepare a Planetary Protection Plan according to the schedule outlined in 2.6. The Planetary Protection Plan shall be the primary planning document describing how a planetary flight project will meet its planetary protection requirements. The Planetary Protection Plan shall indicate planned conformance to those requirements and shall include, as a minimum, the items given in the following outline (see below). It is recognized that each project will prepare various other documents that may adequately cover some of the topics in the outline (e.g., the Project Plan may thoroughly cover the subject of Planetary Protection Management). In such instances, it is suggested that the Planetary Protection Plan include only the major aspects of the topic and that free reference be made to the basic project documents that provide specificity.

b. The Planetary Protection Plan shall include, but is not limited to, the items given in the following outline:

A. General

(1) Introduction

(2) NASA Planetary Protection Constraints

a. Designation of Mission Category

b. Planetary Protection Specifications

B. Planetary Protection Management and Organization

(1) Organization Description

(2) Responsibilities and Relationships

(3) System Interface Management

(4) Contractor Management

(5) Data Management

C. Documentation

(1) Identification of References and Applicable Documents

D. Facilities

(1) Identification and Description of Controlled Facilities

(2) Activities Performed

(3) Hardware Affected

E. Schedules

(1) Identification of Milestones

(2) Preliminary Schedules

In addition, the following subsidiary plans shall be prepared when required for the particular category assigned:

(1) Contamination Analysis Plan

(2) Microbiological Assay Plan

(3) Microbial Reduction Plan

(4) Earth Safety Analysis Plan

c. The following paragraphs address specific Category II-V Mission Planning and Documentation requirements.

(1) For Category II missions, sections B (Planetary Protection Management and Organization) and D (Facilities) of the Planetary Protection Plan may be omitted. No subsidiary plans are required.

(2) For Category III missions, all of the items listed in 2.3.4.1.b. A thru E shall be included. Subsidiary plans shall be provided as appropriate. Probability of impact and planned contamination control procedures shall also be directly addressed in the Planetary Protection Plan for Category III missions. If the mission involves an orbiter, the minimum planned periapsis altitude and planned final disposition of the hardware shall be noted.

(3) For Category IV missions, all of the items listed in 2.3.4.1.b. A thru E describing the Planetary Protection Plan must be addressed. In addition, the Contamination Analysis Plan and the Microbiological Assay Plan (subsidiary plans) are required. If any microbial reduction procedures are contemplated, the Microbial Reduction Plan is also required. These subsidiary plans are described in 2.3.5.

(4) Planning and documentation requirements for Category V missions, including

required subsidiary plans, are described in 2.3.9.

2.3.5 Detailed Description of Subsidiary Plans (Categories III-IV)

2.3.5.1 Contamination Analysis Plan (Categories III and IV)

a. This document shall be the primary planning document covering the major analyses that are performed by the project and ultimately used to demonstrate to the PPO that the project is meeting the planetary protection requirements on microbial burden.

b. This plan should include, but not be limited to, the items given in the following outline:

A. General

(1) Introduction

(2) Rationale and Assumptions

B. Potential Contaminating Sources

C. Microbial Burden Estimate Model

(1) Contamination Sources Analysis

a. Analytical Techniques

b. Assumptions

c. Substantiation of Parameter Values

(2) Allocation Model

a. Systems Allocations (Spacecraft, Launch Vehicle, etc.)

b. Subsystem and Lower Level Allocations

D. Analysis Documentation

2.3.5.2 Microbiological Assay Plan (Category IV)

a. The Microbiological Assay Plan shall identify the space vehicle hardware, facilities, and associated environments which are subject to microbiological assay and shall describe the rationale, concepts, and detailed procedures pertaining to such assays. The plan shall describe the microbiological quality assurance procedures used to ensure validity of the assay results.

b. The plan shall include, but not be limited to, the items given in the following outline:

A. General

(1) Introduction

(2) Rationale and Assumptions

B. Assay Methods

(1) Utilization of NPR 5340.1, NASA Standard Procedures for the Microbiological Examination of Space Hardware. Alternative procedures, consistent with mission and life detection objectives, may be proposed by the Project for approval by the

PPO.

(2) Laboratory Assay Procedures

(3) Sampling Procedures

(4) Provision for Verification Assays

(5) Quality Assurance Provisions

C. Facilities

(1) Controlled Facilities

a. Assay Laboratories

b. Hardware Areas

(2) Uncontrolled Facilities

a. Monitoring

b. Environmental Estimates

D. Space Hardware (Flight) Assay and Control

(1) Identification

(2) Hardware Exceptions

(3) Contingency Planning

E. Assay Data

(1) Traceability

(2) Analysis and Interpretation

(3) Management and Handling

2.3.5.3 Microbial Reduction Plan (Category IV)

a. A Microbial Reduction Plan shall be submitted for planetary missions involving hardware elements that must have their microbial burden reduced to a specified or measured (assayed) level.

b. The Microbial Reduction Plan shall include, but not be limited to, the items in the following outline.

A. General

(1) Introduction

(2) Rationale and Assumptions

B. Spacecraft Hardware Subject to Microbial Reduction Processes

(1) Identification

(2) Exceptions

C. Process Analysis

- (1) Analytical Techniques
- (2) Assumptions
- (3) Process Parameters
- (4) Process Modification

D. Process Verification and Control

- (1) Process Description and Boundaries
- (2) Process Qualification
- (3) Equipment and Facilities Qualification
- (4) Acceptance Criteria
- (5) Process Interruption and Modification
- (6) Quality Assurance Provisions

E. Maintaining Reduced Microbial Level

- (1) Monitoring/Assaying
- (2) Using Microbial Barriers
- (3) Controlling Macro-organisms (Insect, Animal, etc.)
- (4) Contingency Planning

2.3.6 Pre-Launch Planetary Protection Report (Category II-V)

2.3.6.1 General Report Requirements

a. The Pre-Launch Report is the basic document used by a flight project to provide verification to the PPO that planetary protection requirements have been met (to the issue date of the document) and that the project will continue to satisfy planetary protection requirements throughout the mission.

b. This document shall include, but not be limited to, the following information. This information may be included as a part of the document or referenced in the document. Reference documents may be submitted to the PPO as they are published. The following information is required:

- (1) A demonstration that all planetary protection constraints and requirements as noted in the Planetary Protection Plan will be met.
- (2) Identification of all approved planetary protection deviations (see 2.4) from the Planetary Protection Plan.
- (3) Summaries of potentially significant violations of planetary protection requirements or procedures that could occur and thorough discussion of contingency planning associated with each potential event.

2.3.6.2 Mission Category Specific Requirements

- a. For Category II missions, a report on any required contamination control measures shall be provided.
- b. For Category III missions, the following information shall be provided:
 - (1) Calculations of microbial burden estimates.
 - (2) Report on required contamination control measures.
 - (3) Calculations of probability of impact.
 - (4) Organic materials inventory.
- c. If the mission involves the use of hardware subject to microbial reduction processes, the verification that such processes have been properly applied shall be included. If the mission involves an orbiter as part of the launched hardware, the issue of orbital lifetime shall also be addressed.
- d. For Category IV missions, the requirements include the same information as for Category III. Additionally, information must be provided detailing the microbial reduction procedures employed and documentation supporting the results of the process.

2.3.7 Post-Launch Planetary Protection Report (Category II-V)

After the launch of a planetary vehicle, the flight project shall submit to the PPO a

"Post-Launch Planetary Protection Report." This shall be a brief summary document based on the "Pre-Launch Planetary Protection Report" but updated to include the effects of launch and early post-launch events. It shall demonstrate compliance with the overall planetary protection requirements through these early mission events.

2.3.8 End-of-Mission Report (Category II-V)

- a. At the formally declared "end-of-mission," a report shall be provided which documents the degree to which the mission has met the planetary protection requirements throughout the complete mission and reports the final disposition of all launched hardware. For the record, the report shall also document instances where planetary protection requirements were not fully met, including reasons for any deviations and the projected consequences to the degree they are known.
- b. For all Category II and III missions, an inventory of organic materials must also be provided in the End-of-Mission Report for any spacecraft hardware which unintentionally impacted any solar system body.

2.3.9 Category V Missions, Planning, and Documentation

2.3.9.1 Outbound Phase

For the outbound phase of Category V missions, the planning and documentation requirements are those appropriate to the mission if there were no Earth-return phase.

2.3.9.2 Inbound Phase

Earth-return missions certified for "Unrestricted Earth return" have no formal implementation requirements. Missions certified "Restricted Earth return" will complete the following plans:

- a. Earth Safety Analysis Plan

The Earth Safety Analysis Plan shall be the primary planning document covering the Earth-return portion of the mission. Its purpose is to demonstrate to the PPO that the project is meeting its planetary protection requirements. This plan shall include, but not be limited to, the items given in the following outline:

A. General

(1) Identification

(2) Rationale and Assumptions

B. Potential Contaminating Sources

(1) Sample Containment Approach

(2) Decontamination Approach (if required)

(3) Earth Entry Plan

C. Probability of Contamination Model

(1) Mission Probability of Contamination Equation

(2) Critical Parameters

(3) Contamination Sources Analysis

a. Analytical Techniques

b. Assumptions

c. Substantiation of Parameter Values

(4) Probability of Contamination Allocation Model

a. Level of Risk (provided to the Project by the PPO)

b. System Allocations (Return Capsule, Return Vehicle, etc.)

D. Analysis Documentation

b. Earth Pre-Return Report

The "Earth Pre-Return Report" is a document patterned after the Planetary Protection Plan used by a flight project to provide verification to the PPO that planetary protection requirements outlined in the Earth Safety Analysis Plan have been met and that the project can and will continue to satisfy them throughout the Earth-Return portion of the mission.

c. Earth Pre-Entry Report

After the launch of the Earth-return portion of the mission, the flight project shall submit to the PPO an "Earth Pre-Entry Report." This shall be a document that updates the "Earth Pre-Return Report," to include the effects of launch and early post-launch events. It shall indicate how the mission meets the overall planetary protection requirements.

d.. End-of-Mission Report

In addition to the information provided consistent with outbound phase requirements, at

the formally declared "end-of-mission," a report shall be provided which documents the degree to which the mission has met its planetary protection requirements through landing and delivery of sample to containment in a Sample Receiving Facility. Special attention shall be paid to the Earth's biosphere safety requirements of the mission.

e. Sample Pre-Release Report

Before an extraterrestrial sample is released to the general scientific community for investigation, a "Sample Pre-Release Report" shall be prepared certifying that, if released, the sample will not harm the Earth's biosphere. This report verifies that biohazard and life detection protocols have been executed and that samples are free of hazard to the Earth's biosphere and are, therefore, safe for release.

2.4 Requests for Deviations

a. Deviations from the requirements of this NPR may be requested by proposing alternative(s) in distinct and separately identified part(s) of the Planetary Protection Plan (or other applicable subsidiary plan). Approval of the Planetary Protection Plan by the PPO will constitute written approval of proposed deviations so incorporated.

b. Deviations that are requested subsequent to the formal approval of the Planetary Protection Plan (or other applicable subsidiary plans) may be obtained by petitioning the PPO in writing. Such petitions shall be transmitted via established program management channels. Requests shall describe the need for a deviation and the justification to support the request. Such requests shall include the impact of the requested change on the original analyses and resulting changes, if any, in the category of the mission. The degree of compliance with all requirements shall be addressed. This requirement also applies to post-launch changes (see 3.1.5.2). The PPO will respond, in writing, to each request. Changes involving major deviations within Category V will require approval by the Science Associate Administrator. Each approved deviation shall be documented separately, for the record, in the End-of-Mission Report.

2.5 Reviews

2.5.1 General

a. For Categories III, IV, and V (Restricted Earth return) several reviews will be held to assure that planetary protection activities are proceeding properly. At a minimum, these will include the reviews listed in Table 4. Additional formal and informal reviews may be held as warranted and as requested by the PPO.

b. Generally, it is intended that formal planetary protection reviews be scheduled near the dates of project reviews or other technical reviews. Alternatively the formal Planetary Protection reviews specified (see Table 4) may be incorporated as a segment of a broader project review.

c. The PPO or designee shall be in attendance at these reviews.

Table 4. Planetary Protection Review Requirements

Mission Category	Required Review
I (Any)	None
II (Any)	Project Planetary Protection Review (PPO Option)

III (Flyby, Orbiter)	<ol style="list-style-type: none"> 1. Project Planetary Protection Planning Review 2. Pre-Launch Planetary Protection Review 3. Launch Readiness Review
IV (Lander, Probe)	<ol style="list-style-type: none"> 1. Project Planetary Protection Planning Review 2. Pre-Launch Planetary Protection Review 3. Launch Readiness Review
V "Unrestricted Earth return" "Restricted Earth return"	<p>No further reviews beyond those levied for outbound phase of the mission as appropriate (see categories I-IV)</p> <ol style="list-style-type: none"> 1. Project Planetary Protection Planning Review 2. Pre-Launch Planetary Protection Review 3. Launch Readiness Review 4. Earth Return Pre-Launch Review 5. Earth Safety Analysis Review 6. Returned Sample Release Review

2.5.2 Project Planetary Protection Planning Review (Categories II-V)

a. At the request of either the PPO or the project's authorized representative, a Planetary Protection Planning Review may be held when the draft version of the project's Planetary Protection Plan and the subsidiary plans are near completion. The purpose of conducting this review at this time is to enable the PPO to suggest such changes to the project's planetary protection planning as are necessary for the formal version of the Planetary Protection Plan to be approved without major change or delay.

b. The content of this review will be developed from discussions between the PPO and various organizational elements of the project. Action items which may result from this review shall be tracked and closed out by the same procedures the project uses for resolving action items resulting from other formal technical reviews. The PPO may require that all action items resulting from this review be closed out before formal approval of the Planetary Protection Plan. Approval of the mission's Planetary Protection Plan constitutes formal categorization of the mission for planetary protection purposes.

2.5.3 Pre-Launch Planetary Protection Review (Categories III-V)

Prior to launch, a "Pre-Launch Planetary Protection Review" shall be conducted for all missions assigned to Categories III, IV, and V. The PPO shall conduct this review to ascertain whether a project has, to that date, met its planetary protection requirements. As a part of this review, the PPO will also examine, in detail, the planetary protection activities accomplished prior to this review as well as those remaining prior to launch. The "Pre-Launch Planetary Protection Report" (see 2.3.3) shall form the framework for this review.

2.5.4 Launch Readiness Review (Categories III-V)

Various events detrimental to planetary protection could occur subsequent to the Pre-Launch Planetary Protection Review and prior to actual launch of the vehicle. In order to ensure that planetary protection requirements continue to be met, the PPO (or designated alternate) shall participate in the project's formal Launch Readiness Review, the agenda of which shall include planetary protection as a topic. Significant planetary protection events, problems, changes, open action items, etc., that have occurred since the Pre-Launch Planetary Protection Review, shall be addressed.

2.5.5 Earth Return Pre-Launch Review (Category V, "Restricted Earth return")

Prior to launch of the Earth return portion of a Category V mission, an Earth Return Pre-Launch Review shall be conducted for all missions assigned to Category V. The PPO shall conduct this review to ascertain that a project has, to that date, met its planetary protection requirements. As a part of this review, the PPO will also examine, in detail, the planetary protection activities accomplished prior to this review as well as those remaining prior to launch. The formally released edition of the "Earth Pre-return Report" (see 2.3.9.2.b) shall form the framework for this review.

2.5.6 Earth Safety Analysis Review (Category V, "Restricted Earth return")

Prior to committing a spacecraft to the Earth return portion of its mission, the PPO shall conduct an Earth Safety Analysis review to determine whether all planetary protection requirements have been met and will continue to be met throughout the duration of the mission. The formally released document "Earth Safety Analysis Plan" (see 2.3.9.2.a), as updated by the Earth Pre-Entry Report (see 2.3.9.2c), shall form the framework for this review.

2.5.7 Returned Sample Release Review (Category V- Restricted Earth return)

Prior to release of an extraterrestrial sample, or portions of the sample, for study elsewhere, the PPO shall conduct a returned Sample Release Review. This review is to ascertain that all planetary protection requirements, including the execution of prescribed life detection and biohazard protocols have been met. The formally released document "Sample Pre-Release Report" (see 2.3.9.2.e), or an appropriate subset, shall form the framework for the review.

2.6 Schedules of Documentation and Review

Table 5 shows the schedule of planetary protection related documents. It is intended that the established dates be designated "control items" to be reported in the monthly Project Management Reports. The exact dates consistent with the schedule will be determined in a manner agreeable to both PPO and Project Management and will be documented in the Planetary Protection Plan.

Table 5. Planetary Protection Documentation Schedule

Report	Required Schedule
Mission Certification	Request for certification to PPO no later than end of Phase A.

Planetary Protection Plan	Project-approved draft complete no later than end of Project's Conceptual Study Phase (Phase B). Release no later than Project's Preliminary Design Review (PDR).
Subsidiary Plans	Project-approved draft no later than 3 months after completion of draft Planetary Protection Plan. Release of all Subsidiary Plans before, or in conjunction with, the Project's Critical Design Review (CDR).
Certification for "Unrestricted Earth return"	No later than the end of Phase A.
Pre-Launch Planetary Protection Report	No later than 90 days prior to the scheduled launch.
Extended Mission Planetary Protection Report (if applicable)	No later than 60 days prior to scheduled end of the mission per the Planetary Protection Plan.
Post-Launch Planetary Protection Report	No later than 60 days after actual launch.
Earth Pre-Return Report	Release prior to the Earth Return Pre-Launch Review.
Earth Pre-Entry Report	Release prior to the Earth Safety Analysis Review
End-Of-Mission Report	No later than 60 days after the formally declared "End-of-Mission."
Sample Pre-Release Report (may be released in sections)	Release prior to the Returned Sample Release Review and any release of sample material.

2.6.1. Reviews

A summary of the required review schedule is presented in Table 6.

Table 6. Planetary Protection Review Schedule

Review	Schedule
Planetary Protection Plan	Review within 60 days of draft release.
Subsidiary Plans	Review within 60 days of draft release.

Pre-Launch Planetary Protection Review	No later than 90 days or earlier than 120 days prior to earliest scheduled launch date.
Launch Readiness Review	Project scheduled review.
Earth Return Pre-Launch Review	No earlier than 30 day or later than 7 days prior to earliest scheduled return launch date.
Earth Safety Analysis Review	No earlier than 30 days or later than 7 days prior to commencement of Earth-commit trajectory.
Returned Sample Release Review (may be done in separate segments)	Following completion of the life detection and biohazard testing prescribed by the planetary protection protocols and prior to release of sample material from containment.

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