Program Description
Animal Care and Use Program

National Aeronautics and Space Administration (NASA)

John F. Kennedy Space Center (KSC)

Space Station Processing Facility
Mail Code: TOSC-313
Kennedy Space Center, Florida 32899
April 1, 2020

For
AAALAC International

Table of Contents

Section 1. Introduction 1
Section 2. Description 7
I. Animal Care and Use Program 7
A. Program Management 7
1. Program Management Responsibility 7
a. The Institutional Official 7
b. Role of the Attending Veterinarian 7
c. Interinstitutional Collaborations 8
2. Personnel Management 9
a. Training, Education, and Continuing Educational Opportunities 9
i. Veterinary and Other Professional Staff 9
ii. Animal Care Personnel 10
iii. The Research Team 10
b. Occupational Health and Safety of Personnel 13
i. Institutional Oversight 13
ii. Standard Working Conditions and Baseline Precautions 16
1) Medical Evaluation and Preventive Medicine for Personnel 16
2) Personnel Training Regarding Occupational Health and Safety 18
3) Personal Hygiene 19
4) Standard Personnel Protection 20
iii. Animal Experimentation Involving Hazards 24
B. Program Oversight 28
1. The Role of the IACUC/OB 28
a. IACUC/OB Composition and Function 28
b. Protocol Review 28
c. Special Considerations for IACUC/OB Review 30
i. Experimental and Humane Endpoints 30
ii. Unexpected Outcomes that Affect Animal Well-being 31

iii. Physical Restraint 31
iv. Multiple Survival Surgical Procedures 32
v. Food and Fluid Regulation 32
vi. Use of Non-Pharmaceutical-Grade Drugs and Other Substances 33
vii. Field Investigations 33
viii. Animal Reuse 33
2. Post-Approval Monitoring 34
3. Investigating and Reporting Animal Welfare Concerns 35
4. Disaster Planning and Emergency Preparedness 35
II. Animal Environment, Housing and Management 36
A. Animal Environment 36
1. Temperature and Humidity 36
2. Ventilation and Air Quality 37
3. Life Support Systems for Aquatic Species 38
4. Noise and Vibration 39
B. Animal Housing 39
1. Primary Enclosures 39
2. Environmental Enrichment, Social, and Behavioral Management 40
a. Environmental Enrichment 40
b. Social Environment 41
c. Enrichment, Social and Behavioral Management Program Review 41
d. Procedural Habituation and Training of Animals 42
e. Sheltered or Outdoor Housing 42
f. Naturalistic Environments 42
C. Animal Facility Management 43
1. Husbandry 43
a. Food 43
b. Drinking Water 45
c. Bedding and Nesting Materials 45

d. Miscellaneous Animal Care and Use Equipment 46
e. Sanitation 46
i. Bedding/Substrate Change 46
ii. Cleaning and Disinfection of the Micro- and Macro-Environments 47
f. Conventional Waste Disposal 47
g. Pest Control 48
h. Weekend and Holiday Animal Care 49
2. Population Management 49
a. Identification 49
b. Breeding, Genetics, and Nomenclature 50
III. Veterinary Care 50
A. Animal Procurement and Transportation 50
1. Animal Procurement 51
2. Transportation of Animals 51
B. Preventive Medicine 52
1. Animal Biosecurity 52
2. Quarantine and Stabilization 52
3. Separation by Health Status and Species 53
C. Clinical Care and Management 54
1. Surveillance, Diagnosis, Treatment and Control of Disease 54
2. Emergency Care 56
3. Clinical Record Keeping 56
4. Diagnostic Resources 57
5. Drug Storage and Control 57
D. Surgery 58
1. Pre-Surgical Planning 58
2. Surgical Facilities 59
3. Surgical Procedures 60
4. Aseptic Technique 60
5. Intraoperative Monitoring 61

6. Postoperative Care 62
E. Pain and Distress 62
F. Anesthesia and Analgesia 62
G. Euthanasia 64
IV. Physical Plant 64
A. Facilities Overview 64
B. Centralized (Centrally-Managed) Animal Facility(ies) 65
C. Satellite Animal Housing Facilities 67
D. Emergency Power and Life Support Systems 68
1. Power 68
2. Other System Malfunctions. 68
E. Other Facilities 68
1. Other Animal Use Facilities 68
2. Other Animal Program Support Facilities 69

Appendices

Appendix 1: Glossary of Abbreviations and Acronyms
Appendix 2: Summary of Animal Housing and Support Sites
Appendix 3: Line Drawings
Appendix 4: Organizational Chart(s)
Appendix 5: Animal Usage
Appendix 6: Personnel Medical Evaluation Form
Appendix 7: IACUC/OB Membership Roster
Appendix 8: IACUC/OB Meeting Minutes
Appendix 9: Blank IACUC/OB Protocol Form
Appendix 10: IACUC/OB Periodic Program Review and Facility Inspection Report
Appendix 11: Heating, Ventilation and Air Conditioning (HVAC) System Summary
Appendix 12: Aquatic Systems Summary – Part I & II
Appendix 13: Primary Enclosures and Animal Space Provisions
Appendix 14: Cleaning and Disinfection of the Micro- and Macro-Environment
Appendix 15: Facilities and Equipment for Sanitizing Materials
Appendix 16: Lighting Summary
Appendix 17: Satellite Housing Facilities
Appendix 18: Cephalopod Oversight

Program Description

Section 1. Introduction

A. State the name of the program unit and, if applicable, its parent organization. List all organizations (schools, centers, etc.) included within the program unit.

The name of the program unit is the National Aeronautics and Space Administration (NASA), John F. Kennedy Space Center (KSC). The Space Station Processing Facility (SSPF) Science Annex (SA) is the housing facility.

B. Give a brief overview of the institution, its purpose and how the animal care and use program relates to the mission of the institution.

The animal care program is managed under the direction of the NASA KSC Exploration Research and Technology Programs (ER&T Directorate). The program unit provides support to biological experiments scheduled for flight on space craft and International Space Station (ISS) missions, ground research, and wildlife environmental research studies. The program provides visiting Principal Investigators (PIs) with a wide variety of preflight, in-flight, and postflight ground support capabilities and services. Areas of support may include, but are not limited to, the following: laboratory and analytical support; biospecimen housing and care; veterinarian services; surgery; data collection; equipment checkout and repair.

C. Note that AAALAC International's three primary standards are *the Guide for the Care and Use of Laboratory Animals* (*Guide*), NRC, 2011; the *Guide for the Care and Use of Agricultural Animals in Research and Teaching* (*Ag Guide*), FASS, 2010, and the European Convention for the Protection of Vertebrate Animals Used for Experimental and Other Scientific Purposes, Council of Europe (ETS 123). Other regulations (pertinent local and national regulations) and guidelines used (U.S. Department of Agriculture (USDA), Public Health Service (PHS) Policy, Good Laboratory Practice (GLP), Canadian Council on Animal Care (CCAC), etc.) may also apply. Describe which of the three primary standards and other regulations and guidelines are used as standards for the institutional animal care and use program and how they are applied. For example, an academic institution in the United States with an Office of Laboratory Animal Welfare (OLAW) Assurance may use the standards of the *Guide* and PHS Policy for all animals, the Animal Welfare Act regulations for covered species, and the *Ag Guide* for agricultural animals used in agricultural research and teaching (see also *Guide*, pp. 32-33). In the European Union, the standards applied might be the *Guide*, ETS 123, Directive 2010/63, and any country-specific regulations.

The NASA KSC Animal Care Program utilizes the Guide for the Care and Use of Laboratory Animals, the United States Department of Agriculture (USDA) Animal Welfare

Act (AWA), and the Public Health Service (PHS) Policy, CFR Title 14 Chapter V Part 1232 Care and Use of Animals in the Conduct of NASA Activities, NPD 8910.1 Care and Use of Animals, and NPR 8910.1 Care and Use of Animals as the primary standards for the institutional animal care and use program.

D. Describe the organization and include an accurate, current, and detailed organizational chart or charts (see **Appendix 4**) detailing the lines of authority from the Institutional Official to the Attending Veterinarian, the Institutional Animal Care and Use Committee/Oversight Body (IACUC/OB), and the personnel providing animal care. Please include the title, name (*Note:* For individuals whose information is publically available, provide the titles and names; for individuals whose information is not publically available, you may provide titles only.), and degree (if applicable) of each individual at the level of supervisor or above. Names of animal care staff below the title of supervisor need not be included, but the titles and number of animal care personnel under each supervisor should be included. If animal care responsibility is administratively decentralized, including the management of satellite housing areas/locations, the organizational chart or charts must include all animal care programs, indicating the relationship between each administrative unit and personnel, the Attending Veterinarian, and the Institutional Official.

NASA is involved in a wide spectrum of animal research activities, coordinated through its Headquarters in Washington, D.C. These activities are typically managed through private industry and academia and directed to various NASA Field Centers. One of these Centers, the KSC, accepts these animal research packages ready for testing or prepared for actual space flight activities on the space craft or on the ISS. These research activities are accompanied to KSC by the PIs who prepare them for loading on the space craft for space flight. In addition, NASA KSC funds wildlife animal research activities conducted at KSC. The KSC organization consists of the Institutional Official (IO) who is the Associate Center Director of KSC and an Institutional Animal Care and Use Committee (IACUC) appointed by the IO. The NASA KSC IACUC is principally concerned with the care and use of the animals while on KSC property, funded by NASA KSC, or supported by NASA KSC resources, while the science activity, activities conducted within the spacecraft, and in-flight activity is under the purview of the NASA Flight IACUC (NASA Headquarters), according to NASA policy directives. Animal program support is provided by a NASA KSC services support contract. The KSC organizational outline is included in the Appendix 4 – Organizational Charts.

E. Identify the key institutional representatives (including, but not limited to, the Institutional Official; IACUC/OB Chairperson; Attending Veterinarian; animal program manager; individual(s) providing biosafety, chemical hazard, and radiation safety oversight; etc.); and individuals anticipated to participate in the site visit.

F. Briefly describe the major types of research, testing, and teaching programs involving animals and note the approximate number of principal investigators and protocols involving the use of animals. As mentioned in the instructions, please complete **Appendix 5** (Animal Usage) or provide the information requested in a similar format as an Appendix.

Investigations primarily involve pre- and postflight data collection and analysis to examine the physiological effects of space flight. The KSC Environmental group, as part of the

Kennedy Space Center Environmental and Medical Contract (KEMCON), performs ongoing research studies pertaining to wildlife on KSC. Currently there are eight ongoing protocols in support of the KEMCON, and two active approved protocols in support of the ISS program. All studies are listed in the Appendices (See Appendix 5 – Animal Usage).

G. Note the source(s) of research funding (grants, contracts, etc.) involving the use of animals.

Specific research protocols are funded through NASA contracts, NASA grants, NASA Interagency Agreements, other federal government agencies, state agencies, and private industry.

H. List other units (divisions, institutes, areas, departments, colleges, etc.) of your organization that house and/or use animals that are not included in this Description. If any of these are contiguous, physically or operationally (e.g., same IACUC/OB, same animal care staff), with the applicant unit, describe the association. Explain why such units are not part of this program application.
Note: Questions regarding this section should be forwarded to the AAALAC Office.

N/A

I. Contract Facilities: If the institution contracts for animal care facilities or services for animals owned by the institution, the contractor and its AAALAC International accreditation status must be identified. If a contractor's animal care and use program is not accredited by AAALAC International, a brief description, following this Program Description outline, of the relevant contractor's relevant programs and facilities must be provided. In addition, the species and approximate average number of animals housed in the contract facilities and the approximate distance between the institution's animal facility and the contract facility must be noted. Incorporation of the contractor program into the site visit schedule will be discussed with institutional representatives. If the institution does not contract for animal care facilities or services, so note.

In 2017, National Aeronautics and Space Administration (NASA) Johnson Space Center awarded the Research, Engineering, Mission Integration Services (REMIS) Contract. NASA selected 16 companies to provide a diverse range of competitive task-order contracts for serving the research and engineering products and services needs of the International Space Station (ISS). REMIS is a multi-award contract with indefinite-delivery/indefinite-quantity, firm-fixed price and cost-plus-fixed-fee line item numbers. The contract has a five-year base period, followed by a two-year option that may be exercised at NASA's discretion.

The statement of work includes the ability to solicit spaceflight and ground hardware and software, sustaining engineering functions, engineering services, payload facility integration, and research mission integration and operations services on a commercial basis, with minimal involvement of the Government.

The contract was developed for use by NASA's ISS Program, but may be utilized by other NASA organizations or Federal government agencies through a mutual agreement with the ISS Program.

Starting in October, 2018 and continuing through a transition period of three rodent research missions, the visiting REMIS/Charles River contractor performed preflight and ground control operations at the Kennedy Space Center (KSC) Science Annex under the oversight of the NASA KSC animal care program. This included animal receipt, cage change/animal husbandry, daily health checks, data collection, prelaunch science preparations, and postlaunch ground control activities such as animal transfers, science procedures, habitat restocks, and water refills. All personnel were trained by the NASA KSC animal care contractor to perform all required tasks in accordance with the accredited and assured NASA KSC program of animal care. The health reporting did not change. The Test and Operations Support Contract (TOSC) Veterinary Technician reported the health issues to the Attending Veterinarian in accordance with standard procedure. The REMIS/Charles River contractor veterinarian was included in the treatment procedure as required.

Operation and maintenance of the Specific Pathogen Free (SPF) facility and performance of cage and equipment preparations remains with the TOSC. This includes performance of preventative maintenance, equipment calibrations/certifications, cage sanitation/sterilization/quality control and procurement of materials and supplies. TOSC continues to provide all program support as follows:

- Veterinary support/oversight services including the NASA KSC Attending Veterinarian
- Ensuring maintenance/compliance of the programs AAALAC Accreditation, PHS OLAW assurance, United States Department of Agriculture Animal & Plant Health Inspection Service (USDA APHIS) regulations
- Ensuring compliance with all NASA Animal Care Policies
- IACUC support (membership and all administrator functions)

The transition plan for REMIS/Charles River was as follows:

- Mission 1: SpaceX-16 Rodent Research-8: Launch December 4, 2018
  Observe animal receipt, KSC animal care and husbandry activities, Specific Pathogen Free (SPF) testing, science operations. Train on Rodent Research hardware operations and associated rodent care.

- Mission 2: NG-11 Rodent Research-12: Launch April 17, 2019 (KSC Preflight Process/Wallops Launch)
  Perform animal husbandry activities with TOSC assistance and oversight.

- Mission 3: SpaceX-18 Rodent Research-17: Launch July 25, 2019

Perform animal husbandry activities with TOSC assistance and oversight.

- Added Mission: SpaceX-19 Rodent Research-19: Launch December 5, 2019
  Perform animal husbandry activities with TOSC assistance and oversight.

At the current time, the REMIS/Charles River contract is ending as of January 2020. It is unclear if the future husbandry activities will transition back to TOSC or be performed by Charles River or another entity.

J. Note other relevant background that will assist reviewers of this report.

NASA has recently added the oversight of Cephalopods to the institutional policies. NASA KSC is in the process of including Cephalopod ground and flight experiments to the oversight purview of the NASA KSC IACUC. Contractual arrangements are in work.

Section 2. Description

I. Animal Care and Use Program

A. Program Management

1. Program Management Responsibility [*Guide*, pp. 13-15]

a. The Institutional Official [*Guide* pp. 13-14]
Describe how program needs are clearly and regularly communicated to the Institutional Official by the Attending Veterinarian, IACUC/OB, and others associated with the program.

Program needs are regularly communicated to the IO through the submittal of the IACUC meeting minutes, semiannual program and facility reviews, quarterly meetings with the IACUC Chair and Animal Care Program Lead, and through annual funding exercises that identify resources that are required to support the program. The IO attends the IACUC meetings as schedule permits.

A direct line of communication exists for the AV to discuss concerns with the IO.

b. Role of the Attending Veterinarian [*Guide*, p. 14]

i. Describe the institutional arrangement for providing adequate veterinary care. Although individual name(s) and qualifications will be described below, identify by title the veterinarian(s) responsible for the veterinary care program, including:
- a list of responsibilities
- a description of the veterinarian's involvement in monitoring the care and use of laboratory animals
- the percentage of time devoted to supporting the animal care and use program of the institution if full-time; or the frequency and duration of visits if employed part-time or as a consultant.
  Note: If preferred, this information may be provided in a Table or additional Appendix.

The AV is contracted for through a NASA KSC services contract. The position is a part-time consulting arrangement. The AV is a member of the NASA KSC IACUC and therefore participates in the review and approval of all animal care and use protocols. The AV is responsible for the health and well-being of all animals under the NASA KSC Animal Care Program. The responsibilities include: program management and oversight, training of animal care and use, handling and restraint, surgical and post-surgical care, use of anesthetics, analgesics, and tranquilizer drugs, methods of euthanasia,

establishment and monitoring of occupational health and safety program, disease detection, diagnosis, treatment, and monitoring, and facility planning and design. The AV is on the premises at minimum once every six months, and more frequent as necessary. He is available by phone as needed at any time. He is also available via email daily.

One protocol involving the attachment of radio collars to beach mice utilizes the donated services of a local private practice veterinarian for anesthesia and attachment of the device The KSC Environmental Field protocols fall under permits in which the PIs are not allowed to euthanize. Therefore, arrangements are in place with for treatment and/or perform euthanasia if needed.

ii. List others (e.g., Principal Investigators, veterinarians serving as Principal Investigators, veterinary faculty/staff, technical staff, farm managers) who have a *direct role in the provision of veterinary care* and describe their responsibilities. The Organizational Chart(s) provided in **Appendix 4** must depict the reporting relationship between these individuals and the Attending Veterinarian.
Note: If preferred, this information may be provided in a Table or additional Appendix.

When animals are present, the Lead Animal Care Technologist(s) are responsible for daily animal care and report directly to the AV regarding the health status of all animals. The health reporting process did not change for the visiting REMIS/Leidos/Charles River contractor. The TOSC Veterinary Technician reported the health issues to the KSC Attending Veterinarian in accordance with standard procedure. The REMIS/Leidos/Charles River contractor veterinarian was included in the treatment procedure as required.

One protocol involving the attachment of radio collars to beach mice utilizes the services of a local veterinarian for anesthesia and attachment of the device. This individual provides the direct role in the provision of veterinary care when performing the collar attachment.

c. Interinstitutional Collaborations [*Guide*, p. 15]
Describe processes for assigning animal care and use responsibility, animal ownership and IACUC/OB oversight responsibilities at off-site locations for interinstitutional collaborations.

N/A

2. Personnel Management

a. Training, Education, and Continuing Educational Opportunities

Describe *how* the IACUC/OB provides *oversight* and *evaluates the effectiveness* of training programs and the assessment of personnel competencies. Describe how training is documented.
Note: Do not include details about the training program, which should be described in the following sections.

The training and experience of individuals associated with a protocol are evaluated during the IACUC review process. The IACUC reviews the individual training records to assure that all personnel have completed the necessary aspects of individual training and have developed a competency for applicable area of expertise.

KSC contractor employee(s) are certified through the American Association for Laboratory Animal Science (AALAS) and have received extensive training through education and continuing education. Continuing education participation through the AALAS, other laboratory animal science industry related organizations (i.e. Laboratory Animal Management Association (LAMA)), and KSC specific mandated training is provided. Training for IACUC members is provided through documents, attendance at continuing education programs, AALAS Learning Library and local discussions. Training records are maintained by the Animal Care Program Lead.

i. Veterinary and Other Professional Staff [*Guide*, pp. 15-16]

For the Attending Veterinarian and other individuals having a direct role in providing veterinary medical care (veterinarians, other professional staff listed above, private practitioners, etc.), provide: name, credentials (including degrees), and a description of their qualifications, training, and continuing education opportunities.
Note: Please do not provide curriculum vitae of personnel; if preferred, this information may be presented in a Table or additional Appendix.

Lead, Animal Care Program. Licensed Veterinary Technician; AALAS certification at the Technologist and Certified Manager of Animal Resources (CMAR) level. Continuing education is provided through professional association annual meetings, branch meetings, compendium, seminars, and the AALAS Learning Library.

Lead, Animal Care Technologist, Mission Support. Certified Veterinary Technician; AALAS certification at the Technologist level. Continuing education is provided through professional association annual meetings, branch meetings, compendium, seminars, and the AALAS Learning Library.

Attending Veterinarian. Received postdoctoral training in Laboratory Animal Medicine at . Experience includes directing laboratory animal care programs since 1982 and serving as the NASA KSC AV since 2019. Continuing education is provided through professional association annual meetings, branch meetings, seminars, and the AALAS Learning Library.

. She is a graduate of an accredited veterinary college and has multiple years of experience in clinical veterinary practice. She is required by the Florida Veterinary Medical Association to receive continuing education in order to maintain licensure.

: Certified Veterinary Technician. AALAS certification at the Assistant Laboratory Animal Technician level. Continuing education is provided through professional association annual meetings, branch meetings, compendium, seminars, and the AALAS Learning Library.

ii. Animal Care Personnel [*Guide*, p. 16]

1) Indicate the number of animal care personnel.

In addition to the individuals listed in the Veterinary and other Professional Staff members section above the contract is funded for six animal care personnel. Currently four of the six positions are filled.

2) Summarize their training, certification level and type, experience, and continuing education opportunities provided.
Note: If preferred, this information may be provided in a Table or additional Appendix.

Of the four animal care personnel two are AALAS certified. All individuals have received on the job training which has complemented the animal care skills and knowledge that they brought to the positions. Continuing education is required through the AALAS Learning Library and other resources (Public Health Service Office of Laboratory Animal Welfare (PHS OLAW) and AAALAC International webinars/podcasts). All personnel are provided the materials to study for the AALAS Laboratory Animal Certification exams.

iii. The Research Team [*Guide*, pp. 16-17; 115-116; 122; 124]

1) Describe the *general mechanisms* by which the institution or IACUC/OB ensures that research personnel have the necessary knowledge and expertise in the animal procedures proposed and the species used.

PIs not employed at KSC are trained by their local institutions prior to arriving at NASA KSC. The NASA Flight IACUC and the NASA KSC IACUC verify research personnel training and expertise during the protocol review process at which time all personnel engaging in research are required to provide their credentials, training, and experience. All information is reviewed and approved or recommendations are made by the IACUC. Veterinary staff is present during all activities and procedures involving visiting PIs. Protocols submitted from external sources are reviewed for their scientific merit and for the qualifications/training of the investigators, first by their home institution's IACUC and then again reviewed by the NASA KSC IACUC. Environmental protocols submitted by KSC contract staff investigators are reviewed solely by the NASA KSC IACUC. Researchers are required to provide necessary federal/state animal collection permit numbers prior to approval of any protocol.

a) Briefly describe the content of any required training.

All researchers associated with the wildlife studies must complete a Job Safety Analysis (JSA) which then determines the required training needed to perform the requisite job tasks. The JSA evaluates the job description, functions, personal protective equipment, potential accidents or hazards, recommended safe job procedures/control methods, and recommended training and/or certifications. All researchers are informed of changes in internal procedural documents, regulatory laws, and animal research guidelines.

Onsite training of visiting PIs and their technical staff is provided only if the IACUC review judged them unqualified to perform their individual tasks. Training would then be tailored to each individual's needs.

b) Describe the timing of training requirements relative to the commencement of work.

Training is performed prior to the commencement of any research work as well as continuous in order to maintain required certifications. Certain training courses require annual refreshers.

c) Describe continuing education opportunities offered.

Continuing education opportunities offered to animal care program staff include subscription to AALAS Learning Library, attendance at the AALAS national meeting, AALAS Branch meeting, LAMA annual meeting, North American Veterinary Community (NAVC) annual conference, and Public Responsibility in Medicine and Research (PRIM&R) educational programs. In addition, KSC contractor employees

must complete in house training courses on an annual basis as a contract requirement.

Continuing education opportunities are offered to the KEMCON research team through professional meetings and seminars. Visiting PIs and their support staff obtain continuing education at their home institutions. KSC staff personnel have support to travel and assist other researchers in their respective fields, which therefore presents the opportunity to stay up-to-date on animal collection and handling techniques specific to the wildlife studies. In addition, guest lecturers are invited to KSC on a regular basis for the purpose of networking and sharing their research with the KEMCON field biologists.

2) Describe the process(es) to ensure surgical and related procedures are performed by qualified and trained personnel, including:

- who determines that personnel are qualified and trained for surgical procedures
- the roles that the Attending Veterinarian and IACUC/OB have in this determination [*Guide*, pp. 115-116]

The training of PIs and/or technicians performing surgery is evaluated during the IACUC approval process. The IACUC reviews the individual training records to assure that all personnel performing surgery have completed the necessary aspects of individual training and have developed a competency for surgery in their record of experience. In addition, the KSC AV can observe each surgeon performing surgery at least once and evaluates competency if deemed necessary.

3) Describe the training and experience required to perform anesthesia. [*Guide*, p. 122]

Both training and experience required to perform anesthesia are evaluated in the IACUC review process. The AV monitors training of all PIs and/or technicians in person or via the veterinary technicians. These individuals can be observed once initially and periodically by the veterinary staff during their procedures to ensure that proper technique is being employed.

4) Describe how the proficiency of personnel conducting euthanasia is ensured (especially physical methods of euthanasia). [*Guide*, p. 124]

The training and experience required to conduct euthanasia is evaluated in the IACUC review process. The AV monitors training of all PIs and/or technicians in person or via the veterinary technicians. These individuals can

be observed once initially and periodically by the veterinary staff during their procedures to ensure that proper technique is being employed.

b. Occupational Health and Safety of Personnel [*Guide*, pp. 17-23]

i. Institutional Oversight [*Guide*, pp. 17-19]

1) List the institutional entities (units, departments, personnel, *etc*.) that are involved in the planning, oversight, and operation of the institutional occupational health and safety program related to animal care and use (e.g., office(s) of environmental health, institutional health services or clinics (*including contracted health services*), industrial hygienists, Institutional Biosafety Committee(s) and/or Officer(s), Radiation Safety Committee(s) and/or Officer(s).

- Include a brief description of their responsibilities and qualifications.
- If contracted services are used, also include their location (e.g.,remote offices to which personnel must report).

The institutional entities involved in the occupational health and safety program include:

1. NASA Environmental Health & Safety Offices which, manages and provides KSC institutional services including occupational health, safety and medical operations. The program is staffed by Certified Industrial Hygienists (CIHs) and Certified Safety Professionals (CSPs).
2. The KEMCON which, manages the Occupational Health Facilities and Program for NASA KSC, as well as supporting the individual NASA KSC contractor safety offices to include any environmental wildlife studies. The program is staffed by CIHs, CSPs and professionally trained technicians.
3. The Test and Operations Support Contract (TOSC) Safety, Health, and Environmental (SH&E) Office is the direct health, safety & environmental support staff to the personnel and animal care operations/facilities. The program is staffed by a CIH, CSPs, Associate Safety Professionals (ASPs), and a Graduate Safety Professional (GSP). In the case of any animals located in KSC animal care supported facilities, TOSC SH&E will be involved. If additional support services are needed, KEMCON or other specialty service providers will be engaged.

2) Describe methods to identify work-related hazards and the processes used to evaluate the significance of those hazards in the context of duties and tasks. Describe both common approaches and differences, if applicable, for categories of personnel such as, but not limited to, researchers, veterinarians, husbandry staff, cage -washing staff, students, housekeeping, physical plant staff, security personnel, IACUC/OB

members (including non-affiliated members), contractors, visitors, etc. [*Guide*, pp. 18-19; see also Chapters 2 and 3 in Occupational Health and Safety in the Care and Use of Research Animals, NRC 1997.].

Hazards are systematically identified through a combination of surveys, analyses, observations, and inspections of the workplace; investigations of mishaps and close calls summarized in lessons learned; consulting with knowledgeable persons, information in chemical hazard information sheets (e.g., Material Safety Data Sheet (M/SDS) and the collection and trend analysis of safety and health data. Personnel skilled in industrial hygiene perform inspections of the workplace and evaluate the work environment to detect and appraise health hazards. These inspections and appraisals, together with knowledge of the processes and materials used, provide current information about health aspects of the work environment. This information serves as the basis for recommendations to management for corrective measures. Additionally, TOSC SH&E coordinates with KEMCON to obtain monitoring data that is used to assess employee exposure to chemical and physical hazards. The KSC Industrial Hygiene Officer is copied on all reports provided by KEMCON. TOSC SH&E works with KEMCON to identify control measures.

TOSC Laboratory Supervisor performs periodic safety and health self-inspections of work areas. All periodic inspections are documented and inspection findings are tracked until closure.

Hazard identification and risk assessment exists at the project-planning level, activity and task-level planning. When appropriate, other means or methods for hazard analysis may be used, provided they provide results of similar quality. The hazard analysis process is a collaborative effort involving personnel with the appropriate expertise to ensure that all credible hazards are identified and addressed.

The hazard analysis serves as a means for identifying hazards and assessing risk for project activities and categories of personnel such as, but not limited to, researchers, veterinarians, husbandry staff, cage-washing staff, students, housekeeping, physical plant staff, security personnel, IACUC/OB members (including non-affiliated members), contractors, visitors, etc. When activities change or when new activities are identified, the hazard analysis is updated. Improvements in hazard controls or in the project/site SH&E program resulting from the updated hazard analysis shall be implemented in a timely and effective manner and is communicated to the project team.

In addition, the hazard analysis process can be used to support design safety risk assessments, and various pre-task planning processes and tools including Job Hazard Analysis, Work Method Statements, and Safe Plans of Action.

3) Describe methods and frequency of reassessing work-related hazards.

Work-related hazards are reassessed both routinely and also per experiment. A Ground Safety Data Package is required prior to the ground processing experiment which, requires hazard identification and mediation. Hazard Analyses are performed and documented using the Hazard Assessment and Safety Action Plan (HASAP). These Hazard Analyses identify and classify facility hazards and the controls currently in place to mitigate those hazards. From these analyses, SH&E will determine which processes require further mitigations and make recommendations on process improvements. Whenever practical, Engineering Controls will be the first option followed by Administrative Controls, and then PPE. Additionally, the Industrial Hygiene Occupational Exposure Sampling Strategy Plan identifies rationale for exposure monitoring in addition to the HASAP. The HASAP is reviewed and updated as needed due to workplace or process changes.
Job Safety Analyses are developed by affected personnel in conjunction with their management representative and approved by the TOSC SH&E Office. JSAs are reviewed annually with affected employees during work area safety training.

4) Describe institutional programs or methods used to track and evaluate safety-related workplace incidents, including injuries, exposures, accidents, etc. Include the frequency of such assessments. [*Guide*, pp. 18-19]

All incidents are reported in accordance with NASA Procedural Requirements (NPR) for Mishap and Close Call Reporting, Investigating, and Recordkeeping (NPR 8621.1, current revision), KSC Safety Procedural Requirements (KNPR 8715.3, current revision) and Jacobs Health Safety Environment Procedure (HSEP) Incident Reporting & Response (HSEP 5.1, current revision). The KSC Occupational Health Facility (OHF) will complete accident reports regarding injuries due to chemical and physical agents and animal handler injuries, bites, and scratches and will send written notification of the accident to the appropriate supervisor and the TOSC Mishap Coordinator. The KSC OHF will maintain documentation in accordance with current procedures governing medical records. Incidents are investigated in accordance with the Jacobs Incident Investigation process.

Employees are encouraged through several means to report any safety hazards or concerns to their direct management, the TOSC Safety and Health office or the appropriate safety committee. Additionally, all employees have been introduced to the HALT process that encourages employees to use their STOP WORK AUTHORITY to call a HALT when a dangerous or unsafe situation exists or if the task requires further clarification.

Employees have access to the TOSC Safety Environmental Tracking System (SETS), which is a TOSC system where an employee may submit hazards,

anonymously if desired. Submitted reports are reviewed and corrective actions assigned by a member of the S&H group and tracked to closure. Employees also have access to the NASA Safety Reporting System (NSRS), the NASA Safety Hotline and access through the open door policy of the TOSC General Manager.

The Industrial Hygiene Occupational Exposure Sampling Strategy Plan identifies rationale for exposure monitoring in addition to the Hazard Assessment and Safety Action Plan. Sampling rationale and strategies for industrial hygiene are based on information provided in the plan.

Industrial Hygiene survey and exposure data is collected & stored in the KEMCON managed KSC Workers Health At A Glance (WHAAG) database. Incident statistics are collected monthly and reported to TOSC Leadership, and are also reported in the NASA Mishap Information System as required.

ii. Standard Working Conditions and Baseline Precautions

The following section pertains to the Occupational Health and Safety Program for all personnel associated with the animal care and use program. Specific information regarding the use of hazardous agents is included in ***subsection iii*** below.

1) Medical Evaluation and Preventive Medicine for Personnel [*Guide*, pp. 22-23] *Note:* Include blank forms used for individual health assessment as **Appendix 6.**

a) Describe who (e.g., personnel assigned to job/task categories in I.A.2.b.i.2) above) receives personal medical evaluation as a component of individual risk assessment. Describe who are ***not*** included and/or exempted from personal medical evaluation. *Note:* Do not include the names of personnel.

The safety and health programs cover permanent research and animal care staff and long term interns. Volunteers and visiting scientists are provided with a thorough safety briefing and are held to the same safety and PPE standards as employees. All personnel who handle animals are required to have a Primary Animal Contact Direct (PAD) physical.

b) Describe provisions for allowing an individual (following completion of individual health and job related risk assessments) to decline participation in all or part(s) of subsequently available medical evaluation and preventive medicine components of the institutional program, e.g., vaccinations, physical examinations, respiratory protection, as applicable. Provide an estimate (percentage) of

personnel associated with the animal care and use program that have declined participation in the medical evaluation program.
Note: Do not include names of the personnel

All employees who handle animals are required to participate in the occupational health program. It is a requirement of the job. There are no instances where an individual was allowed to decline participation.

c) Describe provisions for assuring confidentiality of medical information.

Confidentiality in accordance with federal, state, and local regulations is provided to all participants of the occupational health program. The Occupational Health office has a document in place which describes the provision for confidentiality of medical information (OCH-I-0109 Managing Medical Data and Privacy Act Information).

d) Describe safety considerations for individuals with incidental exposure to animal care and use (e.g., contractors, personnel working in open laboratories).

All individuals that require access to work within the SA are provided safety orientation training pertinent to the area. Any individual who requires access and has not received training will be escorted at all times (contractors, tours, and etc.). Access will be provided on a noninterference basis to the activities being conducted at the time of the visit. Access will be denied as deemed appropriate to avoid any hazardous activities.

e) Describe general features of the medical evaluation and preventive medicine programs, within the context of work duties, including:

- pre-employment/pre-assignment health evaluation,
- medical evaluations (including periodicity),
- diagnostic tests (e.g., for tuberculosis),
- precautions for working with potentially hazardous species (e.g., nonhuman primates, sheep, venomous species)
- immunization programs, and
- procedures for communicating health related issues.

All individuals who require direct contact with SA maintained animals or require access to Animal Holding Rooms (AHRs) or other facility areas during periods of animal manipulation are classified as “animal contact personnel.” These personnel have a Primary Animal Contact Direct (PAD) medical examination before being granted access to the SA barrier. This applies for all KSC employees, PIs and their staff, and other personnel requiring direct contact with the animals or animal cages.

Medical examinations consist of:

Medical history and limited physical examinations and augmented by:

- Laboratory tests; complete blood count (with differential if white cell count is greater than 10,000)
- Urine analysis
- Blood chemistries
- Serology for C Reactive Protein, Serum Glutamic Oxaloacetic Transaminase, and Rapid Plasma Reagent
- Tuberculosis skin test
- Chest x ray
- Salmonella and Shigella checks
- Tetanus immunization (every 10 years, with booster after frank exposure)
- Other immunizations (as needed)

It is recommended that visiting PIs and their associates have the medical examination performed at their home institution and have their health examination certificates sent to the KSC animal care program management before they arrive at KSC.

All permanent research and animal care staff, interns, and KEMCON employees involved in wildlife research receive an annual physical that includes a respiratory assessment, basic blood and urine tests, and a consultation with a physician.

The KEMCON requires the following physicals if it pertains to the job tasks of the employee: dive physical, flight physical (helicopter), hearing conservation program participation.

f) Describe any other entities that provide medical services (e.g., emergency care, after-hours care, special medical evaluation, contracted services). Include a brief description of their credentials and/or qualifications, and how these entities remain knowledgeable about animal- or institution-related hazards and risks.

N/A.

2) Personnel Training Regarding Occupational Health and Safety [*Guide*, p. 20]

Describe general educational program(s) to inform personnel about:

- allergies,
- zoonoses,

- personal hygiene,
- physical injuries in animal facilities (e.g., noisy areas, large quantities of chemicals such as disinfectants, ergonomics) or species used (e.g., nonhuman primates, agricultural animals),
- other considerations regarding occupational health and safety.

Include in the description a summary of the topics covered, including:

- Entities responsible for providing the training
- Frequency of training or refresher training

Note: Do not include special or agent-specific training for personnel exposed to experiment-related hazardous agents; this will be provided in **Section iii.3** below.

Animal care personnel are trained in the prevention of animal borne allergies. They are instructed on the use of appropriate PPE, facility equipment used to prevent exposure, and in the communication of any allergy symptoms they may develop during the course of their work. An individual who exhibits symptoms is sent to the OHF for evaluation. Note, as part the annual animal contact physical, individuals must disclose any allergies that they are aware of when completing the medical history forms.

The program has one protocol that has the potential for zoonosis and the risks were discussed at length with the PI and advice was transmitted at the time of protocol review.

The KEMCON requires the field biologists to undergo bloodborne pathogen, Cardiopulmonary Resuscitation (CPR), first aid, Personal Protective Equipment (PPE), fire safety, boat operation, All Terrain Vehicle (ATV) operation, and hearing conservation classes. If needed, they also participate in annual hearing evaluations as well as Self-Contained Underwater Breathing Apparatus (SCUBA) and non-crew flight physicals.

3) Personal Hygiene [*Guide*, p. 20; *Ag Guide* pp. 4-5]

a) List routine personal protective equipment and work clothing provided and/or required for animal care personnel, research and technical staff, farm employees, etc.

All personnel who enter any area within the SA barrier are required to wear coveralls, shoe or foot coverings, mask, and hair coverings (head and facial hair) as required. Inside the barrier all personnel don surgical gloves prior to work tasks.

The need for Personnel Protective Equipment (PPE) is evaluated and listed in the JSA performed for each KEMCON employee involved in field study research. PPE referenced within the JSA's include: gloves, sunscreen, drinking water, appropriate footwear (safety), safety glasses/sunglasses, bug repellant, radio and cell phone, GPS unit, hearing protection (for boat/ATV related activities); field clothes, snake boots. In addition, specific PPE applies for boat activities and include: first aid kit, life jacket (Personal Flotation Device – PFD) and throwable life jacket, fire extinguisher, anchor, functioning bilge pump, distress kit, marker float, and non-slip shoes. Snorkel and Self Contained Underwater Breathing Apparatus (SCUBA) requires O2 kit and manual, American Academy of Underwater Sciences (AAUS) dive and safety procedure manual, diver down flag, National Oceanic and Atmospheric Administration (NOAA) weather radio, area clearance and security checks, certified SCUBA equipment, time-keeping device, and dive knife.

b) Describe arrangements for laundering work clothing.

A commercial service is utilized for laundering the SA cleanroom coveralls.

c) Describe provisions and expected practices for washing hands, showering, and changing clothes, including instances where work clothes may be worn outside the animal facility.

Men's and women's changing rooms are provided in the SA. Each is equipped with restroom with sink. Work clothes (jumpsuits) are not permitted to be worn outside of the SA.

d) Describe policies regarding eating, drinking, and smoking in animal facilities.

Eating, transporting food for human consumption, smoking, and chewing gum are prohibited within the SA barrier. Eating is permitted outside the barrier in the building break room, outside patio, offices, or in the cafeteria located in another building.

4) Standard Personnel Protection [*Guide*, pp. 21-22]

a) Describe facility design features, equipment and procedures employed to reduce potential for physical injury inherent to animal facilities (e.g., noisy areas, large quantities of chemicals such as disinfectants, ergonomics) or species used (e.g., nonhuman primates, agricultural animals).

Personnel who are employed in the cagewash area are trained by the veterinary staff on the proper use of machinery to prevent physical injury to the individuals. Material handling equipment used for lifting and transporting of 55-gallon drums, cage components, and miscellaneous equipment and supplies is available. A noise analysis of the cage wash room was conducted. The results were such that no hearing protection is required.

b) Describe likely sources of allergens and facility design features, equipment, and procedures employed to reduce the potential for developing Laboratory Animal Allergies (LAA).

The KSC SA is a Class 8 (100K) ISO 14644-1: 1999 clean room barrier facility. The facility design features (HEPA Filtration, 12-15 air exchanges per hour, 100% fresh non recirculated air) greatly reduce the exposure to animal borne allergens. In addition, equipment used when handling the animals (laminar flow bench, biosafety cabinet, filter caging) also reduces the risk of exposure to personnel. Disposal of used animal bedding is conducted in a downdraft bedding disposal unit and personnel must wear the appropriate PPE when handling dirty bedding and cages.

c) Describe likely sources of zoonoses and facility design features, equipment, and procedures employed to reduce potential exposure to zoonoses.

The KSC wildlife program, which does not utilize indoor animal facilities, has one protocol that has the potential for zoonosis and the risks were discussed at length with the PI and advice was transmitted at the time of protocol review.

d) Describe the procedures for the maintenance of protective equipment and how its function is periodically assessed.

All protective gear (helmets, floatation collars) utilized during field research are directly serviced each year by the KSC Flight Operations group. SCUBA tanks and regulators are checked and serviced annually through a local dive shop. The KEMCON personnel maintain an internal database for the equipment.

e) Respiratory Protection

i) Describe situations where respiratory protective equipment is available or required, such as cage washing facilities, feedmills, etc.

See 4.d) above. No other respiratory protective equipment is required.

ii) Describe programs of medical clearance, fit-testing, and training in the proper use and maintenance of respirators.

N/A

iii) Describe how such respiratory protective equipment is selected and its function periodically assessed.

N/A

f) Heavy Equipment and Motorized Vehicles

i) Provide a general list of the types of cage -processing equipment used, such as rack/cage washers, tunnel washers, robotics, and bulk autoclaves. Describe training programs, informational signage, and other program policies designed to ensure personnel safety when working with such equipment.
Note: Details of specific equipment installed in animal facility(ies) are to be provided in **Appendix 15** (Facilities and Equipment for Sanitizing Materials).

Personnel who are employed in the cagewash area are trained by the veterinary staff on the proper use of machinery to prevent physical injury to the individuals.

ii) List other heavy equipment such as scrapers, tractors, and farm machinery (manufacturer name, model numbers, etc. are not necessary). Describe training programs, informational signage, and other program policies designed to ensure personnel safety when working with such equipment.
Note: If preferred, this information may be provided in a Table or additional Appendix.

KEMCON utilized ATV, boats, and trailers are serviced by the KSC heavy equipment shop through semiannual preventative maintenance programs. Training programs provided by the KEMCON include ATV safety certification and annual recertification by a KEMCON licensed instructor. Boat/trailer training is conducted online and hands on with a resident certified boat captain. Employees required to perform SCUBA diving are required to have obtained the training and certification prior to employment.

Annual SCUBA and non-crew flight physical (which includes a wide battery of blood work, respiratory, and treadmill tests) is conducted through the OHF. This serves as an annual NASA certification.

iii) If motorized vehicles are used for animal transport, describe how the driver is protected from exposure to hazards such as allergens or zoonoses and decontamination methods employed. Also describe instances where vehicles may be shared between animal and passenger transport.

There are several protocols that require the transport of animals in a motorized vehicle:

Newly hatched alligators must be transported from the incubator site to the nest site. Hatchlings are transported via the same plastic containers that the hatchlings are housed in the incubators. A lid is placed on the top of the container for transport. No identifiable hazard such as allergens or zoonoses is associated with the transport via motorized vehicles.

Mice must be transported to and from the SSPF and the launch pad within the flight hardware. Due to the filters associated with the hardware, no identifiable hazard such as allergens or zoonoses is associated with the transport via motorized vehicles.

In support of the flight payloads mice are transported within commercially procured mouse shipping containers to other institutions. The shipping containers are filtered. Therefore, no identifiable hazard such as allergens or zoonoses is associated with the transport via motorized vehicles. The intent is to utilize a courier that has separate compartments for animals and passengers. On occasion, the courier has arrived on site with a vehicle where separation between compartments was not accommodated.

g) Describe safety procedures for using medical gases and volatile anesthetics, including how waste anesthetic gases are scavenged.

All safety procedures for using volatile anesthetics are reviewed by the KSC Safety, Health, and Environmental office. In the event that these agents are used, in every case the gas is scavenged using one of the following three methods:
a) The procedure is performed under an approved, vented hood, which is exhausted to the outside.
b) The procedure is performed using a scavenging device that vents the agent to the facility external vent system.

c) The procedure is performed using a device designed to filter the gas through a chemical absorption media (commercially available).

iii. Animal Experimentation Involving Hazards [*Guide*, pp. 20-21]

1) List, according to each of the categories noted below, hazardous or potentially hazardous agents currently approved to be used in animals that are or will be maintained for more than a few hours following exposure. If the hazardous agent cannot be listed by name for security/proprietary reasons, identify it by the general category of agent and level of hazard. *Note:* If preferred, this information may be provided in a Table or additional Appendix.

a) Biological agents, *noting hazard level* (CDC Biohazard Level, Directive 93/88 EEC, CDC or USDA/DHHS Select Agent, etc.). Examples may include bacteria, viruses, viral vectors, parasites, human-origin tissues, etc.

No experiments involve use of biological agents as part of the experimental protocol.

b) Chemical agents, *noting general category* of hazard (toxicant, toxin, irritant, carcinogen, etc.). Examples may include streptozotocin, BrdU, anti-neoplastic drugs, formalin, etc.

Chemical agents used during experiment procedures may include 10% formalin, pharmaceuticals such as anesthetic gas (isoflurane), injectable anesthetics (ketamine, xylazine), MS-222, euthanasia solution, carbon dioxide gas, and analgesics.

c) Physical agents (radiation, UV light, magnetic fields, lasers, noise, etc.).

A Video Dental Concepts XRAY2GO portable x-ray device and a bone densitometer are available for use in the SA. An approved radiation use authorization is in place for both devices.

Individuals required to perform aerial surveys via helicopter, utilize motor boats or all-terrain vehicles, must participate in a hearing conservation program managed by the OHF.

2) **Experiment-Related Hazard Use** [*Guide*, pp. 18-19; See also Chapters 2 and 3 in *Occupational Health and Safety in the Care and Use of Research Animals*, NRC 1997].
Note: Written policies and standard operating procedures (SOPs) governing experimentation with hazardous biological, chemical, and physical agents

should be available during the site visit.

a) Describe the process used to identify and evaluate experimental hazards. Describe or identify the institutional entity(ies) responsible for ensuring appropriate safety review prior to study initiation.

A Ground Safety Data Package is required prior to the ground processing experiment, which requires hazard identification and mediation. Hazard Analyses are performed and documented using the Hazard Assessment and Safety Action Plan (HASAP). These Hazard Analyses identify and classify facility hazards and the controls currently in place to mitigate those hazards. From these analyses, SH&E will determine which processes require further mitigations and make recommendations on process improvements. Whenever practical, Engineering Controls will be the first option followed by Administrative Controls, and then PPE. Additionally, the Industrial Hygiene Occupational Exposure Sampling Strategy Plan identifies rationale for exposure monitoring in addition to the HASAP. The HASAP is reviewed and updated as needed due to workplace or process changes.
Job Safety Analyses are developed by affected personnel in conjunction with their management representative and approved by the TOSC SH&E Office. JSAs are reviewed annually with affected employees during work area safety training. In addition, potential hazards are identified and evaluated during the IACUC protocol review for each experiment.

b) Describe how risks of these hazards are assessed and how procedures are developed to manage the risks. Identify the institutional entity(ies) responsible for reviewing and implementing appropriate safety or containment procedures.

The NASA and TOSC hazard assessment and mitigation procedures are followed.

c) Describe the handling, storage, method and frequency of disposal, and final disposal location for hazardous wastes, including infectious, toxic, radioactive carcasses, bedding, cages, medical sharps, and glass.

Biomedical waste and medical sharps is collected and stored in a designated freezer and room located at the SSPF. An outside vendor picks up waste for disposal. All chemical wastes are reviewed through a process waste questionnaire submittal and appropriate disposal instructions provided.

d) Describe aspects of the medical evaluation and preventive health program specifically for personnel potentially exposed to hazardous agents.

Animal care staff members receive training for bloodborne pathogens through the occupational health facility. Laboratory and hazardous waste training is provided through KSC and contractor classes.

3) **Hazardous Agent Training for Personnel** [*Guide*, p. 20]
Describe special qualifications and training of staff involved with the use of hazardous agents in animals.

Experiment related hazardous agents may include 10% formalin, pharmaceuticals such as anesthetic gas (isoflurane), injectable anesthetics (ketamine, xylazine), MS-222, euthanasia solution, carbon dioxide gas, and analgesics. Staff members have qualifications obtained through education or on the job training (for example provision of training refresher for the operation of the anesthesia unit occurs on the job through an outside vendor) with the applicable products. PI staff training is verified through the IACUC process.

4) **Facilities, Equipment and Monitoring** [*Guide*, pp. 19-20]

a) Describe locations, rooms, or facilities used to house animals exposed to hazardous agents. Identify each facility according to the hazard(s) and containment levels (if appropriate*).*
Note: If preferred, information may be provided in a Table or additional Appendix.

If hazardous agents/materials are identified during the IACUC protocol review, the animals will be housed per federal Animal Biosafety Level (ABSL) guidelines. Two animal holding rooms are able to be configured to negative pressure if necessary and Class II biosafety cabinets are utilized for the handling of cages. Currently the work conducted here is ABSL-1 and below.

b) Describe circumstances and conditions where animals are housed in rooms outside of dedicated containment facilities (i.e., in standard animal holding rooms). Include practices and procedures used to ensure hazard containment.

No protocols have included hazards that require animals to be housed in dedicated containment facilities.

c) Describe special equipment related to hazard containment; include methods, frequency, and entity(ies) responsible for assessing proper function of such equipment.

Class II biosafety cabinets are available for use if necessary. They are certified through an outside service company to ensure proper function.

d) Describe the husbandry practices in place to ensure personnel safety, including any additional personnel protective equipment used when work assignment involves hazardous agents.

Standard personnel protective equipment for the SA includes jumpsuit, hat, surgical mask, bonnet, shoe covers, and sterile gloves. This is in place for ABSL-1 and lower.

e) Incidental Animal Contact and Patient Areas

i) List and describe facilities that may be used for both animal- and human-based research or patient areas, including the policies and procedures for human patient protection, facility decontamination, animal transport through common corridors or elevators, and other personnel protection procedures.

There are no facilities encompassed within the program that may also be used for human-based research or patient areas.

ii) Describe any *other* circumstances in which animals or caging equipment are transported in common use corridors or elevators (e.g., have the potential to come in contact with individuals not associated with the animal care and use program), and measures taken to mitigate risks associated with such use.

One protocol requires incubation of alligator eggs and return to nest following hatching. Therefore, newly hatched alligators must be transported from the incubator site to the nest site. Transport through the corridor is performed via the same plastic containers that the hatchlings are housed in the incubators. A lid is placed on the top of the container for transport.

The other protocols require the temporary use of a science lab and environmental chamber at the SSPF. Animals are to be transported through common use corridors on a cart in covered flight hardware or covered mouse microisolator cage.

Minimally acceptable risk is associated with the use of the common corridors.

B. Program Oversight

1. The Role of the IACUC/OB [*Guide*, pp. 24-40]

a. IACUC/OB Composition and Function [*Guide*, pp. 17; 24-25]

Please provide a Committee roster, indicating names, degrees, membership role, and affiliation (e.g., Department/Division) as **Appendix 7**.

i. Describe Committee membership appointment procedures.

Committee membership appointment is recommended by the committee to the KSC Associate Director (IO) and appointed via a written appointment letter.

ii. Describe frequency of Committee meetings. Note that **Appendix 8** should contain the last two IACUC/OB meeting minutes.

The IACUC reviews the animal care program and facility (if housing facilities are in existence) semiannually for adequacy and compliance with regulations and directives. In addition to the semiannual reviews, the committee meets at least quarterly, but can meet as often as required to review animal protocols and amendments in support of space flight missions, facility trial runs, ground research and the KSC environmental wildlife studies.

iii. Describe the orientation, training, and continuing education opportunities for IACUC/OB members. [*Guide*, p. 17]

The orientation program for new IACUC members consists of the provision of copies of relevant Federal and state laws and regulations, guidelines, and institutional-specific policies; one-on-one sessions with Chair and veterinarian as needed; attendance at IACUC-focused conferences; video or auto-tutorial training materials; and training and orientation in NASA specific operations and procedures.

b. Protocol Review [*Guide*, pp. 25-27]

A blank copy of your institution's protocol review form should be provided as **Appendix 9**. Also include forms used for annual renewal, modifications, amendments, etc., as applicable.

i. Describe the process for reviewing and approving animal use. Include descriptions of how:

- the IACUC/OB weighs the potential adverse effects of the study against the potential benefits that may result from the use ("harm-benefit analysis"),
- protocols that have the potential to cause pain or distress to animals are reviewed and alternative methodologies reviewed,

- veterinary input is provided, and
- the use of animals and experimental group sizes are justified.

Note: Make sure you address each of the items above.

The IACUC meets as often as required to review animal protocols in support of space flight missions, facility trial runs, ground research, and the NASA KSC environmental wildlife studies. The submittal of an animal care and use protocol through the completion of the NASA KSC IACUC forms are required for all research programs that will use live vertebrate animals at KSC. The completed forms help KSC assure compliance with the Guide for the Care and Use of Laboratory Animals ("Guide") and all Federal, state, and local rules and regulations concerning the care, treatment, and use of laboratory animals. Prior to the meetings, each IACUC member is provided a copy of each protocol for review and is allowed sufficient time for complete review before the scheduled meeting. Any member may notify the Chairman that he or she wishes any protocol to undergo a full IACUC review at a convened meeting. If this occurs, it will be scheduled and undergo a full review at an IACUC meeting. If no member requests a full committee review, the Chairman may schedule the protocol(s) for full committee review or assign the protocol(s) to at least one qualified member for review, with authority to approve, require modifications in (to secure approval), or request full IACUC review. If full IACUC review is requested, the protocol will be scheduled and undergo a full review at an IACUC meeting. An IACUC meeting is defined as a gathering of a quorum (more than 50 percent) of members within a physical location that allows group discussion of the protocols or a group communication of a quorum of IACUC members utilizing electronic methods such as conference telephone calls or audiovisual conferencing. In each instance each member is provided copies of the protocols in advance, allowing sufficient time for his or her individual review before the scheduled meeting. Using electronic methods, a quorum of members is convened on the same conferencing line and in direct communication with each other and is given full opportunity to participate for the duration of the meeting. In both instances approval requires an affirmative vote of a majority of members present. In each instance minutes are compiled and maintained as required by oversight and regulatory agencies. Following IACUC review, notifications of the IACUC's recommendations are communicated to the principal investigator in writing. If modifications to the protocol are required to secure approval, the responses must be in writing to the IACUC prior to full approval of the protocol.

The IACUC procedure for conducting continuing review is to require an annual review, as stipulated by the AWA, and a complete de novo review every three years of all ongoing protocols that requires the submission of a new protocol. The IACUC uses the same review processes as those described above. All the PIs conducting ongoing experiments are notified by the IACUC chairperson or the IACUC Administrator annually of the yearly review requirement. Activities

involving animals may not continue beyond the expiration date even if the protocol is pending IACUC review.

Animal study protocols that have not been funded or approved through a formal review process prior to reaching KSC are not permitted and are not considered for research activities. Before receipt by the NASA KSC IACUC, formal reviews of flight protocols are conducted by the NASA Flight IACUC and by the IACUC of the PI's home institution. NASA KSC IACUC reviews procedures in view of how the animals will be housed and cared for at KSC prior to and after space flight.

The IACUC considers the funding agency to have a major responsibility for evaluation of merit. Through discussions with scientists, committee members, and the AV a decision is reached as to potential benefits versus adverse effects. Outside scientific input may be sought as appropriate.

Pain or distress is carefully evaluated by the AV and committee members. Alternatives of which they are aware are considered, discussed, and a decision is reached.

Selection of species, animal numbers, and group sizes must be justified by the protocol. PIs are present to defend their request.

ii. Describe the process for reviewing and approving amendments, modifications, and revised protocols. If applicable, include a description/definition of "major" vs. "minor" amendments.
Note: If preferred, this information may be provided in a Table or additional Appendix.

All amendments, modifications, and revised protocols are submitted to the entire IACUC. The chair determines if the review will be a designated member review, an expedited designated member review, or a full committee review. In the event a designated member review is assigned, any member of the IACUC may request to participate. Upon review, a designated member may request a full committee review if they deem it necessary.

The IACUC does have a policy in place for Veterinary Verification and Consultation (VVC). This policy enables the IACUC to authorize the AV to make certain significant allowable changes as stated in the VVC process to the approved protocol.

c. Special Considerations for IACUC/OB Review [*Guide*, pp. 5; 27-33]

i. Experimental and Humane Endpoints [*Guide*, pp. 27-28]

1) Describe the IACUC/OB's review of "humane endpoints," i.e., alternatives to experimental endpoints to prevent or in response to unrelieved animal pain and distress.

If a protocol was submitted for review that had the potential for unrelieved pain or distress or other animal welfare concerns, opportunities for refinement through the use of alternative animal models and the use of fewer animals would be considered. Experimental and humane endpoints, when required, would be determined with the involvement of the investigator, the veterinarian, and the IACUC and would be defined when possible before the start of the study.

2) For studies in which humane alternative endpoints are not available, describe the IACUC/OB's consideration of animal monitoring and other means used to minimize pain and distress (e.g., pilot studies, special monitoring, other alternatives).

N/A

3) Identify personnel responsible for monitoring animals for potential pain and distress and describe any mechanisms in place to ensure that the personnel have received appropriate species- and study-specific training.

N/A

ii. **Unexpected Outcomes that Affect Animal Well-being** [*Guide*, pp. 28-29]
Describe how unexpected outcomes of experimental procedures (e.g., unexpected morbidity or mortality, unanticipated phenotypes in genetically-modified animals) are identified, interpreted, and reported to the IACUC/OB.

Currently there are no protocols that involve the introduction of highly novel variables (i.e. breeding of Genetically Modified Animals). All protocols are reviewed with outcomes in mind. If in the course of an experiment, an investigator experiences an unexpected outcome that affects animal well-being, the AV is immediately contacted for consultation.

iii. **Physical Restraint** [*Guide*, pp. 29-30]
Note: This section is to include only those protocols that require prolonged restraint. Brief restraint for the purpose of performing routine clinical or experimental procedures need not be described.

1) Briefly describe the policies for the use of physical restraint procedures or devices. Include, if applicable, the IACUC/OB definition of "prolonged."

PIs are required to submit full descriptions of proposed restraint procedures to the IACUC, which must approve them prior to implementation.

2) Describe animal restraint devices that are used or have been used within the last three years. For each device, briefly describe
- the duration of confinement
- acclimation procedures
- monitoring procedures
- criteria for removing animals that do not adapt or acclimate, and
- provision of veterinary care for animals with adverse clinical consequences.

Note: If preferred, this information may be provided in a Table or additional Appendix.

There have been no such protocols submitted during the past three years.

iv. Multiple Survival Surgical Procedures [*Guide*, p. 30]
Note: One survival surgical procedure followed by a non-survival procedure is not included in this category.

1) Describe the IACUC/OB's expectations regarding multiple survival surgery (major or minor) on a single animal.

All protocols presented to the NASA KSC IACUC are reviewed in accordance with the "Guide," Public Health Service Office of Laboratory Welfare, and AWA provisions. The PI must scientifically justify multiple procedures in order to gain approval by the IACUC. The rationale for approving the protocol is as stated in the "Guide": (1) scientific justification of the experiment, (2) required for clinical reasons, and (3) they are related components of the research proposal.

2) Summarize the types of protocols currently approved that involve multiple major survival surgical procedures

Note: If preferred, this information may be provided in a Table or additional Appendix.

No protocols involving multiple major surgical procedures are currently approved.

v. Food and Fluid Regulation [*Guide*, pp. 30-31]. *Note:* This does not include pre-surgical fast.

Summarize the types of protocols that require food and/or fluid regulation or restriction, including:

- justification
- species involved
- length and type of food/fluid regulation
- animal health monitoring procedures and frequency (e.g., body weight, blood urea nitrogen, urine/fecal output, food/fluid consumption)
- methods of ensuring adequate nutrition and hydration during the regulated period

Note: If preferred, this information may be provided in a Table or additional Appendix.

No protocols requiring food and/or fluid restriction are currently approved.

vi. Use of Non-Pharmaceutical-Grade Drugs and Other Substances [*Guide*, p. 31]

Describe the IACUC/OB's expectations regarding the justification for using non-pharmaceutical-grade drugs or other substances, if applicable.

No non-pharmaceutical grade drugs or other substances are currently utilized as part of an approved protocol.

vii. Field Investigations [*Guide*, p. 32]

Describe any additional considerations used by the IACUC/OB when reviewing field investigations of animals (non-domesticated vertebrate species), if applicable.

Field Investigations are reviewed for the proper permitting requirements as well as zoonotic potential, and veterinary requirements for projects involving capture, identification, sedation, anesthesia, surgery, recovery, holding, transportation, release, or euthanasia. When a protocol defines a need for the species to be removed from the wild, it is reviewed for plans for either a return to the habitat or the final disposition. PIs conducting the research communicate their knowledge regarding disease, safety issues, and any laws and regulations that apply through the review of training and experience of the research team. Exceptions to the above are clearly defined and evaluated by the IACUC at the time of review.

viii. Animal Reuse [*Guide*, p. 5]

1) Describe institutional policies regarding, and oversight of, animal reuse (i.e., on multiple teaching or research protocols).

There are no currently approved protocols that involve the reuse of individual animals.

2) Briefly describe the types of activities currently approved that involve the reuse of individual animals.
Note: A list of specific protocols involving reuse of animals should be available during the site visit.

N/A

3) Describe other instances where the final disposition of animals following study does not involve euthanasia, including adoption, re-homing, rehabilitation, etc.
Note: A list of specific protocols involving reuse of animals should be available during the site visit.

N/A

2. Post-Approval Monitoring [*Guide*, pp. 33-34]

a. Describe mechanisms for IACUC/OB review of ongoing studies and periodic proposal/protocol reviews (e.g., annual, biennial, triennial, or other frequency).

The NASA KSC IACUC requires that all protocols undergo an annual review.

b. Describe the process and frequency with which the IACUC/OB reviews the program of animal care and use.

The IACUC reviews the animal care program semiannually for adequacy and compliance with regulations and directives. In addition to the semiannual reviews, the committee meets as often as required to review animal protocols in support of space flight missions, facility trial runs, ground research, and environmental field studies.

c. Describe the process and frequency with which the IACUC/OB conducts facility and laboratory inspections.
- Describe the rationale or criteria used for exempting or varying the frequency of reviewing satellite holding facilities and/or animal use areas.
- If contract facilities or contractor-provided personnel are used, describe procedures used by the IACUC/OB to review such programs and facilities.

Note: A copy of the last report of these reviews should be included as **Appendix 10**.

The IACUC conducts the facility inspection semiannually for adequacy and compliance with regulations and directives. In addition to the semiannual reviews, the committee meets as often as required to review animal protocols in support of space flight missions, facility trial runs, ground research, and environmental field studies.

d. If applicable, summarize deficiencies noted during external regulatory inspections within the past three years (e.g., funding agencies, government, or other regulatory agencies) and describe institutional responses to those deficiencies. *Note:* Copies of all such inspection reports (if available) should be available for review by the site visitors.

N/A

e. Describe any other monitoring mechanisms or procedures used to facilitate ongoing protocol assessment and compliance, if applicable.

The Institution requires that all protocols undergo an annual review. Amendments to approved protocols are reviewed when needed.

3. Investigating and Reporting Animal Welfare Concerns [*Guide*, pp. 23-24]
Describe institutional methods for reporting and investigating animal welfare concerns.

Animal Welfare concerns are reported directly to the NASA KSC IACUC Chair. In addition, wildlife concerns may be reported directly to the wildlife refuge and Fish and Wildlife Conservation (FWC) office. Notices are posted throughout the SA which provides instructions for reporting any animal welfare concerns without concern of reprisal.

4. Disaster Planning and Emergency Preparedness [*Guide* p. 35]
Briefly describe the plan for responding to a disaster potentially impacting the animal care and use program:

- Identify those institutional components and personnel which would participate in the response.
- Briefly describe provisions for addressing animal needs and minimizing impact to animal welfare.

Note: A copy of disaster plan(s) impacting the animal care and use program must be available for review by the site visitors.

This emergency preparedness plan establishes a uniform policy for the effective mitigation of, preparation for, response to, and recovery from a variety of emergency situations. These emergency situations can have a varying degree of impact on the health, safety, and welfare of employees, visitors and animals at the NASA KSC SSPF SA. Planning and preparation is critical to the successful mitigation of emergencies. Each individual

involved in animal care has reviewed and are familiar with building evacuation routes, equipment, and supplies before an emergency situation arises. The purpose of the plan is to identify measures taken to provide adequate care to live laboratory animals in the event of an emergency or disaster situation. The plan lists contact numbers for institutional components and personnel including the NASA Emergency Management Officer (NEMO), the Continuity of Operations office, the KSC Emergency Operations Center, animal care staff, AV, safety manager, IACUC chair, facilities manager(s), NASA manager, and NASA Chief Veterinarian. In the event of an emergency, the responsibilities of the animal care staff include: rescue and recovery of escaped or released animals, provision of a safe and clean environment for animals, and the triage, treatment and/or euthanasia of animals as required and determined appropriate in accordance with established NASA policy. Personnel will report to the facility as soon as emergency management officials allow access to the facility. The AV and animal technologist or alternate are on call 24/7 whenever animals reside in the facility.

II. Animal Environment, Housing and Management

Note: Complete each section including, where applicable, procedures performed in farm settings, field studies, aquatic environments, cephalopods (whose use may be described in Appendix 18 in lieu of each section of the Program Description), etc.
etc.

A. Animal Environment

Note: Facility-specific details regarding mechanical system construction and operation is requested in Section IV.B.5. and **Appendix 11**; current (measured ***within the last 12 months***), detailed (by room) performance data must also be provided as indicated in **Appendix 11.**

1. Temperature and Humidity [*Guide*, pp. 43-45]

a. Describe the methods and frequencies of assessing, monitoring, and documenting that animal room or housing area temperature and humidity is appropriate for each species.
Note: If preferred, this information may be provided in a Table or additional Appendix.

Temperature and humidity data of occupied AHRs are collected, monitored, and archived using an automated, computer-controlled, data collection system (®). This system is interfaced to the various rooms throughout the facility and is linked to a PC-based data collection system. The computer-controlled system logs data as often as required by the investigator and is alarmed by an automated telephone system as well as e-mail to the NASA KSC veterinary staff. If the recorded data exceeds established limits, the system automatically calls the staff cell phones, and they return to the facility immediately to deal with the problem.

The building is also monitored by the Kennedy Complex Control Set (KCCS) Complex Control Center (CCC) (two consoles: power and HVAC)) twenty-four/seven. In the event of a systems failure, personnel are deployed to the building to assess any alarm conditions within thirty minutes when the facility is occupied with animals. An operational agreement is in place that establishes the roles and responsibilities between contractors regarding operations, maintenance, engineering, and user for the SA.

The detailed HVAC form is included in the Appendices (see Appendix 11 – HVAC Summary).

b. List, by species, set-points and daily fluctuations considered acceptable for animal holding room temperature and relative humidity.
Note: If preferred, this information may be provided in a Table or additional Appendix. [*Guide*, pp. 44 and 139-140]

Mice:
Temperature = 70° F to 80° F
Nominal = 76° F - Warnings at 72° F & 79° F
Alarms at 70° F & 80° F

Relative Humidity = 30% to 70%
Nominal = 45% - Warnings at 34% & 66%
Alarms at 30% & 70%

One protocol involves the incubation of alligator eggs which are placed in environmentally controlled chambers and allowed to hatch. Temperature and humidity is controlled by the chamber with set points of 26°C-38°C at 85% relative humidity.

c. Temperature set-points in animal housing rooms and/or environmental conditions are often outside of the species-specific thermoneutral zone. Describe the process for enabling behavioral thermoregulation (e.g., nesting material, shelter, etc.) or other means used to ensure that animals can control their thermoregulatory environment. Include a description of IACUC/OB approved exceptions, if applicable. [*Guide*, p. 43]

Currently no protocols are approved that require other than the thermoneutral zone for the species involved. Mice are provided standard alpha dri bedding material and igloos where they can huddle together as a group.

Alligator hatchlings are provided a moss nesting substrate in the nesting container.

2. Ventilation and Air Quality [*Guide*, pp. 45-47]

a. Describe the methods and frequencies of assessing, monitoring, and documenting the animal room ventilation rates and pressure gradients (with respect to adjacent areas).
Note: If preferred, this information may be provided in a Table or additional Appendix.

The ventilation data of occupied AHRs is collected, monitored, and archived using an automated, computer-controlled, data collection system (®) and the facilities Building Automation System (BAS). The performance aspect of the ventilation system is continually monitored through the Watchdog® system, BAS, and KCCS. It is assessed quarterly and semi-annually. This assessment is triggered by the facility's preventive maintenance plan as well as by the service plan which is in place for the Watchdog® system by an outside vendor who performs the semiannual certification of the cleanroom.

b. Describe ventilation aspects of any special primary enclosures using forced ventilation.

The Darwin Chamber KB084 incubator chamber has been used in support of the alligator study from 2014 to the present. The incubator provides 82 square feet of space with air exchanges provided through a single 2-inch access port open to the controlled environment chamber. Air is well-mixed within the chamber and humidified using a rotronic ultrasonic humidifier via circulation fans that blow air through a perforated side vent toward the air return ducts on the other side of the chamber. The chamber is constructed of CFC free polyurethane foam wrapped in stainless steel for easy cleaning.

c. If any supply air used in a room or primary enclosure is recycled, describe the percent and source of the air and how gaseous and particulate contaminants are removed.

All air entering the animal rooms is 100% fresh, nonrecirculated, HEPA filtered air.

3. Life Support Systems for Aquatic Species [*Guide*, pp. 84-87]

a. Provide a general description of institutional requirements for enclosures using water as the primary environmental medium for a species (e.g., aquatics).

No aquatic species are currently housed at KSC.

b. Provide a general description of overall system(s) design, housing densities, and water treatment, maintenance, and quality assurance that are used to ensure species appropriateness.

Note: Facility-specific tank design and parameter monitoring frequencies should be summarized in **Appendix 12** (Aquatic Systems Summary).

No aquatic species are currently housed at KSC.

4. **Noise and Vibration** [*Guide*, pp. 49-50]
Describe facility design features and other methods used to control, reduce, or prevent excessive noise and vibration in the animal facility.

The design of the SA is such that noise minimization has been achieved through distant location of the cagewash room relative to the AHRs. Public address system speakers are located outside of AHRs. Personnel are informed as to the sensitivity of noise to the animals and are encouraged to speak in tones that enable them to be heard but will not disturb the animals.

Due to noise issues identified on the ISS, all aspects of noise within the ACP are being looked at including the ISSES Chambers utilized for the ground controls. The investigation is ongoing. Hard data is not available at this time.

Alligator eggs and hatchlings are housed in an Environmental Growth Chamber located in This lab is usually vacant, yet during brief experimental processing noise is kept to a minimum, and thus, within the chamber. The chambers compressor/condenser units are consolidated on the top of the incubator unit. This is a fairly new incubator with the latest in technology of DC fans and CFC free two inch foam covered by stainless steel throughout to keep noise to a minimum.

B. Animal Housing (all terrestrial, flighted, and aquatic species)

1. **Primary Enclosures**
Note: A description of primary enclosures used (e.g., cages (conventional, individually-ventilated cage systems (IVCS), etc.), pens, stalls, pastures, aviaries, tanks) should be included in **Appendix 13**.

a. Describe considerations, performance criteria and guiding documents (e.g. *Guide*, *Ag Guide*, ETS 123 and/or other applicable standards) used by the IACUC/OB to verify adequacy of space provided for all research animals, including traditional laboratory animal species, agricultural animals, aquatic species, cephalopods, and wildlife when reviewing biomedical, field and agricultural research studies.

The Guide For the Care and Use of Laboratory Animals is the guiding document used by the IACUC to verify adequacy of space provided for all research animals. In addition, the Guidelines For Use of Live Amphibians and Reptiles in Field and Laboratory Research and the Guidelines of the American Society of Mammalogists for

the Use of Wild Mammals in Research are the reference documents for the wildlife field studies.

b. Describe space exceptions to the guiding documents (*Guide*, *Ag Guide*, ETS 123, and/or applicable standards), indicating the references, considerations and performance criteria used (e.g., by the IACUC/OB) to verify adequacy of space provided for all animal species covered by the program. [*Guide*, pp. 55-63]

One active US protocol involving space flight missions is currently approved with an exception to the standards for space required for mouse housing. Flight hardware utilized to transport mice to the ISS has a housing floor space that is less than the recommend space requirements as found in the "Guide". However, conditions in microgravity allow the animals to utilize the entire volume of the compartment as living space, including all interior walls of the unit. This increases surface area available for movement. A double density test was conducted at NASA ARC to ensure that mice remained healthy when housed at the intended higher density within the unit as well as in standard microisolator vivarium cages. Acclimation of the animals to the reduced space environment was implemented to reduce stress. Body weight data as well as health observations obtained from this test were utilized as justification to house animals on the ground in the same conditions.

One active Japan Aerospace Exploration Agency (JAXA) protocol involving space flight missions is currently approved with an exception to the standards for space required for mouse housing. Flight hardware utilized to transport mice to the ISS do not meet US standards for housing but meet Japanese standards that are accepted by NASA via international agreement. Once at ISS, conditions in microgravity allow the animals to utilize the entire volume of the compartment as living space, including all interior walls of the unit. This increases surface area available for movement.

2. Environmental Enrichment, Social, and Behavioral Management [*Guide*, pp. 52-55; 63-65: *Ag Guide*, Chapter 4]

a. Environmental Enrichment

i. Describe the structural elements of the environment of primary enclosures that may enhance the well-being of animals housed (e.g., resting boards, privacy areas, shelves/perches, swings, hammocks).

The rodent species housed within the reporting period were housed in cages specifically designed to meet the structural and environmental needs of those species. Standard bedding provides opportunities for digging, scratching, and burrowing.

ii. Describe nonstructural provisions to encourage animals to exhibit species typical activity patterns (e.g., exercise, gnawing, access to pens, opportunity for exploration, control over environment, foraging, denning, burrowing, nesting materials, toys/manipulanda, browsing, grazing, rooting, climbing).

Igloos are used as enrichment for mice during the reporting period.

During this reporting period, alligator hatchlings were housed. The alligator hatchlings that are to be returned to the wild are returned as soon as the entire nest is hatched. Therefore, no provisions for foraging and nesting were provided. A resting board was provided to allow the animals to be out of water if they so desire.

b. Social Environment [*Guide*, p. 64]

i. Describe institutional expectations or strategies for social housing of animals.

Rodent species are group housed. If single housing is required a justification for the request must be reviewed and approved by the IACUC.

ii. Describe exceptions to these expectations (e.g., veterinary care, social incompatibility) and other typical justification approved by the IACUC/OB for housing animals individually.

Protocols are reviewed for housing of aggressive animals, for example, PIs are encouraged to use female mice if consistent with research goals. If male mice must be used the justification is carefully evaluated and the minimum number of males are permitted to be housed together consistent with the research goals.

iii. Describe steps taken with isolated or individually housed animals to compensate for the absence of other animals (interaction with humans, environmental enrichment, etc.).

One protocol required individual housing of male mice. Mice are required to be housed individually in the flight hardware and therefore acclimated to that condition pre-flight. Mice were housed in clear cages to allow for visual observation/interaction with mice in adjacent caging.

c. Enrichment, Social and Behavioral Management Program Review [*Guide*, pp. 58, 69]

Describe how enrichment programs and exceptions to social housing of social species are regularly reviewed to ensure that they are beneficial to animal well-being and consistent with the goals of animal use.

Enrichment is required to be addressed as part of the IACUC review process for each protocol. Enrichment must be included in the protocol or proper justification provided as to why it cannot be used.

d. Procedural Habituation and Training of Animals [*Guide*, pp. 64-65]
Describe how animals are habituated to routine husbandry or experimental procedures, when possible, to assist animals to better cope with their environment by reducing stress associated with novel procedures or people.

Potential flight mice are acclimated to their cage mates, water bottle lixits, food, and floor inserts prior to selection as flight candidates. Acclimation begins upon receipt and continues until approximately launch minus four days when the flight candidates are chosen.

e. Sheltered or Outdoor Housing [*Guide*, pp. 54-55]

i. Describe the environment (e.g., barn, corral, pasture, field enclosure, flight cage, pond, or island).

N/A

ii. Describe methods used to protect animals from weather extremes, predators, and escape (windbreaks, shelters, shaded areas, areas with forced ventilation, heat radiating structures, access to conditioned spaces, etc.).

N/A

iii. Describe protective or escape mechanisms for submissive animals, how access to food and water is assured, provisions for enrichment, and efforts to group compatible animals.

N/A

f. Naturalistic Environments [*Guide*, p. 55]

i. Describe types of naturalistic environments (forests, islands) and how animals are monitored for animal well-being (e.g., overall health, protection from predation).

N/A

ii. Describe how food, water, and shelter are provided.

N/A

iii. Describe how animals are captured.

A live trap (Sherman box trap) is utilized for the capture of beach mice as dictated by experimental protocol. It is baited with sunflower seeds and cotton for warmth (nesting material). Traps are set in the afternoon and checked in the early morning hours.

Fish are collected through the use of seine, cast net, throw trap, hook and line, and gill net as dictated by experimental protocol.

Potter traps and mist nets are used to capture scrub jays as dictated by the experimental protocol.

Marine turtles are captured with large mesh tangle nets as dictated by experimental protocol. Nets are attended at all times.

Loggerhead turtles are captured by hand, drift fences with funnel, minnow, and bucket traps. Funnel traps are shaded and checked twice a day. Minnow traps are set partially out of water in order to allow animals to surface for air. Animals caught in bucket traps are released immediately upon completion of data collection as dictated by the experimental protocol.

Standard herpetological traps are utilized, as well as hand-capture and backhoe excavation, by experienced, trained professionals for the capture of gopher tortoises.

C. Animal Facility Management

1. Husbandry

a. Food [*Guide*, pp. 65-67]

i. List type and source of food stuffs.

Rodents are fed sterilized pellet rodent food and Space Life Sciences Project Office food bars (NASA ARC provided).

ii. Describe feed storage facilities, noting temperature, relative humidity, and vermin control measures, and container (e.g., bag) handling practices, for each of the following:

- vendors (if more than one source, describe each)
- centralized or bulk food storage facilities if applicable
- animal facility or vivarium feed storage rooms

- storage containers within animal holding rooms

Vendor Storage:
The vendor supports weekly deliveries of pelleted food. Turnaround time is one week maximum. During that time, food bags are stored off the floor on racks or pallets at ambient temperature. Vermin monitoring is achieved through sticky traps.

The food bars are produced and shipped to NASA ARC or the end user directly. No storage occurs at the vendor's facility.

SA: Rodent food is stored in a walk-in freezer (-5°F) located at the SA. The freezer provides an impervious barrier to vermin. All rodent food is sterilized before placement in animal environments.

iii. Describe special food preparation areas, such as feedmills and locations where special diets are formulated, if applicable. Include in the description sanitation and personnel safety practices (noting that respiratory protection is described in Section 2.I.A.2.b. ii. Standard Working Conditions and Baseline Precautions above).

Food preparation is not normally required. Food is purchased ready to use, with exception of sterilization which is accomplished in an autoclave that is provided in the SA. If an experimental protocol requires a special diet (i.e., post-surgical recovery), then it is prepared by the PI. This preparation occurs under a laminar flow bench in the PI laboratory.

iv. Describe how food is provided to various species (*ad libitum*, limited amounts, types of feeders).

Rodent species are fed sterile food, ad libitum, in feed hoppers designed appropriate for their cages. Flight and ground control rodent food bars in the habitat are attached to the cage hardware food bar inserts using nontoxic glue.

v. Describe special food quality control procedures including procedures for rotating stock, monitoring milling dates, nutritional quality, bio load, chemical contaminants, etc.

Animals that are associated with a specific flight protocol are typically in the facility for a relatively short period of time. At the end of the brief period, the animals depart the facility and their food stocks are eliminated. The assurance of quality control and issues of contamination are addressed onsite by veterinary staff of all food received before giving it to the animals by monitoring the dates and signs of contamination.

b. Drinking Water [*Guide*, pp. 67-68]

i. Describe the water source, treatment or purification process, and how it is provided to the animals (e.g., bowls, bottles with sipper tubes, automatic watering, troughs, ponds, streams).

All rodents are provided sterilized, deionized water ad libitum via water bottles and sipper tubes. Prior to space flight rodents are acclimated to a customized lixit delivery system.

ii. Describe methods of quality control, including monitoring for contaminants.

All the water that is produced in the facility is monitored for quality control (i.e., conductivity, pH, and etc.) through a KSC testing laboratory. All autoclave loads of filled water bottles with sipper tubes include a sample bottle that is analyzed by the NASA KSC microbiology laboratory for sterility. Water bottles are not utilized for animal drinking purposes until test results have been obtained.

iii. If automatic water delivery systems are used, describe how they are maintained and sanitized.

N/A

c. Bedding and Nesting Materials [*Guide*, pp. 68-69]

i. Describe type(s) and how used for various species.

The rodent species are housed on direct bedding sterilized by irradiation or steam. Alphdri® has been utilized during the reporting period.

ii. Describe bulk bedding storage facilities, if applicable, including vermin control measures.

Animals are kept in the facility for relatively short amounts of time. This necessitates minimal storage of bedding for any given mission. However, for the bedding that does require storage, it is stored in small amounts within the local facility until the mission is completed. Bedding is sterilized within the cage prior to housing of animals.

iii. Describe quality control procedures, including monitoring for contaminants.

Bedding material is placed in the cages prior to autoclaving. Each autoclave load is monitored through the use of a biological indicator and an integrator strip within an autoclave pouch.

d. Miscellaneous Animal Care and Use Equipment

i. Describe motorized vehicles and other equipment (e.g., trailers) used for transporting animals, noting the type and how the cargo compartment is environmentally controlled, if applicable.

A government owned truck is utilized to transport alligator eggs from the nests to the (b) (7)(F) and hatchlings back to the original nest they were obtained from. Trucks are air conditioned. Due to the remote location of some of the nests, in addition to truck transport, it is necessary to use a boat to reach some of the nests.
The boats are not environmentally controlled.

A climate controlled lift gate truck is utilized to transport flight hardware containing mouse species to and from the launch pad.

ii. Describe other animal care related equipment used in the animal care program (specialized equipment for exercise or enrichment, high pressure sprayers, vacuum cleaners, tractors, trailers, spreaders, etc.).

High-Efficiency Particulate Absorption (HEPA) filtered cleanroom vacuum cleaners are utilized to assist in the sanitation of the facility. Standard cotton mops and cellulose sponges are utilized in achieving surface sanitation. No other miscellaneous animal care equipment is utilized.

e. Sanitation [*Guide*, pp. 69-73]

i. Bedding/Substrate Change

1) Describe frequency of contact and non-contact bedding change for each species and enclosure type (solid-bottom or suspended) or pen.

Group housed rodents are cage changed twice a week. Single housed rodents are changed once a week. Cage change intervals are increased as needed for animal comfort or on the basis of the PI's requirements'. The same frequency of cage changes occurs if grid floor inserts are used in the microisolator cages.

2) Describe any IACUC/OB approved exceptions to frequencies recommended in the *Guide* or applicable regulations and the criteria used to justify those exceptions.

None.

3) Note the location where soiled bedding is removed from the cages/enclosures and where clean bedding is placed into the

cages/enclosures.

Soiled bedding is removed from the AHRs in the microisolator cages via the "dirty" corridor, where it is manually dumped into a plastic garbage bag at a bedding dump station. Clean bedding is placed in clean cages in the cage preparation area within the barrier following sanitation of cage components and prior to autoclaving.

ii. Cleaning and Disinfection of the Micro- and Macro-Environments
Note: A description of the washing/sanitizing frequency, methods, and equipment used should be included in **Appendix 14** (Cleaning and Disinfection of the Micro- and Macro-Environment) and **Appendix 15** (Facilities and Equipment for Sanitizing Materials).

1) Describe any IACUC/OB approved exceptions to the *Guide* (or applicable regulations) recommended sanitation intervals.

None.

2) Assessing the Effectiveness of Sanitation and Mechanical Washer Function

a) Describe how the effectiveness of sanitation procedures is monitored (e.g., water temperature monitoring, microbiological monitoring, visual inspections).

In the facility, heat sensitive indicator strips are used to assure that water temperature reaches 180°F. Periodic samples of cages, food, bedding, and water are collected for microbiological monitoring and to validate quality control techniques performed by the technical staff when autoclaving supplies. In addition, air and surface sampling are performed routinely to further assess the facility environment. Samples are evaluated by the NASA KSC KEMCON Microbiology Group.

b) Describe preventive maintenance programs for mechanical washers.

The mechanical washers are maintained through a preventative maintenance service contract with the vendor.

f. Conventional Waste Disposal [*Guide*, pp. 73-74]
Describe the handling, storage, method and frequency of disposal, and final disposal location for each of the following:

i. Soiled bedding and refuse.

Soiled bedding and animal waste from the cages are placed in plastic bags and removed to the dumpster at the end of each day. Excess waste and bedding are removed from the cages by rinsing the cages with hot water before they are placed in the cagewasher. The trash is emptied daily into the dumpster. Sharp objects, broken glass, or biohazardous materials are placed in the designated trash cans located in the lab areas and are also emptied daily.

ii. Animal carcasses.

Dead (natural, accidental, and euthanized) animals are double-bagged in biohazard bags and stored under refrigeration or in freezers until postmortem examination or disposition. Animal carcasses to be sent to PI's institute for further analysis will be provided proper refrigerated transportation containers for shipment.

Tags showing the animal's identification number or marking, the time and date of death, and the room in which the animal died are affixed to bags containing dead animals. Euthanized carcasses of animals in good health not required by PIs for analysis or postmortem examination are dispositioned to the Florida Audubon Society or picked up by an outside contractor as biohazardous waste.

g. Pest Control [*Guide*, p. 74]

i. Describe the program for monitoring and controlling pests (insects, rodents, predators, etc.). Include a description of:

- monitoring devices and the frequency with which devices are checked
- control agent(s) used and where applied, and
- who oversees the program, monitors devices, and/or applies the agent(s).

Vermin are controlled by an outside contractor who controls and monitors the facility on a quarterly basis. Baited traps, sticky boards, and roach motels are used in life science experimental areas. Treatment of the exterior perimeter of the building is conducted on a monthly basis. The product used is Temprid FX.

ii. Describe the use of natural predators (e.g., barn cats) or guard animals (e.g., dogs, donkeys) used for pest and predator control, if applicable.

N/A

iii. Note how animal users are informed of pesticide use and how animal users may opt out of such use in specific areas.

No insecticides are routinely used in the facility. Sticky boards are used where necessary.

h. Weekend and Holiday Animal Care [*Guide*, pp. 74-75]

i. Describe procedures for providing weekend and holiday care. Indicate who (regular animal care staff, students, part-time staff, etc.) provides and oversees care and what procedures are performed.

The animal care staff and the PI provide for weekend and holiday care. An emergency call roster is posted. The Laboratory Animal Technologist (LATG) or an alternate staff member is on call 24 hours a day, seven days a week while animals are resident in the facility. Daily monitoring, feeding, and watering are performed.

The alligator PI and other team members as designated in the approved protocol conduct nest checks on the weekends and holidays. The checks include separating hatched alligators from unhatched eggs and performing a health check on all alligators that have hatched.

ii. Indicate qualifications of weekend/holiday staff if not regular staff.

N/A

iii. Describe procedures for contacting responsible animal care and/or veterinary personnel in case of an emergency.

The AV and animal technologist are on call whenever animals reside in the facility.

2. Population Management [*Guide*, pp. 75-77]

a. Identification

Describe animal identification methods for each species (e.g., microchips, cage/tank cards, collars, leg bands, tattoo, ear tags, brands).

Where feasible, animals are individually identified with a permanent number or code. Rodents are ear punched, ear tagged, or otherwise identified in accordance with the IACUC-approved protocol at the appropriate ages. Animals brought into the facility by the PIs or which arrive from other NASA Centers are processed with existing identification. Each cage bears identification of the animals contained within. Implantable identification chips have been utilized as dictated by individual protocol.

The KEMCON wildlife protocols utilize several methods for identifying and tracking animals based on the species under study. Methods currently utilized include leg bands, radio tags, Passive Integrated Transponder PIT tags, ear tags, shell scute markings, satellite transmitters, tail tag patagial tags, radio collars, fluorescent tracking powder, monel tags, sonic tags/acoustic telemetry tags, dart tags, and Roto tags.

b. Breeding, Genetics, and Nomenclature

i. Describe the program for advising investigators on the selection of animals based on genetic characteristics.

The selection of animals based on genetic characteristics occurs at the PI institution and is approved by their IACUC. The NASA KSC IACUC reviews the animal selection and makes recommendations as deemed necessary.

ii. Describe the program for advising investigators on using standardized nomenclature to ensure proper reporting of the identification of the research animals with regard to both the strain and substrain or the genetic background of all animals used in a study.

This process is taken care of by the PIs IACUC, is reviewed at the NASA Flight IACUC for flight protocols, and is reviewed once more by the NASA KSC IACUC.

iii. Describe genetic management techniques used to assess and maintain genetic variability and authenticity of breeding colonies, including recordkeeping practices (*Guide*, pp. 75-76).

N/A

iv. For newly generated genotypes, describe how animals are monitored to detect phenotypes that may negatively impact health and well-being. Note that the methods used to report unexpected phenotypes to the IACUC/OB should be described in section 2.1.B.1.c.ii, “Unexpected Outcomes that Affect Animal Well-Being.”

N/A

III. Veterinary Care [*Guide*, pp. 105-132]

Note: Complete each section, including, where applicable, procedures performed in farm settings, field studies, aquatic environments, etc.

A. Animal Procurement and Transportation [*Guide*, pp. 106-109; *Ag Guide*, pp. 8; 45; 50-57]

1. **Animal Procurement**

Describe the method for evaluating the quality of animals supplied to the institution (from commercial vendors, other institutions, etc.).

The animal care staff coordinates procurement of animals with the PI and the NASA experiment management Centers.

Animals must meet health criteria for a particular species as determined by current NASA policies. Prior to vendor selection and animal receipt, the veterinary staff performs a review of the tentative supplier's most recent health reports. A commercial vendor performs animal health screens in support of the flight payloads.

2. **Transportation of Animals**

Describe how animals are transported between outside sources and the institution and within the institution, including loading, unloading, level of biosecurity, immune status and specific pathogen status (consider all species, including aquatic and semi-aquatic species).

Procured animals are transported to the facility in shipping containers via a climate-controlled vehicle arranged for by the animal vendor. Delivery occurs directly at the building. All shipping containers are unloaded from the vehicle and immediately passed through the door of the facility.

Animals and caging equipment are transported to support laboratories through common use corridors and elevators when required. This has been performed during simulation periods and post-flight. Rodents are transported on a covered cart in microisolator cages with the filter tops in place or in approved flight developed hardware.

Transportation to the launch pad occurs by NASA or contractor personnel via a climate-controlled van. Animals are sealed into the flight hardware at the time of transport.

In support of the flight payloads mice are transported to other institutions within commercially procured filtered SPF mouse shipping containers. The transportation is coordinated with couriers who have expertise in the transport of animals. The shipment is monitored along the way and temperature/humidity data loggers are attached for download following arrival at destination. There is no concern of risk for biosecurity and minimal risk for immune status and specific pathogen status for this species.

Transportation of alligator hatchlings is performed via the same plastic containers within which the hatchlings are housed in the controlled environment chambers. A lid is placed on the top of the container for transport. A government owned truck is utilized to transport the hatchlings back to the original nest they were obtained from. Due to the remote location of some of the nests, in addition to truck transport, it is necessary to use a boat to reach some of the nests. There is no concern of risk for biosecurity, immune status, and specific pathogen status for this species.

B. Preventive Medicine

1. Animal Biosecurity [*Guide*, pp. 109-110]

a. Describe methods used to monitor for known or unknown infectious agents. Note that if sentinel animals are used, specific information regarding that program is to be provided below.

Prior to receipt of rodents, a review of the health status from the vendor from which they are obtained is conducted. At receipt plus five to seven days, a representative population of the animals is sampled for microbiological assessment of their current health status. Specimens are sent to a diagnostic laboratory. In addition, at flight minus eleven days a final microbiological sampling is obtained and sent to a diagnostic laboratory for evaluation. No sentinel animals are used.

b. Describe methods used to control, contain, or eliminate infectious agents.

The KSC facility is a Class 8 (100K) ISO 14644-1: 2015 clean room barrier. Personnel are required to don clean room attire (clean room coveralls, hat, mask, shoe covers, and sterile gloves.) All equipment and supplies are decontaminated either through the cagewasher and autoclave or wiped down with 70% Ethanol or sanitary wipes. The cleanroom is certified semiannually to verify that it is within the Class 8 (100K) ISO 14644-1: 2015 specifications. In addition, air and surface sampling for detection of microbial organisms is conducted on a quarterly basis when no animals are present and two weeks prior to receipt of animals in support of a flight payload. To date no infectious agents have been found to be introduced to the facility or animals housed within.

2. Quarantine and Stabilization [*Guide*, pp. 110-111]

a. Describe the initial animal evaluation procedures for each species.

Prior to receipt of rodents, a review of the health status from the vendor from which they are obtained is conducted.

Upon arrival at KSC, rodent animals will be brought to the receiving area in the facility for processing. Before acceptance and entry into the facility, animals undergo a health examination by the AV or veterinary technician.

At receipt plus five to seven days, a representative population of NASA program animals is sampled for microbiological assessment of their current health status. Specimens are sent to a diagnostic laboratory. Results of these analyses are verbally reported at 24 hours, 48 hours, and 72 hours, with a written report due in 7 days.

b. Describe quarantine facilities and procedures for each species. For each species, indicate whether these practices are used for purpose-bred animals, random-source animals, or both.

When the animals are received into the facility, they undergo health examinations, screening, and an initial period of quarantine or isolation from other animals. This depends on the species, source, and condition of the animal. The purpose of quarantine is to assess the animal's health, protect against contagious diseases, allow a period of recovery from transportation, and allow for adjustment to the new environment. An animal will be released for research use by the AV or the AV in conjunction with other PI veterinarians, as appropriate, after the proper quarantine period has passed and the animal's health has been assessed and determined to be acceptable based on the following criteria:

a) Animal must be overtly in good health.
b) Laboratory tests must confirm animal to be free of the organisms of exclusion as appropriate.
c) Other health assessment procedures, as appropriate, must indicate the animal is in good health and is "normal."

No random source species were used in a research protocol during the reporting period.

c. Describe the required/recommended stabilization period for each species.

Noninvasive procedures such as special housing, animal training, etc., may begin within 24 hours of receipt. Due to the unpredictable nature of the space flight program, we do not have a specified period of acclimation before invasive procedures may begin. However, as a matter of course, usually no invasive procedures are conducted prior to one to two weeks after arrival.

3. Separation by Health Status and Species [*Guide*, pp. 111-112]

a. Describe the program for the separation of animals by species, source, and health status. If the animals in different status are not maintained separately, describe circumstances in which mixing occurs and explain the rationale for mixing.

The NASA program animals are housed in rooms with their own species (rodent rooms). Animals of a given species belonging to a separate PI are kept together whenever possible depending on experimental design and space available at that time. Moreover, all rodent species are housed in microisolator cages.

b. Describe situations where multiple species may be housed in the same room, area, or enclosure.

There is no instance where multiple species may be housed in the same room.

c. Describe isolation procedures and related facilities for animals.

Ill animals or those found to harbor organisms listed for exclusion would be separated and maintained in isolator caging systems in the holding room or in the quarantine room. The animal would be monitored, treated, or euthanized as determined by the AV.

C. Clinical Care and Management [*Guide*, pp. 112-115]

1. Surveillance, Diagnosis, Treatment and Control of Disease [*Guide*, pp. 112-113]

a. Describe the procedure(s) for daily observation of animals for illness or abnormal behavior, including:

- the observers' training for this responsibility
- method(s) for reporting observations (written or verbal)
- method(s) for ensuring that reported cases are appropriately managed in a timely manner.

As a minimum, an LATG, veterinary technician or other members of the animal care staff performs a check of each animal once a day while the animals are in the facility. Deviations from the normal are reported to the lead and the veterinarian. The staff monitors the animals for illness, unusual behavior, and escaped animals.

PIs are notified of deviations by telephone with a written follow up. PIs may also check on their experimental animals routinely while the PIs are in residence.

The alligator PI and other team members as designated in the approved protocol conduct daily nest checks. The checks include separating hatched alligators from the container of unhatched eggs and performing a health check on all alligators that have hatched. Any issues are reported to the AV or animal technologist.

b. Describe methods of communication between the animal care staff and veterinary staff and the researcher(s) regarding ill animals.

PIs and animal staff report observations to the lead technologist who in turn reports to the AV and/or PI. Researchers contact animal care staff/veterinarian when necessary. This is accomplished via email or telephone.

A licensed veterinarian who is an American College of Laboratory Animal Medicine diplomat and qualified in the field of Laboratory Animal Medicine provides veterinary medical care. The AV makes routine site visits and is available when necessary; i.e., emergencies, pre-flight instructions, and consultation. The veterinarian is notified by

telephone with a written follow up. During periods of flight experimentation involving animal surgical procedures, a laboratory animal veterinarian is onsite. Other procedures are observed by the veterinary technician/technologist and problems reported to the AV.

In case of illness or injury, the manager and veterinarian will be notified and an effort made to diagnose and treat the condition, if possible. The veterinarian attending the sick or injured animal will consult with the PI or an alternate designated by the PI before treating the animal therapeutically. A list of PIs and alternate contacts, including home telephone numbers, is available to the veterinary staff. PIs advise the LATG, veterinary technician, and veterinarian of experimental restrictions on medical treatment of animals, particularly the use of antibiotics and other therapeutic agents, at the time animals are purchased or brought into the facility. If the necessity becomes evident during the research, PIs advise the veterinarian in writing.

When emergency treatment is necessary without prior consultation with the PI, the animal care staff, following instructions from the veterinarian, will treat the animal, and the PI will be advised promptly as to the diagnosis and treatment of the animals involved.

Contagious animals may be held in quarantine or isolated from other animals by order of the veterinarian to protect against the potential spread of contagious disease. Such animals may be removed only by the permission of the AV. PIs will be notified immediately of any quarantined animals.

Providing veterinary medical care to ill animals in support of the wildlife research is the responsibility of the AV. One protocol involving the attachment of radio collars to beach mice utilizes the services of a local veterinarian for anesthesia and attachment of the device. Any issues resulting from that procedure would refer back to the local veterinarian.

c. Describe the preventive medicine and health management/monitoring programs (e.g., physical examination, TB testing, vaccination, hoof/nail trimming, teeth cleaning/floating, vendor surveillance, use of sentinel animals) for each species.

Vendor or institutional surveillance is performed for rodent species. Microbiological sampling of a reasonable percentage of each shipment cohort of the KSC flight research animals is conducted upon arrival and at intervals prior to space flight.

There are no in-house breeding colonies at the facility. Due to the short-term duration of animals in-house to support a flight experiment as well as the stringent microbiological sampling that occurs of those animals, no other program for monitoring the health status is in place.

2. **Emergency Care** [*Guide*, p. 114]

a. Describe the procedures to ensure that emergency veterinary care is continuously available for animals during and outside of regular work hours, including access to drugs or other therapeutics and equipment.

The veterinary staff is on call at all times when animals are being housed. Researchers contact animal care staff/veterinarian when necessary. This is accomplished via email or telephone. Access to drugs or other therapeutics and equipment is available to veterinary staff at all times.

b. Describe the authority of the Attending Veterinarian or his/her designee relative to the emergency treatment of animals in the program.

In the case of an emergency health problem, if the responsible person (e.g. PI) is unavailable or if the PI and veterinarian cannot reach consensus on treatment, the veterinarian has the authority to treat the animal, remove it from the study, institute appropriate measures to relieve severe pain or distress, or perform euthanasia if necessary.

3. **Clinical Record Keeping** [*Guide*, p. 115]

a. Describe the procedure for maintaining medical records and documenting treatment of ill animals including: clinical laboratory findings, diagnoses, treatments, medical progress records, etc. Identify the species for which individual records are maintained and where such records are kept.

All information is recorded daily using logbooks, data sheets, and/or daily observation sheets. Individual records are not maintained for rodent species.

Field study research animals are free ranging wildlife or aquatic species. Therefore no clinical records are applicable. Hatchling alligators are immediately returned to the wild. If it were necessary a medical notation would be entered in a medical record if veterinary care were administered.

b. Identify individual(s) (titles, not necessarily names) responsible for maintaining such records and identify where the records are maintained and who, including the IACUC/OB has access to the records.

The LATG is responsible for maintaining all health records. Animal health records are on file in the animal care office. The veterinary staff and the IACUC has access to the records as needed.

c. Describe the role of the Attending Veterinarian in recordkeeping.

The AV may log notes in the daily logs/observation sheets or dictate to the veterinary technician assisting with the health check.

4. **Diagnostic Resources.** Describe available diagnostic methods used in the program including:

   a. In-house diagnostic laboratory capabilities.

Rodent health screens performed by the supplier are requested and reviewed by the AV prior to vendor selection for laboratory rodents. Results of microbiology screens performed by KSC and outside laboratories are also reviewed with the AV.

The KSC Clinical Microbiology Laboratory is accredited by the College of American Pathologists and provides microbiological services for diagnostics as determined by the AV.

Due to the nature of operations at the facility (animal holding) and pre-shipment health screens, diagnostic services are rarely required.

   b. Commercially provided diagnostic laboratory services.

A commercial laboratory provides diagnostic services. Services include blood chemistries, histology, microbiology, virology, parasitology, and necropsy.

   c. Necropsy facilities and histopathology capabilities.

Necropsy procedures to determine cause of death or illness can be performed under a fume hood under the general oversight and supervision of the AV. There are no histopathology capabilities on site.

Regarding wildlife protocols, if necropsy is necessary it is conducted on site in the field or at the University of Florida.

   d. Radiology and other imaging capabilities.

A portable digital x-ray unit (Video Dental Concepts XRAY2GO) is available for use by the PIs. An approved Radiation Use Authorization is in place and must list all users of the unit. Training provided by NASA KSC Health Physics Office must be completed prior to use of the unit.

5. **Drug Storage and Control**

   a. Describe the purchase and storage of controlled and non-controlled drugs.

The SSPF is the storage location for controlled and non-controlled pharmaceutical substances. An inventory database is maintained for all items. Controlled drugs are stored in a double-door, narcotics cabinet which is mounted to the wall in a locked room. The controlled drug cabinet construction material is 14-gauge steel inner door and double-walled outer door. It has a separate key lock on each door. Drugs will be purchased by the purchasing agent of the Jacobs Technology Inc..

b. Describe record keeping procedures for controlled substances.

The Drug Control Officer monitors use and maintains records under the supervision of the AV. Records are maintained in accordance with the Drug Enforcement Administration (DEA). All DEA 222 forms are completed and kept for at least two years. Schedule II – V drugs are logged in, and a daily log is maintained of all schedule drugs as they are used. These records are reviewed and the drugs are inventoried at quarterly intervals.

D. Surgery [*Guide*, pp. 115-123]

1. Pre-Surgical Planning [*Guide*, p. 116]

Describe the process(es) used to ensure adequate pre-surgical planning, including: identifying personnel; locating equipment, supplies, veterinary involvement for selecting analgesic and anesthetic agents and facilities; planning; and pre- and post-operative care.

The pre-surgical planning occurs at the PI's institution and is approved by his/her IACUC. The NASA KSC IACUC reviews all aspects of a surgical procedure performed by visiting PIs in our facilities. This includes pre-surgical planning and pre- and post-operative care. All questions and recommendations are made at this time. The PI provides the surgical team. The PI and team credentials are reviewed by the NASA KSC IACUC to ensure that qualified personnel are being utilized. Coordination of required equipment and supplies is performed prior to the arrival of the team via agreements between the NASA payload managers and PIs. Following arrival and commencement of the experiment activities, the NASA KSC veterinarian observes the procedure and makes recommendations, as deemed necessary, to the PI.

If wildlife or aquatic studies will utilize surgery the AV will review procedures with the PI and provide the training if indicated. Anesthetic and analgesic agent selection and use would be reviewed by the AV and IACUC members during IACUC review. The PI pre-planning will include:

- Literature review
- Consultation and possibly hands-on training with other colleagues in the field
- Consultation with AV if necessary
- Obtain approval from the IACUC committee
- Purchase and organize field supplies into tagging kits

2. **Surgical Facilities** [*Guide*, pp. 116-117, 144-145]
List building name(s) and room number(s) or other locations (coded, if confidential) where surgical procedures are performed. For each, describe:

- the type of species (including rodents, fish, agricultural species, etc.)
- nature of procedure(s) (major/minor/emergency, survival and non-survival, etc.)
- the amount of use [heavy (daily), moderate (weekly), or light]
- major surgical support equipment available (gas anesthesia machines, respirators, surgical lights, etc.)
- facilities for aseptic surgery, surgical support, animal preparation, surgeon's scrub, operating room, and postoperative recovery
- construction features of the operating room(s), including interior surfaces, ventilation, lighting, and fixed equipment used to support surgical procedures and other means of enhancing contamination control

Note: If preferred, the information requested in this section may be provided in Table.

The facility is equipped with a surgical suite located on the "clean" side of the SA and is composed of a surgical prep, surgeons scrub, operating room and postoperative recovery room (b) (7)(F) This facility is used for aseptic surgery for rodent species only on a light schedule. It has no fixed equipment in the operating room and the interior surfaces are such to allow for sanitation and contamination control (smooth, impervious to liquids, sealed ceiling lights, 100% fresh non-recirculated air with 12-15 air exchanges per hour). Fixed equipment in the support areas include scrub sink, fume hood, and utility sink. (See Appendix 3 – Science Annex Layout).

In most incidences, surgical support equipment is provided as dictated by the protocol. Items can be provided by the PI or research support managers. The logistics are agreed upon and coordinated prior to the arrival of the PI at the facility. A gas anesthesia unit (isoflurane) is available for use.

The (b) (7)(F) is strictly used for the anesthetic procedure necessary to apply transmitters onto wild, caught beach mice that are trapped in prescribed areas in Florida. The mice are brought to the hospital for same-day, outpatient, anesthetic procedure and are not kept for research or study purposes. They are released back into their same habitat for monitoring. The hospital is a modern, well-equipped, small animal hospital with reception area; dog/cat dedicated waiting rooms, exam rooms, exercise areas, hospital and boarding areas; treatment and surgical prep areas; surgery room; radiology room; offices; kitchen and laundry areas; grooming room; isolation room; and ICU area. A gas (Isoflurane) anesthesia machine is utilized to administer anesthesia to the beach mice. Other field investigations require that the surgical procedure to be performed on a boat or out in the field.

3. **Surgical Procedures** [*Guide*, pp. 117-118]

   a. Describe the criteria used to differentiate major from minor survival surgery, including classification for certain procedures (e.g., laparoscopic technique).

   Major and minor surgical procedures are differentiated in the IACUC package submitted for review to the NASA KSC IACUC. The criteria utilized are as defined in the "Guide". Major survival surgery is categorized as having penetrated a body cavity and/or producing significant physiological impairment. Minor surgery is less invasive and causes little or no physical impairment. Aseptic techniques are utilized in both cases. Differentiation between a survival and non-survival procedure is also defined in the IACUC package. Survival surgery is categorized as total recovery from the procedure, whereas non-survival surgery requires that the animal is euthanized without recovery from anesthesia.

   b. How is non-survival surgery defined?

   Survival surgery is categorized as total recovery from the procedure, whereas non-survival surgery requires that the animal is euthanized without recovery from anesthesia.

4. **Aseptic Technique** [*Guide*, pp. 118-119]

   a. Describe procedures, equipment, and protective clothing used for aseptic surgery. Include patient and surgeon preparation.

   Our facility is unique in that visiting scientists utilize procedures that are established within their own institutions and protocols. The NASA KSC IACUC performs assessment of these distinctive procedures and the equipment used for aseptic surgical technique for each payload experiment. The IACUC reviews and assures that the standards for patient and surgeon preparation are met within each protocol.

   Surgery performed in the field is best described as "clean" surgery. The surgical site is scrubbed and chemical disinfection performed. Instruments are initially sterilized and then soaked in cold sterilant and rinsed in sterile saline before reuse. Surgeons scrub hands with surgical scrub and wear sterile surgical gloves. The NASA KSC IACUC performs assessment of these distinctive procedures, the equipment and protective clothing used for aseptic surgical technique for each experiment. The IACUC reviews and assures that the standards for patient and surgeon preparation are met within each protocol.

   b. Describe methods used to sterilize instruments and protective clothing, including a description of approved liquid sterilants and instrument exposure time(s) required for each, if applicable.

Instruments are sterilized by steam autoclaving or ethylene oxide gas sterilization. For autoclaving the effectiveness is monitored by the use of indicator tape and biological ampules in each load. Disposable and/or sterile protective clothing is worn for surgical procedures.

Some of the wildlife studies protocols do outline the use of liquid sterilization when necessary as follows: by submerging all surgical tools and tags in a 70% isopropyl alcohol bath for a minimum of ten minutes and rinsed with sterile saline prior to use; utilizing betadyne to disinfect tagging needles in between use. Sterile gloves are used.

c. Describe methods for instrument re-sterilization between serial surgeries.

Instruments are sterilized by steam autoclaving or ethylene oxide gas sterilization. In addition, a glass bead sterilizer is available for use.

d. Indicate how effectiveness of sterilization is monitored.

For autoclaving the effectiveness is monitored by the use of indicator tape, integrator strip, and biological ampule in each load.

e. Describe surgical support functions provided by the program to investigators.

The AV provides oversight of all surgical procedures. The AV can view all procedures when desired. All procedures as outlined in study protocols are reviewed by the AV prior to the start of work.

5. Intraoperative Monitoring [*Guide*, p. 119]
Describe monitoring and recording requirements for each species, including the type of record(s) maintained. Also note monitoring of anesthesia during non-survival procedures.

The AV provides oversight of all surgical procedures. The AV can view all procedures when desired. All procedures as outlined in study protocols are reviewed by the AV prior to the start of work.

Our facility is unique in that visiting scientists utilize procedures that are established within their own institutions and protocols. The NASA KSC IACUC performs assessment of these distinctive procedures and the PIs methods for maintaining records for the payload experiments. The IACUC reviews and assures that the standards for patient care is met within each protocol. Note that no non-survival surgical procedures occurred during the reporting period.

Procedures performed in conjunction with field investigations involving surgical procedures in the field are monitored by the PIs and approved team members. Documentation of the surgical procedure care is required and is the responsibility of the PI.

6. **Postoperative Care** [*Guide*, pp. 119-120]
   Describe the postoperative care program, including who is responsible for overseeing and providing the care, types of records maintained (e.g., perioperative), where the records are maintained, etc.

The veterinary staff is responsible for overseeing/ensuring that postsurgical care is provided. The animals are allowed to recover from recumbency in the recovery room. The animals are checked frequently by the LATG/PI team and maintained in isolation until able to maintain upright posture. Once recovered, the animals are relocated to their AHR. Postsurgical animal health is reviewed daily by the AV or as needed during the initial period following surgery. The LATG maintains all records in a daily logbook. PIs also maintain records of procedures and care associated with their individual protocols. These records are required by and are under the authority of the visiting PIs IACUC.

In reference to the field investigation protocols, the researcher is responsible for overseeing/ensuring that postsurgical care is provided. Where feasible the animals are checked frequently by the PI team and maintained in isolation until able to maintain upright posture. Once recovered, the animals are returned to the environment. PI's maintain records of procedures and care associated with their individual protocols.

E. Pain and Distress [*Guide*, pp. 120-121]

1. Describe how and by whom pain and distress are assessed.

Pain and distress is initially addressed by the PI's protocol and reviewed by the NASA KSC IACUC prior to approval. Pain and distress issues are assessed and categorized real-time by the PI team, the LATG, and AV. Likewise, animals are monitored postoperatively and observed as frequently as necessary following a surgical procedure. Upon resumption of upright posture and resumption of locomotive skills, they are returned to their normal environment.

2. Describe training programs for personnel responsible for monitoring animal well-being, including species-specific behavioral manifestations as indicators of pain and distress.

Trained credentialed veterinary technicians are responsible for monitoring animal well-being along with the PI team. The PI team is trained at their home institutions. The training and experience is evaluated by the IACUC during the review of the protocols.

F. Anesthesia and Analgesia [*Guide*, pp. 121-123]

1. List the agents used for each species.
   Note: If preferred, this information may be provided in Table or additional Appendix.

During the reporting period Isoflurane and Ketamine/Xylazine cocktail was used as an anesthetic for rodents. Ice was used to anesthetize turtle flippers to place identification tags. Lidocaine and MS-222 was also utilized in approved wildlife protocols.

Since our PIs come from varied institutions and many countries, our IACUC reviews each protocol for proposed drugs and dosages and determines whether or not they are appropriate for the protocol.

2. Describe how the veterinarian provides guidance and advice to researchers concerning choice and use of anesthetics, analgesics or other pain moderating methods.

The PI or designated agent attends their protocol reviews by the IACUC. The AV along with the NASA KSC IACUC reviews all protocols, discusses use of appropriate anesthetic, analgesic and tranquilizing drugs with the PI, makes recommendations, and approves the ultimate choice and use of all drugs. This review is provided in addition to the prior reviews of each protocol by the visiting PIs' IACUCs and the NASA Flight IACUC (for spaceflight experiments).

3. Describe the monitoring of the effectiveness of analgesics, including who does the monitoring. Include in the description any non-pharmacologic means used to diminish pain and distress.

Anesthetics and analgesic administration is assessed by the AV. PIs associated with the protocol are responsible for monitoring the effectiveness of analgesics. Credentialed veterinary technicians are present during all PI activities and provide technical support as required.

4. Describe how the veterinarian(s) and the IACUC/OB evaluate the proposed use of neuromuscular blocking agent to ensure the well-being of the animal.

Neuromuscular blocking agents are not used. If use was proposed, justification would be required by the IACUC and approval by the AV would be necessary.

5. Describe policies and practices for maintaining and ensuring function of equipment used for anesthesia.

The anesthesia unit is assessed annually through a service agreement with an outside vendor and certified for use. Fume extractors used in concert with the induction tank is certified for flow rates every six months.

(b) (7)(F) is responsible for maintaining and ensuring function of the equipment used for anesthesia of the beach mice.

G. Euthanasia [*Guide*, pp. 123-124]

1. Describe approved methods of euthanasia, including humane slaughter (for additional guidance, see pertinent AAALAC Reference Resources). Include:

- consideration of species, age, condition (e.g., gestational period, or neonatal) and
- location(s) for the conduct of the procedure.

Note: If preferred, this information may be provided in Table or additional Appendix.

Methods recommended by the latest edition of the American Veterinary Medical Association Guide on Euthanasia are used. Upon written request of the PI or designated alternate, the animals can be terminated. A record of the animal's death is included in the daily log and made a part of the permanent document in the animal health files. Methods include barbiturate anesthesia overdose followed by cervical dislocation and carbon dioxide overdose followed by cervical dislocation. In field studies, aquatic species are caught by conventional means (net, etc.) and placed on ice. Overdose with the chemical MS222 in solution is used for euthanasia in some instances. There is one approved protocol that includes on orbit cervical dislocation without anesthesia as an emergency procedure as authorized by the JAXA veterinarian.

2. Describe policies and practices for maintaining and ensuring function of equipment used for euthanasia.

Equipment is monitored for functionality each time it is utilized but prior to the procedure. Regulators are sent for rebuild as necessary.

3. Describe the methods used to confirm death of an animal.

The method used to confirm death of an animal is auscultation of the chest and or palpation for detection of heartbeat by personnel trained to recognize cessation of vital signs in the species being euthanized. Bilateral thoracotomy is performed in some instances to ensure death.

IV. Physical Plant [*Guide*, pp. 133-155]

A. Facilities Overview

Provide a brief introduction to the animal housing and use facilities. Note that this overview should augment the information provided in **Appendix 2** (Summary of Animal Housing and Support Sites), which includes area, average daily census, and person responsible for each site. Please use consistent terminology for the buildings/areas/sites described in the Location section of the Appendix. Please do not repeat information, but supplement the descriptions provided elsewhere to assist the reviewers understanding of the interaction between facilities, special housing locations,

and separate procedural areas.

The SA is a stand-alone building located at the southeast corner of the SSPF complex. It consists of AHRs, surgical suite, treatment room, data collection room, receiving and integration room, quarantine room(s), "dirty" and "clean" cage wash area, "clean" storage area, and a mechanical/data room. It is approximately 6500 sq. ft. See Appendix 2 – Summary of Animal Housing and Support Sites.

B. Centralized (Centrally-Managed) Animal Facility(ies)

In this section, describe each centralized or centrally-managed animal housing and use facility. Include in **Appendix 3** the floor plans of each on 8.5" x 11" or A4 paper. Ensure that the drawings are legible and the use of each room is indicated (animal housing, procedure room, clean cage storage, hazardous waste storage, etc.). Note that a separate section for describing "satellite housing areas" is included below.

Separately describe **each** Location or Animal Facility, addressing each of the features outlined below (1-8). A complete description of each must be provided; however, common features among locations or facilities may be indicated as such and do not need to be repeated.

1. General arrangement of the animal facilities (conventional, clean/dirty corridor, etc.).
2. Physical relationship of the animal facilities to the research laboratories where animals may be used.
3. Types of available animal housing spaces used, such as conventional, barrier, isolation/quarantine, hazard containment (infectious, radioactive, chemical), "animal cubicles" or facilities specifically designed for housing certain species such as ponds, pastures, feedlots, etc.
4. Finishes used throughout the animal facility for floors, walls, ceilings, doors, alleyways, gates, etc. (note any areas that are not easily sanitized and describe how these are maintained).
5. Engineering features (design, layout, special HVAC systems, noting exhaust air treatment, if applicable) used in hazardous agent containment.
6. Security features, such as control of entry, perimeter fences, gates, entryways, cameras, guards; identify and describe exceptions for individual facilities or areas incorporating fewer or additional security features than the general features described.
7. Consideration for facilities with exterior windows, if applicable, including management of environmental conditions (i.e., temperature and photoperiod control) and potential security risks.
8. Storage areas for flammable or hazardous agents and materials (e.g., disinfectants, cage -washing chemicals, pesticides, fuel).

1. The general arrangement of the SA is a barrier facility with a clean/dirty corridor system.

2. The SA is located directly next door in close proximity to the SSPF where the science laboratories are located.

3. The type of available animal housing space used is a barrier facility specifically designed for housing rodent species.

4. Finishes: The floors are monolithic and high-performance resin (epoxy). Walls and ceilings are gypsum board and cement block painted with a high-performance, waterproof gloss or semi-gloss coating. The doors are sound-sealed aluminum or fiberglass reinforced polyester with glass viewing panels tinted with red film for maintaining light/dark cycles. All doors have been painted with a high-performance, waterproof gloss, or semi-gloss coating. Corridor ceilings are suspended acoustical panels designed for use in clean room facilities.

5. Engineering features of HVAC system: Note, the SA is not a hazard containment facility and therefore does not have engineering features integrated into the design, layout, and HVAC systems, or have the capability for exhaust air treatment.

Class 100K HEPA filtered air with positive pressure over ambient.

Meets NASA Specific Pathogen Free requirements for mice.

An environmental control and monitoring system monitors temperature, humidity, air exchange rate, and differential pressure. The system is capable of sending alarm notifications to cell phones and email. The system has data archive capabilities and remote system access.

Clean rooms have positive pressure; dirty rooms have negative pressure.

Two redundant air handler units (AHU) are installed. HVAC system is based on 96DB/81WB cooling design day and 30DB heating design day conditions.

HVAC system is able to provide 100% of the HVAC needs for the facility, and is able to operate in a configuration with one unit as primary and the other as backup, and have controls that transfer operations to the backup when the other fails.

Controls are programmed so that the main and primary roles may be switched on a prescheduled basis.

If systems reconfigure to an emergency position/status in the case of fire alarms, or other off-nominal safing (closed dampers, sealing exterior air intakes, natural gas cutoff, etc.), all systems revert to a nominal operating status, once the emergency condition has been deemed corrected/cleared by the Incident Commander.

The facility has a BAS that controls the HVAC. The system provides continuous monitoring of temperature, humidity, exchange rate and differential pressure.

The BAS provides a slave Modbus TCP/IP interface and give the government the Modbus addresses for all the points that will be monitored and controlled by KCCS so the government can update KCCS accordingly. The AHU controllers need to be programmed so KCCS can override them on and off. This is normally done by sending a 0, 1 or 2 variable to the controller and the program is written so if it receives a 0 the AHU turns off, if it receives a 1, the AHU turns on if it receives a 2 the local control program takes control.

The BAS system integrates with KCCS. The preferred integration method will be from the BAS network controller via Modbus TCP/IP protocol.

The KCCS console is able to assess the conditions within the building and respond to alarms when the building goes out of specification.

(b) (7) (E), (b) (7) (F)

8. Flammable or hazardous agents are stored in lockable cabinets designed for maintenance of these types of supplies. The flammable lockers are bright yellow and labeled for content on the cabinet. These are approved for use by the KSC Fire Inspector. The cage-washing chemicals are located in the space between the cage rack washer and sterilizer.

C. Satellite Animal Housing Facilities

In addition to the Appendices summarizing Heating, Ventilation, and Air-Conditioning (Appendix 11) and Lighting Systems (Appendix 16), summarize animal housing areas that are not centrally-managed or maintained in (Appendix 17), "Satellite Animal Housing Areas."

1. **Describe the criteria used to determine/define a "Satellite Animal Housing Area," which may include remote housing facilities or laboratories temporarily or consistently housing animals.**

   N/A

2. **Describe the process used by the IACUC/OB to authorize, provide oversight of, and ensure compliance with *Guide* standards for the housing of animals outside of centrally-maintained facilities. Include a description of Attending Veterinarian access**

and physical security.

N/A

D. Emergency Power and Life Support Systems

Note: Complete a Heating, Ventilation, and Air-Conditioning (HVAC) Summary (**Appendix 11**) and Lighting Summary (**Appendix 16**) for each Location described in the Summary of Animal Housing and Support Sites (**Appendix 2**).

1. **Power** [*Guide*, p. 141]
   For each Location, Centralized Animal Facility, and Satellite Housing Facility, provide a brief description of the following:
   - Availability of emergency power and if so, what electrical services and equipment are maintained in the event the primary power source fails.
   - History of power failures, noting frequency, duration, and, if emergency power was not available, steps taken to ensure the comfort and well-being of the animals present and the temperature extremes reached in animal rooms during the failure.

Emergency power is provided by a diesel-fueled, 480 V, 3-phase generator (rated at 2000 KW) set in a weatherproof walk-in housing. This power serves the entire SA. A secondary, portable diesel-fueled, 480 V, 3-phase generator (rated at 125 KW) is placed at the SA when animals are present. This also provides total power required to the SA. There have been no unplanned power outages at the SA during the last three years.

2. **Other System Malfunctions.** If not previously reported, describe animal losses or health problems resulting from power, HVAC, or other life support system (e.g., individually ventilated cages) failures, and mechanisms for reporting such incidences. AAALAC International Rules of Accreditation (Section 2.f).

No animal losses or health problems resulting from power, HVAC, or other life support system failures occurred in the history of the NASA KSC animal care program.

E. Other Facilities [*Guide*, pp. 144, 150]

1. **Other Animal Use Facilities** [*Guide*, pp. 146-150]
   Describe other facilities such as imaging, irradiation, and core/shared behavioral laboratories or rooms. Include a description of decontamination and methods for preventing cross-contamination in multi-species facilities.

N/A

2. Other Animal Program Support Facilities

Describe other facilities providing animal care and use support, such as feedmills, diagnostic laboratories, abattoirs, etc.

Diagnostic laboratory: Prior to receipt of rodents, a review of the health status from the vendor from which they are obtained is conducted. At 5-7 days following receipt, a representative population of the animals is sampled for microbiological assessment of their current health status. Specimens are sent to a qualified diagnostic laboratory. In addition, at flight minus 11-15 days a final microbiological sampling is obtained and sent to the diagnostic laboratory for evaluation. Charles River Laboratories is the current laboratory utilized for this purpose.

According to the privacy principles on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, we wish to advise you that the personal data in the Program Description will become part a permanent file owned by AAALAC International, and that can be shared with AAALAC International offices and representatives in order to perform an evaluation of the institution´s animal care and use program and provide accreditation services. The institution has the option of exercising rights of data access, rectification, erasure, restriction and opposition at: accredit@aaalac.org

Appendix 1: Glossary of Abbreviations and Acronyms

Please provide a Table defining abbreviations and acronyms used in this Program Description.

Abbreviation/Acronym	Definition
AALAS	American Association for Laboratory Animal Science
AHRs	Animal Holding Rooms
AHU	Air Handler Units
ARC	Ames Research Center
ASP	Associate Safety Professionals
ATV	All-Terrain Vehicle
AV	Attending Veterinarian
AWA	Animal Welfare Act
BAS	Building Automation System
CCC	Complex Control Center
CIH	Certified Industrial Hygienists
CMAR	Certified Manager of Animal Resources
CPR	Cardiopulmonary Resuscitation
CSP	Certified Safety Professionals
HEPA	High-Efficiency Particulate Absorption
HSEP	Health Safety Environment Procedure
IACUC	Institutional Animal Care and Use Committee
IACUC/OB	Institutional Animal Care and Use Committee/Oversight Body
IO	Institutional Official
ISO	International Organization of Standardization
ISS	International Space Station
JAXA	Japan Aerospace Exploration Agency
JSA	Job Safety Analysis
KCCS	Kennedy Complex Control Set
KEMCON	Kennedy Space Center Environmental and Medical Contract
KSC	Kennedy Space Center
LAMA	Laboratory Animal Management Association
LAT	Laboratory Animal Technician
LATG	Laboratory Animal Technologist

Appendix 1: Glossary of Abbreviations and Acronyms

Abbreviation/Acronym	Definition
LCC	Launch Control Complex
M/SDS	Material/Safety Data Sheet
MERV	Minimum Efficiency Reporting Value
N/A	Not Applicable
NASA	National Aeronautics and Space Administration
NAVC	North American Veterinary Community
NEMO	NASA Emergency Management Officer
NSRS	NASA Safety Reporting System
OHF	Occupational Health Facility
PHS OLAW	Public Health Service Office of Laboratory Animal Welfare
PIs	Principal Investigators
PIV	Personal Identity Verification
PPE	Personal Protective Equipment
PRIM&R	Public Responsibility in Medicine and Research
PSCC	Protective Services Control Center
RH	Relative Humidity
SA	Science Annex
SCUBA	Self-Contained Underwater Breathing Apparatus
SETS	Safety Environmental Tracking System
SH&E	Safety, Health, and Environmental
SSPF	Space Station Processing Facility
TOSC	Test and Operations Support Contract
USDA	United States Department of Agriculture
VAV	Variable Air Volume
WHAAG	Workers Health At A Glance

Appendix 2: Summary of Animal Housing and Support Sites

Briefly summarize in the following Table the animal facility or facilities, noting the number of areas in which animals are housed (buildings, floors, farms, satellite housing facilities, etc.), the total square footage/metres and/or acreage for animal care and use, and the total square footage/metres and/or acreage for necessary support of the animal care and use program covered by this Description (water treatment plant/area if housing aquatic or amphibian species, cage washing facilities, service corridors, etc. and additional areas to be considered are enumerated in the *Guide*). Detailed information for satellite housing facilities is requested in Appendix 17. Include only one line entry for satellite housing facilities in this table to provide the total square footage for all satellite housing areas listed in Appendix 17. If more than one facility/site, note the approximate distance (yards/miles or meters/kilometers) to each facility from a reference point such as from the largest animal facility. A campus/site map (with a distance scale) may be included as an additional Appendix (Appendix 2.1) to provide this information. See Instructions, Addendum A - Animal Facility Square Footage/Metres Compilation Form for guidance in calculating the size of your animal care and use program.

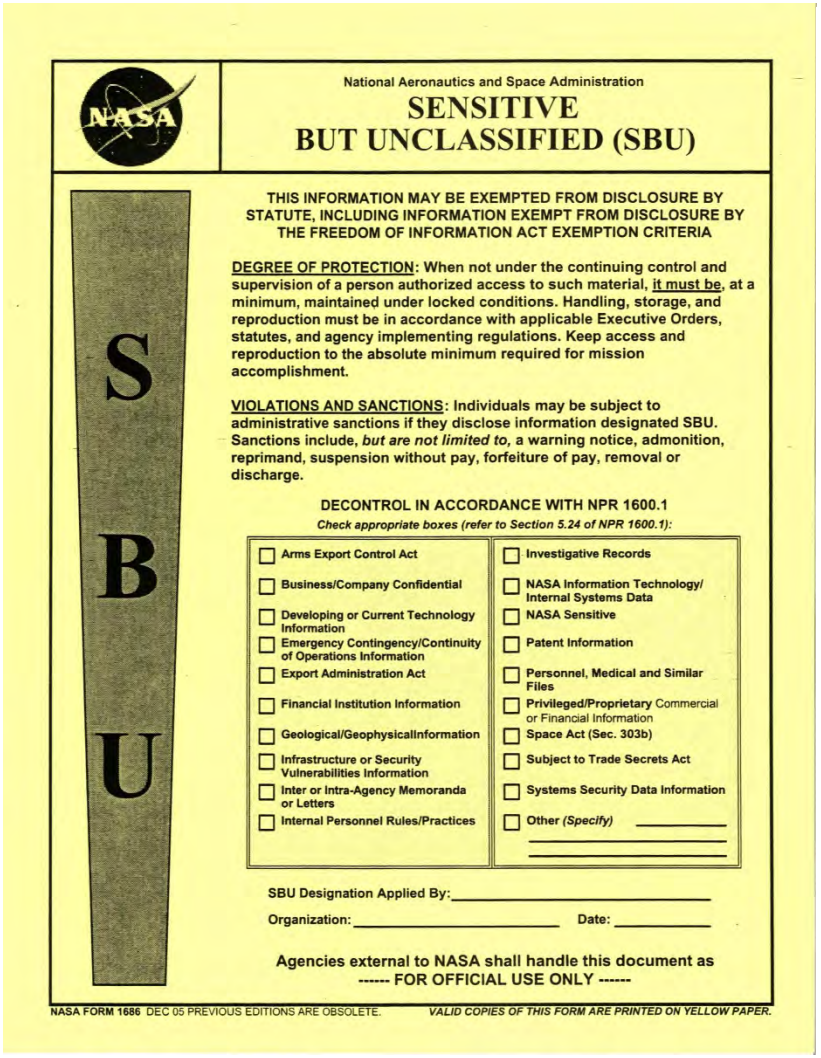
Animal Housing and Support Sites						
Location (bu d ng, s te, farm name, etc.[a])	**Distance** from ma n fac ty[b]	**Animal Housing** Approx. ft²/m²	**Support/** Approx. ft²/m² or acreage	**Species Housed**	**Animal Census by Species** Approx. Da y	**Person in Charge of Site**
SSPF Science Annex	N/A	1,058 sq. ft.	4,899 sq. ft.	Rodent	N/A	Attending Veterinarian & Animal Care Program Lead
Satellite Housing Facilities Total (Expand n Append x 17)						

Subtotals (ft²/m²):	1,058 sq. ft.	4,899 sq. ft.
TOTAL Acreage:		
TOTAL Animal Housing/Support Procedures (excluding acreage):	5,957 sq. ft. (p ease spec fy ft² or m²)	

[a]Please state name and/or use acronyms described in **Appendix 1** for building names, if not coded for confidentiality.
[b]Campus or site map(s) may also be provided in lieu of this information.

Appendix 3: Line Drawings

Provide floor plans of each centralized animal housing facility. Plans should be provided on 8.5” x 11” or A4 paper. Ensure that the drawings are legible, including room numbers if used, and the use of each room is indicated (animal housing, procedure room, clean cage storage, hazardous waste storage, etc.) either directly on the drawing or in a Key/Table.



National Aeronautics and Space Administration

SENSITIVE BUT UNCLASSIFIED (SBU)

S B U

THIS INFORMATION MAY BE EXEMPTED FROM DISCLOSURE BY STATUTE, INCLUDING INFORMATION EXEMPT FROM DISCLOSURE BY THE FREEDOM OF INFORMATION ACT EXEMPTION CRITERIA

DEGREE OF PROTECTION: When not under the continuing control and supervision of a person authorized access to such material, it must be, at a minimum, maintained under locked conditions. Handling, storage, and reproduction must be in accordance with applicable Executive Orders, statutes, and agency implementing regulations. Keep access and reproduction to the absolute minimum required for mission accomplishment.

VIOLATIONS AND SANCTIONS: Individuals may be subject to administrative sanctions if they disclose information designated SBU. Sanctions include, *but are not limited to,* a warning notice, admonition, reprimand, suspension without pay, forfeiture of pay, removal or discharge.

DECONTROL IN ACCORDANCE WITH NPR 1600.1

Check appropriate boxes (refer to Section 5.24 of NPR 1600.1):

- ☐ Arms Export Control Act
- ☐ Business/Company Confidential
- ☐ Developing or Current Technology Information
- ☐ Emergency Contingency/Continuity of Operations Information
- ☐ Export Administration Act
- ☐ Financial Institution Information
- ☐ Geological/GeophysicalInformation
- ☐ Infrastructure or Security Vulnerabilities Information
- ☐ Inter or Intra-Agency Memoranda or Letters
- ☐ Internal Personnel Rules/Practices
- ☐ Investigative Records
- ☐ NASA Information Technology/ Internal Systems Data
- ☐ NASA Sensitive
- ☐ Patent Information
- ☐ Personnel, Medical and Similar Files
- ☐ Privileged/Proprietary Commercial or Financial Information
- ☐ Space Act (Sec. 303b)
- ☐ Subject to Trade Secrets Act
- ☐ Systems Security Data Information
- ☐ Other *(Specify)* _____

SBU Designation Applied By: _____

Organization: _____ Date: _____

Agencies external to NASA shall handle this document as ------ FOR OFFICIAL USE ONLY ------

NASA FORM 1686 DEC 05 PREVIOUS EDITIONS ARE OBSOLETE. *VALID COPIES OF THIS FORM ARE PRINTED ON YELLOW PAPER.*

EAR 99 -- NO LICENSE REQUIRED

The information contained in the document is technical in content, but not technical data as defined by the International Traffic in Arms Regulations (ITAR) or the Export Administration Regulations (EAR), and therefore is EAR 99 NLR, no export license required. (General Prohibition Six (Embargo) applies to all items subject to the EAR, (i.e., items on the CCL and within EAR 99 NLR). You may not make an export or re-export contrary to the provisions of part 746 (Embargos and Other Special Controls) of the EAR and 22 CFR part 126.1 of the ITAR). **WARNING:** This document is **SENSITIVE BUT UNCLASSIFIED (SBU).** It contains information that may be exempt from public release under the Freedom of Information Act (5 U.S.C. 552) or other applicable laws or restricted from disclosure based on NASA policy. It is to be controlled, stored, handled, transmitted, distributed, and disposed of in accordance with NASA policy relating to SBU information and is not to be released to the public or other personnel who do not have a valid "need-to-know" without prior approval of an authorized NASA official.

EDR # 1629141 NASA KSC Export Control Office (321-867-9209)

Appendix 3: Line Drawings

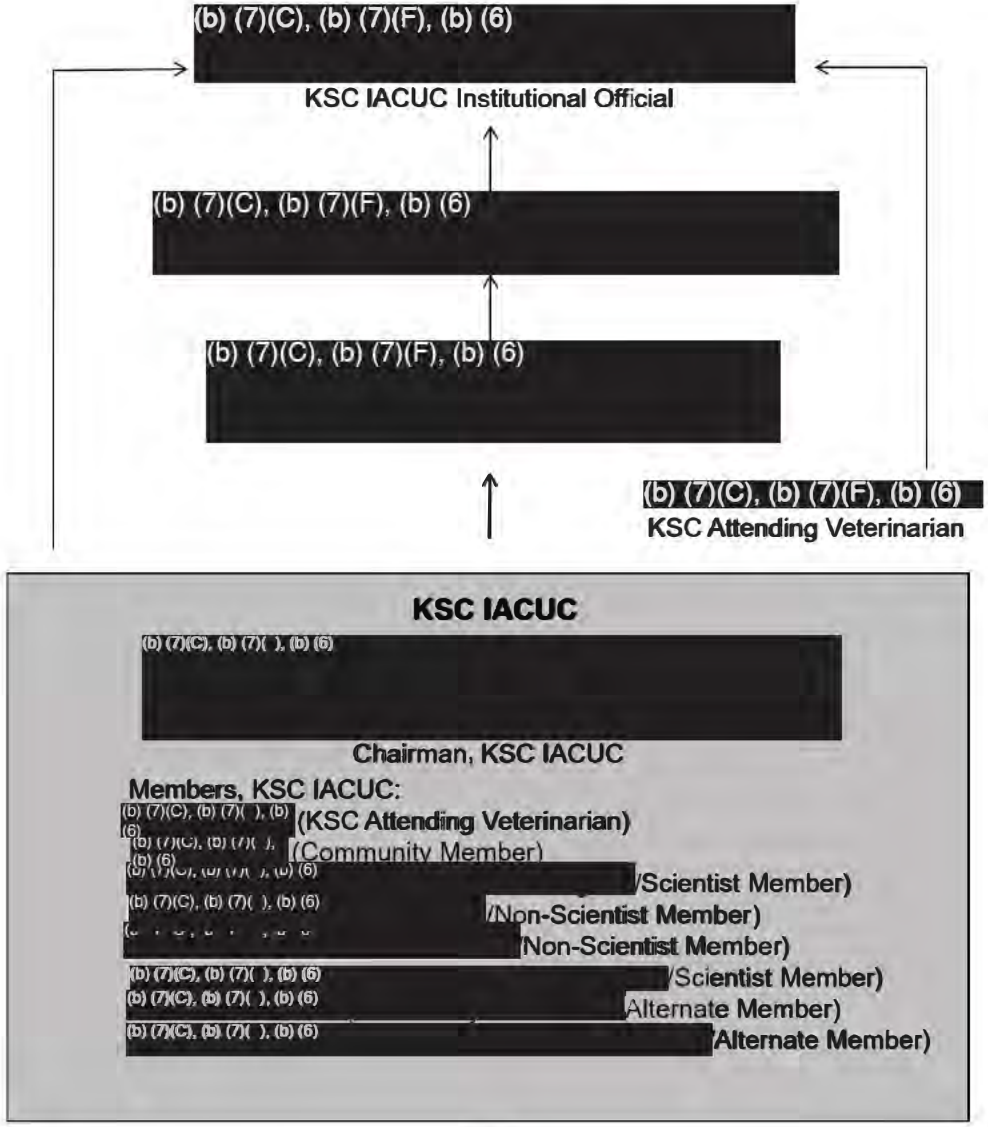
(b) (7)(F)

Appendix 4: Organizational Chart(s)

Provide an accurate, current, and detailed organization chart or charts that detail the lines of authority from the Institutional Official to the Attending Veterinarian, the IACUC/OB, and personnel providing animal care. If applicable, include personnel responsible for managing satellite housing areas/locations and depict the reporting relationship between the Attending Veterinarian and other(s) having a direct role in providing veterinary care.

Appendix 4: Organizational Chart(s)

John F. Kennedy Space Center
Institutional Animal Care and Use Committee (IACUC)
Reporting Chain



Appendix 4: Organizational Chart(s)

(b) (4)

Appendix 5: Animal Usage

In order to assist the site visitors in their evaluation of the animal care and use program, please provide the information requested below. Information should be provided for all animals approved for use in research, teaching or testing, including those which may be used or housed in laboratories outside the animal care facility. Of particular interest is information on those animals which are used in research projects involving recovery surgical procedures, behavioral or other testing requiring chairing or other forms of restraint, or exposure to potentially hazardous materials. An alternate format is acceptable as long as the information requested is provided.

Project/Protocol Title	IACUC/OB Number	Principal Investigator	Species	Total Number of Animals Approved	Pain & Distress Category (1)	Special Considerations (use checkmark if applicable)					
						SS (2)	MSS (3)	FFR (4)	PR (5)	HAU (6)	NCA (7)
Herpetological Surveys on Kennedy Space Center	GRD-06-041	(b) (6), (b) (7)(C), (b) (7)(F)	72 Species (list at site visit)	As many as captured	C						
Gopher Tortoise Relocations and Research on Kennedy Space Center	GRD-06-042		Gopher Tortoise	As many as require relocation	C						
Long-term Population Dynamics of the Florida Scrub-Jay (*aphelocoma coerulescens*) on Kennedy Space Center	GRD-06-043		Florida Scrub Jay	200	C						
Assessment of the American Alligator (*Alligator mississippiensis*) at	GRD-06-044		Alligator	630 400 eggs	D	✓					✓

Appendix 5: Animal Usage

the Kennedy Space Center		(b) (6), (b) (7)(C), (b) (7)(F)									
Small mammal community dynamics, demography, gene flow, homerange, habitat management, and occupancy of the southeastern beach mouse (*Peromyscus polionotus niveiventris*) and the Florida mouse (*Podomys floridanus*) on the Kennedy Space Center/Merritt Island Wildlife Refuge.	GRD-06-046		Mouse Rat	1500 100	D						✓
Relative Abundance and Distribution of Marine Turtles Inhabiting Kennedy Space Center Waters (*Chelonia mydas* and *Caretta caretta*)	GRD-06-047		Turtles	102	C						
Applying Autonomous Acoustic Telemetry to Evaluate	GRD-06-049		13 pecies Sportfish (list at site visit)	215	D	✓					

Appendix 5: Animal Usage

Seasonal and Daily Movements of Estuarine and Coastal Sportfish at Cape Canaveral, Florida		(b) (6), (b) (7)(C), (b) (7)(F)									
Small mammal and gopher tortoise community responses to NASA, contractor, and commercial operations and restoration projects on Kennedy Space Center	GRD-11-082		Mouse Rat Tortoise	1050 250 150	C						
The Role of CDKN1a/p21 Pathway in Microgravity-Induced Bone Tissue Regenerative Arrest - A Spaceflight Study of Transgenic CDKN1a/p21-Null Mice in Microgravity (RR-10)	FLT-18-115		Mouse	1120	E						
JAXA Mouse Habitat Unit Technical Verification, Mouse	FLT-19-121		Mouse	240	E						

Appendix 5: Animal Usage

Habitat Unit 5 (MHU-5)											

(1) If applicable, please provide a description / definition of any pain/distress classification used within this Appendix in the space below. If pain/distress categories are not used, leave blank.
(2) Survival Surgery (SS)
(3) Multiple Survival Surgery (MSS)
(4) Food or Fluid Regulation (FFR)
(5) Prolonged Restraint (PR)
(6) Hazardous Agent Use (HAU)
(7) Non-Centralized Housing and/or Procedural Areas (NCA), i.e., use of live animals in any facility, room, or area that is not directly maintained or managed by the animal resources program, such as investigator laboratories, department-managed areas, teaching laboratories, etc.

Pain/Distress Classification Description/Definition, if applicable:

Category C: No Pain or Distress
(Use of Pain Relieving Drugs Is Not Indicated). Procedures that may result in only slight or momentary pain such as routine injections, blood collections, or other minor procedures are included in this category.

Category D: Tests or Procedures Involving the Potential for Pain or Distress
(Appropriate Anesthetic, Analgesic or Tranquilizing Drugs are Used). Animals in Type D studies have the potential to experience pain/discomfort, but the necessary drugs to alleviate the symptoms are provided. This includes terminal bleeding performed under anesthesia or retro-orbital sinus bleeding of rodents under general anesthesia, because these procedures would result in pain if anesthetics were withheld. All surgical procedures where anesthesia is used to alleviate pain or distress, including studies on anesthetized animals that do not regain consciousness are included in this category.

Category E: Pain or Distress Without the Benefit of Pain Relief These are procedures (e.g., efficacy studies of novel pain therapeutics) or situations (induction of chronic illness/disorder such as arthritis or liver failure) for which the use of analgesics, anesthetics or tranquilizing drugs would adversely affect the procedures, results or interpretation of data.

Appendix 5: Animal Usage

In the Table below, provide an approximate annual usage for all species: Numbers provided for 2020 Annual Report

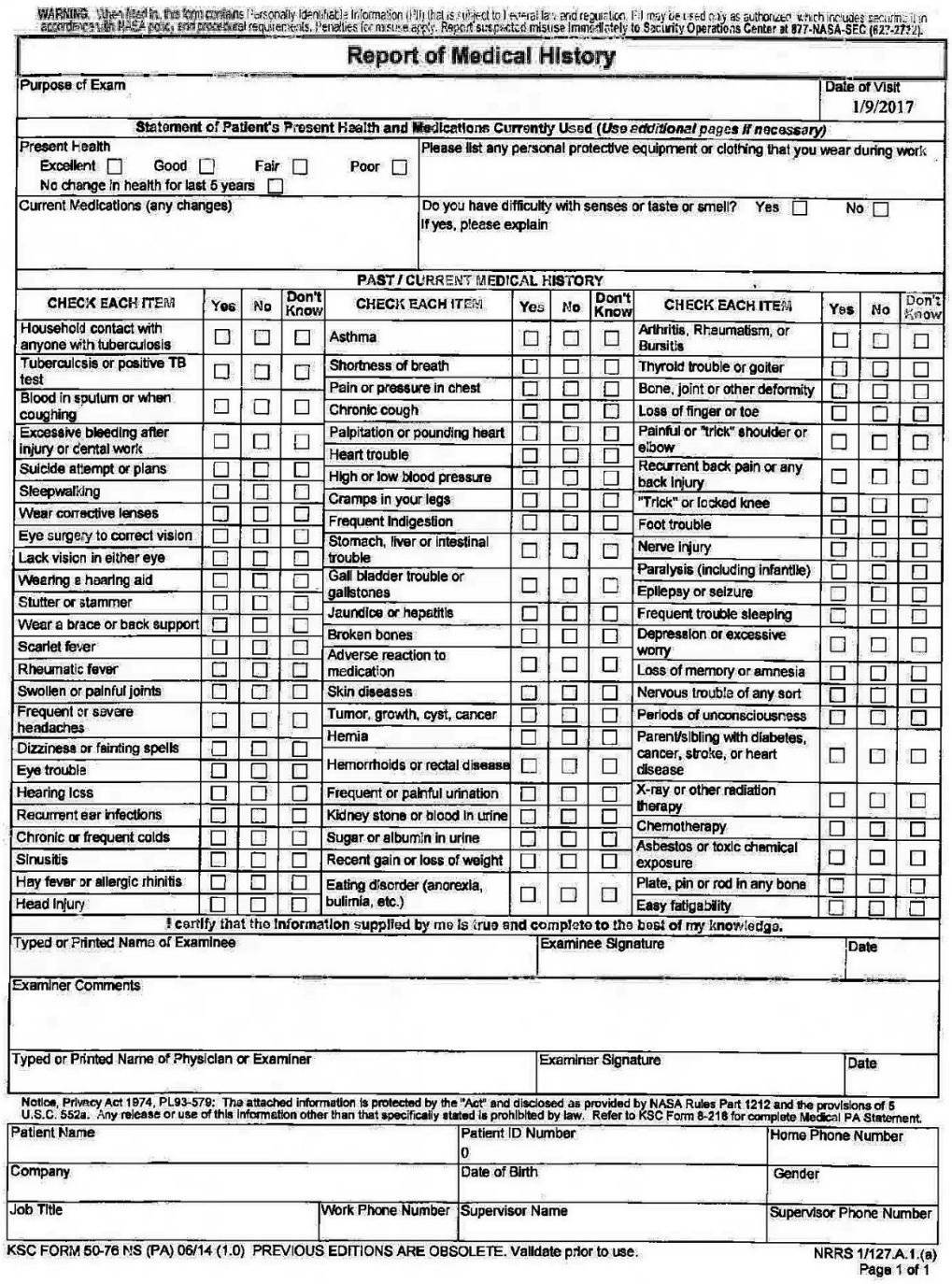
Animal Type or Species	Approximate Annual Use
Mouse	2762
Rats	18
Reptile	323

Animal Type or Species	Approximate Annual Use
Amphibian	300

[Create additional rows by pressing TAB in the bottom-right box.]

Appendix 6: Personnel Medical Evaluation Form

Provide a ***blank*** copy of form(s) used by medically-trained personnel to review individual health assessment, individual risk assessment, health history evaluation, health questionnaire, periodic medical evaluation, etc. If form(s) are not used, include a description of how such evaluations are performed in the Program Description (Section 2.I.A.2.b.ii.1).d), Section 2 (Description). I (Animal Care and Use Program). A (Program Management). 2 (Personnel Management). b (Occupational Health and Safety or Personnel). ii (Standard Working Conditions and Baseline Precautions). 1) (Medical Evaluation and Preventive Medicine for Personnel). d).



WARNING: When filled in, this form contains Personally Identifiable Information (PII) that is subject to Federal law and regulation. PII may be used only as authorized, which includes security in accordance with NASA policy and procedural requirements. Penalties for misuse apply. Report suspected misuse immediately to Security Operations Center at 877-NASA-SEC (627-2732).

Report of Medical History

Purpose of Exam	Date of Visit
	1/9/2017

Statement of Patient's Present Health and Medications Currently Used (*Use additional pages if necessary*)

Present Health	Please list any personal protective equipment or clothing that you wear during work
Excellent ☐ Good ☐ Fair ☐ Poor ☐ No change in health for last 5 years ☐	
Current Medications (any changes)	Do you have difficulty with senses or taste or smell? Yes ☐ No ☐ If yes, please explain

PAST / CURRENT MEDICAL HISTORY

CHECK EACH ITEM	Yes	No	Don't Know	CHECK EACH ITEM	Yes	No	Don't Know	CHECK EACH ITEM	Yes	No	Don't Know
Household contact with anyone with tuberculosis	☐	☐	☐	Asthma	☐	☐	☐	Arthritis, Rheumatism, or Bursitis	☐	☐	☐
Tuberculosis or positive TB test	☐	☐	☐	Shortness of breath	☐	☐	☐	Thyroid trouble or goiter	☐	☐	☐
Blood in sputum or when coughing	☐	☐	☐	Pain or pressure in chest	☐	☐	☐	Bone, joint or other deformity	☐	☐	☐
Excessive bleeding after injury or dental work	☐	☐	☐	Chronic cough	☐	☐	☐	Loss of finger or toe	☐	☐	☐
Suicide attempt or plans	☐	☐	☐	Palpitation or pounding heart	☐	☐	☐	Painful or "trick" shoulder or elbow	☐	☐	☐
Sleepwalking	☐	☐	☐	Heart trouble	☐	☐	☐	Recurrent back pain or any back injury	☐	☐	☐
Wear corrective lenses	☐	☐	☐	High or low blood pressure	☐	☐	☐	"Trick" or locked knee	☐	☐	☐
Eye surgery to correct vision	☐	☐	☐	Cramps in your legs	☐	☐	☐	Foot trouble	☐	☐	☐
Lack vision in either eye	☐	☐	☐	Frequent indigestion	☐	☐	☐	Nerve injury	☐	☐	☐
Wearing a hearing aid	☐	☐	☐	Stomach, liver or intestinal trouble	☐	☐	☐	Paralysis (including infantile)	☐	☐	☐
Stutter or stammer	☐	☐	☐	Gall bladder trouble or gallstones	☐	☐	☐	Epilepsy or seizure	☐	☐	☐
Wear a brace or back support	☐	☐	☐	Jaundice or hepatitis	☐	☐	☐	Frequent trouble sleeping	☐	☐	☐
Scarlet fever	☐	☐	☐	Broken bones	☐	☐	☐	Depression or excessive worry	☐	☐	☐
Rheumatic fever	☐	☐	☐	Adverse reaction to medication	☐	☐	☐	Loss of memory or amnesia	☐	☐	☐
Swollen or painful joints	☐	☐	☐	Skin diseases	☐	☐	☐	Nervous trouble of any sort	☐	☐	☐
Frequent or severe headaches	☐	☐	☐	Tumor, growth, cyst, cancer	☐	☐	☐	Periods of unconsciousness	☐	☐	☐
Dizziness or fainting spells	☐	☐	☐	Hernia	☐	☐	☐	Parent/sibling with diabetes, cancer, stroke, or heart disease	☐	☐	☐
Eye trouble	☐	☐	☐	Hemorrhoids or rectal disease	☐	☐	☐				
Hearing loss	☐	☐	☐	Frequent or painful urination	☐	☐	☐	X-ray or other radiation therapy	☐	☐	☐
Recurrent ear infections	☐	☐	☐	Kidney stone or blood in urine	☐	☐	☐	Chemotherapy	☐	☐	☐
Chronic or frequent colds	☐	☐	☐	Sugar or albumin in urine	☐	☐	☐	Asbestos or toxic chemical exposure	☐	☐	☐
Sinusitis	☐	☐	☐	Recent gain or loss of weight	☐	☐	☐	Plate, pin or rod in any bone	☐	☐	☐
Hay fever or allergic rhinitis	☐	☐	☐	Eating disorder (anorexia, bulimia, etc.)	☐	☐	☐	Easy fatigability	☐	☐	☐
Head injury	☐	☐	☐								

I certify that the information supplied by me is true and complete to the best of my knowledge.

Typed or Printed Name of Examinee	Examinee Signature	Date

Examiner Comments

Typed or Printed Name of Physician or Examiner	Examiner Signature	Date

Notice, Privacy Act 1974, PL93-579: The attached information is protected by the "Act" and disclosed as provided by NASA Rules Part 1212 and the provisions of 5 U.S.C. 552a. Any release or use of this information other than that specifically stated is prohibited by law. Refer to KSC Form 8-218 for complete Medical PA Statement.

Patient Name		Patient ID Number 0	Home Phone Number
Company		Date of Birth	Gender
Job Title	Work Phone Number	Supervisor Name	Supervisor Phone Number

KSC FORM 50-76 NS (PA) 06/14 (1.0) PREVIOUS EDITIONS ARE OBSOLETE. Validate prior to use. NRRS 1/127.A.1.(a)
Page 1 of 1

Appendix 6: Personnel Medical Evaluation Form

WARNING: When filled in, this form contains Personally Identifiable Information (PII) that is subject to Federal law and regulation. PII may be used only as authorized, which includes securing it in accordance with NASA policy and procedural requirements. Penalties for misuse apply. Report suspected misuse immediately to Security Operations Center at 877-NASA-SOC (877-627-2762).

REPORT OF MEDICAL EXAMINATION

MEASUREMENTS AND OTHER FINDINGS

Date of Visit	BP Sitting Sys.	BP Sitting Dias.	Height	Weight	Pulse	Respiration	Temperature
1/11/2017							

DISTANT VISION		INTERMEDIATE VISION		NEAR VISION	
Both 20/	Corr. To 20/	Both 20/	Corr. To 20/	Both 20/	Corr. To 20/
Right 20/	Corr. To 20/	Right 20/	Corr. To 20/	Right 20/	Corr. To 20/
Left 20/	Corr. To 20/	Left 20/	Corr. To 20/	Left 20/	Corr. To 20/

HETEROPHORIA *(Specify distance)*
ESO EXO R.H. L.H.

JAEGER
Pass: Jaeger 1 ☐ Jaeger 2 ☐ Corrected ☐

AMSLER GRID
Normal ☐ Abnormal ☐

Color Vision *(Test used and result)*	Depth Perception	RN / MA Name	RN / MA Signature	Date

FIELD OF VISION: Right Left

ACCOMMODATION: Right Left

CLINICAL EVALUATION

(Check each item in appropriate column	Normal	Ab-Normal	Not Evaluated	*(Check each item in appropriate column*	Normal	Ab-Normal	Not Evaluated
Head, Face, Neck, and Scalp	☐	☐	☐	Prostate (over 40 or clinically indicated)	☐	☐	☐
Ears - General (Internal canals)	☐	☐	☐	Testicular	☐	☐	☐
Drums (Perforation)	☐	☐	☐	Anus and Rectum *(Hemorrhoids, Fistulae) (Hemocult Results)*	☐	☐	☐
Nose	☐	☐	☐	Endocrine System	☐	☐	☐
Sinuses	☐	☐	☐	G-U System	☐	☐	☐
Mouth and Throat	☐	☐	☐	Upper Extremities *(Except feet) (Strength, range of motion)*	☐	☐	☐
Eyes - General	☐	☐	☐	Feet	☐	☐	☐
Ophthalmoscopic	☐	☐	☐	Lower Extremities *(Except feet) (Strength, range of motion)*	☐	☐	☐
Pupils *(Equality and reaction)*	☐	☐	☐	Spine, Other Musculoskeletal	☐	☐	☐
Ocular Motility *(Associated parallel movements nystagmus)*	☐	☐	☐	Identifying Body Marks, Scars, Tattoos	☐	☐	☐
Lungs and Chest	☐	☐	☐	Skin, Lymphatics	☐	☐	☐
Heart *(Thrust, size, rhythm, sounds)*	☐	☐	☐	Neurologic	☐	☐	☐
Vascular System *(Varicosities, etc.)*	☐	☐	☐	Psychiatric *(Specify any personality deviation)*	☐	☐	☐
Abdomen and Viscera *(Include hernia)*	☐	☐	☐	Breasts	☐	☐	☐
NOTES: *(Describe every abnormality in detail.)*				Pelvic *(Females only)*	☐	☐	☐

Summary of Defects and Diagnoses

Recommendations - Further Specialist Examinations Indicated *(Specify)*	If not qualified, list disqualifying defects
EXAMINEE *(Check)* ☐ Is Qualified for ☐ Is Not Qualified for	

Typed or Printed Name of Physician	Physician Signature	Date

Notice, Privacy Act 1974, PL93-579: The attached information is protected by the "Act" and disclosed as provided by NASA Rules Part 1212 and the provisions of 5 U.S.C. 552a. Any release or use of this information other than that specifically stated is prohibited by law. Refer to KSC Form 8-218 for complete Medical PA Statement.

Patient Name		Patient ID Number 0	Home Phone Number
Company		Date of Birth	Gender
Job Title	Work Phone Number	Supervisor Name	Supervisor Phone Number

KSC FORM 50-249 NS (PA) 06/14 (1.0) PREVIOUS EDITIONS ARE OBSOLETE. Validate prior to use.

NRRS 1/127.A.1.(a)
Page 1 of 1

Appendix 6: Personnel Medical Evaluation Form

PRIVACY: When filled in, this form contains Personally Identifiable Information (PII) that is subject to Federal law and regulation. PII may be used only as authorized, which includes securing it in accordance with NASA policy and procedural requirements. Penalties for misuse apply. Report suspected misuse immediately to Security Operations Center at 877-NASA-SEC (877-627-2732).

Primary Animal Contact Medical Examination Report

OCHH-I-0023

Clinical Evaluation

	Normal	Abnormal		Normal	Abnormal
Head, Face Scalp			Neck		
Eyes, General			Chest		
Ears, General			Chest X-ray		
Sinuses			Hands		
Nose			Feet		
Teeth and Gums			Skin		
Mouth and Throat			Lymphatics		
Other			If other, please specify		

1. Comment on any physical abnormality present

2. Does any such abnormality inidcate a contagious or infectious disease? (Describe)

3. Does any information from history, medical examination, or laboratory indicate excessive risk as a primary animal contact? If so, describe

4. Recommendations

   (a) Primary animal contact ☐ Access ☐ Direct ☐ Primate Recommended

   (b) Disqualified for primary animal contact status

   (c) Further evaluation required, specify below:

Examiner's Stamped Name	Examiner's Signature	Date

The information collected in this form is covered by the Privacy Act of 1974 and will become part of NASA's Health Information Management System (HIMS). Refer to KSC Form 8-218. A complete description of this System of Records can be found by searching the Web for "78 FR 77503".

Patient Name		Patient ID Number 0	Home Phone Number
Company		Date of Birth	Gender
Job Title	Work Phone Number	Supervisor Name	Supervisor Phone Number

Appendix 6: Personnel Medical Evaluation Form

WARNING. When filled in, this form contains Personally Identifiable Information (PII) that is subject to Federal law and regulation. PII may be used only as authorized, which includes securing it in accordance with NASA policy and procedural requirements. Penalties for misuse apply. **Report suspected misuse immediately to Security Operations Center at 877-NASA-SEC (627-2732).**

Medical History For TB

Name			Date 1/10/2017
Previous History	**Yes**	**No**	**Date**
Have you ever been exposed to TB?			
Have you ever had TB?			
Have you ever had a positive reaction to a TB skin test?			
Have you ever had the TB vaccine?			
Date of last chest x-ray.			
Have you had a recent illness?			
Do you have the following symptoms?			
1. Cough			
2. Chest Pain			
3. Fever			
4. Shortness of Breath			
5. Night Sweats			
6. Fatigue			
7. Wheezing			
8. Hoarseness			
9. Hemoptysis, coughing up blood			
10. Weight Loss			
11. Other			
If you have other symptoms, please explain			
Have you taken medication for TB prevention?			
If Yes, please name the medication			

The information collected in this form is covered by the Privacy Act of 1974 and will become part of NASA's Health Information Management System (HIMS). Refer to KSC Form 8-218. A complete description of this System of Records can be found by searching the Web for "78 FR 77503".

Patient Name		Patient ID Number 0	Home Phone Number
Company		Date of Birth	Gender
Job Title	Work Phone Number	Supervisor Name	Supervisor Phone Number

Appendix 6: Personnel Medical Evaluation Form

WHEN FILLED IN: When filled in, this form contains Personally Identifiable Information (PII) that is subject to Federal law and regulation. PII may be used only as authorized, which includes securing it in accordance with NASA policy and procedural requirements. Penalties for misuse apply. Record suspected misuse immediately to Security Operations Center at 877-NASA-SOC (877-627-2762).

Summary of Care

No.	Chronic Illness / Problems	Date	Medications	Start	Stop
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					

No.	Hospitalization / Surgery	Date	No.	Acute Treatment Problems	Date
1.			1.		
2.			2.		
3.			3.		
4.			4.		
5.			5.		
6.			6.		
7.			7.		
8.			8.		
9.			9.		
10.			10.		

		Reviewed with Patient	
Item	Description	Date	Initial
Occupation			
Tobacco Use	☐ Yes ☐ No Type _____ Years _____		
Allergies			
Alcohol Use	☐ Yes ☐ No Frequency _____		
Family History			
Other			

The information collected in this form is covered by the Privacy Act of 1974 and will become part of NASA's Health Information Management System (HIMS). Refer to KSC Form 8-218. A complete description of this System of Records can be found by searching the Web for "78 FR 77503".

Patient Name		Patient ID Number 0	Home Phone Number
Company		Date of Birth	Gender
Job Title	Work Phone Number	Supervisor Name	Supervisor Phone Number

Appendix 7: IACUC/OB Membership Roster

Please provide a Committee roster, indicating names, degrees, membership role, and affiliation (e.g., Department/Division).

Member Name	PHS Policy Membership Requirement	Mailing Address	Telephone Number	Email Address
(b) (6), (b) (7)(C), (b) (7)(F)	TOSC Animal Care Program Lead (Scientist)	(b) (6), (b) (7)(C), (b) (7)(F)	(b) (6), (b) (7)(C), (b) (7)(F)	
	TOSC Animal Care Technologist (Scientist Alternate for (b) (6), (b) (7)(C), (b) (7)(F))			
	TOSC Consulting Veterinarian (Attending Veterinarian)			
	SSPF Science Annex Construction Manager (Non-scientist)			
	Project Scientist (IACUC Chair/Scientist)			
	Community/Non-affiliated			
	Project Scientist Alternate Chair/Scientist)			
	Assistant Chief Counsel (Non-scientist)			
	Wildlife Biologist (Scientist)			

Appendix 8: IACUC/OB Meeting Minutes

Please provide the latest two minutes of the IACUC/OB meetings.

KSC IACUC MEETING MINUTES
September 12, 2019; 13:00
Space Station Processing Facility (b) (7)(F)

(b) (6), (b) (7)(C), (b) (7)(F) **(IACUC Chair)**
NASA Exploration Research and Technology Programs
Utilization and Life Sciences Office
Space Station Processing Facility
Kennedy Space Center, FL 32899

ATTENDEES

(b) (6), (b) (7)(C), (b) (7)(F)	REMIS/Leidos
	NASA Chief Veterinarian
	IACUC Member (Technical); TOSC Animal Care Program Lead
	IACUC Member (Alternate Technical); TOSC Animal Care Technologist
	IACUC Member (KSC TOSC Attending Veterinarian)
	IACUC Member (Non-Scientist); NASA Strategic Implementation Office
	IACUC Member (Chair); NASA Utilization and Life Sciences Office
	IACUC Member (Community/Non-Affiliated)
	KEMCON/Integrated Mission Support Service Contract
	KEMCON/Integrated Mission Support Service Contract
	REMIS/Leidos
	REMIS/Leidos
	KEMCON/Integrated Mission Support Service Contract
	Technical Advisor (TOSC Veterinary Technician)
	IACUC Member (Non-Scientist); NASA Legal Representative
	IACUC Member (Scientist); Integrated Mission Support Service Contract

I. Protocol Reviews

New Submittal:

1. **FLT-19-122:** XENOGRISS XENOpus laevis Growth & Regeneration on ISS (SpaceX-19 XENOGRISS)
    1. **Section 4A**: Please check chemical hazards box.
    2. **Section 7**: Identify vendor.
    3. **Section 7A:** Explain reference to previous experiment.
    4. **Section 7C**: Please clarify the following sentence: Studies on ground have tested this timeline and demonstrated tadpole survival in this condition as they are not eating during the first days and medium is fresh, oxygenated, we have a gas permeable membrane and the charcoal inside the water is providing a passive filter.
    5. **Section 7C**: Describe tadpole selection process.
    6. **Section 7C**: Explain what after 100 hr and 150 in second attempt mean.

7. **Section 9F**: Please define tadpole stress.
8. **Section 11A**: Deselect category D. Spaceflight is always considered category E.
9. **Section 12A**: Please explain statement "we need to order at least 3 batch…". Is there a potential for more embryos to be ordered or is 3 batches the maximum.
10. **Section 18**: Table requires: title/affiliation, email address, and phone number of all individuals listed.
11. **Page 31**: Revise scientific justification statement.
12. **Administrative Corrections**: Typographical corrections sent to the PI.

Committee Decision → Requires modification to secure approval.

2. **FLT-19-125:** Mighty Mice in Space: Preclinical Evaluation of a Broad Spectrum Myostatin Inhibitor to Prevent Muscle and Bone Loss Due to Disuse (SpaceX-19 RR-19)
   1. General Comment: All responses should be in black font and unbold.
   2. General Comment: Items not addressed within the protocol include: housing in transporter, housing in habitat, the flight rules for intervention, dragon lab environment, and ground control ISSES chamber housing and environmental conditions. If these subject items are now considered "standard housing and or processes" as per the flight IACUC, then the documentation describing the standards should be provided to the IACUC or added to the protocol as an addendum until the documentation is developed and filed with the KSC IACUC as standards that will be adhered to. Any deviation from the standard will need to be included in the protocol for review and approval by the IACUC prior to implementation.
   3. **Section 4C**: Add the CASIS peer review.
   4. **Section 8**: Has the Ketamine/Xylazine dose been tested in both strains of mice?
   5. **Section 8**: Add route of administration of anesthetic.
   6. **Section 8:** Add the atipamezole concentration and dose.
   7. **Section 8:** Add the use of eye lubricant.
   8. **Section 8:** Add the use of isoflurane for pre-flight DXA.
   9. **Section 8:** Add that Ground Controls are also housed in the ISSES chambers.
   10. **Section 8:** Explain who the partner personnel are.
   11. **Section 8**: Explain where will the ground controls be sent and how will they be transported.
   12. **Section 12B**: Add that the actual launch warrants a category E assignment.
   13. **Section 13**: Add the dose and route of ketamine/xylazine to be given prior to cervical dislocation.
   14. **Section 13**: Uncheck IP euthanasia solution and delete drugs listed there.
   15. **Section 18**: Years of experience is not listed for several individuals. Please add.
   16. **Administrative Corrections:** Typographical corrections sent to the PI.

   Committee Decision → Requires modification to secure approval.

Renewals:

1. **GRD-06-047:** Relative Abundance and Distribution of Marine Turtles Inhabiting Kennedy Space Center Waters (*Chelonia mydas and Caretta caretta*)

   ([redacted] – recused due to participation as listed on the protocol)

It was noted that the project is not currently funded. It is undergoing review by the funding source. The committee will be notified when the funding is approved and work resumes on the protocol once again. The PI requests renewal so as to be in a good posture to restart the project as soon as the funding becomes available.

1. **Section 4C:** Please add the Project Review and Advisory Board (PRAB) peer review.
2. **Section 4C:** Update reference to NASA Environmental Program Branch.
3. **Section 13B:** Please delete statement "NOT APPLICABLE AS NO category D or E actions. Section is applicable.
4. **Administrative Corrections:** Typographical corrections sent to the PI.

Committee Decision → Approved

2. **GRD-06-049:** Applying Autonomous Acoustic Telemetry to Evaluate Seasonal and Daily Movements of Estuarine and Coastal Sportfish at Cape Canaveral, Florida
   1. **Administrative Corrections:** Typographical corrections sent to the PI.

   Committee Decision → Approved

3. **GRD-11-082: S**mall mammal and gopher tortoise community responses to NASA, contractor, and commercial operations and restoration projects on Kennedy Space Center [redacted] – recused due to participation as listed on the protocol)
   1. **Section 3D**:
      - Confirm the date that work continued through – 2018 or 2019?
      - Please clarify which species you are referring to in the sentence "Animals were measured, marked, and moved to undisturbed habitat adjacent to the construction site that was separated by silt fencing."
      - Please clarify the total number of juveniles/subadults that were captured.
      - Please explain how far from the point of capture that animals were released.
   2. **Section 4A:** Please verify if spotted skunks should be included here as a target species of this protocol or are they an incidental catch? If it is a targeted species, please explain why the quantity listed is requested.
   3. **Section 8 & Section 13A:** What timeframe for checking the traps is listed as per the permit (number of hours)?
   4. **Section 8:**
      - Section 3D states that beach mice are released on the other side of a silt fence from the construction area. Please clarify the difference from the statement in this section that states release at point of capture.
      - Are sticks placed in buckets so that any small mammals that may fall in (e.g., beach mice) can get out?
   5. **Section 10 & 11:** Please add the following for southeastern beach mice – All injured southeastern beach mice, a federally listed species, will be taken for treatment to the following institution in order of priority: [redacted] (due to proximity and previous work with the species). If rehabilitation is required after treatment then the animal will be transported to the [redacted] to recover until it can be released back at the point of capture.
   6. **Section 18B:** It is noted that the Merritt Island special use permit expires December 2019. Please add a statement that recognizes this and notes that a copy of the new

permit will be forwarded to the IACUC when received.

7. **Administrative Corrections:** Typographical corrections sent to the PI.

Committee Decision → Requires modification to secure approval.

Continuing Review from June 6, 2019 Meeting:

1. **FLT-19-121 JAXA MHU5 FLT:** Name changed to JAXA Mouse Habitat Unit Technical Verification, Mouse Habitat Unit 5 (MHU-5) from Mechanism of accelerated aging under microgravity, Mouse Habitat Unit 5 (SpaceX-20 MHU-5). Separated into two protocols MHU5 and MHU6. MHU6 is a new protocol. MHU5 protocol requires continued review due to removal of pertinent study objectives to MHU6.
    1. **Administrative Corrections:** Typographical corrections sent to the PI.

    Committee Decision → Approved

II. IACUC Business Conducted Since June 6, 2019 Meeting:

1. **FLT-18-115 RR-10 Renewal:** Received all changes as requested by IACUC. Approval granted via DMR. Note, the KSC IACUC has been notified that an amendment will be forthcoming.

2. **FTR-19-123 JAXA MHU5 FTR: N**ame change to JAXA *MHU6* FTR. MHU5 FTR will not be conducted. Approval granted via DMR.

DMR Since June 6, 2019:

1. **FLT-19-120:** ISS National Lab Rodent Research Reference Mission-2: Understanding Aging through Evaluation of C57BL Mice in Microgravity (SpaceX-18 RR-17)
    - Two Amendments: both approved
        1. June 24, 2019: experimental plan and personnel update
        2. July 16, 2019: personnel update

Pre-review Since June 6, 2019:

1. **FLT-19-125 RR-19:** Mighty Mice in Space: Preclinical Evaluation of a Broad Spectrum Myostatin Inhibitor to Prevent Muscle and Bone Loss Due to Disuse. July 31, 2019: Comments provided to Leidos POC.

III. Miscellaneous Items

A. Rodent Research Mission Status
- SpaceX-18 Rodent Research-17(REMIS): July 25, 2019
    - Annex Support: June 18, 2019 – August 28, 2019 (L-4 weeks to L+ 30/60 days – GC shipped to LAR at L+30days)
    - Discussed impact due to Hurricane Dorian. All GCs were shipped to LAR site prior to the storm.

- SpaceX-19 Rodent Research-19: December 4, 2019
  - Annex Support: (L-4 weeks to L+ 40 days)

- SpaceX-19 ASI XenoGRISS
  - No Annex support. Will be located in a SSPF Science Processing Area. IACUC will need to site visit.
  - Discussed the need to site visit the assigned room and conduct post approval monitoring.

- SpaceX-20 March 2020 JAXA MHU5 & TBD Rodent Research-*22*
  - Annex Support: (L-3 or 4 weeks to L+ TBD days)

B. Semiannual Program Review

- New/Updated Policies: The committee members will review the policies and provide comments to the IACUC Administrator. Final review and approval to occur at the December full committee meeting.
  1. IACUC Review Process including DMR
  2. Veterinary Verification and Consultation (VVC)
  3. Habitat Water Refill
  4. Habitat Food Bar change
- The committee discussed the need to have the Principal Investigator or relevant Point of Contact (POC) present at the full committee review. The committee agreed that the POC should be present for the following scenarios: 1) new protocols only, 2) if after reading the protocol a member indicated that they required clarification or an answer to a question only the PI could provide, 3) for continuing renewal protocols with significant changes and for rotating PI presence between protocol renewals (i.e. once every three years).
- The committee discussed the necessity for the veterinary staff to be able to send photos/video to the attending veterinarian for assistance in diagnosing and prescribing a treatment plan for clinical issues that arise during animal housing. The photo documentation policy will be discussed at the upcoming NASA Animal Policy Review Board meeting. The request for clinical photos/video will be discussed by the board.

C. Semiannual Facility Inspection

No items of concern identified during the facility inspection. It was noted that NASA is continuing to work towards a resolution to the floor crack issue. All cracks were currently observed as sealed.

D. Appointment Letters

Membership Changes:

- An appointment letter will be drafted for the new scientist member of the committee.

E. IACUC Training

Revamp of training requirements continues to be in work. Will status committee at next meeting.

F. Third Hand Smoke Policy Status

A draft memorandum is in finalization. It will be distributed to the committee for review and comments.

G. SPF Testing Conflict of Interest

The legal member is contacting the NASA contracting officer to ensure no conflict of interest exists.

H. Annex Floors/Facility painting

Three flooring companies have completed their site visit and are in process to provide NASA options for repair or replacement. The walls, ceilings, and door frames are also under discussion for re-painting with an appropriate sanitation resilient product. Update to be provided at the December meeting.

I. New Business

None.

Meeting Adjourned: 1530

(b) (6), (b) (7)(C), (b) (7)(F)

(b) (6), (b) (7)(C), (b) (7)(F) **NASA KSC IACUC Chair**

September 23, 2019

Date

Appendix 8: IACUC/OB Meeting Minutes

KSC IACUC MEETING MINUTES

December 5, 2019; 13:00
Space Station Processing Facility (b) (7)(F)

(b) (6), (b) (7)(C), (b) (7)(F) **(IACUC Chair)**
NASA Exploration Research and Technology Programs
Utilization and Life Sciences Office
Space Station Processing Facility
Kennedy Space Center, FL 32899

ATTENDEES

(b) (6), (b) (7)(C), (b) (7)(F)	IACUC Member (Technical); TOSC Animal Care Program Lead
	IACUC Member (KSC TOSC Attending Veterinarian)
	IACUC Member (Chair); NASA Utilization and Life Sciences Office
	IACUC Member (Community/Non-Affiliated)
	KEMCON/Integrated Mission Support Service Contract
	IACUC Member (Non-Scientist); NASA Legal Representative

IV. Protocol Reviews

New Submittal:

3. **FLT-19-124:** Mechanism of accelerated aging under microgravity, Mouse Habitat Unit 6 (MHU-6)
   13. **Section 7B:** Change to "For MHU-6, blood collection and whole body freezing will be performed from more than 6 mice (up to a maximum of 10) selected from the remaining mice just after Space X launch if sufficient blood is *not* obtained from an individual.
   14. **Section 8 & 13:** Please provide information on how the euthanasia unit functions.
   15. **Section 8C. 1):** Please state minimum temperature requirement. Only the maximum is listed.
   16. **Section 8.A.7.):** Suggest adding a sentence clarifying a time limit on the reusability of mice that are part of a scrubbed launch attempt.
   17. **Section 12 A, Replacement:** Add sentence "Since we do not know why aging is accelerated, we cannot model it."
   18. **Section 14**: Isoflurane is not listed in Section 8, description of animal use. Please add or delete from Section 14.
   19. **Section 14**: Is BZK used on the ground too?
   20. **Section 18:** Add astronaut information when known. Clarify what (xxxx) means. Please add telephone number and email for all personnel listed.

   Committee Decision → Requires modification to secure approval.

Renewals:

4. **GRD-06-043:** Long-term population dynamics of the Florida Scrub-Jay (Aphelocoma coerulescens) on Kennedy Space Center. (Protocol and additional information attached)

[redacted] – recused due to participation as listed on the protocol)

Administrative Corrections only.
Committee Decision → Approved.

5. **GRD-06-046:** Small mammal community dynamics, demography, gene flow, home range, habitat management, and occupancy of the southeastern beach mouse (Peromyscus polionotus niveiventris) and the Florida mouse (Podomys floridanus) on the Kennedy Space Center/Merritt Island National Wildlife Refuge.

([redacted] – recused due to participation as listed on the protocol)

   2. **Section 3D:** Update the progress summary to reflect the additional trapping that occurred after protocol submittal.
   3. **Section 8:** Remove references to tail snip.
   4. **Section 8:** General Procedures – Add words to clearly state that as per the permit, no trapping will occur below 50°F and that personally, you do not trap below 55°F.
   5. **Section 13.B.:** Change "Although they have experienced some mortality with this method, we have collared 75 mice from 2008-2012 with no mortalities." to "Although they have experienced some mortality with this method, we have collared __ mice from 2008-2019 with no mortalities."
   6. **Section 15:** Change "All animals will be released at the point of capture we deemed appropriate." to "All animals will be released at the point of capture."
   7. **Section 15:** Pentobarbital anesthetic dose for mice is 40-90 mg/kg. AVMA Euthanasia guidelines recommends three times anesthetic dose. Please correct.
   8. **Section 18.A.:** Delete State of Florida FWC (Number LSSC-11-00031B).
   9. **Section 19:** Remove "All" from table and replace with specified procedures to be conducted by each individual.

Committee Decision → Requires modification to secure approval.

Amendment:

1. **FLT-19-121:** JAXA Mouse Habitat Unit Technical Verification, Mouse Habitat Unit 5 (MHU-5)
   1. **Section 10. 4) and Section 13:** Is a method of assuring death used in conjunction with the CO2 apparatus on the ISS? If not, why not? Please explain how the CO2 unit functions to assure death.

Committee Decision → Requires modification to secure approval.

Pre-review (Comments only. No voting on protocol at this meeting):

1. **FLT-19-126:** Effects of simulated and natural microgravity on the beneficial symbiosis between the bobtail squid Euprymna scolopes and luminescent bacterium Vibrio fischeri
   1. General: The protocol encompasses both the ground and flight grants. Please separate into two protocols, one for each grant.

2. **Section 7. C.**: Include picture of the housing system.
3. **Section 7. C.**: Provide confirmation that health checks occur 7 days a week including holidays; Is there an emergency preparedness plan?
4. **Section 7. C.**: Clarify the methods of euthanasia for adults and paralarvae.
5. **Section 13 and Page 30:** describe euthanasia using liquid nitrogen and RNAlater. Please provide reference for euthanasia method chosen. Add RNAlater and liquid nitrogen as methods under "Other".
6. **Section 14:** Add the chemicals to the table and address the handling question as per the instructions.
7. **Section 18:** Where did PI receive training; CITI? AALAS LL? Years of experience for all? CVs. Add years of experience for all individuals listed on the protocol.
8. **Page 30:** Add verbiage regarding stress of space flight. IACUC Administrator will supply the wording.
9. **Administrative Corrections:**
    1. General:
        1. Choose one way throughout document for consistency: animal(s) versus squid(s)
        2. Choose one way throughout document for consistency: 4" or 4-in.
        3. Choose one way throughout document for consistency: light/dark or light-dark
        4. When using e.g. include a comma: e.g.,
        5. Define acronym at first use. Use acronym for remainder of document.
    2. **Section 6:** Change "The bobtail squid has a specialized organ called the light organ - the site of the symbiosis with the beneficial bacterium Vibrio fischeri." to "The bobtail squid (Euprymna scolopes) has a specialized organ called the light organ - the site of the symbiosis with the beneficial luminescent bacterium Vibrio fischeri."
    3. **Section 7A. 3):** Change "adult female squid will lay…." to "3) an adult female squid will lay…"
    4. **Section 7C:**
        1. Change "…part of the University of Hawaii and located in Honolulu." to "…part of the University of Hawaii located in Honolulu."
        2. Change "…within the close aquarium system." to "…within the closed aquarium system."
        3. Change "…the animal is squid is quickly…" to "…the animal is quickly…"
        4. Change "…the animals was revived and further the drip..." to "…the animal was revived and the drip…"
        5. Change "…the animals was revived..." to "…the animal was revived…"
        6. Change "…no stress aggressive activity..." to "…no stress or aggressive activity…"
        7. Change "The eggs clutches are laid on 4" half PCV…" to "The eggs clutches are laid on 4" half PVC..."
        8. Change "…the University of Florida Whitney Marine Lab in St. Augustine." to "…the University of Florida Whitney Marine Lab in St. Augustine, Florida."
    5. **Section 8:**
        1. Change "…have colonized animal's…" to "…have colonized the animal's…"
        2. This statement does not identify multiple treatments as it state. Please clarify: "After exposure to the simulated microgravity experiments, the animals are anesthetized using the previously described protocol and then undergo one of following treatments immediate staining with nucleic acid stain (e.g. Acridine Orange or DAPI) to observe the onset of bacteria-induced apoptosis using

epifluorescence microscopy."

6. **Section 9E:**
   1. Change "…a dissecting microscopy..." to "…a dissecting microscope..."
   2. In the statement "Paralarvae used for live imaging are anesthetized as described.". Add where described.
   3. Change "…is immediate placed..." to "…is immediately placed…"
7. **Section 12C:**
   1. Change "…may be necessarily..." to "…may be necessary…"
8. **Section 16:** Photo documentation form - uncheck no photo-documentation.

V. IACUC Business Conducted Since September 12, 2019 Meeting:

Notification Received

1. **FLT-19-120 (RR-17):** Received for the records a summary of action taken during hurricane Dorian.

DMR:

2. **FLT-19-125:** Amendment October 29, 2019; Recommended for approval
3. **FLT-19-125:** Amendment November 15, 2019; Recommended for approval

VI. Miscellaneous Items

J. Rodent Research Mission Status

- SpaceX-18 Rodent Research-17(REMIS): July 25, 2019
  - Annex Support Complete

- SpaceX-19 Rodent Research-19: Launched December 5, 2019
  - Annex Support: (L-4 weeks to L+1 day)
  - ISS ES: L+1 to L+34 Days

- SpaceX-19 ASI XenoGRISS
  - The IACUC site visit of the Space Station Processing Facility (b) (7)(F) was conducted by (b) (6), (b) (7)(C), (b) (7)(F) and (b) (6), (b) (7)(C), (b) (7)(F) on December 2nd. The Principle Investigator was present for the visit to answer questions and demonstrate the quality of the tadpoles that they received. The room and associated equipment was found to be set up appropriately. No issues were identified.
  - The payload activities were complete within a few days following successful launch.
  - Support is complete.

- SpaceX-20 March 2020 JAXA MHU5
  - Annex Support: (L-3 or 4 weeks to L+ TBD days)

- Rodent Research-7 Ground Control Repeat Under Review: TBD Spring 2020

- SpaceX-21 Rodent Research-23/Rodent Research -24 is Under Review: August 5, 2020
  - Annex Support: (L-4 weeks to L+ 30 days)

K. REMIS Contract Status

(b) (4) [redacted]

L. Techshot Inc. – Cephalopod payload

Cephalopods have been added to the NASA Policy Directive 8910.1C (current rev.) Care and Use of Animals. There is a NASA funded cephalopod experiment in progress at the Space Life Sciences Laboratory outside of the controlled perimeter of Kennedy Space Center. Two grants have been funded. One is for the ground experiment and one for a flight experiment in which manifest assignment is TBD. Both must be encompassed under the authority of the NASA KSC Animal Care Program. The NASA Office of the Chief Council is determining

(b) (5) [redacted]

M. Policy Review

- IACUC Review Process including DMR
- Veterinary Verification and Consultation (VVC)
- Habitat Water Refill
- Habitat Food Bar change

All policy reviews were tabled to the next meeting to allow for more discussion with the entire committee.

N. Peer Review Reference

The reference was distributed to all members prior to the meeting date. Further discussion and questions were tabled to the next meeting to allow for more discussion with the entire committee.

O. Ethics Review Template

The non-scientist/legal member of the committee took and action to contact the NASA Flight IACUC regarding the template in an effort to better understand its use. It will be discussed again at the next quarterly meeting of the NASA KSC IACUC.

P. Appointment Letters

The new scientist member appointment letter is ready for signature by the Institutional Official.

Q. IACUC Training

- Establish policy for every three years
- Mimic Flight IACUC requirements

Current requirement is for all members to have completed the IACUC Essentials class via the AALAS Learning Library within the last three years. Please send any additional proof of training that you perform to the NASA KSC IACUC Administrator upon completion.

R. Third Hand Smoke Policy Status

The recommendation to refrain from smoking prior to entering the facility will be added to the Science Annex Orientation package that is provided to all customers and new employees prior to entering the Annex.

S. SPF Testing Conflict of Interest

Non-issue. Item closed.

T. Annex Floors/Facility painting

A window of opportunity exists to perform the work from mid-March to July 2020 if the (b) (5) (b) (5) does not occur. Updates will continue to be provided at each meeting.

U. New Business

None.

Meeting Adjourned: 1610

(b) (6), (b) (7)(C), (b) (7)(F)

(b) (6), (b) (7)(C), (b) (7)(F) NASA KSC IACUC Chair

December 19, 2019

Date

Appendix 9: IACUC/OB Protocol Form

Please attach a ***blank*** copy of form(s) used by the IACUC/OB to review and approve studies. Include forms used for annual (or other periodic) renewal, modifications, amendments, etc., as applicable.

Protocol Number:

Institutional Animal Care and Use Protocol

Federal animal welfare regulations require that the Institutional Animal Care and Use Committee (IACUC) must review and approve all activities involving the use of vertebrate animals prior to initiation of such use. Once approved by the IACUC, any change(s) to the following protocol must be submitted in a written amendment for review and approval by the IACUC prior to implementation of the change(s). Protocols and related amendments are active for 1 year from protocol approval date and must be renewed yearly.

PLEASE DO NOT REMOVE SECTION DIRECTIONS

1. Title

Provide a descriptive title for the proposed study that includes the common name of the species to be used.

2. Principal Investigator

(The ONE individual responsible and accountable for the design, conduct and monitoring of the protocol.)

Provide the following information on the Principal Investigator (PI) and Responsible Point-of-Contact for this protocol. Please identify all other personnel (including Co-PIs) who will perform experimental manipulations on animals in section 19.

PI

Name:
Title:
Affiliation:
Mailing Address:
Email:
Phone Number:
Fax Number:
Emergency Contact Number:

Responsible Point-of-Contact

Name:
Title:
Affiliation:
Mailing Address:
Email:
Phone Number:
Fax Number:
Emergency Contact Number:

3. Protocol Information

Protocols are approved for one year. Please indicate if this is a new or renewal protocol.

3A. ☐ **New Protocol**

1

Appendix 9: IACUC/OB Protocol Form

Protocol Number:

Institutional Animal Care and Use Protocol

If this is a new protocol, please move on to section 4

☐ **Renewal Protocol**

If this is a renewal protocol, please complete the following:

3B. Previously Approved Protocol Number

3C. Problems/Adverse Events: *Have there been any unanticipated problems that have affected animal use, welfare, morbidity, or mortality?*

☐ No ☐ Yes

If YES, provide a summary of the problems, the cause(s), if known, and how these problems were resolved.

3D. Progress Report: *Provide a brief statement of progress to date. State what was done in the previous approval period, how many animals were used, what was learned, and why additional animals are required to continue the study. If this work resulted in any changes in how you will proceed, please explain.*

4. Nature of the Project/Study

4A.

Project Types: (indicate all that are applicable)	**Type of Procedures: (indicate all that are applicable)**	**Hazardous Procedures: (indicate all that are applicable)**
☐ Research/ Discovery Project	☐ Behavioral/Neurobehavioral Studies	☐ Biohazardous/Infectious Agents
☐ Testing –Preclinical Development	☐ Blood/Tissue/Embryo Collection	☐ Rodent Cell Lines/Biological Materials
☐ Training	☐ Breeding Colony	☐ Human Cell Lines/Biological Materials
☐ Other (specify):	☐ Prolonged Restraint (>15min)	

Appendix 9: IACUC/OB Protocol Form

Protocol Number:

Institutional Animal Care and Use Protocol

Species:
Indicate all applicable:
- ☐ Mice
- ☐ Rats
- ☐ Guinea Pigs
- ☐ Rabbits
- ☐ Nonhuman Primates
- ☐ Other (specify):

- ☐ Compound Dosing
- ☐ Single Dose
- ☐ Multiple Doses
- ☐ Induction of Acute Disease
- ☐ Induction of Chronic Disease
- ☐ Surgery
- ☐ Vendor performed
- ☐ Multiple Survival
- ☐ Single Survival
- ☐ Terminal
- ☐ Tumor Inducement/Xenograft
- ☐ Expts. done (partially) at another institution
- ☐ Other (specify):

- ☐ Recombinant DNA
- ☐ Chemical Hazards
- ☐ Radioactive Materials/ Radioisotopes
- ☐ X-Ray Machine Usage
- ☐ Irradiator Usage

4B. Is this a Pilot/Feasibility Study?
(Small-scale discovery trial of limited duration and animal numbers designed to evaluate, refine, or modify devices, techniques, methodology and/or study design prior to submitting a protocol for a full-scale project. Duration of study is usually limited to six months or less and fifty animals or less)

☐ Yes ☐ No

4C. Federal Funding Source(s) and Peer Review
Is this project currently or proposed to be funded by either federal or other funding agencies?

☐ No. Please move on to section 5.
☐ Yes. Please complete the following:

Current and Proposed Federal (or other) Funding Sources:

Title(s) of Grant Submittal:

Has this proposed activity undergone peer review? ☐ Yes ☐ No

If YES, who provided peer review and when?
(For new protocols include one copy of the grant proposal with protocol submission.)

5. Location of Work
Please mark all areas where work pertaining to this protocol will be conducted. If you will be doing work outside of the Contract Research Services (CRS) Facility, please list the institution's full name under 'other'. Please note all areas used for animal housing or procedures must first be approved by the IACUC and will be

included in all facility inspections.

☐ **Contract Research Services Facility At Ames Research Center**
- ☐ Building N236 (Main Vivarium)
- ☐ Building N239 (list room number):
- ☐ Other (list buildings/ room number):

(Please complete the attached form *IACUC PERSONNEL SIGNATURE PAGE)*

☐ **NASA Facilities**
- ☐ Johnson Space Center (list buildings/ room number):
- ☐ Kennedy Space Center (list buildings/ room number):

☐ **Other** (Including Field Studies. List facility or location, address, and room number):

6. Project Overview

Using layperson terms, describe the purpose of the study and its intended benefits to science, medicine, or mankind. Please avoid the use of technical jargon and abbreviations that would not be understood by a non-scientist.

7. Animal Information

Please provide the specifications for all of the animals requested for use in this protocol. Please list each species separately. Please put 'any' if no preference.

Species: Common Name/ Scientific Name	Breed/Strain	Preferred Sex	Preferred Age Range	Preferred Weight Range	Preferred Vendor or Source	Total Number Requested

7A. Justification of Species

Please explain why the species and/or strain(s) requested is/are the most appropriate for this research. Statements that the planned species is traditionally used for the proposed research are not sufficient.

7B. Justification of Animal Numbers

Provide a detailed justification for the number of animals requested. Include number of animals/group X number and composition of groups/study X number of studies. Whenever possible, the number of animals requested should be justified statistically. These numbers are the annual maximum that will be used, inclusive of breeding, animals

used for maintaining colony size, animals used for developing and practicing techniques, or animals required for unforeseen circumstances.

7C. Special Animal Care
If housing or care of animals is different from standard Animal Facility procedures (e.g., individual housing of rodents; change in caging type or light cycle or diet or cleaning schedule), provide detailed description and scientific justification.

8. Description of Animal Use
Provide a complete description of the proposed use of the animals, including the approximate time period the animals will be on study. Include descriptions of: animal identification methods; radiation (dosage and schedule); use of restraint devices (note that prolonged restraint of greater than 15 minutes must be justified); sites, volumes, and frequency of collections of bodily fluids; names/type, dosages, and routes of administration of compounds and other materials administered; animal manipulations (such as centrifugation, microgravity exposure, etc.); summary of surgical manipulations; and similar details. If surgical manipulations are to be included in the protocol, details must be provided in Section 9.
This description should allow the IACUC to understand the entire experimental design, from the arrival of an animal at the Vivarium, through the experiment and its endpoints, and final disposition of the animal(s). A diagram or chart may be helpful to explain what is being done.

9. Surgery (To be completed only if surgery is involved.)
All surgical procedures must be performed in compliance with the relevant IACUC guidelines for surgery.

Check the statements that describe your project:
☐ Non-survival surgery (animals are euthanized under anesthesia without regaining consciousness)
☐ Vendor conducted
☐ Major survival surgery (penetration and exposure of a body cavity, or resulting in a permanent impairment of physical or physiologic functions)
☐ Minor survival surgery
☐ Multiple survival surgical procedures (provide the timeframe between surgeries, describe any differences in surgical procedures, and provide a scientific justification for conducting multiple survival surgical procedures, if applicable)

9A. Location (where surgery will be performed—building and room number)

Appendix 9: IACUC/OB Protocol Form

9B. Anesthetics

List the anesthetic(s), including dosage(s), frequency of dosing, and route(s) of administration that will be used, and describe how you will monitor the depth/quality of anesthesia to ensure it is adequate.

9C. Preoperative Care

Describe the preoperative care of the animal (e.g. withholding of feed for 18 hours prior to surgery or administration of prophylactic antibiotics).

9D. Minimization of Contamination

Describe the methods employed to minimize microbial contamination of the surgical site. Include brief descriptions of the preparation of the animal, surgeon, and instruments.

9E. Surgical Procedures

Describe the surgical procedure. Include descriptions of methods and materials for ligatures and wound closure.

9F. Postoperative Surgical Care

Describe the post-surgical care. Include information regarding the use of pain-relieving drugs (give the drug(s), dosages, route(s) of administration, frequency), monitoring of animals for normal recovery from anesthesia and wound healing, and provision of supportive care, such as supplemental heat and fluid or antibiotic therapy. Describe who will perform post-surgical observations, and the frequency and duration of observations.

Reminder: Documentation of the surgical procedure and post-surgical care is required and is the responsibility of the Principal Investigator. Copies of the surgical/post-surgical records must be readily available to the veterinary staff, the IACUC, and regulatory officials.

10. Minimizing Pain and Distress- Clinical Outcomes and Humane Endpoints

Describe any pain, distress, or clinical outcomes (e.g.: tumors/ lesions, weight loss, behavioral abnormalities, etc.) that an animal may experience as a result of this study Please indicate any treatment/ procedures designed to ensure that discomfort and injury to animals will be limited to that which is unavoidable in the conduct of this project. Describe objective criteria/ parameters (e.g.: weight loss of 20%, loss of mobility, etc. and endpoints, as well as the frequency/ schedule of monitoring of animals during the

entire experiment. Clearly indicate when animals will be euthanized should any of these endpoints be reached.

11. Pain, Discomfort, and Distress

11A. USDA Pain/Distress Classification

Check the category that indicates the highest level of pain/distress the animals will experience during the course of these studies (use the reference chart below for determination).

☐ C ☐ D ■ E*

Category C: No Pain or Distress
(Use of Pain Relieving Drugs Is Not Indicated). Procedures that may result in only slight or momentary pain such as routine injections, blood collections, or other minor procedures are included in this category.

Category D: Tests or Procedures Involving the Potential for Pain or Distress
(Appropriate Anesthetic, Analgesic or Tranquilizing Drugs are Used). Animals in Type D studies have the potential to experience pain/discomfort, but the necessary drugs to alleviate the symptoms are provided. This includes terminal bleeding performed under anesthesia or retro-orbital sinus bleeding of rodents under general anesthesia, because these procedures would result in pain if anesthetics were withheld. All surgical procedures where anesthesia is used to alleviate pain or distress, including studies on anesthetized animals that do not regain consciousness are included in this category.

Category E: Pain or Distress Without the Benefit of Pain Relief* These are procedures (e.g., efficacy studies of novel pain therapeutics) or situations (induction of chronic illness/disorder such as arthritis or liver failure) for which the use of analgesics, anesthetics or tranquilizing drugs would adversely affect the procedures, results or interpretation of data.

**For all E category classifications complete the Category E Explanation Sheet at the end of this form.*

12. Alternatives to Potentially Painful/Distressful Procedures

12A. Written Statement

*Provide a written statement of the methods and sources used to determine that alternatives to potentially painful/distressful procedures are not available. **Reduction** of animal numbers and **Refinement** of procedures to*

eliminate or minimize pain and distress must be considered, as well as Replacement of animals with non-animal alternatives. if alternatives to painful or distressful procedures exist, but were not chosen, explain the reasons for not using the alternatives.

Reduction:

Refinement:

Replacement:

12B. Alternatives Search

Describe your consideration of alternatives to procedures listed for categories D and E that may cause more than momentary or slight pain or distress to the animals, and your determination that alternatives were not available. Delineate the methods and SPECIFIC SOURCES used in the table below. Examples of appropriate sources include Biological Abstracts, Index Medicus, the Current Research Information Service, and the Animal Welfare Information Center. You must use at least two different databases. ***The key words "Alternative" and/or "Alternatives to Animal Testing" and common name(s) of species must be included and combined with the potentially painful procedures.***

Date Literature Search Conducted:					
Date Range Used in Search:		From:		To:	
Keywords Used in Search:					
Database(s) Consulted:					
Other Information Source: (provide details)					

Summary of findings:

12C. Assurance of Non-duplication

Provide a written statement that the experiments covered under this proposal do not unnecessarily duplicate previous experiments.

13. Method of Euthanasia or Disposition of Animals

Provide details on method(s) of euthanasia or final disposition of animals. Euthanasia methods must comply with the current recommendations of the American Veterinary Medical Association's Guidelines on Euthanasia

Appendix 9: IACUC/OB Protocol Form

(http://www.awma.org/resources/euthanasia.pdf). Justification must be provided for any proposed alternative methods. If injectable agents are used, provide agent name, dose, and route of administration.

(Check All Applicable Boxes)

- ☐ CO_2- followed by secondary method (e.g. bilateral thoracotomy, cervical dislocation)
- ☐ Isoflurane overdose
- ☐ Cervical Dislocation (rodents < 200 gm) w/ sedation
- ☐ Decapitation/Guillotine w/ sedation
- ☐ IV Euthanasia Solution (*Specify agent, route, dose):*
- ☐ IP Euthanasia Solution (*Specify agent, route dose):*
- ☐ Excess/Deselected Animals may be transferred per approved process to another protocol, if applicable
- ☐ Other (*Specify method and provide justification*):

14. Use of Hazardous Agents or Biological Materials

Will animals be exposed to any of the following agents? If yes, specify the agent, including CDC biosafety level, as applicable.

Agent	Name, Type or Description of Agent
Radioisotopes	
Chemical Hazards	
Biohazards	
Recombinant DNA	
Biological Materials	
Other	

For specific agents used, provide special handling instructions for animals, caging and equipment, and other special precautions (e.g., special housing, personal protective equipment requirements and any decontamination procedures). Use of radioactive materials will take place in designated areas only.

15. Safety Precautions

Protocols involving radiation or biosafety hazards must be approved by the appropriate official before IACUC approval will be granted.

_____

Environmental Health & Safety Representative (Print and Sign Name, Date)

Appendix 9: IACUC/OB Protocol Form

Protocol Number:

Institutional Animal Care and Use Protocol

Biosafety Officer (Print and Sign Name, Date)

Radiation Safety Officer (Print and Sign Name, Date)

Appendix 9: IACUC/OB Protocol Form

Protocol Number:

Institutional Animal Care and Use Protocol

16. Photo Documentation

As per the NASA Photo-documentation Policy, images involving animals may be obtained for purposes of animal welfare, scientific data collection, operational verification of hardware or procedures, and/or education, training, and public outreach purposes. However, all photo-documentation must be approved in advance by the Institutional Animal Care and Use Committee (IACUC) and, in cases involving flight downlinks, by the NASA Chief Veterinary Officer (CVO) or designee. Only those purposes listed above provide sufficient justification for approval of photo-documentation. No unofficial or personal photos of animal activities are allowed. The IACUC or CVO may require, as a condition of approval, an opportunity to review, prior to their use, images that will be used in publications or presentations.

This policy applies to all animal activities that are conducted at NASA facilities, use NASA personnel, and/or use NASA hardware or vehicles for any portion of the activity.

It should be noted that the Public Affairs Office (PAO) must additionally review and approve release to the media of any images involving animals. The PAO may not approve the release of images that the IACUC and/or CVO have disapproved, but the PAO may prohibit the release to the media of images that the IACUC/CVO has approved for collection for approved purposes.

Note that appropriate personal protective equipment (PPE) must be worn by <u>all</u> individuals working with the animals. Images that include people without the appropriate PPE will not be approved.

☐ I have read the photo documentation policy above. <u>No photo-documentation will be conducted during this experiment.</u>

☐ <u>Yes, photo-documentation will be conducted during this experiment</u>. I have completed, signed, and attached the photo-documentation approval sheet to this protocol for IACUC review for approval.

Protocol Number:

Institutional Animal Care and Use Protocol

17. Permits

17A. Are Special Permits required? ☐Yes ☐No

If Yes: Permit type:

17B. Does the NASA facility (or PI) already have this permit? ☐Yes ☐No

If Yes: Permit Expiration Date:

17C. Are the animal numbers requested in Section 7 within the limits of the permit? ☐Yes ☐No

18. Experience and Qualifications

List the experience and qualifications of the PI and all personnel who will be supporting this protocol, along with their role in each procedure listed. Only personnel listed on the protocol are approved to work with animals, and only for the procedures indicated in the protocol. All personnel who perform any animal manipulations, including, but not limited to anesthesia or surgery, must be qualified through training or experience to accomplish these tasks in a humane and scientifically acceptable manner. For any personnel who require training to participate in a procedure, describe what training will be provided. Current training files documenting experience, continuing education and/or training must be provided for all personnel in conjunction with participation in an Occupational Health Program and maintained in the IACUC Office.

Name Title/ Affiliation Email address Phone Number	List all procedures this individual will perform and their experience for each procedure listed.

Appendix 9: IACUC/OB Protocol Form

Protocol Number:

Institutional Animal Care and Use Protocol

19. Principle Investigator Assurances

I hereby certify that the foregoing information is complete and correct and that professionally acceptable, ethical and humane standards governing the care, treatment and use of animals will be followed.

I affirm that all procedures involving animals will be carried out humanely and will be performed by qualified personnel, and that as the Principal Investigator, I am responsible for all work conducted under this protocol.

I understand that federal regulations authorize the Attending Veterinarian to utilize his/her discretion in the implementation of the procedures herein described in order to assure the welfare of the animal subjects.

I understand that any other variance from what is written in the protocol form would constitute a violation of regulatory guidelines. Any changes in this project will be forwarded promptly to the IACUC for review. Changes to protocols will not be implemented until IACUC approval has been obtained.

I agree to abide by all applicable laws, regulations and guidelines for the care and use of animals. I agree to cooperate with the IACUC and the Attending Veterinarian to assure compliance with federal, state and institutional regulatory requirements and policies.

I hereby certify that these studies do not unnecessarily duplicate previous experiments.

Signature of Principal Investigator: _____ **Date** ___/___/___

ANY INDIVIDUAL MAY CONTACT THE IACUC CHAIRPERSON, ATTENDING VETERINARIAN OR ANY MEMBER OF THE IACUC (ANONYMOUSLY, IF SO DESIRED) IF THERE ARE ANY COMPLAINTS OR CONCERNS REGARDING THE CARE OR USE OF RESEARCH ANIMALS AT OUR FACILITIES. PERSONNEL SHALL NOT BE DISCRIMINATED AGAINST OR BE SUBJECT TO ANY REPRISAL FOR REPORTING ANY CONCERNS.

Appendix 9: IACUC/OB Protocol Form

Protocol Number:

Institutional Animal Care and Use Protocol

NASA Management Approval and Assignment of Point Of Contact
(NASA Protocols Only)

I have reviewed this protocol and affirm that the use of animals for this protocol is necessary to achieve our organization's scientific or engineering goals. The work is consistent with NASA's guidelines on the ethical use of animals, and will be carried out in accordance with the relevant federal, agency, and institutional regulations and policies. Resources are available to complete these activities as described.

Manager's Name and Title (Print)	Date	Signature

Point of Contact (Print)	Date	Signature

Appendix 9: IACUC/OB Protocol Form

Protocol Number:

Institutional Animal Care and Use Protocol

IACUC Chairperson Signature

This protocol has been approved by the IACUC.

Chairperson (Print)	Date	Signature

For IACUC Office Use Only

Species: USDA Category:

Date Submitted:

IACUC Approval Date:

Date Notification of IACUC Decision Sent to PI:

Protocol Number: Protocol Expiration Date:

A copy of the signed protocol will be sent directly to the PI listed in Section 2 of this document.

Appendix 9: IACUC/OB Protocol Form

Protocol Number:

Institutional Animal Care and Use Protocol

Category E Explanation Form

This form is intended as an aid to completing the Category E explanation. A Category E Explanation must be written so as to be understood by laypersons, as well as scientists.

Species (common name) of animals used in these studies:

Explain the procedure producing pain and/or distress:

Provide scientific justification why pain and/or distress could not be relieved. State methods or means used to determine that pain and/or distress relief would interfere with test results:

Signature of Principal Investigator: _____ Date: _____

Appendix 9: IACUC/OB Protocol Form

AMENDMENT to Protocol for Animal Use

Please read through this entire document. Fill out the form completely. Fill in an answer for each section including the investigator and protocol number in the header of the document. **Please describe your amendment and justify the change in section 3**, providing details as necessary in the following sections (not all changes have additional sections for details). Contact the IACUC Office if you have questions. All amendments will be received by the IACUC Administrator and reviewed by the IACUC.

1. **Approved Protocol Title:**

2. **Approved Protocol Approval Date:**

3. **Amendment Descriptions and Justification**
   Provide a general description of and justification for the proposed amendment to the protocol. Describe why the amendment is needed and outline any changes. (Please provide the specific details in the following sections as appropriate).

4. **Location of work**

   _____ This amendment does NOT require a change in location.

   _____This amendment DOES require a change in location. Check all locations where work will be performed. If "other" is checked, indicate where the work will be performed. Please also indicate if this is a room change within the same location.

   ☐ ARC ☐ KSC ☐ JSC ☐ Other _____

5. **Experimental Plan/Animal Procedures Details**

   _____This amendment does NOT request a change to existing or the use of new procedures.

   _____ This amendment DOES request a change to existing or the use of new procedures. Please list all procedures described above and indicate if it is a changed (e.g., new method, increased frequency, etc.) or new procedure. Provide details for the procedure, and the expected effect on the animal. Surgery details including method of anesthesia, surgical procedures, post-operative care and monitoring should be described.

6. **Pain, Discomfort and Distress**

   Please address the pain, discomfort and/or distress associated with all new procedures. Otherwise, state that the consideration of pain, discomfort and distress remain the same as described in the approved protocol.

   _____ This amendment does NOT result in any changes to pain, discomfort and distress.

   _____This amendment DOES result in a change to pain, discomfort and distress. Describe the changes, explain how the effects will be minimized, and scientifically justify their use.

7. **Animal Requirements**

   7a. Species Required: Please provide information on new species requested.

_____ This amendment does NOT require a change in species. Leave table blank.

_____This amendment DOES require a change in species. Provide information in table and explain why this species is appropriate in section 7b.

Species	Sex	Strain	Age	Weight Range	Source/ Vendor

7b. Animal Species Justification

7c. ***Animal Numbers: Provide information on the number of new animal requested and new animal total for year in the appropriate boxes. Adjust the total number of animals required as necessary.***

_____ This amendment does NOT require a change in animal numbers. Leave table blank.

_____This amendment DOES require a change in animal numbers. Complete table to provide information on the additional number of animals requested, and the new total for animals requested each year, as applicable. Justify the need for the change in animal numbers in section 7d.

	Year 1	Year 2	Year 3	Total
Number added				
New Total				

7d. Animal Number Justification

8. Husbandry

_____ This amendment does NOT request a change in husbandry.

_____This amendment DOES include a change in husbandry. Please include any deviation from standard husbandry, housing, or handling, especially if the change results in a deviation from the Guide

9. Drugs

_____ This amendment does NOT request a change in drugs required for the protocol.

_____This amendment DOES include a change in drugs (including a change in dose and/or route of administration) required for the protocol. Please complete the table below.

Drug	Purpose	Dose	Route of Administration	Schedule

Appendix 9: IACUC/OB Protocol Form

10. Disposition of Animals

Please address <u>any new procedures</u> with regards to euthanasia.

_____ This amendment <u>does NOT</u> request a change to the method of euthanasia

_____This amendment <u>DOES</u> request a change to the method of euthanasia. Please describe the method and state whether or not it is an AVMA-approved method.

11. Safety Precautions

The appropriate officer must approve protocols involving radiation or biosafety hazards before IACUC approval will be granted. <u>If this amendment adds any procedures that are biohazardous or include radiation this section must be filled out and signed by the appropriate official.</u>

Radiation Safety Officer Signature

_____
(Print name and sign)

Biosafety Officer Signature

_____
(Print name and sign)

12. Photo Documentation

Please check the appropriate box below. If your answer is yes, or if any procedures are being added that include any type of photo images (i.e. video, still photography, daily observations that include photo images, etc.), please submit a signed copy of the photo-documentation form along with this amendment. Please contact the IACUC Office if you have any questions.

_____ This amendment <u>does NOT</u> request a change in photo documentation.

_____This amendment <u>DOES</u> request a change in photo-documentation. I have completed, signed, and attached the photo-documentation approval sheet to this amendment for IACUC review for approval.

13. Personnel

If your amendment includes a change in personnel please include their experience and qualifications with respect to their specific role in the protocol.

_____ This amendment <u>does NOT</u> request a change in personnel.

_____This amendment <u>DOES</u> request a change in personnel. List all new personnel, their role in the study, and their qualifications and training.

14. Principal Investigator Signature

_____
Principal Investigator

_____
Date

Appendix 9: IACUC/OB Protocol Form

This Section for IACUC use only
The IACUC will use this section to record the actions taken by the committee on your protocol.

Reviewed by IACUC Administrator .....

Reviewed by Attending Veterinarian.....

Amendment Classification

_____ **Significant**

Approved _____ Disapproved _____

_____ **Minor**

Approved _____ Disapproved _____

Review Process

_____ **IACUC Review**

Approved _____ Disapproved _____

_____ **Designated Review**

Approved _____ Disapproved _____

_____ **Administrative Review**

Approved _____ Disapproved _____

IACUC Chairperson Signature Date

Appendix 10: IACUC/OB Periodic Program Review and Facility Inspection Report

Please attached a copy of the latest facilities (including laboratory inspections) and program assessment report conducted by the IACUC/OB.

Appendix 10: IACUC/OB Periodic Program Review and Facility Inspection Report

I. NASA KSC Semiannual Program Review Checklist [i]

Institutional Policies and Responsibilities

Date: September 12, 2019

1. Animal Care and Use Program NEW	A*	M	S	C	NA
• Responsibility for animal well-being is assumed by all members of the program (*Guide*, p 1) [must]	X				
• IO has authority to allocate needed resources (*Guide*, p 13)	X				
• Resources necessary to manage program of veterinary care are provided (*Guide*, p 14) [must]	X				
• Sufficient resources are available to manage the program, including training of personnel in accord with regulations and the *Guide* (*Guide*, pp 11, 15)	X				
• Program needs are regularly communicated to IO by AV and/or IACUC (*Guide*, p 13)	X				
• Responsibilities for daily animal care and facility management are assigned to specific individual(s) when a full-time veterinarian is not available on site (*Guide*, p 14) [must]	X				
• Inter-institutional collaborations are described in formal written agreements (*Guide*, p 15)					X
• Written agreements address responsibilities, animal ownership, and IACUC oversight (*Guide*, p 15)					X

2. Disaster Planning and Emergency Preparedness NEW	A*	M	S	C	NA
• Disaster plans for each facility to include satellite locations are in place (*Guide*, p 35, p 75) [must]	X				
• Plans include provisions for euthanasia (*Guide*, p 35) [must]	X				
• Plans include triage plans to meet institutional and investigators' needs (*Guide*, p 35)	X				
• Plans define actions to prevent animal injury or death due to HVAC or other failures (*Guide*, p 35)	X				
• Plans describe preservation of critical or irreplaceable animals (*Guide*, p 35)	X				
• Plans include essential personnel and their training (*Guide*, p 35)	X				
• Animal facility plans are approved by the institution and incorporated into overall response plan (*Guide*, p 35)	X				
• Law enforcement and emergency personnel are provided a copy and integration with overall plan is in place (*Guide*, p 35)	X				

3. IACUC NEW	A*	M	S	C	NA
• Meets as necessary to fulfill responsibilities (*Guide*, p 25) [must]	X				
• IACUC Members named in protocols or with conflicts recuse themselves from protocol decisions (*Guide*, p 26) [must]	X				
• Continuing IACUC oversight after initial protocol approval is in place (*Guide*, p 33)	X				
• IACUC evaluates the effectiveness of training programs (*Guide*, p 15)	X				

4. IACUC Protocol Review - Special Considerations	A*	M	S	C	NA
• Humane endpoints are established for studies that involve tumor models, infectious diseases, vaccine challenge, pain modeling, trauma, production of monoclonal antibodies, assessment of toxicologic effects, organ or system failure, and models of cardiovascular shock (*Guide*, p 27)	X				
• For pilot studies, a system to communicate with the IACUC is in place (*Guide*, p 28)	X				
• For genetically modified animals, enhanced monitoring and reporting is in place (*Guide*, p 28)	X				
• Restraint devices are justified in the animal use protocols (*Guide*, p 29) [must]					X
• Alternatives to physical restraint are considered (*Guide*, p 29)					X
• Period of restraint is the minimum to meet scientific objectives (*Guide*, p 29)					X
• Training of animals to adapt to restraint is provided (*Guide*, p 29)					X
• Animals that fail to adapt are removed from study (*Guide*, p 29)					X
• Appropriate observation intervals of restrained animals are provided (*Guide*, p 29)					X
• Veterinary care is provided if lesions or illness result from restraint (*Guide*, p 30) [must]					X

Appendix 10: IACUC/OB Periodic Program Review and Facility Inspection Report

• Explanations of purpose and duration of restraint are provided to study personnel (*Guide*, p 30)					X
• Multiple surgical procedures on a single animal are justified and outcomes evaluated (*Guide*, p 30)					X
• Major versus minor surgical procedures are evaluated on a case-by-case basis (*Guide*, p 30)	X				
• Multiple survival procedure justifications in non-regulated species conform to regulated species standards (*Guide*, p 30)					X
• Animals on food/fluid restriction are monitored to ensure nutritional needs are met (*Guide*, p 31)					X
• Body weights for food/fluid restricted animals are recorded at least weekly (*Guide*, p 31)					X
• Daily written records are maintained for food/fluid restricted animals (*Guide*, p 31)					X
• Pharmaceutical grade chemicals are used , when available, for animal-related procedures (*Guide*, p 31)	X				
• Non-pharmaceutical grade chemicals are described, justified, and approved by IACUC (*Guide*, p 31)	X				
• Investigators conducting field studies know zoonotic diseases, safety issues, laws and regulations applicable in study area (*Guide*, p 32)	X				
• Disposition plans are considered for species removed from the wild (*Guide*, p 32)	X				
• Toe-clipping only used when no alternative, performed aseptically and with pain relief (*Guide*, p 75)	X				
5. IACUC Membership and Functions	**A***	**M**	**S**	**C**	**NA**
• IACUC is comprised of at least 5 members, appointed by CEO (PHS Policy, IV.A.3.)	X				
• Members include a veterinarian, a scientist, a nonscientist, and a nonaffiliated non-lab animal user (*Guide*, p 24)[ii]	X				
• IACUC authority and resources for oversight and evaluation of institution's program are provided (*Guide*, p 14)	X				
• IACUC conducts semiannual evaluations of institutional animal care and use program (PHS Policy, IV.B.)	X				
• Conducts semiannual inspections of institutional animal facilities (PHS Policy, IV.B.)	X				
• IACUC organizationally reports to the Institutional Official (PHS Policy, IV.A.1.b.)	X				
• Methods for reporting and investigating animal welfare concerns are in place (*Guide*, p 23) [must]	X				
• Reviews and investigates concerns about animal care and use at institution[iii] (PHS Policy, IV.B.)	X				
• Procedures are in place for review, approval, and suspension of animal activities[iv] (PHS Policy, IV.B.)	X				
• Procedures are in place for review and approval of significant changes to approved activities (PHS Policy, IV.B.)	X				
• Policies are in place for special procedures (e.g., genetically modified animals, restraint, multiple survival surgery, food and fluid regulation, field investigations, agricultural animals) (*Guide*, p 27-32)	X				
• Requests for exemptions from major survival surgical procedure restrictions are made to USDA/APHIS[v] (*Guide*, p 30) [must]					X
6. IACUC Training NEW	**A***	**M**	**S**	**C**	**NA**
• All IACUC members should receive:					
○ Formal orientation to institution's program (*Guide*, p 17)	X				
○ Training on legislation, regulations, guidelines, and policies (*Guide*, p 17)	X				
○ Training on how to inspect facilities and labs where animal use or housing occurs (*Guide*, p 17)	X				
○ Training on how to review protocols as well as evaluate the program (*Guide*, p 17)	X				
○ Ongoing training/education (*Guide*, p 17)	X				
7. IACUC Records and Reporting Requirements[vi]	**A***	**M**	**S**	**C**	**NA**
• Semiannual report to the IO (PHS Policy, IV.B.)					
○ Submitted to IO every 6 months	X				

Appendix 10: IACUC/OB Periodic Program Review and Facility Inspection Report

○ Compiles program review and facility inspection(s) results (includes all program and facility deficiencies)	X					
○ Includes minority IACUC views	X					
○ Describes IACUC-approved departures from the *Guide* or PHS Policy and the reasons for each departure[vii]	X					
○ Distinguishes significant from minor deficiencies	X					
○ Includes a plan and schedule for correction for each deficiency identified[viii]	X					
• Reports to OLAW (PHS Policy, IV.F.)						
○ Annual report to OLAW documents program changes, dates of the semiannual program reviews and facility inspections and includes any minority views	X					
○ Promptly advises OLAW of serious/ongoing *Guide* deviations or PHS Policy noncompliance (NOT-OD-05-034)	X					
○ Institute must promptly advise OLAW of any suspension of an animal activity by the IACUC (NOT-OD-05-034)	X					
• Reports to U.S. Department of Agriculture (USDA) or Federal funding agency[ix]						
○ Annual report to USDA contains required information including all exceptions/exemptions	X					
○ Reporting mechanism to USDA is in place for IACUC-approved exceptions to the regulations and standards	X					
○ Reports are filed within 15 days for failures to adhere to timetable for correction of significant deficiencies	X					
○ Promptly reports suspensions of activities by the IACUC to USDA and any Federal funding agency	X					
• Records (PHS Policy, IV.E.)						
○ IACUC meeting minutes and semiannual reports to the IO are maintained for 3 years	X					
○ Records of IACUC reviews of animal activities include all required information*	X					
○ Records of IACUC reviews are maintained for 3 years after the completion of the study	X					

8. Veterinary Care (See also next section - Veterinary Care)	**A***	**M**	**S**	**C**	**NA**
• An arrangement for veterinarian(s) with training or experience in lab animal medicine is in place including backup veterinary care[xi]	X				
• Veterinary access to all animals is provided (*Guide*, p 14) [must]	X				
• Direct or delegated authority is given to the veterinarian to oversee all aspects of animal care and use (*Guide*, p 14) [must]	X				
• Veterinarian provides consultation when pain and distress exceeds anticipated level in protocol (*Guide*, p 5) [must]	X				
• Veterinarian provides consultation when interventional control is not possible (*Guide*, p 5) [must]	X				
• If part time /consulting veterinarian, visits meet programmatic needs (*Guide*, p 14)	X				
• Regular communication occurs between veterinarian and IACUC (*Guide*, p 14)	X				
• Veterinarian(s) have experience and training in species used (*Guide*, p 15) [must]	X				
• Veterinarian(s) have experience in facility administration/management (*Guide*, p 15)	X				

9. Personnel Qualifications and Training	**A***	**M**	**S**	**C**	**NA**
• All personnel are adequately educated, trained, and/or qualified in basic principles of laboratory animal science. Personnel included: [must]					
○ Veterinary/other professional staff (*Guide*, p 15-16)	X				
○ IACUC members (*Guide*, p 17)	X				
○ Animal care personnel (*Guide*, p 16)	X				
○ Research investigators, instructors, technicians, trainees, and students (*Guide*, pp 16-17)	X				
• Continuing education for program and research staff provided to ensure high quality care and reinforce training (*Guide*, pp 16-17)	X				
• Training is available prior to starting animal activity (*Guide*, p 17)	X				
• Training is documented (*Guide*, p 15)	X				
• Training program content includes: (*Guide*, p 17)					
○ Methods for reporting concerns (*Guide*, p 17)	X				
○ Humane practices of animal care (e.g., housing, husbandry, handling) [xii]	X				

Appendix 10: IACUC/OB Periodic Program Review and Facility Inspection Report

○ Humane practices of animal use (e.g., research procedures, use of anesthesia, pre- and post-operative care, aseptic surgical techniques and euthanasia (*Guide*, p 17)[xiii]	X				
○ Research/testing methods that minimize numbers necessary to obtain valid results (PHS Policy, IV.A.1.g.)	X				
○ Research/testing methods that minimize animal pain or distress (PHS Policy, IV.A.1.g.)	X				
○ Use of hazardous agents, including access to OSHA chemical hazard notices where applicable (*Guide*, p 20)	X				
○ Animal care and use legislation (*Guide*, p 17)	X				
○ IACUC function (*Guide*, p 17)	X				
○ Ethics of animal use and Three R's (*Guide*, p 17)	X				
10. Occupational Health and Safety of Personnel	**A***	**M**	**S**	**C**	**NA**
• Program is in place and is consistent with federal, state, and local regulations (*Guide*, p 17) [must]	X				
• Program covers *all* personnel who work in laboratory animal facilities (*Guide*, p 18)	X				
• Changing, washing, and showering facilities are available as appropriate (*Guide*, p 19)	X				
• Hazardous facilities are separated from other areas and identified as limited access (*Guide*, p 19)	X				
• Personnel training is provided based on risk (e.g., zoonoses, hazards, personal hygiene, special precautions, animal allergies) (*Guide*, p 20)	X				
• Personal hygiene procedures are in place (e.g., work clothing, eating/drinking/smoking policies) (*Guide*, p 20)	X				
• Procedures for use, storage, and disposal of hazardous biologic, chemical, and physical agents are in place (*Guide*, p 21)	X				
• Personal Protective Equipment for the work area is appropriate and available (*Guide*, p 21)	X				
• Program for medical evaluation and preventive medicine for personnel includes:					
○ Pre-employment evaluation including health history (*Guide*, p 22)	X				
○ Immunizations as appropriate (e.g., rabies, tetanus) and tests as appropriate (*Guide*, p 22)	X				
○ Zoonosis surveillance as appropriate (e.g., Q-fever, tularemia, Hantavirus, plague) (*Guide*, p 23)	X				
○ Procedures for reporting and treating injuries, including accidents, bites, allergies, etc. (*Guide*, p 23)	X				
○ Promotes early diagnosis of allergies including preexisting conditions (*Guide*, p 22)	X				
○ Considers confidentiality and other legal factors as required by federal, state and local regulations (*Guide*, p 22) [must]	X				
○ If serum samples are collected, the purpose is consistent with federal and state laws (*Guide*, p 22) [must]	X				
• Waste anesthetic gases are scavenged (*Guide*, p 21)	X				
• Hearing protection is provided in high noise areas (*Guide*, p 22)	X				
• Respiratory protection is available when performing airborne particulate work (*Guide*, p 22)					X
• Special precautions for personnel who work with nonhuman primates, their tissues or body fluids include:					
○ Tuberculosis screening provided for all exposed personnel (*Guide*, p 23)					X
○ Training and implementation of procedures for bites, scratches, or injuries associated with macaques (*Guide*, p 23)					X
○ PPE is provided including gloves, arm protection, face masks, face shields, or goggles (*Guide*, p 21)					X
○ Injuries associated with macaques are carefully evaluated and treatment implemented (*Guide*, p 23)					X
• Occupational safety and health of field studies is reviewed by OSH committee or office (*Guide*, p 32)	X				
11. Personnel Security NEW	**A***	**M**	**S**	**C**	**NA**
• Preventive measures in place include pre-employment screening, and physical and IT security (*Guide*, p 23)	X				

Appendix 10: IACUC/OB Periodic Program Review and Facility Inspection Report

12. Investigating & Reporting Animal Welfare Concerns NEW	A*	M	S	C	NA
• Methods for investigating and reporting animal welfare concerns are established (*Guide*, p 23) [must]	X				
• Reported concerns and corrective actions are documented (*Guide*, p 24)	X				
• Mechanisms for reporting concerns are posted in facility and at applicable website with instructions (*Guide*, p 24)	X				
○ Includes multiple contacts (*Guide*, p 24)	X				
○ Includes anonymity, whistle blower policy, nondiscrimination and reprisal protection (*Guide*, p 24)	X				

* **A** = acceptable
M = minor deficiency
S = significant deficiency (is or may be a threat to animal health or safety)
C = change in program (PHS Policy IV.A.1.a.-i.) (include in semiannual report to IO and in annual report to OLAW)
NA = not applicable

NOTES:

Appendix 10: IACUC/OB Periodic Program Review and Facility Inspection Report

Veterinary Care

Date: September 12, 2019

1. Clinical Care and Management NEW	A*	M	S	C	NA
• Veterinary program offers high quality of care and ethical standards (*Guide*, p 105) [must]	X				
• Veterinarian provides guidance to all personnel to ensure appropriate husbandry, handling, treatment, anesthesia, analgesia, and euthanasia (*Guide*, p 106)	X				
• Veterinarian provides oversight to surgery and perioperative care (*Guide*, p 106)	X				
• Veterinary care program is appropriate for program requirements (*Guide*, pp 113-114)	X				
• Veterinarian(s) is familiar with species and use of animals and has access to medical and experimental treatment records (*Guide*, p 114)	X				
• Procedures to triage and prioritize incident reports are in place (*Guide*, p 114)	X				
• Procedures are in place to address:					
○ Problems with experiments to determine course of treatment in consultation with investigator(*Guide*, p 114)	X				
○ Recurrent or significant health problems with the IACUC and documentation of treatments and outcomes (*Guide*, p 114)	X				
○ Veterinary review and oversight of medical and animal use records (*Guide*, p 115)	X				
• Procedures established for timely reporting of animal injury, illness, or disease (*Guide*, p 114) [must]	X				
• Procedures established for veterinary assessment, treatment, or euthanasia (*Guide*, p 114) [must]	X				
• Veterinarian is authorized to treat, relieve pain, and/or euthanize (*Guide*, p 114) [must]	X				

2. Animal Procurement and Transportation/Preventive Medicine	A*	M	S	C	NA
• Procedures for lawful animal procurement are in place (*Guide*, p 106) [must]	X				
• Sufficient facilities and expertise are confirmed prior to procurement (*Guide*, p 106)	X				
• Procurement is linked to IACUC review and approval (*Guide*, p 106)	X				
• Random source dogs and cats are inspected for identification (*Guide*, p 106)					X
• Population status of wildlife species is considered prior to procurement (*Guide*, p 106)					X
• Appropriate records are maintained on animal acquisition (*Guide*, p 106)	X				
• Animal vendors are evaluated to meet program needs and quality (*Guide*, p 106)	X				
• Breeding colonies are based on need and managed to minimize numbers (*Guide*, p 107)					X
• Procedures for compliance with animal transportation regulations, including international requirements, are in place (*Guide*, p 107) [must]	X				
• Transportation is planned to ensure safety, security and minimize risk (*Guide*, p 107)	X				
• Movement of animals is planned to minimize transit time and deliveries are planned to ensure receiving personnel are available (*Guide*, pp 107- 108)	X				
• Appropriate loading and unloading facilities are available (*Guide*, p 109)	X				
• Environment at receiving site is appropriate (*Guide*, p 109)	X				
• Policies in place on separation by species, source, and health status (*Guide*, pp 109, 111-112)	X				
• Procedures in place for quarantine to include zoonoses prevention (*Guide*, p 110)	X				
• Quarantined animals from different shipments are handled separately or physically separated (*Guide*, p 110)	X				
• Procedures in place for stabilization/acclimation (*Guide*, pp 110-111)	X				
• Policies in place for isolation of sick animals (*Guide*, p 112)	X				
• Program is in place for surveillance, diagnosis, treatment and control of disease to include daily observation (*Guide*, p 112)	X				
• Diagnostic resources are available for preventive health program (*Guide*, p 112)	X				

3. Surgery	A*	M	S	C	NA
• Surgical outcomes are assessed and corrective changes instituted (*Guide*, p 115)	X				
• Researchers have appropriate training to ensure good technique (*Guide*, p 115) [must]	X				

Appendix 10: IACUC/OB Periodic Program Review and Facility Inspection Report

• Pre-surgical plans are developed and include veterinary input (e.g., location, supplies, anesthetic and analgesic use, peri-operative care, recordkeeping) (*Guide*, p 116)	X				
• Aseptic surgery is conducted in dedicated facilities or spaces, unless exception justified and IACUC approved (*Guide*, p 116)	X				
• Surgical procedures including laparoscopic procedures are categorized as major or minor (*Guide*, pp 117-118)	X				
• For nonsurvival surgery, the site is clipped, gloves are worn and instruments and area are clean (*Guide*, p 118)	X				
• Aseptic technique is followed for survival surgical procedures (*Guide*, pp 118-119)	X				
• Effective procedures for sterilizing instruments and monitoring expiration dates on sterile packs are in place (*Guide*, p 119)	X				
• Procedures for monitoring surgical anesthesia and analgesia are in place (*Guide*, p 119)	X				
• For aquatic species, skin surfaces are kept moist during surgical procedures (*Guide*, p 119)	X				
• Post-operative monitoring and care are provided by trained personnel and documented (e.g., thermoregulation, physiologic function, analgesia, infection, removal of skin closures) (*Guide*, pp 119-120)	X				
4. Pain, Distress, Anesthesia and Analgesia	**A***	**M**	**S**	**C**	**NA**
• Guidelines for assessment and categorization of pain, distress and animal wellbeing are provided during training (*Guide*, p 121)	X				
• Selection of analgesics and anesthetics is based on professional veterinary judgment (*Guide*, p 121)	X				
• Painful procedures are monitored to ensure appropriate analgesic management (*Guide*, p 122)	X				
• Nonpharmacologic control of pain is considered as an element of postprocedural care (*Guide*, p 122)	X				
• Procedures are in place to assure antinociception before surgery begins (*Guide*, p 122) [must]	X				
• Guidelines for selection and use of analgesics and anesthetics are in place and regularly reviewed and updated (*Guide*, p 122)	X				
• Special precautions for the use of paralytics are in place to ensure anesthesia[xiv] (*Guide*, p 123)	X				
5. Euthanasia	**A***	**M**	**S**	**C**	**NA**
• Methods are consistent with AVMA Guidelines on Euthanasia unless approved by the IACUC (*Guide*, p 123)	X				
• Standardized methods are developed and approved by the veterinarian and IACUC that avoid distress and consider animal age and species (*Guide*, pp 123-124)	X				
• Training is provided on appropriate methods for each species and considers psychological stress to personnel (*Guide*, p 124)	X				
• Procedures and training are in place to ensure death is confirmed (*Guide*, p 124) [must]	X				
6. Drug Storage and Control NEW	**A***	**M**	**S**	**C**	**NA**
• Program complies with federal regulations for human and veterinary drugs(*Guide*, p 115) [must]	X				
• Drug records and storage procedures are reviewed during facility inspections (*Guide*, p 115)	X				
• Procedures are in place to ensure analgesics and anesthetics are used within expiration date (*Guide*, p 122) [must]	X				
• Anesthetics and analgesics are acquired, stored, and their use and disposal are recorded legally and safely (*Guide*, p 122)	X				

* **A** = acceptable
M = minor deficiency
S = significant deficiency (is or may be a threat to animal health or safety)
C = change in program (PHS Policy IV.A.1.a.-i.) (include in semiannual report to IO and in annual report to OLAW)
NA = not applicable

NOTES:

Appendix 10: IACUC/OB Periodic Program Review and Facility Inspection Report

II. Semiannual Facility Inspection Checklist

Terrestrial Animal Housing and Support Areas

Date: September 12, 2019
Location: Space Station Processing Facility Science Annex

	A*	M	S	C	NA
• **Location:**					
○ animal areas separate from personnel areas (*Guide*, p 134)	X				
○ separation of species (*Guide*, p 111)	X				
○ separation by disease status (*Guide*, p 111)	X				
○ security and access control (*Guide*, p 151)	X				
• **Construction:**					
○ corridors (*Guide*, p 136)	X				
○ animal room doors (*Guide*, p 137)	X				
○ exterior windows (*Guide*, p 137)	X				
○ floors (*Guide*, p 137)		X			
○ drainage (*Guide*, p 138)	X				
○ walls and ceilings (*Guide*, p 138)	X				
○ heating ventilation and air conditioning (*Guide*, p 139)	X				
○ power and lighting (*Guide*, p 141)	X				
○ noise control (*Guide*, p 142)	X				
○ vibration control (*Guide*, p 142)	X				
○ environmental monitoring (*Guide*, p 143)	X				
• **Room/Cage:**					
○ temperature and humidity (*Guide*, p 43)	X				
○ ventilation and air quality (*Guide*, p 45)	X				
○ illumination (*Guide*, p 47)	X				
○ noise and vibration (*Guide*, p 49)	X				
• **Primary Enclosure:**					
○ space meets physiologic, behavioral [xv], and social[xvi] needs (*Guide*, pp 51, 55-63)	X				
○ secure environment provided (*Guide*, p 51)	X				
○ durable, nontoxic materials in good repair and no risk of injury (*Guide*, p 51)	X				
○ flooring is safe and appropriate for species (*Guide*, p 51)	X				
○ adequate bedding and structures for resting, sleeping, breeding (*Guide*, p 52)	X				
○ objective assessments of housing and management are made (*Guide*, p 52)	X				
○ procedures for routine husbandry are documented (*Guide*, p 52)	X				
○ socially housed animals can escape or hide to avoid aggression (*Guide*, p 55)	X				
○ cage height provides adequate clearance (*Guide*, p 56)	X				
○ animals express natural postures, can turn around, access food and water, and rest away from urine and feces (*Guide*, p 56) [must]	X				
○ rationale[xvii] for *Guide*/USDA space exceptions approved by IACUC and based on performance indices (*Guide*, p 56)	X				
○ dogs and cats allowed to exercise and provided human interaction (*Guide*, p 58)					X
○ nonhuman primates are socially housed except for scientific, veterinary or behavior reasons (*Guide*, pp 58-59)					X
○ single housing of nonhuman primates is for shortest duration possible (*Guide*, p 60)					X
○ opportunities for release into larger enclosures is considered for single caged nonhuman primates (*Guide*, p 60)					X
○ agricultural animals are housed socially (*Guide*, p 60)					X
○ food troughs and water devices for agricultural animals allow access for all animals (*Guide*, p 60)					X
• **Environmental Enrichment, Behavioral and Social Management:**					
○ structures and resources promote species typical behavior (*Guide*, pp 52-54)	X				
○ novelty of enrichment is considered (*Guide*, p 53)	X				
○ species specific plans for housing including enrichment, behavior and activity are developed and reviewed regularly by IACUC, researchers and veterinarian					

Appendix 10: IACUC/OB Periodic Program Review and Facility Inspection Report

	(*Guide*, pp 53, 58, 60, 63)	X				
○	animal care personnel receive training to identify abnormal animal behaviors (*Guide*, p 53)	X				
○	stability of pairs or groups is monitored for incompatibility (*Guide*, p 64)	X				
○	single housing is justified for social species (*Guide*, p 64)	X				
○	single housing is limited to the minimum period necessary (*Guide*, p 64)	X				
○	additional enrichment for single housed animals is provided (*Guide*, p 64)	X				
○	single housing is reviewed regularly by IACUC and veterinarian (*Guide*, p 64)	X				
○	habituation to routine procedures is part of enrichment program (*Guide*, p 64)	X				
•	**Sheltered or Outdoor Housing:** (e.g., barns, corrals, pastures, islands)					
○	weather protection and opportunity for retreat (*Guide*, p 54) [must]					X
○	appropriate size (*Guide*, p 54)					X
○	ventilation and sanitation of shelter (no waste/moisture build-up) (*Guide*, p 54)					X
○	animal acclimation (*Guide*, p 55)					X
○	social compatibility (*Guide*, p 55)					X
○	roundup/restraint procedures (*Guide*, p 55)					X
○	appropriate security (*Guide*, p 55)					X
•	**Naturalistic Environments:**					
○	animals added /removed with consideration of effect on group (*Guide*, p 55)					X
○	adequate food, fresh water, and shelter ensured (*Guide*, p 55)					X
•	**Food:**					
○	feeding schedule and procedures including caloric intake management (*Guide*, pp 65-67)	X				
○	contamination prevention (*Guide*, p 65)	X				
○	vendor quality control (*Guide*, p 66)	X				
○	storage in sealed containers (*Guide*, p 66)	X				
○	expiration date labeling (*Guide*, p 66)	X				
○	vermin control (*Guide*, p 66)	X				
○	rotation of stocks (*Guide*, p 66)	X				
•	**Water:**					
○	ad libitum unless justified (*Guide*, pp 67-68)	X				
○	QC procedures (*Guide*, pp 67-68)	X				
•	**Bedding and Nesting Materials:**					
○	species appropriate (*Guide*, pp 68-69)	X				
○	keeps animals dry (*Guide*, pp 68-69)	X				
○	QC procedures (*Guide*, pp 68-69)	X				
○	minimizes scientific variables (*Guide*, pp 68-69)	X				
•	**Sanitation:**					
○	frequency of bedding/substrate change (*Guide*, p 70)	X				
○	cleaning and disinfection of microenvironment (*Guide*, pp 70-71)	X				
○	cleaning and disinfection of macroenvironment (*Guide*, p 72)	X				
○	assessing effectiveness (*Guide*, p 73)	X				
•	**Waste Disposal:**					
○	procedures for collection (*Guide*, pp 73-74)	X				
○	procedures for storage and disposal (*Guide*, pp 73-74)	X				
○	hazardous wastes are rendered safe before removal from facility (*Guide*, pp 73-74) [must]	X				
○	animal carcasses (*Guide*, pp 73-74)	X				
•	**Pest Control:**					
○	regularly scheduled (*Guide*, p 74)	X				
○	documented program including control of rodent pests and insecticide use (*Guide*, p 74)	X				
•	**Emergency, Weekend, and Holiday Animal Care:**					
○	care provided by qualified personnel every day (*Guide*, p 74)	X				
○	provision for accessible contact information (*Guide*, p 74)	X				
○	monitoring of backup systems (*Guide*, p 143)	X				
○	veterinary care available after hours, weekends, and holidays (*Guide*, pp 74, 114) [must]	X				
○	a disaster plan that takes into account both personnel and animals (*Guide*, p 75)	X				

Appendix 10: IACUC/OB Periodic Program Review and Facility Inspection Report

• **Identification:**						
○ cage/rack cards contain required information (*Guide*, p 75)	X					
○ genotype information included and standardized nomenclature used when applicable (*Guide*, p 75)	X					
• **Recordkeeping:**						
○ clinical records accessible and contain appropriate information (*Guide*, pp 75-76)	X					
○ records are provided when animals are transferred between institutions (*Guide*, p 75)	X					
• **Breeding Genetics and Nomenclature:**						
○ appropriate genetic records, management and monitoring procedures (*Guide*, p 76)						X
○ phenotypes that affect wellbeing are reported to IACUC and effectively managed (*Guide*, p 77)						X
• **Storage:**						
○ adequate space for equipment, supplies, food, bedding and refuse (*Guide*, p 141)	X					
○ bedding in vermin-free area and protected from contamination(*Guide*, p 141)	X					
○ food in vermin-free, temperature and humidity controlled area and protected from contamination (*Guide*, p 141)	X					
○ refuse storage is separate (*Guide*, p 141)	X					
○ carcass and animal tissue storage is separate, refrigerated below 7ºC and cleanable (*Guide*, p 141)	X					
• **Personnel:**						
○ adequate space for locker rooms, administration and training (*Guide*, p 135)	X					

* **A** = acceptable
M = minor deficiency
S = significant deficiency (is or may be a threat to animal health or safety)
C = change in program (PHS Policy IV.A.1.a.-i.) (include in semiannual report to IO and in annual report to OLAW)
NA = not applicable

NOTES:

Appendix 10: IACUC/OB Periodic Program Review and Facility Inspection Report

Aquatic Animal Housing and Support Areas NEW

Date: NA
Location: NA

	A*	M	S	C	NA
• **Location:**					
○ animal areas separate from personnel areas (*Guide*, p 134)					X
○ separation of species (*Guide*, p 111)					X
○ separation by disease status (*Guide*, p 111)					X
○ security and access control (*Guide*, p 151)					X
• **Construction:**					
○ corridors (*Guide*, p 136)					X
○ animal room doors (*Guide*, pp 137, 150)					X
○ exterior windows (*Guide*, p 137)					X
○ floors (*Guide*, pp 137, 150)					X
○ drainage (*Guide*, pp 138, 150)					X
○ walls and ceilings (*Guide*, pp 138, 150)					X
○ heating ventilation and air conditioning (*Guide*, pp 139, 150-151)					X
○ power and lighting (*Guide*, pp 141, 150)					X
○ noise control (*Guide*, p 142)					X
○ vibration control (*Guide*, p 142)					X
○ environmental monitoring (*Guide*, p 143)					X
• **Water Quality:**					
○ standards for acceptable quality are established (*Guide*, p 78)					X
○ chlorine, chloramines, chemical, and reactive bioproducts are removed or neutralized prior to use in aquatic systems (*Guide*, pp78, 86) [must]					X
• **Life Support System:**					
○ water source is based on appropriate controls and research requirements (*Guide*, p 79)					X
○ biofilter is of sufficient size to process bioload (*Guide*, p 80) [must]					X
• **Temperature, Humidity and Ventilation/Illumination/Noise and Vibration:**					
○ temperature and humidity (*Guide*, pp 43, 80-81)					X
○ ventilation and air quality (*Guide*, pp 45, 81)					X
○ illumination (*Guide*, pp 47, 81)					X
○ noise and vibration (*Guide*, pp 49, 81)					X
• **Primary Enclosure:**					
○ allows for normal physiological and behavioral needs (*Guide*, p 82)					X
○ allows social interaction for social species (*Guide*, p 82)					X
○ provides a balanced, stable environment (*Guide*, p 82)					X
○ provides appropriate water quality and monitoring (*Guide*, p 82)					X
○ allows access to food and waste removal (*Guide*, p 82)					X
○ restricts escape and entrapment (*Guide*, p 82)					X
○ allows undisturbed observation (*Guide*, p 82)					X
○ constructed of nontoxic materials (*Guide*, p 82)					X
○ prevents electrical hazards (*Guide*, p 82)					X
○ space needs of species are evaluated by IACUC during program evaluations and facility inspections (*Guide*, p 83)					X
• **Environmental Enrichment, Social Housing, Behavioral and Social Management:**					
○ enrichment elicits appropriate behaviors and is safe (*Guide*, p 83)					X
○ semi-aquatic reptiles are provided terrestrial areas (*Guide*, p 83)					X
○ handling is kept to a minimum and appropriate techniques are in place at facility or protocol level (*Guide*, p 84)					X
○ nets are cleaned, disinfected and managed to avoid contamination of systems (*Guide*, p 84)					X
• **Food:**					
○ storage to prevent contamination, preserve nutrients and prevent pests (*Guide*, p					

Appendix 10: IACUC/OB Periodic Program Review and Facility Inspection Report

	84)					X
○	delivery ensures access to all , minimizing aggression and nutrient loss (*Guide*, p 84)					X
○	storage times are based on manufacturer recommendations or accepted practice (*Guide*, p 84)					X
○	a nutritionally complete diet is provided (*Guide*, p 84)					X
•	**Substrate:**					
○	amount, type and presentation of substrate is appropriate for the system and the species (*Guide*, p 85)					X
•	**Sanitation, Cleaning and Disinfection**					
○	frequency of tank/cage cleaning and disinfection is determined by water quality, permits adequate viewing and health monitoring (*Guide*, p 86)					X
○	cleaning and disinfection of macroenvironment (*Guide*, p 86)					X
•	**Waste Disposal:**					
○	procedures for collection (*Guide*, pp 73-74)					X
○	hazardous wastes are rendered safe before removal from facility (*Guide*, pp 73-74) [must]					X
○	animal carcasses (*Guide*, pp 73-74)					X
•	**Pest Control:**					
○	regularly scheduled (*Guide*, p 74)					X
○	documented program including control of pests and insecticide use (*Guide*, p 74)					X
•	**Emergency, Weekend, and Holiday Animal Care:**					
○	care provided by qualified personnel every day (*Guide*, pp 74, 87)					X
○	provision for accessible contact information (*Guide*, pp 74, 87)					X
○	emergency response plans in place to address major system failures (*Guide*, 87)					X
○	veterinary care available after hours, weekends, and holidays (*Guide*, pp 74, 114) [must]					X
•	**Identification:**					
○	cage/tank cards contain required information (*Guide*, pp 75, 87)					X
○	genotype information included and standardized nomenclature used when applicable (*Guide*, pp 75, 87)					X
•	**Recordkeeping:**					
○	water quality parameters and frequency of testing recorded (*Guide*, p 88)					X
○	records kept on feeding, nonexpired food supplies, live cultures (*Guide*, p 88)					X
•	**Storage:**					
○	adequate space for equipment, supplies, food, substrate and refuse (*Guide*, p 141)					X
○	substrate protected from contamination (*Guide*, p 141)					X
○	food in vermin-free, temperature and humidity controlled area and protected from contamination (*Guide*, p 141)					X
○	refuse storage is separate (*Guide*, p 141)					X
○	carcass and animal tissue storage is separate, refrigerated below 7ºC and cleanable (*Guide*, p 141)					X
•	**Personnel:**					
○	adequate space for locker rooms, administration and training (*Guide*, p 135)					X

* **A** = acceptable
M = minor deficiency
S = significant deficiency (is or may be a threat to animal health or safety)
C = change in program (PHS Policy IV.A.1.a.-i.) (include in semiannual report to IO and in annual report to OLAW)
NA = not applicable

NOTES:

Appendix 10: IACUC/OB Periodic Program Review and Facility Inspection Report

Cagewash

Date: September 12, 2019
Location: Space Station Processing Facility Science Annex

	A*	M	S	C	NA
• **Construction and Operation:**					
○ dedicated central area for sanitizing cages and equipment is provided (*Guide*, p 143)	X				
○ cage-washing equipment meets need (*Guide*, p 143)	X				
○ doors, windows, floors, drainage, walls, ceilings (*Guide*, pp 136-138)		X			
○ convenient to animal areas/waste disposal (*Guide*, p 143)	X				
○ ease of access (including door size) facilitates use (*Guide*, p 143)	X				
○ sufficient space for staging and maneuvering (*Guide*, p 143)	X				
○ safety precautions/clothing/equipment used for waste disposal/prewash/acid wash ((*Guide*, p 143)	X				
○ traffic flow clean to dirty with no contamination of clean equipment by dirty equipment and appropriate air pressurization (*Guide*, p 143)	X				
○ insulation and/or sound attenuation present as needed (*Guide*, p 143)	X				
○ utilities are appropriate (*Guide*, p 143)	X				
○ ventilation meets heat and humidity load (*Guide*, p 143)	X				
○ safety features (e.g., SOPs, warning signs, eyewash stations) are in use (*Guide*, p 143)	X				
○ functioning safety devices to prevent entrapment in washer/sterilizers (*Guide*, p 143)	X				
○ cage wash temperatures are monitored and records are available (*Guide*, p 73)	X				
○ appropriate clean cage storage (*Guide*, p 141)	X				

* **A** = acceptable
M = minor deficiency
S = significant deficiency (is or may be a threat to animal health or safety)
C = change in program (PHS Policy IV.A.1.a.-i.) (include in semiannual report to IO and in annual report to OLAW)
NA = not applicable

NOTES:

Appendix 10: IACUC/OB Periodic Program Review and Facility Inspection Report

Special Facilities: Aseptic Surgery

Date: September 12, 2019
Location: Space Station Processing Facility Science Annex

	A*	M	S	C	NA
• **General Considerations:**					
○ location minimizes traffic/contamination (*Guide*, p 144)	X				
○ functional components (surgical support, animal preparation, surgeon scrub, operating room, postoperative recovery) are designed and separated (physically or otherwise) (*Guide*, p 144)	X				
○ appropriate drug storage, control, expiration date monitoring (*Guide*, pp 115, 122)	X				
○ safe sharps disposal system (*Guide*, p 74)	X				
○ adequate records of anesthesia and perioperative care (*Guide*, p 122)	X				
○ aseptic procedures in use for all survival surgery (*Guide*, pp 118-119)	X				
• **Operating Room:**					
○ effective contamination control procedures (*Guide*, p 144)	X				
○ effective cleaning procedures/dedicated tools (*Guide*, p 145)	X				
○ interior surfaces smooth and impervious to moisture (*Guide*, p 145)	X				
○ HVAC system meets *Guide* requirements (*Guide*, p 145)	X				
○ lighting safe and appropriate (*Guide*, p 145)	X				
○ outlets safe and appropriate (*Guide*, p 145)	X				
○ scavenging of anesthetic gases implemented (*Guide*, p 145)	X				
• **Surgical Support:**					
○ facility for washing, sterilizing, storing instruments and supplies (*Guide*, p 145)	X				
○ autoclave monitoring procedures are implemented (*Guide*, pp 119, 145)	X				
○ storage of autoclaved materials maintains sterility (*Guide*, p 145)	X				
○ cold sterilization procedures are appropriate (*Guide*, p 119)	X				
• **Animal Preparation:** contains large sink to facilitate cleaning of animal and operative site (*Guide*, p 145)	X				
• **Surgeon Scrub:** outside operating room, non-hand-operated sink (*Guide*, p 145)	X				
• **Postoperative Recovery:** allows adequate observation, easily cleaned, supports physiologic functions, minimizes risk of injury (*Guide*, p 145)	X				
• **Dressing Area:** place for personnel to change (*Guide*, p 145)	X				

* **A** = acceptable
M = minor deficiency
S = significant deficiency (is or may be a threat to animal health or safety)
C = change in program (PHS Policy IV.A.1.a.-i.) (include in semiannual report to IO and in annual report to OLAW)
NA = not applicable

NOTES:

Appendix 10: IACUC/OB Periodic Program Review and Facility Inspection Report

Special Facilities: Procedure Areas, Non-survival Surgeries, Laboratories, Rodent Surgeries, Imaging, Whole Body Irradiation, Hazardous Agent Containment, Behavioral Studies

Date: September 12, 2019
Location: Space Station Processing Facility Science Annex

	A*	M	S	C	NA
• **General Considerations:**					
○ labs used to house animals only when scientifically required and limited to minimum period necessary (*Guide*, p 134)					X
○ drug storage, control, and expiration dates (*Guide*, pp 115, 122)	X				
○ sharps disposal (*Guide*, p 74)	X				
○ anesthetic monitoring (*Guide*, p 120)	X				
○ scavenging of anesthetic gases (*Guide*, p 21)	X				
○ safety features (e.g., SOPs, safety signs, eyewash stations, secure gas cylinders) are in place (*Guide*, p 19)	X				
○ carcass disposal (*Guide*, pp 73-74)	X				
• **Additional Concerns for Survival Surgery:** (rodent and minor procedures only)					
○ rodent survival surgery clean and uncluttered, not used for anything else during surgery (*Guide*, p 144)	X				
○ records of peri-operative care (*Guide*, p 120)	X				
○ aseptic procedures (*Guide*, pp 118-119)	X				
○ autoclave monitoring procedures (*Guide*, pp 119, 145)	X				
○ storage of autoclaved materials (*Guide*, p 145)	X				
○ cold sterilization procedures are appropriate (*Guide*, p 119)	X				
• **Imaging/Whole Body Irradiation:** NEW					
○ location of resource limits contamination risk (*Guide*, p 147)	X				
○ appropriate transportation methods are in place (*Guide*, p 147)	X				
○ gas anesthesia provision, scavenging and monitoring are appropriate (*Guide*, p 147)	X				
○ appropriate sensors and ventilation are provided for cryogen gases (*Guide*, p 147) [must]					X
○ imaging console is located away from radiation source (*Guide*, p 147)	X				
• **Hazardous Agent Containment:** NEW					
○ facility adheres to APHIS, USDA and CDC Select Agent Regulations and other federal, state and local regulations including security measures (*Guide*, p 148) [must]					X
• **Behavioral Studies:** NEW					
○ facility minimizes airborne transmission of noise and ground-borne transmission of vibration (*Guide*, p 149)					X
○ floor coverings reduce sound transmission (*Guide*, p 149)					X
○ testing equipment allows for surface disinfection (*Guide*, p 150)					X
○ components that cannot be cleaned are not in ready contact with animals and kept covered when not in use (*Guide*, p 150)					X
○ housing areas are contiguous with testing areas when appropriate (*Guide*, p 150)					X

* **A** = acceptable
M = minor deficiency
S = significant deficiency (is or may be a threat to animal health or safety)
C = change in program (PHS Policy IV.A.1.a.-i.) (include in semiannual report to IO and in annual report to OLAW)
NA = not applicable

NOTES:

Appendix 10: IACUC/OB Periodic Program Review and Facility Inspection Report

III. Semiannual Program Review and Facility Inspection Report

Date: September 12, 2019
Members in Attendance: (b) (6), (b) (7)(C), (b) (7)(F)

Deficiency Category*	√	Location	Deficiency and Plan for Correction	Responsible Party	Correction Schedule and Interim Status	Date Complete

* **A** = acceptable
M = minor deficiency
S = significant deficiency (is or may be a threat to animal health or safety)
C = change in program (PHS Policy IV.A.1.a.-i.) (include in semiannual report to IO and in annual report to OLAW)
NA = not applicable
√ Check if repeat deficiency

Appendix 10: IACUC/OB Periodic Program Review and Facility Inspection Report

IV. Endnotes

[i] The PHS Policy requires that Assured institutions comply with the regulations (9 CFR, Subchapter A) issued by the U.S. Department of Agriculture (USDA) under the Animal Welfare Act, as applicable. The endnotes below are specific USDA regulatory requirements that differ from or are in addition to the PHS Policy. This list is not intended to be all inclusive. For additional information please refer to 9 CFR Subchapter A - Animal Welfare.

[ii] Part 2 Subpart C - Research Facilities
- 2.31(b)(2) - "The Committee shall be composed of a Chairman and at least two additional members;... at least one shall not be affiliated in any way with the facility...such person will provide representation for general community interests in the proper care and treatment of animals." [PHS policy requires 5 members]

[iii] 2.32(c)(4) - "...No facility employee, Committee member, or laboratory personnel shall be discriminated against or be subject to any reprisal for reporting violations of any regulation or standards under the Act." [USDA requirement additional to PHS Policy]

[iv] 2.31(d)(5) - "...shall conduct continuing reviews of activities...not less than annually." [PHS Policy requires a complete new review every 3 years utilizing all the criteria for initial review]

[v] 2.31(d)(1)(x) - "...no animal will be used in more than one major operative procedure from which it is allowed to recover unless...(it is) justified for scientific reasons...(or is) required as routine veterinary procedure...or other special circumstances as determined by the Administrator on an individual basis." [this last point is an additional USDA justification for multiple survival surgeries]

[vi] 2.36 - "...each reporting facility shall submit an annual report to the APHIS, AC sector supervisor for the State where the facility is located on or before December 1 of each calendar year." [The USDA annual report has a list of requirements which differ from PHS annual report]

[vii] 2.36(b)(3) - "...exceptions to the standards and regulations be specified and explained by the principal investigator and approved by the IACUC. A summary of all such exceptions must be attached to the facility's annual report." [Refers to USDA annual report]

[viii] 2.31(e)(3) - "...Any failure to adhere to the plan and schedule that results in a significant deficiency remaining uncorrected shall be reported in writing within 15 business days by the IACUC, through the institutional official, to APHIS and any Federal agency funding that activity." [PHS Policy requires prompt reporting to OPRR of serious or continuing noncompliance with the PHS Policy or serious deviations from the provisions of the *Guide*]

[ix] 2.36 - "...each reporting facility shall submit an annual report to the APHIS, AC sector supervisor for the State where the facility is located on or before December 1 of each calendar year." [The USDA annual report has a list of requirements which differ from PHS annual report]

[x] In addition to PHS requirements for IACUC review/application for funding, USDA regulations require:

2.31(d)(1)(ii) - "The principal investigator (PI) consider alternatives to procedures that cause more than momentary or slight pain or distress to the animals, and has provided a written narrative description of the methods and sources...used to determine that alternatives were not available."

2.31(d)(1)(iii) - "The PI has provided written assurance that the activities do not unnecessarily duplicate previous experiments."

2.31(d)(1)(iv) - "Procedures that may cause more than momentary or slight pain or distress to the animals will:
- involve in their planning, consultation with the attending veterinarian or his or her designee; [PHS Policy does not specify veterinary consultation]
- not include paralytics without the use of anesthesia;"

Appendix 10: IACUC/OB Periodic Program Review and Facility Inspection Report

2.31(d)(1)(x) - "No animal will be used in more than one major operative procedure from which it is allowed to recover, unless justified for scientific reasons by the principal investigator, in writing..."

[xi] 2.33(a)(1) - "In the case of a part-time attending veterinarian or consultant arrangements, the formal arrangements shall include a written program of veterinary care and regularly scheduled visits to the research facility." [USDA requirement additional]

[xii] 2.32(c) - "Humane methods of animal maintenance and experimentation, including the basic needs of each species, proper handling and care for the various species of animals used by the facility, proper pre-procedural and post-procedural care of animals, and aseptic surgical methods and procedures."

[xiii] 2.32(c) - additional specifications include:
- "proper use of anesthetics, analgesics, and tranquilizers for any species of animals used by the facility"
- "methods whereby deficiencies in animal care and treatment are reported, including deficiencies in animal care and treatment reported by any employee of the facility..."
- "utilization of services (e.g., National Agricultural Library, National Library of Medicine) to provide information on appropriate animal care and use, alternatives to the use of live animals in research , that could prevent unintended and unnecessary duplication of research involving animals, and regarding the intent and requirements of the Act." [USDA training specifications are more detailed than PHS Policy].

[xiv] 2.31(d)(iv)(C) - "Procedures that may cause more than momentary or slight pain or distress to the animals will...not include the use of paralytics without anesthesia."

[xv] Part 3 Subpart A 3.8 - "...research facilities must develop, document, and follow an appropriate plan to provide dogs with the opportunity for exercise. In addition the plan must be approved by the attending veterinarian. The plan must provide written standard procedures..."

[xvi] Part 3 Subpart D 3.81 - "...research facilities must develop, document, and follow an appropriate plan for environment enhancement adequate to promote the psychological well-being of nonhuman primates."

[xvii] Part 3 Subpart A 3.6(c)(1) - "Each dog housed in a primary enclosure must be provided with a minimum amount of floor space, calculated as follows:
(length of dog in inches + 6)^2 /144 = required floor space in square feet)."

- Part 3 Subpart D 3.80 (b) - "Primary enclosures [for nonhuman primates] must meet the minimum space requirements provided in this subpart."

- In situations where the USDA regulations and the *Guide* differ with respect to space requirements, the larger of the two must be followed.

Appendix 11: Heating, Ventilation and Air Conditioning (HVAC) System Summary

Summarize the heating, ventilation and air conditioning (HVAC) systems for each animal facility, ***including all satellite facilities***. Include ***all animal holding rooms*** (including satellite holding rooms), surgical facilities, procedure rooms, and support spaces integral to animal facilities (e.g., cage wash, cage and feed storage areas, necropsy, treatment).

Location/Building/Facility:	**SSPF Science Annex**

In the text box below, provide a general description of the mechanical systems used to provide temperature, humidity and air pressure control. Include details such as:

- the source(s) of air and air recirculation rates if other than 100% fresh air
- treatment of air (filters, absorbers, *etc.*)
- design features such as centralized chilled water, re-heat coils (steam or hot water), individual room vs. zonal temperature and relative humidity control, the use of variable air volume (VAV) systems and other key features of HVAC systems affecting performance
- features that minimize the potential for adverse consequences to animal well-being (such as re-heat coils that fail closed or that are equipped with high-temperature cut-off systems), and
- how room temperature, ventilation, and critical air pressures are monitored and maintained in the event of a system or component failure, including notifying appropriate personnel in the event of a significant failure that occurs outside of regular working hours and/or other management systems used to respond to alerts or failures.

100% fresh air is provided by two redundant supply fans, capable of providing in excess of 15 air exchanges per hour. Each fan has 2" Minimum Efficiency Reporting Value (MERV) 8 filters as pre-filters and 12" MERV 15 filters. The final filtration is provided by 12" 99.97% alpha cell HEPA filtration. UV lighting is installed at the cooling coils.

Chilled water is provided to the facility from the SSPF by two redundant chilled water pumps. Heating is provided by installed duct heaters for each room. Variable Air Volume systems (VAV's) are used to mix the chilled air and warmed air to maintain temperatures. There are six humidifiers that control the Relative Humidity (RH) at the supply air fan exhaust and in the animal rooms.

Room temperature, ventilation, and critical air pressures are monitored continuously by the CCC located in the LCC, and by the installed (b) (4) [redacted]. A call list is maintained at the CCC in the event of any anomalies.

Appendix 11: Heating, Ventilation and Air Conditioning (HVAC) System Summary

In the Table below, provide room-specific information requested. Include all animal holding rooms (including satellite holding rooms), surgical facilities, procedure rooms, and support spaces integral to animal facilities (e.g., cage wash, cage and feed storage areas, necropsy, treatment). For each of these rooms/areas, indicate use, including the species for animal housing rooms. *Measurement of air exchange rates and verification of relative pressure within the areas mentioned above must be completed* ***within the 12 months preceding completion of this Program Description.*** Air exchange rates may be important to maintain air quality in other areas; *however, measurements may be left at the discretion of the institution (e.g., air measurements in areas where aquatics are held.)* Information may be provided in another format, providing all requested data is included. **[*Note*: Please remove the examples provided in the Table below.]**

Room No.	Specific Use	Temperature Set-Point (define units)	Electronic / Emergency Monitoring of Temperatures (Y/N)	Alert/Alarm Temperature Ranges (if applicable; define units)	Humidity Control (Y/N)	Relative Pressure	Air Exchange Rate (per hour)	Date Verified / Measured
		(settings to be verified)					(values to be measured)	
(b) (7)(F)	Animal Housing Room – Mouse	76°F	Y	72-79°F (alert) 70 -80°F (critical alarm)	Y	+	12-15	9/2019
	Animal Housing Room – Mouse	76°F	Y	72-79°F (alert) 70 -80°F (critical alarm)	Y	+	12-15	9/2019
	Animal Housing Room – Mouse	76°F	Y	72-79°F (alert) 70 -80°F (critical alarm)	Y	+	12-15	9/2019
	Animal Housing Room – Mouse or Quarantine	76°F	Y	72-79°F (alert) 70 -80°F (critical alarm)	Y	+ or – as needed	12-15	9/2019
	Animal Housing Room – Mouse or Quarantine	76°F	Y	72-79°F (alert) 70 -80°F (critical alarm)	Y	+ or – as needed	12-15	9/2019
	Procedure Room	68°F	Y	60-72°F (alarm)	Y	+	12-15	9/2019
	Surgery	68°F	Y	60-72°F (alarm)	Y	+	12-15	9/2019
	Recovery Room	68°F	Y	60-72°F (alarm)	Y	+	12-15	9/2019

Appendix 11: Heating, Ventilation and Air Conditioning (HVAC) System Summary

Room No.	Specific Use	Temperature Set-Point (define units)	Electronic / Emergency Monitoring of Temperatures (Y/N)	Alert/Alarm Temperature Ranges (if applicable; define units)	Humidity Control (Y/N)	Relative Pressure	Air Exchange Rate (per hour)	Date Verified / Measured
		(settings to be verified)					(values to be measured)	
(b) (7)(F)	Cage Wash – Clean Side	68°F	Y	60-72°F (alarm)	Y	+	12-15	9/2019
	Cage Wash – Dirty Side	68°F	Y	60-72°F (alarm)	Y	+	12-15	9/2019
	Feed Storage Freezer	-10°F	Y	-20°F - 1°F (alarm)	N/A	N/A	N/A	9/2019

[Create additional rows by pressing TAB in the bottom-right box.]

Copy and repeat the Description and Table for each location, including all satellite housing locations.

Appendix 12: Aquatic Systems Summary – Part I

Please summarize water management and monitoring information programs for each animal facility, including all satellite facilities, rooms, cephalopod housing systems, and enclosures. The following key will assist you in completing the form:

(1) List location of aquaria, including outdoor enclosures (ponds or outdoor tanks). If indoors, list building and room number. Note that all species housed at the same location and maintained via the same design and monitoring may be listed in the same row.
(2) Please indicate if embryonic (E), larval (L), juvenile (J) or Adult (A)
(3) Group tanks (ponds, outdoor tanks, multiple aquaria) are arranged as arrays with shared water supply; individual aquaria have exclusive water handling systems.
(4) Indicate water type, e.g., fresh, brackish, or marine.
(5) Indicate water pre-treatment, e.g., dechlorination, rough filters.
(6) Indicate water circulation, e.g., static, re-circulated, constant flow, or some combination of these. If applicable, indicate water exchange frequency and amount (percentage).
(7) Provide a key word for filtration employed, e.g., biological, chemical, mechanical, and type (e.g., mechanical-bead filter). A diagram may be provided showing the flow of water, filtration, source of "make-up" water and amount replaced daily.

Part I

Location (1)	Species (2)	System Design					
		Group / Individual (3)	Water Type (4)	Pre-treatment (5)	Circulation (6)	Filtration (7)	Disinfection (e.g., UV, ozone)
N/A							

Note: Records of equipment maintenance (filter changes, UV bulb changes, probe changes, calibrations, *etc.*) should be available for review.

[Create additional rows by pressing TAB in the bottom-right box.]

Appendix 12: Aquatic Systems Summary – Part II

The following key will assist you in completing this form:

(1) In these columns, please indicate monitoring frequency, e.g. daily, weekly, monthly or other point sampling frequency; continuous/real time, or none, if applicable. Also indicate method of control (heaters versus room HVAC, hand versus auto dosing, etc.).

(2) Indicate other parameters and their monitoring frequency, e.g., alkalinity, total hardness, conductivity, chlorine/chloramine.

Part II

Monitoring *Indicate in the boxes below the frequency of monitoring and method of control for the following parameters. (1)*									
Location (from Part I)	**Temperature**	**Salinity**	**pH**	**NH_4**	**NO_2**	**NO_3**	**Dissolved O_2**	**Total Dissolved Gases**	**Other. Please List (2):**
N/A									

Note: This information may be provided in another format, provided that all requested data is included.

[Create additional rows by pressing TAB in the bottom-right box.]

Appendix 13: Primary Enclosures and Animal Space Provisions

Please complete the Table below considering performance criteria and guiding documents (e.g., *Guide*, Ag *Guide*, ETS 123 and/or other applicable standards) used by the IACUC/OB to establish adequacy of space provided for all research animals including traditional laboratory species, agricultural animals, aquatic species, and wildlife when reviewing biomedical, field, and agricultural research studies. Refer to AAALAC International's Position Statement "Cage or Pen Space" for additional guidance.

Species	Dimensions of Enclosure (cage, pen, tank*, corral, paddock, etc.)	Maximum Number Animals / Enclosure	Guiding Document Used to determine the Institution's Space Standards (*Guide*, Ag *Guide*, ETS 123, Other)	Enclosure Composition & Description**
Alligator	16" x 20" x 15"	One clutch of eggs/hatchlings (20-40)	Guide/Guidelines For Use of Live Amphibians and Reptiles in Field and Laboratory Research	Plastic container with lid (Rubbermaid)
Florida Mice (Field Study)	Four Sizes: 8.5 x 13 7 x 11 5.5 x 8.25 4 x 6.5	One mouse per transport cage/carrier	Guide/Guidelines of the American Society of Mammalogists for the Use of Wild Mammals in Research	Transport Cage/Carrier: Plastic ventilated animal carrier with self-locking lid
Mice	11" x 7 ½" x 5"	Five mice per cage	Guide for Care and Use of Laboratory Animals	Static Microisolator system – High Temp
Mice	19"L x 10-1/2"W x 6"D	Ten – Fifteen mice per cage	Guide for Care and Use of Laboratory Animals	Static Microisolator system – High Temp

*For aquatic species, provide tank volume.
**Include descriptors such as open-topped, static microisolator, individually-ventilated cage systems (IVCS).

Appendix 14: Cleaning and Disinfection of the Micro- and Macro-Environment

Please describe the cleaning and disinfection methods in the Table below. Note the washing/sanitizing frequency and method for each of the following:

Area	Washing/Sanitizing Method (mechanical washer, hand washing, high-pressure sprayers, etc.)	Washing/ Sanitizing Frequency	Chemical(s) Used*	Other Comments (e.g., autoclaved)
Micro-environment				
Solid-bottom cages (static)	Mechanical washer	Twice weekly	Potassium Hydroxide (Alka Det HW)	Autoclaved
Solid-bottom cages (IVC)	N/A			
Suspended wire-bottom or slotted floor cages	N/A			
Cage lids	Mechanical washer	Twice weekly	Potassium Hydroxide (Alka Det HW)	Autoclaved
Filter tops	Mechanical washer	Twice weekly	Potassium Hydroxide (Alka Det HW)	Autoclaved
Cage racks and shelves	Mechanical washer	Twice Monthly	Potassium Hydroxide (Alka Det HW)	Autoclaved if wheels allow
Cage pans under suspended cages	N/A			
Play pens, floor pens, stalls, etc.	N/A			
Corrals for primates or outdoor paddocks for livestock	N/A			
Aquatic, amphibian, and reptile tanks and enclosures	Hand Wash	Following nest hatching and prior to reuse	20% bleach solution followed by a dishwashing soap solution	

Appendix 14: Cleaning and Disinfection of the Micro- and Macro-Environment

Area	Washing/Sanitizing Method (mechanical washer, hand washing, high-pressure sprayers, etc.)	Washing/ Sanitizing Frequency	Chemical(s) Used*	Other Comments (e.g., autoclaved)
Feeders	Mechanical washer	Twice weekly	Potassium Hydroxide (Alka Det HW)	Autoclaved
Watering devices	Mechanical washer	Twice weekly	Potassium Hydroxide (Alka Det HW)	Autoclaved
Exercise devices and manipulanda used in environmental enrichment programs, etc.	Mechanical washer	Twice weekly	Potassium Hydroxide (Alka Det HW)	Autoclaved
Transport cages	Mechanical washer/Hand wash	After each use	Potassium Hydroxide (Alka Det HW) and/or Quaternary ammonium compounds, benzyl-C12-16-alkyldimethyl, chlorides (Betco AF315) disinfectant Used from point of capture in the field to [redacted] and return of animal for release into the wild.	Autoclaved if used in barrier
Operant conditioning & recording chambers, mechanical restraint devices (chairs, slings, etc.)	N/A			
Euthanasia chambers	Hand Wash	After each use	Quaternary ammonium compounds, C12-18-alkyl	

Appendix 14: Cleaning and Disinfection of the Micro- and Macro-Environment

Area	Washing/Sanitizing Method (mechanical washer, hand washing, high-pressure sprayers, etc.)	Washing/ Sanitizing Frequency	Chemical(s) Used*	Other Comments (e.g., autoclaved)
			[(ethylphenyl) methyl] dimethyl, Chlorides (Sanicloth®) and 70% ethanol	
Macro-Environment				
Animal Housing Rooms:				
Floors	Hand wash (mop)	Daily	6-10% bleach solution	
Walls	Hand wash (mop)	Once monthly	6-10% bleach solution	
Ceilings	Hand wash (mop)	Once monthly	6-10% bleach solution and 70% Ethanol	
Ducts/Pipes	N/A			
Fixtures	Hand wash	Once monthly	6-10% bleach solution and 70% Ethanol	
Corridors:				
Floors	Hand wash (mop)	Daily	6-10% bleach solution	
Walls	Hand wash (mop)	Once monthly	6-10% bleach solution	
Ceilings	Hand wash (mop)	Once monthly	6-10% bleach solution	
Ducts/Pipes	N/A			
Fixtures	Hand wash	Once monthly	6-10% bleach solution and 70% Ethanol	

Appendix 14: Cleaning and Disinfection of the Micro- and Macro-Environment

Area	Washing/Sanitizing Method (mechanical washer, hand washing, high-pressure sprayers, etc.)	Washing/ Sanitizing Frequency	Chemical(s) Used*	Other Comments (e.g., autoclaved)
Support Areas (e.g., surgery, procedure rooms, etc.); complete for each area:				
Floors	Hand wash (mop)	Following each use and/or once monthly	6-10% bleach solution	
Walls	Hand wash (mop)	Once monthly	6-10% bleach solution	
Ceilings	Hand wash (mop)	Once monthly	6-10% bleach solution	
Ducts/Pipes	N/A			
Fixtures	Hand wash	Once monthly	6-10% bleach solution and 70% Ethanol	
Implements (note whether or not shared):				
Mops	Soak	Daily	6-10% bleach solution	
Mop buckets	Soak	Daily	6-10% bleach solution	
Aquaria nets	N/A			
Other	N/A			
Other:				
Vehicle(s)	Vacuum cleaner; Hand clean	Prior to use	6-10% bleach solution; 70% Ethanol	
Other transport equipment (list): Carts, platform trucks	Mechanical washer	Once monthly (more frequent as required)	Potassium Hydroxide (Alka Det HW)	

*Please provide chemical, not trade name.

Appendix 15: Facilities and Equipment for Sanitizing Materials

In the Tables below, summarize the facilities and equipment used to sanitize animal related equipment (tunnel washer, bottle washer, rack washer, bulk autoclave, hand -washing area, bedding dispensing unit, *etc.*). Note that some descriptions may be combined if all share identical features (e.g., all rack washers).

[*Note*: Please remove the examples provided in the Table below.]

Building	Room No.	Equipment Type	Safety Feature(s)	Methods of Monitoring Effectiveness
Science Annex	(b) (7)(F)	Rack washer	Emergency "off" button; labeled exit door, de-energizing cord on both sides, instructional signage	Guarantee 180-degree hot water rinse; temperature-sensitive tape used with each load; Load data digitally archived; Logs maintained. Quarterly service contract in place.
Science Annex		Bulk autoclave	Door closure button must be held continuously in order for door to close.	Biological indicators used with each load. Integrators used in each wrapped item. Logs maintained as well as print out. Quarterly service contract in place.
Science Annex		Bottle washer	Emergency "off" button	Guarantee 180-degree hot water rinse; temperature-sensitive tape used with each load; Load data digitally archived; Logs maintained. Quarterly service contract in place.

[Create additional rows by pressing TAB in the bottom-right box.]

Appendix 16: Lighting Summary

Using the Table below, summarize the lighting system(s) for the animal housing facility(ies). For each species or holding room type, list light intensity (range), construction features (e.g., water resistance), photoperiod (light:dark) and control (e.g., automatic versus manual, phasing). For systems automatically controlling photoperiod, describe override mechanisms (including alarms, if applicable).

Location:	**SSPF Science Annex**

[*Note*: Please remove the examples provided in the Table below.]

Room Type[a]	**Light Intensity Range**	**Lighting Fixture Construction Features**[b]	**Photo-period** (hrs)[c]	**Photoperiod and Lighting Control**	**Override Mechanisms** (if applicable)
Rodent Holding Rooms	130-325 lux	Recessed, water proof, red light capability; dimmable	12:12	Automatic via (b) (4) [redacted]	Photoperiod override and alarm capability is available via (b) (4) [redacted]. Authorized access is required.
Surgery	466 lux Low 699 lux High	Recessed, water proof	NA	N/A	N/A
Clean Cage Wash	695 lux	Recessed, water proof	N/A	N/A	N/A
Dirty Cage Wash	847 lux	Recessed, water pro	N/A	N/A	N/A
Cage Washing Procedure Room	673 lux	Recessed, water proof	N/A	N/A	N/A

[Create additional rows by pressing TAB in the bottom-right box.]

[a] A list of each room is not needed; group or cluster rooms by species or function
[b] Include such features as water resistance, red lighting, *etc.*
[c] Note if light cycle inverted/reversed.

Repeat Location and Table as necessary for each location, including satellite housing locations.

Appendix 17: Satellite Housing Facilities

Note: In the Program Description Section 2. IV. (Physical Plant), item C., describe the criteria used to determine a "Satellite Animal Holding Area." In the Table below, summarize these animal housing areas. Note that the total square footage for all each of these must also be included in the Summary of Animal Housing and Support Sites **(Appendix 2)**, and applicable information regarding these areas included in the Heating, Ventilation, and Air Conditioning (HVAC) Summary (**Appendix 11**) and Lighting Systems Summary (**Appendix 16**).

Building	Room(s)	Person Responsible	Species Used	Approximate Area (ft^2 or m^2) Devoted to Housing	Maximum Period of Stay	Purpose / Rationale / Justification	Construction Features and Finishes
N/A							

[Create additional rows by pressing TAB in the bottom-right box.]

Appendix 18: Cephalopod Oversight

Please describe below the oversight of cephalopods (for guidance, refer to AAALAC International's Frequently Asked Question, "Invertebrate animals" and AAALAC's Reference Resource, "Guidelines for the Care and Welfare of Cephalopods in Research-A consensus based on an initiative by CephRes, FELASA and the Boyd Group," (*Note AAALAC International's caveats regarding this resource*). In addition, the care and use of cephalopods may be described in the relevant sections (i.e., housing, husbandry, veterinary care, surgery and euthanasia, etc.) within the Program Description.

The NASA KSC animal care program is in the process of accepting oversight of NASA grant funded flight and ground research experiments involving cephalopods. At the time of the writing of the Program Description, the work is under the oversight of an approved IACUC protocol by the PI's institution. The current effort to transition to the NASA KSC animal care program and IACUC oversight includes contractual coordination with addition of scope, as well as development of the animal care program components as directed by the *Guide* (i.e. housing, husbandry, veterinary care, surgery and euthanasia, and etc.). A current status of this transition will be provided to the AAALAC site visitors at the scheduled site visit.