SECTION A. Project Title: Sample Preparation Laboratory R3

SECTION B. Project Description and Purpose:

Revision 3

The purpose of this revision is to address the installation of an emergency diesel generator, provide clarification, and revise several operating parameters.

- An emissions monitoring system would be installed on the SPL stack per the requirements of the American National Standards Institute (ANSI)/Health Physics Societ (HPS)-13.1 if the potential to emit from SPL is greater than or equal to 0.1 mrem/year.
- Increase the threshold for SPL experiments or source material to 5 feet in length instead of 4 feet.
- The acronym for the storage and transfer cell is STC instead of S&T cell.
- Waste items with relatively high radiation levels will not be transferred to HFEF for repackaging and then transferred to a storage or disposal facility. Waste items will be repackaged, stored, and shipped from SPL.
- SPL will store and manage small amounts of accountable nuclear material.
- An emergency diesel generator was installed in 2022. APAD INL-20-012 was completed for this emergency diesel generator.
- Decrease the maximum amount of remote handled low-level waste projected to be generated at SPL to 39 cubic feet/year.

Revision 2

The purpose of this revision is to capture additional work activities (soil sampling and asbestos disturbance) and environmental aspects. A discussion regarding storm water and wastewater has been added, and the following language has been added to Section E:

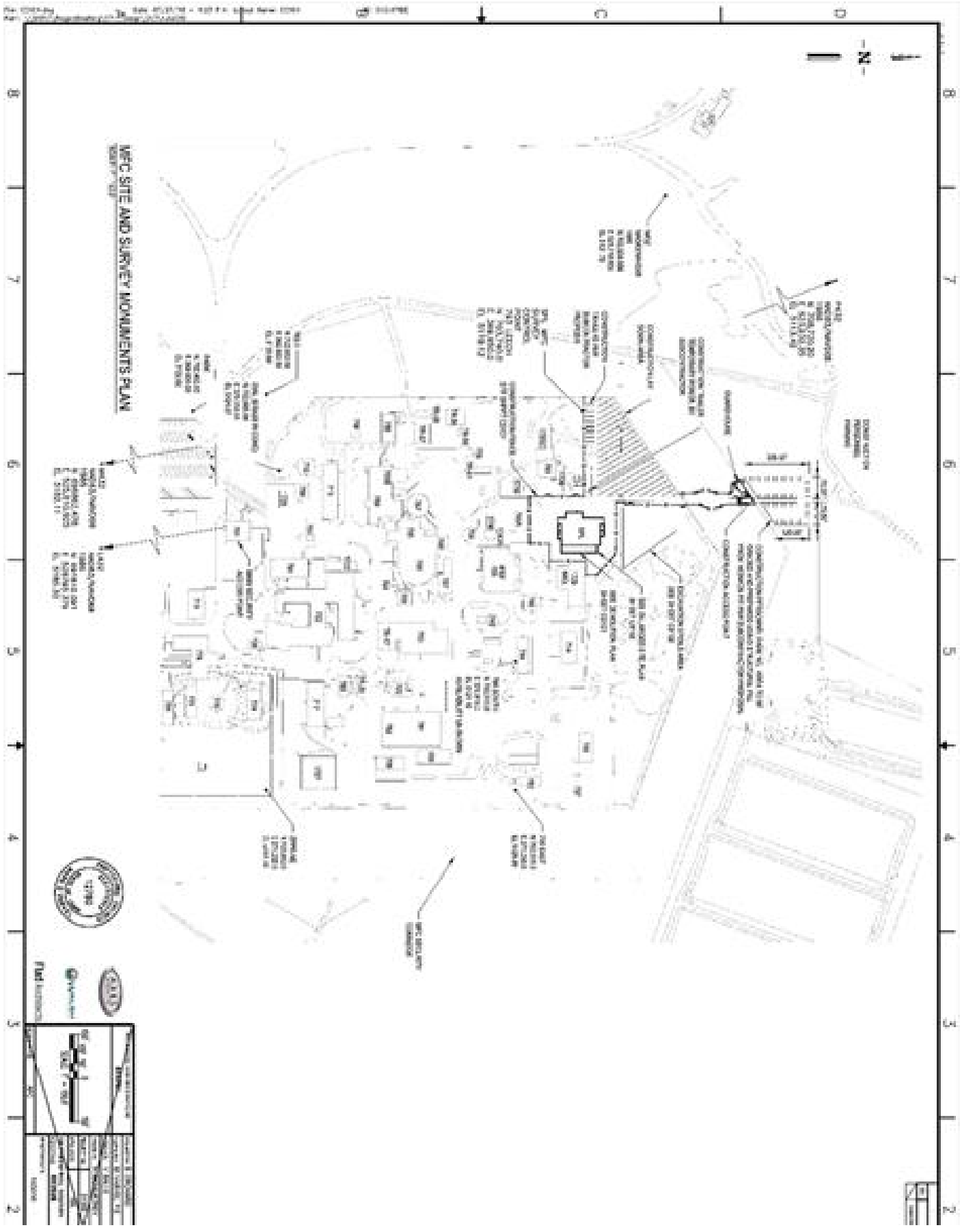
"An archaeological survey has been completed and the potential effects to the built environment are being assessed by the in-progress Cultural Resource Review (CRR). CRMO staff are in communication with project staff and will provide the CRR prior to final approvals and construction activities. For additional information, please contact Sharon Plager for archaeological concerns, or Mary Scales English regarding the built environment. No ground disturbing activities should occur within or outside of the fence prior to receiving the CRR from the CRMO staff. If the scope of the project changes, additional review may be required."

Revision 1

This environmental checklist (EC) is being revised to address changes in the scope of construction of the Sample Preparation Laboratory (SPL) at the Materials and Fuels Complex (MFC) at Idaho National Laboratory (INL). This revision makes the following changes to the original scope:

- Increases size of the SPL from 44,000 to 49,000 ft2
- Changes from a masonry block structure to a steel structure with architectural pre-cast walls
- Removes requirements of Executive Order 13693
- Removes the requirement for the building to be Leadership in Energy and Environmental Design (LEED) "Gold" certified
- Constructs a 26,000 ft2 gravel parking lot
- Installs a new security check point trailer, fencing, and pop-up security barrier between or immediately outside the existing security fences
- Supplies temporary power from facility power to the new security check point trailer, construction support trailers, and the SPL construction site.

Figure R1 shows the location and proposed construction activities.


MFC SITE AND SURVEY MONUMENTS PLAN

In addition, the mechanical properties test cell (MPTC) will be outfitted with three stations rather than four. The remaining scope of the original EC remains unchanged as included below:

Original EC

The demand for clean, sustainable energy continues to increase in the United States (U.S.), and nuclear energy will play a major role in fulfilling that demand. Understanding nuclear fuel and material performance in the nuclear environment at the micro, nano, and atomic scale is critical to development of innovative fuels and materials required for future nuclear energy systems. Current post irradiation examination (PIE) capabilities will continue to serve basic needs for fuel examination, material handling, and waste disposal, but they are limited in their ability to function on smaller scales.

Most U.S. national laboratory PIE capabilities are in 30 to 50-year-old hot cell facilities not designed for modern-day research tools and instruments. Modern research tools and instruments require facility spaces with flexibility to accommodate unique sensitivities to various environmental conditions, such as radiation field intensity, dust and contamination, noise and vibration, electromagnetic and radio-frequency interference, and temperature and humidity fluctuations. Current capabilities can serve basic PIE functions but are unable to adequately characterize the behavior of nuclear fuels and materials at the resolution (i.e., nanoscale and finer) needed to accomplish Department of Energy Nuclear Energy's (DOE-NE's) mission objectives.

Understanding nuclear fuel and material performance in the nuclear environment at the micro, nano, and atomic scale requires suitable nuclear facilities that can accommodate such research. Therefore, Department of Energy (DOE) proposes to construct a new, modern facility at the Materials and Fuels Complex (MFC) at Idaho National Laboratory (INL) to support these needed capabilities. The proposed facility, the Sample Preparation Laboratory (SPL), would provide needed capabilities by supplementing current capabilities at MFC (e.g., the Irradiated Materials Characterization Laboratory [IMCL] and Hot Fuel Examination Facility [HFEF]) with a functionally focused building dedicated to non-alpha sample preparation that would support deployment of equipment to study fuel and material performance in the nuclear environment at the micro, nano, and atomic scale.

The SPL would receive irradiated nuclear materials and aid in sample preparation for micro and nano-scale structural, chemical, mechanical, and thermal properties analyses. The laboratory would fulfill near-term advanced post-irradiation needs and serve as a center for advanced fuels and materials characterization and development of new processes, tools, and instruments to further DOE-NE Research, Development, and Demonstration (RD&D).

The new capabilities would improve overall sample throughput and quality by establishing dedicated sample receipt and preparation capabilities for beta and gamma-emitting materials. Non-alpha emitting samples would include solids and contained powders. Direct receipt of non-alpha containing structural material samples at the SPL would reduce decontamination efforts and associated waste generation currently required when these samples are processed through HFEF due to alpha contamination levels in the HFEF hot cells.

Equipment that would be deployed at the facility includes load frame and charpy testing machines, micro- and nano-hardness testers, scanning electron microscopes, surface science instruments, x-ray diffraction, electric discharge machines, focused ion beam, electron probe micro-analyzer, transmission electron microscope, and sample preparation machinery (lathes, mills, saws, metallurgical mounting equipment, and cutting or sizing equipment).

The facility would include shielded cell(s), gloveboxes, and hoods to support sample preparation of non-alpha bearing materials with the ability to receive small and medium-sized casks, and to sort, size, polish, mount and conduct initial analyses of material specimens. Advanced scientific instrumentation would be housed in enclosures specifically designed to support such instrumentation. Samples with non-fixed alpha contamination would continue to be managed at HFEF and IMCL.

The proposed action includes the following activities:

- Constructing an approximately 44,000 sq ft building, in a previously disturbed area, that would include a general office area, laboratory area, shipping and receiving area, and areas for support equipment (e.g., heating, ventilation and air conditioning [HVAC]; electrical; and mechanical system; and monitoring systems, such as radiation area monitors, continuous air monitors, personnel monitors, building stack monitors, and ventilation) systems for control of contamination within the facility and high-efficiency particulate air (HEPA) filters to filter the air before release to the environment.

- Tying into utilities at MFC, including potable water, fire water, sanitary and industrial waste, electrical power, telephone and data, and access security systems. The sanitary waste system or industrial waste system would handle effluents from the restrooms, sinks, and air conditioning condensate.

- Constructing a dedicated non-alpha sample preparation hot cell, a mechanical properties testing cell, and several examination instrument enclosures

- Installing a pneumatic transfer system to support material transfer within the facility and provide for future inter-facility transfer at MFC.

The SPL would be a three story, slab-on-grade, masonry block structure with steel roof joists and deck and a low-sloped, internally drained roof. The first floor would be reinforced, cast-in-place concrete. Portions of the floor in areas designated for examination enclosures may have thickened slabs to reduce vibration levels in those areas. The second and third floors would be steel deck with reinforced concrete.

Nuclear confinement ventilation would be designed in accordance with the requirements of Department of Energy Standard (DOE-STD)-1189 and Department of Energy Handbook (DOE-HDBK)-1169, Nuclear Air Cleaning Handbook. Air flow would be designed so air would flow from areas with lesser potential for contamination to areas of greater potential for contamination. Two stages of HEPA filtration would be provided in the final HEPA filter housings located in the HVAC room before exhausting to the facility stack. Filters would also be provided on the inlet to the hot cells and instrument enclosure to prevent back-flow of contaminated gas to the operating area. Additional filters would be provided on the outlets from the cells to reduce radiation from the ducting between the cells and the HVAC room. The facility stack would have emissions monitoring per the requirements of American National Standards Institute (ANSI)/Health Physics Society (HPS)-13.1. A separate ventilation system would be provided in the administration area for comfort ventilation and would operate at a slightly higher pressure than the rest of the facility to prevent contamination from being drawn into this area.

Water for domestic, industrial, and fire suppression would be supplied by the single system at MFC. Potable uses would be protected from other uses by appropriate use of backflow prevention devices. The facility would include appropriate sanitary sewer piping and fixtures to connect to the MFC sanitary sewer system.

Large electrical loads (mainly HVAC equipment) would be supplied with 480-V, three-phase power. Motor control centers would be installed to supply power to pump, blower, fan, heater, and compressor motor loads. The motor control centers would have communications capability to interface with the building management system for metering functions. Variable frequency drives would be installed as close to the motor as possible. Drive isolation transformers would be used with variable frequency drives to lessen the harmonic and transient generation back into the facility power supply.

The 480-V distribution panels would supply 480-208/120-V step-down transformers to provide power for small 208-V three and single-phase loads, single-phase lighting, receptacle loads, and telecommunications equipment. The 208/120-V distribution panels would be installed throughout the facility to minimize branch circuit routing for the equipment loads. A 200-ampere, 208/120-V panel would be dedicated to the telecommunication room to supply power to information technology equipment.

INL telecommunication capabilities (i.e., voice, network, multimedia, and special services transport) would be provided in the facility. A new duct bank would be routed from the telecommunications manhole near the SPL to the telecommunication room in the facility. Conduit and ducts would be installed under the support facility floor slab and stub up and into the telecommunications room. The duct bank from the dial room, MFC-1728, to the manhole near the SPL is not part of the proposed action but would be provided as part of MFC activities necessary for current and future operating infrastructure at the complex.

Fire alarm and emergency notification information would be supplied via single-mode fiber optics. Modular communication access points would be located throughout the SPL. Dedicated telecommunications raceways would be provided to minimize unintended signal noise in the administrative areas. A fire alarm and mass notification system would be provided throughout the facility meeting the requirements of National Fire Protection Association (NFPA)-72, “National Fire Alarm and Signaling Code."

Based on material quantity, facility processes, and primary radionuclides of concern, the SPL would be a Hazard Category 3 nuclear facility per DOE STD-1027-18 focused primarily on materials that emit beta and gamma radiation. Experiments accepted at the SPL would consist primarily of non-alpha, non-dispersable solids in the form of irradiated structural materials. Based on the primary radionuclides of concern, these materials primarily represent a direct radiation hazard. No alpha contamination would be generated from sample preparation activities. In some cases, very small quantities of non-dispersable alpha-emitting materials may be received in the form of metallurgical mounts for examination using the advanced examination capabilities at SPL. The quantity of non-dispersable alpha-emitting samples would be managed within the thresholds for a Hazard Category 3 nuclear facility and samples would be returned to the originated facility following analysis. Non-alpha emitting isotope material experiments that are currently processed through HFEF would normally be sent directly to the new SPL to improve sample preparation throughput and quality in both facilities.

Roughly 10% of historical throughput at HFEF was devoted to processing and examination of non-fueled experiments. Under the proposed action, non-fuel experiments would be handled in the SPL. Most non-fuel experiments would be derived from material irradiations conducted at the Advanced Test Reactor (ATR). These materials would be sent directly to SPL from ATR. Additionally, the proposed work at SPL is not dependent on capabilities housed at other MFC facilities.

If SPL is constructed, HFEF’s throughput for other work could potentially increase by approximately 10%. However, the number of fueled experiments examined in HFEF is programmatically driven and current throughput is less than what has occurred in the past. The number of experiments examined at HFEF may increase above current levels but would remain within the historical levels of activities conducted at HFEF. Overall waste generation (including types of waste generated) and air emissions estimates for HFEF are not anticipated to change.

No revisions to the HFEF safety analysis report (SAR) are anticipated due to the potential ability to prepare more samples from a given fueled experiment or the ability to process more experiments through HFEF. Furthermore, anticipated experiments are not expected to increase the hazardous material inventory limits in HFEF.

The SPL would provide the ability to repackage non-alpha materials for shipment to other facilities--including facilities that are part of the Advanced Test Reactor National Scientific User Facility--and, in addition to the proposed mechanical properties testing and examination equipment, would provide space for future installation of instrument enclosures to support advanced PIE analytical capabilities. Future equipment installation may require revision to this Environmental Checklist (EC).

Materials would be transferred to the SPL via casks or other similar containers that provide appropriate radiation shielding and confinement. Thresholds for the SPL are listed below:

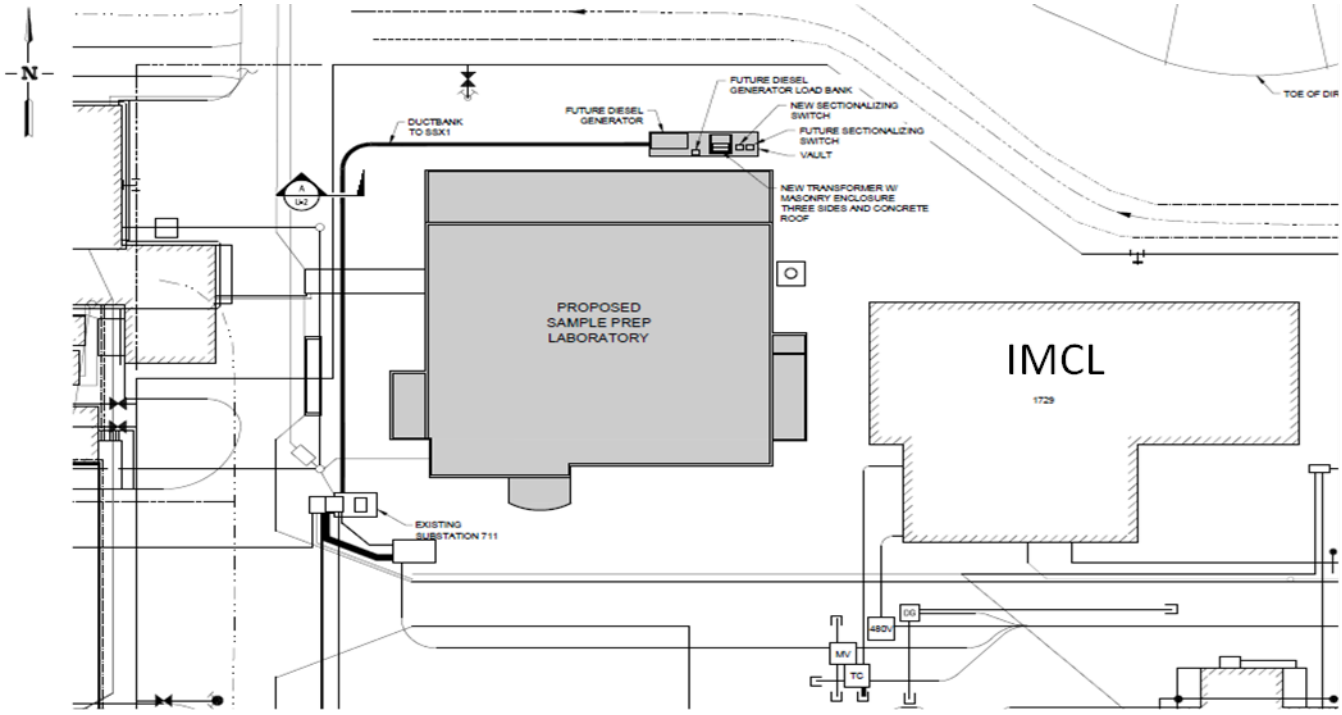
- Experiments or source material would consist of materials up to 4 ft in length. The capability to handle material of this size would facilitate direct shipment of experiments from ATR and to accommodate use of the HFEF-5 cask (and other similar casks) for direct disposition of wastes without the need to transfer wastes through HFEF for repackaging

- Materials processed through the sample preparation line would be limited to those that only emit beta and gamma radiation (non-alpha material). Limited quantities of samples of fixed alpha-emitting materials (prepared elsewhere) may be examined in the instrument enclosures.

- Storage would be provided for up 2000 samples.

The SPL would be designed and constructed using sustainable building considerations in accordance with DOE Guide 413.3-6, “High Performance Sustainable Building,” and INL/EXT-10-17808, "INL High-Performance Building Strategy." As a minimum, the facility design would include provisions for meeting the Guiding Principles for Federal Leadership in High Performance and Sustainable Buildings per Executive Order 13693. In addition, the building would be designed, to the extent practical considering nuclear facility requirements, to be Leadership in Energy and Environmental Design (LEED) certified, with “Gold” certification as a goal.

The SPL would be constructed to the west of the IMCL at MFC (see Figure 1).



Source material received at the SPL would undergo the following process:

The irradiated material would be shipped to SPL in casks ranging in size from the IMCL shielded cask (a local cask for shipping small samples) to the Battelle Energy Alliance (BEA) Research Reactor (BRR) cask, which weighs about 32,000 pounds. Casks would be off-loaded from trucks and transporters in the truck lock on the north side of the SPL and transferred into the cask docking cave below the transfer cell. These casks are mated to connections to the transfer cell in the sample preparation line where the contents are removed from the cask, decontaminated of alpha contamination, if necessary, and passed on to the sizing, grinding and polishing (SGP) cell where the material would be reduced in size, experiments disassembled, and samples removed from the source material or experiment assembly. Sized and prepared samples would be transferred to the decontamination cell where the samples would be decontaminated and passed on to the storage and transfer cell (S&T cell). In the S&T cell, the samples would be placed in shielded storage or transferred to the mechanical properties test cell (MPTC), the shielded instrument enclosures, or other locations via a pneumatic transfer system.

The MPTC would be a single, large concrete cell with three outfitted stations and a fourth station for future use. The three outfitted stations would provide the following:

1. A universal testing machine for obtaining information about tensile and compressive characteristics of materials
2. A pendulum impact testing machine to determine the amount of energy dissipated during fracture of material
3. A material conditioning furnace, hardness tester, and digital microscope.

The shielded instrument cells house scientific instruments that would examine prepared samples at the micro- and nano-meter scales.

Waste material would be transferred back to the transfer cell and placed into the appropriate cask or shielded drum for transport to a handling or disposal facility. Waste items with relatively high radiation levels would be transferred to HFEF for repackaging and transfer to a storage or disposal facility if required.

SECTION C. Environmental Aspects or Potential Sources of Impact:

Air Emissions

Air emissions applies to operations or activities that have the potential to generate air pollutants, including but not limited to radionuclides, chemical and combustion emissions, fugitive dust, asbestos-containing material (RACM), and refrigerants. The INL Environmental ALARA Committee evaluates activities that release radionuclides or involve direct radiation exposure to the environment.

Discharging to Surface-, Storm-, or Ground Water

Discharging to surface water, storm water, or ground water applies to activities that have the potential to contaminate waters of the U.S. or ground water.

Disturbing Cultural or Biological Resources

Cultural: A Section 106 review was completed under CRMO project number No Adverse Effect (INL/MIS-22-69161). SHPO concurrence was received in 2023 (SHPO Rev. 2023-239). Project specific consultation is not required for this project. Please refer to Hold Points and/or Project Specific Instructions of the ECP.

Cultural resource disturbance applies to activities that have the potential to impact cultural resources, such as disturbing soils by grading, excavating, sampling, off-road vehicle use, or removing vegetation and to project activities in areas where sensitive cultural or biological resources are located. The aspect also applies to modifying or demolishing historical buildings or structures, or activities that could result in loss or damage to these resources. Examples of cultural resources include buildings, structures, or objects over 50 years old or those identified as historic because of special significance, Experimental Breeder Reactor (EBR-I), archaeological resources, historic home sites, trails, and canals, caves, and places or items of significance to Native Americans and others. Biological resources apply to activities that have potential to interact, disturb or affect wildlife or habitat (e.g., soil disturbance – including the areas below the ordinary high water mark, vegetation removal, physical disturbance of wildlife) or activities involving revegetation or weed control.

Generating and Managing Waste

Regulated, hazardous, or radioactive material and waste packaging and transportation applies to activities that generate, store, treat, or dispose hazardous, radioactive, mixed, industrial waste, or nanoparticle waste.

Releasing Contaminants

Releasing contaminants applies to activities that may release potentially hazardous contaminants into water, soil, or other non-contaminated or previously contaminated locations (NOTE: the "Air Emissions" aspect covers air contaminants, see above). These activities may include, but are not limited to, industrial and laboratory chemicals; radionuclides; and direct exposure to radiation; hazardous, radioactive, and mixed waste treatment and decontamination operations; and contaminated soils disturbance. Releasing contaminants also applies to asbestos containing material (ACM) remediation; repair, replacement, and disposal of contaminated tanks and associated piping; and the handling and disposal of Polychlorinated biphenyl (PCB)-contaminated equipment and waste. The INL Environmental ALARA Committee evaluates activities that release radionuclides or involve direct radiation exposure to the environment.

Using, Reusing, and Conserving Natural Resources

Using, reusing, and recycling resources applies to activities that use or recycle resources such as water, energy, fuels, minerals, borrow material, wood or paper products, and other materials derived from natural resources. This aspect also applies to activities that require use, reuse, and recycle as integral to the project such as constructing and operating a LEED certified building. This applies to waste disposition activities including building demolition and activities implementing sustainable practices and conserving of natural resources. Energy, Water, and Land Use are not specific singular INL 'work activities'; however, the global nature of their influence across all INL work activities make them integral in a review of significant environmental work activities.

Environmental Justice

According to the CEQ Climate and Economic Justice Screening Tool, the INL site as well as the Research and Education Campus in Idaho Falls, ID are located in U.S. Census tracts that are identified as disadvantaged communities. Census tracts identified as disadvantaged meet or exceed socioeconomic, environmental, health, or demographic thresholds identified by CEQ. Given that activities analyzed in this document will happen within the boundaries of existing DOE/INL land and/or facilities where there are no permanent residents, any impacts to Environmental Justice in surrounding communities are anticipated to be negligible.

SECTION D. Determine Recommended Level of Environmental Review, Identify Reference(s), and State Justification: Identify the applicable categorical exclusion from 10 Code of Federal Regulation (CFR) 1021, Appendix B, give the appropriate justification, and the approval date.

For Categorical Exclusions (CXs), the proposed action must not: (1) threaten a violation of applicable statutory, regulatory, or permit requirements for environmental, safety, and health, or similar requirements of Department of Energy (DOE) or Executive Orders; (2) require siting and construction or major expansion of waste storage, disposal, recovery, or treatment or facilities; (3) disturb hazardous substances, pollutants, contaminants, or Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)-excluded petroleum and natural gas products that pre-exist in the environment such that there would be uncontrolled or unpermitted releases; (4) have the potential to cause significant impacts on environmentally sensitive resources (see 10 CFR 1021). In addition, no extraordinary circumstances related to the proposal exist that would affect the significance of the action. In addition, the action is not "connected" to other action actions (40 CFR 1508.25(a)(1) and is not related to other actions with individually insignificant but cumulatively significant impacts (40 CFR 1608.27(b)(7)).

References: B3.6 "Small-scale research and development, laboratory operations, and pilot projects"

Justification: The activities described in this scope are covered by INL-24-026: SMALL-SCALE RESEARCH AND DEVELOPMENT, LABORATORY OPERATIONS AND PILOT PROJECTS, which references CX B3.6.

JUSTIFICATION: Based on the purpose and need and description of the proposed action and potential environmental impacts, the proposed action fits within the class of actions that is listed in Appendix B CX B3.6. There are no extraordinary circumstances related to the proposed action that may affect the significance of the environmental effects of the proposal. The proposed action has not been segmented to meet the definition of a categorical exclusion. This proposal is not connected to other actions with potentially significant impacts (40 CFR 1508.25(a)(1)), is not related to other actions with individually insignificant but cumulatively significant impacts (40 CFR 1508.27(b)(7)) and is not precluded by 40 CFR 1506.1 or 10 CFR 1021.211 concerning limitations on actions during preparation of an environmental impact statement.

Authorizing the proposed action will not (1) threaten a violation of applicable statutory, regulatory, or permit requirements for environment, safety, and health, including DOE and/or Executive orders; (2) require siting of new facilities or expansion of existing facilities; (3) disturb hazardous substances, pollutants, or contaminants; (4) adversely affect environmentally sensitive resources; or (5) involve genetically engineered organisms, synthetic biology, governmentally designated noxious weeds, or invasive species.

Is the project funded by the American Recovery and Reinvestment Act of 2009 (Recovery Act) ☐ Yes ☒ No

Approved by Robert Douglas Herzog, DOE-ID NEPA Compliance Officer on: 9/11/2024