CATEGORICAL EXCLUSION FOR U.S. CUSTOMS AND BORDER PROTECTION HIGH-ENERGY RADIOGRAPHY TEST CAPABILITY, PACIFIC NORTHWEST NATIONAL LABORATORY, RICHLAND, WASHINGTON

Proposed Action:

To support the U.S. Department of Homeland Security's Customs and Border Protection (CBP) Program, the U.S. Department of Energy (DOE) Pacific Northwest Site Office (PNSO) proposes to test high-energy radiography systems at the Pacific Northwest National Laboratory (PNNL) site. These systems have a primary beam energy of less than 8.0 million electron volts (MeV) and an average beam power of less than 300 watts (W).

Location of Action:

The Physical Sciences Facility (PSF) Complex at the PNNL site.

Description of the Proposed Action:

PNNL proposes to test the operation of high-energy radiography systems that rely on a pulsed source of gamma radiation (e.g., betatron or linear accelerator [LINAC]), including their effect on the effectiveness of radiation-detection equipment. Radiation-detection systems are deployed at U.S. Ports of Entry (POE) to detect elevated radiation in cargo. In addition to these radiation-detection systems, second-generation LINAC-based high-energy radiography systems are also beginning to be deployed to image selected shipments. First-generation radiography systems relied on lower energy radioactive sources; new second-generation systems allow for greater penetration into denser cargo often encountered in commerce. Further, the radiography systems' output can be detected by a radiation portal monitor (RPM) and may result in an alarm or cause interference that decreases radiation-detection sensitivity. PNNL would install high-energy radiography systems belonging to CBP to test their overall operation and operation when co-located with other radiation-detection equipment.

The radiography systems would be installed at PNNL's Large Detector Facility, located adjacent to the 3440 Building in the PSF Complex. This area is commonly referred to as the "test track." Although these systems, as a class, rely on radiation-generating devices for their pulsed photon source, other features are driven by their intended usage and design. Installation requirements are highly variable (e.g., some larger systems require semi-permanent engineered structures, while other, self-contained mobile systems, require only small footprint exclusion zones). Two devices are currently under consideration for installation and later testing at the PSF Complex. Both systems are commercially available. These systems are:

- Smiths HiTrax Cargo and Vehicle Portal (HCVP): a relocatable LINAC-based 6 MeV system with an average beam power of 240 W. The integrated RPM uses a plastic scintillator for gamma detection and a boron-10-coated proportional counter for neutron detection. There are three major system components: the technical cabinet housing the x-ray head and various processors, the detector-line archway, and an operations booth. System components can be placed directly on pavement without additional foundation. The radiography portal opening is 15 ft across. For safe operation, the system requires additional shielding. Smiths' design uses 100 ft of 3.5-m-high modular, interlocking walls made of concrete on each side of the lane. The walls are 10 in thick with a 4-ft-

deep base for stability. The shield walls are placed to form a corridor, with system components (other than the operations booth) located in the center with one side requiring a 'bump-out' of ~35 ft along the lane and 25 ft deep. Without shielding, the offset distance to a 2 mR/hr dose rate is 100 ft. With the concrete shield wall, the dose outside the wall is natural background. The dose in the lane at the ends of the shield walls is less than 2 mR/hr. Programmable logic controllers (PLCs) limit beam activation to when a truck cab has exited the portal, thus preventing x-rays from illuminating the truck's cab and driver. Optimal truck speed is about 5 mph. If a truck is too fast, the image aspect ratio is affected; if it is too slow (<2 mph), an interlock will shut off the beam to protect the driver. The value for the low-speed shutoff is factory coded. The pulse frequency is factory set to 200 Hz.

- SAIC P7500: a permanent betatron-based 7.5 MeV system operated at 6.5 MeV that requires a substantial foundation. The system has an average beam power not exceeding 125 W. The SAIC P7500 is an integrated radiography- and radiation-detection system with a hardwired blanking signal that keeps radiography x-rays from interfering with radiation detection. The radiography portal is designed for one-way traffic due to its method of detecting the cab edge (traffic may cross in either direction if the system is not scanning). The cab edge is detected using a sensor unit located in the overhead horizontal unit and a pressure sensor located in the pavement. The scan is automated and cannot be manually started; no x-rays penetrate the driver's cab. The photon source is a betatron x-ray generator that may be operated at up to 7.5 MeV. Operation at border crossing installations is normally limited to 6.5 MeV to limit neutron production. The system has an operating range of -20 to 50°C. A radar speed detector provides information for maintaining vehicle aspect ratios. System installation in the PSF Complex would include features to facilitate return of the test track to its as-found condition when the unit is demobilized. The system has three major pieces: two towers and a horizontal piece. The foundation includes a standardized driver-side pedestal, typically pre-fabricated, with embedded conduit for ventilation/cooling and cabling. The foundation pedestal weighs 30,000 lb; adding the two towers and the horizontal overhead piece with shielding brings the weight to 170,000 lb. The offset distance between the two portals is flexible. The RPM portal could be installed on PNNL's relocatable bases and is typically installed at the exit side of the radiography portal. The integrated system has lead for shielding in some components (e.g., the radiation sensor panels). Backstop shielding for the radiography portal is made more effective using steel shot. A trap door drain is used for removing this shot when the system is demobilized.

Although these systems were marketed for commercial use and were purchased by CBP for the Secure Freight Initiative for interdiction in foreign ports, PNNL use would be solely for testing purposes. Installation of both systems is targeted for summer of 2012 with startup and systems acceptance testing to be completed by September 2012. Figure 1 shows the proposed installation location of the systems at the test track in the PSF Complex.

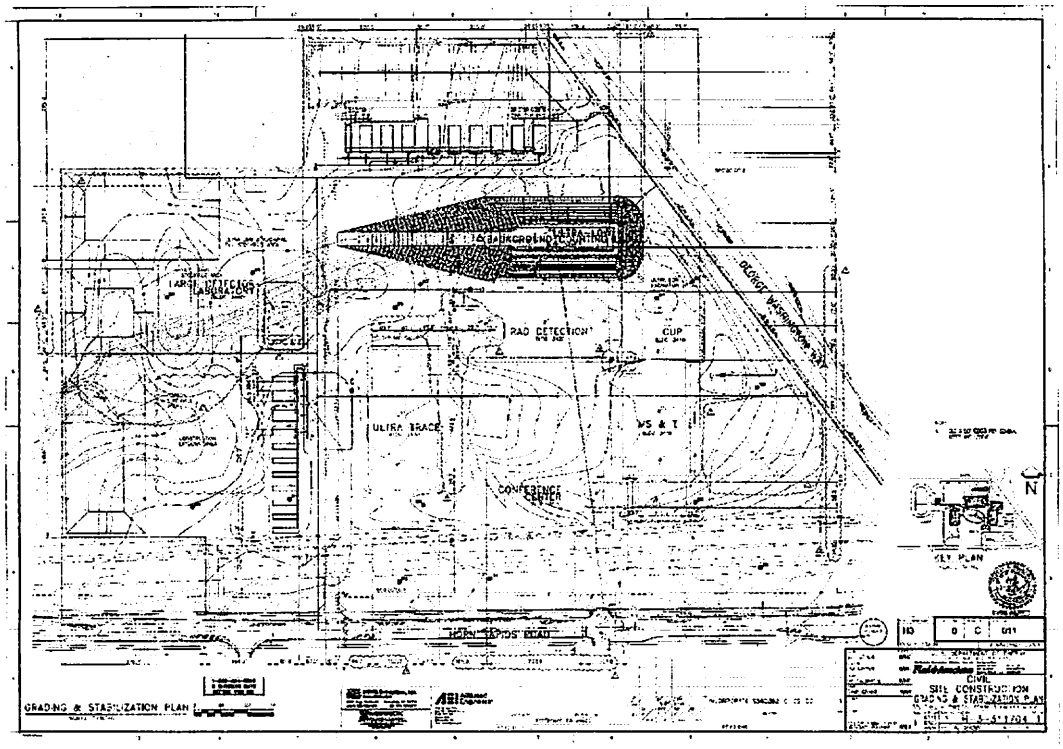

Figure 1. Location of the Large Detector Test Laboratory PSF

Given the installation needs for the considered radiography systems, a number of placement options have been developed. To minimize environmental impacts, all options involve installation within previously disturbed areas of the test track. Options include the following:

- In-Line Lane 6: Install both systems in line in Lane 6, westernmost lane. This concept would place the Smiths system near the entry to Lane 6 and the SAIC system just south of the existing concrete foundation. This concept requires limited new infrastructure and keeps the systems in a single lane. The shielding for the Smiths system would limit future use of the infrastructure between Lanes 5 and 6 and may prevent use of Lane 5. The SAIC system would require a new foundation that would require asphalt removal prior to construction. Figure 2 depicts the conceptual locations of the radiography systems for this option.
- In-Line Offset Lane 6: Install both systems in line, offset to the west of Lane 6, westernmost lane. This concept would place the Smiths system near the entry to Lane 6 and the SAIC system just south of the existing concrete foundation. The offset Lane 6 would require traffic to drive on top of concrete not originally intended for traffic and prevent future use of the infrastructure access west of Lane 6 unless it is moved or reconstructed. This concept requires limited new infrastructure and keeps the systems in a single lane. The Smiths technical cabinet and operations booth would require new paving. The SAIC system would require a new foundation that would require asphalt removal prior to construction.
- In-Line New Lane 7: Install both systems in line in a new lane (Lane 7) to the west of Lane 6, westernmost lane. This concept would place the Smiths system near the entry to the new Lane 7 and the SAIC system just south of the existing concrete foundation but in the new lane. The new Lane 7 would require installation of a new lane and would not impact existing infrastructure. Both systems would be in a single lane.

- Lane 6/Lane 7: Install the Smiths system in a new lane (Lane 7) to the west of Lane 6, westernmost lane and the SAIC system just south of the existing concrete foundation in Lane 6. This concept would place the Smiths system near the entry to the new Lane 7 and the SAIC system in Lane 6 just south of the existing concrete foundation. The new Lane 7 would require installation of a new lane that could accommodate the shield wall and space for the Smiths system technical cabinet and operations booth that would not impact existing capability. The SAIC system would require a new foundation that would require asphalt removal prior to construction.

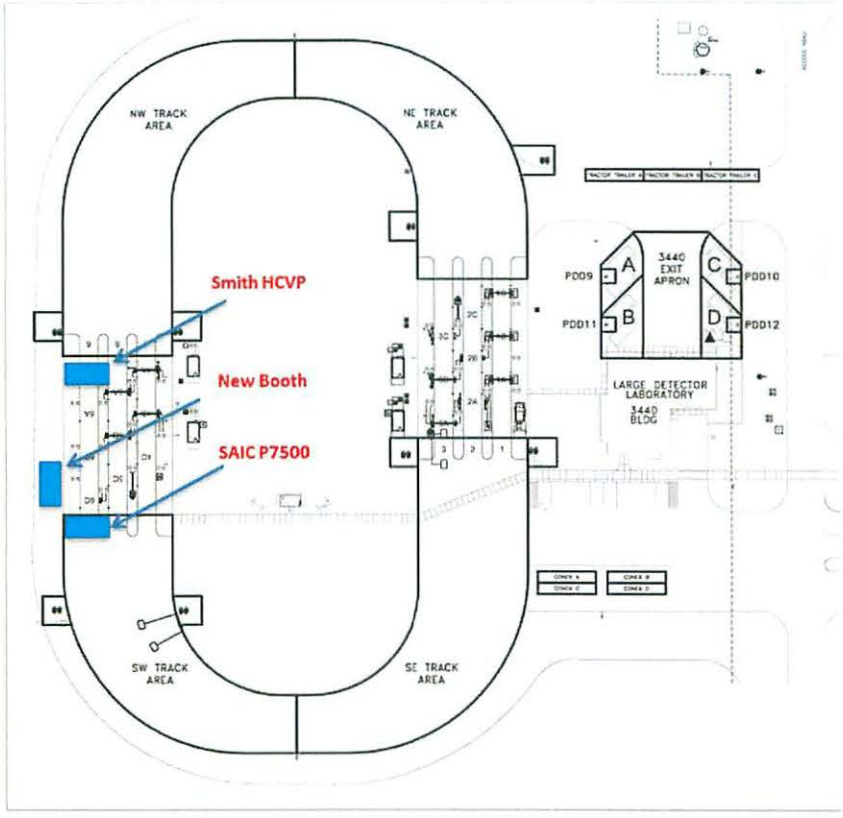

Figure 2. Lane 6 In-Line Concept for Equipment Location within PNNL's Large Detector Facility

Biological and Cultural Resources:

Installation and subsequent testing of the new radiography systems at PSF is not likely to result in adverse impacts to sensitive biological or cultural resources. Biological and cultural resource reviews will be conducted prior to installation and operation to assure that impacts to sensitive resources are avoided and minimized.

The biological resource review will identify the occurrence of federal and state protected species in the project area such as avian species protected under the Migratory Bird Treaty Act (MBTA); plant and animal species protected under the Endangered Species Act (ESA), including candidates for such protection; and species listed as threatened or endangered by the State of Washington. Resource review recommendations will be followed to assure there are no adverse impacts to sensitive species and resources.

The cultural resource review will assure that impacts to sensitive cultural resources are avoided. Consultation with the State Historic Preservation Office and/or affected tribes, if deemed necessary, would be initiated before project implementation.

DOE Order 420.2C, Safety of Accelerator Facilities:

DOE Order 420.2C defines accelerators, including radiation-generating devices, and establishes accelerator-specific safety requirements and approval authorities which, when supplemented by other applicable safety and health requirements, promote safe operations to assure protection of workers, the public, and the environment for DOE. DOE facilities with hazards that can be safely managed under the provisions of Title 10, Code of Federal Regulations (CFR), Part 835, Occupational Radiation Protection and Part 851, Worker Safety and Health Program, that are non-complex in nature, and that produce only local work-area impacts may be exempted from the requirements of the Order. Such facilities may include unmodified commercially available equipment including x-ray generators. The systems under consideration are commercially available systems that rely upon single beam x-ray generators. With the system shielding and controls in place, these systems have only local work-area impacts. To determine the applicability of DOE Order 420.2C, and therefore the need for additional controls, an evaluation of the potential for a system or control failure to result in greater-than-local work-area impacts will be performed. If necessary, additional controls will be implemented to assure protection of workers, the public, and the environment.

Categorical Exclusion to Be Applied:

As the proposed action is to install and conduct outdoor testing of particle-accelerator-based equipment at the PSF Complex, the following categorical exclusions (CXs), as listed in the DOE National Environmental Policy Act (NEPA) implementing procedures, 10 CFR 1021, would apply:

B3.10 Siting, construction, modification, operation, and decommissioning of particle accelerators, including electron beam accelerators, with primary beam energy less than approximately 100 million electron volts (MeV) and average beam power less than approximately 250 kilowatts (kW), and associated beamlines, storage rings, colliders, and detectors, for research and medical purposes (such as proton therapy), and isotope production, within or contiguous to a previously disturbed or developed area (where active utilities and currently used roads are readily accessible), or internal modification of any accelerator facility regardless of energy, that does not increase primary beam energy or current. In cases where the beam energy exceeds 100 MeV, the average beam power must be less than 250 kW, so as not to exceed an average current of 2.5 milliamperes (mA).

B3.11 Outdoor tests and experiments for the development, quality assurance, or reliability of materials and equipment (including, but not limited to, weapon system components), under controlled conditions. Covered actions may include, but are not limited to, burn tests (such as tests of electric cable fire resistance or the combustion characteristics of fuels), impact tests (such as pneumatic ejector tests using earthen embankments or

concrete slabs designated and routinely used for that purpose), or drop, puncture, water-immersion, or thermal tests. Covered actions would not involve source, special nuclear, or byproduct materials, except encapsulated sources manufactured to applicable standards that contain source, special detector/sensor development and testing and first responder field training.

Eligibility Criteria:

The proposed activity meets the eligibility criteria of 10 CFR 1021.410(b) because the proposed action does not have any extraordinary circumstances that might affect the significance of the environmental effects, 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 environmental impact statement preparation.

The "Integral Elements" of 10 CFR 1021 are satisfied as discussed below:

INTEGRAL ELEMENTS, 10 CFR 1021, SUBPART D, APPENDIX B (1)-(5)	
WOULD THE PROPOSED ACTION:	EVALUATION:
Threaten a violation of applicable statutory, regulatory, or permit requirements for environment, safety, and health?	The proposed action would not threaten a violation of regulations or DOE or Executive Orders.
Require siting and construction or major expansion of waste storage, disposal, recovery, or treatment facilities?	No waste management facilities would be constructed under this CX. Any generated waste would be managed in accordance with applicable regulations in existing facilities. Waste disposal pathways would be identified prior to generating waste and waste generation would be minimized.
Disturb hazardous substances, pollutants, or contaminants that preexist in the environment such that there would be uncontrolled or unpermitted releases?	No preexisting hazardous substances, pollutants, or contaminants would be disturbed in a manner that results in uncontrolled or unpermitted releases.
Have the potential to cause significant impacts on environmentally sensitive resources., including, but not limited, to: • protected historic/archaeological resources • protected biological resources and habitat • jurisdictional wetlands, 100-year floodplains • Federal- or state-designated parks and wildlife refuges, wilderness areas, wild and scenic rivers, national monuments, marine sanctuaries, national natural landmarks, and scenic areas.	No environmentally sensitive resources would be adversely affected. Resource reviews would be conducted for special circumstances. Refer to the Biological and Cultural Resources section for details regarding the application of cultural and biological resource reviews. The proposed action would not adversely affect floodplains, wetlands regulated under the Clean Water Act, national monuments, or other specially designated areas, prime agricultural lands, or special sources of water.
Involve genetically engineered organisms, synthetic biology, governmentally designated noxious weeds, or invasive species?	The proposed action would not involve the use of genetically engineered organisms, synthetic biology, governmentally designated noxious weeds, or invasive species, unless the proposed activity would be contained or confined in a manner designed and operated to prevent unauthorized release into the environment and conducted in accordance with applicable requirements.

Checklist Summarizing Environmental Impacts: The following checklist summarizes environmental impacts considered when preparing this CX determination. Answers to relevant questions are explained in detail following the checklist.

	Would the proposed action:	YES	NO
1	Result in more than minimal air impacts?		X
2	Increase offsite radiation dose measurably?		X
3	Require a radiological work permit?	X	
4	Cause more than a minor or temporary increase in noise level?		X
5	Discharge any liquids to the environment?		X
6	Require a Spill Prevention Control and Countermeasures plan?		X
7	Require an excavation permit (e.g., for test pits, wells, utility installation)?	X	
8	Disturb an undeveloped area?		X
9	Use carcinogens, hazardous, or toxic chemicals/materials?	X	
10	Involve hazardous, radioactive, polychlorinated biphenyl, or asbestos waste?	X	
11	Require environmental permits?		X

Explanations:

3. Although the proposed activity would not involve source, special nuclear, or byproduct materials, the project would require a radiological work permit. Activities would be performed in compliance with as low as reasonably achievable principles, applicable state and federal regulations, DOE Orders, and PNNL guidelines. PNNL would establish, mark, and maintain the radiation-exclusion zone. Once identified, the 2 mR boundary would be marked with yellow and magenta-colored markings, with "High Radiation Area" placards at 15-m intervals. PNNL radiation control would update radiation-exclusion zones as needed during operations. PNNL would be responsible for control of the exclusion zone(s). The radiation received by workers during the performance of activities would be administratively controlled below DOE limits as defined in 10 CFR 835.202(a). Under normal circumstances, those limits control individual radiation exposure to below an annual effective dose equivalent of 5 rem.

7. Installation of the systems would require an excavation permit. Stipulations in the excavation permit to minimize potential impacts to safety and the environment would be followed.

9. The proposed project would use small quantities of carcinogens and hazardous and/or toxic chemicals and materials. For example, equipment or machinery might contain or require the use of chemicals such as antifreeze, hydraulic fluids, or fuel. In addition, project decontamination and closeout activities might require the use of cleaning materials such as cleaning solutions and solvents. Project inventories would be maintained at the lowest practicable levels, and chemical wastes would be recycled, neutralized, or regenerated if possible. Radiography units may be shielded using lead. This lead will not be exposed to the environment and will be kept inside the unit or wrapped. Product substitution (use of

less toxic chemicals in place of more toxic chemicals) would be considered where reasonable.

10. The proposed project would not generate radioactive or mixed wastes as the project will rely upon sealed sources for testing and the particle accelerators generate high-energy photons without a radioactive source material. Proposed activities might generate small quantities of hazardous wastes. If unrecyclable, such wastes would be characterized, handled, packaged, transported, treated, stored, and/or disposed of in existing Hanford Site or offsite treatment, storage, and disposal facilities in accordance with applicable local, state, and federal regulations, DOE Orders and guidelines.

Compliance Action:

I have determined that the proposed action satisfies the DOE NEPA eligibility criteria and integral elements, does not pose extraordinary circumstances, and meets the requirements for the CX referenced above. Therefore, using the authority delegated to me by DOE Order 451.1B, Change 2, I have determined that the proposed action may be categorically excluded from further NEPA review and documentation.

Signature: _____ **Date:** 6/28/12

Theresa L. Aldridge
PNSO NEPA Compliance Officer

cc: JA Stegen, PNNL