

### About PNNL

Interdisciplinary teams at PNNL address many of America's most pressing issues in energy, the environment, and national security through advances in basic and applied science. PNNL employs more than 4,000 staff, has an annual budget that exceeds \$1 billion, and has been managed for the U.S. Department of Energy by Ohio-based Battelle since the Laboratory's inception in 1965.

About half of PNNL's business is centered on national security, with more than half of that focused on nonproliferation and nuclear security. We are known for our independent, rigorous testing of detection and data communication systems and our experienced cadre of subject matter experts who have fielded complex radiation detection systems across the globe.

PNNL has worked with the U.S. government and more than 80 countries to help coordinate the design, installation, testing, operations, and troubleshooting of radiation detection equipment at seaports, land crossings, and airports. PNNL also provides leadership working with international law enforcement agencies like INTERPOL in the deployment of mobile radiation detection systems for law enforcement and intelligence-driven operations.

We have numerous staff with systems engineering credentials and we are a corporate advisory board member for the International Council on Systems Engineering.

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## PACIFIC NORTHWEST NATIONAL LABORATORY

# Systems Integration and Testing Facility (SITF)

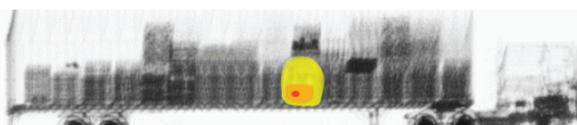
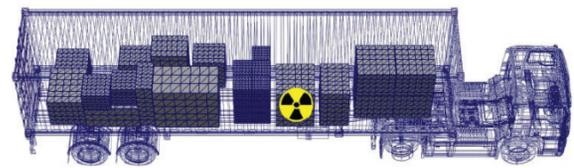
## Test Bed for Threat Detection Systems



## Systems Integration and Testing Facility (SITF)

Countering the threats associated with the illicit trafficking of proliferation-concern nuclear materials is one of the foremost security challenges worldwide. An important part of meeting this challenge is the ability to integrate and test threat detection systems under realistic field conditions before deployment.

The Systems Integration Testing Facility (SITF), at the Pacific Northwest National Laboratory (PNNL) in Washington state, provides a comprehensive, customizable, and scalable test environment. PNNL researchers associated with this facility have deep expertise in integrating, evaluating, and deploying radiation detection and other similar threat reduction systems worldwide.



The SITF includes integrated radiography and radiation detection systems.

Government and industry partners can provide or specify detection systems and other peripheral equipment to be tested under various requirements. PNNL can integrate, test, and advance technology for detecting radiological or nuclear materials, explosives, and other dangerous contraband that could be used by terrorists.

» **Radioactive sources** – SITF has licensed access to a diverse and expansive set of proliferation-concern radioactive sources, including weapons-usable special nuclear materials, and naturally occurring radioactive material used to create real-world scenarios for testing system performance. This allows systematic testing that challenges a wide range of configurations and operational modes.



A broad selection of naturally occurring radioactive material is available.

The SITF houses multiple radiation detection systems and components, allowing testing of equipment in actual field configurations.

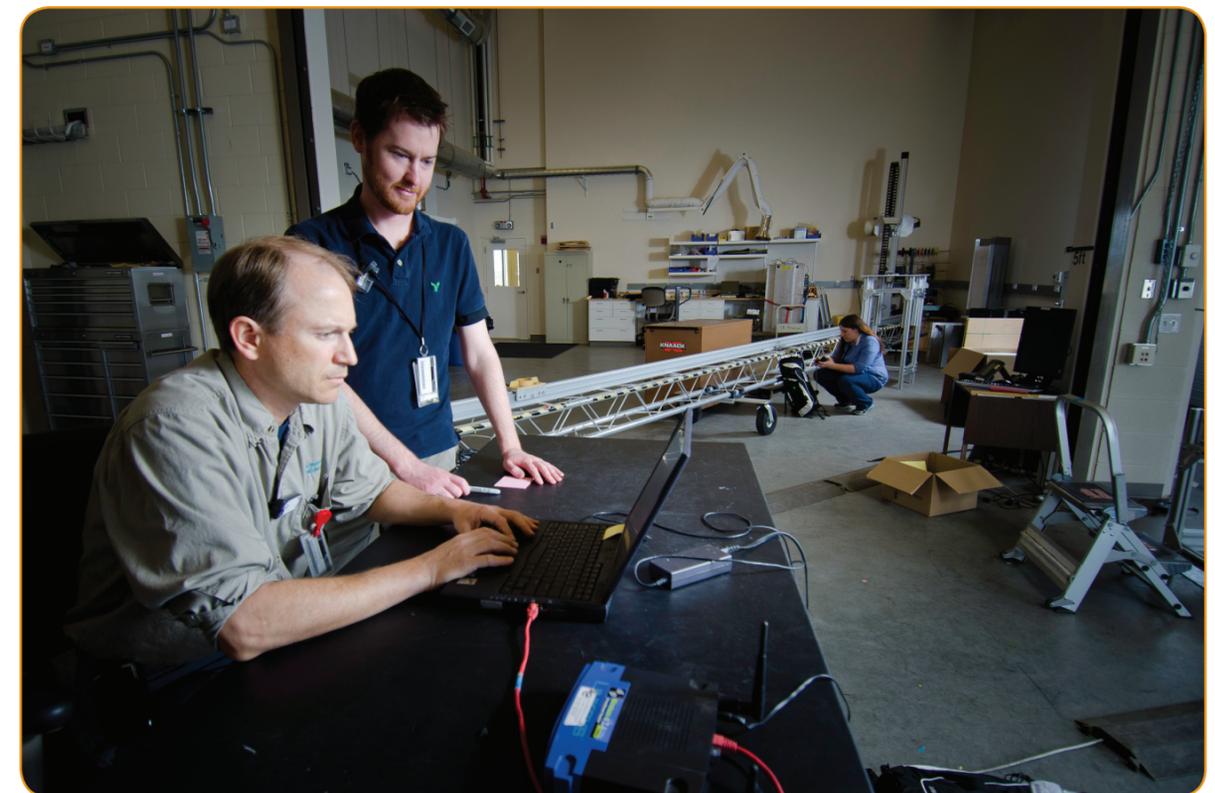


- » Operational testing to develop location-specific standard operating procedures
- » Equipment optimization testing to enhance system performance
- » Troubleshooting to recreate and resolve issues experienced in the field
- » Training confirmation to ensure that materials provided to officers in the field are current and that those installing the equipment have appropriate experience
- » Demonstrations of functionality for project participants and interested stakeholders, such as clients, executive visitors, and legislative representatives.

## Unique Features

The SITF offers some unique tools and features to facilitate data collection and analysis.

- » Testing shuttle is rail-mounted, adjustable height and designed to glide between facing detector panels. This provides a variety of testing options and allows for the collection of large amounts of data under precisely controlled conditions in a short period of time.
- » Drive-through high bays, an enclosed work space, a fume-hood bench, computer workstations, and a 12,000-lb overhead crane make this a highly configurable test area. Storage and plenty of work space complete the multi-test capacity of this area.



The shuttle platform, the long metal system shown in the background of the photo, can be loaded with a radiation source or other testing tool and used to verify the impact that speed has on detector readings and the effect of shape on vehicle presence sensors.



Systems are integrated and tested in realistic deployment environments.

### Developmental and Operational Testing

Work at the SITF includes developmental testing, completed in a controlled environment with specific measures of performance. Operational testing can also be performed, under field conditions, to confirm the functionality of the system. Several phases or types of testing may be included to meticulously verify the operational readiness of a system:

- » Investigative testing, used in adapting commercial, off-the-shelf components for specific needs
- » Technology readiness testing to confirm the functionality of prototype systems prior to field deployment

- » Scenario recreation testing to understand the response of a known system to an observed field situation
- » Type testing to ensure that a procured component meets the requirements defined by the project
- » Supplemental testing to verify that required functions are operating as expected
- » Integration testing to exercise the entire system and ensure all components integrate properly
- » Installation and configuration testing to validate instruction manuals
- » Failure mode testing to selectively “fail” components and connections to confirm that the system responds and that there is clear indication of the failure



Efficient development and testing of new and existing threat detection equipment is conducted on-site.

- » **Subject matter experts and unique facilities** – PNNL experts in fields such as nuclear physics, radiological engineering, test engineering, operations and field deployment, and statistics are available to assist project staff.

PNNL’s SITF has access to all of the necessary resources to support technology maturation and readiness assessments, pre-deployment stress testing, and operational testing of detection technologies. This multi-use facility is uniquely configured and equipped to test a wide range of technologies designed to address today’s and tomorrow’s threats.

### Simulated Field Conditions

The facility realistically simulates field conditions for screening vehicles, cargo, pedestrians, baggage, and express courier packages. Checkpoint configurations include seaport and airport cargo terminals, mail

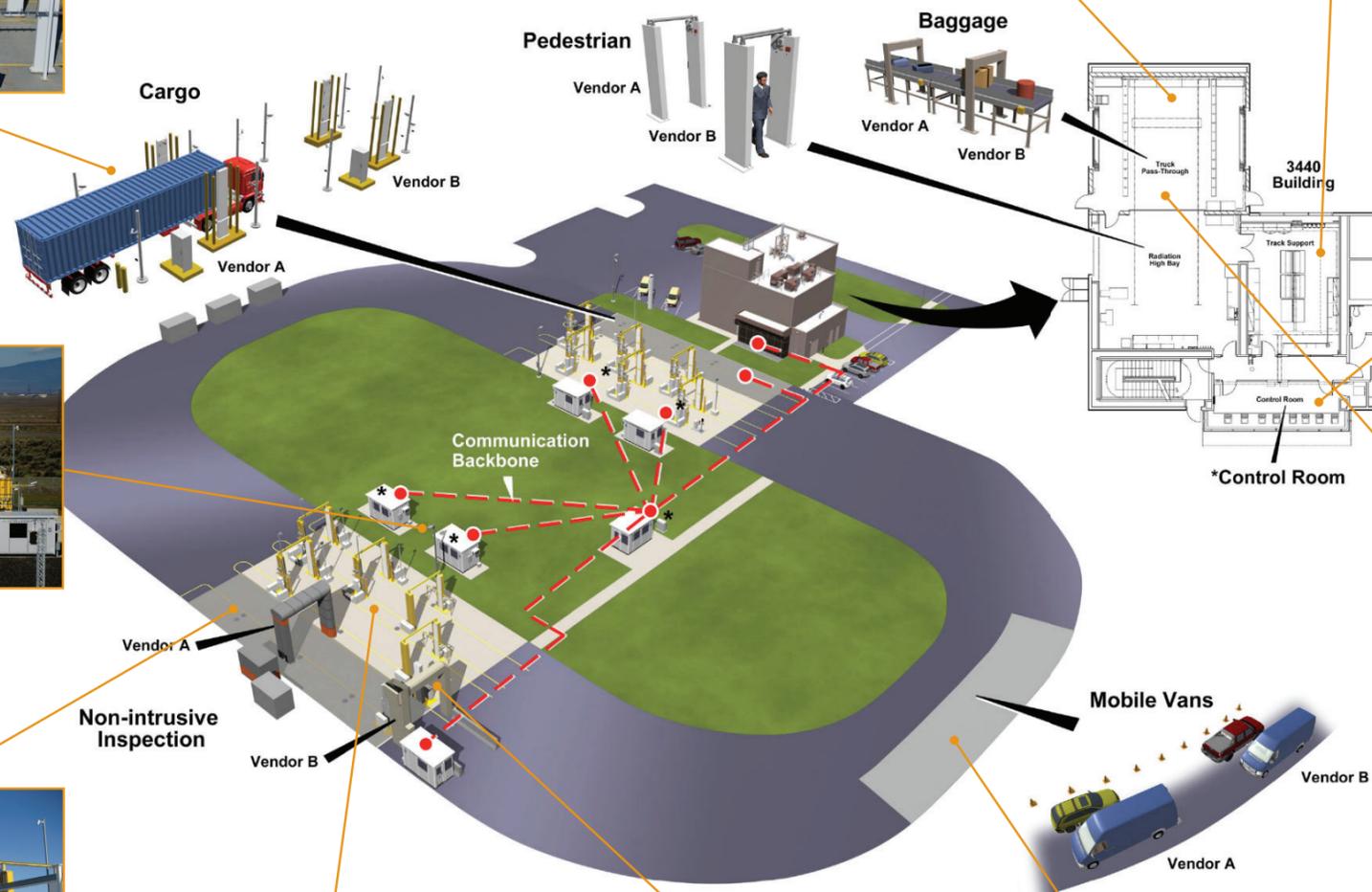
and courier facilities, and land border crossings. Areas are also available for standoff detection and dynamic operation of mobile systems.

The facility maintains versions of the radiation detection systems currently fielded by the U.S. government under domestic and international security programs, which includes systems manufactured by five vendors. PNNL also developed experimental units that can be adapted for in-depth and novel investigation.

The facility’s scale, about the size of a football field, enables developers to examine the interaction between active interrogation (radiography) and multiple passive radiation detection systems simultaneously. This is very useful for understanding the impact to system performance from interference and cross-talk effects often experienced in high-density ports of entry.

# Systems Integration and Testing Facility

The Systems Integration and Testing Facility has a 400-meter lit, paved track with two separate three-lane-wide testing areas with room for 30 fixed-site systems.



## Capabilities

The SITF at PNNL is the world's most comprehensive testing and evaluation laboratory for border threat detection technology. This laboratory hosts all of the necessary equipment and infrastructure to efficiently and effectively test detection systems and includes equipment and features to reduce planning and execution times.

Current technology testing capabilities include:

- » Equipment and systems to simulate seaports, land crossings, driving lanes, baggage carousels, and mail-handling facilities
- » Two X-ray generators: Smith system 6.0 MeV and SAIC system 6.5 MeV
- » Integrated radiography and radiation detection systems
- » 24-hour, 7-days-a-week controlled access and operations in a secure, fenced area
- » Semi-trailers to configure for drive-through or drive-by testing
- » Automated data collection and analysis capabilities in an onsite control room
- » Additional capacity and infrastructure to accommodate up to 30 detection systems including communications and camera systems
- » 93-square-meter indoor high-bay laboratory with a 10-ton overhead gantry for test support
- » Instrumentation benches to calibrate and troubleshoot sensors and other equipment.

The grounds include the test track itself, which has multiple lanes to accommodate several tests simultaneously, as well as a host of additional features to ensure testing needs are met in one location. Wide-open, unpaved spaces within the test track grounds allow for additional tests with ground-penetrating radar.