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Review of July 2013 Nuclear Security Insider Threat Exercise

November 2013

Prepared by

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UT-BATTELLE
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Nuclear Security and Isotope Technology Division

REVIEW OF JULY 2013 NUCLEAR SECURITY INSIDER THREAT EXERCISE

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CONTENTS

Page

LIST OF FIGURES

Page

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1. INTRODUCTION

Oak Ridge National Laboratory (ORNL) hosted the Nuclear Security Insider Threat Exercise (NSITE) from July 8–12, 2013. Sponsored by the United States Department of State Partnership for Nuclear Security (US DOS PNS) program, the workshop hosted individuals from around the world to participate in an insider threat table top exercise (TTX) and lectures on nuclear security. This document provides an overview of the development of NSITE, the implementation of the workshop and exercise, and considerations for future iterations. Additional documents from and information about the NSITE workshop are provided in the appendices.

1.1 PURPOSE OF NSITE

Nuclear security culture and the insider threat are best learned through experience. Culture is inherently difficult to teach, and as such is best learned through modeled behaviors and learning exercise. This TTX, NSITE, is a tool that strives to aid students in learning what an effective (and ineffective) nuclear security culture might look like by simulating dynamic events that strengthen or weaken the nuclear security regime. The goals of NSITE are to stimulate complex thought and discussion and assist decision makers and management in determining the most effective policies and procedures for their country or facility.

In addition, NSITE focuses on the following various aspects of security, safeguards, material controls and accounting, and nuclear security culture not traditionally modeled in TTXs.

- Material handling
- Human reliability
- Insider modeling and threat mitigation
- Material storage and shipping

The exercise is conducted by dividing the participants into multiple groups – in this case, three. Facility activities are simulated during the TTX, and each participant has an opportunity to identify potential insider threat activities present in the normal operations of a hypothetical facility. At the conclusion of the activity, the groups combine to discuss lessons learned from each scenario.

2. DEVELOPMENT

A team from ORNL developed the NSITE workshop over a period of 3 to 4 months using ORNL subject matter experts and previously performed TTXs. Patrick Lynch organized the workshop with instructors Cameron Coates, Ph.D., Jerry Eisele, Ph.D., Jarmes Larkin, and Jeff Chapman. Mentors during the exercises were Dyrk Greenhalgh, Michael Shannon, and Jeremy Townsend. In addition, this workshop would not have taken place without the funding and invaluable support provided by DOS PNS.

2.1 PARTICIPANTS

Twenty-eight individuals participated in the ORNL NSITE workshop. Altogether, they represented eight countries from around the world: Egypt, India, Indonesia, Jordan, Morocco, Nigeria, South Africa, and the United Arab Emirates (Figs. 1 and 2). Participants were identified and invited through DOS PNS based on their background and expertise in the field of nuclear security.

Fig. 1. Group photo at Oak Ridge National Laboratory.

Fig. 2. Map of participants' countries.

2.2 TABLETOP EXERCISE

For the TTX, a hypothetical uranium repackaging facility (URF) was created. The URF was set at an undisclosed location in a nonspecific declared nuclear material state and was not modeled after any existing facility. A detailed map of the site's multiple layers of protection and its layout was printed in large scale (3 ft × 5 ft) for actual game play during the TTX (Fig. 3). Computer-generated images of the URF and descriptions of the various security features were also created and provided to participants. Appendix A provides these images, a facility description, and the layout of the URF.

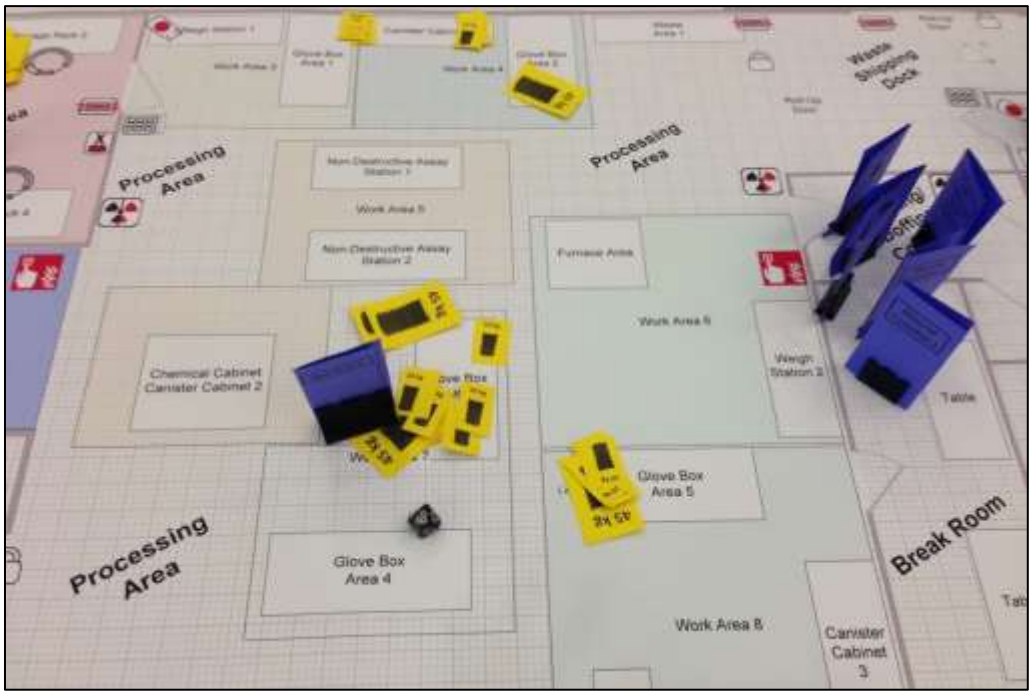


Fig. 3. Portion of TTX game play map.

3. IMPLEMENTATION

3.1 AGENDA

The workshop agenda is provided in Appendix B.

3.2 OVERVIEW OF PREPARATION FOR TABLETOP EXERCISE

Prior to carrying out the official TTX, participants viewed presentations on nuclear security topics, worked in small groups on worksheets, and performed a dry run of the exercise. In addition to preparing the individuals for the exercise, the lectures and accompanying worksheets were aimed at enhancing individual learning and participation.

The lecture hall utilized auditorium-style seating, with microphones at each desk, and three projector screens for easy viewing from anywhere in the room, as well as whiteboards in the front. The large space and whiteboards were necessary for the small-group break-out sessions in which the participants worked together to fill out worksheets and have discussions.

3.2.1 Day 1—Monday

On the first day, participants were introduced to ORNL and the NSITE workshop (Fig. 4). The participants were also shown two presentations entitled "Evolution and Importance of Nuclear Security Culture" and "Physical Protection Fundamentals."

Fig. 4. Oak Ridge National Laboratory Director Dr. Thom Mason welcoming participants

In addition to the lectures, the participants were divided into three groups of 10 individuals each and assigned roles at random. Each group of 10 represented a full contingent of workers able to successfully process material in the TTX's fictional facility, the URF. Each participant was assigned a role and a badge with an explanation of his/her job duties and authority. Appendix C provides job descriptions for each role. Some of the roles were duplicated within a group to simulate a two-person rule or multiple operational needs. The roles in each group were as follows.

- Operations Manager
- Security Officer Supervisor
- Security Officer
- Lab Technician/Health Physics
- Material Custodian
- Radiological Engineer

3.2.2 Day 2—Tuesday

The second day began with an overview of the NSITE facility site. The daily roles and responsibilities of the previously assigned characters were explained in conjunction with the facility attributes. During presentations on "Vulnerability Assessment for Insider Threat" and "Psychological Profiles of the Malicious Insider: What Makes them Tick?", participants considered the potential threat each character might pose and discussed system effectiveness exercises based on the charters and possible facility access (Fig. 5). The presentations were followed by clips from the film "Last Best Chance" and relevant case studies.

Fig. 5. Participants actively discuss insider characteristics.

In the afternoon, the participants split into their groups to outline and define the policies and procedures for the URF before touring ORNL's historic Graphite Reactor (Fig. 6). The policies and procedures prepared by the participants can be found in Appendix D.

Fig. 6. Visiting the historic Graphite Reactor at ORNL.

3.2.3 Day 3—Wednesday

On the third day, participants prepared for the TTX. After an initial presentation on the "Evaluation of Security Systems for Mitigation of Insider Threat," participants divided into their respective groups to continue work on policy and procedure development, complete the roles and responsibilities worksheet, go through work flow processing, and lastly do a dry run of the TTX (Fig. 7).

The completed roles and responsibilities worksheet can be found in Appendix E.

Fig. 7. Participants working through the TTX dry run.

3.3 TABLETOP EXERCISE

On Day 4, the TTX was delivered. Participants were divided into the three groups they were assigned to on the first day, with at least one mentor assisting each group. Each group had its own facility blueprint, characters, uranium canisters, and dice (Fig. 8).

Fig. 8. Game day TTX setup prior to start.

Mentors guided the participants through the exercise and worked through the time stamps provided to each character (Figs. 9 and 10). They were especially helpful in explaining why security systems might hold a certain probability of detection and providing additional information as necessary.

Fig. 9. TTX groups.

Fig. 10. TTX in play.

3.4 PRESENTATIONS AND REVIEW OF TABLETOP EXERCISE

At the conclusion of the week's activities at ORNL, the participants traveled to Palm Desert, California, for the 54th Annual Meeting of the Institute of Nuclear Materials Management (INMM). Working in groups of five or six, they prepared "Lessons Learned" presentations outlining their expectations before arriving at ORNL, experience in implementing the TTX, and recommendations for future applications of the NSITE model.

3.4.1 Nuclear Security Culture: From Theory to Implementation

On Sunday, July 14, PNS hosted a session at which the NSITE participants presented their impressions of the workshop.

Group 1 was composed of five participants from Egypt, India, Jordan, Nigeria, and South Africa (Fig. 11). They expressed that nuclear energy may be deployed as a future solution to counter global water and energy shortages, and identified problems related to safety, waste protection, and proliferation as the major challenges. Through the TTX, they expected to learn how to better implement a nuclear security culture in their home countries. Their experience was positive, expressed through a very lively and enthusiastic presentation. The TTX provided very useful, applied scenarios in which teamwork was crucial to stopping an insider. They hope to expand the TTX to include regional workshops in their home countries and would like to replicate the exercise using the actual blueprints of their home facilities. Introducing this very real aspect, they noted, could clarify issues of actual concern and encourage policy makers to make the right choices in upholding international obligations.

Fig. 11. Group 1 with Mr. Patrick Lynch (ORNL).

Group 2 was composed of six participants from Egypt, India, Indonesia, Jordan, Nigeria, and South Africa (Fig. 12). They looked forward to the NSITE TTX as an opportunity to better understand and apply the concept of nuclear security culture. They also welcomed the opportunity to interact and network with nuclear faculty and professionals from around the world. Their positive experience was amplified by the development of the facility policies and procedures, presentations on human reliability, and examples of synergy between physical and cyber security. They also gained first-hand experience at how a multi-operational team can enhance security more efficiently than a few high-level officials. Future applications were suggested to include design-based threats (DBT), using more statistically based probabilities, and outside security threats. They all expressed a desire to continue following the progress of the NSITE model. Dr. A. R. Prasad noted that he will introduce the TTX in his university in India.

Fig. 12. Group 2 with Mr. Patrick Lynch (ORNL).

Group 3 was composed of six participants from Indonesia, Jordan, Morocco, Nigeria, South Africa, and the United Arab Emirates (Fig. 13). They too described the overall experience as extremely positive, stating that while the TTX was "nice and fun to practice," it was "very serious in implementation." The group expected to learn from the experience and models of the United States and to identify new opportunities for international collaboration to increase the nuclear security culture in their home countries. There was an expressed interest in recreating the TTX in their home organizations and using it to enhance existing university curricula. In the future, they recommended that the TTX be combined with other PNS-hosted workshops. The TTX encourages cooperation, gauges system effectiveness, shows qualitative effectiveness, and is applicable to other security systems. The group applauded the combination of NSITE with international conferences such as INMM.

Fig. 13. Group 3 with Mr. Patrick Lynch (ORNL).

Group 4 was composed of five participants from Indonesia, Nigeria, South Africa and Morocco (Fig. 14). They described the overall TTX experience as "very, very interesting." The group placed a particular emphasis on learning the behavioral characteristics of an insider and the real methods for identifying and countering insider threats. Their expectations were centered on learning more about the exercise itself, as well as assessing the threat of an insider. The week at ORNL far exceeded their expectations and emphasized the importance of teamwork in observing and analyzing staff to discourage and identify insiders. They stressed the need for every facility to review and improve its security procedures and evaluate staff on a regular basis. Future applications could be extended to cover real facilities and include behavioral assessments of the characters.

Fig. 14. Group 4 with Mr. Patrick Lynch (ORNL).

Group 5 was composed of four participants from Indonesia, Nigeria, and South Africa. Like *Group 4*, they expected to learn about the characteristics of an insider and how to mitigate and defeat an insider threat. They learned that nuclear security is everyone's responsibility and saw where there may be holes in the security of existing facilities. The flexibility of the TTX was appreciated as it can be easily modified to fit individual cultures, knowledge, and facilities. This also made the exercise very attractive to reproduce, and the participants stressed that they felt obligated to take the exercise and knowledge gained back to their home countries. They recommended that PNS continue supporting the NSITE TTX to help educate even the "lowest staff" of the value of a "security culture built on friendship and trust, not paranoia" (Fig. 15).

Fig. 15. Group 5 with Mr. Patrick Lynch (ORNL).

3.4.2 Next-Generation Nuclear Security Training Techniques

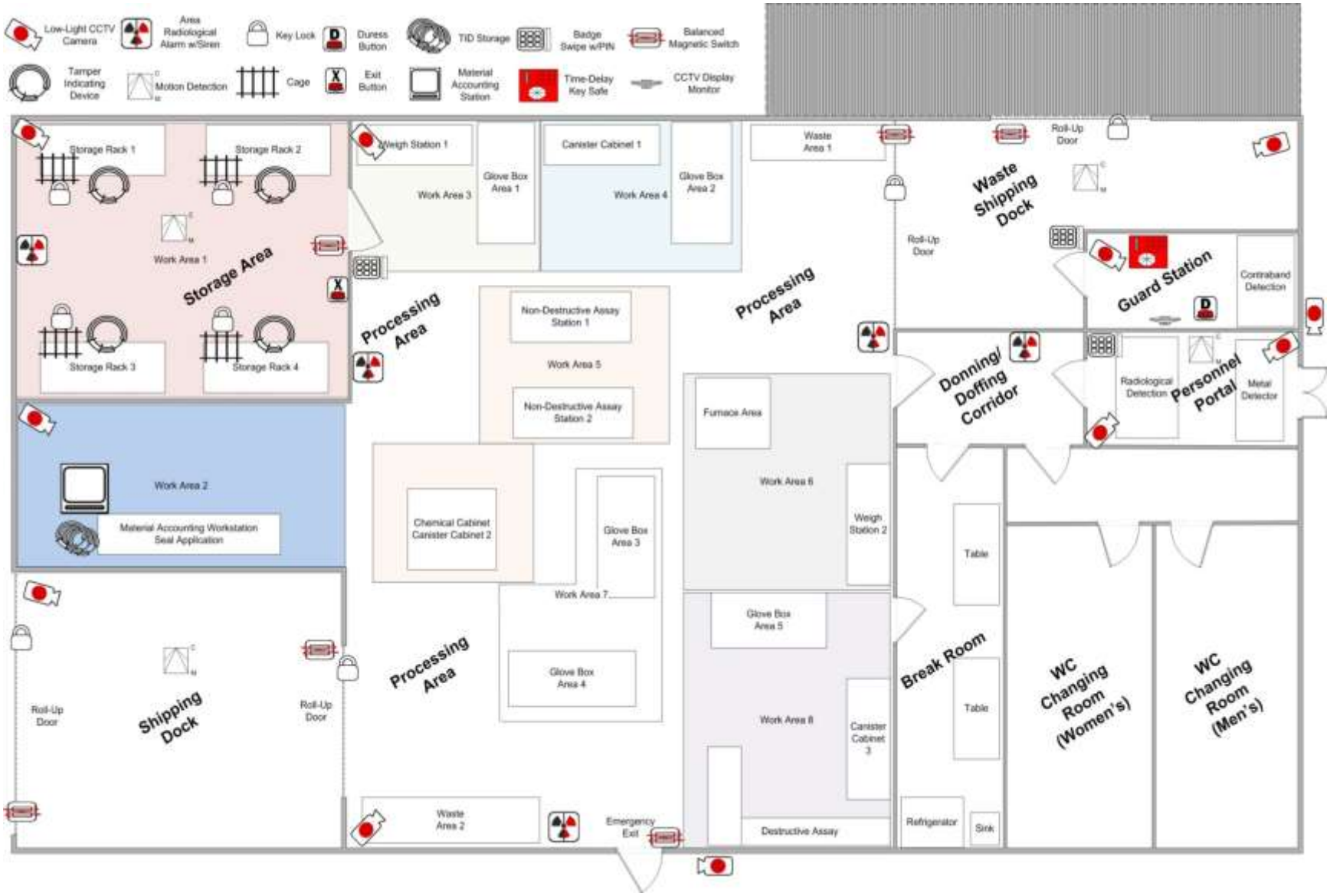
During the INMM Annual Meeting, on July 17, Jeremy Townsend and Patrick Lynch of ORNL delivered a presentation on their experience of hosting the NSITE TTX. The session was very well attended by approximately 50 national and international industry professionals. The audience posed several questions displaying interest in the development of the facility and the character roles. Though this particular exercise was simplistic in size, it could be expanded to include many more characters and facility operations, thus increasing the complexity of the exercise and risk of an insider threat.

4. EVALUATION AND CONCLUSION

At the beginning of the workshop, participants were asked to fill out a Pre-Event Questionnaire which highlighted their understanding of nuclear security culture and expectations for the week ahead. The results displayed that the majority of the participants placed a high level of importance on nuclear security but that they were largely unaware of any international or domestic resources to help identify and promote a security culture. The Post- Event Questionnaires reflected an increase in resource awareness and echoed the positive sentiments which were expressed in the INMM presentations. The majority of the participants noted an increase in their awareness of facility and policy vulnerabilities, as well as a better understanding of the human risk factor across all levels of staff. Over half of the participants found the TTX to be the most beneficial aspect of the workshop and expressed interest in developing academic curricula focused on the discussions of the week.

Overall, the goals and expectations of the NSITE TTX were exceeded for the participants and organizers alike. The participants left with an increased understanding of nuclear security culture and the vulnerabilities threatening their facilities and staff. The organizers and mentors documented their lessons learned from the TTX and plan to improve the details of the scenarios in future applications. Both the participants and organizers look forward to building upon their experience and working together to strengthen the global nuclear security culture.

APPENDIX A: FACILITY LAYOUT, DESCRIPTION, AND TTX MAP



Overview of Facility

The URF depicted in this TTX is at a hypothetical and undisclosed location in a nonspecific declared nuclear materials state. Any semblance to a real world facility is purely coincidental. The overall site is described in terms of protection layers to more easily describe its many features.

- **Offsite** is considered any area outside of the protective barriers and roads which lead into the site. Badges are checked at the offsite area perimeter of every person who enters. Entry of non-badged persons into the offsite area is permitted by the accompaniment of legitimate badged persons. Entry from personnel and vehicle control portals requires a 5 mile/8 km drive/hike to the target facility exclusion zone.

- The **Controlled Area (CA)** begins at the facility's outer walls and ends at the inner-perimeter fence of the facility. This area is occasionally patrolled by security officers (SOs) and supports vehicle traffic such as material delivery trucks (material shipping portal, west corner) and other support vehicles (waste shipping door, northeastern corner). Unused cargo containers are stored in the northwestern edge of the facility. A small dumpster is on the western side of the building for nonhazardous wastes.

- The **Material Mixing Area (MMA)** is located inside the processing facility and is the center for material operations at this site. Material is processed and measured here. There are several employees present during work hours who serve various roles. Quantities of low-enriched material (estimated 90 kg) might be processed in the MMA during working hours, but this material is locked at night in a vault, which is alarmed with video assessment. One guard occupies a position inside the building, with one more patrolling the floor during day shifts. The entry control guard also allows employees to enter the MMA through a personnel portal after successful radiological, x-ray package contraband, and badge inspection.

- The **Vault** is a secure storage location where the bulk of the low-enriched material is kept in tamper-indicating containers, which are stacked and secured on shelves in iron grating (grating not pictured). Two-person badge access is required to open the vault door, as is the grating inside (two keys, maintained by the guard in the interior personnel portal guard position).

Facility Building (Housing MMA and Vault)

The building's dimensions are 150 (EW) x 60 (NS) meters. Entrances and exits to the building are located in the following areas:

(1) one main entry steel reinforced double door on east wall leading to Personnel Access Control Station (PACS),

(2) one door on south wall is an alarmed emergency exit,

(3) one alarmed low-enriched uranium (LEU) vehicle shipping dock with two roll-up gates and one exterior steel-reinforced personnel door on west wall, and

(4) one alarmed non-LEU vehicle shipping dock with two roll-up gates on north wall.

The west vehicle roll-up gate allows an entire vehicle to enter the building to load and unload for shipments of no more than 50 g/week containerized LEU. One dumpster lines the west wall for nonradiological and industrial waste disposal. All facility doors are equipped with alarmed, balanced magnetic switched (BMSs).

Double door on east wall to personnel entry control

Emergency exit on south wall

LEU shipping dock, outer roll-up gate

LEU shipping dock, inner roll-up gate

Non-LEU (waste) shipping dock

Non-LEU shipping dock

Non-LEU shipping dock, view from outside

The personnel entry control station houses one security officer supervisor. A 2-meter-wide hallway houses one package x-ray contraband detector (not pictured) along with a personnel radiation and metal detector portal.

Personnel entry control station

Personnel entry control station, facing east

Personnel entry control station, guard position

Once through the entry control station, taking a left (rather than going straight to the MMA) leads to the restrooms and changing rooms. These are located in the southeast corner of the facility. A break room may also be accessed through this hallway.

Opposite side of entry control station, facing east

Personnel changing rooms

Heating, ventilation, and air-conditioning (HVAC) are handled on the roof of the main building (not shown in facility images), with the main unit located above the changing and dress-down rooms of the workers. Air-duct entries are cover by 6 in. square grated and welded steel. The air inside the building is under a slight negative pressure and is filtered in three progressively fine stages inside the building, with exposed ducts mounted directly to the ceiling (not pictured). There is no direct access to the roof. For HVAC or roof maintenance, a bucket/ladder truck is used, and personnel are searched, escorted, and only allowed on the roof.

All industrial and radioactive wastes are stored on-site in quantities which do not exceed 20 and 5 liters, respectively. All site water and sewer are piped in and out via 3 meter buried lines which parallel the northeastern approach to the site. Site plumbing is 0.25 meter in diameter.

Material Mixing Area

The Material Mixing Area (MMA) houses glove boxes, furnaces, machine presses, heavy equipment, and various tools necessary for handling LEU. The storage area/bunker and break room may be accessed from the MMA.

Material Mixing Area, facing west

Material Mixing Area, facing southeast

Material Mixing Area, facing east

Material Mixing Area, facing east

Material Mixing Area, facing north

Material Mixing Area, facing northwest

Material Mixing Area Accounting Station

Material Mixing Area, facing west

Storage Area / Bunker

The LEU storage area sits in the northwest corner of the building. Assessment cameras are also located inside. Entrance to the storage area utilizes a two-person entry rule (badge readers). Material canisters are locked behind iron-grating cages on all sides (not pictured), with two-person A & B keys stored in the hardened guard post. During the day, the grating is open, although the alarms remain on. Canisters have

tamper-indicating seals requiring a special bolt removal tool also stored at the guard post. Each canister, depending on its type and purpose holds 45 kg or 10 kg of material. Sample sizes of material may also be found within the storage area and in the MMA to facilitate certain operations. Material canisters designed to hold 45 kg or 10 kg of material may be designated as full, partially full, or empty, depending on the quantity of material contained.

Storage area, reinforced entry door

Inside storage area, facing entry door

Storage area, inside

Storage area, inside

APPENDIX B: AGENDA

Day 1, Monday: July 8, 2013 **Location: Bldg. 5100 Rm 128**

Time	Event	Instructor(s)
0800 – 0900	Arrival to ORNL, Badge Process	Pat Lynch
0900 – 0930	Welcome to ORNL	ORNL Director, Dr. Thom Mason
0930 – 1030	Agenda Overview, Participant Introductions, Pre-event Questionnaire	Pat Lynch/All
1030 – 1130	Small Group Breakout (preparation for (7/14) presentations)	Pat Lynch
1130 – 1230	Lunch	-
1230 – 1330	Evolution and Importance of Nuclear Security Culture	Pat Lynch
1330 – 1430	Physical Protection Fundamentals	Michael Shannon
1430 – 1445	Break	
1445 – 1530	Introduction to the Nuclear Security Insider Threat Exercise (NSITE) & Role Assignment	Dyrk Greenhalgh
1530 – 1630	International Participant Overviews	All
1630	Institute for Nuclear Security (INS) Sponsored Reception	All
1715	*Day 1 Concludes*	-

Day 2, Tuesday: July 9, 2013 **Location: Bldg. 5100 Rm 128**

Time	Event	Instructor(s)
0900 – 1000	NSITE Facility Overview	Dyrk Greenhalgh
1000 – 1045	Insider Threat Introduction	Cameron Coates
1045 – 1100	Break	-
1100 – 1130	Vulnerability Assessment for Insider Threat	Dyrk Greenhalgh
1130 – 1200	Psychological Profiles of the Malicious Insider: What Makes Them Tick?	Jerry Eisele
1200 – 1300	Lunch	-
1300 – 1400	Historical Evidence: Insider Threat Video(s) & Discussion & Case Studies	Jeremy Townsend
1400 – 1445	Overview of Policy and Procedure for Roles and Responsibilities	Mentors
1445 – 1530	Policy and Procedure Development (Session 1)	Mentors
1545 - 1630	Historic Graphite Reactor Tour	All
1630	*Day 2 Concludes*	-
1430 – 1700	*Academic Leaders may Participate in Event at the University of Tennessee's Howard H. Baker Center – Engaging Faculty and Students Who Will Be Present on Global Issues*	Pat Lynch and Select Academic Leaders

Day 3, Wednesday: July 10, 2013 **Location: Bldg. 5100 Rm 128**

Time	Event	Instructor(s)
0900 – 1000	Evaluation of Security Systems for Mitigation of Insider Threat	Dyrk Greenhalgh
1000 – 1100	Policy and Procedure Development (Session 2)	Mentors
1100 – 1115	Break	-
1115 – 1215	Roles and Responsibilities: Worksheet	Mentors
1215 – 1315	Lunch	-
1315 – 1445	Work Flow Processing	Mentors
1445 – 1500	Break	-
1500 – 1700	NSITE Insider Development	Mentors
1700	*Day 3 Concludes*	-

Day 4, Thursday: July 11, 2013 **Location: Bldg. 5200 Rm 202A, 202B**

Time	Event	Instructor(s)
0900 – 0945	International Approach to Nuclear Security Culture	James Larkin, South Africa
0945 – 1200	NSITE Activity (TABLETOP EXERCISE DELIVERED): Phase 1	All
1200 – 1245	Lunch	-
1245 – 1445	NSITE Activity (TABLETOP EXERCISE DELIVERED): Phase 2	All
1445 – 1500	Break	-
1500 – 1700	Review NSITE Outcome / (7/14) Presentation Preparation	Mentors
1700	*Day 4 Concludes*	-

Day 5, Friday: July 12, 2013 Locations: Bldg. 5100 Rm 128, Bldg. 5700 Rm L202, SG Laboratory

Time	Event	Instructor(s)
0900 – 1200	Safeguards Lab – Effective Use of Portal Monitors and Handheld Detection Equipment	Jeff Chapman
1200 – 1300	Lunch	-
1300 – 1500	Small Group Discussion – Nuclear Security Culture National Implementation Strategy and Final Preparations for (7/14) Presentations	Patrick Lynch, Jeremy Townsend
1500 – 1515	Break	-
1515 – 1600	Training Evaluations, Post-Event Questionnaire	Pat Lynch
1600	*Workshop Concludes*	

APPENDIX C: ROLE DESCRIPTIONS

Operations Manager

- Plan, direct, or coordinate the operations of facility.
- Duties and responsibilities include formulating policies, managing daily operations, and planning the use of materials and human resources, but are too diverse and general in nature to be classified in any one functional area of management or administration, such as personnel, purchasing, or administrative services.
- Oversee activities directly related to material process. Review financial statements, activity reports, and other performance data to measure productivity and goal achievement and to determine areas needing cost reduction and program improvement.
- Manage staff, prepare work schedules, and assign specific duties.
- Direct and coordinate organization's financial and budget activities to fund operations and increase efficiency.
- Establish and implement departmental policies, goals, objectives, and procedures, conferring with board members, organization officials, and staff members as necessary.
- Determine staffing requirements and interview, hire, and train new employees, or oversee those personnel processes.

Security Officer Supervisor

- Directly supervise and coordinate activities of members of protective force.
- Maintain logs, prepare reports, and direct the preparation, handling, and maintenance of security and training records.
- Explain protective force operations to subordinates to assist them in performing their job duties.
- Investigate and resolve personnel problems within organization and charges of misconduct against staff.
- Inform personnel of changes in regulations and policies and implications of new or amended laws.
- Monitor and evaluate the job performance of subordinates and authorize promotions and site transfers.

Security Officer (SO)

- Guard, patrol, or monitor premises to prevent theft, violence, or infractions of rules.
- May operate x-ray and metal detector equipment.
- Monitor and authorize entrance and departure of employees, visitors, and other persons to guard against theft and maintain security of premises.
- Write reports of daily activities and irregularities such as equipment or property damage, theft, presence of unauthorized persons, or unusual occurrences.
- Call emergency departments in cases of emergency, such as fire or other events.
- Answer alarms and investigate disturbances.
- Patrol facility premises to prevent and detect signs of intrusion and ensure security of doors, windows, and gates.
- Escort or drive motor vehicle to transport individuals to specified locations or to provide personal protection.
- Operate detection devices to screen individuals and prevent passage of prohibited articles into restricted areas.

- Warn persons of rule infractions or violations and apprehend or evict violators from premises, using force when necessary.

Lab Technician / Health Physics

- Assist in laboratory or production activities.
- May operate, maintain, or provide quality control for nuclear testing and research equipment.
- Collect data on work environments for analysis. Implement and conduct evaluation of programs designed to limit chemical, physical, radiological risks to workers.
- Review, evaluate, and analyze work environments and design programs and procedures to control, eliminate, and prevent harm or injury caused by chemical, physical, and radiological factors.
- May conduct inspections and enforce adherence to laws and regulations governing the health and safety of individuals.
- Test workplaces for environmental hazards, such as exposure to radiation, chemical hazards, or excessive noise.
- Verify availability or monitor use of safety equipment, such as hearing protection, eye protection, gloves, radiation dosimeters, or respirators.
- Supply, operate, or maintain personal protective equipment (PPE).
- Evaluate situations or make determinations when a worker has refused to work on the grounds that danger or potential harm exists.
- Maintain all required environmental records and documentation. Prepare or calibrate equipment used to collect or analyze samples.
- Plan emergency response drills.
- Recommend corrective measures to be applied based on results of environmental contaminant analyses.
- Prepare or review specifications or orders for the purchase of safety equipment, ensuring that proper features are present and that items conform to health and safety standards.
- Order suspension of activities that pose threats to workers' health or safety.
- Investigate accidents to identify causes or to determine how such accidents might be prevented in the future.
- Recommend measures to help protect workers from potentially hazardous work methods, processes, or materials.
- Inspect or evaluate workplace environments, equipment, or practices to ensure compliance with safety standards and government regulations.
- Develop or maintain hygiene programs, such as noise surveys, continuous atmosphere monitoring, ventilation surveys, or radiological contamination management plans.
- Collect samples of dust, gases, vapors, or other potentially toxic materials for analysis.
- Investigate the adequacy of ventilation, exhaust equipment, lighting, or other conditions that could affect employee health, comfort, or performance.
- Conduct safety training or education programs and demonstrate the use of safety equipment.
- Investigate health-related complaints and inspect facilities to ensure that they comply with public health legislation and regulations.

Material Custodian

- Responsible for processing or testing of nuclear materials, process monitoring, conducting inventories, nuclear material transfers, and tamper-indicating devices (TIDs).
- Perform destructive and nondestructive measurements and their functionality in relationship to process and accountability measurements, including waste measurements.
- Control nuclear material movement throughout facility including to and from associated processes, approve transfers of nuclear material and waste, and conduct physical inventories.
- Identify nuclear material along with description of authorized operations for that material and define key measurement points for inputs, outputs, and inventory.

Radiological Engineer

- Conduct research or apply principles and theory of nuclear science to problems concerned with release, control, and use of nuclear material and nuclear waste disposal.
- Initiate corrective actions or order plant shutdowns in emergency situations.
- Direct operating or maintenance activities to ensure efficiency and conformity to safety standards.
- Monitor nuclear facility operations to identify any design, construction, or operation practices that violate safety regulations and laws or that could jeopardize the safety of operations.
- Examine accidents to obtain data that can be used to design preventive measures.
- Write operational instructions to be used in operation or waste handling and disposal.
- Perform experiments that will provide information about acceptable methods of nuclear material usage or waste disposal.
- Conduct tests of material behavior and performance of nuclear machinery and equipment to optimize performance of existing processes.

Waste Handler

- Identify, remove, pack, or dispose of waste materials, including asbestos, lead-based paint, waste oil, fuel, transmission fluid, radioactive materials, or contaminated soil.
- Possess specialized training and certification in hazardous materials handling.
- May operate earth-moving equipment or trucks.
- Comply with prescribed safety procedures or federal laws regulating waste disposal methods.
- Record numbers of containers stored at disposal sites, specifying amounts or types of equipment or waste disposed.
- Drive trucks or other heavy equipment to convey contaminated waste to designated locations.
- Operate machines or equipment to remove, package, store, or transport loads of waste materials.
- Load or unload materials into containers or onto trucks, using hoists or forklifts.
- Clean contaminated equipment or areas for reuse, using detergents or solvents, sandblasters, filter pumps, or steam cleaners.
- Handle radiological materials and chemical compounds, and possess knowledge of their hazards and uses.

Alarm Maintenance

- Install, program, maintain, or repair security or radiation alarm wiring and equipment.
- Ensure that work is in accordance with relevant codes.
- Examine systems to locate problems, such as loose connections or broken insulation.

- Test backup batteries, keypad programming, sirens, and all security features in order to ensure proper functioning, and to diagnose malfunctions.
- Mount and fasten control panels, door and window contacts, sensors, or video cameras and attach electrical and telephone wiring to connect components.
- Install, maintain, or repair security and radiation systems, alarm devices, or related equipment, following blueprints of electrical layouts and building plans.
- Feed cables through access holes, roof spaces, and cavity walls to reach fixture outlets; then position and terminate cables, wires and strapping.
- Inspect installation sites and study work orders, building plans, and installation manuals to determine materials requirements and installation procedures.
- Adjust sensitivity of units, based on room structures and manufacturers' recommendations, using programming keypads.
- Test and repair circuits and sensors, following wiring and system specifications.
- Drill holes for wiring in wall studs, joists, ceilings, or floors.
- Demonstrate systems for protective force supervision and explain details, such as the causes and consequences of false alarms.

Facility Maintenance

- Perform work to keep machines, mechanical equipment, or the structure of the facility in repair.
- Duties may involve pipe fitting; boiler making; insulating; welding; machining; carpentry; repairing electrical or mechanical equipment; installing, aligning, and balancing new equipment; and repairing buildings, floors, or stairs.
- Use tools ranging from common hand and power tools, such as hammers, hoists, saws, drills, and wrenches, to precision measuring instruments and electrical and electronic testing devices.
- Perform routine preventive maintenance to ensure that machines continue to run smoothly, building systems operate efficiently, or the physical condition of buildings does not deteriorate.
- Inspect, operate, or test machinery or equipment to diagnose machine malfunctions.
- Diagnose mechanical problems and determine how to correct them, checking blueprints, repair manuals, or parts catalogs, as necessary.
- Assemble, install, or repair wiring, electrical or electronic components, pipe systems, plumbing, machinery, or equipment. Inspect drives, motors, and belts; check fluid levels; replace filters; or perform other maintenance actions, following checklists.
- Clean or lubricate shafts, bearings, gears, or other parts of machinery.
- Adjust functional parts of devices or control instruments, using hand tools, levels, plumb bobs, or straightedges.
- Repair or replace defective equipment parts, using hand tools and power tools, and reassemble equipment. Record type and cost of maintenance or repair work.

Administrative Assistant

- Provide high-level administrative support by conducting research, preparing statistical reports, handling information requests, and performing clerical functions such as preparing correspondence, receiving visitors, arranging conference calls, and scheduling meetings.
- May also train and supervise lower-level clerical staff.
- Prepare invoices, reports, memos, letters, financial statements, and other documents, using word processing, spreadsheet, database, or presentation software.
- Answer phone calls and direct calls to appropriate parties or take messages.

- Conduct research, compile data, and prepare papers for consideration and presentation by executives, committees and boards of directors.
- Attend meetings to record minutes.
- Read and analyze incoming memos, submissions, and reports to determine their significance and plan their distribution.
- Perform general office duties, such as ordering supplies, maintaining records management database systems, and performing basic bookkeeping work.
- File and retrieve corporate documents, records, and reports.
- Open, sort, and distribute incoming correspondence, including faxes and email.

Courier/Transport

- Pick up and deliver nuclear material or waste.
- Load vehicles with material, ensuring material is loaded correctly and taking precautions with hazardous material.
- Unload and sort material.
- Receive messages or materials to be delivered, and information on recipients, such as names, addresses, telephone numbers, and delivery instructions, communicated via telephone, two-way radio, or in person.
- Plan and follow the most efficient routes for delivering goods.
- Obtain signatures, receipts, and payments, or arrange for recipients to make payments.
- Record information, such as items received and delivered. Confirm deliveries and collections and to receive instructions for other deliveries.

Janitor

- Keep buildings in clean and orderly condition.
- Perform heavy cleaning duties, such as cleaning floors, shampooing rugs, washing walls and glass, and removing rubbish.
- Duties may include performing routine light maintenance activities, notifying management of need for repairs, and cleaning snow or debris from sidewalk.
- Service, clean, or supply restrooms.
- Gather and empty trash.
- Clean building floors by sweeping, mopping, scrubbing, or vacuuming.
- Follow procedures for the use of chemical cleaners and power equipment to prevent damage to floors and fixtures.
- Mix water and detergents or acids in containers to prepare cleaning solutions, according to specifications.
- Strip, seal, finish, and polish floors.
- Notify managers concerning the need for major repairs or additions to building operating systems.
- Requisition supplies or equipment needed for cleaning and light maintenance duties.
- Clean windows, glass partitions, or mirrors, using soapy water or other cleaners, sponges, or squeegees.

APPENDIX D: POLICY AND PROCEDURES, URANIUM REPACKAGING FACILITY

Overview
These policies and procedures are intended for those who perform work at the Uranium Repackaging Facility (URF). They represent guidelines to be used in performing work safely and securely with attention to protecting people and material assets.

Badges
Each employee will be issued a personal badge upon arrival and is expected to always wear the badge for identification and for site access control and authorization purposes.
How should the badge be used and controlled?

> All employees should wear a photo badge which is visible at all times. Lost badges must be reported immediately. The Security Department is responsible for managing all badges.

Site Access
Employees who enter the site will be asked to present their badges to the security personnel for inspection. In some areas, employees are expected to scan badges and enter personal identification numbers (PINs) in order to proceed. Specific facility elements, such as delivery docks, require the use of keys which are held by Operations Management or Security personnel.

Contraband Inspection
Site entry and exit may require inspection of personal items. The guards at the point of entry will determine if an inspection is warranted. Contraband inspection will be performed.

> All personnel must be inspected before entering. Radiation detectors must be worn at all times. No personal vehicles may enter the facility at any time.

Donning/Doffing Clothing
Workers in material areas are required to change into site-provided clothing before and after interacting with materials to reduce the chance of potential contamination from the work site. Clothing will be handled according to the following waste management practices.

> The waste area must be protected. Differentiation between contaminated and clean clothes must be clearly marked and adhered to at all times. Areas will be further defined by colors.

Visitors
Visitors may be allowed to enter the site under the following circumstances.

> Visiting time will be strictly regulated. Visitors must be escorted by a host 100% of the time. Before entering the facility, visitors must declare the purpose of their visit and present a valid ID. Visitors must wear a special “Visitors Badge” that is visible at all times as well as a dosimeter. All visitors must undergo site safety and security training.

Emergency Procedures
In the event of emergency, follow directions given by managers and security personnel.
The following emergency procedures will assist in the protection of employees and materials at the site.

> An emergency plan will be well defined, and all workers will be well trained in it.
> The public will also be notified of emergency procedures. This includes local residents who may be affected by certain emergencies, as well as local emergency service workers who may assist in extreme emergency situations.

Radiological Contamination

The facility is equipped with area and entry/exit radiation detection systems. The following emergency procedures will be followed in the event that an area radiological alarm occurs.

A portal monitor will be at the exit. In the event a contamination alarm sounds, the Health Physicist will be called immediately. If a radiological alarm occurs and the portal monitor does not detect it, the security guard on duty will call the Health Physicist, who will make the final decision.

In the event of a fire alarm or radiological alarm – all staff will convene at an assembly point. A head count will be taken and personnel will be verified, per the emergency procedure.

All alarms will be treated as true to protect the system and the personnel.

Hiring Process/Fitness for Duty Program

The Uranium Research Facility (URF) hires qualified personnel to perform important and sensitive research for the state and the power industry. As such, a condition of hire and continued employment is that personnel meet minimum qualification standards at the time of hire and continue to demonstrate trustworthiness during the period of employment. A few ways the URF provides assurance that its employees meet these standards are the following.

1. Criminal Investigation
   Before hiring, each potential employee will undergo an identification check, Social Security check, and fingerprinting.

2. Education Verification
   This verification will be contingent on the position sought. All declared degrees will be checked for authenticity.

3. Employment History and References
   A check will be made with all declared previous employers.

4. Financial Records
   As credit checks can be difficult to perform in developing countries; this will not be stressed. A credit check will be performed when possible, and employees will be asked to declare their assets.

5. Psychiatric Evaluation
   A generic medical and psychological evaluation will be required of each employee prior to employment.

6. Anonymous Reporting Program
   An anonymous Suggestion Box will be placed in an open and easily accessible location for all employees.

Material Handling

Prudent management practice dictates that material is protected at all times. All keys, locks, and systems exist to protect against potential theft or sabotage.

The storage room will be controlled with a digital lock that is changed on a regular basis.

Health Physics and Radiation Measurements

Radiation measurements are to be taken whenever an employee exits the facility for the workday or to travel off-site. Depending on the work performed at the site, additional contamination screening may be necessary. All waste or materials leaving the production area are verified to be within acceptable standards prior to transfer off-site.

Material In-Process
Materials in the Processing Area are handled while in containers or in glove boxes. Small samples (a few gram quantities) of material may be out of containers or glove boxes for testing purposes in the Assay Stations. Employees to whom material is assigned are expected to protect the material and know its location and condition at all times.

Storage Area Access

A minimum two-person rule will be maintained at all times for all facilities. Locks and combinations will be changed periodically. Managers, Security Officers, Health Physicists and Custodians will be allowed to enter the storage facility, but no one can enter without the knowledge of a Security Officer.

Tamper-Indicating Devices
Tamper-indicating Devices (TIDs) are applied by Material Custodians before returning material to the storage area and after processing operations. Stocks of TIDs are locked and controlled in Work Area 2.

Inventory Inspection Process and Frequency

Inventory will be inspected twice a day – once in the morning and once in the evening. All inspections will respect the two-person rule. All seals will be verified twice a day. A full material contamination inspection will take place on a monthly basis.

Inventory Control
Material custodians control material movement into and out of the Material Storage Area. Materials moved or shipped to other areas will be inspected for possible tampering, validation of container identification numbers, and a status change in the material accounting workstation before processing operations or shipping.

Response to Security-Related Events

All work must be stopped immediately and not reconvened until the problem has been resolved. All security officials must be notified immediately. The severity of the security breach is indicated by the type of alarm that is sounded.

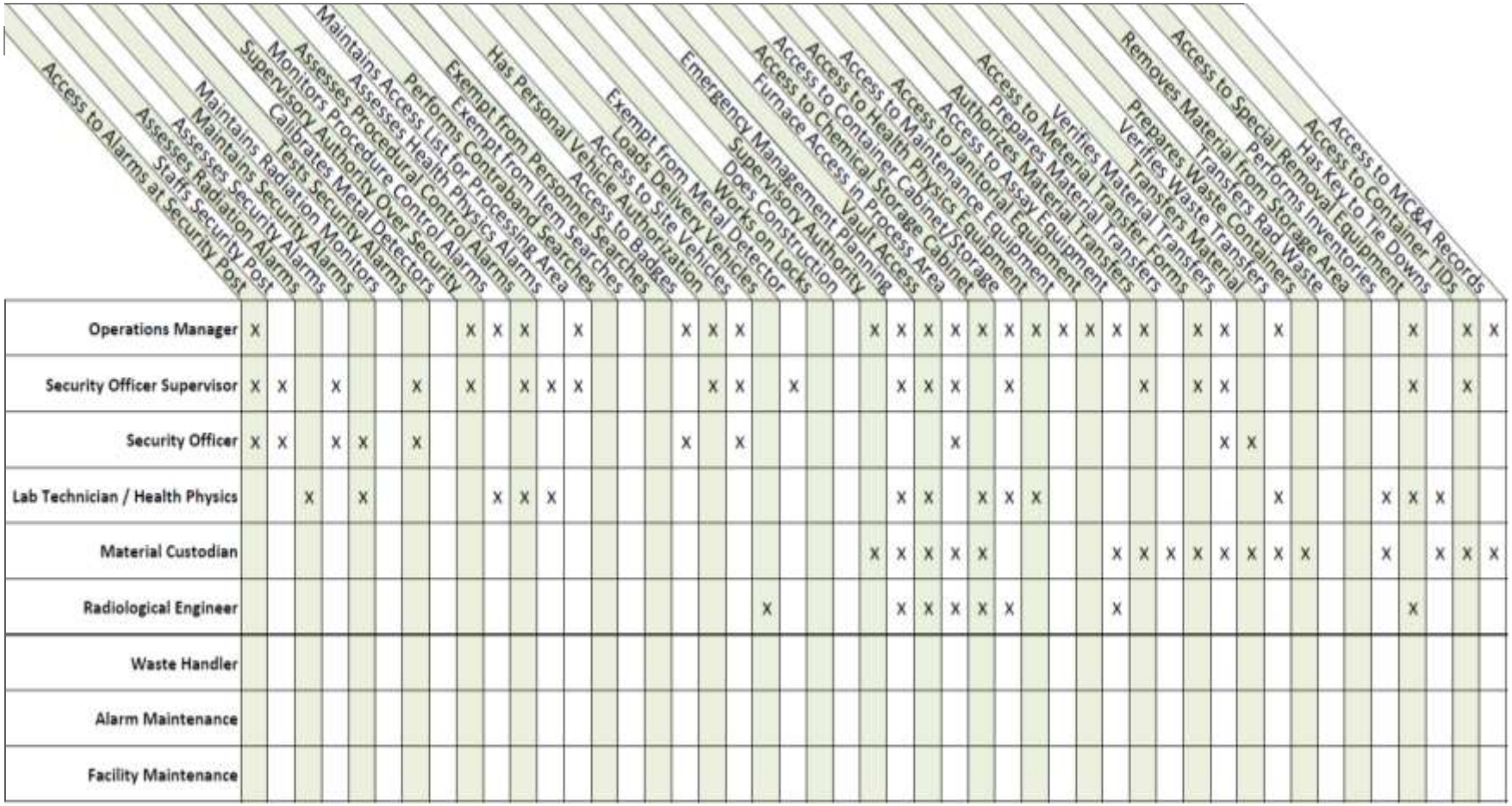
Abnormal Employee Behavior Policy

Any abnormal behavior must be reported immediately to the Operations Manager. If the Operations Manager is of suspect, the Security Officer will be notified.
Any employee who insists on working alone will be reported.
Management will evaluate all staff every 6 months. Any suspect employee will be removed from their work environment until the situation is remedied.

Other: Operations Security
At the time of hire, all employees will sign a nondisclosure agreement. Sensitive information will be protected at all times. Access will be based on/only granted to relevant roles and tasks.

Other: Records
All records will be kept for at least 2 weeks.
In the event an employee is terminated or transferred, his or her access must be changed or terminated immediately.

APPENDIX E: COMPLETED ROLES AND RESPONSIBILITIES WORKSHEET



	Access to Alarms at Security Post	Staffs Security Post	Assesses Radiation Alarms	Maintains Security Alarms	Tests Security Alarms	Calibrates Radiation Monitors	Supervisory Authority Over Security	Monitors Procedure Control Alarms	Assesses Procedural Control Alarms	Maintains Access List for Processing	Assesses Health Physics Alarms	Performs Contraband Searches	Exempt from Item Searches	Exempt from Personnel Searches	Has Personal Vehicle Authorization	Access to Badges	Access to Site Vehicles	Loads Delivery Vehicles	Exempt from Metal Detector	Emergency Management Planning	Supervisory Authority	Does Construction	Works on Locks	Furnace Access in Process Area	Access to Chemical Storage Cabinet	Vault Access	Access to Container Cabinet/Storage	Access to Health Physics Equipment	Access to Maintenance Equipment	Access to Janitorial Equipment	Authorizes Material Transfers	Access to Assay Equipment	Prepares Material Transfers	Verifies Material Transfers	Verifies Material Transfer Forms	Prepares Waste Transfers	Transfers Waste Containers	Transfers Material from Storage Area	Performs Inventories	Removes Material Equipment	Has Key to Tie Downs	Access to Container TIDs	Access to Special Removal Equipment	Access to MC&A Records
Operations Manager	X								X	X	X		X						X	X	X					X	X	X	X	X	X	X	X	X	X	X		X	X		X				X		X	X
Security Officer Supervisor	X	X		X			X		X		X	X	X							X	X		X				X	X	X		X				X		X	X						X		X	
Security Officer	X	X		X	X		X												X		X								X										X	X									
Lab Technician / Health Physics			X		X					X	X	X															X	X		X	X	X								X				X	X	X		
Material Custodian																								X	X	X	X	X						X	X	X	X	X	X	X	X		X		X	X	X
Radiological Engineer																				X					X	X	X	X	X					X									X					
Waste Handler																																																
Alarm Maintenance																																																
Facility Maintenance																																																