



Audit of Laboratory Safety

**Report No. 21/22-01
September 28, 2021**

FIU | Office of Internal Audit

Date: September 28, 2021

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From: Trevor L. Williams, Chief Audit Executive



Subject: Audit of Laboratory Safety, Report No. 21/22-01

We have completed an audit of Laboratory Safety for the period July 1, 2019, through December 31, 2020, and have assessed current practices through May 31, 2021.

The Department of Environmental Health and Safety helps to ensure compliance with laboratory standards, as well as all applicable regulations and best practices. Nevertheless, laboratory safety is a shared responsibility of lab personnel, department leadership, and Office of Research and Economic Development together with the Department of Environmental Health and Safety.

In summary, the University is in general compliance with local, state, and federal guidelines and regulations pertaining to hazardous materials and equipment. Although we noted no instances of serious safety violations, we have identified gaps in the management and operations of laboratories that when addressed, could result in strengthening safe operations of laboratories. Strengthening the specific areas of internal controls noted in the report will also contribute to the safe operations of University laboratories. We offered 11 recommendations to address the issues identified during the audit. Management has agreed to implement all recommendations offered.

We take this opportunity to express our appreciation to you and your staff for the cooperation and courtesies extended to us during the audit.

Attachment

C: FIU Board of Trustees

Mark B. Rosenberg, University President

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EXECUTIVE SUMMARY

The operation of laboratories on FIU campuses is vital to the University attaining its goal of promoting and fostering leading research and instruction. There are safety and regulatory risks that typically accompany such operations. We performed this audit to assess the extent of risk mitigation practices in place over lab safety. The audit considered various aspects of lab safety, including the governance structure in place, the protocols for ensuring the physical safety of lab personnel, the mechanisms for instilling safety consciousness, the effectiveness of the lab inspections program, and the level of compliance with regulations and safety standards.

In summary, we concluded that the University has established robust policies and procedures and effective governance and oversight practices to enforce regulatory compliance over lab safety. However, we have identified gaps in the operations of laboratories—some having a more direct impact on safety, others being operational in nature—that must be addressed. Specifically, internal controls and processes over lab safety could be strengthened by the following actions:

- The process the University's Department of Environmental Health and Safety (EH&S) has for identifying and inventorying covered labs and for managing and monitoring their lab safety inspection efforts is inefficient. EH&S should consider implementing an efficient process to improve management of lab safety inspections.
- Lab personnel refresher training completion rate is suboptimal. Ensure lab personnel are current with all required safety training.
- Delays in the notification and correction of lab deficiencies were noted. Timely report and resolve identified deficiencies.
- Inconsistent use of the chemical inventory system (EHS Assistant) was noted. EH&S should address this issue by ensuring implementation of its new system.
- Controlled substances were improperly purchased with departmental credit cards. Ensure controlled substances and other hazardous materials are purchased in accordance with University policies.
- Delays in approving payments for hazardous waste expenses were noted. Improve EH&S's internal process to facilitate timely submission of invoices for payment.
- Upon termination, certain former lab employees' electronic access to lab spaces was not deactivated and physical keys were not returned. Implement a process to review the access of terminated lab employees and timely remove their access to labs—electronic and keyed—once no longer required.

The reportable conditions found and background giving rise to the foregoing recommendations are detailed in the Observations and Recommendations section beginning on page 9 of this report. The report also provides an overall assessment of internal controls pertaining to the areas of lab safety audited (page 8). We have also included the mitigation plans management has proposed in response to our observations and recommendations, along with their implementation dates and complexity ratings.

OBJECTIVES, SCOPE, AND METHODOLOGY

The primary objectives of our audit were to determine whether controls and processes in place were adequate and effective; being adhered to; and compliant with University policies and procedures, and applicable laws, rules, and regulations. Specifically, we evaluated controls related to: (a) lab safety, (b) safety inspections of the labs, (c) chemical and controlled substance administration, and (d) environmental management. Our audit period was July 1, 2019, through December 31, 2020. We also assessed the current practices through May 31, 2021.

The audit was conducted in conformance with the *International Standards for the Professional Practice of Internal Auditing*, promulgated by The Institute of Internal Auditors. The audit included tests of the supporting records and such other auditing procedures, as we considered necessary under the circumstances. Audit planning and fieldwork were conducted from September 2020 through May 2021.

During the audit, we:

- reviewed University policies and procedures and applicable statutes, rules, and regulations (federal, state, and county, accordingly);
- interviewed personnel and documented the various facets of lab safety operations;
- observed current practices and techniques pertaining to maintaining a safe environment in labs;
- accompanied staff on lab inspections and evaluation of hazardous waste accumulation areas at the Modesto Maidique Campus (MMC), Biscayne Bay Campus (BBC), Engineering Center (EC), and FIU Center for Translational Science;
- evaluated the effectiveness of established controls and procedures over lab safety;
- tested the adequacy of internal controls and processes specific to lab safety;
- evaluated lab access controls for terminated employees; and
- applied data analysis techniques to evaluate lab inspection reports and identify improper purchases of hazardous materials or controlled substances.

Sample sizes and transactions selected for testing were determined on a judgmental basis applying a non-statistical sampling methodology.

An audit of laboratory safety¹ was last conducted by our office in November 2015. As a part of our audit, we reviewed that report to determine whether there were any prior recommendations that required follow-up. We noted that three of five recommendations were fully implemented. The conditions related to the other two recommendations were again observed during the current audit as discussed on pages 11 and 15. Additionally, during our audit period, the Miami-Dade County Department of Regulatory and Economic Resources conducted an external inspection and reported no violations. Thus, further follow-up to their report was not required.

¹ Audit of Laboratory Safety, Report No. 15/16-04, issued on November 6, 2015.

BACKGROUND

The Occupational Safety and Health Administration (OSHA) Laboratory Standard, 29 CFR 1910.1450, "Occupational exposure to hazardous chemicals in laboratories," sets forth requirements for all employers that engage in the laboratory use of hazardous chemicals. As such, FIU is committed to meeting its obligations under this standard and to providing a safe and healthy workplace. The Department of Environmental Health & Safety helps to ensure compliance with the laboratory standard, as well as all applicable regulations and best practices. However, lab safety is a shared responsibility among the lab personnel, their department leadership, Office of Research and Economic Development (ORED), and EH&S.

EH&S evaluates University operations ranging from residential living to lab research. The department's programs are designed to provide a foundation, clear guidance, and the resources to help maintain a safe, environmentally friendly campus as it relates to the following:

- Biological Safety
- Chemical Safety
- Controlled Substances Safety
- Environmental Compliance
- Fire Prevention and Protection
- General Safety
- Industrial Safety
- Laboratory Safety
- Laser Safety
- Radiation Safety
- Safety Training

The Laboratory Safety program helps researchers, lab managers, and supporting lab staff establish a safe work environment and maintain compliance with local, state, and federal regulations. EH&S staff provides oversight and guidance related to:

- use, storage, and disposal of hazardous materials;
- research proposal safety reviews;
- hazard assessments;
- lab equipment certifications;
- development of specific laboratory safety programs;
- new lab walkthroughs/consultations; and
- special hazard materials/equipment approvals.



Currently, EH&S has identified approximately 441 labs at the University that require compliance inspections to be performed by their department (covered labs). Specifically, these labs are areas in which hazardous materials or equipment are utilized.

Chemical Hygiene Plan

The FIU Chemical Hygiene Plan (CHP), required under the OSHA laboratory standard, replaced the University's former Laboratory Safety Manual. The CHP was developed by EH&S and is a written set of policies and procedures that provides operating guidelines for laboratory operations and chemical safety at the University. The CHP outlines information pertaining to health and safety training, personal protection, medical evaluation and consultation, housekeeping and maintenance, laboratory safety equipment, environmental monitoring, safety consideration for hazardous material, emergency response procedures, and recordkeeping requirements.

According to the CHP, the labs' Principal Investigator (PI), Instructor, and/or Laboratory Manager serve as the supervisor of the laboratory. Some of their responsibilities include the following:

- Ensuring that laboratory personnel and students are advised of and follow prudent safety practices; that protective equipment is available and in working order; and that the specific precautions applicable to the type of work being conducted have been provided, assuring that emergency response procedures for the area(s) under their control are maintained current and appropriate for the type of occurrences to be expected in such locations.



- Assuring access control procedures have been developed and are complied with for the laboratory or work area under their control.
- Maintaining current laboratory chemical inventory.
- Providing timely notification to EH&S of process, procedural, or facility-related changes within their area of operation which would likely change the hazard rating assigned to that location.
- Identifying those substances and equipment, such as explosive materials or lasers, used in their laboratories that may pose a high risk of injury and/or property damage and implementing procedures to control exposures.
- Notifying EH&S of problems related to the general operation and implementation of laboratory safety practices and engineering controls.

Moreover, the CHP states that the EH&S Laboratory Safety Team assists department leadership, PIs, and laboratory managers in achieving compliance with laboratory safety standards by doing the following:

- Assisting PIs in the selection of best laboratory safety practices, personal protective equipment, and engineering controls.
- Conducting laboratory safety inspections, at the frequency prescribed by the degree of hazard of each laboratory.
- Facilitating and scheduling appropriate training and dissemination of topical information to promote safe laboratory practices.
- Monitoring laboratory personnel for potential exposure to hazardous substances.
- Providing guidance on administrative and procedural controls for the safe management of regulated substances.
- Facilitating safe storage, handling, and ultimate disposal of hazardous wastes generated by maintaining the Manual [CHP] current to address changes in regulations, technology, etc.
- Providing a process for reporting accidents and near-miss accidents to help identify hazards, safety concerns, and issues that could pose a threat to the health and safety of laboratory personnel and environment.
- Investigating all reported accidents that result in personnel or environmental exposure to hazardous materials and recommending corrective action to reduce the likelihood for recurrence.
- Assuring the adequacy of clean-up and decontamination procedures in situations where accidents have resulted in contamination of laboratory areas.

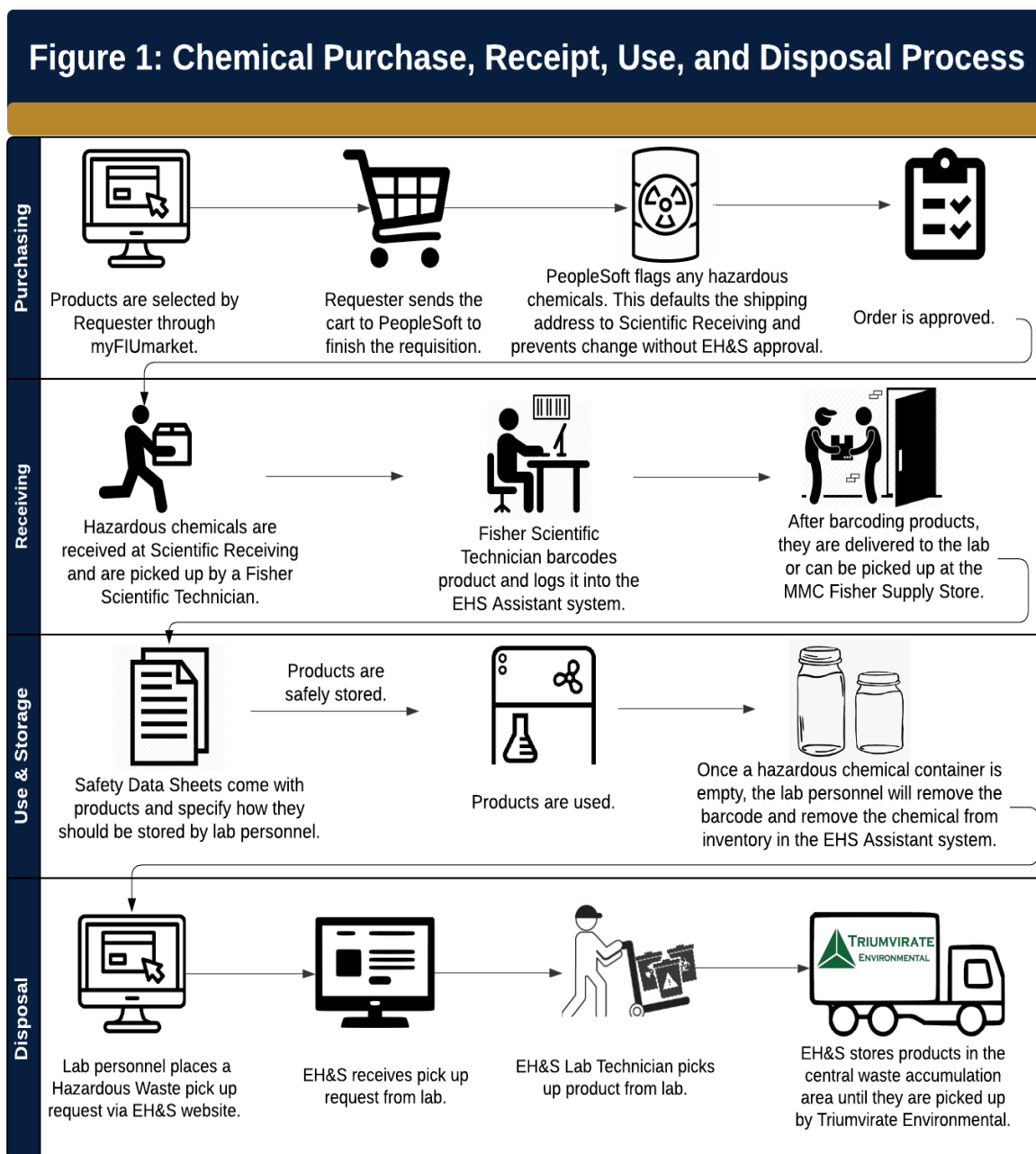
Chemical Purchase, Use, and Disposal Process

As a part of safety considerations for hazardous material, the CHP addresses lab security, purchasing, storage, distribution, and waste management requirements for hazardous materials. Hazardous materials include hazardous chemicals, radioactive materials, lasers, and biological and infectious materials. In general, all hazardous chemicals must be accounted for (inventoried) in each space, and all waste generated must be appropriately stored until picked-up by EH&S personnel for proper removal and disposal.

To help with tracking of hazardous chemicals purchased, EH&S contracted with Fisher Scientific to facilitate the barcoding of all hazardous chemicals arriving at FIU sites. In addition, EH&S utilizes a web-based software, called EHS Assistant. Through the system, users are able to access, enter, and update chemical inventory. EHS Assistant is to be

used to help PIs and laboratory managers manage the purchase, receipt, and use of the labs' chemical inventory.

The process flow below provides a high-level overview of the chemical purchase, receipt, use, and disposal process.

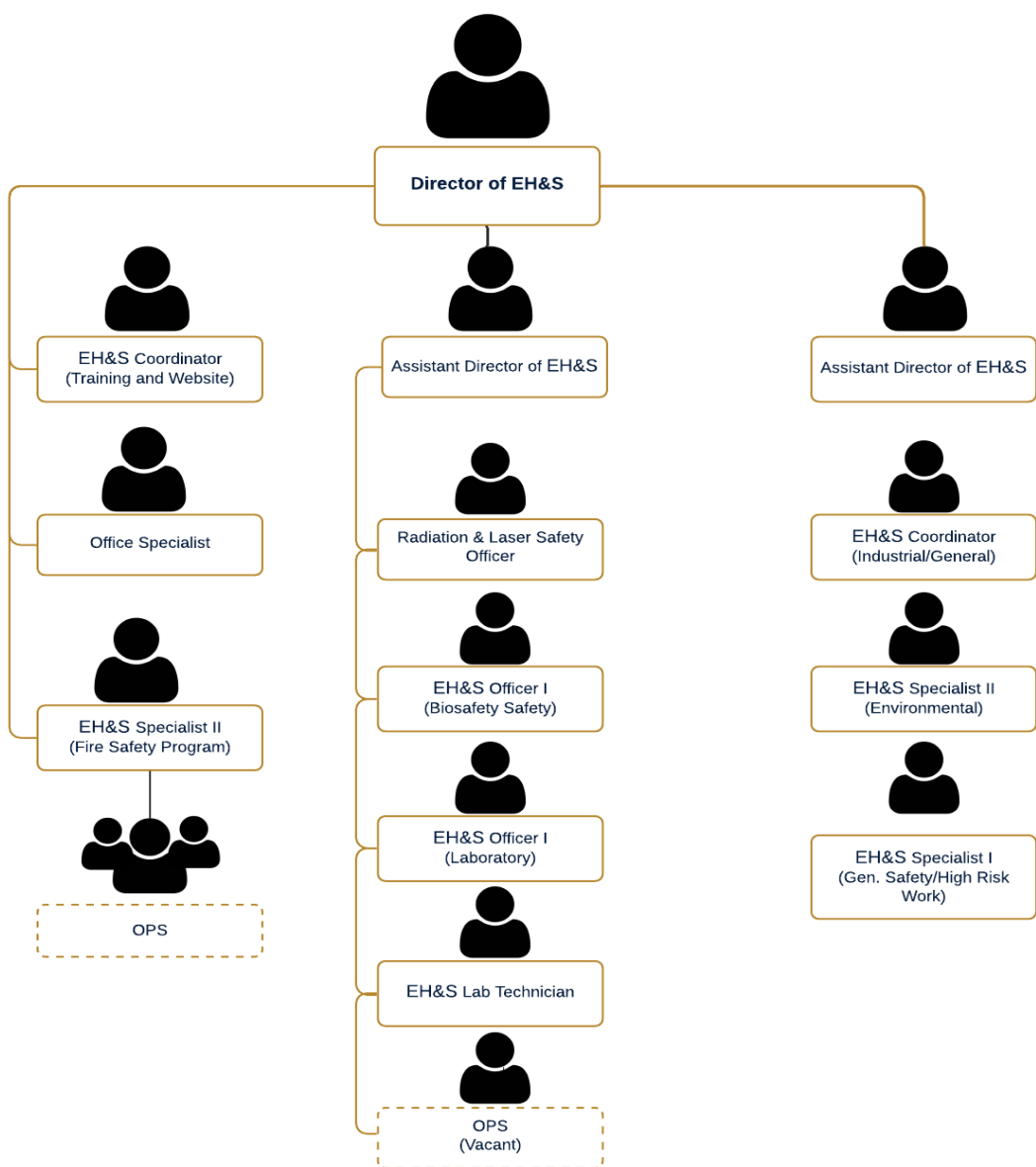


Source: Environmental Health & Safety (EH&S)

Organizational Structure

Principle Investigators and laboratory managers are overseen by either ORED or the Department Chair or Dean of their respective College or School. The Director of EH&S serves as the University's laboratory safety program administrator. Below is the organizational structure for the Department of Environmental Health and Safety.

Figure 2: Environmental Health & Safety Organizational Chart



Source: Environmental Health & Safety (EH&S)

OVERALL ASSESSMENT OF INTERNAL CONTROLS

Our overall assessment of internal controls is presented in the table below.

CRITERIA	SATISFACTORY	OPPORTUNITIES TO IMPROVE	INADEQUATE
Process Controls		X	
Policy & Procedures Compliance		X	
Effect	X		
Information Risk		X	
External Risk	X		
INTERNAL CONTROLS LEGEND			
CRITERIA	SATISFACTORY	OPPORTUNITIES TO IMPROVE	INADEQUATE
Process Controls (Activities established mainly through policies and procedures to ensure that risks are mitigated, and objectives are achieved.)	Effective	Opportunities exist to improve effectiveness	Do not exist or are not reliable
Policy & Procedures Compliance (The degree of compliance with process controls – policies and procedures.)	Non-compliance issues are minor	Instances of non-compliance are evident	Non-compliance issues are pervasive, significant, or have severe consequences
Effect (The potential negative impact to the operations, financial, reputational, social, etc.)	Not likely to impact operations or program outcomes	Impact on outcomes contained	Negative impact on outcomes
Information Risk (The risk that information upon which a business decision is made is inaccurate.)	Information systems are reliable	Data systems are mostly accurate but need to be improved	Systems produce incomplete or inaccurate data which may cause inappropriate financial and operational decisions
External Risk (Risks arising from events outside of the organization's control; e.g., political, legal, social, cybersecurity, economic, environment.)	None or low	Potential for damage	Severe risk of damage

OBSERVATIONS AND RECOMMENDATIONS

Areas Within the Scope of the Audit Tested Without Exception:

Lab Safety Governance

We tested to determine whether the appropriate safety committees have been established to develop lab safety and research protocols and to oversee compliance. The University has the 12 committees listed below that are overseen by ORED or EH&S. Committee members include University faculty and staff from various departments.

- | | |
|---|---|
| ❖ FIU-Nanotechnology Safety Committee | ❖ FIU-Radiation Control Committee |
| ❖ FIU-Institutional Biosafety Committee | ❖ FIU-Institutional Review Board |
| ❖ FIU-Controlled Substances Committee | ❖ FIU-Diving Control Board |
| ❖ FIU-Laser Safety Committee | ❖ FIU-Boating Safety Committee |
| ❖ FIU-Institutional Review Entity | ❖ FIU-Lab Safety Committee |
| ❖ FIU-Institutional Animal Care and Use Committee | ❖ FIU-Conflict in Interest Research Committee |

We selected and reviewed meeting agendas and minutes for three committees: the FIU-Lab Safety Committee, FIU-Institutional Biosafety Committee, and the FIU-Institutional Animal Care and Use Committee. We concluded that all three committees met regularly during our audit period and addressed issues that are relevant to the respective committee.

Hazardous Waste Management

During our audit period, lab personnel requested 1,007 hazardous waste pickups. EH&S's process is to collect waste within one to five business days once a request has been generated. We reviewed applicable documentation for a sample of 20 pickup requests (2%) and found that on average, waste was collected from labs within four business days from the request date.

In addition, we evaluated the hazardous waste storage facilities at MMC and BBC and reviewed the University's contingency plan, *Spill Prevention Controls and Countermeasure Plan*, for compliance with federal regulations. Pursuant to 40 CFR §265.52(d), the plan must list names, addresses, and phone numbers (office and home) of all persons qualified to act as emergency coordinator, and this list must be kept up to date. We noted that the contact information in the contingency plan needed to be updated, as it listed former employees of the University. EH&S updated the document accordingly. Apart from this, we concluded that EH&S has adequate controls in place for collecting, storing, and disposing of chemical waste.

Furthermore, we evaluated waste manifests and the process once hazardous waste is removed from the University by the contracted supplier. Our observations in this area are discussed in Observation No. 4, Hazardous Waste Disposal Expenses.

Controlled Substances Inspections

The University's Controlled Substances Safety Manual ("Manual") states: "the Controlled Substance Committee (CSC) provides guidance and oversight over all aspects of use and management of CS [controlled substance] and instructional purposes within the University. The CSC develops University policies and procedures and guidelines to ensure that all possession, use and disposition of CS by the University personnel at Florida International University comply with pertinent federal and state regulations and with the specific conditions of permits (registrations) issued to the University researchers." In addition, the Manual states, "a representative from EH&S will inspect each laboratory or research facility using CS on at least an annual basis using the Controlled Substance Inspection Checklist..."

EH&S informed us that their inspection schedules were affected by lab shutdowns during the COVID-19 pandemic and most labs did not receive a true controlled substance inspection during our audit period, which would typically utilize the Controlled Substance Inspection Checklist. Therefore, a minor or limited review of controlled substances was included during the general safety inspections of the labs. As such, 15 of 17 labs (88%) that utilize controlled substances have since had a general safety inspection performed by EH&S and two labs (12%) did not. We also performed a walkthrough of three labs and found that adequate controls were in place over the storage, safeguarding, and use of controlled substances in those labs.

Areas Within the Scope of the Audit Tested With Exception:

1. Lab Safety

EH&S's laboratory safety program entails compliance inspections (general safety or hazard specific inspections) that are performed by EH&S and Laboratory Self Audits (LSA) that are performed by lab personnel.

In 2016, EH&S upgraded use of the EHS Assistant software and launched the LSA program. The purpose of these initiatives was to effectively manage the lab safety function, maintain lab inventory data, and ensure lab space information was up-to-date and accurate. EHS Assistant lab location information is populated from data in the FAMIS² database. EH&S has access to FAMIS, which provides them with real-time information on lab space assignments, designations, and activity status.

The LSA is a general self-inspection conducted annually by personnel of FIU laboratories containing hazardous materials and is intended to cultivate a proactive approach to safety and regulatory compliance. EH&S identified 428 of the 441 covered labs that are required to complete the LSA and have a general safety inspection performed. EH&S utilizes the LSA as a feeder source, in conjunction with their annual general safety inspections, for identifying special hazards, deficiencies, and compliance concerns. In addition, the LSA allows EH&S to assist in implementing corrective actions by educating users on best laboratory practices and procedures. Labs are given a specific time frame to complete the LSA. The period for completing the 2020 LSA was September 9, 2020, through November 18, 2020.

Lab Inspection Data

To evaluate controls over the lab inspection process, we requested the population of covered labs with their corresponding hazard categories, the last date of inspection, and the most current LSA results. EH&S provided various spreadsheets, specifically: EHS Spaces; Research Labs in the FAMIS system; Emergency Lab Signage; Lab Locations and PI; and Open Labs During COVID. According to EH&S, the population of covered labs is determined by obtaining information from various sources, including Qualtrics reports or different spreadsheets with varying numbers of labs, inspection dates, lab personnel, and other data. We reviewed the spreadsheets and noted several discrepancies in the information, such as different PIs associated with the same space and inconsistent labeling of lab spaces, which made it difficult to easily identify the covered labs. A similar condition was noted in our prior audit of lab safety in 2015, in which there were discrepancies and inaccurate information in the list of labs provided from various spreadsheets or systems.

² FAMIS (Facilities Administration Management Information System) identifies and tracks departments that reside in each space. For each space, the system has a department ID that is assigned and used for the purpose of identifying occupancy and management.

Based on our observation and discussion with EH&S, the following are examples of issues encountered when trying to maintain a comprehensive and accurate list of covered labs:

- Shared spaces – Difficulty accounting for various open lab areas, shared spaces and/or rooms used by multiple PIs.
- Personnel changes – EH&S is not always informed of space reassignments or lab turnover (e.g., if a PI retires).

We also noted that EH&S is not currently utilizing EHS Assistant for recordkeeping of lab inspection data. EH&S informed us that they are reevaluating the capabilities and continued use of EHS Assistant since the program is outdated, not user-friendly, and is not adequately supported by the supplier. Currently, EH&S utilizes a combination of paper inspection checklists, Qualtrics surveys, and email communications to document lab inspections. In addition, they work closely with ORED and Academic Space to update lab information on their spreadsheets whenever they identify a change of lab information during their visits to the labs.

Use of an effective data management tool can be helpful in organizing lab inspection information and monitoring corrective actions of safety violations, in addition to ensuring lab inspections are effectively prioritized, managed, and performed at least annually or in accordance with regulatory requirements.

General Safety Inspections

A general safety inspection is required annually for each covered lab. During the audit period, 312 of 428 labs (73%) completed the LSA—a 24% increase over 2019's total of 251. A general safety inspection was conducted by EH&S on the remaining 116 labs (27%) that did not complete the LSA. We were informed that COVID-19 affected the inspection schedule during fiscal year 2019-2020 and the beginning of fiscal year 2020-2021. When the University transitioned to a remote work environment, many labs were not in use, which limited physical inspections, and EH&S's priorities shifted to assist with COVID-19-related matters for the University and for labs that remained open. Additionally, EH&S made a strategic decision to use the completed LSAs in lieu of performing onsite inspections, under the circumstances.

We selected 41 labs and reviewed the latest EH&S inspection reports, LSA results, and other applicable supporting documentation for any deficiencies or violations that were reported. Additionally, we accompanied the Assistant Director of EH&S to perform onsite inspections of 35 labs. Labs that were not included in the onsite inspections were those that completed the LSA, had an inspection performed, and did not have any safety issues, violations, or deficiencies noted, and therefore, no follow-up was needed by EH&S – six in total (15%).

Our results for the 35 labs where onsite inspections were conducted were as follows:

- 20 labs (49%) needed to update the contact information in their policies and procedures. Since this was the case with most of the labs, EH&S sent out an email notifying all PIs and lab managers to update their procedures, accordingly.
- 15 labs (36%) had safety issues, violations, or deficiencies noted. We further requested and reviewed supporting documentation to determine if the violations were timely reported and corrected.

We concluded the following:

Table 1: Reporting and Correcting Safety Violations		
Reporting:	Count (Labs)	Percentage
Issues were reported to PI or lab manager within 7 days of inspection date. (No exception noted):	11	73%
Issues were not reported to PI or lab manager within 7 days of inspection date. (Exception noted):	4	27%
Totals	15	100%
Corrective Action:	Count (Labs)	Percentage
Issues were corrected within 30 days. (No exception noted):	4	27%
Issues were not corrected within 30 days. (Exception noted):	11	73%
Totals	15	100%

Our analysis disclosed that although safety violations were mostly communicated in a timely manner, they were not being timely corrected or fully resolved and followed-up.

We followed up with EH&S on the 11 labs pending corrective action. The related EH&S inspection notes reported deficiencies and violations, including: failed and/or expired fume hood or biosafety cabinet certifications, blocked access to emergency showers and eye wash stations, chemical waste not in a secondary container, hazardous waste not properly labeled, unsecured gas cylinders, loose electrical cords or wires, a full sharp glass container with glass sticking out, no signage on refrigerators or freezers to indicate content and hazards, too many gas cylinders in one space, and improper use of fume hoods (used as storage for chemicals or other items). Several other housekeeping issues were also noted such as clutter, poor hygiene or best practices not being observed, excessive items in aisles, on floors and under bench tops, and old equipment or leftover chemicals from a previous PI that are not being used.

EH&S determined that these violations did not require escalation of lab closure and had granted lab personnel extensions beyond the 30-day timeframe to comply. We were informed that these allowances or extensions are granted on a case-by-case basis. However, guidelines describing the circumstances for granting such extensions have not been formally established in writing. According to EH&S, 10 labs have since corrected the identified safety violations and one lab is closed and is not currently operational. EH&S indicated that most of the corrective actions were confirmed via email or in-person visits. However, the supporting documentation subsequently provided by EH&S did not demonstratively evidence full remediation of all identified safety violations.

Safety Training

EH&S transitioned lab safety training courses from the Moodle Learning Management system to the FIU Develop platform in August 2020. We requested a list of all employees working in the 41 labs selected for testing, which included a total of 81 PIs, lab managers, and other lab personnel.

We obtained training reports from EH&S and tested 100% of the employees to determine if they were up to date with their training renewal requirements for the following:

- The core training courses required for all lab employees, specifically, Laboratory Hazard Awareness, Hazard Communication (HAZCOM) and Fire Safety; and
- Other lab-specific training courses, which varies depending on the type of hazardous materials used in the labs.

The results of our review are presented in the following table:

Table 2: Lab Safety Training – Renewal Completion Rates				
Course Name	Completed	%	Not Completed	%
Laboratory Hazard Awareness	39	48%	42	52%
Hazard Communication (HAZCOM)	41	51%	40	49%
Fire Safety	43	53%	38	47%
Other - Lab Specific Courses*	6	10%	57	90%

* Applicable for only 63 of the 81 employees tested.

In addition, we identified several challenges in EH&S's current process to verify training requirements during lab inspections. These include:

- 1) The Lab Safety Officer may not have full knowledge at the time of the inspection of all employees currently working in the lab. ORED knows the faculty member assigned to the lab (the PI), but other personnel may have been hired and/or terminated throughout the year without ORED's knowledge. Thus, relevant training documentation for those employees may not be in the training binders reviewed by the Lab Safety Officer during the inspection.
- 2) The location of the training documents in the lab may not be known to the Lab Safety Officer. If the lab manager or PI is not present or the lab is vacant at the time of inspection, the Lab Safety Officer would not be able to verify this information.
- 3) Training records might be stored electronically instead of a physical hard copy stored in a binder. Therefore, the Lab Safety Officer would not have access to training details if the lab were vacant at the time of the inspection.
- 4) Beyond the required core training courses, some labs require additional training be completed depending on the respective hazardous material used in the lab. It may be difficult for the Lab Safety Officer to verify with certainty during the inspection if all requirements have been met.

Completion of renewal training courses could limit the risks to lab employees that may range from personal injury to themselves or others, unhealthy exposure to hazardous materials, and non-compliance with regulatory requirements, which could result in fines and adverse public relations for the University. Employees who are knowledgeable and properly trained are better able to identify and minimize safety risks.

During our prior audit of lab safety in 2015, we identified similar issues with lab personnel not completing safety training courses and EH&S's inability to identify and notify these employees and their supervisors of training delinquencies.

Recommendations

Environmental Health & Safety should:	
1.1	Implement a better system for data management of lab inspections. This should include all related inspection dates for a particular lab, safety violations noted and reported, corrective actions taken, follow-up and/or escalation of issues, and documentation of related correspondence until the issue is resolved.
1.2	Formally define guidelines for granting extensions for correcting violations and ensure safety violations are corrected and resolved in a timely manner.

1.3	Obtain a list of approved lab occupants from FAMIS, utilize FIU Develop to confirm training compliance, and establish escalation protocol for notifying lab occupants, their supervisors, and appropriate University personnel of any delinquencies to ensure all lab personnel complete required renewal training courses at the appropriate frequency. To ensure the proper level of responsiveness to the notification of delinquencies and accountability is achieved, EH&S should initiate a discussion with the appropriate University units, including Academic Affairs, ORED, and Human Resources regarding the development of a process whereby the University, through the appropriate department, may take intervening action, as permitted by agreements and contracts, for unresolved delinquencies.
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Management Response/Action Plan

- 1.1 EH&S met with representatives of iAuditor, a software system designed to track lab inspections from beginning to end. This system meets the department's needs and addresses the gaps identified during the audit. It was purchased on September 8th and will be implemented by the end of the month.

Implementation date: September 30, 2021

Complexity rating: 1

- 1.2 The guidelines for violation criteria and granting extensions are now formally documented in the EH&S Chemical Hygiene Plan (CHP) on page 28 (under section 6.3.1 Safety Violations). The updates will be communicated to users via the EH&S listserv. To ensure efficient tracking and resolution of safety violations, EH&S is implementing the inspection database system mentioned in 1.1.

Implementation date: Immediately

Complexity rating: 1

- 1.3 EH&S will continue to work with ORED and FAMIS to obtain an updated list of lab occupants to ensure completion of initial and refresher training. EH&S has already implemented the use of FIU Develop analytics to track training completion. In addition, FIU Develop is programmed to send out renewal notifications to users once training certificates expire. EH&S reached out to contacts in Academic Affairs and HR to discuss piggybacking the current escalation procedures for training compliance delinquencies. A meeting will be scheduled before the end of the month to finalize procedures. EH&S will also work with FIU DoIT to add EH&S courses to the FIU Oracle Business Intelligence (BI) Organizational Learning Tracking Dashboard to monitor training completion compliance and assist in initiating escalation notifications.

Implementation date: September 30, 2021

Complexity rating: 1

2. Chemical Inventory

Pursuant to University Policy No. 125.405, *Security in Laboratories with Special Hazards*, “Special Hazard Materials (SHM) include, but are not limited to, radioactive materials, Drug Enforcement Administration (DEA) controlled substances, select agents, carcinogenic and explosive materials, infectious materials, and laser devices, and any other hazardous materials, the purchase, handling, storage or transfer and disposal of which is regulated by federal, state, or local laws.”

In addition, the policy states: “All research and academic laboratories approved to possess SHM, must maintain current and accurate records of their inventory of SHM (ordered, received, stored, used, transferred, and disposed) for three (3) years or more, as designated by the applicable safety program requirements.”

EH&S has also developed internal guidelines for the tracking and monitoring of hazardous material, including to the ordering, barcoding, and use of chemicals.



We obtained a Chemical Inventory Report from EHS Assistant for six labs. We selected approximately 15 chemicals per lab (87 in total) and traced the items from the report to the lab or from the lab to the report for accuracy. Amongst other relevant information, the report sometimes listed the National Fire Protection Association (NFPA) Rating. This rating indicates the health, flammability, reactivity, and special hazards for many hazardous chemicals based on NFPA 704³. The higher the rating, the more potentially hazardous the item. Items were selected at random and when available, based on the NFPA rating.

We traced 68 chemicals (78%) from the report to the lab and vice versa with no exceptions. We could not trace the remaining 19 chemicals (22%) for the following possible reasons:

- 1) The item could be a legacy chemical, meaning it was purchased prior to EH&S's implementation of the chemical barcoding process and the EHS Assistant system, and therefore, may not be found on the Chemical Inventory Report.
- 2) The item may have been used and disposed of but was not properly removed from inventory in the system, and thus would still show as being in the lab's inventory on the Chemical Inventory Report.

³ NFPA 704 is a standard system for the identification of the hazards of materials for emergency response.

Overall, we found that chemicals were properly stored. Notwithstanding the general conditions of the labs noted above, we noted two significant matters of concern as follows:

- **Inconsistent practice for updating inventory.** Although EH&S guidelines specify that once a hazardous chemical container is empty, the assigned lab personnel is to remove the barcode and remove the chemical from inventory via the EHS Assistant system, not all labs are utilizing EHS Assistant or following this process. For example, some labs remove and save the barcode, then occasionally give them to EH&S to remove the items from the system. Other labs may utilize a different chemical management system that provides benefits specifically needed for their type of work (e.g., chemical conversion tables) and is better equipped for maintaining their chemical inventory. These labs may simply send a report to EH&S of their updated chemical inventory. EH&S would then update EHS Assistant accordingly.
- **Use of the EHS Assistant system.** As noted above, management explained that some labs are not currently using EHS Assistant to manage the inventory of hazardous materials. EHS Assistant serves as FIU's central source for maintaining chemical inventory information and allows the University to meet Environmental Protection Agency regulations when required to report how much of a particular hazardous chemical there is on campus. In addition, EH&S runs reports from the system to provide emergency officials similar information. Decreased or non-use of EHS Assistant can ultimately lead to inaccurate knowledge of the type, quantity, and location of hazardous chemicals on each campus.

We were informed by EH&S that over the past two years (since 2019), they were developing an in-house chemical management system in collaboration with the Division of Information Technology (DoIT). The system is integrated with the FAMIS and HR systems. EH&S and DoIT piloted the system with lab personnel and used the feedback to make improvements. The launch of the new system is scheduled for August 2021. EH&S will continue to use EHS Assistant until the transition to the new system is complete.

Recommendation

Environmental Health & Safety should:	
2.1	Ensure full implementation of their new chemical management system and disable EHS Assistant. The implementation should include the necessary notification and training to system users.

Management Response/Action Plan

- 2.1 The new EH&S Chemical Inventory Tracking System was officially launched and implemented on August 16, 2021. On August 16th, EH&S hosted a virtual meeting with lab users to review use of the system and address any concerns/questions. Information pertaining to the new system was distributed via the EH&S listserv on August 12th and 16th. Information is also available on the EH&S website (Announcements and Chemical Safety tabs). EH&S continues to work with DoIT to address any system issues and user requests. Onsite Systems was notified to disable EHS Assistant on September 8th, 2021.

Implementation date: Immediately

Complexity rating: 1

3. Purchases of Controlled Substances

EH&S's responsibilities include issuing purchase and use approvals for controlled substances and auditing the records and procedures of individuals and departments that have possession of controlled substances under DEA Registration Certificates issued to University researchers and/or departments.

As of May 2021, the University had 14 DEA permits to purchase controlled substances (two of which were registered to the Student Health Center Pharmacy and were excluded from our scope), and 15 users (i.e., PIs) that were approved to purchase and utilize controlled substances.

The University's Departmental Card Guidelines & Procedures disallows purchases of hazardous materials [biohazard, radioactive materials and chemicals, and controlled substances, including drugs, alcohol, and tobacco] with the departmental card.

In addition, the Controlled Substances Safety Manual states that the Purchasing Department is responsible for the proper processing of requisitions for controlled substances purchases and will coordinate such purchases with the Controlled Substance Safety Officer (CSSO). All orders for Schedule I and II controlled substances must include a DEA Form 222. Pursuant to DEA Title 21 CFR 1305.17,

"DEA Forms 222 must be maintained separately from all other records of the registrant. DEA Forms 222 are required to be kept available for inspection for a period of two years. If a purchaser has several registered locations, the purchaser must retain a copy of the executed DEA Form 222 and any attached statements or other related documents (not including unexecuted DEA Forms 222, which may be kept elsewhere under §1305.12(e)), at the registered location printed on the DEA Form 222."

To test controls in this area, we obtained a log of controlled substances purchases approved by EH&S during the audit period. We selected four purchases to determine if applicable requirements were met and noted the following:

- We were unable to identify the method of purchase (i.e., purchase order or university credit card) for two (50%) of the purchases. It was noted that EH&S does not specifically require this information to approve a purchase of controlled substances.
- One purchase (25%) of controlled substances was made from a supplier (Cayman Chemical) utilizing the university credit card, which is not allowed.
- We obtained and reviewed the DEA Forms 222 EH&S received from the registrants, at our request. Our review revealed that only one of the four purchases of Schedule I or II controlled substances selected had a DEA Form 222, which details agreed with the controlled substances approved in the EH&S log. For the other three purchases tested, the DEA Forms 222 provided

did not agree with the controlled substances approved for purchase in the EH&S log.

To further determine the extent of controlled substances purchased with the department card, we requested from Procurement Services a list of vendors that supply hazardous materials. Fisher Scientific⁴ and Cayman Chemical were identified as vendors mostly used. Since Fisher Scientific does not sell controlled substances, we reviewed all 48 credit card invoices from Cayman Chemical during our audit period, totaling \$13,886. Our analysis disclosed the following:

- ❖ 20 invoices (42%), totaling \$4,076, did not contain controlled substances.
- ❖ 25 invoices (52%), totaling \$9,190, contained controlled substances—a disallowed use of the department card.
- ❖ Three invoices (6%), totaling \$620, of which two were only for shipping charges (\$252) and one for unknown charges of \$368, as we were unable to open the document (i.e., the invoice) through the financial system.

Unauthorized purchases with the department card could potentially bypass the controls to ensure EH&S approves all purchases of controlled substances and to ensure compliance with University policies and federal and state regulations.

In addition to the regulatory requirements stated above, DEA Title 21 CFR 1304.11, *Inventory Requirements*, requires a biennial inventory of controlled substances. We noted that EH&S requested updated inventory of all controlled substances from PIs and lab managers in March 2021 to meet this requirement.

EH&S informed us that the controlled substances program is in the process of undergoing a review and update in procedures to reflect changes in the current process and address the observations mentioned in this report.

Recommendations

Environmental Health & Safety should:	
3.1	Ensure that labs that purchase controlled substances are properly maintaining DEA Form 222 and have them readily available upon inspection.

⁴ As permitted by an approved exception, *the purchase of hazardous chemicals/materials with the university card is limited exclusively to Fisher Scientific on an emergency/expedited basis only.*

Procurement Services Department should:	
3.2	Review the invoices where controlled substances were purchased with the departmental card and determine what further actions are warranted with the respective cardholders.
3.3	Provide communication to the PIs and the respective cardholders to reinforce adherence to the University's Departmental Card Guidelines & Procedures when purchasing controlled substances and other hazardous materials. Also, work with EH&S to ensure all suppliers that distribute controlled substances are included in the department's periodic audits to identify cardholder violations.

Management Response/Action Plan

- 3.1 EH&S will send reminders to all controlled substance registrants to maintain DEA 222 forms at the beginning of each semester. EH&S will continue to verify this action during the scheduled compliance visits and escalate as necessary to the appropriate departmental units.

Implementation date: September 30, 2021

Complexity rating: 1

- 3.2 The Credit Card Solutions Team will review the 25 items identified in this review for appropriateness. If validated, a violation email notification will be sent to both the cardholder and their departmental approver, to educate on the appropriate process for procurement of controlled substances. The Controller's Office Quality Assurance Team and Environmental Health and Safety will also be copied in the notification sent to the department.

Implementation date: September 30, 2021

Complexity rating: 1

- 3.3 Because there is not a VISA MCC specific to Controlled Substances and to block chemicals would dramatically impact program efficiency, as many purchases under this umbrella are allowable; our preventative measures will continue to be mostly end-user education. The Credit Card Solutions Team will proceed with the following interventions: an immediate reminder email will be sent out to all Pcard Program Participants via our cardholder/approver dedicated listserv with a reminder of the restriction of purchasing Controlled Substances and Hazardous Materials with the university PCard. Additionally, a reminder article will be published, no less than bi-annually, in the Controller's Office Panther Post Newsletter, reminding program participants of the restriction of purchasing Controlled Substances and Hazardous Materials with the university PCard. In Q1 of FY22, the Credit Card Solutions program completed a mandatory retraining of all program participants, where they

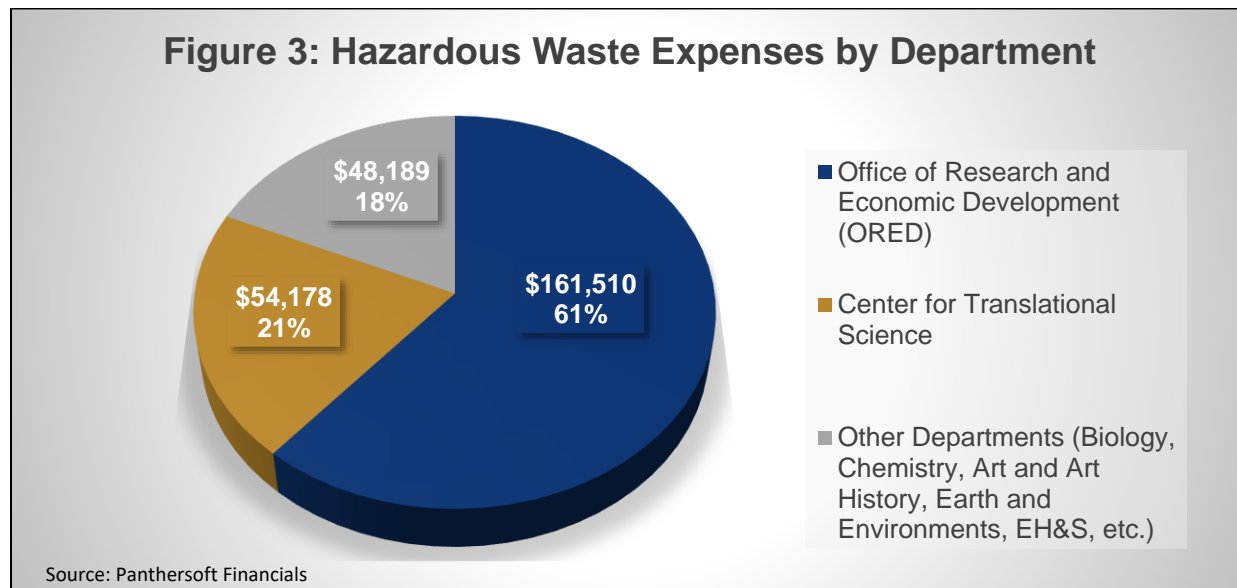
were reminded of the rules and regulations (including hazardous materials/controlled substances). Additional verbiage will also be added to ORED's PI Orientation, advising them on the restriction of purchasing Controlled Substances and Hazardous Materials with the university PCard.

Implementation date: September 30, 2021

Complexity rating: 1

4. Hazardous Waste Disposal Expenses

Expenses for hazardous waste collection and disposal totaled \$263,877 comprising a total of 61 invoices for the period audited. A breakdown of cost by department is shown in Figure 3 below.



FIU Board of Trustees Regulation FIU-2202, *Prompt Payment*, states:

"It is the policy of the University that documentation authorizing payment of an invoice shall be approved for payment not later than forty (40) days after receipt of a proper invoice and receipt, inspection, and approval of the commodities or services, except that in the case of a bona fide dispute, the payment voucher shall contain a statement of the dispute and authorize payment only in the amount not in dispute."

In addition, the regulation states:

"If payment of an invoice is not issued within forty (40) days after receipt of a proper invoice and receipt, inspection, and approval of the commodities and services, the University will pay to the contractor, in addition to the amount of the invoice, an interest penalty at the rate established pursuant to Section 55.03(1), F.S., provided, however, that the interest penalty is in excess of one dollar (\$1.00)."

We selected and tested 13 waste manifests against their respective invoices to ensure accuracy and found no exceptions. In addition, we further analyzed all 61 invoices to determine timeliness of payment. Our analysis found that overall, 12 invoices (20%) were approved for payment after the 40-day requirement. These invoices were approved for payment on average 93 days after they were received by the University.

Upon further analysis and discussion with FIU Accounts Payable (AP) department, we determined that it took on average, 88 days for the department to send the invoice to AP. Once the invoice was uploaded and received in the system, it was processed and paid within five days. Thus, the root cause appears to be attributed to internal processes that impacted the department's timely submission of invoices when received.

Along with Regulation FIU-2202, stated above, Section 218.74, Florida Statutes, requires prompt payments, within 45 days, by local governmental entities and their institutions and agencies or incur penalty and interest costs. Paying invoices late could result in incremental costs for the University.

Recommendation

Environmental Health & Safety should:	
4.1	Work with the department's budget manager to ensure hazardous waste invoices are timely reviewed and submitted for payment.

Management Response/Action Plan

- 4.1 EH&S will send reminders for payments to the Budget Manager and request confirmation of payment before the 30-day deadline. The Director and Assistant Director have been assigned this task.

Implementation date: Immediately

Complexity rating: 1

5. Access Control for Terminated Employees

When an employee is terminated from the University, all roles within the PantherSoft and FIU OneCard Systems are automatically revoked. The FIU OneCard system then feeds the relevant information to the Facilities Management system. This prompts the removal of any physical access. In addition, University Policy No. 520.020, *Access Control for University Buildings and Facilities*, states:

“University keys are returned when employees terminate employment, retire, resign, transfer departments, or change room assignments. Keys must be returned to the Key Control Department. Employee must complete the Separation Transfer Clearance Form available from the Human Resource Department...Replacement of stolen/lost keys or failure to return assigned keys will result in charges to the employee, or the Department employing the person identified as the responsible person for the key. Human resources will withhold final payment until payments are satisfied using the employee debt repayment procedure set forth in FIU-111 Employee Debt Collection regulation.”

We obtained a list of University employees who were terminated during the audit period. Of the 725 individuals identified, we selected a sample of 125 (17%) lab employees, researchers, scientists, and/or research postgraduates to determine if: (a) electronic access was timely removed and (b) physical keys were returned upon separation from the University. We noted the following:

a) Electronic Access

Electronic access for 40 former employees (32%) was not terminated within 14 days of their effective separation date, as is the expected practice according to the Division of Human Resources (HR). For 23 of the 40 individuals, electronic access was terminated between 15 and 543 days (median of 39 days) after their separation date. Access for the other 17 individuals were still active, despite being terminated between 182 and 670 days ago, at the time of our review. The remaining 85 individuals (68%) had either their access timely removed or were never issued an FIU One Card, and therefore, did not have electronic access to University buildings.

We noted a similar condition in a prior audit⁵, which scope included a period that overlaps the scope of this audit. In that audit, we recommended that HR formalize the threshold and rationale for the count of days in which employees should be terminated within PantherSoft, ensuring terminations are processed in a timely manner.

The Key Control Department informed us that the abovementioned 17 individuals with access were still associated with the University in some capacity, although

⁵ Audit of Payroll Irregularities, Fraud Controls, and New Employee Document Verification, Report No. 20/21-01, issued on October 28, 2020.

our review of those individuals' HR records indicated their employment status as terminated and inactive in all positions within the University. Further discussions with Key Control and HR disclosed that if the former employees were also students or Persons of Interest (POI), then their access would remain unchanged and would only be removed upon their supervisors' request. In addition, Key Control informed us that several departments within the University, including ORED, have assigned System Operators that manage electronic access for their respective areas and have the capability to add and remove access via the Schlage Management System.

Nonetheless, upon our request, Key Control provided an updated list of access and the respective Cardholder Access reports, which disclosed that four of the 17 individuals' access had been subsequently removed. At our request, management of the respective departments or areas in which the employees had access reviewed the Cardholder Access reports for the 13 remaining individuals and concluded that five still needed access and eight no longer needed access.

We also noted that the University Policy No. 520.020, *Access Control for University Buildings and Facilities* did not specify the procedures for electronic card access.

Access to labs, offices, or other rooms associated with an employee's former position should be removed once no longer needed.

b) Physical Keys

We found that 23 of the 125 former employees sampled (18%) were issued keys that were not returned, as confirmed by the Key Control Department. There were 38 individual keys issued among these employees. The associated unbilled charges for unreturned property totaled \$1,900. The remaining 102 former employees sampled (82%) either were not issued physical keys or returned them upon separation from FIU.

According to University Procedure No. 1710.280a, *Separation from Employment/Transfer Clearance Procedure*, it is the supervisor's responsibility to complete the Separation from Employment/Transfer Clearance Form on behalf of the departing employee. The form states:

"All employees separating from employment with Florida International University ("Departing Employees") are required to return all University property issued to them and to settle all outstanding accounts, prior to release of final funds due to the employee. The University reserves the right to offset any funds due to the employee to compensate for unreturned property or unsettled accounts....The Department Head/Supervisor certifies that he/she has consulted with the Departing Employee during the completion of this form regarding the status of his/her (1) return of University property; and (2) proper handling and disposition of all regulated materials."

Departing employees whose access is not timely revoked or do not return keys may have unauthorized physical access to labs and/or University buildings. Also, depending on the type of key issued (i.e., individual key, department key, or building master key), unreturned keys increase the risk of unauthorized entry to University managed spaces and result in additional costs for departments, especially if rekeying of lock cylinders would be required.

Recommendations

Office of Research and Economic Development and Academic Affairs should:	
5.1	Ensure that their respective System Operators are timely deactivating electronic access in the Schlage Management System when an employee, student, and/or Person of Interest leave the University. In addition, the System Operators should review the Cardholders Access Report on a periodic basis to ensure that only current employees, students, and/or Person of Interests who are authorized to have access to managed spaces are listed.
Facilities Management should:	
5.2	<p>Update University Policy No. 520.020, <i>Access Control for University Buildings and Facilities</i>, to document the process for adding and removing electronic access. This process should:</p> <ul style="list-style-type: none"> • Clearly articulate, through policy or procedures, the responsibility for Schlage Management System Operators and Key Control to immediately deactivate terminated employee's electronic access to unauthorized spaces upon notification by the former employee's supervisor. • Conspicuously remind managers, supervisors, and/or department heads whenever access to University spaces is requested of their responsibility to ensure that employees' access is removed immediately upon termination. • Establish requirements for Schlage Management System Operators or other designated employees to perform periodic audits of Cardholder Access Reports. For areas centrally managed, Key Control should provide the Cardholder Access Report to the respective business unit head to review.
5.3	Consider recovering the \$1,900 in charges associated with unreturned keys from the respective departments.

Management Response/Action Plan

- 5.1 ORED will routinely distribute the access reports that will be enhanced by facilities for ORED owned space to PIs who been assigned labs to review to ensure any department personnel listed are those who are authorized by the PI to have access to lab space. ORED can only be responsible for departmental personnel and not individuals that may have access in other units across the university such as facilities, emergency management, etc. Escalation procedures will be put in place in consultation with Academic Affairs for non-compliance by PIs.

Implementation date: February 1, 2022

Complexity rating: 3

- 5.2 Facilities Management Department (FMD) will update the University Policy on Access Control to include a section on electronic access that addresses the points mentioned below.
- Facilities will reimplement a “System Operators Acceptance Use Form” which will be signed by each Schlage Management System (SMS) Operator and the Department Head. This form clearly articulates the responsibilities of the System Operator to authorize, monitor, and terminate access when no longer required, including deactivating access when an individual terminates FIU employment or no longer needs access to the designated space.
 - When Facilities Management transitions from the current desktop SMS software to the new MyFacilities web-based system (projected for January 2022), the web-based system will provide a popup reminder to the SMS Operator at the start of each session. For Supervisors who only approve electronic requests, Facilities will add a popup reminder for each request before approval.
 - The “System Operators Acceptance Use Form” as described above includes requirements for System Operators to perform periodic audits of Cardholder Access Reports. For areas that are centrally managed, Key Control will periodically generate and provide the Cardholder Access Report to the respective business unit head for review.

Implementation date: February 1, 2022



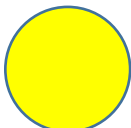



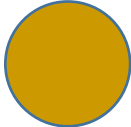
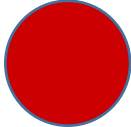

Complexity rating: 3

- 5.3 We agree with this recommendation. Key Control (Facilities Management) has developed a “Unreturned Key Fee Notice.” Fee notices will be sent out within the next 30 days to the respective departments to recover the \$1,900 in charges.

Implementation date: September 30, 2021

Complexity rating: 1

APPENDIX I – COMPLEXITY RATINGS LEGEND

Legend: Estimated Time of Completion		Legend: Complexity of Corrective Action	
	Estimated completion date of less than 30 days.		Routine: Corrective action is believed to be uncomplicated, requiring modest adjustment to a process or practice.
	Estimated completion date between 30 to 90 days.		Moderate: Corrective action is believed to be more than routine. Actions involved are more than normal and might involve the development of policies and procedures.
	Estimated completion date between 91 to 180 days.		Complex: Corrective action is believed to be intricate. The solution might require an involved, complicated, and interconnected process stretching across multiple units and/or functions; may necessitate building new infrastructures or materially modifying existing ones.
	Estimated completion date between 181 to 360 days.		
	Estimated completion date of more than 360 days.		Exceptional: Corrective action is believed to be complex, as well as having extraordinary budgetary and operational challenges.

*The first rating symbol reflects the initial assessment based on the implementation date reported by Management, while the second rating symbol reflects the current assessment based on existing conditions and auditor's judgment.

APPENDIX II – OIA CONTACT AND STAFF ACKNOWLEDGMENT:

OIA contact:

Joan Lieuw 305-348-2107 or jlieuw@fiu.edu

Contributors to the report:

In addition to the contact named above, the following staff contributed to this audit in the designated roles:

Tranae S. Rey (auditor in-charge);
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Miguel Gabache Legisa (assistant – student intern);
Vivian Gonzalez (supervisor and reviewer); and
Manuel Sanchez (independent reviewer).

Definition of Internal Auditing

Internal auditing is an independent, objective assurance and consulting activity designed to add value and improve an organization's operations. It helps an organization accomplish its objectives by bringing a systematic, disciplined approach to evaluate and improve the effectiveness of risk management, control, and governance processes.