OFFICE OF THE STATE INSPECTOR GENERAL

Higher Education Institutions: Chemical Inventory Management

Performance Audit

March 2020

Michael C. Westfall, CPA
State Inspector General

Report No. 2020-PA-003

COMMONWEALTH OF VIRGINIA

Office of the State Inspector General

Michael C. Westfall, CPA
State Inspector General

P.O. Box 1151
Richmond, VA 23218

Telephone 804-625-3255
Fax 804-786-2341
www.osig.virginia.gov

March 25, 2020

Governor Ralph Northam
Office of the Governor
P.O. Box 1475
Richmond, VA 23219

Dear Governor Northam,

The Office of the State Inspector General (OSIG) completed an audit of Chemical Inventory Management in Higher Education Institutions. The final report is attached.

OSIG would like to thank President Jonathan R. Alger (James Madison University), President John R. Broderick (Old Dominion University) and President Brian O. Hemphill (Radford University) and their staff for their cooperation and assistance during the fieldwork phase of the audit. OSIG would also like to thank all of the presidents of Virginia's institutions of higher education and their staff for their cooperation and assistance during the planning phase of the audit.

Sincerely,

Michael C. Westfall, CPA
State Inspector General

CC: Mr. Clark Mercer, Chief of Staff to Governor Northam
Mr. Atif Qarni, Secretary of Education
Senator L. Louise Lucas, Chair of the Senate Education and Health Committee
Delegate Roslyn C. Tyler, Chair of the House Education Committee
Mr. Robert A. Archer, Rector to the Board of Visitors for Radford University
Ms. Maribeth D. Herod, Rector to the Board of Visitors for James Madison University
Ms. Lisa B. Smith, Esq., Rector to the Board of Visitors for Old Dominion University
Mr. Jonathan R. Alger, President of James Madison University
Mr. John R. Broderick, President of Old Dominion University
Dr. Brian O. Hemphill, President of Radford University

Chemical Inventory Management in Higher Education Institutions

What OSIG Found

First Responders Are Not Provided Access to Chemical Inventory

Local first responders in the cities of Norfolk (Old Dominion University), Harrisonburg (James Madison University) and Radford (Radford University) are not regularly provided a chemical inventory to help them prepare for and react to emergencies.

Chemical Hazards and University Contact Information Is Not Posted on Laboratory Doors

Old Dominion University (ODU) and Radford University (RU) have notification signs on laboratory doors as to what types of chemical hazards exist inside of the laboratory. James Madison University (JMU) did not have such notification signs.

Physical Chemical Inventory of the Integrated Science and Technology Department Does Not Match Inventory Records

The chemical inventory for JMU's Integrated Science and Technology (ISAT) department does not accurately represent the chemicals on hand. Of 43 items judgmentally sampled, eight errors (19 percent) were identified. Inventories at ODU and RU accurately reflected items in the laboratories.

Acceptance of Donated Chemicals from Entities Outside of the University Is Not Formally Prohibited

JMU inconsistently applied Environmental Health and Safety's verbal policy of not accepting chemical donations or donating chemicals. No accepting of or donating chemicals was identified at ODU and RU.

March 2020

HIGHLIGHTS

Why OSIG Did This Audit

The Commonwealth of Virginia has 39 publically supported higher education institutions, including 15 that offer at least a four-year bachelor's degree. This presents the potential for a large chemical inventory for use in teaching and research. OSIG conducted this performance audit to determine if institutions are effectively managing their chemical inventories to mitigate the risk of theft and misuse of chemicals, and to identify areas where safety and emergency preparedness might be enhanced.

While OSIG's audit scope only included ODU, JMU and RU, all higher education institutions should review the findings and recommendations for beneficial information that might assist efforts to manage chemicals used in teaching and research laboratories.

What OSIG Recommends

- Higher education institutions should:
  - Regularly provide first responders with a complete and accurate chemical inventory.
  - Post chemical hazards and contact information on laboratory doors.
  - Conduct annual inventory counts of chemicals across all departments.
  - Develop and enforce formal policies prohibiting donating chemicals and receiving donated chemicals.

For more information, contact OSIG at 804-625-3255 or www.osig.virginia.gov

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BACKGROUND

The Commonwealth of Virginia contains a vast number of diverse public higher education institutions consisting of:

- Fifteen institutions that award at least a four-year bachelor's degree.
- Two institutions that have Cooperative Extension operations that are considered separate educational institutions (Virginia Tech and Virginia State University).
- One two-year institution (Richard Bland College).
- Twenty-three community colleges with 40 physical campuses.

These institutions have various degree programs, instructional and research concentrations, and resources to accomplish their mission. One area that all institutions have in common is the use of chemicals in their instructional and research laboratories. The chemicals used in these laboratories range from low-risk, low-hazard to high-risk, high-hazard, and some chemicals must be reported to the U.S. Department of Homeland Security (DHS). While an institution's Environmental Health and Safety (EHS) organization can assist with managing chemicals, responsibility for monitoring chemicals used in a laboratory and chemical inventory management rests solely with the owner of that chemical such as the professor, researcher, instructor, etc. The basic mission of EHS at any higher education institution is to review and implement practical aspects of environmental protection and safety at work. Chemical inventory management is a small part of EHS responsibilities, but one that can contain significant risk that may be overlooked.

There are no regulatory requirements for a higher education institution to maintain a chemical inventory. The Occupational Safety and Health Administration (OSHA) addresses laboratory safety in various portions of Section 29 of U.S. Code of Federal Regulations (CFR), including appendices than are not mandatory but are considered to be best practices. These non-mandatory OSHA recommendations were based on the National Research Council's (NRC) publication of "Prudent Practices in the Laboratory: Handling and Management of Chemical Hazards." This reference, henceforth referred to as "Prudent Practices," is cited because of its wide distribution and acceptance and because of its preparation by recognized authorities in the laboratory community through the sponsorship of the NRC. One of the non-mandatory recommendations states, "Prudent management of chemicals in any laboratory is greatly facilitated by keeping an accurate inventory of the chemicals stored."

The Chemical Facility Anti-Terrorism Standards (CFATS) was authorized by Congress in 2007 and gave authority to regulate CFATS to DHS. Under CFATS, a chemical facility is any establishment or individual that possesses or plans to possess any chemicals of interest (COI). DHS has identified more than 300 COI with each chemical having an established screening

threshold quantity (STQ). DHS considers these chemicals high-risk and are categorized under three main risks:

- Release: Toxic, flammable or explosive chemicals or materials that can be released at a facility.
- Theft or diversion: Chemicals or materials that, if stolen or diverted, can be converted into weapons using simple chemistry, equipment or techniques.
- Sabotage: Chemicals or materials that can be mixed with readily available materials.

CFATS applies to facilities across many industries, including universities and laboratories. If a facility is at or above the established STQ for a COI, it must report its chemical holdings to DHS. If the facility is considered high-risk by DHS, it must develop a security plan that addresses three main security (risk) issues discussed above for the associated COI.
Five basic elements need to be recorded for each chemical in a chemical inventory management system:

- Name of the chemical.
- Chemical abstracts service (CAS) number.
- Quantity on hand.
- Location.
- Owner or contact information.

Some institutions might choose to not only use the five basic elements above, but also:

- Assign and affix a pre-printed barcoded numeric label that will be attached to the chemical container throughout the chemical lifecycle.
- List the vendor name of the chemical (e.g. Fisher Scientific, Sigma Aldrich, etc.).
- Assign sub-locations in the laboratory (e.g. flammables cabinet, refrigerator, bulk storage, acid cabinet, etc.).
- Enter the date the chemical was acquired.

In order to gain a better understanding of the chemical inventory management process at the Commonwealth's publicly supported higher education institutions, OSIG developed a survey that asked questions related to the chemical lifecycle (purchase, storage, use and disposal). The Chief Audit Executive at each institution provided an EHS contact for their respective institution that would receive and answer the survey. All institutions responded to the survey and for some institutions, not only did the EHS contact respond, laboratory managers also responded. Some notable survey results were:

- Chemicals are purchased by the individual departments (decentralized) and there is no centralized purchasing or receiving of chemicals.
- Chemicals can be purchased using the small purchase charge card (SPCC).
- Chemicals used in instructional labs are purchased in bulk quantities and are not diverse in the type of chemical used. Whereas, chemicals used in research labs are purchased in small quantities and are very diverse in the type of chemical used.
- Annual inventories, if conducted, are performed by the principal investigator.
- Written guidelines exist regarding the methods to be used for the labeling, accumulation and storage of hazardous waste.

SCOPE

The audit scope covered chemicals used in instructional and research laboratories at Old Dominion University (ODU), James Madison University (JMU), and Radford University (RU) operations from July 1, 2015, through June 30, 2018. OSIG selected these universities to provide for testing at three different sized universities while taking into consideration any planned coverage by university internal auditors. Chemicals acquired for non-laboratory use (e.g. custodial and facility maintenance chemicals) were excluded from the scope of this audit.

While our audit scope only included ODU, JMU and RU, all higher education institutions should review our findings and recommendations for beneficial information that might assist them in their efforts to manage their chemicals used in teaching and research laboratories.

OBJECTIVES

Objectives of this audit were to:

- Determine if university requirements for managing chemicals includes the purchase, approval and storage of the chemicals and is documented in their policies and procedures.
- Determine if inventory counts are performed and reconciled to the inventory system at least annually.
- Determine if Safety Data Sheets (SDS) are “readily accessible” in accordance with 29 C.F.R. 1910.1450(h)(1)(ii).
- Determine if periodic inspections of hazardous waste accumulation areas are being conducted and records of the inspections are maintained in accordance with applicable federal law.
- Determine if hazardous waste is disposed of timely according to C.F.R. §262.16(b)-(d) and that hazardous waste manifests are prepared and maintained in accordance with §262.20 and §262.40.

- Determine if the institution uses a chemical inventory management system to track chemicals through the chemicals' lifecycle on campus (chemical delivery through chemical disposal).
- Determine whether the likelihood of fraud by those directly responsible for the chemical (referred to as principal investigators or "PIs") or EHS personnel in the chemical lifecycle for laboratory or research chemicals is significant at selected universities.
- Determine if the institution has a process in place to assess its chemical inventory against DHS's Chemicals of Interest requirements.
- Determine if the institution provides its chemical inventory to authorized outside entities as part of its efforts "to make arrangements with the local police department, fire department, other emergency response teams" required in C.F.R § 262.16 (b)(8)(vi)(A).
- Determine if the institution has an established process to submit the Tier II form per Section 312 of the Emergency Planning and Community Right-to-Know Act (EPCRA).

METHODOLOGY

OSIG conducted this performance audit in accordance with generally accepted government auditing standards. Those standards require that OSIG plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for the findings and conclusions based on the audit objectives. OSIG believes that the evidence obtained provides a reasonable basis for the findings and conclusions based on the audit objectives.

OSIG applied various methodologies during the audit process to gather and analyze information pertinent to the audit scope and to assist with developing and testing the audit objectives. The methodologies included the following:

- Conducting interviews.
- Conducting observations and walk-throughs.
- Conducting surveys.
- Examining policies and procedures to gain an understanding of the review areas.
- Examining and assessing processes for efficiency and effectiveness.
- Collecting and analyzing relevant data.

The audit objectives and the methodologies applied during the audit process were the same for each of the three institutions listed in the scope section above.

FINDINGS

First Responders Are Not Provided Access to Chemical Inventory

Applies to:

- ODU
- JMU
- RU

Local first responders in the cities of Norfolk (ODU), Harrisonburg (JMU) and Radford (RU) are not regularly provided a chemical inventory to help them prepare for and react to emergencies. Knowledge of the universities' chemicals is potentially shared with first responders only during annual campus tours or if first responders ask during an actual emergency response.

Firsthand knowledge of the chemicals that a school possesses affects what action should take place during an emergency. Access to a complete and accurate chemical inventory allows first responders to better prepare for and respond to emergencies at the universities.

While the specific reasons for not providing a chemical inventory to first responders vary by institution, common themes include not being asked by first responders to provide a chemical inventory and potential security concerns of providing this information.

Not providing a chemical inventory to local first responders can result in an ineffective response or delayed response to emergencies. This can further lead to destruction of property, bodily harm and even possibly death to first responders and members of the university community.

Recommendation(s):

JMU, ODU and RU should regularly provide first responders with a complete and accurate chemical inventory. The exact nature and timing of inventory updates should be discussed between the universities and their respective first responders.

James Madison University Response(s):

JMU concurs with the recommendation and will provide inventory to first responders annually and at their request.

James Madison University Corrective Action Plan:

Appendix I contains JMU's corrective action plan received to address the above recommendation(s). In providing the plan, JMU committed to the following:

> Annually JMU will provide a report from the chemical inventory database to the Harrisonburg Fire Department.

Old Dominion University Response(s):

First responders at ODU will be the ODU Police Department. Key personnel within the department will be given access to our online chemical inventory system and will be able to advise any other emergency responders who are called to the campus.

Old Dominion University Corrective Action Plan:

Appendix II contains ODU's corrective action plan received to address the above recommendation(s). In providing the plan, ODU stated the following:

> Access to the Chemtracker software platform has been granted to ODU campus police and Communication staff.

Radford University Response(s):

RU and the Radford City Fire Department, which is also the regional HAZMAT team, have mutually agreed that access to the Chemical Inventory Management and Electronic Reporting Application (CHIMERA) database be granted to the Fire Chief and the three captains underneath the Chief. RU EHS is currently working with the fire department to establish the accounts and provide appropriate training for accessing the system.

Radford University Corrective Action Plan:

Appendix III contains RU's corrective action plan received to address the above recommendation(s). In providing the plan, RU committed to the following:

> Granting access to the Chemical Inventory Management and Electronic Reporting Application (CHIMERA) database to the Fire Chief and Captains underneath the Chief.

CHEMICAL HAZARDS AND UNIVERSITY CONTACT INFORMATION IS NOT POSTED ON LABORATORY DOORS

Applies to:

- JMU

ODU and RU have notification signs on laboratory doors as to what types of chemical hazards exist inside of the laboratory. ODU has chosen to use the Global Harmonized Symbols (GHS pictograms), while RU has chosen to use the National Fire Protection Association (NFPA) Hazard Identification System (NFPA four-colored diamond; red, yellow, white and blue) to identify chemical hazards in their laboratories. Both institutions list the appropriate contact information. JMU did not have such notification signs on laboratory doors.
Prudent Practices states, "To aid emergency responders, many laboratories also post contact information on the laboratory door, as well as information about the hazards within the laboratory." Not listing the hazards and contact information on the outside of laboratories can cause a delayed or ineffective response in the event of emergencies.

Recommendation(s):
OSIG recognizes the procedures by ODU and RU to post chemical hazards and contact information on laboratory doors as a potential best practice for other state universities and recommends these universities explore implementation.

James Madison University Response(s):
JMU concurs with the recommendation.

James Madison University Corrective Action Plan:
Appendix I contains JMU's corrective action plan received to address the above recommendation(s). In providing the plan, JMU committed to the following:

Evaluate hazards annually in each lab and develop appropriate signage indicating the hazards and contact information.

Generate and post signs. Include a process in the chemical hygiene plan to ensure door signs will be accurately maintained.

PHYSICAL CHEMICAL INVENTORY OF THE INTEGRATED SCIENCE AND TECHNOLOGY (ISAT) DEPARTMENT DOES NOT MATCH INVENTORY RECORDS

Applies to:

- JMU

The chemical inventory for JMU's Integrated Science and Technology (ISAT) department does not accurately represent chemicals on hand. Chemical inventories tested at ODU and RU as well as those tested in JMU's Biology, Geology and Chemistry departments accurately represented chemicals on hand. OSIG's limited inventory test counts consisted of using "list-to-floor" and "floor-to-list" methods. The inventory listings used were provided by EHS, which were obtained from the Vertére system. The inventory test counts were limited to the following areas within the ISAT-CS building:

- Chemicals where the ISAT Lab Coordinator listed as the owner.
- Chemicals in room 230, regardless of the listed owner.
- Chemicals in room 134, regardless of the listed owner.
- Chemicals where the listed owner was no longer at the university. (This was unknown to OSIG when this chemical owner was selected.)

OSIG's analysis revealed missing chemicals as shown in the table below:

Total Available Chemicals In Areas Tested	**Sample Selected for Testing**	**Missing From Sample**	**Percentage Missing From Sample**
883	43	8	19%

When questioned, ISAT personnel could not offer a viable explanation as to why the chemicals were missing.

In order for a chemical inventory to be useful, it must contain reasonably accurate information. An inaccurate chemical inventory can lead to excessive chemical orders and incorrect regulatory reporting. One way to ensure the accuracy of information is through periodic physical inventories. Lab personnel report that the last physical inventory in the ISAT department occurred in 2009.

Recommendation(s):
JMU needs to conduct a physical inventory of the chemicals in its ISAT department. JMU should annually conduct an inventory of the chemicals across all departments.

James Madison University Response(s):
JMU concurs with the recommendation.

James Madison University Corrective Action Plan:
Appendix I contains JMU's corrective action plan received to address the above recommendation(s). In providing the plan, JMU committed to the following:

Perform annual chemical inventory in all departments.

ACCEPTANCE OF DONATED CHEMICALS FROM ENTITIES OUTSIDE OF THE UNIVERSITY IS NOT FORMALLY PROHIBITED

Applies to:

- JMU

PIs at JMU inconsistently apply EHS's verbal policy of not accepting chemical donations or donating chemicals. PIs at ODU and RU do not accept or donate chemicals. One JMU PI told OSIG that "receiving donated chemicals and/or donating chemicals is too risky and places too much liability on JMU." However, another JMU PI told OSIG in the presence of EHS personnel that he had accepted donated chemicals, they were stored in his office and he would not hesitate to receive donated chemicals because "research dollars are tight."
Prudent Practices states, "donated material can easily become a liability" and "do not donate entire chemical inventories to schools." Although EHS practices forbid accepting chemical donations or donating chemicals, a formal policy does not exist preventing the acceptance of donated chemicals or donating chemicals to other institutions.

The potential effects of allowing PIs to accept and/or donate chemicals include:

1. Greater liability on JMU if a chemical-related emergency happened at the accepting institution as a result of the donation.
2. Higher waste disposal cost if the accepted chemical cannot be used.
3. Misuse of state funds and/or grant dollars if the funds used to purchase the donated chemicals were provided for a specific purpose.

Recommendation(s):
JMU should develop and enforce a formal policy prohibiting donating chemicals and receiving donated chemicals, then educate its PIs on this policy.

James Madison University Response(s):
JMU agrees with the observation presented and will address donating chemicals, receiving donated chemicals and educate its constituents.

James Madison University Corrective Action Plan:
Appendix I contains JMU's corrective action plan received to address the above recommendation(s). In providing the plan, JMU committed to the following:

> Update all chemical hygiene plans (CHPs) to prohibit donating or receiving donated chemicals. CHPs are reviewed by all PIs.

TIER II REPORT WAS NOT SUBMITTED

Applies to:

- JMU

JMU has not submitted a Tier II form to the Virginia Department of Environmental Quality (DEQ) for the period of 2012 – 2017. Section 312 of EPCRA requires that a Tier II form be submitted for the previous calendar year to the Local Emergency Planning Committee (LEPC), the State Emergency Response Commission (SERC) and the local fire department by March 1 of the current year. ODU and RU had submitted the Tier II forms as required.

JMU EHS staff prioritize tasks they deem to be high risk such as laboratory safety inspections and fire safety inspections. JMU EHS staff indicated they were unaware a Tier II form had not been submitted for each calendar year during the period of 2012 – 2017.

Not submitting this form can cause delays in or inappropriate responses to emergencies involving chemicals as well as daily fines by the Environmental Protection Agency (EPA). OSIG calculated a potential minimum and maximum penalty. As of July 23, 2019, the potential minimum fine is $17,963 and the potential maximum fine is $174,975.

Recommendation(s):
JMU should collaborate with DEQ regarding the submission of a Tier II form to any combination of DEQ, LEPC, SERC or JMU's local fire department. Based on the results of the collaboration with DEQ, JMU should self-report any violation of Section 312 of the EPRCA to minimize any potential fines.

James Madison University Response(s):
JMU concurs with the recommendation. Facilities Management submitted a Tier II report in February 2019 to the DEQ, LEPC, LEPC fire department and SERC and will update and resubmit a report annually prior to March 1.

James Madison University Corrective Action Plan:
Appendix I contains JMU's corrective action plan received to address the above recommendation(s). In providing the plan, JMU committed to the following:

Submit Tier II report to the DEQ, LEPC, SERC, and Harrisonburg Fire Department.

CAS Numbers Are Not Entered into Chemical Inventory Management System for Tracking

Applies to:

- JMU

Universally recognized CAS numbers are not consistently recorded in JMU's Vertére system. Although OSIG was told by JMU staff that the easiest way to look up a chemical in Vertére was using the CAS number, auditors discovered the lack of the CAS number in all five locations tested at JMU. As discussed in JMU's response below, they do not use the field for mixtures but OSIG did not expect the mixtures to be in the inventory.
When a new chemical is entered into Vertére, a master record for that chemical is created. However, Vertére's master record does not require the chemicals' CAS numbers. These numbers, unique numerical identifiers assigned and maintained in a registry by CAS since 1957, currently identify more than 144 million unique organic and inorganic substances and 67 million protein and DNA sequences. The registry is updated with around 15,000 additional new substances daily. Both the ODU and RU chemical inventory systems used CAS numbers which were consistently recorded.

Prudent Practices states that a "chemical inventory should include the… Chemical Abstract Service number." Chemicals may have several names but will only have one CAS number. When a master record is created in Vertére, the system accepts a supplier and product number in lieu of a chemical's CAS number. Not requiring the CAS number in inventory can lead to the inability to identify specific chemicals JMU has on hand. This can result in regulatory noncompliance, increased safety risk and a potentially inaccurate inventory. Additionally, this can cause errors in system reports that rely on the CAS number to identify chemicals.

Recommendation(s):
JMU should assign each new and existing chemical master record in Vertére with that chemical's appropriate CAS number.

James Madison University Response(s):
JMU concurs with the recommendation.

James Madison University Corrective Action Plan:
Appendix I contains JMU's corrective action plan received to address the above recommendation(s). In providing the plan, JMU committed to the following:

Enter CAS numbers into Vertére.

SAFETY DATA SHEETS ARE NOT READILY ACCESSIBLE

Applies to:

- JMU

SDS at JMU were not readily accessible but were accessible at ODU and RU using online systems. SDS binders that were supposed to contain SDS were incomplete or misfiled. OSHA standard 1910.1450(h)(1)(ii) states that "employers shall maintain any safety data sheets that are received… and ensure that they are readily accessible."

SDS binders are not always updated when a new chemical is introduced to a laboratory. Printing, hole-punching and alphabetically filing a new SDS every time a new chemical is added to a laboratory can be a time-consuming process. Additionally, the responsibility for updating and maintaining SDS binders when new chemicals are introduced to the laboratory was unclear. SDS not being readily accessible can cause delays in knowing critical chemical information contained when needed in the event of an emergency.

Recommendation(s):
JMU should update SDS binders when a new chemical is received as required by OSHA. To augment the required physical binders, JMU should consider acquiring an online SDS solution to allow information to be readily accessible for all chemicals in the laboratory.

James Madison University Response(s):
JMU contracted with KHA Online SDS and is in alpha testing of the system at this date.

James Madison University Corrective Action Plan:
Appendix I contains JMU's corrective action plan received to address the above recommendation(s). In providing the plan, JMU committed to the following:

Purchase electronic SDS system

Ensure electronic system contains SDSs for all chemicals on campus

Educate university personnel on the electronic system and its use

SEPARATED EMPLOYEES ARE STILL LISTED AS CHEMICAL OWNER

Applies to:

- JMU

At the time of our audit, a former employee at JMU was listed as being responsible for 633 chemicals in the university's chemical inventory management system, Vertére. As a result, chemicals did not have a legitimate responsible party or "chemical owner" to ensure accurate representation in the institution's chemical inventory. Similar errors at ODU and RU were not identified as chemical inventories tested accurately represented items on hand.

No documented process exists to reassign chemicals to a new chemical owner and remove the former chemical owner from the institution's chemical inventory system after a chemical owner leaves the university. Without a legitimate chemical owner updating chemicals in the chemical inventory, the inventory will become obsolete and unreliable for internal use and compliance reporting purposes. This can result in additional safety risk and compliance exposure.

Recommendation(s):
JMU EHS should establish a formal process for updating Vertére when a chemical owner leaves the university. This process should include reassigning chemicals to a new owner or disposing of the former owner's chemicals, removing the former chemical owner from the chemical inventory and removing the former chemical owner's access to the chemical inventory system.

James Madison University Response(s):
JMU concurs with the recommendation.

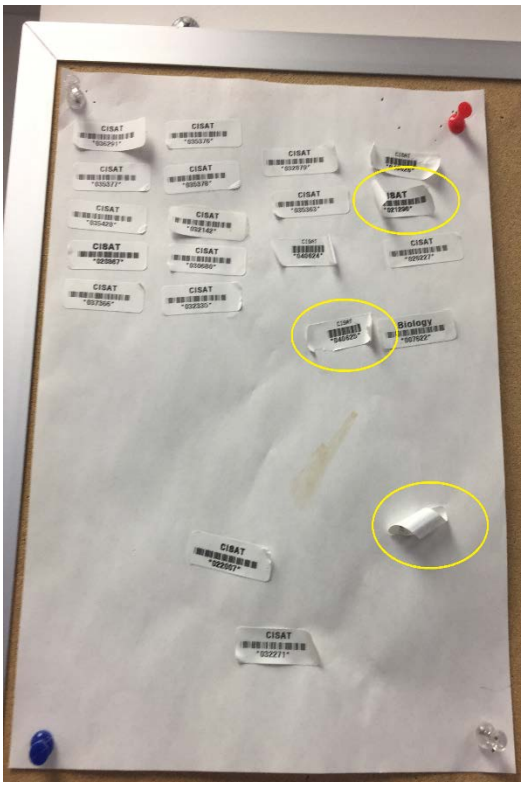
James Madison University Corrective Action Plan:
Appendix I contains JMU's corrective action plan received to address the above recommendation(s). In providing the plan, JMU committed to the following:

> When a new chemical owner is hired, they will be added to Vertére. When a current chemical owner is separated, they will be removed from the current chemical owner directory. The chemicals will be disposed of, reassigned, or returned to the stock room.

PROCESS TO REMOVE CHEMICALS FROM INVENTORY IS INEFFECTIVE

Applies to:

- JMU



JMU's current process for removing consumed chemicals from the chemical inventory in the chemistry, biology and ISAT departments is not effective. This process relies on irregular collection of peeled off inventory labels from empty chemical containers by select individuals responsible for maintaining the inventory. In some instances, as shown in the picture, these inventory labels are peeled off a container and attached to a piece of paper on a bulletin board in the laboratory. In this picture, some labels are beginning to exhibit signs of curling up and falling into a hazardous waste receptacle located below. Processes at ODU and RU were more effective as they complete inventory removal forms.

Once chemicals are consumed, they should be removed from the chemical inventory promptly. Not having a process that reliably removes consumed chemicals from inventory results in an obsolete inventory for assessing JMU's compliance with various regulations.

Recommendation(s):

JMU should reassess the process it uses to identify how chemicals are ready to be removed from the chemical inventory in the chemistry, biology and ISAT departments. For instance, PIs could place empty chemical containers in a central location as is done in JMU's geology department.

James Madison University Response(s):

JMU concurs with the recommendation.

James Madison University Corrective Action Plan:

Appendix I contains JMU's corrective action plan received to address the above recommendation(s). In providing the plan, JMU committed to the following:

> Consumed or disposed chemicals will be removed from the inventory by either providing the empty container to the appropriate inventory manager, placing the barcode label on a designated sheet and/or writing the barcode number on the designated sheet which will be processed at least monthly.

SCREENING THRESHOLD QUANTITIES ARE NOT MONITORED FOR CHEMICALS OF INTEREST

Applies to:

- JMU
- RU

JMU and RU do not have a process to assess its COI against STQ established by DHS under CFATS. ODU has a process in place. While our audit did not test for STQ of a chemical, our results did reveal the physical existence of COI in the laboratory.

CFATS regulations require entities who store COI in excess of the established STQ to notify DHS within 60 days of possessing COI in excess of the STQ. EHS prioritizes tasks it deems to be high risk such as laboratory safety inspections and fire safety.

JMU and RU are exposing themselves to additional safety risks by not properly assessing whether its COI are at quantities deemed by DHS to require additional security measures. Additionally, if the universities failed to self-report in a timely manner after reaching the STQ for any COI, they would expose themselves to potential fines from DHS.

Recommendation(s):
JMU and RU should use their chemical inventory management systems to identify whether COI in their chemical inventory are above DHS' STQ on a monthly basis and allow enough time to properly self-report to DHS should they exceed the STQ.

James Madison University Response(s):
JMU concurs with the recommendation and will run a monthly electronic Vertére report to verify that no laboratory chemicals on the COI list exceed DHS' STQ.

James Madison University Corrective Action Plan:
Appendix I contains JMU's corrective action plan received to address the above recommendation(s). In providing the plan, JMU committed to the following:

> Run a monthly COI report from the chemical inventory database and verify that COIs are below the STQ as required by DHS.

Radford University Response(s):

RU is using CHIMERA, which can provide real-time information on COI. COI information will be pulled on a quarterly basis for comparison against established thresholds. Unless held quantities exceed these thresholds, the generated report will be filed for recordkeeping purposes only.

RU's process, prior to utilizing CHIMERA, for assessing COI involved EHS staff reviewing chemical purchases through the procurement flow (any COI being purchased would be followed up on by EHS for quantity, storage, use and disposal) and through regularly scheduled laboratory inspections. Our assessment consistently indicated that storage of COI has continued to be less than 10 percent of COI STQs. The process of reviewing chemical purchases and laboratory inspections will continue but now in conjunction with the capabilities within CHIMERA.

Given the small volume of COI the university has and given the controls EHS has in place for the procurement flow of chemical purchases, the university feels that running the report on a quarterly basis should be adequate. RU does not possess the quantity or volume of COI to justify monthly running of such a report. Should quantities of a COI at RU exceed 10 percent of the STQ, EHS will begin running monthly reports until the value drops under 10 percent for the specific COI.

Radford University Corrective Action Plan:

Appendix III contains RU’s corrective action plan received to address the above recommendation(s). In providing the plan, RU committed to the following:

> RU is using CHIMERA, which can provide real-time information on COI. COI information will be pulled on a monthly basis for comparison against established thresholds. The generated report will be filed for recordkeeping purposes only, unless STQ quantities are exceeded, in which case a report will be made to DHS.

LABORATORY SAFETY INSPECTION DEFICIENCIES ARE NOT FOLLOWED-UP

Applies to:

- JMU

JMU EHS staff do not follow-up with laboratories that have deficiencies noted during laboratory safety inspections. Instead, the responsibility of correcting deficiencies is left to individual departments. ODU and RU EHS do follow up with the laboratories that have deficiencies noted during safety inspections.

Knowing whether deficiencies are being adequately addressed in a timely manner allows escalation of the matter, if needed. Without following-up on deficiencies, EHS does not know whether the deficiencies are addressed until the laboratories' next inspection.

Recommendation(s):
JMU EHS staff should follow-up with laboratories that have noted deficiencies from its laboratory safety inspections. Further, they should document this process and its laboratory safety inspection process.

James Madison University Response(s):
JMU concurs with the recommendation.

James Madison University Corrective Action Plan:
Appendix I contains JMU's corrective action plan received to address the above recommendation(s). In providing the plan, JMU committed to the following:

> Hire a Safety Manager to oversee lab safety that acts as a liaison between Risk Management and Academic Affairs.
>
> Follow-up to inspection findings will now be conducted at most two weeks plus one day from EHS reports.

PRUDENT PRACTICES IN CHEMICAL HYGIENE PLAN ARE NOT COMPLETE

Applies to:

- JMU
- ODU
- RU

The Prudent Practices lists several practices that are signs of a mature and effective chemical inventory management function. Policies at ODU, JMU and RU do not explicitly require the below practices:

1. Assessing surplus chemicals prior to ordering new chemicals.
2. Ordering the minimum amount of chemicals necessary.
3. Substituting less hazardous chemicals when feasible.
4. Assessing whether adequate storage space exists for chemicals and any waste that will be produced prior to purchasing chemicals.

The Prudent Practices are not explicitly documented in policies at the three universities because PIs at each university are expected by their management to follow the best practices of their field. Not explicitly requiring PIs to follow these prudent practices exposes the universities to unnecessary risks. This can result in additional cost to the university and increase the inherent safety risk associated with chemicals.

Recommendation(s):
ODU, JMU and RU should amend their existing chemical inventory management policies so that these prudent practices are required.

James Madison University Response(s):
JMU will amend chemical hygiene plans to include these four best practices working with constituents to implement these best practices.

James Madison University Corrective Action Plan:
Appendix I contains JMU's corrective action plan received to address the above recommendation(s). In providing the plan, JMU committed to the following:

Update chemical hygiene plans with guidance from prudent practices.

Old Dominion University Response(s):
ODU will make an amendment to the chemical hygiene plan addressing these four best practices and notify all chemical inventory "owners" of the addition.

Old Dominion University Corrective Action Plan:
Appendix II contains ODU's corrective action plan received to address the above recommendation(s). In providing the plan, ODU stated the following:

> The Chemical Hygiene Plan was revised to provide direction on prudent practices regarding chemical purchases.

Radford University Response(s):
RU is currently updating the university chemical hygiene plan and the update will include amended language to address the prudent practices mentioned. The updated chemical hygiene plan is expected to be finalized by June 30, 2020.

Radford University Corrective Action Plan:
Appendix III contains RU's corrective action plan received to address the above recommendation(s). In providing the plan, RU committed to the following:

> RU is currently updating the university chemical hygiene plan and the update will include amended language to address the prudent practices mentioned. The updated chemical hygiene plan is expected to be finalized by June 30, 2020.

UNIVERSITY HAS MULTIPLE CHEMICAL INVENTORY MANAGEMENT SYSTEMS

Applies to:

- RU

RU's Chemistry Department, Biology Department and Geology Department use separate chemical inventory management systems. To mitigate this issue, EHS has identified the need for one system that can be used by all departments. EHS is in the preliminary stage of reviewing various commercial off-the-shelf systems that will meet its requirements as well as identifying university resources needed for possible implementation. JMU and ODU use a single consolidated system.

A single system would allow more effective and efficient management of the university's chemical inventory. However, each department developed or acquired their own disparate systems ranging from a legacy system to freeware (software that requires no annual payment or licensing fee).
Using different chemical inventory management systems across departments:

- Weakens EHS' ability to consistently manage chemicals.
- Places a greater burden on IT to manage different systems.
- Complicates monitoring for regulatory compliance.
- Promotes inconsistency in chemical inventory management processes surrounding inventory.

Recommendation(s):
RU should establish deadlines and expedite its selection, procurement and implementation of a university-wide chemical inventory management system.

Radford University Response(s):
RU is now using a single chemical inventory management system, CHIMERA. This system was fully activated on April 9, 2019, with the completion of current inventory upload to the system finalized on May 16, 2019.

Radford University Corrective Action Plan:
Appendix III contains RU's corrective action plan received to address the above recommendation(s). In providing the plan, RU committed to the following:

> RU is now using a single chemical inventory management system, CHIMERA. This system was fully activated on April 9, 2019, with the completion of current inventory upload to the system finalized on May 16, 2019.

ENVIRONMENTAL HEALTH AND SAFETY IS NOT NOTIFIED OF NEW HIRES AND SEPARATED EMPLOYEES

Applies to:

- JMU
- RU

ODU EHS staff are notified by their Human Resources department when new hires occur and when employees separate from the institution. In turn, EHS filters the listing provided their Human Resources department for employees who potentially need access or removal to/from their chemical inventory system. This practice also allows EHS to prepare for actions to set up or dispose of chemical inventories.

EHS is responsible for implementing practical aspects of environmental protection and safety at the institution, as well as promoting good working practices. One such practice is granting access to the chemical inventory management system for new hires and removing access for separating employees. Another such practice is to perform a "close-out" procedure of the laboratory used by the separating employee, including inventory of laboratory chemicals and possible disposal.

Recommendation(s):
OSIG recognizes ODU's procedure as a potential best practice for other state universities and recommends these universities explore implementation.

James Madison University Response:
Risk Management will either be allowed to run their own query or be provided the results of one performed by Human Resources indicating the employees who have been hired or separated from the university. For any separated employee who is listed as a chemical owner in the chemical inventory system, the AUH will determine the disposition of their chemicals. If the chemicals are not all offered for disposal, the AUH will select to whom they should be reassigned, which will be reflected in the electronic inventory record. New hires will be added upon request from the departmental purchasing agent if/when the new hire intends to purchase chemicals.

James Madison University Corrective Action Plan:
Appendix I contains JMU's corrective action plan received to address the above recommendation(s). In providing the plan, JMU committed to the following:

Obtain notification from Human Resources of new hires and separated employees

Radford University Response:

EHS maintains all access to the chemical inventory system. EHS is informed of new staff hires from Human Resources and faculty hires from the College Dean's Office. EHS is made aware of all separations from the university and access is removed in accordance with the separation date. Awarding access to the system is recommended by the Dean or Department Chair and entered by EHS.

Radford University Corrective Action Plan:

Appendix III contains RU's corrective action plan received to address the above recommendation(s). In providing the plan, RU committed to the following:

> EHS maintains all access to the chemical inventory system. Access will be granted based on the completion and approval of a system access request form. EHS is made aware of all separations from the university and access is removed in accordance with the separation date.
>
> Awarding access to the system is determined by EHS in consultation with the Dean or Department Chair as necessary.

AUDIT RESULTS

This report presents the results of our audit of chemical inventory management at the select higher education institutions of ODU, JMU and RU. The following audit testing was performed with immaterial, if any, discrepancies noted:

- Using information provided from interviews and walkthroughs, OSIG found that:

  - PIs are using established state contracts to purchase chemicals from suppliers and vendors. Many PIs stated this helped ensure chemicals were purchased at the lowest cost while not sacrificing quality.
  - Satellite waste accumulation areas located in the labs were clearly labeled as such and the accumulated waste containers themselves were labeled. Inspection logs are maintained in the accumulation area showing inspections are occurring on a regular basis by the PI.
  - Laboratory operations are visible to faculty, staff, students and the general public. To mitigate the risk of potential harmful chemicals that could be used for nefarious actions being visually identified outside of the lab, some PIs have chosen to turn the chemical container around where the label is not visible and/or hide the chemical behind a larger container.
  - All disposal costs for hazardous waste generated by the labs are incurred by EHS.

- Institutions are using some type of a chemical inventory management system, albeit a commercial off-the-shelf system or in an Excel spreadsheet format.

Based on the results and findings of the audit test work conducted of chemical inventory management at the select higher education institutions of ODU, JMU and RU, OSIG concluded that internal controls related to the audit objectives were operating properly, except as identified in the report findings.

APPENDIX I – JMU CORRECTIVE ACTION PLAN

FINDING TITLE.	RECOMMENDATION	CORRECTIVE ACTION	DELIVERABLE	ESTIMATED COMPLETION DATE	RESPONSIBLE POSITION
First Responders Are Not Provided Access To Chemical Inventory	JMU, ODU and RU should regularly provide first responders with a complete and accurate chemical inventory. The exact nature and timing of inventory updates should be discussed between the universities and their respective first responders.	Annually JMU will provide a report from the chemical inventory database to Harrisonburg Fire Department	Excel spreadsheet	Jan 29, 2020. Current and ongoing annually before February 1st.	Environmental Health Coordinator
Chemical Hazards And University Contact Information Is Not Posted On Laboratory Doors	OSIG recognizes the procedures by ODU and RU to post chemical hazards and contact information on laboratory doors as a potential best practice for other state universities and recommends these universities explore implementation.	Evaluate hazards annually in each lab and develop appropriate signage indicating the hazards and contact information. Generate and post signs. Include a process in the chemical hygiene plan to ensure door signs will be accurately maintained.	Accurate signage Updated chemical hygiene plan	September 30, 2020	Academic Unit Heads Lab Coordinators *Vivarium and Lab Safety Manager *Vivarium and Lab Safety Assistant

FINDING TITLE.	RECOMMENDATION	CORRECTIVE ACTION	DELIVERABLE	ESTIMATED COMPLETION DATE	RESPONSIBLE POSITION
Physical Chemical Inventory Of The Integrated Science and Technology (ISAT) Department Does Not Match Inventory Records	JMU needs to conduct a physical inventory of the chemicals in its ISAT department. JMU should annually conduct an inventory of the chemicals across all departments.	Perform annual chemical inventory in all departments.	Annual inventory of chemicals	September 30, 2020	Academic Unit Heads Lab Coordinators
Acceptance Of Donated Chemicals From Entities Outside Of The University Is Not Formally Prohibited	JMU should develop and enforce a formal policy prohibiting donating chemicals and receiving donated chemicals, then educate its PIs on this policy.	Update all chemical hygiene plans (CHPs) to prohibit donating or receiving donated chemicals. CHPs are reviewed by all PIs.	Updated chemical hygiene plans	September 30, 2020	Academic Unit Heads Lab Coordinators
Tier II Report Was Not Submitted	JMU should collaborate with DEQ regarding the submission of a Tier II form to any combination of DEQ, LEPC, SERC or JMU's local fire department. Based on the results of the collaboration with DEQ, JMU should self-report any violation of Section 312 of the EPRCA to minimize any potential fines.	Submit Tier II report to the DEQ, LEPC, SERC, and Harrisonburg Fire Department	Tier II Report	February 11, 2019. February 29, 2020. Current and ongoing annually prior to March 1st.	Power Plant Manager, Facilities Management
CAS Numbers Are Not Entered Into Chemical	JMU should assign each new and existing chemical master record in Vertére	Enter CAS numbers into Vertére	Updated Vertére records	September 30, 2020	Academic Unit Heads

FINDING TITLE.	RECOMMENDATION	CORRECTIVE ACTION	DELIVERABLE	ESTIMATED COMPLETION DATE	RESPONSIBLE POSITION
Inventory Management System for Tracking	with that chemical's appropriate CAS number.				Lab Coordinators
Safety Data Sheets Are Not Readily Accessible	JMU should update SDS binders when a new chemical is received as required by OSHA. To augment the required physical binders, JMU should consider acquiring an online SDS solution to allow information to be readily accessible for all chemicals in the laboratory.	Purchase electronic SDS system Ensure electronic system contains SDSs for all chemicals on campus Educate university personnel on the electronic system and its use	Electronic SDSs available online or via any mobile device JMU e-binder representing all JMU chemicals Knowledgeable personnel	July 22, 2019 April 1, 2020 Currently in process and ongoing	Environmental Health Coordinator Environmental Health Coordinator/KHA (vendor) Risk Management personnel/Chemical Hygiene Officers/Safety Coordinators

FINDING TITLE.	RECOMMENDATION	CORRECTIVE ACTION	DELIVERABLE	ESTIMATED COMPLETION DATE	RESPONSIBLE POSITION
Separated Employees Are Still Listed As Chemical Owner	JMU EHS should establish a formal process for updating Vertére when a chemical owner leaves the university. This process should include reassigning chemicals to a new owner or disposing of the former owner's chemicals, removing the former chemical owner from the chemical inventory and removing the former chemical owner's access to the chemical inventory system.	When a new chemical owner is hired, they will be added to Vertére. When a current chemical owner is separated, they will be removed from the current chemical owner directory. The chemicals will be disposed of, reassigned, or returned to the stock room.	Updated Vertére database with only current JMU employees as chemical owners.	Currently verifying accuracy of chemical owners September 30, 2020	Academic Unit Heads Lab Coordinators
Process To Remove Chemicals From Inventory Is Ineffective	JMU should reassess the process it uses to identify how chemicals are ready to be removed from the chemical inventory in the chemistry, biology and ISAT departments. For instance, PIs could place empty chemical containers in a central location as is done in JMU's geology department.	Consumed or disposed chemicals will be removed from the inventory by either providing the empty container to the appropriate inventory manager, placing the barcode label on a designated sheet and/or writing the barcode number on the designated sheet which will be processed at least monthly.	Process to ensure empty or disposed chemicals are removed from the chemical inventory system. Updated chemical hygiene plan	September 30, 2020	Academic Unit Heads Lab Coordinators
Screening Threshold Quantities Are Not	JMU and RU should use their chemical inventory management systems to	Run a monthly COI report from the chemical inventory database and verify that COIs are below the STQ as required	Monthly report	Prior to the 15th of each month	Environmental Health Coordinator

FINDING TITLE.	RECOMMENDATION	CORRECTIVE ACTION	DELIVERABLE	ESTIMATED COMPLETION DATE	RESPONSIBLE POSITION
Monitored For Chemicals of Interest	identify whether COI in their chemical inventory are above DHS' STQ on a monthly basis and allow enough time to properly self-report to DHS should they exceed the STQ.	by DHS.		beginning February 2020. Current and on-going	
Laboratory Safety Inspection Deficiencies Are Not Followed-Up	JMU EHS staff should follow-up with laboratories that have noted deficiencies from its laboratory safety inspections. Further, they should document this process and its laboratory safety inspection process.	Hire a Safety Manager to oversee lab safety that acts as a liaison between Risk Management and Academic Affairs. Follow-up to inspection findings will now be conducted at most two weeks plus one day from EHS reports	Vivarium and Lab Safety Manager position in the Office of Research Integrity (ORI) Vivarium and Lab Safety Assistant in the Office of Research Integrity (ORI) Documented process for laboratory safety inspections and follow-up.	September 19, 2019 (hired) January 6, 2020 (hired) March 2020	Academic Unit Heads Lab Coordinators *Vivarium and Lab Safety Manager *Vivarium and Lab Safety Assistant

FINDING TITLE.	RECOMMENDATION	CORRECTIVE ACTION	DELIVERABLE	ESTIMATED COMPLETION DATE	RESPONSIBLE POSITION
Prudent Practices In Chemical Hygiene Plan Are Not Complete	ODU, JMU and RU should amend their existing chemical inventory management policies so that these prudent practices are required.	Update chemical hygiene plans with guidance from prudent practices	Updated chemical hygiene plans	September 30, 2020	Academic Unit Heads Lab Coordinators *Vivarium and Lab Safety Manager *Vivarium and Lab Safety Assistant
Environmental Health And Safety Is Not Notified Of New Hires And Separated Employees	OSIG recognizes ODU's procedure as a potential best practice for other state universities and recommends these universities explore implementation.	Obtain notification from Human Resources of new hires and separated employees.	Reports of new hires and separated employees	Current and on-going. Risk Management receives daily reports from HR of new and separated employees	Risk Management Safety and Training Coordinator

APPENDIX II – ODU CORRECTIVE ACTION PLAN

FINDING TITLE.	RECOMMENDATION	CORRECTIVE ACTION	DELIVERABLE	ESTIMATED COMPLETION DATE	RESPONSIBLE POSITION
First Responders Are Not Provided Access To Chemical Inventory	JMU, ODU and RU should regularly provide first responders with a complete and accurate chemical inventory. The exact nature and timing of inventory updates should be discussed between the universities and their respective first responders.	ODU Police Department First Responders have been granted access to the Chemtracker software platform. Twenty-six members of the ODUPD and Communication Room staff have full access to the secure website from their response vehicle and/or dispatch computers in the event of a reported emergency. They will be responding to all emergencies in conjunction with Norfolk Fire Department personnel and will provide chemical inventory information as necessary.	Attached is a list of ODUPD and Communication staff who have been granted access.	2-26-2020	Director, EHSO
Prudent Practices In Chemical Hygiene Plan Are Not Complete	ODU, JMU and RU should amend their existing chemical inventory management policies so that these prudent practices are required.	The Chemical Hygiene Plan was revised to provide direction on prudent practices regarding chemical purchases.	https://www.odu.edu/facultystaff/university-business/safety/programs Click link to Chemical Hygiene Plan and see section 6, page 22, "Chemical Purchasing"	2-26-2020	Director, EHSO

APPENDIX III – RU CORRECTIVE ACTION PLAN

FINDING TITLE.	RECOMMENDATION	CORRECTIVE ACTION	DELIVERABLE	ESTIMATED COMPLETION DATE	RESPONSIBLE POSITION
First Responders Are Not Provided Access To Chemical Inventory	JMU, ODU and RU should regularly provide first responders with a complete and accurate chemical inventory. The exact nature and timing of inventory updates should be discussed between the universities and their respective first responders.	Access to the Chemical Inventory Management and Electronic Reporting Application (CHIMERA) database is to be granted to the Fire Chief and Captains underneath the Chief.	The Fire Chief and Captains are able to view current inventory within the program.	Completed	Assistant Director, EHS
Screening Threshold Quantities Are Not Monitored For Chemicals of Interest	JMU and RU should use their chemical inventory management systems to identify whether COI in their chemical inventory are above DHS' STQ on a monthly basis and allow enough time to properly self-report to DHS should they exceed the STQ.	RU is using CHIMERA, which can provide real-time information on COI. COI information will be pulled on a monthly basis for comparison against established thresholds. The generated report will be filed for recordkeeping purposes only, unless STQ quantities are exceeded, in which case a report will be made to DHS.	COI inventory is tracked in real-time via CHIMERA. Monthly reports run by EHS.	Completed	Assistant Director, EHS
Prudent Practices In Chemical Hygiene Plan Are Not Complete	ODU, JMU and RU should amend their existing chemical inventory management policies so that these prudent practices are required.	RU is currently updating the university chemical hygiene plan and the update will include amended language to address the prudent practices mentioned. The updated chemical hygiene plan is expected to be finalized by June 30, 2020.	Updated CHP, expected to be completed June 30, 2020	Estimated Completion 6/30/2020	Assistant Director, EHS

FINDING TITLE.	RECOMMENDATION	CORRECTIVE ACTION	DELIVERABLE	ESTIMATED COMPLETION DATE	RESPONSIBLE POSITION
University Has Multiple Chemical Inventory Management Systems	RU should establish deadlines and expedite its selection, procurement and implementation of a university-wide chemical inventory management system.	RU is now using a single chemical inventory management system, CHIMERA. This system was fully activated on April 9, 2019, with the completion of current inventory upload to the system finalized on May 16, 2019.	CHIMERA is currently in use. All departments are currently utilizing the program for tracking inventory.	Completed Activated on 4/9/19 Inventory uploaded to the system finalized on 5/16/19	Assistant Director, EHS
Environmental Health And Safety Is Not Notified Of New Hires And Separated Employees	OSIG recognizes ODU's procedure as a potential best practice for other state universities and recommends these universities explore implementation.	EHS maintains all access to the chemical inventory system. Access will be granted based on the completion and approval of a system access request form. EHS is made aware of all separations from the university and access is removed in accordance with the separation date. Awarding access to the system is determined by EHS in consultation with the Dean or Department Chair as necessary.	Access is requested via a system access request form. EHS is made aware of all separations from the University by IT and access is removed in accordance with the separation date.	Completed: Spring 2019	Assistant Director, EHS