Multi – Division Assessment
of
Chemical Stewardship
2020
ES&H Self-Assessment Report

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2.0 Executive Summary

Participation in the assessment provided the following benefits:

This Self-Assessment will assist our Associate Laboratory Directors, Division Directors, and Division Deputies in implementing the Compensatory Measures identified in the January 30, 2020 directive that are within the scope of Division Safety Coordinators:

- Ensure Area and Division leaders are engaged in the stewardship of worker health and safety at all Laboratory and off-site locations.
- Ensure chemical and hazardous materials inventories remain current and accurate.
- Ensure that staff understand the financial and operational consequences of ordering chemicals in large volume containers (smaller containers are less expensive from chemical waste generation and disposal perspectives).
- Conduct routine safety and chemical management inspections of laboratories, including documentation and correction of deficiencies.
- Restrict the purchase of hazardous chemicals, including time- and shock-sensitive chemicals. Consider the use of less toxic alternatives when possible.
- Ensure time-sensitive chemicals are properly managed over the duration of their life cycle, including periodic inspection, testing and documentation.
- Ensure that laboratory safety and chemical management requirements are incorporated into work authorization documents and experimental procedures and include, at a minimum, the proper purchase and acceptance of chemicals, as well as labeling, tracking, handling, storage and disposal.

To improve Chemical Stewardship at LBNL, the assessment team recommends improvements to the following systems:

- Procurement process;
- Selection, assignment of responsibility, and training of persons who manage chemicals;
- Transition of chemicals to new owners;
- Chemical Management System database and its interaction with other related databases;
- Clarification and communication of inventory requirements, particularly for consumer products and consumable materials;
- Tracking of chemicals used / stored outside the owning Division’s space;
- Management of samples, gas cylinders, chemicals in glove boxes,and time-sensitive chemicals.

See Section 3.2 for detailed recommendations.

2.0 Scope

The following Divisions, described hereafter as the Participating Divisions, and their matrixed personnel and affiliates conducted a joint assessment of Chemical Stewardship.

- Physical Sciences Area:
    - Accelerator Technology & Applied Physics (AA)
    - Engineering (EG)
    - Nuclear Science (NS)
    - Physics (PH)
- Earth and Environmental Sciences Area (EESA):
    - Climate and Ecosystem Sciences (CESD)
    - Energy Geosciences (EGD)
- Energy Technologies Area (ETA):
    - Cyclotron Road
    - Energy Analysis and Environmental Impacts (EAEI)
    - Energy Storage and Distributed Resources (ESDR)
    - Building Technologies Urban Systems (BTUS)

Methodology

Methods included:

- **Evaluation of Chemical Inventory Reconciliation:** Inventories in all of participating Divisions' work areas have been reconciled. Each Division compiled records of "before" and "after" statistics.
- **Interviews:** Division Safety Coordinators collected and documented feedback from key people involved in chemical inventory reconciliation efforts to identify issues, Lessons Learned, and Best Practices.
- **Benchmarking:** EHS shared information from related ongoing parallel efforts, including the Chemical Management System upgrade and the Chemical Lifecycle Management Working Group.
- **Document reviews**:
    - Related work activities- include time sensitive chemicals, management of CMS, training
    - Training- EHS0346 completion for chemical owners and proxies
    - CMS chemical inventory spreadsheets- incorrect owners, chemicals located in other divisions areas, missing data, etc.

- **Work Observations:**
  - Time sensitive chemicals- labeling, dates last tested/inspected, visible issues
  - Chemical storage- incompatibles, secondary container identification, unidentified storage locations (drawers, cabinets)

The assessment took place from October 2019 to August 2020. The assessment activities included:

- October 4, 2019 -- Began organizing team, planning scope and lines of inquiry.
- October 23 and December 9 2019 – Team meetings to work on a draft plan.
- December 20, 2019 -- An LBNL management directive was issued to all Divisions to complete a field inspection and chemical inventory update of all LBNL chemicals.
- December 22, 2019 – January 24, 2020. Divisions responded to management directive, completing most of the fieldwork that was originally planned for this Multi-Division Self Assessment.
- January 31 -- Team meeting to share information from chemical inventory exercise and re-scope assessment
- February 20, 2020 – Team meeting to complete plan, share information from chemical inventory, and comment on user requirements for Chemical Management System.
- February 28 – April 3, 2020 – ALD and Division Director review and approval of self-assessment plan.
- April - July 2020 - Team prepared assessment report.

Current Requirements

Listed below are some of the key regulations, standards, and requirements driving LBNL's Chemical Stewardship systems at this time:

Federal Regulations:
29 CFR 1910.1200 Hazard Communication
29 CFR 1910.1450 Occupational exposure to hazardous chemicals in laboratories (Chemical Hygiene Plan)
10 CFR 851.21 Hazard identification and assessment.
10 CFR 851.23 Safety and health standard

DOE Standards:
Order 151.1D Comprehensive Emergency Management System requires detailed hazard analysis for NFPA Health Hazard 3 or 4 chemicals above certain threshold quantities (>10 lbs. gas, >5 gal. liquid, >40 lbs. solid). LBNL is required to use software to model possible airborne concentrations of chemicals following a release, and then develop Emergency Planning Hazard Analysis (EPHA) documents.

Order 470.3C Design Basis Threat addresses the security of chemical storage and use areas. It requires LBNL to analyze impacts and establish protection levels. The scope of chemicals included in 470.3C is greater and it lacks clear thresholds. It is focused on prevention. LBNL is in the process of implementing Order 470.3C.

To perform the analysis and planning required by the DOE Orders, we need to maintain an accurate inventory of chemicals on site.

California Requirements:
Cal-OSHA transition impacts are in the process of being analyzed by EHS.

City of Berkeley Requirements:
Certified Unified Program Agency (CUPA) Hazardous Materials Management Plan

LBNL Requirements:
Requirements and Policies Manual, Chemical Hygiene and Safety Plan
EHS Manual, Chapter 45, Chemical Hygiene and Safety Plan

3.0 Results

3.1 Lines of Inquiry:

- **Roles and Responsibilities**: **How can our Divisions assist the people who manage chemicals in performing their responsibilities?** We assessed the processes used to select appropriate people for chemical management, train them adequately to understand their roles and responsibilities, authorize the work, and hold them accountable for performance. We found that responsibilities for chemical management were not clearly designated and communicated. The people responsible for managing chemicals need better initial training and on-going communication of requirements and best practices.

- **Chemical Inventory Process**: **How can our Divisions ensure chemical inventories remain current and accurate?** We assessed the processes used to maintain the inventory (adding new chemicals, removing disposed/used chemicals, and transitioning ownership when personnel change). We found that the transition of ownership and inventory reconciliation processes need improvement. Frequent (at least annual) chemical inventory reconciliation and review of materials to be retained or disposed is a good management practice.

- **Tools and procedures**: **What are the systems our Divisions need to efficiently and effectively manage our chemicals?** We identified systems that require/utilize chemical information, and assessed how the systems interact, from the Division data users' perspective, to help identify needs for improvement. We coordinate our efforts with The Chemical Management System upgrade committee and the Chemical Lifecycle Management Working Group to avoid duplication of effort. We concurred with these groups that the Chemical Management System needs to interact with other key databases that maintain information about the lifecycle of chemicals, including procurement (Financial Management System), use (Work Planning and Control), and waste management. Updated features, including RFID barcode reading and data management through mobile devices are much desired by users.

3.2 Findings, Observations, and Noteworthy Practices:

3.2.1 Findings

A Finding (a term that is interchangeable with “Issue”) refers to a programmatic or performance deficiency and/or a regulatory, policy or procedural noncompliance generally identified in a formal assessment or audit.

There were 8 Findings.

Findings	Corrective Actions
1. Transition of chemical ownership from departing employees to new owners is not rigorous, thus creating “legacy” containers. Chemicals belonging to departing employees have sometimes been “disposed” from inventory without verifying actual disposal.	1. Division management and/or Human Resources should notify Division Safety Coordinators with as much lead time as possible that an employee plans to depart. 2. HR should Include chemical ownership transition in departing employee check-out list. 3. The new CMS system should notify Division Safety Coordinators when a chemical owner has departed. 4. Division Safety Coordinators should be notified so that they can verify that containers belonging to departing employees have actually been disposed of before the containers are removed from inventory.
2. Inventory Reconciliation processes have created inaccurate results. Inventory reconciliations caused deletion of chemicals from the inventory while they were still in fact located in the lab space. This could lead to serious problems in the event a “deleted” item had been categorized as time sensitive.	The new CMS system should change the reconciliation process so that an item is not “deleted” when not found but placed into a separate holding category.

3. Chemicals outside "owner" Division areas are not accurately tracked and communicated. Chemical containers are often moved from one space to another. When this occurs, it is difficult to ensure the CMS is updated. In several instances, chemicals owned by one division become stored in a space owned by another division. Space owners may not be aware of particularly hazardous chemicals being used or stored in their space.	1. All chemicals stored or used in a space should be under the authority of the Division owning the space. LBNL policy or procedure should restrict people from bringing chemicals into other spaces without the sponsor space owner taking ownership of the chemicals brought in. 2. Create a notification system to alert space owners to the presence of a chemical that does not belong to them. 3. Place the chemical owner's name and lab/shop room number on the container when borrowed. 4. Make barcode scanners more readily available so that they can be used to quickly update a container.
4. Sample contents and hazards are often not clearly identified. A number of samples and other secondary containers were found in drawers and cabinets that were not clearly identified. This makes proper disposal of unwanted containers difficult. In some instances, the containers have contained unidentified time sensitive or reactive chemicals.	**The following are best practices researchers should consider in the management of samples generated in their lab areas:** **1. Sample Identification** All sample and secondary containers must be clearly identified for chemical contents and any associated hazards. Labels must be legible, prominently displayed, and written in English. The researcher's name and date created are recommended information if space is available. Bar coding is required for samples containing time-sensitive chemicals. **2. Sample Log** A sample log is used to track multiple samples collected within the lab space. This can be through the

	use of a spreadsheet. **3. Sample Containers** The type of sample containers used must be compatible with the materials placed into it. The sample container volume should be minimized to the actual size needed. **4. Sample Storage** Samples must be stored in designated locations within the lab space. Samples containing hazardous materials and/or liquids should be stored in designated chemical cabinets. **5. Sample Transport** Samples can be hand carried from one lab space to another in a box or tray. Under no circumstances should public transportation such as the LBNL shuttles be used for transporting hazardous samples. In the event that samples must be shipped off-site to another location, the LBNL Shipping Department must be contacted. **6. Sample Retention** Monitor stored samples and do not keep them for longer than necessary. Planning is required for samples requiring long-term (more than 2 year) storage. An inventory of these types of samples should be retained and reviewed quarterly. Trays or boxes containing accumulations of samples should have a name, date, and retention time indicated for items requiring long term storage. Arrangements should be made with the Principal Investigator in the event samples need to be retained after the researcher leaves LBNL. Samples containing time-sensitive chemicals should be labeled, carefully

	monitored, and tested as required. **7. Sample Disposal** Samples must be properly disposed when they are no longer needed or prior to the researcher leaving LBNL. Chemical samples that are flammable, corrosive, reactive or toxic must be collected and disposed of as hazardous waste. Non-hazardous samples may be placed in the regular trash. Place the samples inside a Ziploc bag and write the non-hazardous constituents on the outside. Clearly write or place a sticker on the baggie that states “NON-HAZARDOUS.”
5. Some chemical “owners” have an inadequate understanding of inventory processes. A number of chemical owners and their proxies were identified as not completing EHS0346 “CMS Web Application” training. Without proper training, there can be issues with proper use of the CMS system and maintenance of an accurate inventory.	1. Divisions should clearly designate and communicate the assignment of chemical management responsibilities. 2. Only persons designated by each Division should be given access to enter information into CMS. All personnel to be given “write” access should first complete EHS0346 training. Our assessment team also concurs with the recommendation of the Chemical Inventory Management Focus Group that Training should focus more on personal accountability to ensure the safety of all workers at LBNL and their proposed corrective actions: 1) Create educational content for chemical owners so they are aware of the consequences and responsibilities associated with their chemical inventory management,

	2) identify clear expectations for chemical inventory accuracy.
6. Time-sensitive chemicals Field inspection of time sensitive chemicals revealed that some containers either did not have the required label affixed or the label was not properly completed. There were some instances where the required testing/inspection was not performed within the required time frequency.	1. The new CMS chemical inventory should be linked to the WPC system. When generating a work activity, there should be a simple search for chemicals in the work spaces to add to the work activity. 2. Hazards/controls for time sensitive chemicals should be added to the WPC system. Our assessment team also concurs with the institutional recommendations of the Time-Sensitive Chemicals Focus Group: a) Establish best practices for reviewing hazards associated with chemical work. b) Establish and communicate best practices for managing time sensitive chemicals. c) Promote buying smaller volumes. d) Better align use and disposal. e) Modify WPC to better encompass the hazards and controls associated with time sensitive chemicals. f) Develop appropriate training for time sensitive chemicals. g) Move toward more centralized chemical ordering processes. h) Establish firm “must test by” dates for unopened containers i) Pilot RFID tracking and subject time sensitive chemicals to more frequent reconciliations

	j) Implement better processes to manage samples and secondarily filled containers (a.k.a. splits). k) Implement a more robust, formal turnover process for chemicals of departing researchers. l) Maintain, enhance and communicate tools and resources to help manage time sensitive chemicals.
7. Procurement Procurement of chemicals authorized by a division other than the one the work was to be performed, resulted in chemicals being used without authorization.	Our assessment team concurs with the recommendations of the Chemical Purchasing Focus Group, including: 1) Create educational content for chemical purchasers so they are aware of the consequences and responsibilities associated with their purchases, 2) require more formal processes to occur within EHS in regards to more frequent updates to the Restricted Items List, 3) formal processes established between EHS and Transportation controlling the transport of chemicals from offsite facilities to LBNL, and 4) adding new features in FMS that could communicate data to CMS.
8. Accurate gas cylinder inventories are not being maintained. Information on cylinder volumes is often not readily available. Bar codes do not stick well. Old bar codes may represent a previous use of the cylinder. Multi-container inventory sheets are often misplaced or are not understood. Communication between vendors and owners regarding pick-up and delivery is lacking.	Our assessment team concurs with the recommended corrective action of the Chemical Inventory Management Focus Group: Use a vendor, or the LBNL shipping department, to receive and pre-label gases upon their arrival on site.

3.2.2 Observations

An Observation is a practice or condition that is compliant with a regulation or requirement, but, if left unaddressed, could lead to a noncompliance.

There were 6 Observations:

Observation	Recommended Action
1. CMS The Chemical Management system is difficult to use and lacks connectivity to other related databases.	1. The current CMS system and processes need to be replaced with newer software, tools, and improved processes for tracking the full chemical life cycle. (In process). 2. Chemicals are manually entered into CMS. Most chemical containers have a manufacturer's barcode. It would be helpful to scan this barcode and use it to populate the information in CMS. 3. Bar code scanners for chemical inventory checks had connectivity issues, old operating system- Upgrade is needed. Our assessment team concurs with the recommendations of the Chemical Inventory Management Focus Group: ● All related EHS databases should be linked in a user-friendly environment that would improve people's understanding and eliminate multiple entries into different databases. ● Improve the CMS reporting and notification capabilities and provide performance feedback to chemical owners and users to strengthen chemical ownership and accountability.

	● Use mobile scanners/phones, and obtain mobile software that works on multiple devices and operating systems. Utilizing mobile device photo recognition of manufacturer information from labels or manufacturer barcodes We also concur with the recommendations of the Work Planning Focus Group: ● Integrate the full work planning process and use WPC Activity Manager as a central hub; ● Restructure high hazard chemical activities and modify WPC hazards; ● Educate staff; ● Incorporate peer reviews.
2. Glove boxes It is very difficult to ensure chemicals stored inside glove boxes are in the CMS inventory. Bar codes are hard to see. Access to the containers is limited.	1. Use RFID barcodes in remote areas such as glove boxes. 2. Post an inventory sheet on the outside of each glove box.
3. Inventory of Time-Sensitive Chemicals There were several time sensitive chemicals identified during field checks that did not show up in CMS time sensitive chemical reports. The CMS database did not have the correct hazards associated with that particular chemical entry. Some chemicals in the CMS inventory were either mis-spelled or had a space inserted in the name.	1. Remove or update multiple chemical entries that are missing the correct hazard categories, are mis-spelled, or have a space inserted. 2. Regular review of time sensitive chemicals listed in CMS database by EHS to ensure it is accurate and complete.
4. Management of Time-sensitive Chemicals It is not easy to identify when a time sensitive chemical was last tested/inspected without physically going to the lab area and visually inspecting. In cases where a division has hundreds of	1. Add inspection and expiration date information to the CMS database for affected chemical containers. Add a reporting feature. 2. Use the “date entered” as an indicator of age. Maintain time

time sensitive chemicals, this can be problematic.	sensitive chemicals in small quantities such that they are used up in 1-2 years.
5. Inventory requirements and exclusions for consumer products are unclear to users. There is widespread confusion about when consumer products can be excluded from the CMS because their usage is consistent with how the manufacturer intends the average consumer to use the product. Examples typically include cleaning products, duster aerosol cans, white board cleaner etc.	Clear communication is needed for sealants, adhesives, flammable aerosol cans such as aerosol lubricants (WD40), and cutting fluid that need to be included in the CMS since they are hazardous material and need to be tracked for fire protection purposes.
6. Consumable materials owners are often unaware of which materials need to be tracked in CMS.	EHS and Divisions should clearly communicate requirements to groups who use consumable materials.

3.2.3 Noteworthy Practices

A Noteworthy Practice is a practice or condition that is recognized for excellence, and should be considered for Lab-wide application. There were 3 Noteworthy Practices identified:

- Regular chemical clean-out events make it easier for researchers to dispose of numerous unwanted or expired chemicals. This prevents unnecessary accumulations and gives more storage space for chemicals that are actually being used. Divisions (ETA) who perform clean-out events multiple times each year have found these clean-outs are very successful in removing thousands of unwanted chemicals.
- Time-sensitive chemical surveys are conducted every 6 months for ETA divisions. This includes a mandatory survey form along with a field inspection of each area. Issues are identified and reported to top management as needed.
- Storage of compatible time sensitive chemicals such as peroxide formers in a common storage location like a tray makes it easier to track and inspect. The storage location is clearly identified for quick identification.

4.0 Conclusion

To improve Chemical Stewardship at LBNL, the assessment team recommends improvements to the following systems:

- **Procurement process**. There need to be controls on procurement of highly hazardous and time-sensitive chemicals. Quantity-based hazards need to be considered prior to ordering. Divisions should promote using less hazardous alternatives, ordering smaller quantities, and considering disposal logistics to their respective chemical owners .
- **Selection, assignment of responsibility, and training of persons who manage chemicals**. Divisions should assist chemical owners / managers by organizing regular pre-scheduled clean-outs for old/unwanted chemicals. We need to make it easier for researchers to get rid of larger numbers of items.
- **Transition of chemicals to new owners**.When possible, Division Safety Coordinators should be notified before a chemical owner leaves LBNL so that an orderly transition process can be organized.
- **Chemical Management System database** and its interaction with other related databases. A new web application should be considered to replace the current CMS. It should be linked to Work Planning and Control - Activity Manager to ensure proper chemical hazards/controls are identified for each area. The system should be more accessible to RFID technology barcode scanners. It should include features that enhance tracking of time-sensitive chemicals
- **Clarification and communication of inventory requirements**, particularly for consumer products and consumable materials.
- **Tracking of chemicals** used / stored outside the owning Division's space;
- **Management of samples, gas cylinders, chemicals in glove boxes,and time-sensitive chemicals**.

5.0 Appendices - Summaries of Division Chemical Stewardship Reviews

Appendix 5.1 Physical Sciences Area

Accelerator Technology and Applied Physics Division:

Issues:

- Information on volumes of gas cylinder contents is often not readily available and estimates were used.
- There is no reliable system to determine the actual age of gas cylinders.
- Multi-container inventory sheets can be lost, particularly in outdoor locations.
- During chemical clean-outs, there is no process for chemical pick-up vendors to keep track of the containers that were picked up.
- Transition of chemical ownership from departing employees to new owners is not rigorous, creating “legacy” containers. Chemicals owned by departing employees should not be automatically “disposed” from the inventory.
- CMS autocorrects Container Division entries to match the “owner” employee’s division. In ATAP spaces, most chemicals are managed by an Engineering Division technician. The entries have to be manually corrected to show the Container Division as AA.
- In shop areas, chemicals are frequently used up and the empty containers discarded without removing the CMS entry from inventory.
- In one area (58 complex), many containers didn't have labels, or labels were on them but the information was never added to CMS.
- Additional training is needed for chemical users. They need to know the basic LBNL chemical inventory and hazardous waste requirements.
- Chemical users and owners need to know why it is important to maintain the inventory, including regulatory compliance requirements and safety benefits.
- Chemical owners need to know how to use CMS and have hazardous waste management training, with annual refresher training.

- People who conduct the chemical inventory would like to have a phone app for scanning barcodes.
- People who enter chemicals into inventory would like to be able to set an expiration date. There should be automatic reminders, with justification required for keeping the chemicals.
- The chemical inventory should be reviewed and updated at least annually.
- Chemicals should be stored in designated chemical storage areas. Chemicals that are “not found” during bar code scanning should be placed on a list for review.
- Shop personnel need more guidance on how to manage small (<100 micron) metal particulates from grinders.
- The CMS and waste management systems need to be coordinated, to avoid duplication of effort in entering information, and to allow EHS to provide feedback on the status of containers requisitioned for pick-up.
- The new CMS system should provide report options that allow chemical owners to easily find high-hazard containers.

Inventory results by building:

Bldg. 46

Before:

- ATAP chemicals are in the shop/lab areas belonging to the Superconducting Magnet Program: 46-0170, 170A, 170B, 176, 176A
- The January 6 CMS report shows 229 entries

After:

- During manual comparison of the inventory spreadsheet to actual chemicals present, it was learned that many chemicals had been used without removing the entries from inventory.
- Locations were corrected for chemicals listed in room 170 that were actually in 170A.
- The February 4 CMS report shows 191 entries

Bldg. 53

Before:

- ATAP areas are the Bldg. 53 basement (53-004A, 53-004B, 53-0008, 53-0199X).
- A chemical container cleanout was performed on December 20 by a vendor, Clean Harbors, as part of the 53/58A move project. The vendor did not remove the containers from CMS or provide a list of containers picked up.
- There are two containers of lithium that the vendor was not able to pick up. They have been reported to EHS and are waiting for disposal
- The January 6 CMS report shows 201 entries.

After:

- The CMS spreadsheet was manually compared to the containers actually in and around the Bldg. 53 basement.
- One previous chemical was confirmed to still be present.
- Two containers of solder paste were added to the inventory (1 ATAP, 1 Cyclotron Road).
- MSD has assumed responsibility for the Pelletron in 53-0008 and is in the process of preparing to move it to UC. The sulfur hexafluoride is in the process being removed.
- ATAP management decided which gas cylinders to keep and which to dispose. 42 gas cylinders were designated for disposal
- Multi-container inventory sheets were missing. The gas cylinders to be kept were re-inventoried.
- The February 3 CMS report shows 11 entries.

58 Complex

ATAP chemicals are found in Bldg. 58, 58A, and 58B. 58 and 58A have “open concept” floor plans. 58B is a storage unit. The chemicals are shared by researchers and technicians from different ATAP Programs, and are managed centrally by Engineering Division technicians who serve the entire space. A lot of the containers didn't have labels, or labels that were on them were merely stuck on there but were never added to the system. The multi-container inventory sheets for the gas cylinders needed to be re-done.

58

The January 6 CMS report shows 135 entries

The February 3 CMS report shows 223 entries

58A

The January 6 CMS report shows 53 entries

The February 3 CMS report shows 114 entries

58B

The January 6 CMS report shows 25 entries

The February 3 CMS report shows 17 entries

71 Complex

ATAP chemicals are found in Bldg. 71, 71A, and 71B. While ATAP occupies most rooms in Bldg. 71, there are a few rooms occupied by ETA.

71

Gas cylinders were re-inventoried. The multi-container inventory sheet was replaced.

11 gas cylinders have been reported to EHS for disposal

The January 6 CMS report shows 68 entries

The February 3 CMS report shows 89 entries

71A

25 containers have been reported to EHS for disposal

The January 6 CMS report shows 33 entries

The February 3 CMS report shows 34 entries

71B

The January 6 CMS report shows 35 entries

The February 3 CMS report shows 27 entries

Bldg. 77A

ATAP occupies room 77A-0103 cable winding and 77A-0105 magnet assembly. There is also an inactive Physics Division test stand in 77A-0105

1 container was removed and 1 was added.

The January 6 CMS report shows 87 entries

The February 4 CMS report shows 87 entries

Bldg. 88

ATAP occupies one room, 88-0071.

The January 6 CMS report shows 8 entries

The February 3 CMS report shows 10 entries

Engineering Division:

Before:

Jan. 13, 2020

Total chemicals 2580 listed with 27 EG container owners.

Due to the highly matrixed nature of the Engineering staff, chemicals listed in the various other Physical Sciences Divisions have container owners from Engineering. Engineering staff manages all of the machine shops within the Physical Sciences Divisions.

Issues:

- Matrixed staff home division is often erroneously assigned chemical. EG staff are usually aligned with the chemicals found in the shops they manage.
- Engineering have the bulk of the shop responsibilities and most of the chemicals are related to that shop work which supports ATA,PHY , and NSD
- CMS system assigns ownership division based on staff division
- Legacy issues with retiring staff results in containers owners with several hundred chemicals transferred to thor name with a proper validation path required.

Building were EG container owners are located:

2, 6, 7, 15, 30, 33, 46, 58, 70A, 77, 79, 80, 88

Of those, we have addressed about 1850 of them. Most EG staff listed have chemicals belonging to their respective matrixed divisions.

Between Jan 6 and Jan 23rd, **299 chemicals were disposed of.**

After:

At the end of the chemical inventory in Feb., EG had reduced the container owners of EG chemicals to 20

- Bulk transfers to correct CMS errors allowed the chemical buying division to better track their respective chemicals
- EG had reduced chemicals within the division to 1507 by March 2020.

Nuclear Science Division:

NSD Chemical inventory summary

Issues:

- Gas cylinder inventory not tracked correctly
- Side note - No reliable system to determine the actual age of gas cylinders
- Multi-container inventory sheets can be lost
- Confusion about what needs to be in CMS and what can be exempted
- Common sealants / adhesives were noted in all locations without labels
- Transition of chemical ownership from departing employees to new owners is not rigorous, creating “legacy” containers
- CMS autocorrects Container Division entries to match the “owner” employee’s division. In B088, most shop chemicals are managed by an Engineering Division employee. The entries have to be manually corrected to show the Container Division as NSD.
- CMS never requires a verification of inventory (change in ownership, annually) (Would be helpful to get quarterly reminder of current inventory)
- B088 - Shop chemicals are frequently used up and the empty containers discarded, throughout the building, without removing them from CMS
- B088 - Many containers didn't have labels or labels were on containers but the information was never added to CMS
- Multiple retirees at B088 had their inventories disposed of by EH&S employees, over ten years ago, even though the containers were still located in the rooms/storage areas as noted in CMS

Bldg. 70

Before:

- NSD chemicals are in the following B070 lab areas: 131A, 141, 208, and 268
- The January 6 CMS report showed **22** entries

After:

- Four containers were added in 141 for gas cylinders and cryo tanks.
- Seven containers were added in 208. Containers were found in the room, and CMS, that belonged to a division that had previously shared the space. They were sent to waste.
- Thirteen containers (mostly adhesives) were added in 268.

- Locations were corrected for chemicals listed in room 131 that were actually in 131A. Eighteen containers were added. Majority of containers added were from previous researchers. Included paints and adhesives.
- The February 11 CMS report shows **64** entries

Bldg. 70A

Before:

- NSD chemicals are in the following B070A lab areas: 3337, 3343, and 3347
- The January 6 CMS report showed **34** entries.

After:

- The lab spaces are shared spaces with the Engineering Division and chemicals are maintained by both divisions.
- Eight containers, mostly adhesives, were added in room 3343.
- The gas cylinder in room 3343 was removed (not in CMS).
- The February 11 CMS report shows **42** entries.

88 Facility

NSD chemicals are found in room 011, 041, 051, 067, 071, 129, 129A, 129B, 130, 131, 134, 135, 137, 141, 147, 155, 181, 199X (Outside), and 161 which includes all the experimental caves, cave roof, and vault roof as an “open concept” floor plan. The majority of chemicals are shared by researchers and technicians from three different divisions (NSD, Engineering, Facilities), and are managed centrally by an Engineering Division employee who serves the entire building.

- A number of containers didn't have labels,
- Containers were labeled but were never added in CMS,
- Containers had been removed from CMS but were still in the building.
- The multi-container inventory sheets for the gas cylinders had to be re-done.
- A chemical container cleanout was performed the week of January 27th by a vendor. 603 containers were removed (350 in CMS (223 active / 127 inactive), 56 barcoded but not in CMS, 197 not barcoded)
- Total B088 inventory, not including containers managed by ATAP, went from 837 to 721 (as of February 19).
- Engineering employee inventory, for NSD, has remained around 400 containers

19A

The January 6 CMS report shows **1** entry

No Changes

50B

The January 6 CMS report shows **5** entries

No Changes

FINAL NUMBERS (11/2019 – 2/17/2020)

-B088 – Removed from CMS (682) / Added to CMS (280)

(Still need to barcode and enter all lecture gas cylinders - waiting for labels)

-Rest of NSD – Removed from CMS (45) / Added to CMS (50)

Physics Division:

The following Labs in Physics have chemicals in the CMS database; CMB, DESI, ATLAS, DUNE, LZ, MSL, Machine Shop. We Inventoried over 550 Chemicals in the different Labs and crossed checked in CMS.

The MSL had the most chemicals of all Physics Labs. We reviewed 160 chemicals and gases in the MSL.

Issues:

- Transition of chemical ownership from departing employees to new owners is not rigorous, creating “legacy” containers. This was found to be a major issue for Physics.
- Gas cylinder inventory not tracked correctly. No reliable system to determine the actual age of gas cylinders
- The bar code labels on gas cylinders do not stick well and fall off over time. Need a better way to label it.
- Confusion about what needs to be in CMS and what can be exempted. Examples of items found without labels included WD40, pump oil, resins, sealants/adhesives.
- Bar code scanners are not readily available for quick inventory checks. Therefore, in order to do a chemical inventory, researchers have to read the bar codes, write them down, take cell phone pictures and check against CMS once they get to their computers . This is very time consuming and prone to error. The bar code is difficult to read, numbers are very small, chemicals are in cabinets and it is awkward to get a picture of the bar code. Physics learned that EHS had portable barcode readers available. However, Physics was told that there were insufficient barcode readers available and the entire Chemical Inventory in Physics was done manually.
- The current CMS system and processes need to be replaced with newer software, tools, and improved processes for tracking cradle to grave.
- LBNL should consider outsourcing the management of incoming chemicals to a third party. They could be responsible for procurement, delivery, barcoding, and maintenance of inventories databases.
- The definition of “expired” for time sensitive chemicals needs to be clearly defined and communicated. What specifically needs to be done if a chemical has exceeded the date on the container and the owner feels it is still safe to use? What if a container does not have a manufacturer expiration date?

- Most chemical containers arrive with a barcode on them. It would be helpful if the scanner can scan the supplier's barcode and use that to populate the information in CMS.
- There needs to be a quick-start guide for CMS, labeling, storage, etc rules for chemical, samples and gases. It should be a printed document or PDF that is given to all new personnel. The web-based training does not really help new hires understand the day-to-day management of chemicals once they start working in the lab.
- For those handling chemicals and gases we need to make sure everyone takes the following training. It should be required through WPC.
    - EHS348 - Chemical Hygiene and Safety Training
    - EHS 604 – Hazard Waste Generator
    - EHS 346 – Chemical Management System Training
- Time-sensitive chemicals seem like a particularly important hazard to track. This should be handled at a Lab-wide level. Ideally collecting time-sensitive chemical information should be triggered as part of the procurement process, the chemical should be inventoried on delivery (akin to the way computers are handled), and all relevant information (including expiration date) should be entered in the CMS at that point. The researcher should only be a point of backstop checking, not the primary source of information

Earth and Environmental Sciences Area (EESA):

Issues:

- Procurement of the chemical was authorized by a division other than the one the work was to be performed.
- Staff did not enter the chemical information in CMS for proper tracking.
- Staff did not fully understand the hazards related to this chemical.
- The work was not discussed and authorized by the lab PI.
- Work Scope and Hazard controls were not described in a wpc activity.

Completed the inventory of chemicals and cross checked with the existing inventory in CMS; it included the following steps:

- Every Lab PI identified staff knowledgeable in chemical use, hazard recognition and control, proper storage, and safe and compliant transport and disposal of chemicals.
- All EESA staff performing the lab chemical inventory reconciliation have completed the following training, as listed in lab wpc activities:
    - *EHS 348 Chemical Hygiene and Safety Training;*
    - EHS 346, *Chemical Management System Web Application Training*;
    - EHS 604, *Hazardous Waste Generator Training*
- The EESA safety coordinator (DSC) retrieved the CMS records for each lab and provided a list of all chemicals to the lab staff to be compared with the chemicals located in the lab. Electronic scanners were used to scan and update all chemicals in the EESA labs.
- Secondary containers for time sensitive chemicals were not used nor identified during this effort.
- Secondary containers for all other chemicals had been properly labeled with the chemical name and hazard.
- The majority of the EESA lab staff used electronic scanners to reconcile the chemical inventory. The information was updated and records were electronically submitted to the CMS.
- The lab PIs were provided the EHS chemical storage posters as a guidance for proper chemical storage.
- No new chemicals, suspected or determined to pose a heightened risk or danger, were identified during the chemical inventory reconciliation.
- Unwanted chemicals were identified and disposed
- No time-sensitive chemicals had passed their expiration date. H_2O_2 no longer needed and was requisitioned as hazardous waste.

- The ALD and DDs performed walkthroughs of EESA labs and reviewed chemical inventory, chemical procurement and use and chemical storage areas.

Examples of EESA chemical inventory reconciliation

EESA LAB	Total Scanned	Automatched	Mismatched Location	Mismatched Owner	Disposed:	Unscanned:	New	Un-barcoded
070A-4463B	582	6 of 6	532 of 532	0 of 0	30 of 30	8 of 8	14 of 14	23 of 23
070A-4463	53	35 of 35	11 of 11	0 of 0	6 of 6	38 of 38	1 0f 1	22 of 22
070A-4461	30	25 of 25	1 of 1	0 of 0-	3 of 3	31 of 31	1 of 1	3 of 3
070A-4459	66	58 of 58	0 of 0	0 of 0	6 of 6	105 of 105	2 of 2	7 of 7
070A-2212	74	67 of 67	2 of 2	0 of 0	2 of 2	18 of 18	3 of 3	5 of 5
070A-2235	44	33 of 33	8 of 8	0 of 0	0 of 0	28 of 28	1 of 1	2 of 2
064-0163	109	85 of 85	20 of 20	0 of 0	1 of 1	82 of 82	3 of 3	14 of 14
064-0161	17	6 of 6	9 of 9	0 of 0	0 of 0	0 of 0	2 of 2	14 of 14
084-0375	169	164 of 164	0 of 0	0 of 0	0 of 0	0 of 0	5 of 5	

3. EESA Verified the following:
   - Chemical inventory for all work areas in the Laboratory is up to date and documented in the Chemical Management System.
   - The EESA ALD and DDs directed the Lab PIs to assign personnel to review and update the chemical inventory for all EESA labs.
   - Training on how to perform the chemical inventory reconciliation was provided by the CMS administrator on 1/6/2020; additional daily brownbag meetings were held by the EESA DSC and EHS liaison to discuss the chemical inventory reconciliation process requirements and tutorial on the use of the scanners. Guidance on how to identify and handle peroxide forming compounds and time sensitive chemicals was provided to all lab staff.
   - A wall to wall inventory was conducted for all EESA labs
   - The EESA ALD and DDs conducted walkthroughs in selected labs and discussed with the Lab PIs and staff the inventory reconciliation process and actions to improve chemical procurement, storage, use, and disposal.
   - Each DD held a meeting with all division Lab PIs to evaluate processes and receive feedback on process improvement.
   - Work Planning and Control activities involving time-sensitive chemicals have been comprehensively evaluated and appropriate documentation and controls are in place before those chemicals are permitted to be used.
     - The WPC activity, AU-0273 *EESA Labspace Lead PI (LLPI) Roles and Responsibilities, was updated* to explicitly discuss chemical stewardship with an emphasis on time sensitive and peroxide forming chemicals. The WPC activity AU-0273 is approved by the EESA ALD
     - All EESA lab WPC activities will be updated, as necessary, to discuss requirements on tracking, using, storing and disposing chemicals with a special attention to appropriate health and safety precautions of time-sensitive chemicals and peroxide forming chemicals.

- LLPIs will document how chemicals are procured and controlled in their wpc activities. Affiliates, students and guests will not be authorized to bring chemicals to the lab without discussing the work and chemicals with the LLPI, all chemicals should be entered into CMS per the Lab WPC activity requirements.
- An annual mandatory chemical inventory reconciliation will be conducted for each lab space and the DSC will monitor and report results to the DD.
- Monthly LLPI (or designee) and DSC walkthrough, will be conducted focusing on new staff, new work, chemical stewardship, and new equipment.
- No time sensitive chemicals beyond their expiration date were identified nor in process to be procured.
- Future procurements of all chemicals will be monitored. *The* EESA procurement form will be updated to include a field for procurement of chemicals, the LLPIs name and lab location. The EESA DSC will quarterly review the EESA procurements for chemicals and evaluate tracking through CMS. Any issues will be discussed with the Lab PIs and reported to the DD.
- The EESA DSC will develop a Checklist to be used at the end of a project to remind and help PIs identify unwanted chemicals that would be requisitioned as hazardous waste.
- Prior to EESA staff leaving LBNL, the EESA DSC will review CMS to ensure any chemicals are properly disposed of or assigned to knowledgeable staff.
- Lab PI chemical stewardship guidelines:
  - How do you determine the chemical(s) you need for an experiment?
  - Do you evaluate existing lab inventory before ordering a new chemical?
  - Do you review SDSs (can find the SDS in CMS or A-Z Safety Data Sheet)?
  - Do you try to find an alternative, less hazardous chemical?
  - Do you buy the smallest amount possible?
  - Do you ensure that all chemicals are timely entered into CMS?
  - Do you ensure that all chemicals are timely removed from CMS when used up or disposed?
  - Do you identify reaction by-products and set proper controls?
  - How do you store chemicals?
  - Evaluate compatibility with other chemicals
  - Segregation of incompatible materials
  - No spills or leaking containers
  - Secondary containers for hazardous chemicals (*secondary containment capacity must be 110% of the largest container or 10% of the aggregate volume of all containers)*

- Time sensitive chemicals: Do you properly label, track and assess time sensitive chemical containers (e.g., Hydrogen peroxide 30% or higher)?
- Do you regularly evaluate your chemical inventory and dispose as hazardous waste, old, out of date chemicals?
- Do you appropriately and accurately label, contain, and dispose within 6 months of initial date of accumulation (EESA requirement).
- **Do you discuss your expectations with the lab staff?**

EESA Actions:

Work Planning and Control:

- The WPC activity, AU-0273 *EESA Labspace Lead PI (LLPI) Roles and Responsibilities, will be updated* to explicitly discuss chemical stewardship with an emphasis on time sensitive chemicals. The WPC activity AU—0273 will be approved by the EESA ALD
- Chemical stewardship and processes are clearly discussed in each lab WPC activity, including at a minimum:
  - o LLPIs evaluate lab processes on tracking, using, storing and disposing chemicals, and Implement a Time-Sensitive Chemical Management Plan.
  - o LLPIs designate lab staff responsible for the procurement of chemicals and timely CMS entry.
  - o Affiliates, students and guests are not authorized to bring chemicals to the lab without discussing the work and chemicals with the activity lead, all chemicals should be entered into CMS per the Lab WPC activity requirements.

Annual Lab Safety Meeting/Walkthrough(s):

- At the time of the annual EESA Lab safety meetings, a mandatory chemical inventory reconciliation will be conducted and results shall be reported to DD and DSC
- Annual DD walkthrough, bi-annual Dept. Head walkthrough and monthly LLPI (or designee) and DSC walkthrough, will be conducted focusing on chemical stewardship, new work, equipment, staff.

Administrative Controls:

- EESA procured scanners that will be available to the lab staff to periodic perform electronic reconciliation of the lab chemical inventory;
- The EESA procurement form will be updated to clearly identify procurement of chemicals, list LLPIs name and lab location;
- Quarterly review of EESA procurements for chemicals by the DSC and discussion with the LLPI and/or responsible staff

EESA Time-Sensitive Chemical Management Plan guidelines:

EESA responsible lab person(s) carry out these requirements with full authority.

Start with a visual inspection: look for any abnormalities in its storage location/condition.

For Unstable/Self-Reactive Materials:

- Are there any signs of pressure build-up?
- Is the container past its expiration date?
- If everything looks safe, carefully vent the container at this time.

For Hazardous Polymerizers:

- Are there any signs of pressure build-up?
- Is there any solid polymerized material?
- Is the container past its expiration date?

For Explosive-When-Dry Materials:

- Is there any solid residue in the bottle, around the cap threads (visible without removing the cap), or
- on the outside of the container due to leaks?
- Has there been significant evaporation?
- If everything looks safe, you may top off the stabilizing liquid at this time.

For Time-Sensitive Gases:

- If there is already a regulator attached, has the pressure inside the cylinder increased?
- Are there any signs of corrosion?
- Is the cylinder near the end of its shelf life?

If the container fails its assessment: follow the instructions below to safely manage it. Assess all containers annually (at a minimum). (Tip: Set up reminders on your calendar, or perform assessments at the same time as other recurring events.)

Safely manage unsafe/expired/unneeded containers

Annually evaluating the lab chemical inventory and dispose as hazardous waste, old, out of date chemicals. Appropriately and accurately label, contain, and dispose of unwanted chemicals. Waste requisition must be completed within 6 months of the initial date of accumulation (EESA requirement).

Energy Technologies Area (ETA):

ETA Chemical Management System (CMS) Validation Effort Results

Date: 2/5/2020

Ron Scholtz

CMS Inventory (Bar Codes)

Inventory Before (12/20/19)		Inventory After (2/5/20)	
BTUS	402	BTUS	356
EAEI	712	EAEI	846
Cyclotron Road	232	Cyclotron Road	245
ESDR- B62	2018	ESDR- B62	2106
ESDR- B70	2628	ESDR B70	2632
Total- 5992		Total- 6185	

CMS Inventory Added After 1/1/20.

(These are chemicals that were either found without a barcode, had a barcode but were not entered, were "undisposed", or had been received during the validation)

BTUS	47
EAEI	160
Cyclotron Road	63
ESDR- B62	408
ESDR B70	355
Total- 1033	

CMS Inventory Not Found and Removed from CMS

BTUS	93
EAEI	45
Cyclotron Road	25
ESDR- B62	341
ESDR- B70	211
Total- 715	

CMS Bar Coded Chemicals Disposed as Hazardous Waste and Removed from CMS

B62 "Old Chemicals"	40
B70 "Old Chemicals"	272
Total- 312	

(Note: An additional 250 chemical containers or bags containing sample vials that were not CMS bar coded were disposed as hazardous waste)

Highlights

1. There were 45 "time sensitive" peroxide former chemicals sent out for disposal as hazardous waste. A number of these containers were fairly old (> 2 years).

2. All remaining "time sensitive" peroxide former containers were field inspected and verified that they were properly labeled and tested within the last 12 months.

3. Accumulations of old sample containers were identified and sent out for waste disposal. This effort will need to continue. There were also 250 chemical containers sent out for hazardous waste disposal that were not CMS bar coded or listed in the inventory.

4. A number of containers were found in lab areas that were bar coded, but were no longer listed in the CMS inventory. These were originally deleted from the CMS when not found during previous inventory reconciliation efforts. All were "undisposed" and returned to the inventory.

5. A number of chemicals were identified in locations not belonging to ETA. A follow-up was performed for each item and location/owner/status updated as appropriate.

6. Chemical storage cabinets, lab drawers, and lab cabinets were inspected. Storage issues were identified and corrected on the spot.

7. Personnel identified as CMS chemical "owners" were updated to only Principal Investigators or designated career personnel. In addition, those assigned as "proxies" for each owner was updated. CMS access levels were updated to eliminate many who had "universal" access to "proxy" access only.

8. A number of personnel assigned as CMS "owners" and "proxies" had not previously completed EHS0346 "CMS Web Application" training. All owners and their proxies are in the process of completing this training.

9. A town hall meeting was held with ETA personnel on 1/6/20. Top management emphasized the importance of this effort and steps needed by each chemical owner. A follow-up town hall is being scheduled.

10. A mandatory survey was distributed to all chemical owners in order to document completion of required CMS validation tasks.

Energy Technologies Area

Chemical Management System (CMS) Feedback Summary

Date: 1/17/2020

Contact: Ron Scholtz X8137

The following is a compilation of feedback from ETA researchers regarding use of the Chemical Management System (CMS) for maintaining their chemical inventories:

1. A number of barcoded chemicals were identified as present in the lab area but were deleted (disposed) from the CMS. This was most common in areas that recently had a CMS inventory reconciliation performed. These chemicals were not scanned during the reconciliation and were "disposed" at the end as chemicals not found though they were present.

2. Bar code scanners are not readily available for quick inventory checks. There are a number of non-CMS scanners already in use by researchers, but they are not compatible with the older CMS system. We need to find a way to allow use of various types of scanners in order to perform quick field evaluations of inventories.

3. Chemical containers are being moved by researchers from one lab area to another. It is difficult to ensure the CMS is updated when this occurs. When a lab area inventory is reconciled and the container is not found, it can be deleted from the CMS when it actually still exists in another lab area.

4. We noticed quite a few personnel listed as "owners" in the inventory when they should only have "proxy" access. Almost everyone listed had "universal" access and hardly any were proxy only. We need to update the CMS so that access levels are restricted unless approved by Division Safety Coordinators. In addition, the toggles for selecting access levels need to be improved.

5. When personnel are added to the CMS as an owner, proxy, or universal access, the system should automatically trigger EHS0246 "CMS Web Application" training. Similar to a hazardous waste requisition, access cannot be given unless required training is completed. Needs to be mandatory rather than suggested.

6. We have found ETA chemicals in the CMS inventory that are located in other lab areas not under ETA control. This includes ALS and Foundry. We need to come up with a policy or procedure that restricts researchers from bringing chemicals into other areas without the

sponsor lab area taking ownership of the chemicals brought in. There is a potential disconnect where a highly hazardous item might be brought in and the lab area management is not aware.

7. The current CMS system and processes need to be replaced with newer software, tools, and improved processes for tracking cradle to grave.

8. LBNL should consider outsourcing the management of incoming chemicals to a third party. They could be responsible for procurement, delivery, barcoding, and maintenance of inventories databases.

9. The definition of “expired” for time sensitive chemicals needs to be clearly defined and communicated. What specifically needs to be done if a chemical has exceeded the date on the container and the owner feels it is still safe to use? What if a container does not have a manufacturer expiration date?

10. LBNL should consider having regular pre-planned chemical disposal events that can take place building-wide. These events can be set-up to make disposal of old chemicals and samples as easy as possible for researchers. This will help minimize the accumulation of chemicals in lab areas over time.

11. It is very difficult to track chemicals maintained inside glove boxes. It is not easy to read or scan barcodes and access to the containers is limited. Many containers are high hazard or time sensitive. Perhaps some sort of remote read barcodes that enable a single scan for a complete inventory.

12. Most chemical containers arrive with a barcode on them. It would be helpful if the scanner can scan the supplier’s barcode and use that to populate the information in CMS.

13. There needs to be a quick-start guide for CMS, labeling, storage, etc rules for chemical and samples. It should be a printed document or PDF that is given to all new personnel, and is also posted in chemical storage areas. The web-based training does not really help new hires understand the day-to-day management of chemicals once they start working in the lab.

14. My perception is that the CMS user interface does not readily allow the entry of the expiration date for a chemical. At least I couldn't find such a field in a quick scan of the system. There needs to be some way for manual entry of those expiration data into CMS. It wasn't clear to me that a researcher could do such data entry in the current system.

15. Time-sensitive chemicals seem like a particularly important hazard to track. This should be handled at a Lab-wide level. Ideally collecting time-sensitive chemical information should be triggered as part of the procurement process, the chemical should be inventoried on delivery (akin to the way computers are handled), and all relevant information (including expiration date)

should be entered in the CMS at that point. The researcher should only be a point of backstop checking, not the primary source of information.

16. The WPC Activity Manager system does not currently have hazards/controls available for time sensitive chemicals such as “generates pressure”, “explosive when dry” and “hazardous polymerization.” These need to be added into work activities as needed once available.

17. The CMS chemical inventory needs to be linked to the WPC Activity Manager system. When generating a work activity, there should be a simple search for each chemical hazard selected that identifies the relevant chemicals. Currently, we are having to manually add the names of specific chemicals. In the case of time sensitives, this is not always an accurate process.

18. Most time sensitive chemicals DO NOT have a manufacturer’s expiration date indicated. There needs to be a process identified for tracking expiration of containers that have no expiration date. Perhaps use the date entered in the CMS and use 2 years as a benchmark for disposal or justification for keeping.

20. Need to promote purchasing of smaller containers of time sensitive chemicals so that they are used up well before any expiration occurs. The hazards are minimized as well.

21. Need to identify options for replacing time sensitive/highly hazardous chemicals with less hazardous chemicals or make process changes. Several researchers in ETA eliminated the use of peroxide formers entirely.

22. Propylene Carbonate showed up on ETA’s list of peroxide formers. We do not believe this showed up on previous reports. Our researchers dispute this should be handled as a peroxide former based on chemical properties. It is in almost all of our electrolyte solutions and will result in dozens of containers requiring labeling and testing. It is not clear to us how chemicals are added as peroxide formers in the CMS database and how this is communicated to researchers when this does occur.

23. We were going through the glove box in 70-263 and found a container of Dimethoxyethane #CH374853. It had the required PF label affixed, but it was not on my CMS list of peroxide formers. I searched the CMS database and it was active, but did not show any hazard classification. It was entered as dimethoxy ethane (with a space). I updated to dimethoxethane and it now shows up as a PF. An instance where we could have missed a time sensitive. We might want to remove that rogue chemical name (with the space) from the database.

24. Given the number of actions LBNL has had to take recently regarding high hazard chemicals, restrictions on who can purchase, and what can be purchased seems prudent.

25. I found a bottle of tert-butyl methyl ether that was identified as a peroxide former by my researchers. It is not a peroxide former according to the CMS (and I also believe the CHSP) so

was not on my list of PF's to look for. I did a web search and it is thought to be a PF by others. I think the researchers were just assuming it's a PF based on their chemical background. Just based off the chemical name with "ether" in it, I would also assume it to be a PF. We may need to come up with a sticker we can affix to containers that are not PF's but would lead someone to think they are ("not a time sensitive chemical)". There are other examples.

26. We have 1.0M lithium tetracholocuprate in tetrahydrofuran, a peroxide former. It is not on my CMS list of peroxide formers when performing a search. The researchers had identified it as a peroxide former since it contains tetrahydrofuran. The CMS only identifies it as a flammable liquid. The CMS needs to be updated for mixtures that contain PF's. Otherwise, we could miss it in our surveys.

27. I receive a lot of feedback from researchers regarding the difficulty of getting waste chemicals disposed. It takes quite a while to get wastes picked up once a requisition is submitted. There are recent cases where it is 2 months or more. Accumulation areas become too full. There are some reactive wastes that must remain in a glove box until picked up. We have to coordinate removal of the items just prior to pick-up and we don't know when this is. There are times certain wastes are not picked up and it is never communicated what the reasons are.

28. We really liked it when wastes were picked up from each building on a scheduled basis. There used to be an "every other Tuesday" schedule for our building that we could plan for. Our wastes were picked up regularly and it got us into a routine of getting requisitions submitted in a timely manner.

29. Consider additional training and awareness resources for time sensitive chemicals. This may already be included in EHS0348 training, but one of the 3-5 minute videos could be a useful resource. Focus should be on main requirements and how to properly label. In addition, we really need a video that demonstrates proper use of the peroxide former test strips.

Lessons Learned

- Use of the small peroxide former warning labels instead of the larger labels that contain required dates and test information. Need to associate small labels for very small containers only and these need to be recorded on a log or placed in an outer baggie with the larger PF label affixed.
- Many samples accumulated in the lab areas in a short period. Not always cleaned out by researchers prior to leaving LBNL. Need a better process to ensure samples are regularly disposed.
- Drawers used for storing samples. Need better process for identification of contents, name of researcher, and date on outside of drawer.

- We need to be very strict about who is assigned an “owner” in the CMS. Only responsible individuals such as Principal Investigators should be given owner access. Assignment to the CMS needs to be restricted to the ETA Safety Manager only to ensure only properly trained individuals are given read/write access.
- Still finding chemicals that are not barcoded.

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DOCUMENT ID	b34b10f901ae01fceda60500b40fc228a7fc2959
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FILE NAME	Chemical_Stewards...ent_Report v2.pdf
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TITLE	Chemical Stewardship Self - Assessment Report v2
FILE NAME	Chemical_Stewards...ent_Report v2.pdf
DOCUMENT ID	64e1f164b892d4956c9649cba4d52e31e90fb82b
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