

# **Chemical Sciences Division**

**Fiscal Year 2016**

**Environmental Health and Safety**

**Self-Assessment Report**

## **Chemical Sciences Radiological Program Self Assessment**

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## Executive Summary

This Radiological Self-Assessment evaluated a variety of radiological related issues within the Heavy Element Research Laboratory. Areas of focus were radiological work processes, scope of work procedures, training, and communication. The Self Assessment team was comprised of four radiological work knowledgeable people who were from outside of the division and could give a fresh perspective, and insure confidential interview responses. Over all, both PIs and workers were aware of their responsibilities with respect to contamination control, training, and staying within the boundaries of the RWA. More importantly, both the PIs and workers seem motivated to both work safely and to make sure others work safely. However, we identified some issues with communication. While the overall concepts of the program appear to be well communicated, some details are not necessarily being communicated completely effectively. To address the communication issues identified along with any emerging issues, we hope to initiate a HERL email newsletter. Some suggestions for improvement were provided by rad workers. These suggestions will be examined and implemented if found to be appropriate. If practical, we would also like to create a video of how to self-frisk for the HERL, including how and when to perform a post-work survey.

## Introduction

Environment, Health, and Safety Self-Assessment is a process of continuously evaluating safety program effectiveness. This Radiological Program Safety Self-Assessment evaluated a wide variety of Radiation Protection related issues within the Heavy Element Research Laboratory. The Chemical Sciences Division conducted interviews to identify deficiencies in the division's radiological work processes, scope of work procedures, training, and communication.

As part of this self assessment we examined the following:

1. Human performance issues. Identify inefficiencies or vagueness in processes that cause misunderstandings or confusion that could lead to human error.
2. Communication. Investigating whether researchers are internalizing and retaining conveyed information.
3. Worker qualification/OJT. Are workers qualified for the tasks that they perform? How are workers trained and deemed qualified?
4. Scope of work - this is pretty tightly proscribed for radiological protection since it determines the engineering controls. However, we would like to assess whether workers know their scope of work and tools or processes that they use to stay within the scope.

## Assessment Methodology

### Scope of Assessment

The Chemical Sciences Division has recently undergone a full review of our work authorizations in the transition to Work Planning and Control. Additionally, the Radiation Protection Group reviews and reauthorizes the

Radiological Work Authorizations on an 18 month cycle. Reviewing these documents and authorizations would be redundant and of limited usefulness.

Furthermore, The Chemical Sciences Division is largely in lock-step with the radiation protection group (RPG) on all of the major programmatic issues, and we have worked collaboratively with RPG for approximately 5-6 years. While the radiological protection requirements (10 CFR 835 and LBNL's Radiological Control Manual) are inflexible, the Chemical Sciences Division is very familiar with the requirements and accepts the compliance-driven nature of this program. Moreover, although the radiological protection requirements are inflexible, they are relatively easy to comply with given the support provided by RPG. We are confident that we are in compliance with these programmatic elements, and therefore we chose not to review this in the current assessment.

However our adherence to compliance and close partnership with RPG may be causing an unanticipated problem. Since we are focused on compliance with the requirements, we may be missing some hazard that is not in the requirements. One of the goals of this Self Assessment is to attempt to find any hidden hazards that are not directly dictated by requirements.

Changes to the scope of the work happen regularly in science as answers lead to new questions and experiments. It is particularly important for radiological workers to stay conscious of these changes since the amount and type of material dictates the engineering control that is required. Another goal of this self assessment was to discover or develop best practices for managing the scope of work, and tools to help workers recognize when the scope of the work has changed.

Other objectives of this Self Assessment are to look at worker qualification, On-the-Job-Training (OJT), and ongoing communication. It is very important to accurately gauge the level of previous knowledge of a new worker, deliver appropriate OJT and ongoing training and communication. This training and communication is being performed, however, we would like to gauge the effectiveness of whether researchers are internalizing and retaining conveyed information.

## **Assessment Team**

The Self Assessment team was comprised of people knowledgeable in radiological work, but who were not familiar with the radiological work of the division. We needed people knowledgeable in radiological protection and research, however those who are familiar with the group will already have identified any significant issues that they have found. We reasoned that completely fresh eyes would be the most useful for identifying things that everyone else has missed, and therefore we chose to select assessment team members who are radiological workers, staff or PIs from outside of the division. In addition, we wanted the people being interviewed to be candid if they have critical things to say about any of the workers or PIs. We felt that having interviewers from outside of the division would help reassure the people being interviewed that their responses would be kept confidential.

The team was comprised of;

- Keith Heinzelman, Health Physicist, LBNL Radiation Protection Group
- Jim O'Neil, Staff Scientist, Group Leader, Biomedical Isotope Facility
- Larry Phair, Program Head, 88-Inch Cyclotron

- Kurt Galloway, Manager, Radiation Protection & Waste Operations

## Lines of Inquiry

- 1) (PIs only) How do you assess the previous education and experience of an incoming rad worker?
- 2) (PIs only) How do you provide OJT to new rad workers? – How do you insure that the worker understands the training delivered?
- 3) (PIs only) How do you know when your workers are qualified to work unescorted? – Please explain the process you use to authorize and notify them.
- 4) (PIs only) Do you have a practice that reassures you that your workers remain within the scope of the authorization?
- 5) What do you do if you find contamination inside your rad work area?
- 6) What do you do if you find contamination outside of your work area?
- 7) If you want to move a tool from a rad area to a non-rad area, what do you have to do?
- 8) How can you move something from a rad area to a clean area?
- 9) What are some of the things you do to prevent the spread of contamination?
- 10) What do you do if you want to work on a new rad project (different chemistry or radionuclides, or higher activity)?
- 11) Contamination (not radon) is found on the floor in HERL. What went wrong to cause contamination to spread outside of the control areas? (up to 3 answers OK)
- 12) What worries you most about working with rad materials?
- 13) What worries you most about others in your group working with rad materials (no names!)?
- 14) If there were a single change you could make to DOE and/or LBNL rad protection policy, what would it be?

## Assessment Results

Of the 24 people working in the Heavy Element Research Laboratory at the time of this assessment, 13 people were interviewed for this assessment. Questionnaires were anonymized and supplied to the HERL Laboratory Manager, Wayne Lukens for analysis. These findings are presented below in the Results and Discussion sections.

### Results:

The results of the survey were largely unsurprising with a few exceptions. The interview records are provided in the appendix and are briefly summarized here.

The first set of questions are related to how PIs provide training and how they ensure that their workers are qualified and are working within the limits of the RWA. The PIs gave similar answers. They provide OJT based to some degree on the worker's previous experience, and they determine the worker's qualification by watching him or her work. The mechanisms by which PIs make sure workers remain within the scope of the RWA vary, but most simply talk with their workers either during weekly group meetings or more frequently when walking through the labs. One PI stated that the RWA was easy to comply with since the limits are high.

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The next set of questions involve contamination control since spread of contamination is the primary concern for the isotopes that we work with. Everyone responded similarly when asked which actions should be taken upon discovering contamination. For contamination inside the work area, almost all said they would simply clean up the contamination and either record the presence of contamination or report it to the HERL manager or to RPG. The correct response. For contamination outside of their work area, everyone gave the same, correct, response – notify RPG.

The next two questions are related to moving an item from a rad area to a non-rad area. In hindsight, the questions were poorly worded as “rad area” can refer to either a radiological materials area (RMA), radiologically controlled area (RCA), contamination area (CA), or designated work area (DWA). Most workers responded that they would ask RPG to “green tag” the items; however, a few responded that they would survey (frisk and/or smear) the item and remove it. Asking RPG to “green tag” items is always the correct response, but surveying an item and removing it is also appropriate for some area (RMAs and RCAs) if the item has not been in a CA or DWA. Given the ambiguity of the questions, no conclusions can be reached.

The last question in the set concerned practical steps that can be taken to prevent the spread of contamination. A wide variety of responses were received. All were appropriate contamination control techniques.

The next question asked workers what they would do if they wanted to change their work scope (different isotopes and different techniques). The minimal response was to check the RWA, which is acceptable. However, most responded that they would contact the health physicist (HP) or HERL manager, which is the desired action.

The answers to the questions discussed above demonstrate that the training is largely effective in communicating the broad scope of radiation protection principles, controlling contamination and remaining within the scope of the RWA, to new employees. This is not the same as demonstrating that these desired actions have been effectively communicated such that the workers always remember them while they are performing rad work; however, it does demonstrate that workers can correctly recall the concepts.

The next question asked workers to suggest the causes of a hypothetical contamination event (the intent was to determine which contamination control practices caused concern among rad workers). The responses were varied; however, common themes were the following:

1. Ineffective self-frisking leading to contamination being tracked around the lab.
2. Spills of radioactive material while working including dropping a container of material.
3. Contamination left in work area by others possibly due to ineffective post work surveys.
4. Ineffective containment of radioactive material removed from either boxes or hoods.

The next set of questions asked researchers about their concerns regarding working with radioactive materials both their personal concerns and their concerns about the work of others in the lab. The answers were varied, but the most common concern is tracking contamination out the lab, which correlates well with the response to the previous question. Many responded that they had no particular concerns about working with radioactive materials. Some expressed concern about ingestion or injection or radioactive

material or the dose received in HERL. The concerns about the work of others was widely varied and included the following responses:

1. Poor communication between people sharing the same work area (hoods), and poor communication in general.
2. Competence of new workers with respect to contamination control and variation of OJT.
3. Colocation of different isotopes (U and Pu used in the same work area).
4. Ineffective post work surveys.
5. Apathy towards contamination control.

Skipping the question about improvements, the last three questions deal with radioactivity limits, transportation of radioactive materials, and receiving radioactive materials. These questions were all answered correctly.

Workers were asked how they would improve the radiation protection program. The responses are paraphrased below:

1. Remove rules that are so difficult to follow that rad workers will not do them (e.g. surveying the floor every time a worker leaves a rad work area).
2. Better training on handling radioactive materials at universities.
3. Daily dosimeter readings and electronic dosimeters for HERL.
4. Hand and foot monitors for every lab where work with dispersible materials occur.
5.  $\alpha$  meters need a check source.
6. Get rid of rechargeable batteries (they lose charge after 1/2 hour).
7. Body frisk takes too long (1/2 hour).
8. Definition of radiation detection limits, and no detectable activity.
9. DOE policy for some radioactive materials doesn't make sense (e.g. Samples that are naturally contaminated by uranium (NORM – naturally occurring radioactive materials) are treated identically to samples which  $\alpha$  emitters are enriched).
10. WPC/RWA should be integrated.
11. Better labeling system for samples. Many sample containers are too small to include all of the information (isotope and chemical form).
12. Some confusion about the difference between Designated Work Areas and Contamination Areas.
13. Being able to move radioactive samples from LBNL to UCB without having to go through RPG.
14. Amount of paperwork and approvals too great for very small samples (<1 nCi). No de minimis limit for radioactivity.
15. Remove the requirement to notify RPG of glovebox passouts. We don't notify RPG of hood passouts, which are equivalent.
16. RPG hotline not working.
17. When the HP changes, the new HP should meet with the rad workers so that the rad workers know who to call. The RCTs already do this.
18. Why were NSD workers included in a CSD self-assessment?

## Discussion:

Overall, both PIs and workers were aware of their responsibilities with respect to contamination control, training, and staying within the boundaries of the RWA. The combination of formal training, OJT, and ongoing work experience seems to be effective in communicating these concepts. More importantly, both the PIs and workers expressed concern about contamination control both their own performance and the performance of others with respect to this topic. They are motivated to both work safely and to make sure others work safely.

While the overall concepts appear to be well communicated, the details are not necessarily being communicated well as illustrated by some of the comments above. Specifically the following are incorrect and reflect poor communication when training new rad workers.

- 1) Remove rules that are so difficult to follow that rad workers will not do them (e.g. surveying the floor every time a worker leaves a rad work area).

There is no requirement to survey the floor every time a rad worker leaves an area. The only floor survey requirement is the post work survey. Rad workers are supposed to self-frisk when they leave a work area.

- 2) Definitions of NDA (non-detectable activities) and the detection limits of various instruments are not well (or consistently) communicated.
- 3) There is confusion about Contamination Areas vs Designated Work Areas.
- 4) Body frisk takes ½ hour (we want a 2 minute self frisk in HERL!).
- 5) In addition, poor communication was noted as an issue by at least one rad worker.

Going forward, we will focus on providing better communication of contamination control principles and of our expectations for rad workers. Specifically, an email newsletter addressing issues related to RWA 1020 will be initiated to address the issues identified in this self-assessment, and to address emerging issues. The suggestions for improvement provided by rad workers will be examined and either implemented or an explanation of why they cannot be implemented will be provided. Assuming that resources are available, we'll create a video of how to self-frisk for HERL and how to perform a post-work survey including defining when the survey is required (once a day, when you are finished).

## Conclusion

Environment, Health, and Safety Self-Assessment is a process of continuously evaluating safety program effectiveness. This Radiological Self-Assessment evaluated a variety of radiological related issues within the Heavy Element Research Laboratory. Areas of focus were radiological work processes, scope of work procedures, training, and communication. Over-all, both PIs and workers were aware of their responsibilities with respect to contamination control, training, and staying within the boundaries of the RWA. More importantly, both the PIs and workers seem motivated to both work safely and to make sure others work safely. However, there seem to be some issues with communication. While the overall concepts appear to be well communicated, the details are not necessarily being communicated completely effectively. To address the communication issues identified along with any emerging issues, an email newsletter will be initiated. In addition, the suggestions for improvement provided by rad workers will be examined and implemented if appropriate. If practical, we would

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also like to create a video of how to self-frisk for the HERL, including how and when to perform a post-work survey. With these schemes in place, the division should deliver improved communication and training.

## Appendix 1:

### Interview Records

#### Interview 1.

Answers to questions:

1) Two types of assessments.

1. Previous rad worker experience (e.g. other facility — can be a problem if training is different at the other facility).
2. PI does an initial assessment. With the idea in mind of “what kind of supervision is needed?” (for this person)

2) The PI does not do much rad work himself. Has relied on overlapping (time-wise) expertise of postdocs to do this OJT. Recently, he has not had an overlapping postdoc and has had to give the OJT himself. He insures understanding through observation. Observation is done by several people: Wayne, Melissa, and the PI. He asks questions to assess understanding.

Questions 3-8 see notes attached.

Question 10: see answer to question 4

Question 11: see notes

Question 12: see notes. Also the PI mentioned the usefulness of respirator training for some work. He also expressed a general lack of enthusiasm for respiratory use here compared to ORNL.

Question 13: see notes. The PI is confident with the current HERL users that work areas are indeed left clean. It has not always been that way in the past.

Question 14: see notes

Lines of Inquiry

1) (PIs only) How do you assess the previous education and experience of an incoming rad worker?

2) <sup>types</sup> 1) Previous rad worker experience (other facility — can be a problem if training is different)  
 2) Initial assessment ⇒ what kind of supervision needed?

2) (PIs only) How do you provide OJT to new rad workers? — How do you insure that the worker understands the training delivered?

He doesn't do much rad work himself. Overlapping PDs did it. Recently, by observation. Wayne, Melissa, also observe.  
 Asking questions.

3) (PIs only) How do you know when your workers are qualified to work unescorted? — Please explain the process you use to authorize and notify them.

① PI ② Melissa, ③ Wayne. All 3 sign off  
 By email. → HERL access ⇒ unescorted work at that point

4) (PIs only) Do you have a practice that reassures you that your workers remain within the scope of the authorization?

Somewhat informal. <sup>worker</sup> → PI → Wayne.  
 Notices.

new scope. ← { Amounts (greater)  
 Different isotopes

5) What do you do if you find contamination inside your rad work area? Depends on level.

① Clean-up if amounts below use level → notify EHS

② Large amounts → call RCT

6) What do you do if you find contamination outside of your work area? Immediately report. Work stops.

RCT + Wayne

7) If you want to move a tool from a rad area to a non-rad area, what do you have to do?  
 lab space  
 Have to be cleared by RCT.

8) How can you move something from a ~~rad~~ rad area to a clean area?

Green-tagged.

9) What are some of the things you do to prevent the spread of contamination? *Containment.  
Hoods (solutions). Glove box.*

10) What do you do if you want to work on a new rad project (different chemistry or radionuclides, or higher activity)?  
*See question 8*

11) Contamination (not radon) is found on the floor in HERL. What went wrong to cause contamination to spread outside of the control areas? (up to 3 answers OK) *Usually a hood issue.*

*3) Bagging out of the glove box. Piercing w/ a glove (syringe)*

12) What worries you most about working with rad materials?  
*Ingestion. Piercing yourself. Not so much airborne.  
Cleaning instrument under concerns about airborne. Respirator training.*

13) What worries you most about others in your group working with rad materials (no names!)?  
*Sharing hoods. People leaving ~~behind~~ behind contamination in a "clean" hood. stuff left behind. Confidential now.*

14) If there were a single change you could make to DOE and/or LBNL rad protection policy, what would it be?

- 1) All meters ( $\alpha$ ) should have a check source. Should be required.
- 2) Rechargeable batteries, drop all at once. Re-check batteries hourly.
- 3) Body frisk takes  $\frac{1}{2}$  hour.  $\Rightarrow$  Check most probable places.  
hands, shoes, front of coat. Training out of sync w/ actual work.
- 4) NDA —  
 $\alpha$  levels above which we need to be worried (10 cts/min?)  
 $\Rightarrow$  Post this level.  
 $\wedge$

Interview 2.

**Lines of Inquiry**

- 1) (PIs only) How do you assess the previous education and experience of an incoming rad worker?
- 2) (PIs only) How do you provide OJT to new rad workers? – How do you insure that the worker understands the training delivered?
- 3) (PIs only) How do you know when your workers are qualified to work unescorted? – Please explain the process you use to authorize and certify them.
- 4) (PIs only) Do you have a practice that reassures you that your workers remain within the scope of the authorization?

5) What do you do if you find contamination inside your rad work area?  
Inside + small  $\Rightarrow$  I can clean. Outside my area. I call someone (RCT)

6) What do you do if you find contamination outside of your work area?

7) If you want to move a tool from a rad area to a non-rad area, what do you have to do?  
1) Check w/ RPG, Get details from RCT. Check for removable contamination.

8) How can you move something from a ~~rad~~ rad area to a clean area?

Same

- 9) What are some of the things you do to prevent the spread of contamination? <sup>B</sup> Trial runs w/ cold material. Write protocol. So we only have to follow it. PPE.  
Be extra cautious. <sup>Use</sup> Local meters and hand + foot counters. Post-job
- 10) What do you do if you want to work on a new rad project (different chemistry or radionuclides, or higher activity)? <sup>survey.</sup> Check if new materials are covered by existing authorization.  
If not, go to PI to find out next steps.
- 11) Contamination (not radon) is found on the floor in HERL. What went wrong to cause contamination to spread outside of the control areas? (up to 3 answers OK)
- 1) Spill that someone did not see.
  - 2) Contaminated item in CA
  - 3) Trip hazard.
- 12) What worries you most about working with rad materials? Not afraid.  
More precious, more dangerous. Easy to spill.
- 13) What worries you most about others in your group working with rad materials (no names)?  
Other people doing their post-work survey.
- 14) If there were a single change you could make to DOE and/or LBNL rad protection policy, what would it be?  
Samples. Labelling. Poorly labeled. Because they are such small samples → small labels.  
Identifying Type of chemical form.

Interviews 3-6.

**Lines of Inquiry**

- 1) (PIs only) How do you assess the previous education and experience of an incoming rad worker?
- 2) (PIs only) How do you provide OJT to new rad workers? – How do you insure that the worker understands the training delivered?
- 3) (PIs only) How do you know when your workers are qualified to work unescorted? – Please explain the process you use to authorize and notify them.
- 4) (PIs only) Do you have a practice that reassures you that your workers remain within the scope of the authorization?
- 5) What do you do if you find contamination inside your rad work area?

Interviewee 1	Only use HERL for LSC, and helped out with pass outs – Clean up contamination and survey by swipe and frisk make sure area is clean.
Interviewee 2	Using a GM and find something, stop, check self, call RCT and post some kind of sign to warn others.
Interviewee 3	Assuming I am actively working in the rad area, and If the spill is something I can clean myself, I would clean it up and do surveys with swipe. Larger spills or not comfortable handle alone I would call an RCT for help.
Interviewee 4	This is somewhat routine and most times you can change out the paper or cleaned the area, where the contamination was found. No reporting necessary it can be logged.

- 6) What do you do if you find contamination outside of your work area?

Interviewee 1	Call RCT, then clean up. If RCT not available, leave a message and then clean up. Survey swipe and frisk until clean.
Interviewee 2	Survey, stop check self and area to isolate contamination location(s). Determine if you need to leave area, post area, call RCT to help support spill.
Interviewee 3	Assuming this is a major spill, call the RCT and inform Wayne of the contamination outside my work area.
Interviewee 4	If the material you are working with got out paste the line [tape], report it to RPG. Call immediately for larger spills or spills that you need help with, if the spill is small it could be cleaned up and then call RPG.

- 7) If you want to move a tool from a rad area to a non-rad area, what do you have to do?

Interviewee 1	Green tag by RCT
Interviewee 2	Depends on the tool, may not be allowed to be moved; check for contamination, small things may/may not need swipe. Some items may requires swipe before moved.
Interviewee 3	Assuming tool is not contaminated, swipe and frisk, bag or move to non rad area. If the tool is being actively used, call RCT for release. Ensure with someone it is OK to use tool in non-

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	rad area. Simple and hard tools require different thoughts and maybe it is something you just use rad waste, g..g, pipet fs other items is something that would be hard to survey and would likely need to be exchanged
Interviewee 4	It the tool is large enough to survey you would survey it with a meter, it is real small you may only take wipes. The surveys need to consider it removable or fixed is needed.

8) How can you move something from a rad area to a clean area?

Interviewee 1	Depends on what it i: green tag by RCT; going from rad area to rad area, pass out to double bag and survey outside of bag, sometimes depends on the rad area too.
Interviewee 2	Swipe counted; HERL lab RCT to release
Interviewee 3	Green tag item with RCT.
Interviewee 4	Survey the items to make sure not contaminated and mostly the same as above.

9) What are some of the things you do to prevent the spread of contamination?

Interviewee 1	Check gloves frequently with meter; be aware and notice if you drop or touch something changing gloves each time; if gloves are contaminated change and survey area, clean up spills as soon as you notice them to avoid spreading contamination.
Interviewee 2	Ate HERL, place chunk of U in plastic bag to break apart. Bag works like containment and prevents small U pieces form falling away. Powder material, use a wet Kimwipe to hold the powder material and place in bag to put in trash.
Interviewee 3	Double glove every time, in all of my work areas, I remove the outer of gloves often. Survey hands often and change outer gloves each time my hands touch something else or come out of the glove box or fume hood. Survey work area after each step/task
Interviewee 4	Ware the correct PPE, gloves and lab coat. Double gloves most of the time so you can remove the outer glove as needed. Frequent surveys of self and work space; pipet example, survey where you were pipetting to and make sure the pipet did not touch something not intended.

10) What do you do if you want to work on a new rad project (different chemistry or radionuclides, or higher activity)?

Interviewee 1	Check RWA to see if you would be within the limits and if it would be approved. Talk to PI and HP.
Interviewee 2	Discuss with Wayne Lukens what would be needed to be done, maybe check with RCT or whomever runs the lab.
Interviewee 3	Talk to the PI to see if change is feasible for safe. Talk to Wayne and use official channels to work with RPG to change RWA and/or WPC. Once approved mock runs, change protocols to work with WPC.
Interviewee 4	Changes in chemical reaction would need to go through the WPC process, if both you and researcher [lead/supervisor] thought the reaction would be safe. Depending on the level of changes you may need to check with oversight groups like RPG to see if the changes could be approved.

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11) Contamination (not radon) is found on the floor in HERL. What went wrong to cause contamination to spread outside of the control areas? (up to 3 answers OK)

Interviewee 1	Negligence on other researchers part; stepped in and was track unknowingly, persons thought something was clean but it was really contaminated.
Interviewee 2	Tracking out with shoe or booties, did not use the hand foot counter.
Interviewee 3	Spill tracked out; there would have to be lots of things gone wrong for this to happen in the HERL. Maybe got something on booties, bypassed hand and foot counter.
Interviewee 4	Improper surveys or use of hand and foot counter. Not using the appropriate PPE or using PPE correctly. Maybe a sample being moved to another lab was dropped.

12) What worries you most about working with rad materials?

Interviewee 1	Not much now [better understanding]; meter not correct for isotope energies, not being able to detect the radiation or measure the correct level of radiation.
Interviewee 2	Ingestion, unknowingly ingesting something.
Interviewee 3	Nothing really worries me other than things I cannot control. Feeling confident now.
Interviewee 4	Not really a worry, but thinks about the long term effect of dose/exposure. Thinks about the gravity of what is being done and the potential consequences; pressure of doing it right.

13) What worries you most about others in your group working with rad materials (no names!)?

Interviewee 1	Other not following protocols. Handling rad and non-rad with the same gloves.
Interviewee 2	Co-located isotopes used in the same work spaces within a lab, by other that are more hazardous e.g. PU in the same places as U is being used. Really it is the lack of separation of work spaces, no private space to use only one isotope.
Interviewee 3	No worries, assumed other have been sufficiently trained.
Interviewee 4	Worries about other not communication issues/problems in the work area [walks into some haz unknowingly]. Generally worries there is not enough communication for all areas.

14) If there were a single change you could make to DOE and/or LBNL rad protection policy, what would it be?

Interviewee 1	Major amendments need to go faster, should not have to wait for the RSC to decide to meet. Clear or better definitions of a major and minor spill.
Interviewee 2	Noting at this point because I have adjusted to current protocols. Some of the RWA requirements need to be less burdensome, particularly at the ALS
Interviewee 3	<ul style="list-style-type: none"> <li>• Unreasonable over bearing controls for small quantities, nCi/pCi levels; too much paper and approvals.</li> <li>• RPG knowing every time we have to do pass outs from the glovebox; this does not make senses because you do not need RPG to pass out of hoods and it really is the same thing.</li> <li>• Calling the [RPG] hot line after 330 and no one will answers</li> <li>• Not letting us know the HP is going to change or has changed. There should be formal communication for either case.</li> </ul>

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	<ul style="list-style-type: none"><li>○ The RCT do a great job of coming and talking with each of us; introducing the new RCT coming into the zone. HP need formal communication to all workers so we know who to call.</li></ul> <p>Feedback related to how my name was pick for this assessment; maybe someone should talk to me first and explain how and why me an NSD person was being selected.</p>
Interviewee 4	<p>Wishes it was easier to handle low levels of non TRU isotopes. No reason to have same controls for low hazard isotopes, certainly not the level of TRU. Same exact work at Campus with the same isotopes has much less controls. From a practical standpoint, unnecessary controls reduce efficiency of work production.</p>

Interview 7.

**Lines of Inquiry**

- 1) (PIs only) How do you assess the previous education and experience of an incoming rad worker?

NA

- 2) (PIs only) How do you provide OJT to new rad workers? – How do you insure that the worker understands the training delivered?

NA

- 3) (PIs only) How do you know when your workers are qualified to work unescorted? – Please explain the process you use to authorize and notify them.

NA

- 4) (PIs only) Do you have a practice that reassures you that your workers remain within the scope of the authorization?

NA

- 5) What do you do if you find contamination inside your rad work area?

If in CA, if on diaper pad, toss in DAW and frisk self and area. Call RCT if in a DWA. Change diaper paper after each experiment even if no contamination found.

- 6) What do you do if you find contamination outside of your work area?

Call an RCT. Notify work lead.

- 7) If you want to move a tool from a rad area to a non-rad area, what do you have to do?

Call RCT to check and clear.

- 8) How can you move something from a rad area to a clean area?

Same as above.

- 9) What are some of the things you do to prevent the spread of contamination?

PPE. Check hands between each procedure. Have partners check each other. Control the work area. Postings. Scheduling.

- 10) What do you do if you want to work on a new rad project (different chemistry or radionuclides, or higher activity)?

Check RWA. Is it within limits? If not, talk to PI. In general, the PI directs the work and any new rad work would be directed by the PI.

- 11) Contamination (not radon) is found on the floor in HERL. What went wrong to cause contamination to spread outside of the control areas? (up to 3 answers OK)

Maybe someone opened a container that sprayed beyond the area that was surveyed post-work. Or someone dropped a sample and didn't survey completely. Or legacy contamination. Or it was brought in on shoes from another contamination area.

- 12) What worries you most about working with rad materials?

Rad material leaving the area accidentally – for example, contamination on door handle that was transferred to person and then to some other materials.

- 13) What worries you most about others in your group working with rad materials (no names!)?

That a new individual may not have received adequate training and because of that bad work practices. OJT is given by more than one person in the group and some people may give more thorough OJT than others. It would help to have standardized OJT for the group.

- 14) If there were a single change you could make to DOE and/or LBNL rad protection policy, what would it be?

WPC/RWA should be integrated.

- 15) Are you aware of any limits on radioactivity within the facility (B70A)?

Aware there are limits, but not what they are.

- 16) Do you ever transfer radioactive materials between buildings? If so, what is the process?

Yes. The process is to fill out transfer form. And go through RPG.

- 17) What is the process to bring radioactivity into your building/lab?

Talk to the PI.

Interview 8.

**Lines of Inquiry**

- 1) (PIs only) How do you assess the previous education and experience of an incoming rad worker?

Talk to them. Review previous publications, if any. Talk to previous PI.

- 2) (PIs only) How do you provide OJT to new rad workers? – How do you insure that the worker understands the training delivered?

Go through in-depth OJT. Go through a reaction start to finish, waste processing, clean up, survey, etc.

This PI has had new workers with a range of experience from new to rad work to very experienced. After initial training, will check in on the next operation to make sure the worker knows what they're doing. Checks log book (survey) entries. Check to see if they maintain clean work space.

- 3) (PIs only) How do you know when your workers are qualified to work unescorted? – Please explain the process you use to authorize and notify them.

After formal training completed, authorize the worker to work under supervision. Slowly decrease the amount of supervision and once the PI is comfortable, allows work alone.

- 4) (PIs only) Do you have a practice that reassures you that your workers remain within the scope of the authorization?

Not challenging within his RWA. The limits are high enough that the amount of material to exceed them would be very high and workers understand the limits. Talk about plans at weekly meeting. Daily lab walk-throughs. Limitations on chemical use.

- 5) What do you do if you find contamination inside your rad work area?

Small spill, clean it up. Large spill, call RCT. Usually notify the RCT in either case.

- 6) What do you do if you find contamination outside of your work area?

Notify RCT.

- 7) If you want to move a tool from a rad area to a non-rad area, what do you have to do?

Notify the RCT and ask them to release it.

- 8) How can you move something from a rad area to a clean area?

Same as above.

- 9) What are some of the things you do to prevent the spread of contamination?

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Perform work in fume hoods and glove boxes. OJT includes best practices, like putting down absorbent material. Work slowly. Plan work steps.

- 10) What do you do if you want to work on a new rad project (different chemistry or radionuclides, or higher activity)?

Check scope of work of the RWA and other authorizations. If outside scope, authorizations must be amended before work.

- 11) Contamination (not radon) is found on the floor in HERL. What went wrong to cause contamination to spread outside of the control areas? (up to 3 answers OK)

Solvent splashed outside. Dropped container.

- 12) What worries you most about working with rad materials?

The chemicals are the main worry because of the higher hazard. For rad, spread of contamination outside of controlled areas.

Some people in the lab don't work with rad materials so this PI wants to make sure they are comfortable.

- 13) What worries you most about others in your group working with rad materials (no names!)?

Same answer as number 12.

- 14) If there were a single change you could make to DOE and/or LBNL rad protection policy, what would it be?

Transfer material from Lab to campus: If that could be done without RPG, it would be easier.

- 15) Are you aware of any limits on radioactivity within the facility (B70A)?

Yes.

- 16) Do you ever transfer radioactive materials between buildings? If so, what is the process?

Yes. From 70A to ALS and to Molecular Foundry. Procedure is to package sample, notify RPG or Doug Taube at ALS, to have material added to the inventory on the other end.

- 17) What is the process to bring radioactivity into your building/lab?

Everything goes through RPG.

Interview 9.

**Lines of Inquiry**

- 1) (PIs only) How do you assess the previous education and experience of an incoming rad worker?

Never had a worker that he trusted fully. To assess their experience, work with them and watch their behavior. Typically, workers have had no previous experience with rad work. All uncontained material was handled by the PI.

- 2) (PIs only) How do you provide OJT to new rad workers? – How do you insure that the worker understands the training delivered?

Watch them work. No work unsupervised.

- 3) (PIs only) How do you know when your workers are qualified to work unescorted? – Please explain the process you use to authorize and notify them.

They never got to work with unsealed material unescorted.

- 4) (PIs only) Do you have a practice that reassures you that your workers remain within the scope of the authorization?

Make sure the material doesn't exceed limits. There really isn't independent work performed by the workers so deviation from the scope of the authorization is not likely.

- 5) What do you do if you find contamination inside your rad work area?

Clean it up. Contact the PI and the RCT. If it's a survey of someone else's area, call the individual who is responsible for the area.

- 6) What do you do if you find contamination outside of your work area?

Contact the RCT.

- 7) If you want to move a tool from a rad area to a non-rad area, what do you have to do?

Get it surveyed by an RCT.

- 8) How can you move something from a rad area to a clean area?

Get it surveyed by an RCT.

- 9) What are some of the things you do to prevent the spread of contamination?

Move material from shipping container directly into the rad area. Put samples on Kim wipe within a tray. Immediately perform a survey. Pack into a secondary containment to allow removal from rad area. Survey secondary containment prior to removal. Survey hands and arms when done with each step.

- 10) What do you do if you want to work on a new rad project (different chemistry or radionuclides, or higher activity)?

Talk to the experts. Talk to the PI. Talk to RPG. Discuss what is required to make it safe. Does it require an amendment to the RWA? Get amendment if required. Perform the experiment and see how it went and if adjustments are required.

- 11) Contamination (not radon) is found on the floor in HERL. What went wrong to cause contamination to spread outside of the control areas? (up to 3 answers OK)

Post work survey inadequate. Containment was not adequate – problem with the process.

- 12) What worries you most about working with rad materials?

Quantities are low so risk of exposure is not a worry. The worry is that the consequences of an event could impact ability to perform rad work.

- 13) What worries you most about others in your group working with rad materials (no names!)?

Individuals are not allowed to work with the more hazardous/dispersible materials or greater quantities unless they are very experienced and trusted by the PI. So not a big worry. But contamination caused by other individuals may cause administrative problems.

- 14) If there were a single change you could make to DOE and/or LBNL rad protection policy, what would it be?

It's sometimes the case that a rule is so difficult to follow that it might not be followed every time. Example, survey of floor every time an individual leaves the rad area (example, taking contained sample from the rad work area to a balance for a measurement).

- 15) Are you aware of any limits on radioactivity within the facility (B70A)? Yes.

- 16) Do you ever transfer radioactive materials between buildings? If so, what is the process? No.

- 17) What is the process to bring radioactivity into your building/lab?

Go through RPG.

Interview 10.

**Lines of Inquiry**

- 1) (PIs only) How do you assess the previous education and experience of an incoming rad worker?

The PI hires project scientists, affiliates, post-docs. Sometime he knows the person and is familiar with the experience. Get's recommendations from previous employers

- 2) (PIs only) How do you provide OJT to new rad workers? – How do you insure that the worker understands the training delivered?

Many people from different backgrounds and experience at different institutions with different rules. This PI takes this very seriously. Emphasizes the differences in rules. Training starts with low hazard materials (uranium). Not everyone will go on to transuranics. Training includes having new individuals watch an experienced worker (PI or designee) a few times. Then the PI will observe while the new individual does the work. If the individual does not show they are able to handle the radioactive materials safely, the individual may never be qualified to work independently with tranuranics.

- 3) (PIs only) How do you know when your workers are qualified to work unescorted? – Please explain the process you use to authorize and notify them.

See question 2. Also, the OJT records specify the isotopes and quantities the individuals are authorized to work with.

- 4) (PIs only) Do you have a practice that reassures you that your workers remain within the scope of the authorization?

The practice is to be close to the work and to know what each individual is doing each day. If the PI is away, he delegates that to another individual.

- 5) What do you do if you find contamination inside your rad work area?

Many common work areas in HERL. His practice is to check the area before work begins. If contamination is found, record that and let the facility manager know. Inform the RCT. Very important to verify that there is no contamination before beginning because if it is there without you knowing then you may spread it.

- 6) What do you do if you find contamination outside of your work area?

Check first to verify it isn't radon. If not, then control the area and inform the RCT.

- 7) If you want to move a tool from a rad area to a non-rad area, what do you have to do?

Very strict about moving things outside the rad area. Only notebooks (if they are not placed in the work area) may be removed without RCT survey.

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8) How can you move something from a rad area to a clean area?

Same as above.

9) What are some of the things you do to prevent the spread of contamination?

Work in a designated areas within the lab. Radioactive material containers are also in secondary containment. Constant monitoring to catch any contamination as early as possible.

10) What do you do if you want to work on a new rad project (different chemistry or radionuclides, or higher activity)?

Write down the new protocol and send to the HP. Talk with facility manager. Sometimes involve the safety coordinator. Needs approval from RPG, CSD and facility manager before beginning new work.

11) Contamination (not radon) is found on the floor in HERL. What went wrong to cause contamination to spread outside of the control areas? (up to 3 answers OK)

When samples were transferred from one area to another they were not sufficiently contained. Normally samples are bagged when transfers are done. Or, if a small spill while working was transferred on booties.

12) What worries you most about working with rad materials?

No worries.

13) What worries you most about others in your group working with rad materials (no names!)?

People working with transuranics that do not have sufficient experience. Sometimes post docs have no experience before coming to LBNL.

14) If there were a single change you could make to DOE and/or LBNL rad protection policy, what would it be?

It would be good if the radiochemistry programs in the universities included education on the safe handling of radioactive materials.

15) Are you aware of any limits on radioactivity within the facility (B70A)? Yes.

16) Do you ever transfer radioactive materials between buildings? If so, what is the process?

Yes. It was all as prescribed in the RWA.

17) What is the process to bring radioactivity into your building/lab?

Received through RPG.

Interview 11.

**Interview conducted November 15, 2016 by JPO**

**Lines of Inquiry**

- 1) (PIs only) How do you assess the previous education and experience of an incoming rad worker?

N/A

- 2) (PIs only) How do you provide OJT to new rad workers? – How do you insure that the worker understands the training delivered?

N/A

- 3) (PIs only) How do you know when your workers are qualified to work unescorted? – Please explain the process you use to authorize and notify them.

N/A

- 4) (PIs only) Do you have a practice that reassures you that your workers remain within the scope of the authorization?

N/A

- 5) What do you do if you find contamination inside your rad work area?

If the activity was in my area, ie I caused it and it was at the appropriate levels I would decon myself.

Otherwise I would contact someone from the extensive list of people we have posted in the HERL

- 6) What do you do if you find contamination outside of your work area?

Call RPG for assistance

- 7) If you want to move a tool from a rad area to a non-rad area, what do you have to do?

Usually just would not do so. Likes to treat as once in Rad area stays there.

She has seen Wayne take care of this by putting things in a designated area by the door for future survey and release by RPG

- 8) How can you move something from a rad area to a clean area?

Wouldn't do so. Again would move into release area post Rad survey.

- 9) What are some of the things you do to prevent the spread of contamination?

Careful movement to non-Rad area. Change of gloves. Frisking.

- 10) What do you do if you want to work on a new rad project (different chemistry or radionuclides, or higher activity)?

Would apply for new RWA.

Less clear on this one as seemed unaware that need not get new RWA but rather let RPG determine if appended scope of work or task appropriate.

- 11) Contamination (not radon) is found on the floor in HERL. What went wrong to cause contamination to spread outside of the control areas? (up to 3 answers OK)

Spills – lack of containment

Step in something – Avoid this by post work survey...First monitor booties, survey feet after booties off, post work survey for contamination.

- 12) What worries you most about working with rad materials?

Getting contaminated and tracking it out – especially home and “getting my dogs sick”

Has worked with Rad throughout PhD work and seems comfortable and confident.

- 13) What worries you most about others in your group working with rad materials (no names!)?

No issues to date. Has been at Lab a short time. Only 2 others working near her in HERL and feels they are competent.

Currently training a student (post doc?) and they are “not very good with their hands”. This is a worry but they are going slowly. Also some worry that the person is ESL and has difficulty communicating. Fear they might not understand some of the guidelines but won't say so?

- 14) If there were a single change you could make to DOE and/or LBNL rad protection policy, what would it be?

Disappointed that had to ask 5 different people what the detection limits are at LBL for alphas and still never got the same answer from 2 of them. Would like to see a posting of detection limits and postings in the HERL.

Scaler is within a contamination area. However tweezers are moved in and out of said area to use the scalar and thus treated as though they haven't been in the contamination area and thus need clearance. Seems as though a big gray area.

Check sources are treated the same way. Put into contamination area and moved freely out.

Interview 12.

**Lines of Inquiry 09-09-2016**

- 1) (PIs only) How do you assess the previous education and experience of an incoming rad worker?

PI starts from scratch and assumes that the incoming workers have no previous experience. This assures that the Rad Worker does not bring in old knowledge and or habits that do not fit DOE/LBL/HERL policy.

- 2) (PIs only) How do you provide OJT to new rad workers? – How do you insure that the worker understands the training delivered?

1) EHS required training.

2) The new worker watches and observes experiments that will be similar to the work they will be conducting.

3) Work in pairs with an experienced rad worker on an experiment.

4) Perform solo experiment under supervision of an experienced rad worker.

Throughout the process is constant discussion of the process, techniques and experiments.

- 3) (PIs only) How do you know when your workers are qualified to work unescorted? – Please explain the process you use to authorize and notify them.

After training and OJT the rad worker is assessed and their work plan is discussed. At this point if deemed qualified then the status in the WPC is changed.

- 4) (PIs only) Do you have a practice that reassures you that your workers remain within the scope of the authorization?

Weekly group meetings are conducted. Each worker discusses their work and planned experiments.

PI holds key to locked cabinet where stock solutions as kept.

- 5) What do you do if you find contamination inside your rad work area?

Stop work, call RPG (RCT and HP), Access the contamination, clean up/decontaminate.

- 6) What do you do if you find contamination outside of your work area?

Same answer as above (5)

- 7) If you want to move a tool from a rad area to a non-rad area, what do you have to do?

In a contamination area contact RCT to survey and provide a green tag. (release)

From a DWA/Buffer Area Self survey and release

- 8) How can you move something from a non-rad area to a clean area?

This question did not make sense to PI. What is a non-rad versus clean area?

- 9) What are some of the things you do to prevent the spread of contamination?

If contamination occurs -- Stop Work, Evaluate extent of contamination, close all rad containers, survey, cordon off work/contamination area.

- 10) What do you do if you want to work on a new rad project (different chemistry or radionuclides, or higher activity)?

Consult HP – evaluate hazard, plan experiment, change RWA/WPC as necessary

- 11) Contamination (not radon) is found on the floor in HERL. What went wrong to cause contamination to spread outside of the control areas? (up to 3 answers OK)

Defective containers

Contaminated containers

- 12) What worries you most about working with rad materials?

Spreading contamination outside of the lab

- 13) What worries you most about others in your group working with rad materials (no names!)?

Spreading contamination outside of the lab

- 14) If there were a single change you could make to DOE and/or LBNL rad protection policy, what would it be?

Implement daily dosimeter readings. Obtain electronic dosimeters for HERL as are used at B56 and B88.

Make hand and foot monitors required outside of every lab.

SPACE: making changes so that it would not be necessary to leave the lab, enter public spaces such as the hallways to go to another lab to do work. Integral lab areas.

Requiring that HPs attend weekly lab group meetings.

Interview 13.

**Lines of Inquiry**

15) (PIs only) How do you assess the previous education and experience of an incoming rad worker?

NA

16) (PIs only) How do you provide OJT to new rad workers? – How do you insure that the worker understands the training delivered?

NA

17) (PIs only) How do you know when your workers are qualified to work unescorted? – Please explain the process you use to authorize and notify them.

NA

18) (PIs only) Do you have a practice that reassures you that your workers remain within the scope of the authorization?

NA

19) What do you do if you find contamination inside your rad work area?

**For small spills would do cleanup by self and then record in logbook. Finally, follow up with the Lab Manager.**

**For larger spills would contact RPG immediately.**

20) What do you do if you find contamination outside of your work area?

**If outside personal workspace in HERL would first report to RPG and Lab Manager.**

**Mark area with signage indicating contamination**

**Inform others in room that there is contamination found.**

21) If you want to move a tool from a rad area to a non-rad area, what do you have to do?

**In HERL cannot take anything out on your own. Need to contact RPG for clearance survey**

22) How can you move something from a rad area to a clean area?

Same answer as (7). There is no differentiation between rad areas.

23) What are some of the things you do to prevent the spread of contamination?

**Experimental Design...attention to details to avoid problems**

For transUranics practice experiments without radioactivity (dry runs)

Be prepared for problems such as contamination. Keeps decon materials close at hand.

If feels there is bigger potential for contamination or issues then asks someone else to work alongside.

Helper

24) What do you do if you want to work on a new rad project (different chemistry or radionuclides, or higher activity)?

See question 9 answer. Ask RPG or other workers if it is much different.

25) Contamination (not radon) is found on the floor in HERL. What went wrong to cause contamination to spread outside of the control areas? (up to 3 answers OK)

2 potential things came to mind.

First, sample transportation and especially if the container was not sealed properly.

Second, is that if someone leaving the area doesn't do a proper job of survey especially when removing booties.

26) What worries you most about working with rad materials?

New things in general,... Feels problems arise most when working with experiments/isotopes where there isn't a lot of previous experience.

27) What worries you most about others in your group working with rad materials (no names!)?

- 1) Training is most important. If someone doesn't get properly trained and then begins work.
- 2) Some people just seem to care less. This has happened to this rad worker and felt they had to avoid working with them and or needed to be much more aware of possible contamination from them.

28) If there were a single change you could make to DOE and/or LBNL rad protection policy, what would it be?

Feels HERL has good procedures,

However some DOE policy too restrictive or doesn't make a lot of sense...all rad materials treated the same.

Example is that natural Uranium samples are treated the same for transportation as other alpha emitters that are enriched.