

Best Practice #134

3/21/2011

Best Practice Title: Historical Hazard Identification Process for D&D

Facility: LLNL

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Brief Description of Best Practice:

Facility historical hazard identification is a critical first step in the deactivation and decommissioning (D&D) process. The historical hazard identification process presented here is the result of eight years of refinements at the Lawrence Livermore National Laboratory (LLNL). The process is not presented as a one-size-fits-all solution, but can be used as either a starting point for other U.S. Department of Energy (DOE) sites without a process in place, to supplement existing processes, or as a benchmark for other sites to evaluate their current processes. It is similar to all planning processes in that it is a living document, changing with the experience of use, new requirements, and lessons learned.

The process does not, however, limit itself to historical hazard identification since the effort is also intended to provide the technical data and information needed to assist in the production of a D&D project execution plan as well as a facility historical hazards identification map. So, in addition to identifying the hazards, there is a clear need within the D&D process to display, in a systematic way, the complex historical hazard information. This best practice proposes a way for this information to be gathered, analyzed, summarized and clearly depicted through the use of a hazard identification map. This map identifies hazards room by room/area by area. It is a distillation of the hazard information in an easy to use clear graphical format. Figure 5 at the end of this document presents an example of such a map. The LLNL process identifies four broad categories of information resources including: facility information, hazard information, environmental information, and general information related to the facility.

The use of this process at LLNL has led to a high level of confidence in hazard identification and a defensible level of due diligence, without excessive sampling and characterization. The resultant hazard identification map has also proven to be an efficient and effective way to communicate existing conditions, areas of contamination or concern, and a guide for both sampling and project plan development.

Historic records and drawings at many old DOE facilities are poor or missing. The need for accurate information about these facilities led to the more robust historical hazard identification process described in this best practice that includes personnel interviews to identify undocumented practices, events, releases, hazards, and other relevant information.

Summary:

The historical hazard identification process describes the participants and steps of the process. The discussion then centers around four major categories of information. How this information is gathered, analyzed, processed, and used is the next phase of the discussion. Examples of the steps in the process and the documents used to gather and organize the data are then shown. The results of this effort are provided to the project manager in two formats. The first is the binder(s) containing the collected information in a systematic format. The second is a hazards map, which summarizes and graphically depicts the hazard information contained in the binders. The project manager uses this information as a baseline to start the project execution plan. Subject matter experts use this information as a starting point for sampling plan development.

The historical hazards identification process for building D&D, as detailed in Figure 1 of the Appendix, begins with the D&D Information Manager being assigned a task designed to compile historic information on a specific facility or area. The hazard data and information is then researched, organized, and placed in binders. Implementation of the historical hazard identification process is a first critical step in the planning of a D&D project. Many of the other project planning processes cannot take place without this initial research being completed.

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Other facility related information must also be collected and organized. This includes data related to the management of the facility itself. Facility drain reports, environmental permits, storm water pollution prevention plans, and sub-surface information, are examples of this type of data. The building's master equipment list, telecommunications resources, information and data management files must also be taken into account during project planning. Certain specialized facilities may have high-pressure lines and unique cabling and conductors that should be identified and located. Other organizations such as Archives and Security provide unique perspectives, adding to the knowledge base of the project planning data.

Experience has shown that the three most important sources of information are: personnel interviews, historical Incident Analyses and Occurrence Reports, and other documentation of facility hazard history that the site has on record. Of these three, personnel interviews are by far the most valuable. A more detailed discussion of the personnel interview process is presented in the Appendix.

After the D&D project is completed, the historical information binders, containing both the facility's historical information and the completed project information is taken to LLNL Archives for final disposition based on records retention schedules.

It should be noted that this process can be automated to some extent by scanning and storing the collected materials digitally. Scanning documents, adding metadata, and storing the data takes time and resources, and significantly improves the ability to search for specific topics quickly. Digitizing, although a good aid to access, adds significant work and cost down the line for continual migration as electronic media change. Since planning, obtaining funding for, and execution of D&D projects can be a long term process, LLNL places an emphasis on the use of hard copy documentation to maximize the potential for successfully retrieving records at a future date.

Why the Best Practice was used:

The best practice was used because LLNL recognized that: (1) there was no single, comprehensive information source; (2) some information was incomplete and inaccurate; and (3) a standardized approach would be more efficient to implement and would maximize the probability that all historical hazard information was identified and compiled. The use of this process at LLNL has led to both a level of confidence in hazard identification and a defensible level of due diligence, without excessive sampling and characterization.

What problems/issues were associated with the Best Practice

This best practice has evolved since the initial deployment. Problems with incomplete information lead to more sources of information being identified. These sources could have been identified earlier in the process if a specific task to identify a comprehensive process would have been implemented at the outset of the D&D program. In addition, the process was strengthened with the use of personnel interviews to identify undocumented past practices and events/releases and to update/correct record and historical documents.

When retirees and/or others no longer possess sufficient clearance levels, plant documents can typically not be taken along to the interviews. For this situation, developing an interview checklist that is approved by Authorized Derivative Classifiers should be considered.

How the success of the Best Practice was measured:

Historical hazard identification based on historical data gathering can be critical in ensuring safety and cost-effectiveness. On one project, without this process in place, detonatable quantities of shock sensitive crystallized perchloric acid inside a fume hood would not have been identified with potential high consequence results. This could have resulted in both fatalities and off-site radiological contamination.

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The success of the historical hazard identification process is measured by the completion of D&D projects which were safe and cost-effective with a limited amount of significant undocumented/unknown information being discovered during D&D.

What are the benefits of the Best Practice:

The principal purpose of this effort is to keep people from being injured and to keep projects on budget and schedule. Early hazard identification will lead to more efficient, compliant, and cost effective project planning and execution. While there is no set schedule, it is advisable to start facility hazard research early in the scoping process of potential D&D projects or even as early as the final operational phase of the facility. As time passes, it becomes more challenging to access records and contact former employees.

Alternative solutions considered:

The historical hazard identification process is similar to all planning processes in that it is a living document, changing with the experience of use, new requirements, and lessons learned. Alternatives could include using all electronic documentation instead of paper binders. This was, in fact, done on one major project at another DOE site. It provided an excellent method to search all of the information in an efficient and effective manner. The problems with archiving were solved by having a second set of traditional paper in binders.

Additional Information

Technology Links:

Vendor Links:

Videos Pictures:

Other References:

Santos, Joseph. *Capturing Process Knowledge for Facility Deactivation and Decommissioning*, SRNL-TR-2009-00018, Revision 0, February 2009,
http://www.em.doe.gov/EM20Pages/PDFs/PK_Report_Final.pdf

Gawande, Atul. *The Checklist Manifesto: How to get things right*. New York: Metropolitan Books, 2009.

Comments: The SRNL report referenced above is an excellent source of information on this subject. The report details the essential facility process knowledge to have when planning for D&D of that facility and how this information can be collected.

Appendix

Facility Designation/Organization File Review

The following sources of information are critical to the identification of a facility's hazards. The first task is to identify the facility's unique designator, both current and historical. At LLNL, facilities are assigned building numbers and these have changed over time. Facilities could have a designation dating back to the WWII Naval air station era, or a different number before June 12, 1967, when all the facility numbers were changed. This change renumbered all of the facilities in order to place them in blocks for emergency response purposes. Facilities are also frequently "named" to indicate their functions ("Xyz High Level Laboratory"). Caution and a certain level of skepticism are recommended in the early and unchallenged acceptance of facility numbers/names as being indicative of facility hazards. Experience has shown that for various reasons (e.g., change in mission over the years without a concomitant change in facility names, cold war era security concerns), facility names don't always reflect historic or current missions or hazards. In addition to site specific facility names/numbers, a cross reference to the Facility Information Management System (FIMS) designations should be made.

The second task is to review the previous site plans, using the data from the facility number research as a starting point. The third is a review of the on-site organization files. The salient portions are then copied and placed in binders.

Hazards Information

One of the three most important sources of information is files from the organization that oversees worker safety and health. This organization keeps facility specific hazard information in paper files. These files include:

- Screening reports which tell the current hazards associated with the facility
- Safety Basis documentation and facility hazard classification
- Facility files identifying specific facility hazards
- Fire Department files may identify historic hazards
- RAD Survey 10 CFR 835 information
- HEPA filter database information
- Asbestos reports
- High-pressure database identifies high-pressure equipment in the facility
- Beryllium characterization project files

Restricted Database Information

Some of the hazard-related facility information is in restricted databases. Inquiries are made from several sources. The process for accessing this information needs to be done on a site-by-site basis. The following is a partial listing of these sources at LLNL.

- Occurrence Reports
- Incident Analysis
- Classified Programmatic Hazard Information

Environmental Information

The on-site environmental organization provides important information from several internal sources. This information provides the required due diligence effort regarding almost all of the

environmental information provided to projects. The balance of the information includes chemical tracking information and the hazardous waste information related to that facility. The environmental organization at LLNL provides information from the following sources:

- Facility Drain Reports
- Operation's files review
- Environmental Operations Spill Reports
- Environmental Permits
- Storm Water Pollution Prevention Plan
- Retention Tank Reports
- National Environmental Policy Act information
- Life-cycle chemical tracking
- Subsurface information
- Hazardous Waste Management Records

Facility Information

This information is not always specifically related to hazards. It is, however, required to produce a project execution plan. Finding and documenting the sources of this type of information can be a significant time saver. Types of sources/information may include:

- Facility Number Designation (current and historical)
- Master Equipment List
- Phone/ Building Alarm Resources
- Information and Data Management facility files
- Floor plans/ Room size/area sheets/Historical Site Plans/ Photogrammetric maps
- Facility Condition Assessment Survey (CAS)
- Facility Photos-recent and historic
- DOE's Facility Information Management System (FIMS)
- Issues Tracking System (ITS) Deficiency tracking information

General Information

This category of information provides a place for data that do not readily fit into the other categories. They include:

- Personnel interviews
- E-mails/project correspondence
- Property Management Database
- Archives
- Security
- Financial History- used to identify past and current facility 'owners' and types of use
- Records Management- organizational information by facility designation

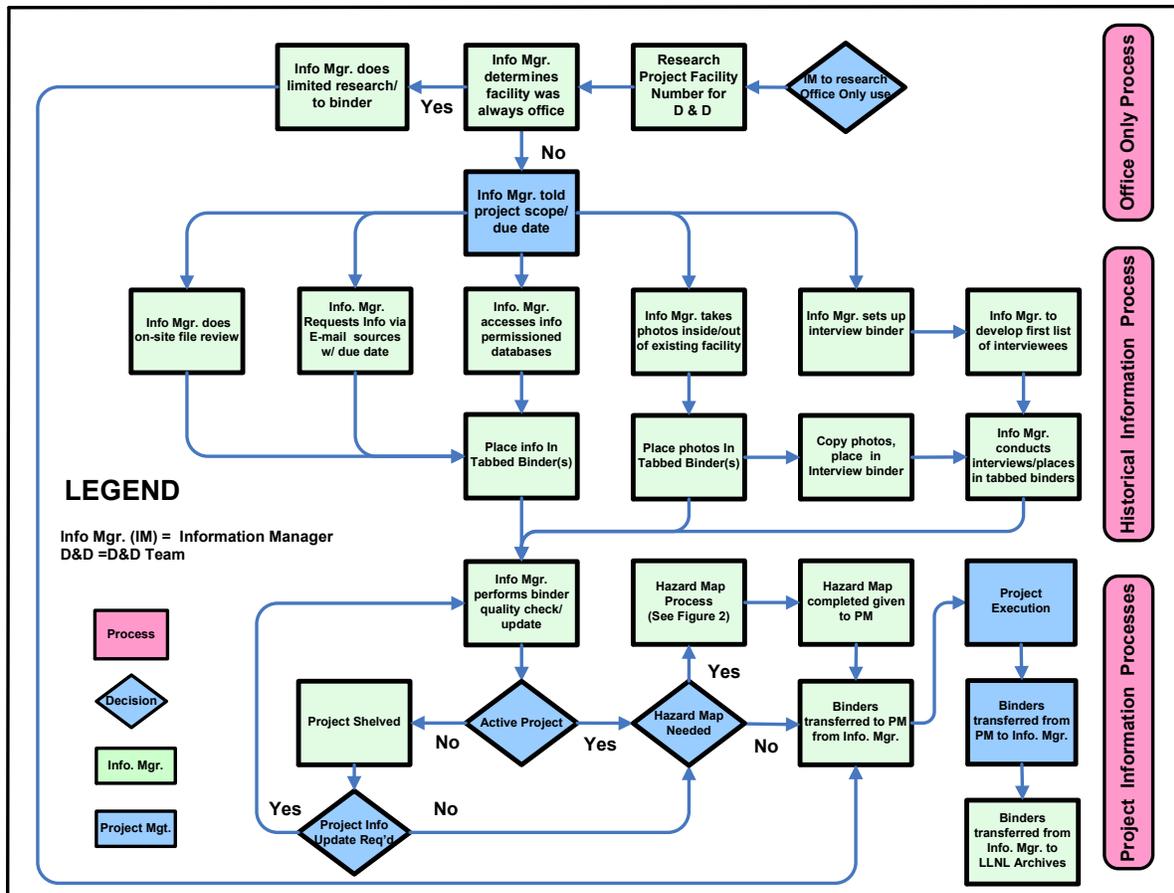


Fig. 1 LLNL Historical Information Process

PERSONAL INTERVIEWS

Personal interviews have been identified as a critical source of facility hazard information. The following guidelines can be used to facilitate the interview process. They are broken down into the following 3 phases:

Phase 1. Pre-Interview Guidelines: Develop interview materials and identify contact information for interviewees.

Phase 2. Guidelines For Conducting Interviews: Conduct interviews, adding additional interviews, when warranted, as the process progresses.

Phase 3. Post Interview Guidelines: Compile the interviews, contact data, and place in tabbed historical information binder(s).

Phase 1. Pre-Interview Guidelines

- The identification of interviewees and the knowledge of how to get in touch with them should be addressed when names are provided.
- Typical inquiries of on-site staff regarding other persons familiar with the facility include:
 - Are they still on-site?
 - Do you know where they live or lived?
 - Do they still work here part-time?
 - If retired, did they move out of state? If so, to where?
 - Are there others who might know where they are?
 - Use "Zabasearch.com" which prompts for name and state of residence to find contact information for retirees. Also consider, "Pipl.com" and "Spokeo.com" search tools.
- Work on having good relations with everyone, especially when identifying contacts at the initial phase of the effort.
- Retirees and experienced on-site personnel have some of the best facility hazard knowledge available. If a person is identified repeatedly as someone who knows a lot about a facility, keep calling, and be very polite, in your quest for an interview.
- To identify a person's address, use local government land records if you suspect they live in a specific city/county. If they own property, you can generally get important contact information from county/ city clerk's office.
- Be open to doing a "cold call" if the person in question has important and unique knowledge, even if they have "an ax to grind".
- Suggest you bring a floor plan(s) of the facility and other "memory jogger" materials such as a list of typical contaminants (see Figure 3) and especially recent facility photos.
- Bring multiple copies of floor plans and different color felt tip pens so that interviewees can mark directly on them, identifying areas of concern and possible contamination.
- Before the interview, create a contact sheet to document the interviewee's personal information and answers to open-ended questions regarding potential hazards within the facility. Include a question identifying who else might be contacted regarding the facility (see Figure 2).
- Be willing to go where they live, meet in the middle, whatever it takes to get the interview.
- You may not have a travel budget, and may be forced to conduct phone interviews. If possible, e-mail the questions and related interview material prior to your call. Consider this option only as a last resort. Historically, many responses using this approach have been disappointing in both quality and quantity of information.
- Come to the interview with knowledge of the facility, after having, for example, taken photos and having researched what went on in the facility over a period of years.
- Be on time and respectful of their time, especially on-site personnel.
- Give both the appearance of being organized and be organized/prepared for the interview.
- A list of typical contaminant types on a single sheet of paper can be a very useful memory jogger (see Figure 3).
- Consider tracking all of your contacts using a spreadsheet that includes columns for contact information, date/time contacted, and status/remarks to document calls and notes for needed follow up actions.
- Consider setting up a database and asking the interviewee what other facilities he/she has hazard knowledge of.
- Estimate the number of interviews that may be appropriate for this facility. Complexity, size, age, types of contamination, and existing documentation are all relevant issues to address when deciding how many initial sets of questionnaires and graphics to make.
- The identification of interviewees usually starts with the identification of current facility management staff with the greatest familiarity with the building, who, when interviewed, may identify others who have personal knowledge of the potential hazards in the facility.
- These interviews usually start with on-site staff, and as the list develops, often include

retirees.

Phase 2. Guidelines For Conducting Interviews

- Show your official credential when visiting retirees off-site as a form of identification and reassurance.
- Demonstrate that you appreciate the fact that they are willing to talk to you. Remember that opinions are formed in the first 30 seconds of the interview that will last a long time.
- Demonstrate that you value their knowledge, experience, and information.
- Be someone they can trust.
- Briefly explain the steps in the process.
- Consider recording the interview with a computer linked pen, and always keep a hard copy.
- If they have extensive knowledge of the facility, at the initial contact, ask if the person would be willing to walk through the building. Though this can be a great memory jogger, capturing the information this way can be a challenge unless photos and notes can be taken simultaneously, generally with the assistance of a third person.
- Listen carefully, and ask leading, open-ended, clarifying and follow-on questions.
- Make friends with interviewees; you may need them again for other facilities.
- If possible, bring a third party to take down the information, so you can be a better listener/interviewer. Trying to write down what is being said while listening is difficult.
- Take down the information for the person who is not at the interview.
- Write so others can read it, easily. Sometimes it means asking the interviewee for just a minute to collect that information.
- When the interview is completed, re-read your notes aloud to the interviewee and verify that you have captured the issues accurately.

Phase 3. Post Interview Guidelines

- Place all interview documents in a tabbed binder as soon as they are completed.
- If follow-up is needed, schedule it as soon as possible.
- Make sure to write down the names of other persons to contact on the contact sheet when you get back to the office.
- If more than 2 interviewees have the same person on their, "to be contacted" list, work hard at finding and interviewing that person.
- Consider enough interviews have been done when little or no new information is forthcoming.
- Give them your business card, and ask them to contact you should they think of anything else.
- Send hand written thank you notes the same week as the interview.

Contact Sheet

(Facility Number)

Person contacted: _____

Title: _____ Facility Affiliation from _____ to _____

Org. Representation: _____

Date Interviewed: ___/___/___ by _____

Interview type: Personal ___ Phone _____ E-Mail _____ Site Visit _____

Contact Information: _____

What were your job responsibilities?

When? Do you remember any spills, fires, accidents, explosions, and unusual occurrences?

What parts of the building would you be concerned about if you or someone you knew is going to work on this demo?

Who do you think we can contact for more information on the building?

Fig. 2 Interview Contact Sheet

Since it is impossible to list all potentially hazardous substances, the following broad hazard categories and the most prevalent hazardous materials commonly found within each category are listed below. The following form is used as both a memory jogger and a checklist (Figure 3).

Classifications of Metals, Chemicals, Contaminants* 1/19/12

- **Organic Chemicals**
 - Polychloro-biphenols (PCB)
 - Chloroform
 - Insecticides/fungicides/herbicides

- **Solvents**
 - Acetone
 - Toluene
 - Tetrachloroethylene (PCE)
 - Trichloroethylene (TCE)
 - Carbon tetrachloride (carbon tet)
 - Methyl ethyl ketone (MEK)

- **Inorganics**
 - Cyanide
 - Boron
 - Silicon

- **Radionuclides**
 - Uranium-234, 235, 238
 - Thorium-233, 234
 - Plutonium-238
 - Neptunium
 - Cesium-137
 - Cobalt-60
 - Tritium (H₃)
 - Strontium-90
 - Europium 152, 154, 154

- **Heavy Metals (a specific grouping of inorganic chemicals) (examples)**
 - Mercury (Hg)
 - Lead (Pb)
 - Arsenic (As)
 - Selenium (Se)
 - Beryllium (Be)
 - Lithium (Li)
 - Gold (Au)
 - Silver (Ag)
 - Cobalt (Co)
 - Chromium (Cr)

- **Acids**
 - Nitric Acid
 - Hydrochloric Acid
 - Sulfuric Acid
 - Hydrofluoric Acid
 - Perchloric Acid (ask about perchloric, specifically)
 - Muriatic acid

- **Asbestos, explosive, pyrophoric, shock sensitive materials**

* This list identifies examples within classifications and is not intended to be an exhaustive list.

Fig. 3 Classification of Chemicals and Contaminates

The following Hazard Map process, Figure 4, is typical for the LLNL site. Identifying and tailoring a hazard map process to a specific project can be a useful exercise. LLNL experience with this tool has been very positive. It provides an excellent manner in which hazard information can be organized, summarized, and graphically depicted. Figure 5 is a hazard map example developed using this process.

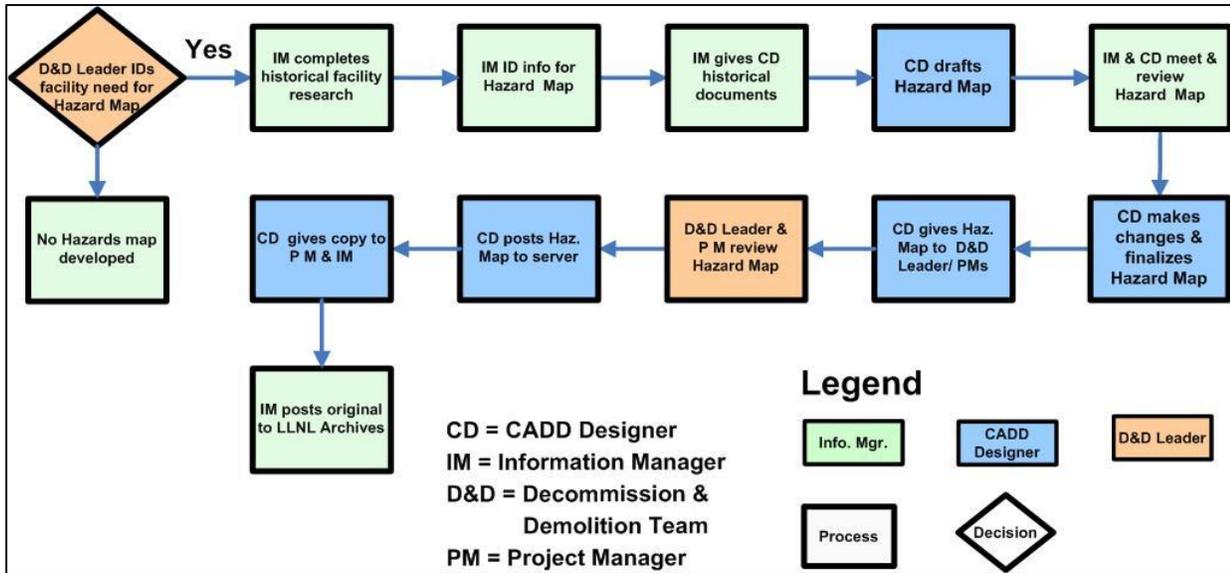


Fig. 4 Hazard Map Process

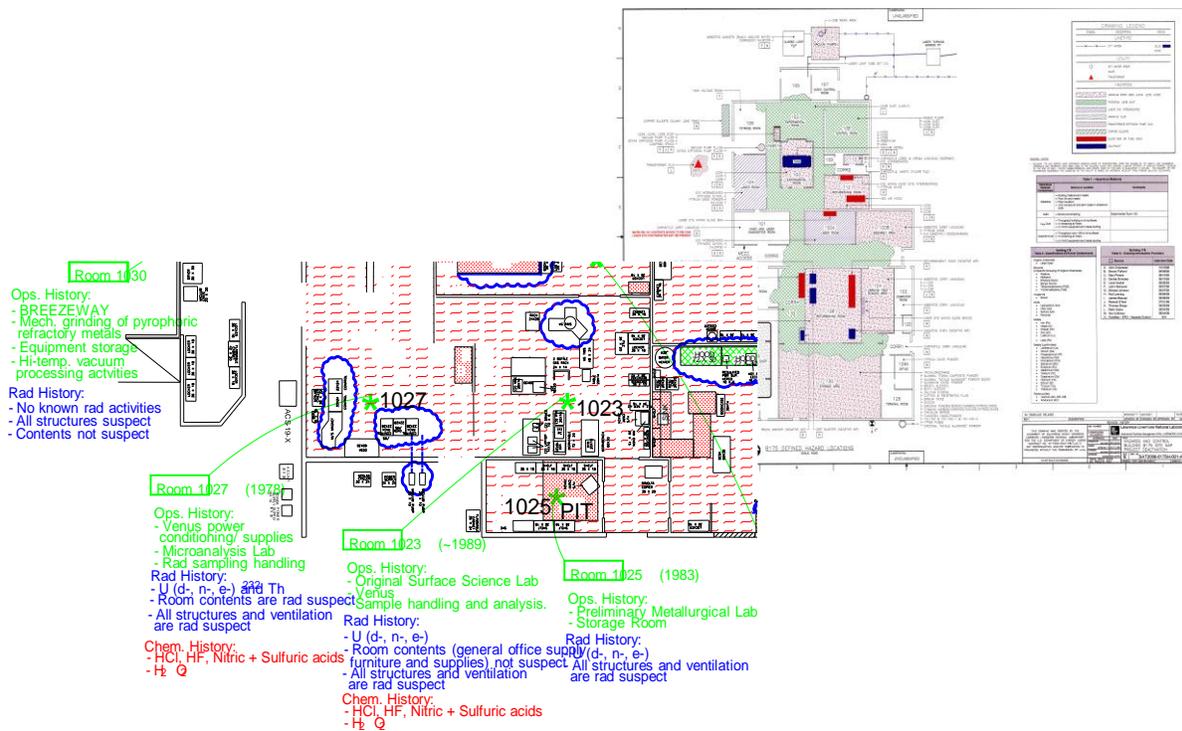


Fig. 5 Sample Hazard Map

This sample map provides a visual summary of the hazard information specific to both rooms and areas within facilities (Figure 5). It is a valuable and well used D&D tool. Having vast amounts of hazard information distilled into a single graphical display also promotes the understanding of the hazards in specific areas of the facilities by the D&D workers who will be performing work in these areas.