

LA-UR-16-21836

Approved for public release; distribution is unlimited.

Title: LAFD: TA-15 DARHT Firefighter Facility Familiarization Tour, OJT
53044, Revision 0.2

Author(s): Rutherford, Victor Stephen
Priestley, Terry B.
Maestas, Marvin Manuel

Intended for: Training

Issued: 2016-03-17

Disclaimer:

Los Alamos National Laboratory, an affirmative action/equal opportunity employer, is operated by the Los Alamos National Security, LLC for the National Nuclear Security Administration of the U.S. Department of Energy under contract DE-AC52-06NA25396. By approving this article, the publisher recognizes that the U.S. Government retains nonexclusive, royalty-free license to publish or reproduce the published form of this contribution, or to allow others to do so, for U.S. Government purposes. Los Alamos National Laboratory requests that the publisher identify this article as work performed under the auspices of the U.S. Department of Energy. Los Alamos National Laboratory strongly supports academic freedom and a researcher's right to publish; as an institution, however, the Laboratory does not endorse the viewpoint of a publication or guarantee its technical correctness.



Handout

LAFD: TA-15 DARHT Firefighter Facility Familiarization Tour

OJT 53044

Revision 0.2

LA-UR-

TITLE PAGE

Course Title **LAFD: TA-15 DARHT Firefighter Facility Familiarization Tour**

Course **53044**

Computer File Name **Student Handout, LAFD_Tour DARHT_53044_HO,R0.2**

Course Length **Estimated 2 Hours**

Authors and Contributors: **Terry B. Priestley, J-1
Marvin Maestas, SEO-IS
Victor Rutherford, SI-ITS**

Initial Date of Preparation **May 25, 2011**

Date of Revision(s) **January 2013
May 2014 (PFITS action change to section 1m, page 6)
March 2016**

Date of Next Review **January 2019**

Training Setting **Facility Tour**

Target Audience **All Los Alamos Fire Department Response Personnel**

Optimum Training Location **On-site**

INTRODUCTION

The Los Alamos National Laboratory (LANL or the Lab) will conduct familiarization tours for the Los Alamos County Fire Department (LAFD) at the Dual-Axis Radiographic Hydrodynamic Test (DARHT) Facility, TA-15-0312. The purpose of these tours is to orient LAFD firefighters to the DARHT facility layout and hazards.

This document provides information and figures to supplement the familiarization tours. The document will be distributed to the trainees at the time of the familiarization tour. A checklist (Attachment A) has also been developed to ensure that all required information is consistently presented to LAFD personnel during the familiarization tours.

DARHT PURPOSE AND MISSION

The DARHT facility is designed to study the three-dimensional implosion of mock nuclear weapons. As part of the nation's Stockpile Stewardship Plan (SSP), the Department of Energy (DOE) built the DARHT facility to provide an enhanced high-resolution radiography capability to perform hydrodynamic tests and dynamic experiments to support its historic mission. Because of this purpose, the facility was located at a distance from large general public residential areas and away from routes of heavy general public traffic. A secondary mission of the DARHT facility is to provide support to other explosive testing programs.

The DARHT R312 Firing Site (FS) consists of two major components: (1) the DARHT Accelerator Building, R312 (hereafter referred to as Building 312), consisting of the east and west accelerator halls that house Axis 1 and Axis 2 DARHT accelerators respectively (Attachment B); and (2) the DARHT R312 Firing Site (hereafter referred to as the Firing Site).

Building 312 and the Firing Site occupy 39,650 square feet; the walls and roof of Building 312 are constructed of reinforced concrete. The structure was designed to withstand explosive surface detonation of up to 150 pounds (TNT equivalent) of high explosives (HE) located at the dual-axis intersection point at the Firing Site.

OPERATING SCENARIOS

There are four plausible operating scenarios for DARHT:

- Scenario One: Accelerators not operating and no explosives are on the Firing Point.
- Scenario Two: Accelerators operating without HE on the Firing Point.
- Scenario Three: Accelerators operating with HE involved and present on the Firing Point. This scenario occurs approximately 6 to 12 days per year.
- Scenario Four: Accelerators not operating and HE on the Firing Point (e.g., insertion of dynamic device).

HAZARDS

DARHT is a moderate-hazard facility. Based on the DARHT Emergency Planning Hazards Assessment (EPHA), there are three major hazards—beryllium (Be), lithium hydride (LiH), and depleted uranium (DU).

- Be contamination can be airborne, on a surface, or in the soil, and is a major inhalation health hazard.

- LiH is very reactive and when exposed to water. Do not use water or foam on a LiH fire.
- DU's health hazards as a heavy metal are much more significant than its radioactive hazard.

All three hazards plus high explosives (in small amounts) can be found on the Firing Point. The Firing Point is a Radiologically Controlled Area (RCA).

The following hazards are stored inside and outside of Building 312:

- Flammable and nonflammable gases (natural gas, helium, nitrogen, sulfur hexafluoride, argon, and compressed air).
- Flammable/combustible liquids (acetone, propane, regent alcohol, ethanol, and isopropyl alcohol).
- Mineral oil and glycol.

Accelerators require substantial power requirements. There is 13.2 kV power to DARHT and 480 V throughout the facility.

No significant radionuclide or biological hazards exist at DARHT.

TELEPHONE CONTACTS

Position	Telephone	Pager	Cell
DARHT OPS Manager (Terry Priestley)	665-1330	664-5090	500-2742
WFO Emergency Preparedness Planning (Marvin Maestas)	667-6437		500-2789
DARHT Control Room (personnel varies with shift)	667-4524		
TA-15 Access Control Office (personnel varies)	667-6742		
WFO Duty Officer (varies with shift)	699-1765	664-2926	

CHECKLIST REFERENCES

A checklist (Attachment A) has been developed to ensure that all required information is presented consistently to LAFD personnel during the familiarization tours. The numeric references below correlate with the numbering on the checklist. Not all items on the checklist will have a correlating explanation.

- 1.a Meet firefighters at TA-15-446 Access Control Office (ACO) with escort documents, handouts, and two training rosters (LANL and LAFD). A handout includes an unclassified map of the facility.

NOTE: LAFD radios do not work inside DARHT. The ACO will need to monitor fire frequency and make an announcement if a response is initiated.

- 1.b The DARHT purpose and mission are outlined on page 3.
- 1.c The standoff location for DARHT is near TA-15-446, ACO. Responders will remain at the ACO until cleared to proceed by DARHT operations. If a medical emergency occurs and does not involve HE, responders will proceed directly to DARHT.

1.d&e The TA-15 ACO is open from 0715 to 1730 hours Monday through Thursday and 0715 to 1600 hours on Friday. The ACO is the communication hub for TA-14, 15, and 36. The ACO is aware of all explosives and routine activity in these areas and is key to the emergency response. The ACO houses material safety data sheets (MSDSs) and the "classified package" for the chemicals, if applicable, and can provide either of those pieces of information to emergency responders.

Under nonemergency situations, individuals entering DARHT must possess an active L or Q security clearance and must complete specific training to have unescorted access to DARHT (Area 3). Any individual who is not a "knowledgeable person" must sign in and out at the ACO.

1.f DARHT has cameras that remotely view the Firing Point; however, this remote camera capability does not exist at the ACO. The ACO has the capability to view the plan of the day and the plan of the week. ACO personnel will be glad to answer any questions that the LAFD has regarding this activity.

1.g The LAFD Knox Box is located in between the double doors at the northeast end of TA-15-183. The box contains nine keys. The key series and what the keys will open include the following.

Key Series	Opens
DX3-37/40	TA-15-183 & 484, TA-15-494 Offices
DX3-41/44	TA-36-78
DX3-49/52	TA-15-285
DX3-53/56	TA-15- 285 & 604
X4-5/8	TA-15-183 Exterior Doors
DX4-73	DARHT Exterior Doors
TSO-9	Phermex Chain Gate
DARHT-1	TA-15-456 & 468
FM67-2	Equipment Rooms

1.h Deliver pre-tour safety briefing and other access control procedures as needed.

1.i Escort fire fighters to the DARHT facility.

1.j There are four fire hydrants at DARHT; their locations are as follows.

- East of Building 312 by PIV shut off
- Southeast of Building 312 near the blue aboveground storage tanks (Tanks 461 and 462)
- West of Building 312
- North of Building 312 on the Firing Point

1.k There are two DARHT assembly areas. **Noncontaminated personnel** assemble south of Building 312 at the edge of the parking lot. **Contaminated personnel** assemble southeast of Building 312 near the blue aboveground storage tanks (Tanks 461 and 462). Both assembly areas are marked with standard brown and white signs.

- 1.l If a fire alarm occurs at DARHT, personnel will typically evacuate DARHT and assemble at the noncontaminated or contaminated assembly areas. The control room will be evacuated and unavailable for support during a fire. Emergency procedures for DARHT are addressed in WFO- PLAN-035, *WFO Building Emergency Plan*.

NOTE: Personnel may shelter in place if HE is involved in the emergency.

- 1.m The vehicle gate to the Firing Point exclusion area (see Figure 1) is on the northwest side of DARHT. The exclusion area is surrounded by an industrial chain link fence.

The gate is typically locked, especially if HE is on the Firing Point. DARHT operators have keys to the vehicle gate lock. If Building 312 has been evacuated, DARHT operators will be at the assembly area south of Building 312 at the edge of the parking lot.

The gravel/dirt areas of the Firing Point are potentially contaminated with Be, LiH, and DU. If vehicles and personnel stay on asphalt surfaces, an RCT does not have to monitor personnel and vehicles exiting the Firing Point.

Electrically operated TA-15 Areas I, II, and III administrative gates, including access to TA-15-312 DARHT, are provided with local battery backup power that provides limited duration power for badge reader and access gate operation. Keys for manual override of electrically operated vehicle access gates to TA-15-36 Administrative Areas I, II, and III are available in Knox key boxes located at TA-15-183.

NOTE: There is no natural gas on the Firing Point, and combustible loading levels are low.

- 1.n Access to the MARX basement can be attained through door 70.
- 1.o Main access to Building 312 is through door 1 (access to fire panel) and door 14 (access to the control room).
- 1.p The main gas cylinder storage area is south of the control room, near door 14.
- 1.q Portable liquid nitrogen Dewars are in the Axis 1 high bay.
- 1.r Two aboveground storage tanks (TA-15-461 and 462) are on the southeast side of DARHT. Both storage tanks are below grade with containment walls. These two tanks are typically empty but could contain mineral oil from the accelerators.
- 1.s Multiple transportainers are located on edge of the south parking lot. These transportainers contain spare parts and storage. No power is supplied to and no hazardous chemicals are stored in these transportainers. DARHT operators control the keys to these units.
- 1.t The glycol tank (black cistern-type container) is on the southeast side of Building 312. This tank is normally empty unless the glycol has been evacuated from the Axis 1 accelerator.
- 1.u Building 312 has natural gas to run the boiler (through door 15 A/B) for heating only. The main shutoff is located on the southeast exterior wall near door 60 A/B.

- 1.v DARHT has two large transformers; one is located southwest of door 14 and the other is located southwest of door 1. There is 13.2 kV power to the transformers and 480 V throughout the facility. The DARHT power can be shut off 24/7 by contacting the utilities duty officer at 699-4075 or 664-6455.
- 1.w The DARHT fire protection system includes a sprinkler system and smoke detection. The fire panel is located inside door 1.
- 1.x The four automated external defibrillators (AEDs) at DARHT are located as follows.
 - Room 120 on the northwest wall between rooms 119 and 121.
 - Room 100 (west hallway) on the northwest wall opposite the door to room 107.
 - Room 126B, the Marx Room, at bottom of the stairs, just inside the room.
 - Room 111, Axis 1 power supply hall.
- 2.a The main access to Building 312 is through doors 1 and 14. All DARHT exterior doors are blast doors and are always locked. The DARHT exterior door key (DX4-73) is stored in the LAFD Knox Box located in between the double doors at the northeast end of TA-15-183.
- 2.b & c The accelerator control room (room 109) is the heart of DARHT operations. The master control panel is in the middle of the console area. During operations, the radiation safety keys will be inserted into the master panel. The accelerators cannot operate without the radiation safety keys physically inserted into the master panel.

When personnel evacuate the accelerator control room to the assembly area, the radiation safety keys should be removed. During accelerator operations, the accelerator hall doors (doors 50, 51, 52, and 53 for Axis 1 and doors 32, 33, 69, 70, 71, and 72 for Axis 2) are locked. The LAFD will not be able to enter accelerator halls without the radiation safety key from DARHT operators.

If shelter-in-place protective actions are required at DARHT, personnel will assemble in the accelerator control room. DARHT operators can shut down the ventilation system and minimize any airborne hazards from entering the facility.

- 2.d Figure 1 shows the areas where a potential exists for Be and DU contamination on the Firing Point. Basically, the beams of Axis 1 (right side of photo) and Axis 2 (left side of photo) intersect on the Firing Point. Therefore, the Firing Point has the greatest potential for Be, LiH, and DU contamination.
- 2.e In the past, both open-air explosive tests and contained explosive tests have been conducted at DARHT. Currently only contained-vessel tests are conducted at DARHT. The accelerator control room diagram shows the configuration of the containment vessels currently used at DARHT.
- 2.f The DARHT fire panel is located just inside door 1.
- 2.g Each of the accelerators has a power hall and an accelerator hall. The whole building is equipped with a sprinkler system. Both the power halls and the accelerator halls are also protected by AFFF fire protection foam. The most likely type of fire in DARHT is an electrical fire. In the event that the fire protection sprinklers are active and electrical power is not secured, entry into the power halls is not recommended because of the high voltages.

2.h During accelerator operations, doors 50, 51, 52, and 53 for Axis 1 and doors 32, 33, 69, 70, 71, and 72 for Axis 2, all blast doors, should be locked. If sprinklers are operating and the power hall is energized, do not enter the power hallways.

2.i The power hall houses the power sources for the Axis 1 accelerator. The Axis 2 power hall is located in Room 108 and the Axis 1 power hall is located in room 111. The pulse-forming networks (PFNs) are the blue units and contain approximately 100 gallons of mineral oil per cell (there are 64 PFNs for Axis 1 and 74 for Axis 2). The mineral oil insulates the voltage needed to run the accelerator. Mineral oil has only slight flammability but could pose a slipping hazard if spilled on the floor.

When the PFNs undergo maintenance, the mineral oil from the PFNs can be transferred to the two tanks (TA-15-461 and 462) on the southeast side of DARHT for temporary storage. The mineral oil is returned to the PFNs when maintenance is completed.

2.j The Axis II Injector (round steel object) is located in Axis 2. It is filled with mineral oil and is basically three floors high. The MARX tank, in the basement of Room 126, provides the electrical spark to generate the electrons that are accelerated.

The basement could be an oxygen-deficient area. One of the three oxygen monitors in DARHT is located in MARX basement room 126B. The monitor readout is located on the main level. All oxygen monitors are equipped with an audible alarm and a strobe light.

The other two oxygen monitors are located in room 111C in Axis 1 power hall and room 111D in the Axis 1 high bay.

2.k Combustible loading within DARHT is maintained at low levels. If a fire starts, the major hazard is electrical because of the overhead sprinkler system.

2.l The yellow lights attached to the accelerator in the accelerator halls indicate that a nearby magnet is energized. The magnets are not typically energized while the accelerator is not operating.

DARHT is equipped with a personnel safety system (PSS) that is a computer-controlled set of interlocks (door locks) that control access to the accelerator halls and Firing Site during operations. PSS lights are blue/magenta and are scattered throughout DARHT. SCRAM buttons (red) are located in the power and accelerator halls and are a safety feature that, when pressed, turn off the accelerators and lasers.

2.m Axis 1 and Axis 2 have basically the same configuration.

Axis 1 has a Class 4 laser in the accelerator hall. When in use, access into the accelerator hall is limited. Power to the laser is interlocked with the PSS system.

2.n The DARHT detection chamber is located in room 110. Data acquisition for the test device is collected in this room. When operational, classified processing will be present.

2.o Two closed areas (vault-type rooms) at DARHT are located in rooms 110E and 121A. Under normal, nonemergency conditions, individuals will be escorted into these special security areas.

2.p The class 4 laser in Axis 1 would not be active during an evacuation. DARHT uses sulfur hexafluoride gas (SF_6) to activate certain electrical switches. SF_6 could pose a problem because it displaces oxygen.

- 2.q Room 115A is the fire closet and contains the sprinkler shutoff and chemicals for the cooling towers. The PIV shutoff is located by the fire hydrant on the east side of the building.
- 2.r The DARHT fire protection system automatically pages the WFO duty officer. The WFO duty officer will meet the LAFD or the ACO at DARHT, depending if HE is present on the Firing Point.
- 2.s Room 119 is the optics room. On the day of a shot, this room is the diagnostics center. Sealed sources are stored in the cabinet labeled "Radioactive Sources." The sealed sources are not normally a concern; however, firefighters must carry and monitor their UltraRadiac when entering room 119.
- 2.t The ventilation system in DARHT is different from ventilation systems in other nuclear facilities at LANL. At DARHT, the ventilation system shuts down and seals the intakes, preventing outside explosives and toxins from entering the building. In other nuclear facilities, the ventilation system remains operational in any emergency as long as the HEPA filters remain intact.

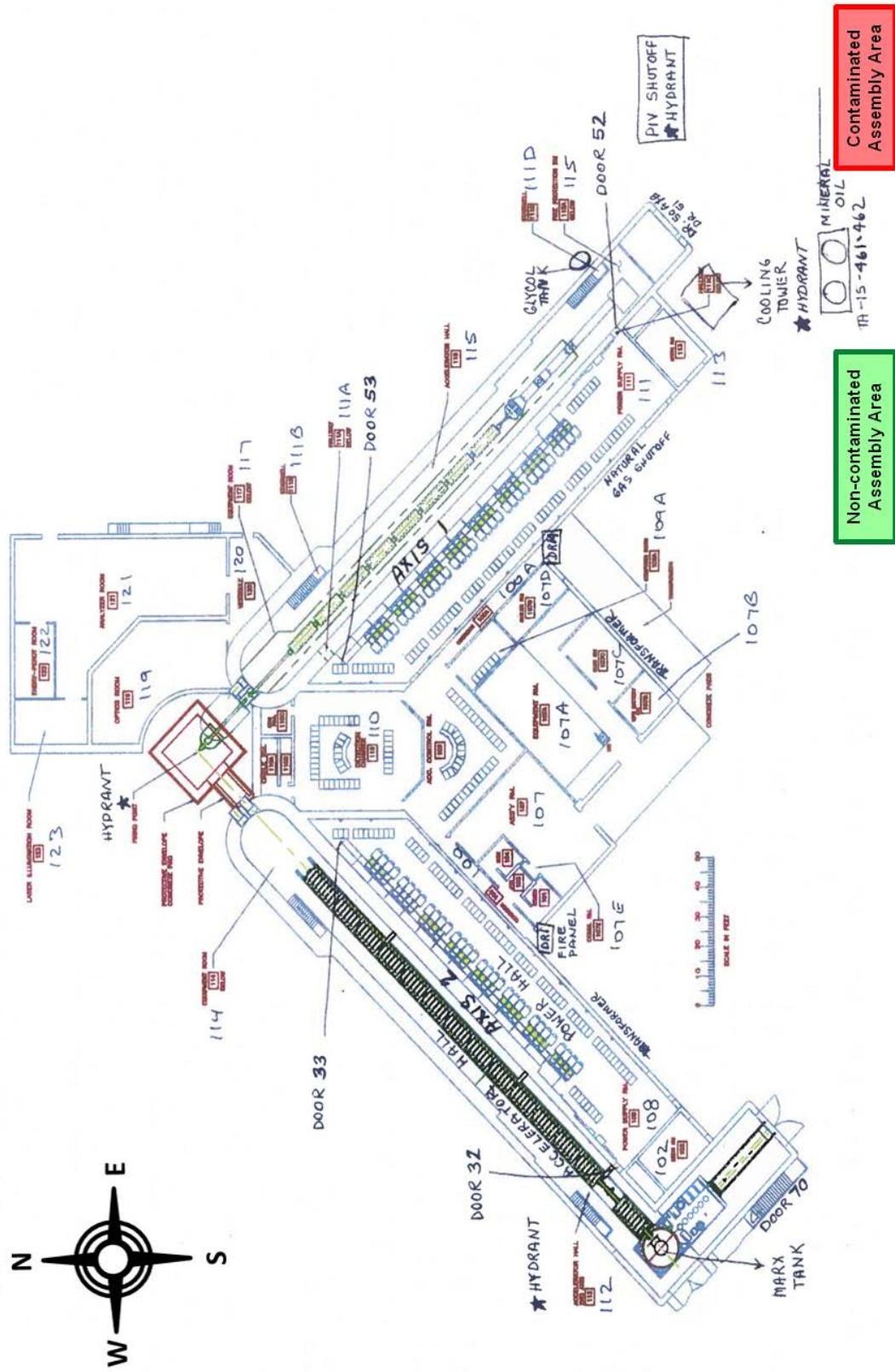
Because the ventilation system keeps potentially hazardous materials out of DARHT, the accelerator control room, room 119, is a safe location in a shelter-in-place protective action.

- 2.u Room 107A is the equipment room. It contains the primary cooling pumps and filters. The chiller is cooled by the cooling towers outside of doors 50 A&B and 51.
- 2.v The gas boiler room is located in room 107D. Natural gas is used only to fuel the boiler. The main shutoff is located on the southeast exterior wall by door 60 A/B.
- 2.w Room 107C is the electrical room. There are two power buses in these panels. The large switches (SWBA and SWBB) will kill the power to Axis 1 and 2. They are 480 V; ideally a trained and properly protected electrical worker should be interfacing with this equipment.
- 2.x The battery room, located in room 107B, no longer has batteries.



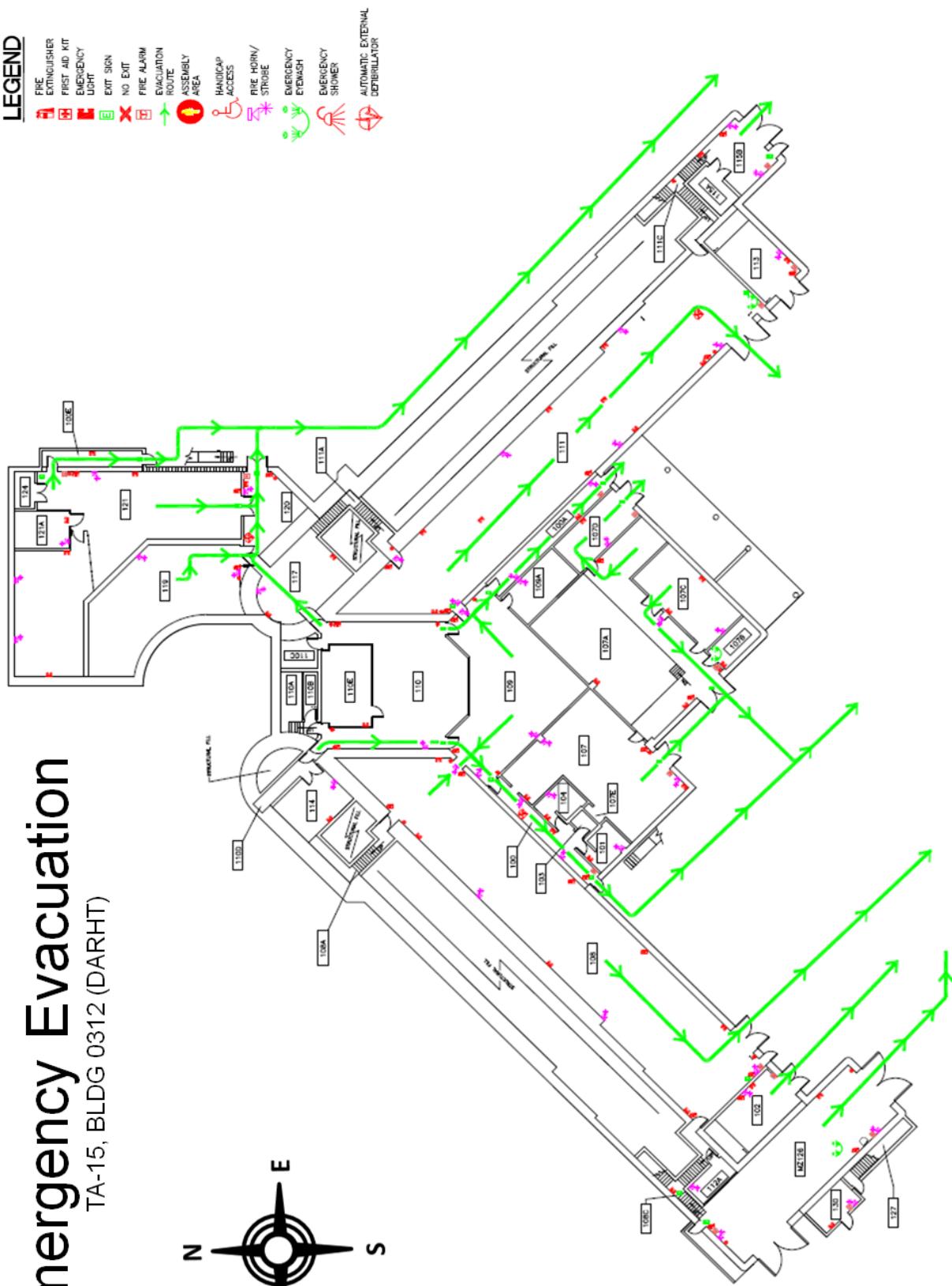
Figure 1: DARHT Be/DU potentially contaminated areas.

DARHT FLOOR PLAN



Emergency Evacuation

TA-15, BLDG 0312 (DARHT)



DARHT FLOOR PLAN

