GENERAL ATOMICS

38/67-4747
August 15, 2016

Ms. Marlayna G. Vaaler, Decommissioning Project Manager
Reactor Decommissioning Branch
Division of Decommissioning, Uranium Recovery, and Waste Programs
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission

Docket Nos: **050-00089 and 050-00163 (R-38 and R-67, respectively)**

Subject: **Request for Approval of Release Criteria for General Atomics' TRIGA® Reactor Facility**

Dear Ms. Vaaler,

The purpose of this letter is to advance General Atomics' (GA's) discussion and rationale in support of a request for approval of isotope specific release criteria applicable to the decontamination of GA's TRIGA® Reactor Facility where GA's Mark I and Mark F non-power research reactors, R-38 and R-67 respectively, are located.

Background

As you are aware, all components and pool fixtures have been removed from GA's Mark I and Mark F reactors. The fuel from these reactors was shipped off site in 2010. The pools have been drained and cleaned of debris. While this request is for NRC approval of release criteria for residual soil and concrete within the entire TRIGA® Reactor Facility and Licensed land area, including both of the TRIGA® reactors themselves, the rationale and basis for GA's request is focused herein on the larger of the two reactors, i.e., the Mark F reactor.

In 2015, hazardous materials (i.e., cadmium and lead) fixed to the wall and floor surfaces of the Mark F reactor pit were removed and appropriately packaged and shipped off site for disposal as low level mixed waste. This campaign was followed by core drilling at twenty locations in the concrete floor and walls of the concrete structure (e.g., biological shield) which comprises the reactor pit to determine the extent of volumetric activation of concrete plus any activation and contamination, if any, of the soil beyond (beneath or outside) the concrete structure.

In the process of collecting core samples of the structural concrete and soil beyond, GA learned that the actual wall thicknesses are often times significantly in excess of thicknesses indicated on design drawings. Furthermore, an examination of the results of concrete core sample analyses demonstrated that the presence of volumetric activation of the concrete is found only in the lower most portions of the pit (e.g., $\leq$ 5 ft. up from bottom in certain locations and up to ~ 4 ft. deep into the floor of pit in certain locations) representing only a small fraction of the volume of structural concrete comprising the reactor pit.

In planning for the final stages of decommissioning, it is important to know what levels of residual activity (for each individual nuclide of interest) are acceptable to the U.S. Nuclear Regulatory Commission (NRC) for release of GA's TRIGA® Reactor Facility (including the associated land area) to unrestricted use. Those levels (i.e., release criteria) are the primary factors in determining the volume of concrete that will need to be removed from the reactor structure and the amounts of contaminated or activated soil that may need to be excavated. That information will, in turn, drive the scope of the decontamination efforts, including the extent of building demolition required, the volume of low-level waste that must be packaged and shipped off-site for disposal, numerous and various other associated D&D costs, and the schedule for completing the decommissioning of GA's TRIGA® Reactor Facility.

Unfortunately, GA's NRC-approved TRIGA® Reactor Facility Decommissioning Plan (Ref. 1) does not contain isotope specific release criteria applicable to activated concrete or to activated or contaminated soil (e.g., the soil behind the biological shield). GA is convinced that the most expeditious path forward in terms of obtaining NRC approval for isotope specific release criteria is a commitment to the adoption of the NUREG 1757 soil screening levels (DCGLs) as the criteria for release to unrestricted use of residual soil and residual concrete.

Rationale/Basis for Request

As mentioned above, while conducting the core drilling it was discovered that the concrete bio-shield was significantly thicker near the reactor center line than original design plans indicated. The bio-shield wall thickness varies from 34" to 81" up to approximately 5 ft. from the floor of the pit at which point the thickness is reduced to approximately 24"up to approximately 15 ft. from the floor where it narrows to, and remains, about 12 inches from that point to the top of the pit (See Figure 1).

As stated in GA's TRIGA® Reactor Facility Decommissioning Plan, GA initially intended to remove any and all activated/contaminated steel and concrete by completely removing the bottom portion of the reactor tank and concrete structure for eventual disposition as Low Level Radioactive Waste (LLRW). However, based on the analytical results of the concrete core samples and newly discovered wall thicknesses, GA considers supporting the upper structure while removing the entire bottom portion of the reactor tank a considerable safety risk. Furthermore, this effort would have resulted in a significantly larger volume of LLRW than GA's current proposed approach of removing only that volume of concrete that is activated or contaminated at levels above NRC approved release criteria; which is consistent with the objective of waste minimization. (The material removed as part of decontamination efforts will be disposed of as LLRW at an authorized disposal facility.)

The analytical results of the concrete core samples allows GA to establish with reasonable accuracy and precision the location and extent of volumetric activated concrete as a function of activation product concentration. This facilitates estimates of what volume of activated concrete will need to be removed, and from where, in order to meet approved release criteria. As illustrated in the attached Figures 1 and 2, the activation in the concrete (primarily Eu-152) at ~50% of the proposed screening levels extends approximately 25" below the surface of the floor of the pit and, near the bottom of the pit looking North it extends approximately ~19" beyond the surface of the pit wall.

Although, the screening levels found in NUREG 1757, Appendix H, Table H.2 are directly applicable to soil, a careful evaluation of credible disposition scenarios of residual activated or contaminated concrete clearly does not carry any additional exposure risk to the public than residual activated or contaminated soil. Applying soil screening levels to rubblized concrete was approved in General Atomics' NRC-approved Site Decommissioning Plan (approved by the NRC in September 1996) (Ref. 2). It is also noted that a more recent precedent of applying soil screening levels to concrete, especially in volumetric activated concrete, has been established. Specifically, the University of Arizona Research Reactor, designed and built by General Atomics, was decommissioned and the license terminated in 2011 following approval by the NRC to apply soil screening levels to residual concrete as release criteria for license termination. This reactor had very similar structural concrete and decommissioning challenges as GA's TRIGA® reactors.

GA proposes removing only those portions of its TRIGA® Reactor Facility concrete structure(s) which exceed the screening levels for those radionuclides listed in Table 1 below, and demonstrating by using industry accepted Health Physics sampling and measurement techniques found in MARSSIM that the facility meets release criteria for license termination. In doing so, GA will move the TRIGA Facility Decommissioning project toward completion in a manner that protects human health and the environment.

Table 1: Applicable NRC Screening Levels for Soils*

Radionuclide	Screening Level for Unrestricted Release (pCi/g)
Cobalt-60	3.8
Cesium-137	11
Europium-152	7**
Europium-154	8

* Applicable radionuclides based on characterization core samples of the bio-shield and soil analyzed by gamma spectroscopy and verified with split samples by the NRC

** The Eu-152 NRC screening value is greater than the EPA and the NRC Memorandum of Understanding consultation trigger value of 7 pCi/g. Therefore the lower value will be used.

Accordingly, GA hereby requests that the isotope specific release criteria (e.g., in pCi/gm) listed in NUREG 1757, Appendix H, Table H.2, with one modification, be approved by the NRC for use in obtaining the release to unrestricted use of GA's TRIGA® Reactor Facility (including residual soil and concrete within the Licensed boundary). The single modification being that the ^{152}Eu screening level will be reduced from 8.7 pCi/gm to 7.0 pCi/gm to meet the EPA/NRC Memorandum of Understanding.

If you have questions or desire additional information regarding this request, please contact me at keith.asmussen@ga.com or (858) 455-2823, or Paul Pater at paul.pater@ga.com or (858) 455-2758.

Very truly yours,

Keith E. Asmussen

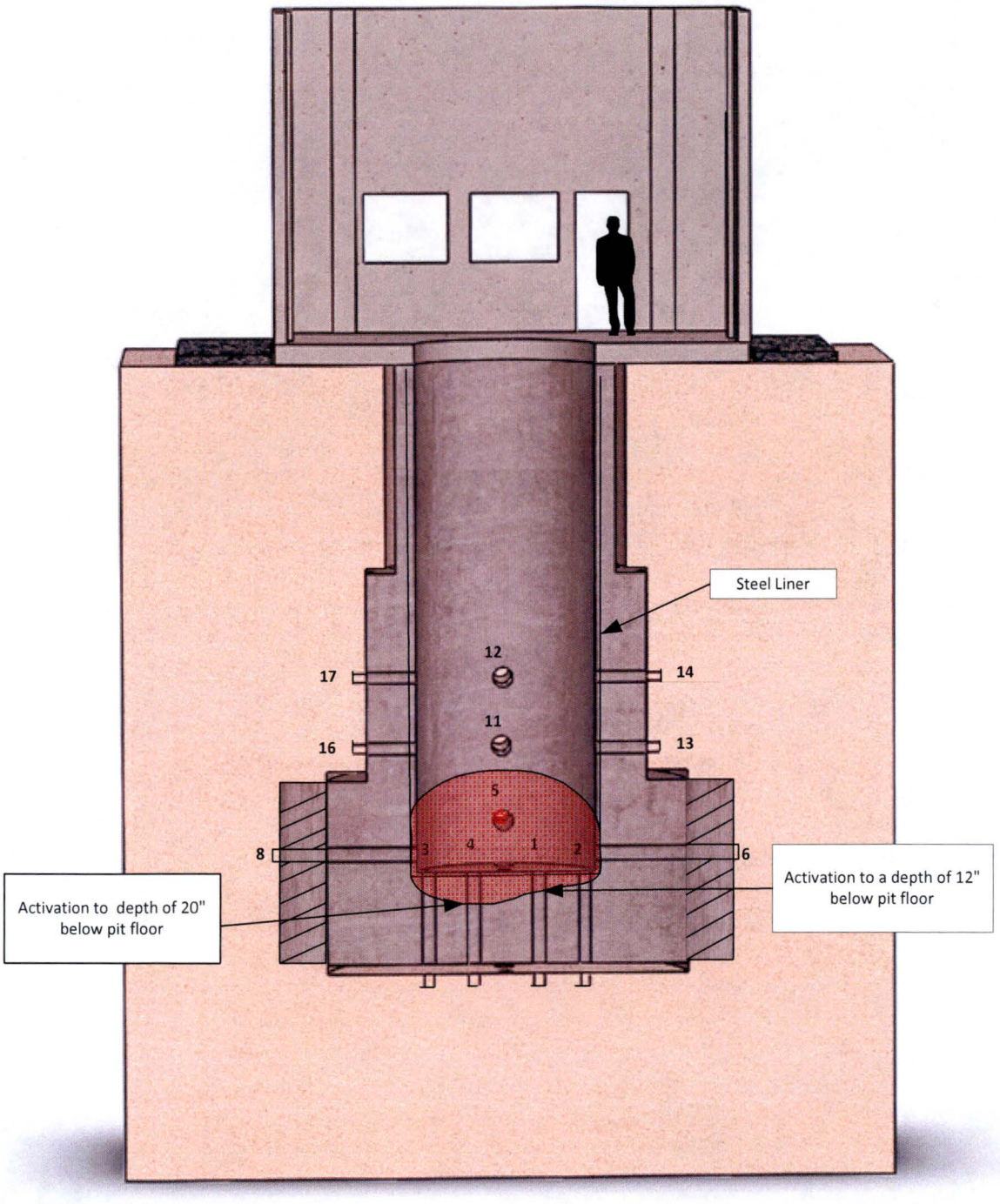
Keith E. Asmussen, Ph.D., Director
Licensing, Safety and Nuclear Compliance

References: 1) "General Atomics TRIGA® Reactor Facility Decommissioning Plan," dated July 1999

2) "General Atomics' Site Decommissioning Plan," September 1996, Revised December 1996, Revised April 1997 and Revised January 1998. Approved by NRC per SNM-696 License Amendment No. 45 dated April 29, 1998

Attachments: Figure 1: "TRIGA® Core Sample Results, Cross Section Looking North"
Figure 2: "TRIGA® Core Sample Results, Cross Section Looking East"

FIGURE 1: TRIGA CORE SAMPLE RESULTS, CROSS SECTION LOOKING NORTH



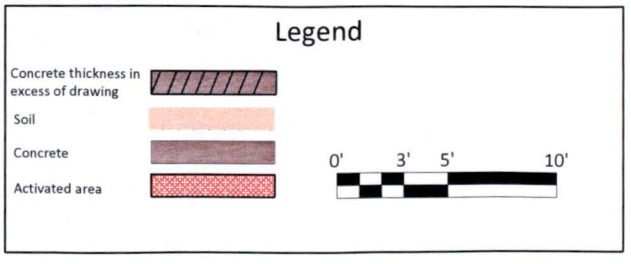
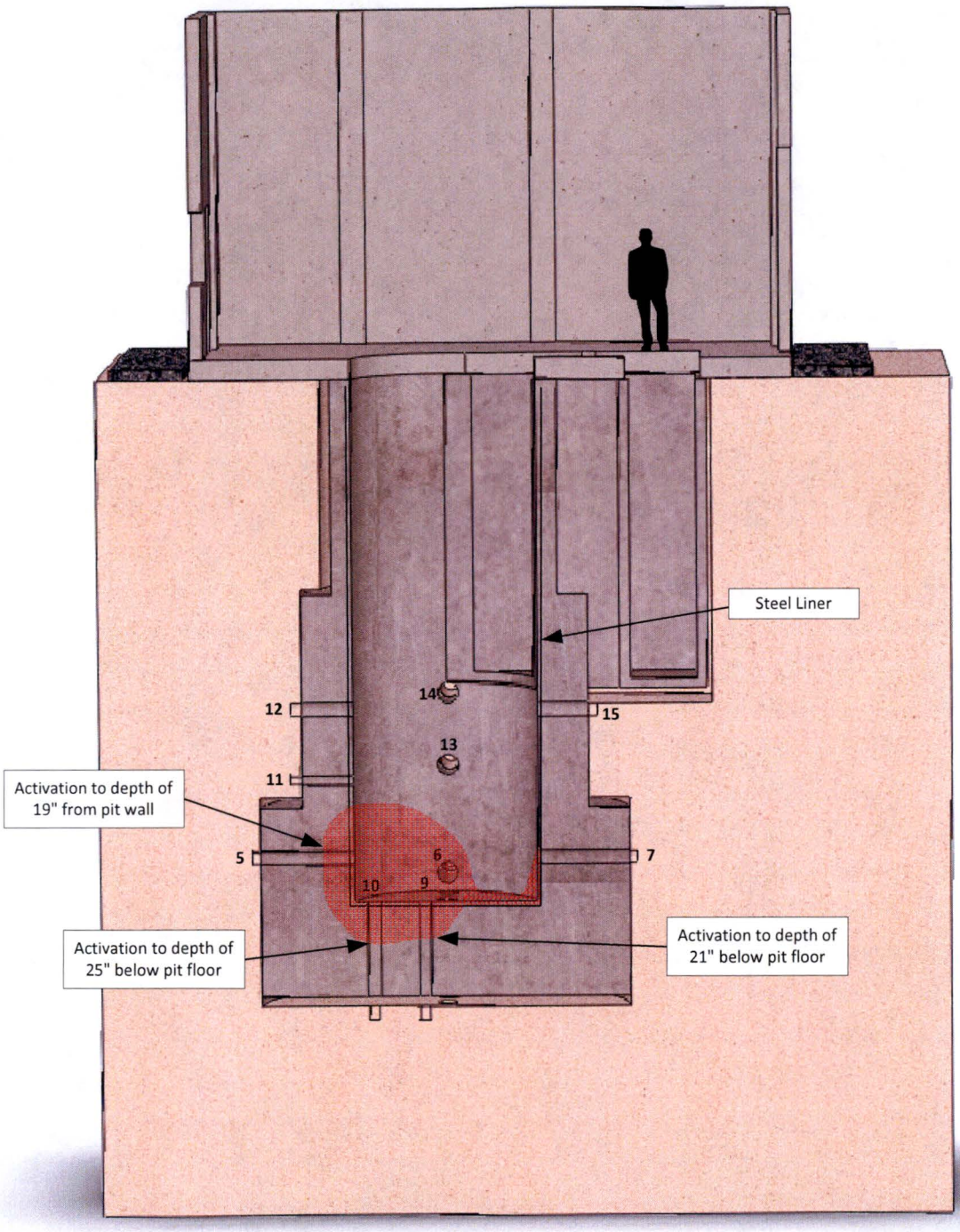


FIGURE 2: TRIGA CORE SAMPLE RESULTS, CROSS SECTION LOOKING EAST



Legend

SOIL

CONCRETE

CONTAMINATED AREA

0' 3' 5' 10'