

## **NRR-PMDAPEm Resource**

---

**From:** Lingam, Siva  
**Sent:** Tuesday, July 23, 2013 3:33 PM  
**To:** Mackaman, Clyde Douglas (cdmackaman@tva.gov)  
**Cc:** Broaddus, Doug; McMurtray, Anthony; Hon, Andrew; Uribe, Juan  
**Subject:** SQN 1 & 2 and WBN-1 - RAIs on TVA's Letter Dated January 18, 2013 (ADAMS Accession No. ML13025A262) - HESCO Flood Barriers and Earthen Embankments  
**Attachments:** RAIs for Sequoyah and Watts Bar CAL Supplemental Info on HESCO Barriers ....docx

Attached please find our Mechanical and Civil Engineering Branch official RAIs on the subject letter. Please provide the responses by August 31, 2013.

Siva P. Lingam  
U.S. Nuclear Regulatory Commission  
Project Manager (NRR/DORL/LPL2-2)  
Sequoyah Nuclear Plant  
St. Lucie Plant  
Location: O8-D5; Mail Stop: O8-G9a  
Telephone: 301-415-1564; Fax: 301-415-1222  
E-mail address: [siva.lingam@nrc.gov](mailto:siva.lingam@nrc.gov)

**Hearing Identifier:** NRR\_PMDA  
**Email Number:** 773

**Mail Envelope Properties** (Siva.Lingam@nrc.gov20130723153200)

**Subject:** SQN 1 & 2 and WBN-1 - RAIs on TVA's Letter Dated January 18, 2013 (ADAMS  
Accession No. ML13025A262) - HESCO Flood Barriers and Earthen Embankments  
**Sent Date:** 7/23/2013 3:32:32 PM  
**Received Date:** 7/23/2013 3:32:00 PM  
**From:** Lingam, Siva

**Created By:** Siva.Lingam@nrc.gov

**Recipients:**

"Broaddus, Doug" <Doug.Broaddus@nrc.gov>

Tracking Status: None

"McMurtray, Anthony" <Anthony.McMurtray@nrc.gov>

Tracking Status: None

"Hon, Andrew" <Andrew.Hon@nrc.gov>

Tracking Status: None

"Uribe, Juan" <Juan.Uribe@nrc.gov>

Tracking Status: None

"Mackaman, Clyde Douglas (cdmackaman@tva.gov)" <cdmackaman@tva.gov>

Tracking Status: None

**Post Office:**

<b>Files</b>	<b>Size</b>	<b>Date &amp; Time</b>
MESSAGE	454	7/23/2013 3:32:00 PM
RAIs for Sequoyah and Watts Bar CAL Supplemental Info on HESCO Barriers ....docx		
21873		

**Options**

**Priority:** Standard

**Return Notification:** No

**Reply Requested:** No

**Sensitivity:** Normal

**Expiration Date:**

**Recipients Received:**

**REQUESTS FOR ADDITIONAL INFORMATION (RAIs)  
TENNESSEE VALLEY AUTHORITY (TVA)  
SEQUOYAH NUCLEAR PLANT (SQN), UNITS 1 AND 2 AND  
WATTS BAR NUCLEAR PLANT (WBN), UNIT 1  
RELATED TO THE REVIEW OF POTENTIAL BREACHES OF HESCO FLOOD BARRIERS &  
EARTHEN EMBANKMENTS AFFECTING THE UPDATED HYDRO ANALYSIS RESULTS  
(DOCKET NOS. 50-327, 50-328 and 50-390)**

**Reference:**

Letter from Joseph W. Shea of TVA to NRC, "Potential for breaches of HESCO Modular Flood Barriers and Earthen Embankments Affecting the Updated Hydrologic Analysis Results for Sequoyah Nuclear Plant, Units 1 and 2, and Watts Bar Nuclear Plant, Unit 1" dated January 18, 2013 (ADAMS Accession Number ML13025A262).

**Mechanical and Civil Engineering Branch (EMCB)-RAI-1**

With regards to the Computational Fluid Dynamics (CFD) Model for the Fort Loudoun and Tellico reservoirs, the Reference notes that the CFD model was developed to determine the likely movement that an uncontrolled barge would have during a Probable Maximum Flood (PMF) event. However, the Reference concludes, in the CFD model analysis section, that it is possible that the HESCO barriers could be approached by a simulated barge trajectory, but that the results should be considered indeterminate based on particle tracking results.

Please provide additional information regarding the particle seed location and the use of other post-processing results that lead you to reach this conclusion. Regarding the seed location, the response should describe if alternate seed locations were considered in the reservoir. Regarding other visualization/post-processing methods, please state if inverse particle tracking methods were considered for use. For example, inverse particle tracking techniques could be used to determine where the particles (i.e., barge surrogates) would need to originate (i.e., moored and released) in order to have them approach the HESCO barriers during the PMF event.

**EMCB-RAI-2**

The Reference notes that no bathymetry data was available for the Fort Loudoun/Tellico channel, between the two reservoirs when developing the model, and therefore the channel bottom was estimated to be 10 meters (m) below the pool level. Due to the high importance of this location in relation to the case model studies performed as part of the analysis, please provide additional technical information that documents the basis for selecting 10m as a bathymetry estimate between the channels. The response should clarify if a sensitivity study was performed as means of verifying the estimate and provide reasonable assurance that the bathymetry assigned to the model is conservative and appropriate for use.

### **EMCB-RAI-3**

The Reference notes that the barges were modeled using a sphere whose wetted area equals that of a 195 foot(ft) barge with a width of 35ft and draft of 6ft. Furthermore, the Reference notes that the density of the sphere matches the laden weight of a barge weighing 1000 tons. The simulations use 1000-ton large objects to represent the barges. The 195ft by 35ft dimensions are typical for a single barge. However, commercial barges are frequently transported in groups and this has been acknowledged by TVA. Please clarify if the barges, once stationed at the docks, are also tied together. If a group of barges were not considered for the model, please provide additional information that documents why this approach was acceptable.

### **EMCB-RAI-4**

In Figure 19 of the Reference, it is not clear what the caption or the image is trying to convey. The caption states that 17% of the modeled sphere beaches. If this is assumed, then 83% of the modeled sphere would then continue in the flow path. However, a typical barge that is flowing uncontrolled would flow as a unit. Please clarify the perceived discrepancy in this analysis.