Entergy Operations, Inc.
17265 River Road
Killona, LA 70057-3093
Tel 504-739-6660
Fax 504-739-6698
mchisum@entergy.com

Michael R. Chisum
Site Vice President
Waterford 3

W3F1-2017-0005

February 1, 2017

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

SUBJECT: Responses to Request for Additional Information Set 11 Regarding the License Renewal Application for Waterford Steam Electric Station, Unit 3 (Waterford 3)
Docket No. 50-382
License No. NPF-38

REFERENCES:
1. Entergy letter W3F1-2016-0012 "License Renewal Application, Waterford Steam Electric Station, Unit 3" dated March 23, 2016.
2. NRC letter to Entergy "Requests for Additional Information for the Review of the Waterford Steam Electric Station, Unit 3, License Renewal Application – Set 11" dated December 19, 2016.

Dear Sir or Madam:

By letter dated March 23, 2016, Entergy Operations, Inc. (Entergy) submitted a license renewal application (Reference 1).

In letter dated December 19, 2016 (Reference 2), the NRC staff made a Request for Additional Information (RAI) Set 11, needed to complete its review. Enclosure 1 provides the responses to the Set 11 RAIs.

There are no new regulatory commitments contained in this submittal. If you require additional information, please contact the Regulatory Assurance Manager, John Jarrell, at 504-739-6685.

I declare under penalty of perjury that the foregoing is true and correct. Executed on February 1, 2017.

Sincerely,

MRC/AJH

Enclosures: 1. Set 11 RAI Responses – Waterford 3 License Renewal Application

cc:

Kriss Kennedy Regional Administrator U. S. Nuclear Regulatory Commission Region IV 1600 E. Lamar Blvd. Arlington, TX 76011-4511	RidsRgn4MailCenter@nrc.gov
NRC Senior Resident Inspector Waterford Steam Electric Station Unit 3 P.O. Box 822 Killona, LA 70066-0751	Frances.Ramirez@nrc.gov Chris.Speer@nrc.gov
U. S. Nuclear Regulatory Commission Attn: Phyllis Clark Division of License Renewal Washington, DC 20555-0001	Phyllis.Clark@nrc.gov
U. S. Nuclear Regulatory Commission Attn: Dr. April Pulvirenti Washington, DC 20555-0001	April.Pulvirenti@nrc.gov
Louisiana Department of Environmental Quality Office of Environmental Compliance Surveillance Division P.O. Box 4312 Baton Rouge, LA 70821-4312	Ji.Wiley@LA.gov

Enclosure 1 to

W3F1-2017-0005

Set 11 RAI Responses
Waterford 3 License Renewal Application

RAI 3.1.1.81-1a

Background:

In its letter dated November 10, 2016, the applicant responded to RAI 3.1.1.81-1 which addresses aging management of cracking due to stress corrosion cracking (SCC) for the reactor coolant pump (RCP) thermal barrier heat exchanger. In its response, the applicant indicated that the RCP thermal barrier heat exchanger is represented in LRA Table 3.1.2-3 by the component type "Heat exchanger – water jacket (seal heat exchanger). The LRA also indicates that this component type is associated with LRA item 3.1.1-33, which credits the Inservice Inspection Program and Water Chemistry Control – Primary and Secondary Program to manage cracking due to SCC.

Issue:

It is not clear to the staff what inspection activities are performed to manage cracking due to SCC for the thermal barrier heat exchanger components under the Inservice Inspection Program.

Request:

Describe what inspection activities are performed to manage cracking due to SCC for the thermal barrier heat exchanger components under the Inservice Inspection Program.

Waterford 3 Response

Leakage testing of Class 1 components is performed by visual inspection (VT2) at normal operating pressure following each refueling outage as required by station procedures and ASME code. The exam will detect external leakage from the reactor coolant pump and associated reactor coolant pressure boundary components. In addition, the Inservice Inspection Program includes numerous non-destructive examinations of stainless steel components in the reactor coolant system that serve to verify effectiveness of the Water Chemistry Control – Primary and Secondary Program in managing the effects of aging.

Radiation detectors also monitor radiation levels in the component cooling water system headers as described in FSAR Section 11.5.2.4.2.2. Monitoring radiation levels is an effective means of detecting leakage that could indicate cracking due to SCC in a thermal barrier heat exchanger.

RAI B.1.10-4a

Background:

1. The response to RAI B.1.10-4 dated December 7, 2016, states that based on a review of operating experience, cracking is not an aging effect requiring management for the external surfaces of the stainless steel plant stack monitoring instrument tubing exposed to outdoor air in the Miscellaneous HVAC System (LRA Table 3.3.2-12). The response also states that, "[i]n addition, stainless steel tubing exposed to outdoor air is widely used in pressurized systems that are subject to aging management review at WF3. Identification of cracking caused by exposure of that tubing to outdoor air would be an indicator that corrective actions should be taken with respect to the stainless steel tubing in the miscellaneous HVAC system."

   LRA Section 3.3.2.2.3 states that cracking due to stress corrosion cracking could occur for stainless steel components exposed to outdoor air due to Waterford 3 being located near other industrial facilities, including chemical manufacturers, where chloride contamination of stainless steel components exposed to outdoor air may occur.

   GALL Report AMP XI.M36, "External Surfaces Monitoring of Mechanical Components," is not a sampling-based program.

2. The response to RAI B.1.10-4 dated December 7, 2016, states that aluminum heat exchanger fins in the Component Cooling and Auxiliary Component Cooling Water System (LRA Table 3.3.2-3) are not pressure boundary components, so inspection for leakage to indicate cracking is not applicable.

   The response to RAI B.1.30-5 dated December 12, 2016, states that the External Surfaces Monitoring program employs visual inspections that will monitor accessible surfaces of the subject aluminum heat exchanger fins to manage loss of material.

3. The response to RAI B.1.10-4 dated December 7, 2016, states that the aluminum flame arrestor in the Auxiliary Diesel Generator System (LRA Table 3.3.2-13) was removed from the LRA based on a further review which determined that it does not perform the license renewal intended function of pressure boundary.

Issue:

1. Although the RAI response states that a search of operating experience showed no instances of cracking of stainless steel components exposed to outdoor air, it is unclear to the staff why cracking is not an applicable aging effect for the stainless steel plant stack monitoring instrument tubing given that chloride contamination of stainless steel components exposed to outdoor air may occur due to Waterford 3 being located near other industrial facilities.

   In addition, no basis was provided for why a sampling-based approach using other pressurized stainless steel components is acceptable when AMP XI.M36 is not a sampling-based program.

2. It is unclear to the staff why the aluminum heat exchanger fins performing a heat transfer intended function, as opposed to a pressure boundary intended function precludes the need to manage cracking for these components. For example, cracking could, over time, lead to loss of fins and a corresponding reduction in heat transfer. The staff noted that the December 12, 2016, letter states that visual inspections will monitor accessible surfaces of the fins to manage loss of material; however, the statement does not include cracking as an aging effect requiring management.
3. Although the aluminum flame arrestor might not perform a pressure boundary intended function, it is unclear to the staff why this component was removed from the LRA given that it may perform another license renewal intended function. For example: (a) the clearances in a flame arrestor are specifically sized to prevent the propagation of a fire based on the fuel source and configuration of the component being protected; and (b) the flame arrestor could also function as a “cover” to the tank opening, which in effect is a pressure boundary function. Loss of material or cracking could affect the clearances in the flame arrestor. Loss of material or cracking could affect the ability of the flame arrestor to prevent water intrusion into the tank.

.

<u>Request:</u>

1.
    a. Justify why cracking is not an applicable aging effect for the stainless steel plant stack monitoring instrument tubing given that chloride contamination of stainless steel components exposed to outdoor air may occur; or
    b. State the parameters monitored and the inspection methods that will be used to determine whether cracking is present in the stainless steel plant stack monitoring instrument tubing.
2.
    a. Justify why the aluminum heat exchanger fins performing a heat transfer intended function, as opposed to a pressure boundary intended function, precludes the need to manage these components for cracking; or
    b. State the parameters monitored and the inspection methods that will be used to determine whether cracking is present for the aluminum heat exchanger fins.
3.
    a. Provide additional detail to justify why the aluminum flame arrestor does not perform a license renewal intended function; or,
    b. State the parameters monitored and the inspection methods that will be used to determine whether cracking is present for the aluminum flame arrestor.

Waterford 3 Response

1. License renewal application (LRA) Section 3.3.2.2.3, Section 3.3.2.2.5, Table 3.3.1, and Table 3.3.2-12 were revised in a letter dated December 7, 2016. The revision eliminated cracking and loss of material as aging effects requiring management for stainless steel tubing with an air – outdoor external environment. Cracking and loss of material had conservatively been identified as aging effects requiring management due to the possibility of industrial contaminants in the outdoor air. As described in the response to RAI B.1.10-4 in the December 7, 2016 letter, a search of operating experience did not identify cracking of SS tubing exposed to outdoor air at Waterford 3. Nevertheless, to provide reasonable assurance that aging effects are not resulting from exposure to contaminants in outdoor air, Entergy is adding the stainless steel tubing serving the plant stack radiation monitor to the One-Time Inspection Program, which will confirm the absence of cracking. The External Surfaces Monitoring Program will manage loss of material for the tubing. LRA Section 3.3.2.2.3, Section 3.3.2.2.5, Section A.1.28, Section B.1.28, Table 3.3.1, and Table 3.3.2-12 are revised to indicate that the One-Time Inspection Program will manage cracking and the External Surfaces Monitoring Program will manage loss of material for plant stack radiation monitor stainless steel tubing exposed to an external environment of air-outdoor.

2. The response to RAI B.1.30-5 in a letter dated December 12, 2016, states that the External Surfaces Monitoring Program employs visual inspections that will monitor accessible surfaces of the subject aluminum heat exchanger fins to manage loss of material. Entergy is revising the Waterford 3 license renewal application to credit the Periodic Surveillance and Preventive Maintenance Program to manage the aging effects of loss of material and cracking of the fins. Periodic cleaning and visual inspections will identify indications of loss of material and cracking of the aluminum fins. Indications of cracking are loose, missing, or detached fins. LRA Section B.1.30, Periodic Surveillance and Preventive Maintenance, is revised.

3. The auxiliary diesel fuel tank flame arrestor consists of a cast iron base and cover with aluminum plate stacks and weather shield. LRA Table 3.3.2-13 included both gray cast iron and aluminum materials of construction for the flame arrestor. In addition, Table 3.3.2-13 conservatively included cracking of aluminum as an aging effect requiring management.

   As described in EPRI Report 1010639, Non-Class 1 Mechanical Implementation Guideline and Mechanical Tools, Revision 4, pure aluminum is not susceptible to stress corrosion cracking in an air or gas environment. The auxiliary diesel fuel tank flame arrestor aluminum components are fabricated from Alloy 3003. As described in ASME Section II, Alloy 3003 contains a maximum of 0.1% zinc and 1.5% manganese, which is below the threshold for the development of stress corrosion cracking. Because the aluminum material is not susceptible to SCC, cracking is not an aging effect requiring management.

   The response to RAI B.1.10-4 in a letter dated December 7, 2016, included a revision to LRA Table 3.3.2-13 that removed the flame arrestor, however only the line item including aluminum with cracking as an aging effect requiring management should have been removed. As a result, flame arrestor line items in Table 3.3.2-13 are restored with the exception of line items with aluminum and cracking as an aging effect requiring management. Loss of material for the

flame arrestor will be managed by the External Surfaces Monitoring Program through visual inspections.

In addition, LRA Table 3.3.2-13 described the carbon based material of the flame arrestor base as gray cast iron in the original submittal. The carbon based material was determined to be cast iron. Since the aging effects of cast iron and carbon steel are the same, cast iron is included in the term “carbon steel” similar to the inclusion of cast iron in the broad term “steel” in NUREG-1801. Therefore, the material of the flame arrestor base is included in LRA Table 3.3.2-13 as carbon steel.

.

The LRA is revised as follows. Additions are underlined and deletions are lined through.

3.3.2.2.3 Cracking due to Stress Corrosion Cracking

Cracking due to stress corrosion cracking could occur for stainless steel piping, piping components, piping elements and tanks exposed to outdoor air, including air which has recently been introduced into buildings, such as near intake vents. WF3 is located near other industrial facilities, including chemical manufacturers. Chloride contamination of components exposed to outdoor air may occur. Consistent with NUREG-1801, cracking of stainless steel components exposed to outdoor air, including indoor components accessible to outdoor air, is identified as an aging effect requiring management and is managed by the External Surfaces Monitoring Program.

In Table 3.3.2-12, Miscellaneous HVAC, stainless steel tubing, which serves the plant stack monitoring instrumentation, is exposed externally to air-outdoor and has an internal environment of air-indoor. Waterford 3 operating experience was reviewed to determine if cracking had been documented in stainless steel components exposed to an external environment of air-outdoor. No occurrences were identified. Therefore, cracking of the stainless steel tubing in the stack monitoring system is not expected. ~~Based on the operating experience review,~~ <u>For the stainless steel tubing serving the plant stack monitoring instrumentation, the One-Time Inspection Program will confirm that</u> cracking due to stress corrosion cracking is not an aging effect requiring management ~~for the subject tubing~~.

3.3.2.2.5 Loss of Material due to Pitting and Crevice Corrosion

Loss of material due to pitting and crevice corrosion could occur for stainless steel piping, piping components, piping elements, and tanks exposed to outdoor air, including air which has recently been introduced into buildings, such as near intake vents. WF3 is located near other industrial facilities, including chemical manufacturers. Chloride contamination of components exposed to outdoor air may occur. Consistent with NUREG-1801, loss of material for stainless steel components exposed to outdoor air, including indoor components accessible to outdoor air, is identified as an aging effect requiring management and is managed by the External Surfaces Monitoring Program.

~~In Table 3.3.2-12, Miscellaneous HVAC, stainless steel tubing, which serves the plant stack monitoring instrumentation, is exposed externally to air-outdoor and has an~~

~~internal environment of air-indoor. Waterford 3 operating experience was reviewed to determine if loss of material had been documented for stainless steel components exposed to an external environment of air-outdoor. No occurrences were identified. Therefore, loss of material of the stainless steel tubing in the stack monitoring system is not expected. Based on the operating experience review, loss of material due to pitting and crevice corrosion is not an aging effect requiring management for the subject tubing.~~

Table 3.3.1
Summary of Aging Management Programs for the Auxiliary Systems
Evaluated in Chapter VII of NUREG-1801

Table 3.3.1: Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-4	Stainless steel piping, piping components, and piping elements; tanks exposed to air – outdoor	Cracking due to stress corrosion cracking	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes, environmental conditions need to be evaluated	Consistent with NUREG-1801. Cracking in stainless steel components exposed to outdoor air is managed by the External Surfaces Monitoring Program (with the exception ~~of the~~ that cracking of the plant stack radiation monitor stainless steel ~~monitoring instrument~~ tubing exposed to air-outdoor is managed by the One-Time Inspection Program). See Section 3.3.2.2.3.
3.3.1-5	Steel (with stainless steel or nickel-alloy cladding) pump casings exposed to treated borated water	Loss of material due to cladding breach	A plant-specific aging management program is to be evaluated. Reference NRC Information Notice 94-63, “Boric Acid Corrosion of Charging Pump Casings Caused by Cladding Cracks."	Yes, verify that plant- specific program addresses clad cracking	The WF3 charging pump casings are solid stainless steel. See Section 3.3.2.2.4.
3.3.1-6	Stainless steel piping, piping components, and piping elements; tanks exposed to air – outdoor	Loss of material due to pitting and crevice corrosion	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes, environmental conditions need to be evaluated	Consistent with NUREG-1801. Loss of material in stainless steel components exposed to outdoor air is managed by the External Surfaces Monitoring Program ~~(with the exception of the plant stack monitoring instrument tubing)~~. See Section 3.3.2.2.5.

Table 3.3.2-12
Miscellaneous HVAC Systems
Summary of Aging Management Evaluation

Table 3.3.2-12: Miscellaneous HVAC Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Tubing	Pressure boundary	Stainless steel	Air – indoor (int)	None	None	VII.J.AP-123	3.3.1-120	A
Tubing	Pressure boundary	Stainless steel	Air – outdoor (ext)	~~None~~ Cracking	~~None~~ One-Time Inspection	VII.F2.AP-209	3.3.1-4	E
Tubing	Pressure boundary	Stainless steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2.AP-221	3.3.1-6	A

A.1.28 One-Time Inspection Program

The program will include activities to verify effectiveness of aging management programs and activities to confirm the insignificance of aging effects as described below

Plant stack radiation monitor stainless steel tubing exposed to air-outdoor	One-time inspection activity will confirm that cracking is not occurring or is occurring so slowly that it will not affect the component intended function during the period of extended operation.

B.1.28 One-Time Inspection

The program will include activities to verify effectiveness of aging management programs and activities to confirm the insignificance of aging effects as described below.

Plant stack radiation monitor stainless steel tubing exposed to air-outdoor	One-time inspection activity will confirm that cracking is not occurring or is occurring so slowly that it will not affect the component intended function during the period of extended operation.

B.1.30 Periodic Surveillance and Preventive Maintenance

Credit for program activities has been taken in the aging management review of systems, structures and components as described below.

System	Inspection
Component cooling and auxiliary component cooling water system	Use visual in conjunction with cleaning activities to inspect a representative sample of the tube fins of the CCW dry cooling tower heat exchanger (radiator) to manage loss of material and cracking that could result in a reduction of heat transfer capability.

Table 2.3.3-13
Auxiliary Diesel Generator System
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Expansion joint	Pressure boundary
Flame arrestor	Pressure boundary
Piping	Pressure boundary
Silencer	Pressure boundary
Tank	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

Table 3.3.2-3
Component Cooling and Auxiliary Component Cooling Water System
Summary of Aging Management Evaluation

Table 3.3.2-3: Component Cooling and Auxiliary Component Cooling Water System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Heat exchanger (fins)	Heat transfer	Aluminum	Condensation (ext)	Cracking	~~External Surfaces Monitoring~~ Periodic Surveillance and Preventive Maintenance	--	--	G
Heat exchanger (fins)	Heat transfer	Aluminum	Condensation (ext)	Loss of material	~~External Surfaces Monitoring~~ Periodic Surveillance and Preventive Maintenance	--	--	G
Heat exchanger (fins)	Heat transfer	Aluminum	Condensation (ext)	Reduction of heat transfer	Periodic Surveillance and Preventive Maintenance	--	--	G

Table 3.3.2-13
Auxiliary Diesel Generator System
Summary of Aging Management Evaluation

Table 3.3.2-13: Auxiliary Diesel Generator System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-125	3.3.1-12	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	B
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	B
Expansion joint	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Flame arrestor	Pressure boundary	Aluminum	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.AP-256	3.3.1-81	A
Flame arrestor	Pressure boundary	Aluminum	Air – outdoor (int)	Loss of material	External Surfaces Monitoring	--	--	G, 305
Flame arrestor	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.H1.A-24	3.3.1-80	A
Flame arrestor	Pressure boundary	Carbon steel	Air – outdoor (int)	Loss of material	External Surfaces Monitoring	--	--	G, 305

RAI 3.5.2.2.2.1-1a

Background:

Section 54.21(a)(3) of the10 CFR requires the applicant to demonstrate that the effects of aging for structures and components will be adequately managed so that the intended function(s) will be maintained consistent with the current licensing basis for the period of extended operation.

In its response letter dated December 7, 2016, to request 1 of RAI 3.5.2.2.2.1-1 related to further evaluation in LRA Section 3.5.2.2.2.1, item 4 (corresponding to LRA Table 3.5.1, item 3.5.1-47), the applicant concluded that an increase in porosity and permeability, and loss of strength due to leaching of calcium hydroxide and carbonation, is not an aging effect requiring management in above- and below-grade inaccessible areas of Waterford 3 (WF3) concrete structures [Groups 1-5, 7-9] exposed to [GALL Report] "water-flowing" environment [fluid environment in LRA Table 3.0-2]. In request 2 of the response, the applicant revised LRA Section 3.5.2.2.2.1, item 4, and LRA Table 3.5.1, item 3.5.1-13, accordingly.

Issue:

The staff finds that the basis provided in the applicant's response to request 1 of RAI 3.5.2.2.2.1-1 is adequate to satisfy the further evaluation criteria of SRP-LR Section 3.5.2.2.2.1 item 4 for SRP-LR Table 3.5.1, item 47 (for Group 1-5, 7-9 structures) and the corresponding GALL Report AMR items (e.g., item III.A3.TP-67) to support a conclusion that a plant-specific AMP or enhancement is not necessary to manage the related aging effects. However, the response does not support the applicant's conclusion that the aging effects of increase in porosity and permeability and loss of strength due to leaching of calcium hydroxide and carbonation is not an aging effect requiring management for above- and below-grade inaccessible areas of Groups 1-5, 7-9 concrete structures subject to the GALL Report "water-flowing" environment [exposed to fluid environment in LRA Table 3.0-2]. The staff finds that the aging effect corresponding to SRP-LR Table 3.5.1, item 47, is still applicable because the component(s), material, and environment for it exists at WF3, and therefore should be managed consistent with the provisions in the corresponding GALL Report AMR items. The LRA item 3.5.1-47, therefore, should remain applicable to WF3; however, there are no LRA Table 2 AMR items included in the LRA that correspond to SRP-LR Table 3.5.1, item 47, to indicate that the aging effects will be adequately managed during the period of extended operation. Further, LRA Table 3.5.1, item 3.5.1-47 continues to state that the AMR item is consistent with GALL Report, and the Structures Monitoring Program manages the listed aging effect, which appears to be a reasonable conclusion; however, the staff finds the statement to be contradictory to the conclusion in the RAI response.

Additionally, the response to request 2 of RAI 3.5.2.2.2.1-1 revised LRA Table 3.5.1, item 3.5.1-13 to delete the following statement in the discussion column "[t]he listed aging effects are addressed by [i]tem 3.5.1-47." The staff finds the deletion of this statement to be contradictory to the corresponding further evaluation in LRA Section 3.5.2.2.1.9, which states:

> "…However, the listed aging effects will be addressed under the concrete foundation for the safety-related shield building and the common rigid reinforced concrete foundation structure for the [nuclear plant island structure] NPIS and further discussed in Section 3.5.2.2.2.1, [i]tem 4. Therefore, increase in porosity and permeability due

to leaching of calcium hydroxide and carbonation are not aging effects requiring management for the WF3 [steel containment vessel] SCV concrete base foundation."

Therefore, the applicant's response to request 2 of RAI 3.5.2.2.2.1-1 and statement in LRA Section 3.5.2.2.1.9 are also inadequate and contradictory.

Request:

1. Provide information to demonstrate that the aging effects corresponding to SRP-LR Table 3.5.1, items 47 and 13 (and corresponding GALL Report AMR items) will be adequately managed during the period of extended operation consistent with the requirements of 10 CFR 54.21(a)(3). Alternately, provide technical justification for not including Table 2 AMR line items in LRA Tables 3.5.2-1 through 3.5.2-4 (as applicable) for LRA Table 3.5.1, item 3.5.1-47 and item 3.5.1-13 (and corresponding GALL Report line items), which address aging effects that may require management at WF3 during the period of extended operation.

2. Update applicable LRA sections and tables consistent with the response.

Waterford 3 Response

1. To demonstrate that the aging effects corresponding to license renewal application (LRA) Table 3.5.1, Items 47 and 13 (and corresponding GALL Report AMR items) will be adequately managed during the period of extended operation, the further evaluation discussion in Waterford 3 (WF3) LRA Section 3.5.2.2.2.1, Item 4, is revised to clarify that the Structures Monitoring Program manages increase in porosity and permeability and loss of strength due to leaching of calcium hydroxide and carbonation. Also, the LRA Table 3.5.1, Item 13 discussion is revised to add the reference to LRA Table 3.5.1, Item 47.

2. LRA revisions are as follows. Additions are shown with underline and deletions with strikethrough.

.

3.5.2.2.2.1 Aging Management of Inaccessible Areas

4. Increase in Porosity and Permeability, and Loss of Strength Due to Leaching of Calcium Hydroxide and Carbonation of Below-grade Inaccessible Concrete Areas of Groups 1–5 and 7–9 Structures

   The Groups 1–5 and 7–9 Structures at WF3 are designed in accordance with ACI 318-63 and/or ACI 318-71 and constructed in accordance with the recommendations in ACI 318-63 and ACI 318-71 using ingredients/materials conforming to ACI and ASTM standards. The concrete mix uses Portland cement conforming to ASTM C150, Type II. Concrete aggregates conform to the requirements of ASTM C33. Materials for concrete used in WF3 concrete structures and components were specifically investigated, tested, and examined in accordance with pertinent ASTM standards. The type and size of aggregate, slump, cement and additives have been established to

produce durable concrete in accordance with ACI. Cracking is controlled through proper arrangement and distribution of reinforcing steel. Concrete structures and concrete components are constructed of a dense, well-cured concrete with an amount of cement suitable for strength development and achievement of a water-to-cement ratio that is characteristic of concrete having low permeability. This is consistent with the recommendations and guidance provided by ACI 201.2R-77. The below-grade inaccessible concrete areas of Groups 1–5 and 7–9 concrete structures at WF3 are exposed to groundwater which is considered equivalent to a flowing water environment.

WF3 operating experienced has not identified leaching of calcium hydroxide and carbonation of below-grade accessible areas of its Groups 1-5 and 7-9 concrete structures exposed to a ground water environment. Therefore, increase in porosity and permeability, and loss of strength due to leaching of calcium hydroxide and carbonation in below-grade inaccessible concrete areas is not ~~an aging effect requiring management~~ expected for the inaccessible concrete of WF3 Groups 1-5 and 7–9 concrete structures. Nevertheless, as discussed in WF3 LRA Table 3.5.1, item 47, the Structures Monitoring Program manages increase in porosity and permeability, and loss of strength due to leaching of calcium hydroxide and carbonation in below-grade inaccessible areas of WF3 Groups 1–5 and 7–9 concrete structures.

Table 3.5.1: Structures and Component Supports

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.5.1-13	Concrete (inaccessible areas): basemat, Concrete (inaccessible areas): dome; wall; basemat	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Further evaluation is required to determine if a plant-specific aging management program is needed.	Yes, if leaching is observed in accessible areas that impact intended function	WF3 is a PWR with free-standing SCV supported on a common rigid reinforced concrete foundation structure for the NPIS. The SCV structure's base foundation (basemat) is integral with the base foundation of the shield building and protected from the external environments by the shield building's base foundation. Since the WF3 primary containment concrete foundation (basemat) is inaccessible, it is exempted from inspection and the ISI-IWL program does not apply. Accordingly, WF3 does not have an ISI-IWL program. The listed aging effects are addressed by Item 3.5.1-47. For further evaluation, see Section 3.5.2.2.1.9.

Table 3.5.2-2: Nuclear Plant Island Structure

Structure and/or Component or Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Concrete (inaccessible areas): exterior above and below-grade; foundation	EN, FLB, HS MB, SNS, SRE, SSR	Concrete	Exposed to fluid environment	Increase in porosity and permeability; loss of strength	Structures monitoring	III.A1.TP-67 III.A3.TP-67 III.A5.TP-67	3.5.1-47	E

Table 3.5.2-3: Turbine Building and Other Structures

Structure and/or Component or Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Concrete (inaccessible areas): exterior above and below-grade; foundation	EN, SNS, SRE	Concrete	Exposed to fluid environment	Increase in porosity and permeability; loss of strength	Structures monitoring	III.A3.TP-67	3.5.1-47	E