Enclosure 2 to VPN-001-2019

License Renewal Application Mark-up

LICENSE APPLICATION SECTION REVISION STATUS,
LIST OF AFFECTED SECTIONS, ~~AND~~ REVISION SUMMARY, AND LIST OF LRA CHANGES

~~REPORT~~ TITLE	Trojan ISFSI License Renewal Application (LRA)

This ~~report~~ LRA is submitted to the NRC in support of the application to renew the Trojan ISFSI Part 72 Site-Specific License No. SNM-2509.

~~Report review and verification are controlled at the Chapter level and changes are annotated at the Chapter level.~~

~~A Section in a Chapter is identified by two numerals separated by a decimal. Unless indicated as a "complete revision" in the summary description of change below, if~~ If any change in the content is made to LRA Chapter 1, 2, or 3 or Appendix A, B, C, or D, then the change is indicated by a "bar" in the right page margin and the revision number of the entire Chapter or Appendix is changed.

If any change in the content is made to the Appendix E, F, G, or H attached documents, then the change is indicated by a "bar" in the right page margin and the page footer revision number is updated along with the attached document's "List of Effective Pages".

To support NRC's review, the attached "List of LRA Changes" contains a comprehensive listing of changes in sequential order throughout the LRA including the Appendices. Minor editorial changes to this LRA may not be included in the List of LRA Changes. The List of LRA Changes contains the following:

- Sequential Item number,
- Section number,
- Page number,
- Reason Type (E = editorial, C = clarification or correction, and RAI = RAI response),
- Description of change

~~A summary description of changes is provided below for each application Chapter/Appendix. Minor editorial changes to this report may not be summarized in the description of changes.~~

License Application Section Revision Status, List of Affected Sections, Revision Summary, and List of LRA Changes

Affected Section or Table No.	Current Revision No.	Summary Description of Change
Pages 1 through 18	1	New List of LRA Changes is attached

LRA Table of Contents/Glossary/Acronym List

Affected Section or Table No.	Current Revision No.	Summary Description of Change
Pages i through vii~~viii~~	~~0~~1	~~Initial Issue~~ January 2019

LICENSE APPLICATION SECTION REVISION STATUS, LIST OF AFFECTED SECTIONS, ~~AND~~ REVISION SUMMARY, AND LIST OF LRA CHANGES

Chapter 1 – General Information

Affected Section or Table No.	Current Revision No.	Summary Description of Change
Pages 1-1 through ~~1-11~~1-13	~~0~~1	~~Initial Issue~~January 2019

Chapter 2 – Renewal Scoping

Affected Section or Table No.	Current Revision No.	Summary Description of Change
Pages 2-1 through ~~2-13~~2-16	~~0~~1	~~Initial Issue~~January 2019

Chapter 3 – Aging Management Reviews

Affected Section or Table No.	Current Revision No.	Summary Description of Change
Pages 3-1 through ~~3-32~~3-42	~~0~~1	~~Initial Issue~~January 2019

Appendix A – Aging Management Programs

Affected ~~Section or Table No.~~ AMP	Current Revision No.	Summary Description of Change
Pages A-1 through A-~~13~~20	~~0~~1	~~Initial Issue~~January 2019

Appendix B - Time-Limited Aging Analyses (TLAAs)

Affected Section or Table No.	Current Revision No.	Summary Description of Change
Pages B-1 through B-3	~~0~~1	~~Initial Issue~~January 2019

Appendix C – Tollgate Assessments

Affected Section or Table No.	Current Revision No.	Summary Description of Change
Page~~s~~ C-1 ~~through C-4~~(C-2 through C-4 deleted)	~~0~~1	~~Initial Issue~~January 2019

Appendix D – Pre-Application/Baseline Inspections

Affected Section or Table No.	Current Revision No.	Summary Description of Change
Pages D-1 through D-3	~~0~~1	~~Initial Issue~~January 2019

Appendix E – PGE-1070, Trojan Environmental Report, Supplement 1

Affected Section or Table No.	Current Revision No.	Summary Description of Change
Page E-1 with Attachment	0	Initial Issue

LICENSE APPLICATION SECTION REVISION STATUS,
LIST OF AFFECTED SECTIONS, ~~AND~~ REVISION SUMMARY, AND LIST OF LRA CHANGES

Appendix F – Proposed Changes to Trojan ISFSI License and Technical Specifications

Affected Section or Table No.	Current Amendment No.	Summary Description of Change
Page F-1 ISFSI License Technical Specifications	1 Proposed Amendment 7 Proposed Amendment 6	~~Initial~~ January 2019 Submittal

Appendix G – Proposed Changes to Trojan ISFSI SAR

Affected Section or Table No.	Current Revision No.	Summary Description of Change
Page G-1 with Attachment	1 Proposed Revision 15a	~~Initial~~ January 2019 Submittal

Appendix H – PGE-1082, Trojan ISFSI Preliminary Radiological Decommissioning Plan, Proposed Revision 1

Affected Section or Table No.	Current Revision No.	Summary Description of Change
Pages H-1 and H-2 with Attachment	1 Proposed 1a	~~Initial~~ January 2019 Submittal

List of LRA Changes

Item	Section	Page (Note 1)	Reason (Note 2)	Description
1	LRA Revision Status	1 through 3	E	Added "LRA" acronym and replaced word "report" with "LRA". Added description of PGE's "List of LRA Changes" that has been added to the LRA Revision Status Section. In each section, updated the number of pages and Revision numbers, and changed "Initial Issue" to say "January 2019 Version" and "Initial Submittal" to say "January 2019 Submittal". Also, added a new footer "Revision 1 January 2019" to applicable LRA pages.
4	List of LRA Changes	4 through 18	E	This new List of LRA Changes contains a comprehensive listing of changes in sequential order throughout the LRA including the Appendices.
ii	TOC	ii, iii	RAI 2-1	Added new Section 3.7 for Aging Management Review Results - ISFSI Pad and re-numbered following Sections to be 3.8 - 3.10.
iii	TOC	iii, iv	RAI 2-1 RAI A-13	Added references to new ISFSI SAR 9.7 Table numbers and added new Table 2-7 for Intended Safety Functions of ISFSI Pad Subcomponents.
v	Glossary	v, vi	C	Added a new Term for the Fuel Debris Process Can Capsule and supporting words to two other related Terms. Also, added a new Term for Intended Functions.
1-1	1.2	1-2	E	Clarified wording describing damaged fuel.
1-2	1.3.7 1.3.7.1 1.3.7.2	1-6 through 1-8	C	For clarification, added the word "Proposed" to Revision 1 for PGE-1082.
1-3	1.3.7 1.3.7.3 1.3.7.4	1-6, 1-8	C/RAI	Describes PGE-1082, Section 2.6 revision of the 40-year Concrete Cask activation analysis to cover 60 years and the Section 4.1 revision for “conclusions” added in response to NRC’s RAI letter, dated April 3, 2018. (Reference PGE response letter dated May 15, 2018.)
1-4	1.3.1	1-9	C	Added new Reference 1.3.1 for Holtec Shielding Evaluation, Revision 6 that contains the Concrete Cask activation analysis.
1-5	Table 1-1	1-11 through 1-13	C	Added new Row for Section 3.7 - Aging Management Review Results - ISFSI Pad and re-numbered following Sections to be 3.8 - 3.10. For clarification, added the word "Proposed" to Revision 1 for PGE-1082.
2-1	2.1	2-2	C/RAI A-13	Added reference to new ISFSI SAR table numbers throughout chapter. LRA Tables 2-1 through 2-7 will be added to the SAR as Tables 9.7-1 through 9.7-7.
2-2	2.2	2-2	E	Clarified the content of the MPC to include the Damaged Fuel Container, Failed Fuel Can, and Fuel Debris Process Can Capsule.
2-3	2.2.1.1	2-2	E	Clarified wording describing damaged fuel.
2-4	2.2.1.3	2-3	E	Moved and clarified wording regarding intended functions of the Concrete Cask.
2-5	2.2.1.5	2-3, 2-4	RAI 2-1	Clarified description of ISFSI Pad. Clarified location of ISFSI SAR reference to ISFSI Pad. Changed conclusion of scoping evaluation for Storage and Service Pads, such that the pads scope in. Although the pads are classified as Not Important to Safety and therefore have no ITS functions, gross failure of the pads could affect the ITS function of Retrievability by hampering the movement of Concrete Casks from their storage position to the Transfer Station.
2-6	2.2.1.6	2-4	E	Clarified wording for ISFSI security equipment.
2-7	2.2.1.7	2-4	E	Changed "Transfer Station mat" to "Transfer Station pad" for clarity. A leveling mat was placed directly on bedrock as part of the Transfer Station Pad design. However, this LRA section refers to the reinforced concrete pad above the mat. Also changed "test MPC" to "dummy MPC" since that terminology was used in various Trojan documents at the time the Transfer Station was originally tested.
2-8	2.2.1.8	2-4	E	Clarified wording.
2-9	2.2.2	2-4, 2-5	RAI 2-1	Clarified the content of the MPC to include the Damaged Fuel Container, Failed Fuel Can, and Fuel Debris Process Can Capsule. Noted that the ISFSI Pad now scopes in. Added reference to new ISFSI SAR tables.
2-10	2.2.3	2-5	C	Added reference to new ISFSI SAR table and deleted words for ISFSI Pads.
2-11	2.2.2	2-5	C	Updated Reference 2.2.2 to NUREG 1927, Revision 1, Section 2.4.2 for the definition of ITS functions.
2-12	Table 2-1	2-6	RAI 2-1	Added reference to new ISFSI SAR table. Clarified the content of the MPC to include the Damaged Fuel Container, Failed Fuel Can, and Fuel Debris Process Can Capsule. Noted that the ISFSI Pad now scopes in per Criterion 2.

List of LRA Changes

Item	Section	Page (Note 1)	Reason (Note 2)	Description
2-13	Table 2-2	2-7, 2-8	C/RAI 2-2	Added reference to new ISFSI SAR table. For Item 1 (Shell), made correction to delete drawing part number 32 and add part number 17. For Item 6 (Basket Cell Spacer Block), changed Intended Function from Structural Integrity to N/A. For Item 9 (Short Cell Spacer Plates), changed Intended Function from N/A to Criticality Control and Structural Integrity. For Item 17 (Plugs for Drilled Holtes), changed Intended Function from Shielding to N/A. For Items 28 (Vent and Drain Tube) and 29 (Vent and Drain Cap), added reference to new Table Note 2 indicating that these items were used during loading oprations and have no Intended Functions during storage. For Item 21 (Vent and Drain Cap Screw), corrected subcomponent title. For Item 32 (Port Cover Plate Set Screw), changed Intended Function from Confinement to N/A. Added Item 39 (Fuel Debris Process Can Capsule) for completeness. Corrected Reference number (2.2.2) in Note 1. Added Note 2 for items that were used during loading operations but have no Intended Function during storage.
2-14	Table 2-3	2-9	RAI A-6	Added reference to new ISFSI SAR table. For Items 10 (Inlet Air Assembly) and 11 (Outlet Air Assembly), added reference to new Note 4. Corrected Reference number (2.2.2) in Note 1. Added Note 4 to clarify that the heat transfer function of the Concrete Cask air assemblies is to maintain an open air flow path.
2-15	Table 2-4	2-10, 2-11	C/RAI 2-2	Added reference to new ISFSI SAR table. For Item 3 (Lead Fill Plug), corrected description to match drawing. Deleted Item 17 (Lid Bolt) since this is no longer used. The row was left in place to maintain the existing Item number references. For Item 18 (Lifting Trunnion Block) and 21 (Top Lid Lifting Block), added Intended Function of Shielding. For Item 22 (Top Lid Stud / Top Lid Bolt) and 23 (Top Lid Nut / Top Lid Washer), changed Intended Function from N/A to Structural Integrity. For Item 27 (Water Jacket Port Cover Plate, Gasket, and Screws) changed Intended Function from Structural Integrity to N/A, For Items 28 (Door Lip) and 30 (Door Beam), changed Intended Function from N/A to Structural Integrity. For Items 33 (Door Top Plate Clevis), 34 (Door Stop Plate), and 35 (Door Hex Bolt), added reference to new Note 2. Corrected Reference number (2.2.2) in Note 1. Added Note 2 for items that were used during loading operations but have no Intended Function during storage.
2-16	Table 2-5	2-12	C	Added reference to new ISFSI SAR table. Corrected Reference number (2.2.2) in Note 1.
2-17	Table 2-6	2-13 through 2-15	RAI 2-2	Extensively revised table to include part level description of the Transfer Station, Transfer Pad, and Impact Limiter for completeness. Revised header descriptions for consistency with other LRA tables.
2-18	Table 2-7	2-16	RAI 2-1	Added new table listing Intended Functions of ISFSI Pad subcomponents. The pad scopes in since, although it is not ITS, gross failure could affect the Intended Function of Retrievability.
3-1	3.1	3-1	E	Clarified that the management review process involves identification of aging effects requiring managment as well as the associated aging mechanism.
3-2	3.1.1	3-1	C	Added references to new ISFSI SAR tables.
3-3	3.1.2	3-1, 3-2	C	Corrected references to LRA table numbers and added reference to new ISFSI SAR tables.
3-4	3.1.2.1	3-2	C	Added reference to inert gas environment inside Transfer Cask Water Jacket for completeness.
3-5	3.1.2.2	3-2	E	Changed description of air temperature "limits" to air temperature "range" since controls are not placed on ambient air flowing through Concrete Cask annulus and inlet/outlet assemblies.
3-6	3.1.2.4	3-2	C	Added reference to new ISFSI SAR tables.
3-7	3.1.4	3-3	E	Updated LRA table reference for consistency.
3-8	3.1.6.1	3-4	C	Clarified that external Concrete Cask inspections have been performed on all casks, and internal Concrete Cask inspections have been performed on one specific cask. Added reference to 2018 internal Concrete Cask inspection that examined accessible external MPC surfaces, and included information on the equipment used. Updated reference numbers for related inspection reports. Removed reference to "Trojan" personnel since contract personnel also participated in past inspections.
3-9	3.1.6.2	3-5	E	Updated LRA section reference.
3-10	3.2	3-5	C	Added reference to new ISFSI SAR table. Add reference to aging mechanism for consistency with LRA Section 3.1.4 and Tables 3-1 through 3-5.
3-11	3.2.1.4	3-7	C	Added description of Fuel Debris Process Can Capsule for completeness and consistency with LRA Section 2, Section 2.2, and Table 2-1.

List of LRA Changes

Item	Section	Page (Note 1)	Reason (Note 2)	Description
3-12	3.2.2	3-7	C	Added reference to new ISFSI SAR table.
3-13	3.2.4	3-8	E	Updated LRA section reference.
3-14	3.2.5	3-8	C	Clarified aging mechanisms for MPC materials of construction. Removed reference to radiation effects on the neutron absorber and steel components since these are excluded by referenced analyses (TLAA for the neutron absorber, and similar analysis for steel components).
3-15	3.2.6	3-8	C	Added reference to new ISFSI SAR table. Updated LRA section references.
3-16	3.3	3-8	C	Added reference to new ISFSI SAR table. Add reference to aging mechanism for consistency with LRA Section 3.1.4 and Tables 3-1 through 3-5.
3-17	3.3.1	3-9	E	Clarified that the Transfer Cask trunnions "were" designated as special lifting devices (past tense) since the Transfer Cask is no longer used as a special lifting device.
3-18	3.3.2	3-10	E	Removed extraneous comma.
3-19	3.3.2	3-10	C	Added reference to new SAR table.
3-20	3.3.3	3-10	RAI 3-5	Clarified that the Transfer Cask water jacket cavity was exposed to potable (non-borated) water during fuel loading operations. Described this exposure as intermittent during fuel loading. Described extended storage conditions (prior to use for future fuel transfers) as inert gas, and intermittent periods filled with water and air during future MPC transfers.
3-21	3.3.4	3-10	E	Updated reference to LRA section for consistency.
3-22	3.3.5	3-11	RAI A-5	Expanded the description of the aging effect requiring management to "corrosion pitting and crevice corrosion" for consistency with Table 3-2.
3-23	3.3.6	3-11	C	Added reference to new SAR table. Updated reference to LRA section for consistency.
3-24	3.4	3-11	C	Added reference to new SAR table. Added reference to aging mechanism for consistency with LRA Section 3.1.4 and Tables 3-1 through 3-5.
3-25	3.4.1	3-12	C	Removed the word "reinforced" from the description of the Concrete Cask chamfered corners since that does not represent the actual design.
3-26	3.4.2	3-12, 3-13	C	Replaced "pouring concrete" with "placing concrete" when referring to construction of Concrete Casks based on common usage of the terms. Eliminated redundant description of metal coating in the first paragraph. Added wording to similar sentence in third paragraph to capture all information in one place. Added references to new SAR tables.
3-27	3.4.3	3-13	C	Added reference to new SAR table.
3-28	3.4.4	3-13	E	Updated reference to LRA section for consistency.
3-29	3.4.5	3-14	RAI A-6	Removed reference to loss of fracture toughness for metal components (from radiation exposure) based on analysis results. Expanded description of concrete aging effects to include loss of strength, spalling, cracking, and scaling caused by corrosion of embedded reinforcing steel.
3-30	3.4.6	3-14	C	Added reference to new SAR table. Updated reference to LRA section for consistency.
3-31	3.5	3-14	C	Added reference to new SAR table. Added reference to aging mechanism for consistency with LRA Section 3.1.4 and Tables 3-1 through 3-5.
3-32	3.5.1	3-14	C	Updated reference to LRA table for consistency.
3-33	3.5.2	3-15	C	Added reference to new SAR table.

List of LRA Changes

Item	Section	Page (Note 1)	Reason (Note 2)	Description
3-34	3.5.3	3-15	C	Added reference to new SAR table.
3-35	3.5.4	3-15	C	Updated reference to LRA section for consistency.
3-36	3.5.6	3-15	C	Added reference to new SAR table.
3-37	3.6	3-16	C	Added reference to new SAR table. Added reference to aging mechanism for consistency with LRA Section 3.1.4 and Tables 3-1 through 3-5.
3-38	3.6.1	3-17	RAI 2-2	Expanded description of Impact Limiter components to include top plate. Added reference to new SAR table.
3-39	3.6.3	3-17	C	Added reference to new SAR table.
3-40	3.6.4	3-17	C	Noted that no TLAAs are associated with the Transfer Station.
3-41	3.6.5	3-17	RAI 2-2 RAI 3-4 RAI A-9	Added aging effects of Transfer Pad concrete. Added aging effects for Impact Limiter top plate and epoxy foam.
3-42	3.6.6	3-18	RAI 2-2 RAI 3-4	Added reference to new SAR table. Updated references to LRA sections for consistency. Added Transfer Station Pad and Impact Limiter top plate and epoxy foam as Transfer Station components with aging management activities.
3-43	3.7	3-18	RAI 2-1	New section based on ISFSI Pad scoping in.
3-44	3.7.1	3-18	RAI 2-1	New section based on ISFSI Pad scoping in.
3-45	3.7.2	3-19	RAI 2-1	New section based on ISFSI Pad scoping in.
3-46	3.7.3	3-19	RAI 2-1	New section based on ISFSI Pad scoping in.
3-47	3.7.4	3-19	RAI 2-1	New section based on ISFSI Pad scoping in.
3-48	3.7.5	3-19	RAI 2-1	New section based on ISFSI Pad scoping in.
3-49	3.7.6	3-19	RAI 2-1	New section based on ISFSI Pad scoping in.
3-50	3.8	3-19	E	Renumbered for consistency.
3-51	3.8.1	3-19	E	Renumbered for consistency.
3-52	3.8.2	3-20	E	Renumbered for consistency. Updated LRA section reference for consistency.
3-53	3.8.3	3-20	E	Renumbered for consistency. Updated LRA section reference for consistency.
3-54	3.8.3.1	3-20	E	Renumbered for consistency. Updated LRA section reference for consistency. Corrected typographical error.
3-55	3.8.3.2	3-20, 3-21	E	Renumbered for consistency. Updated LRA section reference for consistency.
3-56	3.9	3-21	E	Renumbered for consistency.

List of LRA Changes

Item	Section	Page (Note 1)	Reason (Note 2)	Description
3-57	3.10	3-21	E	Renumbered for consistency.
3-58	3.10.1	3-21	E	Renumbered for consistency. Updated LRA section reference for consistency.
3-59	3.10.2	3-21,3-22	E	Renumbered for consistency. Updated LRA section references for consistency.
3-60	3.10.3	3-22	E	Renumbered for consistency. Updated LRA section reference for consistency.
3-61	3.10.4	3-22	E	Renumbered for consistency.
3-62	3.11	3-23	C	Renumbered for consistency. Added Reference 3.1.5 (Trojan 2018 inspection report on Concrete Cask internal inspection). Renumbered References 3.8.1, 3.8.2, 3.8.3, and 3.10.1 for consistency. Updated Reference 3.8.3 (Holtec Shielding Calculation) revision number from 4 to 6.
3-63	Table 3-1	3-24 through 3-27	C	Added reference to new SAR table.
3-64	Table 3-1	3-24 through 3-27	E	Corrected column entries for aging effect and aging mechanism that were reversed for the Shell, Baseplate, Lid, Closure Ring, and Plugs for Drilled Holes.
3-65	Table 3-1	3-24 through 3-27	RAI 2-2	Deleted Intended Function and remaining information for Plugs for Drilled Holes based on evaluation of these items in Table 2-2.
3-66	Table 3-1	3-24 through 3-27	C	Corrected descriptions of Vent and Drain Cap Screw, Port Cover Plate Set Screw subcomponents.
3-67	Table 3-1	3-24 through 3-27	C	Added reference to Note 4 for Vent and Drain Tube, Vent and Drain Cap subcomponents. Added Note 4 for items used during operations and not relied on for Intended Functions during extended storage.
3-68	Table 3-1	3-24 through 3-27	C	Added reference to Note 3 in Fuel Basket category in left column table. Added reference to Note 3 in Aging Mechanism column for Damaged Fuel Container, Failed Fuel Cans, and Fuel Debris Process Can Capsule subcomponents. Added Note 3 referencing Holtec RRTI 2536-004R0 which concluded that certain MPC subcomponents do not require fatigue evaluation.
3-69	Table 3-1	3-24 through 3-27	C	Added Fuel Debris Process Can Capsule for completeness and consistency with Table 2-2. Added Basket Cell Spacer Block and Basket Center Column subcomponents, and filled in table columns for these subcomponents, for completeness and consistency with Table 2-2.
3-70	Table 3-1	3-24 through 3-27	C	For Short Cell Spacer Plates filled in table columns for consistency with Table 2-2.
3-71	Table 3-2	3-28 through 3-31	C	Added reference to new SAR table.
3-72	Table 3-2	3-28 through 3-31	C	Replaced "Transfer Cask AMP" with "N/A" for the aging management activities of the Radial Lead Shield since this subcomponent is in an Embedded environment. Also changed "None" to say "None Identified".
3-73	Table 3-2	3-28 through 3-31	RAI A-1	Corrected the Top Lid Shielding (Holtite) environment to say Embedded, resulting in no aging effects, aging mechanisms, or aging management activites in subsequent columns.
3-74	Table 3-2	3-28 through 3-31	RAI 2-2	Corrected the description of "Plugs for Lifting Holes" to say "Lead Fill Plug" to match its description on the design drawing.
3-75	Table 3-2	3-28 through 3-31	RAI 3-5	Added new material/environment combinations for subcomponents forming the Transfer Cask Water Jacket since these subcomponents are in multiple environments. The subcomponents affected are the Outer Shell, Water Jacket End Plate, Water Jacket Shell, Water Jacket Bottom Ring, Water Jacket Top Plates, Water Jacket Trunnion Plate, and Water Jacket Cap Plate. As appropriate, the material/environment combinations added are Carbon Steel / Embedded and Carbon Steel / Intert Gas. Added Note 3 for the Embedded environment stating that the subcomponent is exposed to lead. Added Note 4 for the Inert Gas environment stating that this is for storage conditions. Note 4 further states that the cavity will be intermittently exposed to potable (non-borated) water and air during future MPC transfer activities.
3-76	Table 3-2	3-28 through 3-31	RAI 3-1	Deleted Lid Bolt subcomponent to be consistent with Table 2-4 Item 17. This subcomponent is no longer used.
3-77	Table 3-2	3-28 through 3-31	C	Clarified that the Structural Integrity function of the Lifting Trunnions was applicable during initial fuel loading only, to be consistent with Table 2-4 Item 19. Added the words "(during lifting for loading only)" to the Intended Function column and "N/A" to the remaining columns.
3-78	Table 3-2	3-28 through 3-31	C	Added the material/environment combination of Carbon Steel / Embedded to the Top Lid Lifiting Block for completness. No aging effects requiring management or aging mechanisms were identified, and no aging management activities were called out for this inaccessible region.
3-79	Table 3-2	3-28 through 3-31	RAI 3-1	Added the Intended Function of Structural Integrity and filled in the remaining columns for the Transfer Cask Lid studs, nuts, and washers.
3-80	Table 3-2	3-28 through 3-31	C	For Water Jacket Port Cover Plate, Gasket, and Screws, changed all columns to say N/A for consistency with Table 2-4.

List of LRA Changes

Item	Section	Page (Note 1)	Reason (Note 2)	Description
3-81	Table 3-2	3-28 through 3-31	RAI 2-2	Added the Intended Function of Structural Integrity and filled in the remaining columns for the Door Lip and Door Beam.
3-82	Table 3-2	3-28 through 3-31	RAI 2-2	Added reference to Note 2 for the Door Top Plate Clevis, Door Stop Plate, and Door Hex Bolt subcomponents. Added Note 2 stating that these items were used during operations and are not relied on for Intended Functions during storage.
3-83	Table 3-3	3-32 and 3-33	C	Added reference to new SAR table.
3-84	Table 3-3	3-32 and 3-33	E	Updated section number references in Aging Management Activities column.
3-85	Table 3-3	3-32 and 3-33	E	Changed "N/A" to "None Identified" for the Tile aging mechanism for consistency.
3-86	Table 3-3	3-32 and 3-33	RAI 3-2	Added "Loss of Material" as an aging effect requiring management for Reinforcement Bar. For this aging effect, added corrosion as the aging mechanism and added a reference to the Concrete Cask AMP for aging management activities.
3-87	Table 3-3	3-32 and 3-33	RAI 3-2	Added "Reinforcement Bar Corrosion" as an aging mechanism for the Concrete Shell, with the Concrete Cask AMP as the Aging Management Activity.
3-88	Table 3-3	3-32 and 3-33	RAI A-6	Changed aging effects requiring management and aging mechanism entries for Inlet Air Assembly and Outlet Air Assembly to N/A with a reference to Note 2. Added Note 2 stating that the concern for these subcomponents is to maintain an open air flow path.
3-89	Table 3-4	3-34	C	Added reference to new SAR table.
3-90	Table 3-4	3-34	E	Changed "None" to "None Identified" in aging effects requiring management column for consistency. Changed "N/A" to "None Identified" in aging mechanism column for consistency.
3-91	Table 3-5	3-35 through 3-40	C	Added reference to new SAR table.
3-92	Table 3-5	3-35 through 3-40	RAI 2-2 RAI 3-4	Revised entire table to a parts level evaluation of Transfer Station subcomponents. Included separate sections for the Transfer Station Structure, Transfer Station Pad, and Impact Limiter.
3-93	Table 3-6	3-41	RAI 2-1	Added new table for ISFSI Pad Subcomponents based on the ISFSI Pad scoping in per Criterion 2.
3-94	Table 3-7	3-42	E	Updated table number.
3-95	Table 3-8	3-43	E	Updated table number. Updated section reference in Note 1.
A-1	Appendix A MPC AMP	A-1	C	Updated section number reference. Added references to new SAR tables.
A-2	Appendix A MPC AMP Introduction	A-2	C	Changed "mechanisms of concern" to "effects requiring management" for consistency of terminology. Listed pitting, crevice corrosion, and cracking due to stress corrosion cracking as additional aging effects requiring management. Clarified extent of MPC inspections as applicable to external MPC surfaces.
A-3	Appendix A MPC AMP Introduction	A-2	RAI A-13	Deleted statement that the MPC AMP is based on a contuation of the existing Trojan Structural Inspection Program for consistency with revised propsed SAR wording which notes that the old program (reference SAR Section 9.7.7) is bring replaced by the new MPC AMP.
A-4	Appendix A MPC AMP Element 4	A-2	C	Called out removal of Concrete Cask Lid, and lifting or removal of Concrete Cask Shield Ring to gain access to the top of the MPC for periodic visual inspection.
A-5	Appendix A MPC AMP Element 4	A-2	RAI A-13	Identified MPC-28 as the specific MPC inside Concrete Cask PCC-03 that will be inspected by the MPC AMP. Changed the wording "...different cask" to "...different cask or canister" for consistency with this change. Changed "This selected cask is consistent with the cask previously inspected" to "This selected cask is the cask previously inspected..." for clarity.
A-6	Appendix A MPC AMP	A-2	E	Moved Note 1 to end of table for clarity.
A-7	Appendix A MPC AMP Element 4	A-2, A-3	C	Added new sample basis wording that was not included in the original LRA.
A-8	Appendix A MPC AMP Element 4	A-3	RAI A-7	Included the ISFSI Manager along with the inspector as personnel who will determine whether to upgrade the inspection to the VT-1 standard, and whether to utilize a volumetric examination method. Including the ISFSI Manager in these decisions is appropriate since the ISFSI Manager represents the licensee. The inspector may be contracted.

List of LRA Changes

Item	Section	Page (Note 1)	Reason (Note 2)	Description
A-9	Appendix A MPC AMP Element 6	A-3, A-4	C	Moved wording about the option to remove deposits and rust stains to reveal undamaged welds to the end of AMP Element 6, under "Indications Requiring Additional Evaluation," for clarity.
A-10	Appendix A MPC AMP Element 6	A-4	C	Added the word "accessible" in reference to temporary attachment locations for clarity, since not all MPC locations are accessible.
A-11	Appendix A MPC AMP Element 6	A-4	C	Added wording for inspector to evaluate inspection results for indications to be entered into the CAP, for consistency.
A-12	Appendix A MPC AMP Element 7	A-4	C	Deleted the words "apparent and root" that are not used in Trojan's CAP for root cause evaluations.
A-13	Appendix A MPC AMP Element 9	A-5	C	Deleted the words "QA program and" because Trojan's QA Program does not include this detailed level of information for each AMP. This information will be included in the AMP implementing procedure.
A-14	Appendix A MPC AMP Element 9	A-5	C	Clarified wording for when the AMP will be updated (as necessary based on periodic tollgate assessments) and where the tollgate assessments are described (SAR Section 9.7.8.5).
A-15	Appendix A MPC AMP Element 10	A-5	C	Deleted reference to Note 2. Deleted Note 2 which contained ADAMS ML number references.
A-16	Appendix A MPC AMP Element 10	A-5	C	Added reference to MPC-28 as the MPC that was inspected in 2018 and will be inspected during periodic internal inspections of Concrete Cask PCC-03.
A-17	Appendix A TC AMP	A-6	C	Added reference to new SAR table.
A-18	Appendix A TC AMP Introduction	A-6	C	Changed "mechanisms of concern" to "effects requiring management" for consistency of terminology. Listed crevice corrision cracking as additional aging effect requiring management.
A-19	Appendix A TC AMP Element 3	A-6	C	Deleted reference to Lifting Trunnions with regard to parameters monitored/inspected, consistent with corrections to table 3-2.
A-20	Appendix A TC AMP Element 3	A-6	C	Changed "external surfaces" to "accessible surfaces" in the description of parameters inspected, to clarify the scope. Accessible surfaces are surfaces exposed to the environment that may be observed without moving or lifting the cask. This includes the MPC cavity surface, which could be described as an internal or external surface depending on the context.
A-21	Appendix A TC AMP Element 3	A-6	RAI A-3	Added description of inspection for defects and/or irregularities.
A-22	Appendix A TC AMP Element 4	A-6	RAI A-4	Added the words "and conducted by qualified individuals" in reference to Transfer Cask visual inspections to clarify inspection requirements.
A-23	Appendix A TC AMP Element 4	A-6	RAI A-2	Changed "painted" to "coated" for consistency. Clarified that the scope includes MPC cavity surfaces. Changed inspection scope to defects and irregularities, which are defined elsewhere.
A-24	Appendix A TC AMP Element 4	A-7	C	Deleted reference to surfaces to be inspected to be consistent with the description in the first bullet item.

List of LRA Changes

Item	Section	Page (Note 1)	Reason (Note 2)	Description
A-25	Appendix A TC AMP Element 4	A-7	C	Deleted reference to Lifting Trunnions with regard to parameters monitored/inspected, consistent with corrections to table 3-2.
A-26	Appendix A TC AMP Element 4	A-7	C	Deleted the wording "using a QA validated procedure" because this terminology is not used at Trojan.
A-27	Appendix A TC AMP Element 6	A-7	RAI A-4	Added specific acceptance criteria (with reference to Note 2) and evaluation by the ISFSI Manager for entry into the CAP. Added Note 2 which references RRTI 2536-002R2 for the technical basis for the acceptance criteria. Deleted confusing wording about enginering evaluations.
A-28	Appendix A TC AMP	A-7, A-8	E	Moved Note 1 to the end of the table for formatting consistency.
A-29	Appendix A TC AMP Element 7	A-7	C	Deleted confusing wording about engineering evaluations.
A-30	Appendix A TC AMP Element 7	A-7	C	Deleted the words "apparent and root" that are not used in Trojan's CAP for root cause evaluations.
A-31	Appendix A TC AMP Element 7	A-8	RAI A-4	Added wording to clarify the engineering evaluation process.
A-32	Appendix A TC AMP Element 9	A-8	C	Deleted the words "QA program and" because Trojan's QA Program does not include this detailed level of information for each AMP. This information will be included in the AMP implementing procedure.
A-33	Appendix A TC AMP Element 9	A-8	C	Clarified wording for when the AMP will be updated (as necessary based on periodic tollgate assessments) and where the tollgate assessments are described (SAR Section 9.7.8.5).
A-34	Appendix A CC AMP	A-9	C	Added reference to new SAR table.
A-35	Appendix A CC AMP Introduction	A-9	RAI 3-2 RAI A-6	Removed reference to loss of fracture toughness for metal components (from radiation exposure) based on analysis results. Expanded description of concrete aging effects to include loss of strength, spalling, cracking, and scaling caused by corrosion of embedded reinforcing steel. Added reference to LRA Section 3.8.3.
A-36	Appendix A CC AMP Introduction	A-9	RAI A-13	Deleted statement that the MPC AMP is based on a contuation of the existing Trojan Structural Inspection Program for consistency with revised proposed SAR wording which notes that the old program (reference SAR Section 9.7.7) is being replaced by the new MPC AMP.
A-37	Appendix A CC AMP Element 1	A-9	RAI A-13	Corrected wording to refer to visual inspection of accessible interior and exterior Concrete Cask surfaces.
A-38	Appendix A CC AMP Element 3	A-9, A10	RAI A-6	Created separate subsections for Concrete Cask Interior parameters and Concrete Cask Exterior parameters. Added description of exterior inspection for defects and/or irregularities. Defined the terms "defect" and "irregularity." Added description of aging effects and aging mechanisms.
A-39	Appendix A CC AMP Element 3	A-10, A-11	RAI A-6 RAI A-8	Clarified interior inspection wording and added description of heat transfer function and air flow path.
A-40	Appendix A CC AMP Element 4	A-12	E	Changed "External" to ""Exterior" and changed "Internal" to "Interior" for clarity and consistency with other references.

List of LRA Changes

Item	Section	Page (Note 1)	Reason (Note 2)	Description
A-41	Appendix A CC AMP Element 4	A-12	RAI A-6 RAI A-13	Clarified that visual inspection is intended to detect defects an+E176d irregularities. Deleted wording describing inspections per the Structural Inspection Program described in SAR Section 9.7.6 since this will be replaced by the Concrete Cask AMP. Clarified wording describing documentation of inspection findings.
A-42	Appendix A CC AMP Element 4	A-12	C	Called out removal of Concrete Cask Lid, and lifting or removal of Concrete Cask Shield Ring to gain access to the top of the MPC for periodic visual inspection. Clarified the scope of remote visual inspection through the inlet and outlet vents.
A-43	Appendix A CC AMP Element 4	A-12	C	Changed "This selected cask is consistent with the cask previously inspected" to "This selected cask is the cask previously inspected..." for clarity.
A-44	Appendix A CC AMP Element 4	A-12	C	Moved Note 1 to the end of the table for formatting consistency.
A-45	Appendix A CC AMP Element 4	A-12	C	Added new wording describing the basis for potentially increasing sample size.
A-46	Appendix A CC AMP Element 4	A-13	C	Deleted "existing" when referring to Trojan ISFSI inspection procedures to avoid implying that the wording only applies to current procedures.
A-47	Appendix A CC AMP Element 5	A-13	RAI A-3 RAI A-6 RAI A-8	Deleted wording referencing ACI standards since this does not apply to the inspection methods in the Concrete Cask AMP. Deleted wording describing evaluation of results by a qualified individual, and the circumstances for entering any issues in the CAP. These topics are more appropriately covered in Element 6.
A-48	Appendix A CC AMP Element 6	A-13 through A-15	RAI A-8	Created separate subsections for Concrete Cask Interior acceptance criteria and Concrete Cask Exterior acceptance criteria. Deleted wording related to IPR-224 due to new acceptance criteria. Added specific acceptance criteria for the Concrete Cask Shell and Concrete Cask Lid. Added reference to Note 2 for Concrete Cask Lid, Liner, Shield Ring, and Bottom Plate acceptance criteria. Added Note 2 providing a reference to RRTI 2536-002R2 for the technical basis for the acceptance criteria. For interior inspection, added wording for VT-3 / VT-1 inspector to evaluate inspection results for indications to be entered into the CAP.
A-49	Appendix A CC AMP Element 6	A-13, A-14	RAI A-6	Added acceptance criteria for the inlet and outlet air assemblies.
A-50	Appendix A CC AMP Element 6	A-14	RAI A-8	Added evaluation of exterior inspection results by the ISFSI Manager for entry into the CAP.
A-51	Appendix A CC AMP Element 7	A-15	E	Deleted unnecessary wording regarding unacceptable effects.
A-52	Appendix A CC AMP Element 7	A-15	C	Deleted the words "apparent and root" that are not used in Trojan's CAP for root cause evaluations.
A-53	Appendix A CC AMP Element 7	A-15	C	Added wording about an engineering evaluation in the CAP to determine the extent and impact of a condition on the ability of the cask to perform its Intended Function(s).
A-54	Appendix A CC AMP Element 9	A-15	C	Deleted the words "QA program and" because Trojan's QA Program does not include this detailed level of information for each AMP. This information will be included in the AMP implementing procedure.
A-55	Appendix A CC AMP Element 9	A-15	C	Clarified wording for when the AMP will be updated (as necessary based on periodic tollgate assessments) and where the tollgate assessments are described (SAR Section 9.7.8.5).

List of LRA Changes

Item	Section	Page (Note 1)	Reason (Note 2)	Description
A-56	Appendix A CC AMP Element 10	A-16	C	Replaced "experienced" with "noted" to clarify the intent of the statement regarding cracking.
A-57	Appendix A TS AMP	A-17	C	Added reference to new SAR table.
A-58	Appendix A TS AMP Introduction	A-17	C	Changed "aging mechanisms" to "aging effects" for consistency with other AMPs. Added the following sentence for consistency with other AMPs: "The following AMP identifies the main elements of the program needed to manage the effects of these aging mechanisms during the extended storage period."
A-59	Appendix A TS AMP Introduction	A-17	RAI 3-4	Added the aging mechanism for Impact Limiter foam.
A-60	Appendix A TS AMP Introduction	A-17	RAI A-9	Added description of the aging effect (loss of material due to corrosion) for Transfer Station steel. Added description of the aging effect requiring management (concrete aging) for the Transfer Station Pad.
A-61	Appendix A TS AMP Element 2	A-17	E	Clarified wording regarding Transfer Station preventive actions.
A-62	Appendix A TS AMP Element 3	A-17	C	Created separate subsections for Transfer Station, Transfer Station Pad, and Impact Limiter.
A-63	Appendix A TS AMP Element 3	A-17	RAI A-12	Added description of defects and irregularities that are monitored / inspected for the Transfer Station.
A-64	Appendix A TS AMP Element 3	A-17	RAI A-10	Added description of defects and irregularities that are monitored / inspected for the Transfer Station Pad.
A-65	Appendix A TS AMP Element 3	A-18	RAI 3-4	Added description of parameters monitored and trended for the Impact Limiter.
A-66	Appendix A TS AMP Element 4	A-18	RAI A-12	Added wording for "qualified individuals" and clarified wording for inspection of metal surfaces.
A-67	Appendix A TS AMP Element 4	A-18	C	Deleted the wording "using a QA validated procedure" because this terminology is not used at Trojan.
A-68	Appendix A TS AMP Element 4	A18, A-19	RAI A-10	Clarified wording for the Transfer Pad inspection and added a list of aging effects.
A-69	Appendix A TS AMP	A-18, A-23	E	Moved Note 1 to end of table for clarity.
A-70	Appendix A TS AMP Element 4	A-19	RAI 3-4	Added description of Impact Limiter foam testing, scheduled testing dates, and storage of foam samples.
A-71	Appendix A TS AMP Element 4	A-19	RAI 3-4	Added description of Impact Limiter top plate inspection.

List of LRA Changes

Item	Section	Page (Note 1)	Reason (Note 2)	Description
A-72	Appendix A TS AMP Element 5	A-19, A-20	C	Created separate subsections for Transfer Station, Transfer Station Pad, and Impact Limiter.
A-73	Appendix A TS AMP Element 5	A-19	RAI A-10	Added wording for trending and evaluating Transfer Station Pad defects and irregularities
A-74	Appendix A TS AMP Element 5	A-20	RAI 3-4	Added wording for monitoring and evaluating test results of representative samples of Impact Limiter foam. Added wording for trending visual inspection results of Impact Limiter top plate.
A-75	Appendix A TS AMP Element 6	A-21, A-22	RAI A-12	Added specific acceptance criteria for metal (with reference to Note 2) and evaluation by the ISFSI Manager for entry into the CAP. Added Note 2 which references RRTI 2536-002R2 for the technical basis for the acceptance criteria. Deleted confusing wording about enginering evaluations.
A-76	Appendix A TS AMP Element 6	A-21	RAI A-10	Added specific acceptance criteria for the Transfer Station Pad.
A-77	Appendix A TS AMP Element 6	A-21	RAI A-12	Added evaluation of Transfer Station Pad inspection results by the ISFSI Manager for entry into the CAP.
A-78	Appendix A TS AMP Element 6	A-21	RAI A-10	Deleted wording referencing ACI standards since this does not apply to the inspection methods in the Transfer Station AMP.
A-79	Appendix A TS AMP Element 6	A-22	RAI 3-4	Added acceptance criteria for testing of Impact Limiter representative foam samples. Added acceptance criteria for Impact Limiter top plate. Added wording for ISFSI Manager to evaluate inspection results for entering into the CAP.
A-80	Appendix A TS AMP Element 7	A-22	RAI A-12	Deleted confusing wording about engineering evaluations. Added wording that an engineering evaluation may be performed as part of the CAP process.
A-81	Appendix A TS AMP Element 7	A-22	C	Deleted the words "apparent and root" that are not used in Trojan's CAP for root cause evaluations.
A-82	Appendix A TS AMP Element 9	A-23	C	Deleted the words "QA program and" because Trojan's QA Program does not include this detailed level of information for each AMP. This information will be included in the AMP implementing procedure.
A-83	Appendix A TS AMP Element 9	A-23	C	Clarified wording for when the AMP will be updated (as necessary based on periodic tollgate assessments) and where the tollgate assessments are described (SAR Section 9.7.8.5).
A-84	Appendix A TS AMP Element 10	A-23	C	Clarified wording for past Transfer Station testing, including the use of "dummy MPC" to be consistent with Trojan terminology. Added description of previous Transfer Station Pad inspections as part of the Trojan Structural Inspection Program. Added description of Impact Limiter representative foam sample testing referenced in Element 4 of the Transfer Station AMP.
B-1	B-3	B-1	C	Updated LRA section reference and clarified wording in Section B.3 for Transfer Cask Fatigue Evaluation.
C-1	Appendix C Title page	C-1	RAI A-13	Changed Appendix Title to "Tollgate Assessments".
C-2	Appendix C Paragraph 2	C-1	RAI A-13	Conforming changes made to second paragraph due to moving Tollgate Assessments from SAR Section 9.7.10 into Section 9.7.8.5. Deleted the words referring to the "specific license" because Technical Specification 5.5.5 was changed to delete the words referring to SAR 9.7.10 tollgates. Also, corrected last sentence in this paragraph to say "should be performed" to be consistent with NEI 14-12 Section 3.2. The remaining changes on this page change the references for LRA Tables C-1 and C-2 to refer to the corresponding ISFSI SAR Tables 9.7-18 and 9.7-19.

List of LRA Changes

Item	Section	Page (Note 1)	Reason (Note 2)	Description
C-3	Appendix C Table C-1 Table C-2	C-1 through C-4	RAI A-13	Deleted Tables C-1 and C-2 because they were already in the SAR as Tables 9.7-1 and 9.7-2 and these SAR Table numbers are changed to 9.7-18 and 9.7-19 to accommodate the new future SAR Tables 9.7-1 through 9.7-17.
D-1	Appendix D Paragraph 3	D-1	RAI A-13	Added information related to the completed 2018 Concrete Cask Interior Inspection including the inspection results and the capability of the improved inspection equipment. Also added explanation for the need to remove the Concrete Cask Lid to provide access and perform the required Concrete Cask Interior AMP and MPC Exterior AMP inspections of the top end subcomponents.
D-2	Appendix D Baseline Inspection	D-2 - D-3	C RAI A-13	Corrected previous Baseline Inspection wording and added information to say that the first canister loaded was placed in service on January 17, 2003 so the 20 years in service date is January 17, 2023. Added Trojan's plans to implement the new ISFSI SAR Section 9.7.8 Aging Management Program on January 1, 2022 and to schedule the timing of the first inspections for all four AMPs (baseline inspections) to be completed in the first two years (2022 – 2023). Added information for the Baseline Inspection of the four AMPs.The MPC AMP Baseline Inspection includes removing the Concrete Cask Lid to inspect the MPC exterior and Concrete Cask interior top end subcomponents that are not accessible through the Concrete Cask outlet vents. The Baseline Inspection for the Transfer Cask will be a partial inspection because it is in long-term storage.
E-1	Appendix E PGE-1070	PGE-1070		No changes.
F-1	Appendix F Paragraph 1	F-1	RAI A-13	Reworded to say "requirement for an Aging Management Program" and deleted words for "tollgate assessments" due to moving Tollgate Assessments from ISFSI SAR Section 9.7.10 into SAR Section 9.7.8.5 and deleting the no longer needed Technical Specification 5.5.5 sentence.
F-2	Appendix F Tech Spec 5.5.5	5.5-3	RAI A-13	Corrected TS 5.5.5 wording to delete the specific reference to ISFSI SAR "Section 9.7.8". Also, due to moving Tollgate Assessments from SAR Section 9.7.10 into SAR Section 9.7.8.5, deleted the no longer needed Technical Specification 5.5.5 sentence.
G-1	Appendix G Paragraph 1	G-1	RAI A-13	Added wording to describe the new additions to SAR Section 9.7.8 and to introduce the use of "place holders" for new SAR 9.7 Tables that will be incorporated into the SAR subsequent to NRC approval of the Trojan ISFSI license renewal. Also corrected the use of the words "Chapter" and "Section" to use "Chapter" for the LRA and "Sections" for the SAR.
G-2	Appendix G Paragraph 2	G-1	RAI A-13	Added wording to describe the "track changes text" colors (Black, Red, Blue and Blue cross-out) used to differentiate current SAR Revision 14 wording; March 2017 wording changes; and the new 2019 proposed SAR changes.
G-3	Appendix G Paragraph 3	G-1	RAI A-13	Added these words: PGE will continue to revise and update this Trojan LRA throughout the license renewal review process. For efficiency and in order to avoid repetition, selected tables in LRA Chapters 2, 3 and the Appendix A four AMPs, proposed for future inclusion in the Trojan ISFSI SAR Section 9.7, will be maintained current in this LRA. Upon issuance of the renewed Trojan ISFSI license, PGE will provide an update to the Trojan ISFSI SAR which incorporates the final approved LRA Chapters 2, 3, and LRA Appendix A tables for the four AMPs containing the NRC approved content in accordance with the provisions of 10 CFR 72.70(c).
G-4	Appendix G SAR markup	SAR Pages with 2019 changes	E	Changed the footer on all ISFSI SAR Table of Content's pages and all pages containing 2019 changes to say: Proposed Revision 15a.
G-5	Appendix G SAR TOC	xiii and xiv	RAI A-13	Revised SAR Table of Contents to list the revised Sections and Subsections for SAR Section 9.7.8.
G-6	Appendix G List of Tables	xix	RAI A-13	Added listing of future SAR tables and Tollgate Assessment new Table numbers 9.7-18 and 9.7-19 and new name for Table 9.7-19.
G-7	Appendix G List of Eff. Pages	xxiv through xxix	E	Updated list of effective pages to show new "15a" revision numbers.
G-8	Appendix G SAR 9.7	9-13	E	Added current Revision 14 SAR page (without changes) that contains Section 9.7 Programs to show the requirements that apply to all of the Section 9.7 Programs, including the new Section 9.7.8 for the Aging Management Program
G-9	Appendix G SAR 9.7.6 SAR 9.7.7	9-14	RAI A-13	Corrected SAR Section 9.7.6 and 9.7.7 words in last paragraphs to clearly say that "Concurrent with implementation of the new Aging Management Program" these two Programs are replaced by the new AMPs.

List of LRA Changes

Item	Section	Page (Note 1)	Reason (Note 2)	Description
G-10	Appendix G SAR 9.7.8	9-14	RAI A-13	Added Technical Specification 5.5.5 wording that establishes the SAR 9.7.8 Aging Management Program.
G-11	Appendix G SAR 9.7.8	9-14	RAI A-13	Added description of the content of the overall Aging Management Program including Scoping Evaluation Results, Aging Management Review Results, and Time-Limited Aging Analysis Results.
G-12	Appendix G SAR 9.7.8	9-14	RAI A-13	Added descriptions of the Aging Management Programs for inspection and monitoring of the selected MPC and associated Concrete Cask, Transfer Cask, Concrete Casks, and Transfer Station and the Tollgate Assessments of the overall Aging Management Program.
G-13	Appendix G SAR 9.7.8.1	9-15	RAI A-13	Added summary of Scoping Evaluation Results and reference to the new SAR Tables to be extracted from final LRA Chapter 2, Scoping Results Tables 2-1 through 2-7 (new SAR Tables 9.7-1 through 9.7-7).
G-14	Appendix G 9.7.8.2	9-15	RAI A-13	Added summary of AMR results and reference to the new SAR Tables to be extracted from LRA Chapter 3, AMR Results Tables 3-1 through 3-6 (new SAR Tables 9.7-8 through 9.7-13).
G-15	Appendix G SAR 9.7.8.3	9-15 and 9-16	RAI A-13	Moved the previously proposed SAR Section 9.7.9 TLAA words to this subsection (without changes, except for adding "Results" to the title) and deleted unused SAR Section 9.7.9.
G-16	Appendix G SAR 9.7.8.4	9-16 through 9-18	RAI A-13	Added description of the Aging Management Programs for inspection and monitoring of the selected MPC and associated Concrete Cask, the Transfer Cask, Concrete Casks, and Transfer Station. Also added wording for new SAR Tables to be extracted from LRA Appendix A, AMPs (new SAR Tables 9.7-14 through 9.7-17).
G-17	Appendix G SAR 9.7.8.4	9-17	RAI A-13	Added timing (2022 – 2023) for first inspection (Baseline Inspection) for the four AMPs to be performed after the new Aging Management Program is implemented in January 2022.
G-18	Appendix G SAR 9.7.8.4.1	9-17	RAI A-13	Moved the previously proposed SAR 9.7.8.1 words to this subsection.
G-19	Appendix G SAR Appendix G SAR 9.7.8.4.1	9-17	RAI A-13	Made correction by deleting the first sentence that indicated the old SAR 9.7.7 Concrete Cask Interior Inspection Program would be used through the extended storage period.
G-20	Appendix G SAR 9.7.8.4.1	9-17	RAI A-13	Corrected words to say "MPC-28" versus "canister PCC-03".
G-21	Appendix G SAR 9.7.8.4.1	9-17	RAI A-13	Added sentence for final MPC 10 Element AMP to be added as new SAR Table extracted from LRA Appendix A MPC AMP (new SAR Table 9.7-14).
G-22	Appendix G SAR 9.7.8.4.1	9-17	RAI A-13	Deleted "monitored condition" phrase and bulleted list because MPC AMP will be in new SAR Table 9.7-14.
G-23	Appendix G SAR 9.7.8.4.2	9-17	RAI A-13	Moved the previously proposed SAR 9.7.8.2 words to this subsection.
G-24	Appendix G SAR 9.7.8.4.2	9-17	RAI A-13	Added sentence for final Transfer Cask 10 Element AMP to be added as new SAR Table extracted from LRA Appendix A Transfer Cask AMP (new SAR Table 9.7-15).
G-25	Appendix G SAR 9.7.8.4.2	9-17	RAI A-13	Deleted "visual inspection" phrase and bulleted list because Transfer Cask AMP will be in new SAR Table 9.7-15.
G-26	Appendix G SAR 9.7.8.4.3	9-17 and 9-18	RAI A-13	Moved the previously proposed SAR 9.7.8.3 words to this subsection.

List of LRA Changes

Item	Section	Page (Note 1)	Reason (Note 2)	Description
G-27	Appendix G SAR 9.7.8.4.3	9-18	RAI A-13	Made correction by deleting two sentences that indicated the old SAR 9.7.6 and 9.7.7 programs would continue into the period of extended storage. These are being replaced by the new AMPs.
G-28	Appendix G SAR 9.7.8.4.3	9-18	RAI A-13	Added sentence for final Concrete Cask 10 Element AMP to be added as new SAR Table extracted from LRA Appendix A Concrete Cask AMP (new SAR Table 9.7-16).
G-29	Appendix G SAR 9.7.8.4.4	9-18	RAI A-13	Moved the previously proposed SAR 9.7.8.4 words to this subsection.
G-30	Appendix G SAR 9.7.8.4.4	9-18	RAI A-13	Added sentence for final Transfer Station 10 Element AMP to be added as new SAR Table extracted from LRA Appendix A Transfer Station AMP (new SAR Table 9.7-17).
G-31	Appendix G SAR 9.7.8.4.4	9-18	RAI A-13	Deleted "visual inspection" phrase and bulleted list because Transfer Station AMP will be in new SAR Table 9.7-17.
G-32	Appendix G SAR 9.7.9	9-18 and 9-19	RAI A-13	Deleted this Section 9.7.9 due to moving TLAAs to subsection 9.7.8.3.
G-33	Appendix G SAR 9.7.10	9-19	RAI A-13	Changed this SAR Section number from 9.7.10 to 9.7.8.5 that effectively moved Tollgate Assessments into SAR Section 9.7.8 to clearly show that Tollgate Assessments are a part of the overall SAR Section 9.7.8 Aging Management Program.
G-34	Appendix G SAR 9.7.8.5	9-19	RAI A-13	Changed the title of this subsection from "Tollgates" to "Tollgate Assessments".
G-35	Appendix G SAR 9.7.8.5	9-19	RAI A-13	Deleted the reference to the ISFSI license. (As a result of moving Tollgate Assessments into SAR Section 9.7.8, a conforming change to Technical Specification 5.5.5 first paragraph has been made to delete the last sentence that is no longer needed).
G-36	Appendix G SAR 9.7.8.5	9-19	RAI A-13	Updated the referenced Section number to say: 9.7.8.4 for the AMPs and 9.7.8.3 for the TLAAs
G-37	Appendix G SAR 9.7.8.5	9-20	RAI A-13	Changed the reference numbers for the Tollgate Tables that have changed from 9.7-1 and 9.7-2 to 9.7-18 and 9.7-19.
G-38	Appendix G SAR 9.7.8.5	9-20	RAI A-13	Added wording "and performance criteria for tollgate assessments are shown in Table 9.7-19".
G-39	Appendix G SAR Section 9.10	9-23	RAI A-13	Added Reference 9, Trojan's LCA 72-07 and Reference 10, NUREG-1927, Revision 1.
G-40	Appendix G SAR Section 9.7 Tables	Tables 9.7-1 through 9.7-17	RAI A-13	Revised this Table section to add place holders for the new Aging Management Program Tables 9.7-1 through 9.7-17 that will be extracted from LRA Chapter 2, Chapter 3, and LRA Appendix A and added to the SAR subsequent to NRC approval of Trojan's renewed license.
G-41	Appendix G SAR Section 9.7 Tables	N/A	RAI A-13	Revised the Tollgate Table numbers 9.7-1 and 9.7-2 to use SAR Table numbers 9.7-18 and 9.7-19, respectively.
G-42	Appendix G SAR Section 9.7 Tables	N/A	RAI A-13	In Table 9.7-18, Element 1, corrected reference to Tollgate Table 9.7-2 to say: 9.7-19. In Table 9.7-19, changed the title to say: "Tollgate Assessment Performance Criteria by Element".
G-43	Appendix G SAR Section 9.7 Tables	N/A	C	Corrected Tollgate Table 9.7-19, Element 1 to refer to the location of the new Sample Bases wording located in LRA Appendix A, Element 4 of the MPC AMP and Concrete Cask AMP.
G-44	Appendix G SAR Section 9.7 Tables	N/A	C	Corrected Tollgate Table 9.7-19, Element 4, wording "sample size is expanded" to say: "sample size expansion is considered".

List of LRA Changes

Item	Section	Page (Note 1)	Reason (Note 2)	Description
G-45	Appendix G SAR Section 9.7 Tables	N/A	E	Changed Tollgate Table 9.7-19, Element 7, generic wording "Condition reports" to use Trojan's words "Corrective Action Requests".
H-1	Appendix H Title page Throughout	H-1 and H-2	E	For clarification of PGE-1082 revision status, changed "Revision 1" wording to say: "Proposed Revision 1".
H-2	Appendix H Throughout	H-1 and H-2	C	Added wording to describe new 2018 changes to PGE-1082 Sections 2.6, 4.1 and 9.0. Section 2.6, describes the results of the new 60-year Concrete Cask "activation" analysis; Section 4.1 was changed in response to a NRC RAI letter to provide PGE's conclusions following review of the four specified events; and Section 9.0 adds a new Reference 11 for the calculation containing the 60 year activation analysis.
H-3	Appendix H PGE 1082 List of Eff. Pages	v	E	Updated list of effective pages to show new revision number "1a" for pages containing changes.
H-4	Appendix H Section 2.6 Table 2-1 Table 2-3	2-4 and 2-5	C	Revised Section 2.6 and Tables 2-1 and 2-3 to incorporate the new 60-year Concrete Cask "activation analysis" results from Holtec Report No. HI-2012749, Section O.1, Revisions 5 and 6. These 60-year results confirm that no changes are required to the PGE-1082 radiological decommissioning cost estimate.
H-5	Appendix H PGE 1082 Section 4.1	4-1	C	Pursuant to NRC's RAI Letter, dated April 3, 2018 and PGE's RAI response Letter (VPN-004-2018, dated May 15, 2018), added wording related to the 2018 changes to Appendix H, PGE-1082, Section 4.1 that was revised for each of the four specified events to add the words "No Changes" for the effects on the 2015 detailed cost estimate.
H-6	Section 9.0	9-1	C	Deleted reference to Table 2.4.1 in Reference 8 and added Reference 11 for Holtec Report HI-2012749 Revisions 5 and 6.

Note 1 Page numbers refer to those from Enclosure 2 (LRA Markup) which show blue text cross-out formatting for deleted text.

Note 2 C = Correction / Clarification
E = Editorial
RAI = RAI question / response

TABLE OF CONTENTS

GLOSSARY OF TERMS v

LIST OF ACRONYMS vii

CHAPTER 1: GENERAL INFORMATION 1-1

1.0 GENERAL INFORMATION 1-1

1.1 APPLICATION FORMAT AND CONTENT 1-1

1.2 FACILITY DESCRIPTION 1-1

1.3 INFORMATION REQUIRED BY 10 CFR 72.22 1-2
1.3.1 Full Name of Applicant 1-2
1.3.2 Address of Applicant 1-2
1.3.3 Address of Trojan ISFSI 1-2
1.3.4 Description of Business or Occupation of Applicant 1-2
1.3.5 Organization and Management of Applicant 1-3
1.3.6 Financial Qualifications of Applicant 1-6
1.3.7 Financial Assurance for Radiological Decommissioning (10 CFR 72.30) 1-6

1.4 REFERENCES 1-9

CHAPTER 2: RENEWAL SCOPING 2-1

2.0 SCOPING EVALUATION 2-1

2.1 SCOPING EVALUATION PROCESS 2-1

2.2 SCOPING EVALUATION DISCUSSION AND RESULTS 2-2
2.2.1 Description of SSCs 2-2
2.2.2 SSCs Within the Scope of License Renewal 2-4
2.2.3 SSCs Not Within the Scope of License Renewal 2-5

2.3 REFERENCES 2-5

CHAPTER 3: AGING MANAGEMENT REVIEWS 3-1

3.0 AGING MANAGEMENT REVIEWS 3-1

3.1 AGING MANAGEMENT REVIEW METHODOLOGY 3-1
3.1.1 Identification of In-Scope Subcomponents Requiring Aging Management Review 3-1
3.1.2 Identification of Environments 3-1
3.1.3 Identification of Materials 3-3
3.1.4 Identification of Aging Effects Requiring Management 3-3

3.1.5 Determination of Aging Management Activity Required to Manage Effects of Aging .. 3-3
3.1.6 Operating Experience Review for Process Confirmation 3-3

3.2 AGING MANAGEMENT REVIEW RESULTS – MPC 3-5
3.2.1 Description of MPC Subcomponents 3-6
3.2.2 MPC Subcomponent Materials 3-7
3.2.3 MPC Subcomponents Environments 3-7
3.2.4 TLAA for MPCs 3-8
3.2.5 Aging Effects Requiring Management for MPC 3-8
3.2.6 Aging Management Programs for MPC 3-8

3.3 AGING MANAGEMENT REVIEW RESULTS – TRANSFER CASK 3-8
3.3.1 Description of Transfer Cask Subcomponents 3-9
3.3.2 Transfer Cask Subcomponent Materials 3-9
3.3.3 Transfer Cask Subcomponents Environments 3-10
3.3.4 TLAA for Transfer Cask 3-10
3.3.5 Aging Effects Requiring Management for Transfer Cask 3-11
3.3.6 Aging Management Activities for Transfer Cask 3-11

3.4 AGING MANAGEMENT REVIEW RESULTS – CONCRETE CASK 3-11
3.4.1 Description of Concrete Cask Subcomponents 3-11
3.4.2 Concrete Cask Subcomponent Materials 3-12
3.4.3 Concrete Cask Subcomponents Environments 3-13
3.4.4 TLAA for Concrete Cask 3-13
3.4.5 Aging Effects Requiring Management for Concrete Cask 3-13
3.4.6 Aging Management Activities for Concrete Cask 3-14

3.5 AGING MANAGEMENT REVIEW RESULTS – FUEL ASSEMBLY 3-14
3.5.1 Description of Fuel Assembly Subcomponents 3-14
3.5.2 Fuel Assembly Subcomponent Materials 3-15
3.5.3 Fuel Assembly Subcomponents Environments 3-15
3.5.4 TLAA for Fuel Assemblies 3-15
3.5.5 Aging Effects Requiring Management for Fuel Assemblies 3-15
3.5.6 Aging Management Activities for Fuel Assemblies 3-15

3.6 AGING MANAGEMENT REVIEW RESULTS – TRANSFER STATION 3-16
3.6.1 Description of Transfer Station Subcomponents 3-16
3.6.2 Transfer Station Subcomponent Materials 3-17
3.6.3 Transfer Station Subcomponents Environments 3-17
3.6.4 TLAA for Transfer Station 3-17
3.6.5 Aging Effects Requiring Management for Transfer Station 3-17
3.6.6 Aging Management Activities for Transfer Station 3-17

3.7 AGING MANAGEMENT REVIEW RESULTS – ISFSI PAD 3-18
3.7.1 Description of ISFSI Pad Subcomponents 3-18
3.7.2 ISFSI Pad Subcomponent Materials 3-18
3.7.3 ISFSI Pad Subcomponents Environments 3-19
3.7.4 TLAA for ISFSI Pad 3-19
3.7.5 Aging Effects Requiring Management for the ISFSI Pad 3-19

3.7.6 Aging Management Activities for the ISFSI Pad 3-19

3.~~7~~8 TIME-LIMITED AGING ANALYSES 3-19
3.~~7~~8.1 TLAA Identification Criteria 3-19
3.~~7~~8.2 TLAA Identification Process and Results 3-20
3.~~7~~8.3 Radiation Effects Analysis 3-20

3.~~8~~9 AGING MANAGEMENT PROGRAM 3-21

3.~~9~~10 CHANGE DOCUMENTS 3-21
3.~~9~~10.1 ECOs 3-21
3.~~9~~10.2 Manufacturing Deviations 3-21
3.~~9~~10.3 72.48 Screenings and Evaluations 3-22
3.~~9~~10.4 Active Exemption 3-22

3.~~10~~11 REFERENCES 3-23

APPENDIX A – AGING MANAGEMENT PROGRAMS A-1

APPENDIX B – TIME-LIMITED AGING ANALYSES (TLAAs) B-1

APPENDIX C – TOLLGATE ASSESSMENTS C-1

APPENDIX D – PRE-APPLICATION/BASELINE INSPECTIONS D-1

APPENDIX E – PGE-1070, TROJAN ISFSI ENVIRONMENTAL REPORT, SUPPLEMENT 1 .... E-1

APPENDIX F – PROPOSED CHANGES TO TROJAN ISFSI LICENSE AND TECHNICAL SPECIFICATIONS F-1

APPENDIX G – PROPOSED CHANGES TO TROJAN ISFSI SAR G-1

APPENDIX H – PGE-1082, TROJAN ISFSI PRELIMINARY RADIOLOGICAL DECOMMISSIONING PLAN, PROPOSED REVISION 1 .... H-1

LIST OF TABLES

Table 1-1 Regulatory Compliance Cross-Reference Matrix 1-10

Table 2-1 Summary of Scoping Evaluation Results (0 9.7-1) 2-6
Table 2-2 Intended Safety Functions of MPC Subcomponents (new ISFSI SAR Table 9.7-2) 2-7
Table 2-3 Intended Safety Functions of Concrete Cask Subcomponents (new ISFSI SAR Table 9.7-4) 2-9
Table 2-4 Intended Safety Functions of Transfer Cask Subcomponents (new ISFSI SAR Table 9.7-3) 2-10
Table 2-5 Intended Safety Functions of Spent Fuel Assembly Subcomponents (new ISFSI SAR Table 9.7-5) 2-12
Table 2-6 Intended Safety Functions of Transfer Station Subcomponents (new ISFSI SAR Table 9.7-6) 2-13

Table 2-7	Intended Safety Functions of ISFSI Pad Subcomponents (new ISFSI SAR Table 9.7-7)	2-16
Table 3-1	Aging Management Review for MPC Subcomponents (new ISFSI SAR Table 9.7-8)	3-24
Table 3-2	Aging Management Review for Transfer Cask Subcomponents (new ISFSI SAR Table 9.7-9)	3-28
Table 3-3	Aging Management Review for Concrete Cask Subcomponents (new ISFSI SAR Table 9.7-10)	3-32
Table 3-4	Aging Management Review for Fuel Assembly Subcomponents (new ISFSI SAR Table 9.7-11)	3-34
Table 3-5	Aging Management Review for Transfer Station Subcomponents (new ISFSI SAR Table 9.7-12)	3-35
Table 3-6	Aging Management Review for ISFSI Pad Subcomponents (new ISFSI SAR Table 9.7-13)	3-40
Table 3-7	Trojan Fuel Assembly Parameters at Time of Fuel Load	3-41
Table 3-8	Radiation Effects Analysis	3-42

GLOSSARY OF TERMS

AMP is an acronym for Aging Management Program, which is a program implemented by Trojan to address aging effects that may include prevention, mitigation, condition monitoring, and performance monitoring.

Concrete Cask is the cask that receives and contains the sealed multi-purpose canisters (MPC) containing spent nuclear fuel for long-term storage. It provides gamma and neutron shielding, ventilation passages, missile protection, and protection against natural phenomena and accidents for the loaded MPC.

Confinement Boundary is the outline formed by the all-welded cylindrical enclosure of the MPC shell, MPC baseplate, MPC lid, MPC port cover plates, and the MPC closure ring which provides redundant sealing. The Fuel Debris Process Can Capsule also provides a confinement boundary.

Damaged Fuel Container or **DFC** means a specially designed enclosure for damaged fuel or fuel debris which permits flow of gaseous and liquid media while minimizing dispersal of gross particulates.

Design Life is the minimum duration for which the component is engineered to perform its Intended Function set forth in the Trojan ISFSI SAR, if operated and maintained in accordance with the SAR.

Dry Storage System or **DSS** is spent fuel storage technology comprised of a canister inside a ventilated or unventilated vertical cask (overpack) or horizontal storage module used at an ISFSI (see also "Concrete Cask").

ECO is an acronym for Engineering Change Order, which is a documented process of making changes to Holtec licensing documents.

Failed Fuel Can is designed for storage of a fuel rod storage container, fuel debris Process Can Capsules, fuel assembly metal fragments (e.g., portions of fuel rods, grid assemblies, bottom nozzles, etc.), and fuel debris Process Cans that contain fuel debris and fuel assembly metal fragments.

Fuel Debris Process Can Capsule is designed to provide a confinement boundary for storage of up to five fuel debris Process Cans containing fuel debris processed during the Trojan Fuel Debris Processing Project.

High Burnup Fuel refers to fuel with a burnup greater than 45,000 MWd/MTU.

Important to Safety (ITS) means a function or condition required to store spent nuclear fuel safely; to prevent damage to spent nuclear fuel during handling and storage, and to provide reasonable assurance that spent nuclear fuel can be received, handled, packaged, stored, and retrieved without undue risk to the health and safety of the public.

Independent Spent Fuel Storage Installation (ISFSI) means a facility designed, constructed, and licensed for the interim storage of spent nuclear fuel and other radioactive materials associated with spent fuel storage in accordance with 10 CFR 72.

Intended Functions are criticality control, heat transfer, radiation shielding, confinement, structural integrity, and retrievability as described in Reference 1.1.1.

License Life means the duration for which the system is authorized by virtue of its certification by the NRC.

Multi-Purpose Canister or MPC means the sealed canister consisting of a honeycombed fuel basket for spent nuclear fuel storage, contained in a cylindrical canister shell (the MPC Enclosure Vessel). The MPC is the confinement boundary for storage conditions. The Fuel Debris Process Can Capsule also provides a confinement boundary.

SAR is an acronym for Safety Analysis Report.

Service Life means the duration for which the component is reasonably expected to perform its Intended Function, if operated and maintained in accordance with the provisions of the SAR. Service Life may be much longer than Design Life because of the conservatism inherent in the codes, standards, and procedures used to design, fabricate, operate, and maintain the component.

SMDR is an acronym for Supplier Manufacturing Deviation Report which is used by Holtec to evaluate and disposition deviations during manufacturing.

SSC is an acronym for Structures, Systems, and Components.

Time-Limited Aging Analysis or TLAA is a specific license calculation or analysis that has all of the following attributes:

- Involves SSCs within the scope of license renewal
- Considers the effects of aging
- Involves time-limited assumptions defined by the current operating term
- Was determined to be relevant by the licensee in making a safety determination
- Involves conclusions or provides the basis for conclusions related to the capability of the SSCs to perform their Intended Functions
- Is contained or incorporated by reference in the licensing basis

Tollgate Assessment is a written evaluation performed by licensees at a specified time ("tollgate"), of the aggregate impact of aging-related dry cask storage operational experience, research, monitoring, and inspections on the Intended Functions of in scope dry cask storage SSCs. Tollgate assessments may include non-nuclear and international operating information on a best-effort basis. Corrective or mitigative actions arising from tollgate assessments are managed through the Corrective Action Program of the specific or general licensee and/or the holder.

Transfer Cask is the metal cask used to provide temporary shielding and structural protection for the spent fuel canister during fuel loading in a spent fuel pool and during transfer of the loaded canister to or from the Concrete Cask or Transportation Cask.

LIST OF ACRONYMS

Acronym	Definition
AMID	Aging Management INPO Database
AMP	Aging Management Program
BNFL	British Nuclear Fuels Limited
CAP	Corrective Action Program
CoC	Certificate of Compliance
DFC	Damaged Fuel Container
DSS	Dry Storage System
ECO	Engineering Change Order
ER	Environmental Report
INEEL	Idaho National Engineering and Environmental Laboratory
INPO	Institute of Nuclear Power Operations
ISG	Interim Staff Guidance
ITS	Important to Safety
ISFSI	Independent Spent Fuel Storage Installation
LWR	Light Water Reactor
MPC	Multi-Purpose Canister
NEI	Nuclear Energy Institute
NRC	Nuclear Regulatory Commission
OR	Oregon
PGE	Portland General Electric
PNL	Pacific Northwest Laboratory
PWR	Pressurized Water Reactor
RCCA	Rod Cluster Control Assemblies
SAR	Safety Analysis Report
SER	Safety Evaluation Report
SMDR	Supplier Manufacturing Deviation Report
SNM	Special Nuclear Material
SSC	Structures, Systems, and Components
TLAA	Time-Limited Aging Analysis
TNP	Trojan Nuclear Plant

CHAPTER 1: GENERAL INFORMATION

1.0 GENERAL INFORMATION

Portland General Electric Company (PGE) has prepared this application for renewal of the license for the site-specific Trojan ISFSI. This application supports ISFSI license renewal for an additional 40-year period beyond the end of the current license term of Materials License Number SNM-2509 (Docket Number 72-17). The original 20-year ISFSI license will expire on March 31, 2019. This application is submitted in accordance with 10 CFR 72.42(b) and includes Time Limited Aging Analyses, Aging Management Programs, and the applicable general, technical, decommissioning funding plan information required by 10 CFR 72.30(c) and environmental supporting information required by 10 CFR 72, Subpart B.

1.1 APPLICATION FORMAT AND CONTENT

The format and content of the application are based on 10 CFR 72, NRC NUREG-1927 (Ref. 1.1.1), and generally following NEI 14-03 (Ref. 1.1.2). Based on this guidance, the application includes:

1. General Information – Section 1 has been expanded beyond the general administrative requirements of 10 CFR 72.22 to include information on the format and content of the application and a facility description.

2. Scoping Evaluation – Section 2 provides the scoping evaluation for the site-specific ISFSI systems, structures, and components (SSCs).

3. Aging Management Reviews – Section 3 includes the methodology and results of the aging management reviews performed for site-specific ISFSI SSCs that are in the scope of license renewal.

4. Appendices related to AMPs, TLAAs, Tollgates, proposed changes to SAR, License and Technical Specifications, pre-application/baseline inspections, PGE-1082 with 10 CFR 72.30 decommissioning funding plan information, and a PGE-1070 Environmental Report Supplement.

1.2 FACILITY DESCRIPTION

The Trojan ISFSI safely stores the spent nuclear fuel that resulted from the approximately 17 years of operation of the Trojan Nuclear Plant.

The Trojan ISFSI is located in Columbia County, Oregon, along the west bank of the Columbia River, approximately 42 miles north of Portland, Oregon, and 50 miles east of the Pacific Ocean. The Trojan ISFSI uses BNFL Fuel Solutions TranStor™ Concrete Casks, which are a vertical ventilated type cask, loaded with seal-welded, stainless steel Holtec International Multipurpose Canisters (type MPC-24E or MPC-24EF). The MPC-24E is designed to accommodate up to 24 PWR fuel assemblies. Up to four of the fuel assemblies in any one MPC-24E may be classified as damaged fuel and the balance must be intact

fuel. The MPC-24EF is also designed for 24 PWR fuel assemblies, with up to four assemblies classified as damaged fuel or fuel debris. The 34 MPCs stored in the Trojan ISFSI ranged in heat load at time of loading from 4.1 kW to 14.3 kW, and were moved to the ISFSI Pad between January and September of 2003.

The ISFSI consists of a reinforced concrete Storage Pad supporting 34 Trojan Storage Systems, each made up of the Concrete Cask and stored MPC. In addition to these primary components, the ISFSI also requires a Transfer Cask, Transfer Station, and ISFSI-related security equipment.

A complete description of the ISFSI is provided in the Trojan ISFSI SAR (Ref. 1.2.1).

1.3 INFORMATION REQUIRED BY 10 CFR 72.22

1.3.1 Full Name of Applicant

Portland General Electric Company

1.3.2 Address of Applicant

121 SW Salmon St.
Portland, Oregon 97204

1.3.3 Address of Trojan ISFSI

71760 Columbia River Highway
Rainier, OR 97048

1.3.4 Description of Business or Occupation of Applicant

PGE is the majority owner of the Trojan ISFSI and has responsibility for operating and maintaining the ISFSI. PGE is an investor-owned utility engaged in the generation, purchase, transmission and distribution of electricity to industrial, commercial and residential customers. PGE has approximately 2,650 employees and provides electricity to more than 848,000 retail electricity customers. PGE's service area covers approximately 4,000 square miles. PGE has a diverse mix of low cost generating resources including hydroelectric power, wind, coal, and gas combustion. The Trojan ISFSI is jointly owned by PGE, the City of Eugene through the Eugene Water and Electric Board (EWEB), and PacifiCorp.

1.3.5 Organization and Management of Applicant

State of Incorporation and Principal Location of Business

PGE is incorporated in the State of Oregon and its general office and principal place of business is located in Portland, Oregon.

Executive Officers and Senior Leadership of PGE

The PGE business address, names, current titles and citizenship of current executive officers and the senior nuclear leadership for the Trojan ISFSI are as follows:

Portland General Electric
121 SW Salmon Street
Portland, Oregon 97204

Portland General Electric Corporate Officers

Name	Position	Citizenship
James J. Piro	President and Chief Executive Officer	U.S.
James F. Lobdell	Sr. Vice President, Finance, Chief Financial Officer and Treasurer	U.S.
William O. Nicholson	Sr. Vice President, Customer Service, Transmission and Distribution	U.S.
Maria M. Pope	Sr. Vice President, Power Supply, Operations and Resource Strategy	U.S.
Larry N. Bekkedahl	Vice President, Transmission and Distribution Services	U.S.
Carol A. Dillin	Vice President, Customer Strategies and Business Development	U.S.
J. Jeffrey Dudley	Vice President, General Counsel, Corporate Compliance Officer and Assistant Secretary	U.S.
Campbell A. Henderson	Vice President, Information Technology and Chief Information Officer	U.S.
Bradley Y. Jenkins	Vice President, Power Supply Generation	U.S.
Anne F. Mersereau	Vice President, Human Resources, Diversity and Inclusion	U.S.
W. David Robertson	Vice President, Public Policy and Corporate Resiliency	U.S.
Kristin A. Stathis	Vice President, Customer Service Operations	U.S.

Portland General Electric Board of Directors

Name	Position	Citizenship
John W. Ballantine	Director	U.S.
Rodney L. Brown, Jr.	Director	U.S.
Jack E. Davis	Chairman	U.S.
David A. Dietzler	Director	U.S.
Kirby A. Dyess	Director	U.S.
Mark B. Ganz	Director	U.S.
Kathryn J. Jackson	Director	U.S.
Neil J. Nelson	Director	U.S.
M. Lee Pelton	Director	U.S.
James J. Piro	Director	U.S.
Charles W. Shivery	Director	U.S.

The Eugene Water & Electric Board (EWEB or the Board) is a publicly owned electric and water utility in Oregon. EWEB is an administrative unit of the City of Eugene, Oregon. EWEB operates as a primary government, and is not considered a component unit of the City. The Board supplies electric and water service within the city limits of Eugene and to certain areas outside the city limits. EWEB's address is 500 East Fourth Avenue; Eugene, OR 97401.

EWEB Commissioners and General Managers

Name	Position	Citizenship
Dick Helgeson	President	U.S.
John Brown	Vice President	U.S.
John Simpson	Commissioner	U.S.
Steve Mital	Commissioner	U.S.
Sonya Carlson	Commissioner	U.S.
Frank Lawson	Secretary/General Manager	U.S.
Anne Kah	Assistant Secretary	U.S.
Susan Fahey	Treasurer	U.S.
Susan Eicher	Assistant Treasurer	U.S.

PacifiCorp, an indirect wholly owned subsidiary of Berkshire Hathaway Energy, is a United States regulated electric utility company headquartered in Oregon that serves 1.8 million retail electric customers in portions of Utah, Oregon, Wyoming, Washington, Idaho and California. PacifiCorp is principally engaged in the business of generating, transmitting, distributing and selling electricity. PacifiCorp's principal executive offices are located at 825 NE Multnomah Street, Portland, Oregon 97232.

PacifiCorp Corporate Officers

Name	Title	Address	Citizenship
Gregory E. Abel	Chairman & Chief Executive Officer	825 NE Multnomah, Suite 2000, Portland, OR 97232	Canada
Stefan A. Bird	President & Chief Executive Officer, Pacific Power	825 NE Multnomah, Suite 2000, Portland, OR 97232	U.S.
Cindy A. Crane	President & Chief Executive Officer, Rocky Mountain Power	1407 West North Temple, Suite 310, Salt Lake City, UT 84116	U.S.
Jeffery B. Erb	Corporate Secretary	825 NE Multnomah, Suite 2000, Portland, OR 97232	U.S.
Gary W. Hoogeveen	Senior Vice President & CCO, Rocky Mountain Power	1407 West North Temple, Suite 310, Salt Lake City, UT 84116	U.S.
Michael G. Jenkins	Assistant Secretary	1407 West North Temple, Suite 320, Salt Lake City, UT 84116	U.S.
Nikki L. Kobliha	Vice President, CFO & Treasurer	825 NE Multnomah, Suite 1900, Portland, OR 97232	U.S.

PacifiCorp Board of Directors

Name	Citizenship
Gregory E. Abel	Canada
Stefan A. Bird	U.S.
Cindy A. Crane	U.S.
Patrick J. Goodman	U.S.
Natalie L. Hocken	U.S.
Nikki L. Kobliha	U.S.

1.3.6 Financial Qualifications of Applicant

PGE and the Trojan ISFSI co-owners will remain financially qualified to carry out the operation and decommissioning of the ISFSI during the period of the renewed material license as required by 10 CFR 72.22(e). Information supporting this statement is submitted in annual financial reports, as required by regulation. Links to the most recent annual financial reports for PGE, PacifiCorp, and EWEB are provided below.

PGE

http://files.shareholder.com/downloads/POR/3837145308x0x881574/BA0FEC70-5C54-4A23-87B6-BB37D1574A5F/2015_Annual_Report.pdf

PacifiCorp

https://www.berkshirehathawayenergyco.com/assets/upload/financial-filing/BHE%2012.31.15%20Form%2010-K_FINAL%20_with%20hyperlinks.pdf

EWEB

http://www.eweb.org/about-us/publications-and-reports
(scroll down to Financial Reports and click on most recent year)

1.3.7 Financial Assurance for Radiological Decommissioning (10 CFR 72.30)

In accordance with the requirements of 10 CFR 72.30(c) "at the time of license renewal", PGE is submitting another copy of PGE-1082, Proposed Revision 1, "Trojan ISFSI Preliminary Radiological Decommissioning Plan" (see Appendix H to this Application). This document was previously submitted to the NRC for review on December 10, 2015 (ML15349A939) and is still in the NRC's review process.

During 2016, PGE performed additional radiation and contamination surveys at the Trojan ISFSI and Section 1.3.7.1 below provides this additional information related to PGE-1082, Proposed Revision 1, Section 2.5. In addition, Section 1.3.7.2 below provides December 31, 2016 Radiological Decommissioning Trust balances for PGE and PacifiCorp that are more recent than those contained in PGE-1082, Proposed Revision 1 Tables 5.3.1 and 5.3.2.

In 2018, PGE made additional changes to PGE-1082, Proposed Revision 1 and these are described in the new Sections 1.3.7.3 and 1.3.7.4 below.

With this additional information, the 2015 PGE-1082, Proposed Revision 1 contains PGE's most up-to-date projected Trojan ISFSI radiological decommissioning schedule, detailed radiological decommissioning cost estimate, and funding plans.

1.3.7.1 Pursuant to 10 CFR 72.30(b)(5), PGE-1082, Proposed Revision 1, Section 2.5, provides information on PGE's evaluation of past and current ISFSI radiological conditions related to subsurface material contamination that could contain residual radioactivity that would

require remediation to meet the 10 CFR 20.1402 radiological criteria for unrestricted use and ISFSI license termination. Based on the information in this PGE-1082, Proposed Revision 1, Section 2.5, and the results of additional surveys performed in 2016, PGE has determined that currently there is no volume of ISFSI onsite subsurface material containing residual radioactivity that will require remediation to meet the 10 CFR 20.1402 radiological criteria for unrestricted use and ISFSI license termination.

1.3.7.2 PGE-1082, Proposed Revision 1, contains Table 5.3-1 for PGE's Decommissioning Trust Funds' Balances and Table 5.3-2 for PacifiCorp's Decommissioning Trust Funds' Balances. The following two tables provide the 2015 balances from these PGE-1082 Tables and the new December 31, 2016 balances.

As shown in the tables below, PGE's ISFSI Radiological Decommissioning Fund balance is substantially more than the amount of PGE's 67.5% share of funds required for ISFSI facility radiological decommissioning as specified in PGE-1082, Proposed Revision 1, Table 5.2-1 (PGE Trust Fund Expenditures, Column A, Total of $3,994,000) and PacifiCorp's ISFSI Radiological Decommissioning Fund balance is more than the full amount of PacifiCorp's 2.5% share of funds required for ISFSI facility radiological decommissioning as specified in PGE-1082, Proposed Revision 1, Table 5.2-3 (PacifiCorp Trust Fund Expenditures, Column A, Total of $148,000).

The Bonneville Power Administration (BPA) is obligated through Net Billing Agreements to pay costs associated with EWEB's share of Trojan, including radiological decommissioning costs. As a government agency, EWEB uses a Statement of Intent for their financial instrument as described in PGE-1082. EWEB's Statement of Intent and Certification of Financial Assurance both document BPA's obligation to pay the decommissioning funding obligations of EWEB. The funding plan described in Table 5.2-2 of PGE-1082 ensures that EWEB/BPA's 30% portion of the radiological decommissioning activity expenditures will be fully funded.

Table 5.3-1
PGE's Decommissioning Trust Funds' Balances

Portland General Electric (PGE)	ISFSI Radiological Decommissioning Fund Market Value	Total Market Value of All Funds in PGE's Trojan Decommissioning Trust Accounts
PGE-1082 Proposed Rev. 1 as of 10-31-2015	**$5,130,604**	**$40,130,043**
As of 12-31-2016	**$5,150,625**	**$40,996,096**

Table 5.3-2
PacifiCorp's Decommissioning Trust Funds' Balances

PacifiCorp	ISFSI Radiological Decommissioning Fund Market Value	Total Market Value of All Funds in PacifiCorp's Trojan Decommissioning Trust Accounts
PGE-1082 Proposed Rev. 1 as of 11-24-2015	**$148,013**	**$1,547,446**
As of 12-31-2016	**$148,395**	**$1,847,925**

1.3.7.3 In 2018, Trojan discovered that PGE-1082 Section 2.6 and Tables 2-1 and 2-3 for Concrete Cask "activation" were not revised from 40 years to cover the new 60 years proposed in the 2017 License Renewal Application. PGE-1082 Section 2.6 and Tables 2-1 and 2-3 have been revised to incorporate the results of the 2018 Concrete Cask 60-year activation analysis contained in Holtec Report No. HI-2012749, "Shielding Evaluation for the Trojan ISFSI Completion Project", Table O.1, Revisions 5 and 6 (Ref. 1.3.1), to replace the 40-year analysis numbers with the 60-year analysis numbers. In addition, Table 2-3 was revised to use the 60-year nuclide values to calculate the Percentage of Residual Activity vs Concentration for 25 mrem/year to verify that the results are less than 100%.

1.3.7.4 Pursuant to NRC's RAI letter, dated April 3, 2018, and PGE's response letter (VPN-004-2018, dated May 15, 2018), PGE revised PGE-1082, Section 4.1 to add Trojan's conclusions of "No Changes" to decommissioning costs for each of the following events listed in 10 CFR 72.30(c)(1)-(4): (1) spills of radioactive material producing additional residual radioactivity in onsite subsurface material, (2) facility modifications, (3) changes in authorized possession limits, and (4) actual remediation costs that exceed the previous cost estimate.

1.4 REFERENCES

1.1.1 NUREG-1927, Revision 1, "Standard Review Plan for Renewal of Specific Licenses and Certificates of Compliance for Dry Storage of Spent Nuclear Fuel"

1.1.2 NEI 14-03, Revision 1, "Format, Content and Implementation Guidance for Dry Cask Storage Operation Based Aging Management"

1.2.1 Trojan ISFSI SAR (PGE-1069), Revision 14

1.3.1 Holtec Report No. HI-2012749, "Shielding Evaluation for the Trojan ISFSI Completion Project", Revision 6.

Table 1-1 - Regulatory Compliance Cross-Reference Matrix

License Renewal Application Section Number and Heading	NUREG-1927 R1 Section Number and Heading	CFR Requirement
1.0 – General Information	Section 1.4.1, General Information	10 CFR 72.22(a),(b),(c),(d)
1.1 – Application Format and Content	Section 1.4.4, Application Content	10 CFR 72.22(a),(b),(c),(d)
1.2 – Facility Description	Section 1.4.1, General Information	10 CFR 72.22(a),(b),(c),(d)
1.3 – Information Required by 10 CFR 72.22	Section 1.4.1, General Information Section 1.4.2, Financial Information	10 CFR 72.22(e) 10 CFR 72.30(c)
1.4 – References		
2.0 – Scoping Evaluation	Section 2.4.1, Scoping Process	10 CFR 72.24(g) 10 CFR 72.42(b)
2.1 – Scoping Evaluation Process		
2.2 – Scoping Evaluation Discussion and Results		
2.2.1 – Description of SSCs		
2.2.2 – SSCs within the Scope of License Renewal	Section 2.4.2, Structures, Systems, and Components within the Scope of Renewal	10 CFR 72.24(b),(c),(d) 10 CFR 72.24(g)
2.2.3 – SSCs Not Within the Scope License Renewal	Section 2.4.3, Structures, Systems, and Components not within the Scope of Renewal	10 CFR 72.24(b),(c),(d) 10 CFR 72.24(g)
2.3 – References		
3.0 – Aging Management Reviews		
3.1 – Aging Management Review Methodology		
3.1.1 – Identification of In-Scope Subcomponents Requiring Aging Management Review		
3.1.2 – Identification of Materials	Section 3.4.1.1, Identification of Materials and Environments	
3.1.3 – Identification of Environments	Section 3.4.1.1, Identification of Materials and Environments	

Table 1-1 - Regulatory Compliance Cross-Reference Matrix

License Renewal Application Section Number and Heading	NUREG-1927 R1 Section Number and Heading	CFR Requirement
3.1.4 – Identification of Aging Effects Requiring Management	Section 3.4.1.2, Identification of Aging Mechanisms and Effects	10 CFR 72.24(d) 10 CFR 72.120(a),(d) 10 CFR 72.122(a),(b),(c),(h1),(h5),(l) 10 CFR 72.124 10 CFR 72.126 10 CFR 72.128(a) 10 CFR 72.158 10 CFR 72.162 10 CFR 72.164
3.1.5 – Determination of Aging Management Activity Required to Manage Effects of Aging	Section 3.4.1.3, Aging Management Activities	
3.1.6 – Operating Experience Review for Process Confirmation		
3.2 – Aging Management Review Results – MPC		
3.3 – Aging Management Review Results – Transfer Cask		
3.4 – Aging Management Review Results – Concrete Cask		
3.5 – Aging Management Review Results – Fuel Assembly	Section 3.4.1.4, Aging Management Review for Dry Storage System Internals	
3.6 – Aging Management Review Results – Transfer Station		
3.7 – Aging Management Review Results – ISFSI Pad		
3.~~7~~8 – Time-Limited Aging Analyses	Section 3.5, Time-Limited Aging Analyses	10 CFR 72.24(d) 10 CFR 72.120(a),(d) 10 CFR 72.122(a),(b),(c),(h1),(h5),(l) 10 CFR 72.122(f),(h4),(l) 10 CFR 72.124 10 CFR 72.126 10 CFR 72.128(a)

Table 1-1 - Regulatory Compliance Cross-Reference Matrix

License Renewal Application Section Number and Heading	NUREG-1927 R1 Section Number and Heading	CFR Requirement
		10 CFR 72.170
3.~~8~~9 – Aging Management Programs	Section 3.6, Aging Management Programs	10 CFR 72.82(d) 10 CFR 72.122(f)(h4)(I) 10 CFR 72.126 10 CFR 72.128(a) 10 CFR 72.158 10 CFR 72.162 10 CFR 72.164 10 CFR 72.168(a)
3.~~9~~10 – Change Documents		
Appendix A – Aging Management Programs	Section 3.6, Aging Management Programs	10 CFR 72.82(d) 10 CFR 72.122(f)(h4)(I) 10 CFR 72.126 10 CFR 72.128(a) 10 CFR 72.158 10 CFR 72.162 10 CFR 72.164 10 CFR 72.168(a)
Appendix B – TLAAs	Section 3.5, Time-Limited Aging Analyses	10 CFR 72.240(c)(2)
Appendix C – Tollgates		
Appendix D – Pre-Application/Baseline Inspections	Section 3.4.1.2, Identification of Aging Mechanisms and Effects	10 CFR 72.240(c)(3)
Appendix E – PGE-1070, Trojan ISFSI Environmental Report, Supplement 1	Section 1.4.3, Environmental Report	10 CFR 51.45(a) through (d) 10 CFR 51.60(a) 10 CFR 72.34
Appendix F – Proposed Changes to Trojan ISFSI License and Technical Specifications	Section 1.4.7, Terms, Conditions, and Specifications for Specific Licenses and CoCs in the Period of Extended Operation	10 CFR 72.240(c)
Appendix G – Proposed Changes to Trojan ISFSI SAR	Section 1.4.7, Terms, Conditions, and Specifications for Specific Licenses and CoCs in the Period of Extended Operation	10 CFR 72.240(c)

Table 1-1 - Regulatory Compliance Cross-Reference Matrix

License Renewal Application Section Number and Heading	NUREG-1927 R1 Section Number and Heading	CFR Requirement
Appendix H – PGE-1082, Trojan ISFSI Preliminary Radiological Decommissioning Plan, Proposed Revision 1	Section 1.4.2, Financial Information	10 CFR 72.30(b)(5) 10 CFR 72.30(c)

CHAPTER 2: RENEWAL SCOPING

2.0 SCOPING EVALUATION

A general description of the ISFSI is provided in Section 1.2. A more thorough description of the ISFSI is contained in the ISFSI SAR (Ref. 1.2.1).

PGE's license renewal process for the ISFSI is consistent with the guidance in NUREG-1927 and NEI 14-03 (Ref. 1.1.1 and 1.1.2). This license renewal application also follows the format of the Calvert Cliffs application (Ref. 2.0.1), which has been approved by the NRC.

License renewal is not intended to impose requirements beyond those that were met by the facility when it was initially licensed by the NRC. Therefore, the current licensing basis for the ISFSI will be carried forward through the renewed license period.

The scoping evaluation identifies those SSCs of the Trojan ISFSI that are within the scope of the license renewal, and require further evaluation for potential aging effects. The process and methodology used for the scoping evaluation is described in Section 2.1. The scoping evaluation results are summarized in Section 2.2.

2.1 SCOPING EVALUATION PROCESS

The scoping evaluation of the Trojan ISFSI is performed based on the two-step process described in NUREG-1927 (Ref. 1.1.1). The first step in the process is a screening evaluation to determine which SSCs are within the scope of the renewal. Per NUREG-1927, Section 2.4.2, SSCs are considered to be within the scope of the renewal if they satisfy either of the following criteria:

> *1) They are classified as Important-to-safety, as they are relied on to do one of the following functions:*
>
> *i. Maintain the conditions required by the regulation or specific license to store spent fuel safely;*
>
> *ii. Prevent damage to the spent fuel during handling and storage; or*
>
> *iii. Provide reasonable assurance that spent fuel can be received, handled, packaged, stored, and retrieved without undue risk to the health and safety of the public.*
>
> *These SSCs ensure that important safety functions are met for (1) confinement, (2) radiation shielding, (3) sub-criticality control, (4) heat-removal capability, (5) structural integrity, and (6) retrievability.*
>
> *2) They are classified as Not-Important-To-Safety, but, according to the design bases, their failure could prevent fulfillment of a function that is ITS.*

Any ISFSI SSC that meets either Scoping Criterion 1 or 2 above is considered within the scope of license renewal (in-scope), and the function(s) it is required to perform during the extended term is identified. The results of the scoping evaluation are presented in Section 2.2.

The sources of information reviewed in the scoping evaluation that describe the intended safety functions of the SSC ITS are the Trojan ISFSI SAR (Ref. 1.2.1), License (Ref. 2.1.1), Technical Specifications (Ref. 2.1.2), and Safety Evaluation Report (Ref. 2.1.3).

Section 2.2 discusses the Trojan ISFSI renewal scoping evaluation and results. Table 2-1 (new ISFSI SAR Table 9.7-1) summarizes the results of the scoping evaluation, listing the SSCs that are identified within the scope of renewal and the criteria upon which they are determined to be within the scope of renewal. The subcomponents of the in-scope SSC and their Intended Functions are identified in Section 2.2.1.

2.2 SCOPING EVALUATION DISCUSSION AND RESULTS

The Trojan ISFSI includes the following components and equipment:

- MPC (including Damaged Fuel Container, Failed Fuel Can, and Fuel Debris Process Can Capsule)
- Transfer Cask
- Concrete Cask
- Spent Fuel Assembly
- ISFSI Pad (including Storage Pad and Service Pad)
- ISFSI Security Equipment
- Transfer Station (including Transfer Station Pad and Impact Limiter)
- Fuel Transfer and Auxiliary Equipment

Drawings of the SSCs are contained in the Trojan ISFSI SAR, Appendix 1.A (Ref. 1.2.1).

2.2.1 Description of SSCs

2.2.1.1 MPC

The MPC-24E is designed to accommodate up to 24 PWR fuel assemblies. Up to four of the fuel assemblies in any one MPC-24E may be classified as damaged fuel and the balance must be intact fuel. The MPC-24EF is also designed for 24 PWR fuel assemblies, with up to four assemblies classified as damaged fuel or fuel debris. The MPC is constructed of stainless steel and is seal welded. The MPC fuel basket is made of stainless steel plates formed into an array of 24 square fuel storage locations (cells). The MPC relies on geometry for subcriticality, and credit was taken for the Boral™ plates in the dry storage criticality analysis, consistent with the analysis for the flooded condition. The HI-STORM 100 FSAR (Ref. 2.2.1) provides a complete description of the generic MPC designs.

The functions of the MPC (including fuel basket) are confinement, criticality control, heat transfer, and shielding. The MPC meets the requirements of Section 2.1, Criterion 1 and is therefore in scope for license renewal.

2.2.1.2 Transfer Cask

The Transfer Cask was used to complete the initial loading of the MPCs into the Concrete Casks. In the future, the Transfer Cask will be utilized with the Transfer Station to transfer an MPC to a Transportation Cask for transportation off-site. The Transfer Cask provides radiation shielding to minimize exposure rates during transfer operations. The Transfer Cask also functions as structural support during transfer operations.

The functions of the Transfer Cask are shielding and structural integrity. The Transfer Cask meets the requirements of Section 2.1, Criterion 1 and is therefore in scope for license renewal.

2.2.1.3 Concrete Cask

The Concrete Cask provides structural integrity, shielding, and natural circulation cooling for the MPC. The Concrete Cask also protects the MPC from weather and postulated environmental events and performs necessary security functions. The Concrete Cask is ventilated by internal air flow paths which allow decay heat to be removed by natural circulation from air inlets at the bottom to the air outlets in the top. ~~The functions of the Concrete Cask are to protect the MPC from weather and postulated environmental events, to provide heat transfer, to provide shielding, and to perform necessary security functions.~~ The Concrete Cask meets the requirements of Section 2.1, Criterion 1 and is therefore in scope for license renewal.

2.2.1.4 Spent Fuel Assemblies

The Trojan Storage System is designed to accommodate up to 24 PWR fuel assemblies, and depending on the MPC design, these assemblies may be classified as damaged fuel or fuel debris and stored in damaged fuel containers (DFCs). The PWR fuel is 17x17 designs by Westinghouse and Babcock and Wilcox. The detailed characteristics of the fuel are described in Table 3.1-1 of the Trojan ISFSI SAR (Ref. 1.2.1). The maximum initial enrichment is limited to 3.09wt %U^{235}, and the maximum assembly average burnup level is 42,000 MWd/MTU. The maximum decay heat per assembly is 0.725 kW.

The functions of the spent fuel assemblies are to provide shielding, confinement, structural integrity, and criticality control. The spent fuel assemblies meet the requirements of Section 2.1, Criterion 1 and are therefore in scope for license renewal.

2.2.1.5 ISFSI Pad (~~including~~consisting of Storage Pad and Service Pad)

The Trojan ISFSI ~~Storage~~ Pad is not an ITS part of the Trojan Storage System as approved by the Trojan ISFSI license, and as such, is not described in detail in the Trojan ISFSI SAR~~,~~ (see Section 4.2.1). The layout of the Trojan ISFSI Pad is shown in Figure 2.1-3 of the Trojan ISFSI SAR (Ref. 1.2.1)~~, Figure 2.1-3~~. The ISFSI Storage Pad is constructed of reinforced concrete including embedded electrical conduits. The pad supports 34 Trojan Storage Systems. The adjacent ISFSI Service Pad is ~~also~~ constructed of reinforced concrete. ~~Failure of the ISFSI Storage Pad or Service Pad would not prevent the stored casks from performing their intended function.~~ The ISFSI Pad does not perform an ITS function for any of the functions described in Section 2.1, Criterion 1. ~~, nor does~~ Gross failure of the pad could prevent

fulfillment of ~~an~~ the ITS function of Retrievability under Criterion 2 and the Pad is therefore ~~out of~~in scope for license renewal.

2.2.1.6 ISFSI Security Equipment

Trojan ISFSI security equipment is not part of the Trojan Storage System as approved by the Trojan ISFSI license, and as such, is not described in detail in the Trojan ISFSI SAR. The layout of the Trojan ISFSI Pad is shown in the Trojan ISFSI SAR (Ref. 1.2.1), Figure 2.1-3, which includes some of the ISFSI security equipment. The Trojan ISFSI has programs and procedures to ensure that ISFSI security equipment requirements are met, and failure of the ISFSI security equipment would not prevent the stored casks from performing their Intended Functions. The security equipment does not perform an ITS function for any of the functions described in Section 2.1, Criterion 1 nor does failure of the security equipment prevent fulfillment of an ITS function under Criterion 2. ~~and~~ ISFSI security equipment is therefore out of scope for license renewal.

2.2.1.7 Transfer Station (including Transfer Station Pad and Impact Limiter)

The Transfer Station is a fixed structure supported on a reinforced concrete mat foundation, placed directly on bedrock. An Impact Limiter is located directly below the MPC transfer position. The Impact Limiter is flush with the top of the Transfer Station ~~mat~~pad. The Impact Limiter is designed to provide defense-in-depth to ensure that the consequences of hypothetical drops of a loaded MPC into either a Concrete Cask or Transportation Cask are acceptable. The Transfer Station was tested with a ~~test~~ dummy MPC during initial loading operations at the ISFSI site, and will be used with the Transfer Cask when the MPCs are transported off-site. The Transfer Station provides lateral and vertical support that prevents the loaded Transfer Cask from falling or overturning during transfer operations. The function of the Transfer Station is to secure the Transfer Cask in position during MPC transfer operations. The Transfer Station Pad is ITS and is designed to have a structural function to support the Transfer Station under all normal and accident loads. The Transfer Station meets the requirements of Section 2.1, Criterion 1 and is therefore in scope for license renewal.

2.2.1.8 Fuel Transfer and Auxiliary Equipment

Auxiliary equipment previously used for loading MPCs and moving casks (e.g., drying system, air pad system, welding equipment, etc.) ~~are~~ is not included as part of the Trojan ISFSI license, and as such ~~are~~ is not described in detail in the Trojan ISFSI SAR. Fuel transfer equipment and auxiliary equipment are outside the scope of the 10 CFR 72 license renewal.

2.2.2 <u>SSCs Within the Scope of License Renewal</u>

The SSCs determined to be within the scope of renewal are the MPC (including Damaged Fuel Container, Failed Fuel Can, and Fuel Debris Process Can Capsule), Transfer Cask, Concrete Cask, Fuel Assemblies, ~~and~~ Transfer Station (including Transfer Pad and Impact Limiter), and ISFSI Pad as shown in Table 2-1 (new ISFSI SAR Table 9.7-1). Note that the fuel assembly hardware and cladding which supports the retrievability of the spent fuel are considered in scope. The subcomponents of the in-scope SSC and

their intended safety functions are identified in Table 2-2 through Table 2-~~6~~7 (new ISFSI SAR Tables 9.7-2 through 9.7-7).

2.2.3 SSCs Not Within the Scope of License Renewal

As shown in Table 2-1 (new ISFSI SAR Table 9.7-1), ~~the ISFSI Storage and Service Pads,~~ ISFSI Security Equipment~~,~~ and Fuel Transfer and Auxiliary Equipment do not meet the criteria for being within scope of license renewal. Note that, in accordance with Ref. 1.1.1, the fuel pellets within the assemblies are not considered in the original safety analysis, and are not relied on to meet retrievability or confinement functions.

2.3 REFERENCES

2.0.1 "Calvert Cliffs ISFSI License Renewal Application," ML102650247

2.1.1 Trojan ISFSI License, SNM-2509, Amendment 6

2.1.2 Trojan ISFSI Technical Specifications, Amendment 5

2.1.3 NRC SER for Trojan License SNM-2509, Amendment 6

2.2.1 HI-STORM 100 FSAR, HI-2002444, Revision 12

2.2.2 ~~"ITS Categorization of HI-STAR 100, HI-STORM 100, and Cask Transfer Facility System Components," HI-992332, Revision 22~~NUREG 1927, Revision 1, Section 2.4.2.

Table 2-1 – Summary of Scoping Evaluation Results
(new ISFSI SAR Table 9.7-1)

SSC	Scoping Results		In-Scope SSC
	Criterion 1[1]	Criterion 2[2]	
MPC (consisting of Damaged Fuel Container, Failed Fuel Can, and Fuel Debris Process Can Capsule)	Yes	N/A	Yes
Transfer Cask	Yes	N/A	Yes
Concrete Cask	Yes	N/A	Yes
Fuel Assembly	Yes[3]	N/A	Yes
ISFSI Pad (consisting of Storage and Service Pads)	No	~~No~~Yes	~~No~~Yes
ISFSI Security Equipment	No	No	No
Transfer Station (including Transfer Station Pad and Impact Limiter)	Yes	N/A	Yes
Fuel Transfer and Auxiliary Equipment	No	No	No

Notes:
(1) SSC is Important to Safety (ITS)
(2) SSC is Not Important to Safety, but its failure could prevent an ITS function from being fulfilled
(3) Fuel pellets not included

Table 2-2 – Intended Safety Functions of MPC Subcomponents
(new ISFSI SAR Table 9.7-2)

Item No.	Subcomponent	Drawing Part Number	Reference Drawing	Intended Function[1]
1	Shell	2,~~32~~17	3663	Confinement, Structural Integrity, Shielding, Heat Removal
2	Baseplate	1	3663	Confinement, Structural Integrity, Shielding, Heat Removal
3	Lid	8	3663	Confinement, Structural Integrity, Shielding, Heat Removal
4	Closure Ring	9	3663	Confinement
5	Port Cover Plates	13	3663	Confinement
6	Basket Cell Spacer Block	19	3490	~~Structural Integrity~~N/A
7	Basket Center Column	1	3490	Criticality Control
8	Basket Cell Plates	6,7,9,13,18	3490	Criticality Control, Structural Integrity, Heat Removal
9	Short Cell Spacer Plates	8	3490	~~N/A~~Criticality Control, Structural Integrity
10	Flux Gap Cover	11	3490	Criticality Control
11	Flux Gap Plate	12	3490	Criticality Control
12	Basket Cover Angle	17	3490	Criticality Control
13	Basket Cell Angle	2,5,10	3490	Criticality Control, Structural Integrity
14	Basket Cell Channel	14	3490	Criticality Control, Structural Integrity
15	Neutron Absorber	3,16	3490	Criticality Control
16	Drain and Vent Shield Block	10,16	3663	Shielding
17	Plugs for Drilled Holes	30	3663	~~Shielding~~N/A
18	Upper Fuel Spacer Pipe			Structural Integrity
19	Sheathing	4,15	3490	Structural Integrity
20	Shims	7	3663	Structural Integrity
21	Lift Lug	6	3663	N/A – used only with unloaded MPC
22	Lift Lug Baseplate	5	3663	N/A – used only with unloaded MPC
23	Upper Fuel Spacer Bolt			Structural Integrity
24	Upper Fuel Spacer End Plate			Structural Integrity
25	Lower Fuel Spacer Column	26	3663	Structural Integrity
26	Lower Fuel Spacer End Plate	25,27	3663	Structural Integrity
27	Vent Shield Block Spacer	17	3663	Structural Integrity
28	Vent and Drain Tube	11	3663	N/A[2]
29	Vent and Drain Cap	12	3663	N/A[2]
30	Vent and Drain Cap Seal Washer	18	3663	N/A

Table 2-2 – Intended Safety Functions of MPC Subcomponents
(new ISFSI SAR Table 9.7-2)

Item No.	Subcomponent	Drawing Part Number	Reference Drawing	Intended Function[1]
31	Vent and Drain ~~Cap Seal~~ Cap Screw	19	3663	N/A
32	Port Cover Plate Set Screw	20	3663	~~Confinement~~N/A
33	Coupling	14	3663	N/A
34	Drain Line	15	3663	N/A
35	Damaged Fuel Container		SAR Figure 4.2-5a	Criticality Control, Structural Integrity
36	Failed Fuel Cans		SAR Figure 4.2-5	Criticality Control, Structural Integrity
37	Drain Tube Plate	3	3663	N/A
38	Drain Line Guide Tube	4	3663	N/A
39	Fuel Debris Process Can Capsule		SAR Figure 4.2-6b	Confinement

Notes:

(1) Intended Functions are based on Section 2.1, Criterion 1 – Criticality control, heat transfer, radiation shielding, confinement, structural integrity, and retrievability. N/A means not applicable, where the subcomponent does not have a Criterion 1 function. See Ref. 2.2.2.

(2) Used during loading operations. Not relied on for Intended Functions described in Section 2.1 during storage.

Table 2-3 – Intended Safety Functions of Concrete Cask Subcomponents
(new ISFSI SAR Table 9.7-4)

Item No.	Subcomponent	Drawing Part Number	Reference Drawing[1]	Intended Function[2]
1	Cask Lid	1	PGE-002	Radiation Shielding, Structural Integrity
2	Cask Liner Shell	2	PGE-002	Radiation Shielding, Structural Integrity
3	Tile	3	PGE-002	Note 3
4	Bottom Plate Assembly	4	PGE-002	Structural Integrity
5	Reinforcement Bar	5	PGE-002	Structural Integrity
6	Concrete Shell	6	PGE-002	Radiation Shielding/ Structural Integrity
7	Transfer Cask Alignment Plates	7	PGE-002	N/A
8	Shield Ring	8	PGE-002	Radiation Shielding
9	Screen	9	PGE-002	N/A
10	Inlet Air Assembly	10	PGE-002	Heat Transfer[4]
11	Outlet Air Assembly	11	PGE-002	Heat Transfer[4]

Notes:

(1) Included in Appendix 1.A of the Trojan ISFSI SAR.

(2) Intended Functions are based on Section 2.1, Criterion 1 – Criticality control, heat transfer, radiation shielding, confinement, structural integrity, and retrievability. N/A means not applicable, where the subcomponent does not have a Criterion 1 function. See Ref. 2.2.2.

(3) This component does not have an Intended Function as described in Section 2.1, Criterion 1. However, it is credited for corrosion protection, and is described in the AMP as a preventive measure.

(4) Airflow path only.

Table 2-4 – Intended Safety Functions of Transfer Cask Subcomponents
(new ISFSI SAR Table 9.7-3)

Item No.	Subcomponent	Drawing Part Number	Reference Drawing	Intended Function[1]
1	Radial Lead Shield	2	3555	Shielding
2	Top Lid Shielding	54	3555	Shielding
3	Lead Fill Plug ~~for Lifting Holes~~	18	3555	Shielding
4	Outer Shell	3	3555	Structural Integrity, Shielding, Heat Removal
5	Inner Shell	1	3555	Structural Integrity Shielding, Heat Removal
6	Water Jacket End Plate	9	3555	Structural Integrity, Shielding
7	Top Flange	16	3555	Structural Integrity, Shielding
8	Water Jacket Shell	13, 14, 15	3555	Structural Integrity, Shielding
9	Water Jacket Bottom Ring	6	3555	Structural Integrity, Shielding
10	Water Jacket Top Plates	8	3555	Structural Integrity, Shielding
11	Water Jacket Trunnion Plate	11	3555	Structural Integrity, Shielding
12	Water Jacket Cap Plate	10	3555	Structural Integrity, Shielding
13	Top Lid Outer Ring	52	3555	Structural Integrity, Shielding
14	Top Lid Inner Ring	50	3555	Structural Integrity, Shielding
15	Top Lid Top Plate	53	3555	Structural Integrity, Shielding
16	Top Lid Bottom Plate	51	3555	Structural Integrity, Shielding
17	~~Lid Bolt~~ Row Not Used	~~17~~	~~3555~~	~~Structural Integrity~~
18	Lifting Trunnion Block	4	3555	Structural Integrity, Shielding
19	Lifting Trunnion	5	3555	Structural Integrity (during lifting for initial loading only)
20	Door Pins	37, 38	3555	N/A
21	Top Lid Lifting Block	55	3555	Structural Integrity, Shielding

Table 2-4 – Intended Safety Functions of Transfer Cask Subcomponents
(new ISFSI SAR Table 9.7-3)

Item No.	Subcomponent	Drawing Part Number	Reference Drawing	Intended Function[1]
22	Top Lid Stud (Top Lid Bolt)	17	3555	~~N/A~~Structural Integrity
23	Top Lid Nut (Top Lid Washer)	56	3555	~~N/A~~Structural Integrity
24	Drain Pipes	23, 24	3555	N/A
25	Couplings, Valves and Vent Plug	21, 22	3555	N/A
26	Rib Plates	7, 12	3555	Structural Integrity Shielding, Heat Removal
27	Water Jacket Port Cover Plate, Gasket and Screws	19, 20, 25	3555	~~Structural Integrity~~N/A
28	Door Lip	29	3555	~~N/A~~Structural Integrity
29	Door Top Plate	31	3555	Structural Integrity
30	Door Beam	32	3555	~~N/A~~Structural Integrity
31	Rail Bolt	49	3555	N/A
32	Door Top	34	3555	Structural Integrity
33	Door Top Plate Clevis	60	3555	N/A[2]
34	Door Stop Plate	62	3555	N/A[2]
35	Door Hex Bolt	63	3555	N/A[2]
36	Door Bottom	33	3555	Structural Integrity
37	Door Slide Plate	45	3555	N/A

Notes:

(1) Intended Functions are based on Section 2.1, Criterion 1 – Criticality control, heat transfer, radiation shielding, confinement, structural integrity, and retrievability. N/A means not applicable, where the subcomponent does not have a Criterion 1 function. See Ref. 2.2.2.

(2) Used during loading operations. Not relied on for Intended Functions described in Section 2.1 during storage and Transfer Station operations.

Table 2-5 – Intended Safety Functions of Spent Fuel Assembly Subcomponents
(new ISFSI SAR Table 9.7-5)

Item No.	Subcomponent	Intended Function[1]
1	Fuel Pellets	N/A
2	Fuel Cladding	Criticality Control, Confinement, Structural Integrity, Shielding, Retrievability
3	Spacer Grid Assemblies	Criticality Control, Structural Integrity, Shielding, Retrievability
4	Upper End Fitting	Structural Integrity, Retrievability
5	Lower End Fitting	Structural Integrity, Retrievability
6	Guide Tubes	Structural Integrity, Retrievability
7	Hold-down Spring & Upper End Plugs	N/A
8	Control Components	N/A

Notes:

(1) Intended Functions are based on Section 2.1, Criterion 1 – Criticality control, heat transfer, radiation shielding, confinement, structural integrity, and retrievability. N/A means not applicable, where the subcomponent does not have a Criterion 1 function. See Ref. 2.2.2.

Table 2-6 – Intended Safety Functions of Transfer Station Subcomponents (new ISFSI SAR Table 9.7-6)

Item	Subcomponent	Drawing Part Number	Reference Drawing[2]	Intended Function[1]
Transfer Station Structure				
1	Deck Plate	58	D-AI-100	N/A
2	Angle, ASTM A36	56, 57	D-AI-100	N/A
3	Bar, ASTM A36	54, 55	D-AI-100	N/A
4	Fastener, ASTM A325	23, 24, 25, 26, 27, 42, 53	D-AI-100	Structural Integrity
5	Fastener, ASTM A325	28, 52	D-AI-100	N/A
6	Fastener, ASTM A325	29, 30	D-AI-100	Retrievability
7	Fastener, ASTM A325	51	D-AI-100	Shielding, Retrievability
8	Concrete Stud Anchor	50	D-AI-100	N/A
9	Hydraulic System Assembly	49	D-AI-100 (D-AI-960-A1)	N/A[3]
10	Kick Plate	48	D-AI-100 (D-AI-315-5)	N/A[3]
11	Transfer Cask Restraint	47	D-AI-100 (D-AI-950-A4)	Retrievability[3]
12	Hex Nut, ASTM A194 Class 2H	36, 37, 44	D-AI-100	Structural Integrity
13	Hex Nut, ASTM A194 Class 2H	38	D-AI-100	Retrievability
14	Hex Nut, ASTM A194 Class 2H	46	D-AI-100	N/A
15	Hardened Flat Washer, ASTM F436	32, 33, 43	D-AI-100	Structural Integrity
16	Hardened Flat Washer, ASTM F436	34	D-AI-100	Retrievability
17	Hardened Flat Washer, ASTM F436	35	D-AI-100	N/A
18	Hardened Flat Washer, ASTM F436	45	D-AI-100	Retrievability
19	Shim Plate	41	D-AI-100 (D-AI-530-8)	Structural Integrity
20	Inside Upper Restraint	40	D-AI-100 (D-AI-530-A2)	Structural Integrity[5]
21	Hex Nut, ASTM A563 Grade A	39	D-AI-100	N/A
22	Fastener, ASTM A449	31	D-AI-100	N/A
23	Deck Plate	22	D-AI-100 (D-AI-315-A3)	N/A[3]
24	Hydraulic Cylinder	21	D-AI-100	N/A

Table 2-6 – Intended Safety Functions of Transfer Station Subcomponents (new ISFSI SAR Table 9.7-6)

Item	Subcomponent	Drawing Part Number	Reference Drawing[2]	Intended Function[1]
25	Upper Deck Ladder	20	D-AI-100 (D-AI-900-A3)	N/A[3]
26	Main Deck Ladder	19	D-AI-100 (D-AI-900-A1)	N/A[3]
27	Upper Restraints	18	D-AI-100 (D-AI-530-A1)	Structural Integrity[3]
28	Cross Brace, Left Hand	17	D-AI-100 (D-AI-520-A2)	Structural Integrity[3]
29	Cross Brace, Right Hand	16	D-AI-100 (D-AI-520-A1)	Structural Integrity[3]
30	Quadrapod Weldment, Right Side	15	D-AI-100 (D-AI-510-A3)	Structural Integrity[5]
31	Quadrapod Weldment, Left Side	14	D-AI-100 (D-AI-510-A2)	Structural Integrity[5]
32	Quadrapod Weldment, Back	13	D-AI-100 (D-AI-510-A1)	Structural Integrity[3]
33	Upper Deck	12	D-AI-100 (D-AI-400-A1)	N/A[3]
34	Adaptor Ring, Storage Cask	11	TNP1-M-DAI33033 Sheet 3 (Weldment A3)	Shielding, Retrievability[3]
35	Adaptor Ring, Transport Cask	10	TNP1-M-DAI33033 Sheet 3 (Weldment A2)	Shielding, Retrievability[3]
36	Shield Ring	9	D-AI-100 (D-AI-330-A1)	Shielding[3]
37	Handrail, Main Deck, Front & Back	8	D-AI-100 (D-AI-320-A3)	N/A[3]
38	Handrail, Main Deck, Left Side	7	D-AI-100 (D-AI-320-A2)	N/A[3]
39	Handrail, Main Deck, Right Side	6	D-AI-100 (D-AI-320-A1)	N/A[3]
40	Deck Plate	5	D-AI-100 (D-AI-315-A2)	N/A[3]
41	Deck Plate	4	D-AI-100 (D-AI-315-A1)	N/A[3]
42	Main Deck Structure	3	D-AI-100 (D-AI-310-A1)	Shielding, Structural Integrity[6]
43	Cylinder Bracket	2	D-AI-100 (D-AI-950-A1, A2)	Retrievability[3]
44	Alignment Stop	1	D-AI-100 (D-AI-950-A3)	Retrievability[3]

Table 2-6 – Intended Safety Functions of Transfer Station Subcomponents (new ISFSI SAR Table 9.7-6)

Item	Subcomponent	Drawing Part Number	Reference Drawing[2]	Intended Function[1]
Transfer Station Pad				
45	Threaded Rod, ASTM A193 GR B7	12	D-AI-200	Structural Integrity
46	Plate, ASTM A36	11	D-AI-200	Structural Integrity
47	Hex Jam Nut, ASTM A325	10	D-AI-200	Structural Integrity
48	Hex Nut, ASTM A194 Class 2H	9	D-AI-200	Structural Integrity
49	Hardened Washer, ASTM F436	8	D-AI-200	Structural Integrity
50	Concrete	7	D-AI-200	Structural Integrity
51	Not used	6	D-AI-200	N/A
52	Rebar or equivalent, ASTM A615 GR 60	5	D-AI-200	Structural Integrity
53	Plate, ASTM A36	4	D-AI-200	Structural Integrity
54	Grout	3	D-AI-200	N/A
55	Plate, ASTM A36	2	D-AI-200	Structural Integrity
56	Rebar, ASTM A615 GR 60	1	D-AI-200	Structural Integrity
Impact Limiter				
57	Plate, ASTM A36	N/A	C-3056	Structural Integrity
58	Sheet Metal, ASTM A-167 or A-240 Type 304	N/A	C-3056	N/A
59	Angle Iron, ASTM A-479 Type 304	N/A	C-3056	N/A
60	Polyurethane foam, General Plastics Last-A-Foam FR-3708	N/A	C-3056	Structural Integrity
61	Threaded Plug, carbon steel	N/A	C-3056	N/A

Notes:

(1) Intended Functions are based on Section 2.1, Criterion 1 – Criticality control, heat transfer, radiation shielding, confinement, structural integrity, and retrievability. N/A means not applicable, where the subcomponent does not have a Criterion 1 function. See Reference 2.2.2.

(2) Drawing D-AI-100 is the overall assembly drawing for the Transfer Station. Subassembly drawings referenced in D-AI-100, where applicable, are included in parentheses for reference.

(3) All items in the subassembly have the listed Intended Function(s).

(4) ~~Washers associated with the Shield Ring support brackets (D-AI-950-A1, A2) have an Intended Function of Shielding. The Intended Function of all other washers is classified as N/A.~~Not used.

(5) Item 10 on D-AI-530-A2, Item 11 on D-AI-510-A2, and Item 11 on D-AI-510-A3 are used during assembly of the Transfer Station, prior to its use with a fuel canister. Their Intended Function is classified as N/A. All other parts have an Intended Function of Structural Integrity.

(6) Items 8, 9, 10, 11, 12, and 13 on D-AI-310-A1 have an Intended Function of Shielding. All other parts have an Intended Function of Structural Integrity.

Table 2-7 – Intended Safety Functions of ISFSI Pad Subcomponents (new ISFSI SAR Table 9.7-7)

Item	Subcomponent	Drawing Part Number	Reference Drawing	Intended Function[1]
1	Concrete	N/A	I-C-001 R3	Retrievability[2]
2	Rebar, ASTM A615 Gr 60	N/A	I-C-001 R3	N/A
3	Engineered fill	N/A	I-C-001 R3	N/A
4	Conduit and electrical connectors	1-10	E-8100 R2	N/A

Notes:

(1) Intended Functions are based on Section 2.1, Criterion 1 – Criticality control, heat transfer, radiation shielding, confinement, structural integrity, and retrievability. N/A means not applicable, where the subcomponent does not have a Criterion 1 function. See Reference 2.2.2.

(2) The concrete is classified as Not Important to Safety, and so it does not have an Intended Function. However, gross failure of the concrete could affect the Intended Function of Retrievability.

CHAPTER 3: AGING MANAGEMENT REVIEWS

3.0 AGING MANAGEMENT REVIEWS

3.1 AGING MANAGEMENT REVIEW METHODOLOGY

The aging management review of the Trojan ISFSI provides an assessment of aging effects that could adversely affect the ability of in-scope SSCs to perform their Intended Functions during the renewal period. The aging management review process involves the following four major steps:

1. Identification of in-scope subcomponents requiring aging management review (Screening)
2. Identification of materials/environment
3. Identification of aging effects requiring management and aging mechanism
4. Determination of aging management activity required to manage the effects of aging (TLAA/AMP)

Each of these steps is described in the following sections.

3.1.1 Identification of In-Scope Subcomponents Requiring Aging Management Review

The scoping tables in Section 2 identify the subcomponents of SSCs that are in-scope for aging management, as well as their Intended Function. Subcomponents that perform or support any of the identified Intended Functions in a passive manner are determined to require an aging management review.

Those subcomponents that do not perform or support an Intended Function or are short-lived and periodically replaced are excluded from further evaluation in the aging management review with supporting justification. Items that already have their condition monitored at some established frequency have the existing condition monitoring incorporated into the aging management activities as much as possible to ensure consistency and the ability to trend collected data.

Tables 3-1 through 3-~~5~~6 (new ISFSI SAR Tables 9.7-7 through 9.7-12) identify the Intended Functions for the ISFSI subcomponents that require an aging management review. ISFSI subcomponents that do not require an aging management review are identified in Tables 2-2 through 2-~~6~~7 (new ISFSI SAR Tables 9.7-2 through 9.7-7) with "N/A," as they do not have any of the Intended Functions from Section 2.1, Criterion 1, nor do they support an ITS function of another component (Criterion 2).

3.1.2 Identification of Environments

The next step in the aging management review process is to identify the materials of construction for each of the subcomponents identified in the first scoping step, and the environments to which those materials are exposed during normal storage conditions. The materials of construction for these subcomponents are identified on the drawings listed in Tables 2-2, 2-3, 2-4, 2-6, and 2-7 (new ISFSI SAR

Tables 9.7-2, 9.7-4, 9.7-3, 9.7-6, and 9.7-7). The environments to which the materials are normally exposed are determined based on a review of the Trojan ISFSI SAR and site environmental information.

A generic description of the four basic environments is provided below:

3.1.2.1 Inert Gas

~~The~~ One inert gas environment ~~refers to~~is the inside of the MPC, which is backfilled with inert helium gas. Based on the vacuum drying process, the environment has negligible amounts of oxygen or moisture. The inert environment is exposed to the range of temperatures calculated for the MPC and significant radiation impacts from the stored fuel. Another inert gas environment is the inside of the Transfer Cask water jacket, which is backfilled with argon gas and sealed during long-term dry layup of the cask.

3.1.2.2 Sheltered Environment

The term sheltered environment refers to environments that may include ambient air, but are shielded from sunlight, rain, or wind exposure. One sheltered environment at the Trojan ISFSI is the annular space between the Concrete Cask and the MPC. The ambient air contains moisture, salinity, or other contaminants typical for the Trojan site. The temperature of the sheltered environment is within the ~~limits~~ range of the air temperature passing through the annular space.

Additionally, the term sheltered is used to refer to the interior of a storage building, such as the ISFSI Utility Building where the Transfer Cask is stored or the Trojan Warehouse where the Impact Limiter is stored. These buildings provide protection from direct sunlight, rain, and wind. However, the air in the buildings is not conditioned by HVAC equipment.

3.1.2.3 Embedded Environment

The embedded environment applies to materials that are embedded or sealed inside another material. Items in this environment include the internal metal items of the Concrete Cask and reinforcing bars embedded in the ISFSI Pad. The embedded items are exposed to the temperatures of the components in which they are embedded.

3.1.2.4 Exposed Environment

The term exposed environment is used for exterior surfaces that are exposed to direct sunlight, wind, rain, and other weather aspects. Items in an exposed environment at the Trojan ISFSI are the Concrete Casks and the Transfer Station. The exposed environment has temperature ranges equivalent to the Trojan site ambient temperature ranges, as described in the Trojan ISFSI SAR, Section 3.2.

A description of the subcomponent material of construction and environmental information is given in the following sections and summarized in Tables 3-1 through 3-~~5~~6 (new ISFSI SAR Tables 9.7-8 through 9.7-13).

3.1.3 Identification of Materials

The materials of construction of the Trojan ISFSI include stainless steel, carbon steel, concrete, and neutron absorber (Boral). The materials, design life, environmental compatibility and other items are described in detail in the Trojan ISFSI SAR, Section 4.8.

3.1.4 Identification of Aging Effects Requiring Management

After the materials and environments have been identified, the next step involves determining the aging effects requiring management. Aging effects requiring management during the renewed license period are those that could cause a loss of SSC intended safety function(s). If degradation of a subcomponent would be insufficient to cause a loss of function, or the relevant conditions do not exist at the Trojan ISFSI site for the aging effect to occur and propagate, then no aging management is required. These aging effects were determined based on the combination of materials and environments and a review of known literature, industry operating experience, and maintenance and inspection records. Both potential aging effects that could theoretically occur, as well as aging effects that have actually occurred based upon industry and Trojan operating experience, were considered.

Aging effects occur due to aging mechanisms. In order to manage aging effects, the aging mechanism that could be at work based on material and environment must be determined. Therefore, the aging management review process identifies both aging effects and the aging mechanism causing that effect. The aging effects and mechanisms for each SSC are described in the following sections, and broken down by subcomponent in Tables 3-1 through 3-~~5~~6.

3.1.5 Determination of Aging Management Activity Required to Manage Effects of Aging

The final step in the aging management review process is to determine the aging management activity or program to manage the effect of aging. Where possible, existing ISFSI programs and activities were credited to manage aging effects that could cause a loss of intended safety function during the renewed operating period.

As described in NUREG-1927 (Ref. 1.1.1), there are two options for managing aging effects on components: a time-limited aging analysis (TLAA) or an aging management program (AMP). A TLAA is a calculation that meets the six attributes defined in 10 CFR 72.3, and an AMP is a program defined to address aging effects with ten specific elements as defined in NUREG-1927.

3.1.6 Operating Experience Review for Process Confirmation

Industry and plant-specific operating experience for the Trojan ISFSI was also reviewed in order to confirm that the previously identified aging mechanisms are applicable to the ISFSI system, as well as to identify any aging effects that were not previously addressed.

3.1.6.1 Canister and Cask Degradation

The Trojan ISFSI has operating experience with external inspections of ~~the~~ all Concrete Casks, and internal inspections of one Concrete Cask ~~and MPCs~~. The Trojan ISFSI SAR requires a "Concrete Cask Interior" inspection on a five-year interval. Based on loading dates, the first ~~two~~ three inspections were performed in 2008, ~~and~~ 2013, and 2018. The inspections were performed on the Concrete Cask storing the first MPC loaded at Trojan. The scope ~~of the inspection~~ included visual inspection of the full inlet and outlet vents, visual inspection of the interior concrete liner, and opportunistic visual inspection of the MPC surface. The third inspection used improved video inspection and robotic conveyance equipment to provide ASME VT-1 video resolution, clear and stable video recordings and still photos of accessible MPC surfaces (including circumferential and vertical welds), and measurement of normal fabrication markings as detailed in Appendix D: Pre-Application/Baseline Inspections. Trojan has developed procedures and equipment to perform these inspections, and has submitted summaries of the inspection to the NRC (Refs. 3.1.1, ~~and~~ 3.1.2, and 3.1.5). These inspections showed that ~~Trojan~~ personnel were able to successfully inspect the interior of the Concrete Cask with relatively low operational doses. The ~~first two~~ inspections have shown ~~showed~~ no evidence of aging degradation on the internal liner, the vent assemblies, or the exterior of the MPC. The experience from these inspections has been utilized to develop the AMPs for the interior of the Concrete Cask and exterior of the MPC.

3.1.6.2 Fuel Assembly Degradation

The potential degradation mechanisms identified for the spent nuclear fuel assemblies include oxidation, corrosion, cladding creep, cladding annealing, and hydride redistribution and reorientation within the cladding. The Trojan ISFSI only contains low burnup fuel assemblies (assemblies with an average burnup level less than 45,000 MWd/MTU).

Oxidation of the zircaloy fuel cladding and the irradiated fuel pellets can occur if the fuel is exposed to air, causing the pellets to swell and potentially impact the fuel cladding. Excessive oxidation of the fuel cladding, combined with internal stress, could cause a fuel cladding breach. For low burnup fuel assemblies, such as those stored in the Trojan ISFSI, NUREG/CR-6831 (Ref. 3.1.3) suggests that degradation of the fuel cladding will not occur during initial storage and will not occur during extended storage if the inert atmosphere is maintained. The integrity of the MPC containment boundary maintains the inert environment and prevents oxidation of the fuel. Oxidation is therefore not considered a credible degradation mechanism.

Corrosion of the fuel assembly components can only occur if they are exposed to moisture during the storage period. However, residual water within the MPC is limited to very low levels through the vacuum drying process, which requires that the MPCs were dried as described in the technical specifications. Therefore, no significant amount of moisture is within the MPC cavity during extended storage, and water ingress is considered to not be credible due to the MPC confinement boundary, which is managed as described below. Therefore, there are no credible corrosion mechanisms of the fuel assembly subcomponents.

The rate of creep in fuel cladding is a function of the cladding temperature and hoop stress, with creep exceeding 1.0% strain potentially causing gross rupture. However, as discussed in ISG-11 (Ref. 3.1.4), creep will not cause gross rupture if the cladding temperatures do not exceed 752°F (400°C) during loading or storage. Cladding creep is not likely to be a significant effect over the extended storage period, since the rate of creep is a strong function of temperature, and the cladding temperatures that occur after 20 years in dry storage are relatively low and decrease over time, as described in the TLAA referenced in Section 3.~~7~~8.

Extended exposure to elevated temperature may also result in annealing of the fuel rod cladding, which could impact its structural properties. However, examination of low burnup fuel rods, described in NUREG/CR-6831 (Ref. 3.1.3), showed that very little cladding annealing occurred over the first 15 years of dry storage. Therefore, cladding annealing is not considered to be a significant degradation mechanism that needs to be addressed for extended storage.

Hydride redistribution and reorientation can occur in cladding during high temperature, high hoop stress scenarios such as vacuum drying, which could adversely affect the structural properties of the cladding. Per ISG-11 (Ref. 3.1.4), significant hydride re-orientation is not expected to occur in low burnup fuel assemblies, and this is supported by the examination of low burnup fuel after 15 years as documented in NUREG/CR-6831. The Trojan ISFSI SAR, Section 4.2.6.1, limits fuel cladding temperatures to approximately 647°F (340°C) for normal conditions and 1058°F (570°C) for off-normal and accident limits. These limits are in accordance with those set forth in ISG-11. Therefore, for the low burnup fuel stored at the Trojan ISFSI, hydride redistribution and reorientation are not considered to be credible during extended storage.

3.2 AGING MANAGEMENT REVIEW RESULTS – MPC

This section provides the results of the aging management review of the MPC, which was determined to be in the scope of license renewal as identified in Section 2.2.2.

A summary of the results of the aging management review for the MPC subcomponents is provided in Table 3-1 (new ISFSI SAR Table 9.7-8). The table provides the following information related to each subcomponent determined to require aging management review: the Intended Function, the material group, the environment, the aging effects requiring management, the aging mechanism, and the specific aging management activities that manage those aging effects. The table also identifies subcomponents that did not support, or whose failure would not compromise, the SSC intended safety function(s) and were, therefore, not subjected to further aging management review.

A description of the MPC subcomponents that support an SSC Intended Function is provided in Subsection 3.2.1, and a summary of the materials and environments for the MPCs is provided in Subsections 3.2.2 and 3.2.3, respectively. Subsection 3.2.4 references any TLAA for the MPC during storage. Subsections 3.2.5 and 3.2.6 provide a discussion of the aging effects requiring management for the applicable MPC subcomponents, if any, and any aging management activities used to manage the effects of aging.

3.2.1 Description of MPC Subcomponents

Each MPC serves as the confinement vessel during transfer and storage operations. Each MPC is sized to hold 24 PWR fuel assemblies.

3.2.1.1 MPC Enclosure Vessel

The MPC enclosure vessel is a welded cylindrical structure which provides the confinement boundary for the stored fuel. The confinement boundary consists of the MPC baseplate, shell, lid, port covers, and closure ring. The confinement boundary is a strength-welded enclosure of all stainless steel construction. The top end of the MPC incorporates a redundant closure system. The MPC lid is a circular plate edge-welded to the MPC outer shell. The lid is equipped with vent and drain ports that were utilized to remove moisture and air from the MPC and backfill the MPC with a specified amount of inert gas (helium). The vent and drain ports were covered and seal-welded before the closure ring was installed. The closure ring is a circular ring edge-welded to the MPC shell and lid. The MPC lid provides sufficient rigidity to allow the entire MPC loaded with spent nuclear fuel to be lifted by threaded holes in the MPC lid.

Lifting lugs attached to the inside surface of the MPC canister shell served to permit placement of the empty MPC into the Transfer Cask. The lifting lugs also served to axially locate the MPC lid prior to welding. These internal lifting lugs are not used to handle a loaded MPC. Since the MPC lid is installed prior to any handling of a loaded MPC, there is no access to the lifting lugs once the MPC is loaded.

3.2.1.2 MPC Fuel Basket

Within each enclosure vessel is a honeycombed fuel basket which contains spent nuclear fuel assemblies. The basket has neutron absorber panels that are completely enclosed in stainless steel sheathing that is stitch welded to the MPC basket cell walls along their entire periphery. The MPC-24E and MPC-24EF have fuel storage cells that are physically separated from one another by a flux trap for criticality control. Formed angles are interposed onto the orthogonally configured plate assemblage to create the required flux trap channels. The cross section of the fuel basket simulates a multi-flanged closed section beam, resulting in extremely high bending rigidity. The principal structural frame of the basket consists of co-planar plate-type members (i.e., no offset).

The MPC fuel basket is positioned and supported within the MPC shell by a set of basket supports welded to the inside of the MPC shell. The MPC basket (and cavity) height is based on the maximum height fuel assemblies (i.e., those assemblies containing RCCAs). For those assemblies without RCCAs, the MPC design includes a stainless steel lower spacer to maintain the proper axial position of the fuel assemblies in the basket.

3.2.1.3 Damaged Fuel Container/Failed Fuel Can

Both the Failed Fuel Can and Damaged Fuel Container are designed to contain partial or complete fuel assemblies with damaged or suspect rods. The internal square opening accommodates a fuel assembly without RCCA inserts. The Failed Fuel Can is designed for storage of a fuel rod storage container, fuel

debris Process Can Capsules, fuel assembly metal fragments (e.g., portions of fuel rods, grid assemblies, bottom nozzles, etc.), and fuel debris Process Cans that contain fuel debris and fuel assembly metal fragments. The outside dimensions allow the Failed Fuel Can or Damaged Fuel Container to fit in one of the four oversized storage locations within an MPC.

The shells and lids of both the Failed Fuel Can and the Damaged Fuel Container were fabricated from stainless steel. On the bottom of the shell assemblies and in the lids are screened vent holes. The shells contain four holes on the Failed Fuel Can and five on the Damaged Fuel Container. The lids contain four holes for both the Failed Fuel Can and the Damaged Fuel Container. These vent holes enabled moisture removal from the canister. The vent holes also expose the contents of the Failed Fuel Can or Damaged Fuel Container to the helium atmosphere of the MPC.

3.2.1.4 Fuel Debris Process Can Capsule

The primary function of the Fuel Debris Process Can Capsule is to provide a confinement boundary for fuel debris processed during the Trojan Fuel Debris Processing Project. The Fuel Debris Process Can Capsule is constructed of 304 stainless steel for corrosion resistance and is inerted with helium. The Fuel Debris Process Can Capsule is structurally analyzed for external pressure, internal pressure, dead weight, thermal stresses, and drops.

3.2.2 MPC Subcomponent Materials

The materials of construction for MPC subcomponents that are subject to further aging management review are stainless steel and Boral™ neutron absorber. The material type of each MPC subcomponent is identified in Table 3-1 (new ISFSI SAR Table 9.7-8).

3.2.3 MPC Subcomponents Environments

The environments that affect the subcomponents of each MPC, both externally and internally, are described below.

3.2.3.1 External

Each MPC is stored in a vertical, ventilated Concrete Cask. Based on this, the external surface of each MPC is exposed to the same environment as the inside of the Concrete Cask (described in Section 3.4.3), which is a sheltered environment protected from precipitation and wetting. This sheltered environment includes ambient air, but not direct sunlight, rain, or wind exposure. The ambient air may contain some moisture and contaminants. The normal operating temperature of the outside MPC surface is highest at the top, and is described in Table 4.2-12 of Ref. 1.2.1. These maximum surface temperatures are assumed to continue into the license renewal period.

3.2.3.2 Internal

The internal subcomponents of the MPC are all exposed to the inert gas (helium) environment inside the MPC. The temperature of this gas ranges from the highest value at the maximum canister heat load, to as low as ambient air temperature as the heat load reduces over time. The gas pressure inside the MPC

is described in Table 4.2-9 of Ref. 1.2.1. There is very limited oxygen or moisture within the MPC due to the vacuum drying process. Additionally, the internal MPC components are exposed to significant gamma and neutron radiation.

3.2.4 TLAA for MPCs

Section 3.~~7~~8 describes the findings of the TLAAs related to the Trojan ISFSI. For the MPC, there is a fatigue evaluation, neutron absorber depletion evaluation, and a radiation effects analysis.

3.2.5 Aging Effects Requiring Management for MPC

Based on the MPC materials of construction and the environments experienced during the period of extended storage at the ISFSI, the aging effects requiring management are loss of material (due to corrosion, pitting, and crevice corrosion)~~,~~ and cracking (due to ~~corrosion and~~ stress corrosion cracking on the external MPC surfaces)~~ and radiation effects on the neutron absorber and steel components~~.

3.2.6 Aging Management Programs for MPC

Based on the aging management review of the MPC subcomponents documented in Table 3-1 (new ISFSI SAR Table 9.7-8), an AMP is required for the aging management activities of the MPC and TLAAs are required as described above. These aging management activities are discussed in detail in Sections 3.~~7~~8 and 3.~~8~~9.

3.3 AGING MANAGEMENT REVIEW RESULTS – TRANSFER CASK

This section provides the results of the aging management review of the Transfer Cask, which was determined to be in the scope of license renewal as identified in Section 2.2.2.

A summary of the results of the aging management review for the Transfer Cask subcomponents is provided in Table 3-2 (new ISFSI SAR Table 9.7-9). The table provides the following information related to each subcomponent determined to require aging management review: the Intended Function, the material group, the environment, the aging effects requiring management, the aging mechanism, and the specific aging management activities that manage those aging effects. The table also identifies subcomponents that did not support, or whose failure would not compromise, the SSC intended safety function(s) and were, therefore, not subjected to further aging management review.

A description of the Transfer Cask subcomponents that support an SSC intended safety function is provided in Subsection 3.3.1, and a summary of the materials and environments for the Transfer Cask is provided in Subsections 3.3.2 and 3.3.3, respectively. Subsection 3.3.4 references any TLAA for the Transfer Cask during storage. Subsections 3.3.5 and 3.3.6 provide a discussion of the aging effects requiring management for the applicable Transfer Cask subcomponents, and any aging management activities used to manage the effects of aging.

3.3.1 Description of Transfer Cask Subcomponents

The Transfer Cask was required for initial cask loading, and will be required at the Transfer Station for transferring the MPC from the Concrete Cask into the Transportation Cask. The Transfer Cask uses lead for gamma radiation shielding and a water-filled jacket for neutron shielding. The Transfer Cask is designed for use in conjunction with the Transfer Station at the ISFSI to temporarily hold the MPC during transfer into and out of Concrete Casks or Transportation Casks. The Transfer Cask is no longer used as a lifting device.

The Transfer Cask is a cylindrical steel weldment designed in accordance with ASME Section III, Subsection NF, with approved alternatives as listed in Table 4.2-1a of the Trojan ISFSI SAR (Ref. 1.2.1). The lifting trunnions on the Transfer Cask ~~are~~ were designated as special lifting devices designed and fabricated in accordance with the guidance of NUREG-0612 (Ref. 3.3.1) and ANSI N14.6 (Ref. 3.3.2). The Transfer Cask provides the necessary shielding to reduce the radiation dose to Trojan plant personnel in accordance with ALARA principles.

The Trojan Transfer Cask design is similar to the Holtec HI-TRAC 100, with moveable shield doors at the lower end and a top lid with a hole in the center. The hole allows for lifting sling access to raise or lower the contained MPC. The cylindrical wall of the Transfer Cask consists of various material layers. The inner and outer shells are made of steel. Sandwiched between the steel shells is a thickness of lead. A water jacket welded to the outer shell wall of the Transfer Cask provides neutron shielding. The moveable shield doors at the lower end allow lowering of the MPC into the Concrete Cask or the Transportation Cask. The doors slide in steel guides along each side of the Transfer Cask. Mechanical stops are used to prevent inadvertent opening of the doors. Hydraulic pistons are used to open the doors for the MPC transfer. The top lid of the Transfer Cask extends over the MPC to provide shielding and to prevent the MPC from being inadvertently lifted out of the top of the Transfer Cask.

In the Trojan Fuel Building, which has been demolished, the Transfer Cask was lifted from above via two lifting trunnions located on the outer shell. The lifting trunnions consist of a threaded cylindrical trunnion screwed into a trunnion block that is welded to the inner and outer shell of the Transfer Cask. It is important to note that the trunnions are not used for transfer now that the canisters have been loaded and stored. The trunnions are only used to lift an empty Transfer Cask when installing it in, or removing it from, the Transfer Station. This procedure never takes place over a loaded MPC. The support for the Transfer Cask during transfer is provided by the Transfer Station, as described in Section 3.6.

3.3.2 Transfer Cask Subcomponent Materials

The Transfer Cask structure is fabricated from carbon steel. Other materials included in the Transfer Cask design are Holtite™ (in the top lid for neutron shielding); elemental lead (in the cask wall for gamma shielding); aluminum (in the hydraulic actuator bar used for the moving bottom doors) and brass, bronze, and stainless steel appurtenances (pressure relief valves, drain tube, etc.). A description of materials is provided on the Transfer Cask drawing in Chapter 1 of the Trojan ISFSI SAR (Ref. 1.2.1). The Holtite and lead shielding materials are completely enclosed by the top lid and cask wall

construction, respectively. Therefore, there will be no significant galvanic or chemical reactions~~,~~ between these shielding materials and the air or borated water. The carbon steel components of the Transfer Cask are coated with an epoxy-based material suitable for borated water service, as follows:

- Primer – Keeler & Long, 6548/7107 White Epoxy Primer
- Top Coat – Keeler & Long, E-1-7155 Epoxy Enamel

The Transfer Cask coating prevents corrosion and aids in surface decontamination. Sealing surfaces, wear surfaces, gap flush supply line inner surfaces, threaded holes, plugs, and seals are not coated since the coating could affect their ability to perform their design functions.

The material type of each Transfer Cask subcomponent is identified in Table 3-2 (new ISFSI SAR Table 9.7-9).

3.3.3 Transfer Cask Subcomponents Environments

The exterior of the Transfer Cask was exposed to borated water during fuel loading (while the Transfer Cask was in the SFP), and to demineralized water in the annulus between the MPC and inner cavity wall of the Transfer Cask when cleaned. The Transfer Cask water jacket cavity was exposed to potable (non-borated) water during fuel loading operations. Following fuel loading of the MPC, the Transfer Cask was removed from the SFP. The external surfaces were then decontaminated and rinsed with demineralized water. The annulus water was removed following welding of the lid to the MPC, purging of the water in the MPC, drying, and backfilling with helium. The water jacket water was drained into a temporary storage container for re-use with the next MPC.

During transfer to and loading operations at the ISFSI, the Transfer Cask is briefly exposed to outside ambient conditions.

The brief exposure of the Transfer Cask to borated,~~ and~~ demineralized, and potable water while in the Auxiliary Building, and to the outside environment during transfer/loading operations, does not contribute to the aging of the Transfer Cask materials during the renewal period. It is the prolonged or frequently recurring exposure to environmental conditions and stresses that must be evaluated for aging effects, such as those encountered during storage or staging prior to use for MPC transfers.

The ~~environment to which the~~ Transfer Cask is exposed to a Sheltered environment in the ISFSI Utility Building during storage and staging prior to and between infrequent use for MPC transfers~~ is sheltered~~. The Transfer Cask water jacket cavity is exposed to an Inert Gas environment during long term storage in the Utility Building. The water jacket cavity will be exposed to an Embedded environment (intermittent periods filled with water and with air) during future MPC transfers.

3.3.4 TLAA for Transfer Cask

Section 3.~~7~~8 describes the findings of the TLAAs related to the Trojan ISFSI. For the Transfer Cask, a fatigue evaluation is necessary.

3.3.5 Aging Effects Requiring Management for Transfer Cask

Based on a review of the Transfer Cask materials of construction and the environments experienced during the period of extended storage at the ISFSI, the aging effect requiring management is loss of material due to corrosion pitting and crevice corrosion. As stated above, the Transfer Cask was previously used during loading, but the brief exposure to water does not contribute to the aging.

3.3.6 Aging Management Activities for Transfer Cask

Based on the aging management review of the Transfer Cask subcomponents documented in Table 3-2 (new ISFSI SAR Table 9.7-9), the aging management activities required for the Transfer Cask are an AMP for the Transfer Cask, and the TLAA as described in Section 3.3.4. These aging management activities are discussed in detail in Section 3.~~8~~9.

3.4 AGING MANAGEMENT REVIEW RESULTS – CONCRETE CASK

This section provides the results of the aging management review of the Concrete Cask, which was determined to be in the scope of license renewal as identified in Section 2.2.2.

A summary of the results of the aging management review for the Concrete Cask subcomponents is provided in Table 3-3 (new ISFSI SAR Table 9.7-10). The table provides the following information related to each subcomponent determined to require aging management review: the Intended Function, the material group, the environment, the aging effects requiring management, the aging mechanism, and the specific aging management activities that manage those aging effects. The table also identifies subcomponents that did not support, or whose failure would not compromise, the SSC intended safety function(s) and were, therefore, not subjected to further aging management review.

A description of the Concrete Cask subcomponents that support an SSC Intended Function is provided in Subsection 3.4.1, and a summary of the materials and environments for the Concrete Cask is provided in Subsections 3.4.2 and 3.4.3, respectively. Subsection 3.4.4 references TLAAs for the Concrete Cask during storage. Subsections 3.4.5 and 3.4.6 provide a discussion of the aging effects requiring management for the applicable Concrete Cask subcomponents, and aging management activities used to manage the effects of aging.

3.4.1 Description of Concrete Cask Subcomponents

The Concrete Cask provides structural support, shielding, and natural circulation cooling for the MPC. The Concrete Cask is ventilated by internal air flow paths which allow the decay heat to be removed by natural circulation around the metal MPC wall. An air flow path is formed by the openings at the bottom (air entrance), the air inlet ducts, the gap between the MPC exterior and the Concrete Cask interior, and the air outlet ducts at the top. A temperature monitoring device located in each of the four air outlets in each Concrete Cask provides indication of proper decay heat removal. The air inlet and outlet vents are steel lined penetrations that take non-planar paths to minimize radiation streaming. A shield ring is provided over the MPC-liner annulus to reduce the dose rate at the top of the

Concrete Cask. Side surface radiation dose rates are limited by the thick steel and concrete walls of the Concrete Cask.

The Concrete Cask is a reinforced concrete cylinder designed to the requirements of ACI-349 (Ref. 3.4.1) and constructed to ACI-318 (Ref. 3.4.2). The concrete is Type II Portland Cement, 145 pcf, 4000 psi concrete. Outer and inner re-bar cages are formed by vertical hook bars and horizontal ring bars. The internal cavity of the Concrete Cask is formed by a coated steel liner and bottom plate. The steel and concrete walls of the Concrete Cask are designed to minimize side surface radiation dose rates. The steel liner is coated to promote radiant heat dissipation and to minimize corrosion. The concrete mix used to fabricate the Concrete Casks is intended to allow satisfactory long-term concrete temperatures which bound the calculated values for the Trojan ISFSI (Table 4.2-12 of Ref. 1.2.1).

The Concrete Cask lid is fabricated from a steel plate which provides additional shielding to reduce the skyshine radiation. The Concrete Cask lid also provides a cover and seal to protect the MPC from the environment and postulated tornado missiles. The lid is bolted in place and is provided with a locking wire with a lead seal. The bottom of the Concrete Cask is covered with a steel plate which minimizes loss of cask concrete during a bottom drop accident. The Concrete Cask has ~~reinforced~~ chamfered corners at the top and bottom to minimize damage during handling.

3.4.2 Concrete Cask Subcomponent Materials

The Concrete Cask structure is fabricated from a coated carbon steel liner and bottom plate. Outer and inner re-bar cages are formed by vertical hook bars and horizontal ring bars. The Concrete Cask was constructed by ~~pouring~~ placing concrete between a re-usable outer form and the inner metal liner. The reinforcing bars and air flow embedments were installed and tied prior to pouring. ~~The coating that has been applied to the carbon steel components of the Trojan Concrete Casks is Carboline Carbozinc 11 VOC.~~

The concrete in the cask shell is in direct contact with carbon steel through reinforcing bars, liner assembly, etc., and stainless steel through the inlet screens, nameplate, etc. Concrete has been used with carbon and stainless steels in many commercial applications including Reactor Containment Buildings (e.g., carbon steel reinforcement, stainless steel liner). No adverse chemical or galvanic interactions are anticipated in this application. Similarly, as concrete is a standard construction material used for civil projects such as dams, buildings, and bridges that are exposed to severe environmental conditions, no adverse concrete reactions associated with weather are anticipated.

Carbon steel surfaces on the cask that would otherwise be exposed to ambient conditions (such as the cask liner, lid, etc.) have been coated with Carboline Carbozinc 11 VOC, an inorganic zinc-rich coating that provides galvanic protection against corrosion of the steel. Consequently, significant steel corrosion is not anticipated. No stainless steel surfaces in the cask other than small nonstructural fasteners are in direct contact with carbon steel parts used elsewhere in the cask (see Table 3-3 [new ISFSI SAR Table 9.7-10] for subcomponent materials). The coating is also in direct contact with carbon steel, concrete (at the periphery of the liner) and galvanized carbon steel (in the lid bolts). This coating has been used in nuclear applications and has no significant chemical interaction with concrete. The

galvanized lid bolts are close in galvanic potential to the zinc-rich coating and no significant interaction is anticipated. In order to prevent the carbon steel liner from coming in direct contact with the stainless steel MPC baseplate, ceramic tiles are arranged around the liner base to act as an insulator between the two steels. Therefore, no galvanic interaction between carbon and stainless steels is anticipated during the extended storage period.

Some stainless steel parts such as the inlet air screens will be exposed to ambient conditions. However, due to the chemical nature of stainless steels, no significant chemical or galvanic reactions with moist air, rain, etc., are anticipated during the extended storage period.

The material type of each Concrete Cask subcomponent is identified in Table 3-3 (new ISFSI SAR Table 9.7-10).

3.4.3 Concrete Cask Subcomponents Environments

The Concrete Casks are located outdoors at the Trojan ISFSI site. The environment for the Concrete Casks is bounded by the extreme winter and summer conditions which are described in Table 2.7-1 of Ref. 1.2.1. The interior components of the Concrete Cask (inner liner, bottom plate, inlet air assembly, outlet air assembly, shield ring, and tile) are exposed to a sheltered environment. This environment includes ambient air through the air passages, but does not include sunlight, rain, or wind exposure. The ambient air may contain moisture, salinity, or other contaminants.

The metal components of the Concrete Cask that are in contact with concrete, such as the outer surfaces of the liner shell, bottom surface of the bottom plate, concrete-side surfaces of the inlet and outlet air assemblies, and the rebar in the concrete, are considered to be in an embedded environment. The primary concern for embedded environments is the potential chemical reaction between the two materials. The interactions between materials of the Concrete Cask subcomponents are described in Section 3.4.2, and are not considered to be of concern for the extended storage period.

The exterior surfaces of the Concrete Cask are exposed to all weather-related effects, including sunlight, wind, rain, snow, ice, and ambient air at the Trojan ISFSI site, and are considered to be in an exposed environment. Additionally, the Concrete Cask is exposed to radiation from the MPC stored inside.

The environment for each subcomponent of the Concrete Cask is given in Table 3-3 (new ISFSI SAR Table 9.7-10).

3.4.4 TLAA for Concrete Cask

Section 3.~~7~~8 describes the findings of the TLAAs related to the Trojan ISFSI. A radiation effects evaluation for the Concrete Cask is performed, as described in Section 3.~~7~~8.3.

3.4.5 Aging Effects Requiring Management for Concrete Cask

Based on a review of the Concrete Cask materials of construction and the environments experienced during the period of extended storage at the ISFSI the aging effects requiring management are loss of

material due to corrosion, ~~loss of fracture toughness (due to radiation impacts) for the metal components,~~ and concrete aging ~~issues~~ effects (loss of strength, spalling, cracking, and scaling) caused by corrosion of embedded reinforcing steel, freeze-thaw cycles, alkali-silica reaction, and/or calcium hydroxide leaching.

3.4.6 Aging Management Activities for Concrete Cask

Based on the aging management review of the Concrete Cask subcomponents documented in Table 3-3 (new ISFSI SAR Table 9.7-10), the aging management activities required for the Concrete Cask are an AMP for the Concrete Cask. These aging management activities are discussed in detail in Section 3.~~8~~9. For those components potentially impacted by radiation, the radiation impacts have been evaluated and no additional aging management activities beyond those in the Concrete Cask AMP are needed. This radiation analysis is not a TLAA by definition since it was not part of the initial licensing basis; however, it provides valuable information for AMP development.

3.5 AGING MANAGEMENT REVIEW RESULTS – FUEL ASSEMBLY

This section provides the results of the aging management review of the fuel assemblies, which were determined to be in the scope of license renewal as identified in Section 2.2.2.

A summary of the results of the aging management review for the fuel assembly subcomponents is provided in Table 3-4 (new ISFSI SAR Table 9.7-11). The table provides the following information related to each subcomponent determined to require aging management review: the Intended Function, the material group, the environment, the aging effects requiring management, the aging mechanism, and the specific aging management activities that manage those aging effects. The table also identifies subcomponents that did not support, or whose failure would not compromise, the SSC intended safety function(s) and were, therefore, not subjected to further aging management review.

A description of the fuel assembly subcomponents that support an SSC Intended Function is provided in Subsection 3.5.1, and a summary of the materials and environments for the fuel assembly is provided in Subsections 3.5.2 and 3.5.3, respectively. Subsection 3.5.4 references any TLAA for the fuel assembly during storage. Subsections 3.5.5 and 3.5.6 provide a discussion of the aging effects requiring management for the applicable fuel assembly subcomponents, if any, and any aging management activities used to manage the effects of aging.

3.5.1 Description of Fuel Assembly Subcomponents

Each MPC is designed to contain 24 PWR irradiated fuel assemblies with the specifications shown in Table 3-~~6~~7. Full details of all the fuel stored in the Trojan MPCs are given in Table 3.1-2 of Ref. 1.2.1. No high burnup fuel is stored in the Trojan MPCs.

The Intended Functions of the fuel assemblies include criticality control, radiation shielding, confinement, and structural integrity. The geometry of the fuel assembly is a factor in the criticality model. The fuel cladding provides a confinement barrier, and its structural integrity is necessary to maintain a favorable geometry and to support potential retrieval. After fuel loading and MPC drying~~,~~

the fuel assemblies are not moderated, assuring subcriticality during subsequent operations and configurations. The fuel assembly principal function during dry storage is to maintain proper geometry and position of radioactive material through confinement.

The fuel pellets, hold-down springs and upper end plugs, and control components were excluded from further aging management review because they do not support or impact the Intended Function of the fuel assemblies during the extended storage period.

3.5.2 Fuel Assembly Subcomponent Materials

The fuel assembly subcomponents included in the aging management review are made from Zircaloy, stainless steel, and/or Inconel materials.

The material type of each fuel assembly subcomponent is identified in Table 3-4 (new ISFSI SAR Table 9.7-11).

3.5.3 Fuel Assembly Subcomponents Environments

The fuel assembly environment refers to the internal MPC atmosphere. The MPC is dried and backfilled with helium gas according to the Trojan ISFSI Technical Specifications. During initial cask loading, the long-term temperature of the fuel cladding was limited to 647°F with short-term temperature limits of 1058°F (Section 4.2.6.1 of Ref. 1.2.1).

The environment for each subcomponent of the fuel assembly is given in Table 3-4 (new ISFSI SAR Table 9.7-11).

3.5.4 TLAA for Fuel Assemblies

Section 3.~~7~~8 describes the findings of the TLAAs related to the Trojan ISFSI. For the fuel assemblies, the TLAA is the cladding integrity evaluation.

3.5.5 Aging Effects Requiring Management for Fuel Assemblies

The fuel assemblies are in an inert gas environment, and therefore there are very few aging effects on the fuel assembly subcomponents, as described in Section 3.1.6.2. Additionally, the Trojan ISFSI does not store any high burnup fuel, and therefore the cladding is not susceptible to hydrogen embrittlement and radial hydride formation aging mechanisms, as discussed in NRC ISG-11 (Ref. 3.1.4).

3.5.6 Aging Management Activities for Fuel Assemblies

Based on the aging management review of the fuel assembly subcomponents documented in Table 3-4 (new ISFSI SAR Table 9.7-11), the aging management activities required for the fuel assembly is the TLAA for the fuel assembly, as described in Section 3.5.4. These aging management activities are discussed in detail in Section 3.~~7~~8.

3.6 AGING MANAGEMENT REVIEW RESULTS – TRANSFER STATION

This section provides the results of the aging management review of the Transfer Station, which was determined to be in the scope of license renewal as identified in Section 2.2.2.

A summary of the results of the aging management review for the Transfer Station subcomponents is provided in Table 3-5 (new ISFSI SAR Table 9.7-12). The table provides the following information related to each subcomponent determined to require aging management review: the Intended Function, the material group, the environment, the aging effects requiring management, the aging mechanism, and the specific aging management activities that manage those aging effects. The table also identifies subcomponents that did not support, or whose failure would not compromise, the SSC Intended Function and were, therefore, not subjected to further aging management review.

A description of the Transfer Station subcomponents that support an SSC Intended Function is provided in Subsection 3.6.1, and a summary of the materials and environments for the Transfer Station is provided in Subsections 3.6.2 and 3.6.3, respectively. Subsection 3.6.4 references any TLAA for the Transfer Station during storage. Subsections 3.6.5 and 3.6.6 provide a discussion of the aging effects requiring management for the applicable Transfer Station subcomponents and aging management activities used to manage the effects of aging.

3.6.1 Description of Transfer Station Subcomponents

The Transfer Station is utilized for MPC transfer operations at the ISFSI site. The Transfer Station provides lateral and vertical support that prevents the loaded Transfer Cask from falling or overturning during transfer operations. During MPC transfer to a Transportation Cask, the Transfer Cask is locked into the Transfer Station, while the destination cask is moved under the Transfer Cask. All MPC transfers are accomplished by vertical lifts using a qualified mobile crane, with the Transfer Cask secured and stationary within the Transfer Station.

The Transfer Station is ITS and designed for the seismic requirements described in the Trojan ISFSI SAR (Ref. 1.2.1). The structural steel Transfer Station allows a Concrete Cask or Transportation Cask to be positioned under the Transfer Cask for MPC transfers. A collar inside the station is clamped around the Transfer Cask approximately at the height of its center of gravity and locked in place to stabilize the Transfer Cask during handling operations.

The Transfer Station is a structural steel frame designed as a stationary lateral and vertical restraint. The operations of the Transfer Station are described in Section 5.3.1.4 of the Trojan ISFSI SAR (Ref. 1.2.1). The subcomponents are the Transfer Station Pad (which supports the Transfer Station), the steel structure of the Transfer Station, and the foam Impact Limiter, which is encased in a thin stainless steel shell and includes a thick top plate.

3.6.2 Transfer Station Subcomponent Materials

The structural components of the Transfer Station are fabricated from carbon steel. The Transfer Station Pad is made of reinforced concrete. The Impact Limiter is made from foam and surrounded by a thin stainless steel shell.

The material type of each Transfer Station subcomponent is identified in Table 3-5 (new ISFSI SAR Table 9.7-12).

3.6.3 Transfer Station Subcomponents Environments

The Transfer Station is located outdoors at the Trojan ISFSI site. The environment for the Transfer Station is bounded by the extreme winter and summer conditions which are described in Table 2.7-1 of Ref. 1.2.1. The entirety of the Transfer Station is exposed to weather-related effects including sunlight, wind, rain, snow, ice, and ambient air at the Trojan ISFSI site, and is considered to be in an exposed environment. The only exceptions are the Impact Limiter which is stored inside a building on site and the support footings which are embedded in the Transfer Station Pad.

The Transfer Station is not exposed to any significant radiation levels over the period of extended storage, as the MPC, Transfer Cask, and Concrete Cask are only present at the Transfer Station during the short time of moving the MPC between the Transfer Cask and a Concrete Cask.

The environment for each subcomponent of the Transfer Station is given in Table 3-5 (new ISFSI SAR Table 9.7-12).

3.6.4 TLAA for Transfer Station

~~Section 3.7 describes the findings of the TLAAs related to the Trojan ISFSI.~~There are no TLAAs associated with the Transfer Station.

3.6.5 Aging Effects Requiring Management for Transfer Station

Based on a review of the Transfer Station materials of construction and the environments experienced during the period of extended storage at the ISFSI, the aging effects requiring management are loss of material due to corrosion on the Transfer Station, and concrete aging effects (loss of strength, spalling, cracking, and scaling) caused by freeze-thaw cycles, alkali-silica reaction, calcium hydroxide leaching, ~~and~~ embedded reinforcing steel corrosion, and cracking and distortion due to differential movement on the Transfer Station Pad. As stated above, the Transfer Station is only used for the short duration of MPC transfer between the Transfer Cask, Concrete Cask, and ~~eventual~~ Transportation Cask. The aging effect requiring management for the Impact Limiter top plate is loss of material due to corrosion. The aging effect requiring management for the Impact Limiter foam is a change in dynamic crush strength due to chemical changes.

3.6.6 Aging Management Activities for Transfer Station

Based on the aging management review of the Transfer Station subcomponents documented in Table 3-5~~3~~ (new ISFSI SAR Table 9.7-12), the aging management activities required for the Transfer Station, Transfer Station Pad, and the Impact Limiter's top plate and foam are an AMP for these Transfer Station subcomponents. These aging management activities are discussed in detail in Section 3.~~8~~9.

3.7 AGING MANAGEMENT REVIEW RESULTS – ISFSI PAD

This section provides the results of the aging management review of the ISFSI Pad, which was determined to be in the scope of license renewal as identified in Section 2.2.2.

A summary of the results of the aging management review for the ISFSI Pad subcomponents is provided in Table 3-6 (new ISFSI SAR Table 9.7-13). The table provides the following information related to each subcomponent determined to require aging management review: the Intended Function, the material group, the environment, the aging effects requiring management, the aging mechanism, and the specific aging management activities that manage those aging effects. The table also identifies subcomponents that did not support, or whose failure would not compromise, the SSC Intended Function and were, therefore, not subjected to further aging management review.

A description of the ISFSI Pad subcomponents whose failure would compromise an SSC Intended Function is provided in Subsection 3.7.1, and a summary of the materials and environments for the ISFSI Pad is provided in Subsections 3.7.2 and 3.7.3, respectively. Subsection 3.7.4 references any TLAA for the ISFSI Pad during storage. Subsections 3.7.5 and 3.7.6 provide a discussion of any aging effects requiring management for the applicable ISFSI Pad subcomponents and any aging management activities used to manage the effects of aging.

3.7.1 Description of ISFSI Pad Subcomponents

The reinforced concrete Storage Pad on which the Concrete Casks rest and the adjacent concrete Service Pad are at-grade ISFSI structures. The concrete pads are located on approximately 24 inches of engineered fill founded on competent rock.

The ISFSI Storage and Service Pads meet the requirements of ACI-318 and are capable of supporting the loads associated with the array of Concrete Casks and transfer equipment. The ISFSI Storage and Service Pads are classified as not important to safety. The concrete pads provide a supporting surface for the Concrete Casks and the HI STAR 100 Transport Cask. They also provide a smooth level surface to allow operation of the air pad system.

The Storage Pad with its engineered fill is designed to preclude unacceptable damage to the Concrete Cask under a hypothetical tipover accident. The Storage Pad is also designed as a beam system on elastic foundation for bounding case loading combinations per ACI-318, including consideration of seismic components associated with a Seismic Margin Earthquake (SME).

3.7.2 ISFSI Pad Subcomponent Materials

The ISFSI Pad is constructed of reinforced concrete founded on engineered fill placed on competent bedrock. The pad includes embedded rigid electrical conduits and connectors made of galvanized steel for the Concrete Cask temperature monitoring system.

The material type of each ISFSI Pad subcomponent is identified in Table 3-6 (new ISFSI SAR Table 9.7-13).

3.7.3 ISFSI Pad Subcomponents Environments

The ISFSI Pad is located outdoors at the Trojan ISFSI site. The environment for the ISFSI Pad is bounded by the extreme winter and summer conditions which are described in Table 2.7-1 of Ref. 1.2.1. The ISFSI Pad is exposed to weather-related effects including sunlight, wind, rain, snow, ice, and ambient air at the Trojan ISFSI site, and is considered to be in an exposed environment. The only exceptions are the embedded materials (reinforcement and rigid conduits) which are embedded in the ISFSI Pad.

The environment for each subcomponent of the ISFSI Pad is given in Table 3-6 (new ISFSI SAR Table 9.7-13).

3.7.4 TLAA for ISFSI Pad

There are no TLAAs associated with the ISFSI Pad.

3.7.5 Aging Effects Requiring Management for the ISFSI Pad

Based on a review of the role played by the ISFSI Pad in supporting Retrievability, and the environments experienced during the period of extended storage at the ISFSI, no aging effects require management. Potential aging effects including concrete spalling, cracking, and scaling do not prevent the ISFSI Pad from supporting Retrievability using standard methods (air pads and sheet metal) to move a Storage System from its position on the ISFSI Pad to a position underneath the Transfer Station. This is supported by conclusions in ISFSI SAR Sections 2.4.2.2, 2.6.1, 2.6.4, 3.2.3.1.7, and 3.2.3.1.8 regarding the stability of the ISFSI Pad on its foundation.

3.7.6 Aging Management Activities for the ISFSI Pad

Based on the aging management review of the ISFSI Pad subcomponents documented in Table 3-6 (new ISFSI SAR Table 9.7-13), no aging management activities are required for the ISFSI Pad and no AMP is required for the ISFSI Pad.

3.8~~7~~ TIME-LIMITED AGING ANALYSES

3.~~7~~8.1 TLAA Identification Criteria

The following criteria defined in NUREG-1927 (Ref. 1.1.1) are used to identify an analysis that can be considered a TLAA for existing SSCs with a time dependent operating life. The analysis:

1. Involves SSCs important to safety within the scope of license or CoC renewal
2. Considers the effects of aging

3. Involves time-limited assumptions defined by the current operating term
4. Was determined to be relevant by the licensee in making a safety determination
5. Involves conclusions or provides the basis for conclusions related to the capability of the SSCs to perform their intended safety functions
6. Is contained or incorporated by reference in the design basis

3.~~7~~8.2 TLAA Identification Process and Results

Design documents for the Trojan ISFSI were reviewed against the TLAA identification criteria discussed in Section 3.~~7~~8.1. These included the license, SER, Technical Specifications, and site-specific calculations and evaluations. The following TLAAs were identified as the time-based calculations that exist in the current licensing basis. These calculations required further evaluation and disposition for the extended period of operation.

1. MPC Fatigue Evaluation
2. Neutron Absorber Depletion Evaluation
3. Transfer Cask Fatigue Evaluation
4. Fuel Cladding Integrity Evaluation

Each of those TLAAs is described in Appendix B.

3.~~7~~8.3 Radiation Effects Analysis

In addition to the TLAAs identified in Section 3.~~7~~8.2, an analysis was performed to evaluate the effects of radiation on the steel and concrete. This analysis was not part of the original licensing basis, so it is not a TLAA by definition; however, it provides important information on the effects of radiation on components over the extended storage period.

3.~~7~~8.3.1 Stainless Steel

The total neutron and gamma radiation exposures were calculated at the MPC basket, which is the most conservative location for all the stainless steel in the Trojan Storage System. These results are presented in Table 3-~~7~~8. Ref. 3.~~7~~8.1 states that embrittlement does not occur below about 1×10^{17} n/cm^2, which is well above the most conservative number calculated for steel in the Trojan system (shown in Table 3-~~7~~8); therefore, steel embrittlement is not a concern over the 60-year duration. Ref. 3.~~7~~8.1 also states that gamma radiation has no measurable effect on the mechanical properties of steel, and therefore there is no concern over the 60-year duration.

3.~~7~~8.3.2 Concrete

The total cumulative neutron and gamma radiation doses on the Concrete Cask were calculated at the inner surface of the Concrete Cask, and the results are presented in Table 3-~~7~~8. Neutron radiation has little effect on shielding or thermal properties of concrete, but it can impact its structural properties starting at levels as low as 1×10^{18} n/cm^2 (Ref. 3.~~7~~8.2). This level is well above the calculated value (Ref. 3.8.3) for the Trojan Concrete Casks over 60 years, and thus there is no impact to the structural

properties of the concrete due to neutron radiation. Ref. 3.78.2 also indicates that structural properties of concrete may be affected by gamma radiation doses as low as 1x10^9 rads, which is also well above the calculated value for the Trojan Concrete Casks over 60 years, and therefore there is no impact to the structural properties of the concrete due to gamma radiation.

Based on this analysis, no further AMP is needed to manage the effects of radiation on steel or concrete in the Trojan ISFSI.

3.89 AGING MANAGEMENT PROGRAM

Based on the reviews performed in the above sections, the following AMPs are needed during the Trojan ISFSI renewed storage period:

1. MPC AMP
2. Transfer Cask AMP
3. Concrete Cask AMP
4. Transfer Station AMP

Full details of these AMPs are contained in Appendix A.

3.910 CHANGE DOCUMENTS

The aging management activities developed in the preceding sections are based on the Trojan ISFSI licensing basis. However, any changes made during fabrication and operation of the ISFSI, under the allowances of 10 CFR 72.48, must be evaluated to determine if there are any impacts on the aging of the system.

3.910.1 ECOs

Holtec International uses Engineering Change Orders (ECOs) in its change management process. As the Trojan MPCs are the same as those utilized in the generic licensed Holtec HI-STORM 100 system, Holtec's ECOs were reviewed to identify those that apply to the Trojan MPCs and determine if those ECOs had any aging impacts, as documented in Ref. 3.910.1. Based on this report, none of the ECOs had any adverse impacts on aging of the MPCs that would change the way the AMPs described in this document should be implemented.

3.910.2 Manufacturing Deviations

Manufacturing deviations are evaluated using a deviation report (called an SMDR) to determine if the deviation can be accepted as is or needs to be repaired or reworked. These deviations are also evaluated under the 10 CFR 72.48 process, as necessary. Any SMDRs issued for the Trojan ISFSI components were reviewed and evaluated to determine if the condition could have an impact on aging. The SMDR review is detailed in Holtec Report HI-2167366 (Ref. 3.910.1).

In summary, the majority of the manufacturing deviations on the 34 Trojan ISFSI components were related to documentation of material lots, sheathing damage, mousehole shapes, and other minor

issues that were repaired in accordance with accepted procedures. These deviations were evaluated in Holtec Report HI-2167366 (Ref. 3.~~9~~10.1) and determined to have no impact on aging, because either the affected subcomponent did not perform a safety function over the extended storage period, or the deviation had no impact on aging mechanisms. The only manufacturing deviation of concern for aging was documented in SMDR-924, which relates to an MPC shell height slightly below the minimum in approximately 20% of the circumference. This deviation has the effect of an increased closure ring to shell weld root gap. However, the closure ring has sufficient flexibility to adjust for this extra clearance. Because the Trojan canister with this deviation passed its required leakage testing, and the closure ring is a redundant closure over the lid to shell weld, no additional aging management activities are needed for this deviation.

3.~~9~~10.3 72.48 Screenings and Evaluations

Under Holtec International's Quality Assurance program each of the SMDRs and ECOs identified above are reviewed under 10 CFR 72.48, and as such any aging impacts of associated 72.48 screenings or evaluations are covered in the aging impact evaluations described above.

The Trojan ISFSI organization also has the ability to write 72.48 screenings and evaluations. Each of those evaluations were reviewed, with the results documented in Ref. 3.~~9~~10.1. The majority of the changes reviewed in these 72.48 screenings and evaluations were documentation changes to emergency plans, radioactive effluent programs, and the Quality Assurance Plan, due to demolition of site buildings, or other site changes. None of the Trojan ISFSI 72.48s that were reviewed were determined to have any impact on the AMPs as described in this document.

3.~~9~~10.4 Active Exemption

The following active exemption was issued during the initial licensing period. On July 6, 2005, PGE submitted an Exemption Request in letter VPN-021-2005 (ML052080020) to the NRC to eliminate the ISFSI Technical Specification 5.5.2.c that stated: "An annual report shall be submitted pursuant to 10 CFR 72.44(d)(3) specifying the quantity of each of the principal radionuclides released to the environment in liquid and in gaseous effluents during the previous calendar year of operation."
On November 9, 2005, the NRC granted the exemption to 10 CFR 44(d)(3) and issued Amendment 5 to the Trojan ISFSI License (ML053180563) that included the deletion of the ISFSI Technical Specification 5.5.2.c requirement. The NRC's Safety Evaluation Report (SER) cited Trojan ISFSI SAR Section 3.3.2.1, that states, in part: "The MPC is designed to be leak tight under all normal, off-normal, and accident conditions of storage." The NRC's conclusions in the SER state, in part: "that there is reasonable assurance that the proposed exemption and conforming amendment will have no impact on offsite doses" and "granting of the requested exemption and amendment to PGE will not impact health and safety." This active 10 CFR 72.44(d)(3) exemption, that deleted the administrative requirement to submit an annual effluent release report, is not affected by the proposed MPC AMP nor does it affect the proposed MPC AMP.

3.~~10~~11 REFERENCES

3.1.1 Trojan 2008 Inspection Report sent to NRC, ML082520016

3.1.2 Trojan 2013 Inspection Report sent to NRC, ML13304B428

3.1.3 NUREG/CR-6831, "Examination of Spent PWR Fuel Rods After 15 Years in Dry Storage"

3.1.4 ISG-11, Revision 3, "Cladding Considerations for the Transportation and Storage of Spent Fuel"

3.1.5 Trojan 2018 Inspection Report sent to NRC, PGE Letter VPN-008-2018

3.3.1 NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants: Resolution of Generic Technical Activity A-36"

3.3.2 ANSI N14.6, "Radioactive Materials – Special Lifting Devices for Shipping Containers Weighing 10,000 Pounds (4500 kg) or More"

3.4.1 ACI-349, "Code Requirements for Nuclear Safety Related Concrete Structures"

3.4.2 ACI-318, "Building Code Requirements for Structural Concrete"

3.~~7~~8.1 EPRI TR-102462, "Shipment of Spent Fuel in Storage Canisters," June 1993

3.~~7~~8.2 INEEL/EXT-04-02319, "Literature Review of the Effects of Radiation and Temperature on the Aging of Concrete", Idaho National Engineering and Environmental Laboratory, Sept. 2004

3.~~7~~8.3 HI-2012749, "Shielding Evaluation for the Trojan ISFSI Completion Project," Rev. ~~4~~6

3.~~9~~10.1 HI-2167366, "Review of Change Documents in Support of Trojan License Renewal," Rev. 0

Table 3-1 – Aging Management Review for MPC Subcomponents
(new ISFSI SAR Table 9.7-8)

Subcomponent		Intended Function	Material	Environment[1,2]	Aging Effects Requiring Management	Aging Mechanism	Aging Management Activities
Enclosure Vessel	Shell	Confinement, Structural Integrity, Shielding, Heat Removal	Stainless Steel	Inert Gas	~~Fatigue~~Cracking	~~Cracking~~Fatigue	MPC Fatigue TLAA
				Sheltered	Loss of Material	Corrosion	MPC AMP
					Cracking	Stress Corrosion Cracking	
					~~Pitting and Crevice Corrosion~~Loss of Material	~~Loss of Material~~Pitting and Crevice Corrosion	
					~~Fatigue~~Cracking	~~Cracking~~Fatigue	MPC Fatigue TLAA
					Loss of Fracture Toughness	Radiation	N/A, see Section 3.~~7~~8.3
	Baseplate	Confinement, Structural Integrity, Shielding, Heat Removal	Stainless Steel	Inert Gas	~~Fatigue~~Cracking	~~Cracking~~Fatigue	MPC Fatigue TLAA
				Sheltered	Loss of Material	Corrosion	MPC AMP
					Cracking	Stress Corrosion Cracking	
					~~Pitting and Crevice Corrosion~~Loss of Material	~~Loss of Material~~Pitting and Crevice Corrosion	
					~~Fatigue~~Cracking	~~Cracking~~Fatigue	MPC Fatigue TLAA
					Loss of Fracture Toughness	Radiation	N/A, see Section 3.~~7~~8.3

Table 3-1 – Aging Management Review for MPC Subcomponents
(new ISFSI SAR Table 9.7-8)

	Subcomponent	Intended Function	Material	Environment[1,2]	Aging Effects Requiring Management	Aging Mechanism	Aging Management Activities
Enclosure Vessel	Lid	Confinement, Structural Integrity, Shielding, Heat Removal	Stainless Steel	Inert Gas	~~Fatigue~~Cracking	~~Cracking~~Fatigue	MPC Fatigue TLAA
				Sheltered	Loss of Material	Corrosion	MPC AMP
					Cracking	Stress Corrosion Cracking	
					~~Pitting and Crevice Corrosion~~Loss of Material	~~Loss of Material~~Pitting and Crevice Corrosion	MPC AMP
					~~Fatigue~~Cracking	~~Cracking~~Fatigue	MPC Fatigue TLAA
					Loss of Fracture Toughness	Radiation	N/A, see Section 3.~~7~~8.3
	Closure Ring	Confinement	Stainless Steel	Inert Gas	None Identified	None Identified	N/A
				Sheltered	Loss of Material	Corrosion	MPC AMP
					Cracking	Stress Corrosion Cracking	
					~~Pitting and Crevice Corrosion~~Loss of Material	~~Loss of Material~~Pitting and Crevice Corrosion	MPC AMP
					Loss of Fracture Toughness	Radiation	N/A, see Section 3.~~7~~8.3
	Port Cover Plates	Confinement	Stainless Steel	Inert Gas	None Identified	None Identified	N/A
				Embedded	Loss of Fracture Toughness	Radiation	N/A, see Section 3.~~7~~8.3
	Drain and Vent Shield Block	Shielding	Stainless Steel	Inert Gas	None Identified	None Identified	N/A

Table 3-1 – Aging Management Review for MPC Subcomponents
(new ISFSI SAR Table 9.7-8)

	Subcomponent	Intended Function	Material	Environment[1,2]	Aging Effects Requiring Management	Aging Mechanism	Aging Management Activities
Enclosure Vessel	Plugs for Drilled Holes	~~Shielding~~N/A	~~Stainless Steel~~N/A	~~Embedded~~N/A	~~None Identified~~N/A	~~None Identified~~N/A	N/A
				~~Sheltered~~	~~Loss of Material~~	~~Corrosion~~	~~MPC AMP~~
					~~Cracking~~	~~Stress Corrosion Cracking~~	
					~~Pitting and Crevice Corrosion~~	~~Loss of Material~~	
					~~Loss of Fracture Toughness~~	~~Radiation~~	~~N/A, see Section 3.7.3~~
	Upper Fuel Spacer Pipe	Structural Integrity	Stainless Steel	Inert Gas	None Identified	None Identified	N/A
	Lift Lug	N/A	N/A	N/A	N/A	N/A	N/A
	Lift Lug Baseplate	N/A	N/A	N/A	N/A	N/A	N/A
	Upper Fuel Spacer Bolt	Structural Integrity	Stainless Steel	Inert Gas	None Identified	None Identified	N/A
	Upper Fuel Spacer End Plate	Structural Integrity	Stainless Steel	Inert Gas	None Identified	None Identified	N/A
	Lower Fuel Spacer Column	Structural Integrity	Stainless Steel	Inert Gas	None Identified	None Identified	N/A
	Lower Fuel Spacer End Plate	Structural Integrity	Stainless Steel	Inert Gas	None Identified	None Identified	N/A
	Vent Shield Block Spacer	Structural Integrity	Stainless Steel	Inert Gas	None Identified	None Identified	N/A
	Vent and Drain Tube	N/A[4]	N/A	N/A	N/A	N/A	N/A
	Vent and Drain Cap	N/A[4]	N/A	N/A	N/A	N/A	N/A
	Vent and Drain Cap Seal Washer	N/A	N/A	N/A	N/A	N/A	N/A
	Vent and Drain ~~Cap Seal Washer Bolt~~ Cap Screw	N/A	N/A	N/A	N/A	N/A	N/A
	~~Vent and Drain Cap Lock Washer~~ Port Cover Plate Set Screw	N/A	N/A	N/A	N/A	N/A	N/A
	Coupling	N/A	N/A	N/A	N/A	N/A	N/A
	Drain Line	N/A	N/A	N/A	N/A	N/A	N/A
	Damaged Fuel Container	Criticality Control, Structural Integrity	Stainless Steel	Inert Gas	None Identified	None Identified[3]	N/A
	Failed Fuel Cans	Criticality Control, Structural Integrity	Stainless Steel	Inert Gas	None Identified	None Identified[3]	N/A
	Drain Tube Plate	N/A	N/A	N/A	N/A	N/A	N/A

Table 3-1 – Aging Management Review for MPC Subcomponents
(new ISFSI SAR Table 9.7-8)

	Subcomponent	Intended Function	Material	Environment[1,2]	Aging Effects Requiring Management	Aging Mechanism	Aging Management Activities
	Drain Line Guide Tube	N/A	N/A	N/A	N/A	N/A	N/A
	Fuel Debris Process Can Capsule	Confinement	Stainless Steel	Inert Gas	None Identified	None Identified[3]	N/A
Fuel Basket[3]	Flux Gap Cover	Criticality Control	Stainless Steel	Inert Gas	None Identified	None Identified	N/A
	Flux Gap Plate	Criticality Control	Stainless Steel	Inert Gas	None Identified	None Identified	N/A
	Basket Cover Angle	Criticality Control	Stainless Steel	Inert Gas	None Identified	None Identified	N/A
	Basket Cell Angle	Criticality Control, Structural Integrity	Stainless Steel	Inert Gas	None Identified	None Identified	N/A
	Basket Cell Channel	Criticality Control, Structural Integrity	Stainless Steel	Inert Gas	None Identified	None Identified	N/A
	Neutron Absorber	Criticality Control	Boral	Inert Gas	Loss of material properties	Radiation	TLAA - Neutron Absorber Depletion Evaluation
	Basket Cell Spacer Block	N/A	N/A	N/A	N/A	N/A	N/A
	Basket Center Column	Criticality Control	Stainless Steel	Inert Gas	None Identified	None Identified	N/A
	Basket Cell Plates	Criticality Control, Structural Integrity, Heat Removal	Stainless Steel	Inert Gas	None Identified	None Identified	N/A
	Short Cell Spacer Plates	~~N/A~~Criticality Control, Structural Integrity	~~N/A~~Stainless Steel	~~N/A~~Inert Gas	~~N/A~~None Identified	~~N/A~~None Identified	N/A
	Sheathing	Structural Integrity	Stainless Steel	Inert Gas	None Identified	None Identified	N/A
	Shims	Structural Integrity	Stainless Steel	Inert Gas	None Identified	None Identified	N/A

Notes:

(1) Where more than one environment is listed, the subcomponent is exposed to one environment on the inside and a second environment on the outside.

(2) The inert gas environment refers to the interior of the helium filled, sealed MPC. The sheltered environment refers to the interior of the Concrete Cask. The embedded environment refers to subcomponents which are sealed inside another material.

(3) Response to Request for Technical Information (RRTI) 2536-004R0 concluded that the MPC subcomponents do not require fatigue evaluation under the exemption criteria of the ASME Code.

(4) Used during operations. Not relied on for Intended Functions described in Section 2.1 during storage.

Table 3-2 – Aging Management Review for Transfer Cask Subcomponents
(new ISFSI SAR Table 9.7-9)

Subcomponent	Intended Function	Material	Environment[1]	Aging Effects Requiring Management	Aging Mechanism	Aging Management Activities
Radial Lead Shield	Shielding	Lead	Embedded	None Identified	None Identified	~~Transfer Cask AMP~~N/A
Top Lid Shielding	Shielding	Holtite	~~Sheltered~~Embedded	~~Loss of Material~~None Identified	~~Corrosion Pitting and Crevice Corrosion~~None Identified	~~Transfer Cask AMP~~N/A
~~Plugs for Lifting Holes~~Lead Fill Plug	Shielding	Carbon Steel	Sheltered	Loss of Material	Corrosion Pitting and Crevice Corrosion	Transfer Cask AMP
Outer Shell	Structural Integrity, Shielding, Heat Removal	Carbon Steel with coating	Sheltered	Loss of Material	Corrosion Pitting and Crevice Corrosion	Transfer Cask AMP
		Carbon Steel	Embedded[3]	None Identified	None Identified	N/A
		Carbon Steel	Inert Gas[4]	None Identified	None Identified	N/A
Inner Shell	Structural Integrity, Shielding, Heat Removal	Carbon Steel with coating	Sheltered	Loss of Material	Corrosion Pitting and Crevice Corrosion	Transfer Cask AMP
Water Jacket End Plate	Structural Integrity, Shielding	Carbon Steel with coating	Sheltered	Loss of Material	Corrosion Pitting and Crevice Corrosion	Transfer Cask AMP
		Carbon Steel	Inert Gas[4]	None Identified	None Identified	N/A
Top Flange	Structural Integrity, Shielding	Carbon Steel with coating	Sheltered	Loss of Material	Corrosion Pitting and Crevice Corrosion	Transfer Cask AMP
Water Jacket Shell	Structural Integrity, Shielding	Carbon Steel with coating	Sheltered	Loss of Material	Corrosion Pitting and Crevice Corrosion	Transfer Cask AMP
		Carbon Steel	Inert Gas[4]	None Identified	None Identified	N/A

Table 3-2 – Aging Management Review for Transfer Cask Subcomponents
(new ISFSI SAR Table 9.7-9)

Subcomponent	Intended Function	Material	Environment[1]	Aging Effects Requiring Management	Aging Mechanism	Aging Management Activities
Water Jacket Bottom Ring	Structural Integrity, Shielding	Carbon Steel with coating	Sheltered	Loss of Material	Corrosion Pitting and Crevice Corrosion	Transfer Cask AMP
		Carbon Steel	Embedded[3]	None Identified	None Identified	N/A
		Carbon Steel	Inert Gas[4]	None Identified	None Identified	N/A
Water Jacket Top Plates	Structural Integrity, Shielding	Carbon Steel with coating	Sheltered	Loss of Material	Corrosion Pitting and Crevice Corrosion	Transfer Cask AMP
		Carbon Steel	Inert Gas[4]	None Identified	None Identified	N/A
Water Jacket Trunnion Plate	Structural Integrity, Shielding	Carbon Steel with coating	Sheltered	Loss of Material	Corrosion Pitting and Crevice Corrosion	Transfer Cask AMP
		Carbon Steel	Inert Gas[4]	None Identified	None Identified	N/A
Water Jacket Cap Plate	Structural Integrity, Shielding	Carbon Steel with coating	Sheltered	Loss of Material	Corrosion Pitting and Crevice Corrosion	Transfer Cask AMP
		Carbon Steel	Inert Gas[4]	None Identified	None Identified	N/A
Top Lid Outer Ring	Structural Integrity, Shielding	Carbon Steel with coating	Sheltered	Loss of Material	Corrosion Pitting and Crevice Corrosion	Transfer Cask AMP
Top Lid Inner Ring	Structural Integrity, Shielding	Carbon Steel with coating	Sheltered	Loss of Material	Corrosion Pitting and Crevice Corrosion	Transfer Cask AMP
Top Lid Top Plate	Structural Integrity, Shielding	Carbon Steel with coating	Sheltered	Loss of Material	Corrosion Pitting and Crevice Corrosion	Transfer Cask AMP
Top Lid Bottom Plate	Structural Integrity, Shielding	Carbon Steel with coating	Sheltered	Loss of Material	Corrosion Pitting and Crevice Corrosion	Transfer Cask AMP

Table 3-2 – Aging Management Review for Transfer Cask Subcomponents
(new ISFSI SAR Table 9.7-9)

Subcomponent	Intended Function	Material	Environment[1]	Aging Effects Requiring Management	Aging Mechanism	Aging Management Activities
~~Lid Bolt~~ Row Not Used	~~Structural Integrity~~	~~Stainless Steel~~	~~Sheltered~~	~~Loss of Material~~	~~Corrosion Pitting and Crevice Corrosion~~	~~Transfer Cask AMP~~
Lifting Trunnion Block	Structural Integrity, Shielding	Carbon Steel with coating	Sheltered	Loss of Material	Corrosion Pitting and Crevice Corrosion	Transfer Cask AMP
Lifting Trunnion	Structural Integrity (during lifting for initial loading only)	~~Inconel~~N/A	~~Sheltered~~N/A	~~Loss of Material~~N/A	~~Corrosion Pitting and Crevice Corrosion~~ N/A	~~Transfer Cask AMP~~N/A
Door Pins	N/A	N/A	N/A	N/A	N/A	N/A
Top Lid Lifting Block	Structural Integrity	Carbon Steel with coating	Sheltered	Loss of Material	Corrosion Pitting and Crevice Corrosion	Transfer Cask AMP
	Shielding	Carbon Steel	Embedded	~~N/A~~None Identified	~~N/A~~None Identified	N/A
Top Lid Stud (Top Lid Bolt)	~~N/A~~ Structural Integrity	~~N/A~~Carbon Steel	~~N/A~~Sheltered	~~N/A~~Loss of Material	~~N/A~~Corrosion Pitting and Crevice Corrosion	~~N/A~~Transfer Cask AMP
Top Lid Nut (Top Lid Washer)	~~N/A~~ Structural Integrity	~~N/A~~Carbon Steel	~~N/A~~Sheltered	~~N/A~~Loss of Material	~~N/A~~Corrosion Pitting and Crevice Corrosion	~~N/A~~Transfer Cask AMP
Drain Pipes	N/A	N/A	N/A	N/A	N/A	N/A
Couplings, Valves, and Vent Plug	N/A	N/A	N/A	N/A	N/A	N/A
Rib Plates	Structural, Shielding, Heat Removal	Carbon Steel ~~with coating~~	~~Sheltered~~Inert Gas[4]	~~Loss of Material~~None Identified	~~Corrosion Pitting and Crevice Corrosion~~ None Identified	~~Transfer Cask AMP~~N/A
Water Jacket Port Cover Plate, Gasket, and Screws	~~Structural, Shielding~~N/A	~~Carbon Steel with coating~~ N/A	~~Sheltered~~N/A	~~Loss of Material~~N/A	~~Corrosion Pitting and Crevice Corrosion~~ N/A	~~Transfer Cask AMP~~N/A

Table 3-2 – Aging Management Review for Transfer Cask Subcomponents
(new ISFSI SAR Table 9.7-9)

Subcomponent	Intended Function	Material	Environment[1]	Aging Effects Requiring Management	Aging Mechanism	Aging Management Activities
Door Lip	~~N/A~~Structural Integrity	~~N/A~~Carbon Steel with coating	~~N/A~~Sheltered	~~N/A~~Loss of Material	~~N/A~~Corrosion Pitting and Crevice Corrosion	~~N/A~~Transfer Cask AMP
Door Top Plate	Structural Integrity	Carbon Steel with coating	Sheltered	Loss of Material	Corrosion Pitting and Crevice Corrosion	Transfer Cask AMP
Door Beam	~~N/A~~Structural Integrity	~~N/A~~Carbon Steel with coating	~~N/A~~Sheltered	~~N/A~~Loss of Material	~~N/A~~Corrosion Pitting and Crevice Corrosion	~~N/A~~Transfer Cask AMP
Rail Bolt	N/A	N/A	N/A	N/A	N/A	N/A
Door Top	Structural Integrity	Carbon Steel with coating	Sheltered	Loss of Material	Corrosion Pitting and Crevice Corrosion	Transfer Cask AMP
Door Top Plate Clevis	N/A[2]	~~Carbon Steel~~N/A	~~Sheltered~~N/A	~~Loss of Material~~N/A	~~Corrosion Pitting and Crevice Corrosion~~N/A	~~Transfer Cask AMP~~N/A
Door Stop Plate	N/A[2]	~~Carbon Steel~~N/A	~~Sheltered~~N/A	~~Loss of Material~~N/A	~~Corrosion Pitting and Crevice Corrosion~~N/A	~~Transfer Cask AMP~~N/A
Door Hex Bolt	N/A[2]	~~Aluminum~~N/A	~~Sheltered~~N/A	N/A	N/A	N/A
Door Bottom	Structural Integrity	Carbon Steel with coating	Sheltered	Loss of Material	Corrosion Pitting and Crevice Corrosion	Transfer Cask AMP
Door Slide Plate	N/A	N/A	N/A	N/A	N/A	N/A

Notes:

(1) The listed environment is the long-term extended storage environment. During future MPC movements at the Transfer Station, the environment will be Exposed.
(2) Used during operations. Not relied on for Intended Functions described in Section 2.1 during storage.
(3) The subcomponent is exposed to lead in the Embedded environment.
(4) The listed environment is the long-term extended storage environment. During future MPC movements at the Transfer Station, the Transfer Cask water jacket cavity will be intermittently exposed to potable (non-borated) water and air.

Table 3-3 – Aging Management Review for Concrete Cask Subcomponents
(new ISFSI SAR Table 9.7-10)

Subcomponent	Intended Function	Material	Environment[1]	Aging Effects Requiring Management	Aging Mechanism	Aging Management Activities
Cask Lid	Radiation Shielding, Structural Integrity	Carbon Steel with coating	Exposed/ Sheltered	Loss of Material	Corrosion	Concrete Cask AMP
				Loss of Fracture Toughness	Radiation	N/A, see Section 3.~~7~~8.3
Cask Liner Shell	Radiation Shielding, Structural Integrity	Carbon Steel with coating	Sheltered/ Embedded	Loss of Material	Corrosion	Concrete Cask AMP
				Loss of Fracture Toughness	Radiation	N/A, see Section 3.~~7~~8.3
Tile	Corrosion Protection	Ceramic	Sheltered	None Identified	~~N/A~~None Identified	N/A
Bottom Plate Assembly	Structural Integrity	Carbon Steel with coating	Sheltered	Loss of Material	Corrosion	Concrete Cask AMP
				Loss of Fracture Toughness	Radiation	N/A, see Section 3.~~7~~8.3
Reinforcement Bar	Structural Integrity	Carbon Steel	Embedded	Loss of Material	Corrosion	Concrete Cask AMP
				Loss of Fracture Toughness	Radiation	N/A, see Section 3.~~7~~8.3
Concrete Shell	Radiation Shielding/ Structural Integrity	Concrete	Exposed	Loss of Strength, Spalling, Cracking, Scaling	Alkali-Silica Reaction CaOH Leaching Freeze-~~/~~Thaw	Concrete Cask AMP
					Reinforcement Bar Corrosion	Concrete Cask AMP
					Radiation	Radiation Analysis, see Section 3.~~7~~8.3
Transfer Cask Alignment Plates	N/A	N/A	N/A	N/A	N/A	N/A
Shield Ring	Radiation Shielding	Carbon Steel with coating	Sheltered	Loss of Material	Corrosion	Concrete Cask AMP
Screen	N/A	N/A	N/A	N/A	N/A	N/A

Table 3-3 – Aging Management Review for Concrete Cask Subcomponents
(new ISFSI SAR Table 9.7-10)

Subcomponent	Intended Function	Material	Environment[1]	Aging Effects Requiring Management	Aging Mechanism	Aging Management Activities
Inlet Air Assembly	Heat Transfer	Carbon Steel with coating	Sheltered	~~Loss of Material~~N/A[2]	~~Corrosion~~N/A[2]	Concrete Cask AMP
Outlet Air Assembly	Heat Transfer	Carbon Steel with coating	Sheltered	~~Loss of Material~~N/A[2]	~~Corrosion~~N/A[2]	Concrete Cask AMP

Notes:

(1) Where more than one environment is listed, the subcomponent is exposed to one environment on the inside and a second environment on the outside.

(2) Airflow path only.

Table 3-4 – Aging Management Review for Fuel Assembly Subcomponents
(new ISFSI SAR Table 9.7-11)

Subcomponent	Intended Function	Material	Environment[1,2]	Aging Effects Requiring Management	Aging Mechanism	Aging Management Activities
Fuel Pellets	N/A	N/A	N/A	N/A	N/A	N/A
Fuel Cladding	Criticality Control, Confinement Structural Integrity	Zircaloy	Inert Gas	Change in material property	Thermal fatigue	TLAA – Cladding Integrity Evaluation
Spacer Grid Assemblies	Criticality Control, Structural Integrity	Zircaloy	Inert Gas	None Identified	~~N/A~~None Identified	N/A
Upper End Fitting	Structural Integrity	Stainless Steel/ Inconel	Inert Gas	None Identified	~~N/A~~None Identified	N/A
Lower End Fitting	Structural Integrity	Stainless Steel/ Inconel	Inert Gas	None Identified	~~N/A~~None Identified	N/A
Guide Tubes	Structural Integrity	Zircaloy/ Stainless Steel	Inert Gas	None Identified	~~N/A~~None Identified	N/A
Hold-down Spring & Upper End Plugs	N/A	N/A	N/A	N/A	N/A	N/A
Control Components	N/A	N/A	N/A	N/A	N/A	N/A

Notes:

(1) Where more than one environment is listed, the subcomponent is exposed to one environment on the inside and a second environment on the outside.

(2) The inert gas environment refers to the interior of the helium filled, sealed MPC. The sheltered environment refers to the interior of the Concrete Cask.

Table 3-5 – Aging Management Review for Transfer Station Subcomponents
(new ISFSI SAR Table 9.7-12)

Subcomponent	Intended Function	Material	Environment[1]	Aging Effects Requiring Management	Aging Mechanism	Aging Management Activities
Transfer Station Structure						
Deck Plate	N/A	N/A	N/A	N/A	N/A	N/A
Angle, ASTM A36	N/A	N/A	N/A	N/A	N/A	N/A
Bar, ASTM A36	N/A	N/A	N/A	N/A	N/A	N/A
Fastener, ASTM A325	Structural Integrity	Carbon steel with coating	Exposed	Loss of material	Corrosion	Transfer Station AMP
Fastener, ASTM A325	N/A	N/A	N/A	N/A	N/A	N/A
Fastener, ASTM A325	Retrievability	Carbon steel with coating	Exposed	Loss of material	Corrosion	Transfer Station AMP
Fastener, ASTM A325	Shielding, Retrievability	Carbon steel with coating	Exposed	Loss of material	Corrosion	Transfer Station AMP
Concrete Stud Anchor	N/A	N/A	N/A	N/A	N/A	N/A
Hydraulic System Assembly	N/A	N/A	N/A	N/A	N/A	N/A
Kick Plate	N/A	N/A	N/A	N/A	N/A	N/A
Transfer Cask Restraint	Retrievability	Carbon steel with coating	Exposed	Loss of material	Corrosion	Transfer Station AMP
Hex Nut, ASTM A194 Class 2H	Structural Integrity	Carbon steel with coating	Exposed	Loss of material	Corrosion	Transfer Station AMP
Hex Nut, ASTM A194 Class 2H	Retrievability	Carbon steel with coating	Exposed	Loss of material	Corrosion	Transfer Station AMP
Hex Nut, ASTM A194 Class 2H	N/A	N/A	N/A	N/A	N/A	N/A
Hardened Flat Washer, ASTM F436	Structural Integrity	Carbon steel with coating	Exposed	Loss of material	Corrosion	Transfer Station AMP
Hardened Flat Washer, ASTM F436	Retrievability	Carbon steel with coating	Exposed	Loss of material	Corrosion	Transfer Station AMP
Hardened Flat Washer, ASTM F436	N/A	N/A	N/A	N/A	N/A	N/A

Table 3-5 – Aging Management Review for Transfer Station Subcomponents (new ISFSI SAR Table 9.7-12)

Subcomponent	Intended Function	Material	Environment[1]	Aging Effects Requiring Management	Aging Mechanism	Aging Management Activities
Hardened Flat Washer, ASTM F436	Retrievability	Carbon steel with coating	Exposed	Loss of material	Corrosion	Transfer Station AMP
Shim Plate	Structural Integrity	Carbon steel with coating	Exposed	Loss of material	Corrosion	Transfer Station AMP
Inside Upper Restraint	Structural Integrity	Carbon steel with coating	Exposed	Loss of material	Corrosion	Transfer Station AMP
Hex Nut, ASTM A563 Grade A	N/A	N/A	N/A	N/A	N/A	N/A
Fastener, ASTM A449	N/A	N/A	N/A	N/A	N/A	N/A
Deck Plate	N/A	N/A	N/A	N/A	N/A	N/A
Hydraulic Cylinder	N/A	N/A	N/A	N/A	N/A	N/A
Upper Deck Ladder	N/A	N/A	N/A	N/A	N/A	N/A
Main Deck Ladder	N/A	N/A	N/A	N/A	N/A	N/A
Upper Restraints	Structural Integrity	Carbon steel with coating	Exposed	Loss of material	Corrosion	Transfer Station AMP
Cross Brace, Left Hand	Structural Integrity	Carbon steel with coating	Exposed	Loss of material	Corrosion	Transfer Station AMP
Cross Brace, Right Hand	Structural Integrity	Carbon steel with coating	Exposed	Loss of material	Corrosion	Transfer Station AMP
Quadrapod Weldment, Right Side	Structural Integrity	Carbon steel with coating	Exposed	Loss of material	Corrosion	Transfer Station AMP
Quadrapod Weldment, Left Side	Structural Integrity	Carbon steel with coating	Exposed	Loss of material	Corrosion	Transfer Station AMP
Quadrapod Weldment, Back	Structural Integrity	Carbon steel with coating	Exposed	Loss of material	Corrosion	Transfer Station AMP
Upper Deck	N/A	N/A	N/A	N/A	N/A	N/A
Adaptor Ring, Storage Cask	Shielding, Retrievability	Carbon steel with coating	Exposed	Loss of material	Corrosion	Transfer Station AMP

Table 3-5 – Aging Management Review for Transfer Station Subcomponents
(new ISFSI SAR Table 9.7-12)

Subcomponent	Intended Function	Material	Environment[1]	Aging Effects Requiring Management	Aging Mechanism	Aging Management Activities
Adaptor Ring, Transport Cask	Shielding, Retrievability	Carbon steel with coating	Exposed	Loss of material	Corrosion	Transfer Station AMP
Shield Ring	Shielding	Carbon Steel	Exposed	Loss of material	Corrosion	Transfer Station AMP
		Lead	Embedded	None Identified	None Identified	N/A
Handrail, Main Deck, Front & Back	N/A	N/A	N/A	N/A	N/A	N/A
Handrail, Main Deck, Left Side	N/A	N/A	N/A	N/A	N/A	N/A
Handrail, Main Deck, Right Side	N/A	N/A	N/A	N/A	N/A	N/A
Deck Plate	N/A	N/A	N/A	N/A	N/A	N/A
Deck Plate	N/A	N/A	N/A	N/A	N/A	N/A
Main Deck Structure	Shielding, Structural Integrity	Carbon steel with coating	Exposed	Loss of material	Corrosion	Transfer Station AMP
Cylinder Bracket	Retrievability	Carbon steel with coating	Exposed	Loss of material	Corrosion	Transfer Station AMP
Alignment Stop	Retrievability	Carbon steel with coating	Exposed	Loss of material	Corrosion	Transfer Station AMP
Transfer Station Pad						
Threaded Rod, ASTM A193 GR B7	Structural Integrity	Carbon steel	Embedded	Loss of material	Corrosion	Transfer Station AMP
Plate, ASTM A36	Structural Integrity	Carbon steel	Embedded	Loss of material	Corrosion	Transfer Station AMP
Hex Jam Nut, ASTM A325	Structural Integrity	Carbon steel	Embedded	Loss of material	Corrosion	Transfer Station AMP
Hex Nut, ASTM A194 Class 2H	Structural Integrity	Carbon steel (some with coating)	Exposed (coated), Embedded	Loss of material	Corrosion	Transfer Station AMP

Table 3-5 – Aging Management Review for Transfer Station Subcomponents
(new ISFSI SAR Table 9.7-12)

Subcomponent	Intended Function	Material	Environment[1]	Aging Effects Requiring Management	Aging Mechanism	Aging Management Activities
Hardened Washer, ASTM F436	Structural Integrity	Carbon steel (some with coating)	Exposed (coated), Embedded	Loss of material	Corrosion	Transfer Station AMP
Concrete	Structural Integrity	Concrete	Exposed	Loss of strength, spalling, cracking, scaling	Alkali-Silica Reaction, CaOH Leaching, Freeze-Thaw, Rebar Corrosion	Transfer Station AMP
Not used	N/A	N/A	N/A	N/A	N/A	N/A
Rebar or equivalent, ASTM A615 GR 60	Structural Integrity	Carbon steel	Embedded	Loss of material	Corrosion	Transfer Station AMP
Plate, ASTM A36	Structural Integrity	Carbon steel with coating	Exposed, Embedded	Loss of material	Corrosion	Transfer Station AMP
Grout	N/A	N/A	N/A	N/A	N/A	N/A
Plate, ASTM A36	Structural Integrity	Carbon Steel	Embedded	Loss of material	Corrosion	Transfer Station AMP
Rebar, ASTM A615 GR 60	Structural Integrity	Carbon Steel	Embedded	Loss of material	Corrosion	Transfer Station AMP
Impact Limiter						
Plate, ASTM A36	Structural Integrity (under hypothetical accident conditions)	Carbon steel with coating	Sheltered, embedded	Loss of material	Corrosion	Transfer Station AMP
Sheet Metal, ASTM A-167 or ASTM A-240 Type 304	N/A	N/A	N/A	N/A	N/A	N/A

Table 3-5 – Aging Management Review for Transfer Station Subcomponents
(new ISFSI SAR Table 9.7-12)

Subcomponent	**Intended Function**	**Material**	**Environment[1]**	**Aging Effects Requiring Management**	**Aging Mechanism**	**Aging Management Activities**
Angle Iron, ASTM A-479 Type 304	N/A	N/A	N/A	N/A	N/A	N/A
Polyurethane Foam	Structural Integrity (under hypothetical accident conditions)	General Plastics FR-3708 polyurethane foam	Embedded	Change in dynamic crush strength	Chemical changes	Transfer Station AMP
Threaded Plug, carbon steel	N/A	N/A	N/A	N/A	N/A	N/A

Notes:
(1) Where more than one environment is listed, the subcomponent is exposed to one environment on the inside and a second environment on the outside.

Subcomponent	Intended Function	Material	Environment[1]	Aging Effects Requiring Management	Aging Mechanism	Aging Management Activities
Transfer Station Structural Steel	Structural Integrity	Carbon Steel	Exposed	Loss of Material	Corrosion	Transfer Station AMP
Transfer Station Impact Limiter	Structural Integrity (under hypothetical accident conditions)	Foam with Stainless Steel Shell	Sheltered	None	N/A	N/A[2]
Transfer Station Base Plate	Structural Integrity	Carbon Steel	Exposed	Loss of Material	Corrosion	Transfer Station AMP
Transfer Station Footing	Structural Integrity	Concrete	Embedded	None	N/A	N/A
Transfer Station Pad	Structural Integrity	Concrete	Exposed	Loss of Strength, Spalling, Cracking, Scaling	Alkali Silica Reaction CaOH Leaching Freeze/Thaw	Transfer Station AMP
Transfer Station Shield Ring	Shielding	Carbon Steel	Exposed	Loss of Material	Corrosion	Transfer Station AMP

Notes:

(1) Where more than one environment is listed, the subcomponent is exposed to one environment on the inside and a second environment on the outside.

(2) The current licensing basis requirements for periodic Impact Limiter foam coupon testing will be maintained.

Table 3-6 - Aging Management Review for ISFSI Pad Subcomponents (new ISFSI SAR Table 9.7-13)

Subcomponent	Intended Function	Material	Environment[1]	Aging Effects Requiring Management	Aging Mechanism	Aging Management Activities
Concrete	Retrievability[2]	Concrete	Exposed / embedded	None Identified[3]	None Identified[3]	N/A
Rebar	N/A	N/A	N/A	N/A	N/A	N/A
Engineered fill	N/A	N/A	N/A	N/A	N/A	N/A
Conduit and electrical connectors	N/A	N/A	N/A	N/A	N/A	N/A

Notes:

(1) Where more than one environment is listed, the subcomponent is exposed to one environment on the inside and a second environment on the outside.

(2) The concrete is classified as Not Important to Safety, and so it does not have an Intended Function. However, gross failure of the concrete to include a vertical offset across a crack could affect the Intended Function of Retrievability by preventing the use of air pads to move Storage Systems from the ISFSI Pad to the Transfer Station Pad.

(3) As described in ISFSI SAR Sections 2.4.2.2, 2.6.1, 2.6.4, 3.2.3.1.7, and 3.2.3.1.8, the ISFSI Pad is founded on impervious rock. The foundation has no soluble or cavernous rocks, and no poorly consolidated or mineralogically unstable rocks. No oil, gas, or other mineral extraction or subsurface mining has occurred in the vicinity of the site. The ISFSI Pad is founded on the crest of a rock ridge which shows no evidence of deformation since Pliocene time. No evidence of unrelieved residual stress was observed during excavations for the nuclear plant foundations in this area. These SAR sections conclude that (1) future subsidence is not a problem at the site; (2) foundation rock joints and fractures should not be expected to affect the stability of the foundation rock during vibratory motion; (3) there will be no loss of strength or stability of the foundation rock during vibratory motions; and (4) soil-structure interaction is negligible. Based on these references, gross failure of the ISFSI Pad that would prevent operation of the air pad system to support Retrievability is not credible. Potential concrete aging effects including spalling, cracking, and scaling do not affect Retrievability since standard practices when using air pads include the use of thin sheet metal to cover surface defects. These methods were used during the dry run of transferring a dummy MPC at the Transfer Station at the time of initial ISFSI fuel loading.

Table 3-~~6~~7 – Trojan Fuel Assembly Parameters at Time of Fuel Load

Parameter	Value
Number of Fuel Assemblies per Canister	24
Maximum Decay Heat per Assembly	0.725 kW
Maximum Decay Heat per Canister	17.4 kW
Maximum Average Burnup	42,000 MWd/MTU
Minimum Cooling Time	9 years

Table 3-~~7~~8 – Radiation Effects Analysis Note 1

Parameter	Value
Steel Neutron Flux over 60 years (n/cm^2)	1.3×10^{15}
Steel Gamma Dose over 60 years (rad)	1.7×10^{10}
Concrete Neutron Flux over 60 years (n/cm^2)	4.8×10^{14}
Concrete Gamma Dose over 60 years (rad)	2.0×10^{8}

Note 1: Calculations performed in Ref. 3.~~7~~8.3.

APPENDIX A

AGING MANAGEMENT PROGRAMS

Appendix A: Aging Management Programs

Section 3.~~8~~9 identifies the following needed AMPs:

(1) MPC AMP (new ISFSI SAR Table 9.7-14)

(2) Transfer Cask AMP (new ISFSI SAR Table 9.7-15)

(3) Concrete Cask AMP (new ISFSI SAR Table 9.7-16)

(4) Transfer Station AMP (new ISFSI SAR Table 9.7-17)

This appendix contains the 10 elements of the AMPs, following the guidance of NUREG-1927 Revision 1.

MPC AMP (new ISFSI SAR Table 9.7-14)

As identified in Section 3.2.5, the aging effects requiring management for the MPC are loss of material due to corrosion, pitting and crevice corrosion, and cracking due to stress corrosion cracking on the external MPC surfaces~~mechanisms of concern for the MPC are loss of material due to corrosion and stress corrosion cracking~~. The following AMP identifies the main elements of the program needed to manage the effects of these aging mechanisms during the extended storage period. ~~The MPC AMP is based on a continuation of the existing Trojan Concrete Cask Interior Inspection Program.~~

Element	**Description**
1. Scope of Program	This program covers the Trojan MPCs, and the subcomponents identified in Table 3-1 which require the MPC AMP.
2. Preventive Actions	This AMP uses condition monitoring to manage aging effects. Preventive actions to minimize corrosion and stress corrosion cracking were taken during fabrication. Namely, stainless steel material was used to provide corrosion resistance. These preventive actions minimize the likelihood of aging effects, but do not replace the need for condition monitoring during the extended storage period. No new preventive actions are included in this AMP.
3. Parameters Monitored/ Inspected	The MPC AMP uses inspections as described below to look for visual evidence of discontinuities and imperfections, such as localized corrosion, including pitting corrosion and stress corrosion cracking of the accessible canister welds and weld heat affected zones. The inspections also look for the appearance and location of deposits on the canister surfaces.
4. Detection of Aging Effects	The Concrete Cask lid will be removed, and the shield ring will be lifted or removed to provide access to the top end Concrete Cask interior space above the MPC. A visual inspection of the MPC lid and closure ring will be performed using a boroscope (or equivalent). In addition, a~~A~~ visual inspection of the MPC surfaces below the shield ring will be performed using a boroscope (or equivalent) run ~~as far as possible into each inlet vent and~~ through each outlet vent to the bottom of the annulus[~~1~~]. The boroscope (or equivalent) inspection will look at the accessible areas of the MPC surface. This visual inspection will meet the requirements of a VT-3 Examination, as given in the ASME Boiler & Pressure Vessel Code (B&PVC) Section XI, Article IWA-2200. The inspection will be performed on one canister at the Trojan ISFSI at a frequency of 5 years (+/- 25%)[~~2~~1]. The inspection will be performed on the first cask placed in service at the Trojan ISFSI (Serial Number PCC-03 with MPC-28 inside), unless there is a specific technically justified reason to select a different cask or canister. This selected cask is ~~consistent with~~ the cask previously inspected as part of the Concrete Cask Interior Inspection Program (Section 9.7.7 of Ref. 1.2.1), which will allow for the best continued monitoring

Element	Description
	and trending. This cask is also the oldest cask and has the lowest heat load of the casks at the Trojan ISFSI. If aging related degradation is discovered on the currently selected Concrete Cask internal surfaces or MPC external surfaces and inspection of a second sample Concrete Cask and/or MPC is determined to be necessary, the new sample Concrete Cask/MPC should be selected based on the following considerations: aging mechanism of concern, Cask/MPC fabrication history, heat load, Cask/MPC time in service, environmental effects at Cask location, and accessibility for inspection at Cask storage pad location, with the goal of selecting the new sample Cask/MPC that is most susceptible to the aging mechanism of interest. In addition, selecting an MPC-24EF design should be considered. The inspection will be documented in accordance with Trojan ISFSI inspection procedures, and will require a detailed description of the surface condition and location of areas showing surface degradation. The inspection will be scheduled concurrently with the 5-year Concrete Cask Interior Inspection for ALARA purposes. At the discretion of the inspector and Trojan ISFSI Manager, the inspection of selected areas on the MPC may be upgraded to the VT-1 standard, as described in ASME Section XI, Article IWA-2200, which is capable of detecting indications of smaller size than the VT-3. Alternatively, a volumetric exam may be utilized, if determined necessary by the inspector and Trojan ISFSI Manager.
5. Monitoring and Trending	Monitoring and trending methods are in accordance with ASME Code Section XI evaluation criteria. The documented inspection results should provide the ability to monitor and trend the appearance of the canister, with the inspection video retained for comparison in subsequent examinations. Changes to the size and location of any areas of discoloration, localized corrosion, and/or stress corrosion cracking should be identified and documented for subsequent inspections.
6. Acceptance Criteria	The acceptance criteria for the MPC surface ~~is~~are: No indication of localized corrosion pits, etching, stress corrosion cracking, or red-orange colored corrosion products in the vicinity of canister fabrication welds and accessible closure welds. ~~In accessible locations, removal of the deposits and rust stains that reveal undamaged welds (i.e., absence of pits, crack, localized attack or etching) and the original machining/grinding marks on the stainless steel base metal, including weld heat affected zones, may be used to confirm that localized corrosion or stress corrosion cracking has not been initiated.~~

Element	Description
	<u>Indications Requiring Additional Evaluation</u> Indications of interest that are subject to additional examination and disposition through the CAP include: • Localized corrosion pits, stress corrosion cracking, and etching; deposits; or corrosion products • Discrete red-orange colored corrosion products that are 1 mm in diameter or larger especially those adjacent to fabrication welds, closure welds, accessible locations where temporary attachments may have been welded to and subsequently removed from the MPC and the weld heat affected zones of these areas • Linear appearance of any color of corrosion products of any size parallel to or traversing fabrication welds, closure welds, and the weld heat affected zones of these areas • Red-orange colored corrosion products greater than 1 mm in diameter combined with deposit accumulations in any location of the stainless steel canister • Red-orange colored corrosion tubercles of any size The inspection results are evaluated by the ASME VT-3 or VT-1 Inspector, and if indications specified in the above acceptance criteria or indications requiring additional evaluation are detected on the MPC surface, the issue will be entered into Trojan's CAP. The CAP evaluation may include removal of the deposits and rust stains, in accessible locations that reveal undamaged welds (i.e., absence of pits, crack, localized attack or etching) and the original machining/grinding marks on the stainless steel base metal, including weld heat affected zones, to confirm that localized corrosion or stress corrosion cracking has not been initiated. In addition, this process may result in an engineering evaluation to determine the extent and impact of the condition on the ability of the MPC to perform its Intended Function(s).
7. Corrective Actions	The corrective actions performed based on unacceptable aging effects are in accordance with the Trojan ISFSI Quality Assurance (QA) program. The QA Program ensures that corrective actions are completed within the Trojan ISFSI Corrective Action Program (CAP). As applicable per the Trojan CAP, Trojan staff will perform ~~apparent and root~~ cause evaluations, address the extent of condition, determine any necessary actions to prevent recurrence, identify any changes to the existing AMP, and determine if the condition is reportable. Corrective actions will also identify the actions needed for increased scope or frequency of inspections, as necessary, based on any detected aging effects.

Element	Description
8. Confirmation Process	The confirmation process will be commensurate with the Trojan ISFSI QA Program. The QA program ensures that inspections, evaluations, and corrective actions are completed in accordance with the Trojan ISFSI CAP.
9. Administrative Controls	The Trojan ISFSI ~~QA program and~~ implementing procedures for this AMP will address instrument calibration and maintenance, inspector requirements, record retention requirements, and document control. This AMP will be updated ~~periodically~~, as necessary, based on the periodic tollgate assessments described in ~~Appendix C of this application~~SAR Section 9.7.8.5. Inspection results will be documented and made available for NRC inspectors to view upon request.
10. Operating Experience	<u>Spent Fuel Storage</u> No cases of chloride induced stress corrosion cracking for stainless steel dry storage canisters have been reported. Inspections of dry storage canisters after 20 years in service have been conducted at a few ISFSI sites. No evidence of localized corrosion was identified but some amount of chloride-containing salts were determined to be present and corrosion products believed to be related to iron contamination were identified. The Trojan ISFSI has a requirement for a 5-year periodic inspection of the Concrete Cask interior. Although the focus of the inspection is on the Concrete Cask Inner Liner, a portion of the inspection has looked at the MPC exterior surface. Inspection reports from 2008 and 2013~~[1]~~ on Cask Number PCC-03 and MPC-28, stated that, "the outer surface of the MPC visible in the concrete cask annulus region showed no signs of degradation."

Notes:

(1) Tolerances on the inspection frequency are not cumulative. Each 5-year interval is pre-defined with an independent tolerance to allow for scheduling flexibility.

~~[1] These inspection reports can be found under ML082520016 and ML13304B428.~~

TRANSFER CASK AMP (new ISFSI SAR Table 9.7-15)

As identified in Section 3.3.5, the aging effect requiring management for the Transfer Cask is loss of material due to corrosion pitting and crevice corrosion~~the aging mechanism of concern for the Transfer Cask is loss of material due to corrosion~~. The following AMP identifies the main elements of the program needed to manage the effect~~s~~ of ~~this~~ these aging mechanisms during the extended storage period.

Element	Description
1. Scope of Program	The program covers the subcomponents of the Transfer Cask identified in Table 3-2 which require the Transfer Cask AMP.
2. Preventive Actions	The Transfer Cask AMP utilizes inspections to ensure that the equipment maintains its Intended Function through the extended storage period. The design and materials of construction of the Transfer Cask were implemented to minimize aging effects, but no new preventive actions are included as part of this AMP.
3. Parameters Monitored/ Inspected	The parameter inspected by the Transfer Cask AMP is visual evidence of degradation of ~~external~~ accessible surfaces of the Transfer Cask~~ and trunnions~~. Degradation of the Transfer Cask surfaces will be detected by identification of defects and/or irregularities. Defects are defined as water jacket leakage; chipped, cracked, blistered or missing coating that exposes base metal; and corrosion products showing through the coating. An irregularity is defined as damage or degradation to a component that is noted, but is less severe, and does not meet the definition of a defect. All noted defects and irregularities are documented on an inspection data sheet and recorded in a Defect Log. Previously reported defects and irregularities are reviewed against the Defect Log and evaluated to determine whether their condition has visibly changed. Areas where new defects are found, or previously identified irregularities or defects have changed, are also closely examined to determine whether their condition has visibly changed. Inspecting the Transfer Cask to this level of detail for defects and irregularities ensures that degradation will be detected and addressed before it impairs the ability of the Transfer Cask to perform its Intended Functions.
4. Detection of Aging Effects	The Transfer Cask AMP manages loss of material due to corrosion, predominately for coated steel components. The following list provides a basis for the visual inspection, which will be implemented via detailed inspection procedures and conducted by qualified individuals. • All accessible ~~painted~~ coated surfaces including MPC cavity surfaces will be inspected for ~~corrosion and chipped, cracked, or blistered paint~~defects and irregularities • ~~All accessible lid surfaces will be relatively free of dents, scratches, gouges, or other damage~~

Element	Description
	~~• Lifting trunnions will be inspected for deformation, cracks, damage, corrosion, and excessive galling~~ • The water jacket will be inspected for leaks ~~• All other surfaces will be inspected for dents, scratches, gouges, or other damage~~ This inspection will be performed ~~using a QA validated procedure~~ prior to use of the Transfer Cask and at a minimum once a year (+/-25%)[1] while in use. Because the Transfer Cask was used during initial fuel loading, and will not be used until the MPCs need to be removed from storage, pre-service inspections are more appropriate for the Transfer Cask. Periodic inspections when the Transfer Cask is not in use are not needed.
5. Monitoring and Trending	Visual inspections will determine the existence of loss of material on the external surfaces of the Transfer Cask, and observations regarding the material condition are recorded in accordance with inspection procedures and are corrected or evaluated as satisfactory before use of the Transfer Cask. Inspection results are compared to those obtained during previous inspections, so that the progression of degradation can be evaluated and predicted. Evaluation of this information during the preparations for MPC retrieval and transfers provides adequate predictability and allows for corrective action if necessary prior to the need for the Intended Function of the component to be performed.
6. Acceptance Criteria	The Transfer Cask AMP consists of visual inspections as described above. The acceptance criteria[2] for Transfer Cask subcomponents are: • No corrosion, dents, cracks, scratches, or gouges in base metal that exceeds 1/8" in depth (defects in the protective coating are acceptable provided the underlying base metal meets the above criteria). • No leakage of water from the water jacket. The inspection results are evaluated by the Trojan ISFSI Manager and ~~If~~ if water jacket leakage or degradation of material ~~is~~ was detected on any of the identified subcomponents within the Transfer Cask that exceeds the above acceptance criteria, the issue will~~ould~~ be entered into Trojan's CAP ~~and an engineering evaluation would be performed to determine the extent and impact of the corrosion on the ability of the Transfer Cask to perform its intended function~~.
7. Corrective Actions	~~If the engineering evaluation described above shows that the Transfer Cask has indications that exceed acceptable limits, the issue will be entered into the corrective action process. This process may result in supplemental inspections, such as non-destructive examinations (NDE).~~ As applicable per the CAP, Trojan staff will perform ~~apparent and root~~ cause evaluations, address the extent of condition, determine any necessary actions

Element	Description
	to prevent recurrence, identify any changes to the existing AMP, and determine if the condition is reportable. In addition, this process may result in an engineering evaluation to determine the extent and impact of the condition on the ability of the Transfer Cask to perform its Intended Function or in supplemental inspections, such as non-destructive examinations (NDE). Corrective actions will also identify actions needed for increased scope or frequency of inspections, as necessary, based on any detected aging effects.
8. Confirmation Process	The confirmation process will be commensurate with the Trojan ISFSI QA Program. The QA program ensures that inspections, evaluations, and corrective actions are completed in accordance with the Trojan ISFSI CAP.
9. Administrative Controls	The Trojan ISFSI ~~QA program and~~ implementing procedure~~s~~ for this AMP will address instrument calibration and maintenance, inspector requirements, record retention requirements, and document control. This AMP will be updated ~~periodically~~, as necessary, based on the periodic tollgate assessments described in ~~Appendix C of this application~~ SAR Section 9.7.8.5. Inspection results will be documented and made available for NRC inspectors to view upon request.
10. Operating Experience	The Transfer Cask was used during the initial loading of the Trojan ISFSI. The Transfer Cask was inspected before use in accordance with existing operating procedures. The overall effectiveness of these inspections in maintaining the condition and functionality of the Transfer Cask was confirmed by the continued use of the Transfer Cask.

Notes:

(1) Tolerances on the inspection frequency are not cumulative. Each interval is pre-defined with an independent tolerance to allow for scheduling flexibility.

(2) Response to Request for Technical Information (RRTI) 2536-002R2 provides the technical basis for the following acceptance criteria stated in Element 6 of the Aging Management Plan (AMP) for the Transfer Cask, Concrete Cask and Transfer Station: "No corrosion, dents, cracks, scratches, or gouges in base metal that exceeds 1/8" in depth".

CONCRETE CASK AMP (new ISFSI SAR Table 9.7-16)

As identified in Sections 3.4.5 and 3.8.3, the aging ~~mechanisms of concern~~ effects requiring management for the Concrete Cask are loss of material (steel) due to corrosion, ~~loss of steel fracture toughness (due to radiation impacts),~~ and concrete aging ~~issues~~ effects (loss of strength, spalling, cracking, and scaling) caused by freeze-thaw cycles, alkali-silica reaction, ~~and/or~~ calcium hydroxide leaching, and corrosion of embedded reinforcing steel. The following AMP identifies the main elements of the program needed to manage the effects of these aging mechanisms during the extended storage period. ~~The Concrete Cask AMP is based on a continuation of the existing Trojan Concrete Cask Interior Inspection Program and Structural Inspection Program.~~

Element	Description
1. Scope of Program	The program covers the subcomponents of the Concrete Cask identified in Table 3-3 which require the Concrete Cask AMP. ~~The AMP covers both internal areas and external areas of the Concrete Cask.~~ The AMP consists of visual inspections of accessible interior and exterior Concrete Cask surfaces.
2. Preventive Actions	This AMP uses condition monitoring to manage aging effects. The design of the system is intended to minimize aging effects, but this AMP focuses on condition monitoring. No new preventive actions are included in this AMP.
3. Parameters Monitored/ Inspected	Concrete Cask ~~External~~ Exterior The Concrete Cask exposed steel and concrete surfaces are visually examined for indication of surface deterioration. Degradation could affect the ability of the concrete to provide support to the MPCs, to provide radiation shielding, to provide missile shielding, or to provide a path for heat transfer. The inlet and outlet vents are monitored by visual inspection to ensure they are not obstructed. The exposed concrete surfaces include the complete vertical and top surfaces of the cylindrical casks. The exposed steel surface is the Concrete Cask Lid. Deterioration of the exposed steel and concrete surfaces will be detected by identification of defects and/or irregularities in or on each inspected item. Defects associated with the concrete surface are defined as damage or degradation (scabbing, spalling, cracking, etc.) larger than ½ inch in diameter or width and with a depth of greater than ¼ inch. Defects also include evidence of leachate deposits, staining, or stalactite growth on the concrete surface. The inspections identify defects or irregularities of any form that meet or exceed the above criteria regardless of their cause or origin. An irregularity is damage or degradation to a component that is noted, but is less severe, and does not meet the definition of a defect. Contact radiation dose rate measurements are taken at the location of any identified defect in the concrete surface and at an unaffected location

	adjacent to the defect. The results of these measurements are compared to each other to assess whether the defect has compromised the radiation shielding function of the concrete. Defects associated with the cask lid are defined as chipped, cracked, blistered, or missing coating that exposes base metal, and corrosion products showing through the coating. Defects associated with the Inlet and Outlet Air Assemblies are visible signs of blockage in the air flow path. All noted defects and irregularities are documented on an inspection data sheet and recorded in a Defect Log. Previously reported defects and irregularities are reviewed against the Defect Log and evaluated to determine whether their condition has visibly changed. Areas where new defects are found, or previously identified irregularities or defects have changed, are closely examined to determine whether any reinforcing steel is exposed. If the concrete in the area is spalled or cracked, it is checked for soundness by tapping with a hammer. Rust stains which may indicate rebar degradation are also identified. This inspection program provides the means to detect and address the aging effects and mechanisms identified in Section 3.4.5, including: • Loss of material (steel) due to corrosion • Cracking or loss of material (concrete) due to freeze-thaw degradation • Cracking or loss of material (concrete) due to alkali-silica reactions • Cracking or loss of material (concrete) due to corrosion of embedded reinforcing steel • Calcium Hydroxide leaching that could cause loss of strength Inspecting to this level of detail for defects and irregularities ensures that degradation will be detected before it impairs the ability of the cask to perform its Intended Functions. Concrete Cask ~~Internal~~Interior The accessible ~~internal~~interior surfaces of the Concrete Cask are inspected for indications of corrosion~~ and coating degradation~~. These indications may impact the long-term ability of the Concrete Cask to meet its Intended Functions of structural support, shielding, and heat transfer. The heat transfer function of the Concrete Cask is maintained by the presence of an open airflow channel through the cask. Corrosion of steel

	surfaces inside the cask does not affect this function unless corrosion products block the flow path.

4. Detection of Aging Effects	Concrete Cask ~~External~~Exterior The Concrete Cask ~~external~~exterior AMP is a visual inspection ~~in order~~ to detect any defects and/or irregularities which are considered to be aging effects. ~~The visual survey will identify the source of any staining or corrosion-related activity and the degree of damage. The visual survey is performed in accordance with the Trojan ISFSI Structural Inspection Program, identified in Section 9.7.6 of the Trojan ISFSI SAR, and associated implementing procedures. This visual inspection identifies the current condition of the structure and can identify the extent and cause of any aging effect noted.~~ This visual inspection is conducted annually by qualified individuals and includes all Concrete Casks ~~on the pad~~ in service at the Trojan ISFSI. Data from all inspection and monitoring activities, including evidence of degradation and its extent and location, ~~shall be documented~~ are recorded on a checklist or inspection form~~. The results for the inspection will be documented,~~ and include ~~including~~ descriptions of observed aging effects, ~~and~~ supporting sketches~~,~~ and photographs or video. Concrete Cask ~~Internal~~Interior The Concrete Cask lid will be removed, and the shield ring will be lifted or removed to provide access to the top end Concrete Cask interior space above the MPC. A visual inspection of the Concrete Cask lid, shield ring, and top-end surfaces of the cask liner will be performed using a boroscope (or equivalent). In addition, a visual inspection of the accessible Concrete Cask liner surfaces below the shield ring, the annular space, and the interior areas of the vents will be performed using a boroscope (or equivalent) run ~~as far as possible into each inlet vent and~~ through each outlet vent to the bottom of the annulus and as far as necessary into each inlet vent to cover the full surface of the vent. This visual inspection will meet the requirements of a VT-3 Examination, as given in the ASME Boiler & Pressure Vessel Code (B&PVC) Section XI, Article IWA-2200. The inspection will be performed on one Concrete Cask at the Trojan ISFSI at a frequency of 5 years (+/-25%)[1]. The inspection is performed on the first Concrete Cask placed in service at the Trojan ISFSI (Serial Number PCC-03). This selected Concrete Cask is ~~consistent with~~ the cask previously inspected as part of the Concrete Cask Interior Inspection Program (Section 9.7.7 of Ref. 1.2.1), which will allow for the best continued monitoring and trending. If aging related degradation is discovered on the currently selected Concrete Cask interior surfaces or MPC exterior surfaces and a second sample Concrete Cask and/or MPC is determined to be necessary, the new sample Concrete Cask/MPC should be selected based on the following considerations: aging mechanism of concern, Cask/MPC fabrication history, heat load, Cask/MPC time in service, environmental effects at Cask location,

	and accessibility for inspection at Cask storage pad location, with the goal of selecting the new sample Cask/MPC that is most susceptible to the aging mechanism of interest. The inspection will be documented in accordance with ~~existing~~ Trojan ISFSI inspection procedures, which require a detailed description of the surface condition and location of areas showing surface degradation.
5. Monitoring and Trending	~~Monitoring and trending methods are commensurate with consensus defect evaluation guides and standards. These may include standards such as American Concrete Institute Standard (ACI) ACI 201.IR, ACI 207.3R, ACI 364.IR, ACI 562, or ACI 224.IR, as applicable.~~ The inspections ~~and surveillances~~ described for both the ~~internal~~interior and ~~external~~exterior subcomponents of the Concrete Cask are performed periodically in order to identify areas of degradation. ~~The results will be evaluated by a qualified individual, and areas of degradation not meeting established criteria will be entered into the Trojan CAP for resolution or more detailed evaluation.~~ The results will be compared against previous inspections in order to monitor and trend the progression of the aging effects over time.
6. Acceptance Criteria	Concrete Cask ~~External~~Exterior ~~ACI 349.3R-02 includes quantitative three-tier acceptance criteria for visual inspections of concrete surfaces, namely (1) acceptance without further evaluation, (2) acceptance after review, and (3) acceptance requiring further evaluation. Acceptable signifies that a component is free of significant deficiencies or degradation that could lead to the loss of structural integrity. Acceptable after review signifies that a component contains deficiencies or degradation but will remain able to perform its design basis function until the next inspection or repair. Acceptance requiring further evaluation signifies that a component contains deficiencies or degradation that could prevent (or could prevent prior to the next inspection) the ability to perform its design basis function. Degradations or conditions meeting the ACI 349.3R-02 Tier 2 and 3 criteria will be entered into the site's CAP for evaluation and resolution. Should Trojan staff determine there is a need to deviate from the ACI 349.3R-02 acceptance criteria; a technical justification will be fully documented. The loss of material due to age-related corrosion of exterior metal subcomponents will be evaluated by a qualified person in accordance with ACI 349.3R-02. A technical basis will be provided for any deviation from ACI 349.3R-02 acceptance criteria.~~ The acceptance criteria for the concrete shell of the Concrete Cask are: • No exposed reinforcing steel on the surface of the Concrete Cask • No defects in the Concrete Cask surface result in a contact radiation dose rate of 150% or more of the contact radiation dose rate of adjacent unaffected areas of the Concrete Cask

- No leachate deposits, staining, or stalactite growth on the concrete surface
- No areas of unsound concrete

Areas where reinforcing steel is visible or the concrete is suspected to be unsound are recorded by the inspector as defects and are evaluated by the ISFSI Manager for entry into the Corrective Action Program.

The acceptance criteria[2] for the exterior surface of the Concrete Cask Lid is:

- No corrosion, dents, cracks, scratches, or gouges in base metal that exceeds 1/8" in depth (defects in the protective coating are acceptable provided the underlying base metal meets the above criteria)

The acceptance criteria for the Inlet and Outlet Air Assemblies are:

- No more than 28 in.^{2} (cross sectional area) of visible foreign material blockage on any Inlet Air Assembly vent screen or within ~~in~~ the flow channel
- No more than 14 in.^{2} (cross sectional area) of visible foreign material blockage on any Outlet Air Assembly vent screen or within ~~in~~ the flow channel

The inspection results are evaluated by the Trojan ISFSI Manager, and if degradation of material was detected on the exterior surface of the Concrete Cask Lid or reduced cross-section area for an Inlet or Outlet Air Assembly or flow channel that exceeds the above acceptance criteria, the issue will be entered into Trojan's CAP.
~~Concerning the Concrete Cask Inner Liner, Section 4.8 (Materials) of the ISFSI SAR, states: "Carbon steel surfaces on the cask that would otherwise be exposed to ambient conditions (such as the cask liner, lid, etc.) have been coated with an inorganic zinc-rich coating that provides galvanic protection against corrosion of the steel. Consequently, significant steel corrosion is not anticipated." Some insignificant corrosion of the carbon steel surfaces is possible and is not unexpected as evidenced by ISFSI Problem Report IPR-224, "Evaluation for Localized Rust Inside of the Concrete Cask Air Vents." This ISFSI Problem Report evaluated localized rusted areas of the outlet vents visible from the outlet vent exit openings during cask inspections per Trojan ISFSI Procedure TIP 09,Structural Inspection Program. The ISFSP Problem Report concludes that the surface rusting of the carbon steel is acceptable since it is tightly adhering and provides an equivalent emissivity as a properly coated steel surface. Although originally written to address a condition observed in the outlet vents, this ISFSI Problem Report also refers to the Concrete Cask liner plate and would similarly apply to rusting found on the inlet vent surfaces. Further evaluation is not required for new areas of minor corrosion on the~~

	~~Concrete Cask carbon steel surfaces found during the cask interior inspection.~~ Concrete Cask Interior The acceptance criteria[2] for Concrete Cask accessible interior subcomponents are: • Concrete Cask Liner, Shield Ring, Bottom Plate: No corrosion, dents, cracks, scratches, or gouges in base metal that exceeds 1/8" in depth (defects in the protective coating are acceptable provided the underlying base metal meets the above criteria) The inspection results are evaluated by the ASME VT-3 or VT-1 Inspector, and if degradation of material was detected on any of the identified subcomponents within the Concrete Cask that exceeds the above acceptance criteria, the issue will be entered into Trojan's CAP.
7. Corrective Actions	Corrective actions ~~performed based on unacceptable effects~~ will be in accordance with the Trojan ISFSI Quality Assurance (QA) program. The QA Program ensures that corrective actions are completed within the Trojan ISFSI CAP. As applicable per the CAP, Trojan staff will perform ~~apparent and root~~ cause evaluations, address the extent of condition, determine any necessary actions to prevent recurrence, identify any changes to the existing AMP, and determine if the condition is reportable. In addition, this process may result in an engineering evaluation to determine the extent and impact of the condition on the ability of the Concrete Cask to perform its Intended Function(s). Corrective actions will also identify the actions needed for increased scope or frequency of inspections, as necessary, based on any detected aging effects.
8. Confirmation Process	The confirmation process will be commensurate with the Trojan ISFSI QA Program. The QA program ensures that inspections, evaluations, and corrective actions are completed in accordance with the Trojan ISFSI CAP.
9.Administrative Controls	The Trojan ISFSI ~~QA program and~~ implementing procedure~~s~~ for this AMP will address instrument calibration and maintenance, inspector requirements, record retention requirements, and document control. This AMP will be updated ~~periodically~~, as necessary, based on the periodic tollgate assessments described in ~~Appendix C of this application.~~ SAR Section 9.7.8.5. Inspection results will be documented and made available for NRC inspectors to view upon request.

10. Operating Experience	The Trojan ISFSI has utilized the same Concrete Casks since they were initially loaded. Both the Structural Inspection Program and Concrete Cask Interior Inspection Program have been followed consistently over that time and have found no degradation of concern. Trojan has not ~~experienced~~ noted any cracking due to freeze-thaw cycles, but this Concrete Cask AMP has factored in those possible concerns.

Notes:

(1) Tolerances on the inspection frequency are not cumulative. Each 5-year interval is pre-defined with an independent tolerance to allow for scheduling flexibility.

(2) Response to Request for Technical Information (RRTI) 2536-002R2 provides the technical basis for the following acceptance criteria stated in Element 6 of the Aging Management Plan (AMP) for the Transfer Cask, Concrete Cask and Transfer Station: "No corrosion, dents, cracks, scratches, or gouges in base metal that exceeds 1/8" in depth".

TRANSFER STATION AMP (new ISFSI SAR Table 9.7-17)

As identified in Section 3.6.5, the aging ~~effects requiring management are~~ effect requiring management ~~mechanism of concern~~ for the Transfer Station and Impact Limiter top plate is loss of material due to corrosion and for the Impact Limiter foam is a change in dynamic crush-strength due to chemical changes. The aging effect requiring management for the Transfer Station Pad is concrete aging (loss of strength, spalling, cracking, scaling) caused by freeze-thaw cycles, alkali-silica reaction, calcium hydroxide leaching, and corrosion of embedded reinforcing steel. The following AMP identifies the main elements of the program needed to manage the effects of these aging mechanisms during the extended storage period. As stated above, the Transfer Station is only used for the short duration of MPC transfer between the Transfer Cask, Concrete Casks, and ~~an eventual~~ Transportation Cask.

Element	Description
1. Scope of Program	The program covers the subcomponents of the Transfer Station identified in Table 3-5 which require the Transfer Station AMP to operate into the extended storage period.
2. Preventive Actions	The Transfer Station AMP utilizes inspections to ensure that the equipment maintains its Intended Function through the extended storage period. The design and materials of construction of the Transfer Station were selected to minimize aging effects. ~~, but n~~No new ~~P~~preventive Transfer Station actions are included as part of this AMP.
3. Parameters Monitored/Inspected	Transfer Station The parameters inspected by the Transfer Station AMP are~~is~~ visual evidence of degradation of accessible external surfaces of the Transfer Station. Degradation of the Transfer Station surfaces will be detected by identification of defects and/or irregularities. Defects are defined as chipped, cracked, blistered, or missing coating that exposes base metal, and corrosion products showing through the coating. An irregularity is defined as damage or degradation to a component that is noted, but is less severe, and does not meet the definition of a defect. ~~The Transfer Station AMP also address degradation of the concrete Transfer Station Pad.~~ Transfer Station Pad The complete exposed surface of the pad is inspected for defects and irregularities or other signs of damage. Defects are defined as visible signs of movement, or holes or large cracks greater than ½ inch across or extending into rebar. Defects also include evidence of leachate deposits or staining on the concrete surface. Irregularities are damage or degradation to a component that is noted, but is less severe, and does not meet the definition of a defect.

	Impact Limiter The parameters monitored and trended by the Transfer Station AMP are static crush strength values of representative foam samples of the Impact Limiter foam, and visual evidence of degradation of the external surfaces of the Impact Limiter top plate.
4. Detection of Aging Effects	Transfer Station The Transfer Station AMP manages loss of material due to corrosion, predominately for coated steel components. The ~~below~~ following list provides a basis for the visual inspection, which will be implemented via detailed inspection procedures and conducted by qualified individuals. • All ~~painted~~ coated surfaces will be inspected for ~~corrosion and chipped, cracked, or blistered paintcoating~~defects and irregularities • ~~All exposed surfaces will be relatively free of dents, scratches, gouges, or other damage~~ This inspection will be performed prior to use of the Transfer Station and at least once a year (+/-25%)[1] while in use ~~utilizing a QA validated procedure~~. Because the Transfer Station was used during initial fuel loading, and will not be used until the MPCs need to be removed from storage, pre-service inspections are ~~more~~ appropriate ~~for the Transfer Station~~. Periodic inspections when the Transfer Station is not in use are not needed. Transfer Station Pad The Transfer Station Pad portion of the AMP is a visual inspection ~~in order~~ to detect any aging effects by identifying defects and irregularities. This inspection is conducted by qualified individuals. ~~The visual survey should identify the source of any staining or corrosion-related activity and the degree of damage. This visual inspection identifies the current condition of the structure and can identify the extent and cause of any aging effect noted. This visual inspection is conducted prior to use of the Transfer Station and at a minimum once a year while in use by a qualified individual.~~ This inspection program provides the means to detect and address the aging effects identified in Section 3.6.5, including: • Cracking or loss of material (concrete) due to freeze-thaw degradation • Cracking or loss of material (concrete) due to alkali-silica reactions • Cracking or loss of material (concrete) due to corrosion of embedded reinforcing steel • Calcium Hydroxide leaching that could cause loss of strength • Cracking and distortion due to differential movement

	Inspecting to this level of detail for defects and irregularities ensures that degradation will be detected and addressed before it impairs the ability of the pad to perform its Intended Functions. Impact Limiter Samples of foam representative of foam in ~~The~~ the Impact Limiter ~~material samples~~ shall be ~~periodically~~tested for static crush strength on a 10-year interval to estimate the equivalent dynamic crush strength of the Impact Limiter foam ~~following existing Trojan procedures~~. Testing shall be conducted on the following dates, plus or minus 90 days, as a continuation of the existing Trojan testing program: June 15, 2000 (Completed 9/6/2000) June 15, 2004 (Completed 7/7/2004) June 15, 2009 (Completed 8/20/2009) June 15, 2019 June 15, 2029 June 15, 2039 June 15, 2049 June 15, 2059 While in storage, the foam samples shall be maintained in environmental conditions similar to those for the Impact Limiter. As a part of the Transfer Station visual inspection of coated metal components, the Impact Limiter top plate will be inspected for chipped, cracked, blistered or missing coating that exposes base metal and corrosion products showing through the coating.
5. Monitoring and Trending	Transfer Station Visual inspections will determine the existence of loss of material on the external surfaces of the Transfer Station, and observations regarding the material condition are recorded in accordance with inspection procedures and are corrected or evaluated as satisfactory before use of the Transfer Station. Transfer Station Pad All noted defects and irregularities on the Transfer Station Pad are documented on an inspection data sheet and recorded in a Defect Log. Previously reported defects and irregularities are reviewed against the Defect Log and evaluated to determine whether their condition has visibly changed. Areas where new defects are found, or previously identified irregularities or defects have changed, are closely examined to determine the extent of the damage. Evaluation of this information during the preparations for MPC retrieval and transfers provides adequate predictability and allows for corrective action if

	necessary prior to the need for the Intended Function of the component to be performed. Impact Limiter Representative samples of Impact Limiter foam are periodically tested for static crush strength to determine equivalent dynamic crush strength values. These values are compared against limits in the MPC drop analysis at the Transfer Station to verify the material properties are adequate for the Intended Function of Structural Integrity under hypothetical accident conditions. Visual inspections will determine the existence of loss of material on the external surfaces of the Impact Limiter top plate, and observations regarding the material condition are recorded in accordance with inspection procedures and are corrected or evaluated as satisfactory before use of the Impact Limiter.

6. Acceptance Criteria	<u>Transfer Station</u> The acceptance criteria[2] for Transfer Station metal subcomponents are: • Metal: No corrosion, dents, cracks, scratches, or gouges in base metal that exceed 1/8" in depth (defects in the protective coating are acceptable provided the underlying base metal meets the above criteria) ~~The Transfer Station AMP consists of visual inspections as described above.~~ The inspection results are evaluated by the Trojan ISFSI Manager and if degradation ~~corrosion~~ of material is detected on any of the identified subcomponents within the Transfer Station that exceeds the above acceptance criteria, the issue will ~~would~~ be entered into Trojan's CAP. ~~and an engineering evaluation would be performed to determine the extent and impact of the corrosion on the ability of the Transfer Station to perform its intended function.~~ <u>Transfer Station Pad</u> The acceptance criteria for the Transfer Station Pad are: • No cracks or holes greater than ½ inch wide or extending to rebar • No leachate deposits or staining on the concrete surface. • No unsound concrete • No differential movement greater than one inch between portions of the pad or between the pad and Transfer Station footings The inspection results are evaluated by the Trojan ISFSI Manager and if degradation of material or differential movement of the Pad is detected for the Transfer Station Pad that exceeds the above acceptance criteria, the issue will be entered into Trojan's CAP. ~~ACI 349.3R-02 includes quantitative three-tier acceptance criteria for visual inspections of concrete surfaces, namely (1) acceptance without further evaluation, (2) acceptance after review, and (3) acceptance requiring further evaluation. Acceptable signifies that a component is free of significant deficiencies or degradation that could lead to the loss of structural integrity. Acceptable after review signifies that a component contains deficiencies or degradation but will remain able to perform its design basis function until the next inspection or repair. Acceptance requiring further evaluation signifies that a component contains deficiencies or degradation that could prevent (or could prevent prior to the next inspection) the ability to perform their design basis function. Degradations or conditions meeting the ACI 349.3R-02 Tier 2 and 3 criteria will be entered into the site's CAP for evaluation and resolution. Should Trojan staff determine there is a need to deviate from the ACI 349.3R-02 acceptance criteria, a technical justification will be fully documented.~~

	<u>Impact Limiter</u> The results of the ~~Impact Limiter~~ periodic materials tests on representative foam samples shall be evaluated to ensure that the ~~material~~ Impact Limiter foam maintains the critical parameters needed for the MPC d~~D~~rop a~~A~~nalysis. Acceptable values for static crush strength of the representative foam samples are as follows: At 10% strain: 201.7 psi minimum (corresponding to 283.0 psi dynamic crush strength for Impact Limiter foam) 274.5 psi maximum (389.1 psi) At 30% strain: 205.6 psi minimum (275.2 psi) 283.2 psi maximum (378.4 psi) At 45% strain: 234.0 psi minimum (308.8 psi) 322.0 psi maximum (424.6 psi) At 60% strain: 334.9 psi minimum (405.7 psi) 463.0 psi maximum (557.8 psi) The acceptance criteria for the Impact Limiter top plate are: • Metal: No corrosion, dents, cracks, scratches, or gouges in base metal (defects in the protective coating are acceptable provided the underlying base metal meets the above criteria). The inspection results are evaluated by the Trojan ISFSI Manager and if degradation of material is detected that exceeds the above acceptance criteria, the issue will be entered in Trojan's CAP.
7. Corrective Actions	~~If the engineering evaluation described above shows that the Transfer Station has indications that exceed acceptable limits, the issue will be entered into the corrective action process. This process may result in supplemental inspections, such as non-destructive examinations (NDE).~~ As applicable per the CAP, Trojan staff will perform ~~apparent and root~~ cause evaluations, address the extent of condition, determine any necessary actions to prevent recurrence, identify any changes to the existing AMP, and determine if the condition is reportable. In addition, this process may result in an engineering evaluation to determine the extent and impact of the condition on the ability of the Transfer Station to perform its Intended Function.

	Corrective actions will also identify actions needed for increased scope or frequency of inspections, as necessary, based on any detected aging effects.
8. Confirmation Process	The confirmation process will be commensurate with the Trojan ISFSI QA Program. The QA program ensures that inspections, evaluations, and corrective actions are completed in accordance with the Trojan ISFSI CAP.
9. Administrative Controls	The Trojan ISFSI ~~QA program and~~ implementing procedure~~s~~ for this AMP will address instrument calibration and maintenance, inspector requirements, record retention requirements, and document control. This AMP will be updated~~ periodically~~, as necessary, based on the periodic tollgate assessments described in ~~Appendix C of this application~~SAR Section 9.7.8.5. Inspection results will be documented and made available for NRC inspectors to view upon request.
10. Operating Experience	The functionality of the Transfer Station was ~~used~~ demonstrated at the time of ~~during the~~ initial loading of the Trojan ISFSI by transferring a dummy MPC between the Transfer Cask and a Concrete Cask. The Transfer Station was inspected ~~before use~~at that time in accordance with existing operating procedures, and has been inspected annually thereafter.~~ The overall effectiveness of these inspections in maintaining the condition and functionality of the Transfer Station was confirmed by its continued use.~~ The Transfer Station Pad has been inspected on an annual basis starting in 1999, in accordance with the Structural Inspection Program identified in the ISFSI SAR. Identified defects and irregularities have been sealed or coated as necessary to preclude further degradation. Representative foam samples of the Transfer Station Impact Limiter have been tested as described in Element 4 of the Transfer Station AMP. Test results have been within the acceptable ranges specified in Element 6.

Notes:

(1) Tolerances on the inspection frequency are not cumulative. Each 5-year interval is pre-defined with an independent tolerance to allow for scheduling flexibility.

(2) Response to Request for Technical Information (RRTI) 2536-002R2 provides the technical basis for the following acceptance criteria stated in Element 6 of the Aging Management Plan (AMP) for the Transfer Cask, Concrete Cask and Transfer Station: "No corrosion, dents, cracks, scratches, or gouges in base metal that exceeds 1/8" in depth".

APPENDIX B

TIME-LIMITED AGING ANALYSES (TLAAs)

Appendix B – Time-Limited Aging Analyses

The Time-Limited Aging Analyses (TLAAs) performed in support of the Trojan ISFSI License Renewal are listed in Section 3.~~7~~8.2. This appendix provides a summary of the TLAAs and their results.

B.1 *MPC Fatigue Evaluation*

The Trojan ISFSI SAR, Section 4.2.5.3.6 discussion of MPC fatigue indicates that the low stress, high-cycle conditions of ambient temperature and sunlight cycling during normal dry storage conditions cannot lead to a fatigue failure of the MPC, with endurance limits well in excess of 20,000 psi. However, it is possible that repeated lifting of the MPC might cause increased stresses and therefore lower the fatigue life of the MPC. To determine the maximum number of lifting cycles, the lifting points are evaluated against allowables from NUREG-0612, ANSI N14.6, and RG 3.61, with the maximum applicable stress limit for MPC components set as the secondary stress limit from ASME Code Section III Subsection NB.

The detailed calculation is described in Ref. B.1.1. The calculation concludes that the allowable number of lifting cycles of the MPC, as shown in Table B-1, greatly exceeds the amount of lifts of an MPC that would be necessary over the 60-year extended storage of the MPC. Lifts of MPCs are only expected to be necessary for off-site transport, so each MPC is conservatively expected to undergo less than 5 lifts in the extended storage period.

B.2 *Neutron Absorber Depletion Evaluation*

Section 4.8 of the Trojan ISFSI SAR describes the boron depletion of the fixed neutron absorber within the MPC. The original analysis, incorporated by reference from the HI-STORM 100 FSAR, demonstrated that the boron depletion of the neutron absorbing material is negligible over a 50-year duration. The same analysis was re-performed in support of this license renewal request, as documented in Ref. B.2.1. The analysis concludes that the total depletion of B-10 in Boral over a 500-year period is negligible (less than 1 ppm of total B-10 atoms depleted). Therefore, the TLAA for neutron absorber depletion shows that the neutron absorber will perform its Intended Function well into the extended storage period and that no AMP is needed to manage the neutron absorber aging.

B.3 *Transfer Cask Fatigue Evaluation*

Section 4.8 summarizes a cyclic loading fatigue evaluation of the Transfer Cask which concludes that stresses are well below the endurance limit of the trunnion material. Following placement of MPCs into Concrete Casks, the Transfer Cask is no longer used to lift loaded MPCs. Thus, trunnion fatigue is not an issue during the extended license period. Potential fatigue issues are limited to Transfer Cask components in the load path when the Transfer Cask supports a loaded MPC in the Transfer Station. To evaluate a cyclic fatigue loading in these components, the maximum number of lifting cycles was determined ~~the maximum number of lifting cycles,~~ by comparing the primary stress with a stress concentration factor ~~is compared~~ to the allowables from NUREG-0612 and RG 3.61.

The detailed calculation is described in Ref. B.3.1. The calculation concludes that the allowable number of lifting cycles is as shown in Table B-1. It is conservatively assumed that the Transfer Cask is utilized

for all lifts of the Trojan ISFSI MPCs, although during the extended storage period, the Transfer Cask is lifted only in the empty condition. However, the allowable number of lifting cycles far exceeds the number of lifts of the Transfer Cask that will be needed. Therefore, no additional aging management plan is needed to address fatigue failure of the Transfer Cask.

B.4 *Fuel Cladding Integrity Evaluation*

Section 4.2.6.1 of the Trojan ISFSI SAR, describes a calculation for the fuel cladding temperature limit, which is a function of temperature versus time as well as internal rod pressurization. The original fuel cladding temperature limit was established to keep the probability of cladding breach less than 0.5 percent per fuel rod over a 40-year storage term, using the methodology described in Ref. B.4.1. The calculated limit is presented in Table B-2.

As the renewed license will allow for storage of fuel over 60 years, the original calculation for 40 years was reviewed. The detailed calculation is contained in Ref. B.4.2. The calculation uses the peak fuel rod cumulative cladding damage in accordance with Ref. B.4.3 to ensure that the probability of cladding breach is less than 0.5 percent, consistent with the original analysis. Based on the results of the calculation, the life usage fraction of the fuel cladding, based on normal storage peak cladding temperature, is as shown in Table B-2. This value is significantly below a value of 1, so the evaluation supports the conclusion that cladding integrity is assured under 60-year fuel storage at the Trojan ISFSI. This evaluation, in conjunction with the discussion in Section 3.1.6.2, supports the conclusion that no additional aging management plan is needed for the fuel cladding stored at the Trojan ISFSI.

References

B.1.1 HI-2012787R22, "Structural Calculation Package for MPC," Supplement 68

B.2.1 HI-951322R24, "HI-STAR 100 Shielding Design and Analysis for Transport and Storage," Appendix 3

B.3.1 HI-2012785R11, "Structural Calculation Package for HI-TRAC," Supplement 28

B.4.1 E. R. Gilbert et al., "Control of Degradation of Spent LWR Fuel During Dry Storage in an Inert Atmosphere," PNL-6364, Pacific Northwest Laboratory, Richland, WA (1987)

B.4.2 HI-2167021R0, "Cladding Integrity Evaluation Under 60-Year Fuel Storage in Trojan Concrete Cask"

B.4.3 "Recommended Temperature Limits for Dry Storage of Spent Light Water Reactor Zircaloy-Clad Fuel Rods in Inert Gas", PNL-6189, May 1987

Table B-1 – Allowable Lifting Cycles

Component	Allowable Number of Lifting Cycles
MPC	6750
Transfer Cask	3730

Table B-2 – Fuel Cladding

Parameter	Value
Allowable fuel cladding temperature, 40-year storage (per Ref. B.4.1)	647°F (341.7°C)
Life fraction usage of fuel cladding for 60 years	0.06

APPENDIX C

TOLLGATES ASSESSMENTS

Appendix C: Tollgates Assessments

NEI 14-03 (Ref. 1.1.2) introduced the concept of tollgates to be included as part of an operations-based AMP. The tollgate concept provides a structured way for licensees to pause and formally assess aggregated feedback at specific points in time during the period of extended storage.

Tollgates Assessments are established as a requirements in Trojan's ~~renewed specific~~ ISFSI ~~license~~ SAR Section 9.7.8.5 and will be implemented to evaluate aging management feedback and ensure continued effectiveness of the AMPs implemented at Trojan. These tollgate assessments ~~will~~ should be performed consistent with the guidance in NEI 14-12 (Ref. C.1-1), for periodically evaluating AMP effectiveness.

Each tollgate assessment should follow the recommended approach outlined below:

1) Perform tollgate assessments at the intervals as specified in ISFSI SAR Table ~~C-1~~9.7-18.
2) Utilize the performance criteria outlined below to evaluate the AMP.
3) Correlate the performance criteria in ISFSI SAR Table ~~C-2~~9.7-19 with one or more of the applicable ten program elements. It is not necessary to evaluate all ten elements; however, particular attention should be focused on the detection of aging effects (Element 4), corrective action (Element 7), and operating experience (Element 10) as a minimum.
4) Perform a review of plant-specific and industry operating experience to confirm the effectiveness of the AMP, utilizing the INPO database described below.
5) Use the following criteria to arrive at a conclusion regarding "effective"
   a) AMP implementing activities are completed as scheduled.
   b) Industry and site-specific operating experience is routinely evaluated and program adjustments are made as necessary.
   c) Self-assessments are conducted and program adjustments are made as necessary.
   d) No significant findings are identified from external assessments or internal audits.
6) Ineffective programs or ineffective elements of programs would be addressed in the site's CAP.
7) Document the results of the effectiveness reviews, summarize in a tollgate assessment, and maintain as records available for audit and NRC inspection.

Trojan will have access to the ISFSI Aging Management INPO Database (AMID) to facilitate the aggregation and dissemination of aging-related information for the completion of these tollgate assessments. Trojan's tollgates are shown in ISFSI SAR Table ~~C-1~~9.7-18. Note that the implementation of these tollgates does not infer that Trojan will wait until one of these designated times to evaluate information. Trojan will continue to follow existing processes for addressing emergent issues, including the use of the CAP on site. These tollgates are specific times where an aggregate of information will be evaluated as a whole.

References

C.1-1 NEI 14-12 Revision 0, "Aging Management Program Effectiveness," December 2014

Table C-1 - Tollgate Assessments for Trojan ISFSI

Tollgate	Year	Assessment
1	2024	Perform an assessment of the AMP effectiveness considering the criteria in Table C-2. It is not necessary to evaluate all ten elements; however, particular attention should be focused on the detection of aging effects (Element 4), corrective action (Element 7), and operating experience (Element 10) as a minimum. This assessment should include information from the INPO AMID.
2	2029	Evaluate additional information gained from the AMID and subsequent AMP inspections to update the assessment listed in Tollgate 1, to ensure continued AMP effectiveness.
3	2034	Evaluate additional information gained from the AMID and subsequent AMP inspections to update the assessment listed in Tollgate 2, to ensure continued AMP effectiveness.
4	2039	Evaluate additional information gained from the AMID and subsequent AMP inspections to update the assessment listed in Tollgate 3, to ensure continued AMP effectiveness.
5	2044	Evaluate additional information gained from the AMID and subsequent AMP inspections to update the assessment listed in Tollgate 4, to ensure continued AMP effectiveness.
6	2049	Evaluate additional information gained from the AMID and subsequent AMP inspections to update the assessment listed in Tollgate 5, to ensure continued AMP effectiveness.
7	2054	Evaluate additional information gained from the AMID and subsequent AMP inspections to update the assessment listed in Tollgate 6, to ensure continued AMP effectiveness.
8	2059	Evaluate additional information gained from the AMID and subsequent AMP inspections to update the assessment listed in Tollgate 7, to ensure continued AMP effectiveness.

~~**Table C-2 - Performance Criteria by Element**~~

~~**Element**~~	~~**Performance Criteria for Tollgate Assessment**~~
~~1. Scope of Program~~	• ~~Procedures and work orders contain appropriate components~~ • ~~For programs requiring sample selection, the sample bases are applied consistent with those outlined in this application and the associated SER~~ • ~~Additions or deletions to program scope are properly addressed~~
~~2. Preventative Actions~~	• ~~Identified program enhancements are instituted in implementing procedures~~ • ~~Implementing activities are completed as scheduled and not deferred without adequate technical justification~~ • ~~Preventative measures are appropriate for the applicable degradation methods~~
~~3. Parameters Monitored or Inspected~~	• ~~Implementing procedures identify parameters the program monitors~~ • ~~Parameters monitored should be those being controlled to achieve prevention or mitigation of aging effects~~ • ~~When evidence of an aging effect or mechanism is observed, document the extent of the condition~~
~~4. Detection of Aging Effects~~	• ~~Inspections and examinations are conducted at appropriate intervals~~ • ~~Aging effects are identified and actions are implemented before loss of intended function~~ • ~~Samples are biased toward locations most susceptible to aging effect of concern and sample size is expanded when degradation is detected in the initial sample~~ • ~~Unexpected results are evaluated and program adjustments are made as warranted~~ • ~~Operating experience is considered in evaluating the appropriateness of technique and frequency and adoption of new (enhanced techniques as they become available.~~
~~5. Monitoring and Trending~~	• ~~Aging effects are monitored and trended such that no loss of intended functions occurs~~ • ~~Results are used to establish a rate of degradation in order to confirm that timing of the next scheduled inspection will occur before a loss of intended function~~ • ~~Inspection frequencies are adjusted when warranted~~
~~6. Acceptance Criteria~~	• ~~Implementing procedures contain acceptance criteria for each parameter monitored or inspected~~ • ~~Acceptance criteria should anticipate rates of change and margin to loss of function~~ • ~~Unexpected or new aging mechanisms trigger actions to address extent of condition~~

~~Table C-2 - Performance Criteria by Element~~

~~Element~~	~~Performance Criteria for Tollgate Assessment~~
~~7. Corrective Actions~~	• ~~Condition reports are generated when program results fail to meet acceptance criteria and upon detection of unexpected significant aging degradation~~ • ~~Cause evaluations are performed per site procedures~~ • ~~Appropriate extent of condition is applied~~ • ~~Prediction of the extent of degradation is used to effect timely preventive actions~~ • ~~Additional preventive actions, monitoring and inspections are stipulated and instituted as necessary~~
~~8. Confirmation Process~~	• ~~Evaluations are conducted when unexpected conditions of significant aging effects are discovered. The evaluations should address the expected conditions, rates, future inspections, and consideration of the impact on intended functions.~~ • ~~Self-assessments are conducted and program improvements instituted as necessary~~ • ~~Recommendations or deficiencies from external assessments should be addressed~~
~~9. Administrative Controls~~	• ~~Recommendations or deficiencies from external assessments are being addressed~~ • ~~Appropriate documentation is verified in accordance with existing procedures~~
~~10. Operating Experience~~	• ~~Industry operating experience is evaluated and program adjustments are made as necessary~~ • ~~Plant-specific operating experience is used to adjust programs as necessary~~

APPENDIX D

PRE-APPLICATION/BASELINE INSPECTIONS

Appendix D: Pre-Application/Baseline Inspections

Trojan's license for the initial period included both the Structural Inspection Program (Trojan ISFSI SAR Section 9.7.6) for the Concrete Cask externals and the Concrete Cask Interior Inspection Program (Trojan ISFSI SAR Section 9.7.7) for the cask internals. Therefore, there have been multiple inspections throughout the initial storage period.

Specifically, the Concrete Cask Interior Inspection Program inspection results, from inspections performed in 2008 ~~and~~, 2013, and 2018 have been submitted to the NRC staff. ~~Additionally, a third inspection will be performed in 2018, consistent with the existing requirements.~~ The 2008 and 2013 ~~two~~ inspection reports submitted to the NRC had the following conclusions:

- No identified degradation mechanisms affecting system performance not identified in the SAR
- No blockages of inlet, outlet, and annulus regions
- Minor dirt, debris, and miscellaneous insects found
- Small amounts of calcium leaching observed during ~~from~~ initial inspection did not significantly change ~~into~~ as observed in the second inspection. ~~and n~~No degradation of vent surfaces in the area of observed calcium leaching.
- Outer surface of MPC visible in the Concrete Cask annulus region showed no signs of degradation

The 2018 inspection report (VPN-006-2018, dated September 12, 2018) submitted to the NRC had the following conclusions:

- No identified degradation mechanisms affecting system performance not identified in the SAR
- No blockages of inlet, outlet, and annulus regions
- Areas of light rust noted in the outlet and inlet vent assemblies and at bottom of Cask inner liner plate
- Minor dirt, debris, and miscellaneous insects and cobwebs found
- White calcium residue identified in the two previous inspections did not significantly change

Although not discussed in the report, Trojan used this opportunity to determine the capability of improved video inspection and robotic conveyance equipment to provide ASME VT-1 video resolution, clear and stable video recordings and still photos of accessible MPC surfaces (including circumferential and vertical welds), and measurement of normal fabrication markings with an approximate size of 1 mm. The equipment also demonstrated the ability to find or return to a specific location by using known reference points; i.e., fabrication weld numbers. The equipment performed these functions adequately and more improvements are expected for future inspections. In addition, during use of this improved inspection equipment for the 2018 Concrete Cask Interior Inspection, it was confirmed that the clearances between the Shield Ring and the top and side surfaces of the MPC are not large enough to insert a boroscope (or equivalent) into the Concrete Cask top end space to perform required AMP inspections. Therefore, the Concrete Cask Lid will have to be removed to perform the required Concrete Cask AMP and MPC AMP inspections of the top end subcomponents.

The results and experience from these inspections have been incorporated in the development of the AMPs in this application, s. Specifically, in the inspection tools used for looking at the surface of the MPC, which have been improved over the course of the two three previous inspections. Similarly, any additional information gained from the 2018 inspection will be incorporated into the learning AMP implemented at Trojan. The Structural Inspection Program for the external portion of the Concrete Casks and Transfer Station has also found no degradation that would impact the system safety functions. Experience from that program has also been incorporated into the AMPs submitted with this application.

Based on these previous and ongoing inspections, no further pre-application inspections are considered necessary for the Trojan ISFSI.

Baseline Inspection

As the AMPs for Trojan are predominately the continuation of existing programs, there are already scheduled inspections for the interior of the Concrete Casks/MPCs, external area of the Concrete Casks, and Transfer Station in 2023. These inspections will be considered the baseline inspection prior to entering the extended storage period. The proposed Technical Specification 5.5.5 states, in part: "The Aging Management Program will be implemented on or before 20 years from the date of the first canister loading." The first canister loaded at Trojan was placed in service on the Trojan ISFSI storage pad on January 17, 2003. Pursuant to this Technical Specification, Trojan plans to implement the new ISFSI SAR, Section 9.7.8 Aging Management Program, on January 1, 2022 and this replaces the SAR, Section 9.7.6, Structural Inspection Program and the SAR, Section 9.7.7, Concrete Cask Interior Inspection Program. It is noted that the Structural Inspection Program annual inspections will continue to be performed until these programs are replaced by the new component inspection AMPs in 2022.

Consistent with NUREG-1927, Section 3.6.1.4, under Timing of Inspections, Trojan will schedule the first implementation of the following new component AMPs to be completed in calendar years 2022 and/or 2023 and these will be considered Baseline Inspections.

- SAR Section 9.7.8.4.1, MPC Exterior Aging Management Program and SAR Section 9.7.8.4.3, Concrete Cask Interior Aging Management Program for the specified MPC and Concrete Cask. This baseline inspection will include removing the Concrete Cask Lid to provide access to the Cask top-end space to visually inspect the MPC Lid, and Closure Ring, and to inspect the Concrete Cask Lid bottom side, Shield Ring top side, and Cask Liner. If the inspection results are acceptable for these first-time top-end MPC and Cask AMP inspections, PGE may consider requesting a change to the inspection intervals (from 5 years to 10 years) for only the inspection of the top-end subcomponents required by the MPC exterior AMP and Concrete Cask interior AMP.
- SAR Section 9.7.8.4.2, Transfer Cask Aging Management Program for only a partial Baseline Inspection. Following ISFSI fuel loading in 2003, the Transfer Cask was refurbished and placed in long-term storage and will not be used until it is needed for fuel transfer operations. This partial inspection will be performed on the accessible surfaces of the Transfer Cask and its

subcomponents in their current storage configuration. Therefore, the inspection will not include lifting the Transfer Cask to inspect the bottom surface of the Door Top Plate or lifting and moving the Lid or Bottom Doors to inspect all of their surfaces. In addition, it will not include filling the water jacket (neutron shield) to test for leaks. The next scheduled inspection will be prior to use.

- SAR Section 9.7.8.4.3, Concrete Cask Exterior Aging Management Program for all 34 Concrete Casks.
- SAR Section 9.7.8.4.4, Transfer Station Aging Management Program, including the Transfer Station Pad. The next scheduled inspection for the Transfer Station and Transfer Station Pad will be prior to use. The next scheduled test for the Impact Limiter is June 15, 2019 as specified in the LRA Appendix A, Transfer Station AMP, Element 4.

APPENDIX E

PGE-1070, TROJAN ISFSI ENVIRONMENTAL REPORT SUPPLEMENT 1

Appendix E: PGE-1070, Trojan ISFSI Environmental Report, Supplement 1

To meet the requirements of 10 CFR 72.34 and 10 CFR 51 Subpart A, PGE is providing the attached Supplement 1 to PGE-1070, Trojan ISFSI Environmental Report, Revision 0 as part of its application to the NRC to renew the site-specific ISFSI license. This Supplement 1 focuses on providing any significant environmental changes from PGE-1070, Trojan ISFSI Environmental Report, Revision 0.

PGE-1070
Supplement 1

Trojan Independent Spent Fuel Storage Installation Environmental Report, Supplement 1

Revision 0

Portland General Electric Company

Table of Contents

E1 Introduction E1-1

E1.1 Purpose and Need for Proposed Action E1-1
E1.2 Proposed Action E1-1
E1.2.1 Licensing History E1-1
E1.2.2 Operations E1-2
E1.3 Environmental Report Supplement Scope and Methodology E1-2
E1.4 Applicable Regulatory Requirements, Permits, and Required Consultations E1-4
E1.4.1 Threatened and Endangered Species Consultation E1-5
E1.4.2 Historic Preservation Consultation E1-6

E2 Alternatives to the Proposed Action E2-1

E2.1 No-Action Alternative E2-1
E2.2 Other Alternatives E2-1
E2.2.1 Ship Fuel to an Offsite Interim Storage Facility E2-1
E2.2.2 Ship Fuel to a Permanent Federal Repository E2-1

E3 Affected Environment E3-1

E3.1 Site Location E3-1
E3.2 Land Use E3-4
E3.3 Transportation E3-4
E3.4 Geologic Conditions E3-5
E3.5 Water Resources E3-6
E3.6 Ecological Resources E3-6
E3.7 Meteorology, Climatology, and Air Quality E3-9
E3.8 Noise E3-9
E3.9 Historical and Cultural Resources E3-10
E3.10 Visual Resources E3-10
E3.11 Demography and Socioeconomics E3-11
E3.11.1 Demography E3-11
E3.11.2 Environmental Justice E3-15
E3.11.3 Socioeconomics E3-18

E4 Environmental Impacts E4-1

E4.1 Impacts from Refurbishment and Construction E4-1
E4.2 Occupational and Public Radiological Health Impact E4-1
E4.2.1 Occupational Dose E4-2
E4.2.2 Public Dose E4-2
E4.3 Other Operational Impacts E4-2
E4.4 Impacts from Postulated Accidents E4-4

E5 Mitigation Measures E5-1

E6 Environmental Measurement and Monitoring E6-1

E7 Summary of Environmental Consequences E7-1

E7.1 Unavoidable Adverse Impacts E7-1
E7.2 Irreversible and Irretrievable Commitment of Resources E7-1
E7.3 Short-term Uses, Maintenance, and Enhancment of Long-term Productivity E7-1

E8 References E8-1

List of Tables

Table E1-1. Environmental Report Section(s) that Respond(s) to License Renewal Environmental Regulatory Requirements E1-3
Table E1-2. Environmental Authorizations for Trojan ISFSI License Renewal E1-5
Table E3-1. Federal and State Listed Species with a Potential to Occur within or near the Trojan Site E3-7
Table E3-2. Current Populations and Projections, by Sector, to 2060 ..... E3-12
Table E3-3. Minority and Low-Income Percentages, by Geographic Comparison Area E3-17
Table E4-1. Annual Doses to Offsite Receptors for the Trojan ISFSI in millirem E4-2
Table E4-2. Hypothetical Accident Dose Results from Failure of Fuel Pins with Subsequent Breach of Multi-Purpose Canister in Millirem within 30 Days E4-5

List of Figures

Figure E3-1. Trojan Site Layout E3-2
Figure E3-2. View of ISFSI (Looking North-Northeast) E3-3
Figure E3-3. Population Sectors within 10 Miles of the Trojan Site E3-14

List of Effective Pages

Section	Effective Pages	Revision
Table of Contents	Pages E-i through E-iii	0
Acronyms and Abbreviations	Page E-iv	0
Section E1	E1-1 through E1-6	0
Section E2	E2-1 through E2-2	0
Section E3	E3-1 through E3-18	0
Section E4	E4-1 through E4-5	0
Section E5	E5-1	0
Section E6	E6-1	0
Section E7	E7-1	0
Section E8	E8-1 through E8-5	0

Acronyms and Abbreviations

°F	degrees Fahrenheit
ACHP	Advisory Council on Historic Preservation
ACS	American Community Survey
ALARA	As Low As Reasonably Achievable
AQCR	Air Quality Control Region
BNSF	Burlington Northern Santa Fe
CEQ	Council on Environmental Quality or Council
CFR	Code of Federal Regulations
CISF	consolidated interim storage facility
DOE	U.S. Department of Energy
DPS	Distinct Population Segment
EA	environmental assessment
EFSC	Energy Facility Siting Council
ER	environmental report
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
GTCC	Greater Than Class C
I-5	Interstate 5
ISFSI	Independent Spent Fuel Storage Installation
MPC	Multi-Purpose Canister
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NMSS	Office of Nuclear Materials Safety and Safeguards
NRC	U.S. Nuclear Regulatory Commission
OAR	Oregon Administrative Rules
ODA	Oregon Department of Agriculture
ODOE	Oregon Department of Energy
ODFW	Oregon Department of Fish and Wildlife
ORBIC	Oregon Biodiversity Information Center
PGE	Portland General Electric Company
SAR	Safety Analysis Report
SHPO	State Historic Preservation Officer
TNP	Trojan Nuclear Plant
USC	United States Code
USCB	U.S. Census Bureau
USFWS	U.S. Fish and Wildlife Service
WCS	Waste Control Specialists LLC

E1 INTRODUCTION

E1.1 PURPOSE AND NEED FOR PROPOSED ACTION

The U.S. Nuclear Regulatory Commission (NRC) licenses the operation of independent spent fuel storage installations (ISFSIs) for storing power reactor spent fuel and associated radioactive materials. The NRC issues licenses in accordance with the Atomic Energy Act of 1954 (42 United States Code [USC] 2011, et seq.) and NRC implementing regulations (10 Code of Federal Regulations [CFR] Part 72). On March 31, 1999, the NRC issued Portland General Electric Company (PGE) a site-specific license (SNM-2509) valid for 20 years to receive, possess, store, and transfer the Trojan Nuclear Plant (TNP) spent fuel to vertical sealed storage casks at an ISFSI located on the Trojan site.

The ISFSI was constructed to facilitate decommissioning of the TNP. The ISFSI provides interim storage for the spent nuclear fuel that had been stored in the TNP Spent Fuel Pool, and thereby allowed PGE to proceed with decommissioning of the Spent Fuel Pool and associated systems. By contract, the U.S. Department of Energy (DOE) has the ultimate responsibility for the long-term disposal or storage of the spent fuel stored at TNP (PGE 1996a, 1996b). Interim storage for the TNP spent fuel was necessary because there was no operational DOE facility for permanent disposal or storage for irradiated spent nuclear fuel at the time the TNP was being decommissioned.

The proposed action is to renew the Trojan ISFSI license for an additional 40 years beyond the term of the current ISFSI license. The purpose for the proposed action is to extend the NRC authorization for operation of the ISFSI and allow PGE to continue to maintain safe storage of the spent fuel until it can be accepted by the DOE for transport offsite. Extended operation of the Trojan ISFSI is needed because PGE must be able to store spent fuel until the DOE has opened a permanent disposal or storage facility and is able to accept the spent fuel.

E1.2 PROPOSED ACTION

The proposed action is to renew the site-specific license, SNM-2509, for the Trojan ISFSI. The current site-specific license will expire on March 31, 2019. PGE proposes to extend the Trojan ISFSI license for 40 years beyond the current site-specific license term, through March 2059, in accordance with 10 CFR 72.42. Extending the specific license for the ISFSI will allow PGE to maintain safe storage of the spent fuel until its acceptance by DOE for removal from the Trojan site.

E1.2.1 Licensing History

On March 31, 1999, the NRC issued PGE a 20-year license (SNM-2509) to receive, possess, store, and transfer the TNP spent nuclear fuel to an ISFSI located on property that previously was part of the TNP site. The site-specific license authorizes storage of up to 344.5 metric tons of uranium as intact spent fuel assemblies, damaged fuel assemblies, and fuel debris. The ISFSI consists of a reinforced concrete pad and dry storage system using sealed vertical cylindrical canisters within steel-lined Concrete Casks. The storage facility employs a passive ventilation system and is designed to require minimal surveillance. A total of 34 casks were placed on the Storage Pad between January and September 2003 in a single continuous loading campaign. No additions or alterations to the storage configuration have occurred since that time.

On May 23, 2005, PGE submitted a request to amend SNM-2509 to revise the Technical Specification for the designated controlled area at the ISFSI. The original specification defined the boundary as extending 300 meters from the edge of the Storage Pad, and PGE proposed to define the boundary as 200 meters from the edge of the Storage Pad (PGE 2005b). NRC prepared an EA and determined the proposed actions would not have a significant impact on the environment. NRC approved Amendment 6 to SNM-2509 in March 2006 (NRC 2006).

In July 2005, PGE requested exemption from the annual reporting requirement of 10 CFR 72.44(d)(3), and for an amendment to SNM-2509 that revised the Technical Specifications in Appendix A of the license to eliminate the requirement to submit an annual effluent release report to the NRC (PGE 2005a). NRC prepared an environmental assessment (EA) and determined the proposed actions will not have a significant impact on the environment (NRC 2005).

E1.2.2 Operations

The Trojan ISFSI consists of a dry fuel storage system that includes a reinforced concrete pad and sealed vertical cylindrical canisters within steel-lined Concrete Casks. One function of the Concrete Cask is to provide radiation shielding. The cask is also designed to passively dissipate decay heat generated by the stored spent fuel. The cask provides adequate heat removal capacity to maintain safe fuel clad temperatures without active cooling systems. The Trojan ISFSI Safety Analysis Report (SAR; PGE 2017) contains a detailed description of the dry fuel storage system.

The Trojan ISFSI is located within a secure area on the former TNP site. The ISFSI has general site lighting.

The onsite PGE staff currently performs daily activities associated with the operation of the ISFSI facility, which primarily involve security, routine maintenance, and monitoring. No major changes in staffing levels are anticipated during the license renewal term. The passive nature of the facility requires little maintenance beyond periodic surveillance. Low-level radioactive waste is not generated during storage of the casks at the ISFSI.

No major construction or refurbishment projects are currently planned for the ISFSI during the license renewal term. Due to the delay in establishing a permanent federal repository, the spent nuclear fuel from the TNP reactor will be stored onsite for an extended period. The ISFSI will be subject to aging management activities to ensure the continued integrity of the dry storage casks during the ISFSI license renewal term. The aging management programs are summarized in Appendix A of the license renewal application.

E1.3 ENVIRONMENTAL REPORT SUPPLEMENT SCOPE AND METHODOLOGY

PGE has prepared this supplemental environmental report (ER) as part of its application to the NRC to renew the site-specific ISFSI license in accordance with the following NRC regulations:

- 10 CFR Part 72, Licensing Requirements for the Independent Storage of Spent Nuclear Fuel, High-Level Radioactive Waste, and Reactor-Related Greater Than Class C Waste, 72.42, Duration of License; Renewal, and 72.34, Environmental Report
- 10 CFR Part 51, Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions, 51.60, Environmental Report-Materials Licenses

NRC regulation 10 CFR 72.42 provides for ISFSI license renewal, and regulation 72.34 requires an application to include an ER that meets the requirements of 10 CFR 51 Subpart A. In Subpart A, 10 CFR 51.60 requires that the ER be a separate document entitled "Supplement to Applicant's Environmental Report" and specifies ER contents. The regulation focuses on presenting any significant environmental change from the previously submitted ER.

In determining what information to include in the ISFSI ER supplement, PGE has relied on guidance provided in NUREG-1748 (NRC 2003). NRC guidance in NUREG-1927 (NRC 2016a) indicates that license renewal is not an exercise in re-licensing and is not intended to impose requirements beyond those that were met by the facility when it was initially licensed. PGE assembled a team to review the ER submitted with the original ISFSI license application and NRC's subsequent environmental analysis, to identify areas that require updating to meet the expectations of NUREG-1748, and to evaluate whether any significant changes have occurred during the initial licensing period or if significant changes are anticipated during the renewal term. To perform this review, PGE utilized staff members that are knowledgeable of the Trojan site and ISFSI operations. PGE references material in the original ISFSI Environmental Report (PGE 1996a, 1996b) and NRC Environmental Assessment (NRC 1996) that remains valid throughout this document.

Table E1-1 was prepared to verify conformance with the regulatory requirements. Table E1-1 indicates which ER supplement section provides responsive information.

Table E1-1. Environmental Report Section(s) that Respond(s) to License Renewal Environmental Regulatory Requirements

Regulatory Requirement	Responsive ER Section(s)
10 CFR 72	Entire Document
10 CFR 51.60(a)	Entire Document
10 CFR 51.45(a)	Entire Document
10 CFR 51.45(b) statement of purpose	E1.1 Purpose and Need for the Proposed Action
10 CFR 51.45(b) description of proposed action	E1.2 Proposed Action
10 CFR 51.45(b) affected environment	E3.0 Affected Environment
10 CFR 51.45(b)(1) impact of proposed action	E4.0 Environmental Impacts

Table E1-1. Environmental Report Section(s) that Respond(s) to License Renewal Environmental Regulatory Requirements (continued)

Regulatory Requirement	Responsive ER Section(s)	
10 CFR 51.45(b)(2) adverse environmental effects	E4.0	Environmental Impacts
	E6.0	Environmental Measurement and Monitoring
	E7.1	Unavoidable Adverse Impacts
10 CFR 51.45(b)(3) alternatives to proposed action	E2.0	Alternatives to the Proposed Action
10 CFR 51.45(b)(4) short term use and long term productivity	E7.3	Short-Term Use, Maintenance, and Enhancement of Long-Term Productivity
10 CFR 51.45(b)(5) irreversible and irretrievable commitments	E7.2	Irreversible and Irretrievable Resource Commitments of Resources
10 CFR 51.45(c) alternatives for reducing or avoiding effects	E4.0	Environmental Impacts
	E5.0	Mitigation Measures
10 CFR 51.45(d)	E1.4	Applicable Regulatory Requirements, Permits, and Required Consultations

E1.4 APPLICABLE REGULATORY REQUIREMENTS, PERMITS, AND REQUIRED CONSULTATIONS

Continued operation of the Trojan ISFSI does not require any additional permits, licenses, or approvals other than the renewal of the NRC operating license. Table E1-2 lists the authorizations and consultations that are precedent to the NRC renewing the site-specific ISFSI license. This section discusses the consultations in more detail.

Table E1-2. Environmental Authorizations for Trojan ISFSI License Renewal

Agency	Authority	Requirement	Remarks
NRC	Atomic Energy Act (42 USC 2011, et seq.)	ISFSI License Renewal	ER Supplement submitted in support of license renewal application
Oregon Department of Energy (ODOE)	Oregon Administrative Rules (OAR), Division 26, 345-026-0390 Spent Nuclear Fuel Storage	Approval for dry cask storage	OAR 345-026-390(2) authorizes storage for up to 791 complete and partial fuel assemblies and storage of containers with nuclear fuel materials
U.S. Fish and Wildlife Service (USFWS)	Endangered Species Act (ESA) Section 7 (16 USC 1536)	Consultation	Requires federal agency issuing license to consult with USFWS if the action may affect species listed under the ESA
Oregon Parks and Recreation Department, Heritage Programs	National Historic Preservation Act Section 106 (16 USC 470f)	Consultation	Requires federal agency issuing a license to consider cultural impacts and consult with State Historic Preservation Officer (SHPO)

The Oregon Energy Facility Siting Council (EFSC) regulates spent nuclear fuel storage at TNP through the Oregon Administrative Rules (OAR) Chapter 345, Division 26. The EFSC concluded that the Trojan ISFSI plans complied with criteria set forth in OAR 345-026-0390 "Spent Nuclear Fuel Storage" (OOE 1999). PGE submits periodic reports to NRC and ODOE covering the status of the Trojan ISFSI in accordance with 10 CFR 72.48(d)(2) and OAR 345-026-0390(5). No further action by the EFSC is required to support renewal of SNM-2509 for an additional 40-year term.

E1.4.1 Threatened and Endangered Species Consultation

Section 7 of the Endangered Species Act (16 USC 1531 et seq.) requires federal agencies to ensure that their actions are not likely to jeopardize the continued existence of species that are listed, or proposed for listing, as endangered or threatened. Depending on the type of action and potential effects involved, the Act requires consultation with the U.S. Fish and Wildlife Service (USFWS) regarding effects on terrestrial and freshwater species, and with the National Marine Fisheries Service (NMFS) regarding effects on anadromous and marine species. USFWS and NMFS have issued joint procedural regulations at 50 CFR Part 402, Subpart B, that address consultation, and USFWS maintains the joint list of threatened or endangered species at 50 CFR Part 17.

A federal agency is not required to consult with the USFWS and/or NMFS if it determines an action will not affect listed species or designated critical habitat. The agency is required to

consult if it determines that the action may affect listed species or critical habitat, even if the effects are expected to be beneficial. If the agency determines that the action is not likely to adversely affect listed species or critical habitat, it can request the concurrence of the USFWS and/or NMFS with that determination. Therefore, whether and how the NRC may choose to consult with USFWS and NMFS will depend upon the determination as to potential effect. As discussed in Sections E3.6 and E4.3, the applicant expects that there will be a "no-effect" determination. The NRC may choose to solicit comments from the Oregon Department of Fish and Wildlife (ODFW) and Oregon Department of Agriculture (ODA) regarding species listed in Oregon prior to renewing the ISFSI license.

E1.4.2 Historic Preservation Consultation

Section 106 of the National Historic Preservation Act (16 USC 470 et seq.) requires federal agencies having the authority to license any undertaking to consider the effect of the undertaking on historic properties and to afford the Advisory Council on Historic Preservation (ACHP) an opportunity to comment on the undertaking, prior to the agency issuing the license. ACHP regulations provide for the State Historic Preservation Officer (SHPO) to have a consulting role (36 CFR 800.2). To initiate the Section 106 process, the federal agency must determine whether the proposed federal action is an undertaking as defined in the regulations and, if so, whether it is a type of activity that has the potential to cause effects on historic properties (36 CFR 800.3). If the undertaking is a type of activity that does not have the potential to cause effects on historic properties, assuming such historic properties were present, the agency has no further obligations under Section 106.

In Section 4.4 of the original EA, NRC (1996) concluded there were no historical or cultural resources that would be impacted by construction or operation of the Trojan ISFSI. The proposed action to continue operation of the ISFSI would not involve any new disturbance that would have the potential to affect cultural resources. Nonetheless, the NRC may choose to request comments from the Oregon SHPO while conducting its environmental review of the proposed action to renew the ISFSI license.

E2 ALTERNATIVES TO THE PROPOSED ACTION

E2.1 NO-ACTION ALTERNATIVE

Under the no-action alternative, the NRC would not renew the site-specific license for the Trojan ISFSI. The operating license would expire on March 31, 2019, at which time PGE would no longer be able to store spent fuel at the ISFSI. PGE would need to remove the stored fuel from the ISFSI, transport the fuel to another licensed storage facility, and decommission the fuel storage facility associated with SNM-2509. There is no federal repository or other federal disposition path available for the spent fuel presently stored under SNM-2509; therefore, the no-action alternative is not a reasonable alternative.

E2.2 OTHER ALTERNATIVES

In Section 9 of the ER for the ISFSI license application (PGE 1996a, 1996b), PGE evaluated the following alternatives to constructing and operating the Trojan ISFSI:

- Continued storage in the Trojan Spent Fuel Pool
- Transfer to an offsite storage facility

Section 10 of the original ER considered design and location alternatives for an ISFSI at the Trojan site.

Continued storage of discharged spent fuel in the TNP Spent Fuel Pool is not an alternative, because the Spent Fuel Pool and associated facilities have been decommissioned. An updated evaluation of the remaining alternatives from the original ISFSI ER is provided in the following sections.

E2.2.1 Ship Fuel to an Offsite Interim Storage Facility

This alternative was considered in Section 9.1.2 of the original ER. An updated analysis is provided below.

Commercial entities have expressed interest in establishing a consolidated interim storage facility (CISF) for away-from-reactor storage of spent nuclear fuel. Development of a CISF would require a specific license from the NRC. Two facilities at locations in the southwestern U.S., the Eddy-Lea Alliance facility in New Mexico (Holtec 2015) and the Waste Control Specialists LLC (WCS) facility in Andrews County, Texas (WCS 2015), have been proposed. The proponents for the Eddy-Lea Alliance facility have engaged in pre-application consultation with the NRC. WCS submitted a license application for a CISF in April 2016 (WCS 2016), but the NRC requested supplemental information (NRC 2016b) and has not completed its acceptance review of the application (NRC 2016c). Both entities seeking authorization for a CISF have identified acceptance of spent fuel from "stranded" sites (ISFSIs at shutdown reactor sites [BRC 2012]) such as Trojan as a priority. Because the availability of a CISF for spent fuel in time (by 2019) to eliminate the need for the Trojan ISFSI license renewal is unlikely, shipment of the spent fuel to an offsite facility is not a reasonable alternative.

E2.2.2 Ship Fuel to a Permanent Federal Repository

PGE and NRC intend for storage at the Trojan ISFSI to be an interim action pending availability of a federal repository. There is uncertainty regarding when or whether a federal repository will

be licensed, and the schedule under which it might be available to accept spent fuel shipments impacts the necessity for Trojan ISFSI site-specific license renewal. The repository schedule drives the ISFSI schedule; the longer it takes for the repository to begin accepting spent fuel shipments, the longer the ISFSI must store spent fuel.

In response to recommendations by the Blue Ribbon Commission on America's Nuclear Future (BRC 2012), DOE identified a strategy to implement storage capabilities within the next 10 years and to engage in a consent-based siting process and begin to conduct preliminary site investigations for a geologic repository (DOE 2013). DOE's goal is to have a repository sited by 2026; the site characterized and the repository designed and licensed by 2042; and the repository constructed and operational by 2048 (DOE 2013). The earliest that DOE anticipates availability of a geologic repository to accept spent nuclear fuel is the year 2048. Therefore, shipment of spent fuel to a permanent repository is not a viable alternative to the Trojan ISFSI license renewal.

E3 AFFECTED ENVIRONMENT

E3.1 SITE LOCATION

The Trojan ISFSI is within the site of the former TNP located in Columbia County, Oregon, on the west bank of the Columbia River at approximately river mile 72.5, 42 miles north of Portland. The Columbia River forms the boundary between the states of Oregon and Washington at this location.

The former TNP site occupies approximately 30 acres within a PGE property comprising 634 acres (PGE 2017, Section 2.1.2; see Figure E3-1). The ISFSI occupies less than 1 acre within the northeastern portion of the TNP site. The ISFSI reinforced concrete pad, which is approximately 105 feet by 170 feet, is located inside the ISFSI Protected Area fence near the eastern edge of the TNP site and the PGE property.

Figure E3-1 shows the PGE property, the former TNP site, the ISFSI location, and the Controlled Area Boundary as defined in 10 CFR 72.106. Figure E3-2 provides a view of the ISFSI surroundings. The nearest edge of the ISFSI reinforced concrete Storage Pad is about 160 feet from the Oregon bank (mean low water) of the Columbia River, about 1/2 mile from the U.S. Highway 30 right-of-way, and about 700 feet from the Portland and Western railroad right-of-way that transects the property from north to south (PGE 2017, Section 2.1.2).

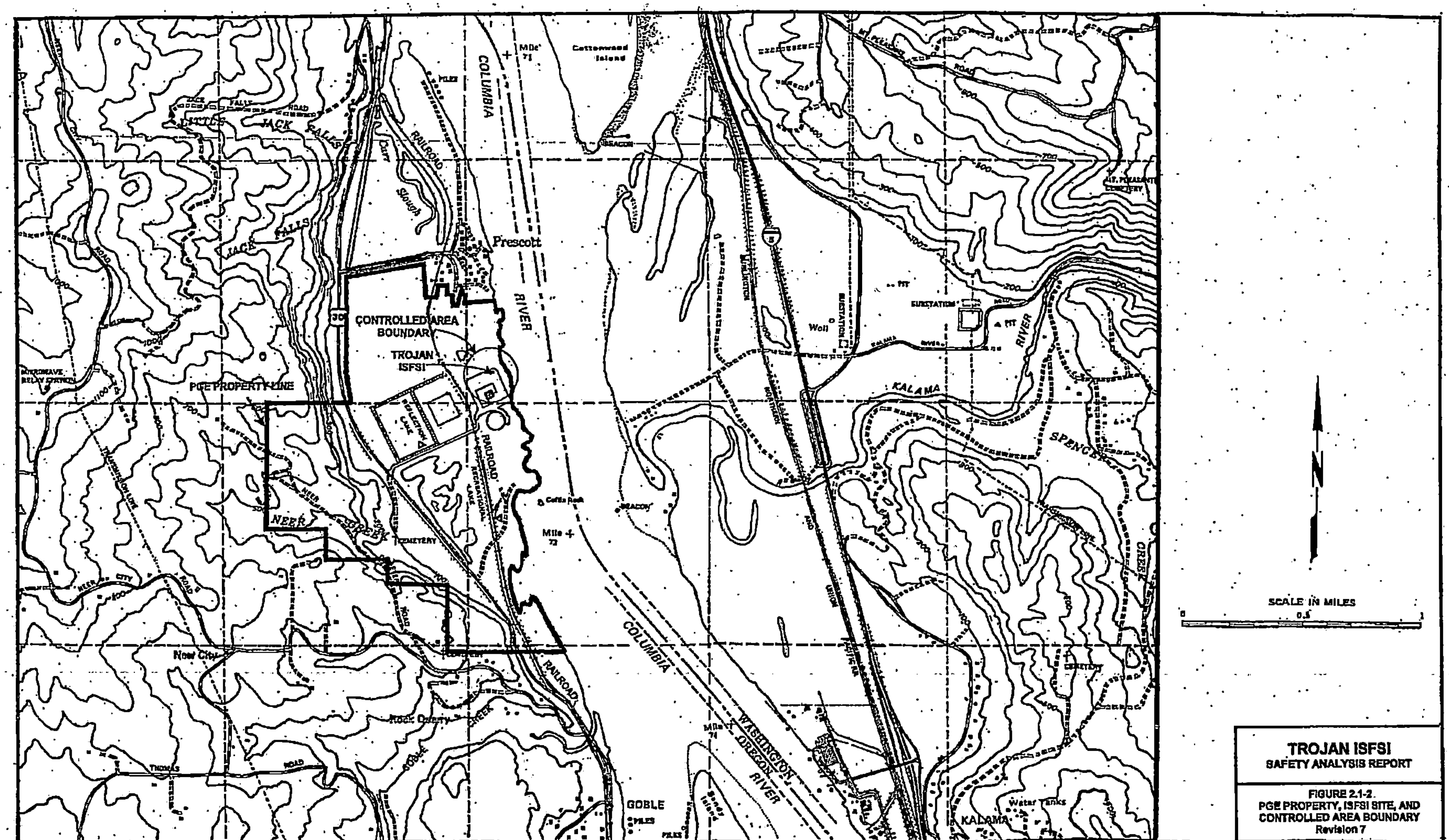

Figure E3-1. Trojan Site Layout

Figure E3-2. View of ISFSI (Looking North-Northeast)

E3.2 LAND USE

The distribution of land use in the vicinity of the Trojan site remains essentially as described in Section 4.1 of the EA (NRC 1996). Lands adjacent to the site lie within Columbia County, Oregon, in which the site is located, and Cowlitz County, Washington, across the Columbia River. The area within a radius of 10 miles of the ISFSI site lies within these two counties. Both have agriculturally based economies, with land use in the vicinity of the site primarily agricultural.

The Trojan site lies in a heavily timbered area, characterized by rough terrain and suited primarily to logging and other forestry operations. One major population center (Portland, Oregon) lies within a 50-mile radius, as do several smaller cities. Most of the industrial uses in and near the smaller cities are related to forest product processing or agriculture.

There are no state or federal parks within 10 miles of the Trojan site. The Columbia River, which supports substantial commercial and recreational use, represents the most significant natural resource in the vicinity.

As described in Section 2.1.1 of the original ER, approximately 140 acres of the PGE property are set aside for recreational uses. The 26-acre reflecting lake and 28-acre recreational lake located on PGE property are accessible to the general public from the property entrance road. Fishing activity peaks in the spring (about 30 fishermen per day) when the state of Oregon stocks the recreational lake, and then the fishing activity tapers off to a couple of fisherman per day (PGE 2017, Section 2.1.4),

Facilities associated with the former TNP (Reactor Containment Building; Cooling Tower; Control, Turbine, Auxiliary, and Fuel Buildings) have been removed as part of decommissioning, leaving a graded pad where the structures were at the time of the original ISFSI licensing. The switchyard located on the PGE property remains in use.

E3.3 TRANSPORTATION

Transportation conditions relative to the ISFSI site are generally the same as reported in the ER. U. S. Highway 30 parallels the western boundary of the Trojan site and is the primary travel route in the vicinity. This two-lane highway connects communities along the Columbia River from Portland to Astoria, and carries moderate passenger and freight traffic.

As noted in the ER, a railroad right-of-way traverses the Trojan site. This rail line is now operated by the Portland and Western Railroad (Port of Portland 2016), and it primarily serves freight traffic to/from shippers in Oregon along the Columbia River.

Two major land transportation arteries are located across the Columbia River in Washington. A main BNSF rail line is approximately 1 mile east of the site. Interstate Highway 5 (I-5) runs generally parallel to the BNSF line and is approximately 1.25 miles from the Trojan site. I-5 is the primary north-south highway between Portland and Seattle, and is a six-lane freeway in this area.

The Columbia River is also a major route for waterborne commerce. A deep-draft channel is maintained in the river to provide access for oceangoing vessels to ports upstream of the Trojan site.

E3.4 GEOLOGIC CONDITIONS

PGE conducted a significant amount of research related to site geology and potential seismic hazards to support the original TNP license. The research included evaluation of regional geology, site geology, seismicity, tectonic activity, maximum earthquake potential, surface faulting, stability of subsurface materials/foundations, and volcanology. Applicable results from those evaluations are summarized in the original ER for the ISFSI (PGE 1996a, 1996b). This ER supplement focuses on any new or revised information that warrants updating of the ER documentation related to geology and seismology.

The SAR for the ISFSI (PGE 2017) indicates that the Storage Pad may rest on more than one rock type. The design of the foundation was based on the properties of a tuff, which was considered to be the weakest of the rock types. PGE has not performed subsequent investigations of the site geologic conditions, and the review conducted to support the ER supplement yielded no new information that would warrant an update of the geologic conditions documented in the ER.

Section 2.5 of the ER provided a summary discussion of PGE activities to investigate potential earthquake hazards and vibratory ground motion considerations relative to the ISFSI. As documented in the SAR, the result of the PGE investigations was an estimate of 0.38g as the maximum horizontal ground acceleration for the Trojan site; the 0.38g figure was incorporated into the ISFSI design basis. With respect to seismic activity, the focus of PGE's review to support the ER supplement was to determine whether there is new information indicating there should be a revision to the estimated maximum horizontal ground acceleration for the Trojan site. As a result of increased knowledge and awareness concerning the earthquake hazards associated with the Cascadia subduction zone (Cascadia Region Earthquake Workgroup 2013), documentation of recent research efforts was reviewed in the states of Oregon and Washington regarding potential seismic activity and preparations for such events. Key sources included in this review are summarized as follows:

- Oregon Seismic Safety Policy Advisory Commission (2000), Oregon at Risk
- Oregon Department of Geology and Mineral Industries (DOGAMI) interpretive map series IMS-7 (Madin and Wang 1999)
- Oregon DOGAMI (2016), HazVu: Statewide Geohazards Viewer
- Oregon DOGAMI Publication GMS-100, Earthquake Hazard Maps for Oregon (Madin and Mabey 1996)
- Oregon DOGAMI Open File Report O-13-06 (Madin and Burns 2013)
- Washington Department of Natural Resources (2016), Washington State Earthquake Hazards Scenario Catalog

In all of the research cases reviewed, the estimated or simulated intensity and ground acceleration parameters were within the range of the estimated maximum ground acceleration used in the design of the ISFSI. Therefore, a revision to the Seismic Margin Earthquake (SME) discussed in the ER is not warranted.

Section 2.5 of the ER provided a brief discussion of volcanic hazards that focused on the Mt. St. Helens volcano approximately 34 miles northeast of the Trojan site. The ISFSI SAR describes other volcanoes present in the Cascade Range, east of the ISFSI, such as Mt. Adams

(67 miles distant), Mt. Hood (74 miles), and Mt. Rainier (77 miles). These stratovolcanoes are considered potentially active, and of these four, only Mt. Adams has not erupted within the past 150 years. The ISFSI SAR provides a brief summary of research findings regarding volcanology. The main points are that predictions of future activity cannot be made, and the possibility of volcanic activity that would affect the site is considered to be remote. Review of additional information about potential volcanic hazards did not identify any newer research that indicates the previous ash fall accumulation estimates made by PGE needed to be revised. Therefore, the ER supplement includes no additional information on this topic, beyond what is discussed above.

E3.5 WATER RESOURCES

Water resources in the vicinity of the ISFSI remain essentially as described in Section 2.4 of the ER (PGE 1996a, 1996b). The eastern boundary of the PGE property is the Columbia River. Other than the Columbia River and tributaries, there are no nearby natural geographic features of prominence offsite. Human-made features on the PGE property include a 26-acre reflecting lake and a 28-acre recreational lake.

As described in Section 2.4.3 of the ER (PGE 1996a, 1996b) and Section 2.5.1 of the SAR (PGE 2017), the Trojan site is located on an impervious rocky ridge that is bounded on one side and end by the Columbia River and the other side by an old river channel that has been completely filled with impervious sediments. The water in the rock and in the alluvium moves toward the Columbia River and not toward existing offsite wells or springs. The hydraulic gradient of the water table precludes contamination of the portion of the bedrock that now supplies groundwater to offsite wells or springs. There is virtually no possibility of contamination of existing or future offsite groundwater supplies by accidental release of radioactive materials onto the alluvium or rock at the site. Groundwater monitoring studies conducted as part of the final survey activities for the former TNP determined there is no significant concentration of residual radioactivity from plant operations in the groundwater (NRC 2004).

PGE operates two wells that supply water for Trojan site use. Each well is capable of producing 250 gallons per minute. Site demands, including domestic water for personnel supporting ISFSI operation, are anticipated to be much less than this capacity (PGE 2017, Section 2.5.1).

E3.6 ECOLOGICAL RESOURCES

Section 2.2 of the ER contains detailed information on the biotic communities and ecosystems of the Trojan site (PGE 1996a, 1996b). Section E3.2 of this ER supplement addresses land use conditions at and near the site, which have not changed substantially since 1996.

The original ER provided a list of the federal and state threatened and endangered species that could potentially occur in Oregon. The USFWS, NMFS, ODFW, and ODA have updated the federal and state list of threatened and endangered species since publication of the ER. Table E3-1 contains the current list of federal and state listed species that could potentially occur within Columbia County, and subsequently, within or near the Trojan site. However, there are no species listed as threatened or endangered that are known to currently occupy the Trojan site.

Table E3-1. Federal and State Listed Species with a Potential to Occur within or near the Trojan Site

Common Name	Scientific Name	Federal Status	State Status
Mammals			
Columbian white-tailed deer	*Odocoileus virginianus leucurus*	T	–
Wolverine	*Gulo*	–	T
Birds			
Marbled murrelet	*Brachyramphus marmoratus*	T	T
Northern spotted owl	*Strix occidentalis caurina*	T	T
Streaked horned lark	*Eremophila alpestris strigata*	T	–
Yellow-billed cuckoo	*Coccyzus americanus*	T	–
Fish			
Bull trout	*Salvelinus confluentus*	T	–
Chinook salmon *(5 potential ESUs)* – Lower Columbia River – Snake River fall-run – Snake River spring/summer – Upper Columbia River spring – Upper Willamette River	*Oncorhynchus tshawytscha*	 T T T E T	 – T T – –
Chum salmon *(1 potential ESU)* -Columbia River	*Oncorhynchus keta*	T	–
Coho salmon *(1 potential ESU)* – Lower Columbia River	*Oncorhynchus kisutch*	T	E
Sockeye salmon *(1 potential ESU)* – Snake River	*Oncorhynchus nerka*	E	–
Steelhead *(5 potential DPSs)* – Lower Columbia – Middle Columbia – Snake River Basin – Upper Columbia River – Upper Willamette River	*Oncorhynchus mykiss*	T	–
Pacific eulachon *(1 potential DPSs)* – Southern	*Thaleichthys pacificus*	T	–
Green sturgeon *(1 potential DPSs)* – Southern	*Acipenser medirostris*	T	–

Table E3-1. Federal and State Listed Species with a Potential to Occur within or near the Trojan Site (continued)

Common Name	Scientific Name	Federal Status	State Status
Plants			
Bradshaw's desert parsley	*Lomatium bradshawii*	E	E
Golden paintbrush	*Castilleja levisecta*	T	E
Kincaid's lupine	*Lupinus sulphureus* ssp. *Kincaidii*	T	T
Nelson's checker-mallow	*Sidalcea nelsoniana*	T	T
Water howellia	*Howellia aquatilis*	T	T
Willamette daisy	*Erigeron decumbens* var. *decumbens*	E	E

Table Key:
ESU = Evolutionarily Significant Unit (this relates to listed fish species)
DPS = Distinct Population Segments (this relates to listed fish species)
T = Threatened
E = Endangered
Source: USFWS 2016a, 2016b; NOAA 2010, 2016a; ORBIC 2016

Note that the original assessment of federal and state listed species presented in the original ER addressed all listed species found within the state of Oregon, including species that were not found in Columbia County or in areas near the Trojan site. The list presented in Table E3-1 is restricted to those listed species that could occur in Columbia County and therefore could potentially occur on or near the Trojan site (e.g., it excludes species that are only found on the east side of the Cascades, areas south of Columbia County, or along the outer coastline). Other differences in the two lists include recent changes that have occurred to the status of listed species. For example, the Columbian white-tailed deer was considered "endangered" in 1996; however, currently it has a status of "threatened" under the ESA (USFWS 2015). The statuses of anadromous species have also changed since 1996, with the populations of salmon, steelhead, and other fish species (e.g., eulachon and sturgeon) being broken out into various Evolutionarily Significant Units (ESU) and Distinct Population Segments (DPS), each of which may have a different listing status than other ESU or DPS within the same species. In addition, new species such as the yellow-billed cuckoo have become listed under the ESA since 1996 (USFWS 2016a).

The Oregon Biodiversity Information Center's (ORBIC) recent publication regarding rare, threatened, and endangered species in Oregon indicates that the Oregon spotted frog (*Rana pretiosa*), which is federally listed as threatened, could be potentially present in Columbia County (ORBIC 2016); however, distribution data provided by the USFWS indicate that this species is not present in or near Columbia County (USFWS 2016c). ORBIC (2016) also indicates that the grizzly bear (*Ursus arctos*), which is federally listed as threatened, once inhabited Columbia County, but this species is currently considered extirpated from the area. Based on this information, PGE concluded that these two species are not likely present within or near the Trojan site, and have excluded these species from Table E3-1.

In 1996, the bald eagle (*Haliaeetus leucocephalus*) and the peregrine falcon (*Falco peregrinus anatum*) were known to breed on the Trojan site. Both species were listed as endangered under the ESA in 1996; however, these species have been delisted and are no longer protected by the ESA (USFWS 2016d, 2016e). The bald eagle and peregrine falcon are currently considered state

"vulnerable sensitive species" in Oregon[1] (ORBIC 2016). As part of decommissioning of the TNP, PGE removed the Cooling Tower that once contained a peregrine falcon nest. Peregrine falcons have since been documented as nesting in the vicinity (within a mile of the Trojan site). Bald eagles have also nested in various locations in the vicinity in recent years, including one location on the larger PGE Trojan property, approximately 2,000 feet from the Trojan ISFSI facility. Nesting bald eagles and peregrine falcons in the area are acclimated to ongoing activity at the facility, and nest locations are located at sufficient distance from the Trojan ISFSI facility to make it unlikely that ongoing operation of the facility would impact bald eagle or peregrine falcon breeding behavior.

E3.7 METEOROLOGY, CLIMATOLOGY, AND AIR QUALITY

Meteorology, climate, and air quality conditions in the vicinity of the ISFSI remain essentially as described in Section 2.3 of the ER (PGE 1996a, 1996b). The regional climate of the Trojan site is typical of the marine climate of the Pacific coast. It is characterized by wet winters and dry summers with mild temperatures year round. The Columbia River Valley, which runs generally north-south in the vicinity of the ISFSI, tends to channel winds along the path of the valley. (PGE 2017, Section 2.3.2.3).

The ISFSI SAR states that the regional mean temperatures for summer is 65 degrees Fahrenheit (°F) and for winter is 40°F (PGE 2017, Section 2.3.1.1). These figures are consistent with National Weather Service data for 1981-2000 for Portland, Oregon (NOAA 2016b), which indicate the lowest monthly mean temperature is 41.4°F in January and the highest is 69.5°F in August. The daily mean temperature minimum was 35.2°F in December and the maximum was 81.1°F in August. Severe storms and thunderstorms are infrequent; tornadoes rarely occur (PGE 2017, Section 2.3.1.1). Onsite meteorological data are not being collected during ISFSI operation, because the ISFSI does not have gaseous effluents that require monitoring (PGE 2017, Section 2.3.3). The original ER, which remains accurate, provides more detail on the climate and meteorology.

The Trojan ISFSI is in the Portland Interstate Air Quality Control Region (AQCR; 40 CFR 81.51). The air quality near the ISFSI is in attainment (unclassifiable/attainment) for all criteria pollutants (40 CFR 81.338).

E3.8 NOISE

Section 2.7 of the ER (PGE 1996a, 1996b) includes a summary of the expected noise impacts from construction and operation of the Trojan ISFSI. Similarly, Section 6.1.4 of the associated EA (NRC 1996) discusses noise impacts from construction of the Trojan ISFSI and Section 6.2.4.2 addresses noise impacts from facility operation. Neither the ER nor the EA provide a specific description of the affected environment relative to noise.

Section 2.1 of the ER contains detailed information about land uses and human activities in the vicinity of the Trojan site, which represent both existing noise sources and potential receptors of noise associated with the ISFSI. Section E3.2 of this Supplemental ER provides updated information about land use conditions, and Section E3.11 provides updated information about

[1] "Vulnerable sensitive species" are those that are defined by the state of Oregon as facing one or more threats to their populations or habitats. Vulnerable species are not currently imperiled with extirpation from a specific geographic area or the state but could become so with continued or increased threats to populations or habitats (ORBIC 2016).

human communities near the site. Residences in the small, incorporated community of Prescott (estimated population 55 [Population Research Center 2015]), located approximately 0.6 mile north of the ISFSI, are the permanently occupied structures that are closest to the facility and represent potential noise receptors. Users of Trojan Park and the adjacent natural area within the 634-acre Trojan property represent the other potential noise receptor group of note. Vehicle traffic on U.S. Highway 30, located along the western boundary of the Trojan site and approximately 0.5 mile from the ISFSI, accounts for the most prominent source of relatively continuous noise in the site vicinity. Train activity on the Portland and Western Railroad that transects the Trojan site and vessel traffic on the Columbia River east of the site are sources of intermittent audible noise.

E3.9 HISTORICAL AND CULTURAL RESOURCES

Section 2.6 of the original ER (PGE 1996a, 1996b) and Section 4.4 of the EA (NRC 1996) draw conclusions relative to cultural resources based on information considered during the initial licensing of the TNP. At that time, an area adjacent to the barge slip (south of the Cooling Tower) was found to contain Native American artifacts and was determined to be an archaeological site (35C01: pre-contact village site). Agreements were reached between PGE and Oregon SHPO regarding the treatment and avoidance of site 35C01. Becker (2005) provides a detailed account of the known history for site 35C01, including disturbance between 1971 and 1975 during the construction of the TNP. The Trojan ISFSI is located in an area previously disturbed during construction of TNP and its operation does not involve activities near the archaeological site.

In support of the effort to develop this ER supplement, PGE reviewed cultural resources documentation applicable to the Trojan site. PGE has sponsored several previous archaeological surveys within the PGE Trojan property and adjacent areas (Mastrangelo and Holschuh 2014). The majority of surveys conducted in the vicinity of the barge slip area have focused on Site 35CO1 and were not undertaken in the vicinity of the ISFSI. Other investigations included monitoring of geotechnical excavations and demolition activities at the Trojan fish rearing ponds, and monitoring of trench excavation for TNP telecommunications installation. Both of these areas are located in the southern portion of the Trojan site. These cultural investigations, which included subsurface testing, indicate that portions of the TNP had been built on a layer of imported fill that overlays native soils (Lloyd-Jones 2007; Lloyd-Jones et al. 2008). In summary, PGE's latest review did not identify any documentation that would require an update of the cultural resource conditions relative to the Trojan ISFSI provided in the original ER.

E3.10 VISUAL RESOURCES

Section 2.1 of the ER (PGE 1996a, 1996b) contains detailed information about land uses and human activities in the vicinity of the Trojan site and indirectly provides a summary of landscape conditions near the site. Section E3.2 of this Supplemental ER provides updated information about land use conditions, and Section E3.11 provides updated information about human communities near the site. The ER does not provide a specific description of the affected environment relative to visual resources.

The Trojan ISFSI occupies a cleared, graded, paved area in the northeastern corner of the 30-acre developed portion of the Trojan site. A large, vegetated, natural berm approximately 50 feet in height extends along the north and east sides of the ISFSI. The few remaining structures from the former nuclear plant, paved areas, and security fencing extend to the south and west from the ISFSI. The switchyard is located west of the ISFSI, beyond the security fencing for the former

plant site. A 26-acre reflecting lake and approximately 140 acres identified as Trojan Park are located to the west and southwest of the switchyard and the former plant site. Trojan Park is managed for day-use recreation and has limited developed facilities. The balance of the 634-acre Trojan property consists of extensive areas left in an undeveloped condition and supporting primarily forest and meadow vegetation.

The features of the ISFSI have limited or no visibility from locations that are accessible to the public, i.e., from locations outside of the controlled area. The berm along the north and east sides of the ISFSI provides a complete visual barrier for potential viewers in the Prescott area or on the adjacent Columbia River. For example, the Washington Department of Fish and Wildlife Sportsman Club water access site near Kalama, Washington, is directly across the river from the Trojan site and has an unobstructed view to the Trojan site. Field investigation in November 2016 confirmed that features such as the water intake facility, the graded pad for the plant, and light poles are plainly visible from the access site, but the ISFSI is blocked from view by the berm. Views toward the ISFSI from locations to the south, within the undeveloped portion of the Trojan site, are blocked by terrain. Views toward the ISFSI from locations to the west and southwest, such as potential viewpoints within Trojan Park or on U.S. Highway 30, are at least partially obstructed by the switchyard structures, the remaining buildings within the plant site, and/or the change in grade from the park area to the plant site.

E3.11 DEMOGRAPHY AND SOCIOECONOMICS

E3.11.1 Demography

The original ER (PGE 1996a, 1996b) included population estimates by sector for a 10-mile radius of the site, based on 1990 census data and projected those populations through 2010. Population data have been updated for the 10-mile radius using the U.S. Census Bureau (USCB) 2010 decennial census data (USCB 2011, 2012) and county population projections provided by state government agencies (OEA 2013; OFM 2012).. The 10-mile radius population is projected through 2060 to cover the proposed period of extended ISFSI operation. County-level population projections are based on growth rates calculated using Census data (2010) and county growth projections (2030). Based upon historical factors, the population growth within 10 miles of the Trojan site is approximately 6.3 percent per decade. The growth projections developed here are not significantly different from those found in PGE's original ER, where the population within 10 miles of the site was projected to grow by 5 percent per decade.

The estimated resident population distribution within 10 miles of the Trojan site for the years 2010, 2020, 2030, 2040, 2050, and 2060 is listed in Table E3-2. Figure E3-3 illustrates the locations of the sectors identified in these tables.

There is relatively little recreational land use within the immediate area of the site. There are no state or federal parks nearby. The lower Columbia River is used for recreational fishing and boating, most of which occurs from March to September. The heaviest concentration of anglers on the river near the ISFSI will be about 24 anglers per day per river mile in September. The 26-acre reflecting lake and 28-acre recreational lake located on PGE property are accessible to the general public from the property entrance road. Fishing activity peaks in the spring (about 30 fishermen per day) when the state of Oregon stocks the recreational lake, and then the fishing activity tapers off to a couple of fisherman per day (PGE 2017, Section 2.1.4).

Table E3-2. Current Populations and Projections, by Sector, to 2060

Mile Radius	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Total
2010																	
1	5	0	1	1	12	6	0	0	5	11	7	3	2	1	1	53	107
2	0	33	86	12	53	219	1	13	80	41	32	36	21	17	14	45	701
3	0	205	242	111	267	337	787	2	40	80	67	45	54	29	38	143	2,447
4	47	355	231	65	147	182	1,073	0	21	89	113	56	57	80	208	95	2,821
5	157	394	232	87	112	227	649	11	94	117	58	58	91	236	1,478	4	4,005
10	12,564	770	664	318	422	372	2,097	771	725	484	263	244	442	1,480	1,902	37,532	61,050
Total	**12,772**	**1,757**	**1,455**	**593**	**1,013**	**1,343**	**4,607**	**796**	**967**	**822**	**540**	**442**	**667**	**1,843**	**3,642**	**37,872**	**71,131**
2020																	
1	5	0	1	1	13	6	0	0	6	12	8	3	2	2	1	59	118
2	0	35	90	12	56	231	1	14	90	46	36	40	23	19	16	50	758
3	0	216	256	117	282	356	719	2	45	89	75	50	60	32	43	135	2,476
4	50	375	244	69	155	192	1,133	0	23	100	126	63	64	89	232	103	3,017
5	166	416	244	92	119	240	685	12	105	130	64	64	102	263	1,644	4	4,350
10	13,265	813	701	336	446	393	2,214	848	808	539	292	272	492	1,647	2,077	39,627	64,768
Total	**13,485**	**1,855**	**1,536**	**626**	**1,070**	**1,418**	**4,751**	**875**	**1,076**	**915**	**601**	**492**	**742**	**2,052**	**4,013**	**39,978**	**75,486**
2030																	
1	6	0	1	1	14	7	0	0	7	14	9	4	2	2	1	65	130
2	0	37	95	13	59	244	1	16	100	51	40	44	26	21	18	56	819
3	0	228	270	123	298	376	759	2	50	99	83	56	67	36	48	150	2,644
4	53	396	257	73	164	203	1,196	0	26	111	141	70	71	99	258	112	3,229
5	175	439	258	97	125	253	723	13	117	144	71	71	113	293	1,829	4	4,728
10	14,005	858	740	354	471	415	2,337	932	899	600	325	303	547	1,834	2,270	41,838	68,729
Total	**14,238**	**1,959**	**1,622**	**661**	**1,130**	**1,497**	**5,016**	**962**	**1,198**	**1,019**	**670**	**548**	**826**	**2,285**	**4,423**	**42,226**	**80,279**

Table E3-2. Current Populations and Projections, by Sector, to 2060 (continued)

Mile Radius	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Total
2040																	
1	6	0	1	1	14	7	0	0	7	15	10	4	2	2	1	73	144
2	0	39	101	14	62	257	1	17	111	57	45	49	29	23	20	63	886
3	0	241	285	130	314	397	801	2	56	110	92	62	75	40	53	167	2,826
4	56	418	272	77	173	214	1,263	0	29	123	157	78	79	110	288	122	3,457
5	184	464	273	102	132	268	764	14	130	161	79	79	126	326	2,034	4	5,142
10	14,787	906	781	374	497	438	2,467	1,025	1,001	668	362	337	609	2,042	2,482	44,173	72,951
Total	**15,033**	**2,068**	**1,712**	**698**	**1,193**	**1,580**	**5,296**	**1,059**	**1,334**	**1,134**	**745**	**610**	**920**	**2,544**	**4,877**	**44,601**	**85,405**
2050																	
1	7	0	1	1	15	7	0	0	8	17	11	5	2	2	1	81	159
2	0	41	106	15	65	272	1	19	124	63	50	55	32	26	22	70	959
3	0	255	301	137	332	419	846	2	62	123	103	69	83	45	59	186	3,021
4	59	441	287	81	183	226	1,334	0	32	137	174	86	88	123	320	132	3,703
5	195	490	288	108	140	282	806	16	145	179	88	88	140	363	2,263	5	5,597
10	15,612	957	825	395	524	463	2,605	1,128	1,114	744	403	375	678	2,274	2,715	46,637	77,451
Total	**15,872**	**2,184**	**1,808**	**737**	**1,259**	**1,668**	**5,592**	**1,166**	**1,485**	**1,263**	**830**	**679**	**1,024**	**2,832**	**5,380**	**47,111**	**90,891**
2060																	
1	8	0	1	1	16	8	0	0	9	19	13	5	3	2	1	90	176
2	0	43	112	15	69	287	1	21	138	70	55	61	36	29	24	77	1,039
3	0	269	318	145	350	442	893	3	69	137	115	77	93	50	66	207	3,232
4	62	466	303	86	193	238	1,408	0	36	153	194	96	98	137	357	144	3,970
5	206	517	304	114	147	298	851	18	161	199	98	98	156	404	2,517	5	6,096
10	16,483	1,010	871	417	554	488	2,751	1,242	1,241	828	449	418	755	2,531	2,972	49,240	82,252
Total	**16,758**	**2,305**	**1,909**	**778**	**1,330**	**1,762**	**5,904**	**1,284**	**1,654**	**1,406**	**924**	**756**	**1,140**	**3,153**	**5,937**	**49,763**	**96,764**

Sources: OEA 2013; OFM 2012; USCB 2011, 2012

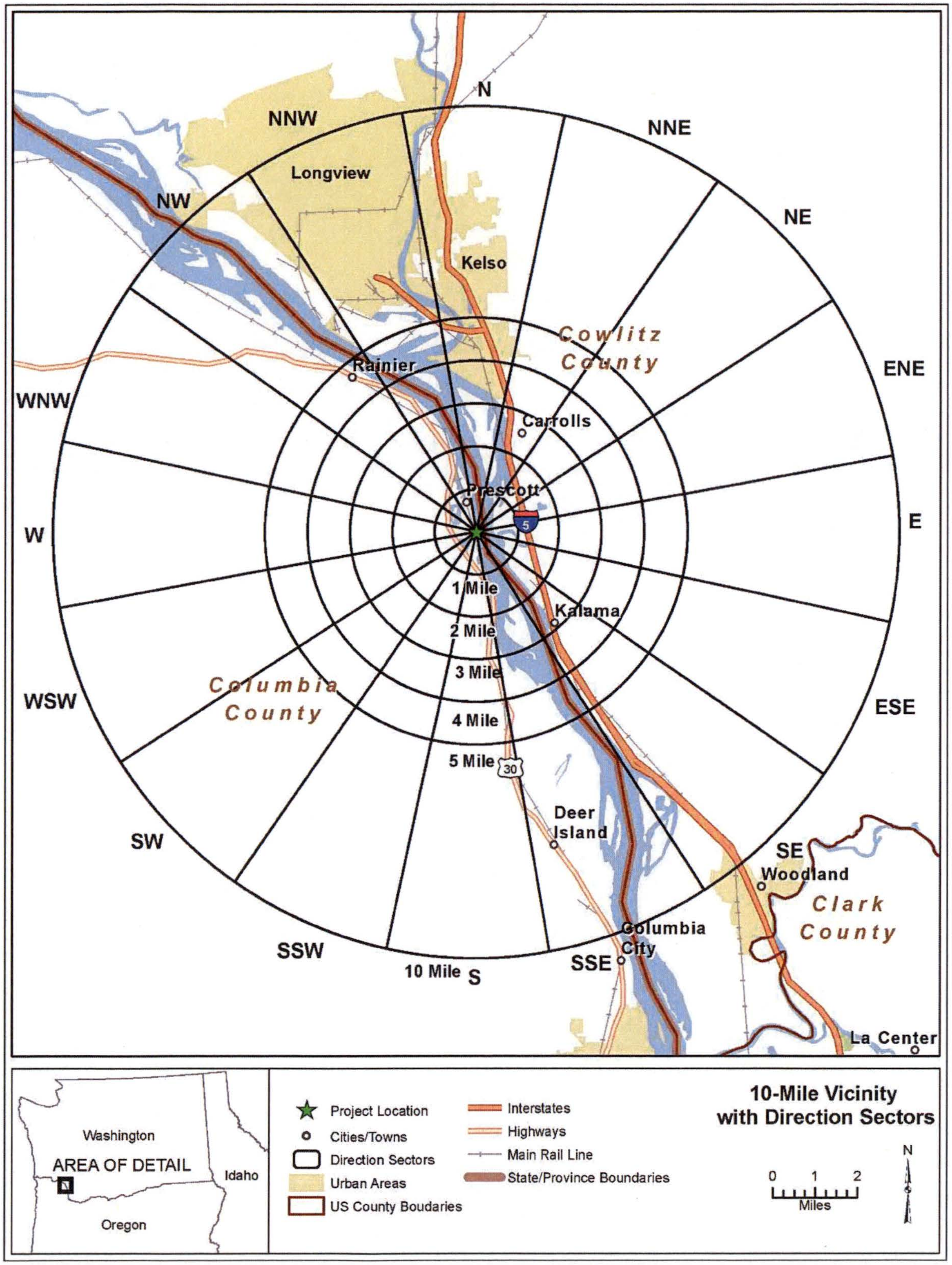

Figure E3-3. Population Sectors within 10 Miles of the Trojan Site

E3.11.2 Environmental Justice

On February 11, 1994, the President signed Executive Order 12898 "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," which directs all Federal agencies to develop strategies for considering environmental justice in their programs, policies, and activities. Environmental justice is described in the Executive Order as "identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations." On December 10, 1997, the Council on Environmental Quality (the Council or CEQ) issued "Environmental Justice Guidance under the National Environmental Policy Act" (CEQ 1997). The Council developed this guidance to "further assist Federal agencies with their National Environmental Policy Act (NEPA) procedures."

In 2003, the NRC issued guidance for Office of Nuclear Materials Safety and Safeguards (NMSS) staff conducting environmental justice reviews for proposed actions as part of NRC's compliance with NEPA (NRC 2003, Appendix C). NRC guidance was used in determining the minority and low-income composition in the environmental impact area.

E3.11.2.1 Methodology and Analysis

The original ER (PGE 1996a, 1996b) did not address environmental justice, so this section has been added to provide locations of potential minority and low-income populations. Accordingly, information requirements for environmental justice determinations in NUREG-1748 were considered (NRC 2003, Appendix C). The guidance document also contains a methodology to identify the locations of minority and low-income populations of interest. The guidance suggests that a 4-mile radius could reasonably be expected to contain the area of potential effect and that the state and county are considered the appropriate geographic areas for comparative analysis. USCB demographic data provide the necessary information on race, ethnicity, and poverty.

ArcGIS®[2] Desktop 10.3 software and USCB American Community Survey (ACS) 5-Year Summary data for 2010-2014 was used to determine minority and low-income characteristics by block group within 4 miles of the ISFSI site. A census block group is a geographic unit used by the USCB that is between the census tract and the census block. A block group was included if any part of its occupied area fell within 4 miles of the site. A total of 12 block groups were identified within the 4-mile radius. Consistent with NRC guidance, the geographic areas for comparative analysis was defined as the states of Oregon and Washington and the counties of Columbia County, Oregon, and Cowlitz County, Washington. Block groups in each state were analyzed separately against their respective state's and county's data.

E3.11.2.2 Minority Populations

NMSS guidance defines minority categories as: American Indian or Alaskan Native; Asian; Native Hawaiian or other Pacific Islander; African American (not of Hispanic or Latino origin); some other race; and Hispanic or Latino ethnicity (of any race) (NRC 2003). There is also a "Multiracial" category. This includes individuals that identify themselves as more than one race.

The guidance also indicates that a block group has a significant minority population if either of the following two conditions is met:

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[2] ArcGIS is a trademark of Environmental Systems Research Institute, Inc.

- The minority population of the block group or environmental impact area exceeds 50 percent of the total population for that census block group.
- The minority population percentage of the environmental impact area is significantly greater (typically at least 20 percentage points) than the minority population percentage in the geographic areas chosen for comparative analysis.

The percentage of a block group's population represented by each minority category was calculated for each of the 12 block groups within the 4-mile radius, using the USCB ACS data, and calculated the percentage of each minority category in the block group's corresponding state and county. If the percentage of any block group minority category exceeded 50 percentage of the total block group population, or exceeded its corresponding state or county percentage by more than 20 percent, it was identified as containing a significant minority population. Table E3-3 provides minority percentages for each of the geographic comparison areas (states and counties). The results of the analysis indicate that no census block groups within the 4-mile radius have significant percentages of minority populations, as identified above.

E3.11.2.3 Low-Income Populations

The NRC guidance defines low-income households based on USCB statistical poverty thresholds (NRC 2003). A block group has a significant low-income population if either of the following two conditions is met:

- The low-income population in the census block group exceeds 50 percent of its total population.
- The percentage of households below the poverty level in a block group is significantly greater (typically at least 20 percentage points) than the low-income population percentage in the geographic areas chosen for comparative analysis.

USCB low-income households in each census block group were divided by the total number of households for that block group to obtain the percentage of low-income households per block group. The same geographic comparison areas were used. Table E3-3 provides low-income percentages for each of the geographic comparison areas (states and counties). If the percentage of any block group low-income category exceeded 50 percent of the total block group population, or exceeded its corresponding state or county percentage by more than 20 percent, it was identified as containing a significant low-income population. The results of the analysis indicate that no census block groups within the 4-mile radius have significant percentages of low-income households.[3]

[3] There is one block group in the analysis that has a significant low-income population (58%). However, the portion of the block group falling within the 4-mile radius contains no residents.

Table E3-3. Minority and Low-Income Percentages, by Geographic Comparison Area

Geographic Area of Comparison	Total Population	Black/ African American	American Indian or Alaska Native	Asian	Native Hawaiian or Other Pacific Islander	Other	Multiracial	Hispanic or Latino Ethnicity	Low-Income Households
State of Oregon	3,900,343	2%	1%	4%	0%	4%	4%	12%	15%
Columbia County, Oregon	49,325	0%	2%	1%	0%	1%	3%	4%	12%
State of Washington	6,899,123	4%	1%	8%	1%	4%	5%	12%	12%
Cowlitz County, Washington	102,072	1%	1%	1%	0%	1%	4%	8%	17%

Sources: USCB 2014a, 2014b

E3.11.3 Socioeconomics

The workforce at the Trojan ISFSI consists of security personnel and an operations staff to conduct periodic monitoring and inspections.

The nearest population centers with amenities suitable for a longer-term workforce, such as that found at the Trojan ISFSI, are the cities of Rainier, Oregon, and Longview and Kelso, Washington, about 5 to 10 miles north of the ISFSI. Rainier's 2015 population estimate was 1,920 (USCB 2015a). Longview and Kelso, located across the Columbia River from Rainier, are adjacent to one another and their combined 2015 population estimate was 48,749 (USCB 2015b). The largest population center within daily commuting distance of the plant site is Portland, Oregon, approximately 35 to 40 miles south-southeast. The 2015 population estimate for Portland was 632,309 (USCB 2015b).

PGE and the other Trojan site owners pay property taxes to the Columbia County Tax Collector for the remaining structures at the Trojan site. Based on a net book value of about $126,000, the owners paid about $2,000 in property taxes in 2015. The owners' expectations are that the property tax payments will remain the same or decline immaterially over the remaining life of the facility. Columbia County's annual property taxes in fiscal year 2014-2015 were about $65 million. In fiscal year 2015-2016, they were about $66 million (Columbia County 2016, pg. 41).

E4 ENVIRONMENTAL IMPACTS

The following sections discuss environmental consequences associated with continued operations of the Trojan ISFSI. PGE considered the specific resource areas that have potential impacts associated with the ISFSI operations over the extended license term.

On September 19, 2014, the NRC published a revised rule in 10 CFR 51.23, "Environmental Impacts of Continued Storage of Spent Nuclear Fuel Beyond the Licensed Life for Operations of a Reactor" (79 Federal Register 56238-56264). The NRC rule codifies the generic impact determinations in NUREG–2157, Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel (NRC 2014). This rule was formerly known as the Waste Confidence Decision and Rule. The revised rule adopts the generic impact determinations made in NUREG–2157 and codifies the NRC's generic determinations regarding the environmental impacts of continued storage of spent fuel beyond a reactor's operating license (i.e., those impacts that could occur as a result of the storage of spent fuel at at-reactor or away-from-reactor sites between the time a reactor's licensed operation ends and a permanent repository becomes available). The updated Continued Storage Rule and NUREG-2157 provide the NEPA analyses of human health and environmental impacts of continued storage of spent fuel beyond the licensed life of a reactor that are needed to support renewal of the Trojan ISFSI license.

The analysis in NUREG–2157 concludes that the potential impacts of at-reactor storage during the short-term time frame (no more than 60 years after the expiration of the reactor's license to operate) would be small (NRC 2014, Section 4.20). PGE is requesting renewal of the Trojan ISFSI license through 2059, which is less than 60 years after the TNP license was terminated in 2005. Further, the analysis in NUREG–2157 states that disposal of the spent fuel in a DOE repository by the end of the short-term time frame is the most likely outcome (NRC 2014, Section 1.2). As described in the following sections, impacts from the proposed renewal of SNM-2509 are primarily occupational and public health impacts associated with radiological exposure.

NRC determined in the initial licensing of the ISFSI (NRC 1996, Section 9.2) that "the storage of spent nuclear fuel and GTCC waste at the Trojan ISFSI will not significantly affect the quality of the human environment." In light of NRC's findings in NUREG-2157 (NRC 2014) and those in the remaining subsections of this chapter, PGE concludes that the conclusions of NRC's 1996 EA remain unchanged.

E4.1 IMPACTS FROM REFURBISHMENT AND CONSTRUCTION

The Proposed Action does not include refurbishment or new construction. Impacts for construction of the Trojan ISFSI were addressed in the original licensing evaluation (NRC 1996, Chapter 6). As described in Section E1.2.2, no refurbishment is planned. Only routine monitoring and maintenance is expected over the proposed 40-year period of extended operation. Therefore, there are no environmental impacts from refurbishment or construction beyond those analyzed in the original EA (NRC 1996).

E4.2 OCCUPATIONAL AND PUBLIC RADIOLOGICAL HEALTH IMPACT

No liquid or gaseous effluents are released to the environment from operation of the ISFSI. Therefore, only radiation from the sealed Multi-Purpose Canisters (MPCs) within concrete casks

could affect workers or members of the public. The design and operational features of the storage system described in Section E1.2.2, along with the ISFSI radiological protection program, mitigate radiological impacts (PGE 2017, Section 7.1.1). Potential occupational and public ISFSI doses are addressed separately below.

E4.2.1 Occupational Dose

The SAR presents dose calculations for 1) staff loading transport casks for offsite shipment and 2) staff performing surveillance and maintenance at the ISFSI. The calculated collective dose to workers loading transport casks is 0.84 person-rem for each of the 34 casks. Two operators would receive the highest collective dose of 0.8 person-rem, for an average individual dose 0.4 rem (400 millirem) per cask, each. The collective dose per year for weekly surveillances, annual and quarterly surveys, and regular ISFSI maintenance is 1.6 person-rem per year (PGE 2017, Table 7.4-3).

Actual occupational doses would be less than those calculated because of the conservative assumptions discussed in Chapter 7 of the SAR (PGE 2017) and the PGE As Low As Reasonably Achievable (ALARA) program. Based on actual operating experience, Trojan ISFSI personnel have not recorded any dose on individual dosimetry in the last decade, as documented in annual PGE submittals to the NRC.

E4.2.2 Public Dose

The SAR presents calculation of the annual dose from ISFSI radiation to 1) an individual at the Controlled Area Boundary 200 meters (660 feet) from the edge of the pad and 2) the nearest permanent resident 660 meters (2,200 feet) from the pad. Table E4-1 gives the results for of the dose calculations, which indicate compliance with all applicable NRC dose limits. Using population data from Section E3.11 (census year 2010), the collective dose is calculated as if all the individuals within 1 mile of the site boundary live at the location of the nearest permanent resident. The resulting collective dose is 0.25 person-rem. The assumption that all residents would be at the location of the nearest permanent residence is conservative. More recent environmental measurements at the Controlled Area Boundary (PGE 2016) are consistent with these results.

Table E4-1. Annual Doses to Offsite Receptors for the Trojan ISFSI in millirem

	Dose at Controlled Area Boundary	Dose at Nearest Residence	Regulatory Limit[1]
Whole Body	3.6	2.3	25
Thyroid	3.5	2.2	75
Critical Organ	5.1	3.2	25

Source: PGE 2017, Table 7.4-4.

[1] 10 CFR 72.104(a)

Note: Doses include direct radiation and radionuclide release from off-normal fuel pin failure and MPC leakage. There is no credible scenario where this release would occur, but the consequences are included for conservatism (PGE 2017, Section 8.1.4).

Note: The direct radiation component of these values is based on field measurements and 2,080 hours per year occupancy for the Controlled Area Boundary and 8,760 hours per year at the Nearest Resident.

E4.3 OTHER OPERATIONAL IMPACTS

The routine operation of the ISFSI involves dry storage of spent nuclear fuel in sealed containers. With the exception of inspections and maintenance, storage operation is passive. There are no

liquid or gaseous effluents. Accordingly, no impacts are expected other than those from radiation as described in Section E4.2. NUREG-1748 identifies the types of environmental impacts to be analyzed for a materials license ER (NRC 2003). Each identified discipline or resource area is briefly addressed below. Conclusions drawn from the original ISFSI EA (NRC 1996) are adopted, where available and still appropriate.

The land occupied by the ISFSI was committed when the ISFSI was constructed. It is located within the former TNP developed area on land previously occupied by buildings. No additional land use impacts are expected from continued operation beyond those described in the original EA (NRC 1996).

No significant changes in staffing are anticipated to manage the ISFSI during the term of the renewed license, and no new radwaste shipments or related activities are expected. Therefore, no impacts to transportation are expected.

Impacts to geology and soils occurred when the TNP and, subsequently, the ISFSI were constructed. No additional impacts to geology or soils are expected from continued operation.

The ISFSI does not require water for its operation, and does not discharge effluents to surface or groundwater. Based on the size of the ISFSI work force, minimal sanitary waste is generated. It is disposed in a septic system. No impact to water resources is expected from continued operation beyond those described in the original EA (NRC 1996).

Any ecological impacts occurred when the ISFSI was constructed. The original EA asserted that ISFSI operation would have minimal impact on local wildlife (NRC 1996). Fences provided for other purposes deter wildlife access to the ISFSI. No ecological impact is expected from continued operation beyond those described in the original EA (NRC 1996). As discussed in Section E3.6, license renewal and continued operation of the Trojan ISFSI facility is not expected to impact sensitive wildlife species or habitat. There are no species listed as threatened or endangered that are known to currently occupy the Trojan site. Permit renewal and continued operation of the Trojan ISFSI would not alter any wildlife or plant habitat and is not expected to affect listed species or critical habitat. Therefore, the applicant expects that the NRC would make a no-effect determination for the license renewal, in which case consultation with USFWS and NMFS would not be required.

The ISFSI does not release airborne emissions. No adverse air quality impact is expected from continued operation beyond those described in the original EA (NRC 1996).

Storage of irradiated fuel and associated materials at the ISFSI involves use of a passive system that does not generate noise. Audible noise directly attributable to operation of the ISFSI is generally limited to occasional vehicle traffic to and from the ISFSI during routine operations and maintenance activities. The large natural berm along the north and east sides of the ISFSI provides an effective noise barrier in those directions. Noise from ISFSI-related vehicle activity is likely not noticeable to recreational visitors in Trojan Park. Based on these considerations, no adverse noise impact is expected from continued operation of the Trojan ISFSI.

The continued management of irradiated fuel and associated materials at the ISFSI involves use of the existing dry fuel storage system, and no significant structural modifications or construction are anticipated that would result in ground disturbance. Based on these considerations, no adverse cultural resource impact is expected from continued operation of the Trojan ISFSI.

Structures at the ISFSI have limited or no visibility from locations outside of the controlled area, because of the view obstruction created by terrain or by other existing structures on the plant site. The visible evidence of ISFSI operation that could be observed by public viewers is limited to occasional vehicle (passenger cars and light-duty trucks) traffic to and from the ISFSI during routine operations and maintenance activities. Therefore, no adverse visual impact is expected from continued operation of the Trojan ISFSI.

Any changes to the local economy as a result of the construction and operation of the ISFSI occurred when the ISFSI was constructed. NRC concluded the workforce is not of sufficient size to affect the socioeconomic characteristics of the local area (NRC 1996, Section 4.4). No socioeconomic impacts are expected from continued operation beyond those described in the original EA.

The minority and low-income populations (Section E3.11.2) are located more than 4 miles away from the ISFSI—beyond the range of any public dose effects. Furthermore, NRC has determined that overall human health and environmental impacts from at-reactor spent fuel storage during the short-term timeframe are small for all populations. Therefore, minority or low-income populations are not expected to experience disproportionately high and adverse impacts during this timeframe (NRC 2014, Section 4.3.1). There are no site-specific conditions associated with extended operation of the Trojan ISFSI that would alter NRC's generic conclusion.

Radiological public and occupational health is addressed in Section E4.2. As discussed above, ISFSI operations have no effect on nonradiological public health. Nonradiological occupational health effects at the Trojan ISFSI are managed through PGE's safety and health program. No adverse health impact is expected from continued operation.

As noted in the original EA, operation of the ISFSI would not result in the generation of gaseous, liquid, or solid radioactive wastes. Non-radioactive wastes associated with the operation of the ISFSI include small amounts of mercury light bulbs, empty aerosol cans, batteries, and fluorescent light ballasts that may contain polychlorinated biphenyls (PCBs). PGE manages these wastes in accordance with Resource Conservation and Recovery Act regulations governing small quantity generators. Based on the size of the ISFSI organization, little sanitary or other wastes are generated as a result of the operation of the ISFSI. Therefore, no waste management impacts are expected from continued ISFSI operation.

E4.4 IMPACTS FROM POSTULATED ACCIDENTS

NRC regulations at 10 CFR 72.106(b) prescribe dose limits at the nearest boundary of the controlled area from a design basis ISFSI accident. The SAR for the Trojan ISFSI (PGE 2017), Section 8.2, examines 12 design basis and beyond design-basis accidents. These are, with some exceptions, the same as the 14 accidents reviewed by NRC in the original EA for the ISFSI (NRC 1996, Section 6.2.2). Two of NRC's accidents are no longer possible, because TNP no longer exists. The following are the current SAR accidents:

1. Failure of Fuel Pins with Subsequent Breach of Multi-Purpose Canister
2. Maximum Anticipated Heat Load
3. Concrete Cask Overturning Event
4. Tornado

5. Earthquake Event
6. Pressurization
7. Full Blockage of Air Inlets
8. Explosions of Chemicals, Flammable Gases, and Munitions
9. Fires
10. Volcanism
11. Lightning
12. Offsite Shipping Events

Of these accidents, only three ("Failure of Fuel Pins with Subsequent Breach of Multi-Purpose Canister," "Earthquake Event," and "Lightning") have radiological consequences. Two of them ("Earthquake Event" and "Lightning") result in a degradation of shielding causing dose to workers to repair the damage, but no release of radioactive effluents. Repair work would be performed in accordance with normal site procedures in compliance with radiation protection regulations. Only "Failure of Fuel Pins with Subsequent Breach of Multi-Purpose Canister" has potential to release radioactive effluents to the environment.

The accident "Failure of Fuel Pins with Subsequent Breach of Multi-Purpose Canister" involves the failure of 100 percent of the fuel rods in 24 fuel assemblies in the MPC. There is no known cause for this accident coincident with loss of MPC integrity. Therefore, the analysis is hypothetical. Dose results are provided in Table E4-2. The calculated doses are considerably less than the dose limits in 10 CFR 72.106.

Table E4-2. Hypothetical Accident Dose Results from Failure of Fuel Pins with Subsequent Breach of Multi-Purpose Canister in Millirem within 30 Days

Receptor	Whole Body	Critical Organ (Bone)	Skin
Controlled Area Boundary	1.18	18.5	0.0021
Nearest Residence	0.18	2.74	3.1×10^{-4}
10 CFR 72.106 Dose Limit	5,000	50,000	50,000

Source: PGE 2017, Table 8.2-2

E5 MITIGATION MEASURES

As presented in Chapter 4, the only impact of the proposed action is radiological dose to workers and the public. PGE adopted measures to mitigate for those potential impacts in conjunction with construction and operation of the ISFSI under the original license, as discussed below. PGE will continue to implement these measures throughout the license renewal term.

Workers in the ISFSI Radiologically Controlled Area wear personnel radiation monitoring devices and dose is recorded and tracked for analysis. Radiation outside the ISFSI fence is continually measured at the 200-meter Controlled Area Boundary surrounding the ISFSI. Control dosimeters are also used to measure background. If measured doses were to significantly exceed historical levels, PGE would perform analyses to determine the cause and would establish mitigation measures. The PGE Radiological Protection ALARA program is an effective method for ensuring that doses to workers and the public are as low as can be achieved by reasonable, cost-effective methods. In addition to monitoring the radiation environment around the ISFSI, inspections and maintenance of the ISFSI casks are performed to ensure that no degradation of equipment could lead to increased radiation levels.

E6 ENVIRONMENTAL MEASUREMENT AND MONITORING

Given that the TNP has been dismantled and removed from the site and that the ISFSI is a passive operation that does not release radioactive effluents into the environment, the only environmental measurements required are related to direct radiation. PGE has placed environmental dosimeters at eight locations on the Controlled Area Boundary.

The regulatory agencies with jurisdiction have prescribed no other physical, chemical, or ecological monitoring requirements, beyond those described above, to support operations of the ISFSI. The proposed action does not involve any changes to the ISFSI Technical Specifications, refurbishment of the ISFSI, or changes in ISFSI operation that would impact the effectiveness or validity of the radiation measurement program. Therefore, the current monitoring program would continue through the license renewal period, and no additional environmental measurements or monitoring would be required.

E7 SUMMARY OF ENVIRONMENTAL CONSEQUENCES

E7.1 UNAVOIDABLE ADVERSE IMPACTS

As presented in Section E4, the only adverse impacts of the proposed action are radiological dose to workers and radiological dose to the public. Although PGE employs inspections, maintenance, monitoring, and ALARA principles (Section E5) to mitigate these impacts, some impact is unavoidable. However, as indicated in Section E4, NRC concluded that the impact of the ISFSI to both occupational workers and members of the public is within regulatory limits (radiation protection standards of 10 CFR 72.104(a)) (NRC 1996, Section 9.1).

E7.2 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

The continued operation of the Trojan ISFSI for the license renewal term would result in no additional irreversible and irretrievable resource commitments beyond those materials committed during the initial licensing of the ISFSI that cannot be recovered or recycled or that are consumed or reduced to unrecoverable forms. As noted in the original license application for the ISFSI and NRC's corresponding EA, those resources committed to this facility, whether irreversibly or for the life of the facility, represent small portions of the total amount of such resources available for use in any particular category. No resources would be irretrievably committed as a result of continued ISFSI operations for the license renewal term.

E7.3 SHORT-TERM USES, MAINTENANCE, AND ENHANCMENT OF LONG-TERM PRODUCTIVITY

The current balance between short-term use and long-term productivity of the environment would be unchanged by the renewal of the specific license for the Trojan ISFSI. The ISFSI is a temporary storage facility. Once the spent nuclear fuel is moved to a permanent repository, the casks, concrete pads, and fencing could be removed and the land used for another purpose. Extended operation of the ISFSI would postpone restoration of the site and its potential availability for uses other than fuel storage for up to an additional 40 years.

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APPENDIX F

PROPOSED CHANGES TO TROJAN ISFSI LICENSE
AND
TECHNICAL SPECIFICATIONS

Appendix F: Proposed Changes to Trojan ISFSI License and Technical Specifications

This appendix provides pertinent changes to the Trojan ISFSI License and Technical Specifications to include the ~~need~~ requirement for an Aaging Mmanagement Pprogram ~~and tollgate assessments~~ to be performed into the extended storage period.

The proposed changes to the License are made to show the new proposed Amendment number and the new proposed License expiration date in year 2059.

The Technical Specification change is limited to the addition of Section 5.5.5 for the "Aging Management Program," which provides a high-level requirement for the implementation of the program. The details of the program are contained in the SAR and in lower level implementing procedures so that the program can be a true learning aging management program.

Proposed changes to the Trojan ISFSI Technical Specifications are provided in the attached copy with changes shown using "track changes text".

LICENSE FOR INDEPENDENT STORAGE OF SPENT NUCLEAR FUEL AND HIGH-LEVEL RADIOACTIVE WASTE

Pursuant to the Atomic Energy Act of 1954, as amended, the Energy Reorganization Act of 1974 (Public Law 93-438), and Title 10, Code of Federal Regulations, Chapter 1, Part 72, and in reliance on statements and representations heretofore made by the licensee, a license is hereby issued authorizing the licensee to receive, acquire, and possess the power reactor spent fuel and other radioactive materials associated with spent fuel storage designated below; to use such material for the purpose(s) and at the place(s) designated below; and to deliver or transfer such material to persons authorized to receive it in accordance with the regulations of the applicable Part(s). This license shall be deemed to contain the conditions specified in Section 183 of the Atomic Energy Act of 1954, as amended, and is subject to all applicable rules, regulations, and orders of the Nuclear Regulatory Commission now or hereafter in effect and to any conditions specified herein.

Licensee	
1. Portland General Electric Company, with Eugene Water and Electric Board and PacifiCorp	3. License No. SNM-2509 Amendment No. 6 7
2. Portland General Electric Company 71760 Columbia River Highway Rainier, Oregon 97048	4. Expiration Date March 31, 2019 2059
	5. Docket or Reference No. 72-17

6. Byproduct, Source, and/or Special Nuclear Material	7. Chemical and/or Physical Form	8. Maximum Amount That Licensee May Possess at Any One Time Under This License
Spent fuel from Trojan Nuclear Plant and associated radioactive materials related to receipt, storage, and transfer of the fuel assemblies	A. Spent fuel assemblies and damaged fuel assemblies as UO_2 clad with Zircaloy-4. Fuel debris as UO_2 contained in Failed Fuel Cans or Damaged Fuel Containers	A. 344.5 MTU of intact spent fuel assemblies, damaged fuel assemblies, and fuel debris.

9. Authorized Use: The material identified in 6.A. and 7.A above is authorized for receipt, possession, storage in the Trojan Storage System, and transfer as described in the approved Trojan ISFSI Safety Analysis Report (SAR), as supplemented and amended in accordance with 10 CFR 72.70 and 10 CFR 72.48.

10. Authorized Place of Use: The licensed material is to be received, possessed, transferred, and stored at the Trojan ISFSI located on the Portland General Electric Company site in Columbia County, Oregon, near Rainier, Oregon.

NRC FORM 588A (10-2000) 10 CFR 72	U. S. NUCLEAR REGULATORY COMMISSION	PAGE 2 OF 2 PAGES	
LICENSE FOR INDEPENDENT STORAGE OF SPENT NUCLEAR FUEL AND HIGH-LEVEL RADIOACTIVE WASTE SUPPLEMENTARY SHEET		License No. SNM-2509	Amendment No. ~~6~~ 7
		Docket or Reference No. 72-17	

11. The Technical Specifications contained in Appendix A attached hereto, as revised through Amendment ~~6~~ 7, are incorporated into the license. The licensee shall operate the installation in accordance with the Technical Specifications in Appendix A. Appendix A contains Technical Specifications related to Environmental Protection to satisfy the requirements of 10 CFR 72.44(d)(2).

12. The licensee shall follow the physical protection plan entitled "Trojan ISFSI Security Plan," dated March 26, 1996 and Revision 1, dated January 8, 1999; and as it may be further amended under the provisions of 10 CFR Parts 72.44(e) and 72.180. The requirements of 10 CFR Part 73, Appendix B for guard training and qualification are incorporated in Appendix C of the approved security plan. The requirements of 10 CFR, Part 73, Appendix C, for contingency planning are addressed in Chapter 1.9 of the physical security plan.

13. This license is effective as of the date of issuance shown below.

FOR THE NUCLEAR REGULATORY COMMISSION

Robert Nelson, Chief
Licensing Section
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards
Washington, DC 20555

Date of Issuance: March 31, 1999

As amended by Amendment ~~6~~ 7 dated March 17, 2000

UNITED STATES NUCLEAR REGULATORY COMMISSION

TECHNICAL SPECIFICATIONS

FOR

TROJAN

INDEPENDENT SPENT FUEL STORAGE INSTALLATION (ISFSI)

TABLE OF CONTENTS

5.0 ADMINISTRATIVE CONTROLS 5.1-1

5.1 Responsibility 5.1-1
5.2 Organization 5.2-1
5.3 ISFSI Staff Qualifications 5.3-1
5.4 Procedures 5.4-1
5.5 Programs 5.5-1
- 5.5.1 Technical Specifications (TS) Bases Control Program 5.5-1
- 5.5.2 Radioactive Effluent Control Program 5.5-1
- 5.5.3 CONCRETE CASK Thermal Monitoring Program 5.5-2
- 5.5.4 Radiation Protection Program 5.5-3
- 5.5.5 Aging Management Program 5.5-3

5.6 High Radiation Areas 5.6-1

LIST OF EFFECTIVE PAGES

Page	Amendment
i	4
ii and iii	6
1.1-1 through 1.1-3	4
1.2-1 and 1.2-2	4
1.3-1 and 1.3-2	4
1.4-1 through 1.4-3	4
2.1-1	4
2.2-1 through 2.2-3	4
3.0-1 through 3.0-3	4
3.1-1	4
3.2-1 and 3.2-2	4
3.3-1	4
4.1-1	4
4.2-1 through 4.2-3	4
4.3-1	4
5.1-1	4
5.2-1	4
5.3-1	4
5.4-1	4
5.5-1 and 5.5-2	5
5.5-3	6
5.6-1	4

5.0 ADMINISTRATIVE CONTROLS

5.5 Programs

5.5.4 Radiation Protection Program

The Radiation Protection Program will establish administrative controls to limit personnel exposure to As Low As Reasonably Achievable (ALARA) levels in accordance with 10 CFR 20.

A monitoring program to ensure the annual dose equivalent to any real individual located outside the ISFSI Controlled Area does not exceed regulatory limits is incorporated as part of the environmental monitoring program in the Radioactive Effluent Control Program of Specification 5.5.2.

5.5.5 Aging Management Program

The Aging Management Program will establish the processes and procedures to manage the aging of ISFSI components into extended storage periods. This program will be implemented consistent with the ISFSI Safety Analysis Report ~~Section 9.7.8As part of this program, tollgate assessments will be performed in accordance with Trojan SAR Section 9.7.10~~.

The Aging Management Program will be implemented on or before 20 years from the date of the first canister loading.

APPENDIX G

PROPOSED CHANGES TO TROJAN ISFSI SAR

Appendix G: Proposed Changes to Trojan ISFSI SAR

This appendix provides pertinent changes to the Trojan ISFSI SAR. These changes include updates throughout ~~Chapters~~ Sections 3 and 4 to update the license life to 60 years and to address some updated analyses and updates to Section ~~Chapter~~ 7 to reflect one revised analysis. The most significant change is the addition of ~~new~~ Subsection~~s~~ 9.7.8 ~~in Chapter 9 that~~which describes the following aging management activities and adds place holders for new SAR Tables associated with these activities: Scoping Evaluation Results, Aging Management Review Results, Time-Limited Aging Analysis Results, and the four ~~aging~~ Aging ~~management~~ Management ~~programs~~Programs.~~time limited aging analyses, and tollgates addressed in this license renewal application.~~

The proposed SAR changes are shown in "track changes text" in the following Appendix G pages.

- "Black text" Original
- "Red text" Added in 2017
- "Blue text" Added in 2018
- "Blue cross-out" Deleted in 2017 and 2018 (includes deletion of text added in 2017)

PGE will continue to revise and update this Trojan LRA throughout the license renewal review process. For efficiency and in order to avoid repetition, selected tables in LRA Chapters 2, 3 and the Appendix A four AMPs, proposed for future inclusion in the Trojan ISFSI SAR Section 9.7, will be maintained current in this LRA. Upon issuance of the renewed Trojan ISFSI License, PGE will provide an update to the Trojan ISFSI SAR which incorporates the final approved LRA Chapters 2, 3, and Appendix A tables for the four AMPs containing the NRC approved content in accordance with the provisions of 10 CFR 72.70(c).

9.0 CONDUCT OF OPERATIONS 9-1

9.1 ORGANIZATIONAL STRUCTURE 9-2
9.1.1 ISFSI OPERATION ORGANIZATION 9-2
9.1.1.1 Corporate Organization 9-2
9.1.1.1.1 Support Staff 9-2
9.1.1.1.2 ISFSI Safety Review Committee 9-2
9.1.1.2 Operating Organization 9-2
9.1.1.3 Nuclear Oversight 9-3
9.1.1.4 Succession of Authority 9-3
9.1.2 PERSONNEL QUALIFICATION REQUIREMENTS 9-3
9.1.3 LIAISON WITH OUTSIDE ORGANIZATIONS 9-3

9.2 PRE-OPERATIONAL AND STARTUP TESTING 9-4

9.3 TRAINING PROGRAMS 9-5
9.3.1 TRAINING PROGRAM DESCRIPTION 9-5

9.4 NORMAL OPERATIONS 9-6
9.4.1 PROCEDURES 9-6
9.4.2 RECORDS 9-6

9.5 EMERGENCY PLANNING 9-8

9.6 REVIEWS AND AUDITS 9-9
9.6.1 INDEPENDENT SAFETY REVIEWS 9-9
9.6.2 ISFSI SAFETY REVIEW COMMITTEE 9-9
9.6.3 RECORDS 9-12

9.7 PROGRAMS 9-13
9.7.1 FIRE PROTECTION PROGRAM 9-13
9.7.2 TRAINING PROGRAM 9-13
9.7.3 TROJAN ISFSI EMERGENCY PLAN 9-13
9.7.4 TROJAN ISFSI SECURITY PLAN 9-13
9.7.5 TRANSFER CASK AND CONCRETE CASK HANDLING AND STORAGE PROGRAM 9-13
9.7.6 STRUCTURAL INSPECTION PROGRAM 9-13
9.7.7 CONCRETE CASK INTERIOR INSPECTION PROGRAM 9-14
9.7.8 AGING MANAGEMENT PROGRAMS 9-14
9.7.8.1 Scoping Evaluation Results 9-15
9.7.8.2 Aging Management Review Results 9-15
9.7.8.3 Time-Limited Aging Analysis Results 9-15
9.7.8.4 Aging Management Programs 9-16
9.7.8.4.1 MPC Aging Management Program 9-17
9.7.8.4.2 Transfer Cask Aging Management Program 9-17
9.7.8.4.3 Concrete Cask Aging Management Program 9-17
9.7.8.4.4 Transfer Station Aging Management Program 9-18
9.7.8.5 Tollgate Assessments 9-19

~~9.7.9 TIME-LIMITED AGING ANALYSIS .... 9-16~~
~~9.7.10 TOLLGATES .... 9-17~~
9.8 ISFSI DECOMMISSIONING PLAN 9-21
9.9 NUCLEAR LIABILITY INSURANCE 9-22
9.10 REFERENCES 9-23
10.0 OPERATING CONTROLS AND LIMITS 10-1
11.0 QUALITY ASSURANCE 11-1

LIST OF TABLES

TABLE	TITLE
2.1-1	Public Facilities and Institutions
2.1-2	1994 Land Use Census Nearest Location to Trojan Within a Five-Mile Radius
2.2-1	Nearby Industrial Facilities
2.7-1	Summary of Site Conditions Affecting Construction and Operating Requirements
3.1-1	Fuel Characteristics
3.1-2	Design Maximum Radiological Characteristics of Stored Material
3.1-3	Design Maximum Thermal Characteristics of Stored Material
3.1-4	Physical Parameters of Fuel Assembly Inserts
3.2-1	Wind and Tornado Design Specifications
3.2-2	Design Basis Tornado Generated Missiles
3.2-3	Design Load Combinations for Concrete Cask
3.2-4	Summary of Load Combinations for MPC
3.2-5	MPC Design Criteria
3.2-6	Design Load Combinations for Transfer Station
3.6-1	Summary of Concrete Cask Design Criteria
3.6-2	Summary of Transfer Cask Design Criteria
4.2-1	Fabrication Specification Summary Multi-Purpose Canister (MPC)
4.2-1a	ASME Code Alternatives
4.2-2	Concrete Cask Fabrication Summary
4.2-2a	Concrete Cask Code Alternatives
4.2-3	Conformity to Requirements
4.2-4	Nominal Weights and Centers of Gravity
4.2-5	Mechanical Properties of Steels Used in the Storage System
4.2-6	Mechanical Properties of Concrete Used in Concrete Cask
4.2-7	Summary of Maximum MPC Thermal Stresses (ksi)

LIST OF TABLES

TABLE	TITLE
4.2-8	Maximum Stress Evaluation MPC
4.2-9	Summary of MPC Pressure Analysis
4.2-10	Concrete Cask Structural Load Combination Summary
4.2-11	Summary of Bounding Concrete Cask Thermal Stresses 75EF Ambient Air, Normal Operation
4.2-12	Summary of Cask Thermal Evaluation
4.2-13	Thermal Properties
4.2-14	Summary of Storage System Cooling Air Flow Analysis for Normal Storage Conditions
4.2-15	Bounding Maximum K_{eff} Values in the Trojan MPC-24E/EF
4.2-16	Fuel Composition Used in the Criticality Evaluation of the Trojan Storage System
4.7-1	Transfer Station Fabrication Specification Summary
4.7-2	Transfer Cask Lift Components
4.8-1	Trojan Storage System Material Compatibility with Operating Environments
7.2-1	Isotopic Inventory (Curies per assembly)
7.2-2	Fuel Region Gamma Source Strength
7.2-3	Fuel Region Neutron Source Strengths
7.2-4	Relative Burnup Level and Source Strengths for PWR Assembly Axial Sub-Sections
7.2-5	Mass of Non-Fuel Material in the Westinghouse 17X17 Fuel Assembly
7.2-6	Scaling Factors Used in Calculating the Co-60 Source
7.2-7	Co-60 Gamma Source Strengths (curies Co-60/assembly)
7.2-8	Mass of Material in the Burnable Poison Rod Assemblies and Thimble Plug Devices

LIST OF TABLES

TABLE	TITLE
7.2-9	Burnable Poison Rod Assembly and Thimble Plug Device Co-60 Gamma Source Strengths (curies Co-60/device)
7.2-10	Parameters for Test and Normal Conditions
7.2-11	Bounding χ/Q Values for the Controlled Area Boundary and Nearest Residence for Normal Conditions
7.2-12	Release Fractions
7.2-13	Description of Rod Cluster Control Assembly Configurations for Source Term Calculations
7.2-14	Source Terms for Rod Cluster Control Assembly Configurations
7.3-1	Elemental Densities of Shielding Materials Used in Calculational Models (gm/cc)
7.3-2	Axial Configuration of the Modeled Fuel Assembly
7.3-3	Neutron Energy Group Flux-to-Dose Conversion Factors (mrem/hr per neutron/cm^2-sec)
7.3-4	Gamma Flux-to-Dose Conversion Factors (mrem/hr per γ/cm^2-sec)
7.3-5	Burnup and Cooling Times Used for Casks in the ISFSI Analysis
7.3-6	Dose Versus Distance from Radiation Emanating off the Side of a Single Concrete Cask 42,000 MWD/MTU and 9 Years Cooling
7.3-7	Dose Versus Distance from Radiation Emanating off the Top of a Single Concrete Cask 42,000 MWD/MTU and 9 Years Cooling
7.3-8	Dose Versus Distance from Radiation Emanating off the Sides of the Concrete Casks in the ISFSI with Uniform Burnup and Cooling Time of 42,000 MWD/MTU and 9 Years Cooling
7.3-9	Dose Versus Distance from Radiation Emanating from the ISFSI with Uniform Burnup and Cooling Time of 42,000 MWD/MTU and 9 Years Cooling

LIST OF TABLES

TABLE	TITLE
7.4-1	Maximum Expected Dose Rates for the Storage Cask System (42,000 MWD/MTU and 9-Year Cooling)
7.4-2	Normal Condition Effluent Dose Calculation Results for the Fully Loaded Trojan ISFSI
7.4-3	Estimated Personnel Doses while Operating the Cask System (42,000 MWD/MTU and 9-Year Cooling)
7.4-4	Dose Rates at the Controlled Area Boundary and Nearest Resident from Effluent and Direct Radiation During Normal and Off-Normal Conditions
8.0-1	Design Basis Normal and Off-Normal Events
8.0-2	Design Basis and Beyond Design Basis Infrequent (Accident) Events
8.1-1	MPC Stresses (ksi) Resulting From Off-Normal Handling Event
8.1-2	Deleted
8.1-3	Summary of Impact from Off-Normal Operations
8.1-4	Release Fractions for Confinement Evaluation of Off-Normal and Accident Conditions
8.2-1	MPC Stresses/Loads Resulting from Accident Pressurization
8.2-2	Off-Normal and Hypothetical Accident Confinement Dose Calculations (Single Cask)
8.2-3	Regulatory Guide 1.76 Design Basis Comparison
8.2-4	Tornado Missile Probability Data
8.2-5	Parameters for Accident Conditions
8.2-6	Bounding χ/Q Values for the Controlled Area Boundary and Nearest Residence for Accident Conditions
8.3-1	Summary of Site Characteristics Affecting the Safety Analysis
9.1-1	ISFSI Staffing Qualifications

LIST OF TABLES

TABLE **TITLE**

NOTE: Tables 9.7-1 through 9.7-17 are future new ISFSI SAR tables that will be added following NRC issuance of the renewed Trojan ISFSI License.

TABLE	TITLE
9.7-1	Summary of Scoping Evaluation Results
9.7-2	Intended Safety Functions of MPC Subcomponents
9.7-3	Intended Safety Functions of Transfer Cask Subcomponents
9.7-4	Intended Safety Functions of Concrete Cask Subcomponents
9.7-5	Intended Safety Functions of Spent Fuel Assembly Subcomponents
9.7-6	Intended Safety Functions of Transfer Station Subcomponents
9.7-7	Intended Safety Functions of ISFSI Pad Subcomponents
9.7-8	Aging Management Review for MPC Subcomponents
9.7-9	Aging Management Review for Transfer Cask Subcomponents
9.7-10	Aging Management Review for Concrete Cask Subcomponents
9.7-11	Aging Management Review for Fuel Assembly Subcomponents
9.7-12	Aging Management Review for Transfer Station Subcomponents
9.7-13	Aging Management Review for ISFSI Pad Subcomponents
9.7-14	MPC Aging Management Program
9.7-15	Transfer Cask Aging Management Program
9.7-16	Concrete Cask Aging Management Program
9.7-17	Transfer Station Aging Management Program
9.7-~~1~~18	Tollgate Assessments for Trojan ISFSI
9.7-~~2~~19	Tollgate Assessment Performance Criteria by Element
9.8-1	Deleted

LIST OF FIGURES

Figure Number	Title
1.1-1	Location of Trojan ISFSI
1.3-1	Storage System
Appendix 1.A	Licensing Drawings
3969	Trojan MPC-24E/EF Enclosure Vessel General Arrangement
3970	Trojan MPC-24E/EF Fuel Basket Assembly
PGE-002	Trojan Concrete Cask
3971	Trojan Transfer Cask Assembly
2.1-1	Site Location
2.1-2	PGE Property, ISFSI Site, and Controlled Area Boundary
2.1-3	Trojan ISFSI Layout
2.1-4	1990 Population Distribution within 10 miles
2.1-5	2000 Projected Population Distribution within 10 miles
2.1-6	2010 Projected Population Distribution within 10 miles
2.2-1	Nearby Industrial Activity
2.2-2	Longview Area Industrial Activity
2.3-1	Topographical Cross Sections (Maximum Elevations) SSE, S, SSW
2.3-2	Topographical Cross Sections (Maximum Elevations) SW, NW, WNW
2.3-3	Topographical Cross Sections (Maximum Elevations) W, WSW, NNW
2.3-4	Topographical Cross Sections (Maximum Elevations) N, NNE, NE
2.3-5	Topographical Cross Sections (Maximum Elevations) ENE, E
2.3-6	Topographical Cross Sections (Maximum Elevations) ESE, SE
2.4-1	ISFSI Topography
2.4-2	ISFSI Site Drainage
4.2-1a	Multi-Purpose Canister Elevation View

LIST OF FIGURES

Figure Number	Title
4.2-1b	MPC-24E/EF Cross Section
4.2-2	Deleted
4.2-3	Deleted
4.2-4	Concrete Cask
4.2-5	Failed Fuel Can
4.2-5a	Damaged Fuel Container
4.2-6a	Fuel Debris Process Can
4.2-6b	Fuel Debris Process Can Capsule
4.2-7	Deleted
4.2-8	Nominal Weights and Centers of Gravity
4.2-9	Concrete Cask Thermal Model
4.2-10	MPC Heat Transfer Model
4.2-11	Homogenization of the Storage Cross Section
4.2-12	MPC Cross Section Replaced with an Equivalent Two Zone Axisymmetric Body
4.2-13	MPC Temperature Distribution (75 Degrees F Ambient Air)
4.2-14	MPC Temperature Distribution (100 Degrees F Ambient Air)
4.2-15	MPC Temperature Distribution (125 Degrees F Ambient Air)
4.2-16	Damaged Fuel and Fuel Debris Model with 16X16 Bare Fuel Rod Array in MPC-24E/EF Corner Cell
4.7-1	Transfer Cask
4.7-2	Transfer Cask Lifting Trunnion Design
4.7-3	Transfer Station
4.7-4	Deleted
4.7-5	Deleted
4.7-6	Transfer Cask Shield Door Rail Design
4.7-7	Deleted

LIST OF FIGURES

Figure Number	Title
4.7-7	Deleted
4.7-8	HI-TRAC Transfer Cask FLUENT Model
4.7-9	MPC Temperature Distribution in Transfer Cask (75 Degrees F Ambient Air)
4.7-10	MPC Temperature Distribution in Transfer Cask (100 Degrees F Ambient Air)
4.7-11	Transfer Cask Through Wall Temperature Distribution (75 Degrees F Ambient Air Temperature)
4.7-12	Vacuum Transient Peak Cladding Temperature (Helium) (Design Maximum Heat Load Q = 17.4kW)
4.7-12a	Vacuum Transient Peak Cladding Temperature (Nitrogen) (Design Maximum Heat Load Q = 17.4kW)
4.7-13	Vacuum Transient Peak Cladding Temperature (Helium) (Bounding Heat Load Analysis Q = 15kW)
4.7-13a	Vacuum Transient Peak Cladding Temperature (Nitrogen) (Bounding Heat Load Analysis Q = 15kW)
7.2-1	PWR Fuel Assembly Axial Burnup Profile
7.3-1	ISFSI Pad Configuration
7.3-2	Summary of Dose Rates for Concrete Cask
7.3-3	Summary of Dose Rates for Transfer Cask
7.3-4	Cross Sectional Elevation View of the Concrete Cask with As-Modeled Dimensions
7.3-5	View A of the Concrete Cask with As-Modeled Dimensions
7.3-6	View B of the Concrete Cask with As-Modeled Dimensions
7.3-7	View C of the Concrete Cask with As-Modeled Dimensions
7.3-8	View D of the Concrete Cask with As-Modeled Dimensions

LIST OF FIGURES

Figure Number	Title
7.3-9	Transfer Cask Cross Sectional Elevation View with As-Modeled Dimensions
7.3-10	Cross Sectional View of the Transfer Cask with As-Modeled Dimensions
7.3-11	Cross Sectional View of an MPC-24E Fuel Cell with As-Modeled Dimensions
8.1-1	Concrete Cask Temperature Distribution (100°F Day)
8.1-2	Concrete Cask Temperature Distribution (-40°F Day)
8.2-1	Concrete Cask Temperature Distribution (125°F Short Term)
8.2-2	Missile/Cask Impact Geometry
8.2-3	Cask Tip-Over Geometry
8.2-4	Inner Concrete Temperature All Inlets Blocked
8.2-5	Deleted
8.2-6	MPC Lift Cleats and Rigging
9.1-1	ISFSI Organization

LIST OF EFFECTIVE PAGES

Page Number	Revision
Table of Contents i	7
Table of Contents ii and iii	4
Table of Contents iv	12
Table of Contents v through vii	9
Table of Contents viii	4
Table of Contents ix and x	7
Table of Contents xi	4
Table of Contents xii	8
Table of Contents xiii through xxix~~viii~~	15a
1-1 through 1-6	4
1-7	6
Figure 1.1-1	4
Figure 1.3-1	2
Appendix 1.A	4
Drawing 3969	2
Drawing 3970	5
PGE-002	2
Drawing 3971	2
2-1	7
2-2	6
2-3	13
2-4	7
2-5 through 2-7	2
2-8 through 2-10	8
2-11	7
2-12 through 2-15	8
2-16	2
2-17	7
2-18	8
2-19	7
2-20	5
2-21	8
2-22 through 2-27	2
2-28	5
2-29	6
2-30 through 2-33	2

LIST OF EFFECTIVE PAGES

Page Number	Revision
2-34	7
2-35 and 2-36	2
2-37	6
2-38 through 2-42	2
2-43	4
2-44	8
2-45	2
2-46	6
2-47	2
Table 2.1-1	0
Table 2.1-2	0
Table 2.2-1	2
Table 2.7-1	2
Figure 2.1-1	4
Figure 2.1-2	7
Figure 2.1-3	4
Figures 2.1-4 through 2.1-6	0
Figures 2.2-1 and 2.2-2	0
Figures 2.3-1 through 2.3-6	0
Figure 2.4-1	0
Figure 2.4-2	8
3-1 through 3-5	4
3-6	6
3-7 through 3-14	4
3-15	5
3-16	4
3-17	5
3-18	15
3-19 and 3-20~~8 through 3-21~~	12
3-21	15
3-22	2
3-23	11
3-24	2
3-25	5
Table 3.1-1	0
Tables 3.1-2 and 3.1-3	2
Table 3.1-4	0

LIST OF EFFECTIVE PAGES

Page Number	**Revision**
Tables 3.2-1 through 3.2-3	0
Tables 3.2-4 and 3.2-5	2
Table 3.2-6	0
Tables 3.6-1 and 3.6-2	2
4-1 through 4-6	4
4-7 ~~through 4-20~~and 4-8	9
4-9~~7 through 4-20~~	~~9~~15
4-~~7~~10 through 4-~~20~~15	9
4-16	15
4-17 through 4-20	9
4-21	5
4-22 through 4-24	4
4-25 and 4-26	5
4-27~~ and 4-28~~	15~~4~~
4-28	4
4-29 through 4-31	5
4-32	15
4-33~~29~~ and~~through~~ 4-34	5
4-35	4
4-36 and 4-37	5
4-38 through 4-42	4
4-43	12
4-45 through 4-48	4
4-49	8
4-50 through 4-57	9
4-58	10
4-59 through 4-61	9
4-62 and 4-63	15
4-~~62~~64 through 4-66	4
4-67	8
4-68 and 4-69~~through 4-71~~	15~~4~~
4-70~~68~~ and~~through~~ 4-71	4
4-72	14
4-73	~~10~~15
Tables 4.2-1 and 4.2-2	2
Table 4.2-3, Page 1	8
Table 4.2-3, Pages 2 through 4	2

LIST OF EFFECTIVE PAGES

Page Number	Revision
Table 4.2-3, Page 5	11
Tables 4.2-4 and 4.2-5	2
Table 4.2-6	0
Tables 4.2-7 and 4.2-8	2
Table 4.2-9	3
Table 4.2-10	0
Table 4.2-11	2
Tables 4.2-12 and 4.2-13	3
Tables 4.2-14 through 4.2-16	2
Table 4.7-1	0
Table 4.7-2	8
Table 4.8-1	2
Figures 4.2-1a and 4.2-1b	2
Figure 4.2-4	0
Figures 4.2-5 and 4.2-5a	9
Figure 4.2-6a	0
Figure 4.2-6b	0
Figures 4.2-8 through 4.2-16	2
Figures 4.7-1 and 4.7-2	2
Figure 4.7-3	0
Figure 4.7-6	2
Figures 4.7-8 through 4.7-11	2
Figures 4.7-12 through 4.7-13a	3
5-1	4
5-2	12
5-3 through 5-6	4
5-7	6
5-8	4
6-1	4
7-1 and 7-2	4
7-3 through 7-10	5
7-11	6
7-12 through 7-14	5
7-15 and 7-16	7
7-17 and 7-18	4
7-19	7
7-20	4

LIST OF EFFECTIVE PAGES

Page Number	**Revision**
7-21	6
7-22	4
7-23 through 7-32~~3~~	7
7-33	15
Tables 7.2-1 through 7.2-3	2
Table 7.2-4	0
Tables 7.2-5 through 7.2-10	2
Table 7.2-11	7
Tables 7.2-12 through 7.2-14	2
Tables 7.3-1 through 7.3-9	2
Table 7.4-1	2
Table 7.4-2	7
Table 7.4-3	4
Table 7.4-4	7
Figure 7.2-1	0
Figures 7.3-1 through 7.3-11	2
8-1	6
8-2	4
8-3	6
8-4 through 8-6	5
8-7	7
8-8 and 8-9	6
8-10	5
8-11	6
8-12 through 8-14	4
8-15	14
8-16 through 8-24	4
8-25	7
8-26 through 8-28	4
8-29 and 8-30	5
8-31	8
8-32	4
8-33 and 8-34	7
8-35	8
8-36 and 8-37	4
8-38 through 8-40	14
8-41 and 8-42	8

LIST OF EFFECTIVE PAGES

Page Number	**Revision**
8-43	14
Tables 8.0-1 and 8.0-2, Page 1 of 2	2
Table 8.0-2, Page 2 of 2	8
Table 8.1-1	2
Tables 8.1-3 and 8.1-4	2
Tables 8.2-1 and 8.2-2	2
Tables 8.2-3 and 8.2-4	0
Table 8.2-5	2
Table 8.2-6	7
Table 8.3-1	8
Figures 8.1-1 and 8.1-2	2
Figures 8.2-1 through 8.2-4	2
Figure 8.2-6	2
9-1	4
9-2 and 9-3	6
9-4	4
9-5 through 9-7	6
9-8	4
9-9 through 9-12	6
9-13~~145~~ through 9-~~1720~~23	~~11~~15a
~~9-20 and 9-21~~	~~10~~
Table 9.1-1	8
~~Table 9.8-1~~	~~11~~
Tables 9.7-1 through 9.7-19	15a
~~Table 9.7-2~~	~~15~~
Figure 9.1-1	6
10-1	4
11-1	6

LIST OF EFFECTIVE PAGES

Page Number	Revision
Tables 3.2-1 through 3.2-3	0
Tables 3.2-4 and 3.2-5	2
Table 3.2-6	0
Tables 3.6-1 and 3.6-2	2
4-1 through 4-6	4
4-7 ~~through 4-20~~and 4-8	9
4-9~~7 through 4-20~~	~~9~~15
4-~~7~~10 through 4-~~20~~15	9
4-16	15
4-17 through 4-20	9
4-21	5
4-22 through 4-24	4
4-25 and 4-26	5
4-27~~ and 4-28~~	15~~4~~
4-28	4
4-29 through 4-31	5
4-32	15
4-33~~29~~ and~~through~~ 4-34	5
4-35	4
4-36 and 4-37	5
4-38 through 4-42	4
4-43	12
4-45 through 4-48	4
4-49	8
4-50 through 4-57	9
4-58	10
4-59 through 4-61	9
4-62 and 4-63	15
4-~~62~~64 through 4-66	4
4-67	8
4-68 and 4-69~~through 4-71~~	15~~4~~
4-70~~68~~ and~~through~~ 4-71	4
4-72	14
4-73	~~10~~15
Tables 4.2-1 and 4.2-2	2
Table 4.2-3, Page 1	8
Table 4.2-3, Pages 2 through 4	2

Additional discussion of temperature monitoring is provided in Section 5.2.1.

3.3.3.2.2 Seismic Monitoring

Comprehensive seismic data is available from the U.S. Geological Survey, Advanced National Seismic System (ANSS) website and/or other seismic monitoring networks so that the intensity of local seismic ground motion can be determined. This data can then be compared with the design bases of equipment/components identified as important to safety.

3.3.4 NUCLEAR CRITICALITY SAFETY

The storage system is designed to maintain subcritical conditions ($K_{eff} \leq 0.95$) under normal handling and storage conditions, off-normal handling and component functioning, and hypothetical accident conditions.

3.3.4.1 Control Methods for Prevention of Criticality

Subcritical conditions are to be maintained by MPC fuel basket geometry and the use of Boral. The MPC fuel basket establishes fuel assembly spacing. The design assumes a fuel assembly enrichment equal to or greater than the maximum initial fuel assembly enrichment that is stored (3.56 wt% U^{235}). No credit is taken for burnup or fuel assembly control inserts. Boral is used as a neutron absorbing material in the MPC fuel basket design, and is credited in the criticality analysis for dry storage conditions.

Boral is a patented product of AAR Advanced Structures that has been licensed for and used as a neutron poison material in many spent nuclear fuel storage applications. Boral is made of two chemically compatible materials, boron carbide and 1100 alloy aluminum. The boron carbide has a high boron content in a physically stable and chemically inert form. The aluminum is a lightweight metal with high tensile strength that is protected from corrosion by a highly resistant oxide film. The materials are ideal for long-term use in a radiation, thermal, and chemical environment of a nuclear reactor, Spent Fuel Pool, or dry Concrete Cask. There is a substantial amount of experience demonstrating the capability of Boral to function as designed for extended periods of time. As discussed in Sections 3.4.12 and 6.3.2 of the HI-STORM FSAR (Reference 1), the MPC fuel basket is designed such that the fixed Boral neutron absorber will remain effective for the 60-year design life of the ISFSI. There are no credible means to lose the Boral in dry storage service. Therefore, there is no need to provide a surveillance or monitoring program to verify the continued efficacy of the neutron absorber as required by 10 CFR 72.124(b).

Table 3.1-1 lists the fuel characteristics. Fuel debris (except for fuel assemblies classified as fuel debris) is placed in fuel debris Process Cans. Fuel debris Process Cans that contained organic filter material were processed to destroy the organic material, sealed in fuel debris Process Can Capsules, and are placed in Failed Fuel Cans. Fuel debris Process Cans containing only fuel

The fuel clad temperature limit is a function of fuel burnup, fuel pin fill gas pressure, and fuel age. For the Trojan ISFSI, the fuel clad temperature limit is shown in Table 3.1-3. This limit was determined using Westinghouse 17x17 fuel with a limiting combination of cooling time and burnup to produce the highest decay heat emission rate, as shown in Table 3.1-3. This fuel is limiting because any assembly with burnup greater than that listed in Table 3.1-3 will have greater than the minimum amount of cooling time prior to loading in the MPC, and will have lower initial fill gas pressures.

Concrete Cask temperature limits are based on guidance provided by ACI-349 (1985). Section 4.2.6 presents the thermal analysis of the Concrete Cask and MPC for the anticipated range of operating conditions.

The design criteria for maintaining a subcritical condition are presented in Section 3.3.4. Contamination control is addressed in Section 3.3.2.

No credible events result in loss of confinement due to damage to an MPC.

The storage system components and the ISFSI are designed for a minimum design life of 60 years.

3.3.7.2 Radioactive Waste Treatment

ISFSI operations do not result in the generation of liquid or gaseous radioactive waste. Although generation of solid radioactive waste is not expected, it is possible that small quantities of low level radioactive waste could be generated as a result of routine radiological surveys (e.g., swipes). This waste would be stored in an appropriate container pending disposal.

3.3.7.3 Waste Storage Facilities

Chapter 6 discusses waste confinement and management for the ISFSI.

3.3.8 INDUSTRIAL AND CHEMICAL SAFETY

There are no required special industrial or chemical design criteria that are important to personnel or plant safety.

conditions without release of radioactive material or excessive radiation exposure to workers or members of the general public. Storage systems and components are designed and fabricated in accordance with recognized codes and standards that provide ample safety margin.

Design features that have been incorporated in the ISFSI to provide safe long-term fuel storage include:

1. Leak-tight welds on each MPC shell, baseplate, lid, vent and drain port cover plates, and closure ring,

2. Thick MPC lid to minimize radiation exposure to the public and site personnel,

3. Design of MPC body and internals to withstand a postulated drop accident during storage or transportation, and

4. Design of Concrete Cask to provide radiation shielding of the public and operations personnel, and to protect the MPCs from postulated environmental events.

Methods used to minimize personnel radiation exposure during ISFSI operations are discussed in Chapter 7.

Design features to maintain subcritical conditions for normal operations and credible accident scenarios are discussed in Section 4.2.7.

10 CFR 72.126(a)(3) requires access to areas of potential contamination or high radiation within an ISFSI to be controlled. During normal storage conditions, if high radiation areas are identified, they will be controlled in accordance with ISFSI Technical Specification 5.6.1. Increased radiation levels are possible during component handling evolutions. Although not anticipated, any contamination associated with ISFSI operations should be limited to the Storage Pad. The Storage Pad is located in the Protected Area which is surrounded by a security fence. Access to this area is controlled by security and is discussed in Section 3.3.5.1. The Radiation Protection Program is discussed in Chapter 7.

The ISFSI is designed to provide safe storage of spent nuclear fuel for 60 years. In the event that a permanent off-site disposal or storage facility is not available within 60 years, PGE could pursue one of three options. These include: 1) seek relicensing of the present ISFSI based on additional analysis to extend the design life; 2) construct and license a new ISFSI; or 3) transfer the spent nuclear fuel to an off-site temporary storage facility, if available.

Major design requirements are summarized in Table 4.2-3.

4.2.6.1 Summary of Thermal Properties of Materials

The thermal properties used in the thermal hydraulic analyses (Reference 30) are shown in Table 4.2-13. The derived parameters (effective thermal conductivities) are discussed in Section 4.2.6.3, Section 4.2.6.5, and Reference 16. Low values derived from the open literature and conservative calculations were used.

Temperature limits were established for the materials used in the storage system. Specifically, these limits are for concrete, steel, and fuel cladding. The limits were established in accordance with the following:

Source	Component
PNL-6364 Report and BFS analysis (long term) NUREG-1536/PNL-4835 (short term)	Fuel
ASME Section III	Steel
ACI-349[2]	Concrete

Based upon evaluation of these limits it was determined that the fuel cladding and concrete temperature limits were the limiting conditions. Table 4.2-12 presents more details on the long-term and short-term temperature limits for the concrete. While the concrete limit is based on ACI-349, Appendix A, the fuel cladding temperature limit is actually a complex function of temperature versus time, and internal rod pressurization (Reference 2). The limit is established to keep the probability of cladding breach less than 0.5 percent per fuel rod over a 40-year storage term. Using the methodology presented in Reference 2, the fuel cladding allowable temperature limit for normal steady-state conditions was determined to be 341.7°C (647°F) for a Westinghouse 17 x 17 fuel assembly and a minimum cooling time of nine years. The 341.7°C (647°F) limit was determined to bound the B&W 17 x 17 fuel assemblies, which will also be stored in the ISFSI. A short-term temperature limit of 570°C (1058°F) is established for off-normal and accident limits. This calculation was updated (see Reference 36) for a 60-year storage term and found that the temperature limits ensure that the probability of cladding breach remains less than 0.5 percent per fuel rod over the 60-year storage term.

In order to determine the applicability of the 1058°F short-term limit for spent fuel clad temperature in NUREG-1536, the Trojan spent fuel was compared to that fuel on which the temperature limit was based. According to PNL-4835, "Technical Basis for Storage of Zircaloy-Clad Spent Fuel in Inert Gases," the spent fuel on which 1058°F was based had a burnup of 28,000 MWd/MTU. The hoop stresses on the spent fuel rods that were tested ranged from approximately 25 MPa to 140 MPa. The maximum hoop stresses in the most limiting Trojan spent fuel rods (i.e., the fuel rods with the highest internal pressure and highest burnup) were within this range indicating that the Trojan fuel is comparable to the fuel rods tested on which the 1058°F temperature limit is based.

[2] Refer to Section 4.2.4.2.2 for justification for deviation from ACI-349 temperature limits.

2. The incorporation of permanent fixed neutron-absorbing panels (Boral) in the MPC fuel basket structure; and

3. An administrative limit on the maximum enrichment.

The off-normal and accident conditions defined in Chapter 3 and considered in Chapter 8 have no adverse effect on the design parameters important to criticality safety, and thus the off-normal and accident conditions are identical to those for normal conditions.

The Trojan Storage System is designed such that the fixed neutron absorber (Boral) will remain effective for a storage period greater than 60 years, and there are no credible means to lose it. Therefore, in accordance with 10 CFR 72.124(b), there is no need to provide a surveillance or monitoring program to verify the continued efficacy of the neutron absorber.

Criticality safety of the Trojan Storage System does not rely on the use of any of the following credits:

- Burnup of fuel;
- Fuel-related burnable neutron absorbers; or
- More than 75 percent of the B-10 content for the fixed neutron absorber (Boral).

The Trojan Storage System also includes the Transfer Cask and the Concrete Cask. The Transfer Cask was required for initial cask loading, and will be required at the Transfer Station for transferring the MPC from the Concrete Cask into the Transport Cask. The Transfer Cask uses a lead shield for gamma radiation and a water-filled jacket for neutron shielding. The Concrete Cask uses concrete as a shield for both gamma and neutron radiation.

The Trojan Storage System for storage is dry (no moderator), and thus the reactivity is very low ($k_{eff} < 0.4$). However, the Trojan Storage System was flooded with water during initial cask loading operations, and thus the flooded condition represents the limiting case in terms of reactivity. Soluble boron credit is not required for the flooded condition.

Evaluations presented in the HI-STORM FSAR incorporate configurations with the MPC in the HI-STAR overpack and the HI-STORM overpack. These evaluations show that the reflector material outside the MPC (steel for HI-STAR, concrete for HI-STORM, and lead for HI-TRAC) does not significantly affect the reactivity. Therefore, calculations for the Trojan Storage System are performed with the Trojan MPC modeled in the HI-STAR overpack for calculations assuming flooded conditions, and with the Trojan MPC modeled in the HI-STORM overpack for calculations assuming dry conditions. This is acceptable, as the HI-STORM and TranStor™ Concrete Casks have a similar radial cross-section around the MPC, with an inner steel shell surrounded by concrete. Reactivities in both systems are therefore comparable.

MPC-24E/EF are: (1) nominal cell pitch (10.847 inches); (2) maximum box inner diameter (8.81 inches, 9.36 inches for corner cells); (3) nominal box wall thickness (5/16 inches); and (4) minimum flux trap thickness (1.076 inches, 0.526 inches for corner cells).

4.2.7.3.2 Cask Regional Densities

The fuel composition used in the criticality evaluations of the Trojan Storage System is listed in Table 4.2-16. Compositions of the various other components used in the criticality evaluations of the Trojan Storage System are listed in the HI-STORM LAR 1014-1, Table 6.3.4.

The Trojan Storage System is designed such that the fixed neutron absorber (Boral) will remain effective for a storage period greater than 60 years, and there are no credible means to lose it. A detailed physical description, historical applications, unique characteristics, service experience, and manufacturing quality assurance of Boral are provided in Section 1.2.1.3.1 of the HI-STORM FSAR.

The continued efficacy of the Boral is assured by acceptance testing, documented in Section 9.1.5.3 of HI-STORM FSAR, to validate the Boron-10 (poison) concentration in the Boral. Calculations documented in Subsection 6.3.2 of the HI-STORM FSAR demonstrate that the neutron flux from the irradiated fuel results in a negligible depletion of the poison material over the storage period. Therefore, in accordance with 10 CFR 72.124(b), there is no need to provide a surveillance or monitoring program to verify the continued efficacy of the neutron absorber.

4.2.7.4 Criticality Calculations

4.2.7.4.1 Criticality Safety Calculations

The principal method for the criticality analysis (Reference 32) is the general three-dimensional continuous energy Monte Carlo N-Particle code MCNP4a (Reference 9) developed at the Los Alamos National Laboratory. MCNP4a was selected because it has been used extensively and verified, and has the necessary features for this analysis. MCNP4a calculations used continuous energy cross-section data based on ENDF/B-V, as distributed with the code. MCNP4a is the same code used for the criticality analysis of the generically certified HI-STORM 100 System.

The convergence of a Monte Carlo criticality problem is sensitive to the following parameters: (1) number of histories per cycle, (2) the number of cycles skipped before averaging, (3) the total number of cycles, and (4) the initial source distribution. The MCNP4a criticality output contains a great deal of useful information that may be used to determine the acceptability of the problem convergence. This information was used in parametric studies to develop appropriate values for the aforementioned criticality parameters to be used in the criticality calculations. Based on these studies, a minimum of 5,000 histories were simulated per cycle, a minimum of 20 cycles were skipped before averaging, a minimum of 100 cycles were accumulated, and the initial source was specified as uniform over the fueled regions. Further, the output was examined to ensure that

4.8 MATERIALS

NRC ISG-15 (Reference 18) provides specific guidance for the review of materials selected for dry cask storage systems. Regulatory requirements and review acceptance criteria are presented in Sections X.3 and X.4, respectively, of ISG-15. While there are a large number of requirements and criteria presented, they can be grouped into ten major categories, as follows:

1. Adequate Description – Structures, systems and components (SSCs) that are important to safety and the materials from which they are constructed must be described in sufficient detail to permit adequate review. [ISG-15 Sections X.3.1.a, X.3.2.d and X.4.1]

2. Quality Standards – SSCs important to safety must be designed, built, and tested to quality standards adequate for the safety function performed by the SSC. [ISG-15 Section X.3.2.a]

3. Design Life – The cask design and the materials from which it is constructed must be designed to safely store spent fuel and permit required maintenance for the entire 60-year license period. [ISG-15 Sections X.3.2.e and X.4.2]

4. Environmental Compatibility – The cask design and the materials from which it is constructed (including coatings) must be compatible with all expected environmental conditions, including wet and dry loading and unloading facilities. Adverse chemical or corrosion reactions that would impact safe operation must be avoided. [ISG-15 Sections X.3.1.b, X.3.2.c, X.3.3 and X.4.1 through X.4.4]

5. Cladding Integrity – Spent fuel cladding must be protected, under both normal and upset conditions, from temperatures and environments that could cause degradation leading to cladding rupture. [ISG-15 Sections X.3.4.a and X.4.4]

6. Fire Protection – Noncombustible and heat resistant materials shall be used wherever possible. [ISG-15 Sections X.3.2.f, X.4.3 and X.4.4]

7. Nuclear Control – Materials used for shielding and criticality functions must be appropriately selected to perform the function adequately and without susceptibility to slumping or other loss of effectiveness. [ISG-15 Sections X.3.2.b and X.4.2]

8. Confinement Boundary – Confinement of radioactive materials must be maintained under all normal and upset conditions. [ISG-15 Section X.3.2.g]

9. Offsite Shipment – The cask system must be designed to allow spent fuel to be transported off site for eventual delivery to a fuel repository.

10. Operating Conditions – Materials used to construct the cask must maintain acceptable physical and mechanical properties over all operating conditions, including temperature extremes. [ISG-15 Sections X.4.2 and X.4.4]

Each of these ten categories from ISG-15 has been evaluated for the MPC and the Transfer Cask and is discussed below.

Adequate Description

This category requires that those components of the cask system that are important to safety are identified appropriately and that complete and accurate descriptions of those components be provided. Section 3.3.3.1 of this SAR identifies equipment and components that are designated as important to safety. Chapters 1 and 3 of this SAR provide descriptions of the identified important to safety components and equipment.

Quality Standards

This category requires ensuring that appropriate governing codes be selected for SSCs important to safety. The MPC fuel basket is constructed in accordance with Section III, Subsection NG of the ASME Code. The MPC confinement boundary is constructed in accordance with Section III, Subsection NB, of the ASME Code. The Transfer Cask is designed and fabricated in accordance with Section III, Subsection NF, of the ASME Code. The Transfer Cask lifting trunnions are constructed in accordance with the applicable guidance of NUREG-0612 and ANSI N14.6. The governing design code/standard for the Concrete Cask is ACI-349/ANSI N57.9 and construction is in accordance with ACI-318. The Process Can Capsule is constructed using the guidance of ASME Section III, Subsection NG, and the Failed Fuel Can and Damaged Fuel Container are constructed to ASME Section III, Subsection NG. Alternatives to the ASME Code requirements for these components are listed in Tables 4.2-1a and 4.2-2a.

Design Life

This category requires that the design life of the cask system be specified and be at least 20 years in duration. The design life of the cask system is 60 years, as specified in Section 3.3.7.1.

Environmental Compatibility

In accordance with NRC Bulletin 96-04 [Reference 27], a review of the potential for chemical, galvanic, or other reactions among the materials of the Trojan Storage System, its contents and the operating environments, which may produce adverse reactions, has been performed.

MPC

The passive, non-cyclic nature of dry storage conditions does not subject the MPC to conditions that might lead to structural fatigue failure. Ambient temperature and insolation cycling during

An inorganic-zinc coating is applied to carbon steel cask parts that would otherwise be directly exposed to ambient conditions. Consequently, the coating is in direct contact with carbon steel, concrete (at the periphery of the liner), viton (lid gasket), and galvanized carbon steel (lid bolts). The coating provides a physical barrier against moisture contact with the carbon steel and also provides galvanic protection to the steel. This coating has been used in nuclear applications and has no significant chemical interaction with concrete. Similarly, the viton lid gasket is essentially inert with respect to the coating. The galvanized lid bolts are close in galvanic potential to the zinc-rich coating and no significant interaction is anticipated. Any corrosion in this area from degraded coating surfaces, etc., would not be a structural issue due to the non-structural function of the bolts and cask lid.

The ceramic tiles at the base of the cask interior were selected specifically to act as a galvanic insulator between the coated carbon steel liner and the stainless steel fuel canister. No chemical interactions between the tiles and the MPC, cask liner, or ambient air are anticipated.

Neutron Control

The effectiveness of the fixed borated neutron absorbing material used in the MPC fuel basket design requires that sufficient concentrations of boron be present to assure criticality safety during worst case design basis conditions over the 40-year design life of the MPC. Information on the characteristics of the borated neutron absorbing material used in the MPC fuel basket is provided in Subsection 1.2.1.3.1 of the HI-STORM 100 System FSAR. The relatively low neutron flux, which will continue to decay over time, does not result in significant depletion of the material's available boron to perform its intended safety function. In addition, the boron content of the material used in the criticality safety analysis is conservatively based on the minimum specified boron areal density (rather than the nominal), which is further reduced by 25 percent for analysis purposes, as described in Section 6.1 of the HI-STORM 100 System FSAR. The analysis discussed in Section 6.3.2 of the HI-STORM 100 System FSAR demonstrates that the boron depletion in the Boral is negligible over a 50-year duration. This calculation (Reference 37) has been updated as part of the license renewal application, and boron depletion has been determined to be negligible over the full 60-year duration. Thus, sufficient levels of boron are present in the fuel basket neutron absorbing material to maintain criticality safety functions over the 60-year design life of the MPC. Shielding in the Transfer Cask is provided primarily by lead, steel, and water, all of which are commonly used in nuclear applications. A small amount of Holtite-A neutron shield material is used in the lid of the Transfer Cask. A detailed description of Holtite-A may be found in Section 1.2.1.3.2 of the HI-STORM 100 System FSAR.

Table 4.8-1 provides a listing of the materials of fabrication for the Trojan Storage System and summarizes the performance of the material in the expected operating environments during short-term loading/unloading operations and long-term storage operations. As a result of this review, no operations were identified which could produce adverse reactions beyond those conditions already analyzed in this SAR.

Cladding Integrity

This category requires that appropriate fuel cladding temperature limits be determined and met and that the fuel cladding be protected from exposure to reacting environments. Section 4.2.6.1 of this SAR describes the determination of allowable fuel cladding temperature limits and provides values for the limits. The normal condition limits ensure a probability of cladding breach of less than 0.5 percent over the 60-year design life and the short-term accident cladding temperature limit is in accordance with NRC guidance. Section 4.2.6.2 of this SAR describes that the MPC cavity is backfilled with helium, an inert gas, eliminating any reacting environment within the canister.

Fire Protection

This category requires using only materials that will not ignite when exposed to heat or flame. The Failed Fuel Can, Damaged Fuel Container, Process Can Capsule, and a significant portion of the MPC are austentic stainless steel. That portion of the MPC that is not stainless steel is passivated Boral (boron carbide and aluminum). The Transfer Cask is constructed from the following materials: carbon steels; elemental lead; Holtite-A neutron shield material; paint; and brass, bronze or stainless steel appurtenances (pressure relief valves, drain tube, etc.). None of these materials is known to ignite when exposed to heat or flame.

Nuclear Control

This category requires the use of materials with known radiation shielding and criticality control performance. Materials used for criticality control in the MPC are the Boral panels affixed to the walls of the fuel cells. Boral has been used successfully for many years in wet storage applications and, more recently, in dry storage service, in the nuclear industry. Shielding in the Transfer Cask is provided primarily by lead, steel, and water, all of which are commonly used in nuclear applications. A small amount of Holtite-A neutron shield material is used in the lid of the Transfer Cask. A detailed description of Holtite-A may be found in Section 1.2.1.3.2 of the HI-STORM 100 System FSAR.

Confinement Boundary

This category requires demonstrating that the MPC confinement boundary and fuel cladding operating limits (i.e., stresses and temperatures) are not exceeded. The structural and thermal analyses discussed elsewhere in this SAR provide this information.

Offsite Shipment

This category requires that the cask system or, in the case of canister-based systems, the MPC be designed for transportation. The MPC is certified for transportation under 10 CFR 71 in the Holtec HI-STAR 100 Transport Cask.

31. Holtec Report No. HI-2012725, "Computation of Peak Cladding Temperature During Vacuum Drying of Trojan Fuel (Trojan ISFSI Completion Project)," Revision 4.

32. Holtec Report No. HI-2012681, "Criticality Evaluation for the Trojan ISFSI Completion Project," Revision 7.

33. Holtec Report No. HI-2012662, "Fuel Parameter Evaluation of TNP Fuel to be Stored at the Trojan ISFSI," Revision 3.

34. Holtec PS-1209, Purchase Specification for the MPC Lift Cleat (Ancillary No. 209).

35. Holtec Report No. HI-992234, "Stress Analysis of MPC Lift Cleat", Rev. 5, and supporting document Holtec Report No. HI-2104737, "Trojan Specific MPC Lifting Analysis," Rev. 0 (Trojan ISFSI Calculation TI-146, Rev. 1).

36. Holtec Report No. HI-2167021, "Cladding Integrity Evaluation Under 60-Year Fuel Storage in Trojan Concrete Cask," Revision 0.

37. Holtec Report No. HI-951322, "HI-STAR 100 Shielding Design and Analysis for Transport and Storage, Appendix 3," Revision 24.

13. American Society of Mechanical Engineers (ASME), Boiler and Pressure Vessel Code, Section III, Division 1, Subsection NB, Class 1 Components, 1995 Edition.

14. ANSI N14.5-1997. "American National Standard for Radioactive Material Leakage Tests on Packages for Shipment."

15. U.S. EPA, Federal Guidance Report No. 11, "*Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion and Ingestion,*" *EPA-520/1-88-020*, 1988.

16. U.S. EPA, Federal Guidance Report No. 12, "*External Exposure to Radionuclides in Air, Water, and Soil*," EPA 402-R-93-081, 1993.

17. Rohsenow, W.M. and Hartnett, J.P., "*Handbook of Heat Transfer*," McGraw Hill Book Company, New York, 1973.

18. U.S. Department of Energy, "Characteristics of Spent Fuel, High-Level Waste, and Other Radioactive Wastes Which May Require Long-Term Isolation," DOE/RW-0184, December 1987.

19. Ludwig, S. B. and Renier, J. P., "Standard- and Extended-Burnup PWR and BWR Reactor Models for the ORIGEN2 Computer Code," ORNL/TM-11018, ORNL, December 1989.

20. Luksic, A., "Spent Fuel Assembly Hardware: Characterization and 10 CFR 61 Classification for Waste Disposal," PNL-6906-Vol. 1, Pacific Northwest Laboratory, June 1989.

21. U.S. Department of Energy, "Characteristics of Potential Repository Wastes," DOE/RW-0184-R1, July 1992.

22. Cacciapouti, R. J., Van Volkinburg, S., "Axial Burnup Profile Database for the Combustion Engineering 14X14 Fuel Design," September 1995.

23. Holtec Report No. HI-2012662, "Fuel Parameter Evaluation of TNP Fuel to be Stored at the Trojan ISFSI," Revision 3.

24. Holtec Report No. HI-2012749, "Shielding Evaluation for the Trojan ISFSI Completion Project," Revision 4.

25. Holtec Report No. HI-2012677, "Trojan ISFSI Site Boundary Confinement Analysis," Revision 5.

26. Trojan ISFSI (TI) Calculation No. TI-159, "Calculation to Establish Trojan ISFSI Controlled Area Boundary at 200 Meters."

9.7 PROGRAMS

The following programs will be established, implemented, and maintained in addition to the programs required by ISFSI Technical Specifications, Section 5.5.

9.7.1 FIRE PROTECTION PROGRAM

The Fire Protection Program provides controls to prevent and protect the facility from fires and explosions which could impact the safe storage of spent nuclear fuel or cause the release of radioactive material.

9.7.2 TRAINING PROGRAM

The Training Program contains the training and certification requirements for the ISFSI Specialists.

9.7.3 TROJAN ISFSI EMERGENCY PLAN

The Trojan ISFSI Emergency Plan contains actions and responsibilities to be performed in response to a radiological emergency. This plan complies with the requirements of 10 CFR 72.32(a).

9.7.4 TROJAN ISFSI SECURITY PLAN

The Trojan ISFSI Security Plan (PGE-1073) contains a detailed plan for security measures for physical protection of the ISFSI. In addition, this plan contains contingencies for responding to threats and potential radiological sabotage. This plan complies with the requirements of 10 CFR 72, Subpart H, "Physical Protection."

9.7.5 TRANSFER CASK AND CONCRETE CASK HANDLING AND STORAGE PROGRAM

The Transfer Cask and Concrete Cask Handling and Storage Program places controls on the handling and storage of the Concrete Cask, Transfer Cask, and MPC. This program will consist of elements that will control: the heights at which the loaded Concrete Casks can be lifted, use of the Transfer Cask, and arrangement of Concrete Casks on the ISFSI Storage Pad. The program also provides requirements for use of a mobile crane for lifting MPCs in the Transfer Station and provides controls for movement and loading of Transport Casks.

9.7.6 STRUCTURAL INSPECTION PROGRAM

The Structural Inspection Program establishes periodic inspection of the concrete surface of the Concrete Casks and the Storage Pad. The inspections will ensure that the structural integrity of the concrete is maintained. The structural inspection program establishes periodic inspection of

the Transfer Station foundation, anchorage and structural steel and fasteners. The program provides acceptance criteria, evaluation methods for degradation, and repair and restoration instructions.

~~After the first 20 years of service,~~Concurrent with implementation of the Aging Management Program specified in Section 9.7.8, the Structural Inspection Program inspections for the Concrete Cask Exterior and Transfer Station are ~~is~~replaced by the long-term aging management programs described in Subsections 9.7.8.4.3 and 9.7.8.4.4.

9.7.7 CONCRETE CASK INTERIOR INSPECTION PROGRAM

The Concrete Cask Interior Inspection Program establishes periodic inspections – at five- year intervals – of the first Concrete Cask placed in service at the Trojan ISFSI. The Concrete Cask interior annulus area and the interior areas of vents shall be inspected to identify degradation mechanisms (not identified in the Safety Analysis Report) that may affect system performance.

The Concrete Cask Interior Inspection Program requires the results of the inspections to be documented and a report summarizing the findings to be submitted to the NRC within 30 days of the inspections. The report shall be submitted in accordance with 10 CFR 72.4 with a copy sent to the appropriate NRC regional office.

~~After the first 20 years of service,~~Concurrent with implementation of the Aging Management Program specified in Section 9.7.8, the Concrete Cask Interior Inspection Program is replaced by the long-term aging management programs described in Subsections 9.7.8.4.1 and 9.7.8.4.3.

9.7.8 AGING MANAGEMENT PROGRAM~~S~~

Pursuant to Technical Specification 5.5.5, this Aging Management Program (AMP) establishes the processes and procedures to manage the aging of ISFSI components into extended storage periods. As part of the license renewal process detailed in License Change Application 72-07 (Reference 9), an aging management assessment of the Concrete Cask, MPC~~s~~, Transfer Cask, Transfer Station, Spent Fuel Assembly, and ISFSI Pad was performed to identify ~~. Through this review,~~ inspection and monitoring activities ~~were identified~~ that are necessary to provide reasonable assurance that ISFSI and Transfer Cask components within the scope of license renewal continue to perform their intended functions consistent with the current licensing basis for the renewed operating period. This section describes the~~se~~ following aging management program~~s~~ activities: scoping evaluation results, aging management review results, and time-limited aging analysis results. In addition, this section describes the Aging Management Programs for inspection and monitoring of the selected MPC and associated Concrete Cask, the Transfer Cask, Concrete Casks, and Transfer Station and the Tollgate Assessments of the overall aging management program.

9.7.8.1 Scoping Evaluation Results

This section provides a summary of the Trojan ISFSI renewal scoping evaluation and results. The scoping evaluation was performed based on the process described in NUREG-1927 (Reference 10). The first step in the process was a screening evaluation to determine which components and structures are within the scope of the license renewal. The second step in the process was identifying the function(s) each in-scope component and structure is required to perform during the period of extended operations.

The components and structures determined to be within the scope of renewal are the MPC, Transfer Cask, Concrete Cask, Fuel Assemblies, Transfer Station (including the Transfer Station Pad and Impact Limiter), and ISFSI Pad. SAR Table 9.7-1 [to be extracted from final LRA Table 2-1] summarizes the results of the scoping evaluation, listing the above in-scope components and structures and the criteria upon which they were determined to be within the scope of renewal. In addition, the scoping evaluation reviewed the subcomponents of the above in-scope components and structures and results for these subcomponents and their intended function(s) are identified in SAR Table 9.7-2 through Table 9.7-7 [to be extracted from final LRA Tables 2-2 through 2-7].

9.7.8.2 Aging Management Review Results

This section provides a summary of the Trojan ISFSI renewal Aging Management Review (AMR) results. The AMR was performed in accordance with the processes described in NUREG-1927.

A summary of the results of the AMR for the MPCs, Transfer Cask, Concrete Casks, Fuel Assemblies, Transfer Station, and ISFSI Pad is contained in SAR Tables 9.7-8 through 9.7-13 [to be extracted from final LRA Tables 3-1 through 3-6], respectively. These tables provide the following information related to each subcomponent determined to require aging management review: the intended function, the material group, the environment, the aging effects requiring management, the aging mechanisms, and the specific aging management activities that manage those aging effects. The tables also identify subcomponents that did not support, or whose failure would not compromise, the SSC intended safety function(s) and were, therefore, not subjected to further aging management review.

~~9.7.9~~9.7.8.3 Time-Limited Aging Analysis Results

This section discusses the results for each of the Time-Limited Aging Analyses (TLAAs) evaluated for license renewal. The evaluations have demonstrated that the analyses have been projected to the end of the renewed license period.

MPC Fatigue Evaluation

Section 4.2.5.3.6 already indicates that the low stress, high-cycle conditions during normal dry storage conditions cannot lead to a fatigue failure of the MPC. However, it is possible that repeated lifting of the MPC might cause increased stresses and therefore lower the fatigue life of the MPC. Based on an evaluation of lifting stresses, the allowable number of MPC lifting cycles greatly exceeds the number of MPC lifts necessary during the 60-year storage life.

Neutron Absorber Depletion Evaluation

Section 4.8 describes boron depletion of the fixed neutron absorber within the MPC, and demonstrates that it is negligible over 50 years. The same analysis was updated in support of the license renewal request and concludes that the total depletion of B-10 in Boral over a 500-year period is negligible, and therefore, the neutron absorber will perform its intended function beyond the extended storage period.

Transfer Cask Fatigue Evaluation

Section 4.8 summarizes a cyclic loading fatigue evaluation of the Transfer Cask which concludes that stresses are well below the endurance limit of the trunnion material. Following placement of MPCs into Concrete Casks, the Transfer Cask is no longer used to lift loaded MPCs. Thus trunnion fatigue is not an issue during the extended license period. Potential fatigue issues are limited to Transfer Cask components in the load path when the Transfer Cask supports a loaded MPC in the Transfer Station. As a conservative measure, an evaluation was performed to determine the allowable number of Transfer Cask lifting cycles involving a loaded MPC. Stresses in this scenario exceed those when supporting a loaded MPC in the Transfer Station. Based on this evaluation, the allowable number of cycles supporting a loaded MPC in the Transfer Station greatly exceeds the number needed during the extended license period.

Fuel Cladding Integrity Evaluation

Section 4.2.6.1 describes a calculation for the fuel cladding temperature limit, which is a function of temperature versus time as well as internal rod pressurization. The original fuel cladding temperature limit was established to keep the probability of cladding breach less than 0.5% per fuel rod. This calculation was revised to ensure that the probability of cladding breach is less than 0.5% over the 60-year storage life at the Trojan ISFSI. Based on the results of the calculation, the life usage fraction of the fuel cladding demonstrates that cladding integrity is assured for the 60-year storage life.

9.7.8.4 Aging Management Programs

This section describes the Aging Management Programs for inspection and monitoring of the selected MPC and associated Concrete Cask, the Transfer Cask, Concrete Casks, and Transfer

Station as detailed in Tables 9.7-14 through 9.7-17 *[to be extracted from final LRA Appendix A, A component AMPs]*.

Consistent with NUREG-1927 (Reference 9), Section 3.6.1.4, Timing of Inspections, Trojan will schedule the first implementation of the following four AMPs to be completed in calendar years 2022 through 2023 and these will be considered Baseline Inspections.

9.7.8.4.1 MPC Aging Management Program

~~The MPC Aging Management Program makes use of the Concrete Cask Interior Inspection Program through the extended storage period.~~ This program involves monitoring the exterior surface of a representative MPC, including visual inspection of accessible MPC surfaces for signs of degradation. This inspection shall be performed on MPC-28 ~~canister PCC-03~~ at a frequency of 5 years ±25%. The detailed 10-element MPC Aging Management Program is contained in Table 9.7-14 *[to be extracted from final LRA Appendix A, MPC AMP]*.

~~The monitored conditions in accessible locations include, but are not limited to:~~
- ~~Localized corrosion pits, stress corrosion cracking, etching, or deposits~~
- ~~Discrete colored corrosion products, especially those adjacent to welds and weld heat affected zones~~
- ~~Linear appearance of corrosion products parallel to or traversing welds or weld heat affected zones~~
- ~~Red-orange colored corrosion products combined with deposit accumulations in any location~~
- ~~Red-orange colored corrosion tubercles of any size~~

9.7.8.4.2 Transfer Cask Aging Management Program

The Transfer Cask Aging Management Program utilizes inspections to ensure that the Transfer Cask maintains its intended function through the extended storage period, by performing a visual inspection for degradation of the external surfaces of the Transfer Cask. This inspection is performed prior to use of the Transfer Cask and once per year (±25%) while in use. The detailed 10-element Transfer Cask Aging Management Program is contained in Table 9.7-15 *[to be extracted from final LRA Appendix A, Transfer Cask AMP]*.
~~The visual inspection will include the following:~~
- ~~All painted surfaces for corrosion and paint integrity~~
- ~~All lid surfaces for dents, scratches, gouges, or other damage~~
- ~~The water jacket for leaks~~
- ~~All other surfaces for dents scratches, gouges, or other damage.~~

9.7.8.4.3 Concrete Cask Aging Management Program

The Concrete Cask Aging Management Program utilizes condition monitoring to manage aging effects of the Concrete Casks, both internally and externally. ~~The external portion of this AMP~~

continues the Structural Inspection Program into the period of extended storage. The external Concrete Cask AMP is performed annually (±25%) on all Concrete Casks on the pad as a visual survey inspection to identify any surface deterioration. The internal portion of the Concrete Casks AMP is performed in conjunction with the MPC AMP, and involves a visual inspection of the interior Concrete Cask annular space of cask PCC-03 every 5 years (±25%). This AMP continues the Concrete Cask Interior Inspection Program described in Section 9.7.7 into the period of extended storage. The detailed 10-element Concrete Cask Aging Management Program is contained in Table 9.7-16 *[to be extracted from final LRA Appendix A, Concrete Cask AMP].*

9.7.8.4.4 Transfer Station Aging Management Program

The Transfer Station Aging Management Program utilizes inspections to ensure that the Transfer Station maintains its intended function through the extended storage period, by performing a visual inspection for degradation of the external surfaces of the Transfer Station and Transfer Station Pad. This inspection is performed prior to use of the Transfer Station and once per year (±25%) while in use. The detailed 10-element Transfer Station Aging Management Program is contained in Table 9.7-17 *[to be extracted from final LRA Appendix A, Transfer Station AMP].*

The visual inspection will include the following:

- All painted surfaces for corrosion and paint integrity
- All other surfaces for dents, scratches, gouges, or other damage
- Transfer Station Pad for concrete degradation

9.7.9 TIME-LIMITED AGING ANALYSIS

This section discusses the results for each of the Time-Limited Aging Analyses (TLAAs) evaluated for license renewal. The evaluations have demonstrated that the analyses have been projected to the end of the renewed license period.

MPC Fatigue Evaluation

Section 4.2.5.3.6 already indicates that the low stress, high-cycle conditions during normal dry storage conditions cannot lead to a fatigue failure of the MPC. However, it is possible that repeated lifting of the MPC might cause increased stresses and therefore lower the fatigue life of the MPC. Based on an evaluation of lifting stresses, the allowable number of MPC lifting cycles greatly exceeds the number of MPC lifts necessary during the 60-year storage life.

Neutron Absorber Depletion Evaluation

Section 4.8 describes boron depletion of the fixed neutron absorber within the MPC, and demonstrates that it is negligible over 50 years. The same analysis was updated in support of the license renewal request and concludes that the total depletion of B-10 in Boral over a 500-year

~~period is negligible, and therefore, the neutron absorber will perform its intended function beyond the extended storage period.~~

~~Transfer Cask Fatigue Evaluation~~

~~Section 4.8 summarizes a cyclic loading fatigue evaluation of the Transfer Cask which concludes that stresses are well below the endurance limit of the trunnion material. Following placement of MPCs into Concrete Casks, the Transfer Cask is no longer used to lift loaded MPCs. Thus trunnion fatigue is not an issue during the extended license period. Potential fatigue issues are limited to Transfer Cask components in the load path when the Transfer Cask supports a loaded MPC in the Transfer Station. As a conservative measure, an evaluation was performed to determine the allowable number of Transfer Cask lifting cycles involving a loaded MPC. Stresses in this scenario exceed those when supporting a loaded MPC in the Transfer Station. Based on this evaluation, the allowable number of cycles supporting a loaded MPC in the Transfer Station greatly exceeds the number needed during the extended license period.~~

~~Fuel Cladding Integrity Evaluation~~

~~Section 4.2.6.1 describes a calculation for the fuel cladding temperature limit, which is a function of temperature versus time as well as internal rod pressurization. The original fuel cladding temperature limit was established to keep the probability of cladding breach less than 0.5% per fuel rod. This calculation was revised to ensure that the probability of cladding breach is less than 0.5% over the 60-year storage life at the Trojan ISFSI. Based on the results of the calculation, the life usage fraction of the fuel cladding demonstrates that cladding integrity is assured for the 60-year storage life.~~

9.7.8.5~~10~~ Tollgate~~s~~ Assessments

Tollgate~~s~~ Assessments are established as a requirement ~~in Trojan's renewed ISFSI license that are implemented~~ to evaluate aging management feedback and perform a safety assessment that confirms the safe storage of spent nuclear fuel. The impact of the aggregate feedback will be assessed as it pertains to components at the Trojan ISFSI and actions taken as necessary, such as:

- Adjustment of aging-related degradation monitoring and inspection programs in AMPs described in Section 9.7.8.4
- Modification of TLAAs described in Section 9.7.8.3~~9~~
- Performance of mitigation activities

Each tollgate assessment should address the following elements:

- Summary of research findings, operating experience, monitoring data, and inspection results made available since last assessment
- Aggregate impact of findings, including any trends
- Consistency of data with the assumptions and inputs in Trojan's TLAAs
- Effectiveness of AMPs

- Corrective actions, including any changes to AMPs
- Summary and conclusions

Trojan's tollgates are shown in Table 9.7-18 and performance criteria for tollgate assessments are shown in Table 9.7-19. Note that the implementation of these tollgates does not imply that Trojan will wait until one of these designated times to evaluate information. Trojan will continue to follow existing processes for addressing emergent issues, including the use of the corrective action program on site. These tollgates are specific times where an aggregate of information will be evaluated as a whole.

9.8 ISFSI DECOMMISSIONING PLAN

The Trojan ISFSI Preliminary Radiological Decommissioning Plan (PGE-1082) contains the detailed plan for implementing 10 CFR 72.30, Financial Assurance and Recordkeeping for Decommissioning (Reference 1). This plan contains information on proposed practices and procedures for the decontamination of the site and facilities and for disposal of residual radioactive materials after all of the spent fuel has been removed from the Trojan site, in order to provide reasonable assurance that the decontamination and decommissioning of the ISFSI at the end of its useful life will provide adequate protection to the health and safety of the public.

The plan includes a description of the facility; a projected decommissioning schedule; a detailed site-specific cost estimate for radiological decommissioning; co-owners' funding plans; co-owners' financial assurance instrument information; co-owners' certifications of financial assurance; and recordkeeping for radiological decommissioning.

9.9 NUCLEAR LIABILITY INSURANCE

The NRC requires that PGE maintain a minimum of $100 million in nuclear liability insurance coverage, as described in Indemnity Agreement No. B-78, "until all the radioactive material has been removed from the location and transportation of the radioactive material from the location has ended as defined in subparagraph 5(b), Article I" (Reference 8), or until the Commission authorizes the termination or modification of such financial protection. It is noted that the site location described in Item 4 of the attachment to the indemnity agreement means the original 10 CFR 50 license site boundaries. This requirement to maintain a minimum of $100 million in nuclear liability insurance coverage must remain in the Trojan ISFSI Safety Analysis Report unless prior NRC approval is received for its elimination or for a reduction in coverage amount (Reference 8).

9.10 REFERENCES

1. Code of Federal Regulations, Title 10, Part 72.30, "Financial Assurance and Recordkeeping for Decommissioning."

2. Deleted in Revision 12.

3. Deleted in Revision 12.

4. Deleted in Revision 9.

5. Deleted in Revision 12.

6. PGE-8010, "Portland General Electric (PGE) Nuclear Quality Assurance Program for Trojan Independent Spent Fuel Storage Installation (10 CFR 72) Operations and Radioactive Material Packaging and Transportation (10 CFR 71) Activities," a.k.a., Trojan Nuclear Quality Assurance Program.

7. Deleted in Revision 13.

8. U.S. Nuclear Regulatory Commission letter, "Termination of Trojan Nuclear Plant Facility Operating License No. NPF-1," dated May 23, 2005.

9. "Trojan Site-Specific Independent Spent Fuel Storage Installation (ISFSI) License Change Application (LCA) 72-07, License Renewal" (VPN-004-2017) dated March 23, 2017.

10. NUREG-1927, Revision 1, "Standard Review Plan for Renewal of Specific Licenses and Certificates of Compliance for Dry Storage of Spent Nuclear Fuel."

PLACE HOLDERS FOR FUTURE NEW ISFSI SAR TABLES

Table 2-1 (New ISFSI SAR Table 9.7-1)

Summary of Scoping Evaluation Results

[Insert Final LRA Table 2-1]

Table 2-2 (New ISFSI SAR Table 9.7-2)

Intended Safety Functions of MPC Subcomponents

[Insert Final LRA Table 2-2]

Table 2-4 (New ISFSI SAR Table 9.7-3)

Intended Safety Functions of Transfer Cask Subcomponents

[Insert Final LRA Table 2-4]

Table 2-3 (New ISFSI SAR Table 9.7-4)

Intended Safety Functions of Concrete Cask Subcomponents

[Insert Final LRA Table 2-3]

Table 2-5 (New ISFSI SAR Table 9.7-5)

Intended Safety Functions of Spent Fuel Assembly Subcomponents

[Insert Final LRA Table 2-5]

PLACE HOLDERS FOR FUTURE NEW ISFSI SAR TABLES

Table 2-6 (New ISFSI SAR Table 9.7-6)

Intended Safety Functions of Transfer Station Subcomponents

[Insert Final LRA Table 2-6]

Table 2-7 (New ISFSI SAR Table 9.7-7)

Intended Safety Functions of ISFSI Pad Subcomponents

[Insert Final LRA Table 2-7]

Table 3-1 (New ISFSI SAR Table 9.7-8)

Aging Management Review for MPC Subcomponents

[Insert Final LRA Table 3-1]

Table 3-2 (New ISFSI SAR Table 9.7-9)

Aging Management Review for Transfer Cask Subcomponents

[Insert Final LRA Table 3-2]

Table 3-3 (New ISFSI SAR Table 9.7-10)

Aging Management Review for Concrete Cask Subcomponents

[Insert Final LRA Table 3-3]

PLACE HOLDERS FOR FUTURE NEW ISFSI SAR TABLES

Table 3-4 (New ISFSI SAR Table 9.7-11)

Aging Management Review for Fuel Assembly Subcomponents

[Insert Final LRA Table 3-4]

Table 3-5 (New ISFSI SAR Table 9.7-12)

Aging Management Review for Transfer Station Subcomponents

[Insert Final LRA Table 3-5]

Table 3-6 (New ISFSI SAR Table 9.7-13)

Aging Management Review for ISFSI Pad Subcomponents

[Insert Final LRA Table 3-6]

LRA Appendix A MPC AMP (New ISFSI SAR Table 9.7-14)

MPC Aging Management Program

[Insert Final LRA Appendix A, MPC AMP]

LRA Appendix A Transfer Cask AMP (New ISFSI SAR Table 9.7-15)

Transfer Cask Aging Management Program

[Insert Final LRA Appendix A, Transfer Cask AMP]

PLACE HOLDERS FOR FUTURE NEW ISFSI SAR TABLES

LRA Appendix A Concrete Cask AMP (New ISFSI SAR Table 9.7-16)

Concrete Cask Aging Management Program

[Insert Final LRA Appendix A, Concrete Cask AMP]

LRA Appendix A Transfer Station AMP (New ISFSI SAR Table 9.7-17)

Transfer Station Aging Management Program

[Insert Final LRA Appendix A, Transfer Station AMP]

TABLE 9.7-18
Tollgate Assessments for Trojan ISFSI

Tollgate	Year	Assessment
1	2024	Perform an assessment of the AMP effectiveness considering the criteria in Table 9.7-192. It is not necessary to evaluate all ten elements; however, particular attention should be focused on the detection of aging effects (Element 4), corrective action (Element 7), and operating experience (Element 10) as a minimum. This assessment should include information from the ISFSI Aging Management INPO Database (AMID).
2	2029	Evaluate additional information gained from the AMID and subsequent AMP inspections to update the assessment listed in Tollgate 1, to ensure continued AMP effectiveness.
3	2034	Evaluate additional information gained from the AMID and subsequent AMP inspections to update the assessment listed in Tollgate 2, to ensure continued AMP effectiveness.
4	2039	Evaluate additional information gained from the AMID and subsequent AMP inspections to update the assessment listed in Tollgate 3, to ensure continued AMP effectiveness.
5	2044	Evaluate additional information gained from the AMID and subsequent AMP inspections to update the assessment listed in Tollgate 4, to ensure continued AMP effectiveness.
6	2049	Evaluate additional information gained from the AMID and subsequent AMP inspections to update the assessment listed in Tollgate 5, to ensure continued AMP effectiveness.
7	2054	Evaluate additional information gained from the AMID and subsequent AMP inspections to update the assessment listed in Tollgate 6, to ensure continued AMP effectiveness.
8	2059	Evaluate additional information gained from the AMID and subsequent AMP inspections to update the assessment listed in Tollgate 7, to ensure continued AMP effectiveness.

TABLE 9.7-19~~2~~ **Page 1 of 2**

Tollgate Assessment Performance Criteria by Element

Element	Performance Criteria for Tollgate Assessment
1. Scope of Program	• Procedures and work orders contain appropriate components • For programs requiring sample selection, the sample bases are applied consistent with those outlined in LRA Appendix A, MPC AMP Element 4 and Concrete Cask AMP Element 4~~this application and the associated SER~~ • Additions or deletions to program scope are properly addressed
2. Preventative Actions	• Identified program enhancements are instituted in implementing procedures • Implementing activities are completed as scheduled and not deferred without adequate technical justification • Preventative measures are appropriate for the applicable degradation methods
3. Parameters Monitored or Inspected	• Implementing procedures identify parameters the program monitors • Parameters monitored should be those being controlled to achieve prevention or mitigation of aging effects • When evidence of an aging effect or mechanism is observed, document the extent of the condition
4. Detection of Aging Effects	• Inspections and examinations are conducted at appropriate intervals • Aging effects are identified and actions are implemented before loss of intended function • Samples are biased toward locations most susceptible to aging effect of concern and sample size expansion is considered ~~is expanded~~ when degradation is detected in the initial sample • Unexpected results are evaluated and program adjustments are made as warranted • Operating experience is considered in evaluating the appropriateness of technique and frequency and adoption of new (enhanced techniques as they become available
5. Monitoring and Trending	• Aging effects are monitored and trended such that no loss of intended functions occurs • Results are used to establish a rate of degradation in order to confirm that timing of the next scheduled inspection will occur before a loss of intended function • Inspection frequencies are adjusted when warranted

TABLE 9.7-~~2~~19
Tollgate Assessment Performance Criteria by Element

Element	Performance Criteria for Tollgate Assessment
6. Acceptance Criteria	• Implementing procedures contain acceptance criteria for each parameter monitored or inspected • Acceptance criteria should anticipate rates of change and margin to loss of function • Unexpected or new aging mechanisms trigger actions to address extent of condition
7. Corrective Actions	• ~~Condition reports~~Corrective Action Requests are generated when program results fail to meet acceptance criteria and upon detection of unexpected significant aging degradation • Cause evaluations are performed per site procedures • Appropriate extent of condition is applied • Prediction of the extent of degradation is used to effect timely preventive actions • Additional preventive actions, monitoring and inspections are stipulated and instituted as necessary
8. Confirmation Process	• Evaluations are conducted when unexpected conditions of significant aging effects are discovered. The evaluations should address the expected conditions, rates, future inspections, and consideration of the impact on intended functions. • Self-assessments are conducted and program improvements instituted as necessary • Recommendations or deficiencies from external assessments should be addressed
9. Administrative Controls	• Recommendations or deficiencies from external assessments are being addressed • Appropriate documentation is verified in accordance with existing procedures
10. Operating Experience	• Industry operating experience is evaluated and program adjustments are made as necessary • Plant-specific operating experience is used to adjust programs as necessary

APPENDIX H

PGE-1082, TROJAN ISFSI PRELIMINARY RADIOLOGICAL DECOMMISSIONING PLAN PROPOSED REVISION 1

Appendix H: PGE-1082, Trojan ISFSI Preliminary Radiological Decommissioning Plan, Proposed Revision 1

As described in Section 1.3.7 of the Application, in accordance with the requirements of 10 CFR 72.30(c) "at the time of license renewal", PGE is submitting this copy of PGE-1082, Proposed Revision 1, "Trojan ISFSI Preliminary Radiological Decommissioning Plan". This document was previously submitted to the NRC for review on December 10, 2015 (ML15349A939) and is still in the NRC's review process.

In 2018, PGE made additional changes to PGE-1082, Proposed Revision 1 and the changes have been incorporated into the enclosed Appendix H copy of PGE-1082. These changes are described below and in the new LRA Sections 1.3.7.3 and 1.3.7.4.

Sections 2.6 and 9.0 Changes

In 2018, PGE discovered that PGE-1082 Section 2.6 and the following Tables 2-1 and 2-3 for Concrete Cask "activation" were not revised from 40 years to cover the new 60 years proposed in the License Renewal Application.

- Table 2-1, "Concrete Cask Activation"
- Table 2-3, "Comparison of Residual Activation Activity v. Concentration Equivalent to 25 mrem/year"

PGE-1082 Section 2.6 and Tables 2-1 and 2-3 have been revised to incorporate the results of the 2018 Concrete Cask 60-year activation analysis contained in Holtec Report No. HI-2012749, "Shielding Evaluation for the Trojan ISFSI Completion Project", Table O.1, Revisions 5 and 6, to replace the 40-year analysis numbers with the 60-year analysis numbers. In addition, Table 2-3 was revised to use the 60-year nuclide values to calculate the Percentage of Residual Activity vs Concentration for 25 mrem/year to verify that the results are less than 100%. This Concrete Cask 60-year activation analysis with results shown in Section 2.6 and Tables 2-1 and 2-3 confirm that the following Trojan licensing document conclusions are still valid for the 60-year period and no changes are required to the PGE-1082, Proposed Revision 1, radiological decommissioning cost estimate.

- Trojan ISFSI SAR Table 4.2-3, Conformity to Requirements, 10 CFR 72.130 Criteria for Decommissioning: "No contamination is expected on the Concrete Cask and because of low neutron flux levels activation of the concrete and steel is considered insignificant."
- PGE-1082, Section 2.6: "Based on a comparison, activation levels in all of the Concrete Casks should be below site release criteria after a maximum decay period of two years."

Section 9.0 was changed to add a new Reference 11 for the Holtec Report No. HI-2012749, "Shielding Evaluation for the Trojan ISFSI Completion Project".

Section 4.1 Changes

Pursuant to NRC's RAI letter, dated April 3, 2018, and PGE's response letter (VPN-004-2018, dated May 15, 2018) that are related to PGE-1082, Proposed Revision 1, PGE revised PGE-1082, Section 4.1 to add Trojan's conclusions of "No Changes" to decommissioning costs for each of the following events listed in 10 CFR 72.30(c)(1)-(4): (1) spills of radioactive material producing additional residual

radioactivity in onsite subsurface material, (2) facility modifications, (3) changes in authorized possession limits, and (4) actual remediation costs that exceed the previous cost estimate.

With the additional information provided in Section 1.3.7 of the Application and the 2018 changes to Sections 2.6, 4.1, and 9.0, this 2015 PGE-1082, Proposed Revision 1 contains PGE's most up-to-date projected Trojan ISFSI radiological decommissioning schedule, detailed radiological decommissioning cost estimate, and funding plans.

PGE
Portland General Electric Company
Trojan ISFSI
71760 Columbia River Hwy
Rainier, Oregon 97048

December 10, 2015
VPN-008-2015

Trojan ISFSI
Docket No. 72-017
License No. SNM-2509

ATTN: Document Control Desk
Director, Division of Spent Fuel Storage and Transportation
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Trojan Independent Spent Fuel Storage Installation's (ISFSI)
Radiological Decommissioning Cost Estimate and Funding Plans

Pursuant to 10 CFR 72.30(b), this letter submits for Nuclear Regulatory Commission (NRC) review and approval the proposed Trojan ISFSI Preliminary Radiological Decommissioning Plan (PGE-1082), Revision 1. This plan contains a site-specific Radiological Decommissioning Cost Estimate, associated Co-Owner Funding Plans, and other documents required or requested to meet the 10 CFR 72.30 Sections of the Decommissioning Planning Rule and the guidance in NUREG-1757, Volume 3, Revision 1, Consolidated Decommissioning Guidance, Financial Assurance, Recordkeeping, and Timeliness.

This Revision 1 contains changes to the document since its previous submittal in December 2012. The Decommissioning Cost Estimate has been updated from 2012 dollars to use 2015 dollars. Text changes are identified by margin bars adjacent to the changes and revision numbers in the page footers.

Portland General Electric Company's (PGE) proposed Trojan ISFSI Preliminary Radiological Decommissioning Plan (PGE-1082), Revision 1 is attached in Enclosure I.

Upon receipt of the NRC approval, PGE will issue the Trojan ISFSI Preliminary Radiological Decommissioning Plan (PGE-1082) as Revision 0 and it will supersede the ISFSI decommissioning plan information currently contained in the Trojan ISFSI Safety Analysis Report (SAR), Section 9.8, ISFSI Decommissioning Plan. Trojan ISFSI

Preliminary Radiological Decommissioning Plan (PGE-1082) Revision 0 has not been approved by the NRC as of the submittal date of this Revision 1.

If there are any questions regarding this letter, please contact Mr. Mark E. Tursa of my staff at (503) 556-7030.

Sincerely,

Bradley Y. Jenkins
Vice President
Generation

Enclosures (1)

c: Director, NRC Region IV, DNMS (without Enclosures)
Todd Cornett, ODOE (with Enclosure I)
Susan Eicher, EWEB (with Enclosure I)
Chris Delinski, PacifiCorp (with Enclosure I)
Dana Sandlin, BPA (with Enclosure I)

ENCLOSURE I TO VPN-008-2015

PGE'S PROPOSED TROJAN ISFSI PRELIMINARY RADIOLOGICAL DECOMMISSIONING PLAN (PGE-1082), REVISION 1

PGE-1082

Trojan ISFSI
Preliminary Radiological Decommissioning Plan

Proposed Revision 1

Portland General Electric

TABLE OF CONTENTS

Section	Title	Page
1.0	**SUMMARY OF DECOMMISSIONING PLAN**	**1-1**
1.1	OVERVIEW	1-1
1.2	TROJAN OWNERSHIP	1-1
1.3	TROJAN ISFSI DECOMMISSIONING OVERVIEW	1-2
2.0	**TROJAN SITE LOCATION AND ISFSI FACILITY DESCRIPTION**	**2-1**
2.1	SITE LOCATION	2-1
2.2	ISFSI FACILITY DESCRIPTION	2-1
2.3	FACILITY COMPONENTS AND DIMENSIONS THAT MAY REQUIRE DECONTAMINATION	2-2
2.4	QUANTITIES OF MATERIALS OR WASTE ACCUMULATED DURING STORAGE OPERATIONS AND SPENT FUEL TRANSFER	2-3
2.5	NO VOLUME OF SUBSURFACE MATERIAL THAT REQUIRES REMEDIATION	2-3
2.6	LEVELS OF ACTIVATION	2-4
3.0	**PROJECTED RADIOLOGICAL DECOMMISSIONING SCHEDULE**	**3-1**
3.1	PGE'S ASSUMPTIONS AND BASIS FOR THE TROJAN ISFSI PROJECTED RADIOLOGICAL DECOMMISSIONING SCHEDULE	3-1
4.0	**ISFSI RADIOLOGICAL DECOMMISSIONING COST ESTIMATE**	**4-1**
4.1	DECOMMISSIONING COST ESTIMATE UPDATES	4-1
4.2	DECOMMISSIONING COST ESTIMATE	4-2
4.3	RADIOLOGICAL DECOMMISSIONING COST ESTIMATE RESULTS	4-14
5.0	**ISFSI RADIOLOGICAL DECOMMISSIONING FUNDING PLAN**	**5-1**
5.1	RADIOLOGICAL DECOMMISSIONING FUNDING PLAN	5-1
5.2	TROJAN CO-OWNERS' DECOMMISSIONING FUNDING PLANS	5-1
5.3	STATEMENT OF PGE'S AND PACIFICORP'S TRUST BALANCES	5-5
5.4	MONITORING OF PGE'S AND PACIFICORP'S TRUST BALANCES	5-6
5.5	NUREG-1757 CHECKLISTS FOR DECOMMISSIONING FUNDING PLANS	5-7
6.0	**TROJAN CO-OWNER FINANCIAL ASSURANCE INSTRUMENTS**	**6-1**
6.1	CO-OWNER FINANCIAL ASSURANCE INSTRUMENTS	6-1
6.2	PGE'S FINANCIAL ASSURANCE INSTRUMENT	6-1
6.3	EWEB'S FINANCIAL ASSURANCE INSTRUMENT	6-1
6.4	PACIFICORP'S FINANCIAL ASSURANCE INSTRUMENT	6-1
6.5	SUBMIT FINANCIAL ASSURANCE DOCUMENT TO NRC IF 10 CFR 72.30(e) INFORMATION CHANGES	6-2

TABLE OF CONTENTS

Section	Title	Page
6.6	NUREG-1757 CHECKLISTS FOR TRUSTS AND STATEMENT OF INTENT	6-3
7.0	TROJAN ISFSI CO-OWNERS' CERTIFICATIONS THAT FINANCIAL ASSURANCE HAS BEEN PROVIDED FOR THEIR SHARE OF RADIOLOGICAL DECOMMISSIONING COSTS	7-1
8.0	RECORD KEEPING FOR DECOMMISSIONING	8-1
9.0	REFERENCES	9-1

APPENDICES

Appendix	Title
5-1	Checklist 1, Master Checklist for Decommissioning Financial Assurance For PGE, EWEB/BPA, and PacifiCorp
5-2	Checklist 3, Decommissioning Funding Plans For PGE, EWEB/BPA, and PacifiCorp
6-1	Checklist 4-A, Trust Funds For PGE
6-2	Checklist 4-B, Terms and Conditions Needed in Decommissioning Trust Agreements For PGE
6-3	Checklist 4-A, Trust Funds For PacifiCorp
6-4	Checklist 4-B, Terms and Conditions Needed in Decommissioning Trust Agreements For PacifiCorp
6-5	Checklist 10, External Sinking Funds For PGE
6-6	Checklist 10, External Sinking Funds For PacifiCorp
6-7	Checklist 11-A, Statements of Intent For EWEB
6-8	Checklist 11-B, Terms and Conditions Needed in Decommissioning Statements of Intent For EWEB
7-1	Certification of Financial Assurance from Portland General Electric Company for 67.5% Ownership
7-2	Certification of Financial Assurance from Eugene Water and Electric Board (EWEB) for 30% Ownership
7-3	Certification of Financial Assurance from PacifiCorp for 2.5% Ownership

LIST OF TABLES

Table	Title	Page
2-1	Concrete Cask Activation	2-4
2-2	Comparison of the Trojan TranStor and HI-STORM 100 Concrete Overpack Casks	2-5
2-3	Comparison of Residual Activation Activity v. Concentration Equivalent to 25 mrem/yr	2-5
4.2-1	Labor Cost – Characterization of Activated Cask	4-3
4.2-2	Non-Labor Cost – Characterization of Concrete Casks	4-4
4.2-3	Labor Cost – Disposal of Activated Cask	4-5
4.2-4	Non-Labor Cost – Disposal of Activated Cask	4-6
4.2-5	Labor Cost – Final Status Survey	4-8
4.2-6	Summary of Non-Labor Cost – Final Status Survey	4-9
4.2-6a	Contractor Non-Labor Cost (Travel) – Final Status Survey	4-9
4.2-6b	NRC/ORISE Non-Labor Cost (Travel/Miscellaneous) – Final Status Survey	4-9
4.2-6c	Contractor Non- Labor Cost (Equipment/Consumables) – Final Status Survey	4-10
4.2-6d	Contractor Non- Labor Cost (Laboratory Services) – Final Status Survey	4-10
4.2-6e	NRC/ORISE Non- Labor Cost (Laboratory Services) – Final Status Survey	4-11
4.2-7	PGE Labor Cost – Final Radiological Decommissioning Plan	4-12
4.2-8	Non-Labor Cost – Final Radiological Decommissioning Plan	4-13
4.3-1	Radiological Decommissioning Costs	4-15
4.3-2	ISFSI Radiological Decommissioning Annual Costs	4-15
5.1-1	ISFSI Radiological Decommissioning Total Annual Costs in Nominal Dollars	5-1
5.2-1	Portland General Electric Decommissioning Funding Cash Flow	5-2
5.2-2	EWEB / BPA Decommissioning Funding Annual Cash Obligations	5-3
5.2-3	PacifiCorp Decommissioning Funding Cash Flow	5-4
5.3-1	PGE's Decommissioning Trust Funds' Balances	5-5
5.3-2	PacifiCorp's Decommissioning Trust Funds' Balances	5-6

LIST OF FIGURES

Figures	**Title**
2-1	ISFSI Pad Layout
2-2	Transfer Station
2-3	Concrete Cask
2-4	Transfer Cask
3-1	Trojan ISFSI Project Timeline

LIST OF EFFECTIVE PAGES

Section/Page	Revision
Title Page	1
Table of Contents i through iv	0
List of Effective Pages v	1a
Section 1	
Pages 1-1 through 1-2	0
Section 2	
Pages 2-1 through 2-3	0
Pages 2-4 and 2-5	1a
Figures 2-1 through 2-4	0
Section 3	
Page 3-1	0
Figure 3-1	1
Section 4	
Page 4-1	1a
Pages 4-2 through 4-15	1
Section 5	
Pages 5-1 through 5-7	1
Section 6	
Pages 6-1 through 6-3	0
Section 7	
Page 7-1	0
Section 8	
Page 8-1	0
Section 9	
Page 9-1	1a
All Appendices	1

1.0 SUMMARY OF DECOMMISSIONING PLAN

1.1 OVERVIEW

This Trojan ISFSI Preliminary Radiological Decommissioning Plan was prepared to satisfy the requirements of 10 CFR 72.30, Financial Assurance and Recordkeeping for Decommissioning (Reference 4). The plan includes a description of the facility; a projected decommissioning schedule; a detailed site-specific cost estimate for radiological decommissioning; co-owners' funding plans; co-owners' financial assurance instrument information; co-owners' certifications of financial assurance; and recordkeeping for radiological decommissioning.

As required by 10 CFR 72.30(a), this plan contains sufficient information on proposed practices and procedures for the decontamination of the site and facilities and for disposal of residual radioactive materials after all of the spent fuel has been removed from the Trojan site, in order to provide reasonable assurance that the decontamination and decommissioning of the ISFSI at the end of its useful life will provide adequate protection to the health and safety of the public. This plan also identifies and discusses those design features of the ISFSI that facilitate its decontamination and decommissioning at the end of its useful life.

In accordance with 10 CFR 72.30(b), this plan provides details on how reasonable assurance will be provided that funds will be available to decommission the ISFSI. This information includes a site-specific cost estimate for radiological decommissioning of the Trojan ISFSI and a description of the methods from 10 CFR 72.30(e) that the Trojan ISFSI co-owners use to assure adequate funds for radiological decommissioning, including means of adjusting the cost estimate and associated co-owner funding levels periodically over the life of the ISFSI.

1.2 TROJAN OWNERSHIP

The Trojan site and Trojan ISFSI facilities are jointly owned by Portland General Electric Company (PGE), 67.5 percent; the City of Eugene, Oregon, 30 percent through the Eugene Water and Electric Board (EWEB); and PacifiCorp, 2.5 percent. PGE is the majority owner and has responsibility for operating and maintaining the Trojan ISFSI. The Bonneville Power Administration (BPA), a power marketing agency under the United States Department of Energy, is obligated through Net Billing Agreements to pay costs associated with EWEB's share of Trojan, including decommissioning and spent fuel management costs.

1.3 TROJAN ISFSI DECOMMISSIONING OVERVIEW

Pursuant to the requirements of 10 CFR 72.130 (Reference 6), the ISFSI was designed to minimize the decontamination efforts required for decommissioning. The design of the Holtec Multi-Purpose Canister (MPC) and the operational process for handling the MPC during Storage and Transfer Station operations ensure that the radioactive materials are contained within the sealed MPC, which minimize the potential for contamination of the ISFSI components and structures. Thus, after the spent fuel is transferred to the DOE and removed from the Trojan site, radiological decommissioning of the ISFSI facility will primarily consist of contamination and radiation surveys and disposal of radioactive waste.

As indicated in the Trojan ISFSI Safety Analysis Report (SAR), Section 3.5 and Table 4.2-3, no contamination is expected on the Concrete Cask and because of low neutron flux levels, no significant activation of the concrete and steel is anticipated.

The Trojan ISFSI radiological decommissioning is contingent on the U.S. Department of Energy (DOE) taking title to the spent fuel and removing it from the Trojan site. Based on PGE's assumptions and projection described in Section 3.0, the spent fuel shipments would occur over a period of 10 years, and the last shipment of spent fuel would be removed from the Trojan site in year 2033. ISFSI facility radiological decommissioning will begin subsequent to this last spent fuel shipment.

Pursuant to 10 CFR 72.54 (Reference 5) and Oregon Administrative Rule (OAR) 345-026-0370 (Reference 7), approximately three to four years prior to the last spent fuel shipment, PGE plans to have characterization activities performed to determine the level of neutron activation in a sample of Concrete Casks. This characterization information will be used to prepare and submit a proposed Trojan ISFSI Final Radiological Decommissioning Plan to the NRC for their review and approval. Subsequent to its approval, expected to be by 2033, this Trojan ISFSI Final Radiological Decommissioning Plan will be used to promptly perform ISFSI facility radiological decommissioning activities.

NRC regulation 10 CFR 72.54(d)(1) contains requirements for providing written notification to the NRC when a licensee has decided to permanently cease principal activities and prepare a Final Radiological Decommissioning Plan and begin the radiological decommissioning process. This written notification serves to initiate the radiological decommissioning process. This written notification and the beginning of Trojan ISFSI radiological decommissioning activities are projected to occur in year 2030.

2.0 TROJAN SITE LOCATION AND ISFSI FACILITY DESCRIPTION

2.1 SITE LOCATION

The Trojan site consists of approximately 634 acres located in Columbia County in western Oregon on the Columbia River at River Mile 72.5 from the mouth and approximately 42 miles north of Portland, Oregon. The Trojan ISFSI is located in the northeast corner of the Trojan site industrial area.

2.2 ISFSI FACILITY DESCRIPTION

The Trojan ISFSI is used to store spent fuel assemblies resulting from the operation of Trojan Nuclear Plant. The facility is located within a secure boundary and consists principally of concrete storage and service pads, a steel fuel Transfer Station, Concrete Casks that hold Multi-Purpose Canisters (MPCs), and a Transfer Cask expected to be used to transfer the MPCs to the DOE Shipping Cask (a.k.a. Transport Cask). The following sections provide facility information and expected characteristics at the time of ISFSI facility radiological decommissioning.

2.2.1 LICENSE NUMBER AND TYPE

License Number - SNM-2509
Type - ISFSI 10 CFR 72 specific license

2.2.2 SPECIFIC QUANTITIES AND TYPES OF MATERIALS AUTHORIZED BY THE LICENSE

The facility holds 791 spent fuel assemblies and ten containers of fuel debris and/or fuel assembly-related hardware, all contained in 34 MPCs that will be transferred to the DOE and removed from the Trojan site.

2.2.3 DESCRIPTION OF FACILITY STRUCTURES AND DIMENSIONS OF AREAS THAT REQUIRE DECONTAMINATION

After the removal of the spent fuel from the Trojan site, the ISFSI structures and grounds will consist of an ISFSI pad, a Transfer Station, a Utility building, security barriers, and a short roadway between the ISFSI pad to a rail spur (not yet constructed). A description of the ISFSI facility follows:

- ISFSI Pad – Consists of concrete Storage, Service, and Transfer Pads approximately 170 feet long by 105 feet wide. The concrete pads are approximately 18 inches thick and are constructed on approximately 24 inches of fill. The layout of the ISFSI Pad is shown in Figure 2-1.

- Transfer Station – The Transfer Station is a structural steel assembly that allows a Concrete Cask or Transport Cask to be positioned under the Transfer Cask for MPC transfers. A sketch of the Transfer Station is shown in Figure 2-2.

- Utility Building – This is a metal building approximately 20 feet by 40 feet.

For purposes of this radiological decommissioning plan, the structures and grounds are expected to meet release criteria without decontamination, with only a final status survey required.

2.3 FACILITY COMPONENTS AND DIMENSIONS THAT MAY REQUIRE DECONTAMINATION

After the removal of the spent fuel from the Trojan site, the Transfer Cask and 34 empty Concrete Casks will remain. A description of these components follows:

2.3.1 CONCRETE CASK

The TranStor™ Concrete Cask (manufactured by BNFL Fuel Solutions) is a reinforced concrete cylinder with an internal coated steel liner and bottom plate. There is an air flow path between the air inlet ducts at the bottom of the cask and two openings in the bottom plate. There is an air flow path between the four air outlet ducts at the top of the cask and the four openings in the internal steel liner plate. The Concrete Cask lid is steel plate. The empty nominal weight of the Concrete Cask is 214,000 lbs. The height of the cask is 211.5 inches; the outer diameter is 136.5 inches. An elevation view of the Concrete Cask is shown in Figure 2-3.

2.3.2 TRANSFER CASK

The Transfer Cask (manufactured by Holtec) is a multi-layered steel cylinder designed to facilitate the transfer of a loaded MPC to and from the Concrete Cask or into the Transport Cask. The wall of the cask consists of various materials. The inner and outer layers are made of steel. Sandwiched between the steel shells is a thickness of lead. A water jacket welded to the outer shell wall of the Transfer Cask provides neutron shielding. There are moveable shield doors at the lower end. The empty nominal weight of the Transfer Cask is 111,500 lbs. The height of the cask is 195.75 inches; the outer diameter is 92 inches. A sketch of the Transfer Cask configuration is shown in Figure 2-4.

As discussed in Section 1.3, the levels of surface contamination located on the Concrete Cask steel liners and interior of the Transfer Cask are expected to be minimal. Contamination is expected to be readily removable based on past experience associated with the Transfer Cask during ISFSI fuel loading in 2003 and surface contamination is assumed to be removed after each spent fuel transfer.

Contamination and radiation surveys will be performed to determine if there is any residual contamination and if ISFSI components have been neutron activated above release levels. For purposes of the radiological decommissioning cost estimate in Section 4.0, it is assumed that the following components will require decontamination or disposal:

- Removable surface contamination on the interior surface of the Concrete Cask steel liners
- Removable surface contamination on the Transfer Cask
- Activation of the steel liner in one Concrete Cask

2.4 QUANTITIES OF MATERIALS OR WASTE ACCUMULATED DURING STORAGE OPERATIONS AND SPENT FUEL TRANSFER

Surface decontamination of the Concrete Cask steel liners and any impacted areas will be performed as an element of each spent fuel transfer campaign. Radioactive waste generated as part of surface decontamination will be placed in a container and stored on site. This waste will be disposed of at the completion of the spent fuel transfer campaigns (time of last fuel shipment). As a result, quantities of decontamination materials or waste accumulated during storage operations and spent fuel transfer to DOE are expected to be minimal.

2.5 NO VOLUME OF SUBSURFACE MATERIAL THAT REQUIRES REMEDIATION

Pursuant to 10 CFR 72.30(b)(5), this section provides information on Trojan's evaluation of past and current ISFSI radiological conditions related to subsurface material contamination that could contain residual radioactivity that would require remediation to meet the 10 CFR 20.1402 (Reference 1) radiological criteria for unrestricted use and ISFSI license termination.

Prior to the construction of the ISFSI storage pad and its other facilities, the ISFSI Site area was cleared and a final status survey of the surface and soils was performed. PGE letter VPN-067-96, titled, Trojan Nuclear Plant – Final Survey Report for the Trojan ISFSI Site (TAC No. L22102), was submitted to the NRC on October 30, 1996 (Reference ML050810358). This PGE Report documented that "all surface activity measurements were less than 25% of the release limit values for unrestricted use, and soil concentrations were equivalent to environmental background concentrations." NRC letter, dated November 26, 1996, documents NRC approval of this Trojan ISFSI Site Final Survey Report (Reference ML0508800534).

The Trojan ISFSI Safety Analysis Report (SAR), Section 7.5.3.2.3, Facility Contamination Control, states in part: "Radioactive contamination of the ISFSI is not anticipated because accessible portions of the external surface of the MPC were checked for loose surface contamination during cask loading operations before the loaded Concrete Cask was moved to the Storage Pad. In addition, the spent fuel is inside the seal-welded MPC and there are no credible accidents that would cause a gaseous, liquid, or solid release of radioactivity…." The Trojan ISFSI SAR, Section 7.5.3.2.4, Personnel Contamination Control, states in part: "surveys for contamination at the Concrete Cask air inlets and outlets are routinely performed to confirm that

contamination is not present." As required by SAR Section 7.5.3.2.5, titled Area Surveys, "Quarterly surveys are performed in the accessible areas of the ISFSI. These surveys consist of contamination surveys and external radiation measurements in appropriate areas. Additionally, specific surveys are performed as needed for operational and maintenance functions involving potential exposure of personnel to radiation or radioactive materials." These surveys have consistently determined that no removable contamination is present.

Based on the above, PGE has determined that currently there is no volume of ISFSI onsite subsurface material containing residual radioactivity that will require remediation to meet the 10 CFR 20.1402 radiological criteria for unrestricted use and ISFSI license termination.

2.6 LEVELS OF ACTIVATION

Estimated levels of activation in the Trojan TranStor™ Concrete Casks are based on information extracted from the Holtec Final Safety Analysis Report (FSAR) for the similarly configured HI-STORM 100 Concrete Cask [Report HI-2002444~~, Table 2.4.1~~] (Reference 8) and "Shielding Evaluation for the Trojan ISFSI Completion Project" [Report HI-2012749 Revisions 5 and 6, Table O.1] (Reference 11). Activation levels are estimated to be no greater than the values shown in the following table, since, at the assumed time of fuel shipment, the Trojan spent fuel would have been stored for at least ~~10~~ 30 fewer years (year 2033 minus year 2003) than the ~~40~~60-year fuel storage period analyzed~~ for the HI-STORM FSAR~~. Activation levels at various times are provided in Table 2-1. A comparison of the physical differences between the two casks is provided in Table 2-2.

Table 2-1 - Concrete Cask Activation

Nuclide	Activity After ~~40~~60-Year Storage (Ci/m3) ~~1~~	Activity After ~~40~~60-Year Storage (pCi/gm)	Activity After ~~40~~60-~~-~~Year Storage – 1 Year Decay (pCi/gm)	Activity After ~~40~~60-Year Storage – 2 Years Decay (pCi/gm)	Activity After ~~40~~60-Year Storage – 5 Years Decay (pCi/gm)
Concrete Cask Steel					
^{54}Mn	3.~~62e~~62E-04	4.~~61E~~62E+01	2.06E+01	9.~~16E~~14E+00	8.~~11E~~03E-01
^{55}Fe	~~7.18e~~6.82E-03	~~9.15~~8.72E+02	~~7.10E~~6.77E+02	5.~~51E~~25E+02	2.~~57E~~45E+02
Total	**7.~~18e~~18E-03**	**9.~~61E~~19E+02**	**~~7.30E~~6.97E+02**	**5.~~60E~~34E+02**	**2.~~58E~~46E+02**
Concrete Cask Concrete					
^{39}Ar	~~3.02e~~4.42E-06	1.~~26E~~88E+00	1.~~26E~~87E+00	1.~~26E~~87E+00	1.~~26E~~85E+00
^{41}Ca	~~2.44e~~3.66E-07	1.~~02E~~56E-01	1.~~02E~~56E-01	1.~~02E~~56E-01	1.~~02E~~56E-01
^{54}Mn	1.~~59e~~59E-~~7~~06	6.~~62E~~75E-~~02~~01	~~2.95E-02~~3.00E-01	1.~~31E~~34E-02	1.~~16E~~17E-~~03~~02
^{55}Fe	2.~~95e~~95E-05	1.~~23E~~25E+01	9.~~52E~~73E+00	7.~~39E~~55E+00	3.~~45E~~52E+00
Total	**3.~~43e~~58E-05**	**1.~~37E~~52E+01**	**1.~~09E~~21E+01**	**~~8.76~~9.70E+00**	**~~4.81E~~5.54E+00**

~~Note 1: HI-STORM FSAR, Report HI-2002444, Table 2.4.1, Revision 1~~

Table 2-2 - Comparison of the Trojan TranStor and HI-STORM 100 Concrete Casks

Trojan TranStor Concrete Cask	HI STORM 100 Concrete Overpack
Inner Shell: 2" A36 Steel	Inner Shell: 1¼" SA516 Gr70 Outer Shell: ¾" SA516 Gr70
Rebar in Concrete: #6 Rebar ASTM A615 Gr 60	Rebar: None, but does have four radial steel plates, ¾" SA516 Gr70
Concrete Side Walls: 29" thick	Concrete Side Walls: 27.5" thick
Overall Dimensions: Height: 211.5" Diameter: 136.5"	Overall Dimensions: Height: ~231" Diameter: ~134"
Concrete Density: 145 lbs/ft3	Concrete Density: 155 lbs/ft3
Concrete Strength: 4,000 psi (min.)	Concrete Strength: 3,300 psi (min.)

For the purpose of establishing if activation levels would likely result in exceeding a site release criteria, the estimated concentrations were compared against concentrations extracted from NUREG/CR-5512 (Reference 9) that would result in a dose of 25 mrem/yr. Based on a comparison, activation levels in all of the Concrete Casks should be below the site release criteria after a maximum decay period of two years. Therefore, as a conservative assumption, the estimate assumes that the last Concrete Cask emptied (therefore having the greatest neutron exposure duration and the least time to decay) is activated above release levels, and is disposed of as low-level radioactive waste. If measured activation levels are greater than noted in the above ~~table~~Table 2-1, PGE would have the option of waiting for one or more years to allow for additional decay of the nuclides. A table comparing residual activation and concentrations equivalent to 25 mrem/year is provided in Table 2-3.

Table 2-3 - Comparison of Residual Activation Activity v. Concentration Equivalent to 25 mrem/year

Nuclide	Concentration equivalent to 25 mrem/yr [1] (pCi/gm)	Residual Activity After ~~40~~60-Year Storage – 2 Years Decay (pCi/gm)	Percent of Residual Activity v. Concentration for 25 mrem/yr
Concrete Cask Steel			
^{54}Mn	1.39~~e+1~~E+01	9.1~~6~~4E+00	65.~~9~~8%
^{55}Fe	9.35~~e+3~~E+03	5.25~~4~~E+02	5.~~9~~6%
Total			**<100.0%**
Concrete Cask Concrete			
^{39}Ar	Note 2		
^{41}Ca	5.15~~e~~E+01	1.~~02E~~56E-01	0.~~2~~3%
^{54}Mn	1.39~~e~~E+01	1.~~31E-02~~34E-01	1.0~~.1~~%
^{55}Fe	9.35~~e~~E+03	7.~~39E~~55E+00	0.1%
Total			**<100.0%**

Note 1: Values extracted from Table 6.91, NUREG/CR-5512, Vol 3, Residual Radioactive Contamination from Decommissioning, Parameter Analysis, October 1999.

Note 2: ^{39}Ar is not listed in Table 6.91 of NUREG/CR-5512, Vol 3. It is assumed it was not listed because Argon, being an inert gas, would have minimal impact on Total Effective Dose Equivalent (TEDE).

FIGURE 2-1
ISFSI PAD LAYOUT

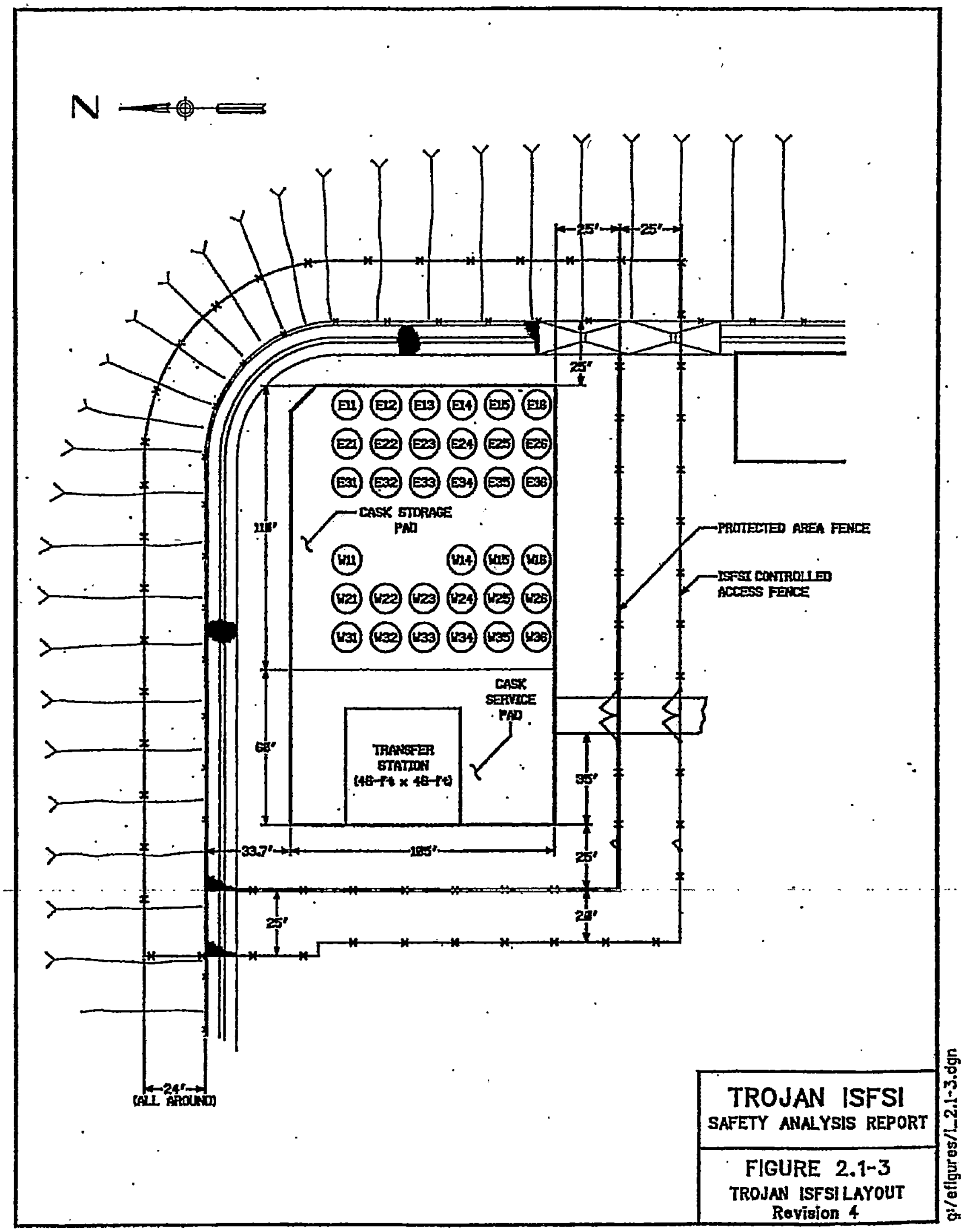


FIGURE 2-2 - TRANSFER STATION

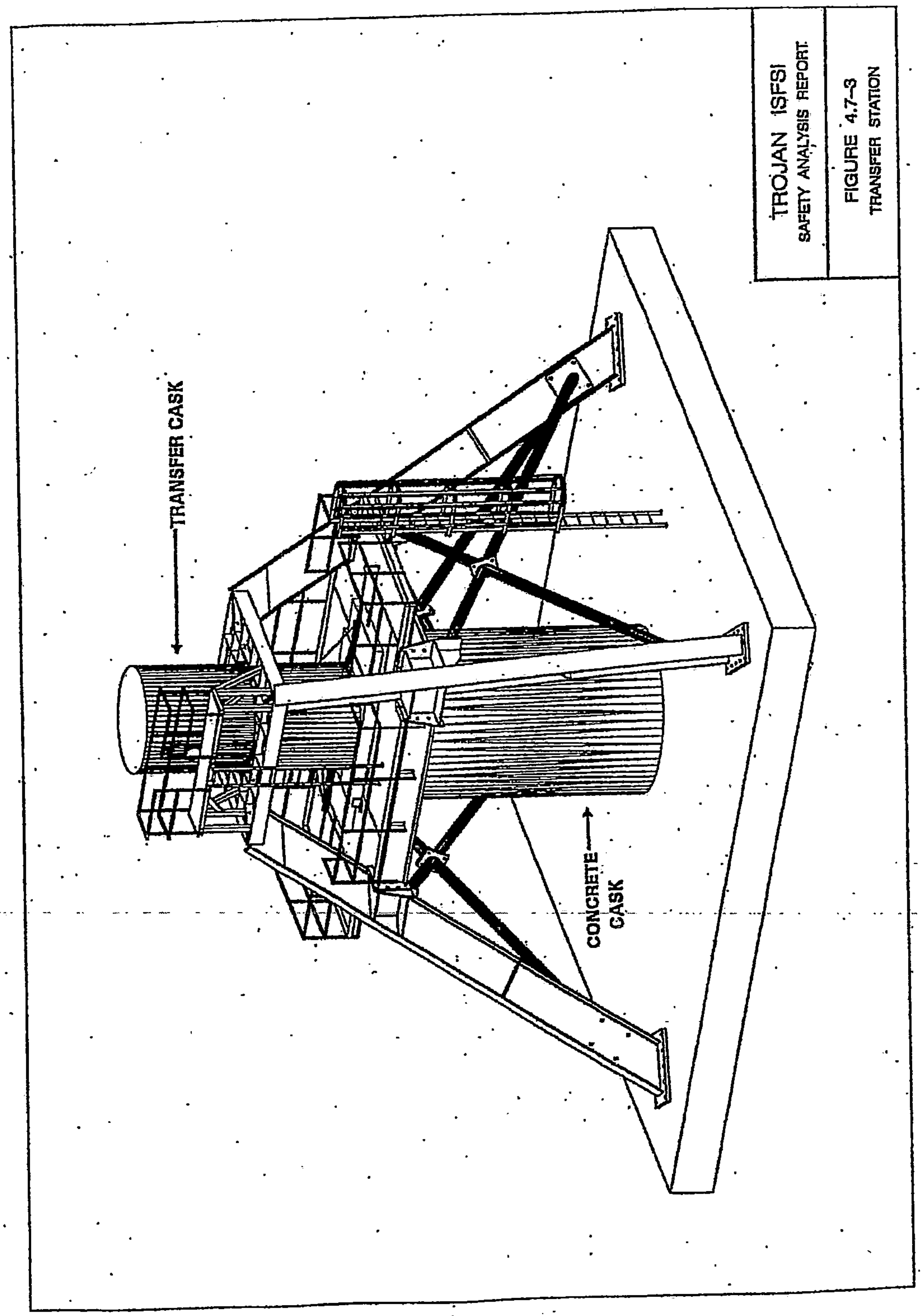


FIGURE 2-3
CONCRETE CASK

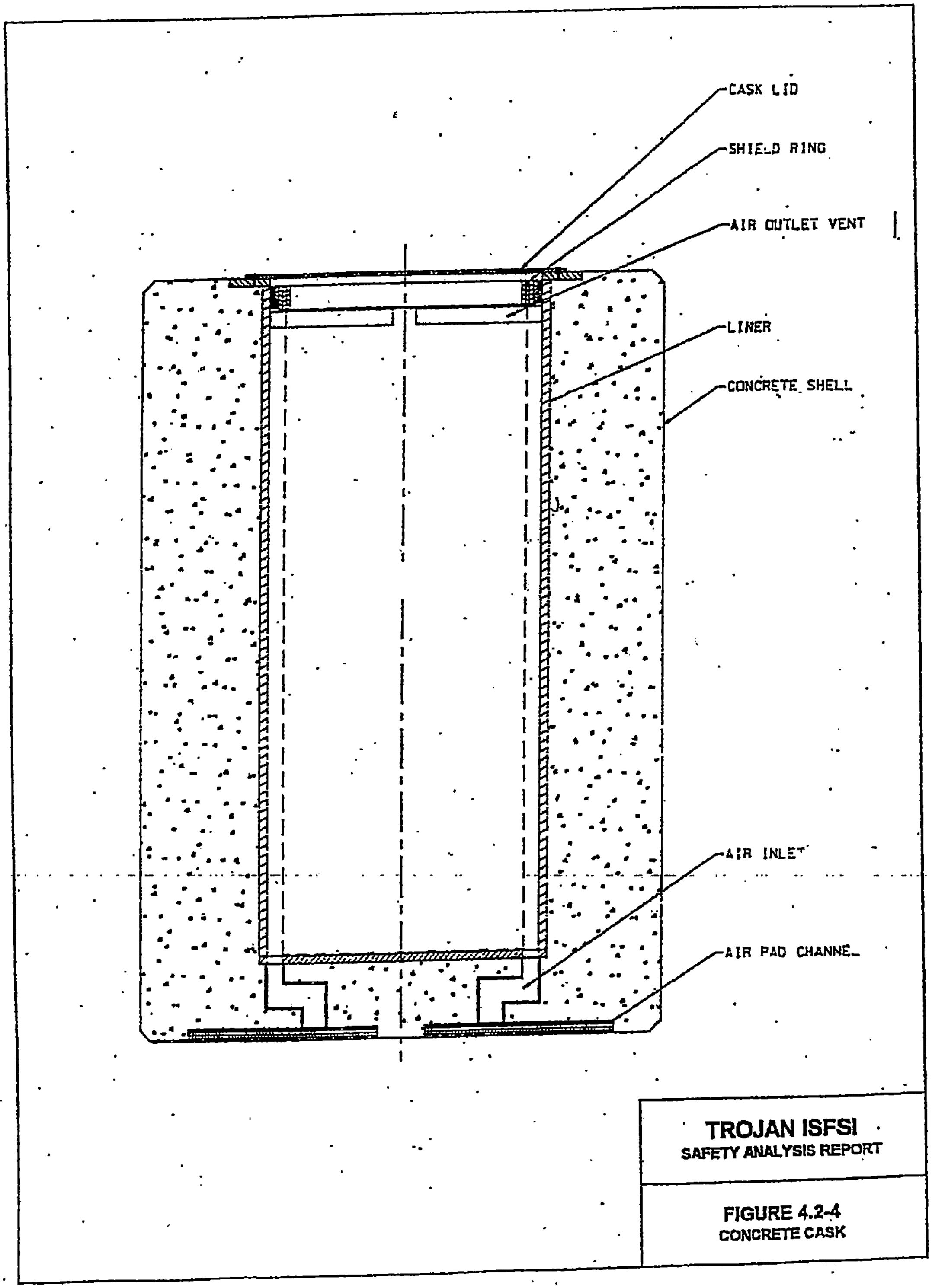
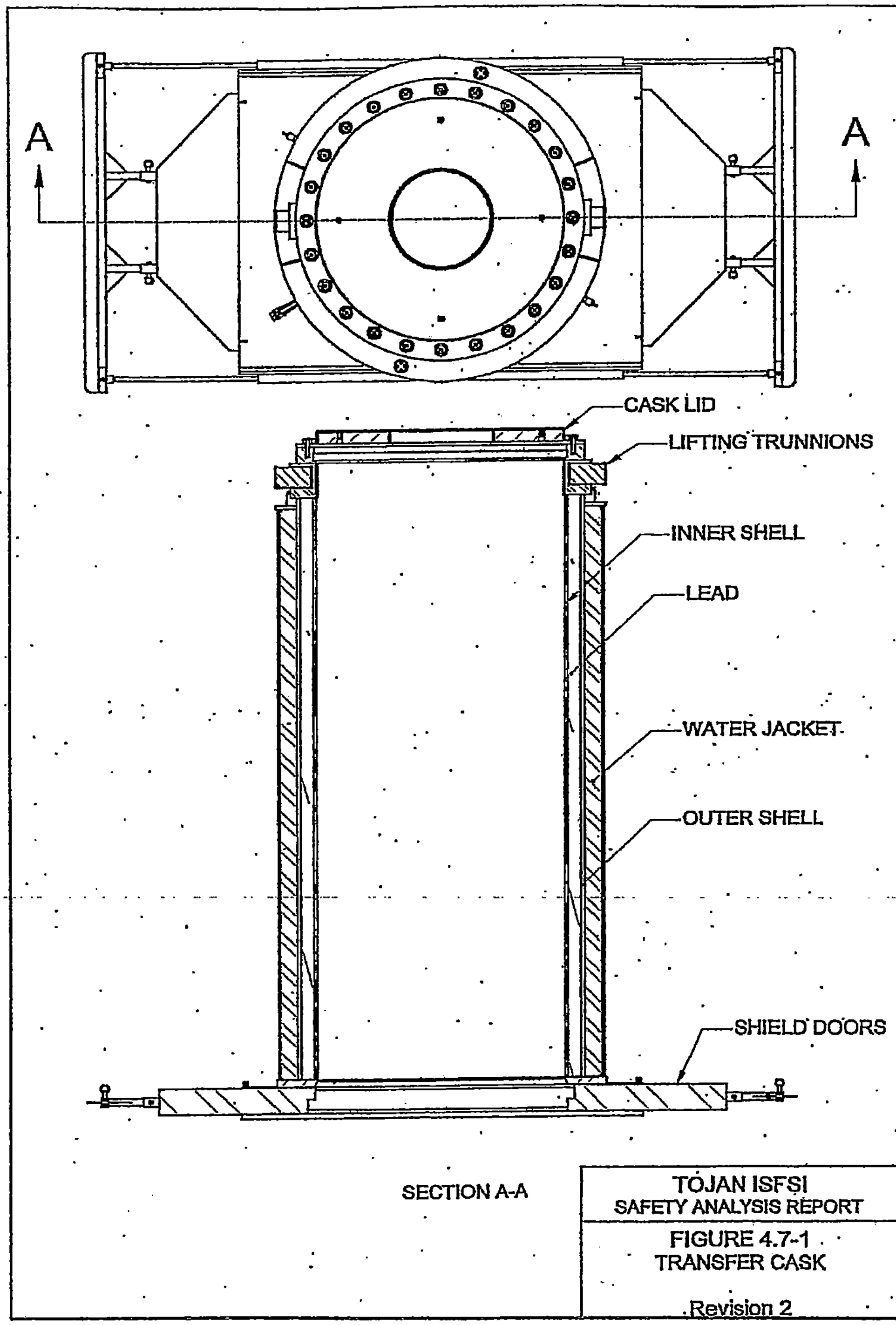


FIGURE 2-4
TRANSFER CASK



3.0 PROJECTED RADIOLOGICAL DECOMMISSIONING SCHEDULE

3.1 PGE'S ASSUMPTIONS AND BASIS FOR THE TROJAN ISFSI PROJECTED RADIOLOGICAL DECOMMISSIONING SCHEDULE

This section provides the Trojan ISFSI radiological decommissioning projected schedule. The DOE is responsible for the acceptance of spent fuel and related nuclear material in accordance with the terms of the 1982 Nuclear Waste Policy Act. The PGE contract with DOE, "Standard Contract for Disposal of Spent Nuclear Fuel and/or High-Level Radioactive Waste," provides the basis for the schedule forecast in DOE's most recent Acceptance Priority Ranking Report (APR) for receipt of spent fuel and/or high-level radioactive waste. The DOE schedule published with the July 2004 APR used 2010 for commencing Repository operations and specified the first shipment date for Trojan fuel in 2013. This schedule covered only 10 years of Repository operations and did not specify a projected date for the final Trojan fuel shipment (the schedule covered only 587 of the 791 Trojan spent fuel assemblies). PGE projected the July 2004 schedule out to cover the remaining 204 fuel assemblies and arrived at 2023 as being the estimated date of the final shipment.

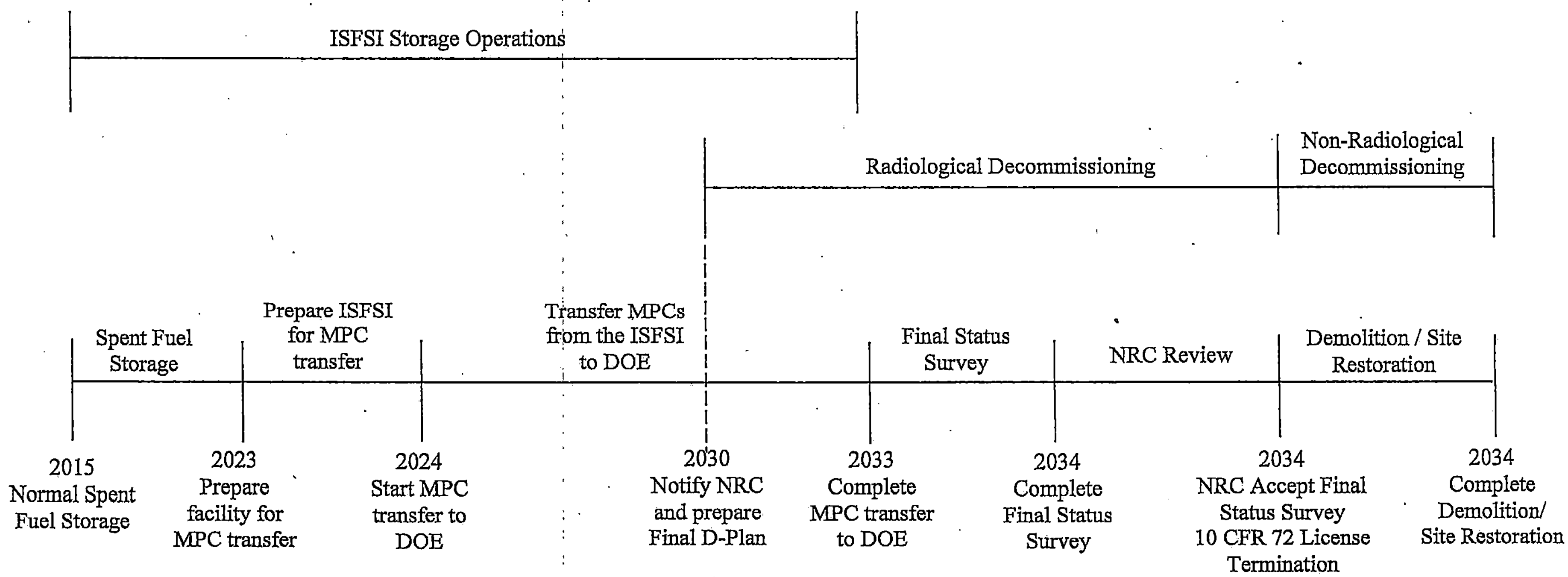
The DOE's Project Decision Schedule published in January 2009 included a new anticipated date of 2020 for commencing Repository operations. Using the same modeling assumptions, PGE used this most recent DOE schedule to project and estimate a new first fuel shipment date of 2023 and a final fuel shipment date of 2033. Characterization of a sample of empty Concrete Casks to determine the level of neutron activation and beginning preparation of the proposed Final ISFSI Radiological Decommissioning Plan, pursuant to 10 CFR 72.54(d) (Reference 5), is projected to be performed in 2030. ISFSI facility radiological decommissioning is projected to begin in year 2033, following the last spent fuel shipment. The radiological decommissioning cost estimate in Section 4.0 and funding plans in Section 5.0 are based on the assumption that ISFSI facility radiological decommissioning will begin in 2033 and complete in 2034.

In March 2010, the DOE filed a motion with the Atomic Safety and Licensing Board to withdraw its Yucca Mountain Repository license application and subsequently closed down the Yucca Mountain project. Based on this, it is unlikely that the DOE will take possession of Trojan's spent fuel by the currently projected date of 2033 and it may be much later. However, as a conservative measure, Trojan will continue to use the same projected dates for spent fuel shipments (2023-2033) and ISFSI facility radiological decommissioning (2033-2034). This is considered conservative because it will continue to provide funding of PGE's and PacifiCorp's decommissioning trust accounts on a schedule that provides adequate funds being collected by 2033, the projected beginning of ISFSI facility radiological decommissioning.

Figure 3-1, Trojan ISFSI Project Timeline, provides an overall project timeline of major activities, including ISFSI radiological decommissioning, and their projected dates.

FIGURE 3-1

TROJAN ISFSI PROJECT TIMELINE



Year Line is Not to Scale

4.0 ISFSI RADIOLOGICAL DECOMMISSIONING COST ESTIMATE

Pursuant to 10 CFR 72.30(b)(2), (b)(3) and (b)(5), this section provides a detailed site-specific radiological decommissioning cost estimate for the Trojan ISFSI. This radiological decommissioning cost estimate includes the cost of an independent contractor to perform essentially all decommissioning activities; a 25 percent contingency factor; the cost of meeting the 10 CFR 20.1402 criteria for unrestricted use; and identification of and justification for the key assumptions. Refer to Section 2.4 for PGE's determination that currently there is no volume of ISFSI onsite subsurface material containing residual radioactivity that will require remediation to meet the criteria for license termination.

4.1 DECOMMISSIONING COST ESTIMATE UPDATES

The site-specific radiological decommissioning cost estimate for the Trojan ISFSI was prepared using the guidance in NUREG-1757, Volume 3, Consolidated Decommissioning Guidance, Financial Assurance, Recordkeeping, and Timeliness, Section A.3.1, Preparing the Site-Specific Cost Estimate (Reference 10).

In accordance with 10 CFR 72.30(b)(4) and (c), the Trojan ISFSI radiological decommissioning cost estimate and associated funding plan will be adjusted over the life of the ISFSI at the time of license renewal and at intervals not to exceed 3 years. Since radiological decommissioning of the ISFSI primarily consists of performing contamination and radiation surveys and disposing of radioactive waste, the radiological decommissioning cost estimate and funding plan adjustments will normally be made to incorporate increased labor costs, and increased radioactive waste burial costs. The ISFSI radiological decommissioning cost estimate and associated funding plans may also be updated to reflect new information from the DOE that would change PGE's assumptions and projection that the final spent fuel shipment would occur in 2033. During future updates, PGE will update the information submitted with the previous revision of this plan and will specifically consider the effect of the following events on decommissioning costs:

Below is the effect of the following on the detailed cost estimate since the previous report:

(1) Spills of radioactive material producing residual radioactivity in onsite subsurface material (refer to Section 2.4). – NO CHANGES
(2) Facility modifications. – NO CHANGES
(3) Changes in authorized possession limits. – NO CHANGES
(4) Actual remediation costs during radiological decommissioning that exceed the previous cost estimate. – NO CHANGES

4.2 DECOMMISSIONING COST ESTIMATE

The scope of the radiological decommissioning cost estimate includes:

- Radiological characterization of the emptied Concrete Casks
- the disposal of any radioactive materials that exceed the release criteria
- a final status survey and NRC license termination;
- PGE staff and overhead associated with preparation of the Final Radiological Decommissioning Plan and management and oversight of the contractor performing final status survey.

The estimated costs are based on reasonable and documented assumptions. The estimate includes sufficient funds to allow an independent third party to assume responsibility for and carry out the radiological decommissioning of the facility if the licensee is unable to do so. This estimate is based on PGE's current assumed projection that the final shipment of spent fuel will be completed in year 2033 promptly followed by radiological decommissioning of the ISFSI Facility in 2033 through 2034.

The costs of operating the ISFSI and packaging spent fuel and transfer to DOE are considered operations and maintenance expenses and are not within the scope of the radiological decommissioning estimate.

Line-item costs are reported in 2015 dollars. Contingency is included as a separate line item at the sub-total level (refer to Section 4.3, Radiological Decommissioning Cost Estimate Results).

4.2.1 CHARACTERIZATION

Characterization of the potentially activated Concrete Cask(s) will be conducted. The purpose of this characterization is to determine the isotopic concentrations and distributions in the cask's steel liner and concrete shell. This information will be used to establish if activation levels have created radioactive material that exceeds the site release criteria. Radiological characterization of the facility's structures, as an element of radiological decommissioning planning, is not considered necessary due to the limited scope of contamination-producing activities conducted at the ISFSI, and the post-spent fuel transfer survey and decontamination work performed after each transfer.

The costs and assumptions associated with characterization are described in the following sections.

4.2.1.1 Labor Cost

The labor cost associated with characterizing ten percent (four) of the Concrete Casks is based on working one day per cask, and mobilization and demobilization. A total of five working days are scheduled. A summary of the labor cost categories, hourly rate, number of hours, and total cost is provided in Table 4.2-1.

Table 4.2-1
Labor Cost – Characterization of Activated Cask

Labor Category	Hourly Rate ($s/hr)	Person-Hours	Total Cost ($s)
Laborer	58.00	80	4,640
Radiation Protection Technician	62.00	40	2,480
Total		**120**	**7,120**

4.2.1.2 Non-Labor Cost

The estimated non-labor cost for the characterization effort is associated with the core drilling and sample analysis. A summary of the equipment, hourly rate (rent and operate), number of hours for each item of equipment, and total costs is provided in the Table 4.2-2.

Table 4.2-2
Non-Labor Cost – Characterization of Concrete Casks

Item	Hourly Rate ($s/hr)	Equipment - Hours	Total Cost ($s)
Equipment			
Telescoping boom to 45' high 500 lb capacity	43.75	40	1,750
Telescoping boom Hourly Operating Cost	14.75	20	295
Water Control Equip. & Misc. Tools (Pumps/Wet-Dry HEPA Vac./Filters/55 gal drums/Misc.)			1,450
Core Boring Equipment	8.56	40	343
Core Boring Hourly Operating Cost	1.77	40	71
Saw, Concrete Cutting Equipment	5.63	40	225
Saw Hourly Operating Cost	6.75	40	270
Subcontracted Services	**Cost Per Unit**	**No. of Samples (Per Core)**	**Total Cost - 4 Cores ($s)**
Concrete Samples			
Gamma Spectroscopy - Concrete	150	15	9,000
Iron 55 and other hard to detect nuclides - Concrete	769	15	46,125
Total Activity - Concrete	63	15	3,750
Special Preparation - Concrete	50	15	3,000
Steel Samples			
Gamma Spectroscopy - Steel	150	1	600
Iron 55 and other hard to detect nuclides - Steel	769	1	3,075
Total Activity - Steel	63	1	250
Special Preparation - Steel	50	1	200
Sample Materials (2% of lab / preparation costs)	-	-	1,320
Shipping (4 cores total)	45	-	180
PPE @ 5% Labor Est.			356
Total - Non-Labor			72,259

4.2.1.3 Assumptions

Characterization will consist of taking a core sample from a representative number of Concrete Casks, analyzing the isotopic concentration and distributions in the sample, and correlating those results with cask internal dose measurements. The following are the critical assumptions used in estimating characterization costs:

- 10% of the Concrete Casks will be sampled (four total).
- Segmenting of the cores into two-inch sample segments. This will be done on site.
- Analysis of the samples will be performed at a licensed laboratory.
- Based on correlating the results of the samples, and internal radiation dose measurements, the extent and impact of activation can be established sufficiently to allow for radiological decommissioning planning.

- Supervision of the coring activities and analysis of the results will be done by the PGE staff assigned to spent fuel transfers and ISFSI O&M (no additional PGE labor costs associated with this characterization task).

4.2.2 DISPOSAL OF RADIOACTIVE MATERIALS

The disposal of activated/contaminated materials will take place promptly after all spent fuel has been removed from the ISFSI. Decontamination materials generated for each MPC transfer are assumed to have been accumulated in waste containers and placed in storage until all the spent fuel has been transferred from the site. The level of activation of the Concrete Cask and steel liner is expected to be minimal, but for planning/estimating purposes it is assumed that portions of the last Concrete Cask (emptied in 2033) are activated above release levels.

Since there is a railway siding adjacent to the ISFSI, and cask handling equipment will be available (from the last MPC transfer), the Concrete Cask will be transported and disposed of as a one-piece shipment. The decontamination materials will be placed into an LSA container, and transported with the Concrete Cask rail shipment.

4.2.2.1 Labor Cost

The estimated labor cost for disposing of the activated Concrete Cask and decontamination waste resulting from the spent fuel transfer campaigns is provided in Table 4.2-3.

Table 4.2-3
Labor Cost – Disposal of Activated Cask

Labor Category	Hourly Rate ($s/hr)	Person-Hours	Total Cost ($s)
Mechanic	79.00	80	6,320
Radiation Protection Technician	62.00	40	2,480
Total		**120**	**8,800**

4.2.2.2 Non-Labor Cost

The estimated non-labor cost for disposing of the activated Concrete Cask and decontamination waste resulting from the spent fuel transfer campaigns is provided in Table 4.2-4. A summary of the material, subcontracted services and disposal charges is also provided in Table 4.2-4.

Table 4.2-4
Non-Labor Cost – Disposal of Activated Cask

Item	Total Cost ($s)
Equipment	
No additional equipment required - equipment provided during MPC transfer	
Materials	
B-25 LSA Box	1,450
Package Closure Material	2,200
Package Bracing and Tiedowns	5,800
PPE @ 5% Labor Est.	440
Subcontracted Services	
Engineering Services (Packaging)	12,080
Railroad (Consulting Services)	12,080
1-Time Shipment Allowance	3,200
Transport to Disposal Site	4,897
Demurrage Charges	1,600
Disposal Services	
Concrete Cask - 3,000 ft3	536,000
B-25 LSA Box	17,152
Special Case Package	12,080
Railcar Return to Service	2,480
Total - Non-Labor	**611,459**

4.2.2.3 Assumptions

In order to be reasonably conservative in estimating the ISFSI radiological decommissioning cost, it is assumed that the last Concrete Cask to be unloaded will have activation levels that exceed release criteria. The following are the critical assumptions used in estimating the disposal cost of activated and contaminated materials.

- Surface contamination, if any, can be readily removed and will not result in any components or facilities to be disposed of as radioactive waste.
- There is the potential that neutron activation of the Concrete Casks will result in the steel liner potentially exceeding release criteria. With the radionuclides expected to be present in the liner, natural radioactive decay could reduce the radionuclide concentration levels below release levels within a year or so of transferring the fuel.
- After each spent fuel shipment campaign, all empty Concrete Casks will be stored at the Trojan site, i.e., subsequent to the last spent fuel shipment there will be 34 empty Concrete Casks onsite.

- One activated Concrete Cask (in its entirety) will be prepared for shipping, and transported in one piece to an off-site disposal facility via railway (the last Concrete Cask to be unloaded).
- Moving the activated Concrete Cask to the rail spur and securing it to the railcar will be done by the MPC transfer crew at the end of the last spent fuel transfer campaign.
- The Concrete Cask will be transported via railway and disposed of at the U.S. Ecology facility in Washington. Decontamination materials resulting from and accumulated during the fuel transfer campaigns will be placed into an LSA container and transported along with the Concrete Cask
- Waste volume is based on the maximum dimensions of the Concrete Cask (rectangular envelope around the cask). Waste cost is based on a U.S. Ecology 2015 price list, including disposal fees; heavy object surcharges, and tax and fee riders. The fully loaded cost of disposal for the material was estimated at $178.67 per cubic foot.
- Openings in the Concrete Cask (air ventilation path) will be sealed to the extent necessary to preclude access to the cask or release of materials inside the cask to the environment.

4.2.3 FINAL STATUS SURVEY

A proposed Final Radiological Decommissioning Plan will be prepared and approved by the NRC and the Oregon Department of Energy (ODOE) to support promptly performing a final status survey. The final status survey of the ISFSI will be performed in accordance with this plan. The final status survey will be contracted to and conducted by an experienced third party. NRC staff and NRC contractor fees have been incorporated within the final status survey cost estimate.

4.2.3.1 Labor Cost

The labor cost associated with planning (includes review of proposed Final Radiological Decommissioning Plan) and completing the final status survey, including an estimate of the NRC and NRC contractor hours and cost is provided in Table 4.2-5.

Table 4.2-5
Labor Cost – Final Status Survey

Labor Category	Hourly Rate ($s/hr)	Person-Hours	Total Cost ($s)
Survey Contractor Labor			
Sr. Rad Engineer	151.00	1,144	172,744
HP Supervisor	112.00	848	94,976
Radiation Protection Technician - FSS	62.00	2,912	180,544
Laborer	58.00	2,912	168,896
Foreman	79.00	728	57,512
Craftsman Coring/Concrete Cutting Equipment	76.00	80	6,080
Equipment Operator	77.00	1,092	84,084
Crane Operator	79.00	80	6,320
Draftsmen/CAD operator	82.00	182	14,924
Clerk	18.00	936	16,848
Contractor Labor - Subtotal		**10,914**	**802,928**
NRC/ORISE Labor			
NRC Inspector	268.00	264	70,752
NRC Inspector HQ Management	268.00	168	45,024
ORISE Project Manager	134.00	144	19,296
ORISE Site Team Leader	108.00	120	12,960
ORISE Survey Crew	67.00	80	5,360
NRC/ORISE Labor - Subtotal		**776**	**153,392**
Labor - Total		**11,690**	**956,320**

4.2.3.2 <u>Non-Labor Cost</u>

The non-labor cost associated with planning and completing the final status survey, including an estimate of the NRC and NRC contractor hours and cost and ODOE fees, is provided in Table 4.2-6. Costs are organized by a Summary of Non-Labor Cost, Survey Contractor's costs (Travel Expenses/Equipment/Laboratory) and NRC/ORISE costs (Travel Expenses/Laboratory).

Table 4.2-6
Summary of Non-Labor Cost – Final Status Survey

Activity	Total Cost ($s)
(a) Contractor Travel	280,113
(b) NRC/ORISE Travel/Miscellaneous	10,472
(c) Contractor Equipment/Consumables	211,745
(d) Contractor Laboratory Services	76,575
(e) NRC/ORISE Laboratory Services	8,533
(f) Oregon Department of Energy Fees	176,200
Total	**763,639**

The table entries above are broken out into greater detail in the following series of Tables 4.2-6(a) through 4.2-6(e).

Table 4.2-6a
Contractor Non-Labor Cost (Travel) – Final Status Survey

Item	Total Cost ($s)
Sr. Rad Engineer	66,869
HP Supervisor	49,826
Radiation Protection Technician - FSS	120,503
Foreman	42,916
Travel/Per Diem - Sub Total	**280,113**

Table 4.2-6b
NRC/ORISE Non-Labor Cost (Travel/Miscellaneous) – Final Status Survey

Item	Total Cost ($s)
Travel/Per Diem	
NRC Inspector	Included in Hourly Rate
ORISE Project Manager	1,885
ORISE Site Team Leader	2,475
ORISE Survey Crew	4,490
Travel/Per Diem - Sub Total	**8,850**
Equipment/Consumables	
On-Site Consumables	1,622
Equipment/Consumables - Sub Total	**1,622**
Sub Total - Travel/Per Diem	**10,472**

Table 4.2-6c
Contractor Non-Labor Cost (Equipment/Consumables) – Final Status Survey

Item	Daily Rate ($s/day)	Equipment - Hours	Total Cost ($s)
Equipment/Consumables			
Aerial Lift Scissor type to 15" high 1000 lb.cap., electric	51.50	728	4,687
Aerial Lift Operating Cost (50% of time)	24.40	728	1,110
Telescoping boom to 45' high 500 lb capacity	350.00	364	15,925
Telescoping boom Operating Cost (50% of time)	118.00	364	2,685
Fork Lift (5000#)	240.00	728	21,840
Fork lift Operating Cost (25% of time)	168.00	728	3,822
Water Control Equip. & Misc. Tools (Final Status Survey)			2,900
Core Boring Equipment	68.50	80	685
Core Boring Operating Cost (50% of time)	14.16	80	71
Saw, Concrete Cutting Equipment	45.00	80	450
Saw Operating Cost (25% of time)	54.00	80	135
Pickup Truck 3/4 Ton	58.50	728	5,324
Pickup Truck, Operating Cost	109.20	728	9,937
Crane, 350 ton capacity 80' boom	3,625.00	80	36,250
Crane, Operating Cost (50% of time)	1,464.00	80	7,320
Temporary Facilities			41,774
Mobilization/DeMobilization			7,500
HP Equipment Costs			37,288
Consumables 1.5% of Labor Cost			12,044
Equipment/Consumables - Sub Total			**211,745**

Table 4.2-6d
Contractor Non-Labor Cost (Laboratory Services) – Final Status Survey

Laboratory Services - Sample Analysis	Cost Per Unit ($s)	No. of Samples	Total Cost ($s)
Gamma Spectroscopy	150	98	14,700
Iron 55 and other hard to detect nuclides	769	63	48,431
Total Activity	63	63	3,938
Sample Preparation	50	98	4,900
Sampling (Supplies & Materials)			3,598
Transport of Samples			1,008
Sampling/Analysis - Sub Total			**76,575**

Table 4.2-6e
NRC/ORISE Non-Labor Cost (Laboratory Services) – Final Status Survey

Laboratory Services - Sample Analysis	Cost Per Unit ($s)	No. of Samples	Total Cost ($s)
Gamma Spectroscopy	150	11	1,650
Iron 55 and other hard to detect nuclides	769	7	5,381
Total Activity	63	7	438
Sample Preparation	50	11	550
Sampling (Supplies & Materials)			401
Transport of Samples			113
Sampling/Analysis - Sub Total			**8,533**

4.2.3.3 Assumptions

The final status survey will be conducted by a third-party contractor. Management and oversight will be provided by PGE staff. The NRC will conduct on-site visits, review the results of the survey and will contract with a third party (ORISE) to independently verify the survey results. The following are the critical assumptions used in estimating the demolition and site restoration costs:

- All activated and contaminated material will be removed from the facility prior to initiating the survey.
- The contractor will work with PGE in developing the Final Radiological Decommissioning Plan, Final Status Survey Plan, and Final Status Survey Report. It is assumed that similar facilities will have been decommissioned prior to the Trojan ISFSI; therefore this will not be a "first-of-a-kind" activity.
- The subcontractor will provide all labor, materials and equipment necessary to complete the survey. Sample analysis will be done by outside laboratories at the contractor's expense.
- An estimate of NRC and NRC contractor fees has been incorporated into the estimate. NRC staff costs are based on hourly rates published in 10 CFR 170. NRC contractor costs are based on estimated hourly rates and travel and living expenses.
- ORISE hourly costs are based on the hourly costs used for PGE's subcontractor labor (for equivalent positions).
- The Oregon Department of Energy (ODOE) is assumed to participate in the Final Radiological Decommissioning Plan and Final Status Survey Plan and Report reviews. ODOE costs are incorporated into the estimate and are based on historical annual fees charged during Trojan Nuclear Plant decommissioning.
- The NRC and the ODOE will complete their reviews of the Final Status Survey Report; the Trojan ISFSI site will meet the criteria for unrestricted release; and the ISFSI License will be promptly terminated. Following license termination, PGE may proceed with demolition of ISFSI clean facilities and components and site restoration.

4.2.4 PGE STAFF AND OVERHEAD COSTS

PGE will provide a staff to prepare the proposed Final Radiological Decommissioning Plan and oversee the radiological decommissioning activities. In addition to the cost of labor it is assumed that certain overhead expenses will be incurred.

The costs and assumptions associated with each of these activities are described in the following sections.

4.2.4.1 Labor Cost

The cost of PGE labor is based on preparing the proposed Final Radiological Decommissioning Plan and contracting for and managing the final status survey (license termination). Costs estimated for this activity are provided by labor cost category, hourly rate, number of hours, and total cost in Table 4.2-7.

Table 4.2-7
PGE Labor Cost - Final Radiological Decommissioning Plan

Labor Category	Hourly Rate ($s/hr)	Person-Hours	Total Cost ($s)
Project Manager	115.00	1,880	216,200
Project Engineer	100.00	2,036	203,600
Licensing Specialist	100.00	2,036	203,600
Admin Assistant	44.00	1,410	62,040
Total		**7,362**	**685,440**

Note: These PGE Labor Costs are spread out over three years in Table 4.3-2.

4.2.4.2 Non-Labor Cost

Non-labor costs for radiological decommissioning work are principally included in specific work activities, including the final status survey. The PGE non-labor cost associated with license termination are those costs expected to be directly incurred by PGE and not accounted for in the subcontractors' scope of work. These costs are provided in Table 4.2-8.

Table 4.2-8
Non-Labor Cost - Final Radiological Decommissioning Plan

Item	License Termination Cost ($s)
Equipment	
No equipment provided by PGE	
Other (Materials / Services)	
Insurance (allowance)	73,400
Utilities (allowance)	36,200
Travel (allowance)	5,000
Total - Non-Labor	**114,600**

4.2.4.3 Assumptions

The Final Radiological Decommissioning Plan is developed and approved prior to the last MPC being transferred to the DOE. The final status survey is assumed to start promptly after the last of the spent fuel has been removed, and the activated Concrete Cask is disposed of at U.S. Ecology in Washington.

- PGE will begin preparing the proposed Final Radiological Decommissioning Plan four years prior to completion of spent fuel shipments (year 2030) and expects to obtain NRC and ODOE approval by 2033, such that the Final Status Survey will commence promptly after the last fuel shipment.
- The cost of PGE labor associated with operating and maintaining the ISFSI and spent fuel transfer to DOE is not included within the radiological decommissioning scope of work.
- The site is assumed to be radiologically clean after the activated Concrete Cask has been shipped to U.S Ecology.
- PGE will prepare the proposed Final Radiological Decommissioning Plan. The final status survey contractor will support PGE's Final Radiological Decommissioning Plan development.
- PGE will contract to have the final status survey done by third parties. Therefore, PGE's principal role is to write bid specifications, select contractors and oversee the final status survey work.
- Labor costs are based on rates published in R.S. Means 2015, Building Construction Cost Data, PGE's experience and the estimator's experience.
- Where labor is subcontracted, the costs include contractor's overhead and profit.
- Insurance costs are an allowance and include costs for Supplier's and Transporter's premium, and general liability insurance.
- Utility costs are an allowance and include electric, water, phone, and sewage.

- Travel costs are an allowance for miscellaneous travel.
- Estimated NRC fees and ODOE fees are included in the Final Status Survey estimate.

4.3 RADIOLOGICAL DECOMMISSIONING COST ESTIMATE RESULTS

The total estimated cost for radiological decommissioning and termination of the ISFSI license is $4.025 million (2015 dollars). The estimate is based on Trojan ISFSI-specific information, an assumed projected final spent fuel shipment date, published labor, equipment and material, and waste disposal costs. Contingency has been included at the rate recommended in NUREG-1757 (25% contingency).

It is assumed that PGE will oversee the radiological decommissioning program, but essentially all of the work will be performed by contractors. Costs associated with operating and maintaining the ISFSI, packaging spent fuel and transfer to DOE, non-radiological decommissioning, and site restoration are not included since these activities are considered outside the scope of radiological decommissioning.

As described in this report, the last spent fuel shipment is assumed to be transferred to the DOE and be removed from the site in 2033.

There is expected to be a minimum amount of radioactive waste generated as a result of spent fuel packaging for shipping activities. As a conservative assumption it is assumed that one Concrete Cask will have been neutron activated and will require disposal as radioactive waste. Such waste is assumed to be transported to the U.S. Ecology facility in Richland, Washington.

The ISFSI facilities used to store and transfer the spent fuel are assumed to be decontaminated (if necessary) as part of each spent fuel transfer campaign. As such, with the exception of disposing of the activated Concrete Cask, radiological decommissioning will principally consist of performing a Final Status Survey.

The schedule for completion is controlled to a large extent by the projected schedule for DOE acceptance of spent fuel. In the event that the DOE schedule changes, the decommissioning costs would be expected to remain the same (in 2015 dollars), but the timing of expenditures would change.

A radiological decommissioning cost breakout by major categories is provided in Table 4.3-1. In addition, radiological decommissioning costs, as a series of annual costs, are provided in Table 4.3-2.

Table 4.3-1
Radiological Decommissioning Costs
(costs in thousands, 2015 dollars)

	Radiological Decommissioning		
Activity	Labor	Non-Labor	Total
Characterization (Tables 4.2-1 and 4.2-2)	7	72	79
Decontamination and Disposal (Tables 4.2-3 and 4.2-4)	9	611	620
Final Status Survey (Tables 4.2-5 and 4.2-6)	956	764	1,720
PGE Staff (Final Radiological Decommissioning Plan) (Tables 4.2-7 and 4.2-8)	685	115	800
Sub-Total (w/o contingency)	1,658	1,562	3,220
Contingency @ 25%	414	390	805
Total	2,072	1,952	4,025

Table 4.3-2
ISFSI Radiological Decommissioning Annual Costs
(costs in thousands, 2015 dollars)

Year of Expenditure	Radiological Decommissioning w/o 25% Contingency	Radiological Decommissioning with 25% Contingency
2030[1]	79	99
2031	161	201
2032	139	173
2033	759	949
2034	2,082	2,603
Total	**3,220**	**4,025**

Note 1: Characterization work is projected to occur in 2030 to support preparation of the Trojan proposed Final Radiological Decommissioning Plan. ODOE-related decommissioning planning and review expenses are projected to occur in 2031-2034. Final status survey is projected to occur in 2033–2034 followed by license termination in 2034.

5.0 ISFSI RADIOLOGICAL DECOMMISSIONING FUNDING PLAN

Pursuant to 10 CFR 72.30(b), this section provides the co-owners' radiological decommissioning funding plans. As required by 10 CFR 72.30(b)(4) and 72.30(c), the means for adjusting the cost estimate and associated funding plans over the life of the Trojan ISFSI are discussed in Section 4.1.

5.1 RADIOLOGICAL DECOMMISSIONING FUNDING PLAN

The following Table 5.1-1, "ISFSI Radiological Decommissioning Total Annual Costs in Nominal Dollars" provides the basis for the Trojan co-owner funding plans.

Table 5.1-1
ISFSI Radiological Decommissioning Total Annual Costs in Nominal Dollars
(costs in thousands)

Year of Expenditure	All Co-Owner's Total Costs[1]	PGE's 67.5% Share	EWEB's 30% Share	PacifiCorp's 2.5% Share
2030	136	92	41	3
2031	281	190	84	7
2032	247	167	74	6
2033	1,382	933	415	35
2034	3,871	2,613	1,161	97
Total	**5,917**	**3,994**	**1,775**	**148**

Note 1: To create this Table 5.1-1, the 2015 dollar values shown in Table 4.3-2 were converted to nominal dollars by multiplying by an annual escalation factor of 2.11% for years 2016 through 2034. This calculated annual average escalation factor value is based on the November 2014 Global Insight All-Urban Consumer Price Index PCCPI values for years 2015–2034.

5.2 TROJAN CO-OWNERS' DECOMMISSIONING FUNDING PLANS

The radiological decommissioning funding plans for each of the Trojan co-owners, needed to provide the total cash flow in Table 5.1-1, are described below.

5.2.1 PGE FUNDING PLAN

Table 5.2-1, "Portland General Electric Decommissioning Funding Cash Flow" provides PGE's radiological decommissioning funding cash flow in nominal dollars for radiological decommissioning. Funded from an external trust fund, the expenditures described in this table are PGE's share (67.5%) of the expenditures described in Table 5.1-1. The funding plan described in Table 5.2-1 ensures that PGE's 67.5% portion of the radiological decommissioning activity expenditures will be fully funded. It is noted that the Trojan ISFSI Radiological Decommissioning Fund Sub-Account's market value specified in Table 5.3-1, PGE's Decommissioning Trust Funds' Balances, is substantially more than the amount of PGE's 67.5%

share of funds required for ISFSI facility radiological decommissioning as specified in Table 5.2-1 (PGE Trust Fund Expenditures, Column A, Total). Therefore, no additional amount remains to be collected for PGE's share of ISFSI facility radiological decommissioning.

Table 5.2-1
Portland General Electric Decommissioning Funding Cash Flow
ISFSI Radiological Decommissioning
(PGE 67.5% Nominal $ x 1000)

Year	PGE Trust Fund Expenditures A	PGE Trust Fund Contributions B	PGE Trust Fund Net Earnings C	PGE Taxes, Fees, and Expenses D	PGE Trust Fund EOY Balance E
2014					5,131
2015	0	0	103	(25)	5,210
2016	0	0	104	(25)	5,289
2017	0	0	106	(26)	5,369
2018	0	0	107	(26)	5,450
2019	0	0	109	(27)	5,533
2020	0	0	111	(27)	5,617
2021	0	0	112	(28)	5,701
2022	0	0	114	(28)	5,787
2023	0	0	116	(29)	5,874
2024	0	0	117	(29)	5,962
2025	0	0	119	(30)	6,051
2026	0	0	121	(31)	6,142
2027	0	0	123	(31)	6,234
2028	0	0	125	(32)	6,327
2029	0	0	127	(32)	6,422
2030	(92)	0	128	(33)	6,425
2031	(190)	0	128	(34)	6,330
2032	(167)	0	127	(34)	6,255
2033	(933)	0	125	(35)	5,412
2034	(2,613)	0	108	(36)	2,872
Total	(3,994)	0	2,330	(595)	

Column A: For years 2030–2032, these numbers show incurred costs. No funds for decommissioning costs will be disbursed from this ISFSI Radiological Decommissioning Fund Sub-Account until after the NRC approves the ISFSI Final Radiological Decommissioning Plan.

Columns A and D: Annual escalation factor is 2.11% per year

Column B: Due to the ISFSI radiological decommissioning account being more than fully funded, PGE stopped contributions to this trust account at the end of 2012.

Column C: Annual Net Earnings of 2% is based on 10 CFR 50.75(e)(1)(ii)

5.2.2 EWEB/BPA FUNDING PLAN

Table 5.2-2, "EWEB/BPA Decommissioning Funding Annual Cash Obligations" provides EWEB/BPA's radiological decommissioning funding cash flow in nominal dollars for radiological decommissioning. The expenditures described in this table are EWEB/BPA's share (30%) of the expenditures described in Table 5.1-1. BPA is obligated through Net Billing Agreements to pay costs associated with EWEB's share of Trojan, including radiological decommissioning costs. As a government agency, EWEB uses a Statement of Intent for their financial instrument (see Section 6.3 and Appendix 7-2, Certification of Financial Assurance). EWEB's Statement of Intent and Certification of Financial Assurance both document BPA's obligation to pay the decommissioning funding obligations of EWEB. The funding plan described in Table 5.2-2 ensures that EWEB/BPA's 30% portion of the radiological decommissioning activity expenditures will be fully funded.

Table 5.2-2
EWEB/BPA Decommissioning Funding Annual Cash Obligations
ISFSI Radiological Decommissioning
(EWEB / BPA 30% Nominal $ x 1000)

Year	EWEB / BPA Obligations
2030	41
2031	84
2032	74
2033	415
2034	1,161
Total	1,775

5.2.3 PACIFICORP FUNDING PLAN

Table 5.2-3, "PacifiCorp Decommissioning Funding Cash Flow" provides PacifiCorp's radiological decommissioning funding cash flow in nominal dollars for radiological decommissioning. Funded from an external trust fund, the expenditures described in this table are PacifiCorp's share (2.5%) of the expenditures described in Table 5.1-1. The funding plan described in Table 5.2-3 ensures that PacifiCorp's portion of the radiological decommissioning activity expenditures will be fully funded. It is noted that the Trojan ISFSI Radiological Decommissioning Fund Sub-account's market value specified in Table 5.3-2, PacifiCorp's Decommissioning Trust Funds' Balances, is equal to the full amount of PacifiCorp's 2.5% share of funds required for ISFSI facility radiological decommissioning as specified in Table 5.2-3 (PacifiCorp Trust Fund Expenditures, Column A, Total). Therefore, no additional amount remains to be collected for PacifiCorp's share of ISFSI facility radiological decommissioning.

Table 5.2-3
PacifiCorp Decommissioning Funding Cash Flow
ISFSI Radiological Decommissioning (PacifiCorp 2.5% Nominal $ x 1000)

Year	PacifiCorp Trust Fund Expenditures A	PacifiCorp Trust Fund Contributions B	PacifiCorp Trust Fund Net Earnings C	PacifiCorp Taxes, Fees, and Expenses D	PacifiCorp Trust Fund EOY Balance E
2014					143
2015	0	0	3	0	146
2016	0	0	3	0	149
2017	0	0	3	0	152
2018	0	0	3	0	155
2019	0	0	3	0	158
2020	0	0	3	0	161
2021	0	0	3	0	164
2022	0	0	3	0	167
2023	0	0	3	0	170
2024	0	0	3	0	173
2025	0	0	3	0	176
2026	0	0	4	0	180
2027	0	0	4	0	184
2028	0	0	4	0	188
2029	0	0	4	0	192
2030	(3)	0	4	0	193
2031	(7)	0	4	0	190
2032	(6)	0	4	0	187
2033	(35)	0	4	0	157
2034	(97)	0	3	0	63
Total	(148)	0	68	0	

Column A: For years 2030–2032, these numbers show incurred costs. No funds for decommissioning costs will be disbursed from this ISFSI Radiological Decommissioning Fund Sub-Account until after the NRC approves the ISFSI Final Radiological Decommissioning Plan.

Columns A and D: Annual escalation factor is 2.11% per year.

Column B: Due to the ISFSI radiological decommissioning account being fully funded, PacifiCorp has stopped contributions to this trust account.

Column C: Annual Net Earnings of 2% is based on 10 CFR 50.75(e)(1)(ii).

Column D: There are no Trustee Fees or Expenses associated with this trust account.

5.3 STATEMENT OF PGE'S AND PACIFICORP'S TRUST BALANCES

Pursuant to NUREG-1757, Volume 3, Section 4.3.2.1 guidance, the balances in PGE's and PacifiCorp's Nuclear Decommissioning Trusts, that include funds for Trojan ISFSI radiological decommissioning, are provided in Table 5.3-1, PGE's Decommissioning Trust Funds' Balances. and Table 5.3-2, PacifiCorp's Decommissioning Trust Funds' Balances.

Table 5.3-1
PGE's Decommissioning Trust Funds' Balances

Trojan Co-Owner	ISFSI Radiological Decommissioning Fund Market Value (as of 10-31-2015)	Total Market Value of All Funds in PGE's Trojan Decommissioning Trust Accounts (as of 10-31-2015)
Portland General Electric (PGE)	$5,130,604	$40,130,043

Note 1: PGE's market value of funds in the Trojan ISFSI Radiological Decommissioning Fund Sub-Account and the total market value of all funds in all four Decommissioning Trust Accounts are specified in the above Table. These are evidenced by The Northern Trust Company's Accounting Statements "Closing Balance, Market Value" for PGE's Nuclear Decommissioning Trust Accounts as of October 31, 2015.

Note 2: Pursuant to 10 CFR 72.54 and a restriction in the PGE Nuclear Decommissioning Trust Agreement, no funds for decommissioning costs shall be disbursed from this ISFSI Radiological Decommissioning Fund Sub-Account until after the NRC approves the ISFSI Final Radiological Decommissioning Plan.

Note 3: PGE's Nuclear Decommissioning Trust was initially established to provide financial assurance for the radiological decommissioning of Trojan Nuclear Plant and in 2008 a separate sub-account was established specifically for ISFSI radiological decommissioning. This Trust has four separate accounts and currently contains and continues to collect funds to be used only for the following activities: Trojan Nuclear Plant non-radiological decommissioning; Trojan ISFSI spent fuel management (including spent fuel packaging and transfer to the DOE); Trojan ISFSI radiological decommissioning and license termination; Trojan ISFSI non-radiological decommissioning; and Trojan Site restoration.

Note 4: It is noted that the above Trojan ISFSI Radiological Decommissioning Fund Sub-Account's market value is substantially more than the amount of PGE's 67.5% share of funds required for ISFSI facility radiological decommissioning as specified in Table 5.2-1 (PGE Trust Fund Expenditures, Column A, Total). Therefore, no additional amount remains to be collected for ISFSI facility radiological decommissioning. In the future, if additional funds are needed for ISFSI radiological decommissioning, the funds will be transferred from one of the other Trojan decommissioning trust accounts into the ISFSI Radiological Decommissioning Fund Sub-Account.

Table 5.3-2
PacifiCorp's Decommissioning Trust Funds' Balances

Trojan Co-Owner	ISFSI Radiological Decommissioning Fund Market Value (as of 11-24-2015)	Total Market Value of All Funds in PacifiCorp's Trojan Decommissioning Trust Accounts (as of 11-24-2015)
PacifiCorp	$148,013.20	$1,547,445.83

Note 1: PacifiCorp's market value of funds in the Trojan ISFSI Radiological Decommissioning Fund Sub-Account and the total market value of all funds in both Decommissioning Trust Accounts are specified in the above Table. These are evidenced by State Street Bank's Accounting Statements "Market Value" for PacifiCorp's Trojan Decommissioning Trust Accounts as of November 24, 2015.

Note 2: Pursuant to 10 CFR 72.54 and a restriction in the PacifiCorp Nuclear Decommissioning Trust Agreement, no funds for decommissioning costs shall be disbursed from this ISFSI Radiological Decommissioning Fund Sub-Account until after the NRC approves the ISFSI Final Radiological Decommissioning Plan.

Note: 3 PacifiCorp's Nuclear Decommissioning Trust was initially established to provide financial assurance for the radiological decommissioning of Trojan Nuclear Plant and in November 2012 a separate sub-account was established specifically for ISFSI radiological decommissioning funds. This Trust has two separate accounts and currently contains and continues to collect funds to be used only for the following activities: Trojan Nuclear Plant non-radiological decommissioning; Trojan ISFSI spent fuel management (including spent fuel packaging and transfer to the DOE); Trojan ISFSI radiological decommissioning and license termination; Trojan ISFSI non-radiological decommissioning; and Trojan Site restoration.

Note 4: It is noted that the above Trojan ISFSI Radiological Decommissioning Fund Sub-Account's market value is equal to the full amount of PacifiCorp's 2.5% share of funds required for ISFSI facility radiological decommissioning as specified in Table 5.2-3 (PacifiCorp Trust Fund Expenditures, Column A, Total). Therefore, no additional amount remains to be collected for ISFSI facility radiological decommissioning. In the future, if additional funds are needed for ISFSI radiological decommissioning, the funds will be transferred from the other Trojan decommissioning trust account into the ISFSI Radiological Decommissioning Fund Sub-Account.

5.4 MONITORING OF PGE'S AND PACIFICORP'S TRUST BALANCES

Pursuant to 10 CFR 72.30(g), PGE and PacifiCorp, as Trojan ISFSI licensees, will monitor the balance of funds held in their Trojan Decommissioning Trusts for ISFSI Radiological Decommissioning to account for market variations. PGE and PacifiCorp will replenish the funds, and report such actions to the NRC, as follows:

5.4.1 If, at the end of a calendar year, the fund balance is below the amount necessary to cover the cost of radiological decommissioning, but is not below 75 percent of the cost, the licensee will increase the balance to cover the cost, and will do so within 30 days after the end of the calendar year.

5.4.2 If, at any time, the fund balance falls below 75 percent of the amount necessary to cover the cost of radiological decommissioning, the licensee will increase the balance to cover the cost, and will do so within 30 days of the occurrence.

5.4.3 Within 30 days of taking the actions required by the above paragraphs 5.4.1 or 5.4.2, the licensee will provide a written report of such actions to the Director, Office of Federal and State Materials and Environmental Management Programs, and state the new balance of the fund.

5.5 NUREG-1757 CHECKLISTS FOR DECOMMISSIONING FUNDING PLANS

The following NUREG-1757 Checklists are provided in Appendix 5-1 and Appendix 5-2:

Appendix

5-1 Checklist 1, Master Checklist for Decommissioning Financial Assurance For PGE, EWEB/BPA, and PacifiCorp

5-2 Checklist 3, Decommissioning Funding Plans For PGE, EWEB/BPA, and PacifiCorp

6.0 TROJAN CO-OWNER FINANCIAL ASSURANCE INSTRUMENTS

Pursuant to 10 CFR 72.30(b)(4), this section provides a description of the Trojan co-owners' methods (financial instruments) from 10 CFR 72.30(e) for assuring funds for radiological decommissioning.

6.1 CO-OWNER FINANCIAL ASSURANCE INSTRUMENTS

The financial assurance instrument that each co-owner uses to provide funding and financial assurance for Trojan ISFSI radiological decommissioning is detailed below.

6.2 PGE'S FINANCIAL ASSURANCE INSTRUMENT

As a majority co-owner in the Trojan ISFSI, PGE is responsible for funding 67.5 percent of the total ISFSI radiological decommissioning costs. As allowed by 10 CFR 72.30(e)(5), PGE provides ISFSI radiological decommissioning funding assurance using the method of 10 CFR 50.75(e)(1)(ii) (Reference 3). Specifically, PGE has established and maintains an external sinking fund in the form of a trust, which is segregated from PGE's assets and outside PGE's administrative control, and into which funds are set aside such that the total amount of funds will be sufficient to pay radiological decommissioning costs. As allowed by 10 CFR 72.30(e)(5) for licensees such as PGE that recover the total estimated radiological decommissioning costs through ratemaking regulation, this method is the exclusive mechanism that PGE relies upon to provide financial assurance for Trojan ISFSI radiological decommissioning. In the event that funds remaining to be placed into PGE's external sinking fund to cover PGE's 67.5 percent ownership share of Trojan ISFSI radiological decommissioning costs are no longer approved for recovery in rates by a competent rate regulating authority (currently Oregon Public Utility Commission (OPUC)), PGE would no longer be allowed to use the financial assurance mechanisms of 10 CFR 50.75(e), but rather would be required to use financial assurance methods as specified in 10 CFR 72.30(e)(1) through (4).

6.3 EWEB'S FINANCIAL ASSURANCE INSTRUMENT

BPA is obligated through Net Billing Agreements to fund EWEB's 30 percent share of the total Trojan ISFSI radiological decommissioning costs. As allowed by 10 CFR 72.30(e)(4), EWEB, as a government agency provides financial assurance in the form of a Statement of Intent. The Statement of Intent includes the commitment that funds for radiological decommissioning of the Trojan ISFSI will be obtained from BPA (a Federal Government agency) when necessary.

6.4 PACIFICORP'S FINANCIAL ASSURANCE INSTRUMENT

PacifiCorp is responsible for funding its 2.5 percent share of the total ISFSI radiological decommissioning costs. As allowed by 10 CFR 72.30(e)(5), PacifiCorp provides ISFSI radiological decommissioning funding assurance using the method of 10 CFR 50.75(e)(1)(ii).

Specifically, PacifiCorp has established and maintains an external sinking fund in the form of a trust, which is segregated from PacifiCorp's assets and outside PacifiCorp's administrative control, and into which funds are set aside such that the total amount of funds will be sufficient to pay radiological decommissioning costs. As allowed by 10 CFR 72.30(e)(5) for licensees such as PacifiCorp that recover the total estimated radiological decommissioning costs through ratemaking regulation, this method is the exclusive mechanism that PacifiCorp relies upon to provide financial assurance for Trojan ISFSI radiological decommissioning. In the event that funds remaining to be placed into PacifiCorp's external sinking fund to cover PacifiCorp's 2.5 percent ownership share of Trojan ISFSI radiological decommissioning costs are no longer approved for recovery in rates by a competent rate regulating authority (currently OPUC), PacifiCorp would no longer be allowed to use the financial assurance mechanisms of 10 CFR 50.75(e), but rather would be required to use financial assurance methods as specified in 10 CFR 72.30(e)(1) through (4).

6.5 SUBMIT FINANCIAL ASSURANCE DOCUMENT TO NRC IF 10 CFR 72.30(e) INFORMATION CHANGES

Pursuant to the requirements in 10 CFR 72.30(e), PGE's Nuclear Decommissioning Trust Agreement, EWEB's Statement of Intent, and PacifiCorp's Nuclear Decommissioning Trust Agreement include the licensee's name, license number, and docket number; and the name, address, and other contact information of the issuer, and the trustee, if applicable. When any of the foregoing information changes in one of these financial instruments, the licensee will, within 30 days, submit a copy of the financial instrument reflecting such changes to the NRC in accordance with 10 CFR 72.4.

6.6 NUREG-1757 CHECKLISTS FOR TRUSTS AND STATEMENT OF INTENT

The following NUREG-1757 Checklists are provided in Appendix 6-1 through Appendix 6-8:

Appendix

6-1 Checklist 4-A, Trust Funds For PGE
6-2 Checklist 4-B, Terms and Conditions Needed in Decommissioning Trust Agreements For PGE

6-3 Checklist 4-A, Trust Funds For PacifiCorp
6-4 Checklist 4-B, Terms and Conditions Needed in Decommissioning Trust Agreements For PacifiCorp

6-5 Checklist 10, External Sinking Funds For PGE
6-6 Checklist 10, External Sinking Funds For PacifiCorp

6-7 Checklist 11-A, Statements of Intent For EWEB
6-8 Checklist 11-B, Terms and Conditions Needed in Decommissioning Statements of Intent For EWEB

7.0 TROJAN ISFSI CO-OWNERS' CERTIFICATIONS THAT FINANCIAL ASSURANCE HAS BEEN PROVIDED FOR THEIR SHARE OF RADIOLOGICAL DECOMMISSIONING COSTS

Pursuant to 10 CFR 72.30(b)(6), this section provides the Trojan Co-Owners' (PGE, EWEB, and PacifiCorp) Certifications that financial assurance for radiological decommissioning of the Trojan ISFSI has been provided for their share of the amount of the cost estimate for radiological decommissioning. These documents will be updated at the time of license renewal and at intervals not exceeding 3 years to reflect any changes in the ISFSI radiological decommissioning cost estimate and/or funding plans.

Pursuant to 10 CFR 72.30(b)(1), these Certifications coupled with the co-owners' financial assurance instruments (PGE's and PacifiCorp's Trusts and EWEB's Statement of Intent) provide reasonable assurance that funds will be provided and will be available for Trojan ISFSI radiological decommissioning.

See the following Appendices for original signed copies of Certifications of Financial Assurance from the Trojan ISFSI licensees:

7-1 Certification of Financial Assurance from Portland General Electric Company for 67.5% Ownership

7-2 Certification of Financial Assurance from Eugene Water and Electric Board (EWEB) for 30% Ownership

7-3 Certification of Financial Assurance from PacifiCorp for 2.5% Ownership

8.0 RECORD KEEPING FOR DECOMMISSIONING

Records of information important to the safe and effective decommissioning of the Trojan ISFSI will be maintained for the life of the ISFSI. The following documents will be maintained as records for radiological decommissioning:

Pursuant to 10 CFR 20.1501(b) (Reference 2), if applicable, records from surveys describing the location and amount of subsurface residual radioactivity identified at the site will be kept with records important for radiological decommissioning and such records will be retained in accordance with 10 CFR 72.30(f).

Pursuant to 10 CFR 72.30(f), the Trojan ISFSI shall keep records of information important to the radiological decommissioning of the facility in an identified location until the site is released for unrestricted use. If records important to the radiological decommissioning of the facility are kept for other purposes, reference to these records and their locations may be used. Information important to decommissioning consists of the following:

(1) Records of spills or other unusual occurrences involving the spread of contamination in and around the facility, equipment, or site. These records may be limited to instances when contamination remains after any cleanup procedures or when there is reasonable likelihood that contaminants may have spread to inaccessible areas as in the case of possible seepage into porous materials such as concrete. These records will include any known information on identification of involved nuclides, quantities, forms, and concentrations.

(2) As-built drawings and modifications of structures and equipment in restricted areas where radioactive materials are used and/or stored, and of locations of possible inaccessible contamination. If required drawings are referenced, each relevant document need not be indexed individually. If drawings are not available, the Trojan ISFSI will substitute appropriate records of available information concerning these areas and locations.

(3) A list contained in a single document and updated no less than every 2 years of the following:

(i) All areas designated and formerly designated as restricted areas as defined under 10 CFR 20.1003; and

(ii) All areas outside of restricted areas that require documentation under 10 CFR 72.30(f)(1).

(4) Records of the cost estimate performed for the radiological decommissioning funding plan and records of the funding method used for assuring funds are available for radiological decommissioning.

9.0 REFERENCES

1. Code of Federal Regulations, Title 10, Part 20.1402, "Radiological Criteria for Unrestricted Use."

2. Code of Federal Regulations, Title 10, Part 20.1501(b), "General" related to survey records.

3. Code of Federal Regulations, Title 10, Part 50.75, "Reporting and Recordkeeping for Decommissioning Planning."

4. Code of Federal Regulations, Title 10, Part 72.30, "Financial Assurance and Recordkeeping for Decommissioning."

5. Code of Federal Regulations, Title 10, Part 72.54, "Expiration and Termination of Licenses and Decommissioning of Sites and Separate Buildings or Outdoor Areas."

6. Code of Federal Regulations, Title 10, Part 72.130, "Criteria for Decommissioning."

7. Oregon Administrative Rule (OAR) 345-026-0370, "Standards for Council Approval of ISFSI Decommissioning Plan."

8. Holtec's FSAR, Revision 1, for the HI-STORM 100 Concrete Cask (Report HI-2002444~~, Table 2.4.1~~).

9. NUREG/CR-5512, Volume 3, Residual Radioactive Contamination from Decommissioning, Parameter Analysis, Table 6.91, October 1999.

10. NUREG-1757, Volume 3, Revision 1, "Consolidated Decommissioning Guidance, Financial Assurance, Recordkeeping, and Timeliness."

11. Shielding Evaluation for the Trojan ISFSI Completion Project, HI-2012749, Revisions 5 and 6.

APPENDIX 5-1

Checklist 1 **Master Checklist for Decommissioning Financial Assurance For PGE, EWEB / BPA, and PacifiCorp**

Name of Licensee/Applicant: **Portland General Electric Company (PGE)**

Mailing Address: **121 SW Salmon Street, Portland, Oregon 97204**

Facility Address: **71760 Columbia River Highway, Rainier, Oregon 97048**

License Number(s): **SNM-2509**

Date of Submission: **Refer to Date on PGE Cover Letter**

Applicable Parts of 10 CFR: ☐ Part 30 ☐ Part 40 ☐ Part 70 ■ **Part 72**

Type of Submission:

☐ Certification of Financial Assurance
■ Decommissioning Funding Plan: **See Checklist No. 3 (Plan Appx 5-2)**

☐ Decommissioning Plan → attach Checklist 13-A

Type of Mechanism:

☐ Prepayment **N/A**
- ☐ Trust → attach Checklist 4-A

☐ Surety, Insurance, or Other Guarantee Method **N/A, PGE & PacifiCorp use 10 CFR 72.30(e)(5) and 50.75(e)(1)(ii)**
- ☐ Surety Bond → attach Checklist 5-A
- ☐ Letter of Credit → attach Checklist 6-A
- ☐ Insurance → attach Checklist 7-A
- ☐ Parent Company Guarantee → attach Checklist 8-A
- ☐ Self-Guarantee → attach Checklist 9-A

■ External Sinking Fund →**See Checklists No. 10, 4-A, and 4-B for PGE & PacifiCorp (Plan Appendices 6-5 & 6-6, and 6-1 & 6-3, and 6-2 & 6-4)**

■ Statement of Intent → **See Checklist No. 11-A and 11-B for EWEB (Plan Appx 6-7 & 6-8)**

☐ Special Arrangement with a Government Entity → attach Checklist 13-B **N/A**

APPENDIX 5-2

Checklist 3 Decommissioning Funding Plans For PGE, EWEB / BPA, and PacifiCorp

License Number(s): **SNM-2509**

Applicable Parts of 10 CFR (check all that apply): ☐ Part 30 ☐ Part 40 ☐ Part 70 ■ **Part 72**

■ Prepare a detailed, site-specific cost estimate (see Section A.3.1). **See Plan Section 4.2**

■ Determine the means that will be used to adjust the site-specific cost estimate and associated funding levels periodically over the life of the facility (see Section A.3.2). **See Plan Section 4.1**

■ Include the necessary documentation (see Section A.3.3). **See Plan Sections 2.0, 4.1, 7.0 and Appendices 7-1, 7-2 &7-3**

■ Include a detailed, site-specific cost estimate that includes the following (see Section A.3.4):

- ■ Detailed facility description. **See Plan Section 2.0**
- ■ Description of the means that will be used to adjust the site-specific cost estimate and associated funding level. **See Plan Section 4.1**
- ■ A certification that financial assurance for decommissioning has been provided in the amount of the decommissioning cost estimate. **See Plan Section 7.0 and Appendices 7-1, 7-2 & 7-3**

☐ Include a financial instrument and supporting documentation. **Co-Owner Trust Agreements and Statement of Intent Document are not included. See Plan Section 6.5 and note that 10 CFR 72.30(e) specifies the requirements for submitting these documents to the NRC.**

APPENDIX 6-1

Checklist 4-A **Trust Funds**
For PGE's Nuclear Decommissioning Trust Agreement

■ Documentation is complete when the following are included:

- ☐ 1. trust agreement (originally signed duplicate); **PGE's Trust Agreement is not included with this submittal. See Plan Sections 6.2 and 6.5 and note that 10 CFR 72.30(e) specifies the requirements for submitting this document to the NRC.**
- ■ 2. Schedule A,
- ■ 3. Schedule B,
- ■ 4. Schedule C,
- ■ 5. specimen certificate of events,
- ■ 6. specimen certificate of resolution,
- ■ 7. letter of acknowledgment,
- ■ 8. receipt or statement from the trustee showing the trust's current market value, **See Plan Section 5.3 and Table 5.3-1**
- ■ 9. Checklist 4-B (if model trust wording is modified or not used). **See Plan Appx 6-2**

■ The trustee is qualified when the following conditions are met:

- ■ The financial institution is regulated by a Federal or State agency.
- ■ The financial institution has authority to act as a trustee and has trust operations that are regulated and examined by a Federal or State agency.

■ The trust's current market value equals or exceeds the required coverage level. **See Plan Section 5.3 and Table 5.3-1**

APPENDIX 6-2

Checklist 4-B Terms and Conditions Needed in Decommissioning Trust Agreements For PGE

■ Execution date of trust includes the following:

- ■ Purpose of trust ("whereas" clauses).
- ■ Statement of licensee's regulatory obligations as reason for the trust fund.
- ■ Grantor or grantors (introductory paragraph).
- ■ Trustee or trustees (introductory paragraph) includes the following:
  - ■ 1. names and addresses; and
  - ■ 2. bank or corporate trustee.

■ Identification of facilities (name, address, and license number) and cost estimates or prescribed amounts (Section 2 and Schedule A).

- ■ Words of transfer, conveyance, and delivery in trust (Section 3).
- ■ Description of trust property (Section 4 and Schedule B) includes the following:
  - ■ 1. cash,
  - ☐ 2. securities, and
  - ☐ 3. other liquid assets.

■ Additions to trust (Section 4).

■ Distribution of trust principal (Section 5) includes the following:

- ■ 1. disbursement to licensee upon proper certification;
- ■ 2. payment for activities at NRC's direction in writing;
- ■ 3. refund to grantor at NRC's written specification upon completion of decommissioning; and
- ■ 4. maximum withdrawal of funds at one time for a particular license is limited to 10 percent of the remaining funds available for that license unless NRC written approval is attached.

■ Trust management (Sections 6–8) includes the following:

- ■ 1. discretionary powers;
- ■ 2. fiduciary duty;
- ■ 3. commingling and investment;
- ■ 4. sale or exchange of trust property;
- ■ 5. scope of investments;

Checklist 4-B Terms and Conditions Needed in Decommissioning Trust Agreements For PGE (continued)

- ■ 6. express powers of trustee;
- ■ 7. borrowing money and encumbering trust assets;
- ☐ 8. insurance (optional);
- ☐ 9. operation of business (optional); and
- ■ 10. compromise of claims (optional).

■ Taxes and expenses (Section 9).

■ Annual valuation (Section 10).

■ Advice of counsel (Section 11).

■ Authority, compensation, and tenure of trustees (Sections 12–14) includes the following:

- ■ 1. trustee compensation (Schedule C),
- ■ 2. successor trustee, and
- ■ 3. instructions to trustee.

■ Amendment of agreement (Section 15).

■ Irrevocability and termination (Section 16).

■ Immunity and indemnification (Section 17).

■ Law to govern construction and operation of trust (Section 18).

■ Interpretation and severability (Section 19).

■ Signatures and titles.

■ Acknowledgments, seals, or attestations, if necessary or desired (witness by notary public).

■ Acceptance of trust by trustee or trustees (acknowledgment).

APPENDIX 6-3

Checklist 4-A Trust Funds
For PacifiCorp's Nuclear Decommissioning Trust Agreement

■ Documentation is complete when the following are included:

- ☐ 1. trust agreement (originally signed duplicate); **PacifiCorp's Trust Agreement is not included with this submittal. See Plan Sections 6.4 and 6.5 and note that 10 CFR 72.30(e) specifies the requirements for submitting this document to the NRC.**
- ■ 2. Schedule A,
- ■ 3. Schedule B,
- ■ 4. Schedule C,
- ■ 5. specimen certificate of events,
- ■ 6. specimen certificate of resolution,
- ■ 7. letter of acknowledgment,
- ■ 8. receipt or statement from the trustee showing the trust's current market value, **See Plan Section 5.3 and Table 5.3-2**
- ■ 9. Checklist 4-B (if model trust wording is modified or not used). **See Plan Appx 6-4**

■ The trustee is qualified when the following conditions are met:

- ■ The financial institution is regulated by a Federal or State agency.
- ■ The financial institution has authority to act as a trustee and has trust operations that are regulated and examined by a Federal or State agency.

■ The trust's current market value equals or exceeds the required coverage level.
See Plan Section 5.3 and Table 5.3-2

APPENDIX 6-4

Checklist 4-B Terms and Conditions Needed in Decommissioning Trust Agreements For PacifiCorp

■ Execution date of trust includes the following:

- ■ Purpose of trust ("whereas" clauses).
- ■ Statement of licensee's regulatory obligations as reason for the trust fund.
- ■ Grantor or grantors (introductory paragraph).
- ■ Trustee or trustees (introductory paragraph) includes the following:
  - ■ 1. names and addresses; and
  - ■ 2. bank or corporate trustee.

■ Identification of facilities (name, address, and license number) and cost estimates or prescribed amounts (Section 2 and Schedule A).

- ■ Words of transfer, conveyance, and delivery in trust (Section 3).
- ■ Description of trust property (Section 4 and Schedule B) includes the following:
  - ■ 1. cash,
  - ☐ 2. securities, and
  - ☐ 3. other liquid assets.

■ Additions to trust (Section 4).

■ Distribution of trust principal (Section 5) includes the following:

- ■ 1. disbursement to licensee upon proper certification;
- ■ 2. payment for activities at NRC's direction in writing;
- ■ 3. refund to grantor at NRC's written specification upon completion of decommissioning; and
- ■ 4. maximum withdrawal of funds at one time for a particular license is limited to 10 percent of the remaining funds available for that license unless NRC written approval is attached.

■ Trust management (Sections 6–8) includes the following:

- ■ 1. discretionary powers;
- ■ 2. fiduciary duty;
- ■ 3. commingling and investment;
- ■ 4. sale or exchange of trust property;
- ■ 5. scope of investments;

Checklist 4-B Terms and Conditions Needed in Decommissioning Trust Agreements For PacifiCorp (continued)

- ■ 6. express powers of trustee;
- ■ 7. borrowing money and encumbering trust assets;
- ☐ 8. insurance (optional);
- ☐ 9. operation of business (optional); and
- ■ 10. compromise of claims (optional).

■ Taxes and expenses (Section 9).

■ Annual valuation (Section 10).

■ Advice of counsel (Section 11).

■ Authority, compensation, and tenure of trustees (Sections 12–14) includes the following:

- ■ 1. trustee compensation (Schedule C),
- ■ 2. successor trustee, and
- ■ 3. instructions to trustee.

■ Amendment of agreement (Section 15).

■ Irrevocability and termination (Section 16).

■ Immunity and indemnification (Section 17).

■ Law to govern construction and operation of trust (Section 18).

■ Interpretation and severability (Section 19).

■ Signatures and titles.

■ Acknowledgments, seals, or attestations, if necessary or desired (witness by notary public).

■ Acceptance of trust by trustee or trustees (acknowledgment).

APPENDIX 6-5

Checklist 10 **External Sinking Funds For PGE**

☐ Documentation is complete when both of the following are included:

☐ 1. prepayment mechanism (originally signed duplicate) and all supporting documentation (see Section A.4 and attach Checklist 4-A, as applicable); and **PGE's prepayment mechanism is a Nuclear Decommissioning Trust with a separate account for ISFSI Radiological Decommissioning Funds. PGE's Trust Agreement is not included with this submittal. See Plan Sections 6.2 and 6.5 and note that 10 CFR 72.30(e) specifies the requirements for submitting this document to the NRC. See Plan Sections 6.2, Tables 5.2-1 and 5.3-1, and Plan Appendices 6-1 and 6-2 for PGE's Checklists 4-A and 4-B.**

☐ 2. surety method, parent company guarantee or self-guarantee, or insurance (originally signed duplicate) and all supporting documentation (see Sections A.5 through A.9 and attach Checklists 5-A through 9-A, as applicable). **N/A for PGE that uses 10 CFR 72.30(e)(5) and 50.75(e)(1)(ii)**

■ The total amount of the external sinking fund plus the surety, guarantee, or insurance equals or exceeds the required coverage level. **PGE's ISFSI Radiological Decommissioning Fund account is more than fully funded for PGE's 67.5% ownership share. See Plan Section 5.3 and Tables 5.2-1 and 5.3-1.**

APPENDIX 6-6

Checklist 10 External Sinking Funds For PacifiCorp

☐ Documentation is complete when both of the following are included:

☐ 1. prepayment mechanism (originally signed duplicate) and all supporting documentation (see Section A.4 and attach Checklist 4-A, as applicable); and **PacifiCorp's prepayment mechanism is a Nuclear Decommissioning Trust with a separate account for ISFSI Radiological Decommissioning Funds. PacifiCorp's Trust Agreement is not included with this submittal. See Plan Sections 6.2 and 6.5 and note that 10 CFR 72.30(e) specifies the requirements for submitting this document to the NRC. See Plan Sections 6.4, Tables 5.2-3 and 5.3-2, and Plan Appendices 6-3 and 6-4 for PacifiCorp's Checklists 4-A and 4-B.**

☐ 2. surety method, parent company guarantee or self-guarantee, or insurance (originally signed duplicate) and all supporting documentation (see Sections A.5 through A.9 and attach Checklists 5-A through 9-A, as applicable). **N/A for PacifiCorp that uses 10 CFR 72.30(e)(5) and 50.75(e)(1)(ii)**

■ The total amount of the external sinking fund plus the surety, guarantee, or insurance equals or exceeds the required coverage level. **PacifiCorp's ISFSI Radiological Decommissioning Fund account is fully funded for PacifiCorp's 2.5% ownership share. See Plan Section 5.3 and Tables 5.2-3 and 5.3-2.**

APPENDIX 6-7

Checklist 11-A **Statements of Intent For EWEB**

■ Documentation is complete when the following are included:

- ☐ 1. statement of intent (originally signed duplicate);
  EWEB's Statement of Intent is not included with this submittal. See Plan Sections 6.3 and 6.5 and note that 10 CFR 72.30(e) specifies the requirements for submitting this document to the NRC. EWEB will submit this document separately to the NRC.

- ■ 2. documentation verifying that the signatory is authorized to represent the licensee in providing the statement of intent (signatory should be head of agency or designee); and
  Signatory is head of agency

- ■ 3. Checklist 11-B (if model statement of intent wording is modified or not used).

■ The amount of the statement of intent equals or exceeds the required coverage level.

APPENDIX 6-8

Checklist 11-B Terms and Conditions Needed in Decommissioning Statements of Intent For EWEB

Use this checklist only if deviating from the wording recommended in Section A.11.4.

- Description of authority of government entity to make the statement of intent.
- Identification of Federal, State, or local government licensee.
- Description of facility(ies) (name, address, and license number) for which statement of intent provides financial assurance and corresponding costs of required activities.
- Specification of the amount of funds being assured.
- Statement that funds for required activities will be requested and obtained from the appropriate funding body when necessary.
- Recitation of authority for signatory to sign the statement of intent.
- Signatures.
- Names and titles of signatories.
- Date.

APPENDIX 7-1

Certification of Financial Assurance

from

Portland General Electric Company for 67.5% Ownership - Enclosed

CERTIFICATION OF FINANCIAL ASSURANCE

Principal: Portland General Electric Company, 121 SW Salmon Street, Portland, Oregon 97204-2901

NRC license number, name and address of facility: SNM-2509, Trojan Independent Spent Fuel Storage Installation (ISFSI), 71760 Columbia River Highway, Rainier, Oregon 97048

Issued to: U.S. Nuclear Regulatory Commission

I certify that Portland General Electric Company, as a co-owner of the Trojan site and Trojan ISFSI facilities with Eugene Water and Electric Board and PacifiCorp, is licensed to possess spent nuclear fuel, licensed under 10 CFR Part 72 in the following amounts:

Type of Material
Spent fuel from Trojan Nuclear Plant and associated radioactive materials related to receipt, storage, and transfer of the fuel assemblies. Chemical and/or Physical Form: Spent fuel assemblies and damaged fuel assemblies as UO_2 clad with Zircaloy-4. Fuel debris as UO_2 contained in Failed Fuel Cans or Damaged Fuel Containers.

Amount of Material
344.5 MTU of intact spent fuel assemblies, damaged fuel assemblies, and fuel debris.

I also certify that financial assurance for Portland General Electric Company's 67.5 percent ownership share of the Trojan site and Trojan ISFSI facilities in the amount of $3,994,000 (of the total site-specific ISFSI radiological decommissioning cost estimate of $5,917,000), in nominal US dollars has been obtained for the purpose of ISFSI radiological decommissioning as prescribed by 10 CFR Part 72.

I also certify that Portland General Electric Company is qualified to use the assurance method of 10 CFR Part 72.30(e)(5) and 10 CFR Part 50.75(e)(1)(ii), and Portland General Electric Company recovers the total cost of its share of Trojan decommissioning costs through rates established by "cost of service" or similar ratemaking regulation which will provide funds needed for its share of ISFSI radiological decommissioning costs. As of October 31, 2015, $5,130,604 has been collected in Portland General Electric Company's Nuclear Decommissioning Trust ISFSI Radiological Decommissioning Sub-Account for its share of ISFSI radiological decommissioning costs. Therefore, no additional amount remains to be collected for ISFSI radiological decommissioning. In the future, if additional funds are needed for ISFSI radiological decommissioning, the funds will be transferred from one of the other Trojan decommissioning trust accounts into the ISFSI Radiological Decommissioning Sub-Account.

Contact information for this certification of financial assurance by Portland General Electric Company is as follows:

Licensee Name:	Portland General Electric Company
License Number:	SNM-2509
Docket Number:	72-017

Issuer: Portland General Electric Company
121 SW Salmon Street
Portland, Oregon 97204-2901
Jim Lobdell, Chief Financial Officer
Phone: 503-464-2723

Trustee: The Northern Trust Company
50 South LaSalle Street
Chicago, Illinois 60603
Mike Sullivan, Second VP, Relationship Manager
Phone: 312-557-1446

Date: December 4, 2015

Portland General Electric Company

By: ______________________________
Name: Jim Lobdell
Title: Senior VP of Finance, CFO and Treasurer

APPENDIX 7-2

Certification of Financial Assurance

from

Eugene Water and Electric Board (EWEB) for 30% Ownership - Enclosed

CERTIFICATION OF FINANCIAL ASSURANCE

Principal: Eugene Water & Electric Board

NRC license number, name and address of facility: SNM-2509, Trojan Independent Spent Fuel Storage Installation (ISFSI), 71760 Columbia River Highway, Rainier, Oregon 97048

Issued to: U.S. Nuclear Regulatory Commission

I certify that Eugene Water & Electric Board, with Portland General Electric Company and PacifiCorp are licensed to possess spent nuclear fuel, licensed under 10 CFR Part 72 in the following amounts:

Type of Material
Spent fuel from Trojan Nuclear Plant and associated radioactive materials related to receipt, storage, and transfer of the fuel assemblies. Chemical and/or Physical Form: Spent fuel assemblies and damaged fuel assemblies as UO_2 clad with Zircaloy-4. Fuel debris as UO_2 contained in Failed Fuel Cans or Damaged Fuel Containers.

Amount of Material
344.5 MTU of intact spent fuel assemblies, damaged fuel assemblies, and fuel debris.

I also certify that financial assurance for Eugene Water &Electric Board's 30 percent Trojan ownership share in the amount of $1,775,000 of the total site-specific ISFSI radiological decommissioning cost estimate of $5,917,000, in nominal US dollars has been obtained for the purpose of ISFSI radiological decommissioning as prescribed by 10 CFR Part 72.

I also certify that the Eugene Water & Electric Board maintains Net Billing Agreements with the Bonneville Power Administration (Bonneville). The Net Billing Agreements contractually obligate Bonneville to pay costs associated with Eugene Water & Electric Board's 30 percent ownership share of Trojan, including spent fuel management, ISFSI radiological decommissioning, and non-radiological decommissioning costs. Bonneville's confirmation of its contractual obligation is attached to this Certification. Pursuant to 10 CFR Part 72.30(e)(4), Eugene Water & Electric Board, a government agency, uses a Statement of Intent to provide financial assurance for Eugene Water & Electric Board's 30 percent of the costs of Trojan decommissioning, including ISFSI radiological decommissioning.

Contact information for this certification of financial assurance by Eugene Water & Electric Board is the following:

Licensee name:	Eugene Water & Electric Board
License number:	SNM-2509
Docket number:	72-017

Licensee: Eugene Water & Electric Board
500 East 4th Avenue
Eugene, Oregon 97401
Roger Gray, General Manager
Phone: 541-685-7000

Signature and Date

[signature] Date: 12.1.1[?]

Roger Gray
Title: General Manager

APPENDIX 7-3

Certification of Financial Assurance

from

PacifiCorp for 2.5% Ownership - Enclosed

CERTIFICATION OF FINANCIAL ASSURANCE

Principal: PacifiCorp, 825 NE Multnomah Street, Suite 2000, Portland, Oregon 97232

NRC license number, name and address of facility: SNM-2509, Trojan Independent Spent Fuel Storage Installation (ISFSI), 71760 Columbia River Highway, Rainier, Oregon 97048

Issued to: U.S. Nuclear Regulatory Commission

I certify that PacifiCorp, as a co-owner of the Trojan site and Trojan ISFSI facilities with Portland General Electric Company and Eugene Water and Electric Board, is licensed to possess spent nuclear fuel, licensed under 10 CFR Part 72 in the following amounts:

Type of Material
Spent fuel from Trojan Nuclear Plant and associated radioactive materials related to receipt, storage, and transfer of the fuel assemblies. Chemical and/or Physical Form: Spent fuel assemblies and damaged fuel assemblies as UO_2 clad with Zircaloy-4. Fuel debris as UO_2 contained in Failed Fuel Cans or Damaged Fuel Containers.

Amount of Material
344.5 MTU of intact spent fuel assemblies, damaged fuel assemblies, and fuel debris.

I also certify that financial assurance for PacifiCorp's 2.5 percent ownership share of the Trojan site and Trojan ISFSI facilities in the amount of $148,000 (of the total site-specific ISFSI radiological decommissioning cost estimate of $5,917,000), in nominal US dollars, has been obtained for the purpose of ISFSI radiological decommissioning as prescribed by 10 CFR Part 72.

I also certify that PacifiCorp is qualified to use the assurance method of 10 CFR Part 72.30(e)(5) and 10 CFR Part 50.75(e)(1)(ii), and PacifiCorp recovers the total cost of its share of decommissioning costs through rates established by "cost of service" or similar ratemaking regulation, which will provide funds needed for PacifiCorp's share of ISFSI radiological decommissioning costs. As of October 31, 2015, $1,547,445.83 has been collected in PacifiCorp's Trojan Nuclear Decommissioning Trust for PacifiCorp's share of Trojan decommissioning costs, including ISFSI radiological decommissioning costs. As of November 24, 2015, $148,013.20 was deposited into the ISFSI Radiological Decommissioning Fund of PacifiCorp's Trojan Nuclear Decommissioning Trust. Therefore, no additional amount remains to be collected in respect of PacifiCorp's share of ISFSI radiological decommissioning costs.

Contact information for this Certification of Financial Assurance by PacifiCorp is as follows:

Licensee Name:	PacifiCorp
License Number:	SNM-2509
Docket Number:	72-017

Issuer: PacifiCorp
825 NE Multnomah Street
Portland, Oregon 97232
Attn: Mahendra B. Shah, Director, Treasury
Phone: 503-813-6390

Trustee: State Street Bank and Trust Company
1200 Crown Colony Drive, CC5
Quincy, MA 02169
Attn: Mark Curran, Vice President
Phone: 617-537 0966

Date: November 24, 2015

PACIFICORP

By: ______________________
Name: Mahendra B. Shah
Title: Director, Treasury