Pacific Gas and Electric Company®

Maureen R. Zawalick
Vice President
Decommissioning and
Technical Services

Diablo Canyon Power Plant
Mail code 104/6/608
P.O. Box 56
Avila Beach, CA 93424

805.545.4242
Internal: 691.4242

PG&E Letter DIL-22-003

ATTN: Document Control Desk
Director, Division of Spent Fuel Management,
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

10 CFR 72.42

Docket No. 72-26, Materials License No. SNM-2511
Diablo Canyon Independent Spent Fuel Storage Installation
License Renewal Application for the Diablo Canyon Independent Spent Fuel Storage Installation

References:

1. NUREG-1927, Revision 1, "Standard Review Plan for Renewal of Specific Licenses and Certificates of Compliance for Dry Storage of Spent Nuclear Fuel," June 2016 (ML16179A148)

2. Regulatory Guide 3.76, Revision 0, "Implementation of Aging Management Requirements for Spent Fuel Storage Renewals," July 2021 (ML21098A022)

Dear Commissioners and Staff:

Pursuant to 10 CFR 72.42, Pacific Gas and Electric Company (PG&E) submits the attached application for renewal of the Diablo Canyon (DC) site-specific Independent Spent Fuel Storage Installation (ISFSI) License SNM-2511. The current license expires March 22, 2024. The application requests that this license be renewed for an additional 40 years beyond the current expiration date. The License Renewal Application (LRA) format and content are based on 10 CFR Part 72 and the guidance contained in References 1 and 2.

The Enclosure contains DC ISFSI Site-Specific LRA, Revision 0.

PG&E requests a 180-day implementation period after receiving the renewed license so that applicable program and procedure changes can be completed.

PG&E makes no new or revised regulatory commitments (as defined by NEI 99-04) in this letter.

If you have any questions or require additional information, please contact Mr. Philippe Soenen at 805-459-3701.

I state under penalty of perjury that the foregoing is true and correct.

Executed on March 9, 2022.

Sincerely,

Maureen R. Zawalick
Vice President, Decommissioning and Technical Services

Enclosure

cc:	Diablo Distribution
cc/enc:	William C. Allen, NMSS Project Manager
	Neil H. Day, Acting NRC Senior Resident Inspector
	Donald C. Habib, NMSS Project Manager
	Chris Markley, NMSS Project Manager
	Scott A. Morris, NRC Region IV Administrator
	Gonzalo L. Perez, California Department of Public Health

Diablo Canyon Independent Spent Fuel Storage Installation Site-Specific License Renewal Application, Revision 0

Diablo Canyon
Independent Spent Fuel Storage Installation
Site-Specific License Renewal Application

Pacific Gas and Electric Company

Revision 0 March 2022

NRC Docket No. 72-26

ACRONYMS AND ABBREVIATIONS

AB	Auxiliary Building
ACI	American Concrete Institute
ALARA	As Low As Reasonably Achievable
AISI	American Iron and Steel Institute
AMID	Aging Management Institute of Nuclear Power Operations Database
AMP	Aging Management Program
AMR	Aging Management Review
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
CAP	Corrective Action Program
CFR	Code of Federal Regulations
CISCC	Chloride-Induced Stress Corrosion Cracking
CLB	Current Licensing Basis
cm	Centimeters
CO	Confinement
CoC	Certificate of Compliance
CPUC	California Public Utilities Commission
CR	Criticality Control (Intended Function)
CTF	Cask Transfer Facility
DC	Diablo Canyon
DCPP	Diablo Canyon Power Plant
DFC	Damaged Fuel Container
DOE	U.S. Department of Energy
EPRI	Electric Power Research Institute
FHB	Fuel Handling Building
ft	Feet
GTCC	Greater Than Class C
GWd/MTU	Gigawatt-Days per Metric Ton Uranium

HBU	High Burnup
HDRP	HBU Dry Storage Cask Research and Development Project
ISFSI	Independent Spent Fuel Storage Installation
ISG	Interim Staff Guidance
ITS	Important To Safety
kW	Kilowatts
LPT	Low-Profile Transporter
LR	License Renewal
LRA	License Renewal Application
MAPS	Managing Aging Processes in Storage
MPC	Multi-Purpose Canister
N/A	Not Applicable
n/cm^2	Neutrons Per Square Centimeter
NDE	Nondestructive Examination
NEI	Nuclear Energy Institute
NITS	Not Important To Safety
No.	Number
NRC	Nuclear Regulatory Commission
OE	Operating Experience
PEO	Period of Extended Operation
PG&E	Pacific Gas and Electric Company
ppm	Parts Per Million
psig	Pounds per square inch gauge
QA	Quality Assurance
RE	Retrievability (Intended Function)
SCC	Stress Corrosion Cracking
SFA	Spent Fuel Assembly
SFSC	Spent Fuel Storage Cask
SH	Radiation Shielding (Intended Function)

SR	Structural Support (Intended Function)
SSC	Structure, System, and Component
TH	Heat Transfer (Intended Function)
TLAA	Time-Limited Aging Analysis
TS	Technical Specifications
UFSAR	Updated Final Safety Analysis Report
μm	Micrometers

TABLE OF CONTENTS

LIST OF TABLES

1.0 GENERAL INFORMATION

In accordance with the requirements of Title 10 of the Code of Federal Regulations (10 CFR) Part 72, Pacific Gas and Electric Company (PG&E) has prepared this application for renewal of the site-specific license for the Diablo Canyon (DC) Independent Spent Fuel Storage Installation (ISFSI). This application supports license renewal (LR) for an additional 40-year period beyond the end of the current license term of Materials License Number SNM-2511 (Docket Number [No.] 72-26). The original 20-year license will expire on March 22, 2024. This application is submitted in accordance with 10 CFR 72.42(b) and includes the general, technical, financial, and environmental supporting information required by applicable portions of Subpart B of 10 CFR Part 72.

The information contained in this section includes:

1. information on the organization of the application (Section 1.1),
2. a general description of the DC ISFSI facility (Section 1.2),
3. the administrative information required by 10 CFR 72.22 (Section 1.3),
4. summary of the financial assurance for decommissioning (Section 1.4),
5. summary of abbreviations and intended function code definitions (Section 1.5), and
6. a list of the references for Section 1.0, General Information (Section 1.6).

1.1 Application Format and Content

The application format and content are based on 10 CFR 72 (Reference 1.6.1) and the guidance contained in NUREG-1927, “Standard Review Plan for Renewal of Specific Licenses and Certificates of Compliance for Dry Storage of Spent Nuclear Fuel,“ (Reference 1.6.2) and Nuclear Energy Institute (NEI) 14-03 as endorsed by Regulatory Guide 3.76 (Reference 1.6.3). The format and content include:

1. General Information – Section 1.0 has been expanded beyond the requirements of 10 CFR 72.22 to provide (1) information on the format and content of the application, (2) a general facility description, (3) financial assurance for decommissioning, and (4) a summary of abbreviations and intended function code definitions used in the application.
2. Scoping Evaluations – Section 2.0 provides the scoping evaluations for the ISFSI systems, structures, and components (SSCs).
3. Aging Management Reviews (AMRs) – Section 3.0 includes the methodology and results of the AMRs performed for site-specific ISFSI SSCs that are in-scope of LR.
4. Time-Limited Aging Analyses (TLAAs) – Section 4.0 includes the methodology and results of the TLAA review for ISFSI SSCs that are in-scope of LR.
5. Appendices:
   Appendix A: Aging Management Programs

Appendix B: Granted Exemptions
Appendix C: Proposed License Changes
Appendix D: DC ISFSI Updated Final Safety Analysis Report (UFSAR) Supplement and Changes (including 10 CFR 72.48 changes since the last biennial update)
Appendix E: Pre-Application Inspection Report
Appendix F: Environmental Report Supplement
Appendix G: DC ISFSI Decommissioning Funding Plan

1.2 Facility Description

The DC ISFSI consists of the storage pads, a cask transfer facility (CTF), an onsite cask transporter, and the dry cask storage system. The dry cask storage system is the Holtec International (Holtec) HI-STORM™ 100 System (referred to HI-STORM 100 herein). The HI-STORM 100 System is comprised of a multi-purpose canister (MPC), the HI-STORM 100SA storage overpack, and the HI-TRAC transfer cask. The DC ISFSI is designed to hold up to 140 storage casks (138 casks plus 2 spare locations). The physical characteristics of the spent fuel assemblies (SFAs) to be stored are described in Section 3.2.

The ISFSI is located on the same property as the existing Diablo Canyon Power Plant (DCPP) which is owned and operated by PG&E. The ISFSI is an interim facility where the spent fuel will be stored until it is transported off-site to a licensed facility.

1.3 Information Required by 10 CFR 72.22

1.3.1 Name of Applicant

PG&E is the applicant and hereby applies for renewed Materials License Number SNM-2511 (Docket No. 72-26) for the DC ISFSI.

PG&E is a wholly owned subsidiary of PG&E Corporation.

1.3.2 Address of Applicant

The principal executive offices of PG&E Corporation and PG&E are located at 77 Beale Street, P.O. Box 770000, San Francisco, California, 94177.

1.3.3 Address of the DC ISFSI

The address for PG&E at DCPP is:

Pacific Gas and Electric Company
Diablo Canyon Power Plant
P.O. Box 56
Avila Beach, CA 93424

1.3.4 Description of Business or Occupation of Applicant

PG&E is an operating public utility primarily regulated by the California Public Utilities Commission (CPUC) and engaged principally in the business of providing electric and natural gas services throughout most of northern and central California.

PG&E Corporation was incorporated in 1995 and became the holding company for PG&E and its subsidiaries on January 1, 1997. PG&E Corporation is headquartered in San Francisco, California. PG&E Corporation is an energy-based holding company that conducts its business principally through PG&E Company.

1.3.5 Organization and Management of Applicant

The DC ISFSI is owned by PG&E.

PG&E is a wholly owned subsidiary of PG&E Corporation, which is organized and exists under the laws of the State of California. Its principal office is located in San Francisco, California at the address stated above. PG&E is not foreign owned, controlled, or dominated by an alien, a foreign, corporation, or foreign government. PG&E is not acting as an agent or representative of any other person.

The directors and principal officers of PG&E Corporation, as of January 1, 2022, are presented below. All persons listed are U. S. citizens and may be contacted at the following address:

77 Beale St.
P.O. Box 770000
San Francisco, CA 94177

PG&E Corporation Board of Directors

Patricia K. Poppe
Rajat Bahri
Cheryl F. Campbell
Kerry W. Cooper
Jessica L. Denecour
Admiral Mark E. Ferguson III
Robert C. Flexon
W. Craig Fugate
Arno L. Harris
Michael R. Niggli
Dean L. Seavers
William L. Smith
Benjamin F. Wilson

PG&E Corporation Officers	
Name	**Title**
Patricia K. Poppe	Chief Executive Officer
Julius Cox	Executive Vice President, People, Shared Services and Supply Chain
Chris Foster	Executive Vice President and Chief Financial Officer
Carla Peterman	Executive Vice President, Corporate Affairs and Chief Sustainability Officer
John R. Simon	Executive Vice President, General Counsel, and Chief Ethics and Compliance Officer
Sumeet Singh	Senior Vice President and Chief Risk Officer
Ajay Waghray	Senior Vice President and Chief Information Officer
Mari Becker	Vice President and Treasurer
Stephen J. Cairns	Vice President and Chief Audit Officer
David S. Thomason	Vice President and Controller
Brian M. Wong	Vice President, Deputy General Counsel and Corporate Secretary

1.3.6 Financial Qualifications of PG&E

PG&E 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). The source of funds to operate the DC ISFSI until the DCPP Unit 1 permanent shutdown in November 2024 is the General Rate

Case process regulated by the CPUC to set customer rates. The most-recent General Rate Case application to the CPUC was submitted in June 2021 and includes an ISFSI funding request into 2025 (Reference 1.6.4). As shown in Reference 1.6.5 (see page WP 3-50, item 5040889), estimated operating and maintenance costs are approximately $12.1 million for 2024 and $8.3 million for 2025. The source of funds to operate and decommission the DC ISFSI starting in November 2024 of the renewed license period will include the PG&E Decommissioning Trust Fund, which is regulated by the CPUC and Nuclear Regulatory Commission (NRC). On a nominal three-year frequency, PG&E submits an updated funding request (termed the Nuclear Decommissioning Cost Triennial Proceeding) to the CPUC for the PG&E Decommissioning Trust Fund. The most-recent CPUC funding request was submitted in December 2021 (Reference 1.6.6). The Irradiated Fuel Management Plan was submitted to the NRC in 2019 (Reference 1.6.7). As shown in the Irradiated Fuel Management Plan, Table 1, estimated operating and maintenance costs for November 2024 through August 2067 are $1.13 billion or approximately $26.2 million annually (in 2019 dollars).

The Irradiated Fuel Management Plan assumes the Department of Energy (DOE) will complete transfer of spent fuel from the DC ISFSI in 2067. PG&E will continue to request additional funding through the CPUC Nuclear Decommissioning Cost Triennial Proceeding process if the DOE transfer date is delayed.

1.4 Financial Assurance for Decommissioning (10 CFR 72.30)

Pursuant to 10 CFR 72.30(a) and (b), a decommissioning funding plan for the ISFSI was submitted to the NRC in PG&E's original application for a materials license on December 21, 2001 (Reference 1.6.8). The basic elements of the plan, i.e., shipping of the fuel to an off-site licensed facility and decontamination and disposal of the dry storage casks, remain unchanged. The actual activities at the time of decommissioning will be dependent upon the regulations and practices in effect at that time. Discussion of decommissioning of the DC ISFSI is contained in Section 4.6 of the DC ISFSI UFSAR (Reference 1.6.9).

10 CFR 72.30(c) requires each holder of a license under Part 72 to resubmit the decommissioning funding plan at the time of LR and at intervals not to exceed three (3) years with adjustments as necessary to account for changes in costs and the extent of contamination. In accordance with 10 CFR 72.30(c), Appendix G provides PG&E’s update to the DC ISFSI decommissioning funding plan at the time of LR. PG&E submitted its most recent decommissioning funding plan for the DC ISFSI on December 14, 2021 (Reference 1.6.10).

1.5 Abbreviations and Intended Function Code Definitions

1.5.1 Abbreviations

The acronyms and abbreviations that pertain to the administrative and technical information in this application, as well as Appendix A through Appendix E and Appendix G, are listed prior to the Table of Contents.

1.5.2 Intended Function Code Definitions

This section contains the meanings for the subcomponent intended function represented by the abbreviations used in subsequent sections of this application, including Table 2-2 through Table 2-8 and Table 3-2 through Table 3-8. Subcomponent intended functions are the specific functions that support the intended function of the structure and component of which they are a part.

Intended Function Code	Definition
CO	Directly or indirectly maintains the MPC pressure boundary (confinement)
CR	Provides criticality control of spent fuel
SH	Provides radiation shielding
SR	Provides structural support and/or functional support, missile shielding, and/or maintains geometry to support retrievability of important to safety equipment (structural integrity)
TH	Provides heat transfer
RE	Provides function to support retrievability

1.6 Section 1.0 References

1.6.1 10 CFR 72, Licensing Requirements for the Independent Storage of Spent Nuclear Fuel, High-Level Radioactive Waste, and Reactor-Related Greater Than Class C Waste.

1.6.2 NUREG-1927, Revision 1, Standard Review Plan for Renewal of Specific Licenses and Certificates of Compliance for Dry Storage of Spent Nuclear Fuel, Nuclear Regulatory Commission, Office of Nuclear Material Safety and Safeguards, June 2016. ADAMS Accession No. ML16179A148.

1.6.3 Regulatory Guide 3.76, Revision 0, Implementation of Aging Management Requirements for Spent Fuel Storage Renewals, July 2021. ADAMS Accession No. ML21098A022.

1.6.4 2023 General Rate Case Application of Pacific Gas and Electric Company (U 39 M) Proceeding Number A2106021. Available online at http://pgera.azurewebsites.net/Regulation/ValidateDocAccess?docID=660454.

1.6.5 2023 General Rate Case Exhibit (PG&E-5) Energy Supply. Workpapers Supporting Prepared Testimony Chapters 2-4, Volume 1 of 2 (Public). June 30, 2021. Available under case "GRC 2023 Ph I [A.21-06-021]" online at http://pgera.azurewebsites.net/Regulation/.

1.6.6 Application of Pacific Gas and Electric Company in the 2021 Nuclear Decommissioning Cost Triennial Proceeding. December 14, 2021. Available under case "Nuclear Decommissioning Cost Triennial Proceeding [A.21-12-007]" online at http://pgera.azurewebsites.net/Regulation/.

1.6.7 PG&E Letter DCL-19-081, "Diablo Canyon Power Plant, Units 1 and 2 Irradiated Fuel Management Plan," December 4, 2019. ADAMS Accession No. ML19338F260.

1.6.8 PG&E Letter DIL-01-002, "License Application for Diablo Canyon Independent Spent Fuel Storage Installation," December 21, 2001. A portion of the submittal is available at ADAMS Accession No. ML020180153.

1.6.9 PG&E Letter DIL-21-004, "Biennial Submittal of Diablo Canyon Independent Spent Fuel Storage Installation Updated Final Safety Analysis Report," Revision 9, December 15, 2021. ADAMS Accession No. ML21349B166.

1.6.10 PG&E Letter DIL-21-010, "Diablo Canyon Independent Spent Fuel Storage Installation, Decommissioning Funding Plan," December 14, 2021. ADAMS Accession No. ML21348A772.

2.0 SCOPING EVALUATIONS

2.1 Introduction

The DC ISFSI LR process and methodology follows the guidance contained in NUREG-1927, “Standard Review Plan for Renewal of Spent Fuel Dry Cask Storage System Licenses and Certificates of Compliance” (Reference 2.4.1). The 10 CFR 72 LR process, as described in NUREG-1927, follows the principle that the basis for renewal of the license depends on “the continuation of the existing licensing basis throughout the period of extended operation (PEO) and on the maintenance of the intended functions of the SSCs important to safety” (Reference 2.4.1). Based on these principles, LR is not intended to impose requirements beyond those reflected in the current licensing basis (CLB). Therefore, the CLB for the DC ISFSI will be carried forward through the PEO.

The scoping process involves identification of the SSCs of the ISFSI and their subcomponents that are within the scope of LR, and thus require evaluation for the effects of aging. A description of the scoping process is provided in Section 2.2, Scoping Methodology, and the results are provided in Section 2.3, Scoping Results.

2.2 Scoping Methodology

The first step in the LR process involves the identification of the in-scope ISFSI SSCs. The scoping criteria used for this scoping evaluation are defined in NUREG-1927 and are based upon the important to safety (ITS) Quality Assurance (QA) classification system. ISFSI SSCs are considered in-scope if their safety function(s) meet either of the following Scoping Criteria:

Criterion 1

The SSC is classified as ITS as it is relied on to do one of the following functions:

a. maintain the conditions required by the regulations, specific license, or Certificate of Compliance (CoC) to store spent fuel safely.
b. prevent damage to the spent fuel during handling and storage.
c. 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 ITS functions are met for: (1) confinement, (2) radiation shielding, (3) sub-criticality control, (4) heat-removal capability, (5) structural integrity, and (6) retrievability.[1]

Criterion 2

The SSC is classified as not ITS (NITS) but, according to the design bases, their failure could prevent fulfillment of a function that is important to safety.

The ISFSI SSCs that meet the Scoping Criteria are presented in Section 2.3, Scoping Results.

[1] The scoping evaluation in this application was completed using the retrievability definition as defined in ISG-2, Fuel Retrievability, Revision 2.

A basic premise of the LR scoping process is that the CLB identifies SSCs and their functions. Thus, the CLB is reviewed to determine those SSCs with safety functions that meet either Scoping Criterion 1 or 2, as defined above. The following documents comprise the CLB for the DC ISFSI:

- DC ISFSI UFSAR (Reference 2.4.2) and associated 10 CFR 72.48 changes since the last update
- Materials License No. SNM-2511 (Reference 2.4.3)
- Technical Specifications (TS) (Reference 2.4.3, Appendix A)
- Docketed Licensing Correspondence (see Docket No. 72-26)

The DC ISFSI UFSAR provides a description of the ISFSI, ISFSI SSCs, and their functions, including safety classifications as established by the safety analyses. The TS govern the safety of the receipt, possession, and storage of irradiated nuclear fuel at the ISFSI, and the transfer of such irradiated fuel to and from the ISFSI. Additionally, the Safety Evaluation Report (Reference 2.4.4), which summarizes the results of the NRC Staff's safety review of the original licensing, and the Safety Evaluation Reports associated with subsequent amendments were used in the LR scoping process.

2.3 Scoping Results

The DC ISFSI consists of the storage pads, a CTF, an onsite cask transporter, and the HI-STORM 100 dry cask storage system. The HI-STORM 100 System is comprised of an MPC, the HI-STORM 100SA overpack, and the HI-TRAC 125D transfer cask. The DC ISFSI is designed to hold up to 140 storage casks (138 casks plus two spare locations). The DC ISFSI is licensed to store spent fuel, including high burnup (HBU) fuel. The DC ISFSI is not licensed to store greater than Class C (GTCC) waste. (Reference 2.4.2, Section 1.1)

A brief, general description of the major SSCs is provided in the paragraphs that follow. Further description of each HI-STORM 100 System SSC is provided in the DC ISFSI UFSAR, Section 4.2. More details on the storage pads, CTF, and transporter are provided in DC ISFSI UFSAR, Sections 4.2 through 4.4.

The MPC is an integrally-welded pressure vessel that holds up to 24 or 32 DCPP SFAs. The MPCs are welded cylindrical structures consisting of a honeycomb-shaped fuel basket, a baseplate, canister shell, a lid, and a closure ring. A loaded MPC is stored on the DC ISFSI storage pads within the HI-STORM 100SA overpack in an anchored vertical orientation. The overpack is a rugged, heavy-walled cylindrical container. (Reference 2.4.2, Section 1.3)

The HI-TRAC 125D transfer cask provides an internal, cylindrical cavity of sufficient size to house an MPC during loading, unloading, and movement of the MPC from the spent fuel pool to the overpack. (Reference 2.4.2, Section 1.3)

A transporter is used to move the transfer cask/MPC assembly from outside the power plant to the CTF, which is adjacent to the ISFSI storage pads. The CTF is designed to contain an overpack partially below grade to facilitate the transfer of a loaded MPC from the HI-TRAC 125D transfer cask to the overpack. The transporter also transfers the MPC to the overpack at the CTF, and then moves the loaded overpack to the storage pads. The transporter is a U-shaped tracked vehicle that permits the transfer cask/MPC assembly and the loaded overpack to be handled vertically. (Reference 2.4.2, Section 1.3)

The loaded overpacks are stored on a series of concrete storage pads within a protected area separate from that of DCPP. Each storage pad is designed to accommodate up to 20 loaded overpacks in a 4-by-5 array. (Reference 2.4.2, Section 1.3)

The SSCs comprising the DC ISFSI are identified in Table 2-1, Scoping Results. Those SSCs meeting Scoping Criterion 1 or 2 are identified in the table as being within the scope of LR, except as noted.

As indicated in Table 2-1, only the SFAs, MPC, transfer cask, HI-STORM 100 SA overpack, cask transportation system, ISFSI storage pads, and CTF were determined to be within the scope of LR and to require further review in the AMR process.

The intended functions[2] performed by the individual subcomponents of these in-scope SSCs are identified in Table 2-2 through Table 2-8. SSC sub-components were identified by review of licensing documents and fabrication drawings.

[2] The intended functions provided in this application are those that support the long-term configuration of the subject SSC.

Table 2-1 Scoping Results

Structures/Components	Criterion 1	Criterion 2	In-Scope
Spent Fuel Assemblies	Yes	N/A	Yes
MPC[a]	Yes	N/A	Yes
HI-TRAC 125D Transfer Cask	Yes	N/A	Yes
HI-STORM 100SA Overpack[b]	Yes	N/A	Yes
Cask Transportation System[c]	Yes	N/A	Yes
ISFSI Storage Pads	Yes	N/A	Yes
CTF[d]	Yes	N/A	Yes
Helium Fill Gas	Yes	N/A	No[e]
Fuel Debris	No	No	No
Security Systems	No	No	No
Fencing	No	No	No
Lighting	No	No	No
Electrical Power	No	No	No
Communications Systems	No	No	No
Automated Welding System	No	No	No
MPC Helium Backfill System	No	No	No
MPC Forced Helium Dehydration System	No	No	No
Rockfall Fence	No	No[f]	No
Rock-bolted Cut-slope	No	No[f]	No
Supplemental Cooling System	No	No[g]	No

Notes:

a. Includes, but is not limited to the fuel basket, fuel spacers, and damaged fuel container (DFC).
b. Includes, but is not limited to the overpack anchorage hardware.
c. Includes, but is not limited to the low-profile transporter (LPT), cask transporter; HI-TRAC lift links; transporter connector pins; MPC lift cleats; MPC downloader slings; HI-STORM 100 lifting brackets; and HI-STORM 100 mating device, bolts, and shielding.
d. Includes, but is not limited to the lateral restraints.
e. The helium fill gas is the actual gas used to backfill the MPCs during initial loading. It is listed as ITS to ensure the quality and purity prior to loading and is credited for the long-term environment used to determine aging.
f. As discussed in DC ISFSI UFSAR, Section 4.2.1.1.9.2, in the unlikely event that rock blocks are completely dislodged from the cut-slope face, the midslope bench width and offset distance from the slope base to the ISFSI pads are sufficient to accommodate the largest rock blocks. Therefore, failure of the rockfall fence or rock-bolted cut slope would not prevent fulfillment of an ITS function.
g. As discussed in DC ISFSI UFSAR, Section 8.2.17, failure of the supplemental cooling system was evaluated and determined it's "failure does not affect the safe operation of the HI-STORM 100 System."

N/A – Not Applicable
Reference: DC ISFSI UFSAR, Table 4.5-1

Table 2-2 Intended Functions of Spent Fuel Assemblies Subcomponents

Subcomponent	Part Number	Reference Drawing[a]	Intended Function[b]
Bottom and Top Nozzles	1, 2	6006510-8, 9, 10, 16, 24, 27, 30, 39, 41, 47, 50, 52, 54, 59, 79, 92, 108, 112, 118, 128, 157, 163	CR, RE, SR
Nozzle Spring Set	3	6006510-8, 9, 10, 16, 24, 27, 30, 39, 41, 47, 50, 52, 54, 59, 79, 92, 108, 112, 118, 128, 157, 163	CR, RE, SR
Guide Thimble	4	6006510-8, 9, 10, 16, 24, 27, 30, 39, 41, 47, 50, 52, 54, 59, 79, 92, 108, 112, 118, 128, 157, 163	CR, RE, SR
Grid Assembly	5, 7, 8, 9	6006510-8, 9, 10, 16, 24, 27, 30, 39, 41, 47, 50, 52, 54, 59, 79, 92, 108, 112, 118, 128, 157, 163	CR, RE, SR, TH
Instrumentation Tube	6	6006510-8, 9, 10, 16, 24, 27, 30, 39, 41, 47, 50, 52, 54, 59, 79, 92, 108, 112, 118, 128, 157, 163	CR, RE, SR
Fuel Tube and End Plugs (Cladding)	1, 3, 5	6006510-12, 13, 15, 17, 18, 19, 20, 25, 26, 28, 29, 33, 40, 42, 46, 48, 51, 53, 55, 59, 60, 80, 89, 91, 93, 109, 111, 113, 115, 119, 129, 131, 158, 164	CO, CR, RE, SH, SR, TH
Fuel Tube Spring	4	6006510-12, 13, 15, 17, 18, 19, 20, 25, 26, 28, 29, 33, 40, 42, 46, 48, 51, 53, 55, 59, 60, 80, 89, 91, 93, 109, 111, 113, 115, 119, 129, 131, 158, 164	CR, RE, SR
Poison Rod Assemblies	N/A	6006510-11, 21, 22	CR

Notes:

a. Drawing 6006510 is not docketed, but is available at the DC ISFSI for NRC review.

b. Intended Functions: Confinement (CO), Sub-criticality (CR), Radiation Shielding (SH), Structural Integrity (SR), Thermal/Heat Removal (TH), Retrievability (RE)

Table 2-3 Intended Functions of Multi-Purpose Canister Subcomponents

Subcomponent	Part Number[b]	Reference Drawing[a]	Intended Function[e]	ITS Category[d]
Baseplate	1	6021754-4, 145, 149 and UFSAR Figure 4.2-13	CO, SH, SR, TH	ITS-A
Shell Bottom	2	6021754-4, 145, 149 and UFSAR Figure 4.2-13	CO, SH, SR, TH	ITS-A
Drain Tube Plate	3	6021754-4, 145, 149 and UFSAR Figure 4.2-13	None[c]	NITS
Drain Guide Tube	4	6021754-4, 145, 149 and UFSAR Figure 4.2-13	None[c]	NITS
Lift Lug Base Plate	5	6021754-4, 145, 149	SR	ITS-C
Lift Lug	6	6021754-4, 145, 149 and UFSAR Figure 4.2-13	SR	ITS-C
Lift Lug Shim	7	6021754-4, 145, 149	None[c]	NITS
Lid	8	6021754-4, 145, 149 and UFSAR Figure 4.2-13	CO, SH, SR, TH	ITS-A
Closure Ring	9	6021754-4, 145, 149 and UFSAR Figure 4.2-13	CO, SH, SR, TH	ITS-A
Drain and Vent Shield Blocks	10, 16	6021754-4, 145, 149 and UFSAR Figure 4.2-13	SH	ITS-C
Vent Drain Tube	11, 11A	6021754-4, 145, 149 and UFSAR Figure 4.2-13	SR	ITS-C
Vent Drain Cap	12, 12A	6021754-4, 145, 149 and UFSAR Figure 4.2-13	SR	ITS-C
Port Cover Plate	13	6021754-4, 145, 149 and UFSAR Figure 4.2-13	CO	ITS-A
Coupling	14	6021754-4, 145, 149	None[c]	NITS
Drain Line	15	6021754-4, 145, 149 and UFSAR Figure 4.2-13	None[c]	NITS
Vent Shield Spacer	17	6021754-4, 145, 149 and UFSAR Figure 4.2-13	SR	ITS-C
Seal Washer	18	6021754-4, 145, 149	None[c]	NITS
Seal Bolt	19	6021754-4, 145, 149	None[c]	NITS
Port Cover Bolt	20	6021754-4, 145, 149	CO	NITS
Lid Channels	21, 22, 23	6021754-4, 145, 149 and UFSAR Figure 4.2-13	SR	ITS-B
Lid Base Plate	24	6021754-4, 145, 149 and UFSAR Figure 4.2-13	SR	ITS-B
Lid Tube Support	25	6021754-4, 145, 149	SR	ITS-B
Upper Fuel Spacer Bolt	27	6021754-4, 145, 149 and UFSAR Figure 4.2-13	None[c]	NITS
Basket Support Plate	28, 31, 32	6021754-4, 145, 149 and UFSAR Figure 4.2-13	SR, CR	ITS-A
Basket Shim	29	6021754-4, 145, 149	SR, CR	ITS-A
Basket Block	30	6021754-4, 145, 149 and UFSAR Figure 4.2-13	None[c]	NITS
SQ Shim	33	6021754-4, 145	None[c]	NITS

Table 2-3 Intended Functions of Multi-Purpose Canister Subcomponents

Subcomponent	Part Number[b]	Reference Drawing[a]	Intended Function[e]	ITS Category[d]
Lid Lift Hole Plug	34	6021754-4, 145, 149	SH	NITS
Shell Top	35	6021754-4, 145, 149 and UFSAR Figure 4.2-13	CO, SH, SR, TH	ITS-A
Lid Shim	36	6021754-4, 140, 145, 149	None[c]	NITS
Spacer Hole Plug	37	6021754-4, 145, 149	None[c]	NITS
Lid Lift Plug	38	6021754-4, 145, 149	None[c]	NITS
Seal Lock Washer	39, 41, 42	6021754-4, 145, 149	None[c]	NITS
Vent Plug	40	6021754-145, 149 and UFSAR Figure 4.2-13	SR	ITS-C
Wedge/Anti-Rotation Bar	43	6021754-145, 149	None[c]	NITS
Lower Fuel Spacer Top and Beam	44, 45	6021754-149 and UFSAR Figure 4.2-13	SR	ITS-B
Basket Cell Plates, Spacer Plates, and Sheathing	1A, 1B, 2, 4, 4A, 5	6021754-3, 144, 148 and UFSAR Figure 4.2-14	CR, SH, SR, TH	ITS-A
Basket Neutron Absorber	3, 6	6021754-3 and UFSAR Figure 4.2-14	CR, SH, TH	ITS-A
Optional Heat Conduction Elements (MPC-24/24E/24EF Only)	N/A	HI-STORM 100 CoC FSAR, Figure 1.2.4	TH	ITS
Flux Gap Plate and Cover (MPC-24/24E/24EF Only)	N/A	HI-STORM 100 CoC FSAR, Figure 1.2.4	CR	ITS
DFC	N/A	HI-STORM 100 CoC FSAR, Section 2.1.3 and Figure 2.1.2B	CR, SR	ITS-C

Notes:

a. Drawing 6021754 is not docketed, but is available at the DC ISFSI for NRC review.
b. Part number 26 from the referenced drawings is not used, and thus, is not included in the above table.
c. None – These sub-components have no ITS intended function and their failure would not affect an ITS function, and are, therefore, screened out of the scope of license renewal.
d. ITS categories are defined in DC ISFSI UFSAR, Section 4.5: ITS-A, critical to safe operation; ITS-B, major impact on safety; and ITS-C, minor impact on safety.
e. Intended Functions: Confinement (CO), Sub-criticality (CR), Radiation Shielding (SH), Structural Integrity (SR), Thermal/Heat Removal (TH), Retrievability (RE)

Table 2-4 Intended Functions of HI-TRAC 125D Transfer Cask Subcomponents

Subcomponent	Part Number	Reference Drawing[a]	Intended Function[d]	ITS Category[c]
Bottom Flange	1	6021754-1 and UFSAR Figure 4.2-8	SR, SH	ITS-B
Inner Shell	2, 3	6021754-1 and UFSAR Figure 4.2-8	SH, SR, TH	ITS-B
Outer Shell	4, 5	6021754-1 and UFSAR Figure 4.2-8	SH, SR, TH	ITS-B
Top Flange	6	6021754-1 and UFSAR Figure 4.2-8	SR, SH	ITS-B
Lead Plug	7	6021754-1	SR, SH	ITS-C
Trunnion Block	8	6021754-1 and UFSAR Figure 4.2-8	SR	ITS-B
Trunnion	9	6021754-1 and UFSAR Figure 4.2-8	SR	ITS-A
Flange Brace	10	6021754-1	SR, SH	ITS-B
Water Jacket Top and Bottom Plates	11, 14, 15, 16, 17	6021754-1 and UFSAR Figure 4.2-8	SH, SR, TH	ITS-B
Water Jacket Ribs	12, 13	6021754-1 and UFSAR Figure 4.2-8	SH, SR, TH	ITS-B
Water Jacket Bottom Plate Support	18, 19	6021754-1 and UFSAR Figure 4.2-8	SH, SR, TH	ITS-B
Water Jacket Drain Pipe	20	6021754-1	None[b]	NITS
Water Jacket Drain Valve	21	6021754-1	None[b]	NITS
Water Jacket Outer Shell	22, 23, 24	6021754-1	SH, SR, TH	ITS-B
Water Jacket Coupling	25	6021754-1	None[b]	NITS
Water Jacket Elbow	26	6021754-1	None[b]	NITS
Water Jacket Pop Valve	27	6021754-1	None[b]	NITS
Shell Lead	28	6021754-1 and UFSAR Figure 4.2-8	SH, TH	ITS-B
Port Cover Plate	29	6021754-1	None[b]	NITS
Port Cover Screw	30	6021754-1	None[b]	NITS
Port Gasket	31	6021754-1	None[b]	NITS
Pool Lid Ring	32	6021754-1 and UFSAR Figure 4.2-8	SH, SR, TH	ITS-B
Pool Lid Lead	33	6021754-1 and UFSAR Figure 4.2-8	SH, TH	ITS-B
Pool Lid	34, 35	6021754-1 and UFSAR Figure 4.2-8	SH, SR, TH	ITS-B
Pool Lid Plug	36	6021754-1	None[b]	NITS
Pool Lid O-Ring	37	6021754-1	None[b]	NITS
Pool Lid Drain	38	6021754-1	None[b]	NITS
Pool Lid Washer	39	6021754-1	None[b]	NITS
Pool Lid Bolt	40	6021754-1	SR	ITS-B
Top Closure Lid	41	6021754-1 and UFSAR Figure 4.2-8	SR, SH	ITS-B

Table 2-4 Intended Functions of HI-TRAC 125D Transfer Cask Subcomponents

Subcomponent	Part Number	Reference Drawing[a]	Intended Function[d]	ITS Category[c]
Top Rings	42, 43	6021754-1 and UFSAR Figure 4.2-8	SR, SH	ITS-B
Top Lift Block	44	6021754-1 and UFSAR Figure 4.2-8	SR, SH	ITS-C
Top Lid Shielding	45	6021754-1	SH	ITS-B
Top Lid Plate	46	6021754-1 and UFSAR Figure 4.2-8	SR, SH	ITS-B
Top Lid Washer	47	6021754-1	None[b]	NITS
Top Lid Bolt	48	6021754-1	SR	ITS-B
Top Lid Plug	49	6021754-1	None[b]	NITS
Mating Device Washer	50	6021754-1	None[b]	NITS
Mating Device Bolt	51	6021754-1	SR	ITS-B

Notes:

a. Drawing 6021754 is not docketed, but is available at the DC ISFSI for NRC review.

b. None – These sub-components have no ITS intended function and their failure would not affect an ITS function, and are, therefore, screened out of the scope of LR.

c. ITS categories are defined in DC ISFSI UFSAR, Section 4.5: ITS-A, critical to safe operation; ITS-B, major impact on safety; and ITS-C, minor impact on safety.

d. Intended Functions: Confinement (CO), Sub-criticality (CR), Radiation Shielding (SH), Structural Integrity (SR), Thermal/Heat Removal (TH), Retrievability (RE)

Table 2-5 Intended Functions of HI-STORM 100SA Overpack Subcomponents

Subcomponent	Part Number[b]	Reference Drawing[a]	Intended Function[f]	ITS Category[e]
Shim Plate	1	6021754-103, 138, 151	SR	ITS-C
Shim	N/A	6021754-36 and UFSAR Figure 4.2-7	SR[d]	NITS
Base Bottom Plate	1	6021754-5, 102, 139, 143,146 150 and UFSAR Figure 4.2-7	SR	ITS-B
Cask Inner Shell	2, 3	6021754-5, 102, 139, 143,146 150 and UFSAR Figure 4.2-7	SH, SR	ITS-B
Cask Top and Bottom Guides	4, 5	6021754-5, 102, 139, 143,146 150 and UFSAR Figure 4.2-7	SR	ITS-B
Base Vent Side Plate	6	6021754-5, 102, 139, 143,146 150 and UFSAR Figure 4.2-7	SR	ITS-B
Base Top Plate	7	6021754-5, 102, 139, 143,146 150 and UFSAR Figure 4.2-7	SR	ITS-B
Vent Frame	8, 9, 13	6021754-5, 102, 139, 143,146 150 and UFSAR Figure 4.2-7	None[c]	NITS
Base Radial Rib	10	6021754-5, 102, 139, 143,146 150 and UFSAR Figure 4.2-7	SR	ITS-B
Cask Outer Shell	11, 12	6021754-5, 102, 139, 143,146 150 and UFSAR Figure 4.2-7	SH, SR	ITS-B
Cask Lid Radial Plate	14	6021754-5, 102, 139, 143,146 150 and UFSAR Figure 4.2-7	SR	ITS-B
Cask Lid Anchor Block	15	6021754-5, 102, 139, 143,146 150 and UFSAR Figure 4.2-7	SR	ITS-B
Cask Mating Device Radial Plate	16	6021754-5, 102, 139, 143,146 150 and UFSAR Figure 4.2-7	SR	ITS-B
Cask Mating Device Anchor Block	17	6021754-5, 102, 139, 143,146 150 and UFSAR Figure 4.2-7	SR	ITS-B
Cask Concrete Cavity Top Plate	18	6021754-5, 102, 139, 143,146 150 and UFSAR Figure 4.2-7	SR	ITS-B
Cask Strap Block	19	6021754-5, 102, 139, 143,146 150	None[c]	NITS
Vent Screen Stud and Nut	20, 22	6021754-5, 102, 139, 143,146 and UFSAR Figure 4.2-7	None[c]	NITS
Cask Name Plate	21	6021754-5, 102, 139, 143,146 150 and UFSAR Figure 4.2-7	None[c]	NITS
Cask Shielding Concrete	23	6021754-5, 102, 139, 143,146 150 and UFSAR Figure 4.2-7	SH	ITS-B
Pedestal Base Plate	24	6021754-5, 102, 139, 143,146 150 and UFSAR Figure 4.2-7	SH	ITS-B
Pedestal Shell	25	6021754-5, 102, 139, 143,146 150 and UFSAR Figure 4.2-7	SR	ITS-B
Pedestal Shielding	26	6021754-5, 102, 139, 143,146 150 and UFSAR Figure 4.2-7	SH	ITS-B
Pedestal Platform	27	6021754-5, 102, 139, 143,146 150 and UFSAR Figure 4.2-7	SH	ITS-B

Table 2-5 Intended Functions of HI-STORM 100SA Overpack Subcomponents

Subcomponent	Part Number[b]	Reference Drawing[a]	Intended Function[f]	ITS Category[e]
Pedestal Plug	28	6021754-5, 102, 139, 143,146 150	None	NITS
Lid Shear Ring	29	6021754-5, 102, 139, 143,146 150 and UFSAR Figure 4.2-7	SH, SR	ITS-B
Lid Shield Ring	30	6021754-5, 102, 139, 143,146 150 and UFSAR Figure 4.2-7	TH	ITS-B
Lid Outer Ring	31	6021754-5, 102, 139, 143,146 150 and UFSAR Figure 4.2-7	SH, SR	ITS-B
Lid Vent Duct	32	6021754-5, 102, 139, 143,146 150 and UFSAR Figure 4.2-7	None[c]	NITS
Lid Inner Ring	33	6021754-5, 102, 139, 143,146 150 and UFSAR Figure 4.2-7	SH, SR	ITS-B
Lid Stud Pipe	34	6021754-5, 102, 139, 143,146 150 and UFSAR Figure 4.2-7	None[c]	NITS
Lid Stud Ring	35	6021754-5, 102, 139, 143,146 150 and UFSAR Figure 4.2-7	None[c]	NITS
Lid Lift Block	36	6021754-5, 102, 139, 143,146 150 and UFSAR Figure 4.2-7	SR	ITS-B
Lid Lift Ring	37	6021754-5, 102, 139, 143,146 150	None[c]	NITS
Lid Vent Shield	38	6021754-5, 102, 139, 143,146 150	SH, SR	ITS-B
Lid Shielding Concrete	39	6021754-5, 102, 139, 143,146 150 and UFSAR Figure 4.2-7	SH	ITS-B
Lid Cover Plate	40	6021754-5, 102, 139, 143,146 150 and UFSAR Figure 4.2-7	SR	ITS-B
Lid Stud	42	6021754-5, 102, 139, 143,146 150 and UFSAR Figure 4.2-7	SR	ITS-B
Lid Stud Handle	43	6021754-5, 102, 139, 143,146 150 and UFSAR Figure 4.2-7	None[c]	NITS
Lid Stud Cap	45	6021754-5, 102, 139, 143,146 150 and UFSAR Figure 4.2-7	None[c]	NITS
Lid Lift Plug	46	6021754-5, 102, 139, 143,146 150 and UFSAR Figure 4.2-7	None[c]	NITS
Gamma Shield Cross Plates	47, 48, 50, 51	6021754-5, 102, 139, 143,146 150 and UFSAR Figure 4.2-7	SH	ITS-C
Lid Shim	49	6021754-5, 102, 139, 143,146 150	None[c]	NITS
Vent Screens, Washers, and Bolts	52, 53, 54, 60	6021754-5, 102, 139, 143,146 150 and UFSAR Figure 4.2-7	None[c]	NITS
Anchor Ring	55	6021754-5, 102, 139, 143,146 150 and UFSAR Figure 4.2-7	SR	ITS-B
Anchor Gusset	56	6021754-5, 102, 139, 143,146 150 and UFSAR Figure 4.2-7	SR	ITS-B

Table 2-5 Intended Functions of HI-STORM 100SA Overpack Subcomponents

Subcomponent	Part Number[b]	Reference Drawing[a]	Intended Function[f]	ITS Category[e]
Anchor Stud	57	6021754-5, 102, 139, 143,146 150 and UFSAR Figure 4.2-7	SR	ITS-B
Anchor Washer	58	6021754-5, 102, 139, 143,146 150 and UFSAR Figure 4.2-7	SR[d]	NITS
Anchor Nut	59	6021754-5, 102, 139, 143,146 150 and UFSAR Figure 4.2-7	SR	ITS-B
Anchor Cap	N/A	6021754-5, 102, 139, 143,146 150	None[c]	NITS

Notes:

a. Drawing 6021754 is not docketed, but is available at the DC ISFSI for NRC review.
b. Part numbers 41 and 44 from the referenced drawings are not used, and thus, are not included in the above table.
c. None – These sub-components have no ITS intended function and their failure would not affect an ITS function, and are, therefore, screened out of the scope of LR.
d. Although this component is NITS, its failure could impact the safety function of the anchor stud and nut, and is therefore screened in for LR.
e. ITS categories are defined in DC ISFSI UFSAR, Section 4.5: ITS-A, critical to safe operation; ITS-B, major impact on safety; and ITS-C, minor impact on safety.
f. Intended Functions: Confinement (CO), Sub-criticality (CR), Radiation Shielding (SH), Structural Integrity (SR), Thermal/Heat Removal (TH), Retrievability (RE)

Table 2-6 Intended Functions of Cask Transportation System Subcomponents

Subcomponent	Part Number[b]	Reference Drawing[a]	Intended Function[e]	ITS Category[d]
Cask Transporter				
Cask Restraint System (including Sling and Adjustable Cask Bumpers)	N/A	6021754-54, 76, 77, 85, 89, 118; 105882	SR, RE	ITS-B
Overhead Beam	N/A	6021754-54, 60, 61, 62, 63, 72, 73	SR, RE	ITS-B
Lift Towers (Structure) and Bolting	N/A	6021754-54, 67, 68, 69, 70, 71	SR, RE	ITS-B
Chassis (i.e., Vehicle Frame)	N/A	6021754-59, 65, 74, 77, 78, 79, 80	SR, RE	ITS-B
Wedge Lock Assembly	N/A	6021754-54, 97, 101, 106	SR, RE	ITS-B
Operator Station	N/A	6021754-54	None[c]	NITS
Personnel Ladders	N/A	6021754-54	None[c]	NITS
Fuel Tank	N/A	6021754-54	None[c]	NITS
Tow Eyes	N/A	6021754-54	None[c]	NITS
Adjustable Cask Bumpers	N/A	6021754-54	None[c]	NITS
Diesel Engine	N/A	6021754-54	None[c]	NITS
Hydraulic Reservoir	N/A	6021754-54	None[c]	NITS
Intertractor Track Assembly	N/A	6021754-54	None[c]	NITS
Hydraulic Cylinders	N/A	6021754-54	None[c]	NITS
Counterbalance Valves	N/A	6021754-54	None[c]	NITS
Seismic Tie Down Lugs	N/A	6021754-54, 79	SR, RE	ITS
HI-TRAC Lift Links	N/A	N/A	SR, RE	ITS-A
Connector Pins	N/A	6021754-23	SR, RE	ITS-B
MPC Downloader System				
Pulley Plates	1, 2, 9, 10, 21	6021754-34	SR, RE	ITS-B
Angle Bracket	3	6021754-34	None[c]	NITS
Pulley Shafts	4, 17	6021754-34	SR, RE	ITS-B
Pin Stop, Catch Plate, and Bolts	5, 6, 7, 8	6021754-34	None[c]	NITS
Cap Plate and Bolt	11, 12	6021754-34	None[c]	NITS
Grease Fitting	13	6021754-34	None[c]	NITS
O-Ring Cap	14	6021754-34	None[c]	NITS
Pipe and Spacer Pipes	15, 22, 23	6021754-34	None[c]	NITS
End Plate	16	6021754-34	None[c]	NITS
Seal Ring	18	6021754-34	None[c]	NITS
Roller Bearing and Set Screw	19, 20	6021754-34	None[c]	NITS
Low-Profile Transporter				
Main Beam Plates and Ribs	1, 2, 3, 4, 5	6021754-9	SR	ITS-B
Lateral Guide Mating Plate	6	6021754-9	SR	ITS-B
Tow Point Plate	7	6021754-9	None[c]	NITS
Roller Mating Plate	8	6021754-9	SR	ITS-B

Table 2-6 Intended Functions of Cask Transportation System Subcomponents

Subcomponent	Part Number[b]	Reference Drawing[a]	Intended Function[e]	ITS Category[d]
Lateral Guide Block	9	6021754-9	SR	ITS-B
Lateral Guide Bolt	10	6021754-9	None[c]	NITS
Pad and Support Gussets	11, 14	6021754-9	SR	ITS-B
Side and Base Plates	12, 13	6021754-9	SR	ITS-B
Roller	15	6021754-9	SR	ITS-C
Roller Pad	16	6021754-9	SR	ITS-B
Roller Bolts and Washers	17, 18	6021754-9	None[c]	NITS
Guide Pins	19, 22, 24	6021754-9	None[c]	NITS
HI-TRAC Mounting Washer	20	6021754-9	None[c]	NITS
HI-TRAC Mounting Bolt	21	6021754-9	SR	ITS-B
Guide Shim	23	6021754-9	None[c]	NITS
MPC Lift Cleats				
Body	1	6021754-11	SR, RE	ITS-A
Stud	2	6021754-11	SR, RE	ITS-A
Hexnut	3	6021754-11	SR, RE	ITS-A
Plate	4	6021754-11	None[c]	NITS
Nameplate	5	6021754-11	None[c]	NITS
Pan Head Screw	6	6021754-11	None[c]	NITS
MPC Downloader Slings				
MPC Downloader Slings	N/A	N/A	SR, RE	ITS-A
HI-STORM Lifting Bracket				
Plates	1	6021754-23	SR, RE	ITS-A
Connecting Pin	2	6021754-23	SR, RE	ITS-A
Connecting Pin Plate	3	6021754-23	None[c]	NITS
Spacer Bar, Hex Bolts, and Washers	4, 9, 10, 11, 15, 16	6021754-23	None[c]	NITS
Stud Plate	5	6021754-23	SR, RE	ITS-A
Stud Washer	6	6021754-23	None[c]	NITS
Hex Nut	7	6021754-23	SR, RE	ITS-A
Hex Lifting Stud	8	6021754-23	SR, RE	ITS-A
Pin Holder and Puller	12, 13, 14, 17, 18	6021754-23	None[c]	NITS
Lift Tongue	19	6021754-23	SR, RE	ITS-A
Top Lift Pin	20	6021754-23	SR, RE	ITS-A
Pin And Tongue Plates	21, 22	6021754-23	None[c]	NITS
Wide Body Shackle	23	6021754-23	SR, RE	ITS-A
Sling	24	6021754-23	SR, RE	ITS-A
HI-STORM Mating Device				
Shielding Frame	1, 4, 6, 7, 8, 21	6021754-18	SR, RE	ITS-A
Spacer Ring	2	6021754-18	SR, RE	ITS-B
Bottom Stiff Plate	3	6021754-18	SR, RE	ITS-B
Shield End	5	6021754-18	SR, RE	ITS-B
Cylinder Lug	9	6021754-18	SR, RE	ITS-C
U Bolt, Plate, and Nut	10, 11, 12	6021754-18	None[c]	NITS

Table 2-6 Intended Functions of Cask Transportation System Subcomponents

Subcomponent	Part Number[b]	Reference Drawing[a]	Intended Function[e]	ITS Category[d]
Shield Block	13	6021754-18	SR, RE	ITS-B
Alignment Ring and Screw	14, 15	6021754-18	None[c]	NITS
Sliders and Screws	16, 17, 18, 19, 20	6021754-18	None[c]	NITS
Lift Lug	22	6021754-18	SR, RE	ITS-B
Locking Pin	23	6021754-18	None[c]	NITS
Tongue Plate	24	6021754-18	SR, RE	ITS-C
Tongue Plate Guide and Spacer	25, 26	6021754-18	None[c]	NITS
Actuator Bar and Draw Bar	27, 28	6021754-18	SR, RE	ITS-C
Actuator Cylinder	29	6021754-18	SR, RE	ITS-C
Actuator Cylinder Bar Pin and Pin	30, 34	6021754-18	SR, RE	ITS-C
Actuator Cylinder Bar Bolt	31	6021754-18	SR, RE	ITS-C
Actuator Cylinder Pin Washer and Bar Washer	32, 33	6021754-18	None[c]	NITS
Bolts, Nuts, and Washers	35, 36, 38, 42, 43	6021754-18	SR, RE	ITS-A
HI-TRAC and Pool Lid Pins	39, 40, 41	6021754-18	None[c]	NITS

Notes:

a. Drawing 6021754 is not docketed, but is available at the DC ISFSI for NRC review.
b. Part number 37 from drawing 6021754-18 is not used, and thus, is not included in the above table.
c. None – These sub-components have no ITS intended function and their failure would not affect an ITS function, and are, therefore, screened out of the scope of LR.
d. ITS categories are defined in DC ISFSI UFSAR, Section 4.5: ITS-A, critical to safe operation; ITS-B, major impact on safety; and ITS-C, minor impact on safety.
e. Intended Functions: Confinement (CO), Sub-criticality (CR), Radiation Shielding (SH), Structural Integrity (SR), Thermal/Heat Removal (TH), Retrievability (RE)

Table 2-7 Intended Functions of Independent Spent Fuel Storage Installation Storage Pads Subcomponents

Subcomponent	Part Number	Reference Drawing[a]	Intended Function[d]	ITS Category[c]
Storage Pads	N/A	6021750-305, 306 and UFSAR Figure 4.2-1	SR	ITS-B
Embedment Support Top Structure Plate	1	6021750-303 and UFSAR Figure 4.2-2	SR	ITS-B
Embedment Support Bottom Structure Plate	2	6021750-303 and UFSAR Figure 4.2-2	SR	ITS-B
Embedment Support Structure Coupler	3	6021750-303 and UFSAR Figure 4.2-2	SR	ITS-B
Embedment Support Structure Bars	4	6021750-303 and UFSAR Figure 4.2-2	SR	ITS-B
Embedment Support Structure Washers	5	6021750-303 and UFSAR Figure 4.2-2	SR	ITS-B
Embedment Support Structure Nuts	6, 7	6021750-303 and UFSAR Figure 4.2-2	SR	ITS-B
Embedment Support Structure Bolts	8	6021750-303 and UFSAR Figure 4.2-2	None[b]	NITS
Embedment Support Structure Washer	9	6021750-303 and UFSAR Figure 4.2-2	None[b]	NITS

Notes:

a. Drawing 6021750 is not docketed, but is available at the DC ISFSI for NRC review.
b. None – These sub-components have no ITS intended function and their failure would not affect an ITS function, and are, therefore, screened out of the scope of LR.
c. ITS categories are defined in DC ISFSI UFSAR, Section 4.5: ITS-A, critical to safe operation; ITS-B, major impact on safety; and ITS-C, minor impact on safety.
d. Intended Functions: Confinement (CO), Sub-criticality (CR), Radiation Shielding (SH), Structural Integrity (SR), Thermal/Heat Removal (TH), Retrievability (RE)

Table 2-8 Intended Functions of Cask Transfer Facility Subcomponents

Subcomponent	Part Number	Reference Drawing[a]	Intended Function[d]	ITS Category[c]
Liner Baseplate	1	6021754-7 and UFSAR Figure 4.4-3	None[b]	NITS
Liner Lower Restraint	2	6021754-7 and UFSAR Figure 4.4-3	SR, RE	ITS-B
Liner Radial Guide	3	6021754-7 and UFSAR Figure 4.4-3	None[b]	NITS
Liner Shell Plate	4	6021754-7 and UFSAR Figure 4.4-3	SR, RE	ITS-B
Liner Wedges	5, 6	6021754-7 and UFSAR Figure 4.4-3	SR, RE	ITS-B
Liner Hanger	7	6021754-7 and UFSAR Figure 4.4-3	SR, RE	ITS-C
Liner Top Position Plate	8	6021754-7 and UFSAR Figure 4.4-3	None[b]	NITS
Liner Guide Plate	9	6021754-7 and UFSAR Figure 4.4-3	None[b]	NITS
Liner Hoist Ring	10	6021754-7	None[b]	NITS
Liner Threaded Rod	11	6021754-7 and UFSAR Figure 4.4-3	SR, RE	ITS-B
Liner Flat Washer	12	6021754-7 and UFSAR Figure 4.4-3	None[b]	NITS
Liner Hex Nut	13	6021754-7 and UFSAR Figure 4.4-3	SR, RE	ITS-B
Temporary CTF Cover	N/A	32-06-12053, SK-01	None[b]	NITS
Structural Concrete	N/A	6021750-310 and UFSAR Figure 4.4-3	SR, RE	ITS
Lateral Restraint: Strut and Collars	N/A	6021750-312	SR	ITS-A
Lateral Restraint: Embedded Plate	N/A	6021750-312	SR	ITS
Lateral Restraint: Bearing Plates	N/A	6021750-312	SR	ITS
Lateral Restraint: Washer Plate	N/A	6021750-312	SR	ITS
Lateral Restraint: Stud Anchors	N/A	6021750-312	SR	ITS
Lateral Restraint: Rock Anchors	N/A	6021750-312	SR	ITS
Lateral Restraint: Grease Caps	N/A	6021750-312, 318	SR	ITS
Lateral Restraint: Bracket	N/A	6021750-312	SR	ITS

Notes:

a. Drawings 6021750, 6021754, and 32-06-12053 and are not docketed, but are available at the DC ISFSI for NRC review.
b. None – These sub-components have no ITS intended function and their failure would not affect an ITS function, and are, therefore, screened out of the scope of LR.
c. ITS categories are defined in DC ISFSI UFSAR, Section 4.5: ITS-A, critical to safe operation; ITS-B, major impact on safety; and ITS-C, minor impact on safety.
d. Intended Functions: Confinement (CO), Sub-criticality (CR), Radiation Shielding (SH), Structural Integrity (SR), Thermal/Heat Removal (TH), Retrievability (RE)

2.4 Section 2.0 References

2.4.1 NUREG-1927, Revision 1, Standard Review Plan for Renewal of Specific Licenses and Certificates of Compliance for Dry Storage of Spent Nuclear Fuel, Nuclear Regulatory Commission, Office of Nuclear Material Safety and Safeguards, June 2016, ADAMS Accession No. ML16179A148.

2.4.2 PG&E Letter DIL-21-004, "Biennial Submittal of Diablo Canyon Independent Spent Fuel Storage Installation Updated Final Safety Analysis Report," Revision 9, December 15, 2021. ADAMS Accession No. ML21349B166.

2.4.3 Diablo Canyon Independent Spent Fuel Storage Installation Materials License No. SNM-2511 and Appendix, Technical Specifications.

2.4.4 Diablo Canyon Independent Spent Fuel Storage Installation Safety Evaluation Report, Docket 72-26, Materials License No. SNM-2511, March 22, 2004, ADAMS Accession No. ML040780107.

3.0 AGING MANAGEMENT REVIEWS

3.1 Aging Management Review Methodology

The purpose of the AMR process is to assess the SSCs determined to be within the scope of LR with respect to aging effects that could affect the ability of the SSC to perform its intended function during the PEO. The AMR process involves the following four (4) major steps:

1. identification of in-scope subcomponents requiring AMRs (screening);
2. identification of materials and environments;
3. identification of aging effects requiring management;
4. determination of the activities/programs required to manage the effects of aging.

Each of these steps is discussed in Sections 3.1.1 through 3.1.4. Also, the operating experience (OE) review for confirmation of the AMR process and the document sources used in the process are discussed in Sections 3.1.5 and 3.1.6.

The results of the AMR for the subcomponents of the ISFSI SSCs that are in the scope of LR are provided in the following sections:

- Section 3.2, Aging Management Review Results – Spent Fuel Assemblies
- Section 3.3, Aging Management Review Results – MPC
- Section 3.4, Aging Management Review Results – HI-TRAC 125D Transfer Cask
- Section 3.5, Aging Management Review Results – HI-STORM 100SA Overpack
- Section 3.6, Aging Management Review Results – Cask Transportation System
- Section 3.7, Aging Management Review Results – ISFSI Storage Pads
- Section 3.8, Aging Management Review Results – Cask Transfer Facility

Each section provides the results of the AMR of SSCs, which were determined to be within the scope of LR as identified in Section 2.3, Scoping Results.

Subcomponents that did not undergo an AMR are listed in Table 2-2 through Table 2-8 with an intended function of "None." A summary of the results of the AMR for the subcomponents that supported an intended function is provided in corresponding AMR tables (Table 3-2 through Table 3-8), at the end of Section 3.0. The AMR tables provide the following information related to each subcomponent determined to require AMR:

(1) the intended function,
(2) material,
(3) environment,
(4) aging effect,
(5) aging mechanism, and
(6) specific aging management activity.

3.1.1 Identification of In-Scope Subcomponents Requiring Aging Management Review

Subcomponents that perform or support any one of the identified intended functions in a passive manner, without moving parts or a change in configuration or properties, are determined to require an AMR.

Those subcomponents that either do not support an intended function, or perform an intended function by a change in configuration or properties (active), or have their condition monitored at some established frequency, are excluded from further evaluation in the AMR with supporting justification.

Table 2-2, Table 2-3, Table 2-4, Table 2-5, Table 2-6, Table 2-7, and Table 2-8 identify the intended functions for the ISFSI subcomponents that require an AMR. The tables also identify subcomponents that do not support the SSC intended function and are not subject to an AMR.

3.1.2 Identification of Materials and Environments

The second step of the AMR process is the identification of the materials of construction and the environments to which these materials are exposed for the ISFSI subcomponents that require an AMR.

The materials of construction were identified through a review of pertinent design bases, which are discussed in Section 3.1.6. A summary of the materials of construction is provided in Sections 3.2.2, 3.3.2, 3.4.2, 3.5.2, 3.6.2, 3.7.2, and 3.8.2 and are reflected in the corresponding AMR summary tables (Table 3-2, Table 3-3, Table 3-4, Table 3-5, Table 3-6, Table 3-7, and Table 3-8). An overview of the material designations utilized for the DC ISFSI are provided in Table 3.1-1.

Table 3.1-1 Use of Terms for Materials

Term	Usage in This Document
Carbon steels	Carbon steels for the DC ISFSI include American Society for Testing and Materials (ASTM) A36, F436, A449, A500-Gr. B, A 514, A563, A572-Gr. 50; American Society of Mechanical Engineers (ASME) SA193-Gr. B7, SA194-Gr. 2H, SA350 LF2 or LF3, SA36, SA 515 or SA516-Gr. 70; American Iron and Steel Institute (AISI) 4140 QT, AISI 4140-Gr.O1; and Weldox® 130 or Weldox® 900.
Concrete	A mixture of hydraulic cement, aggregates, and water with or without admixtures, fibers, or other cementitious materials (Reference 3.9.1).
Holtite-A	A Holtec neutron shielding material consisting of epoxy polymer, B_4C added as a finely divided powder, and aluminum hydroxide. It is fully encased in a metal enclosure. Note: For this application, the metal is carbon steel. (Reference 3.9.1)
K-Spec Fiber	K-spec® fiber (referred to as K-spec herein) is used for the cask restraint system sling on the cask transporter. K-spec is a synthetic fiber blend used in rigging that is known for its high strength and is lightweight compared to steel rigging.
Lead	Used for shielding in the HI-TRAC 125D transfer cask. ASTM B29.
Metamic™ and Boral	Materials used for neutron poison applications. Metamic™ is a boron-carbide aluminum metal-matrix composite produced by cold isostatic pressing followed by vacuum sintering. Boral is a laminate composite consisting of an aluminum and boron-carbide powder core sandwiched between aluminum sheets. (Reference 3.9.1)
Nickel Alloys	Nickel alloys for the DC ISFSI include Inconel 718 and SB637 NO7718.
Polymer	Delrin®, a polyoxymethylene (a thermoplastic), is used in the cask restraint system adjustable cask bumpers and the LPT lateral guide block.

Table 3.1-1 Use of Terms for Materials

Term	Usage in This Document
	Neoprene, or polychloroprene, is a family of synthetic rubbers. Neoprene is used on the LPT as roller padding.
Stainless steels	Stainless steels for the DC ISFSI include ASME SA-240, Types 304 and 304L, Types 316 and 316L, SA193-Gr. B8, SA564 630 H925; ASTM A564 630 H1150, 17-4 PH H1150, Nitronic 60; and Holtec-defined Alloy X (see Reference 3.9.6, Section 1.2.1.1).
Zirconium-based alloys	The materials of construction of fuel cladding and fuel assembly hardware. The cladding type for DCPP is Zircaloy-2, Zircaloy-4, or ZIRLO™ (referred to as ZIRLO herein) (Reference 3.9.2, Table 10.2-5).

The environments to which components are exposed play a critical role in the determination of potential aging mechanisms and effects. A review of documentation, discussed in Section 3.1.6, was performed to quantify the environmental conditions to which the ISFSI SSCs are continuously or frequently exposed. The environmental conditions identified during this review include any conditions known to exist on a recurring basis. They are based on OE unless design features have been implemented to preclude those conditions from recurring. Descriptions of the internal and external environments, which have been used in the AMR, are included in Sections 3.2.3, 3.3.3, 3.4.3, 3.5.3, 3.6.3, 3.7.3, and 3.8.3; are reflected in the corresponding AMR summary tables; and are summarized below in Table 3.1-2.

Table 3.1-2 Use of Terms for Environments

Term	Usage in This Document
Air-indoor	This term is used for the transfer cask, which is stored in an enclosed building, except for the short duration it is in use during transfer activities. This environment is protected from direct exposure to weather-related effects, including sunlight, wind, and rain.
Air-outdoor	This term is used for the exterior surfaces of the HI-STORM 100SA overpack, the ISFSI storage pads, and portions of the CTF that are exposed to all weather-related effects, including insolation (effect of sunlight exposure), wind, rain, snow, ice, and ambient air as discussed in the DC ISFSI UFSAR Table 3.4-1 and Table 4.7-1.
Embedded	The embedded environment applies for materials that are encased, embedded, or sealed inside another material. The embedded items are exposed to the same temperatures of the components in which they are embedded.
Helium	The helium environment refers to the inside of the MPC, which is backfilled with inert helium gas. The environment has negligible amounts of oxygen or moisture, based on the vacuum drying process, and may contain trace quantities of nitrogen, oxygen, argon, and fission product gases. The inert environment is exposed to the range of temperatures calculated for each of the components, and significant radiation impacts to the MPC from the stored fuel.
Soil	This environment applies to the exterior, inaccessible below-grade portions of the DC ISFSI storage pads and CTF. As described in DC ISFSI UFSAR, Sections 2.5.2, 2.5.3, and 2.5.5, the groundwater under the ISFSI and CTF is approximately 190 feet below either structure. Temporary perched water can

Table 3.1-2 Use of Terms for Environments

Term	Usage in This Document
	accumulate locally during the rainy season. This perched water is mitigated by use of drains on the hillside above the ISFSI so that perched rainwater is not in long-term contact with the storage pads and CTF structure. In 2021, soil sampling was conducted in the vicinity of the DC ISFSI. The soil sample results (see Appendix E and Reference 3.9.14) demonstrated that the soil was non-aggressive: • pH: 7.9 (aggressive criterion is less than 5.5) • Sulfates: 75 parts per million (ppm) (aggressive criterion is greater than 1500 ppm) • Chlorides: 53 ppm (aggressive criterion is greater than 500 ppm)
Sheltered	The sheltered environment is experienced in the confined space between the HI-STORM 100SA overpack inner wall and MPC shell, and between the baseplate and concrete storage pad surface. This environment is also experienced by the CTF components that are stored under the temporary cover. This environment is open to the outside air, but is protected from direct exposure to weather-related effects, including sunlight, wind, and rain. The ambient air is a saline air due to its proximity to the Pacific Ocean. The average ambient air annual temperature is 55°F with an extreme temperature range of 24°F to 104°F (Reference 3.9.2, Table 3.4-1). As discussed in ASTM Standard C33-01 (Reference 3.9.5, Figure 1), weathering effects for the area in which the DC ISFSI is located are negligible. Thus, freeze-thaw is not a concern. The maximum HI-STORM 100SA overpack inner shell peak temperature was calculated to be 279°F during normal conditions experienced during long-term storage (i.e., higher than the outside ambient temperature due to a passive heat balance of the MPC and its surroundings). The sheltered environment is also experienced by Cask Transportation System components that are stored long-term within buildings and are exposed to outdoor air for short periods when in use.

3.1.3 Identification of Aging Effects Requiring Management

The third step in the AMR process involves the identification of the aging effects requiring management. Aging effects requiring management during the PEO are those that could cause a loss of passive SSC intended 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 DC ISFSI for the aging effect to occur and propagate, then no aging management is required.

Potential aging effects, presented in terms of material and environment combinations, have been evaluated and those aging effects requiring management have been determined. Both potential aging effects that can theoretically occur, as well as aging effects that have actually occurred based upon industry ISFSI OE and DC ISFSI OE, were considered. The evaluation was applied to subcomponents, regardless of form (i.e., canister body, cover, lid, guide tube, etc.).

As described above, the environments considered in this evaluation are the environments that the subcomponents normally experience. Environmental stressors that are conditions not normally experienced (such as accident conditions), or that may be caused by a design problem, are considered event-driven situations and have not been characterized as sources of long-term aging. Such event-driven situations would be evaluated and corrective actions, if any, implemented at the time of the event.

Aging effects are the manifestation of aging mechanisms. In order to effectively manage an aging effect, it is necessary to determine the aging mechanisms that are potentially at work for a given material and environment application. Therefore, the AMR process identifies both the aging effects and the associated aging mechanisms which cause them. Various mechanisms are only applicable at certain conditions, such as high temperature or moisture, for example. Each identified mechanism was characterized by a set of applicable conditions that must be met for the mechanism to occur and/or propagate. Given this evaluation process, each subcomponent that was subjected to an AMR was evaluated to determine if the potential aging effects/mechanisms were credible considering the material, environment, and conditions of storage.

3.1.4 Determination of the Activities Required to Manage the Effects of Aging

The final step in the AMR process involves the determination of the aging management activities or the aging management program (AMP) to be credited or developed for managing the aging effects/mechanisms. The existing ISFSI surveillance programs were evaluated and supplemented as necessary for the management of aging effects/mechanisms that could cause a loss of component intended function during the PEO.

There are aging effects/mechanisms requiring management during the PEO for portions of each major in-scope SSC as indicated in Sections 3.2.4, 3.3.4, 3.4.4, 3.5.4, 3.6.4, 3.7.4, and 3.8.4 and the corresponding AMR summary tables (Table 3-2, Table 3-3, Table 3-4, Table 3-5, Table 3-6, Table 3-7, and Table 3-8, respectively).

The effectiveness of the AMPs that were selected for the subcomponents is demonstrated as discussed in Appendix A, Aging Management Programs.

3.1.5 Operating Experience Review for Process Confirmation

As described in Section 3.1.3, Identification of Aging Effects Requiring Management, potential aging effects and mechanisms were evaluated based on industry ISFSI and plant OE, as well as various references relating specific materials and environments to aging effects and mechanisms (e.g., Reference 3.9.1). The evaluations were based on the premise that similar materials in similar environments experience similar aging effects. The OE evaluations were primarily conducted to identify any aging effects and mechanisms not previously identified in the aging effects evaluation.

Based on the guidance in NUREG-1927, Section 3.4.1.2, PG&E performed a pre-application inspection of the MPC, overpack, ISFSI storage pads, and CTF structural concrete. A copy of the DC ISFSI Pre-Application Inspection Report is provided in Appendix E.

The following inspections are conducted for current ISFSI operations. The Corrective Action Program (CAP) was reviewed to evaluate those conditions that did not meet inspection acceptance criteria and a discussion of DC ISFSI OE, as it pertains to the effectiveness of the DC ISFSI AMPs credited with the management of aging, is contained in Appendix A.

- HI-STORM 100SA overpack and vent inspections
- ISFSI storage pad concrete inspections
- Radiation surveys
- Pre-service inspections for the transfer cask and trunnions, LPT, cask transporter, HI-STORM 100 lifting brackets, and HI-STORM 100 mating device

3.1.6 Documentation Sources Used for the Aging Management Review Process

The DC ISFSI UFSAR (Reference 3.9.2) was the primary source for determination of the materials and environmental conditions for SSCs identified as in-scope for LR.

Other documents such as drawings, technical reports, vendor manuals, and procedures were consulted, as appropriate, to further clarify materials and environmental conditions.

Lastly, the following industry topical reports, reference books, and standards were consulted as appropriate for description and evaluation of aging effects/mechanisms as discussed in Section 3.1.3.

- Managing Aging Processes in Storage (MAPS) Report (Reference 3.9.1)
- Electric Power Research Institute (EPRI) Structural Tools (Reference 3.9.3)
- EPRI Mechanical Tools (Reference 3.9.4)

3.2 Aging Management Review Results – Spent Fuel Assemblies

This section provides the results of the AMR of SFAs, which were determined to be within the scope of LR as identified in Section 2.3, Scoping Results.

SFA subcomponents that did not undergo an AMR are listed in Table 2-2. A summary of the results of the AMR for the SFA subcomponents that supported an intended function is provided in Table 3-2.

A description of the SFAs is provided in Section 3.2.1, and a summary of the materials and environments for the SFAs is provided in Section 3.2.2 and 3.2.3, respectively. Section 3.2.4 references the aging effects requiring management and any aging management activities used to manage the effects of aging. Section 3.2.5 provides an AMR conclusion.

3.2.1 Description of the Spent Fuel Assemblies

As discussed in DC ISFSI UFSAR, Section 3.1.1.1, the SFAs stored consist of Westinghouse LOPAR (Standard), VANTAGE 5, and VANTAGE+ fuel assemblies. These types are configured in a 17-by-17 array and the fuel rods consist of UO_2 pellets encapsulated in zirconium alloy tubing (cladding) that is plugged and seal-welded at the ends. Fuel records indicate that all DCPP fuel cladding material for intact and damaged assemblies is Zircaloy-2, Zircaloy-4, or ZIRLO (Reference 3.9.2, Table 10.2-5).

The DC ISFSI is allowed to store HBU fuel (i.e., fuel with burnups generally exceeding 45 gigawatt days per metric ton of uranium [GWd/MTU]) with a maximum heat load of 28.74 kilowatts (kW) in the MPC-32 (Reference 3.9.2, Section 3.1.1.1).

3.2.2 Materials Evaluated (Spent Fuel Assemblies)

The materials of construction for the SFA subcomponents that are subject to AMR are zirconium-based alloy, stainless steel, and nickel alloy. Materials were identified from drawings referenced in Table 2-2. The material group of individual SFA subcomponents is identified in Table 3-2.

3.2.3 Environments (Spent Fuel Assemblies)

The environments that affect the SFA subcomponents, both externally and internally, are those that are normally experienced and are described below:

External

The external environment seen by the SFAs is the same internal environment of the MPC. The helium back-fill gas is identified as the inert gas environment used in the AMR.

The maximum fuel cladding temperature was calculated to be 729°F during normal conditions of long-term storage and 912°F under accident conditions. Fuel cladding temperature will decrease over time while in storage. As discussed in DC ISFSI UFSAR Section 10.2.1, all SFA loading is compliant with Interim Staff Guidance (ISG)-11, Revision 3.

Internal

The intact fuel cladding is the only SFA subcomponent that has an internal environment. The fuel rods were initially pressurized with helium during manufacturing. For purposes of this evaluation, the fuel rod internal environment is assumed to be a combination of the original helium fill gas and fission products produced during reactor operation.

3.2.4 Aging Effects Requiring Management and Aging Management Activities (Spent Fuel Assemblies)

The MAPS Report (Reference 3.9.1) was used to identify the possible aging effects/mechanisms. Each line item in Table 3-2 is consistent with the applicable line items in the MAPS Report, Table 4-25.

Consistent with the MAPS Report (Reference 3.9.1), the following aging effects and mechanisms related to the SFAs were determined non-credible for the DC ISFSI:

- changes in dimensions due to low-temperature creep (for cladding SSCs), creep (for non-cladding SSCs), or hydriding (for non-cladding SSCs) – see Reference 3.9.1, Section 3.6.1.4, 3.6.2.1, and 3.6.2.2
- cracking due to stress corrosion cracking (SCC), delayed hydride cracking, fatigue, or mechanical overload – see Reference 3.9.1, Sections 3.6.1.9, 3.6.1.2, 3.6.1.11, 3.6.1.5, and 3.6.2.4
- loss of load bearing capacity due to oxidation – see Reference 3.9.1, Section 3.6.1.6
- Loss of material due to pitting, galvanic, or general corrosion – see Reference 3.9.1, Sections 3.6.1.7, 3.6.1.8, and 3.6.2.3

- Loss of strength due to radiation embrittlement – see Reference 3.9.1, Section 3.6.1.10

The AMR results for the SFA subcomponents are listed in Table 3-2. Based on the material and environment combinations, and consideration of the conditions during the PEO, the following aging effects and associated mechanism(s) were determined to require management:

- changes in dimension due to thermal creep
- loss of ductility due to hydride reorientation

Based on the AMR of the SFA materials and the environments experienced during long-term storage, it has been determined that an AMP (see Appendix A) is required.

3.2.5 Aging Management Review Conclusion (Spent Fuel Assemblies)

The DC ISFSI AMPs described in Appendix A provide reasonable assurance that the SFA's aging effects/mechanisms will be managed effectively such that it will continue to perform its intended function during the PEO.

3.3 Aging Management Review Results – Multi-Purpose Canister

This section provides the results of the AMR of MPC subcomponents, which were determined to be within the scope of LR as identified in Section 2.3, Scoping Results.

MPC subcomponents that did not undergo an AMR are listed in Table 2-3. A summary of the results of the AMR for the MPC subcomponents that supported an intended function is provided in Table 3-3.

A description of the MPC subcomponents which support an SSC intended function is provided in Section 3.3.1, and a summary of the materials and environments for the MPC is provided in Section 3.3.2 and 3.3.3, respectively. Section 3.3.4 references the aging effects requiring management and any aging management activities used to manage the effects of aging. Section 3.3.5 provides an AMR conclusion.

3.3.1 Description of the Multi-Purpose Canister

The MPC enclosure vessel is a welded cylindrical structure with flat ends that provides confinement of the spent nuclear fuel during storage operations (see DC ISFSI UFSAR Figure 3.3-1). It consists of a honeycomb-shaped fuel basket, baseplate, MPC shell, MPC lid, vent and drain port cover plates, and closure ring. The MPC lid provides top shielding and provisions for lifting the loaded MPC during transfer operations between the transfer cask and the overpack. The confinement boundary is comprised of the bottom baseplate, shell, lid, vent and drain port cover plates, and a closure ring (Reference 3.9.2, Sections 4.2.3.2.1 and 4.2.3.3.6)

Access to the MPC cavity for the purposes of moisture/air removal and subsequent backfilling with a specified amount of inert gas (helium) is achieved via two penetrations (i.e., vent and drain ports) in the MPC lid. Circular cover plates are seal welded over the vent and drain ports, completing the primary closure system. A circular closure ring is welded to the MPC shell and lid, providing a redundant closure system at the top end of the MPC.

There are four different MPC types licensed for the DC ISFSI (MPC-24, MPC-24E, MPC-24EF, and MPC-32), with different internal arrangements, that can accommodate intact spent fuel, damaged fuel, fuel debris, and nonfuel core components. While four MPC types are licensed, only the MPC-32 has been used to-date. The originally-licensed MPC-24s will require modifications and analyses similar to the MPC-32 prior to their use. (Reference 3.9.2, Section 1.1)

Multi-Purpose Canister Fuel Basket
The MPC fuel-basket assembly provides support for the fuel assemblies as well as the geometry and fixed neutron absorbers for criticality control. (Reference 3.9.2, Section 4.2.3.2.1)

The number of fuel storage cells will vary depending on the MPC type (24 storage cells for MPC-24s and 32 storage cells for MPC-32). The fuel basket is positioned and supported within the enclosure vessel by “basket shims” located in the space between the inside of the shell and the basket. Upper and lower fuel spacers, as appropriate, are utilized to maintain the axial position of the fuel assembly within the MPC basket (Reference 3.9.2, Section 8.2.11.1).

Multi-Purpose Canister Damaged Fuel Container
The DFC is used to contain fuel assemblies classified as damaged fuel or fuel debris. The DFC is a long, square, stainless-steel container with screened openings at the top and bottom. Each DFC is inserted into a designated storage cell within the MPC. The function of each DFC is to retain the damaged fuel or fuel debris in its storage cell and provide the means for ready retrievability. The DFC permits gaseous and liquid media to escape into the interior of the MPC, but minimizes dispersal of gross particulates. (Reference 3.9.2, Section 4.2.3.2.2).

3.3.2 Materials Evaluated (Multi-Purpose Canister)

The in-scope MPC subcomponents are constructed entirely from stainless steel, except for (1) the neutron absorbers which are constructed of Metamic™ or Boral, (2) an aluminum vent plug, and (3) the optional heat conduction elements found only in the MPC-24 series. Materials for the MPC subcomponents are provided in Table 3-3.

3.3.3 Environments (Multi-Purpose Canisters)

The environments that affect the MPC subcomponents, both externally and internally, are those that are normally experienced and are described below:

External
The external MPC environment is the same environment as the inside of the HI-STORM 100SA overpack. This confined space environment is open to the outside air, but is protected from direct exposure to weather-related effects, including sunlight, wind, and rain.

The ambient air is a saline air due to the proximity to the Pacific Ocean. The average ambient air annual temperature is 55°F (Reference 3.9.2, Table 3.4-1). The HI-STORM 100SA overpack inner shell peak temperature allowable limit is 350°F during normal conditions of long-term storage. The temperature in the confined space is higher than the outside ambient temperature (based on a passive heat balance of the MPC and its surroundings). In Table 3-3, the external MPC environment is designated as “Sheltered.”

Internal
The MPC is sealed, dried, and backfilled with helium prior to entering storage. Therefore, the internal environment is maintained in a very low moisture, inert gas environment. The temperature range varies from the highest value at the maximum canister heat load to the minimum calculated air temperature as the heat load reduces over time. MPC subcomponents are also exposed to significant gamma and neutron radiation.

The evaluation below demonstrates that air ingress during 60 years of storage is not credible, and thus, the helium environment will be maintained. The following inputs and assumptions were used:

- Design basis helium leak rate (Reference 3.9.2, Table 3.4-2) is assumed for the entire 60-year storage duration: 5.0×10^{-6} atm cm^3/seconds.
- Initial helium backfill pressure (Reference 3.9.2, Section 10.2.2.4): 29.3 psig (pounds per square inch, gauge) (Note: this backfill pressure bounds later DC ISFSI license amendments that require 34 psig).
- To maximize calculated helium leakage, the credit for reduction in operating pressure (i.e., as fuel cools) is ignored.
- To maximize calculated helium leakage, the reduction in helium temperature during storage (i.e., as fuel cools) is assumed to be a bounding 0°C.

Internal MPC pressure at the end of the 60-year storage period is greater than 2.7 atm. Because this pressure is greater than 1 atm, ambient air ingress is not credible.

3.3.4 Aging Effects Requiring Management and Aging Management Activities (Multi-Purpose Canister)

The MAPS Report (Reference 3.9.1) was used to identify the possible aging effects/mechanisms. Each line item in Table 3-3 is consistent with the applicable line items in the MAPS Report, Table 4-7.

Consistent with the MAPS Report (Reference 3.9.1), the following aging effects and mechanisms related to the MPC were determined non-credible for the DC ISFSI:

- Change in dimensions due to creep for stainless steels, Boral, and Metamic™ exposed to helium or a sheltered environment – see Reference 3.9.1, Sections 3.2.2.6, 3.2.3.5, and 3.4.2.5.
- Change in dimensions due to wet corrosion and blistering for Boral exposed to helium – see Reference 3.9.1, Section 3.4.2.3.
- Cracking due to radiation embrittlement for stainless steels exposed to helium or a sheltered environment – Reference 3.9.1, Sections 3.2.2.9 and 3.2.3.8.
- Loss of fracture toughness and loss of ductility due to thermal aging for welded stainless steels exposed to helium – see Reference 3.9.1, Section 3.2.2.8.
- Loss of fracture toughness and loss of ductility due to radiation embrittlement for Boral and Metamic™ exposed to helium – see Reference 3.9.1, Section 3.4.2.7.
- Loss of material due to general corrosion for aluminums and Metamic™ exposed to helium – see Reference 3.9.1, Sections 3.2.3.1 and 3.4.2.1.
- Loss of material due to microbiologically influenced corrosion for stainless steels exposed to a sheltered environment – see Reference 3.9.1, Section 3.2.2.4.
- Loss of strength due to thermal aging for aluminums, Boral, and Metamic™ exposed to helium – see Reference 3.9.1, Sections 3.2.3.7 and 3.4.2.6.

The AMR results for the MPC subcomponents are listed in Table 3-3. Based on the material and environment combinations, and consideration of the conditions during the PEO, the following aging effects and associated mechanism(s) were determined to require management:

- cracking due to SCC (for components exposed to a sheltered environment)
- loss of material due to pitting and crevice corrosion (for components exposed to a sheltered environment)
- reduction of neutron-absorbing capacity due to boron depletion (for components exposed to a helium environment)

Based on the AMR of the MPC materials and the environments experienced during long-term storage, it has been determined that an AMP (see Appendix A) is required, as well as TLAAs for the effects of loss of shielding due to boron depletion (see Section 4.4).

3.3.5 Aging Management Review Conclusion (Multi-Purpose Canister)

Section 4.0, and the DC ISFSI AMPs described in Appendix A, provide reasonable assurance that the MPC's aging effects/mechanisms will be managed effectively such that it will continue to perform its intended function during the PEO.

3.4 Aging Management Review Results – HI-TRAC 125D Transfer Cask

This section provides the results of the AMR of HI-TRAC 125D transfer cask subcomponents, which were determined to be within the scope of LR as identified in Section 2.3, Scoping Results.

HI-TRAC 125D transfer cask subcomponents that did not undergo an AMR are listed in Table 2-4. A summary of the results of the AMR for the HI-TRAC 125D Transfer Cask subcomponents that supported an intended function is provided in Table 3-4.

A description of the HI-TRAC 125D transfer cask subcomponents which support an SSC intended function is provided in Section 3.4.1, and a summary of the materials and environments for the HI-TRAC 125D transfer cask is provided in Section 3.4.2 and 3.4.3, respectively. Section 3.4.4 references the aging effects requiring management and any aging management activities used to manage the effects of aging. Section 3.4.5 provides an AMR conclusion.

3.4.1 Description of the HI-TRAC 125D Transfer Cask

The DC ISFSI has one transfer cask. The transfer cask is used to facilitate transport of the loaded MPC from the plant to the CTF and transfer of the loaded MPC into the overpack for storage at the ISFSI storage pads. The transfer cask is a rugged, heavy-walled, cylindrical steel vessel comprised of inner and outer concentric shells, a bolted bottom lid, a top lid, and an outer circumferential water jacket. The annulus between the inner and outer steel shells is filled with lead for shielding. Likewise, the water jacket is filled with water for shielding before movement of the transfer cask to the spent fuel pool for fuel loading.

The transfer cask includes lifting trunnions to allow the loaded transfer cask and MPC to be placed into and removed from the spent fuel pool for decontamination and preparation of the MPC for storage. The transfer cask also features a single bottom lid that is removed at the CTF to facilitate the transfer of the MPC to or from the overpack. (Reference 3.9.2, Sections 3.3.1.1.3 and 4.2.3.2.4)

3.4.2 Materials Evaluated (HI-TRAC 125D Transfer Cask)

The in-scope portions of the HI-TRAC 125D transfer cask are constructed entirely from carbon steel, except for (1) the neutron absorbers which are constructed of Holtite, (2) nickel alloy trunnions, and (3) lead shielding. The carbon steel surfaces of the transfer cask, (except threaded plugs and holes, seal areas, and trunnions) are coated with an epoxy-based coating system, qualified for borated water use, to preclude surface oxidation (Reference 3.9.2, Section 4.7.2). However, conservatively, credit is not taken for the coating in the Table 3-4 AMR. Materials for the HI-TRAC 125D transfer cask subcomponents are provided in Table 3-4.

3.4.3 Environments (HI-TRAC 125D Transfer Cask)

During fuel loading operations, the exterior portions of the HI-TRAC 125D transfer cask are exposed to water or borated water from the spent fuel pool, while the annulus between the MPC and the inner cavity wall of the transfer cask is exposed to demineralized water. During transport operations, the transfer cask is also temporarily exposed to air-outdoor. When not in use, the transfer cask is dried and housed in an enclosed building. In Table 3-4, the environment is designated as “Air-Indoor” for all sub-components.

3.4.4 Aging Effects Requiring Management and Aging Management Activities (HI-TRAC 125D Transfer Cask)

The MAPS Report (Reference 3.9.1) was used to identify the possible aging effects/mechanisms. Each line item in Table 3-4 is consistent with the applicable line items in the MAPS Report, Table 4-10.

Consistent with the MAPS Report (Reference 3.9.1), the following aging effects and mechanisms related to the HI-TRAC 125D transfer cask were determined non-credible for the DC ISFSI:

- Cracking due to radiation embrittlement for carbon steel and nickel alloy exposed to embedded and air-outdoor environments – see Reference 3.9.1, Sections 3.2.1.9 and 3.2.4.6.
- Cracking due to SCC for nickel alloy exposed to an air-outdoor environment – see Reference 3.9.1, Section 3.2.4.4.
- Loss of material due to microbiologically influenced corrosion for carbon steel and nickel alloy exposed to the air-outdoor environment – see Reference 3.9.1, Sections 3.2.1.2 and 3.2.4.3.
- Loss of material due to pitting and crevice corrosion cracking for nickel alloy exposed to an air-outdoor environment – see Reference 3.9.1, Section 3.2.4.2.
- Loss of preload due to stress relaxation for carbon steel exposed to the air-outdoor environment – see Reference 3.9.1, Section 3.2.1.10.

Based on the AMR of the HI-TRAC 125D transfer cask materials and the environments experienced during long-term storage, the applicable aging effects and mechanisms are:

- loss of material due to pitting and crevice corrosion for carbon steel
- loss of material due to general corrosion
- loss of material due to wear

- loss of shielding due to boron depletion

Based on the AMR of the HI-TRAC 125D transfer cask materials and the environments experienced during long-term storage, it has been determined that an AMP (see Appendix A) is required, as well as TLAAs for the effects of loss of shielding due to boron depletion (see Section 4.4).

3.4.4.1 Neutron Shielding

Although the potential for (1) loss of fracture toughness and loss of ductility due to thermal aging and (2) cracking due to radiation embrittlement were identified for the neutron shielding (Holtite-A) in the transfer cask, these have been evaluated and determined not credible for the HI-TRAC 125D transfer cask, as described below. Using Holtec's Holtite-A Development History and Thermal Performance Data ("Sourcebook", Reference 3.9.12, or Confidential Enclosure 3 of ML19221B564), the principal degradation mechanisms are thermal aging and radiation damage, including swelling, shrinkage, or cracking.

<u>Thermal Aging</u>

The principal effect of thermal aging is weight loss of Holtite-A under elevated temperatures as evaluated in the Holtite-A Sourcebook. Fracture toughness and ductility are strength properties which do not apply to the HI-TRAC 125D transfer cask safety evaluation as these are not relied upon in its structural qualification.

To ensure suitability of Holtite-A for spent fuel storage applications, the cumulative weight loss must not exceed the four weight percent qualification criteria (Reference 3.9.12, Section 3.1). To this end, a conservatively articulated weight loss correlation is defined in the Sourcebook. The correlation excerpted below (Reference 3.9.12, Section 3.2) facilitates calculation of cumulative weight loss W (percent) as a function of exposure temperature T (°F) and storage time D (days).

$$W(T,D) = (A \ln(D)+B)*2^{(T-325)/41.3}$$

Where: A = 0.549 and B = 0.19

To conservatively maximize W, the maximum Holtite-A temperature under design basis heat loads is adopted with no credit for decay heat attenuation for the entire duration of 20 years of initial storage and 40-year LR period. The weight loss is computed as follows:

$T = 268^{o}F$

D = (60)*365 = 21,900 Days

W(T,D) = 2.18 percent

The cumulative weight loss was calculated to be 2.18 percent for 60 years of storage. This is well within the Holtite-A qualification criteria of four weight percent, as determined in the Sourcebook.

Radiation Damage

As evaluated in the Sourcebook, radiation testing has qualified Holtite-A for the following exposure levels (Reference 3.9.12, Section 4.1.1):

Neutron Fluence: 1.28×10^{15} neutrons per square centimeter (n/cm^2)
Gamma Dose: 1.7×10^{6} rad

In addition to the above, radiation testing has also qualified thermally-aged Holtite-A under the following exposure levels (Reference 3.9.12, Section 4.2.1):

Neutron Fluence: 1.50×10^{15} n/cm^2
Gamma Dose: 1.97×10^{6} rad

The qualification testing concluded Holtite-A is unaffected by exposure to neutron and gamma radiation, does not swell or shrink and that "…it is an acceptable material for long-term use in casks designed to hold spent nuclear fuel" (Reference 3.9.12, Section 4.2).

An exercise is undertaken below to quantify the qualification margins specific to the HI-TRAC transfer cask. The HI-TRAC 60-Year Exposure is as follows:

Neutron Flux: 9.720×10^{7} $n/cm^2/hour$
Gamma Dose Rate: 1.66×10^{-1} rad/hour
60-Year Exposure Time: 60 * 365 * 24 = 525,600 hours
Neutron Fluence: 9.720×10^{7} * 525,600 = 5.11×10^{13} n/cm^2
Gamma Dose: 1.66×10^{-1} * 525,600 = 8.72×10^{4} rad

Qualification Margin (i.e., radiation exposure under qualification testing divided by HI-TRAC 60-Year Exposure):

Radiation Testing –
Neutron Fluence: $1.28 \times 10^{15} / 5.11 \times 10^{13} = 25.04$
Gamma Dose: $1.7 \times 10^{6} / 8.72 \times 10^{4} = 19.49$

Combined Thermal Aging and Radiation Testing –
Neutron Fluence: $1.50 \times 10^{15} / 5.11 \times 10^{13} = 29.35$
Gamma Dose: $1.97 \times 10^{6} / 8.72 \times 10^{4} = 22.59$

The margins computed above robustly support the conclusion that Holtite-A is unaffected under neutron and gamma exposure in the HI-TRAC transfer cask for the LR period. Therefore, radiation embrittlement of Holtite-A is not credible, even if combined with thermally-aged materials.

Although the AMR indicates no radiation monitoring is required, radiation monitoring is being included as defense-in-depth in the DC ISFSI Reinforced Concrete Structures AMP described in Appendix A.

3.4.5 Aging Management Review Conclusion (HI-TRAC 125D Transfer Cask)

Section 4.0, and the DC ISFSI AMPs described in Appendix A, provide reasonable assurance that the HI-TRAC 125D transfer cask's aging effects/mechanisms will be managed effectively such that it will continue to perform its intended function during the PEO.

3.5 Aging Management Review Results – HI-STORM 100SA Overpack

This section provides the results of the AMR of HI-STORM 100SA overpack subcomponents, which were determined to be within the scope of LR as identified in Section 2.3, Scoping Results.

HI-STORM 100SA overpack subcomponents that did not undergo an AMR are listed in Table 2-5. A summary of the results of the AMR for the HI-STORM 100SA overpack subcomponents that supported an intended function is provided in Table 3-5. A description of the HI-STORM 100SA overpack subcomponents which support an SSC intended function is provided in Section 3.5.1, and a summary of the materials and environments for the HI-STORM 100SA overpack is provided in Section 3.5.2 and 3.5.3, respectively. Section 3.5.4 references the aging effects requiring management and any aging management activities used to manage the effects of aging. Section 3.5.5 provides an AMR conclusion.

3.5.1 Description of the HI-STORM 100SA Overpack

The HI-STORM 100 overpack is a rugged, heavy-walled, cylindrical, steel and concrete structure. The structure is made of inner and outer concentric carbon-steel shells, a baseplate, and a bolted lid (fabricated as a steel-encased concrete disc). The bottom baseplate diameter is increased with gusseted weldments to provide a bolt circle with 16 holes for anchor studs to fasten the overpack to its ISFSI pad anchorage embedment. The overpack is designed to permit natural circulation of air around and up the exterior shell of the MPC, via the chimney effect, to provide for the passive cooling of the spent fuel contained in the MPC. The overpack has four air inlet ducts located at 90-degree spacing in the base of the overpack and four air outlet ducts located in the top lid of the overpack that are situated 45 degrees from the inlet vents to promote crossflow in the annulus. The cooling air enters the inlet ducts, absorbs heat from the MPC surface, and flows upward in the annulus between the MPC and exits at the outlet ducts. (Reference 3.9.2, Section 4.2.3.2.3)

3.5.2 Materials Evaluated (HI-STORM 100SA Overpack)

The majority of the HI-STORM 100SA overpack surfaces are constructed of carbon steel. All accessible exposed carbon steel surfaces of the overpack, including the anchor studs and nuts, are coated with an approved coating to prevent corrosion due to salinity or other airborne contaminants at the ISFSI. However, conservatively, credit is not taken for the coating in the Table 3-5 AMR.

Other materials included in the construction are concrete for the purposes of shielding and stainless steel for the gamma shield cross plates, and inlet and outlet vent perforated plates. Materials for the HI-STORM 100SA overpack subcomponents are provided in Table 3-5.

3.5.3 Environments (HI-STORM 100SA Overpack)

The outer surfaces of the overpack are exposed to outdoor air during long-term storage on the ISFSI storage pads. The ambient air is a saline air due to the proximity to the Pacific Ocean. The average ambient air annual temperature is 55°F (Reference 3.9.2, Table 3.4-1). In Table 3-5, the external overpack environment is designated as “Air-Outdoor.”

The inner surfaces of the overpack are exposed to the confined space between the HI-STORM 100SA overpack inner wall and MPC shell. This environment is open to the outside air, but is protected from direct exposure to weather-related effects, including sunlight, wind, and rain. The HI-STORM 100SA overpack inner shell peak temperature allowable limit is 350°F during normal conditions of long-term storage. The interior wall temperature is higher than the outside ambient temperature (based on a passive heat balance of the MPC and its surroundings). As discussed in ASTM Standard C33-01 (Reference 3.9.5, Figure 1), weathering effects for the area in which the DC ISFSI is located are negligible. Thus, freeze-thaw is not a concern. In Table 3-5, the inner overpack environment is designated as “Sheltered.”

HI-STORM 100SA overpack subcomponents are also exposed to gamma and neutron radiation.

3.5.4 Aging Effects Requiring Management and Aging Management Activities (HI-STORM 100SA Overpack)

The MAPS Report (Reference 3.9.1) was used to identify the possible aging effects/mechanisms. Unless annotated by a table note, each line item in Table 3-5 is consistent with the applicable line items in MAPS Report, Table 4-8.

Consistent with the MAPS Report (Reference 3.9.1), the following aging effects and mechanisms related to the HI-STORM 100SA overpack were determined non-credible for the DC ISFSI:

- Cracking due to SCC for carbon steel exposed to an air-outdoor environment – Reference 3.9.1, Section 3.2.1.5.
- Cracking due to radiation embrittlement for carbon and stainless steels exposed to embedded (concrete), sheltered, and air-outdoor environments – Reference 3.9.1, Sections 3.2.1.9 and 3.2.2.9.
- Cracking, loss of material, and loss of strength due to delayed ettringite formation for concrete embedded in carbon steel – see Reference 3.9.1, Section 3.5.1.13.
- Cracking and loss of strength due to radiation damage for concrete embedded in carbon steel – see Reference 3.9.1, Section 3.5.1.9.
- Cracking and loss of strength due to reaction with aggregates for concrete embedded in carbon steel – see Reference 3.9.1, Section 3.5.1.3.
- Loss of material due to microbiologically influenced corrosion for carbon and stainless steels exposed to sheltered or air-outdoor environments – see Reference 3.9.1, Sections 3.2.1.4 and 3.2.2.4.
- Loss of preload due to stress relaxation for carbon steel exposed to an air-outdoor environment – Reference 3.9.1, Section 3.2.1.10.

The AMR results for individual HI-STORM 100SA overpack subcomponents are listed in Table 3-5. Based on the material and environment combinations, and consideration of the conditions during the PEO, the following aging effects and associated mechanism(s) were determined applicable:

- Cracking due to SCC for stainless steel (welded).
- Loss of material due to pitting and crevice corrosion.
- Loss of material due to general corrosion.

Based on the AMR of the HI-STORM 100SA overpack during long-term storage, it has been determined that an AMP (see Appendix A) is required.

3.5.4.1 Overpack Base Bottom Plate and Shim Plate

Research (Reference 3.9.13) states the corrosion rate of carbon steel in a submerged marine environment varies from 0.0024-0.0043 inches/year (60-110 micrometers (μm)/year) and 0.0004-0.0028 inches/year (10-70 μm/year) in a submerged industrial environment (both more aggressive environments than the DC ISFSI air-outdoor environment). Alloy steels (with Cr and Cu) initially may corrode, if exposed to these environments, but wetting and drying allows pores to fill and the corrosion rate slows down to 0.0006 inches/year (15 μm/year) after 5 years in a marine environment and 0.0002 inches/year (5 μm/year) after 5 years in an industrial environment.

If it is conservatively assumed that over a 1-year period, up to 0.0043 inches (0.110 millimeters) of wall loss may be experienced due to various corrosion mechanisms, this results in a total of 0.258 inches (6.60 millimeters) of wall loss over a 60-year period. This projected wall loss translates to 13 percent of the overpack base bottom plate 2-inch thickness and 26 percent of the plate 1-inch thickness. Neither of these conservative potential material losses result in loss of the components' intended functions.

Furthermore, galvanic couples that may arise due to the dissimilar contact between the carbon steel overpack base bottom plate and the stainless steel field shims, are insignificant as the surface area of the anode (carbon steel) is much larger than the cathode (stainless steel). Based on this discussion, aging management activities are not necessary for these components.

3.5.5 Aging Management Review Conclusion (HI-STORM 100SA Overpack)

The DC ISFSI AMPs described in Appendix A provide reasonable assurance that the HI-STORM 100 overpack aging effects/mechanisms will be managed effectively such that it will continue to perform its intended function during the PEO.

3.6 Aging Management Review Results – Cask Transportation System

This section provides the results of the AMR of the Cask Transportation System, which was determined to be within the scope of LR as identified in Section 2.3, Scoping Results.

Cask Transportation System subcomponents that did not undergo an AMR are listed in Table 2-6. A summary of the results of the AMR for the Cask Transportation System subcomponents that supported an intended function is provided in Table 3-6. A description of the Cask Transportation System subcomponents which support an SSC intended function is provided in Section 3.6.1, and a summary of the materials and environments for the Cask Transportation System is provided in Section 3.6.2 and 3.6.3, respectively. Section 3.6.4 references the aging effects requiring management and any aging management activities used to manage the effects of aging. Section 3.6.5 provides an AMR conclusion.

3.6.1 Description of Cask Transportation System

The Cask Transportation System consists of the cask transporter; HI-TRAC lift links; transporter connector pins; LPT; MPC downloader slings; MPC lift cleats; HI-STORM 100 lifting brackets and slings; and HI-STORM 100 mating device, bolts, and shielding frame.

Cask Transporter, Lift Links, and Connector Pins

As discussed in DC ISFSI UFSAR, Sections 4.3.2.1 and 4.3.2.3, the cask transporter is a self-propelled, open-front, U-shaped, tracked vehicle used for handling and onsite transport of a HI-TRAC 125D transfer cask and HI-STORM 100SA overpack. It is shared with the PG&E-owned Humboldt Bay ISFSI. It is nominally 27.5 feet long, 19 feet wide, and weighs approximately 95 tons, unloaded. It is designed with two steel tracks to spread out the load on the transport route surface as a distributed pressure load. On top of the main structure is a lifting beam supported by two lifting towers that use hydraulic cylinders to provide the lifting force. The cask transporter uses the HI-STORM lifting bracket tongue plates to connect the cask transporter lift points to the lifting trunnions on the transfer cask and the HI-STORM 100 lifting brackets. The tongue plates transfer the force of the loaded transfer cask from the lifting trunnions to the cask transporter lifting points through connector pins. The tongue plates are also used to retrieve a loaded overpack from the CTF. Cask handling is performed only with the overpack or transfer cask in the vertical orientation. A cask restraint system, comprised of adjustable bumpers and a sling, maintain the loaded cask transporter and transfer cask or overpack as a globally rigid structure during design basis seismic events. As discussed in DC ISFSI UFSAR, Section 3.3.3.2.1, the cask transporter design life is 20 years. The cask transporter was procured as a commercial grade item and was upgraded to ITS by functional (including load) testing and inspection.

Because the cask transporter is a large component with many subsystems and components, instead of listing each subcomponent for AMR, Table 3-6 lists groups of components at a higher level. For example, instead of listing all of the subcomponents to the cask transporter overhead beam (i.e., all nuts, bolts, etc.), the AMR merely lists “overhead beam” and provides a line item for each material contained on the overhead beam. In addition, consistent with NUREG-1927, Section 2.4.3, only the passive components on the cask transporter are included in the AMR. This is consistent with the approach approved in the Humboldt Bay ISFSI License Renewal Application (LRA) (SNM-2514).

Low-Profile Transporter

As discussed in DC ISFSI UFSAR, Section 4.3.2.2, the LPT is designed as a dedicated-use multi-roller heavy haul device capable of supporting and moving the HI-TRAC 125D transfer cask. The LPT has a wide rectangular frame fitted with four high-capacity rollers. The transfer cask is secured to the LPT baseplate through bolts along the bottom flange of the transfer cask. The LPT is used to move the loaded transfer cask in a vertical orientation through the plant Fuel Handling Building (FHB) door. The LPT travels on a rail system that runs from inside the FHB to the access road located outside the FHB roll-up door. The rail system is part of the DCPP operating licenses, and is therefore, not discussed further in this application.

Multi-Purpose Canister Downloader Slings

As discussed in DC ISFSI UFSAR, Section 4.3.2.4, the MPC downloader slings are used to lower (or raise) the loaded MPC during MPC transfer operations between the transfer cask and the overpack. The MPC downloader slings transmit the force of the loaded MPC from the MPC lift cleats to the cask transporter structure.

Multi-Purpose Canister Lift Cleats

As discussed in DC ISFSI UFSAR, Section 4.3.2.5, the MPC lift cleats are ancillary devices temporarily attached to the MPC lid and used during transfer of the loaded MPC between the transfer cask and the overpack. The MPC lift cleats transmit the weight of the loaded MPC to the MPC downloader slings.

HI-STORM 100 Lifting Brackets and Slings

As discussed in DC ISFSI UFSAR, Section 4.3.2.6, the HI-STORM 100 lifting brackets are load-bearing, structural steel components used to connect the cask transporter lifting points to the lid studs on the overpack. The HI-STORM 100 lifting brackets and slings transfer the weight of the loaded overpack from the lid studs to the cask transporter lift points through connector pins.

HI-STORM 100 Mating Device

As discussed in DC ISFSI UFSAR, Section 3.3.4.2.2, the mating device provides structural support and shielding at the interface between the top of the open overpack and the bottom of the transfer cask during MPC transfer operations. The mating device also facilitates the removal of the bottom lid from the transfer cask prior to MPC transfer operations.

3.6.2 Materials Evaluated (Cask Transportation System)

Materials for the Cask Transportation System subcomponents are provided in Table 3-6 based on review of design drawings.

3.6.3 Environments (Cask Transportation System)

The cask transportation system subcomponents are housed in an enclosed building. These components are temporarily exposed to an outdoor environment during transport activities before they are re-housed for long-term storage. In Table 3-6, the environment is designated as “Sheltered.”

3.6.4 Aging Effects Requiring Management and Aging Management Activities (Cask Transportation System)

The MAPS Report (Reference 3.9.1) does not contain a specific evaluation of a cask transport system. To determine the aging effects/mechanisms for the cask transportation system materials/environment combinations, MAPS Report Table 3-2, an overall summary table for all system types, was used. Unless annotated by a table note, each line item in Table 3-6 is consistent with the applicable line items in MAPS Report (Reference 3.9.1), Table 3-2.

Based on the material and environment combinations, and consideration of the conditions during the PEO, the following aging effects and associated mechanism(s) were determined to require management:

- loss of material due to pitting and crevice corrosion
- loss of material due to galvanic corrosion
- loss of material due to general corrosion
- loss of material due to wear
- change in material properties in polymers
- loss of preload due to stress relaxation in bolting

Based on the AMR of the cask transportation system during long-term storage, it has been determined that an AMP (see Appendix A) is required.

3.6.5 Aging Management Review Conclusion (Cask Transportation System)

The cask transportation system AMP activities described in Appendix A provide reasonable assurance that the cask transportation system aging effects/mechanisms will be managed effectively such that it will continue to perform its intended function during the PEO.

3.7 Aging Management Review Results – Independent Spent Fuel Storage Installation Storage Pads

This section provides the results of the AMR of the ISFSI storage pads, which were determined to be within the scope of LR as identified in Section 2.3, Scoping Results.

ISFSI storage pads subcomponents that did not undergo an AMR are listed in Table 2-7. A summary of the results of the AMR for the ISFSI storage pads subcomponents that supported an intended function is provided in Table 3-7. A description of the ISFSI storage pads subcomponents which support an SSC intended function is provided in Section 3.7.1, and a summary of the materials and environments for the ISFSI storage pads is provided in Section 3.7.2 and 3.7.3, respectively. Section 3.7.4 references the aging effects requiring management and any aging management activities used to manage the effects of aging. Section 3.7.5 provides an AMR conclusion.

3.7.1 Description of the Independent Spent Fuel Storage Installation Storage Pads

The ISFSI storage pads (total of seven) are structural units constructed of steel-reinforced concrete. Each of the ISFSI storage pads accommodates up to 20 loaded overpacks (4 rows of 5). Each concrete pad is approximately 68 feet (ft) wide by 105 ft long and 7.5 ft thick with longitudinal and transverse horizontal reinforcing bars near the top and bottom of the pads. The function of the ISFSI storage pads is to provide a level, competent structural surface for placement of the loaded overpacks for all design-basis conditions of storage. (Reference 3.9.2, Sections 4.2.1.1.1 and 4.2.1.1.6)

The ISFSI storage pad is designed with an embedded steel structure having a steel plate ring at the surface of the concrete that mates with the bottom of the overpack. Each overpack is compressed against the embedment plate using 16 studs to preclude tipover. (Reference 3.9.2, Section 4.2.1.1.6)

3.7.2 Materials Evaluated (Independent Spent Fuel Storage Installation Storage Pads)

The ISFSI storage pads are constructed of concrete with embedded ASTM reinforcing bar. The embedment structures are fabricated from carbon steel. Materials for the ISFSI storage pads subcomponents are provided in Table 3-7.

As discussed in the DC ISFSI UFSAR, Section 4.7.5, the carbon steel embedment components exposed to outdoor air are coated. Further, the concrete pad surface is maintained with a penetrating, breathable, water-repellent sealer to protect the concrete surfaces exposed to weather and marine air. However, conservatively, credit is not taken for the coating in the Table 3-7 AMR.

3.7.3 Environments (Independent Spent Fuel Storage Installation Storage Pads)

During construction of the ISFSI storage pads, the reinforcing bars were embedded in the concrete before the concrete set, thereby protecting the rebar from direct exposure to the ambient environment. The concrete itself is exposed to all weather-related effects and ambient air as discussed in the DC ISFSI UFSAR, Table 3.4-1. The reinforced concrete of the ISFSI storage pads is in contact with a soil-like subgrade.

The ambient air is a saline air due to the proximity to the Pacific Ocean. The average ambient air annual temperature is 55°F (Reference 3.9.2, Table 3.4-1). In Table 3-7, the above-grade environment is designated as "Air-Outdoor."

The ISFSI storage pads extend 7.5 ft below-grade. During construction, all bedrock seams were filled with grout, and a concrete mud mat installed prior to the 7.5-ft thick pads. Further, the ISFSI pad aprons were backfilled with controlled low strength material. Although the ISFSI pads are not in direct contact with soil due to the bedrock site, for the purposes of LR, in Table 3-7, the below-grade environment is conservatively designated as "Soil."

3.7.4 Aging Effects Requiring Management and Aging Management Activities (Independent Spent Fuel Storage Installation Storage Pads)

The MAPS Report (Reference 3.9.1) was used to identify the possible aging effects/mechanisms. Unless annotated by a table note, each line item in Table 3-7 is consistent with the applicable line items in MAPS Report, Table 4-24, supplemented by MAPS Report, Table 3-2.

Consistent with the MAPS Report (Reference 3.9.1), the following aging effects and mechanisms related to the ISFSI storage pads were determined non-credible for the DC ISFSI:

- Cracking due to creep for concrete exposed to air-outdoor or soil – see Reference 3.9.1, Section 3.5.1.2.
- Cracking and loss of strength due to dehydration at high temperatures for concrete exposed to air-outdoor or soil – see Reference 3.9.1, Section 3.5.1.11.
- Cracking, loss of material, or loss of strength due to delayed ettringite formation for concrete exposed to air- outdoor or soil – see Reference 3.9.1, Section 3.5.1.13.
- Cracking due to shrinkage for concrete exposed to air-outdoor or soil – see Reference 3.9.1, Section 3.5.1.7.
- Cracking due to differential settlement for concrete exposed to air-outdoor – see Reference 3.9.1, Section 3.5.1.4.
- Cracking due to fatigue for concrete exposed to air-outdoor or soil – see Reference 3.9.1, Section 3.5.1.10.
- Cracking and loss of strength due to radiation damage for concrete exposed to air-outdoor or soil – see Reference 3.9.1, Section 3.5.1.9.

Diablo Canyon Independent Spent Fuel Storage Installation Temperature

As discussed in Section 3.3.3, the hottest temperature at the ISFSI storage pads will be experienced in the cavity between the MPC and the HI-STORM 100SA overpack. The HI-STORM 100SA overpack outer shell peak temperature allowable limit is 300°F during normal conditions of long-term storage. This allowable temperature limit is consistent with the temperature (300°F) that EPRI Structural Tools (Reference 3.9.3) defines as an environment that would result in concrete aging effects. This being said, Table 3-7 conservatively provides the aging effects and mechanisms discussed in the MAPS Report.

Soil Corrosivity
Soil samples were taken as part of the pre-application inspection. As presented in Table 3.1-2, the analyses of these soil samples determined that the soil is non-corrosive. It was determined that no additional soil samples should be required since there is no mechanism to change the corrosivity of the soil. However, as discussed in Appendix A, PG&E is conservatively proposing soil samples throughout the PEO.

Settlement
Settlement of the ISFSI storage pads was reviewed during the initial licensing of the DC ISFSI (Reference 3.9.2, Section 4.2.1.1.8; Reference 3.9.7, Sections 5.1.3.1 and 5.1.3.4). Geotechnical evaluations demonstrated that settlement would not occur due to the pads being located on bedrock. This conclusion is reflected in Sections 5.1.3.1 and 5.1.3.4 of the NRC's Safety Evaluation Report. Because it has been demonstrated that settlement would not occur, no aging management is required during the PEO.

The AMR results for individual ISFSI storage pads subcomponents are listed in Table 3-7. Based on the material and environment combinations, and consideration of the conditions during the PEO, the following aging effects and associated mechanism(s) were determined to require management:

- cracking due to aggressive chemical attack
- cracking due to corrosion of reinforcing steel
- cracking due to reaction with aggregates
- increase in porosity and permeability due to leaching of calcium hydroxide
- increase in porosity and permeability due to microbiological degradation
- loss of concrete/steel bond due to corrosion of reinforcing steel
- loss of material due to aggressive chemical attack
- loss of material due to general corrosion
- loss of material due to pitting and crevice corrosion
- loss of material due to microbiological degradation
- loss of material due to microbiologically influenced corrosion
- loss of material due to salt scaling
- loss of material due to corrosion of reinforcing steel
- loss of strength due to aggressive chemical attack
- loss of strength due to corrosion of reinforcing steel
- loss of strength due to leaching of calcium hydroxide
- loss of strength due to microbiological degradation
- loss of strength due to reaction with aggregates
- reduction of concrete pH due to aggressive chemical attack
- reduction of concrete pH due to leaching of calcium hydroxide
- reduction of concrete pH due to microbiological degradation

Based on the AMR of the ISFSI storage pads during long-term storage, it has been determined that an AMP (see Appendix A) is required.

3.7.4.1 Independent Spent Fuel Storage Installation Storage Pad Embedment Structures Exposed to Air-Outdoor

Research (Reference 3.9.13) states the corrosion rate of carbon steel in a submerged marine environment varies from 0.0024-0.0043 inches/year (60-

110 micrometers (µm)/year) and 0.0004-0.0028 inches/year (10-70 µm/year) in a submerged industrial environment (both more aggressive environments than the DC ISFSI air-outdoor environment). Alloy steels (with Cr and Cu) initially may corrode, if exposed to these environments, but wetting and drying allows pores to fill and the corrosion rate slows down to 0.0006 inches/year (15 µm/year) after 5 years in a marine environment and 0.0002 inches/year (5 µm/year) after 5 years in an industrial environment.

If it is conservatively assumed that over a 1-year period, up to 0.0043 inches (0.110 millimeters) of wall loss may be experienced due to various corrosion mechanisms, this results in a total of 0.258 inches (6.60 millimeters) of wall loss over a 60-year period (i.e., the steel plate ring at the surface of the concrete). This projected wall loss translates to 13 percent of the top embedment structure 2-inch thickness. This conservative potential material loss does not impact the component intended functions. Based on this discussion, aging management activities are not necessary for these components.

3.7.5 Aging Management Review Conclusion (Independent Spent Fuel Storage Installation Storage Pads)

The DC ISFSI AMPs described in Appendix A provide reasonable assurance that the ISFSI storage pads' aging effects/mechanisms will be managed effectively such that it will continue to perform its intended function during the PEO.

3.8 Aging Management Review Results – Cask Transfer Facility

This section provides the results of the AMR of the CTF, which was determined to be within the scope of LR as identified in Section 2.3, Scoping Results.

CTF subcomponents that did not undergo an AMR are listed in Table 2-8. A summary of the results of the AMR for the CTF subcomponents that supported an intended function is provided in Table 3-8. A description of the CTF subcomponents which support an SSC intended function is provided in Section 3.8.1, and a summary of the materials and environments for the CTF is provided in Section 3.8.2 and 3.8.3, respectively. Section 3.8.4 references the aging effects requiring management and any aging management activities used to manage the effects of aging. Section 3.8.5 provides an AMR conclusion.

3.8.1 Description of the Cask Transfer Facility

The CTF is comprised of the support structure and the cask transporter lateral restraint system.

The CTF concrete support structure is a cylindrical, steel-lined structure, embedded in the rock, underground and made-up of steel-reinforced slabs and walls. The facility is designed with a sump for incidental water collection. When not in use, the facility is enclosed with a cover for personnel safety and protection of the structure from the environment. The CTF structure is fully embedded in the ground. The top of the structure has a one-inch-high lip above grade and around the top of the CTF shell to prevent entry of liquids into the CTF pit. The bottom of the concrete base slab is approximately 20 ft. below the surface of the adjacent competent rock.

The cask transporter lateral restraint system is designed to apply external restraint loading to the cask transporter structure. The transporter tie down locations are immediately adjacent to the CTF support structure and are supported by rock anchor installations into the ground. (Reference 3.9.2, Section 4.2.1.2)

3.8.2 Materials Evaluated (Cask Transfer Facility)

Materials for the CTF subcomponents are provided in Table 3-8 based on review of design drawings.

3.8.3 Environments (Cask Transfer Facility)

As described above, the CTF structure is fully embedded in the ground. When not in use, the facility is enclosed with a cover for personnel safety and protection of the structure from the environment. In Table 3-8, the non-embedded CTF environment is designated as “Sheltered.”

The cask transporter lateral restraint system is partially embedded in the ground. In Table 3-8, the non-embedded lateral restraint system environment is designated as “Air-outdoor.”

3.8.4 Aging Effects Requiring Management and Aging Management Activities (Cask Transfer Facility)

The MAPS Report (Reference 3.9.1) does not contain a specific evaluation of a CTF. To determine the aging effects/mechanisms for the CTF materials/environment combinations, MAPS Report Table 3-2, an overall summary table for all system types, was used. Unless annotated by a table note, each line item in Table 3-6 is consistent with the applicable line items in MAPS Report (Reference 3.9.1), Table 3-2.

Based on the material and environment combinations, and consideration of the conditions during the PEO, the following aging effects and associated mechanism(s) were determined to require management:

- cracking due to aggressive chemical attack
- cracking due to corrosion of reinforcing steel
- cracking due to reaction with aggregates
- increase in porosity and permeability due to leaching of calcium hydroxide
- increase in porosity and permeability due to microbiological degradation
- loss of concrete/steel bond due to corrosion of reinforcing steel
- loss of material due to aggressive chemical attack
- loss of material due to corrosion of reinforcing steel
- loss of material due to galvanic corrosion
- loss of material due to general corrosion
- loss of material due to microbiological degradation
- loss of material due to microbiologically influenced corrosion
- loss of material due to pitting and crevice corrosion
- loss of material due to salt scaling
- loss of strength due to aggressive chemical attack
- loss of strength due to corrosion of reinforcing steel
- loss of strength due to leaching of calcium hydroxide
- loss of strength due to microbiological degradation
- loss of strength due to reaction with aggregates
- reduction of concrete pH due to aggressive chemical attack
- reduction of concrete pH due to leaching of calcium hydroxide
- reduction of concrete pH due to microbiological degradation

- change in material properties in polymers

Based on the AMR of the CTF during long-term storage, it has been determined that an AMP (see Appendix A) is required.

3.8.5 Aging Management Review Conclusion (Cask Transfer Facility)

The AMP activities described in Appendix A provide reasonable assurance that the CTF aging effects/mechanisms will be managed effectively such that it will continue to perform its intended function during the PEO.

3.9 Section 3.0 References

3.9.1 NUREG-2214, Managing Aging Processes in Storage (MAPS) Report, U.S. Nuclear Regulatory Commission, July 2019.

3.9.2 PG&E Letter DIL-21-004, "Biennial Submittal of Diablo Canyon Independent Spent Fuel Storage Installation Updated Final Safety Analysis Report," Revision 9, December 15, 2021, ADAMS Accession No. ML21349B166.

3.9.3 EPRI Report 1002950, Aging Effects for Structures and Structural Components (Structural Tools), Revision 1, August 2003.

3.9.4 EPRI Report 1010639, Non-Class 1 Mechanical Implementation Guideline and Mechanical Tools, Revision 4, January 2006.

3.9.5 ASTM Standard C33-01, Standard Specification for Concrete Aggregates.

3.9.6 Final Safety Analysis Report for the HI-STORM 100 Cask Storage System, Docket 72-1014, Revision 22, Report HI-2002444, ADAMS Accession No. ML21221A329.

3.9.7 Diablo Canyon Independent Spent Fuel Storage Installation Safety Evaluation Report, Docket 72-26, Materials License No. SNM-2511, March 22, 2004, ADAMS Accession No. ML040780107.

3.9.8 Slingmax Technical Bulletin 21. K-Spec Fiber Characteristics vs. other Fibers. November 2011. Available at: https://slingmax.com/technical-bulletins/

3.9.9 Final Safety Evaluation Report for the Humboldt Bay Independent Spent Fuel Storage Installation License Renewal, Docket 72-27, License No. SNM-2514, June 10, 2020, ADAMS Accession No. ML20161A025 through ML20161A029.

3.9.10 NUREG-1801, Generic Aging Lessons Learned (GALL) Report, Rev. 2, U.S. Nuclear Regulatory Commission, December 2010, ADAMS Accession No. ML103490041.

3.9.11 DuPont, Delrin® Design Guide, DuPont Engineering Polymers, Report No. 230323C.

3.9.12 Holtec Report HI-2002396, “Holtite-A: Development History and Thermal Performance Data,” Revision 5.

3.9.13 Practical Building Conservation: Metals ISBN 13: 9780754645559.

3.9.14 PG&E Work Order 60134342-0010, DC ISFSI Pre-application Concrete Inspection, December 2021.

Table 3-2 Aging Management Review of Spent Fuel Assemblies

Subcomponent	Intended Function[1]	Material	Environment[2]	Aging Effect	Aging Mechanism	Aging Management
Bottom and Top Nozzles	CR, RE, SR	Stainless Steel	Helium	None	N/A	None
Nozzle Spring Set	CR, RE, SR	Nickel Alloy	Helium	None	N/A	None
Guide Thimble	CR, RE, SR	Zirconium-Based Alloy	Helium	None	N/A	None
Grid Assembly	CR, RE, SR, TH	Nickel Alloy	Helium	None	N/A	None
		Zirconium-Based Alloy	Helium	None	N/A	None
Instrumentation Tube	CR, RE, SR	Zirconium-Based Alloy	Helium	None	N/A	None
Fuel Tube and End Plugs (Cladding)	CO, CR, RE, SH, SR, TH	Zirconium-Based Alloy	Helium	Loss of ductility	Hydride reorientation	HBU Fuel AMP
		Zirconium-Based Alloy	Helium	Changes in dimensions	Thermal Creep	
Fuel Tube Spring	CR, RE, SR	Stainless Steel	Helium	None	N/A	None
Poison Rod Assemblies	CR	Stainless Steel	Helium	None	N/A	None

Notes:
1. Intended Functions: Confinement (CO), Sub-criticality (CR), Radiation Shielding (SH), Structural Integrity (SR), Retrievability (RE)
2. As described in Section 3.2.3, the MPC is sealed and filled with helium, so both the inner and outer surfaces of the SFAs are contained within a helium environment.

Table 3-3 Aging Management Review of Multi-Purpose Canister

Subcomponent	Intended Function[1]	Material	Environment[2]	Aging Effect	Aging Mechanism	Aging Management
Baseplate	CO, SH, SR, TH	Stainless Steel (welded)	(E) Sheltered	Cracking	Fatigue	None[4] – no fatigue analysis was performed
					SCC	MPC AMP
				Loss of material	Pitting and crevice corrosion	
			(I) Helium	Cracking	Fatigue	None[4] – no fatigue analysis was performed
Shell Bottom	CO, SH, SR, TH	Stainless Steel (welded)	(E) Sheltered	Cracking	Fatigue	None[4] – no fatigue analysis was performed
					SCC	MPC AMP
				Loss of material	Pitting and crevice corrosion	
			(I) Helium	Cracking	Fatigue	None[4] – no fatigue analysis was performed
Lift Lug Base Plate	SR	Stainless Steel	Helium	None	N/A	None
Lift Lug	SR	Stainless Steel	Helium	None	N/A	None
Lid	CO, SH, SR, TH	Stainless Steel (welded)	(E) Sheltered	Cracking	Fatigue	None[4] – no fatigue analysis was performed
					SCC	MPC AMP
				Loss of material	Pitting and crevice corrosion	
			(I) Helium	Cracking	Fatigue	None[4] – no fatigue analysis was performed
Closure Ring	CO, SH, SR, TH	Stainless Steel (welded)	(E) Sheltered	Cracking	Fatigue	None[4] – no fatigue analysis was performed
					SCC	MPC AMP
				Loss of material	Pitting and crevice corrosion	

Table 3-3 Aging Management Review of Multi-Purpose Canister

Subcomponent	Intended Function[1]	Material	Environment[2]	Aging Effect	Aging Mechanism	Aging Management
Drain and Vent Shield Blocks	SH	Stainless Steel	Helium	None	N/A	None
Vent Drain Tube	SR	Stainless Steel	Helium	None	N/A	None
Vent Drain Cap	SR	Stainless Steel	Helium	None	N/A	None
Port Cover Plate	CO	Stainless Steel (welded)	Helium	Cracking	Fatigue	None[4] – no fatigue analysis was performed
Vent Shield Spacer	SR	Stainless Steel	Helium	None	N/A	None
Port Cover Bolt	CO	Stainless Steel (welded)	Helium	Cracking	Fatigue	None[4] – no fatigue analysis was performed
Lid Channels	SR	Stainless Steel (welded)	Helium	Cracking	Fatigue	None[4] – no fatigue analysis was performed
Lid Base Plate	SR	Stainless Steel (welded)	Helium	Cracking	Fatigue	None[4] – no fatigue analysis was performed
Lid Tube Support	SR	Stainless Steel (welded)	Helium	Cracking	Fatigue	None[4] – no fatigue analysis was performed
Basket Support Plate	SR, CR	Stainless Steel	Helium	Cracking	Fatigue	None[4] – no fatigue analysis was performed
Basket Shim	SR, CR	Stainless Steel	Helium	Cracking	Fatigue	None[4] – no fatigue analysis was performed

Table 3-3 Aging Management Review of Multi-Purpose Canister

Subcomponent	Intended Function[1]	Material	Environment[2]	Aging Effect	Aging Mechanism	Aging Management
Lid Lift Hole Plug	SH	Stainless Steel	Embedded (stainless steel)	N/A	N/A	N/A
			Sheltered	Loss of material[3]	Pitting and crevice corrosion	MPC AMP
Shell Top	CO, SH, SR, TH	Stainless Steel (welded)	(E) Sheltered	Cracking	Fatigue	None[4] – no fatigue analysis was performed
					SCC	MPC AMP
				Loss of material	Pitting and crevice corrosion	
			(I) Helium	Cracking	Fatigue	None[4] – no fatigue analysis was performed
Vent Plug	SR	Aluminum	Helium	None	N/A	None
Lower Fuel Spacer Top and Beam	SR	Stainless Steel	Helium	Cracking	Fatigue	None[4] – no fatigue analysis was performed
Basket Cell Plates, Spacer Plates, and Sheathing	CR, SH, SR, TH	Stainless Steel (welded)	Helium	Cracking	Fatigue	None[4] – no fatigue analysis was performed
Basket Neutron Absorber	CR, SH, TH	Boral	Helium	Reduction of neutron-absorbing capacity	Boron depletion	TLAA will be valid to the end of the PEO per TLAA disposition (ii) – see Section 4.4
		Metamic	Helium	Reduction of neutron-absorbing capacity	Boron depletion	

Table 3-3 Aging Management Review of Multi-Purpose Canister

Subcomponent	Intended Function[1]	Material	Environment[2]	Aging Effect	Aging Mechanism	Aging Management
Optional Heat Conduction Elements (MPC-24/ 24E/ 24EF Only)	TH	Aluminum	Helium	None	N/A	None
Flux Gap Plate and Cover (MPC-24/ 24E/ 24EF Only)	CR	Stainless Steel	Helium	Cracking	Fatigue	None[4] – no fatigue analysis was performed
DFC	CR, SR	Stainless Steel	Helium	Cracking	Fatigue	None[4] – no fatigue analysis was performed

Notes:

1. Intended Functions: Confinement (CO), Sub-criticality (CR), Radiation Shielding (SH), Structural Integrity (SR), Retrievability (RE)
2. (I)=internal environment, (E)=external environment
3. This line item is consistent with the MAPS Report, Table 3-2 for not considering SCC as an applicable aging mechanism because the stainless steel components have no welds or heat-affected zones. Therefore, sufficient stress does not exist in the components to support SCC. In addition, no dis-similar metals exist to create a galvanic couple.
4. Consistent with the MAPS Report, no aging management is required because there is no TLAA associated with this subcomponent (see Section 4.0).

Table 3-4 Aging Management Review of HI-TRAC 125D Transfer Cask

Subcomponent	Intended Function[1]	Material	Environment	Aging Effect	Aging Mechanism	Aging Management
Bottom Flange	SR, SH	Carbon Steel	Air-indoor	Loss of material	General corrosion Pitting and crevice corrosion	Transfer Cask AMP
Inner Shell	SH, SR, TH	Carbon Steel	Air-indoor	Loss of material	General corrosion Pitting and crevice corrosion	Transfer Cask AMP
			Embedded (lead)	None	N/A	None
Outer Shell	SH, SR, TH	Carbon Steel	Air-indoor	Loss of material	General corrosion Pitting and crevice corrosion	Transfer Cask AMP
			Embedded (lead)	None	N/A	None
Top Flange	SR, SH	Carbon Steel	Air-indoor	Loss of material	General corrosion Pitting and crevice corrosion	Transfer Cask AMP
Lead Plug	SR, SH	Carbon Steel	Air-indoor	Loss of material	General corrosion Pitting and crevice corrosion	Transfer Cask AMP
Trunnion Block	SR	Carbon Steel	Air-indoor	Loss of material	General corrosion Pitting and crevice corrosion	Transfer Cask AMP
Trunnion	SR	Nickel Alloy	Air-indoor	Loss of material	Wear	Transfer Cask AMP
Flange Brace	SR, SH	Carbon Steel	Air-indoor	Loss of material	General corrosion Pitting and crevice corrosion	Transfer Cask AMP
Water Jacket Top and Bottom Plates	SH, SR, TH	Carbon Steel	Air-indoor	Loss of material	General corrosion Pitting and crevice corrosion	Transfer Cask AMP
Water Jacket Ribs	SH, SR, TH	Carbon Steel	Air-indoor	Loss of material	General corrosion Pitting and crevice corrosion	Transfer Cask AMP
Water Jacket Bottom Plate Support	SH, SR, TH	Carbon Steel	Air-indoor	Loss of material	General corrosion Pitting and crevice corrosion	Transfer Cask AMP
Water Jacket Outer Shell	SH, SR, TH	Carbon Steel	Air-indoor	Loss of material	General corrosion Pitting and crevice corrosion	Transfer Cask AMP

Table 3-4 Aging Management Review of HI-TRAC 125D Transfer Cask

Subcomponent	Intended Function[1]	Material	Environment	Aging Effect	Aging Mechanism	Aging Management
Shell Lead	SH, TH	Lead	Embedded (steel)	None	N/A	None
Pool Lid Ring	SH, SR, TH	Carbon Steel	Air-indoor	Loss of material	General corrosion	Transfer Cask AMP
					Pitting and crevice corrosion	
Pool Lid Lead	SH, TH	Lead	Embedded (steel)	None	N/A	None
Pool Lid	SH, SR, TH	Carbon Steel	Air-indoor	Loss of material	General corrosion	Transfer Cask AMP
					Pitting and crevice corrosion	
Pool Lid Bolt	SR	Carbon Steel	Air-indoor	Loss of material	General corrosion	Transfer Cask AMP
					Pitting and crevice corrosion	
Top Closure Lid	SR, SH	Carbon Steel	Air-indoor	Loss of material	General corrosion	Transfer Cask AMP
					Pitting and crevice corrosion	
Top Rings	SR, SH	Carbon Steel	Air-indoor	Loss of material	General corrosion	Transfer Cask AMP
					Pitting and crevice corrosion	
			Embedded (Holtite-A)	None	N/A	None
Top Lift Block	SR, SH	Carbon Steel	Air-indoor	Loss of material	General corrosion	Transfer Cask AMP
					Pitting and crevice corrosion	
			Embedded (Holtite-A)	None	N/A	None
Top Lid Shielding	SH	Holtite-A	Embedded (steel)	Cracking	Radiation embrittlement	None – see Section 3.4.4.1
				Loss of fracture toughness and loss of ductility	Thermal aging	None – see Section 3.4.4.1
				Loss of shielding	Boron depletion	TLAA will be valid to the end of the PEO per TLAA disposition (ii) – see Section 4.4

Table 3-4 Aging Management Review of HI-TRAC 125D Transfer Cask

Subcomponent	Intended Function[1]	Material	Environment	Aging Effect	Aging Mechanism	Aging Management
Top Lid Plate	SR, SH	Carbon Steel	Air-indoor	Loss of material	General corrosion	Transfer Cask AMP
					Pitting and crevice corrosion	
			Embedded (Holtite-A)	None	N/A	None
Top Lid Bolt	SR	Carbon Steel	Air-indoor	Loss of material	General corrosion	Transfer Cask AMP
					Pitting and crevice corrosion	
Mating Device Bolt	SR	Carbon Steel	Air-indoor	Loss of material	General corrosion	Transfer Cask AMP
					Pitting and crevice corrosion	

Notes:
1. Intended Functions: Confinement (CO), Sub-criticality (CR), Radiation Shielding (SH), Structural Integrity (SR), Retrievability (RE)

Table 3-5 Aging Management Review of HI-STORM 100SA Overpack

Subcomponent	Intended Function[1]	Material	Environment[2]	Aging Effect	Aging Mechanism	Aging Management
Shim Plate	SR	Carbon Steel	Air-outdoor	Loss of material	General corrosion	None – see Section 3.5.4.1
					Pitting and crevice corrosion	
Shim	SR	Stainless Steel	Air-outdoor	Loss of material[3]	Galvanic corrosion	Overpack AMP
					Pitting and crevice corrosion	
					Wear	
Base Bottom Plate	SR	Carbon Steel	(E) Air-outdoor	Loss of material	Galvanic corrosion	None – see Section 3.5.4.1
					General corrosion	
					Pitting and crevice corrosion	
			(I) Sheltered	Loss of material	General corrosion	Overpack AMP
					Pitting and crevice corrosion	
Cask Inner Shell	SH, SR	Carbon Steel	Sheltered	Loss of material	General corrosion	Overpack AMP
					Pitting and crevice corrosion	
Cask Top and Bottom Guides	SR	Carbon Steel	Sheltered	Loss of material	General corrosion	Overpack AMP
					Pitting and crevice corrosion	
Base Vent Side Plate	SR	Carbon Steel	Air-outdoor[4]	Loss of material	General corrosion	Overpack AMP
					Pitting and crevice corrosion	
			Embedded (concrete)	None	N/A	None
			Sheltered	Loss of material	General corrosion	Overpack AMP
					Pitting and crevice corrosion	
Base Top Plate	SR	Carbon Steel	Air-outdoor	Loss of material	General corrosion	Overpack AMP
					Pitting and crevice corrosion	
			Embedded (concrete)[5]	None	N/A	None
			Sheltered	Loss of material	General corrosion	Overpack AMP
					Pitting and crevice corrosion	
Base Radial Rib	SR	Carbon Steel	Embedded (concrete)	None	N/A	None
Cask Outer Shell	SH, SR	Carbon Steel	Air-outdoor	Loss of material	General corrosion	Overpack AMP
					Pitting and crevice corrosion	

Table 3-5 Aging Management Review of HI-STORM 100SA Overpack

Subcomponent	Intended Function[1]	Material	Environment[2]	Aging Effect	Aging Mechanism	Aging Management
Cask Lid Radial Plate	SR	Carbon Steel	Embedded (concrete)	None	N/A	None
Cask Lid Anchor Block	SR	Carbon Steel	Embedded (concrete)	None	N/A	None
Cask Mating Device Radial Plate	SR	Carbon Steel	Embedded (concrete)	None	N/A	None
Cask Mating Device Anchor Block	SR	Carbon Steel	Embedded (concrete)	None	N/A	None
Cask Concrete Cavity Top Plate	SR	Carbon Steel	Air-outdoor	Loss of material	General corrosion	Overpack AMP
					Pitting and crevice corrosion	
Cask Shielding Concrete	SH	Concrete	Embedded (steel)	None	N/A	None
Pedestal Base Plate	SH	Carbon Steel	Embedded (steel)	None	N/A	None
			Sheltered	Loss of material	General corrosion	Overpack AMP
					Pitting and crevice corrosion	
Pedestal Shell	SR	Carbon Steel	Embedded (steel)	None	N/A	None
			Sheltered	Loss of material	General corrosion	Overpack AMP
					Pitting and crevice corrosion	
Pedestal Shielding	SH	Concrete	Embedded (steel)	None	N/A	None
Pedestal Platform	SH	Carbon Steel	Embedded (steel)	None	N/A	None
			Sheltered	Loss of material	General corrosion	Overpack AMP
					Pitting and crevice corrosion	
Lid Shear Ring	SH, SR	Carbon Steel	Sheltered	Loss of material	General corrosion	Overpack AMP
					Pitting and crevice corrosion	

Table 3-5 Aging Management Review of HI-STORM 100SA Overpack

Subcomponent	Intended Function[1]	Material	Environment[2]	Aging Effect	Aging Mechanism	Aging Management
Lid Shield Ring	TH	Carbon Steel	Air-outdoor[6]	Loss of material	General corrosion	Overpack AMP
					Pitting and crevice corrosion	
			Sheltered	Loss of material	General corrosion	Overpack AMP
					Pitting and crevice corrosion	
Lid Outer Ring	SH, SR	Carbon Steel	Air-outdoor	Loss of material	General corrosion	Overpack AMP
					Pitting and crevice corrosion	
Lid Inner Ring	SH, SR	Carbon Steel	(E) Sheltered	Loss of material	General corrosion	Overpack AMP
					Pitting and crevice corrosion	
		Carbon Steel	(I) Embedded (concrete)	None	N/A	None
Lid Lift Block	SR	Carbon Steel	Air-outdoor	Loss of material	General corrosion	Overpack AMP
					Pitting and crevice corrosion	
Lid Vent Shield	SH, SR	Carbon Steel	Embedded (concrete)	None	N/A	None
			Sheltered	Loss of material	General corrosion	Overpack AMP
					Pitting and crevice corrosion	
Lid Shielding Concrete	SH	Concrete	Embedded (steel)	None	N/A	None
Lid Cover Plate	SR	Carbon Steel	Air-outdoor	Loss of material	General corrosion	Overpack AMP
					Pitting and crevice corrosion	
Lid Stud	SR	Carbon Steel	Air-outdoor	Loss of material	General corrosion	Overpack AMP
					Pitting and crevice corrosion	
Gamma Shield Cross Plates	SH	Stainless Steel (welded)	Air-outdoor	Cracking	SCC	Overpack AMP
				Loss of material	Pitting and crevice corrosion	Overpack AMP
			Sheltered	Cracking	SCC	Overpack AMP
				Loss of material	Pitting and crevice corrosion	Overpack AMP
Anchor Ring	SR	Carbon Steel	Air-outdoor	Loss of material	Galvanic corrosion	Overpack AMP
					General corrosion	
					Pitting and crevice corrosion	
Anchor Gusset	SR	Carbon Steel	Air-outdoor	Loss of material	General corrosion	Overpack AMP
					Pitting and crevice corrosion	

Table 3-5 Aging Management Review of HI-STORM 100SA Overpack

Subcomponent	Intended Function[1]	Material	Environment[2]	Aging Effect	Aging Mechanism	Aging Management
Anchor Stud	SR	Carbon Steel	Air-outdoor	Loss of material	General corrosion	Overpack AMP
					Pitting and crevice corrosion	
Anchor Washer	SR	Carbon Steel	Air-outdoor	Loss of material	General corrosion	Overpack AMP
					Pitting and crevice corrosion	
Anchor Nut	SR	Carbon Steel	Air-outdoor	Loss of material	General corrosion	Overpack AMP
					Pitting and crevice corrosion	

Notes:

1. Intended Functions: Confinement (CO), Sub-criticality (CR), Radiation Shielding (SH), Structural Integrity (SR), Retrievability (RE)
2. (I)=internal environment, (E)=external environment
3. This line item is consistent with the MAPS Report, Table 3-2 for not considering SCC as an applicable aging mechanism because the stainless steel components have no welds or heat-affected zones. Therefore, sufficient stress does not exist in the components to support SCC.
4. This line item is not consistent with the MAPS Report for considering the Air-outdoor environment. The MAPS Report, Table 4-8 line item for "inlet/outlet vent, vertical and horizontal plates, top plate, lid top plate, shear ring" accounts for the Sheltered environment, but not the Air-outdoor environment also experienced by this SSC. The MAPS Report, Table 4-8 line item for "outer shell" was used to determine aging effects/mechanisms for the Air-outdoor environment.
5. This line item is not consistent with the MAPS Report for considering the Embedded (concrete) environment. The MAPS Report, Table 4-8 line item for "baseplate, base spacer block" accounts for the Air-outdoor environment, but not the Embedded (concrete) environment also experienced by this SSC. The MAPS Report, Table 4-8 line item for "radial plate, radial gusset" was used to determine aging effects/mechanisms for the Embedded (concrete) environment.
6. This line item is not consistent with the MAPS Report for considering the Air-outdoor environment. The MAPS Report, Table 4-8 line item for "heat shield, heat/lid shield ring" accounts for the Sheltered environment, but not the Air-outdoor environment also experienced by this SSC. The MAPS Report, Table 4-8 line item for "outer shell" was used to determine aging effects/mechanisms for the Air-outdoor environment.

Table 3-6 Aging Management Review of Cask Transportation System

Subcomponent	Intended Function[1]	Material	Environment	Aging Effect	Aging Mechanism	Aging Management
Cask Transporter						
Cask Restraint System (including Sling and Adjustable Cask Bumpers)	SR, RE	Carbon Steel	Sheltered	Cracking	Fatigue	None[9] – no fatigue analysis was performed
				Loss of material	General corrosion	Cask Transportation AMP
					Pitting and crevice corrosion	
		K-spec fiber[2]	Sheltered	Loss of material	Wear	Cask Transportation AMP
		Polymer[3]	Sheltered	Change in material properties	N/A	Cask Transportation AMP
		Stainless Steel	Sheltered	Cracking[4]	Fatigue	None[9] – no fatigue analysis was performed
				Loss of material	Galvanic corrosion	Cask Transportation AMP
					Pitting and crevice corrosion	
Overhead Beam	SR, RE	Carbon Steel	Sheltered	Cracking	Fatigue	None[9] – no fatigue analysis was performed
				Loss of material	Galvanic corrosion	Cask Transportation AMP
					General corrosion	
					Pitting and crevice corrosion	
				Loss of preload	Stress relaxation	Cask Transportation AMP
		Stainless Steel	Sheltered	Cracking[4]	Fatigue	None[9] – no fatigue analysis was performed
				Loss of material	Galvanic corrosion	Cask Transportation AMP
					Pitting and crevice corrosion	

Table 3-6 Aging Management Review of Cask Transportation System

Subcomponent	Intended Function[1]	Material	Environment	Aging Effect	Aging Mechanism	Aging Management
Lift Towers (Structure) and Bolting	SR, RE	Carbon Steel	Sheltered	Cracking	Fatigue	None[9] – no fatigue analysis was performed
				Loss of material	Galvanic corrosion	Cask Transportation AMP
					General corrosion	
					Pitting and crevice corrosion	
				Loss of preload	Stress relaxation	Cask Transportation AMP
Chassis (i.e., Vehicle Frame)	SR, RE	Carbon Steel	Sheltered	Cracking	Fatigue	None[9] – no fatigue analysis was performed
				Loss of material	General corrosion	Cask Transportation AMP
					Pitting and crevice corrosion	
				Loss of preload	Stress relaxation	Cask Transportation AMP
Wedge Lock Assembly	SR, RE	Carbon Steel	Sheltered	Cracking	Fatigue	None[9] – no fatigue analysis was performed
				Loss of material	Galvanic corrosion	Cask Transportation AMP
					General corrosion	
					Pitting and crevice corrosion	
		Stainless Steel	Sheltered	Cracking[4]	Fatigue	None[9] – no fatigue analysis was performed
				Loss of material	Galvanic corrosion	Cask Transportation AMP
					Pitting and crevice corrosion	
Seismic Tie Down Lugs	SR, RE	Carbon Steel	Sheltered	Cracking	Fatigue	None[9] – no fatigue analysis was performed
				Loss of material	General corrosion	Cask Transportation AMP
					Pitting and crevice corrosion	

Table 3-6 Aging Management Review of Cask Transportation System

Subcomponent	Intended Function[1]	Material	Environment	Aging Effect	Aging Mechanism	Aging Management
HI-TRAC Lift Links	SR, RE	Carbon Steel	Sheltered	Cracking	Fatigue	None[9]– no fatigue analysis was performed
				Loss of material[5]	General corrosion	Cask Transportation AMP
					Pitting and crevice corrosion	
Connector Pins	SR, RE	Carbon Steel	Sheltered	Cracking	Fatigue	None[9] – no fatigue analysis was performed
				Loss of material	Galvanic corrosion	Cask Transportation AMP
					General corrosion	
					Pitting and crevice corrosion	
		Nickel Alloy	Sheltered	Cracking	Fatigue	None[9] – no fatigue analysis was performed
		Stainless Steel	Sheltered	Cracking[4]	Fatigue	None[9] – no fatigue analysis was performed
				Loss of material	Galvanic corrosion	Cask Transportation AMP
					Pitting and crevice corrosion	
MPC Downloader System						
Pulley Plates	SR, RE	Carbon Steel	Sheltered	Cracking	Fatigue	None[9] – no fatigue analysis was performed
				Loss of material	Galvanic corrosion	Cask Transportation AMP
					General corrosion	
					Pitting and crevice corrosion	
Pulley Shafts	SR, RE	Stainless Steel	Sheltered	Cracking[4]	Fatigue	None[9] – no fatigue analysis was performed
				Loss of material	Galvanic corrosion	Cask Transportation AMP
					Pitting and crevice corrosion	

Table 3-6 Aging Management Review of Cask Transportation System

Subcomponent	Intended Function[1]	Material	Environment	Aging Effect	Aging Mechanism	Aging Management
Low-Profile Transporter						
Main Beam Plates and Ribs	SR	Carbon Steel	Sheltered	Cracking	Fatigue	None[9] – no fatigue analysis was performed
				Loss of material	Galvanic corrosion	Cask Transportation AMP
					General corrosion	
					Pitting and crevice corrosion	
Lateral Guide Mating Plate	SR	Carbon Steel	Sheltered	Cracking	Fatigue	None[9] – no fatigue analysis was performed
				Loss of material	General corrosion	Cask Transportation AMP
					Pitting and crevice corrosion	
Roller Mating Plate	SR	Carbon Steel	Sheltered	Cracking	Fatigue	None[9] – no fatigue analysis was performed
			Sheltered	Loss of material	Galvanic corrosion	Cask Transportation AMP
					General corrosion	
					Pitting and crevice corrosion	
Lateral Guide Block	SR	Polymer[3]	Sheltered	Change in material properties	N/A	Cask Transportation AMP
Pad and Support Gussets	SR	Carbon Steel	Sheltered	Cracking	Fatigue	None[9] – no fatigue analysis was performed
				Loss of material	General corrosion	Cask Transportation AMP
					Pitting and crevice corrosion	
Side and Base Plates	SR	Carbon Steel	Sheltered	Cracking	Fatigue	None[9] – no fatigue analysis was performed
				Loss of material	Galvanic corrosion	Cask Transportation AMP
					General corrosion	
					Pitting and crevice corrosion	

Table 3-6 Aging Management Review of Cask Transportation System

Subcomponent	Intended Function[1]	Material	Environment	Aging Effect	Aging Mechanism	Aging Management
Roller	SR	Carbon Steel	Sheltered	Cracking	Fatigue	None[9] – no fatigue analysis was performed
				Loss of material	Galvanic corrosion	Cask Transportation AMP
					General corrosion	
					Pitting and crevice corrosion	
		Stainless Steel	Sheltered	Cracking[4]	Fatigue	None[9] – no fatigue analysis was performed
				Loss of material	Galvanic corrosion	Cask Transportation AMP
					Pitting and crevice corrosion	
Roller Pad	SR	Polymer[6]	Sheltered	Change in material properties	N/A	Cask Transportation AMP
HI-TRAC Mounting Bolt	SR	Carbon Steel	Sheltered	Cracking	Fatigue	None[9] – no fatigue analysis was performed
				Loss of material[7]	Galvanic corrosion	Cask Transportation AMP
					General corrosion	
					Pitting and crevice corrosion	
				MPC Lift Cleats		
Body	SR, RE	Carbon Steel	Sheltered	Cracking	Fatigue	None[9] – no fatigue analysis was performed
				Loss of material	Galvanic corrosion	Cask Transportation AMP
					General corrosion	
					Pitting and crevice corrosion	
Stud	SR, RE	Nickel Alloy	Sheltered	Cracking	Fatigue	None[9] – no fatigue analysis was performed
Hexnut	SR, RE	Nickel Alloy	Sheltered	Cracking	Fatigue	None[9] – no fatigue analysis was performed

Table 3-6 Aging Management Review of Cask Transportation System

Subcomponent	Intended Function[1]	Material	Environment	Aging Effect	Aging Mechanism	Aging Management
MPC Downloader Slings						
MPC Downloader Slings	SR, RE	N/A	N/A	N/A	N/A	N/A[8]
HI-STORM Lifting Bracket						
Plates	SR, RE	Carbon Steel	Sheltered	Cracking	Fatigue	None[9] – no fatigue analysis was performed
				Loss of material	Galvanic corrosion	Cask Transportation AMP
					General corrosion	
					Pitting and crevice corrosion	
Connecting Pin	SR, RE	Nickel Alloy	Sheltered	Cracking	Fatigue	None[9] – no fatigue analysis was performed
		Stainless Steel	Sheltered	Loss of material	Galvanic corrosion	Cask Transportation AMP
					General corrosion	
					Pitting and crevice corrosion	
Stud Plate	SR, RE	Carbon Steel	Sheltered	Cracking	Fatigue	None[9] – no fatigue analysis was performed
				Loss of material	Galvanic corrosion	Cask Transportation AMP
					General corrosion	
					Pitting and crevice corrosion	
Hex Nut	SR, RE	Nickel Alloy	Sheltered	Cracking	Fatigue	None[9] – no fatigue analysis was performed
		Stainless Steel	Sheltered	Loss of material	Galvanic corrosion	Cask Transportation AMP
					General corrosion	
					Pitting and crevice corrosion	

Table 3-6 Aging Management Review of Cask Transportation System

Subcomponent	Intended Function[1]	Material	Environment	Aging Effect	Aging Mechanism	Aging Management
Hex Lifting Stud	SR, RE	Nickel Alloy	Sheltered	Cracking	Fatigue	None[9] – no fatigue analysis was performed
		Stainless Steel	Sheltered	Loss of material	Galvanic corrosion	Cask Transportation AMP
					General corrosion	
					Pitting and crevice corrosion	
Lift Tongue	SR, RE	Carbon Steel	Sheltered	Cracking	Fatigue	None[9] – no fatigue analysis was performed
				Loss of material	Galvanic corrosion	Cask Transportation AMP
					General corrosion	
					Pitting and crevice corrosion	
Top Lift Pin	SR, RE	Nickel Alloy	Sheltered	Cracking	Fatigue	None[9] – no fatigue analysis was performed
		Stainless Steel	Sheltered	Loss of material	Galvanic corrosion	Cask Transportation AMP
					General corrosion	
					Pitting and crevice corrosion	
Wide Body Shackle	SR, RE	Carbon Steel	Sheltered	Cracking	Fatigue	None[9] – no fatigue analysis was performed
				Loss of material	General corrosion	Cask Transportation AMP
					Pitting and crevice corrosion	
Sling	SR, RE	N/A	N/A	N/A	N/A	N/A[8]
HI-STORM Mating Device						
Shielding Frame	SR, RE	Carbon Steel	Sheltered	Cracking	Fatigue	None[9] – no fatigue analysis was performed
				Loss of material	General corrosion	Cask Transportation AMP
					Pitting and crevice corrosion	
Spacer Ring	SR, RE	Carbon Steel	Sheltered	Cracking	Fatigue	None[9] – no fatigue analysis was performed
				Loss of material	General corrosion	Cask Transportation AMP
					Pitting and crevice corrosion	

Table 3-6 Aging Management Review of Cask Transportation System

Subcomponent	Intended Function[1]	Material	Environment	Aging Effect	Aging Mechanism	Aging Management
Bottom Stiff Plate	SR, RE	Carbon Steel	Sheltered	Cracking	Fatigue	None[9] – no fatigue analysis was performed
				Loss of material	General corrosion	Cask Transportation AMP
					Pitting and crevice corrosion	
Shield End	SR, RE	Carbon Steel	Sheltered	Cracking	Fatigue	None[9] – no fatigue analysis was performed
				Loss of material	General corrosion	Cask Transportation AMP
					Pitting and crevice corrosion	
Cylinder Lug	SR, RE	Carbon Steel	Sheltered	Cracking	Fatigue	None[9] – no fatigue analysis was performed
				Loss of material	Galvanic corrosion	Cask Transportation AMP
					General corrosion	
					Pitting and crevice corrosion	
Shield Block	SR, RE	Grout	Embedded (steel)	None	N/A	None
Lift Lug	SR, RE	Carbon Steel	Sheltered	Cracking	Fatigue	None[9] – no fatigue analysis was performed
				Loss of material	General corrosion	Cask Transportation AMP
					Pitting and crevice corrosion	
Tongue Plate	SR, RE	Carbon Steel	Sheltered	Cracking	Fatigue	None[9] – no fatigue analysis was performed
				Loss of material	General corrosion	Cask Transportation AMP
					Pitting and crevice corrosion	
Actuator Bar and Draw Bar	SR, RE	Carbon Steel	Sheltered	Cracking	Fatigue	None[9] – no fatigue analysis was performed
				Loss of material	Galvanic corrosion	Cask Transportation AMP
					General corrosion	
					Pitting and crevice corrosion	

Table 3-6 Aging Management Review of Cask Transportation System

Subcomponent	Intended Function[1]	Material	Environment	Aging Effect	Aging Mechanism	Aging Management
Actuator Cylinder	SR, RE	Carbon Steel	Sheltered	Cracking	Fatigue	None[9] – no fatigue analysis was performed
				Loss of material	Galvanic corrosion	Cask Transportation AMP
					General corrosion	
					Pitting and crevice corrosion	
Actuator Cylinder Bar Pin and Pin	SR, RE	Stainless Steel	Sheltered	Cracking[4]	Fatigue	None[9] – no fatigue analysis was performed
				Loss of material	Galvanic corrosion	Cask Transportation AMP
					Pitting and crevice corrosion	
Actuator Cylinder Bar Bolt	SR, RE	Carbon Steel	Sheltered	Cracking	Fatigue	None[9] – no fatigue analysis was performed
				Loss of material	General corrosion	Cask Transportation AMP
					Pitting and crevice corrosion	
				Loss of preload	Stress relaxation	
Bolts, Nuts, and Washers	SR, RE	Carbon Steel	Sheltered	Cracking	Fatigue	None[9] – no fatigue analysis was performed
				Loss of material	General corrosion	Cask Transportation AMP
					Pitting and crevice corrosion	
				Loss of preload	Stress relaxation	

Notes:
1. Intended Functions: Confinement (CO), Sub-criticality (CR), Radiation Shielding (SH), Structural Integrity (SR), Retrievability (RE)
2. This line item is not consistent with the MAPS Report as this material is not discussed. The identified aging effect is based on review of the Slingmax Rigging Solutions K-Spec literature (Reference 3.9.8), which indicates that K-spec does not degrade when exposed to water or sunlight and may degrade from exposure to chemicals or elevated temperatures (above 180°F). Because the cask transporter and its associated K-spec rigging is stored in a sheltered environment, it is isolated from chemicals. The storage building is located at DCPP where extreme temperatures are 104°F (DC ISFSI UFSAR, Table 3.4-1). Therefore, these potential degradation mechanisms are not applicable to the cask transporter long-term aging environment. This was found acceptable by NRC in the Safety Evaluation Report for the Humboldt Bay ISFSI LR (Reference 3.9.9, Section 3.3.1.6).

3. This line item is not consistent with the MAPS Report as this material is not discussed. The identified aging effect is based on NRC guidance on aging management of power reactor components which states that changes in material properties for polymers may include hardening and cracking (Reference 3.9.10). Further, the manufacturer's data on environmental effects on Delrin® performance (DuPont) show that the mechanical properties of Delrin® are strongly resistant to a variety of solvents, oils, greases, other petroleum hydrocarbons, and weak acids and bases (Reference 3.9.11). DuPont's testing also showed indoor room-temperature air has no effect on the mechanical properties of Delrin® over a period of 20 years. This was found acceptable by NRC in the Safety Evaluation Report for the Humboldt Bay ISFSI LR (Reference 3.9.9, Section 3.3.1.5).
4. This line item is consistent with the MAPS Report, Table 3-2 for not considering SCC as an applicable aging mechanism because the stainless steel components have no welds or heat-affected zones. Therefore, sufficient stress does not exist in the components to support SCC.
5. This line item is not consistent with the MAPS Report for considering galvanic corrosion as an applicable aging mechanism for the HI-TRAC lift links. The long-term environment for these components is in a storage building, and thus, the metal is not in contact with other metallic materials that could cause this aging mechanism.
6. This line item is not consistent with the MAPS Report as this material is not discussed. The identified aging effect is based on NRC guidance on aging management of power reactor components which states that changes in material properties for polymers may include hardening and cracking (Reference 3.9.10).
7. This line item is not consistent with the MAPS Report for considering stress relaxation as an applicable aging mechanism for the LPT HI-TRAC mounting bolts. These bolts are only under short-term stress when the HI-TRAC is on the LPT for temporary movement, and thus, the metal is not in a long-term configuration that could cause this aging mechanism.
8. These slings are periodically replaced, and are thus, short-lived components and screened out of the scope of LR. Therefore, no long-term aging management is required.
9. Consistent with the MAPS Report, no aging management is required because there is no TLAA associated with this subcomponent (see Section 4.0).

Table 3-7 Aging Management Review of Independent Spent Fuel Storage Installation Storage Pads

Subcomponent	Intended Function[1]	Material	Environment	Aging Effect	Aging Mechanism	Aging Management
Storage Pads	SR	Concrete (Reinforced)	Air-outdoor	Cracking	Aggressive chemical attack	Reinforced Concrete Structures AMP
				Loss of strength	Aggressive chemical attack	Reinforced Concrete Structures AMP
				Loss of material	Aggressive chemical attack	Reinforced Concrete Structures AMP
				Reduction of concrete pH	Aggressive chemical attack	Reinforced Concrete Structures AMP
				Cracking	Freeze and thaw	None[2]
				Loss of material	Freeze and thaw	None[2]
				Cracking	Reaction with aggregates	Reinforced Concrete Structures AMP
				Loss of strength	Reaction with aggregates	Reinforced Concrete Structures AMP
				Loss of material	Salt scaling	Reinforced Concrete Structures AMP
				Loss of strength	Leaching of calcium hydroxide	Reinforced Concrete Structures AMP
				Increase in porosity and permeability	Leaching of calcium hydroxide	Reinforced Concrete Structures AMP
				Reduction of concrete pH	Leaching of calcium hydroxide	Reinforced Concrete Structures AMP
			Soil	Cracking	Aggressive chemical attack	Reinforced Concrete Structures AMP
				Loss of strength	Aggressive chemical attack	Reinforced Concrete Structures AMP
				Loss of material	Aggressive chemical attack	Reinforced Concrete Structures AMP
				Reduction of concrete pH	Aggressive chemical attack	Reinforced Concrete Structures AMP

Table 3-7 Aging Management Review of Independent Spent Fuel Storage Installation Storage Pads

Subcomponent	Intended Function[1]	Material	Environment	Aging Effect	Aging Mechanism	Aging Management
				Cracking	Differential settlement	None[3]
					Freeze and thaw	None[2]
				Loss of material	Freeze and thaw	None[2]
				Loss of strength	Microbiological degradation	Reinforced Concrete Structures AMP
				Loss of material	Microbiological degradation	Reinforced Concrete Structures AMP
				Increase in porosity and permeability	Microbiological degradation	Reinforced Concrete Structures AMP
				Reduction of concrete pH	Microbiological degradation	Reinforced Concrete Structures AMP
				Cracking	Reaction with aggregates	Reinforced Concrete Structures AMP
				Loss of strength	Reaction with aggregates	Reinforced Concrete Structures AMP
				Loss of material	Salt scaling	Reinforced Concrete Structures AMP
				Loss of strength	Leaching of calcium hydroxide	Reinforced Concrete Structures AMP
				Increase in porosity and permeability	Leaching of calcium hydroxide	Reinforced Concrete Structures AMP
				Reduction of concrete pH	Leaching of calcium hydroxide	Reinforced Concrete Structures AMP
		Reinforcing Steel	Soil	Loss of concrete/steel bond	Corrosion of reinforcing steel	Reinforced Concrete Structures AMP
				Loss of material	Corrosion of reinforcing steel	Reinforced Concrete Structures AMP
				Cracking	Corrosion of reinforcing steel	Reinforced Concrete Structures AMP

Table 3-7 Aging Management Review of Independent Spent Fuel Storage Installation Storage Pads

Subcomponent	Intended Function[1]	Material	Environment	Aging Effect	Aging Mechanism	Aging Management
				Loss of strength	Corrosion of reinforcing steel	Reinforced Concrete Structures AMP
Embedment Support Top Structure Plate	SR	Carbon Steel	Air-outdoor	Loss of material	General corrosion	None – see Section 3.7.4.1
					Pitting and crevice corrosion	
					Galvanic corrosion	None[4]
			Embedded (concrete)	Cracking	Fatigue	None[5] – no fatigue analysis was performed
				Loss of material	General corrosion	Overpack AMP
					Pitting and crevice corrosion	
					Microbiologically influenced corrosion	
Embedment Support Bottom Structure Plate	SR	Carbon Steel	Embedded (concrete)	Cracking	Fatigue	None[5] – no fatigue analysis was performed
				Loss of material	General corrosion	Overpack AMP
					Pitting and crevice corrosion	
					Microbiologically influenced corrosion	
Embedment Support Structure Coupler	SR	Carbon Steel	Embedded (concrete)	Cracking	Fatigue	None[5] – no fatigue analysis was performed
				Loss of material	General corrosion	Overpack AMP
					Pitting and crevice corrosion	
					Microbiologically influenced corrosion	

Table 3-7 Aging Management Review of Independent Spent Fuel Storage Installation Storage Pads

Subcomponent	Intended Function[1]	Material	Environment	Aging Effect	Aging Mechanism	Aging Management
Embedment Support Structure Bars	SR	Carbon Steel	Embedded (concrete)	Cracking	Fatigue	None[5] – no fatigue analysis was performed
				Loss of material	General corrosion	Overpack AMP
					Pitting and crevice corrosion	
					Microbiologically influenced corrosion	
Embedment Support Structure Washers	SR	Carbon Steel	Embedded (concrete)	Cracking	Fatigue	None[5] – no fatigue analysis was performed
				Loss of material	General corrosion	Overpack AMP
					Pitting and crevice corrosion	
					Microbiologically influenced corrosion	
Embedment Support Structure Nuts	SR	Carbon Steel	Embedded (concrete)	Cracking	Fatigue	None[5] – no fatigue analysis was performed
				Loss of material	General corrosion	Overpack AMP
					Pitting and crevice corrosion	
					Microbiologically influenced corrosion	

Notes:
1. Intended Functions: Confinement (CO), Sub-criticality (CR), Radiation Shielding (SH), Structural Integrity (SR), Retrievability (RE)
2. This line item is not consistent with the MAPS Report for considering freeze-thaw as an applicable aging mechanism for the concrete storage pads. As discussed in Table 3.1-2, consistent with ASTM Standard C33-01 (Reference 3.9.5, Figure 1), weathering effects for the area in which the DC ISFSI is located are negligible, and thus, freeze-thaw is not a concern.
3. This line item is not consistent with the MAPS Report for considering differential settlement as an applicable aging mechanism for the concrete storage pads. As discussed in Section 3.7.4, geotechnical evaluations demonstrated that settlement would not occur due to the pads being located on bedrock, and, and thus, settlement is not a concern.

4. This line item is not consistent with the MAPS Report for considering galvanic corrosion as an applicable aging mechanism for the carbon steel embedment support top plate. The metal is not in contact with non-carbon steel materials that could cause this aging mechanism.
5. Consistent with the MAPS Report, no aging management is required because there is no TLAA associated with this subcomponent (see Section 4.0).

Table 3-8 Aging Management Review of Cask Transfer Facility

Subcomponent	Intended Function[1]	Material	Environment[2]	Aging Effect	Aging Mechanism	Aging Management
Liner Lower Restraint	SR, RE	Carbon Steel	Sheltered	Cracking	Fatigue	None[6] – no fatigue analysis was performed
				Loss of material	General corrosion	Cask Transportation AMP
					Pitting and crevice corrosion	
Liner Shell Plate	SR, RE	Carbon Steel	Sheltered	Cracking	Fatigue	None[6] – no fatigue analysis was performed
				Loss of material	General corrosion	Cask Transportation AMP
					Pitting and crevice corrosion	
			Embedded (concrete)	Cracking	Fatigue	None[6] – no fatigue analysis was performed
				Loss of material	General corrosion	Cask Transportation AMP
					Pitting and crevice corrosion	
					Microbiologically influenced corrosion	
Liner Wedges	SR, RE	Carbon Steel	Sheltered	Cracking	Fatigue	None[6] – no fatigue analysis was performed
				Loss of material	General corrosion	Cask Transportation AMP
					Pitting and crevice corrosion	
Liner Hanger	SR, RE	Carbon Steel	Sheltered	Cracking	Fatigue	None[6] – no fatigue analysis was performed
				Loss of material	General corrosion	Cask Transportation AMP
					Pitting and crevice corrosion	

Table 3-8 Aging Management Review of Cask Transfer Facility

Subcomponent	Intended Function[1]	Material	Environment[2]	Aging Effect	Aging Mechanism	Aging Management
Liner Threaded Rod	SR, RE	Carbon Steel	Sheltered	Cracking	Fatigue	None[6] – no fatigue analysis was performed
				Loss of material	Galvanic corrosion	Cask Transportation AMP
					General corrosion	
					Pitting and crevice corrosion	
Liner Hex Nut	SR, RE	Carbon Steel	Sheltered	Cracking	Fatigue	None[6] – no fatigue analysis was performed
				Loss of material[5]	Galvanic corrosion	Cask Transportation AMP
					General corrosion	
					Pitting and crevice corrosion	
Structural Concrete	SR, RE	Concrete (Reinforced)	Air-outdoor	Cracking	Aggressive chemical attack	Reinforced Concrete Structures AMP
				Loss of strength	Aggressive chemical attack	Reinforced Concrete Structures AMP
				Loss of material	Aggressive chemical attack	Reinforced Concrete Structures AMP
				Reduction of concrete pH	Aggressive chemical attack	Reinforced Concrete Structures AMP
				Cracking	Freeze and thaw	None[2]
				Loss of material	Freeze and thaw	None[2]
				Cracking	Reaction with aggregates	Reinforced Concrete Structures AMP
				Loss of strength	Reaction with aggregates	Reinforced Concrete Structures AMP
				Loss of material	Salt scaling	Reinforced Concrete Structures AMP
				Loss of strength	Leaching of calcium hydroxide	Reinforced Concrete Structures AMP

Table 3-8 Aging Management Review of Cask Transfer Facility

Subcomponent	Intended Function[1]	Material	Environment[2]	Aging Effect	Aging Mechanism	Aging Management
				Increase in porosity and permeability	Leaching of calcium hydroxide	Reinforced Concrete Structures AMP
				Reduction of concrete pH	Leaching of calcium hydroxide	Reinforced Concrete Structures AMP
			Soil	Cracking	Aggressive chemical attack	Reinforced Concrete Structures AMP
				Loss of strength	Aggressive chemical attack	Reinforced Concrete Structures AMP
				Loss of material	Aggressive chemical attack	Reinforced Concrete Structures AMP
				Reduction of concrete pH	Aggressive chemical attack	Reinforced Concrete Structures AMP
				Cracking	Differential settlement	None[3]
					Freeze and thaw	None[2]
				Loss of material	Freeze and thaw	None[2]
				Loss of strength	Microbiological degradation	Reinforced Concrete Structures AMP
				Loss of material	Microbiological degradation	Reinforced Concrete Structures AMP
				Increase in porosity and permeability	Microbiological degradation	Reinforced Concrete Structures AMP
				Reduction of concrete pH	Microbiological degradation	Reinforced Concrete Structures AMP
				Cracking	Reaction with aggregates	Reinforced Concrete Structures AMP
				Loss of strength	Reaction with aggregates	Reinforced Concrete Structures AMP

Table 3-8 Aging Management Review of Cask Transfer Facility

Subcomponent	Intended Function[1]	Material	Environment[2]	Aging Effect	Aging Mechanism	Aging Management
				Loss of material	Salt scaling	Reinforced Concrete Structures AMP
				Loss of strength	Leaching of calcium hydroxide	Reinforced Concrete Structures AMP
				Increase in porosity and permeability	Leaching of calcium hydroxide	Reinforced Concrete Structures AMP
				Reduction of concrete pH	Leaching of calcium hydroxide	Reinforced Concrete Structures AMP
		Reinforcing Steel	Soil	Loss of concrete/ steel bond	Corrosion of reinforcing steel	Reinforced Concrete Structures AMP
				Loss of material	Corrosion of reinforcing steel	Reinforced Concrete Structures AMP
				Cracking	Corrosion of reinforcing steel	Reinforced Concrete Structures AMP
				Loss of strength	Corrosion of reinforcing steel	Reinforced Concrete Structures AMP
Lateral Restraint: Strut And Collars	SR	Carbon Steel	Air-outdoor	Loss of material	General corrosion	Cask Transportation AMP
					Pitting and crevice corrosion	
Lateral Restraint: Embedded Plate	SR	Carbon Steel	Air-outdoor	Loss of material	General corrosion	Cask Transportation AMP
				Loss of material	Pitting and crevice corrosion	
			Embedded (concrete)	Loss of material	General corrosion	Cask Transportation AMP
					Pitting and crevice corrosion	
					Microbiologically influenced corrosion	

Table 3-8 Aging Management Review of Cask Transfer Facility

Subcomponent	Intended Function[1]	Material	Environment[2]	Aging Effect	Aging Mechanism	Aging Management
Lateral Restraint: Bearing Plates	SR	Carbon Steel	Embedded (concrete)	Loss of material	General corrosion	Cask Transportation AMP
					Pitting and crevice corrosion	
					Microbiologically influenced corrosion	
Lateral Restraint: Washer Plate	SR	Carbon Steel	Embedded (concrete)	Loss of material	General corrosion	Cask Transportation AMP
					Pitting and crevice corrosion	
					Microbiologically influenced corrosion	
Lateral Restraint: Stud Anchors	SR	Carbon Steel	Embedded (concrete)	Loss of material	General corrosion	Cask Transportation AMP
					Pitting and crevice corrosion	
					Microbiologically influenced corrosion	
Lateral Restraint: Rock Anchors	SR	Carbon Steel	Embedded (concrete)	Loss of material	General corrosion	Cask Transportation AMP
					Pitting and crevice corrosion	
					Microbiologically influenced corrosion	
Lateral Restraint: Grease Caps	SR	Polymer[4]	Air-outdoor	Change in material properties	N/A	Cask Transportation AMP
Lateral Restraint: Bracket	SR	Carbon Steel	Air-outdoor	Loss of material	General corrosion	Cask Transportation AMP
					Pitting and crevice corrosion	

Notes:

1. Intended Functions: Confinement (CO), Sub-criticality (CR), Radiation Shielding (SH), Structural Integrity (SR), Retrievability (RE)
2. This line item is not consistent with the MAPS Report for considering freeze-thaw as an applicable aging mechanism for the structural concrete. As discussed in Table 3.1-2, consistent with ASTM Standard C33-01 (Reference 3.9.5, Figure 1), weathering effects for the area in which the DC ISFSI is located are negligible, and thus, freeze-thaw is not a concern.

3. This line item is not consistent with the MAPS Report for considering differential settlement as an applicable aging mechanism for the DC ISFSI. As discussed in Section 3.7.4, geotechnical evaluations demonstrated that settlement would not occur due to the concrete being located on bedrock, and, and thus, settlement is not a concern.
4. This line item is not consistent with the MAPS Report as this material is not discussed. The identified aging effect is based on NRC guidance on aging management of power reactor components which states that changes in material properties for polymers may include hardening and cracking (Reference 3.9.10).
5. This line item is not consistent with the MAPS Report for considering stress relaxation as an applicable aging mechanism for the CTF liner hex nuts. These hex nuts are part of the CTF wedge assembly and are manipulated during each MPC transfer operation at the CTF, and thus, stress relaxation is not a concern to maintain the intended function.
6. Consistent with the MAPS Report, no aging management is required because there is no TLAA associated with this subcomponent (see Section 4.0).

4.0 TIME-LIMITED AGING ANALYSES

4.1 Introduction

Per 10 CFR 72.42(a)(1), an ISFSI LRA must include TLAAs that demonstrate SSCs important to nuclear safety will continue to perform their intended functions for the PEO. This section outlines the screening process used to identify design basis calculations that may be time-limited upon extending the DC ISFSI license by 40 additional years (Section 4.2), the TLAAs identified (Section 4.3), and the disposition of each TLAA (Section 4.4). This section also discusses an evaluation that does not meet the definition of a TLAA, but was used as a basis for the proposed aging management (Section 4.5).

4.2 Identification and Disposition of Time-Limited Aging Analyses

As described in NUREG-1927 (Reference 4.7.1), an analysis, calculation, or evaluation is a TLAA under 10 CFR 72.3 only if it meets all six of the following criteria:

(1) involve SSCs important to safety within the scope of LR;
(2) consider the effects of aging;
(3) involve time-limited assumptions defined by the current operating term;
(4) were determined to be relevant by the licensee in making a safety determination;
(5) involve conclusions or provide the basis for conclusions related to the capability of SSCs to perform their intended safety functions; and
(6) are contained or incorporated by reference in the design basis.

TLAAs should provide conclusions or a basis for conclusions regarding the capability of the SSC to perform its intended function through the PEO. The TLAAs must show one of the following dispositions:

(i) the analyses remain valid for the PEO;
(ii) the analyses have been projected to the end of the PEO; or
(iii) the effects of aging on the intended function(s) of the SSCs will be adequately managed for the PEO.

4.3 Identification Process and Time-Limited Aging Analyses Results

Keyword searches of the DC ISFSI CLB were performed to determine whether the design or analysis feature of each potential TLAA in fact exists at the DC ISFSI and in its licensing basis, and to identify additional potential site-specific TLAAs. The CLB search included:

- DC ISFSI UFSAR (Reference 4.7.2)
- TS
- PG&E and NRC docketed licensing correspondence, including the NRC Safety Evaluation Report for the original license

The following types of source design documents were also reviewed for potential TLAAs:

- Vendor, NRC, and licensee topical reports
- Design calculations

- Code stress reports or code design reports
- Drawings
- Specifications

One evaluation was identified as meeting all six criteria per 10 CFR 72.3:

- Neutron Absorber and Shielding Depletion – see Section 4.4

Although not meeting all six criteria, the following evaluation was reviewed to disposition aging on SSCs within the scope of renewal, and justify exclusion from an AMP:

- Fatigue of the MPC – see Section 4.5

Furthermore, the DC ISFSI licensing basis includes several mentions of words typically indicative of a TLAA. The following SSCs are discussed to clarify why there are no TLAAs associated with their design:

- Overpack steel structure – see Section 4.6.1
- Overpack anchorages – see Section 4.6.2
- HI-TRAC transfer cask and lifting trunnion blocks– see Section 4.6.3
- CTF Structural Members – see Section 4.6.4

4.4 Evaluation and Disposition of Neutron Absorber and Shielding Depletion Time-Limited Aging Analysis

DC ISFSI UFSAR, Sections 4.2.3.3.5, 4.4.1.2.1, and 4.7.4, describe the boron depletion of the fixed neutron absorber (Boral or Metamic™) within the MPC and the neutron shielding (Holtite) within the HI-TRAC transfer cask lid. The original analyses for the fixed neutron absorber and neutron shielding demonstrated that the boron depletions of the neutron absorbing materials (2.6E-09) and neutron shielding (4.0E-08) are negligible over a 50-year duration (Reference 4.7.2, Section 5.3.2 and Reference 4.7.3, Section 6.3.2).

To support the 60-year storage duration for LR, the Boron-10 depletion from the original analyses were scaled up by a factor of 6/5 (60 years/50 years). The analysis concludes that the total depletion of Boron-10 in Boral over a 60-year period remains negligible (less than 3E-09 of total Boron-10 atoms depleted for the fixed neutron absorber and less than 5E-08 of total Boron-10 atoms depleted for the neutron shielding). The TLAA for neutron absorber and shielding depletion has been projected to 60 years and is therefore valid to the end of the PEO in accordance with TLAA disposition (ii).

4.5 Fatigue of the Multi-Purpose Canister

As discussed in the DC ISFSI UFSAR (Reference 4.7.2, Section 4.7.1) and HI-STORM 100 CoC UFSAR (Reference 4.7.3, Section 3.4.12), 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 normal dry storage conditions and the resulting fluctuations in the MPC thermal gradients and internal pressure is the only mechanism for fatigue. These low-stress, high-cycle conditions cannot lead to a fatigue failure of the MPC enclosure vessel or fuel basket structural materials, that are made from austenitic stainless steel. All other off-normal or postulated accident conditions are infrequent or one-time occurrences, which cannot produce fatigue failures.

While the dry storage conditions will not change during the PEO, 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 allowable number of lifting and handling cycles for the MPC components, lifting points for the MPC were selected for evaluation. The evaluation considered stress allowables associated with NUREG-0612, “Control of Heavy Loads at Nuclear Power Plants: Resolution of Generic Technical Activity A-36,” issued July 1980; ANSI N14.6, “American National Standard for Special Lifting Devices for Shipping Containers Weighing 10000 pounds (4500 kg) or More for Nuclear Materials;” and NRC Regulatory Guide 3.61, “Standard Format and Content for a Topical Safety Analysis Report for a Spent Fuel Dry Storage Cask,” issued February 1989. As detailed in Reference B.4.1 of the HI-STORM 100 LRA (HI-2012787, “Structural Calculation Package for MPC”), the stress allowables from ASME Section III, Subsection NB, for other MPC components were also considered. The fatigue life evaluation resulted in 6,750 cycles as the allowable number of lifts without incurring fatigue failure to the MPC.

Once an MPC is loaded at the DC ISFSI, MPC lifts are only expected to be necessary for offsite transport; therefore, each MPC is expected to undergo only a few lifts, which is much below the allowable number of lifting cycles.

Because the evaluation was not part of the original design term, and was conducted solely for the PEO, this is not a TLAA per criterion (3). However, as noted above, the evaluation demonstrates that the number of MPC lifts through the PEO are expected to be a small fraction of the allowable 6,750 lift cycles. Thus, this evaluation is adequate for the PEO.

4.6 Explanation of Non-Time-Limited Aging Analyses

4.6.1 Overpack Steel Structure

The HI-STORM 100 CoC UFSAR (Reference 4.7.3, Section 2.2.8) states that the overpack steel structure meets the stress limits for ASME Section III, Subsection NF. It further states (Section 3.1.2.4) that, in storage, the HI-STORM 100 System is not subject to significant cyclic loads and that failure due to fatigue is not a concern for the HI-STORM 100 System. As discussed in the DC ISFSI UFSAR (Reference 4.7.2, Section 4.7.3), the postulated conditions experienced by the overpack are infrequent or one-time occurrences that do not contribute significantly to fatigue. Because no time-based assumptions are used, there is no TLAA associated with the overpack steel structure.

4.6.2 Overpack Anchorages

As discussed in the DC ISFSI UFSAR (Reference 4.7.2, Section 3.3.2.3.2), the design of the cask anchor studs is governed by the ASME Code, Section III, Subsection NF and Appendix F. An evaluation was conducted during initial design to support the seismic accident analysis to determine whether a fatigue analysis was required. Following the recommended ASME Section III methodology for fatigue analysis, the results from the dynamic analyses were used in determining the likely number of stress cycles. Large margins of safety against a fatigue failure during a single seismic event were obtained, and therefore, fatigue failure of the overpack anchorage was determined not credible at the DC ISFSI. Because the evaluation is event-based, and not based on the operating term, it does not meet TLAA criterion (3); and is therefore, not a TLAA.

4.6.3 HI-TRAC Transfer Cask and Lifting Trunnion Blocks

As discussed in the DC ISFSI UFSAR (Reference 4.7.2, Section 4.7.2) and HI-STORM CoC UFSAR (Reference 4.7.3, Section 3.4.11.2), the transfer cask is designed for repeated normal condition handling operations with high factors of safety, particularly for the lifting trunnions, to assure structural integrity. The resulting cyclic loading produces stresses that are well below the endurance limit of the trunnion material, and therefore, will not lead to a fatigue failure in the transfer cask. All other off-normal or postulated accident conditions are infrequent or one-time occurrences that do not contribute significantly to fatigue. Because no time-based assumptions are used, there is no TLAA associated with the HI-TRAC Transfer Cask or lifting trunnion blocks.

4.6.4 Cask Transfer Facility Structural Members

The HI-STORM CoC UFSAR (Reference 4.7.3, Section 2.3.3.1.E.iii) generically specifies that CTF designs should evaluate fatigue failure modes of primary structural members in the CTF structure whose failure may result in uncontrolled lowering of the HI-TRAC transfer cask or the MPC. As discussed in the DC ISFSI UFSAR (Reference 4.7.2, Section 4.4.5.3), the load path parts of the CTF are conservatively designed in accordance with the ASME Code, Section III, Subsection NF. The design analyses do not include time-dependent considerations; and therefore, there are no TLAAs associated with the CTF structural members.

4.7 Section 4.0 References

4.7.1 NUREG-1927, Revision 1, Standard Review Plan for Renewal of Specific Licenses and Certificates of Compliance for Dry Storage of Spent Nuclear Fuel, Nuclear Regulatory Commission, Office of Nuclear Material Safety and Safeguards, June 2016, ADAMS Accession No. ML16179A148.

4.7.2 PG&E Letter DIL-21-004, "Biennial Submittal of Diablo Canyon Independent Spent Fuel Storage Installation Updated Final Safety Analysis Report," Revision 9, December 15, 2021. ADAMS Accession No. ML21349B166.

4.7.3 Holtec International Report No. HI-2002444, Safety Analysis Report for the HI-STORM 100 System, Revision 22, ADAMS Accession No. ML21221A329.

Appendix A

AGING MANAGEMENT PROGRAMS

A. Introduction

This appendix is a summary of the activities that manage the effects of aging for the DC ISFSI SSCs that have been identified as being subject to AMR. The AMPs credited for the management of those aging effects and mechanisms identified for the DC ISFSI are listed below and evaluated in the sections that follow:

- HBU Fuel AMP – see Section A.1
- MPC AMP – see Section A.2
- Transfer Cask AMP – see Section A.3
- Overpack AMP – see Section A.4
- Reinforced Concrete Structures AMP – see Section A.5
- Cask Transportation System AMP– see Section A.6

A.1 Diablo Canyon Independent Spent Fuel Storage Installation High Burnup Fuel Aging Management Program

A description of the DC ISFSI HBU Fuel AMP is provided below in Table A-1 using each attribute of an effective AMP as described in NUREG-1927 (Reference A.8.1) and NUREG-2214 (Reference A.8.2) for the renewal of a site-specific Part 72 license. The DC ISFSI HBU Fuel AMP is based on the example AMP for HBU fuel monitoring and assessment described in NUREG-2214, Section 6.10 (Reference A.8.2).

Table A-1: Diablo Canyon Independent Spent Fuel Storage Installation High Burnup Fuel Aging Management Program

Element	Description
1. Scope of Program	Fuel stored in a DC ISFSI MPC-32 is limited to an assembly average burnup of 58 GWd/MTU. The cladding materials for the HBU fuel are Zircaloy-2, Zircaloy-4, or ZIRLO, and the fuel is stored in a dry helium environment. HBU fuel was first placed into dry storage in a DC ISFSI MPC-32 on January 30, 2012. The program relies on the joint EPRI and DOE HBU Dry Storage Cask Research and Development Project (HDRP) (Reference A.8.3), conducted in accordance with the guidance in Appendix D of NUREG-1927, Revision 1, as a surrogate demonstration program that monitors the performance of HBU fuel in dry storage. The HDRP is a program designed to collect data from a spent fuel storage system containing HBU fuel in a dry helium environment. The program entails loading and storing an AREVA TN-32 bolted lid cask (the “Research Project Cask”) at Dominion Virginia Power’s North Anna Power Station with intact HBU fuel (of nominal burnups ranging between 50 GWd/MTU and 55 GWd/MTU). The fuel to be used in the program includes four kinds of cladding (Zircaloy-4, low-tin Zircaloy-4, ZIRLO™, and M5™). The Research Project Cask is licensed to the temperature limits contained in ISG-11, Revision 3, and loaded such that the fuel cladding temperature is as close to the limit as practicable. The parameters of the surrogate demonstration program are applicable to the DC ISFSI HBU fuel since the system burnup limits are reasonably

Table A-1: Diablo Canyon Independent Spent Fuel Storage Installation High Burnup Fuel Aging Management Program	
Element	**Description**
	representative of those being tested, the cladding is of the same type as those being tested, and the temperature limits of the fuel are reasonably representative of those being tested.
2. Preventive Actions	During the initial loading operations of the MPC, the design and DC ISFSI TS require that the fuel be stored in a dry inert environment. TS 3.1, SFSC Integrity, demonstrates that the MPC cavity is dry and backfilled with helium by maintaining an MPC cavity absolute pressure as follows: • ≥ 29.3 psig and ≤ 33.3 psig at a reference temperature of 70°F for an MPC-32 originally loaded uniformly with HBU fuel with a total heat load ≤ 24 kW. • ≥ 34 psig and ≤ 40 psig at a reference temperature of 70°F for an MPC-32 containing HBU fuel loaded up to the maximum regional or uniform total heat load. These TS requirements ensure that the HBU fuel is stored in an inert environment, thus preventing cladding degradation due to oxidation mechanisms. The MPC is loaded in accordance with the criteria of ISG-11, Revision 3.
3. Parameters Monitored or Inspected	This program monitors and inspects the following parameters from the HDRP that are applicable to the DC ISFSI HBU fuel: • MPC internal and external temperatures • MPC internal helium pressure • Fuel cladding profilometry; signs of crud or oxide layer spallation, local wear, or other indications of degradation; ductility behavior • Rod internal gas pressure and content; hydride content and orientation These parameters satisfy the guidance of Appendix D of NUREG–1927, Revision 1, by addressing direct observation of rod behavior, temperature monitoring, gas analysis, and degradation.
4. Detection of Aging Effects	The parameters defined in Element 3 are detected through periodic measurements, nondestructive examination (NDE), and destructive examinations as delineated in the HDRP. The data received from these parameters will ensure the DC ISFSI HBU fuel is managed against the effects of loss of ductility due to hydride reorientation and changes in dimensions due to thermal creep during the PEO.
5. Monitoring and Trending	As information/data from a surrogate demonstration program or from other sources (such as testing or research results and scientific analyses) become available, the DC ISFSI HBU Fuel AMP will monitor, evaluate, and trend the information via the OE program and/or the CAP to determine what actions should be taken.

Table A-1: Diablo Canyon Independent Spent Fuel Storage Installation High Burnup Fuel Aging Management Program	
Element	**Description**
	The DC ISFSI HBU Fuel AMP will evaluate the information/data from a surrogate demonstration program or from other sources to determine whether the acceptance criteria in Element 6 are met. • If all of the acceptance criteria are met, no further assessment is needed. • If any of the acceptance criteria are not met, additional assessments will be conducted, and appropriate corrective actions will be implemented (see Element 7). Formal evaluations of the aggregate information from a surrogate demonstration program and other available domestic or international OE (including data from monitoring and inspection programs, NRC-generated communications, and other information) will be performed at specific points in time during the PEO as follows consistent with the scope delineated in Table B-4 of NUREG–1927, Revision 1: 1. Prior to March 2024 (end of the initial license) 2. March 2034 (10 years after first assessment) 3. March 2044 (10 years after second assessment)
6. Acceptance Criteria	The program acceptance criteria are: • Hydrogen content: Maximum hydrogen content of the cover gas over the approved storage period should be extrapolated from the gas measurements to be less than the design-basis limit for hydrogen content. • Moisture content: The moisture content in the MPC, accounting for measurement uncertainty, should be less than the expected upper-bound moisture content per the design-basis drying process (with appropriate consideration for the differences in design/acceptance criteria between the demo cask and the HI-STORM 100). The drying criteria for the MPC is provided in DC ISFSI UFSAR, Section 10.2.2.3. • Fuel condition/performance: NDE (e.g., fission gas analysis) and destructive examination (e.g., to obtain data on creep, fission gas release, hydride reorientation, cladding oxidation, and cladding mechanical properties) should confirm the design-basis fuel condition (i.e., no changes to the analyzed fuel configuration considered in the safety analyses of the approved design basis).
7. Corrective Actions	The DC ISFSI CAP requirements are established in accordance with the requirements of the QA Program. Corrective actions should be implemented if data from a surrogate demonstration program or other sources of information indicate that any of the HBU Fuel Monitoring and Assessment Program acceptance criteria (in Element 6) are not met.

Table A-1: Diablo Canyon Independent Spent Fuel Storage Installation High Burnup Fuel Aging Management Program	
Element	**Description**
	If any of the acceptance criteria are not met, corrective actions will include: • Assessment of DC ISFSI fuel performance (i.e., impacts on fuel and changes to fuel configuration), including any consequences of above-design-basis moisture levels on potential degradation of the fuel assembly. • Assessment of the design-basis safety analyses, considering degraded fuel performance (and any changes to fuel configuration), to determine the ability of the dry cask storage system to continue to perform its intended functions under normal, off-normal, and accident conditions. Corrective actions, as applicable, will ensure: • Management of fuel performance • Management of impacts related to degraded fuel performance to ensure that all intended functions for the dry cask storage system are met. NRC approval will be obtained in the appropriate licensing/certification process, as applicable, for modification of the design bases to address any conditions outside of the approved design bases.
8. Confirmation Process	The confirmation process is part of the PG&E CAP and ensures that the corrective actions taken are adequate and appropriate, have been completed, and are effective. The approved CAP complies with the requirements of 10 CFR 72, Subpart G. The focus of the confirmation process is on the follow-up actions that must be taken to verify effective implementation of corrective actions. The measure of effectiveness is in terms of correcting the adverse condition and precluding repetition of significant conditions adverse to quality. Procedures include provisions for timely evaluation of adverse conditions and implementation of any corrective actions required, including root cause evaluations, and prevention of recurrence where appropriate. These procedures provide for tracking, coordinating, monitoring, reviewing, verifying, validating, and approving corrective actions, to ensure effective corrective actions are taken. The CAP is also monitored for potentially adverse trends. The existence of an adverse trend due to recurring or repetitive adverse conditions will result in the initiation of a corrective action document. The AMP will also uncover unsatisfactory conditions resulting from ineffective corrective action.
9. Administrative Controls	The QA Program, associated formal review and approval processes, and administrative controls applicable to the AMP and Aging Management Activities, are implemented in accordance with the requirements of the 10 CFR Part 72, Subpart G. The administrative controls that govern Aging

Table A-1: Diablo Canyon Independent Spent Fuel Storage Installation High Burnup Fuel Aging Management Program	
Element	**Description**
	Management Activities at the DC ISFSI are established in accordance with the PG&E Administrative Control Program and associated procedures. The administrative controls include provisions that define: • Formal review and approval processes • Record retention requirements • Document control
10. Operating Experience	The DC ISFSI HBU Fuel AMP will be effective in maintaining ISFSI structures and components. This program will include review of applicable OE (internal and industry-wide reports, bulletins, new research/data, initiatives, HDRP, etc.) during periodic assessments. The review of OE will clearly identify any HBU fuel degradation as either age related or event driven, with proper justification for that assessment. A review of ISFSI operating history provides evidence that any potential aging effects have been identified, are being evaluated, and managed effectively, ensuring that structures and components remain capable of performing their intended functions. It can be concluded that there is reasonable assurance that the dry cask storage system will continue to perform its intended functions during the PEO. <u>Routine Inspections and Corrective Action Program</u> There have been no inspections of the DC ISFSI fuel assemblies since characterization prior to loading. A review of items in the CAP was performed. There were no SFA aging issues or findings noted in the CAP database. <u>NRC Inspection Reports</u> NRC inspection reports issued during the period of March 22, 2004 (initial license issuance) through December 2021 were reviewed for the ISFSI site. No issues or findings were noted relative to the aging of spent fuel assemblies. <u>Industry Operating Experience</u> The ISFSI Aging Management Institute of Nuclear Power Operations Database (AMID) was reviewed for OE related to HI-STORM systems and several other dry cask storage systems. The AMID results did not contain any information on HBU fuel. However, significant research has been conducted throughout the industry by NRC, national labs, and EPRI. The culmination of this research resulted in the development of the HDRP to validate acceptability of HBU fuel dry cask storage for greater than 20 years.

Table A-1: Diablo Canyon Independent Spent Fuel Storage Installation High Burnup Fuel Aging Management Program	
Element	**Description**
	Precedent License Renewal Applications Operating Experience A review of precedent ISFSI LRAs was performed to evaluate any relevant OE. ISFSIs included in this review were Prairie Island, Calvert Cliffs, H.B. Robinson, Surry, Oconee, North Anna, Trojan, Rancho Seco, and Humboldt Bay. The review also included OE described in the Holtec HI-STAR 100 and HI-STORM 100 LRAs. The results of these reviews were consistent with this AMP. Assessment of Aging Management Program Effectiveness The DC ISFSI HBU Fuel AMP provides reasonable assurance that the ISFSI SSCs within its scope will be managed effectively so that the dry cask storage system will continue to perform its intended functions during the PEO. PG&E will perform an AMP Effectiveness Review on a frequency consistent with the HBU assessments (see Element 5). Each AMP Effectiveness Review will include evaluation of AMP documentation (e.g., site procedures, inspection results, internal and external OE) compared to each of the ten AMP elements to determine whether the AMP is effectively managing the effects of aging. In addition, an ISFSI Program Health Report will be issued on an annual basis. The Program Health Report will display program health performance metrics, describe issues that impact or may impact program performance, and the actions to address the issues. This report will also evaluate OE from the DC ISFSI-specific and industry sources (including the ISFSI AMID) to ensure that this experience is systematically reviewed on an ongoing basis in accordance with the QA Program, which meets the requirements of 10 CFR 72, Subpart G. Focused self-assessments may also be performed to evaluate specific issues. The DC ISFSI Program Health Report will specifically determine whether the effects of aging are adequately managed. A determination will be made as to whether the frequency of future HBU assessments should be adjusted, whether new activities should be established, and whether the scope should be adjusted or expanded. If there is an indication that the effects of aging may not be adequately managed, the CAP will be used to determine what AMP enhancements are necessary. Because the AMP Effectiveness Reviews and Program Health Reports are based, in part, upon site-specific OE, but are not providing new OE, they are not required to be entered into the ISFSI AMID. However, they will be maintained onsite in an auditable fashion. Conclusion The OE, reviews, and monitoring described above confirm that any potential aging effects will be identified, evaluated, and managed effectively, ensuring that these SSCs remain capable of performing their intended functions.

A.2 Diablo Canyon Independent Spent Fuel Storage Installation Multi-Purpose Canister Aging Management Program

A description of the DC ISFSI MPC AMP is provided below in Table A-2 using each attribute of an effective AMP as described in NUREG-1927 (Reference A.8.1) and NUREG-2214 (Reference A.8.2) for the renewal of a site-specific Part 72 license. The DC ISFSI MPC AMP is based on the example AMP for localized corrosion and SCC of welded stainless steel dry storage canisters described in NUREG-2214, Section 6.5 (Reference A.8.2) and ASME Code Case N-860 (Reference A.8.4).

Table A-2: Diablo Canyon Independent Spent Fuel Storage Installation Multi-Purpose Canister Aging Management Program

Element	Description
1. Scope of Program	The DC ISFSI MPC AMP manages sub-components requiring aging management as shown in LRA Table 3-3 for loss of material due to pitting and crevice corrosion and cracking due to SCC. The program ensures that the aging effects do not challenge the capability of the MPC to fulfill confinement, structural integrity, radiation shielding, and heat transfer functions. The scope of the AMP includes visual inspection of the accessible external surface areas of the MPC subcomponents that are exposed to the long-term sheltered environment.
2. Preventive Actions	This program is a condition monitoring program to detect evidence of degradation. It does not provide guidance for the prevention of aging.
3. Parameters Monitored or Inspected	This program monitors the condition of external MPC stainless steel accessible surfaces to identify loss of material due to pitting and crevice corrosion and cracking due to SCC. Parameters monitored or inspected include: • visual evidence of surface discontinuities and imperfections indicative of pitting corrosion, crevice corrosion, and SCC of the MPC welds, weld heat-affected zones, and known areas of the canister to which temporary supports or attachments were attached by welding and subsequently removed (based on available fabrication records) • size and location of corrosion and SCC • appearance and location of deposits on the canister surfaces
4. Detection of Aging Effects	The method or technique, sample size, frequency, data collection, timing of inspections, and qualifications are provided for each monitoring activity discussed below. Consistent with the DC ISFSI TS, the specified frequency for each inspection is met if it is performed within 1.25 times the interval specified in the frequency, as measured from the previous performance or as measured from the time a specified condition of the frequency is met. <u>Method/Technique: Screening and Assessment Examinations</u> Visual MPC inspections are performed in accordance with the ASME Code Section XI, Article IWA-2213, for VT-3 examinations. The

Table A-2: Diablo Canyon Independent Spent Fuel Storage Installation Multi-Purpose Canister Aging Management Program	
Element	**Description**
	inspections cover 100 percent of the accessible MPC surfaces while the MPC remains in the overpack with the overpack lid installed. Additional assessment is conducted for suspected areas of localized corrosion and SCC. In these cases, the severity of the degradation shall be assessed, including the dimensions of the affected area and the depth of penetration with respect to the thickness of the canister. For accessible areas, remote visual examination meeting the requirements for ASME Code Section XI, Article IWA-2211, for VT-1 examinations may be used to determine the type of degradation present. <u>Method/Technique: Supplemental Examinations or Analysis</u> Volumetric and/or surface examinations are performed in accordance with the ASME Code XI, Article IWA-2220 for surface and IWA-2230 for volumetric examinations, to characterize the extent and severity of localized corrosion and SCC. Volumetric examination of pits and areas immediately adjacent to pits shall be done when pits are located within 25 mm (1 inch) of a through thickness weld or within 25 mm (1 inch) of an area where a temporary attachment was known to be located. Analysis may be performed in lieu of volumetric and/or surface supplemental examinations if the supplemental examination of the indications is not possible or is unable to provide sufficient data for the flaw evaluation. The analysis shall determine whether chloride-induced SCC (CISCC) could be present in all locally-susceptible areas, including inaccessible locally-susceptible areas. The technical basis for the analysis shall consider OE, environmental factors, and, if available, results of surface sampling. <u>Sample Size</u> A minimum of one canister is inspected at each inspection interval if the DC ISFSI is ranked less than 7 using the EPRI Susceptibility Assessment Criteria (Technical Report 3002005371). A minimum of two canisters are inspected at each inspection interval if the DC ISFSI is ranked greater than or equal to 7 using the EPRI Susceptibility Assessment Criteria (Reference A.8.8). The selection criteria for choosing the canister(s) to inspect consider the following: • EPRI Susceptibility Assessment Criteria for CISCC of Welded Stainless Steel Canisters for Dry Cask Storage Systems (Reference A.8.8) • ASME Code Case N-860 Population Size Criteria (Reference A.8.4) • canister age • canister with lowest heat load • canister with specific, previously-identified manufacturing deviation

Table A-2: Diablo Canyon Independent Spent Fuel Storage Installation Multi-Purpose Canister Aging Management Program	
Element	**Description**
	The inspection population may be re-evaluated after each inspection in accordance with ASME Code Cases for canister inspections that have been endorsed by the NRC. <u>Frequency</u> Inspections of accessible surfaces are conducted at least once every 5 years. The inspection frequency may be re-evaluated after each inspection in accordance with ASME Code Cases for canister inspections that have been endorsed by the NRC. <u>Data Collection</u> Data from the examination, including evidence of degradation (including appearance of deposits) and its extent and location, shall be documented on a checklist or inspection form. The results of the inspection shall be documented, including descriptions of observed aging effects and supporting sketches, photographs, or video. Corrective actions resulting from each AMP inspection shall also be documented. <u>Timing</u> Initial inspections are completed prior to entering the PEO. <u>Qualifications</u> Inspection personnel are trained and technically qualified to perform these examinations. The personnel evaluating the structural examination results are degreed engineers with one or more years of structural inspection experience. The personnel evaluating the NDE results shall be certified for the applicable examination type.
5. Monitoring and Trending	Monitoring and trending methods are in accordance with ASME Code Section XI evaluation criteria. Monitoring and trending also includes photographic and video evidence of results with the written report that may be used in subsequent comparisons. The baseline will be established before the PEO. The program requires monitoring and trending of parameters or effects not corrected following a previous inspection (e.g., the locations, size, and depth of any areas of corrosion or SCC; and the disposition of MPCs with identified aging effects and the results of supplemental inspections).
6. Acceptance Criteria	<u>Inspection Results Requiring No Further Evaluation</u> No indication of localized corrosion pits, etching, SCC, red-orange colored corrosion products in the vicinity of canister welds, closure welds, and welds associated with temporary attachments during canister fabrication. Corrosion such as pitting requires additional evaluation.

Table A-2: Diablo Canyon Independent Spent Fuel Storage Installation Multi-Purpose Canister Aging Management Program	
Element	**Description**
	Inspection Results Requiring Additional Evaluation Indications of interest in locations on the MPC susceptible to SCC, which include areas adjacent to fabrication welds, closure welds, locations where temporary attachments may have been welded to and subsequently removed from the MPC, and the weld affected zones that are subject to additional examination and disposition through the CAP include: • localized corrosion pits, SCC, and etching; deposits or corrosion products. • discrete red-orange colored corrosion products especially those adjacent to fabrication welds, closure welds, 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 deposits. Alternatively, acceptance criteria may be used from ASME Code Cases for canister inspections that have been endorsed by the NRC.
7. Corrective Actions	The DC ISFSI CAP requirements are established in accordance with the requirements of the QA Program. The CAP procedures require the initiation of a corrective action document for actual or potential problems including failures, malfunctions, discrepancies, deviations, defective material and equipment, nonconformances, and administrative control discrepancies, to ensure that conditions adverse to quality, operability, functionality, and reportability issues are promptly identified, evaluated if necessary, and corrected as appropriate. Guidance on establishing priority and timely resolution of issues is contained within the CAP procedure. Results that do not meet the acceptance criteria are addressed as conditions adverse to quality or significant conditions adverse to quality under those specific portions of the QA Program approved under 10 CFR Part 72, Subpart G. The QA program ensures that corrective actions are completed within the CAP, and include provisions to: • perform functionality assessments • perform cause evaluations and root cause evaluations • address the extent of condition • determine actions to prevent recurrence for significant conditions adverse to quality; ensure justifications for not performing a repair

Table A-2: Diablo Canyon Independent Spent Fuel Storage Installation Multi-Purpose Canister Aging Management Program	
Element	**Description**
	• trend conditions • identify OE actions, including modification to the existing AMP (e.g., increased frequency) • determine if the condition is reportable to the NRC per 10 CFR 72.75 The inspection population and frequency of exams may be adjusted as needed based on inspection results in accordance with ASME Code Cases for canister inspections that have been endorsed by the NRC.
8. Confirmation Process	The confirmation process is part of the PG&E CAP and ensures that the corrective actions taken are adequate and appropriate, have been completed, and are effective. The approved CAP complies with the requirements of 10 CFR 72, Subpart G. The focus of the confirmation process is on the follow-up actions that must be taken to verify effective implementation of corrective actions. The measure of effectiveness is in terms of correcting the adverse condition and precluding repetition of significant conditions adverse to quality. Procedures include provisions for timely evaluation of adverse conditions and implementation of any corrective actions required, including root cause evaluations, and prevention of recurrence where appropriate. These procedures provide for tracking, coordinating, monitoring, reviewing, verifying, validating, and approving corrective actions, to ensure effective corrective actions are taken. The CAP is also monitored for potentially adverse trends. The existence of an adverse trend due to recurring or repetitive adverse conditions will result in the initiation of a corrective action document. The AMP will also uncover unsatisfactory conditions resulting from ineffective corrective action.
9. Administrative Controls	The QA Program, associated formal review and approval processes, and administrative controls applicable to the AMP and Aging Management Activities, are implemented in accordance with the requirements of the 10 CFR Part 72, Subpart G. The administrative controls that govern Aging Management Activities at the DC ISFSI are established in accordance with the PG&E Administrative Control Program and associated procedures. The administrative controls include provisions that define: • instrument calibration and maintenance • inspector requirements • record retention requirements • document control The administrative controls define: • methods for reporting results to the NRC per 10 CFR 72.75 • frequency for updating the AMP based on industry-wide OE

Table A-2: Diablo Canyon Independent Spent Fuel Storage Installation Multi-Purpose Canister Aging Management Program	
Element	**Description**
10. Operating Experience	The DC ISFSI MPC AMP will be effective in maintaining ISFSI structures and components. A review of ISFSI operating history provides evidence that any potential aging effects have been identified, evaluated, and managed effectively, ensuring that structures and components remain capable of performing their intended functions. It can be concluded that there is reasonable assurance that these structures and components will continue to perform their intended functions during the PEO. <u>Routine Inspections and Corrective Action Program</u> There have been no recurring inspections of the DC ISFSI MPCs since they were put into service. However, in 2014, in collaboration with EPRI, two DC ISFSI MPCs were examined for the potential SCC of welded stainless steel dry storage canisters in marine atmospheres. The inspection was performed remotely (with the MPCs remaining in the overpack) included temperature measurements, surface sampling, and visual examination. While the inspections did not identify any evidence of localized corrosion on the MPCs, it did determine some amount of chloride-containing salts to be present.[3] As discussed in Appendix E, the pre-application inspection included re-examination of these two MPCs; thus, trending information is available. A review of items in the CAP was performed. There were no MPC aging issues or findings noted in the CAP database. <u>NRC Inspection Reports</u> NRC inspection reports issued during the period of March 22, 2004 (initial license issuance) through December 2021 were reviewed for the ISFSI site. No issues or findings were noted relative to the aging of ISFSI structures and components. <u>Industry Operating Experience</u> The ISFSI AMID was reviewed for OE related to HI-STORM systems and several other dry cask storage systems. The AMID results contained several EPRI reports related to CISCC, including evaluation of CISCC susceptibility, crack growth propagation, techniques for identifying CISCC through NDE, and a summary of industry CISCC OE. These documents were considered in the development of the MAPS Report and ASME Code Case N-860, and therefore, are embedded within the bases of this DC ISFSI MPC AMP.

[3] As discussed in Reference A.8.2, Section 3.2.2.5, chloride presence on the MPC surface is needed to experience CISCC.

Table A-2: Diablo Canyon Independent Spent Fuel Storage Installation Multi-Purpose Canister Aging Management Program	
Element	**Description**
	Precedent License Renewal Applications Operating Experience A review of precedent ISFSI LRAs was performed to evaluate any relevant OE. ISFSIs included in this review were Prairie Island, Calvert Cliffs, H.B. Robinson, Surry, Oconee, North Anna, Trojan, Rancho Seco, and Humboldt Bay. The review also included OE described in the Holtec HI-STAR 100 and HI-STORM 100 LRAs. The results of these reviews indicated minor potential aging related to exterior MPC surface consistent with the MAPS Report, which is managed in this AMP inspection scope. Assessment of Aging Management Program Effectiveness The DC ISFSI MPC AMP provides reasonable assurance that the ISFSI SSCs will be managed effectively so that the subcomponents will continue to perform their intended functions during the PEO. PG&E will perform an AMP Effectiveness Review on a five-year frequency. Each AMP Effectiveness Review will include evaluation of AMP documentation (e.g., site procedures, inspection results, internal and external OE compared to each of the ten AMP elements to determine whether the AMP is effectively managing the effects of aging. In addition, an ISFSI Program Health Report will be issued on an annual basis. The Program Health Report will display program health performance metrics, describe issues that impact or may impact program performance, and the actions to address the issues. This report will also evaluate OE from the DC ISFSI-specific and industry sources (including the ISFSI AMID) to ensure that this experience is systematically reviewed on an ongoing basis in accordance with the QA Program, which meets the requirements of 10 CFR 72, Subpart G. Focused self-assessments may also be performed to evaluate specific issues. The DC ISFSI Program Health Report will specifically determine whether the effects of aging are adequately managed. A determination will be made as to whether the frequency of future inspections should be adjusted, whether new inspections should be established, and whether the inspection scope should be adjusted or expanded. If there is an indication that the effects of aging may not be adequately managed, the CAP will be used to determine what AMP enhancements are necessary. Because the AMP Effectiveness Reviews and Program Health Reports are based, in part, upon site-specific OE, but are not providing new OE, they are not required to be entered into the ISFSI AMID. However, they will be maintained onsite in an auditable fashion.

Table A-2: Diablo Canyon Independent Spent Fuel Storage Installation Multi-Purpose Canister Aging Management Program	
Element	**Description**
	Conclusion The OE, reviews, and monitoring described above confirm that any potential aging effects will be identified, evaluated, and managed effectively, ensuring that these SSCs remain capable of performing their intended functions.

A.3 Diablo Canyon Independent Spent Fuel Storage Installation Transfer Cask Aging Management Program

A description of the DC ISFSI Transfer Cask AMP is provided below in Table A-3 using each attribute of an effective AMP as described in NUREG-1927 (Reference A.8.1) and NUREG-2214 (Reference A.8.2) for the renewal of a site-specific Part 72 license. The DC ISFSI Transfer Cask AMP is based on the example AMP for transfer casks described in NUREG-2214, Section 6.9 (Reference A.8.2).

Table A-3: Diablo Canyon Independent Spent Fuel Storage Installation Transfer Cask Aging Management Program	
Element	**Description**
1. Scope of Program	The DC ISFSI Transfer Cask AMP manages sub-components requiring aging management as shown in LRA Table 3-4 for loss of material due to corrosion and wear. The program ensures that this aging effect does not challenge the capability of the transfer cask to fulfill structural integrity, radiation shielding, and heat transfer functions. The scope of the AMP includes visual inspections of the accessible internal and external surfaces of transfer cask subcomponents that are exposed to the long-term environment of indoor air.
2. Preventive Actions	This program is a condition monitoring program to detect evidence of degradation. It does not provide guidance for the prevention of aging.
3. Parameters Monitored or Inspected	This program monitors the condition of internal and external carbon steel and nickel alloy surfaces to identify loss of material due to general, pitting, and crevice corrosion, and wear. The condition of inaccessible carbon steel internal surfaces that are intermittently exposed to demineralized water (i.e., the water jacket) are monitored from the external side of the shield shell. Parameters monitored or inspected for accessible surfaces include: • visual evidence of surface discontinuities and imperfections indicative of corrosion or wear • visual evidence of coating degradation (e.g., blisters, cracking, flaking, delamination) indicative of corrosion of the base metal Parameters monitored or inspected to evaluate inaccessible water jacket carbon steel surfaces include: • visual evidence of leakage on external surfaces

Table A-3: Diablo Canyon Independent Spent Fuel Storage Installation Transfer Cask Aging Management Program	
Element	**Description**
4. Detection of Aging Effects	The method or technique, sample size, frequency, data collection, timing of inspections, and qualifications are provided for each monitoring activity discussed below. Consistent with the DC ISFSI TS, the specified frequency for each inspection is met if it is performed within 1.25 times the interval specified in the frequency, as measured from the previous performance or as measured from the time a specified condition of the frequency is met. Method/Technique: Normally Accessible Surfaces Visual inspections are performed in accordance with the ASME Code Section XI, Article IWA-2213, for VT-3 examinations. The inspections cover 100 percent of the normally accessible carbon steel and nickel alloy transfer cask surfaces, including the cask exterior, cask interior cavity, lid surfaces, and the cask bottom (during lifting). Method/Technique: Normally Inaccessible Internal Surfaces (water jacket) The condition of internal surfaces of the water jacket is monitored by inspections for leakage when the water jacket is filled with water, following ASME Code Section XI, Article IWA-2212, VT-2 (visual) inspection requirements. Sample Size The DC ISFSI has one transfer cask. This one transfer cask will be inspected. Frequency Inspections are conducted before the first loading campaign in the PEO and are valid for five years. If a transfer cask is used within the five-year period since last inspected, no additional inspections are required. If it has been longer than five years since the last inspection, inspections are conducted prior to its use. Data Collection Data from the examination, including evidence of degradation and its extent and location, shall be documented on a checklist or inspection form. The results of the inspection shall be documented, including descriptions of observed aging effects and supporting sketches, photographs, or video. Corrective actions resulting from each AMP inspection shall also be documented. Timing Initial inspections are completed before the use of the transfer casks in the first loading campaign in the PEO.

Table A-3: Diablo Canyon Independent Spent Fuel Storage Installation Transfer Cask Aging Management Program	
Element	**Description**
	Qualifications Inspection personnel are trained and technically qualified to perform these examinations. The personnel evaluating the structural examination results are degreed engineers with one or more years of structural inspection experience. The personnel evaluating the NDE results shall be VT-3 or VT-2 certified, as applicable. The personnel responsible for assessing the type and extent of coating degradation will either (a) possess a NACE Coating Inspector Program Level 2 or 3 inspector qualification; (b) have completed the EPRI Comprehensive Coatings Course; or (c) be qualified as a coatings specialist in accordance with an ASTM standard endorsed in Regulatory Guide 1.54, "Service Level I, II, and III Protective Coatings Applied to Nuclear Power Plants."
5. Monitoring and Trending	Inspection results are compared to those obtained during previous inspections, so that the progression of degradation can be evaluated and predicted. The baseline will be established before the first use of the transfer cask in the first loading campaign in the PEO. The program requires monitoring and trending of parameters or effects not corrected following a previous inspection (e.g., the locations, size, and depth of any areas of corrosion; and the disposition of components with identified aging effects and the results of supplemental inspections). In addition, literature research for carbon steel in a marine environment concludes that up to 0.0043 inches of wall loss may be experienced over a 1-year period (Reference A.8.7), which is less than the calculated wall loss that will not impact the transfer cask components' intended functions (see Element 6).
6. Acceptance Criteria	The program includes acceptance criteria to evaluate the extent of a degraded condition and the need for corrective action before the loss of intended function. The acceptance criteria include sufficient detail to ensure timely detection of any degraded condition, followed by an evaluation in the CAP to ensure that the structure or component intended function(s) is maintained under the existing licensing basis design conditions. Normally Accessible Surfaces For normally accessible surfaces, the acceptance criteria are no detectable loss of material from the base metal, including uniform wall thinning, localized corrosion pits, crevice corrosion, and wear scratches/gouges. If evidence of corrosion, wear, or coating degradation are identified, the severity of the base metal degradation is characterized using NDE methods consistent with PG&E procedures. Instances of degradation are

Table A-3: Diablo Canyon Independent Spent Fuel Storage Installation Transfer Cask Aging Management Program	
Element	**Description**
	entered into the CAP for evaluation and determination of corrective actions (see Element 7). <u>Normally Inaccessible Internal Surfaces (water jacket)</u> For normally inaccessible internal surfaces, the acceptance criterion is no evidence of leakage of the water jacket.
7. Corrective Actions	The DC ISFSI CAP requirements are established in accordance with the requirements of the QA Program. The CAP procedures require the initiation of a corrective action document for actual or potential problems including failures, malfunctions, discrepancies, deviations, defective material and equipment, nonconformances, and administrative control discrepancies, to ensure that conditions adverse to quality, operability, functionality, and reportability issues are promptly identified, evaluated if necessary, and corrected as appropriate. Guidance on establishing priority and timely resolution of issues is contained within the CAP procedure. Results that do not meet the acceptance criteria are addressed as conditions adverse to quality or significant conditions adverse to quality under those specific portions of the QA Program approved under 10 CFR Part 72, Subpart G. The QA Program ensures that corrective actions are completed within the CAP, and include provisions to: • perform functionality assessments • perform cause evaluations and root cause evaluations • address the extent of condition • determine actions to prevent recurrence for significant conditions adverse to quality; ensure justifications for not performing a repair • trend conditions • identify OE actions, including modification to the existing AMP (e.g., increased frequency) • determine if the condition is reportable to the NRC per 10 CFR 72.75
8. Confirmation Process	The confirmation process is part of the PG&E CAP and ensures that the corrective actions taken are adequate and appropriate, have been completed, and are effective. The approved CAP complies with the requirements of 10 CFR 72, Subpart G. The focus of the confirmation process is on the follow-up actions that must be taken to verify effective implementation of corrective actions. The measure of effectiveness is in terms of correcting the adverse condition and precluding repetition of significant conditions adverse to quality. Procedures include provisions for timely evaluation of adverse conditions and implementation of any corrective actions required, including root cause evaluations, and prevention of recurrence where appropriate. These procedures provide for tracking, coordinating, monitoring, reviewing, verifying, validating, and

Table A-3: Diablo Canyon Independent Spent Fuel Storage Installation Transfer Cask Aging Management Program	
Element	**Description**
	approving corrective actions, to ensure effective corrective actions are taken. The CAP is also monitored for potentially adverse trends. The existence of an adverse trend due to recurring or repetitive adverse conditions will result in the initiation of a corrective action document. The AMP will also uncover unsatisfactory conditions resulting from ineffective corrective action.
9. Administrative Controls	The QA Program, associated formal review and approval processes, and administrative controls applicable to the AMP and Aging Management Activities, are implemented in accordance with the requirements of the 10 CFR Part 72, Subpart G. The administrative controls that govern Aging Management Activities at the DC ISFSI are established in accordance with the PG&E Administrative Control Program and associated procedures. The administrative controls include provisions that define: • instrument calibration and maintenance • inspector requirements • record retention requirements • document control The administrative controls define: • methods for reporting results to the NRC per 10 CFR 72.75 • frequency for updating the AMP based on industry-wide OE
10. Operating Experience	The DC ISFSI Transfer Cask AMP will be effective in maintaining ISFSI structures and components. A review of ISFSI operating history provides evidence that any potential aging effects have been identified, evaluated, and managed effectively, ensuring that structures and components remain capable of performing their intended functions. It can be concluded that there is reasonable assurance that these structures and components will continue to perform their intended functions during the PEO. <u>Routine Inspections and Corrective Action Program</u> The DC ISFSI transfer cask has been in use during loading campaigns since 2009. Inspections of the transfer cask are currently conducted prior to campaign use, including (1) internal and external visual exams, (2) water jacket leakage test, (3) lifting trunnion inspections per NUREG-0612/ANSI N14.6. Any conditions not meeting acceptance criteria are entered into the CAP. Routine transfer cask inspections have identified minor coatings degradation, including chipped/scraped coating, surface rust, and minor corrosion that do not impact the transfer cask function. Areas were cleaned and re-coated before any significant corrosion could occur. No base metal degradation was identified.

	<u>NRC Inspection Reports</u> NRC inspection reports issued during the period of March 22, 2004 (initial license issuance) through December 2021, were reviewed for the ISFSI site. No issues or findings were noted relative to the aging of ISFSI structures and components. <u>Industry Operating Experience</u> The ISFSI AMID was reviewed for OE related to HI-STORM systems and several other dry cask storage systems. The AMID results did not identify aging effects not addressed by the MAPS Report. <u>Precedent License Renewal Applications Operating Experience</u> A review of precedent ISFSI LRAs was performed to evaluate any relevant OE. ISFSIs included in this review were Prairie Island, Calvert Cliffs, H.B. Robinson, Surry, Oconee, North Anna, Trojan, Rancho Seco, and Humboldt Bay. The review also included OE described in the Holtec HI-STAR 100 and HI-STORM 100 LRAs. The results of these reviews indicated aging related to metallic coatings and transfer cask lifting trunnions. Both of these items are managed in this AMP inspection scope. <u>Assessment of Aging Management Program Effectiveness</u> The DC ISFSI Transfer Cask AMP provides reasonable assurance that the ISFSI SSCs will be managed effectively so that the subcomponents will continue to perform their intended functions during the PEO. PG&E will perform an AMP Effectiveness Review on a five-year frequency. Each AMP Effectiveness Review will include evaluation of AMP documentation (e.g., site procedures, inspection results, internal and external OE) compared to each of the ten AMP elements to determine whether the AMP is effectively managing the effects of aging. In addition, an ISFSI Program Health Report will be issued on an annual basis. The Program Health Report will display program health performance metrics, describe issues that impact or may impact program performance, and the actions to address the issues. This report will also evaluate OE from the DC ISFSI-specific and industry sources (including the ISFSI AMID) to ensure that this experience is systematically reviewed on an ongoing basis in accordance with the QA Program, which meets the requirements of 10 CFR 72, Subpart G. Focused self-assessments may also be performed to evaluate specific issues. The DC ISFSI Program Health Report will specifically determine whether the effects of aging are adequately managed. A determination will be made as to whether the frequency of future inspections should be adjusted, whether new inspections should be established, and whether the inspection scope should be adjusted or expanded. If there is an indication that the effects of aging may not be adequately managed, the CAP will be used to determine what AMP enhancements are necessary.

Table A-3: Diablo Canyon Independent Spent Fuel Storage Installation Transfer Cask Aging Management Program	
Element	**Description**
	Because the AMP Effectiveness Reviews and Program Health Reports are based, in part, upon site-specific OE, but are not providing new OE, they are not required to be entered into the ISFSI AMID. However, they will be maintained onsite in an auditable fashion. Conclusion The OE, reviews, and monitoring described above confirm that any potential aging effects will be identified, evaluated, and managed effectively, ensuring that these SSCs remain capable of performing their intended functions.

A.4 Diablo Canyon Independent Spent Fuel Storage Installation Overpack Aging Management Program

A description of the DC ISFSI Overpack AMP is provided below in Table A-4 using each attribute of an effective AMP as described in NUREG-1927 (Reference A.8.1) and NUREG-2214 (Reference A.8.2) for the renewal of a site-specific Part 72 license. The DC ISFSI Overpack AMP is based on the example AMP for monitoring of metallic surfaces described in NUREG-2214, Section 6.7 (Reference A.8.2).

Table A-4: Diablo Canyon Independent Spent Fuel Storage Installation Overpack Aging Management Program	
Element	**Description**
1. Scope of Program	The DC ISFSI Overpack AMP manages: • the external surfaces of overpack carbon and stainless steel sub-components exposed to a sheltered or air-outdoor environment requiring aging management as shown in LRA Table 3-5 • carbon steel embedment structure components embedded in concrete requiring aging management as shown in LRA Table 3-7. The program manages loss of material due to general, pitting, crevice, and microbiologically influenced corrosion, and cracking of stainless steel due to SCC for SSCs that fulfill structural integrity, radiation shielding, and heat transfer functions. The scope of the AMP includes visual inspections of the accessible internal and external surfaces of the overpack and exposed anchorage subcomponents (i.e., anchor ring, gussets, studs, and nuts) within the scope of LR as the method used to manage aging effects and mechanisms listed in LRA Table 3-5. This AMP also includes an anchor stud sampling program. Furthermore, the AMP includes visual inspection of normally accessible ISFSI pad concrete portions adjacent to the overpacks to manage the embedded embedment support structure aging effects and mechanisms listed in LRA Table 3-7.

Table A-4: Diablo Canyon Independent Spent Fuel Storage Installation Overpack Aging Management Program	
Element	**Description**
2. Preventive Actions	The DC ISFSI Overpack AMP is a condition monitoring program to detect evidence of degradation. It does not provide guidance for the prevention of aging.
3. Parameters Monitored or Inspected	The parameters monitored by the DC ISFSI Overpack AMP ensure degraded conditions are identified and corrected by clearly defining degraded condition criteria and associated corrective action requirements to prevent the loss of intended function. The condition of the accessible portions of the interior and exterior overpack surfaces, anchor studs, and exposed anchorage subcomponents is visually inspected to ensure the intended functions are not compromised. Visual inspections will look for signs of deterioration of the accessible surfaces, including coatings, such that the structural integrity, radiation shielding, and heat transfer intended functions are maintained. Specifically, parameters monitored and inspected include: • visual evidence of discontinuities, imperfections, and rust staining indicative of corrosion (including SCC) and wear • visual evidence of loose or missing bolts and physical displacement • visual evidence of coating degradation (e.g., blisters, cracking, flaking, delamination) indicative of corrosion of the base material The condition of the embedded embedment support structure will be determined by visually inspecting for evidence of degradation, including staining and rust, on the ISFSI pad concrete adjacent to overpacks. The aging effects that are monitored by these inspections are loss of material and cracking.
4. Detection of Aging Effects	The method or technique, sample size, frequency, data collection, timing of inspections, and qualifications are provided for each monitoring activity discussed below. Consistent with the DC ISFSI TS, the specified frequency for each inspection is met if it is performed within 1.25 times the interval specified in the frequency, as measured from the previous performance or as measured from the time a specified condition of the frequency is met. <u>Method/Technique: Normally Accessible Surfaces (i.e., outside of overpack)</u> Visual inspections are performed in accordance with the ASME Code Section XI, Article IWA-2213, for VT-3 examinations. The inspections cover 100 percent of the normally accessible carbon steel and stainless steel overpack and anchorage surfaces.

	<u>Method/Technique: Normally Inaccessible Surfaces (i.e., inside of overpack)</u> Opportunistic visual inspections are performed in accordance with the ASME Code Section XI, Article IWA-2213, for VT-3 examinations with remote inspection techniques on metallic surfaces within overpacks that are accessed during MPC inspections (e.g., see Section A.2). 100 percent of the metallic surfaces made accessible by remote inspection techniques is inspected. <u>Method/Technique: Normally Accessible ISFSI Pad Surfaces Adjacent to Overpacks</u> The ISFSI pad concrete portions adjacent to overpack shall be inspected visually for any evidence of degradation (such as staining or rust) to determine if the embedded carbon steel embedment support structure components are undergoing degradation. <u>Method/Technique: Anchor Stud Sampling</u> The anchor studs will be sampled for visual inspection. Visual inspection is performed in accordance with the ASME Code Section XI, Article IWA-2213, for VT-3 examinations. <u>Sample Size</u> The readily accessible exterior metallic surfaces of all overpacks and exposed anchorage are inspected. The normally accessible ISFSI pad concrete adjacent to all overpacks is inspected. The inspections of normally inaccessible surfaces within overpacks is opportunistic; inspections are performed whenever the overpacks are accessed for MPC inspections. Consistent with NUREG-1801, Revision 2, (Reference A.8.5, sampling programs), the anchor stud sample size is 20 percent of the anchor stud population or a maximum of 25 anchor studs. Otherwise, a technical justification of the methodology and sample size used for selecting anchor studs for visual inspection should be included as part of the AMP's documentation. <u>Frequency</u> Inspections of readily accessible surfaces are conducted at least once every 5 years. Normally inaccessible surfaces within overpacks are inspected when those surfaces are accessed during remote inspections of MPCs. Consistent with NUREG-1801, Revision 2, (Reference A.8.5, AMP XI.E4), the anchor studs will be sampled on a 10-year frequency. This is an adequate period to preclude failures of the anchor studs since DC ISFSI-specific experience (see Element 10) has shown that anchor stud aging degradation is a slow process. <u>Data Collection</u> Data from the examination, including evidence of degradation and its extent and location, shall be documented on a checklist or inspection form. The results of the inspection shall be documented, including descriptions of observed aging effects and supporting sketches, photographs, or video.

Table A-4: Diablo Canyon Independent Spent Fuel Storage Installation Overpack Aging Management Program

Element	Description
	Corrective actions resulting from each AMP inspection shall also be documented. <u>Timing</u> Initial inspections are completed and the anchor stud sampling program is initiated prior to entering the PEO. <u>Qualifications</u> Inspection personnel are trained and technically qualified to perform these examinations. The personnel evaluating the structural examination results and the adjacent concrete conditions are degreed engineers with one or more years of structural inspection experience. The personnel evaluating the NDE results shall be VT-3 certified. The personnel responsible for assessing the type and extent of coating degradation will either (a) possess a NACE Coating Inspector Program Level 2 or 3 inspector qualification; (b) have completed the EPRI Comprehensive Coatings Course; or (c) be qualified as a coatings specialist in accordance with an ASTM standard endorsed in Regulatory Guide 1.54, “Service Level I, II, and III Protective Coatings Applied to Nuclear Power Plants.”
5. Monitoring and Trending	Inspection results are compared to those obtained during previous inspections, so that the progression of degradation can be evaluated and predicted. The baseline will be established before the PEO. The program requires monitoring and trending of parameters or effects not corrected following a previous inspection (e.g., the locations, size, and depth of any areas of corrosion or cracking; and the disposition of components with identified aging effects and the results of supplemental inspections). In addition, literature research for carbon steel in a marine environment concludes that up to 0.0043 inches of wall loss may be experienced over a 1-year period (Reference A.8.7), which is less than the calculated wall loss that will not impact the overpack components’ intended functions (see Element 6).
6. Acceptance Criteria	The acceptance criteria for all visual inspections of the overpacks, anchor studs, and exposed anchorage are the absence of any degradation aging effects listed in LRA Table 3-5 which, if left uncorrected could adversely affect the component intended function prior to the next inspection. These include: • no detectable loss of material from the base metal, including uniform wall thinning, localized corrosion pits, and crevice corrosion • no indications of loose bolts or hardware, displaced parts

Table A-4: Diablo Canyon Independent Spent Fuel Storage Installation Overpack Aging Management Program	
Element	**Description**
	If evidence of corrosion, wear, or coating degradation (e.g., peeling, delamination, blisters, cracking, flaking, and rusting) are identified, the severity of the base metal degradation is characterized using NDE methods consistent with PG&E procedures. Instances of degradation are entered into the CAP for evaluation and determination of corrective actions (see Element 7). The areas of ISFSI pad concrete adjacent to the overpacks shall not show any evidence of corrosion such as rust.
7. Corrective Actions	The DC ISFSI CAP requirements are established in accordance with the requirements of the QA Program. The CAP procedures require the initiation of a corrective action document for actual or potential problems including failures, malfunctions, discrepancies, deviations, defective material and equipment, nonconformances, and administrative control discrepancies, to ensure that conditions adverse to quality, operability, functionality, and reportability issues are promptly identified, evaluated if necessary, and corrected as appropriate. Guidance on establishing priority and timely resolution of issues is contained within the CAP procedure. Results that do not meet the acceptance criteria (including ISFSI pad concrete findings adjacent to the overpacks indicates potential loss of intended function of the embedded embedment support structure components) are addressed as conditions adverse to quality or significant conditions adverse to quality under those specific portions of the QA Program approved under 10 CFR Part 72, Subpart G. The QA program ensures that corrective actions are completed within the CAP, and include provisions to: • perform functionality assessments • perform cause evaluations and root cause evaluations • address the extent of condition, including inspection of additional components • determine actions to prevent recurrence for significant conditions adverse to quality; ensure justifications for not performing a repair • trend conditions • identify OE actions, including modification to the existing AMP (e.g., increased frequency) • determine if the condition is reportable to the NRC per 10 CFR 72.75
8. Confirmation Process	The confirmation process is part of the PG&E CAP and ensures that the corrective actions taken are adequate and appropriate, have been completed, and are effective. The approved CAP complies with the requirements of 10 CFR 72, Subpart G. The focus of the confirmation process is on the follow-up actions that must be taken to verify effective

Table A-4: Diablo Canyon Independent Spent Fuel Storage Installation Overpack Aging Management Program

Element	Description
	implementation of corrective actions. The measure of effectiveness is in terms of correcting the adverse condition and precluding repetition of significant conditions adverse to quality. Procedures include provisions for timely evaluation of adverse conditions and implementation of any corrective actions required, including root cause evaluations, and prevention of recurrence where appropriate. These procedures provide for tracking, coordinating, monitoring, reviewing, verifying, validating, and approving corrective actions, to ensure effective corrective actions are taken. The CAP is also monitored for potentially adverse trends. The existence of an adverse trend due to recurring or repetitive adverse conditions will result in the initiation of a corrective action document. The AMP will also uncover unsatisfactory conditions resulting from ineffective corrective action.
9. Administrative Controls	The QA Program, associated formal review and approval processes, and administrative controls applicable to the AMP and Aging Management Activities, are implemented in accordance with the requirements of the 10 CFR Part 72, Subpart G. The administrative controls that govern Aging Management Activities at the DC ISFSI are established in accordance with the PG&E Administrative Control Program and associated procedures.
10. Operating Experience	The DC ISFSI Overpack AMP has been effective in maintaining ISFSI structures and components. A review of ISFSI operating history provides evidence that any potential aging effects have been identified, evaluated, and managed effectively, ensuring that structures and components remain capable of performing their intended functions. It can be concluded that there is reasonable assurance that these structures and components will continue to perform their intended functions during the PEO. <u>Routine Inspections and Corrective Action Program</u> The oldest DC ISFSI overpacks have been in service since the first loading campaign in 2009. Inspections of the normally accessible external surfaces of the overpack are conducted annually. Any conditions not meeting acceptance criteria are entered into the CAP. Inspections have identified overpack anchor stud pitting and surface corrosion. As corrective actions, corrosion-inhibiting coating was added to the exposed portions of the anchor studs and caps were installed so the exposed stud head is sheltered from direct weather. Due to this site-specific OE, this AMP includes monitoring of the anchor studs. Routine overpack inspections have identified minor coatings degradation, including chipped/scraped coating, surface rust, minor corrosion, and build-up of deposits that do not impact overpack function. Consistent with DC ISFSI UFSAR Section 4.7.3, areas are cleaned and re-coated before

Table A-4: Diablo Canyon Independent Spent Fuel Storage Installation Overpack Aging Management Program

Element	Description
	any significant corrosion can occur. No base metal degradation has been identified. The DC ISFSI Overpack AMP includes continued inspection of overpack coatings. NRC Inspection Reports NRC inspection reports issued during the period of March 22, 2004 (initial license issuance) through December 2021, were reviewed for the ISFSI site. No issues or findings were noted relative to the aging of ISFSI structures and components. Industry Operating Experience The ISFSI AMID was reviewed for OE related to HI-STORM systems and several other dry cask storage systems. The AMID results did not identify aging effects not addressed by the MAPS Report. Precedent License Renewal Applications Operating Experience A review of precedent ISFSI LRAs was performed to evaluate any relevant OE. ISFSIs included in this review were Prairie Island, Calvert Cliffs, H.B. Robinson, Surry, Oconee, North Anna, Trojan, Rancho Seco, and Humboldt Bay. The review also included OE described in the Holtec HI-STAR 100 and HI-STORM 100 LRAs. The results of these reviews indicated aging related to metallic coatings, overpack bolting, and overpack bottom shells. Except for the bottom shells (discussed in Section 3.5.4.1), these other items are in the scope of this AMP. Assessment of Aging Management Program Effectiveness The DC ISFSI Overpack AMP provides reasonable assurance that the ISFSI SSCs within its scope will be managed effectively so that the subcomponents will continue to perform their intended functions during the PEO. PG&E will perform an AMP Effectiveness Review on a five-year frequency. Each AMP Effectiveness Review will include evaluation of AMP documentation (e.g., site procedures, inspection results, internal and external OE compared to each of the ten AMP elements to determine whether the AMP is effectively managing the effects of aging. In addition, an ISFSI Program Health Report will be issued on an annual basis. The Program Health Report will display program health performance metrics, describe issues that impact or may impact program performance, and the actions to address the issues. This report will also evaluate OE from the DC ISFSI-specific and industry sources (including the ISFSI AMID) to ensure that this experience is systematically reviewed on an ongoing basis in accordance with the QA Program, which meets the requirements of 10 CFR 72, Subpart G. Focused self-assessments may also be performed to evaluate specific issues.

Table A-4: Diablo Canyon Independent Spent Fuel Storage Installation Overpack Aging Management Program	
Element	**Description**
	The DC ISFSI Program Health Report will specifically determine whether the effects of aging are adequately managed. A determination will be made as to whether the frequency of future inspections should be adjusted, whether new inspections should be established, and whether the inspection scope should be adjusted or expanded. If there is an indication that the effects of aging may not be adequately managed, the CAP will be used to determine what AMP enhancements are necessary. Because the AMP Effectiveness Reviews and Program Health Reports are based, in part, upon site-specific OE, but are not providing new OE, they are not required to be entered into the ISFSI AMID. However, they will be maintained onsite in an auditable fashion. <u>Conclusion</u> The OE, reviews, and monitoring described above confirm that any potential aging effects will be identified, evaluated, and managed effectively, ensuring that these SSCs remain capable of performing their intended functions.

A.5 Diablo Canyon Independent Spent Fuel Storage Installation Reinforced Concrete Structures Aging Management Program

A description of the DC ISFSI Reinforced Concrete Structures AMP is provided below in Table A-5 using each attribute of an effective AMP as described in NUREG-1927 (Reference A.8.1) and NUREG-2214 (Reference A.8.2) for the renewal of a site-specific Part 72 license. The DC ISFSI Reinforced Concrete Structures AMP is based on the example AMP for reinforced concrete structures described in NUREG-2214, Section 6.6 (Reference A.8.2).

Table A-5: Diablo Canyon Independent Spent Fuel Storage Installation Reinforced Concrete Structures Aging Management Program	
Element	**Description**
1. Scope of Program	The DC ISFSI Reinforced Concrete Structures AMP manages the concrete sub-components exposed to a soil or air-outdoor environment requiring aging management as shown in LRA Table 3-7 and Table 3-8 with radiation shielding and structural integrity functions. The program requires periodic inspection activities that monitor the condition of SSCs within the scope of LR as the method used to manage aging effects and mechanisms listed in LRA Table 3-7 and Table 3-8. The scope of the program includes: 1) visual inspection of the ISFSI storage pads and CTF structural concrete

Table A-5: Diablo Canyon Independent Spent Fuel Storage Installation Reinforced Concrete Structures Aging Management Program	
Element	**Description**
	2) radiation monitoring for defense-in-depth 3) soil sample analyses in lieu of a groundwater monitoring program to identify conditions conducive to below-grade (underground) aging mechanisms
2. Preventive Actions	Because the DC ISFSI concrete structures were designed and fabricated in accordance with American Concrete Institute (ACI) 349 (DC ISFSI UFSAR, Tables 3.4-3 and 3.4-5), the DC ISFSI Reinforced Concrete Structures AMP does not include preventive actions. It is a condition monitoring program to detect evidence of degradation. It does not provide guidance for the prevention of aging.
3. Parameters Monitored or Inspected	The parameters monitored by the DC ISFSI Reinforced Concrete Structures AMP are consistent with those identified in industry codes and standards including EPRI Report 1002950, “Aging Effects for Structures and Structural Components (Structural Tools),” EPRI Technical Report 1007933, "Aging Assessment Field Guide," and ACI Report 349.3R-18, “Report on Evaluation and Repair of Existing Nuclear Safety-Related Concrete Structures.” The parameters included in the program ensure degraded conditions are identified and corrected by clearly defining degraded condition criteria and associated corrective action requirements to prevent the loss of intended function. Industry and site-specific OE are also reviewed to ensure that parameters inspected focus on conditions identified during these OE reviews. <u>Independent Spent Fuel Storage Installation Pads and Cask Transfer Facility Structural Concrete Inspections</u> A visual inspection of the accessible areas of the ISFSI pads concrete and CTF structural concrete is performed to determine that no deterioration has occurred and that the intended function is not compromised. Parameters monitored or inspected include: • affected surface area • geometry/depth of defect • cracking, crazing, delaminations, drummy areas • curling or deflections • honeycombing, bug holes • popouts and voids • exposure of embedded steel • staining/evidence of corrosion • dusting, efflorescence of any color The parameters evaluated consider any surface geometries that may support water ponding and potentially increase the rate of degradation. The aging effects that are monitored by these inspections are cracking, increase in porosity and permeability, loss of concrete/steel bond, loss of material, loss of strength, and reduction of concrete pH.

Table A-5: Diablo Canyon Independent Spent Fuel Storage Installation Reinforced Concrete Structures Aging Management Program	
Element	**Description**
	<u>Radiation Monitoring</u> Radiation surveys at the overpack side and top are used to verify that the radiation levels and dose rates remain within the specified limits and that the shielding materials are intact and are effectively performing their shielding intended function. Degradation in the effectiveness of the shielding material would be detected by a corresponding unexpected increase in radiation levels (gamma dose rate and neutron fluence rate). Although the AMR indicates no radiation monitoring is required, this monitoring is being included as defense-in-depth. <u>Soil Samples</u> Soil samples are taken to verify that pH, and concentrations of chlorides and sulfates are indicative of non-corrosive soil. Inspections of exposed portions of the below grade concrete are conducted when excavated for any reason. The aging effects that are monitored by these inspections are cracking, increase in porosity and permeability, loss of concrete/ steel bond, loss of material, loss of strength, and reduction of concrete pH.
4. Detection of Aging Effects	The method or technique, sample size, frequency, data collection, timing of inspections, and qualifications are provided for each monitoring activity discussed below. Consistent with the DC ISFSI TS, the specified frequency for each inspection is met if it is performed within 1.25 times the interval specified in the frequency, as measured from the previous performance or as measured from the time a specified condition of the frequency is met. <u>Independent Spent Fuel Storage Installation Pads and Cask Transfer Facility Structural Concrete Inspections</u> Visual inspections of 100 percent of the accessible above-grade areas of the ISFSI storage pads and CTF structural concrete will be conducted with feeler gauges, crack comparators, or other suitable visual quantification methods in accordance with ACI 349.3R-18 every five years to provide a means to detect degradation of these areas due to potential change in material properties, cracking, and loss of material. These inspections confirm that the intended function is not compromised. These inspections will be implemented prior to the PEO. See “soil samples” below for discussion of inaccessible below-grade concrete inspections. <u>Radiation Monitoring</u> A shielding effectiveness survey shall be performed every five years on the overpacks that house the MPCs inspected by the DC ISFSI MPC AMP. Calibrated neutron and gamma dose meters with valid energy ranges shall be used to measure the actual neutron and gamma dose rates at the surface of the overpack side and top. The shielding effectiveness survey locations were chosen to correspond to the

Table A-5: Diablo Canyon Independent Spent Fuel Storage Installation Reinforced Concrete Structures Aging Management Program	
Element	**Description**
	calculated dose rates as discussed in the UFSAR (see Element 6). These surveys will be implemented prior to the PEO. <u>Soil Samples</u> Soil samples at a five-year frequency, consistent with ACI 349.3R-18 inspection frequencies, will confirm that soil corrosive conditions will not compromise the intended function of the below-grade portions of the concrete. These soil samples will be implemented prior to the PEO. Soil testing will include determination of pH, and concentrations of chlorides and sulfates of soil in the vicinity of the DC ISFSI by a chemical analysis method with a valid measurement range relative to the acceptance criteria and adequate resolution and sensitivity. Examinations of representative samples of the exposed portions of the below grade concrete are conducted when excavated for any reason. For inaccessible below-grade concrete structural elements with aggressive water/soil (pH < 5.5, chlorides > 500 ppm, or sulfates > 1500 ppm), and/or where the concrete structural elements have experienced degradation, an AMP accounting for the extent of the degradation experienced will be implemented to manage the concrete aging during the PEO. Data from all inspection and monitoring activities, including evidence of degradation and its extent and location, shall be documented on a checklist or inspection form. The results of the inspection shall be documented, including descriptions of observed aging effects and supporting sketches, photographs, or video. Additionally, the DC ISFSI Reinforced Concrete Structures AMP requires inspection personnel to be trained and technically qualified to perform these examinations. Concrete inspectors are qualified consistent with ACI 349.3R-18. Personnel reviewing concrete inspection results are licensed civil engineers. Radiation monitoring personnel are qualified in accordance with PG&E radiation protection procedures.
5. Monitoring and Trending	Inspection results are compared to those obtained during previous inspections, so that the progression of degradation can be evaluated and predicted. The baseline will be established before the PEO. The program requires monitoring and trending of parameters or effects not corrected following a previous inspection (e.g., crack growth/extent; pore/void density and affected areas; and dose rates).

Table A-5: Diablo Canyon Independent Spent Fuel Storage Installation Reinforced Concrete Structures Aging Management Program	
Element	**Description**
	Trending of concrete inspection results are consistent with defect evaluation guides and standards (e.g., ACI 201.1R, ACI 207.3R, ACI 364.1R, ACI 562, or ACI 224.1R for crack evaluation). Measurements obtained during the shielding effectiveness survey will be compared to the design basis limits for surface dose rates established in the DC ISFSI UFSAR Chapter 7 and previous measured radiation levels provide a means to detect shielding material degradation and confirm that the intended function is not compromised.
6. Acceptance Criteria	The DC ISFSI Reinforced Concrete Structures AMP includes acceptance criteria to evaluate the extent of a degraded condition and the need for corrective action before the loss of intended function. The acceptance criteria include sufficient detail to ensure timely detection of any degraded condition, followed by an evaluation in the CAP to ensure that the structure or component intended function(s) is maintained under the existing licensing basis design conditions. Industry and plant-specific OE are also reviewed to ensure that the DC ISFSI Reinforced Concrete Structures AMP's acceptance criteria focus on conditions identified during these OE reviews. <u>Independent Spent Fuel Storage Installation Pads and Cask Transfer Facility Structural Concrete Inspections</u> The acceptance criteria for visual inspections of the DC ISFSI concrete are consistent with those contained in ACI 349.3R-18. ACI 349.3R-18 includes quantitative three-tier acceptance criteria for visual inspections of concrete surfaces, namely (1) acceptance without further evaluation, (2) acceptance after review, (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 support. 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 or exceeding the ACI 349.3R-18 Tier 2 criteria will be entered into the site's CAP for evaluation, implementation of compensatory measures as necessary, long-term and resolution. <u>Radiation Monitoring</u> The acceptance criterion for shielding effectiveness survey of the DC ISFSI is as follows: • Less than 34.8 mrem/hour surface dose rate for monitoring at the overpack side. This acceptance criterion was established based on the calculated dose rate as discussed in DC ISFSI

Table A-5: Diablo Canyon Independent Spent Fuel Storage Installation Reinforced Concrete Structures Aging Management Program	
Element	**Description**
	UFSAR, Table 7.3-1B, Point 2 at the overpack side for meeting the requirements of 10 CFR 20. • Less than 28.9 mrem/hour surface dose rate for monitoring at the overpack lid. This acceptance criterion was established based on the calculated dose rate as discussed in DC ISFSI UFSAR, Table 7.3-1B, Point 4a at the overpack lid for meeting the requirements of 10 CFR 20. Soil Samples Consistent with NUREG-1801, Revision 2, Sections IX.D and IX.F (Reference A.8.5), soil sample acceptance criteria for determination of a non-aggressive environment are as follows: Chloride less than or equal to 500 ppm Sulfate less than or equal to 1500 ppm pH greater than or equal to 5.5
7. Corrective Actions	The DC ISFSI CAP requirements are established in accordance with the requirements of the QA Program. The CAP procedures require the initiation of a corrective action document for actual or potential problems including failures, malfunctions, discrepancies, deviations, defective material and equipment, nonconformances, and administrative control discrepancies, to ensure that conditions adverse to quality, operability, functionality, and reportability issues are promptly identified, evaluated if necessary, and corrected as appropriate. Guidance on establishing priority and timely resolution of issues is contained within the CAP procedure. Results that do not meet the acceptance criteria are addressed as conditions adverse to quality or significant conditions adverse to quality under those specific portions of the QA Program approved under 10 CFR Part 72, Subpart G. The QA program ensures that corrective actions are completed within the CAP, and include provisions to: • perform functionality assessments • perform cause evaluations and root cause evaluations • address the extent of condition • determine actions to prevent recurrence for significant conditions adverse to quality; ensure justifications for not performing a repair • trend conditions • identify OE actions, including modification to the existing AMP (e.g., increased frequency) • determine if the condition is reportable to the NRC per 10 CFR 72.75

Table A-5: Diablo Canyon Independent Spent Fuel Storage Installation Reinforced Concrete Structures Aging Management Program	
Element	**Description**
	For concrete inspections not meeting acceptance criteria, the following concrete rehabilitation guides or standards may be used: • cracking: ACI 224.1R, ACI 562, ACI 364.1R, and ACI RAP Bulletins • spalling/scaling: ACI 562, ACI 364.1R, ACI 506R, and ACI RAP Bulletins
8. Confirmation Process	The confirmation process is part of the PG&E CAP and ensures that the corrective actions taken are adequate and appropriate, have been completed, and are effective. The approved CAP complies with the requirements of 10 CFR 72, Subpart G. The focus of the confirmation process is on the follow-up actions that must be taken to verify effective implementation of corrective actions. The measure of effectiveness is in terms of correcting the adverse condition and precluding repetition of significant conditions adverse to quality. Procedures include provisions for timely evaluation of adverse conditions and implementation of any corrective actions required, including root cause evaluations, and prevention of recurrence where appropriate. These procedures provide for tracking, coordinating, monitoring, reviewing, verifying, validating, and approving corrective actions, to ensure effective corrective actions are taken. The CAP is also monitored for potentially adverse trends. The existence of an adverse trend due to recurring or repetitive adverse conditions will result in the initiation of a corrective action document. The AMP will also uncover unsatisfactory conditions resulting from ineffective corrective action.
9. Administrative Controls	The QA Program, associated formal review and approval processes, and administrative controls applicable to the AMP and Aging Management Activities, are implemented in accordance with the requirements of the 10 CFR Part 72, Subpart G. The administrative controls that govern Aging Management Activities at the DC ISFSI are established in accordance with the PG&E Administrative Control Program and associated procedures.
10. Operating Experience	The DC ISFSI Reinforced Concrete Structures AMP has been effective in maintaining ISFSI structures and components. A review of ISFSI operating history provides evidence that any potential aging effects have been identified, evaluated, and managed effectively, ensuring that structures and components remain capable of performing their intended functions. It can be concluded that there is reasonable assurance that these structures and components will continue to perform their intended functions during the PEO. <u>Routine Inspections and Corrective Action Program</u> Inspections of the ISFSI pad surfaces near deployed overpacks are conducted annually. Any conditions not meeting acceptance criteria are

Table A-5: Diablo Canyon Independent Spent Fuel Storage Installation Reinforced Concrete Structures Aging Management Program	
Element	**Description**
	entered into the CAP. Review of the CAP identified no age-related degradation of these ISFSI pad locations. In addition, environmental thermoluminescent dosimeters surrounding the DC ISFSI have been monitoring doses since the year prior to the first loading campaign. The quarterly dose data was compiled for 2008–2020 and demonstrated that while doses at the ISFSI have increased slightly over time as more casks are stored on the ISFSI pads, there are no dose measurements or trends that indicate degradation of shielding. <u>NRC Inspection Reports</u> NRC inspection reports issued during the period of March 22, 2004 (initial license issuance) through December 2021, were reviewed for the ISFSI site. No issues or findings were noted relative to the aging of ISFSI structures and components. <u>Industry Operating Experience</u> The ISFSI AMID was reviewed for OE related to HI-STORM systems and several other dry cask storage systems. The AMID results did not identify aging effects not addressed by the MAPS Report. <u>Precedent License Renewal Applications Operating Experience</u> A review of precedent ISFSI LRAs was performed to evaluate any relevant OE. ISFSIs included in this review were Prairie Island, Calvert Cliffs, H.B. Robinson, Surry, Oconee, North Anna, Trojan, Rancho Seco, and Humboldt Bay. The review also included OE described in the Holtec HI-STAR 100 and HI-STORM 100 LRAs. The results of these reviews indicated concrete aging related to cracking, efflorescence deposits, surface voids, and disbonded patches, which would be identified in the scope of this AMP. <u>Assessment of Aging Management Program Effectiveness</u> The DC ISFSI Reinforced Concrete Structures AMP provides reasonable assurance that the ISFSI SSCs within its scope will be managed effectively so that the subcomponents will continue to perform their intended functions during the PEO. PG&E will perform an AMP Effectiveness Review on a five-year frequency. Each AMP Effectiveness Review will include evaluation of AMP documentation (e.g., site procedures, inspection results, internal and external OE compared to each of the ten AMP elements to determine whether the AMP is effectively managing the effects of aging. In addition, an ISFSI Program Health Report will be issued on an annual basis. The Program Health Report will display program health performance metrics, describe issues that impact or may impact program performance, and the actions

Table A-5: Diablo Canyon Independent Spent Fuel Storage Installation Reinforced Concrete Structures Aging Management Program	
Element	**Description**
	to address the issues. This report will also evaluate OE from the DC ISFSI-specific and industry sources (including the ISFSI AMID) to ensure that this experience is systematically reviewed on an ongoing basis in accordance with the QA Program, which meets the requirements of 10 CFR 72, Subpart G. Focused self-assessments may also be performed to evaluate specific issues. The DC ISFSI Program Health Report will specifically determine whether the effects of aging are adequately managed. A determination will be made as to whether the frequency of future inspections should be adjusted, whether new inspections should be established, and whether the inspection scope should be adjusted or expanded. If there is an indication that the effects of aging may not be adequately managed, the CAP will be used to determine what AMP enhancements are necessary. Because the AMP Effectiveness Reviews and Program Health Reports are based, in part, upon site-specific OE, but are not providing new OE, they are not required to be entered into the ISFSI AMID. However, they will be maintained onsite in an auditable fashion. <u>Conclusion</u> The OE, reviews, and monitoring described above confirm that any potential aging effects will be identified, evaluated, and managed effectively, ensuring that these SSCs remain capable of performing their intended functions.

A.6 Diablo Canyon Independent Spent Fuel Storage Installation Cask Transportation System Aging Management Program

A description of the DC ISFSI Cask Transportation System AMP is provided below in Table A-6 using each attribute of an effective AMP as described in NUREG-1927 (Reference A.8.1) and NUREG-2214 (Reference A.8.2) for the renewal of a site-specific Part 72 license. The DC ISFSI Cask Transportation System AMP is based on the vendor-recommended maintenance, but is enhanced as needed to address aging effects/mechanisms for the PEO. During the PEO, existing maintenance activities will continue and the DC ISFSI Cask Transportation System AMP will be implemented.

Table A-6: Cask Transportation System Aging Management Program	
Element	**Description**
1. Scope of Program	The Cask Transportation System AMP manages the external surfaces of sub-components exposed to an embedded, sheltered or air-outdoor environment requiring aging management as shown in LRA Table 3-6 and Table 3-8 with structural integrity and retrievability functions: The program requires periodic and prior-to-use inspection activities that monitor the condition of SSCs within the scope of LR as the method

Table A-6: Cask Transportation System Aging Management Program	
Element	**Description**
	used to manage aging effects and mechanisms listed in LRA Table 3-6 (change in material properties, loss of material, and loss of preload) and Table 3-8 (change in material properties and loss of material). The scope of the Cask Transportation System AMP includes visual inspection of the following: 1) exterior of the cask transporter structure, including the overhead beam, lift towers, chassis, associated bolting, and welds 2) cask transporter cask restraint system, MPC downloader system, cask transporter wedge lock assembly, and welds 3) HI-TRAC lift links, cask transporter connector pins, and associated welds 4) CTF liner, lateral restraints, and associated welds 5) MPC lift cleats, HI-STORM lifting brackets, HI-STORM mating device, and associated welds 6) LPT structure, mounting bolts, and rollers The AMP also includes visual inspection of normally accessible concrete portions adjacent to the CTF liner and lateral restraints to manage the embedded CTF liner and lateral restraints aging effects and mechanisms listed in LRA Table 3-8.
2. Preventive Actions	The Cask Transportation System AMP is a condition monitoring program to detect evidence of degradation. It does not provide guidance for the prevention of aging.
3. Parameters Monitored or Inspected	The parameters monitored by the Cask Transportation System AMP ensure degraded conditions are identified and corrected by clearly defining degraded condition criteria and associated corrective action requirements to prevent the loss of intended function. Industry and site-specific OE are also reviewed to ensure that parameters inspected focus on conditions identified during these OE reviews. The Cask Transportation System AMP manages changes in material properties, loss of material, and loss of preload (in bolting). The conditions of the cask transportation system components are inspected visually to ensure the intended functions are not compromised. Visual inspections will look for signs of deterioration such that the retrievability and structural integrity intended functions are maintained. Parameters monitored and inspected for metallic components include: • visual evidence of discontinuities, imperfections, and rust staining indicative of corrosion (including pitting, crevice, general, and galvanic) and wear • size and location of localized corrosion • visual evidence of missing bolts and physical displacement

Table A-6: Cask Transportation System Aging Management Program	
Element	**Description**
	• appearance and location of deposits on the surfaces The condition of the embedded portions of the CTF liner and lateral restraints will be determined by visually inspecting for evidence of degradation, including staining and rust, on the concrete adjacent to the CTF liner and lateral restraints. Parameters monitored and inspected for K-spec components (i.e., sling) include visual evidence of general damage (burns, snags, tears, punctures, wear, distortion).

4. Detection of Aging Effects	The method or technique, frequency, sample size, data collection, and timing of inspections are provided for each monitoring activity discussed below.
	
	<u>Cask Transporter Structure Inspection</u>
	A VT-3 inspection of the accessible portions of the exterior surface of the cask transporter structure and bolting provides a means to detect degradation of these components due to a potential loss of material or loss of preload and confirm that the intended functions are not compromised. The VT-3 inspection is performed before the first use (e.g., prior to the first use for onsite cask handling operations or prior to the first offsite transport) if the cask transporter has been in-service for greater than 20 years (see DC ISFSI UFSAR, Section 3.3.3.2.1). The inspection is valid for five years. If the cask transporter is used within the five-year period, no additional inspections are required. If it has been longer than five years, the inspection is conducted prior to its use. These VT-3 inspections will be implemented prior to the PEO.
	• A VT-3 inspection of 100 percent of the following accessible portions of structural members (including welds) will be conducted to detect loss of material. The VT-3 inspection will include sufficient resolution and lighting to identify the degradation:
	  ○ overhead beam
	  ○ lift link saddles
	  ○ lift towers
	  ○ chassis
	• 100 percent of accessible bolting on the cask transporter structure will be checked for proper torque to detect for loss of preload.
	
	<u>Cask Transporter Cask Restraint System, Multi-Purpose Canister Downloader System, and Cask Transporter Wedge Lock Assembly Inspection</u>
	A VT-3 inspection of the exterior surfaces of the cask transporter cask restraint system, MPC downloader system, and wedge lock assembly provides a means to detect degradation of these components due to a potential loss of material and confirm that the intended functions are not compromised. The VT-3 inspection is performed before the first use (e.g., prior to the first use for onsite cask handling operations or prior to

Table A-6: Cask Transportation System Aging Management Program	
Element	**Description**
	the first offsite transport) if the cask transporter has been in-service for greater than 20 years (see DC ISFSI UFSAR, Section 3.3.3.2.1). The inspection is valid for five years. If the cask transporter is used within the five-year period, no additional inspections are required. If it has been longer than five years, the inspection is conducted prior to its use. These VT-3 inspections will be implemented prior to the PEO. • A VT-3 inspection of 100 percent of the cask restraint system, MPC downloader system, wedge lock assembly (including welds) will be conducted to detect loss of material. The VT-3 inspection will include sufficient resolution and lighting to identify the degradation. • A visual and tactile inspection of 100 percent of K-spec components (i.e., sling) will be conducted to detect loss of material. The polymer cask transporter adjustable cask bumpers will be replaced prior to the start of each cask transfer campaign if the cask transporter has been in service greater than 20 years and it has been greater than five years since the last bumper replacement. These bumper replacements preclude the need for specific bumper inspections and manage the potential change in material properties. <u>HI-TRAC Lift Links and Cask Transporter Connector Pins Inspection</u> A VT-3 surface condition examination is an acceptable method used to identify aging effects and is consistent with methods provided in industry codes and standards. Prior to use (e.g., prior to the first use for onsite cask handling operations or prior to the first offsite transport) and every 5 years thereafter, a VT-3 inspection of 100 percent of the HI-TRAC lift links and connector pins will be conducted. If the cask transporter is used less frequently than once every five years, inspections are conducted prior to use. A VT-3 inspection provides a means to detect degradation of these components due to a potential loss of material, and confirm that the intended functions are not compromised. The VT-3 inspections will include sufficient resolution and lighting to identify the degradation. These VT-3 inspections will be implemented prior to the PEO. <u>Cask Transfer Facility Liner and Lateral Restraints Inspection</u> A VT-3 inspection of 100 percent of the accessible surfaces of the CTF liner (and in-scope appurtenances), lateral restraints (including struts, collars, and embedded plates), and associated welds provides a means to detect degradation of these components due to a potential loss of material and confirm that the intended functions are not compromised. The VT-3 inspection is performed prior to use (e.g., prior to the first use for onsite cask handling operations that involve the CTF or prior to the first offsite transport) and every 5 years thereafter. If the CTF is used less frequently than once every five years, inspections are conducted prior to use. The VT-3 inspections will include sufficient resolution and

Table A-6: Cask Transportation System Aging Management Program	
Element	**Description**
	lighting to identify the degradation. These VT-3 inspections will be implemented prior to the PEO. The concrete portions adjacent to CTF liner and lateral restraints shall be inspected visually for any evidence of degradation (such as staining or rust) to determine if the embedded carbon steel CTF liner and lateral restraint components are undergoing degradation. Inspections of readily accessible concrete surfaces are conducted at least once every 5 years. These inspections will be implemented prior to the PEO. <u>Multi-Purpose Canister Lift Cleats, HI-STORM Lifting Brackets, HI-STORM Mating Device Inspection</u> A VT-3 inspection of MPC lift cleats, HI-STORM lifting brackets, HI-STORM mating device and bolting, and associated welds provides a means to detect degradation of these components due to a potential loss of material and loss of preload and confirm that the intended functions are not compromised. The VT-3 inspection is performed prior to use (e.g., prior to the first use for onsite cask handling operations that involve the components or prior to the first offsite transport) and every five years thereafter. If a component is used less frequently than once every five years, inspections are conducted prior to use. The VT-3 inspections will include sufficient resolution and lighting to identify the degradation. These VT-3 inspections will be implemented prior to the PEO. • A VT-3 inspection of 100 percent of the MPC lift cleats, HI-STORM lifting brackets, HI-STORM mating device (including welds) will be conducted to detect loss of material. The VT-3 inspections will include sufficient resolution and lighting to identify the degradation. • 100 percent of accessible bolting on the HI-STORM mating device will be checked for proper torque to detect for loss of preload. <u>Low-Profile Transporter Structure, Mounting Bolt, and Rollers Inspection</u> A VT-3 inspection of LPT structure (including main beam, side, and base plates; ribs; mating plates; and support gussets), mounting bolt, rollers, and associated welds provides a means to detect degradation of these components due to a potential loss of material and confirm that the intended functions are not compromised. The VT-3 inspection is performed prior to use (e.g., prior to the first use for on-site cask handling operations that involve the components or prior to the first offsite transport) and every five years thereafter. If a component is used less frequently than once every five years, inspections are conducted prior to use. The VT-3 inspections will include sufficient resolution and lighting to identify the degradation. These VT-3 inspections will be implemented prior to the PEO. The polymer LPT lateral guide blocks and roller pad will be replaced prior to the start of each cask transfer campaign if it has been greater

Table A-6: Cask Transportation System Aging Management Program	
Element	**Description**
	than five years since the last replacement. These replacements preclude the need for specific component inspections and manage the potential change in material properties. <u>Data Collection</u> Data from all inspection and monitoring activities, including evidence of degradation and its extent and location, shall be documented on a checklist or inspection form. The results of the inspection shall be documented, including descriptions of observed aging effects and supporting sketches, photographs, or video. <u>Qualifications</u> Additionally, the Cask Transportation System AMP requires inspection personnel to be trained and technically qualified to perform these examinations. The personnel performing the VT-3 inspections shall be VT-3 certified. The individuals performing follow-up visual, surface, or volumetric examinations shall be certified in accordance with associated ASME Section III requirements. The personnel evaluating the examination results are degreed engineers with one or more years of structural inspection experience.
5. Monitoring and Trending	The baseline inspections will be established during the first AMP inspection for each component. The Cask Transportation System AMP requires monitoring and trending the condition of structures and components using current and historical OE along with industry OE to detect, evaluate, and trend degraded conditions. The frequencies of these inspections were developed based on PG&E OE and vendor maintenance requirements. When degraded conditions are detected and all associated corrective actions are complete, the structures and components are again monitored against established performance goals. The program ensures the original design basis for the structures and components is maintained by effectively managing the applicable aging effects. All observations regarding the material condition of the AMP components are recorded in inspection procedures. Pictures and video are maintained to allow comparison in subsequent inspections so that the progression of degradation can be evaluated and predicted. Procedures discuss the required processes for providing timely reporting of OE to the industry via use of the ISFSI AMID. The Cask Transportation System AMP includes a process used to evaluate past and current conditions of structures and components and to determine whether they represent an adverse trend or random deficiency indicative of normal aging. If degradation exceeds or appears that it will exceed that expected of a properly maintained structure or component, the condition is entered into the CAP requiring further engineering

Table A-6: Cask Transportation System Aging Management Program	
Element	**Description**
	evaluation. All degraded conditions that result in a corrective action are trended in accordance with the CAP.
6. Acceptance Criteria	The Cask Transportation System AMP includes acceptance criteria to evaluate the extent of a degraded condition and the need for corrective action before the loss of intended function. The acceptance criteria include sufficient detail to ensure timely detection of any degraded condition, followed by an evaluation in the CAP to ensure that the structure or component intended function(s) is maintained under the existing licensing basis design conditions. Industry and plant-specific OE are also reviewed to ensure that the Cask Transportation System AMP's acceptance criteria focus on conditions identified during these OE reviews. <u>Visual Inspection Acceptance Criteria</u> The acceptance criteria for all visual inspections are the absence of any degradation aging effects listed in LRA Table 3-6 and Table 3-8 which, if left uncorrected could adversely affect the component intended function. For visual inspections, these include: • no detectable loss of material from the base metal greater than 1/8 inch (per vendor maintenance requirements), including uniform wall thinning, localized corrosion pits, and crevice corrosion • no indications of loose bolts or hardware, or displaced parts • concrete adjacent to the CTF liner and lateral restraints shall not show any evidence of corrosion such as rust <u>Bolting Acceptance Criteria</u> For cask transporter structure bolting torque checks, bolting is torque checked to values specified by the original equipment manufacturer. <u>Polymer Acceptance Criteria</u> The polymer cask transporter adjustable cask bumpers will be replaced prior to the start of each cask transfer campaign if the cask transporter has been in service greater than 20 years and it has been greater than 5 years since the last replacement. The polymer LPT lateral guide blocks and roller pad will be replaced prior to the start of each cask transfer campaign if it has been greater than 5 years since the last replacement. These component replacements preclude the need for specific component inspections and associated acceptance criteria. <u>K-spec (i.e., sling) Acceptance Criteria</u> For K-spec visual and tactile inspections acceptance criteria, acceptance criteria include: • no distortion, damage, or worn or broken stitching on end fittings

Table A-6: Cask Transportation System Aging Management Program	
Element	**Description**
	• no general damage such as burns, snags, tears, cuts, punctures, or excessive wear on webbing or stitching. Excessive wear is defined as core threads being visible.
7. Corrective Actions	The DC ISFSI CAP requirements are established in accordance with the requirements of the QA Program. The CAP procedures require the initiation of a corrective action document for actual or potential problems including failures, malfunctions, discrepancies, deviations, defective material and equipment, nonconformances, and administrative control discrepancies, to ensure that conditions adverse to quality, operability, functionality, and reportability issues are promptly identified, evaluated if necessary, and corrected as appropriate. Guidance on establishing priority and timely resolution of issues is contained within the CAP procedure. Results that do not meet the acceptance criteria are addressed as conditions adverse to quality or significant conditions adverse to quality under those specific portions of the QA Program approved under 10 CFR Part 72, Subpart G. The QA program ensures that corrective actions are completed within the CAP, and include provisions to: • perform functionality assessments • perform cause evaluations and root cause evaluations • address the extent of condition • determine actions to prevent recurrence for significant conditions adverse to quality; ensure justifications for not performing a repair • trend conditions • identify OE actions, including modification to the existing AMP (e.g., increased frequency) • determine if the condition is reportable to the NRC per 10 CFR 72.75
8. Confirmation Process	The confirmation process is part of the PG&E CAP and ensures that the corrective actions taken are adequate and appropriate, have been completed, and are effective. The approved CAP complies with the requirements of 10 CFR 72, Subpart G. The focus of the confirmation process is on the follow-up actions that must be taken to verify effective implementation of corrective actions. The measure of effectiveness is in terms of correcting the adverse condition and precluding repetition of significant conditions adverse to quality. Procedures include provisions for timely evaluation of adverse conditions and implementation of any corrective actions required, including root cause evaluations, and prevention of recurrence where appropriate. These procedures provide for tracking, coordinating, monitoring, reviewing, verifying, validating, and approving corrective actions, to ensure effective corrective actions are taken.

Table A-6: Cask Transportation System Aging Management Program	
Element	**Description**
	The CAP is also monitored for potentially adverse trends. The existence of an adverse trend due to recurring or repetitive adverse conditions will result in the initiation of a corrective action document. The AMP will also uncover unsatisfactory conditions resulting from ineffective corrective action.
9. Administrative Controls	The QA Program, associated formal review and approval processes, and administrative controls applicable to the AMP and Aging Management Activities, are implemented in accordance with the requirements of the 10 CFR Part 72, Subpart G. The administrative controls that govern Aging Management Activities at the DC ISFSI are established in accordance with the PG&E Administrative Control Program and associated procedures.
10. Operating Experience	The Cask Transportation System AMP has been effective in maintaining DC ISFSI transport-related components. A review of ISFSI operating history provides evidence that any potential aging effects have been identified, evaluated, and managed effectively, ensuring that structures and components remain capable of performing their intended functions. It can be concluded that there is reasonable assurance that these structures and components will continue to perform their intended functions during the PEO. <u>Routine Inspections and Corrective Action Program</u> The Cask Transporter has been in service since 2007. Any conditions not meeting acceptance criteria are entered into the CAP. Recurring routine inspections of the cask transporter have identified minor coatings degradation, loose bolting, and weld cracking. The cask transporter was recoated in 2020. After discovery in 2015, the loose bolts were re-torqued in accordance with vendor-recommended torque values. There have been no indications of loose bolts during subsequent recurring inspections since the re-torquing. Cracking in portions of chassis welds were discovered in 2008. Engineering evaluation concluded the subject welds are non-critical (i.e., uncontrolled lowering of the load would not result). The weld portions were removed and repaired and eight additional exterior steel plates (doubler plates) were welded onto the chassis beneath the four corners of the supports for each of the lift towers. Additional cracks were also identified in the interior corner non-critical welds where the bottom base plate meets the vertical plate attaching the tractor drive assembly. Initially, these were ground and drilled out, and have been managed by inspection, and additional minor grinding in 2009 was performed. In 2015, the base weld (non-critical) of the cask lateral restraint failed due to porosity and inclusions in the filler metal. The base welds of the restraints were removed and repaired and remain satisfactory. In 2018,

Table A-6: Cask Transportation System Aging Management Program	
Element	**Description**
	three small crack indications in a critical weld were discovered during a planned maintenance inspection of the bottom plate of the header beam at a transition joint. The weld was repaired and remains satisfactory. The welds continue to be inspected at the vendor-recommended frequencies (e.g., pre-use, periodic during use, post-load testing, etc.) and no further cracking in critical welds has been identified. Because the vendor-recommended inspections are pre-use inspections and periodic maintenance inspections during continued use, these inspections will identify a critical weld crack prior to loss of intended function. The subject cracking and follow-up actions were observed by the NRC, as documented in Reference A.8.5 (page 31 of 64). <u>NRC Inspection Reports</u> NRC inspection reports issued during the period of March 22, 2004 (initial license issuance) through December 2021 were reviewed for the ISFSI site. No issues or findings were noted relative to the aging of ISFSI structures and components. <u>Industry Operating Experience</u> The ISFSI AMID was reviewed for OE related to HI-STORM systems and several other dry cask storage systems. The AMID results did not identify aging effects associated with components in the scope of this AMP. <u>Precedent License Renewal Applications Operating Experience</u> A review of precedent ISFSI LRAs was performed to evaluate any relevant OE. ISFSIs included in this review were Prairie Island, Calvert Cliffs, H.B. Robinson, Surry, Oconee, North Anna, Trojan, Rancho Seco, and Humboldt Bay. The review also included OE described in the Holtec HI-STAR 100 and HI-STORM 100 LRAs. The results of these reviews indicated concrete aging related to cracking, efflorescence deposits, surface voids, and disbonded patches, which would be identified in the scope of this AMP. <u>Assessment of Aging Management Program Effectiveness</u> The Cask Transportation System AMP provides reasonable assurance that the ISFSI SSCs within its scope will be managed effectively so that the subcomponents will continue to perform their intended functions during the PEO. PG&E will perform an AMP Effectiveness Review on a five-year frequency. Each AMP Effectiveness Review will include evaluation of AMP documentation (e.g., site procedures, inspection results, internal and external OE compared to each of the ten AMP elements to determine whether the AMP is effectively managing the effects of aging. In addition, an ISFSI Program Health Report will be issued on an annual basis. The Program Health Report will display

Table A-6: Cask Transportation System Aging Management Program	
Element	**Description**
	program health performance metrics, describe issues that impact or may impact program performance, and the actions to address the issues. This report will also evaluate OE from the DC ISFSI-specific and industry sources (including the ISFSI AMID) to ensure that this experience is systematically reviewed on an ongoing basis in accordance with the QA Program, which meets the requirements of 10 CFR 72, Subpart G. Focused self-assessments may also be performed to evaluate specific issues. The DC ISFSI Program Health Report will specifically determine whether the effects of aging are adequately managed. A determination will be made as to whether the frequency of future inspections should be adjusted, whether new inspections should be established, and whether the inspection scope should be adjusted or expanded. If there is an indication that the effects of aging may not be adequately managed, the CAP will be used to determine what AMP enhancements are necessary. Because the AMP Effectiveness Reviews and Program Health Reports are based, in part, upon site-specific OE, but are not providing new OE, they are not required to be entered into the ISFSI AMID. However, they will be maintained onsite in an auditable fashion. Conclusion The OE, reviews, and monitoring described above confirm that any potential aging effects will be identified, evaluated, and managed effectively, ensuring that these SSCs remain capable of performing their intended functions

A.7 Summary

The review of OE (obtained from DC ISFSI, previous ISFSI LRAs, and the ISFSI AMID) identified a number of incidents related to dry fuel storage. Although many of these were event-driven and most were not age-related, for those that did involve credible aging effects and mechanisms, evaluations were conducted to assess potential susceptibility. These evaluations indicated that the aging effects and mechanisms that were identified at the DC ISFSI are bounded by the AMRs that were performed for those structures and components identified as within the scope of LR.

While OE to date has indicated some degradation of SSCs that if left uncorrected, could potentially affect the intended function of those structures and components, the AMPs described in this Appendix, coupled with effective implementation of the CAP, will preclude any degradation from impacting SSC functionality. Inspections, monitoring, and surveillances continue to be conducted that would identify deficiencies. The CAP is in place to track and correct deficiencies in a timely manner. Corrective actions have been effectively implemented when inspection and monitoring results have indicated degradation. Continued implementation of the DC ISFSI AMPs provides reasonable assurance that the aging effects will be managed such that the intended functions will be maintained during the PEO.

A.8 References

A.8.1 NUREG-1927, Revision 1, Standard Review Plan for Renewal of Specific Licenses and Certificates of Compliance for Dry Storage of Spent Nuclear Fuel, Nuclear Regulatory Commission, Office of Nuclear Material Safety and Safeguards, June 2016, ADAMS Accession No. ML16179A148.

A.8.2 NUREG-2214, Revision 0, Managing Aging Processes in Storage (MAPS) Report, Nuclear Regulatory Commission, Office of Nuclear Material Safety and Safeguards, July 2019, ADAMS Accession No. ML19214A111.

A.8.3 EPRI. “HBU Dry Storage Cask Research and Development Project Final Test Plan.” DOE Contract No.: DE-NE-0000593. Palo Alto, California: Electric Power Research Institute. 2014.

A.8.4 ASME Code Case N-860, Inspection Requirements and Evaluation Standards for Spent Nuclear Fuel Storage and Transportation Containment System, Section XI Division 1 and Division 2, Supplement 6 of ASME Code 2019.

A.8.5 NUREG-1801, Generic Aging Lessons Learned (GALL) Report, Revision 2, Nuclear Regulatory Commission, December 2010, ADAMS Accession No. ML103490041.

A.8.6 NRC Letter, "NRC Inspection Report 050-133/07-004; 072-027/07-002," dated September 16, 2008, ADAMS Accession No. ML082600729.

A.8.7 Practical Building Conservation: Metals ISBN 13: 9780754645559.

A.8.8 Susceptibility Assessment Criteria for Chloride-Induced Stress Corrosion Cracking (CISCC) of Welded Stainless Steel Canisters for Dry Cask Storage Systems. Technical Report 3002005371. September 2015.

Appendix B

GRANTED EXEMPTIONS

B.1 Introduction

An application for a renewed license includes a list of site-specific exemptions granted pursuant to 10 CFR 72.7. The applicant shall provide information pertaining to these granted exemptions and their implication to aging management (Reference B.5.1).

B.2 Methodology

A search of docketed NRC incoming and outgoing correspondence, the DC ISFSI license (Reference B.5.2), and the DC ISFSI UFSAR (Reference B.5.2) identified and listed exemptions in effect. Each exemption in effect was then evaluated to determine whether it affected the DC ISFSI AMPs as described in Appendix A.

The search found two 10 CFR 72.7 exemptions for the DC ISFSI that are currently in effect. These exemptions are described in the DC ISFSI UFSAR, Table 1.1-1, and Sections 1.1, 4.2, 4.4, 5.3, 9.4.2; NRC correspondence; and in License Condition 16 of the DC ISFSI License SNM-2511. See Section B.3 for the evaluation of the impact to aging management.

B.3 Evaluation

10 CFR 72.72(d):

PG&E was granted an exemption from 10 CFR 72.72(d), which requires that spent fuel and high level radioactive waste records in storage be kept in duplicate. The exemption allows PG&E to maintain records of spent fuel and high level radioactive waste in storage either in duplicate, as required by 10 CFR 72.72(d), or alternatively; a single set of records may be maintained at a records storage facility that satisfies the standards of ANSI N45.2.9-1974. All other requirements of 10 CFR 72.72(d) must be met.

This exemption has no implication on aging management because, as discussed in Element 9 of each AMP, the records retention requirements are addressed through administrative controls required by the DCPP QA Program. The DCPP QA Program meets ANSI N45.2.9-1974 as shown in the DCPP UFSAR, Table 17.1-1, Sheet 7.

10 CFR 50.68(b)(1):

10 CFR 50.68(b)(1) prohibits the handling and storage at any one time of more fuel assemblies than have been determined to be safely subcritical under the most adverse moderation conditions feasible by unborated water. Specifically, the regulation ensures a subcritical condition will be maintained without credit for soluble boron. For an MPC loaded with fuel having the highest permissible reactivity, soluble boron credit is necessary to ensure the MPC remains subcritical in the spent fuel pool. PG&E requested an exemption from 10 CFR 50.68(b)(1) to allow MPC loading, unloading, and handling operations without meeting the requirement of being subcritical under the most adverse moderation conditions feasible by unborated water. Based on the alarms, procedures, administrative controls, assumption of zero burnup fuel, and availability of trained operators, the NRC granted an exemption from the criticality requirements of 10 CFR 50.68(b)(1) during loading, unloading, and handling of the MPC in the DCPP spent fuel pool.

This exemption has no implication on aging management because the exemption does not affect the materials or long-term aging environment of SSCs.

B.4 Conclusion

There are no implications to the proposed aging management.

B.5 References

B.5.1 NUREG-1927, Revision 1, Standard Review Plan for Renewal of Specific Licenses and Certificates of Compliance for Dry Storage of Spent Nuclear Fuel, Nuclear Regulatory Commission, Office of Nuclear Material Safety and Safeguards, June 2016, ADAMS Accession No. ML16179A148.

B.5.2 Diablo Canyon Independent Spent Fuel Storage Installation Materials License No. SNM-2511 and Appendix, Technical Specifications.

B.5.3 PG&E Letter DIL-21-004, "Biennial Submittal of Diablo Canyon Independent Spent Fuel Storage Installation Updated Final Safety Analysis Report," Revision 9, December 15, 2021, ADAMS Accession No. ML21349B166.

Appendix C

PROPOSED LICENSE CHANGES

C.1 Proposed License Changes

NUREG-1927, Section 1.4.4 (Reference C.2.1), states the LRA shall include changes or additions to TS or to the specific license. A review of the information provided in this LRA and the DC ISFSI TS confirms that no changes to the DC ISFSI TS are necessary. Proposed changes to the DC ISFSI license (SNM-2511) are listed below.

Proposed changes to the DC ISFSI license (SNM-2511) are shown as electronic markups (deletions crossed out and insertions italicized).

- New license condition 17 would discuss incorporation of the LRA, Appendix D UFSAR changes into the UFSAR. The proposed condition would read:

  Within 90 days after issuance of the renewed license, PG&E shall submit an updated final safety analysis report (FSAR) to the U.S. Nuclear Regulatory Commission in accordance with 10 CFR 72.70(a)(1) and (2). PG&E shall continue to update the FSAR pursuant to the requirements in 10 CFR 72.70(a), (b), and (c). PG&E will follow the requirements in 10 CFR 72.4 for submitting the FSAR. The updated FSAR shall reflect the information provided in Appendix D of the DC ISFSI License Renewal Application. The licensee may make changes to the updated FSAR, consistent with 10 CFR 72.48(c).

- New license condition 18 would discuss incorporation of the LRA, Appendix D UFSAR AMP summaries into implementing procedures. The proposed condition would read:

  Within 180 days after issuance of the renewed license, PG&E shall create, update, or revise procedures for implementing the activities in the Aging Management Programs (AMPs) summarized in Appendix D of the DC ISFSI License Renewal Application, and maintained in the updated FSAR. PG&E shall maintain procedures that implement the AMPs throughout the term of this license.

  Each procedure for implementing the AMPs shall contain a reference to the specific AMP provision the procedure is intended to implement. The reference shall be maintained if procedures are modified.

- Existing license condition 17 would be moved to new license condition 19 to discuss the license effective date. The proposed condition would read:

  This *renewed license*~~amendment~~ is effective as of the date of issuance shown below.

C.2 References

C.2.1 NUREG-1927, Revision 1, Standard Review Plan for Renewal of Specific Licenses and Certificates of Compliance for Dry Storage of Spent Nuclear Fuel, Nuclear Regulatory Commission, Office of Nuclear Material Safety and Safeguards, June 2016, ADAMS Accession No. ML16179A148.

Appendix D

UPDATED FINAL SAFETY ANALYSIS REPORT SUPPLEMENT AND CHANGES

D.1 Introduction

This appendix identifies pertinent changes to the DC ISFSI UFSAR. Section D.2 of this appendix contains proposed changes to the existing DC ISFSI UFSAR. Section D.3 of this appendix contains new proposed sections to be added to DC ISFSI UFSAR Section 9. The new sections provide the scoping results, a table of the AMR results, a summarized description of the DC ISFSI AMPs for managing the effects of aging of ISFSI structures and components, and a summary description of the TLAAs and conclusions for the PEO. Section D.4 of this appendix contains 10 CFR 72.48 ("Changes, Tests, and Experiments") changes since the last biannual update as required by 10 CFR 72.48(d)(2).

D.2 Changes to Existing Diablo Canyon Independent Spent Fuel Storage Installation Updated Final Safety Analysis Report

Proposed changes to the DC ISFSI UFSAR are shown as electronic markups (deletions crossed out and insertions italicized).

- UFSAR Section 1: Clarify a renewed license has been issued. The proposed sentences would read:

  The license was issued for a***n initial*** period of 20 years ***and renewed for a period of 40 years*** in accordance with 10 CFR 72.42.
  …
  In accordance with 10 CFR 72.42, the Diablo Canyon ISFSI license was issued for a***n initial*** term of 20 years ***and renewed for a term of 40 years***.

- UFSAR Section 3.3.2.3: Clarify the design life of the DC ISFSI was evaluated for 60 years of operation. The proposed sentence would read:

  The original ISFSI pad design life ***was***~~is~~ 40 years***, but was evaluated for 60 years of operation in accordance with 10 CFR 72.42(a)(1)***.

- UFSAR Section 3.3.3.2.1: Clarify when the cask transporter was initially used and point to the associated AMP. The proposed sentence would read:

  The cask transporter design life of 20 years ***(from initial use in 2007)*** has been established based on a reasonable length of time for a vehicle of its type with normal maintenance. The cask transporter may be replaced or re-certified for continued use *as needed and* at the end of its design life. ***The cask transporter is age managed by the Cask Transportation System AMP described in Section 9.4.3.3.3 if used for greater than 20 years.***

- UFSAR Section 3.3.4.2: Clarify the design life of the CTF was evaluated for 60 years. The proposed sentence would read:

  The ***original*** design life of the CTF ***was***~~is~~ 40 years***, but was evaluated for 60 years of operation in accordance with 10 CFR 72.42(a)(1)***.

- UFSAR Table 3.4-2: Clarify the design life of the HI-STORM 100 System was evaluated from 40 years to 60 years. The proposed table line would read:

Design Criterion	Design *Evaluation* Value	Reference Documents
HI-STORM 100 System Design Life	**~~40~~*60*** years	Holtec FSAR[(a)], Section 2.0.1 and Diablo Canyon ISFSI FSAR Section***s*** 3.3.1.3.1 ***and 9.4.3***

- UFSAR Table 3.4-3: Clarify the design life of the ISFSI pads was evaluated from 40 years to 60 years. The proposed table line would read:

Design Criterion	Design *Evaluation* Value	Reference Documents
Design Life	**~~40~~*60*** years	Diablo Canyon ISFSI FSAR Section***s*** 3.3.2.3 ***and 9.4.3***

- UFSAR Table 3.4-5: Clarify the design life of the CTF was evaluated from 40 years to 60 years. The proposed table line would read:

Design Criterion	Design *Evaluation* Value	Reference Documents
Design Life	**~~40~~*60*** years	Holtec FSAR, Section 2.3 ***and Diablo Canyon ISFSI FSAR Section 9.4.3***

- UFSAR Section 4.2.3.3.5: Based on the evaluation of neutron absorber effectiveness described in Section 4.4, change the neutron absorber effectiveness from 50 years to 60 years. The proposed sentences would read:

  The HI-STORM 100 System is designed such that the fixed neutron absorber (Boral or Metamic) will remain effective for a storage period **~~greater than 20~~*of 60*** years, and there are no credible means to lose the Boral or Metamic effectiveness. As discussed in Section ***9.4.3.4.1*****~~6.3.2 of the HI-STORM 100 System FSAR~~**, the reduction in Boron-10 concentration due to neutron absorption from storage of design-basis fuel in a HI-STORM 100SA overpack over a **~~50~~*60***-year period is expected to be negligible.

- UFSAR Section 4.7.4: Clarify the MPC design life was evaluated from 40 years to 60 years and change the neutron absorber effectiveness from 50 years to 60 years as described in Section 4.4. The proposed sentences would read:

  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~~*60***-year ***evaluated*** design life of the MPC.

  …

An evaluation discussed in Section ***9.4.3.4.1***~~6.3.2 of the HI-STORM 100 System FSAR~~ demonstrates that the boron depletion in the Boral or Metamic is negligible over a ~~50~~***60***-year duration. Thus, sufficient levels of boron are present in the fuel basket neutron absorbing material to maintain criticality safety functions over the ~~40~~***60***-year ***evaluated*** design life of the MPC.

- UFSAR Table 4.2-2: Clarify the design life of the HI-STORM 100SA overpack was evaluated for 60 years of operation. The proposed table line would read:

PARAMETER	***EVALUATED*** VALUE	REFERENCE
Design Life	~~40~~***60*** years	Table 2.0.2 of the HI-STORM 100 System FSAR, Revision 1A ***and Diablo Canyon ISFSI FSAR Section 9.4.3***

- UFSAR Table 4.2-3: Clarify the design life of the HI-TRAC 125D transfer cask was evaluated for 60 years of operation. The proposed table line would read:

PARAMETER	***EVALUATED*** VALUE	REFERENCE
Design Life	~~40~~***60*** years	Table 2.0.3 of the HI-STORM 100 System FSAR, Revision 1A ***and Diablo Canyon ISFSI FSAR Section 9.4.3***

- UFSAR Appendix A: Clarify a renewed license has been issued, and therefore, design is for a 60-year storage period. Also, the design life of the HI-STORM 100 System was evaluated from 40 years to 60 years. The proposed sentences would read:

(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 ~~20~~***60***-year license period (ISG-15, Sections X.3.2.e and X.4.2).

…

Design Life

This category requires that the design life of the cask system be specified and be at least ~~20~~***60*** years in duration. The design life of the cask system is ***evaluated for*** ~~40~~***60*** years, as specified in FSAR Table 3.4-2.

…

The normal condition limits ensure a probability of cladding breach of less than 0.5 percent over the ~~40~~***60***-year ***evaluated*** design life and the short-term accident cladding temperature limit is in accordance with NRC guidance.

D.3 New Diablo Canyon Independent Spent Fuel Storage Installation Updated Final Safety Analysis Report Supplement

The following information will be integrated into DC ISFSI UFSAR Section 9 to document scoping results, AMR results, and summaries of TLAAs and the DC ISFSI AMPs credited in the DC ISFSI LRA. The information will be located in new ISFSI UFSAR Section 9.4.3.

9.4.3 License Renewal Aging Management

The DC ISFSI License Renewal Application was submitted to the NRC in 2021. The license renewal (LR) process and methodology followed the guidance contained in NUREG-1927, Revision 1, "Standard Review Plan for Renewal of Spent Fuel Dry Cask Storage System Licenses and Certificates of Compliance." The 10 CFR Part 72 license renewal process, as described in NUREG-1927, follows the principle that the basis for renewal of the license depends on "the continuation of the existing licensing basis throughout the period of extended operation and on the maintenance of the intended functions of the SSCs important to safety." The following subsections document the salient portions of the DC ISFSI License Renewal Application upon which the NRC based their conclusion that the DC ISFSI is safe to continue storing spent fuel for an additional 40 years. Section 9.4.3.1 provides the scoping results. Section 9.4.3.2 provides a table of the aging management review (AMR) results for those in-scope SSCs that require aging management. Section 9.4.3.3 provides a summary of the DC ISFSI aging management programs (AMPs) that will be required to manage aging for the period of extended operation. Section 9.4.3.4 provides a summary description of time-limited aging analyses (TLAAs) and the evaluation conclusions for the period of extended operation.

9.4.3.1 License Renewal Scoping Results

The LR scoping process involves identification of the DC ISFSI SSCs and their subcomponents that are within the scope of license renewal, and thus require evaluation for the effects of long-term aging. The following SSCs were determined to be in the scope of LR:

- Spent fuel assemblies
- MPC
- HI-TRAC 125D transfer cask
- HI-STORM 100 SA overpack
- Cask transportation system*
- ISFSI storage pads
- CTF

The following SSCs were determined not to be in the scope of LR:

- Helium fill gas
- Fuel debris
- Security systems
- Fencing
- Lighting
- Electrical power
- Communications systems
- Automated welding system
- MPC helium backfill system
- MPC forced helium dehydration system

- Rockfall fence
- Rock-bolted cut-slope
- Supplemental cooling system

* Includes, but is not limited to, the LPT, cask transporter; HI-TRAC lift links; transporter connector pins; MPC lift cleats; MPC downloader slings; HI-STORM 100 lifting brackets; and HI-STORM 100 mating device, bolts, and shielding.

9.4.3.2 Aging Management Review Results

An AMR of the ISFSI SSCs was conducted as part of the ISFSI LR process. The AMR assessed aging effects/mechanisms that could adversely affect the ability of the SSCs to perform their intended functions during the period of extended operation. Aging effects, and the mechanisms that cause them, are evaluated for the combinations of materials and environments identified for the subcomponent of the in-scope SSCs based on a review of relevant technical literature, available industry operating experience, and DC ISFSI operating experience. Aging effects that could adversely affect the ability of the in-scope SSC to perform their safety function(s) require additional aging management activity to address potential degradation that may occur during the extended storage period. The AMPs and TLAAs that are credited with managing aging effects during the extended period of operation are discussed in Sections 9.4.3.3 and 9.4.3.4, respectively.

The results of the AMR determined that there were aging effects that require aging management activities for all the SSCs in the scope of LR. Table 9.4-1 provides the AMR results for those SSCs requiring aging management for the period of extended operation.

9.4.3.3 Aging Management Programs

Aging effects that could result in the loss of in-scope SSCs' intended function(s) are managed during the extended storage period. Some aging effects are adequately managed for the extended period of operation using TLAAs, as discussed in Section 9.4.3.4. An AMP is used to manage those aging effects that are not addressed by TLAAs. The DC ISFSI AMPs that manage each of the identified aging effects for all in-scope SSCs include the High Burnup (HBU) Fuel AMP, MPC AMP, Transfer Cask AMP, Overpack AMP, Reinforced Concrete Structures AMP, and Cask Transportation System AMP. The purpose of these AMPs is to ensure that the intended functions of SSCs listed in Table 9.4-1 are maintained for the license renewal period.

A summary of the DC ISFSI AMPs is provided in the sections below:

9.4.3.3.1 DC ISFSI High Burnup Fuel AMP

<u>Scope of Program:</u>
Periodic assessment of results from a surrogate demonstration program that monitors the performance of HBU fuel in dry storage (i.e., the joint EPRI and DOE HBU Dry Storage Cask Research and Development Project [HDRP]).

Preventive Actions:

- Technical Specification requirements ensure that the HBU fuel is stored in an inert environment, thus preventing cladding degradation due to oxidation mechanisms.
- The MPC is loaded in accordance with the criteria of ISG-11, Revision 3.

Parameters Monitored or Inspected:

- MPC internal and external temperatures.
- MPC internal helium pressure.
- Fuel cladding profilometry; signs of crud or oxide layer spallation, local wear, or other indications of degradation; ductility behavior.
- Rod internal gas pressure and content; hydride content and orientation.

Detection of Aging Effects:
Periodic measurements, NDE, and destructive examinations results are obtained from the HDRP.

Monitoring and Trending:

- Information from the HDRP or from other sources is monitored, evaluated, and trended.
- Formal evaluations of the aggregate information from the HDRP and other available domestic or international operating experience are performed as follows:
  - Prior to March 2024 (end of the initial license)
  - March 2034 (10 years after first assessment)
  - March 2044 (10 years after second assessment)

Acceptance Criteria:

- Hydrogen content: Maximum hydrogen content of the cover gas over the approved storage period is extrapolated from the gas measurements to be less than the design-basis limit for hydrogen content.
- Moisture content: The moisture content in the MPC, accounting for measurement uncertainty, is less than the expected upper-bound moisture content per the design-basis drying process (with appropriate consideration for the differences in design/acceptance criteria between the demo cask and the HI-STORM 100). The drying criteria for the MPC is provided in Section 10.2.2.3.
- Fuel condition/performance: NDE and destructive examination confirm the design-basis fuel condition (i.e., no changes to the analyzed fuel configuration considered in the safety analyses of the approved design bases).

Corrective Actions:
Conditions identified by the AMP inspections that do not meet AMP acceptance criteria will be entered into the Corrective Action Program. Corrective actions provide reasonable assurance that deficiencies adverse to quality are either promptly corrected or are evaluated to determine whether there is reasonable assurance that the intended function is maintained until the next inspection frequency. Where evaluations are performed without repair or replacement, engineering analysis reasonably assures that the intended function is maintained consistent with the CLB. If the deviating condition is

assessed to be significantly adverse to quality, the cause of the condition is determined and an action plan is developed to preclude recurrence.

Confirmation Process:
Confirmatory actions, as needed, are implemented as part of the Corrective Action Program and ensure the corrective actions taken are effective.

Administrative Controls:
Administrative controls under the PG&E Quality Assurance Program procedures and Corrective Action Program provide a formal review and approval process.

Operating Experience:
PG&E will perform an AMP Effectiveness Review on a frequency consistent with the HBU assessments. Each AMP Effectiveness Review will include an evaluation of AMP documentation (e.g., site procedures, inspection results, internal and external operating experience) compared to each of the ten AMP elements to determine whether the AMP is effectively managing the effects of aging. In addition, an ISFSI Program Health Report will be issued on an annual basis. The Program Health Report will display program health performance metrics, describe issues that impact or may impact program performance, and the actions to address the issues.

9.4.3.3.2 DC ISFSI MPC AMP

Scope of Program:
Visual inspection of accessible external surfaces of the MPC subcomponents that are exposed to the long-term sheltered environment.

Preventive Actions:
The program is a condition-monitoring program that does not include preventive actions.

Parameters Monitored or Inspected:

- Visual evidence of discontinuities and imperfections indicative of pitting corrosion, crevice corrosion, and stress corrosion cracking (SCC) of the MPC welds, weld heat-affected zones, and known areas of the canister to which temporary supports or attachments were attached by welding and subsequently removed (based on available fabrication records).
- Size and location of corrosion and SCC
- Appearance and location of deposits on the canister surfaces.

Detection of Aging Effects:

SSC	Method or Technique	Frequency	Sample Size
MPC	Screening: Visual inspection (VT-3)	5 years[3] ± 25%	100% of areas normally accessible MPC[1, 2] surfaces while the MPC remains in the overpack with the overpack lid installed
	Assessment: Visual inspection (VT-1)	As-required by results of Screening	100% of the suspected areas of localized corrosion and SCC
	Supplemental: Volumetric and/or surface examinations OR Analysis: to determine whether CISCC could be present in all locally susceptible areas	As-required by results of Assessment	100% of pits and areas immediately adjacent to pits when pits are located within 25 mm (1 inch) of a through thickness weld or within 25 mm (1 inch) of an area where a temporary attachment was known to be located

Notes:
1. A minimum of one canister is inspected at each inspection interval if the DC ISFSI is ranked less than 7 using the EPRI Susceptibility Assessment Criteria (Technical Report 3002005371). A minimum of two canisters are inspected at each inspection interval if the DC ISFSI is ranked greater than or equal to 7 using the EPRI Susceptibility Assessment Criteria (Technical Report 3002005371).
2. The inspection population may be re-evaluated after each inspection in accordance with ASME Code Cases for canister inspections that have been endorsed by the NRC.
3. The inspection frequency may be re-evaluated after each inspection in accordance with ASME Code Cases for canister inspections that have been endorsed by the NRC.

Data collection: Record of the inspection, including evidence of degradation and its extent and location and supporting photos or videos.

Monitoring and Trending:
- The baseline will be established before the period of extended operation.
- Degraded conditions are monitored and trended by reviewing the condition of SSCs using current and historical operating experience along with industry operating experience.

Acceptance Criteria:
Results requiring no further evaluation are no indication of localized corrosion pits, etching, SCC, red-orange colored corrosion products in the vicinity of canister welds,

closure welds, and welds associated with temporary attachments during canister fabrication.

Results requiring additional evaluation for areas adjacent to fabrication welds, closure welds, locations where temporary attachments may have been welded to and subsequently removed from the MPC, and the weld affected zones:

- Localized corrosion pits, SCC, and etching; deposits or corrosion products.
- Discrete red-orange colored corrosion products especially those adjacent to fabrication welds, closure welds, 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 products.

Alternatively, acceptance criteria may be used from ASME Code Cases for canister inspections that have been endorsed by the NRC.

<u>Corrective Actions:</u>
Conditions identified by the AMP inspections that do not meet AMP acceptance criteria will be entered into the Corrective Action Program. Corrective actions provide reasonable assurance that deficiencies adverse to quality are either promptly corrected or are evaluated to determine whether there is reasonable assurance that the intended function is maintained until the next inspection frequency. Where evaluations are performed without repair or replacement, engineering analysis reasonably assures that the intended function is maintained consistent with the current licensing basis. If the deviating condition is assessed to be significantly adverse to quality, the cause of the condition is determined and an action plan is developed to preclude recurrence.

<u>Confirmation Process:</u>
Confirmatory actions, as needed, are implemented as part of the Corrective Action Program and ensure the corrective actions taken are effective.

<u>Administrative Controls:</u>
Administrative controls under the PG&E Quality Assurance Program procedures and Corrective Action Program provide a formal review and approval process.

<u>Operating Experience:</u>
PG&E will perform an AMP Effectiveness Review on a five-year frequency. Each AMP Effectiveness Review will include evaluation of AMP documentation (e.g., site procedures, inspection results, internal and external operating experience) compared to each of the ten AMP elements to determine whether the AMP is effectively managing the effects of aging. In addition, an ISFSI Program Health Report will be issued on an annual basis. The Program Health Report will display program health performance metrics, describe issues that impact or may impact program performance, and the actions to address the issues.

9.4.3.3.3 DC ISFSI Transfer Cask AMP

Scope of Program:
Visual inspection of accessible internal and external surfaces of the transfer cask subcomponents that are exposed to the long-term environment of indoor air.

Preventive Actions:
The program is a condition-monitoring program that does not include preventive actions.

Parameters Monitored or Inspected:
For accessible surfaces:

- Visual evidence of discontinuities and imperfections indicative of corrosion or wear.
- Visual evidence of coating degradation (e.g., blisters, cracking, flaking, delamination) indicative of corrosion of the base material.

For inaccessible water jacket carbon steel surfaces:

- Visual evidence of leakage on external surfaces.

Detection of Aging Effects:

SSC	Method or Technique	Frequency	Sample Size
Transfer Cask	Visual inspection (VT-3)	Prior to first use in period of extended operation and every 5 years thereafter[1]	100% of normally accessible transfer cask surfaces
	Visual inspection (VT-2)	Prior to first use in period of extended operation and every 5 years thereafter[1]	100% of the water jacket

Note:
1. The inspection is valid for five years. If the transfer cask is used within the five-year period, no additional inspections are required. If it has been longer than five years, the inspection is conducted prior to its use.

Data collection: Record of the inspection, including evidence of degradation and its extent and location and supporting photos or videos.

Monitoring and Trending:

- The baseline will be established before the use of the transfer cask in the first loading campaign in the period of extended operation.
- Degraded conditions are monitored and trended by reviewing the condition of SSCs using current and historical operating experience along with industry operating experience.

Acceptance Criteria:
For normally accessible surfaces:

- No detectable loss of material from the base metal, including uniform wall thinning, localized corrosion pits, crevice corrosion, and wear scratches/gouges.

For normally inaccessible internal surfaces:

- No evidence of leakage of the water jacket.

Corrective Actions:
Conditions identified by the AMP inspections that do not meet AMP acceptance criteria will be entered into the Corrective Action Program. Corrective actions provide reasonable assurance that deficiencies adverse to quality are either promptly corrected or are evaluated to determine whether there is reasonable assurance that the intended function is maintained until the next inspection frequency. Where evaluations are performed without repair or replacement, engineering analysis reasonably assures that the intended function is maintained consistent with the current licensing basis. If the deviating condition is assessed to be significantly adverse to quality, the cause of the condition is determined and an action plan is developed to preclude recurrence.

Confirmation Process:
Confirmatory actions, as needed, are implemented as part of the Corrective Action Program and ensure the corrective actions taken are effective.

Administrative Controls:
Administrative controls under the PG&E Quality Assurance Program procedures and Corrective Action Program provide a formal review and approval process.

Operating Experience:
PG&E will perform an AMP Effectiveness Review on a five-year frequency. Each AMP Effectiveness Review will include evaluation of AMP documentation (e.g., site procedures, inspection results, internal and external operating experience) compared to each of the ten AMP elements to determine whether the AMP is effectively managing the effects of aging. In addition, an ISFSI Program Health Report will be issued on an annual basis. The Program Health Report will display program health performance metrics, describe issues that impact or may impact program performance, and the actions to address the issues.

9.4.3.3.4 DC ISFSI Overpack AMP

Scope of Program:
- Visual inspection of accessible internal and external surfaces of the overpack.
- Visual inspection of exposed anchorage subcomponents (i.e., anchor ring, gussets, studs, and nuts).
- Visual inspection of anchor studs.
- Visual inspection of normally accessible ISFSI pad concrete portions adjacent to the overpacks.

Preventive Actions:
The program is a condition-monitoring program that does not include preventive actions.

Parameters Monitored or Inspected:
For metallic components:
- Visual evidence of discontinuities, imperfections, and rust staining indicative of corrosion (including SCC) and wear.
- Visual evidence of missing bolts and physical displacement.
- Visual evidence of coating degradation (e.g., blisters, cracking, flaking, delamination) indicative of corrosion of the base material.

For concrete adjacent to the overpacks that is indicative of the embedded embedment support structure condition:

- Visual evidence of degradation, including staining and rust.

Detection of Aging Effects:

SSC	Method or Technique	Frequency	Sample Size
Accessible Overpack Surfaces	Visual inspection (VT-3)	5 years ± 25%	100% of normally accessible surfaces (i.e., outside of overpacks)
	Visual inspection (VT-3)	Opportunistic	100% of the metallic surfaces made accessible by remote inspection techniques during MPC inspections
Accessible Anchorage Surfaces	Visual inspection (VT-3)	5 Years ± 25%	100% of normally accessible surfaces
Anchor Studs	Visual inspection (VT-3)	10 years ± 25%	20% of anchor stud population or a maximum of 25 anchor studs[1]
Normally Accessible ISFSI Pad Surfaces Adjacent to Overpacks	Visual inspection	5 years ± 25%	100% of normally accessible surfaces adjacent to overpacks

Note:

1. Deviation from the specified sample size requires a technical justification and inclusion in the AMP’s documentation

Data collection: Record of the inspection, including evidence of degradation and its extent and location and supporting photos or videos.

Monitoring and Trending:

- The baseline will be established prior to the beginning of the period of extended operation.
- Degraded conditions are monitored and trended by reviewing the condition of SSCs using current and historical operating experience along with industry operating experience.

Acceptance Criteria:

- No detectable loss of material from the base metal, including uniform wall thinning, localized corrosion pits, and crevice corrosion.
- No indications of loose bolts or hardware, displaced parts.
- The areas of ISFSI pad concrete adjacent to the overpacks shall not show any evidence of corrosion such as rust.

Corrective Actions:
Conditions identified by the AMP inspections that do not meet AMP acceptance criteria will be entered into the Corrective Action Program. Corrective actions provide reasonable assurance that deficiencies adverse to quality are either promptly corrected or are evaluated to determine whether there is reasonable assurance that the intended function is maintained until the next inspection frequency. Where evaluations are performed without repair or replacement, engineering analysis reasonably assures that the intended function is maintained consistent with the current licensing basis. If the deviating condition is assessed to be significantly adverse to quality, the cause of the condition is determined and an action plan is developed to preclude recurrence.

Confirmation Process:
Confirmatory actions, as needed, are implemented as part of the Corrective Action Program and ensure the corrective actions taken are effective.

Administrative Controls:
Administrative controls under the PG&E Quality Assurance Program procedures and Corrective Action Program provide a formal review and approval process.

Operating Experience:
PG&E will perform an AMP Effectiveness Review on a five-year frequency. Each AMP Effectiveness Review will include evaluation of AMP documentation (e.g., site procedures, inspection results, internal and external operating experience) compared to each of the ten AMP elements to determine whether the AMP is effectively managing the effects of aging. In addition, an ISFSI Program Health Report will be issued on an annual basis. The Program Health Report will display program health performance metrics, describe issues that impact or may impact program performance, and the actions to address the issues.

9.4.3.3.5 DC ISFSI Reinforced Concrete Structures AMP

Scope of Program:
- Visual inspection of the ISFSI storage pads and CTF structural concrete.
- Radiation monitoring for defense-in-depth.
- Soil sample analyses.

Preventive Actions:
The program is a condition-monitoring program that does not include preventive actions.

Parameters Monitored or Inspected:
ISFSI pads concrete and CTF structural concrete:
- Affected surface area
- Geometry/depth of defect
- Cracking, crazing, delaminations, drummy areas
- Curling or deflections
- Honeycombing, bug holes
- Popouts and voids
- Exposure of embedded steel
- Staining evidence of corrosion

- Dusting, efflorescence of any color

Radiation monitoring:
- Dose rates

Soil sample analyses:
- pH
- Chloride concentrations
- Sulfate concentrations

Detection of Aging Effects:

Inspection	Method or Technique	Frequency	Sample Size
ISFSI Pads and CTF Structural Concrete	Visual inspection in accordance with ACI 349.3R-18	5 Years ± 25%	100% of accessible above-grade areas
		Opportunistic	100% of areas that become accessible for any reason
Radiation monitoring	Neutron and gamma measurements at the surface of the overpack side and top	5 Years ± 25%	All overpacks that house the MPCs inspected by the DC ISFSI MPC AMP
Soil samples	Chemical analysis	5 Years ± 25%	Representative samples in vicinity of ISFSI
		Opportunistic	Representative samples of exposed portions of below-grade concrete if excavated

Data collection: Record of the inspection, including evidence of degradation and its extent and location and supporting photos or videos.

Monitoring and Trending:
- The baseline will be established prior to the beginning of the period of extended operation.
- Degraded conditions are monitored and trended by reviewing the condition of SSCs using current and historical operating experience along with industry operating experience.

Acceptance Criteria:
ISFSI Storage Pad and CTF concrete:
- Consistent with the three-tier acceptance criteria contained in ACI 349.3R-18.
- Degradations or conditions meeting or exceeding the ACI 349.3R-18 Tier 2 criteria will be entered into the Corrective Action Program for evaluation and resolution.
- Should the site determine there is a need to deviate from the ACI 349.3R-18 acceptance criteria; a technical justification will be fully documented.

Radiation monitoring:

- Less than 34.8 mrem/hour dose rate for monitoring at the overpack side (based on the calculated dose rate as discussed in Table 7.3-1B, Point 2 at the overpack side).
- Less than 28.9 mrem/hour dose rate for monitoring at the overpack lid (based on the calculated dose rate as discussed in Table 7.3-1B, Point 4a at the overpack lid).

Soil sample analyses:
A soil sample is non-aggressive if:

Chloride	less than or equal to 500 ppm
Sulfate	less than or equal to 1500 ppm
pH	greater than or equal to 5.5

Corrective Actions:
Conditions identified by the AMP inspections that do not meet AMP acceptance criteria will be entered into the Corrective Action Program. Corrective actions provide reasonable assurance that deficiencies adverse to quality are either promptly corrected or are evaluated to determine whether there is reasonable assurance that the intended function is maintained until the next inspection frequency. Where evaluations are performed without repair or replacement, engineering analysis reasonably assures that the intended function is maintained consistent with the current licensing basis. If the deviating condition is assessed to be significantly adverse to quality, the cause of the condition is determined and an action plan is developed to preclude recurrence.

Confirmation Process:
Confirmatory actions, as needed, are implemented as part of the Corrective Action Program and ensure the corrective actions taken are effective.

Administrative Controls:
Administrative controls under the PG&E Quality Assurance Program procedures and Corrective Action Program provide a formal review and approval process.

Operating Experience:
PG&E will perform an AMP Effectiveness Review on a five-year frequency. Each AMP Effectiveness Review will include evaluation of AMP documentation (e.g., site procedures, inspection results, internal and external operating experience) compared to each of the ten AMP elements to determine whether the AMP is effectively managing the effects of aging. In addition, an ISFSI Program Health Report will be issued on an annual basis. The Program Health Report will display program health performance metrics, describe issues that impact or may impact program performance, and the actions to address the issues.

9.4.3.3.6 DC ISFSI Cask Transportation System AMP

Scope of Program:

- Inspection of external surfaces of the cask transporter structure, including the overhead beam, lift towers, chassis, associated bolting, and welds.

- Inspection of the cask transporter cask restraint system, MPC downloader system, cask transporter wedge lock assembly, and welds.
- Visual inspection of the HI-TRAC lift links, cask transporter connector pins, and associated welds.
- Visual inspection of the CTF liner, lateral restraints, and associated welds
- Visual inspection of the MPC lift cleats, HI-STORM lifting brackets, HI-STORM mating device, and associated welds.
- Visual inspection of the LPT structure, mounting bolts, and rollers.
- Visual inspection of normally accessible concrete portions adjacent to the CTF liner and lateral restraints.

Preventive Actions:
The program is a condition-monitoring program that does not include preventive actions.

Parameters Monitored or Inspected:
- Visual evidence of discontinuities, imperfections, and rust staining indicative of corrosion (including pitting, crevice, general, and galvanic) and wear.
- Size and location of localized corrosion.
- Visual evidence of missing bolts and physical displacement.
- Appearance and location of deposits on the surfaces.
- Visual evidence of general damage on K-spec (i.e., sling) (burns, snags, tears, punctures, wear, distortion).

For concrete adjacent to the CTF liner and lateral restraints that is indicative of the embedded component condition:
- Visual evidence of degradation, including staining and rust.

Detection of Aging Effects:

SSC	Method or Technique	Frequency	Sample Size
Cask Transporter Structure (overhead beam, lift link saddles, lift towers, and chassis)	Visual Inspection (VT-3)	Prior to first use, if greater than 20 years in service[1] and every 5 years thereafter[2]	100% of the accessible surfaces
	Bolting torque check	Prior to first use, if greater than 20 years in service[1] and every 5 years thereafter[2]	100% of the accessible bolting
Cask Transporter Cask Restraint System (including sling and adjustable cask bumpers)	Visual Inspection (VT-3)	Prior to first use, if greater than 20 years in service[1] and every 5 years thereafter[2]	100% of the surfaces
	Replacement	Prior to the start of each cask transfer campaign if the cask transporter has been in service greater than 20 years and it has been greater than 5	100% of the polymers (e.g., adjustable cask bumpers)

SSC	Method or Technique	Frequency	Sample Size
		years since the last replacement	
	K-spec visual and tactile inspection	Prior to first use, if greater than 20 years in service[1] and every 5 years thereafter[2]	100% of the slings
MPC Downloader System	Visual Inspection (VT-3)	Prior to first use, if greater than 20 years in service[1] and every 5 years thereafter[2]	100% of the surfaces
Cask Transporter Wedge Lock Assembly	Visual Inspection (VT-3)	Prior to first use, if greater than 20 years in service[1] and every 5 years thereafter[2]	100% of the surfaces
HI-TRAC Lift Links	Visual Inspection (VT-3)	Prior to first use, if greater than 20 years in service[1] and every 5 years thereafter[2]	100% of the surfaces
Cask Transporter Connector Pins	Visual Inspection (VT-3)	Prior to first use, if greater than 20 years in service[1] and every 5 years thereafter[2]	100% of the surfaces
CTF Liner and Lateral Restraints	Visual Inspection (VT-3)	Prior to first use, if greater than 20 years in service[1] and every 5 years thereafter[2]	100% of the accessible surfaces
	Visual inspection	5 years ± 25%	100% of areas normally accessible concrete surfaces adjacent to CTF liner and lateral restraints
MPC Lift Cleats	Visual Inspection (VT-3)	Prior to first use, if greater than 20 years in service[1] and every 5 years thereafter[2]	100% of the surfaces
HI-STORM Lifting Brackets	Visual Inspection (VT-3)	Prior to first use, if greater than 20 years in service[1] and every 5 years thereafter[2]	100% of the surfaces
HI-STORM Mating Device	Visual Inspection (VT-3)	Prior to first use, if greater than 20 years in service[1] and every 5 years thereafter[2]	100% of the surfaces

SSC	Method or Technique	Frequency	Sample Size
	Bolting torque check	Prior to first use, if greater than 20 years in service[1] and every 5 years thereafter[2]	100% of the accessible bolting
LPT Structure (including main beam, side, and base plates; ribs; mating plates; and support gussets)	Visual Inspection (VT-3)	Prior to first use, if greater than 20 years in service[1] and every 5 years thereafter[2]	100% of the surfaces
LPT Mounting Bolt	Visual Inspection (VT-3)	Prior to first use, if greater than 20 years in service[1] and every 5 years thereafter[2]	100% of the bolt
LPT Rollers	Visual Inspection (VT-3)	Prior to first use, if greater than 20 years in service[1] and every 5 years thereafter[2]	100% of the surfaces
LPT lateral guide blocks and roller pad	Replacement	Prior to the start of each cask transfer campaign if it has been greater than 5 years since the last replacement	100% of the polymers (e.g., LPT lateral guide blocks and roller pad)

Notes:

1. Prior to the first use for on-site cask handling operations or prior to the first offsite transport.
2. The inspection is valid for five years. If the cask transporter is used within the five-year period, no additional inspections are required. If it has been longer than five years, the inspection is conducted prior to its use.

Data collection: Record of the inspection, including evidence of degradation and its extent and location and supporting photos or videos.

Monitoring and Trending:

- The baseline will be established during the first AMP inspection (as delineated above).
- Degraded conditions are monitored and trended by reviewing the condition of SSCs using current and historical operating experience along with industry operating experience.

Acceptance Criteria:
Visual Inspection Acceptance Criteria:

- No detectable loss of material from the base metal greater than 1/8 inch, including uniform wall thinning, localized corrosion pits, and crevice corrosion.

- No indications of loose bolts or hardware, displaced parts.
- The areas of concrete adjacent to the CTF liner and lateral restraints shall not show any evidence of corrosion such as rust.

Bolting Acceptance Criteria:
Bolting is torque checked to values specified by the original equipment manufacturer.

Polymer Acceptance Criteria:
The polymer Cask Transporter Adjustable Cask Bumpers will be replaced prior to the start of each cask transfer campaign if the Cask Transporter has been in service greater than 20 years and it has been greater than 5 years since the last replacement. The polymer LPT lateral guide blocks and roller pad will be replaced prior to the start of each cask transfer campaign if it has been greater than five years since the last replacement. These bumper replacements preclude the need for specific component inspections and associated acceptance criteria.

K-spec Acceptance Criteria
- No distortion, damage, or worn or broken stitching on end fittings
- No general damage such as burns, snags, tears, cuts, punctures, or excessive wear on webbing or stitching. Excessive wear is defined as core threads being visible.

Corrective Actions:
Conditions identified by the AMP inspections that do not meet AMP acceptance criteria will be entered into the Corrective Action Program. Corrective actions provide reasonable assurance that deficiencies adverse to quality are either promptly corrected or are evaluated to determine whether there is reasonable assurance that the intended function is maintained until the next inspection frequency. Where evaluations are performed without repair or replacement, engineering analysis reasonably assures that the intended function is maintained consistent with the current licensing basis. If the deviating condition is assessed to be significantly adverse to quality, the cause of the condition is determined and an action plan is developed to preclude recurrence.

Confirmation Process:
Confirmatory actions, as needed, are implemented as part of the Corrective Action Program and ensure the corrective actions taken are effective.

Administrative Controls:
Administrative controls under the PG&E Quality Assurance Program procedures and Corrective Action Program provide a formal review and approval process.

Operating Experience:
PG&E will perform an AMP Effectiveness Review on a five-year frequency if any AMP inspections have been completed in that five-year period. Each AMP Effectiveness Review will include evaluation of AMP documentation (e.g., site procedures, inspection results, internal and external operating experience) compared to each of the ten AMP elements to determine whether the AMP is effectively managing the effects of aging. In addition, an ISFSI Program Health Report will be issued on an annual basis. The Program Health Report will display program health performance metrics, describe issues that impact or may impact program performance, and the actions to address the issues.

9.4.3.4 Time-Limited Aging Analyses

10 CFR 72.42(a)(1) requires that an applicant for a renewed ISFSI license identify TLAAs and evaluate them for the period of extended operation. A comprehensive review to identify the TLAAs for the in-scope SSCs of the DC ISFSI was performed to determine the analyses that could be credited with managing aging effects over the period of extended operation. The TLAAs identified involved the in-scope SSCs, considered the effects of aging, involved explicit time-limited assumptions, provided conclusions regarding the capability of the SSC to perform its intended function through the operating term, and were contained or incorporated in the licensing basis. The following TLAA has been identified and evaluated for the DC ISFSI and is summarized below.

9.4.3.4.1 Neutron Absorber and Shielding Depletion

To support the 60-year storage duration for license renewal, neutron flux and fluence values for depletion of Boron-10 from the original 50-year neutron absorbing and shielding materials analysis were conservatively scaled up by a factor of 6/5 (60 years/50 years). The analysis concludes that the total depletion of Boron-10 over a 60-year period remains negligible (less than 3E-09 of total Boron-10 atoms depleted for the fixed neutron absorber and less than 5E-08 of total Boron-10 atoms depleted for the neutron shielding). The TLAA for neutron absorber (Boral or Metamic^{TM}) and shielding (Holtite) depletion has been projected to 60 years and is therefore valid to the end of the period of extended operation in accordance with TLAA disposition (ii).

TABLE 9.4-1

LICENSE RENEWAL AGING MANAGEMENT REVIEW RESULTS FOR COMPONENTS REQUIRING AGING MANAGEMENT

Subcomponent	Aging Effect	Aging Mechanism	Aging Management
Spent Fuel Assemblies (PG&E Drawing 6006510, Sheets 8-13, 15-21, 24-30, 33, 39-42, 46-48, 50-55, 59, 60, 79, 80, 89, 91-93, 108, 109, 111-113, 115, 118, 119, 128, 129, 131, 157, 158, 163, 164)			
Fuel Tube and End Plugs (Cladding)	Loss of ductility	Hydride reorientation	High Burnup Fuel AMP
	Changes in dimensions	Thermal creep	High Burnup Fuel AMP
MPC (PG&E Drawing 6021754, Sheets 3, 4, 144, 145, 148, 149)			
Baseplate	Cracking	Stress corrosion cracking	MPC AMP
	Loss of material	Pitting and crevice corrosion	MPC AMP
Shell Bottom	Cracking	Stress corrosion cracking	MPC AMP
	Loss of material	Pitting and crevice corrosion	MPC AMP
Lid	Cracking	Stress corrosion cracking	MPC AMP
	Loss of material	Pitting and crevice corrosion	MPC AMP
Closure Ring	Cracking	Stress corrosion cracking	MPC AMP
	Loss of material	Pitting and crevice corrosion	MPC AMP
Lid Lift Hole Plug	Loss of material[3]	Pitting and crevice corrosion	MPC AMP
Shell Top	Cracking	Stress corrosion cracking	MPC AMP
	Loss of material	Pitting and crevice corrosion	MPC AMP
Basket Neutron Absorber	Reduction of neutron-absorbing capacity	Boron depletion	TLAA will be valid to the end of the period of extended operation per TLAA disposition (ii) – see Section 9.4.3.4.1

Subcomponent	Aging Effect	Aging Mechanism	Aging Management
HI-TRAC 125D Transfer Cask (PG&E Drawing 6021754-1)			
Bottom Flange	Loss of material	General, pitting, and crevice corrosion	Transfer Cask AMP
Inner Shell	Loss of material	General, pitting, and crevice corrosion	Transfer Cask AMP
Outer Shell	Loss of material	General, pitting, and crevice corrosion	Transfer Cask AMP
Top Flange	Loss of material	General, pitting, and crevice corrosion	Transfer Cask AMP
Lead Plug	Loss of material	General, pitting, and crevice corrosion	Transfer Cask AMP
Port Plugs	Loss of material	General, pitting, and crevice corrosion	Transfer Cask AMP
Trunnion Block	Loss of material	General, pitting, and crevice corrosion	Transfer Cask AMP
Trunnion	Loss of material	Wear	Transfer Cask AMP
Flange Brace	Loss of material	General, pitting, and crevice corrosion	Transfer Cask AMP
Water Jacket Top and Bottom Plates	Loss of material	General, pitting, and crevice corrosion	Transfer Cask AMP
Water Jacket Ribs	Loss of material	General, pitting, and crevice corrosion	Transfer Cask AMP
Water Jacket Bottom Plate Support	Loss of material	General, pitting, and crevice corrosion	Transfer Cask AMP
Water Jacket Outer Shell	Loss of material	General, pitting, and crevice corrosion	Transfer Cask AMP
Pool Lid Ring	Loss of material	General, pitting, and crevice corrosion	Transfer Cask AMP
Pool Lid	Loss of material	General, pitting, and crevice corrosion	Transfer Cask AMP
Pool Lid Bolt	Loss of material	General, pitting, and crevice corrosion	Transfer Cask AMP
Top Closure Lid	Loss of material	General, pitting, and crevice corrosion	Transfer Cask AMP
Top Rings	Loss of material	General, pitting, and crevice corrosion	Transfer Cask AMP
Top Lift Block	Loss of material	General, pitting, and crevice corrosion	Transfer Cask AMP

Subcomponent	Aging Effect	Aging Mechanism	Aging Management
Top Lid Shielding	Loss of shielding	Boron depletion	TLAA will be valid to the end of the period of extended operation per TLAA disposition (ii) – see Section 9.4.3.4.1
Top Lid Plate	Loss of material	General, pitting, and crevice corrosion	Transfer Cask AMP
Top Lid Bolt	Loss of material	General, pitting, and crevice corrosion	Transfer Cask AMP
Mating Device Bolt	Loss of material	General, pitting, and crevice corrosion	Transfer Cask AMP
HI-STORM 100 SA Overpack (PG&E Drawing 6021754, Sheets 5, 36, 102, 103, 138, 139, 143,146 150, 151)			
Shim	Loss of material	Galvanic, pitting, and crevice corrosion; wear	Overpack AMP
Base Bottom Plate	Loss of material	General, pitting, and crevice corrosion	Overpack AMP
Cask Inner Shell	Loss of material	General, pitting, and crevice corrosion	Overpack AMP
Cask Top and Bottom Guides	Loss of material	General, pitting, and crevice corrosion	Overpack AMP
Base Vent Side Plate	Loss of material	General, pitting, and crevice corrosion	Overpack AMP
Base Top Plate	Loss of material	General, pitting, and crevice corrosion	Overpack AMP
Cask Outer Shell	Loss of material	General, pitting, and crevice corrosion	Overpack AMP
Cask Concrete Cavity Top Plate	Loss of material	General, pitting, and crevice corrosion	Overpack AMP
Pedestal Base Plate	Loss of material	General, pitting, and crevice corrosion	Overpack AMP
Pedestal Shell	Loss of material	General, pitting, and crevice corrosion	Overpack AMP
Pedestal Platform	Loss of material	General, pitting, and crevice corrosion	Overpack AMP
Lid Shear Ring	Loss of material	General, pitting, and crevice corrosion	Overpack AMP
Lid Shield Ring	Loss of material	General, pitting, and crevice corrosion	Overpack AMP
Lid Outer Ring	Loss of material	General, pitting, and crevice corrosion	Overpack AMP
Lid Inner Ring	Loss of material	General, pitting, and crevice corrosion	Overpack AMP
Lid Lift Block	Loss of material	General, pitting, and crevice corrosion	Overpack AMP

Subcomponent	Aging Effect	Aging Mechanism	Aging Management
Lid Vent Shield	Loss of material	General, pitting, and crevice corrosion	Overpack AMP
Lid Cover Plate	Loss of material	General, pitting, and crevice corrosion	Overpack AMP
Lid Stud	Loss of material	General, pitting, and crevice corrosion	Overpack AMP
Gamma Shield Cross Plates	Cracking	Stress corrosion cracking	Overpack AMP
	Loss of material	Pitting, and crevice corrosion	Overpack AMP
Anchor Ring	Loss of material	Galvanic, general, pitting, and crevice corrosion	Overpack AMP
Anchor Gusset	Loss of material	General, pitting, and crevice corrosion	Overpack AMP
Anchor Stud	Loss of material	General, pitting, and crevice corrosion	Overpack AMP
Anchor Washer	Loss of material	General, pitting, and crevice corrosion	Overpack AMP
Anchor Nut	Loss of material	General, pitting, and crevice corrosion	Overpack AMP
Cask Transportation System (PG&E Drawings 6021754, Sheets 9, 11, 18, 23, 34, 54, 60-63, 65, 67-74, 76-80, 85, 89, 97, 101, 106, 118; and 105882)			
Cask Transporter			
Cask Restraint System (including Sling and Adjustable Cask Bumpers)	Loss of material	Galvanic, general, pitting, and crevice corrosion; wear	Cask Transportation AMP
	Change in material properties	N/A	Cask Transportation AMP
Overhead Beam	Loss of material	Galvanic, general, pitting, and crevice corrosion	Cask Transportation AMP
	Loss of preload	Stress relaxation	Cask Transportation AMP
Lift Towers (Structure) And Bolting	Loss of material	Galvanic, general, pitting, and crevice corrosion	Cask Transportation AMP
	Loss of preload	Stress relaxation	Cask Transportation AMP
Chassis (i.e., Vehicle Frame)	Loss of material	General, pitting, and crevice corrosion	Cask Transportation AMP
	Loss of preload	Stress relaxation	Cask Transportation AMP
Wedge Lock Assembly	Loss of material	Galvanic, general, pitting, and crevice corrosion	Cask Transportation AMP
Seismic Tie Down Lugs	Loss of material	General, pitting, and crevice corrosion	Cask Transportation AMP

Subcomponent	Aging Effect	Aging Mechanism	Aging Management
HI-TRAC Lift Links	Loss of material	General, pitting, and crevice corrosion	Cask Transportation AMP
Connector Pins	Loss of material	Galvanic, general, pitting, and crevice corrosion	Cask Transportation AMP
MPC Downloader System			
Pulley Plates	Loss of material	Galvanic, general, pitting, and crevice corrosion	Cask Transportation AMP
Pulley Shafts	Loss of material	Galvanic, pitting, and crevice corrosion	Cask Transportation AMP
Low-Profile Transporter			
Main Beam Plates and Ribs	Loss of material	Galvanic, general, pitting, and crevice corrosion	Cask Transportation AMP
Lateral Guide Mating Plate	Loss of material	General, pitting, and crevice corrosion	Cask Transportation AMP
Roller Mating Plate	Loss of material	Galvanic, general, pitting, and crevice corrosion	Cask Transportation AMP
Lateral Guide Block	Change in material properties	N/A	Cask Transportation AMP
Pad and Support Gussets	Loss of material	General, pitting, and crevice corrosion	Cask Transportation AMP
Side and Base Plates	Loss of material	Galvanic, general, pitting, and crevice corrosion	Cask Transportation AMP
Roller	Loss of material	Galvanic, general, pitting, and crevice corrosion	Cask Transportation AMP
Roller Pad	Change in material properties	N/A	Cask Transportation AMP
HI-TRAC Mounting Bolt	Loss of material	Galvanic, general, pitting, and crevice corrosion	Cask Transportation AMP
MPC Lift Cleats			
Body	Loss of material	Galvanic, general, pitting, and crevice corrosion	Cask Transportation AMP

Subcomponent	Aging Effect	Aging Mechanism	Aging Management
HI-STORM Lifting Bracket			
Plates	Loss of material	Galvanic, general, pitting, and crevice corrosion	Cask Transportation AMP
Connecting Pin	Loss of material	Galvanic, general, pitting, and crevice corrosion	Cask Transportation AMP
Stud Plate	Loss of material	Galvanic, general, pitting, and crevice corrosion	Cask Transportation AMP
Hex Nut	Loss of material	Galvanic, general, pitting, and crevice corrosion	Cask Transportation AMP
Hex Lifting Stud	Loss of material	Galvanic, general, pitting, and crevice corrosion	Cask Transportation AMP
Lift Tongue	Loss of material	Galvanic, general, pitting, and crevice corrosion	Cask Transportation AMP
Top Lift Pin	Loss of material	Galvanic, general, pitting, and crevice corrosion	Cask Transportation AMP
Wide Body Shackle	Loss of material	General, pitting, and crevice corrosion	Cask Transportation AMP
HI-STORM Mating Device			
Shielding Frame	Loss of material	General, pitting, and crevice corrosion	Cask Transportation AMP
Spacer Ring	Loss of material	General, pitting, and crevice corrosion	Cask Transportation AMP
Bottom Stiff Plate	Loss of material	General, pitting, and crevice corrosion	Cask Transportation AMP
Shield End	Loss of material	General, pitting, and crevice corrosion	Cask Transportation AMP
Cylinder Lug	Loss of material	Galvanic, general, pitting, and crevice corrosion	Cask Transportation AMP
Lift Lug	Loss of material	General, pitting, and crevice corrosion	Cask Transportation AMP
Tongue Plate	Loss of material	General, pitting, and crevice corrosion	Cask Transportation AMP
Actuator Bar and Draw Bar	Loss of material	Galvanic, general, pitting, and crevice corrosion	Cask Transportation AMP
Actuator Cylinder	Loss of material	Galvanic, general, pitting, and crevice corrosion	Cask Transportation AMP
Actuator Cylinder Bar Pin and Pin	Loss of material	Galvanic, pitting, and crevice corrosion	Cask Transportation AMP

Subcomponent	Aging Effect	Aging Mechanism	Aging Management
Actuator Cylinder Bar Bolt	Loss of material	General, pitting, and crevice corrosion	Cask Transportation AMP
	Loss of preload	Stress relaxation	Cask Transportation AMP
Bolts, Nuts, and Washers	Loss of material	General, pitting, and crevice corrosion	Cask Transportation AMP
	Loss of preload	Stress relaxation	Cask Transportation AMP
ISFSI Storage Pads (PG&E Drawing 6021750, Sheets 303, 305, 306)			
Storage Pads	Cracking	Aggressive chemical attack, corrosion of reinforcing steel, reaction with aggregates	Reinforced Concrete Structures AMP
	Loss of concrete/ steel bond	Corrosion of reinforcing steel	Reinforced Concrete Structures AMP
	Loss of material	Aggressive chemical attack, corrosion of reinforcing steel, microbiological degradation, salt scaling	Reinforced Concrete Structures AMP
	Loss of strength	Aggressive chemical attack, corrosion of reinforcing steel, leaching of calcium hydroxide, microbiological degradation, reaction with aggregates	Reinforced Concrete Structures AMP
	Increase in porosity and permeability	Leaching of calcium hydroxide, microbiological degradation	Reinforced Concrete Structures AMP
	Reduction of concrete pH	Aggressive chemical attack, leaching of calcium hydroxide, microbiological degradation	Reinforced Concrete Structures AMP
Embedment Support Top Structure Plate	Loss of material	General, pitting, and crevice corrosion; microbiologically influenced corrosion	Overpack AMP
Embedment Support Bottom Structure Plate	Loss of material	General, pitting, and crevice corrosion; microbiologically influenced corrosion	Overpack AMP
Embedment Support Structure Coupler	Loss of material	General, pitting, and crevice corrosion; microbiologically influenced corrosion	Overpack AMP
Embedment Support Structure Bars	Loss of material	General, pitting, and crevice corrosion; microbiologically influenced corrosion	Overpack AMP

Subcomponent	Aging Effect	Aging Mechanism	Aging Management
Embedment Support Structure Washers	Loss of material	General, pitting, and crevice corrosion; microbiologically influenced corrosion	Overpack AMP
Embedment Support Structure Nuts	Loss of material	General, pitting, and crevice corrosion; microbiologically influenced corrosion	Overpack AMP
Cask Transfer Facility (PG&E Drawings 6021750, Sheets 310, 312, 318; 6021754-7; 32-06-12053; SK-01)			
Liner Lower Restraint	Loss of material	General, pitting, and crevice corrosion	Cask Transportation AMP
Liner Shell Plate	Loss of material	General, pitting, and crevice corrosion; microbiologically influenced corrosion	Cask Transportation AMP
Liner Wedges	Loss of material	General, pitting, and crevice corrosion	Cask Transportation AMP
Liner Hanger	Loss of material	General, pitting, and crevice corrosion	Cask Transportation AMP
Liner Threaded Rod	Loss of material	Galvanic, general, pitting, and crevice corrosion	Cask Transportation AMP
Liner Hex Nut	Loss of material	Galvanic, general, pitting, and crevice corrosion	Cask Transportation AMP
Structural Concrete	Cracking	Aggressive chemical attack, corrosion of reinforcing steel, reaction with aggregates	Reinforced Concrete Structures AMP
	Loss of concrete/ steel bond	Corrosion of reinforcing steel	Reinforced Concrete Structures AMP
	Loss of material	Aggressive chemical attack, corrosion of reinforcing steel, microbiological degradation, salt scaling	Reinforced Concrete Structures AMP
	Loss of strength	Aggressive chemical attack, corrosion of reinforcing steel, leaching of calcium hydroxide, microbiological degradation, reaction with aggregates	Reinforced Concrete Structures AMP
	Increase in porosity and permeability	Leaching of calcium hydroxide, microbiological degradation	Reinforced Concrete Structures AMP
	Reduction of concrete pH	Aggressive chemical attack, leaching of calcium hydroxide, microbiological degradation	Reinforced Concrete Structures AMP

Subcomponent	Aging Effect	Aging Mechanism	Aging Management
Lateral Restraint: Strut and Collars	Loss of material	General, pitting, and crevice corrosion	Cask Transportation AMP
Lateral Restraint: Embedded Plate	Loss of material	General, pitting, and crevice corrosion; microbiologically influenced corrosion	Cask Transportation AMP
Lateral Restraint: Bearing Plates	Loss of material	General, pitting, and crevice corrosion; microbiologically influenced corrosion	Cask Transportation AMP
Lateral Restraint: Washer Plate	Loss of material	General, pitting, and crevice corrosion; microbiologically influenced corrosion	Cask Transportation AMP
Lateral Restraint: Stud Anchors	Loss of material	General, pitting, and crevice corrosion; microbiologically influenced corrosion	Cask Transportation AMP
Lateral Restraint: Rock Anchors	Loss of material	General, pitting, and crevice corrosion; microbiologically influenced corrosion	Cask Transportation AMP
Lateral Restraint: Grease Caps	Change in material properties	N/A	Cask Transportation AMP
Lateral Restraint: Bracket	Loss of material	General, pitting, and crevice corrosion	Cask Transportation AMP

D.4 10 CFR 72.48 Changes Since the Last Biannual Diablo Canyon Independent Spent Fuel Storage Installation Updated Final Safety Analysis Report Submittal

As of January 21, 2022, there have been no 10 CFR 72.48 changes made to the DC ISFSI UFSAR since the last biannual submittal.

Appendix E

PRE-APPLICATION INSPECTION REPORT

Table of Contents

List of Attachments

List of Figures

List of Tables

Executive Summary

To support DC ISFSI LR in accordance with NRC guidance, PG&E performed a pre-application inspection of the DC ISFSI. The pre-application inspection included a visual inspection of eight MPCs and HI-STORM overpacks, soil sampling, and concrete inspection.

The inspection results demonstrated that the DC ISFSI is in overall good condition and continues to perform its intended safety functions. The following items were entered into the Corrective Action Program (CAP) for evaluation and determination of corrective actions. Conditions did not indicate a challenge to the proposed inspection frequencies or intended safety functions. This information will be used for future trending.

1. MPC 17 – SAPN 51126762
2. MPC 123 – SAPN 51126763
3. MPC 165 – SAPN 51126764
4. MPC 166 – SAPN 51126765
5. MPC 170 – SAPN 51126766
6. MPC 251 – SAPN 51126767
7. MPC 383 – SAPN 51126768
8. MPC 503 – SAPN 51126769
9. Overpack 93 – SAPN 51126863
10. Overpack 318 – SAPN 51126864
11. Overpack 507 – SAPN 51126865
12. Overpack 514 – SAPN 51126866
13. Overpack 516 – SAPN 51126867
14. Overpack 639 – SAPN 51126868
15. Overpack 881 – SAPN 51126869
16. Overpack 1096 – SAPN 51126870
17. Concrete Inspection: >Tier 1 Findings – SAPN 51127961
18. Concrete Inspection: >Tier 2 Findings – SAPN 51127962

There were no aging effects or mechanisms identified that deviated from those described in NUREG-2214, "Managing Aging Processes in Storage" (MAPS Report). Based on a thorough review of the inspection results, the aging effects discussed in the LRA are appropriately identified. The AMPs and associated inspection frequencies proposed in LRA Appendix A will adequately manage the aging associated with the DC ISFSI and will be modified, as necessary, based on future inspection results.

The following document describes the inspection background, methodology, and results, and is laid out with hyperlinks and photos for ease of navigation between text and photos in the attachments.

E.1 Purpose

In accordance with NUREG-1927, "Standard Review Plan for Renewal of Specific Licenses and Certificates of Compliance for Dry Storage of Spent Nuclear Fuel," Revision 1, Section 3.4.1.2, the applicant for an ISFSI LR may choose to verify the condition of the system and demonstrate that SSCs within the scope of the LRA have not undergone unanticipated aging and degradation prior to entering the PEO. If the system inspection reveals unanticipated aging or degradation, then the applicant would need to address the condition of the SSCs in the LRA.

The pre-application inspection is an important element in an operations-focused aging management approach and provides valuable OE. The results from the pre-application inspection were used to develop detailed AMPs, including inspection and maintenance frequencies, and provide a baseline for the monitoring and trending element of AMPs in the PEO.

In response to NUREG-1927 guidance, PG&E performed a pre-application inspection of the DC ISFSI to support LR efforts. The pre-application inspection included a visual inspection of eight MPCs and HI-STORM overpacks, soil sampling, and concrete inspection.

E.2 Site Description

The DC ISFSI consists of the following major SSCs: storage pads, a CTF, an onsite cask transporter, and the dry cask storage system. The dry cask storage system is the Holtec International (Holtec) HI-STORM 100 System. The HI-STORM 100 System is comprised of an MPC, the HI-STORM 100SA storage overpack, and the HI-TRAC transfer cask. The DC ISFSI is designed to hold up to 138 storage casks (with two spare storage locations) on seven concrete pads (see Figure 1). The MPC is an integrally-welded pressure vessel that holds DCPP spent fuel assemblies. The MPC is primarily comprised of an 0.5 inches thick outer shell, a 9.5 inches thick lid, and a 2.5 inches thick base plate. A loaded MPC is stored on the DC ISFSI storage pads within the HI-STORM 100SA overpack in an anchored vertical orientation (see embedded anchorage rings in Figure 1). The overpack is a heavy-walled cylindrical container that is made of inner and outer concentric carbon-steel shells (each 1 inch thick), a baseplate (2 inches thick), and a bolted lid (fabricated as a steel-encased concrete disc, up to 19 inches thick). The spacing of the carbon-steel inner and outer shells provides approximately 30 inches of annular space that is filled with unreinforced concrete for radiation shielding.

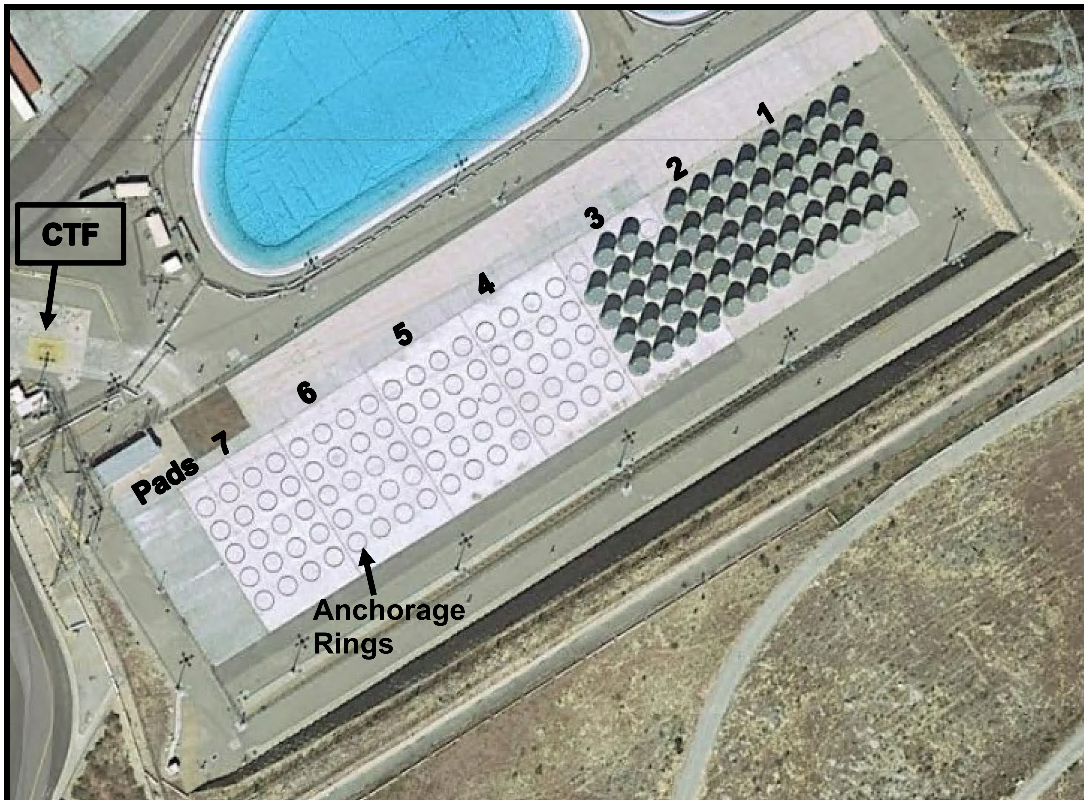
Because the MPC is stored within the overpack, its exterior MPC surfaces and internal overpack surfaces are exposed to the outside air, but are protected from direct exposure to weather-related effects, including sunlight, wind, and rain. The outer surfaces of the overpack are directly exposed to outdoor air. The ambient air is a saline air due to the proximity to the Pacific Ocean.

As shown in Table 1 below, as of 2021, 7 loading campaigns have been completed at the DC ISFSI, resulting in a total of 58 loaded systems.

Table 1: Diablo Canyon Independent Spent Fuel Storage Installation Loading Campaign History

Loading Campaign	Year	Casks	MPC Material
01	2009	8	Grade 304
02	2010	8	Grade 304
03	2012	7	Grade 304
04	2013	6	Grade 304
05	2015	8	Grades 304, 304/304L
06	2016	12	Grades 304, 316/316L
07	2018	9	Grade 316/316L

Figure 1: Diablo Canyon Independent Spent Fuel Storage Installation Aerial View



E.3 License Renewal Scope Determination

The DC ISFSI LR process and methodology follows the guidance contained in NUREG-1927, Revision 1. A description of the scoping process is provided in LRA Section 2.2, Scoping Methodology, and the results are provided in LRA Section 2.3, Scoping Results.

The SSCs comprising the DC ISFSI are identified in LRA Table 2-1, Scoping Results. The SFAs, MPC, transfer cask, HI-STORM 100SA overpack, cask transportation system, ISFSI storage pads, and CTF were determined to be within the scope of LR and to require further review in the AMR process.

LRA Chapter 3 describes the AMR process that was conducted as part of the ISFSI LR process. The AMR addresses aging effects and aging mechanisms that could affect the ability of the SSCs to perform their intended functions during the PEO. The results of the AMR demonstrated that there were aging effects that require aging management activities for each of the in-scope components discussed above.

E.4 Pre-Application Inspection Scope Determination

The pre-application inspection scope included those types of SSCs that have aging effects that require aging management. As discussed below, the specific SSCs chosen for inspection were based on site-specific conditions, EPRI and NRC guidance, OE, system design, material combinations, and operating parameters that may contribute to aging and degradation. Considering the results of the AMR and the degradation mechanism(s) of concern for the in-scope SSCs, the SSCs selected for a pre-application inspection were the CTF concrete, ISFSI storage pad concrete, MPCs, overpacks, and surrounding soil.

Typically, the sample size of pre-application inspections is one or two MPCs and overpacks. The DC ISFSI pre-application inspection is larger than typical to serve as a bounding, one-time inspection to validate assumptions pertaining to multiple aging-related factors. Following this pre-application inspection, recurring inspection scopes would be consistent with proposed AMPs that will be informed by the observations from this initial inspection. Because of existing periodic and pre-use inspections of the transfer cask and cask transportation system, specific pre-application inspections were not completed for these SSCs.

- **CTF:** 100 percent of the accessible structural concrete surfaces in the CTF and its anchor blocks were inspected.

- **ISFSI Storage Pads:** 100 percent of the above-grade accessible portions of the concrete storage pads were inspected. In addition, soil sampling adjacent to the storage facility was conducted to determine whether the soil is considered “aggressive” per industry standards (see sampling locations in Attachment 4).

- **MPC Selection:** A subset of the 58 in-service MPCs (see Table 2 and Figure 2) were chosen for inspection using the following considerations:

  - **Material Type:** The DC ISFSI has three MPC material types in service: Grade 304, 304/304L (Dual Cert), and 316/316L (Dual Cert). Five Grade 304 MPCs, one Grade 304/304L MPC, and two Grade 316/316L MPCs were inspected. Inspection of a larger number of MPCs constructed of 304 materials is due to their increased susceptibility to CISCC as compared to 316/316L.

  - **Build:** As shown in Table 2, there have been six separate “builds” (i.e., manufacturing campaigns) over the course of the seven loading campaigns. At least one MPC was selected from each build to account for the range of raw material suppliers and range of loading campaigns. PG&E has witnessed variations in surface finish across the builds which could contribute to CISCC. DC ISFSI-specific fabrication defects were also considered. For example, MPC #165 was selected as an MPC known to have the most significant repaired fabrication defect which resulted in an additional external heat affected zone.

  - **Age:** The loading campaign in which an MPC was put into service (see Table 1 and Table 2) provides the “age.” Other than providing the age, a specific loading campaign does not impact aging. MPCs were selected with a wide range of years in service, 3-12 years as of 2021, to look for age-related differentiation between casks. The first loaded MPC (i.e., the oldest in service) was not chosen due to as low as reasonably achievable (ALARA) considerations for a long-duration inspection activity and ease of accessibility; however, the difference in age from the next oldest MPC that was inspected is approximately 4 weeks, which would not lead to a substantive difference in aging.

- **Heat Load:** The heat output of an MPC is expected to have an impact on the potential for deliquescence of chlorides on the MPC exterior surface. Lower heat load and older canisters are more likely to be susceptible to CISCC. MPCs were selected with a range of 12.25 kW-24.02 kW heat loads (at time of loading) that bound the lower heat loads that could lead to deliquescence.

- **Location:** Primarily, systems along the perimeter of the ISFSI pads were selected for ALARA considerations and ease of accessibility. Inspection stations were deployed a short distance away from the overpacks without being surrounded by other overpacks. While the entire DC ISFSI is exposed to salt air from proximity to the Pacific Ocean, the outer DC ISFSI perimeter is likely subject to more humidity and airborne contaminants than the inner systems. This is based on the outer systems being first to draw in the humid air, heat, and exhaust out the upper vents, as well as radiant heating from the grouping of systems. One interior location was also conservatively selected to account for any potential environmental differences between perimeter and interior locations. Selecting systems on all sides of the ISFSI also addresses various shading characteristics from the other overpacks and the neighboring hillside.

- **EPRI V_{can} Score:** EPRI Report 3002005371, "Susceptibility Assessment Criteria for Chloride-Induced Stress Corrosion Cracking (CISCC) of Welded Stainless Steel Canisters for Dry Cask Storage Systems" provides a set of criteria to determine the susceptibility of MPCs to CISCC. Consistent with EPRI's methodology, factors described above (i.e., material type, age, heat load, and location) were used to calculate the CISCC susceptibility of each loaded MPC at the DC ISFSI. Susceptibility ranged from 1.5 to 9.0 with higher ranked MPCs being more susceptible to CISCC than lower ranked MPCs. As shown in Table 2, the MPCs chosen for inspection include the higher (more susceptible) ranking of 9.0.

- **Re-inspect EPRI Locations:** EPRI and Holtec performed inspections of two DC ISFSI loaded MPCs with a remote crawler in 2014 (EPRI Report 3002002822). Re-inspecting these MPCs provided an opportunity for trending seven years after the EPRI inspection.[1]

• **Overpack Selection:** The overpacks associated with the chosen MPCs discussed above received a VT-3 visual inspection[2] of all accessible surfaces (see Figure 2).

Separate from the pre-application inspection, PG&E currently plans to perform inspection of two overpack bottom baseplates and have results in 2022. These bottom baseplate inspection results are not required for the NRC's LR review. Inspection results will be

[1] While the EPRI inspections did not identify any evidence of localized corrosion on the MPCs, it did determine some amount of chloride-containing salts to be present.
[2] VT-3 is a defined ASME visual testing level.

available at the DC ISFSI. They were not included in the scope of the pre-application inspection because the DC ISFSI has no signs of degradation as indicated by rust staining from beneath the overpacks. In addition, while specific qualified exams were not conducted, during previous overpack movements[3] on the ISFSI pads, personnel did not observe any signs of degradation under the overpacks or on the overpack bottoms. Furthermore, the DC ISFSI pad is a sloped design to preclude water ponding.

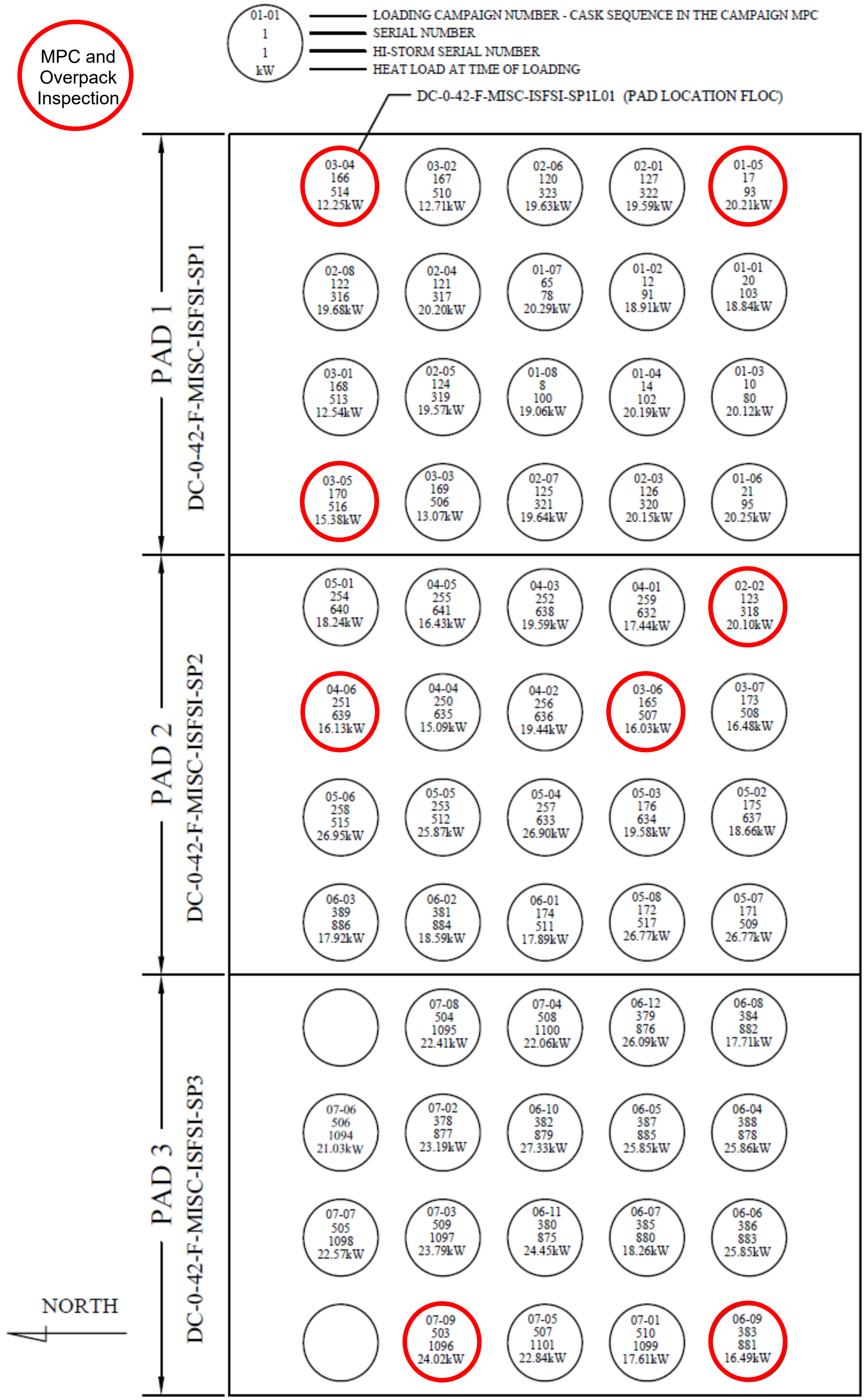
Table 2: Diablo Canyon Independent Spent Fuel Storage Installation License Renewal Multi-Purpose Canister Selection Summary

Build # - MPC Material	MPC Serial # (Loading Campaign-Sequence)	Heat Load at Loading	Years in Service	EPRI V_{can} Score	Basis for Selection
Build 1 - Grade 304	17 (01-05)	20.21kW	12	9.0	One of the longest in service with a high V_{can} score and most-susceptible material. Located in an open corner for ALARA and access.
Build 2 - Grade 304	123 (02-02) *	20.10kW	11	8.5	In scope of 2014 EPRI inspection; allows for trending of findings. High V_{can} score and most-susceptible material.
Build 3 - Grade 304	165 (03-06)	16.03kW	9	7.5	Known to have the most significant fabrication defect. Most-susceptible material. Location is a row in from the perimeter casks, allowing for an interior inspection sample.
	166 (03-04)	12.25kW	9	8.5	Most-susceptible material. Located in an open corner for ALARA and access. Lowest heat load.
	170 (03-05) *	15.38kW	9	8.5	In scope of 2014 EPRI inspection; allows for trending of findings. Most-susceptible material.
Build 4 - Grade 304/304L Dual Cert	251 (04-06)	16.13kW	8	6.0	Primarily selected to capture every build and material, as well as perimeter location for accessibility.
Build 5 - Grade 316/316L Dual Cert	383 (06-09)	16.49kW	5	2.5	Located in an open corner for ALARA and access. Mid-range heat load.
Build 6 - Grade 316/316L Dual Cert	503 (07-09)	24.02kW	3	1.5	Most recent loading campaign for a baseline of a newer MPC. Higher heat load.

[3] Moving a loaded overpack to another storage location in the DC ISFSI is conducted as needed prior to and during loading campaigns to ensure weight is distributed as analyzed on the ISFSI pads.

* EPRI Inspected MPC #s 123 (Loading Campaign-Loading Sequence 02-02) and 170 (03-05) in 2014. (EPRI Report 3002002822)

Figure 2: Overpack and MPC Selection on DC ISFSI Pads



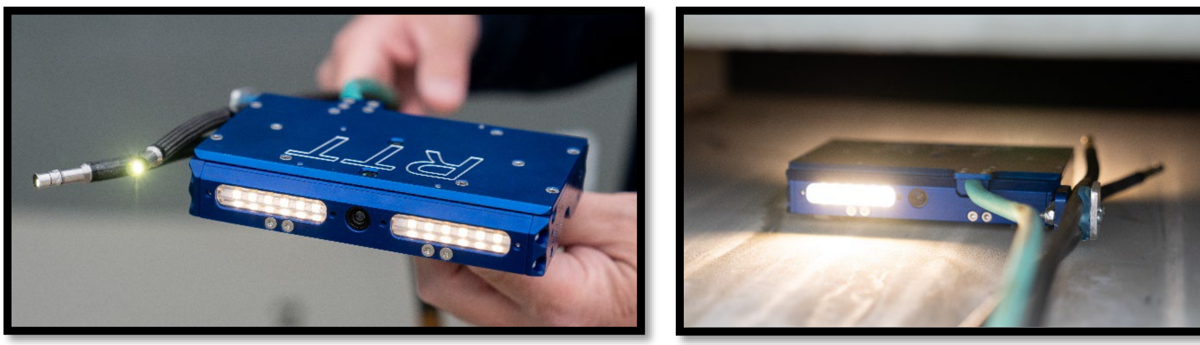
E.5 Inspection Methodology

This section discusses the methodologies, acceptance criteria, and inspection details that are associated with each item listed in Section E.4. Inspection findings resulting from these methodologies are presented in Section E.6.

E.5.1 Multi-Purpose Canister In-Situ Inspection

The detailed inspection of eight MPCs was conducted in accordance with DCPP Procedure NDE VT 3-3, Revision 1, “Visual Examination of ISFSI Components and the Cask Transporter,” for a VT-3 exam of the surfaces accessible by remote means via the upper overpack vents. The VT-3 inspection examined the MPC exterior surfaces. Remote visual examinations were conducted by using a magnetic crawler. The magnetic crawler is shown in Figure 3 and contains wheels and magnets to allow for vertical surface travel. The magnetic crawler traveled on the internal overpack carbon steel surfaces and inspected the stainless steel MPC surfaces across the annulus (see photo on right in Figure 3).

Figure 3: RTT Magnetic Crawler System



As shown in Figure 4, access to the exterior MPC surfaces and interior overpack surfaces was gained via the upper overpack vents. Normally-installed gamma shields and screens were temporarily removed and the robotic crawler was fed into each opened vent for insertion into the annular gap between the MPC and overpack. The magnetic crawler was controlled by an operator that remained outside the overpack vents. Inspection video feed was viewed real-time by a VT-3 qualified inspector to determine if further, more detailed examination or characterization was required. The robotic crawler video probe meets the requirements for VT-3 examinations; however, measurements of indications are not qualified. Therefore, measurements are estimates for information only.

Figure 4: Inspection Set-up

The extent of the examination is estimated to be 100 percent of total accessible MPC exterior surface area (see calculation of percentage inspected of total accessible surface area in Attachment 5). Non-accessible areas include the MPC bottom where it sits on a pedestal within the overpack.

The observation of the following conditions from ASME Code Case N-860 were used during the inspection to identify areas requiring further evaluation:

- Surface discontinuities (such as wear, gouges, dents, surface irregularities) that have occurred during service. These surface discontinuities do not include standard, normal, or expected surface discontinuities which result from normal fabrication or loading practices.
- Corrosion or corrosion products (e.g., discoloration, cracking, pitting, oxides, crud).
- Flaws (e.g., cracking, pitting).
- Loose, missing, distorted, displaced, cracked, fractured, or damaged systems, structures, or components.

E.5.2 Overpack In-Situ Inspection

The detailed inspection of eight overpacks was conducted in accordance with DCPP Procedure NDE VT 3-3, Revision 1, “Visual Examination of ISFSI Components and the Cask Transporter,” for a VT-3 exam of the surfaces accessible by direct inspection (overpack exterior surfaces) and by remote means via the upper overpack vents (overpack interior surfaces). Remote visual examinations were conducted by using the means and methods as described in Section E.5.1 and shown in Figure 3 and Figure 4.

Due to the configuration restrictions, the extent of the examination is estimated to be 89.5 percent of total accessible interior surface area and 100 percent of total accessible exterior surface area (see calculation of percentage inspected of total accessible surface area in Attachment 5).

Consistent with the proposed DC ISFSI Overpack AMP in LRA, Appendix A, the following acceptance criteria for external surfaces monitoring were used during the inspection:

- no detectable loss of material from the base metal, including uniform wall thinning, localized corrosion pits, and crevice corrosion
- no coating defects (e.g., peeling, delamination, blisters, cracking, flaking, and rusting)
- no indications of loose bolts or hardware, displaced parts

E.5.3 Concrete Inspection

Inspections of the accessible portions of the ISFSI storage pads and CTF concrete were conducted in accordance with DCPP Procedure PEP DF-19, Revision 1, "Inspection of ISFSI Concrete Structures," which implements the criteria of ACI 349.3R-18, "Report on Evaluation and Repair of Existing Nuclear Safety-Related Concrete Structures." The acceptance criteria for all concrete visual inspections are consistent with those contained in ACI 349.3R-18. ACI 349.3R-18 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. The inspection was performed by personnel qualified in accordance with ACI 349.3R.

For each ISFSI Storage Pad, an X-Y coordinate system was used to locate indications, with the northwest corner being (0,0). The X-direction is in the east-west (short direction) and the Y-direction is in the north-south (long direction) as shown in Attachment 3, Figures 1 – 7. Each pad is approximately 68 feet by 105 feet.

The CTF structure consists of a concrete slab at the bottom of the steel lined round section. The concrete pad is approximately 12 feet in diameter. In the center of the pad is a square recessed sump that is approximately 44 inches square by 20 inches deep. Surrounding the CTF structure are four anchor blocks that each have concrete pads that are approximately 10 feet by 10 feet. See in Attachment 3, Figure 8.

Deficiencies that did not exceed first tier degradation criteria were considered acceptable and required no further documentation; therefore, these deficiencies were not entered into CAP. Deficiencies that exceeded first tier were documented in accordance with the inspection procedure. Cracks were documented by measuring the location, width, and length of the cracked surface. Other deficiencies were documented by location and general dimensions of the defect. Calibrated crack comparator cards and tape measures were used to measure the remaining defect attributes.

E.5.4 Soil Sampling

Soil samples were obtained in the vicinity of the ISFSI (see Attachment 4 for the soil sample locations) to represent the soil conditions at the ISFSI storage pad concrete. A total of two soil samples were taken at a depth of 4 to 8 inches. All surface gravel and geotextile were discarded and representative portions from each of the entire soil columns were transferred to a qualified laboratory for analysis.

Consistent with NUREG-1801, Revision 2, Sections IX.D and IX.F, PG&E used the soil sample acceptance criteria for determination of a non-aggressive environment as follows:

Chloride	less than or equal to 500 ppm
Sulfate	less than or equal to 1500 ppm
pH	greater than or equal to 5.5

E.5.5 Radiation Monitoring

Radiation measurements were taken on all eight of the inspected overpacks. The measurements were obtained using calibrated gamma dose meters with valid energy ranges at the upper overpack vents in the normal storage configuration.

The acceptance criteria for radiation dose rate monitoring is less than 30.8 mrem/hour dose rate as measured at the external surface of the overpack upper vent. This acceptance criterion was established based on the calculated dose rate as discussed in the DC ISFSI UFSAR, Table 7.3-1B and Figure 7.3-1, Point 3 at the overpack upper vent for meeting the requirements of 10 CFR 20.

E.6 Pre-Application Inspection Results

This section presents the results from the inspections described in Section E.5. In summary, the pre-application inspection showed that the DC ISFSI SSCs are in good condition and that aging effects are consistent with the LRA. Inspection results yielded indications that were entered into the CAP for evaluation; however, none of the findings indicated a loss of SSC intended function.

E.6.1 MPCs

(See Attachment 1 photos)

The pre-application inspection demonstrated that the MPCs are maintaining their intended functions and are in overall good condition. There are several conditions that were noted and entered into CAP for evaluation (see a list of CAP entries in Section E.7). These conditions will be used in trending during future inspections. The conditions provide no challenge to the MPC intended safety functions prior to the next inspection as proposed in the MPC AMP (i.e., a sample of MPCs at least once every five years). Furthermore, there were no aging effects or mechanisms identified that deviated from those described in the MAPS Report. Each type of condition is presented in Table 3 with estimated dimensions where available and is evaluated further below.

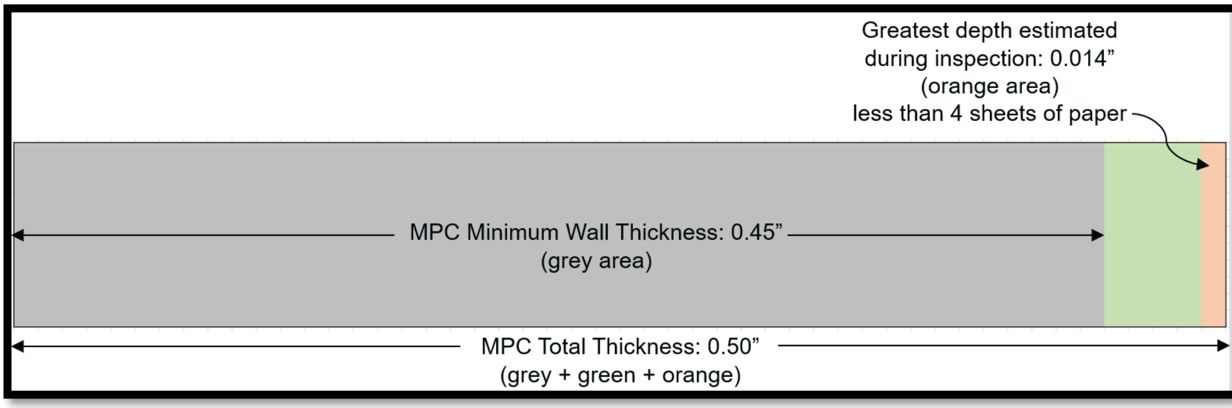
Table 3: Summary of Multi-Purpose Canister Indications and Findings

MPC #	Staining/ Discoloration	Scrape Marks	Rust [a]	Divots/ Gouges [b]	Other [a]	Example Photos (Attachment 1)	Disposition
17	X	X				1 – 3	Acceptable as-is; see Sections E.6.1.1 and E.6.1.2 below
123	X	X	X			4 – 12	
165	X		X	X		13 – 27	
166	X		X		X	28 – 41	
170	X		X	X		42 – 66	
251		X	X	X	X	67 – 74	
383	X	X	X	X	X	75 – 124	
503	X	X	X		X	125 – 169	

a. Indications had estimated depths up to 0.008 inches.
b. Indications had estimated depths up to 0.014 inches.

The evaluations below make reference to minimum MPC shell thickness. Figure 5 illustrates the difference between the actual total MPC wall thickness, minimum MPC wall thickness per design calculations (i.e., the minimum thickness in which there are no impacts to the intended safety functions), and indication depths observed during the inspections.

Figure 5: Explanation of Minimum Multi-Purpose Canister Wall Thickness



E.6.1.1 Evaluation of MPC Discoloration, Staining, and Rust

Almost all MPCs experienced varying degrees of discoloration and deposit staining on the MPC shells. The origins of these could have occurred from a multitude of different scenarios from fabrication to being loaded with fuel on the ISFSI and coming in contact with rainwater or dust through the HI-STORM vents. Regardless of the origin, there is no observed degradation on the MPC shells from the discoloration or staining; therefore, there is no impact on the MPC shell base material.

The inspection of the MPCs also identified areas of rust, some being surface rust with no observable degradation and others being rust build up or having depth. Most of this rust could be seen on the MPC shell itself, but there were examples of rust on the MPC welds as well (e.g., MPC #170). Similar to the discoloration discussion above, this rust could have been caused during fabrication activities or during shipment and loading contact with handling slings.

The rust indications on the MPC are superficial (i.e., 0.008 inches or less, which equates to the approximate thickness of two sheets of paper) and show no indications of MPC degradation, and therefore, pose no threat of penetrating into the material and damaging the shell’s structural integrity or shielding capabilities. In accordance with NUREG-2214, "Managing Aging Processes in Storage," negligible general corrosion or rusting is expected in dry storage canisters and is not considered a credible aging mechanism. Furthermore, the constant air flow through the overpack vents will result in oxidization of any free iron present on the MPC shell surface resulting in the formation of an iron oxide layer on the surface. Once the free iron has oxidized, further rusting is not expected (i.e., the oxide layer becomes protective). Based on an engineering assessment of the observed conditions, the rust is expected to remain superficial and not progress through the canister wall.

The rust that was observed to have depth up to approximately 0.008 inches into the MPC shells and the rust located on the MPC welds is classified as pitting and crevice corrosion. The observed rust depth of approximately 0.008 inches is approximately 1.8 percent of the minimum MPC shell thickness. Engineering evaluation concludes the pitting and crevice corrosion rates for the MPC are within those evaluated in NUREG-2214, "Managing Aging Processes in Storage," and thus will not propagate through-wall during 60 years of storage. In particular, NUREG-2214 Section 3.2.2.2 cites research findings that indicate (1) pitting rates measured under aggressive marine environments would require more than 250 years to penetrate the MPC shell; and (2) penetration rates for crevice corrosion would require more than 400 years to penetrate the MPC shell. Further, NUREG-2214, Table 6-2, Element 10, cites research findings that yield a SCC growth rate of 0.06 inches in a 5-year period (see Figure 5 for MPC minimum wall thickness). Therefore, the next inspection interval of 5 years as proposed in the MPC AMP is acceptable.

E.6.1.2 Evaluation of Multi-Purpose Canister Scrape Marks, Divots, and Gouges

Superficial scratches and scrape marks were observed. Because these had no associated observable depth, the indications are acceptable as-is with no impacts to the intended functions.

Some divots and gouges observed had estimated depths up to 0.014 inches (equates to the approximate thickness of less than four sheets of paper). Engineering evaluation concluded these depths equate approximately 3.1 percent of the minimum MPC shell thickness. Therefore, there are no impacts to the intended functions.

E.6.2 Overpacks

(See Attachment 2 photos)
The pre-application inspection demonstrated that the overpacks are maintaining their intended functions and are in overall good condition. There are several conditions that were noted and entered into CAP for evaluation (see a list of CAP entries in Section E.7). The conditions provide no challenge to the overpack intended safety functions prior to the next inspection as proposed in the Overpack AMP (i.e., a sample of overpacks at least once every five years). Furthermore, there were no aging effects or mechanisms identified that deviated from those described in the MAPS Report. Each type of condition is presented in Table 4 and evaluated further below.

Table 4: Summary of Overpack Indications

#	Paint Chip	Interior Rust	Exterior Rust	Divots/ Gouges	Staining	Debris	Coating Damage	Example Photos (Attachment 2)	Disposition
93	X	X	X	X	X	X		1 – 12	Acceptable as-is; see Sections E.6.2.1 and E.6.2.2 below
318	X		X		X			15 – 22	
507	X		X				X	23 – 33	
514	X		X	X	X			34 – 43	
516	X		X	X	X	X		44 – 54	
639	X		X	X	X			55 – 63	
881	X		X	X	X			64 – 72	
1096	X		X	X	X		X	73 – 90	

E.6.2.1 Evaluation of Overpack Staining, Rust, Paint Chips, and Coating Damage

As with the MPCs, almost all overpacks experienced varying degrees of discoloration and deposit staining on the shells. Because there is no observed degradation on the overpack shells from the discoloration or staining, there is no impact on the overpack material.

Rusting was identified with no observable depth into the base material. Engineering evaluation concluded the overpack exterior portions can experience up to 0.125 inches depth of material loss without a loss of intended function. Because these rust spots are much less than the allowable material loss depth, there are no impacts to the intended functions.

All remaining paint chipping and coating damage is superficial and does not pose a threat to penetrate into the material. Therefore, these signs of corrosion do not have an impact on the overpack intended functions.

E.6.2.2 Evaluation of Overpack Divots, Gouges, and Debris

Divots/gouges were identified on multiple overpack inner shells. There are no estimated dimensions for these divots, but they are observed to be very shallow in nature. Engineering evaluation concluded the inner shell can experience up to 0.25 inch depth of material loss without a loss of intended function. Because these divots are much less than the allowable material loss depth, there are no impacts to the intended functions.

Debris was observed at the bottom of the overpack annuluses. This minor amount of debris does not have an impact to the MPC or overpack intended functions because there is sufficient air flow to allow for adequate cooling.

E.6.3 Independent Spent Fuel Storage Installation Storage Pad Concrete

There were a total of 43 indications that exceeded the tier 1 and/or tier 2 degradation criteria (summarized in Table 5 below). While the indications were observed during the concrete inspection, because the concrete is structurally sound, none prevent the SSC from performing its intended function or require immediate corrective action. These indications will be evaluated in the CAP and the information used for future trending purposes

Tier 1

There were a total of 37 indications that exceeded the tier 1 degradation criteria, but which meet the tier 2 criteria. Because the indications did not meet the acceptance criteria, the condition was entered into CAP for evaluation (SAPN 51127961). See Attachment 3 photos and Figures 1 – 7 for results.

- 26 concrete cracks were found with widths greater than 0.015 inches but less than 0.040 inches. Examples of this cracking are shown in Attachment 3 photos 2, 3, 4, and 5.
- There were seven areas of shallow scaled/peeled surface. Each of the seven scaled areas is located near the overpack anchorage rings.
- Four surface voids with diameters greater than 0.75 inches were observed.

Tier 2

6 of the 37 reportable indications exceed the second tier criteria.

Five areas of delamination were observed on the eastern edge of the pad. These locations had “drummy” sounding concrete[4] and were found by visual inspection and hammer sounding. Each of the delaminated areas was located along the eastern joint on pad 1 in the Vertical Cask Transporter travel path (see Attachment 3 photo 1).

One surface void greater than 2 inches in diameter was found during the inspection of pad #1. The void is approximately 3 inches by 2 inches with a maximum depth of 0.5 inches and is located near the northeastern edge of the pad. Additional testing performed on the concrete around the void area was to sound for “drummy” concrete. Results showed the void surface and surrounding concrete was sound and intact.

Because these conditions did not meet the acceptance criteria, the conditions were entered into CAP for evaluation (SAPN 51127962).

[4] "Drummy" refers to an area where there is a hollow sound beneath a layer of concrete due to a delamination, poor consolidation, or void.

Table 5: Summary of Independent Spent Fuel Storage Installation Storage Pad Concrete Indications Exceeding the First Tier Criteria

Pad Number	Indication	X, Y (ft)	Length (in)	Width (in)	Depth (in)
1	Crack	0, 1	24	0.030	
1	Void	8, 1	3	2	0.50
1	Scaling	36, 22	18	1	0.20
1	Scaling	10, 28	18	1	0.38
1	Scaling	28, 29	2	1	0.20
1	Delamination	0, 1	12	4	
1	Delamination	0, 24	72	4	
1	Delamination	0, 33	24	5	
1	Delamination	0, 38	12	4	
1	Delamination	0, 49	72	4	
1	Scaling	32, 73	18	2	0.20
2	Scaling	35, 19			0.20
2	Crack	0, 47	36	0.018	
2	Scaling	15, 53	6	1	0.20
2	Scaling	20, 91	2	1	0.20
4	Crack	1, 56	12	0.016	
5	Crack	27, 45	4	0.020	
5	Crack	65, 48	24	0.020	
5	Crack	0, 50	12	0.018	
5	Crack	0, 54	12	0.018	
5	Crack	0, 57	12	0.018	
5	Crack	65, 64	12	0.020	
5	Crack	0, 77	6	0.018	
6	Crack	42, 55	6	0.020	
7	Crack	15, 16	24	0.018	
7	Crack	18, 18	24	0.018	
7	Crack	66, 46	18	0.016	
7	Crack	1, 49	12	0.018	
7	Crack	1, 60	12	0.018	
7	Crack	48, 95	24	0.018	
7	Crack	48, 99	24	0.018	
7	Crack	7, 88	24	0.020	
7	Crack	23, 37	12	0.030	
7	Crack	25, 87	24	0.018	
7	Crack	21, 37	24	0.030	
7	Crack	43, 86	24	0.016	
7	Crack	33, 70	24	0.020	
7	Crack	38, 83	24	0.016	
7	Crack	40, 90	24	0.016	
7	Void	3, 21	1	1	0.25
7	Void	27, 35	1	1	0.75
7	Void	63, 98	1	1	0.25
7	Void	8, 26	1	1	0.25

E.6.4 Cask Transfer Facility Structural Concrete

There were a total of five indications that exceeded the tier 1 and/or tier 2 degradation criteria. While the indications were observed during the concrete inspection, because the concrete is structurally sound, none prevented the SSC from performing its intended function or required immediate corrective action. These indications will be evaluated in the CAP and the information used for future trending purposes

Tier 1

There were a total of three indications that exceeded the tier 1 degradation criteria, but which meet the tier 2 criteria, and are summarized below. Because the indications did not meet the acceptance criteria, the condition was entered into CAP for evaluation (SAPN 51127961). See Attachment 3 photos and Figure 8 for results.

- Two concrete cracks were found with a width greater than 0.015 inches but less than 0.040 inches.
- One delamination was found that was approximately 15 inches by 8 inches as shown in Attachment 3 photo 6. The delamination is adjacent to the steel ring section. Surface penetrating radar was used to determine that the depth of concrete cover near the delamination is approximately 4 inches. Findings do not indicate the delamination extends to the depth of the reinforcing steel.
- Two general areas of poor consolidation were observed in the recessed sump area. The poorly consolidated regions are shown in Attachment 3 photo 7.

Tier 2

Two of the five reportable indications exceed the second tier criteria. These locations were surface voids greater than 2 inches in diameter in the sump of the CTF structure. The first surface void that measured 4 inches by 20 inches with a maximum depth of 0.75 inches (versus the 20 inch concrete thickness) was found on the southeast vertical face of the sump. The second surface void that measured 4 inches by 12 inches with a maximum depth of 0.75 inches (versus the 20 inch concrete thickness) was located on the southwest vertical face of the sump. Additional testing performed on the concrete around each of the two void areas was to sound for “drummy” concrete. Results showed the void surfaces and surrounding concrete were sound and intact. Because these conditions did not meet the acceptance criteria, the conditions were entered into CAP for evaluation (SAPN 51127962).

E.6.5 Soil Sampling

As shown in Table 6, all soil sample results meet the NUREG-1801, Revision 2, Sections IX.D and IX.F criteria for non-aggressive soil. Although the soil is non-aggressive, the soil conditions may change over time. Thus, as discussed in LRA Appendix A, PG&E will conduct soil sampling and lab analysis on a five-year frequency to confirm that the soil surrounding the DC ISFSI remains non-aggressive during the PEO.

Table 6: Soil Sample Results

Parameter/acceptance criteria	Location 1	Location 2
Chloride (ppm) / <500	None Detected	53
Sulfate (ppm) / <1500	None Detected	75
pH / >5.5	7.92	7.97
Meets All Criteria for Non-Aggressive Soil	Yes	Yes

E.6.6 Radiation Monitoring

As discussed in Section E.5.5, dose rates were measured at the inspected overpack upper vents. As shown in Table 7 below, the highest measured dose rate at the overpack upper vents was 1.2 mrem/hour (3.9 percent of the acceptance criterion). Because the dose rates met the inspection acceptance criteria, there were no entries into the CAP for DC ISFSI radiation monitoring.

Table 7: Radiation Monitoring Results

Overpack Serial No.	Dose Rate (mrem/hr)	Percent of Acceptance Criterion (30.8 mrem/hr)
93	1.0	3.2
318	0.6	1.9
507	0.8	2.6
514	0.3	1.0
516	0.4	1.3
639	1.0	3.2
881	0.6	1.9
1096	1.2	3.9

E.7 Pre-Application Inspection Conclusions

As discussed in Section E.6, the DC ISFSI is in overall good condition and continues to perform its intended safety functions. The following items were entered into CAP for evaluation and determination of corrective actions.

1. MPC 17 – SAPN 51126762
2. MPC 123 – SAPN 51126763
3. MPC 165 – SAPN 51126764
4. MPC 166 – SAPN 51126765
5. MPC 170 – SAPN 51126766
6. MPC 251 – SAPN 51126767
7. MPC 383 – SAPN 51126768
8. MPC 503 – SAPN 51126769
9. Overpack 93 – SAPN 51126863
10. Overpack 318 – SAPN 51126864
11. Overpack 507 – SAPN 51126865
12. Overpack 514 – SAPN 51126866
13. Overpack 516 – SAPN 51126867
14. Overpack 639 – SAPN 51126868
15. Overpack 881 – SAPN 51126869
16. Overpack 1096 – SAPN 51126870
19. Concrete Inspection: >Tier 1 Findings – SAPN 51127961
20. Concrete Inspection: >Tier 2 Findings – SAPN 51127962

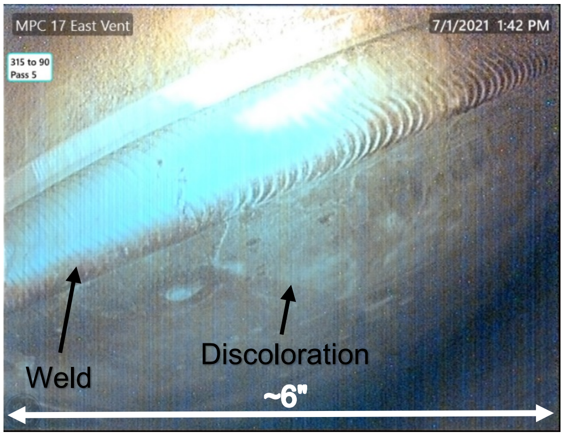
While the conditions entered into CAP do not prevent the SSCs from performing their intended functions, the information will be evaluated and used for future trending. The inspection results were entered into the ISFSI AMID. There were no aging effects or mechanisms identified that deviated from those described in the MAPS Report. Based on review of the inspection results, the aging effects discuss in the LRA are appropriately identified. The AMPs proposed in LRA Appendix A will adequately manage the aging associated with the DC ISFSI and will be modified, as necessary, based on future inspection results.

Attachment 1

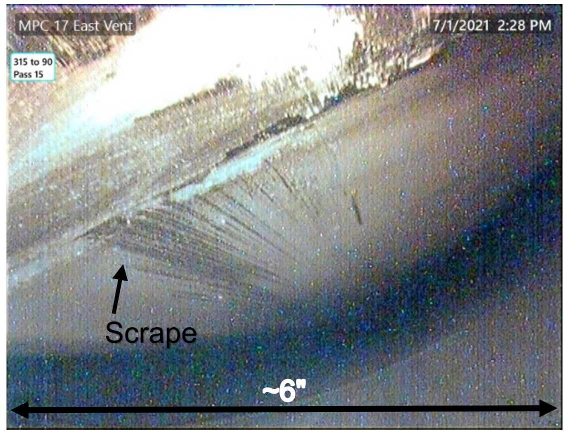
Multi-Purpose Canister Exam Results Photos

Note: Static in photos is a camera effect from radiation. The 6 inch dimension shows the field-of-view width.

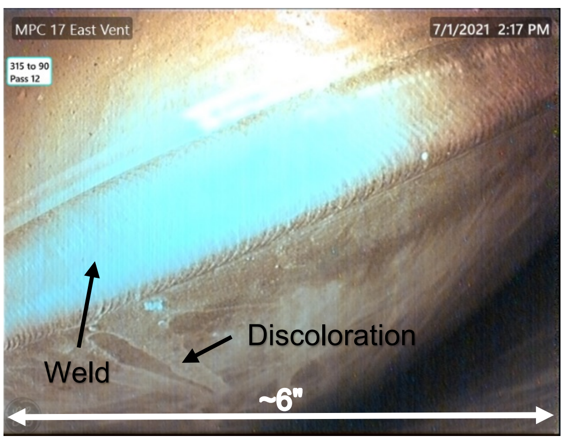
1.1, Multi-Purpose Canister Serial #17 Photos



1. Light discoloration on MPC

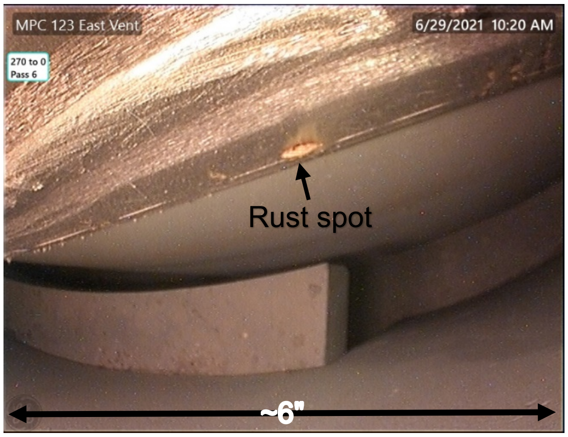


2. Superficial scrape marks on MPC



3. Deposit discoloration on MPC

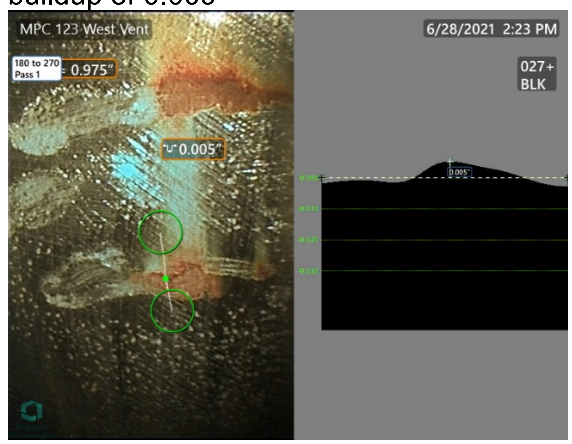
1.2, Multi-Purpose Canister Serial #123 Photos



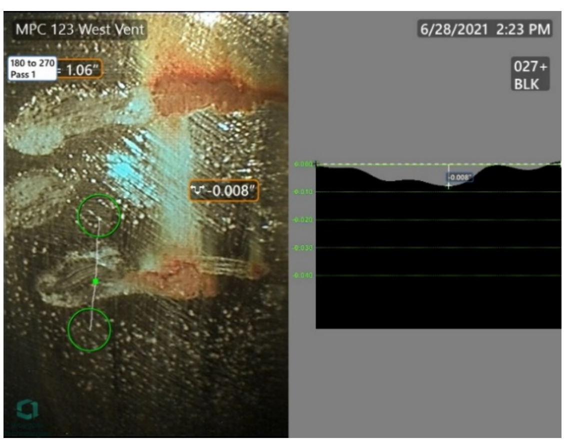
4. Rust spot at bottom area of MPC

4a. Rust spot (photo 4) measurement, buildup of 0.009" [5]

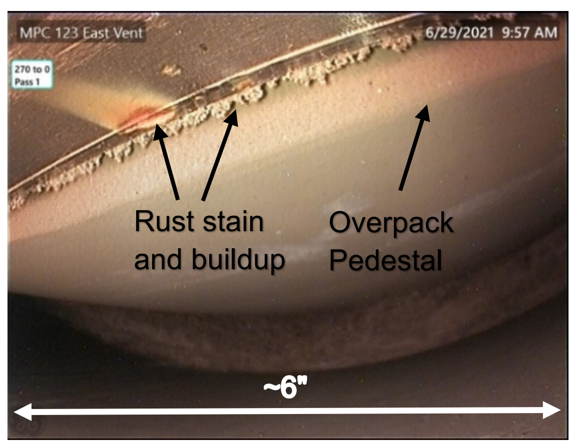
5. Rust spots on MPC



5a. Rust spots (photo 5): 0.005" buildup [4]

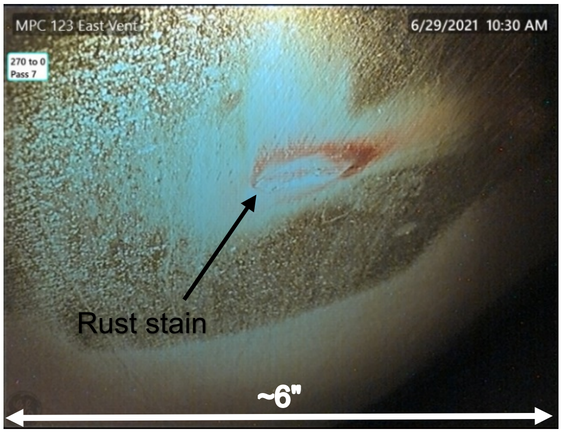


5b. Rust area (photo 5) is 0.008" deep [4]

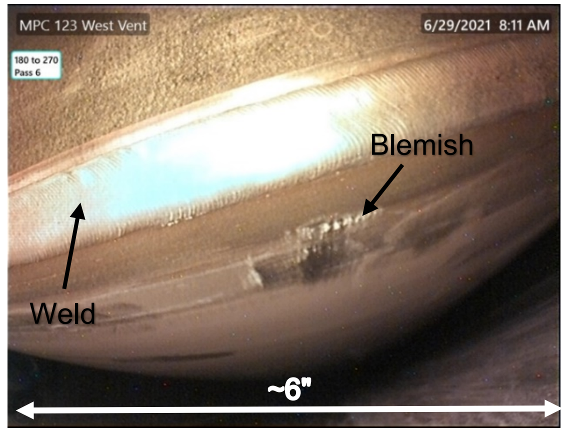


6. Rust stain and deposit buildup at bottom of MPC

[5] Depth/height measurements obtained with a commercial grade video probe and are considered information only



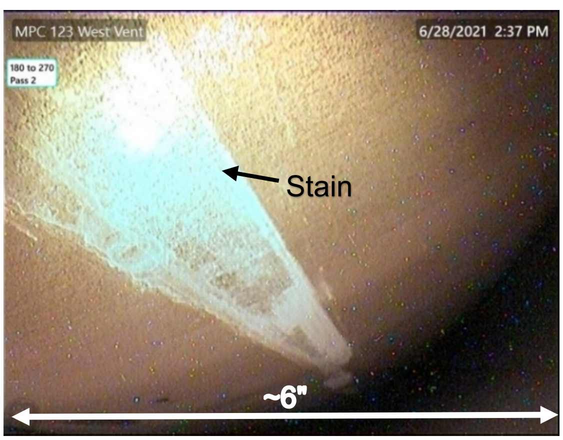
7. Rust stain discoloration on MPC, not 3-D



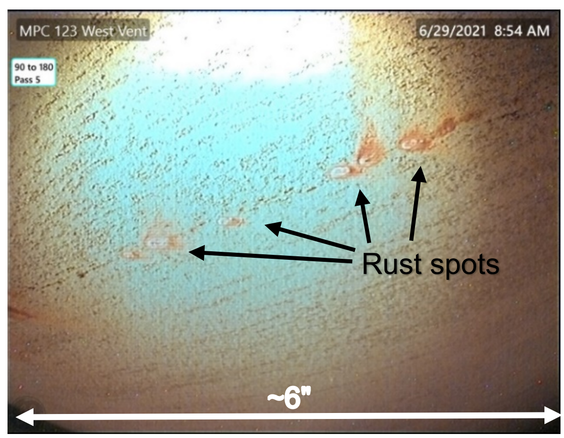
8. Light superficial deposit or blemish on MPC

9. Superficial scratches on MPC

10. Superficial scratches on MPC continued



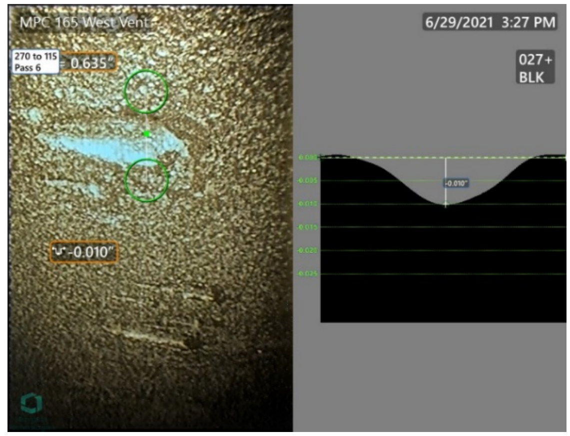
11. Deposit stain on MPC



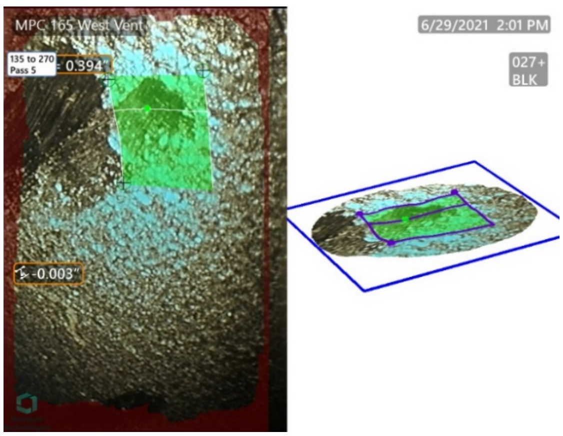
12. Area of rust spots on MPC, no observable degradation

1.3, Multi-Purpose Canister Serial #165 Photos

13. Minor divots in MPC

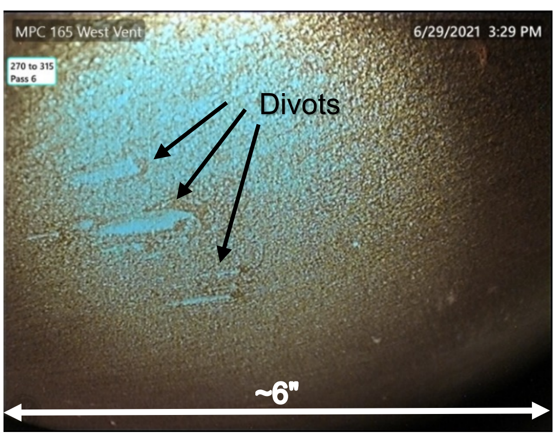


13a. Divot (photo 13): 0.010" deep [6]

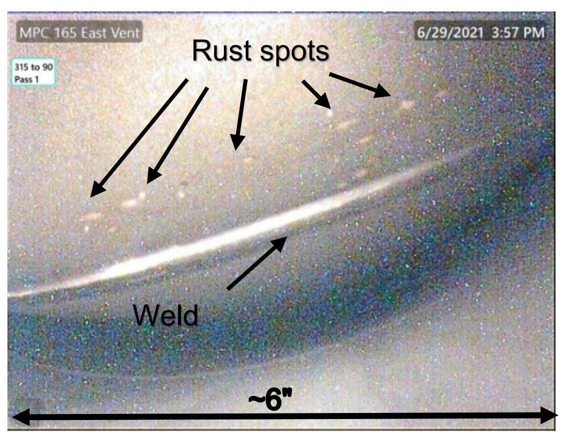


13b. Divot area (photo 13): 0.003" deep [5]

14. Deposit staining on MPC

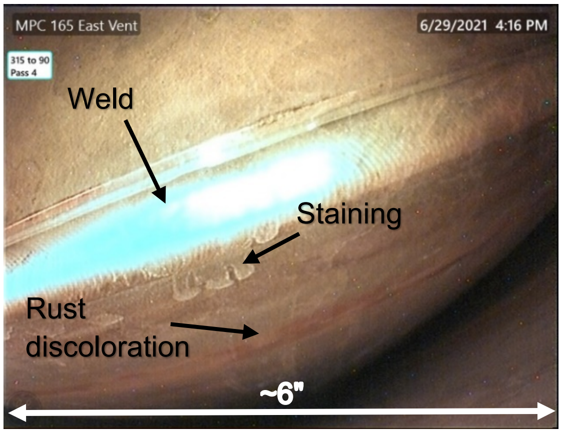


15. Other divots in MPC

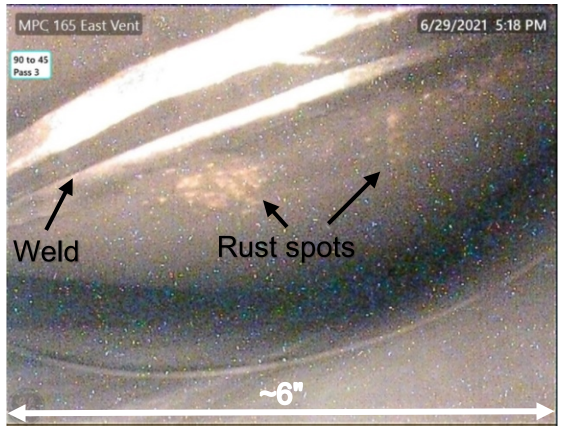


16. Rust spots near middle weld of MPC, not 3-D

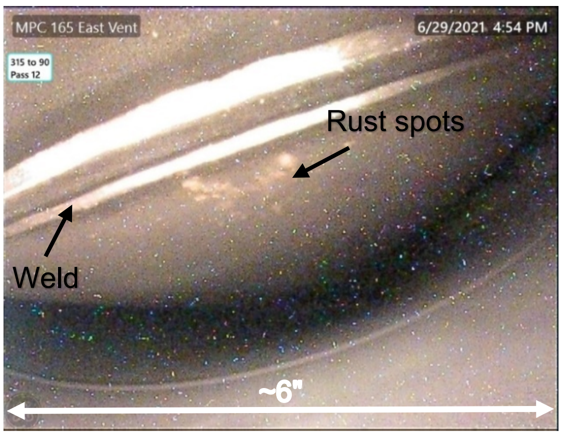
[6] Depth/height measurements obtained with a commercial grade video probe and are considered information only



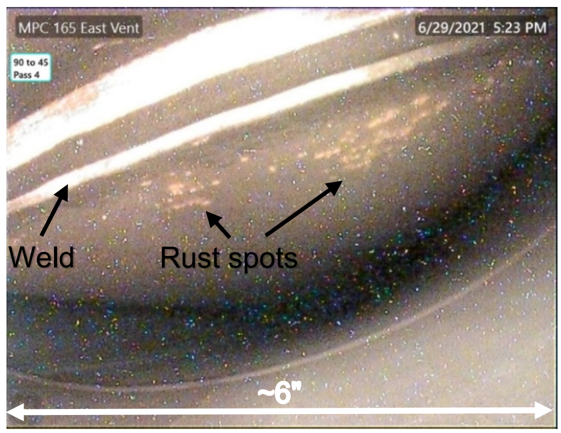
17. Deposit staining and rust discoloration near top of MPC



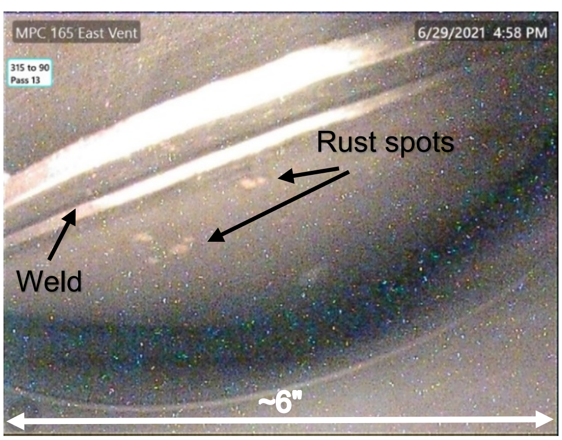
18. Rust spots near middle weld of MPC, not 3-D



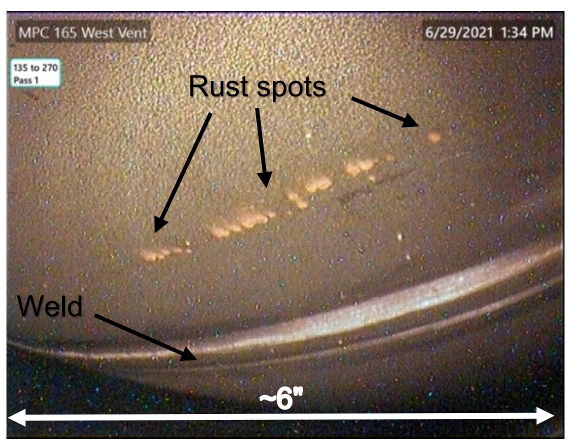
19. Rust spots near middle weld of MPC, not 3-D



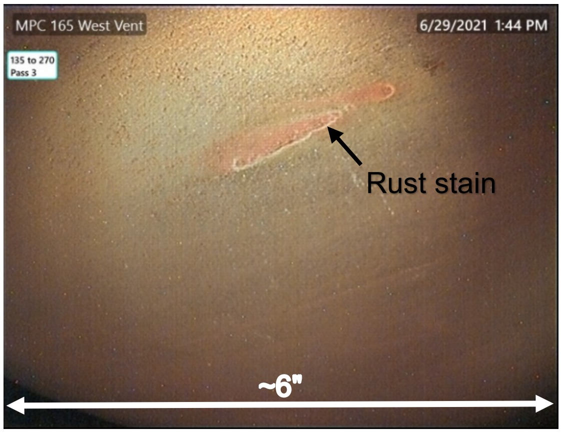
20. Rust spots near middle weld of MPC, not 3-D



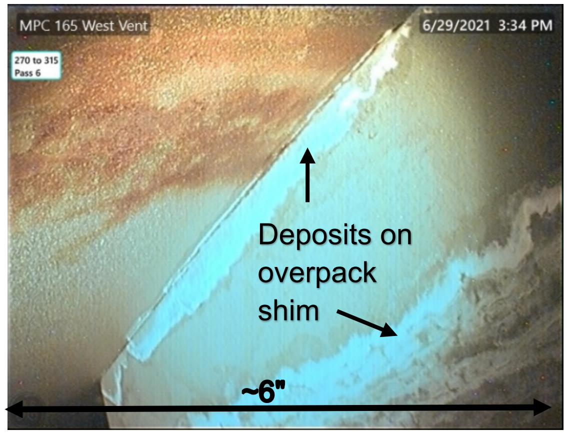
21. Rust spots near middle weld of MPC, not 3-D



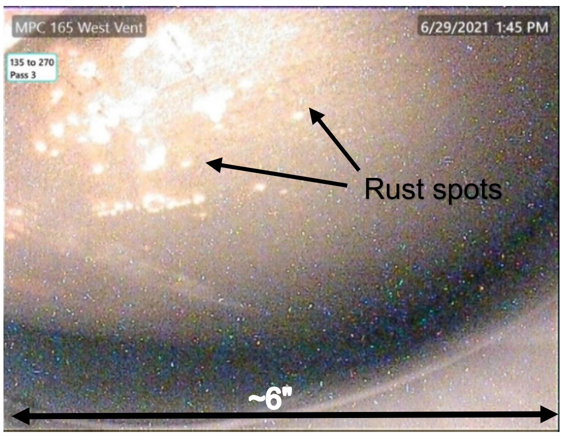
22. Rust spots near middle weld of MPC, not 3-D



23. Rust stain on MPC, not 3-D

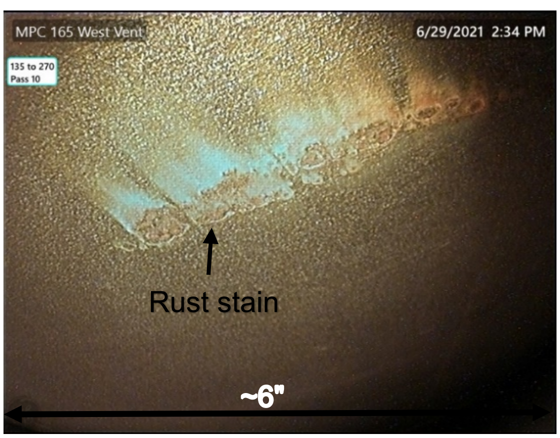


24. Deposit on shim and rust discoloration band on MPC

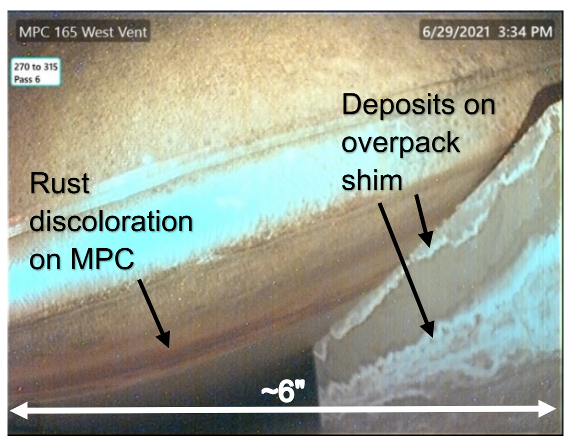


25. Rust spots near middle weld of MPC, not 3-D

25a. Close up (photo 25) rust spots near middle weld of MPC, not 3-D

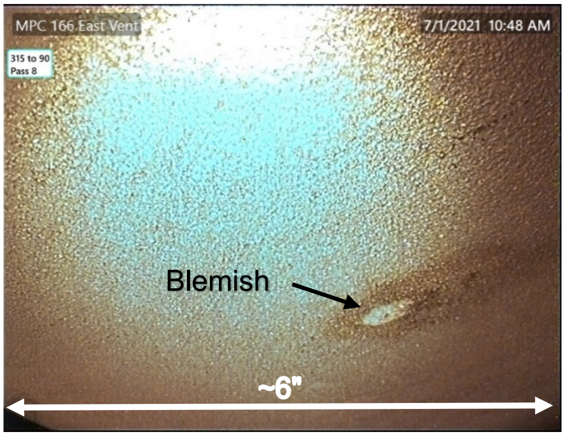


26. Sporadic rust stains on MPC, not 3-D

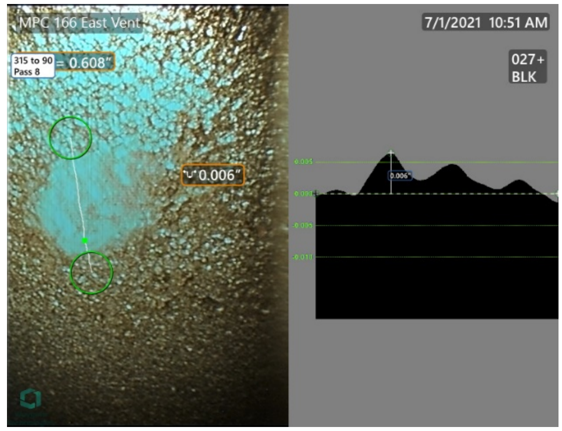


27. Deposit on shim and rust discoloration band on MPC

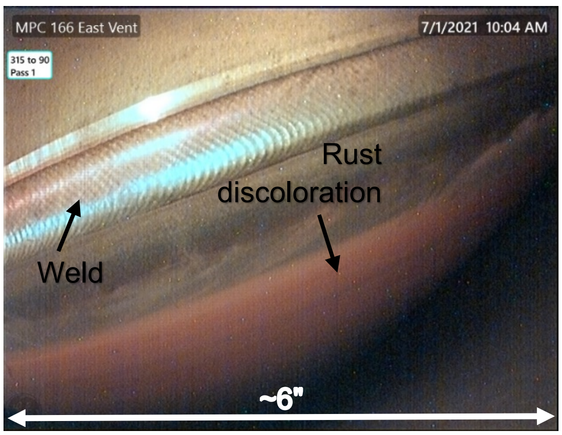
1.4, Multi-Purpose Canister Serial #166 Photos



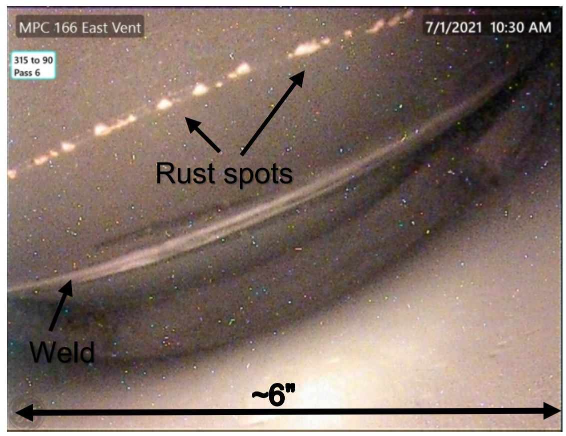
28. MPC blemish that is buildup, 0.006"



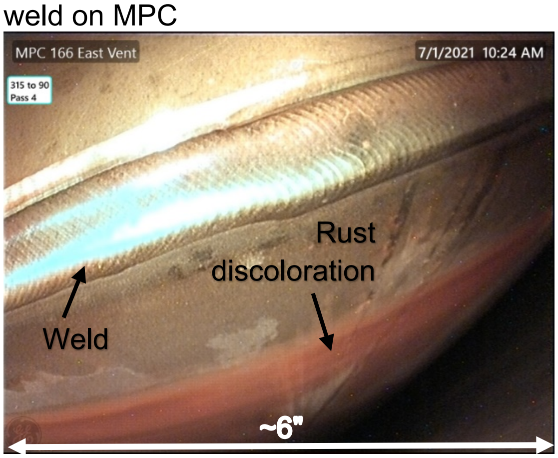
28a. 0.006" buildup measurement [7]



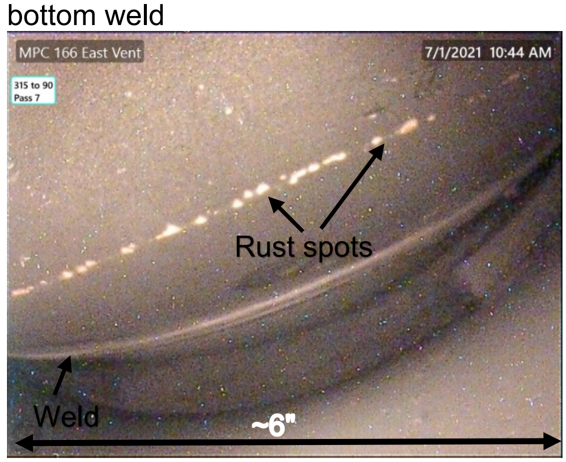
29. Rust discoloration band below top weld on MPC



30. Sporadic rust spots on MPC near bottom weld

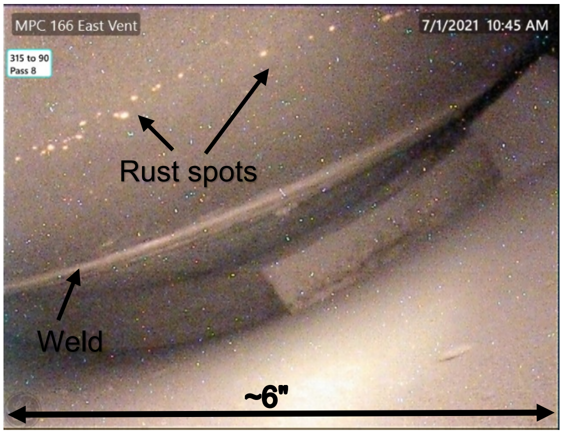


31. More of rust discoloration band

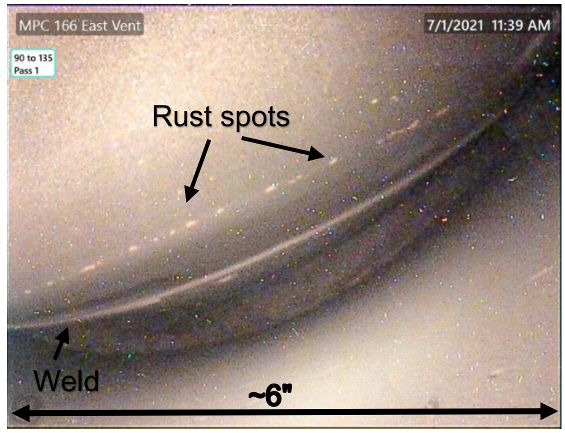


32. Sporadic rust spots on MPC near bottom weld (continued)

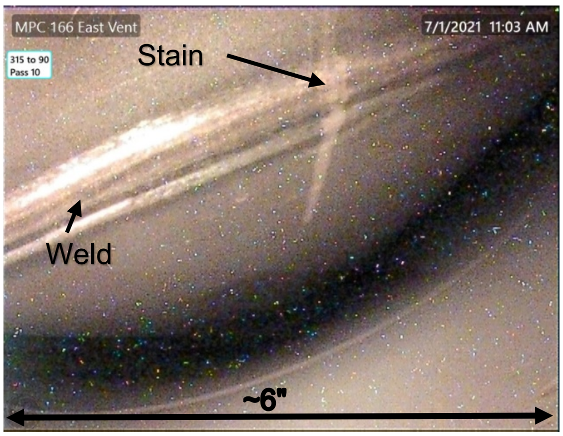
[7] Depth/height measurements obtained with a commercial grade video probe and are considered information only



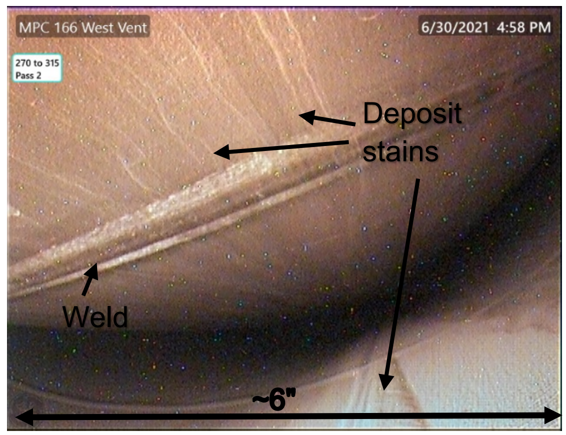
33. Sporadic rust spots on MPC near bottom weld (continued)



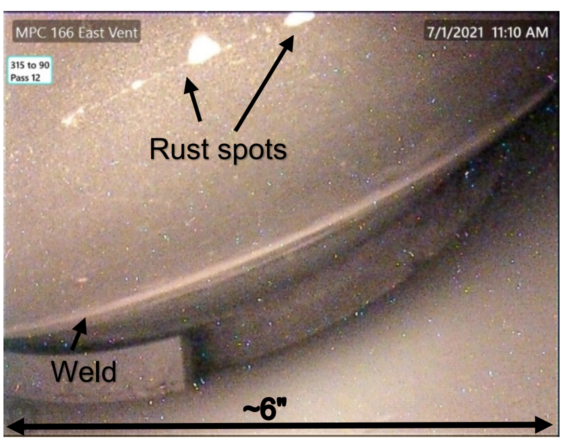
34. Sporadic rust spots on MPC near bottom weld (continued)



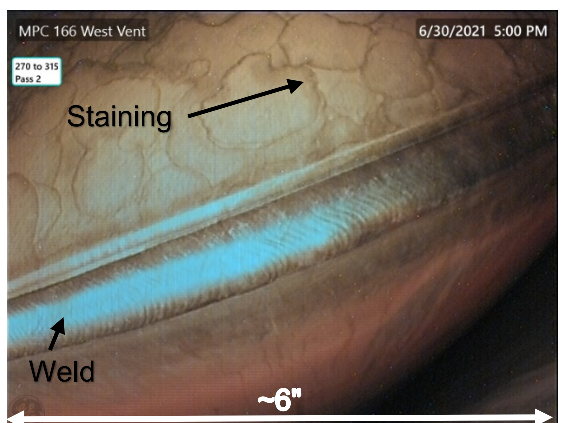
35. Stain on MPC at middle weld, not 3-D



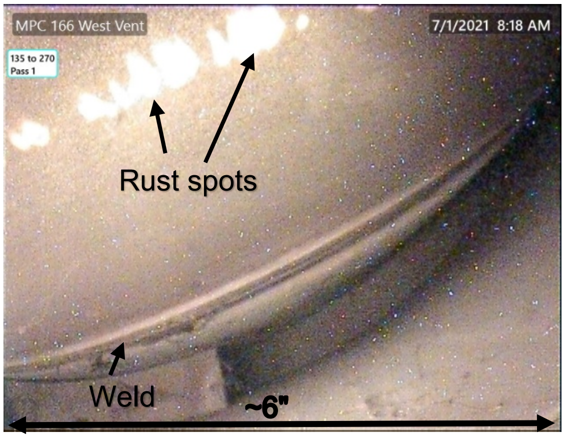
36. Deposit stains on overpack and MPC



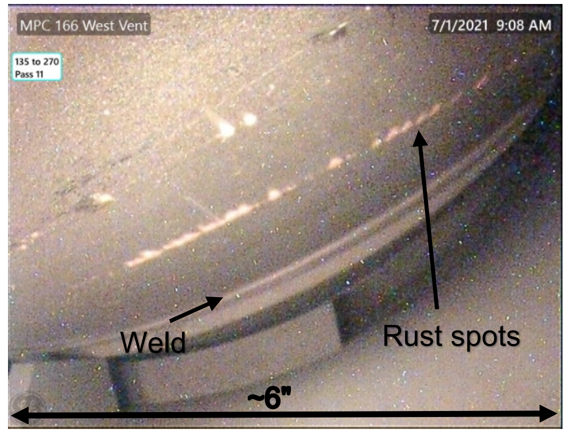
37. Sporadic rust spots on MPC near bottom weld (continued)



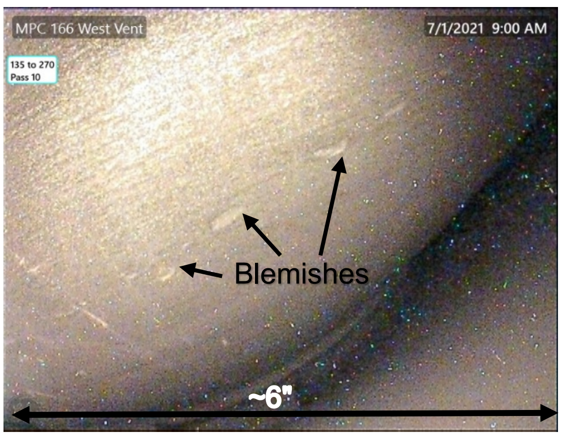
38. Staining on top of MPC, not 3-D



39. Sporadic rust spots on MPC near bottom weld (continued)

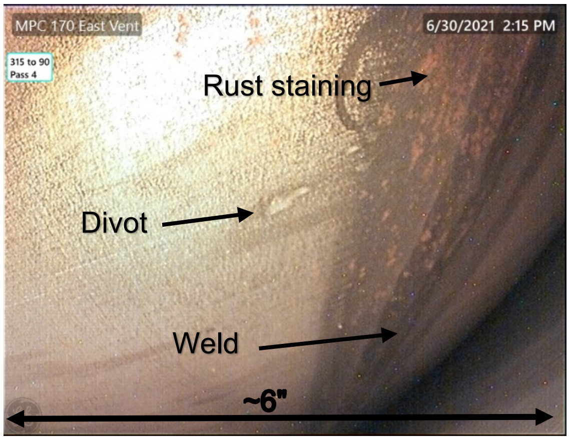


40. Sporadic rust spots on MPC near bottom weld (continued)

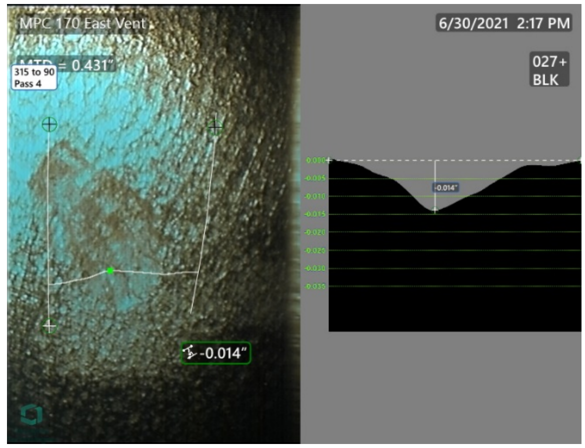


41. Blemishes on MPC, no measurable depth

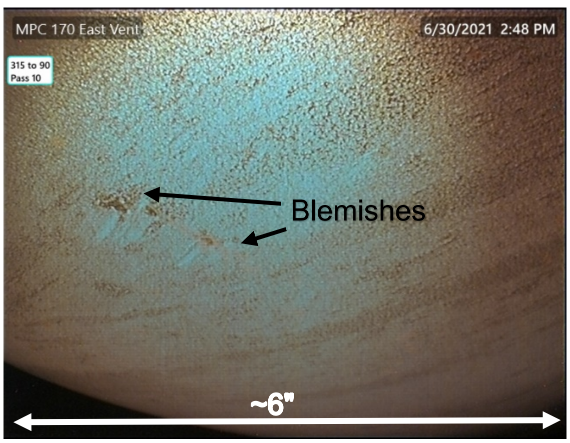
1.5, Multi-Purpose Canister Serial #170 Photos



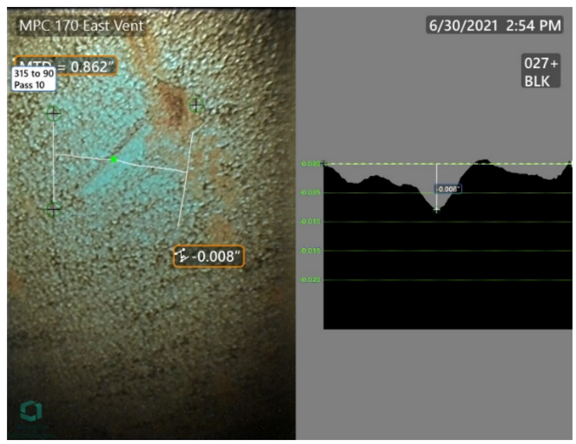
42. Divot in MPC and rust staining on longitudinal weld



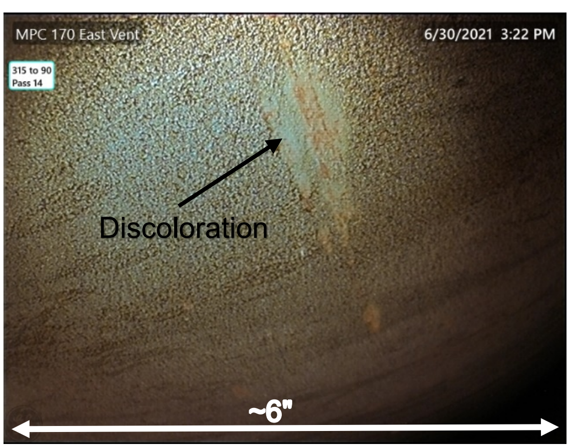
43. Divot measures 0.014" deep [8]



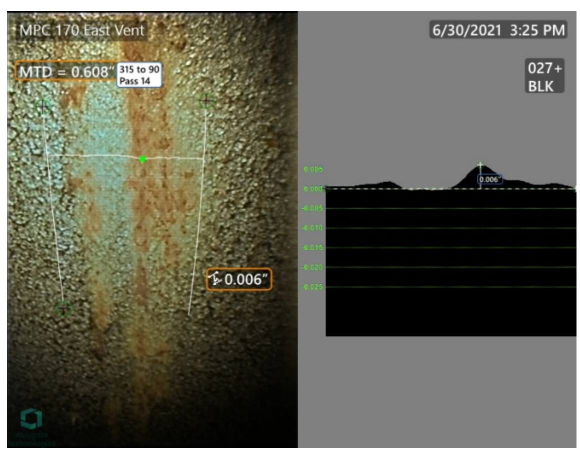
44. Blemishes on MPC



45. Blemishes measure 0.008" deep [7]

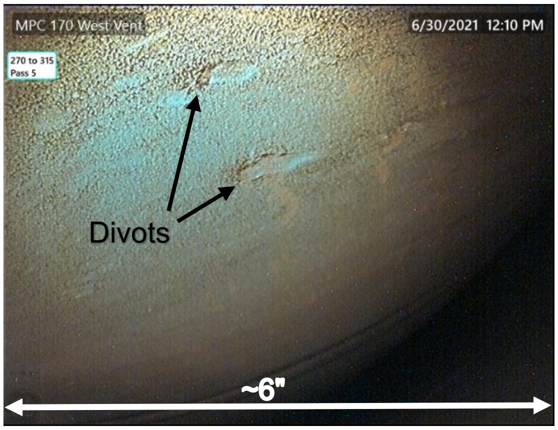


46. Discoloration on MPC

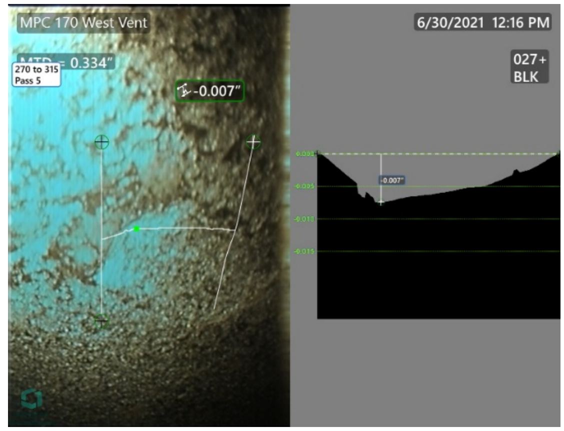


47. Discoloration is buildup of 0.006" [7]

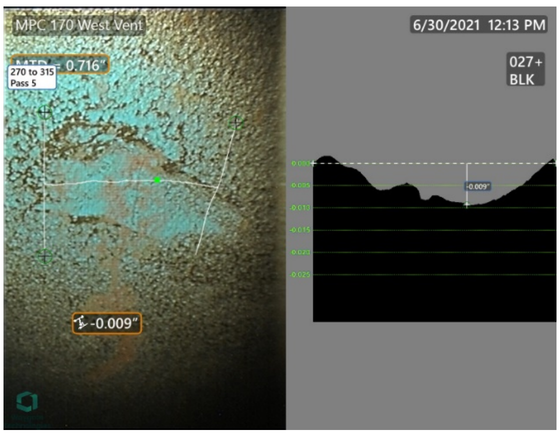
[8] Depth/height measurements obtained with a commercial grade video probe and are considered information only



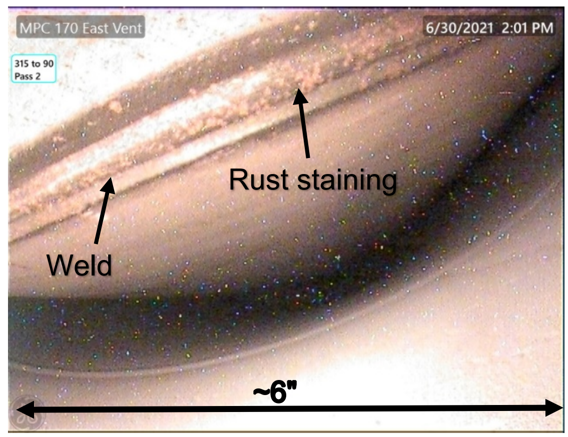
48. Divots in MPC



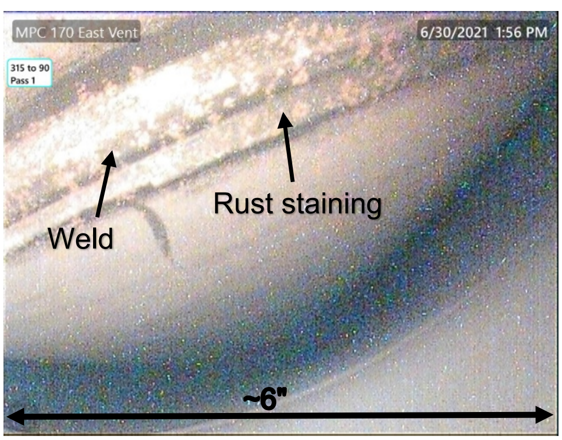
48a. One divot measures 0.007" deep [9]



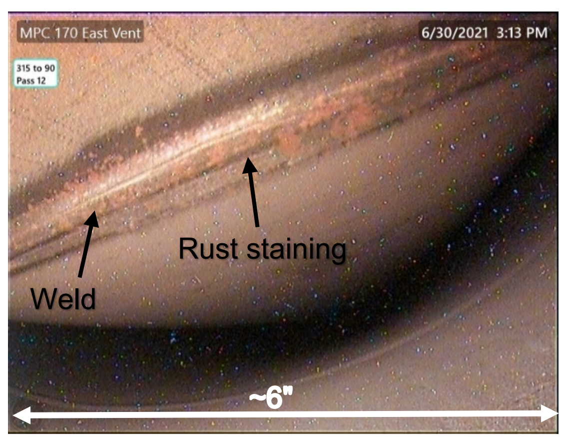
48b. Other divot measures 0.009" deep [8]



49. Rust staining on middle MPC circumferential weld

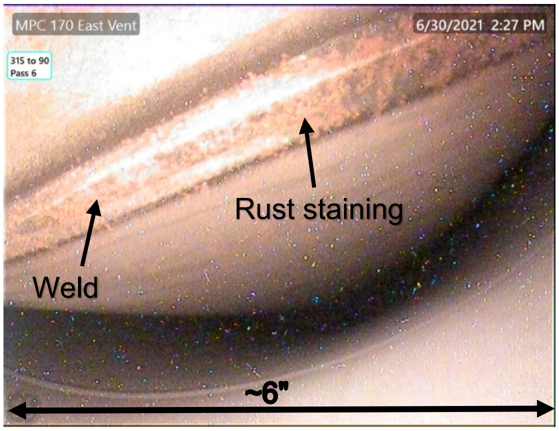


50. Rust staining on middle MPC circumferential weld (continued)

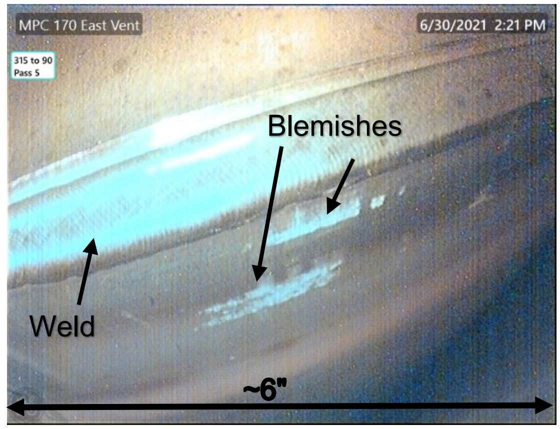


51. Rust staining on middle MPC circumferential weld (continued)

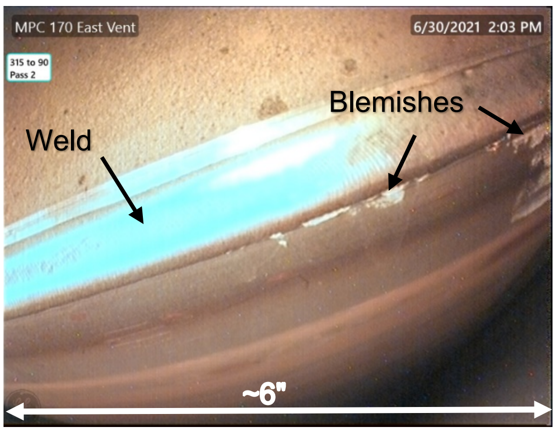
[9] Depth/height measurements obtained with a commercial grade video probe and are considered information only



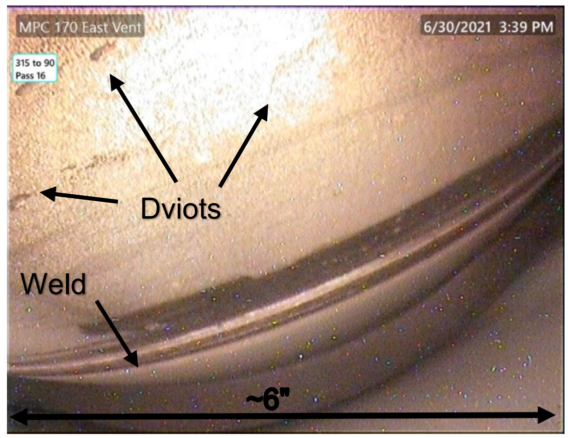
52. Rust staining on middle MPC circumferential weld (continued)



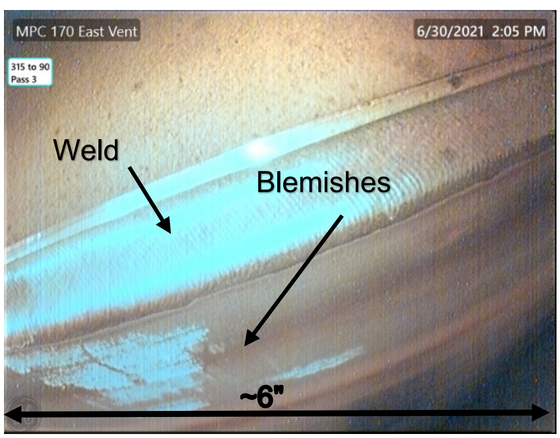
53. Blemishes below upper weld of MPC



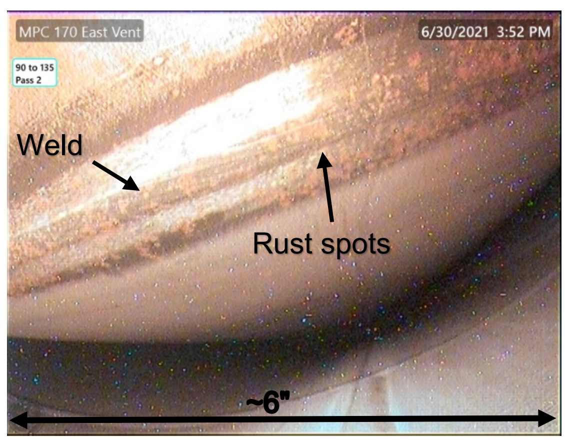
54. Blemishes below upper weld of MPC



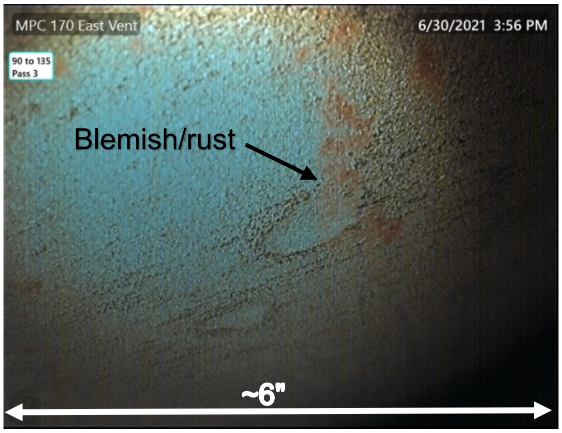
55. Divots in MPC, not measured, appear shallow



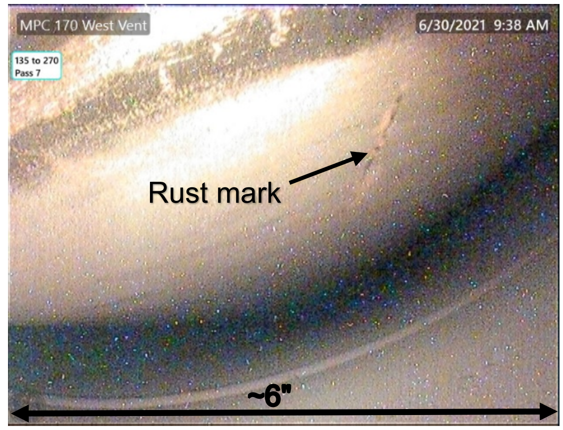
56. Blemishes below upper weld of MPC (continued)



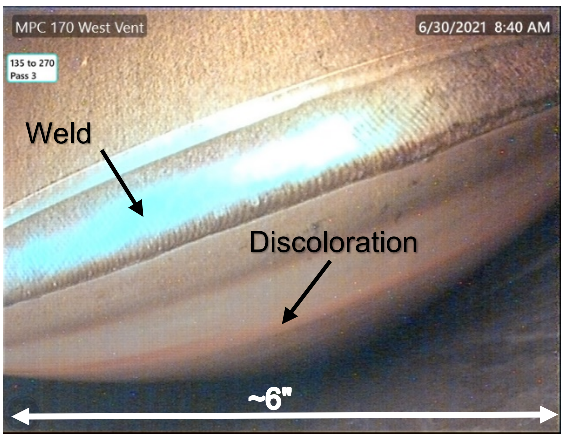
57. Deposit running down overpack and rust on MPC weld



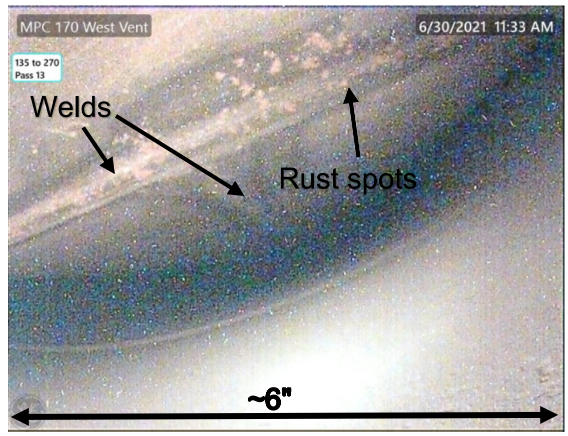
58. Blemishes / rust on MPC, superficial



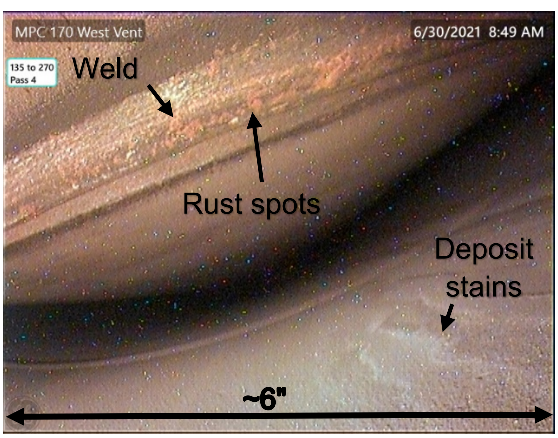
59. Rust mark on MPC, not 3-D



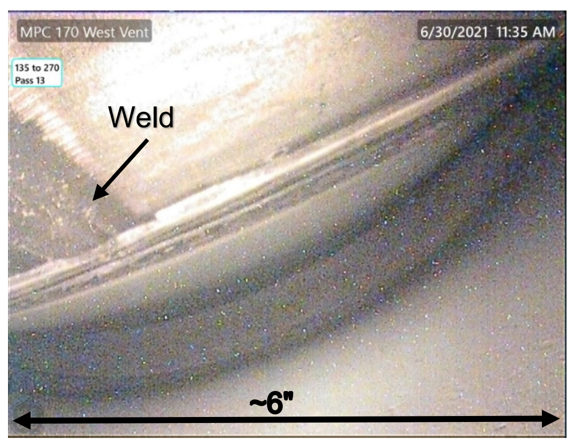
60. Rust colored discoloration below upper weld of MPC



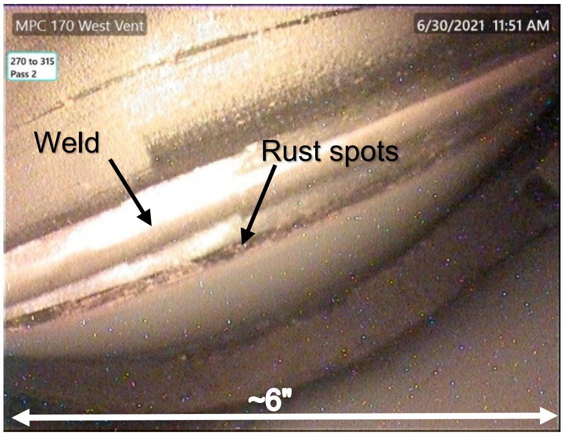
61. Rust on longitudinal weld below, as well as circumferential weld



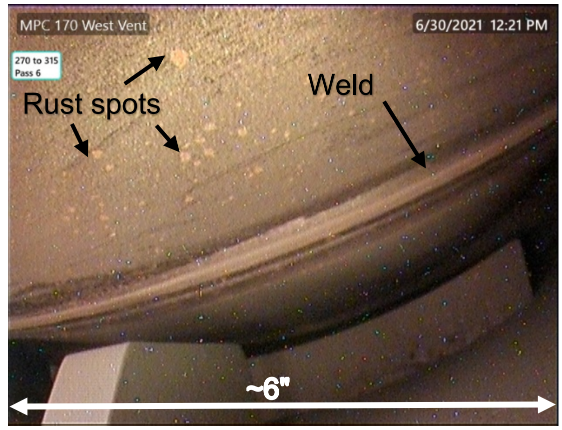
62. Deposits on overpack, rust on MPC weld



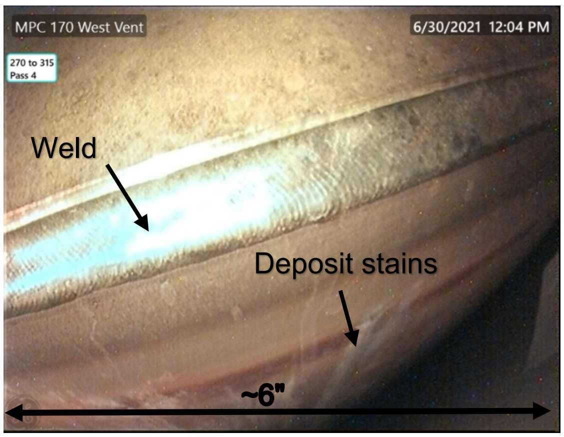
63. Other end of longitudinal weld



64. Rust spots along lower MPC weld



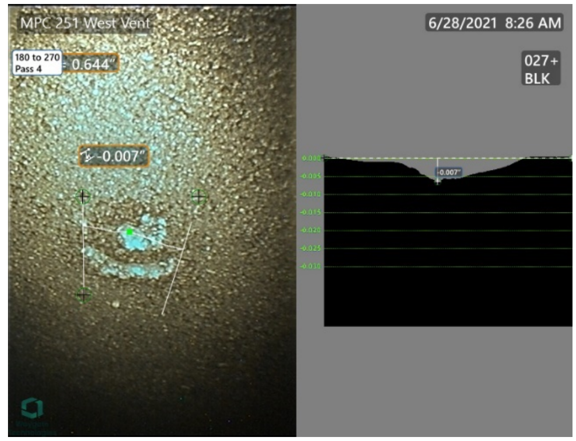
65. Sporadic rust spots on MPC



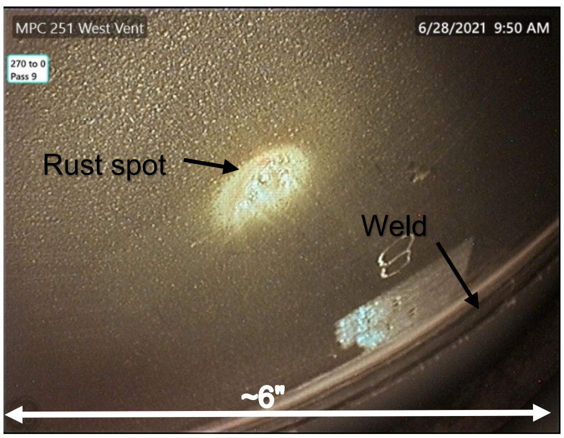
66. Deposit staining on MPC

1.6, Multi-Purpose Canister Serial #251 Photos

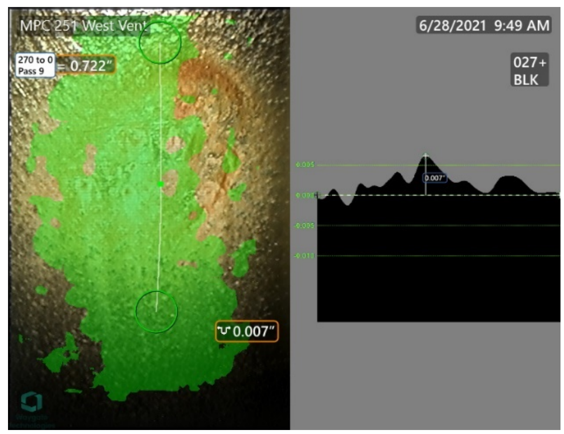
67. Surface blemishes on MPC, possibly scrape marks



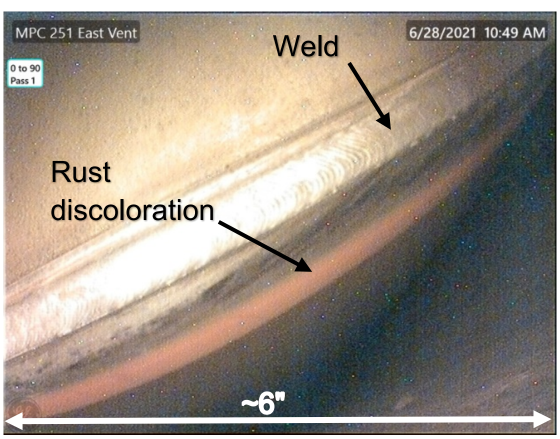
67a. Surface blemish (photo 67) measures 0.007" deep [10]



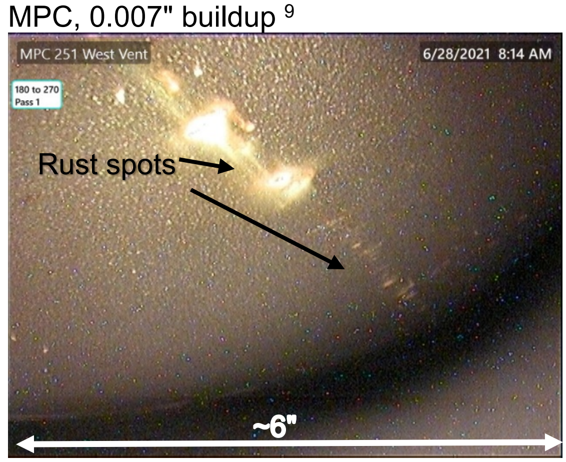
68. Rust or other deposit spot on MPC



68a. No surface damage from rust spot on MPC, 0.007" buildup [9]

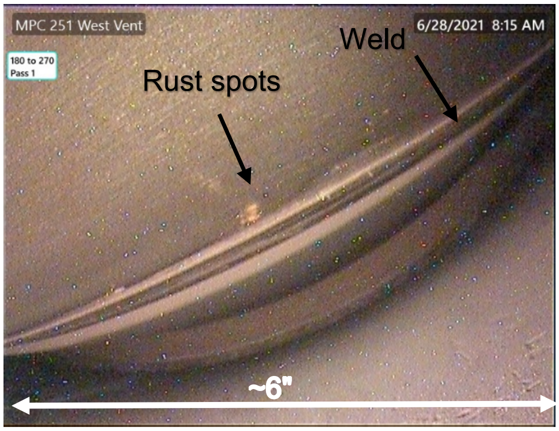


69. Rust discoloration band just below upper MPC weld



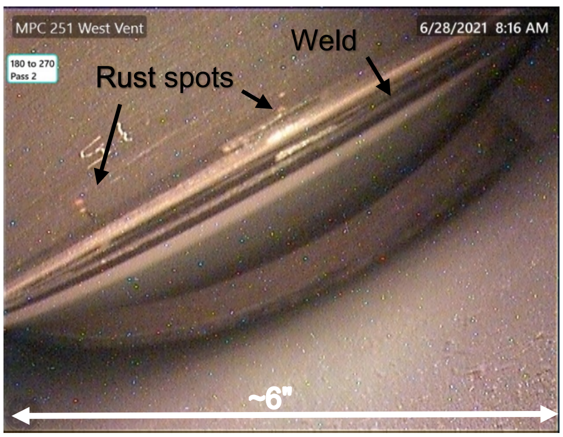
70. Line of rust spots on MPC, no surface degradation observed

[10] Depth/height measurements obtained with a commercial grade video probe and are considered information only

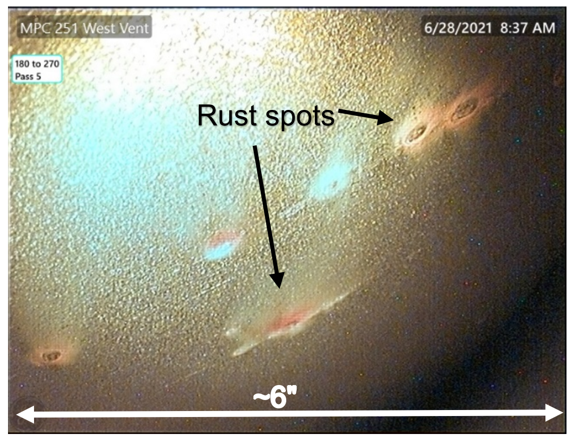


71. Line of rust spots on MPC (continued)

72. Superficial scrape mark on MPC



73. Sporadic rust spots on MPC, no surface degradation observed

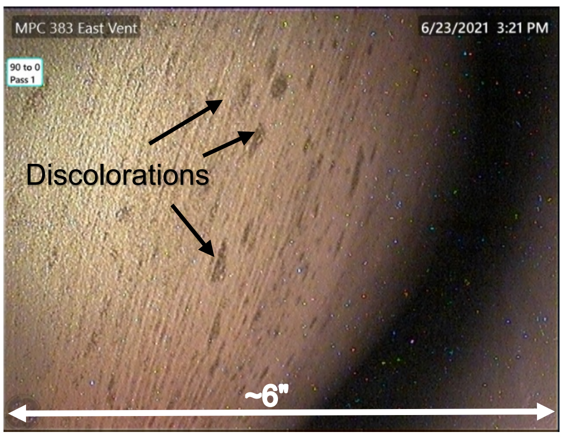


74. Rust spots on MPC, could not measure any 3-D aspect

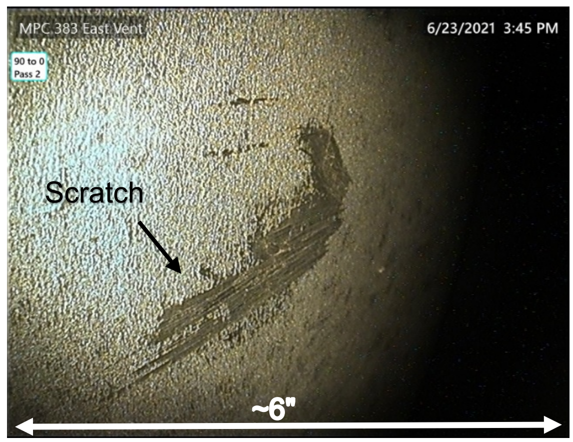
1.7, Multi-Purpose Canister Serial #383 Photos

75. Rust deposit on MPC

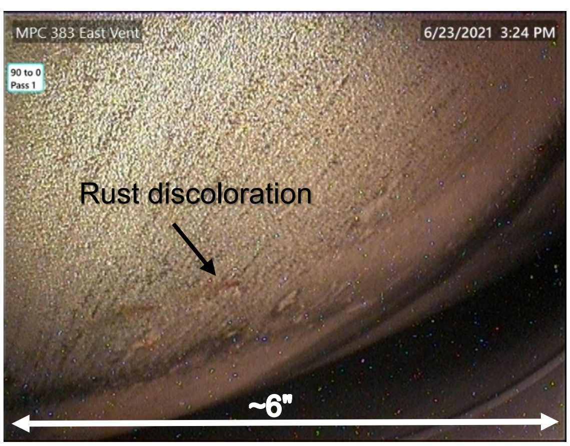
75a. Dimensions: no depth/height [11]



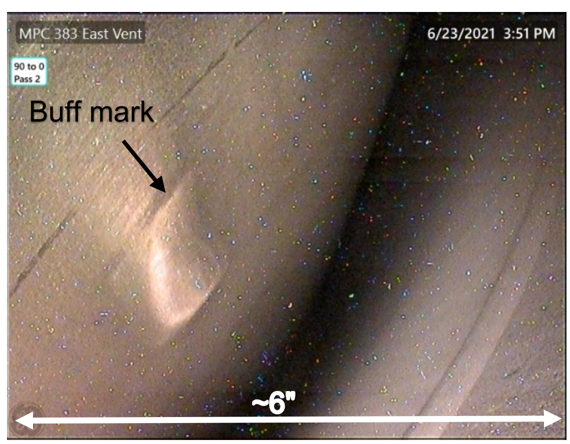
76. Typical pattern of discoloration on MPC



77. Superficial scratch on MPC, no depth observed



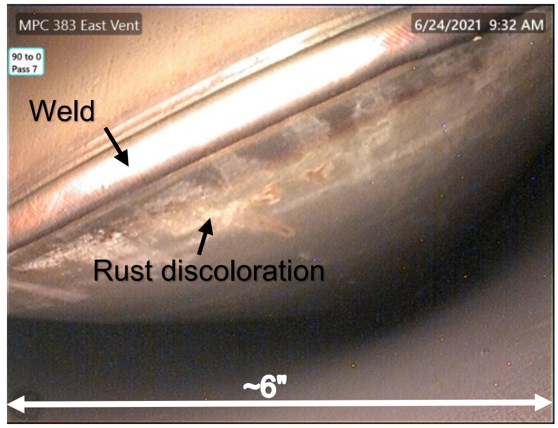
78. Rust discoloration on MPC, not 3-D



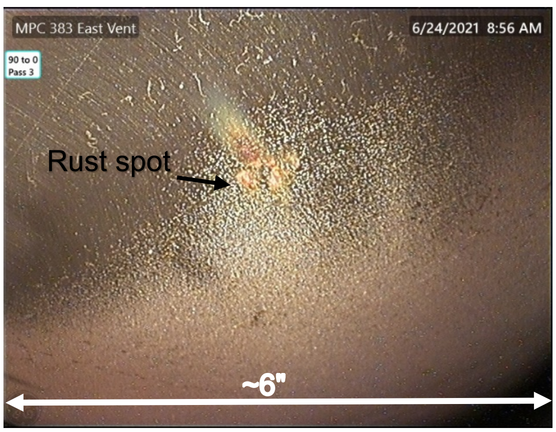
79. Buff mark on MPC

[11] Depth/height measurements obtained with a commercial grade video probe and are considered information only

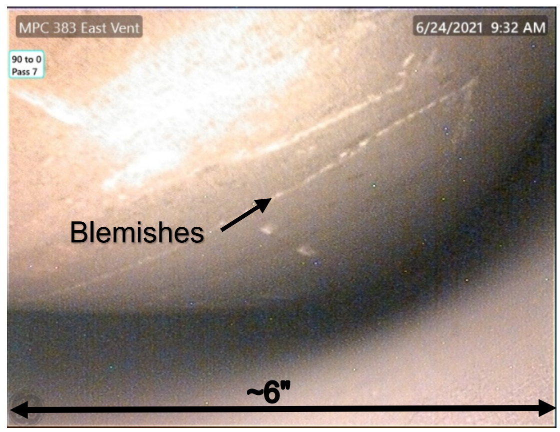
80. Rust spot on MPC, not 3-D



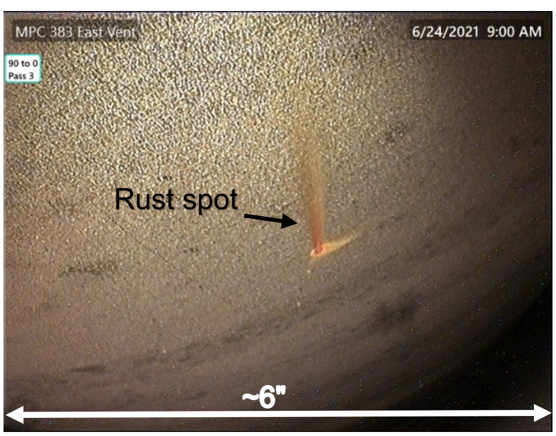
81. Rust colored discoloration near upper weld of MPC



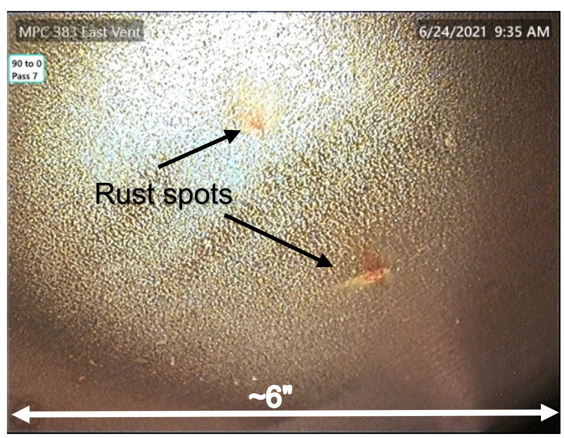
82. Rust spot on MPC, not 3-D



83. Blemishes on MPC, not 3-D

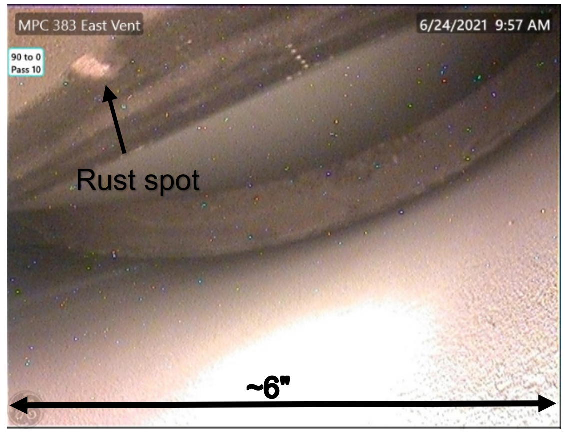


84. Rust spot on MPC, not 3-D

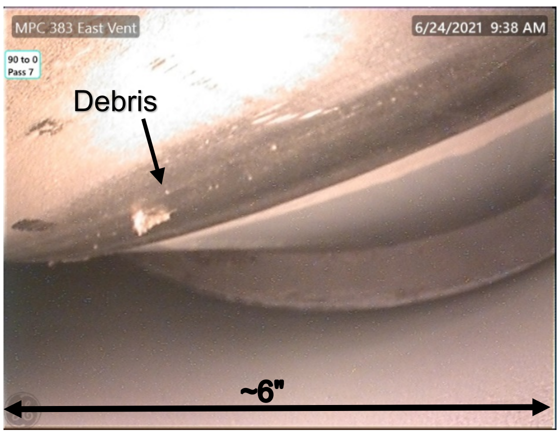


85. Rust spots on MPC, not 3-D

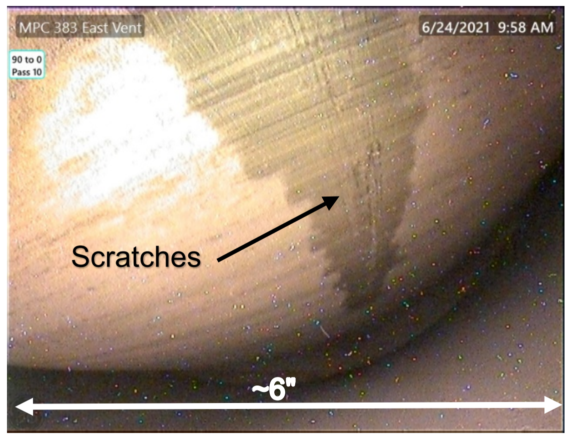
86. Mark on MPC, not 3-D



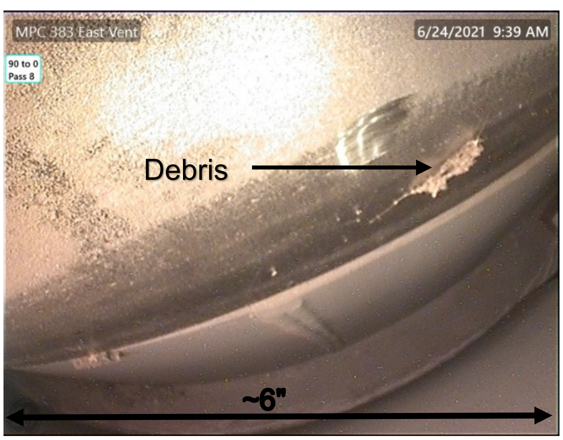
87. Rust spot on MPC, not 3-D



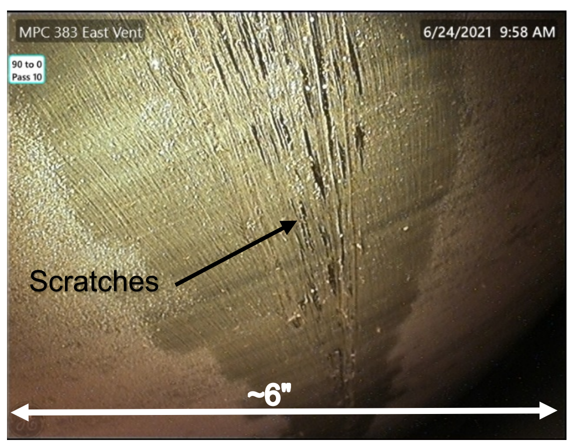
88. Debris on MPC



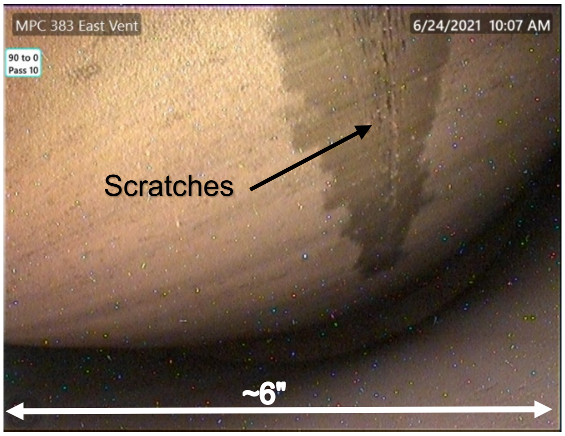
89. Superficial scratches on MPC



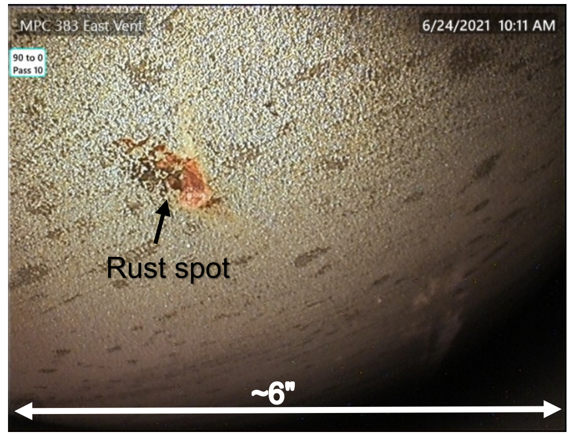
90. Debris on MPC (closeup)



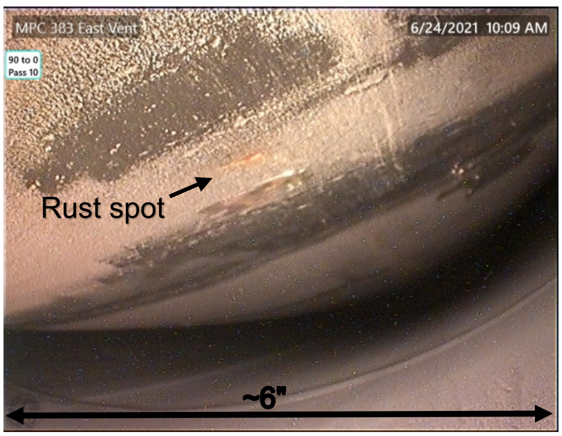
91. Closeup of scratches, very shallow, not measured



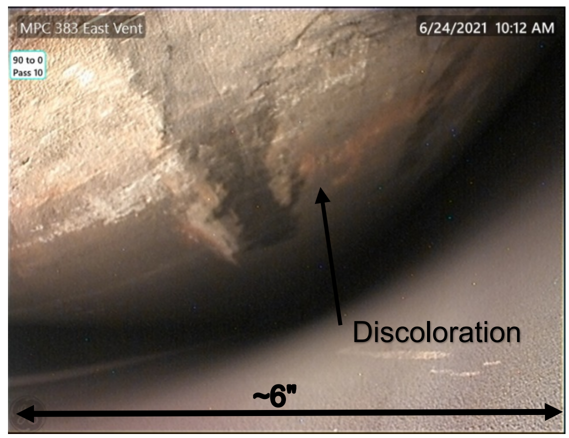
92. More of scratches on MPC



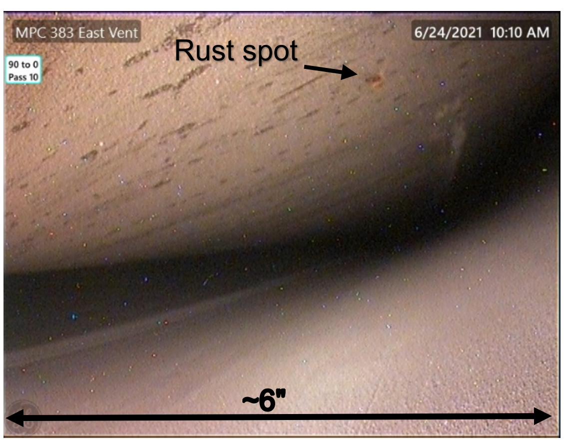
93. Rust spot on MPC, not 3-D



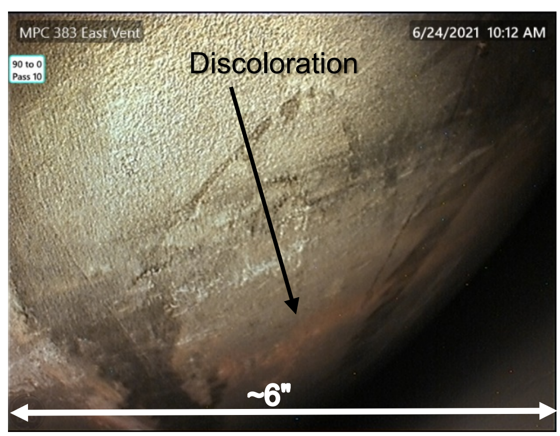
94. Rust spots and blemishes on MPC, not 3-D



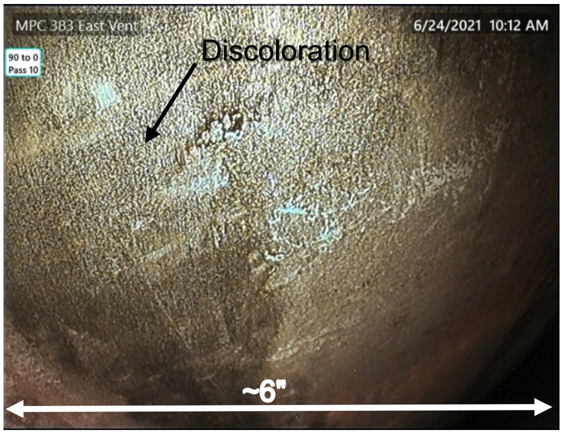
95. Rust colored discoloration/blemishes on MPC, not 3-D



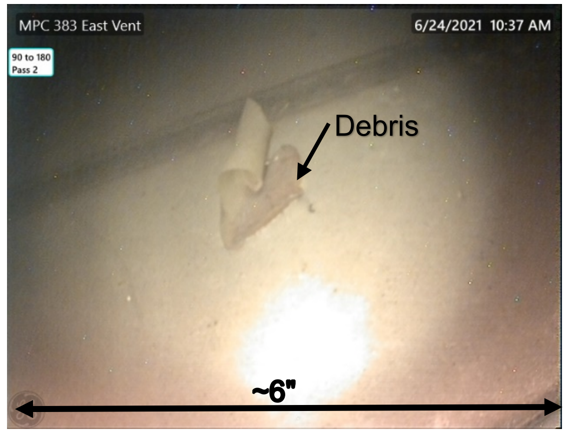
96. Rust spot on MPC, not 3-D



97. Close up of rust colored discoloration/blemishes

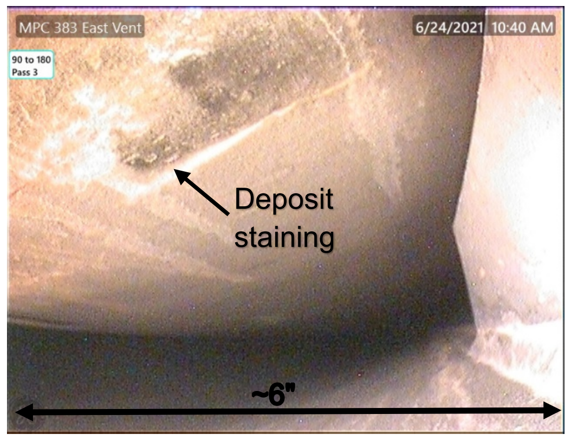


97a. Close up of discoloration/blemishes

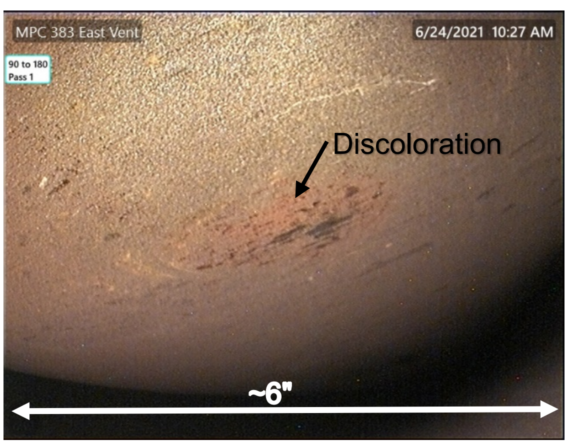


98. Debris on top of MPC

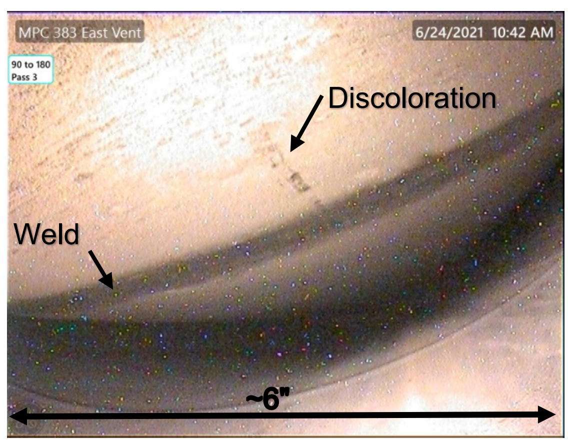
99. Grinding mark on upper weld of MPC



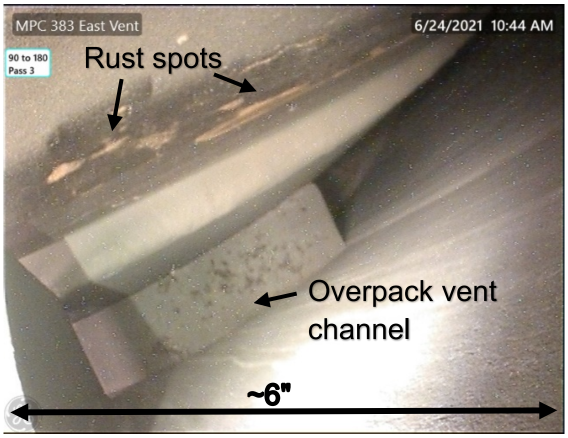
100. Deposit staining on MPC and overpack and along shim



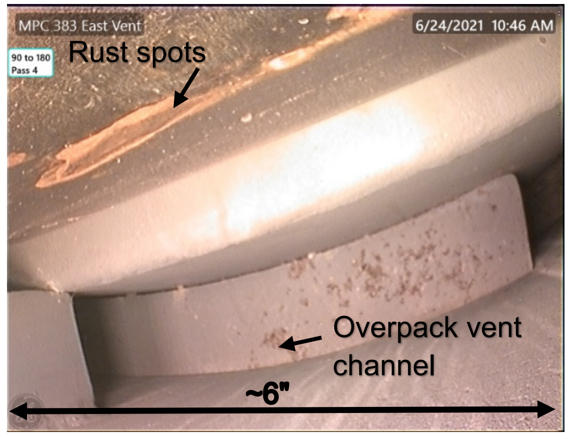
101. Rust colored discoloration on MPC



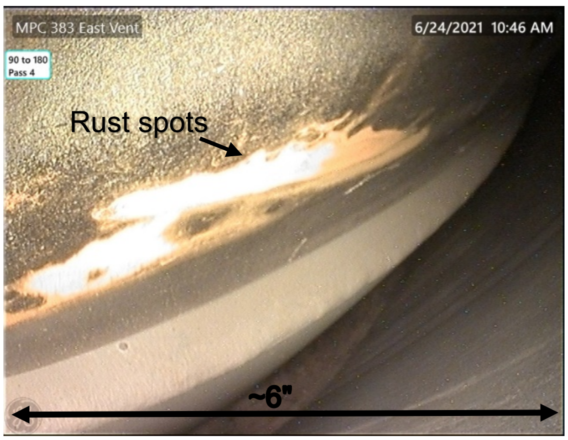
102. Discoloration mark on MPC, not 3-D



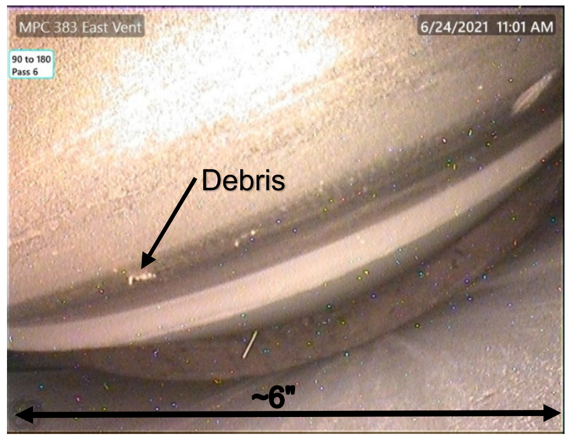
103. Rust spots near lower weld of MPC



103a. Close up of rust spots

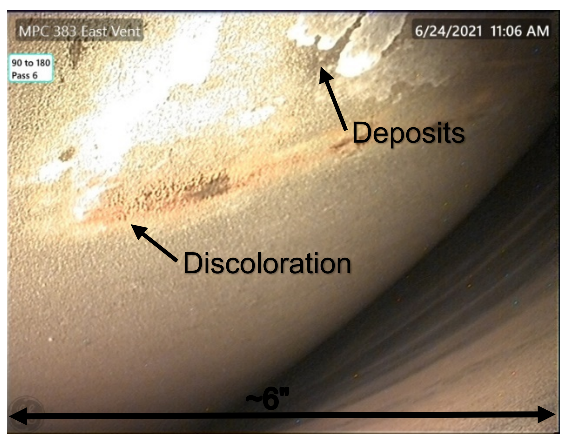


103b. Another close up of rust spots

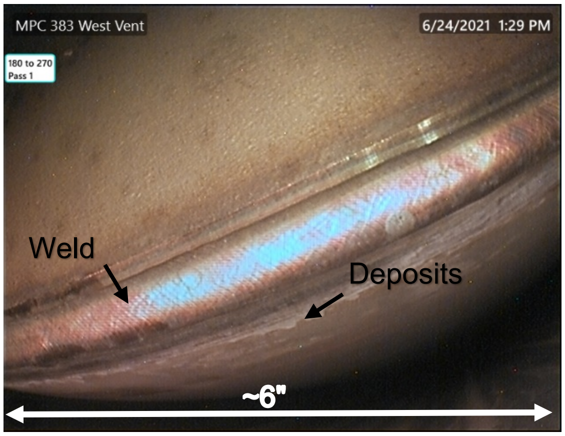


104. Debris and mark on MPC

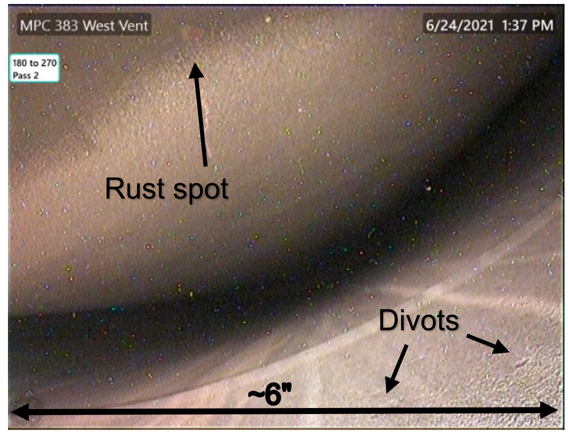
105. Scratch on MPC, no observable depth



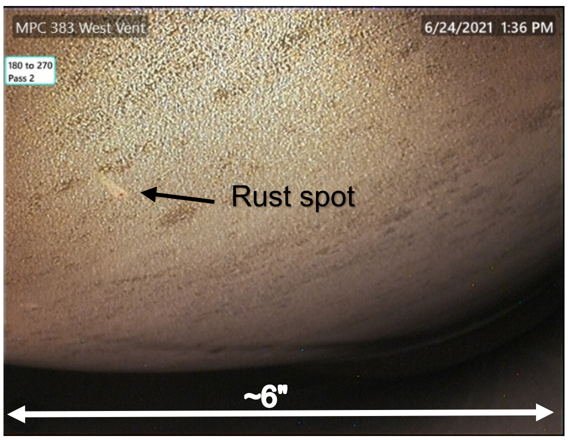
106. Rust discoloration and deposits on MPC



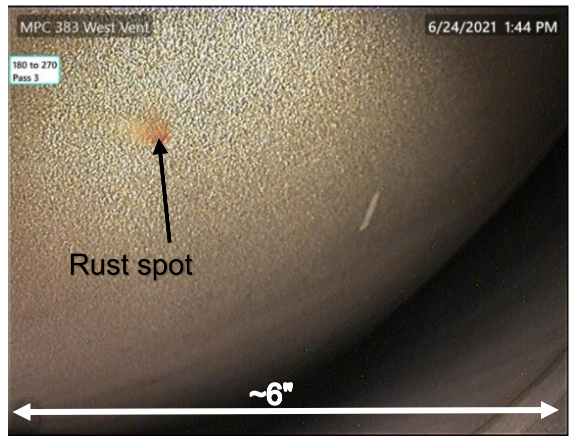
107. Superficial deposits on MPC



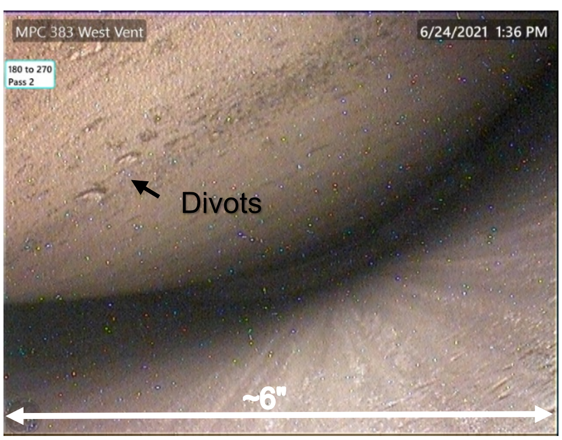
108. Rust spot on MPC, not 3-D; shallow divots on overpack



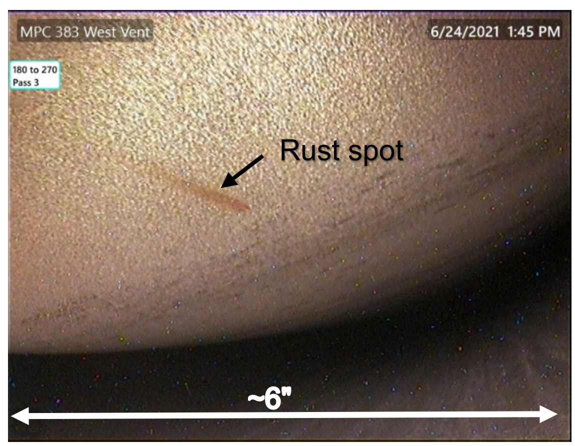
109. Rust spot on MPC, not 3-D



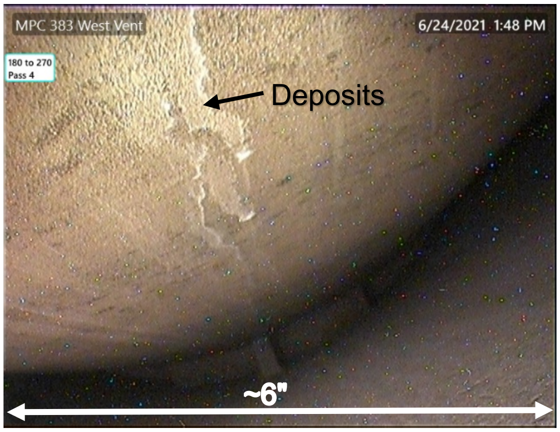
110. Rust spot on MPC, not 3-D



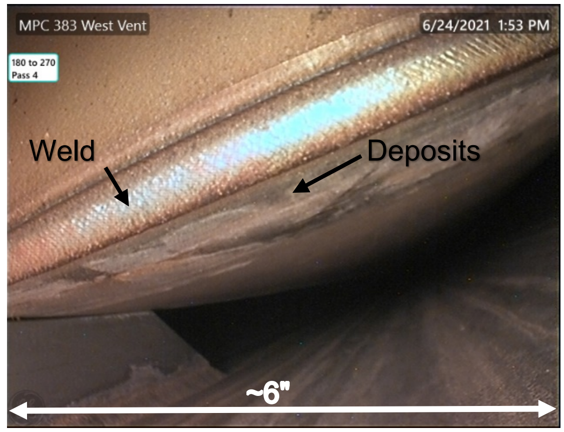
111. Divots on MPC, shallow, no observable depth



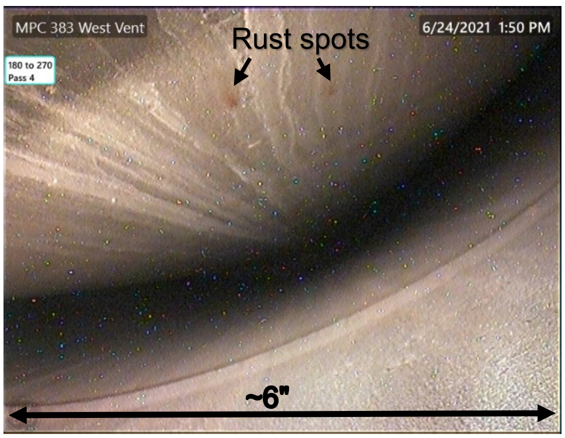
112. Rust spot on MPC, not 3-D



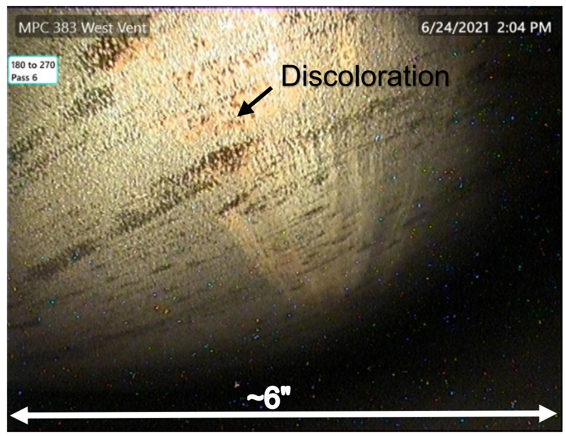
113. Deposits on MPC



114. Deposits on MPC and overpack and along shim

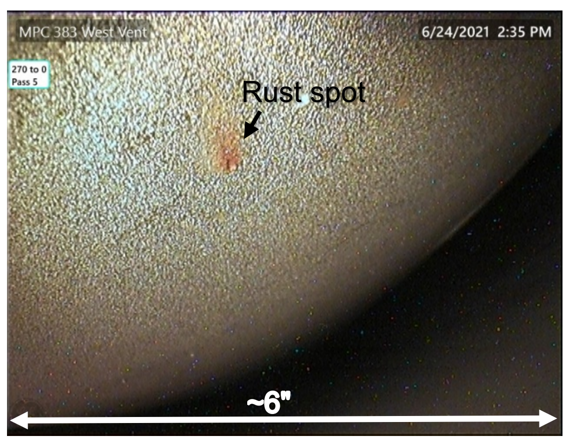


115. Deposits and rust spots on MPC, not 3-D

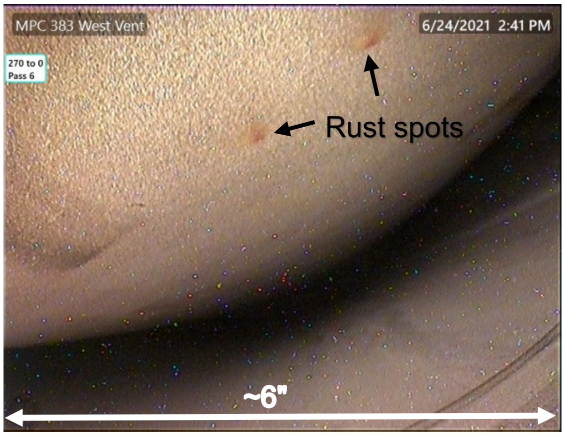


116. Rust colored discoloration on MPC

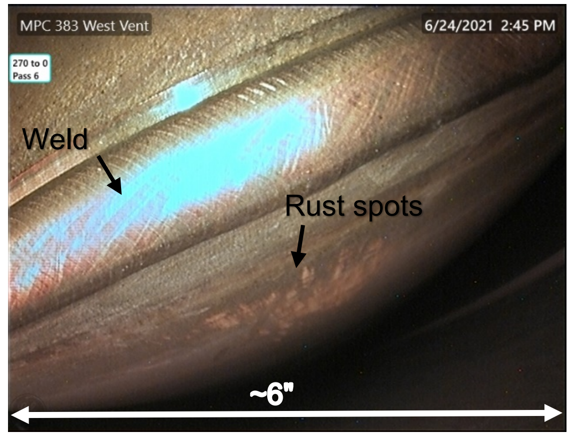
117. Deposits on MPC



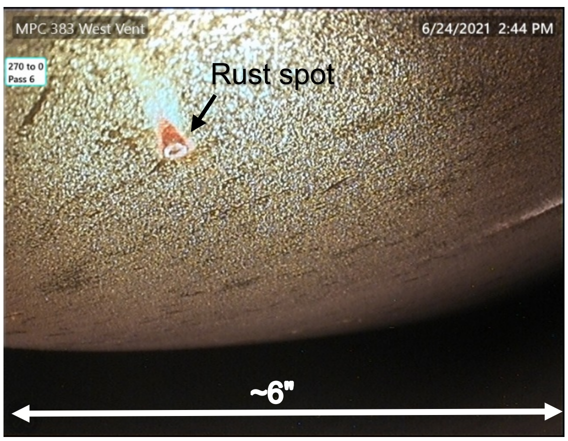
118. Rust spot on MPC, not 3-D



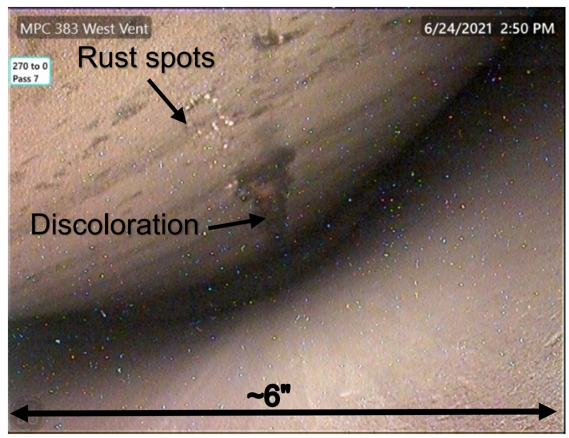
119. Rust spot on MPC, not 3-D



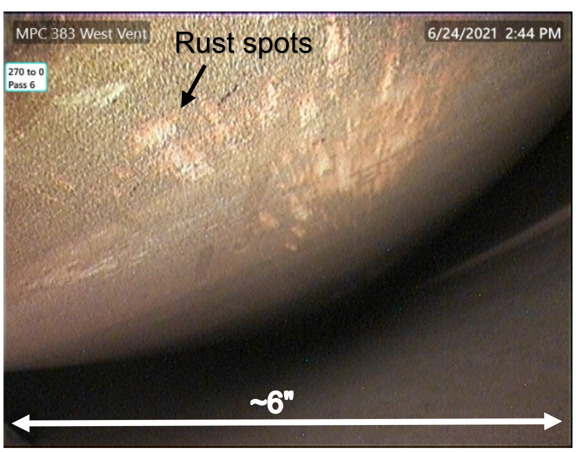
120. Rust spots / discoloration on MPC, not 3-D



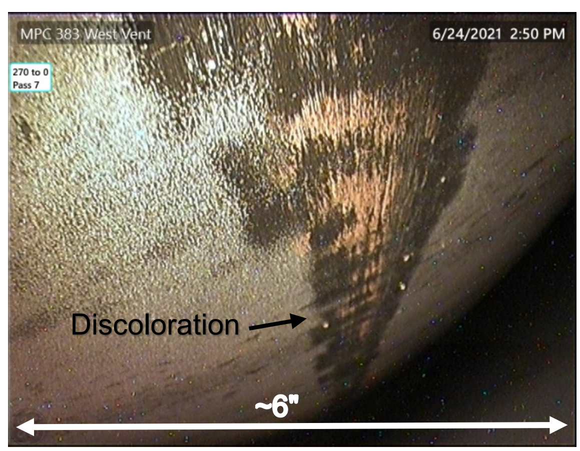
121. Rust spot on MPC, not 3-D



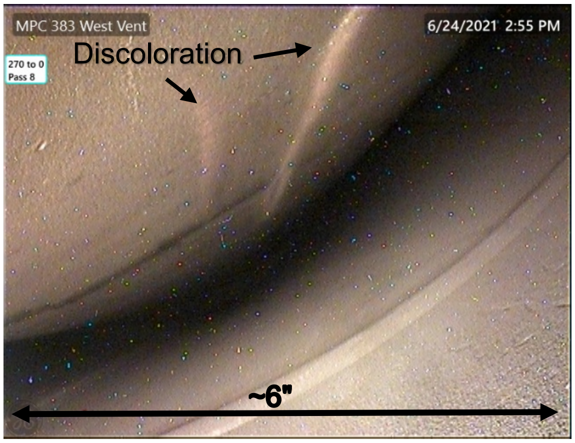
122. Rust spots / discoloration on MPC, not 3-D



123. Rust spots / discoloration on MPC, not 3-D

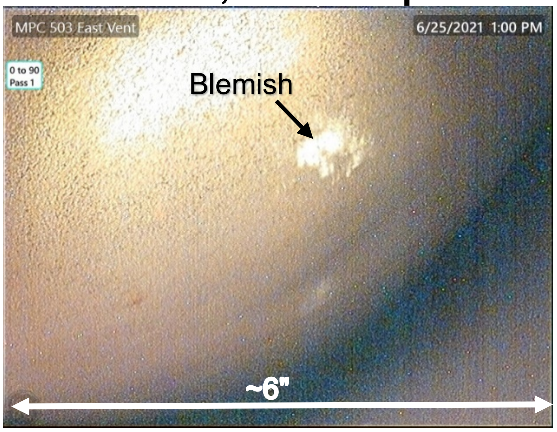


123a. Closeup of rust spots / discoloration on MPC (photo 123)

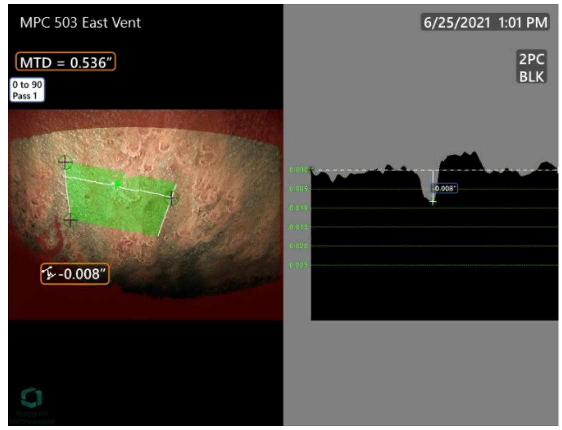


124. Discoloration on MPC

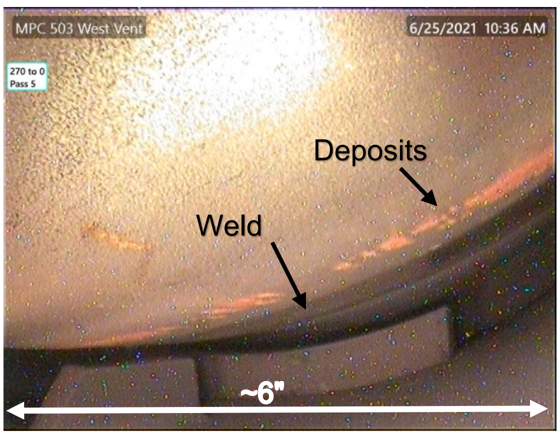
1.8, Multi-Purpose Canister Serial #503 Photos



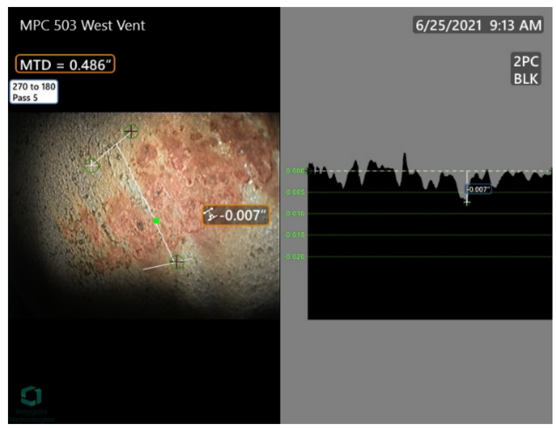
125. Rust colored blemish on MPC



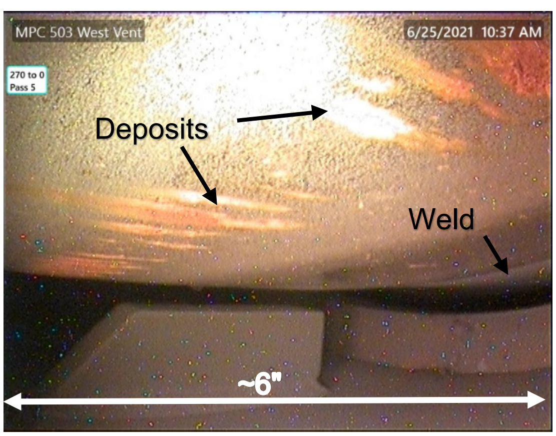
125a. Blemish measures 0.008" deep [12]



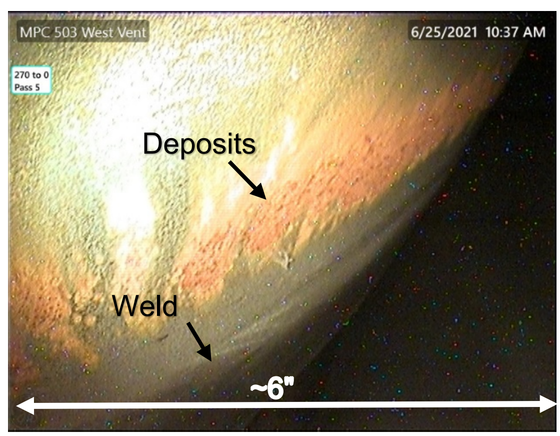
126. Rust colored deposits near lower weld of MPC



126a. Rust colored deposits measured up to 0.007" deep [11]

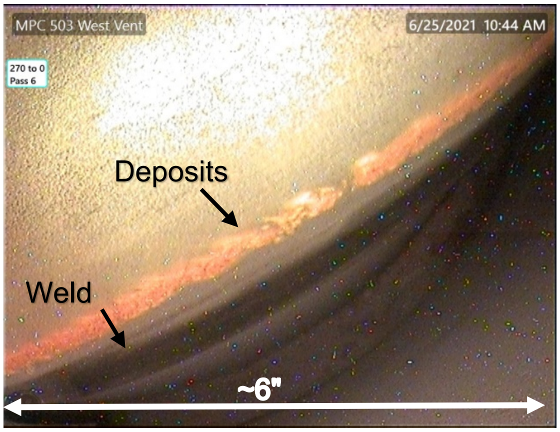


127. Rust colored deposits near lower weld of MPC (continued)

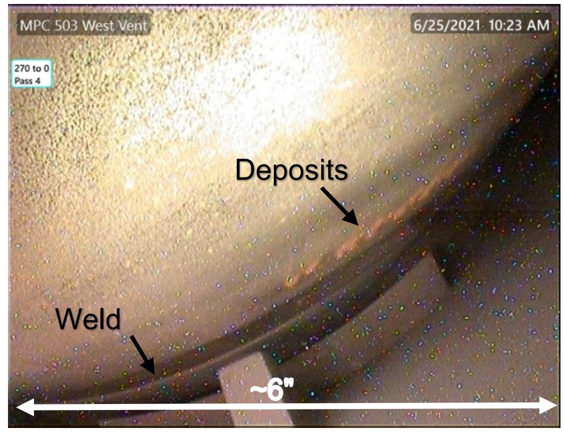


128. Rust colored deposits near lower weld of MPC (continued)

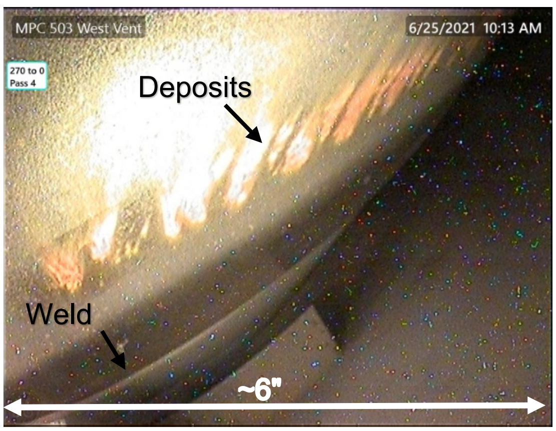
[12] Depth/height measurements obtained with a commercial grade video probe and are considered information only



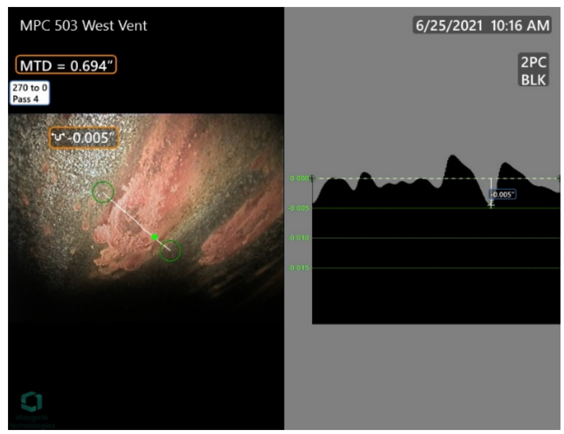
129. Rust colored deposits near lower weld of MPC (continued)



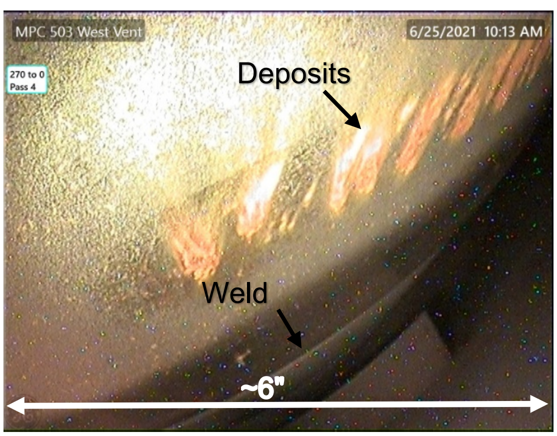
130. Rust colored deposits near lower weld of MPC (continued)



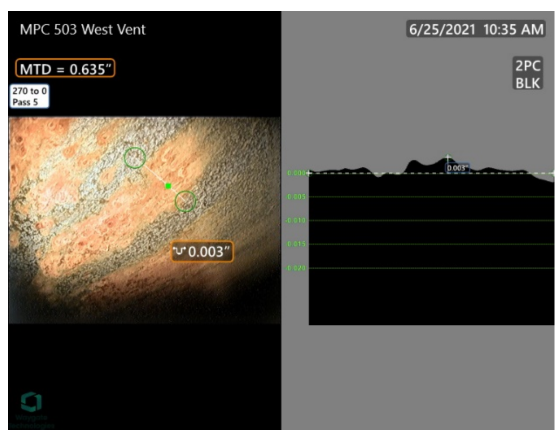
131. Rust colored deposits near lower weld of MPC (continued)



131a. Rust colored deposits measured at 0.005" deep [13]

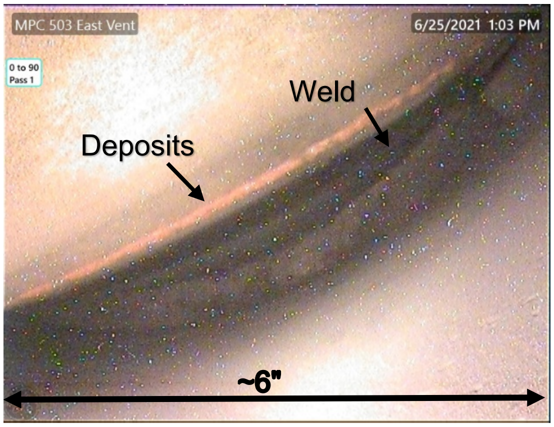


132. Rust colored deposits near lower weld of MPC (continued)

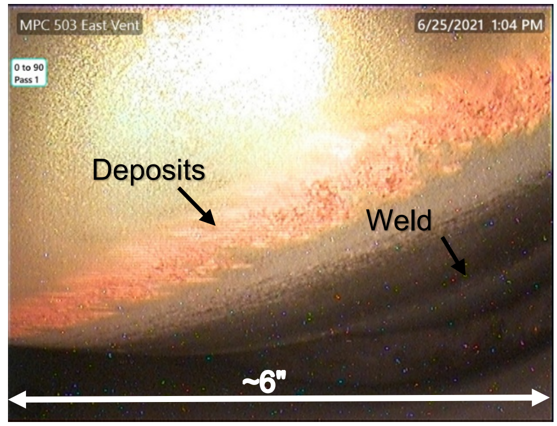


132a. Rust colored deposit is 0.003" buildup [12]

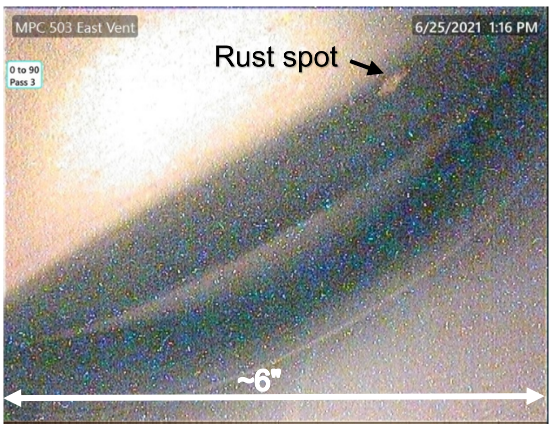
[13] Depth/height measurements obtained with a commercial grade video probe and are considered information only



133. Rust colored deposits near lower weld of MPC (continued)

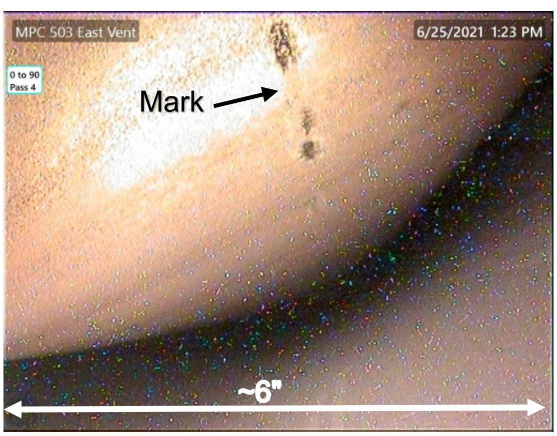


134. Rust colored deposits near lower weld of MPC (continued)

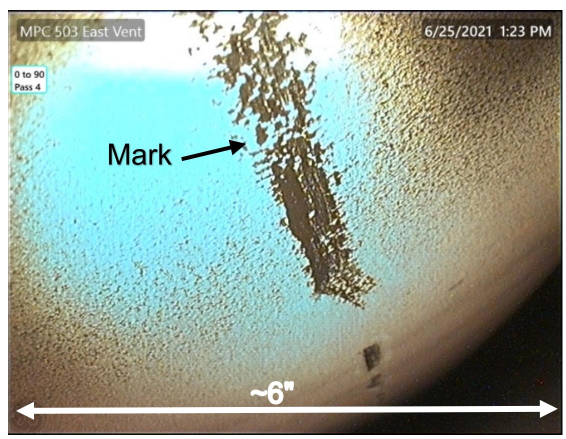


135. Rust colored spot on MPC

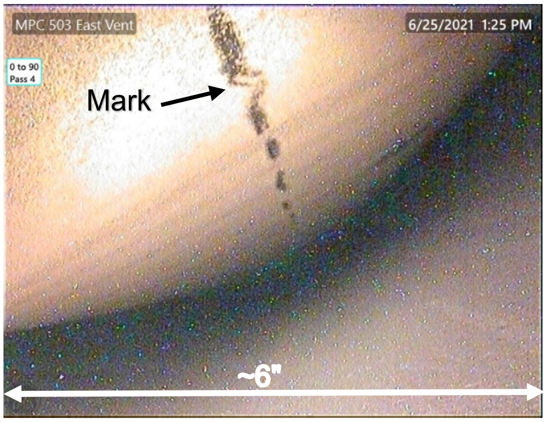
136. Rust colored spot on MPC, no observable depth



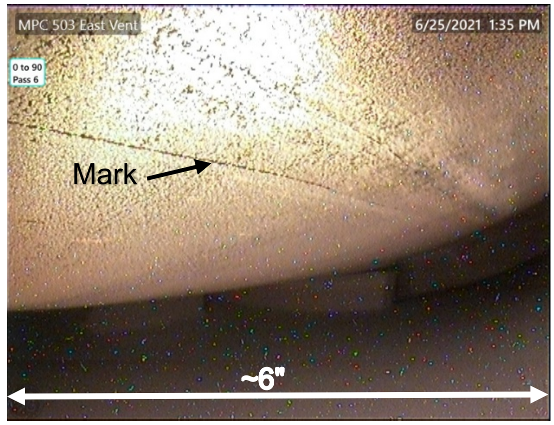
137. Mark on MPC, no observable depth



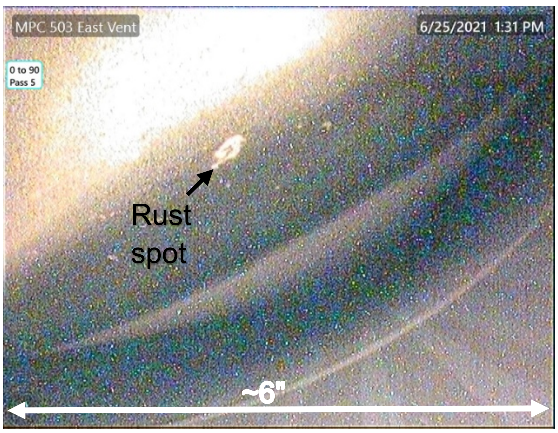
138. Mark on MPC (continued)



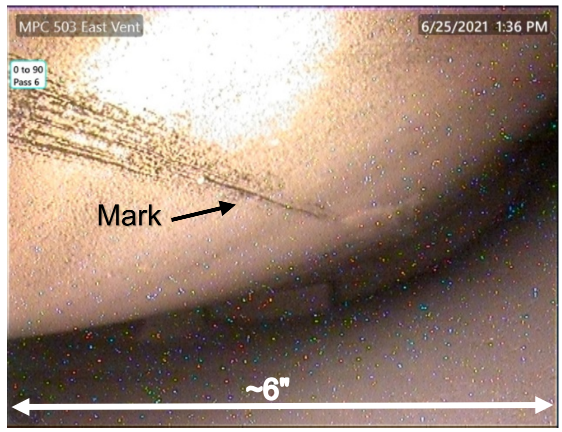
139. Mark on MPC (continued)



140. Mark on MPC, no observable depth

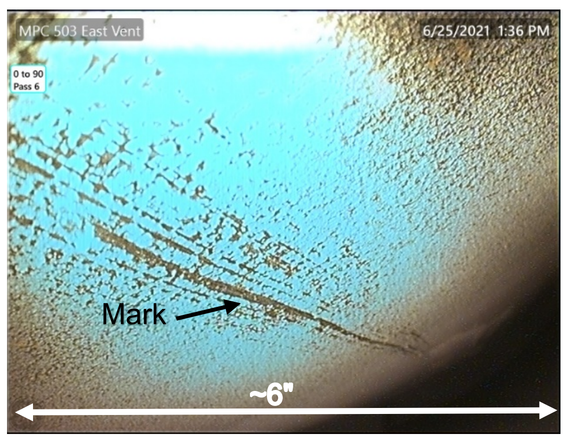


141. Rust spot on MPC, no observable depth

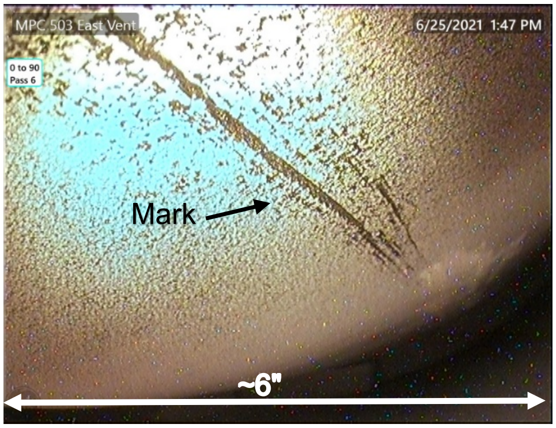


142. Mark on MPC (continued)

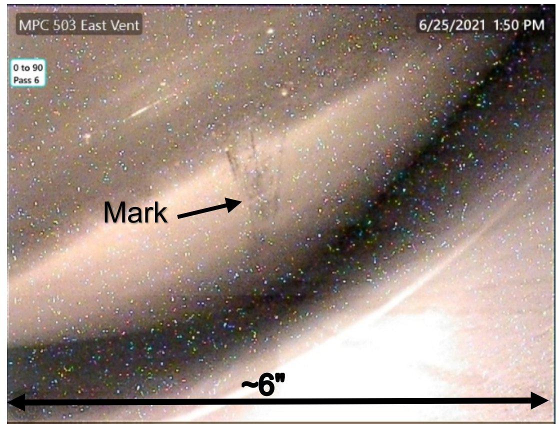
143. Debris deposit on MPC and small rust spots



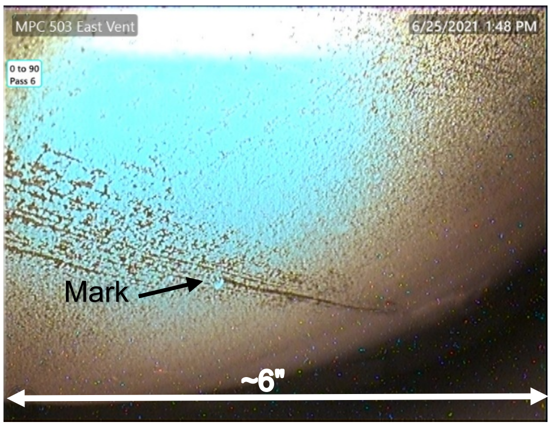
144. Mark on MPC (continued)



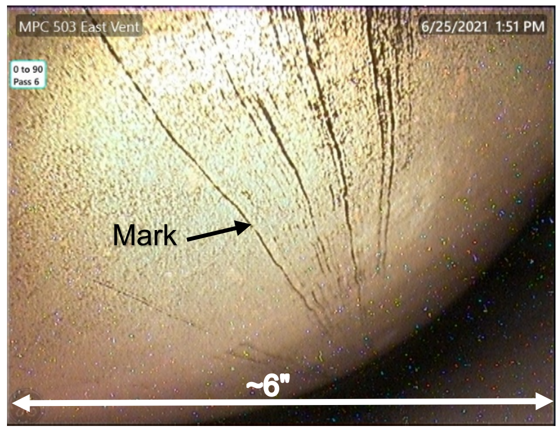
145. Mark on MPC (continued)



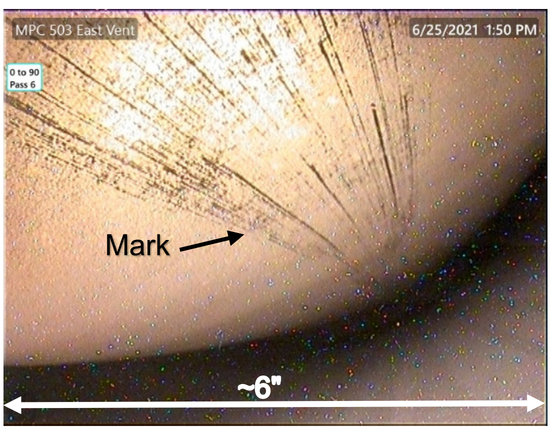
146. Mark on MPC (continued)



147. Mark on MPC (continued)



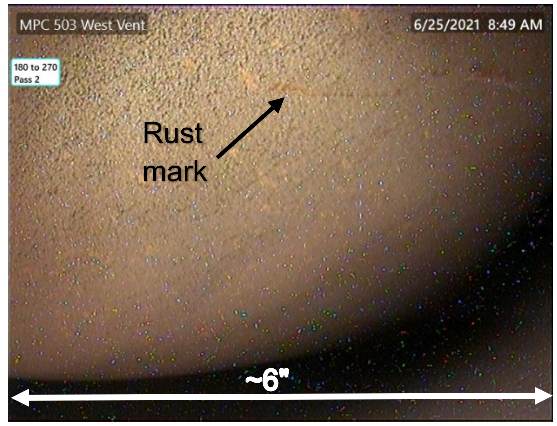
148. Mark on MPC (continued)



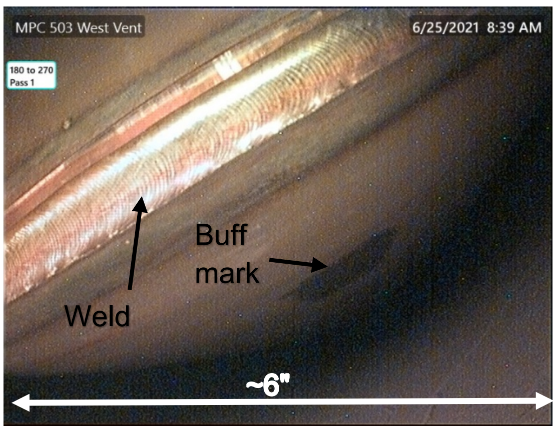
149. Mark on MPC (continued)

150. Deposit on MPC, no observable depth

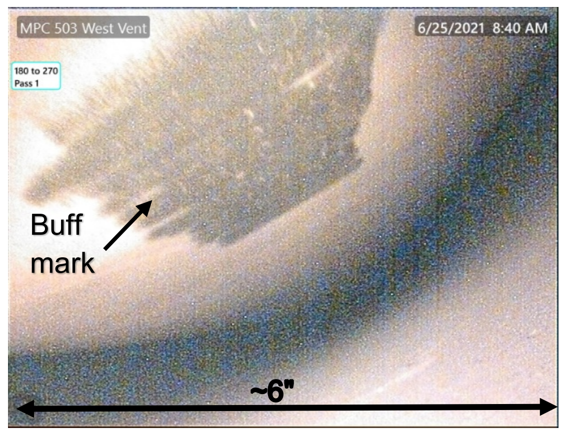
151. Marks on MPC, no observable depth



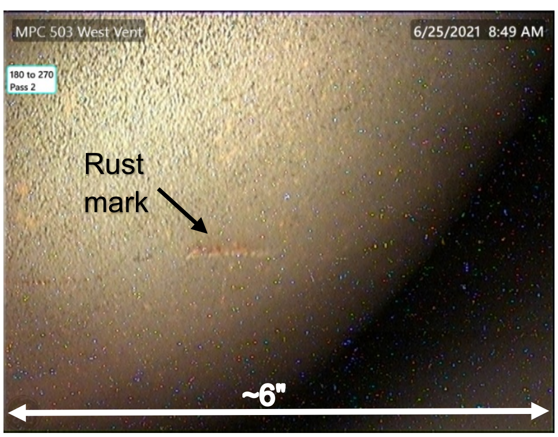
152. Rust mark on MPC, no observable depth



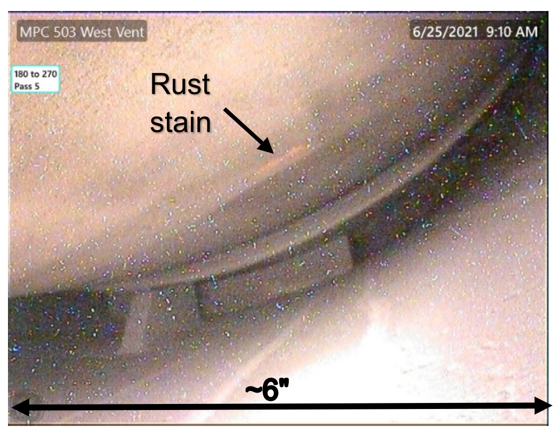
153. Buff mark on MPC



154. Buff mark on MPC (photo 153 closeup)

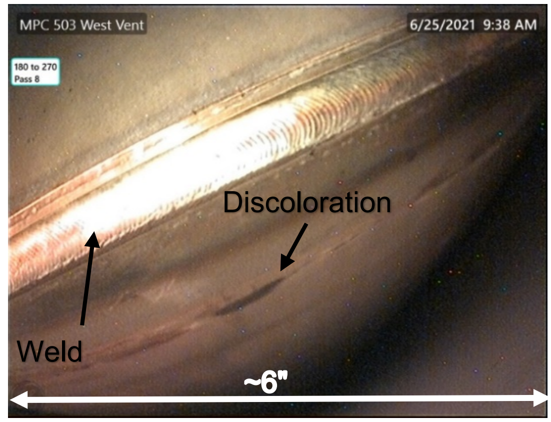


155. Rust mark on MPC, no observable depth

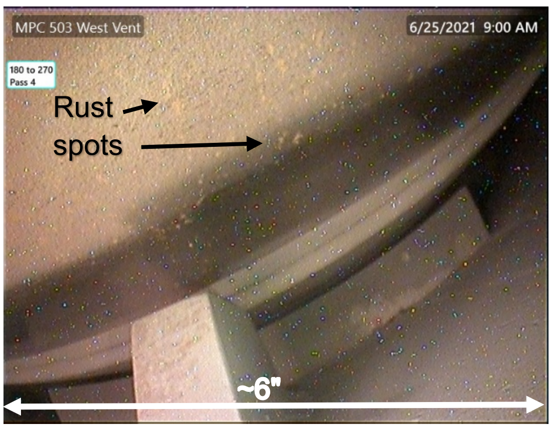


156. Rust stain on MPC

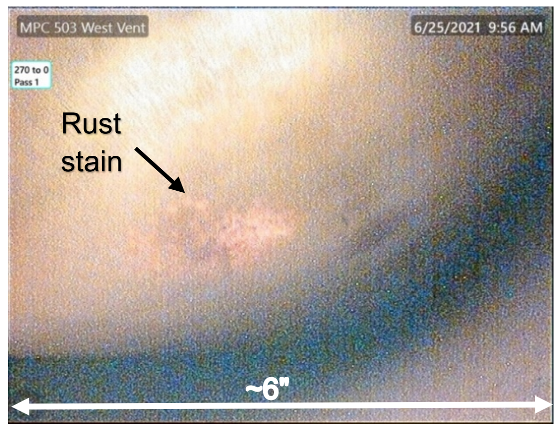
157. Superficial mark on MPC



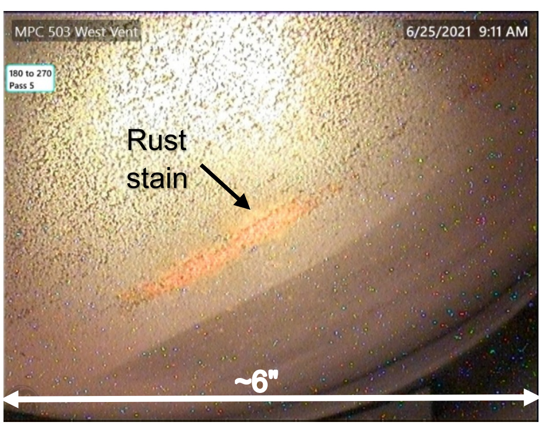
158. Rust colored discoloration near upper weld of MPC



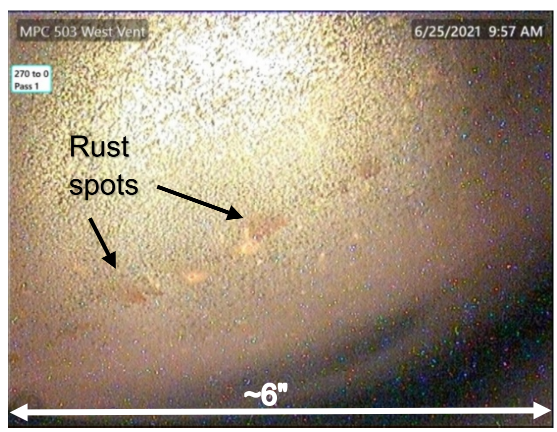
159. Sporadic rust spots on MPC



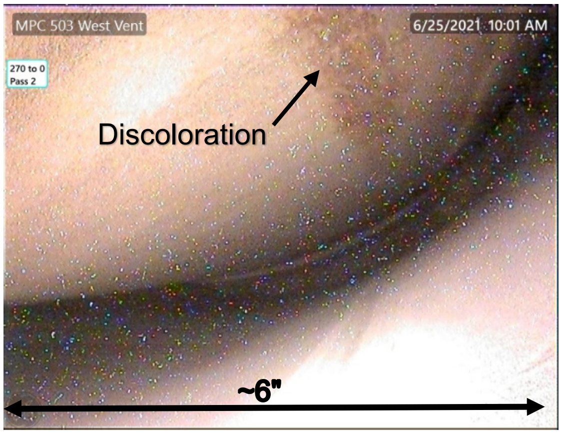
160. Rust stain on MPC



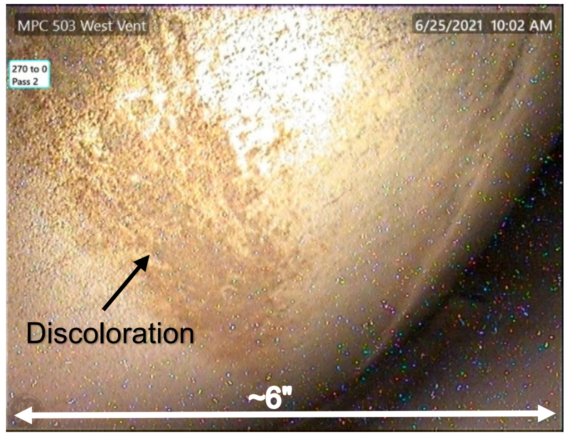
161. Rust stain on MPC closeup



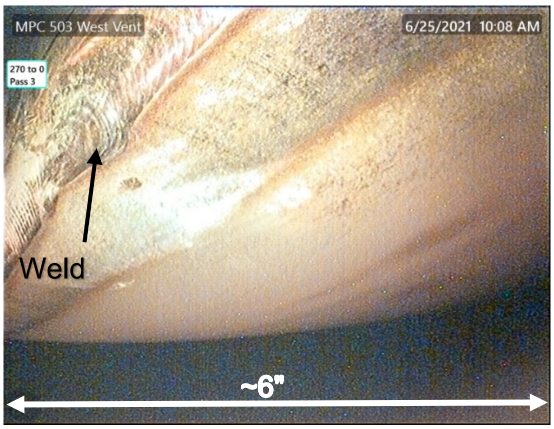
162. Sporadic rust spots on MPC



163. Discoloration mark on MPC

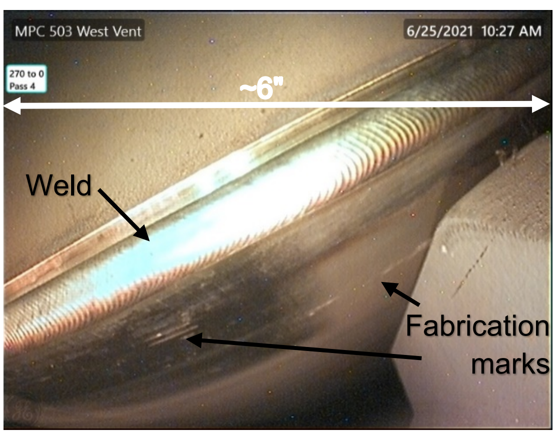


164. Discoloration mark on MPC (continued)

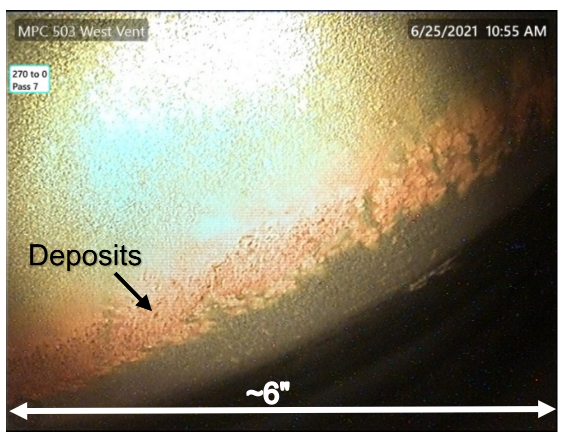


165. Small blemish near upper weld of MPC, superficial

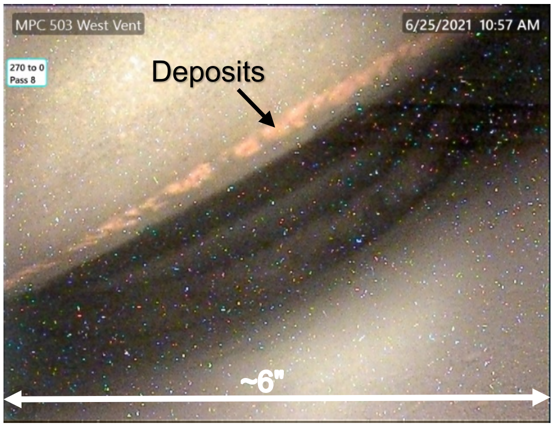
166. Blemish on MPC, no observable depth



167. Fabrication marks on MPC



168. Rust colored deposits near lower weld of MPC



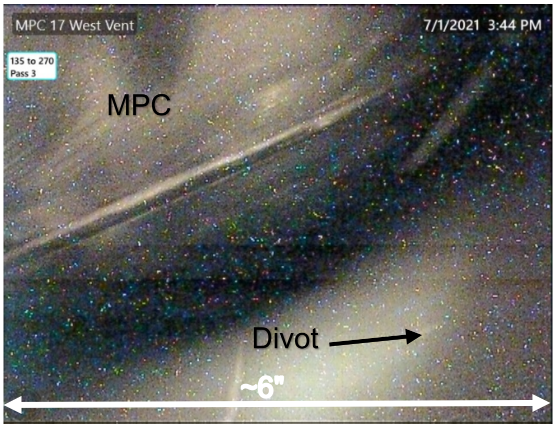
169. Rust colored deposits near lower weld of MPC (continued)

Attachment 2

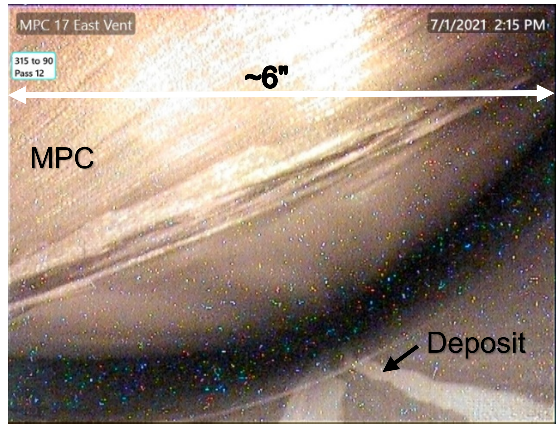
Overpack Exam Results Photos

2.1, Overpack Serial #93 Photos

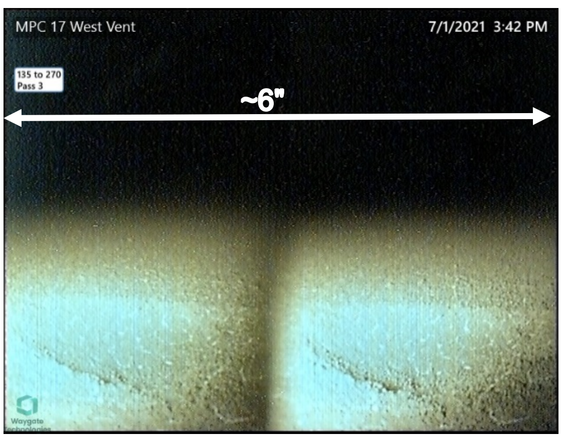
Interior



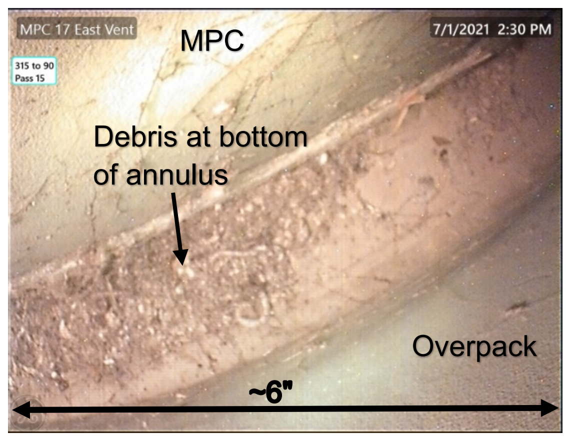
1. Small divot in overpack wall



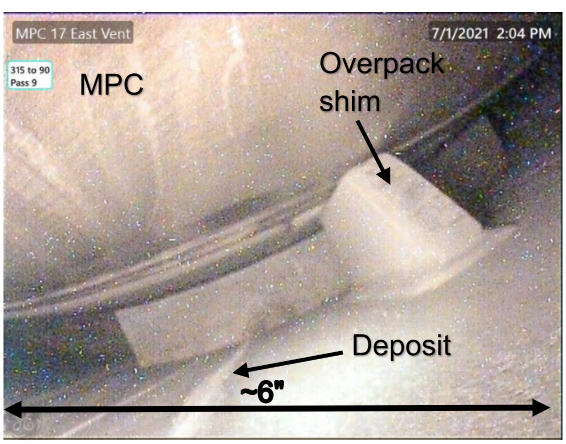
2. Deposit streak on inside of overpack



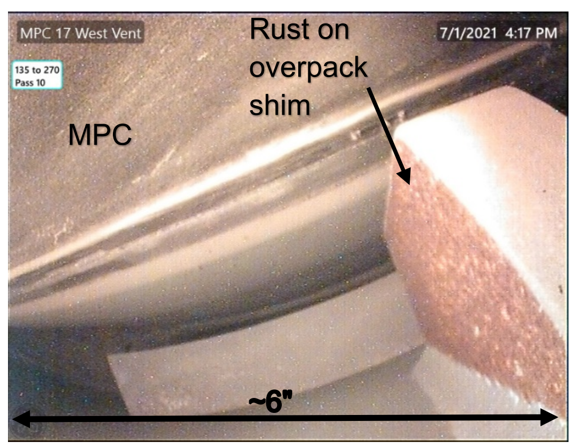
3. Divot in overpack wall, cannot be measured, looks very shallow



4. Debris at bottom between pedestal and overpack



5. Deposit on inside of overpack

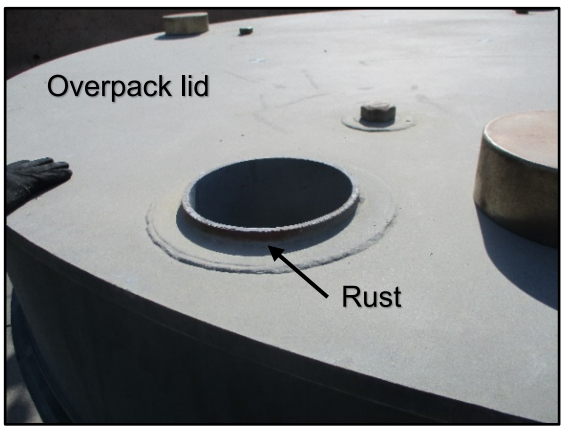


6. Superficial rust on overpack shim

Exterior

7. West upper overpack vent (gamma shield out) rust

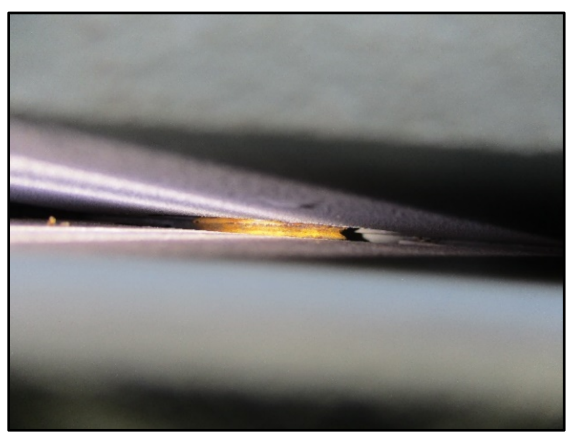
8. NE lid-stud pipe rust



9. NW lid-stud pipe rust

10. NE lid-stud pipe (inside) rust

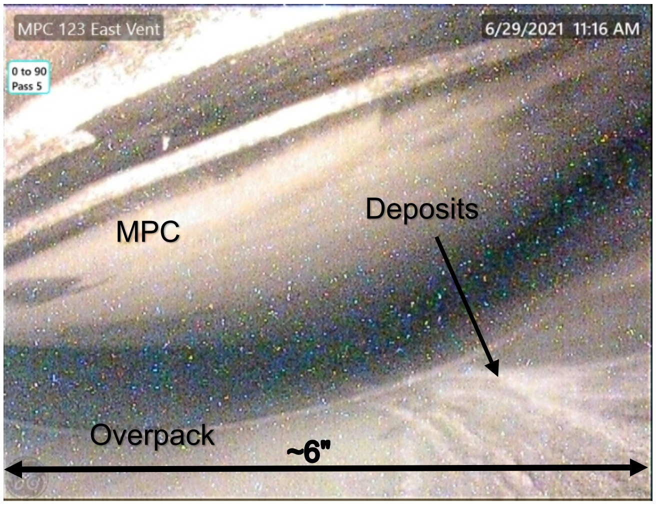
11. NW lid-stud pipe (inside) rust



12. Lid to cask stud through interface (rust)

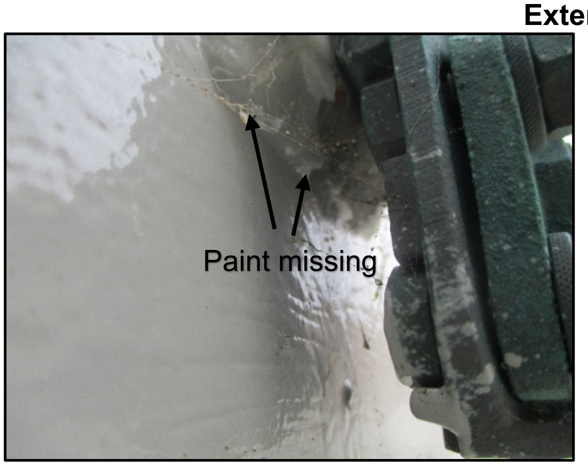
2.2, Overpack Serial #318 Photos

Interior

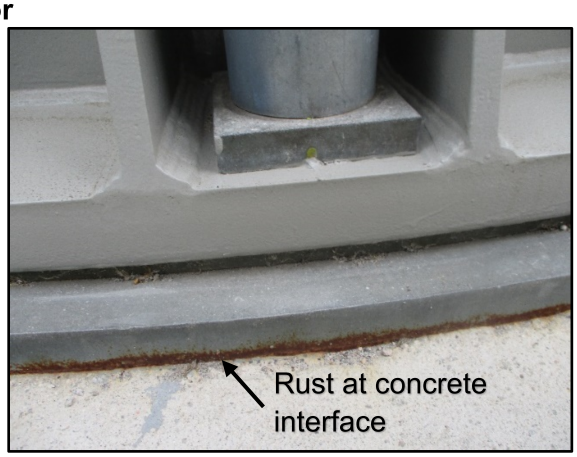


15. Deposits on inner wall of overpack

Exterior

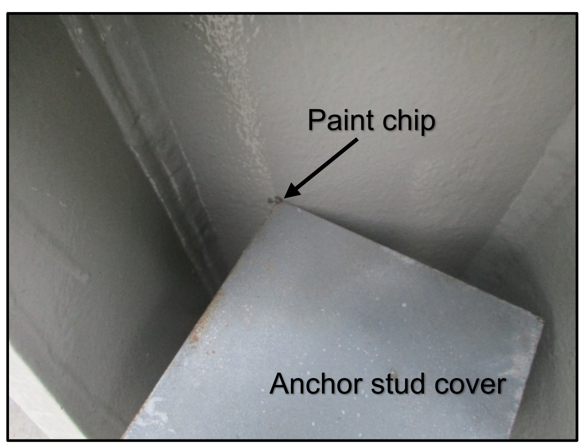


16. 270° ground strap underside

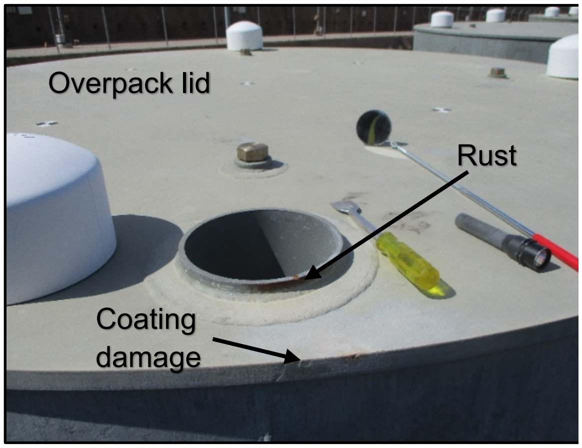


17. Anchor support ring at concrete (area shown at 180°)

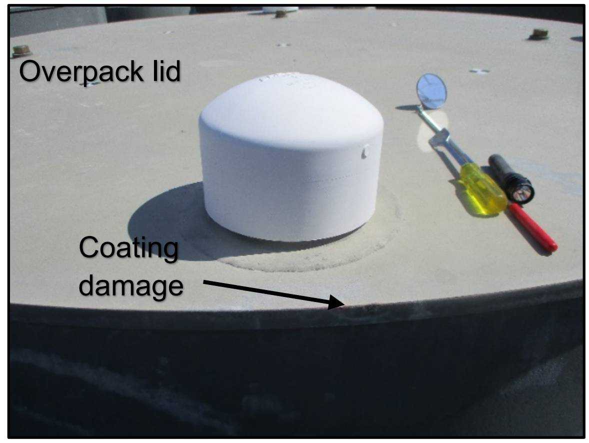
18. 90° ground strap underside



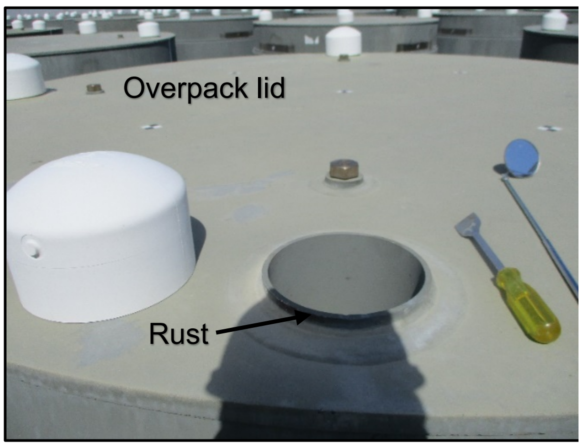
19. Anchor stud #14 paint chip where cover hits



20. NE lid-stud pipe chipped paint and rust, chip at lid edge



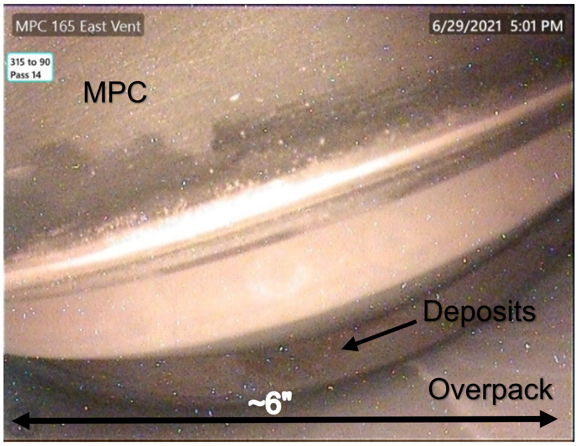
21. Coating damage at SW lid edge



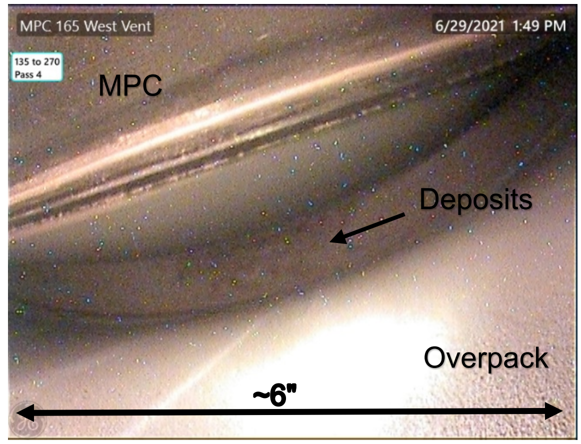
22. SE lid-stud pipe rust

2.3, Overpack Serial #507 Photos

Interior

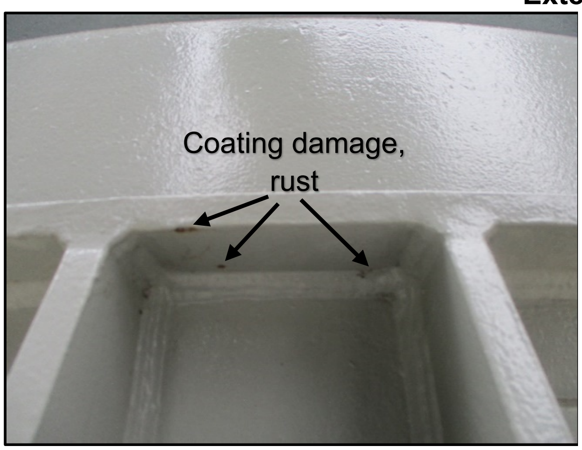


23. Deposits at bottom next to pedestal and in overpack

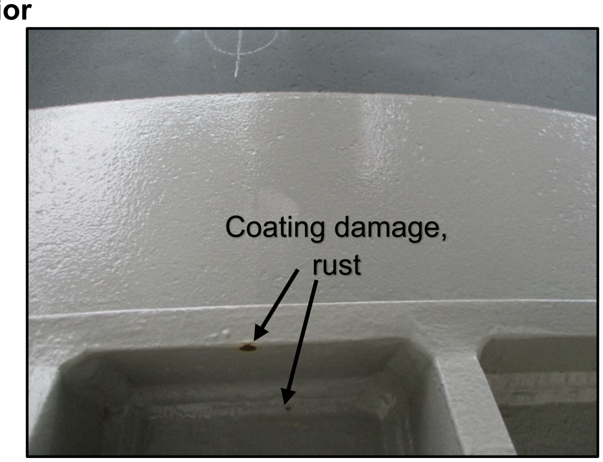


24. Deposits at bottom next to pedestal

Exterior

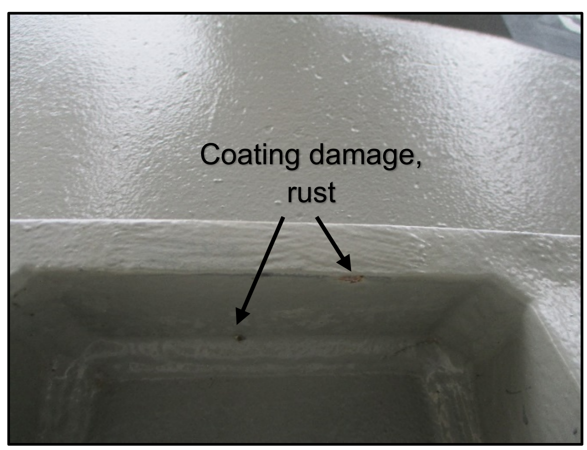


25. Anchor stud #7 area paint chip/rust

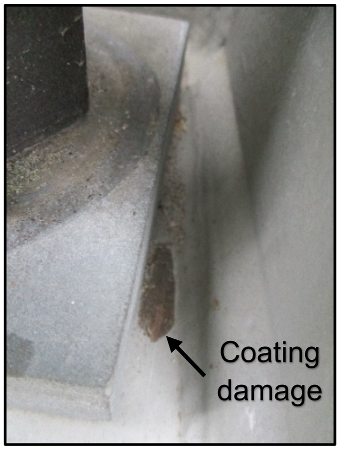


26. Anchor stud #16 area paint chip/rust

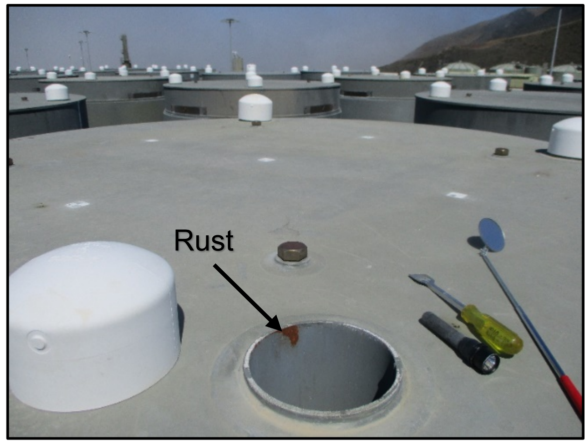
27. Anchor stud #7 paint chip



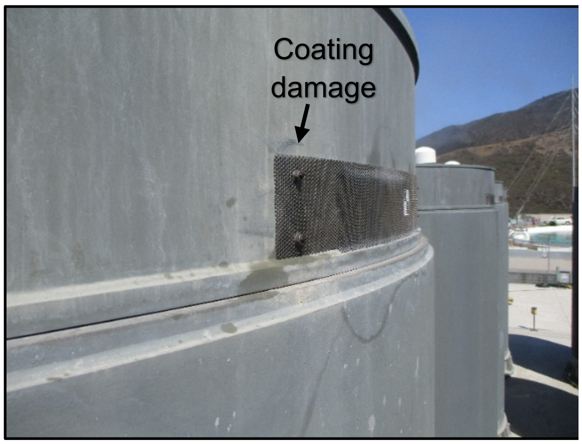
28. Anchor stud #2 area paint chip/rust



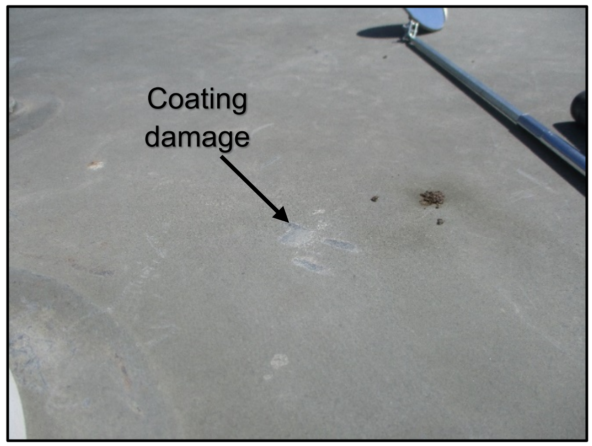
29. Anchor stud #5 paint chip in base



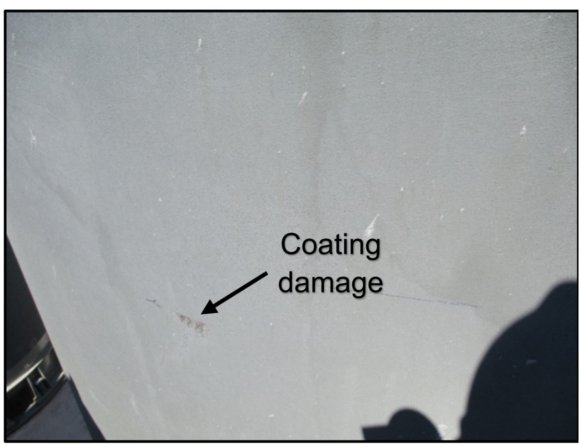
30. SE lid-stud pipe rust



31. Upper east vent coating damage from nut removal



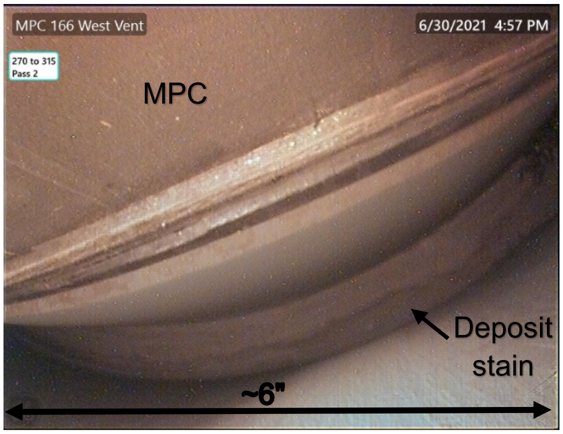
32. SW lid coating damage



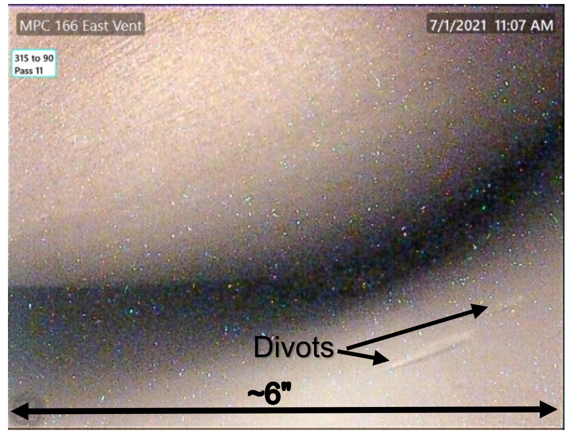
33. Coating damage on south side of overpack

2.4, Overpack Serial #514 Photos

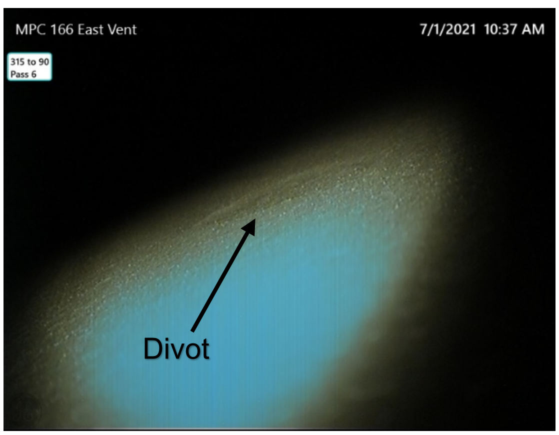
Interior



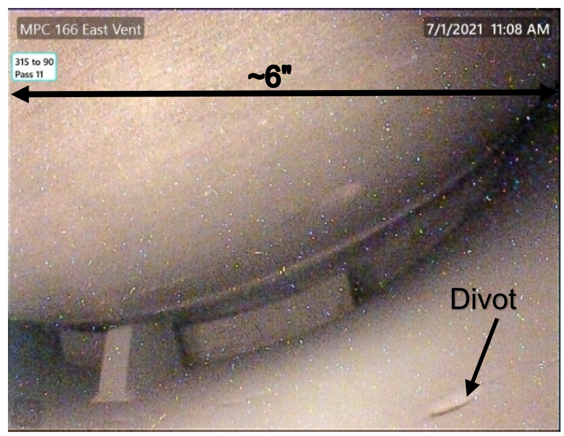
34. Deposit stain on overpack



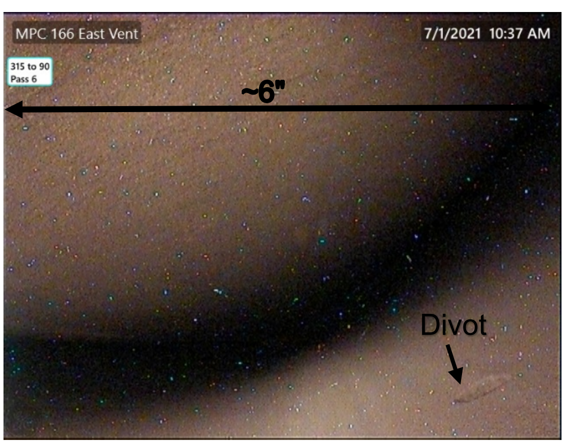
35. Minor divots in overpack , not service related



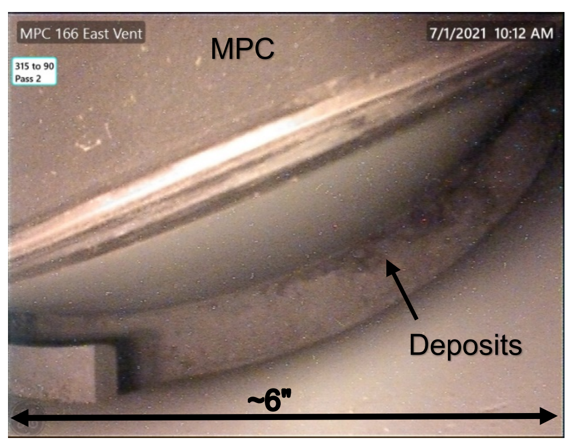
35a. Closeup of overpack divot (photo 35)



36. Minor divots in overpack, not service related

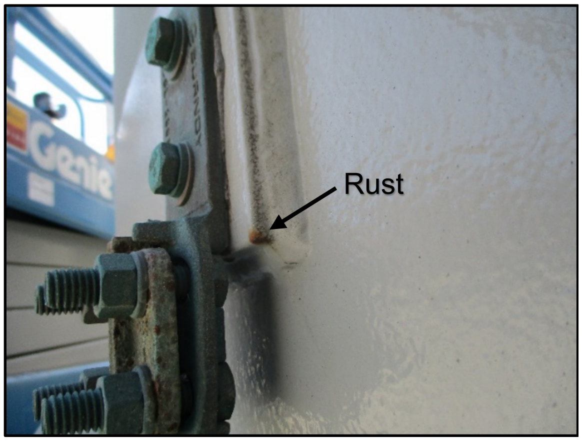


37. Divot in overpack, could not measure, looks shallow

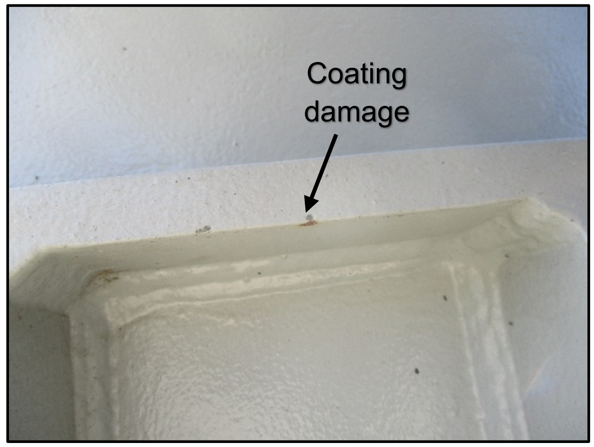


38. Deposits in bottom next to pedestal

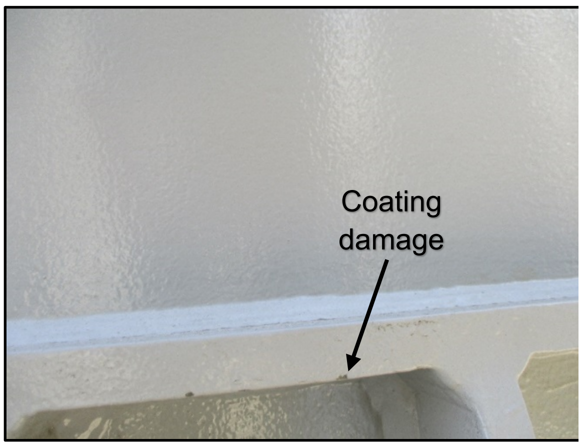
Exterior



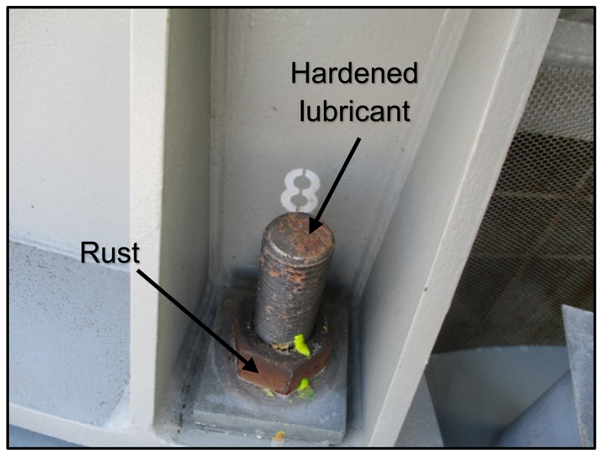
39. 180° ground strap rust area



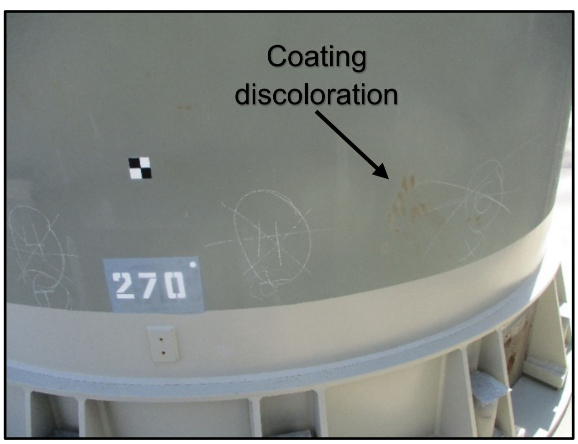
40. Anchor stud #14 area paint chip/rust



41. Anchor stud #11 outer coating chip



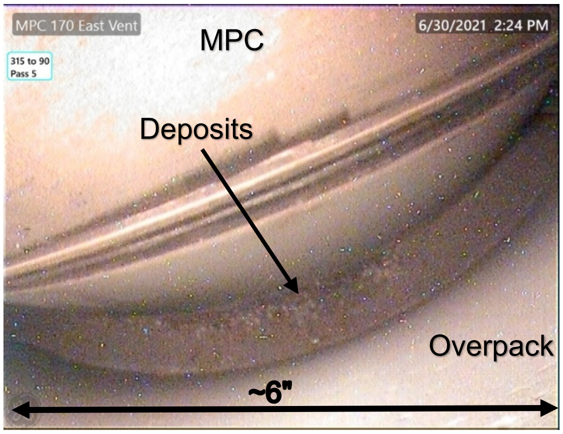
42. Anchor stud #8 hardened coating on stud, nut light rust



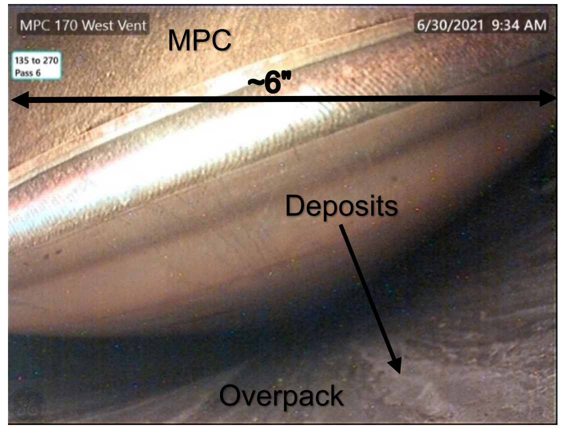
43. 270° area rust stain discoloration

2.5, Overpack Serial #516 Photos

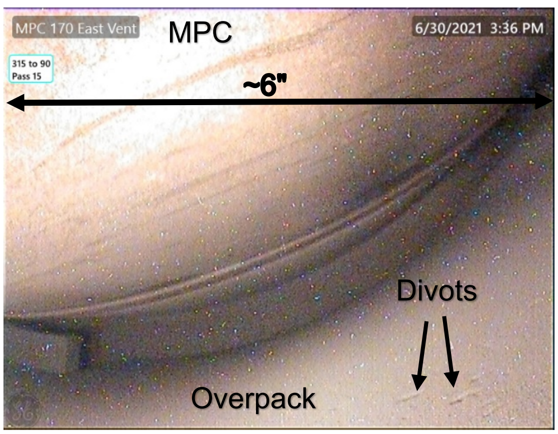
Interior



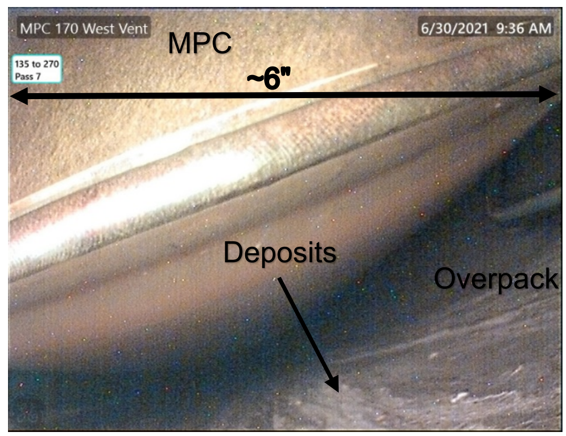
44. Deposits in bottom next to pedestal



45. Deposits on overpack

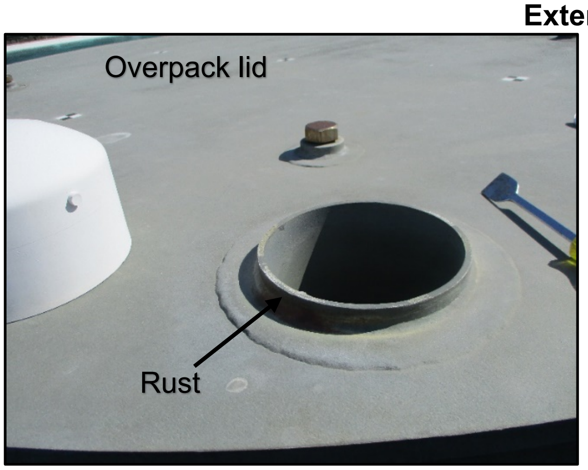


46. Divots in overpack, not service related

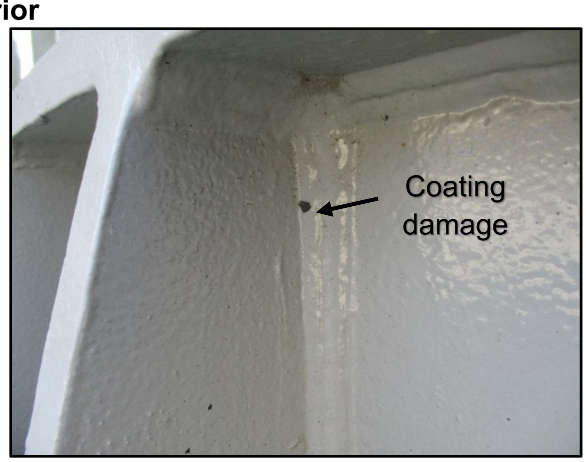


47. Deposits on overpack

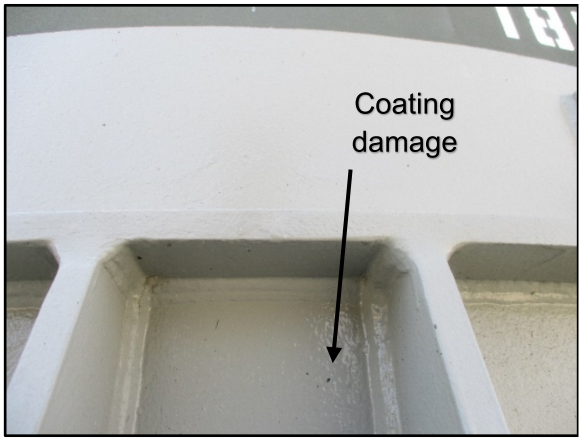
Exterior



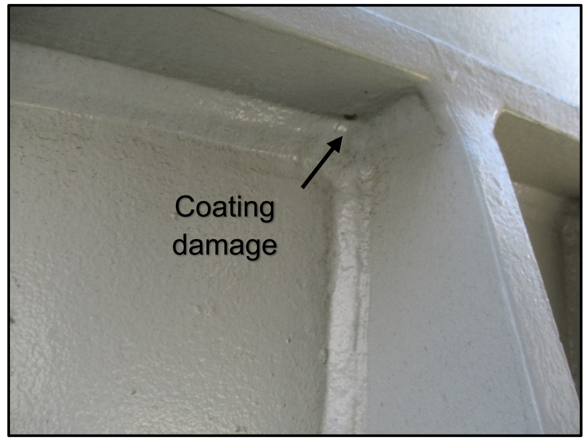
48. Southwest lid-stud pipe rust



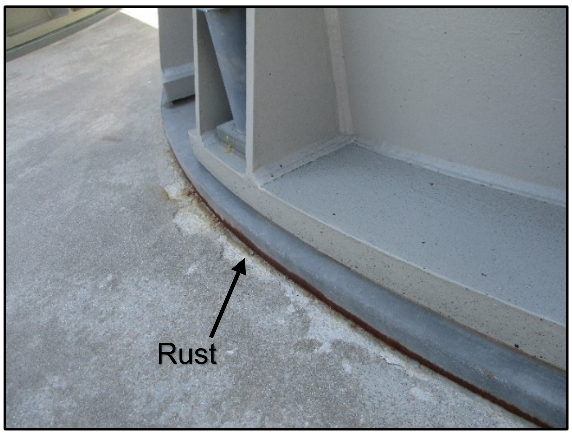
49. Area adjacent to anchor stud #16 outer coating chip



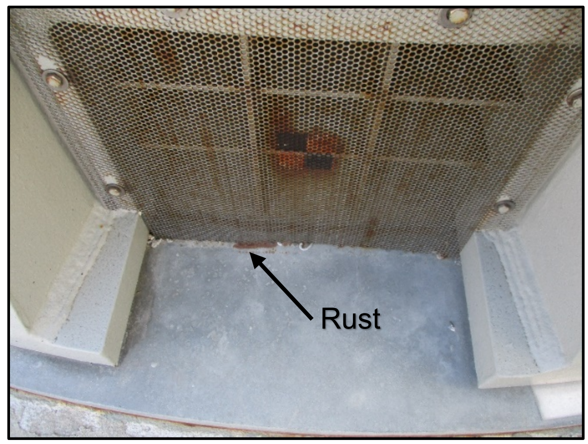
50. Anchor stud #2 outer coating chip



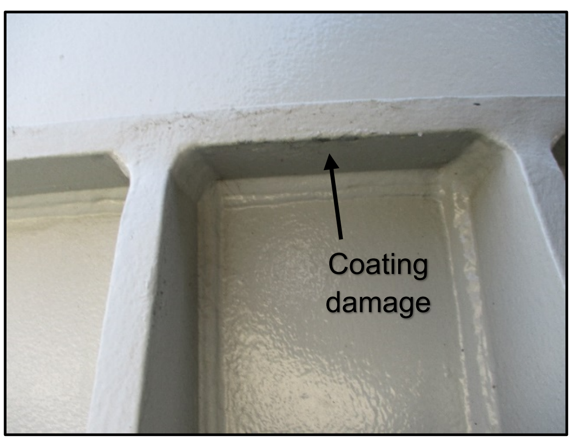
51. 270° outer coating chip



52. Rust around anchor ring at concrete interface



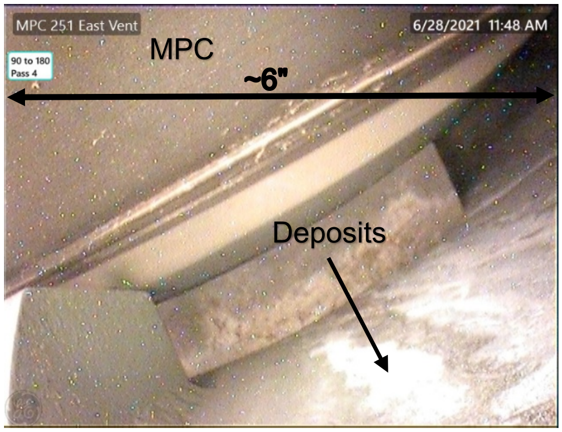
53. Rust on top of anchor ring at lower vent screen



54. Anchor stud #12 outer coating chip

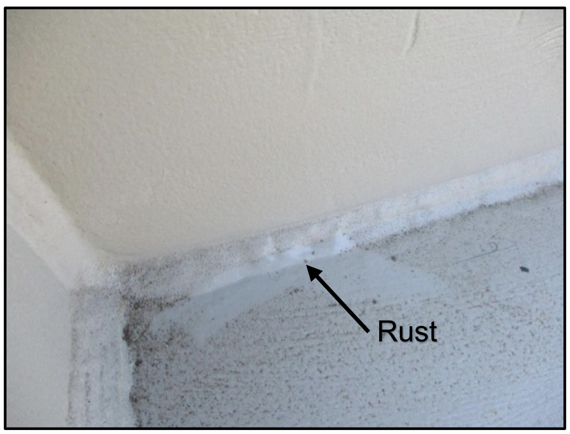
2.6, Overpack Serial #639 Photos

Interior

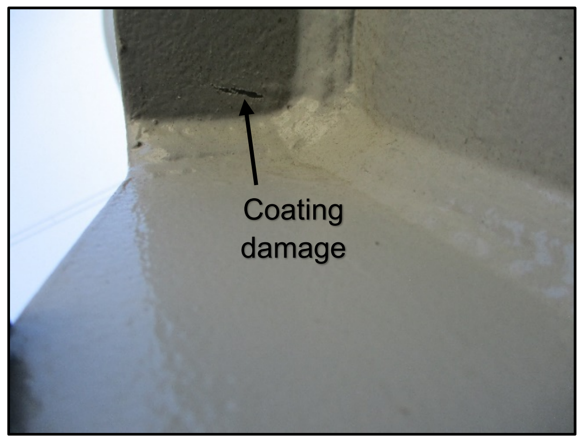


55. Deposit running down inner surface of overpack

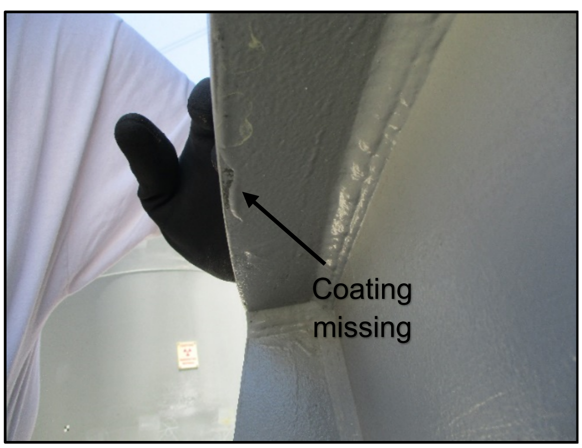
Exterior



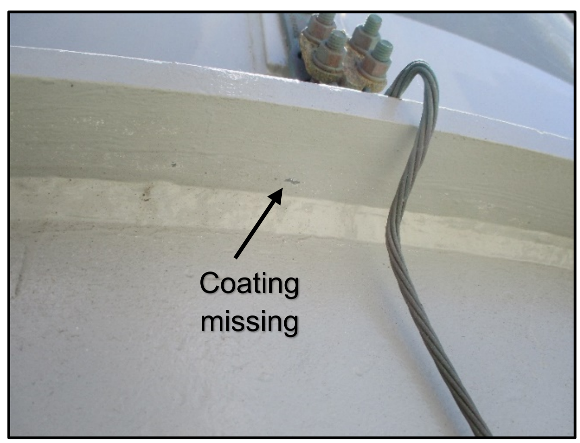
56. Very small rust spot between anchor studs #10 & #7



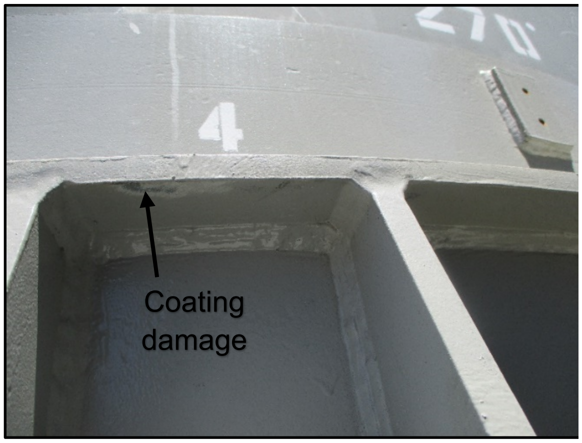
57. Outer coating scrape between anchor studs #10 & #7



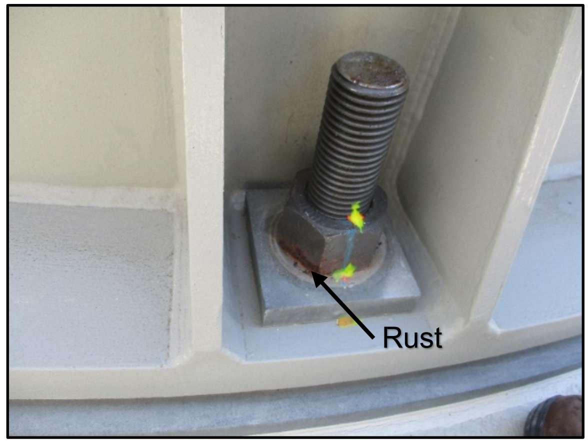
58. Missing outer coating between anchor studs #10 & #7



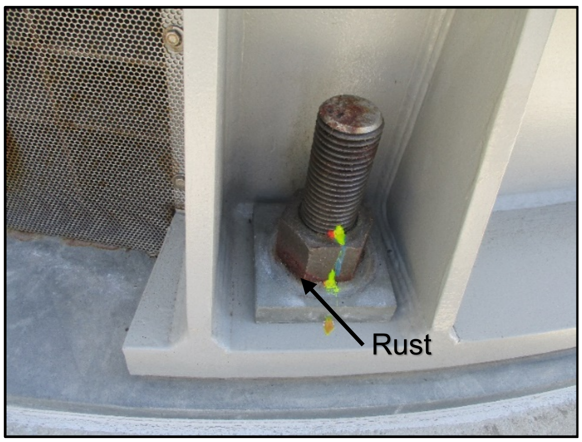
59. Small area of outer coating missing at 180°



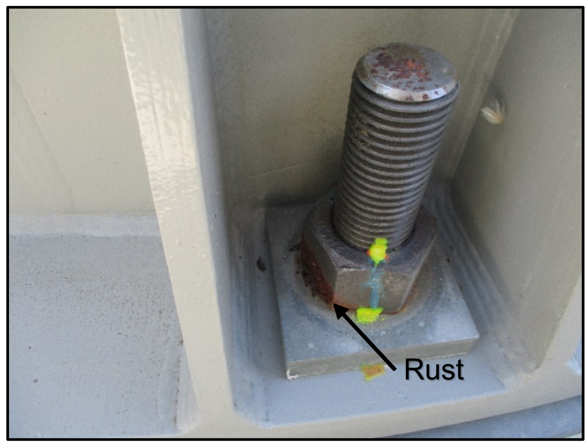
60. Area of coating degradation at anchor stud #4



61. Rust on nut at anchor stud #10



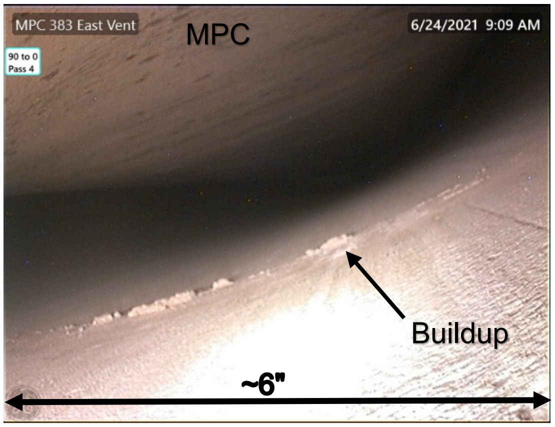
62. Rust on nut at anchor stud #16



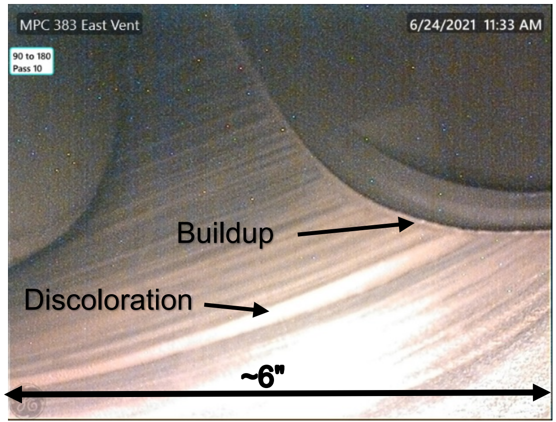
63. Rust on nut at anchor stud #3

2.7, Overpack Serial #881 Photos

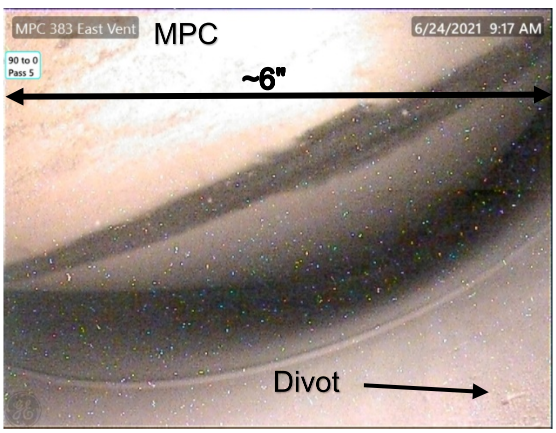
Interior



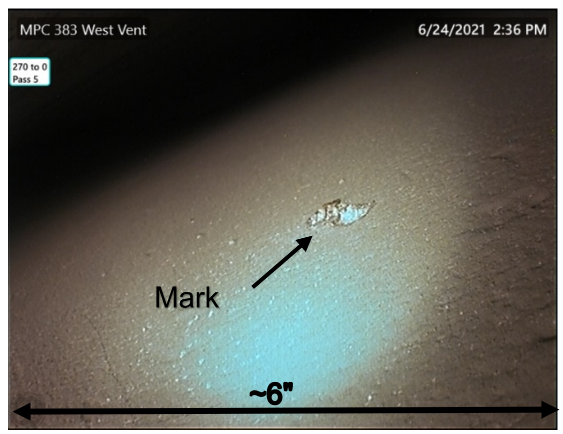
64. Buildup on overpack, not service related



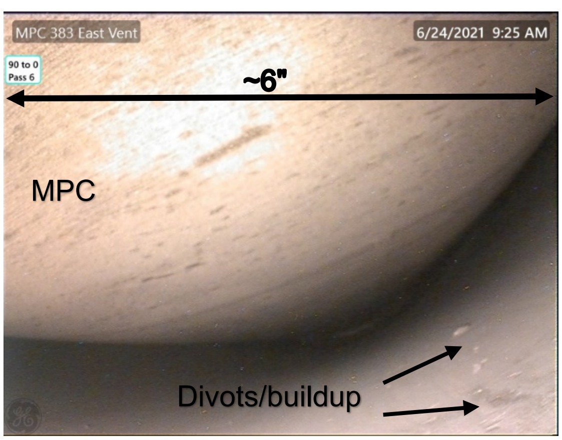
65. Upper portion of overpack showing discoloration



66. Divot on overpack, not service related

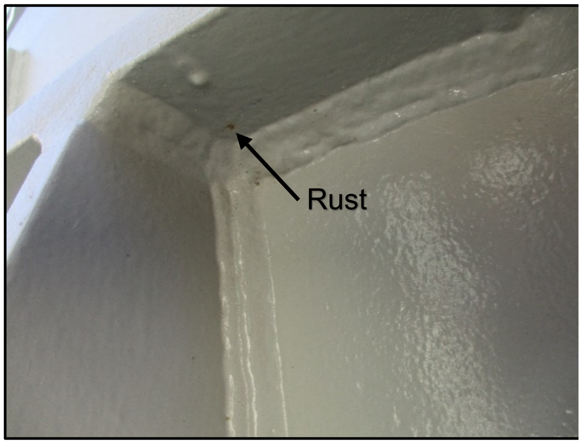


67. Mark on overpack, no rust coming from it

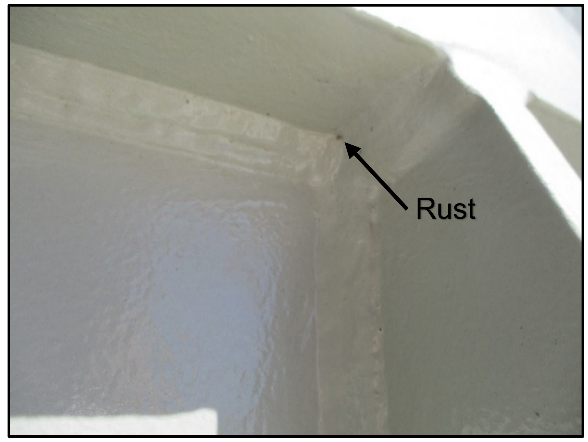


68. Divots and buildup on overpack, not service related

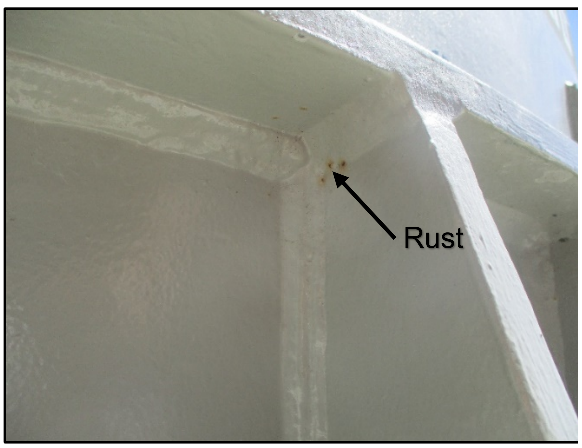
Exterior



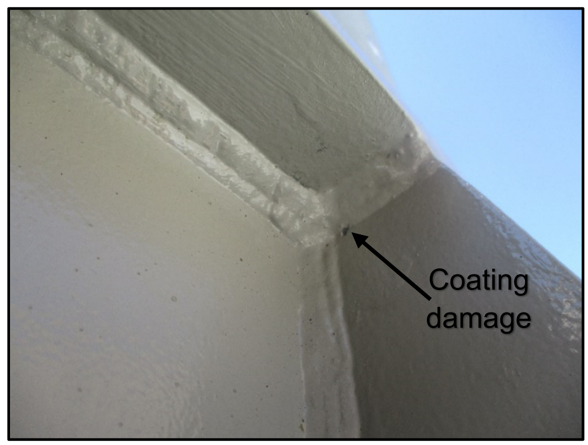
69. Rust spot at anchor stud #10



70. Rust spot in area between anchor studs #12 and #8



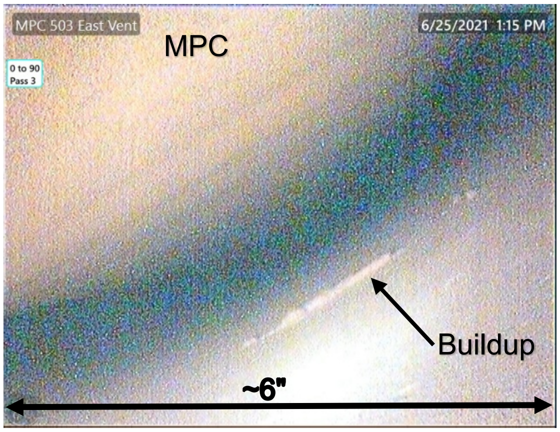
71. Rust spots in area between anchor studs #16 and #2



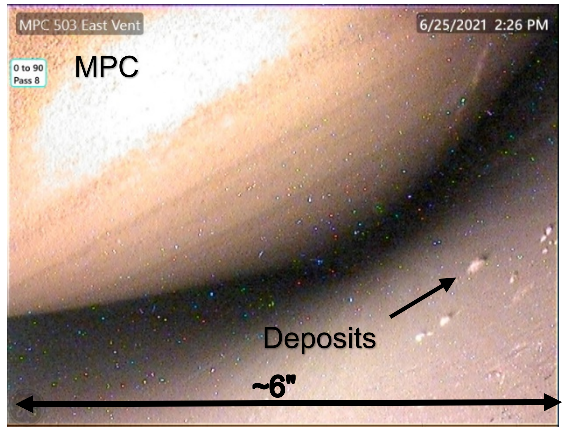
72. Chipped outer coating at anchor stud #1

2.8, Overpack Serial #1096 Photos

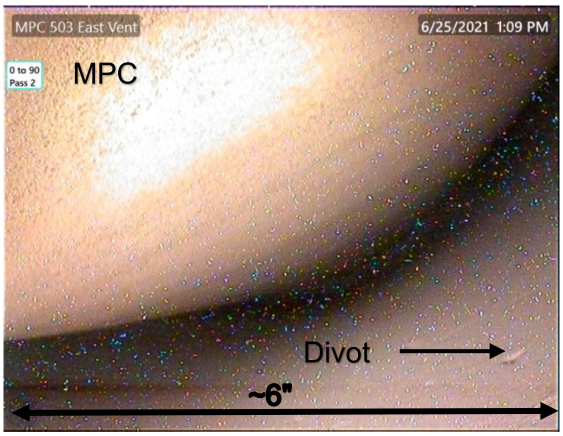
Interior



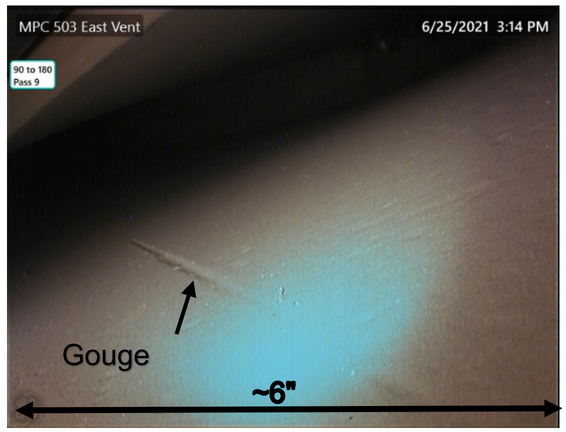
73. Buildup on overpack, not service related



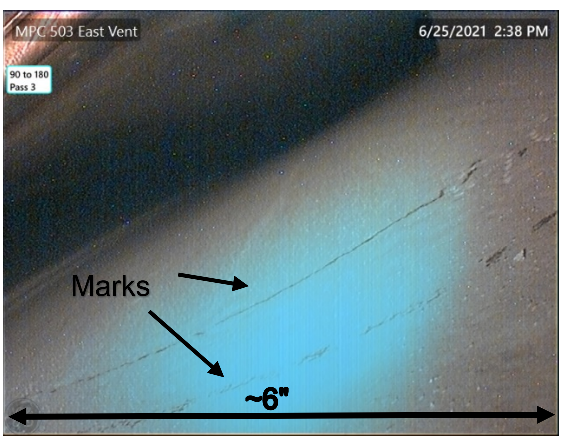
74. Deposits on overpack, not service related



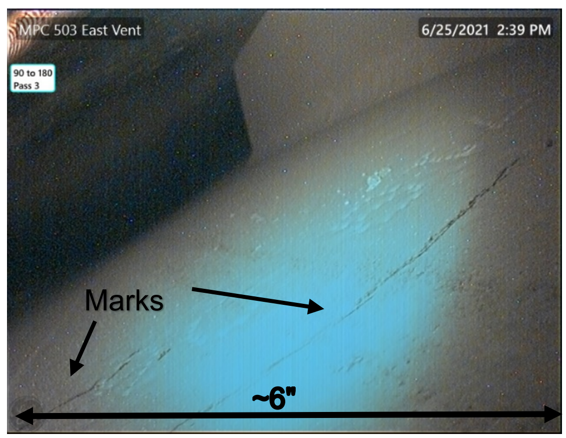
75. Divots on overpack, not service related



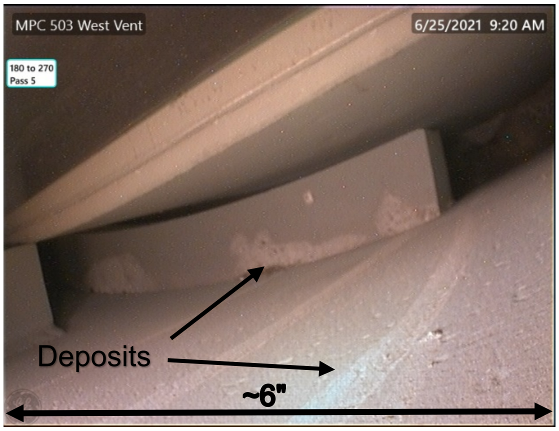
76. Shallow gouge in overpack, not service related



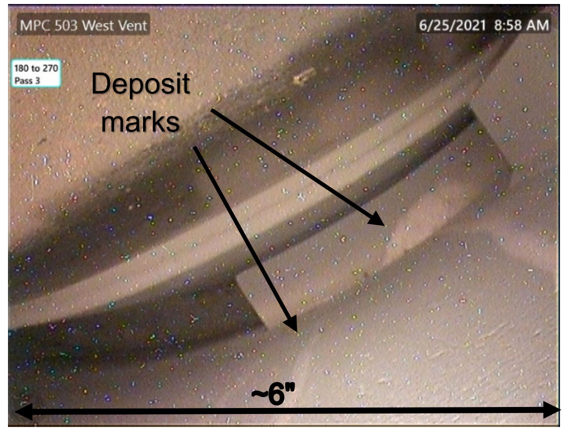
77. Marks on overpack, no observable depth



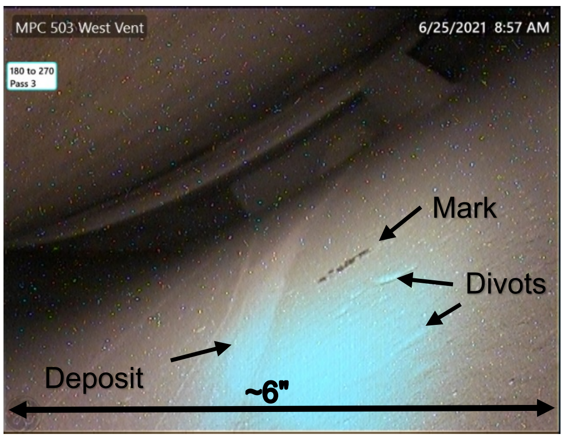
77a. Marks on overpack (continued)



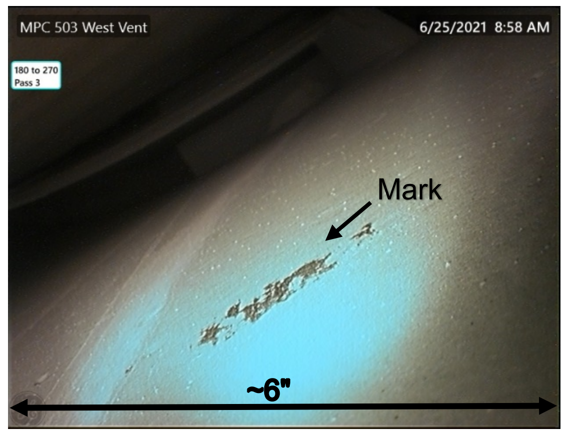
78. Deposits on overpack and onto lower vent and bottom



79. Deposit marks on overpack and at lower vent

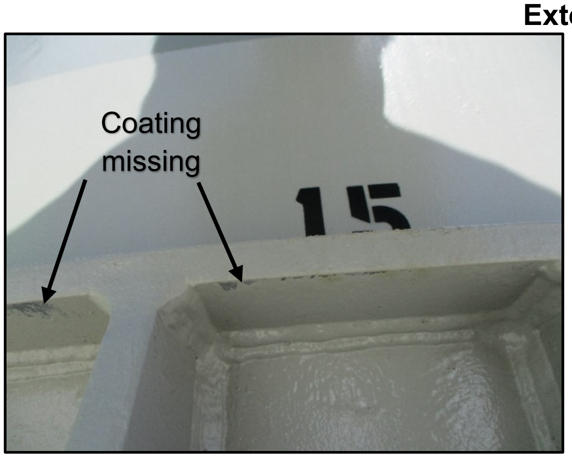


80. Deposit, divots, and mark on overpack, superficial

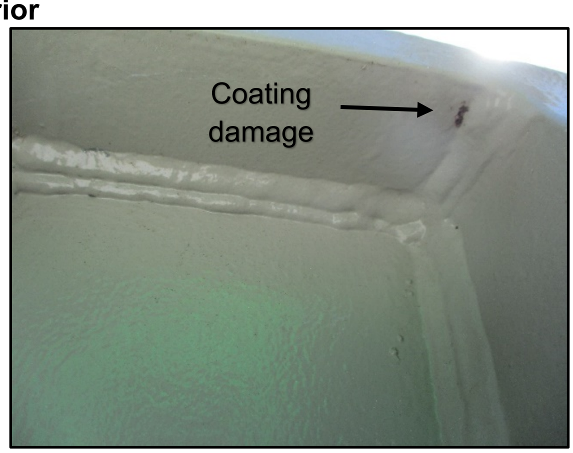


80a. Closeup of mark on overpack

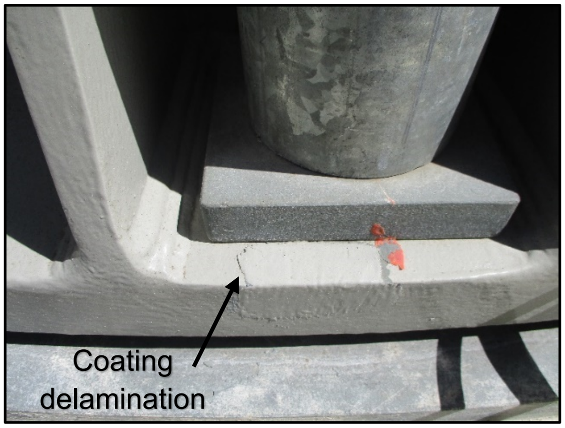
Exterior



81. Missing outer coating at anchor stud #15 (also adjacent)

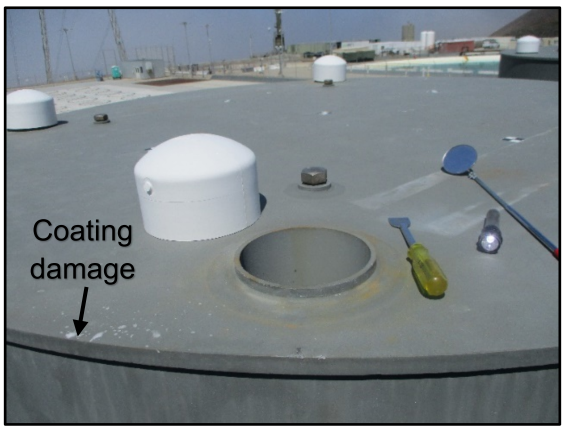


82. Outer coating degradation at anchor stud #12

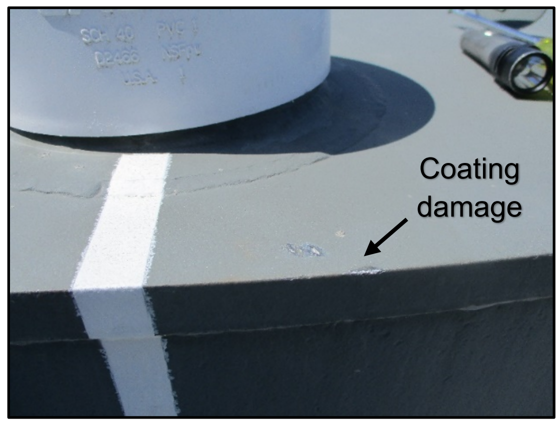


83. Coating delamination at anchor stud #2

84. Chip in coating of overpack edge, SW quadrant

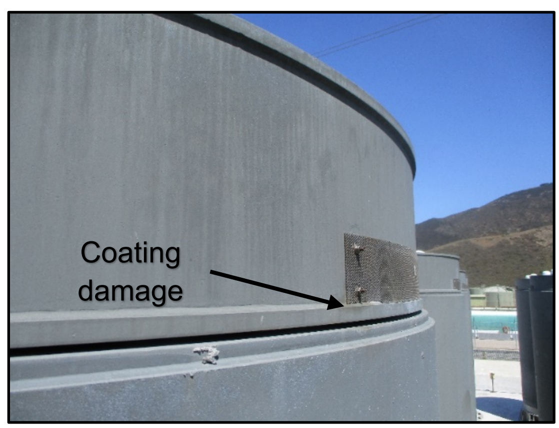


85. Coating damage at edge of lid SE quadrant

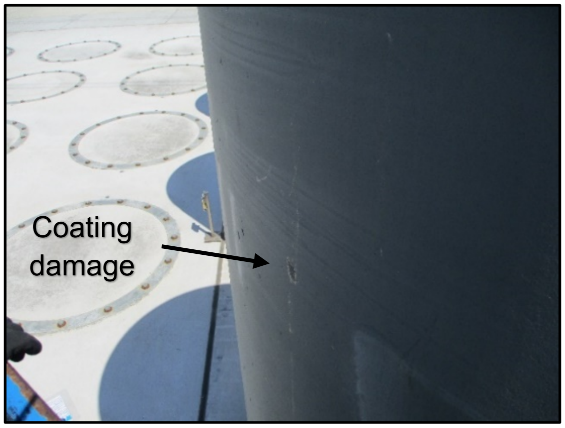


86. Coating damage at edge NE quadrant

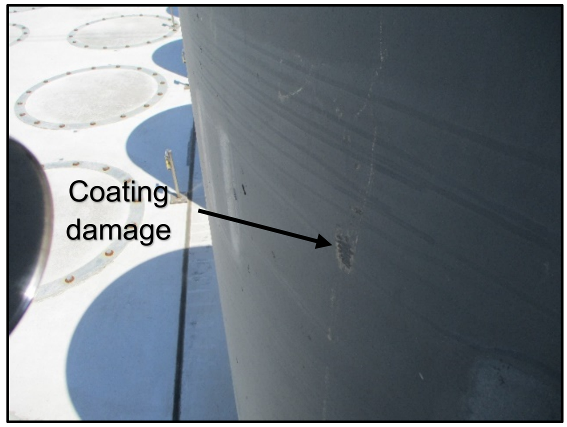
87. Rust staining SE lid-stud pipe



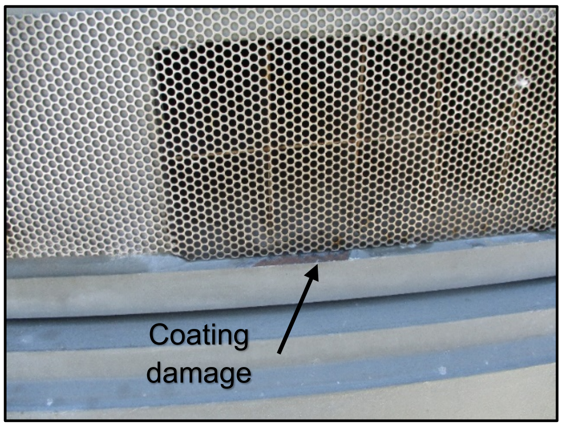
88. Tooling damage to coating; upper East vent



89. Coating damage overpack SW quadrant



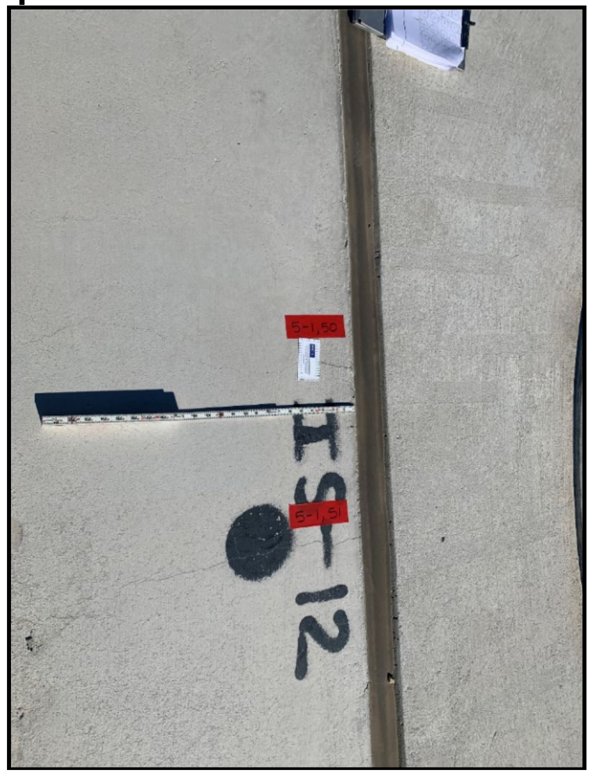
89a. Coating damage overpack SW quadrant (close-up)



90. Tooling damage to coating; upper West vent

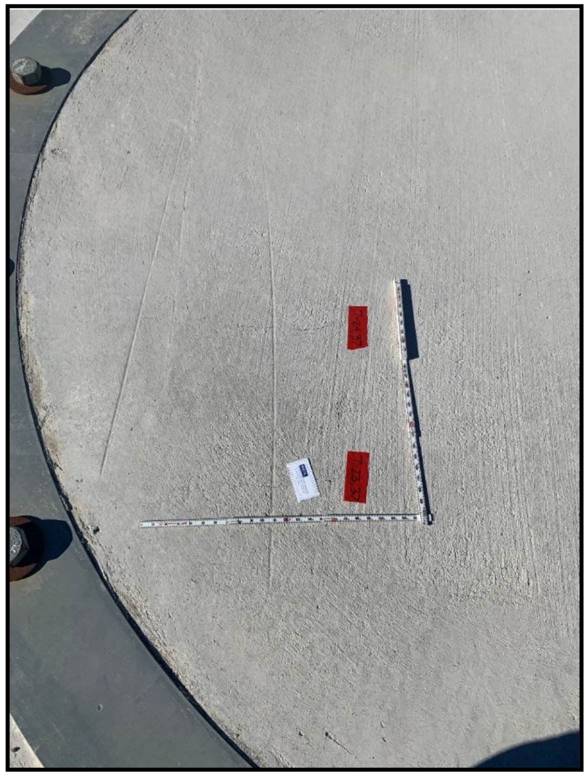
Attachment 3
Independent Spent Fuel Storage Installation Pad and Cask Transfer Facility Concrete Inspection Results

1. Delaminated concrete on Pad 1 eastern side



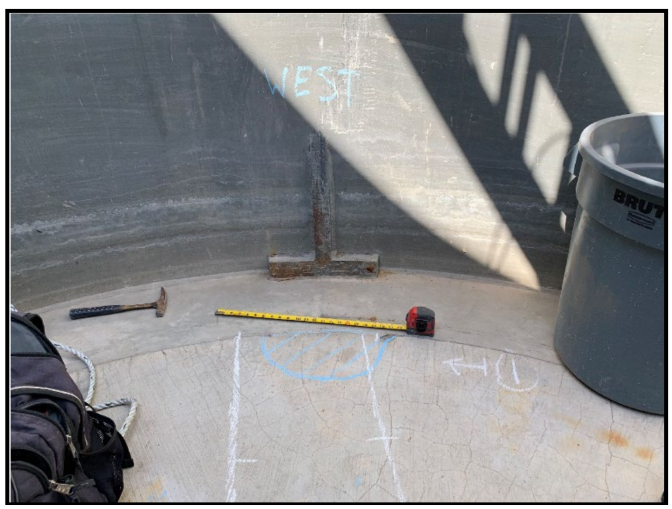
2. Cracking on Pad 5 near joint

3. Closeup of cracking on Pad 5 near joint



4. Cracking on Pad 7 inside anchorage ring

5. Closeup of cracking on Pad 7 inside anchorage ring (photo 4)



6. Delamination on west side of the CTF structure

7. Area of poor consolidation in sump of the CTF structure

Attachment 3 Figures

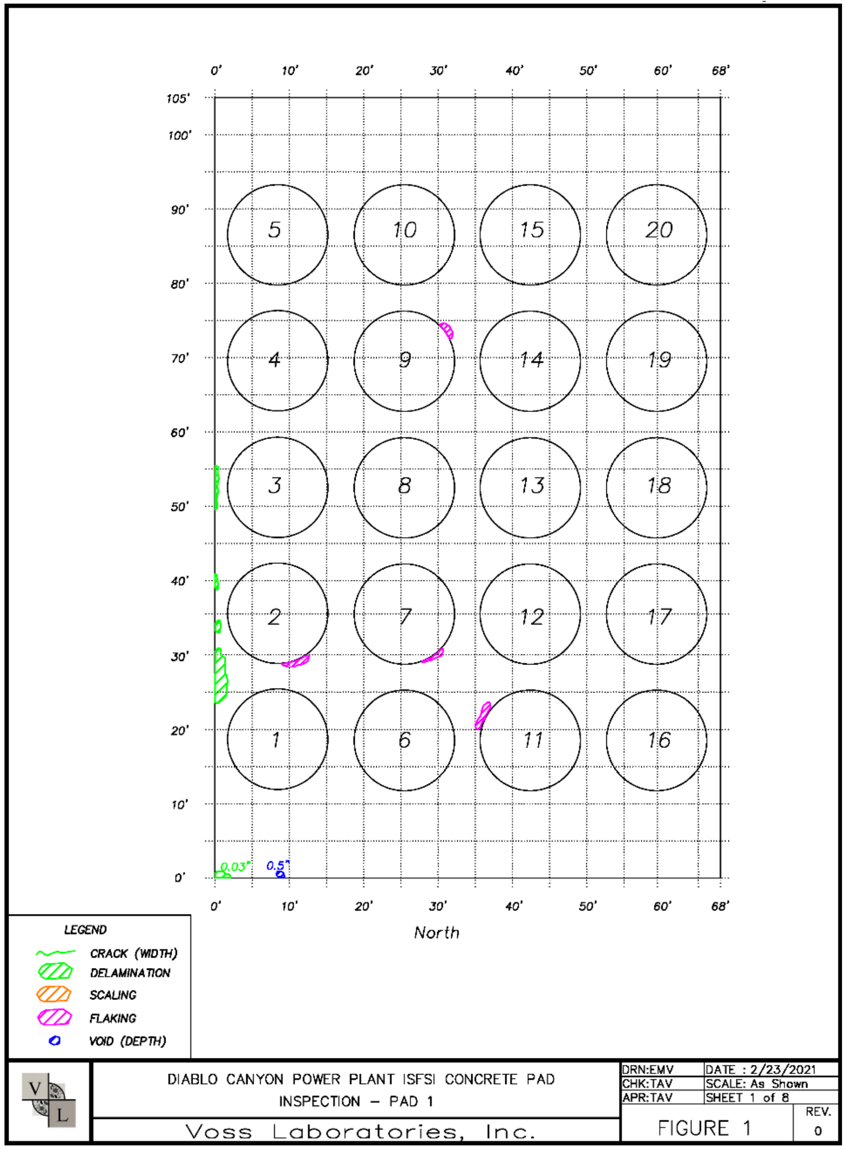


FIGURE 1

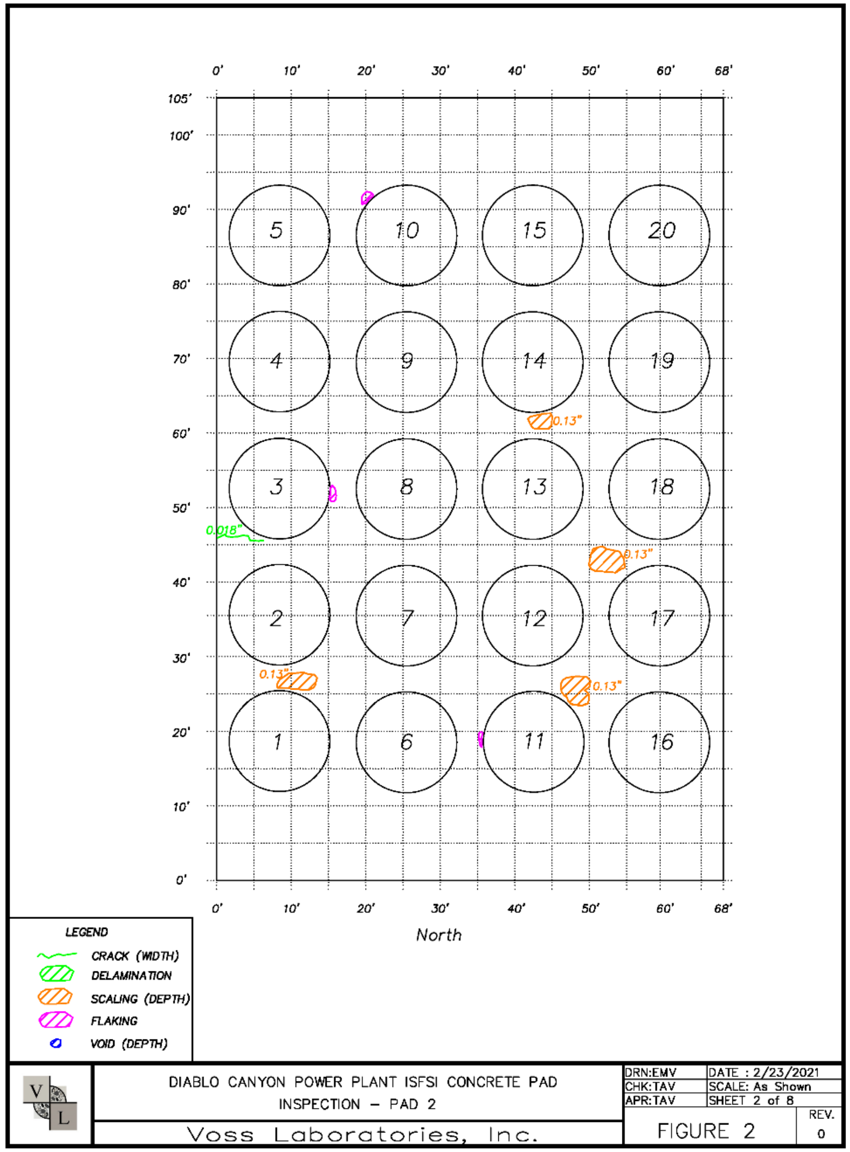
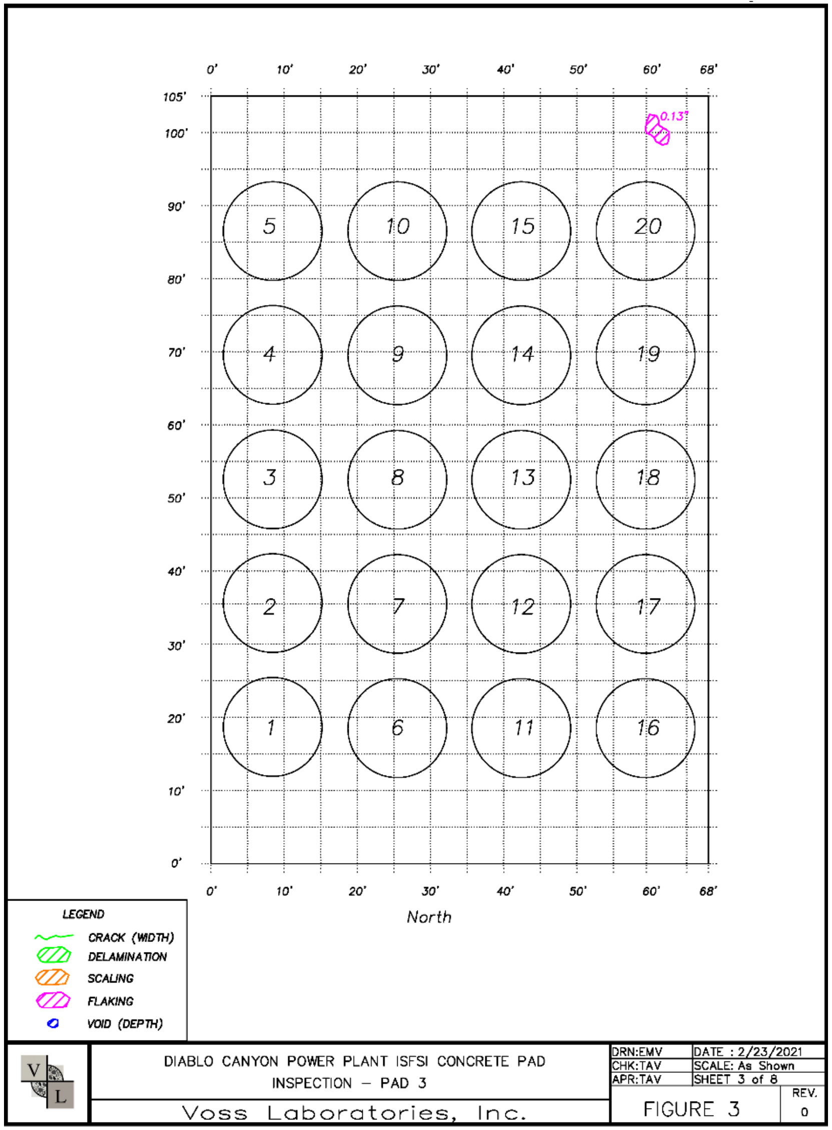
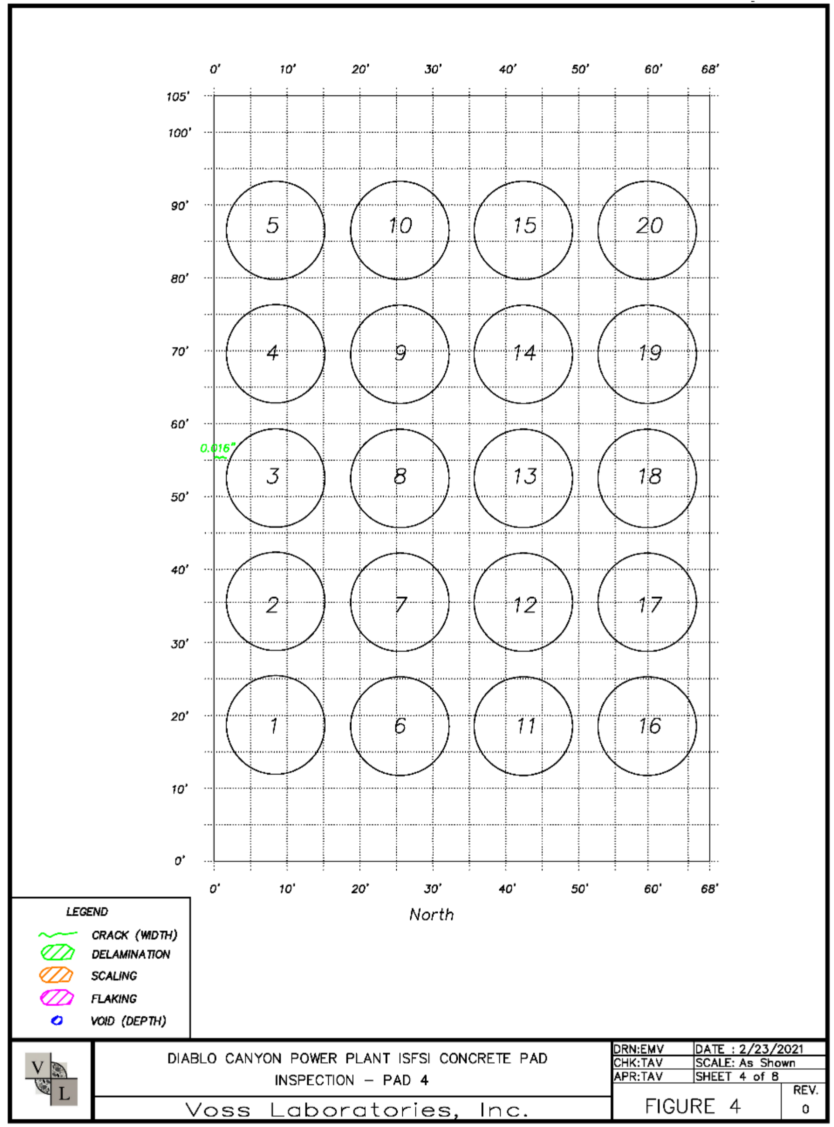
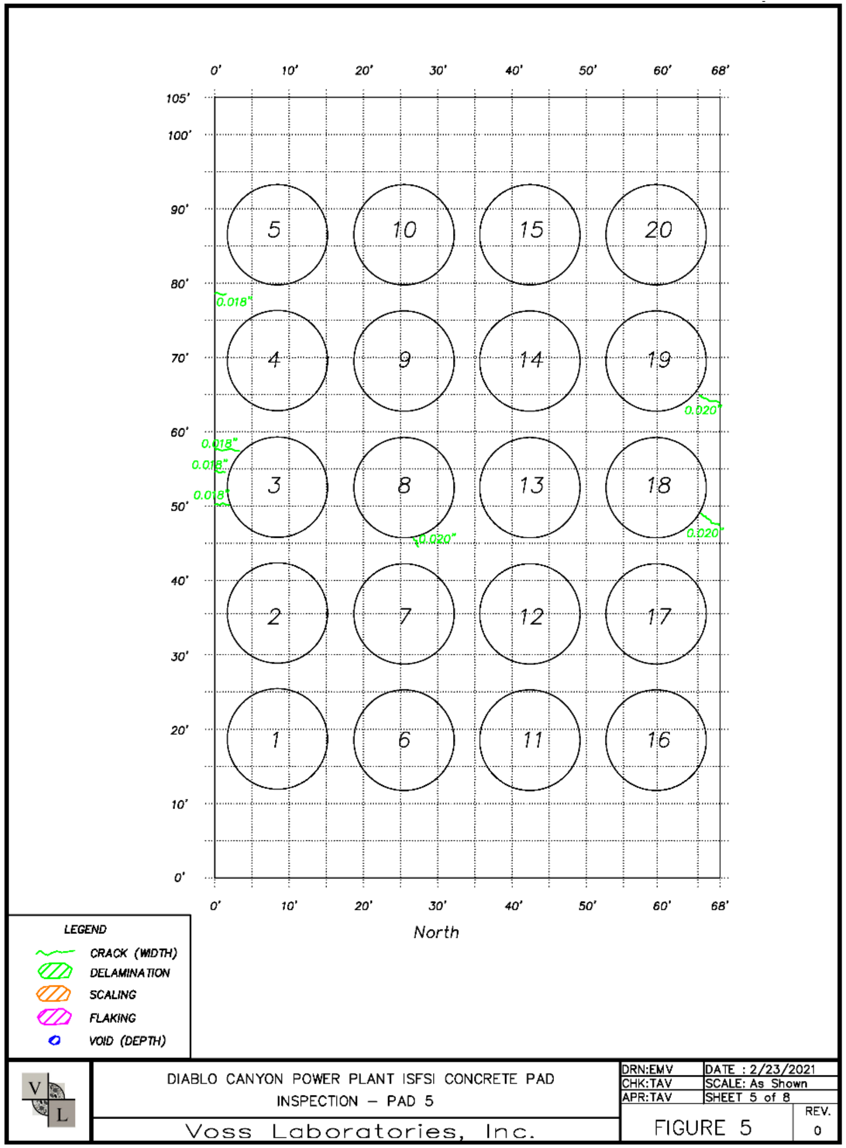
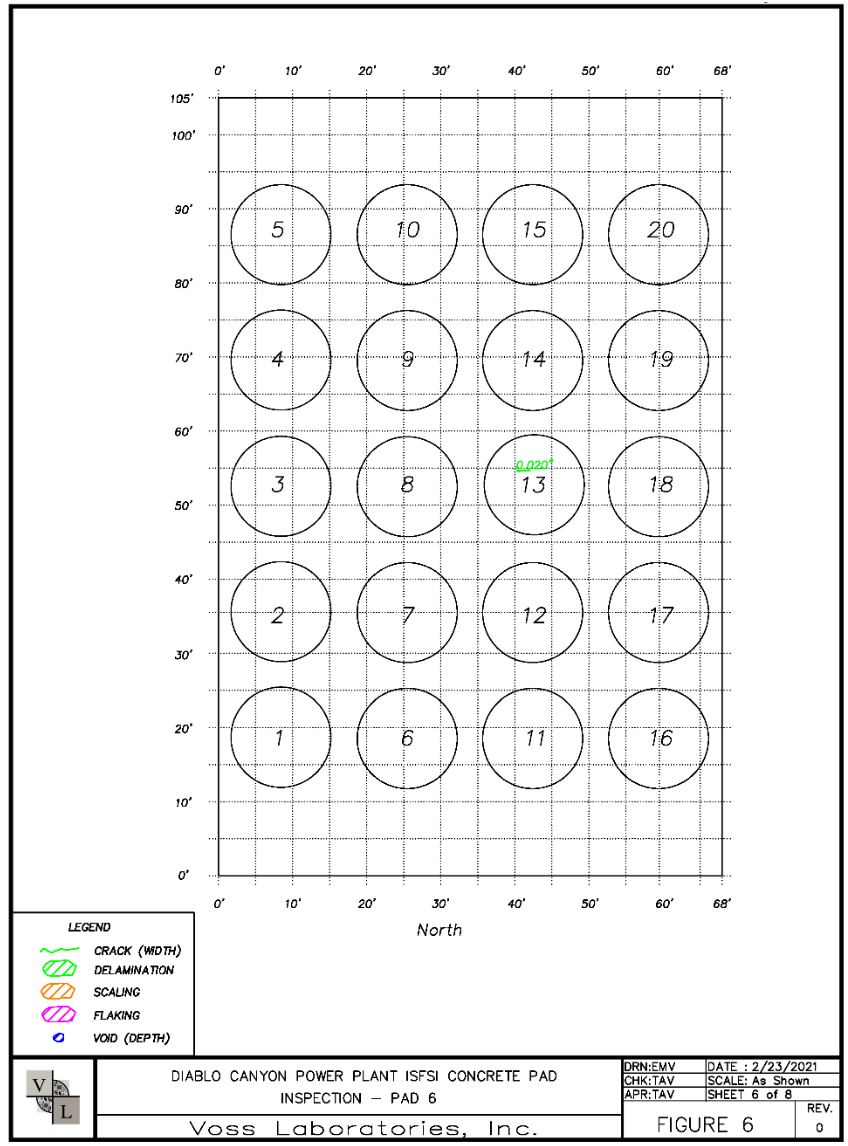


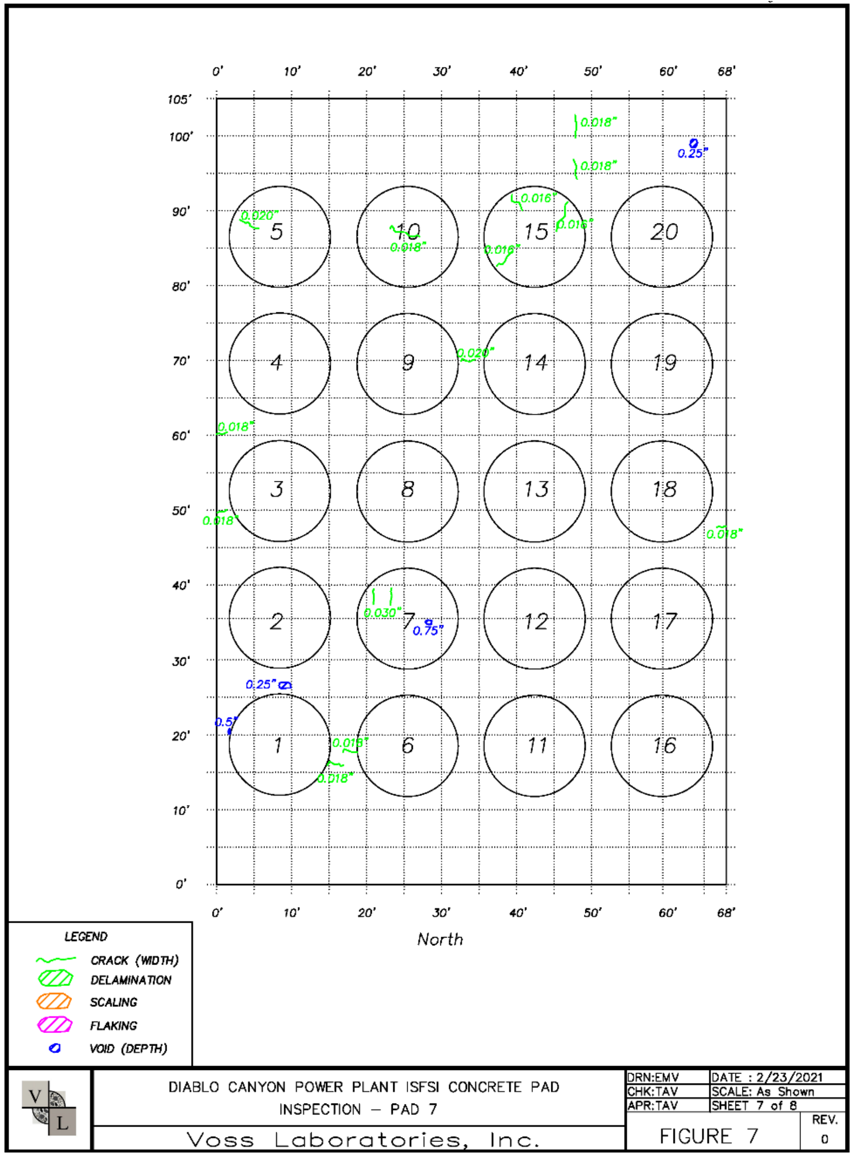
FIGURE 2

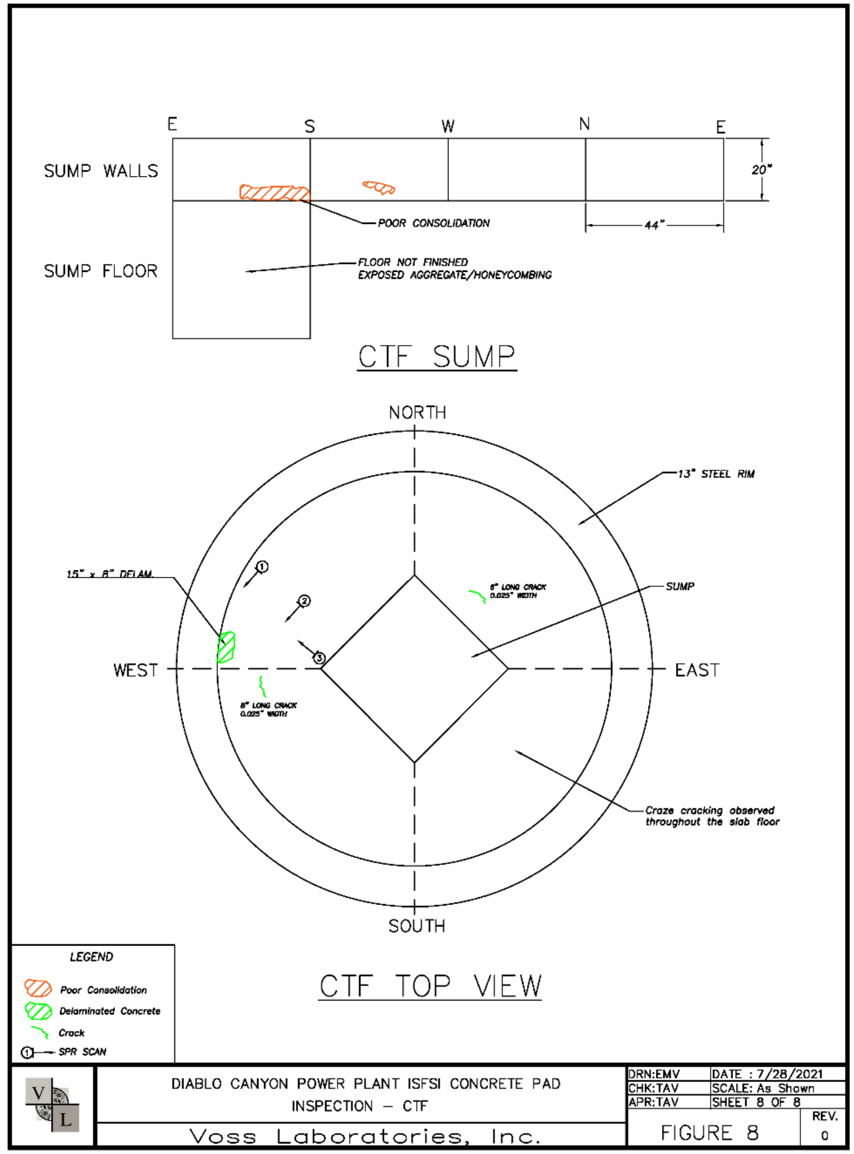

0.13"
5
10
15
20
4
9
14
19
3
8
13
18
2
7
12
17
1
6
11
16
North
LEGEND
CRACK (WIDTH)
DELAMINATION
SCALING
FLAKING
VOID (DEPTH)
DIABLO CANYON POWER PLANT ISFSI CONCRETE PAD
INSPECTION – PAD 3
Voss Laboratories, Inc.
DRN:EMV
CHK:TAV
APR:TAV
DATE : 2/23/2021
SCALE: As Shown
SHEET 3 of 8
FIGURE 3
REV.
0


0.016"
5
10
15
20
4
9
14
19
3
8
13
18
2
7
12
17
1
6
11
16
North
LEGEND
CRACK (WIDTH)
DELAMINATION
SCALING
FLAKING
VOID (DEPTH)
DIABLO CANYON POWER PLANT ISFSI CONCRETE PAD
INSPECTION – PAD 4
Voss Laboratories, Inc.
DRN:EMV
CHK:TAV
APR:TAV
DATE : 2/23/2021
SCALE: As Shown
SHEET 4 of 8
FIGURE 4
REV.
0


LEGEND
CRACK (WIDTH)
DELAMINATION
SCALING
FLAKING
VOID (DEPTH)
North
0.018"
0.020"
DIABLO CANYON POWER PLANT ISFSI CONCRETE PAD
INSPECTION – PAD 5
Voss Laboratories, Inc.
DRN:EMV
CHK:TAV
APR:TAV
DATE : 2/23/2021
SCALE: As Shown
SHEET 5 of 8
REV.
0
FIGURE 5


LEGEND
CRACK (WIDTH)
DELAMINATION
SCALING
FLAKING
VOID (DEPTH)
North
0.020"
DIABLO CANYON POWER PLANT ISFSI CONCRETE PAD
INSPECTION – PAD 6
Voss Laboratories, Inc.
DRN:EMV
CHK:TAV
APR:TAV
DATE : 2/23/2021
SCALE: As Shown
SHEET 6 of 8
REV.
0
FIGURE 6


North
LEGEND
CRACK (WIDTH)
DELAMINATION
SCALING
FLAKING
VOID (DEPTH)
DIABLO CANYON POWER PLANT ISFSI CONCRETE PAD
INSPECTION – PAD 7
Voss Laboratories, Inc.
DRN:EMV
CHK:TAV
APR:TAV
DATE : 2/23/2021
SCALE: As Shown
SHEET 7 of 8
FIGURE 7
REV. 0


SUMP WALLS
SUMP FLOOR
E
S
W
N
E
20"
44"
POOR CONSOLIDATION
FLOOR NOT FINISHED
EXPOSED AGGREGATE/HONEYCOMBING
CTF SUMP
NORTH
SOUTH
WEST
EAST
13" STEEL RIM
15" x 8" DELAM.
SUMP
Craze cracking observed throughout the slab floor
CTF TOP VIEW
LEGEND
Poor Consolidation
Delaminated Concrete
Crack
SPR SCAN
DIABLO CANYON POWER PLANT ISFSI CONCRETE PAD
INSPECTION – CTF
Voss Laboratories, Inc.
DRN:EMV
CHK:TAV
APR:TAV
DATE : 7/28/2021
SCALE: As Shown
SHEET 8 OF 8
FIGURE 8
REV. 0

Attachment 4

Soil Sampling Locations

Attachment 5

VT-3 Exam Coverage Calculation

Applicable dimensions:

MPC reference Holtec Drawing: 4408
Overpack reference Holtec Drawing: 4425

MPC Radius = 34.2"
MPC Height = 181.3"
Overpack Inner Shell Radius = 36.75"
Overpack Inner Shell Height = 207.5"
Overpack Lower Vent Width = 16.63"
Overpack Lower Vent Height = 12.13"
Pedestal Radius = 34.19"
Pedestal Height = 17.25"
Overpack outer shell radius = 66.38"
Overpack Outer Shell Height = 207.5"
Overpack Anchor Ring Inner Diameter = 132.5"
Overpack Anchor Ring Outer Diameter = 137.5"
Overpack Anchor Ring Thickness = 0.75"
Overpack Bottom Plate Radius = 73.3"
Overpack Lid Radius = 65.1"
Overpack Lid Height = 20.0"

Multi-Purpose Canisters:

Note: In its storage configuration, the bottom of the MPC sits on the Overpack pedestal, and is therefore inaccessible.

MPC Exterior Shell = $\pi(34.2*2)*181.3 = 38{,}929.7$ in^2
MPC Lid Top (Including Closure Ring & Weldment) = $\pi(34.2)^2 = 3{,}670.5$ in^2
Total Accessible MPC Area = 38,929.7 + 3,670.5 = 42,600.2 in^2
Examined Accessible MPC Area = 38,929.7 + 3,670.5 = 42,600.2 in^2
Accessible MPC Percentage Examined = 100(42,600.2 / 42600.2) = **100 Percent**

Overpack Interior:

Note: The following exposed areas were not inspected due to the inability to get access with the robot:

- Baseplate
- Overpack lid interior

Note: The following areas were not inspected due to inaccessibility in the storage configuration:

- Top and bottom of pedestal
- Baseplate area in contact with the pedestal

Inner Shell (total)= $\pi(73.5)*207.5 = 47{,}888.9$ in^2

Inner Shell cut-outs for lower vent area (4 locations) = 16.63*12.13*4 = 806.9 in^2
Inner Shell below pedestal less the lower vent areas = 3,981.1 - 806.9 = 3,174.2 in^2
Inner Shell occluded by upper guide (4 locations) = 15*1*4 = 60.0 in^2
Inner Shell occluded by lower guide (4 locations) = 7.5*1*4 = 30.0 in^2
Upper guide sides (8 locations) = (15*2.1) - (3.5*2.1) = 24.2*8 sides = 193.6 in^2
Upper guide front edge (4 locations) = 16.2*1*4 sides = 64.8 in^2
Lower guide sides (8 locations) = (7.5*2.1) - (0.5*2.5*2.1) = 15.2*8 sides = 121.6 in^2
Lower guide front edge (4 locations) = 8.26*1*4 sides = 33.0 in^2

Inner Shell total exposed area = 47,888.9 - 806.9 - 60.0 - 30.0 + 193.6 + 64.8 + 121.6 + 33.0 = 47,405.0 in^2

Pedestal sides = π(68.38)*17.25 = 3,703.8 in^2
Inner baseplate (total) = $\pi(36.75)^2$ = 4,240.8 in^2
Inner baseplate covered by pedestal = $\pi(34.19)^2$ = 3,670.5 in^2
Inner baseplate less the area covered by pedestal = 570.3 in^2
Overpack lid interior bottom = $\pi(36.8)^2$ = 4,252.3 in^2
Overpack lid interior sides = π(73.5)*7 = 1,615.5 in^2
Overpack lid cut-outs for upper vent (4 locations) = 25.9*4.5*4 = 466.2 in^2
Overpack lid interior sides less cut-outs for upper vents = 1,615.5 - 466.2 = 1,149.3 in^2

Total exposed surfaces = 47,405.0 + 3,703.8 + 570.3 + 4,252.3 + 1,149.3 = 57,080.7 in^2
Total exposed surfaces not inspected = 570.3 + 4,252.3 + 1,149.3 = 5,971.9 in^2
Exposed Overpack interior percentage examined = 100(51,108.8 / 57,080.7) = **89.5 percent**

Overpack Exterior:

Note: The following areas were not inspected due to inaccessibility when in-situ:

- Outer shell covered by the nameplate (1 location) and radiological signs (4 locations)
- Baseplate thru holes for anchor studs (16 locations)
- Baseplate covered by anchor washers (16 locations)
- Bottom baseplate

Outer Shell = π(132.75)*207.5 = 86,493.3 in^2
Outer Shell occluded by anchor ring = π(132.5)*0.75 = 312.0 in^2
Outer Shell occluded by gusset (32 locations) = 16*0.75*32 = 384.0 in^2
Outer Shell occluded by nameplate = 4*10 = 40.0 in^2
Outer Shell occluded by radiological postings (4 locations) = 8*12*4 = 384.0 in^2
Outer Shell cut-outs for lower vent (4 locations) = 16.63*12.13*4 = 806.9 in^2
Outer Shell total accessible area = 86,493.3-312.0 - 312.0 - 384 - 40.0 - 384.0 - 806.9 = 84,566.4 in^2

Anchor Ring Top and Bottom = $\pi(68.75)^2 - \pi(66.25)^2$ = 1,059.7 in^2
Anchor Ring bottom occluded by top of gusset (32 locations) = 2*0.75*32 = 48.0 in^2
Anchor Ring perimeter = π(137.5)*.75 = 323.8 in^2
Anchor Ring total accessible area = 1,059.7 + 1,059.7 + 323.8 - 48.0 = 2,395.2 in^2

Gusset sides (64 locations) = (16*7) - (0.5*5*16) = 72 in^2*64 = 4,608.0 in^2
Gusset front edge (32 locations) = 16*.75*32 = 384.0 in^2
Gusset total accessible area = 4,608.0 + 384.0 = 4,992.0 in^2

Bottom plate = $\pi(73.3)^2$ - $\pi(66.4)^2$ 3,012.1 in^2
Bottom plate cut-out for gamma shields (4 locations) = 6.87*15.19*4 = 417.4 in^2
Bottom plate anchor stud thru holes (16 locations) = $\pi(1.25)^2$ = 4.9*16 = 78.5 in^2
Bottom plate occluded by the anchor stud washers (16 locations, assume round washers) = 25.9 in^2

25.9*16 = 414.4 in^2 - 78.5 = 335.9 in^2

Bottom plate perimeter edge = $\pi(146.5)$*2 = 920.0 in^2
Bottom plate total accessible area = 3,012.1 + 920.0 - 417.4 - 335.9 = 3,178.7 in^2

Overpack lid top = $\pi(65.1)^2$ = 13,319.6 in^2
Overpack lid side = $\pi(130.3)$*20 = 8,179.7 in^2
Overpack lid side cut-out for upper vent (4 locations) = 25.9*4.5*4 = 466.2 in^2
Overpack lid stud pipe (4 locations) = $\pi(8)$*18.1*4 = 1,818.7 in^2
Overpack lid total accessible area = 13,319.6 + 8,179.7 + 1,818.7 - 466.2 = 22,851.8 in^2

Overpack exterior total accessible area = 84,566.4 +2,395.2 + 4,992.0 + 3,178.7 + 22,851.8 = 117,984.1 in^2
Accessible Overpack exterior percentage examined = 100(117,984.1 / 117,984.1) = **100.0 percent**

Appendix F

ENVIRONMENTAL REPORT SUPPLEMENT

Table of Contents

Table of Contents

List of Tables

List of Figures

Acronyms and Abbreviations

ACS	American Community Survey
ALARA	As Low As Reasonably Achievable
AMP	Aging Management Program
CCC	California Coastal Commission
CCMP	California Coastal Management Program
CDP	Coastal Development Permit
CFR	Code of Federal Regulations
CISF	Consolidated Interim Storage Facility
CTF	Cask Transfer Facility
DC	Diablo Canyon
DCPP	Diablo Canyon Power Plant
DOE	Department of Energy
EA	Environmental Assessment
ER	Environmental Report
FR	Federal Register
GAO	Government Accountability Office
GEIS	Generic Environmental Impact Statement
HB	Humboldt Bay
ISFSI	Independent Spent Fuel Storage Installation
ISP	Interim Storage Partners
LR	License Renewal
LRA	License Renewal Application
MPC	Multi-Purpose Canister
MSL	Mean Sea Level
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NMSS	Nuclear Material Safety and Safeguards
NPDES	National Pollutant Discharge Elimination System
NRC	Nuclear Regulatory Commission
NRHP	National Register of Historic Places
PG&E	Pacific Gas and Electric Company
PVNGS	Palo Verde Nuclear Generating Station
SCE	Southern California Edison
SHPO	State Historic Preservation Officer
SONGS	San Onofre Nuclear Generating Station
SWPPP	Stormwater Pollution Prevention Plan
UFSAR	Updated Final Safety Analysis Report
USC	United States Code
USCB	United States Census Bureau

Acronyms and Abbreviations

USFWS	U.S. Fish and Wildlife Service

F.1 Introduction

Independent Spent Fuel Storage Installations (ISFSIs) for storing spent nuclear fuel and associated radioactive materials are licensed by the U.S. Nuclear Regulatory Commission (NRC). ISFSIs are licensed in accordance with the Atomic Energy Act of 1954 (42 United States Code [USC] 2011, et. seq.) and NRC implementing regulations.

Pacific Gas and Electric Company (PG&E) owns and operates the Diablo Canyon (DC) ISFSI in San Luis Obispo County, California. The DC ISFSI consists of the HI-STORM 100 System, transporter, cask transfer facility (CTF), storage pads, and ancillary equipment. The DC ISFSI operates pursuant to its own site-specific NRC License (SNM-2511), which was issued in March 2004 (Reference F8.1). The DC ISFSI was constructed to store the spent fuel associated with DC Power Plant (DCPP) Units 1 and 2, two pressurized water reactors that will permanently cease operations at the expiration of the current operating licenses in 2024 and 2025, respectively. NRC License SNM-2511 currently allows PG&E to store up to 4,400 spent fuel assemblies in up to 140 HI-STORM 100SA casks (138 plus two spare locations) at the DC ISFSI. The current site-specific DC ISFSI license will expire on March 22, 2024.

F1.1 Purpose and Need for the Proposed Action

PG&E and the NRC intend for the storage at the DC ISFSI to be interim pending availability of a federal repository. Commercial entities have also expressed interest in establishing Consolidated Interim Storage Facilities (CISF) for storage of spent nuclear fuel. However, there is uncertainty regarding when a repository or CISF will be available, and the schedule under which such a repository or CISF will accept spent fuel shipments. The repository and CISF schedules drive the DC ISFSI schedule; the longer it takes for a repository or CISF to begin accepting spent fuel shipments, the longer the DC ISFSI must store spent fuel.

In the Nuclear Waste Policy Act of 1982, Congress directed the U.S. Department of Energy (DOE) to construct and operate a geologic repository for the permanent disposal of commercial spent nuclear fuel. In the Amendments of 1987, Congress directed the DOE to study Yucca Mountain as a potential location for a federal repository. In 2002, the President and Congress approved Yucca Mountain as the site for the federal repository. In June 2008, the DOE submitted a license application to the NRC that proposed initial loading of the facility in the 2020 timeframe. In 2009, the President announced plans to terminate the Yucca Mountain program. In 2017, the Government Accountability Office (GAO) released report GAO-17-340, "Resuming Licensing of the Yucca Mountain Repository Would Require Rebuilding Capacity at [Department of Energy] DOE and NRC, Among Other Key Steps," which evaluated resumption of the Yucca Mountain licensing review.

In the Agency's 1990 Waste Confidence findings, the NRC previously assessed its degree of confidence that radioactive wastes produced by nuclear power plants could be safely disposed of, and reaffirmed and revised multiple findings (55 Federal Register [FR] 38474, September 18, 1990). These revised findings form the basis of the NRC's generic determination of no significant environmental impact from temporary storage of spent nuclear fuel. In 1999, the NRC confirmed these findings (64 FR 68005, December 6, 1999). In 2008, the NRC proposed updated Waste Confidence findings (73 FR 59551, dated October 9, 2008), including findings that there is reasonable assurance a sufficient mined geologic repository can reasonably be expected to be available within 50-60 years beyond the licensed life for operation of any reactor to dispose of the commercial high-level waste and spent fuel. On September 19, 2014, the NRC published a revised rule at Title 10 of the Code of Federal Regulations (CFR) 51.23, “Environmental Impacts of Continued Storage of Spent Nuclear Fuel Beyond the Licensed Life for Operation of a Reactor” [79 FR 56260]. The rule codifies the NRC’s generic determinations in NUREG-2157, “Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel” (Reference F8.2), regarding the environmental impacts of continued storage of spent nuclear fuel beyond a reactor’s operating license (i.e., those impacts that could occur as a result of the storage of spent nuclear fuel at at-reactor or away-from-reactor sites after a reactor’s licensed life for operation and until a permanent repository becomes available). NUREG–2157, Appendix B provides an assessment of the technical feasibility of a deep geologic repository and continued safe storage of spent fuel. That assessment concluded that a deep geologic repository is technically feasible and that a reasonable timeframe for its development (i.e., candidate site selection and characterization, final site selection, licensing review, and initial construction for acceptance of waste) is approximately 25 to 35 years.

Due to the current timeframe projections for development of a federal geologic repository, the purpose and the need for the proposed action is to provide for continued temporary dry storage of spent nuclear fuel generated from operation of DCPP at the DC ISFSI until facilities are available for interim or permanent disposal.

F1.2 The Proposed Action

The proposed action is the renewal of the license for the DC ISFSI. The current site-specific license will expire on March 22, 2024. PG&E proposes to extend the DC ISFSI license for 40 years beyond the current site-specific license term (through March 2064), as allowed by 10 CFR 72.42. No major construction or refurbishment projects are currently planned for the DC ISFSI during the license renewal (LR) period. Storage at the DC ISFSI is interim pending the availability of a federal repository for interim or permanent disposal, as discussed in Section F1.1. The DC ISFSI will be subject to aging management activities to ensure the continued integrity of the dry cask storage systems during the ISFSI LR term. The aging management programs (AMPs) are summarized in Appendix A of the license renewal application (LRA).

F1.3 Environmental Background

The NRC has previously evaluated environmental impacts from ISFSIs in accordance with the National Environmental Policy Act (NEPA). These evaluations include preparation of an environmental impact statement in conjunction with establishing the ISFSI regulation (10 CFR 72) and two environmental assessments for substantive revisions to the regulation, in addition to a Generic Environmental Impact Statement (GEIS) for plant LR (NUREG-1437; Reference F8.3). The NRC has prepared environmental impact statements and environmental assessments for numerous site-specific and general ISFSI licenses. In the course of these evaluations, the NRC has not identified any significant environmental impacts associated with ISFSI operation.

In addition, the NRC has issued and periodically updated its waste confidence decision in 10 CFR 51.23. An update was most recently completed in 2014 via NUREG-2157

(Reference F8.2). The NRC's evaluation of the potential environmental impacts of continued storage of spent fuel presented in NUREG–2157 identifies an impact level, or a range of impacts, for each resource area for a range of site conditions and timeframes. The timeframes analyzed in NUREG–2157 include the short-term timeframe (60 years beyond the licensed life of a reactor), the long-term timeframe (an additional 100 years after the short-term timeframe), and an indefinite timeframe. The DC ISFSI license renewal falls within the NUREG-2157 short-term timeframe definition.

In December 2001, PG&E submitted an application for a NRC license to construct and operate the DC ISFSI using the HI-STORM 100 System. As part of the application, PG&E submitted an ISFSI Environmental Report (ER) (Reference F8.4), as required by 10 CFR 72.34. In October 2003, the NRC issued an Environmental Assessment (EA) related to the construction and operation of the DC ISFSI, which concluded that issuance of a materials license would not significantly affect the quality of the environment (Reference F8.5).

In addition to the ISFSI ER, construction and initial operations of the DC ISFSI were also evaluated in the ISFSI Coastal Development Permit (CDP) Application (Reference F8.6) submitted to the California Coastal Commission (CCC). The CCC issued a Staff Report on the CDP Application (Reference F8.27) which evaluated the conformity of DC ISFSI construction and operations to applicable policies of the California Coastal Act.

F1.4 Environmental Report Scope and Methodology

10 CFR 72.34 requires that each application for an ISFSI license contain an ER Supplement that meets the requirements of 10 CFR 51 Subpart A. This ER Supplement was prepared by PG&E as part of its application to the NRC for DC ISFSI LR in accordance with the following NRC regulations:

- 10 CFR 72, Licensing Requirements for the Independent Storage of Spent Nuclear Fuel, High Level Radioactive Waste, and Reactor-Related Greater than Class C Waste
    - 10 CFR 72.34, Environmental report; and
    - 10 CFR 72.42, Duration of license; renewal.

- 10 CFR 51, Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions
    - 10 CFR 51.23, Environmental impacts of continued storage of spent nuclear fuel beyond the licensed life for operation of a reactor,
    - 10 CFR 51.45, Environmental report; and
    - 10 CFR 51.60, Environmental report-materials licenses.

Each environmental resource area discussed in NUREG-2157, and codified in 10 CFR 51.23, is addressed in Sections F.3 and F.4.

10 CFR 51.60 requires that the ER Supplement contain information specified in 10 CFR 51.45. 10 CFR 51.60 directs the applicant to focus on significant environmental changes from the previously submitted ER. Table F1.4-1 indicates which section of the ER Supplement provides information to meet each requirement of 10 CFR 51.60, including 10 CFR 51.45 as adopted by reference.

PG&E reviewed the NRC's Environmental Review Guidance for Licensing Actions Associated with Nuclear Material Safety and Safeguards (NMSS) Programs (NUREG-1748; Reference F8.7) when developing this ER Supplement. PG&E also reviewed ERs (as well as the NRC's related requests for additional information) previously submitted to the NRC in support of ISFSI LR in order to confirm this ER Supplement contains the information necessary to support the NRC's environmental review.

Table F1.4-1 Cross-Reference Table for Environmental Requirements of 10 CFR 51

Regulatory Requirement	Responsive Environmental Report Supplement Section(s)
10 CFR 51.60(a), submit an ER 10 CFR 51.45(a). submit an ER	Entire ER Supplement
10 CFR 51.45(b), description of proposed action	F1.2, The Proposed Action
10 CFR 51.45(b), statement of purposes	F1.1, Purpose and Need for the Proposed Action
10 CFR 51.45(b), environment affected	F.3, Affected Environment
10 CFR 51.45(b)(1), impact of proposed action on the environment	F.4, Environmental Impacts
10 CFR 51.45(b)(2), adverse environmental effects that cannot be avoided	F7.1, Unavoidable Adverse Impacts
10 CFR 51.45(b)(3), alternatives to the proposed action	F.2, Alternatives
10 CFR 51.45(b)(4), short-term use versus long-term productivity of environment	F7.3, Short-Term Use Versus Long-Term Productivity of the Environment
10 CFR 51.45(b)(5), irreversible and irretrievable commitments of resources	F7.2, Irreversible and Irretrievable Resource Commitments
10 CFR 51.45(c), environmental effects, impact of alternatives, and alternatives for reducing or avoiding effects	F.2, Alternatives F.3, Affected Environment F.4, Environmental Impacts F.5, Mitigation Measures
10 CFR 51.45(d), status of compliance	F1.5, Applicable Regulatory Requirements, Permits, and Required Consultations
10 CFR 51.45(e), adverse information	F.3, Affected Environment F.4, Environmental Impacts

The environmental impacts of the DC ISFSI were first presented in the ER for the DC ISFSI license (Reference F8.4) and NRC issued an EA related to the construction and operation of the DC ISFSI (Reference F8.5). Because these documents have previously defined the impacts of the DC ISFSI, PG&E adopts relevant material from these documents by reference.

F1.5 Applicable Regulatory Requirements, Permits, and Required Consultations

Other than its site-specific NRC license, the DC ISFSI does not require any additional permits, licenses, or approvals to operate during the LR period. Table F1.5-1 lists the authorizations and consultations related to the DC ISFSI LR application.

Table F1.5-1 Regulatory Requirements, Permits, and Consultations for Diablo Canyon Independent Spent Fuel Storage Installation License Renewal

Agency	Authority	Requirement	Remarks
U.S. NRC	Atomic Energy Act (42 USC 2011 et. Seq.)	DC ISFSI LR	ER Supplement submitted by PG&E in support of the DC ISFSI LRA.
U.S. Fish and Wildlife Service / National Marine Fisheries Service	Endangered Species Act Section 7 (16 USC 1536)	Consultation	Requires the federal agency issuing a license to consult with this agency regarding impacts of the proposed action.
California Department of Fish and Wildlife	Endangered Species Act Section 7 (16 USC 1536)	Consultation	The federal agency issuing a license may choose to consult with this agency regarding impacts of the proposed action.
California State Office of Historic Preservation	National Historic Preservation Act Section 106 (16 USC 470f)	Consultation	Requires the federal agency issuing a license to consult with the State Historic Preservation Officer regarding impacts of the proposed action.
CCC	Federal Coastal Zone Management Act (16 USC 1452 et seq.)	Certification request; not required	Obtain a certification that LR would be consistent with the Federally approved State Coastal Zone Management program.
Central Coast Regional Water Quality Control Board	Clean Water Act Section 401 (33 USC 1341)	Certification	State issuance of National Pollutant Discharge Elimination System (NPDES) permit constitutes 401 certification.
San Luis Obispo County Environmental Health	California Health and Safety Code Division 20, Chapter 6.95	Hazardous Materials Business Plan	Requires applicant to maintain a business plan on file for all activities at the site.

F1.5.1 Special-Status Species Consultations

Section 7 of the Endangered Species Act (16 USC 1536) requires federal agencies to ensure that agency action is not likely to jeopardize any species that is listed or proposed for listing as threatened or endangered. If review of the proposed action indicates the potential for adversely affecting listed or candidate species, the federal agency must consult with the U.S. Fish and Wildlife Service (USFWS) regarding effects on non-marine species, the National Marine Fisheries Service (NMFS) for marine species, or both. In addition, the NRC may seek concurrence from the California Department of Fish and Wildlife on the Section 7 determination. USFWS and NMFS have issued joint procedural regulations at 50 CFR 402, Subpart B, that address consultation, and USFWS maintains the joint list of threatened and endangered species at 50 CFR 17.

F1.5.2 Historic and Cultural Resource Consultations

Section 106 of the National Historic Preservation Act (16 USC 470f) requires federal agencies having the authority to license any undertaking to, prior to issuing the license, take into account the effect of the undertaking on historic properties and to afford the Advisory Council on Historic Preservation an opportunity to comment on the undertaking.

In Section 7.2 of the original EA (Reference F8.5), the California State Historic Preservation Officer (SHPO) concurred with the NRC determination that the DC ISFSI would not adversely affect any historic properties. The proposed action to continue operation of the ISFSI would not involve any new disturbance that would have the potential to affect cultural resources.

F1.5.3 Coastal Zone Management Act

Principal requirements of the Coastal Act applicable to the continued operation of the DC ISFSI are identified and addressed in Attachment A of this ER Supplement.

F.2 Alternatives

This section provides an updated description of alternatives to the proposed action.

F2.1 No-Action Alternative

Under the no-action alternative, the NRC would not renew the site-specific license for the DC ISFSI. The license would expire on March 22, 2024, at which time PG&E would no longer be able to store spent fuel at the ISFSI. The existing DCPP spent fuel pools no longer have enough storage capacity to house the spent fuel stored at the ISFSI. PG&E would need to remove the stored fuel from the ISFSI, transport the fuel to another licensed storage facility, and decommission the storage facility associated with SNM-2511. There is no federal repository or other federal disposition path available for the spent fuel presently stored under SNM-2511; therefore, the no-action alternative is not a reasonable alternative.

F2.2 Other Alternatives

In the original DC ISFSI license application ER, Section 8.2 (Reference F8.4), PG&E evaluated, in part, the following long-term alternatives to constructing the DC ISFSI in addition to the no-action alternative:

- Ship Fuel to a Permanent Federal Repository
- Ship Fuel to a Reprocessing Facility
- Ship Fuel to a Private Spent Fuel Storage Facility
- Ship Fuel to Another Nuclear Power Plant

Updated analyses for each of the alternatives from the original ISFSI ER are discussed in the sections that follow. It was concluded that none of the alternatives are viable at this time as they are either (1) not yet licensed/permitted, or (2) are not in compliance with the existing DC ISFSI License (SNM-2511). No additional new alternatives have been identified for consideration.

F2.2.1 Ship Fuel to a Permanent Federal Repository

The ER considered shipment of spent fuel to a DOE repository (specifically, Yucca Mountain) or a monitored retrievable storage facility. At the time neither existed, though the ER postulated that Yucca Mountain could be open as soon as 2010. No permanent federal storage facility or interim monitored retrievable storage facility has been licensed or built and there appears to be no prospect for one available in time to eliminate the need for DC ISFSI LR. Therefore, shipping to a federal facility is not a reasonable alternative to renewing the DC ISFSI license.

F2.2.2 Ship Fuel to a Reprocessing Facility

The ER considered shipping the fuel to a reprocessing facility to extract the residual uranium and plutonium for recycling into new fuel assemblies. At that time, no reprocessing facility existed in the United States. No commercial reprocessing facilities currently exist in the United States and there are no prospects for such facilities in the foreseeable future. Therefore, reprocessing is not a reasonable alternative to renewing the DC ISFSI license.

F2.2.3 Ship Fuel to a Private Spent Fuel Storage Facility

Commercial entities have expressed interest in establishing a CISF for away-from-reactor storage of spent nuclear fuel. Development of a CISF would require a specific license from the NRC. At the time of this filing, two facilities have been proposed at the following locations:

- Interim Storage Partners, LLC (ISP) facility in Andrews County, Texas (originally submitted by Waste Control Specialists (WCS) as discussed below)
- Eddy-Lea Alliance facility in Lea County, New Mexico

Waste Control Specialists submitted a license application to the NRC for a CISF in April 2016 (Reference F8.8). In April 2017, WCS requested the NRC to temporarily suspend all safety and environmental review activities as well as public participation activities associated with WCS' license application until the completion of the sale of WCS to EnergySolutions. In August 2018, the NRC resumed review of the license application under the ISP joint venture (Reference F8.9). In July 2021, NRC issued the final environmental impact statement (NUREG-2239). The NRC issued the license to ISP to construct and operate the CISF in September 2021 (Reference F8.10). Although licensing has proceeded successfully, there is no assurance the project will be permitted and built. Further, the ISP facility does not accept Holtec cask designs which are used at the DC ISFSI. Because the ISP facility does not accept Holtec casks designs, DC ISFSI casks cannot be stored at this location and it is removed from further review.

In March 2017, Holtec International (Holtec) submitted a CISF license application to the NRC for the Eddy-Lea Alliance facility (Reference F8.11). By letter dated November 19, 2021, NRC indicated a revised review schedule will be published at a future date pending additional information from Holtec (Reference F8.12). Although licensing is proceeding at this time, there is no assurance the project will be eventually licensed, permitted, and built. Moreover, even if the Holtec CISF were available, a license amendment and permits would be required to allow for transport of the DC ISFSI spent nuclear fuel to the CISF. Further, this alternative would involve an extra offsite shipment of the spent nuclear fuel for ultimate disposal at a DOE repository. This is not considered a viable alternative at this time because the option is not yet licensed and not in compliance with the current DC ISFSI License (SNM-2511) as discussed above.

F2.2.4 Ship Fuel to Another Nuclear Power Plant

This alternative would involve shipping the DC ISFSI spent nuclear fuel to another nuclear power plant with sufficient storage capacity. The receiving utility would have to be licensed for and agree to accept the DC ISFSI spent nuclear fuel. PG&E does not expect other utilities to be willing to reduce or expand onsite spent nuclear fuel storage capacity to accommodate DCPP spent nuclear fuel. There is a recent example of a utility attempting to implement this alternative. Specifically, according to public documents (Reference F8.13), Southern California Edison (SCE) asked the owners of Palo Verde Nuclear Generating Station (PVNGS) to consider expanding the ISFSI at PVNGS to store spent nuclear fuel from San Onofre Nuclear Generating Station (SONGS). Even though SCE is part-owner of PVNGS, the proposal was rejected. Shipment of DCPP spent nuclear fuel to the Humboldt Bay (HB) ISFSI, a site owned by PG&E, is not allowed by the existing DC ISFSI license or the HB ISFSI license. Even if PG&E obtained the license amendments to allow for shipment and storage of DC ISFSI spent nuclear fuel at the HB ISFSI, this alternative would require significant involvement with state permitting agencies and agreement from local communities to store non-HB Power Plant spent nuclear fuel in Humboldt County, California. Based on PG&E's experience with initial HB ISFSI licensing and permitting, PG&E anticipates significant community opposition to storing additional spent nuclear fuel at the HB ISFSI which has a different seismic environment and less space available for additional storage. In summary, shipment of DCPP spent nuclear fuel to another nuclear power plant or ISFSI site is not a viable alternative because other plants are not licensed to accept DCPP spent nuclear fuel; DC and HB ISFSI licenses do not authorize storing DCPP spent nuclear fuel at the HB ISFSI; any proposal to transport and store DCPP spent nuclear fuel at the HB ISFSI would face significant opposition from the local community; and, the alternative would involve an additional offsite shipment of the spent nuclear fuel for ultimate disposal at a DOE repository. Finally, modification to the HB ISFSI state CDP to store DCPP spent nuclear fuel is discretionary in nature, not ministerial.

F.3 Affected Environment

As discussed in Section F1.4, the environmental impacts of the DC ISFSI were first presented in the ER for the DC ISFSI license application (Reference F8.4) and NRC issued an EA related to the construction and operation of the DC ISFSI (Reference F8.5). Because these documents have previously defined the impacts of the DC ISFSI, PG&E adopts relevant material from these documents by reference.

PG&E plans to permanently cease DCPP Units 1 and 2 power operations at the end of the existing operating licenses in November 2024 and August 2025, respectively. PG&E plans to employ the DECON method and begin active decommissioning soon after Unit 2 shutdown (Reference F8.15). DCPP 10 CFR Part 50 license termination is currently targeted for approximately 9 years after Unit 2 shutdown. As described in Section F1.1, the LR period would be from March 2024 through March 2064; therefore, a portion of the LR period occurs during active DCPP decommissioning.

F3.1 Site Location

The ISFSI is located on the central California coast in San Luis Obispo County adjacent to the Pacific Ocean and roughly equidistant from San Francisco and Los Angeles. This area is located along the coast directly southeast of Montaña de Oro State Park and is approximately 12 miles west-southwest of the city of San Luis Obispo, the county seat and the nearest significant population center (Figure F3.1-1). The coordinates of the ISFSI site are 35°12’52” North, 120°51’00” West (UTM 3,898,723 meters North, 695,689 meters East). (Reference F8.14)

Los Osos is approximately 8 miles north of the ISFSI site and is located in a mountainous area adjacent to Montaña de Oro State Park. The township of Avila Beach is located down the coast approximately 6 miles southeast of the ISFSI site. The city of Morro Bay is located up the coast approximately 10 miles northwest of the site. A number of other cities, as well as some unincorporated residential areas, exist along the coast and inland. However, these communities are greater than 8 miles from the ISFSI site. Only a few individuals reside within 5 miles of the site. Figure F3.1-2 is a 6-mile vicinity map. (Reference F8.14)

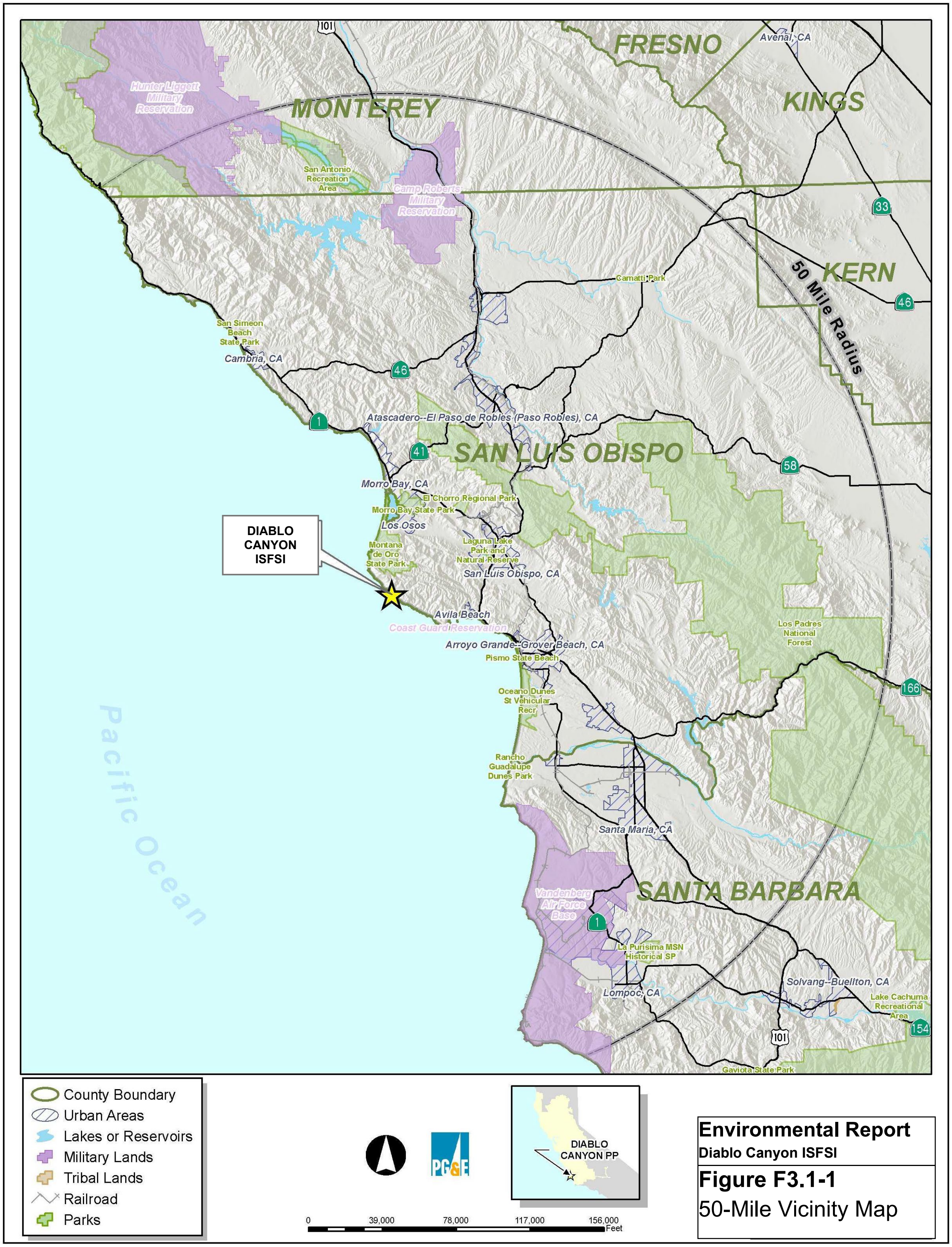
The ISFSI is located within the PG&E owner-controlled area at DCPP, which consists of approximately 750 acres of land. Approximately 165 acres of the owner-controlled area are located north of Diablo Creek. The remaining 585 acres are located adjacent to and south of Diablo Creek. PG&E controls the entire owner-controlled acreage along with all coastal properties north of Diablo Creek, to the southerly boundary of Montaña de Oro State Park and inland a distance of 0.5 to 1.75 miles. Similarly, PG&E controls all coastal properties south of Diablo Creek for approximately 8 miles and inland approximately 1.75 miles. Except for the DCPP and ISFSI sites, all of the acreage north and south of DCPP and the ISFSI are encumbered by two grazing licenses. (Reference F8.14) Two public trails, Point Buchon Trail and Pecho Coast Trail, are located on the north and south acreages, respectively.

The DC owner-controlled area occupies a coastal terrace and adjacent uplands that range in elevation from 60 to 1,400 ft above mean sea level (MSL). The ISFSI is located at an elevation of approximately 310 ft above MSL. Back from the terrace and extending for several miles inland are the rugged Irish hills, an area of steep, brush-covered hillsides and deep canyons that are part of the San Luis Mountains. The coastal areas surrounding the ISFSI are well drained, primarily via Diablo Creek, and the water table is typically low. (Reference F8.14)

The owner-controlled area is not traversed by public highway or railroad. Normal access to the ISFSI is from the south by a 6.5-mile long private road through the owner-controlled area, which is fenced and posted by PG&E. The private road is connected to a local public roadway, Avila Beach Drive, which runs along the shoreline of San Luis Obispo Bay. The major access to the area is via US Highway 101, which passes about 9 miles east of the ISFSI site and is accessible at approximately 15 miles to the southeast of the site. (Reference F8.14)

Commercial air traffic into and out of San Luis Obispo County is primarily through San Luis Obispo County Regional Airport which is located 12 miles east of the ISFSI site. (Reference F8.14)

The Southern Pacific Transportation Company provides rail service to the county by a route that essentially parallels US Highway 101. It passes approximately 9 miles east of the site, separated from it by the Irish Hills. There is no spur track into the ISFSI site. (Reference F8.14)



Environmental Report
Diablo Canyon ISFSI

Figure F3.1-1
50-Mile Vicinity Map

Environmental Report
Diablo Canyon ISFSI

Figure F3.1-2
6-Mile Vicinity Map

F3.2 Land Use

This section updates information previously presented in the ER (Reference F8.4; Section 2.2.2). Information regarding land use of the area outside of the DC owner-controlled area that is not discussed below has not changed from the information presented in the ER or the NRC's EA (Reference F8.5; Section 4.2); therefore, PG&E adopts this information by reference.

Farming is a significant land use in San Luis Obispo County; the principal agricultural industries/crops are wine grapes, vegetables, cattle, nurseries, fruits, nuts, and grains (Reference F8.16). The total land acreage of San Luis Obispo County is 2,111,084 acres. In 2017, farm acreage in the county was approximately 931,291 acres. There are several vineyards and wineries in the county. Wine grapes account for approximately 26 percent of the top ten value crops in the county (Reference F8.16). The fruit and nut crop industries had an estimated value of $603 million in 2020, with wine grapes accounting for $218 million (Reference F8.16).

In the immediate vicinity of the DCPP and the ISFSI site, most agricultural activities conducted take place on lands leased from PG&E. These activities consist of cattle grazing on much of the area surrounding the site, and dry farming of hay for cattle, which takes place on a single farm in the east-southeast sector of the PG&E-controlled property. The farm is located along the site access road on the coastal plateau, approximately 3.5 miles south from the plant and extends for 1 mile south. In addition, there are two household gardens greater than 500 square feet within 5 miles of the ISFSI site. One garden is approximately 0.25 acres and is located 4.42 miles north-northeast of the ISFSI. The second garden is approximately 500 square feet and is located 4.63 miles east of the ISFSI. The only dairy farm operation is located 12 miles northeast of the site at California Polytechnic State University in San Luis Obispo.

The land use within the DC owner-controlled area will change significantly during the ISFSI license renewal period due to DCPP's decommissioning activities (i.e., dismantlement, decontamination, and final site restoration). Final DCPP site restoration will be conducted to conclude DCPP decommissioning activities, including transitioning the site to unrestricted use. As decommissioning progresses, the owner-controlled area will be collapsed to support ISFSI operations, security, and transmission operations via the 230 and 500 kV switchyards. A DCPP final site restoration plan, including land uses, will be developed, reviewed, and approved by applicable state and local agencies as DCPP decommissioning progresses.

F3.3 Transportation

Except for updated traffic volumes presented below, information regarding transportation in the DC ISFSI area has not changed from the information presented in the ER (Reference F8.4; Section 2.8.2) or the NRC's EA (Reference F8.5; Section 4.8); therefore, PG&E adopts this information by reference.

As of 2021, approximately 1,400 full-time personnel commute to DCPP and the DC ISFSI each workday. These employees travel predominantly on the highways serving the DC ISFSI area. During the ISFSI LR period, the number of full-time commuting personnel is expected to significantly decrease due to the permanent shutdown of DCPP. The number of full-time commuting personnel will continue to decrease until the

DCPP licenses are terminated after DCPP decommissioning is complete.

Table F3.3-1 presents the existing traffic volumes for the major highways and roads serving the DC ISFSI site.

Table F3.3-1 Annual Average Daily Traffic Volume (Two-Way)

Road/Highway	Daily Traffic Volume
U.S. Highway 101 *(at San Luis Bay Drive)*	67,000 vehicles/day
State Highway 1 *(at North Highway 101)*	22,000 vehicles/day
Avila Beach Drive *(West of San Luis Bay Drive)*	12,578 vehicles/day
San Luis Bay Drive *(West of Ontario Road)*	8,359 vehicles/day

Source: References F8.17 and F8.18

F3.4 Demography and Socioeconomics

This section updates information previously presented in the ER (Reference F8.4; Sections 2.2.3 and 2.7).

F3.4.1 Socioeconomics

This section provides a description of the local economic characteristics of the area surrounding the DC ISFSI. The information is for San Luis Obispo County, the county in which the ISFSI is located.

Economy

An economic profile of San Luis Obispo County is shown in Table F3.4-1. The estimated population for San Luis Obispo County in 2020 was 278,862 (Reference F8.21). The population employed within the county was approximately 137,399 in 2018 with an unemployment rate of 4.0 percent (Reference F8.20). The unemployment rate of 4.0 percent was lower than the state's rate of 6.1 percent for 2019.

Income

The median family income in San Luis Obispo for 2019 was $92,71688,636, compared with $85,837 for the state of California. In 2019, 12.5 percent of the population in San Luis Obispo County was considered to have incomes below the poverty level, compared with 13.4 percent in California and 13.4 percent in the U.S. (Reference F8.20)

Table F3.4-1 San Luis Obispo County Economic Profile, 2018-2020

A. Estimated Population	278,862
B. Median Family Income	$92,716
C. Estimated Employment	
Private Wage/Salary	$94,348
Government	$24,073
D. Unemployment Rate	4.0%
E. Income Below Poverty Level	12.5%

Source: References F8.20, F8.21

F3.4.2 Demography

Population Distribution and Trends

The population distribution and projections for areas around the DC ISFSI site are based on the 2010 census and on estimates prepared by the California Department of Finance.[1] Consistent with the ER, the ISFSI site is located approximately 0.22 miles northeast of the Unit 1 containment. The population data presented in this section for the ISFSI are actually based on distances from the Unit 1 containment rather than distances from the ISFSI site. The 0.22 mile offset to the ISFSI, however, is considered to have a negligible effect on the population estimates at various distances and directions from the ISFSI.

The area within 50 miles of the ISFSI includes most of San Luis Obispo County, some portions of Santa Barbara County, and a small area of both Monterey and Kern Counties (see Figure F3.1-1).

Regional Population

According to the State of California Department of Finance, the 2010 population of San Luis Obispo County was 269,637. Table F3.4-2 shows the population trends of the State of California and San Luis Obispo County from 1940 to 2020 and projections from 2030 to 2060. San Luis Obispo County has seven incorporated cities ranging in size from approximately 7,655 to 45,119 persons. Approximately 56 percent of San Luis Obispo County's residents live in incorporated communities. (Reference F8.19)

[1] As of January 3, 2022, census results were not publicly available to update this section comprehensively prior to NRC submittal.

Table F3.4-2 Population Trends of the State of California and of San Luis Obispo County

Year	California	San Luis Obispo County
1940	6,907,387	33,246
1950	10,586,223	51,417
1960	15,717,204	81,044
1970	19,971,069	105,690
1980	23,667,764	155,435
1990	29,760,021	217,162
2000	33,871,653	246,681
2010	37,253,956	269,637
2020	40,129,160	278,862
2030	42,263,654	283,966
2040	43,946,643	285,976
2050	44,856,461	287,393
2060	45,299,375	290,619

Source: References F8.19, F8.21

According to the State Department of Finance, the cities of Paso Robles and San Luis Obispo together contain about 28 percent of San Luis Obispo County's population, while another 28 percent of the population is scattered among five other incorporated cities.

Table F3.4-3 shows the growth since 1970 of the incorporated cities and other major communities within 50 miles of the ISFSI site and provides distance and direction from the site (Reference F8.19).

Table F3.4-3 Population Centers Within 50 Miles of ISFSI Site

Community	Distance and Direction from Site	Population				
		2010	2000	1990	1980	1970
Los Osos	8 miles N	14,276	14,351	14,648	10,933	3,487
Morro Bay	10 miles N	10,234	10,350	9,664	9.064	7,109
San Luis Obispo	12 miles ENE	45,119	44,174	41,958	34,252	28,036
Pismo Beach	13 miles ESE	7,655	8,551	7,669	5,364	4,043
Grover Beach	14 miles ESE	13,156	13,067	11,656	8,827	5,939
Oceano	15 miles ESE	7,286	7,260	6,249	4,478	2,564
Arroyo Grande	17 miles ESE	17,252	15,851	14,378	11,290	7,454
Atascadero	21 miles NNE	28,310	26,411	23,138	16,232	N/A
Nipomo	24 miles ESE	16,714	12,626	11,070	5,247	3,642
Cambria	28 miles NNW	6,032	6,232	5,635	3,061	1,716
Santa Maria	29 miles SE	99,553	77,423	60,187	39,685	32,749

Community	Distance and Direction from Site	Population				
		2010	2000	1990	1980	1970
Paso Robles	30 miles NNE	29,793	24,297	18,583	9,163	7,168
Lompoc	45 miles SSE	42,434	41,103	49,960	26,267	25,284

Source: References F8.4, F8.19, F8.22
N/A = not available

Table F3.4-4 provides the distribution of population by race as reported in the 2010 census. (References F8.22 and F8.23)

Table F3.4-4 Percent of 2010 Population by Race for the State of California and for San Luis Obispo County

Race	Percent of Total Population	
	California	San Luis Obispo County
Hispanic or Latino	37.6	20.8
White	57.6	82.6
Black or African American	6.2	2.1
Native American	0.9	0.9
Asian	13.0	3.2
Pacific Islander	0.4	0.1
Some other race	17.0	7.3
Two or more races	4.9	3.8

Source: Reference F8.22, F8.23

Population Between 5 and 50 Miles
Figure F3.4-1 shows the United States Census Bureau (USCB) American Community Survey (ACS) 2015 5-Year Estimate population distribution between 5 and 50 miles, within the sectors of 22.5 degrees, with part circles of radii of 5, 10, 20, 30, 40, and 50 miles. Populations in each sector were estimated by determining the ratio of a given sector area to the census blocks that enter the sector. The USCB ACS 2015 5-Year Estimate reported 494,655 people living within 50 miles of the ISFSI site.

Population within 5 Miles
Figure F3.4-2 shows the USCB ACS 2015 5-Year Estimate population distribution between 0 and 5 miles, within the sectors of 22.5 degrees, with part circles of radii of 1, 2, 3, 4, and 5 miles. Populations in each sector were estimated by determining the ratio of a given sector area to the census blocks that enter the sector. The USCB ACS 2015 5-Year Estimate counted less than 734 residents within 5 miles of the ISFSI site. The nearest residence is about 1.5 miles north-northwest of the ISFSI site.

The nearest population center is the residential community of Los Osos located approximately 8 miles north of the ISFSI site. The California State Department of Finance shows the city to have a population of 14,276 (Reference F8.22).

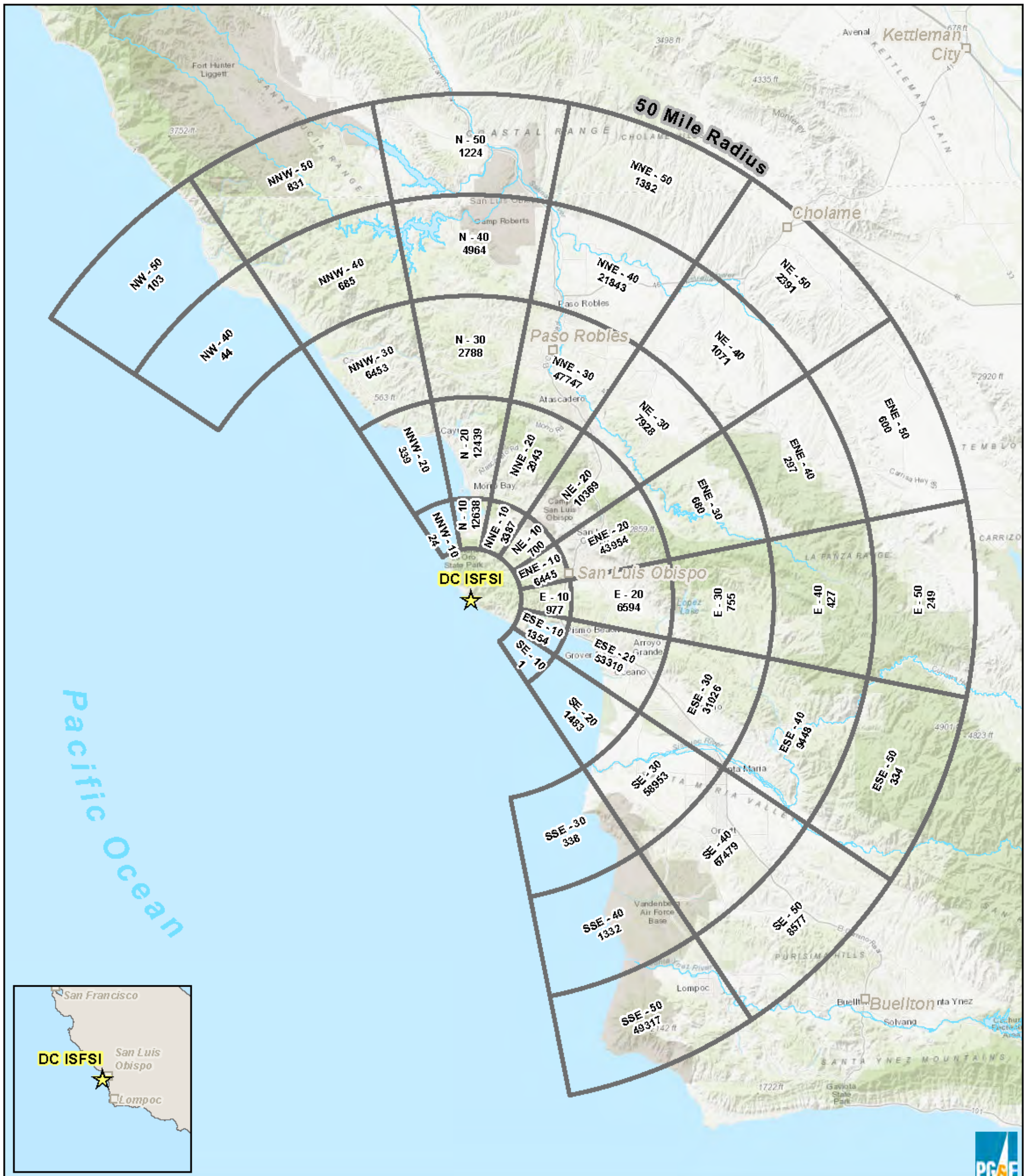
There are several schools located within 10 miles of the ISFSI site, particularly in the population centers listed in Table F3.4-3. No schools are located within 5 miles of the site. California Polytechnic State University, with an enrollment of approximately 22,300 students, is located in the city of San Luis Obispo approximately 12 miles east-northeast of the ISFSI site. Cuesta College is located approximately 16 miles northeast of the site and has an enrollment of approximately 7,100 at the San Luis Obispo campus.

Montaña de Oro Park is located north of the ISFSI site. Its area of principal use is along the beach, between 4 and 5 miles north-northwest of the site.

Transient Population

In addition to the resident population presented in the tables and population distribution figures, there is a seasonal influx of vacation and weekend visitors within a 50-mile radius, especially during the summer months. The influx is heaviest to the south along the coast from Avila Beach to south of Oceano.

Reference F8.4, Table 2.2-5 lists state and county recreation areas within 50 miles of the site.



Note: Sectors are not shown over the Pacific Ocean where there is no population to report.

☆ DC ISFSI

▭ Approximate Populations*
Source: 2015 ACS Survey

Environmental Report
Diablo Canyon ISFSI

Figure F3.4-1
Population Distribution
5 to 50 Miles

0 5 10 20 Miles

**2019 Land Use Census in the Diablo Canyon Power Plant, Units 1 and 2, 2019 Annual Radiological Environmental Operating Report, dated April 16, 2020*

Note: Sectors are not shown over the Pacific Ocean where there is no population to report.

DC ISFSI
Approximate Populations*
Source: 2015 ACS Survey
Counties

Environmental Report
Diablo Canyon ISFSI

Figure F3.4-2
Population Distribution Less Than 5 Miles

0 0.5 1 2 Miles

*2019 Land Use Census in the Diablo Canyon Power Plant, Units 1 and 2, 2019 Annual Radiological Environmental Operating Report, dated April 16, 2020

F3.5 Climatology, Meteorology, and Air Quality

Information regarding climatology and meteorology has not changed from the information presented in the ER (Reference F8.4; Section 2.4) or the NRC's EA (Reference F8.5; Section 4.4); therefore, PG&E adopts this information by reference. Below is information regarding air quality.

The California Air Resources Board monitors the air quality in California and publishes air quality information pertinent to the ISFSI. U.S. Environmental Protection Agency and California Air Resources Board have set ambient air quality standards for criteria pollutants to protect human health; the listed criteria pollutants are ozone, sulfur dioxide, nitrogen dioxide, suspended particulate matter PM_{10}, fine suspended particulate matter $PM_{2.5}$, carbon monoxide, sulfates, lead, hydrogen sulfide, and visibility reducing particles. Based on information from the California Air Resources Board, the ambient air quality at the ISFSI site meets national and state standards for all criteria pollutants except ozone and particulate PM_{10}. Criteria pollutants ozone and particulate PM_{10} would not impact the operation of the ISFSI facility.

F3.6 Geology and Soils

PG&E has conducted extensive analyses of the geologic and seismic characteristics of the region around the DCPP site as well as during initial design and licensing of the DC ISFSI site. Section 2.6 of the DC ISFSI Updated Final Safety Analysis Report (UFSAR) (Reference F8.14) describes and evaluates these characteristics and provides detailed information regarding the vibratory ground motions, foundation conditions and stability, and slope stability of the ISFSI site, the related CTF, and the transport route between the fuel handling building and the CTF.

The DC ISFSI UFSAR is maintained up to date by PG&E through periodic revisions made in accordance with 10 CFR 72.70. Hence, the information contained in the UFSAR is current, and material from Section 2.6 of the UFSAR is incorporated herein by reference.

F3.7 Water Resources

Sections 2.4 and 2.5 of the DC ISFSI UFSAR (Reference F8.14) describe the surface and groundwater hydrology for the DC area, including at the DC ISFSI. The DC ISFSI UFSAR is maintained up to date by PG&E through periodic revisions made in accordance with 10 CFR 72.70. Hence, the information contained in the UFSAR is current, and material from Sections 2.4 and 2.5 of the UFSAR is incorporated herein by reference.

Surface and groundwater uses at the DC site will change as DCPP decommissioning progresses (i.e., as freshwater demands decrease) during the ISFSI LR period. To support ISFSI operations (including personnel), PG&E expects to transition from existing onsite freshwater sources (e.g., seawater reverse osmosis system) to trucking in freshwater. As presented in the ER (Reference F8.4; Section 2.5), there are several potable water sources in the San Luis Obispo County area from which trucked water could be obtained. PG&E estimates approximately 385,000 gallons will be trucked onsite per year to support ISFSI operations after DCPP decommissioning and final site restoration are complete.

Sanitary waste will be generated during the ISFSI LR period. During DCPP decommissioning, sanitary waste will continue to be treated and disposed of using existing systems that support the ISFSI and DCPP. After DCPP decommissioning and site restoration is complete, PG&E estimates less than 50 personnel will be required to support ISFSI operations. Consistent with Reference F8.25 (Project Description, Section 2.3.21), PG&E plans to store sanitary waste in holding tanks and ship offsite for disposal.

The Construction Stormwater General Permit and Stormwater Pollution Prevention Plan (SWPPP) for the DCPP decommissioning program will govern stormwater management on the site, thereby providing further protection to the adjacent natural areas and receiving waters. As a part of DCPP decommissioning and final site restoration, a Long-Term Stormwater Management Plan will be approved by applicable local jurisdictions which will detail permanent Best Management Practices to be implemented (e.g., concrete conveyances and new stormwater detention basins).

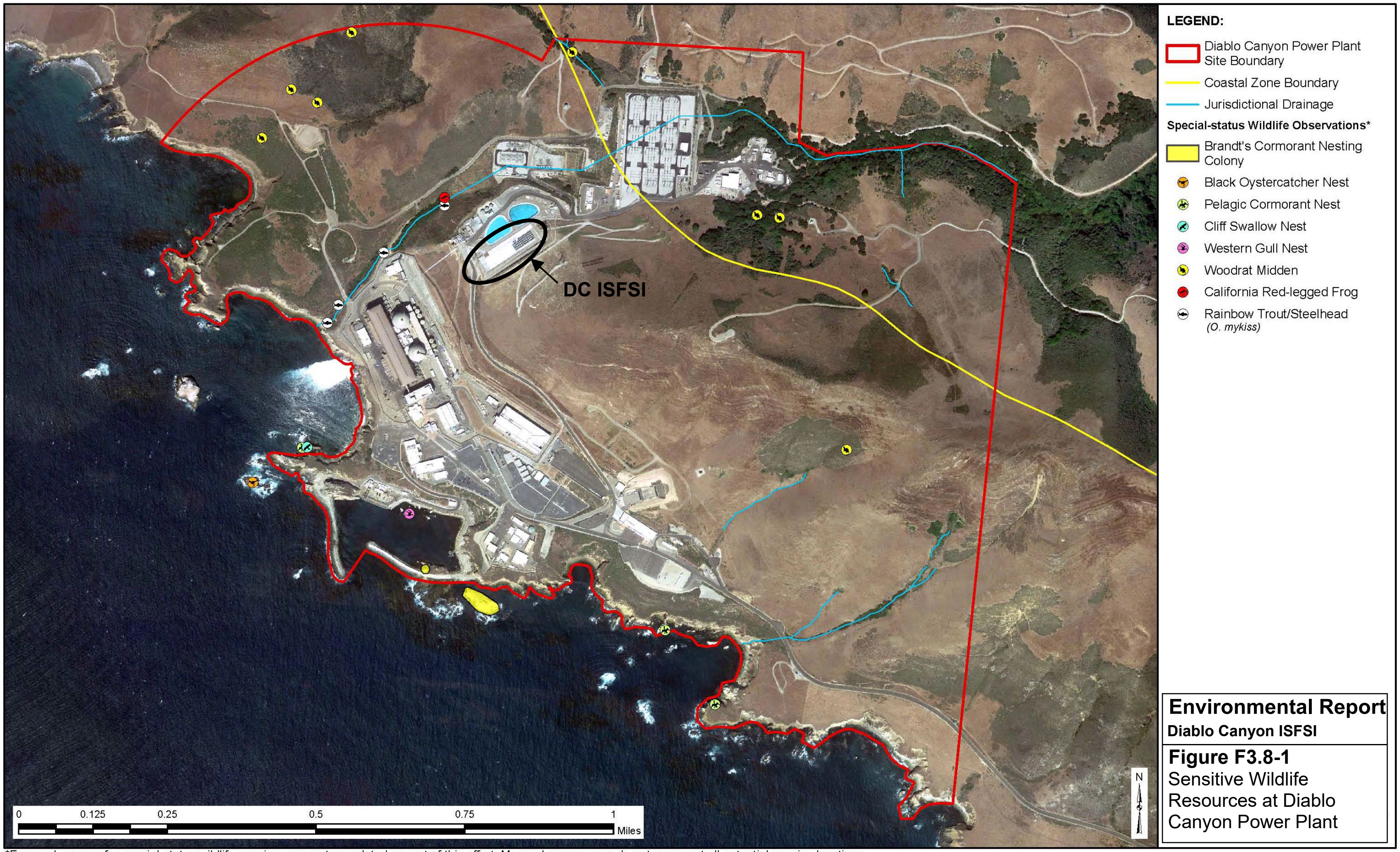
F3.8 Ecological Resources

The ER (Reference F8.4; Section 2.3) contains detailed information on the biotic communities and ecosystems of the DC ISFSI site and vicinity. The ER provided lists of plants, birds, mammals, amphibians and reptiles, terrestrial, aquatic invertebrates, fishes, and aquatic species that could potentially occur at the DC ISFSI site and in the vicinity, including the status of the species. To support the DCPP Decommissioning CDP, a literature review, desktop analysis, and series of surveys for the DCPP site were conducted. The surveys included a habitat assessment and vegetation community classification, botanical and wildlife species inventory, jurisdictional analysis and mapping, and analysis of the potential for special-status botanical and wildlife species to occur on site (Reference F8.25, Environmental Impact Analysis, Sections 3.4 and 3.5). PG&E adopts the findings from Reference F8.25 for use in this ER Supplement.

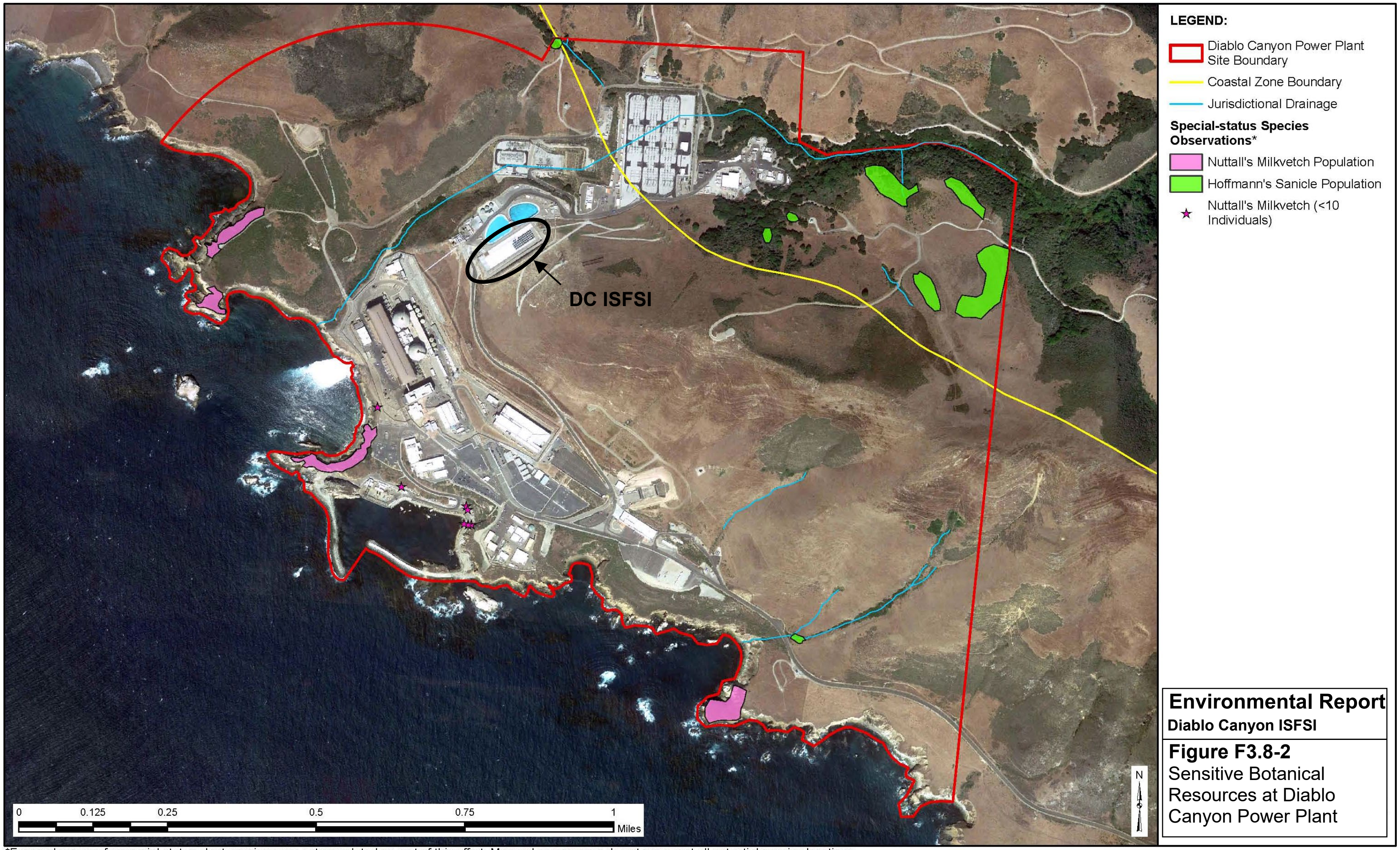
The results of special-status plant and wildlife species queries and surveys were combined into lists (Reference F8.25, Environmental Impact Analysis, Sections 3.4 and 3.5) that include those species that have suitable habitat present or been observed to occur on the DCPP site and have the following status designations:

- State or federally threatened, endangered, candidate, proposed threatened, or proposed endangered
- State species of concern
- Plant species with a California Rare Plant Rank of 1A, 1B, 2A, 2B, or 4 by the California Native Plant Society
- "Special Animals" as designated by the California Department of Fish and Wildlife's California Natural Diversity Database

As shown by Figure F3.8-1 and Figure F3.8-2 (Reference F8.24), there are no species listed as threatened or endangered that are known to currently occupy the ISFSI site.



*Focused surveys for special-status wildlife species were not completed as part of this effort. Mapped occurrences do not represent all potential species locations.



Environmental Report
Diablo Canyon ISFSI

Figure F3.8-2
Sensitive Botanical Resources at Diablo Canyon Power Plant

*Focused surveys for special-status plant species were not completed as part of this effort. Mapped occurrences do not represent all potential species locations.

F3.9 Visual and Scenic Resources

Section 2.2.2 of the ER (Reference F8.4) contains detailed information about land uses and human activities in the vicinity of the ISFSI site and indirectly provides a summary of landscape conditions near the site. Section F3.2 of this ER Supplement provides updated information about land use conditions, and Section F3.4 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.

As discussed in Section F3.1, the ISFSI is located at an elevation of approximately 310 ft above MSL within the PG&E owner-controlled area at DCPP, which consists of approximately 750 acres of land. The DCPP site is bordered on the west by the Pacific Ocean, on the east by the Irish Hills, and to the north and south by PG&E controlled lands. Two public trails -- Point Buchon Trail and Pecho Coast Trail -- are located on the north and south acreages, respectively.

As a result of several factors, DCPP is mostly isolated from adjacent public and private viewing areas (Reference F8.4):

- The coastline between Point Buchon and Point San Luis extends out into the Pacific Ocean in a gentle curve.
- The Irish Hills, extending from Point Buchon in the north to Point San Luis in the south, create a strong visual barrier along the property's eastern boundary.
- There are no public roads within or adjacent to the PG&E property.
- The Point San Luis promontory, and the hills directly north of it, obscure views from the south into the property.

The DC ISFSI is currently viewable to the public only from the Pacific Ocean from the west. However, the Captain of the Port of Los Angeles-Long Beach, under the authority of 33 U.S.C. 1226 and 1231, has established a Security Zone in the Pacific Ocean from surface to bottom, within a 2,000-yard radius of DCPP. No person or vessel may enter or remain in this Security Zone without permission of the Captain of the Port of Los Angeles-Long Beach (Reference F8.26). While this exclusion zone may be reduced as DCPP decommissioning progresses during the ISFSI LR period, offshore views of the DC ISFSI are visually subordinate due to the surrounding foothill topography.

As mentioned in Section F3.2, the DCPP final site restoration plan, including land uses, will be reviewed and approved by applicable state and local agencies as DCPP decommissioning progresses. Therefore, after the DCPP licenses are terminated, portions of land within the existing PG&E owner-controlled area may transition to unrestricted use by private or public entities. Although the DC ISFSI may potentially be visible from upper portions of the DCPP site, it is minimized due to the surrounding topography and its location within DC.

F3.10 Noise

The ER (Reference F8.4; Sections 2.8 and 4.1.7) discussed the impacts of construction noise on construction workers, the public, and surrounding fauna. In all cases, the impact of noise on sensitive receptors was determined to be acceptable (Reference

F8.5; Section 5.1.1, 5.1.2). 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.

F3.11 Historical and Cultural Resources

The ER (Reference F8.4; Section 2.9) provided historic and archaeological overviews of the DC ISFSI site and surrounding area. This section provides information that has changed since previously presented in the ER.

Decades of archaeological research on the DC lands have provided complete systematic survey coverage of the coastal terrace, including the developed plant operational area. The 2001 cultural resources study for the ISFSI found no sites listed in or eligible for inclusion in the National Register of Historic Places (NRHP) within the area of the proposed ISFSI. One archaeological site listed in the NRHP (CA-SLO-2/3) was identified as within 150 meters of the proposed ISFSI site. Seven other sites (CA-SLO-61, -584, -1159, -1160, -1161, -1162, and –1163) were identified as located within the 750-acre exclusion zone surrounding DCPP (i.e., DCPP owner-controlled area; Reference F8.4; Section 2.9). As discussed in Section 7.2 of the original EA (Reference F8.5), the California SHPO concurred with the NRC determination that the DC ISFSI would not adversely affect any historic properties.

In conjunction with California State Parks, PG&E has recently undertaken nomination of the Rancho Cañada de los Osos y Pecho y Islay Archaeological District (Boundary Increase) (District). This District comprises 2,434 acres and includes 84 contributing archaeological sites (15 previously listed resources and 69 nominated resources) and 22 non-contributing archaeological sites along the coastal terrace within PG&E's property (including portions of the DCPP site) and Montaña de Oro State Park, north of Avila Beach, San Luis Obispo County, California. While the District includes portions of the DCPP site, there are no contributing resources present within or immediately adjacent to the DC ISFSI.

Several archaeological and cultural resource management studies have been undertaken on the DC lands since the 2001 ISFSI cultural study. In addition to those cultural sites identified in the ER, CA-SLO-2866 has been more recently identified within the DCPP owner-controlled area. None of the sites identified within the DCPP owner-controlled area are within the DC ISFSI. The closest site is CA-SLO-2/3, as discussed in the ER. Table F3.11-1 displays the current national register status of each site.

Table F3.11-1 Known Cultural Resources Within Diablo Canyon Power Plant's Owner-Controlled Area

Site No. CA-SLO-	Age	Site Type	National Register Status
2/3	Prehistoric	Prehistoric village	Listed
61	Prehistoric	Midden	Eligible*
584	Prehistoric	Short-term residential	Destroyed
1159	Prehistoric	Short-term residential	Eligible*
1160	Prehistoric	Short-term residential	Eligible*
1161	Prehistoric	Short-term residential	Eligible*
1162	Prehistoric	Short-term residential	Eligible*
1163	Prehistoric	Lithic and shell scatter	Eligible**
2865	Prehistoric	Lithic and shell scatter	Eligible**
2866	Prehistoric	Location	Eligible**

* Appears to meet National Register criteria; SHPO has not yet concurred.

** Appears to meet National Register criteria as a part of a District; SHPO has not yet concurred.

Renewal of the ISFSI license and continued ISFSI operation does not require any new construction or other ground disturbance. Given the extensive cultural resources monitoring, testing, consultation, and mitigation conducted for the DCPP site during operations and for DCPP decommissioning, it is highly unlikely that additional cultural resources would be encountered in support of ISFSI operations during the LR period. No historic properties will be affected by ISFSI operations or LR.

F3.12 **Waste Management**

Section 3.4 of the ER (Reference F8.4) contains a description of the potential effluents and wastes associated with multi-purpose canister (MPC) loading and closure operations. As discussed in the DC ISFSI UFSAR (Reference F8.14; Section 3.3.1.5.3), the dry spent fuel storage casks used at the DC ISFSI emit no solid, liquid, or gaseous effluents under normal or off-normal conditions of storage.

In addition to the storage system, PG&E maintains the cask transport vehicle. The small amounts of wastes, such as ethylene glycol (antifreeze) or drips of lubricating fluid produced as a result of maintenance, would be cleaned up and disposed of in accordance with site procedures. Other waste generated at the DC ISFSI may include small amounts of cleaning and maintenance waste products, such as would be used for equipment repair/replacement. Sanitary sewage is produced at the DCPP site and will continue to be produced and appropriately disposed of to support the DC ISFSI during the LR period as discussed in Section F3.7.

F3.13 **Environmental Justice**

The ER (Reference F8.4; Section 2.7.2) addressed environmental justice; however, new NRC-issued guidance is now available on the methodology that should be used to perform an environmental justice review. Thus, this section updates the environmental justice methodology and input data previously presented in the ER.

In 2003, the NRC issued guidance for staff conducting environmental justice reviews for proposed actions as part of NRC's compliance with NEPA (Reference F8.7; 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® Desktop 10.8.1 software and USCB ACS 2016 5-Year Estimate data were used to determine minority characteristics by block group and low-income characteristics by census tract[2] 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 two block groups were identified within the 4-mile radius. Consistent with NRC guidance, the geographic areas for comparative analysis were defined as the state of California and San Luis Obispo County. Block groups in each state/county were analyzed separately against their respective state's and county's data.

F3.13.1 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) (Reference F8.7). 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:

- 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.

PG&E calculated the percentage of a block group's population represented by each minority category for each of the two 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 (see Table F3.13-1). If the percentage of any block group minority 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 minority population. 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.

[2] Low income information was not available at the census block level for the area of interest; thus, census tract information was used.

F3.13.2 Low-Income Populations

The NRC guidance defines low-income households based on USCB statistical poverty thresholds (Reference F8.7). A block group[3] 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.

PG&E divided USCB low-income households in each census tract by the total number of households for that tract to obtain the percentage of low-income households per tract. The same geographic comparison areas were used. Table F3.13-1 provides low-income percentages for each of the geographic comparison areas (state and county). If the percentage of any tract low-income category exceeded 50 percent of the total tract 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 tracts within the 4-mile radius have significant percentages of low-income households.

Table F3.13-1 Minority and Low-Income Percentages, by Geographic Comparison Area

Geographic Comparison Area	San Luis Obispo County	California State
Total Population	262,763	37,913,144
American Indian or Alaskan Native	0.70%	0.74%
Asian	3.72%	13.85%
Native Hawaiian or Pacific Islander	0.09%	0.39%
Black/African American	1.98%	5.85%
All Other Single Minorities	4.73%	13.28%
Multi-Racial Minorities	3.33%	4.62%
Hispanic or Latino Ethnicity	22.20%	39.31%
Low-Income	14.20%	15.80%

[3] Low income information was not available at the census block level for the area of interest; thus, census tract information was used.

F.4 Environmental Impacts

The following sections discuss environmental consequences associated with continued operations of the DC ISFSI. PG&E considered the specific resource areas that have potential impacts associated with the ISFSI operations over the LR period.

On September 19, 2014, the NRC published a revised rule at 10 CFR 51.23, "Environmental Impacts of Continued Storage of Spent Nuclear Fuel Beyond the Licensed Life for Operations of a Reactor" [79 FR 56238]. The rule codifies the NRC's generic determinations in NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel" (Reference F8.2), regarding the environmental impacts of continued storage of spent nuclear fuel beyond a reactor's operating license (i.e., those impacts that could occur as a result of the storage of spent nuclear fuel at at-reactor or away-from-reactor sites after a reactor's licensed life for operation and until 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 DC 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 (Reference F8.2; Section 4.20). PG&E is requesting renewal of the DC ISFSI license through 2064, which is less than 60 years after the expiration of the current DCPP Unit 1 and 2 operating licenses. As described in the following sections, impacts from the proposed renewal of SNM-2511 are primarily occupational and public health impacts associated with radiological exposure.

The NRC determined in the initial licensing of the DC ISFSI (Reference F8.5; Section 8) that "storage of spent nuclear fuel at the Diablo Canyon ISFSI will not significantly affect the quality of the human environment". In light of the NRC's findings in NUREG-2157 (Reference F8.2) and those PG&E findings in the remaining subsections of this chapter, PG&E concludes that the conclusions of NRC's DC ISFSI EA remain unchanged.

F4.1 Impacts from Refurbishment and Construction

The Proposed Action does not include refurbishment or new construction. Impacts for construction of the DC ISFSI were addressed in the original licensing evaluation (Reference F8.5; Section 5.1.1). As described in Section F1.2, 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 DC ISFSI EA (Reference F8.5).

The following is a description of the routine monitoring and maintenance for the LR period. Over the proposed 40-year LR period, PG&E anticipates continuation of existing monitoring and maintenance activities for the HI-STORM 100 systems and reinforced concrete pads, including upkeep of security monitoring equipment, and quarterly radiation monitoring. ISFSI security monitoring equipment is maintained operable on a continuous basis and replaced on an as-needed basis.

Aging management activities to be carried out over the 40-year LR period include the following as described in Appendix A of the LRA:

- High Burnup Fuel AMP
- MPC AMP
- Transfer Cask AMP
- Overpack AMP
- Reinforced Concrete Structures AMP
- Cask Transportation System AMP

As described in Appendix A, these programs are condition monitoring programs and include periodic visual inspection and soil sampling.

Environmental impacts from existing monitoring and maintenance and aging management activities over the 40-year LR period could include the generation of limited quantities of non-radioactive cleanup or replacement materials, such as would be used for equipment repair/replacement (see Section F3.12). Accordingly, the environmental impacts of maintenance or aging management activities over the proposed 40-year LR period are expected to be SMALL. Any dose associated with occupational exposure will be monitored, maintained, and mitigated in accordance with the site's Radiological Protection Program.

F4.2 Occupational and Public Health Impacts

Risks to occupational health and safety include exposure to industrial hazards (i.e., moving heavy objects, working outside, and working with heavy equipment during cask transfer operations), hazardous materials, and radioactive materials. Industrial hazards for the DC ISFSI are typical for similar industrial facilities and include accidents ranging from minor cuts to industrial machinery accidents.

ISFSIs in the United States are licensed by the NRC and must comply with NRC regulations and conditions specified in the license in order to operate. The licensees are required to comply with 10 CFR 20, Subpart C, “Occupational Dose Limits for Adults”; 10 CFR Part 20, Subpart D, “Radiation Dose Limits for Individual Members of the Public”; and 10 CFR 72.104, “Criteria for Radioactive Materials in Effluents and Direct Radiation from an ISFSI or MRS.”

Radiological protection and doses from DC ISFSI operations (including cask transport, surveillance, and maintenance, etc.) are discussed in Section 7 of the UFSAR (Reference F8.14). The major aspects of the Radiological Protection Program are summarized in the following sections. There are no other potential health impacts other than those associated with moving heavy objects, working outside, and working with heavy equipment during cask transfer operations.

F4.2.1 Policy Considerations

The DC ISFSI utilizes the DCPP As Low As Reasonably Achievable (ALARA) Program to maintain radiation exposures to DC ISFSI personnel, visitors, and the general public below regulatory limits and ALARA. The DCPP ALARA Program complies with 10 CFR

20.1101, "Radiation Protection Programs," and is consistent with Regulatory Guides and publications that deal with ALARA concepts and practices, including 10 CFR 20. In addition, PG&E regularly reviews operational experience from throughout the industry and incorporates relevant lessons learned into DC ISFSI operations.

The Radiation Protection Program identifies the organizations participating in the programs, the positions involved, and the responsibilities and functions of the various positions in conducting the programs. Adequately trained personnel develop and conduct the health physics programs. Radiation Protection personnel currently receive Institute of Nuclear Power Operations-certified training and obtain process experience to carry out the Radiation Protection programs in an efficient manner to assure that company and regulatory requirements are met.

A discussion of the ALARA policy considerations can be found in Section 7.1.1 of the DC ISFSI UFSAR (Reference F8.14).

F4.2.2 Occupational Dose

This section establishes the expected cumulative dose delivered to site personnel during the fuel handling and transfer activities associated with one overpack. Chapter 5 of the UFSAR (Reference F8.14) describes in detail the DC ISFSI operational procedures, a number of which involve radiation exposure to personnel.

The conservative estimated occupational exposure to DC ISFSI personnel from DC ISFSI operations is presented in Section 7.4 of the UFSAR (Reference F8.14) and is summarized as follows. The dose rates used for this analysis are conservatively estimated using design-basis fuel.

- The estimated total occupational exposures to all personnel during overpack loading is 2.1 rem per overpack. The estimated total occupational exposures to all personnel during overpack unloading is 1.5 rem per overpack.
- The estimated annual occupational exposure as a result of ISFSI walkdowns is approximately 1.8 rem. The estimated dose is based on a total occupancy time of 122 hours per year and a 1-meter dose rate of 15 millirem/hour.
- The estimated annual occupational exposure as a result of maintenance/repairs is approximately 0.8 rem. The doses for the repair operations assume one repair operation per month of one-hour duration with two people performing the operation. The dose rates were conservatively based on 65 millirem/hour.
- The estimated dose rates experienced by personnel at normally-occupied locations outside the ISFSI will be maintained below 10 CFR 20 limits by the Radiation Protection Program.

The conservative dose rates demonstrate that the estimated occupational exposures from the DC ISFSI meet the regulatory requirements of 10 CFR 20. The actual doses from the ISFSI are expected to be considerably less than the conservatively estimated values. (Reference F8.14; Section 7.4)

F4.2.3 Dose to the Public

The dose to members of the public during normal operations will result from (1) the gamma and neutron radiation that is emitted from the dry cask storage system surfaces, (2) spent fuel loading activities at DCPP, and (3) other uranium fuel cycle operations at DCPP. The dose rate decreases rapidly as a function of distance from the DC ISFSI, as indicated in Table 7.5-4 of the UFSAR (Reference F8.14).

Because the MPCs provide containment, at a distance of 1.5 miles (the nearest resident location), the total annual dose rate estimate, as provided in the UFSAR, is 0.047 millirem/year.

F4.3 Other Impacts

The routine operation of the ISFSI involves dry storage of spent nuclear fuel in sealed containers within overpacks. 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 F4.2. Each resource area discussed in Section F.3 is briefly addressed below. Conclusions drawn from the original ISFSI EA (Reference F8.5) are adopted, where available and still appropriate.

Land Use

The land occupied by the ISFSI was committed when the ISFSI was constructed. It is located within the developed area of the PG&E owner-controlled DCPP site. No additional land use impacts are expected from continued operation. Furthermore, the DC ISFSI was permitted in perpetuity by the County of San Luis Obispo and the CCC.

Transportation

During the ISFSI LR period, the number of full-time commuting personnel is expected to significantly decrease due to the permanent shutdown of DCPP. However, no significant changes in staffing are anticipated to manage the ISFSI during the LR period, and no new ISFSI-related radwaste shipments are expected. Therefore, for the ISFSI LR period, no impacts to transportation are expected.

Demography and Socioeconomics

Any changes to the local economy as a result of the construction and operation of the ISFSI occurred when the ISFSI was constructed. In the original EA, NRC concluded the operational workforce would not impact socioeconomics (Reference F8.5; Section 5.1.2). Thus, no socioeconomic impacts are expected from continued operation.

Climatology, Meteorology, Air Quality

The ISFSI does not release airborne emissions. In the original EA, NRC concluded the ISFSI operation would not impact climate (Reference F8.5; Section 5.1.2). No adverse air quality impact is expected from continued operation.

Geology and Soils

Impacts to geology and soils occurred when the DC ISFSI was constructed. There are no construction activities associated with renewing the ISFSI license. No additional impacts to geology or soils are expected from continued operation.

Water Resources

The ISFSI does not require water for its operation and does not discharge effluents to surface or groundwater. Based on the minimal size of the ISFSI workforce, minimal sanitary waste is generated. Consistent with Reference F8.25 (Project Description, Section 2.3.21), after DCPP decommissioning is complete, PG&E plans to store sanitary waste in holding tanks and ship offsite for disposal. No impact to water resources is expected from continued operation beyond those described in the original EA (Reference F8.5; Section 5.1.2).

Ecological Resources

Any ecological impacts occurred when the ISFSI was constructed. The original EA asserted that ISFSI operation is not expected to adversely impact terrestrial and aquatic environments or their associated plant and animal species (Reference F8.5; Section 5.1.2). As discussed in Section F3.8, there are no species listed as threatened or endangered that are known to currently occupy the DC ISFSI site. Continued operation of the DC ISFSI would not alter any wildlife or plant habitat and is not expected to affect listed species or critical habitat. Furthermore, the ecological impacts associated with retaining structures for long-term use to support ISFSI operations were evaluated and mitigated in perpetuity as part of the original DC ISFSI permitting (Reference F8.27, page 25). Therefore, PG&E expects that the NRC would make a no-effect determination for the LR period, in which case consultation with USFWS and NMFS would not be required.

Visual and Scenic Resources

As discussed in Section F3.9, although the DC ISFSI is currently visible from the Pacific Ocean and potentially from the DCPP site once decommissioning is complete, visibility of the DC ISFSI is minimized due to the surrounding topography and its location within DC. Therefore, no adverse visual impact is expected from continued operation of the DC ISFSI.

Noise

Storage of spent fuel 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 and routine operations and maintenance activities. Thus, no adverse noise impact is expected from continued operation of the DC ISFSI.

Historical and Cultural Resources

As described in Section F3.11, no historic or archaeological resources have been identified within the DC ISFSI. As evaluated in the ER, one site is located within 150 meters of the ISFSI. It is possible, though unlikely, that unidentified historic or archaeological resources may be buried in the project vicinity. However, the continued management of spent fuel at the DC ISFSI involves use of the existing dry fuel storage system, and no structural modifications or construction are anticipated that would result in new ground disturbance. Based on these considerations, no adverse effect to cultural resources are expected from continued operation of the DC ISFSI.

Waste Management
As discussed in Section F3.12, the dry spent fuel storage casks used at the DC ISFSI emit no solid, liquid, or gaseous effluents under normal or off-normal conditions of storage. Effluents and waste generated during MPC loading and closure operations are disposed of per the DCPP license and site procedures. Therefore, no waste management impacts are expected from continued ISFSI operation.

Environmental Justice
As discussed in Section F3.13, the minority and low-income populations 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 long-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 (Reference F8.2; Section 4.3.2). There are no site-specific conditions associated with extended operation of the DC ISFSI that would alter NRC's generic conclusion.

F4.4 Impacts from Potential Accidents

PG&E has evaluated the potential radiological impacts resulting from a suite of postulated accidents for the DC ISFSI in the UFSAR (Reference F8.14; Section 8). 10 CFR 72.70(c)(6) requires PG&E to update the UFSAR every 24 months from the date of issuance of the license. The following are the current UFSAR accidents:

- Off-normal pressures
- Off-normal environmental temperatures
- Confinement boundary leakage
- Partial blockage of overpack air inlets
- Loss of electric power
- Cask transporter off-normal operation
- Earthquake
- Tornado
- Flood – not credible
- Drops and tip-over – not credible
- Fire
- Explosion
- Electrical accident
- Loading of an unauthorized fuel assembly
- Extreme environmental temperature
- Transfer Cask loss of neutron shielding
- Adiabatic heat-up – not credible
- Partial blockage of MPC vent holes
- 100 percent fuel rod rupture
- 100 percent blockage of overpack air inlets
- Transmission tower collapse

- Supplemental cooling system failure

As discussed in the UFSAR, there is the potential for radiological impacts from a postulated confinement boundary leakage; blockage of air inlets; fire; explosion; electrical accident, or transfer cask loss of neutron shielding; however, the resulting doses are well within the limits specified in 10 CFR 72.106. Radiological impacts from the remaining credible listed accidents are insignificant since the confinement barrier is not breached and there is no reduction in shielding.

F.5 Mitigation Measures

As presented in Section F.4, the only impact of the proposed action is radiological dose to workers and the public. PG&E adopted measures to mitigate for those potential impacts in conjunction with construction and operation of the ISFSI under the original license, as discussed below. PG&E will continue to implement these measures throughout the LR period.

Workers in the ISFSI Radiologically Controlled Area wear personnel radiation monitoring devices and dose is recorded and tracked per 10 CFR 20 regulations. Dosimetry is used to monitor direct radiation around the ISFSI. If measured doses were to significantly exceed historical levels, PG&E would perform analyses to determine the cause and would establish mitigation measures. The PG&E 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, as discussed in Appendix A to this LRA, inspections and maintenance of the ISFSI dry cask storage systems are performed to ensure that no degradation of components could lead to increased radiation levels.

F.6 Environmental Measurements and Monitoring

As described in Section F.3, DCPP and related structures will undergo decommissioning (i.e., dismantlement and demolition) during the ISFSI LR period. Thus , on-site environmental monitoring will continue in accordance with the DCPP 10 CFR 50 licenses until termination of the licenses. Given 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. PG&E has placed environmental dosimeters at locations adjacent to the ISFSI security fence.

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, except for the following:

- Implementation of a Drainage and Polluted Runoff Control Plan to minimize long-term stormwater runoff
- Physical monitoring of the cut slopes above the DC ISFSI for sliding, ground movement, or other motion
- Physical monitoring of shoreline retreat along a portion of the transporter route from DCPP to 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 or required continued monitoring discussed above. Therefore, the current monitoring program would continue through the LR period, and no additional environmental measurements or monitoring would be required.

F.7 Summary of Environmental Consequences

This Supplemental ER describes the proposed action, which is renewal of the license of the DC ISFSI for 40 years, and the associated impacts. Table F7-1 identifies the non-radiological and radiological environmental impacts of DC ISFSI LR. Based on this evaluation, DC ISFSI LR would involve no significant environmental impact.

Table F7-1 Environmental Impacts of Diablo Canyon Independent Spent Fuel Storage Installation License Renewal

Issue	Environmental Impact
Land Use	None
Transportation	None
Demography and Socioeconomics	None
Climatology, Meteorology, and Air Quality	None
Geology and Soils	None
Water Resources	None
Ecological Resources	None
Visual and Scenic Resources	None
Noise	None
Historical and Cultural Resources	None
Waste Management	None
Environmental Justice	None
Occupational Health and Safety from Normal Operations	SMALL. The conservative estimated occupational exposures from the DC ISFSI are below the regulatory requirements of 10 CFR 20.
Other Occupational Health Effects	SMALL. Any other health effects would be the result of normal workplace hazards (moving heavy objects, etc.).
Dose to the Public from Normal Operations	SMALL. The closest resident to the DC ISFSI could receive an annual collective dose of up to 0.047 millirem.
Dose to the Public from Accidents	SMALL. Dose rates from postulated accidents are well within the limits specified in 10 CFR 72.106.

F7.1 Unavoidable Adverse Impacts

As presented in Section F.4, the only adverse impacts of the proposed action are radiological dose to workers and radiological dose to the public. Although PG&E employs inspections, maintenance, monitoring, and ALARA principles (Section F.5) to mitigate these impacts, some impact is unavoidable. However, as indicated in Section F.4, 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, 10 CFR 20.1201, and 1301) (Reference F8.5; Section 8.0).

F7.2 Irreversible and Irretrievable Resource Commitments

The continued operation of the DC ISFSI for the LR period 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 LR period.

F7.3 Short-Term Versus Long-Term Productivity of the Environment

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 DC ISFSI. The ISFSI is a temporary storage facility. Once the spent fuel is moved to an offsite repository, the 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 spent fuel storage for up to an additional 40 years.

F.8 References

F8.1. NRC Letter to PG&E, "Issuance of Materials License No. SNM-2511 for the Diablo Canyon Independent Spent Fuel Storage Installation (TAC No. L23399)," March 22, 2004, ADAMS Accession No. ML040780207.

F8.2. NUREG–2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel." Nuclear Regulatory Commission, Office of Nuclear Material Safety and Safeguards. September 2014. ADAMS Accession No. ML14196A105.

F8.3. NUREG–1437, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants," Main Report (Volume 1) and Appendices (Volume 3), Revision 1, Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation, June 2013, ADAMS Accession Nos. ML13106A241 and ML13106A244.

F8.4. "Diablo Canyon Independent Spent Fuel Storage Installation Environmental Report," December 21, 2001, Pacific Gas and Electric, Attachment to PG&E Letter DIL-01-002, ADAMS Accession Nos. ML020180173 and ML020180196.

F8.5. NRC Letter to PG&E, "Environmental Assessment and Finding of No Significant Impact Related to the Construction and Operation of the Diablo Canyon Independent Spent Fuel Storage Installation (TAC No. L23399)," October 2003, ADAMS Accession Nos. ML032970368, ML032970369, and ML032970370.

F8.6. PG&E Letter DIL-01-001, "Coastal Development Permit Application for the Diablo Canyon Independent Spent Fuel Storage Installation," November 5, 2001.

F8.7. NUREG-1748, "Environmental Review Guidance for Licensing Actions Associated with NMSS Programs," Nuclear Regulatory Commission, Office of Nuclear Material Safety and Safeguards, August 2003, ADAMS Accession No. ML032450279.

F8.8. "License Application to Construct and Operate a Consolidated Interim Storage Facility for Spent Nuclear Fuel in Andrews County, Texas," Docket 72-1050, Waste Control Specialists LLC, April 28, 2016, ADAMS Accession No. ML16132A533.

F8.9. "Resumption of the U.S. Nuclear Regulatory Commission Staff Review of a License Application to Construct and Operate the Waste Control Specialist Consolidated Interim Storage Facility, Andrews County, Texas, Docket No. 72-1050," August 21, 2018, ADAMS Accession No. ML18225A281.

F8.10. "Interim Storage Partners, Issuance of Materials License SNM-2515, WCS Consolidated Interim Storage Facility ISFSI," Nuclear Regulatory Commission. September 13, 2021, ADAMS Accession No. ML21188A096.

F8.11. "Holtec International HI-STORE CIS (Consolidated Interim Storage Facility) License Application," Docket No. 72-1051, Holtec International, March 30, 2017, ADAMS Accession No. ML17115A418.

F8.12. "Holtec International's Application for a Specific Independent Spent Fuel Storage Installation License for the HI-STORE Consolidated Interim Storage Facility for Spent Nuclear Fuel – Review Schedule Delay," November 19, 2021, ADAMS Accession No. ML21322A219.

F8.13. "Settlement Agreement Implementation, Status Report," dated December 31, 2018. Available online at https://www.songscommunity.com/document-library/decommissioning-documents?q=&c=26843, Accessed September 2021.

F8.14. PG&E Letter DIL-21-004, "Biennial Submittal of Diablo Canyon Independent Spent Fuel Storage Installation Updated Final Safety Analysis Report," Revision 9, December 15, 2021, ADAMS Accession No. ML21349B166.

F8.15. PG&E Letter DCL-19-077, "Diablo Canyon Power Plant, Units 1 and 2 – Post-Shutdown Decommissioning Activities Report," December 4, 2019, ADAMS Accession No. ML19338F173.

F8.16. "2020 Annual Crop Report," San Luis Obispo County Department of Agriculture, Weights and Measures, Not dated, Available online at: https://www.slocounty.ca.gov/Departments/Agriculture-Weights-and-Measures/All-Forms-Documents/Information/Crop-Report/Crop-Report-Current/Crop-Report-2020.pdf, Accessed September 2021.

F8.17. "2020 Traffic Volumes on California State Highways," Caltrans, Available online at: https://dot.ca.gov/programs/traffic-operations/census, Accessed January 2022.

F8.18. "2009-2020 Traffic Counts," San Luis Obispo County, Public Works Department. Traffic and Transportation Division, March 19, 2021, Available online at: https://www.slocounty.ca.gov/Departments/Public-Works/Forms-Documents/Transportation/Traffic-Count-Data.pdf, Accessed September 2021.

F8.19. "Historical Census Populations: 1850-2020, California, Counties and Incorporated Cities," California State Department of Finance, August 13, 2021, Available online at: https://www.dof.ca.gov/Reports/Demographic_Reports/documents/2020-1850_STCO_IncCities.xlsx, Accessed September 2021.

F8.20. "DP03 Selected Economic Characteristics: 2019 American Community Survey 5-Year Estimates Data Profile," U.S. Census Bureau, Available online at: https://data.census.gov/cedsci/table?q=san%20luis%20obispo%20county&g=0100000US_0400000US06&y=2019&d=ACS%205-Year%20Estimates%20Data%20Profiles, Accessed January 2022.

F8.21. "Report P-2A: Total Population Projections, 2010-2060, California and Counties (2019 Baseline)," California Department of Finance, Available online at: http://www.dof.ca.gov/Forecasting/Demographics/Projections/, Accessed September 2021.

F8.22. "Census 2010 Demographic Profile Release Table 3A: Race Detail (Hispanic Inclusive), April 1, 2010, Incorporated Cities and Census Designated Places (CDP) by County in California," California State Department of Finance, January 30, 2015, Available online at: http://www.dof.ca.gov/Reports/Demographic_Reports/Census_2010/, Accessed September 2021.

F8.23. "Census 2010 Demographic Profile Release Table 3B: Hispanic Origin Detail, April 1, 2010, Incorporated Cities and Census Designated Places (CDP) by County in California," California State Department of Finance, January 30, 2015, Available online at: http://www.dof.ca.gov/Reports/Demographic_Reports/Census_2010/, Accessed September 2021.

F8.24. PG&E Letter DCL-21-025, Appendix K-1, "Diablo Canyon Decommissioning Terrestrial Biological Resources Assessment," Terra Verde Environmental Consulting and ERM, Prepared for Pacific Gas and Electric Company, August 2020, Available online at: https://energov.sloplanning.org/EnerGov_Prod/SelfService#/plan/b9aba58d-62aa-4ed6-a139-30c8ed2ef82c?tab=attachments

F8.25. PG&E Letter DCL-21-045, "DRC2021-00092 – Diablo Canyon Power Plant Decommissioning: Revised Development Plan/Coastal Development Permit and Conditional Use Permit Application," Pacific Gas and Electric Company, June 30, 2021, Available online at: https://energov.sloplanning.org/EnerGov_Prod/SelfService#/plan/b9aba58d-62aa-4ed6-a139-30c8ed2ef82c?tab=attachments

F8.26. "Diablo Canyon Independent Spent Fuel Storage Installation (ISFSI) Final Environmental Impact Report," Marine Research Specialists, Prepared for San Luis Obispo County Department of Planning and Building, January 2004.

F8.27. Revised Findings, Staff Report Coastal Development Permit Application, Application File No. A-3-SLO-04-035, Pacific Gas and Electric Company, December 16, 2004, California Coastal Commission.

F.9 List of Preparers

Table F9-1 Diablo Canyon Independent Spent Fuel Storage Installation Environmental Report Supplement List of Preparers

Name	Title	Responsibility
Benjamin, Christopher	PG&E Director Corporate Sustainability	Subject Matter Expert Review
Flickinger, Sean	DCPP Decommissioning Supervisor, Material Handling and Transportation Lead	Subject Matter Expert Review
Juarez, Tim	DCPP Decommissioning Supervisor, Plant Systems Lead	Subject Matter Expert Review
Kephart, Kelly	Senior Terrestrial Biologist	Subject Matter Expert Review
Olsofsky, Michelle	Licensing Engineer	Document Preparation/Review
Lopez, Brandy	DCPP Permitting and Licensing, Supervisor	Document Review
Post, Jennifer	Chief Counsel, Nuclear	Subject Matter Expert Review
Soenen, Philippe	DCPP Decommissioning Environmental and Licensing Manager	Project Manager, Document Review
Rebel, Trevor	DCPP Decommissioning Environmental Supervisor	Subject Matter Expert Review
Sun, Joseph	Geosciences, Manager	Subject Matter Expert Review
Taggart, Michael	Senior Consulting Scientist, Cultural Resources	Subject Matter Expert Review
Vardas, Kris	DCPP Site Restoration, Supervisor	Subject Matter Expert Review
Wagoner, Michael	DCPP Permitting and Licensing, Supervisor	Subject Matter Expert Review

Attachment A
Statement of Compliance with the California Coastal Act of 1976

PG&E is seeking renewal of the DC ISFSI license for an additional 40 years. The Federal Coastal Zone Management Act (16 USC 1452 et seq.) requires ISFSI LR applicants to obtain a certification that LR would be consistent with the Federally approved State Coastal Zone Management program. The California Coastal Management Program (CCMP) policies are contained in Division 20, Chapter 3 of the California Public Resource Code and require persons seeking approval for activities which may impact the Coastal Zone to demonstrate that the activity is consistent with all enforceable policies in Division 20, Chapter 3 of the California Public Resource Code.

The statement of compliance with California Coastal Act of 1976 for construction and initial operations of the DC ISFSI was first presented in the ER for the DC ISFSI license (Reference F8.4, ER Appendix A) and CDP Application (Reference F8.6). The CCC issued a Staff Report on the CDP Application (Reference F8.27) which evaluated the conformity of DC ISFSI construction and operations to applicable policies of the Coastal Act. The CCC Staff Report evaluation assumed the ISFSI would "remain in perpetuity" (Reference F8.27, page 25).

Because these documents have previously defined the impacts of the DC ISFSI, PG&E adopts relevant material from these documents by reference.

The following is a discussion of the proposed project's compliance with policies contained in Division 20, Chapter 3 of the California Public Resource Code. This discussion will identify only those sections which are pertinent to the proposed project and how the project will comply with those sections.

Section 30211:

> *Development shall not interfere with the public's right of access to the sea where acquired through use or legislative authorization, including, but not limited to, the use of dry sand and rocky coastal beaches to the first line of terrestrial vegetation.*

In accordance with special condition 3 of the CDP issued by the CCC for the construction and operation of the DC ISFSI, PG&E opened the Point Buchon Loop Trail to the public in July 2007. The original trail was open to the public three days per week. During 2008, the trail was lengthened twice to its current full length of 6.5 miles and the number of days per week that the public was allowed to hike was increased from three to five. PG&E plans to continue, through termination of the Part 72 License of the DC ISFSI, the five days per week of public access for the Point Buchon Trail, allowing up to 275 hikers per day on the trail. The trail is open Thursday through Monday year-round. Hikers check-in at a registration kiosk where they are met by a PG&E representative. At the kiosk, hikers read and sign a waiver document, familiarize themselves with hiker safety information provided by PG&E, and check out again upon leaving the property. This process allows PG&E to track visitor numbers and helps support site security and emergency response should a hiker not check out at the end of the day or if the trail needs to be evacuated in an emergency. The trail extends from a kiosk at the southern boundary of Montaña de Oro State Park to Crowbar Canyon, just north of DCPP. The trail also includes a public beach access point at the mouth of Coon Creek.

No changes are being proposed to the Point Buchon Loop Trail as part of DC ISFSI LR. Therefore, because the Point Buchon Loop Trail provides adequate public access, as determined by the CCC in CDP A-3-SLO-04-035 for the DC ISFSI in perpetuity, the proposed project is consistent with this section of the CCMP.

Section 30214(a):

The public access policies of this article shall be implemented in a manner that takes into account the need to regulate the time, place, and manner of public access depending on the facts and circumstances in each case including, but not limited to, the following:

(1) Topographic and geologic site characteristics.
(2) The capacity of the site to sustain use and at what level of intensity.
(3) The appropriateness of limiting public access to the right to pass and repass depending on such factors as the fragility of the natural resources in the area and the proximity of the access area to adjacent residential uses.
(4) The need to provide for the management of access areas so as to protect the privacy of adjacent property owners and to protect the aesthetic values of the area by providing for the collection of litter.

As discussed above in response to Section 30211, PG&E manages the number of hikers and has gates and a PG&E representative at the trail access point at the southern boundary of Montaña de Oro State Park. The check-in process helps support site security and emergency response should a hiker not check out at the end of the day or if the trail needs to be evacuated in an emergency.

No changes are being proposed to the Point Buchon Loop Trail as part of DC ISFSI LR. Therefore, because the Point Buchon Loop Trail provides adequate public access, as determined by the CCC in CDP A-3-SLO-04-035 for the DC ISFSI in perpetuity, the proposed project is consistent with this section of the CCMP.

Section 30220:

Coastal areas suited for water-oriented recreational activities that cannot readily be provided at inland water areas shall be protected for such uses.

As with Sections 30211 and 30214(a), this section applies to the Point Buchon Loop Trail, which traverses the PG&E property. As discussed above, DC ISFSI LR will not adversely impact public access in the area. Therefore, the proposed project is in compliance with this section of the CCMP.

Section 30230:

Marine resources shall be maintained, enhanced, and where feasible, restored. Special protection shall be given to areas and species of special biological or economic significance. Uses of the marine environment shall be carried out in a manner that will sustain the biological productivity of coastal waters and that will maintain healthy populations of all species of marine organisms adequate for long-term commercial, recreational, scientific, and educational purposes.

The DC ISFSI was constructed on an existing and disturbed industrial site. PG&E-owned land in the vicinity of the ISFSI was inventoried for threatened or endangered species prior to ISFSI construction and, most recently, to support DCPP decommissioning. No state or federally proposed or listed, threatened or endangered plant, terrestrial wildlife, or aquatic species have been identified within the immediate ISFSI area. Refer to Section F3.8 of this ER Supplement for a more detailed discussion of ecological resources.

Continued DC ISFSI operations during the LR period will result in no impacts to marine resources near the site. In addition, as discussed in Section F3.10 of this ER Supplement, no noise is directly attributable to the operation of the DC ISFSI, other than the vehicle traffic to and from the site during routine maintenance activities.

The proposed project is in compliance with this section of the CCMP.

Section 30231:

> *The biological productivity and the quality of coastal waters, streams, wetlands, estuaries, and lakes appropriate to maintain optimum populations of marine organisms and for the protection of human health shall be maintained and, where feasible, restored through, among other means, minimizing adverse effects of waste water discharges and entrainment, controlling runoff, preventing depletion of ground water supplies and substantial interference with surface water flow, encouraging waste water reclamation, maintaining natural vegetation buffer areas that protect riparian habitats, and minimizing alteration of natural streams.*

As discussed in Reference F8.4, F8.6, and F8.27, there are no liquid industrial waste discharges from operations of the DC ISFSI. Operation of the DC ISFSI site is currently addressed by existing industrial NPDES Permit No. CA0003751 and the site SWPPP. The construction NPDES permit and SWPPP for the DCPP decommissioning program will govern stormwater management on the site and, once decommissioning is complete, the SWPPP will continue to govern the entire site, thereby providing further protection to the adjacent natural areas and receiving waters. As a part of DCPP decommissioning and final site restoration, new stormwater detention basins will be developed. These new basins will be in place during a portion of the DC ISFSI LR period.

Because DC ISFSI LR does not include refurbishment, new construction, or changes to ISFSI operations, the proposed project is in compliance with the requirements of this section of the CCMP.

Section 30240:

> *(a) Environmentally sensitive habitat areas shall be protected against any significant disruption of habitat values, and only uses dependent on those resources shall be allowed within those areas.*
>
> *(b) Development in areas adjacent to environmentally sensitive habitat areas and parks and recreation areas shall be sited and designed to prevent impacts which would significantly degrade those areas, and shall be compatible with the continuance of those habitat and recreation areas.*

The DC ISFSI was constructed on an existing and disturbed industrial site. PG&E-owned land in the vicinity of the ISFSI was inventoried for threatened or endangered species prior to ISFSI construction and, most recently, to support DCPP decommissioning. No state or federally proposed or listed, threatened or endangered plant, terrestrial wildlife, or aquatic species have been identified within the immediate ISFSI area. Refer to Section F3.8 of this ER Supplement for more a more detailed discussion of ecological resources.

Continued DC ISFSI operations during the LR period will result in no impacts to marine resources near the site. In addition, as discussed in Section F3.10 of this ER Supplement, no noise is directly attributable to the operation of the DC ISFSI, other than the vehicle traffic to and from the site during routine maintenance activities.

The proposed project is in compliance with this section of the CCMP.

Section 30244:

> *Where development would adversely impact archaeological or paleontological resources as identified by the State Historic Preservation Officer, reasonable mitigation measures shall be required.*

As discussed in Reference F8.4, F8.6, and F8.27, the DC ISFSI was constructed on an existing and disturbed industrial site. There are no registered scenic, natural landmarks or cultural resources that will be impacted by the proposed project because DC ISFSI LR does not include refurbishment or new construction. Refer to Section F3.11 of this ER Supplement for a more detailed discussion of archaeological resources. The proposed project is in compliance with this section of the CCMP.

Section 30250(a):

> *New residential, commercial, or industrial development, except as otherwise provided in this division, shall be located within, contiguous with, or in close proximity to, existing developed areas able to accommodate it or, where such areas are not able to accommodate it, in other areas with adequate public services and where it will not have significant adverse effects, either individually or cumulatively, on coastal resources. In addition, land divisions, other than leases for agricultural uses, outside existing developed areas shall be permitted only where 50 percent of the usable parcels in the area have been developed and the created parcels would be no smaller that the average size of surrounding parcels.*

The DC ISFSI is located on the developed DCPP site within the PG&E property boundary. As such, the proposed project complies with this section of the CCMP.

Section 30250(b):

> *Where feasible, new hazardous industrial development shall be located away from existing developed areas.*

As discussed above, the DC ISFSI was constructed on an existing and disturbed industrial site. DC ISFSI operation-related activities will take place wholly within the DCPP site and will not occur in any neighboring developed areas or on public roadways. Thus, the proposed project is in compliance with this section of the CCMP.

Section 30251:

> *The scenic and visual qualities of coastal areas shall be considered and protected as a*

resource of public importance. Permitted development shall be sited and designed to protect views to and along the ocean and scenic coastal areas, to minimize the alteration of natural landforms, to be visually compatible with the character of the surrounding areas, and, where feasible, to restore and enhance visual quality in visually degraded areas. New development in highly scenic areas such as those designated in the California Coastline Preservation and Recreation Plan prepared by the Department of Parks and Recreation and by local government shall be subordinate to the character of its setting.

As discussed in Reference F8.4, F8.6, and F8.27, the DC ISFSI site is situated at an elevation of approximately 310 ft above MSL within the PG&E owner-controlled area at DCPP. The DC ISFSI is currently viewable to the public only from the Pacific Ocean from the west. However, the Captain of the Port of Los Angeles-Long Beach, under the authority of 33 U.S.C. 1226 and 1231, has established a Security Zone in the Pacific Ocean from surface to bottom, within a 2,000-yard radius of DCPP. No person or vessel may enter or remain in this Security Zone without permission of the Captain of the Port of Los Angeles-Long Beach (Reference F8.26). DC ISFSI LR does not include refurbishment or new construction, and thus, does not result in any changes to the visual impacts. Furthermore, an additional 40 years of DC ISFSI operations does not change the CCC original conclusion because the evaluation assumed long-term presence of the DC ISFSI.

Furthermore, while this exclusion zone may be reduced as DCPP decommissioning progresses during the ISFSI LR period, offshore views of the DC ISFSI are visually subordinate due to the surrounding foothill topography. The proposed project is in compliance with this section of the CCMP.

<u>Section 30253</u>:

New development shall:

- *(1) Minimize risks to life and property in areas of high geologic, flood, and fire hazard.*
- *(2) Assure stability and structural integrity, and neither create nor contribute significantly to erosion, geologic instability, or destruction of the site or surrounding area or in any way require the construction of protective devices that would substantially alter natural landforms along bluffs and cliffs.*
- *(3) Be consistent with requirements imposed by an air pollution control district or the State Air Resources Control Board as to each particular development.*
- *(4) Minimize energy consumption and vehicle miles traveled.*
- *(5) Where appropriate, protect special communities and neighborhoods which, because of their unique characteristics, are popular visitor destination points of recreational uses.*

Subsections (1) and (2):
As discussed in Reference F8.4, F8.6, and F8.27, detailed geologic and geotechnical investigations were conducted in support of original design, licensing, and permitting of the DC ISFSI. These investigations concluded that there were no geologic hazards or adverse geologic or geotechnical conditions that would preclude construction and operation of an ISFSI. DC

ISFSI LR does not include refurbishment or new construction, and thus, does not result in any changes to the geologic and geotechnical conclusions.

Although the NRC concluded the DC ISFSI design is adequate to withstand hazards at the DC ISFSI site, the CCC concluded that the DC ISFSI transport route that runs along the coastal bluff may potentially be affected by shoreline erosion at Patton Cove (Reference F8.27, Sections 4.4.2.4). The CCC approved the construction and operation of the DC ISFSI, including the transport route, on the condition (Special Condition 5) that PG&E conduct annual shoreline erosion surveys to verify the transport route will not be impacted. PG&E complies with CDP A-3-SLO-04-035 Special Condition 5 and submits annual reports to the CCC. As discussed in PG&E letter dated June 11, 2021, to the CCC, the Patton Cove landslide has been quiescent since the 2006 baseline inspection.

Subsection (3):
DC ISFSI LR does not include refurbishment or new construction. No air permits are required for continued operations. Thus, the proposed project complies with Subsection (3).

Subsection (4):
The DC ISFSI is a stationary and passive facility. The only energy needs for the DC ISFSI are for the associated personnel, site lighting, and ancillary functions. As such, the proposed project complies with Subsection (4).

Subsection (5):
As discussed above, the DC ISFSI is located on land that was an existing and disturbed industrial site. DC ISFSI operation-related activities will take place wholly within the DCPP site and will not occur in any neighboring developed areas or on public roadways. Thus, the proposed project is in compliance with Subsection (5).

Appendix G

DECOMMISSIONING FUNDING PLAN

G.1 Introduction

As discussed in Section 1.4, pursuant to 10 CFR 72.30(b), PG&E submitted its most recent decommissioning funding plan for the DC ISFSI on December 14, 2021 (ADAMS Accession No. ML21348A772).

10 CFR 72.30(c) requires each holder of a license under Part 72 to resubmit the decommissioning funding plan at the time of license renewal and at intervals not to exceed three (3) years with adjustments as necessary to account for changes in costs and the extent of contamination. In accordance with 10 CFR 72.30(c), this appendix provides PG&E's update to the DC ISFSI Decommissioning Funding Plan at the time of license renewal.

G.2 PG&E's Response to 10 CFR 72.30(c) Considerations

PG&E's consideration of certain events on decommissioning costs in accordance with 10 CFR 72.30(c) is as follows.

The decommissioning funding plan must specifically consider the effect of the following events on decommissioning costs:

(1) *Spills of radioactive material producing additional residual radioactivity in onsite subsurface material.*

PG&E Response: There have not been any spills of radioactive material in the DC ISFSI storage site and CTF.

Spills of radioactive material in the DC ISFSI storage site and CTF are not expected to occur because radioactive material that could spill will not be brought into the ISFSI area, and because of the ISFSI design and administrative control features described in the DC ISFSI UFSAR, Section 7.3.1. Specifically:

- There are no radioactive systems at the ISFSI storage pads other than the overpacks containing MPCs.
- The fuel is stored dry inside the MPC, so that no radioactive liquid is available for leakage.
- The MPCs are loaded, welded, and the upper lid decontaminated in the DCPP FHB/auxiliary building (AB) before being moved to the CTF located near the ISFSI storage pads.
- The overpacks are loaded and the lids installed prior to movement from the CTF to the ISFSI pads.
- Fuel is not removed from the MPCs at either the ISFSI storage pads or the CTF. Unloading of the fuel from the MPC, if necessary, would only occur in the spent fuel pool in the FHB/AB.

In the NRC Safety Evaluation Report dated March 22, 2004, Section 13.1.2.1, the NRC concurred with PG&E's assessment that the DC ISFSI storage system will "minimize contamination and facilitate decommissioning." The Safety Evaluation

Report states, "The zero-leakage design of the MPCs…and the passive design of the storage system, minimize the potential for radioactive contamination to occur and to spread."

(2) *Facility modifications.*

PG&E Response: There have been no modifications to the DC ISFSI design that could impact decommissioning costs. However, to support the plan for plant decommissioning, in addition to the spent fuel casks located on the ISFSI pad after shutdown, additional casks are expected to be used for GTCC waste storage on a separate GTCC waste pad. The present ISFSI was not sized for both spent fuel and GTCC waste casks when licensed. Remedies include an additional storage pad as a separate facility or changes made to the current storage system that will be subject to updated licensing with the NRC.[4] Such changes could affect decommissioning costs.

(3) *Changes in authorized possession limits.*

PG&E Response: The DC ISFSI design consists of 7 storage pads containing space for 20 fuel storage casks each. The quantity of fuel to fill these casks is the authorized limit as defined in Materials License No. SNM-2511, namely 2100 metric tons of uranium of intact spent fuel assemblies, damaged fuel assemblies and fuel debris. No changes to this limit are planned during the plant operating period. To support the plant decommissioning period, a license amendment to incorporate storage of GTCC waste on a separate pad is expected in the future.[5] This change would not add any material that would increase radiological decommissioning costs.

(4) *Actual remediation costs that exceed the previous cost estimate.*

PG&E Response: PG&E will not begin to decommission the DC ISFSI and GTCC waste pad until after the U.S. DOE takes possession of the spent fuel and GTCC waste, respectively. Currently, this is estimated to begin no earlier than 2038. Therefore, there have been no actual remediation costs that exceed previous cost estimates. PG&E currently shows complete decommissioning of the ISFSI and GTCC waste pad by 2071 as part of its recent submittal of the Decommissioning Cost Estimate for the 2018 Nuclear Decommissioning Cost Triennial Proceeding before the CPUC.

The CPUC requires PG&E to update the ISFSI decommissioning cost estimate every three years. If a revised cost estimate exceeds a previous cost estimate,

[4] Future licensing activities for a separate GTCC waste storage facility are not included in the LRA. Impacts to the LRA (or renewed ISFSI license, as applicable) will be addressed as part of the GTCC waste licensing actions.
[5] *Id.*

PG&E will submit a request to the CPUC requesting approval of increased funding based on a justifiable reason.

G.3 10 CFR 72.30 Diablo Canyon Independent Spent Fuel Storage Installation Decommissioning Cost Estimate

1. Background and Introduction

The NRC issued its final rule on decommissioning planning on June 17, 2011,[6] with the rule becoming effective on December 17, 2012. Subpart 72.30, "Financial assurance and recordkeeping for decommissioning," requires that each holder of, or applicant for, a license under this part must submit for NRC review and approval a decommissioning funding plan that contains information on how reasonable assurance will be provided that funds will be available to decommission the ISFSI.

In accordance with the rule, a detailed cost estimate for decommissioning the DC ISFSI is provided in an amount reflecting:

1. the work is performed by an independent contractor;
2. an adequate contingency factor; and
3. release of the facility and dry storage systems for unrestricted use, as specified in 10 CFR Part 20.1402.

This document also provides:

1. identification of the key assumptions contained in the cost estimate; and
2. the volume of onsite subsurface material containing residual radioactivity, if any, that will require remediation to meet the criteria for license termination.

2. Spent Fuel Management Strategy

The operating licenses for DCPP Units 1 and 2 are currently set to expire on November 2, 2024, and August 26, 2025, respectively. Approximately 4,398 spent fuel assemblies are projected to be generated as a result of plant operations through these license expiration dates. The ISFSI is operated under a Part 72 site-specific license.

Assuming that the plant operates to the end of currently licensed life, the spent fuel pools are expected to contain up to 2,542 spent fuel assemblies after the final core offloads (1,261 and 1,281 spent fuel assemblies stored in the Unit 1 and 2 spent fuel pools, respectively). To facilitate immediate dismantling, the

6 U.S. Code of Federal Regulations, Title 10, Parts 20, 30, 40, 50, 70 and 72 "Decommissioning Planning," Nuclear Regulatory Commission, Federal Register Volume 76, Number 117 (p 35512 et seq.), June 17, 2011

spent fuel that cannot be transferred directly to the DOE from the pools is assumed to be packaged in dry storage casks for interim storage at the ISFSI. Transferring the spent fuel from the pools to the ISFSI will permit decontamination and dismantling of the spent fuel pool systems and fuel pool areas.

Completion of the ISFSI decommissioning process is dependent upon the DOE's ability to remove spent fuel from the site. DOE's repository program assumes that spent fuel allocations will be accepted for disposal from the nation's commercial nuclear plants, with limited exceptions, in the order (the "queue") in which it was discharged from the reactor.[7] PG&E's current spent fuel management plan for the DCPP spent fuel is based in general upon: (1) a 2038 start date for DOE initiating transfer of commercial spent fuel to a federal facility, and (2) completion of spent fuel and GTCC waste receipt by year 2067.[8] The completion date is based upon the DOE's generator allocation/receipt schedules which are based upon the oldest fuel receiving the highest priority. In accordance with the 10 CFR 961 standard contract,[9] PG&E will be able to load a maximum of five full MPCs into five DOE-supplied transportation casks each year. Thus, the spent fuel and GTCC waste is projected to be removed from the DC ISFSI in 2067.

3. Independent Spent Fuel Storage Installation Decommissioning Strategy

At the conclusion of the spent fuel transfer process to DOE, the ISFSI will be promptly decommissioned (similar to the power reactor DECON alternative) by removing and disposing of residual radioactivity and verifying that remaining materials satisfy NRC release criteria.

For purposes of providing an estimate for a funding plan, financial assurance is expected to be provided based on a prompt ISFSI decommissioning scenario. In this estimate, the ISFSI decommissioning is considered an independent project, regardless of the decommissioning alternative identified for the nuclear power plant.

---

[7] U.S. Code of Federal Regulations, Title 10, Part 961.11, Article IV - Responsibilities of the Parties, B. DOE Responsibilities, 5.(a) " ... DOE shall issue an annual acceptance priority ranking for receipt of SNF and/or HLW at the DOE repository. This priority ranking shall be based on the age of SNF and/or HLW as calculated from the date of discharge of such material from the civilian nuclear power reactor. The oldest fuel or waste will have the highest priority for acceptance, except as ... "

[8] "Application of Pacific Gas and Electric Company in the 2018 Nuclear Decommissioning Cost Triennial Proceeding." Pacific Gas and Electric Company filed with the California Public Utilities Commission on December 13, 2018.

[9] "Acceptance Priority Ranking & Annual Capacity Report," DOE/RW-0567, July 2004.

4. Independent Spent Fuel Storage Installation Description

The DC ISFSI uses a Holtec International (Holtec) HI-STORM 100 System. The HI-STORM 100 System is comprised of an MPC, the HI-STORM 100SA storage overpack, and the HI-TRAC transfer cask. The MPCs are assumed to be transferred directly to the DOE and not returned to the station. The cost to dispose of residual radioactivity, and verify that the remaining facility and surrounding environs meet the NRC's radiological limits established for unrestricted use, form the basis of the ISFSI decommissioning estimate.

PG&E's current spent fuel management plan for the DCPP spent fuel would result in up to 138 SFSCs (nominal 32 assemblies per cask) being placed on storage pads at the site after all spent fuel has been removed from the spent fuel pools. This represents 100 percent of the total spent fuel projected to be generated during the current licensed operating period.

In addition to the spent fuel casks located on the ISFSI pad after shutdown, there are projected to be additional casks that are expected to be used for GTCC waste storage on a separate GTCC waste pad. The storage overpacks used for the GTCC waste canisters (estimated quantity of 10) are not expected to have any interior contamination or residual activation and can be reused or disposed of by conventional means after a final status survey. It should be noted that the present ISFSI is not sized nor licensed for GTCC waste. A new license amendment would need to be submitted in the future for constructing an additional storage pad onsite that accommodates GTCC waste as approved stored contents.[10] PG&E may elect to implement a different storage system that will work within the existing estimated pad footprint.

Table G-1 provides the significant quantities and physical dimensions used as the basis in developing the ISFSI decommissioning estimate.

5. Key Assumptions/Estimating Approach

The decommissioning estimate is based on the configuration of the ISFSI expected after all spent fuel and GTCC waste material have been removed from the site. Configuration of the ISFSI is based on the Units 1 and 2 operating until the end of their current licenses, November 2, 2024, and August 26, 2025, respectively, and the assumptions associated with DOE's spent fuel acceptance, as previously described.

The current size of the ISFSI pad is sufficient to store the projected amount of spent fuel and is approximately 105 feet in width and 476 feet in length.

[10] Future licensing activities for a separate GTCC waste storage facility are not included in the LRA. Impacts to the LRA (or renewed ISFSI license, as applicable) will be addressed as part of the GTCC waste licensing actions.

If a new pad is added onsite as a separate facility to accommodate GTCC waste, the total GTCC waste concrete dimensions are expected to be approximately 105 feet in width and 34 feet in length.[11]

It is not expected that the overpacks will have any interior or exterior radioactive surface contamination. It is expected that this assumption would be confirmed as a result of the good radiological practice of surveying potentially impacted areas after each spent fuel transfer campaign. Any neutron activation of the steel and concrete is expected to be extremely small. This is addressed in the Holtec Final Safety Analysis Report supporting General License 72-1014. To validate this assumption, it is likely that some of this characterization will take place well before the last of the fuel is removed from the ISFSI in order to establish a more definitive decommissioning scope.

It is not expected that there will be any residual contamination left on the concrete ISFSI pad or in the CTF area. It is expected that this assumption would be confirmed as a result of the good radiological practice of surveying potentially impacted areas after each spent fuel transfer campaign. Therefore, it is assumed for this analysis that the ISFSI pad and transfer facility area will not be contaminated. As such, only verification surveys are included for the pad in the decommissioning estimate.

There is no known subsurface material in the proximity of the ISFSI containing residual radioactivity that will require remediation to meet the criteria for license termination.

However, the site-specific detailed cost estimate assumes radiological remediation of surficial soil in a limited area of approximately 1.2 acres (containing approximately 500 cubic yards) adjacent to the footprint of the ISFSI/GTCC waste pads. Impacts to soil beneath the ISFSI/GTCC waste pads are not anticipated given the limited pathways for contamination from the canisters, as well as the 7-foot thick concrete base of the pad.

To support an application for ISFSI license termination, the estimate assumes that a final status survey will be performed; this will include a 100 percent survey of the concrete overpack surfaces, and a significant fraction of the ISFSI pad and the immediate area surrounding the pad.

As per 10 CFR 72.30(b)(2)(i), decommissioning is assumed to be performed by an independent contractor. As such, essentially all labor, equipment, and material costs are based on national averages, i.e., costs from national publications such as R.S. Means' Building Construction Cost Data (adjusted for

[11] Future licensing activities for a separate GTCC waste storage facility are not included in the license renewal application. Impacts to the license renewal application (or renewed ISFSI license, as applicable) will be addressed as part of the GTCC waste licensing actions.

regional variations), and laboratory service costs are based on vendor price lists. Those craft labor positions that are expected to be provided locally, are consistent with fully burdened contractor labor rates used in the most recently developed site-specific DCPP decommissioning cost estimate in 2017 dollars and escalated to 2021 dollars.

PG&E, as licensee, will oversee the site activities; the estimate includes PG&E's labor and overhead costs.

Low-level radioactive waste packaging, transport, and disposal costs are based on rates consistent with the most recently developed site-specific decommissioning cost estimate in 2021 dollars.

Costs are reported in 2021 dollars.

An overall contingency of 18.5 percent has been added. As provided for in NUREG-1757, because the DCPP decommissioning cost estimate is site-specific with a high degree of certainty, the contingency of 18.5 percent is less than the contingency referenced in NUREG-1757.[12]

6. Cost Estimate

The estimated cost to decommission the ISFSI and release the facility for unrestricted use is provided in Table G-2. The cost has been organized into four major scopes of work, including:

- Utilities and Structures Demolition – includes planning, decontamination (as needed), and removal of site ISFSI pad and associated features.
- Soil Remediation – remediate residual radiologically contaminated soil to meet radiological cleanup criteria.
- Final Site Survey – license termination surveys, independent surveys, and application for license termination.
- Waste, Transportation, and Material Management – waste handling, packaging, transportation, and disposal fees.

In addition to the direct costs associated with decontamination, demolition, and restoration, the estimate also contains costs for PG&E's oversight staff, site operating costs, and the NRC (and NRC contractor).

For estimating purposes, it should be assumed that all planning will occur between 2063-2067 and execution will occur between 2068-2071.

[12] "Consolidated Decommissioning Guidance, Financial Assurance, Recordkeeping, and Timeliness," U.S. Nuclear Regulatory Commission's Office of Nuclear Material Safety and Safeguards, NUREG-1757, Volume 3, Revision 1, February 2012

Table G-1
Significant Quantities and Physical Dimensions

Independent Spent Fuel Storage Installation and Greater Than Class C Pads

Item	Length (ft)	Width (ft)	Residual Radioactivity
ISFSI Pad	476	105	No
GTCC Pad	34	105	No

Independent Spent Fuel Storage Installation Overpack

Item	Value	Notes (all dimensions are nominal and rounded up)
Overall Height (inches)	229.5	
Outside Diameter (inches)	132.5	Main cylindrical body of overpack
Inside Diameter (inches)	73.5	
Inner Liner Thickness (inches)	1	
Quantity (total)	148	Spent Fuel (138) GTCC (10)

Other Potentially Impacted Items

Item	Value	Notes
Number of Overpacks used for GTCC storage	10	No residual radioactivity

Table G-2
Independent Spent Fuel Storage Installation Decommissioning Costs and Waste Volumes

	(thousands, 2021 $)							(ft^3)	hours
Scope	**Labor**	**Material**	**Equipment**	**Transport**	**Disposal**	**Other**	**Total**	**Waste Volume**	**Labor Quantity**
ISFSI Demolition and Site Restoration									
Utilities and Structures Demo	$12,482	$1,077	$5,211		$727	$1,955	$21,453		126,595
Soil Remediation	$437	$70	$87			$94	$688		3,546
Final Site Survey	$1,200	$301				$129	$1,629		9,014
Waste, Transportation, and Material Management	$9,209	$727	$888	$1,325		$1,834	$12,658	260,089	93,806
Support Costs									
Staffing	$6,673					$233	$6,906		42,782
Insurance						$1,100	$1,100		
Property Tax						$3,189	$3,189		
NRC Fees / Reviews	$239					$1,826	$2,064		797
Facility Maintenance	$113						$113		1,530
Water Management	$115		$470			$28	$613		2,702
Permits	$293					$2,213	$2,506		1,881
License Termination Plan	$3,731						$3,731		23,164
Consumables		$363					$363		
Security		$170					$170		
Total (without contingency)	**$40,432**	**$2,556**	**$6,869**	**$1,325**	**$727**	**$20,598**	**$71,182**	**234,407**	**354,686**
Contingency	$7,852	$573	$1,551	$199	$255	$2,729	$13,158		
Grand Total	**$48,284**	**$3,129**	**$8,420**	**$1,524**	**$982**	**$23,327**	**$84,340**	**234,407**	**354,686**