

**B.4 FACILITY DESIGN REQUIREMENTS FOR INTEGRATED DATA SYSTEMS****B.4.1 FACILITY DESIGN REQUIREMENTS FOR INTEGRATED DATA SYSTEMS****B.4.1.1 DESCRIPTION**

This section of Appendix B defines the ESF design requirements to support the IDS. The elements of the IDS to be supported at the ESF are grouped in five major categories:

- A. An IDS SBTF, containing the primary IDS computers, archiving devices and communications equipment.
- B. Data Acquisition Station facility support at each IDS supported test alcove or location in the ESF.
- C. Cabling systems to support collection of test data, movement of data and commands between IDS components and distribution of data and status to users.
- D. An underground IDS repair shop with spare parts storage capability.
- E. Office space in the Area 25 Field Operations Center for IDS work stations.

**B.4.1.2 FUNCTIONAL REQUIREMENTS**

Provide the system design and operational flexibility necessary to support the IDS.

- A. Provide the surface facilities necessary to ensure the PIs and their respective organizations obtain adequate IDS support to perform their testing needs. The SBTF will provide a controlled environment space which will contain the equipment needed to support the IDS operations and the various tests conducted by PIs throughout the ESF.
- B. Provide the facilities in the ESF necessary to ensure that the PIs and their respective organizations obtain adequate IDS support at the test locations to perform their testing needs.
- C. Provide the cabling systems necessary to support the testing needs of the principal investigators and operation of the IDS.
- D. Provide an environmentally controlled underground enclosure to repair IDS equipment and to store spare parts.
- E. Provide office space in the Area 25 Field Operations Center for IDS work stations to support PIs in controlling and monitoring their tests.

**B.4.1.3 PERFORMANCE CRITERIA**

- A. A surface facility shall be provided with a minimum usable floor space of 390.6 square meters (4200 square feet) to house the IDS computers and associated equipment.
1. The building shall have a 0.46 meter (1.5 feet) raised floor to house IDS power and data cabling.
  2. The building shall be environmentally controlled to provide a temperature of 23 degrees celsius, plus or minus two degrees, and a relative humidity of 50% non-condensing. Windows will be dust tight and an air-lock type entry shall be provided.
  3. The building's metallic segments shall be connected in such a fashion that the entire structure can be connected to the common earth ground.
  4. The SBTF requires [TBD] kVA, 208/120V, 3-phase UPS system.
  5. The SBTF requires [TBD] kVA, 208/120V, 3-phase normal power distribution system.
  6. The IDS SBTF requires a fire suppression system designed for computer room service.
- [SD&TRD 3.7.A, 3.7.B.3][42 USC 10133(c)(1)]
- B. A data acquisition system is required at each IDS supported test location. The individual DAS specific facility support requirements are [TBD].
1. Each DAS must be located as near to its supported test as is possible (within the constraints of designated construction practice), and requires a minimum of 3 meters by 3 meters (10 feet by 10 feet) floor space.
  2. DAS enclosure and environmental requirements are [TBD].
- [SD&TRD 3.7.A, 3.7.B.3][42 USC 10133(c)(1)]
- C. All IDS components and systems shall conform to the IDS grounding and shielding plan that will be developed as part of the IDS design.
1. The cabling systems on all runs shall be designed to provide the maximum possible separation between the power cables, the data cables and the communications cables.
  2. All power systems shall have their neutral and grounds returned to a single common earth ground.
  3. A telephone is required at each DAS location.

4. Cabling shall be provided from each DAS to other IDS components. A data communications system shall connect to each DAS and the IDS SBTF.  
[SD&TRD 3.7.A, 3.7.B.3][42 USC 10133(c)(1)]
- D. The underground IDS repair and spare parts storage facility shall be located on the main test level adjacent to the core test panel.
1. The underground repair and spare parts storage facility shall be a minimum of 100 square meters (1076.4 square feet).
  2. The underground repair and spare parts storage facility shall be environmentally controlled to provide a temperature of 24 degrees celsius plus or minus 3 degrees.
  3. The underground repair and spare parts storage facility will require [TBD] UPS system power and [TBD] normal power distribution system.
  4. A fire suppression system shall be provided for the underground repair and spare parts storage facility.  
[SD&TRD 3.7.A, 3.7.B.3][42 USC 10133(c)(1)]
- E. The IDS work space required in the Field Operations Center is typical office environment and a minimum of 37 square meters (398.3 square feet).
1. The power requirements are 5 kVA, 120V, 1-phase and are normal power. There are no UPS power requirements.
  2. There are no "special" environmental or fire suppression requirements.
  3. Electrical cables are required between the room and the microwave equipment located elsewhere in the building for the data communications link to the IDS surface facility. Three telephones are required.  
[SD&TRD 3.7.A, 3.7.B.3][42 USC 10133(c)(1)]

#### B.4.1.4 CONSTRAINTS

The IDS Surface Facilities shall be placed as far away from any equipment likely to produce electromagnetic fields as is practical. This includes power feeders, electrical rotating machinery and other large electrical loads.

[SD&TRD 3.7.A, 3.7.B.3][42 USC 10133(c)(1)]

#### B.4.1.5 ASSUMPTIONS

The IDS surface facility will exist in time to support IDS installation prior to the beginning of North Ramp construction.

**B.5 ACRONYMS AND ABBREVIATIONS**

CHn	Calico Hills Non-Welded Unit
CTA	Core Test Area
ESF	Exploratory Studies Facility
ESFDR	Exploratory Studies Facility Design Requirements
IDAS	Integrated Data Acquisition System
IDS	Integrated Data System
kPa	kilo Pascals
LDBR	Lower Demonstration Breakout Room
lpm	Liters per Minute
MPBH	Multi-Purpose Boreholes
MPBX	Multi-Point Borehole Extensometers
MTL	Main Test Level
NRC	Nuclear Regulatory Commission
OD	Outside Diameter
PI	Principal Investigator
PTn	Paintbrush Tuff Nonwelded Unit
SBTF	Surface-Based Test Facility
SCP	Site Characterization Plan
SD&TRD	Site Design & Test Requirements Document
SMF	Sample Management Facility
TBD	To Be Determined
TBM	Tunnel Boring Machine
TCw	Tiva Canyon Welded Unit
TSw1	Topopah Spring Welded Unit 1
TSw2	Topopah Spring Welded Unit 2
TSw3	Topopah Spring Welded Unit 3
UDBR	Upper Demonstration Breakout Room
USGS	United States Geological Survey
VSP	Vertical Seismic Profiling
YMP	Yucca Mountain Site Characterization Project

APPENDIX C

GOVERNMENT-FURNISHED EQUIPMENT

[TBD]

APPENDIX D

SITE DESIGN AND TEST REQUIREMENTS DOCUMENT  
TRACEABILITY MATRIX

## APPENDIX D

SITE DESIGN AND TEST REQUIREMENTS DOCUMENT  
TRACEABILITY MATRIX

SD&TRD Traceability Matrix	
SD&TRD Section	ESFDR Section
3.2.A	Not Allocated to the ESF
3.2.B	Not Allocated to the ESF
3.2.C	Not Allocated to the ESF
3.2.1.A	Not Allocated to the ESF
3.2.1.B	Not Allocated to the ESF
3.2.1.C	Not Allocated to the ESF
3.2.1.D	Not Allocated to the ESF
3.2.1.E	Not Allocated to the ESF
3.2.1.F	Not Allocated to the ESF
3.2.1.G.1	Not Allocated to the ESF
3.2.1.G.2	Not Allocated to the ESF
3.2.1.H	Not Allocated to the ESF
3.2.1.I.1	Not Allocated to the ESF
3.2.1.I.2.a	Not Allocated to the ESF
3.2.1.I.2.b	Not Allocated to the ESF
3.2.1.I.3	Not Allocated to the ESF
3.2.1.J	Not Allocated to the ESF
3.2.1.1	Not Allocated to the ESF
3.2.1.2	Not Allocated to the ESF
3.2.1.2.A	Not Allocated to the ESF
3.2.1.2.A.1	Not Allocated to the ESF
3.2.1.2.A.1.a	Not Allocated to the ESF
3.2.1.2.A.2	Not Allocated to the ESF
3.2.1.2.A.2.a	Not Allocated to the ESF
3.2.1.2.A.2.b	Not Allocated to the ESF

SD&TRD Traceability Matrix	
SD&TRD Section	ESFDR Section
3.2.1.2.A.3	Not Allocated to the ESF
3.2.1.2.A.3.a	Not Allocated to the ESF
3.2.1.2.A.3.b	Not Allocated to the ESF
3.2.1.2.A.3.c	Not Allocated to the ESF
3.2.1.2.A.3.d	Not Allocated to the ESF
3.2.1.2.A.4	Not Allocated to the ESF
3.2.1.2.A.4.a	Not Allocated to the ESF
3.2.1.2.A.4.b	Not Allocated to the ESF
3.2.1.2.A.4.c	Not Allocated to the ESF
3.2.1.2.A.4.d	Not Allocated to the ESF
3.2.1.2.B	Not Allocated to the ESF
3.2.1.2.B.1	Not Allocated to the ESF
3.2.1.2.B.1.a	Not Allocated to the ESF
3.2.1.2.B.1.b	Not Allocated to the ESF
3.2.1.2.B.1.c	Not Allocated to the ESF
3.2.1.2.B.2	Design requirements are in SD&TRD 3.2.1.2.B.2.a
3.2.1.2.B.2.a	B.2.1.3.A-H, B.2.1.4.A-F, B.2.1.5
3.2.1.2.B.3	Not Allocated to the ESF
3.2.1.2.B.3.a	B.2.2.3.A-F, B.2.2.4.A-E, B.2.2.5
3.2.1.2.B.3.b	Not Allocated to the ESF
3.2.1.2.B.3.c	Not Allocated to the ESF
3.2.1.2.B.4	Design requirements are in SD&TRD 3.2.1.2.B.4.a-c, g-h, j
3.2.1.2.B.4.a	B.2.3.3.A-E, B.2.3.4.A-C, B.2.3.5
3.2.1.2.B.4.b	B.2.4.3.A-G, B.2.4.4.A-F, B.2.4.5
3.2.1.2.B.4.c	B.2.5.3.A-F, B.2.5.4.A-F, B.2.5.5
3.2.1.2.B.4.d	B.2.6.3.A-H, B.2.6.4.A-E, B.2.6.5
3.2.1.2.B.4.e	B.2.7.3.A-I, B.2.7.4.A-H, B.2.7.5



SD&TRD Traceability Matrix	
SD&TRD Section	ESFDR Section
3.2.1.2.B.4.f	Activity no longer being performed
3.2.1.2.B.4.g	B.2.9.3.A-G, B.2.9.4.A-D, B.2.9.5
3.2.1.2.B.4.h	B.2.10.3.A-J, B.2.10.4.A-E, B.2.10.5
3.2.1.2.B.4.i	Not Allocated to the ESF
3.2.1.2.B.4.j	B.2.12.3.A-J, B.2.12.4.A-G, B.2.12.5
3.2.1.2.B.5	Design requirements are in SD&TRD 3.2.1.2.B.5.a
3.2.1.2.B.5.a	B.2.13.3.A-H, B.2.13.4.A-F, B.2.13.5
3.2.1.2.B.6	Not Allocated to the ESF
3.2.1.2.B.6.a	Not Allocated to the ESF
3.2.1.2.B.7	No design requirements, for sample collection only
3.2.1.2.B.7.a	No design requirements, for sample collection only
3.2.1.2.B.7.b	No design requirements for sample collection only
3.2.1.2.B.8	Not Allocated to the ESF
3.2.1.2.B.8.a	Not Allocated to the ESF
3.2.1.2.B.8.b	Not Allocated to the ESF
3.2.1.2.B.9	Not Allocated to the ESF
3.2.1.2.B.9.a	Not Allocated to the ESF
3.2.1.2.B.9.b	Not Allocated to the ESF
3.2.1.2.B.9.c	Not Allocated to the ESF
3.2.1.2.B.9.d	Not Allocated to the ESF
3.2.1.2.B.9.e	Not Allocated to the ESF
3.2.1.2.C	Not Allocated to the ESF
3.2.1.2.C.1	Not Allocated to the ESF
3.2.1.2.C.1.a	Not Allocated to the ESF
3.2.1.2.C.1.b	Not Allocated to the ESF
3.2.1.2.C.1.c	Not Allocated to the ESF

SD&TRD Traceability Matrix	
SD&TRD Section	ESFDR Section
3.2.1.2.C.1.d	Not Allocated to the ESF
3.2.1.2.C.1.e	Not Allocated to the ESF
3.2.1.2.C.1.f	Not Allocated to the ESF
3.2.1.2.C.1.g	Not Allocated to the ESF
3.2.1.2.C.1.h	Not Allocated to the ESF
3.2.1.2.C.2	Not Allocated to the ESF
3.2.1.2.C.2.a	Not Allocated to the ESF
3.2.1.2.C.2.b	Not Allocated to the ESF
3.2.1.2.C.2.c	Not Allocated to the ESF
3.2.1.2.C.2.d	Not Allocated to the ESF
3.2.1.2.C.3	Not Allocated to the ESF
3.2.1.2.C.3.a	Not Allocated to the ESF
3.2.1.2.C.3.b	Not Allocated to the ESF
3.2.1.2.C.3.c	Not Allocated to the ESF
3.2.1.3	Not Allocated to the ESF
3.2.1.3.A	Not Allocated to the ESF
3.2.1.3.A.1	Not Allocated to the ESF
3.2.1.3.B	Not Allocated to the ESF
3.2.1.3.B.1	Design requirements are in SD&TRD 3.2.1.3.B.1.a-c
3.2.1.3.B.1.a	B.2.14.3.A-E, B.2.14.4.A-B, B.2.14.5
3.2.1.3.B.1.b	B.2.15.3.A-E, B.2.15.4.A-B, B.2.15.5
3.2.1.3.B.1.c	B.2.16.3.A-D, B.2.16.4.A-C, B.2.16.5
3.2.1.3.B.2	No design requirements, for sample collection only
3.2.1.3.B.2.a	B.2.17.3.A-D, B.2.17.4.A-F, B.2.17.5
3.2.1.3.B.2.b	No design requirements, for sample collection only
3.2.1.3.C	Not Allocated to the ESF

SD&TRD Traceability Matrix	
SD&TRD Section	ESFDR Section
3.2.1.3.C.1	Not Allocated to the ESF
3.2.1.3.C.2	Not Allocated to the ESF
3.2.1.3.C.2.a	Not Allocated to the ESF
3.2.1.3.C.2.b	Not Allocated to the ESF
3.2.1.3.C.2.c	Not Allocated to the ESF
3.2.1.3.C.3	Not Allocated to the ESF
3.2.1.3.D	Not Allocated to the ESF
3.2.1.3.D.1	Not Allocated to the ESF
3.2.1.3.D.1.a	Not Allocated to the ESF
3.2.1.3.D.1.b	Not Allocated to the ESF
3.2.1.3.D.1.c	Not Allocated to the ESF
3.2.1.3.D.1.d	Not Allocated to the ESF
3.2.1.3.D.1.e	Not Allocated to the ESF
3.2.1.3.D.2	B.2.18.3.A-H, B.2.18.4.A-F, B.2.18.5
3.2.1.3.D.3	Not Allocated to the ESF
3.2.1.3.E	Not Allocated to the ESF
3.2.1.3.E.1	Not Allocated to the ESF
3.2.1.3.E.1.a	Not Allocated to the ESF
3.2.1.3.E.1.b	Not Allocated to the ESF
3.2.1.3.E.1.c	Not Allocated to the ESF
3.2.1.3.E.2	Not Allocated to the ESF
3.2.1.3.E.2.a	Not Allocated to the ESF
3.2.1.3.E.2.b	Not Allocated to the ESF
3.2.1.3.F	Not Allocated to the ESF
3.2.1.3.F.1	Not Allocated to the ESF
3.2.1.3.F.1.a	Not Allocated to the ESF
3.2.1.3.F.1.b	Not Allocated to the ESF
3.2.1.3.F.1.c	Not Allocated to the ESF

SD&TRD Traceability Matrix	
SD&TRD Section	ESFDR Section
3.2.1.3.F.1.d	Not Allocated to the ESF
3.2.1.3.F.1.e	Not Allocated to the ESF
3.2.1.3.F.2	Not Allocated to the ESF
3.2.1.3.F.2.a	Not Allocated to the ESF
3.2.1.3.F.2.b	Not Allocated to the ESF
3.2.1.3.F.2.c	Not Allocated to the ESF
3.2.1.3.G	Not Allocated to the ESF
3.2.1.3.G.1	Not Allocated to the ESF
3.2.1.3.G.1.a	Not Allocated to the ESF
3.2.1.3.G.1.b	Not Allocated to the ESF
3.2.1.3.G.1.c	Not Allocated to the ESF
3.2.1.3.G.2	Not Allocated to the ESF
3.2.1.3.G.2.a	Not Allocated to the ESF
3.2.1.3.G.2.b	B.2.19.3.A-F, B.2.19.4.A-G, B.2.19.5
3.2.1.3.G.2.c	Not Allocated to the ESF
3.2.1.3.G.2.d	Not Allocated to the ESF
3.2.1.3.H	Not Allocated to the ESF
3.2.1.3.H.1	Not Allocated to the ESF
3.2.1.3.H.1.a	Not Allocated to the ESF
3.2.1.3.H.1.b	Not Allocated to the ESF
3.2.1.4	Not Allocated to the ESF
3.2.1.4.A	Not Allocated to the ESF
3.2.1.4.A.1.a	Not Allocated to the ESF
3.2.1.4.A.1.b	Not Allocated to the ESF
3.2.1.4.B	Not Allocated to the ESF
3.2.1.4.B.1	Not Allocated to the ESF
3.2.1.4.B.1.a	Not Allocated to the ESF
3.2.1.4.B.1.b	Not Allocated to the ESF

SD&TRD Traceability Matrix	
SD&TRD Section	ESFDR Section
3.2.1.4.B.1.c	Not Allocated to the ESF
3.2.1.4.B.1.d	Not Allocated to the ESF
3.2.1.4.B.1.e	Not Allocated to the ESF
3.2.1.4.B.2	Design requirements are in SD&TRD 3.2.1.4.B.2.d-e
3.2.1.4.B.2.a	Not Allocated to the ESF
3.2.1.4.B.2.b	Not Allocated to the ESF
3.2.1.4.B.2.c	Not Allocated to the ESF
3.2.1.4.B.2.d	B.2.20.3.A-I, B.2.20.4.A-E, B.2.20.5
3.2.1.4.B.2.e	B.2.21.3.A-G, B.2.21.4.A-D, B.2.21.5
3.2.1.4.B.3	Not Allocated to the ESF
3.2.1.4.B.3.a	Not Allocated to the ESF
3.2.1.4.C	Not Allocated to the ESF
3.2.1.4.C.1.a	Not Allocated to the ESF
3.2.1.4.C.2	Not Allocated to the ESF
3.2.1.4.C.2.a	Not Allocated to the ESF
3.2.1.5	Not Allocated to the ESF
3.2.1.5.A	Not Allocated to the ESF
3.2.1.5.A.1	Not Allocated to the ESF
3.2.1.5.A.1.a	Not Allocated to the ESF
3.2.1.5.A.2	Not Allocated to the ESF
3.2.1.5.A.2.a	Not Allocated to the ESF
3.2.1.5.A.2.b	Not Allocated to the ESF
3.2.1.5.A.2.c	Not Allocated to the ESF
3.2.1.5.A.2.d	Not Allocated to the ESF
3.2.1.5.A.3	Not Allocated to the ESF
3.2.1.5.A.3.a	Not Allocated to the ESF
3.2.1.5.A.3.b	Not Allocated to the ESF
3.2.1.5.A.3.c	Not Allocated to the ESF

SD&TRD Traceability Matrix	
SD&TRD Section	ESFDR Section
3.2.1.5.A.4	Not Allocated to the ESF
3.2.1.5.A.4.a	Not Allocated to the ESF
3.2.1.5.A.4.b	Not Allocated to the ESF
3.2.1.5.A.4.c	Not Allocated to the ESF
3.2.1.5.A.5	Not Allocated to the ESF
3.2.1.5.A.5.a	Not Allocated to the ESF
3.2.1.5.A.6	Not Allocated to the ESF
3.2.1.5.A.6.a	Not Allocated to the ESF
3.2.1.5.A.6.b	Not Allocated to the ESF
3.2.1.5.A.6.c	Not Allocated to the ESF
3.2.1.5.A.6.d	Not Allocated to the ESF
3.2.1.5.B	Not Allocated to the ESF
3.2.1.5.B.1	Not Allocated to the ESF
3.2.1.5.B.1.a	Not Allocated to the ESF
3.2.1.5.B.1.b	Not Allocated to the ESF
3.2.1.5.B.1.c	Not Allocated to the ESF
3.2.1.5.B.1.d	Not Allocated to the ESF
3.2.1.5.B.1.e	Not Allocated to the ESF
3.2.1.5.B.2	Not Allocated to the ESF
3.2.1.5.B.2.a	Not Allocated to the ESF
3.2.1.5.B.2.b	Not Allocated to the ESF
3.2.1.5.B.2.c	Not Allocated to the ESF
3.2.1.6	Not Allocated to the ESF
3.2.1.6.A	Not Allocated to the ESF
3.2.1.6.A.1	Not Allocated to the ESF
3.2.1.6.A.1.a	Not Allocated to the ESF
3.2.1.6.A.1.b	Not Allocated to the ESF
3.2.1.6.A.1.c	Not Allocated to the ESF

SD&TRD Traceability Matrix	
SD&TRD Section	ESFDR Section
3.2.1.6.B	Not Allocated to the ESF
3.2.1.6.B.1	Not Allocated to the ESF
3.2.1.6.B.1.a	Not Allocated to the ESF
3.2.1.6.C	Not Allocated to the ESF
3.2.1.6.C.1	Not Allocated to the ESF
3.2.1.6.C.1.a	Not Allocated to the ESF
3.2.1.6.D	Not Allocated to the ESF
3.2.1.6.D.1	Not Allocated to the ESF
3.2.1.7	Not Allocated to the ESF
3.2.1.8	Not Allocated to the ESF
3.2.1.8.A	Not Allocated to the ESF
3.2.1.8.A.1	Not Allocated to the ESF
3.2.1.8.A.1.a	Not Allocated to the ESF
3.2.1.8.A.1.b	Not Allocated to the ESF
3.2.1.8.A.1.c	Not Allocated to the ESF
3.2.1.8.A.1.d	Not Allocated to the ESF
3.2.1.8.A.2	Not Allocated to the ESF
3.2.1.8.A.2.a	Not Allocated to the ESF
3.2.1.8.A.2.b	Not Allocated to the ESF
3.2.1.8.A.2.c	Not Allocated to the ESF
3.2.1.8.B	Not Allocated to the ESF
3.2.1.8.B.1	Not Allocated to the ESF
3.2.1.8.B.1.a	Not Allocated to the ESF
3.2.1.8.B.1.b	Not Allocated to the ESF
3.2.1.8.B.1.c	Not Allocated to the ESF
3.2.1.8.B.1.d	Not Allocated to the ESF
3.2.1.8.B.1.e	Not Allocated to the ESF
3.2.1.8.B.1.f	Not Allocated to the ESF

SD&TRD Traceability Matrix	
SD&TRD Section	ESFDR Section
3.2.1.8.B.1.g	Not Allocated to the ESF
3.2.1.8.C	Not Allocated to the ESF
3.2.1.8.C.1	Not Allocated to the ESF
3.2.1.8.C.1.a	Not Allocated to the ESF
3.2.1.8.C.1.b	Not Allocated to the ESF
3.2.1.8.C.1.c	Not Allocated to the ESF
3.2.1.8.C.1.d	Not Allocated to the ESF
3.2.1.8.C.1.e	Not Allocated to the ESF
3.2.1.8.C.1.f	Not Allocated to the ESF
3.2.1.8.C.1.g	Not Allocated to the ESF
3.2.1.8.C.2	Not Allocated to the ESF
3.2.1.8.C.2.a	Not Allocated to the ESF
3.2.1.8.C.2.b	Not Allocated to the ESF
3.2.1.8.C.2.c	Not Allocated to the ESF
3.2.1.8.C.2.d	Not Allocated to the ESF
3.2.1.8.C.2.e	Not Allocated to the ESF
3.2.1.8.C.2.f	Not Allocated to the ESF
3.2.1.8.C.3	Not Allocated to the ESF
3.2.1.8.C.3.a	Not Allocated to the ESF
3.2.1.8.C.3.b	Not Allocated to the ESF
3.2.1.8.C.3.c	Not Allocated to the ESF
3.2.1.8.D	Not Allocated to the ESF
3.2.1.8.D.1	Not Allocated to the ESF
3.2.1.8.D.1.a	Not Allocated to the ESF
3.2.1.8.D.1.b	Not Allocated to the ESF
3.2.1.8.D.1.c	Not Allocated to the ESF
3.2.1.8.D.1.d	Not Allocated to the ESF
3.2.1.8.E	Not Allocated to the ESF



SD&TRD Traceability Matrix	
SD&TRD Section	ESFDR Section
3.2.1.8.E.1	Not Allocated to the ESF
3.2.1.8.E.1.a	Not Allocated to the ESF
3.2.1.8.E.1.b	Not Allocated to the ESF
3.2.1.8.E.1.c	Not Allocated to the ESF
3.2.1.8.E.1.d	Not Allocated to the ESF
3.2.1.8.E.1.e	Not Allocated to the ESF
3.2.1.8.E.2	Not Allocated to the ESF
3.2.1.8.E.2.a	Not Allocated to the ESF
3.2.1.8.E.2.b	Not Allocated to the ESF
3.2.1.8.E.2.c	Not Allocated to the ESF
3.2.1.8.E.3	Not Allocated to the ESF
3.2.1.8.E.3.a	Not Allocated to the ESF
3.2.1.9	Not Allocated to the ESF
3.2.1.9.A	Not Allocated to the ESF
3.2.1.9.A.1	Not Allocated to the ESF
3.2.1.9.A.1.a	Not Allocated to the ESF
3.2.1.9.A.1.b	Not Allocated to the ESF
3.2.1.9.B	Not Allocated to the ESF
3.2.1.9.B.1	Not Allocated to the ESF
3.2.1.9.B.1.a	Not Allocated to the ESF
3.2.1.9.B.1.b	Not Allocated to the ESF
3.2.1.9.B.1.c	Not Allocated to the ESF
3.2.1.9.B.1.d	Not Allocated to the ESF
3.2.1.9.B.1.e	Not Allocated to the ESF
3.2.1.9.B.2	Not Allocated to the ESF
3.2.1.9.B.2.a	Not Allocated to the ESF
3.2.1.9.C	Not Allocated to the ESF
3.2.1.9.C.1	Not Allocated to the ESF

SD&TRD Traceability Matrix	
SD&TRD Section	ESFDR Section
3.2.1.9.C.1.a	Not Allocated to the ESF
3.2.1.9.C.2	Not Allocated to the ESF
3.2.1.9.C.2.a	Not Allocated to the ESF
3.2.1.9.C.2.b	Not Allocated to the ESF
3.2.1.10	Not Allocated to the ESF
3.2.1.11	Not Allocated to the ESF
3.2.1.12	Not Allocated to the ESF
3.2.1.12.A	Not Allocated to the ESF
3.2.1.12.A.1	Not Allocated to the ESF
3.2.1.12.A.2	Not Allocated to the ESF
3.2.1.12.B	Not Allocated to the ESF
3.2.1.12.B.1	Not Allocated to the ESF
3.2.1.12.B.1.a	Not Allocated to the ESF
3.2.1.12.B.1.b	Not Allocated to the ESF
3.2.1.12.C	Not Allocated to the ESF
3.2.1.12.D	Not Allocated to the ESF
3.2.1.12.D.1	Not Allocated to the ESF
3.2.1.13	Not Allocated to the ESF
3.2.1.13.A	Not Allocated to the ESF
3.2.1.13.A.1.a	Not Allocated to the ESF
3.2.1.13.A.1.b	Not Allocated to the ESF
3.2.1.13.A.1.c	Not Allocated to the ESF
3.2.1.13.B	Not Allocated to the ESF
3.2.1.13.B.1.a	Not Allocated to the ESF
3.2.1.13.B.1.b	Not Allocated to the ESF
3.2.1.13.B.1.c	Not Allocated to the ESF
3.2.1.13.B.1.d	Not Allocated to the ESF
3.2.1.14	Not Allocated to the ESF

SD&TRD Traceability Matrix	
SD&TRD Section	ESFDR Section
3.2.1.14.A	Not Allocated to the ESF
3.2.1.14.B	Not Allocated to the ESF
3.2.1.14.B.1	Not Allocated to the ESF
3.2.1.14.B.1.a	Not Allocated to the ESF
3.2.1.14.B.1.b	Not Allocated to the ESF
3.2.1.14.B.1.c	Activity no longer being performed
3.2.1.14.B.2	Not Allocated to the ESF
3.2.1.14.B.2.a	Not Allocated to the ESF
3.2.1.14.B.2.b	Not Allocated to the ESF
3.2.1.14.B.3	Not Allocated to the ESF
3.2.1.14.B.3.a	Not Allocated to the ESF
3.2.1.14.B.3.b	Not Allocated to the ESF
3.2.1.14.B.3.c	Not Allocated to the ESF
3.2.1.15	Not Allocated to the ESF
3.2.1.15.A	B.2.22.3.A-E, B.2.22.4.A-D, B.2.22.5
3.2.1.15.A.1	No design requirements, for sample collection only
3.2.1.15.A.1.a	No design requirements, for sample collection only
3.2.1.15.A.1.b	No design requirements, for sample collection only
3.2.1.15.A.1.c	No design requirements, for sample collection only
3.2.1.15.A.2	No design requirements, for sample collection only
3.2.1.15.A.2.a	No design requirements, for sample collection only
3.2.1.15.A.3	No design requirements, for sample collection only
3.2.1.15.A.3.a	No design requirements, for sample collection only

SD&TRD Traceability Matrix	
SD&TRD Section	ESFDR Section
3.2.1.15.A.3.b	No design requirements, for sample collection only
3.2.1.15.A.4	No design requirements, for sample collection only
3.2.1.15.A.4.a	No design requirements, for sample collection only
3.2.1.15.A.4.b	No design requirements, for sample collection only
3.2.1.15.A.5	Design requirements are in SD&TRD 3.2.1.15.A.5.a-c
3.2.1.15.A.5.a	B.2.23.3.A-F, B.2.23.4.A-F, B.2.23.5
3.2.1.15.A.5.b	B.2.24.3.A-H, B.2.24.4.A-G, B.2.24.5
3.2.1.15.A.5.c	B.2.25.3.A-G, B.2.25.4.A-E, B.2.25.5
3.2.1.15.A.6	Design requirements are in SD&TRD 3.2.1.15.A.6.a-c
3.2.1.15.A.6.a	B.2.26.3.A-I, B.2.26.4.A-E, B.2.26.5
3.2.1.15.A.6.b	B.2.27.3.A-G, B.2.27.4.A-E, B.2.27.5
3.2.1.15.A.6.c	B.2.28.3.A-F, B.2.28.4.A-E, B.2.28.5
3.2.1.15.A.6.d	B.2.29.3.A-F, B.2.29.4.A-D, B.2.29.5
3.2.1.15.A.6.e	B.2.30.3.A-G, B.2.30.4.A-E, B.2.30.5
3.2.1.15.A.7	Design requirements are in SD&TRD 3.2.1.15.A.7.a-b
3.2.1.15.A.7.a	B.2.31.3.A-G, B.2.31.4.A-E, B.2.31.5
3.2.1.15.A.7.b	B.2.32.3.A-G, B.2.32.4.A-E, B.2.32.5
3.2.1.15.A.8	Design requirements are in SD&TRD 3.2.1.15.A.8.a-d
3.2.1.15.A.8.a	B.2.33.3.A-G, B.2.33.4.A-D, B.2.33.5
3.2.1.15.A.8.b	B.2.34.3.A-G, B.2.34.4.A-D, B.2.34.5
3.2.1.15.A.8.c	B.2.35.3.A-F, B.2.35.4.A-E, B.2.35.5
3.2.1.15.A.8.d	B.2.36.3.A-F, B.2.36.4.A-E, B.2.36.5
3.2.1.15.B	Not Allocated to the ESF

SD&TRD Traceability Matrix	
SD&TRD Section	ESFDR Section
3.2.1.15.B.1	Design requirements are in SD&TRD 3.2.1.15.B.1.b
3.2.1.15.B.1.a	Not Allocated to the ESF
3.2.1.15.B.1.b	B.2.37.3.A-E, B.2.37.4.A-B, B.2.37.5
3.2.1.15.B.2	Not Allocated to the ESF
3.2.1.15.B.2.a	Not Allocated to the ESF
3.2.1.16	Not Allocated to the ESF
3.2.1.16.A	Not Allocated to the ESF
3.2.1.16.A.1	Not Allocated to the ESF
3.2.1.16.A.1.a	Not Allocated to the ESF
3.2.1.16.B	Not Allocated to the ESF
3.2.1.16.B.1	Not Allocated to the ESF
3.2.1.16.B.1.a	Not Allocated to the ESF
3.2.1.16.B.1.b	Not Allocated to the ESF
3.2.1.16.B.1.c	Not Allocated to the ESF
3.2.1.16.B.1.d	Not Allocated to the ESF
3.2.1.16.C	Not Allocated to the ESF
3.2.1.16.C.1	Not Allocated to the ESF
3.2.1.16.C.1.a	Not Allocated to the ESF
3.2.1.17	Not Allocated to the ESF
3.2.1.17.A	Not Allocated to the ESF
3.2.1.17.A.1	Not Allocated to the ESF
3.2.1.17.A.1.a	Not Allocated to the ESF
3.2.1.17.A.1.b	Not Allocated to the ESF
3.2.1.17.A.1.c	Not Allocated to the ESF
3.2.1.17.B	Not Allocated to the ESF
3.2.1.17.B.1	Not Allocated to the ESF
3.2.1.17.B.1.a	Not Allocated to the ESF
3.2.1.17.B.1.b	Not Allocated to the ESF

SD&TRD Traceability Matrix	
SD&TRD Section	ESFDR Section
3.2.1.17.C	Not Allocated to the ESF
3.2.1.17.C.1	Not Allocated to the ESF
3.2.1.17.C.1.a	Not Allocated to the ESF
3.2.1.17.C.1.b	Not Allocated to the ESF
3.2.1.17.C.2	Not Allocated to the ESF
3.2.1.17.C.2.a	Not Allocated to the ESF
3.2.1.17.C.2.b	Not Allocated to the ESF
3.2.1.17.C.3	Not Allocated to the ESF
3.2.1.17.C.3.a	Not Allocated to the ESF
3.2.1.17.C.3.b	Not Allocated to the ESF
3.2.1.17.C.4	Not Allocated to the ESF
3.2.1.17.C.4.a	Not Allocated to the ESF
3.2.1.17.C.4.b	Not Allocated to the ESF
3.2.1.17.C.5	Not Allocated to the ESF
3.2.1.17.C.5.a	Not Allocated to the ESF
3.2.1.17.C.5.b	Not Allocated to the ESF
3.2.1.17.C.6	Not Allocated to the ESF
3.2.1.17.C.6.a	Not Allocated to the ESF
3.2.1.17.C.6.b	Not Allocated to the ESF
3.2.1.17.D	Not Allocated to the ESF
3.2.1.17.D.1	Not Allocated to the ESF
3.2.1.17.D.1.a	Not Allocated to the ESF
3.2.1.17.D.1.b	Not Allocated to the ESF
3.2.1.17.D.1.c	Not Allocated to the ESF
3.2.1.17.D.2	Not Allocated to the ESF
3.2.1.17.D.2.a	Not Allocated to the ESF
3.2.1.17.D.2.b	Not Allocated to the ESF
3.2.1.17.D.3	Not Allocated to the ESF

SD&TRD Traceability Matrix	
SD&TRD Section	ESFDR Section
3.2.1.17.D.3.a	Not Allocated to the ESF
3.2.1.17.D.3.b	Not Allocated to the ESF
3.2.1.17.D.3.c	Not Allocated to the ESF
3.2.1.17.D.3.d	Not Allocated to the ESF
3.2.1.17.D.3.e	Not Allocated to the ESF
3.2.1.17.D.3.f	Not Allocated to the ESF
3.2.1.17.D.4	Not Allocated to the ESF
3.2.1.17.D.4.a	Not Allocated to the ESF
3.2.1.17.D.4.b	Not Allocated to the ESF
3.2.1.17.D.4.c	Not Allocated to the ESF
3.2.1.17.D.4.d	Not Allocated to the ESF
3.2.1.17.D.5	Not Allocated to the ESF
3.2.1.17.D.5.a	Not Allocated to the ESF
3.2.1.17.D.5.b	Not Allocated to the ESF
3.2.1.17.D.5.c	Not Allocated to the ESF
3.2.1.17.D.5.d	Not Allocated to the ESF
3.2.1.17.D.5.e	Not Allocated to the ESF
3.2.1.17.D.6	Not Allocated to the ESF
3.2.1.17.D.6.a	Not Allocated to the ESF
3.2.1.17.D.6.b	Not Allocated to the ESF
3.2.1.17.D.7	Not Allocated to the ESF
3.2.1.17.D.7.a	Not Allocated to the ESF
3.2.1.17.D.7.b	Not Allocated to the ESF
3.2.1.17.D.7.c	Not Allocated to the ESF
3.2.1.17.D.7.d	Not Allocated to the ESF
3.2.1.17.D.7.e	Not Allocated to the ESF
3.2.1.17.D.7.f	Not Allocated to the ESF
3.2.1.17.D.7.g	Not Allocated to the ESF

SD&TRD Traceability Matrix	
SD&TRD Section	ESFDR Section
3.2.1.17.D.7.h	Not Allocated to the ESF
3.2.1.17.D.8	Not Allocated to the ESF
3.2.1.17.D.8.a	Not Allocated to the ESF
3.2.1.17.D.8.b	Not Allocated to the ESF
3.2.1.17.D.8.c	Not Allocated to the ESF
3.2.1.17.D.8.d	Not Allocated to the ESF
3.2.1.17.D.9	Not Allocated to the ESF
3.2.1.17.D.9.a	Not Allocated to the ESF
3.2.1.17.D.9.b	Not Allocated to the ESF
3.2.1.17.D.9.c	Not Allocated to the ESF
3.2.1.17.D.10	Not Allocated to the ESF
3.2.1.17.D.10.a	Not Allocated to the ESF
3.2.1.17.D.10.b	Not Allocated to the ESF
3.2.1.17.D.10.c	Not Allocated to the ESF
3.2.1.17.D.11	Not Allocated to the ESF
3.2.1.17.D.11.a	Not Allocated to the ESF
3.2.1.17.D.12	Not Allocated to the ESF
3.2.1.17.D.12.a	Not Allocated to the ESF
3.2.1.17.D.12.b	Not Allocated to the ESF
3.2.1.17.D.12.c	Not Allocated to the ESF
3.2.2	Not Allocated to the ESF
3.2.2.1	Not Allocated to the ESF
3.2.2.1.A	B.2.38.3.A-G, B.2.38.4.A-D, B.2.38.5
3.2.3	Not Allocated to the ESF
3.2.3.1	Not Allocated to the ESF
3.2.3.2	Not Allocated to the ESF
3.2.3.2.A.1.a	B.2.39.3.A-I, B.2.39.4, B.2.39.5
3.2.3.2.A.1.b	Not Allocated to the ESF



SD&TRD Traceability Matrix	
SD&TRD Section	ESFDR Section
3.2.4	Not Allocated to the ESF
3.2.4.1	Not Allocated to the ESF
3.2.4.2	Not Allocated to the ESF
3.2.4.2.A.1	Not Allocated to the ESF
3.2.4.2.A.1.a	Not Allocated to the ESF
3.2.4.2.A.1.b	Not Allocated to the ESF
3.2.4.2.A.1.c	Not Allocated to the ESF
3.2.4.2.A.1.d	Not Allocated to the ESF
3.2.4.2.A.1.e	Not Allocated to the ESF
3.2.4.2.A.1.f	Not Allocated to the ESF
3.2.4.2.A.1.g	Not Allocated to the ESF
3.2.4.2.A.2	Not Allocated to the ESF
3.2.4.2.A.2.a	Not Allocated to the ESF
3.2.4.2.A.2.b	Not Allocated to the ESF
3.2.4.2.A.2.c	Not Allocated to the ESF
3.2.4.2.A.3	B.2.40.3.A-J, B.2.40.4.A-H, B.2.40.5
3.2.4.2.A.3.a	Design requirements are in SD&TRD 3.2.4.2.A.3
3.2.4.2.A.3.b	Design requirements are in SD&TRD 3.2.4.2.A.3
3.2.4.2.A.3.c	Design requirements are in SD&TRD 3.2.4.2.A.3
3.2.4.2.A.4	Design requirements are in SD&TRD 3.2.4.2.A.4.a-b
3.2.4.2.A.4.a	B.2.41.3.A-N, B.2.41.4.A-J, B.2.41.5
3.2.4.2.A.4.b	B.2.42.3.A-F, B.2.42.4.A-J, B.2.42.5
3.2.4.2.A.4.c	Not Allocated to the ESF
3.2.4.2.A.5	Requirements are in SD&TRD 3.2.4.2.A.5.a-d
3.2.4.2.A.5.a	No design requirements, for sample collection only

SD&TRD Traceability Matrix	
SD&TRD Section	ESFDR Section
3.2.4.2.A.5.b	No design requirements, for sample collection only
3.2.4.2.A.5.c	No design requirements, for sample collection only
3.2.4.2.A.5.d	No design requirements
3.2.5.1.1.A	Not Allocated to the ESF
3.2.5.1.1.B	Not Allocated to the ESF
3.2.5.1.1.C	Not Allocated to the ESF
3.2.5.1.1.D	Not Allocated to the ESF
3.2.5.1.2.A	Not Allocated to the ESF
3.2.5.1.2.B	Not Allocated to the ESF
3.2.5.1.2.C	Not Allocated to the ESF
3.2.5.1.3.A	Not Allocated to the ESF
3.2.5.1.3.B	Not Allocated to the ESF
3.2.5.1.3.C	Not Allocated to the ESF
3.2.5.1.4.A	Not Allocated to the ESF
3.2.5.1.4.B	Not Allocated to the ESF
3.2.5.1.4.C	Not Allocated to the ESF
3.2.5.1.4.D	Not Allocated to the ESF
3.2.5.1.4.E.1	Not Allocated to the ESF
3.2.5.1.4.E.2	Not Allocated to the ESF
3.2.5.2.1.A	Not Allocated to the ESF
3.2.5.2.1.B	Not Allocated to the ESF
3.2.5.3.1	Not Allocated to the ESF
3.2.5.4.1.A	Not Allocated to the ESF
3.2.5.4.1.B	Not Allocated to the ESF
3.2.5.4.1.C	Not Allocated to the ESF
3.2.5.4.1.D	Not Allocated to the ESF
3.2.5.4.1.E	Not Allocated to the ESF

SD&TRD Traceability Matrix	
SD&TRD Section	ESFDR Section
3.2.5.4.2.A	Not Allocated to the ESF
3.2.5.4.2.B	Not Allocated to the ESF
3.2.5.4.2.C	Not Allocated to the ESF
3.2.5.4.2.D	Not Allocated to the ESF
3.2.5.4.3.A	Not Allocated to the ESF
3.2.5.4.3.B	Not Allocated to the ESF
3.2.5.4.3.C	Not Allocated to the ESF
3.2.5.4.3.D	Not Allocated to the ESF
3.2.5.4.3.E	Not Allocated to the ESF
3.2.5.4.3.F	Not Allocated to the ESF
3.2.5.4.4	Not Allocated to the ESF
3.2.5.4.5	Not Allocated to the ESF
3.2.5.4.6	Not Allocated to the ESF
3.2.5.5.1	Not Allocated to the ESF
3.2.5.5.2	Not Allocated to the ESF
3.2.5.5.3	Not Allocated to the ESF
3.2.5.5.3.A.1	Not Allocated to the ESF
3.2.5.5.3.A.1.a	Not Allocated to the ESF
3.2.5.5.3.A.1.b	Not Allocated to the ESF
3.2.5.5.3.B	Not Allocated to the ESF
3.2.5.5.3.B.1	Not Allocated to the ESF
3.2.5.5.3.B.2	Not Allocated to the ESF
3.2.5.5.4	Not Allocated to the ESF
3.2.5.5.5	Not Allocated to the ESF
3.2.5.6.1	Not Allocated to the ESF
3.2.5.6.2.A	Not Allocated to the ESF
3.2.5.6.2.B	Not Allocated to the ESF
3.2.5.6.3	Not Allocated to the ESF

SD&TRD Traceability Matrix	
SD&TRD Section	ESFDR Section
3.2.5.6.4.A	Not Allocated to the ESF
3.2.5.6.4.B	Not Allocated to the ESF
3.2.5.6.5.A	Not Allocated to the ESF
3.2.5.6.5.B	Not Allocated to the ESF
3.2.5.6.6.A	Not Allocated to the ESF
3.2.5.6.6.B	Not Allocated to the ESF
3.2.5.6.7	Not Allocated to the ESF
3.2.6	Not Allocated to the ESF
3.2.7.A	3.2.1.Z
3.2.7.A	3.2.1.Z.1
3.2.7.A	3.2.1.Z.2
3.2.7.A	3.2.1.AD
3.2.7.A	A.1-1
3.2.7.A	A.1-2
3.2.7.A	A.1-4
3.2.7.B	Not Applicable
3.2.7.1.A.1	3.2.1.1.A
3.2.7.1.A.1	3.2.2.G
3.2.7.1.A.1	3.2.2.G.1
3.2.7.1.A.1	3.2.2.4.D.4
3.2.7.1.A.1	3.2.2.4.D.5
3.2.7.1.A.1	3.2.2.4.L.7
3.2.7.1.A.1	3.2.2.4.X.6
3.2.7.1.A.1	3.2.8.8.D.
3.2.7.1.A.2	3.2.2.4.L
3.2.7.1.A.2	3.2.2.4.L.1
3.2.7.1.A.2	3.2.2.4.L.2
3.2.7.1.A.2	3.2.2.4.L.6

SD&TRD Traceability Matrix	
SD&TRD Section	ESFDR Section
3.2.7.1.A.2	3.2.2.4.L.6(a)
3.2.7.1.A.2	3.2.2.4.L.8
3.2.7.1.A.2	3.2.2.4.L.8(b)
3.2.7.1.A.2	3.2.2.4.L.9
3.2.7.1.A.2	3.2.2.4.L.10
3.2.7.1.A.3	3.2.1.1.E
3.2.7.1.A.3	3.2.1.2.B
3.2.7.1.A.3	3.2.1.3.C
3.2.7.1.A.3	3.2.1.4.H
3.2.7.1.A.3	3.2.1.5.H
3.2.7.1.A.3	3.2.1.6.E
3.2.7.1.A.3	3.2.1.6.F
3.2.7.1.A.3	3.2.2.G
3.2.7.1.A.3	3.2.2.4.M
3.2.7.1.A.3	3.2.2.4.M.1
3.2.7.1.A.3	3.2.2.4.M.2
3.2.7.1.A.3	3.2.2.4.M.3
3.2.7.1.A.3	3.2.2.4.M.4
3.2.7.1.A.3	3.2.2.4.M.5
3.2.7.1.B.1	3.2.1.H
3.2.7.1.B.1	3.2.1.J.13
3.2.7.1.B.1	A.1-3
3.2.7.1.B.2	3.2.1.H
3.2.7.1.B.2.a	3.2.1.H.2(a)
3.2.7.1.B.2.a	3.2.6.5.H
3.2.7.1.B.2.b	3.2.1.H.2(b)
3.2.7.1.B.2.c	3.2.1.H.2(c)
3.2.7.1.B.2.c	3.2.2.2.B

SD&TRD Traceability Matrix	
SD&TRD Section	ESFDR Section
3.2.7.1.B.2.c	3.2.2.2.2.D
3.2.7.1.B.2.c	3.2.2.2.2.E
3.2.7.1.B.2.c	3.2.5.5.4.L
3.2.7.1.B.2.d	3.2.1.H.2(c)i
3.2.7.1.B.2.e	3.2.5.A
3.2.7.1.B.2.e	3.2.5.A.1
3.2.7.1.B.2.e	3.2.5.C
3.2.7.1.B.2.f	3.2.1.H.2(c)ii
3.2.7.1.B.3	3.2.1.H
3.2.7.1.B.3	3.2.1.H.2(d)
3.2.7.1.B.4	3.2.1.H.2(e)
3.2.7.1.B.5	3.2.1.H
3.2.7.1.B.5	3.2.1.Z.1
3.2.7.1.B.5	3.2.1.4.D
3.2.7.1.B.5	3.2.1.4.D.1
3.2.7.1.B.5	3.2.1.4.D.2
3.2.7.1.B.5	3.2.1.4.D.3
3.2.7.1.B.5	3.2.2.1.I.1
3.2.7.1.B.5	3.2.2.1.I.2
3.2.7.1.B.5	3.2.2.4.S.4
3.2.7.1.B.5	3.2.5.3.1.G
3.2.7.1.B.6	3.2.1.H
3.2.7.1.B.6	3.2.8.1
3.2.7.1.B.6	3.2.9.4.D.
3.2.7.1.B.6	3.2.9.4.D.1
3.2.7.1.B.6	3.2.9.4.D.2
3.2.7.1.B.6	3.2.9.4.D.4
3.2.7.1.B.6	3.2.9.4.D.5

SD&TRD Traceability Matrix	
SD&TRD Section	ESFDR Section
3.2.7.1.B.6	3.2.9.4.D.6
3.2.7.2.A	3.2.1.J.3
3.2.7.2.B	3.2.1.J.3
3.2.7.2.C.1	3.2.1.J.4
3.2.7.2.C.2	3.2.1.J.4
3.2.7.3.A	3.2.1.I.1
3.2.7.3.B	3.2.1.I.2
3.2.7.3.B	3.2.2.4.D.11
3.2.7.3.B	3.2.2.6.C
3.2.7.3.B	3.2.5.6
3.2.7.3.B	3.2.6.2.1.I.1
3.2.7.3.C	3.2.1.I.3
3.2.7.3.D	3.2.1.I.4
3.2.7.3.D	3.2.2.6.D.1
3.2.7.3.D	3.2.6.2.1.J
3.2.7.3.D	3.2.8.8.C.1
3.2.7.3.E	3.2.1.I.5
3.2.8	3.2.1.8
3.2.8.1.1	3.2.1.8.1.A
3.2.8.1.2	3.2.1.8.1.B
3.2.8.1.2	3.2.2.2.C
3.2.8.1.3	3.2.1.8.1.C
3.2.8.1.4	3.2.1.8.1.D
3.2.8.1.5	3.2.1.8.1.E
3.2.9	3.2.1.9
3.2.9.1.A	3.2.1.9.1.A
3.2.9.1.B	3.2.1.9.1.B
3.2.9.2.A.1	3.2.1.9.2.A.1

SD&TRD Traceability Matrix	
SD&TRD Section	ESFDR Section
3.2.9.2.A.1	3.2.5.D
3.2.9.2.A.2	3.2.1.9.2.A.2
3.2.9.2.A.2.a	3.2.1.9.2.A.2(a)
3.2.9.2.A.2.b	3.2.1.9.2.A.2(b)
3.2.9.2.A.2.c	3.2.1.9.2.A.2(c)
3.2.9.2.A.2.d	3.2.1.9.2.A.2(d)
3.2.9.2.A.2.e	3.2.1.9.2.A.2(e)
3.2.9.2.A.3	3.2.1.9.2.A.3
3.2.9.2.B	3.2.1.9.2.B
3.2.9.2.B	3.2.7.5
3.2.9.3.A	3.2.1.9.3.A
3.2.9.3.B	3.2.1.9.3.B
3.2.9.3.C	3.2.2.4.D.12
3.2.9.3.C.1	3.2.1.E
3.2.9.3.C.1.a	3.2.1.9.3.C.1(a)
3.2.9.3.C.1.a-d	3.2.1.5.D
3.2.9.3.C.1.b	3.2.1.9.3.C.1(b)
3.2.9.3.C.1.c	3.2.1.9.3.C.1(c)
3.2.9.3.C.1.d	3.2.1.9.3.C.1(d)
3.2.9.3.C.1.e	3.2.1.9.3.C.1(e)
3.2.9.3.C.1.f	3.2.1.9.3.C.1(f)
3.2.9.3.C.1.g	3.2.1.9.3.C.1(g)
3.2.9.3.C.2	3.2.1.9.3.C.2
3.2.9.3.C.3	3.2.1.9.3.C.3
3.2.9.3.D	3.2.1.9.3.D
3.2.9.3.D.1	3.2.1.9.3.D.1
3.2.9.3.D.2	3.2.1.9.3.D.2
3.2.9.3.E	3.2.1.9.3.E



SD&TRD Traceability Matrix	
SD&TRD Section	ESFDR Section
3.2.9.3.E.1	3.2.1.9.3.E.1
3.2.9.3.E.2	3.2.1.9.3.E.2
3.2.9.3.E.3	3.2.1.9.3.E.3
3.2.9.3.F	3.2.1.9.3.F
3.2.9.3.F.1	3.2.1.9.3.F.1
3.2.9.3.F.2	3.2.1.9.3.F.2
3.2.9.3.F.3	3.2.1.9.3.F.3
3.2.9.3.G	3.2.1.9.3.G
3.2.9.3.G.1.a	3.2.1.9.3.G.1(a)
3.2.9.3.G.1.b	3.2.1.9.3.G.1(b)
3.2.9.3.G.1.c	3.2.1.9.3.G.1(c)
3.2.9.3.G.1.d	3.2.1.9.3.G.1(d)
3.2.9.3.G.1.e	3.2.1.9.3.G.1(e)
3.2.9.3.G.2	3.2.1.9.3.G.2
3.2.9.3.G.3.a	3.2.1.9.3.G.3(a)
3.2.9.3.G.3.b	3.2.1.9.3.G.3(b)
3.2.9.3.G.4	3.2.1.9.3.G.4
3.2.9.4.A	3.2.1.9.4.A
3.2.9.4.A	3.2.1.9.4.B.1
3.2.9.4.A	3.2.1.9.4.B.4
3.2.9.4.A	3.2.1.9.4.B.5
3.2.9.4.A	3.2.1.9.4.C
3.2.9.4.B	3.2.1.9.4.B.2
3.2.9.4.B	3.2.1.9.4.B.4
3.2.9.4.B	3.2.1.9.4.C
3.2.9.4.C	3.2.1.9.4.B.3
3.2.9.4.C	3.2.1.9.4.B.4
3.2.9.4.C	3.2.1.9.4.C

SD&TRD Traceability Matrix	
SD&TRD Section	ESFDR Section
3.2.9.4.C	3.2.1.9.4.C.1
3.2.9.4.C	3.2.1.9.4.C.2
3.2.9.4.C	3.2.1.9.4.C.3
3.2.9.4.C	3.2.1.9.4.C.4
3.2.9.4.D	3.2.1.9.4.B.6
3.2.9.4.E	Allocated to the SBTFRD
3.2.9.5	3.2.1.E
3.2.9.5	3.2.1.9.5
3.2.9.6	3.2.1.9.6
3.2.9.6	3.2.3.3.D
3.2.10.1[1]	3.2.1.10.1[1]
3.2.10.1[2]	3.2.1.10.1[2]
3.2.10.1.A	3.2.1.5.E.1
3.2.10.1.A	3.2.1.10.1.A
3.2.10.1.B	3.2.1.10.1.B
3.2.10.1.C	3.2.1.10.1.C
3.2.10.1.C	3.2.6.2.1.G
3.2.10.1.D	3.2.1.10.1.D
3.2.10.1.E	3.2.1.10.1.E
3.2.10.1.F	3.2.1.10.1.F
3.2.10.1.F	3.2.2.1.2.B
3.2.10.1.F	3.2.2.1.2.B.1
3.2.10.1.F	3.2.2.1.2.B.2
3.2.10.1.F	3.2.2.1.2.B.3
3.2.10.1.G	3.2.2.4.1.D
3.2.10.1.G	J.12.A-C
3.2.10.1.G.1	3.2.1.10.1.G.1
3.2.10.1.G.1	3.2.2.1.B

SD&TRD Traceability Matrix	
SD&TRD Section	ESFDR Section
3.2.10.1.G.1	J.12.A-C
3.2.10.1.G.2	3.2.1.10.1.G.2
3.2.10.1.G.2	J.12.A-C
3.2.10.1.H.1	3.2.1.10.1.H.1
3.2.10.1.H.2	3.2.1.10.1.H.2
3.2.10.1.I	3.2.1.10.1.I
3.2.10.1.J	3.2.1.10.1.J
3.2.10.2.1.A	3.2.1.10.2.A.1
3.2.10.2.1.A	3.2.1.10.2.A.1(a)
3.2.10.2.1.A	3.2.1.10.2.A.1(b)
3.2.10.2.1.A	3.2.1.10.2.A.1(c)
3.2.10.2.1.A	3.2.1.10.2.A.1(d)
3.2.10.2.1.A	3.2.5.A.2
3.2.10.2.1.B	3.2.1.5.G
3.2.10.2.1.B	3.2.1.10.2.A.2
3.2.10.2.1.B	3.2.2.5.5.A
3.2.10.2.1.B	3.2.2.5.6.B
3.2.10.2.2.A	3.2.1.10.2.B.1
3.2.10.2.2.B	3.2.1.10.2.B.2
3.2.10.2.3	3.2.1.10.2.C
3.2.10.2.4	3.2.1.10.2.D
3.2.11	3.2.1.11
3.2.11	3.2.2.3.K
3.2.12	3.2.1.5.C
3.2.12	3.2.1.12
3.2.12	3.2.2.1.2.F
3.2.12	3.2.6.5.K
3.2.13.A	3.2.1.13.A

SD&TRD Traceability Matrix	
SD&TRD Section	ESFDR Section
3.2.13.B	3.2.1.13.B
3.2.13.C	3.2.1.13.C
3.2.14.1	3.2.1.14.1
3.2.14.2	3.2.1.14.2.A
3.2.14.2	3.2.1.14.2.B
3.2.14.3	3.2.1.14.3.A
3.2.14.3	3.2.1.14.3.B
3.3.1.A	3.2.1.P
3.3.1.A	3.2.2.D
3.3.1.A	3.2.2.D.1
3.3.1.A	3.2.2.D.2
3.3.1.A	3.2.2.D.3
3.3.1.A	3.2.2.1.A
3.3.1.B	3.2.1.Q
3.3.1.B	3.2.2.4.K
3.3.1.B	3.2.2.4.K.1
3.3.1.B	3.2.2.4.K.2
3.3.1.B	3.2.2.4.K.3
3.3.1.B	3.2.2.4.K.4
3.3.1.C	3.2.1.G
3.3.1.C	3.2.1.R
3.3.1.C	3.2.2.C
3.3.1.D	3.2.1.S
3.3.1.E	3.2.1.N
3.3.1.F	3.2.1.T
3.3.2.A	3.2.1.15.A
3.3.2.A	3.2.6.2.4.N
3.3.2.A	3.2.6.4

SD&TRD Traceability Matrix	
SD&TRD Section	ESFDR Section
3.3.2.B	3.2.1.15.B
3.3.2.C	3.2.1.15.C
3.3.2.D	3.2.1.15.D
3.3.3.A	3.2.1.16.A
3.3.3.B	3.2.1.16.B
3.3.3.C	3.2.1.16.C
3.3.3.D	3.2.1.16.D
3.3.3.E	3.2.1.16.E
3.3.3.F	3.2.1.16.F
3.3.4.A	3.2.1.17.A
3.3.4.B	3.2.1.17.B
3.3.5	3.2.1.18
3.3.5	3.2.6.2.1.L
3.3.6.1	3.2.3.3.F
3.3.6.1	3.2.8.8.C
3.3.6.1.A	3.2.1.W
3.3.6.1.A	3.2.1.19.1.A
3.3.6.1.A	3.2.2.4.D.3
3.3.6.1.A	3.2.2.4.I
3.3.6.1.A	3.2.2.4.I.1
3.3.6.1.A	3.2.2.4.I.2
3.3.6.1.A	3.2.2.4.I.3
3.3.6.1.A	3.2.2.4.I.8
3.3.6.1.A	3.2.2.4.I.9
3.3.6.1.A	3.2.2.5.B
3.3.6.1.A	3.2.2.5.9.D
3.3.6.1.A	3.2.5.4.5.I
3.3.6.1.A	3.2.5.5.F

SD&TRD Traceability Matrix	
SD&TRD Section	ESFDR Section
3.3.6.1.A	3.2.5.5.4.B
3.3.6.1.A	3.2.5.5.4.O
3.3.6.1.A	3.2.5.5.9.H
3.3.6.1.A	3.2.6.2.B
3.3.6.1.A	3.2.6.2.1.A
3.3.6.1.A	3.2.6.2.4.Q
3.3.6.1.A	3.2.6.4.3.A
3.3.6.1.A	3.2.6.5.D
3.3.6.1.A	3.2.6.5.G
3.3.6.1.A	3.2.6.5.1.C
3.3.6.1.B	3.2.1.H.2(e)i
3.3.6.1.B	3.2.1.W
3.3.6.1.B	3.2.1.19.1.B
3.3.6.1.B	3.2.2.B
3.3.6.1.B	3.2.2.4.1.10
3.3.6.1.B	3.2.2.4.3.D
3.3.6.1.B	3.2.2.6.D
3.3.6.1.B	3.2.5.4.5.H
3.3.6.1.B	3.2.5.5.9.E
3.3.6.1.B	3.2.5.5.11.A
3.3.6.1.B	3.2.5.5.11.B
3.3.6.1.B	3.2.5.5.11.C
3.3.6.1.B	3.2.6.2.4.D
3.3.6.1.B	3.2.6.5.11.E
3.3.6.2.A	3.2.1.19.2.A
3.3.6.2.B	3.2.1.19.2.B
3.3.6.2.C	3.2.1.19.2.C
3.3.6.2.D	3.2.1.19.2.D

SD&TRD Traceability Matrix	
SD&TRD Section	ESFDR Section
3.3.6.2.E.1	3.2.1.19.2.E.1
3.3.6.2.E.2	3.2.1.19.2.E.2
3.3.6.2.E.2	3.2.2.B
3.3.6.2.E.2	3.2.2.5.8.G
3.3.6.2.E.2	3.2.2.6.D
3.3.6.2.E.3	3.2.1.19.2.E.3
3.3.6.3.A	3.2.1.W
3.3.6.3.A	3.2.1.19.3
3.3.6.3.A.1	3.2.1.19.3.A.1
3.3.6.3.A.2	3.2.1.19.3.A.2
3.3.6.3.A.2	3.2.5.4.5.B
3.3.6.3.A.3	3.2.1.19.3.A.3
3.3.6.3.A.4	3.2.1.19.3.A.4
3.3.6.3.B	3.2.1.19.3.B
3.3.6.3.B	3.2.5.3.1.B
3.3.6.3.B	3.2.5.5.9.E
3.3.6.3.B	3.2.6.5.11.A
3.3.6.3.B	3.2.6.5.11.B
3.3.6.3.B	3.2.6.5.11.E
3.3.6.3.C	3.2.1.19.3.C
3.3.6.3.D	3.2.1.19.3.D
3.3.6.4.A	3.2.1.19.4.A
3.3.6.4.B	3.2.1.19.4.B
3.3.6.4.C	3.2.1.19.4.C
3.3.6.5.A	3.2.1.19.5.A
3.3.6.5.B	3.2.1.19.5.B
3.3.6.5.C	3.2.1.19.5.C
3.3.6.6.A	3.2.1.19.6.A

SD&TRD Traccability Matrix	
SD&TRD Section	ESFDR Section
3.3.6.6.B	3.2.1.19.6.B
3.3.6.6.C	3.2.1.19.6.C
3.3.6.7.A	3.2.1.19.7.A
3.3.6.7.B	3.2.1.19.7.B
3.3.6.7.C	3.2.1.19.7.C
3.3.6.7.D	3.2.1.19.7.D
3.3.6.7.E	3.2.1.19.7.E
3.3.6.7.F	3.2.1.19.7.F
3.3.6.8.A	3.2.1.19.8.A
3.3.6.8.B	3.2.1.19.8.B
3.3.6.9.A	3.2.1.19.9.A
3.3.6.9.B	3.2.1.19.9.B
3.3.6.9.C	3.2.1.19.9.C
3.3.7	3.2.1.20
3.3.7	3.2.5.5.4.N
3.3.7.1	3.2.1.20.A
3.3.7.2	3.2.1.20.B
3.3.7.3	3.2.1.20.C
3.3.7.4	3.2.1.20.D
3.3.7.5.A	3.2.1.20.E.1
3.3.7.5.B	3.2.1.20.E.2
3.3.7.6	3.2.1.20.F
3.3.8.1.A	3.2.1.21.A.1
3.3.8.1.B	3.2.1.21.A.2
3.3.8.1.C	3.2.1.21.A.3
3.3.8.1.D	3.2.1.21.A.4
3.3.8.2	3.2.1.21.B
3.3.9.A	3.2.1.22.A



SD&TRD Traceability Matrix		
SD&TRD Section		ESFDR Section
3.3.9.B		3.2.1.22.B
3.3.9.B		3.2.7
3.3.9.C		3.2.1.22.C
3.3.10.A		3.2.1.23.A
3.3.10.B		3.2.1.23.B
3.3.11	7 USC 136	Not Allocated to the ESF
3.3.11	15 USC 2601	Not Allocated to the ESF
3.3.11	16 USC 1531	J.7.A
3.3.11	33 USC 1251	J.5.1.A-D, J.5.1.1.A, J.5.1.2.A
3.3.11	40 CFR 122	J.5.1.A-D, J.5.1.1.A, J.5.1.2.A
3.3.11	40 CFR 204	J.13.A
3.3.11	40 CFR 205	J.13.A
3.3.11	42 USC 300	J.4.1.A-B
3.3.11	42 USC 300	J.4.2.A-B
3.3.11	42 USC 300h part C	J.4.2.A-B
3.3.11	42 USC 4901	J.13.A
3.3.11	42 USC 6901	J.6.1.A-C
3.3.11	42 USC 7401	J.2.A-B
3.3.11	49 USC 1801	J.6.1.A-C
3.3.11	Executive Order 11990	J.12.A-C
3.3.11	NAC 444.750-840	J.5.3.A-D
3.3.11	NAC 445.070-4278	J.4.1.A-B
3.3.11	NAC 445.070-4278	J.4.2.A-B
3.3.11	NAC 445.070-4278	J.5.1.A-D, J.5.1.1.A, J.5.1.2.A
3.3.11	NAC 445.070-4278	J.5.3.A-D
3.3.11	NAC 445.070-.241	3.2.2.1.F
3.3.11	NRS 445.131-399	J.4.1.A-B
3.3.11	NRS 445.131-399	J.4.2.A-B

SD&TRD Traceability Matrix		
SD&TRD Section		ESFDR Section
3.3.11	NRS 445.131-399	J.5.2.A-C
3.3.11	NRS 445.131-.399	3.2.2.1.F
3.3.11	NRS 533.325	J.3.A
3.3.11.A		3.2.1.W.2
3.3.11.A		3.2.1.24.A
3.3.11.A		3.2.2.3.F
3.3.11.A		3.2.2.3.G
3.3.11.A		3.2.2.3.K
3.3.11.B		3.2.1.7.D
3.3.11.B		3.2.1.24.B
3.3.11.B		3.2.6.5.11.D
3.4.1.A		3.2.1.25.1.A
3.4.1.B		3.2.1.25.1.B
3.4.1.C		3.2.1.25.1.C
3.4.2		3.2.1.25.2
3.4.3		3.2.1.25.3
3.4.4		3.2.1.25.4
3.4.5		3.2.1.25.5
3.4.6.A		3.2.1.25.6.A
3.4.6.B		3.2.1.25.6.B
3.4.6.B		3.2.1.25.6.B.1
3.4.6.B		3.2.1.25.6.B.2
3.4.6.B		3.2.1.25.6.B.3
3.4.6.B		3.2.1.25.6.B.4
3.4.6.B		3.2.1.25.6.B.5
3.4.6.B		3.2.1.25.6.B.6
3.4.6.B		3.2.1.25.6.B.7
3.4.6.B		3.2.1.25.6.B.8

SD&TRD Traceability Matrix	
SD&TRD Section	ESFDR Section
3.4.6.B	3.2.1.25.6.B.9
3.4.6.B	3.2.1.25.6.B.10
3.4.6.B	3.2.1.25.6.B.11
3.4.6.B	3.2.2.4.L.8(c)
3.4.7	3.2.1.25.7
3.4.8	3.2.1.25.8
3.5.1	3.2.1.26.1
3.5.1.1	3.2.1.26.1.A
3.5.1.2.A	3.2.1.26.1.B.1
3.5.1.2.B	3.2.1.26.1.B.2
3.5.2	3.2.1.26.2
3.5.3.1	3.2.1.26.3.A
3.5.3.1	3.2.3.3.7.A
3.5.3.2.A	3.2.1.26.3.B.1
3.5.3.2.B	3.2.1.26.3.B.2
3.5.3.2.C	3.2.1.26.3.B.3
3.5.4	Not Applicable
3.6.1	Not Applicable
3.6.2.1.A	3.2.1.27.A
3.6.2.1.B	3.2.1.27.B
3.6.2.1.C	3.2.1.27.C
3.7	3.2.1
3.7.A	3.2.1.4.B
3.7.A	3.2.2.4.C.
3.7.A	3.2.2.4.C.1
3.7.A	3.2.2.4.C.2
3.7.A	3.2.2.4.C.3
3.7.A	3.2.2.4.C.4

SD&TRD Traceability Matrix		
SD&TRD Section		ESFDR Section
3.7.A		3.2.2.4.C.5
3.7.A		3.2.2.4.C.6
3.7.A		3.2.2.4.C.7
3.7.A		3.2.2.4.C.8
3.7.A		3.2.2.4.C.9
3.7.A		3.2.2.4.C.10
3.7.A		3.2.2.4.C.11
3.7.A		3.2.2.4.C.12
3.7.A		3.2.2.4.D.8
3.7.A		3.2.2.4.D.17(a)
3.7.A		3.2.5.5.I
3.7.A		3.2.6.5.J
3.7.A		3.2.8.8.B
3.7.A		B.3.1.3.A-B
3.7.A		B.3.2.3
3.7.A		B.3.3.3, B.3.3.4
3.7.A		B.3.4.3.A-D, B.3.4.4.A-B
3.7.A		B.3.5.3.A-C, B.3.5.4.A-B
3.7.A		B.3.6.3.A-B
3.7.A		B.3.7.3, B.3.7.4.A-D
3.7.A		B.4.1.3.A-E, B.4.1.4
3.7.B.1	10 CFR 60.4(b)	3.2.10
3.7.B.1	10 CFR 60.15(b)	3.2.1.A
3.7.B.1	10 CFR 60.15(b)	3.2.1.B
3.7.B.1	10 CFR 60.15(b)	3.2.1.C
3.7.B.1	10 CFR 60.15(b)	3.2.1.D
3.7.B.1	10 CFR 60.15(b)	3.2.2.4.A
3.7.B.1	10 CFR 60.15(c)(1)	3.2.1.K

SD&TRD Traceability Matrix		
SD&TRD Section		ESFDR Section
3.7.B.1	10 CFR 60.15(c)(1)	3.2.1.M
3.7.B.1	10 CFR 60.15(c)(1)	3.2.1.M.1
3.7.B.1	10 CFR 60.15(c)(1)	3.2.1.M.2
3.7.B.1	10 CFR 60.15(c)(1)	3.2.1.M.3
3.7.B.1	10 CFR 60.15(c)(1)	3.2.1.M.4
3.7.B.1	10 CFR 60.15(c)(1)	3.2.1.M.5
3.7.B.1	10 CFR 60.15(c)(1)	3.2.1.M.5(a)
3.7.B.1	10 CFR 60.15(c)(1)	3.2.1.M.5(b)
3.7.B.1	10 CFR 60.15(c)(1)	3.2.1.AA.1
3.7.B.1	10 CFR 60.15(c)(1)	3.2.1.AA.2
3.7.B.1	10 CFR 60.15(c)(1)	3.2.1.AA.3
3.7.B.1	10 CFR 60.15(c)(1)	3.2.1.AA.4
3.7.B.1	10 CFR 60.15(c)(1)	3.2.1.AA.5
3.7.B.1	10 CFR 60.15(c)(1)	3.2.1.AA.6
3.7.B.1	10 CFR 60.15(c)(1)	3.2.1.AA.7
3.7.B.1	10 CFR 60.15(c)(1)	3.2.1.1.A
3.7.B.1	10 CFR 60.15(c)(1)	3.2.1.1.B
3.7.B.1	10 CFR 60.15(c)(1)	3.2.1.4.A
3.7.B.1	10 CFR 60.15(c)(1)	3.2.1.4.B
3.7.B.1	10 CFR 60.15(c)(1)	3.2.1.4.B.1
3.7.B.1	10 CFR 60.15(c)(1)	3.2.1.4.B.1(a)
3.7.B.1	10 CFR 60.15(c)(1)	3.2.1.4.B.1(b)
3.7.B.1	10 CFR 60.15(c)(1)	3.2.1.4.B.1(b)i
3.7.B.1	10 CFR 60.15(c)(1)	3.2.1.4.B.1(b)ii
3.7.B.1	10 CFR 60.15(c)(1)	3.2.1.4.B.1(b)iii
3.7.B.1	10 CFR 60.15(c)(1)	3.2.1.4.B.1(b)iv
3.7.B.1	10 CFR 60.15(c)(1)	3.2.1.4.B.1(b)v
3.7.B.1	10 CFR 60.15(c)(1)	3.2.1.4.B.1(b)vi

SD&TRD Traceability Matrix		
SD&TRD Section		ESFDR Section
3.7.B.1	10 CFR 60.15(c)(1)	3.2.1.4.B.2
3.7.B.1	10 CFR 60.15(c)(1)	3.2.1.4.B.3
3.7.B.1	10 CFR 60.15(c)(1)	3.2.1.4.B.4
3.7.B.1	10 CFR 60.15(c)(1)	3.2.1.4.B.5
3.7.B.1	10 CFR 60.15(c)(1)	3.2.1.4.E.1
3.7.B.1	10 CFR 60.15(c)(1)	3.2.1.4.E.1(a)
3.7.B.1	10 CFR 60.15(c)(1)	3.2.1.4.F
3.7.B.1	10 CFR 60.15(c)(1)	3.2.1.5.A
3.7.B.1	10 CFR 60.15(c)(1)	3.2.1.5.A.1
3.7.B.1	10 CFR 60.15(c)(1)	3.2.1.5.G
3.7.B.1	10 CFR 60.15(c)(1)	3.2.2.G
3.7.B.1	10 CFR 60.15(c)(1)	3.2.2.G.1
3.7.B.1	10 CFR 60.15(c)(1)	3.2.2.1.J.1
3.7.B.1	10 CFR 60.15(c)(1)	3.2.2.1.J.2, 3.2.2.1.J.3, 3.2.2.1.J.4
3.7.B.1	10 CFR 60.15(c)(1)	3.2.2.1.J.5
3.7.B.1	10 CFR 60.15(c)(1)	3.2.2.1.J.6
3.7.B.1	10 CFR 60.15(c)(1)	3.2.2.1.J.7
3.7.B.1	10 CFR 60.15(c)(1)	3.2.2.2.D
3.7.B.1	10 CFR 60.15(c)(1)	3.2.2.2.E
3.7.B.1	10 CFR 60.15(c)(1)	3.2.2.2.F
3.7.B.1	10 CFR 60.15(c)(1)	3.2.2.2.G
3.7.B.1	10 CFR 60.15(c)(1)	3.2.2.4.D
3.7.B.1	10 CFR 60.15(c)(1)	3.2.2.4.D.4
3.7.B.1	10 CFR 60.15(c)(1)	3.2.2.4.D.5
3.7.B.1	10 CFR 60.15(c)(1)	3.2.2.4.D.6
3.7.B.1	10 CFR 60.15(c)(1)	3.2.2.4.D.7
3.7.B.1	10 CFR 60.15(c)(1)	3.2.2.4.L.7
3.7.B.1	10 CFR 60.15(c)(1)	3.2.2.4.X.6

SD&TRD Traceability Matrix		
SD&TRD Section		ESFDR Section
3.7.B.1	10 CFR 60.15(c)(1)	3.2.2.5.5.A
3.7.B.1	10 CFR 60.15(c)(1)	3.2.2.5.6.B
3.7.B.1	10 CFR 60.15(c)(1)	3.2.2.5.8.D
3.7.B.1	10 CFR 60.15(c)(1)	3.2.2.5.8.D.1
3.7.B.1	10 CFR 60.15(c)(1)	3.2.2.5.10.A
3.7.B.1	10 CFR 60.15(c)(1)	3.2.2.6.E.6
3.7.B.1	10 CFR 60.15(c)(1)	3.2.5.4.5.M
3.7.B.1	10 CFR 60.15(c)(1)	3.2.6.5.I
3.7.B.1	10 CFR 60.15(c)(1)	3.2.8.8.D
3.7.B.1	10 CFR 60.15(c)(1)	3.2.9.4.A
3.7.B.1	10 CFR 60.15(c)(1)	3.2.9.4.A.1
3.7.B.1	10 CFR 60.15(c)(1)	3.3.1.4
3.7.B.1	10 CFR 60.15(c)(1)	3.3.1.5.6
3.7.B.1	10 CFR 60.15(c)(1)	3.3.1.6
3.7.B.1	10 CFR 60.15(c)(2)	3.2.1.AA.1
3.7.B.1	10 CFR 60.15(c)(2)	3.2.1.AA.2
3.7.B.1	10 CFR 60.15(c)(2)	3.2.1.AA.3
3.7.B.1	10 CFR 60.15(c)(2)	3.2.1.AA.4
3.7.B.1	10 CFR 60.15(c)(2)	3.2.1.AA.5
3.7.B.1	10 CFR 60.15(c)(2)	3.2.1.AA.6
3.7.B.1	10 CFR 60.15(c)(2)	3.2.1.AA.7
3.7.B.1	10 CFR 60.15(c)(2)	3.2.2.E
3.7.B.1	10 CFR 60.15(c)(2)	3.2.2.4.B, 3.2.2.4.B.1
3.7.B.1	10 CFR 60.15(c)(2)	3.2.2.4.B.2
3.7.B.1	10 CFR 60.15(c)(3)	3.2.1.AA.1
3.7.B.1	10 CFR 60.15(c)(3)	3.2.1.AA.2
3.7.B.1	10 CFR 60.15(c)(3)	3.2.1.AA.3
3.7.B.1	10 CFR 60.15(c)(3)	3.2.1.AA.4

SD&TRD Traceability Matrix		
SD&TRD Section		ESFDR Section
3.7.B.1	10 CFR 60.15(c)(3)	3.2.1.AA.5
3.7.B.1	10 CFR 60.15(c)(3)	3.2.1.AA.6
3.7.B.1	10 CFR 60.15(c)(3)	3.2.1.AA.7
3.7.B.1	10 CFR 60.15(c)(3)	3.2.2.F
3.7.B.1	10 CFR 60.15(c)(3)	3.2.2.4.L
3.7.B.1	10 CFR 60.15(c)(3)	3.2.2.4.L.1
3.7.B.1	10 CFR 60.15(c)(3)	3.2.2.4.L.2
3.7.B.1	10 CFR 60.15(c)(3)	3.2.2.4.L.6
3.7.B.1	10 CFR 60.15(c)(3)	3.2.2.4.L.6(a)
3.7.B.1	10 CFR 60.15(c)(3)	3.2.2.4.L.8
3.7.B.1	10 CFR 60.15(c)(3)	3.2.2.4.L.8(b)
3.7.B.1	10 CFR 60.15(c)(3)	3.2.2.4.L.9
3.7.B.1	10 CFR 60.15(c)(3)	3.2.2.4.L.10
3.7.B.1	10 CFR 60.15(c)(4)	3.2.1.H.1(a)
3.7.B.1	10 CFR 60.15(c)(4)	3.2.1.H.1(b)
3.7.B.1	10 CFR 60.15(c)(4)	3.2.1.H.1(c)
3.7.B.1	10 CFR 60.15(c)(4)	3.2.1.H.1(d)
3.7.B.1	10 CFR 60.15(c)(4)	3.2.1.1.E
3.7.B.1	10 CFR 60.15(c)(4)	3.2.1.2.B
3.7.B.1	10 CFR 60.15(c)(4)	3.2.1.3.C
3.7.B.1	10 CFR 60.15(c)(4)	3.2.1.4.H
3.7.B.1	10 CFR 60.15(c)(4)	3.2.1.5.H
3.7.B.1	10 CFR 60.15(c)(4)	3.2.1.6.E
3.7.B.1	10 CFR 60.15(c)(4)	3.2.1.6.F
3.7.B.1	10 CFR 60.15(c)(4)	3.2.2.G
3.7.B.1	10 CFR 60.15(c)(4)	3.2.2.4.L.2
3.7.B.1	10 CFR 60.15(c)(4)	3.2.2.4.L.3
3.7.B.1	10 CFR 60.15(c)(4)	3.2.2.4.L.4



SD&TRD Traceability Matrix		
SD&TRD Section		ESFDR Section
3.7.B.1	10 CFR 60.15(c)(4)	3.2.2.4.L.5
3.7.B.1	10 CFR 60.15(c)(4)	3.2.2.4.L.6(b)
3.7.B.1	10 CFR 60.15(c)(4)	3.2.2.4.M
3.7.B.1	10 CFR 60.15(c)(4)	3.2.2.4.M.1
3.7.B.1	10 CFR 60.15(c)(4)	3.2.2.4.M.2
3.7.B.1	10 CFR 60.15(c)(4)	3.2.2.4.M.3
3.7.B.1	10 CFR 60.15(c)(4)	3.2.2.4.M.4
3.7.B.1	10 CFR 60.15(c)(4)	3.2.2.4.M.5
3.7.B.1	10 CFR 60.15(c)(4)	3.2.2.6.B
3.7.B.1	10 CFR 60.16	3.2.1.O
3.7.B.1	10 CFR 60.21(c) (1)(ii)(D)	3.2.1.4.C
3.7.B.1	10 CFR 60.21(c) (1)(ii)(D)	3.2.1.4.C.1
3.7.B.1	10 CFR 60.21(c) (1)(ii)(D)	3.2.1.4.C.2
3.7.B.1	10 CFR 60.21(c) (1)(ii)(D)	3.2.1.4.C.3
3.7.B.1	10 CFR 60.21(c) (1)(ii)(D)	3.2.1.4.C.4
3.7.B.1	10 CFR 60.21(c) (1)(ii)(D)	3.2.1.4.C.5
3.7.B.1	10 CFR 60.21(c) (1)(ii)(E)	3.2.1.J.1
3.7.B.1	10 CFR 60.21(c)(11)	3.2.1.Y
3.7.B.1	10 CFR 60.21(c)(11)	3.2.2.4.S.2
3.7.B.1	10 CFR 60.72	3.2.1.25.6.B
3.7.B.1	10 CFR 60.72	3.2.1.25.6.B.1
3.7.B.1	10 CFR 60.72	3.2.1.25.6.B.2
3.7.B.1	10 CFR 60.72	3.2.1.25.6.B.3
3.7.B.1	10 CFR 60.72	3.2.1.25.6.B.4
3.7.B.1	10 CFR 60.72	3.2.1.25.6.B.5

SD&TRD Traceability Matrix		
SD&TRD Section		ESFDR Section
3.7.B.1	10 CFR 60.72	3.2.1.25.6.B.6
3.7.B.1	10 CFR 60.72	3.2.1.25.6.B.7
3.7.B.1	10 CFR 60.72	3.2.1.25.6.B.8
3.7.B.1	10 CFR 60.72	3.2.1.25.6.B.9
3.7.B.1	10 CFR 60.72	3.2.1.25.6.B.10
3.7.B.1	10 CFR 60.72	3.2.1.25.6.B.11
3.7.B.1	10 CFR 60.72	3.2.2.4.L.8(c)
3.7.B.1	10 CFR 60.72(a)	3.3.1.2.2
3.7.B.1	10 CFR 60.72(a)	3.3.1.5.6
3.7.B.1	10 CFR 60.74(a)	3.2.9.4.B
3.7.B.1	10 CFR 60.74(a)	3.2.9.5.A
3.7.B.1	10 CFR 60.74(a)	3.2.9.5.A.1
3.7.B.1	10 CFR 60.74(b)	3.2.9.4.C
3.7.B.1	10 CFR 60.111	3.2.2.4.Q
3.7.B.1	10 CFR 60.111(a)	3.2.1.J.2
3.7.B.1	10 CFR 60.111(b)(1)	3.2.1.J.13
3.7.B.1	10 CFR 60.111(b)(1)	A.1-3
3.7.B.1	10 CFR 60.111(b)(3)	3.2.1.J.14
3.7.B.1	10 CFR 60.112	3.2.1.M.6
3.7.B.1	10 CFR 60.112	3.2.1.1.C.2
3.7.B.1	10 CFR 60.112	3.2.1.5.G
3.7.B.1	10 CFR 60.112	3.2.2.1.I.2
3.7.B.1	10 CFR 60.112	3.2.2.2.H
3.7.B.1	10 CFR 60.112	3.2.2.2.2.P
3.7.B.1	10 CFR 60.112	3.2.2.2.3.E
3.7.B.1	10 CFR 60.112	3.2.2.2.5.D
3.7.B.1	10 CFR 60.112	3.2.2.4.X.1
3.7.B.1	10 CFR 60.112	3.2.2.5.5.A

SD&TRD Traceability Matrix		
SD&TRD Section		ESFDR Section
3.7.B.1	10 CFR 60.112	3.2.2.5.5.B
3.7.B.1	10 CFR 60.112	3.2.2.5.6.B
3.7.B.1	10 CFR 60.112	3.2.2.5.6.E
3.7.B.1	10 CFR 60.112	3.2.2.5.8.D
3.7.B.1	10 CFR 60.113(a)(1)(i)	3.2.1.J.3
3.7.B.1	10 CFR 60.113(a)(1)(ii)(A)	3.2.1.J.4
3.7.B.1	10 CFR 60.113(a)(1)(ii)(B)	3.2.1.J.4
3.7.B.1	10 CFR 60.130	3.2.1.N
3.7.B.1	10 CFR 60.131(b)	3.2.1.N.2
3.7.B.1	10 CFR 60.131(b)	3.2.1.N.2(a)
3.7.B.1	10 CFR 60.131(b)(1)	3.2.1.H.2(a)
3.7.B.1	10 CFR 60.131(b)(1)	3.2.1.N.1
3.7.B.1	10 CFR 60.131(b)(1)	3.2.1.10.1[1]
3.7.B.1	10 CFR 60.131(b)(1)	3.2.2.2.2.D
3.7.B.1	10 CFR 60.131(b)(1)	3.2.2.2.2.E
3.7.B.1	10 CFR 60.131(b)(1)	3.2.2.4.T.3
3.7.B.1	10 CFR 60.131(b)(1)	3.2.5.A
3.7.B.1	10 CFR 60.131(b)(1)	3.2.5.5.4.L
3.7.B.1	10 CFR 60.131(b)(1)	3.2.6.5.H
3.7.B.1	10 CFR 60.131(b)(1)	A.5
3.7.B.1	10 CFR 60.131(b)(2)	3.2.1.H.2(b)
3.7.B.1	10 CFR 60.131(b)(2)	3.2.2.2.2.D
3.7.B.1	10 CFR 60.131(b)(2)	3.2.2.2.2.E
3.7.B.1	10 CFR 60.131(b)(2)	3.2.5.5.4.L
3.7.B.1	10 CFR 60.131(b)(3)	3.2.1.4.E.1
3.7.B.1	10 CFR 60.131(b)(3)	3.2.1.4.E.1(a)
3.7.B.1	10 CFR 60.131(b)(3)	3.2.1.9.2.A.3
3.7.B.1	10 CFR 60.131(b)(3)	3.2.2.2.2.B

SD&TRD Traceability Matrix		
SD&TRD Section		ESFDR Section
3.7.B.1	10 CFR 60.131(b)(3)	3.2.2.2.2.D
3.7.B.1	10 CFR 60.131(b)(3)	3.2.2.2.2.E
3.7.B.1	10 CFR 60.131(b)(3)	3.2.5.A
3.7.B.1	10 CFR 60.131(b)(3)	3.2.5.A.1
3.7.B.1	10 CFR 60.131(b)(3)	3.2.5.5.4.L
3.7.B.1	10 CFR 60.131(b)(3)(i)	3.2.1.H.2(c)
3.7.B.1	10 CFR 60.131(b)(3)(ii)	3.2.1.H.2(c)i
3.7.B.1	10 CFR 60.131(b)(3)(iii)	3.2.5.C
3.7.B.1	10 CFR 60.131(b)(3)(iv)	3.2.1.H.2(c)ii
3.7.B.1	10 CFR 60.131(b)(4)(i)	3.2.1.J.5
3.7.B.1	10 CFR 60.131(b)(6)	3.2.1.H.2(d)
3.7.B.1	10 CFR 60.131(b)(6)	3.2.1.9.3.B
3.7.B.1	10 CFR 60.131(b)(6)	3.2.1.9.3.G
3.7.B.1	10 CFR 60.131(b)(6)	3.2.1.26.1
3.7.B.1	10 CFR 60.131(b)(9)	3.2.1.H.2(e)
3.7.B.1	10 CFR 60.133	3.2.1.H
3.7.B.1	10 CFR 60.133	3.2.1.Z.1
3.7.B.1	10 CFR 60.133	3.2.1.5.H
3.7.B.1	10 CFR 60.133	3.2.1.6.F
3.7.B.1	10 CFR 60.133	3.2.2.1.1.1
3.7.B.1	10 CFR 60.133	3.2.2.1.1.2
3.7.B.1	10 CFR 60.133	3.2.5.3.1.G
3.7.B.1	10 CFR 60.133(a)	3.2.2.4.T.6
3.7.B.1	10 CFR 60.133(a)(1)	3.2.1.4.D.
3.7.B.1	10 CFR 60.133(a)(1)	3.2.1.4.D.1
3.7.B.1	10 CFR 60.133(a)(1)	3.2.1.4.D.2
3.7.B.1	10 CFR 60.133(a)(1)	3.2.1.4.D.3
3.7.B.1	10 CFR 60.133(a)(1)	3.2.2.4.B.1, 3.2.2.4.N

SD&TRD Traceability Matrix		
SD&TRD Section		ESFDR Section
3.7.B.1	10 CFR 60.133(a)(1)	3.2.2.4.N.2
3.7.B.1	10 CFR 60.133(a)(1)	3.2.2.4.S.2
3.7.B.1	10 CFR 60.133(a)(2)	3.2.1.4.E
3.7.B.1	10 CFR 60.133(a)(2)	3.2.1.5.E
3.7.B.1	10 CFR 60.133(a)(2)	3.2.1.5.E.1
3.7.B.1	10 CFR 60.133(a)(2)	3.2.1.5.E.2
3.7.B.1	10 CFR 60.133(a)(2)	3.2.2.1.B
3.7.B.1	10 CFR 60.133(a)(2)	3.2.2.4.O
3.7.B.1	10 CFR 60.133(a)(2)	3.2.2.4.O.1
3.7.B.1	10 CFR 60.133(a)(2)	3.2.2.4.O.2
3.7.B.1	10 CFR 60.133(a)(2)	3.2.2.4.O.3
3.7.B.1	10 CFR 60.133(a)(2)	3.2.2.4.S.2
3.7.B.1	10 CFR 60.133(a)(2)	3.2.2.4.S.3
3.7.B.1	10 CFR 60.133(a)(2)	3.2.2.4.S.7
3.7.B.1	10 CFR 60.133(a)(2)	3.2.2.4.S.8
3.7.B.1	10 CFR 60.133(a)(2)	3.2.2.5.E
3.7.B.1	10 CFR 60.133(a)(2)	3.2.2.5.5.A
3.7.B.1	10 CFR 60.133(a)(2)	3.2.2.5.8.A
3.7.B.1	10 CFR 60.133(a)(2)	3.2.2.5.8.B
3.7.B.1	10 CFR 60.133(a)(2)	3.2.2.5.8.C
3.7.B.1	10 CFR 60.133(a)(2)	3.2.2.5.8.D.1
3.7.B.1	10 CFR 60.133(a)(2)	3.2.2.5.8.E
3.7.B.1	10 CFR 60.133(a)(2)	3.2.2.5.8.F
3.7.B.1	10 CFR 60.133(a)(2)	B.2.35.3.A-F, B.2.35.4.A-E, B.2.35.5
3.7.B.1	10 CFR 60.133(b)	3.2.2.4.D.10
3.7.B.1	10 CFR 60.133(b)	3.2.2.4.P
3.7.B.1	10 CFR 60.133(b)	3.2.2.4.P.1
3.7.B.1	10 CFR 60.133(b)	3.2.2.4.P.2

SD&TRD Traceability Matrix		
SD&TRD Section		ESFDR Section
3.7.B.1	10 CFR 60.133(b)	3.2.2.4.T.2
3.7.B.1	10 CFR 60.133(b)	3.2.2.4.U.4(c)
3.7.B.1	10 CFR 60.133(b)	3.2.2.5.C
3.7.B.1	10 CFR 60.133(b)	3.2.2.5.C.1
3.7.B.1	10 CFR 60.133(b)	3.2.9.4.E
3.7.B.1	10 CFR 60.133(b)	3.2.9.4.E.1
3.7.B.1	10 CFR 60.133(c)	3.2.2.4.Q
3.7.B.1	10 CFR 60.133(d)	3.2.2.4.D.2
3.7.B.1	10 CFR 60.133(d)	3.2.2.4.S
3.7.B.1	10 CFR 60.133(d)	3.2.2.4.S.1
3.7.B.1	10 CFR 60.133(d)	3.2.2.4.S.2
3.7.B.1	10 CFR 60.133(d)	3.2.2.4.S.3
3.7.B.1	10 CFR 60.133(d)	3.2.2.4.S.4
3.7.B.1	10 CFR 60.133(d)	3.2.2.4.S.5
3.7.B.1	10 CFR 60.133(d)	3.2.2.4.S.6
3.7.B.1	10 CFR 60.133(d)	3.2.2.4.S.7
3.7.B.1	10 CFR 60.133(d)	3.2.2.4.S.8
3.7.B.1	10 CFR 60.133(d)	3.2.2.4.X.5
3.7.B.1	10 CFR 60.133(d)	3.2.2.5.D
3.7.B.1	10 CFR 60.133(d)	3.2.2.5.D.1
3.7.B.1	10 CFR 60.133(d)	3.2.2.5.D.2
3.7.B.1	10 CFR 60.133(d)	3.2.2.5.F
3.7.B.1	10 CFR 60.133(d)	3.2.2.5.G
3.7.B.1	10 CFR 60.133(d)	3.2.2.6.E.
3.7.B.1	10 CFR 60.133(d)	3.2.2.6.E.1
3.7.B.1	10 CFR 60.133(d)	3.2.2.6.E.2
3.7.B.1	10 CFR 60.133(d)	3.2.2.6.E.3
3.7.B.1	10 CFR 60.133(d)	3.2.2.6.E.4

SD&TRD Traceability Matrix		
SD&TRD Section		ESFDR Section
3.7.B.1	10 CFR 60.133(d)	3.2.2.6.E.5
3.7.B.1	10 CFR 60.133(d)	3.2.2.6.E.6
3.7.B.1	10 CFR 60.133(e)	3.2.2.4.I.5
3.7.B.1	10 CFR 60.133(e)	3.2.2.4.J.1
3.7.B.1	10 CFR 60.133(e)	3.2.2.4.T.5
3.7.B.1	10 CFR 60.133(e)	3.2.2.4.U.6
3.7.B.1	10 CFR 60.133(e)	3.2.2.4.U.6(a)
3.7.B.1	10 CFR 60.133(e)	3.2.2.4.U.6(b)
3.7.B.1	10 CFR 60.133(c)	3.2.2.4.U.6(c)
3.7.B.1	10 CFR 60.133(c)	3.2.2.4.U.6(d)
3.7.B.1	10 CFR 60.133(e)(1)	3.2.2.4.D.9
3.7.B.1	10 CFR 60.133(e)(1)	3.2.2.4.R
3.7.B.1	10 CFR 60.133(e)(1)	3.2.2.4.R.1
3.7.B.1	10 CFR 60.133(e)(1)	3.2.2.4.T.1
3.7.B.1	10 CFR 60.133(c)(2)	3.2.2.4.N.2
3.7.B.1	10 CFR 60.133(e)(2)	3.2.2.4.N.3
3.7.B.1	10 CFR 60.133(e)(2)	3.2.2.4.T
3.7.B.1	10 CFR 60.133(c)(2)	3.2.2.4.T.2
3.7.B.1	10 CFR 60.133(c)(2)	3.2.2.4.T.4
3.7.B.1	10 CFR 60.133(e)(2)	B.2.35.3.A-F, B.2.35.4.A-E, B.2.35.5
3.7.B.1	10 CFR 60.133(f)	3.2.1.1.C.1
3.7.B.1	10 CFR 60.133(f)	3.2.1.1.C.2
3.7.B.1	10 CFR 60.133(f)	3.2.2.1.I.2
3.7.B.1	10 CFR 60.133(f)	3.2.2.4.U.
3.7.B.1	10 CFR 60.133(f)	3.2.2.4.U.1
3.7.B.1	10 CFR 60.133(f)	3.2.2.4.U.2
3.7.B.1	10 CFR 60.133(f)	3.2.2.4.U.2(a)
3.7.B.1	10 CFR 60.133(f)	3.2.2.4.U.2(b)

SD&TRD Traceability Matrix		
SD&TRD Section		ESFDR Section
3.7.B.1	10 CFR 60.133(f)	3.2.2.4.U.3
3.7.B.1	10 CFR 60.133(f)	3.2.2.4.U.4(a)
3.7.B.1	10 CFR 60.133(f)	3.2.2.4.U.4(b)
3.7.B.1	10 CFR 60.133(f)	3.2.2.4.U.4(c)
3.7.B.1	10 CFR 60.133(f)	3.2.2.4.U.5
3.7.B.1	10 CFR 60.133(f)	B.2.7.3.A-I, B.2.7.4.A-H, B.2.7.5
3.7.B.1	10 CFR 60.133(g)	3.2.1.J.6
3.7.B.1	10 CFR 60.133(g)	3.2.2.4.3.G
3.7.B.1	10 CFR 60.133(g)	3.2.2.4.4.C
3.7.B.1	10 CFR 60.133(g)(1)	B.2.36.3.A-F, B.2.36.4.A-E, B.2.36.5
3.7.B.1	10 CFR 60.133(g)(3)	3.2.2.4.H.4
3.7.B.1	10 CFR 60.133(h)	3.2.1.J.7
3.7.B.1	10 CFR 60.133(i)	3.2.2.4.U.6(b)
3.7.B.1	10 CFR 60.133(i)	3.2.2.4.V
3.7.B.1	10 CFR 60.133(i)	3.2.2.4.V.1
3.7.B.1	10 CFR 60.133(i)	3.2.2.4.V.2
3.7.B.1	10 CFR 60.133(i)	3.2.2.4.V.3
3.7.B.1	10 CFR 60.133(i)	3.2.2.4.V.4
3.7.B.1	10 CFR 60.133(i)	3.2.2.4.V.5
3.7.B.1	10 CFR 60.133(i)	B.2.26.3.A-I, B.2.26.4.A-E, B.2.26.5
3.7.B.1	10 CFR 60.133(i)	B.2.27.3.A-G, B.2.27.4.A-E, B.2.27.5
3.7.B.1	10 CFR 60.133(i)	B.2.28.3.A-F, B.2.28.4.A-E, B.2.28.5
3.7.B.1	10 CFR 60.133(i)	B.2.29.3.A-F, B.2.29.4.A-D, B.2.29.5
3.7.B.1	10 CFR 60.133(i)	B.2.30.3.A-G, B.2.30.4.A-E, B.2.30.5
3.7.B.1	10 CFR 60.137	3.2.8.1
3.7.B.1	10 CFR 60.137	3.2.9.4.D
3.7.B.1	10 CFR 60.137	3.2.9.4.D.1
3.7.B.1	10 CFR 60.137	3.2.9.4.D.2



SD&TRD Traceability Matrix		
SD&TRD Section		ESFDR Section
3.7.B.1	10 CFR 60.137	3.2.9.4.D.4
3.7.B.1	10 CFR 60.137	3.2.9.4.D.5
3.7.B.1	10 CFR 60.137	3.2.9.4.D.6
3.7.B.1	10 CFR 60.137	3.2.9.5.B
3.7.B.1	10 CFR 60.137	3.2.9.5.B.1
3.7.B.1	10 CFR 60.140	3.2.1.J.8
3.7.B.1	10 CFR 60.140(b)	3.2.1.I.1
3.7.B.1	10 CFR 60.140(c)	3.2.1.I.2
3.7.B.1	10 CFR 60.140(c)	3.2.2.4.D.11
3.7.B.1	10 CFR 60.140(c)	3.2.2.6.C
3.7.B.1	10 CFR 60.140(c)	3.2.5.6
3.7.B.1	10 CFR 60.140(c)	3.2.6.2.1.I.1
3.7.B.1	10 CFR 60.141	3.2.1.J.9
3.7.B.1	10 CFR 60.141	3.2.9.4.D.3
3.7.B.1	10 CFR 60.142	3.2.1.J.10
3.7.B.1	10 CFR 60.142	3.2.9.4.D.3
3.7.B.1	10 CFR 60.142(a)	3.2.1.I.3
3.7.B.1	10 CFR 60.142(b)	3.2.1.I.4
3.7.B.1	10 CFR 60.142(b)	3.2.2.6.D.1
3.7.B.1	10 CFR 60.142(b)	3.2.8.8.C.1
3.7.B.1	10 CFR 60.142(d)	3.2.1.I.5
3.7.B.1	10 CFR 60.142(d)	3.2.6.2.1.J
3.7.B.1	10 CFR 60.142(d)	B.2.39.3.A-I, B.2.39.4, B.2.39.5
3.7.B.1	10 CFR 60.151	3.2.1.J.11
3.7.B.1	10 CFR 60.152	3.2.1.J.12
3.7.B.2	10 CFR 60.17	F.2.1
3.7.B.2	10 CFR 60.24(a)	F.2.2
3.7.B.2	10 CFR 60.113(a)(2)	F.2.3

SD&TRD Traceability Matrix		
SD&TRD Section		ESFDR Section
3.7.B.2	10 CFR 60.113(b)(2)	F.2.4
3.7.B.2	10 CFR 60.113(b)(3)	F.2.4
3.7.B.2	10 CFR 60.113(b)(4)	F.2.4
3.7.B.2	10 CFR 60.122	F.2.5
3.7.B.2	10 CFR 60.131(a)	F.2.6
3.7.B.2	10 CFR 60.131(b)(4)(ii)	F.2.7
3.7.B.2	10 CFR 60.131(b)(8)	F.2.8
3.7.B.2	10 CFR 60.131(b)(10)	F.2.9
3.7.B.2	10 CFR 60.134(a)	3.2.2.H.1
3.7.B.2	10 CFR 60.134(a)	3.2.2.4.W
3.7.B.2	10 CFR 60.134(a)	3.2.2.4.X.1
3.7.B.2	10 CFR 60.134(a)	3.2.2.4.X.2
3.7.B.2	10 CFR 60.134(a)	3.2.2.4.X.2(a)
3.7.B.2	10 CFR 60.134(a)	3.2.2.4.X.2(b)
3.7.B.2	10 CFR 60.134(a)	3.2.2.4.X.2(c)
3.7.B.2	10 CFR 60.134(a)	3.2.2.4.X.2(d)
3.7.B.2	10 CFR 60.134(a)	3.2.2.4.X.2(e)
3.7.B.2	10 CFR 60.134(a)	3.2.2.4.X.3
3.7.B.2	10 CFR 60.134(a)	3.2.2.4.X.4
3.7.B.2	10 CFR 60.134(b)	3.2.2.H.2
3.7.B.2	10 CFR 60.134(b)	3.2.2.4.X
3.7.B.2	10 CFR 60.134(b)	3.2.2.4.X.1
3.7.B.2	10 CFR 60.134(b)	3.2.2.4.X.2
3.7.B.2	10 CFR 60.134(b)	3.2.2.4.X.2(a)
3.7.B.2	10 CFR 60.134(b)	3.2.2.4.X.2(b)
3.7.B.2	10 CFR 60.134(b)	3.2.2.4.X.2(c)
3.7.B.2	10 CFR 60.134(b)	3.2.2.4.X.2(d)
3.7.B.2	10 CFR 60.134(b)	3.2.2.4.X.2(e)

SD&TRD Traceability Matrix		
SD&TRD Section		ESFDR Section
3.7.B.2	10 CFR 60.134(b)	3.2.2.4.X.3
3.7.B.2	10 CFR 60.134(b)	3.2.2.4.X.4
3.7.B.2	10 CFR 60.134(b)	3.2.2.4.X.5
3.7.B.2	10 CFR 60.143	F.2.10
3.7.B.3	27 CFR 55	3.2.2.3.B
3.7.B.3	27 CFR 55	3.2.2.3.C
3.7.B.3	29 CFR 1910	3.2.1.W
3.7.B.3	29 CFR 1910	3.2.1.8.1.B
3.7.B.3	29 CFR 1910	3.2.1.19.1.B
3.7.B.3	29 CFR 1910	3.2.1.19.2.E.2
3.7.B.3	29 CFR 1910	3.2.1.19.3
3.7.B.3	29 CFR 1910	3.2.1.19.5.C
3.7.B.3	29 CFR 1910	3.2.1.19.7.A
3.7.B.3	29 CFR 1910	3.2.2.2.C
3.7.B.3	29 CFR 1910	3.2.2.2.3.C
3.7.B.3	29 CFR 1910	3.2.2.4.3.D
3.7.B.3	29 CFR 1910	3.2.2.5.8.G
3.7.B.3	29 CFR 1910	3.2.5.4.5.B
3.7.B.3	29 CFR 1910	3.2.5.5.11.A
3.7.B.3	29 CFR 1910	3.2.5.5.11.B
3.7.B.3	29 CFR 1910	3.2.5.5.11.C
3.7.B.3	29 CFR 1910	3.2.6.2.4.D
3.7.B.3	29 CFR 1910, Subpart D	3.2.1.19.3.A.1
3.7.B.3	29 CFR 1910, Subpart D	3.2.1.19.8.B
3.7.B.3	29 CFR 1910, Subpart E	3.2.1.19.3.A.2
3.7.B.3	29 CFR 1910, Subpart F	3.2.1.19.8.A
3.7.B.3	29 CFR 1910, Subpart F	3.2.1.19.8.B
3.7.B.3	29 CFR 1910, Subpart G	3.2.1.19.3.A.3

SD&TRD Traceability Matrix		
SD&TRD Section		ESFDR Section
3.7.B.3	29 CFR 1910, Subpart H	3.2.1.19.3.C
3.7.B.3	29 CFR 1910, Subpart H	3.2.1.19.3.D
3.7.B.3	29 CFR 1910, Subpart I	3.2.1.19.4.A
3.7.B.3	29 CFR 1910, Subpart J	3.2.1.19.3.A.4
3.7.B.3	29 CFR 1910, Subpart J	3.2.1.19.5.A
3.7.B.3	29 CFR 1910, Subpart O	3.2.1.19.3.D
3.7.B.3	29 CFR 1910, Subpart O	3.2.1.19.7.C
3.7.B.3	29 CFR 1910, Subpart P	3.2.1.19.7.D
3.7.B.3	29 CFR 1910, Subpart Q	3.2.1.19.7.E
3.7.B.3	29 CFR 1910, Subpart S	3.2.1.19.9.A
3.7.B.3	29 CFR 1910.94	3.2.2.4.H
3.7.B.3	29 CFR 1910.94	3.2.2.4.H.1
3.7.B.3	29 CFR 1910.94	3.2.2.4.H.2
3.7.B.3	29 CFR 1910.94	3.2.2.4.H.3
3.7.B.3	29 CFR 1910.94	3.2.5.5.4.A
3.7.B.3	29 CFR 1910.94	3.2.5.5.4.C
3.7.B.3	29 CFR 1910.94	3.2.5.5.4.D
3.7.B.3	29 CFR 1910.94	3.2.5.5.4.E
3.7.B.3	29 CFR 1910.94	3.2.5.5.4.F
3.7.B.3	29 CFR 1910.94	3.2.5.5.4.G
3.7.B.3	29 CFR 1910.94	3.2.5.5.4.H
3.7.B.3	29 CFR 1910.94	3.2.5.5.4.I
3.7.B.3	29 CFR 1910.94	3.2.5.5.4.J
3.7.B.3	29 CFR 1910.94	3.2.5.5.4.K
3.7.B.3	29 CFR 1910.94	3.2.6.4.5.A
3.7.B.3	29 CFR 1910.94	3.2.6.4.5.B
3.7.B.3	29 CFR 1910.95	3.2.1.8.1.D
3.7.B.3	29 CFR 1910.95	3.2.1.19.4.B

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3.7.B.3	29 CFR 1910.132	3.2.1.19.4.C
3.7.B.3	29 CFR 1910.141	3.2.1.8.1.A
3.7.B.3	29 CFR 1910.147	3.2.1.19.7.B
3.7.B.3	29 CFR 1910.151(c)	3.2.1.19.7.F
3.7.B.3	29 CFR 1926	3.2.1.W
3.7.B.3	29 CFR 1926	3.2.1.8.1.B
3.7.B.3	29 CFR 1926	3.2.1.8.1.C
3.7.B.3	29 CFR 1926	3.2.1.8.1.D
3.7.B.3	29 CFR 1926	3.2.1.14.3.C
3.7.B.3	29 CFR 1926	3.2.1.19.1.B
3.7.B.3	29 CFR 1926	3.2.1.19.2.E.2
3.7.B.3	29 CFR 1926	3.2.1.19.5.C
3.7.B.3	29 CFR 1926	3.2.1.19.7.A
3.7.B.3	29 CFR 1926	3.2.1.19.7.B
3.7.B.3	29 CFR 1926	3.2.1.19.7.C
3.7.B.3	29 CFR 1926	3.2.1.19.7.D
3.7.B.3	29 CFR 1926	3.2.1.19.7.E
3.7.B.3	29 CFR 1926	3.2.1.19.8.A
3.7.B.3	29 CFR 1926	3.2.1.19.8.B
3.7.B.3	29 CFR 1926	3.2.1.19.9.A
3.7.B.3	29 CFR 1926	3.2.2.2.C
3.7.B.3	29 CFR 1926	3.2.2.2.3.C
3.7.B.3	29 CFR 1926	3.2.2.4.3.D
3.7.B.3	29 CFR 1926	3.2.2.5.8.G
3.7.B.3	29 CFR 1926	3.2.5.5.11.A
3.7.B.3	29 CFR 1926	3.2.5.5.11.B
3.7.B.3	29 CFR 1926	3.2.5.5.11.C
3.7.B.3	29 CFR 1926	3.2.6.2.4.D

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3.7.B.3	29 CFR 1926, Subpart E	3.2.1.19.4.A
3.7.B.3	29 CFR 1926, Subpart S	3.2.1.H.2(e)i
3.7.B.3	29 CFR 1926, Subpart S	3.2.1.10.2.A.2
3.7.B.3	29 CFR 1926.51(F)	3.2.1.19.7.F
3.7.B.3	29 CFR 1926.59	3.2.1.19.5.A
3.7.B.3	29 CFR 1926.101	3.2.1.19.4.B
3.7.B.3	29 CFR 1926.200	3.2.1.19.5.A
3.7.B.3	29 CFR 1926.800(c)	3.2.1.19.1.B.1
3.7.B.3	29 CFR 1960	3.2.1.AB
3.7.B.3	29 USC 651 et.seq.	3.2.1.W
3.7.B.3	29 USC 651 et.seq.	3.2.1.19.1.A
3.7.B.3	29 USC 651 et.seq.	3.2.2.1.2.D
3.7.B.3	29 USC 651 et.seq.	3.2.2.4.D.3
3.7.B.3	29 USC 651 et.seq.	3.2.2.4.I
3.7.B.3	29 USC 651 et.seq.	3.2.2.4.I.1
3.7.B.3	29 USC 651 et.seq.	3.2.2.4.I.2
3.7.B.3	29 USC 651 et.seq.	3.2.2.4.I.3
3.7.B.3	29 USC 651 et.seq.	3.2.2.4.I.8
3.7.B.3	29 USC 651 et.seq.	3.2.2.5.B
3.7.B.3	29 USC 651 et.seq.	3.2.3.3.F
3.7.B.3	29 USC 651 et.seq.	3.2.5.4.5.I
3.7.B.3	29 USC 651 et.seq.	3.2.5.5.F
3.7.B.3	29 USC 651 et.seq.	3.2.5.5.4.B
3.7.B.3	29 USC 651 et.seq.	3.2.5.5.4.N
3.7.B.3	29 USC 651 et.seq.	3.2.5.5.4.O
3.7.B.3	29 USC 651 et.seq.	3.2.5.5.9.H
3.7.B.3	29 USC 651 et.seq.	3.2.6.2.B
3.7.B.3	29 USC 651 et.seq.	3.2.6.2.1.A

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3.7.B.3	29 USC 651 et.seq.	3.2.6.2.4.Q
3.7.B.3	29 USC 651 et.seq.	3.2.6.4.3.A
3.7.B.3	29 USC 651 et.seq.	3.2.6.5.D
3.7.B.3	29 USC 651 et.seq.	3.2.6.5.G
3.7.B.3	29 USC 651 et.seq.	3.2.6.5.1.C
3.7.B.3	29 USC 651 et.seq.	3.2.8.8.C
3.7.B.3	30 CFR 31	3.2.1.AB
3.7.B.3	30 CFR 32	3.2.1.AB
3.7.B.3	30 CFR 36	3.2.1.AB
3.7.B.3	30 CFR 57	3.2.1.H.2(e)i
3.7.B.3	30 CFR 57	3.2.1.W
3.7.B.3	30 CFR 57	3.2.1.5.G
3.7.B.3	30 CFR 57	3.2.1.8.1.A
3.7.B.3	30 CFR 57	3.2.1.8.1.B
3.7.B.3	30 CFR 57	3.2.1.8.1.C
3.7.B.3	30 CFR 57	3.2.1.8.1.D
3.7.B.3	30 CFR 57	3.2.1.14.3.C
3.7.B.3	30 CFR 57	3.2.1.19.1.B
3.7.B.3	30 CFR 57	3.2.1.19.2.E.1
3.7.B.3	30 CFR 57	3.2.1.19.3.B
3.7.B.3	30 CFR 57	3.2.1.19.7.A
3.7.B.3	30 CFR 57	3.2.1.19.8.A
3.7.B.3	30 CFR 57	3.2.1.19.8.B
3.7.B.3	30 CFR 57	3.2.1.19.9.A
3.7.B.3	30 CFR 57	3.2.2.4.1.9
3.7.B.3	30 CFR 57	3.2.2.4.3.D
3.7.B.3	30 CFR 57	3.2.2.5.5.A
3.7.B.3	30 CFR 57	3.2.2.5.6.B

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3.7.B.3	30 CFR 57	3.2.2.5.8.G
3.7.B.3	30 CFR 57	3.2.2.5.9.D
3.7.B.3	30 CFR 57	3.2.5.3.1.B
3.7.B.3	30 CFR 57	3.2.5.5.9.E
3.7.B.3	30 CFR 57	3.2.5.5.11.A
3.7.B.3	30 CFR 57	3.2.5.5.11.B
3.7.B.3	30 CFR 57	3.2.5.5.11.C
3.7.B.3	30 CFR 57	3.2.6.2.4.D
3.7.B.3	30 CFR 57, Subpart B	3.2.2.4.I
3.7.B.3	30 CFR 57, Subpart B	3.2.2.4.1.A
3.7.B.3	30 CFR 57, Subpart B	3.2.2.4.1.B
3.7.B.3	30 CFR 57, Subpart B	3.2.2.4.1.C
3.7.B.3	30 CFR 57, Subpart B	3.2.2.4.1.E
3.7.B.3	30 CFR 57, Subpart C	3.2.1.10.2.A.2
3.7.B.3	30 CFR 57, Subpart D	3.2.2.4.H
3.7.B.3	30 CFR 57, Subpart D	3.2.2.4.H.1
3.7.B.3	30 CFR 57, Subpart D	3.2.2.4.H.2
3.7.B.3	30 CFR 57, Subpart D	3.2.2.4.H.3
3.7.B.3	30 CFR 57, Subpart D	3.2.5.5.4.A
3.7.B.3	30 CFR 57, Subpart D	3.2.5.5.4.C
3.7.B.3	30 CFR 57, Subpart D	3.2.5.5.4.D
3.7.B.3	30 CFR 57, Subpart D	3.2.5.5.4.E
3.7.B.3	30 CFR 57, Subpart D	3.2.5.5.4.F
3.7.B.3	30 CFR 57, Subpart D	3.2.5.5.4.G
3.7.B.3	30 CFR 57, Subpart D	3.2.5.5.4.H
3.7.B.3	30 CFR 57, Subpart D	3.2.5.5.4.I
3.7.B.3	30 CFR 57, Subpart D	3.2.5.5.4.J
3.7.B.3	30 CFR 57, Subpart D	3.2.5.5.4.K



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SD&TRD Section		ESFDR Section
3.7.B.3	30 CFR 57, Subpart D	3.2.6.4.5.A
3.7.B.3	30 CFR 57, Subpart D	3.2.6.4.5.B
3.7.B.3	30 CFR 57, Subpart E	3.2.2.3.C
3.7.B.3	30 CFR 57, Subpart K	3.2.1.19.9.C
3.7.B.3	30 CFR 57, Subpart M	3.2.1.19.7.C
3.7.B.3	30 CFR 57, Subpart N	3.2.1.19.4.A
3.7.B.3	30 CFR 57, Subpart O	3.2.2.3.C
3.7.B.3	30 CFR 57.5037	3.2.6.5.11.E
3.7.B.3	30 CFR 57.11050	3.2.2.B
3.7.B.3	30 CFR 57.11050	3.2.2.6.D
3.7.B.3	30 CFR 57.11050(b)	3.2.5.4.5.H
3.7.B.3	30 CFR 57.11058	3.2.1.19.1.B.1
3.7.B.3	30 CFR 57.12016	3.2.1.19.7.B
3.7.B.3	30 CFR Ch.I	3.2.1.H.2(e)
3.7.B.3	30 CFR Ch.I	3.2.1.AB
3.7.B.3	33 CFR 323	J.5.1.A-D, J.5.1.1.A, J.5.1.2.A
3.7.B.3	40 CFR 50	J.2.A-B
3.7.B.3	40 CFR 60	J.2.A-B
3.7.B.3	40 CFR 61	J.2.A-B
3.7.B.3	40 CFR 141	J.4.1.A-B
3.7.B.3	40 CFR 143	J.4.1.A-B
3.7.B.3	40 CFR 165	3.2.1.AB
3.7.B.3	40 CFR 204	J.13.A
3.7.B.3	40 CFR 205	J.13.A
3.7.B.3	40 CFR 261	J.6.1.A-C
3.7.B.3	40 CFR 262	J.6.1.A-C
3.7.B.3	40 CFR 270	J.6.1.A-C
3.7.B.3	41 CFR 101-29.603	3.2.1.20.E.1

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3.7.B.3	42 USC 10101 et seq	3.2.2.4.B
3.7.B.3	42 USC 10101 et seq	J.9.A
3.7.B.3	42 USC 10133(c)(1)	3.2.1.4.B
3.7.B.3	42 USC 10133(c)(1)	3.2.2.4.B.1
3.7.B.3	42 USC 10133(c)(1)	3.2.2.4.C
3.7.B.3	42 USC 10133(c)(1)	3.2.2.4.C.1
3.7.B.3	42 USC 10133(c)(1)	3.2.2.4.C.2
3.7.B.3	42 USC 10133(c)(1)	3.2.2.4.C.3
3.7.B.3	42 USC 10133(c)(1)	3.2.2.4.C.4
3.7.B.3	42 USC 10133(c)(1)	3.2.2.4.C.5
3.7.B.3	42 USC 10133(c)(1)	3.2.2.4.C.6
3.7.B.3	42 USC 10133(c)(1)	3.2.2.4.C.7
3.7.B.3	42 USC 10133(c)(1)	3.2.2.4.C.8
3.7.B.3	42 USC 10133(c)(1)	3.2.2.4.C.9
3.7.B.3	42 USC 10133(c)(1)	3.2.2.4.C.10
3.7.B.3	42 USC 10133(c)(1)	3.2.2.4.C.11
3.7.B.3	42 USC 10133(c)(1)	3.2.2.4.C.12
3.7.B.3	42 USC 10133(c)(1)	3.2.2.4.D.8
3.7.B.3	42 USC 10133(c)(1)	3.2.2.4.D.17(a)
3.7.B.3	42 USC 10133(c)(1)	3.2.5.5.I
3.7.B.3	42 USC 10133(c)(1)	3.2.6.5.J
3.7.B.3	42 USC 10133(c)(1)	3.2.8.8.B
3.7.B.3	42 USC 10133(c)(1)	B.3.1.3.A-B, B.3.1.4
3.7.B.3	42 USC 10133(c)(1)	B.3.2.3, B.3.2.4
3.7.B.3	42 USC 10133(c)(1)	B.3.3.3, B.3.3.4
3.7.B.3	42 USC 10133(c)(1)	B.3.4.3.A-D, B.3.4.4.A-B
3.7.B.3	42 USC 10133(c)(1)	B.3.5.3.A-C, B.3.5.4.A-B
3.7.B.3	42 USC 10133(c)(1)	B.3.6.3.A-B

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3.7.B.3	42 USC 10133(c)(1)	B.3.7.3, B.3.7.4.A-D
3.7.B.3	42 USC 10133(c)(1)	B.4.1.3.A-E, B.4.1.4
3.7.B.3	49 CFR 177	J.6.1.A-C
3.7.B.3	49 USC 1501 et seq	3.2.2.3.J
3.7.B.3	ACI 318	3.2.2.4.2.A
3.7.B.3	ACI 318	3.2.2.4.2.B
3.7.B.3	ACI 349	3.2.2.4.2.A
3.7.B.3	ACI 349	3.2.2.4.2.B
3.7.B.3	ANSI R15.16	3.2.1.AB
3.7.B.3	ANSI/ASTM D4256	3.2.1.AB
3.7.B.3	ANSI/C2	3.2.1.19.9.C
3.7.B.3	ANSI/HFS 100-1988	3.2.1.20.A
3.7.B.3	ANSI/S-3.18	3.2.1.8.1.E
3.7.B.3	ASCE 7-88	3.2.1.10.1.J
3.7.B.3	BLM Vol.34	3.2.1.7.A
3.7.B.3	BLM Vol.34	3.2.2.1.3.J
3.7.B.3	BLM Vol.34	J.9.A
3.7.B.3	CMAA 70	3.2.1.AB
3.7.B.3	DOE 3790.1A	3.2.1.AB
3.7.B.3	DOE Order 4330.4A, I.3.1.4	3.2.1.27.A
3.7.B.3	DOE Order 4700.1, p.V-17, g	3.2.1.9.3.C.1(b)
3.7.B.3	DOE Order 4700.1, p.V-17, g	3.2.1.9.3.C.1(c)
3.7.B.3	DOE Order 4700.1, p.V-17, g	3.2.1.9.3.C.1(d)
3.7.B.3	DOE Order 4700.1, p.V-17, g	3.2.1.9.3.C.1(e)
3.7.B.3	DOE Order 4700.1, p.V-17, g	3.2.1.9.3.C.1(f)
3.7.B.3	DOE Order 5480.4	3.2.1.W
3.7.B.3	DOE Order 5480.4	3.2.1.10.2.A.1(a)
3.7.B.3	DOE Order 5480.4	3.2.2.1.2.D

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3.7.B.3	DOE Order 5480.4	3.2.2.3.B
3.7.B.3	DOE Order 5480.4	3.2.2.4.K.1
3.7.B.3	DOE Order 5480.7	3.2.1.10.2.A.1(a)
3.7.B.3	DOE Order 5480.7	3.2.5.A.2
3.7.B.3	DOE Order 6430.1A	3.2.1.E
3.7.B.3	DOE Order 6430.1A	3.2.1.G
3.7.B.3	DOE Order 6430.1A	3.2.1.P
3.7.B.3	DOE Order 6430.1A	3.2.1.Q
3.7.B.3	DOE Order 6430.1A	3.2.1.R
3.7.B.3	DOE Order 6430.1A	3.2.1.9.3.C.1(a)
3.7.B.3	DOE Order 6430.1A	3.2.1.9.3.C.1(g)
3.7.B.3	DOE Order 6430.1A	3.2.2.C
3.7.B.3	DOE Order 6430.1A	3.2.5.A.2
3.7.B.3	DOE Order 6430.1A, 0101-2	3.2.1.S
3.7.B.3	DOE Order 6430.1A, 0109	3.2.1.17.B
3.7.B.3	DOE Order 6430.1A, 0110-6	3.2.1.10.2.A.1
3.7.B.3	DOE Order 6430.1A, 0110-6	3.2.1.10.2.A.1(a)
3.7.B.3	DOE Order 6430.1A, 0110-6	3.2.1.10.2.A.1(b)
3.7.B.3	DOE Order 6430.1A, 0110-6	3.2.1.10.2.A.1(c)
3.7.B.3	DOE Order 6430.1A, 0110-6	3.2.1.10.2.A.1(d)
3.7.B.3	DOE Order 6430.1A, 0110-6.3	3.2.1.10.2.B.1
3.7.B.3	DOE Order 6430.1A, 0110-6.3	3.2.1.10.2.B.2
3.7.B.3	DOE Order 6430.1A, 0110-13.2	3.2.1.14.3.A
3.7.B.3	DOE Order 6430.1A, 0110-13.2	3.2.1.14.3.B
3.7.B.3	DOE Order 6430.1A, 0110-99.0.4	3.2.1.5.D
3.7.B.3	DOE Order 6430.1A, 0110-99.0.4	3.2.1.5.F
3.7.B.3	DOE Order 6430.1A, 0110-99.8.3	3.2.1.15.C
3.7.B.3	DOE Order 6430.1A, 0111-2	3.2.1.10.1.B

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3.7.B.3	DOE Order 6430.1A, 0111-2.3.2	3.2.1.10.1.J
3.7.B.3	DOE Order 6430.1A, 0111-2.5	3.2.1.10.1.C
3.7.B.3	DOE Order 6430.1A, 0111-2.5	3.2.6.2.1.G
3.7.B.3	DOE Order 6430.1A, 0111-2.7	3.2.1.10.1.E
3.7.B.3	DOE Order 6430.1A, 0111-2.8.1	3.2.1.10.2.C
3.7.B.3	DOE Order 6430.1A, 0111-2.8.2	3.2.1.10.1.H.1
3.7.B.3	DOE Order 6430.1A, 0111-2.8.2	3.2.1.10.1.H.2
3.7.B.3	DOE Order 6430.1A, 0111-2.8.4	3.2.1.10.1.I
3.7.B.3	DOE Order 6430.1A, 0111-2.8.5	3.2.1.10.2.D
3.7.B.3	DOE Order 6430.1A, 0111-2.10	3.2.1.10.1.D
3.7.B.3	DOE Order 6430.1A, 0200-99.8.1	3.2.1.15.A
3.7.B.3	DOE Order 6430.1A, 0200-99.8.1	3.2.6.2.4.N
3.7.B.3	DOE Order 6430.1A, 0200-99.8.1	3.2.6.4
3.7.B.3	DOE Order 6430.1A, 0283	3.2.1.14.1
3.7.B.3	DOE Order 6430.1A, 0283	3.2.1.14.2.A
3.7.B.3	DOE Order 6430.1A, 0283	3.2.1.14.2.B
3.7.B.3	DOE Order 6430.1A, 0283	3.2.1.14.3.A
3.7.B.3	DOE Order 6430.1A, 0283	3.2.1.14.3.B
3.7.B.3	DOE Order 6430.1A, 1300-12.4.11	3.2.1.16.A
3.7.B.3	DOE Order 6430.1A, 1300-12.4.11	3.2.1.16.B
3.7.B.3	DOE Order 6430.1A, 1300-12.4.11	3.2.1.16.C
3.7.B.3	DOE Order 6430.1A, 1300-12.4.11	3.2.1.16.D
3.7.B.3	DOE Order 6430.1A, 1300-12.4.11	3.2.1.16.E
3.7.B.3	DOE Order 6430.1A, 1655-1	3.2.1.19.6.C
3.7.B.3	DOE Order 6430.1A, 1655-99.8	3.2.1.15.B
3.7.B.3	DOE/RW-0194	3.2.1.AB
3.7.B.3	DOE/RW-0199	3.2.1.AB
3.7.B.3	MTR 10090	3.2.1.20.F

SD&TRD Traceability Matrix		
SD&TRD Section		ESFDR Section
3.7.B.3	NFPA 70	3.2.1.19.3.C
3.7.B.3	NFPA 70	3.2.1.19.9.A
3.7.B.3	NFPA 70	3.2.1.19.9.C
3.7.B.3	QARD	3.2.1.17.A
3.7.B.3	QARD	3.2.1.21.A.1
3.7.B.3	QARD	3.2.1.25.1.B
3.7.B.3	QARD	3.2.1.25.2
3.7.B.3	QARD	3.2.1.25.3
3.7.B.3	QARD	3.2.1.25.5
3.7.B.3	QARD	3.2.1.25.6.B
3.7.B.3	QARD	3.2.1.25.6.B.1
3.7.B.3	QARD	3.2.1.25.6.B.2
3.7.B.3	QARD	3.2.1.25.6.B.3
3.7.B.3	QARD	3.2.1.25.6.B.4
3.7.B.3	QARD	3.2.1.25.6.B.5
3.7.B.3	QARD	3.2.1.25.6.B.6
3.7.B.3	QARD	3.2.1.25.6.B.7
3.7.B.3	QARD	3.2.1.25.6.B.8
3.7.B.3	QARD	3.2.1.25.6.B.9
3.7.B.3	QARD	3.2.1.25.6.B.10
3.7.B.3	QARD	3.2.1.25.6.B.11
3.7.B.3	QARD	3.2.1.25.7
3.7.B.3	QARD	3.2.1.29
3.7.B.3	QARD	3.2.2.4.L.8(c)
3.7.B.3	UCRL 15910	3.2.1.10.1.F
3.7.B.3	UCRL 15910	3.2.2.1.2.B
3.7.B.3	UCRL 15910	3.2.2.1.2.B.1
3.7.B.3	UCRL 15910	3.2.2.1.2.B.2

SD&TRD Traceability Matrix		
SD&TRD Section		ESFDR Section
3.7.B.3	UCRL 15910	3.2.2.1.2.B.3
3.7.B.3	UCRL 53526	3.2.1.AB
3.7.C		3.2.1.AD
3.7.C		3.2.1.3.B
3.7.D		3.2.1.U
3.7.D		3.2.2.1.D
3.7.D		3.2.2.1.H
3.7.D		3.2.2.1.K
3.7.D		3.2.2.1.M
3.7.D		3.2.2.1.N
3.7.D		3.2.2.1.O
3.7.D		3.2.2.1.2.E
3.7.D		3.2.2.1.2.G
3.7.D		3.2.2.1.3.G
3.7.D		3.2.2.1.3.I
3.7.D		3.2.2.1.4
3.7.D		3.2.2.2.3.A
3.7.D		3.2.2.2.3.B
3.7.D		3.2.2.2.3.C
3.7.D		3.2.2.2.3.D
3.7.D		3.2.2.2.5.B
3.7.D		3.2.2.2.5.C
3.7.D		3.2.2.3.3.B
3.7.D		3.2.2.3.4.B
3.7.E		3.2.1.M
3.7.E		3.2.1.4.A
3.7.E		3.2.1.4.B
3.7.E		3.2.1.5.A

SD&TRD Traceability Matrix	
SD&TRD Section	ESFDR Section
3.7.E	3.2.2.2.D
3.7.E	3.2.2.5.5.A
3.7.E	3.2.9.4.A
3.7.F	3.2.1.O
3.7.1.1	Allocated to the SBTFRD
3.7.1.2	Allocated to the SBTFRD
3.7.1.2.A	Allocated to the SBTFRD
3.7.1.2.B	Allocated to the SBTFRD
3.7.1.2.C	Allocated to the SBTFRD
3.7.1.2.1	Allocated to the SBTFRD
3.7.1.2.1.A	Allocated to the SBTFRD
3.7.1.2.1.B	Allocated to the SBTFRD
3.7.1.2.2	Allocated to the SBTFRD
3.7.2	3.2.2.4.D.15
3.7.2	3.2.2.4.D.15(a)
3.7.2	3.2.2.4.D.17(a)
3.7.2.1	3.2.1.4.G
3.7.2.2.A	3.2.1.M
3.7.2.2.A	3.2.1.M.1
3.7.2.2.A	3.2.1.M.2
3.7.2.2.A	3.2.1.M.3
3.7.2.2.A	3.2.1.M.4
3.7.2.2.A	3.2.1.M.5
3.7.2.2.A	3.2.1.M.5(a)
3.7.2.2.A	3.2.1.M.5(b)
3.7.2.2.A	3.2.1.1.A
3.7.2.2.A	3.2.1.1.B
3.7.2.2.A	3.2.1.4.A



SD&TRD Traceability Matrix	
SD&TRD Section	ESFDR Section
3.7.2.2.A	3.2.1.4.B.1
3.7.2.2.A	3.2.1.4.B.1(a)
3.7.2.2.A	3.2.1.4.B.1(b)
3.7.2.2.A	3.2.1.4.B.1(b)i
3.7.2.2.A	3.2.1.4.B.1(b)ii
3.7.2.2.A	3.2.1.4.B.1(b)iii
3.7.2.2.A	3.2.1.4.B.1(b)iv
3.7.2.2.A	3.2.1.4.B.1(b)v
3.7.2.2.A	3.2.1.4.B.1(b)vi
3.7.2.2.A	3.2.1.4.B.2
3.7.2.2.A	3.2.1.4.B.3
3.7.2.2.A	3.2.1.4.B.4
3.7.2.2.A	3.2.1.4.B.5
3.7.2.2.A	3.2.1.4.F
3.7.2.2.A	3.2.1.5.A
3.7.2.2.A	3.2.1.5.A.1
3.7.2.2.A	3.2.2.4.D
3.7.2.2.A	3.2.2.4.D.6
3.7.2.2.A	3.2.2.4.D.7
3.7.2.2.A	3.2.2.4.X.6
3.7.2.2.A	3.2.2.5.5.A
3.7.2.2.A	3.2.2.5.6.B
3.7.2.2.A	3.2.2.5.10.A
3.7.2.2.A	3.2.5.4.5.M
3.7.2.2.A	3.2.6.5.I
3.7.2.2.A	3.2.9.4.A
3.7.2.2.A	3.2.9.4.A.1
3.7.2.2.B	3.2.2.E

SD&TRD Traceability Matrix	
SD&TRD Section	ESFDR Section
3.7.2.2.B	3.2.2.4.B
3.7.2.2.B	3.2.2.4.B.2
3.7.2.2.C	3.2.2.F
3.7.2.2.D	3.2.1.H.1(a)
3.7.2.2.D	3.2.1.H.1(b)
3.7.2.2.D	3.2.1.H.1(c)
3.7.2.2.D	3.2.1.H.1(d)
3.7.2.2.D	3.2.2.G
3.7.2.2.D	3.2.2.6.B
3.7.2.2.E	3.2.1.4.C
3.7.2.2.F	3.2.1.J.13
3.7.2.2.G	3.2.1.J.13
3.7.2.2.H	3.2.1.J.2
3.7.2.2.I	3.2.1.M.6
3.7.2.2.J	3.2.1.8.1.F
3.7.2.2.1	3.2.1.1
3.7.2.2.1	3.2.1.1.D
3.7.2.2.1	3.2.2.1.C
3.7.2.2.1	3.2.2.1.E
3.7.2.2.1	3.2.2.1.G
3.7.2.2.1	3.2.2.1.P
3.7.2.2.1	3.2.2.1.Q
3.7.2.2.1	3.2.2.1.1.A
3.7.2.2.1	3.2.2.1.1.A.1
3.7.2.2.1	3.2.2.1.1.A.2
3.7.2.2.1	3.2.2.1.1.A.3
3.7.2.2.1	3.2.2.1.1.A.4
3.7.2.2.1	3.2.2.1.1.A.5

SD&TRD Traceability Matrix	
SD&TRD Section	ESFDR Section
3.7.2.2.1	3.2.2.1.1.A.6
3.7.2.2.1	3.2.2.1.1.A.7
3.7.2.2.1	3.2.2.1.1.A.8
3.7.2.2.1	3.2.2.1.1.A.9
3.7.2.2.1	3.2.2.1.1.A.10
3.7.2.2.1	3.2.2.1.1.A.11
3.7.2.2.1	3.2.2.1.1.A.12
3.7.2.2.1	3.2.2.1.1.A.13
3.7.2.2.1	3.2.2.1.1.B
3.7.2.2.1	3.2.2.1.1.C
3.7.2.2.1	3.2.2.1.2.A
3.7.2.2.1	3.2.2.1.2.A.1
3.7.2.2.1	3.2.2.1.2.A.1(a)
3.7.2.2.1	3.2.2.1.2.A.1(b)
3.7.2.2.1	3.2.2.1.2.A.1(c)
3.7.2.2.1	3.2.2.1.2.A.1(d)
3.7.2.2.1	3.2.2.1.2.A.1(e)
3.7.2.2.1	3.2.2.1.2.A.1(f)
3.7.2.2.1	3.2.2.1.2.A.2
3.7.2.2.1	3.2.2.1.2.A.2(a)
3.7.2.2.1	3.2.2.1.2.A.2(b)
3.7.2.2.1	3.2.2.1.2.A.2(c)
3.7.2.2.1	3.2.2.1.2.A.2(d)
3.7.2.2.1	3.2.2.1.2.A.2(e)
3.7.2.2.1	3.2.2.1.2.A.2(f)
3.7.2.2.1	3.2.2.1.2.A.2(g)
3.7.2.2.1	3.2.2.1.2.A.2(h)
3.7.2.2.1	3.2.2.1.2.A.2(i)

SD&TRD Traceability Matrix	
SD&TRD Section	ESFDR Section
3.7.2.2.1	3.2.2.1.2.A.2(j)
3.7.2.2.1	3.2.2.1.2.A.3
3.7.2.2.1	3.2.2.1.2.A.3(a)
3.7.2.2.1	3.2.2.1.2.A.3(b)
3.7.2.2.1	3.2.2.1.2.A.3(c)
3.7.2.2.1	3.2.2.1.2.A.3(d)
3.7.2.2.1	3.2.2.1.2.A.3(e)
3.7.2.2.1	3.2.2.1.2.A.3(f)
3.7.2.2.1	3.2.2.1.2.A.4
3.7.2.2.1	3.2.2.1.2.A.4(a)
3.7.2.2.1	3.2.2.1.2.A.5
3.7.2.2.1	3.2.2.1.2.A.5(a)
3.7.2.2.1	3.2.2.1.2.A.5(b)
3.7.2.2.1	3.2.2.1.2.A.5(c)
3.7.2.2.1	3.2.2.1.2.A.5(d)
3.7.2.2.1	3.2.2.1.2.A.5(e)
3.7.2.2.1	3.2.2.1.2.A.5(f)
3.7.2.2.1	3.2.2.1.2.A.5(g)
3.7.2.2.1	3.2.2.1.2.A.6
3.7.2.2.1	3.2.2.1.2.A.6(a)
3.7.2.2.1	3.2.2.1.2.A.6(b)
3.7.2.2.1	3.2.2.1.2.A.6(c)
3.7.2.2.1	3.2.2.1.2.A.6(d)
3.7.2.2.1	3.2.2.1.2.A.6(e)
3.7.2.2.1	3.2.2.1.2.C
3.7.2.2.1	3.2.2.1.3.A
3.7.2.2.1	3.2.2.1.3.B
3.7.2.2.1	3.2.2.1.3.C

SD&TRD Traceability Matrix	
SD&TRD Section	ESFDR Section
3.7.2.2.1	3.2.2.1.3.D
3.7.2.2.1	3.2.2.1.3.E
3.7.2.2.1	3.2.2.1.3.F
3.7.2.2.1	3.2.2.1.3.H
3.7.2.2.1	3.2.2.1.3.J
3.7.2.2.1	3.2.9.1
3.7.2.2.2	3.2.1.X
3.7.2.2.2	3.2.1.2
3.7.2.2.2	3.2.1.2.A
3.7.2.2.2	3.2.1.5.B
3.7.2.2.2	3.2.2.2.A
3.7.2.2.2	3.2.2.2.B
3.7.2.2.2	3.2.2.2.C
3.7.2.2.2	3.2.2.2.2.A
3.7.2.2.2	3.2.2.2.2.B
3.7.2.2.2	3.2.2.2.2.C
3.7.2.2.2	3.2.2.2.2.F
3.7.2.2.2	3.2.2.2.2.G
3.7.2.2.2	3.2.2.2.2.H
3.7.2.2.2	3.2.2.2.2.I
3.7.2.2.2	3.2.2.2.2.J
3.7.2.2.2	3.2.2.2.2.K
3.7.2.2.2	3.2.2.2.2.L
3.7.2.2.2	3.2.2.2.2.M
3.7.2.2.2	3.2.2.2.2.N
3.7.2.2.2	3.2.2.2.2.O
3.7.2.2.2	3.2.2.2.5.A
3.7.2.2.2	3.2.2.2.7

SD&TRD Traceability Matrix	
SD&TRD Section	ESFDR Section
3.7.2.2.2	3.2.3.3.E
3.7.2.2.2	3.2.3.3.6.H
3.7.2.2.2	3.2.3.3.7.E
3.7.2.2.2	3.2.5.B
3.7.2.2.2	3.2.5.2
3.7.2.2.2	3.2.5.2.2
3.7.2.2.2	3.2.5.2.6.A
3.7.2.2.2	3.2.5.2.6.B
3.7.2.2.2	3.2.5.2.6.C
3.7.2.2.2	3.2.5.2.6.D
3.7.2.2.2	3.2.5.2.6.E
3.7.2.2.2	3.2.5.3.1.A
3.7.2.2.2	3.2.5.3.1.C
3.7.2.2.2	3.2.5.3.1.D
3.7.2.2.2	3.2.5.3.1.E
3.7.2.2.2	3.2.5.3.1.F
3.7.2.2.2	3.2.5.3.1.G
3.7.2.2.2	3.2.5.3.1.H
3.7.2.2.2	3.2.5.4.5.K
3.7.2.2.2	3.2.6.2.A
3.7.2.2.2	3.2.6.2.1.A
3.7.2.2.2	3.2.6.2.1.B
3.7.2.2.2	3.2.6.2.1.C
3.7.2.2.2	3.2.6.2.1.D
3.7.2.2.2	3.2.6.2.1.E
3.7.2.2.2	3.2.6.2.1.F
3.7.2.2.2	3.2.6.2.1.F.1
3.7.2.2.2	3.2.6.2.1.F.2

SD&TRD Traceability Matrix	
SD&TRD Section	ESFDR Section
3.7.2.2.2	3.2.6.2.1.F.3
3.7.2.2.2	3.2.6.2.1.F.4
3.7.2.2.2	3.2.6.2.1.F.5
3.7.2.2.2	3.2.6.2.1.F.6
3.7.2.2.2	3.2.6.2.1.F.7
3.7.2.2.2	3.2.6.2.1.F.8
3.7.2.2.2	3.2.6.2.1.F.9
3.7.2.2.2	3.2.6.2.1.F.10
3.7.2.2.2	3.2.6.2.1.H
3.7.2.2.2	3.2.6.2.1.H.1
3.7.2.2.2	3.2.6.2.1.H.2
3.7.2.2.2	3.2.6.2.1.H.3
3.7.2.2.2	3.2.6.2.1.I
3.7.2.2.2	3.2.6.2.1.J
3.7.2.2.2	3.2.6.2.1.K
3.7.2.2.2	3.2.6.2.1.M
3.7.2.2.2	3.2.6.2.1.N
3.7.2.2.2	3.2.6.2.4.A
3.7.2.2.2	3.2.6.2.4.B
3.7.2.2.2	3.2.6.2.4.C
3.7.2.2.2	3.2.6.2.4.D
3.7.2.2.2	3.2.6.2.4.E
3.7.2.2.2	3.2.6.2.4.F
3.7.2.2.2	3.2.6.2.4.G
3.7.2.2.2	3.2.6.2.4.H
3.7.2.2.2	3.2.6.2.4.I
3.7.2.2.2	3.2.6.2.4.J
3.7.2.2.2	3.2.6.2.4.K

SD&TRD Traceability Matrix	
SD&TRD Section	ESFDR Section
3.7.2.2.2	3.2.6.2.4.L
3.7.2.2.2	3.2.6.2.4.M
3.7.2.2.2	3.2.6.2.4.O
3.7.2.2.2	3.2.6.2.4.P
3.7.2.2.2	3.2.6.3
3.7.2.2.2	3.2.6.3.1
3.7.2.2.2	3.2.6.3.3
3.7.2.2.3	3.2.1.X
3.7.2.2.3 A	3.2.3.3.8.F
3.7.2.2.3.A	3.2.1.X
3.7.2.2.3.A	3.2.1.3
3.7.2.2.3.A	3.2.1.3.A
3.7.2.2.3.A	3.2.2.3.A
3.7.2.2.3.A	3.2.2.3.D
3.7.2.2.3.A	3.2.2.3.E
3.7.2.2.3.A	3.2.2.3.H
3.7.2.2.3.A	3.2.2.3.I
3.7.2.2.3.A	3.2.2.3.2
3.7.2.2.3.A	3.2.2.3.3.A
3.7.2.2.3.A	3.2.2.3.4.A
3.7.2.2.3.A	3.2.2.3.4.A.1
3.7.2.2.3.A	3.2.2.3.4.A.2
3.7.2.2.3.A	3.2.2.3.4.A.3
3.7.2.2.3.A	3.2.2.3.4.A.4
3.7.2.2.3.A	3.2.2.3.4.A.5
3.7.2.2.3.A	3.2.2.3.4.A.6
3.7.2.2.3.A	3.2.2.3.4.C
3.7.2.2.3.A	3.2.2.3.4.D



SD&TRD Traceability Matrix	
SD&TRD Section	ESFDR Section
3.7.2.2.3.A	3.2.2.3.4.E
3.7.2.2.3.A	3.2.2.3.4.F
3.7.2.2.3.A	3.2.2.3.4.G
3.7.2.2.3.A	3.2.2.3.5.A
3.7.2.2.3.A	3.2.2.3.5.A.1
3.7.2.2.3.A	3.2.2.3.5.A.2
3.7.2.2.3.A	3.2.2.3.5.A.3
3.7.2.2.3.A	3.2.2.3.5.A.4
3.7.2.2.3.A	3.2.2.3.5.A.5
3.7.2.2.3.A	3.2.2.3.5.A.6
3.7.2.2.3.A	3.2.2.3.5.A.7
3.7.2.2.3.A	3.2.2.3.5.A.8
3.7.2.2.3.A	3.2.2.3.5.A.9
3.7.2.2.3.A	3.2.2.3.5.A.10
3.7.2.2.3.A	3.2.2.3.5.A.11
3.7.2.2.3.A	3.2.2.3.5.B
3.7.2.2.3.A	3.2.2.3.5.C
3.7.2.2.3.A	3.2.2.3.5.D
3.7.2.2.3.A	3.2.3.3.A
3.7.2.2.3.A	3.2.3.3.A.1
3.7.2.2.3.A	3.2.3.3.A.2
3.7.2.2.3.A	3.2.3.3.A.3
3.7.2.2.3.A	3.2.3.3.A.4
3.7.2.2.3.A	3.2.3.3.A.5
3.7.2.2.3.A	3.2.3.3.A.6
3.7.2.2.3.A	3.2.3.3.A.7
3.7.2.2.3.A	3.2.3.3.A.8
3.7.2.2.3.A	3.2.3.3.A.9

SD&TRD Traceability Matrix	
SD&TRD Section	ESFDR Section
3.7.2.2.3.A	3.2.3.3.A.10
3.7.2.2.3.A	3.2.3.3.A.11
3.7.2.2.3.A	3.2.3.3.A.12
3.7.2.2.3.A	3.2.3.3.A.13
3.7.2.2.3.A	3.2.3.3.A.14
3.7.2.2.3.A	3.2.3.3.A.15
3.7.2.2.3.A	3.2.3.3.A.16
3.7.2.2.3.A	3.2.3.3.A.17
3.7.2.2.3.A	3.2.3.3.A.18
3.7.2.2.3.A	3.2.3.3.A.19
3.7.2.2.3.A	3.2.3.3.A.20
3.7.2.2.3.A	3.2.3.3.A.21
3.7.2.2.3.A	3.2.3.3.B
3.7.2.2.3.A	3.2.3.3.C
3.7.2.2.3.A	3.2.3.3.D
3.7.2.2.3.A	3.2.3.3.G
3.7.2.2.3.A	3.2.3.3.H
3.7.2.2.3.A	3.2.3.3.6.A
3.7.2.2.3.A	3.2.3.3.6.B
3.7.2.2.3.A	3.2.3.3.6.C
3.7.2.2.3.A	3.2.3.3.6.D
3.7.2.2.3.A	3.2.3.3.6.E
3.7.2.2.3.A	3.2.3.3.6.F
3.7.2.2.3.A	3.2.3.3.6.G
3.7.2.2.3.A	3.2.3.3.6.H
3.7.2.2.3.A	3.2.3.3.6.I
3.7.2.2.3.A	3.2.3.3.6.J
3.7.2.2.3.A	3.2.3.3.7.A

SD&TRD Traceability Matrix	
SD&TRD Section	ESFDR Section
3.7.2.2.3.A	3.2.3.3.7.B
3.7.2.2.3.A	3.2.3.3.7.C
3.7.2.2.3.A	3.2.3.3.7.D
3.7.2.2.3.A	3.2.3.3.7.E
3.7.2.2.3.A	3.2.3.3.7.F
3.7.2.2.3.A	3.2.3.3.8.A
3.7.2.2.3.A	3.2.3.3.8.A.1
3.7.2.2.3.A	3.2.3.3.8.A.2
3.7.2.2.3.A	3.2.3.3.8.A.3
3.7.2.2.3.A	3.2.3.3.8.A.4
3.7.2.2.3.A	3.2.3.3.8.A.5
3.7.2.2.3.A	3.2.3.3.8.A.6
3.7.2.2.3.A	3.2.3.3.8.B
3.7.2.2.3.A	3.2.3.3.8.C
3.7.2.2.3.A	3.2.3.3.8.D
3.7.2.2.3.A	3.2.3.3.8.E
3.7.2.2.3.A	3.2.3.3.8.G
3.7.2.2.3.A	3.2.3.3.9.A
3.7.2.2.3.A	3.2.3.3.9.B
3.7.2.2.3.A	3.2.3.3.9.C
3.7.2.2.3.A	3.2.3.3.9.C.1
3.7.2.2.3.A	3.2.3.3.9.C.2
3.7.2.2.3.A	3.2.3.3.9.C.3
3.7.2.2.3.A	3.2.3.3.9.C.4
3.7.2.2.3.A	3.2.3.3.9.C.5
3.7.2.2.3.A	3.2.3.3.9.C.6
3.7.2.2.3.A	3.2.3.3.9.C.7
3.7.2.2.3.A	3.2.3.3.9.D

SD&TRD Traceability Matrix	
SD&TRD Section	ESFDR Section
3.7.2.2.3.A	3.2.3.5.11
3.7.2.2.3.A	3.2.10.3
3.7.2.2.3.A	3.2.10.3.5
3.7.2.2.3.A	3.2.10.3.7
3.7.2.2.3.B	3.2.2.3.J
3.7.2.2.4.A	3.2.2.1.2.D
3.7.2.2.4.A	3.2.2.3.B
3.7.2.2.4.B	3.2.2.3.C
3.7.2.2.5	3.2.1.14.3.C
3.7.2.2.5	3.2.5.3.1.B
3.7.2.2.6	3.2.1.4
3.7.2.2.6	3.2.2.4.A.1
3.7.2.2.6	3.2.2.4.A.1(a)
3.7.2.2.6	3.2.2.4.A.1(b)
3.7.2.2.6	3.2.2.4.A.1(c)
3.7.2.2.6	3.2.2.4.A.2
3.7.2.2.6	3.2.2.4.A.3
3.7.2.2.6	3.2.2.4.D.13
3.7.2.2.6	3.2.2.4.D.14
3.7.2.2.6	3.2.2.4.E
3.7.2.2.6	3.2.2.4.E.1
3.7.2.2.6	3.2.2.4.E.2
3.7.2.2.6	3.2.2.4.F
3.7.2.2.6	3.2.2.4.F.1
3.7.2.2.6	3.2.2.4.F.2
3.7.2.2.6	3.2.2.4.F.3
3.7.2.2.6	3.2.2.4.F.4
3.7.2.2.6	3.2.2.4.I

SD&TRD Traceability Matrix	
SD&TRD Section	ESFDR Section
3.7.2.2.6	3.2.2.4.I.4
3.7.2.2.6	3.2.2.4.I.6
3.7.2.2.6	3.2.2.4.I.7
3.7.2.2.6	3.2.2.4.I.11
3.7.2.2.6	3.2.2.4.J
3.7.2.2.6	3.2.2.4.1.A
3.7.2.2.6	3.2.2.4.1.B
3.7.2.2.6	3.2.2.4.1.C
3.7.2.2.6	3.2.2.4.1.E
3.7.2.2.6	3.2.2.4.2.C
3.7.2.2.6	3.2.2.4.2.D
3.7.2.2.6	3.2.2.4.3.A
3.7.2.2.6	3.2.2.4.3.B
3.7.2.2.6	3.2.2.4.3.C
3.7.2.2.6	3.2.2.4.3.D
3.7.2.2.6	3.2.2.4.3.F
3.7.2.2.6	3.2.2.4.3.H
3.7.2.2.6	3.2.2.4.3.I
3.7.2.2.6	3.2.2.4.4.A
3.7.2.2.6	3.2.2.4.4.B
3.7.2.2.6	3.2.2.4.6.A
3.7.2.2.6	3.2.2.4.6.B
3.7.2.2.6	3.2.2.4.6.C
3.7.2.2.6	3.2.2.4.6.D
3.7.2.2.6	3.2.2.5.A
3.7.2.2.6	3.2.4.4.2.A
3.7.2.2.6	3.2.4.4.2.B
3.7.2.2.6	3.2.4.4.4.A

SD&TRD Traceability Matrix	
SD&TRD Section	ESFDR Section
3.7.2.2.6	3.2.4.4.4.B
3.7.2.2.6	3.2.4.4.4.C
3.7.2.2.6	3.2.4.4.4.D
3.7.2.2.6	3.2.4.4.4.E
3.7.2.2.6	3.2.4.4.4.F
3.7.2.2.6	3.2.4.4.4.G
3.7.2.2.6	3.2.4.4.4.G.1
3.7.2.2.6	3.2.4.4.4.G.2
3.7.2.2.6	3.2.4.4.4.G.3
3.7.2.2.6	3.2.4.4.4.G.4
3.7.2.2.6	3.2.4.4.4.G.5
3.7.2.2.6	3.2.4.4.4.G.6
3.7.2.2.6	3.2.4.4.4.G.7
3.7.2.2.6	3.2.4.4.4.G.8
3.7.2.2.6	3.2.4.4.5
3.7.2.2.6	3.2.5.4.5.A
3.7.2.2.6	3.2.5.4.5.B
3.7.2.2.6	3.2.5.4.5.C
3.7.2.2.6	3.2.5.4.5.D
3.7.2.2.6	3.2.5.4.5.E
3.7.2.2.6	3.2.5.4.5.F
3.7.2.2.6	3.2.5.4.5.G
3.7.2.2.6	3.2.5.4.5.J
3.7.2.2.6	3.2.5.4.5.L
3.7.2.2.6	3.2.5.4.5.N
3.7.2.2.6	3.2.9.A
3.7.2.2.7.A	3.2.1.19.1.B.1
3.7.2.2.7.B	3.2.2.4.I

SD&TRD Traceability Matrix	
SD&TRD Section	ESFDR Section
3.7.2.2.7.B	3.2.2.4.1.A
3.7.2.2.7.B	3.2.2.4.1.B
3.7.2.2.7.B	3.2.2.4.1.C
3.7.2.2.7.B	3.2.2.4.1.E
3.7.2.2.8	3.2.2.5.5.A
3.7.2.2.8.A	3.2.1.5
3.7.2.2.8.A	3.2.2.2.C
3.7.2.2.8.A	3.2.2.4.G
3.7.2.2.8.A	3.2.2.4.J.2
3.7.2.2.8.A	3.2.2.4.3.E
3.7.2.2.8.A	3.2.2.5.6.A
3.7.2.2.8.A	3.2.2.5.6.B.1
3.7.2.2.8.A	3.2.2.5.6.B.2
3.7.2.2.8.A	3.2.2.5.6.B.3
3.7.2.2.8.A	3.2.2.5.6.C
3.7.2.2.8.A	3.2.2.5.6.D
3.7.2.2.8.A	3.2.2.5.6.F
3.7.2.2.8.A	3.2.2.5.9.A
3.7.2.2.8.A	3.2.2.5.9.B
3.7.2.2.8.A	3.2.2.5.9.C
3.7.2.2.8.A	3.2.2.5.9.E
3.7.2.2.8.A	3.2.2.5.9.F
3.7.2.2.8.A	3.2.2.5.10.B
3.7.2.2.8.A	3.2.2.5.10.C
3.7.2.2.8.A	3.2.5.4.6.A
3.7.2.2.8.A	3.2.5.4.6.B
3.7.2.2.8.A	3.2.5.5.A
3.7.2.2.8.A	3.2.5.5.B

SD&TRD Traceability Matrix	
SD&TRD Section	ESFDR Section
3.7.2.2.8.A	3.2.5.5.C
3.7.2.2.8.A	3.2.5.5.D
3.7.2.2.8.A	3.2.5.5.E
3.7.2.2.8.A	3.2.5.5.G
3.7.2.2.8.A	3.2.5.5.H
3.7.2.2.8.A	3.2.5.5.4.M
3.7.2.2.8.A	3.2.5.5.4.P
3.7.2.2.8.A	3.2.5.5.7
3.7.2.2.8.A	3.2.5.5.9.A
3.7.2.2.8.A	3.2.5.5.9.B
3.7.2.2.8.A	3.2.5.5.9.C
3.7.2.2.8.A	3.2.5.5.9.D
3.7.2.2.8.A	3.2.5.5.9.F
3.7.2.2.8.A	3.2.5.5.9.G
3.7.2.2.8.A	3.2.6.2.4.C
3.7.2.2.8.A	3.2.6.4.3.B
3.7.2.2.8.A	3.2.6.5.A
3.7.2.2.8.A	3.2.6.5.B
3.7.2.2.8.A	3.2.6.5.C
3.7.2.2.8.A	3.2.6.5.E
3.7.2.2.8.A	3.2.6.5.F
3.7.2.2.8.A	3.2.6.5.1.A
3.7.2.2.8.A	3.2.6.5.1.B
3.7.2.2.8.A	3.2.6.5.1.D
3.7.2.2.8.A	3.2.6.5.1.E
3.7.2.2.8.A	3.2.6.5.1.F
3.7.2.2.8.A	3.2.6.5.1.G
3.7.2.2.8.A	3.2.6.5.1.H



SD&TRD Traceability Matrix	
SD&TRD Section	ESFDR Section
3.7.2.2.8.A	3.2.6.5.1.I
3.7.2.2.8.A	3.2.6.5.1.J
3.7.2.2.8.A	3.2.6.5.3.A
3.7.2.2.8.A	3.2.6.5.3.B
3.7.2.2.8.A	3.2.6.5.3.C
3.7.2.2.8.A	3.2.6.5.3.D
3.7.2.2.8.A	3.2.6.5.3.E
3.7.2.2.8.A	3.2.6.5.3.F
3.7.2.2.8.A	3.2.6.5.3.G
3.7.2.2.8.A	3.2.6.5.9
3.7.2.2.8.A	3.2.6.5.11.C
3.7.2.2.8.A	3.2.8.8.B.1
3.7.2.2.8.A	3.2.9.A.1
3.7.2.2.8.B	3.2.2.4.H
3.7.2.2.8.B	3.2.2.4.H.1
3.7.2.2.8.B	3.2.2.4.H.2
3.7.2.2.8.B	3.2.2.4.H.3
3.7.2.2.8.B	3.2.5.5.4.A
3.7.2.2.8.B	3.2.5.5.4.C
3.7.2.2.8.B	3.2.5.5.4.D
3.7.2.2.8.B	3.2.5.5.4.E
3.7.2.2.8.B	3.2.5.5.4.F
3.7.2.2.8.B	3.2.5.5.4.G
3.7.2.2.8.B	3.2.5.5.4.H
3.7.2.2.8.B	3.2.5.5.4.I
3.7.2.2.8.B	3.2.5.5.4.J
3.7.2.2.8.B	3.2.5.5.4.K
3.7.2.2.8.B	3.2.6.4.5.A

SD&TRD Traceability Matrix	
SD&TRD Section	ESFDR Section
3.7.2.2.8.B	3.2.6.4.5.B
3.7.2.2.9.A	3.2.1.6
3.7.2.2.9.A	3.2.1.6.A
3.7.2.2.9.A	3.2.1.6.B
3.7.2.2.9.A	3.2.1.6.C
3.7.2.2.9.A	3.2.1.6.D
3.7.2.2.9.A	3.2.1.6.G.1
3.7.2.2.9.A	3.2.1.6.G.2
3.7.2.2.9.A	3.2.2.3.9
3.7.2.2.9.A	3.2.2.4.D.16
3.7.2.2.9.A	3.2.2.6.A
3.7.2.2.9.A	3.2.6.5.11.H
3.7.2.2.9.A	3.2.6.6
3.7.2.2.9.A	3.2.8
3.7.2.2.9.A	3.2.8.8.A
3.7.2.2.9.B	3.2.2.4.D.15
3.7.2.2.9.C	3.2.2.4.D.15
3.7.2.2.9.C	3.2.2.4.D.15(a)
3.7.2.2.10.A	3.2.1.AA.1
3.7.2.2.10.B	3.2.1.AA.2
3.7.2.2.10.C	3.2.1.AA.3
3.7.2.2.10.D	3.2.1.AA.4
3.7.2.2.10.E	3.2.1.AA.5
3.7.2.2.10.F	3.2.1.AA.6
3.7.2.2.10.G	3.2.1.AA.7
3.7.2.2.11	3.2.1.Y
3.7.2.2.11	3.2.1.5.F
3.7.2.2.11	3.2.1.7

SD&TRD Traceability Matrix	
SD&TRD Section	ESFDR Section
3.7.2.2.11	3.2.1.7.A
3.7.2.2.11	3.2.1.7.B
3.7.2.2.11	3.2.1.7.C
3.7.2.2.11	3.2.2.4.2.E
3.7.2.2.11	3.2.2.7.1.A
3.7.2.2.11	3.2.2.7.1.B
3.7.2.2.11	3.2.2.7.1.C
3.7.2.2.11	3.2.2.7.1.D
3.7.2.2.11	3.2.2.7.1.E
3.7.2.2.11	3.2.2.7.2.A
3.7.2.2.11	3.2.2.7.2.B
3.7.2.2.11	3.2.2.7.2.B.1
3.7.2.2.11	3.2.2.7.2.B.2
3.7.2.2.11	3.2.2.7.2.B.3
3.7.2.2.11	3.2.2.7.2.B.4
3.7.2.2.12	3.2.1.H
3.7.2.2.13.A	3.2.5.C
3.7.2.2.13.B	3.2.1.J.5
3.7.2.2.13.C	3.2.1.H.2(c)
3.7.3	Not Allocated to ESF
3.8.A.1.a	3.2.1.28.A.1(a)
3.8.A.1.b	3.2.1.28.A.1(b)
3.8.A.1.c	3.2.1.28.A.1(c)
3.8.A.2.a	3.2.1.28.A.2(a)
3.8.A.2.b	3.2.1.28.A.2(b)
3.8.A.3	3.2.1.28.A.3
3.8.A.4	3.2.1.28.A.4
3.8.B	3.2.1.28.B

SD&TRD Traceability Matrix	
SD&TRD Section	ESFDR Section
3.8.C	3.2.1.28.C
3.8.C.1	3.2.1.28.C.1
3.8.C.2	3.2.1.28.C.2
3.9	3.2.1.29
DERIVED	3.2.1.K.1
DERIVED	3.2.1.L
DERIVED	3.2.1.W.1
DERIVED	3.2.1.AC
DERIVED	3.2.1.8.1
DERIVED	3.2.2.4.L.8(a)
DERIVED	3.2.2.4.N.1

APPENDIX E

APPLICABLE REGULATIONS, CODES, STANDARDS, AND DOE ORDERS

## APPENDIX E

## APPLICABLE REGULATIONS, CODES, STANDARDS, AND DOE ORDERS

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**APPENDIX E****APPLICABLE REGULATIONS, CODES, STANDARDS, AND DOE ORDERS****E.1 INTRODUCTION**

The design and construction of the Exploratory Studies Facility (ESF) shall be in accordance with all applicable parts of the documents listed in this Appendix.

The ESF design shall comply with the latest version of all Federal Laws and Documents, State laws and Documents, and Local Ordinances. For all Non-Government Documents, the issue in effect on the date of approval of the ESFDR forms a part of the requirements.

Omission of any applicable documents from this appendix shall not relieve the designer of the responsibility to meet those omitted requirements.

**E.2 GENERAL****E.2.1 CODE OF FEDERAL REGULATIONS (CFR)**

- o 10 CFR 60, Disposal of High-Level Radioactive Wastes in Geologic Repositories
- o 10 CFR 960, General Guidelines for the Recommendation of Sites for Nuclear Waste Repositories
- o 29 CFR 1910, Occupational Safety and Health Standards
- o 29 CFR 1926, Safety and Health Regulations for Construction
- o 30 CFR CHAPTER I, Mine Safety and Health Administration
- o 40 CFR 191, Environmental Radiation Protection Standards for Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes

**E.2.2 U.S. CODE (USC)**

- o 49 USC 1501, Federal Aviation Act

**E.2.3 U.S. CONGRESS**

- o Nuclear Waste Policy Act of 1982, Public Law 97-425
- o Nuclear Waste Policy Act Amendments of 1987, Public Law 100-203

**E.2.4 U.S. DEPARTMENT OF ENERGY (DOE)**

- o DOE Order 5400, Environmental Quality and Impact  
(Also refer to Appendix J, "Exploratory Studies Facility Environmental Requirements" which contains ESF-related environmental requirements)

- DOE Order 5400.3, Hazardous and Radioactive Mixed Waste Program
- DOE Order 5480.1B, Environmental, Safety and Health Program for DOE Operations
- DOE/NV Order 5480.1B-20, Environmental Safety and Health Program for DOE Operations
- DOE Order 5480.4, Environmental Protection, Safety, and Health Protection Standards. In Attachment 2, Section 2.e.8(b), Mine Safety, do not apply.
- DOE/NV Order 5480.4-17, Environmental Protection, Safety, and Health Protection Standards
- DOE Order 5480.7A, Fire Protection
- DOE Order 5480.9, Construction Safety and Health Program
- DOE Order 5480.10, Contractor Industrial Hygiene Program
- DOE/NV Order 5480.10-26, Contractor Industrial Hygiene Program
- DOE Order 5481.1B, Safety Analysis and Review System
- DOE/NV Order 5481.1B-21, Safety Analysis and Review System
- DOE Order 5482.1B, Environmental, Safety, and Health Appraisal Program
- DOE/NV Order 5482.1B-19, Environmental, Safety, and Health Appraisal Program
- DOE Order 5483.1A, Occupational Safety and Health Program for Government Owned Contractor-Operated Facilities
- DOE Order 5484.1, Environmental Protection, Safety and Health Protection Information Reporting Requirements
- DOE/NV 54XA.1-2, NTS Traffic Regulations (proposed)
- DOE/NV 54XB.1-28, Laser Safety (proposed)
- o DOE Order 5900, Energy Information Collection, Analysis and Dissemination
- o DOE Order 6400, Construction and Engineering
  - DOE Order 6430.1A, General Design Criteria
- o DOE/RW-0005, Mission Plan for the Civilian Radioactive Waste Management Program
- o DOE/AD/06212-1, Site Development Planning Handbook



- o DOE/NV/00410-77, Reynolds Electrical & Engineering Co. Safety and Health Program Plan, Nevada Nuclear Waste Storage Investigations Exploratory Shaft at Yucca Mountain
- o UCRL 15910, Design Evaluation guidelines for Department of Energy Facilities Subjected to Natural Phenomena Hazards, Draft
- o DOE/EP 0108, Standard for Fire Protection of DOE Electronic Computer/Data Processing Systems
- o DOE/EV 0051/1, Electrical Safety Criteria for Research and Development Activities
- o DOE/EV 06194-3, DOE Explosive Safety Manual
- o Site Design and Test Requirements Document, YMP/CM-0021

#### **E.2.5 U.S. DEPARTMENT OF INTERIOR**

- o Bureau of Land Management Manual Volume 34, 9100 Engineering, Section 113, Roads

#### **E.2.6 STATE OF NEVADA**

- o Nevada Revised Statutes (NRS) Title 21, Cities and Towns
  - Chapter 278, Joint Exercise of Powers and Duties by Public Agencies; Planning and Zoning
- o NRS Title 40, Public Health and Safety
  - Chapter 439, Administration of Public Health
  - Chapter 444, Sanitation
  - Chapter 445, Water Controls, Air Pollution
  - Chapter 446, Food Establishments
- o NRS Title 46, Mines and Minerals
  - Chapter 512, State of Nevada Health and Safety Standards for Open Pit and Underground Metal and Nonmetal Mines and Sand, Gravel, and Crushed Stone Operations
- o NRS Title 53, Labor and Industrial Relations
  - Chapter 618, Occupational Safety and Health
- o Nevada Administrative Code (NAC)

- Chapter 444, Hazardous Waste Disposal
- Chapter 445, Water Pollution Control, Air Pollution
- Chapter 512, Inspection and Safety of Mines
- o Department of Transportation
  - Standard Specifications for Road and Bridge Construction
  - Standard Plans for Road and Bridge Construction
  - Road Design Division, Design Manual, Parts 1 and 2

### **E.3 INDUSTRIAL AND PROFESSIONAL SOCIETY PUBLICATIONS**

#### **AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)**

- o AASHTO GDHS a Policy on Geometric Design of Highways and Streets
- o AASHTO GD-2 a Policy on Geometric Design of Rural Highways

#### **AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS**

- o Threshold Limit Values and Biological Exposure Indices

#### **AMERICAN CONCRETE INSTITUTE (ACI)**

- o ACI 301, Specifications for Structural Concrete for Buildings
- o ACI 304, Recommended Practice for Measuring, Mixing, Transporting , and Placing Concrete
- o ACI 305R, Recommended practice for Hot Weather Concreting
- o ACI 308, Standard Practice for Curing Concrete
- o ACI 316, Recommended Practice for Construction of Concrete Pavements and Concrete Bases
- o ACI 318, Building Code Requirements for Reinforced Concrete
- o ACI 318.1, Building Code Requirements for Structural Plain Concrete
- o ACI 347, Recommended Practice for Concrete Formwork
- o ACI 349, Requirements for Nuclear Safety Related Concrete Structure

PRESTRESSED CONCRETE INSTITUTE (PCI)

- o PCI MNL-120, Design Handbook

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

- o AISC M011 Manual of Steel Construction

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

- o ANSI B31.3, Chemical Plant and Petroleum Refinery Piping
- o ANSI C2, National Electrical Safety Code

AMERICAN NUCLEAR SOCIETY (ANS)

- o ANS-2.3, Standard for Estimating Tornado and Extreme Wind Characteristics at Nuclear Power Sites
- o ANS-2.5, Standard for Determining Meteorological Information at Nuclear Power Sites
- o ANS-2.8, Standard for Determining Design Basis Flooding at Power Reactor Sites

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

- o ASCE 7-88, Minimum Design Loads for Buildings and Other Structures

AMERICAN SOCIETY OF HEATING, REFRIGERATING, AND AIR CONDITIONING ENGINEERS

- o Handbooks, Fundamentals
- o Handbook, Equipment
- o Handbook, Systems
- o Handbook, Applications
- o Handbook, Refrigeration
- o Standard 62, Ventilation for Acceptable Indoor Air Quality
- o Standard 90.1, Energy Efficient Design of New Buildings Except Low-Rise Residential Buildings

AMERICAN SOCIETY OF MECHANICAL ENGINEERS

- o Boiler and Pressure Vessel Code: Section VIII, Division I, Unfired Pressure Vessel Code

**AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)**

- o ASTM A184, Standard Specification for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement
- o ASTM A185, Standard Specification for Steel Welded Wire, Fabric, Plain, for Concrete Reinforcement
- o ASTM A615, Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
- o ASTM A775, Standard Specification for Epoxy-Coated Reinforcing Steel Bars
- o ASTM C309, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
- o ASTM D1751, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction
- o ASTM E488, Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements

**AMERICAN WATER WORKS ASSOCIATION**

- o C700, Cold-Water Meters--Displacement Type, Bronze Main Case
- o C5186, Standard for Disinfecting Water Mains

**AMERICAN WELDING SOCIETY (AWS)**

- o AWS D1.1 Structural Welding Code - Steel
- o AWS D1.2, Structural Welding Code - Aluminum
- o AWS D1.3, Structural Welding Code - Sheet Steel

**DIESEL ENGINE MANUFACTURER ASSOCIATION**

- o Standard Practices for Stationary Diesel and Gas Engines

**INSTRUMENTATION SOCIETY OF AMERICA**

- o Standards and Specifications

**INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)**

- o IEEE 141, Recommended Practice for Electrical Power Distribution for Industrial Plants

- o IEEE 142, Recommended Practice for Grounding of Industrial and Commercial Power Systems
- o IEEE 242, Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems
- o IEEE 387, Standard Criteria for Diesel-Generator Units Applied as Standby Power Supplies for Nuclear Generating Stations
- o IEEE 485, Recommended Practice for Sizing Large Lead Storage Batteries for Generating Stations and Substations
- o IEEE 583, Standard Modular Instrumentation and Digital Interface System
- o IEEE 595, Standard Serial Highway Interface System
- o IEEE 650, Qualification of Class 1E Battery Chargers and Inverters for Nuclear Power Generating Stations

#### INTERNATIONAL CONFERENCE OF BUILDING OFFICIALS

- o Uniform Building Code
- o Uniform Mechanical Code
- o Uniform Plumbing Code

#### NATIONAL ASSOCIATION OF PLUMBING-HEATING-COOLING CONTRACTORS

- o National Standard Plumbing Code

#### NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

- o National Fire Codes
- o NFPA 22, Standard for Water Tanks for Private Fire Protection
- o NFPA 20, Installation of Centrifugal Fire Pumps
- o NFPA 24, Installation of Private Fire Service Mains and Their Appurtenances
- o NFPA 70, National Electrical Code
- o NFPA 101, Safety to Life from Fire in Buildings and Structures

#### ILLUMINATING ENGINEERING SOCIETY OF NORTH AMERICA

- o Lighting Handbook, application and reference volumes

**E.4 ACRONYMS**

AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
AISC	American Institute of Steel Construction
ANS	American Nuclear Society
ANSI	American National Standards Institute
ASCE	American Society of Civil Engineers
ASTM	American Society for Testing and Materials
AWS	American Welding Society
CFR	Code of Federal Regulations
DOE	U.S. Department of Energy
ESF	Exploratory Studies Facility
IEEE	Institute of Electrical and Electronics Engineers
NAC	Nevada Administrative Code
NFPA	National Fire Protection Association
NRS	Nevada Revised Statutes
PCI	Prestressed Concrete Institute
USC	U.S. Code

APPENDIX F

10 CFR 60 REQUIREMENTS APPLICABLE TO THE EXPLORATORY STUDIES FACILITY

## APPENDIX F

## 10 CFR 60 REQUIREMENTS APPLICABLE TO THE EXPLORATORY STUDIES FACILITY

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APPENDIX F

10 CFR 60 REQUIREMENTS APPLICABLE TO THE EXPLORATORY STUDIES FACILITY

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## APPENDIX F

## 10 CFR 60 REQUIREMENTS APPLICABLE TO THE EXPLORATORY STUDIES FACILITY

**F.1 INTRODUCTION**

The Site Design and Test Requirements Document (SD&TRD) (Tables 3-10 and 3-11) provides a list of Chapter 1, Title 10, Part 60, Code of Federal Regulations (10 CFR 60) requirements which are either mandatory or are to be considered in the design and construction of the Exploratory Studies Facility (ESF). Table F-1 presents the traceability of these requirements to the statements in the ESF Design Requirements (ESFDR). Section F.2 presents the requirements which were considered but found to have no impact on the ESF design.

Table F-1 and Section F.2 address all 10 CFR 60 requirements in the Nuclear Regulatory Commission's (NRC) Staff Technical Position on Regulatory Considerations in the Design and Construction of the Exploratory Studies Facility (NUREG-1439).

**F.2 10 CFR 60 REQUIREMENTS CONSIDERED BUT FOUND NOT APPLICABLE**

The use of several of the 10 CFR 60 requirements was the subject of discussion between NRC and Department of Energy (DOE). The reasons for considering but not directly using certain requirements, are given in the February 27, 1990, letter from DOE (Appel) to the NRC (Linehan) and are repeated in this section.

**F.2.1 10 CFR 60.16 AND 10 CFR 60.17, SITE CHARACTERIZATION PLAN**

- This section does not directly impose requirements on the ESF since it only briefly identifies the required contents of the Site Characterization Plan (SCP), referring specifically to plans and descriptions that need to be provided in that document.
- The SCP and its supporting study plans identify the parameters that need to be considered in ESF design, construction, and operation.

**F.2.2 10 CFR 60.24(a), UPDATING OF APPLICATION AND ENVIRONMENTAL REPORT**

- This section does not directly impose requirements on the design, construction, and operation of the ESF since its focus is directed to providing for updating the license application and accompanying documents.
- It provides indirect guidance to the extent that the license application must be as complete as possible in terms of the information required for NRC to make a determination.
- The SCP provides the plans with respect to what needs to be considered in the ESF design.

Table F-1 10 CFR 60 Requirements Considered in the ESFDR

10 CFR 60 Requirement	Description	ESFDR Paragraph No.
10 CFR 60.2	Definitions	3.2.1.W.1
*10 CFR 60.4(b)	Communications and records	3.2.10
10 CFR 60.15(b)	In situ exploration	3.2.1.A, 3.2.1.B, 3.2.1.C, 3.2.1.D, 3.2.2.4.A
10 CFR 60.15(c)(1)	Limit adverse effects on repository	3.2.1.K, 3.2.1.M, 3.2.1.M.1, 3.2.1.M.2, 3.2.1.M.3, 3.2.1.M.4, 3.2.1.M.5, 3.2.1.M.5(a), 3.2.1.M.5.(b), 3.2.1.AA.1, 3.2.1.AA.2, 3.2.1.AA.3, 3.2.1.AA.4, 3.2.1.AA.5, 3.2.1.AA.6, 3.2.1.AA.7, 3.2.1.1.A, 3.2.1.1.B, 3.2.1.4.A, 3.2.1.4.B, 3.2.1.4.B.1, 3.2.1.4.B.1(a), 3.2.1.4.B.1(b), 3.2.1.4.B.2, 3.2.1.4.B.3, 3.2.1.4.B.4, 3.2.1.4.B.5, 3.2.1.4.E.1, 3.2.1.4.E.1(a), 3.2.1.4.F, 3.2.1.5.A, 3.2.1.5.A.1, 3.2.1.5.G, 3.2.2.G, 3.2.2.G.1, 3.2.2.1J.1, 3.2.2.1J.2, 3.2.2.1J.3, 3.2.2.1J.4, 3.2.2.1J.5, 3.2.2.1J.6, 3.2.2.1J.7, 3.2.2.2.D, 3.2.2.2.E, 3.2.2.2.F, 3.2.2.2.G, 3.2.2.4.D, 3.2.2.4.D.4, 3.2.2.4.D.5, 3.2.2.4.D.6, 3.2.2.4.D.7, 3.2.2.4.L.7, 3.2.2.4.X.6, 3.2.2.5.5.A, 3.2.2.5.6.B, 3.2.2.5.8.D, 3.2.2.5.8.D.1, 3.2.2.5.10.A, 3.2.2.6.E.6, 3.2.5.4.5.M, 3.2.6.5.I, 3.2.8.8.D, 3.2.9.4.A, 3.2.9.4.A.1, 3.3.1.4, 3.3.1.5.6, 3.3.1.6
10 CFR 60.15(c)(2)	Limit borings	3.2.1.AA.1, 3.2.1.AA.2, 3.2.1.AA.3, 3.2.1.AA.4, 3.2.1.AA.5, 3.2.1.AA.6, 3.2.1.AA.7, 3.2.2.E, 3.2.2.4.B, 3.2.2.4.B.1, 3.2.2.4.B.2
10 CFR 60.15(c)(3)	Boring locations	3.2.1.AA.1, 3.2.1.AA.2, 3.2.1.AA.3, 3.2.1.AA.4, 3.2.1.AA.5, 3.2.1.AA.6, 3.2.1.AA.7, 3.2.2.F, 3.2.2.4.L, 3.2.2.4.L.1, 3.2.2.4.L.2, 3.2.2.4.L.6, 3.2.2.4.L.6(a), 3.2.2.4.L.8, 3.2.2.4.L.8(a), 3.2.2.4.L.8(b), 3.2.2.4.L.9, 3.2.2.4.L.10

Table F-1 10 CFR 60 Requirements CONSIDERED in the ESFDR (continued)

10 CFR 60 Requirement	Description	ESFDR Paragraph No.
10 CFR 60.15(c)(4)	Coordinate with repository design	3.2.1.H.1(a), 3.2.1.H.1(b), 3.2.1.H.1(c), 3.2.1.H.1(d), 3.2.1.1.E, 3.2.1.2.B, 3.2.1.3.C, 3.2.1.4.H, 3.2.1.5.H, 3.2.1.6.E, 3.2.1.6.F, 3.2.2.G, 3.2.2.4.L.2, 3.2.2.4.L.3, 3.2.2.4.L.4, 3.2.2.4.L.5, 3.2.2.4.L.6(b), 3.2.2.4.M, 3.2.2.4.M.1, 3.2.2.4.M.2, 3.2.2.4.M.3, 3.2.2.4.M.4, 3.2.2.4.M.5, 3.2.2.6.B
10 CFR 60.16	SCP required	Not Applicable (see Section F.2)
10 CFR 60.17(a)	General plan for site characterization	Not Applicable (see Section F.2)
10 CFR 60.17(b)	Description of waste form or waste package	Not Applicable (see Section F.2)
10 CFR 60.17(c)	Conceptual design for potential geologic repository	Not Applicable (see Section F.2)
10 CFR 60.21(c)(1)(ii)(D)	SAR: effectiveness of barriers	3.2.1.4.C, 3.2.1.4.C.1, 3.2.1.4.C.2, 3.2.1.4.C.3, 3.2.1.4.C.4, 3.2.1.4.C.5
10 CFR 60.21(c)(1)(ii)(E)	SAR: analysis of SSC important to safety	3.2.1.J.1
10 CFR 60.21(c)(11)	SAR: close and decommission	3.2.1.Y, 3.2.2.4.S.2
10 CFR 60.24(a)	Updating of application and environmental impact statement	Not Applicable (see Section F.2)
10 CFR 60.72(a)	Construction records	3.2.1.25.6.B, 3.2.2.4.L.8(c), 3.3.1.2.2, 3.3.1.5.6
10 CFR 60.72(b)	Construction records	3.2.1.25.6.B, 3.2.2.4.L.8(c)
10 CFR 60.74	Tests	3.2.9.4.B, 3.2.9.4.C, 3.2.9.5.A, 3.2.9.5.A.1
10 CFR 60.111(a)	Protection against rad exposures	3.2.1.J.2
10 CFR 60.111(b)(1)	Retrievability	3.2.1.J.13, A.1-3
10 CFR 60.111(b)(3)	Retrievability: schedule	3.2.1.J.14
10 CFR 60.112	Overall system performance	3.2.1.M.6, 3.2.1.1.C.2, 3.2.1.5.G, 3.2.2.1.I.2, 3.2.2.2.H, 3.2.2.2.P, 3.2.2.2.3.E, 3.2.2.2.5.D, 3.2.2.4.X.1, 3.2.2.5.5.A, 3.2.2.5.6.B, 3.2.2.5.6.E, 3.2.2.5.8.D
10 CFR 60.113(a)(1)(i)	EBS	3.2.1.J.3
10 CFR 60.113(a)(1)(ii)(A)	Waste package	3.2.1.J.4
10 CFR 60.113(a)(1)(ii)(B)	EBS	3.2.1.J.4
10 CFR 60.113(a)(2)	Geologic setting: GWTT	Not Applicable (see Section F.2)
10 CFR 60.113(b)(2)	Radionuclide release rate: Thermal pulse	Not Applicable (see Section F.2)

Table F-1 10 CFR 60 Requirements CONSIDERED in the ESFDR (continued)

10 CFR 60 Requirement	Description	ESFDR Paragraph No.
10 CFR 60.113(b)(3)	Radionuclide release rate: Geochemical characteristics	Not Applicable (see Section F.2)
10 CFR 60.113(b)(4)	Radionuclide release rate: Uncertainty	Not Applicable (see Section F.2)
10 CFR 60.122(a)(1)	Siting criteria	Not Applicable (see Section F.2)
10 CFR 60.122(a)(2)	Siting criteria	Not Applicable (see Section F.2)
10 CFR 60.122(b)	Favorable conditions	Not Applicable (see Section F.2)
10 CFR 60.122(c)	Potentially adverse conditions	Not Applicable (see Section F.2)
10 CFR 60.122(c)(1)	Potentially adverse conditions (flooding)	3.2.2.1.4
10 CFR 60.130	Scope of design criteria	3.2.1.N
10 CFR 60.131(a)	Radiological protection	Not Applicable (see Section F.2)
10 CFR 60.131(b)(1)	Natural phenomena/environmental conditions	3.2.1.H.2(a), 3.2.1.N.1, 3.2.1.10.1[1], 3.2.2.2.2.D, 3.2.2.2.2.E, 3.2.2.4.T.3, 3.2.5.A, 3.2.5.5.4.L, 3.2.6.5.H, A.5
10 CFR 60.131(b)(2)	Equipment failure	3.2.1.H.2(b), 3.2.2.2.2.D, 3.2.2.2.2.E, 3.2.5.5.4.L
10 CFR 60.131(b)(3)(i)	Fires and explosions	3.2.1.H.2(c)
10 CFR 60.131(b)(3)(ii)	Heat resistant materials	3.2.1.H.2(c)(i)
10 CFR 60.131(b)(3)(iii)	Fire detection and suppression systems	3.2.5.C
10 CFR 60.131(b)(3)(iv)	Failure of fire suppression systems	3.2.1.H.2(c)(ii)
10 CFR 60.131(b)(4)(i)	Emergency control of radioactive materials	3.2.1.J.5
10 CFR 60.131(b)(4)(ii)	Emergency response capability	Not Applicable (see Section F.2)
10 CFR 60.131(b)(6)	Maintainability	3.2.1.H.2(d), 3.2.1.9.3.B, 3.2.1.9.3.G, 3.2.1.26.1
10 CFR 60.131(b)(8)	Instrumentation and control	Not Applicable (see Section F.2)
10 CFR 60.131(b)(9)	MSHA regulations	3.2.1.H.2(c)
10 CFR 60.131(b)(10)	Shaft conveyances	Not Applicable (see Section F.2)
10 CFR 60.133(a)(1)	Configuration of underground facility	3.2.1.4.D, 3.2.1.4.D.1, 3.2.1.4.D.2, 3.2.1.4.D.3, 3.2.2.4.B.1, 3.2.2.4.N, 3.2.2.4.N.2, 3.2.2.4.S.2

Table F-1 10 CFR 60 Requirements CONSIDERED in the ESFDR (continued)

10 CFR 60 Requirement	Description	ESFDR Paragraph No.
10 CFR 60.133(a)(2)	Disruptive events	3.2.1.4.E, 3.2.1.5.E, 3.2.1.5.E.1, 3.2.1.5.E.2, 3.2.2.1.B, 3.2.2.4.O, 3.2.2.4.O.1, 3.2.2.4.O.2, 3.2.2.4.O.3, 3.2.2.4.S.2, 3.2.2.4.S.3, 3.2.2.4.S.7, 3.2.2.4.S.8, 3.2.2.5.E, 3.2.2.5.5.A, 3.2.2.5.8.A, 3.2.2.5.8.B, 3.2.2.5.8.C, 3.2.2.5.8.D.1, 3.2.2.5.8.E, 3.2.2.5.8.F, B.2.35.3.A-F, B.2.35.4.A-E, B.2.35.5
10 CFR 60.133(b)	Flexibility	3.2.2.4.D.10, 3.2.2.4.P, 3.2.2.4.P.1, 3.2.2.4.P.2, 3.2.2.4.T.2, 3.2.2.4.U.4(c), 3.2.2.5.C, 3.2.2.5.C.1, 3.2.9.4.E, 3.2.9.4.E.1
10 CFR 60.133(c)	Retrievability	3.2.2.4.Q
10 CFR 60.133(d)	Control of water and gas	3.2.2.4.D.2, 3.2.2.4.S, 3.2.2.4.S.1, 3.2.2.4.S.2, 3.2.2.4.S.3, 3.2.2.4.S.4, 3.2.2.4.S.5, 3.2.2.4.S.6, 3.2.2.4.S.7, 3.2.2.4.S.8, 3.2.2.4.X.5, 3.2.2.5.D, 3.2.2.5.D.1, 3.2.2.5.D.2, 3.2.2.5.F, 3.2.2.5.G, 3.2.2.6.E, 3.2.2.6.E.1, 3.2.2.6.E.2, 3.2.2.6.E.3, 3.2.2.6.E.4, 3.2.2.6.E.5, 3.2.2.6.E.6
10 CFR 60.133(e)(1)	Underground openings: safe operations	3.2.2.4.D.9, 3.2.2.4.R, 3.2.2.4.R.1, 3.2.2.4.T.1
10 CFR 60.133(e)(2)	Underground openings: stability	3.2.2.4.N.2, 3.2.2.4.N.3, 3.2.2.4.T, 3.2.2.4.T.2, 3.2.2.4.T.4, B.2.35.3.A-F, B.2.35.4.A-E, B.2.35.5
10 CFR 60.133(f)	Rock excavation	3.2.1.1.C.1, 3.2.1.1.C.2, 3.2.1.1.I.2, 3.2.2.4.U, 3.2.2.4.U.1, 3.2.2.4.U.2, 3.2.2.4.U.2(a), 3.2.2.4.U.2(b), 3.2.2.4.U.3, 3.2.2.4.U.4(a), 3.2.2.4.U.4(b), 3.2.2.4.U.4(c), 3.2.2.4.U.5, B.2.7.3.A-I, B.2.7.4.A-H, B.2.7.5
10 CFR 60.133(g)	Ventilation	3.2.1.J.6, 3.2.2.4.3.G, 3.2.2.4.4.C
10 CFR 60.133(g)(1)		B.2.36.3.A-F, B.2.36.4.A-E, B.2.36.5
10 CFR 60.133(g)(3)		3.2.2.4.H.4
10 CFR 60.133(h)	EBS	3.2.1.J.7

Table F-1 10 CFR 60 Requirements CONSIDERED in the ESFDR (continued)

10 CFR 60 Requirement	Description	ESFDR Paragraph No.
10 CFR 60.133(i)	Thermal loads	3.2.2.4.U.6(b), 3.2.2.4.V, 3.2.2.4.V.1, 3.2.2.4.V.2, 3.2.2.4.V.3, 3.2.2.4.V.4, 3.2.2.4.V.5, B.2.26.3.A-I, B.2.26.4.A-E, B.2.26.5, B.2.27.3.A-G, B.2.27.4.A-E, B.2.27.5, B.2.28.3.A-F, B.2.28.4.A-E, B.2.28.5, B.2.29.3.A-F, B.2.29.4.A-D, B.2.29.5, B.2.30.3.A-G, B.2.30.4.A-E, B.2.30.5
10 CFR 60.134(a)	Design of seals: general design criteria	3.2.2.H.1, 3.2.2.4.W, 3.2.2.4.X.1, 3.2.2.4.X.2, 3.2.2.4.X.2(a), 3.2.2.4.X.2(b), 3.2.2.4.X.2(c), 3.2.2.4.X.2(d), 3.2.2.4.X.2(e), 3.2.2.4.X.3, 3.2.2.4.X.4
10 CFR 60.134(b)	Design of seals: selection of materials and placement methods	3.2.2.H.2, 3.2.2.4.X, 3.2.2.4.X.1, 3.2.2.4.X.2, 3.2.2.4.X.2(a), 3.2.2.4.X.2(b), 3.2.2.4.X.2(c), 3.2.2.4.X.2(d), 3.2.2.4.X.2(e), 3.2.2.4.X.3, 3.2.2.4.X.4, 3.2.2.4.X.5, B.2.39.3.A-I, B.2.39.4, B.2.39.5
10 CFR 60.137	Performance confirmation: comply with following paragraphs	3.2.8.1, 3.2.9.4.D, 3.2.9.4.D.1, 3.2.9.4.D.2, 3.2.9.4.D.4, 3.2.9.4.D.5, 3.2.9.4.D.6, 3.2.9.5.B, 3.2.9.5.B.1
10 CFR 60.140(b)	Performance confirmation: start ASAP (performance confirmation program is defined in 10 CFR 60.140(a))	3.2.1.J.8, 3.2.1.I.1
10 CFR 60.140(c)	Performance confirmation: field tests	3.2.1.I.2, 3.2.1.J.8, 3.2.2.4.D.11, 3.2.2.6.C, 3.2.5.6, 3.2.6.2.1.I.1
10 CFR 60.140(d)(1)	Performance confirmation: don't compromise repository	3.2.1.J.8
10 CFR 60.141(a)	Confirmation of parameters	3.2.1.J.9, 3.2.9.4.D.3
10 CFR 60.141(b)	Evaluate conditions against assumptions	3.2.1.J.9, 3.2.9.4.D.3
10 CFR 60.141(c)	Measure rock parameters	3.2.1.J.9, 3.2.9.4.D.3
10 CFR 60.141(d)	Evaluate observations against assumptions	3.2.1.J.9, 3.2.9.4.D.3
10 CFR 60.141(e)	Monitor until permanent closure	3.2.1.J.9, 3.2.9.4.D.3
10 CFR 60.142(a)	Seal, backfill tests and thermal interactions	3.2.1.I.3, 3.2.1.J.10, 3.2.9.4.D.3
10 CFR 60.142(b)	Early testing	3.2.1.I.4, 3.2.1.J.10, 3.2.2.6.D.1, 3.2.8.8.C.1, 3.2.9.4.D.3
10 CFR 60.142(c)	Backfill tests	3.2.1.J.10, 3.2.9.4.D.3

Table F-1 10 CFR 60 Requirements CONSIDERED in the ESFDR (continued)

10 CFR 60 Requirement	Description	ESFDR Paragraph No.
10 CFR 60.142(d)	Seal tests	3.2.1.I.5, 3.2.1.J.10, 3.2.6.2.1.J, 3.2.9.4.D.3, B.2.39.3.A-I, B.2.39.4, B.2.39.5
10 CFR 60.143(a)	Monitoring and testing of waste packages	Not Applicable (see Section F.2)
10 CFR 60.143(b)	Waste package environment	Not Applicable (see Section F.2)
10 CFR 60.143(c)	Waste package monitoring program experiments	Not Applicable (see Section F.2)
10 CFR 60.143(d)	Length of waste package monitoring program	Not Applicable (see Section F.2)
10 CFR 60.151	QA	3.2.1.J.11
10 CFR 60.152	QA	3.2.1.J.12

\*Not included in NUREG 1439



**F.2.3 10 CFR 60.113(a)(2), PREWASTE EMPLACEMENT GROUNDWATER TRAVEL TIME**

- While the design, construction, and operation of the underground workings of the ESF could affect the location of the disturbed zone boundary, this requirement directs determination of groundwater travel time from wherever that boundary is located. This is effectively a siting criterion applicable to the geologic setting, but does not directly impose requirements on the ESF.
- The requirement to minimize impacts to the disturbed zone is generally covered by 10 CFR 60.15(c), not 10 CFR 60.113(a)(2).

**F.2.4 10 CFR 60.113(b)(2), (3), (4), FACTORS NRC WILL CONSIDER IN CASE-BY-CASE EVALUATION OF PERFORMANCE OBJECTIVES**

- This section does not directly impose requirements on the ESF. This section serves to provide flexibility with respect to the numerical limits pertaining to the performance objectives for the engineered barrier system and the geologic setting, as stipulated in 10 CFR 60.113(a).
- The need for the ESF to allow gathering of information relevant to the factors listed in this section of Part 60 come from the scope of the site characterization program which is defined in the SCP and related study plans.

**F.2.5 10 CFR 60.122, SITING CRITERIA**

- This section does not directly impose requirements on the ESF since it addresses favorable and potentially adverse conditions which are to be used as siting criteria applicable to the geologic setting.
- The requirement to evaluate the existence of potentially adverse conditions, including 10 CFR 60.122(c)(1) (in the ESFDR), is addressed in program requirements documents and the SCP and its related study plans.
- Evaluation of the location of underground accesses with respect to flooding potential is being considered as part of the ESF design process in accordance with 10 CFR 60.133(d).

**F.2.6 10 CFR 60.131(a), GENERAL DESIGN CRITERIA FOR RADIOLOGICAL PROTECTION**

- This section, in particular 10 CFR 60.131(a)(1), needs to be considered to the extent that the ESF must be designed such that it does not preclude the repository from meeting these requirements. It should be noted that compliance with these requirements is primarily a function of equipment design and operating procedures for the purpose of radiation protection, which imposes future requirements on equipment and operations.
- It should be noted that, while the Nuclear Waste Policy Act (NWPA) requires the NRC to concur on the need to use radioactive material during site characterization, the use of

such material is not subject to NRC licensing requirements, as stipulated in 10 CFR 60.7. DOE radiological safety orders would be applicable.

- Currently, there is no plan to use radioactive wastes in the ESF during site characterization.

#### **F.2.7 10 CFR 60.131(b)(4)(II), ON-SITE FACILITIES FOR EMERGENCIES**

- This section does not impose requirements on the ESF since it addresses requirements that are applicable only to repository operations and would not affect the design of ESF permanent components.
- This section requires that the geologic repository operations area (GROA) includes on-site facilities and services for responding to radiological emergencies and that facilitate the use of available off-site services for that application.
- The ESF will include similar facilities or services in accordance with nonradiological safety requirements.
- It should be noted that, while the NWA requires the NRC to concur on the need to use radioactive material is not subject to NRC licensing requirements, as stipulated in 10 CFR 60.7. DOE radiological safety orders would be applicable.
- Currently, there is no plan to use radioactive wastes in the ESF during site characterization.

#### **F.2.8 10 CFR 60.131(b)(8), INSTRUMENTATION AND CONTROL SYSTEMS**

- This section does not directly impose requirements on the ESF since it addresses requirements that are applicable only to repository operations and would not affect the design of ESF permanent components.
- This section requires that instrumentation and control systems be provided to monitor the behavior of systems important to safety over the anticipated ranges for normal operation and for accident conditions.
- The extent to which this requirement would need to be considered in ESF design is to ensure that the ESF design does not preclude the addition of instrumentation and control systems. However, the inclusion of such a requirement is not expected to provide any additional flexibility in design beyond what already exists.

#### **F.2.9 10 CFR 60.131(b)(10), SHAFT CONVEYANCES USED IN RADIOACTIVE WASTE HANDLING**

- This section does not impose requirements on the ESF since it addresses requirements for hoists important to safety that are used for radioactive waste handling.
- Currently, radioactive wastes are not planned to be used in the ESF during site characterization.

- It should be noted that, while the NWPA requires the NRC to concur on the need to use radioactive material during site characterization, the use of such material is not subject to NRC licensing requirements, as stipulated in 10 CFR 60.7. DOE radiological orders would be applicable.

#### **F.2.10 10 CFR 60.143, MONITORING AND TESTING OF WASTE PACKAGES**

- This section does not impose requirements on the ESF since it addresses performance confirmation monitoring and testing that is specifically applicable to the waste packages.
- Currently, no radioactive wastes are planned to be used in the ESF during site characterization.
- Likewise, in the future, the ESF portion of the geologic repository operations area will not contain waste packages.

The following additional 10 CFR 60 requirement has been considered but has not been included in the ESFDR because it is covered elsewhere.

- 10 CFR 60.16, site characterization plan required before sinking shafts (the Site Characterization Plan has been written and NRC comments have been received and considered by the DOE).

**F.3 ACRONYMS**

CFR	Code of Federal Regulations
DOE	U.S. Department of Energy
ESF	Exploratory Studies Facility
ESFDR	Exploratory Studies Facility Design Requirements
GROA	Geologic Repository Operations Area
NRC	Nuclear Regulatory Commission
NWPA	Nuclear Waste Policy Act
SCP	Site Characterization Plan
SD&TRD	Site Design and Test Requirements Document

**APPENDIX G**  
**(RESERVED FOR FUTURE USE)**

**APPENDIX H**  
**(RESERVED FOR FUTURE USE)**

**APPENDIX I**  
**PERFORMANCE ASSESSMENT ANALYSIS**

## APPENDIX I

## PERFORMANCE ASSESSMENT ANALYSIS

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## APPENDIX I

## PERFORMANCE ASSESSMENT ANALYSIS

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## APPENDIX I

## PERFORMANCE ASSESSMENT ANALYSES

## I.1 INTRODUCTION

This appendix presents the relationships between the Nuclear Regulatory Commission (NRC) regulations governing the design, construction, and operation of the Exploratory Studies Facility (ESF); the ESF design requirements (ESFDR); and performance assessment (PA) analyses. Summaries of analyses performed to date and recommendations derived from the results of these analyses are also included.

The strategy for complying with the Code of Federal Regulations (CFR) 10 CFR 60 requirements related to PA is discussed in this section. Also discussed in this section are the relationships between ESFDR requirements specified in 10 CFR 60, the ESFDR, and PA analyses. Summaries of the results of analyses completed to date, and the associated recommendations, are presented in Section I.2. A list of abbreviations and acronyms are provided in Section I.3.

Table I-1 contains a list of the analyses defined to date. These analyses were defined to quantify criteria in Chapters 0 through 5 of the ESF Subsystem Design Requirements Document (SDRD), YMP/CM-0006, Benchmark 5 (ESF Title II Design Summary Report (Rev. 0)) and were grouped by disciplines: hydraulics, rock mechanics, thermal, chemical, and safety. Since the definition of these analyses, the SDRD has evolved into the ESFDR, for which these analyses are applicable but not exhaustive.

Table I-1 Analysis Supporting ESF Design

Analysis Number	Title
1	Surface Construction Water Movement
2	Construction Water Movement
3	Sewage and Settling Pond Water Movement
4	Water Entry into Optional Shafts Through Rock Mass Surrounding the Shaft Collar & Liner
5	Optional Shaft and Main Pad Blasting Effects
6	Optional Shaft and Collar Creep
7	Optional Shaft, Ramp, and Collar Thermal Stress
8	Far Field Thermal Effects
9	Systems and Components Important to Safety
10	Hydrologic and Geochemical Effects of Tracers
11	Hydrologic and Geochemical Effects of Chemicals and Materials in the ESF

The 10 CFR 60 requirements which apply to the design, construction, and operation of the ESF are the basis for compliance. These requirements are the 57 sections or requirements identified and agreed upon by the U.S. Department of Energy (DOE) and NRC. All 57 of these requirements are considered and are linked to the associated ESFDR requirements in Table I-2. Compliance with the 10 CFR 60 requirements is then demonstrated by addressing the concerns in the ESFDR

Table I-2 PA Analysis Support for the ESF

	Lbl	10 CFR Requirement	ESFDR Requirement	ESFDR or 10 CFR 60 Description	Sub Syst.	St.	Analysis	
							Group	No.
*	2	60.15(b)	3.2.1.C	Base location & design of shafts & ramps on drillcore & results of investigations.	Gen.		Y	
	6	60.15(c)(1)	3.2.1.M	Limit potential for adverse impacts on repository performance.	Gen.		R	*
	7	60.15(c)(1)	3.2.1.1.A	Limit potential for adverse impacts on repository performance.	Site		R	*
	8	60.15(c)(1)	3.2.2.2.D	Limit potential for adverse impacts on repository performance.	SU		R	*
	12	60.15(c)(1)	3.2.1.5.A	Limit potential for adverse impacts on repository performance.	UGSS		R	*
	44	60.15(c)(1)	3.2.1.M3	Control all substances & tracers added to water & compressed air.	Gen.		Y	10f,11f
	45	60.15(c)(1)	3.2.1.M4	Use of hydrocarbons and solvents comply with criteria determined by PA.	Gen.		Y	11f
	13	60.15(c)(1)	3.2.1.4B1b	Review materials for substance effects on EBS & waste isolation.	Shaft		Y	11f
	14	60.15(c)(1)	3.2.1.4B1b	Review materials for substance effects on EBS & waste isolation.	Ramp		Y	11f
	15	60.15(c)(1)	3.2.1.4B1b	Review materials for substance effects on EBS & waste isolation.	UGE		Y	11f
	16	60.15(c)(1)	3.2.1.4B1b	Assess impacts of materials & support components on waste isolation.	Shaft		Y	11f
	17	60.15(c)(1)	3.2.1.4B1b	Assess impacts of materials & support components on waste isolation.	Ramp		Y	11f
	18	60.15(c)(1)	3.2.1.4B1b	Assess impacts of materials & support components on waste isolation.	UGE		Y	11f
	21	60.15(c)(1)	3.2.2.4T3	Shaft shall not compromise ability to isolate waste.	Shaft		Y	*
	22	60.15(c)(1)	3.2.9.4A1	Ramp shall not compromise ability to isolate waste.	Ramp		Y	*
	23	60.15(c)(1)	3.2.1.4C4	Underground excavation shall not compromise ability to isolate waste.	UGE		Y	*
	31	60.15(c)(2)	3.2.2.4B	Limit number of boreholes & shafts to accommodate site characterization.	Shaft		Y	
	32	60.15(c)(2)	3.2.2.4B	Limit number of boreholes & shafts to accommodate site characterization.	Ramp		Y	
	33	60.15(c)(2)	3.2.2.4B	Limit number of boreholes & shafts to accommodate site characterization.	UGE		Y	

Table I-2 PA Analysis Support for the ESF (continued)

Lbl	10 CFR Requirement	ESFDR Requirement	ESFDR or 10 CFR 60 Description	Sub Syst.	St.	Analysis	
						Group	No.
40	60.15(c)(3)	3.2.2.4L7	No boreholes within 15 m. of UG openings outside ESF dedicated test area.	UGE		Y	
41	60.15(c)(3)	3.2.2.4L8	PA prior to horizontal boreholes from main test level.	UGE		Y	
42	60.15(c)(3)	3.2.2.4L10	Boreholes shall not penetrate TSw2 base without evaluation.	UGT		Y	
43	60.15(c)(4)	3.2.1.M1	UG construction shall not adversely affect site characterization.	Gen.		Y	
47	60.15(c)(4)	3.2.2.4M1	Consider impacts on waste isolation of locating UGF outside perimeter drift.	UGE		Y	
48	60.15(c)(4)	3.2.2.4M2	75 ft. stand off from ESF test area.	UGE		Y	
49	60.15(c)(4)	3.2.2.4M5	Verify < 30% extraction ratio in ESF.	UGE		Y	
52	60.21(c)(1)(ii)(D)	3.2.1.4C1	Shaft ground support system shall limit adverse effects on waste isolation.	Shaft		Y	
343	60.21(c)(1)(ii)(D)	3.2.1.4C2	Diameter shall limit adverse effects on waste isolation.	Shaft		Y	
53	60.21(c)(1)(ii)(D)	3.2.1.4C1	Ramp ground support system shall limit adverse effects on waste isolation.	Ramp		Y	
344	60.21(c)(1)(ii)(D)	3.2.1.4C2	Diameter shall limit adverse effects on waste isolation.	Ramp		Y	
345	60.21(c)(1)(ii)(D)	3.2.1.4C1	Layout and drift size shall limit adverse effects on waste isolation.	UGE		Y	
54	60.21(c)(1)(ii)(D)	3.2.1.4C2	Underground facility ground support shall limit adverse effects on waste isolation.	UGE		Y	
346	60.21(c)(1)(ii)(D)	3.2.1.4C3	Liner shall limit adverse effects on waste isolation.	Shaft		Y	
347	60.21(c)(1)(ii)(D)	3.2.1.4C3	Liner shall limit adverse effects on waste isolation.	Ramp		Y	
348	60.21(c)(1)(ii)(D)	3.2.1.4C4	Operational seals shall limit adverse effects on waste isolation.	Shaft		Y	
349	60.21(c)(1)(ii)(D)	3.2.1.4C4	Operational seals shall limit adverse effects on waste isolation.	Ramp		Y	
350	60.21(c)(1)(ii)(D)	3.2.1.4C4	Operational seals shall limit adverse effects on waste isolation.	UGE	TBD	Y	
57	60.21(c)(11)	3.2.1 Y	Design considerations intended to facilitate permanent closure.	Gen		Y	
71	60.111(b)(1)	3.2.1 J13	GROA designed to preserve retrievability.	UGE		Y	
74	60.112	3.2.2.1 I2	Shall not affect the capability to meet performance objectives.	Site	TBD	R	*

Table I-2 PA Analysis Support for the ESF (continued)

Lbl	10 CFR Requirement	ESFDR Requirement	ESFDR or 10 CFR 60 Description	Sub Syst.	St.	Analysis	
						Group	No.
76	60.112	3.2.2.2 H	Shall not affect the capability to meet performance objectives.	SU		R	*
77	60.112	3.2.2.4X1	Shall not affect the capability to meet performance objectives.	Shaft	TBD	R	*
78	60.112	3.2.2.4X1	Shall not affect the capability to meet performance objectives.	Ramp	TBD	R	*
79	60.112	3.2.2.4X1	Shall not affect the capability to meet performance objectives.	UGE	TBD	R	*
80	60.112	3.2.2.5.5 A	Shall not affect the capability to meet performance objectives.	UGT		R	*
351	60.112	3.2.2.5.6 B	Shall not affect the capability to meet performance objectives.	UGT		R	*
352	60.112	3.2.2.5.6 E	Shall not affect the capability to meet performance objectives.	UGT		R	*
353	60.112	3.2.2.5.8D1	Shall not affect the capability to meet performance objectives.	UGT	TBD	R	*
46	60.112	3.2.1 M6	Shall not affect overall system performance objectives.	Gen.		R	*
82	60.113(a)(1)(i)(A) & (B)	3.2.1 J3	Containment of HLW shall be substantially complete during decay period & release of HLW shall be gradual process.	Gen.		R	*
84	60.113(a)(1)(ii)(A) & (B)	3.2.1 J4	Minimum period of substantially complete containment and maximum release rate.	Gen.		R	*
*	124	60.122(c)(1)	Preclude water inflow to ESF following water tank failures.	SU		Y	
*	125	60.122(c)(1)	Preclude water inflow to ESF following water pipe ruptures.	SU		Y	
92	60.122(c)(1)	3.2.2.1.4 B	Control drainage to reduce potential for flooding.	Site		Y	
*	123	60.133(a)(2)	Control drainage to reduce potential for flooding.	Site		Y	
*	100	60.130	Tag fluids, gases, and other materials used in construction.	Shaft	TBD	Y	10f,11f
*	101	60.130	Tag fluids, gases, and other materials used in construction.	Ramp	TBD	Y	10f,11f
*	102	60.130	Tag fluids, gases, and other materials used in construction.	UGE	TBD	Y	10f,11f
24	60.133(a)(1)	3.2.1.4 D1	Rock support & structural materials shall be compatible with waste isolation.	Shaft	TBD	Y	11f

Table I-2 PA Analysis Support for the ESF (continued)

Lbl	10 CFR Requirement	ESFDR Requirement	ESFDR or 10 CFR 60 Description	Sub Syst.	St.	Analysis	
						Group	No.
27	60.133(a)(1)	3.2.1.4 D2	Rock support & structural materials shall not lessen radionuclide containment.	Shaft	TBD	Y	11f
25	60.133(a)(1)	3.2.1.4 D1	Rock support & structural materials shall be compatible with waste isolation.	Ramp	TBD	Y	11f
28	60.133(a)(1)	3.2.1.4 D2	Rock support & structural materials shall not lessen radionuclide containment.	Ramp	TBD	Y	11f
114	60.133(a)(1)	3.2.1.4 D3	Configuration shall contribute to or not detract from performance.	Shaft	TBD	Y	
115	60.133(a)(1)	3.2.1.4 D3	Configuration shall contribute to or not detract from performance.	Ramp	TBD	Y	
120	60.133(a)(1)	3.2.2.4 N2	Drift spacing shall be a minimum of two drift diameters.	UGE		Y	2
26	60.133(a)(1)	3.2.1.4 D2	Rock support & structural materials shall be compatible with waste isolation.	UGE	TBD	Y	11f
121	60.133(a)(1)	3.2.1.4 D3	The UGF shall contribute to or not detract from performance.	UGE	TBD	Y	
122	60.133(a)(2)	3.2.2.1 B	Locate shaft collar & ramp portal to protect from probable maximum flood.	Site		Y	
130	60.133(a)(2)	3.2.2.4 O2	Design collar to prevent significant water inflow during characterization.	Shaft		Y	4
131	60.133(a)(2)	3.2.2.4 O2	Design portal to prevent significant water inflow during floods.	Ramp		Y	
354	60.133(a)(2)	3.2.1.4 E1	Materials & UG design to limit geochemical effects in event of fire.	Shaft	TBD	Y	
355	60.133(a)(2)	3.2.1.4 E1	Materials & UG design to limit geochemical effects in event of fire.	Ramp	TBD	Y	
132	60.133(a)(2)	3.2.1.4 E1	Materials & UG design to limit geochemical effects in event of fire.	UGE	TBD	Y	
133	60.133(a)(2)	3.2.1.4 E1A	Materials & UG design to limit geochemical effects in event of fire.	UGE		Y	
* 192	60.133(b)	3.2.2.4 D5	Water use in const./oper. shall not cause interference of tests.	Shaft		Y	2
* 193	60.133(b)	3.2.2.4 D5	Water use in const./oper. shall not cause interference of tests.	Ramp		Y	2
* 194	60.133(b)	3.2.2.4 D5	Water use in const./oper. shall not cause interference of tests.	UGE		Y	2
195	60.133(b)	3.2.2.4 D6	Dust control & cleaning walls to limit adverse effects on SC.	Shaft		Y	11f
* 196	60.133(b)	3.2.2.4 D6	Dust control & cleaning walls to limit adverse effects on SC.	Ramp		Y	11f

Table I-2 PA Analysis Support for the ESF (continued)

	Lbl	10 CFR Requirement	ESFDR Requirement	ESFDR or 10 CFR 60 Description	Sub Syst.	St.	Analysis	
							Group	No.
*	197	60.133(b)	3.2.2.4 D6	Dust control & cleaning walls to limit adverse effects on SC.	UGE		Y	11f
*	138	60.133(b)	3.2.2.4 C2	Accommodate site specific conditions so that testing is not adversely affected.	Shaft		Y	
*	139	60.133(b)	3.2.2.4 C2	Accommodate site specific conditions so that testing is not adversely affected.	Ramp		Y	
*	140	60.133(b)	3.2.2.4 C2	Accommodate site specific conditions so that testing is not adversely affected.	UGE		Y	
*	148	60.133(b)	3.2.2.4 D17	Locate relative to other accesses to limit interference of tests in either.	Shaft		Y	2
*	149	60.133(b)	3.2.2.4 D17	Locate relative to other accesses to limit interference of tests in either.	Ramp		Y	2
*	235	60.133(b)	3.2.2.4 N2	Drift spacing shall be a minimum of two drift diameters.	UGE		Y	2
	154	60.133(b)	3.2.2.4 P	Design facility with flexibility to adjust for site specific conditions.	Shaft		Y	
	155	60.133(b)	3.2.2.4 P	Design facility with flexibility to adjust for site specific conditions.	Ramp		Y	
	156	60.133(b)	3.2.2.4 P	Design facility with flexibility to adjust for site specific conditions.	UGE		Y	
	157	60.133(b)	3.2.2.5 C	Design facility with flexibility to adjust for site specific conditions.	UGSS		Y	
*	158	60.133(b)	3.2.2.4 C7	Limit interference between tests & between construction & tests.	UGE		Y	
*	159	60.133(b)	3.2.2.4 L7	No boreholes within 15 m. of UG openings outside ESF dedicated test area.	UGE	TBV	Y	
	160	60.133(b)	3.2.1.6 D	Location of tests shall not interfere with or endanger structured stability.	UGT		Y	
*	376	60.133(c)	3.2.2.4 J1	Design to maintain stability through retrieval period.	Shaft		Y	
*	377	60.133(c)	3.2.2.4 J1	Design to maintain stability through retrieval period.	Ramp		Y	
*	162	60.133(c)	3.2.1.9.8 B2	Design & construct shaft collars & ramp portals for a 100 year life.	Gen.	TBV	Y	
	167	60.133(c)	3.2.2.4 Q	UGF shall be designed to permit retrieval of waste.	Ramp		Y	
	168	60.133(c)	3.2.2.4 Q	UGF shall be designed to permit retrieval of waste.	UGE		Y	
	169	60.133(d)	3.2.2.4 S	ESF design shall provide for control of water or gas intrusion.	Gen.		Y	

Table I-2 PA Analysis Support for the ESF (continued)

	Lbl	10 CFR Requirement	ESFDR Requirement	ESFDR or 10 CFR 60 Description	Sub Syst.	St.	Analysis	
							Group	No.
	171	60.133(d)	3.2.2.1 J1	Limit use of water.	Site		Y	1f
	172	60.133(d)	3.2.2.1 J2	Avoid blockage of water that could impact post-closure performance.	Site		Y	
	175	60.133(d)	3.2.2.2 G	Fluids recovered shall be disposed to avoid performance impacts.	SU		Y	3f,11f
	239	60.133(d)	3.2.2.6 E4	Fluids recovered shall be disposed to avoid performance impacts.	UGT		Y	11f
*	179	60.133(d)	3.2.2.2.3 A	Sewage effluent shall not affect site characterization.	SU		Y	
*	180	60.133(d)	3.2.2.2.5 C	Prevent interference with characterization activities by the SWWCS.	SU		Y	3
	188	60.133(d)	3.2.2.6 E5	Excess water shall be removed.	UGT	TBD	Y	
	198	60.133(d)	3.2.2.6 E6	Cleaning of ESF walls shall limit water saturation.	UGT		Y	
*	199	60.133(d)	3.2.1.4 B1	Tag fluids, gases, and other materials used in construction.	Shaft		Y	10f,11f
	200	60.133(d)	3.2.1.4 B1	Tag fluids, gases, and other materials used in construction.	Ramp		Y	10f,11f
*	201	60.133(d)	3.2.1.4 B1	Tag fluids, gases, and other materials used in construction.	UGE	TBD	Y	10f,11f
*	202	60.133(d)	3.2.1.4 B1b	Fluids & materials shall be evaluated before use.	Shaft	TBD	Y	11f
*	203	60.133(d)	3.2.1.4 B1b	Fluids & materials shall be evaluated before use.	Ramp	TBD	Y	11f
*	204	60.133(d)	3.2.1.4 B1b	Fluids & materials shall be evaluated before use.	UGE	TBD	Y	11f
	205	60.133(d)	3.2.1.4 B1b	Fluids & materials shall be evaluated before use.	UGT	TBD	Y	11f
*	206	60.133(d)	3.2.2.4 D7	Control blasting agents and explosives so SC is not adversely affected.	Shaft		Y	
*	207	60.133(d)	3.2.2.4 D7	Control blasting agents and explosives so SC is not adversely affected.	Ramp		Y	
*	208	60.133(d)	3.2.2.4 D7	Control blasting agents and explosives so SC is not adversely affected.	UGE		Y	
*	209	60.133(d)	3.2.1.4 A	Evaluate chemical content of blasting agents and explosives.	Shaft	TBD	Y	
	210	60.133(d)	3.2.1.4 A	Evaluate chemical content of blasting agents and explosives.	Ramp	TBD	Y	



Table I-2 PA Analysis Support for the ESF (continued)

Lbl	10 CFR Requirement	ESFDR Requirement	ESFDR or 10 CFR 60 Description	Sub Syst.	St.	Analysis	
						Group	No.
211	60.133(d)	3.2.1.4 A	Evaluate chemical content of blasting agents and explosives.	UGE	TBD	Y	
* 212	60.133(d)	3.2.2.4 D17	Locate relative to other accesses to limit interference of tests in either.	Shaft		Y	2
* 213	60.133(d)	3.2.1.4 A	Locate relative to other accesses to limit interference of tests in either.	Ramp		Y	2
214	60.133(d)	3.2.2.4 S4	Limit water use to limit effects on waste isolation.	Shaft		Y	2
215	60.133(d)	3.2.2.4 S4	Limit water use to limit effects on waste isolation.	Ramp		Y	2
216	60.133(d)	3.2.2.4 S4	Limit water use to limit effects on waste isolation.	UGE		Y	2
217	60.133(d)	3.2.2.6 E1	Limit water use to limit effects on waste containment & isolation.	UGT	TBD	Y	
220	60.133(d)	3.2.2.4 S2	Drainage plan shall be consistent with repository oper. & postclosure sealing.	Ramp	TBD	Y	
221	60.133(d)	3.2.2.4 S2	Drainage plan shall be consistent with repository oper. & postclosure sealing.	UGE		Y	
* 233	60.133(b)	3.2.1.4 B2C	Control combustible materials to limit adverse effects on testing.	UGE		Y	
242	60.133(d)	3.2.2.8 D	Gaseous products shall not produce adverse geochemical affects.	UGT	TBD	Y	11f
* 243	60.133(e)(1)	3.2.2.4 J1	Design to maintain stability through retrieval period.	Shaft		Y	
* 364	60.133(e)(1)	3.2.2.4 J1	Design to maintain stability through retrieval period.	Shaft		Y	
245	60.133(e)(1)	3.2.2.4 R	Maintain retrievability.	Shaft		Y	
246	60.133(e)(2)	3.2.2.4 T	Design openings to reduce potential for rock movement or fracturing.	Shaft		Y	
247	60.133(e)(2)	3.2.2.4 T	Design openings to reduce potential for rock movement or fracturing.	Ramp		Y	
248	60.133(e)(2)	3.2.2.4 T2	Design openings to reduce potential for rock movement or fracturing.	UGE		Y	
249	60.133(e)(2)	3.2.2.4 T3	Shall withstand effects of seismic events.	Shaft		Y	
250	60.133(e)(2)	3.2.2.4 T3	Shall withstand effects of seismic events.	Ramp		Y	
251	60.133(e)(2)	3.2.2.4 T3	Shall withstand effects of seismic events.	UGE		Y	
252	60.133(e)(2)	3.2.2.4 T5	Locate accesses to limit potential mech. & hydrological interference.	Shaft		Y	2

Table I-2 PA Analysis Support for the ESF (continued)

Lbl	10 CFR Requirement	ESFDR Requirement	ESFDR or 10 CFR 60 Description	Sub Syst.	St.	Analysis	
						Group	No.
253	60.133(e)(2)	3.2.2.4 T5	Locate accesses to limit potential mech. & hydrological interference.	Ramp		Y	2
256	60.133(e)(2)	3.2.2.4 T1	Design of UG openings to provide for safe, maintainable ground control.	UGE		Y	
257	60.133(e)(2)	3.2.2.4 T4	Design MTL to limit overall response to excavation.	UGE		Y	
258	60.133(e)(2)	3.2.2.4 T6	Design UG openings to limit changes in rock properties.	UGE		Y	
260	60.133(f)	3.2.2.1 I1	Construction methods shall limit damage to underlying rock mass.	Site		Y	5f
261	60.133(f)	3.2.2.1 I2	Shall not affect the capability to meet performance objectives.	Site	TBD	Y	
262	60.133(f)	3.2.1.1 C1	Shall not significantly increase pathways/reduce performance.	Site		Y	5f
263	60.133(f)	3.2.2.4 T	Shall provide stability and minimize creation of preferential pathways.	Shaft		Y	
264	60.133(f)	3.2.2.4 T	Shall provide stability and minimize creation of preferential pathways.	Ramp		Y	
265	60.133(f)	3.2.2.4 T	Shall provide stability and minimize creation of preferential pathways.	UGE		Y	
266	60.133(f)	3.2.2.4 U6a	Area w/o thermal load, diametrical closure rate decreasing after const.	Shaft	TBD	Y	
267	60.133(f)	3.2.2.4 U6a	Area w/o thermal load, diametrical closure rate decreasing after const.	Ramp	TBD	Y	
268	60.133(f)	3.2.2.4 U6a	Area w/o thermal load, diametrical closure rate decreasing after const.	UGE	TBD	Y	
341	60.133(f)	3.2.2.4 U5	Controlled blasting shall limit disturbance of surrounding rock mass.	Shaft		Y	5f
272	60.133(f)	3.2.2.4 U4a	Controlled blasting shall limit disturbance of surrounding rock mass.	Shaft		Y	
342	60.133(f)	3.2.2.4 U5	Controlled blasting shall limit disturbance of surrounding rock mass.	Ramp		Y	5f
273	60.133(f)	3.2.2.4 U2a	Blast induced change in permeability > .5 opening dimension < 1 O.M.	Shaft		Y	5f
274	60.133(f)	3.2.2.4 U2a	Blast induced change in permeability > .5 opening dimension < 1 O.M.	Ramp		Y	5f
275	60.133(f)	3.2.2.4 U2a	Blast induced change in permeability > .5 opening dimension < 1 O.M.	UGE		Y	5f
281	60.133(f)	3.2.2.4 U5	Use controlled drilling & blasting methods to limit excavation induced damage.	UGE		Y	5f

Table I-2 PA Analysis Support for the ESF (continued)

Lbl	10 CFR Requirement	ESFDR Requirement	ESFDR or 10 CFR 60 Description	Sub Syst.	St.	Analysis	
						Group	No.
291	60.133(h)	3.2.1 J7	EBS shall assist geologic setting in meeting performance objectives.	Gen.		Y	
294	60.133(i)	3.2.2.4 V1	Consider thermal , mechanical & hydrologic response of host rock.	Shaft	TBD	Y	6f
295	60.133(i)	3.2.2.4 V1	Consider thermal , mechanical & hydrologic response of host rock.	Ramp	TBD	Y	6f
296	60.133(i)	3.2.2.4 V1	Consider thermal , mechanical & hydrologic response of host rock.	UGE	TBD	Y	6f
338	60.133(i)	3.2.2.4 V2	Thermal loads shall be considered in predicting the long-term response.	Shaft		Y	
339	60.133(i)	3.2.2.4 V2	Thermal loads shall be considered in predicting the long-term response.	Ramp		Y	
297	60.133(i)	3.2.2.4 V2	Thermal loads shall be considered in predicting the long-term response.	UGE		Y	
340	60.133(i)	3.2.2.4 S6	Shall withstand pressures exerted due to thermal loads.	Shaft	TBD	Y	7f
366	60.133(i)	3.2.2.4 V3	Shall withstand pressures exerted due to thermal loads.	Ramp	TBD	Y	7f
299	60.133(i)	3.2.2.4 V3	Shall withstand pressures exerted due to thermal loads.	UGE	TBD	Y	7f
298	60.133(i)	3.2.2.4 V4	Thermal & thermomechanical effects shall not increase saturation.	UGE	TBD	Y	
300	60.133(i)	3.2.2.4 V5	Thermal effects shall not increase temperature in TS <sub>w3</sub> or CH <sub>n</sub> >115 C.	UGE		Y	8f
301	60.134(a) & (b)	3.2.2 H	Seals shall prevent surface penetrations from creating preferential pathways.	Gen.		Y	
302	60.134(a) & (b)	3.2.2.4 W	Seals shall prevent surface penetrations from creating preferential pathways.	Shaft	TBD	Y	
303	60.134(a) & (b)	3.2.2.4 W	Seals shall prevent surface penetrations from creating preferential pathways.	Ramp	TBD	Y	
304	60.134(a) & (b)	3.2.2.4 W	Seals shall prevent surface penetrations from creating preferential pathways.	UGE	TBD	Y	
367	60.134(a), (b), & (c)	3.2.2.4 X2	Construction materials shall not interfere with postclosure sealing.	Shaft	TBD	Y	
368	60.134(a) , (b), & (c)	3.2.2.4 X2	Construction materials shall not interfere with postclosure sealing.	Ramp	TBD	Y	
305	60.137	3.2.8.1	Site shall facilitate performance confirmation testing.	Site	TBD	Y	*
306	60.137	3.2.9.4 D3	Performance confirmation testing shall consider adverse impacts on site.	Shaft		Y	*

Table I-2 PA Analysis Support for the ESF (continued)

Lbl	10 CFR Requirement	ESFDR Requirement	ESFDR or 10 CFR 60 Description	Sub Syst.	St.	Analysis	
						Group	No.
307	60.137	3.2.9.4 D3	Performance confirmation testing shall consider adverse impacts on site.	Ramp		Y	*
308	60.137	3.2.9.4 D3	Performance confirmation testing shall consider adverse impacts on site.	UGE		Y	*
369	60.141 & 60.142	3.2.9.4 D3	Performance confirmation testing shall consider adverse impacts on site.	Shaft		Y	*
370	60.141 & 60.142	3.2.9.4 D3	Performance confirmation testing shall consider adverse impacts on site.	Ramp		Y	*
371	60.141 & 60.142	3.2.9.4 D3	Performance confirmation testing shall consider adverse impacts on site.	UGE		Y	*
323	60.151	3.2.1 J11	QA program applicability.	Gen.		Y	9
325		3.2.2.1.1 A1	Analysis shall determine if muck and access roads should be included on MS.	Site		Y	
326		3.2.2.1.1 A2	Analysis shall determine if shaft accesses should be included on MS.	Site		Y	
327		3.2.2.1.1 A3	Analysis shall determine if ramp accesses should be included on MS.	Site		Y	
329		3.2.2.1.1 A5	Analysis shall determine if construction facilities should be included on MS.	Site		Y	
330		3.2.2.1.1 A6	Analysis shall determine if muck handling facilities should be included on MS.	Site		Y	
332		3.2.2.1.1 A8	Analysis shall determine if utilities should be included on MS.	Site		Y	
331		3.2.2.1.1 A12	Analysis shall determine if multi purpose boreholes should be included on MS.	Site		Y	
333		3.2.2.1.2 A1	Analysis shall determine if items of construction utilities shall be included.	AS		Y	
334		3.2.2.1.2 A2	Analysis shall determine if construction surface storage shall be included.	AS		Y	
335		3.2.2.1.2 A5	Analysis shall determine if SC surface storage shall be included.	AS		Y	

## Legend for Table I-2

<u>Heading</u>	<u>Definition</u>
<b>Sub-system</b>	
AS	Auxiliary site
CHn	Calico Hills nonwelded vitric unit
DECOM	Decommissioned
EBS	Engineered barrier system
FPS	Fire Protection System
GEN	General
GROA	Geologic repository operations area
MEM	Mechanical excavation methods
MS	Main site
MTL	Main test level
SC	Site characterization
SF	Surface facilities
SU	Surface utilities
SWS	Surface water systems
TBM	Tunnel boring machine
TSw3	Topopah Springs Welded Unit 3
UGE	Underground excavation
UGSS	Underground service systems
UGT	Underground testing
UGWWCS	Underground waste water collection system
WDS	Water distribution system
<b>ESFDR Requirement</b>	
3.2.X.X	Refers to a specific ESFDR requirement
<b>Analysis group</b>	
N	No PA analyses are required
R	Compliance is demonstrated by satisfying lower level requirements.
Y	PA analysis are required to demonstrate compliance.
<b>Analysis No.</b>	
xx	Analysis number from Table 1-2: the result from corresponding analysis adequately address concerns expressed in the requirement.
xxf	Analysis number from Table 1-2: results from the corresponding analysis may be applied to address the concerns expressed in the requirement. Further analysis is required.

## Legend for Table I-2 (continued)

<u>Heading</u>	<u>Definition</u>
*	Results from all of the analyses listed in Table I-2 may be applied in addressing the concerns in the requirements.

St.

TBD To be determined

TBV To be verified

**Left Margin Annotation**

*	Indicates an ESFDR/10 CFR 60 linkage, due to NRC interpretations of 10 CFR 60, that is not shown in Volume I.
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requirements. The Design Acceptability Analysis strategy for showing compliance is employed wherein the hierarchy of requirements was established. Compliance with the higher-level requirements is demonstrated by showing compliance collectively with the lower-level requirements. To this end, the ESFDR requirements are divided into the following groups:

- Those for which no PA analysis have been identified, however other means for demonstrating compliance may be required,
- Those which can be satisfied by roll-ups of lower-level requirements, and
- Those requiring PA analysis.

Analyses 1 through 9 have been completed while analyses 10 and 11 are integral parts of the design and construction process and are ongoing. These analyses are based on available data and on the present conceptual understanding of the processes and mechanisms perceived active at Yucca Mountain, and may be refined as better understanding evolves through site characterization and additional analyses. These analyses have been reviewed for applicability to the Revised ESF Title I Configuration. The recommendations put forth in this Appendix are based on the results of this review and are to be used in the Revised ESF Title II design.

Follow-up studies should be conducted to address uncertainties and the sensitivity of the results to alternate conceptual models. The sensitivity of the results of these analyses to design changes should also be ascertained. Recommendations based on these results are intended to provide guidance for applying engineering judgment during the design, construction, and operation of the ESF.

Additional analyses will be defined, as appropriate, through interactions among analysts, architects/engineers, and investigators responsible for site characterization activities. It is also anticipated that the results of analyses will impact the design and result in changes in ESFDR performance criteria. Further, analysis results may suggest additional analyses are necessary or that scheduled analyses are not needed. To accommodate this flexibility, this appendix will be dynamic and will be updated periodically to report the results of analyses and recommendations.

Table I-2 presents the relationship between the 10 CFR 60 requirements applicable to the design, construction, and operation of the ESF; the ESFDR requirements; and the results of PA analyses. Columns 1 through 6 of the table contain the reference baseline for analysis support for the ESFDR. A unique label, which is displayed in the first column of the table, has been assigned each requirement to facilitate requirement reference.

The second column (the 10 CFR 60 Requirement column) cites the requirements applicable to the design, construction, or operation of the ESF; and the third column (the ESFDR Requirement column) contains the associated ESFDR requirement. A blank in the 10 CFR 60 column indicates that the requirement cited in the ESFDR Requirement column has been identified as needing analysis, but is not a direct descendant of an applicable 10 CFR 60 requirement. A blank in the ESFDR Requirement column indicates that the current version of the ESFDR does not contain a requirement that corresponds to that listed in the 10 CFR 60 Requirement column.

The fourth column (the ESFDR or 10 CFR 60 Description column) contains a condensed description of the ESFDR requirement contained in the 10 CFR 60 Requirement column, and a condensed description of the 10 CFR 60 requirement when the ESFDR Requirement column is blank.

The fifth column (the ESF Subsystem column) refers to the ESF subsystem to which requirements apply; the sixth column (the ESFDR status column) provides the ESFDR status of concerns expressed in requirements; and the seventh column (the Analysis Group column) provides analysis grouping.

The last column (the Analysis Number column) provides the relationship between PA analyses listed in Table I-1 and requirements. Numbers in this column refer to the analysis numbers in Table I-1 and indicate that the results of the corresponding analysis can be applied to address concerns expressed in the requirements. Numbers annotated with "f" indicate that further analysis is required to adequately address all of the concerns expressed in the requirement. Numbers without that annotation indicate that the results from the corresponding analysis adequately address concerns expressed in the requirement. Note that the results from more than one analysis may be required to address all of the concerns expressed in a requirement.

Descriptions at the end of Table I-2 provide additional information for interpreting data in the table.

## **I.2 ANALYSES SUMMARY**

The analyses summarized in this appendix are based on widely used conceptual and mathematical models that incorporate our present understanding of processes and mechanisms ongoing at Yucca Mountain. It should be emphasized that the results of these analyses may not agree with results of future analyses based on alternate conceptual models. As our knowledge of the site increases these uncertainties may be reduced or removed by future analyses.

Recommendations based on these analyses are provided only as guidance and will be evaluated and revised through continual interactions among the architectural engineers, analysts, and investigators responsible for site characterization. Thus, refinement of the results is an ongoing and iterative process, which must complement site characterization. These analyses were based on the ESF Title II Design (ESF Title II Summary Report (Rev. 0)), but have been reviewed for applicability to the Revised ESF Title I Configuration. The recommendations which follow are based on this review and are to be used in the Revised ESF Title II design.

### **I.2.1 ANALYSIS 1. SURFACE CONSTRUCTION WATER MOVEMENT ABOVE THE POTENTIAL REPOSITORY**

#### **Purpose:**

To provide numerical criteria for limiting the amount of water that can be placed on the surface above the potential repository and for determining the lateral extent of water as it flows within the mountain due to water application at the surface.



**Summary:**

The calculations were performed in accordance with Problem Definition Memos (PDM) 72-28 (one-dimensional), and PDM 72-29 (two-dimensional).

A series of one-dimensional calculations were made using Total Systems Performance Assessment Code (TOSPAC) to estimate changes in saturation at depth, and to provide input to the two-dimensional calculations. The two-dimensional calculations were performed using Groundwater Flow Computer Code (NORIA-SP) to substantiate the one-dimensional results and to determine the lateral movement of the water within the mountain due to application of water at the surface.

The physics associated with water transport at the surface are complicated and include unpredictable variables such as the weather and topography. Thus, the amount of water that will enter the mountain can only be inferred from measurements of rainfall, surface evaporation, run-off, the amount of water applied on the surface and through a surface water balance. Because only the water that enters the mountain can affect potential repository performance and underground tests, these calculations were posed in terms of the amount of water penetrating the surface rather than the amount of water applied to the surface. This minimizes complications and uncertainties associated with surface water balances and scenarios for water application in the calculations.

The result of this analysis shows that 16 cubic meters (565 cubic feet) of water per square meter of surface area can enter the mountain without increasing the saturation at the potential repository horizon within 10,000 years. Additionally, the lateral extent of the water is confined to within four times the wetted surface area. Sixteen cubic meters (565 cubic feet) of water per square meter of surface area is the amount of water that would infiltrate the mountain after five years of infiltration at a constant rate of 8.76 mm/day (2.0 gallons/yard<sup>2</sup>/day).

These results address concerns expressed in ESFDR requirement 3.2.2.1.J.1.

**Recommendation:**

The results of Analysis 1 indicate that limiting the cumulative amount of water (including precipitation) placed on the surface above the potential repository to 3,540 gallons per square yard (16 cubic meters per square meter) of watered area, will not impact the performance of the potential repository in 10,000 years (3.2.2.1.J.1). Monitor precipitation and surface water applications from all operations such as dust suppression, surface base testing, compaction and potential repository construction; and budget water applications onto the surface such that the total water budget does not exceed 3,540 gallons per square yard of watered area above the potential repository. Limit water use to as low as reasonably achievable.

Citations for the data used, lists of assumptions, results, and the rationale for applying the results to address concerns expressed in requirements, can be found in PDM 72-28 and PDM 72-29.

## **1.2.2 ANALYSIS 2. ANALYSES OF CONSTRUCTION WATER MOVEMENT**

**Purpose:**

To estimate the potential for water used in the construction of optional shafts and ramps to interfere with experiments conducted in the surrounding host rock.

**Summary:**

The calculations were performed in accordance with PDM 72-30. One-dimensional calculations using NORIA-SP were performed to determine construction water movement from optional shafts and drifts; the results and conclusions for drifts may also be applied to ramps. These calculations are extensions of the analyses performed by Eaton and Peterson [1988] but at higher construction water requirements and higher retention factors (i.e., for more water entering the surrounding host rock). The calculations were performed as summarized below:

**Shafts****Geometry**

One-Dimensional axisymmetric

Shaft radius: 2.21 meters (7.3 feet)

**Modified Permeability Zone (MPZ):** one diameter

**Parameters**

Stratigraphic Units:

Tiva Canyon, Paintbrush, Topopah Springs, Calico Hills

Construction water used:

2.856 cubic meters (101 cubic feet) per meter of shaft

Retention factor

Without ventilation: 15 percent

With ventilation: 10, 15, 20 percent

**Drifts****Geometry**

One-dimensional cartesian

Drift dimensions:

Height 4.3 meters (14 feet), width 6.4 meters (21 feet) per the ESF Title II Design

Summary Report (REV. 0) design

**Modified Permeability Zone (MPZ):** 2.76 m

**Parameters**

Stratigraphic Units:

Topopah Springs, Calico Hills

Construction water used:

2.918 cubic meters (103 cubic feet) per meter of drift

Retention factor

Without ventilation: 15 percent

With ventilation: 10, 15, 20 percent

The results of these calculations show that ventilation removes the retained construction water and dries out the surrounding rock.

The penetration of water into the rock at constant values of saturation change is illustrated as a function of time. These curves provide bounds for evaluating the interference of construction water with experiments conducted in the surrounding host rock.

These results address concerns expressed in ESFDR requirements 3.2.1.4.A, 3.2.2.4.D.5, 3.2.2.4.D.7, 3.2.2.4.D.17, 3.2.2.4.N.2, 3.2.2.4.S.2, 3.2.2.4.S.4 and 3.2.2.4.T.5.

**Recommendations:**

Separate optional shafts, ramps, and drifts from other accesses 34 meters (111.5 feet) in Calico Hills and 20 meters (65.6 feet) elsewhere, to limit interference of tests in either location (3.2.2.4.D.17, 3.2.2.4.N.2, 3.2.2.4.S.2, 3.2.2.4.S.4, and 3.2.2.4.T.5). For cases where these criteria are restrictive, use the loci of saturation change as a function of distance from optional shafts to limit hydrological interference to acceptable levels.

**Recommendations:**

Separate tests 17 meters (56 feet) from optional shafts, ramps, and drifts in Calico Hills and 10 meters (33 feet) from optional shafts elsewhere to prevent interference of construction with tests (3.2.2.4.D.5). For cases where these criteria are restrictive, use the loci of saturation change as a function of distance from optional shafts to design experiments such that the hydrological interference is within acceptable limits.

Citations for the data used, lists of assumptions, results, and the rationale for applying the results to address concerns expressed in requirements can be found in PDM 72-30.

### **I.2.3 ANALYSIS 3. ANALYSES OF SEWAGE AND SETTLING POND WATER MOVEMENT**

**Purpose:**

To estimate the potential for water leakage from settling ponds in the muck storage area and water discharged from the sewage pond system, to interfere with experiments conducted in the ESF.

**Summary:**

The calculations were performed in accordance with PDM 72-31.

Calculations were performed to evaluate both sewage ponds and settling ponds using the conditions summarized below.

**Sewage ponds**

The potential effects of the sewage pond locations were investigated by performing calculations at two locations, one near the edge of the potential repository block and the other approximately two miles east of the potential repository boundary. These calculations predicted water movement from the sewage ponds at the two locations. These locations were selected to correspond to the Title II design for the locations for muck settling ponds and sewage ponds.

The sewage pond size was obtained from the ESF Title II Design Summary Report (Rev. 0) and the pond was assumed to be unlined and to contain sewage at a constant 1.83 meters (6 feet) depth for five years.

**Settling ponds**

Water movement from settling ponds and the effects of leaks in pond liners were predicted by calculations for leakages which correspond to 100, 10, and 1 percent of the Title II design settling pond surface area. Leaks were assumed to be discrete with negligible impedance to flow and the depth of the pond was assumed to be a constant 3.05 meters (10 feet).

**Summary:**

These calculations show that water leakage from the settling ponds in the muck storage area and in the location of the sewage ponds has had no effect on the saturation at the potential repository horizon and will not interfere with experiments conducted in the ESF.

These results adequately address concerns expressed in ESFDR requirements 3.2.2.2.D, 3.2.2.2.3.D, and 3.2.2.2.5.C and address concerns expressed for fluids with transport properties similar to water in requirement 3.2.2.2.G.

**Recommendation:**

Storage of wastewater in ponds located outside the potential repository block will not affect potential repository performance (3.2.2.2.D).

**Recommendation:**

Sewage ponds located outside the potential repository block will not affect potential repository performance (3.2.2.2.3.D).

**Recommendation:**

Locate wastewater ponds at least 213.4 meters (700 feet) from site characterization activities to assure that the wastewater will not interfere with site characterization anywhere in the potential repository block. Use the two-dimensional saturation profiles produced from the results of this analysis to determine the interference from ponds located closer to the potential repository block (3.2.2.2.5.C).

**Recommendation:**

Fluids with transport properties similar to water stored in ponds located outside the potential repository block will not affect potential repository performance (3.2.2.2.G).

Citations for the data used, lists of assumptions, results, and the rationale for applying the results to address concerns expressed in requirements can be found in PDM 72-31.

#### **1.2.4 ANALYSIS 4. WATER ENTRY INTO OPTIONAL SHAFTS THROUGH ROCK MASS SURROUNDING THE SHAFT COLLAR AND LINER**

**Purpose:**

To determine the amount of water entering the optional shaft through the near-surface fracture network.

These calculations were performed in accordance with PDM 76-08.

Three scenarios considered in this study are as described below (Fernandez et al., 1989):

- (a) The rainfall rate scenario in which the flow of water into the fractures is controlled by the rate of rainfall. Rain falling in excess of the fracture network's ability to absorb water is assumed to drain off the pad. This is not the case if the pad site is restored after closure of the ESF so that the postclosure hydrology is like that prior to construction, or if the engineered drainage features around the ESF pad do not maintain drainage.

- (b) The sheet flow scenario in which sheet flow is assumed to occur over the pad. This scenario assumes that no restoration of the Exploratory Shaft (ES) pad occurs and that the amount of water entering the fracture network is limited only by the network's ability to absorb water.
- (c) The zones of influence of the Probable Maximum Flood Channel and the optional shaft (worst case) are 43 and 42 meters (141 and 138 feet), respectively. Thus, locating optional shafts more than 85 meters (278.9 feet) from the Probable Maximum Flood Channel will prevent water inflow into optional shafts during flooding.

These analyses were performed under the assumption that no remedial measures were performed in the vicinity of the optional shaft to limit water inflow into the rock matrix. The retarding effect of an alluvial cover was neglected.

The primary conclusion of this analysis is that the water entry into the optional exploratory shaft by way of the rock mass behind the shaft collar is less than the storage and drainage capacity of the shaft sump under the host rock conditions. Performance implications associated with this water flow are not expected. For this reason no design constraints are imposed on the shaft collar to limit the permeability of rock behind the collar. This conclusion adequately addresses a concern expressed in ESFDR requirement 3.2.2.4.O.2.

It is necessary to emphasize that should significant water entry occur behind the shaft collar as a result of optional shaft excavation, remedial measures may be applied. These remedial measures include grouting the fractures near the collar and restoring the pad area at closure using the strategies to control infiltration given in Section 8.3.2 of Fernandez et al. (1989).

**Recommendation:**

Locate optional shafts 85 meters (279 feet) from the Maximum Probable Flood Channel to prevent inflow during floods (3.2.2.4.O.2).

Citations for the data used, lists of assumptions, results, and the rationale for applying the results to address concerns expressed in requirements can be found in PDM 76-08.

## **1.2.5 ANALYSIS 5. OPTIONAL SHAFT AND MAIN PAD BLASTING EFFECTS**

**Purpose:**

To provide quantitative estimates of the extent of fracturing which may result from blasting used to excavate the optional shaft and bring the pad area to grade. The blast design will be assessed to determine the length of fractures predicted to extend from blast holes.

**Summary:**

This evaluation was performed in accordance with Design Investigation Memo (DIM) 257.

An assessment of the extent of fracturing in preparation of the pad, collar, and optional shaft for the ESF has been completed. The investigation provides background and guidance for determining if controlled blasting can be used to limit excavation-induced damage to the rock. This assessment is based on the Site Characterization Plan Conceptual Design Report (SCP-CDR), MacDougall [1987]. The results, for the most part, are specific to that design; however, the results may be applied to the Revised ESF Title I Configuration as described

herein. For this analysis, a preliminary conceptual design for the pad was used because no reference design existed. The extent of fracturing for the collar and optional shaft was based on McKenzie [1987].

The assessment for the pad indicates that if the Tiva Canyon unit is high in lithophysal content, then surface preparations (which must include a cut and fill operation) could be completed by ripping. If the Tiva Canyon unit is low in lithophysal content, a bench blast design will be conceived to minimize damage. This information applies to ESFDR requirements 3.2.1.1.C.1 and 3.2.2.1.I.1.

A review of the blast design prepared by Fenix and Scisson for the optional shaft, indicates that damage caused by blasting could extend 0.9 to 1.2 meters (3 to 4 feet) beyond the excavation wall. The comments on this design provide a means to understand and possibly decrease the expected blast-induced damage.

This analysis addresses the extent of fracturing due to blasting, and therefore may be applied in a generic fashion to the following requirements: 3.2.1.1.C.1, 3.2.2.1.I.1, 3.2.2.4.U.2(a), and 3.2.2.4.U.5.

The empirical methods used in this analysis were not developed specifically for tuff and may not be directly applicable. Computer analysis methods employing a more quantitative approach will be conducted as the required data (e.g., dynamic rock properties) become available.

**Recommendation:**

The results of Analysis 5 indicate that excavation methods incorporating ripping in high lithophysal material and a bench blast design for low lithophysal material, should be considered to limit damage to the underlying rock mass (3.2.1.1.C.1, and 3.2.2.1.I.1).

**Recommendation:**

The results of Analysis 5 indicate that a goal for the extension of blast-induced fracturing into intact rock should be limited to less than 1 meter (3.28 feet) using controlled blasting. (3.2.2.4.U.2(a), and 3.2.2.4.U.5)

Citations for the data used, lists of assumptions, results, and the rationale for applying the results to address concerns expressed in requirements can be found in DIM 257.

## **1.2.6 ANALYSIS 6. OPTIONAL SHAFT AND COLLAR CREEP**

**Purpose:**

The purpose of this analysis is to estimate the potential for rock creep and its effect on the optional shaft and collar.

This analysis was performed in accordance with DIM 256...

This assessment is based on the SCP-CDR. The results, for the most part, are specific to that design; however, the results may be applied to the Revised ESF Title I Configuration as described herein. This investigation provides background and guidance to assess whether the total closure of the rock around the optional shaft is expected to be less than 76 millimeters (3 inches) in 100 years and if the diametrical closure will average less than 1 millimeter (0.04 inches) per year.

The thermal and mechanical environment in the vicinity of the optional shafts (unlined) for the 100-year operational period is reviewed in light of potential time-dependent deformation mechanisms. Magnitudes of creep strains will be on the same order as the magnitudes of the instantaneous elastic and plastic strains resulting from excavation of the optional shaft ( $\sim 10^{-3}$ ). Data from existing tunnels in rocks having mineralogies, structures (joints, fractures, and deformation), and overburden similar to those at the Yucca Mountain site suggest that creep deformation is not likely to lead to deformations that produce instability. Calculations of the creep strain in granitic rocks at temperatures and stresses more severe than those expected at the ESF result in creep strain magnitudes that are on the same order as the elastic and plastic strain magnitudes expected in tuff. The most significant unknown in this study is the potential magnitude of creep along fractures. It is concluded that creep strains on favorably oriented fractures may exceed the estimated matrix strains. The strain magnitudes postulated based on the review of available information can be accommodated in an appropriate liner design for the ESF.

Data available for predicting the creep strains at the ESF are sparse. The potential creep phenomena should be further studied through an integrated laboratory and field experimentation program and a monitoring program coupled with analyses.

This analysis addresses the potential for collar creep and its potential effects, and therefore may be applied in a generic fashion to the following requirement: 3.2.2.4.V.1.

**Recommendation:**

The results of Analysis 6 indicate that the thermomechanical response of the host rock matrix and surrounding strata to time-dependent deformation mechanisms, will be comparable to the instantaneous elastic and plastic strains ( $\sim 10^{-3}$ ) for rock units at and above the Topopah Spring Welded Unit 2 (TSw2) resulting from excavation of the optional shaft (3.2.2.4.V.1). This recommendation may not be appropriate for the Calico Hills unit.

Citations for the data used, lists of assumptions, results, and the rationale for applying the results to address concerns expressed in requirements can be found in DIM 256.

## **I.2.7 ANALYSIS 7. OPTIONAL SHAFT, RAMP, AND COLLAR THERMAL STRESS**

**Purpose:**

The purpose of this analysis is to provide quantitative estimates of the thermal stresses expected on the optional shaft liner and collar, through the optional shaft breakout zones, the main test level, and along the main access drifts in the potential repository.

**Summary:**

The analysis was performed in accordance with PDM 75-13 Rev C.

This analysis is based on the SCP-CDR. The results, for the most part, are specific to that design; however, the results may be applied to the Revised ESF Title I Configuration as described herein. The computer code STRES3D was used to predict the temperature, stress and strain resulting from the emplacement of heat generating high-level waste. This model simplifies the geometry of the potential repository as a semi-infinite elastic half space. The panels containing waste are modeled as four exponentially decaying source terms for the first 1,000 years after waste emplacement and six source terms for times of 1,000 to 10,000 years. Waste is assumed to be emplaced within 25 years. A total of 130 plate elements were used to model the waste panels.

The thermally-induced axial stress (vertical) change at the location of ES1 and ES2 indicates a stress decrease at all times. The thermally-induced horizontal normal stresses are compressive at elevations below 1051.6 meters (3450 feet) elevation (in and below the TSw2) at both optional shaft locations with negative stress changes generated near the surface.

At the ES1 location, changes in the north-south and east-west horizontal stresses peak at approximately the same value at 2,000 years. The maximum north-south horizontal stress change is approximately 1.8 MPa, and the maximum east-west horizontal stress change is approximately 1.7 MPa. The maximum vertical stress change at the ES1 location occurs 300 years after the start of waste emplacement and is approximately 2.2 MPa (negative).

At the location of ES2, the maximum temperature is slightly less than that for ES1. The maximum vertical stress change is 1.6 MPa (negative) and occurs at 300 years. The maximum north-south horizontal stress change occurs at 2,000 years at a value of approximately 1.7 MPa (compressive). The maximum east-west horizontal stress change of approximately 2.1 MPa (compressive) occurs at 500 years.

The temperature changes at the upper and lower breakout rooms are significantly lower than at the Main Test Level (MTL). The temperatures and stress changes at the MTL are strongly dependent on the location relative to the closest waste emplacement panels.

Stress and temperature changes along the centerline of the mains and the exploratory drifts are presented. The temperature at the centerline of the main drifts will reach approximately 57° C (a change of 32° C). For the exploratory drifts, which later function as panel access drifts, temperature changes of approximately 70° C are predicted and the horizontal compressive stress at the drift location is predicted to increase by 11 MPa.

The numerical values presented are based on thermal and thermomechanical properties which are cited in PDM 75-13 Rev. C., and are sensitive to the potential repository layout, waste emplacement loading density, and the in situ site conditions.

The results of this analysis provide general information which might be used to address concerns expressed in ESFDR requirement 3.2.2.4.V.3. Further analysis is required.

**Recommendation:**

The results of Analysis 7 indicate that during the 100 years following waste emplacement the thermal and thermomechanical response of the host rock at the location of ES1 and ES2 will be such that the vertical stress will have decreased by less than 2 MPa at the proposed elevation of the potential repository (3.2.2.4.V.3).

**Recommendation:**

The results of Analysis 7 indicate that horizontal stresses increase at the ES locations on the order of 0.3 MPa (maximum north-south horizontal stress change for first 100 years) and on the order of 1.3 MPa (maximum east-west horizontal stress change due to thermal loading of the potential repository) at the potential repository horizon. The maximum vertical stress is expected to decrease on the order of 1.7 MPa for the same time frame (3.2.2.4.V.3) at these same locations.

Citations for the data used, lists of assumptions, results, and the rationale for applying the results to address concerns expressed in requirements can be found in PDM 75-13 Rev. C.



**I.2.8 ANALYSIS 8. FAR FIELD THERMAL EFFECTS****Purpose:**

To provide three-dimensional far-field predictions for the temperatures surrounding a potential repository.

**Summary:** The analysis was performed in accordance with PDM 75-13.

This analysis is based on the SCP-CDR. The results, for the most part, are specific to that design; however, the results may be applied to the Revised ESF Title I Configuration as described herein. The thermal calculations were conducted as part of the thermal-mechanical calculations using STRES3D and are discussed in Analysis 7. The results of Analysis 8 indicate that the maximum temperature from waste emplacement at the Topopah Spring Welded Unit 3 (TSw3)-Calico Hills Non-vitric Ashflow (CHn) boundary under the main test level will be less than 45° C. Further analysis will be required.

These results address concerns expressed in ESFDR requirement 3.2.2.4.V.5.

**Recommendation:**

Unless the output of the heaters exceeds the thermal loading of the potential repository, the temperature at the TSw3-CHn boundary will not exceed 115° C (3.2.2.4.V.5).

Citations for the data used, lists of assumptions, results, and the rationale for applying the results to address concerns expressed in requirements can be found in PDM 75-13 Rev. C.

**I.2.9 ANALYSIS 9. SYSTEMS AND COMPONENTS IMPORTANT TO SAFETY****Purpose:**

To perform a technical review of the documentation identifying Items Important to Safety and Items Important to Waste Isolation.

The document describing the Q-List has been reviewed and published as YMP/90-55. (3.2.1.J.11)

**Recommendation:**

Items to be included as Items Important to Safety and Items Important to Waste Isolation are identified in the results of Analysis 9.

**I.2.10 ANALYSIS 10. ANALYSES OF THE HYDROLOGIC AND GEOCHEMICAL EFFECTS OF TRACERS****Purpose:**

To identify, characterize and control tracer tagging compounds and to evaluate their potential effects on experiments and waste isolation.

**Summary:**

Analyses 10 and 11 have been combined into a Memorandum of Understanding (MOU 330011) among Yucca Mountain Site Characterization Project (YMP) participants that will create a project control list for tracers and materials including water which will be used at Yucca Mountain. This document formalizes the relationships required to perform the work described in Analyses 10 and 11.

This analysis will address concerns expressed in ESFDR requirements 3.2.1MO3 and 3.2.1.4.B.2(b).

**Recommendation:**

Analysis 10 is ongoing as part of MOU 330011. The region of influence related to hydrological and geochemical effects of tracers is assumed to be similar to the area influenced by water (3.2.1.M.3, and 3.2.14.B.2.(b)). After the tracers have been identified and their transport properties characterized, analyses may show that the transport of certain tracers may significantly differ from the transport of water.

**1.2.11 ANALYSIS 11. ANALYSES OF THE HYDROLOGIC AND GEOCHEMICAL EFFECTS OF CHEMICALS**

**Purpose:**

To identify, characterize, and control materials and chemicals and to evaluate their potential effects on experiments and waste isolation.

Analyses 10 and 11 have been combined into an MOU 330011 among YMP participants that create a project control list for tracers and materials including water which will be used at Yucca Mountain. This document formalizes the relationships required to perform the work described in Analyses 10 and 11.

This analysis will address concerns expressed in ESFDR requirements 3.2.1.M.3, 3.2.1.M.4, 3.2.2.2.G, 3.2.2.4.D.6, 3.2.1.4.B.1, 3.2.1.4.B.1(b), 3.2.1.4.B.2(b), 3.2.1.4.D.1, 3.2.1.4.D.2, 3.2.8.8.D and 3.2.2.6.E.4.

**Recommendation:**

Analysis 11 is ongoing as part of MOU 330011. The region of influence related to hydrological and geochemical effects of hydrocarbons and solvents is assumed to be similar to the area influenced by water (3.2.1M4). After the materials and chemicals have been identified and their transport properties characterized, analyses may show that the transport of certain materials and chemicals may significantly differ from the transport of water.

**I.3 REFERENCES**

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**I.4 ACRONYMS AND ABBREVIATIONS**

CFR	Code of Federal Regulations
CHn	Calico Hills Nonvitric Ashflow
DIM	Design Investigation Memo
DOE	Department of Energy
ES	Exploratory Shaft
ESF	Exploratory Studies Facility
ESFDR	Exploratory Studies Facility Design Requirements
MOU	Memorandum of Understanding
NORIA-SP	Groundwater flow computer code
PA	Performance Assessment
PDM	Problem Definition Memo
SCP-CDR	Site Characterization Plan Conceptual Design Report
SDRD	Subsystems Design Requirements Document
TSw2	Topopah Springs Welded Unit 2
TSw3	Topopah Springs Welded Unit 3
YMP	Yucca Mountain Site Characterization Project

**APPENDIX J**

**EXPLORATORY STUDIES FACILITY ENVIRONMENTAL REQUIREMENTS**

## APPENDIX J

## EXPLORATORY STUDIES FACILITY ENVIRONMENTAL REQUIREMENTS

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## EXPLORATORY STUDIES FACILITY ENVIRONMENTAL REQUIREMENTS

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## APPENDIX J

## EXPLORATORY STUDIES FACILITY ENVIRONMENTAL REQUIREMENTS

**J.1 INTRODUCTION****J.1.1 PURPOSE**

The purpose of this appendix is to provide a brief, but comprehensive, presentation of the environmental design requirements (federal, state, and local) that apply to all Exploratory Studies Facility (ESF) activities. These design requirements affect all phases of the ESF. Inclusion of these requirements in the design of site characterization activities is essential to ensuring that the activities are conducted in a manner that will protect, maintain, and restore environmental quality; minimize potential threats to the environment, and comply with environmental regulations and policies.

**J.1.2 OVERVIEW OF THE ENVIRONMENTAL PROGRAM**

The U.S. Department of Energy (DOE) is committed to performing its activities in an environmentally safe and sound manner, and will comply with all applicable environmental statutes and regulations. To fulfill this commitment at the Yucca Mountain site, the DOE has established an environmental program that assures that site characterization studies will be conducted in such a way that applicable environmental design requirements are met. The Yucca Mountain Site Characterization Project (YMP) environmental program is structured to satisfy the statutory requirements of the Nuclear Waste Policy Act (NWPA), as amended; the National Environmental Policy Act (NEPA); the Atomic Energy Act (AEA); and other applicable statutes, regulations and DOE Orders.

Federal and State statutes, regulations, requirements, and DOE Orders that apply to the YMP, and a brief description of each, are presented in the Environmental Regulatory Compliance Plan (ERCP; DOE, 1992a). The ERCP describes the way in which the YMP would satisfy the environmental regulatory requirements for site characterization, and identifies the information necessary to prepare a specific permit application.

**J.1.3 ENVIRONMENTAL REQUIREMENTS FLOWDOWN**

The ERCP was the upper-tier reference document used for determining the environmental design requirements identified in this Appendix. Table J-1 presents the flowdown interfaces between the ERCP and Appendix J.



Table J-1. Flowdown Interfaces Between the ERCP and Appendix J

Environmental Regulations	ERCP Section	Appendi x J Section	Appendix J Section Titles
Nuclear Waste Policy Act	1.1	9	Reclamation
Endangered Species Act	3.2.2	7	Biological Resource Protection
Farmland Protection Policy Act	3.2.3	9	Reclamation
Hazardous Material Transportation Act	3.2.5	6.1	Solid & Hazardous Waste Mgmt.
Noise Control Act	3.2.12	13	Noise
EO 11988, Floodplain Management	3.2.13	12	Floodplain Protection
EO 11990, Protection of Wetlands	3.2.14	12	Wetlands Protection
Clean Air Act	3.3.1	2	Air Pollution Control
Federal Water Pollution Control Act	3.3.2	5.1	Federal Water pollution Control Act
Resource Conservation & Recovery Act	3.3.3	6.1	Resource Conservation and Recovery Act of 1976
Safe Drinking Water Act	3.3.4	4.1	Safe Drinking Water Act of 1974
Underground Injection Control Program	3.3.5	4.2	Underground Injection Control Program
Sanitary and Sewage Collection System Requirements	3.4.1	5.3	Sanitary and Sewage Collection System Requirements
Permit to Appropriate Public Waters of Nevada	3.4.2	3	Water Appropriation
Nevada Water Law	3.4.3	5.2	Nevada Water Pollution Control Law

## J.2 AIR POLLUTION CONTROL

CLEAN AIR ACT, as amended (P.L. 95-95; 42 USC 7401-7642; 40 CFR 50-53, 58, 60-61, 81.300-.400, 124; EO 12088; NRS 445.401 et seq)

### Background

The Clean Air Act (CAA, 1977) establishes federal policy for preserving and enhancing the quality of the Nation's air resources to protect the public health and welfare. The CAA ensures, through a state-issued permit program, that adequate steps are taken to control the release of air contaminants from industrial processes and land-disturbing activities. Section 118 of the CAA requires federal agencies to comply with all federal, state, interstate, and local requirements regarding the control and abatement of air pollution in the same manner, and to the same extent, as any non-governmental entity.

In 1980, the Environmental Protection Agency (EPA) approved Nevada's plan to implement and enforce the CAA, and in 1988, the agency granted Nevada the authority to implement the Prevention of Significant Deterioration (PSD) Program of the CAA; however, authority to regulate radioactive air emissions has been retained by the EPA. Responsibility for implementing and enforcing the CAA in Nevada resides with the Nevada Division of Environmental Protection (NDEP).

### Applicability to the ESF

Site characterization activities such as construction and operation of the optional exploratory shaft, operation of concrete-batch plants, and land disturbances from field testing and site preparation, will generate particulate and gaseous emissions of air pollutants. The origin of most particulates will be non-point sources (e.g., drilling, blasting, rock removal and storage, surface grading and leveling, wind erosion, vehicle travel, and diesel and gasoline engines).

### Requirements for the ESF

- A. An Air Quality Surface Disturbance Permit is required before any land-disturbing activities are initiated. A strategy for dust minimization, in particular, must be included in any plan for surface-disturbing activities.  
[SD&TRD 3.3.11, 3.7.B.3][40 CFR 50, 40 CFR 60, 40 CFR 61][42 USC 7401]
- B. All stationary sources (point sources) of air emissions shall comply with the applicable provisions of the CAA, as amended (42 USC 7401), which may include PSD permitting, or offset Policy Review, or both. Federal regulations pertaining to compliance with the CAA include:

40 CFR 50 (National Primary and Secondary Ambient Air Quality Standards) and 40 CFR 60 (Standards of Performance for New Stationary Sources). The YMP shall comply with the state or local standards included under the stipulations of Nevada

Revised Statutes (NRS) Chapter 445.401-601 for Air Quality: 1) Permit to Construct; 2) Prevention of Significant Deterioration; and 3) Permit to Operate.

[SD&TRD 3.3.11, 3.7.B.3][40 CFR 50, 40 CFR 60, 40 CFR 61][42 USC 7401]

**J.3****WATER APPROPRIATIONS****NEVADA WATER LAW, (NRS 533.325-.540; 534.010-.190)****Background**

The State of Nevada requires a permit for the appropriation of state waters. The purpose of a Water Appropriation Permit is to prevent possible interference with prior water rights and/or improper use of waters not legally available for use. The Nevada State Engineer's Office administers Nevada water law.

**Applicability to the ESF**

Site characterization activities will require water. These requirements are currently based on the use of water from Wells J-12 and J-13, but apply to water from any well at the site (including VH1).

**Requirements for the ESF**

- A. Design of the water system shall conform to the requirements and stipulations of the water appropriation permits.

[SD&TRD 3.3.11][NRS 533.325]

**J.4 DRINKING WATER PROTECTION****J.4.1 SAFE DRINKING WATER ACT OF 1974, as amended (P.L. 93-523; 42 USC 300f-300j-10; 40 CFR 124, 141, 143; EO 12088; NRS 445.361 et seq; NAC 445.244-.420)**Background

The Safe Drinking Water Act (SDWA, 1974) grants the EPA authority to regulate public drinking water supplies by establishing drinking water regulations, delegating authority for enforcement of drinking water standards to the states, and protecting aquifers from such things as injection of wastes and other materials into wells.

In 1978, the EPA approved Nevada's program for enforcing the drinking water standards established by the EPA. The Nevada Division of Health within the Nevada Department of Human Resources is the agency responsible for this enforcement.

Construction characteristics of water-supply wells are addressed in NAC 445.358 through 445.400. Storage and distribution specifications required for a public drinking water supply are discussed in NAC 445.410-.418.

Applicability to the ESF

By definition, the water supply is considered a "public water supply" since it will probably service 15 or more connections or 25 people for more than 60 days per year. Bottled water will be purchased for underground drinking water purposes.

Requirements for the ESF

- A. Design of the potable water system shall conform to the requirements and stipulations of the drinking water system permit (NAC 445.370-.420).  
[SD&TRD 3.3.11, 3.7.B.3][40 CFR 141; 40 CFR 143][NAC 445.070-4278][NRS 445.131-399][42 USC 300]
- B. Drinking water must meet the standards set forth in 40 CFR 141 and NAC 445.244-.262.  
[SD&TRD 3.3.11, 3.7.B.3][40 CFR 141; 40 CFR 143][NAC 445.070-4278][NRS 445.131-399][42 USC 300]

**J.4.2 UNDERGROUND INJECTION CONTROL PROGRAM (91 Stat. 1397; P.L. 93-523; 42 USC 300h (Part C); 40 CFR 124, 144-147; NAC 445.422-.4278; NRS 445.131-.354)**Background

Federal agencies engaged in any activity resulting in an underground injection that may jeopardize a drinking water supply must comply with all federal, state, and local requirements concerning underground injections. Federal requirements are promulgated under Part C of the SDWA. The EPA granted the State of Nevada's Division of Environmental Protection the authority to implement and enforce an underground injection control (UIC) program. Nevada's UIC program seeks to prohibit the pollution of existing and potential sources of underground drinking water in Nevada. Exemptions to obtaining a permit would be granted only if the affected groundwater is not now, and will not be, a

source of drinking water, or if the total dissolved solids of the affected groundwater exceeds 10,000 milligrams per liter and the water is not reasonably expected to become a supply of drinking water (NAC 445.424).

Applicability to the ESF

Studies proposed for the ESF to characterize the hydrologic environment of Yucca Mountain may require the use of tracers. The State of Nevada has determined that the use of tracers must be regulated under the UIC program.

Requirements for the ESF

- A. Design of any injection system shall conform to the requirements and stipulations of the underground injection permit (NRS 445.131-.354).  
[SD&TRD 3.3.11][42 USC 300, 300h part C][NAC 445.070-4278][NRS 445.131-399]
- B. Tracers added to the water system must be of a composition and concentration compatible with the sanitary waste disposal system.  
[SD&TRD 3.3.11][42 USC 300, 300h part C][NAC 445.070-4278][NRS 445.131-399]

**J.5 WATER POLLUTION CONTROL****J.5.1 FEDERAL WATER POLLUTION CONTROL ACT**, as amended by the Clean Water Act of 1972, and the WATER QUALITY ACT OF 1987, as amended (33 USC 1251-1376; 33 CFR 209, 320, 323-330; 40 CFR 110, 112, 116, 117, 121, 122-125, 129, 133, 136, 230, 401, and 403; EO 12088; NAC 445.070-.241)

The federal acts cited in this section are referred to collectively throughout the remainder of this discussion as "the Clean Water Act (CWA)." The CWA establishes federal policy for restoring and maintaining the chemical, physical, and biological integrity of the Nation's waters. Among other things, the CWA provides for the EPA or federally-authorized states to implement permit programs for regulating the discharge of pollutants to navigable waters from any point source, as follows:

- A. Title IV of the CWA (i.e., Permits and Licenses, Section 402, the National Pollutant Discharge Elimination System (NPDES)) is administered by the State of Nevada; [SD&TRD 3.3.11, 3.7.B.3][33 CFR 323; 40 CFR 122][33 USC 1251][NAC 445.070-4278]
- B. Federal effluent limitations for direct discharges, and pre-treatment standards for discharges into publicly-owned treatment works (Title III of the Act) are enforced by the EPA; [SD&TRD 3.3.11, 3.7.B.3][33 CFR 323; 40 CFR 122][33 USC 1251][NAC 445.070-4278]
- C. A program to regulate the discharge of oil and hazardous substances (Section 311 of the act) is enforced by the EPA; and [SD&TRD 3.3.11, 3.7.B.3][33 CFR 323; 40 CFR 122][33 USC 1251][NAC 445.070-4278]
- D. A permit system for the use of dredge and fill material (Section 404 of the act) is administered by the U.S. Army Corps of Engineers. [SD&TRD 3.3.11, 3.7.B.3][33 CFR 323; 40 CFR 122][33 USC 1251][NAC 445.070-4278]

**J.5.1.1 NPDES PERMIT PROGRAM**Background

Section 313 of the CWA directs federal agencies to comply with all federal, state, interstate, and local requirements regarding the control and abatement of water pollution in the same manner, and to the same extent, as any non-government entity.

On September 9, 1975, the EPA approved Nevada's NPDES permit program and authorized Nevada to implement and enforce the program. The NDEP is the agency responsible for issuing or denying NPDES permits.

Applicability to the ESF

Water-related activities which may require an NPDES permit include all point source discharges. Examples of these are stormwater discharge, sewage treatment facilities, mine wastewater ponds, rock storage piles, pump tests, drinking-water supplies, monitoring and injection wells, and infiltration studies.

Requirements for the ESF

- A. Design of the discharge system shall conform to the requirements and stipulations of all NPDES permits.  
[SD&TRD 3.3.11, 3.7.B.3][33 CFR 323; 40 CFR 122][33 USC 1251][NAC 445.070-4278]

**J.5.1.2 CORPS OF ENGINEERS SECTION 404 PERMIT**Background

Any federal agency, state or individual that plans to dredge, fill, modify, or discharge into navigable waters or waters of the United States, as defined in the CWA, must first receive a Section 404 permit from the U.S. Army Corps of Engineers (Corps) (Section 404 of the CWA [33 CFR 320.2(g)]). Section 404 establishes federal policy for restoring and maintaining the chemical, physical, and biological characteristics of the Nation's waterways. (Floodplain compliance is discussed in J.12.)

Applicability to the ESF

On April 28, 1988, the DOE submitted an informal opinion to the Corps concerning the applicability of Section 404 of the CWA to site characterization at Yucca Mountain, and requested a formal determination by the Corps regarding Section 404 permitting applicability. Site characterization will require re-routing small segments of several dry washes along the east side of Yucca Mountain. The Corps conducted an on-site inspection at Yucca Mountain on October 18, 1989. On November 15, 1989, the Corps made a formal determination that re-routing of washes for site characterization would require Section 404 permitting, to be authorized under a Nationwide General Permit. This type of Section 404 permit allows the discharge of dredged or fill material into isolated, nontidal waters of the United States, including wetlands that are not part of a surface tributary system to interstate waters of the United States. The Corps included the YMP in a nationwide permit on August 17, 1990. Any significant changes in ESF design may require a review of the current Section 404 permit.

Requirements for the ESF

- A. Design of facilities required in the 100-year floodplain shall conform to the requirements and stipulations of the Section 404 permit.  
[SD&TRD 3.3.11, 3.7.B.3][33 CFR 323; 40 CFR 122][33 USC 1251][NAC 445.070-4278]

**J.5.2 NEVADA WATER POLLUTION CONTROL LAW (NRS 445.131-.399)****Background**

The Nevada Water Pollution Control Law was enacted to maintain the quality of the waters of the State of Nevada for public health and enjoyment, protection of animal life, operation of existing industries, the pursuit of agriculture, and the economic development of the state. This law is administered by the NDEP which requires that discharges of pollutants into the subsurface be controlled if the potential for contamination of groundwater supplies exists. If the NDEP determines that there is a potential for contamination, the agency will generally require, through issuance of zero-discharge permits, that impoundments be lined sufficiently to prevent seepage of pollutants into the ground.

**Applicability to the ESF**

Site characterization activities, such as the construction and use of sewage lagoons and mud and cutting pits, must be evaluated to determine their potential to contaminate groundwater supplies.

**Requirements for the ESF**

- A. Design of the discharge system shall conform to the requirements and stipulations of all discharge permits.  
[SD&TRD][NRS 445.131-399]
- B. Runoff from disturbed areas will be controlled to minimize erosion (see Reclamation Section).  
[SD&TRD][NRS 445.131-399]
- C. Runoff from potentially contaminated areas (e.g., parking lots) will be controlled.  
[SD&TRD][NRS 445.131-399]

**J.5.3 SANITARY AND SEWAGE COLLECTION SYSTEM REQUIREMENTS (NAC 444.750-.840; 445.179-.182)****Background**

The purpose of this permit authority is to regulate the design, construction, and operation of sanitary and sewage collection systems and to grant operating permits for such facilities in an effort to prevent or limit discharges of pollutants into waters of the state. NDEP administers this regulation.

**Applicability to the ESF**

The ESF will require a sanitary and sewage collection system.

**Requirements for the ESF**

- A. Design of the sanitary and sewage collection and treatment systems shall conform to the requirements and stipulations of the sewage treatment permit.  
[SD&TRD 3.3.11][NAC 444.750-840; NAC 445.070.4278]



- B. The design of the system must comply with NAC 445.140-.241.  
[SD&TRD 3.3.11][NAC 444.750-840; NAC 445.070.4278]
- C. The system must be located outside of the floodplain.  
[SD&TRD 3.3.11][NAC 444.750-840; NAC 445.070.4278]
- D. The ultimate disposal of sludge from the wastewater treatment facilities shall be performed in accordance with the requirements of Section 405 of the CWA, in addition to any applicable permit conditions.  
[SD&TRD 3.3.11][NAC 444.750-840; NAC 445.070.4278]

**J.6 SOLID AND HAZARDOUS WASTE MANAGEMENT****J.6.1 RESOURCE CONSERVATION AND RECOVERY ACT OF 1976**, as amended (P.L. 94-580; 42 USC 6901-6987; 49 USC 1801; 40 CFR 124, 240, 241, 243-247, 260-264, 266, 270, 271, and 280; 49 CFR 171-178; NRS 459.400 et seq; and 444.842-.8746)Background

Management and disposal of solid and hazardous wastes (excluding radioactive wastes) shall be conducted in accordance with the requirements of the Resource Conservation and Recovery Act (RCRA), as amended, which includes RCRA permitting for hazardous wastes. The EPA has authorized the State of Nevada to administer Subtitle C of RCRA, regulating the management and disposal of hazardous wastes.

Applicability to the ESF

ESF activities may require the use of hazardous materials and the generation of both solid and hazardous wastes. The proper handling, disposal and transportation of solid and hazardous materials will require compliance with various federal and state regulations; reporting requirements in the event of spills are included.

Requirements for the ESF

- A. The requirements for management and disposal of hazardous wastes must be satisfied in accordance with Subtitle C of RCRA.  
[SD&TRD 3.3.11, 3.7.B.3][40 CFR 261; 40 CFR 262; 40 CFR 270; 49 CFR 177][42 USC 6901; 49 USC 1801]
- B. Design of underground storage tanks must be in accordance with Subtitle I of RCRA.  
[SD&TRD 3.3.11, 3.7.B.3][40 CFR 261; 40 CFR 262; 40 CFR 270; 49 CFR 177][42 USC 6901; 49 USC 1801]
- C. Transportation of all hazardous materials to the Yucca Mountain site must meet the requirements of the Hazardous Material Transportation Act (49 USC 1801; 49 CFR 171-178).  
[SD&TRD 3.3.11, 3.7.B.3][40 CFR 261; 40 CFR 262; 40 CFR 270; 49 CFR 177][42 USC 6901; 49 USC 1801]
- Nonhazardous solid waste will be re-collected and hauled to an approved landfill, as required by NAC 444.570-.748.
- Soil contaminated with spilled oil or fuel must be disposed of in an approved landfill or by another approved method.

**J.6.2 RESERVED**

**J.7****BIOLOGICAL RESOURCE PROTECTION**

ENDANGERED SPECIES ACT of 1973 (P.L. 93-205, as amended; 16 USC 1531-1543; 50 CFR 13, 17, 222, 226, 227, 402, 424, and 450-453)

Background

Any federal or federally-supported activity must be performed in compliance with the Endangered Species Act (ESA, 1973). Accordingly, any federal activity that could directly affect protected fish, wildlife, or vegetation, or destroy or alter the specific habitat of protected species, must be designed to avoid or mitigate all potentially adverse impacts. In addition, Nevada statutes provide for the protection of various wildlife and vegetation indigenous to the state.

Applicability to the ESF

The desert tortoise, existing at the Yucca Mountain site, has been listed as a federally-protected, threatened species. ESF activities will require the performance of surface-disturbing work having the potential to affect the desert tortoise. Actions taken during site characterization must not jeopardize the continued existence of this species.

Requirements for the ESF

The following constraint is derived from requirements set forth in the Biological Opinion (BO) rendered by the U.S. Fish and Wildlife Service (McNatt, 1990) and is consistent with accepted revisions to the BO.

- A. Trash containers will be designed with lids so that food and other garbage do not attract ravens which prey on the young desert tortoise.

[SD&TRD 3.3.11][16 USC 1531]

J.8

RESERVED

**J.9****RECLAMATION**

NUCLEAR WASTE POLICY ACT of 1982, as amended (P.L. 97-425, 42 USC 10101)

FARMLAND PROTECTION POLICY ACT of 1981 (7 USC 4201)

Background

In compliance with the amended NWPA, the DOE has developed a program for the reclamation of areas disturbed by site characterization. This program requires that disturbed land be returned to a stable ecological state with a form and productivity similar to its predisturbed state.

Applicability to the ESF

Bureau of Land Management (BLM) Right-of-Way-Reservations and NWPA Section 113(b)(1)(A) require that areas altered by site characterization activities be reclaimed. Any surface-disturbing activities to be undertaken at Yucca Mountain under the purview of the YMP must be planned in accordance with the Reclamation Implementation Plan (RIP), YMP/91-14.

Requirements for the ESF

- A. Design of facilities shall consider reclamation requirements as described in the RIP.  
[SD&TRD 3.7.B.3][42 USC 10101 et seq][BLM Vol. 34]

**J.10      RESERVED**

**J.11      RESERVED**

**J.12 FLOODPLAIN PROTECTION**

Executive Order 11988, FLOODPLAIN MANAGEMENT (10 CFR 1022)

Executive Order 11990, PROTECTION OF WETLANDS (10 CFR 1022)

**Background**

Executive Order (EO) 11988 requires each federal agency to take action to reduce the risk of flood damage, minimize the impact of floods on human safety, health, and welfare, and restore and preserve the natural and beneficial values served by floodplains. In conjunction, EO 11990 stipulates that long- and short-term adverse impacts from the destruction or modification of wetlands, or direct or indirect support of new construction in wetlands, is to be avoided if a practicable alternative is available.

**Applicability to the ESF**

Activities planned within the 100-year floodplain at the Yucca Mountain site require certain compliance actions (EO 11988, as implemented by 10 CFR 1022). Although compliance with EO 11990 is required for all federal and federally-supported activities and projects, the U.S. Fish and Wildlife Service has determined that site characterization activities should not affect any wetlands at or near the Yucca Mountain site (also see J.5.1.2 of this document). Floodplain Assessment of Site Characterization Activities at the Yucca Mountain Site, Nye County, Nevada (YMP/92-30) (DOE, 1992), shall be consulted to determine if activities are within the 100-year floodplain.

**Requirements for the ESF**

- A. Any activity conducted in a floodplain must be preceded by a floodplain/wetlands assessment, in compliance with 10 CFR 1022.  
[SD&TRD 3.2.10.1.G, 3.2.10.1.G.1, 3.2.10.1.G.2, 3.3.11][Executive Order 11988, Section 2(b); Executive Order 11990]
- B. Alternatives to building in the defined 100-year floodplain must be identified and considered.  
[SD&TRD 3.2.10.1.G, 3.2.10.1.G.1, 3.2.10.1.G.2, 3.3.11][Executive Order 11988, Section 2(b); Executive Order 11990]
- C. Structures/facilities built in the floodplain should be designed to both minimize effects on the floodplain and protect the structure/facilities in the floodplain.  
[SD&TRD 3.2.10.1.G, 3.2.10.1.G.1, 3.2.10.1.G.2, 3.3.11][Executive Order 11988, Section 2(b); Executive Order 11990]



**J.13 NOISE**

NOISE CONTROL ACT OF 1972, as amended by the Quiet Communities Act of 1978, (42 USC 4901-4918; EO 12088; 40 CFR Chapter I, Subchapter G, Parts 204 & 205)

Background

Federal agencies must carry out their programs in a manner that promotes an environment free of noise that could jeopardize public health or welfare.

Applicability to the ESF

Construction and operational activities for the ESF will cause noise pollution that must be monitored to ensure that the noise does not jeopardize worker health or significantly impact wildlife.

Requirements for the ESF

- A. The design and construction of facilities and equipment shall control and monitor noise level in accordance with regulations implementing the Noise Control Act (40 CFR Chapter I, Subchapter G, Parts 204 and 205).  
[SD&TRD 3.3.11, 3.7.B.3][40 CFR 204, 40 CFR 205][42 USC 4901]

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## ACRONYMS AND ABBREVIATIONS

AEA	Atomic Energy Act
BLM	Bureau of Land Management
BO	Biological Opinion
CAA	Clean Air Act
CFR	Code of Federal Regulations
Corps	Army Corps of Engineers
CWA	Clean Water Act
DOE	Department of Energy
EO	Executive Order
EPA	Environmental Protection Agency
ERCP	Environmental Regulatory and Compliance Plan
ESA	Endangered Species Act
ESF	Exploratory Studies Facility
NAC	Nevada Administrative Code
NDEP	Nevada Division of Environmental Protection
NEPA	National Environmental Policy Act
NPDES	National Pollutant Discharge Elimination System
NRS	Nevada Revised Statutes
NWPA	Nuclear Waste Policy Act
P.L.	Public Law
PSD	Prevention of Significant Deterioration
RCRA	Resource Conservation and Recovery Act
RIP	Reclamation Implementation Plan
SARA	Superfund Amendments and Reauthorization Act
SDWA	Safe Drinking Water Act
TSCA	Toxic Substances Control Act
UIC	Underground Injection Control
USC	U.S. Code
WQO	Water Quality Officer
YMP	Yucca Mountain Site Characterization Office