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# YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT
# STUDY PLAN APPROVAL FORM

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Study Plan Number 8.3.1.4.2.1

Study Plan Title CHARACTERIZATION OF THE VERTICAL AND LATERAL DISTRIBUTION OF STRATIGRAPHIC UNITS WITHIN THE SITE AREA

Revision Number 3

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Date: 8/18/93

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**Table 1.2-1** Design & Performance Issues and Requirements Supported by this Study

ACTIVITY: 8.3.1.4.2.1.1 Surface and subsurface stratigraphic studies of the host rock and surrounding units

1.1 Limiting radionuclide releases to the accessible environment for 10,000 years after repository closure as required by 10 CFR 60.112 and 40 CFR 191.13

1.4 Containment of high-level waste in the waste package for 300 to 1,000 years after repository closure as required by 10 CFR 60.113

1.5 Limiting radionuclide releases from the engineered-barrier systems from the end of the containment period to 10,000 years following repository closure as required by 10 CFR 60.113

1.6 Pre-waste-emplacement ground-water travel time from the disturbed zone to the accessible environment shall be at least 1,000 years as required by 10 CFR 60.113

1.10 Waste-package characteristics and configurations that comply with the postclosure design criteria of 10 CFR 60.135

1.11 Underground repository and engineered-barrier characteristics and configurations that comply with the postclosure design criteria of 10 CFR 60.133

1.12 Shaft and borehole seal characteristics and configurations that comply with the postclosure design criteria of 10 CFR 60.134

2.7 Repository design criteria for radiological safety that comply with the preclosure design criteria of 10 CFR 60.130 through 60.133

4.4 Repository preclosure design and technical feasibility

CHARACTERIZATION PARAMETERS:

Contact altitude
Lithostratigraphy, exposed bedrock
Lithostratigraphy, glass, pumice and spherulite
Lithostratigraphy, lithic fragments
Lithostratigraphy, lithophysae
Lithostratigraphy, mineralogy and petrography
Lithostratigraphy, particle sorting
Lithostratigraphy, particle-size distribution
Lithostratigraphy, subunits
Mineralogy, diagenesis, paragenesis, epigenesis
Stratigraphic depositional history, flow units
Stratigraphic orientation, attitude
Stratigraphic thickness

## Table 1.2-1 (cont.)

DESIGN/PERFORMANCE REQUIREMENTS (PARAMETERS):

Contact altitude
Contact altitude, areas of minimum ground-water travel time
Contact altitude, areas of minimum overburden
Contact altitude, exploratory boreholes
Contact altitude, for positioning underground facility
Contact altitude, hydrologic units
Contact altitude, lithologic units
Contact altitude, rock unit lateral and vertical variability
Contact altitude, thermomechanical units
Morphology of bedrock surface, shaft locations
Rock-unit chemistry, mineralogy

ACTIVITY: 8.3.1.4.2.1.2 Surface-based geophysical surveys

1.6 Pre-waste-emplacement ground-water travel time from the disturbed zone to the accessible environment shall be at least 1,000 years as required by 10 CFR 60.113

1.11 Underground repository and engineered-barrier characteristics and configurations that comply with the postclosure design criteria of 10 CFR 60.133

4.4 Repository preclosure design and technical feasibility

CHARACTERIZATION PARAMETERS:

Electromagnetic signature (stratigraphy)
Gravity anomaly, mass difference
Lithostratigraphy, subunits
Magnetic intensity (geophysical), gradient, anomaly, lithologic correlation
Magnetism, lithologic correlation
Seismic motion, surface, subsurface and geologic bias, f(depth, direction)

DESIGN/PERFORMANCE REQUIREMENTS (PARAMETERS):

Contact altitude, lithologic units
Contact altitude, rock unit lateral and vertical variability
Seismic design basis, depth attenuation

## Table 1.2-1 (cont.)

ACTIVITY: 8.3.1.4.2.1.3 Borehole geophysical surveys

1.5 Limiting radionuclide releases from the engineered-barrier systems from the end of the containment period to 10,000 years following repository closure as required by 10 CFR 60.113

1.6 Pre-waste-emplacement ground-water travel time from the disturbed zone to the accessible environment shall be at least 1,000 years as required by 10 CFR 60.113

1.11 Underground repository and engineered-barrier characteristics and configurations that comply with the postclosure design criteria of 10 CFR 60.133

1.12 Shaft and borehole seal characteristics and configurations that comply with the postclosure design criteria of 10 CFR 60.134

2.7 Repository design criteria for radiological safety that comply with the preclosure design criteria of 10 CFR 60.130 through 60.133

4.4 Repository preclosure design and technical feasibility

CHARACTERIZATION PARAMETERS:

Borehole locations, characteristics
Borehole temperature profiles
Electrical conductivity (geophysical), lithologic correlation
Electrical resistivity (geophysical), lithologic correlation
Gamma-ray radiation (geophysical), intensity, lithologic/discontinuity correlation
In-situ thermal gradient
Induced polarization (geophysical), lithologic correlation
Magnetic intensity (geophysical), gradient, anomaly, lithologic correlation
Magnetism, susceptibility
Porosity, lithostratigraphic correlation
Spontaneous potential (geophysical), lithologic correlation
Water content, in-situ

DESIGN/PERFORMANCE REQUIREMENTS (PARAMETERS):

Borehole casing (location and condition), exploratory holes
Borehole depth, exploratory and waste-emplacement holes
Borehole diameter, exploratory and waste-emplacement holes
Borehole location, exploratory holes and waste-emplacement holes
Contact altitude, exploratory boreholes
Electrical resistivity (geophysical)
In-situ temperature, regional heat flow
Moisture content, volumetric, rock matrix
Porosity, total, fractures
Porosity, total, rock matrix
Water quantity, near-field

## Table 1.2-1 (cont.)

ACTIVITY 8.3.1.4.2.1.4 Petrophysical properties testing

1.1 Limiting radionuclide releases to the accessible environment for 10,000 years after repository closure as required by 10 CFR 60.112 and 40 CFR 191.13

1.6 Pre-waste-emplacement ground-water travel time from the disturbed zone to the accessible environment shall be at least 1,000 years as required by 10 CFR 60.113

2.7 Repository design criteria for radiological safety that comply with the preclosure design criteria at 10 CFR 60.130 through 60.133

CHARACTERIZATION PARAMETERS:

Density, bulk
Density, grain
Electrical resistivity (geophysical), lithologic correlation
Induced polarization (geophysical), lithologic correlation
Permeability, intrinsic, unsaturated-zone units
Porosity

DESIGN/PERFORMANCE REQUIREMENTS (PARAMETERS):

Density, bulk
Density, grain
Electrical resistivity (geophysical)
Porosity
Porosity, total, rock matrix

ACTIVITY 8.3.1.4.2.1.5 Magnetic properties and stratigraphic correlations

1.6 Pre-waste-emplacement ground-water travel time from the disturbed zone to the accessible environment shall be at least 1,000 years as required by 10 CFR 60.113

1.11 Underground repository and engineered-barrier characteristics and configurations that comply with the postclosure design criteria of 10 CFR 60.133

## Table 1.2-1 (cont.)

CHARACTERIZATION PARAMETERS:

Contact type, depositional/tectonic
Curie temperature
Lithostratigraphy, glass, pumice and spherulite
Lithostratigraphy, particle variation, flow units
Lithostratigraphy, texture, fabric and grain size
Magnetic intensity (geophysical), gradient, anomaly, lithologic correlation
Magnetic minerals, abundance and saturation
Magnetic minerals, remnant paleomagnetism
Magnetism, demagnetism and alternating thermal fields
Magnetism, susceptibility
Stratigraphic depositional history, flow units
Stratigraphic thickness

DESIGN/PERFORMANCE REQUIREMENTS (PARAMETERS):

Contact altitude, lithologic units
Contact altitude, rock unit lateral and vertical variability

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