OBJECTIVES OF SOILS PROGRAM

• PROVIDE DATA NECESSARY TO DESCRIBE THE SOIL RESOURCE IN THE YUCCA MOUNTAIN AREA

• DELINEATE EXTENT AND DISTRIBUTION OF SOIL GROUPS

• SUPPORT RECLAMATION REQUIREMENTS RESULTING FROM LAND ACCESS AGREEMENTS WITH THE BUREAU OF LAND MANAGEMENT AND FROM REQUIREMENTS LISTED IN NWPA
TECHNICAL APPROACH

- CONDUCT REGIONAL SOIL SURVEY TO COMPLETE SOIL MAPPING OF YUCCA MOUNTAIN REGION

- CONDUCT PRE-ACTIVITY SOILS INVESTIGATIONS TO PROVIDE SITE-SPECIFIC SOILS INFORMATION FOR RECLAMATION PLANNING

- CONDUCT PRE-RECLAMATION SOIL SAMPLING AND ANALYSIS JUST PRIOR TO RECLAMATION
TECHNICAL QUESTIONS

1. HOW ARE THE SOIL MAP UNITS DISTRIBUTED AT YUCCA MOUNTAIN?

2. WHAT IS THE COMPOSITION OF THE SOILS FOUND AT YUCCA MOUNTAIN?

3. WHAT IS THE SUITABILITY OF SOILS FOR RECLAMATION?
TECHNICAL QUESTION 1: HOW ARE THE SOIL MAP UNITS DISTRIBUTED AT YUCCA MOUNTAIN?

TECHNICAL APPROACH

- **CONDUCT INITIAL FIELD STUDY TO DEVELOP THE INITIAL SOIL SURVEY LEGEND, AND TO DETERMINE TRENCH/PIT LOCATIONS FOR MAPPING**

- **SOIL SURVEY TO MEET ORDER 3 NATIONAL COOPERATIVE SOIL SURVEY STANDARDS**

- **MAP UNITS TO CONSIST OF SOIL ASSOCIATIONS**

- **SURVEY TO COVER DOE, U.S. AIR FORCE, AND BLM LANDS**

- **EXCAVATION OF TRENCHES TO ASSIST IN FIELD MAPPING OF REPRESENTATIVE SOILS**

- **SAMPLING OF ADDITIONAL TRENCH LOCATIONS TO ANALYZE REPRESENTATIVE SOIL PEDONS TO ASSIST IN SOIL COMPOSITION INTERPRETATION**
STATUS

- INTERAGENCY AGREEMENT WITH SOIL CONSERVATION SERVICE TO BE PUT IN PLACE 5/90

- TECHNICAL PROCEDURES TO BE SUBMITTED FOR PROJECT OFFICE APPROVAL 6/90

- OPERATIONS AND SAFETY PLAN FOR CONDUCTING SURVEY TO BE COMPLETED 6/90; APPROVAL EXPECTED 7/90

- INITIAL FIELD STUDY TO TAKE 2 TO 3 WEEKS

- SUBMITTAL AND APPROVAL OF THE SITE ACCESS REQUESTS FOR TRENCHING TO REQUIRE 4–6 WEEKS; SUBSEQUENT FIELD MAPPING AND SAMPLING WILL REQUIRE 3 TO 4 MONTHS

- THREE MONTHS REQUIRED FOR PRODUCTION OF FINAL REPORT AND MAPS
TECHNICAL QUESTION 2: WHAT IS THE COMPOSITION OF THE SOILS FOUND AT YUCCA MOUNTAIN?

TECHNICAL APPROACH

- FOR EACH PEDON CONDUCT LABORATORY ANALYSIS OF SOIL PROPERTIES BY HORIZON

- SAMPLE 8 TO 12 BENCHMARK SOILS

- PHYSICAL PROPERTIES TO BE EXAMINED:
  - TEXTURE
  - PARTICLE SIZE DISTRIBUTION
  - WATER RETENTION CAPABILITY
  - BULK DENSITY
  - SATURATION PERCENT
CHEMICAL PROPERTIES TO BE EXAMINED:

- REACTION
- SALINITY
- ORGANIC CARBON
- CATION EXCHANGE CAPACITY
- SODIUM ABSORPTION RATIO
- CALCIUM CARBONATE EQUIVALENT
- GYPSUM CONTENT
- EXTRACTABLE CARBONS (CARBONATES)
- AVAILABLE NITROGEN AND PHOSPHORUS
- AMORPHOUS SILICA
- IRON
TECHNICAL QUESTION 2 (CONTINUED)

- INTERPRETATIONS TO BE DEVELOPED BASED ON CHARACTERISTICS OF SOIL PROPERTIES
  - TAXONOMIC CLASSIFICATION
  - HORIZON CHARACTERISTICS

STATUS

- SOIL SAMPLES TAKEN DURING PRE-ACTIVITY SURVEYS IN 1989
- SOIL ANALYSIS CONDUCTED ON THESE SAMPLES IN 1989
- SOILS SAMPLES TAKEN IN 1990 TO BE ANALYZED IN LATE 1990
TECHNICAL QUESTION 3: WHAT IS THE SUITABILITY OF SOILS FOR USE IN RECLAMATION EFFORTS?

TECHNICAL APPROACH

- BASED ON SOIL CHARACTERISTICS, DETERMINE USE SUITABILITY OF EACH SERIES WITHIN SURVEY AREA

- CONDUCT PRE-ACTIVITY SOIL INVESTIGATIONS TO PROVIDE SITE-SPECIFIC SOILS INFORMATION
  - DETERMINE VOLUME OF SUITABLE SOILS AVAILABLE
  - PROVIDE SOIL PROPERTIES DATA

- CONDUCT PRE-RECLAMATION SOILS SAMPLING AND ANALYSIS
  - SAMPLING AND ANALYSIS OF STOCKPILED TOPSOIL MATERIALS
  - SAMPLING AND ANALYSIS OF UNCONSOLIDATED MATERIALS AT DISTURBED SITES
STATUS AND ACCOMPLISHMENTS

- SAMPLE ANALYSES CONDUCTED IN 1989 WERE TRANSMITTED TO EG&G/EM FOR RECLAMATION SUITABILITY ASSESSMENTS

- ENVIRONMENTAL FIELD ACTIVITY PLAN FOR SOILS RELEASED 3/90

- INTERAGENCY AGREEMENT BETWEEN DOE AND SOIL CONSERVATION SERVICE INITIATED; TO BE FINALIZED 5/90
U.S. DEPARTMENT OF ENERGY
OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT

PRESENTATION TO
THE NUCLEAR WASTE TECHNICAL REVIEW BOARD

SUBJECT: SOILS

PRESENTER: MONICA M. DUSSMAN

PRESENTER'S TITLE AND ORGANIZATION: MANAGER
ENVIRONMENTAL FIELD PROGRAMS DEPARTMENT
SCIENCE APPLICATIONS INTERNATIONAL CORPORATION

PRESENTER'S TELEPHONE NUMBER: (702) 794-7799

APRIL 24, 1990
OBJECTIVES OF SOILS PROGRAM

- PROVIDE DATA NECESSARY TO DESCRIBE THE SOIL RESOURCE IN THE YUCCA MOUNTAIN AREA

- DELINEATE EXTENT AND DISTRIBUTION OF SOIL GROUPS

- SUPPORT RECLAMATION REQUIREMENTS RESULTING FROM LAND ACCESS AGREEMENTS WITH THE BUREAU OF LAND MANAGEMENT AND FROM REQUIREMENTS LISTED IN NWPA
TECHNICAL APPROACH

- CONDUCT REGIONAL SOIL SURVEY TO COMPLETE SOIL MAPPING OF YUCCA MOUNTAIN REGION

- CONDUCT PRE-ACTIVITY SOILS INVESTIGATIONS TO PROVIDE SITE-SPECIFIC SOILS INFORMATION FOR RECLAMATION PLANNING

- CONDUCT PRE-RECLAMATION SOIL SAMPLING AND ANALYSIS JUST PRIOR TO RECLAMATION
TECHNICAL QUESTIONS

1. HOW ARE THE SOIL MAP UNITS DISTRIBUTED AT YUCCA MOUNTAIN?

2. WHAT IS THE COMPOSITION OF THE SOILS FOUND AT YUCCA MOUNTAIN?

3. WHAT IS THE SUITABILITY OF SOILS FOR RECLAMATION?
TECHNICAL QUESTION 1: HOW ARE THE SOIL MAP UNITS DISTRIBUTED AT YUCCA MOUNTAIN?

TECHNICAL APPROACH

• CONDUCT INITIAL FIELD STUDY TO DEVELOP THE INITIAL SOIL SURVEY LEGEND, AND TO DETERMINE TRENCH/PIT LOCATIONS FOR MAPPING

• SOIL SURVEY TO MEET ORDER 3 NATIONAL COOPERATIVE SOIL SURVEY STANDARDS

• MAP UNITS TO CONSIST OF SOIL ASSOCIATIONS

• SURVEY TO COVER DOE, U.S. AIR FORCE, AND BLM LANDS

• EXCAVATION OF TRENCHES TO ASSIST IN FIELD MAPPING OF REPRESENTATIVE SOILS

• SAMPLING OF ADDITIONAL TRENCH LOCATIONS TO ANALYZE REPRESENTATIVE SOIL PEDONS TO ASSIST IN SOIL COMPOSITION INTERPRETATION
STATUS

- INTERAGENCY AGREEMENT WITH SOIL CONSERVATION SERVICE TO BE PUT IN PLACE 5/90

- TECHNICAL PROCEDURES TO BE SUBMITTED FOR PROJECT OFFICE APPROVAL 6/90

- OPERATIONS AND SAFETY PLAN FOR CONDUCTING SURVEY TO BE COMPLETED 6/90; APPROVAL EXPECTED 7/90

- INITIAL FIELD STUDY TO TAKE 2 TO 3 WEEKS

- SUBMITTAL AND APPROVAL OF THE SITE ACCESS REQUESTS FOR TRENCHING TO REQUIRE 4–6 WEEKS; SUBSEQUENT FIELD MAPPING AND SAMPLING WILL REQUIRE 3 TO 4 MONTHS

- THREE MONTHS REQUIRED FOR PRODUCTION OF FINAL REPORT AND MAPS
TECHNICAL QUESTION 2: WHAT IS THE COMPOSITION OF THE SOILS FOUND AT YUCCA MOUNTAIN?

TECHNICAL APPROACH

- FOR EACH PEDON CONDUCT LABORATORY ANALYSIS OF SOIL PROPERTIES BY HORIZON
- SAMPLE 8 TO 12 BENCHMARK SOILS
- PHYSICAL PROPERTIES TO BE EXAMINED:
  - TEXTURE
  - PARTICLE SIZE DISTRIBUTION
  - WATER RETENTION CAPABILITY
  - BULK DENSITY
  - SATURATION PERCENT
CHEMICAL PROPERTIES TO BE EXAMINED:

- REACTION
- SALINITY
- ORGANIC CARBON
- CATION EXCHANGE CAPACITY
- SODIUM ABSORPTION RATIO
- CALCIUM CARBONATE EQUIVALENT
- GYPSUM CONTENT
- EXTRACTABLE CARBONS (CARBONATES)
- AVAILABLE NITROGEN AND PHOSPHORUS
- AMORPHOUS SILICA
- IRON
TECHNICAL QUESTION 2  (CONTINUED)

- INTERPRETATIONS TO BE DEVELOPED BASED ON CHARACTERISTICS OF SOIL PROPERTIES
  - TAXONOMIC CLASSIFICATION
  - HORIZON CHARACTERISTICS

STATUS

- SOIL SAMPLES TAKEN DURING PRE-ACTIVITY SURVEYS IN 1989
- SOIL ANALYSIS CONDUCTED ON THESE SAMPLES IN 1989
- SOILS SAMPLES TAKEN IN 1990 TO BE ANALYZED IN LATE 1990
TECHNICAL QUESTION 3: WHAT IS THE SUITABILITY OF SOILS FOR USE IN RECLAMATION EFFORTS?

TECHNICAL APPROACH

- BASED ON SOIL CHARACTERISTICS, DETERMINE USE SUITABILITY OF EACH SERIES WITHIN SURVEY AREA

- CONDUCT PRE-ACTIVITY SOIL INVESTIGATIONS TO PROVIDE SITE-SPECIFIC SOILS INFORMATION
  - DETERMINE VOLUME OF SUITABLE SOILS AVAILABLE
  - PROVIDE SOIL PROPERTIES DATA

- CONDUCT PRE-RECLAMATION SOILS SAMPLING AND ANALYSIS
  - SAMPLING AND ANALYSIS OF STOCKPILED TOPSOIL MATERIALS
  - SAMPLING AND ANALYSIS OF UNCONSOLIDATED MATERIALS AT DISTURBED SITES
TECHNICAL QUESTION 3 (CONTINUED)

STATUS AND ACCOMPLISHMENTS

- SAMPLE ANALYSES CONDUCTED IN 1989 WERE TRANSMITTED TO EG&G/EM FOR RECLAMATION SUITABILITY ASSESSMENTS

- ENVIRONMENTAL FIELD ACTIVITY PLAN FOR SOILS RELEASED 3/90

- INTERAGENCY AGREEMENT BETWEEN DOE AND SOIL CONSERVATION SERVICE INITIATED; TO BE FINALIZED 5/90