

**U.S. DEPARTMENT OF ENERGY
OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT**

**PRESENTATION TO
THE NUCLEAR WASTE TECHNICAL REVIEW BOARD**

**SUBJECT: INTRODUCTION AND
FRAMEWORK OF
UNSATURATED-ZONE STUDIES**

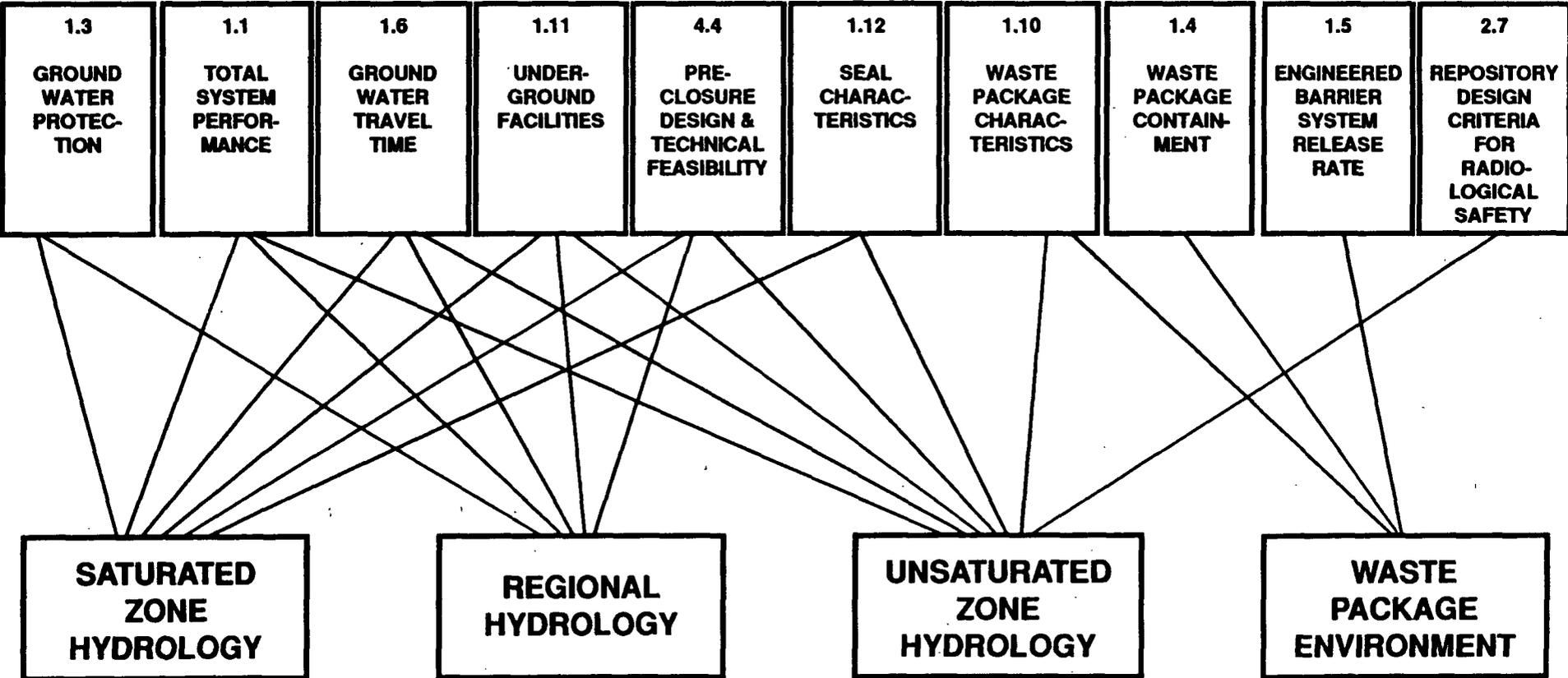
PRESENTER: CLAUDIA M. NEWBURY

**PRESENTER'S TITLE
AND ORGANIZATION: PHYSICAL SCIENTIST,
U.S. DEPARTMENT OF ENERGY
LAS VEGAS, NEVADA**

**PRESENTER'S
TELEPHONE NUMBER: (702) 794-7942**

**REGISTRY HOTEL, DENVER, COLORADO
JUNE 25-27, 1991**

ISSUES RELATING TO GROUNDWATER HYDROLOGY



PEER REVIEW OF THE UNSATURATED ZONE HYDROLOGY PROGRAM

MARCH - AUGUST 1990

**PANEL COMPOSED OF SEVEN INTERNATIONALLY
KNOWN HYDROLOGISTS WHO HAVE NOT BEEN
INVOLVED IN THE PROGRAM:**

**DR. R. ALLAN FREEZE, CHAIRMAN
DR. LORNE G. EVERETT
MR. GERALD E. GRISAK
DR. JAMES W. MERCER
MR. R. WILLIAM NELSON
DR. STAVROS S. PAPADOPULOS
DR. M. T. (REIN) VAN GENUCHTEN**

SCOPE LIMITED TO FLOW IN UNSATURATED ZONE

PEER REVIEW OF THE UNSATURATED ZONE HYDROLOGY PROGRAM

(CONTINUED)

UZ PRT METHODOLOGY

- **REVIEW GENERAL INFORMATION ON THE HYDROGEOLOGIC SETTING OF YUCCA MOUNTAIN**
- **DISCUSS MECHANISMS OF FLOW WHICH MIGHT OPERATE AT THE SITE**
- **DEVELOP A SET OF QUESTIONS TO EVALUATE THE UZ PROGRAM AGAINST THE TEAM'S CONCEPTS OF WHAT SUCH A PROGRAM SHOULD ENCOMPASS**
- **REVIEW LITERATURE DESCRIBING THE WORK THAT HAD BEEN DONE OR WAS PLANNED AT YUCCA MOUNTAIN**
- **MEET WITH THE PROJECT PIs AND QUESTION THEM ON THEIR WORK**
- **PRODUCE A REPORT (THE PEER REVIEW RECORD MEMORANDUM) OUTLINING EVALUATION OF THE UZ PROGRAM**

PEER REVIEW OF THE UNSATURATED ZONE HYDROLOGY PROGRAM

(CONTINUED)

UZ PRT RESPONSES

- **DOE RESPONDED TO THE TEAM'S RECOMMENDATIONS WITH A LIST OF 14 PROPOSED ACTIONS**
- **TEAM EVALUATED AND ACCEPTED THOSE RESPONSES**
- **DOE WILL PUBLISH THE COMPLETE PRRM AND MAKE IT AVAILABLE UPON REQUEST**

PEER REVIEW OF THE UNSATURATED ZONE HYDROLOGY PROGRAM

(CONTINUED)

PRT CONCLUSIONS AND RECOMMENDATIONS

- **MOST COMMENTS WERE VERY COMPLIMENTARY
OF THE PROGRAM**
- **EMPHASIS WAS ON “POURING WATER ON ROCKS”
- ACTUALLY TESTING THE HYPOTHESES AND MODELS
THAT HAVE BEEN PROPOSED**

PEER REVIEW OF THE UNSATURATED ZONE HYDROLOGY PROGRAM

(CONTINUED)

KEY POINTS

- **IT IS IMPERATIVE THAT THE YUCCA MOUNTAIN RESEARCH TEAMS GAIN ACCESS TO SUITABLE FIELD SITES ON YUCCA MOUNTAIN OR IN SIMILAR TERRAIN**
- **ENCOURAGE EARLY FIELD EXPERIMENTATION IN THE PAINTBRUSH NONWELDED TUFF AND THE NONWELDED TUFFS OF THE CALICO HILLS UNIT**

PEER REVIEW OF THE UNSATURATED ZONE HYDROLOGY PROGRAM

(CONTINUED)

KEY POINTS

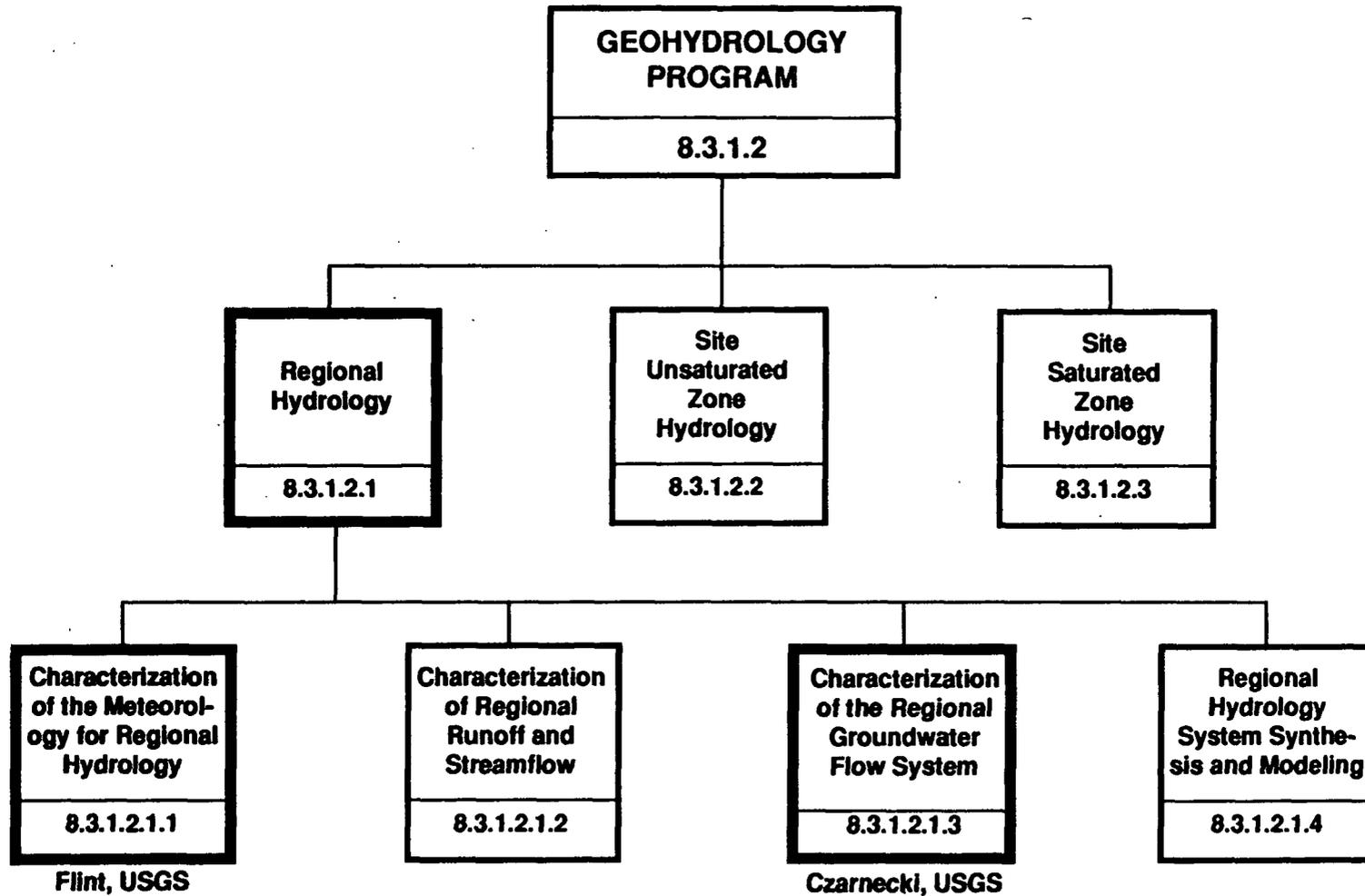
- **IT IS IMPERATIVE THAT THERE BE CONTINUED EVALUATION OF THE ASSUMPTIONS UNDERLYING THE THEORETICAL APPROACHES BEING DEVELOPED WITHIN THE YUCCA MOUNTAIN PROJECT. THIS MUST BE ACCOMPLISHED THROUGH EXPERIMENTAL OR IN-SITU VALIDATION**
- **THE PRT ENCOURAGES THE EMERGING DEVELOPMENT OF STOCHASTIC MODELING APPROACHES**

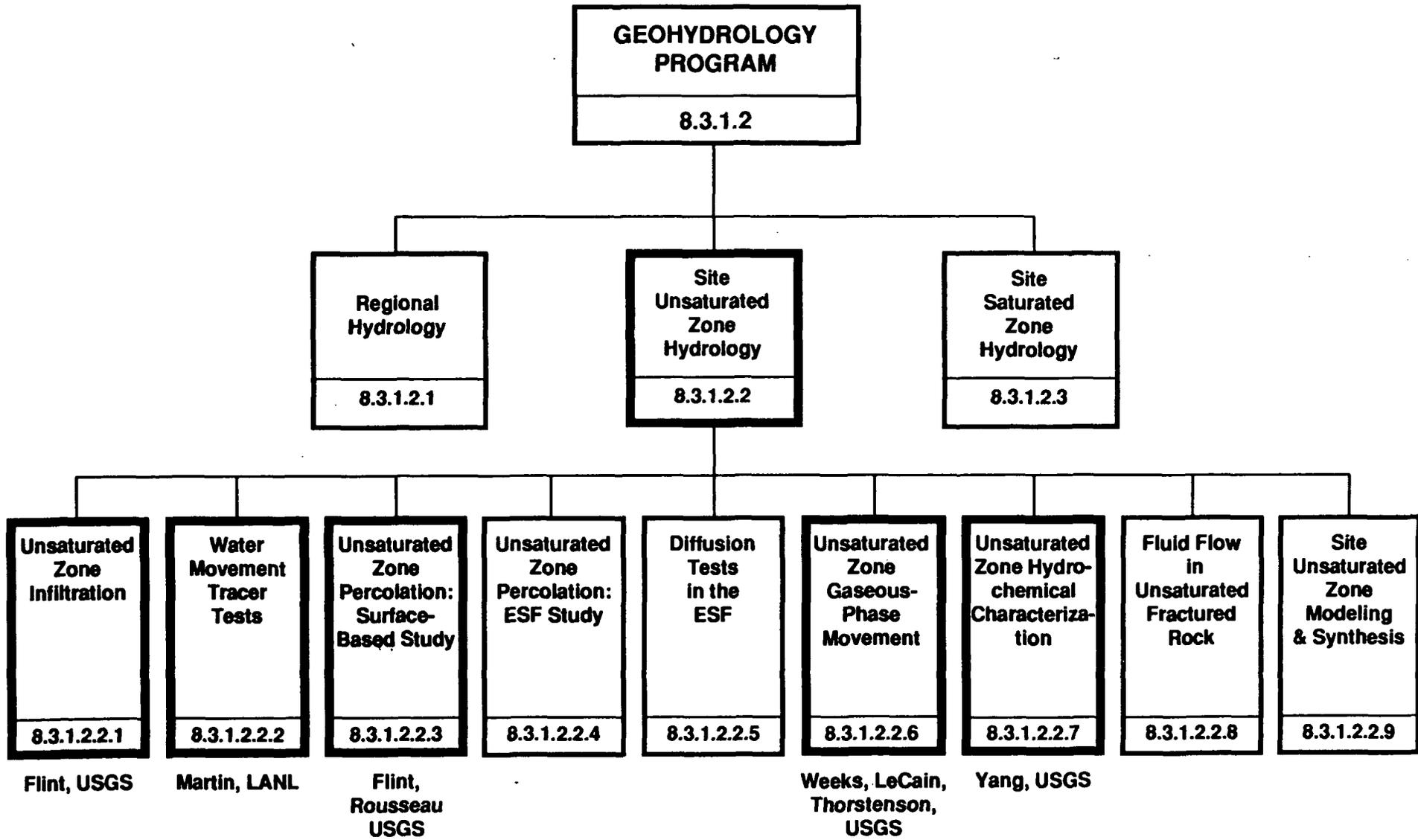
PEER REVIEW OF THE UNSATURATED ZONE HYDROLOGY PROGRAM

(CONTINUED)

KEY POINTS

- **INCONSISTENCIES BETWEEN ISOTOPIC AGE DATING OF WATERS AT DEPTH AND UNSATURATED GROUNDWATER TRAVEL TIMES CALCULATED WITH HYDROGEOLOGIC MODELS MUST BE RESOLVED**
- **RE-EXAMINE THE SATURATED ZONE TRAVEL TIME CALCULATIONS; TRAVEL TIME MAY BE MUCH LONGER THAT WAS ORIGINALLY ESTIMATED**





WASTE PACKAGE ENVIRONMENT

8.3.4.2.4

Near-field mineralogy & chemistry

8.3.4.2.4.1

Water Quality

Hydrothermal testing

Radiation chemistry

Dissolution & precipitation

Vadose water

Computer simulations

Near-field hydrology

8.3.4.2.4.2

Buscheck, LLNL

Water quantity

Single phase flow

Two phase flow

Near-field thermal and mechanical properties

8.3.4.2.4.3

Borehole stability & thermal loading

Near-field mechanical properties

Near-field thermal properties