7/15/83

See Rocket P- for Enclosure

(rec'd fm Olson, DOE, to Wright, NRC)

SUMMARY MEETING NOTES
DOE/NRC MEETING ON HYDROLOGY TESTING
RICHLAND, WASHINGTON
JULY 11-15, 1983

WM Record File 101.2

WM Project 10

Docket No.

PDR ✓

LPDR ✓

Distribution:

(Return to WM, 623-SS) C2

WM DOCKET CONTROL CENTER
'83 JUL 27 A9:27

00518

Enclosure to 7/11-15/83 Summary Meeting

SUMMARY MEETING NOTES
DOE/NRC MEETING ON HYDROLOGY TESTING
RICHLAND, WASHINGTON
JULY 11-15, 1983

Agenda: See Attachment 1

Attendees: See Attachment 2

Technical Developments:

Beginning July 11, discussions centered around Rockwell's "BWIP Plans for Hydrologic Characterization" (Attachment 3); Rockwell's "Siting of Piezometers" (Attachment 4); and a preliminary version of NRC's "Draft Site Technical Position of Hydrogeologic Testing Strategy for the BWIP Site" (in preparation). As a result of the discussions, modifications to the hydrologic characterization strategy were made by Rockwell. These are summarized in Attachment 5, which is a modification of Figure 4 in the NRC draft technical position. General understandings on testing strategy are summarized in Attachment 6.

On July 12, the NRC was provided with a summary of selected test results in boreholes RRL-2, RRL-6, RRL-14, DC-16 group, DB-11 and McGee. Investigations of the mud effect were discussed, and some photos of core in DC-16A were examined. No attempt was made to discuss regional hydrology or the interpretation of hydrochemical data, and the cumulative test results of the past 12 months were not reviewed.

On July 15, Rockwell presented current plans for revisions in geologic logs. These appear to address the concerns raised by NRC during the technical meeting held the week of April 11, 1983. Summary notes of the July 15 discussion are attached (Attachment 7).

Other Developments:

Effective July 18, direct communication on technical project matters will be established between specified Rockwell/DOE and NRC individuals.

DOE/Rockwell will put into place a system to advise NRC and other affected parties, on a monthly basis, of new project test data and its availability.

BWIP site characterization data reports in the Rockwell engineering release system will be placed in the public reading room and will be provided, as requested, to NRC and other affected parties. NRC and other affected parties will receive a monthly status report of additions to the engineering release system dealing with site characterization activities.

DOE will propose a schedule for monthly meetings on various technical matters. Tentative meetings for next month are: August 5 (Silver Spring) - SCP contents dealing with conceptual design and reliability of the engineered system; and week of August 30 - underground testing. Plans also will be made for a meeting on management of licensing records. NRC will identify priorities for site characterization data updates.

NRC will become a participant in the task force on regional hydrology.

NRC tabled, for DOE comment, two draft tables: "Level of Detail Matrix" and "DOE/NRC Informal Consultation."

for O. L. Olson, DOE
July 15, 1983

Robert J. Wright, NRC
July 15, 1983

NRC TECHNICAL CONTACTS

Topic	Name of Contact	FTS
Hydrology	Telak Verma	427-4683
	Alt. Mark Logsdon	427-4680
Geology	Paul Prestholt	427-4597
	Alt. Martha Pendleton	427-4629
Geochemistry	Philip Justus	427-4677
	Alt. David Brooks	427-4603
Repository design	John Greeves	427-4672
	Alt. Mysore Nataraja	427-4678
Waste package	Robert Cook	427-4163
Performance assessment	Malcolm Knapp	427-4058
	Alt. Matthew Gordon	427-4133
Quality assurance	John Greeves	427-4672
	Alt. Jay Rhoderick	427-4682
General	Robert Wright	427-4674
	Alt. Paul Prestholt	427-4597

SUMMARY MEETING NOTES
DOE/NRC MEETING ON HYDROLOGY TESTING
RICHLAND, WASHINGTON
JULY 11-15, 1983

TABLE OF CONTENTS

AGENDA

NRC/DOE WORKSHOP ON HYDROLOGIC TESTING
USDOE/ROCKWELL HANFORD OPERATIONS
BASALT WASTE ISOLATION PROJECT

Date: July 11-15, 1983

Place: 1135 Jadwin Avenue, Richland, Washington

Purpose: To discuss and begin the process of resolving the DSCA comments concerning the BWIP groundwater flow system

Objectives:
(1) To discuss alternative hydrologic testing approaches

(2) To review hydrogeologic data collected by BWIP that are important to test plans, e.g., DC-4/5, DC-16, RRL-2, RRL-6, RRL-14, McGee

(3) To clarify open questions on hydrochemistry concerns in the DSCA

Participants:
NRC: M. Logsdon, T. Verma, R. Wright

Golder Associates: A. Brown, G. Rowe

Williams and Associates: D. Ralston, R. Williams, G. Winter

DOE: L. Olson, D. Squires, A. Lassilla

Rockwell: S. Baker, R. Bryce, J. LaRue, J. Bazemore
L. Leonhart, G. Hunt

Agenda:

July 11

9:30 a.m. - DOE Introduction - L. Olson

9:45 a.m. - NRC Presentation - R. Wright

10:00 a.m. - (1) DOE/Rockwell presents proposed testing plans (piezometers, cluster tests, vertical conductivity)

(2) NRC presents draft site technical position on hydrologic testing strategy

July 12

(1) Continue discussion of testing approaches

(2) Clarification of hydrochemistry concerns in the DSCA

July 13

(1) NRC caucus; DOE/Rockwell caucus

(2) NRC - DOE/Rockwell meetings to clarify or discuss questions on test data and testing strategy

July 14

(1) NRC-DOE/Rockwell meeting to discuss and to the extent practicable prepare a draft hydrologic testing approach

(2) NRC-DOE/Rockwell wrap-ups - discussion to include; data release, rules for communication, major concerns, SCP schedule

July 15

Will be reserved if needed

DOE/NRC Meeting on Hydrologic Testing
Richland, Washington
July 11-14, 1983

Name	Organization	Phone
O. L. Olson	DOE-RL-BWIPO Project Manager	444-7334 FTS
D. J. Squires	DOE-RL-BWIPO	444-7240 FTS
J. H. LaRue	Licensing-Rockwell	444-8506 FTS
R. A. Deju	Director - Rockwell BWIP	444-6806 FTS
R. J. Wright	NRC	427-4674 FTS
J. W. Rowe	Golder - NRC	206-827-0777
Roy E. Williams	NRC Consultant	208-885-6259
Gerry Winter	NRC Consultant	208-883-0153
Teek R. Verma	NRC	427-4683 FTS
Adrian Brown	NRC/Golder Consultant	303-973-9587
Steve Baker	BWIP-Rockwell	444-7981 FTS
Marc Saidman	Weston	301-963-6838
William Ives	Weston NWTS HQ Support	301-963-6844
Charlie Cole	PNL	509-376-8451
D. L. Graham	BWIP-Rockwell	444-6258 FTS
David Myers	PNL	509-376-9680
Pat Domenico	DOE Consultant	409-775-4863
Art Lassila	DOE-RL-BWIPO	444-6158 FTS
W. F. Heine	Rockwell	444-7114 FTS
H. A. Haerer	Rockwell	444-7005 FTS
Vivien Lee	Rockwell Consultant	444-7005 FTS
M. J. Graham	Rockwell	444-7005 FTS
R. W. Bryce	Rockwell-BWIP	444-4605 FTS
W. H. Price	Rockwell-BWIP	373-4521
G. S. Hunt	Rockwell-BWIP	444-6786 FTS
Jay L. Smith	DOE-RL Overview Committee	213-595-5795
Roger J. Henning	Morrison-Knudsen Co., Inc.	208-345-5000
L. L. Mink	Morrison-Knudsen Co., Inc.	208-345-5000
L. S. Leonhart	Rockwell-BWIP	444-2655 FTS
Harry Tanaka	State of Washington	206-459-6023
Don Provost	State of Washington	206-459-6023

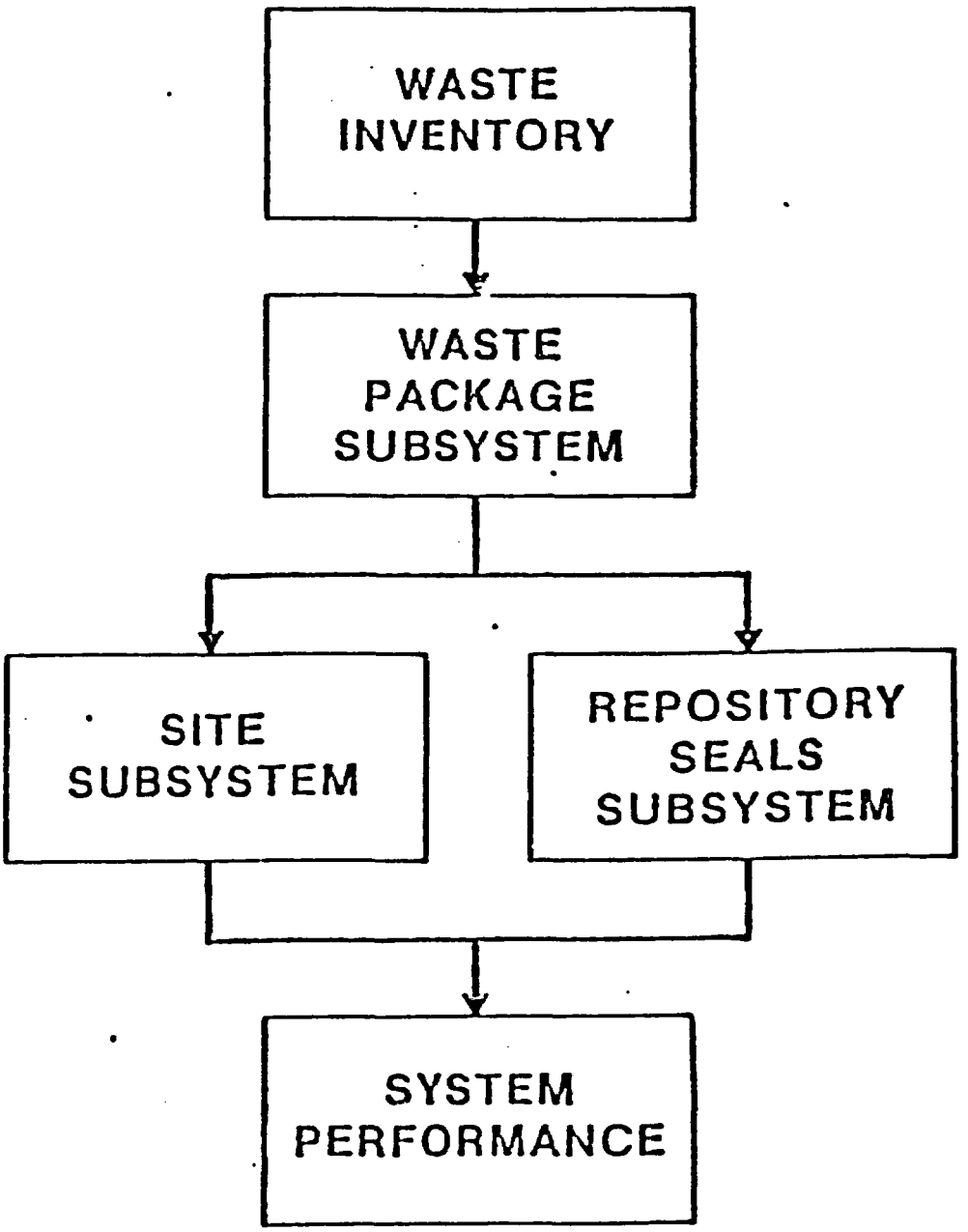
BWIP PLANS FOR

HYDROLOGIC CHARACTERIZATION

Attachment 3
(22 pgs.)

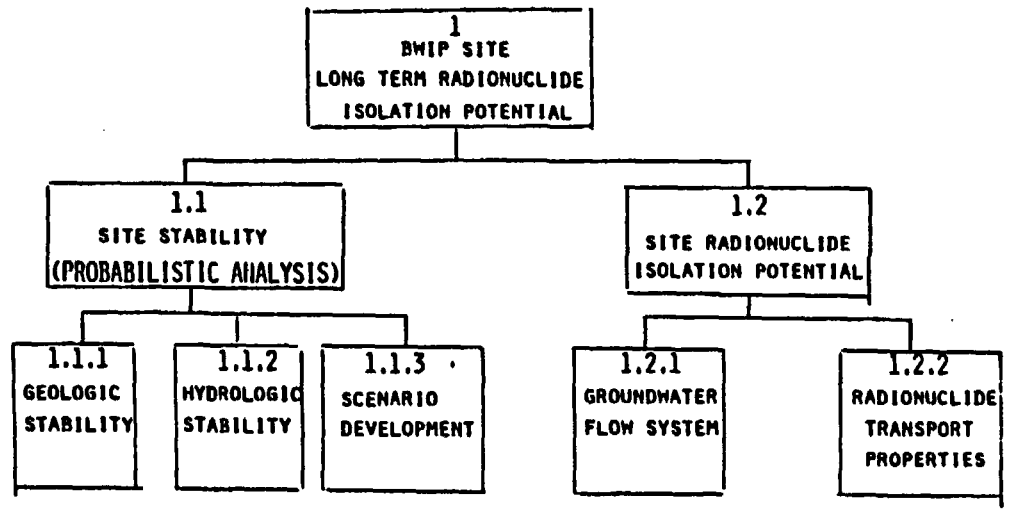
OBJECTIVES OF THIS PRESENTATION

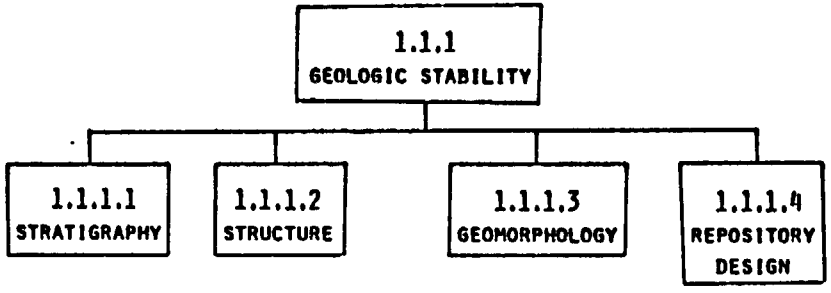
- Show hydrologic characterization in the context of overall project objectives
- Focus upon establishing a comprehensive approach for hydrologic characterization

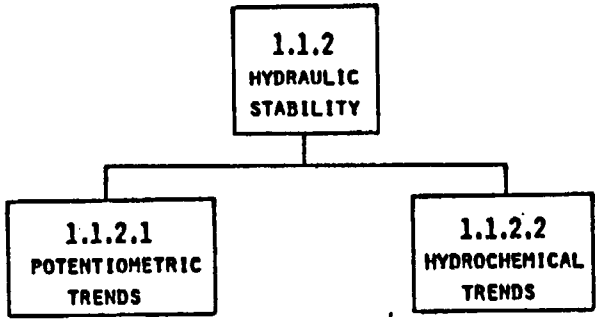

WASTE INVENTORY
WASTE PACKAGE SUBSYSTEM
SITE SUBSYSTEM
REPOSITORY SEALS SUBSYSTEM
SYSTEM PERFORMANCE

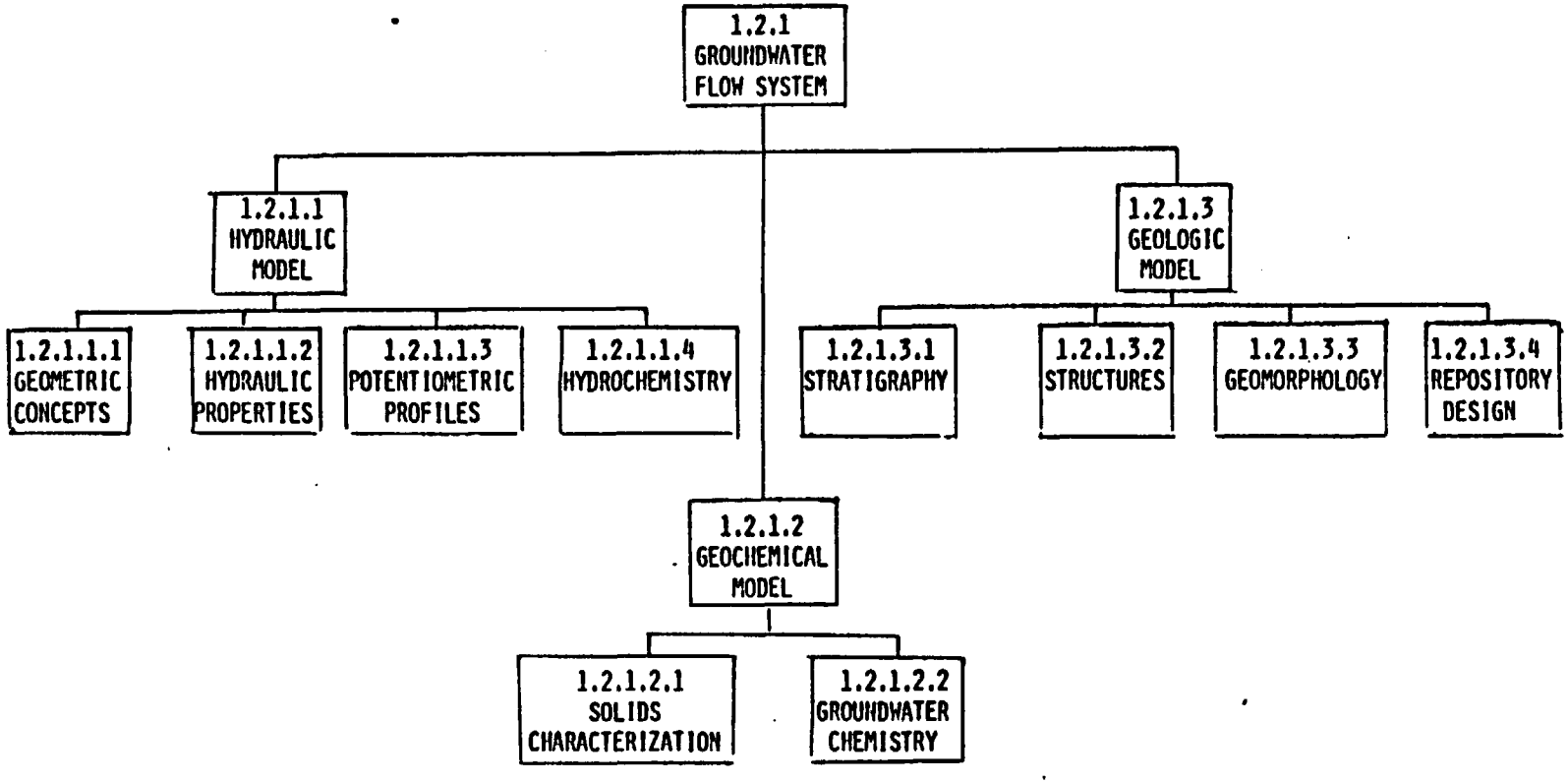
PLANNING STATUS

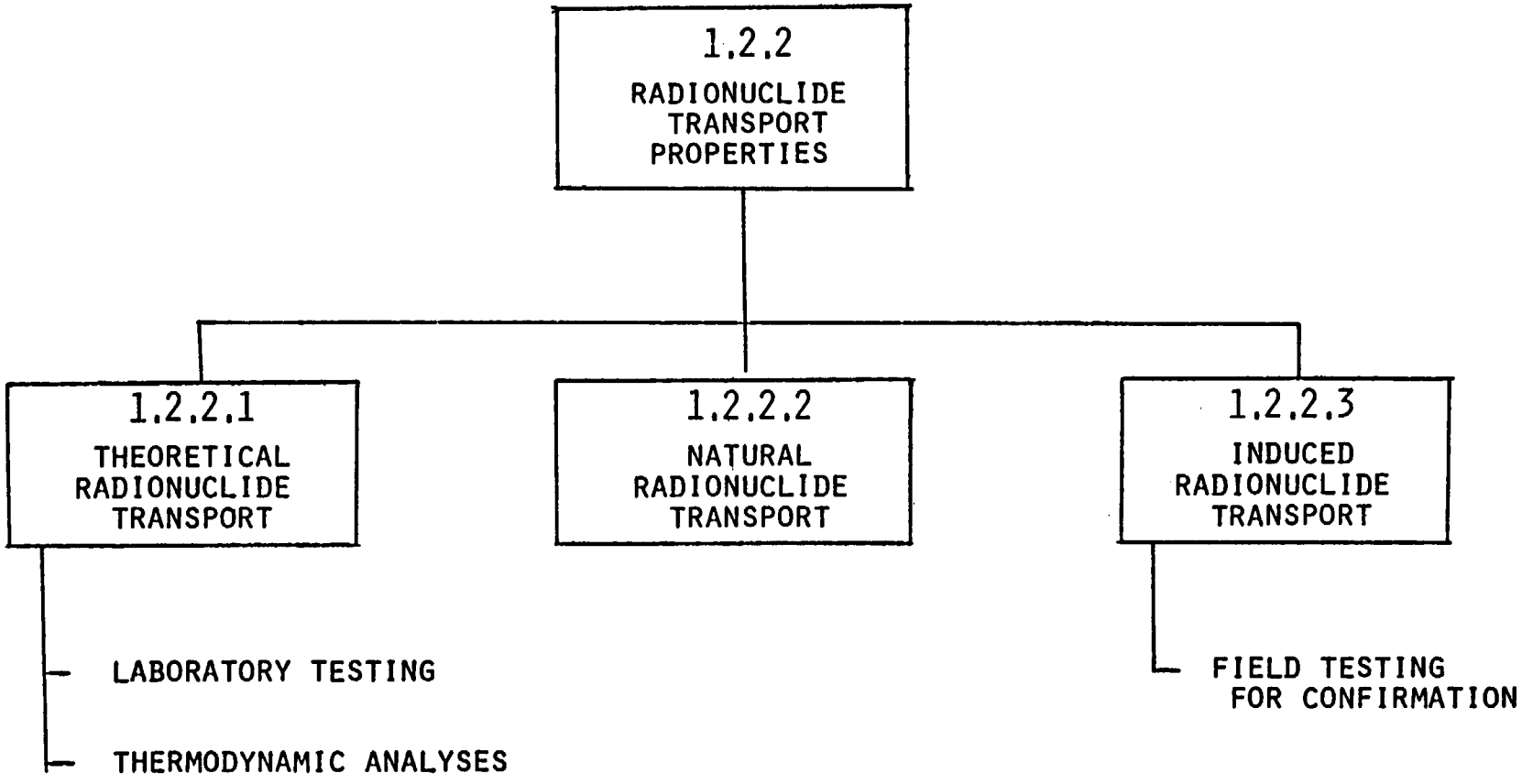
- Approach and Schedule Being Formulated
- Long Range Plans (Three Years)
- Sequencing of critical activities
- Implementation of Plans Does Not Depend Upon a Specific Conceptual Model
- Contingency and Flexibility is Being "Built-In"
- Input From Scientific Community is Desired


1
BWIP SITE
LONG TERM RADIONUCLIDE
ISOLATION POTENTIAL
1.1
SITE STABILITY
(PROBABILISTIC AHALYSIS)
1.2
SITE RADIONUCLIDE
ISOLATION POTENTIAL
1.1.1
GEOLOGIC
STABILITY
1.1.2
HYDROLOGIC
STABILITY
1.1.3
SCENARIO
DEVELOPMENT
1.2.1
GROUNDWATER
FLOW SYSTEM
1.2.2
RADIONUCLIDE
TRANSPORT
PROPERTIES

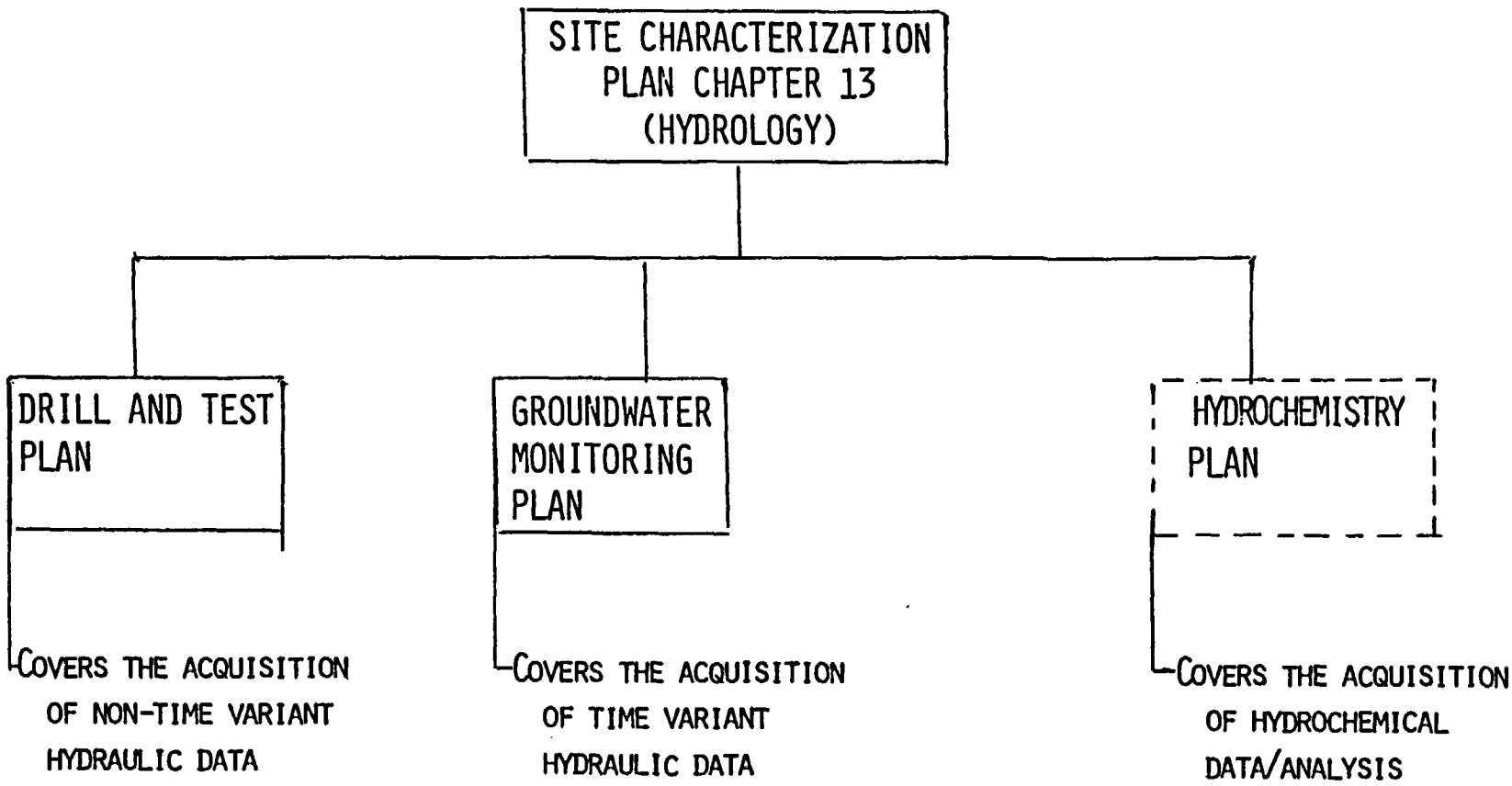

1.1.1
GEOLOGIC STABILITY
1.1.1.1
STRATIGRAPHY
1.1.1.2
STRUCTURE
1.1.1.3
GEOMORPHOLOGY
1.1.1.4
REPOSITORY
DESIGN


1.1.2
HYDRAULIC
STABILITY
1.1.2.1
POTENTIOMETRIC
TRENDS
1.1.2.2
HYDROCHEMICAL
TRENDS


1.2.1
GROUNDWATER
FLOW SYSTEM
1.2.1.1
HYDRAULIC
MODEL
1.2.1.3
GEOLOGIC
MODEL
1.2.1.1.1
GEOMETRIC
CONCEPTS
1.2.1.1.2
HYDRAULIC
PROPERTIES
1.2.1.1.3
POTENTIOMETRIC
PROFILES
1.2.1.1.4
HYDROCHEMISTRY
1.2.1.3.1
STRATIGRAPHY
1.2.1.3.2
STRUCTURES
1.2.1.3.3
GEOMORPHOLOGY
1.2.1.3.4
REPOSITORY
DESIGN
1.2.1.2
GEOCHEMICAL
MODEL
1.2.1.2.1
SOLIDS
CHARACTERIZATION
1.2.1.2.2
GROUNDWATER
CHEMISTRY

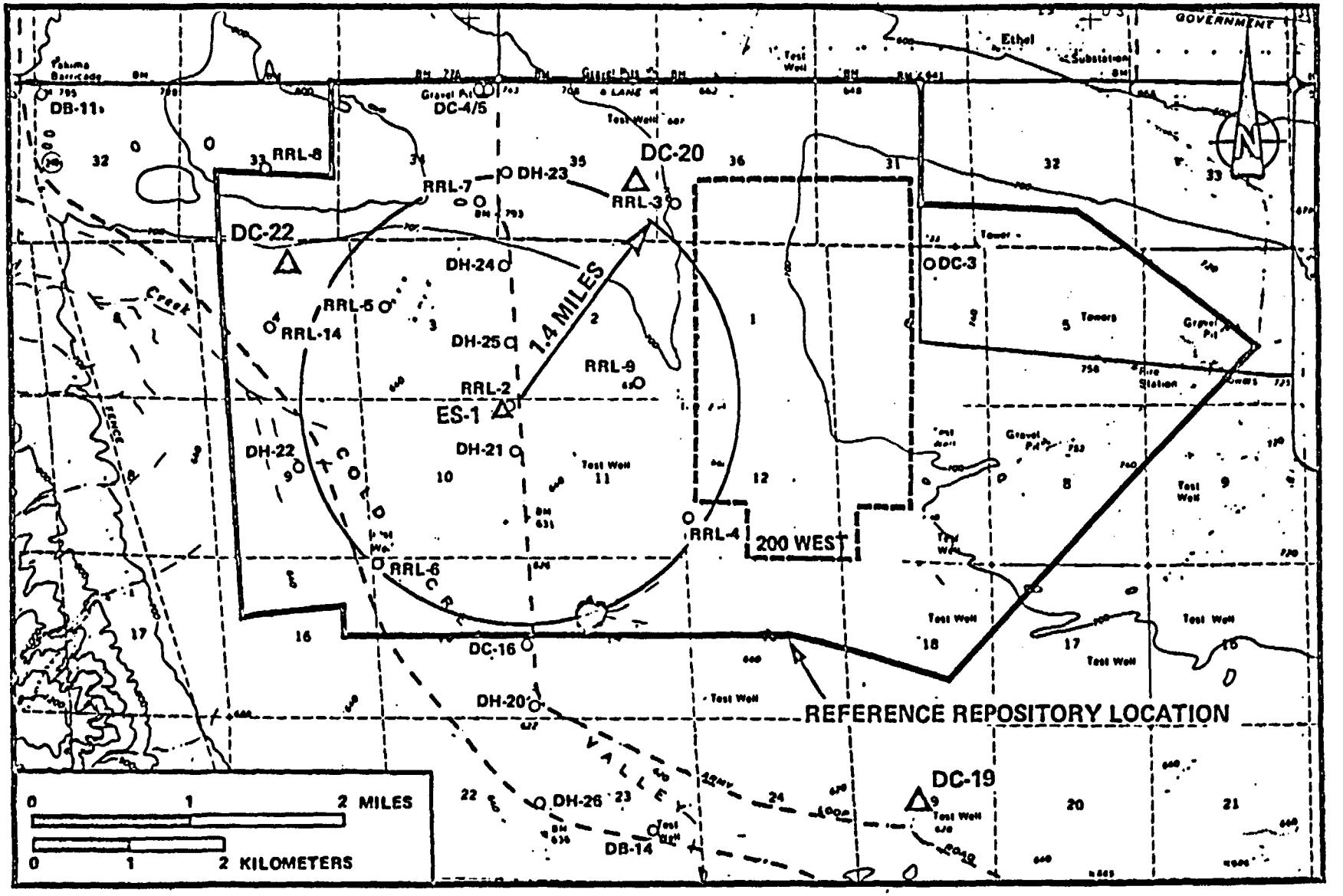

1.2.2
RADIONUCLIDE TRANSPORT PROPERTIES
1.2.2.1
THEORETICAL RADIONUCLIDE TRANSPORT
1.2.2.2
NATURAL RADIONUCLIDE TRANSPORT
1.2.2.3
INDUCED RADIONUCLIDE TRANSPORT
LABORATORY TESTING
THERMODYNAMIC ANALYSES
FIELD TESTING FOR CONFIRMATION

CONTROLLING PLANS



MAJOR ACTIVITIES REQUIRED FOR HYDROLOGIC CHARACTERIZATION

- o Piezometer Baseline (DC-19, 20, 22, RRL 14, RRL-2)
  - Validity of head data
  - Model boundary conditions
  - Support pre-emplacement travel time determination
  - Install multi-port systems in RRL-14 and RRL-2
- o Large Scale Multiple Well Aquifer Testing (DC-16, 19, 20, 22)
  - Representativeness of data (includes validity of testing)
  - Evaluate hydrologic significance of structures
  - Vertical conductivity
- o Small Scale Hydraulic Testing (Single and Multiple Well)
  - Hydraulic properties
  - Hydrochemical data (DC-18)
  - Special testing (mud effects, dynamic logging)
- o Groundwater Monitoring
- o Geochemical Analyses
  - Hydrochemical sampling
  - Solids characterization
  - Geochemical modeling
  - Field testing (tracer tests)
  - Isotopic analyses



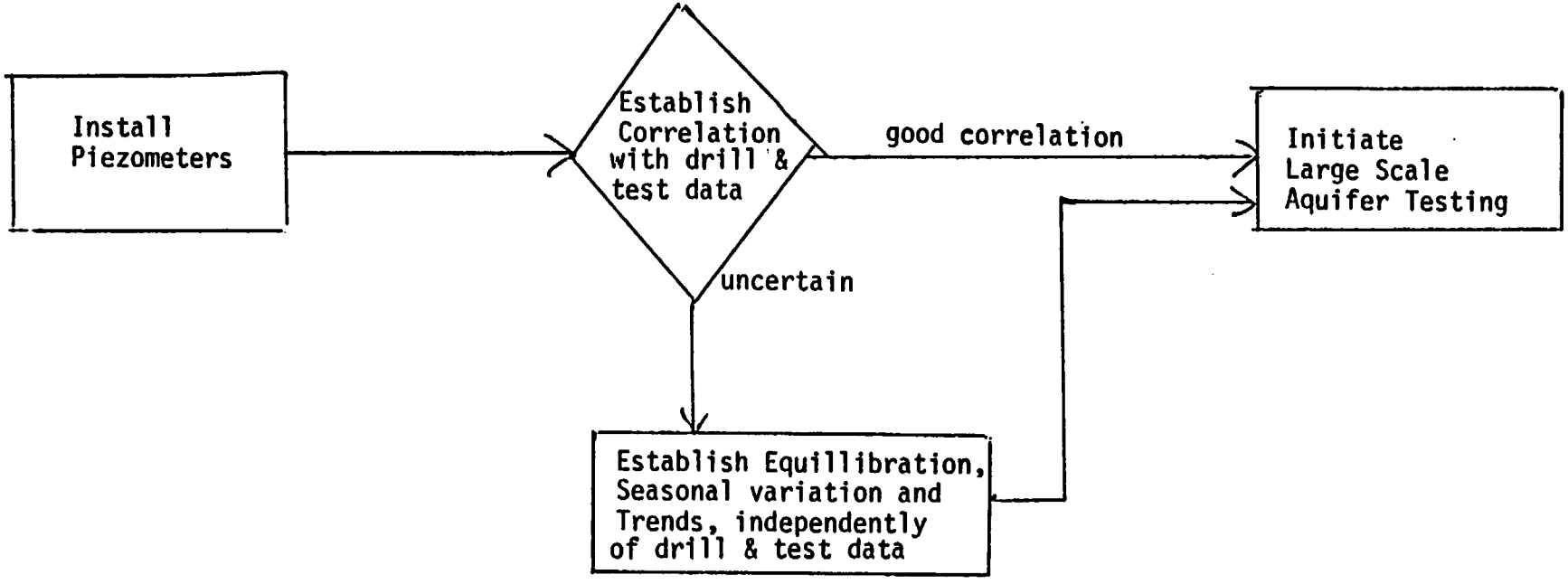
Existing and Planned Boreholes In and Around the Reference Repository Location.

Δ = new cluster wells

Note: RRL-14 and RRL-2 to be equipped with multi-port piezometer

PIEZOMETRIC BASELINE

- THREE MULTIPLE LEVEL PIEZOMETRIC STATIONS AROUND THE REPOSITORY SITE
- TWO EXISTING WELLS EQUIPPED WITH MULTIPORT SYSTEMS
- PREREQUISITE FOR LARGE SCALE HYDRAULIC TESTING AT THE RRL


Install Piezometers
Establish Correlation with drill & test data
good correlation
Initiate Large Scale Aquifer Testing
uncertain
Establish Equillibration, Seasonal variation and Trends, independently of drill & test data

VALIDITY OF HEAD DATA

- ESTABLISH CORRELATION BETWEEN RRL-14 (WITH MULTI-PORT SYSTEM) POINT HEAD DATA AND DC-22 PIEZOMETER DATA
- ESTABLISH CORRELATION BETWEEN RRL-2 (WITH MULTI-PORT SYSTEM) POINT HEAD DATA AND INTERPOLATED PIEZOMETER DATA
- ESTABLISH CORRELATION BETWEEN DC-16A POINT HEAD DATA AND EXTRAPOLATED PIEZOMETER DATA
- EXTENT OF CORRELATION WILL BE USED TO ESTIMATE
  - UNCERTAINTY OF DRILL AND TEST HEAD DATA
  - EQUILIBRATION STATE OF PIEZOMETERS
  - CYCLICAL VARIATION
  - TRENDS

MODEL BOUNDARY CONDITIONS

- LARGE SCALE MODELING MINIMIZES IMPACT OF BOUNDARY CONDITIONS ON COLD CREEK SYNCLINE

- HIGH RESOLUTION HEAD PROFILE NEAR RRL WILL BE USED TO CALIBRATE LARGE SCALE MODELS

- CALIBRATED LARGE SCALE MODEL WILL BE USED TO PROVIDE BOUNDARY CONDITIONS FOR SMALLER SCALE MODELS

PIEZOMETRIC BASELINE

SUPPORT PRE-EMPLACEMENT TRAVEL TIME DETERMINATION

- VELOCITY = $\frac{K}{N} \frac{\delta H}{\delta S}$

- HEAD PROFILE NEEDED TO DETERMINE PRE-EMPLACEMENT GRADIENT

LARGE SCALE MULTIPLE WELL

AQUIFER TESTS

- MULITPLE LAYER TESTS
- PUMP MIDDLE LAYER
- OBSERVE ALL THREE LAYERS AT THREE OR MORE LOCATIONS
- HYDROLOGIC PROPERTIES DETERMINED FROM PRE-TEST AND POST-TEST PARAMETRIC NUMERICAL ANALYSES
- COMPLEMENTS SMALL SCALE TESTS

LARGE SCALE MULTIPLE WELL AQUIFER TESTS

REPRESENTATIVENESS OF DATA

- TRANSMISSIVITY DETERMINED USING MULTIPLE WELL TECHNIQUES
- CORRELATIONS ESTABLISHED BETWEEN DIFFERENT TESTS, BOTH LARGE AND SMALL SCALE
- ANALYSES WILL BE CONDUCTED TO DETERMINE APPROPRIATE VALUES TO BE USED IN PERFORMANCE ASSESSMENT MODELS

HYDROLOGIC SIGNIFICANCE OF STRUCTURES

- INTERPRETED GEOPHYSICAL AND GEOLOGIC DATA USED TO SUPPORT PARAMETRIC PRE-TEST PREDICTIONS
- HYDRAULIC BOUNDARIES MAY BE INFERRED FROM MULTIPLE WELL TESTING
- THREE DIMENSIONAL SIGNIFICANCE OF BOUNDARIES WILL BE INVESTIGATED

VERTICAL CONDUCTIVITY

- DRAWDOWN ABOVE AND/OR BELOW THE PUMPED LAYER INDICATES VERTICAL LEAKAGE
- DISCRETE AND DISTRIBUTED LEAKAGE WILL BE MODELED
- GEOMETRY AND QUANTIFICATION OF LEAKAGE MAY BE DETERMINED BY MATCHING DRAWDOWN TO PARAMETRIC ANALYSIS RESULTS

MUD EFFECTS

- o Large scale tests
  - Air rotary holes
  - Results compared to those from mud drilled holes
- o Hydraulic effects
  - DB-2 tests
- o Hydrochemical effects
  - DC-14 test

SITING OF PIEZOMETERS

Attachment 4
(22 pgs.)

JUSTIFICATION

1. TECHNICAL CONCERNS

   - O TIME-VARIANCE
   - O 4-DIMENSIONAL PHENOMENA
   - O MODEL CALIBRATION
   - O DATA VALIDATION

2. PRACTICAL CONCERNS

   - O EXISTING FACILITIES WITHOUT MODIFICATION CANNOT FULFILL HYDROLOGIC CHARACTERIZATION NEEDS (E.G., NUMBER OF HORIZONS, SPATIAL DISTRIBUTION, INTEGRITY, ETC.)
   - O SCHEDULING OF TESTING AT EXISTING FACILITIES

MINIMUM NUMBER OF SITES REQUIRED AT THIS TIME

CONSIDERATIONS

1. A MINIMUM OF THREE SITES ARE REQUIRED TO DETERMINE HYDRAULIC GRADIENTS IF POTENTIOMETRIC SURFACE IS PLANAR
2. MORE THAN THREE SITES ARE PROBABLY UNWARRANTED AT THIS TIME BASED ON:
    - o UNCERTAINTIES
    - o THE POTENTIAL FOR USING TESTING DATA FROM OTHER BOREHOLES TO SUPPLEMENT PIEZOMETER DATA AND REFINE POTENTIOMETRIC SURFACES

RECOMMENDATION

INSTALL A MINIMUM OF THREE NEW, DEDICATED PIEZOMETER SITES AT STRATEGIC LOCATIONS ACROSS THE RRL.

SELECTION OF HORIZONS FOR MONITORING

CONSIDERATIONS

1. > 80 FLOW/INTERBEDS IN SECTION
2. HYDRAULIC HEAD AND HYDROCHEMICAL BREAKS
3. MODELING DATA NEEDS
4. TRANSMISSIVITY AND PRODUCTION
5. RELATIONSHIP TO CANDIDATE HORIZON
6. IDENTIFIABLE FROM GEOPHYSICAL LOGS

RECOMMENDATION

NINE HORIZONS

- o TOB
- o RATTLESNAKE RIDGE INTERBED
- o MABTON INTERBED
- o PRIEST RAPIDS #2 FLOW TOP
- o ROZA/UPPER FRENCHMAN SPRINGS FLOW TOP(S)
- o LOWER FRENCHMAN SPRINGS FLOW TOP(S)
- o GRANDE RONDE #3 FLOW TOP
- o COHASSETT FLOW TOP
- o UMTANUM FLOW TOP

DATA FROM THESE NINE HORIZONS WILL BE USED IN MATHEMATICAL MODELING

SELECTION OF STRATIGRAPHIC HORIZONS

FORMATION	STRATIGRAPHIC UNIT	RATIONALE
SADDLE MOUNTAINS	1. TOP OF BASALT	o MODEL BOUNDARY o MOST DYNAMIC o ARTIFICIAL RECHARGE
	2. RATTLESNAKE RIDGE INTERBED	o UPPER SADDLE MOUNTAINS o OTHER DATA AVAILABLE o ARTIFICIAL RECHARGE
	3. MABTON INTERBED	o HYDRAULIC & HYROCHEMICAL "BREAKS" o DATA AVAILABLE THROUGHOUT BASIN o LOWER SADDLE MOUNTAINS
WANAPUM	1. PRIEST RAPIDS	o HIGH PRODUCER o UPPER WANAPUM o HYDRAULIC & HYDROCHEMICAL "BREAKS"
	2. ROZA/U. FRENCHMAN SPRINGS	o AQUIFER PRODUCTIVITY o POSSIBLE TRANSITION
	3. LOWER FRENCHMAN SPRINGS	o ISOLATION OF GRANDE RONDE o HYDRAULIC AND HYDROCHEMICAL "BREAKS"
GRANDE RONDE	1. U. GRANDE RONDE	o ISOLATION ABOVE COHASSETT o HYDRAULIC & HYDROCHEMICAL "BREAKS" o GRADIENT ACROSS CANDIDATE HORIZON
	2. COHASSETT	o CANDIDATE HORIZON
	3. UMTANUM	o CANDIDATE HORIZON o GRADIENT ACROSS CANDIDATE HORIZON

SITE SELECTION

CONSIDERATIONS:

1. CONFIGURATION OF POTENTIOMETRIC SURFACE

    - o PROBABLE FLOW DIRECTIONS
    - o HYDRAULIC GRADIENTS
    - o GEOPHYSICAL ANOMALIES

2. PRACTICAL CONSIDERATIONS

    - o LOCATION AND COMPLETION CHARACTERISTICS OF EXISTING BOREHOLES
    - o RELATIONSHIP TO ES
    - o INTEGRITY OF ROCK
    - o EXCLUSION AREA
    - o SHALLOW CONTAMINANT PLUMES
    - o MEASUREMENT SENSITIVITY
    - o OTHER TESTING LOCATIONS

RECOMMENDATIONS:

LOCATIONS FOR DC-19, 20 AND 22

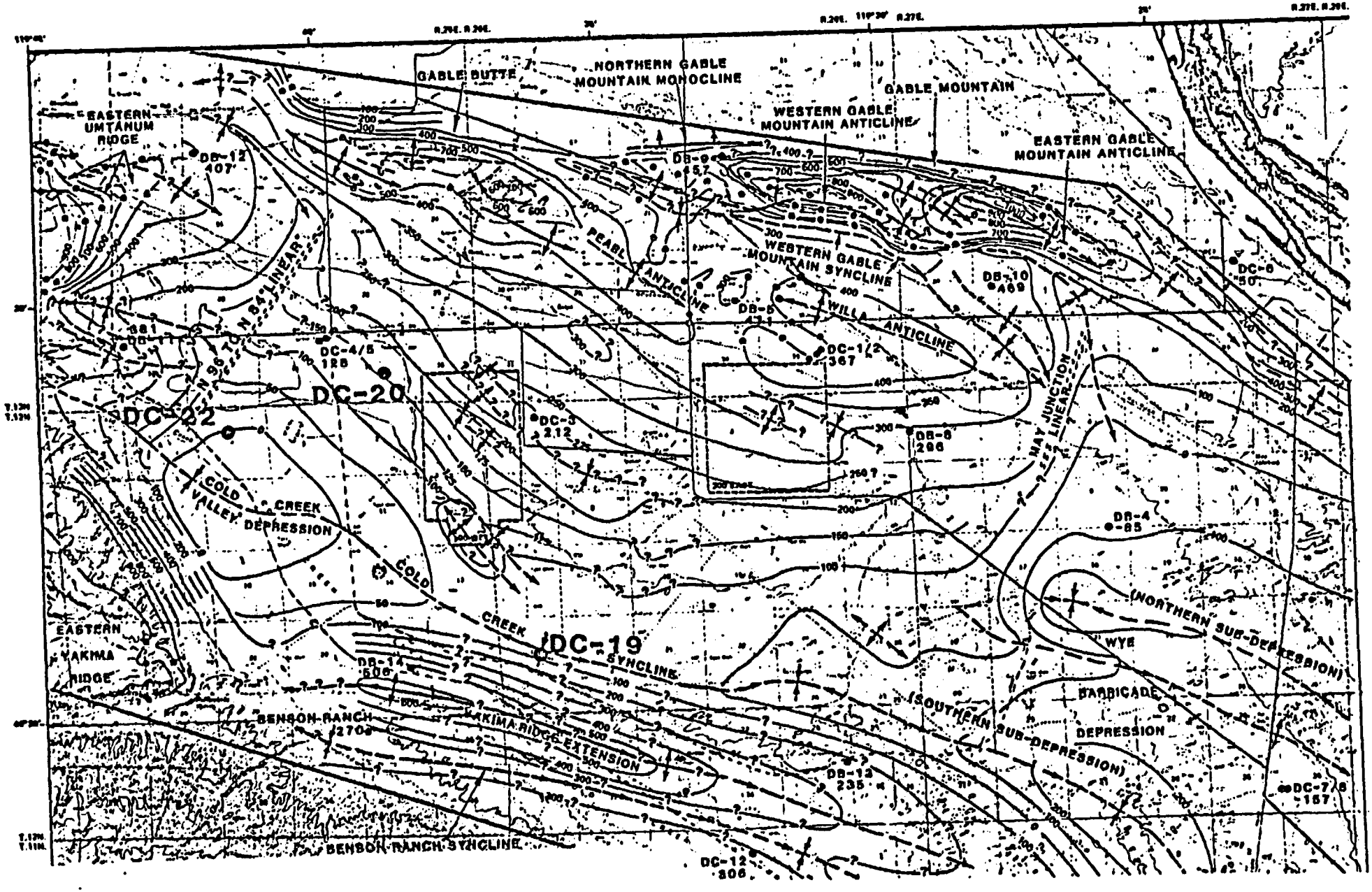
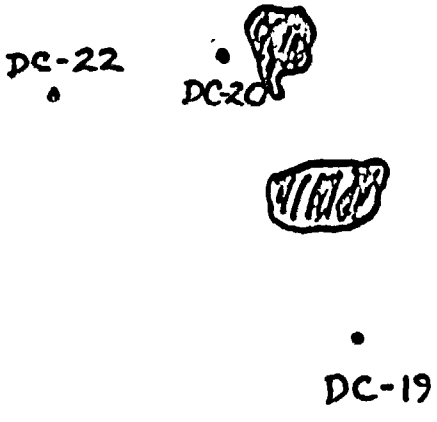
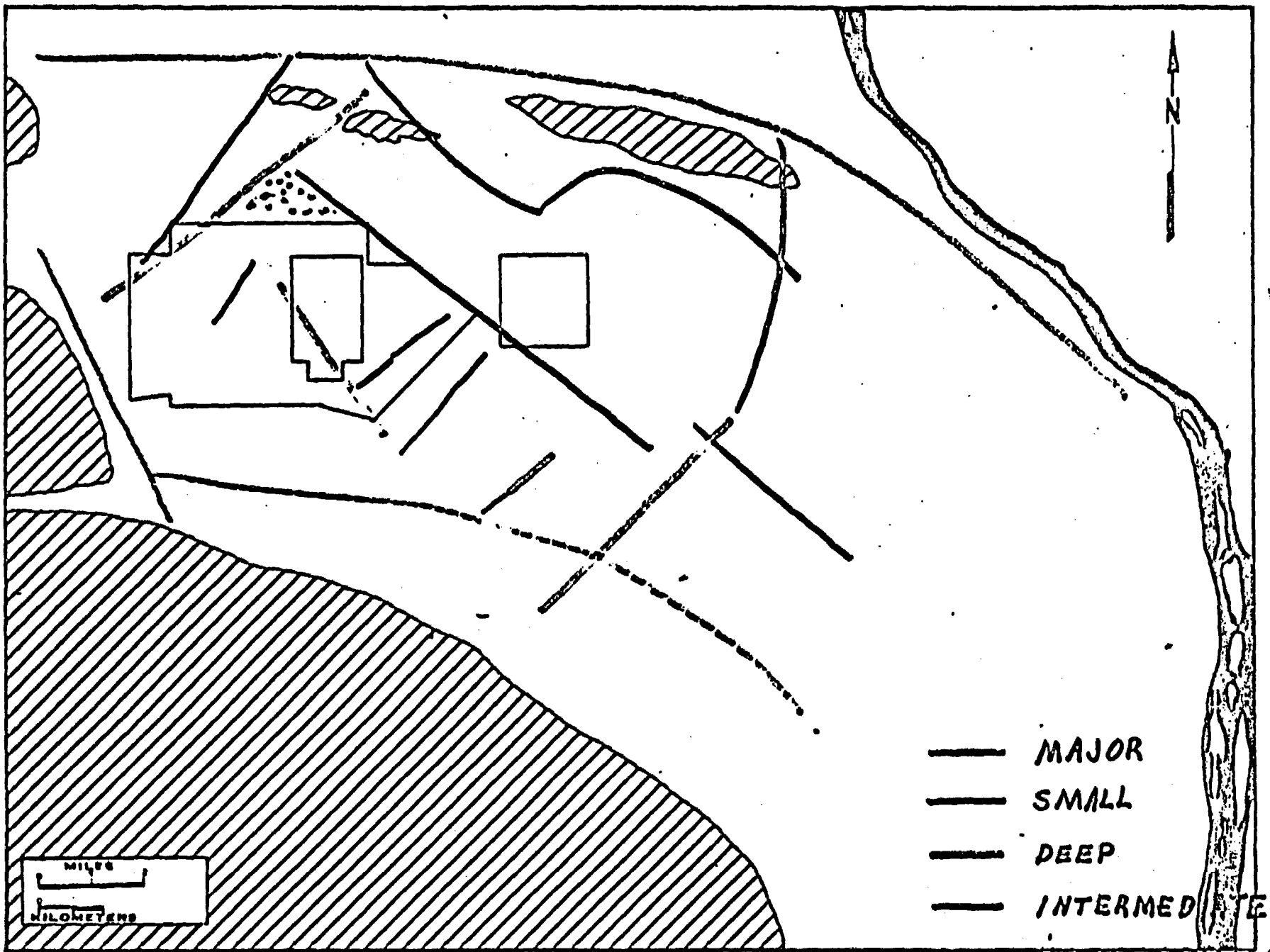


FIGURE 3. Top-Of-Basalt Structure Map, Cold Creek Syncline


DC-22
DC-20
DC-19


N
MAJOR
SMALL
DEEP
INTERMEDIATE
HIGH DENSITY
MILES
KILOMETERS

METHOD OF PIEZOMETER COMPLETION

CONSIDERATIONS:

1. AVAILABLE DESIGNS

   A. DIAMETER CONSTRAINT

      - o CLUSTER OF STANDPIPES
      - o MULTIPLE-PORTED PIEZOMETER (e.g., WESTBAY)
      - o MULTIPLE PACKERS (e.g., BASKI)

   B. NO CONSTRAINT

      - o NESTS OF STANDPIPES (e.g., DC-1)
      - o COMBINATION

2. DRILLING

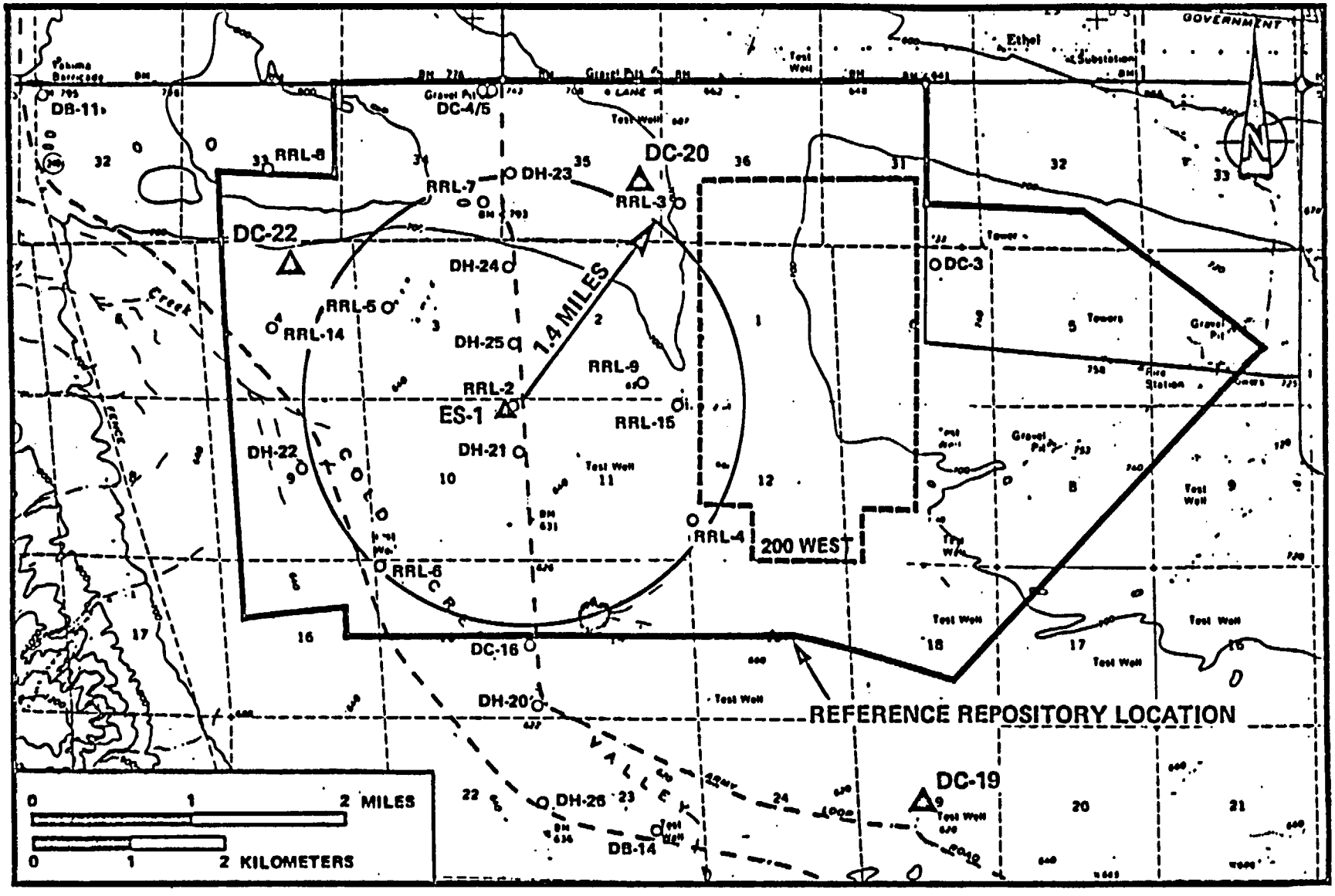
      - o SUBCONTRACTED
      - o IN-HOUSE

RECOMMENDATIONS:

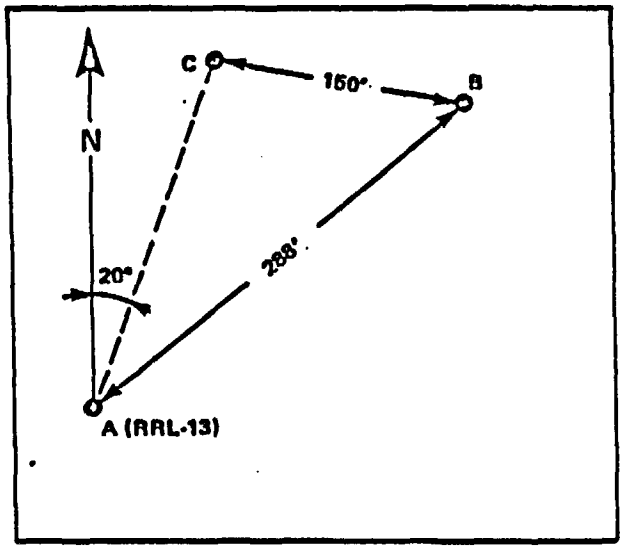
USE A COMBINATION OF SYSTEMS AT EACH SITE

PROPOSAL

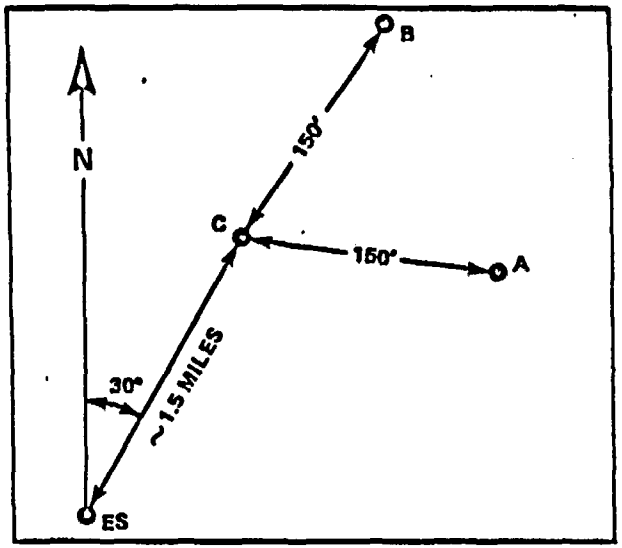
- THREE DEDICATED PIEZOMETER SITES (DC-19, DC-20, DC-22)
- INSTRUMENTATION OF RRL-2 AND RRL-14
- CONTINUOUS MONITORING WITHIN 9 HYDROSTRATIGRAPHIC UNITS ACROSS THE RRL
- USE OF NESTED AND SINGLE STANDPIPE PIEZOMETERS AT EACH SITE



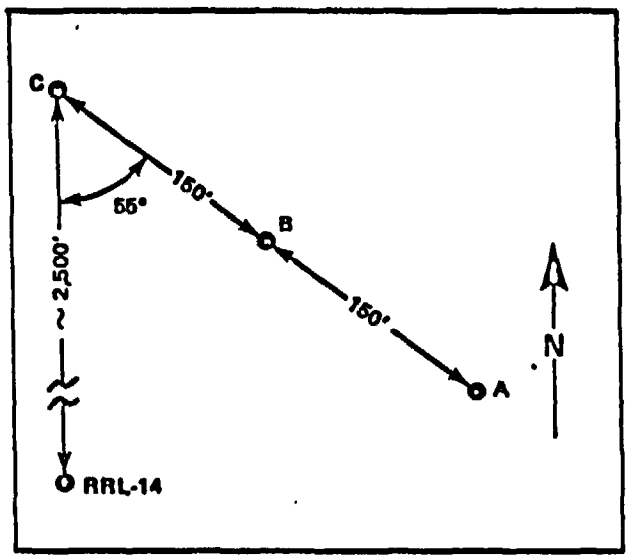
Existing and Planned Boreholes In and Around the Reference Repository Location.



DC-19 CONFIGURATION

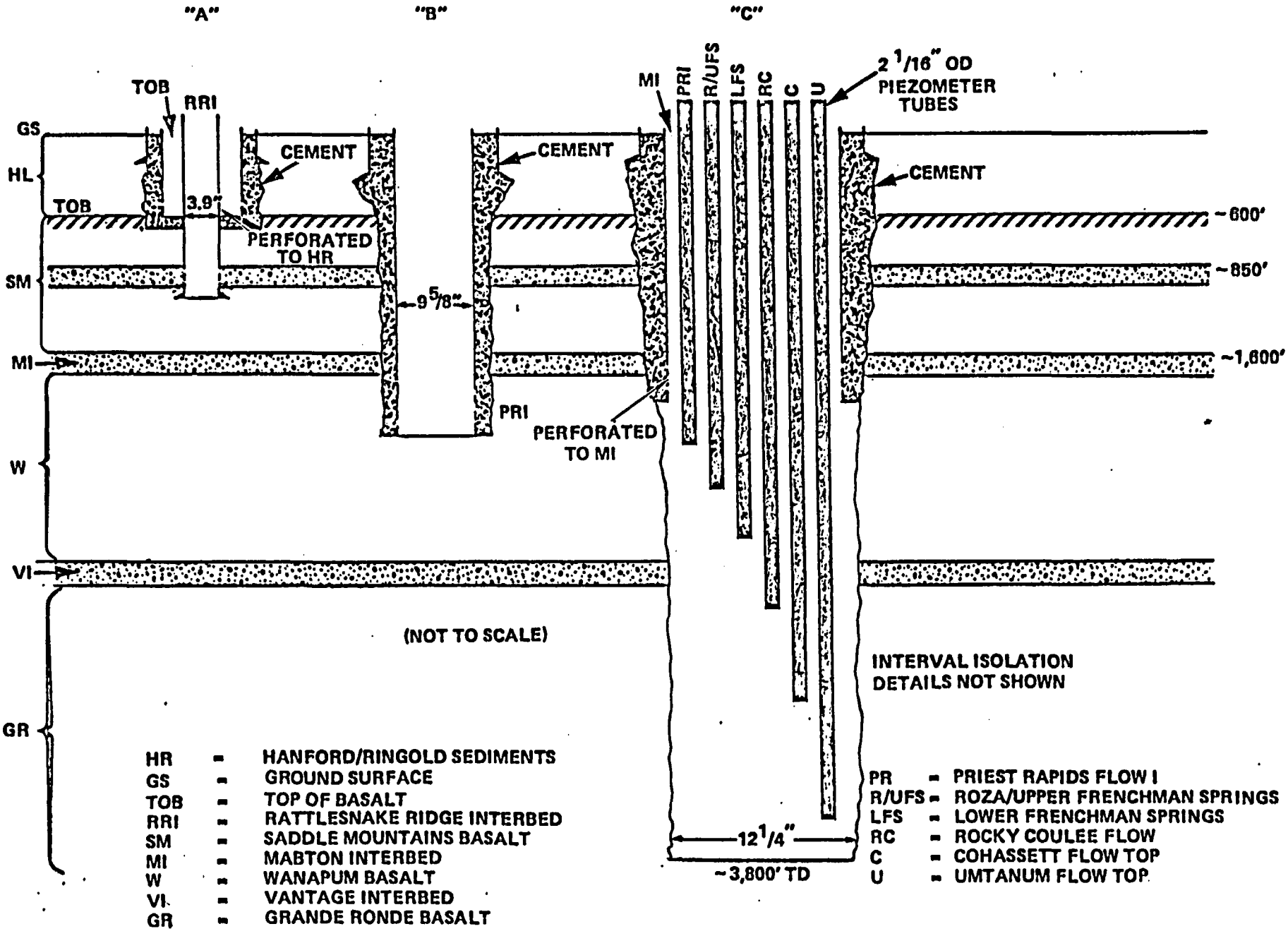


DC-20 CONFIGURATION

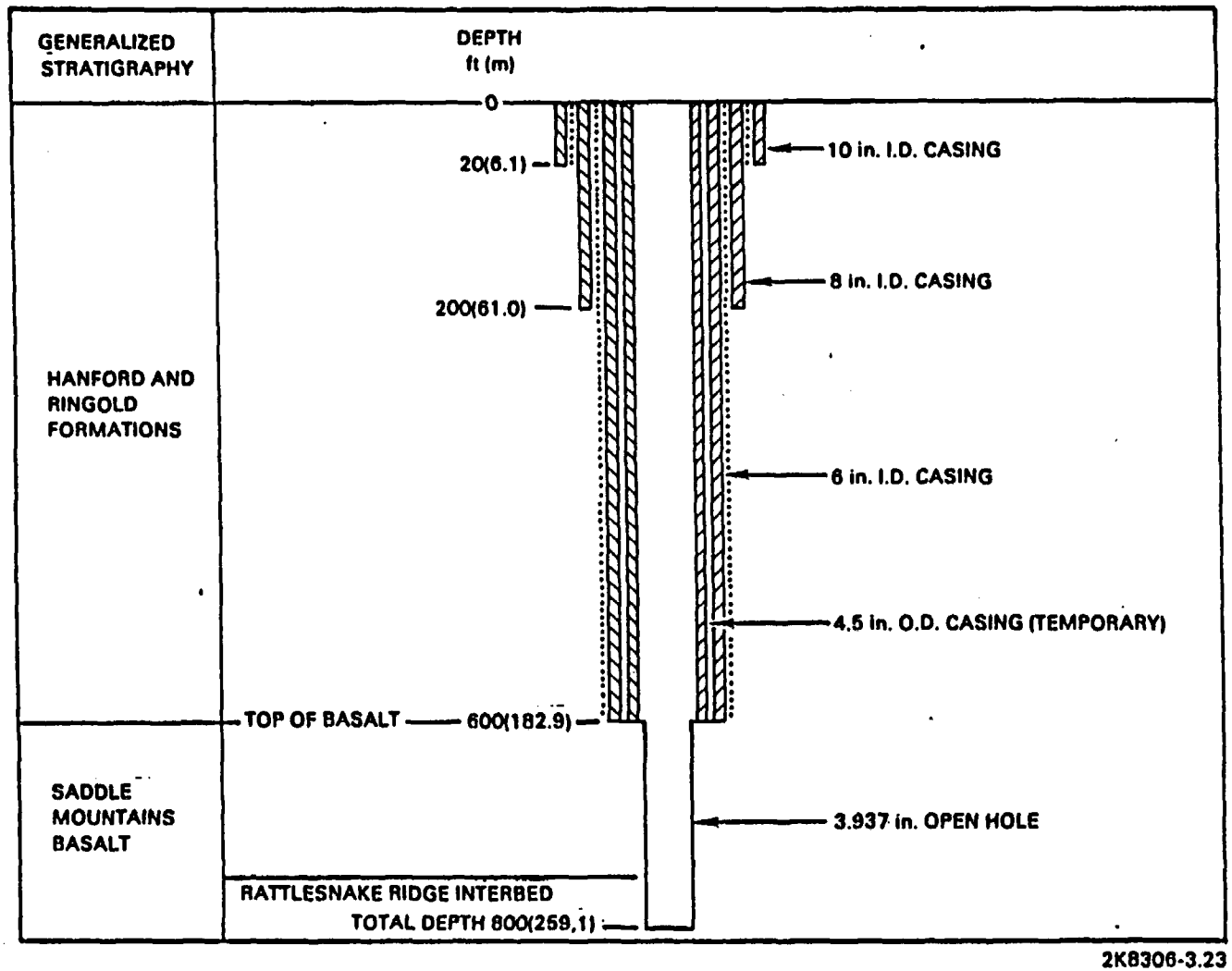


DC-22 CONFIGURATION

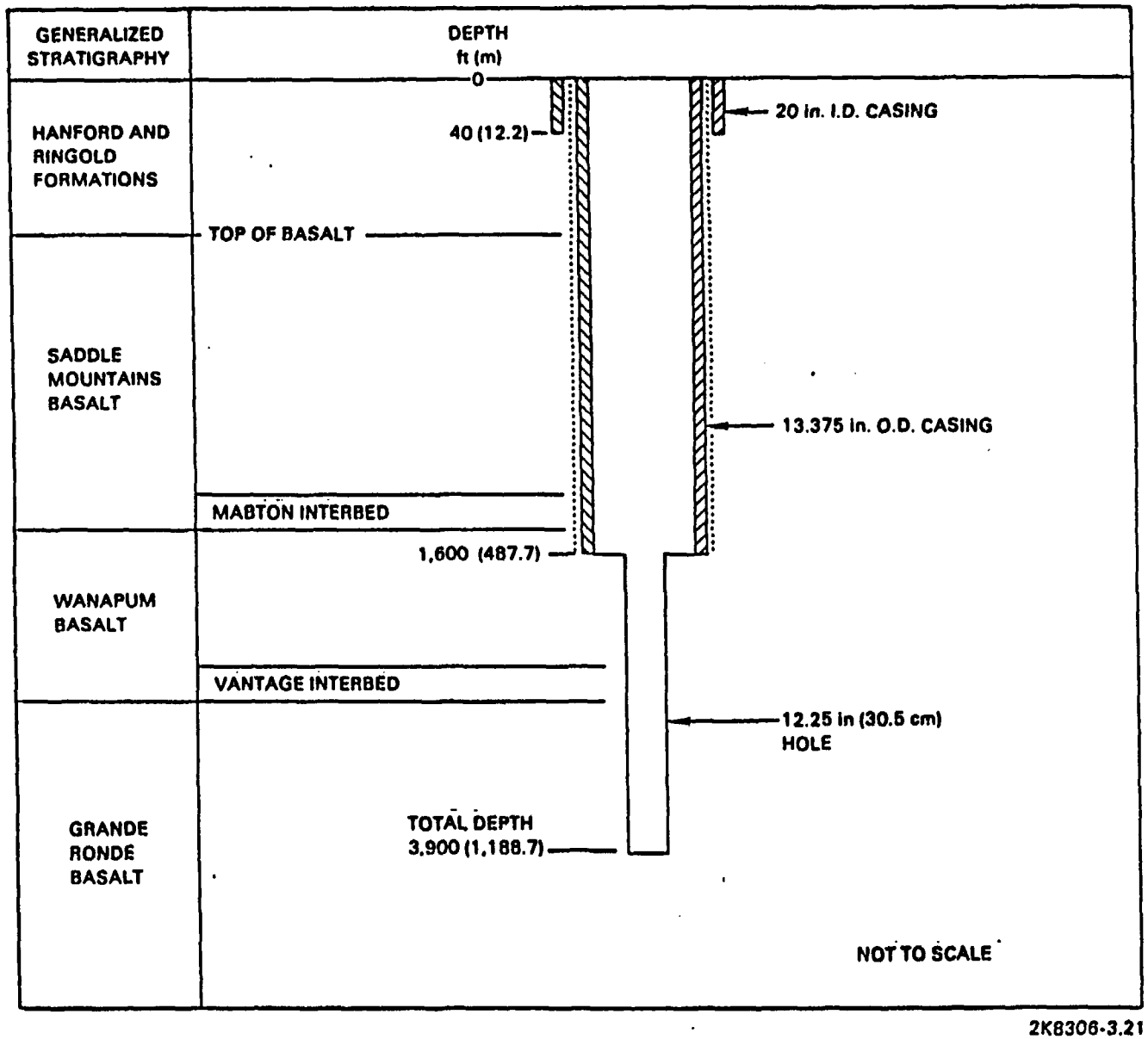
Plan View Illustrating the Relationships of Boreholes at Each Cluster Site.



Section View of Boreholes at Each Cluster Site Illustrating Completion Design and Horizons to be Monitored.



Section View of DC-19A, DC-20A, and DC-22A Prior to Perforating the Ringold Formation and Installing of Piezometer Tube.



Section View of DC-19C, DC-20C and DC-22C Prior to Perforating the Mabton Interbed and Installation of Six Piezometers.

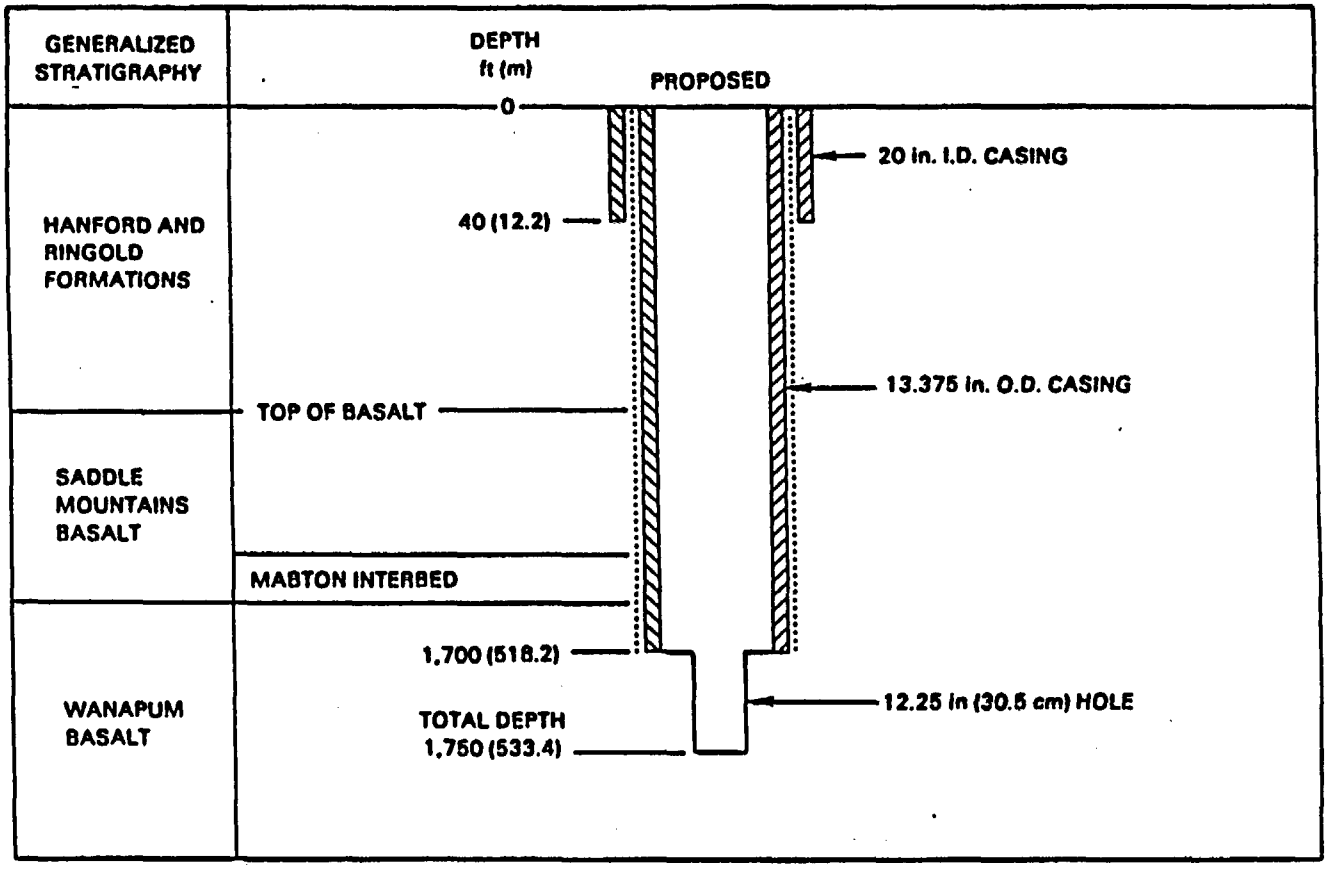
SUMMARY

- THREE NEW CLUSTER WELL SITES
- NINE HORIZONS MONITORED AT EACH SITE
- MULTIPORT SYSTEMS INSTALLED AT RRL-2 AND RRL-14
- SITING BASED UPON GEOLOGIC HYDROLOGIC AND ENVIRONMENTAL CONSIDERATIONS

SITING OF PUMPING WELLS

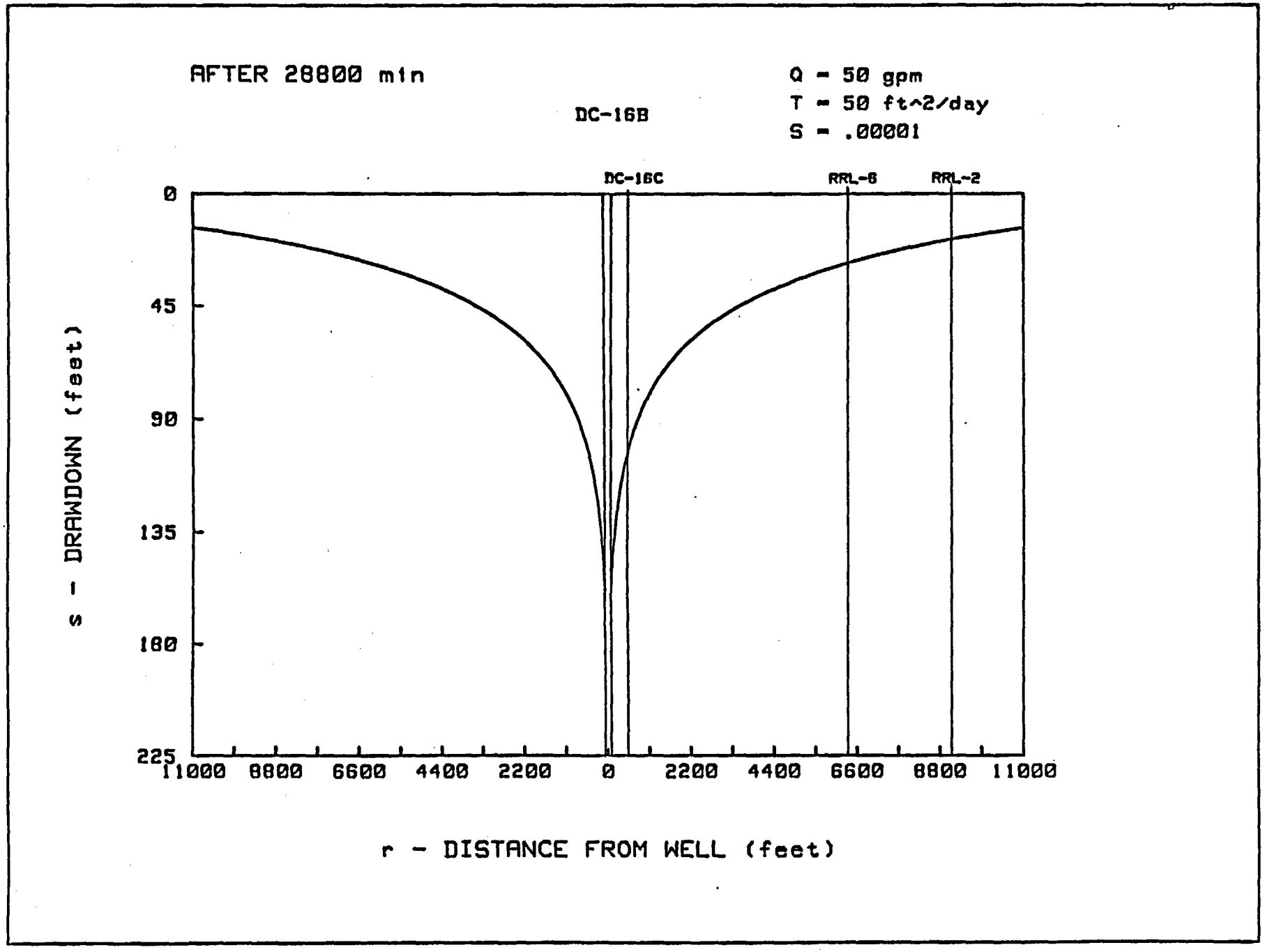
SITING OF PUMPING WELLS

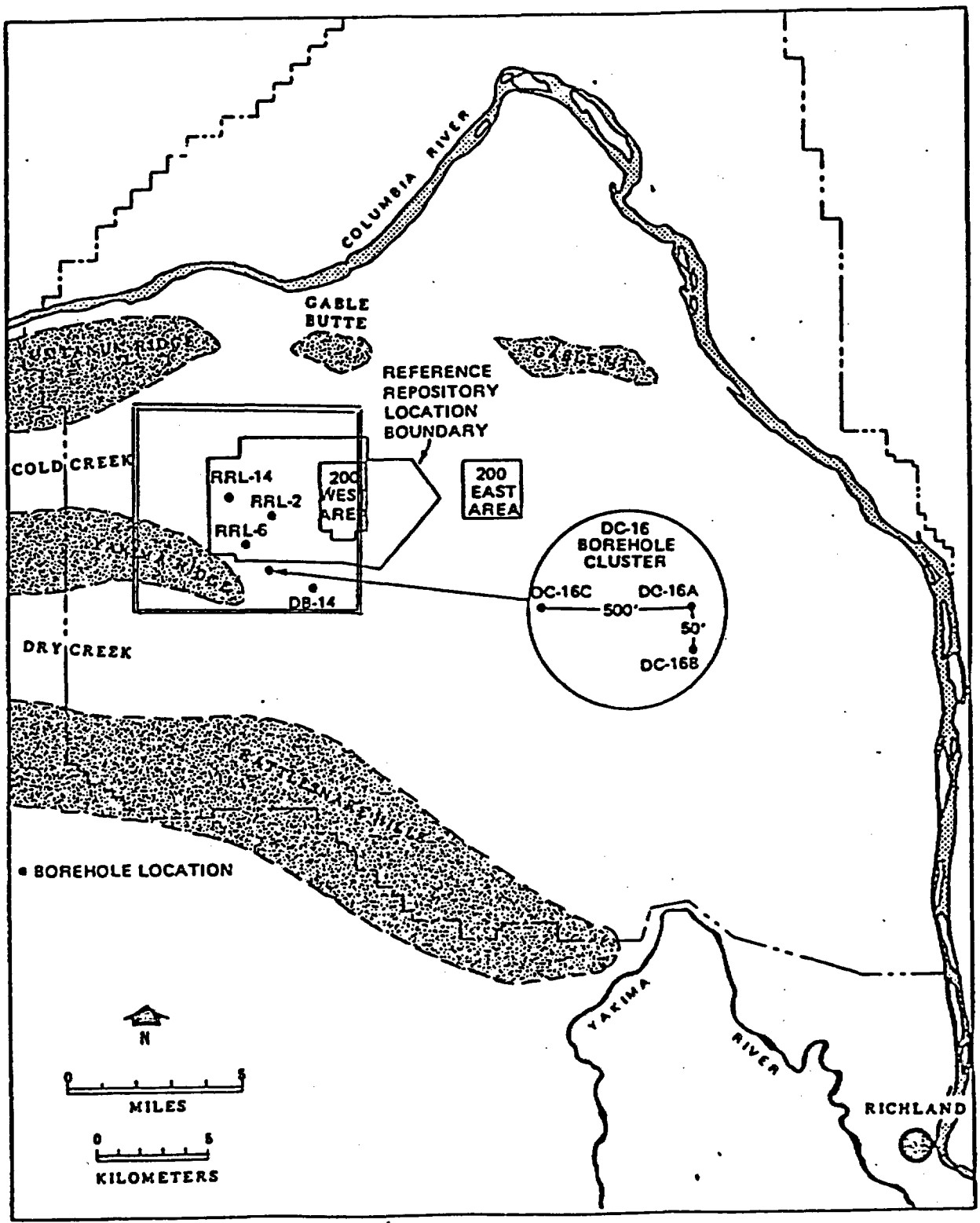
- POSITION RELATIVE TO MULTILEVEL OBSERVATION POINTS
- POSITION RELATIVE TO ES
- POSITION RELATIVE TO OTHER POTENTIAL OBSERVATION SITES
- LOCATION OF POSSIBLE STRUCTURES OR ANOMALIES
- PREDICTED RADII OF INFLUENCE
- OTHER CONSIDERATIONS



2K306-3.22

Section View of DC-19B, DC-20B, and DC-22B Production Wells as Completed in the Wanapum Basalt.


AFTER 28800 min
Q = 50 gpm
T = 50 ft^2/day
S = .00001
DC-16B
DC-16C
RRL-6
RRL-2
0
45
90
135
180
225
s - DRAWDOWN (feet)
11000
8800
6600
4400
2200
0
2200
4400
6600
8800
11000
r - DISTANCE FROM WELL (feet)



Location of DC-16 Borehole Cluster.

Attachment 5
(6 pgs.)

BWIP-NRC General Understanding on Testing Strategy
July 14, 1983

BWIP-NRC General Understanding on
Testing Strategy
July 14, 1983

1.0 GENERAL

1.1 Additional data are required for hydrologic characterization of the Reference Repository Location (RRL).

(a) Continuous head measurements are required.

(b) Large-scale hydraulic testing is necessary.

(c) Small-scale testing should be continued at the designated wells.

(d) Short-duration, low stress interference tests should be continued.

(e) The completion of a pumping well near RRL-2 will provide important information.

1.2 Periodic consultation between DOE and NRC should be continued prior to decision points in the program. These discussions will be held sufficiently early so that any changes that NRC comments may entail can be duly considered by DOE in a manner not to delay DOE activities.

1.3 Hydrochemistry is principally used to confirm groundwater flow systems as determined from hydraulic data.

2.0 INSTALLATIONS

2.1 The proposed large-scale aquifer test facilities are appropriate in number and location.

2.2 The selection of the 9 designated units to be monitored appears appropriate.

2.3 Installation of a pumping well (RRL-2B) near RRL-2 will provide useful information.

2.4 Multiport equipment for specific applications in cored holes should be qualified.

2.5 Cement off only those zones in the Grande Ronde that are necessary for well construction, allowing for maximum potential for future testing.

3.0 HEAD MEASUREMENT

3.1 Plans (as presented) for installing piezometers are appropriate and should be implemented as soon as possible. Specifically, the number, location and air mist drilling methods for the piezometers including use of drilling mud through the Mabton, are appropriate.

3.2 The use of multiple-completion standpipe piezometers for long-term head measurements is appropriate.

3.3 The viewgraph entitled "Validity of Head Data" outlines three approches to correlation of new head data and existing head data. Two of these use data from RRL-2 and DC-16A and involve correlations with interpolated and extrapolated new head data. It is unlikely that these two approaches will be highly convincing in validating the existing head data. Continuing thought should be given to other possible means for qualifying the existing head data.

4.0 LARGE SCALE TESTS

4.1 The initial large-scale test should be performed after initial piezometric data are obtained such that pre-emplacement conditions can be reasonably well-defined.

4.2 The Grande Ronde formation is the primary target for large-scale hydraulic property testing, but the major aquifers in the Wanapum should also be tested.

4.3 The burden of proving the hydraulic continuity of rock units across the RRL cannot be put on hydraulic testing if hydraulic parameters do not allow long distance response (say, 1-3 km). If large scale tests do not work, local-scale tests may be necessary to characterize hydrologic conditions.

4.4 The large scale pump tests may provide opportunities to quality existing horizontal conductivity values. Values from interference tests should be compared with values from earlier single-hole tests.

4.5 The approach to testing presented for the DC-16 borehole cluster test specification seems appropriate.

4.6 The tests proposed under "Large Scale Multiple Well Aquifer Testing" in viewgraph "Major Activities Required for Hydrologic Characterization" may not provide adequate information about the groundwater system near the repository. An understanding of this part of the system is needed to predict pre-emplacement groundwater travel time, as required by 10 CFR 60. The proposed pump test at RRL-2B, and related tests in the RRL, will address this matter.

5.0 MUD EFFECTS

5.1 In investigating possible effects of drilling mud on hydraulic properties, attention should be given not only to high and low permeability units but also to intermediate permeability units - say, 10^{-6} to 10^{-8} m/s.

5.2 The DB-2 test specification should be modified to better simulate drilling conditions.

5.3 Mud loss in boreholes will be reported as cumulative gallons with depth.

6.0 TRACER TESTS

6.1 The two hole tracer tests should be conducted in wells near the RRL. They should include, at a minimum, determination of effective porosity and longitudinal dispersivity.

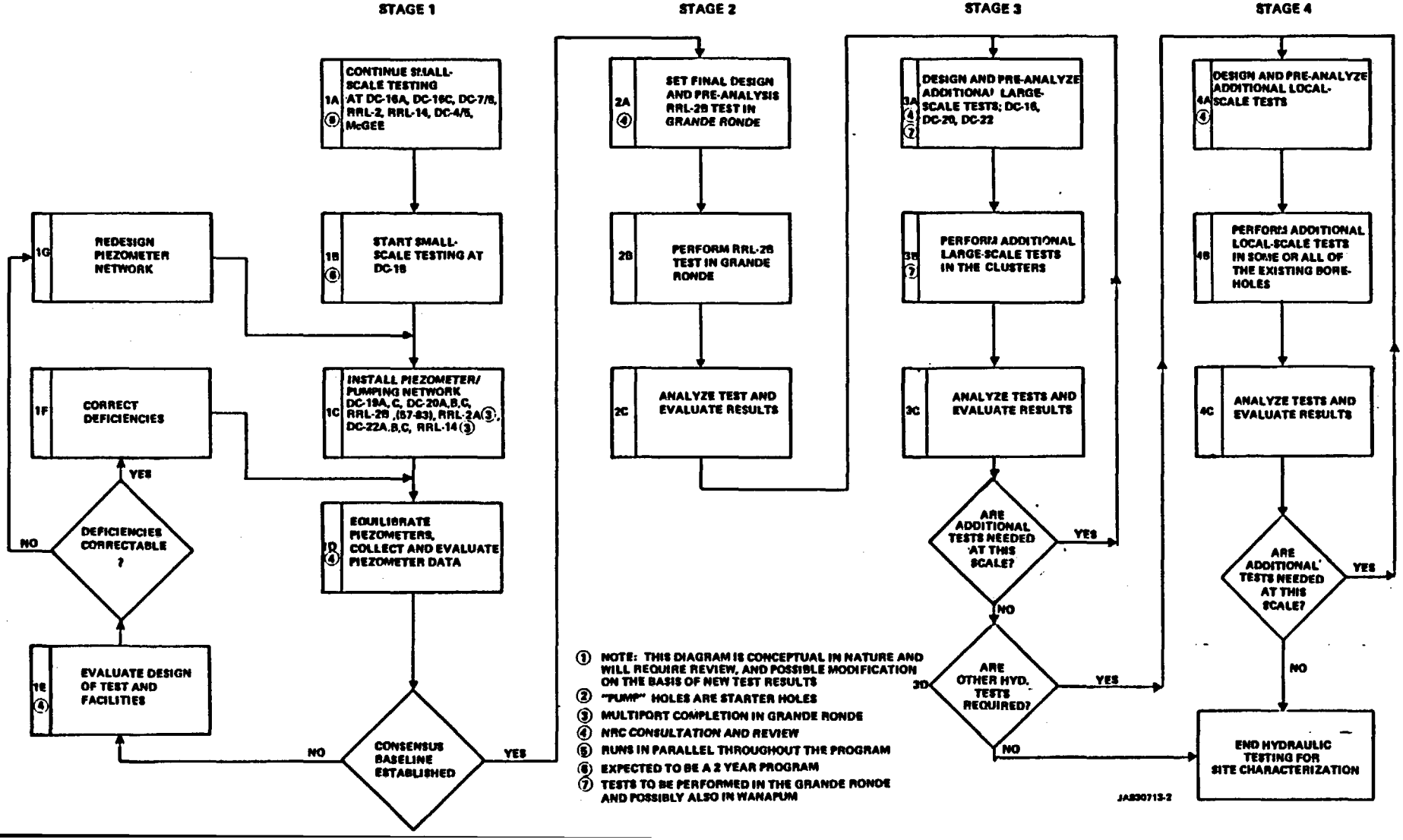
Attachment 6
(8 pgs.)

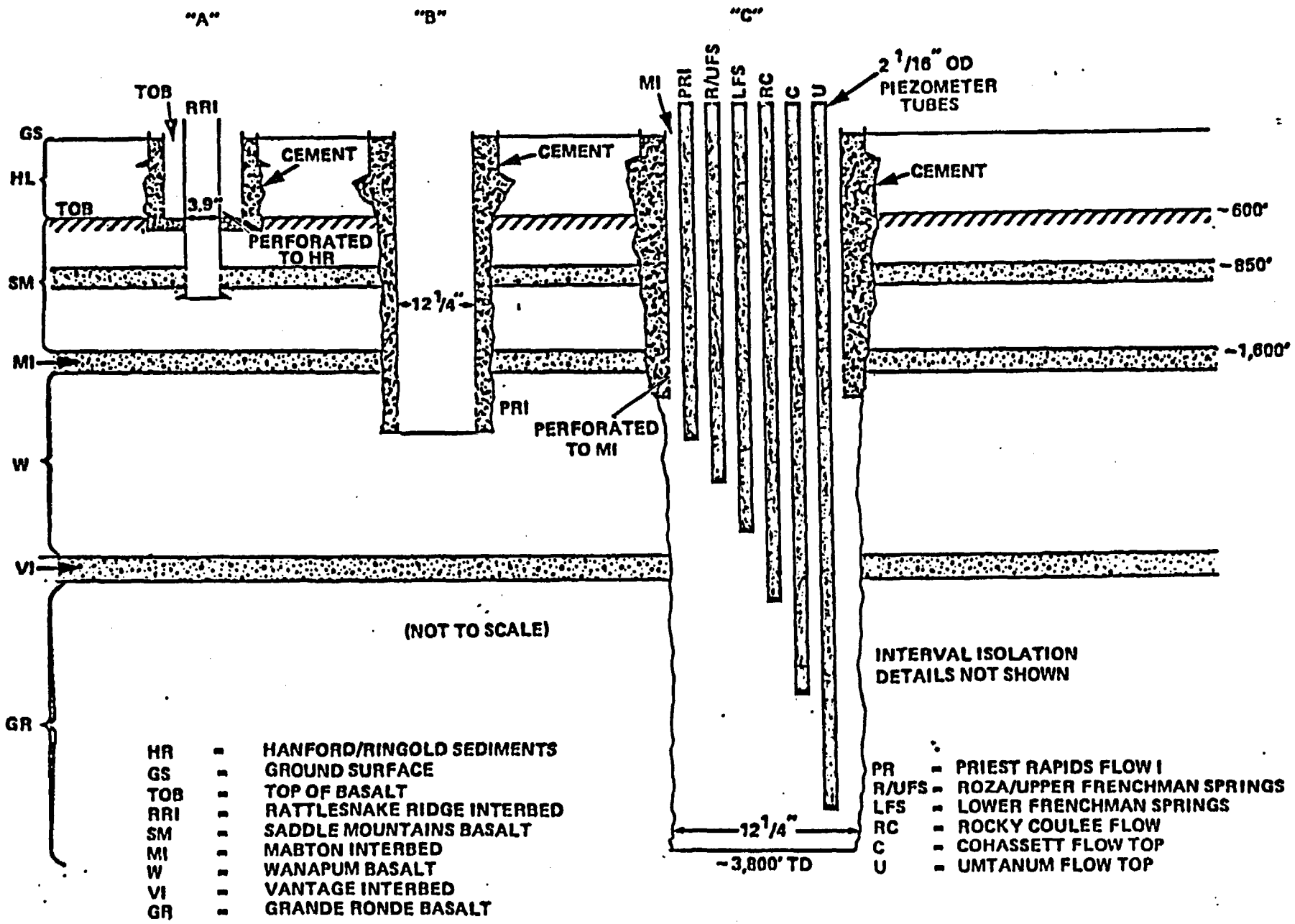
MODIFIED BWIP STRATEGY FOR HYDROLOGIC CHARACTERIZATION

HYDROLOGIC CHARACTERIZATION PLAN ELEMENTS

Objectives	Required Activities	Data Needs	Facilities
collect additional data required for hydrologic characterization of the RRL while addressing concerns raised	piezometric baseline large scale hydraulic testing continue small scale testing	o head data validation o establish model boundary conditions o determine pre-emplacement travel times o representativeness of data (repository scale o flow system evaluation (4-D)	piezometric network DC-19; DC-20; DC-22; RRL-14; RRL-2A; 699-57-83 miscellaneous observation points DB-11; DB-12; DB-14; DC-16; DC-4/5; RRL-6; large scale pumping network RRL-2B; DC-16; DC-20; DC-22; small scale testing DC-18; McGee; DC-16; DC-4/5; DC-7/8

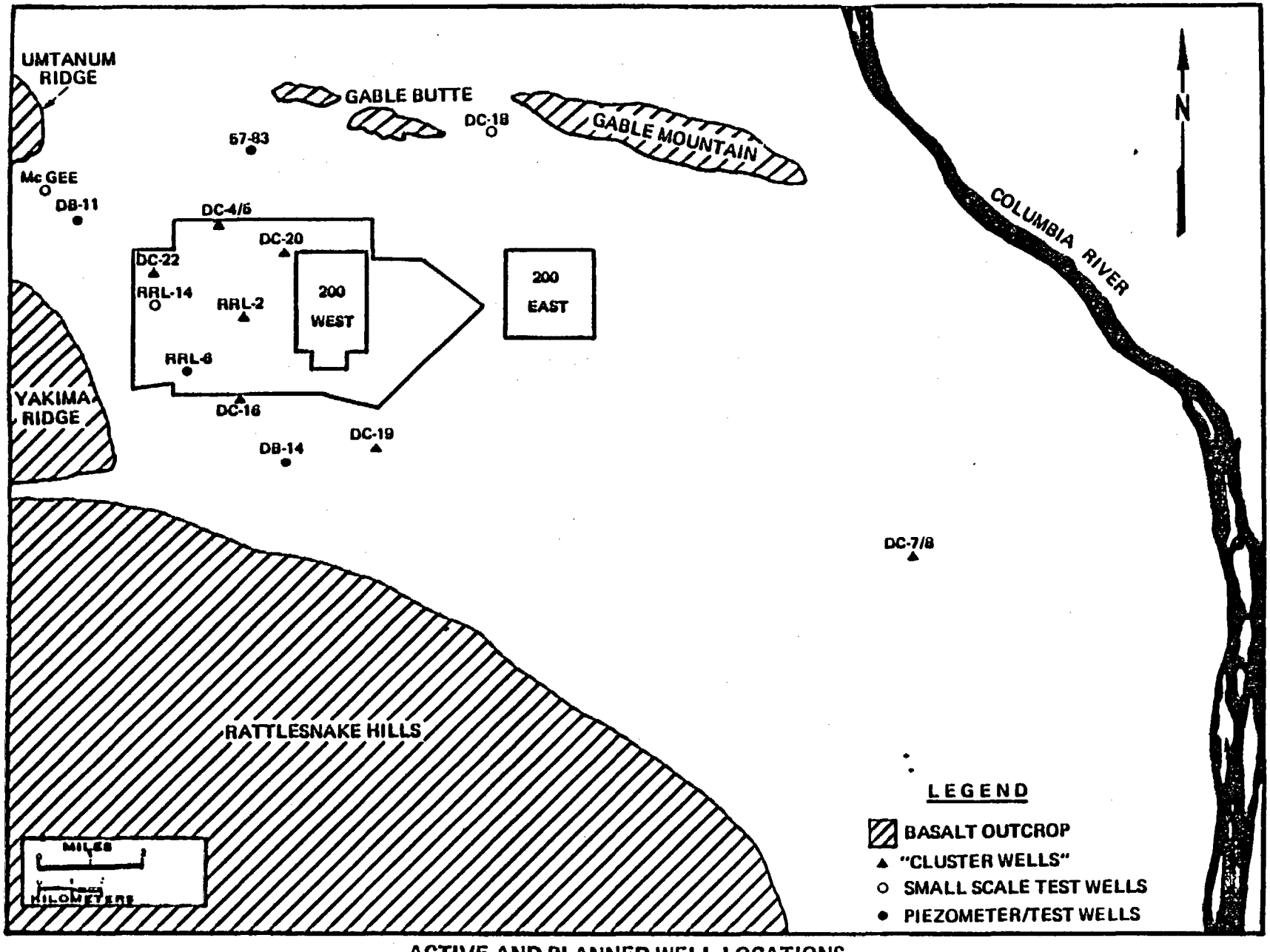
LOGIC DIAGRAM FOR BWIP BOREHOLE: HYDROLOGIC TEST STRATEGY ①



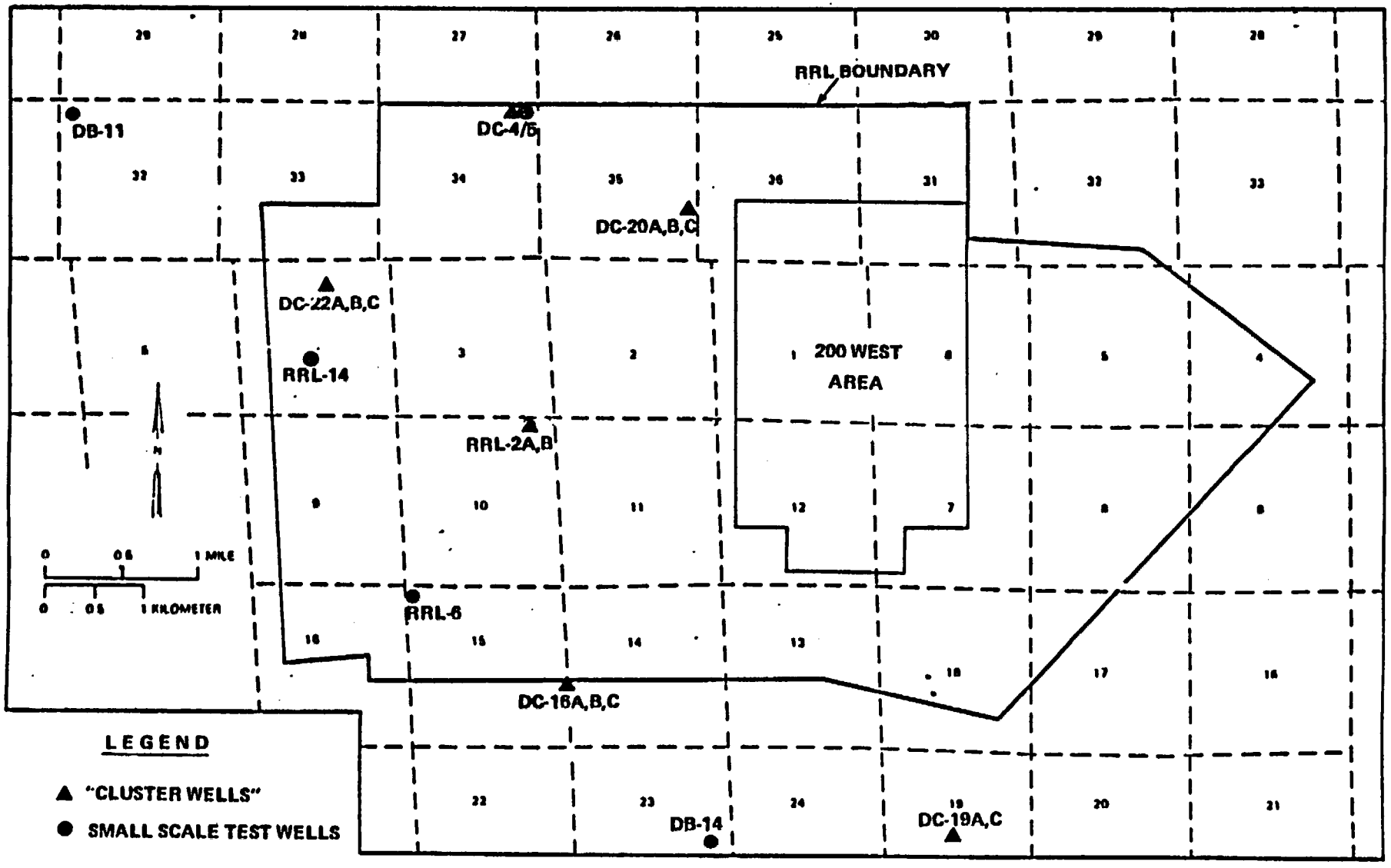


SD-BWI-TC-016
REV 0-0

FIGURE 5. Section View of Boreholes at Each Cluster Site Illustrating Completion Design and Horizons to be Monitored.



ACTIVE AND PLANNED WELL LOCATIONS



ACTIVE AND PLANNED WELL LOCATIONS

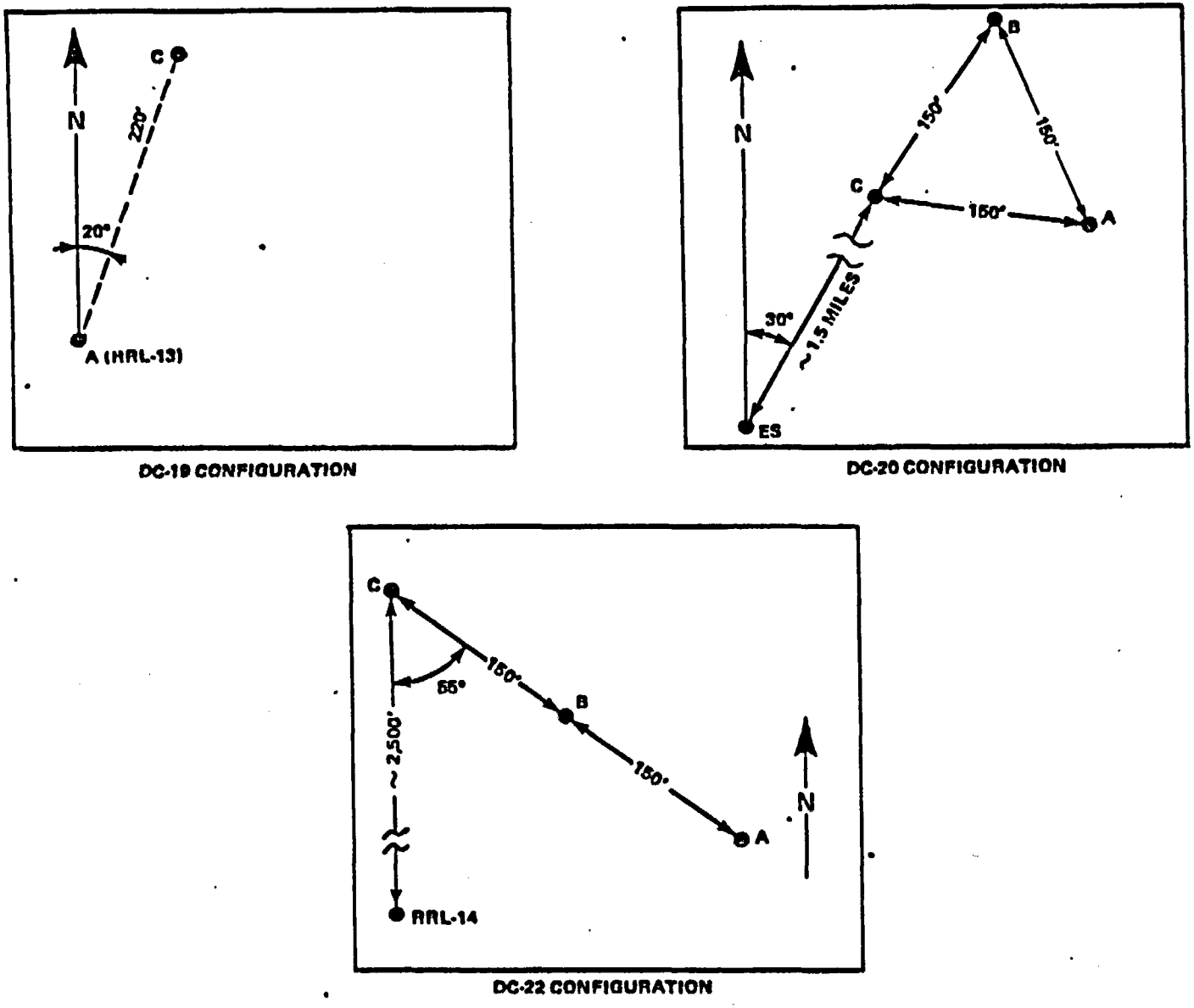
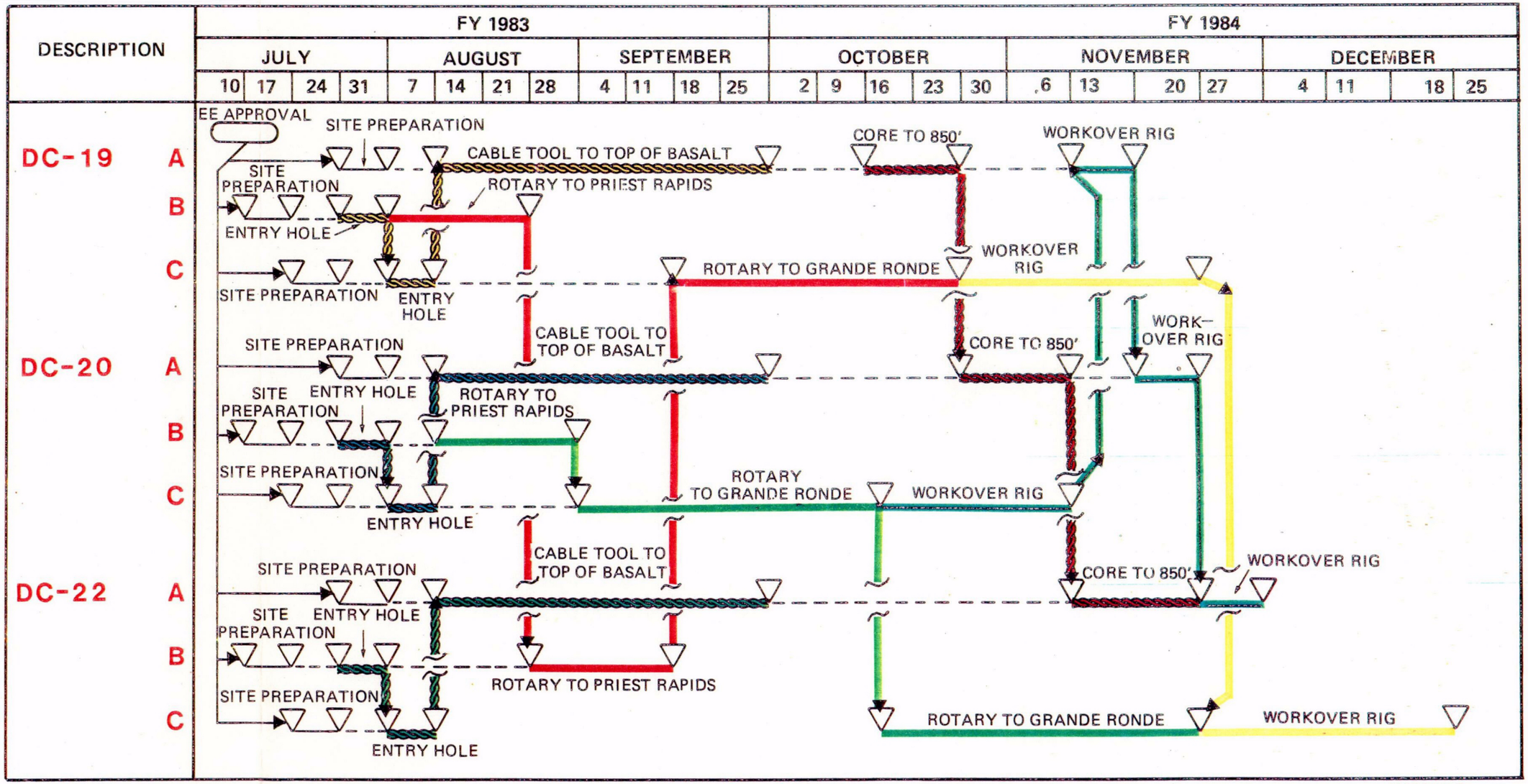


FIGURE 2. Plan View Illustrating the Relationships of Boreholes at Each Cluster Site.

FIGURE 9. **DRILLING SCHEDULE FOR DC-19, DC-20, DC-22**



Col

ATTACHMENT 7
(7 pgs.)

BOREHOLE LOGGING MEETING

SUMMARY MEETING NOTES

1. Specific concerns as identified in the BWIP/NRC meeting of April 11-15, 1983 (see attachment 1) are addressed by the BWIP logging approach shown on attachments 2 and 3.

2. NRC consultant will review our proposed field log and procedure to assure that concerns relative to fracture logging have been satisfied.

3. BWIP agrees to investigate correlating geophysical logs to rock properties.

4. BWIP will revise procedures so that training of well site geologists includes familiarization with characteristics of basalt and sediments as seen in outcrop.

5. Procedures for logging core are to be revised to mark location of stub when possible.

6. Location of core losses should continue to be recorded.

7. Shift Report of Operations as shown on attachments 4 and 5 are adequate. Consideration will be given to requiring the driller to take additional responsibility in preparing this report.

BOREHOLE LOGGING MEETING
JULY 15, 1983

Name	Organization
W. H. Price	Drilling & Testing Group, Rockwell
J. H. LaRue	Licensing, Manager, Rockwell
Teek R. Verma	NRC, Washington, D.C.
Richard W. Galster	Corps of Engineers, Seattle
Douglas E. Hansen	Lachel Hansen, Bellevue
D. J. Moak	Drilling & Testing Group, Rockwell
A. G. Lassila	BWIPO/DOE
G. S. Hunt	BWIP Site Department
S. M. Price	BWIP Geosciences Group
L. C. Hulstrom	BWIP Waste Package
R. D. Landon	BWIP Geosciences Group
R. K. Ledgerwood	BWIP Geosciences Group

Specific Concerns of NRC on Geologic Logging Practices

- Geologic Logging scale (1" = 10') does not provide sufficient detail to meet user needs.
- Well site geologist logs are inconsistent in describing units (ex., vesicles) (standardization).
- No logs exist which summarize all data needed by data users.
- Drillers logs are not being prepared by drillers.
- Fracture logs may be misleading to data users.

ATTACHMENT 1
(to attachment 7)

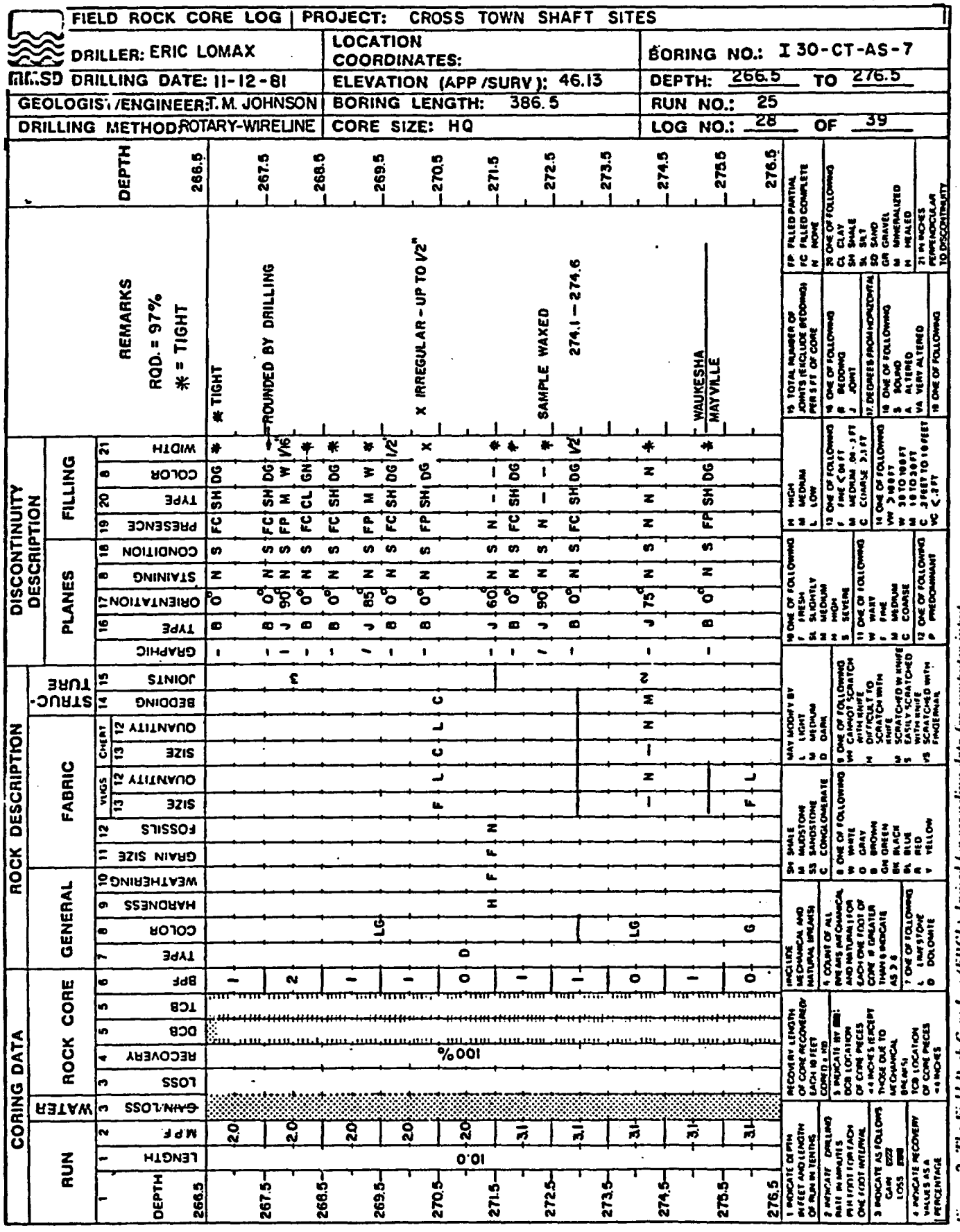


Figure 2. The Field Rock Core Log (FRCL) devised for recording data for computer input.

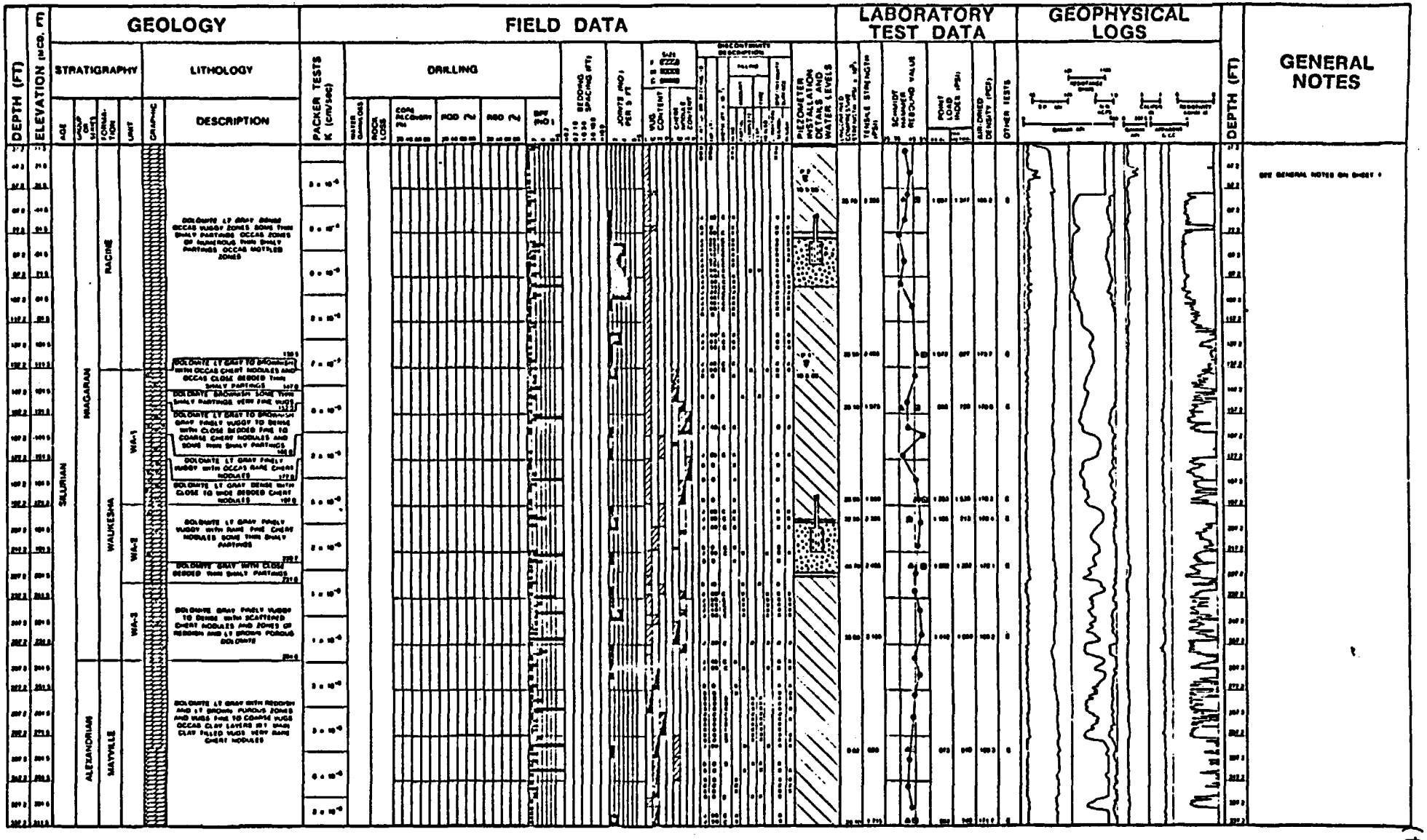


Figure 4. A typical borehole log traced directly from a computer printout.

ATTACHMENT 3
(to Attachment 7)

ATTACHMENT 4
(to Attachment 7)

SHIFT REPORT OF OPERATIONS

Date: Mo._____ Day_____ Yr._____ Rockwell Contract No._____

Hole Number: _____

Location Of Hole: _____ Area: _____ Type Hole _____

SHIFT ☐ 1st ☐ 2nd ☐ 3rd

Core Rig	Fluid Level	Time Distribution	From:
( ) ool		Moving	To:
Rotary	Ground Elevation	Setting Up	Personnel
Size Hole		Tearing Down	Driller _____ (Acceptance)
Size Casing	Depth Start	Drilling	Helper
Casing To Depth		Fishing	Helper
Start	Depth End	Cementing	Laborers
Casing To Depth		W.O.C.	
End	Footage In Overburden	Drilling Cement	
Footage By Drive Barrel		Testing	Mud Used
	Footage In Basalt	Repairs	
Footage By Bit		Standby	
	Footage In Interbed	Weather	
Bit No.		Rockwell Time	
Reamer No.	Drilling Mud Condition	Contractor Time	
Bit Type	Vis. Wt.	Compressor Hours	Cubic Ft. Cement Used
Bit Condition	Wl. Ph.	Generator Hours	

Run No.	Depth From	Depth To	Feet Drilled	Core Recovered	% Recovery	Core Time	Remarks
( )							

Daily Footage: Report No.: Project:

Repo : _____ Approved By: _____

Ti ( ) _____ Title: _____

tribution: White – Basalt Records Retention Center
Green – Drilling & Testing Field File
Canary – Contract File
Pink – Site Analysis Group
Goldenrod – Geoscience Group
Buff Hard Copy – Retain At Wellsite

BC-6403 072 (R-6-82)

Richland WA

ATTACHMENT 5

Date: Mo. _____ Day _____ Yr. _____

SHIFT REPORT OF OPERATIONS

Rockwell Contract No. (to Att. 7)

Hole Number: _____

Location Of Hole: _____ Area: _____ Type Hole _____

SHIFT

☐ 1st ☐ 2nd ☐ 3rd

Continuation of Report No.:

Project:

Report By: _____ Approved By: _____

Title: _____ Title: _____

Distribution: White — Basalt Records Retention Center
Green — Drilling & Testing Field File
Canary — Contract File
Pink — Site Analysis Group
Goldenrod — Geo Sciences Group
Buff Hard Copy — Retain at Wellsite

BC-6400-072 1 (N-9 52

DOE Richland, WA