NOTICE

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DOE STIPULATED AGREEMENT WITH STATE OF NEW MEXICO (PARTIAL)
APPENDIX A

STIPULATED AGREEMENT (PARTIAL)

The Department of Energy (DOE) and the State of New Mexico on July 1, 1981, entered into a Stipulated Agreement to perform certain work to validate the design of the WIPP underground facilities. Proposals for performing this work were identified in two parts: 1) tasks necessary to detail plans and rationale for the proposed design validation assessment, and 2) tasks necessary to prepare a report providing data, analysis and interpretation of the results of design validation assessment. The scope of work associated with these two DOE proposals included in the Stipulated Agreement are given below:

DOE Proposal to Prepare the Plan for Design Validation

1. Assumptions

The following assumption was made to define the tasks necessary to fulfill the requirements of this request.

   a) The plan will primarily focus on the development of test panels for observing rock mechanics behavior.

2. Proposed Work

The tasks to be completed to provide the required plan include:

   a) Review of the current test plans.

   b) Establishment of objectives and needs of the test plan, based on past analysis, material property data, uncertainty in design assumptions, the behavior, time period for test, etc.

   c) Establishment of the rational behind the test plan.
d) Establishment of priorities for various components of the test.

e) Preparation of the steps in design, analysis, monitoring and review of the test program.

f) Review of the consistency of the proposed plan with the objectives and rationale for the test.

g) DOE will provide an individual to coordinate communications on test planning and experiment progress with the state.

3. Expected Results

The anticipated results include a more detailed test plan with appropriate technical rationale, and justification to perform to construct a test panel within the non-waste experimental area. The test panel may consist of four rooms separated by pillars. The dimensions of each will be similar to those to be used in the WIPP waste storage area. The results from the test should validate key assumptions for design regarding rock mass behavior. The test results will be of particular interest for predicting long term behavior of room closures.

4. Merits of the Proposed Plan

The proposed plan will provide a defensible, rational plan for the design test panel. The actual tests should significantly enhance the level of confidence and credibility in the resulting design.

5. Schedule

The draft of the proposed plan will be submitted to the State of New Mexico by the end of November 1981. [Revised to the end of October 1982 at a joint meeting on September 21, 1982, between DOE, EEG, et al]
DOE Proposal for the Proposed Report

1. Assumptions

The following assumption was made with regard to the proposal to provide the subject report:

a) The impact of SPDV Design Validation Experiment results on basic design assumptions will be the focus of this report, and validity of the actual designs in all its aspects will not be emphasized.

b) If all the tests can not be completed within the present schedule, an interim report summarizing the status of experiments may be provided.

2. Proposed Work

The following tasks will be undertaken as a part of the proposed work.

a) The experimental data will be obtained and deciphered.

b) A basic data package will be prepared.

c) Analysis of data for the rock mechanics parameters will be made.

d) The results will be evaluated against the basic design assumptions.

e) An overall evaluation of the impact of any differences between the assumed and observed design parameters will be made.

f) A report summarizing the above steps will be prepared.
3. Work Not Proposed

The proposed work will not include validation/verification of the designs, since the verification/validation would require further steps being carried out separately such as checking of the design calculations and drawings.

4. Expected Results

Results of the experiments will likely demonstrate the validity of the basic design assumptions regarding rock mechanics parameters. It could also possibly suggest a review of these assumptions and their overall impact on the design development.

5. Schedule

A draft of the proposed topical report will be provided by the end of March 1983*. If significant experimental results are not available prior to that time, an interim status report will be provided, and a draft of the entire report will follow as soon as reasonably possible.

*Revised to the end of March 1983 at a joint meeting on September 21, 1982, between DOE, EEG, et al.
APPENDIX B

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(5 Sheets) |
| B-2        | Geologic Correlation  
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Facility Horizon Area |
| B-3        | Geologic Correlation  
C & SH Shaft to ERDA-9  
Facility Level Area |
| B-4        | Geologic Correlation  
North-South Section, E140 Drift  
Station N254 to S3656 |
| B-5        | Geologic Correlation  
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East-West Section, NI420 Drift  
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| B-8        | Geologic Correlation  
East-West Section, N1270±  
Station E0 to W630 |
| B-9        | Geologic Correlation  
East-West Section, N1100 Drift  
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(2 Sheets) |
The following descriptions pertain to the geologic map units shown in the drifts on Figures 8-4, 8-5 and 8-8:

UNIT DESCRIPTIONS

UNIT 6
Halite: colorless with grayish orange-pink (1 OR 8/2) tint; transparent to translucent; coarsely crystalline; trace of dispersed polyhalite; unit extends into the roof; lower contact with Unit 5 is gradational and/or diffuse.

UNIT 5
Halite: colorless; transparent to translucent; coarsely crystalline; trace of bluish-white (SB 5/1) to light bluish-gray (SB 7/1) argillaceous material occurring as pods (1/2-inch diameter) and discontinuous laminations or filling interstices; lower contact with Unit 4 is generally sharp and based on prominent color change in argillaceous material (gray to red-brown) from Unit 5 to Unit 4.

UNIT 4
Argillaceous halite: colorless to moderate reddish-brown (1 OR 4/6), less frequently light bluish-gray (SB 7/1); transparent; coarsely crystalline; trace of dispersed polyhalite; trace to abundant argillaceous material (decreasing downward) consisting of clay containing a trace of silt and fine crystals of halite, occurring as discontinuous laminations in upper half of unit and interstitially in lower half; lower contact with Unit 3 is gradational and based on absence of argillaceous material in Unit 3.

UNIT 3
Halite: colorless to moderate reddish-orange (1 OR 6/6); transparent to translucent; coarsely crystalline; trace of dispersed polyhalite; polyhalite content commonly increases downward; lower contact with Unit 2 is sharp.

UNIT 2
Argillaceous halite: moderate reddish-brown (1 OR 5/5), less frequently light bluish-gray (SB 7/1); medium to coarsely crystalline; argillaceous material primarily occurs interstitially or as discontinuous laminations; lower contact with Unit 1 is generally sharp, less frequently gradational.

UNIT 1
Halite: light reddish-orange (1 OR 8/6) to moderate reddish-orange (1 OR 6/6), less frequently colorless; translucent to transparent; medium to coarsely crystalline; trace of dispersed polyhalite; lower contact with Unit 0 is sharp.

UNIT 0
Argillaceous halite: colorless to moderate reddish-orange (1 OR 6/6) and moderate reddish-brown (1 OR 4/6); medium to coarsely crystalline; trace of dispersed polyhalite; some argillaceous material occurs as discontinuous laminations and blebs or fills interstices (decreasing downward); contains finely crystalline halite; unit extends into the floor.

NOTES:
(1) Units listed in descending order from roof to floor.
(2) Alpha-numeric color designations are based on Geological Society of America Rock Color Chart.
APPENDIX C

MATHEMATICAL SIMULATION OF UNDERGROUND IN SITU BEHAVIOR
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APPENDIX C
MATHEMATICAL SIMULATION OF UNDERGROUND IN SITU BEHAVIOR

C.1 INTRODUCTION

The methodology described in the following sections presents analytical techniques for simulating underground behavior in salt formations. Consideration is given to time-dependent non-linear material behavior and incorporation of in situ measurements to predict structural responses. The theoretical background and procedures presented by this methodology are explained.

C.2 MATERIAL BEHAVIOR OF HOST ROCKS

The most significant physical property of halite is that it creeps. Its creep behavior is dependent upon the variations of stress and temperature with respect to time. The creep phenomenon is also affected by the physical properties of the geologic strata adjacent to the halite and by discontinuities in the geologic layers. Therefore, non-halite interbeds and clay seams should also be considered when modeling and simulating the structural behavior of salt formations. The following subsections summarize the material behavior of various host rocks (ref. C-1).

C.2.1 Halitic Materials

The constitutive equation for halitic materials can be expressed as:

\[ \ddot{e}_{ij} = - \frac{v}{E} \sigma_{kk} \delta_{ij} + \frac{1+v}{E} \sigma_{ij} + \ddot{c}_{ij} \quad (C.2-1) \]

where: \( \ddot{e}_{ij} \) are the components of the strain tensor;
\( v \) is Poisson's ratio;
\( E \) is Young's modulus;
\( \delta_{ij} \) is the Kronecker delta;
\( \sigma_{ij} \) are the components of the stress tensor; and
the creep strain rate, \( \dot{\varepsilon}_{ij}^c \), is given by:

\[
\dot{\varepsilon}_{ij}^c = |\dot{\varepsilon}_{k1}^c| \frac{\sigma_{ij}^l}{|\sigma_{mn}^l|}
\]  

(C.2-2)

where: \( \sigma_{ij}^l \) are the components of the deviatoric stress tensor.

The magnitude of the creep strain rate can be expressed in terms of the effective creep strain rate, \( \varepsilon \), or the effective stress, \( \sigma \). Thus,

\[
|\dot{\varepsilon}_{ij}^c| = \sqrt{1.5} \dot{\varepsilon}
\]  

(C.2-3)

where the effective strain rate \( \dot{\varepsilon} \) is defined as:

\[
\dot{\varepsilon} = \left( \frac{2}{3} \dot{\varepsilon}_{ij}^c \dot{\varepsilon}_{ij}^c \right)^{1/2}
\]  

(C.2-4)

which is the sum of the primary and secondary creep strain rates, namely

\[
\dot{\varepsilon} = \dot{\varepsilon}_p + \dot{\varepsilon}_s
\]  

(C.2-5)

where the primary creep strain rate is defined as:

\[
\dot{\varepsilon}_p = (A - B \varepsilon_p) \dot{\varepsilon}_s \quad \text{for } \dot{\varepsilon}_s > \dot{\varepsilon}_s^*\]

and

\[
\dot{\varepsilon}_p = (A - B \frac{\dot{\varepsilon}_s^*}{\dot{\varepsilon}_s} \varepsilon_p) \dot{\varepsilon}_s \quad \text{for } \dot{\varepsilon}_s < \dot{\varepsilon}_s^*
\]  

(C.2-6)

where \( \dot{\varepsilon}_s \) can be defined by an exponential law

\[
\dot{\varepsilon}_s = D \sigma^{-n} e^{-Q/RT}
\]  

(C.2-7)

and \( \sigma = \left( \frac{3}{2} \sigma_{ij}^l \sigma_{ij}^l \right)^{1/2} \) is the effective stress;

\( \varepsilon^* \), A and B are primary creep constants;

D and n are secondary creep constants;

\( T \) is temperature in Kelvin;

Q is the effective activation energy in cal/mole; and

R is the universal gas constant, 1.987 cal/mole-K.
C.2.2 Non-halitic Materials

In the underground facility horizon at the WIPP site, certain portions of the rock are non-halitic. The stress-strain relationship for non-halitic materials is assumed to follow the Prandtl-Reuss constitutive equation:

$$\dot{\varepsilon}_{ij} = -\frac{\nu}{E}\ddot{\varepsilon}_{kk}\delta_{ij} + \frac{1+\nu}{E}\dot{\varepsilon}_{ij} + \dot{\varepsilon}_{ij}^p$$  \hspace{1cm} (C.2-8)

The plastic behavior is defined by the two-dimensional Mohr-Coulomb criterion:

$$\sigma_3 - \sigma_1 = 2\Theta_0 \cos\beta - (\sigma_3 + \sigma_1) \sin\beta$$  \hspace{1cm} (C.2-9)

and the Drucker-Prager criterion, which is the generalized form of the Mohr-Coulomb criterion:

$$\sqrt{|J|^H} = c - aJ_1$$  \hspace{1cm} (C.2-10)

where: \( \sigma_3 \) and \( \sigma_1 \) are the two principal stresses, which are positive in tension;
\( \Theta_0, \beta, c \) and \( a \) are the plastic constants;
\( \sqrt{|J|^H} \) is the second deviatoric stress invariant; and
\( J_1 \) is the first stress invariant.

The numerical modeling does not include failure criterion for the non-halitic materials. Anhydrite is assumed to be linearly elastic.
C.2.3 Clay Seams

Thin seams of clay are present between some of the rock layers. These clay seams can allow relative slippage and separation of the layers across the clay seams. The slippage of the clay seams follows a dry friction law:

$$\sigma_{12} = \mu |\sigma_{11}|$$  \hspace{1cm} (C.2-11)

where:  $\mu$ is the frictional coefficient; direction 1 of the stress is normal to the plan of the seam; and direction 2 of the stress is in the direction of motion or incipient motion.
C.3 FORMULATION OF GOVERNING EQUATIONS

The underground behavior of salt can be determined by solving the following governing equations:

(1) Equation of equilibrium:

\[ \sigma_{ij,j} + X_i = 0 \]  \hfill (C.3-1)

where: \( \sigma_{ij} \) is the stress tensor; and
\( X_i \) is the body force vector.

(2) Strain-rate velocity relation:

\[ 2\dot{\varepsilon}_{ij} = \dot{\mathbf{u}}_{i,j} + \dot{\mathbf{u}}_{j,i} \]  \hfill (C.3-2)

where: \( \dot{\varepsilon}_{ij} \) is the strain rate tensor;
\( \dot{\mathbf{u}}_{i} \) is the velocity vector; and
\( (\cdot)' \) represents the derivative of ( ) with respect to time t.

(3) Stress strain relations:

**halitic materials**

\[ \dot{\varepsilon}_{ij} = - \frac{1}{E} \hat{\sigma}_{kk} \delta_{ij} + \frac{1+v}{E} \dot{\sigma}_{ij} + \dot{\varepsilon}^C_{ij} \]  \hfill (C.3-3)

where: \( \dot{\varepsilon}^C \) is defined in subsection C.2.1.

**non-halitic materials**

\[ \dot{\varepsilon}_{ij} = - \frac{1}{E} \hat{\sigma}_{kk} \delta_{ij} + \frac{1+v}{E} \dot{\sigma}_{ij} + \dot{\varepsilon}^P_{ij} \]  \hfill (C.3-4)
(4) Boundary conditions:

\[
\dot{u}_i = \dot{U}_i \quad \text{over } S_u \quad (C.3-5)
\]

\[
\sigma_{ij}n_j = T_i \quad \text{over } S_\sigma \quad (C.3-6)
\]

where: $S_u$ is the surface on which $\dot{u}_j$ is specified as $U_i$ and $S_\sigma$ is the surface on which the traction vector $\sigma_{ij}n_j$ is specified as $T_i$ where $n_j$ is the component of the outward-pointing unit normal vector.
C.4 NORMALIZATION OF GOVERNING EQUATIONS

In order to determine the creep properties of halite, the governing equations in Section C.3 need to be solved before knowing the values of the creep constants. This can be achieved by normalizing the governing equations to the creep function and solving the normalized equations. The creep constants can then be determined by correlating the analytical results with in situ data.

Consider the creep behavior of halitic material follows a power law:

\[ \dot{e} = F \sigma^{-n} \]  \hspace{1cm} (C.4-1)

where: \( F \) is a creep function.

The governing equations in Section C.2 can be normalized to \( F \) by transforming to a normalized time domain in terms of time \( t^* \) such that:

\[ dt^* = F \, dt \]  \hspace{1cm} (C.4-2)

By substituting equation (C.4-2) into equations (C.3-1) through (C.3-6), a system of normalized equations can be formed:

1. Equation of equilibrium:

\[ \sigma_{ij,j} + \chi_1 = 0 \]  \hspace{1cm} (C.4-3)
(2) Strain-rate velocity relation:

\[ 2{\dot{\varepsilon}}_{ij}^* = \dot{u}_{i,j}^* + \dot{u}_{j,i}^* \]  

\[ (C.4-4) \]

where: \( (\cdot)^* \) represents the derivative of \( (\cdot) \) with respect to the normalized time \( t^* \).

(3) Stress strain relations:

**halitic materials**

\[ {\dot{\varepsilon}}_{ij}^* = -\frac{\nu}{E} \sigma_{kk}^* \delta_{ij} + \frac{1+\nu}{E} \sigma_{ij}^* + \dot{\varepsilon}_{ij}^c \]  

\[ (C.4-5) \]

where:

\[ \dot{\varepsilon}_{ij}^* = \sigma_{ij}^* \]  

\[ (C.4-6) \]

**non-halitic materials**

\[ {\dot{\varepsilon}}_{ij}^* = -\frac{\nu}{E} \sigma_{kk}^* \delta_{ij} + \frac{1+\nu}{E} \sigma_{ij}^* + \dot{\varepsilon}_{ij}^p \]  

\[ (C.4-7) \]

(4) Boundary conditions:

\[ \dot{u}_{i}^* = \dot{U}_{i}^* \quad \text{over} \quad S_u \]  

\[ (C.4-8) \]

where: \( \dot{U}_{i}^* \) is computed as \( \dot{U}_{i}^* = U_{i}/F \)

\[ \sigma_{ij} n_j = T_{i} \quad \text{over} \quad S_\sigma \]  

\[ (C.4-9) \]

The above normalized governing equations are similar to the governing equations before normalization, except that the time derivatives in the normalized equations are taken with respect to normalized time \( t^* \), and the creep function \( F \) has been eliminated. Since the normalized governing equations have the same form as the governing equations before normalization, a conventional method such as the finite element technique can be used to solve the normalized governing equations for the analytical results in terms of normalized time \( t^* \), without knowing the creep function \( F \).
After obtaining the normalized analytical result, the creep function \( F \) can be determined for establishing the relationship between the real and the normalized time domains. From Equations (C.2-5) through (C.2-7), the function \( F \) can be expressed as:

\[
F = [f(\varepsilon_p, \varepsilon_s) + 1] C
\]  
(C.4-10)

where: \( C = D e^{-Q/R\Theta} \); \( A \) is defined in equation (C.2-6); \( D, Q, R \), and \( \Theta \) are defined in equation (C.2-7); and \( f(\varepsilon_p, \varepsilon_s) \) represents the portion inside the parentheses of equation (C.2-5), which is expressed as:

\[
f(\varepsilon_p, \varepsilon_s) = A - B \varepsilon_p \quad \text{for } \varepsilon_s \geq \varepsilon^*
\]

and

\[
f(\varepsilon_p, \varepsilon_s) = A - B \frac{\varepsilon^*}{\varepsilon_s} \varepsilon_p \quad \text{for } \varepsilon_s < \varepsilon^*
\]
(C.4-11)

From equation (C.4-11), it can be found that at time \( t = 0 \), \( \varepsilon_p = 0 \), which provides an initial condition:

\[
f(\varepsilon_p, \varepsilon_s) = A \quad \text{for } t = 0
\]  
(C.4-12)

When the time \( t \) approaches the steady state stage \( t_s \), primary creep is no longer active. Therefore:

\[
f(\varepsilon_p, \varepsilon_s) \rightarrow 0 \quad \text{for } t \rightarrow t_s
\]  
(C.4-13)

since the primary creep decreases exponentially with time (ref. C-1). Based on the auxiliary conditions (C.4-12) and (C.4-13), the function \( f \) can be expressed as an exponential function:

\[
f = A e^{-zt}
\]  
(C.4-14)
By substituting equation (C.4-14) into equation (C.4-1), function F can be written as:

$$F = [A e^{-zt} + 1]C$$

(C.4-15)

where: the constants C, A and z can be determined from in situ data.

The relationship between the real time domain and the normalized time domain can then be obtained by integrating equation (C.4-2):

$$t^* = \int_{0}^{t} F \, dt$$

(C.4-16)

Substituting equation (C.4-15) into equation (C.4-16) and using the initial condition $t^* = 0$, when $t = 0$, equation (C.4-16) becomes:

$$t^* = C [t + A/z (1 - e^{-zt})]$$

(C.4-17)

After determining the creep constants, the analytical results can then be mapped from the normalized time domain to the real time domain using equation (C.4-17).
C.5 DETERMINATION OF CREEP CONSTANTS

The computational method can also be considered as a two-phased process which allows structural responses to be determined for any time in question. The first phase is a transformation from the real to the normalized time domain by use of parametric equations containing creep constants. The second phase is relating a structural response to that the normalized time by performing a structural analysis. The fundamental relationship can be represented graphically as shown on Figure C-1. The upper curve indicates the expression relating the two time domains which depends on the creep constants C, A and z. The double vertical axes represent the relationship between the normalized time $t^*$ and response as indicated by the results of the structural analysis.

The terms A and z represent primary creep constants that can be viewed in a number of ways. By themselves, 'A' relates the ratio of initial to steady-state creep rates and 'z' corresponds to the primary creep decay constant. A simplified relationship can be used utilizing only the ratio of A to z when the term inside the parentheses in equation (C.4-15) approaches unity in the steady-state period. As Figure C-2 indicates, the value of $A/z$ (also identified as $t_0$) represents a real time offset such that the following equation can be used:

$$t^* = C \left( t + \frac{A}{z} \right)$$ (C.5-1)

A Salt Creep Constant Evaluation computer program (SCCE, Bechtel computer program CE 465) was developed for the purpose of evaluating the creep constants from in situ data.
\[ t^* = C \left[ t + \frac{A}{z} \left( 1 - e^{-zt} \right) \right] \]

- \[ t^* = C \ t \]

FIGURE C-1

TIME RESPONSE RELATIONSHIP OF THE NORMALIZED CREEP ANALYSIS METHOD
FIGURE C-2

GRAPHICAL REPRESENTATION OF

CREEP CONSTANTS RELATING TIME DOMAINS
The link between real time and response is completed by relating the normalized time to the response determined from the structural analysis. In brief, if the creep constants are known, the normalized time associated with any real time can be determined from equation (C.4-17) and the response corresponding to this time is found from the analysis results. Conversely, if in situ data which relates real time to response is available, this two-phased process can be worked backwards to evaluate the creep constants.

Because the response in both the in situ measurements and the structural analysis must be consistent, the displacements caused by creep are related.

In the analysis, the total response is an accumulation of elastic and creep responses,

\[ R_t(t^*) = R_c(t^*) + R_e(t^*) \]  \hspace{1cm} (C.5-2)

where: \( R_t \) is the total response;
\( R_c \) is the creep response; and
\( R_e \) is the elastic response.

In as much as the total response at time \( t^* = 0 \) consists of elastic response only, and the elastic response \( R_e(t^*) \) is always approximately equal to \( R_t(0) \), the following equation can be used in lieu of equation (C.5-2):

\[ R_c(t^*) = R_t(t^*) - R_t(0) \]  \hspace{1cm} (C.5-3)
The in situ readings represent the response relative to the time when the instrument was installed. In order for an actual creep response to be determined, the creep response which takes place between the time the excavation was made and the time when the instrument was installed must be found. Theoretically, if an instrument had been installed very shortly after excavation, this difference between measured and actual creep responses would be negligible. In reality, the excavation of all material contributing to the support of a specific location in an opening cannot be completed within a few days. As a result, the measured response from an instrument installed immediately after excavation would be a combination of initial creep and elastic responses. The term "instrument offset" is introduced to identify the difference between the actual creep response and the measured response starting at time \( t_1 \) when nearby excavations no longer introduce initial creep and elastic responses. This relationship is shown below:

\[
R_I(t) = R_M(t) + R_I(t_1) \tag{C.5-4}
\]

where:
- \( R_I \) is the actual in situ response;
- \( R_M \) is the measured response; and
- \( R_I(t_1) \) is the instrument offset.

Determination of the constant \( C \), which represents the steady state creep rate, requires that the in situ readings are well into the steady state range. If this is the case, the relationship

\[
dt^* = F \, dt \tag{C.5-5}
\]

can be used to determine the value of \( C \) since \( C \) equals \( F \) at very large values of \( t \). The expression for \( C \) is:

\[
C = (t^*_n - t^*_m) / (t_n - t_m) \tag{C.5-6}
\]
If \( t_m \) and \( t_n \) represent the times at which instrument readings are taken and \( R_m(t_m) \) and \( R_n(t_n) \) are the actual creep responses at these times, then the values of \( t^*_m \) and \( t^*_n \) can be found by relating these actual in situ creep responses with the analytical creep responses.

Assuming for the moment that the true value of instrument offset is known, equation (C.4-15) can be written for two time-response situations to produce two simultaneous equations which contain only the two remaining creep constants, \( A \) and \( z \). By cancelling out the \( A \) term, the solution of the following equation provides the value of \( z \).

\[
\frac{1 - e^{-zt_n}}{1 - e^{-zt_m}} - \frac{t^*_n/C - t_n}{t^*_m/C - t_m} = 0
\]  \hspace{1cm} (C.5-7)

Once the value of \( z \) is found to satisfy the expression, \( A \) can be found from the following equation:

\[
A = z \left( \frac{t^*_m/C - t_m}{1 - e^{-zt}} \right)
\]  \hspace{1cm} (C.5-8)

Graphically this method determines constants which force the analytical curve to match the in situ data at the two time-response situations used in calculating the constants. Each different set of data points yields different values of \( A \) and \( z \). Figure C-3 compares analytical and in situ responses for a few different sets of data points. Whereas creep behavior is history dependent, matching the last available data point is advantageous in predicting future responses. The determination of best values of \( A \) and \( z \) is done by minimizing the area between in situ and analytic response histories. The least area yields the best values. The SCCE program can be set up to search for this optimal condition.
C > C, A' > A, Z' < Z

C > C, A' < A, Z' > Z

NOTES:
1) C, A, z ARE "TRUE" VALUES
2) INSTRUMENT OFFSET = 0,0

FIGURE C-3
COMPARISON OF ANALYTICAL RESULTS AND IN-SITU RESPONSES FOR VARIOUS DATA POINT SETS
The point which must be kept in perspective is that the determination of the constants A and z are dependent on both the instrument offset and the steady-state creep constant C. The effects of uncertainty in C can be minimized by assuring that no extraneous data are used in the solution of equation (C.5-6). The appropriate value of the instrument offset can only be found from minimizing the response deviation as was described in the previous paragraph. Figure C-4 shows how analytical and in situ responses compare for a few different values of the instrument offset. The curves in Figures C-3 and C-4 were generated through use of the SCCE program.

The SCCE computer program provides an effective means of determining salt creep properties by being able to process the large volume of in situ data and analytical results for design validation.

C.6 PREDICTION OF STRUCTURAL BEHAVIOR

After the creep constants C, A and z are determined, the structural response history can then be mapped from the normalized time domain into the real time domain using equation (C.4-15). Utilizing the in situ creep constants, additional mathematical models can also be used to predict the future structural responses for various facilities.

C.7 CONCLUSIONS

By normalizing the time in the governing equations to the creep function, the structural responses can be computed as functions of normalized time. This computation is performed without knowing the creep constants. After correlating the response history obtained from the analysis to the corresponding one measured from the site, the creep constants can be determined. Consequently, the relationship between the normalized and real time can be established, and the analytical responses can be mapped from the normalized time domain to the real time domain. Predicted results can therefore be provided for validating the adequacy of the underground behavior in the salt formation.
FIGURE C.4

COMPARISON OF ANALYTICAL RESULTS AND IN-SITU RESPONSE FOR VARIOUS INSTRUMENT OFFSET VALUES
REFERENCES

APPENDIX D

C & SH SHAFT
GEOLOGIC LOGS AND MAPS
<table>
<thead>
<tr>
<th>Figure No.</th>
<th>Title/Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>D-1</td>
<td>Geologic Drill Log</td>
</tr>
<tr>
<td></td>
<td>0 to 850 feet</td>
</tr>
<tr>
<td></td>
<td>(11 Sheets)</td>
</tr>
<tr>
<td>D-2</td>
<td>Key Area Geology</td>
</tr>
<tr>
<td></td>
<td>Bottom of casing to 920 feet</td>
</tr>
<tr>
<td>D-3</td>
<td>Lithologic Log Showing Sample and Instrument Locations</td>
</tr>
<tr>
<td></td>
<td>Bottom of casing to 2200 feet</td>
</tr>
<tr>
<td></td>
<td>(3 Sheets)</td>
</tr>
<tr>
<td>D-4</td>
<td>Facility Level Area Geology</td>
</tr>
<tr>
<td></td>
<td>2080 to 2192 feet</td>
</tr>
</tbody>
</table>
GELOGIC DRILL LOG

PROJECT: WIPP
JOB NO.: 12484
SHEET NO.: 10
HOLE NO.: 11
COORDINATES (PLANT GRID)
N 9687.23
E 6894.89

BEGIN: 7-4-81
COMPLETED: 10-24-81
DRILLER: CHALLENGER DRILLING CO.
DRILL MAKE AND MODEL: NATIONAL 125
HOLE SIZE: 142 IN.
ROCK (FT.): 2282
OVERBURDEN (FT.): 16
TOTAL DEPTH (FROM G.S.): 2298 FT.

DEPTH/EL. GROUND WATER
DEPTH/EL. TOP OF ROCK
(GROUND SURFACE): 16 FT. / 3394.5

Cores:
- Sample 1: 3410.5
- Sample 2: 3394.5
- Sample 3: 3374.0
- Sample 4: 3347.5

Cores Weight/Fall:
- 180 IN./11 FT.
- 164 IN./93.4 FT.

Cores Adv.: 172

Water Pressure Tests:
- Elevation: 3417.5
- Depth: 0

Description and Classification:
- GROUND SURFACE

0-11' DUNE SAND, reddish brown

11-16' CALICHÆ WHITE

16-36.5' CATUNA FORMATION, sandstone, reddish brown, fine to medium grained

36.5-46.5' SANTA ROSA FORMATION, Sandstone, gray and reddish brown, fine grained

46.5-538' DENNY LAKE FORMATION, slatstone and sandstone, reddish brown, whitish veins of gypsum interspersed throughout

Rig depths measured from kelly bushing approx. 7 ft. above ground surface.

NOTES:
1. Stratigraphic description from 0 to 103 ft. based on geologic log of boring 8-25.
2. 168 in. dia. pilot hole augered from 0-97.5 ft. by Meredith Drilling Co. prior to setting and cementing 164 in. dia. surface casing.
3. All depths given are from ground surface except for those shown in depth column.

Casting:
- 0-11 ft. = 180 in. dia CMP
- 0-93.4 ft. = 144 in. dia. surface casing
- 0-843 ft. = 120 in. dia. steel liner (installed after completion of shaft drilling)
<table>
<thead>
<tr>
<th>Depth (ft.)</th>
<th>Elevation</th>
<th>Description and Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td></td>
<td>DEWEY LAKE FORMATION. Siltstone and sandstone, reddish brown, whitish veins of gysum interspersed throughout.</td>
</tr>
<tr>
<td>110</td>
<td></td>
<td>Siltstone, dark reddish brown, moderately weak, thinly bedded.</td>
</tr>
<tr>
<td>120</td>
<td></td>
<td>Sandstone, dark reddish brown, fine grained, well sorted, sub-rounded grains, weakly cemented.</td>
</tr>
<tr>
<td>130</td>
<td></td>
<td>Sandstone, silty, very fine grained, grading into siltstone in places.</td>
</tr>
<tr>
<td>140</td>
<td></td>
<td>As above.</td>
</tr>
<tr>
<td>150</td>
<td></td>
<td>Siltstone, sandy, dark reddish brown.</td>
</tr>
</tbody>
</table>

**Notes:**
- Horizontal displacement at 99 ft. was 0.01 ft. 52706'
- Cutting samples collected from discharge end of borehole unless otherwise indicated. Sample depths shown are approximate.
- Drilling rate from 122 to 148 ft. was 1.4 ft/hr.
<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Description and Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>3267.5</td>
<td>Sandstone, sandy, dark reddish brown, moderately weak, thin bedded, grading into sandstone in places.</td>
</tr>
<tr>
<td>150</td>
<td>Clay, dark reddish brown, some siltstone (dark reddish brown and greenish gray, moderately weak), clay probably occurs as claystone interbedded with siltstone.</td>
</tr>
<tr>
<td>170</td>
<td>Siltstone, sandy, dark reddish brown, moderately weak, little clay.</td>
</tr>
<tr>
<td>180</td>
<td>As above.</td>
</tr>
<tr>
<td>190</td>
<td>Clay and Siltstone, dark reddish brown.</td>
</tr>
<tr>
<td>200</td>
<td>Sandstone, dark reddish brown, moderately weak, very fine grained, subrounded, well sorted.</td>
</tr>
<tr>
<td>210</td>
<td>Siltstone, dark reddish brown, moderately weak, pyroclastic fragments.</td>
</tr>
<tr>
<td>220</td>
<td>Sandstone, silty, dark reddish brown, moderately weak, very fine grained, subrounded, well sorted.</td>
</tr>
</tbody>
</table>

Horizontal displacement at 143 ft. was 0.02 ft. S04°07'W. Drilling rate from 148 to 158 ft. was 3.3 ft./hr. Drilling rate from 158 to 194 ft. was 12 ft./hr. Horizontal displacement at 182 ft. was 0.01 ft. S17°47'W. Drilling rate from 194 to 203 ft. was 1.3 ft./hr. Drilling rate from 203 to 117 ft. was 1.2 ft./hr. Drilling rate from 217 to 243 ft. was 1.4 ft./hr.
GEOLOGIC DRILL LOG

DESCRIPTION AND CLASSIFICATION

3187.5 320 230
Siltstone, dark reddish brown, moderately weak, gypsum fragments, little clay

240 14
Sandstone, silty, dark reddish brown, moderately weak, very fine grained, subrounded, well sorted, some siltstone, abundant gypsum fragments

250 15
As above, much less gypsum

260 16
As above (sample No. 14)

270 17
As above, abundant gypsum and greenish sandstone fragments

280 18
As above

290 19
As above

300 20
Sandstone, silty, dark reddish brown, moderately weak, very fine grained, well sorted, and:
Siltstone, dark reddish brown, moderately weak, some gypsum fragments

3107.5 310 22
Sandstone, as above, some lt. green color

NOTES ON:
WATER LEVELS,
WATER RETURN,
CHARACTER OF
DRILLING, ETC.

Horizontal displacement at 229 ft. was 0.02 ft. 543°30'W

SPL6 taken from drill bit - no formal description

Drilling rate from 245 to 262 ft. was 1.9 ft./hr.

Drilling rate from 262 to 276 ft. was 0.6 ft./hr.

Horizontal displacement at 271 ft. was 0.03 ft. 81°29'W

Drilling rate from 276 to 299 ft. was 1.2 ft./hr.

Drilling rate from 299 to 309 ft. was 1.3 ft./hr.
<table>
<thead>
<tr>
<th>ELEVATION</th>
<th>DEPTHS (F.T.)</th>
<th>DESCRIPTION AND CLASSIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>3107.5</td>
<td>310</td>
<td>Graphic Log Sample</td>
</tr>
<tr>
<td>320</td>
<td>23</td>
<td>Sandstone, silty, dark reddish brown, moderately weak, very fine grained, well sorted, and siltstone, dark reddish brown, moderately weak</td>
</tr>
<tr>
<td>330</td>
<td>24</td>
<td>Sandstone, silty, dark reddish brown, moderately weak, very fine grained, subrounded, well sorted, some gyspum fragments</td>
</tr>
<tr>
<td>340</td>
<td>26</td>
<td>Siltstone, clayey, dark reddish brown, moderately weak, and siltstone, dark reddish brown, moderately weak, very fine grained, trace of clay</td>
</tr>
<tr>
<td>350</td>
<td>22</td>
<td>Siltstone, sandy, dark reddish brown and greenish gray, moderately weak</td>
</tr>
<tr>
<td>360</td>
<td>28</td>
<td>Siltstone, sandy, dark reddish brown, moderately weak, grades into sandstone, dark reddish brown, moderately weak, very fine grained</td>
</tr>
<tr>
<td>370</td>
<td>22</td>
<td>Sandstone, silty, dark reddish brown, moderately weak, very fine grained, subrounded, well sorted</td>
</tr>
<tr>
<td>380</td>
<td>30</td>
<td>As above, with gyspum fragments</td>
</tr>
<tr>
<td>390</td>
<td>30</td>
<td>Sandstone, as above, and siltstone</td>
</tr>
<tr>
<td>392</td>
<td></td>
<td>Drilling rate from 375 to 433 ft. was 2.0 ft./hr.</td>
</tr>
</tbody>
</table>

Drilling rate from 309 to 322 ft. was 1.9 ft./hr. and Drilling rate from 322 to 336 ft. was 1.6 ft./hr.
<table>
<thead>
<tr>
<th>ELEVATION</th>
<th>DESCRIPTION AND CLASSIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>3027.5</td>
<td>Sandstone, as above, and</td>
</tr>
<tr>
<td>400</td>
<td>Siltstone, sandy, dark reddish brown, some greenish gray frags., moderately weak, abundant gypsum fragments</td>
</tr>
<tr>
<td>410</td>
<td>Sandstone, as sample No. 29, abundant gypsum fragments</td>
</tr>
<tr>
<td>420</td>
<td>As above</td>
</tr>
<tr>
<td>430</td>
<td>As above</td>
</tr>
<tr>
<td>440</td>
<td>As above, some gray green color</td>
</tr>
<tr>
<td>450</td>
<td>Sandstone and Siltstone, as sample No. 32</td>
</tr>
<tr>
<td>460</td>
<td>As above</td>
</tr>
<tr>
<td>2947.5</td>
<td>Sandstone, as sample No. 29</td>
</tr>
</tbody>
</table>

**NOTES ON:**
- Horizontal displacement at 401 ft. was 0.08 ft. SRF 13' W
- Horizontal displacement at 445 ft. was 0.10 ft. SRF 30' W
- Drilling rate from 433 to 464 ft. was 1.6 ft./hr.
<table>
<thead>
<tr>
<th>ELEVATION</th>
<th>DRILLING PROGRESS</th>
<th>DESCRIPTION AND CLASSIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>2947.5</td>
<td>470</td>
<td>Siltsone, dark reddish brown, moderately weak, gyspum fragments, trace of sandstone</td>
</tr>
<tr>
<td>480</td>
<td></td>
<td>Sandstone, silty, dark reddish brown, moderately stringy to moderately weak, very fine grained, abundant greenish gray reduction spots</td>
</tr>
<tr>
<td>500</td>
<td>500</td>
<td>As above</td>
</tr>
<tr>
<td>510</td>
<td>510</td>
<td>As above, subrounded, well sorted, gyspum fragments</td>
</tr>
<tr>
<td>520</td>
<td>520</td>
<td>As above</td>
</tr>
<tr>
<td>530</td>
<td>530</td>
<td>As above, moderately weak, some greenish gray reduction spots</td>
</tr>
<tr>
<td>560</td>
<td>560</td>
<td>As above</td>
</tr>
<tr>
<td>580</td>
<td>580</td>
<td>As above</td>
</tr>
<tr>
<td>2872.5</td>
<td>2872.5</td>
<td>538 - 850' HUSTLER FORMATION, primarily anhydrite, dolomite, and mudstone</td>
</tr>
<tr>
<td>2867.5</td>
<td>2867.5</td>
<td>Anhydrite, white to light brownish gray</td>
</tr>
</tbody>
</table>

**Notes on Water Levels, Water Return, Character of Drilling, etc.**

- Drilling rates:
  - 460-490 ft. = 1.5 ft./hr.
  - 490 - 502 ft. = 0.8 ft./hr.
  - 502 - 506 ft. = 0.7 ft./hr.

- Horizontal displacement at 489 ft. was 0.14 ft. 528°17'W

- Drilling rates:
  - 506 - 510 ft. = 1.3 ft./hr.
  - 510 - 513 ft. = 0.5 ft./hr.
  - 513 - 527 ft. = 0.6 ft./hr.
  - 527 - 538 ft. = 0.5 ft./hr.
  - 538 - 548 ft. = 0.4 ft./hr.

- Horizontal displacement at 533 ft. was 3.18 ft. 535°10'W
GEOLOGIC DRILL LOG

PROJECT: WIPP

ELEVATION

DEPHT (FT)

DESCRIPTION AND CLASSIFICATION

2867.5
550

Anhydrite, white to light brownish gray, hard, finely crystalline, some gypsum fragments

Drilling rates:
566-554 ft = 0.5 ft/hr.
554-561 ft = 0.7 ft/hr.

As above

560

570

As above, light gray to light brownish gray

580

Clay, dark brown, high plasticity, some silt

590

Silts tone, medium gray, moderately weak, some very fine sand and minor clay

600

2817.5

393 - 628' MAGNETA DOLONITE MEMBER

Silts tone, calcareous, medium olive gray to olive gray, strong, mod. hard, mod. to well cemented, sparse gypsum crystals

610

620

As above

2795.5

2787.5

630

Dolomite, olive gray

Horizontal displacement at 577 ft was 0.24 ft.
640' 12'W
<table>
<thead>
<tr>
<th>Depth (ft.)</th>
<th>Elevation</th>
<th>Description and Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>630</td>
<td>2787.5</td>
<td>Dolomite, olive gray, mod. strong, mod. hard, sugary texture w/small silver blebs (mica?), evidence of lamella, powdered sample reacts slightly w/HCl acid</td>
</tr>
<tr>
<td>640</td>
<td>2782.5</td>
<td>Anhydrite, very light gray to brownish gray, mod. strong, mod. hard, well cemented, possibly gysiferous</td>
</tr>
<tr>
<td>650</td>
<td></td>
<td>As above</td>
</tr>
<tr>
<td>660</td>
<td></td>
<td>As above</td>
</tr>
<tr>
<td>670</td>
<td></td>
<td>As above, contains minor amt. of small black grains w/resinous luster, pulverized grains have earthy to sandy appearance &amp; small reaction w/HCl acid</td>
</tr>
<tr>
<td>680</td>
<td></td>
<td>As above (sample No. 58), lighter in overall color and larger fragments</td>
</tr>
<tr>
<td>690</td>
<td></td>
<td>As above, lighter in overall color, smaller fragments than above</td>
</tr>
<tr>
<td>700</td>
<td></td>
<td>Anhydrite, mot. pale yellow brn. overall, some pale reddish brn. frags. (polyhalite), stronger and harder than previous samples, trace translucent w/white, fibrous atinspar gypsum, trace gray clay fragr.</td>
</tr>
<tr>
<td>710</td>
<td>2707.5</td>
<td>Anhydrite, slightly mot. med. to lt. gray</td>
</tr>
</tbody>
</table>
# GEOLOGIC DRILL LOG

<table>
<thead>
<tr>
<th>ELEVATION</th>
<th>DESCRIPTION AND CLASSIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>2707.5</td>
<td>Anhydrite, slightly mot. nod. to lt. gray overall, trace gypsum</td>
</tr>
<tr>
<td>2699.5</td>
<td>711-740' CULEBRA DOLOMITE MEMBER</td>
</tr>
<tr>
<td>720</td>
<td>Dolomite, crystalline, lt. olive gray, mod. strong, well cemented, sugary texture, powdered sample reacts slightly w/HCl acid, trace transparent gypsum crystals</td>
</tr>
<tr>
<td>730</td>
<td>As above</td>
</tr>
<tr>
<td>740</td>
<td>As above</td>
</tr>
<tr>
<td>2670.5</td>
<td>Anhydrite, crystalline, variegated color (primarily grayish pink, pale red, and light gray, strong, hard, sugary texture, blebs of grayish red (polyhalite))</td>
</tr>
<tr>
<td>2658.5</td>
<td>Halite, pale reddish brn., strong, hard, dissolves slowly in hot water, few transparent frggs, exhibiting cleavage faces, trace argillaceous material</td>
</tr>
<tr>
<td>750</td>
<td>As above, more abundant crystals, some mudstone (clay to fine sand particles, grayish red, porous to mod. cementation, crumbles easily)</td>
</tr>
<tr>
<td>770</td>
<td>As above, trace anhydrite (yellow gray, strong, mod. hard)</td>
</tr>
<tr>
<td>780</td>
<td>Mudstone, moderately brown</td>
</tr>
<tr>
<td>2627.5</td>
<td>- Horiz. displ. at 753 ft., was 0.49 ft. 85'13&quot;w'</td>
</tr>
</tbody>
</table>

**NOTES ON:**
- WATER LEVELS
- WATER RETURN
- CHARACTER OF DRILLING, ETC.
<table>
<thead>
<tr>
<th>ELEVATION</th>
<th>DEPTH</th>
<th>SAMPLE</th>
<th>DESCRIPTION AND CLASSIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>2627.5</td>
<td>790</td>
<td></td>
<td></td>
</tr>
<tr>
<td>800</td>
<td>77</td>
<td></td>
<td>Mudstone, primarily silt w/clay and fine sand particles, mod. brn., strong, hard, well cemented, trace transparent halite crystals</td>
</tr>
<tr>
<td></td>
<td></td>
<td>74</td>
<td>As above, less halite, trace anhydrite</td>
</tr>
<tr>
<td>810</td>
<td>75</td>
<td></td>
<td>Mudstone, primarily silt w/fine sand &amp; minor clay particles, olive gray, strong, hard, mod. cemented, mica flakes present</td>
</tr>
<tr>
<td></td>
<td></td>
<td>74</td>
<td>As above (sample No. 73), trace gypsum crystals and olive gray mudstone</td>
</tr>
<tr>
<td>820</td>
<td>76</td>
<td></td>
<td>As above (sample No. 75), trace brn. mudstone</td>
</tr>
<tr>
<td>830</td>
<td>77</td>
<td></td>
<td>As above</td>
</tr>
<tr>
<td>840</td>
<td>78</td>
<td></td>
<td>As above, larger frogs.</td>
</tr>
<tr>
<td></td>
<td>850</td>
<td>84</td>
<td>As above, brown and olive gray, trace anhydrite</td>
</tr>
<tr>
<td></td>
<td>850-2298</td>
<td>85</td>
<td>850-2298' SALADO FORMATION</td>
</tr>
</tbody>
</table>

Note: For description of Salado Formation stratigraphy and lithology see geologic map of shaft

Horizontal displacement at 841 ft. was 0.59 ft. 154°18'W

850-2298' SALADO FORMATION

Site: WIPP - Eddy Co., N. M.
APPENDIX E

WASTE SHAFT
GEOLOGIC LOGS AND MAPS
<table>
<thead>
<tr>
<th>Figure No.</th>
<th>Title/Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>E-1</td>
<td>Lithologic Log</td>
</tr>
<tr>
<td></td>
<td>97 to 2286 feet</td>
</tr>
<tr>
<td></td>
<td>(26 Sheets)</td>
</tr>
<tr>
<td>E-2</td>
<td>Magenta Dolomite</td>
</tr>
<tr>
<td></td>
<td>597 to 620 feet</td>
</tr>
<tr>
<td>E-3</td>
<td>Culebra Dolomite</td>
</tr>
<tr>
<td></td>
<td>705 to 727 feet</td>
</tr>
<tr>
<td>E-4</td>
<td>Rustler Formation Fracture Zone</td>
</tr>
<tr>
<td></td>
<td>779 to 843 feet</td>
</tr>
<tr>
<td>E-5</td>
<td>Rustler/Salado Formation Contact</td>
</tr>
<tr>
<td></td>
<td>840 to 930 feet</td>
</tr>
<tr>
<td></td>
<td>(2 Sheets)</td>
</tr>
<tr>
<td>E-6</td>
<td>Facility Level Area</td>
</tr>
<tr>
<td></td>
<td>2100 to 2170 feet</td>
</tr>
<tr>
<td></td>
<td>(2 Sheets)</td>
</tr>
</tbody>
</table>
EXPLANATION

ROCK TYPE

SANDSTONE

MUDSTONE/CLAYSTONE

SILTSTONE

HALITE

ANHYDRITE/GYPSUM

POLYHALITE

DOLOMITE

ACCESSORY CONSTITUENTS

ESTIMATED PERCENTAGE OF ACCESSORY CONSTITUENTS INDICATED AS FOLLOWS

TRACE

SOME

ABUNDANT

Argillaceous

Halitic

Anhydritic/Gypsiferous

Polyhalitic

LAMINAR FEATURES

Seam

(Between 6" and 1/4" thick)

Parting

(Between 1/4" and 1/16" thick)

Clays

Anhydrite/Gypsum

Polyhalite

Stringer Zones

CONTACTS

SHARP

(Identifiable within 0.05 feet)

GRADATIONAL

(Identifiable within 0.05 to 0.2 feet)

DIFFUSE

(Identifiable within 0.2 to 0.5 feet)

Queries on inferred or uncertain contacts.

"Obscured" where lithologic and stratigraphic details are uncertain in the interval between contacts shown.

See "remarks" for complete description of units.

REFERENCE:

Geotechnical Activities in the Waste Handling Shaft, October 1984, WSTD-THE-038,

PREPARED BY DATE 6/24/84
CHECKED BY DATE
<table>
<thead>
<tr>
<th>ELEV. (FT. MSL)</th>
<th>DEPTH (FT.)</th>
<th>STRATIGRAPHIC COLUMN</th>
</tr>
</thead>
<tbody>
<tr>
<td>3310</td>
<td>100</td>
<td>Dewey Lake Redbeds</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Silty fine sandstone and siltstone, reddish-brown, thinly bedded (&lt; 4&quot;) to laminated; contains local interbeds of fine sandstone and siltstone.</td>
</tr>
<tr>
<td>3300</td>
<td>110</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Silty fine sandstone and siltstone, reddish-brown; green-gray reduced zones occur as discontinuous bands (&lt; 2&quot;), nodules, and lenses.</td>
</tr>
<tr>
<td>3290</td>
<td>120</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>As above, without greenish-gray reduced zones.</td>
</tr>
<tr>
<td>3280</td>
<td>130</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>As above, without greenish-gray reduced zones.</td>
</tr>
<tr>
<td>3270</td>
<td>140</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>As above, vuggy, particularly 122.6&quot; - 122.7&quot; vugs, 1&quot; - 2&quot; diameter, up to 5&quot; deep; local sandy zones, especially in greenish-gray reduced zones.</td>
</tr>
<tr>
<td>3260</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Siltstone, reddish-brown, laminated.</td>
</tr>
<tr>
<td>3250</td>
<td>160</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Siltstone, greenish-gray.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Siltstone, reddish-brown.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Alternating layers of fine sandstone and siltstone, 2&quot; - 18&quot; each; soft sediment deformation structures; vugs.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Silty fine sandstone and siltstone, reddish-brown, thin bedded (&lt; 4&quot;) to laminated; local interbeds of fine sandstone and siltstone.</td>
</tr>
<tr>
<td>3240</td>
<td>170</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Silty fine sandstone and siltstone, greenish-gray.</td>
</tr>
<tr>
<td>3230</td>
<td>180</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Silty fine sandstone and siltstone, reddish-brown, thin bedded to laminated.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Silty fine sandstone and siltstone; green-gray reduced zones in 1/8&quot; - 1/4&quot; thick, approximately horizontal bands; closed fractures, &lt; 1/8&quot;, calcite filled, random orientation, few intersect.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sandstone, light gray, approximately horizontal; some dark grains.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Siltstone, reddish-brown; few, gray, spherical reduced zones (&lt; 1/2&quot; diameter); calcareous cement.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sandstone, reddish-brown, silty, very fine grained, non-calcareous; upper contact (4&quot;) is light gray; joints/fractures (1/8&quot; - 1/2&quot;) filled with gypsum, most are subhorizontal, discontinuous, irregular, 1&quot; - 1' spacing and offset by high angle fractures.</td>
</tr>
</tbody>
</table>

**FIGURE E-1**

WASTE HANDLING SHAFT
LITHOLOGIC LOG
SHEET 2 OF 26
<table>
<thead>
<tr>
<th>ELEV. (FT. MSL)</th>
<th>DEPTH (FT.)</th>
<th>STRATIGRAPHIC COLUMN</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>180</td>
<td></td>
<td>As above.</td>
<td></td>
</tr>
<tr>
<td>3220</td>
<td>190</td>
<td>Sandstone, light gray, hard, non-calcareous, fine-grained; irregular, subhorizontal, discontinuous gypsum layers (1/8&quot; - 1/2&quot; thick), 2&quot; - 6&quot; spacing.</td>
<td></td>
</tr>
<tr>
<td>3200</td>
<td>200</td>
<td>Sandstone, reddish-brown, silty, very fine grained, non-calcareous; gradational contact; gypsum layers; intermittent laminae and cross-bedding.</td>
<td></td>
</tr>
<tr>
<td>3190</td>
<td>220</td>
<td>As above, without gypsum layers, laminated, cross-bedded near base.</td>
<td></td>
</tr>
<tr>
<td>3180</td>
<td>230</td>
<td>Sandstone, reddish-brown, silty, minor cross-bedding and laminations; gypsum layers occur 196.9&quot;, downward, greenish-gray, irregular, subhorizontal layers: 196.7&quot;-196.9&quot;; 203.9&quot;-204.1&quot;; 211.8&quot;; 230.5&quot;; 243.6&quot;-243.8&quot;; 249.3&quot;; 253.1-253.2&quot;; 253.8&quot;-255.1&quot;; 265.1&quot;-265.2&quot;, gypsum layers less abundant below 221&quot;, average spacing &gt;1.</td>
<td></td>
</tr>
<tr>
<td>3160</td>
<td>250</td>
<td>Discontinuous, reddish-brown siltstone lenses at 243.3&quot;, 249.4&quot;-249.9&quot;, 251.5&quot;-253.0&quot;</td>
<td></td>
</tr>
<tr>
<td>3150</td>
<td>260</td>
<td>Gypsum layer, 1 1/2&quot; maximum thickness, crenulated, with local bifurcations, subhorizontal.</td>
<td></td>
</tr>
<tr>
<td>3140</td>
<td>270</td>
<td>Sandstone as above, gypsum layers increase in frequency downward, mostly subhorizontal, up to 1&quot; thick; high angle layers are thinner</td>
<td></td>
</tr>
</tbody>
</table>

**Figure E-1**

WASTE HANDLING SHAFT
LITHOLOGIC LOG
SHEET 3 OF 26
### Preliminary

<table>
<thead>
<tr>
<th>ELEV. (FT. MSL)</th>
<th>DEPTH (FT.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>310</td>
<td>310</td>
</tr>
<tr>
<td>309</td>
<td>309</td>
</tr>
<tr>
<td>308</td>
<td>308</td>
</tr>
<tr>
<td>307</td>
<td>307</td>
</tr>
<tr>
<td>306</td>
<td>306</td>
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<tr>
<td>305</td>
<td>305</td>
</tr>
</tbody>
</table>

### Stratigraphic Column

<table>
<thead>
<tr>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>As above, with dark reddish-brown, sandy siltstone layers at 336.7' - 337.0', 343.4' - 344.2' (with underlying gypsum layer) greenish-gray, reduced layers at 337.0' - 337.4', 343.8' - 343.9' 351.3' - 351.4', 359.3' - 359.7', 361.1' - 361.2', local increase in subhorizontal and subvertical gypsum layers (335.1' - 337.1', 348.1' - 362.6').</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Siltstone, reddish-brown, 271.6' - 271.7'</td>
</tr>
<tr>
<td>Sandstone, reddish-brown, silty; greenish-gray layers at 272.8' 272.9', 279.1' - 279.3', 284.0' - 284.2', gypsum layer decreases downward from 281.1' to 320.1'.</td>
</tr>
<tr>
<td>Siltstone, reddish-brown, sandy.</td>
</tr>
<tr>
<td>Sandstone, reddish-brown, silty; siltstone layers with underlying gypsum at 305.6' - 305.9', 307.6' - 307.7', 311.7' - 311.8', 312.6' - 312.9', 315.2' - 316.0', 317.7' - 317.9', (without gypsum), 318.6' - 318.8', (without gypsum), 319.3' - 319.4' (without gypsum); irregular greenish-gray layers at 315.9' - 316.1', 317.5', 321.9' - 322.2', 326.0' - 326.4', gypsum layer frequency increases downward from 321.1' to 326.1'.</td>
</tr>
<tr>
<td>ELEV. (FT. MSL)</td>
</tr>
<tr>
<td>----------------</td>
</tr>
<tr>
<td>360</td>
</tr>
<tr>
<td>3040</td>
</tr>
<tr>
<td>3030</td>
</tr>
<tr>
<td>3020</td>
</tr>
<tr>
<td>3010</td>
</tr>
<tr>
<td>2990</td>
</tr>
<tr>
<td>2980</td>
</tr>
</tbody>
</table>

FIGURE E-1
WASTE HANDLING SHAFT
LITHOLOGIC LOG
SHEET 5 OF 26
<table>
<thead>
<tr>
<th>ELEV. (FT. MSL)</th>
<th>DEPTH (FT.)</th>
<th>PRELIMINARY COLUMN</th>
<th>STRATIGRAPHIC COLUMN</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>450</td>
<td></td>
<td></td>
<td></td>
<td>As above</td>
</tr>
<tr>
<td>2950</td>
<td>460</td>
<td>Siltstone or very silty sandstone, hard, massive; abundant reduced spots at base.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2940</td>
<td>470</td>
<td>Sandstone, reddish-brown; gypsum layers abundant and prominent, 467.1-473.1; sparse greenish-grey reduced spots near top.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2930</td>
<td>480</td>
<td>Siltstone or silty sandstone, reddish-brown; fewer gypsum layers 473.6-492.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2910</td>
<td>500</td>
<td>Sandstone, reddish-brown; increasing frequency of gypsum layers; few high angle gypsum layers; siltstone lens at 497.7-497.8 containing a greater percentage of horizontal gypsum layers; occasional greenish-grey reduced spots.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2900</td>
<td>510</td>
<td>Siltstone, reddish-brown, sandy, gradational contact, massive, finely bedded at base, hard; thin gypsum layers; sand content increases below about 511.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2890</td>
<td>520</td>
<td>Sandstone, reddish-brown, massive, silty to very silty, hard; thin gypsum seams; occasional reduced spots of varying size; contacts gradational.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2880</td>
<td>530</td>
<td>Siltstone, reddish-brown, sandy, massive, hard, very fine sand; thin gypsum layers; At basal contact gypsum layers surround clasts of siltstone; basal 4&quot; to 6&quot; aquire a purplish hue; basal 1&quot; is reduced; basal contact contains soft sediment deformation features.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| 2870           | 540         | **RUSTLER FORMATION**
**FORTY-NINER MEMBER**
See description next sheet. |

**FIGURE E-1**

WASTE HANDLING SHAFT
LITHOLOGIC LOG
SHEET 6 OF 26
<table>
<thead>
<tr>
<th>ELEV. (FT. MSL)</th>
<th>DEPTH (FT.)</th>
<th>PRELIMINARY STRATIGRAPHIC COLUMN</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>2860</td>
<td>540</td>
<td>Anhydrite, light gray, hard, finely crystalline; massive in upper part, grading to banded light-dark on a 1/2&quot; scale; upper contact undulates up to 8&quot;; 1/2&quot; to 1&quot; wide gypsum filled fractures occur through out, spacing of 9&quot; to 18&quot;; gypsum filled fractures 1/8&quot; to 1/2&quot; wide occur through out, spacing of 1&quot; to 6&quot;; basal 6&quot; is dark brown, coarse crystalline gypsum. As above, with 3&quot;-4&quot; vugs filled with well developed gypsum crystals, at 557.6.</td>
<td></td>
</tr>
<tr>
<td>2850</td>
<td>550</td>
<td>Claystone, silty.</td>
<td></td>
</tr>
<tr>
<td>2840</td>
<td>570</td>
<td>Anhydrite, gray or grayish-white, hard, finely crystalline, gypsum-filled fractures and gypsum stringers, banded near 588.0</td>
<td></td>
</tr>
<tr>
<td>2830</td>
<td>580</td>
<td>MAGNETA DOLOMITE MEMBER Dolomite, with disseminated gypsum (Figure E2)</td>
<td></td>
</tr>
<tr>
<td>2820</td>
<td>590</td>
<td>TAMARISK MEMBER Anhydrite, gray, coarsely crystalline; gypsum occurs in upper part; increasing hardness downward; some high angle gypsum layers; transition to less gypsiferous anhydrite. Anhydrite, gray, finely crystalline, hard; with gypsum stringers, most sub-horizontal, 1'-2' thick; banding appears light and dark gray, below 651.1' banding replaced by motiled gray coloration; becomes slightly argillaceous toward the base.</td>
<td></td>
</tr>
</tbody>
</table>

FIGURE E-1
WASTE HANDLING SHAFT LITHOLOGIC LOG SHEET 7 OF 26
Continuous gypsum layer (3/8") with black clay parting (1/8") above and seam (1/4") below at 657.3'-658.0'; white gypsum, soft clay; locally displaced by small fractures with a thrust component of movement.

As above, except unmottled, sugary, hard, uniformed.

Anhydritic claystone

Anhydrite

Claystone, silty.

Anhydrite, light gray, finely crystalline; banded; local black clay laminae; upper 1' gypsiferous, whitish-gray.

Clay seam, dark gray, soft, up to 6", includes thin, discontinuous gypsum seam.

Anhydrite, as above.

CULEBRA DOLOMITE MEMBER

Dolomite, contains abundant gypsum filled vugs. (See Figure E-3)
<table>
<thead>
<tr>
<th>ELEV. (FT. MSL)</th>
<th>DEPTH (FT.)</th>
<th>STRATIGRAPHIC COLUMN</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>720</td>
<td></td>
<td>Dolomite, contains abundant gypsum filled vugs (See Figure E-3)</td>
<td></td>
</tr>
<tr>
<td>2680-730</td>
<td></td>
<td><strong>UNNAMED LOWER MEMBER</strong></td>
<td>Claystone</td>
</tr>
<tr>
<td>2670-740</td>
<td></td>
<td>Anhydrite</td>
<td></td>
</tr>
<tr>
<td>2660-750</td>
<td>Argillaceous siltstone and halite mudstone. Argillaceous halite or halite mudstone.</td>
<td></td>
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</tr>
<tr>
<td>2650-760</td>
<td>Halite, argillaceous</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2640-770</td>
<td>Anhydrite</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2630-780</td>
<td>Halite, Argillaceous and silty</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2620-790</td>
<td>Siltstone, sandy. Siltstone (See Figure E-4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2610-300</td>
<td>Obscured Contact Mudstone, reddish-brown, finely laminated with some dark brown laminae and grayish-brown laminae; small cross-laminations and trough cross-laminations; also, some soft sediment deformation features</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2600-810</td>
<td>Sandstone, reddish-brown, silty, upper part finely laminated with small cross-laminations; trough cross-laminated at the base.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Claystone, gray, finely laminated, laminae are occasionally terminated, erasional and lensoid in shape; near the base, cross-laminations occur.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mudstone, gray, banded or locally reddish-brown, finely laminated, local cross-laminations; grading to a siltstone at the base.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**FIGURE E-1**

WASTE HANDLING SHAFT
LITHOLOGIC LOG
SHEET 9 OF 26
<table>
<thead>
<tr>
<th>Layer</th>
<th>Elevation (ft. MSL)</th>
<th>Depth (ft.)</th>
<th>Stratigraphic Column</th>
<th>Remarks</th>
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<tbody>
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<td></td>
<td>810</td>
<td></td>
<td></td>
<td>As above</td>
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<tr>
<td>2590</td>
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<td>820</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2580</td>
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<td>830</td>
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<tr>
<td>2570</td>
<td></td>
<td>94c</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2560</td>
<td></td>
<td>850</td>
<td></td>
<td>Salado Formation</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Claystone, halite</td>
<td>(See Figure B-5)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2550</td>
<td></td>
<td>860</td>
<td></td>
<td>Halite</td>
</tr>
<tr>
<td>2540</td>
<td></td>
<td>870</td>
<td></td>
<td>Halite</td>
</tr>
<tr>
<td>2530</td>
<td></td>
<td>880</td>
<td></td>
<td>Halite</td>
</tr>
<tr>
<td>2520</td>
<td></td>
<td>890</td>
<td></td>
<td>Halite, argillaceous</td>
</tr>
<tr>
<td>2510</td>
<td></td>
<td>900</td>
<td></td>
<td>Halite, with abundant argillaceous material; transition to clear halite with trace polyhalite, trace argillaceous material, underlain by 1” seam gray green clayey silt.</td>
</tr>
</tbody>
</table>

**Figure E-1**

Waste Handling Shaft
Lithologic Log
Sheet 10 of 26
<table>
<thead>
<tr>
<th>ELEV. (FT. MSL)</th>
<th>DEPTH (FT)</th>
<th>PRELIMINARY</th>
<th>STRATIGRAPHIC COLUMN</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>900</td>
<td>900</td>
<td>-X</td>
<td>-</td>
<td>As above</td>
</tr>
<tr>
<td>2500</td>
<td>2500</td>
<td>X</td>
<td>X</td>
<td>Halite, clear, massive, moderately soft; trace polyhalite</td>
</tr>
<tr>
<td>2490</td>
<td>2490</td>
<td>X</td>
<td>X</td>
<td>Halite, argillaceous; trace polyhalite.</td>
</tr>
<tr>
<td>2480</td>
<td>2480</td>
<td>X</td>
<td>X</td>
<td>Halite, clear; trace polyhalite.</td>
</tr>
<tr>
<td>2470</td>
<td>2470</td>
<td>X</td>
<td>X</td>
<td>Halite, reddish-brown, argillaceous and silty; soft gray-green band near upper contact.</td>
</tr>
<tr>
<td>2450</td>
<td>2450</td>
<td>X</td>
<td>X</td>
<td>Halite, less argillaceous than above; trace to some polyhalite; bleeds of gray-green siltstone; layers (1/4&quot;) of clear halite with trace argillaceous material and polyhalite (914.0' - 915.0', 916.7' - 917.7'); clear halite with white claystone parting (1/8&quot;) (919.6' - 921.6').</td>
</tr>
<tr>
<td>2440</td>
<td>2440</td>
<td>X</td>
<td>X</td>
<td>Polyhalite, red-orange, halitic (921.6' - 921.9'); halite, argillaceous, trace polyhalite, soft (921.9' - 922.2'); polyhalite, light-orange, medium soft to hard (922.2' - 922.8'); halite, clear, and polyhalite in alternating layers (1/4&quot; - 1&quot;) (922.8' - 924.7').</td>
</tr>
<tr>
<td>2430</td>
<td>2430</td>
<td>X</td>
<td>X</td>
<td>Halite; argillaceous content increases downward; trace polyhalite; gray-green siltstone blebs or layers, reduced zones.</td>
</tr>
<tr>
<td>2420</td>
<td>2420</td>
<td>X</td>
<td>X</td>
<td>Halite, clear, trace argillaceous material and siltstone; argillic content increases downward between 936.3' - 940.4'.</td>
</tr>
<tr>
<td>2410</td>
<td>2410</td>
<td>X</td>
<td>X</td>
<td>Halite, clear, very argillaceous, brown-red; gray-green siltstone at lower contact; undulatory upper contact.</td>
</tr>
<tr>
<td>2400</td>
<td>2400</td>
<td>X</td>
<td>X</td>
<td>Halite, brown-red; trace polyhalite, lower argillaceous content than above; gradational contacts.</td>
</tr>
<tr>
<td>2390</td>
<td>2390</td>
<td>X</td>
<td>X</td>
<td>Halite, brown-red, very argillaceous; many thin (&lt;1/4&quot;) polyhalite stringers.</td>
</tr>
<tr>
<td>2380</td>
<td>2380</td>
<td>X</td>
<td>X</td>
<td>Halite, red-brown, very argillaceous, soft.</td>
</tr>
<tr>
<td>2370</td>
<td>2370</td>
<td>X</td>
<td>X</td>
<td>Halite, clear to pale pink, coarse crystals; trace polyhalite increases downward; layer of polyhalite (953.0' - 953.2').</td>
</tr>
<tr>
<td>2360</td>
<td>2360</td>
<td>X</td>
<td>X</td>
<td>Halite, red to brown red, abundant polyhalite; argillaceous content increases downward, especially 955.6 - 955.9.</td>
</tr>
<tr>
<td>2350</td>
<td>2350</td>
<td>X</td>
<td>X</td>
<td>Mudstone, silty or siltstone, brown-red, trace halite, massive, medium soft to soft, hard at upper contact and very hard 2&quot; - 3&quot; inside wall; fractures.</td>
</tr>
<tr>
<td>2340</td>
<td>2340</td>
<td>X</td>
<td>X</td>
<td>As above, except light gray.</td>
</tr>
<tr>
<td>2330</td>
<td>2330</td>
<td>X</td>
<td>X</td>
<td>Halite, clear to red-brown, some to abundant argillaceous material; some polyhalite, orange to red-brown.</td>
</tr>
<tr>
<td>2320</td>
<td>2320</td>
<td>X</td>
<td>X</td>
<td>Polyhalite, reddish-orange, massive, medium soft to medium hard.</td>
</tr>
<tr>
<td>2310</td>
<td>2310</td>
<td>X</td>
<td>X</td>
<td>Interbedded polyhalite and halite, hard; massive polyhalite; lower portion contains 2'-3&quot; bed of anhydrite.</td>
</tr>
<tr>
<td>2300</td>
<td>2300</td>
<td>X</td>
<td>X</td>
<td>Halite, red-brown, argillaceous; argillic content decreases with depth and is largely absent below 972.1'; trace polyhalite, increases downward; clear halite alternates with polytaelite and halitic polyhalite in 12&quot; - 14&quot; beds near lower contact; hard where argillic content is low.</td>
</tr>
<tr>
<td>2290</td>
<td>2290</td>
<td>X</td>
<td>X</td>
<td>Anhydrite, with halite, fine-grained, gray, hard.</td>
</tr>
<tr>
<td>2280</td>
<td>2280</td>
<td>X</td>
<td>X</td>
<td>Halite, clear, high argillic content, red-brown; some discontinuous argillicous stringers and disseminated along crystal boundaries and in crystals; medium to large halite crystals; trace disseminated polyhalite; polyhalitic in lower 1'; some gray-green clay stringers.</td>
</tr>
</tbody>
</table>

FIGURE E-1
WASTE HANDLING SHAFT
LITHOLOGIC LOG
SHEET 11 OF 26

PREPARED BY: DATE: 6/21/84
CHECKED BY: DATE:__
<table>
<thead>
<tr>
<th>ELEV. (FT. MSL)</th>
<th>DEPTH (FT.)</th>
<th>STRATIGRAPHIC COLUMN</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>990</td>
<td></td>
<td>- - - - - - - - - - -</td>
<td>As above</td>
</tr>
</tbody>
</table>

- **Halite, clear; trace polyhalite and argillaceous material in 0.3' bands alternating with discontinuous argillaceous, polyhalite halite bands, 0.01; at 999.6, halite bands thin to 1'; argillaceous content increases downward in halite bands; polyhalite occurs in layers (up to 1') downward.**

- **Polyhalite, reddish-orange, thickness ranges 9'-19'; underlain by gray clay seam (1/4') and gray anhydrite and polyhalite (1'-4').**

- **Halite, some argillaceous material; argillic content decreases downward; thin (1/4') clay partings at 1010.6', gray and at 1012.1' (reddish brown); argillaceous bed (1011.5'-1011.8').**

- **Halite, some argillaceous material; argillaceous material evenly disseminated, decreases slightly below 1016.1', wavy, irregular (1/8'-1'), reddish-brown clay seam at 1016.1'.**

- **Anhydrite, dark gray or banded light and dark gray; halite-rich lenses near upper contact; several subvertical, open (1/4'-1/2') or tight fractures; some halite fracture filling (1031.6'-1033.6').**

- **Clay, moderate gray and reddish-brown, soft; halite-filled fractures.**

- **Halite, some argillaceous material, disseminated trace polyhalite; decreasing argillaceous material below about 1034.1'; occasional gray blebs in lower portion.**

- **Anhydrite, light gray, hard; vuggy and dissolved near upper contact.**

- **Halite, clear, coarsely crystalline; trace argillaceous material; thin discontinuous anhydrite bands up to 1/2' thick; trace polyhalite at base.**

- **Polyhalite, reddish-orange, medium soft, some anhydrite.**

- **Halite, clear, coarsely crystalline; trace argillaceous material and polyhalite.**

- **Halite; some argillaceous material.**

- **Halite, clear; trace argillaceous material; thin discontinuous polyhalite stringers.**

- **Halite, some argillaceous material, disseminated; gray clay parting (up to 1/4'), soft, discontinuous (1052.4'); gray and reddish-brown clay parting (up to 1/8'), discontinuous (1054.3'); gray clay stringers and blebs (up to 1/8') (1057.8'-1058.9'); disseminated polyhalite below 1055.1'.**

- **Polyhalite, up to 18'; underlain by gray anhydrite (1') and gray and reddish-brown clay (2').**

- **Halite, some disseminated argillaceous material and trace polyhalite.**

- **Halite; some argillaceous material; some polyhalite in discontinuous stringers; gray clay blebs (up to 1') at 1062.8'.**

- **Halite, coarse crystalline; trace argillaceous material and polyhalite.**

- **Halite, trace to some argillaceous material; trace polyhalite; polyhalite both disseminated and in discontinuous stringers; polyhalite increases 1074.3' to 1075.1'.**

- **Polyhalite; continuous, irregular layer (3'-4'' thick) underlain by soft clay at lower contact.**

- **Halite; some to abundant argillaceous material, decreases downward; few red-brown clay blebs (3'-4'' diam.); trace polyhalite.**

- **Polyhalite; continuous, irregular contacts, 4'-6'' thick; immediately overlain by gray clay blebs and underlain by red-brown and gray clay seam (1'-2').**

- **Halite; some to abundant argillaceous material; trace polyhalite.**

---

**FIGURE E-1**

WASTE HANDLING SHAFT
LITHOLOGIC LOG
SHEET 12 OF 26
<table>
<thead>
<tr>
<th>PRELIMINARY ELEV. (FT. MSL)</th>
<th>STRATIGRAPHIC COLUMN</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1080</td>
<td></td>
<td>As above</td>
</tr>
<tr>
<td></td>
<td>- X -</td>
<td>Halite, argillaceous; argillaceous content decreases downward; gray and red-brown clay blebs at 1085.6'-1087.9'; discontinuous polyhalite stringer at lower contact (1087.9').</td>
</tr>
<tr>
<td>2320</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1090</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- - -</td>
<td>Halite, medium to coarse crystalline, trace to some argillaceous material; occasional gray clay blebs; argillaceous content decreases toward 1091.8'; increases toward base; contains polyhalite stringers, blebs, and beds (1&quot;-3&quot; thick) at 1095.9'-1096.0 and 1098.0'-1098.3.</td>
</tr>
<tr>
<td>2310</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1100</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- X -</td>
<td>Halite, clear; trace argillaceous material and polyhalite.</td>
</tr>
<tr>
<td>2300</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1110</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- - -</td>
<td>Halite, abundant argillaceous material and gray clay blebs at contact and in upper 1'; trace to some argillaceous material at bottom; trace polyhalite below 1104.1', increases to some downward to 1111.1'; polyhalite bed and stringers, reddish-orange, moderately soft (1113.8'-1114.2').</td>
</tr>
<tr>
<td>2290</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1120</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- X -</td>
<td>Halite, clear, trace argillaceous material and polyhalite.</td>
</tr>
<tr>
<td>2280</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1130</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WIRE MESH</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2270</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1140</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anhydrite, gray, dense.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Polyhalite, orange-red, medium hard.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anhydrite; clay bed (3&quot;) underlies anhydrite.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Halite; some (10%) interstitial polyhalite.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anhydrite, with anhydrite and some polyhalite in stringers (1/4&quot;-1&quot;) at 1/56.8&quot;, 1/57.2&quot;, 1/57.9&quot;, 1/59.2&quot;, 1/59.3&quot;, and several discontinuous stringers.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anhydrite</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Halite, clear; trace polyhalite.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anhydrite layers (2”), underlain by clear halite, with two anhydrite layers (1/4&quot;) at 1/61.2&quot;-1/61.3&quot;; underlain by anhydrite layer (2’).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Halite, clear; two anhydrite layers at 1/62.6&quot; (1/4&quot;, discontinuous) and at 1/63.0&quot; (1/2&quot;, continuous).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anhydrite, gray, dense; lower 0.2&quot; is polyhalite, clay-rich seam (1/64.8&quot;-1/65.6&quot;).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Halite; some (~20%) polyhalite</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anhydrite, gray, dense.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**FIGURE E-1**

WASTE HANDLING SHAFT
LITHOLOGIC LOG
SHEET 13 OF 26
<table>
<thead>
<tr>
<th>PRELIMINARY ELEV. (FT. MSL)</th>
<th>STRATIGRAPHIC COLUMN</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1170</td>
<td>X</td>
<td>As above</td>
</tr>
<tr>
<td></td>
<td>X</td>
<td>Halite; trace to some argillaceous material, dark gray clay; trace polyhalite.</td>
</tr>
<tr>
<td></td>
<td>X</td>
<td>Halite, argillaceous, decreasing toward base; trace to some polyhalite, layers (1/2&quot;) at 1176.1 and 1176.6&quot; continuous gray-reddish-brown clay seam (=5&quot;) at 1178.2&quot;-1178.6&quot;.</td>
</tr>
<tr>
<td>2230</td>
<td>X</td>
<td>Halite, trace polyhalite, disseminated argillaceous material.</td>
</tr>
<tr>
<td>1180</td>
<td>X</td>
<td>Halite, argillaceous, reddish-brown; trace polyhalite; argillaceous content decreases toward the base.</td>
</tr>
<tr>
<td></td>
<td>X</td>
<td>Halite, trace to some argillaceous material, trace polyhalite.</td>
</tr>
<tr>
<td>2220</td>
<td>X</td>
<td>Polyhalite; has irregular contacts; underlain by 1&quot;-2&quot; thick gray clay seam.</td>
</tr>
<tr>
<td>1190</td>
<td>X</td>
<td>Halite; trace polyhalite.</td>
</tr>
<tr>
<td>2210</td>
<td>X</td>
<td>Polyhalite; irregular anhydrite layers with halite crystals.</td>
</tr>
<tr>
<td>1200</td>
<td>X</td>
<td>Halite; trace to some polyhalite.</td>
</tr>
<tr>
<td>2200</td>
<td>X</td>
<td>Halite; some argillaceous material; polyhalite bands ≤1/4&quot; thick.</td>
</tr>
<tr>
<td>1210</td>
<td>X</td>
<td>Polyhalite.</td>
</tr>
<tr>
<td>2190</td>
<td>X</td>
<td>Halite; clear; trace argillaceous material and polyhalite.</td>
</tr>
<tr>
<td>1220</td>
<td>X</td>
<td>Halite, clear.</td>
</tr>
<tr>
<td>2180</td>
<td>X</td>
<td>Halite; some argillaceous material.</td>
</tr>
<tr>
<td></td>
<td>X</td>
<td>Anhydrite, gray, dense.</td>
</tr>
<tr>
<td>1230</td>
<td>X</td>
<td>Halite; clear, thin; discontinuous polyhalite bands, 0.2&quot;-0.4&quot; apart.</td>
</tr>
<tr>
<td></td>
<td>X</td>
<td>Halite; some polyhalite.</td>
</tr>
<tr>
<td>2160</td>
<td>X</td>
<td>Halite; trace argillaceous material, with gray clay stringers.</td>
</tr>
<tr>
<td>1240</td>
<td>X</td>
<td>Halite; abundant argillaceous material; nodules (1/2&quot;) of reddish-brown clay; argillaceous content decreases to some (1227.8&quot;-1234.7&quot;).</td>
</tr>
<tr>
<td>2150</td>
<td>X</td>
<td>Halite, clear.</td>
</tr>
<tr>
<td></td>
<td>X</td>
<td>Halite; some polyhalite.</td>
</tr>
<tr>
<td>1250</td>
<td>X</td>
<td>Polyhalite; undulatory upper contact, 0.7&quot; relief; gray clay seam (1&quot;-2&quot; thick) underlies polyhalite.</td>
</tr>
<tr>
<td></td>
<td>X</td>
<td>Halite; trace to some (≤10%) polyhalite.</td>
</tr>
<tr>
<td></td>
<td>X</td>
<td>Halite, some (~10-15%) argillaceous material, discontinuous stringers and disseminated gray clay; trace polyhalite.</td>
</tr>
<tr>
<td></td>
<td>X</td>
<td>Halite, some (10-20%) polyhalite in thin, discontinuous stringers, and interstitially.</td>
</tr>
<tr>
<td></td>
<td>X</td>
<td>Halite, trace polyhalite is thin, relatively continuous stringers; polyhalite blebs and irregular masses (2&quot;-3&quot; diam.) (1250.9&quot;-1257.5&quot;).</td>
</tr>
<tr>
<td>2150</td>
<td>X</td>
<td>Polyhalite, thickness varies 2&quot;-6&quot;, underlain by gray clay seam (1/4&quot;-1/2&quot;), contacts undulatory.</td>
</tr>
</tbody>
</table>

FIGURE E-1
WASTE HANDLING SHAFT
LITHOLOGIC LOG
SHEET 14 OF 26
<table>
<thead>
<tr>
<th>ELEV. (F.T. MSL)</th>
<th>DEPTH (F.T.)</th>
<th>STRATIGRAPHIC COLUMN</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1260</td>
<td>X</td>
<td>X</td>
<td>As above</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Polyhalite, 16&quot;-18&quot; thick; thin halite layers at 1265.4'; underlain by gray clay seam (1/2').</td>
</tr>
<tr>
<td></td>
<td></td>
<td>X</td>
<td>Halite, clear.</td>
</tr>
<tr>
<td>2140</td>
<td>X</td>
<td>X</td>
<td>Halite, clear; trace polyhalite</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Halite, some argillaceous material, gray clay.</td>
</tr>
<tr>
<td>2130</td>
<td>X</td>
<td>X</td>
<td>Halite, some (10-20%) polyhalite interstitially in stringers and scattered blebs; continuous band of polyhalite stringers (1272.4'-1272.8').</td>
</tr>
<tr>
<td>2120</td>
<td>X</td>
<td>X</td>
<td>Halite, clear; trace some polyhalite.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Halite, trace argillaceous material, gray clay.</td>
</tr>
<tr>
<td>2110</td>
<td>X</td>
<td>X</td>
<td>Halite, clear; trace polyhalite.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Halite, some to abundant argillaceous material, reddish-brown clay, reddish-brown clay seam up to 3&quot; thick (1282.4'-1282.5').</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Halite, clear; trace polyhalite in discontinuous layers (+2&quot;) at 2187.5' and 2187.8'.</td>
</tr>
<tr>
<td>2090</td>
<td>X</td>
<td>X</td>
<td>Polyhalite.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Halite, clear; trace argillaceous material and polyhalite; banded halite and polyhalite near upper contact (1290.6'-1290.1').</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Halite, clear; diffuse contact.</td>
</tr>
<tr>
<td>2080</td>
<td>X</td>
<td>X</td>
<td>Polyhalite; in stringers (1298.5'-1298.9', 1299.4'-1299.5') and layers (2&quot;-6&quot;) (1298.9'-1299.4').</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Halite, clear; trace polyhalite.</td>
</tr>
<tr>
<td>2060</td>
<td>X</td>
<td>X</td>
<td>Halite, trace to some polyhalite; several polyhalite layers at 1304.1' (up to -1/4'), 1304.6' (-1/4'), and 1305.1' (2').</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Halite, clear; gradational upper contact.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Halite, trace to some argillaceous material, reddish-brown.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Halite, clear; trace polyhalite.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Polyhalite; some halite.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Halite, argillaceous; or halitic clay, gray.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Halite, clear; polyhalite blebs.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Anhydrite, in bands (+1/2&quot;) at 1324.0', 1324.2', 1324.4'.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Polyhalite; anhydrite in lower 3&quot; (1327.4'-1327.8').</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Halite, clear; trace polyhalite.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Halite, some to abundant polyhalite.</td>
</tr>
<tr>
<td>2070</td>
<td>X</td>
<td>XX</td>
<td>Halite, clear; polyhalite stringers and blebs (1336.6'-1336.6'); distinct polyhalite layers (1/4'-1&quot;) at 1336.9', 1337.1'.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Polyhalite; clear halite layer (+4&quot;) at 1339.0'-1339.3'; underlain by gray clay seam (1/4').</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Halite, clear; trace polyhalite.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>McNutt Pothole Zone.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Halite, trace to some polyhalite.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Halite; some argillaceous material and polyhalite.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Halite; abundant argillaceous material; trace to some polyhalite with large polyhalite blebs.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Halite; some to abundant argillaceous material, reddish-brown, including irregular clay masses and clayey silt.</td>
</tr>
</tbody>
</table>

FIGURE E-1

WASTE HANDLING SHAFT
LITHOLOGIC LOG
SHEET 15 OF 26
<table>
<thead>
<tr>
<th>ELEV. (FT. MSL)</th>
<th>DEPTH (FT.)</th>
<th>STRATIGRAPHIC COLUMN</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1350</td>
<td></td>
<td></td>
<td>As above</td>
</tr>
<tr>
<td>2050</td>
<td>1360</td>
<td></td>
<td>Halite; trace argillaceous material; some polyhalite.</td>
</tr>
<tr>
<td>2040</td>
<td>1370</td>
<td></td>
<td>Polyhalite; trace to some polyhalite, with stringers in upper 4&quot; (1359.6'-1360.0'); trace polyhalite below 1360.0'.</td>
</tr>
<tr>
<td>2030</td>
<td>1380</td>
<td></td>
<td>Halite, clear; trace to some polyhalite in stringers.</td>
</tr>
<tr>
<td>2020</td>
<td>1390</td>
<td></td>
<td>Halite, some argillaceous material, red-brown, stringer and blebs of polyhalite.</td>
</tr>
<tr>
<td>2010</td>
<td>1400</td>
<td></td>
<td>Halite, polyhalitic, with dark gray clay stringers.</td>
</tr>
<tr>
<td>2000</td>
<td>1410</td>
<td>Clay, red-brown, gray, halitic, silty.</td>
<td>Halite; some argillaceous material, trace polyhalite.</td>
</tr>
<tr>
<td>1980</td>
<td>1430</td>
<td>Halite, clear; trace polyhalite; 1&quot;-2&quot; diam. clay blebs; argillaceous and polyhalite layer (1/2&quot;) at 1413.5'.</td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>1440</td>
<td>Polyhalite; clay seam (1/2&quot;-3&quot; thick), gray, with halite stringer underlying.</td>
<td>Halite, clear; trace to some polyhalite.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Polyhalite; irregular (1/4&quot;-3&quot;).</td>
<td>Halite, clear; trace to some polyhalite; at about 1425.5' trade gray clay and polyhalite layers; 1&quot; argillaceous halite layer at 1438.0'.</td>
</tr>
</tbody>
</table>

PREPARED BY R.D. DATE 6/11/82
CHECKED BY ____ DATE ____

FIGURE E-1
WASTE HANDLING SHAFT
LITHOLOGIC LOG
SHEET 16 OF 26
<table>
<thead>
<tr>
<th>ELEV. (FT. WSL)</th>
<th>DEPTH (FT.)</th>
<th>STRATIGRAPHIC COLUMN</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1440</td>
<td></td>
<td>X</td>
<td>As above Halite, clear; trace to some polyhalite; polyhalite layers at 1444.3'-1445.0' and 1442.2'-1442.4', locally bifurcated and pinch and swell. Polyhalite. Halite, argillaceous, red brown. Halite, clear; some polyhalite.</td>
</tr>
<tr>
<td>1960</td>
<td>-1450</td>
<td>-</td>
<td>Halite, argillaceous; argillaceous content decreases to base.</td>
</tr>
<tr>
<td>1950</td>
<td>1460</td>
<td>X</td>
<td>Halite, clear; trace to some polyhalite, slightly argillaceous. Halite, clear; some polyhalite.</td>
</tr>
<tr>
<td>1940</td>
<td>1470</td>
<td>X</td>
<td>Halite, clear; trace to some polyhalite.</td>
</tr>
<tr>
<td>1930</td>
<td>1480</td>
<td>-</td>
<td>Polyhalite; undulatory upper contact (&gt; 6'' relief); clay, gray, underlying (&lt;2''). Halite, clear to white; trace to some polyhalite. Polyhalite. Halite, clear; trace polyhalite. Halite, argillaceous, reddish-brown. Halite, grey, locally argillaceous. Halite, argillaceous, reddish-brown. Halite, locally argillaceous. Halite, argillaceous; argillaceous content decreases to base.</td>
</tr>
<tr>
<td>1920</td>
<td>1490</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>1910</td>
<td>1500</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>1900</td>
<td>1510</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>1890</td>
<td>1520</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>1880</td>
<td>1530</td>
<td>-</td>
<td></td>
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FIGURE E-1

WASTE HANDLING SHAFT
LITHOLOGIC LOG
SHEET 17 OF 26
<table>
<thead>
<tr>
<th>ELEV. (FT.MSL)</th>
<th>DEPTH (FT.)</th>
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<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1530</td>
<td>x</td>
<td>Polyhalite blebs within 6&quot; above contact. Polyhalite; with localized halite lenses.</td>
</tr>
<tr>
<td></td>
<td>1870-1540</td>
<td>x x x x</td>
<td>Anhydrite, gray, abundant polyhalite; several horizontal fractures (?) ; clay-filled lenses parallel bedding plane (i 1/2&quot;) ; halite-filled vertical fractures at 1537.3 and 1538.0; clay seam (1/2&quot;), gray, underlying; undulatory lower contact, I relief.</td>
</tr>
<tr>
<td></td>
<td>1860-1550</td>
<td>x x x x x</td>
<td>Halite, trace to some (10-25%) polyhalite.</td>
</tr>
<tr>
<td></td>
<td>1850-1560</td>
<td>x x x x x x</td>
<td>Halite, some (-10%) argillaceous material, gray. Halite, trace to some polyhalite. Halite, trace to some polyhalite. As above; trace gray clay. As above; no clay.</td>
</tr>
<tr>
<td></td>
<td>1840-1570</td>
<td>x x x x x x x</td>
<td>Clay, gray seam (3); halite. Halite, argillaceous, some polyhalite; local masses of clear halite. Halite; some polyhalite. Halite; slightly argillaceous; some polyhalite.</td>
</tr>
<tr>
<td></td>
<td>1830-1580</td>
<td>x x x x</td>
<td>Halite; argillaceous zones parallel to bedding.</td>
</tr>
<tr>
<td></td>
<td>1820-1590</td>
<td>x x x x</td>
<td>Halite, clear to white; trace polyhalite; locally argillaceous.</td>
</tr>
<tr>
<td></td>
<td>1810-1600</td>
<td>x x x x</td>
<td>Anhydrite and halite, banded; 1&quot;-3&quot; anhydrite bands.</td>
</tr>
<tr>
<td></td>
<td>1800-1610</td>
<td>x x x x</td>
<td>Anhydrite, gray, hard.</td>
</tr>
</tbody>
</table>

FIGURE E-1
WASTE HANDLING SHAFT LITHOLOGIC LOG SHEET 18 OF 26
<table>
<thead>
<tr>
<th>ELEV.</th>
<th>STRATIGRAPHIC COLUMN</th>
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<tbody>
<tr>
<td>(FT. MSL)</td>
<td></td>
<td>As above</td>
</tr>
<tr>
<td>1620</td>
<td>Polyhalite, underlain by 1&quot; gray clay seam.</td>
<td></td>
</tr>
<tr>
<td>1780</td>
<td>Halite; clear; trace polyhalite.</td>
<td></td>
</tr>
<tr>
<td>1630</td>
<td>Anhydrite, gray, finely crystalline; clay partings and seams, gray at /635.6-1/4&quot;, /635.0-1/636.7&quot; (with anhydrite and polyhalite stringer and bands), /637.3-1/637.4&quot; (soft); polyhalite at /636.7-1/637.6&quot;.</td>
<td></td>
</tr>
<tr>
<td>1770</td>
<td>Halite; trace polyhalite; polyhalite sand, 1639.9; clay seam, gray, at /643.0&quot;.</td>
<td></td>
</tr>
<tr>
<td>1640</td>
<td>Halite; clear; polyhalite increases to trace amounts below 1646.1&quot;; clay parting, gray, discontinuous, and blebs (1/8&quot;-1/4&quot;) at 1650.1&quot;.</td>
<td></td>
</tr>
<tr>
<td>1760</td>
<td>Halite, clear; argillaceous (1650.1&quot;-1650.5&quot;); trace polyhalite and argillaceous material (1650.5&quot;-1651.9&quot;) ; argillaceous, with gray clay blebs (1651.9&quot;-1652.1&quot;.</td>
<td></td>
</tr>
<tr>
<td>1650</td>
<td>Halite, clear; trace to some polyhalite; polyhalite increases downward to 1675.1&quot; before increasing at 1678.1&quot;; possible clay zones between 1652.1&quot;-1675.1&quot;.</td>
<td></td>
</tr>
<tr>
<td>1750</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1660</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1740</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1670</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1730</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1680</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1720</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1690</td>
<td>Halite, argillaceous; trace polyhalite; clay blebs, gray, upper 1&quot;; red-brown clay blebs below; contacts uncertain.</td>
<td></td>
</tr>
<tr>
<td>1700</td>
<td>Halite; clear; trace to some polyhalite.</td>
<td></td>
</tr>
<tr>
<td>1690</td>
<td>Halite, with red-brown clay blebs; (?) clay seam (1/4&quot;-1/2&quot;) with polyhalite at 1694.8&quot;.</td>
<td></td>
</tr>
<tr>
<td>1710</td>
<td>Halite, clear; trace to some argillaceous material.</td>
<td></td>
</tr>
</tbody>
</table>

FIGURE E-1
WASTE HANDLING SHAFT
LITHOLOGIC LOG
SHEET 19 OF 26
<table>
<thead>
<tr>
<th>ELEV. (FT. MSL)</th>
<th>DEPTH (FT.)</th>
<th>STRATIGRAPHIC COLUMN</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1710</td>
<td>-</td>
<td>- X - - X</td>
<td>As above</td>
</tr>
<tr>
<td>1690 - 1720</td>
<td>-</td>
<td>X - X - X</td>
<td>Halite, coarse (1&quot;) crystalline; abundant (~50%) polyhalite. Polyhalite, halite.</td>
</tr>
<tr>
<td>1680 - 1730</td>
<td>-</td>
<td>X - X - X</td>
<td>Clay seam, gray, (4&quot;); underlain by halite, clear; trace polyhalite in halite. Halite; discontinuous clay stringers and blebs, reddish-brown (1728.7 - 1729.1); trace polyhalite (1729.1 - 1739.1).</td>
</tr>
<tr>
<td>1670 - 1740</td>
<td>-</td>
<td>- X - X</td>
<td>Halite clear. (Shaft walls obscured by ~1/2&quot; crust). Halite, clear; trace polyhalite.</td>
</tr>
<tr>
<td>1660 - 1750</td>
<td>-</td>
<td>X - X - X</td>
<td>Halite; polyhalite stringers Polyhalite, reddish-orange, uniform. Polyhalite, reddish-orange; underlain by clay seam (1/16&quot; - 1&quot;). Halite, clear; trace polyhalite.</td>
</tr>
<tr>
<td>1650 - 1760</td>
<td>-</td>
<td>X - X - X</td>
<td>Halite, clear; polyhalite in bands (1/8&quot; - 2&quot;). Polyhalite, pale orange to reddish-brown, aphydritic; halite layers at 1765.4 - 1765.6 (thinning to 1/2&quot;), 1766.0 - 1766.1. Halite, clear; trace polyhalite.</td>
</tr>
<tr>
<td>1640 - 1770</td>
<td>-</td>
<td>- X - X</td>
<td>Halite, argillaceous. Halite, polyhalite.</td>
</tr>
<tr>
<td>1630 - 1780</td>
<td>-</td>
<td>- X - X</td>
<td>Polyhalite, reddish-orange; 1&quot; gray clay seam at lower contact. Halite, clear; trace polyhalite and argillaceous material.</td>
</tr>
<tr>
<td>1620 - 1790</td>
<td>-</td>
<td>X - X - X</td>
<td>Halite, clear; trace polyhalite and argillaceous material.</td>
</tr>
<tr>
<td>1610 - 1800</td>
<td>-</td>
<td>- X - X</td>
<td>Halite, clear; trace polyhalite and argillaceous material.</td>
</tr>
<tr>
<td>ELEV. (FT. MSL)</td>
<td>DEPTH (FT.)</td>
<td>STRATIGRAPHIC COLUMN</td>
<td>REMARKS</td>
</tr>
<tr>
<td>----------------</td>
<td>-------------</td>
<td>----------------------</td>
<td>---------</td>
</tr>
<tr>
<td>1800</td>
<td></td>
<td>X</td>
<td>Halite, clear; grading downward to polyhalite halite; polyhalite layer 1801.6-1801.7; halite clear; trace polyhalite (1801.7-1802.1), underlain by gray clay seam (1802.1-1802.3).</td>
</tr>
<tr>
<td>1600-1810</td>
<td></td>
<td>X X X X X X</td>
<td>Halite, clear; trace to some polyhalite.</td>
</tr>
<tr>
<td>1590-1820</td>
<td></td>
<td>X X X X X X X X X X X</td>
<td>Halite, clear; coarsely crystalline; stringers or blebs of polyhalite.</td>
</tr>
<tr>
<td>1580-1830</td>
<td></td>
<td>X X X X X X X X X X X</td>
<td>Halite, clear; gray clay stringers.</td>
</tr>
<tr>
<td>1570-1840</td>
<td></td>
<td>X X X X X X X X X X X</td>
<td>Polyhalite; reddish-orange.</td>
</tr>
<tr>
<td>1560-1850</td>
<td></td>
<td>X X X X X X X X X X X</td>
<td>Halite; trace polyhalite; gray clay seam (~2&quot;) at 1852.2&quot;, contains halite crystals, grading downward to argillaceous halite.</td>
</tr>
<tr>
<td>1550-1860</td>
<td></td>
<td>X X X X X X X X X X X</td>
<td>Halite, clear; trace polyhalite.</td>
</tr>
<tr>
<td>1540-1870</td>
<td></td>
<td>X X X X X X X X X X X</td>
<td>Halite, clear; trace to some polyhalite in stringers.</td>
</tr>
<tr>
<td>1530-1880</td>
<td></td>
<td>X X X X X X X X X X X</td>
<td>Halite, clear; polyhalite bands, pale orange to light orange.</td>
</tr>
<tr>
<td>1520-1890</td>
<td></td>
<td>X X X X X X X X X X X</td>
<td>Clay, gray, very stiff, with halite crystals.</td>
</tr>
<tr>
<td>1510-1890</td>
<td></td>
<td>X X X X X X X X X X X</td>
<td>Halite; abundant argillaceous material; trace polyhalite.</td>
</tr>
<tr>
<td>1500-1890</td>
<td></td>
<td>X X X X X X X X X X X</td>
<td>Polyhalite; clear halite above and below polyhalite.</td>
</tr>
<tr>
<td>1490-1890</td>
<td></td>
<td>X X X X X X X X X X X</td>
<td>Halite, clear, slightly argillaceous.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>X X X X X X X X X X X</td>
<td>Halite, clear; trace polyhalite.</td>
</tr>
</tbody>
</table>

FIGURE E-1
WASTE HANDLING SHAFT
LITHOLOGIC LOG
SHEET 21 OF 26
<table>
<thead>
<tr>
<th>ELEV. (FT. MSL)</th>
<th>DEPTH (FT.)</th>
<th>STRATIGRAPHIC COLUMN</th>
<th>REMARKS</th>
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<tbody>
<tr>
<td>1890</td>
<td></td>
<td>X</td>
<td>As above</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-X - X - X - X</td>
<td>Polyhalite; slightly undulatory lower contact; with clay seam (1/4&quot;-1/2&quot;) at base.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-X - X - X - X</td>
<td>Halite, clear; trace polyhalite.</td>
</tr>
<tr>
<td>1490</td>
<td></td>
<td>X</td>
<td>Halite, clear; polyhalite increasing downward.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>XXXXXXXXXXXXXXX</td>
<td>Halite, polyhalitic halite, and polyhalite in alternating bands.</td>
</tr>
<tr>
<td>1920</td>
<td></td>
<td>-X - X - X - X</td>
<td>Polyhalite; reddish-orange, with discontinuous halite layers at 1920.3&quot;-1920.4&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>X</td>
<td>Anhydrite, gray, finely crystalline; trace polyhalite; underlain by gray clay and reddish-orange polyhalite layer (1921.4&quot;-1921.6&quot;)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>X</td>
<td>Halite; some polyhalite; slightly argillaceous.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>X</td>
<td>Halite; argillaceous; some polyhalite.</td>
</tr>
<tr>
<td>1460</td>
<td></td>
<td>? - ? - X</td>
<td>Halite; argillaceous (gray); slightly polyhalitic.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>X</td>
<td>Halite; argillaceous (gray), content decreases to base.</td>
</tr>
<tr>
<td>1950</td>
<td></td>
<td>X</td>
<td>Polyhalite.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>X</td>
<td>Anhydrite; light orange to gray, polyhalitic; grades downward to gray, with trace polyhalite.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>X</td>
<td>Halite, clear.</td>
</tr>
<tr>
<td>1450</td>
<td></td>
<td>X</td>
<td>Anhydrite, gray, hard.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>X</td>
<td>Clay, gray (C.I), hard.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>X</td>
<td>Halite, argillaceous in bands and stringers.</td>
</tr>
<tr>
<td>1430</td>
<td></td>
<td>X</td>
<td>Halite, clear; trace polyhalite; at lower contact becomes polyhalitic and anhydritic.</td>
</tr>
<tr>
<td>1980</td>
<td></td>
<td>X</td>
<td>Anhydrite, gray, hard; weathered anhydrite or anhydritic clay (4&quot;) at lower contact.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>X</td>
<td>Halite; locally argillaceous in bands, content decreases to base.</td>
</tr>
</tbody>
</table>

PREPARED BY R MH DATE 6/24/84
CHECKED BY DATE

FIGURE E-1
WASTE HANDLING SHAFT
LITHOLOGIC LOG
SHEET 22 OF 26
<table>
<thead>
<tr>
<th>ELEV. (FT. MSL)</th>
<th>DEPTH (FT.)</th>
<th>STRATIGRAPHIC COLUMN</th>
<th>REMARKS</th>
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<tr>
<td>1980</td>
<td></td>
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<td>As above</td>
</tr>
<tr>
<td>1420</td>
<td>1990</td>
<td>Halite, clear to white; local argillaceous stringers.</td>
<td></td>
</tr>
<tr>
<td>1410</td>
<td>2000</td>
<td>Halite, anhydritic; alternating beds. Anhydrite, gray, hard; slightly undulatory lower contact; underlain by clay parting (-1/8&quot;)</td>
<td></td>
</tr>
<tr>
<td>1400</td>
<td>2010</td>
<td>Halite, clear to white, argillaceous in stringers and bands; some polyhalite near the base.</td>
<td></td>
</tr>
<tr>
<td>1390</td>
<td>2020</td>
<td>Halite, clear, trace of gray argillaceous stringers becoming more argillaceous toward the base.</td>
<td></td>
</tr>
<tr>
<td>1380</td>
<td>2030</td>
<td>Halite, polyhalite; uncertain contact. Anhydrite, gray, hard; undulatory upper contact.</td>
<td></td>
</tr>
<tr>
<td>1370</td>
<td>2040</td>
<td>Polyhalitic anhydrite, fine crystalline. Anhydrite, gray, fine crystalline; clay seam, gray, at 2045.1'-2045.3</td>
<td></td>
</tr>
<tr>
<td>1360</td>
<td>2050</td>
<td>Halite, clear; trace to some polyhalite; locally argillaceous in stringers.</td>
<td></td>
</tr>
<tr>
<td>1350</td>
<td>2060</td>
<td>Halite, clear</td>
<td></td>
</tr>
<tr>
<td>1340</td>
<td>2070</td>
<td>Halite, clear; trace argillaceous material; trace polyhalite.</td>
<td></td>
</tr>
</tbody>
</table>
PRELIMINARY

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<tr>
<td>2070</td>
<td></td>
<td>- -</td>
<td>As above</td>
</tr>
<tr>
<td>1330 - 2080</td>
<td></td>
<td>X X X X</td>
<td>Halite, clear; some polyhalite.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>X - X</td>
<td>Anhydrite, halite, gray, finely crystalline; 2&quot; thick; both contacts undulatory.</td>
</tr>
<tr>
<td>1320 - 2090</td>
<td></td>
<td>X X X</td>
<td>Halite, clear; some polyhalite; slightly argillaceous.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>X X X</td>
<td>Halite, white to clear, coarse crystalline; some polyhalite; argillaceous at top.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- - - -</td>
<td>Halite, argillaceous; trace polyhalite; clear halite occurs in pods; argillaceous content decreases toward the base.</td>
</tr>
<tr>
<td>1300 - 2100</td>
<td></td>
<td>- - - -</td>
<td>Halite, clear; trace polyhalite.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- - - -</td>
<td>Anhydrite, very light gray, hard, dense; gray and brown clay at 2100.1' - 2100.2'.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- - - -</td>
<td>Halite, argillaceous, medium soft to medium hard.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- - - -</td>
<td>Halite, clear; trace to some argillaceous material.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- - - -</td>
<td>Halite, clear.</td>
</tr>
<tr>
<td>1290 - 2120</td>
<td></td>
<td>- - - -</td>
<td>Halite, clear; some polyhalite; anhydrite layer (1/2&quot;) at 2120.1'.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- - - -</td>
<td>Anhydrite, light gray, hard, dense; underlain by clay seam (1/4&quot;).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- - - -</td>
<td>Halite, argillaceous; trace polyhalite.</td>
</tr>
<tr>
<td>1270 - 2140</td>
<td></td>
<td>- - - -</td>
<td>Halite, clear; polyhalite increases downward to trace amounts; argillaceous material increases downward to trace to some; anhydrite layer (1/4&quot;) at 2140.4'; anhydrite, light gray, dense, hard (2140.6' - 2140.8'); underlain by clay parting (1/8&quot; - 1/4&quot;).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- - - -</td>
<td>Halite; trace polyhalite.</td>
</tr>
<tr>
<td>1260 - 2150</td>
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<td>- - - -</td>
<td>End of reconnaissance mapping.</td>
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<tr>
<td>1250 - 2160</td>
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FACILITY LEVEL (See Figure E-6)
<table>
<thead>
<tr>
<th>ELEV. (FT. MSL)</th>
<th>DEPTH (FT.)</th>
<th>STRATIGRAPHIC COLUMN</th>
<th>REMARKS</th>
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<tbody>
<tr>
<td>2160</td>
<td>As above</td>
<td></td>
<td></td>
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</table>

- **Start of sump mapping.**
- **Hoitite, white to reddish orange, coarse to very coarsely crystalline, polyhalitic; undulatory basal contact.**
- **Anhydrite, with polyhalite, medium gray to very light pink, finely crystalline to sugary texture; thinly laminated to banded (horizontal to subhorizontal); anhydrite color banded white to medium gray in lower 2; basal 4' is dark gray claystone; basal contact undulates 4'-5', wavelength 3'.'
- **Hoitite, white to clear with thin seams or gray clay/anhydrite and irregular seams to clots of orange polyhalitic hoitite, medium to coarse crystalline, structureless; polyhalite and clay/anhydrite seams content decreases toward base; basal contact gradational.**
- **Hoitite, light pink to orange, medium to coarsely crystalline, polyhalitic; thin (1'-1.5') polyhalite seam at base, polyhalite dark orange and contains large hoitite crystals; 1.5 wide shallow dissolution pit at base; basal contact sharp.**
- **Hoitite, white to light gray with local orange areas, coarse to very coarse crystalline, faintly banded to structureless; irregular gray clay seams at top and through-out; basal contact gradational.**
- **Hoitite, with some clay/anhydrite; orange to white near top, orange and medium brown near base, coarse to very coarse crystalline, faint banded, polyhalitic; clay/anhydrite becomes more abundant near base, basal contact irregular (2'-5' vertical variations) and gradational.**
- **Hoitite, white to orange with some clear hoitite masses, coarse to very coarse crystalline, broadly banded (2'-4'), trace polyhalite; contact irregular, diffuse over 2' and diffuse near the top.**
- **Hoitite, orange to white with clear irregular masses, coarse to very coarse crystalline, trace polyhalite; crudely banded; poorly defined subhorizontal bedding; basal contact based on color and is gradational.**
- **Hoitite, white to slightly pink, medium to coarsely crystalline, trace polyhalite; gray 2'-4' anhydrite bed with underlying gray clay seam (1/8') near top; 3'-5' deep, 8'-16' wide dissolution pit into the underlying unit occurs at the basal contact; over dissolution pit, anhydrite bed is downwarped 4'-6'; basal contact gradational.**
- **Hoitite, anhydritic and argillaceous; light gray with white and clear zones, crudely banded; becomes less anhydritic and argillaceous with depth; basal contact gradational.**
- **Hoitite, white to light brown, finely to medium crystalline, sugary texture; contains 1/8' beds of anhydrite spaced 2'-4', content decreases toward the base; basal contact gradational.**
- **Hoitite, white to very light orange, medium to coarse crystalline, structureless, sugary texture; basal contact gradational.**
- **Hoitite, orange to white, finely to medium crystalline at top grades to medium clay at base, indistinct banded, polyhalitic; horizontal to subhorizontal light gray bands of anhydrite near top; lower 20'-40' contains masses of coarse crystalline hoitite; polyhalite content increases toward base; basal contact sharp.**
- **Anhydrite, gray, very finely crystalline, crudely banded at top, finely banded at base.**
- **Polyhalite, pink, structureless at top grading to crudely banded at base.**
- **Clay/anhydrite, gray; basal contact sharp.**
- **Hoitite, white to light orange, medium to coarse crystalline; basal contact slightly irregular; sharp.**
- **Anhydrite, very dark browish-gray with thin layers (1'/5'-2'/5') of light gray to white, microlaminated to thinly banded; occasionally, white bands are closely spaced and lenticular; 1'-6' thick bed of gray clay occurs at base; basal contact irregular (erosional?), sharp.**
- **Hoitite, white to slightly pink; upper 12'-16' contains gray clay-rich anhydrite in large clots (8'-12' diameter), smaller clots (2'-5' diameter), and in thin interbeds; remainder is hoitite, medium to coarse crystalline, weakly banded; lower 1'-2' is reddish brown, coarse clay; basal contact sharp, undulatory (2'-4'), slightly periodic (3'-6'), and truncates bedding in underlying unit.**
- **Hoitite, argillaceous/anhydritic in upper part, lower 20' polyhalitic; thin to medium banded in upper part; bedding truncated at upper contact.**

**FIGURE E-1**

**WASTE HANDLING SHAFT**

**LITHOLOGIC LOG**

**SHEET 25 OF 26**

**PREPARED BY**

**DATE** 2/23/06

**CHECKED BY**

**DATE**
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<tr>
<th>ELEV. (FT. MSL)</th>
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<tr>
<td>1120</td>
<td>2290</td>
<td>XXXXXXXXXX</td>
<td>Halite, similar to above. Bottom of waste shaft sump.</td>
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<tr>
<td>1130</td>
<td>2280</td>
<td>XXXXXXXX</td>
<td>Halite, similar to above.</td>
</tr>
<tr>
<td>1140</td>
<td>2270</td>
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<td>Anhydrite, with some polyhalite, gray to orange; occasionally continuous with overlying polyhalite, very thin gray clay bed at base; basal contact slightly undulatory (4&quot;) sharp.</td>
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<tr>
<td>1150</td>
<td>2260</td>
<td>XXXXXXXX</td>
<td>Halite, light orange to orange to light brown, coarsely to very coarsely crystalline; discontinuous 1'-2' subhorizontal polyhalite layers at and near base; basal contact slightly irregular, sharp.</td>
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<tr>
<td>1160</td>
<td>2250</td>
<td>XXXXXXXXXX</td>
<td>Halite, white to very light orange with discontinuous orange bedding; trace polyhalite; basal contact undulatory (8&quot;) and gradational.</td>
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<tr>
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<td></td>
<td><strong>As above</strong></td>
<td>Halite, argillaceous and anhydritic, orange to reddish-brown; medium to coarsely crystalline, bedded; upper 1&quot;-6&quot; reddish-brown to gray halitic claystone; basal contact gradational.</td>
</tr>
</tbody>
</table>

FIGURE E-1

PREPARED BY: [Redacted] DATE: 9/3/74
CHECKED BY: [Redacted] DATE: 

WASTE HANDLING SHAFT LITHOLOGIC LOG
SHEET 26 OF 26
**LEGEND**

- CONTACT
- GRADATIONAL CONTACT (DEFINED WITHIN 2")
- DIFFUSE CONTACT (DEFINED WITHIN 6")
- INDEFINITE OR INFERRED CONTACT
- CLAY PARTING (TO 1/4" THICK)
- CLAY SEAM (1/4" THICK)

**FRACTURE NOTES**

- **f1** Open.
- **f2** Open.
- **f3** Gypsum filled near the north extent, open (1/2") or accompanied by gypsum dissolution on west wall.
- **f4** Open (1/32")
- **f5** Open (1/32") gypsum filled at depth appears to offset laminae in dolomite.
- **f6** Open (1/32") near upper terminus; filled near 604'; open (1/16"-1/2") toward lower terminus; composed of several small fractures.
- **f7** Open (1/16").
- **f8** Fracture connects vuggy or leached zone to the west.
- **f9** Open (up to 1/4"), some gypsum fill has been leached.
- **f10** As f9
- **f11** Open (1/16"), small amount of gypsum fill.

**OTHER NOTES**

- **O1** Iron oxide (red) stain.
- **O2** Large dolomite clast embedded in laminated dolomite; laminae distorted downward around clast.
- **O3** Solution feature in underlying Rustler Formation (anhydrite)

**REFERENCE:**

Geotechnical Field Data Report
No. 4, 1963, Geologic Mapping &
Water Inflow Testing in SPDV
Ventilation Shaft.

Figure E-2
WASTE SHAFT
MAGENTA DOLOMITE
597 TO 620 FEET
Anhydrite, gray, banded, sandy or silty, calcareous, laminated, with laminae finer downward; near lower contact, laminae are distorted.

Clay, black seam (1"), soft where exposed, stiff to hard, dry inside shaft wall

Dolomite, light gray, hard, fine-grained, vuggy; clay, black-gray parting (1/16") at 709.0', dipping slightly north; large vugs (1'-2' deep) in 1'-2' zone at 712.0'; series of clay laminae, black, dip slightly to north at -714.5'-714.8'.

REFERENCE:

FRAC TURE NOTES

\( f_1 \) Closed, tight, clay fill.

\( f_2 \) Closed, tight.

\( f_3 \) Series of short, hairline fractures; at 718.0' hairline fracture density increases.

\( f_4 \) Open, up to 1/8", filled with soft erodible material (clay?).

\( f_5 \) Sparry calcite or dolomite, may be fracture fill.

LEGEND

--- CONTACT
---- GRADATIONAL CONTACT (DEFINED WITHIN 2")
-------- DIFFUSE CONTACT (DEFINED WITHIN 6")
---- ?-- INDEFINITE OR INFERRED CONTACT
---- CLAY PARTING (TO 1/4" THICK)
---- CLAY SEAM (>1/4" THICK)

Figure E-3
WASTE SHAFT
CULEBRA DOLOMITE
705 TO 727 FEET
Heat rock is dark reddish-brown mudstone.

**FRACUTURE NOTES**

1. Open (1/4"-1").
2. Open (1/4"-2").
3. Open (1/4"-1").
4. Open.
5. Open (1/4").
6. Open (1"), 1/2" deep into shaft wall.
7. Open (1/4").
8. Open (1/2").
9. Open (1/8"-1"), polyhalite halite fill.
10. Open (1/8").
11. Open (1/16") to closed.
12. Open (2"), polyhalite and halite fill actively dissolving.
14. Open (1/2"-2 1/2"), up to 1 deep in shaft wall.
15. Open (1"), polyhalite fill.
16. Open (1/16").
17. Open (1/4"-3/4"), halite fill remnants.
18. Open (1/4") to closed.
19. Open (1/4") to closed.
20. Open (1/4"-1"), halite fill remnants; curved fracture strikes S50E to S25E.
21. Open (1/4") to closed.
22. Closed; below 830", open (1/8"-1/4"), probable halite fill.
23. Fracture plane roughly parallel shaft wall, strike N80E.
24. Closed.

**REFERENCE:**

GEOTECHNICAL FIELD DATA REPORT
NO. 4, 1983, GEOLoGIC MAPPING AND WATER INFLOW TESTING IN SPV VENTILATION SHAFT.

**Figure E-4**

WASTE SHAFT
RUSTLER FORMATION FRACTURE ZONE
779 TO 843 FEET
EXPLANATION

1. Mudstone, light gray to reddish-brown, silty.
2. Mudstone, dark reddish-brown, silty (clay siltstone), 3"-6" thick; finer-grained than 1; minor deformations due perhaps to dissolution below.
3. Mudstone or siltstone, banded dark and light gray, silty, fine sand.
4. Mudstone or siltstone, reddish-brown, fine-grained, softer than 3.
5. Anhydrite, light gray, bands (1/8"-1/2") in an "X" thick zone in unit 4.
6. Dissolution residue, granular, soft, loose material, dark reddish-brown.
7. Polyhalite, moderate reddish-orange, pinch and swell (0.5-5"), locally underlain by dissolution residue.
8. Halite, light reddish-brown to reddish-orange, polyhalite disseminated in upper 1', locally rich polyhalite pockets, trace disseminated elsewhere, polyhalite-rich at lower 1'; argillaceous material on surface residue (dolay).
9. Clayey mudstone or silt claystone, dark reddish-brown, 0-1/2" thick.
10. Halite, dark reddish-brown, some argillaceous material.
11. Halite, light reddish-brown to clear, trace polyhalite, argillaceous in upper 1-1/4.
12. Anhydrite and polyhalite, light gray to light reddish-orange, fine granular, 6" thick, underlain by seam (1"-2") of clay, dark reddish-brown, soft.
13. Halite, dark to moderate reddish-brown, some polyhalite and argillaceous material.
14. Halite, clear to light reddish-brown, banded; trace polyhalite, in stringers and bands (3'-6').
15. Siltstone or mudstone, gray-green, sandy, anhydrite blebs, variable thickness (1/8'-1').
16. Halite, reddish-brown, argillaceous, clay residuum on shaft wall.
17. Halite, polyhalite; indistinct bedding; polyhalite veins along crystal boundaries; polyhalite content increases downward.
18. Halite, argillaceous material, reddish-brown, clay residuum on shaft surface.
19. Halite; trace polyhalite; trace argillaceous material; irregular upper contact.
20. Mudstone, reddish-brown, gray-green motling with higher silt content; soft where weathered.
23. Halite, reddish-brown, argillaceous; clay residuum on shaft surface.
24. As above; transition to lower argillaceous content.

FRACTURE NOTES

1/1 Open (up to 1/4") to closed; ends with depth.
2/1 Open (up to 1/16") to closed; nearby vertical fractures are general closed and discontinuous.
3/1 Strike = N 45°E; halite fill, 1/2" wide, increases downward to 1/2" to 2".
4/1 Strike = N 30°E.
5/1 Strike N 60°E, uncertain upward extent.

REFERENCE:

GEOTECHNICAL FIELD DATA REPORT
NO. 4, 1983, GEOLOGIC MAPPING AND WATER INFLOW TESTING IN SPY VENTILATION SHAFT

Figure E-5
WASTE SHAFT
RUSTLER/SALADO FORMATION CONTACT
840 TO 930 FEET

SHEET 1 OF 2
EXPLANATION

25 Halite, argillaceous content higher than 24.
26 Halite, some argillaceous material.
27 Halite, clear, trace polyhalite and argillaceous material, transition from 26.
28 Silt, gray-green, clayey, silt.
29 Halite, some to abundant argillaceous material; clayey residuum on shaft surface.
30 Halite, clear.
31 Halite, polyhalite.
32 Halite, clear.
33 Halite, polyhalite, argillaceous.
34 Halite, clear.
35 Clay, gray thin seam (~1/8"
36 Halite, polyhalite, argillaceous.
37 Clay, gray and reddish-brown seam (0.1"-0.3"
38 Mudstone, halite and/or very argillaceous halite; stiff clay, halite crystals up to 1.
39 Clay, gray and reddish-brown seam (0.1"-0.3"
40 Halite, some argillaceous material.
41 Clay, gray and reddish-brown, and polyhalite, reddish-orange seam (1/8"-1/2"), soft.
42 Polyhalite, pale orange, underlain by anhydrite, grey, dense, 1/4".
43 Halite, polyhalite, thinly interbedded.
44 Halite, clear, trace polyhalite.
45 Clay parting, grey.
46 Halite, abundant argillaceous material, reddish-brown with grey streaks, gradational to halitic mudstone; halite crystals up to 1/2.
47 Halite, some to abundant argillaceous material.
48 Clay, reddish-brown, few grey blebs; inclusion in 47, disseminated halite.

LEGEND

CONTACT

GRADATIONAL CONTACT (DEFINED WITHIN 2")

DIFFUSE CONTACT (DEFINED WITHIN 6")

INDIFFERENT OR INFERRED CONTACT

CLAY SEAM (>1/4" THICK)

CONTACT

FIGURE E-5

WASTE SHAFT

RUSTLER/SALADO FORMATION CONTACT

840 TO 930 FEET

Sheet 2 of 2
Halite, clear; trace to some polyhalite in small beds and stringers; trace argillaceous stringers.

Halite; some argillaceous material.

Halite, clear; trace polyhalite increasing downward to some.

Halite; polyhalitic anhydrite band (1/8"-1/4") at 2105.8.

Halite, clear; trace polyhalite; anhydrite band, gray to white, at 2106.4.

Halite; trace polyhalite; some anhydrite stringers.

Anhydrite, gray; brown clay parting (1/4") at 2107.9.

Halite, argillaceous to 2108.3; argillaceous material decreases to some below 2108.3.

Halite, clear; trace argillaceous material.

Halite, clear; clay seam, brown at 2115.5-2116.0.

Halite, some argillaceous material.

Halite, clear; anhydrite band (1/4"-1/2") at 2120.0.

Halite, clear; two anhydrite bands (1/4"-1/2" at 2121.1-2121.4), underlain by brown clay seam (1/2").

Halite; trace argillaceous material and occasional gray clay beds; trace polyhalite.

Halite, clear; some argillaceous material; some polyhalite.

---

**LEGEND**

- CONTACT
- GRADATIONAL CONTACT (DEFINED WITHIN 2")
- Diffuse Contact (Defined Within 6")
- ? INDEFINITE OR INFERRED CONTACT
- Clay Parting (1/4" to 1/16" THICK)

---

**REFERENCE:**

GEOTECHNICAL FIELD DATA REPORT
NO. 4, 1983, GEOLOGIC MAPPING AND WATER INFLOW TESTING IN SPDV VENTILATION SHAFT.

**Figure E-6**

WASTE SHAFT

FACILITY LEVEL AREA

2100 TO 2170 FEET

SHEET 1 OF 2
Anhydrite seams (1/4") at 2130.3' and 2130.6'; thin (1/8") clay seams underlie each.

Anhydrite "a", gray, hard, dense; polyhalite seam (1/4") at upper contact; clay parting (1/8" - 1/4") at lower seam.

Halite, clear; trace polyhalite; trace argillaceous material and a few clay blebs.

Several anhydrite and clay partings (1/8").

Anhydrite "b", anhydrite (-t) underlain by gray clay seam (1/2").

Halite, clear; trace argillaceous material.

Halite, clear; trace polyhalite.

Halite; some red-brown argillaceous material.

Halite, clear; trace polyhalite; trace argillaceous material.

Halite; some gray argillaceous material.

Halite, clear; trace disseminated polyhalite.

Halite; clear; trace to some gray clay blebs; increase in clay content in upper 1.

Halite; some polyhalite (5-10%); trace gray clay in blebs.

Halite; some to abundant polyhalite in blebs and interstitially (10 - 30%); trace argillaceous material.

Anhydrite, light gray, banded; abundant polyhalite in upper 6"; underlain by gray clay seam (1/4" - 1/2").

Halite, polyhalitic.

---

<table>
<thead>
<tr>
<th>contact</th>
<th>gradational contact (defined within 2&quot;)</th>
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<tbody>
<tr>
<td>diffuse contact (defined within 6&quot;)</td>
<td>? ? indefinite or inferred contact</td>
</tr>
<tr>
<td>clay parting (to 1/4&quot; thick)</td>
<td>clay seam (&gt;1/4&quot; thick)</td>
</tr>
</tbody>
</table>

---

**Figure E-6**

WASTE SHAFT

FACILITY LEVEL AREA

2100 TO 2170 FEET

SHEET 2 OF 2
APPENDIX F

EXHAUST SHAFT

GEOLOGIC LOG
<table>
<thead>
<tr>
<th>Figure No.</th>
<th>Title/Description</th>
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<tbody>
<tr>
<td>F-1</td>
<td>Exhaust Shaft Geologic Log</td>
</tr>
<tr>
<td></td>
<td>(49 Sheets)</td>
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</table>
EXPLANATION

ROCK TYPE

SAND/SANDSTONE

MUDSTONE/CLAYSTONE

SILTSTONE

HALITE

ANHYDRITE/GYPSUM

POLYHALITE

DOLOMITE

ACCESSORY CONSTITUENTS

ESTIMATED PERCENTAGE OF ACCESSORY CONSTITUENTS INDICATED AS FOLLOWS

TRACE

SCME

ABUNDANT

Argillaceous

Halitic

Anhydritic/Gypsiferous

Polyhalitic

LAMINAR FEATURES

Seam (Between 6" and 1/4" thick)

Parting (Between 1/4" and 1/16" thick)

Clays

Anhydrite/Gypsum Polyhalite

Stringer Zones

CONTACTS

SHARP (Identifiable within 0.05 feet)

GRADATIONAL (Identifiable within 0.05 to 0.2 feet)

DIFFUSE (Identifiable within 0.2 to 0.5 feet)

SALADO MARKER BEDS ARE IDENTIFIED BY NUMBER IN THE STRATIGRAPHIC COLUMN

EXHAUST SHAFT
LITHOLOGIC LOG
SHEET 1 OF 49
<table>
<thead>
<tr>
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<td>COLLAR PAD</td>
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<tr>
<td>3410</td>
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<td></td>
<td>QUATERNARY DUNE SAND. SAND, SILTY, REDDISH-BROWN, POORLY SORTED, SUBANGULAR GRAINS, A FEW MAFIC GRAINS (LESS THAN 10%); WEAKLY CONSOLIDATED.</td>
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<tr>
<td>3409</td>
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<td>NESCALEGRO CALICHE. CALICHE, WHITE TO TAN, MODULAR, SIZE AND QUANTITY OF NODULES INCREASING WITH DEPTH; CARBONATE CONTENT HIGHEST IN LIGHT COLORED SUBHORIZONTAL STRINGERS; UPPER 1.0' HARD, HARDNESS DECREASING TOWARD BASE; MOIST; CONTAINS LOCAL CONCENTRATIONS OF SILTSTONE AND SANDSTONE; COLOR BECOMES REDDISH-BROWN TOWARD BASE; IRREGULARLY-SHAPED DISCONTINUOUS BEDS OF SILTSTONE, CHERT AND SANDSTONE PEBBLE CONGLOMERATE MIGRATE VERTICALLY AND LATERALLY; THICK DISCONTINUOUS BEDS OF ORANGISH-BROWN SAND OCCUR NEAR BASE; BASAL CONTACT DIFFUSE.</td>
</tr>
<tr>
<td>3404</td>
<td>5</td>
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<td>CATUNA FORMATION. SANDSTONE, FINE TO VERY FINE GRAINED, REDDISH-BROWN, POORLY SORTED, CALCAREOUS, FRIABLE, DRY; BASAL 1.0' IS SANDSTONE, COARSE TO FINE GRAINED, POORLY SORTED, BOUNDED, CONTAINING ANGULAR DEBRIS FROM UNDERLYING REDBEDS; BASAL CONTACT SHARP, EROSIONAL, SLIGHTLY UNDULATORY.</td>
</tr>
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<td>3394</td>
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<td>SANTA ROSA FORMATION. SILTSTONE AND VERY FINE GRAINED SANDSTONE, SILT TO VERY FINE SAND-SIZED GRAINS, REDDISH-BROWN, CALCAREOUS, POORLY SORTED, CONTAINS PEBBLES OF CHERT AND MAFIC GRAINS; UPPER 1.0' CONTAINS CALICHE IN SUBHORIZONTAL STRINGERS; BASAL CONTACT DIFFUSE.</td>
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<tr>
<td>3324</td>
<td>85</td>
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</tr>
</tbody>
</table>

**DEWEY LAKE REDBEDS**

Mudstone interbedded with argillaceous siltstone, reddish-brown, thinly laminated to thinly bedded (1/8" to 1"), bedding slightly undulatory, hard; sedimentary structures include: small tabular rip-up clasts (<1/4") aligned in thin beds, cross laminations, load structures, filled desiccation cracks; occasional 1-1/2" interbeds of gray siltstone; rare greenish-gray sutured spots (<1/16" diameter); basal contact gradational.
<table>
<thead>
<tr>
<th>PRELIMINARY ELEV. (FT. MSL)</th>
<th>DEPTH (FT.)</th>
<th>STRATIGRAPHIC COLUMN</th>
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<td>3324</td>
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MUDSTONE, REDDISH-BROWN, THINLY LAMINATED TO THINLY BEDDED, HARD; CONTAINS THIN BEDS (1/2" TO 1") OF GRAY SILTY MUDSTONE; FRACHTURES PARALLEL TO BEDDING, SPACED 3'; OCCASIONAL GREENISH-GRAY REDUCTION SPOTS (1/4" TO 1/2" DIAMETER); CONTAINS OCCASIONAL LOAD STRUCTURES; BASAL CONTACT DIFFUSE.

| 3319                        | 90          |                      |         |

SILTY MUDSTONE INTERBEDDED WITH ARGILLACEOUS SILTSTONE, REDDISH-BROWN, THINLY LAMINATED TO THINLY BEDDED (<1/32" TO 2-1/2"); OCCASIONAL GREENISH-GRAY SILTSTONE INTERBEDS; OCCASIONAL LOAD STRUCTURES: SMALL OPEN FRACHTURES PARALLEL TO BEDDING, SPACED 1" TO 2-1/2"; FEW SUBVERTICAL FRACHTURES, SPACED 1' TO 1.5'; BASAL CONTACT DIFFUSE.

| 3309                        | 100         |                      |         |

SANDSTONE, VERY FINE GRAINED, REDDISH-BROWN, THINLY LAMINATED TO CROSS-LAMINATED, HARD TO SOFT, RARE INTERBEDS OF SILTY MUDSTONE (1/2" TO 1" THICK); THIN (<1/32") SUBHORIZONTAL FRACHTURES PARALLEL TO BEDDING, SPACED 3" TO 9"; TWO 1/2" THICK PARALLEL HORIZONTAL FRACHTURES FILLED WITH CARBONATE OCCUR AT 108.0' AND 108.3'; OCCASIONAL GREENISH-GRAY REDUCTION SPOTS; BASAL CONTACT DIFFUSE.

| 3309                        | 105         |                      |         |

SILTY MUDSTONE INTERBEDDED WITH MUDSTONE, REDDISH-BROWN, THINLY LAMINATED TO CROSS-LAMINATED, HARD; RARE GREENISH-GRAY REDUCTION SPOTS (1/16" TO 1/2" DIAMETER); OCCASIONAL 1/4" TO 2" THICK GREENISH-GRAY INTERBEDS; OCCASIONAL SOFT SEDIMENT DEFORMATION FEATURES; HORIZONTAL FRACHTURES PARALLEL TO BEDDING, SPACED 1" TO 4"; BASAL CONTACT SHARP.

| 3309                        | 110         |                      |         |

SILTSTONE, REDDISH-BROWN, THINLY LAMINATED TO CROSS-LAMINATED; OCCASIONAL INTERBEDS OF SILTY MUDSTONE; LOAD STRUCTURES, MUDSTONE RIP-UP CLASTS; MODERATELY ABUNDANT GREENISH-GRAY REDUCTION SPOTS (1/16" TO 1/4" DIAMETER); OCCASIONAL GREENISH-GRAY BEDS (1/2" TO 2" THICK); THIN HORIZONTAL FRACHTURES (<1/32") WITH GYPSUM FILLING BELOW 111.5', SPACED 2' TO 1.5'; BASAL CONTACT SHARP.

| 3309                        | 120         |                      |         |

| 3309                        | 125         |                      |         |

<p>| 3309                        | 130         |                      |         |</p>
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<td>130</td>
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<td>SILTY MUDSTONE, REDDISH-BROWN, THINLY LAMINATED (&lt;1/32&quot;), LOCALLY INTERBEDDED WITH SILTSTONE; CONTAINS CROSS-LAMINATIONS, FILLED DESICCAITION CRACKS; SUBVERTICAL CLAY-FILLED FRACTURES OCCUR NEAR TOP, SPACED 3&quot; TO 4&quot;; LOCALLY, BEDDING MAY BE GREENISH-GRAY IN COLOR; OCCASIONAL GREENISH-GRAY REDUCTION SPOTS (1/16&quot; TO 1&quot; DIAMETER); SUBHORIZONTAL GYPSUM-FILLED FRACTURES; SPACED 3&quot; TO 6&quot;; SUBVERTICAL FRACUTURES SPACED 3&quot; TO 12&quot;; IN LOWER 3', 1/8&quot; TO 1&quot; THICK HORIZONTAL GREENISH-GRAY REDUCTION ZONES OCCUR IN GROUPS, INDIVIDUAL ZONES SPACED 1/2&quot;, GROUPS SPACED 0.8' TO 1.5'; BASAL CONTACT SHARP, MARKED BY 2&quot; BED OF WHITISH-GRAY SILTSTONE WITH A GREENISH-GRAY REDUCTION ZONE ABOVE AND BELOW.</td>
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<td>3269</td>
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<td>MUDSTONE, DARK REDDISH-BROWN, INTERBEDD WITH SILTY MUDSTONE, LIGHT REDDISH-BROWN, THINLY LAMINATED TO BEDDED (1/12&quot; TO 1/2&quot;), LOCALLY POSSIBLE, OCCASIONALLY CROSS-LAMINATED, BEDDING MAY TERMINATE EROSIONALLY, STRUCTURES BECOME LESS FINE BELOW 148.0'; RARE SUBVERTICAL TO HIGH ANGLE FRACUTURES WITH GRANULAR GYPSUM FILLING (&lt;1/8&quot; THICK); FROM 132.5' TO 147.5', ABUNDANT SUBHORIZONTAL FRACUTURES, SPACED 1'; ABUNDANT GREENISH-GRAY REDUCTION SPOTS (1/32&quot; TO 1&quot; DIAMETER); BASAL CONTACT GRADATIONAL.</td>
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<td>3259</td>
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<td>SILTY MUDSTONE, DARK REDDISH-BROWN, INTERBEDD WITH SILTSTONE, REDDISH-BROWN, THINLY LAMINATED TO BEDDED (1/12&quot; TO 1-1/2&quot;), SOFT; OCCASIONALLY CROSS-LAMINATED, CONTAINS LOAD STRUCTURES, OVERALL SEDIMENTARY STRUCTURES ARE LESS FINE THAN OVERLYING UNIT, GRAIN SIZE COARSENS DOWNWARD; 1&quot; TO 2&quot; THICK HORIZONTAL GREENISH-GRAY REDUCED ZONES, SPACED 3&quot; TO 5&quot;; FRACUTURES OCCUR BELOW 154.5', 1/8' THICK, FILLED WITH GYPSUM; SUBVERTICAL FRACUTURES SPACED 2' TO 3', SUBHORIZONTAL FRACUTURES SPACED 0.5' TO 1.5'; BASAL 2' CONTAINS GREENISH-GRAY AND REDDISH-BROWN INTERBEDD MUDSTONE; ABUNDANT GREENISH-GRAY REDUCTION SPOTS (1/32&quot; TO 1&quot; DIAMETER); BASAL CONTACT SHARP.</td>
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<td>SILTSTONE, REDDISH-BROWN, THINLY LAMINATED TO STRUCTURELESS; BEDDING THICKENS AND THINS (1/2&quot; TO 2&quot;); OCCASIONAL GREENISH-GRAY BEDS 1/8&quot; TO 1/2&quot; THICK, SPACED 3.0'; ONLY A FEW HIGH ANGLE FRACUTURES 1/8&quot; THICK, GYPSUM-FILLED, STRIKING 160°; AT 167.5' CHANNEL LAG CONGLOMERATE OCCURS CONTAINING SILTSTONE PBESLES; THINLY LAMINATED SILTY MUDSTONE FROM 170.5' TO 171.3' WITH GREENISH-GRAY REDUCTION ZONES 1&quot; TO 1&quot; THICK, SPACED 4&quot;; NEAR 171.3' BECOMES POORLY SORTED; THINLY LAMINATED WITH CROSS-LAMINATIONS AND EROSIONAL TERMINATIONS NEAR BASE; CONTAINS GREENISH-GRAY REDUCTION SPOTS UP TO 2&quot; DIAMETER; BASAL CONTACT GRADATIONAL.</td>
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3229 - 180

3224 - 185

NODSTONE, REDDISH-BROWN, THINLY LAMINATED TO BEDDED (1/32" TO 1/2" THICK), SOFT; BEDDING INDISTINCT; RARE GREENISH-GRAY REDUCTION SPOTS TO 1" DIAMETER, REDUCTION SPOTS CONCENTRATED AROUND REDUCED, GREENISH-GRAY, 1" WIDE HORIZONTAL BAND AT 191.7', VERY FEW FRACTURES; BASAL 1.5' BECOMES SILTY; BASAL CONTACT SHARP, SLIGHTLY UNDULATORY, OVERLYING BEDS DRAPE OVER CONTACT, EROSIONAL.

3219 - 190

3214 - 195

SANDSTONE, VERY FINE GRAINED, GRAYISH-WHITE, HARD TO SOFT; THROUGH CROSS-BEDDING BECOMES APPARENT NEAR BASE; CONTAINS FIBROUS GYPSUM-FILLED FRACTURES WITH VARIABLE ORIENTATION, 1/4" TO 1" THICK; BASAL CONTACT SHARP.

3209 - 200

3204 - 205

SANDSTONE AT TOP GRADING TO SILTSTONE, REDDISH-MAROON, LAMINATED TO BEDDED. OCCA-
SIONALLY CROSS-LAMINATED, HARD; COLOR BECOMES WHITISH-MAROON TOWARD BASE; LOWER 1.3' IS SANDSTONE, STRUCTURELESS EXCEPT FOR OCCASIONAL INTERBEDS OF REDDISH-BROWN SILTSTONE; ABUNDANT FRACTURES, MOST HORIZONTAL TO SUBHORIZONTAL AND SLIGHTLY UNDULATORY, FILLED WITH FIBROUS GYPSUM, THICKNESS 1/16" TO 2", SPACED 1/8" TO 6": BASAL CONTACT SHARP, SLIGHTLY UNDULATORY.

3199 - 210

3194 - 215

CLAYSTONE, REDDISH-BROWN, THINLY LAMINATED; CROSS-LAMINATED, SETS 1/2" ACROSS, BEDDING EROSIONALLY TERMINATED, CONTAINS SOFT SEDIMENT DEFORMATION FEATURES; 3ICONES SILTY TOWARD BASE; OCCASIONAL GREENISH-GRAY REDUCTION SPOTS TO 1/2" DIAMETER, SPOTS OCCASIONALLY BROKEN BY GYPSUM-FILLED FRACTURES; SEE FIGURE 6 FOR FRACUTURE NOTES; BASAL CONTACT GRADATIONAL.

3189 - 220

MUDSTONE WITH INTERBEDDED SILTSTONE, DARK REDDISH-BROWN, THINLY LAMINATED, ABUNDANT CROSS-LAMINATIONS, BEDDING OFTEN TERMINATED EROSIONALLY; ABUNDANT SUBHORIZONTAL GYPSUM-FILLED FRACTURES, SPACED 6". 1/8" TO 3" THICK; VERTICAL AND SUBVERTICAL FRACTURES RARE; OCCASIONAL GREENISH-GRAY REDUCTION SPOTS; BASAL CONTACT GRADATIONAL.
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<td>SILTSTONE INTERBEDD WITH VERY FINE SANDSTONE, REDDISH-BROWN, THINLY LAMINATED TO BEDDED, CROSS-LAMINATED, BODS OFTEN EROSIONALLY TERMINATED, HARD; CROSS-LAMINATIONS INCREASE BELOW 223.0', HORIZONTAL EROSIONAL PLANE OCCUR BELOW 223.0', SPACED 1.0' TO 2.0'; SUBHORIZONTAL GYPSUM-FILLED FRACURES ABUNDANT, 1/16'' TO 1/4'' THICK; RARE SUBVERTICAL FRACURES; BASAL CONTACT GRADATIONAL.</td>
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<td>SANDSTONE, REDDISH-BROWN, SILTY, THINLY LAMINATED TO BEDDED, OCCASIONALLY CROSS-LAMINATED; ABUNDANT SUBHORIZONTAL GYPSUM-FILLED FRACURES, 1/16'' TO 1'' THICK, SPACED 2'' TO 1.0'', FRACURES BIFURCATE LOCALLY; RARE SUBVERTICAL GYPSUM-FILLED FRACURES; BASAL CONTACT SHARP.</td>
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<td>SANDSTONE, REDDISH-BROWN, SILTY, STRUCTURELESS EXCEPT RARE CROSS-LAMINATIONS AND HORIZONTAL LAMINATIONS; FEWER GYPSUM-FILLED FRACURES THAN OVERLYING UNIT, FRACURES TO 1'' THICK; BASAL CONTACT GRADATIONAL.</td>
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<td>3159</td>
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<td>3154</td>
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<td>SANDSTONE, REDDISH-BROWN, SILT, LOCALLY LAMINATED AND CROSS-LAMINATED; OCCASIONAL SUBHORIZONTAL GYPSUM-FILLED FRACURES, 1/4'' TO 1/2'' THICK, SPACED 2.4' TO 3.4''. FRACURES BIFURCATE LOCALLY; SUBVERTICAL FRACURES RARE; OCCASIONAL GREENISH-GRAY REDUCTION SPOTS TO 1'' DIAMETER; BASAL 1.0' CONSISTS OF REDDISH-BROWN SILTSTONE; BASAL CONTACT GRADATIONAL.</td>
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<td>3144</td>
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<td>3139</td>
<td>270</td>
<td>Sandstone, reddish-brown, silty, mostly massive with some local laminations and cross-bedding; subhorizontal and subvertical gypsum-filled fractures, subhorizontal more abundant, see Figure 7; basal contact gradational.</td>
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<td>3134</td>
<td>275</td>
<td>Arcillaceous silstone, reddish-brown, thinly laminated to laminated (1/16&quot; to 1/4&quot; thick); abundant sedimentary structures including: trough cross-laminations, erosional surfaces traceable around circumference of shaft, soft sediment deformation features; cross-lamination sets are 1&quot; to 4&quot; across, increasing to 2.0' to 3.0' across near base; lower 1.0' contains 1/4&quot; thick beds of claystone; horizontal and subhorizontal gypsum-filled fractures 1/4&quot; to 1&quot; thick, spaced 0.5' to 2.0'; vertical and subvertical gypsum-filled fractures 1/8&quot; to 1/4&quot; thick, spaced 3.0' to 5.0'; occasional greenish-gray reduction spots to 1&quot; diameter; basal contact sharp, marked by occurrence of a mudstone bed.</td>
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<td>3129</td>
<td>280</td>
<td>Mudstone interbedded with silty claystone, reddish-brown, thinly laminated to very thinly bedded (&lt;1/16&quot; to 1/2&quot; thick); abundant sets of trough cross-laminations 1&quot; to 4&quot; across, clay drape over ripple cross-laminations; occasional soft sediment deformation; occasional greenish-gray reduction spots (1/16&quot; to 1/2&quot; diameter); unit bounded by horizontal gypsum-filled fractures, 1&quot; thick at top grading to 1/2&quot; thick at base; basal contact sharp.</td>
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<td>3119</td>
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<td>Mudstone at top grading to silstone at base, reddish-brown, thinly laminated to thinly bedded (1/6&quot; to 1&quot; thick); abundant fine structures including: flaser bedding, cross-laminations, trough cross-laminations, filled desiccation cracks, load structures, abundant erosional contacts; gypsum-filled fractures are moderately abundant, 1/16&quot; to 1-1/2&quot; thick, horizontal and subhorizontal fractures spaced 1.0' to 4.0', vertical and subvertical fractures spaced 3.0' to 5.0'; occasional greenish-gray reduction spots (1/16&quot; to 1&quot; diameter); rare 2&quot; thick, subhorizontal, greenish-gray reduced zones; basal contact sharp.</td>
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**REMARKS**

MUDSTONE GRADING TO SILTSTONE IN VERTICAL GRADATIONAL SEQUENCES 1.0' TO 3.0' THICK, REDDISH-BROWN (SILTSTONE) AND DARK REDDISH-BROWN (MUDSTONE), EACH SEQUENCE CONSISTS OF STRUCTURELESS MUDSTONE AT TOP GRADING TO THINLY LAMINATED TO BEDDED SILTSTONE AT BASE; AMOUNT OF SEDIMENTARY STRUCTURES INCREASES TO BASE OF EACH SEQUENCE, THESE STRUCTURES INCLUDE: CROSS-LAMINATIONS, TROUGH CROSS-LAMINATIONS, EROSIONAL SURFACES, OCCASIONAL SOFT SEDIMENT DEFORMATION FEATURES; UPPER CONTACT OF EACH SEQUENCE IS EROSIONAL; OCCASIONAL GREENISH-GRAY REDUCTION SPOTS (1/16" TO 1" DIAMETER); ALL FRACTURES GYPSUM-FILLED; VERTICAL AND HIGH ANGLE FRACTURES APPEAR YOUNGER THAN HORIZONTAL AND SUBHORIZONTAL FRACTURES; SUBHORIZONTAL FRACTURE FILLING OCCASIONALLY SIGMOIDAL AND/OR TILTED; FILLING IN VERTICAL AND HIGH ANGLE FRACTURES HAVE A COMPONENT OF THRUST; THREE TYPES OF HORIZONTAL AND SUBHORIZONTAL FRACTURES; THICK - 1/2" TO 1", SPACED 1.0' TO 2.0'; MODERATELY THIN - 1/8" TO 1/2", SPACED 1" TO 1.5'; THIN - (1/8", SPACED 1/4" TO 1"; BASAL CONTACT SHARP.

SILTSTONE, REDDISH-BROWN, WITH INTERBEDDED CLAYSTONE, DARK REDDISH-BROWN, 1" TO 4" THICK FINING UPWARD SEQUENCES, THINLY LAMINATED TO THINLY BEDDED (1/16" TO 2" THICK), HARD; SEDIMENTARY STRUCTURES INCLUDE: CROSS-LAMINATIONS, SOFT SEDIMENT LOAD STRUCTURES, EROSIONAL CONTACTS AT TOP OF EACH FINING UPWARD SEQUENCE; LOCALLY ABUNDANT GREENISH-GRAY REDUCTION SPOTS (1/16" TO 1" DIAMETER), SOME OCCUR IN ALIGNED ZONES; OVERALL GRAIN SIZE INCREASES TO BASE; ABUNDANT HORIZONTAL, FIBROUS GYPSUM-FILLED FRACTURES OCCUR IN TWO SIZE GROUPS: 0" TO 1/4" THICK, SPACED 1/4" TO 1"; 1/4" TO 1/2" THICK, SPACED 0.5' TO 2.0'; VERTICAL AND HIGH ANGLE FIBROUS GYPSUM-FILLED FRACTURES ARE MODERATELY ABUNDANT, 1/16" TO 1/2" THICK, SPACED 2.5' TO 5'; BASAL CONTACT SHARP, UNDULATORY, POSSIBLY EROSIONAL.
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<td>Siltstone, reddish-brown, with interbedded claystone, dark reddish-brown, 1&quot; to 4&quot; thick fining upward sequences, thinly laminated to thinly bedded (1/16&quot; to 2&quot; thick), hard; sedimentary structures include: cross-laminations, soft sediment load structures, erosional contacts at top of each fining upward sequence; locally abundant greenish-gray reduction spots (1/16&quot; to 1&quot; diameter), some occur in aligned zones; overall grain size increases to base; abundant horizontal, fibrous cuspum-filled fractures occur in two size groups: 0&quot; to 1/4&quot; thick, spaced 1/4&quot; to 1&quot;; 1/4&quot; to 1/2&quot; thick, spaced 0.5' to 2.0'; vertical and high angle fibrous cuspum-filled fractures are moderately abundant, 1/16&quot; to 1/2&quot; thick, spaced 2.5' to 5'; basal contact sharp, undulatory, possibly erosional.</td>
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<td>Siltstone at top, grading to claystone at base, reddish-brown to dark reddish-brown, trace of bedding at top grading to structureless at base, hard; contains occasional claystone clasts &lt;1/8&quot; diameter; rare interbeds of claystone, 1/16&quot; thick; abundant greenish-gray reduction spots (1/16&quot; to 2&quot; diameter) occur in zones; abundant horizontal and subhorizontal fibrous cuspum-filled fractures, majority 1/16&quot; thick, spaced 1&quot; to 2&quot;; moderately abundant vertical and subvertical fibrous cuspum-filled fractures up to 1/4&quot; thick, spaced 1.0' to 3.0'; basal contact obscured.</td>
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<td>Slightly Sandy Siltstone, Reddish-Brown, Interbedded with Silty-Mudstone, Dark Reddish-Brown, 1&quot; Thick Fining Upward Sequences, Thinly Bedded (1&quot;); Minor Erosional Contacts at Top of Each Fining Upward Sequence; Horizontal and Subhorizontal Fibrous Gypsum-Filled Fractures &lt;1/8&quot; Thick, Spaced 0&quot; to 6&quot;; Subvertical and Vertical Fibrous Gypsum-Filled Fractures Are Less Abundant and Cross-Cut Horizontal and Subhorizontal Fractures; Basal Contact Sharp.</td>
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<td>Siltstone At Top Grading to Claystone at Base, Reddish-Brown to Dark Reddish-Brown, Trace of Bedding at Top Grading to Structureless at Base, Hard; Abundant Greenish-Gray Reduction Spots (1/16&quot; to 2&quot; Diameter); Horizontal and Subhorizontal Fibrous Gypsum-Filled Fractures &lt;1/8&quot; Thick; Subvertical and Vertical Gypsum-Filled Fractures Are Less Abundant and Cross-Cut Horizontal and Subhorizontal Fractures; Basal Contact Sharp.</td>
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Mudstone, Silty, Dark Reddish-Brown, Structureless; No Horizontal or Subhorizontal Gypsum-Filled Fractures; Rare Subvertical and Vertical Fractures Present, 0" to 1/2" Thick; Basal Contact Gradational.
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<td>CLAYSTONE GRADING TO SILTSTONE WITH DEPTH, REDDISH-BROWN TO DARK REDDISH-BROWN, THIN 1&quot; TO 3&quot; THICK FINING UPWARDS SEQUENCES, THINLY SEDDED; CONTAINS MINOR EROSIONAL CONTACTS AT TOP OF EACH FINING UPWARDS SEQUENCE; ABUNDANT HORIZONTAL AND SUBHORIZONTAL FIBROUS CYPSUM-FILLED FRACTURES 0&quot; TO 1/8&quot; THICK, SPACED 0&quot; TO 6&quot;; MODERATELY ABUNDANT VERTICAL AND SUBVERTICAL FIBROUS CYPSUM-FILLED FRACTURES 1/8&quot; TO 1/2&quot; THICK; BASAL CONTACT SHARP.</td>
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EXHAUST SHAFT
LITHOLOGIC LOG
SHEET 13 OF 49
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<td>AMMODYRITE, FINELY CRYSTALLINE, GRAY TO GRAYISH-BROWN, WHITE AT UPPER CONTACT, BANDED TO OCCASIONALLY LAMINATED, SPACED 1/16&quot; TO 1&quot;; BANDS AND LAMINAE UNDULATORY UP TO 1/4&quot; AND OCCASIONALLY TERMINATE ABRUPTLY, GRAY BANDS USUALLY THICKER, BECOME STRUCTURELESS WITH DEPTH, LOCALLY MODULAR; UPPER 3.0' CONTAINS INTERBEDDED CLAY LAMINAS, CONTENT DECREASING WITH DEPTH; LOCALLY CYPHEROUS IN UPPER 6&quot;; NEAR TOP, HORIZONTAL AND SUBHORIZONTAL CUPSIN-FILLED FRACTURES ARE ABUNDANT, 1/8&quot; TO 1/2&quot; THICK, SPACED 1&quot; TO 1&quot;; BEDDING TERMINATED EROSIONALLY AT UPPER CONTACT; HORIZONTAL AND SUBHORIZONTAL CUPSIN-FILLED FRACTURES SPACED 1&quot; TO 2.0', 1/16&quot; TO 1/4&quot; THICK; RARE VERTICAL AND SUBVERTICAL CUPSIN-FILLED FRACTURES, 1/8&quot; TO 1/4&quot; THICK, SPACED 2.0' TO 6.0'; BASEL CONTACT SHARP.</td>
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**TAMARISK MEMBER**

Anhydrite, finely crystalline, gray to light brownish-gray to tan with depth, laminated to nodular, hard; locally gypserous at upper contact; contains interbeds of laminated carbonate locally and near base; laminae may locally be terminated erosionally; 1" to 2" thick organic (?) black claystone at 665.9', contains fibrous gypsun-filled fractures, fibers oriented vertically, 1/32" to 1" thick, discontinuous, locally bifurcating; horizontal fibrous gypsun-filled fractures throughout with spacing 0.5' to 1.5', 1/32" to 1/16" thick; rare subvertical fractures; basal contact gradational.
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SILSTONE AND SANDY SILSTONE, LIGHT BROWN TO REDDISH-BROWN WITH THIN LAYERS OF MEDIUM GRAY CLAYSTONE AND MUDSTONE, THINLY BEDDED TO LAMINATED, DIVISIBLE INTO UNITS 8" TO 20" THICK; BEDDING AND LAMINATIONS GENERALLY HORIZONTAL TO SUBHORIZONTAL, SOME WAVY BEDDING, SOME MICRO CROSS-LAMINATIONS; FROM 792.0' TO 795.0' LARGER CROSS-CUTTING RELATIONSHIPS WITH SOME UNITS PARTIALLY TO WHOLLY EROSIONALLY REMOVED, UNITS GENERALLY DOWN-CUT TO EAST AND SOUTHEAST; SMALL-SCALE CROSS-BEDDING HAS VARIABLE CURRENT DIRECTIONS WITH DEPTH, MOST SOUTH; AT 794.0' SYMMETRICAL RIFFLES WITH CLAY DRAPE; RIPPLE SETS 1/4" TO 1/2" THICK; MINOR SOFT SEDIMENT DEFORMATION, LOCAL FINING UPWARDS SEQUENCES; BASAL CONTACT GRADATIONAL.
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<td>HALITE MIXED WITH POLYHALITE, FINELY TO COARSELY CRISTALLINE, WHITE TO CLEAR; POLYHALITE CONTENT DECREASES WITH DEPTH, CONTENT GREATEST IN UPPER 0.5'; OCCURS AS GROUPS OF SUBHORIZONTAL STRINGERS, BECOMING LESS ABUNDANT WITH DEPTH; SUBHORIZONTAL STRINGERS OF ANHYDRITE OCCUR WITH DEPTH; STRINGERS OF POLYHALITE AND ANHYDRITE BECOME RANDOMLY ORIENTED WITH DEPTH; BASAL CONTACT GRADATIONAL.</td>
</tr>
<tr>
<td>2479</td>
<td>930</td>
<td>X X X</td>
<td>HALITE, MEDIUM TO COARSELY CRISTALLINE, WHITE TO ORANGE TO CLEAR; ABUNDANT POLYHALITE IN UPPER 3&quot; TINTS HALITE ORANGE; SUBHORIZONTAL STRINGERS OF POLYHALITE AND ANHYDRITE SPACED 1&quot; TO 3&quot;; BED OF VERY POLYHALITIC HALITE OCCURS BETWEEN 729.4' AND 730.0', UNIDENTIFIED GAS ORIGIANATES FROM THIS AREA ALONG FRATURES; BASAL CONTACT DIFFUSE.</td>
</tr>
<tr>
<td>2474</td>
<td>935</td>
<td></td>
<td>ARILICACEOUS HALITE, ARILICACEOUS; MATERIAL REDDISH-BROWN, HALITE WHITISH-GRAY TO CLEAR; HALITE OCCURS AS DISPLACIVE CRYSTALS AND AGGREGATES OF CRYSTALS; UNIT CONTAINS LOCAL GREENISH-GRAY REDUCTION ZONES; CLAY CONTENT DECREASES WITH DEPTH, DECREASES ABRUPTLY BELOW 931.0'; ROCK BELOW 937.0' CLASSIFIED AS: HALITE, WHITE, MEDIUM TO COARSELY CRISTALLINE, SLIGHTLY ARILICACEOUS, CLAY CONTENT DECREASING WITH DEPTH, TRACE POLYHALITE AND ANHYDRITE STRINGERS CONTENT INCREASING WITH DEPTH, STRINGERS RANDOMLY ORIENTED AT TOP, BECOMING SUBHORIZONTAL WITH DEPTH, SPACED 1&quot; TO 3&quot;; BASAL CONTACT GRADATIONAL, MARKED BY 1&quot; THICK ZONE OF GRAYISH-WHITE HALITE.</td>
</tr>
<tr>
<td>2469</td>
<td>940</td>
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<tr>
<td>2469</td>
<td>940</td>
<td>x - - - - x</td>
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<tr>
<td>2464</td>
<td>945</td>
<td>- x - x x</td>
<td>ARGINACEOUS HALITE, FINELY TO COARSELY CRYSTALLINE, WHITISH-GRAY TO CLEAR, MASSIVE; HALITE OCCURS AS CRYSTAL AGGREGATES IN ZONES OR PODS; CLAY CONTENT DECREASES ABRUPTLY BELOW 949.0'; TRACE DISSEMINATED POLYHALITE BLOWS; CONTENT INCREASES WITH DEPTH; BECOMES BEDDED IN LOWER 2.0' WITH ALTERNATING POLYHALITE HALITE AND CLEAR HALITE BEDS 2&quot; TO 3&quot; THICK; BASAL CONTACT SHARP. DISCONFORMABLE.</td>
</tr>
<tr>
<td>2459</td>
<td>950</td>
<td>x - x x x</td>
<td>ARGINACEOUS HALITE IN UPPER 2.0', REDDISH-BROWN, CLAY CONTENT DECREASES WITH DEPTH, GRADATIONS INTO POLYHALITE HALITE; HALITE IS WHITE TO TINTED ORANGE TO CLEAR, MEDIUM TO COARSELY CRYSTALLINE; POLYHALITE OCCURS AS BLOWS AND STRINGERS, POLYHALITE BED AT 961.5'; CONTAINS LOCAL REDDISH-BROWN REDUCTION SPOTS IN ARGINACEOUS MATERIAL NEAR THE BASE; BASAL CONTACT SHARP, MARKED BY 3&quot; THICK HORIZONTAL FIBROUS HALITE-FILLED FRACTURE.</td>
</tr>
<tr>
<td>2454</td>
<td>955</td>
<td>x x x x x x x x x x x</td>
<td>Siltstone, REDDISH-BROWN, TRACE OF BEDDING; CONTAINS SMALL 1/4&quot; INHABITED DISPLACIVE HALITE CRYSTALS NEAR TOP; CONTAINS RARE SUBVERTICAL HALITE-FILLED FRACTURES; BECOMES ANHYDRITE (GRAY) IN LOWER 2.0'; CONTAINS DISPLACIVE HALITE CRYSTALS &lt;1/8&quot;; BASAL CONTACT SHARP.</td>
</tr>
<tr>
<td>2449</td>
<td>960</td>
<td>x x x x x x x x x x x x x</td>
<td>ARGINACEOUS HALITE, ARGINACEOUS MATERIAL REDDISH-BROWN, HALITE CLEAR; BELOW 969.0' CLAY CONTENT DECREASES ABRUPTLY, UNIT BECOMES SLIGHTLY ARGINACEOUS AND POLYHALITIC, CLAY AND POLYHALITE OCCUR AS RANDOMLY ORIENTED STRINGERS; OVERALL CLAY CONTENT DECREASES WITH DEPTH; POLYHALITE CONTENT INCREASES WITH DEPTH; BASAL CONTACT GRADATIONAL.</td>
</tr>
<tr>
<td>2444</td>
<td>965</td>
<td>x x x x x x x x x x x x x</td>
<td>POLYHALITE, ANHYDRITE, FINELY CRYSTALLINE, ORANGE, HARD; HALITE, HALITE WHITE; ANHYDRITE GRAY; DISCONTINUOUS BEDS OF WHITE FINELY CRYSTALLINE HALITE NEAR TOP; AT 975.5', 1&quot; THICK BED OF THINLY LAMINATED ANHYDRITE OCCURS; UNIT CONTAINS CLEAR DISPLACIVE HALITE CRYSTALS NEAR BASE; BASAL CONTACT SHARP.</td>
</tr>
<tr>
<td>2439</td>
<td>970</td>
<td>x x x x x x x x x x x x x</td>
<td>POLYHALITE, POLYHALITE, MEDIUM TO COARSELY CRYSTALLINE, WHITE TO TINTED ORANGE, THIN TO MEDIUM BEDDED BY SUBVERTICAL STRINGERS OF POLYHALITE; BASAL CONTACT SHARP, MARKED BY A 2&quot; THICK BED OF POLYHALITE.</td>
</tr>
<tr>
<td>2434</td>
<td>975</td>
<td>x x x x x x x x x x x x x</td>
<td>ARGINACEOUS HALITE, REDDISH-BROWN, SLIGHTLY ANHYDRITE, CLAY CONTENT DECREASES WITH DEPTH; NEAR TOP, HALITE OCCURS AS DISPLACIVE CRYSTALS; BECOMES THE DOMINANT MINERAL TYPE WITH DEPTH, BECOMES MEDIUM TO COARSELY CRYSTALLINE, WHITE TO CLEAR, THINLY BEDDED IN LOWER 2.0' WITH STRINGERS OF POLYHALITE SEPARATING BEDS; ARGINACEOUS MATERIAL OCCURS AS MATRIX IN UPPER PART, STRINGERS IN LOWER PART; SOME REDDISH-GRAY REDUCTION SPOTS OCCUR NEAR TOP; TRACE POLYHALITE, CONTENT INCREASES WITH DEPTH; BASAL CONTACT SHARP, DISCONFORMABLE.</td>
</tr>
<tr>
<td>2429</td>
<td>980</td>
<td>x x x x x x x x x x x x x</td>
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<td>985</td>
<td>x x x x x x x x x x x x x</td>
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<td>x x x</td>
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<tr>
<td>2419</td>
<td>990</td>
<td>x - x</td>
<td>ARCTILACEOUS HALITE, MEDIUM TO COARSELY CRYSTALLINE, WHITE TO TINTED ORANGE; REDDISH-BROWN CLAY MATRIX IN UPPER 4&quot;; POLYHIALITIC; CLAY AND POLYHIALITE OCCUR AS SUBHORIZONTAL STRINGERS SPACED 1&quot; TO 4&quot;; BASAL CONTACT SHARP.</td>
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<td>x - x</td>
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<td>- x -</td>
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<tr>
<td>2414</td>
<td>995</td>
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<tr>
<td>2409</td>
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<tr>
<td>2394</td>
<td>1015</td>
<td>x x</td>
<td>POLYHIALITE, FINELY CRYSTALLINE, REDDISH-ORANGE; 1&quot; THICK GRAY CLAYSTONE BEDS ABOVE AND AT BASAL CONTACT; BASAL CONTACT SHARP.</td>
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<td>x x</td>
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<tr>
<td>2389</td>
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<td>- x -</td>
<td>ARGILLACEOUS HALITE, WHITE TO CLEAR, MEDIUM TO COARSELY CRYSTALLINE; CLAY OCCURS AS BROWN SUBHORIZONTAL STRINGERS, SPACED 1&quot; TO 2&quot;; STRINGERS ARE TERMINATED EROSIONALLY AT UPPER CONTACT, CLAY CONTENT DECREASES WITH DEPTH; TRACE POLYHIALITE STRINGERS AND DISSEMINATED BLESSES, CONTENT INCREASES IN LOWER 3.0'; BASAL CONTACT SHARP, EROSIONAL, UNDOMINATORY UP TO 1.0'.</td>
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<td>x x</td>
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<tr>
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<td>1030</td>
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<td>ELEV. (FT. MSL)</td>
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<td>STRATIGRAPHIC COLUMN</td>
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</tr>
<tr>
<td>2379</td>
<td>1030</td>
<td>MB 103</td>
<td>ANHYDRITE, FINELY CRYSTALLINE, ALTERNATING LIGHT AND DARK GRAY, LAMINATED TO VERY THINLY BEDDED; BEDDING UNLAMINATED SLIGHTLY, BEDS OFTEN CONTAIN ECTROLITHIC STRUCTURES; LOCAL &lt;1/4&quot; CRYSTALS OF HALITE; LIGHT BROWN CARBONATE (?) INTERBEDS; BASAL CONTACT GRADATIONAL.</td>
</tr>
<tr>
<td>2374</td>
<td>1035</td>
<td></td>
<td>CARBONATE (DOLOMITE), FINELY CRYSTALLINE OR GRAINED, LIGHT BROWN WITH GRAYISH-BROWN LAMINÆ, THINLY LAMINATED, LAMINÆ OCCUR AS CONCAVE DOWNWARD SETS AVERAGING 4&quot; TO 1&quot; ACROSS; PROBABLY ALCALI SEDIMENTATION; GREYER LAMINÆ ORGANIC (?) BASAL CONTACT MARKED BY SUBHORIZONTAL GRAYISH-BROWN LAMINÆ, GRADATIONAL.</td>
</tr>
<tr>
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<td>MB 104</td>
<td>DOLOMITE, FINELY CRYSTALLINE, LIGHT BROWN, HINT OF BEDDING; BASAL CONTACT SHARP, EROSIONAL.</td>
</tr>
<tr>
<td>2364</td>
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<td>ANHYDRITE, CARBONATE-RICH, FINELY CRYSTALLINE, ALTERNATING LIGHT GRAY AND GRAY, THINLY LAMINATED IN UPPER 0.9', REMAINDER STRUCTURELESS; BASAL CONTACT SHARP, EROSIONAL.</td>
</tr>
<tr>
<td>2359</td>
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<td>SILTY CLAYSTONE, GRAY, LOCALLY THINLY LAMINATED; CONTAINS DISPLACEMENT HALITE CRYSTALS; BASAL CONTACT SHARP.</td>
</tr>
<tr>
<td>2354</td>
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<td></td>
<td>HALITE, MEDIUM TO COARSELY CRYSTALLINE, WHITE TO CLEAR OR ORANGE; CLAY &quot;MATURE&quot; IN UPPER 1.0'; HALITE OCCURS AS DISPLACEMENT CRYSTALS, CLAY CONTENT DECREASES WITH DEPTH; CLAY MORPHOLOGY CHANGES FROM MATRIK TO SUBHORIZONTAL STRINGERS SPACED 1&quot; TO 2&quot;. BELOW 1047.3' ARGILLACEOUS STRINGERS BECOME DISCONTINUOUS AND ORIENTED RANDOMLY; TRACE DISCONTINUOUS SUBHORIZONTAL STRINGERS AND PODS OF POLYHALITE, CONTENT INCREASES WITH DEPTH AT 1050.0' A 0.1' THICK LAMINATED BED OF ANHYDRITE OCCURS, BELOW THIS BED CLAY CONTENT DECREASES &quot;MARKEDLY AND TRACE AMOUNTS OF POLYHALITE AND ANHYDRITE OCCUR IN DISCONTINUOUS STRINGERS; 2&quot; THICK BED OF ANHYDRITE OCCURS AT 1053.0'; LOWER 1.0' IS VERY POLYHALITIC; BASAL CONTACT SHARP.</td>
</tr>
<tr>
<td>2349</td>
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<td></td>
<td>ARGILLACEOUS HALITE, MEDIUM TO COARSELY CRYSTALLINE, WHITE TO CLEAR, CLAY OCCURS IN RANDOMLY-ORIENTED STRINGERS; STRINGERS AND BLUES OF POLYHALITE; BASAL CONTACT SHARP, UNLAMINATED TO 1.0'.</td>
</tr>
<tr>
<td>2344</td>
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<td>POLYHALITE, FINELY CRYSTALLINE, ORANGE, STRUCTURELESS EXCEPT NEAR BASE; LOCALLY HALITIC; THIN GRAY ANHYDRITE BED OCCURS AT BASE; BASAL CONTACT SHARP, MARKED BY A THIN BED OF GRAY CLAYSTONE.</td>
</tr>
<tr>
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<td>HALITE, MEDIUM TO COARSELY CRYSTALLINE, WHITE TO CLEAR; ARGILLACEOUS AT TOP, REDDISH-BROWN, CONTENT DECREASES WITH DEPTH, CLAY OCCURS IN STRINGERS; TRACE POLYHALITE AS RANDOMLY-ORIENTED STRINGERS WHICH GRADE TO SUBHORIZONTAL WITH DEPTH, CONTENT INCREASES WITH DEPTH AT 1071.6', 1&quot; THICK BED OF POLYHALITE OCCURS UNDERLAIN BY 1&quot; THICK GRAY CLAYSTONE BED; CLAY CONTENT INCREASES SLIGHTLY BELOW 1071.6', COLOR REDDISH-BROWN TO GRAY; BECOMES VERY POLYHALITIC IN LOWER 1.0'; BASAL CONTACT SHARP.</td>
</tr>
<tr>
<td>2334</td>
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EXHAUST SHAFT LITHOLOGIC LOG SHEET 25 OF 49
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<tr>
<td>2329 1080</td>
<td>x x x x</td>
<td>POLYHALITE, FINELY CRYSTALLINE, ORANGE; UNDERLAIN BY 1/2&quot; THICK GRAY CLAYSTONE BED; BASAL CONTACT SHARP.</td>
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<tr>
<td>2324 1085</td>
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<td>HALITE, MEDIUM TO COARSELY CRYSTALLINE, CLEAR TO WHITE; UPPER 1.0' ARGILLACEOUS STRINGERS, CONTENT DECREASES WITH DEPTH; POLYHALITE STRINGERS, CONTENT INCREASES WITH DEPTH; BASAL CONTACT SHARP.</td>
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<td>POLYHALITE, FINELY CRYSTALLINE, ORANGE, STRUCTURELESS; UNDERLAIN BY 1&quot; THICK GRAY CLAYSTONE BED; BASAL CONTACT SHARP.</td>
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<td>HALITE, MODERATELY ARGILLACEOUS AND POLYHALITIC, MEDIUM TO COARSELY CRYSTALLINE, WHITE TO CLEAR TO TINTED ORANGE; LOCAL REDDISH-BROWN CLAY MATRIX, HALITE OCCURS AS DISPLACIVE CRYSTALS, LOCAL GREENISH-GRAY REDUCTION ZONES; ARGILLACEOUS STRINGERS ABUNDANT IN Upper 3.0', CONTENT DECREASES WITH DEPTH, ABSENT BELOW 1101.0'; POLYHALITE OCCURS AS DISSEMINATED BLEBS AND STRINGERS, CONTENT INCREASING WITH DEPTH, 1&quot; THICK POLYHALITE BED AT 1105.2'; BASAL CONTACT SHARP.</td>
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<td>2309 1100</td>
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<td>2304 1105</td>
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SHEET 26 OF 49
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**POLYHAILITE, FINELY CRYSTALLINE, ORANGE, STRUCTURELESS; UNDERLAIN BY 2" THICK GRAY CLAYSTONE BED; BASAL CONTACT SHARP.**

**HALITE, MEDIUM TO COARSELY CRYSTALLINE, WHITE TO CLEAR TO TINTED ORANGE; UPPER 4" VERY AGRICILLACEOUS, CLAY OCCURS AS REDDISH-BROWN DISCONTINUOUS RANDOMLY-ORIENTED STRINGERS; REMAINDER CONTAINS TRACE CLAY STRINGERS, LOCALLY STRINGERS BECOME SUBHORIZONTAL AND DENSITY MAY INCREASE; CONTAINS TRACE POLYHALITE WITH DEPTH; BASAL CONTACT SHARP, DISCONFORMABLE.**

**HALITE, COARSELY CRYSTALLINE, WHITE TO CLEAR TO ORANGE; UPPER 1" VERY AGRICILLACEOUS, SLIGHTLY AGRICILLACEOUS TO 1146.0'; MODERATELY ABUNDANT RANDOMLY-ORIENTED STRINGERS AND LARGE BLBS OF POLYHALITE, CONTENT INCREASING WITH DEPTH, LOWER 1.5" VERY POLYHALITE; BASAL CONTACT SHARP, DISCONFORMABLE.**

**AGRICILLACEOUS HALITE, FINELY TO COARSELY CRYSTALLINE; LOCALLY INTERBEDDING WITH AGRICILLACEOUS HALITE, CONTAINING DISPLACIVE HALITE CRYSTALS; REDDISH-BROWN CLAY DISSEMINATED THROUGHOUT AS MATRIX, CONTENT INCREASES WITH DEPTH; IRREGULARLY SHAPED ZONES (1.0' x 2.0') OF PURY HALITE RANDOMLY SCATTERED THROUGHOUT UNIT; LOCAL SMALL ZONES OF RECOGNIZABLE-GRAY CLAY; DISSOLUTION PITS THROUGHOUT UNIT FILLED WITH AGRICILLACEOUS HALITE; POLYHALITE, CONTENT INCREASES WITH DEPTH, DISCONTINUOUS 1" THICK POLYHALITE BED AT BASAL CONTACT; BASAL CONTACT GRADATIONAL, IRREGULAR WITH UP TO 1.0' OF RELIEF, LOCALLY SHARP, EROSIONAL.**

**ANHYDRITE, FINELY CRYSTALLINE, LIGHT GRAY TO LIGHT TANISH-GRAY, THINLY LAMINATED TO THINLY BEDDED, BEDS SEPARATED BY DARK GRAY, THIN LAMINAE; PсыMPOSMORPHS OF PY CYPHUM SWALLOWTAIL CRYSTALS BECOME ABUNDANT BELOW 1135.0', 1/16" TO 2" THICK, BECOME MORE ABUNDANT AND LARGER WITH DEPTH, MOST OCCUR ALONG SUBHORIZONTAL BEDDING PLANES, OCCASIONALLY PсыMPOSMORPHS LIE PARALLEL TO BEDDING AT UPPER CONTACT DISSOLUTION PITS INTO ANHYDRITE OCCUR, FILLED WITH GRAY AGRICILLACEOUS HALITE AND AGRICILLACEOUS ANHYDRITE BEDS 0.5' TO 2.0' DEEP INTO ANHYDRITE, BEDDING TERMINATED EROSIONALLY AT SIDES OF DISSOLUTION PITS; LOCALLY, POLYHALITE IS INCLUDED IN HALITE FILLING OF ANHYDRITE PсыMPOSMORPHS OF PY CYPHUM SWALLOWTAIL CRYSTALS, POLYHALITE ALSO OCCURS IN IRREGULARLY-SHAPED ZONES (2" x 3") AS REPLACEMENT OF ANHYDRITE; HALITE OCCURS ALONG BEDDING PLANES BELOW 1137.0'; LOWER 1" CONTAINS INTERBEDS OF POLYHALITE; BASAL CONTACT SHARP.**

**POLYHALITE, SLIGHTLY HALITIVE, FINELY CRYSTALLINE, REDDISH-ORANGE, HINT OF BEDDING IN UPPER 4", REMAINDER STRUCTURELESS EXCEPT FOR RARE HALITE PсыMPOSMORPHS; CRYSTALS ARE IRREGULARLY-SHAPED CRYSTALS OF HALITE (1/32" TO 1/8'"); LOWER 2" IS ANHYDRITE OR CARBONATE-RICH, COLOR GRADS TO BROWN AT BASE; BASAL CONTACT SHARP, UNDULATORY ON TWO SCALES; MINOR - UP TO 3", MAJOR - UP TO 2.5', EXHIBITS SOFT SEDIMENT DEFORMATION DUE TO LOADING.**

**CLAYSTONE, LIGHT GRAY AT TOP TO GRAY AT BASE, STRUCTURELESS EXCEPT FOR FLOWAGE STRUCTURES; THICKNESS RANGES FROM 0.2' TO 1.0'; LOCALLY BROKEN BY 0" TO 2" THICK FRACTURES FILLED WITH CLEAR TO ORANGE HALITE; BASAL CONTACT SHARP, UNDULATORY UP TO 2.0', DISCONFORMABLE.**

**HALITE, COARSELY CRYSTALLINE, CLEAR TO WHITE; CONTAINS GRAY CLAY STRINGERS IN UPPER 2.0', CONTENT DECREASES IN DEPTH; TEMPERATURE POLYHALITE, CONTENT INCREASES WITH DEPTH, OCCURS AS BLBS, RANDOMLY-ORIENTED STRINGERS, AND AS THICK SUBHORIZONTAL STRINGERS 1/4" THICK; ANHYDRITE OCCURS WITH POLYHALITE STRINGERS, CONTENT INCREASES WITH DEPTH; BASAL CONTACT SHARP, UNDULATORY UP TO 1.0'.**
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<tr>
<td>2244</td>
<td>1165</td>
<td>X \ X MB 109</td>
<td>ANHYDRITE, FINELY CRISTALLINE, GRAY TO LIGHT GRAY, HINT OF THIN LAMINATIONS; CONTAINS 1&quot; THICK ANHYDRITE LOCAL ZONES OF MIXED HALITE AND FINELY CRISTALLINE; BASAL CONTACT SHARP.</td>
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<tr>
<td>2239</td>
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<td>HALITE, COARSELY CRISTALLINE, WHITE TO CLEAR; CONTAINS HORIZONTAL STRINGERS OF ANHYDRITE, 1&quot; TO 3&quot; THICK BEDS OF FINELY CRISTALLINE ANHYDRITE WITH HALITE PSEUDOMORPHS AFTER GYPSUM SWALLOWTAIL CRYSTALS AT 1167.3', 1168.4', 1169.4'; BASAL CONTACT SHARP.</td>
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<tr>
<td>2234</td>
<td>1175</td>
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<td>ANHYDRITE, FINELY CRISTALLINE, LIGHT GRAY TO GRAY, FINELY LAMINATED; CONTAINS HALITE PSEUDOMORPHS AFTER GYPSUM SWALLOWTAIL CRYSTALS, 1/4&quot; TO 1-1/2&quot; HIGH, OCCURRING PARALLEL TO BEDDING PLANES; BASAL CONTACT UNDULATORY DUE TO INFILLING OF SHALLOW CHANNEL FORMS IN UNDERLYING UNIT, SHARP, DISCONFORMABLE.</td>
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<tr>
<td>2229</td>
<td>1180</td>
<td>X X</td>
<td>ANHYDRITE AND CLAYSTONE; ANHYDRITE OCCURS AS ISOLATED GRAY NODULES IN A POORLY INDURATED GRAY CLAYSTONE MATRIX; SIZE OF NODULES INCREASES WITH DEPTH; TEXTURE OF BASAL 1.0' DEFINED AS MODULAR; BASAL CONTACT SHARP, DISCONFORMABLE.</td>
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<td>2224</td>
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<td>X X</td>
<td>ANHYDRITE, HALITIC, FINELY CRISTALLINE, GRAY TO BROWNISH-GRAY, MICRO TO THINLY LAMINATED; LAMINAE ALTERNATE LIGHT TO DARK; CONTAINS LOCAL HALITE PSEUDOMORPHS AFTER GYPSUM SWALLOWTAIL CRYSTALS, &lt; 1/8&quot; HIGH; BASAL CONTACT SHARP, UNDULATORY, LOCALLY DISCONFORMABLE, MARKED BY DISCONTINUOUS 1&quot; THICK POLYHALITE BED.</td>
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<tr>
<td>2219</td>
<td>1190</td>
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<td>HALITE, COARSELY CRISTALLINE, WHITE TO CLEAR TO TINTED ORANGE; POLYHALITIC AT TOP, CONTENT DECREASES WITH DEPTH; BASAL CONTACT SHARP, DISCONFORMABLE.</td>
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<tr>
<td>2214</td>
<td>1195</td>
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<td>POLYHALITE, FINELY CRISTALLINE, PALE ORANGISH-BROWN, LOCALLY NICHOLAMINATED TO BANDED (&lt; 1/32&quot; TO 1&quot; THICK); LOCALLY 1/2&quot; TO 1&quot; THICK UNALTERED ANHYDRITE BEDS, NEAR TOP BEDS CONTAIN HALITE PSEUDOMORPHS AFTER GYPSUM SWALLOWTAIL CRYSTALS 1/4&quot; TO 1/2&quot; HIGH; BASAL CONTACT SHARP, UNDULATORY UP TO 0.5', DISCONFORMABLE, MARKED BY THE OCCURRENCE OF 1&quot; TO 2&quot; THICK BED OF GRAY CLAYSTONE.</td>
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<tr>
<td>2209</td>
<td>1200</td>
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<td>HALITE, COARSELY CRISTALLINE, WHITE TO CLEAR TO TINTED ORANGE; BLEBS AND SUBHORIZONTAL STRINGERS OF POLYHALITE TO 1/2&quot; THICK; LOCAL GRAY SUBHORIZONTAL STRINGERS OF CLAY TERMINATED AT PNEUMOCONTEMPOREANES DURATION PITS; BASAL CONTACT SHARP, DISCONFORMABLE, UNDULATORY 5' TO 0.4'.</td>
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<tr>
<td>2204</td>
<td>1205</td>
<td>X X</td>
<td>HALITE AND ARGLICACEOUS HALITE; HALITE: WHITE TO CLEAR TO TINTED ORANGE; CLAY: REDDISH-BROWN; UPPER 0.5' VERY ARGLICACEOUS, CONTAINS DISEMBLICATE HALITE CRYSTALS (&lt; 1/4&quot;) IN MUDDSTONE MATRIX, UPPER 3&quot; GREENISH-CRAY IN COLOR, CLAY CONTENT DECREASES WITH DEPTH TO 1189.0', 0.5' THICK REDDISH-BROWN ARGILLACEOUS HALITE BED OCCURS BELOW 1189.0', CLAY CONTENT INCREASES ABRUPTLY, THEN DECREASES WITH DEPTH, CLAY MATERIAL OCCURS AS MATRIX MATERIAL OR AS RANDOMLY-ORIENTED STRINGERS, CLAY CONTENT LOCALLY INCREASES BELOW 1200.0'; TRACE POLYHALITE AT TOP, CONTENT INCREASING WITH DEPTH, AS DISSERATE ALEBS AND RANDOMLY-ORIENTED DISCONTINUOUS STRINGERS; BASAL CONTACT SHARP, SLIGHTLY UNDULATORY, DISCONFORMABLE.</td>
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EXHAUST SHAFT
LITHOLOGIC LOG
SHEET 28 OF 49
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<td>2199</td>
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<td>Halite, medium to coarsely crystalline, white to orangish-white; upper 2.0' reddish-brown halitic mudstone containing displacive halite crystals, grades into slightly argillaceous halite; remainder contains gray clay disseminated throughout as intercrystalline material; polyhalite occurs as randomly-oriented stringers and disseminated blebs, between 1217.0' and 1219.0', 2.0' thick polyhalite beds spaced 0.5' to 1.0' occur. 3' thick discontinuous bed of polyhalite underlain by a thin bed of gray claystone occurs at 1219.0', bed of finely crystalline orangish-white polyhalite occurs between 1227.1' to 1227.5'; 1/8' to 1/4' thick subhorizontal stringers of polyhalite occur in the intervals from 1227.1' to 1227.5' and 1227.5' to 1229.5'. Basal contact sharp, slightly undulatory, disconformable.</td>
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<tr>
<td>2194</td>
<td>1215</td>
<td>Halite, coarsely crystalline, white to clear; clay and polyhalite occur as randomly-oriented discontinuous stringers; upper 2.0' argillaceous halite, halite occurs in discontinuous zones and pods of crystals in clay and halite matrix, clay content decreases with depth; basal contact sharp, undulatory.</td>
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<tr>
<td>2189</td>
<td>1220</td>
<td>Halite, coarsely crystalline, white to clear; polyhalite and argillaceous; argillaceous halite occurs in upper 0.5', content decreases with depth; polyhalite occurs as discontinuous stringers, below 1243.0' polyhalite becomes abundant; basal contact sharp, undulatory up to 1.0'.</td>
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<td>2184</td>
<td>1225</td>
<td>Polyhalite, finely crystalline, reddish-orange, contains zones of light orange; appears to have mound forms at upper contact; contains irregularly-shaped crystals of halite (1/16&quot; to 1/4&quot;) disseminated throughout; basal contact sharp, marked by 1&quot; to 2-1/2&quot; thick gray claystone containing halite.</td>
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<tr>
<td>2179</td>
<td>1230</td>
<td>Halite, medium to coarsely crystalline, white to clear to tinted orange; trace gray clay, content decreases with depth, between 1255.8' and 1257.0' subhorizontal stringers of reddish-brown clay are continuous around the circumference of the shaft; disseminated polyhalite blebs, content increases with depth; basal contact sharp.</td>
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EXHAUST SHAFT LITHOLOGIC LOG  
SHEET 29 OF 49
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<td>- - - X X X X</td>
<td>HALITE, MEDIUM TO COARSELY CRYSTALLINE, WHITE TO CLEAR; UPPER 0.5' ARGILLACEOUS. CLAY OCCURS WITH HALITE AS MATRIX, BELOW 1260.7' CLAY OCCURS AS STRINGERS, CONTENT DECREASES WITH DEPTH; DISSIMINATED POLYHALITE BLEBS; BASAL CONTACT SHARP. POLYHALITE, FINELY CRYSTALLINE, ORANGISH-RED, STRUCTURELESS; UNDERLAIN BY 1&quot; THICK GRAY CLAYSTONE BED; BASAL CONTACT SHARP.</td>
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<tr>
<td>2144</td>
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<td>- - - X X</td>
<td>HALITE, WHITE TO CLEAR, COARSELY CRYSTALLINE, SLIGHTLY ARGILLACEOUS; CLAY OCCURS IN STRINGERS, CONTENT DECREASES WITH DEPTH, ABSENT BELOW 1268.0'; TRACE POLYHALITE BLEBS; BASAL CONTACT SHARP.</td>
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<tr>
<td>2139</td>
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<td>POLYHALITE, FINELY CRYSTALLINE, REDDISH-ORANGE, STRUCTURELESS; UNIT SPLIT BY 4&quot; THICK CLEAR HALITE BED, OCCURS 3' BELOW UPPER CONTACT; BASAL CONTACT SHARP, MARKED BY 2&quot; THICK GRAY CLAYSTONE BED.</td>
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<tr>
<td>2134</td>
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<td>HALITE, MEDIUM TO COARSELY CRYSTALLINE, WHITE TO ORANGE TO CLEAR; TRACE POLYHALITE, OCCURS AS DISCONTINUOUS RANDOMLY-ORIENTED STRINGERS AND AS DISSIMINATED BLEBS; SLIGHTLY ARGILLACEOUS, GRAY CLAY STRINGERS TO 1276.0', ABSENT BETWEEN 1276.0' AND 1280.0', CLAY STRINGERS IN 1.0' THICK SAND BELOW 1280.0', BELOW 1284.0' CLAY CONTENT INCREASES AS SUBHORIZONTAL STRINGERS; BASAL CONTACT SHARP, SLIGHTLY UNDULATORY.</td>
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<td>HALITE, MEDIUM TO COARSELY CRYSTALLINE, WHITE TO CLEAR; ARGILLACEOUS, UPPER 1.5' TO 2.0' ARGILLACEOUS HALITE WITH CLAY AND HALITE MATRIX, HALITE OCCURS AS ZONES AND PODS OF CRYSTALS AND DISPLACIVE CRYSTALS TO 1/2&quot; ACROSS, CLAY CONTENT DECREASES WITH DEPTH; POLYHALITE OCCURS AS SUBHORIZONTAL STRINGERS AND DISSIMINATED BLEBS, CONTENT INCREASES WITH DEPTH; BASAL CONTACT SHARP, UNDULATORY. POLYHALITE, FINELY CRYSTALLINE, ORANGISH-RED, STRUCTURELESS EXCEPT FOR 1&quot; THICK INTERBEDS OF HALITE; BASAL CONTACT SHARP, SLIGHTLY UNDULATORY.</td>
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<td>HALITE, COARSELY CRYSTALLINE, WHITE TO CLEAR; CONTAINS SUBHORIZONTAL CONTINUOUS STRINGERS OF POLYHALITE IN UPPER 0.5', IN THE REMAINDER OF THE UNIT POLYHALITE OCCURS AS RARE DISSIMINATED BLEBS; BASAL CONTACT SHARP.</td>
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**REMARKS:**

- **POLYHALITE, FINELY CRYSSTALLINE, REDDISH-ORANGE:** CONTAINS IRREGULAR CRYSTALS AND BEDS OF HALITE; BASAL CONTACT SHARP, EXTREMELY IRREGULAR.
- **HALITE, MEDIUM TO COARSELY CRYSSTALLINE, WHITE TO CLEAR TO TINTED ORANGE:** POLYHALITE OCCURS AS IRREGULAR RANDONLY-ORIENTED AND SUBHORIZONTAL STRINGERS AND AS DISSEMINATED BLESSES, CONTENT INCREASES WITH DEPTH; BETWEEN 1307.0' AND 1308.0' HORIZONTAL AND SUBHORIZONTAL STRINGERS OF CLAY OCCUR; BASAL CONTACT DIFFUSE.
- **ARGILLACEOUS HALITE, REDISH-BROWN CLAY, HALITE WHITE TO CLEAR:** HALITE OCCURS IN PODS AND IRREGULARLY-SHAPED ZONES AND AS GROUPS OF CRYSTALS DISPERSED THROUGHOUT, BOTH CLAY AND HALITE OCCUR AS MATRIX; BASAL CONTACT GRADATIONAL.
- **HALITE, COARSELY CRYSSTALLINE, WHITE TO CLEAR:** SLIGHTLY ARGILLACEOUS, REDDISH-BROWN, CLAY CONTENT DECREASES WITH DEPTH; TRACE DISSEMINATED POLYHALITE BLESSES, CONTENT INCREASES WITH DEPTH, FROM 1320.4' TO 1325.9' A REDDISH-ORANGE, FINELY CRYSSTALLINE POLYHALITE BED OCCURS; BASAL CONTACT SHARP.
- **HALITE, COARSELY CRYSSTALLINE, WHITE TO CLEAR:** UPPER 4" ARGILLACEOUS, CLAY OCCURS AS FINE DISCONTINUOUS STRINGERS, CONTENT DECREASES WITH DEPTH, ABSENT BELOW 1326.0'; BECOMES POLYHALITIC BELOW 1326.0', CONTENT INCREASES WITH DEPTH; BASAL CONTACT GRADATIONAL.
- **ANHYDRITE, FINELY CRYSSTALLINE, LIGHT AND MEDIUM CLAY; INTERBEDS OF HALITE IN UPPER PART. CONTENT DECREASES WITH DEPTH; LOWER 1/2 CONTAINS NO INTERBEDS OF HALITE; BASAL CONTACT SHARP.**
- **POLYHALITE, HALITE, FINELY CRYSSTALLINE, REDDISH-ORANGE:** CONTAINS IRREGULAR DISCONTINUOUS BEDS OF CLEAR HALITE AND IRREGULARLY-SHAPED CRYSTALS OF HALITE 1/32" TO 1/8" ACROSS; OCCASIONAL HALITE PSEUDOMORPHS AFTER GYPSUM SWALLOWTAIL CRYSTALS IN UPPER 1"; FROM 1331.5' TO 1331.8' OF CLAY FINELY CRYSSTALLINE ANHYDRITE BED OCCURS; BASAL CONTACT SHARP, MARKED BY 1" THICK BED OF CLAY CLAYSTONE.
- **HALITE, COARSELY CRYSSTALLINE, WHITE TO CLEAR:** VERY SLIGHTLY ARGILLACEOUS; TRACE POLYHALITE AND ANHYDRITE, IRREGULAR BLESSES OF POLYHALITE OCCURS ABOVE 1335.0', ANHYDRITE OCCURS AS CONTINUOUS AND DISCONTINUOUS STRINGERS BELOW 1335.0', BASAL 2.0' CONTAINS 1/4" THICK SUBHORIZONTAL STRINGERS OF ANHYDRITE; BASAL CONTACT SHARP.
- **POLYHALITE INTERBEDDED WITH ANHYDRITE, FINELY CRYSSTALLINE, LIGHT GRAY TO LIGHT CRYSTALLINE ORANGE, THINLY LAMINATED TO STRUCTURELESS; HALITE BED BETWEEN 1343.4' AND 1343.4'; BASAL CONTACT SHARP, MARKED BY 1" THICK GRAY CLAYSTONE BED.**

**EXHAUST SHAFT LITHOLOGIC LOG**

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**PRELIMINARY**

**STRATIGRAPHIC COLUMN**

**REMARKS**

**HALITE, COARSELY CRYSALLINE, WHITE TO CLEAR; POLYHALITE OCCURS AS CONTINUOUS HORIZONTAL AND SUBHORIZONTAL STRINGERS AND AS IRREGULARLY-SHAPED BLEBS, CONTENT INCREASES WITH DEPTH; BASAL CONTACT SHARP.**

**ARGLICACEOUS HALITE, FINELY TO COARSELY CRYSALLINE, REDDISH-BROWN HALITE CLAYSTONE MATRIX, HALITE CLEAR TO WHITE; HALITE OCCURS AS IRREGULARLY-SHAPED AGRGEGATES OF CRYSTALS; CONTAINS 1/4" TO 2" THICK SUBHORIZONTAL HALITE-FILLED FRACURES; BASAL CONTACT UNDULATORY UP TO 2.0'; GRADATIONAL TO SHARP, DISCONFORMABLE.**

**VAGA TRISTA MARKER BED**

**HALITE-SLITESTONE, REDDISH-BROWN, THINLY LAMINATED TO STRUCTURELESS; HALITE OCCURS AS ISOLATED DISPLACEMENT CRYSTALS UP TO 1-1/2" ACROSS; LOCAL CHANNEL FILL STRUCTURES PRESENT; CONTAINS BOTH SUBVERTICAL AND SUBHORIZONTAL HALITE-FILLED FRACURES 1/8" TO 2" THICK; CHANNEL INTO UNDERLIERING UNIT 3.0' DEEP (EAST SIDE OF SHAFT); NUMEROUS FILLED CHANNELS THROUGHOUT UNIT; OCCASIONAL CROSS-LAMINATIONS; BASAL CONTACT GRADATIONAL TO LOCALLY SHARP, UNDOULATORY UP TO 3.0'.**

**HALITE, MEDIUM TO COARSELY CRYSTALLINE, WHITE TO CLEAR; ARGLICACEOUS TO 1360.0'; CLAY OCCURS AS REDDISH-BROWN MATRIX, CONTENT DECREASES WITH DEPTH; HALITE OCCURS AS IRREGULARLY-SHAPED CRYSTAL MASS; TRACE POLYHALITIC, CONTENT INCREASES WITH DEPTH AS SUBHORIZONTAL CONTINUOUS AND DISCONTINUOUS STRINGERS AND THIN BEDS, ALSO AS DISSEMINATED BLESBS; BELOW 1360.0' ARGLICACEOUS MATERIAL OCCURS AS LOCAL SUBHORIZONTAL STRINGERS; 1" THICK BED OF POLYHALITE OCCURS AT 1360.6'; FROM 1373.4' TO 1373.9' ARGLICACEOUS HALITE OCCURS; BASAL CONTACT SHARP, DISCONFORMABLE.**

**HALITE, MEDIUM TO COARSELY CRYSTALLINE, WHITE TO CLEAR TO TINTED ORANGE, CRUDELY THIN TO MEDIUM BEDDED; POLYHALITE OCCURS AS SUBHORIZONTAL PARALLEL STRINGERS GROUPED IN LAYERS 2.0', RANDOMLY-ORIENTED STRINGERS BELOW 1360.0'; DISSEMINATED BLESBS, CONTENT DECREASES WITH DEPTH; LOCALLY SLIGHTLY ARGLICACEOUS, COLOR WHITISH-CREAM, SUBHORIZONTAL STRINGERS AND LOCAL IRREGULARLY-SHAPED ZONES OF CLAY, CONTENT DECREASES WITH DEPTH; 1/4" TO 1/2" THICK CLAYSTONE BED AT 1383.8'; BASAL CONTACT SHARP, SLIGHTLY UNDOULATORY, DISCONFORMABLE.**

**HALITE CLAYSTONE AND ARGLICACEOUS HALITE, CLAY REDDISH-BROWN, HALITE WHITE TO CLEAR AND FINELYS CRYSALLINE; HALITE CONTENT INCREASES WITH DEPTH, OCCURS AS DISPLACEMENT CRYSTALS (1/8" TO 1/2" ACROSS) AND PODS OF RELATIVELY PURE HALITE; LOCAL PODS OF POLYHALITE; BASAL CONTACT GRADATIONAL.**

**HALITE, MEDIUM TO COARSELY CRYSALLINE, WHITE TO CLEAR; LOCALLY ARGLICACEOUS, REDDISH-BROWN CLAY OCCURS AS RANDOMLY-ORIENTED STRINGERS IN SUBHORIZONTAL ZONES, CONTENT DECREASES WITH DEPTH, DECREASES ABRUPTLY BELOW 1390.1'; TRACE POLYHALITE AS RARE DISSEMINATED RANDOMLY-ORIENTED STRINGERS AND BLESBS, CONTENT INCREASES WITH DEPTH, POLYHALITE BED OCCURS BETWEEN 1390.9' AND 1391.1', CONTENT INCREASES ABRUPTLY NEAR BASE; LOCAL ZONES AND STRINGERS OF ARGLICACEOUS HALITE CONTAINING GRAY CLAY; BASAL CONTACT SHARP, DISCONFORMABLE.**
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<td>HAILITE, MEDIUM TO COARSELY CRYSTALLINE, WHITE TO CLEAR TO TINTED ORANGE; AGGREGATE AT TOP, CONTENT DECREASES WITH DEPTH; LOCAL DISCONTINUOUS IRREGULARLY-SHAPED ZONES OF CLAYSTONE, CLAY ALSO OCCURS AS RANDOMLY-ORIENTED AND SUBHORIZONTAL STRINGERS; MODERATELY ABUNDANT POLYHALITE, OCCURS AS DISSEMINATED BLEBS AND SUBHORIZONTAL DISCONTINUOUS STRINGERS; CLAY ABSENT BELOW 1415.0'; BASAL CONTACT SHARP, SLIGHTLY UNDULATORY UP TO 4&quot;.</td>
</tr>
<tr>
<td>1989</td>
<td>1420</td>
<td>— — —</td>
<td></td>
</tr>
<tr>
<td>1984</td>
<td>1425</td>
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</tr>
<tr>
<td>1979</td>
<td>1430</td>
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<tr>
<td>1974</td>
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**EXHAUST SHAFT**

**LITHOLOGIC LOG**

**SHEET 33 OF 49**
<table>
<thead>
<tr>
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<td>1440</td>
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</tr>
<tr>
<td>1964</td>
<td>1445</td>
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<td>POLYHALITE, FINELY CRYSTALLINE, REDDISH-ORANGE, STRUCTURELESS; HALITE IN UPPER 1.5', HALITE OCCURS AS DISCONTINUOUS THIN BEDS AND IRRREGULARLY-SHAPED ZONES, WHITE TO CLEAR; REMAINDER HALITE-FREE; BASAL CONTACT SHARP, MARKED BY 1&quot; TO 2&quot; THICK GREENISH-GRAY CLAYSTONE BED, DISCONFORMABLE.</td>
</tr>
<tr>
<td>1959</td>
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<td>1954</td>
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<td>1949</td>
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<td>X</td>
<td>HALITE, MEDIUM TO COARSELY CRYSTALLINE, WHITE TO CLEAR; TRACE POLYHALITE, CONTINUES WITH DEPTH, OCCURS AS RARE DISSEMINATED BLEBS AND SUBHORIZONTAL STRINGERS; TWO 3/4&quot; THICK BEDS OF POLYHALITE NEAR 1450'; BASAL CONTACT SHARP.</td>
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<tr>
<td>1944</td>
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<td></td>
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<tr>
<td>1939</td>
<td>1470</td>
<td></td>
<td>POLYHALITE, FINELY CRYSTALLINE, REDDISH-ORANGE, STRUCTURELESS EXCEPT FOR RARE SUBHORIZONTAL AND SUBVERTICAL HALITE-FILLED FRAC'TURES &lt; 1/8&quot; THICK; BASAL CONTACT SHARP.</td>
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<tr>
<td>1934</td>
<td>1475</td>
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</tr>
<tr>
<td>1929</td>
<td>1480</td>
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POLYHALITE, FINELY CRYSTALLINE, REDDISH-ORANGE; UPPER 0.5' TO 1.5' GRAY, REMAINDER REDDISH-BROWN; HALITE OCCURS AS IRREGULARLY-SHAPED ZONES, DISCONTINUOUS BEDS, DISPLACIVE CRYSTALS < 1/8" ACROSS; BASAL CONTACT DIFFUSE. |

HALITE, MEDIUM TO COARSELY CRYSTALLINE, WHITE TO CLEAR TO TINTED ORANGE; VERY ARGLICHACEOUS TO 1459.0', CLAY CONTENT DECREASES WITH DEPTH, OCCURS AS IRREGULARLY-SHAPED ZONES OF HALITE CLAYSTONE WITH DISPLACIVE HALITE CRYSTALS AS MATRIX AND RANDOMLY-ORIENTED STRINGERS OF CLAY IN ARGLICHACEOUS HALITE, BELOW 1459.0' CLAY CONTENT DECREASES ABRUPTLY; TRACE POLYHALITE, CONTENT INCREASES WITH DEPTH, OCCURS AS DISSEMINATED BLEBS AND RANDOMLY-ORIENTED TO SUBHORIZONTAL STRINGERS, STRINGERS BECOME HORIZONTAL AND 1/4" THICK SPACED 2" TO 4" IN LOWER 5.0', 0.5' THICK BED OF POLYHALITE OCCURS AT 1469.0' BACK CONTACT CRADIAL.

POLYHALITE, FINELY CRYSTALLINE, REDDISH-ORANGE TO ORANGEISH-BRED; UPPER 0.5' CONTAINS DISCONTINUOUS BEDS OF IRRREGULARLY-SHAPED PODS OF HALITE; BECOMES LAMINATED WITH CLAY PARTINGS BELOW 1470.0'; BASAL CONTACT SHARP, MARKED BY 1" TO 4" THICK BED OF GRAY CLAYSTONE SPLIT BY BIFURCATING HALITE-FILLED SUBHORIZONTAL FRACTURE, UNDULATORY UP TO 0.5'.

POLYHALITE, COARSELY CRYSTALLINE, WHITE, BEDDED WITH SUBHORIZONTAL CONTINUOUS STRINGERS AND BEDS OF POLYHALITE 1/4" TO 3/4" THICK; POLYHALITE CONTENT DECREASES WITH DEPTH, ABSENT BELOW 1475.0'; BEDDED WITH SUBHORIZONTAL STRINGERS OF GRAY CLAY BELOW 1475.0'; BASAL CONTACT SHARP.

HALITE, FINELY CRYSTALLINE, WHITE TO CLEAR; GRAYISH-BLACK CLAY OCCURS AS INTERSTITIAL FILLING AND AS DISCONTINUOUS SUBHORIZONTAL STRINGERS; BASAL CONTACT SHARP.

HALITE, MEDIUM TO COARSELY CRYSTALLINE, WHITE TO CLEAR TO TINTED ORANGE, RANDED BY ORANGE-TINTED HALITE SPACED 1" TO 2"; 1" THICK BED OF GREENISH-GRAY CLAYSTONE OCCURS 2" ABOVE LOWER CONTACT; BASAL CONTACT SHARP, IRREGULAR, SLIGHTLY UNDULATORY.

HALITE CLAYSTONE AND ARGLICHACEOUS HALITE, REDDISH-BROWN; HALITE OCCURS AS displacive CRYSTALS AND SUBHORIZONTAL FRACTURE FILLINGS 1/4" THICK; UPPER 4" GREENISH-GRAY; BASAL CONTACT DIFFUSE.
<table>
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<tr>
<th>ELEV. (FT. MSL)</th>
<th>DEPTH (FT.)</th>
<th>PRELIMINARY</th>
<th>STRATIGRAPHIC COLUMN</th>
<th>REMARKS</th>
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<tr>
<td>1929</td>
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<td>AS ABOVE</td>
</tr>
<tr>
<td>1924</td>
<td>1485</td>
<td></td>
<td>X</td>
<td>HALITE, MEDIUM TO COARSELY CRYSTALLINE, WHITE TO CLEAR TO TINTED ORANGE; SLIGHTLY ARGILLACEOUS IN UPPER 2.0' AS DISCONTINUOUS RANDOMLY-ORIENTED STRINGERS; TRACE POLYHALITE AT TOP, CONTENT INCREASES WITH DEPTH, OCCURS AS DISSEMINATED BLEBS AND STRINGERS; BASAL CONTACT SHARP.</td>
</tr>
<tr>
<td>1919</td>
<td>1490</td>
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<td>X</td>
<td>POLYHALITE, FINELY CRYSTALLINE, REDDISH-ORANGE, STRUCTURELESS; BASAL CONTACT SHARP, MARKED BY 1/2&quot; TO 1&quot; THICK GRAY CLAYSTONE BED.</td>
</tr>
<tr>
<td>1914</td>
<td>1495</td>
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<td>X</td>
<td>HALITE, FINELY TO COARSELY CRYSTALLINE, WHITE TO CLEAR; CONTAINS SUBHORIZONTAL STRINGERS OF BLACKISH-GRAY CLAY SPACED 2&quot; TO 4&quot;; BASAL CONTACT SHARP.</td>
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<tr>
<td>1909</td>
<td>1500</td>
<td></td>
<td>X</td>
<td>ARGILLACEOUS HALITE, FINELY TO COARSELY CRYSTALLINE, WHITE TO CLEAR; HALITE OCCURS AS PODS AND IRRREGULARLY-SHAPED ZONES OF CRYSTALS SURROUNDED BY REDDISH-BROWN CLAY MATRIX; CLAY CONTENT DECREASES WITH DEPTH; UPPER 4&quot; CONTAINS SUBHORIZONTAL STRINGERS OF BLACKISH-GRAY CLAY SPACED 1&quot;; BASAL CONTACT DIFFUSE.</td>
</tr>
<tr>
<td>1904</td>
<td>1505</td>
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<td>HALITE, COARSELY CRYSTALLINE, WHITE TO CLEAR TO ORANGE; TRACE POLYHALITE, CONTENT INCREASES WITH DEPTH, OCCURS AS DISSEMINATED BLEBS AND RANDOMLY-ORIENTED STRINGERS; BASAL CONTACT SHARP, UNREGULAR, UNDOULATORY UP TO 1&quot;, DISCONFORMABLE.</td>
</tr>
<tr>
<td>1899</td>
<td>1510</td>
<td></td>
<td>X</td>
<td>POLYHALITE, FINELY CRYSTALLINE, REDDISH-ORANGE; HALITIC, CONTAINS IRRREGULARLY-SHAPED PODS OF HALITE TO 4&quot; ACROSS; CONTAINS LOCAL ZONES RICH IN ANHYDRITE OR LANGENEBITE (?); BASAL CONTACT SHARP, UNDOULATORY, SLIGHTLY IRREGULAR.</td>
</tr>
<tr>
<td>1894</td>
<td>1515</td>
<td></td>
<td>X</td>
<td>HALITE, MEDIUM TO COARSELY CRYSTALLINE, WHITE TO CLEAR TO TINTED ORANGE; TRACE POLYHALITE, CONTENT INCREASES WITH DEPTH, OCCURS AS DISSEMINATED BLEBS AND RANDOMLY-ORIENTED STRINGERS; BASAL CONTACT SHARP, SLIGHTLY UNDOULATORY.</td>
</tr>
<tr>
<td>1889</td>
<td>1520</td>
<td></td>
<td>X</td>
<td>POLYHALITE, FINELY CRYSTALLINE, BROWN TO TAN, STRUCTURELESS; BASAL CONTACT SHARP.</td>
</tr>
<tr>
<td>1884</td>
<td>1525</td>
<td></td>
<td></td>
<td>HALITE, FINELY TO COARSELY CRYSTALLINE, WHITE TO CLEAR; CONTAINS STRINGERS OF POLYHALITE AND GRAY CLAY SPACED 1&quot; TO 2&quot;; BASAL CONTACT SHARP.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>HALITE, MEDIUM TO COARSELY CRYSTALLINE, WHITE TO TINTED ORANGE; UPPER 0.5' ARGILLACIOUS, REDDISH-BROWN, CONTENT DECREASES WITH DEPTH; TWO 3&quot; THICK BEDS OF REDDISH-BROWN ARGILLACEOUS HALITE OCCUR AT 1519.8' AND 1520.2'; BASAL 0.5' CONTAINS SUBHORizontal GRAY CLAY STRINGERS, SPACED 1&quot; TO 3&quot;; TRACE POLYHALITE, OCCURS AS DISSEMINATED BLEBS AND RANDOMLY-ORIENTED TO SUBHORIZONTAL STRINGERS; BASAL CONTACT SHARP, SLIGHTLY UNDOULATORY, DISCONFORMABLE.</td>
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EXHAUST SHAFT
LITHOLOGIC LOG
SHEET 35 OF 49
<table>
<thead>
<tr>
<th>PRELIMINARY ELEV. (FT. MSL)</th>
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<tr>
<td>1884</td>
<td>X</td>
<td>AS ABOVE</td>
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<tr>
<td>1879</td>
<td></td>
<td>AGBILACEOUS HALITE, MEDIUM TO COARSELY CRYSTALLINE, WHITE TO CLEAR TO TINTED ORANGE; CLAY REDISH-BROWN, UPPER 1.0' TO 2.0' GRAY AGBILACEOUS HALITE WITH DARK SMALL DISPLACIVE HALITE CRYSTALS &lt; 1/16'' ACROSS; HALITE OCCURS AS AGGREGATES OF CRYSTALS IN PODS OR ZONES; CLAY OCCURS AS MATRIX IN UPPER PART, OCCURS AS DISSEMINATED IRREGULARLY-SHAPED ZONES AND RANDOMLY-ORIENTED STRINGERS WITH DEPTH, CONTENT DECREASES WITH DEPTH; BASAL CONTACT SHARP.</td>
</tr>
<tr>
<td>1874</td>
<td></td>
<td>UNION ANHYDRITE</td>
</tr>
<tr>
<td>1869</td>
<td></td>
<td>ANHYDRITE. ALTERNATES WHITISH-GRAY TO DARK GRAY, FINELY CRYSTALLINE, THINLY LAMINATED TO THINLY BEDDED; HALITE, CONTAINS RARE 1/16'' CRYSTALS OF HALITE; UPPER 2'' TO 5'' POLYHALITIC, DISCONTINUOUS POLYHALITE LENS OCCURS ON NORTHWEST SIDE OF SHAFT BETWEEN 1539.5' AND 1541.6'; LOWER 1.0' TO 2.0' CONTAINS WHITE LAMINAE INTERBEDDING WITH ANHYDRITE, POSSIBLY CARBONATE; BASAL CONTACT GRADATIONAL, ALTERNATION CONTACT, CONFORMABLE.</td>
</tr>
<tr>
<td>1864</td>
<td></td>
<td>POLYHALITE, FINELY CRYSTALLINE, ORANGEISH-RED TO REDISH-ORANGE, THINLY LAMINATED TO THINLY BEDDED, LOCALLY STRUCTURELESS, LAMINAE OFTEN SLIGHTLY CONTORTED; LOCALLY ANHYDRITIC, OCCURS AS UNALTERED LAMINAE AND ZONES; BASAL CONTACT SHARP, MARKED BY LENS CASTS INTO UNDERLYING UNIT (1'' DEEP BY 1'' TO 3'' ACROSS) AND FLAME STRUCTURES. ANHYDRITIC CLAYSTONE, FINELY LAMINATED, GRAY TO WHITISH-GRAY; CONTAINS LOCAL, SMALL ENTROLITHIC STRUCTURES; BASAL CONTACT GRADATIONAL TO DIFFUSE.</td>
</tr>
<tr>
<td>1859</td>
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<td>HALITE, MEDIUM TO COARSELY CRYSTALLINE, WHITE TO CLEAR TO TINTED ORANGE, SLIGHTLY BEDDED BY DISCONTINUOUS SUBHORIZONTAL STRINGERS OF POLYHALITE AND BANDS OF POLYHALITIC HALITE; BASAL CONTACT SHARP, DISCONFORMABLE.</td>
</tr>
<tr>
<td>1854</td>
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<td>HALITE, MEDIUM TO COARSELY CRYSTALLINE, WHITE TO TINTED ORANGE, STRUCTURELESS; SLIGHTLY AGGILACEOUS, MODERATELY ABUNDANT IN UPPER 1.0', CONTENT DECREASES WITH DEPTH, OCCURS AS DISSEMINATED BLES AND RANDOMLY-ORIENTED STRINGERS; BASAL CONTACT GRADATIONAL.</td>
</tr>
<tr>
<td>1849</td>
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<tr>
<td>1844</td>
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<tr>
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<tr>
<td>1839</td>
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<tr>
<td>1834</td>
<td>1575</td>
<td>X</td>
</tr>
<tr>
<td>1829</td>
<td>1580</td>
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</tr>
<tr>
<td>1824</td>
<td>1585</td>
<td>X</td>
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<tr>
<td>1819</td>
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<tr>
<td>1809</td>
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<tr>
<td>1804</td>
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<tr>
<td>1799</td>
<td>1610</td>
<td>X</td>
</tr>
<tr>
<td>1794</td>
<td>1615</td>
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</tbody>
</table>

**HALITE, MEDIUM TO COARSELY CRYSTALLINE, WHITE TO TINTED GRAY, STRUCTURELESS:**

- **Upper 0.5' Slightly Argillaceous, Reddish-Brown, Content Decreases with Depth.**
- **Absent below 1582.0', occurs as discontinuous stringers and as intercrystalline matrix; trace disseminated polyhalite blebs; basal contact gradational, highly irregular, marked by the occurrence of argillaceous halite.**

- **HALITE, MEDIUM TO COARSELY CRYSTALLINE, WHITE TO CLEAR; UPPER 0.5' HAS REDDISH-BROWN CLAY MATRIX, CONTENT DECREASES SLIGHTLY WITH DEPTH, CLAY BECOMES BROWER GRAY AND REDDISH-BROWN, OCCURS AS RANDOMLY-ORIENTED STRINGERS; TRACE POLYHALITE, CONTENT INCREASES WITH DEPTH, OCCURS AS DISSEMINATED BLEBS AND AS STRINGERS WITH DEPTH; BASAL CONTACT GRADATIONAL, DISCONFORMABLE.**

- **HALITE, MEDIUM TO COARSELY CRYSTALLINE, WHITE TO CLEAR; SLIGHTLY ARGILLACEOUS, CONTENT DECREASES WITH DEPTH, REDDISH-BROWN, OCCURS AS INTERCRYSTALLINE MATERIAL AND RANDOMLY-ORIENTED STRINGERS, LOCALLY OCCURS IN GREATER CONCENTRATIONS; TRACE POLYHALITE, CONTENT INCREASES SLIGHTLY WITH DEPTH, OCCURS AS DISSEMINATED BLEBS, BLEBS BECOME LARGER WITH DEPTH (2" TO 1"); BASAL CONTACT SHARP.**

**EXHAUST SHAFT**

**LITHOLOGIC LOG**

**SHEET 37 OF 49**
<table>
<thead>
<tr>
<th>ELEV. (FT.MSL)</th>
<th>DEPTH (FT.)</th>
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<th>REMARKS</th>
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</thead>
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<tr>
<td>1794</td>
<td>1615</td>
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<td>ANYDORITE, FINELY CRYSTALLINE, BROWNISH-GRAY TO ORANGISH-TAN, THINLY LAMINATED; LOCALLY ALTERED TO POLYHALITE; LAMINAE OFTEN CONTORTED AND SLIGHTLY HALITIC, LOCALLY MODULAR, STRUCTURE OFTEN ENTROLITHIC; BASAL CONTACT GRADATIONAL.</td>
</tr>
<tr>
<td>1789</td>
<td>1620</td>
<td>MB 123</td>
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<tr>
<td>1784</td>
<td>1625</td>
<td>X</td>
<td>HALITE, FINELY TO COARSELY CRYSTALLINE, WHITE TO TINTED ORANGE; 3&quot; THICK BED OF ORANGISH-BRED POLYHALITE AT 1628.2'; TRACE POLYHALITE, OCCURS AS RANDOMLY-ORIENTED TO SUBHORIZONTAL STRINGERS AND AS DISSEMINATED BLEBS; THIN 1&quot; THICK IRREGULAR BED OF ANYDORITE AT 1628.3'; BASAL CONTACT SHARP, DISCONFORMABLE (?).</td>
</tr>
<tr>
<td>1779</td>
<td>1630</td>
<td>MB 124</td>
<td>ANYDORITE, FINELY CRYSTALLINE, BROWNISH-GRAY TO TANNISH-GRAY, ENTROLITHIC TO MODULAR TO 1633.0'; BELOW 1633.0', BECOMES LAMINATED TO THINLY BEDDED, LOCALLY CONTAINS ANYDORITE PSEUDOMORPHS AFTER GYPSUM SMALLTAIL CRYSTALS; LOCALLY POLYHALITIC; BASAL CONTACT SHARP, MARKED BY 2.0&quot; TO 4.0&quot; THICK GRAY THINLY LAMINATED CLAYSTONE BED CONTAINING SEVERAL SUBHORIZONTAL FIBRUS HALITE-FILLED FRACTURES 1/8&quot; TO 1/4&quot; THICK, SPACED 1&quot; TO 2&quot;; BASAL CONTACT GRADATIONAL.</td>
</tr>
<tr>
<td>1774</td>
<td>1635</td>
<td>MB 125</td>
<td></td>
</tr>
<tr>
<td>1769</td>
<td>1640</td>
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<td>AGRILLAGOUS POLYHALITE, FINELY CRYSTALLINE, REDDISH-ORANGE; POLYHALITE OCCURS AS REPLACEMENT OF ANYDORITE OR GYPSUM NODULES IN GRAY CLAYSTONE MATRIX; NODULE CONCENTRATION INCREASES WITH DEPTH UNTIL MATRIX IS POLYHALITE; NODULE DIAMETER 1/8&quot; TO 1/2&quot; UNDERLAIN BY 1&quot; TO 2&quot; GRAY CLAYSTONE BED; BASAL CONTACT SHARP, UNDULATORY, IRREGULAR.</td>
</tr>
<tr>
<td>1764</td>
<td>1645</td>
<td>X</td>
<td>HALITE, MEDIUM TO COARSELY CRYSTALLINE, WHITE TO TINTED ORANGE; POLYHALITIC, OCCURS AS DISSEMINATED BLEBS AND AS RANDOMLY-ORIENTED TO SUBHORIZONTAL STRINGERS; GRAY CLAYSTONE BED OCCURS AT 1644.0'; POLYHALITE CONTENT TRACE BELOW 1644.0'; LOWER 1.5' CONTAINS TRACE AMOUNT OF CLAY STRINGERS; BASAL CONTACT SHARP, IRREGULAR WITH DISSOLUTION PITS 0.3' DEEP, MARKED BY 2&quot; TO 3&quot; THICK GRAY CLAYSTONE BED.</td>
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<tr>
<td>1759</td>
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AS BELOW

EXHAUST SHAFT
LITHOLOGIC LOG
SHEET 38 OF 49
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<tr>
<th>ELEV. (FT MSL)</th>
<th>DEPTH (FT.)</th>
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<tr>
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**Preliminary**

**Stratigraphic Column**

**Halite, medium to coarsely crystalline, white to clear; trace reddish-brown and gray clay, occurring as stringers and as locally disseminated matrix; clay content increases abruptly below 1662.0', as reddish-brown stringers, content decreases with depth, argillaceous halite bed occurs with clay as stringers and matrix between 1673.0' and 1673.8'; lower 2.5' contains discontinuous horizontal and subhorizontal stringers of gray clay; trace polyhalite, content increases with depth, occurs as disseminated blebs with size increasing with depth (1' diameter); basal contact sharp, irregular, indistinct to 0.5'.

**Halite, medium to coarsely crystalline, white to clear to tinted orange; argillaceous halite occurs between 1681.4' and 1682.6', gray clay; reddish-brown argillaceous halite occurs between 1682.6' and 1684.1', clay occurs as randomly-oriented stringers and as matrix; clay content decreases abruptly below 1684.1'; trace polyhalite below 1686.8', content increases with depth, occurs as disseminated blebs and as randomly-oriented to subhorizontal stringers; basal contact sharp.**

**Halite, medium to coarsely crystalline, white to clear to tinted orange; very argillaceous in upper 0.5', clay reddish-brown, content decreases with depth, occurs as intercrystalline matrix and rare stringers, content decreases abruptly below 1704.0'; trace polyhalite, occurs as disseminated blebs; basal contact sharp, irregular, disconformable.
<table>
<thead>
<tr>
<th>PRELIMINARY ELEV. (FT. MSL)</th>
<th>DEPTH (FT.)</th>
<th>STRATIGRAPHIC COLUMN</th>
<th>REMARKS</th>
</tr>
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<td>1704</td>
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<td>1699 - 1710</td>
<td>X</td>
<td>HALITE, MEDIUM TO COARSELY CRYSTALLINE, WHITE TO CLEAR; UPPER 0.3' TO 0.4' AND LOWER 0.7' PURE HALITE, REMAINDER SLIGHTLY ARGILLACEOUS, CLAY REDDISH-BROWN, BECOMING GRAY WITH DEPTH; BASAL CONTACT SHARP, IRREGULAR, DISCONFORMABLE.</td>
<td></td>
</tr>
<tr>
<td>1694 - 1715</td>
<td>X</td>
<td>X</td>
<td>HALITE, MEDIUM TO COARSELY CRYSTALLINE, WHITE TO CLEAR TO TINTED ORANGE; UPPER 1.0' ARGILLACEOUS, CONTENT DECREASES WITH DEPTH; TRACE POLYHALITE, CONTENT INCREASES WITH DEPTH, OCCURS AS DISSEMINATED BLEBS AND RANDOMLY-ORIENTED STRINGERS, LOWER 1.3' VERY POLYHALITIC; BASAL CONTACT SHARP, IRREGULAR, UNDULATORY.</td>
</tr>
<tr>
<td>1689 - 1720</td>
<td>X</td>
<td>X</td>
<td>POLYHALITE, FINELY CRYSTALLINE, ORANGISH-RED, STRUCTURELESS; UNIT VERY UNDULATORY; BASAL 0.4' CONSISTS OF GREENISH-GRAY CLAYSTONE; BASAL CONTACT SHARP, UNDULATORY, DISCONFORMABLE.</td>
</tr>
<tr>
<td>1684 - 1725</td>
<td>X</td>
<td>X</td>
<td>HALITE, MEDIUM TO COARSELY CRYSTALLINE, WHITE TO CLEAR; LOCALLY ARGILLACEOUS, CLAY REDDISH-BROWN, CONTENT DECREASES WITH DEPTH; TRACE POLYHALITE, OCCURS AS DISSEMINATED BLEBS; BASAL CONTACT SHARP, IRREGULAR WITH DISSOLUTION PITS 1.0' DEEP INTO UNDERLYING UNIT.</td>
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<tr>
<td>1679 - 1730</td>
<td>X</td>
<td>X</td>
<td>HALITE, MEDIUM TO COARSELY CRYSTALLINE, WHITE TO CLEAR; LOWER 2.0' SLIGHTLY ARGILLACEOUS, CLAY REDDISH-BROWN, OCCURS AS RANDOMLY-ORIENTED TO SUBHORIZONTAL STRINGERS AND DISSEMINATED INTERCRYSTALLINE MATERIAL; TRACE POLYHALITE AT TOP, CONTENT INCREASES WITH DEPTH, OCCURS AS DISSEMINATED BLEBS AND RANDOMLY-ORIENTED STRINGERS; BASAL CONTACT GRADATIONAL.</td>
</tr>
<tr>
<td>1674 - 1735</td>
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<td>1669 - 1740</td>
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<td>1664 - 1745</td>
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<td>1659 - 1750</td>
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<thead>
<tr>
<th>ELEV. [FT. MSL]</th>
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<tr>
<td>1614</td>
<td>1795</td>
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</table>

**STRATIGRAPHIC COLUMN**

- **1659-1750**: Polyhalite, finely crystalline, reddish-orange, trace thin laminations; locally anhydritic; basal contact sharp.
- **1654-1755**: Halite, medium to coarse crystalline, white occasionally tinted orange; subhorizontal polyhalite stringers, 1/8" thick; basal contact sharp, irregular.
- **1649-1760**: Polyhalite, finely crystalline, reddish-orange; basal contact sharp, marked by 1" thick gray claystone bed.
- **1644-1765**: Halite, coarsest crystalline, white to clear to tinted orange; polyhalitic, content decreases with depth, occurs as stringers and blebs; 0.1' to 0.6' thick anhydrite bed occurs at 1761.9'; basal contact sharp.
- **1639-1770**: Polyhalite, finely crystalline, reddish-orange, thinly laminated; 0.3' thick halite bed at 1762.9'; lower 0.1' to 0.2' halitic claystone; basal contact sharp.
- **1634-1775**: Halite, medium to coarsest crystalline, white occasionally tinted orange, hint of horizontal stringers of polyhalite spaced 0.2'; 0.1' thick bed of aragonitic halite occurs at 1767.3'; polyhalite content increases abruptly near base; basal contact sharp, disconformable.
- **1629-1780**: Aragonitic halite, finely to coarsely crystalline, white to clear to tinted orange; gray clay occurs as matrix and intercrystalline material, clay becomes reddish-brown below 1771.8'; clay content decreases with depth; clay-free polyhalitic halite occurs between 1773.3' and 1773.8'; polyhalite content increases with depth; basal contact sharp, irregular.
- **1524-1785**: Halite, medium to coarsest crystalline, white to clear to tinted orange; aragonitic to 1782.4', content decreases abruptly below, clay occurs as matrix; trace polyhalite, content increases with depth, occurs as disseminated blebs and randomly-oriented stringers; basal contact gradational.
- **1619-1790**: Polyhalite, finely crystalline, dark reddish-orange, hint of thin laminations; trace halite; basal contact sharp, marked by 1" thick gray claystone bed, slightly undulatony, disconformable.
- **1614-1795**: Aragonitic halite, finely to coarsely crystalline, clear; gray clay at top, grading to reddish-brown with depth, content decreases with depth until absent at 1792.3'; clay content increases as intercrystalline material and stringers below 1792.3', content decreases with depth, absent below 1794.0'; trace polyhalite, content increases with depth, occurs as disseminated blebs and randomly-oriented to subhorizontal stringers; basal contact sharp, marked by 0.1' thick bed of polyhalite underlain by 1/4" thick gray claystone bed.
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<th>STRATIGRAPHIC COLUMN</th>
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<tr>
<td>1614</td>
<td>1795</td>
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<td>1609</td>
<td>1800</td>
<td>X</td>
<td>HALITE, MEDIUM TO COARSELY CRYSTALLINE, WHITE TO CLEAR; CONTAINS SUBHORIZONTAL GRAY CLAY STRINGERS TO 1804.3', ABSENT BELOW 1804.3'; TRACE POLYHALITE, CONTENT INCREASES WITH DEPTH, OCCURS AS DISSEMINATED BLEBS AND SUBHORIZONTAL STRINGERS; BASAL CONTACT SHARP, MARKED BY 3' ZONE OF GRAYISH HALITE UNDERLAIN BY 1' THICK GRAY CLAYSTONE.</td>
</tr>
<tr>
<td>1604</td>
<td>1805</td>
<td>X</td>
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<tr>
<td>1599</td>
<td>1810</td>
<td>X</td>
<td>HALITE, MEDIUM TO COARSELY CRYSTALLINE, WHITE TO CLEAR; UPPER 1.8' ARGILLACEOUS, REDDISH-BROWN, CONTENT DECREASES WITH DEPTH; TRACE POLYHALITE, CONTENT INCREASES WITH DEPTH, OCCURS AS DISSEMINATED BLEBS, BLEBS ALIGNED IN ZONES AND STRINGERS OCCUR BELOW 1811.6'; CONTAINS GRAY CLAY AS STRINGERS AND DISSEMINATED INTERCRYSTALLINE MATERIAL BETWEEN 1819.2' AND 1819.9'; BASAL CONTACT SHARP, IRREGULAR, DISCONFORMABLE.</td>
</tr>
<tr>
<td>1594</td>
<td>1815</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>1589</td>
<td>1820</td>
<td>X</td>
<td>HALITE, FINELY TO COARSELY CRYSTALLINE, WHITE TO CLEAR TO TINTED ORANGE; ARGILLACEOUS, REDDISH-BROWN, CLAY OCCURS AS INTERCRYSTALLINE MATRIX AND STRINGERS, CONTENT DECREASES WITH DEPTH, CONTENT DECREASES ABRUPTLY BELOW 1823.0'; TRACE POLYHALITE, OCCURS AS DISSEMINATED BLEBS; BASAL CONTACT GRADATIONAL.</td>
</tr>
<tr>
<td>1584</td>
<td>1825</td>
<td>X</td>
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<tr>
<td>1579</td>
<td>1830</td>
<td>X</td>
<td>HALITE, FINELY TO COARSELY CRYSTALLINE, WHITE TO CLEAR TO TINTED ORANGE; SLIGHTLY ARGILLACEOUS IN UPPER 4.0', CONTENT DECREASES WITH DEPTH, CLAY OCCURS AS STRINGERS AND INTERCRYSTALLINE MATRIX, CONTAINS RARE SMALL (&lt;1/16'') DISPLACEMENT HALITE CRYSTALS; TRACE POLYHALITE, OCCURS AS DISSEMINATED BLEBS; BASAL CONTACT SHARP, MARKED BY DISSOLUTION PITS 6'' TO 8'' DEEP INTO UNDERLYING UNIT, IRREGULAR, UNDULATORY.</td>
</tr>
<tr>
<td>1574</td>
<td>1835</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>1569</td>
<td>1840</td>
<td>X</td>
<td>HALITE, MEDIUM TO COARSELY CRYSTALLINE, WHITE TO CLEAR; ARGILLACEOUS TO 1839.8', OCCURS AS GRAY STRINGERS; TRACE POLYHALITE, CONTENT INCREASES WITH DEPTH, OCCURS AS BLEBS AND RANDOMLY-ORIENTED TO SUBHORIZONTAL STRINGERS; BASAL CONTACT GRADATIONAL, HIGHLY IRREGULAR, SLIGHTLY UNDULATORY.</td>
</tr>
<tr>
<td>ELEV. (FT. MSL)</td>
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<td>REMARKS</td>
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<tr>
<td>1569</td>
<td>1840</td>
<td>AS ABOVE</td>
<td></td>
</tr>
<tr>
<td>1564</td>
<td>1845</td>
<td>POLYHALITE, FINELY CRISTALLINE, REDDISH-ORANGE; HIALITIC; BASAL CONTACT GRADATIONAL, VERY IRREGULAR, UNDULATORY.</td>
<td></td>
</tr>
<tr>
<td>1559</td>
<td>1850</td>
<td>HALITE, FINELY TO COARSELY CRISTALLINE, WHITE TO CLEAR TO TINTED ORANGE; ARGLACEOUS, GRAY AT TOP GRADING TO REDDISH-BROWN WITH DEPTH, CONTENT DECREASES WITH DEPTH. CLAY OCCURS AS SUBHORIZONTAL STRINGERS AND AS MATRIX MATERIAL IN IRREGULARLY-SHAPED ZONES OF ARGILLACEOUS HALITE; POLYHALITIC; CONTENT INCREASES WITH DEPTH, OCCURS AS DISSEMINATED BLOBS AND RANDOMLY-ORIENTED DISCONTINUOUS STRINGERS; CONTAINS LARGE IRREGULAR ZONES (SEVERAL, SQUARE FOOT AREA) OF PURE WHITE HALITE WHICH ARE CONTINUOUS INTO UNDERLYING UNIT (DISSOLUTION PITS ?); BASAL CONTACT SHARP, IRREGULAR, DISCONFORMABLE.</td>
<td></td>
</tr>
<tr>
<td>1554</td>
<td>1855</td>
<td>HALITE, MEDIUM TO COARSELY CRISTALLINE, WHITE TO CLEAR; ARGILLACEOUS AT TOP, CONTENT DECREASES WITH DEPTH, OCCURS AS RANDOMLY-ORIENTED STRINGERS; TRACE POLYHALITE, OCCURS AS DISSEMINATED BLOBS; CONTAINS DISSOLUTION PITS 2.0' TO 3.0' DEEP, FILLED WITH WHITE COARSELY CRISTALLINE HALITE; BASAL CONTACT SHARP TO ABSENT, &quot;MARKED BY 1&quot; THICK GRAY CLAYSTONE BED.</td>
<td></td>
</tr>
<tr>
<td>1549</td>
<td>1860</td>
<td>HALITE, COARSELY CRISTALLINE, WHITE TO TINTED ORANGE; POLYHALITIC, CONTENT INCREASES WITH DEPTH, OCCURS AS DISSEMINATED BLOBS AND SUBHORIZONTAL 1/4&quot; THICK STRINGERS; BASAL CONTACT SHARP, SLIGHTLY UNDULATORY.</td>
<td></td>
</tr>
<tr>
<td>1544</td>
<td>1865</td>
<td>POLYHALITE, FINELY CRISTALLINE, DARK REDDISH-ORANGE, STRUCTURELESS; HALITIC; UNDERLAIN BY 4&quot; THICK BED OF GRAY HALITIC CLAYSTONE; BASAL CONTACT GRADATIONAL.</td>
<td></td>
</tr>
<tr>
<td>1539</td>
<td>1870</td>
<td>HALITE, MEDIUM TO COARSELY CRISTALLINE; WHITE TO CLEAR; SLIGHTLY ARGILLACEOUS, CONTENT DECREASES WITH DEPTH, OCCURS AS SUBHORIZONTAL STRINGERS; POLYHALITIC, CONTENT INCREASES WITH DEPTH, OCCURS AS DISSEMINATED BLOBS AND SUBHORIZONTAL STRINGERS, POLYHALITE BED 0.1' THICK AT 1875.7'; BASAL CONTACT SHARP, IRREGULAR, SLIGHTLY UNDULATORY.</td>
<td></td>
</tr>
<tr>
<td>1534</td>
<td>1875</td>
<td>ARGILLACEOUS HALITE, FINELY TO COARSELY CRISTALLINE, WHITE TO CLEAR; CLAY REDDISH-BROWN TO GRAY, OCCURS AS IRREGULAR SUBHORIZONTAL STRINGERS; HALITE OCCURS IN PODS OR ZONES OF CRYSTALS; TRACE POLYHALITE; BASAL CONTACT SHARP, SLIGHTLY UNDULATORY.</td>
<td></td>
</tr>
<tr>
<td>1529</td>
<td>1880</td>
<td>HALITE, COARSELY CRISTALLINE, WHITE; BECOMES SLIGHTLY ARGILLACEOUS WITH DEPTH; POLYHALITIC, OCCURS AS BLOBS AND SUBHORIZONTAL STRINGERS; BASAL CONTACT SHARP, IRREGULAR, SLIGHTLY UNDULATORY.</td>
<td></td>
</tr>
<tr>
<td>1524</td>
<td>1885</td>
<td>ARGILLACEOUS HALITE, REDDISH-BROWN, TRACE OF GRAY HALITE, FINELY TO COARSELY CRISTALLINE, WHITE TO CLEAR, OCCURS AS IRREGULARLY-SHAPED BEDS AND PODS, LOCALLY POLYHALITIC AND FREE OF CLAY; TRACE POLYHALITE, CONTENT INCREASES WITH DEPTH, OCCURS AS DISSEMINATED BLOBS AND IRREGULAR RANDOMLY-ORIENTED STRINGERS; 1/4&quot; THICK BED OF POLYHALITE UNDERLAIN BY 1/4&quot; THICK DISCONTINUOUS BED OF GRAY CLAYSTONE OCCURS AT 1898.2'; BASAL CONTACT SHARP, IRREGULAR, SLIGHTLY UNDULATORY.</td>
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**EXHAUST SHAFT**

**LITHOLOGIC LOG**

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<table>
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<td>1479</td>
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**POLYHALITE, FINELY CRYSSTALLINE, DARK REDDISH-ORANGE, STRUCTURELESS; UNDERLAIN BY 1" THICK GREENISH-GRAY CLAYSTONE; BASAL CONTACT SHARP.**

**SALITE, FINELY TO COARSELY CRYSSTALLINE, WHITE TO CLEAR TO TINTED ORANGE; TRACE ARCILLACEOUS MATERIAL BELOW 1901.0', CONTENT DECREASES WITH DEPTH, TOTALLY ABSENT BELOW 1904.8', OCCURS AS RANDOMLY-ORIENTED TO SUBHORIZONTAL STRINGERS BECOMING BLEDS WITH DEPTH; 1/4" THICK SUBHORIZONTAL STRINGERS OF ANHYDRITE OCCUR BELOW 1914.0'; AT 1916.5', A 0.2" THICK PINKISH-RED POLYHALITE BED OCCURS; BASAL CONTACT SHARP, SLIGHTLY IRREGULAR AND UNDOULATORY.**

**POLYHALITE, FINELY CRYSSTALLINE, DARK RED, STRUCTURELESS AT TOP GRADING TO LAMINATED AT BASE; HALITIC, BASAL CONTACT SHARP TO GRADATIONAL, MARKED BY 0.1' TO 0.2' THICK GRAY CLAYSTONE BED.**

**SALITE, MEDIUM TO COARSELY CRYSSTALLINE, WHITE TO CLEAR, SLIGHTLY ARCILLACEOUS, OCCURS AS RANDOMLY-ORIENTED STRINGERS; ABUNDANT POLYHALITE, OCCURS AS DISSEMINATED BLEDS; CONTAINS LOCAL ZONES OF PURE HALITE; BASAL CONTACT GRADATIONAL, IRREGULAR.**

**SALITE, MEDIUM TO COARSELY CRYSSTALLINE, CLEAR TO WHITE; RANDOMLY-ORIENTED TO SUBHORIZONTAL STRINGERS OF BLACK CLAY OCCUR BETWEEN 1923.5' AND 1926.4'; POLYHALITIC, CONTENT INCREASES ABRUPTLY BELOW 1926.8', THEN DECREASES WITH DEPTH, OCCURS AS DISSEMINATED BLEDS; BASAL CONTACT DIFFUSE.**
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<th>Stratigraphic Column</th>
<th>Remarks</th>
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<td>1479</td>
<td>1930</td>
<td>-</td>
<td>Halite, finely to coarsely crystalline, clear to white; moderately argillaceous, content decreases with depth, occurs as black blebs and stringers; trace polyhalite. Content increases with depth, occurs as discontinuous irregularly-oriented to subhorizontal stringers and disseminated blebs; contains local beds and zones of clay-free halite; polyhalite content increases abruptly near base; basal contact sharp.</td>
</tr>
<tr>
<td>1474</td>
<td>1935</td>
<td>-</td>
<td>Anhydrite, finely crystalline, light to dark gray, thinly laminated to laminated; upper 0 to 0.3' polyhalitic; locally halitic, occurs as discontinuous beds and pods; some laminae organic-rich (?); laminae undulate slightly; underlain by 0.1' to 0.3' thick gray halite claystone; basal contact sharp, irregular, slightly undulatory.</td>
</tr>
<tr>
<td>1469</td>
<td>1940</td>
<td>X</td>
<td>Halite, coarsely crystalline, white to clear to tinted orange, structureless; slightly argillaceous in upper 5.0', occurs as gray discontinuous subhorizontal stringers; below 1952.3' content increases sharply, then decreases with depth, discontinuous 1' to 2' thick irregular gray claystone bed occurs at 1952.3'; trace polyhalite, occurs as light orangeish-white disseminated blebs; in basal 1.0' polyhalite and anhydrite occur as discontinuous subhorizontal stringers; basal contact sharp, irregular.</td>
</tr>
<tr>
<td>1459</td>
<td>1950</td>
<td>X</td>
<td>Anhydrite, finely crystalline, gray alternating with dark gray, thinly laminated; locally contains pods of halite and halite-rich laminae; basal contact sharp, conformable.</td>
</tr>
<tr>
<td>1464</td>
<td>1955</td>
<td>-</td>
<td>Anhydrite, finely crystalline, gray; halitic, occurs as abundant halite pseudomorphs after gypsum small-grained crystals aligned parallel to bedding, 1/8&quot; to 2&quot; high, majority oriented vertically; locally, anhydrite is free of pseudomorphs and thinly laminated; laminae alternate from light to dark gray; halite pseudomorphs absent between 1966.6' and 1967.3'; basal contact gradational to diffuse.</td>
</tr>
<tr>
<td>1449</td>
<td>1960</td>
<td>X</td>
<td>Anhydrite, finely crystalline, alternating light and dark gray, thinly laminated to laminated; laminae often contain insipient euhedral structures and anhydrite pseudomorphs after gypsum small-grained crystals; underlain by 0.4' to 0.5' thick bed of microlaminated to thinly laminated gray claystone containing subhorizontal bifurcating 0 to 1' thick halite-filled fractures; basal contact sharp, irregular, undulatory, disconformable.</td>
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<tr>
<td>1419</td>
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<tr>
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<td>1995</td>
<td>X</td>
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<td></td>
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<tr>
<td>1389</td>
<td>2020</td>
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**REMARKS**

HALITE, MEDIUM TO COARSELY CRYSTALLINE, WHITE TO CLEAR, STRUCTURELESS; MODERATELY ARGLICINEOUS, GRAY, CONTENT DECREASES WITH DEPTH, OCCURS AS DISSEMINATED RANDOMLY-ORIENTED DISCONTINUOUS STRINGERS AND BLEBS; TRACE POLYHALITE BLEBS; CONTAINS INTRACOLUMN DISINTEGRATION PITS FILLED WITH RELATIVELY PURE HALITE; FREE OF CLAY CLAY FROM 1985.0' TO 1989.0'; THIN (<1/8") SUBHORIZONTAL STRINGERS OF ANHYDRITE OCCUR BELOW 1988.0'; IRREGULAR BED OF HALITE ANHYDRITE IN LOWER 1" TO 3" OVERLIES HIGHLY UNDULATORY BASAL CONTACT, CONTACT MARKED BY GRAY CLAYSTONE IN CHANNEL TROUGHS, CONTACT EROSIONALLY TERMINATES UNDERLYING UNIT AT THE WEST SIDE OF SHAFT; BASAL CONTACT SHARP.

HALITE, MEDIUM TO COARSELY CRYSTALLINE, WHITE; CONTAINS DISCONTINUOUS SUBHORIZONTAL STRINGERS OF ANHYDRITE, <1/4" THICK; UNIT THICKNESS VARIES FROM 0 TO 1.5' AS IT IS EROSIONALLY TERMINATED AT UPPER CONTACT; SHAPE LENTICULAR (0 TO 1.5' X 6'); BASAL CONTACT SHARP.

ANHYDRITE, FINELY CRYSTALLINE, LIGHT GRAY, LOCALLY THINLY LAMINATED; CONTAINS ABUNDANT HALITE PSEUDOMORPHS AFTER CUPRUM SLOWSTONE CRYSTALS; BASAL CONTACT SHARP, MARKED BY 1/4" TO 1/2" THICK GRAY CLAYSTONE BED.

HALITE, MEDIUM TO COARSELY CRYSTALLINE, WHITE TO CLEAR TO TINTED GRAY, BANDED, SPACED 1/2" TO 4", TRACE GRAY CLAY; CONTAINS CONTINUOUS IRREGULAR SUBHORIZONTAL STRINGERS OF GRAY CLAY; BASAL CONTACT SHARP, SLIGHTLY UNDULATORY UP TO 4".

HALITE, MEDIUM TO COARSELY CRYSTALLINE, WHITE TO CLEAR TO TINTED GRAY, BANDED ON 1/2" TO 2" SCALE, SLIGHTLY ARGLICINEOUS, OCCURS AS SUBHORIZONTAL STRINGERS AND LOCAL RANDOMLY-ORIENTED STRINGERS; TRACE POLYHALITE, OCCURS AS DISSEMINATED BLEBS, CONTENT INCREASES WITH DEPTH; BASAL CONTACT SHARP.

HALITE, MEDIUM TO COARSELY CRYSTALLINE, WHITE TO CLEAR, STRUCTURELESS; SLIGHTLY ARGLICINEOUS IN UPPER PART, CONTENT DECREASES WITH DEPTH, OCCURS AS REDDISH-BROWN RANDOMLY-ORIENTED STRINGERS; TRACE POLYHALITE, CONTENT INCREASES WITH DEPTH; BASAL CONTACT SHARP, SLIGHTLY IRREGULAR, SLIGHTLY UNDULATORY (3').

ARGILICINEOUS HALITE, FINELY TO COARSELY CRYSTALLINE, WHITE TO TINTED ORANGE; CLAY REDDISH-BROWN, CONTENT DECREASES WITH DEPTH, OCCURS AS INTERCRYSTALLINE MATRIX, GRADES TO SUBHORIZONTAL STRINGERS WITH DEPTH; HALITE OCCURS AS DISCONTINUOUS BEDS AND ALIGNED PODS; BASAL CONTACT SHARP, IRREGULAR, UNDULATORY.
<table>
<thead>
<tr>
<th>ELEV. (FT MSL)</th>
<th>DEPTH (FT.)</th>
<th>STRATIGRAPHIC COLUMN</th>
<th>REMARKS</th>
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</thead>
<tbody>
<tr>
<td>1389</td>
<td>2020</td>
<td>-</td>
<td>AS ABOVE</td>
</tr>
<tr>
<td>1384</td>
<td>2025</td>
<td>-</td>
<td>HALITE, FINELY TO COARSELY CRYSTALLINE, WHITE TO TINTED ORANGE, OCCURS AS IRREGULAR DISCONTINUOUS BEDS 1/2&quot; TO 2&quot; THICK AT TOP, BECOMES MASSIVE WITH DEPTH; VERY ARGILLACEOUS AT TOP, CONTENT DECREASES WITH DEPTH, OCCURS AS INTERCRYSTALLINE MATRIX; ABUNDANT POLYHALITE AT TOP, CONTENT INCREASES WITH DEPTH, OCCURS AS DISEMIXED BLESSES AND RARE SUBHORIZONTAL STRINGERS; CONTAINS ABUNDANT VERTICALLY-ORIENTED ELONGATE ZONES OF PURE AND POLYHALITIC HALITE WITH IRREGULAR EDGES, 1.0' TO 2.0' ACROSS, UP TO 3.0' DEEP; BASAL CONTACT EXHIBITS CHANNEL FORM, WITH HIGH SIDE OCCURRING ON WEST SIDE OF SHAFT AT 2031.0' AND LOW POINT OCCURRING ON EAST SIDE OF SHAFT AT 2036.3'; CHANNEL FILL CONSISTS OF HALITE AND POLYHALITIC HALITE BELOW 2032.0', A 0.5' THICK BED OF FINELY CRYSTALLINE ANHYDRITE OCCURS AT 2032.3' AND TERMINATES AGAINST UNDERLYING UNIT AT WEST SIDE OF SHAFT, FILL CONTAINS ABUNDANT SUBHORIZONTAL STRINGERS OF ANHYDRITE THAT TERMINATE AGAINST UNDERLYING UNIT AT WEST SIDE OF SHAFT; BASAL CONTACT SHARP.</td>
</tr>
<tr>
<td>1379</td>
<td>2030</td>
<td>-</td>
<td>POLYHALITE, FINELY CRYSTALLINE, REDDISH-ORANGE, STRUCTURELESS EXCEPT FOR LOCAL ZONES CONTAINING HALITE PSEUDOMORPHS AFTER CYSTID SWALLOWTAIL CRISTALS AND LOCAL ZONES WITH MODULAR STRUCTURE, LOCALLY THINLY LAMINATED NEAR BASE; UPPER 2.0' ON WEST SIDE OF SHAFT CONSISTS OF THINLY LAMINATED ANHYDRITE; BASAL CONTACT CRADATIONAL, UNDULATORY.</td>
</tr>
<tr>
<td>1369</td>
<td>2040</td>
<td>MB 136</td>
<td>ANHYDRITE, FINELY CRYSTALLINE, ALTERNATING LIGHT AND DARK GRAY, THINLY LAMINATED, LAMINATE UNDULATE SLIGHTLY; 0.5' ABOVE LOWER CONTACT, 0 TO 1&quot; THICK DISCONTINUOUS PURE HALITE BED OCCURS, CONTAINS ONE DISCONTINUOUS STRINGER OF POLYHALITE; BASAL CONTACT SHARP.</td>
</tr>
<tr>
<td>1364</td>
<td>2045</td>
<td>MB 136</td>
<td>HALITE, MEDIUM TO COARSELY CRYSTALLINE, WHITE TO CLEAR; SLIGHTLY ARGILLACEOUS, CONTENT DECREASES WITH DEPTH, OCCURS AS REDDISH-BROWN TO GRAY RANDOMLY-ORIENTED TO SUBHORIZONTAL STRINGERS WHICH BECOME SUBHORIZONTAL WITH DEPTH; TRACE POLYHALITE, OCCURS AS DISEMIXED BLESSES AND SUBHORIZONTAL STRINGERS NEAR BASE; 1&quot; TO 2&quot; THICK BED OF ANHYDRITE (NORTHWEST SIDE OF SHAFT) AND POLYHALITE (SOUTHEAST SIDE OF SHAFT) AT 2059.3'; SUBHORIZONTAL STRINGERS OF ANHYDRITE IN LOWER 5.0'; NO CLAY OCCURS BELOW 2059.3'; BASAL CONTACT SHARP, UNDULATORY TO 0.4', DISCONTINUOUS.</td>
</tr>
<tr>
<td>1359</td>
<td>2050</td>
<td>-</td>
<td>HALITE, MEDIUM TO COARSELY CRYSTALLINE, WHITE TO CLEAR TO TINTED ORANGE AND GRAY, THINLY BEDDED TO GRAY ARGILLACEOUS HALITE WITH CLAY-FREE HALITE, BEDDING TERMINATED AT UPPER CONTACT; TRACE POLYHALITE AT TOP, CONTENT INCREASES WITH DEPTH, OCCURS AS DISEMIXED BLESSES; ARGILLACEOUS, CONTENT DECREASES WITH DEPTH, GRAY AT TOP GRADING TO GRAYISH-BROWN WITH DEPTH, OCCURS AS DISCONTINUOUS RANDOMLY-ORIENTED STRINGERS AND LOCAL ZONES OF INTERCRYSTALLINE MATERIAL, BECOMES REDDISH-BROWN BELOW 2070.2', CONTENT DECREASES ABRUPTLY BELOW 2079.0', BASAL 2.0' SLIGHTLY ARGILLACEOUS; BASAL CONTACT SHARP, SLIGHTLY UNDULATORY, IRREGULAR, MARKED BY DISCONTINUOUS IRREGULAR 2&quot; THICK BED OF HALITIC ANHYDRITE.</td>
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<td>1349</td>
<td>2060</td>
<td>MB 137x</td>
<td>EXHAUST SHAFT</td>
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<tr>
<td>1344</td>
<td>2065</td>
<td>-</td>
<td>LITHOLOGIC LOG</td>
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<tr>
<th>PRELIMINARY ELEV. (FT MSL)</th>
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<tr>
<td>1339 - 2070</td>
<td>X</td>
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<tr>
<td>1334 - 2075</td>
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<td>1324 - 2085</td>
<td>X</td>
<td>HALITE, MEDIUM TO COARSELY CRYSALLINE, WHITE TO CLEAR; TRACE POLYHALITE, OCCURS AS DISSEMINATED BLEBS; ARGILLACEOUS IN UPPER 1.2', OCCURS AS REDDISH-BROWN DISCONTINUOUS SUBHORIZONTAL STRINGERS AND MASSES OF HALITE MUDSTONE, CONTENT DECREASES WITH DEPTH; BASAL CONTACT SHARP.</td>
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<td>1319 - 2090</td>
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<td>1314 - 2095</td>
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</tr>
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<td>1309 - 2100</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>1304 - 2105</td>
<td>XXXXXXXX</td>
<td>ANHYDRITE, FINELY CRYSALLINE, ALTERNATING LIGHT AND DARK GRAY, THINLY LAMINATED; UNDERLAIN BY 1/2 THICK CRATEISH-BROWN CLAYSTONE BED; BASAL CONTACT SHARP.</td>
</tr>
<tr>
<td>1299 - 2110</td>
<td></td>
<td>HALITE, FINELY TO COARSELY CRYSALLINE, WHITE TO TINTED ORANGE, BEDDED AT TOP WITH REDDISH-BROWN ARGILLACEOUS HALITE, SPACED 1&quot; TO 2&quot;; ARGILLACEOUS, CONTENT DECREASES WITH DEPTH, OCCURS AS INTERCRYSTALLINE MATRIX IN ARGILLACEOUS HALITE BANBS AT TOP AND RANDOMLY-ORIENTED STRINGERS WITH DEPTH; CONTENT DECREASES ABRUPTLY BELOW 2111.7'; RARE DISSEMINATED BLEBS OF POLYHALITE; BASAL CONTACT DIFFUSE.</td>
</tr>
<tr>
<td>ELEV. (FT MSL)</td>
<td>DEPTH (FT)</td>
<td>REMARKS</td>
</tr>
<tr>
<td>---------------</td>
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</tr>
<tr>
<td>1299</td>
<td>2110</td>
<td>AS ABOVE</td>
</tr>
<tr>
<td>1294</td>
<td>2115</td>
<td>HALITE, MEDIUM TO COARSELY CRYSTALLINE, WHITE TO CLEAR; RARE STRINGERS OF CLAY IN UPPER 1.7'; TRACE SUBHORIZONTAL TO HORIZONTAL CONTINUOUS STRINGERS OF ANHYDRITE BELOW 2117.0'; BASAL CONTACT SHARP.</td>
</tr>
<tr>
<td>1289</td>
<td>2120</td>
<td>HALITE, MEDIUM TO COARSELY CRYSTALLINE, WHITE TO TINTED ORANGE, RARE RANDOMLY-ORIENTED CLAY STRINGERS TO 2125.2'; UPPER CONTACT MARKED BY ANHYDRITIC CLAYSTONE CONTAINING DISPLACIVE HALITE CRYSTALS (&lt;1/4'''); TRACE POLYHALITE BLEBS; ANHYDRITE STRINGERS OCCUR BETWEEN 2128.1' AND 2129.5'; BASAL CONTACT SHARP, SLIGHTLY UNDULATORY, IRREGULAR.</td>
</tr>
<tr>
<td>1284</td>
<td>2125</td>
<td>ANHYDRITE (A), FINELY CRYSTALLINE, LIGHT GRAY, THINLY LAMINATED, LAMINAE SLIGHTLY CONTORTED; LOCALLY CONTAINS SMALL HALITE CRYSTALS (&lt;1/16''); BASAL CONTACT SHARP, SLIGHTLY UNDULATORY.</td>
</tr>
<tr>
<td>1279</td>
<td>2130</td>
<td>HALITE, MEDIUM TO COARSELY CRYSTALLINE, WHITE TO CLEAR; RARE CLAY STRINGERS TO 2131.5'; SUBHORIZONTAL STRINGERS OF ANHYDRITE SPACED 2'' TO 4'' OCCUR BELOW 2134.0'; BASAL CONTACT SHARP.</td>
</tr>
<tr>
<td>1274</td>
<td>2135</td>
<td>ANHYDRITE (B), FINELY CRYSTALLINE, LIGHT GRAY, HINT OF THIN LAMINATIONS; HALITIC, BASAL CONTACT SHARP, IRREGULAR, SLIGHTLY UNDULATORY.</td>
</tr>
<tr>
<td>1269</td>
<td>2140</td>
<td>HALITE, MEDIUM TO COARSELY CRYSTALLINE, WHITE TO CLEAR; RARE SUBHORIZONTAL CLAY STRINGERS AT TOP, CONTENT DECREASES WITH DEPTH; VERY RARE BLEBS OF POLYHALITE; BASAL CONTACT NOT OBSERVED.</td>
</tr>
<tr>
<td>1264</td>
<td>2145</td>
<td>FACILITY LEVEL</td>
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<tr>
<td>2146.4</td>
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<td>EXHAUST SHAFT</td>
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LITHOLOGIC LOG
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APPENDIX G

TEST ROOMS
GEOLOGIC MAPS AND SECTIONS
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<tr>
<th>Figure No.</th>
<th>Title/Description</th>
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<tbody>
<tr>
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<td>Test Room 1 - Instrument Array Geologic Strip Map</td>
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<tr>
<td>G-2</td>
<td>Test Room 2 - Instrument Array Geologic Strip Map</td>
</tr>
<tr>
<td>G-3</td>
<td>Test Room 3 - Instrument Array Geologic Strip Map</td>
</tr>
<tr>
<td>G-4</td>
<td>Test Room 4 - Instrument Array Geologic Strip Map</td>
</tr>
<tr>
<td>G-5</td>
<td>Section Through Test Room 1</td>
</tr>
<tr>
<td>G-6</td>
<td>Section Through Test Room 2</td>
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<tr>
<td>G-7</td>
<td>Section Through Test Room 3</td>
</tr>
<tr>
<td>G-8</td>
<td>Section Through Test Room 4</td>
</tr>
<tr>
<td>G-9</td>
<td>Room T Large Diameter Drill Hole Location Plan</td>
</tr>
<tr>
<td>G-10</td>
<td>Geologic Map of Drill Hole TV-01</td>
</tr>
<tr>
<td>G-11</td>
<td>Geologic Map of Drill Hole TV-02</td>
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<tr>
<td>G-12</td>
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<td>Geologic Map of Drill Hole TV-21</td>
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<tr>
<td>G-31</td>
<td>Geologic Map of Drill Hole TV-22</td>
</tr>
<tr>
<td>G-32</td>
<td>Section A Through Room T</td>
</tr>
<tr>
<td>G-33</td>
<td>Section B Through Room T</td>
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<tr>
<td>G-34</td>
<td>Geologic Map of Drill Hole P4X-84</td>
</tr>
</tbody>
</table>
The following descriptions pertain to the geologic map units shown on Figures 6-1 through 6-4:

UNIT DESCRIPTIONS

UNIT 6 (1) Halite: colorless with grayish orange-pink (1 DR 8/2) tint; transparent to translucent; coarsely crystalline; trace of dispersed polyhalite; unit extends to the roof; lower contact with Unit 5 is gradational and/or diffuse.

UNIT 5 Halite: colorless; transparent to translucent; coarsely crystalline; trace of bluish-white (5B 9/1) to light bluish-gray (5B 7/1) argillaceous material occurring as pods (1/2-inch diameter) and discontinuous laminations or filling interstices; lower contact with Unit 4 is generally sharp and based on prominent color change in argillaceous material (gray to red-brown) from Unit 5 to Unit 4.

UNIT 4 Argillaceous halite: colorless to moderate reddish-brown (1 DR 4/6); less frequently light bluish-gray (5B 7/1); transparent; coarsely crystalline; trace of dispersed polyhalite; trace to abundant argillaceous material (decreasing downward) consisting of clay containing a trace of silt and fine crystals of halite, occurring as discontinuous laminations in upper half of unit and interstitially in lower half; lower contact with Unit 3 is gradational and based on absence of argillaceous material in Unit 3.

UNIT 3 Halite: colorless to moderate reddish-orange (1 DR 6/6); transparent to translucent; coarsely crystalline; trace of dispersed polyhalite; polyhalite content commonly increases downward; lower contact with Unit 2 is sharp.

UNIT 2 Argillaceous halite: moderate reddish-brown (1 DR 5/5), less frequently light bluish-gray (5B 7/1); medium to coarsely crystalline; argillaceous material primarily occurs interstitially or as discontinuous laminations; lower contact with Unit 1 is generally sharp, less frequently gradational.

UNIT 1 Halite: light reddish-orange (1 DR 8/6) to moderate reddish-orange (1 DR 6/6), less frequently colorless; translucent to transparent; medium to coarsely crystalline; trace of dispersed polyhalite; lower contact with Unit 0 is sharp.

UNIT 0 Argillaceous halite: colorless to moderate reddish-orange (1 DR 6/4) and moderate reddish-brown (1 DR 4/6); medium to coarsely crystalline; trace of dispersed polyhalite; some argillaceous material occurs as discontinuous laminations and blebs or fills interstices (decreasing downward); contains finely crystalline halite; unit extends into the floor.

NOTES:
(1) Units listed in descending order from roof to floor.
(2) Alpha-numeric color designations are based on Geological Society of America Rock Color Chart.
The following legend and notes pertain to the geologic maps shown on Figures G-1 through G-4:

**LEGEND:**

**CONTACTS**
- SHARP (LESS THAN 0.05 FEET)
- GRADATIONAL (0.05 TO 0.2 FEET)
- DIFFUSE (0.2 TO 0.5 FEET)

**WEEP**

DAMP AREA WITH 1/4" TO 3/4" DIAMETER KNOBS AND INCUSTATIONS OF FINELY-CRYSTALLINE HALITE.

**BREAKS IN BED CONTINUITY**

![Diagram of Unit Breaks]

SYN- OR IMMEDIATELY POST-DEPOSITIONAL DISSOLUTION OR SCOUR CHANNELS FILLED WITH SEDIMENT FROM OVERLYING UNIT. (TYPICAL)

**NOTES:**

1. VERTICAL CONTROL FOR MAPPING IS MEAN SEA LEVEL (MSL) REFERENCED TO UNDERGROUND SURVEY POINTS ESTABLISHED BY CEMENTATION WEST, INC.

2. HORIZONTAL CONTROL FOR MAPPING REFERENCED TO ZERO POINT AT CENTER-LINE OF C&SH SHAFT.
EXPLANATION

ANHYDRITE UNIT

CLAY, AT LOWER CONTACT OF MB-139.

ORIGINAL (DASHED LINE) AND DEFLECTED (SOLID LINE)
POSITIONS OF INCLINOMETER, EXAGGERATED SCALE
AS SHOWN.

BOREHOLE WITH OBSERVED OFFSET (NOT TO SCALE),
SHOWING RELATIVE MOVEMENTS.

VERTICAL COREHOLE

DO-67

NOTES

1. INCLINOMETER DATA AS OF AUG. 20, 1985 UNLESS NOTED
   OTHERWISE.

2. OFFSETS IN BOREHOLES ARE NOT DRAWN TO SCALE;
   ONLY RELATIVE MOVEMENTS ARE SHOWN.

Figure G-5
SECTION THROUGH TEST ROOM 1
EXPLANATION

ANHYDRITE UNIT

CLAY, AT LOWER CONTACT OF MB-139.

ORIGINAL (DASHED LINE) AND DEFLECTED (SOLID LINE) POSITIONS OF INCLINOMETER, EXAGGERATED SCALE AS SHOWN.

BOREHOLE WITH OBSERVED OFFSET (NOT TO SCALE), SHOWING RELATIVE MOVEMENTS.

VERTICAL COREHOLE

NOTES

1. INCLINOMETER DATA AS OF AUG. 20, 1985 UNLESS NOTED OTHERWISE.

2. OFFSETS IN BOROHOLES ARE NOT DRAWN TO SCALE; ONLY RELATIVE MOVEMENTS ARE SHOWN.

FIGURE G-6
SECTION THROUGH TEST ROOM 2
EXPLANATION

ANHYDRITE UNIT

FRACUTURE ZONE

CLAY, AT LOWER CONTACT OF MB-139.

OPEN FRACTURE

ORIGINAL (DASHED LINE) AND DEFLECTED (SOLID LINE) POSITIONS OF INCLINOMETER, EXAGGERATED SCALE AS SHOWN.

BOREHOLE WITH OBSERVED OFFSET (NOT TO SCALE), SHOWING RELATIVE MOVEMENTS.

VERTICAL BOREHOLE

NOTES

1. OPEN FRACATURES AND FRACUTURE ZONES SHOWN BELOW ROOM 3 ARE GENERALIZED FROM GEOLOGIC MAPPING OF LARGE 36-INCH DIAMETER BOREHOLES. INFORMATION ON FRACATURES BELOW OTHER ROOMS IS INCOMPLETE.

2. INCLINOMETER DATA AS OF AUG. 20, 1985 UNLESS NOTED OTHERWISE.

3. OFFSETS IN BOREHOLES ARE NOT DRAWN TO SCALE; ONLY RELATIVE MOVEMENTS ARE SHOWN.

Figure G-7
SECTION THROUGH TEST ROOM 3
ANHYDRITE UNIT

CLAY, AT LOWER CONTACT OF MB-139.

ORIGINAL (DASHED LINE) AND DELECTED (SOLID LINE) POSITIONS OF INCLINOMETER, EXAGGERATED SCALE AS SHOWN.

BOREHOLE WITH OBSERVED OFFSET (NOT TO SCALE), SHOWING RELATIVE MOVEMENT.

VERTICAL COREHOLE

DO-91

INCLINOMETER DEFLECTION SCALE (INCHES)

VERTICAL AND HORIZONTAL SCALE (FEET)

LOOKING NORTH

DO-93

ANHY. A

UNMARKED HOLE

ANHY. B

5IX-IG-00225

0.72"

5IX-IG-00223

0.52"

5IX-IG-00226

0.41"

5IX-IG-0224

0.47"

MB-139

P4X-27

P4X-31

DO-91

8.0

1/0.5

1/0.75

1/1.5

1/2

1/3

1/4

1/5

1/6

1/10

INCLINOMETER DATA AS OF AUG. 20, 1985 UNLESS NOTED OTHERWISE.

1. OFFSETS IN BOREHOLES ARE NOT DRAWN TO SCALE; ONLY RELATIVE MOVEMENTS ARE SHOWN.

Figure G-8

SECTION THROUGH TEST ROOM 4
FIGURE G-9

ROOM T
LARGE DIAMETER DRILL HOLES
LOCATION PLAN
EXPLANATION

- **MINED SALT BACKFILL**
- **HALITE**
- **MARKER BED 139**
  - Upper Contact of MB-139
  - Upper Contact of Subunit B
  - Clay E (Lower Contact of MB-139)

- **FRACTURE TRACE**
  - Distinct fractures, usually closed within a few inches of the drill hole side.

- **FRACTURE ZONE**
  - Zone of fractured rock bounded by distinct fractures.

- **SMALL FRACTURE**
  - Closed hairline fractures, usually forming fracture zones less than one inch wide.

- **APPROXIMATE FRACTURE SEPARATION**
  - Inches, separations are measured within the fracture or zone 12 inches from drill hole wall.

NOTES:

1. **Drill Hole is 36 inches in diameter.**
2. **Mapping was performed from inside the hole. All features were measured from a surveyed reference line.**
3. **Original mapping was performed at a scale of one inch to one foot.**
4. **Unless noted otherwise, the bottom of the drill hole (B.O.H.) coincides with Clay E.**

**DATE MAPPED: 10/30/85**
**MAPPED BY: J.E. GALLERANI**

**FIGURE G-10**

**GEOLOGIC MAP OF DRILL HOLE TV-01**
EXPLANATION

- MINED SALT BACKFILL
- HALITE
- MARKER BED 139
- UPPER CONTACT OF MB-139
- UPPER CONTACT OF SUBUNIT B
- CLAY E (LOWER CONTACT OF MB-139)
- FRACTURE TRACE
  DISTINCT FRACTURES, USUALLY CLOSED WITHIN A FEW INCHES OF THE DRILL HOLE SIDE.
- FRACTURE ZONE
  ZONE OF FRACTURED ROCK BOUNDED BY DISTINCT FRACTURES.
- SMALL FRACTURE
  CLOSED HAIRLINE FRACTURES, USUALLY FORMING FRACTURE ZONES LESS THAN ONE INCH WIDE.
- APPROXIMATE FRACTURE SEPARATION, IN INCHES. SEPARATIONS ARE MEASURED WITHIN THE FRACTURE OR ZONE 12 INCHES IN FROM DRILL HOLE WALL.

NOTES:
1. DRILL HOLE IS 36 INCHES IN DIAMETER.
2. MAPPING WAS PERFORMED FROM INSIDE THE HOLE. ALL FEATURES WERE MEASURED FROM A SURVEYED REFERENCE LINE.
3. ORIGINAL MAPPING WAS PERFORMED AT A SCALE OF ONE INCH TO ONE FOOT.
4. UNLESS NOTED OTHERWISE, THE BOTTOM OF THE DRILL HOLE (B.O.H.) COINCIDES WITH CLAY E.

DATE MAPPED: 11/25/85
MAPPED BY: J.E. GALLERANI

GEOLOGIC MAP OF DRILL HOLE TV-03

FIGURE G-12
EXPLANATION

- MINED SALT BACKFILL
- HALITE
- MARKER BED 139
- UPPER CONTACT OF MB-139
- UPPER CONTACT OF SUBUNIT B
- CLAY E (LOWER CONTACT OF MB-139)
- FRACTURE TRACE
  DISTINCT FRACTURES, USUALLY CLOSED WITHIN A FEW INCHES OF THE DRILL HOLE SIDE.
- FRACTURE ZONE
  ZONE OF FRACTURED ROCK BOUNDED BY DISTINCT FRACTURES.
- SMALL FRACTURE
  CLOSED HAIRLINE FRACTURES, USUALLY FORMING FRACTURE ZONES LESS THAN ONE INCH WIDE.
- APPROXIMATE FRACTURE SEPARATION, IN INCHES. SEPARATIONS ARE MEASURED WITHIN THE FRACTURE OR ZONE 12 INCHES IN FROM DRILL HOLE WALL.

NOTES:
1. DRILL HOLE IS 36 INCHES IN DIAMETER.
2. MAPPING WAS PERFORMED FROM INSIDE THE HOLE. ALL FEATURES WERE MEASURED FROM A SURVEYED REFERENCE LINE.
3. ORIGINAL MAPPING WAS PERFORMED AT A SCALE OF ONE INCH TO ONE FOOT.
4. UNLESS NOTED OTHERWISE, THE BOTTOM OF THE DRILL HOLE (B.O.H.) COINCIDES WITH CLAY E.

FIGURE G-13
GEOLOGIC MAP OF DRILL HOLE TV-04

DATE MAPPED: 11/20/85
MAPPED BY: J.E. GALLERANI
EXPLANATION

- MINED SALT BACKFILL
- HALITE
- MARKER BED 139
- UPPER CONTACT OF MB-139
- UPPER CONTACT OF SUBUNIT B
- CLAY E (LOWER CONTACT OF MB-139)
- FRACTURE TRACE
  DISTINCT FRACTURES, USUALLY CLOSED WITHIN A FEW INCHES OF THE DRILL HOLE SIDE.
- FRACTURE ZONE
  ZONE OF FRACTURED ROCK BOUNDED BY DISTINCT FRACTURES.
- SMALL FRACTURE
  CLOSED HAIRLINE FRACTURES, USUALLY FORMING FRACTURE ZONES LESS THAN ONE INCH WIDE.
- APP. APPROXIMATE FRACTURE SEPARATION, IN INCHES. SEPARATIONS ARE MEASURED WITHIN THE FRACTURE OR ZONE 12 INCHES IN FROM DRILL HOLE WALL.

NOTES:
1. DRILL HOLE IS 36 INCHES IN DIAMETER.
2. MAPPING WAS PERFORMED FROM INSIDE THE HOLE. ALL FEATURES WERE MEASURED FROM A SURVEYED REFERENCE LINE.
3. ORIGINAL MAPPING WAS PERFORMED AT A SCALE OF ONE INCH TO ONE FOOT.
4. UNLESS NOTED OTHERWISE, THE BOTTOM OF THE DRILL HOLE (B.O.H.) COINCIDES WITH CLAY E.

FIGURE G-14
GEOLOGIC MAP OF DRILL HOLE TV-05
EXPLANATION

- MINED SALT BACKFILL
- HALITE
- MARKER BED 129
- UPPER CONTACT OF MB-139
- UPPER CONTACT OF SUBUNIT B
- CLAY E (LOWER CONTACT OF MB-139)

FRACTURE TRACE
- DISTINCT FRACTURES, USUALLY CLOSED WITHIN A FEW INCHES OF THE DRILL HOLE SIDE.

FRACTURE ZONE
- ZONE OF FRACTURED ROCK BOUNDED BY DISTINCT FRACTURES.

SMALL FRACTURE
- CLOSED HAIRLINE FRACTURES, USUALLY FORMING FRACTURE ZONES LESS THAN ONE INCH WIDE.

APPROXIMATE FRACTURE SEPARATION, IN INCHES. SEPARATIONS ARE MEASURED WITHIN THE FRACTURE OR ZONE 12 INCHES IN FROM DRILL HOLE WALL.

NOTES:
1. DRILL HOLE IS 36 INCHES IN DIAMETER.
2. MAPPING WAS PERFORMED FROM INSIDE THE HOLE, ALL FEATURES WERE MEASURED FROM A SURVEYED REFERENCE LINE.
3. ORIGINAL MAPPING WAS PERFORMED AT A SCALE OF ONE INCH TO ONE FOOT.
4. UNLESS NOTED OTHERWISE, THE BOTTOM OF THE DRILL HOLE (B.D.H.) COINCIDES WITH CLAY E.

FIGURE G-15
GEOLGIC MAP OF DRILL HOLE TV-06
EXPLANATION

MINED SALT BACKFILL
HALITE
MARKER BED 139
- UPPER CONTACT OF MB-139
- UPPER CONTACT OF SUBUNIT B
- CLAY E (LOWER CONTACT OF MB-139)

- FRACTURE TRACE
DISTINCT FRACTURES, USUALLY CLOSED WITHIN A FEW INCHES OF THE DRILL HOLE SIDE.

- FRACTURE ZONE
ZONE OF FRACTURED ROCK BOUNDED BY DISTINCT FRACTURES.

- SMALL FRACTURE
CLOSED HAIRLINE FRACTURES, USUALLY FORMING FRACTURE ZONES LESS THAN ONE INCH WIDE.

- 1/2 APPROXIMATE FRACTURE SEPARATION, IN INCHES. SEPARATIONS ARE MEASURED WITHIN THE FRACTURE OR ZONE 12 INCHES IN FROM DRILL HOLE WALL.

NOTES:
1. DRILL HOLE IS 36 INCHES IN DIAMETER.
2. MAPPING WAS PERFORMED FROM INSIDE THE HOLE, ALL FEATURES WERE MEASURED FROM A SURVEYEDREFERENCE LINE.
3. ORIGINAL MAPPING WAS PERFORMED AT A SCALE OF ONE INCH TO ONE FOOT.
4. UNLESS NOTED OTHERWISE, THE BOTTOM OF THE DRILL HOLE (B.O.H.) COINCIDES WITH CLAY E.

DATE MAPPED: 11/25/85
MAPPED BY: J.E. GALLERANI

FIGURE G-16
GEOLOGIC MAP OF DRILL HOLE TV-07
DATE MAPPED: 12/5/85
MADE BY: J.E. GALLERANI

EXPLANATION
- MINED SALT BACKFILL
- HALITE
- MARKER BED 139
  - UPPER CONTACT OF MB-139
  - UPPER CONTACT OF SUBUNIT B
  - CLAY E (LOWER CONTACT OF MB-139)
- FRACTURE TRACE
  - DISTINCT FRACTURES, USUALLY CLOSED WITHIN A FEW INCHES OF THE DRILL HOLE SIDE.
- FRACTURE ZONE
  - ZONE OF FRACTURED ROCK BOUNDED BY DISTINCT FRACTURES.
- SMALL FRACTURE
  - CLOSED HAIRLINE FRACTURES, USUALLY FORMING FRACTURE ZONES LESS THAN ONE INCH WIDE.
- \( \frac{1}{2} \)
  - APPROXIMATE FRACTURE SEPARATION, IN INCHES, SEPARATIONS ARE MEASURED WITHIN THE FRACTURE OR ZONE 12 INCHES IN FROM DRILL HOLE WALL.

NOTES:
1. DRILL HOLE IS 36 INCHES IN DIAMETER.
2. MAPPING WAS PERFORMED FROM INSIDE THE HOLE, ALL FEATURES WERE MEASURED FROM A SURVEYED REFERENCE LINE.
3. ORIGINAL MAPPING WAS PERFORMED AT A SCALE OF ONE INCH TO ONE FOOT.
4. UNLESS NOTED OTHERWISE, THE BOTTOM OF THE DRILL HOLE (B.O.H.) COINCIDES WITH CLAY E.

FIGURE G-17
GEOLOGIC MAP OF DRILL HOLE TV-08
EXPLANATION

- MINED SALT BACKFILL
- HALITE
- MARKER BED 139
- UPPER CONTACT OF MB-139
- UPPER CONTACT OF SUBUNIT B
- CLAY E/LOWER CONTACT OF MB-139
- FRACTURE TRACE
  DISTINCT FRACTURES, USUALLY CLOSED WITHIN A FEW INCHES OF THE DRILL HOLE SIDE.
- FRACTURE ZONE
  ZONE OF FRACTURED ROCK BOUNDED BY DISTINCT FRACTURES.
- SMALL FRACTURE
  CLOSED HAIRLINE FRACTURES, USUALLY FORMING FRACTURE ZONES LESS THAN ONE INCH WIDE.
- APPROXIMATE FRACTURE SEPARATION, IN INCHES. SEPARATIONS ARE MEASURED WITHIN THE FRACTURE OR ZONE 12 INCHES IN FROM DRILL HOLE WALL.

NOTES:
1. DRILL HOLE IS 36 INCHES IN DIAMETER.
2. MAPPING WAS PERFORMED FROM INSIDE THE HOLE. ALL FEATURES WERE MEASURED FROM A SURVEYED REFERENCE LINE.
3. ORIGINAL MAPPING WAS PERFORMED AT A SCALE OF ONE INCH TO ONE FOOT.
4. UNLESS NOTED OTHERWISE, THE BOTTOM OF THE DRILL HOLE (B.O.H.) COINCIDES WITH CLAY E.

DATE MAPPED: 12/5/85
MAPPED BY: J.E. GALLERANI

FIGURE G-18
GEOLOGIC MAP OF DRILL HOLE TV-09
EXPLANATION

- MINED SALT BACKFILL
- HALITE
- MARKER BED 139
- UPPER CONTACT OF MB-139
- UPPER CONTACT OF SUBUNIT B
- CLAY E/LOWER CONTACT OF MB-139
- FRACTURE TRACE
  DISTINCT FRACTURES, USUALLY CLOSED WITHIN A FEW INCHES OF THE DRILL HOLE SIDE.
- FRACTURE ZONE
  ZONE OF FRACTURED ROCK BOUNDED BY DISTINCT FRACTURES.
- SMALL FRACTURE
  CLOSED HAIRLINE FRACTURES, USUALLY FORMING FRACTURE ZONES LESS THAN ONE INCH WIDE.
- APPROXIMATE FRACTURE SEPARATION, IN INCHES. SEPARATIONS ARE MEASURED WITHIN THE FRACTURE OR ZONE 12 INCHES IN FROM DRILL HOLE WALL.

NOTES:
1. DRILL HOLE IS 36 INCHES IN DIAMETER.
2. MAPPING WAS PERFORMED FROM INSIDE THE HOLE. ALL FEATURES WERE MEASURED FROM A SURVEYED REFERENCE LINE.
3. ORIGINAL MAPPING WAS PERFORMED AT A SCALE OF ONE INCH TO ONE FOOT.
4. UNLESS NOTED OTHERWISE, THE BOTTOM OF THE DRILL HOLE (6.0, 0.4) COINCIDES WITH CLAY E.

DATE MAPPED: 12/2/85
MAPPED BY: J.E. GALLERANI

FIGURE G-19
GEOLOGIC MAP OF DRILL HOLE TV-18
EXPLANATION

- MINED SALT BACKFILL
- HALITE
- MARKER BED 139
- UPPER CONTACT OF MB-139
- UPPER CONTACT OF SUBUNIT B
- CLAY E/LOWER CONTACT OF MB-139
- FRACTURE TRACE
  DISTINCT FRACTURES, USUALLY CLOSED WITHIN A FEW INCHES OF THE DRILL HOLE SIDE.
- FRACTURE ZONE
  ZONE OF FRACUTRED ROCK BOUNDED BY DISTINCT FRACTURES.
- SMALL FRACTURE
  CLOSED HAIRLINE FRACTURES, USUALLY FORMING FRACTURE ZONES LESS THAN ONE INCH WIDE.
- APPROXIMATE FRACTURE SEPARATION, IN INCHES. SEPARATIONS ARE MEASURED WITHIN THE FRACTURE OR ZONE 12 INCHES IN FROM DRILL HOLE WALL.

NOTES:

1. DRILL HOLE IS 36 INCHES IN DIAMETER.
2. MAPPING WAS PERFORMED FROM INSIDE THE HOLE. ALL FEATURES WERE MEASURED FROM A SURVEYED REFERENCE LINE.
3. ORIGINAL MAPPING WAS PERFORMED AT A SCALE OF ONE INCH TO ONE FOOT.
4. UNLESS NOTED OTHERWISE, THE BOTTOM OF THE DRILL HOLE (B.O.H.) COINCIDES WITH CLAY E.

DATE MAPPED: 11/20/85
MAPPED BY: J.E. GALLERANI

FIGURE G-20
GEOLOGIC MAP OF DRILL HOLE TV-11
EXPLANATION

- MINED SALT BACKFILL
- HALITE
- MARKER BED 139
- UPPER CONTACT OF MB-139
- UPPER CONTACT OF SUBUNIT B
- CLAY E/LOWER CONTACT OF MB-139
- FRACTURE TRACE
  DISTINCT FRACTURES, USUALLY CLOSED WITHIN A FEW INCHES OF THE DRILL HOLE SIDE.
- FRACTURE ZONE
  ZONE OF FRACUTRED ROCK BOUNDED BY DISTINCT FRACTURES.
- SMALL FRACTURE
  CLOSED HAIRLINE FRACTURES, USUALLY FORMING FRACTURE ZONES LESS THAN ONE INCH WIDE.
- APPROXIMATE FRACTURE SEPARATION, IN INCHES. SEPARATIONS ARE MEASURED WITHIN THE FrACTURE OR ZONE 12 INCHES IN FROM DRILL HOLE WALL.

NOTES:
1. DRILL HOLE IS 36 INCHES IN DIAMETER.
2. MAPPING WAS PERFORMED FROM INSIDE THE HOLE. ALL FEATURES WERE MEASURED FROM A SURVEYED REFERENCE LINE.
3. ORIGINAL MAPPING WAS PERFORMED AT A SCALE OF ONE INCH TO ONE FOOT.
4. UNLESS NOTED OTHERWISE, THE BOTTOM OF THE DRILL HOLE (B.O.H.) COINCIDES WITH CLAY E.

DATE MAPPED: 10/18/85
MAPPED BY: J.E. GALLERANI

FIGURE G-21
GEOLOGIC MAP OF DRILL HOLE TV-12
EXPLANATION

- MINED SALT BACKFILL
- HALITE
- MARKER BED 139
- UPPPER CONTACT OF MB-139
- UPPPER CONTACT OF SUBUNIT B
- CLAY E/LOWER CONTACT OF MB-139

FRACTURE TRACE
DISTINCT FRACTURES, USUALLY CLOSED WITHIN A FEW INCHES OF THE DRILL HOLE SIDE.

FRACTURE ZONE
ZONE OF FRACTURED ROCK BOUNDED BY DISTINCT FRACTURES.

SMALL FRACTURE
CLOSED HAIRLINE FRACTURES, USUALLY FORMING FRACTURE ZONES LESS THAN ONE INCH WIDE.

APPROXIMATE FRACTURE SEPARATION, IN INCHES. SEPARATIONS ARE MEASURED WITHIN THE FRACTURE OR ZONE 12 INCHES IN FROM DRILL HOLE WALL.

NOTES:
1. DRILL HOLE IS 36 INCHES IN DIAMETER.
2. MAPPING WAS PERFORMED FROM INSIDE THE HOLE. ALL FEATURES WERE MEASURED FROM A SURVEYED REFERENCE LINE.
3. ORIGINAL MAPPING WAS PERFORMED AT A SCALE OF ONE INCH TO ONE FOOT.
4. UNLESS NOTED OTHERWISE, THE BOTTOM OF THE DRILL HOLE (B.O.H.) COINCIDES WITH CLAY E.

DATE MAPPED: 10/25/85
MAPPED BY: J.E. GALLERANI

FIGURE G-22
GEOLOGIC MAP OF DRILL HOLE TV-13
**EXPLANATION**

- **Mined Salt Backfill**
- **Halite**
- **Marker Bed 139**
- **Upper Contact of MB-139**
- **Upper Contact of Subunit B**
- **Clay E/Lower Contact of MB-139**

**Fracture Trace**
- Distinct fractures, usually closed within a few inches of the drill hole side.

**Fracture Zone**
- Zone of fractured rock bounded by distinct fractures.

**Small Fracture**
- Closed hairline fractures, usually forming fracture zones less than one inch wide.

**Approximate Fracture Separation in Inches**
- Separations are measured within the fracture or zone 12 inches in from drill hole wall.

**NOTES:**
1. Drill hole is 36 inches in diameter.
2. Mapping was performed from inside the hole, all features were measured from a surveyed reference line.
3. Original mapping was performed at a scale of one inch to one foot.
4. Unless noted otherwise, the bottom of the drill hole (B.O.H.) coincides with clay e.

**Figure G-23**

Geologic Map of Drill Hole TV-14
EXPLANATION

- MINED SALT BACKFILL
- HALITE
- MARKER BED 139
  - UPPER CONTACT OF MB-139
  - UPPER CONTACT OF SUBUNIT B
  - CLAY E/LOWER CONTACT OF MB-139

- FRACTURE TRACE
  DISTINCT FRACTURES, USUALLY CLOSED WITHIN A FEW INCHES OF THE DRILL HOLE SIDE.

- FRACTURE ZONE
  ZONE OF FRACTURED ROCK BOUNDED BY DISTINCT FRACTURES.

- SMALL FRACTURE
  CLOSED HAIRLINE FRACTURES, USUALLY FORMING FRACTURE ZONES LESS THAN ONE INCH WIDE.

- @2 APPROXIMATE FRACTURE SEPARATION, IN INCHES. SEPARATIONS ARE MEASURED WITHIN THE FRACTURE OR ZONE 12 INCHES IN FROM DRILL HOLE WALL.

NOTES:

1. DRILL HOLE IS 36 INCHES IN DIAMETER.
2. MAPPING WAS PERFORMED FROM INSIDE THE HOLE. ALL FEATURES WERE MEASURED FROM A SURVEYED REFERENCE LINE.
3. ORIGINAL MAPPING WAS PERFORMED AT A SCALE OF ONE INCH TO ONE FOOT.
4. UNLESS NOTED OTHERWISE, THE BOTTOM OF THE DRILL HOLE (B.O.H.) COINCIDES WITH CLAY E.

DATE MAPPED: 10/9/85
MAPPED BY: J.E. CALLERANI

FIGURE G-24

GEOLOGIC MAP OF DRILL HOLE TV-15
EXPLANATION

- MINED SALT BACKFILL
- HALITE
- MARKER BED 139
- UPPER CONTACT OF MB-139 AND SUBUNIT A
- UPPER CONTACT OF SUBUNIT B
- CLAY E/LOWER CONTACT OF MB-139
- FRACTURE TRACE
  DISTINCT FRACTURES, USUALLY CLOSED WITHIN A FEW INCHES OF THE DRILL HOLE SIDE.
- FRACTURE ZONE
  ZONE OF FRACTURED ROCK BOUNDED BY DISTINCT FRACTURES.
- SMALL FRACTURE
  CLOSED HAIRLINE FRACTURES, USUALLY FORMING FRACTURE ZONES LESS THAN ONE INCH WIDE.
- APPROXIMATE FRACTURE SEPARATION, IN INCHES. SEPARATIONS ARE MEASURED WITHIN THE FRACTURE OR ZONE 12 INCHES IN FROM DRILL HOLE WALL.

NOTES:
1. DRILL HOLE IS 36 INCHES IN DIAMETER.
2. MAPPING WAS PERFORMED FROM INSIDE EACH HOLE. ALL FEATURES WERE MEASURED FROM A SURVEYED REFERENCE LINE.
3. ORIGINAL MAPPING WAS PERFORMED AT A SCALE OF ONE INCH TO ONE FOOT.
4. UNLESS OTHERWISE NOTED, THE BOTTOM OF EACH DRILL HOLE (3.04) COINCIDES WITH CLAY E.

FIGURE G-25
GEOLeGIC MAP OF DRILL HOLE TV-16
EXPLANATION

- MINED SALT BACKFILL
- HALITE
- MARKER BED 139
- UPPER CONTACT OF MB-139 AND SUBUNIT A
- UPPER CONTACT OF SUBUNIT B
- CLAY E/LOWER CONTACT OF MB-139

FRACTURE TRACE
DISTINCT FRACTURES, USUALLY CLOSED WITHIN A FEW INCHES OF THE DRILL HOLE SIDE.

FRACTURE ZONE
ZONE OF FRACTURED ROCK BOUNDED BY DISTINCT FRACTURES.

SMALL FRACTURE
CLOSED HAIRLINE FRACTURES, USUALLY FORMING FRACTURE ZONES LESS THAN ONE INCH WIDE.

(1/2)
APPROXIMATE FRACTURE SEPARATION, IN INCHES. SEPARATIONS ARE MEASURED FROM THE FRACTURE OR ZONE 12 INCHES IN FROM DRILL HOLE WALL.

NOTES:
1. DRILL HOLE IS 36 INCHES IN DIAMETER.
2. MAPPING WAS PERFORMED FROM INSIDE EACH HOLE. ALL FEATURES WERE MEASURED FROM A SURVEYED REFERENCE LINE.
3. ORIGINAL MAPPING WAS PERFORMED AT A SCALE OF ONE INCH TO ONE FOOT.
4. UNLESS OTHERWISE NOTED, THE BOTTOM OF EACH DRILL HOLE (B.O.H.) COINCIDES WITH CLAY E.

DATE MAPPED: 10/24/86
MAPPED BY: J.E. GALLERANI

GEOLOGIC MAP OF DRILL HOLE TV-17
EXPLANATION

- MINEO SALT BACKFILL
- HALITE
- MARKER BED 139
- UPPER CONTACT OF MB-139 AND SUBUNIT A
- UPPER CONTACT OF SUBUNIT B
- CLAY E/LOWER CONTACT OF MB-139
- FRACTURE TRACE
  DISTINCT FRACTURES, USUALLY CLOSED WITHIN A FEW INCHES OF THE DRILL HOLE SIDE.
- FRACTURE ZONE
  ZONE OF FRACUTRED ROCK BOUNDED BY DISTINCT FRACTURES.
- SMALL FRACTURE
  CLOSED HAIRLINE FRACTURES, USUALLY FORMING FRACTURE ZONES LESS THAN ONE INCH WIDE.
- Approximate fracture separation, in inches. Separations are measured within the fracture or zone 12 inches in from drill hole wall.

NOTES:
1. DRILL HOLE IS 36 INCHES IN DIAMETER.
2. MAPPING WAS PERFORMED FROM INSIDE EACH HOLE. ALL FEATURES WERE MEASURED FROM A SURVEYED REFERENCE LINE.
3. ORIGINAL MAPPING WAS PERFORMED AT A SCALE OF ONE INCH TO ONE FOOT.
4. UNLESS OTHERWISE NOTED, THE BOTTOM OF EACH DRILL HOLE (B.O.H.) COINCIDES WITH CLAY E.

DATE MAPPED: 10/11/85
MAPPED BY: J.E. GALLERANI

FIGURE G-27
GEOLOGIC MAP OF DRILL HOLE TV-18
EXPLANATION

- MINED SALT BACKFILL
- HALITE
- MARKER BED 139
  - UPPER CONTACT OF MB-139 AND SUBUNIT A
  - UPPER CONTACT OF SUBUNIT B
  - CLAY E/LOWER CONTACT OF MB-139
- FRACTURE TRACE
  - DISTINCT FRACTURES, USUALLY CLOSED WITHIN A FEW INCHES OF THE DRILL HOLE SIDE.
- FRACTURE ZONE
  - ZONE OF FRACTURED ROCK BOUNDED BY DISTINCT FRACTURES.
- SMALL FRACTURE
  - CLOSED HAIRLINE FRACTURES, USUALLY FORMING FRACTURE ZONES LESS THAN ONE INCH WIDE.
  - APPROXIMATE FRACTURE SEPARATION, IN INCHES. SEPARATIONS ARE MEASURED WITHIN THE FRACTURE OR ZONE 12 INCHES IN FROM DRILL HOLE WALL.

NOTES:
1. DRILL HOLE IS 36 INCHES IN DIAMETER.
2. MAPPING WAS PERFORMED FROM INSIDE EACH HOLE. ALL FEATURES WERE MEASURED FROM A SURVEYED REFERENCE LINE.
3. ORIGINAL MAPPING WAS PERFORMED AT A SCALE OF ONE INCH TO ONE FOOT.
4. UNLESS OTHERWISE NOTED, THE BOTTOM OF EACH DRILL HOLE (B.O.H.) COINCIDES WITH CLAY E.

DATE MAPPED: 10/22/85
MAPPED BY: J.E. GALLERANI

GEOLOGIC MAP OF DRILL HOLE TV-19
EXPLANATION

- MINED SALT BACKFILL
- HALITE
- MARKER BED 139
- UPPER CONTACT OF MB-139 AND SUBUNIT A
- UPPER CONTACT OF SUBUNIT B
- CLAY E/LOWER CONTACT OF MB-139
- FRACTURE TRACE
  DISTINCT FRACTURES, USUALLY CLOSED WITHIN A FEW INCHES OF THE DRILL HOLE SIDE.
- FRACTURE ZONE
  ZONE OF FRACTURED ROCK BOUNDED BY DISTINCT FRACTURES.
- SMALL FRACTURE
  CLOSED HAIRLINE FRACTURES, USUALLY FORMING FRACTURE ZONES LESS THAN ONE INCH WIDE.
- \(1/4 \) APPROXIMATE FRACTURE SEPARATION, IN INCHES. SEPARATIONS ARE MEASURED WITHIN THE FRACTURE OR ZONE 12 INCHES IN FROM DRILL HOLE WALL.

NOTES:
1. DRILL HOLE IS 36 INCHES IN DIAMETER.
2. MAPPING WAS PERFORMED FROM INSIDE EACH HOLE. ALL FEATURES WERE MEASURED FROM A SURVEYED REFERENCE LINE.
3. ORIGINAL MAPPING WAS PERFORMED AT A SCALE OF ONE INCH TO ONE FOOT.
4. UNLESS OTHERWISE NOTED, THE BOTTOM OF EACH DRILL HOLE (B.O.H.) COINCIDES WITH CLAY E.

DATE MAPPED: 10/09/85
MAPPED BY: J.E. GALLERANI

FIGURE G-29
GEOLOGIC MAP OF DRILL HOLE TV-20
EXPLANATION

- MINED SALT BACKFILL
- HALITE
- MARKER BED 139
- UPPER CONTACT OF MB-139 AND SUBUNIT A
- UPPER CONTACT OF SUBUNIT B
- CLAY E/LOWER CONTACT OF MB-139
- FRACUTRE TRACE
  DISTINCT FRACTURES, USUALLY CLOSED WITHIN A FEW INCHES OF THE DRILL HOLE SIDE.
- FRACUTRE ZONE
  ZONE OF FRACTURED ROCK BOUNDED BY DISTINCT FRACUTURES.
- SMALL FRACUTRE
  CLOSED HAIRLINE FRACTURES, USUALLY FORMING FRACUTRE ZONES LESS THAN ONE INCH WIDE.
- APPROXIMATE FRACUTRE SEPARATION, IN INCHES, SEPARATIONS ARE MEASURED WITHIN THE FRACTURE OR ZONE 12 INCHES IN FROM DRILL HOLE WALL.

NOTES:

1. DRILL HOLE IS 36 INCHES IN DIAMETER.
2. MAPPING WAS PERFORMED FROM INSIDE EACH HOLE. ALL FEATURES WERE MEASURED FROM A SURVEYED REFERENCE LINE.
3. ORIGINAL MAPPING WAS PERFORMED AT A SCALE OF ONE INCH TO ONE FOOT.
4. UNLESS OTHERWISE NOTED, THE BOTTOM OF EACH DRILL HOLE (B.O.H.) COINCIDES WITH CLAY E.

DATE MAPPED: 10/22/95
MAPPED BY: J.E. GALLERANI

GEOLOGIC MAP OF DRILL HOLE TV-21
EXPLANATION

- **MINED SALT BACKFILL**
- **HALITE**
- **MARKER BED 139**
- **UPPER CONTACT OF MB-139 AND SUBUNIT A**
- **UPPER CONTACT OF SUBUNIT B**
- **CLAY E/LOWER CONTACT OF MB-139**

**FRACTURE TRACE**
- DISTINCT FRACTURES, USUALLY CLOSED WITHIN A FEW INCHES OF THE DRILL HOLE SIDE.

**FRACTURE ZONE**
- ZONE OF FRACUTRED ROCK BOUNDED BY DISTINCT FRACTURES.

**SMALL FRACTURE**
- CLOSED HAIRLINE FRACTURES, USUALLY FORMING FRACTURE ZONES LESS THAN ONE INCH WIDE.
- APPROXIMATE FRACTURE SEPARATION, IN INCHES. SEPARATIONS ARE MEASURED WITHIN THE FRACTURE OR ZONE 12 INCHES IN FROM DRILL HOLE WALL.

NOTES:

1. DRILL HOLE IS 36 INCHES IN DIAMETER.
2. MAPPING WAS PERFORMED FROM INSIDE EACH HOLE. ALL FEATURES WERE MEASURED FROM A SURVEYED REFERENCE LINE.
3. ORIGINAL MAPPING WAS PERFORMED AT A SCALE OF ONE INCH TO ONE FOOT.
4. UNLESS OTHERWISE NOTED, THE BOTTOM OF EACH DRILL HOLE (B.O.H.) COINCIDES WITH CLAY E.

**FIGURE G-31**

GEOLeGIC MAP OF DRILL HOLE TV-22
EXPLANATION

- MINED SALT BACKFILL
- HALITE
- MARKER BED 139
  - UPPER CONTACT OF MB-139
  - UPPER CONTACT OF SUBUNIT B
  - CLAY E (LOWER CONTACT OF MB-139)
- FRACTURE TRACE
  - DISTINCT FRACTURES, USUALLY CLOSED WITHIN A FEW INCHES OF THE DRILL HOLE SIDE.
- FRACTURE ZONE
  - ZONE OF FRACTURED ROCK BOUNDED BY DISTINCT FRACTURES.
- SMALL FRACTURE
  - CLOSED HAIRLINE FRACTURES, USUALLY FORMING FRACTURE ZONES LESS THAN ONE INCH WIDE.
- \( \frac{1}{2} \) APPROXIMATE FRACTURE SEPARATION, IN INCHES. SEPARATIONS ARE MEASURED WITHIN FRACTURE OR ZONE 12 INCHES IN FROM DRILL HOLE WALL.

NOTES:

1. DRILL HOLE IS IN SOUTHWEST CORNER OF TEST ROOM 4 AND IS 36 INCHES IN DIAMETER.
2. MAPPING WAS PERFORMED FROM INSIDE THE HOLE. ALL FEATURES WERE MEASURED FROM AN UNSURVEYED REFERENCE LINE.
3. ORIGINAL MAPPING WAS PERFORMED AT A SCALE OF ONE INCH TO ONE FOOT.
4. UNLESS OTHERWISE NOTED, THE BOTTOM OF THE DRILL HOLE (B.O.H.) COINCIDES WITH CLAY E.
5. HOLE CONTAINS SALT FILL AT BOTTOM.

DATE MAPPED: 2/6/86
MAPPED BY: J.E. GALLERANI

FIGURE G-34
GEOLOGIC MAP OF DRILL HOLE P4X-84
APPENDIX H

DRIFT CROSS SECTIONS
## CONTENTS

<table>
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<td>H-1</td>
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</tr>
<tr>
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<td>East-West Cross Section - E0 Drift at N1110</td>
</tr>
<tr>
<td>H-3</td>
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<td>H-4</td>
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<td>H-5</td>
<td>East-West Cross Section - W30 Drift at S406</td>
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<tr>
<td>H-6</td>
<td>East-West Cross Section - E140 Drift at S1320</td>
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<td>H-7</td>
<td>East-West Cross Section - E140 Drift at S1960</td>
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<td>East-West Cross Section - E140 Drift at S2421</td>
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</tr>
<tr>
<td>H-10</td>
<td>East-West Cross Section - E140 Drift at S3656</td>
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ELEVATION (ABOVE MEAN SEA LEVEL)

CLAY SEAM

TOP OF HOLE

DO-57

DO-86

HD-130

CLAY SEAM

CLAY SEAM

CLAY SEAM

CLAY SEAM

BOTTOM OF HOLE

LEGEND

GE - EXTENSOMETER (MULTIPLE POINT)

DO - CORE DRILL HOLE

RC - RADIAL CONVERGENCE POINT

TC - TEMPORARY CONVERGENCE POINT

WG - ROCK BOLT LOAD CELL

GEOLG:  
CLEAR HALITE
ANHYDRITE
ARGILLACEOUS HALITE
POLYHALITIC HALITE
POLYHALITE

EAST-WEST CROSS-SECTION  
EQ DRIFT AT N621

FIGURE H-3
APPENDIX I

FACILITY LEVEL
GEOLOGIC CORE HOLE LOGS
CONTENTS

Table No.  Title/Description
I-1     Summary of Core Hole Data

Core Hole Logs

See Table I-1 for listing of enclosed logs.
<table>
<thead>
<tr>
<th>Core Hole No.</th>
<th>Direction</th>
<th>Collar Elevation (FT-MSL)</th>
<th>Approximate Facility</th>
<th>Depth/Penetration</th>
<th>Instrument</th>
<th>Designation</th>
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(1) Survey data not available.

## ROCK CORING LOG

**WIPP-SPDV**  
**WASTE ISOLATION PILOT PLANT**

**BORING NO.** MB-139-1  
**TYPE & NUMBER** None  
**HOLE SIZE** NX  
**LOCATION** East Drift, 79' N of Exploratory Shaft centerline, midspan

**STATION** N79, W6  
**COLLAR ELEV.** 1264.1'  
**DIRECTION OF DRILLING** Down  
**MINE COORDINATES** N9766, E6888  
**DEPTH OF BOREHOLE** 10.0'  
**DRILLING METHOD** Air & Brine  
**DRILL MAKE/MODEL** Longyear 38

**PREPARED BY** RLB/TSC/DCK/Bechtel  
**DATE** 1/26/83

### SHEET 1 OF 1

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft)</th>
<th>RECOVERY (%)</th>
<th>% RECOVERED</th>
<th>ROY</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
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<td>15</td>
<td>100</td>
<td>X</td>
<td>-</td>
<td>0.0'-4.4' RALITE: clear halite, coarse crystalline, 1-2% moderate reddish-orange (10R 6/6) polyhalite, 1-2% brown clay, -1% gray clay. all in discrete blebs.</td>
<td></td>
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<tr>
<td>2</td>
<td>08</td>
<td>24</td>
<td>-</td>
<td>X</td>
<td>X</td>
<td>4.5'-6.8' POLYHALITIC RALITE: clear to moderate reddish-orange (10R 6/6) halite, coarse crystalline, -1% polyhalite in blebs above 4.5', in blebs and disseminated below 4.5', clay absent, 10-50% anhydrite from 4.5'-6.8'.</td>
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<tr>
<td>3</td>
<td>5</td>
<td>10</td>
<td>100</td>
<td>X</td>
<td>X</td>
<td>6.8'-8.6' ANHYDRITE: (Marker Bed 139) light gray (10Y 5/2), microcrystalline anhydrite, 1-10% polyhalitic halite from 6.8'-8.6', decreasing downward, gray clay parting at 8.6'.</td>
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<td>4</td>
<td>3.5</td>
<td>88</td>
<td>-</td>
<td>X</td>
<td>X</td>
<td>8.6'-9.5' RALITE: clear to moderate reddish-orange (10R 6/6) halite, medium to coarse crystalline, 1-2% mostly disseminated polyhalite, -1% gray clay.</td>
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**Total depth = 10.0'**
## WIPP-SPDV
### ROCK CORING LOG

**BORING NO.** MB-139-2  
**INSTRUMENT** None  
**HOLE SIZE** NX  
**LOCATION** Intersection of South 400 and East 140 Drifts, 14.5' N of S rib of South 400 Drift, 18' W of E rib of East 140 Drift  
**STATION S410, E150**  
**COLLAR ELEV.** 1251.2'  
**DIRECTION OF DRILLING** Vertical  
**MINE COORDINATES** N9277, E7044  
**DEPTH OF BOREHOLE** 15.7'  
**DRILLING METHOD** Air and Brine  
**DRILL MAKE/MODEL** Longyear D-65  
**PREPARED BY** RMB/Bechtel  
**DATE** 11/27/82

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<td>1.6</td>
<td>89</td>
<td>-</td>
<td>0.0' - 1.1' HALITE: clear halite, medium to coarsely crystalline, trace polyhalite, gray clay break at 0.4'.</td>
<td>Coring started at 12:00 hours on 27 November 1982.</td>
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<td>1.1</td>
<td>90</td>
<td>-</td>
<td>1.1' - 2.8' HALITE: medium reddish-orange (10R 5/6), translucent halite, medium crystalline, moderately hard, 2 - 5% clay, 5% polyhalite, gray clay parting at 1.1', brown clay parting at 1.4'.</td>
<td>From ground surface to 8.7', core was recovered directly into drill rod without use of inner barrel. Inner barrel was used below 8.7'.</td>
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<td>0.6</td>
<td>27</td>
<td>-</td>
<td>2.8' - 6.5' HALITE: predominantly clear halite, coarsely crystalline, trace polyhalite in places, trace gray clay blebs in places.</td>
<td>At ~11''-12'', brine drilling fluid started bubbling back out of hole. Hg trace pressurized gas.</td>
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<td>1.3</td>
<td>100</td>
<td>-</td>
<td>6.5' - 8.1' HALITE: medium reddish-orange (10R 5/6), translucent halite, medium crystalline, ~5% polyhalite, trace gray clay blebs in places, polyhalite absent from 7.4' - 8.1'.</td>
<td></td>
</tr>
<tr>
<td>3</td>
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<td>1.3</td>
<td>100</td>
<td>-</td>
<td>8.1' - 9.7' POLYHALITIC HALITE: medium reddish-orange (10R 5/6), translucent halite, medium to coarsely crystalline, moderately hard, 20 - 25% polyhalite.</td>
<td>Finished coring at 14:15 hours, gas still evident in hole.</td>
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<td>4.9</td>
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<td>-</td>
<td>9.7' - 12.9' ANHYDRITE: (Marker Bed 139) medium light (N6) to very light gray (N8) to light brownish-gray (5Y 6/1) anhydrite, hard, dense, up to 50% halite from 9.7' - 10.5' in &quot;mesh&quot; network with anhydrite, some halite from 10.5' - 12.9', polyhalite band 9.7' - 9.75', 10.5' - 12.9' mostly broken into &quot;poker chips&quot;.</td>
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<td>1.9</td>
<td>95</td>
<td>-</td>
<td>12.9' - 13.7' HALITE: light gray (N7) motled with medium reddish-orange (10R 5/6) translucent halite, clay occurs predominantly as closely spaced breaks, 1&quot; gray clay seam at 12.9', gray clay breaks at 13.1', 13.2', and 13.3'.</td>
<td>Total depth = 15.7'.</td>
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<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>13.7' - 15.7' HALITE: brownish-gray and medium reddish-orange (10R 5/6) translucent halite, medium to coarsely crystalline, ~1% clay, gray clay polyhalite in places, especially 15.3' - 15.7', gray clay breaks at 13.9', 14.3', and 14.7'.</td>
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<td>RUN NUMBER</td>
<td>DEPTH (ft)</td>
<td>RECOVERY (ft)</td>
<td>RQD</td>
<td>PROFILE</td>
<td>DESCRIPTION</td>
<td>REMARKS</td>
</tr>
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<td>------------</td>
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<td>-------------</td>
<td>---------</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>1.1</td>
<td>49</td>
<td>-</td>
<td>0.0' - 7.9' HALITE: clear to moderate reddish-orange (10R 6/6) to moderate brown (5YR 3/4) halite, medium to coarsely crystalline, 1-3% polyhalite, 1-3% gray clay predominantly at top, 1-3% brown clay predominantly at bottom, 0.0'-0.6' has &lt;1% polyhalite, &gt;1% disseminated polyhalite and no clay from 4.2'-4.8', otherwise polyhalite is in discrete blebs.</td>
<td>Hole cored on 28 December 1982.</td>
</tr>
<tr>
<td>2</td>
<td>0.75</td>
<td>0.75</td>
<td>45</td>
<td>X</td>
<td>7.9' - 9.6' POLYHALITIC HALITE: clear to moderate reddish-orange (10R 6/6) halite, 2-5% polyhalite disseminated and in blebs, &lt;1% gray clay, brown clay absent.</td>
<td>Gas encountered while drilling through NR 139.</td>
</tr>
<tr>
<td>3</td>
<td>5</td>
<td>1.2</td>
<td>39</td>
<td>-</td>
<td>9.6' - 11.9' ANHYDRITE: (Marker Bed 139) light gray (97) microcrystalline anhydrite, trace halite from 9.6'-11.2', gray clay seam at 11.9'.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>1.8</td>
<td>1.8</td>
<td>83</td>
<td>X X</td>
<td>11.9' - 16.0' HALITE: clear to moderate reddish-brown (10R 4/6) halite, finely to coarsely crystalline, 1-2% disseminated polyhalite, 1-2% gray clay above 14.3', 1-3% brown clay below 14.8', clay absent elsewhere, 14.3'-14.8' is relatively pure halite.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>4.6</td>
<td>4.6</td>
<td>92</td>
<td>X X</td>
<td>14.8' - 15.0'</td>
<td>Total depth = 14.0'.</td>
</tr>
</tbody>
</table>
# WIPP-SPDV

**WASTE ISOLATION PILOT PLANT**

**ROCK CORING LOG**

**BORING NO.** NB-139-4 **TYPE & NUMBER** None **HOLE SIZE** NX

**LOCATION** Intersection of O East and South 90 Drifts, 5' E of W rib of O East Drift, 3' N of S rib of South 90 Drift

**STATION** S99,W17 **COLLAR ELEV.** 1258.7' **DIRECTION OF DRILLING** Vertical Down

**MINE COORDINATES** N9588, E6877 **DEPTH OF BOREHOLE** 16.2'

**DRILLING METHOD** Wet (brine) **DRILL MAKE/MODEL** Joy 12B

**PREPARED BY** RLB/TSC/DDG/Bechtel **DATE** 1/26/83

## RUN NUMBER

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft)</th>
<th>% RECOVERED</th>
<th>ROD</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
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<tbody>
<tr>
<td>1</td>
<td>0.5</td>
<td>25</td>
<td>-</td>
<td>X</td>
<td>0.0' - 5.6' Halite: mottled white to clear to dark reddish-brown (10R 3/4) halite, coarsely crystalline, 1 - 5% polyhalite and 1 - 5% brown clay, both concentrated in discrete blebs within otherwise clear halite.</td>
<td>Role cored on 29 November 1982. Run 1 recovery seems to be from bottom of run.</td>
</tr>
<tr>
<td>2</td>
<td>3.5</td>
<td>95</td>
<td>-</td>
<td>X</td>
<td>5.6' - 8.5' Polyhalitic Halite: clear halite, coarsely crystalline, 5 - 10% moderate reddish-brown (10R 5/6) polyhalite in discrete blebs, &lt;1% gray clay.</td>
<td>Drilled with solution of vent shaft water and added salt.</td>
</tr>
<tr>
<td>3</td>
<td>5</td>
<td>-</td>
<td>X X</td>
<td>X</td>
<td>8.5' - 11.9' Anhydrite: (Marker Bed 139) Light gray (10N) anhydrite, 30 - 40% halite from 8.3' - 10.7, 5 - 10% halite from 10.7' - 11.1', gray clay seam at 11.9'.</td>
<td>Most core shows signs of dissolution by drilling fluid. Smooth, rounded features of halite, polyhalite and clay stand out in relief.</td>
</tr>
<tr>
<td>4</td>
<td>10</td>
<td>-</td>
<td>X</td>
<td>X</td>
<td>11.9' - 16.2' Halite: clear to moderate reddish-brown (10R 4/6) to light gray (10N) halite, finely to coarsely crystalline, 1 - 5% polyhalite and 1 - 2% gray clay in bands, &lt;1% brown clay.</td>
<td>Total depth = 16.2'.</td>
</tr>
<tr>
<td>5</td>
<td>15</td>
<td>100</td>
<td>-</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RUN NUMBER</td>
<td>DEPTH (ft)</td>
<td>LENGTH CORE RUN</td>
<td>RECOVERY</td>
<td>% RECOVERED</td>
<td>PROFILE</td>
<td>DESCRIPTION</td>
</tr>
<tr>
<td>------------</td>
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</tr>
<tr>
<td>0.0</td>
<td>1</td>
<td>3.2</td>
<td>3.2</td>
<td>100</td>
<td>X</td>
<td>0.0'-4.4' HALITE: Clear with scattered moderate reddish orange (16R 6/6) polyhalite, coarse crystalline with some fine to medium locally. (1, 2)</td>
</tr>
<tr>
<td>3.2</td>
<td>2</td>
<td>4.8</td>
<td>4.8</td>
<td>100</td>
<td>X</td>
<td>4.4'-7.0' HALITE: Clear to light gray (N7) medium to coarse crystalline. 61% gray clay and &lt;1/2% polyhalite. (11)</td>
</tr>
<tr>
<td>8.0</td>
<td>3</td>
<td>4.0</td>
<td>4.0</td>
<td>100</td>
<td>X</td>
<td>7.05'-7.2' ANHYDRITE b: Light gray (N7) to medium gray (N5) microcrystalline. $ 1/2&quot; gray clay at 7.05'. (1)</td>
</tr>
<tr>
<td>12.0</td>
<td>4</td>
<td>1.0</td>
<td>1.0</td>
<td>100</td>
<td>-</td>
<td>7.2'-11.8' HALITE: Clear, fine to coarse crystalline to 8', then predominantly clear, coarse crystalline. Slight moderate reddish orange color to 8'. (1, 2)</td>
</tr>
<tr>
<td>13.0</td>
<td>5</td>
<td>4.2</td>
<td>4.2</td>
<td>100</td>
<td>X</td>
<td>11.8'-13.75' HALITE: Clear with some light moderate reddish brown (16R 6/6) and light gray (N7) medium to coarse crystalline with fine locally. &lt;1/2% gray clay and dispersed polyhalite. (9)</td>
</tr>
<tr>
<td>22.0</td>
<td>7</td>
<td>5.3</td>
<td>4.9</td>
<td>92.3</td>
<td>-</td>
<td>12.85'-17.6' HALITE: Clear to moderate reddish orange (10G 6/6) coarsely crystalline. &lt;1% locally, polyhalite blocks. (2, 3)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>17.6'-22.9' HALITE: Clear, some light gray (N7); medium to coarsely crystalline. &lt;1% gray intercrystalline clay. Break at 20.1'. Gray clay break, trace of anhydrite at 22.5'. (1, 9)</td>
</tr>
</tbody>
</table>

**DATE STARTED:** 2/9/84 (SUN)   **DATE COMPLETED:** 2/10/84 (SUN)   **SHEET LOGGED BY:** J.E. GALLERANI   **DATE:** 3/5/84   **1 OF 2**
<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>RECOVERY %</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>27.3</td>
<td>5.3</td>
<td>5.3</td>
<td>92.5</td>
<td>27.3'-28.6' ARGILLACEOUS HALITE: Clear to moderate brown (5YR 4/4), fine to coarsely crystalline. &lt; 1 to 3% clay, predominantly brown with trace of gray. Breaks at 27.3' and 28.35'. ≤ 5% brown clay from 28.35' to 28.6'.</td>
<td>Run 8. Broken up 30.2'-32' 2.</td>
</tr>
<tr>
<td>8</td>
<td>30.0</td>
<td>4.7</td>
<td>4.7</td>
<td>100</td>
<td>28.6'-31.5' HALITE: Clear, coarsely crystalline 〈1/2% gray clay and polyhalite locally.</td>
<td>(1)</td>
</tr>
<tr>
<td>9</td>
<td>32.0</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>31.5'-34.0' ARGILLACEOUS HALITE: Clear to medium brown (5YR 4/4) and dark reddish brown (10R 3/4) medium to coarsely crystalline. &lt; 1 to 4% brown clay. Scattered breaks at 33.2'-34'.</td>
<td>(10)</td>
</tr>
<tr>
<td>10</td>
<td>35.0</td>
<td>4.3</td>
<td>4.3</td>
<td>100</td>
<td>34.0'-35.0' HALITE: Clear, coarsely crystalline. ≤ 1/2% brown clay.</td>
<td>(1,8)</td>
</tr>
<tr>
<td>11</td>
<td>37.0</td>
<td>4.7</td>
<td>4.7</td>
<td>100</td>
<td>35.0'-35.85' ANHYDRITE: Very light gray (N5) to medium gray (N5) microcrystalline anhydrite. Partially laminated. Scattered halite growths, especially 35.5'-35.85'. ≤ 1/4% brown clay at 35.9'.</td>
<td>(3,4,7)</td>
</tr>
<tr>
<td>12</td>
<td>41.3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>35.85'-37.2' HALITE: Clear, coarsely crystalline. ≤ 1% polyhalite blebs and patches up to 1/2&quot; white anhydrite layer at 36.7'.</td>
<td>(1,2)</td>
</tr>
<tr>
<td>13</td>
<td>45.0</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>37.2'-39.9' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6), coarsely crystalline &lt; 1 to 3% polyhalite blebs and patches. &lt; 1/2% gray clay.</td>
<td>(3,4,7)</td>
</tr>
<tr>
<td>14</td>
<td>49.0</td>
<td>4.8</td>
<td>4.8</td>
<td>100</td>
<td>39.9'-42.3' HALITE: Clear to light brown (5YR 5/4), medium to coarsely crystalline. ≤ 1% brown intercrystalline clay. 1/2&quot; brown clay seam at 41.3'. &lt; 1% polyhalite. Argillaceous halite at 41.8' to 42.3'.</td>
<td>(3,10)</td>
</tr>
<tr>
<td>15</td>
<td>50.8</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>42.3'-45.4' HALITE: Clear, coarsely crystalline. ≤ 1% polyhalite and &lt; 1/2% gray clay.</td>
<td>(1,7)</td>
</tr>
<tr>
<td>16</td>
<td>55.0</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>45.4'-47.0' ARGILLACEOUS HALITE: Clear to moderate brown (5YR 4/4) (5YR 3/4) medium to coarsely crystalline. &lt; 1 to 3% brown clay, intercrystalline and breaks. Breaks from 46.5' to 46.9'.</td>
<td>(12)</td>
</tr>
<tr>
<td>17</td>
<td>50.8</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>47.0'-49.0' HALITE: Clear to medium brown (5YR 4/4) to moderate yellowish brown (10R 5/4) medium to coarsely crystalline, some fine. &lt; 1 to 2% brown clay. Up to 4% clay from 48.7'-49.0'. Scattered breaks here, 3/8&quot; brown clay seam at 49.0'.</td>
<td>(12,17)</td>
</tr>
<tr>
<td>18</td>
<td>55.0</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>49.0'-50.8' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/4), coarsely crystalline. &lt; 1 to 3% polyhalite blebs and patches. &lt; 1/2% gray clay.</td>
<td>(4,7)</td>
</tr>
<tr>
<td>RUN NUMBER</td>
<td>DEPTH (ft.)</td>
<td>LENGTH CORE RUN</td>
<td>RECOVERY %</td>
<td>RECOVERED PROFILE</td>
<td>DESCRIPTION</td>
<td>REMARKS</td>
</tr>
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<td>------------</td>
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<tr>
<td>0.0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td>0.0'-4.8' HALITE: Clear with some light gray (W7); coarsely crystalline, some medium, ≤1% gray intercrystalline clay and &lt;1/2% polyhalite blebs.</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>4.5</td>
<td>4.5</td>
<td>100</td>
<td>X</td>
<td>4.8'-5.3' POLYHALITIC HALITE: Clear to moderate reddish orange; coarsely crystalline. &lt;1 to 3% polyhalite.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>5.0</td>
<td>4.5</td>
<td>90</td>
<td>X</td>
<td>5.3'-8.5' HB-139: Moderate reddish orange anhydrite mixed with halite to 5.4'. Than predominantly white to medium light gray (H6) anhydrite. Some &quot;swallowtail&quot; pattern in upper part. Scattered halite grains throughout. Absent polyhalite halo of the anhydrite from 7.25'-8.0'. &lt;1/4&quot; gray clay at 8.5'.</td>
<td>Watson drill NW double tube barrel; AM rods. Total time: 3-3/4 hours. Had to bolt machine to floor. Vibration of boom was considerable. No gas; dry hole. Contacts below run 2 not able to be determined accurately due to core loss.</td>
</tr>
<tr>
<td>3</td>
<td>5.3</td>
<td>4.6</td>
<td>86.8</td>
<td>X</td>
<td>8.5'-11.8' HALITE: Clear, medium to coarsely crystalline. &lt;1% gray clay and polyhalite.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>5.2</td>
<td>3.3</td>
<td>63.5</td>
<td>X</td>
<td>11.8'-15.7' HALITE: Clear to moderate reddish orange (10R 6/6), coarsely crystalline. &lt;1 to 3% polyhalite. &lt;1/2% gray clay. Some anhydrite at 15.5 to 15.7'. Gray clay parting at 15.7'.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>5.0</td>
<td>4.0</td>
<td>80</td>
<td>X</td>
<td>15.7'-16.4' HALITE: Clear, medium to coarsely crystalline. &lt;1% gray clay and dispersed polyhalite.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>20.0</td>
<td></td>
<td></td>
<td></td>
<td>16.4'-25.6' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6); coarsely crystalline. &lt;1 to 3% polyhalite. &lt;1/2% gray clay below 22.5'.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>25.0</td>
<td></td>
<td></td>
<td></td>
<td>25.0'-30.0' HALITE: Clear, fine to coarsely crystalline. &lt;1/2% clay and polyhalite.</td>
<td></td>
</tr>
<tr>
<td>RUN NUMBER</td>
<td>DEPTH (Ft.)</td>
<td>LENGTH CORE RUN</td>
<td>CORE RECOVERY</td>
<td>% RECOVERED</td>
<td>DESCRIPTION</td>
<td>REMARKS</td>
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<td>35</td>
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<td></td>
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<td>X</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>9.6</td>
<td>1.2</td>
<td>21.4</td>
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<tr>
<td>9</td>
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<td>1.2</td>
<td>23.5</td>
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<td>X</td>
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</tr>
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<td>44.6</td>
<td>45</td>
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<td>5.6</td>
<td>4.5</td>
<td>80.6</td>
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<tr>
<td>50.2</td>
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<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

30.0'-33.9' * HALITE: Clear to moderate reddish orange (108 6/6), coarsely crystalline. <1/2% dispersed polyhalite. 1/2" anhydrite layer at 30'.

33.9'-45.0' * HALITE: Clear to light gray (87) and medium light gray (86); medium to coarsely crystalline, some fine <1% clay and <1/2% dispersed polyhalite.

45.0'-50.2' * HALITE: Clear, medium to coarsely crystalline. None to <1% gray clay. <1/2% polyhalite from 49.3' to 50.2'.

Note: Core recovery from 4.5' is below 95%. Unable to accurately determine contacts. Hole was redrilled twice. Refer to logs for DH-02A and DH-02B.
<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>RECOVERY</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>0.0'-2.75' HALITE: Clear to light gray (W) coarsely crystalline. &lt;1% gray clay. &lt;1/2% polyhalite.</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
<td>2.75'-5.6' HALITE: Clear with some moderate reddish orange (10R 4/6); coarsely crystalline. &lt;1% polyhalite.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5.6</td>
<td></td>
<td></td>
<td></td>
<td>5.0'-8.2' M-139: &quot;Swallowtail&quot; pattern of halite and anhydrite from 5.6' to 7.5'. 1' layer of clear halite at 7.2'. From 7.3' to 8.2' predominantly light gray anhydrite with scattered halite growths. Some irregular laminated present. No clay at 8.2' but core grinding evident.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>10.0</td>
<td>5.0</td>
<td>4.3</td>
<td>86</td>
<td>8.2'-11.8' HALITE: Clear with some light moderate reddish orange and light gray (W). Medium to coarsely crystalline. &lt;1% gray clay. Breaks at 10.15' to 10.05'.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14.8</td>
<td></td>
<td></td>
<td></td>
<td>11.8'-13.0' HALITE: Clear, coarsely crystalline. &lt;1% polyhalite. &lt;1/2% gray clay.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>15.3</td>
<td>5.3</td>
<td>3.8</td>
<td>71.7</td>
<td>13.0'-17.2' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 4/6); coarsely crystalline. &lt;1 to 3% polyhalite. 1-1/2&quot; anhydrite layer at 17.2'. Core loss makes contacts &lt;3&quot;.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>20.1</td>
<td></td>
<td></td>
<td></td>
<td>17.2'-20.1' HALITE: Clear to moderate reddish orange (10R 4/6); medium to coarsely-cristalline. &lt;1% dispersed polyhalite. &lt;1/2% gray clay.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>25.0</td>
<td>4.9</td>
<td>4.9</td>
<td>100</td>
<td>20.1'-25.6' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 4/6); coarsely crystalline. Some medium. &lt;1 to 3% polyhalite. &lt;1% gray intercrystalline clay at 22.4' to 25'.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>25.0'-28.6' HALITE: Clear, medium to coarsely crystalline. None to &lt;1/2% dispersed polyhalite and gray clay.</td>
<td></td>
</tr>
<tr>
<td>RUN NUMBER</td>
<td>DEPTH (ft.)</td>
<td>LENGTH CORE RUN</td>
<td>% RECOVERED</td>
<td>PROFILE</td>
<td>DESCRIPTION</td>
<td>REMARKS</td>
</tr>
<tr>
<td>------------</td>
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<td>-----------------</td>
<td>-------------</td>
<td>---------</td>
<td>-------------</td>
<td>---------</td>
</tr>
<tr>
<td>25.0</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td>28.6'-33.6' HALITE: Clear to moderate reddish orange, coarsely crystalline, &lt;1 to 2% polyhalite, scattered anhydrite stringers, &lt;1/2% gray clay locally.</td>
<td>Run 8. Broken zone 37.4'-37.7' E</td>
</tr>
<tr>
<td>6</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>x</td>
<td>33.6'-34/3' HALITE: Clear, coarsely crystalline, Note to &lt;1/2% polyhalite.</td>
<td>Run 10. Broken up last 8' of Run 10. Core lost probably here.</td>
</tr>
<tr>
<td>30.0</td>
<td>30</td>
<td></td>
<td></td>
<td>x</td>
<td>34.3'-34.6' ANHYDRITE: V. light (N8) to medium light gray (N5) anhydrite. Fairly laminated scattered halite growths. Clay break at 34.6'.</td>
<td>Beyond 35', core is more broken up with evidence of more vibration damage. Contacts at 5.6', 17.2'; 41.4' and 45.9' are approximate due to core loss.</td>
</tr>
<tr>
<td>7</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>x</td>
<td>34.6'-41.4' HALITE: Clear, some light to medium light gray (N7 to N6); coarsely crystalline, &lt;1% gray clay. Core loss zone 8.9 make contact at 41.4' approximate.</td>
<td></td>
</tr>
<tr>
<td>35.0</td>
<td>35</td>
<td></td>
<td></td>
<td></td>
<td>41.4'-45.9' HALITE: Clear to moderate brown some fine, &lt;1 to 3' brown clay, intercrystalline and scattered breaks. Contacts approximate, due to core loss.</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>4.2</td>
<td>1.5</td>
<td>35.7</td>
<td></td>
<td>45.9'-49.2' HALITE: Clear with some light gray (N7) and medium light gray (N6); medium to coarsely crystalline, some fine, &lt;1% gray clay.</td>
<td>Note: Average core recovery for hole is less than 95% some contacts not able to be determined accurately. Replacement hole DH-28 drilled. Refer to log for this hole.</td>
</tr>
<tr>
<td>39.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>5.0</td>
<td>3.8</td>
<td>76</td>
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</tr>
<tr>
<td>44.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>49.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>
## WIPP GEOLOGIC DRILL LOG

**WASTE ISOLATION PILOT PLANT**

**INSTRUMENT TYPE & NUMBER**

**HOLE LOCATION**

**COLLAR ELEV.** 1306.3** DIRECTION OF DRILLING**

**MINE COORDINATES**

**DEPTH OF BOREHOLE** 55.0

**DRILLING METHOD** ROTARY/AIR

**DRILL MAKE/MODEL** WATSON

**DATE STARTED** 3/22/84 (SWING) **DATE COMPLETED** 3/23/84 (SWING)

**LOGGED BY:** J. E. GALLERANI **DATE:** 3/30/84

<table>
<thead>
<tr>
<th>RUN. NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>RECOVERY %</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>0</td>
<td>2.1</td>
<td>100</td>
<td>-</td>
<td>6.0' - 2.7' HALITE: Clear, trace of light gray (#7); coarse crystalline. &lt;1/2% gray clay and scattered polyhalite flakes. (1, 2)</td>
<td>Weezon pest mounted drill NW split tube barrel. Am rods. Drilling time: 5 hours</td>
</tr>
<tr>
<td>1</td>
<td>2.1</td>
<td>1.6</td>
<td>100</td>
<td>X</td>
<td>2.7' - 5.7' HALITE: Clear to moderate reddish orange (11R 6/6); coarse crystalline, some medium; 1/22 grey clay locally. &lt;1/2% polyhalite. (2-4)</td>
<td>Core condition fair. Some discing and vibration damage noted.</td>
</tr>
<tr>
<td>2</td>
<td>3.6</td>
<td>1.2</td>
<td>100</td>
<td>-</td>
<td>5.7' - 8.3' MB-129: From 5.7' to 6.5' is a mixture of halite and anhydrite. Some &quot;Swallowed!!&quot; pattern present. Below 6.5' mostly light gray (#6) to medium light gray (#6) anhydrite. Scattered halite growths. 3/16&quot; halite layer at 4.15'. 3/8&quot; hard gray clay at lower contact.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>5.3</td>
<td>1.3</td>
<td>100</td>
<td>X</td>
<td>8.3' - 11.7' HALITE: Clear to medium light gray (#6) and moderate reddish orange (10R 6/6); medium to coarse crystalline &lt;1% gray clay and &lt;1/2% dispersed polyhalite. (2, 9)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>6.6</td>
<td>1.5</td>
<td>100</td>
<td>-</td>
<td>11.7' - 16.4' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6); coarse crystalline, &lt;1% to &lt;1% polyhalite. Scattered anhydrite. 1/22 anhydrite layer with irregular gray clay parting at 16.25 - 16.4'. (3, 4, 7)</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>8.1</td>
<td>1.5</td>
<td>100</td>
<td>-</td>
<td>16.4' - 20.3' HALITE: Clear to light gray (#7) and light bluish grey (5B 7/2); trace of moderate reddish orange. Coarsely crystalline, some medium &lt;1% grey clay and &lt;1% polyhalite grades into unit below. (2, 9)</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>12.8</td>
<td>4.7</td>
<td>100</td>
<td>X</td>
<td>20.3' - 24.0' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6); coarse crystalline, some medium. &lt;1 to &lt;3% polyhalite. &lt;1% grey clay locally. (2-4, 7)</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>17.9</td>
<td>5.1</td>
<td>100</td>
<td>X</td>
<td>24.0' - 27.9' HALITE: Clear to light reddish orange (10R 6/6); medium to coarse crystalline. &lt;1/2% dispersed polyhalite and light gray clay. Break at 24.03'. (2, 7)</td>
<td></td>
</tr>
<tr>
<td>Run Number</td>
<td>Depth (ft.)</td>
<td>Length of Core Run</td>
<td>Recovery</td>
<td>Profile</td>
<td>Description</td>
<td>Remarks</td>
</tr>
<tr>
<td>------------</td>
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<td>-------------</td>
<td>---------</td>
</tr>
<tr>
<td>9</td>
<td>25</td>
<td>5.0</td>
<td>4.9</td>
<td>X</td>
<td>27.9'–32.9' Halite: Clear to moderate reddish orange (10R 6/6); coarsely crystalline. &lt;1 to 2% polyhalite blebs and patches. Scattered anhydrite from 31'. Predominantly anhydrite at 33.05 to 33.2' with dark gray along core break in anhydrite. [1, 2, 4]</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>30</td>
<td>5.0</td>
<td>5.0</td>
<td>X</td>
<td>33.9'–34.3' Anhydrite: White to medium light gray (8.5) microcrystalline. Scattered halite growths. Trace of gray clay at 34.4'.</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>35</td>
<td>5.0</td>
<td>5.0</td>
<td>X</td>
<td>34.3'–41.3' Halite: Clear with some medium light gray (9.6), light bluish gray (5B 7/1) and moderate reddish orange (10R 6/6). Medium to coarsely crystalline. &lt;1% gray intercrystalline clay. &lt;1/2% dispersed polyhalite. [2, 9, 13]</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>40</td>
<td>5.0</td>
<td>5.0</td>
<td></td>
<td>41.2'–44.75' Halite: Clear to moderate brown (5YR 4/4) and moderate reddish brown 10R 4/6). Medium to coarsely crystalline. &lt;1 to 2% brown clay, trace of gray. &lt;1/2% dispersed polyhalite. [13, 17]</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>45</td>
<td>5.0</td>
<td>5.0</td>
<td></td>
<td>44.75'–47.9' Halite: Clear, some medium light gray (9.6); coarsely crystalline. 5% gray clay, &lt;1/2% polyhalite. [2, 11]</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>50</td>
<td>5.1</td>
<td>5.0</td>
<td></td>
<td>47.9'–49.6 Halite: Clear, coarsely crystalline. &lt;1/2% gray clay at 48.9'. [1]</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>53</td>
<td></td>
<td>5.0</td>
<td></td>
<td>49.6'–53.0' Halite: Clear to light moderate reddish orange (10R 6/6); coarse, some medium crystalline. 5% polyhalite. &lt;1/2% gray clay to 52.4', then increases to 1% clay. B: 9 from 52.4'–53.0'</td>
<td></td>
</tr>
</tbody>
</table>
### WIPP GEOLOGIC DRILL LOG

**Instrument Type & Number:**

**Hole Type/Size:** NX Core

**Location:** N1100 DRIFT - FLOOD

**Station N1112 E446 COLLAR ELEV. 1318.14**

**Direction of Drilling:** Vertical

**Mine Coordinates:** N10.7992 E7335.4

**Depth of Borehole:** 748.8 ft.

**Drilling Method:** Rotary/Air

**Drill Make/Model:** CP-65

**Date Started:** 2/5/84

**Date Completed:** 2/7/84

**Sheet 1 of 2**

**Logged By:** J. E. Gallerani

**Date:** 3/5/84

<table>
<thead>
<tr>
<th>Run Number</th>
<th>Depth (ft.)</th>
<th>Length Core Run (in.)</th>
<th>Recovery % Recovered</th>
<th>Profile</th>
<th>Description</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>0</td>
<td>1.3</td>
<td>1.3</td>
<td>X</td>
<td>0.0' - 4.5' HALITE: Clear, coarsely crystalline, some medium from 3.9 to 4.5'. &lt;1% polyhalite klebs.</td>
<td>CT-65 drill, EW rods. No gas or/and. Run 1. 6&quot; diameter core from 0.0 to 1.5'.</td>
</tr>
<tr>
<td>1.3</td>
<td>1.4</td>
<td>2.1</td>
<td>1.1</td>
<td>X</td>
<td>4.5' - 4.2' HALITE: Clear to light gray medium to coarsely crystalline. &lt;1% grey intercrystalline clay.</td>
<td>Because of poor core recovery, contacts at 4.8': 42.9'; 24.0'; 34.75'; and 44.9' are approximate only.</td>
</tr>
<tr>
<td>2.7</td>
<td>2.7</td>
<td>2.1</td>
<td>2.1</td>
<td>X</td>
<td>8.2' - 8.4' ANHYDRITE A: White to light gray (N7) microcrystalline anhydrite with scattered halite growths. Trace of gray clay at 8.2'. &lt;1/2' Halite layer, then trace of gray clay at 8.2'.</td>
<td></td>
</tr>
<tr>
<td>3.9</td>
<td>4.1</td>
<td>4.1</td>
<td>100</td>
<td>X</td>
<td>8.4' - 12.0' HALITE: Clear, coarsely crystalline. Scattered white anhydrite/magnesite Stringers.</td>
<td></td>
</tr>
<tr>
<td>6.6</td>
<td>5.1</td>
<td>4.9</td>
<td>0.9</td>
<td>X</td>
<td>12.0' - 13.6' HALITE: Clear, some light moderate reddish orange, fine to medium, some coarsely crystalline. &lt;1% dispersed polyhalite and &lt;1% grey intercrystalline clay.</td>
<td>Run 6. Core broken up below anhydrite zone.</td>
</tr>
<tr>
<td>10.7</td>
<td>5.2</td>
<td>4.9</td>
<td>94</td>
<td>X</td>
<td>13.6' - 14.3' ANHYDRITE A: White to light gray (N7) microcrystalline anhydrite. Scattered halite growths, especially common 13.9' - 14.3'. Thin halite layer at 13.9' - 13.9'. Trace of gray clay at 13.6'. Core grinding evident.</td>
<td></td>
</tr>
<tr>
<td>15.8</td>
<td>5.0</td>
<td>3.1</td>
<td>62</td>
<td>X</td>
<td>14.4' - 14.4' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6) coarsely crystalline. &lt;1 to 2% polyhalite.</td>
<td>Run 8. Broken core zones.</td>
</tr>
<tr>
<td>18.4</td>
<td>5.0</td>
<td>3.1</td>
<td>62</td>
<td>X</td>
<td>18.4' - 22.7' HALITE: Clear with local zones of medium brown (1YR 3/4) medium to coarsely crystalline. &lt;1% predominantly brown clay. Local zones of &lt;1% clay at 19.8' - 20.7'; 21.0' - 21.4', &lt;1% polyhalite. Brown clay break at 22.9'. No anhydrite.</td>
<td></td>
</tr>
<tr>
<td>RUN NUMBER</td>
<td>DEPTH (ft.)</td>
<td>LENGTH CORE RUN</td>
<td>RECOVERY % RECOVERED</td>
<td>PROFILE</td>
<td>DESCRIPTION</td>
<td>REMARKS</td>
</tr>
<tr>
<td>------------</td>
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<td>-------------</td>
<td>---------</td>
</tr>
<tr>
<td>8</td>
<td>26.0</td>
<td>5.0</td>
<td>3.1</td>
<td>62</td>
<td>22.8'-26.0' HALITE: Clear, coarsely crystalline. Scattered white anhydrite/magnesite stringers.</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>27.5</td>
<td>1.5</td>
<td>1.3</td>
<td>87</td>
<td>X</td>
<td>Run 10. Broken up core last 1/2 of run.</td>
</tr>
<tr>
<td>10</td>
<td>30.0</td>
<td>2.5</td>
<td>1.0</td>
<td>40</td>
<td>X</td>
<td>Run 12. Borrowed EML stabilizer for EM rods. Tried it on Run 12. Core much better.</td>
</tr>
<tr>
<td>11</td>
<td>33.0</td>
<td>3.0</td>
<td>1.5</td>
<td>50</td>
<td>X</td>
<td>Run 13. Discs of clear halite, some broke up.</td>
</tr>
<tr>
<td>12</td>
<td>35.1</td>
<td>4.0</td>
<td>4.0</td>
<td>100</td>
<td>X</td>
<td>Run 14. Moved stabilizer 15' from barrel. Core broken up in clear halite and lower 6' of run. Drilling going slow. Much trouble with rod chatter.</td>
</tr>
<tr>
<td>13</td>
<td>39.1</td>
<td>4.4</td>
<td>4.4</td>
<td>100</td>
<td>X</td>
<td>Run 15. Core broken. Rods measured 48.8'. May have lost core in bottom of hole.</td>
</tr>
<tr>
<td>14</td>
<td>43.5</td>
<td>5.3</td>
<td>4.5</td>
<td>85</td>
<td></td>
<td>Measurements on Run 15 made from top of run.</td>
</tr>
<tr>
<td>15</td>
<td>48.8</td>
<td>5.3</td>
<td>4.5</td>
<td>85</td>
<td></td>
<td><em>NOTE</em>: Because of poor recovery, replacement hole DH-03A drilled later. Refer to log for DH-03A.</td>
</tr>
</tbody>
</table>
### WIPP
#### GEOLOGIC DRILL LOG

**WASTE ISOLATION PILOT PLANT**

**INSTRUMENT TYPE & NUMBER**

**HOLE TYPE**

**SIZE**

**NX CORE**

**BORING NO.**

**DH-D7A**

**LOCATION**

**N1100**

**DRIFT - ROOF**

---

**STATION**

**N1120**

**E450.5°**

**COLLAR ELEV.**

**1317.4**

**DIRECTION OF DRILLING**

**UP**

**MINE COORDINATES**

**N10.772.90**

**E73913.92**

**DEPTH OF BOREHOLE**

**49.9 FT.**

**DRILLING METHOD**

**ROTARY/AIR**

**DRILL MAKE/MODEL**

**WATSON**

**DATE STARTED**

**3-10-84 (SWING)**

**DATE COMPLETED**

**3-12-84 (SWING)**

**SHEET LOGGED BY:**

**J. E. GALLERANI**

**DATE:**

**3-12-84**

1 OF 2

---

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>RECOVERY</th>
<th>% RECOVERED</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>0</td>
<td>2.1</td>
<td>2.1</td>
<td>100</td>
<td>X</td>
<td>0.0'-4.9' HALITE: Clear, coarsely crystalline, some medium. &gt;3% polyhalite. [2]</td>
<td></td>
</tr>
<tr>
<td>2.1</td>
<td>5</td>
<td>3.5</td>
<td>3.5</td>
<td>100</td>
<td>X</td>
<td>4.9'-7.3' HALITE: Clear to light gray (W7) and light bluish gray (SB 7/1); medium to coarsely crystalline &lt;1% gray clay, &lt;3% polyhalite at 5.6'-7.3'. [9, 11]</td>
<td></td>
</tr>
<tr>
<td>5.6</td>
<td>7</td>
<td>4.4</td>
<td>4.4</td>
<td>100</td>
<td>X</td>
<td>7.3'-7.55' ANHYDRITE a - White to light gray (W7) anhydrite with growths of halite trace of gray clay at 7.3'. Upper contact irregular tightly welded.</td>
<td></td>
</tr>
<tr>
<td>10.0</td>
<td>13</td>
<td>0.9</td>
<td>0.9</td>
<td>100</td>
<td>X</td>
<td>7.55'-12.8' HALITE: Clear, coarsely crystalline, 5% polyhalite at 12.8'-12.8'. [1, 2]</td>
<td></td>
</tr>
<tr>
<td>10.9</td>
<td>15</td>
<td>4.6</td>
<td>4.6</td>
<td>100</td>
<td>X</td>
<td>12.8'-13.7' HALITE: Clear to light gray (W7), some moderate reddish orange (10R 6/6) and moderate brown (10R 4/4). Medium crystalline, some coarse. &lt;3% polyhalite and gray clay. [9]</td>
<td></td>
</tr>
<tr>
<td>15.5</td>
<td>20</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
<td>13.7'-14.3' ANHYDRITE a: White to light gray (W7) anhydrite. Fairly laminated. Couple of very thin anhydrite layers at 13.7'-14'. Scattered halite growths increasing from 14.0'-14.3'. Trace of gray clay at 13.7'.</td>
<td></td>
</tr>
<tr>
<td>14.3'-16.65'</td>
<td>POLYHALITE HALITE: Clear to moderate reddish orange/brown (10R 6/6; 4/4). Coarsely crystalline, &lt;1 to 3% polyhalite. Scattered white anhydrite stringers. [3, 4, 7]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18.65'-23.4'</td>
<td>HALITE: Clear some light brownish gray (5YR 6/1); moderate reddish orange (10R 6/6) and moderate brown (10R 4/4) fine to coarsely crystalline. &gt;0% brown clay, some gray, &lt;1% polyhalite. Brown clay at 23.35' with anhydrite layer above it. [13, 17]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23.4'-27.7'</td>
<td>HALITE: Clear, coarsely crystalline. &lt;3% brown clay from 27.0'. [1]</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

Run 3. Broken up 7.6'-10'.

Run 4. Broken core.

Used piece of foam rubber in barrel to keep core from falling down in barrel. Drill has jockey motion.

Core broken up. Vibration damage evident.

Drilling and broken up zones.

Jockey drill motion is cause of core damage.

No gas; dry hole.

Run 5. Broken zone 14.3'-15.

Run 5. Broken up measured core in rus rods.
<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN (ft.)</th>
<th>CORE RECOVERY</th>
<th>% RECOVERED</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>27.6</td>
<td>2.7</td>
<td>2.7</td>
<td>100</td>
<td></td>
<td>27.7'-28.9' ARGILLACEOUS HALITE: Clear to moderate brown (5YR 4/4); medium to coarsely crystalline. &lt;1 to 3% brown clay. Scattered breaks. Parting at 28.85'. (12)</td>
<td>Run 9. Core broken up recovery difficult to measure.</td>
</tr>
<tr>
<td>9</td>
<td>31.6</td>
<td>4.0</td>
<td>4.0</td>
<td>100</td>
<td></td>
<td>28.9'-35.05' HALITE: Clear to moderate brown (5YR 4/4); coarsely crystalline. 5% brown clay, both inter and intercristalline. Locally argillaceous. Scattered breaks. Clear halite at 34.7' to 35.05'. (3, 10)</td>
<td>Run 10. Broken zones of core.</td>
</tr>
<tr>
<td>10</td>
<td>35.1</td>
<td>3.5</td>
<td>3.5</td>
<td>100</td>
<td></td>
<td>35.05'-35.95' ANHYDRITE: White to light gray (N7), partially laminated. Scattered growths of halite 35.1' to 35.6'. Then becomes a mixture of anhydrite and polyhalitic halite grading upwards to less amount of anhydrite. 1/2'± brown clay at 35.05'.</td>
<td>Run 11. Broken core last 3' of run.</td>
</tr>
<tr>
<td>11</td>
<td>40.0</td>
<td>4.9</td>
<td>4.9</td>
<td>100</td>
<td></td>
<td>35.95'-40.0' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6); coarsely crystalline. &lt;1 to 3% polylalite scattered white anhydrite to 37.3'. (2-4, 7)</td>
<td>Run 12. Broken up last 2' of run.</td>
</tr>
<tr>
<td>12</td>
<td>43.1'</td>
<td>4.9</td>
<td>4.9</td>
<td>100</td>
<td></td>
<td>40.0'-43.1' HALITE: Clear to moderate brown (5YR 4/4); some moderate reddish orange. Medium to coarsely crystalline. Some fine &lt;1% brown clay and &lt;1/3% dispersed polyhalite. (17)</td>
<td>Run 13. Some broken core.</td>
</tr>
<tr>
<td>13</td>
<td>46.1'</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td></td>
<td>43.1'-43.6' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6) coarsely crystalline. &lt;1 to 3% polyhalite. (3, 4, 7)</td>
<td>Run 14.</td>
</tr>
</tbody>
</table>
# GEOLOGIC DRILL LOG

**WIPP**
**WASTE ISOLATION PILOT PLANT**

**INSTRUMENT TYPE & NUMBER**
**HOLE TYPE/ SIZE**
**NX CORE**
**BORING NO.**

**LOCATION**

**STATION**

**ELEV.**

**COLLAR**

**MINE COORDINATES**

**DIRECTION OF DRILLING**

**VERTICAL**

**DRILLING METHOD**

**DRILL MAKE/ MODEL**

**DATE STARTED**

**DATE COMPLETED**

**LOGGED BY**

**DATE**

**SHEET**

**RUN NUMBER**

**DEPTH (ft.)**

**LENGTH CORE RUN**

**% RECOVERED**

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>% RECOVERED</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
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<tbody>
<tr>
<td>0</td>
<td>0.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td>1.0</td>
<td>1.8</td>
<td>1.8</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>2.8</td>
<td>2.0</td>
<td>2.0</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>4.8</td>
<td>2.0</td>
<td>2.0</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>6.8</td>
<td>2.0</td>
<td>2.0</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>8.8</td>
<td>5.0</td>
<td>5.0</td>
<td>X X</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>13.8</td>
<td>5.0</td>
<td>5.0</td>
<td>X X</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>18.8</td>
<td>5.0</td>
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<td>X X</td>
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Boring No. DH-04
<table>
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<th>DESCRIPTION</th>
<th>REMARKS</th>
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<tbody>
<tr>
<td>9</td>
<td>28.8</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>X X</td>
<td>21.1' - 27.6' POLYHALITE: Clear to moderate reddish orange (10R 6/6), coarse crystalline.&lt; 1 to 3% polyhalite. Clay break at 21.55'.&lt; 1/2% gray intercrystalline clay from 25' - 27.6'</td>
<td>Run 10. Core grinding. Run 11. Core grinding throughout run. 0.8' of core left in hole at end of run.</td>
</tr>
<tr>
<td>10</td>
<td>30.0</td>
<td>5.0</td>
<td>4.9</td>
<td>98</td>
<td>X X</td>
<td>27.6' - 30.2' POLYHALITE: Clear to light gray (87) to moderate reddish orange (10R 6/6), fine to coarse crystalline.&lt; 1% gray clay. Breaks at 28.2', 28.45'.&lt; 1/2% polyhalite.</td>
<td>Run 12, 13, 14. Broken up core.</td>
</tr>
<tr>
<td>11</td>
<td>33.8</td>
<td>5.0</td>
<td>4.2</td>
<td>60</td>
<td>X X</td>
<td>30.2' - 35.0' POLYHALITE: Clear to moderate reddish orange (10R 6/6) coarse crystalline.&lt; 1 to 3% polyhalite.</td>
<td>Contacts from 35' are approximate due to core loss.</td>
</tr>
<tr>
<td>12</td>
<td>38.0</td>
<td>5.0</td>
<td>1.4</td>
<td>28</td>
<td>X X</td>
<td>35.0' - 35.6' ANTHRACITE: Moderate reddish orange to medium gray from 35' - 35.4'. Then very light to medium gray. No clay at lower contact but core grinding evident.</td>
<td>Note: Hole beyond 33' not able to be logged accurately because of poor core recovery and quality. Replacement hole DH-04B drilled at later date. Refer to log for hole DH-04B.</td>
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<tr>
<td>13</td>
<td>43.0</td>
<td>1.8</td>
<td>0.4</td>
<td>22</td>
<td>X X</td>
<td>35.6' - 43' POLYHALITE: Clear mottled with some light gray (87) and moderate reddish orange, medium to coarse crystalline.&lt; 1/2% gray clay and polyhalite.</td>
<td></td>
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<tr>
<td>14</td>
<td>44.8</td>
<td>1.0</td>
<td>0.3</td>
<td>30</td>
<td>X X</td>
<td>43.0' - 45.8': Not able to classify due to poor quality and poor recovery of core.</td>
<td></td>
</tr>
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</tbody>
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## WIPP
### WASTE ISOLATION PILOT PLANT

**INSTRUMENT**
- TYPE & NUMBER
- HOLE/TYPE SIZE
- NX CORE
- BORING NO. DH-4A

**LOCATION**
- N1100 DRIFT; FLOOR

**STATION**
- M1113 + E446 +
- COLLAR ELEV. 1309.6 +
- DIRECTION OF DRILLING DOWN

**MINE COORDINATES**
- DEPTH OF BOREHOLE 11.2 FT.

**DRILLING METHOD**
- ROTARY/AIR
- DRILL MAKE/MODEL BOYLES JVA

**DATE STARTED**
- 3-8-84 (SMING)

**DATE COMPLETED**
- 3-9-84 (SMING)

**LOGGED BY**
- J. E. GALLERANI

**DATE**
- 3-9-84

---

### RUN NUMBER

<table>
<thead>
<tr>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>PERCENT RECOVERED</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
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<td>0.0</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.3</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>4.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.2</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

- **0.0' - 7.0' HALITE:** Clear to moderate reddish orange; coarsely crystalline. ≤ 2% polyhalite. <1% gray clay.
- **7.0' - 8.6' POLYHALITIC HALITE:** Clear to moderate reddish orange (19R 6/6) to light brown (5YR 5/6). Coarsely crystalline. ≤1 to 3% polyhalite.
- **8.6' - 11.2' MD-139:** From 8.6 to 9.6', mixture of halite and anhydrite. "Swallowtail" patterns. Then predominantly medium gray to very light gray (NB) anhydrite with scattered halite growths.

**Remarks**
- Used Boyles JVA screw feed drill.
- Used roller bit to 0.6', then NX double tube core barrel.
- No gas. Dry hole.
- Driller stopped hole at 11.2' because of core loss. Drilled replacement hole DH-4B using Watson drill.
- Refer to log for DH-4B.

---

**BORING NO.**
- DH-4A
# WIPP

**WASTE ISOLATION PILOT PLANT**

**INSTRUMENT TYPE & NUMBER:**

**HOLE SIZE:** N/A

**CORE:** N/A

**BORING NO.:** DH-DAB

**LOCATION:** N1100 DRIFT; FLOOR

---

**STATION:** N1112 + E450.5 +

**COLLAR ELEV.:** 1309.7

**DIRECTION OF DRILLING:** VERTICAL DOWN

**MINE COORDINATES:** N10,799.70

**E7348.85**

**DEPTH OF BOREHOLE:** 51.8 FT

**DRILLING METHOD:** ROTARY/AIR

**DRILL MAKE/MODEL:** WATSON

**DATE STARTED:** 3-9-84 (SWING)

**DATE COMPLETED:** 3-19-84 (SWING)

**SHEET:** SHEET

**LOGGED BY:** J. E. GALLERANI

**DATE:** 3-24-84

**1 OF 2**

---

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>RECOVERY %</th>
<th>RECOVERED PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
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<tbody>
<tr>
<td>5.0</td>
<td>0</td>
<td>2.0</td>
<td>2.0</td>
<td>100</td>
<td>X</td>
<td>0.0'-7.9' HALITE: Clear, some moderate reddish orange (10R 6/6) and medium bluish gray (5B 3/1) coarsely crystalline. &lt;1% gray clay and polyhalite blebs. 2, some 9</td>
</tr>
<tr>
<td>5.2</td>
<td>3.2</td>
<td>3.2</td>
<td>100</td>
<td>X</td>
<td>7.0'-8.55' POLYHALITE HALITE: Clear to moderate reddish orange (10R 6/6), coarsely crystalline. &lt;1% polyhalite. [3, 7]</td>
<td></td>
</tr>
<tr>
<td>7.9</td>
<td>2.7</td>
<td>1.0</td>
<td>37</td>
<td>X</td>
<td>8.55'-11.6' N10-139: From 8.55' to 11.6' is a mixture of halite and anhydrite. From 9.65' is predominantly white to light gray (87) anhydrite with growths of halite. Anhydrite is irregularly laminated. Upper contact is tightly closed and dips 25'. Several tightly closed hairline fractures at 10.0' to 11.0'. Grey clay at 11.0'.</td>
<td></td>
</tr>
<tr>
<td>11.0</td>
<td>0.7</td>
<td>0.7</td>
<td>100</td>
<td>X</td>
<td>11.6'-15.45' N10-139: Moderate brown (5YR 6/4) and moderate reddish orange (10R 6/6); medium to coarsely crystalline, some fine. &lt;1% gray clay, trace of brown. &lt;1% polyhalite. Grey clay breaks at 12.4', 14.55', 14.6'. [1]</td>
<td></td>
</tr>
<tr>
<td>16.0</td>
<td>4.3</td>
<td>4.3</td>
<td>100</td>
<td>X</td>
<td>15.45'-19.85' POLYHALITE HALITE: Clear to moderate reddish orange (10R 6/6) and brown (10R 4/6); coarsely crystalline. &lt;1 to 3% polyhalite. &lt;1/2% gray intercrystalline clay to 15.0'. Moderate reddish orange/brown anhydrite and some halite at 19.75' to 19.85'. Grey clay parting at 19.85'. [7]</td>
<td></td>
</tr>
<tr>
<td>21.0</td>
<td>3.0</td>
<td>3.0</td>
<td>100</td>
<td>X</td>
<td>19.85'-21.0' HALITE: Clear to moderate reddish orange (10R 6/6) medium to coarsely crystalline. &lt;1% polyhalite and &lt;1% gray clay. [5, 9]</td>
<td></td>
</tr>
<tr>
<td>21.0</td>
<td>5.1</td>
<td>5.1</td>
<td>100</td>
<td>X</td>
<td>21.0'-26.1' POLYHALITE HALITE: Clear to moderate reddish orange (10R 6/6), medium reddish brown (10R 4/6); coarsely crystalline, some medium. &lt;1 to 3% polyhalite. &lt;1% brown clay at 21.0'-26.1'. &lt;1/2% gray clay locally below 21.6'. [7]</td>
<td></td>
</tr>
</tbody>
</table>

**Watson drill. Post mounted HV split tube core barrel. HV core.**

**Drilling time: 3-1/2 hours.**

**No brine or gas. Core coming out good.**

**My core barrel has stopped diamond bit. Core barrel made by Christensen.**

**No gas; dry hole.**
<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>RECOVERY</th>
<th>% RECOVERED</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>25</td>
<td>5.1</td>
<td>5.1</td>
<td>100</td>
<td>XX</td>
<td>26.1'-37.9' HALITE: Clear with some light gray (W7) and moderate reddish orange (10R 6/6); coarsely crystalline with some medium. &lt;1/2% polyhalite. &lt;1% gray clay. Some of clay is medium plastic, moist. [9]</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>30</td>
<td>5.1</td>
<td>5.1</td>
<td>100</td>
<td>-X</td>
<td>27.8'-29.3' HALITE: Clear to moderate reddish orange (10R 6/6), brownish gray (5YR 4/1) and moderate brown (5YR 3/4). Medium to coarsely crystalline. &lt;1 to 2% brown clay, trace gray. Break at 28.95'. &lt;1% polyhalite. [12]</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>40</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>XX</td>
<td>29.3'-31.6' HALITE: Clear to moderate reddish orange (10R 6/6); medium to coarsely crystalline. &lt;1% gray clay and polyhalite. Break at 29.55'. [9, 13]</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>45</td>
<td>5.1</td>
<td>5.1</td>
<td>100</td>
<td>-X</td>
<td>31.6'-36.1' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6); coarsely crystalline. &lt;1 to 3% polyhalite. Scattered anhydrite stringers. [3, 4, 7]</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>50</td>
<td>5.1</td>
<td>5.1</td>
<td>100</td>
<td>-X</td>
<td>36.1'-36.8' HALITE: Clear. Some moderate reddish orange; medium to coarsely crystalline. &lt;1/2% polyhalite. Anhydrite stringers from 36.55' to 36.8'. [11]</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>55</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-X</td>
<td>36.8'-37.0' ANHYDRITE: Very light (W8) to light gray (W7) anhydrite. Scattered halite growths, especially last 0.5'. Trace gray clay at 37.0'. Core grinding evident here. [8]</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>45</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-X</td>
<td>37.0'-49.35' HALITE: Clear with light bluish gray (5B 7/1), light gray (W7), moderate brown (5YR 4/4) and moderate reddish orange/brown (10R 6/6-10R 4/6). Medium to coarsely crystalline. &lt;1% brown and gray clay. &lt;1% polyhalite. Clear halite at 41.2' to 41.9'. Predominantly brown clay (&lt;1%) from 44.3' to 45.3' and 47.0' to 48.5'. [9, 11, 17]</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>50</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-X</td>
<td>49.35'-51.4' HALITE: Clear, coarsely crystalline &lt;1/2% gray clay locally. [1, 8]</td>
<td></td>
</tr>
</tbody>
</table>

Several pieces in Run 13 are up to 1-1/2' long before taking out of tube.
# WIPP
## GEOLOGIC DRILL LOG
### INSTRUMENT TYPE & NUMBER:
**HOLE TYPE/SIZE:** 4" CORE

### LOCATION:
**STATION:** N1463 E972 COLLAR ELEV. 1329.9
**MINE COORDINATES:** N1149.6 E7865.0
**DIRECTION OF DRILLING:** VERTICAL

### DRILLING METHOD & DRILL MAKE/MODEL:
**DRILLING METHOD:** ROTARY/AIR
**MAKE/MODEL:** LONGYEAR 65

### DATE COMPLETED:
**DATE STARTED:** 3/3/84 (DAY)
**DATE COMPLETED:** 3/9/84 (DAY)

### SHEET
**LOGGED BY:** J. E. GALLERANI
**DATE:** 3/14/84

### BORING NO. DH-05

<table>
<thead>
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<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>RECOVERY</th>
<th>% RECOVERED</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
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<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>0.0'-0.25' HALITE: Clear, some light moderate reddish orange (10R 6/6), medium-coarsely crystalline. &lt; 1/2% dispersed polyhalite.</td>
<td></td>
</tr>
<tr>
<td>3.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>0.35'-1.23' POLYHALITE: Clear to moderate reddish orange (10R 6/6), coarsely crystalline up to 2% polyhalite.</td>
<td></td>
</tr>
<tr>
<td>6.65</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.23'-5.05' HALITE: Clear to light gray (8.7), medium-coarsely crystalline. ≤ 1% intercrystalline gray clay. &lt; 1/2% dispersed polyhalite. Breaks at 1.25', 4.8'. Very light gray anhydrite stringer at 2.6', 1/2&quot; anhydrite, trace of clay at 5.0'. Some core grinding noted.</td>
<td></td>
</tr>
<tr>
<td>9.35</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5.05'-9.3' HALITE: Clear, coarsely crystalline. Scattered white nannoplasts/ stringers.</td>
<td></td>
</tr>
<tr>
<td>13.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>9.3'-9.95' HALITE: Clear with some light gray intercrystalline clay (&lt; 1%). Medium-coarsely crystalline.</td>
<td></td>
</tr>
<tr>
<td>17.15</td>
<td></td>
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<td>9.95'-11.0' ARGILLACEOUS HALITE: Clear to medium brown (5YR 3/4) to moderate reddish orange (10R 6/6), fine-medium, some coarsely crystalline. &lt; 1 to 3% brown clay. &lt; 1/2% dispersed polyhalite coloration. Gray clay along tightly closed irregular upper contact.</td>
<td></td>
</tr>
<tr>
<td>21.15</td>
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<td></td>
<td></td>
<td></td>
<td>X</td>
<td>11.0'-14.1' HALITE: Clear, coarsely crystalline. No clay to 12.9'. From 12.9'-14.1', &lt; 1/2% gray and brown clay.</td>
<td></td>
</tr>
<tr>
<td>24.3</td>
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<td></td>
<td></td>
<td>X</td>
<td>14.1'-17.15' ARGILLACEOUS HALITE: Clear to moderate reddish orange (10R 6/6) medium brown, fine to medium, some coarsely crystalline. &lt; 1 to 4% brown clay, trace of gray. Irregular break at 16.35'.</td>
<td></td>
</tr>
</tbody>
</table>

**Hole-drilled by WHL. Longyear 65 drill with 4" dia. masonry single thin wall core barrel. Diamond bit.**

Run 2. Core grinding at anhydrite-clay layer.

Run 5. Lost at 13'-14', some grinding.

Run 6. Core quality improves beyond 10' depth; some grinding on ends of core pieces.
<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH</th>
<th>CORE RUN</th>
<th>RECOVERY</th>
<th>% RECOVERED</th>
<th>PROFILE</th>
</tr>
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<tbody>
<tr>
<td>8</td>
<td>26.6</td>
<td>2.3</td>
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<tr>
<td>9</td>
<td>30.5</td>
<td>3.3</td>
<td>3.6</td>
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<td>3.2</td>
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<td>13</td>
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<td>14</td>
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<td>3.75</td>
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<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>51.0</td>
<td>3.25</td>
<td>3.25</td>
<td>100</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### DESCRIPTION

- **17.15'-17.75' ANHYDRITE**: Very light (M) to light gray (M7) anhydrite to 17.4'. Then mixed with growths of halite. Tight welded irregular upper contact. Brown clay along lower contact. Core grinding evident here.

- **17.75'-22.7' HALITE**: Clear to moderate reddish orange (10R 6/6), coarsely crystalline, <1% dispersed polyhalite and scattered blains. White very light gray anhydrite stringer up to 1/2" thick at 19.25'.

- **22.7'-26.6' HALITE**: Clear, some moderate reddish brown (10R 4/6), coarsely crystalline with twill of fine-medium, <1% polyhalite. <1% brown clay. Breaks at 23.15', 24.3', 26.1'. Some core grinding evident.

- **26.6'-28.8' ABRILLACOIN HALITE**: Clear to medium brown (5YR 3/4), coarsely crystalline. <1 to 3% brown clay. Core broken 26.0'-27.9'.

- **28.8'-30.1' HALITE**: Clear, coarsely crystalline.<1/2% polyhalite.

- **30.1'-32.3' POLYHALITE HALITE**: Clear, mottled with moderate reddish orange (10R 6/6) coarsely crystalline. <1 to 3% polyhalite. <1/2% gray clay.

- **32.3'-35.4' HALITE**: Clear mottled with moderate brown (5YR 3/4) to dark reddish brown, coarsely crystalline. <1 to 2% patches of brown clay. <1/2% polyhalite. Parting at 35.4' 2 dipping 30° 2.

- **35.4'-36.8' HALITE**: Clear to moderate reddish orange (10R 6/6), coarsely crystalline. <1 to 2%, locally of dispersed polyhalite.

- **38.4'-40.9' HALITE**: Clear, some moderate reddish orange (10R 6/6), coarsely crystalline. <1% polyhalite. Moderate reddish brown, polyhalite at 36.6'-39.0'. Anhydrite stringers at 36.7'-38.8'.

- **40.9'-51.0' HALITE**: Clear to moderate reddish brown (10R 4/6) to medium brown (5YR 3/4) medium-coarsely crystalline. <1 to 3% brown clay, intergranular and in patches. <1/2% polyhalite. Breaks at 41.85', 44.0'-44.2'.
**WIPP WASTE ISOLATION PILOT PLANT**

**INSTRUMENT TYPE & NUMBER**

**HOLE TYPE/SIZE** 4 INCH CORE

**BORING NO.** DH-06

**LOCATION** 1-3 ALCOVE - FLOOR

**STATION** N 1463° E 972' 2''
**COLLAR ELEV.** 1317.9'

**DIRECTION OF DRILLING** VERTICAL DOWN

**MINE COORDINATES** N 11,149.7' E 7064.9'

**DEPTH OF BOREHOLE** 49.75 FT

**DRILLING METHOD** ROTARY/AIR

**DRILL MAKE/MODEL** LONGYEAR 65

**DATE STARTED** 3-4-84 (DAY)

**DATE COMPLETED** 3-7-84 (DAY)

**SHEET LOGGED BY** J. E. GALFERNI

**DATE** 3-10-84

**1 OF 2**

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN (ft.)</th>
<th>CORE RUN</th>
<th>RECOVERY %</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
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<tbody>
<tr>
<td>0.0</td>
<td>0</td>
<td>2.1</td>
<td>2.1</td>
<td>100</td>
<td></td>
<td>0.0'-4.3' HALITE: Clear, coarsely crystalline. &lt;1/2% polyhalite from 3.4' Z.</td>
<td></td>
</tr>
<tr>
<td>2.1</td>
<td>2.05</td>
<td>2.05</td>
<td>100</td>
<td>X</td>
<td></td>
<td>4.2'-5.6' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6); coarsely crystalline. &lt;1 to 2% polyhalite.</td>
<td></td>
</tr>
<tr>
<td>4.15</td>
<td>5</td>
<td>2.1</td>
<td>2.1</td>
<td>100</td>
<td>X X</td>
<td>5.4'-7.8' HALITE: Clear with trace of light gray (N7). Coarsely crystalline. &lt;1/2% gray intercrystalline clay. &lt;1/2% polyhalite.</td>
<td></td>
</tr>
<tr>
<td>6.25</td>
<td>1.75</td>
<td>1.75</td>
<td>100</td>
<td></td>
<td>X</td>
<td>7.8'-9.0' VALITE: Clear to light gray (N7); medium to coarsely crystalline, trace fine. 5% gray intercrystalline clay. 5%/4% gray clay seam at 7.8' and 1/8' clay seam at 8.45' Z.</td>
<td></td>
</tr>
<tr>
<td>8.0</td>
<td>1.85</td>
<td>1.85</td>
<td>100</td>
<td></td>
<td>X X</td>
<td>9.0'-10.8' HALITE: Clear, coarsely crystalline locally some medium. &lt;1/2% gray clay and polyhalite.</td>
<td></td>
</tr>
<tr>
<td>9.85</td>
<td>2.1</td>
<td>2.1</td>
<td>100</td>
<td></td>
<td>X X X</td>
<td>10.8'-13.4' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6); coarsely crystalline. &lt;1 to 3% polyhalite. No clay to 12.35'; then &lt;1% gray clay.</td>
<td></td>
</tr>
<tr>
<td>11.95</td>
<td>1.65</td>
<td>1.65</td>
<td>100</td>
<td>X</td>
<td>X X X</td>
<td>13.6'-16.65' HALITE: Clear to light gray (N7); coarsely crystalline. 5% gray intercrystalline clay. None to &lt;1% polyhalite.</td>
<td></td>
</tr>
<tr>
<td>13.6</td>
<td>1.6</td>
<td>1.6</td>
<td>100</td>
<td></td>
<td>X</td>
<td>18.65'-20.6' HALITE: Clear, some moderate reddish orange (10R 6/6); coarsely crystalline. &lt;1% polyhalite. &lt;1/2% gray clay.</td>
<td></td>
</tr>
<tr>
<td>15.2</td>
<td>1.65</td>
<td>1.65</td>
<td>100</td>
<td></td>
<td></td>
<td>Run 10, 11, 12. Some grinding on core ends.</td>
<td></td>
</tr>
<tr>
<td>16.05</td>
<td>1.8</td>
<td>1.8</td>
<td>100</td>
<td></td>
<td>X</td>
<td>No gas; dry hole.</td>
<td></td>
</tr>
<tr>
<td>18.65</td>
<td>1.85</td>
<td>1.85</td>
<td>100</td>
<td>X</td>
<td>X</td>
<td>20.6'-22.3' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6); coarsely crystalline. 5% to 3% polyhalite. &lt;1/2% gray clay.</td>
<td></td>
</tr>
<tr>
<td>RUN NUMBER</td>
<td>DEPTH (ft.)</td>
<td>LENGTH CORE RUN</td>
<td>RECOVERY</td>
<td>% RECOVERED</td>
<td>DESCRIPTION</td>
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</tr>
<tr>
<td>24</td>
<td>1.2</td>
<td>1.2</td>
<td>100</td>
<td>X</td>
<td>22.1' - 26.1' MB-139: “Mellowtail” pattern of halite and anhydrite from 22.3' to 24.2'. Thin predominately very light (8A) to light gray (8W) and some moderate reddish orange (10R 6/6) anhydrite mixed with growths of halite. No clay at lower contact but some core grinding on ends of core throughout MB-139.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>1.3</td>
<td>1.3</td>
<td>100</td>
<td>X</td>
<td>26.1' - 29.4' HALITE: Clear to light moderate reddish orange (10R 6/6); medium to coarsely crystalline. &lt;1% dispersed polyhalite and &lt;1/2% gray clay.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>1.6</td>
<td>1.6</td>
<td>100</td>
<td>X</td>
<td>29.4' - 31.5' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6); coarsely crystalline. &lt;1% polyhalite, anhydrite mixed with halite at 32.2' - 32.5'. Grey clay at 33.5'.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>1.9</td>
<td>1.9</td>
<td>100</td>
<td>X</td>
<td>31.0</td>
<td></td>
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<tr>
<td>18</td>
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<td>X</td>
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<tr>
<td>19</td>
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<td>26</td>
<td>2.75</td>
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<td>50.0</td>
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<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>REMARKS</th>
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<tbody>
<tr>
<td>22.1' - 26.1' MB-139: “Mellowtail” pattern of halite and anhydrite from 22.3' to 24.2'. Thin predominately very light (8A) to light gray (8W) and some moderate reddish orange (10R 6/6) anhydrite mixed with growths of halite. No clay at lower contact but some core grinding on ends of core throughout MB-139.</td>
<td></td>
</tr>
<tr>
<td>26.1' - 29.4' HALITE: Clear to light moderate reddish orange (10R 6/6); medium to coarsely crystalline. &lt;1% dispersed polyhalite and &lt;1/2% gray clay.</td>
<td></td>
</tr>
<tr>
<td>29.4' - 31.5' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6); coarsely crystalline. &lt;1% polyhalite, anhydrite mixed with halite at 32.2' - 32.5'. Grey clay at 33.5'.</td>
<td></td>
</tr>
<tr>
<td>33.5' - 35.6' HALITE: Clear to light gray (8W) and moderate reddish orange (10R 6/6); medium to coarsely crystalline. &lt;1% gray clay and &lt;1/2% dispersed polyhalite.</td>
<td></td>
</tr>
<tr>
<td>35.6' - 39.1' POLYHALITIC HALITE: Clear to moderate reddish orange/brown (10R 6/6; 4/6); coarsely crystalline. &lt;1 to 4% polyhalite.</td>
<td></td>
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<tr>
<td>39.1' - 46.2' HALITE: Clear to moderate reddish orange/brown (10R 6/6; 4/6) and grayish brown (5YR 7/2); medium to coarsely crystalline. ≤1% brown clay; some gray; &lt;1% polyhalite. Core loss 42' - 45'.</td>
<td></td>
</tr>
<tr>
<td>46.2' - 49.75' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6); coarsely crystalline. &lt;1 to 3% polyhalite. Scattered white stringers of anhydrite/magnesite.</td>
<td></td>
</tr>
</tbody>
</table>
**WIPP**

**GEOLOGIC DRILL LOG**

**WASTE ISOLATION PILOT PLANT**

**INSTRUMENT:**

**HOLE TYPE & NUMBER:**

**LOCATION:** N1100 DRIFT AT RM. B INTERSECTION; ROOF

**COLLAR ELEV.** 1326.7

**DIRECTION OF DRILLING:** VERTICAL - UP

**MINE COORDINATES:** N10,799.3 E7870.8

**DEPTH OF BOREHOLE:** 49.8'

**DRILLING METHOD:** ROTARY/AIR

**DRILL MAKE/MODEL:** WATSON

**DATE STARTED:** 2/21/84 (SWING)

**DATE COMPLETED:** 2/22/84 (SWING)

**SHEET LOGGED BY:** J. E. GALLERANI

**DATE:** 3/4/84

**OF 2**

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft)</th>
<th>LENGTH CORE RUN</th>
<th>CORE RECOVERY</th>
<th>%RECOVERED</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>0.9</td>
<td>0.9</td>
<td>100</td>
<td>X</td>
<td></td>
<td>0.0' - 4.6' HALITE: Clear to moderate reddish orange (10R 6/6), coarsely crystalline ≤ 1% polyhalite blasts and patches. Up to 2% polyhalite from 3.1' - 4.6'. [1, 3]</td>
</tr>
<tr>
<td>0.9</td>
<td>2.0</td>
<td>2.0</td>
<td>100</td>
<td>X</td>
<td></td>
<td>4.6' - 9.0' HALITE: Clear to light gray (8/7), some moderate reddish orange (10R 6/6). Medium to coarsely crystalline, some fine. ≤ 1% gray clay. &lt; 1/10 polyhalite. 1/2&quot; gray clay at 8.35'. Anhydrite and halite 8.9' - 9.0'. [4, 11]</td>
</tr>
<tr>
<td></td>
<td>2.9</td>
<td>2.9</td>
<td>100</td>
<td>X</td>
<td></td>
<td>9.0' - 13.2' HALITE: Clear, coarsely crystalline, zone to &lt; 1% intercristalline gray clay. [1]</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td>13.2' - 14.7' HALITE: Clear to moderate brown (5YR 3/4; 4/4). Medium-coarsely crystalline, some fine. &lt; 1 to 3% brown clay. Locally zones of argillaceous halite. [12, 17]</td>
</tr>
<tr>
<td>3</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
<td></td>
<td>14.7' - 16.3' HALITE: Clear with some moderate brown (5YR 4/4), coarsely crystalline. None to ≤ 1% brown clay. [1, 8]</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>16.5' - 20.85' ARGILLACEOUS HALITE: Clear to moderate brown, medium to coarsely crystalline. &lt; 1 to 4% brown intercristalline clay, trace of gray. Breaks at 20.0', 20.5'. [10, 15]</td>
</tr>
<tr>
<td>4</td>
<td>4.3</td>
<td>4.3</td>
<td>100</td>
<td>X</td>
<td></td>
<td>20.85' - 21.55' ANHYDRITE: White to light gray (8/8), microcristalline anhydrite with scattered halite growths. Up to 3/4&quot; brown clay at 20.85'.</td>
</tr>
<tr>
<td>5</td>
<td>4.5</td>
<td>4.5</td>
<td>100</td>
<td>X</td>
<td></td>
<td>24.0' - 24.9' HALITE: Clear, coarsely crystalline, ≤ 1% polyhalite. [1]</td>
</tr>
<tr>
<td>24.9</td>
<td></td>
<td></td>
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</table>

**REMARKS**
### WIPP
WASTE ISOLATION PILOT PLANT  2 SHEET OF  2 BORING NO. DH-07

<table>
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<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>RECOVERY</th>
<th>% RECOVERED</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>28.6-43.4</td>
<td>4.6</td>
<td>4.6</td>
<td>100</td>
<td>X</td>
<td>28.6'-27.5' HALITE: Clear to moderate brown (5YR 4/4); medium-coarsely crystalline, &lt;1% to 3% brown clay. Break at 27.2' 2. [17]</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>32.6</td>
<td>4.0</td>
<td>4.0</td>
<td>100</td>
<td>-</td>
<td>27.5'-29.35' HALITE: Clear mottled with moderate reddish orange (10R 6/6) polyhalite blebs, coarsely crystalline, ≤ 1% polyhalite. [1-3]</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>37.1</td>
<td>4.5</td>
<td>4.5</td>
<td>100</td>
<td>X</td>
<td>29.35'-30.85 HALITE: Clear mottled with moderate brown (5YR 4/4); coarsely crystalline, &lt;1% brown intercrystalline blebs, small pockets of brown clay. [8, 10]</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>41.1</td>
<td>4.0</td>
<td>4.0</td>
<td>100</td>
<td>-</td>
<td>30.85'-32.3' ARGLICHACEOUS HALITE: Clear to moderate brown (5YR 4/4) coarsely crystalline. Brown clay&lt;1% to 5%, locally. 1/8&quot; brown clay seam at 32.25'. [10, 15]</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>45.4</td>
<td>4.3</td>
<td>4.3</td>
<td>100</td>
<td>-</td>
<td>32.3'-45.6' HALITE: Clear mottled with moderate reddish orange/brown (10R 6/6; 4/4) and moderate brown (5YR 3/4; 4/4). Coarsely crystalline. Core varies from zones containing mostly blebs and patches of reddish orange polyhalite, &lt;1% to 3% to zones containing blebs and patches of brown clay&lt;1% to 2%. reddish orange color, in part, probably due to iron staining. [3, 4, 10]</td>
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<tr>
<td>13</td>
<td>49.8</td>
<td>4.4</td>
<td>4.4</td>
<td>100</td>
<td>-</td>
<td>45.0'-47.8' ARGLICHACEOUS HALITE: Clear to moderate brown (5YR 4/4); medium-coarsely crystalline, &lt;1% to 3% intercrystalline brown clay. Breaks at 45.4'. [15]</td>
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<td></td>
<td></td>
<td>47.8'-49.8' HALITE: Clear with some moderate brown (10R 4/4); medium to coarsely crystalline, ≤ 1% brown clay, trace of gray. [17]</td>
<td></td>
</tr>
</tbody>
</table>

Core quality to 27' is fair. Able to determine depth to clay/amphibole at 8.85' accurately. Below 27', core is in discs 3/8" to 1" size, scattered broken zones. Difficult to measure recovery accurately.

Run 13. Longest piece is 2'.
# WIPP WASTE ISOLATION PILOT PLANT

## GEOLOGIC DRILL LOG

**INSTRUMENT TYPE & NUMBER**

**HOLE TYPE/ SIZE**

**NX CORE**

**BORING NO.** DH-08

**LOCATION** N1100 DRIFT AT BM. 8 INTERSECTION - FLOOR

**STATION** N1112 E976.5 **COLLAR ELEV.** 1318.80 **DIRECTION OF DRILLING**

**MINE COORDINATES** N10.799.4 E 7870.9 **DEPTH OF BOREHOLE** 38.3 FT.

**DRILLING METHOD** ROTARY/AIR **DRILL MAKE/MODEL** WATSON

**DATE STARTED** 2/22/84 (SWING) **DATE COMPLETED** 2/23/84 (SWING) **SHEET LOGGED BY:** J. E. GALLERANI **DATE:** 3/6/84

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>RECOVERY %</th>
<th>RECOVERED</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>0</td>
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<tr>
<td>1</td>
<td>2.2</td>
<td>2.2</td>
<td>100</td>
<td>X</td>
<td></td>
<td>0.0'-2.6' HALITE: Clear to light gray (N7) coarsely crystalline. &lt;1% intergranular gray clay. &lt;1% polyhalite blabs locally.</td>
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<td>2.2</td>
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<tr>
<td>2</td>
<td>2.4</td>
<td>2.4</td>
<td>100</td>
<td>X</td>
<td></td>
<td>7.6'-5.8' HALITE: Clear, some moderate reddish orange (10R 6/6), coarsely crystalline. &lt;1% polyhalite blabs and dispersed polyhalite.</td>
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<tr>
<td>4.6</td>
<td>5.1</td>
<td>1.1</td>
<td>90.9</td>
<td>X</td>
<td></td>
<td>5.85'-10.1' HALITE: Clear to light gray (N7) medium to coarsely crystalline. &lt;1% intergranular gray clay. &lt;1% polyhalite blabs.</td>
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<tr>
<td>5.7</td>
<td>3.3</td>
<td>2.0</td>
<td>60.6</td>
<td>X</td>
<td></td>
<td>10.7'-12.5' HALITE: Clear, some moderate reddish orange (10R 6/6), coarsely crystalline, some fine to medium. &lt;1% polyhalite except 12.2'-12.5', where core is polyhalite, up to 3% polyhalite. Contact at 12.8' approximate due to core loss.</td>
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<td>9.0</td>
<td>5.0</td>
<td>1.8</td>
<td>94.4</td>
<td>X</td>
<td></td>
<td>12.8'-19.5' HALITE: Clear to light bluish gray (5B 7/1), light gray (N7) and light moderate reddish orange (10R 6/6). Medium to coarsely crystalline. &lt;1% gray clay. Break at 14.7'.</td>
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<td>10.8</td>
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<td>X</td>
<td></td>
<td>19.5'-22.0' HALITE: Clear mottled with some moderate reddish orange (10R 6/6) &lt;1% polyhalite. &lt;1% gray clay 25.0' contact measured from bottom of run 8.</td>
<td>Run 6. Broken up about 12.4' in run. Loss possibly here</td>
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<td>15.8</td>
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<tr>
<td>20.5</td>
<td>4.7</td>
<td>4.7</td>
<td>100</td>
<td>X</td>
<td></td>
<td>23.0'-26.6' MB-139: Upper 1.3' of MB-139 shows &quot;swallowtail&quot; pattern, a mixture of anhydrite and halite. Below this is light gray to white anhydrite with scattered halite growths. Some laminae within. Hairline, tightly closed low angle fractures. Trace gray clay at 26.6'.</td>
<td>Run 7. Broken cog of run and at 18.3'-19.5'.</td>
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<td>25.2</td>
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**BORING NO.** DH-08
<table>
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<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>RECOVERY</th>
<th>% RECOVERED</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
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<tbody>
<tr>
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<tr>
<td>9</td>
<td>30.4</td>
<td>5.2</td>
<td>4.1</td>
<td>78.8</td>
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<td></td>
</tr>
<tr>
<td>10</td>
<td>33.4</td>
<td>3.0</td>
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<td>100</td>
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<td></td>
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<tr>
<td>35</td>
<td>38.3</td>
<td>4.9</td>
<td>3.9</td>
<td>79.4</td>
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**26.6'-30.4' HALITE:** Clear to moderate reddish orange (10R 6/6), some light gray, medium to coarsely crystalline, <1% dispersed polyhalite and gray clay.

**30.4'-33.4' POLYHALITIC HALITE:** Clear to moderate reddish orange (10R 6/6), some light gray, medium to coarsely crystalline, <1 to 2% polyhalite.

**33.4'-35.8' HALITE:** Clear to light gray (N7), medium to coarsely crystalline, 5% gray clay. <1/2% dispersed polyhalite. Clay break at 34.6' T.

**35.8'-38.3' HALITE:** Clear to moderate reddish orange (10R 6/6) coarsely crystalline, some medium. 5.1% polyhalite. <1/2% gray clay. Polyhalitic (1 to 3%) from 36.8'-38.3' T.

Note: Hole stopped at 38.3' due to core loss. Replacement holes DH-8A and DH-8B drilled in same vicinity. Refer to these drill logs.

Run 9. Grinding at top of run.

Run 11. Less throughout. Some grinding at top of run.

Following contacts are approximate due to core loss: 12.8'.

- 23.0' - measured from bottom of run 8.
- 26.6' - assumed most loss was in MB-139.
- 35.8' - is -0.5'.
WIPP
WASTE ISOLATION PILOT PLANT

INSTRUMENT TYPE & NUMBER ______________ TYPE/ SIZE ______________ NX CORE ______________ BORING NO. ______________ LOCATION ______________

STATION ______________ COLLAR ELEV. ______________ DIRECTION OF DRILLING ______________ DEPTH OF BOREHOLE ______________

MINE COORDINATES ______________ ROTARY/AIR ______________ DRILL MAKE/ MODEL ______________

DATE STARTED ______________ DATE COMPLETED ______________ SHEET ______________

LOGGED BY: ______________ DATE: ______________ 1 OF 2

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>RECOVERY</th>
<th>% RECOVERED</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
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<tbody>
<tr>
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<tr>
<td>1</td>
<td>1.6</td>
<td>1.6</td>
<td>100</td>
<td></td>
<td>x</td>
<td>0.0'-6.6' x 0.4' HALITE: Clear to light (W7) gray coarsely crystalline. None to &lt;1% grey clay. &lt;1/2% polyhalite locally. Clear 3.4'-4.2'. Clay break at 6.6'.</td>
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<tr>
<td>2</td>
<td>2.1</td>
<td>0.5</td>
<td>0.3</td>
<td>60</td>
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<tr>
<td>3</td>
<td>4.2</td>
<td>2.1</td>
<td>2.1</td>
<td>100</td>
<td>x</td>
<td>6.6'-9.65' HALITE: Clear to light bluish grey (5B 7/1) and light grey (W7), medium-coarsely crystalline. &lt;1% intergranular grey clay. &lt;1/2% dispersed polyhalite.</td>
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<td>4</td>
<td>7.8</td>
<td>3.6</td>
<td>2.8</td>
<td>78</td>
<td>x</td>
<td>9.65'-19.1' HALITE: Clear with some light moderate reddish orange (10R 6/6), coarsely crystalline. &lt;1% polyhalite. &lt;1/2% grey clay.</td>
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<td>5</td>
<td>10.7</td>
<td>2.9</td>
<td>2.9</td>
<td>100</td>
<td>x</td>
<td>13.1'-15.8' HALITE: Clear to light grey (W7), coarsely crystalline. ≤1% grey intergranular clay and &lt;1% polyhalite blebs.</td>
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<td>6</td>
<td>15.3</td>
<td>4.6</td>
<td>4.6</td>
<td>100</td>
<td>x</td>
<td>15.8'-20.95' HALITE: Clear to light bluish grey (5B 7/1) and light moderate, reddish orange (10R 6/6), medium-coarsely crystalline; scattered fine. &lt;1/2% intergranular grey clay and &lt;1/2% dispersed polyhalite. Clay break at 20.9'.</td>
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<td>7</td>
<td>20.2</td>
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<td>4.7</td>
<td>96</td>
<td>x</td>
<td>20.95'-23.15' HALITE: Clear, coarsely crystalline. &lt;1% polyhalite blebs.</td>
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<td>8</td>
<td>25.1</td>
<td>4.9</td>
<td>4.9</td>
<td>100</td>
<td>x</td>
<td>23.15'-26.4' NB-139: Very light grey (W7) to white anhydrite mixed with halite growths to 25.6'. Then mostly microcrystalline anhydrite partially laminated. Grey clay ≤1/8&quot; at 26.4'.</td>
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REMARKS

Watson post mounted. AM rods. NX double tube core barrel.

Drilling Time: 10 hours.

No gas; dry hole.
<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft)</th>
<th>LENGTH</th>
<th>CORE RUN</th>
<th>RECOVERY (ft)</th>
<th>% RECOVERED</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
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<td>9</td>
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<td>26.4'-29.5' HALITE: Clear to light bluish gray (58 7/1) and light gray, medium to coarsely crystalline. &lt;1% dispersed clay, &lt;1% dispersed polyhalite. Break at 29.05'.</td>
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<td>30.2</td>
<td>30</td>
<td>1.7</td>
<td>1.0</td>
<td>59</td>
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<td>31.9</td>
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<td>29.5'-33.6' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6), coarsely crystalline, &lt;1% polyhalite. Angular to platy halite from 33.4'-33.6'. Gray clay break at 33.6'.</td>
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<td>11</td>
<td>35</td>
<td>3.7</td>
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<td>61</td>
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<td>35.6</td>
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<td>33.6'-35.6' HALITE: Clear, some moderate reddish orange (10R 6/6), coarsely crystalline, &lt;1% gray clay, &lt;1% polyhalite.</td>
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<tr>
<td>12</td>
<td>38.9</td>
<td>3.3</td>
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<td>11.0</td>
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<td>40.1'-44.5' HALITE: Clear with some moderate reddish orange and light gray (8/7), medium to coarsely crystalline, &lt;1% polyhalite and gray clay.</td>
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<tr>
<td>14</td>
<td>45</td>
<td>4.7</td>
<td>4.7</td>
<td>100</td>
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<td>45.7</td>
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<td>44.5'-48.75' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6), coarsely crystalline, &lt;1 to 3% polyhalite.</td>
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<tr>
<td>15</td>
<td>50</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
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<td>50.7</td>
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<td>48.75'-50.0' HALITE: Clear coarsely crystalline. &lt;1/2% polyhalite.</td>
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<td>14</td>
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<td>50.0'-50.3' ANHYDRITE: Very light (NB) to medium light gray (8/6) to white microcrystalline anhydrite with scattered halite growths. Up to 1/2&quot; halite layer at 50.1'. No clay at lower contact but possibly ground up.</td>
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<td>45.7</td>
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<td>15</td>
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<td></td>
<td>50.3'-50.7' HALITE: Clear to light gray (7/7), medium to coarsely crystalline. &lt;1/2 gray intercrystalline clay.</td>
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<td>50.7</td>
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<td>Note: Core recovery is below 95%. Replacement hole DH-08B drilled later. Refer to log for DH-08B.</td>
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BORING NO. DH-08A
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<th>RUN NUMBER</th>
<th>DEPTH (ft)</th>
<th>LENGTH CORE RUN</th>
<th>CORE RUN RECOVERY</th>
<th>% RECOVERED</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
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<tbody>
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<td>0.0</td>
<td>0.9</td>
<td>0.0</td>
<td>0</td>
<td>-</td>
<td>0.0'-5.4' HALITE: Clear, medium to coarse crystalline, &lt;1/2% polyhalite blebs and &lt;1/2% gray clay locally. (1.2)</td>
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<tr>
<td>0.9</td>
<td>1.3</td>
<td>2.7</td>
<td>1.7</td>
<td>100</td>
<td>X</td>
<td>6.4'-11.4' HALITE: Clear to medium bluish gray (38 5/1) and medium gray (38). Coarsely crystalline, some medium ≤1% gray clay. 1/4&quot; gray clay seam at 8.9'. (11)</td>
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<tr>
<td>4.0</td>
<td>4.9</td>
<td>1.5</td>
<td>1.5</td>
<td>100</td>
<td>-</td>
<td>11.4'-13.15' HALITE: Clear, some moderate reddish orange (10R 6/6); coarsely crystalline. &lt;1 to 2% polyhalite blebs and dispersed. (1.3)</td>
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<td>6.4</td>
<td>9.2</td>
<td>2.8</td>
<td>2.8</td>
<td>100</td>
<td>-</td>
<td>13.45'-21.75' HALITE: Clear to medium bluish gray (38 5/1) and medium gray (38). Medium to coarsely crystalline. &lt;1/2% dispersed polyhalite. ≤1% gray intercrystalline clay. (9)</td>
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<tr>
<td>14.2</td>
<td>19.2</td>
<td>5.6</td>
<td>5.6</td>
<td>100</td>
<td>X</td>
<td>21.75'-23.75' HALITE: Clear, coarsely crystalline. None increasing to &lt;1% polyhalite with depth. (1.2, 1.3)</td>
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<td>24.3</td>
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<td>X</td>
<td>23.75'-26.9' NS-129: &quot;Dwellwast&quot; patches of halite and anhydrite to 24.55'. Predominantly very light (NB) to light gray (W7) to white, partially laminated, anhydrite with scattered halite growths. Several tightly closed hairline fractures at 26.7' to 26.9'. &lt;1/8&quot; gray clay along lower contact.</td>
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Boring No. DH-098
<table>
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<tr>
<th>RUN NUMBER</th>
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<th>CORE RUN</th>
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<th>DESCRIPTION</th>
<th>REMARKS</th>
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<td>26.9</td>
<td>2.6</td>
<td>2.6</td>
<td>100</td>
<td></td>
<td>26.9'-29.6' HALITE: Clear to light gray (N7); light bluish gray (5B 7/1), and moderate reddish orange (10R 6/6). Medium to coarsely crystalline ≤1% gray clay and ≤1/2% dispersed. (9)</td>
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<tr>
<td>10</td>
<td>31.4</td>
<td>4.5</td>
<td>4.5</td>
<td>100</td>
<td></td>
<td>29.6'-33.8' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6). Coarsely crystalline with some fine to 30.15'. &lt;1% to 3% polylithalite. Anhydrite with halite from 33.7 to 33.8'. Clay break at 33.8'. (2-5,7)</td>
<td>Runs 10 thru 12. Discing in polyhalitic halite.</td>
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<td>11</td>
<td>36.4</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td></td>
<td>37.8'-35.8' HALITE: Clear to light gray (N7) and light bluish gray (5B 7/1). Medium to coarsely crystalline. &lt;1% gray clay. &lt;1/2% polyhalite. (9)</td>
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<tr>
<td>12</td>
<td>41.4</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td></td>
<td>35.8'-39.0' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6) and some moderate reddish brown (10R 4/6). Coarsely crystalline. &lt;1% to 3% polyhalite. (3,4,7)</td>
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<td>13</td>
<td>46.4</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td></td>
<td>39.0'-45.2' HALITE: Clear to moderate reddish orange (10R 6/6); light gray (N7) and light bluish gray (5B 7/1). Medium to coarsely crystalline. ≤1% gray clay and &lt;1% to 2% polyhalite. (2,9)</td>
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<tr>
<td>14</td>
<td>51.4</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td></td>
<td>45.2'-53.2' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6); coarsely crystalline. &lt;1% to 3% polyhalite 1&quot; anhydrite/halite layer at 49.7'. (3,4,7)</td>
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<td>50.2'-50.5' HALITE: Clear, coarsely crystalline, some medium. Scattered white anhydrite stringers at 50.2'-50.25' L. (1)</td>
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<td>50.5'-50.6' ANHYDRITE: Very light gray (N8) to white anhydrite with scattered halite growths. ≤1/8&quot; gray clay at 50.8'.</td>
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<td>50.6'-51.4' HALITE: Clear to light gray (N7) and light bluish gray (5B 7/1) with some moderate reddish orange (10R 6/6). Medium to coarsely crystalline. ≤1/2% dispersed polyhalite. ≤1% gray clay. Break at 51.1'. (9)</td>
<td>Run 14. Discing, chipping of core most of run.</td>
</tr>
</tbody>
</table>
## WIPP WASTE ISOLATION PILOT PLANT

### GEOLOGIC DRILL LOG

**INSTRUMENT**
- **TYPE & NUMBER**
- **HOLE**
- **TYPE/size**
- **NX CORE**
- **BORING NO.**
- **DH-09**

**LOCATION**
- **N1420 DRIFT; ROOF**

**STATION**
- **N1432.43 E1332.52**
- **COLLAR ELEV.** 1324.5

**MINE COORDINATES**
- **N11108.71 E8227.11**

**DEPTH OF BOREHOLE**
- **51.1'**

**DRILLING METHOD**
- **ROTARY/AIR**

**DRILL MAKE/MODEL**
- **WATSON**

**DATE STARTED**
- **3-10-84 (SWING)**

**DATE COMPLETED**
- **3-14-84 (SWING)**

**SHEET LOGGED BY:**
- **J. E. GALLERANT**

**DATE:**
- **3-15-84**

**1 OF 3**

### Table

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>RECOVERY</th>
<th>% RECOVERED</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
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<tr>
<td>1</td>
<td>0.0-0.2</td>
<td>2.75</td>
<td>2.75</td>
<td>100</td>
<td>X</td>
<td>0.0'-0.2' <strong>HALITE:</strong> Clear to light gray (N7) and medium light gray (N8), medium to coarsely crystalline. &lt;1% gray clay. &lt;1/2% polyhalite. 3/8&quot; gray clay at 0.1'. Trace of anhydrite associated. [9,11]</td>
<td>Watson drill. NW rods. NW split tube barrel.</td>
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<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>Drill time: 7 hours.</td>
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</tr>
<tr>
<td>2</td>
<td>2.75-5.5</td>
<td>2.75</td>
<td>2.65</td>
<td>96</td>
<td>X</td>
<td>4.1'-7.3' <strong>HALITE:</strong> Clear, coarsely crystalline. Trace anhydrite at 4.6'. Stunted white stringers. [1]</td>
<td>No gas; dry hole.</td>
</tr>
<tr>
<td>3</td>
<td>5-8.4</td>
<td>2.9</td>
<td>2.2</td>
<td>76</td>
<td></td>
<td>7.7'-9.1' <strong>HALITE:</strong> Clear to light gray (N7); medium light gray (N8). Coarsely crystalline. &lt;1% gray clay, trace brown. [11]</td>
<td>All core shows varying degrees of vibration damage. Jerky drill feed is cause for much of this.</td>
</tr>
<tr>
<td>4</td>
<td>8.4-10.5</td>
<td>4.6</td>
<td>3.8</td>
<td>83</td>
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<td>9.1'-10.3' <strong>HALITE:</strong> Clear to moderate brown (SYR 4/4); medium to coarsely crystalline. &lt;1 to 3% brown clay. [13, 14]</td>
<td>Run 3. Much of core broken up.</td>
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<tr>
<td>5</td>
<td>10-13.0</td>
<td>4.3</td>
<td>3.8</td>
<td>88</td>
<td></td>
<td>10.3'-12.3' <strong>HALITE:</strong> Clear, some light gray (97) coarsely crystalline. None to &lt;1% gray, some brown clay. [11, some 9]</td>
<td>Run 4. Broken up badly last 2'.</td>
</tr>
<tr>
<td>6</td>
<td>13.0-16.1</td>
<td>3.1</td>
<td>3.1</td>
<td>100</td>
<td>X X</td>
<td>12.3'-16.1' <strong>ARGILLACEOUS HALITE:</strong> Clear to moderate brown (SYR 4/4); medium to coarsely crystalline. &lt;1 to 4% brown clay. Intercrystalline and scattered breaks. Parting at 14.75'. 1/2&quot; brown clay seam at 16.05'. [16]</td>
<td>Run 6. Core loss probably above anhydrite.</td>
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<td>7</td>
<td>16.1-19.0</td>
<td>4.3</td>
<td>3.8</td>
<td>88</td>
<td>X X</td>
<td>16.1'-16.75' <strong>ANHYDRITE:</strong> White to light gray anhydrite mixed with halite to 16.45'. Then mostly laminated anhydrite.</td>
<td>Run 7 thru 13. broken zones and discing especially in the coarsely crystalline, polyhalitic halite.</td>
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<td></td>
<td>16.75'-20.9' <strong>POLYHALITIC HALITE:</strong> Clear to moderate reddish orange (10R 6/6); coarsely crystalline. &lt;1 to 3% polyhalite. &lt;1% from 18.4'-20.4'. [2-4,7]</td>
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</tr>
<tr>
<td>8</td>
<td>20.4-25.2</td>
<td>4.8</td>
<td>4.8</td>
<td>100</td>
<td>X X</td>
<td>20.9'-21.9' <strong>HALITE:</strong> Clear to light gray (N7); coarsely crystalline. &lt;1% gray clay. [11]</td>
<td></td>
</tr>
<tr>
<td>RUN NUMBER</td>
<td>DEPTH (FT)</td>
<td>LENGTH CORE RUN</td>
<td>RECOVERY</td>
<td>%RECOVERED</td>
<td>PROFILE</td>
<td>DESCRIPTION</td>
<td>REMARKS</td>
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<tr>
<td>25.2</td>
<td>35.0</td>
<td>3.6</td>
<td>3.6</td>
<td>100</td>
<td>X</td>
<td>21.9'-23.5' HALITE: Clear to moderate brown (5YR 4/4), medium to coarsely crystalline, some fine. &lt;1 to 2% brown clay. [12, 13]</td>
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<tr>
<td>28.8</td>
<td>30</td>
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<td>X</td>
<td>23.5'-26.7' HALITE: Clear, some moderate brown (5YR 4/4), coarsely crystalline. &lt;1% brown clay. Cl/2% polyhalite blebs. Increasing clay content from 26.7'. [2, 10]</td>
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<td>33.6</td>
<td>35</td>
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<td>100</td>
<td>X</td>
<td>26.7'-29.9' ARGILLACEOUS HALITE: Clear to moderate brown (5YR 4/4) and moderate reddish brown (10R 4/6), medium to coarsely crystalline. &lt;2 to 4% brown clay. Scattered partings. Breaks at 27.5', 27.6'. 1/2&quot; clay mixed with halite seam at 29.9' &lt;1 to 2% clay from 27.8'-29.1'. [10, 16]</td>
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<tr>
<td>36.1</td>
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<td>X</td>
<td>29.9'-35.1' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/4); coarsely crystalline. &lt;1 to 3% polyhalite. [3, 4, 7]</td>
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<tr>
<td>36.1</td>
<td>40</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
<td>35.1'-36.2' HALITE: Clear to moderate brown (5YR 4/4) to moderate reddish brown (10R 4/4). Coarsely crystalline. &lt;1 to 2% brown clay. 3/8&quot; clay seam at 35.2'. Breaks at 35.65' and 36.2'. [10]</td>
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<td>41.1</td>
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<td>100</td>
<td>X</td>
<td>36.1'-38.7' POLYHALITIC HALITE: Clear mottled with moderate reddish orange/brown (10R 4/6; 4/6). Coarsely crystalline. &lt;1 to 3% polyhalite blebs and patches. &lt;1/2% blebs of brown clay. [3, 4, 7]</td>
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<td>100</td>
<td>X</td>
<td>38.7'-39.7' HALITE: Clear mottled with moderate brown (5YR 4/4) and moderate reddish brown (10R 4/6) clay. Coarsely crystalline. &lt;1 to 2% clay. 1/2&quot; seam at 39.5'. 3/4&quot; anhydrite mixed with halite at 39.65'. [10]</td>
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<td>51.1</td>
<td>55</td>
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<td>4.9</td>
<td>100</td>
<td>X</td>
<td>39.7'-41.3' HALITE: Clear to moderate reddish orange (10R 6/6); coarsely crystalline. &lt;1 to 2% polyhalite. Polyhalite from 39.7' to 40.3'. [1-3]</td>
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<td>4.9</td>
<td>100</td>
<td>X</td>
<td>41.3'-42.3' HALITE: Clear to moderate brown (5YR 4/4), coarsely crystalline. &lt;1 to 2% brown clay. [8, 10]</td>
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<td>51.1</td>
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<td>4.9</td>
<td>100</td>
<td>X</td>
<td>42.1'-45.1' ARGILLACEOUS HALITE: Clear to moderate brown (5YR 4/4), medium to coarsely crystalline. &lt;1 to 3% brown clay. Scattered breaks. [10, 15]</td>
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<tr>
<td>RUN NUMBER</td>
<td>DEPTH (Ft.)</td>
<td>LENGTH CORE RUN</td>
<td>% RECOVERED PROFILE</td>
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<td>45.1'-48.6' HALITE: Clear mottled with moderate brown (5YR 4/4), coarsely crystalline ≤1% brown clay, trace gray. Locally up to 2% clay. Scattered breaks last 1&quot;. [10, 12]</td>
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<td>48.6'-'51.1' POLYHALITE HALITE: Clear to moderate reddish orange (10R 6/6) and moderate reddish brown (10R 4/6); coarsely crystalline. &lt;1 to 3% polyhalite. [3, 4, 7]</td>
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<td>REMARKS</td>
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</table>

BORING NO. DH-09
**WIPP**

**GEOLOGIC DRILL LOG**

**INSTRUMENT TYPE & NUMBER**

**HOLE TYPE/ SIZE**

**NX CORE**

**BORING NO.**

**DH-10**

**LOCATION**

**N240 DRIFT - FLOOR**

**STATION** 11339.4

**COLLAR ELEV.** 1831.1

**DIRECTION OF DRILLING DOWN**

**MINE COORDINATES**

N 111.08.70

E 8227.09

**DEPTH OF BOREHOLE** 52.0 FT

**DRILLING METHOD** ROTARY/AIR

**DRILL MAKE/ MODEL** WATSON

**DATE STARTED** 3-15-84 (SWING)

**DATE COMPLETED** 3-15-84 (SWING)

**SHEET LOGGED BY** J. E. GALLERANI

**DATE** 3-17-84

**1 OF 2**

<table>
<thead>
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<td>100</td>
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</tbody>
</table>

0.0'-6.1' HALITE: Clear; coarsely crystalline, some fine, <1% gray clay and 1/2% polyhalite locally. [1]

6.1'-10.6' HALITE: Clear mottled with medium dark gray (5B). Coarsely crystalline, some medium locally, ≤ 1% gray clay. Dark gray clay break at 8.0' < 1/2% polyhalite. [1]

10.6'13.3' POLYHALITIC HALITE: Clear mottled with moderate reddish orange (10R 6/6). Coarsely crystalline, <1 to 2% polyhalite blebs and patches, <1/2% gray clay. [3, 4, 7]

13.5'-15.4' HALITE: Clear, some light gray (8L) and medium light gray (6B). Medium to coarsely crystalline, ≤1% gray intercrystalline clay. Breaks at 13.2'-15.3' < 1/2% polyhalite. [2, 11]

19.4'-22.6' HALITE: Clear mottled with some moderate reddish orange (10R 6/6); coarsely crystalline; some medium. ≤1% polyhalite blebs and patches. <1/2% gray clay. [2, 5]

22.6'-24.0' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6); coarsely crystalline, <1 to 3% polyhalite. [3, 4]

24.0'-26.65' MB-139: Moderate reddish orange (10R 6/6) to white anhydrite mixed with halite to 25.4'. Then predominently light gray (8L) to white anhydrite with scattered halite growths faintly laminated. 1/2" clay seam at lower contact.

24.65'-29.3' HALITE: Clear to medium light gray (8L) and moderate reddish orange (10R 6/6) medium to coarsely crystalline. ≤1% gray clay and dispersed polyhalite. Clay break at 27.9' and 29.3'. [2, 11]
<table>
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<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>% RECOVERED</th>
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</table>

**DESCRIPTION**

19.3'-34.8' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6); coarsely crystalline. Less than 1% to 3% polyhalite. 1/2" anhydrite with gray clay break at 34.75'-34.8'. [9-3, 7]

24.6'-37.0' HALITE: Clear to moderate reddish orange (10R 6/6); some light gray (W7) and light bluish gray (3B 7/3). Medium to coarsely crystalline. 5% gray clay. Less than 1% to 2% polyhalite. [1, 11]

37.0'-41.5' POLYHALITIC HALITE: Clear to moderate reddish orange/brown (10R 6/6; 1/6) coarsely crystalline. Less than 1% to 3% polyhalite. Trace brown and gray clay locally. [2-5]

42.5'-46.75' HALITE: Clear to moderate reddish orange/brown (10R 6/6; 4/6) with some medium light gray (W6). Medium to coarsely crystalline. Up to 2% brown clay with some gray clay and polyhalite to 45.3'. Below this is less than 1% clay and polyhalite. [1, 17]

46.75'-51.8' POLYHALITIC HALITE: Clear to moderate reddish orange anhydrite at 51.5' to 51.6'. [2-4, 7]

51.8'-52.0' HALITE: Clear, coarsely crystalline. (1)

Run 8. Barrel plugged because of clay seam.

Run 9 thru 13. Core quality fair. Discing in some runs.
### WIPP GEOLOGIC DRILL LOG

**WASTE ISOLATION PILOT PLANT**

**INSTRUMENT TYPE & NUMBER**: Unspecified

**HOLE TYPE/ SIZE**: NX CORE

**BORING NO.**: DH-1

**LOCATION**: N11100 DRIFT AT ROOM A-2 CENTERLINE; ROOF

**STATION**: N1112.5' E1332.5' COLLAR ELEV. 1320.5' DIRECTION OF DRILLING UP VERTICAL

**MINE COORDINATES**: N10.799.8 E8227.3 DEPTH OF BOREHOLE 50.9' FT

**DRILLING METHOD**: ROTARY/AIR

**DRILL MAKE/MODEL**: WATSON

**DATE STARTED**: 3/5/84 (SWING) **DATE COMPLETED**: 3/5/84 (SWING) **DATE**: 3/6/84

** SHEET LOGGED BY**: J. E. GALLERANI

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<table>
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<th>DEPTH (ft)</th>
<th>LENGTH CORE RUN</th>
<th>RECOVERY</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
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<td>0.0'-0.5' HALITE: Clear, trace of moderate reddish orange. Coarsely crystalline. &lt;1/2% polyhalite. [2]</td>
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<td>1.9</td>
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<td>7.0</td>
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<td>4.1'-8.8' HALITE: Clear to light gray (W7) and medium light gray (G6), some moderate brown (5YR 4/4) medium to coarsely crystalline, some fine, &lt;1% clay. [2,3]</td>
<td></td>
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<td>10.2</td>
<td>2.1</td>
<td>2.1</td>
<td>100</td>
<td></td>
<td>8.8'-12.1' HALITE: Clear, coarsely crystalline. 1/2&quot; grey anhydrite layer at 9.3' with trace of gray clay anhydrite stringers to 10.5'. [1]</td>
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<td>13.1'-15.2' ANHYDRITE: Clear to moderate brown (5YR 4/4); fine to medium, some coarsely crystalline. &lt;1 to 3% brown clay. [12]</td>
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<td>15.6</td>
<td>1.5</td>
<td>1.5</td>
<td>100</td>
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<td>15.2'-17.0' HALITE: Clear, trace of light brown (5YR 6/4). Coarsely crystalline. [1]</td>
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<td>17.1</td>
<td>3.5</td>
<td>3.5</td>
<td>100</td>
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<td>17.0'-20.6' ANHYDRITE: Clear to moderate brown (5YR 4/4); medium to coarsely crystalline. &lt;1 to 3% brown clay, intercrystalline and breaks. 210% clay at 20.5'-20.6'. [10, 15]</td>
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<td>20.6</td>
<td>1.1</td>
<td>1.1</td>
<td>100</td>
<td>X</td>
<td>20.5'-21.2' ANHYDRITE: White to light gray (W7) microcrystalline, partially laminated anhydrite. scattered halite growths. 1/2&quot; brown clay seam at 20.6'.</td>
<td>Bus 10. Some core grinding evident here.</td>
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</table>

**BORING NO.**: DH-11
<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>RECOVERY %</th>
<th>RECOVERED PROFILE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>27.2</td>
<td>3.4</td>
<td>3.6</td>
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</tr>
<tr>
<td>13</td>
<td>29.7</td>
<td>2.5</td>
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<td>100</td>
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</tr>
<tr>
<td>14</td>
<td>30.1</td>
<td>1.4</td>
<td>2.4</td>
<td>100</td>
<td>–</td>
</tr>
<tr>
<td>15</td>
<td>32.1</td>
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<td>–</td>
</tr>
<tr>
<td>15</td>
<td>36.0</td>
<td></td>
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<td></td>
<td>–</td>
</tr>
<tr>
<td>16</td>
<td>40.9</td>
<td></td>
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<td>–</td>
</tr>
<tr>
<td>17</td>
<td>42.9</td>
<td></td>
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<td>–</td>
</tr>
<tr>
<td>18</td>
<td>47.6</td>
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<tr>
<td>19</td>
<td>50.0</td>
<td></td>
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</tbody>
</table>

**DESCRIPTION**

- **21.2'-24.9' HALITE:** Clear, some light moderate reddish orange; coarsely crystalline. ≤ 1% polyhalite. (11, 13)
- **24.9'-30.7' HALITE:** Clear, some moderate brown (YR 4/4); coarsely crystalline except medium at 25.5' to 26.1'. < 1 to 2%, locally, brown clay. ≤ 1/2% dispersed polyhalite. (12, 10)
- **30.3'-35.5' ARGILLACEOUS HALITE:** Clear to moderate brown (YR 4/4); medium to coarsely crystalline. < 1 to 3% brown clay. Breaks at 31.5', 32.8'. (12, 16)
- **35.5'-39.9' HALITE:** Clear to moderate brown (YR 3/4; 4/4) and mottled with moderate reddish orange/brown (10R 6/6; 4/6). Coarsely crystalline. < 1 to 3% brown clay with trace of gray. ≤ 1 to 2% polyhalite blebs and patches. Core varies from zones containing polyhalite blebs with no clay to zones with mixed clay and polyhalite and zones containing only patches of clay. (15, 19)
- Zones with polyhalite blebs and patches and only trace of clay are the following approximate depths:
  - 35.5' - 33.7'
  - 40.4' - 41.3'
  - 43.2' - 44.9'
  - 49.2' - 49.7'
  - 50.0'
**WIPP**

**GEOLOGIC DRILL LOG**

**INSTRUMENT TYPE & NUMBER**

**HOLE TYPE/SIZE**

**CORE**

**BORING NO.** DH-12

**LOCATION** N1100 DRIFT AT ROOM A-2 INTERSECTION, FLOOR

**STATION** N112 ± E1332.5 ± COLLAR ELEV. 1311.1 **DIRECTION OF DRILLING** VERTICAL - DOWN

**MINE COORDINATES** N10,799,4 E 8227,2

**DEPTH OF BOREHOLE** 51.3'

**DRILLING METHOD** ROTARY/SIR

**DRILL MAKE/MODEL** HATSON

**DATE STARTED** 3-7-84 (SWING) **DATE COMPLETED** 3-7-84 (SWING) **SHEET LOGGED BY** J. E. GALLERANI **DATE** 3-24-84

**1 OF 2**

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>RECOVERY %</th>
<th>RECOVERED PROFILE</th>
<th>DESCRIPTION</th>
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<tr>
<td>1</td>
<td>1.8</td>
<td>1.8</td>
<td>100</td>
<td>X</td>
<td>0.0-4.25' HALITE: Clear to light gray (N7) and light bluish gray (2B 7/1); coarsely crystalline, &lt;1% gray intercrystalline clay, &lt;1/2% polyhalite. [11]</td>
</tr>
<tr>
<td>2</td>
<td>5.8</td>
<td></td>
<td></td>
<td>X</td>
<td>4.25'-5.55' HALITE: Clear to moderate reddish orange (10R 6/6); coarsely crystalline, &lt;1% polyhalite. [7]</td>
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<td>3</td>
<td>5.3</td>
<td>5.3</td>
<td>100</td>
<td>X</td>
<td>5.55'-10.0' HALITE: Clear to light gray (N7) and medium light gray (N6); some moderate reddish orange and brown. Coarsely crystalline, some medium. &lt;1% gray clay. Particles at 7.4' and 8.55'. &lt;1% polyhalite. [11,7]</td>
</tr>
<tr>
<td>4</td>
<td>10.1</td>
<td></td>
<td></td>
<td>X</td>
<td>10.0'-12.65' HALITE: Clear to moderate reddish orange, (10R 6/6) coarsely crystalline. &lt;1% polyhalite. Gray clay break at 12.25'. [7]</td>
</tr>
<tr>
<td>5</td>
<td>15.1</td>
<td></td>
<td></td>
<td>X</td>
<td>12.65'-19.8' HALITE: Clear to light bluish gray (3B 7/1) and moderate reddish orange (10R 6/6) medium to coarsely crystalline. 5.1% gray clay; traces brown &lt;1% polyhalite. [11,2]</td>
</tr>
<tr>
<td>7</td>
<td>25.1</td>
<td></td>
<td></td>
<td>X</td>
<td>20.9'-21.45' HALITE: Clear to light gray (N7) medium to coarsely crystalline. &lt;1% gray clay [11]</td>
</tr>
<tr>
<td>8</td>
<td>25.1</td>
<td></td>
<td></td>
<td>X</td>
<td>21.45'-27.75' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6), coarsely crystalline, &lt;1 to &lt;2% polyhalite blebs and patches. [1-3]</td>
</tr>
</tbody>
</table>

**REMARKS**

Watson Drill. NW split cube core barrel.

AW rods.

Drill Time: 6-1/2 hours.

Core quality shows significant improvement over previously drilled core.
### WIPP
#### WASTE ISOLATION PILOT PLANT

**Sheet 2 of 2**

**Boring No. DH-12**

<table>
<thead>
<tr>
<th>Run Number</th>
<th>Depth (ft)</th>
<th>Core Run</th>
<th>Recovery</th>
<th>Profile</th>
<th>Description</th>
<th>Remarks</th>
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<tbody>
<tr>
<td>6</td>
<td>25.0</td>
<td>5.0</td>
<td>100</td>
<td>-</td>
<td>22.75'-25.0' Halite: From 22.75' to 25.0' is a &quot;swell&quot; pattern of halite and anhydrite. Below this is predominantly white to light gray (N7) to medium light gray (N6) microcrystalline anhydrite with scattered halite growths. Anhydrite is partially laminated. &lt; 1/2&quot; moist clay at lower contact.</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>30.0</td>
<td>5.0</td>
<td>100</td>
<td>-</td>
<td>25.0'-29.0' Halite: Clear to moderate reddish orange (10R 6/6) and light gray (N1). Medium to coarse crystalline. ≤1% gray clay and &lt; 1% dispersed polyhalite. (9,11)</td>
<td></td>
</tr>
<tr>
<td>31.3</td>
<td>35.0</td>
<td>5.0</td>
<td>100</td>
<td>-</td>
<td>29.0'-32.4' Polymictic Halite: Clear to moderate reddish orange (10R 6/6); coarse crystalline. &lt; 1% gray clay and &lt; 1% polyhalite. Note to &lt; 1% gray clay. (4-6)</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>35.0</td>
<td>5.0</td>
<td>100</td>
<td>-</td>
<td>33.2'-35.35' Halite: Clear to moderate reddish orange (10R 6/6); medium to coarse crystalline. &lt; 1% gray clay and dispersed polyhalite. (1,2)</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>40.0</td>
<td>5.0</td>
<td>100</td>
<td>-</td>
<td>35.35'-39.9' Polymictic Halite: Clear to moderate reddish orange (10R 6/6); coarse crystalline. &lt; 1% to 3% polyhalite blebs and patches. &lt; 1/2% gray clay locally. (2-6)</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>45.0</td>
<td>5.0</td>
<td>100</td>
<td>-</td>
<td>39.9'-44.8' Halite: Clear, some moderate reddish orange (10R 6/6); coarse crystalline, some medium. ≤1% gray clay and ≤1% polyhalite, locally up to 2%. (1,10)</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>45.0</td>
<td>5.0</td>
<td>100</td>
<td>-</td>
<td>44.8'-49.5' Polymictic Halite: Clear to moderate reddish orange/brown (10R 6/6); coarse crystalline. &lt; 1% polyhalite average ≤ 1% gray clay. Moderate reddish orange/brown microcrystalline anhydrite/polyhalite at 49.1' to 49.3'. Lower surface is irregular and slightly polished. (2-4, 7)</td>
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</tr>
<tr>
<td>11</td>
<td>50.0</td>
<td>5.0</td>
<td>100</td>
<td>-</td>
<td>49.5'-49.8' Anhydrite: White to light gray (N7); microcrystalline, faintly laminated anhydrite. Scattered halite growths. Trace of gray clay at 49.8'.</td>
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</tr>
<tr>
<td>11</td>
<td>51.3</td>
<td>5.0</td>
<td>100</td>
<td>-</td>
<td>49.8'-51.3' Halite: Clear, some light bluish gray (5B 7/2) and moderate reddish orange (10R 6/4). Medium to coarse crystalline. ≤1% gray clay. &lt; 1/2% polyhalite. (9, locally 2)</td>
<td></td>
</tr>
</tbody>
</table>
### WIPP GEOLOGIC DRILL LOG

**WASTE ISOLATION PILOT PLANT**

**INSTRUMENT TYPE & NUMBER**

**HOLE TYPE/SIZE**

**REV CORE**

**BORING NO.** DH-17

**LOCATION** N42° 28' DRIFT & ROOM D INTERSECTION

**STATION** N 1624. E6280
**COLLAR ELEV.** 1314.4
**DIRECTION OF DRILLING** VERTICAL

**MINE COORDINATES** N11 112. E8582
**DEPTH OF BOREHOLE** 13.8 FT.

**DRILLING METHOD** ROTARY/AIR
**DRILL MAKE/MODEL** WATSON MODEL 750

**DATE STARTED** 3/28/84 (SWING)
**DATE COMPLETED** 3/28/84 (SWING)
**SHEET LOGGED BY** J. E. GALLERAN
**DATE** 3/30/84

1. **OF 1**

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN (ft.)</th>
<th>CORE RUN RECOVERY %</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
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<td>0.0</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>2.4</td>
<td>2.4 100</td>
<td>X</td>
<td>0.0'-3.9' HALITE: Clear to moderate reddish orange (10% 4/6); medium to coarsely crystalline; &lt;1% dispersed gangue; 1/2&quot; anhydrite at 3.4'. Gray clay below.</td>
<td>Watson drill, 4' rods, HM split-tube barrel. Set-up time: 7 hrs. Drilling time: 2-1/2 hrs.</td>
</tr>
<tr>
<td>2.4</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>5.5</td>
<td>3.6 65.5</td>
<td>X</td>
<td>3.9'-8.7' HALITE: Clear, coarsely crystalline. None to &lt;1% grey clay.</td>
<td>No gas. Dry hole.</td>
</tr>
<tr>
<td>2</td>
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<td></td>
</tr>
<tr>
<td>3</td>
<td>0.8</td>
<td>0.8 100</td>
<td></td>
<td>8.7'-9.4' HALITE: Clear to moderate brown (5YR 4/4); some light gray (8/7). Medium to coarsely crystalline. &lt;1% brown and grey clay.</td>
<td>Contacts approximate due to core loss.</td>
</tr>
<tr>
<td>3</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>4</td>
<td>5.1</td>
<td>4.1 80.4</td>
<td></td>
<td>9.4'-13.8' HALITE: Clear, some light gray (8/7); coarsely crystalline. &lt;1% dispersed grey clay.</td>
<td>Run 2. Core broken-up much of run.</td>
</tr>
<tr>
<td>13.8</td>
<td></td>
<td></td>
<td></td>
<td>Note: This hole was stopped at 13.8' due to core loss. Refer to drill logs for replacement holes DH-13A and DH-13B.</td>
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</table>
## WIPP
### GEOLOGIC DRILL LOG

**WASTE ISOLATION PILOT PLANT**

**INSTRUMENT TYPE & NUMBER**

**HOLE TYPE/SIZE**

**NX CORE**

**BORING NO.** DH-13A

**LOCATION** 6° N.E. OF DH-13; N1402 DRIFT AT ROOM D INTERSECTION

---

**STATION** N 1424.5, E1691
**COLLAR ELEV.** 1311.5 ft
**DIRECTION OF DRILLING** VERTICAL

**MINE COORDINATES** M1112, E8586
**DEPTH OF BOREHOLE** 49.0 ft

**DRILLING METHOD** ROTARY/AIR
**DRILL MAKE/MODEL** WATSON MODEL 750

**DATE STARTED** 3/28/84 (SWING)
**DATE COMPLETED** 3/29/84 (SWING)

**SHEET LOGGED BY:** J. E. GALLERANI
**DATE:** 3/30/84

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<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>CORE RUN RECOVERY</th>
<th>% RECOVERED PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>0</td>
<td>2.5</td>
<td>2.5</td>
<td>100</td>
<td>0.0'-4.25' HALITE: Clear, some light gray (N7), medium to coarsely crystalline. &lt;1% dispersed gray clay. &lt;1/2% dispersed polyhalite. Break at 4.25'.</td>
<td></td>
</tr>
<tr>
<td>2.5</td>
<td>2</td>
<td>0.7</td>
<td>0.65</td>
<td>93</td>
<td>4.25'-6.3' HALITE: Clear, coarsely crystalline. Scattered white anhydrite stringers. 1/4&quot; anhydrite layer at 4.35'.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>5</td>
<td>2.9</td>
<td>2.9</td>
<td>100</td>
<td>6.3'-10.6' HALITE: Clear to light moderate reddish-orange (10R 6/6); some light bluish gray (5B 7/1). Medium to coarsely crystalline: &lt;1% dispersed polyhalite and gray clay.</td>
<td></td>
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<tr>
<td>6.1</td>
<td>4</td>
<td>2.8</td>
<td>0.6</td>
<td>21</td>
<td>10.6'-13.4' HALITE: Clear to light gray (N7) and medium light gray (N6). Coarsely crystalline. None to &lt;1% gray clay. Upper 1/2&quot; of recovered core is clear.</td>
<td></td>
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<tr>
<td>8.9</td>
<td>5</td>
<td>2.0</td>
<td>2.0</td>
<td>100</td>
<td>13.4'-16.55' ARGILLACEOUS HALITE: Clear to medium brown (3YR 4/4); medium to coarsely crystalline. &lt;1% brown clay. Scattered breaks.</td>
<td></td>
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<tr>
<td>10.9</td>
<td>6</td>
<td>2.0</td>
<td>1.0</td>
<td>50</td>
<td>16.55'-17.25' ANHYDRITE: Light gray, microcrystalline; faintly laminated. Scattered halite growths, especially 16.75'-16.95'. 2-1/2&quot; gray clay seam at 16.55'-16.75', medium plastic. Contains scattered halite crystals.</td>
<td></td>
</tr>
<tr>
<td>12.9</td>
<td>7</td>
<td>2.2</td>
<td>2.2</td>
<td>100</td>
<td>17.25'-22.2' HALITE: Clear to moderate reddish-orange (10R 6/6); coarsely crystalline. &lt;1% to 2% polyhalite. Scattered anhydrite.</td>
<td>Run 6. Much of core broken-up.</td>
</tr>
<tr>
<td>15.1</td>
<td>8</td>
<td>1.6</td>
<td>1.6</td>
<td>100</td>
<td>12.2'-24.5' HALITE: Clear to moderate brown (3YR 4/4); medium to coarsely crystalline. &lt;1% to 2% brown clay. Breaks at 22.4° and 23.25°. [12,17]</td>
<td>Run 7. Tried 3' NX double-tube barrel. Core OK.</td>
</tr>
<tr>
<td>16.7</td>
<td>9</td>
<td>4.0</td>
<td>3.3</td>
<td>83</td>
<td>24.5'-16.7' HALITE: Clear mottled with some moderate reddish orange (10R 6/6); coarsely crystalline. &lt;1/2% gray clay and &lt;1% polyhalite. [2 - 4, some 9]</td>
<td>Run 8. NW split-tube plugged-off at clay seam.</td>
</tr>
<tr>
<td>20.7</td>
<td>10</td>
<td>3.3</td>
<td>3.3</td>
<td>100</td>
<td>26.7'-28.3' HALITE: Clear to moderate brown (3YR 4/4); medium to coarsely crystalline. &lt;1% to 2% brown clay. [8, 10]</td>
<td>Run 9. Core broken-up in polyhalite halite.</td>
</tr>
<tr>
<td>24.0</td>
<td>11</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td></td>
<td>Runs 10-15. Used Sprague and Henwood double-tube core barrel. A piece of foam rubber was used inside barrel to prevent core from falling in barrel.</td>
</tr>
<tr>
<td>RUN NUMBER</td>
<td>DEPTH (ft.)</td>
<td>LENGTH CORE RUN</td>
<td>% RECOVERED</td>
<td>DESCRIPTION</td>
<td>REMARKS</td>
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</tbody>
</table>

**DESCRIPTION**

25.3'-26.6' ARGILLACEOUS HALITE: Clear to moderate brown (5YR 4/4); medium to coarsely crystalline. < 1 to 3% brown clay. Break at 26.4'. 1-1/2" brown clay mixed with halite at 30.4'-30.6". [12]

30.6'-35.55' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6); coarsely crystalline. < 1 to 3% polyhalite. 1/2" grey clay seam at 33.9'. [2 -5]

25.55'-36.8' HALITE: Clear with some moderate brown (5YR 4/4); coarsely crystalline. < 1/2% polyhalite. < 1% brown clay patches. Irregular break at 25.55'. [10, 17]

36.8'-39.0' HALITE: Clear mottled with some moderate reddish orange (10R 6/6) and moderate brown (5YR 4/4). Coarsely crystalline < 1% brown clay blebs. < 1 to 2% polyhalite blebs. [1 -3, 8]

39.0'-39.9' ARGILLACEOUS HALITE: Clear to moderate brown (5YR 4/4); medium to coarsely crystalline. Brown clay < 1 to 3%. Break at 39.6' and 1/2" seam at 39.85'. [12]

39.9'-41.7' HALITE: Clear mottled with moderate reddish orange; coarsely crystalline. < 1% polyhalite. 1-1/2" anhydrite and halite at 39.9'-40.0'. [19, 2]

41.7'-43.3' HALITE: Clear with some moderate brown (5YR 4/4); coarsely crystalline, some medium. < 1% brown clay. [8, 10]

43.3'-46.9' ARGILLACEOUS HALITE: Clear to moderate brown (5YR 4/4; 3/4); medium to coarsely crystalline. < 1 to 3% brown clay. Parting at 43.3'; breaks at 45.5'; 45.6'. [10]

46.9'-49.0' HALITE: Clear to moderate reddish brown (10R 4/6) and moderate brown (5YR 4/4). Medium to coarsely crystalline. < 1% brown clay, trace of grey. < 1% polyhalite. [10]

§
# WIPP

## GEOLOGIC DRILL LOG

### WASTE ISOLATION PILOT PLANT

**INSTRUMENT TYPE & NUMBER**

**HOLE TYPE/SIZE**

**NX CORE**

**BORING NO.**

**DH-13B**

**LOCATION**

**NI420 DRIFT: ROPE AT 8M. D INTERSECTION**

---

### STATION

**NI425.61695 COLLAR ELEV.**

**1311.4 DIRECTION OF DRILLING UP**

**MINE COORDINATES**

**N11112.61 E8590.74**

**DEPTH OF BOREHOLE**

**21.0 FT.**

**DRILLING METHOD**

**ROTARY/AIR**

**DRILL MAKE/MODEL**

**WATSON MODEL 750**

**DATE STARTED**

**4-5-84 (SWING)**

**DATE COMPLETED**

**4-5-84 (SWING)**

---

**SHEET LOGGED BY:**

**J. E. GAILBRANT**

**DATE:**

**4-5-84**

---

### RUN NUMBER

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>RECOVERY</th>
<th>% RECOVERED</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
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<tr>
<td>0.0</td>
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<td></td>
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</tr>
<tr>
<td>1</td>
<td></td>
<td>2.7</td>
<td>2.7</td>
<td>100</td>
<td>0.0'-2.7' HALITE: Clear to medium light gray (N6) and some light moderate reddish orange (10R 6/6). Coarsely crystalline. ≤1% gray clay. [9]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>4.8</td>
<td>4.8</td>
<td>100</td>
<td>2.7'-5.5' HALITE: Clear, coarsely crystalline. Scattered white anhydrite stringers. &lt;1/4&quot; gray clay seam at 3.5' with some anhydrite just above. [1]</td>
<td></td>
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<tr>
<td>3</td>
<td></td>
<td>10</td>
<td>10</td>
<td>100</td>
<td>5.5'-9.9' HALITE: Clear, trace of light gray (N7), medium to coarsely crystalline. &lt;1/2% clay. [1, 9]</td>
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<tr>
<td>4</td>
<td></td>
<td>15</td>
<td>15</td>
<td>100</td>
<td>9.9'-12.1' HALITE: Clear, coarsely crystalline. [1]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>20</td>
<td>20</td>
<td>100</td>
<td>12.1'-15.8' HALITE: Clear with some medium light gray (N6) and medium brown (5YR 4/4). Medium to coarsely crystalline, trace fine locally. &lt;1/2% dispersed polyhalite and ≤1% gray clay. Some brown. Scattered discontinuous breaks. [9, 17]</td>
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<tr>
<td>6</td>
<td></td>
<td>25</td>
<td>25</td>
<td>100</td>
<td>15.8'-16.8' HALITE: Clear, coarsely crystalline. [1]</td>
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<tr>
<td>7</td>
<td></td>
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</tr>
<tr>
<td>8</td>
<td></td>
<td>30</td>
<td>30</td>
<td>100</td>
<td>16.8'-17.5' ANHYDRITE: Light gray (N7) to medium light gray (N6) microcrystalline anhydrite with scattered halite growths. Partially laminated. 1/2&quot; layer of mostly halite at 17.4'. Tightly closed upper contact. Up to 1-1/4&quot; hard gray clay at 16.8'-16.81&quot;.</td>
<td></td>
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<tr>
<td>9</td>
<td></td>
<td>40</td>
<td>40</td>
<td>100</td>
<td>17.5'-18.3' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6), coarsely crystalline. &lt;1 to &lt;2% polyhalite. [7]</td>
<td></td>
<td></td>
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<tr>
<td>10</td>
<td></td>
<td>50</td>
<td>50</td>
<td>100</td>
<td>18.3'-21.0' HALITE: Clear with some moderate reddish orange &lt;1% polyhalite locally. ≤1/2&quot; white anhydrite layer at 18.9'±. [1, 2]</td>
<td></td>
<td></td>
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</table>

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**BORING NO.**

**DH-13B**
<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEEP</th>
<th>CORE</th>
<th>RECOVERY</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
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<tbody>
<tr>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>3.2</td>
<td>3.2</td>
<td>100</td>
<td>X</td>
<td>0.0'-5.8' HALITE: Clear with some light gray (W7), coarse crystalline. &lt; 1% gray clay and polyhalite. [1, 11]</td>
<td>Watson drill, AW rods, 42' double-tube core barrel.</td>
</tr>
<tr>
<td></td>
<td>4.9</td>
<td>4.9</td>
<td>100</td>
<td>X</td>
<td>5.8'-13.15' HALITE: Clear to medium light gray (W6), coarse crystalline, some medium. &lt; 1% gray clay. &lt; 1/2% dispersed polyhalite. [9, 11]</td>
<td>No gas. Dry hole.</td>
</tr>
<tr>
<td></td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
<td>13.15'-16.2' HALITE: Clear to moderate reddish orange (10R 6/6), coarse crystalline. &lt; 1% polyhalite. [1-2]</td>
<td>Core shows some disturbance and surface vibration damage.</td>
</tr>
<tr>
<td></td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
<td>16.2'-21.3' HALITE: Clear to light moderate reddish orange (10R 6/6) and light gray (W7), medium to coarse crystalline. &lt; 1/2% dispersed polyhalite. &lt; 1% gray clay. [9, 11]</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>15.1</td>
<td>15.1</td>
<td>100</td>
<td>X</td>
<td>21.3'-22.7' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6), medium to coarse crystalline. &lt; 1 to 2% polyhalite. Scattered anhydrite. [3, 7]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>20.1</td>
<td>20.1</td>
<td>100</td>
<td>X</td>
<td>23.7'-26.45' H4-139: Light gray to moderate reddish orange mixture of predominantly anhydrite with some polyhalite halite to 25.55'. Then light gray anhydrite with scattered halite growths and laminae. Trace of gray clay at 25.45'.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
<td>26.45'-29.5' HALITE: Clear to moderate reddish orange (10R 6/6) and some light gray (W7). Medium to coarsely crystalline. &lt; 1/2% dispersed polyhalite and &lt; 1% gray clay. [9]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
<td>29.5'-33.9' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6), coarse crystalline. &lt; 1 to 3% polyhalite. Anhydrite mixed with some halite from 33.75'-33.9'. Gray clay at 33.82'. [24]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
<td>33.9'-36.25' HALITE: Clear to light moderate reddish orange (10R 6/6) and some light gray (W7). Medium to coarse crystalline. &lt; 1/2% dispersed polyhalite. &lt; 1% gray clay. [9]</td>
<td></td>
</tr>
<tr>
<td>RUN NUMBER</td>
<td>DEPTH (ft.)</td>
<td>LENGTH CORE RUN</td>
<td>RECOVERY %</td>
<td>PROFILE</td>
<td>DESCRIPTION</td>
<td>REMARKS</td>
</tr>
<tr>
<td>------------</td>
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<td>---------</td>
</tr>
<tr>
<td>6</td>
<td>25</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>36.25'-41.1' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/8), coarsely crystalline. &lt; 1 to 3% polyhalite. &lt; 1/2% gray clay with up to 1% clay at 39.5'-40.3'. Break at 39.5'. [3, 4, 7]</td>
<td></td>
</tr>
<tr>
<td>28.1</td>
<td>5.0</td>
<td></td>
<td></td>
<td></td>
<td>41.1'-44.2' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6) and some light gray (W7). Medium to coarsely crystalline, some fine. &lt; 1/2% dispersed polyhalite. &lt; 1% gray clay. [9]</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>35</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
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<td></td>
</tr>
<tr>
<td>38.1</td>
<td>40</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>43.1</td>
<td>45</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>45</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>48.1</td>
<td>11</td>
<td>1.0</td>
<td>1.0</td>
<td>100</td>
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</table>
# WIPP
## WASTE ISOLATION PILOT PLANT

**INSTRUMENT TYPE & NUMBER**

**HOLE NUMBER**

**TYPE/ SIZE**

**NX CORE**

**BORING NO.**

**LOCATION**

---

**STATION**

**COLLAR ELEV.**

**DIRECTION OF DRILLING**

**MINE COORDINATES**

**DEPTH OF BOREHOLE**

**DRILLING METHOD**

**DRILL MAKE/ MODEL**

**DATE STARTED**

**DATE COMPLETED**

**SHEET LOGGED BY**

**DATE:**

---

**RUN NUMBER**

**DEPTH**

**LENGTH OF CORE RUN**

**RECOVERY**

**% RECOVERED**

**PROFILE**

**DESCRIPTION**

**REMARKS**

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>RECOVERY</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Watson post mounted drill.</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td>AW rods.</td>
</tr>
<tr>
<td>1</td>
<td>0.0</td>
<td>2.4</td>
<td>2.4</td>
<td>0.0'-4.5' HALITE: Clear, coarsely crystalline. &lt;1% polyhalite from 3.7'-4.5' %. Scattered white anhydrite/magnesite? Stringers.</td>
<td>Core generally all together in split tube. Tends to break up some when put in box.</td>
</tr>
<tr>
<td>2</td>
<td>2.0</td>
<td></td>
<td></td>
<td>4.5'-9.2' HALITE: Clear to light gray (W7) medium to coarsely crystalline. &lt;1% gray clay. &lt;1/8&quot; clay seam at 9.1'. From 9.1' to 9.2' anhydrite mixed with halite. (2,11)</td>
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<td></td>
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<td></td>
<td>Run 4. Drilling core in clear halite.</td>
</tr>
<tr>
<td>3</td>
<td>6.3</td>
<td>1.2</td>
<td>1.2</td>
<td>9.2'-13.0' HALITE: Clear, coarsely crystalline. Scattered white stringers.</td>
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<td></td>
<td></td>
<td>Run 5. Some broken core.</td>
</tr>
<tr>
<td>4</td>
<td>7.5</td>
<td>4.2</td>
<td>4.2</td>
<td>13.0'-14.7' HALITE: Clear to light gray (W7) and moderate brown (5YR 4/4); medium to coarsely crystalline, some fine. &lt;1% brown clay with trace gray. Sugary texture 14.1'-14.7'. (7,17)</td>
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<td></td>
</tr>
<tr>
<td>5</td>
<td>11.7</td>
<td>4.9</td>
<td>4.9</td>
<td>14.7'-18.1' HALITE: Clear, coarsely crystalline.</td>
<td>1/2&quot; brown clay seam at 19.6&quot;. (12,16)</td>
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</tr>
<tr>
<td>6</td>
<td>16.6</td>
<td>4.3</td>
<td>4.3</td>
<td>18.1'-20.85' ANHYDRITE: Clear to moderate brown (5YR 4/4) and grayish red (10R 4/2) medium to coarsely crystalline. &lt;1 to 3% brown clay. 1/2&quot; brown clay seam at 20.9&quot;. (12,17)</td>
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<tr>
<td>7</td>
<td>20.9</td>
<td>4.5</td>
<td>4.5</td>
<td>20.85'-21.35' ANHYDRITE: Light (N7) to medium gray (N9) to white anhydrite. Scattered halite growths up to 1/2&quot; brown clay seam at 20.85&quot;.</td>
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<td></td>
<td>21.35'-26.0' HALITE: Clear, coarsely crystalline. Stringers of anhydrite mixed with halite 21.35'-21.75'. Scattered white stringers throughout core. (12,17)</td>
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**BORING NO.**

**DH-15**
<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>RECOVERY %</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
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<td>25.4</td>
<td>25</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>4.5</td>
<td>4.5</td>
<td>100</td>
<td>26.0'-31.2' HALITE: Clear to dark reddish brown and moderate brown (STR 4/4). Predominantly coarse with zones of fine-medium from 26.5'-26.9' 2 and 28.0'-28.5' 2. &lt; 1 to 2% brown clay. [9, 10, 12]</td>
<td></td>
</tr>
<tr>
<td>29.9</td>
<td>30</td>
<td></td>
<td></td>
<td>31.2'-34.75' ARGILLACEOUS HALITE: Clear to moderate brown (STR 4/4) and moderate reddish brown (10% 1/6); medium to coarsely crystalline. &lt; 1 to 3% brown clay; intercrystalline and breaks. From 34.45' to 34.65' clay ≥10%. (10,12)</td>
<td></td>
</tr>
<tr>
<td>34.8</td>
<td>35</td>
<td></td>
<td></td>
<td>34.75'-43.2' POLYHALITIC HALITE: Clear to moderate reddish orange (10% 6/6); coarsely crystalline. &lt; 1 to 2% polyhalite. 2% anhydrite layer at 37.25'. &lt; 1 to 3% brown clay at 40.25'-41.65'. [3, 4, 7]</td>
<td></td>
</tr>
<tr>
<td>43.2'-44.1' HALITE: Clear mottled with dark reddish brown and moderate brown (STR 4/4). Coarsely crystalline. &lt; 1% brown clay. [9, 10]</td>
<td>Run 10. Some discs of core.</td>
<td></td>
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<tr>
<td>44.1'-44.6' ARGILLACEOUS HALITE: Clear to moderate brown (STR 4/4); fine to medium crystalline, some coarse. &lt; 1 to 3% brown clay, intercrystalline and breaks. Anhydrite/halite at 44.4'-44.6'. [12, 17]</td>
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<tr>
<td>44.6'-47.1' POLYHALITIC HALITE: Clear to moderate reddish orange (10% 6/6); coarsely crystalline. &lt; 1 to 3% polyhalite. [13, 4, 7]</td>
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<tr>
<td>47.1'-51.0' ARGILLACEOUS HALITE: Clear to moderate brown (STR 3/4); medium to coarsely crystalline. &lt; 1 to 3% brown clay. [10, 12]</td>
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### WIPP
#### WASTE ISOLATION PILOT PLANT

**INSTRUMENT TYPE & NUMBER**

**HOLE NX CORE**

**BORING NO.** DH-16

**LOCATION** N1100 DRIFT - FLOOR

**STATION** N1104 ± E1688 ² **COLLAR ELEV.** 1300.3 **DIRECTION OF DRILLING** DOWN

**MINE COORDINATES** N10792.89 E8593.39 **DEPTH OF BOREHOLE** 51.0'

**DRILLING METHOD** ROTARY/AIR **DRILL MAKE/MODEL** WATSON

**DATE STARTED** 3/19/84 (SWING) **DATE COMPLETED** 3/19/84 (SWING)

**LOGGED BY:** J. E. GALLERANI **DATE:** 5/20/84

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### GEOLOGIC DRILL LOG

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE (in)</th>
<th>RECOVERY CORE %</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>0.0</td>
<td>2.0</td>
<td>100</td>
<td>0.0'-6.1' HALITE: Clear, coarsely crystalline, some medium. &lt;1/2% polyhalite and gray clay.</td>
<td>Watson drill.</td>
</tr>
<tr>
<td>2.0</td>
<td>0.2</td>
<td>1.1</td>
<td>100</td>
<td>6.1'-10.4' HALITE: Clear to light gray (W7); coarsely crystalline, some medium. &lt;1% gray clay. &lt;1/2% dispersed polyhalite.</td>
<td>Post mounted Ay rods.</td>
</tr>
<tr>
<td>2.3</td>
<td>1.1</td>
<td>1.1</td>
<td>100</td>
<td>10.4'-12.35' HALITE: Clear to moderate reddish orange (10K 6/6); coarsely crystalline, some medium. &lt;1% gray clay at 11.55'-11.95'.</td>
<td>W8 split tube barrel.</td>
</tr>
<tr>
<td>3.4</td>
<td>2.6</td>
<td>2.5</td>
<td>96</td>
<td>12.35'-16.0' HALITE: Clear to light gray (W7); light bluish gray (5B 2/2) and moderate reddish orange (10K 6/6) medium to coarsely crystalline. &lt;1% polyhalite and gray clay.</td>
<td>Drilling Time: 4-1/2 hours.</td>
</tr>
<tr>
<td>4.5</td>
<td>5.1</td>
<td>5.1</td>
<td>100</td>
<td>16.0'-20.1' HALITE: Clear to light bluish gray (5B 2/1) and light gray (W7); coarsely crystalline. &lt;1% gray clay.</td>
<td>No gas. Dry hole.</td>
</tr>
<tr>
<td>6.0</td>
<td>4.9</td>
<td>4.9</td>
<td>100</td>
<td>20.1'-23.5' HALITE: Clear, scattered moderate reddish orange polyhalite blobs. Coarsely crystalline. &lt;1/2% polyhalite.</td>
<td>Overall core quality is satisfactory. Can fit ends together fairly well. Some discing of cores, especially in coarsely crystalline material.</td>
</tr>
<tr>
<td>7.5</td>
<td>5.1</td>
<td>5.1</td>
<td>100</td>
<td>23.5'-25.2' HALITE: Mixture of halite and anhydrite in &quot;swallowtail&quot; pattern from 23.5'-25.2'. From 25.2', predominantly anhydrite with some halite growths. Some laminite, especially noted from 24.5'-25.2'. 1/2&quot; ± clay at lower contact.</td>
<td>Runs 4 and 5.</td>
</tr>
<tr>
<td>15.0</td>
<td>4.9</td>
<td>4.9</td>
<td>100</td>
<td>25.2'-29.4' HALITE: Clear, some moderate reddish orange (10K 6/6) and light gray (W7). Medium to coarsely crystalline. &lt;1/2% polyhalite and gray clay. Coarsely crystalline with no clay from 29.2'-29.4'.</td>
<td>Some discing of core.</td>
</tr>
</tbody>
</table>

---

**BORING NO.** DH-16
<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>RECOVERY</th>
<th>% RECOVERED</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
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<tbody>
<tr>
<td>8</td>
<td>26.0</td>
<td>4.9</td>
<td>4.3</td>
<td>100</td>
<td>X</td>
<td>29.6'-33.05' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6); coarsely crystalline. &lt;1 to 3% polyhalite. 1/2&quot; hard gray clay. Seam at lower contact. [3, 4, 7]</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>31.0</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
<td>33.05'-33.9' HALITE: Clear mottled with some moderate reddish orange polyhalite blebs. Coarsely crystalline, some medium. &lt;1/2% polyhalite and gray clay. [2]</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>36.0</td>
<td>1.0</td>
<td>5.0</td>
<td>100</td>
<td></td>
<td>34.9'-40.35' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6); coarsely crystalline except some medium at 39.65' to 40.35'. &lt;1 to 3% polyhalite &lt;1/2% gray clay. [2-5, 9]</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>41.0</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
<td>40.35'-42.1' HALITE: Clear, coarsely crystalline. None to 1% gray clay and &lt;1/2% dispersed polyhalite. [1, 2]</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>46.1</td>
<td>5.1</td>
<td>5.1</td>
<td>100</td>
<td>X</td>
<td>42.1'-46.3' HALITE: Clear to moderate reddish orange/brown (10R 6/6; 1/6) with some light gray (87). Coarsely crystalline. &lt;1% gray intercrystalline clay. &lt;1 to 2% polyhalite. Locally polyhalitic. [5]</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>51.0</td>
<td>4.9</td>
<td>4.9</td>
<td>100</td>
<td>X</td>
<td>46.3'-49.15' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6); coarsely crystalline. &lt;1 to 3% polyhalite, moderate reddish orange anhydrite mixed with some halite at 48.95'-49.05' E. [2-4, 7]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>55</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>49.15'-49.45' ANHYDRSTE: White to light gray (87), microcrystalline. Scattered halite growths. &lt;1/16&quot; gray clay at 49.45'.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>49.45'-51.0' HALITE: Clear, medium to coarsely crystalline. &lt;1/2% clay at 50.8' to 51.0'. [12]</td>
<td></td>
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</tbody>
</table>
**WIPP**

**GEOLOGIC DRILL LOG**

**INSTRUMENT TYPE & NUMBER:**

**HOLE TYPE/SIZE:**

**NX CORE:**

**BORING NO.:** DH-17

**LOCATION:** N 1420 DRIFT: ROOF

**STATION:** N1277 ± E178 ±

**COLLAR ELEV.:** 1326.45

**DIRECTION OF DRILLING:** UP-VERTICAL

**MINE COORDINATES:** N11114.2 E7071.8

**DEPTH OF BOREHOLE:** 52.0 FT

**DRILLING METHOD:** ROTARY/AIR

**DRILL MAKE/MODEL:** WATSON

**DATE STARTED:** 1/18/84 (DAY)

**DATE COMPLETED:** 1/19/84 (DAY)

**SHEET LOGGED BY:** J.E. Gallerani

**DATE:** 3/6/84

**1 OF 3**

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN (ft.)</th>
<th>% RECOVERED</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td>0.0'-4.2' HALITE: Clear to moderate reddish orange (12N 6/6) coarsely crystalline, some medium. Scattered polyhalite &lt; 1%, &lt; 1/2% gray clay. (3, 9)</td>
</tr>
<tr>
<td>1</td>
<td>3.7</td>
<td>3.7</td>
<td>100</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
<td>4.2'-7.2' HALITE: Clear to light gray (N7) coarsely crystalline. &lt; 1% gray intercrystalline clay. &lt; 1/2% polyhalite. (9, 11)</td>
</tr>
<tr>
<td>3</td>
<td>10.0</td>
<td>4.9</td>
<td>100</td>
<td>X</td>
<td>7.2'-7.4' ANHYDRITE a: Very light (N8) to light gray (N7) microcrystalline anhydrite. Trace of dry gray clay at 7.2°. Some core grinding noted. Tightly closed irregular upper contact. Some halite growths 7.3'-7.4°.</td>
</tr>
<tr>
<td>4</td>
<td>15.0</td>
<td>4.8</td>
<td>100</td>
<td>X</td>
<td>7.4'-12.8' HALITE: Clear, coarsely crystalline. Scattered white anhydrite stringers. &lt; 1% polyhalite 7.3'-7.4° and 12.0'-12.6°. (11, 12)</td>
</tr>
<tr>
<td>5</td>
<td>20.0</td>
<td>5.0</td>
<td>100</td>
<td></td>
<td>12.8'-14.1' HALITE: Clear to light bluish gray (5B 7/1), fine to medium crystalline. &lt; 1% gray intercrystalline clay. Trace of dispersed polyhalite. (9)</td>
</tr>
<tr>
<td>6</td>
<td>23.4</td>
<td></td>
<td></td>
<td></td>
<td>14.1'-14.8' ANHYDRITE a: White to medium light (N6) and very light (N7) gray microcrystalline anhydrite some laminae. Growth of halite present. &lt; 1/32&quot; halite laminae at 14.4°. Trace of gray clay at 14.1°.</td>
</tr>
<tr>
<td>7</td>
<td>25.0</td>
<td></td>
<td></td>
<td></td>
<td>14.8'-19.0' POLYHALITIC HALITE: Clear to moderate reddish orange (10W 6/6) coarsely crystalline. &lt; 1 to 3% polyhalite blebs, patches. (3, 4, 7)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>19.0'-23.0' HALITE: Clear to light gray (N7), fine to medium crystalline with some coarse. &lt; 1 to 2% clay. &lt; 1/2% dispersed polyhalite. (11, 2, 9)</td>
</tr>
</tbody>
</table>

**REMARKS:**

- Watson drill.
- AW rods. NX double tube core barrel.
- Drilling time: 5 hours.
- Dry hole; no gas.
- Overall core condition good. Only several small broken up zones.
- Run 1. Core broken up last 6" of run.
<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>RECOVERY % RECOVERED</th>
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<td>25</td>
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<td>4.8</td>
<td>100</td>
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</tr>
<tr>
<td>8</td>
<td>35</td>
<td>4.5</td>
<td>4.0</td>
<td>100</td>
</tr>
<tr>
<td>9</td>
<td>45</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
</tr>
<tr>
<td>10</td>
<td>43</td>
<td>4.8</td>
<td>4.8</td>
<td>X</td>
</tr>
<tr>
<td>11</td>
<td>47</td>
<td>5.0</td>
<td>5.0</td>
<td>X</td>
</tr>
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<td>X</td>
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<td>5.0</td>
<td>5.0</td>
<td>X</td>
</tr>
<tr>
<td>15</td>
<td>55</td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

**Remarks**

Run 7. Core broken up zone 32.2'-32.7'.

Run 8. Bit plugged off west only 4' and pulled barrel.
<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>% RECOVERED PROFILE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>45.4'-47.05' <strong>HALITE</strong>: Clear, coarsely crystalline. &lt;1% brown intercrystalline clay. &lt;1/2% polyhalite blebs. (8)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>47.05'-50.3' <strong>ARGILLACEOUS HALITE</strong>: Clear to moderate brown (5YR 4/4) medium to coarsely crystalline. &lt;1 to 5% brown clay, intercrystalline and blebs, 1&quot; brown clay mixed with halite crystals at 50.2'. (16)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>50.3'-52.0 <strong>POLYHALITIC HALITE</strong>: Clear mottled with moderate reddish orange (10R 6/6) coarsely crystalline. &lt;1%, locally 2% polyhalite. &lt;1/2% grey clay. (4, 7)</td>
</tr>
</tbody>
</table>

**Remarks**
<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (FT.)</th>
<th>LENGTH CORE RUN</th>
<th>RECOVERY %</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>1</td>
<td>5.1</td>
<td>5.1</td>
<td>100</td>
<td>0.0'-4.7' HALITE: Clear, coarsely crystalline, &lt; 1% gray clay locally. &lt; 1/2% polyhalite blebs.</td>
<td>Watson drill. AW rods, MX double tube barrel. Drilling time: 5-1/2 hours. Dry hole. No Gas.</td>
</tr>
<tr>
<td>5.1</td>
<td>2</td>
<td>4.0</td>
<td>3.1</td>
<td>78</td>
<td>4.7'-5.6' POLYMALITIC HALITE: Clear to moderate reddish orange (10R 6/6), coarsely crystalline. &lt; 1% to 3% polyhalite.</td>
<td>Run 1. Small broken zone 2.2'-2.4' 2.</td>
</tr>
<tr>
<td>9.1</td>
<td>3</td>
<td>4.5</td>
<td>4.5</td>
<td>100</td>
<td>5.6'-9.1' MB-129: from 5.6' to 6.7' is light gray (5G 7/1) to moderate reddish orange (10R 6/6) mixture of halite, polyhalite and anhydrite. Shows &quot;swallowtail&quot; pattern. From 6.1' to 9.1' 2. is white to medium gray (5G) anhydrite with scattered halite growths. Very thin layers of halite lower part of unit. Lower contact approximate because of core loss.</td>
<td></td>
</tr>
<tr>
<td>13.4</td>
<td>4</td>
<td>4.7</td>
<td>4.7</td>
<td>100</td>
<td>9.1'-12.1' HALITE: Clear to light bluish gray (56 7/1) and moderate reddish orange (10R 6/6) medium to coarsely crystalline. &lt; 1% polyhalite and intercrystalline gray clay.</td>
<td>Run 2. Left some core in hole. Ground up in run 3.</td>
</tr>
<tr>
<td>18.3</td>
<td>5</td>
<td>4.8</td>
<td>4.8</td>
<td>100</td>
<td>12.1'-18.2' HALITE: Clear to moderate reddish orange (10R 6/6), coarsely crystalline. &lt; 1% polyhalite, locally 1%. 1&quot; anhydrite layer at 15.6'. 1/2&quot; clay and anhydrite at 15.8'. Dips at 10°. &lt; 1% gray clay at 15.8'-16.8'. &lt; 1/2% polyhalite from 15.8'-18.2'.</td>
<td></td>
</tr>
<tr>
<td>23.1</td>
<td>6</td>
<td>5.2</td>
<td>5.2</td>
<td>100</td>
<td>18.2'-22.4' POLYMALITIC HALITE: Clear to moderate reddish orange (10R 6/6), coarsely crystalline, scattered medium &lt; 1 to 4%.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>22.4'-27.9' HALITE: Clear to light gray (5G7) and moderate reddish orange (10R 6/6) medium to coarsely crystalline. &lt; 1% polyhalite and dispersed gray clay.</td>
<td></td>
</tr>
<tr>
<td>RUN NUMBER</td>
<td>DEPTH (ft)</td>
<td>LENGTH CORE RUN</td>
<td>RECOVERY %</td>
<td>PROFILE</td>
<td>DESCRIPTION</td>
<td>REMARKS</td>
</tr>
<tr>
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<td>---------</td>
</tr>
<tr>
<td>6</td>
<td>25</td>
<td>5.2</td>
<td>5.2</td>
<td>X</td>
<td>27.0'–33.7' HALITE: Clear mottled with moderate reddish orange, coarsely crystalline. &lt;1 to 2% polyhalite with most concentration at 27.0' to 30.0'. 1&quot; anhydrite layer at 33.0'. [7, 1]</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>30</td>
<td>4.8</td>
<td>4.8</td>
<td>X</td>
<td>33.7'–34.05' ANHYDRITE: Very light (NB) to medium gray (M5) microcrystalline anhydrite with scattered halite growths. Trace of dry gray clay at 34.05'.</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>35</td>
<td>5.0</td>
<td>5.0</td>
<td>X</td>
<td>24.05'–41.2' HALITE: Clear mottled with some light gray, fine to coarsely crystalline. &lt;1% gray intercrystalline clay and polyhalite. Clear, fine to medium crystalline from 35.2' to 36.1'. [9, 4]</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>40</td>
<td>5.0</td>
<td>5.0</td>
<td>X</td>
<td>41.2'–44.6' HALITE: Clear to medium brown (54W 4/4) to grayish brown (5YR 3/2) medium to coarsely crystalline. &lt;1% gray, trace gray. [10]</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>43</td>
<td>6.6</td>
<td>6.6</td>
<td>X</td>
<td>44.6'–47.2' HALITE: Clear to light gray (9Y) coarsely crystalline. &lt;1% gray intercrystalline clay. &lt;1/2% dispersed polyhalite. [11]</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>50</td>
<td>3.1</td>
<td>3.1</td>
<td>X</td>
<td>47.2'–50.1' HALITE: Clear, coarsely crystalline. 1/2% gray clay at 48.6' to 48.7'. &lt;1% dispersed polyhalite at 48.7' to 50.1'. [2]</td>
<td></td>
</tr>
<tr>
<td>50.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>50.1'–50.8' HALITE: Clear, with some light gray (9Y), coarsely crystalline. &lt;1% gray intercrystalline clay. Break at 50.5'. [11]</td>
<td></td>
</tr>
</tbody>
</table>

Run 9. Small broken zone.
38.1'–38.4' Z. and come out of hole and empty barrel and put rods back in hole: 43 minutes.
### Geologic Drill Log

**WIPP**

**Waste Isolation Pilot Plant**

**Instrument Type & Number**

**Hole Type/Size**

**Core Boring No.**

**Location**

**Station** N107 ± E 206.5 ±

**Collar Elevation** 1314.7

**Direction of Drilling** Vertical

**Mine Coordinates** N 10.794 E 7101.7

**Depth of Borehole** 51.6 ft.

**Drilling Method** Rotary/Air

**Drill Make/Model** Watson

**Date Started** 1/20/83 (Day)

**Date Completed** 1/21/83 (Day)

**Sheet Logged By** J. E. Gallarani

**Date** 3/5/84

**Run Number**

<table>
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<th>Depth (ft)</th>
<th>Length Core Run (ft)</th>
<th>Recovery</th>
<th>% Recovery</th>
<th>Profile</th>
</tr>
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<td>0.6</td>
<td>100</td>
<td>-</td>
</tr>
<tr>
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<td>X</td>
</tr>
<tr>
<td>2.0</td>
<td>4.6</td>
<td>4.6</td>
<td>100</td>
<td>X</td>
</tr>
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<td>3.6</td>
<td>100</td>
<td>X</td>
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<td>X</td>
</tr>
<tr>
<td>7.0</td>
<td>4.4</td>
<td>4.4</td>
<td>100</td>
<td>X</td>
</tr>
</tbody>
</table>

**Description**

- **9.0'-4.0'** Halite: Clear, coarse crystalline, <1% gray intercrystalline clay and <1% polyhalite blebs. (2)
- **4.0'-7.59'** Halite: Clear with some light gray (N7), medium to coarse crystalline, <1% gray, intercrystalline clay <1/2% dispersed polyhalite. (2,9)
- **7.55'-7.75'** Anhydrite: Very light (N6) to medium gray (N4) microcrystalline anhydrite. Scattered halite growths. Several near-horizontal halite fractures with anhydrite. Trace clay at 7.55'. (7)
- **7.75'-8.2'** Polyhalite: Clear to moderate reddish orange (10R 6/6), coarse crystalline, 1 to 2% polyhalite. (7)
- **8.2'-12.1'** Halite: Clear, coarse crystalline, <1/2% dispersed polyhalite locally. Very clear at 8.2' to 12.1'. (1)
- **12.1'-13.9'** Halite: Clear to light gray (N7) coarse crystalline to 13', then fine to medium <1% gray intercrystalline clay, <1% polyhalite to 13'. (2,9)
- **13.9'-14.5'** Anhydrite: Very light (N6) to medium gray (N4) microcrystalline anhydrite. Scattered halite growths. Thin, irregular halite layer at 14.3'. (2)
- **14.5'-18.5'** Polyhalite: Clear to moderate reddish orange (10R 6/6), coarse crystalline. Scattered anhydrite to 16.2', <1 to 1% polyhalite, dispersed and blebs. (3,4,7)

**Remarks**

- Watson drill.
- AW Bom: NW double tube barrel 6" diameter barrel used to start hole. Roof only 6-1/2' high to accommodate NX core barrel on drill.
- Drill Time: 7-1/2 hours.
- Dry hole; no gas.
- Run 5. Core broken in licks from 14.5 to 17.2'.
- Run 7. Core broken up last 2' of run in clear halite.
<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>RECOVERY</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>26.0</td>
<td>4.4</td>
<td>4.4</td>
<td>100</td>
<td>18.5'-23.8' HALITE: Clear to grayish brown (STR 3/2) fine to coarsely crystalline. &lt;1% clay, predominantly brown with some gray. Brown break at 19.8'. Coarse crystalline from 22.9', 3/4'' anhydrite layer with grayish-brown clay break at 23.2'. Trace of dispersed polyhalite. (17)</td>
<td>Run 8. Broken up last 3'.</td>
</tr>
<tr>
<td>8</td>
<td>30.4</td>
<td>4.4</td>
<td>4.4</td>
<td>100</td>
<td>23.8'-27.5' HALITE: Clear, coarsely crystalline. Scattered irregular anhydrite laminae. (1, 8)</td>
<td>Run 9. Core broken up last 2' of run but within one unit.</td>
</tr>
</tbody>
</table>
| 9          | 35.1        | 4.7              | 4.7      | 100     | 27.5'-29.2' ANGULARHAUS HALITE: Clear to medium brown (STR 4/4) fine to coarsely crystalline. <1% to 3% brown intercrystalline clay, <1/2% dispersed polyhalite. Trace of gray clay. (12) | |}

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>RECOVERY</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
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<tbody>
<tr>
<td>10</td>
<td>39.3</td>
<td>4.2</td>
<td>4.2</td>
<td>100</td>
<td>29.2'-31.4' HALITE: Clear, coarsely crystalline.</td>
<td>Run 10 &amp; 11. Core broken up 38'-39.6' all in clear halite.</td>
</tr>
</tbody>
</table>
| 11         | 44.1        | 4.8              | 4.8      | 100     | 31.4'-32.4' HALITE: Clear with some moderate brown (STR 4/4, 3/4) coarse crystalline <1% brown clay. (8) | |}

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>RECOVERY</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
</table>
| 12         | 51.6        | 3.0              | 3.0      | 100     | 32.4'-35.3' ANGULARHAUS HALITE: Clear to moderate brown (STR 4/4, 3/4) medium to coarsely crystalline. <1% to 4% brown clay. (10, 16) | |}

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>RECOVERY</th>
<th>PROFILE</th>
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<tr>
<td>13</td>
<td>51.6</td>
<td>4.5</td>
<td>4.5</td>
<td>100</td>
<td>35.3'-36.4' HALITE: Clear to moderate reddish orange (10R 6/6 and light gray (87) fine to medium crystalline &lt;1/2% dispersed polyhalite and &lt;1% gray clay. (9)</td>
<td>Run 12. Some broken core last 1.5'.</td>
</tr>
</tbody>
</table>
| 14         | 55.5        |                  |          |         | 36.4'-37.1' ANHYDRITE: Very light to light gray microcrystalline anhydrite. Scattered halite growths. Some horizontal laminae 1/2' brown clay seam at 36.4'. | |}

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
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<th>RECOVERY</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
</table>
| 15         | 55.5        |                  |          |         | 37.1'-40.6' HALITE: Clear mottled with moderate reddish orange (10R 6/6) coarse crystalline. <1% polyhalite blebs. Scattered white very light gray anhydrite/magnesite? (1, 2) | |}

<table>
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<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>RECOVERY</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
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<tbody>
<tr>
<td>16</td>
<td>55.5</td>
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<td></td>
<td>40.6'-43.0' HALITE: Clear with some moderate brown (STR 3/4, 4/4) and mottled with moderate reddish orange (10R 4/6) fine to coarsely crystalline. &lt;1% polyhalite. &lt;1% clay. (2, 17)</td>
<td></td>
</tr>
<tr>
<td>RUN NUMBER</td>
<td>DEPTH (ft.)</td>
<td>LENGTH CORE RUN</td>
<td>% RECOVERED</td>
<td>DESCRIPTION</td>
<td>REMARKS</td>
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<td>43.0'-44.4' ARGILLACEOUS HALITE: Clear to moderate brown (5TH 3/4; 4/4) finely crystalline. &lt;1 to 3% brown intercrystalline clay. (10)</td>
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<td>44.4'-46.0' HALITE: Clear, finely crystalline. &lt;1% polyhalite blebs. (2)</td>
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<td>46.0'-51.35' ARGILLACEOUS HALITE: Clear to moderate brown (5TH 3/4; 4/4) finely to coarsely crystalline. &lt;1 to 3% brown clay, intercrystalline and scattered blebs. 3/8&quot; brown clay seam at 51.0'. (12,16)</td>
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<td></td>
<td>51.35'-51.6' HALITE: Clear, finely crystalline. &lt;1% polyhalite blebs. (2)</td>
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WIPP GEologic Drill Log

INSTRUMENT TYPE & NUMBER:__
HOLE TYPE/SIZE:__
NX CORE:__
BORING NO.: 5H-20

LOCATION: N1100 DRIFT; FLOOR

STATION N1105 = E206 = COLLAR ELEV. 1306.2 = DIRECTION OF DRILLING DOWN

MINe COORDINATES: N10 794.2, E7101.7 = DEPTH OF borehole 51.1'

DRILLING METHOD: ROTARY/AIR = DRILL MAKE/MODEL: WATSON

DATE STARTED: 1/31/89 (DAY) = DATE COMPLETED: 1/31/84 (DAY)
LOGGED BY: J. E. GALLERANI = DATE: 3/5/84

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<th>% RECOVERED</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
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<td>0.9'-2.05' ARGILLACEOUS HALITE: Clear to moderate brown (6&quot;) core, medium to coarsely crystalline. &lt;1 to 4% iron oxide, intercrystalline. Break at 0.7'. (10)</td>
<td>Watson Drill. AW-Beds. 3' single tube barrel to start hole from 0.0' to 2.0'. Then 5' NX double tube barrel. Drill time: 5 hours. Dry; No gas.</td>
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<td>2.3</td>
<td>2.3</td>
<td>2.3</td>
<td>100</td>
<td></td>
<td>2.05'-3.15' HALITE: Clear, medium to coarsely crystalline. ≤1% clay. Brown clay to 2.4&quot;, then gray. &lt;1/2% polyhalite. (2, 3)</td>
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<td>4.6</td>
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<td>4.0</td>
<td>100</td>
<td></td>
<td>8.15'-10.4' POLYHALITIC HALITE: Clear to moderate reddish orange (10&quot;) core, coarsely crystalline. &lt;1 to 4% polyhalite. (7)</td>
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<tr>
<td>8.6</td>
<td>10</td>
<td>5.0</td>
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<td>100</td>
<td></td>
<td>10.4'-12.0' MB-119: From 10.4'-11.15' mixture of moderate reddish orange halite and anhydrite. From 11.15', predominantly white to light gray (8&quot;) to medium gray (8&quot;) micocrystalline anhydrite, some halite intergrowths. Tightly welded upper contact. Up to 1/2&quot; gray, hard clay at lower contact dipping 25° S. Halite laminae just above clay. Anhydrite is laminated. Near-horizontal, irregularly closed hairline fractures in core 12.2'-12.5'.</td>
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<td>4.1</td>
<td>93.2</td>
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<td>13.0'-13.15' HALITE: Clear to moderate reddish orange (10&quot;) core, medium to coarsely crystalline. ≤1% polyhalite ≤1% clay and some brown clay. Break at 15.3'. (9, 17)</td>
<td></td>
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<tr>
<td>18.0</td>
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<td>4.9</td>
<td>4.5</td>
<td>91.8</td>
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<td>17.15'-28.7' POLYHALITIC HALITE: Clear to moderate reddish orange (10&quot;) core, medium to coarsely crystalline. &lt;1 to 4% polyhalite increasing content. 18.0'-20.7'. Gray clay to 1/16&quot; at 20.7'. Some anhydrite mixed with halite 20.4'-20.7'. (3, 4, 7)</td>
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<tr>
<td>22.9</td>
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<td>4.9</td>
<td>98</td>
<td></td>
<td>20.7'-22.85' HALITE: Clear mottled with moderate reddish orange and gray medium to coarsely crystalline. ≤1% polyhalite, ≤1% gray intercrystalline clay. Clear from 21.5'-21.9'. (9)</td>
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<td>RECOVERY %</td>
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22.85'-29.0' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/4) coarsely crystalline. <1 to 3% polyhalite. <1% gray intercrystalline clay. Some anhydrite 28.35'-29.95'.

1, 4, 7

<table>
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29.0'-32.2' HALITE: Clear with some moderate reddish orange (10R 6/4) medium to coarsely crystalline. <1/2% gray intercrystalline clay. <1/2% dispersed polyhalite.

2, 9

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<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>RECOVERY %</th>
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32.2'-36.8' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/4) coarsely crystalline. <1 to 3% polyhalite. <1% polyhalite from 34'-35.05'. Scattered anhydrite stringers below 35'.

13, 4, 7

<table>
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<tr>
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<th>LENGTH CORE RUN</th>
<th>RECOVERY %</th>
<th>RECOVERED PROFILE</th>
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<th>REMARKS</th>
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36.8'-37.8' HALITE: Clear, coarsely crystalline. <1% polyhalite. Scattered anhydrite stringers. Mixture of halite and some anhydrite at 37.1' to 37.2'.

2

<table>
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<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
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</table>

37.3'-38.2' ANHYDRITE: White to light gray (W'). Microminerals. Growth of halite especially common to 37.15'. Hard gray clay parting at 38.3'.

<table>
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<tr>
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<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>RECOVERY %</th>
<th>RECOVERED PROFILE</th>
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<td>3.5</td>
<td>100</td>
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38.3'-42.6' HALITE: Clear, some light gray (W') to medium with some coarsely crystalline. <1% gray clay, locally up to 2%. Some brown clay present. Grey break at 39.25'. Brown colored break at 39.6'.

9, 11

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<th>LENGTH CORE RUN</th>
<th>RECOVERY %</th>
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</table>

42.6'-45.8' HALITE: Clear, coarsely crystalline. <1/2% gray intercrystalline clay and polyhalite blebs. Break at 43.45'.

2, 11

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<td>100</td>
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</tbody>
</table>

45.8'-47.6' HALITE: Clear to grayish brown, medium to coarsely crystalline. <1% brown clay, trace of gray. <1% polyhalite.

17

<table>
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<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>RECOVERY %</th>
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<tbody>
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<td>3.5</td>
<td>100</td>
<td>X</td>
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</tr>
</tbody>
</table>

47.6'-51.1' HALITE: Clear medium to coarsely crystalline. <1% dispersed gray clay and polyhalite.

9
## WIPP
### GEologic Drill Log

**Location:** N1429 DRIFT: ROOF

**Station:** N1421 E786 +
**Collar Elev:** 1331.0
**Direction of Drilling:** VERTICAL UP

**Mine Coordinates:** N11 109.1 E7689.3
**Depth of Borehole:** 50.4'

**Drilling Method:** ROTARY/AIR
**Drill Make/Model:** WATSON

**Date Started:** 2/26/84 (Swing)
**Date Completed:** 2/27/84 (Swing)
**Sheet Logged By:** D.F. GALLERANTI
**Date:** 3/6/84

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<tr>
<td>1.0</td>
<td>2.3</td>
<td>2.3</td>
<td>100</td>
<td>0.0'-6.7' HALITE: Clear with some moderate reddish orange (10E 6/6); medium to coarsely crystalline. &lt;1% polyhalite and &lt;1/2% intercrystalline grey clay. 1/2&quot; gray clay seam at 6.7'. [3, 9]</td>
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</tr>
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<td>1.5</td>
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<tr>
<td>2.0</td>
<td>10.0</td>
<td>4.6</td>
<td>98</td>
<td>6.7'-11.6' HALITE: Clear, coarsely crystalline. Scattered white stringers of anhydrite/magnesite. [1]</td>
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</tr>
<tr>
<td>3.0</td>
<td>15.0</td>
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<tr>
<td>4.0</td>
<td>20.0</td>
<td>3.0</td>
<td>90</td>
<td>11.0'-11.8' HALITE: Clear to light gray (N7) coarsely crystalline, &lt;1% intercrystalline grey clay. [11]</td>
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<td>4.6</td>
<td>25.0</td>
<td>4.6</td>
<td>100</td>
<td>11.6'-13.1' HALITE: Clear, medium to coarsely crystalline. &lt;1/2% dispersed polyhalite and grey clay. [1, 9]</td>
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<tr>
<td>5.0</td>
<td>30.0</td>
<td>4.1</td>
<td>100</td>
<td>13.1'-17.9' HALITE: Clear to light gray (N7) and locally grayish brown. Coarsely crystalline. None to &lt;1% intercrystalline grey clay. Trace brown clay at 17.3'-17.5'. Clear halite at 13.1'-14.4'. [11]</td>
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<tr>
<td>6.0</td>
<td>40.0</td>
<td>4.6</td>
<td>100</td>
<td>17.9'-19.2' ARAGONITE HALITE: Clear to moderate brown (5IR 4/4), medium to coarsely crystalline. &lt;1 to 3% intercrystalline brown clay, trace of gray. Break at 18.95'. [12, 17]</td>
<td></td>
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<tr>
<td>6.5</td>
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<tr>
<td>7.0</td>
<td>50.0</td>
<td>4.6</td>
<td>100</td>
<td>19.2'-19.8' ANHYDRITE: White to light gray (N7) microcrystalline anhydrite to 19.6'. Then mixture of polyhalite halite and anhydrite. Irregular laminae in some of the anhydrite. Up to 3/4&quot; hard brown clay at 19.2'. Some core grinding noted. [18]</td>
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**Boring No.:** DH-21
### Waste Isolation Pilot Plant (WIPP)

#### Sheet 2 of 2

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<tr>
<th>Run Number</th>
<th>Depth (ft.)</th>
<th>Core Run</th>
<th>% Recovered</th>
<th>Profile</th>
<th>Description</th>
<th>Remarks</th>
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<tbody>
<tr>
<td>7</td>
<td>28.0</td>
<td>4.7</td>
<td>4.2</td>
<td>X</td>
<td>26.0' - 27.0' Halite: Clear to light moderate reddish orange (10R 6/6). Fine to medium, some coarsely crystalline. &lt;1% dispersed polyhalite.</td>
<td>Run 7. Much of the core is broken up.</td>
</tr>
<tr>
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<td></td>
<td></td>
<td>X</td>
<td>27.0' - 29.3' Halite: Clear, mottled with moderate brown (5YR 4/4) and dark reddish brown (10R 3/4). Coarsely crystalline. &lt;1/2% polyhalite and &lt;1% brown clay. (2, 8)</td>
<td>Run 8. Biscuit, broken core in part of run.</td>
</tr>
<tr>
<td>8</td>
<td>30.0</td>
<td>5.0</td>
<td>4.7</td>
<td>X</td>
<td>29.3' - 31.1' ABRIGEIGEOUS HALITE: Clear to moderate brown (5YR 4/4) and dark reddish brown (10R 3/4). Medium to coarsely crystalline. &lt;1 to 4% brown clay, intercrystalline and breaks throughout. (15)</td>
<td>Run 9. Biscuit, broken core in most of run.</td>
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<td>9</td>
<td>35.0</td>
<td>4.7</td>
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<td>X</td>
<td>31.1' - 33.0' Halite: Clear to moderate brown (5YR 4/4) and light moderate reddish orange (10R 6/6). Fine to coarsely crystalline. &lt;1/2% dispersed polyhalite. &lt;1% intercrystalline brown clay. Mostly brown clay mixed with some halite at 32.7-32.8. Break at 33.0'. (15, 17)</td>
<td>Run 10, 11, 12. Biscuit in coarse crystalline halite.</td>
</tr>
<tr>
<td>10</td>
<td>40.0</td>
<td>4.3</td>
<td>4.3</td>
<td>X</td>
<td>33.0' - 41.35' POLDHALITIC HALITE: Clear mottled with moderate reddish orange (10R 6/6), moderate reddish brown (10R 6/6), and moderate brown (5YR 4/6). Coarsely crystalline. &lt;1 to 3% polyhalite blebs and patches. &lt;1/2% brown intercrystalline and intracrystalline clay. (4, 5, 7). Mostly brown clay with some halite at 31.7-37.95. &lt;3% clay at 36.83-38.65'. (10)</td>
<td>Run 11. Biscuit, broken core in coarse crystalline halite.</td>
</tr>
<tr>
<td>11</td>
<td>46.0</td>
<td>4.0</td>
<td>4.0</td>
<td>X</td>
<td>41.35' - 42.0' ABRIGEIGEOUS HALITE: Moderate brown (5YR 3/4; 4/4) to reddish brown (10R 3/4), medium crystalline. &lt;3 to 10% brown clay. (10, 16)</td>
<td>Run 11. Biscuit, broken core in coarse crystalline halite.</td>
</tr>
<tr>
<td>12</td>
<td>50.4</td>
<td>4.4</td>
<td>4.4</td>
<td>X</td>
<td>42.0' - 44.9' Halite: Clear mottled with moderate reddish orange/brown (10R 6/6; 4/6) polyhalite blebs and patches. Coarsely crystalline. &lt;1% polyhalite. 1/2&quot; anhydrite layer at 42.2'. No clay. This core is similar to some found from 33-35' but less polyhalite. (2-4)</td>
<td>Run 12. Biscuit, broken core in coarse crystalline halite.</td>
</tr>
<tr>
<td></td>
<td>55.0</td>
<td></td>
<td></td>
<td>X</td>
<td>44.9' - 48.6' Halite: Clear to moderate brown (5YR 3/4; 4/4), coarsely crystalline. &lt;1 to 2% brown intercrystalline and intracrystalline clay. &gt;10% brown clay at 46.0-46.3. Break at 46.4'. (10)</td>
<td>Run 12. Biscuit, broken core in coarse crystalline halite.</td>
</tr>
<tr>
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<td>55.0</td>
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<td>48.6' - 50.4' Halite: Clear, some moderate brown (5YR 4/4), medium to coarsely crystalline. &lt;1% brown, trace gray, intercrystalline clay. &lt;1/2% polyhalite. (8)</td>
<td>Run 12. Biscuit, broken core in coarse crystalline halite.</td>
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## WIPP
### WASTE ISOLATION PILOT PLANT

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<tr>
<th>INSTRUMENT TYPE &amp; NUMBER</th>
<th>HOLE TYPE/SIZE</th>
<th>NX CORE</th>
<th>BORING NO.</th>
<th>DH-22</th>
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<th>STATION</th>
<th>COLLAR ELEV.</th>
<th>DIRECTION OF DRILLING</th>
<th>MINE COORDINATES</th>
<th>DEPTH OF BOREHOLE</th>
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<td>11921.5</td>
<td>785.5</td>
<td>VERTICAL DOWN</td>
<td>N11.109.2 E 7680.9</td>
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<th>DATE COMPLETED</th>
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<td>2/25/84 (SWING)</td>
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<tr>
<td>J. E. GALLERANI</td>
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<th>LENGTH CORE RUN</th>
<th>RECOVERY</th>
<th>% RECOVERED</th>
<th>PROFILE</th>
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<td>0.0-5.1</td>
<td>4.8</td>
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<td>X</td>
<td>HALITE: Clear, slightly crystalline. &lt;1% gray intercrystalline clay locally. &lt;1/2% polyhalite. (1)</td>
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<td>2</td>
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<td>HALITE: Clear to light and medium gray (N7, M1) coarsely crystalline. &lt;1% gray intercrystalline clay. Steeply dipping, irregular break at 7.65'-7.8'. (11)</td>
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<td>HALITE: Clear to light moderate reddish orange (10R 6/6), coarsely crystalline. &lt;1% polyhalite, blebs and dispersed. (3)</td>
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<td>HALITE: Clear to light gray (N7), some moderate reddish orange (10R 6/6), coarsely crystalline. &lt;1% gray intercrystalline clay and &lt;1/2% dispersed polyhalite. (9)</td>
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<td>5</td>
<td>15.0-21.5</td>
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<td>79</td>
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<td>HALITE: Clear, coarsely crystalline. No blebs &lt;1% polyhalite blebs. (1/2% gray intercrystalline clay locally. (1,2)</td>
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<td>6</td>
<td>21.5-24.3</td>
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<td>NX-139: From 21.55’ to 23.10’ core shows “smalwell” pattern a mixture of anhydrite and halite. Light trace of gray clay on upper contact which dips 35°. Predominantly halite from 23.10'-23.2'. Then mostly gray (N7) to white anhydrite with scattered halite growths irregular laminae. Several haline, tightly closed fractures at 22.9'-24.15' L, horizontal halite laminae at 23.2' 2. Trace of gray clay at 24.3'.</td>
<td>Run 5. Core spring worn out. Left 1st core in hole.</td>
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<td>HALITE: Clear to light gray (N7), medium to coarsely crystalline. &lt;1% gray intercrystalline clay. &lt;1/2% polyhalite. Break at 25.2'.</td>
<td>Run 6. Broken up 17.5’ - 18.5’.</td>
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Run 13. Broken up upper part of run.
## WIPP WASTE ISOLATION PILOT PLANT

### GEOLOGIC DRILL LOG

**INSTRUMENT TYPE & NUMBER**
- Hole Type/Size: N/A
- Core Boring No.: DH-23

**LOCATION**
- N1100 DRIFT; ROOF

**STATION**
- N1112' E78° 2′- COLLAR ELEV. 1328.03′

**MINE COORDINATES**
- N10°799.2′ E7579.6′

**DEPTH OF BOREHOLE**
- 510′

**DRILLING METHOD**
- Rotary/Air

**DRILL MAKE/MODEL**
- WATSON

**DATE STARTED**
- 2/13/84 (SWING)

**DATE COMPLETED**
- 2/15/84 (SWING)

**SHEET**
- 1 OF 2

**LOGGED BY**
- J.E. GALLERANI

**DATE**
- 3/5/84

---

### Table

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<tr>
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<th>DEPTH (ft)</th>
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### DESCRIPTION

- **0.0'-1.2' HALLITE:** Clear to light moderate reddish orange (10R 6/6), fine to coarsely crystalline. <1/2" gray clay. Break at 0.25". [2, 9]
- **1.2'-1.9' ANHYDRITE a:** White to medium light gray (6G) microcrystalline anhydrite. Growth of halite within. Gray clay seam <1/16" at 1.2'.
- **1.9'-6.25' POLYHALITIC HALITE:** Clear to moderate reddish orange (10R 6/6), coarsely crystalline. <1 to 3% polyhalite. [3]
- **6.25'-11.05' HALITE:** Clear, some moderate brown (5YR 4/4), coarsely crystalline, some fine to medium Brown and gray clay <1%. Brown clay seam <1/16" with some anhydrite at 13.05". [9, 17]
- **11.05'-14.25' HALITE:** Clear, coarsely crystalline, scattered white stringers of anhydrite/magnesite. [11]
- **14.25'-19.3' HALITE:** Clear to moderate brown (5YR 4/4), medium to coarsely crystalline. Some to 2% brown clay. <1 to 2% clay from 14.25-15.7' and 18.5-19.3'. Clear from 17.0-18.5'. [8, 10]
- **19.3'-23.5' ARGENCALDO HALITE:** Clear to moderate brown (5YR 4/4), coarsely crystalline. Some fine to medium. <1 to 4% brown clay. [8, 10]
- **23.5'-24.4' ANHYDRITE:** White to very light gray (NH) microcrystalline anhydrite. Scattered polyhalitic halite growth, especially common 24-24.4'. 3/4" brown clay seam at 23.5'.

### REMARKS

- N/A Double tube core barrel.
- AW rods. Watson drill mounted on single post jacked to floor/roof.
- Drilling time: 7 hours.
- No gas. Dry hole.

Core recovery difficult to measure because core is sometimes broken up into 1/2" to 1-1/2" discs and gravel size pieces.

- Run 2. Broken up last 0.6'.
- Run 3. Broken up core/disco.
- Run 6. Broken up 12-14".
- Run 7. Zones of broken core.
- Run 8. Broken up last 0.6' of run.
- Run 10. Some broken zones above and below anhydrite.
<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>% RECOVERED</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
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<tr>
<td>10</td>
<td>25</td>
<td>4.25</td>
<td>100</td>
<td>X</td>
<td>24.4'-28.15' HALITE: Clear, some moderate reddish orange, coarsely crystalline. &lt;1% polyhalite blebs. 1/2&quot; white anhydrite layer at 25.1'. Up to 3% polyhalite with trace clay at 27.45'-27.95'.</td>
<td>Run 13. Broken zones beyond 26.7'.</td>
</tr>
<tr>
<td>11</td>
<td>4.3</td>
<td>4.3</td>
<td>100</td>
<td>X</td>
<td>28.15'-31.45' HALITE: Clear to moderate brown (5YR 6/4) and moderate reddish orange (10R 6/6). Coarsely crystalline, some fine. Brown clay &lt;1 to 2%, locally, &lt;1 to 3% polyhalite blebs and patches.</td>
<td>Pen 15. Broken up last 22&quot; of run.</td>
</tr>
<tr>
<td>12</td>
<td>30</td>
<td>4.25</td>
<td>100</td>
<td>X</td>
<td>31.45'-33.2' HALITE: Clear, coarsely crystalline. &lt;1% brown clay blebs.</td>
<td>Contact at 28.15 is approximate due to broken core in Run 11.</td>
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<tr>
<td>13</td>
<td>39.4</td>
<td>4.4</td>
<td>100</td>
<td>X</td>
<td>33.2'-36.5' ARGILLACEOUS HALITE: Clear to moderate brown (5YR 6/4) and some moderate reddish orange (10R 6/6). Coarsely crystalline. &lt;1 to 3% brown clay, intercrystalline and breaks. 1/4&quot; brown clay seam at 33.8'. ≤1/16&quot; clay partings at 35.4' and 36.5'.</td>
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<td>14</td>
<td>40.2</td>
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<td>98</td>
<td>X</td>
<td>36.5'-38.1' HALITE: Clear to moderate reddish orange (10R 6/6), coarsely crystalline. &lt;1% polyhalite blebs and patches. Scattered anhydrite stringers.</td>
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<tr>
<td>15</td>
<td>43.4</td>
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<td>100</td>
<td>X</td>
<td>38.1'-41.65' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6), coarsely crystalline. &lt;1 to 3% polyhalite blebs and patches. &lt;1/2&quot; grey clay.</td>
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<td>16</td>
<td>47.8</td>
<td>3.2</td>
<td>100</td>
<td>X</td>
<td>41.65'-42.9' ARGILLACEOUS HALITE: Clear to moderate brown (5YR 4/4), coarsely crystalline, some medium. &lt;1 to 3% brown clay. 1&quot; brown clay seam with some halite at 42.7'.</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>51.0</td>
<td></td>
<td></td>
<td>X</td>
<td>42.9'-44.3' ANHYDRITE: Clear, some moderate reddish orange (10R 6/6), coarsely crystalline. &lt;1% polyhalite.</td>
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<td></td>
<td>X</td>
<td>44.3'-46.2' HALITE: Clear to moderate reddish orange (10R 6/6) and moderate brown (5YR 1/4). Coarsely crystalline to 44.9'. Fine to medium. &lt;1% brown and grey clay, &lt;3% dispersed polyhalite. &lt;1/4&quot; brown clay seam at 46.05'. Anhydrite at 46.05-46.2'.</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>52.2</td>
<td></td>
<td></td>
<td>X</td>
<td>46.2'-48.25' HALITE: Clear, coarsely crystalline. &lt;1% moderate reddish orange polyhalite blebs.</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>51.0</td>
<td></td>
<td></td>
<td>X</td>
<td>48.25'-51.0' HALITE: Clear to moderate reddish brown (10R 4/4) coarsely crystalline. &lt;1 to 2% brown clay and ≤1% polyhalite blebs.</td>
<td></td>
</tr>
</tbody>
</table>
**WIPP**

**WASTE ISOLATION PILOT PLANT**

**GEOLOGIC DRILL LOG**

**INSTRUMENT**

**TYPE & NUMBER**

**HOLE TYPE/SIZE**

**MY CORE**

**BORING NO.**

**DH-24**

**LOCATION**

**N110C DRIFT; FLOOR**

<table>
<thead>
<tr>
<th>STATION</th>
<th>COLLAR ELEV.</th>
<th>DIRECTION OF DRILLING</th>
<th>MINE COORDINATES</th>
<th>DEPTH OF BOREHOLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>N 1112</td>
<td>+ E 781</td>
<td>DOWN – VERTICAL</td>
<td>M10.794,2 E2679.8</td>
<td>49.4'</td>
</tr>
</tbody>
</table>

**DRILLING METHOD**

**ROTARY/AIR**

**DRILL MAKE/MODEL**

**WATSON**

**DATE STARTED**

2/15/84 (SWING)

**DATE COMPLETED**

2/16/84 (DAY)

**SHEET**

**LOGGED BY**

J.E. GALLERANI

**DATE**

3/5/84

**1 OF 2**

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (Ft.)</th>
<th>LENGTH CORE RUN</th>
<th>RECOVERY</th>
<th>% RECOVERED</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.0</td>
<td>1.6</td>
<td>1.5</td>
<td>94</td>
<td>X</td>
<td>0.0'-3.3' HALITE: Clear, coarsely crystalline. &lt;1/2% polyhalite blebs.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>1.6</td>
<td>1.5</td>
<td>1.5</td>
<td>100</td>
<td>X</td>
<td>3.3'-5.2' HALITE: Clear, coarsely crystalline. &lt;1/2% gray clay and polyhalite blebs.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>3.1</td>
<td>5</td>
<td>2.9</td>
<td>100</td>
<td>X</td>
<td>5.2'-7.15' HALITE: Clear to light gray (N7) medium to coarsely crystalline. &lt;1% gray clay, locally up to 2%. Breaks and intercrystalline. Breaks at 6.05': 6.81', &lt;1/2% polyhalite.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>6.0</td>
<td>4.5</td>
<td>4.5</td>
<td>100</td>
<td>X</td>
<td>7.15'-10.7' HALITE: Clear to moderate reddish orange (10R 6/4), coarsely crystalline blebs and dispersed increasing content from 9.1' to 10.7'. Gray clay break at 10.75'.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>10.5</td>
<td>5.3</td>
<td>3.6</td>
<td>68</td>
<td>X</td>
<td>10.7'-12.6' HALITE: Clear to light gray (N7) and light bluish gray (18 7/1) medium to coarsely crystalline. &lt;1% gray intercrystalline clay. Break at 10.9'.</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>15.8</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
<td>12.6'-20.0' HALITE: Clear, coarsely crystalline. 1/2% polyhalite blebs. No &lt;1% gray intercrystalline clay. Break at 20.75'.</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>20.8</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
<td>20.8'-24.0' MB-139: From 20.8' to 22.6' is mixture of anhydrite and halite. &quot;Swallowtail&quot; pattern. From 22.4 to 24.0' is white to medium gray (N8) microcrystalline anhydrite. Scattered halite growths. Irregular laminae in core. Tightly closed hairline fractures in core from 23.5' to 24.0'. Up to 3/4' gray clay.</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>24.0</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
<td>24.0'-28.3' HALITE: Clear with some moderate reddish orange (10R 6/6) and light gray (N7), medium to coarsely crystalline, some fine. &lt;1/2% dispersed polyhalite and &lt;1% gray intercrystalline clay. Breaks at 24.4': 28.3'.</td>
<td></td>
</tr>
</tbody>
</table>

**BORING NO.**

DH-24
<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>CORE RECOVERY</th>
<th>% RECOVERED</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>25.8</td>
<td>7</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>78.3'-31.8' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6), coarsely crystalline, &lt;1 to 3% polyhalite. Up to 1&quot; anhydrite layer in core.</td>
<td>Run 9. Broked up last 1/2 of core. Probable loss from 35.1'-34.2'.</td>
</tr>
<tr>
<td>31.8'-34.2' HAPLITE: Clear with some light gray (N7), medium to coarsely crystalline &lt;1% gray intercrystalline clay. &lt;1/2% dispersed polyhalite. Core broke up in this section. Some core loss.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30.7</td>
<td>9</td>
<td>3.5</td>
<td>3.5</td>
<td>100</td>
<td>34.2'-35.2' HAPLITE: Clear, coarsely crystalline. &lt;1% polyhalite blebs.</td>
<td></td>
</tr>
<tr>
<td>35.2'-38.4' POLYHALITIC HAPLITE: Clear to moderate reddish orange (10R 6/6), medium to coarsely crystalline, &lt;1 to 3%, locally to 5%, polyhalite. &lt;1/2% gray clay.</td>
<td>Run 11. Measured rods 42.4&quot;. Probable loss within last 2' of run.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>38.4'-43.0' HAPLITE: Clear with some light moderate reddish orange (10R 6/6) fine to coarsely crystalline. &lt;1/2% dispersed polyhalite and gray clay. 5.5' core loss within this zone.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>39.6</td>
<td>11</td>
<td>3.0</td>
<td>2.5</td>
<td>93</td>
<td>43.0'-44.4' POLYHALITIC HAPLITE: Clear to moderate reddish orange (10R 6/4) coarsely crystalline. &lt;1 to 3% polyhalite.</td>
<td></td>
</tr>
<tr>
<td>42.4</td>
<td>12</td>
<td>5.3</td>
<td>5.3</td>
<td>100</td>
<td>44.4'-48.25' HAPLITE: Clear to moderate reddish orange (10R 6/4) coarsely crystalline. &lt;1% polyhalite blebs, patches and dispersed. Predominantly polyhalite 47.35'-47.45'.</td>
<td></td>
</tr>
<tr>
<td>48.25'-48.6' ANHYDRITE: Very light gray (N6) to medium light gray (10N) micocrystalline anhydrite. Scattered halite growths. Up to 1&quot; clear, coarsely crystalline halite from 48.3'-48.4'. &lt;1/16&quot; gray clay at 48.6'. Some core breaking evident.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>48.6'-49.4' HALITE: Clear to light gray (N7) medium to coarsely crystalline. &lt;1 to 2% gray clay. Breaks at 48.7' and 49.0'.</td>
<td>Note: Overall recovery below 95%. Replacement hole DH-24A drilled later. Refer to the drill leg for DH-24A.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# WIPP Waste Isolation Pilot Plant

## Geologic Drill Log

### Instrument Type & Number

**Hole Type/Size**: NY Core

**Boring No.**: DH-29A

**Location**: N1100 Drift - Floor

### Station & Elevation

<table>
<thead>
<tr>
<th>Station</th>
<th>Elevation</th>
</tr>
</thead>
<tbody>
<tr>
<td>N1112</td>
<td>6780</td>
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### Mine Coordinates

<table>
<thead>
<tr>
<th>X</th>
<th>Y</th>
<th>Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>N10793.08</td>
<td>E7678.59</td>
<td>Z199.49</td>
</tr>
</tbody>
</table>

### Depth of Borehole

- **Vertical**: 504 feet

### Drilling Method

**Method**: Rotary/Air

**Make/Model**: Watson

### Date Started

- **3/21/84 (Swing)**

### Date Completed

- **3/22/84 (Swing)**

### Sheet

- **1 of 2**

### Run Number & Depth

<table>
<thead>
<tr>
<th>Run Number</th>
<th>Depth (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>2.2</td>
</tr>
<tr>
<td>3</td>
<td>5.0</td>
</tr>
<tr>
<td>4</td>
<td>10.1</td>
</tr>
<tr>
<td>5</td>
<td>15.2</td>
</tr>
<tr>
<td>6</td>
<td>20.3</td>
</tr>
<tr>
<td>7</td>
<td>25.4</td>
</tr>
</tbody>
</table>

### Length & Recovery

<table>
<thead>
<tr>
<th>Run</th>
<th>Length</th>
<th>Core Run Length</th>
<th>Recovery</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2.2</td>
<td>2.0</td>
<td>91%</td>
</tr>
<tr>
<td>2</td>
<td>2.8</td>
<td>2.8</td>
<td>100%</td>
</tr>
<tr>
<td>3</td>
<td>5.1</td>
<td>5.1</td>
<td>100%</td>
</tr>
<tr>
<td>4</td>
<td>5.1</td>
<td>5.1</td>
<td>100%</td>
</tr>
<tr>
<td>5</td>
<td>5.1</td>
<td>4.9</td>
<td>94%</td>
</tr>
<tr>
<td>6</td>
<td>5.1</td>
<td>5.1</td>
<td>100%</td>
</tr>
</tbody>
</table>

### Description

- **0.0'-0.1' Fill**: 0.0" to 0.1" fill.

- **0.1'-3.1' Halite**: Clear to light moderate reddish orange (10E 6/6) coarsely crystalline. < 1.5% dispersed polysilicate. [1, 7]

- **3.3'-7.4' Halite**: Clear to medium gray (N5); coarsely crystalline. < 1% gray clay. [1, 7]

- **7.4'-10.2' Halite**: Clear to moderate reddish orange (10R 6/6); coarsely crystalline. < 10% polysilicate. Increasing content 9.2" to 10.2". [2, 7]

- **10.2'-15.4' Halite**: Clear to medium light gray (6); light bluish gray (5B-4/1) and light moderate reddish orange (10R 6/6). Medium to coarsely crystalline. < 1% gray clay. Breaks at 10.95"; 11.95". < 1/2% polysilicate. [1, 7]

- **15.9'-21.3' Halite**: Clear with some light moderate reddish orange; coarsely crystalline, some medium. < 1/2% gray clay and polysilicate. [2]

- **21.3'-23.95' Wb-139**: From 21.3' to 22.5' is mixture of anhydrite and halite partially in a "swallowtail" pattern. Upper contact dips 20° with tightly closed fracture along base. Below 22.5' is white to light gray (N7) to moderate reddish orange anhydrite scattered halite growths. 1/2" gray clay at lower contact.

- **23.95'-28.6' Halite**: Clear to light moderate reddish orange 10E 6/6 and trace of light gray (N7) medium to coarsely crystalline. < 1% dispersed polysilicate and < 1/2% gray clay. [2, 7, 9]
<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>RECOVERY %</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>25.4</td>
<td>25</td>
<td></td>
<td></td>
<td>X</td>
<td>28.6'-32.3' POLYHALITIC HALITE: Clear to moderate reddish orange (10E 6/6), coarsely crystalline. &lt; 1 to 3% polyhalite. Irregular gray clay break at 32.1'. [2, 4, 7]</td>
<td></td>
</tr>
<tr>
<td>30.4</td>
<td>30</td>
<td></td>
<td></td>
<td>X</td>
<td>32.1'-34.4' POLYHALITIC HALITE: Clear to medium light gray (M6) and light moderate reddish orange (10E 6/6). Medium to coarsely crystalline. &lt; 1/2% dispersed polyhalite and &lt; 1/2% gray clay. [9]</td>
<td></td>
</tr>
<tr>
<td>35.1</td>
<td>35</td>
<td></td>
<td></td>
<td>X</td>
<td>34.4'-40.5' POLYHALITIC HALITE: Clear to moderate reddish orange (10E 6/6), coarsely crystalline with some medium. None to 3% polyhalite. &lt; 1/2% gray clay locally. [2-5, 7]</td>
<td></td>
</tr>
<tr>
<td>40.4</td>
<td>40</td>
<td></td>
<td></td>
<td>X</td>
<td>40.5'-43.7' POLYHALITIC HALITE: Clear to medium light gray (M6) and some light moderate reddish orange (10E 6/6). Medium to coarsely crystalline. &lt; 1/2% gray intercrystalline clay and &lt; 1/2% dispersed polyhalite. [9]</td>
<td>Run 9. Driller increased RPM's on last 2' of run.</td>
</tr>
<tr>
<td>45.3</td>
<td>45</td>
<td></td>
<td></td>
<td>X</td>
<td>43.7'-48.55' POLYHALITIC HALITE: Clear to moderate reddish orange (10E 6/6); coarsely crystalline. &lt;1% polyhalite. &lt; 1/2% gray clay locally. [3, 4, 7]</td>
<td></td>
</tr>
<tr>
<td>50.4</td>
<td>50</td>
<td></td>
<td></td>
<td>X</td>
<td>48.55'-49.2' POLYHALITIC HALITE: Clear, coarsely crystalline, some medium. Scattered white anhydrite stringers. [1, 2]</td>
<td></td>
</tr>
<tr>
<td>55</td>
<td>55</td>
<td></td>
<td></td>
<td>X</td>
<td>49.2'-49.5' ANHYDRITE: White to medium light gray (M6), microcrystalline. Scattered halite growths. Trace of gray clay at 49.5'.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>49.5'-50.4' POLYHALITIC HALITE: Clear with some moderate reddish orange (10E 6/6); medium to coarsely crystalline. &lt; 1% polyhalite. &lt; 1/2% gray clay. [1, 9]</td>
<td></td>
</tr>
</tbody>
</table>
### WIPP Waste Isolation Pilot Plant

**Geologic Drill Log**

**Location**: N1420 Drift at Room C-2 Intersection

### Station Details
- **Station**: N 1322, E 1510
- **Collar Elevation**: 1318.8 m
- **Direction of Drilling**: Vertical
- **Mine Coordinates**: N 11097.72, E 8403.78
- **Depth of Borehole**: 51.8 m

### Drilling Method
- **Drilling Method**: Rotary/Air
- **Drill Make/Model**: Watson Model 750

### Dates
- **Date Started**: 3/29/84 (swing)
- **Date Completed**: 3/30/84 (swing)

### Logging
- **Logged By**: E. Gallerani
- **Date**: 4/18/84

<table>
<thead>
<tr>
<th>Run Number</th>
<th>Depth (ft.)</th>
<th>Length Core Run</th>
<th>Recovery</th>
<th>% Recovered</th>
<th>Profile</th>
<th>Description</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>0</td>
<td>0.0</td>
<td>2.5</td>
<td>2.5</td>
<td>100</td>
<td>6.0'-6.4' HALITE: Clear to light gray (N7) and light moderate reddish orange (10R 6/6), medium to coarsely crystalline. &lt;1% gray clay, &lt;3% dispersed polyhalite. [1, 2]</td>
<td>Watson drill, post-mounted, AN rods, SN-BX double-cube.</td>
</tr>
<tr>
<td>2.3</td>
<td>4.4</td>
<td>4.4</td>
<td>100</td>
<td></td>
<td>X</td>
<td>4.4'-7.0' HALITE: Clear, coarsely crystalline. Scattered white anhydrite stringers. 1/2' grey anhydrite layer at 4.85'. Trace of grey clay at 4.85'. [1]</td>
<td>Drilling time: 5 hrs.</td>
</tr>
<tr>
<td>3.7</td>
<td>3.7</td>
<td>3.7</td>
<td>100</td>
<td></td>
<td></td>
<td>3.7'-2.0' HALITE: Clear to light grey (N7) and some moderate brown (5YR 4/4). Fine to coarsely crystalline. &lt;1% grey clay, &lt;1% brown clay from 4.5'-6.85'. Clay break at 6.4'. [1]</td>
<td></td>
</tr>
<tr>
<td>6.9</td>
<td>6.9</td>
<td>6.9</td>
<td>100</td>
<td></td>
<td></td>
<td>6.9'-12.4' HALITE: Clear, coarsely crystalline. [1]</td>
<td></td>
</tr>
<tr>
<td>10.9</td>
<td>10.9</td>
<td>10.9</td>
<td>100</td>
<td></td>
<td>X</td>
<td>12.4'-15.4' HALITE: Clear to light grey (N7), medium light grey (86), and locally some moderate reddish orange (10R 6/6). Medium to coarsely crystalline. &lt;1% grey clay. 1/2' clay and halite seam at 15'. &lt;1% dispersed polyhalite. [1]</td>
<td></td>
</tr>
<tr>
<td>15.9</td>
<td>15.9</td>
<td>15.9</td>
<td>100</td>
<td></td>
<td></td>
<td>15.9'-16.9' ARGILLACEOUS HALITE: Clear to moderately brown (5YR 4/4), medium to coarsely crystalline. &lt;1 to 3% brown clay, trace gray. [12, 16]</td>
<td>Run 6: Broken up last 12&quot; of run.</td>
</tr>
<tr>
<td>16.9</td>
<td>16.9</td>
<td>16.9</td>
<td>100</td>
<td></td>
<td>X</td>
<td>16.9'-17.4' HALITE: Clear, coarsely crystalline. &lt;1% dispersed polyhalite. [2]</td>
<td></td>
</tr>
<tr>
<td>20.5</td>
<td>20.5</td>
<td>20.5</td>
<td>100</td>
<td></td>
<td>X</td>
<td>17.4'-18.15' ANHYDRITE: White to medium light grey (86), microcrystalline anhydrite. Pailynated. Growth of halite within. Trace of brown clay at 17.4'. Some polyhalite along upper contact.</td>
<td>Run 7: Bailing of core.</td>
</tr>
<tr>
<td>25.2</td>
<td>25.2</td>
<td>25.2</td>
<td>100</td>
<td></td>
<td></td>
<td>18.0'-21.6' HALITE: Clear mottled with moderate reddish orange (10R 6/6), coarsely crystalline. None to 2% polyhalite. [1, 2]</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RUN NUMBER</td>
<td>DEPTH (ft.)</td>
<td>LENGTH</td>
<td>CORE RUN</td>
<td>RECOVERY</td>
<td>% RECOVERED</td>
<td>PROFILE</td>
<td>DESCRIPTION</td>
</tr>
<tr>
<td>------------</td>
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<td>----------</td>
<td>----------</td>
<td>-------------</td>
<td>---------</td>
<td>-------------</td>
</tr>
<tr>
<td>25.9</td>
<td>25</td>
<td>5.4</td>
<td>5.4</td>
<td>100</td>
<td></td>
<td></td>
<td>21.6'-27.4' HALITE: Clear to moderate brown (5YR 4/4), fine to coarse crystalline. &lt;1 to 2% brown clay, locally argillicose. Breaks at 21.6', 23.6', 24.0'. Brown clay seam at 24.05'. Coarsely crystalline 24.1'-27.4'. [8, 10, 12]</td>
</tr>
<tr>
<td>30.5</td>
<td>30</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td></td>
<td></td>
<td>27.4'-29.6' ARSILLACEOUS HALITE: Clear to moderate brown (5YR 4/4), medium to coarse crystalline, some gray. &lt;1 to 2% brown clay, intergranular and scattered breaks. [12]</td>
</tr>
<tr>
<td>36.2</td>
<td>35</td>
<td>0.9</td>
<td>0.9</td>
<td>100</td>
<td></td>
<td></td>
<td>29.6'-34.3' POLYHALITIC HALITE: Clear to moderate reddish orange, coarse crystalline. &lt;1 to 3% polyhalite. Average &lt;2%. [3, 4]</td>
</tr>
<tr>
<td>40.8</td>
<td>40</td>
<td>4.6</td>
<td>4.6</td>
<td>100</td>
<td></td>
<td></td>
<td>34.3'-35.3' HALITE: Clear, coarse crystalline. &lt;1/2% polyhalite blebs. [1]</td>
</tr>
<tr>
<td>42.1</td>
<td>45</td>
<td>1.3</td>
<td>1.3</td>
<td>100</td>
<td></td>
<td></td>
<td>35.3'-38.5' HALITE: Clear with patches of moderate brown (5YR 3/4; 4/4) and traces of moderate reddish orange (10R 6/6). Coarsely crystalline, some medium to 36.4'. &lt;1 to 2% brown clay. 1/2' brown clay seam with some halite at 36.25'. Mostly brown clay mixed with halite from 38.9-39.2'. &gt;30% clay here. ≤1% polyhalite blebs and patches. Clay breaks at 46.6', 46.8', 47.2', 48.5'. Arsillaceous halite at 46.35'-47.2'. [1, 8, 10]</td>
</tr>
<tr>
<td>46.8</td>
<td></td>
<td>4.7</td>
<td>4.7</td>
<td>100</td>
<td></td>
<td></td>
<td>48.5'-49.7' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6), coarsely crystalline. &lt;1 to 3% polyhalite. [3, 4]</td>
</tr>
<tr>
<td>51.8</td>
<td></td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td></td>
<td></td>
<td>49.7'-51.4' HALITE: Clear with some light gray (W7) and moderate reddish orange (10R 6/6). Coarsely crystalline. ≤1% clay and polyhalite blebs and patches. [9, 11]</td>
</tr>
<tr>
<td>RUN NUMBER</td>
<td>DEPTH (ft)</td>
<td>LENGTH</td>
<td>CORE RUN</td>
<td>RECOVERY</td>
<td>% RECOVERED</td>
<td>PROFILE</td>
<td>DESCRIPTION</td>
</tr>
<tr>
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</tr>
<tr>
<td>1</td>
<td>0.0</td>
<td>4.2</td>
<td>4.2</td>
<td>100</td>
<td>X</td>
<td>-</td>
<td>0.2'-6.2' HALITE: Clear, coarsely crystalline, some medium. &lt;1/2% gray intercrystalline clay. &lt;1/2% polyhalite. [1, 2]</td>
</tr>
<tr>
<td>2</td>
<td>1.3</td>
<td>5.3</td>
<td>3.3</td>
<td>100</td>
<td>X</td>
<td>-</td>
<td>6.2'-9.8' HALITE: Clear to medium light gray (8L6), coarsely crystalline. &lt;1% gray clay. Breaks at 7.75', 8.1', 9.6'. [1, 1]</td>
</tr>
<tr>
<td>3</td>
<td>7.5</td>
<td>4.6</td>
<td>4.6</td>
<td>100</td>
<td>X</td>
<td>-</td>
<td>8.8'-12.5' HALITE: Clear to light moderate reddish orange (10R 6/6), coarsely crystalline. &lt;1% polyhalite</td>
</tr>
<tr>
<td>4</td>
<td>12.1</td>
<td>1.4</td>
<td>1.4</td>
<td>85</td>
<td>61</td>
<td>X</td>
<td>12.5'-15.3' HALITE: Clear to medium light gray (8L6) and light moderate reddish orange (10R 6/6). Fine to coarsely crystalline. &lt;1% gray clay. &lt;1/2% polyhalite. [1, 2]</td>
</tr>
<tr>
<td>5</td>
<td>13.5</td>
<td>4.7</td>
<td>4.7</td>
<td>100</td>
<td>X</td>
<td>-</td>
<td>19.3'-21.8' HALITE: Clear with some moderate reddish orange (10R 6/6), coarsely crystalline. None to &lt;1% polyhalite. [1, 2]</td>
</tr>
<tr>
<td>6</td>
<td>23.2</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
<td>X</td>
<td>21.9'-23.1' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6), coarsely crystalline. &lt;1 to 3% polyhalite. Scattered anhydrite. &lt;1/2% gray clay. [4, 6]</td>
</tr>
<tr>
<td>7</td>
<td>25.9</td>
<td>0.85</td>
<td>0.85</td>
<td>61</td>
<td>X</td>
<td>-</td>
<td>23.1'-25.9' WB-139: Very light gray (8G) to medium light gray (8G) anhydrite with scattered halite growths. Anhydrite is partly laminated. 1-1/2&quot; hard gray clay seam at lower contact.</td>
</tr>
<tr>
<td>8</td>
<td>29.8</td>
<td>4.7</td>
<td>4.7</td>
<td>100</td>
<td>X</td>
<td>-</td>
<td>29.8'-32.5' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6) and light gray (8G). Mixture of coarsely crystalline. &lt;1% gray clay and &lt;1% polyhalite. [2, 9]</td>
</tr>
<tr>
<td>9</td>
<td>33.3</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
<td>X</td>
<td>33.3'-36.0' HALITE: Clear with some moderate reddish orange (10R 6/6) and light gray (8G). Medium to coarsely crystalline. &lt;1/2% dispersed polyhalite. &lt;1% gray intercrystalline clay. [9]</td>
</tr>
</tbody>
</table>

**DATE STARTED:** 3/30/84 (swing)  
**DATE COMPLETED:** 3/30/84 (swing)  
**LOGGED BY:** J. E. Galleron  
**DATE:** 4/18/84  
**1 OF 2**
<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>RECOVERY</th>
<th>% RECEIVED</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
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<tbody>
<tr>
<td>7</td>
<td>25</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>36.0'-41.0' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/4), coarsely crystalline to 39.4', then medium to coarse. &lt;1 to 3% polyhalite blebs and dispersed. &lt;1/2% gray clay locally. Scattered anhydrite 39.6'-40.0' %. [3, 7]</td>
<td>Run 11. Discoloring of core.</td>
</tr>
<tr>
<td>8</td>
<td>30</td>
<td>4.8</td>
<td>4.8</td>
<td>100</td>
<td>41.0'-44.0' HALITE: Clear to light bluish gray (5B 7/1) and light gray (9Y) and some moderate reddish orange, medium to coarsely crystalline. &lt;1/4&quot; gray clay seen at 36.1' and 41.7'. &lt;1% clay. [9]</td>
<td>Run 12. Broken-up in upper one foot. Considerable chipping of core surface below the anhydrite.</td>
</tr>
<tr>
<td>9</td>
<td>35</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>44.0'-48.8' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6), coarsely crystalline. &lt;1 to 3% polyhalite. [7]</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>40</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>48.8'-49.6' ANHYDRITE: Moderate reddish orange anhydrite to 49'. Then halite with some anhydrite from 49'-49.1'. Then medium light gray (9Y) to light gray (9L) anhydrite. Trace of gray clay at 49.6'.</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>45</td>
<td>5.0</td>
<td>3.6</td>
<td>72</td>
<td>49.6'-50.0' HALITE: Clear to medium light gray (9Y), medium to coarsely crystalline. &lt;1% gray clay. &lt;1/2% dispersed polyhalite. [3, 9]</td>
<td></td>
</tr>
<tr>
<td>RUN NUMBER</td>
<td>DEPTH (ft.)</td>
<td>LENGTH CORE RECOVERY</td>
<td>% RECOVERED PROFILE</td>
<td>DESCRIPTION</td>
<td>REMARKS</td>
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</tr>
<tr>
<td>1</td>
<td>3.0</td>
<td>5.0</td>
<td>2.8 93</td>
<td>0.0'-4.5' HALITE: Clear to moderate reddish orange (10R 6/6), coarsely crystalline, &lt;1% polyhalite. [2, 21]</td>
<td></td>
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</tr>
<tr>
<td>2</td>
<td>3.3</td>
<td>3.3</td>
<td>3.3 100</td>
<td>4.5'-5.8' HALITE: Clear to moderate brown (5DR 3/4), coarsely crystalline, some medium &lt;1% to 2% locally, brown clay. Parting @ 3.5'. [8, 10]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>2.2</td>
<td>2.2</td>
<td>2.2 100</td>
<td>5.8'-6.9' HALITE: Clear to moderate reddish brown (10R 4/4), grayish red (10R 4/2), medium to coarsely crystalline, some fine &lt;1% to 2% dispersed polyhalite and &lt;1% gray and brown clay.</td>
<td></td>
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</tr>
<tr>
<td>4</td>
<td>4.4</td>
<td>4.0</td>
<td>5.0 100</td>
<td>6.95'-7.20' ANHYDRITE b: Light (87) to medium light gray (8/6), microcrystalline anhydrite. Halite growths within, most common in middle of run.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>5.0</td>
<td>5.0</td>
<td>5.0 100</td>
<td>7.00'-7.20' HALITE: Clear, coarsely crystalline, scattered white virenos of anhydrite. &lt;1/2% polyhalite. Trace of gray clay @ 12.3'. [1]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>2.2</td>
<td>2.2</td>
<td>2.2 100</td>
<td>12.59'-13.65' HALITE: Clear to moderate reddish orange (10R 6/6), fine to coarsely crystalline, &lt;1% polyhalite and &lt;1% gray clay.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>4.8</td>
<td>4.3</td>
<td>4.3 93</td>
<td>13.95'-14.55' ANHYDRITE a: Very light (85) to medium light gray (8/6), microcrystalline anhydrite, irregular laminae. Scattered halite growths most common from 14.2 to 14.505. Finish gray color here. Trace of gray clay @ 13.95'.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>2.2</td>
<td>2.2</td>
<td>2.2 100</td>
<td>14.55'-18.5' POLYHALITIC HALITE: Clear to moderate reddish brown (10R 6/6), coarsely crystalline, &lt;1% to 3% polyhalite. [4, 7]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>2.2</td>
<td>2.2</td>
<td>2.2 100</td>
<td>19.4'-22.9' HALITE: Clear to moderate brown (10R 4/4), some moderate reddish orange (10R 6/4), coarsely crystalline, some medium. Some in 2% brown clay, &lt;1% polyhalite from 22.1'-22.9'. Scattered anhydrite to 19.4' [8, 10]. 67/8&quot; brown clay seam at 23.7'. 1/2&quot; anhydrite above @ 23.85'.</td>
<td></td>
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</tr>
<tr>
<td>10</td>
<td>2.2</td>
<td>2.2</td>
<td>2.2 100</td>
<td>23.9'-28.6' HALITE: Clear, coarsely crystalline, trace brown clay from 27.1/2 and some medium crystalline. [1] [8 from 27.2']</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RUN NUMBER</td>
<td>DEPTH (ft)</td>
<td>LENGTH CORE RUN</td>
<td>RECOVERY %</td>
<td>PROFILE</td>
<td>DESCRIPTION</td>
<td>REMARKS</td>
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<tr>
<td>26.0</td>
<td>7</td>
<td>4.8</td>
<td>4.3</td>
<td>98</td>
<td>28.6'-30.5' AGBILLACIOUS HALITE: clear to moderate brown (5YR 3/4), fine to medium, some coarsely crystalline, &lt;1% to 3% brown clay. [12]</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>4.2</td>
<td>3.5</td>
<td>73</td>
<td></td>
<td>30.5'-32.4' HALITE: Clear, trace of light moderate brown, coarsely crystalline, &lt;1/2% brown clay. Core broken up @ 30.8'-31.4'. [1, 8]</td>
<td>39% of core recovered was 22 inches in length.</td>
</tr>
<tr>
<td>30.8</td>
<td>3.8</td>
<td>3.7</td>
<td>97</td>
<td></td>
<td>32.4'-36.2' AGBILLACIOUS HALITE: Clear to moderate brown (5YR 3/4), some light moderate reddish orange (10R 6/6). Medium to coarsely crystalline, &lt;1% to 3% brown clay. &lt;1/2% dispersed polyhalite. Scattered breaks. [10, 12]</td>
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</tr>
<tr>
<td>9</td>
<td>3.4</td>
<td>2.9</td>
<td>85</td>
<td></td>
<td>36.2'-36.95' ANHYDRITE: Very light (88) to light gray (87), some moderate reddish orange anhydrite. Scattered halite growths within. 3/4&quot; hard brown clay @ 36.2'-</td>
<td></td>
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<tr>
<td>34.6</td>
<td>0.4</td>
<td>0.3</td>
<td></td>
<td>X</td>
<td>36.95'-40.3' HALITE: Clear, some moderate reddish orange (10R 6/6), coarsely crystalline C1%, locally 2%, polyhalite, scattered white anhydrite stringers. [1, 3]</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>3.4</td>
<td>2.9</td>
<td>87</td>
<td>X</td>
<td>40.3'-41.4' POLYNHALITE HALITE: Clear, to moderate reddish orange (10R 6/6), coarsely crystalline, &lt;1% to 3% polyhalite. [4, 8]</td>
<td></td>
</tr>
<tr>
<td>38.0</td>
<td>4.5</td>
<td>3.9</td>
<td>87</td>
<td>X</td>
<td>41.4'-42.55' HALITE: Clear, some moderate brown (5YR 4/4) coarsely crystalline, some medium, &lt;1% brown clay, break @ 42.5'. [1, 8]</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>4.5</td>
<td>3.9</td>
<td>87</td>
<td>X</td>
<td>42.55'-44.4 HALITE: Clear to moderate reddish orange (10R 6/6), some moderate brown (5YR 4/4). Coarsely crystalline, some medium. &lt;2% polyhalite to 43%; then &lt;1% [1, 2]. &lt;2% brown clay at 43.62'-43.9'. [12]. Break @ 44.3'.</td>
<td></td>
</tr>
<tr>
<td>42.9</td>
<td>4.7</td>
<td>4.7</td>
<td>100</td>
<td>X</td>
<td>46.4'-47.2' AGBILLACIOUS HALITE: Clear to moderate brown (5YR 3/4), coarsely crystalline, &lt;1% to 3% brown clay. Mixture of brown clay and halite seen at 47.1'-47.2'. [110]</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>3.3</td>
<td>3.3</td>
<td>100</td>
<td>X</td>
<td>47.2'-49.3' HALITE: Clear to moderate reddish orange/brown (10R 6/6, 4/6). Medium to coarsely crystalline. &lt;1% brown clay, &lt;1% polyhalite. [17]</td>
<td></td>
</tr>
<tr>
<td>48.3'</td>
<td>30.5'</td>
<td>3.3</td>
<td>100</td>
<td>X</td>
<td>48.3'-50.5' AGBILLACIOUS HALITE: Clear to moderate brown (5YR 4/4), medium to coarsely crystalline, some fine &lt;2% to 5% brown clay. Scattered clay breaks [10, 15].</td>
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</tr>
</tbody>
</table>
# WIPP
## GEOLOGIC DRILL LOG
### WASTE ISOLATION PILOT PLANT

**INSTRUMENT TYPE & NUMBER:**

**HOLE TYPE/SIZE:** NC-CORE

**BORING NO.:** DH-28

**LOCATION:** ROOM 6

**ACCESS DRIFT:** FLOOR

**VERTICAL STATION:** N107, W682

**COLLAR ELEV.:** 12.89

**DIRECTION OF DRILLING:** DOWN

**MINE COORDINATES:** N1079.8, E6218.3

**DEPTH OF BOREHOLE:** 50.5'

**DRILLING METHOD:** ROTARY AIR

**DRILL MAKE/MODEL:** CP-55

**DATE STARTED:** 7-25-84

**DATE COMPLETED:** 7-26-84

**SHEET LOGGED BY:** J. F. CALIFRAN

**DATE:** 7-27-84

---

**RUN NUMBER** | **DEPTH (ft.)** | **LENGTH CORE RUN** | **RECOVERY %** | **PROFILE** | **DESCRIPTION** | **REMARKS**
--- | --- | --- | --- | --- | --- | ---
0.0 | 0 | | | | 0.0'-4.2' HALITE: Clear, coarsely crystalline, some medium. <1% polyhalite, <1% clay, predominantly gray with trace of brown. [1, 2] | NC double tube wireline core barrel with NC core rod, used 1-3/8' core bit, single tube barrel free 0.0'-3.0', Total drilling time: 4.5 hrs. Core quality good, 33% of core recovered is 2 1/8" lengths.
1.0 | 1.0 | 3.0 | 2.7 | 90 | | |
2.0 | 2.0 | 4.8 | 4.79 | 98 | | |
3.0 | 3.0 | 5.2 | 5.1 | 98 | | 5.6'-9.9' MS-139: Mixture of polyhalite, halite and anhydrite to 7.6'. Some "meltwalt" pattern. Then predominantly anhydrite with scattered halite growths. Light gray and moderate reddish orange (10R 6/4), then predominantly light (97) to medium light (96) gray. <1/8" gray clay at 9.8'.
4.0 | 4.0 | 5.0 | 3.0 | 100 | | |
5.0 | 5.0 | 5.3 | 5.3 | 100 | | |
6.0 | 6.0 | 5.1 | 5.1 | 100 | | |
7.0 | 7.0 | | | | |
8.0 | 8.0 | | | | |
9.0 | 9.0 | | | | |
10.0 | 10.0 | | | | |
11.0 | 11.0 | | | | |
12.0 | 12.0 | | | | |
13.0 | 13.0 | | | | |
14.0 | 14.0 | | | | |
15.0 | 15.0 | | | | |
16.0 | 16.0 | | | | |
17.0 | 17.0 | | | | |
18.0 | 18.0 | | | | |
19.0 | 19.0 | | | | |
20.0 | 20.0 | | | | |
21.0 | 21.0 | | | | |
22.0 | 22.0 | | | | |
23.0 | 23.0 | | | | |
24.0 | 24.0 | | | | |
25.0 | 25.0 | | | | |
26.0 | 26.0 | | | | |
27.0 | 27.0 | | | | |
28.0 | 28.0 | | | | |
29.0 | 29.0 | | | | |
30.0 | 30.0 | | | | |
31.0 | 31.0 | | | | |
32.0 | 32.0 | | | | |
33.0 | 33.0 | | | | |
34.0 | 34.0 | | | | |
35.0 | 35.0 | | | | |
36.0 | 36.0 | | | | |
37.0 | 37.0 | | | | |
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<th>RUN NUMBER</th>
<th>LENGTH CORE RUN</th>
<th>% RECOVERED</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
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<td>6</td>
<td>5.1</td>
<td>100</td>
<td>X</td>
<td>28.1'-30.6' HALITE: Clear, medium to coarsely crystalline, &lt;1% dispersed polyhalite, trace of gray clay locally. [1]</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>5.0</td>
<td>98</td>
<td>X</td>
<td>30.4'-35.1' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6), coarsely crystalline, &lt;1% to 3% polyhalite [7]. Moderate reddish orange to light gray anhydrite, some halite, at 34.65'-34.9'.</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
<td>35.1'-35.35' ANHYDRITE: Light (67) to medium light (86) gray, microcrystalline. Scattered halite growths, 49/8&quot; hard gray clay layer at lower contact.</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>4.9</td>
<td>94</td>
<td>X</td>
<td>35.35'-42.55' HALITE: Clear to light moderate reddish orange (10R 6/6) and medium gray (85). Medium to coarsely crystalline, &lt;1% dispersed polyhalite, ±1% gray clay. [9, 11]</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
<td>42.55'-44.6' HALITE: Clear to moderate reddish brown (10R 4/6) and moderate brown (3YR 3/4). Medium to coarsely crystalline, &lt;1% to 2% brown clay, some gray, &lt;1% polyhalite dispersed. [17, some 9]</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>2.5</td>
<td>100</td>
<td>X</td>
<td>44.6'-47.9' HALITE: Clear to moderate reddish orange (10R 6/6), some medium gray (85). Medium to coarsely crystalline, ±1% polyhalite and ±1/2% gray clay. [9]</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>50.5</td>
<td></td>
<td></td>
<td>47.9'-50.5' HALITE: Clear, coarsely crystalline. [1]</td>
<td></td>
</tr>
</tbody>
</table>

Core broken up at 39.6'-39.8'.
### WIPP

**WASTE ISOLATION PILOT PLANT**

**INSTRUMENT TYPE & NUMBER**

**HOLE SIZE**

**NC-CORE**

**BORING NO.**

**LOCATION**

**ROOM & ACCESS DRIFT - ROOF**

**VERTICAL**

**STATION**

**COLLAR ELEV.**

**DIRECTION OF DRILLING**

**MINE COORDINATES**

**DEPTH OF BOREHOLE**

**DRILLING METHOD**

**ROTARY AIR**

**DRILL MAKE/MODEL**

**DATE STARTED**

**DATE COMPLETED**

**LOGGED BY**

**DATE:**

**1 OF 2**

---

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
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<th>LENGTH CORE RUN</th>
<th>RECOVERY %</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
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<td>100</td>
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<tr>
<td>1</td>
<td>2.2</td>
<td>2.2</td>
<td>100</td>
<td>9.0'-3.9' HALITE: Clear, coarsely crystalline. (1)</td>
<td></td>
<td></td>
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<td>2</td>
<td>1.8</td>
<td>1.8</td>
<td>100</td>
<td></td>
<td>7.9'-6.3' HALITE: Clear to moderate brown (5% 3/4), coarsely crystalline, &lt;1% to 2% brown clay.</td>
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<td>3</td>
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<td>100</td>
<td></td>
<td>6.2'-7.5' HALITE: Clear to moderate brown (5% 3/4) and grayish red. Fine to medium, some coarse, 61% clay, brown and gray. &lt;1/2% dispersed polyhalite.</td>
<td></td>
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<tr>
<td>4</td>
<td>4.6</td>
<td>4.6</td>
<td>100</td>
<td></td>
<td>7.55'-7.75' ANHYDITE: Light gray (M7), micro-crystalline, scattered halite growths. Trace of gray clay at 7.55'.</td>
<td>Run 4: 6.2'-10.0', core not good, discing in clear halite.</td>
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<tr>
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<td>100</td>
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<td>11.25'-15.25' HALITE: Clear, coarsely crystalline. &lt;1/2% polyhalite, scattered white stringers.</td>
<td>Run 5: core not good, average length -1&quot; (discing).</td>
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<td>6</td>
<td>4.7</td>
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<td>13.1'-14.8' ANHYDITE: Light gray to medium light gray microcrystalline anhydrite. Scattered halite growths. Trace of gray clay at 14.2'.</td>
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<tr>
<td>7</td>
<td>4.9</td>
<td>4.9</td>
<td>100</td>
<td></td>
<td>14.9'-15.6' POLYHALITIC HALITE: Clear to moderate reddish orange (10% 6/4), coarsely crystalline, &lt;1% to 3% polyhalite.</td>
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<td>4.7</td>
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<td>100</td>
<td></td>
<td>19.6'-22.5' HALITE: Clear, some moderate-brown, coarsely crystalline, some fine and medium, 61% brown clay. &lt;1/2% dispersed polyhalite. Breaks at 20.75', 21.5'.</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>22.5'-24.4' HALITE: Clear, to moderate brown, fine to medium, some coarsely crystalline. &lt;1% brown clay. &lt;1/2% dispersed polyhalite.</td>
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<td>10</td>
<td>24.4'-27.7' HALITE: Clear, coarsely crystalline. Scattered white anhydrite.</td>
<td></td>
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<td></td>
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<tr>
<td>11</td>
<td>27.7'-30.9' HALITE: Clear, mottled with moderate brown, coarsely crystalline, some medium, &lt;1% to 2% brown clay. Core broken up to 29.6'.</td>
<td></td>
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**BORING NO.**

DH-29
<table>
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<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>% RECOVERED</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
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<tbody>
<tr>
<td>8</td>
<td>25</td>
<td>4.8</td>
<td>4.81</td>
<td>100</td>
<td>29.9'-31.7' HALITE: Clear, coarsely crystalline.</td>
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<tr>
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<td>31.7'-31.4 HALITE: Clear, some light moderate brown. Coarsely crystalline. 1/2% brown clay.</td>
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<tr>
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<td></td>
<td></td>
<td>31.4'-37.35' AGRILLACEOUS HALITE: Clear to moderate brown, medium to coarsely crystalline. &lt;1% to 3% brown clay, scattered breaks.</td>
<td>Run 9: Very bad core 29.2'-33.0'.</td>
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<td>9</td>
<td>30</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>37.35'-38.25 ANHYDRITE: Light gray to medium light gray, microcrystalline anhydrite. Scattered halite growths. 1&quot; hard brown clay layer at 37.35&quot;.</td>
<td>Circulation blocked @ 37.3'. Nat mud seam.</td>
</tr>
<tr>
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<td></td>
<td>38.25'-44.4' HALITE: Clear, coarsely crystalline. Some to &lt;1% brown clay. Scattered white stringers. [1].</td>
<td>Run 11: Some discing, broken in clear halite.</td>
</tr>
<tr>
<td></td>
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<td>[2]. Brown clay parting at 44.4'.</td>
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<tr>
<td>10</td>
<td>35</td>
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<td>5.0</td>
<td>100</td>
<td>44.4'-46.65 HALITE: Clear to moderate brown, coarsely crystalline, some zones of medium. &lt;1% to 3%, locally, brown clay. Breaks at 46.35', 46.5'.</td>
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<tr>
<td></td>
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<td>Argillaceous 44.4'-45.0' and 46.35'-46.5'.</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>40</td>
<td>3.5</td>
<td>3.5</td>
<td>100</td>
<td>46.65'-47.4' HALITE: Clear, coarsely crystalline.[1]</td>
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</tr>
<tr>
<td>12</td>
<td>45</td>
<td>4.7</td>
<td>4.7</td>
<td>100</td>
<td>47.4'-47.9' HALITE: Clear, some moderate brown. Coarsely crystalline, 1/2% brown clay.</td>
<td></td>
</tr>
<tr>
<td>13</td>
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<td>3.0</td>
<td>100</td>
<td>47.9'-48.9' AGRILLACEOUS HALITE: Clear to moderate brown, medium crystalline, some coarse, 3% brown clay. 1&quot; halite and brown clay seam @ 47.9'.</td>
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<tr>
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<td></td>
<td>48.9'-50.4' HALITE: Clear, mottled with moderate brown clay, coarse, some medium. &lt;1% to 2% brown clay, 1/2% dispersed polyhalite. [10]</td>
<td></td>
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</table>

39% of recovered core was 22 inch length.

Interval from 20 to 50' was replaced with corehole DH-29A.
<table>
<thead>
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<th>RUN NUMBER</th>
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<th>LENGTH</th>
<th>CORE RUN</th>
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<th>DESCRIPTION</th>
<th>REMARKS</th>
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<tr>
<td></td>
<td>0.0'-10.0'</td>
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<td></td>
<td></td>
<td>NC-CORE: Refer to log for DH-29.</td>
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<tr>
<td>20.0'-25.0'</td>
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<td></td>
<td></td>
<td></td>
<td>HAILITE: Clear to moderate brown (STR 3/4), some moderate reddish orange (STR 6/4). Medium to coarse, crystalline, some fine. &lt;1% to 2% brown clay. &lt;1% polyhalite locally. Anhydrite seam at 25'-2. 6/16&quot; hard brown clay associated. [12, 17]</td>
<td></td>
</tr>
<tr>
<td>25.0'-28.4'</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>HAILITE: Clear, coarse crystalline. Scattered anhydrite stringers. [1]</td>
<td></td>
</tr>
<tr>
<td>28.4'-30.0'</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ARGINOSHEAL HAILITE: Clear to moderate brown (STR 3/4, 4/4), medium to coarse crystalline. &lt;1% to 3% brown clay. &lt;1/2% dispersed polyhalite. [10, 15, 17]</td>
<td></td>
</tr>
<tr>
<td>36.9'-36.0'</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>HAILITE: Clear, some moderate brown (STR 3/4, 4/4), coarse crystalline, some medium. 61% brown clay. [10]</td>
<td></td>
</tr>
<tr>
<td>RUN NUMBER</td>
<td>DEPTH (ft.)</td>
<td>LENGTH CORE RUN</td>
<td>RECOVERY %</td>
<td>REMARKS</td>
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</table>
# WIPP

## Waste Isolation Pilot Plant

**INSTRUMENT TYPE & NUMBER**

**HOLE SIZE & TYPE**

**NC CORE**

**BORING NO.** DH-30

**LOCATION** ROOM 6 ACCESS DRIFT - FLOOR

---

### Geologic Drill Log

**STATION** 1099.9

**COLLAR ELEV.** 1288.2

**DIRECTION OF DRILLING** VERTICAL

**MINE COORDINATES** 10785.5, 55932.3

**DEPTH OF BOREHOLE** 50.1

**DRILLING METHOD** ROTARY AIR

**DRILL MAKE/MODEL** CP-65

**DATE STARTED** 7-25-84

**DATE COMPLETED** 7-25-84

**LOGGED BY** GALLERAN

**DATE** 7-26-84

**SHEET** 1 OF 2

---

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<th>LENGTH (in.)</th>
<th>CORE RUN</th>
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<th>REMARKS</th>
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<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1.7</td>
<td>1.7</td>
<td>1.7</td>
<td>100</td>
<td></td>
<td>0.6'-8.6' HALITE: Clear, some light medium gray. Coarsely crystalline, some medium. 6% gray clay. Trace of brown at 1.0'-1.2'. [1, 11]</td>
<td></td>
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<td>2</td>
<td>4.1</td>
<td>4.1</td>
<td>4.1</td>
<td>100</td>
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<td>8.6'-11.5' POLYHALITE: Clear to moderate reddish orange (10R 6/6). Coarsely crystalline. &lt;1% to 3% polyhalite. [7]</td>
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</tr>
<tr>
<td></td>
<td>5.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>11.5'-16.0' MB-139: Mixture of halite and anhydrite to 13'. Then predominantly very light to medium light gray anhydrite with scattered halite growths. Irregular halite fracture at 14.2'. Gray clay at lower contact.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>4.1</td>
<td>4.1</td>
<td>4.1</td>
<td>100</td>
<td></td>
<td>14.6'-19.2' POLYHALITE: Clear to moderate reddish orange (10R 6/6). Coarsely crystalline. 61% gray clay. &lt;1% to 3% polyhalite. Scattered anhydrite. [some?]</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>5.0</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td></td>
<td>19.2'-20.7' HALITE: Clear, some light medium reddish orange (10R 6/6). Medium to coarsely crystalline. &lt;1% dispersed polyhalite. &lt;1/2% gray clay.</td>
<td></td>
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<tr>
<td></td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>20.7'-25.45' POLYHALITE: Clear to moderate reddish orange (10R 6/6). Coarsely crystalline. &lt;1% to 3% polyhalite. [5, 7]</td>
<td></td>
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<td>5</td>
<td>5.0</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td></td>
<td>25.45'-40.1' HALITE: Clear to light moderate reddish orange (10R 6/6), medium to coarsely crystalline. &lt;1% polyhalite dispersed. 61% gray clay. [9]</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>5.1</td>
<td>5.1</td>
<td>5.1</td>
<td>100</td>
<td></td>
<td>30.7'-35.2' POLYHALITE: Clear to moderate reddish orange (10R 6/6), coarsely crystalline. &lt;1% to 3% polyhalite. Scattered anhydrite [5, 7]. Anhydrite/halite layer at 34.9'-35.4'.</td>
<td></td>
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<tr>
<td></td>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>35.2'-35.6' ANHYDRITE: Light gray (87) to medium light gray (84), euhedral crystals. Scattered halite growths. No clay.</td>
<td></td>
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<tr>
<td>7</td>
<td>5.2</td>
<td>5.2</td>
<td>5.2</td>
<td>100</td>
<td></td>
<td>35.6'-43.75' HALITE: Clear to light moderate reddish orange (10R 6/6), medium to coarsely crystalline. &lt;1% dispersed polyhalite and gray clay [9]. Polyhalite at 42.9'-43.5'.</td>
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66% of core recovered in 42 inch length.
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<td>5.1</td>
<td>100</td>
<td>X</td>
<td></td>
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<tr>
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<td>35.1</td>
<td>5.1</td>
<td>5.1</td>
<td>100</td>
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<tr>
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<td>5.1</td>
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<td>100</td>
<td>X</td>
<td></td>
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<tr>
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<td>5.1</td>
<td>100</td>
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</table>

**DESCRIPTION**

- **43.75'-44.8' HALITE**: Clear to moderate reddish orange (10R 6/6), some moderate brown (10R 4/6). Medium to coarsely crystalline. <2% to 2% brown clay, some gray. Breaks an 44.35' and 45.10' [14, 17].

- **44.8'-46.9' HALITE**: Clear to light moderate reddish orange (10R 6/6), some bluish grey. Medium to coarsely crystalline. <1/2% dispersed polyhalite. <1% gray clay.

- **46.9'-50.1' HALITE**: Clear, some moderate reddish orange (10R 6/6), coarsely crystalline. <1% polyhalite. <1/2% grey clay. 1% to 2% polyhalite at 46.9' to 47.7' [1, 2, 11].

**REMARDS**

- Runs 7, 8, 9: Some breakage in medium to coarsely crystalline halite.
### WIPP GEOLeC DRILL LOG

**WASTE ISOLATION PILOT PLANT**

**INSTRUMENT TYPE & NUMBER**

**HOLE TYPE/ SIZE**

**BOREING NO.**

**LOCATION**

---

**STATION**

**COLLAR ELEV.**

**DIRECTION OF DRILLING**

**DIRECTION**

**DRILLING METHOD**

**DATE STARTED**

**DATE COMPLETED**

**LOGGED BY**

**DATE**

**SHEET**

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<table>
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<tr>
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<th>LENGTH CORE RUN</th>
<th>RECOVERY % RECOVERED</th>
<th>PROFILE</th>
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<td>Non-Core</td>
<td>Non-Core</td>
<td>—</td>
</tr>
<tr>
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</tr>
<tr>
<td>7.7</td>
<td>10</td>
<td>5.0</td>
<td>4.9</td>
<td>98</td>
</tr>
<tr>
<td>12.7</td>
<td>15</td>
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<td>4.8</td>
<td>100</td>
</tr>
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<tr>
<td>21.5</td>
<td>25</td>
<td>4.5</td>
<td>4.2</td>
<td>95</td>
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</table>

**DESCRIPTION**

- 0.0'-5.0' **MONO-CORE.**
- 5.0'-7.25' **HALITE:** Clear to moderate brown (5YR 4/4), coarsely crystalline, same medium, 61% to 7% brown clay.
- 7.25'-7.5' **ANHYDRITE:** Light gray microcrystalline anhydrite. Scattered halite growths. 5 1/4" gray clay at 7.25'.
- 7.5'-13.6' **HALITE:** Clear, same light moderate reddish orange, coarsely crystalline. <1/2% polyhalite. Scattered white stringers.
- 13.6'-14.4' **HALITE:** Clear to moderate reddish brown, medium to coarsely crystalline. 61% brown clay, same gray, and dispersed polyhalite.
- 14.4'-15.1' **ANHYDRITE:** Light gray to medium light gray. Scattered halite growths. Trace gray clay at 14.4'. Core grinding evident.
- 15.1'-19.05' **POLYHALITIC HALITE:** Clear to moderate reddish orange, coarsely crystalline. <1% to 3% polyhalite.
- 19.05'-21.4' **ARGILLACEOUS HALITE:** Clear to moderate brown, medium to coarsely crystalline, <1% to 3% brown clay. <1% dispersed polyhalite.
- 21.4'-23.95' **HALITE:** Clear to light moderate reddish orange, medium to coarsely crystalline. <1% polyhalite. <1/2% brownish gray clay. Brown clay seam at 23.9' with associated anhydrite to 23.95.
- 23.95'-27.9' **HALITE:** Clear, coarsely crystalline. Scattered white anhydrite stringers. (1)
- 27.9'-29.65' **HALITE:** Clear to moderate brown, medium to coarsely crystalline. None to 3% brown clay.
- 29.65'-31.1' **HALITE:** Clear, coarsely crystalline.

**REMKS**

- NC double tube wire line core barrel. NC stepped diamond bit. 2 ft starter barrel with impregnated bit caused too much vibration. Went to plugged diamond bit from 0.5 ft to 5.5 ft. Total drilling time 11.5 hrs.
<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>% RECOVERED</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
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<tbody>
<tr>
<td>26.0</td>
<td>4.5</td>
<td>4.1</td>
<td>91</td>
<td>31.1'-32.7' HALITE: Clear, medium to coarsely crystalline. &lt;1/2% brown clay.</td>
<td>Run 6: Core broken up. Difficult to measure recovery.</td>
</tr>
<tr>
<td>30.5</td>
<td>5.0</td>
<td>4.7</td>
<td>94</td>
<td>34.5'-36.55' ARGILLACEOUS HALITE: Clear to moderate brown (5YR 5/4, 4/4), medium to coarsely crystalline. &lt;1% to 3% brown clay.</td>
<td>Run 7: Discing, some broken core.</td>
</tr>
<tr>
<td>35.5</td>
<td>5.0</td>
<td>4.6</td>
<td>96</td>
<td>37.35'-41.3' HALITE: Clear to moderate reddish orange, coarsely crystalline. &lt;1% to 3% polyhalite. Locally polyhalite.</td>
<td>Run 8: 12 gauge core is broken up.</td>
</tr>
<tr>
<td>40.5</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>44.3'-45.5' HALITE: Clear, coarsely crystalline. &lt;1% polyhalite. &lt;1/2% clay.</td>
<td></td>
</tr>
<tr>
<td>45.5</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>47.0'-50.5' ARGILLACEOUS HALITE: Clear to moderate brown, medium to coarsely crystalline. &lt;1% to 3% brown clay. Breaks from 47.5' to 50.5'.</td>
<td>Note: Hole redrilled due to poor core quality. See log for hole DH-31A.</td>
</tr>
</tbody>
</table>

Note: Hole redrilled due to poor core quality. See log for hole DH-31A.
## GEOLOGIC DRILL LOG

**WIPP WASTE ISOLATION PILOT PLANT**

**HOLE TYPE/SIZE** NC-CORE  
**BORING NO.** DH-31A

**STATION** N1099 W1280  
**COLLAR ELEV.** 1298.5  
**DIRECTION OF DRILLING** UP  
**MINE COORDINATES** N10784.8, E5630.5  
**DEPTH OF BOREHOLE** 49.2'  
**DRILLING METHOD** ROTARY AIR  
**DRILL MAKE/MODEL** CP-65  
**DATE STARTED** 7-20-84  
**DATE COMPLETED** 7-24-84  
**LOGGED BY** J. E. GALLERANI  
**DATE** 7-24-84  
**SHEET** 1 OF 2

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>RECOVERY %</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>0</td>
<td>Non-Core</td>
<td></td>
<td>0.0'–5.2' NON-CORE: Used plugged diamond bit.</td>
<td></td>
</tr>
<tr>
<td>5.1–7.15</td>
<td>0.1</td>
<td></td>
<td></td>
<td>5.1'-7.15' HALITE: Clear to medium brown, some light to moderate reddish orange. Medium to coarsely crystalline. &lt;1% brown clay with trace of gray.</td>
<td></td>
</tr>
<tr>
<td>7.15–7.75</td>
<td>0.6</td>
<td></td>
<td></td>
<td>quartz, partially laminated. Scattered halite growths. Gray clay at 7.15'. Contact dips 10°W.</td>
<td></td>
</tr>
<tr>
<td>7.35–13.85</td>
<td>6.5</td>
<td></td>
<td></td>
<td>7.35'-13.85' HALITE: Clear, some light to moderate reddish orange. Coarsely crystalline. &lt;1/2% polyhalite. Scattered white stringers. (12)</td>
<td></td>
</tr>
<tr>
<td>14.65–15.3</td>
<td>0.7</td>
<td></td>
<td></td>
<td>14.65'-15.3' ANHYDRITE: Light to medium light gray microcrystalline. Scattered halite growths. 43/16' gray clay at 14.65'. Vertical fracture noted from 14.35' to 14.85'.</td>
<td></td>
</tr>
<tr>
<td>15.3–19.5</td>
<td>4.2</td>
<td></td>
<td></td>
<td>15.3'-19.5' POLYHALITE: Clear to moderately reddish orange. (10B 6/1), coarsely crystalline. &lt;1% to 3% polyhalite. &lt;1/2% gray clay locally. (12, 7)</td>
<td>Run 2: Several broken zones in clear halite.</td>
</tr>
<tr>
<td>19.3–24.78</td>
<td>5.4</td>
<td></td>
<td></td>
<td>19.3'-24.78' HALITE: Clear, some lightly moderate reddish orange. Medium to coarsely crystalline with some fine crystalline. &lt;1% brown with some gray clay and polyhalite dispersed. 1/2'' grayish brown hard clay at 24.78'. Scattered halite within. (12, 17)</td>
<td></td>
</tr>
<tr>
<td>24.75–28.2</td>
<td>3.5</td>
<td></td>
<td></td>
<td>24.75'-28.2' HALITE: Clear, coarsely crystalline. Scattered white anhydrite. 3/4'' anhydrite layer at 26.42'. Appears to be vertical fracture at 24.75'–25.15'. Probably caused when banging and placing of core from barrel. (12)</td>
<td></td>
</tr>
<tr>
<td>28.8–30.3</td>
<td>1.5</td>
<td></td>
<td></td>
<td>28.8'-30.3' ARCTILACIDUS HALITE: Clear to moderate brown. Fine to medium crystalline with some coarsely crystalline. &lt;1/2% brown clay. Break at 30.3'. (12)</td>
<td></td>
</tr>
</tbody>
</table>

**BORING NO.** DH-31A
<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>RECOVERY</th>
<th>% RECOVERED</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>25.2</td>
<td>33.3</td>
<td>4.8</td>
<td>4.8</td>
<td>100</td>
<td>30.3'-32.4' HALITE: Clear, coarsely crystalline. [1]</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>33.3</td>
<td>4.7</td>
<td>4.7</td>
<td>100</td>
<td>32.4'-34.7' ABBEYLAGOUS HALITE: Clear to moderately brown, medium to coarsely crystalline. 61% to 93% brown clay. Scattered breaks. [15]</td>
<td></td>
</tr>
<tr>
<td>30.1</td>
<td>33.3</td>
<td>4.7</td>
<td>4.7</td>
<td>100</td>
<td>36.7'-37.1' HALITE: Clear to coarsely crystalline. 61% brown clay. [16, 10]</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>33.3</td>
<td>4.7</td>
<td>4.7</td>
<td>100</td>
<td>37.1'-37.85' ANHYDRITE: Light to medium light gray, microcrystalline anhydrite. Partly laminated. Scattered halite growths. 63/4&quot; hard brown clay seem at 37.1'.</td>
<td>Run 6: Badly broken to 33.3' in very coarse halite.</td>
</tr>
<tr>
<td>34.8</td>
<td>33.3</td>
<td>4.7</td>
<td>4.7</td>
<td>100</td>
<td>37.85'-41.5' HALITE: Clear, coarsely crystalline, scattered medium. 61/2% polyhalite. [11]</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>33.3</td>
<td>4.7</td>
<td>4.7</td>
<td>100</td>
<td>41.5'-44.6' HALITE: Clear to moderate brown. Medium to coarsely crystalline. &lt;1% to 2% brown clay. &lt;1% polyhalite blebs. Irregular 1&quot; brown clay and halite seem at 44.5'. [8, 37]</td>
<td></td>
</tr>
<tr>
<td>39.2</td>
<td>33.3</td>
<td>4.9</td>
<td>4.9</td>
<td>100</td>
<td>44.6'-45.8' HALITE: Clear, coarsely crystalline. &lt;1% polyhalite blebs. [2]</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>33.3</td>
<td>X</td>
<td></td>
<td></td>
<td>45.8'-47.8' HALITE: Clear, mottled with moderate brown, coarsely crystalline. 61% brown clay blebs. &lt;1/2% polyhalite blebs. [8, 10]</td>
<td></td>
</tr>
<tr>
<td>47.8'</td>
<td>33.3</td>
<td>X</td>
<td></td>
<td></td>
<td>47.8'-49.2' ABBEYLAGOUS HALITE: Clear to moderate brown, fine to medium crystalline, some coarsely crystalline. &lt;1% to 3% brown clay with scattered breaks. [12]</td>
<td>Run 9: Core discarded from #5.5' to 48'.</td>
</tr>
<tr>
<td>RUN NUMBER</td>
<td>DEPTH (ft.)</td>
<td>LENGTH CORE RUN</td>
<td>% RECOVERED</td>
<td>PROFILE</td>
<td>DESCRIPTION</td>
<td>REMARKS</td>
</tr>
<tr>
<td>------------</td>
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<td>------------------</td>
<td>-------------</td>
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<td>-------------</td>
<td>---------</td>
</tr>
<tr>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>0.0'-2.4' HALITE: Clear, some moderate reddish orange (10% 6/6), coarsely crystalline. 4% to 2% polyhalite. Scattered anhydrite stringers. [2]</td>
<td>Single tube barrel used.</td>
</tr>
<tr>
<td>1</td>
<td>4.9</td>
<td>4.9</td>
<td>100</td>
<td>X</td>
<td>2.4'-4.9' HALITE: Clear to moderate brown (5YR 4/4), medium to coarsely crystalline. 4% brown clay, trace of gray.[8, some 10].</td>
<td></td>
</tr>
</tbody>
</table>

This hole drilled to replace non-core section of DH31A.
<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>RECOVERY %</th>
<th>RECOVERED PROFILE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0' - 5.3' N/CORE: Used plugged bit.</td>
</tr>
<tr>
<td>1</td>
<td>5.3' - 7.4'</td>
<td></td>
<td>X</td>
<td>4.9</td>
<td>5.3' - 7.4' HALITE: Clear, mottled with some moderate reddish orange and brown. Coarsely crystalline. &lt;1% polyhalite. &lt;1/2% brown and gray clay 6.75' - 7.05'. [3]</td>
</tr>
<tr>
<td>2</td>
<td>7.4' - 8.5'</td>
<td></td>
<td>X X</td>
<td>4.9</td>
<td>7.4' - 8.5' POLYHALITIC HALITE: Clear to moderate reddish orange to coarsely crystalline. &lt;1% to 3% polyhalite [3, 4]</td>
</tr>
<tr>
<td>3</td>
<td>8.5' - 11.3'</td>
<td></td>
<td>X X X</td>
<td>4.9</td>
<td>8.5' - 11.3' KB-139: (upper contact dips 40°). Mixture of halite and anhydrite to 9.6% with some &quot;swallowtail&quot; structure. From 9.6' to dominantly Light to light medium gray anhydrite with scattered halite growths 9.15' to 10.75'. Clear halite layers at 10.3' - 10.4', 13' - 16' gray clay @ 11.3'. Core grinding evident here.</td>
</tr>
<tr>
<td>4</td>
<td>11.3' - 14.2'</td>
<td></td>
<td>X X X</td>
<td>4.9</td>
<td>11.3' - 14.2' HALITE: Clear, some moderate reddish orange (10R 6/6), moderate brown, medium to coarse. 61% clay, gray to 12.7', then brown clay. Irregular brownish gray break @ 14.2'. &lt;1/2% dispersed polyhalite. 19, 27]</td>
</tr>
<tr>
<td>5</td>
<td>14.2' - 18.5'</td>
<td></td>
<td>X X X</td>
<td>4.9</td>
<td>14.2' - 18.5' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6), coarsely crystalline. &lt;1% to 3% polyhalite. Scattered anhydrites. Gray clay parting @ 18.5'. [3, 3, 7]</td>
</tr>
<tr>
<td>6</td>
<td>18.5' - 20.1'</td>
<td></td>
<td>X X X</td>
<td>4.9</td>
<td>18.5' - 20.1' HALITE: Clear to light reddish orange (10R 6/6), medium to coarsely crystalline. &lt;1% dispersed polyhalite. &lt;1/2% gray clay. [9]</td>
</tr>
<tr>
<td>7</td>
<td>20.1' - 25.2'</td>
<td></td>
<td>X X X</td>
<td>4.9</td>
<td>20.1' - 25.2' POLYHALITIC HALITE: Clear to moderate reddish orange and brown (10R 6/6, 4/6), coarse, some medium. &lt;1% to 3% polyhalite. &lt;1/2% brown and gray clay. Vertical fracture in core at 23.4' - 23.8'. Looks like stress fracture. [4, 6, 7]</td>
</tr>
<tr>
<td>8</td>
<td>25.2' - 30.4'</td>
<td></td>
<td>X X X</td>
<td>4.9</td>
<td>25.2' - 30.4' HALITE: Clear to moderate reddish orange (10R 6/6), medium to coarsely crystalline. 0% to 2% polyhalite. &lt;1% gray clay, locally. &lt;1% brown clay at 26.3' - 29.5'. Vertical fractures in core at 27.35' - 27.35' and 28.6' - 29.12'. [9, some 17]</td>
</tr>
</tbody>
</table>

**Remarks:**
- NC double tube wireline core barrel, NC rods and stepped diamond bit. Total drilling time: 64 hrs.
- Upper 5.5' of hole replaced with corehole DH-32A.
- 56% of recovered core was 22 inch length.
### WIPP Waste Isolation Pilot Plant

#### Boring No. DH-32

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>% RECOVERED</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>30</td>
<td>5.2</td>
<td>94.5</td>
<td><strong>35.0' - 35.9' POLYHALITIC HALITE:</strong> Clear to moderate reddish orange (10R 6/6), coarse-crystalline. &lt;1% to 3% polyhalite. &lt;1% gray clay to 31'. [7]</td>
</tr>
<tr>
<td>6</td>
<td>35</td>
<td>5.0</td>
<td>100</td>
<td><strong>35.9' - 40.8' HALITE:</strong> Clear to light moderate brown (5YR 4/4) and light moderate reddish orange (10G 6/6). Medium to coarse-crystalline. &lt;1/2% dispersed polyhalite. &lt;1% clay, predominantly gray. Brown clay at 37.3' - 37.9' [9, 11, 30mm 17]</td>
</tr>
<tr>
<td>7</td>
<td>40</td>
<td>4.8</td>
<td>97</td>
<td><strong>40.8' - 44.2' HALITE:</strong> Clear to moderate reddish orange (10R 6/6), coarse-crystalline. &lt;1% to 2% polyhalite, locally 7% from 43.0' - 43.9'. &lt;1% gray clay [4, 9].</td>
</tr>
<tr>
<td>8</td>
<td>45</td>
<td>5.1</td>
<td>100</td>
<td><strong>44.2' - 46.1' HALITE:</strong> Clear to moderate brown (5Y 4/4), medium to coarse-crystalline. &lt;1% brown clay. &lt;1/2% dispersed polyhalite [17].</td>
</tr>
<tr>
<td>9</td>
<td>50</td>
<td>4.9</td>
<td>100</td>
<td><strong>46.1' - 47.75' HALITE:</strong> Clear, some medium light gray. Medium to coarse-crystalline. &lt;1% gray clay and &lt;1/2% polyhalite [9].</td>
</tr>
</tbody>
</table>

#### Remarks

- **47.75' - 50.0' HALITE:** Clear, mottled with moderate reddish orange (10R 6/6). Coarse-crystalline. <1% polyhalite. <1/2% gray clay locally. [2]
**WIPP**
**GEOLOGIC DRILL LOG**

**WASTE ISOLATION PILOT PLANT**

**INSTRUMENT TYPE & NUMBER**

**HOLE TYPE/ SIZE** 2 3/4" CORE

**BORING NO.** DH-32A

**LOCATION** ROOM 6  ACCESS DRIFT - FLOOR

---

**STATION N1099  W1261**  **COLLAR ELEV. 1299.5**  **DIRECTION OF DRILLING DOWN**

**MINE COORDINATES N10 786.7  E5652.2**  **DEPTH OF BOREHOLE 5.5 FT**

**DRILLING METHOD ROTARY/AIR**  **DRILL MAKE/MODEL CP-65**

**DATE STARTED 9-13-84**  **DATE COMPLETED 9-13-84**  **SHEET LOGGED BY: J. E. GALLERANI DATE: 9-29-84**  **1 OF 1**

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>RECOVERY % RECOVERED</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td>0.0'-5.5' HALITE: Clear, some moderate reddish orange, coarsely crystalline, some fine and medium, &lt;1% to 2% locally polyhalite. &lt;1% clay, gray except at 1.7'-1.6' where it is brown. [2, 9]</td>
<td>Single tube barrel used.</td>
</tr>
<tr>
<td>1</td>
<td>5.5</td>
<td>5.5</td>
<td>100</td>
<td>x</td>
<td></td>
<td>45% of core recovered was 22 inch length.</td>
</tr>
</tbody>
</table>

This hole was drilled to replace non-core section of DH-32.
**WIPP**

**WASTE ISOLATION PILOT PLANT**

**INSTRUMENT**

**TYPE & NUMBER**

**HOLE**

**TYPE/SIZE**

**NC-CORE**

**BORING NO.**

**DH-33**

**LOCATION**

**ROOM & ACCESS DRIFT**

**- ROOF**

---

**STATION**

**N1099, W1582**

**COLLAR ELEV.**

**1298.6**

**DIRECTION OF DRILLING**

**UP**

**MINING COORDINATES**

**N10786.0, E5331.1**

**DEPTH OF BOREHOLE**

**50.5'**

**DRILLING METHOD**

**ROTARY AIR**

**DRILL MAKE/MODEL**

**CP-65**

---

**DATE STARTED**

**7-16-84**

**DATE COMPLETED**

**7-18-84**

**SHEET**

**LOGGED BY:**

**J. E. GALLERANI**

**DATE:**

**7-18-84**

**1**

---

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH</th>
<th>CORE RUN</th>
<th>RECOVERY</th>
<th>% RECOVERED</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>Non-core</td>
<td></td>
<td></td>
<td></td>
<td>0.0'-4.0' NON-CORE: Roller bit to 4' in order to accommodate long core barrel.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>5</td>
<td>5.0</td>
<td>4.9</td>
<td>98</td>
<td></td>
<td>4.0'-5.9' HALITE: Clear with some moderate brown (SYR 4/4). Coarse crystalline with some medium crystalline. &lt;1% brown clay. [9, 13]</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5.9'-7.15' HALITE: Clear to moderate brown (SYR 4/4), medium to coarse crystalline, &lt;1% to 2% brown clay. Irregular break at 6.0'. [10]</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>4.0</td>
<td>4.0</td>
<td>100</td>
<td></td>
<td>7.15'-7.25' ANHYDRITE a: Light gray to medium gray (N7, N6). Microcrystalline. Gray clay 63/16&quot; at 7.15'.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td></td>
<td>X</td>
<td>7.25'-12.9' HALITE: Clear with some light to moderate reddish orange (10R 6/6). Coarse crystalline. Scattered white stringers of anhydrite and/or magnesite. None to &lt;1/2% polyhalite. [11]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td></td>
<td>X</td>
<td>12.9'-13.1' HALITE: Clear to moderate reddish brown (10R 6/6). Coarse crystalline, &lt;1% polyhalite, &lt;1% brown clay. [17]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>18</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>13.1'-13.85' HALITE: Clear to light moderate brown (SYR 4/4). Fine to medium crystalline with some coarse crystalline, &lt;1/2 polyhalite and &lt;1% clay, brown with some gray. [9]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>25</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td></td>
<td>X</td>
<td>13.85'-14.4' ANHYDRITE a: Light gray to light medium gray (N7, N6), microcrystalline anhydrite with scattered halite growths. 41/8&quot; gray clay at lower contact.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>14.4'-19.0' POLYHALITE HALITE: Clear to moderate reddish orange (10R 6/6), coarse crystalline. &lt;1% to 3% polyhalite with scattered anhydrite. [4, 7]</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>19.0'-21.25' HALITE: Clear with some lightly more moderate brown (SYR 3/4), medium to coarse crystalline with some fine crystalline. &lt;1% brown clay. Some gray clay with 41/8&quot; anhydrite at 21.2'-21.25'. [9, 12]</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>21.25'-24.1' HALITE: Clear with some moderate brown (SYR 4/4), coarse crystalline, some fine to medium crystalline, &lt;1% brown clay, &lt;1/2% polyhalite. 1/2&quot; brown clay seams at 23.95' with associated halite anhydrite to 24.1'. [8]</td>
<td></td>
</tr>
</tbody>
</table>

**BORING NO.**

**DH-33**
<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>% RECOVERED</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>24.1'-28.7' HALITE: Clear, coarsely crystalline, trace of brown clay locally. [1]</td>
<td></td>
</tr>
<tr>
<td>28.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>28.7'-30.3' HALITE: Clear to moderate brown (5YR 4/4). Fine to medium crystalline with some coarse crystalline. &lt;1/2% dispersed polyhalite. &lt;1% to 2% brown clay, some gray. [12]</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>30</td>
<td>5.0</td>
<td>4.8</td>
<td>96</td>
<td>30.3'-32.0' HALITE: Clear, coarsely crystalline. [1]</td>
<td></td>
</tr>
<tr>
<td>33.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>32.0'-36.8' ARGILLACEOUS HALITE: Clear to moderate brown (5YR 4/4). Medium to coarsely crystalline. &lt;1% to 3% brown clay. Scattered breaks. [15, 16]</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>35</td>
<td>4.0</td>
<td>4.0</td>
<td>100</td>
<td>36.8'-37.3' ANHYDRITE: Light gray to light medium gray (5Y, 8Y), microcrystalline anhydrite. Scattered halite growths. Brown clay at 36.8'. Core grinding here.</td>
<td></td>
</tr>
<tr>
<td>37.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>37.3'-38.0' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/4). Coarsely crystalline. &lt;1% to 5% polyhalite. [1, 7]</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>40</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>38.0'-42.0' HALITE: Clear with some light to moderate reddish orange (10R 6/4). Coarsely crystalline. &lt;1% polyhalite. [1, 2]</td>
<td></td>
</tr>
<tr>
<td>42.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>45.0'-47.5' HALITE: Clear to lightly moderate reddish orange and moderate brown (5YR 3/4, 4/4). Medium to coarsely crystalline. Some fine crystalline locally. 61% brown clay. &lt;1% polyhalite. Fairly clear. Coarsely crystalline between 45.3' and 48.3'. [1] [10, 17]</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>65</td>
<td>5.0</td>
<td>4.8</td>
<td>96</td>
<td>47.5'-50.5' ARGILLACEOUS HALITE: Clear to moderate brown (5YR 4/4, 3/4). Medium to coarsely crystalline. &lt;1% to 3% brown clay with scattered breaks. [14, 15]</td>
<td></td>
</tr>
</tbody>
</table>

BORING NO. DH-35
### WIPP

**WASTE ISOLATION PILOT PLANT**

**GEOLOGIC DRILL LOG**

**INSTRUMENT TYPE & NUMBER:**

**HOLE TYPE/ SIZE:** 2 3/4" CORE

**BORING NO.:** DH-33A

**LOCATION:** ROOM G, ACCESS DRIFT - ROOF

**STATION:** N1039, W1570

**COLLAR ELEV.:** 1297.4

**DIRECTION OF DRILLING:** VERTICAL

**MINE COORDINATES:** N10786.8, E5342.6

**DEPTH OF BOREHOLE:** 41

**DRILLING METHOD:** ROTARY AIR

**DRILL MAKE/MODEL:** CP-65

**DATE STARTED:** 9-13-84

**DATE COMPLETED:** 9-13-84

**DATE LOGGED BY:** L. F. GALLERANI

**DATE:** 9-23-84

**SHEET LOGGED:** 1 OF 1

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH OF CORE RUN (ft.)</th>
<th>RECOVERY %</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td>0.0'-3.2' HALITE: Clear, some moderate reddish orange (10% 6/4), coarsely crystalline, some medium from 2.7'-3', 61% polyhalite. (1, 3)</td>
<td>Single tube barrel used.</td>
</tr>
<tr>
<td>5.4</td>
<td>4.1</td>
<td>4.1</td>
<td>100</td>
<td>X</td>
<td>3.2'-4.1' HALITE: Clear, some moderate brown (5% 4/4), coarsely crystalline. c1% brown clay. (8)</td>
<td>51% of core recovered was 22 inch length.</td>
</tr>
</tbody>
</table>

This hole was drilled to replace non-core section of DH-33.
<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>RECOVERY %</th>
<th>RECOVERED PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.0'-3.5' NON-CORE.</td>
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<tr>
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<td></td>
<td>3.5'-4.2' HALITE: Clear, some moderate brown (5YR 4/4) and moderate reddish orange (10R 6/6). Coarsely crystalline. ☞1% brown clay, some gray. Trace polyhalite. [8]</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4.2'-7.8' POLYHALITIC HALITE: Clear, mottled with moderate reddish orange (10R 6/6), coarsely crystalline. ☞1% to 3% polyhalite blebs and patches. ☞1% gray clay to 6.1', then no clay. Scattered anhydrite. [5, 7]</td>
<td></td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>7.8'-11.05' MH-139: Mixture of anhydrite and halite (&quot;swallowtail&quot; pattern) from 7.8' to 8.6'. Then becomes mostly anhydrite. Moderate reddish orange with irregular patches of white and light gray to 8.7'. Increase in halite content 9.8'-10.3'. Below 10.3' is light gray anhydrite. Trace of gray clay at 11.05'. Core grinding evident.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>11.05'-12.1' HALITE: Clear, medium to coarsely crystalline. [11]</td>
<td></td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>12.1'-14.2' HALITE: Clear to light moderate reddish orange (10R 6/6). Medium to coarsely crystalline. [1]</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>14.2'-18.6' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6), coarsely crystalline. ☞1% to 3% polyhalite. [5, 6, 7] Moderate reddish orange anhydrite mixed with halite from 18.65'-18.9'. Break at 18.45'. [2]</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>18.9'-20.35' HALITE: Clear to light moderate reddish orange (10R 6/6), some moderate brown (5YR 4/4). Medium to coarsely crystalline. ☞1% brown clay, trace of gray. ☞1% dispersed polyhalite. [17]</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>20.35'-27.45' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6), coarsely crystalline. ☞1% to 3% polyhalite. Medium to coarsely crystalline from 25.2'. Anhydrite-halite from 24.1'-24.2'. ☞1% gray clay from 25.2'-26.8'. [7]</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>26.8'-28.0'. [7]</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>28.0'-30.0'. [7]</td>
<td></td>
</tr>
</tbody>
</table>

CP45 mounted on scissor lift. NW split tube core barrel. NW rods used plugged diamond bit to 3.5' because of low drift back. Unable to use lowerest core barrel. Upper 3.5' of hole replaced with corehole DH-34A. Total drill time: 13 hrs. 42 inch length.
<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>% RECOVERED</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>25</td>
<td></td>
<td></td>
<td>27.45'-29.9' HALITE: Clear, some moderate brown (5YR 4/4) and light moderate reddish orange (10R 6/4), medium to coarsely crystalline, some fine. 11% brown clay, some gray from 29.4'-29.9'. &lt;1/2% dispersed polyhalite. [17, Sems 9]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>29.6</td>
<td></td>
<td></td>
<td>29.9'-35.4' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/4), coarsely crystalline, &lt;1% to 3% polyhalite. 2&quot; anhydrite/halite layer at 35.15'-35.3'. [4, 7]</td>
<td>Run 7: Some vibration this run. Tightened tie down bolts and feed beam.</td>
</tr>
<tr>
<td></td>
<td>30.0</td>
<td>5.0</td>
<td>100</td>
<td>35.4'-36.15' ANHYDRITE: Light gray (87) to moderate reddish orange (10R 6/4), microcrystalline. Halite growths within. Trace of gray clay at 36.15'.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>34.0</td>
<td></td>
<td></td>
<td>36.15'-43.0' HALITE: Clear, coarsely crystalline, some medium. &lt;1/2% dispersed polyhalite. &lt;1% gray clay. [9]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>35.0</td>
<td>5.1</td>
<td>100</td>
<td>43.0'-44.2' HALITE: Clear, some moderate reddish orange, coarsely crystalline. &lt;1/2% polyhalite. [2]</td>
<td>Run 9: Core barrel blocked up this run. Some brown clay on inner tube.</td>
</tr>
<tr>
<td></td>
<td>39.1</td>
<td>3.9</td>
<td>46</td>
<td>44.2'-45.4' HALITE: Clear with some moderate brown (5YR 4/4), coarsely crystalline. &lt;1% brown clay. Break at 45.4'. [8, Sems 10]</td>
<td>Run 11: Dropped core barrel 4&quot; when pulling rods. Dry shift driller drilled over this run. Core broken up because of this.</td>
</tr>
<tr>
<td></td>
<td>43.0</td>
<td></td>
<td></td>
<td>45.5'-51.5' HALITE: Clear, coarsely crystalline, some medium, &lt;1% gray clay, trace brown. [8, 11]</td>
<td></td>
</tr>
</tbody>
</table>
**GEOLOGIC DRILL LOG**

**WIPP**
WASTE ISOLATION PILOT PLANT

**INSTRUMENT TYPE & NUMBER**

**HOLE TYPE/SIZE** 2 3/4" CORE

**BORING NO.** DH-34A

**LOCATION** ROOM 6 ACCESS DRIFT - FLOOR

**STATION** N1090.7, W1570.0
**COLLAR ELEV.** 1289.2
**DIRECTION OF DRILLING** VERTICAL DOWN

**MINE COORDINATES** N10 786.8, E5341.9
**DEPTH OF BOREHOLE** 3.6'

**DRILLING METHOD** ROTARY AIR
**DRILL MAKE/MODEL** CP-65

**DATE STARTED** 9-13-84
**DATE COMPLETED** 9-13-84

**SHEET LOGGED BY:** J. E. GALLERANI
**DATE:** 9-29-84

---

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>RECOVERY %</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>3.6</td>
<td>3.6</td>
<td>100</td>
<td>X</td>
<td>0.0'-1.3' HALITE: Clear, coarsely crystalline, some medium, &lt;1/2% polyhalite blebs. [1]</td>
<td>Used single tube starter barrel.</td>
</tr>
<tr>
<td>3.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.3'-3.6' HALITE: Clear, some moderate brown (5YR 4/4), coarsely crystalline. 41% brown clay. [8, 10]</td>
<td>64% of recovered core was 51 inch length.</td>
</tr>
</tbody>
</table>

This hole was drilled to replace non-core section of DH-34.
<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>RECOVERY %</th>
<th>RECOVERED PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>0</td>
<td>2.2</td>
<td>2.0</td>
<td>91</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>2.2</td>
<td></td>
<td>X</td>
<td></td>
<td>0.0'-4.4' HALITE: Clear to moderate brown (5% 4/4), coarsely crystalline. 6% brown clay. Scattered polyhalite blebs. (4.8)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>5.0</td>
<td>4.5</td>
<td>90</td>
<td></td>
<td>4.4'-6.2' HALITE: Clear to moderate brown (5% 4/4), fine to medium crystalline, some coarser. 6% brown clay, trace of gray. (8,10,12)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>7.2</td>
<td></td>
<td>X</td>
<td></td>
<td>6.2'-6.4' ANHYDRITE &quot;B&quot;: Light medium to medium gray microcrystalline anhydrite with polyhalite halite growths. Trace of hard gray clay at 6.2'. Anhydrite is layered close to clay contact, low angle.</td>
<td></td>
</tr>
<tr>
<td>12.2</td>
<td>10.0</td>
<td>5.0</td>
<td>4.8</td>
<td>96</td>
<td>6.4'-7.2.1' HALITE: Clear, coarsely crystalline. Trace of anhydrite stringers. (1)</td>
<td></td>
</tr>
<tr>
<td>13.2'-15.2'</td>
<td>13.2</td>
<td></td>
<td>X</td>
<td></td>
<td>12.1'-13.2' HALITE: Clear to light moderate reddish orange (10% 6/6), fine to medium crystalline. &lt; 1% dispersed polyhalite. &lt; 1% clay, brown and gray. Brown break at 12.35'. (4.12)</td>
<td></td>
</tr>
<tr>
<td>13.2'-15.2'</td>
<td>13.2</td>
<td></td>
<td>X</td>
<td></td>
<td>13.2'-15.2' ANHYDRITE &quot;a&quot;: Very light to medium gray microcrystalline anhydrite. Irregular laminae. Scattered halite growths. From 13.6'. Up to 1/4&quot; hard gray clay at 13.2'. Core grinding evident.</td>
<td></td>
</tr>
<tr>
<td>15.0</td>
<td>17.2</td>
<td>5.0</td>
<td>4.9</td>
<td>98</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>16.0</td>
<td>15.0</td>
<td></td>
<td>X</td>
<td></td>
<td>15.0'-18.0' POLYHALITIC HALITE: Clear to moderate reddish orange/brown (10% 6/6; 4% 4/4), coarsely crystalline. &lt; 1% polyhalite. (4.7)</td>
<td></td>
</tr>
<tr>
<td>17.2</td>
<td>20.0</td>
<td>5.3</td>
<td>4.2</td>
<td>89</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>18.0'-21.9'</td>
<td>21.9</td>
<td></td>
<td>X</td>
<td></td>
<td>18.0'-21.9' HALITE: Clear to moderate reddish orange/brown (5% 4/4). Coarsely crystalline, some medium, &lt;1/2% polyhalite. 6% brown clay. Up to 3/8&quot; hard brown clay at 24.0'. Trace of anhydrite above. Near horizontal, irregular. (4.10)</td>
<td></td>
</tr>
<tr>
<td>21.9'-24.0'</td>
<td>24.0</td>
<td></td>
<td>X</td>
<td></td>
<td>21.9'-24.0' HALITE: Clear, scattered moderate brown (5% 4/4). Coarsely crystalline, some medium, &lt;1/2% polyhalite. 6% brown clay. Up to 3/8&quot; hard brown clay at 24.0'. Trace of anhydrite above. Near horizontal, irregular. (4.10)</td>
<td></td>
</tr>
<tr>
<td>24.0</td>
<td>25.0</td>
<td>5.0</td>
<td>3.5</td>
<td>70</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

**Remarks:**
- NC single-tube barrel used for run 1. NC double-tube wireline barrel used for remainder of hole.
- Partially broken core upper 2' of Run 2.
- 26% of core recovered was 2-inch lengths.
- Dry hole. No gas detected.

**Boiling No. DH-35**
## WIPP
### WASTE ISOLATION PILOT PLANT

#### BORING NO. DH-35

<table>
<thead>
<tr>
<th>Run Number</th>
<th>Depth (ft)</th>
<th>Core Run</th>
<th>Recovery %</th>
<th>Profile</th>
<th>Description</th>
<th>Remarks</th>
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</thead>
<tbody>
<tr>
<td>6</td>
<td>25</td>
<td>3.0</td>
<td>70</td>
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<td></td>
</tr>
<tr>
<td>27.5</td>
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<td>5.0</td>
<td>66</td>
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<td>32.5</td>
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<td>37.5</td>
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<td>5.0</td>
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<td>55</td>
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</tbody>
</table>

24.05'-27.8' HALITE: Clear, coarsely crystalline. [1]

27.8'-28.7' HALITE: Clear to moderate brown (5YR 4/4); medium to coarsely crystalline. <1% to 2% brown clay. [10]

28.7'-32.5' HALITE: Clear, coarsely crystalline. None to <1% brown clay. [1, some 10]

32.5'-36.5' ± 0.3' AGRILLACEOUS HALITE: Clear to moderate brown (5YR 4/4); medium to coarsely crystalline. <1% to 3% brown clay. Trace brownish-gray locally scattered breaks. [10,15]

36.5'-37.1' ANHYDRITE: Very light to light medium gray, microcrystalline anhydrite. Scattered small polyhalite halite growths. Up to 1/2" hard brown clay at 36.5'. Near horizontal. Core grinding evident.

37.1'-42.6' HALITE: Clear, coarsely crystalline. <1/2% scattered polyhalite blems. Scattered white anhydrite. [1]

42.6'-46.4' HALITE: Clear, some moderate brown (5YR 4/4), coarsely crystalline, except fine to medium from 43.7' to 44.3'. <1/2% moderate reddish orange polyhalite here. <1% brown clay. Irregular break at 44.55'.

46.4'-50.5' AGRILLACEOUS HALITE: Clear to moderate brown (5YR 4/4; 5/4); medium to coarsely crystalline. <1% to 3% brown clay. Up to 1% locally. Seen of clay mixed with halite crystals from 50.4' to 50.6'. [10,12,15]

50.6'-52.0' POLYMIALIC HALITE: Clear to moderate reddish orange/brown (10R 6/6; 4/6); coarsely crystalline. <1% to 3% polyhalite. Moderately reddish brown polyhalite/anhydrite at 50.75' to 50.95'.
### WIPP Waste Isolation Pilot Plant

#### Geologic Drill Log

<table>
<thead>
<tr>
<th>Instrument Type &amp; Number</th>
<th>Hole Type/Size: NG-CORE</th>
<th>Boring No.: DH-36</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>Room G - Floor</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Station</th>
<th>Collar Elevation</th>
<th>Direction of Drilling</th>
<th>Vertical Down</th>
<th>Mine Coordinates</th>
<th>Depth of Borehole</th>
<th>Drilling Method</th>
<th>Drill Make/Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>N1162, W2882</td>
<td>1284.6 FT</td>
<td></td>
<td></td>
<td>N10798.4, E5032.2</td>
<td>51.5 FT</td>
<td>Rotary Air</td>
<td>CP-65</td>
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</table>

#### Date Started: 1-26-85  Date Completed: 1-26-85  Sheet: 1 of 2

#### Logged By: J. E. Gallerani  Date: 1-27-85

<table>
<thead>
<tr>
<th>Run Number</th>
<th>Depth (ft.)</th>
<th>Length Core Run</th>
<th>Recovery %</th>
<th>Profile</th>
<th>Description</th>
<th>Remarks</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>2.0</td>
<td>2.0</td>
<td>100</td>
<td></td>
<td>0.0'-2.7' HALITE: Clear, some moderate brown, coarsely crystalline. &lt;1% brown clay.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>3.5</td>
<td>1.5</td>
<td>93</td>
<td></td>
<td>2.7'-7.0' ± 0.7' POLYHALITE HALITE: Clear to moderate reddish orange (10R 6/6), coarsely crystalline. &lt;1 to 3% polyhalite. Trace clay. [2,5,7]</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>8.0</td>
<td>4.5</td>
<td>93</td>
<td>X</td>
<td>7.0'-10.4' ± 6.3' RB-139: Moderate reddish orange and medium gray to 8.7'. From 8.7', predominantly light to medium gray anhydrite with halite growths. Gray clay, up to 1/2&quot; at 10.4'.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>11.2</td>
<td>3.2</td>
<td>78</td>
<td></td>
<td>11.4'-14.3' HALITE: Clear to light bluish gray; medium to coarsely crystalline. &lt;1/2% dispersed polyhalite. 41% gray clay. [9,11]</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>15.2</td>
<td>5.0</td>
<td>100</td>
<td></td>
<td>14.3'-18.6' POLYHALITE HALITE: Clear to moderate reddish orange/brown, coarsely crystalline. &lt;1 to 3% polyhalite. Gray clay, some anhydrite at 18.3'-18.6'. Irregular gray mass at 18.6'.</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>19.2</td>
<td>5.0</td>
<td>100</td>
<td></td>
<td>18.6'-20.6' HALITE: Clear to light moderate reddish orange (10R 6/6), medium to coarsely crystalline. &lt;1% gray clay and polyhalite. [9]</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>21.2</td>
<td>5.0</td>
<td>100</td>
<td></td>
<td>20.6'-24.7' POLYHALITE HALITE: Clear to moderate reddish orange (10R 6/6) coarsely crystalline. &lt;1 to 3% polyhalite. Average is &lt;1%. [7,4,7]</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>23.2</td>
<td>5.0</td>
<td>100</td>
<td></td>
<td>24.7'-29.4' HALITE: Clear, some moderate reddish orange (10R 6/6); coarsely crystalline. 61% polyhalite. Locally polyhalite. &lt;1% gray clay. [9]</td>
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</tr>
<tr>
<td>9</td>
<td>25.2</td>
<td>5.0</td>
<td>100</td>
<td></td>
<td>29.4'-33.4' POLYHALITE HALITE: Clear to moderate reddish orange (10R 6/6); coarsely crystalline. &lt;1 to 3% polyhalite. Trace anhydrite.</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>26.2</td>
<td>5.0</td>
<td>100</td>
<td></td>
<td>33.4'-39.4' HALITE: Clear, some light moderate reddish orange; coarsely crystalline. &lt;1% polyhalite.</td>
<td>Core partly broken in Run 10.</td>
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<tr>
<td>RUN NUMBER</td>
<td>DEPTH (ft.)</td>
<td>LENGTH</td>
<td>CORE RECOVERY</td>
<td>% RECOVERED</td>
<td>DESCRIPTION</td>
<td>REMARKS</td>
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<td>26.5</td>
<td>5.0</td>
<td>4.8</td>
<td>96</td>
<td>X</td>
<td></td>
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<td>30.0</td>
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<td></td>
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<td>X</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>35.5</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
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<tr>
<td>11</td>
<td>41.5</td>
<td>5.0</td>
<td>4.3</td>
<td>90</td>
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</tr>
<tr>
<td>12</td>
<td>46.5</td>
<td>5.0</td>
<td>4.6</td>
<td>92</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td></td>
<td>51.5</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

34.9'-35.5' ANHYDRITE: Moderate reddish orange microcrystalline anhydrite mixed with halite growths to 35.15'. Very irregular upper contact. Consists of anhydrite intermixed with halite. From 35.15', light to light medium grey anhydrite with scattered halite growths. Some "swallowtail" pattern noted. 1.2" hard grey clay at lower contact. Dips 10°N.

35.0'-41.2' HALITE: Clear, some light medium gray. Coarsely crystalline. Some medium. <1% gray clay and <1/2% polyhalite beds. [1,11]

41.2'-46.7' HALITE: Clear, some moderate reddish orange. Coarsely crystalline. <1% gray clay. [9]

42.1'-44.9' HALITE: Clear to moderate reddish orange/brown (10R 6/6; 4/6); medium to coarsely crystalline. <1% polyhalite, locally polyhalite. <1% brown clay. [17]

46.4'-51.5' HALITE: Clear, coarsely crystalline, some medium. <1/2% dispersed polyhalite locally. <1% gray clay at 47'-47.3' and 48.5'-49.3'. Scattered breaks at 50.5'-51.2'. [1,11]
# WIPP GEOLOGIC DRILL LOG

**WASTE ISOLATION PILOT PLANT**

**INSTRUMENT TYPE & NUMBER:**

**HOLE TYPE/ SIZE:**

**LOCATIONS:**

**STATION N1101, W2182**

**COLLAR ELEV. J297.4 FT**

**DIRECTION OF DRILLING:**

**MINE COORDINATES:**

**DEPTH OF BOREHOLE:**

**DRILLING METHOD:**

**DRILL MAKE/ MODEL:**

**DATE STARTED:** 1-25-85

**DATE COMPLETED:** 1-26-85

**SHEET LOGGED BY:** J. E. GALLERANI

**DATE:** 1-26-85

**1 OF 2**

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft)</th>
<th>LENGTH CORE RUN</th>
<th>RECOVERY %</th>
<th>RECOVERED</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2.2</td>
<td>2.2</td>
<td>100</td>
<td>X</td>
<td>0.0'-1.8' HALITE: Clear, some light moderate reddish orange (5YR 6/6), loosely crystalline. 1/3% polyhalite. [1]</td>
</tr>
<tr>
<td>2</td>
<td>5.8</td>
<td>5.3</td>
<td>91</td>
<td></td>
<td>1.8'-5.3' ± 0.15' HALITE: Clear to moderate brown (5YR 3/4), medium to coarsely crystalline. Some to 1% brown clay, some gray. Scattered breaks at 3.7&quot;, 4.0&quot;, 5.1&quot;.</td>
</tr>
<tr>
<td>3</td>
<td>10</td>
<td>3.5</td>
<td>91</td>
<td></td>
<td>5.3'-5.5' ANHYDRITE &quot;b&quot;. Light to medium gray, microcrystalline anhydrite. Partially Laminated. Trace of gray clay along irregular, low-angle surface at 5.3'. Core broken along this.</td>
</tr>
<tr>
<td>4</td>
<td>15</td>
<td>5.0</td>
<td>96</td>
<td>X</td>
<td>5.5'-11.3' HALITE: Clear, coarsely crystalline. Scattered white anhydrite stringers. [1]</td>
</tr>
<tr>
<td>5</td>
<td>16.5</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
<td>11.3'-12.2' HALITE: Clear, some moderate brown (5YR 4/4). Fine to medium crystalline, some coarser. 4½% brown clay.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>12.2'-12.7' ANHYDRITE &quot;c&quot;. Light to medium gray microcrystalline anhydrite. Up to 1/8&quot; brown clay along low-angle, smooth surface at 12.2'. Some core grinding evident.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X X X X X</td>
<td>12.7'-16.5' POLYHALITIC HALITE: Clear to moderate reddish orange (5YR 6/6); coarsely crystalline. &lt;1% to 3% polyhalite.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X X X X X</td>
<td>16.5'-21.6' HALITE: Clear to moderate brown (5YR 4/4); medium to coarsely crystalline. 6½% brown clay, trace of gray. &lt;1/2% dispersed polyhalite. Up to 1/2&quot; hard brown clay seen at 21.35' Low-angle, irregular. Some anhydrite associated with 21.6'. [10, 17]</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X X X X X</td>
<td>21.6'-24.5' HALITE: Clear, coarsely crystalline. &lt;1/2% brown clay to 23'. (8 to 23'; then 1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X X X X X</td>
<td>24.5'-26.5' HALITE: Clear to light moderate reddish orange (10YR 6/6) and moderate brown (5YR 4/4). Fine to medium, crystalline, some coarser. &lt;1/2% brown clay, trace gray. &lt;1/2% dispersed polyhalite. [12]</td>
</tr>
</tbody>
</table>

**REMARKS:**

- BC single-tube core barrel used for Run 1. BC double-tube core barrel used for remainder of hole.
- 4½% of core recovered was 2 2" lengths.
- Dry hole. No gas detected.
- Run 4: Some broken core.
- First 1' of Run 5 broken.
- First 1' of Run 6 broken.
- Broken zones through Run 7, especially first 18'.
<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>RECOVERY % recovered</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>25</td>
<td></td>
<td></td>
<td>X</td>
<td>26.5'-36.2' HALITE: clear, coarse crystalline.</td>
<td>Broken clear halite in Run 9.</td>
</tr>
<tr>
<td>7</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>-</td>
<td>30.2'-35.15' ARGILLACEOUS HALITE: Clear to moderate brown (SRY 4/4); medium to coarse crystalline, some fine. 11% brown clay to 31.5'; then 1 to 3%. Scattered breaks. [10,15]</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>35.15'-35.85' ANHYDRITE: Light to medium gray, microcrystalline anhydrite with scattered halite growths. Up to 1&quot; hard brown clay at 35.15'. Low angle.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>35</td>
<td>5.0</td>
<td>4.5</td>
<td>90</td>
<td>35.85'-39.7' + 0.7' HALITE: Clear, coarse crystalline. &lt;1/2% polyhalite. Scattered white anhydrite stringers.</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>40</td>
<td>3.5</td>
<td>3.1</td>
<td>60</td>
<td>39.7'-42.6' HALITE: Clear, some moderate brown (SRY 4/4); coarse crystalline. 61% brown clay. Irregular break at 41.7±4 [10]</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>45</td>
<td>4.5</td>
<td>4.5</td>
<td>100</td>
<td>42.6'-44.9' HALITE: Clear with &lt;1% moderate reddish orange polyhalite blebs. Coarse crystalline. [11]</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>55</td>
<td>5.5</td>
<td>5.5</td>
<td>100</td>
<td>44.9'-47.25' HALITE: Clear to moderate brown (SRY 4/4); coarse crystalline. 61% brown clay. [10]</td>
<td></td>
</tr>
<tr>
<td>41.5</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>41.25'-51.5' ARGILLACEOUS HALITE: Clear to moderate brown (SRY 4/4); medium to coarse crystalline, some fine. &lt;1 to 3% brown clay, locally up to 5% from 49.4'-50.9'. Scattered breaks at 47.6'; 50.9'; 51.2±5. &lt;1/2% polyhalite. [15]</td>
<td></td>
</tr>
</tbody>
</table>
# WIPP
## WASTE ISOLATION PILOT PLANT
### GEOLOCIC DRILL LOG

<table>
<thead>
<tr>
<th>HOLE</th>
<th>TYPE/ SIZE</th>
<th>NC CORE</th>
<th>BORING NO.</th>
<th>DH-38</th>
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<tbody>
<tr>
<td>LOCATION</td>
<td>ROOM G - FLOOR</td>
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<tr>
<th>STATION</th>
<th>N1201, #2182</th>
<th>COLLAR ELEV.</th>
<th>1287.0 FT</th>
<th>DIRECTION OF DRILLING</th>
<th>VERTICAL</th>
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<tbody>
<tr>
<td>MINE COORDINATES</td>
<td>N10788.3, E4731.9</td>
<td>DEPTH OF BOREHOLE</td>
<td>47.5 FT</td>
<td>DRILLING METHOD</td>
<td>ROTARY AIR</td>
</tr>
<tr>
<td>DRILL MAKE/ MODEL</td>
<td>CP-65</td>
<td>DATE STARTED</td>
<td>1-25-85</td>
<td>DATE COMPLETED</td>
<td>1-26-85</td>
</tr>
<tr>
<td>SHEET</td>
<td>LOGGED BY: J. E. GALLERANI</td>
<td>DATE:</td>
<td>1-26-85</td>
<td>1 OF 2</td>
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</tr>
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<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>% RECOVERED</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2.4</td>
<td>2.2</td>
<td>100</td>
<td>0.0'-2.5' HALITE: Clear to moderate brown (5YR 3/4); coarsely crystalline, some medium. 61% brown clay.</td>
<td>0.10</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2.5'-3.1' HALITE: Clear, coarsely crystalline.</td>
<td>X/2X polyhalite blebs.</td>
</tr>
<tr>
<td>2</td>
<td>5.0</td>
<td>4.9</td>
<td>98</td>
<td>3.1'-7.4' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6); coarsely crystalline.</td>
<td>&lt;1% to 3% polyhalite. 'Anhydrite' mixed with halite from 5.4' to 7.4'. Some 'mellowall' structure evident.</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td>7.4'-9.45' KD-139: Gray anhydrite mixed with growths of polyhalite/halite to 9'; then predominantly light to light medium gray anhydrite. Scattered halite growths. Gray clay at lower contact. Core grinding evident.</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>10.1</td>
<td>3.9</td>
<td>95</td>
<td>5.45'-13.2' HALITE: Clear to light moderate reddish orange (10R 6/6), medium to coarsely crystalline.</td>
<td>12% polyhalite and gray clay.</td>
</tr>
<tr>
<td>4</td>
<td>15.0</td>
<td>4.2</td>
<td>84</td>
<td>13.2'-17.35' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6); coarsely crystalline.</td>
<td>&lt;1% to 3% polyhalite. Some anhydrite and gray clay from 17.05' to 17.35'.</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>17.35'-18.8' HALITE: Clear to light moderate reddish orange (10R 6/6); coarsely crystalline, some medium.</td>
<td>1% polyhalite. &lt;1/2% clay, brown and gray.</td>
</tr>
<tr>
<td>5</td>
<td>20.0</td>
<td>4.7</td>
<td>94</td>
<td>18.8'-22.3' POLYHALITIC HALITE: Clear to moderate reddish orange/brown (10R 6/6; 4/6); coarsely crystalline.</td>
<td>&lt;1% polyhalite. Trace gray clay at 21.5'.</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>12.3'-28.7' HALITE: Clear to moderate reddish orange/ brown (10R 6/6; 4/6). Coarsely crystalline, some medium. 41% to 2% polyhalite locally.</td>
<td>61% light buff gray clay, slight trace of brown.</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>23.7'-34.3' POLYHALITIC HALITE: Clear to moderate reddish orange/brown (10R 6/6; 4/6), coarsely crystalline.</td>
<td>&lt;1% to 3% polyhalite. Clear halite 34-34.3'.</td>
</tr>
<tr>
<td>RUN NUMBER</td>
<td>DEPTH (Ft.)</td>
<td>LENGTH CORE RUN</td>
<td>RECOVERY</td>
<td>PROFILE</td>
<td>DESCRIPTION</td>
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<td>100</td>
<td>X</td>
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<tr>
<td>8</td>
<td>35</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
</tr>
<tr>
<td>9</td>
<td>40</td>
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<td>5.0</td>
<td>100</td>
<td>X</td>
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<td>10</td>
<td>45</td>
<td>6.0</td>
<td>6.0</td>
<td>85</td>
<td>X</td>
</tr>
<tr>
<td>11</td>
<td>50</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>55</td>
<td></td>
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</tbody>
</table>
# WIPP GEOLOGIC DRILL LOG

**WASTE ISOLATION PILOT PLANT**

**INSTRUMENT TYPE & NUMBER**

**HOLE TYPE / SIZE**

**NC CORE**

**BORING NO.**

**DH-40**

**LOCATION**

**BOOM 6 - FLOOR**

---

**STATION**

N1101, W2482

**COLLAR ELEV.**

1286.1 FT

**DIRECTION OF DRILLING**

VERTICAL DOWN

**MINE COORDINATES**

N10739.2, E4431.0

**DEPTH OF BOREHOLE**

51.0 FT

**DRILLING METHOD**

ROTARY AIR

**DRILL MAKE / MODEL**

CP-65

**DATE STARTED**

1-24-85

**DATE COMPLETED**

1-25-85

**SHEET LOGGED BY:**

J. E. GALLABAN

**DATE:**

1-25-85

---

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (FT.)</th>
<th>LENGTH CORE RUN</th>
<th>% RECOVERED</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3.0</td>
<td>1.9</td>
<td>95</td>
<td>X</td>
<td>3.0'-2.6' HALITE: Clear, some moderate brown (SIR 4/4), coarsely crystalline, some medium. &lt;1/2% polyhalite. &gt;1% brown clay, traces of gray. (8,10)</td>
</tr>
<tr>
<td>2.0</td>
<td>0.7</td>
<td>0.7</td>
<td>100</td>
<td>X</td>
<td>2.4'-5.4' HALITE: Clear, some moderate reddish orange (10R 6/6), coarsely crystalline. &gt;1% polyhalite blanks. Trace gray clay locally. [4,4]</td>
</tr>
<tr>
<td>2.7</td>
<td>3.8</td>
<td>3.7</td>
<td>97</td>
<td>X</td>
<td>5.4'-7.05' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6). Coarsely crystalline, except fins to medium from 5.4' to 7.05'. &lt;1 to 3% polyhalite. Trace anhydrite from 6.55'. [4,7]</td>
</tr>
<tr>
<td>3.5</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
<td>7.05'-10.95' MB-19: Moderately reddish orange to light gray anhydrite and polyhalitic halite to 9.5'. Then light to light medium gray anhydrite with scattered growths of halite within. 3/4' hard, grey, dry clay at lower contact.</td>
</tr>
<tr>
<td>5.0</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
<td>10.95'-15.1' HALITE: Clear with some light moderate reddish orange (10R 6/6), medium to coarsely crystalline. &lt;1/2% dispersed polyhalite. &lt;1/2% gray clay. (9)</td>
</tr>
<tr>
<td>6.0</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
<td>15.1'-18.4' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6), coarsely crystalline. &lt;1 to 3% polyhalite. Average 2%. 1-1/2&quot; polyhalite/anhydrite at 18.25'. Gray clay parting at 18.4'. [7]</td>
</tr>
<tr>
<td>16.5</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
<td>18.4'-20.2' HALITE: Clear to light moderate reddish orange (10R 6/6). Some light gray (97). Medium to coarsely crystalline. &lt;1/2% gray clay. &lt;1/2% polyhalite. (97)</td>
</tr>
<tr>
<td>21.5</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
<td>20.2'-24.3' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6), coarsely crystalline. &lt;1 to 3% polyhalite. (4,7)</td>
</tr>
<tr>
<td>26.0</td>
<td>5.1</td>
<td>5.1</td>
<td>100</td>
<td>X</td>
<td>24.3'-26.4' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6), coarsely crystalline, some medium. &lt;1 to 3% polyhalite. &gt;1% gray clay.</td>
</tr>
</tbody>
</table>

**REMARKS**

- NC double-tube wireline core barrel, except for Runs 1 and 2 where NC single-tube barrel used.
- Total drilling time: 8 hrs. 2.
- Dry hole. No gas detected.
- 7/4" of core recovered was 32-inch lengths. Good core.
<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>% RECOVERED</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
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<tbody>
<tr>
<td>7</td>
<td>25.0</td>
<td>5.1</td>
<td>100</td>
<td>X X</td>
<td>X X</td>
</tr>
<tr>
<td>8</td>
<td>30.5</td>
<td>4.9</td>
<td>100</td>
<td>X</td>
<td>X X</td>
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<tr>
<td>9</td>
<td>35.0</td>
<td>4.5</td>
<td>100</td>
<td>X X</td>
<td>X X</td>
</tr>
<tr>
<td>10</td>
<td>40.0</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
<td>X X</td>
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<tr>
<td>11</td>
<td>45.0</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
<td>X X</td>
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<td>12</td>
<td>50.0</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
<td>X X</td>
</tr>
</tbody>
</table>

### DESCRIPTION

- **26.4'-29.7' HALITE**: Clear, some light moderate reddish orange (10R 6/6), medium to coarsely crystalline. <1/2% dispersed polyhalite and brown clay. Trace gray clay locally. [17, locally 9]

- **29.7'-33.05' POLYHALITIC HALITE**: Clear to moderate reddish orange (10R 6/6), coarsely crystalline. <1% to 2% polyhalite. Moderate reddish orange polyhalite/anhydrite from 34.7'-34.05'. [4,7]

- **35.05'-35.4' ANHYDRITE**: Light to very light (N7, N8) gray anhydrite to 35.15'. Thin anhydrite with scattered halite growths throughout. 1/4" hard, dry gray clay at lower contact.

- **35.4'-36.75' HALITE**: Clear to light moderate reddish orange, fine to medium crystalline. <1/2% dispersed polyhalite and gray clay. [2,6]

- **36.75'-41.0' HALITE**: Clear, trace of moderate brown, coarsely crystalline. <1% brown clay. [8]

- **41.0'-47.0' HALITE**: Clear to moderate reddish orange/brown (10R 6/4, 4/4). Coarsely crystalline, some medium. <1% to 2% polyhalite. <1% gray clay, some brown. Locally polyhalite. [2,4,6]

- **47.0'-48.8' HALITE**: Clear to light moderate reddish orange (10R 6/6), coarsely crystalline. <1% polyhalite. [1,2]

- **48.8'-51.0' HALITE**: Clear to light moderate reddish orange (10R 6/6). Medium to coarsely crystalline, some fine. <1/2% polyhalite and gray clay locally. Break at 50.6' which dips 45°E. Trace of gray clay along contact of fine-medium crystalline and coarse crystalline halite at 49'-50.5'. [1,9]
**GEOLOGIC DRILL LOG**

**INSTRUMENT**
- TYPE & NUMBER: DH-39
- LOCATION: ROOM 6 - ROOF

**STATION**
- N1101, W2482
- COLLAR ELEV.: 1296.0 FT
- DIRECTION OF DRILLING: UP
- MINE COORDINATES: N10789.2, E4430.7
- DEPTH OF BOREHOLE: 50.7 FT
- DRILLING METHOD: ROTARY AIR
- DRILL MAKE/MODEL: CF-65

**DATE STARTED:** 1-24-85  **DATE COMPLETED:** 1-24-85  **LOGGED BY:** J. E. GALLERANI

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft)</th>
<th>LENGTH</th>
<th>CORE RUN</th>
<th>RECOVERY</th>
<th>% RECOVERED</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
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<tr>
<td>1</td>
<td>0</td>
<td>3.7</td>
<td>3.0</td>
<td>41</td>
<td>0.0'-3.6' HALITE: Clear, coarsely crystalline, some medium. [1]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>3.7</td>
<td>5.0</td>
<td>4.3</td>
<td>86</td>
<td>3.6'-6.6' + 0.3' HALITE: Clear, some moderate brown (Syr 3/4), coarsely crystalline to 5', then medium to coarse. &lt; 1% clay, increasing content from 3'. Brown, some gray. Break at 5.9'.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>8.7</td>
<td>5.0</td>
<td>4.8</td>
<td>96</td>
<td>6.6'-6.8' ANHYDRITE &quot;a&quot;: Medium gray, microcrystalline. Gray clay at 6.6'. Core broken. Halite growths especially within 0.05' of lower contact.</td>
<td></td>
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<td></td>
<td></td>
<td>6.0'-13.2' HALITE: Clear, coarsely crystalline. &lt;1/2% polyhalite from 12.7'. [1]</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>4</td>
<td>13.7</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>13.2'-13.9' HALITE: Clear to moderate brown (Syr 3/4) and light moderate reddish orange. Fine to medium crystalline. 5% brown clay. &lt;1% dispersed polyhalite. [9,17]</td>
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<td></td>
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<td></td>
<td></td>
<td>13.9'-14.45' ANHYDRITE &quot;a&quot;: Light gray to light medium gray, microcrystalline anhydrite. Near-horizontal laminae. Scattered halite growths. 3/8&quot; gray clay at 13.9'.</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>14.45'-18.75' POLYHALITIC HALITE: Clear to moderate reddish orange (Syr 6/6); coarsely crystalline. &lt;1% polyhalite, average 2%. Anhydrite stringers at 15.8'. [2,3,4]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>18.75</td>
<td>5.0</td>
<td>4.8</td>
<td>96</td>
<td>18.75'-23.7' HALITE: Clear to moderate brown (Syr 4/4) and some moderate reddish orange (Syr 6/6). Medium to coarsely crystalline. &lt;1% brown clay, locally up to 2%. &lt;1% polyhalite, dispersed and blebs. [10,17]</td>
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<td></td>
<td></td>
<td></td>
<td>23.7'-25.2' HALITE: Clear, coarsely crystalline. &lt;1/2% brown clay to 26'. &lt;1/4% brown clay at 25.0' with associated anhydrite layer at 25.15'. [1]</td>
<td></td>
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<td></td>
<td></td>
<td>25.2'-30.0' HALITE: Clear to moderate brown, some moderate reddish orange. Fine to medium, some coarse. &lt;1% brown clay. &lt;1/2% dispersed polyhalite. [12]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>30.0</td>
<td>4.7</td>
<td>4.7</td>
<td>100</td>
<td>Run 6: Core broken; discing throughout.</td>
<td></td>
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<td></td>
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</table>

**BORING NO.** DH-39
<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>RECOVERY</th>
<th>% RECOVERED</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>28.4</td>
<td>4.7</td>
<td>4.7</td>
<td>100</td>
<td>-</td>
<td>30.0' - 32.6' HALITE: Clear, some moderate brown (SYE 4/4), coarsely crystalline. None to &lt;1% brown clay. [1, 8]</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>30.2</td>
<td>1.8</td>
<td>1.8</td>
<td>100</td>
<td>X</td>
<td>32.4' - 34.9' AMMOLACIOUS HALITE: Clear to moderate brown (SYE 3/4; 4/4). Medium to coarsely crystalline. &lt;1 to &lt;3% brown clay. Trace of dispersed polyhalite.</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>31.7</td>
<td>1.5</td>
<td>1.5</td>
<td>100</td>
<td>-</td>
<td>34.9' - 35.9' HALITE: Clear to light moderate reddish orange; medium to coarsely crystalline. &lt;1/2% dispersed polyhalite and gray clay [2, 9].</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>33.1</td>
<td>1.4</td>
<td>1.4</td>
<td>100</td>
<td>X</td>
<td>35.9' - 36.5' AMMONITE: Light gray to medium gray microcrystalline anhydrite. Some halite growth. Trace brown clay at 35.9'. Core grinding evident.</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>35.9</td>
<td>2.8</td>
<td>2.8</td>
<td>100</td>
<td>X</td>
<td>36.5' - 41.4' HALITE: Clear, some light moderate reddish orange (10R 6/6) coarsely crystalline. &lt;1/2% polyhalite. [1, 2]</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>37.9</td>
<td>2.0</td>
<td>1.7</td>
<td>85</td>
<td>X</td>
<td>41.4' - 45.7' ± 0.6' HALITE: Clear with some moderate brown and moderate reddish orange. Fine to medium crystalline to 45.3', then coarsely crystalline. &lt;1/2% dispersed polyhalite. &lt;1% brown clay.</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>42.9</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
<td>45.7' - 50.7' AMMOLACIOUS HALITE: Clear to moderate brown (SYE 3/4). Medium to coarsely crystalline, some fine. &lt;1 to &lt;3% brown clay.</td>
<td></td>
</tr>
</tbody>
</table>

BORING NO. DH-39
<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft)</th>
<th>LENGTH</th>
<th>CORE RUN</th>
<th>% RECOVERED</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.0</td>
<td>3.0</td>
<td>1.1</td>
<td>37</td>
<td>0.0'-3.0' HALITE: Clear, coarsely crystalline, some medium.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>5.0</td>
<td>4.0</td>
<td>3.3</td>
<td>82</td>
<td>3.0'-5.9' HALITE: Clear, some light moderate brown, coarsely crystalline.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Cl/2% brown clay.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>10.0</td>
<td>4.0</td>
<td>2.8</td>
<td>70</td>
<td>5.9'-7.0' HALITE: Clear to moderate brown (5YR 4/4), fine to medium, some coarse crystalline. 61%, locally 2%, brown clay with trace of gray.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Cl/2% dispersed polyhalite.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>15.0</td>
<td>5.0</td>
<td>4.2</td>
<td>84</td>
<td>7.0'-7.3' ANHYDRITE &quot;b&quot;: Light to light medium gray (7.5Y, 8.5Y), microcrystalline anhydrite.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Laminated to 7.3'. Scattered halite growths. 61/2% clay at 7.0'. Some core grinding evident.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>20.0</td>
<td>5.0</td>
<td>3.4</td>
<td>68</td>
<td>7.3'-12.5' 0.4' HALITE: Clear, coarsely crystalline.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Scattered white anhydrite stringers. Cl/2% polyhalite locally.</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>25.0</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>12.5'-13.9' 0.4' HALITE: Clear to moderate brown (5YR 4/4), medium to coarsely crystalline.</td>
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</tr>
<tr>
<td></td>
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<td></td>
<td>61% brown clay, some gray. Only 3,6' core recovered.</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>30.0</td>
<td></td>
<td></td>
<td></td>
<td>13.8'-14.4' ANHYDRITE &quot;a&quot;: Light to light medium gray (7.5Y, 8.5Y), microcrystalline anhydrite.</td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Irregular dark/light lamina. Trace of brown clay at 13.8'. Low-angle contact.</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>35.0</td>
<td>5.0</td>
<td></td>
<td></td>
<td>14.4'-18.8' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 4/6), coarsely crystalline.</td>
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<tr>
<td></td>
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<td></td>
<td></td>
<td>&lt;1 3% polyhalite.</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>40.0</td>
<td>5.0</td>
<td></td>
<td></td>
<td>18.8'-28.0' HALITE: Clear to moderate brown (5YR 4/4), some moderate reddish orange.</td>
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<tr>
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<td></td>
<td>Medium to coarse crystalline, some fine. 61% brown clay, trace of gray.</td>
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<tr>
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<td></td>
<td></td>
<td>Cl/2% of polyhalite locally. Irregular, low-angle brown clay seam at 24.4'. Up to 1/4&quot;, associated anhydrite to 25'. Core browned.</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>45.0</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>25.0'-27.7' HALITE: Clear, coarsely crystalline.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Scattered polyhalite and anhydrite stringers.</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>50.0</td>
<td></td>
<td></td>
<td></td>
<td>Run 8: Zones of broken core.</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>55.0</td>
<td>5.0</td>
<td></td>
<td></td>
<td>Run 9: Some broken cores.</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>60.0</td>
<td>5.0</td>
<td></td>
<td></td>
<td>Run 10: Some broken zones.</td>
<td></td>
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<tr>
<td>RUN NUMBER</td>
<td>DEPTH (ft.)</td>
<td>LENGTH CORE RUN</td>
<td>RECOVERY</td>
<td>% RECOVERED</td>
<td>PROFILE</td>
<td>DESCRIPTION</td>
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<td>-------------</td>
</tr>
<tr>
<td>26.0</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
<td></td>
<td>27.7'-29.4' HALITE: Clear, some moderate brown (5YR 4/4) and moderate reddish orange (10R 6/4). Medium to coarsely crystalline, some fine. ≤1% brown clay and ≤1% dispersed polyhalite locally.</td>
</tr>
<tr>
<td>7</td>
<td>1.5</td>
<td>1.5</td>
<td>100</td>
<td>X</td>
<td></td>
<td>29.4'-31.4' HALITE: Clear, coarsely crystalline.</td>
</tr>
<tr>
<td>8</td>
<td>30</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td></td>
<td>31.4'-36.5' ANHYDROUS HALITE: Clear to moderate brown (5YR 4/4; 3/4), fine to coarsely crystalline. ≤1% to 3% brown clay. Scattered halite.</td>
</tr>
<tr>
<td>9</td>
<td>35</td>
<td>4.0</td>
<td>4.0</td>
<td>100</td>
<td></td>
<td>36.5'-37.25' ANHYDROUS: Light to medium gray (7.5N, 7.5Y), microporous anhydrite. Laminated most noticeable from 37.0'. Prominent halite growths to 36.75'. Up to 1/4&quot; brown clay at 36.5' but core broken here.</td>
</tr>
<tr>
<td>10</td>
<td>40</td>
<td>4.6</td>
<td>4.6</td>
<td>100</td>
<td>X</td>
<td>37.25'-42.55' HALITE: Clear, coarsely crystalline. Some to 2% polyhalite. Scattered anhydrite. (1.2) ≤2% polyhalite from 38.9-41.1'.</td>
</tr>
<tr>
<td>11</td>
<td>41.1</td>
<td>1.4</td>
<td>1.4</td>
<td>100</td>
<td></td>
<td>42.55'-47.0' HALITE: Clear, some moderate brown (5YR 4/4), coarsely crystalline, some fine to medium locally. ≤1% brown clay.</td>
</tr>
<tr>
<td>12</td>
<td>45</td>
<td>4.4</td>
<td>4.4</td>
<td>100</td>
<td></td>
<td>47.0'-49.9' ANHYDROUS HALITE: Clear to moderate brown (5YR 3/4; 4/4). Medium to coarsely crystalline, some fine. ≤1 to 3% brown clay, locally up to 5%. Scattered breaks.</td>
</tr>
<tr>
<td>13</td>
<td>50</td>
<td>3.0</td>
<td>3.0</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>55</td>
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<tr>
<td>RUN NUMBER</td>
<td>DEPTH (ft.)</td>
<td>LENGTH CORE RUN</td>
<td>% RECOVERED</td>
<td>PROFILE</td>
<td>DESCRIPTION</td>
<td>REMARKS</td>
</tr>
<tr>
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</tr>
<tr>
<td>1</td>
<td>0</td>
<td>3.6</td>
<td>3.6</td>
<td>100</td>
<td>0.0'-5.3' HALITE: Clear, some light moderate brown (SY 4/4) and light moderate reddish orange (10R 6/6). Medium to coarsely crystalline. &lt;1% brown clay.</td>
<td>2-3/4&quot; I.D. single-tube barrel used for Run 1.</td>
</tr>
<tr>
<td>2</td>
<td>3.6</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>5.3'-6.6' HALITE: Clear to moderate reddish orange (10R 6/6), coarsely crystalline. &lt;1% polyhalite from 5.6'.</td>
<td>Dry hole. No gas detected.</td>
</tr>
<tr>
<td>3</td>
<td>8.6</td>
<td>4.6</td>
<td>4.6</td>
<td>100</td>
<td>6.2'-7.3' POLYHALITIC HALITE: Clear to moderate reddish orange/brown (10R 6/6, 4/6). Coarsely crystalline. &lt;1% polyhalite.</td>
<td>Total drilling time: 8 hrs 2.</td>
</tr>
<tr>
<td>4</td>
<td>13.2</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>7.3'-10.1' HB-139: Mixture of halite/anhydrite with &quot;malloctail&quot; pattern from 7.3' to 8.9'. Then predominantly light to medium gray (87, 85) microcrystalline anhydrite. Scattered halite growths. Up to 1/2&quot; dry gray clay at lower contact. Contact dips 20° east.</td>
<td>45% of core recovered one 22-inch length.</td>
</tr>
<tr>
<td>5</td>
<td>18.2</td>
<td>4.8</td>
<td>4.8</td>
<td>100</td>
<td>10.1'-14.5' HALITE: Clear to light moderate reddish orange (10R 6/6). Medium to coarsely crystalline.</td>
<td>Interval 20'-40.5' replaced with hole DH-42A.</td>
</tr>
<tr>
<td>6</td>
<td>23.0</td>
<td>5.3</td>
<td>4.4</td>
<td>83</td>
<td>14.5'-17.6' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6), coarsely crystalline. &lt;1% polyhalite.</td>
<td>Barrel plugged during Run 6.</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>17.6'-24.5' 0.5' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6). Coarsely crystalline. 1 to 3% polyhalite. &lt;1% gray clay to 20.8'. Scattered anhydrite.</td>
<td>No core recovery in Run 7.</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>24.5'-28.3' HALITE: Clear, some light moderate reddish orange (10R 6/6) and moderate brown (SY 4/4). Medium to coarsely crystalline. &lt;1% brown clay.</td>
<td>Poor core quality in Runs 5 and 9.</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>28.3'-30.8' Unable to log due to poor recovery and quality.</td>
<td></td>
</tr>
<tr>
<td>RUN NUMBER</td>
<td>DEPTH (ft.)</td>
<td>LENGTH CORE RUN</td>
<td>RECOVERY</td>
<td>% RECOVERED</td>
<td>PROFILE</td>
<td>DESCRIPTION</td>
</tr>
<tr>
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<td>-------------</td>
</tr>
<tr>
<td>6</td>
<td>25</td>
<td>5.3</td>
<td>4.4</td>
<td>83</td>
<td>-</td>
<td>39.0'-43.3' HALEITE: Clear, some moderate brown (5YR 4/4); medium gray (85) and moderate reddish orange. Coarsely crystalline. 61% clay, gray with some brown. 6% polyhalite.  &quot;Bleach-gray break at 43.3'&quot;.</td>
</tr>
<tr>
<td>25.3</td>
<td>30</td>
<td>5.0</td>
<td>0.0</td>
<td>0</td>
<td>X</td>
<td>43.3'-44.65' ABBECLASSIC HALEITE: Clear to moderate brown (5YR 4/4), fine to medium crystalline, some coarse. &lt;1% polyhalite. &lt;1 to 3% brown clay. Scattered breaks.</td>
</tr>
<tr>
<td>7</td>
<td>35</td>
<td>3.5</td>
<td>2.0</td>
<td>57</td>
<td>-</td>
<td>44.65'-47.2' HALEITE: Clear, some moderate reddish orange (10R 6/6). Coarsely crystalline, some fine to medium. &lt;1% gray clay. Predominantly brown clay to 46'. &lt;1% polyhalite. [9, 11, some 17]</td>
</tr>
<tr>
<td>8</td>
<td>36.8</td>
<td>3.0</td>
<td>0.4</td>
<td>13</td>
<td>-</td>
<td>47.2'-51.2' HALEITE: Clear, coarsely crystalline. &lt;1/2% polyhalite. [1]</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>40.1</td>
<td>3.1</td>
<td>3.1</td>
<td>100</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>42.9</td>
<td>5.1</td>
<td>5.0</td>
<td>58</td>
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<tr>
<td>12</td>
<td>48.0</td>
<td>3.2</td>
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<td>63</td>
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</tr>
<tr>
<td>51.2</td>
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<tr>
<td>RUN NUMBER</td>
<td>DEPTH (ft)</td>
<td>LENGTH CORE RUN</td>
<td>RECOVERY %</td>
<td>RECOVERED PROFILE</td>
<td>DESCRIPTION</td>
<td>REMARKS</td>
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</tr>
<tr>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td>0.0' - 20.0' No core. Refer to DH-42 log...</td>
<td></td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>20.0' - 25.7' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6), coarsely crystalline.</td>
<td>Replacement hole for portion of core hole DH-42.</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td>Cl to 3% polyhalite. &lt;1% gray clay from 24.7' - 25.7'. Some brown clay. [7, some 4]</td>
<td>NG double-tube wireline barrel used. NG rods 20.0' - 40.5'.</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>25.7' - 28.9' HALITE: Clear, some moderate reddish orange (10R 6/6) and moderate brown (5YR 4/4). Medium to coarsely crystalline, some fine. &lt;1% polyhalite and brown clay. Scattered breaks from 26.0'. [17]</td>
<td>50% of core recovered was 32-inch length.</td>
</tr>
<tr>
<td></td>
<td>5.0</td>
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<td></td>
<td></td>
<td>26.9' - 33.4' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6), coarsely crystalline.</td>
<td>Total drilling time: 5 1/2 hrs.</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td>Cl to 3%, average 2% polyhalite. [4,7]</td>
<td>Dry hole. No gas detected.</td>
</tr>
<tr>
<td></td>
<td>10.0</td>
<td></td>
<td></td>
<td></td>
<td>33.4' - 35.0' HALITE: Clear, some light moderate reddish orange (10R 6/6), coarsely crystalline.</td>
<td>Very good core.</td>
</tr>
<tr>
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<td>6% polyhalite, locally 2%. Small melt wad in core. Gradual contact at 33.4'. [1,2,4]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>15.0</td>
<td></td>
<td></td>
<td></td>
<td>35.0' - 35.7' ANHYDRITE: Moderate reddish orange/brown (10R 6/6, 4/6), intermixed with polyhalitic halite to 35.3'. Then moderate reddish orange to light gray anhydrite. Scattered halite growths. Up to 3/4&quot; gray clay at 35.7'. Irregular, low-angle contact.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>20.0</td>
<td></td>
<td></td>
<td></td>
<td>35.7' - 40.5' HALITE: Clear to light moderate reddish orange (10R 6/6), medium to coarsely crystalline.</td>
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</tr>
<tr>
<td></td>
<td>21.0</td>
<td></td>
<td></td>
<td></td>
<td>&lt;1% polyhalite. 0 to &lt;1% gray clay. Breaks at 37.2' and 37.52'. [9,11]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>25.0</td>
<td></td>
<td></td>
<td></td>
<td>37.3'</td>
<td></td>
</tr>
<tr>
<td>RUN NUMBER</td>
<td>DEPTH (ft.)</td>
<td>LENGTH CORE RUN</td>
<td>% RECOVERED</td>
<td>PROFILE</td>
<td>DESCRIPTION</td>
<td>REMARKS</td>
</tr>
<tr>
<td>------------</td>
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<td>---------</td>
</tr>
<tr>
<td>2</td>
<td>26.5</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>X X X</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>31.5</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>X X X</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>36.5</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>40.5</td>
<td>4.0</td>
<td>1.6</td>
<td>90</td>
<td>X</td>
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</tbody>
</table>
**WIPP-SPDV**

**ROCK CORING LOG**

**UPWARD CORING**

**INSTRUMENT** Extensometer

**BORING NO.** DH-207  **TYPE & NUMBER** CE-246  **HOE SIZE** NX

**LOCATION** East 140 Drift, 300’ S of centerline of South 400 Drift, near E rib

**STATION** S697, E155  **COLLAR ELEV.** 1259.8’  **DIRECTION OF DRILLING** Up

**MINE COORDINATES** N8929.7, E7049.1  **BOREHOLE PENETRATION** 53.0’

**DRILLING METHOD** Wet (brine)  **DRILL MAKE/MODEL** Joy 12B

**PREPARED BY** RLB/TSC/DRK/Bechtel  **DATE** 1/26/83  **SHEET** 1 OF 3

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>PENETRATION (ft.)</th>
<th>% RECOVERED</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>25</td>
<td>5.0</td>
<td>X</td>
<td>20.7’ - 25.8’ HALITE: notched colorless to moderate reddish-orange (10R 6/6) to moderate brown (10R 7/4) halite, medium to coarsely crystalline, 0-1% polyhalite, 0-7% brown clay, banded clay/polyhalite appearance.</td>
</tr>
<tr>
<td>8</td>
<td>10</td>
<td>20.0</td>
<td>X</td>
<td>16.4’ - 20.7’ POLYHALITIC HALITE: colorless to moderate reddish-orange (10R 5/6) halite, medium to coarsely crystalline, 10-20% polyhalite from 16.4’-17.2’, 1% from 17.2’-20.7’. Clear, pure halite from 16.9’-17.0’, anhydrite stringer (~1/2”) at 17.0’, no clay, discontinuous anhydrite stringer (~1/8”) at 18.1”.</td>
</tr>
<tr>
<td>7</td>
<td>3</td>
<td>4.7 92</td>
<td>X</td>
<td>15.7’ - 16.4’ ANHYDRITE: (Anhydrite “a”) light gray (N7) microcrystalline anhydrite, 0-2% halite, no basal clay but core is badly broken and chipped up bottom of anhydrite—clay may be washed away.</td>
</tr>
<tr>
<td>6</td>
<td>0</td>
<td>4.2 84</td>
<td>X</td>
<td>8.9’ - 15.7’ HALITE: clear to colorless halite, medium to coarsely crystalline, 1% polyhalite from 8.9’-10.0’ and 13.9’-15.3’, absent elsewhere, ~1% gray clay from 13.9’-15.3’, clay absent elsewhere, anhydrite stringer (1/16”) at 9.0”.</td>
</tr>
<tr>
<td>5</td>
<td>0</td>
<td>20.0 180</td>
<td>X</td>
<td>8.75’ - 8.9’ ANHYDRITE: (Anhydrite “b”) light gray (N7), microcrystalline anhydrite, 8.4’-8.9’ core lost.</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>20.0 59</td>
<td>X</td>
<td>3.1’ - 8.75’ HALITE: colorless to moderate brown (5YR 3/4) halite, finely to coarsely crystalline, fining upward, 0-1% polyhalite, 1-3% brown clay locally concentrated, few blebs of gray clay, gray clay break is 8.75”.</td>
</tr>
<tr>
<td>3</td>
<td>5</td>
<td>1.7 85</td>
<td>X</td>
<td>0.8’ - 3.1’ HALITE: clear halite, coarsely crystalline, 1% polyhalite, 2% gray clay, 1% brown clay increasing upward, grades into next higher unit.</td>
</tr>
</tbody>
</table>

**PRESSURIZED GAS encountered at 11.9’ pushed drill rod back slightly and blew water out of hole.**

**GAS encountered at ~8.4’.**

**Core runs 1 through 4 were drilled without inner barrel.**

**0’ - 1’ drilled with 6” single-tube core barrel.**

**Drilling started at 09:30 hours on 10 December 1982.**
**WIPP-SPDV**

**ROCK CORING LOG**

**UPWARD CORING**

**WASTE ISOLATION PILOT PLANT**

**EXTENSOMETER**

**BORING NO.** DH-207  **TYPE & NUMBER** GE-246  **HOLE SIZE** NX

**LOCATION** East 140 Drift, 300' S of centerline of South 400 Drift, near E rib

<table>
<thead>
<tr>
<th>STATION</th>
<th>S697, E155</th>
<th>COLLAR ELEV.</th>
<th>1259.8'</th>
<th>DIRECTION OF DRILLING</th>
<th>Vertical</th>
</tr>
</thead>
<tbody>
<tr>
<td>MINE COORDINATES</td>
<td>N8989.7, E7049.1</td>
<td>BOREHOLE PENETRATION</td>
<td>53.0'</td>
<td>DRILLING METHOD</td>
<td>Wet (brine)</td>
</tr>
<tr>
<td>DRILL MAKE/MODEL</td>
<td>Joy 12B</td>
<td>PREPARED BY</td>
<td>RLB/TSC/DGK/Bechtel</td>
<td>DATE</td>
<td>1/26/83</td>
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<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>PENETRATION</th>
<th>RECOVERY (ft.)</th>
<th>% RECOVERED</th>
<th>RQD</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>50</td>
<td>4.0</td>
<td>100</td>
<td></td>
<td></td>
<td>46.9' - 49.0' HALITE: colorless halite, coarse-ly crystalline, CIES polyhalite, few blebs of clay 45.9'-48.0', increasing to 1-2' (total brown and gray) from 48.0'-49.0', grades into unit above.</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>46 92</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>43.0' - 46.9' HALITE: mottled colorless to moderate brown (STR 3/4) halite, medium to coarse-ly crystalline, CIES polyhalite, 1-3% brown clay locally concentrated, brown clay parting at 43.5', 45.3'-46.6' is relatively pure halite with one brown clay seam impossible to locate because of condition of core.</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>4.7 94</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>39.5' - 43.0' HALITE: colorless to moderate reddish-orange (10R 6/6) halite, coarse-ly crystalline, 1-3% disseminated polyhalite, several anhydrite stringers but core too broken to locate.</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>4.6 92</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>39.1' - 39.9' ANHYDRITE: (Marker bed 13B) light gray (77) microcrystalline anhydrite, moderate (10R 6/6) to dark reddish-brown (10R 3/4) polyhalite band from 39.8'-39.9', 30-40% halite in upper 0.2'.</td>
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</tr>
<tr>
<td>10</td>
<td>5.0 100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>33.9' - 39.1' HALITE: mottled colorless to moderate brown (STR 3/4) halite, finely to coarse-ly crystalline, fine upward, few blebs of polyhalite except for 1-2' at 38.2', 3% brown clay, CIES grey clay, brown clay seams at 38.3' and 39.1', brown clay break at 37.6', 0.1' of clear halite with trace grey clay at top of unit.</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>5.0 100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>31.4' - 35.9' HALITE: colorless halite, coarse-ly crystalline, CIES polyhalite.</td>
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<tr>
<td>10</td>
<td>5.0 100</td>
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<td></td>
<td>29.4' - 31.4' ARGLILEOUS HALITE: colorless to moderate brown (STR 3/4) halite, finely to coarse-ly crystalline, few blebs of polyhalite, 1-3% brown and gray clay 29.4'-30.0', 10-20%, brown clay 30.0'-31.4', brown clay parting at 30.6', 30.8', 31.0', and 31.3', anhydrite stringer (C166') at 31.2'.</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>5.0 100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>25.8'-29.4' HALITE: colorless halite, coarse-ly crystalline, few blebs of polyhalite, brown clay parting at 25.3', clay absent elsewhere, anhydrite stringer zone 26.3'-27.7', anhydrite stringers (C166') at 26.9', 27.2', 27.6', and 28.3'.</td>
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(as below)
<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>PENETRATION (ft.)</th>
<th>% RECOVERED</th>
<th>PROFILE</th>
</tr>
</thead>
</table>
| 49.0’ - 53.0’ | ANTELLOUS HALITE: snowlike to moderate brown (3YR 3/4) halite, finely to coarsely crystalline, firing upward, <12
polyhalite, 1-10% brown clay, increasing upward, brown clay partings at 50.1’, 51.0’, 52.6’ and
52.9’, brown clay seam at 50.2’. |

Total penetration = 53.0’.

Drilling completed on 11 December 1982.
**WIPP-SPDV ROCK CORING LOG**  
**WASTE ISOLATION PILOT PLANT**

<table>
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<tr>
<th>BORING NO.</th>
<th>DH-208</th>
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<td>INSTRUMENT</td>
<td>None</td>
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<tr>
<td>TYPE &amp; NUMBER</td>
<td>None</td>
</tr>
<tr>
<td>HOLE SIZE</td>
<td>NX</td>
</tr>
<tr>
<td>LOCATION</td>
<td>East 140 Drift, 300' S of centerline of South 400 Drift, near E rib</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>STATION</th>
<th>S698, E150</th>
<th>COLLAR ELEV.</th>
<th>1251.6'</th>
<th>DIRECTION OF DRILLING</th>
<th>Vertical</th>
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<tbody>
<tr>
<td>MINE COORDINATES</td>
<td>N9898.8, E7044.0</td>
<td>DEPTH OF BOREHOLE</td>
<td>49.2'</td>
<td>DRILLING METHOD</td>
<td>Wet (brine)</td>
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<tr>
<td>DRILL MAKE/MODEL</td>
<td>Joy 12B</td>
<td></td>
<td></td>
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</tr>
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<td>PREPARED BY</td>
<td>DGK, JPS/Bechtel</td>
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<tr>
<td>DATE</td>
<td>1/26/83</td>
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| SHEET | 1 OF 2 |

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<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>RECUPERATION</th>
<th>% RECOVERED</th>
<th>RQD</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
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<tr>
<td>1</td>
<td>0</td>
<td>1.5</td>
<td>75</td>
<td>-</td>
<td>X</td>
<td>0.0' - 9.1' HALITE: clear to moderate reddish-orange (1X 6/6) and moderate reddish-brown (1X 4/6) halite, moderately hard, medium to coarsely crystalline, scattered blebs of orange polyhalite throughout. Trace (1X 2/2) of brown interstitial clay. Polyhalite content increases to 30% below 8.0'. Clear halite from 6.5' to 8.0'.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>5</td>
<td>1.5</td>
<td>36</td>
<td>-</td>
<td>X</td>
<td>9.1' - 12.4' ANHYDRITE: (burkite bed 139) light gray (N7) anhydrite, moderately hard, very finely crystalline, core broken into 1/4&quot; to 3/4&quot; pieces.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>10</td>
<td>4.2</td>
<td>100</td>
<td>-</td>
<td>X</td>
<td>12.4' - 12.7' CLAY: medium light gray (N6) clay seam, stiff, moderately plastic.</td>
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<tr>
<td>4</td>
<td>15</td>
<td>4.4</td>
<td>68</td>
<td>-</td>
<td>X</td>
<td>12.7' - 16.9' HALITE: clear to wettled medium gray (N5) to pale reddish-brown (1X 5/4) halite, moderately hard, finely to coarsely crystalline. Clay comprises 3-5% with trace (2-3%) interstitial polyhalite and scattered polyhalite blebs. Clay breaks at 13.6', 13.9', 14.0', 14.4', 14.7', 15.3', 16.1', and 16.7'.</td>
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<tr>
<td>5</td>
<td>20</td>
<td>5.1</td>
<td>100</td>
<td>-</td>
<td>X</td>
<td>16.9' - 28.1' HALITE: clear halite with some moderate reddish-orange (1X 6/6) polyhalite zones, finely to coarsely crystalline, moderately hard. Trace (1X 2) interstitial, light gray (N7) clay from 21.5' - 23.8'. Polyhalite content ranges from 0 to 20% throughout and increases to 2-30% from 26.5' - 28.1'. Clear halite from 26.7' to 26.0'.</td>
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<tr>
<td>6</td>
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<td>4.9</td>
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<td>-</td>
<td>X</td>
<td>28.1' - 30.0'</td>
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# WIPP-SPDV ROCK CORING LOG

**WASTE ISOLATION PILOT PLANT**

**BORING NO.** DH-208  **TYPE & NUMBER** None  **HOLE SIZE** NX

**LOCATION** East 140' Drift, 300' S of centerline of South 400 Drift, near E rib

**STATION** 698  **COLLAR ELEV.** 1251.6'  **DIRECTION OF DRILLING** Vertical

**MINE COORDINATES** N8986.8, E7044.0  **DEPTH OF BOREHOLE** 49.2'

**DRILLING METHOD** Wet (brine) **DRILL MAKE/MODEL** Joy 12B

**PREPARED BY** DGK, IPS/Bechtel  **DATE** 1/26/83

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>RECOVERY</th>
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28.1' - 34.0' **HALITE**: clear to very light gray (NH) to light brownish-gray (STL 6/1) halite, moderately hard, medium to coarsely crystalline, clay in part comprises up to 3% of core. Few polyhalite blebs throughout. Very light gray (NH) halite from 29.3' - 30.2'. Clay breaks at 28.4', 29.3', 29.8', 30.9', and 32.0'.

34.0' - 39.2' **HALITE**: polyhalite, clear to moderate reddish-orange (IOR 6/6) halite, moderately hard, coarsely crystalline. Polyhalite occurs as interstitial layers and scattered blebs and comprises 2-3% of core. Polyhalite lens from 38.5' - 39.0'.

39.2' - 39.4' **ANHYDRITE**: very light gray (NH) anhydrite, dense, hard, very finely crystalline, few blebs of clear halite.

39.4' - 49.2' **ANHYDROUS HALITE**: clear to mottled medium dark gray (NH) to pale yellowish-brown (10YR 6/2), to pale red (12R 6/2) halite, moderately hard, finely to coarsely crystalline, clay content ranges from 0 to 10%. Scattered, near-horizontal clay breaks at 40.5', 40.7', 42.7', 42.9', 43.3', 47.6', 48.2', and 48.5'. Finely crystalline below 45.5'.

Drilling finished 14:30 hours, 10 December 1982.

Total depth = 49.2'.

Hole slowly discharging gas on 13 December 1981.
# WIPP-SPDV ROCK CORING LOG
## UPWARD CORING

**BORING NO.** DH-211  
**TYPE & NUMBER** None  
**HOLE SIZE** NX  
**LOCATION** East 140 Drift, 930' 5 of South 400 Drift centerline, near E rib

**STATION** S1320, E163  
**COLLAR ELEV.** 1270.5'  
**DIRECTION OF DRILLING** Vertical  
**MINE COORDINATES** N8366.5, E7557.1  
**BOREHOLE PENETRATION** 30.0'  
**DRILLING METHOD** Wet (brine)  
**DRILL MAKE/MODEL** Joy 12B  
**PREPARED BY** RLB/TSC/DOK/Bechtel  
**DATE** 1/26/83  
**SHEET** 1 OF 2

<table>
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**DESCRIPTION**

- 19.0' - 14.2' Halite: Mottled colorless to moderate brown (5% halite, locally to coarsely crystalline, filling upward, < 1% polyhalite, 1-3% brown clay locally concentrated, < 1% gray clay.)
- 15.1' - 19.0' Halite: Colorless to moderate reddish-orange (5% halite, coarsely crystalline, 1-3% polyhalite, polyhalite stringers at 15.1', anhydrite stringers from 15.1' - 15.6', anhydrite stringers at 15.3' and 17.1'.
- 14.5' - 15.1' Anhydrite: (Anhydrite "a") Light gray (87) microcrystalline anhydrite.
- 13.7' - 14.5' Halite: Mottled colorless to grayish-orange (5% halite, medium to finely crystalline, < 1% polyhalite, 1-3% disseminated brown clay, < 1% gray clay, gray clay parting at 14.5'.
- 7.9' - 13.7' Halite: Colorless halite, coarsely crystalline, < 1% polyhalite and clay, anhydrite stringers at 9.5' (0.5") and 10.6' (0.5"), gray clay increases from 0-1% from 13.7' - 13.9', grades into unit above.
- 7.8' - 7.5' Anhydrite: (Anhydrite "b") Light gray (87) microcrystalline anhydrite, mixed with halite at upper contact.
- 5.0' - 7.8' Halite: Colorless to mottled moderate reddish-orange (5% halite, medium to finely crystalline, < 1% polyhalite locally concentrated, < 1% gray clay, clay gray clay break at 7.8'.
- 3.0' - 5.0' Halite: Colorless halite, coarsely crystalline, < 1% polyhalite, few blebs of gray clay.

**REMARKS**

Advancing 5' in 0.5 hr.

Gas at about 2'. Flow rate measured for 30 seconds = 11.3 clm.

Gas at moderate pressure at just under 8'.

CORE LOSS:

Run #1, at 1.5'-2.1'

Run #2, throughout run

0' - 1.0' drilled with 6" single-scew core barrel. Drilling started at 13:45

Drilling started at 18 December 1982.
**WIPP-SPDV**

**ROCK CORING LOG**

**UPWARD CORING**

**BORING NO.** DH-211  
**TYPE & NUMBER** None  
**HOLE SIZE** NX

**LOCATION** East 140 Drift, 930' S of South 400 Drift centerline, near E rib

---

**STATION** 51320, E163  
**COLLAR ELEV.** 1270.5'  
**DIRECTION OF DRILLING** Vertical

**MINE COORDINATES** N8366.5, E7057.1  
**BOREHOLE PENETRATION** 50.0'

**DRILLING METHOD** Wet (brine)  
**DRILL MAKE/MODEL** Joy 12B

**PREPARED BY** RLB/TSC/DDK/Bechtel  
**DATE** 1/26/83  
**SHEET** 2 of 2

---

### Run Numbers

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<td>25</td>
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**TOTAL PENETRATION** = 50.0'  
Finished at 15:00 hours on 19 December 1982.

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**48.1' - 50.0' HALITE:** Mottled, clear/colorless to moderate brown (3YR 3/4) halite, coarse to finely crystalline, fining upward, 1-2X disseminated polyhalite from 49.6'-50.0', few blebs elsewhere, 1-5X brown clay locally concentrated.

**46.2' - 48.1' HALITE:** Clear to colorless halite, coarse crystalline, <1X polyhalite and brown and grey clay, brown clay increases upward to 13 as unit grades into unit above.

**42.3' - 46.2' HALITE:** Mottled colorless to moderate brown 3YR 3/4 halite, medium to coarse crystalline, <1X polyhalite except 45.5' - 45.9' where 1-2X disseminated, 1-5X brown clay locally concentrated, brown clay break at 46.0'.

**38.5' - 42.3' POLYHALITIC HALITE:** Colorless to moderate reddish-orange (10R 6/6) halite, coarse to very crystalline, 2-5X polyhalite with localized elongate blebs of polyhalite, anhydrite alteration 38.5' - 38.7', 38.9', and 39.1', few blebs of clay, grades into unit above.

**38.0' - 38.3' ANHYDRITE:** (Marker Red 13B) Light gray (Y6) microcrystalline anhydrite.

**32.7' - 38.0' HALITE:** Mottled whiteish to moderate brown (3YR 3/4) halite, finely to coarse crystalline, <1X polyhalite except 36.8' - 37.1', 3X brown clay locally concentrated, brown clay break at 35.9', brown clay seam at 38.5'.

**30.4' - 32.7' HALITE:** Clear halite, coarse crystalline, <1X polyhalite and clay.

**28.5' - 30.4' HALITE:** Mottled whiteish to moderate brown (3YR 3/4) halite, finely to coarse crystalline, fining upward, <1X polyhalite, 1-5X brown clay locally concentrated, <1X grey clay, brown clay break at 29.4', brown clay parting at 30.5'.

**24.2' - 28.5' HALITE:** Colorless halite, coarse crystalline, <1X polyhalite and clay, anhydrite/grey clay parting at 24.6', anhydrite parting at 24.8', both ~0.3".
**WIPP-SPDV**

**ROCK CORING LOG**

**BORING NO. DH-212**

**TYPE & NUMBER** None

**LOCATION** East 140 Drift, 930' S of South 400 Drift centerline, near E rib

**STATION S1320, E153**

**COLLAR ELEV.** 1261.7'

**DIRECTION OF DRILLING** Down

**MINE COORDINATES** N8366.5', E7057.1'

**DEPTH OF BOREHOLE** 52.1'

**DRILLING METHOD** Wet (brine)

**DRILL MAKE/MODEL** Joy 12B

**PREPARED BY** DGK, JPS, Bechtel

**DATE** 1/26/83

**SHEET** 1 of 3

<table>
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<th>RECOVERY (%)</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
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<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>80</td>
<td>X</td>
<td>0.0' - 4.3' <em>HALITE</em>: clear to medium gray (NS) halite, moderately hard, coarse crystalline, 5% clay in part. Gray clay breaks at 2.0', 2.8', and 3.1'. Trace (&lt;1/2%) polyhalite at 1.9'.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>5.1</td>
<td>100</td>
<td>X</td>
<td>4.3' - 10.7' POLYHALITE<em>HALITE</em>: clear and moderate reddish-orange (10R 4/6) halite, moderately hard, fine to coarse crystalline, with trace of moderate brown (5YR 3/4) clay bands. 1% clay from 7.1' - 7.7'. Polyhalite occurs as blebs and interstitially and ranges from &lt;1% to 10%.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>10.0</td>
<td>100</td>
<td>X</td>
<td>10.7' - 12.6' ANHYDRITE* (Marked Bed 139) subhydrite, hard, dense, finely crystalline. Core is broken into 1/4&quot;-1/2&quot; chips from 12.1' to 12.6'. Medium light gray (8G) clay smear at 12.6', moderately soft and plastic, &lt;1/2&quot; chip.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>15.0</td>
<td>100</td>
<td>X</td>
<td>12.6' - 14.5' <em>HALITE</em>: clear, coarse crystalline halite, moderately hard, &lt;1% clay throughout. Medium light gray (8G) clay breaks at 13.0' and 15.1'.</td>
<td></td>
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<tr>
<td>5</td>
<td>20.0</td>
<td>100</td>
<td>X</td>
<td>14.3' - 27.3' POLYHALITE<em>HALITE</em>: clear and moderate reddish-orange (10R 4/6) halite, moderately hard, medium to coarse crystalline. Polyhalite is interstitial and occurs as blebs and ranges from 0% to 10%. Discontinuous, very thin clay breaks at 15.6', 18.8', 19.9', 21.6', 12.0', and 27.4'.</td>
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## WIPP-SPDV ROCK CORING LOG

**WASTE ISOLATION PILOT PLANT**

**BORING NO:** DIH-212  **TYPE & NUMBER:** None  **HOLE SIZE:** NY

**LOCATION:** East 140 Drift, 930' S of South 400 Drift centerline, near E rib

### ROCK CORING LOG

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<th>COLLAR ELEV.</th>
<th>DIRECTION OF DRILLING</th>
<th>MINE COORDINATES</th>
<th>Depth of Borehole</th>
<th>DRILLING METHOD</th>
<th>Drill Make/Model</th>
<th>PREPARED BY</th>
<th>DATE</th>
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<tr>
<td>S1320</td>
<td>1261.7'</td>
<td>Vertical</td>
<td>N8366.5, E7057.1</td>
<td>52.1'</td>
<td>Wet (brine)</td>
<td>Joy 12B</td>
<td>DGK, IPS/Bechtel</td>
<td>1/26/83</td>
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<td>51 100</td>
<td>(as above)</td>
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- **27.9" - 32.8" HALITE:** argillaceous in part, clear to mottled grayish-red (5R 6/2) and medium light gray (6G) halite, moderately hard, finely to medium crystalline. Clay is interstitial and comprises up to 5%. Few medium light gray (6G) and moderate brown (5YR 3/4) clay breaks at 28.2", 28.4", 29.4", 29.7", 30.0", 30.1", and 31.3". Trace (1/2") orange polyhalite blebs scattered from 31.2" to 32.8".

### Run Number 6

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<td>30</td>
<td>53 100</td>
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- **32.8" - 38.6" HALITE:** polyhalitic, clear and moderate reddish-orange (10R 6/6) halite, slightly banded in part, moderately hard, finely to coarsely crystalline. Polyhalite is interstitial and occurs as blebs and ramps from 33-51.

### Run Number 7

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<td>47 94</td>
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- **38.6" - 38.9" ANHYDRITE:** light gray (7G) anhydrite, dense, hard, very finely crystalline. At 38.9", trace of light gray (7G) clay on anhydrite fragments.

### Run Number 8

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- **38.9" - 51.9" ARGILLACEOUS HALITE:** clear to medium gray (5G) and pale yellowish-brown (10YR 6/2) halite, moderately hard, medium to coarsely crystalline, clay content from <1% to 10%. Few orange polyhalite blebs scattered throughout. Clay breaks at 43.0", 45.9", 48.1", 48.6", and 50.3".

### Run Number 10

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# WIPP-SPDV

## ROCK CORING LOG

**WASTE ISOLATION PILOT PLANT**

**BORING NO.** DH-212  
**TYPE & NUMBER** None  
**HOLE SIZE** NX  
**LOCATION** East 140 drift, 930" S of South 400 Drift centerline, near E rib

---

**STATION** S1320, E163  
**COLLAR ELEV.** 1261.7'  
**DIRECTION OF DRILLING** Vertical  
**MINE COORDINATES** N8366.5, E7057.1  
**DEPTH OF BOREHOLE** 52.1'  
**DRILLING METHOD** Wet (brine)  
**DRILL MAKE/MODEL** Joy 12B  
**PREPARED BY** DGK, JPS/Bechtel  
**DATE** 1/26/83

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<td>(as above)</td>
<td>31.9' - 52.1' Salite, clear halite, moderately hard, coarsely crystalline.</td>
<td>Finished hole at 12:45 hours on 18 December 1982. Total depth = 52.1'.</td>
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<td>X X</td>
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<td>23.2' - 28.8' halite: clear, fine to coarsely crystalline halite, moderately hard, few white anhydrite seams. At 24.7', anhydrite seam, 0.1' with brown clay parting. At 25.6', 1/2' white anhydrite seam, near horizontal and irregular.</td>
</tr>
<tr>
<td>6</td>
<td>4.3</td>
<td>X X X</td>
<td></td>
<td>23.4' - 23.2' halite: clear, medium to coarsely crystalline halite. 1% to 2% polyhalite bleb. Trace of interstitial brown clay.</td>
</tr>
<tr>
<td>5</td>
<td>5.0</td>
<td>X X X</td>
<td></td>
<td>18.0' - 22.4' halite: clear halite with 10-15% brown clay, coarsely crystalline. Clay breaks at 19.2', 19.1', and 20.3'. 3% interstitial polyhalite from 20.0' to 20.3'. At 20.6', anhydrite bleb.</td>
</tr>
<tr>
<td>4</td>
<td>4.9</td>
<td>X X</td>
<td></td>
<td>14.5' - 18.0' halite: clear, coarsely crystalline halite, 5% polyhalite in blebs. At 14.8', 1/2' thick anhydrite seam, sub-horizontal, irregular surface. From 15.1' - 17.0' polyhalite reduced to 1%. From 17.0' - 18.0' trace of grey clay.</td>
</tr>
<tr>
<td>3</td>
<td>1.7</td>
<td>X X X</td>
<td></td>
<td>14.0' - 14.5' anhydrite: (Anhydrite &quot;a&quot;) grey brown (5YR 3/2) to light grey, microcrystalline anhydrite.</td>
</tr>
<tr>
<td>2</td>
<td>0.7</td>
<td>X X X</td>
<td></td>
<td>7.6' - 14.0' halite: clear to light brown (10YR 4/2), coarsely crystalline halite. Less than 5% polyhalite, trace (&lt;5%) of interstitial light grey clay, Grey clay seam at 14.0'.</td>
</tr>
<tr>
<td>1</td>
<td>1.5</td>
<td>X X</td>
<td></td>
<td>7.4' - 7.6' anhydrite: (Anhydrite &quot;b&quot;) grey (1.4), hard anhydrite, grey halite, clay seam at 7.4'.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3.5' - 7.4' anhydrous halite: dark grey (5N) to brown (5YR 3/2), coarsely crystalline halite, 5-10% interstitial brown clay, trace of polyhalite.</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td>0.0' - 3.5' halite: clear coarsely crystalline halite, from less than 1% to 10% polyhalite.</td>
</tr>
</tbody>
</table>

Remarks:
- 0' - 1.0' drilled with 6" single-tube core barrel.
- Set casing to 4.5' at 09:00 hr. Begun NX coring with brine at 09:30 hrs, 7 January 1983.
- From 7.0' - 8.0', hit trace of pressurized gas.

Sheet 1 of 3
**WIPP-SPDV**  
**ROCK CORING LOG**

**UPWARD CORING**

**BORING NO.** DH-215  
**TYPE & NUMBER** GE-247  
**HOLE SIZE** NX  
**LOCATION** East 140 Drift, 1960' S of Exploratory Shaft centerline, 13' from E rib

**STATION** S1960, E153  
**COLLAR ELEV.** 1272.0'  
**DIRECTION OF DRILLING** Up  
**MINE COORDINATES** N7727.2, E7046.9  
**BOREHOLE PENETRATION** 52.0'  
**DRILLING METHOD** Wet (brine)  
**DRILL MAKE/MODEL** Joy 12B  
**PREPARED BY** BWH/TSC//RMB, JPS/Bechtel  
**DATE** 1/5-6/83  
**SHEET** 2 OF 3

<table>
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<tr>
<td>7</td>
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<td>6</td>
<td>20.0</td>
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<tr>
<td>3</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td></td>
<td></td>
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</table>

**42.0' - 52.0' ARGILLACEOUS HALITE:** halite with trace polyhalite, mottled grayish brown and reddish-orange (10YR 6/5). From 42.0' - 45.4', 20-30% brownish clay, coarsely crystalline with less than 1% polyhalite. Clay breaks as:
- 42.6', 42.9', 44.0', 44.2', 44.5', and 45.3'.
- From 45.4' - 47.4', clear, medium to coarsely crystalline, trace of gray clay, less than 1% polyhalite. From 47.4' - 52.0', argillaceous with 10-15% clay, fine to coarsely crystalline, moderately hard. Clay breaks as: 48.2', 48.8', 49.3', 49.4', 49.5', 50.4', 50.7', 50.9', 51.1', and 51.4'. From 51.2' - 52.0', finely crystalline with less than 1% interstitial polyhalite.

**36.4' - 42.0' HALITE:** polyhalitic (5-10%) halite, clear and mottled reddish-orange, polyhalite as blebs in part. Moderately hard, medium crystalline, trace of gray clay throughout. At 38.9', thin 1/4" anhydrite stringer.

**37.8' - 38.4' ANHYDRITE:** (Marker Bed 138) light gray (HS) anhydrite, hard, dense, with light and dark gray banding. At 37.8', 0.1' thick brown clay seam, moderately stiff.

**36.6' - 37.8' HALITE:** polyhalitic (20%) halite to 37.0', finely crystalline, mottled gray, brown, and reddish-orange, moderately hard. Argillaceous (10-15%) to 37.8', finely to medium crystalline, gray brown.

**32.8' - 36.6' ARGILLACEOUS HALITE:** dark grayish brown (5YR 3/2) halite with some clear halite. Moderately hard, medium to coarsely crystalline. Clay breaks at 33.3', 33.3', 34.1', 34.6', 35.9', 35.0', 35.4', 35.8', 36.3', and 36.6'.

**30.4' - 32.8' HALITE:** clear halite, moderately hard, finely to medium crystalline.

**28.8' - 30.4' ARGILLACEOUS HALITE:** brownish gray (5YR 4/3), finely to coarsely crystalline halite, moderately hard. Clay (10-20%) in dark brown with trace of gray polyhalite (1%) from 30.2' to 30.4'. At 29.6', brown clay break.

(As below)
WIPP-SPDV  ROCK CORING LOG
WASTE ISOLATION PILOT PLANT
UPWARD CORING

BORING NO.  DH-215  TYPE & NUMBER  GE-247  HOLE SIZE  NX
LOCATION  Fast 140 Drift, 1960' S of Exploratory Shaft centerline, 13' from E rib

STATION  S1960, E153  COLLAR ELEV. 1272.0'  DIRECTION OF DRILLING  Up
MINE COORDINATES  N7727.2, E7046.9  BOREHOLE PENETRATION 52.0'
DRILLING METHOD  Wet (brine)  DRILL MAKE/MODEL  Joy 128

PREPARED BY  BWH/TSC/RNB/JPS/Bechtel  DATE 1/5-6/82  SHEET 3 OF 3

Total penetration = 52.0'.
Completed hole at 10:00
hours on 6 January 1983.

<table>
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<th>PENETRATION (ft.)</th>
<th>% RECOVERED</th>
<th>DESCRIPTION</th>
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<td>(As below)</td>
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Remarks
# WIPP-SPDV ROCK CORING LOG

**WASTE ISOLATION PILOT PLANT**

**BORING NO.** DH-216  
**TYPE & NUMBER** GE-248  
**HOLE SIZE** NX

**LOCATION** East 140 Drift, 1960' S of Exploratory Shaft centerline, 13' from E rib

**STATION** 31960, E153  
**COLLAR ELEV.** 1262.6'  
**DIRECTION OF DRILLING** Down

**MINE COORDINATES** N7727.2', E7046.9'  
**DEPTH OF BOREHOLE** 54.2'  
**DRILLING METHOD** Wet (brine)  
**DRILL MAKE/MODEL** Joy 12B

**PREPARED BY** PMB, JPS/Bechtel  
**DATE** 1/8-10/83  
**SHEET** 1 OF 3

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
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<th>ROD</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
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<tr>
<td>0</td>
<td>0</td>
<td>0.7</td>
<td>70</td>
<td>X</td>
<td>0.0' - 2.0' HALITE: clear, fine to coarsely crystalline halite, trace of polyhalite.</td>
<td>NX coring began at 10:20 hours on 6 January 1983. From 0-7', core loss due to grinding throughout core 0 &amp; 1. 0' - 1' drilled with 4' single-cube core barrel.</td>
</tr>
<tr>
<td>1</td>
<td>4.8</td>
<td>80</td>
<td></td>
<td></td>
<td>2.0' - 8.6' ARGILLACEOUS HALITE: clear and medium gray (55) halite, moderately hard, 10-20% grey interstitial clay throughout, medium to coarsely crystalline. Clay breaks at 3.5' and 3.6'. At 4.2', blebs and trace of polyhalite.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>4.0</td>
<td>100</td>
<td></td>
<td></td>
<td>8.0' - 9.2' POLYHALITIC HALITE: clear and medium reddish-orange (10R 6/5) halite, coarsely crystalline, hard. Brittle, 20-30% finely crystalline polyhalite.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>5.2</td>
<td>100</td>
<td></td>
<td></td>
<td>11.5' - 12.3' POLYHALITIC: medium reddish-orange (10R 6/5) polyhalite, hard, finely crystalline, with 20-30% clear halite.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>6.3</td>
<td>100</td>
<td></td>
<td></td>
<td>12.3' - 12.5' CLAY: brownish-grey (5YR 7/1) clay seam, stiff to firm, subhorizontal with irregular lower contact. Trace of gas at 11.0'.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>5.2</td>
<td>100</td>
<td></td>
<td></td>
<td>15.6' - 27.8' POLYHALITIC HALITE: clear and medium reddish-orange (10R 6/5) halite, moderately crystalline, hard. 5-30% blebs of polyhalite. Polyhalite &lt; 1% from 20.5'-23.0'. Clay grey break at 26.9'.</td>
<td></td>
</tr>
<tr>
<td>RUN NUMBER</td>
<td>DEPTH (ft)</td>
<td>RECOVERY (%)</td>
<td>ROD</td>
<td>DESCRIPTION</td>
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<tr>
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<td>X X X X X</td>
<td>(As above)</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>30</td>
<td>5.3</td>
<td>100</td>
<td>X X X X X</td>
<td>27.8' - 27.8' ARGILLACEOUS HALITE: motiled brownish-gray (BYR 4/1) halite with trace of orange polyhalite. Moderately hard, finely to coarsely crystalline. Abundant interstitial clay at 30.9'. Clay breaks at: 27.85', 27.8', 28.5', 29.2', 29.3', 29.9', 30.2', 30.6', 31.4'.</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>35</td>
<td>5.2</td>
<td>100</td>
<td>X X X X X</td>
<td>32.4' - 38.2' HALITE: clear and medium reddish orange (10R 6/3) halite, finely to coarsely crystalline, moderately hard, few slabs of polyhalite throughout. Polyhalite generally less than 5%. At 37.2', sub-horizontal polyhalite seam.</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>40</td>
<td>5.1</td>
<td>100</td>
<td>X X X X X</td>
<td>38.2' - 38.4' ANHYDRITE: medium light gray (5B) anhydrite. Hard, dense, underlain by light gray clay parting of unknown thickness.</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>45</td>
<td>5.3</td>
<td>100</td>
<td>X X X X X</td>
<td>42.9' - 45.2' ARGILLACEOUS HALITE: mottled medium gray (5/5) halite, finely to medium crystalline, 10R gray clay throughout. Clay breaks at: 39.4', 39.6', 40.2', 40.6', 41.6'. From 40.9' to 41.8', trace of polyhalite.</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>50</td>
<td>5.1</td>
<td>100</td>
<td>X</td>
<td>45.2' - 49.7' ARGILLACEOUS HALITE: heavy grayish-brown halite, finely to medium crystalline, moderately hard, brown clay 2-3% clay breaks at: 45.7', 46.3', 46.7', 47.5', 49.6'. Trace of polyhalite.</td>
<td></td>
</tr>
</tbody>
</table>

(see description on next sheet)
**WIPP-SPDV**  
**ROCK CORING LOG**

**BORING NO.** DH-216  
**INSTRUMENT** Extensometer  
**TYPE & NUMBER** GE-248  
**HOLE SIZE** NX  
**LOCATION** East 140 Drift, 1960' S of Exploratory Shaft centerline, 13' from E rib

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**STATION** S1960, E153  
**COLLAR ELEV.** 1262.6'  
**DIRECTION OF DRILLING** Vertical Down  
**MINE COORDINATES** N7727.2, E7046.9  
**DEPTH OF BOREHOLE** 54.2'  
**DRILLING METHOD** Wet (brine)  
**DRILL MAKE/MODEL** Joy 128

**PREPARED BY** RMB, JPS/Bechtel  
**DATE** 1/8-10/83  
**SHEET** 3 OF 3

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft)</th>
<th>RECOVERY(%)</th>
<th>% RECOVERED</th>
<th>ROD</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
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<tbody>
<tr>
<td>10</td>
<td>50</td>
<td>5.1</td>
<td>100</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
| 11         | 55         | 1.5         | 100         | -   | -       | 45.7' - 54.2' HALITE: clear, medium to coarsely crystalline halite, moderately hard. Trace of gray clay throughout. | Hole completed on 6 January 1983 at 15:00 hours.  
Total depth = 54.2'. |

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**WIPP-SPDV**

**ROCK CORING LOG**

**UPWARD CORING**

**BORING NO.** DH-219  
**TYPE & NUMBER** None  
**HOLE SIZE** NX

**LOCATION** East 140 Drift, 2422' S of Exploratory Shaft centerline, 5' from E rib

**STATION S2422, E162**  
**COLLAR ELEV.** 1266.1'  
**DIRECTION OF DRILLING** Up  
**MINE COORDINATES** N7264.9, E7056.6  
**BOREHOLE PENETRATION** 51.0'

**DRILLING METHOD** Wet (brine)  
**DRILL MAKE/MODEL** Jor 12B

**PREPARED BY** JPS/Bechtel  
**DATE** 1/18/83  
**SHEET** 1 OF 3

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<td>28</td>
<td>5.1</td>
<td>0.0</td>
<td>65</td>
<td></td>
<td>24.0' - 28.0' HALITE: clear, medium to coarsely crystalline halite, moderately hard, few scattered white anhydrite blebs. At 24.3', 1/2&quot; thick medium gray (45) clay seam, dense, highly plastic.</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>25</td>
<td>5.0</td>
<td>0.0</td>
<td>65</td>
<td></td>
<td>21.7' - 24.0' HALITE: clear to light brownish-gray (5YR 4/1) halite, finely crystalline, moderately hard. Trace (&lt; 1%) of brown, interstitial argillaceous material throughout.</td>
<td></td>
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<tr>
<td>6</td>
<td>15</td>
<td>5.0</td>
<td>0.0</td>
<td>65</td>
<td></td>
<td>19.0' - 21.7' HALITE: argillaceous, clear to mottled brownish-gray (5YR 4/1) and moderate brown (5YR 3/4) halite, finely to medium crystalline, moderately hard. Light and dark brown interstitial argillaceous zones (5%) throughout. Clay breaks at: 19.0', 19.4', 19.9', 20.6', 20.7' and 21.5'.</td>
<td>Trace of pressurized gas encountered at 15.0'.</td>
</tr>
<tr>
<td>5</td>
<td>10</td>
<td>4.8</td>
<td>0.0</td>
<td>65</td>
<td></td>
<td>15.1' - 19.0' HALITE: clear, medium to coarsely crystalline halite, moderately hard. At 15.7', 45' dipping very light gray (5N) anhydrite seam, 1&quot; thick. Few blebs of reddish-orange (10R 5/6) polyhalite throughout. Polyhalite content increases to 1/2% below 18.2'.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>0.7</td>
<td>0.0</td>
<td>65</td>
<td></td>
<td>14.5' - 15.1' ANHYDRITE: (Anhydrite &quot;a&quot;) banded light (5N) to dark (5N) gray anhydrite, hard, dense, trace of clear interstitial halite throughout.</td>
<td></td>
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<tr>
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<td>2.1</td>
<td>2.1</td>
<td>0.0</td>
<td>65</td>
<td></td>
<td>14.4' - 14.5' CLAY: very light gray (5N) clay seam, subhorizontal, moderately soft.</td>
<td></td>
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<tr>
<td>2</td>
<td>1.5</td>
<td>2.1</td>
<td>0.0</td>
<td>65</td>
<td></td>
<td>8.0' - 14.4' HALITE: clear to very pale orange (10YR 8/2) halite, finely to coarsely crystalline, moderately hard. From 13.0' to 14.4', argillaceous content up to 1%. Few polyhalite blebs at 14.2'.</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>0.7</td>
<td>1.1</td>
<td>0.0</td>
<td>65</td>
<td></td>
<td>5.8' - 8.0' HALITE: argillaceous, clear to mottled brownish-gray (5YR 4/1) to moderate brown (5YR 3/4) halite, moderately hard, slightly brittle, finely to coarsely crystalline.</td>
<td></td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
<td>0.5' - 5.8' HALITE: clear halite, medium to coarsely crystalline, moderately hard. Trace (1%) of interstitial polyhalite and few scattered blebs of medium reddish-orange (10R 5/6) polyhalite throughout.</td>
<td></td>
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**CORE LOSS:**

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<td>4.1' - 4.8'</td>
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<td>5.2' - 6.0'</td>
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<tr>
<td>6.5' - 6.9'</td>
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</tr>
<tr>
<td>4</td>
<td>7.3' - 8.2'</td>
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**NOTE** coring began at 13:00 hours on 13 January 1983.
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<td>(see description on next sheet)</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>45</td>
<td>3.1</td>
<td>100</td>
<td></td>
<td>42.8' - 49.9' HALITE: argillaceous, clear to mottled grayish-brown (5YR 3/2) halite, moderately hard, finely to coarsely crystalline. Numerous scattered, brown clay breaks throughout. Argillaceous content ranges from 0% to 2%. Reduction in clay content from 46.8'-48.0'. Clay breaks at: 43.2', 43.8', 44.8', 44.9', 45.4', 45.9', 46.4', 46.5', 49.0', and 49.6'.</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>40</td>
<td>5.0</td>
<td>100</td>
<td></td>
<td>38.9' - 42.8' HALITE: clear, medium to coarsely crystalline halite, moderate hard. Few scattered stringers of light gray (N7) anhydrite throughout. Irregular anhydrite partings at: 39.0', 39.1', 3.97', and 40.2'.</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>35</td>
<td>4.8</td>
<td>96</td>
<td></td>
<td>38.1' - 38.9' ANHYDRITE: (Marker Bed 138) white (N9) to very light gray (N8) anhydrite, dense, hard, finely crystalline.</td>
<td>Trace of pressurized gas at 37.0'.</td>
</tr>
<tr>
<td>9</td>
<td>30</td>
<td>5.3</td>
<td>100</td>
<td></td>
<td>38.0' - 38.1' CLAY: moderate brown (5YR 3/4) clay, more or less plastic, subhorizontal contact with overlying anhydrite.</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>25</td>
<td>5.1</td>
<td>100</td>
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<td>32.5' - 38.0' ARGILLACEOUS HALITE: clear to mottled grayish-brown (5YR 3/2) halite, finely to medium crystalline, moderately hard. Argillaceous content 10-20%, but less than 5% from 32.5'-33.5'. From 37.3'-38.0', trace of interstitial dark yellowish-orange (10YR 6/6) polyhalite. Clay breaks at: 36.0', 34.2', 34.6', 35.6', 36.2', 36.3', and 36.9'.</td>
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<td>30.3' - 32.5' HALITE: clear, medium to coarsely crystalline halite, moderately hard.</td>
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<td>28.8' - 30.3' HALITE: argillaceous, clear to brownish-gray (5YR 4/1) halite, finely crystalline. Argillaceous content 0-2% from 28.8' to 29.3' and &lt; 1% from 29.3' to 30.3'.</td>
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</table>

(As below)
WIPP-SPDV ROCK CORING LOG
UPWARD CORING

BORING NO. DII-219 INSTRUMENT Type & NUMBER None HOLE SIZE NX
LOCATION East 140 Drift, 2422' S of Exploratory Shaft centerline, 5' from E rib.

STATION S2422, E162 COLLAR ELEV. 1266.3' DIRECTION OF DRILLING Up
MINE COORDINATES N7264.9, E7056.6 BOREHOLE PENETRATION 51.0'
DRILLING METHOD Wet (brine) DRILL MAKE/MODEL Joy 12K
PREPARED BY JPS/Bechtel DATE 1/18/83 SHEET

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>PENETRATION (ft.)</th>
<th>RECOVERED</th>
<th>% RECOVERED</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
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<td>13</td>
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<td>40</td>
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<tr>
<td>49.9'-51.0'</td>
<td>HALITE: argillaceous, clear, moderate brown (3TR 3/4) halite, very finely crystalline, sugary texture in part, moderately hard, 2-5% argillaceous content. Irregular, moderate brown (3TR 3/4) clay breaks at 50.0' and 50.2'.</td>
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</table>

Total penetration = 51.0'.

Hole completed at 15:15 hours on 14 January 1983.
### WIPP-SPDV ROCK CORING LOG

**UPWARD CORING**

**BORING NO.** DH-219A  
**TYPE & NUMBER** None  
**HOLE SIZE** NX  
**LOCATION** East 140 Drift, 2418’ S of exploratory shaft centerline, 5’ from E rib

**STATION** 82418, E162  
**COLLAR ELEV.** 1266.1’  
**DIRECTION OF DRILLING** Up  
**MINE COORDINATES** N7268.5, E7056.2  
**BOREHOLE PENETRATION** 11.3’

**DRILLING METHOD** Wet (brine)  
**DRILL MAKE/MODEL** Joy 12B

**PREPARED BY** JPS/Bechtel  
**DATE** 1/18/83  
**SHEET** 1 OF 1

<table>
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<tr>
<th>RUN NUMBER</th>
<th>PENETRATION (ft.)</th>
<th>RECOVERY (%)</th>
<th>% RECOVERED</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.2' - 11.3'</td>
<td>HALITE: clear halite, moderately hard, medium to coarsely crystalline. Few scattered halite stringers of very light gray (N8) anhydrite at 8.5', 8.8', 8.8', 10.0', 10.8' and 11.1'</td>
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<tr>
<td>5.5' - 8.2'</td>
<td>ARGLICIOUS HALITE: clear to semi-translucent brown (5YR 3/4) halite, medium to coarsely crystalline, moderately hard. Interstitial argillaceous material comprises 20% of core. Trace of grayish-orange (10YR 7/4) polyhalite (&lt;1%) from 7.0' to 7.3'. Brown clay break at 7.3' and gray clay parting at 8.2'.</td>
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<tr>
<td>0.0' - 5.5'</td>
<td>HALITE: clear halite, finely to coarsely crystalline, moderately hard, trace of medium reddish-orange (10R 5/6) polyhalite and scattered polyhalite bleds.</td>
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</table>

Total penetration = 11.3’.

Hole cored to determine exact location, thickness, and character of clay parting and anhydrite lens at 8.2’ not recovered in DH-219.

0' - 1.0' drilled with 6' single-tube coring barrel.

**RUN 1** core lost between 1.7' - 2.0'.

NX coring began at 10:00 hours and ended at 11:13 hours on 17 January 1983.
# WIPP-SPDV Waste Isolation Pilot Plant

## Rock Coring Log

**BORING NO.** DH-220  
**TYPE & NUMBER** None  
**HOLE SIZE** NX  
**LOCATION** East 140 Drift, 2421' S of Exploratory Shaft centerline, 5' from E rib

**STATION** S2421, E162  
**COLLAR ELEV.** 1257.4'  
**DIRECTION OF DRILLING** Down  
**MINE COORDINATES** N7265.5, E7055.9  
**DEPTH OF BOREHOLE** 51.8'  
**DRILLING METHOD** Wet (brine)  
**DRILL MAKE/MODEL** Joy 12B  
**PREPARED BY** JPS/Bechtel  
**DATE** 1/19/83

---

### Profile

<table>
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<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>% RECOVERED</th>
<th>PROFILES</th>
<th>DESCRIPTION</th>
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<tbody>
<tr>
<td>1</td>
<td>0</td>
<td></td>
<td>X-X</td>
<td>0.0'-4.3' SALTITE: clear, finely to coarsely crystalline halite, moderately hard. Trace (&lt;1%) of reddish-orange (10R 5/6) polyhalite blebs throughout. Few grayish-brown argillaceous zones, &lt;1%.</td>
</tr>
<tr>
<td>2</td>
<td>0.9</td>
<td>90</td>
<td>X-X</td>
<td>4.5'-4.8' POLYHALITIC SALTITE: clear to moderate reddish-orange (10R 6/6) halite, moderately hard, medium to coarsely crystalline. Polyhalite (5-10%) occurs as blebs and interstitial layers.</td>
</tr>
<tr>
<td>3</td>
<td>10</td>
<td>100</td>
<td>X-X</td>
<td>8.8'-11.0' ANHYDRITE: (Marker Bed 139) polyhalitic, pale reddish-brown (10R 5/4) and medium gray (N5) anhydrite, dense, finely crystalline, hard, numerous polyhalite seams and partings comprise up to 30% of core, slightly banded. Medium gray (N5) clay parting at 11.0'.</td>
</tr>
<tr>
<td>4</td>
<td>15</td>
<td>98</td>
<td>X-X</td>
<td>11.0'-19.9' SALTITE: polyhalitic in part, clear halite, light gray (N7) and moderate reddish-orange (10R 6/6). Finely to coarsely crystalline, moderately hard, interstitial gray clay at 12.2'. Polyhalite content 2X (3-5X) from 16.0' to 19.9'. Scattered polyhalite blebs at 14.0', seam at 19.3'.</td>
</tr>
<tr>
<td>5</td>
<td>20</td>
<td>100</td>
<td>X-X</td>
<td>19.9'-22.0' SALTITE: clear to light gray (N7) halite, medium to coarsely crystalline, moderately hard, trace clay (&lt;1%) in part. Gray clay break at 20.0'.</td>
</tr>
<tr>
<td>6</td>
<td>25</td>
<td>100</td>
<td>X-X</td>
<td>22.0'-28.4' SALTITE: polyhalitic, clear to moderate reddish-orange (10R 6/6) and light brown-lavender clay (5R 6/2) halite, finely to coarsely crystalline, moderately hard, 2-3X polyhalite and trace (&lt;1%) clay from 28.3'-28.4'. Finely crystalline from 24.9'-27.0'. Polyhalite occurs as interstitial layers and irregular blebs. Below 26.8', 5X interstitial clay gray, with clay breaks at 26.8', 27.0' and 27.4'.</td>
</tr>
</tbody>
</table>

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**NOTES:**
- NX coring began at 08:30 hours on 15 January 1983.
- **CORE LOSS:**
  - RUN 1: 1.3'-1.4'
  - 2: 4.3'-4.4'
  - 3: 5.0'-5.1'
  - 4: 12.2'-12.3'
  - 8: 33.4'-33.7'

---

**RUN**  
**WHERE LOST**
1 1.3'-1.4'
2 4.3'-4.4'
3 5.0'-5.1'
4 12.2'-12.3'
8 33.4'-33.7'
## ROCK CORING LOG

**BOREHOLE NO.** DH-220  
**TYPE & NUMBER** None  
**HOLE SIZE** NX  
**LOCATION** East 140 Drift, 2421' S of Exploratory Shaft centerline, 5' from E rib  

**STATION** S2421, E162  
**COLLAR ELEV.** 1257.4'  
**DIRECTION OF DRILLING** Down  
**MINE COORDINATES** N7265.5, E7055.9  
**DEPTH OF BOREHOLE** 51.8'  
**DRILLING METHOD** Wet (brine)  
**DRILL MAKE/MODEL** Joy 12B  

**PREPARED BY** JPS/Bechtel  
**DATE** 1/19/83  
**SHEET** 2 OF 3

### Table: Rock Coring Log

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<th>RUN #</th>
<th>DEPTH (ft)</th>
<th>% RECOVERED</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
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<tbody>
<tr>
<td>6</td>
<td>25</td>
<td>5.0 100</td>
<td>X X</td>
<td>(as above)</td>
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<tr>
<td></td>
<td>28.4' - 30.4' <em>HALITE:</em> clear to light gray (N7) halite, medium to coarsely crystalline, soft to moderately hard. Clay content &lt; 1%.</td>
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<tr>
<td>7</td>
<td>30</td>
<td>5.0 100</td>
<td>X X</td>
<td>30.4' - 36.3' <em>HALITE:</em> polyhalite, clear to moderate reddish-orange (10R 6/6) halite, moderately to coarsely crystalline, moderately hard. Blanks and interstitial polyhalite comprise 3-5% of core. Few scattered, discontinuous halite streaks of white anhydrite. At 35.7', light gray anhydrite parting with irregular surfaces.</td>
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<tr>
<td>8</td>
<td>35</td>
<td>4.7 94</td>
<td>X X</td>
<td>36.3' - 36.5' <em>ANHYDRITE:</em> light (N7) and dark (N3) grey anhydrite bands, dense, hard, very finely crystalline. At 36.5' light gray (N7) clay seam, firm to stiff, moderately plastic.</td>
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<tr>
<td>9</td>
<td>40</td>
<td>5.3 100</td>
<td></td>
<td>36.5' - 42.6' <em>HALITE:</em> clear to light gray (N7) to light brownish-gray (SYR 6/1) halite, moderately to coarsely crystalline, moderately hard. Trace (&lt; 1%) clay in part.</td>
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<td>10</td>
<td>45</td>
<td>5.1 100</td>
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<td>42.6' - 50.5' <em>ARGLILLACEOUS HALITE:</em> mottled medium light gray (N6) to grayish-brown (SYR 3/2) and clear, finely to coarsely crystalline halite, moderately hard. Clay content 10-20% with clay streaks at: 44.5', 44.6', 45.1', 45.6', 47.4', 47.8', 48.2' and 48.9'.</td>
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*From 28.3' to 29.5' core is broken into very small 1/8"-1/16" fragments.
<table>
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<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>RECOVERY (ft.)</th>
<th>RQD</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
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<td>50</td>
<td>3.9</td>
<td>100</td>
<td>(As Drilled)</td>
<td>50.5' - 51.8' HALITE: clear halite, moderately hard, moderately to coarsely crystalline.</td>
<td></td>
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</tbody>
</table>

Hole completed at 15:00 hours on 15 January 1983.

Trace of gas encountered after completion of hole.

Total depth = 51.8'.
**WIPP-SPDV**

**ROCK CORING LOG**

**UPWARD CORING**

**INSTRUMENT**
- Extensometer

**BORING NO.**
- DH-223

**TYPE & NUMBER**
- GE-249

**HOLE SIZE**
- NY

**LOCATION**
- East 140 Drift, 3079' S of Exploratory Shaft centerline, 13' from E rib

**STATION**
- S3079, E154

**COLLAR ELEV.**
- 1255.1'

**DIRECTION OF DRILLING**
- Up

**MINE COORDINATES**
- N6607.2, E7048.5

**BOREHOLE PENETRATION**
- 52.6'

**DRILLING METHOD**
- Wet (brine)

**DRILL MAKE/MODEL**
- Joy 12B

**PREPARED BY**
- RMB, JPS, Rechtel

**DATE**
- 1/26/83

**SHEET**
- 1 OF 3

---

<table>
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</table>

**19.2' - 28.9' HALITE:** argillaceous and polyhalite in part; clear to mottled light gray (W7) and moderate brown (5YR 3/4) halite, moderately hard, finely to coarsely crystalline. Clay content <2%. Polyhalite <1% from 20.8' to 21.1'. Clay breaks at 19.3', 22.3', 23.1', 23.8', clay parting at 24.3'. At 28.3', anhydrite stringer, 1/4' thick, bluish-white (5B 9/1), hard, dense.

**15.2' - 19.2' HALITE:** clear halite, medium to coarsely crystalline, moderately hard, trace (1%) moderate reddish-orange (10R 5/6) polyhalite blebs throughout.

**14.2' - 15.2' ANHYDRITE:** (Anhydrite "a") very light (W6) to light gray (W7) anhydrite, dense, hard, finely crystalline, feathery banded in part. Some interstitial clear halite from 14.8' to 15.2'.

Pressurized gas at 15' blew return line out of reserve pond.

Trace of gas between 8' and 9'.

**CORE LOSS:**

**RUN**
- 2

**WHERE LOST**
- 1.0' - 1.3'

**THROUGHOUT RUN**
- Throughout run

Core Run #1 was a 1' run with a 6" O.D. core barrel.

Drilling started 09:30 hours on 21 January 1983.
### WIPP-SPDV ROCK CORING LOG
### UPWARD CORING

**BORING NO.** DH-223  
**TYPE & NUMBER** GE-249  
**HOLE SIZE** NX  
**LOCATION** East 140 Drift, 3079’ S of Exploratory Shaft centerline, 13’ from E rib

**STATION** 33079, BLS4  
**COLLAR ELEV.** 1255.1'  
**DIRECTION OF DRILLING** Vertical

**MINE COORDINATES** N6697.2, E7048.5  
**BOREHOLE PENETRATION** 52.6’

**DRILLING METHOD** Wet (brine)  
**DRILL MAKE/MODEL** Joy 12B

**PREPARED BY** RMB, JPS/Bechtel  
**DATE** 1/26/83  
**SHEET** 2 OF 3

### Rock Description

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
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<th>DESCRIPTION</th>
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<td>13</td>
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<td>(see description on next sheet)</td>
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</tr>
<tr>
<td>12</td>
<td>45</td>
<td>5.0 100</td>
<td>44.9’ - 48.6’ HALITE: clear halite, moderately hard, coarsely crystalline. Trace interstitial dark reddish-brown (10R 3/4) clay from 44.9’ - 45.4’.</td>
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<tr>
<td>11</td>
<td>40</td>
<td>5.2 100</td>
<td>42.0’ - 44.9’ ARGILLACEOUS HALITE: clear and dark reddish-brown (10R 3/4) halite, finely to coarsely crystalline, moderately hard. Clay content up to 30%. Clay breaks at 42.0’, 42.5’, 42.9’, 43.0’, 43.25’, 43.6’, and 44.7’.</td>
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<tr>
<td>10</td>
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<td>5.1 100</td>
<td>38.6’ - 42.0’ HALITE: clear halite, medium to coarsely crystalline, moderately hard, trace interstitial moderate reddish-orange (10R 6/6) polyhalite and medium gray (8S) clay. Very light gray (8S) anhydrite stringers at 39.0’ and 39.5’. 37.9’ - 38.6’ ANHYDRITE: (Marker Bed 13B) light gray (8W) anhydrite, dense, hard, very finely crystalline.</td>
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<td>30</td>
<td>5.2 100</td>
<td>33.5’ - 37.9’ ARGILLACEOUS HALITE: brownish-gray (5YR 4/1) to grayish-brown (5YR 3/2) halite, finely to coarsely crystalline, moderately hard, 15-30% interstitial clay with clear halite. Clay breaks at 36.6’, 35.1’, 35.3’, 35.7’, 35.9’, 36.3’, 37.0’, 37.2’, 37.4’, and 37.6’. At 37.9’, 3/4”-thick clay seam, grayish-brown (5YR 3/1), stiff, moderately plastic.</td>
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<tr>
<td>8</td>
<td>25</td>
<td>5.0 100</td>
<td>30.3’ - 33.5’ HALITE: clear halite, coarsely crystalline, moderately hard, trace (&lt;1/12) clay from 32.7’ to 33.5’.</td>
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<td>28.9’ - 30.7’ ARGILLACEOUS HALITE: close to moderate brown (5YR 3/4) halite, moderately hard, finely to moderately crystalline, 10-15% clay. Clay breaks at 29.1’, 29.9’, 30.6’. Core is slightly vesicular at 30.0’. Clay seam, 1/4” thick, medium light gray (8S), stiff and moderately plastic at 30.2’.</td>
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(Pressurized gas encountered at ≥30°)

(see below)
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<th>% RECOVERED</th>
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<td></td>
<td>48.6' - 52.6'</td>
<td>ARGILLACEOUS BULITE: clear to moderate brown (3YR 3/4) bulite, moderately hard, finely to coarsely crystalline. Clay comprises 30-35% in part. Finely crystalline from 50.8'-52.6'. Clay breaks at 48.8', 49.0', 50.1', 52.0', 52.5', and 52.6'.</td>
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<tr>
<td>50</td>
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<td>Total penetration = 52.6'. Completed hole at 08:30 hours on 23 January 1983.</td>
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<td>X</td>
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<tr>
<td>2</td>
<td>1.7</td>
<td>40</td>
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<td>X</td>
</tr>
<tr>
<td>3</td>
<td>5.2</td>
<td>100</td>
<td></td>
<td>x</td>
<td>0.0' - 7.8' HALITE: clear halite, moderately hard, medium to coarsely crystalline, trace clay (1/16) from 1.0' - 3.0', few moderate reddish-orange (10R 6/6) polyhalite balls.</td>
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<tr>
<td>4</td>
<td>9.9</td>
<td>90</td>
<td></td>
<td>x</td>
<td>7.6' - 10.7' ANHYDRITE: (Marlker Bed 139), banded light bluish-gray (5B 7/1) to medium light gray (8E) to moderate reddish-brown (10R 6/6) anhydrite, very finely crystalline, hard, dense, halitic and polyhalitic. Medium gray (85) clay seams, moderately soft and plastic, ±1/2' thick at 10.7'.</td>
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<td>x</td>
<td>10.7' - 15.2' HALITE: clear and mottled moderate reddish-orange (10R 6/6) to light gray (8F) to grayish-orange (10R 7/4) halite, moderately hard, finely to medium crystalline. Polyhalite and clay content varies throughout from 1/2 to 3X. Polyhalite is interstitial with some blebs. Medium light gray (8E) clay breaks at 11.7', 12.0', and 14.3'.</td>
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<tr>
<td>6</td>
<td>20.0</td>
<td>100</td>
<td></td>
<td>x</td>
<td>13.2' - 19.6' POLYHALITIC HALITE: clear to moderate reddish-orange (10R 6/6) halite, moderately hard, medium to coarsely crystalline, polyhalite content ranges from 1/2 to 10% in blebs and interstitially, clay-filled fracture at 13.2.5'.</td>
</tr>
<tr>
<td>7</td>
<td>25.2</td>
<td>100</td>
<td></td>
<td>x</td>
<td>18.6' - 21.7' HALITE: clear to brownish-gray (5YR 4/1) halite with trace of moderate reddish-orange (10R 6/6) halite, medium to coarsely crystalline, trace (1/16) clay in part with trace (1/16) interstitial polyhalite throughout, clay breaks at 18.75', 19.9', and 20.75'.</td>
</tr>
</tbody>
</table>

21.7' - 25.0' HALITE: polyhalitic, clear and moderate reddish-orange (10R 6/6) halite, moderately hard, coarsely crystalline, polyhalite occurs as blebs and interstitial layers, ranging from 3-52,
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<tr>
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<th>DEPTH (ft)</th>
<th>RECOVERY (ft)</th>
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<td></td>
<td>- x</td>
<td>23.0' - 30.0' HALITE: clear to mottled pale reddish-brown (10R 5/4) to pale brown (5YR 5/2) halite, finely to medium crystalline, slightly argillaceous and polyhalitic in part, clay content about 2% with breaks at 25.1', 26.5', 26.7', and 27.4'.</td>
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<td>8</td>
<td>30</td>
<td>3.0</td>
<td>100</td>
<td></td>
<td>- x</td>
<td>30.0' - 35.4' HALITE: clear and moderate reddish-orange (10R 1/2) halite, moderately hard, medium to coarse crystalline. Polyhalite (C12) is interstitial or occurs as blebs. At 34.6', medium light gray (N4) anhydrite stringer 3/4&quot; thick.</td>
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<td>9</td>
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<td>5.3</td>
<td>100</td>
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<td>- x</td>
<td>35.4' - 35.8' ANHYDRITE: banded very light gray (N8) and dark gray (N1) anhydrite, hard, dense, very finely crystalline.</td>
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<tr>
<td>10</td>
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<td>100</td>
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<td>- x</td>
<td>35.7' - 35.8' CLAY: medium dark gray (N4) clay seam, moist, soft, near horizontal.</td>
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<td>5.3</td>
<td>100</td>
<td></td>
<td>- x</td>
<td>35.8' - 49.1' ANHYDROUS HALITE: clear to medium dark gray (N4) halite, finely to coarsely crystalline, moderately hard. Clay content ranges from C12 to N12 with few orange polyhalite blebs at 43.7', clay breaks at 36.6', 43.8', 44.3', and 44.4'.</td>
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**WIPP-SPDV**  
**ROCK CORING LOG**  
**WASTE ISOLATION PILOT PLANT**

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<th>BORING NO.</th>
<th>DIH-224</th>
<th>TYPE &amp; NUMBER</th>
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<th>HOLE SIZE</th>
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<td>LOCATION</td>
<td>East 140 Drift, 3079' S of Exploratory Shaft centerline, 13' from E rib</td>
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<tr>
<td>STATION</td>
<td>S3079, E154</td>
<td>COLLAR ELEV.</td>
<td>1246.6'</td>
<td>DIRECTION OF DRILLING</td>
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<td>MINE COORDINATES</td>
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<td>DEPTH OF BOREHOLE</td>
<td>52.5'</td>
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<td>DRILLING METHOD</td>
<td>Wet (brine)</td>
<td>DRILL MAKE/MODEL</td>
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<td>2</td>
<td>55</td>
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</table>

49.1' - 52.5' BHALITE: clear and mottled pale reddish-brown (10R 5/4) to light gray (87) halite, finely to coarsely crystalline, moderately hard. Trace (Cl/2X) polyhalite and clay throughout. At 52.0', 3/8"-thick, light gray (87) clay seam, firm, moderately plastic. Thin clay break at 52.3'.

Hole completed at 14:30 hours on 22 January 1983.  
Total depth = 52.5'.
### WIPP-SPDV ROCK CORING LOG
#### UPWARD CORING

**BORING NO.** DH-227  
**TYPE & NUMBER** None  
**HOE SIZE** NX  
**LOCATION** East 140 Drift, 3656' S of Exploratory Shaft centerline, 5' from W rib

**STATION** S3656, E147  
**COLLAR ELEV.** 1247.0'  
**DIRECTION OF DRILLING** Up  
**MINE COORDINATES** N6030.7, E7041.2  
**BOREHOLE PENETRATION** 51.7'  
**DRILLING METHOD** Wet (brine)  
**DRILL MAKE/MODEL** Joy 12B

**PREPARED BY** JPS/Bechtel  
**DATE** 1/28/83  
**SHEET** 1 OF 3

<table>
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</table>

18.0' - 24.3' ARGILLACEOUS HALITE: clear and medium light gray (66) halite with isolated bands of moderate reddish-orange (10R 6/6) polyhalite, finely to coarsely crystalline, moderately hard. Argillaceous content 5-10% with clay breaks at 18.1', 18.5', 19.0', 19.6', 20.2', 20.5', 21.5', 22.4', 22.6', and 23.3'. Isolated bands of polyhalite at 19.2', 19.9', and 20.9'.

14.5' - 18.0' POLYHALITIC HALITE: clear and moderate reddish-orange (10R 6/6) halite, medium to coarsely crystalline, moderately hard. Polyhalite generally <2% and occurs as scattered blebs or interstitially.

13.8' - 14.5' HALITE: clear halite, coarsely crystalline, moderately hard. At 14.5', very light gray (89) anhydrite lens.

13.0' - 13.8' ANHYDRITE: (Anhydrite "a") banded very light gray (98) and medium gray (14) anhydrite, hard, dense, microcrystalline.

12.9' - 13.0' CLAY: light gray (75) clay, moderately soft, moist.

7.1' - 12.9' HALITE: clear halite, medium to coarsely crystalline, moderately hard. From 12.1' - 12.9', few interstitial argillaceous and polyhalitic zones. Clay content about 1-2% from 12.1' - 12.5', and polyhalite about 1% from 12.5' - 12.9'.

Trace of gas at 7.0'.

Core Loss:

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<th>Where Lost</th>
<th>Remarks</th>
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<tr>
<td>2</td>
<td>Throughout Run</td>
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</tr>
<tr>
<td>12</td>
<td>46.7' - 48.2'</td>
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0' - 1.0' drilled with 6' single-tube core barrel.

Hole began at 13:00 hours on 28 January 1983.
## WIPP-SPDV Rock Coring Log

**Waste Isolation Pilot Plant**

**Boring No.:** DH-227  
**Instrument Type & Number:** None  
**Hole Size:** NX  
**Location:** East 140 Drift, 3656' S of Exploratory Shaft centerline, 5' from W rib  
**Station:** S3656, E147  
**Collar Elev.:** 1247.0'  
**Direction of Drilling:** Vertical  
**Mine Coordinates:** N6030.7, E7041.2  
**Borehole Penetration:** 51.7'  
**Drilling Method:** Wet (brine)  
**Drill Make/Model:** Joy 128  
**Prepared By:** JPS/Bechtel  
**Date:** 1/28/83

<table>
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**45.6' - 50.4' ARGILLACEOUS HALITE:** Clear to grayish-brown (50% 3/100) halite, finely to coarsely crystalline, moderately hard, finely crystalline from 49.8' - 50.6'. Clay content generally 0-12% and about 1% from 45.6' - 47.4'. Clay breaks at 47.1', 47.4', 47.8', 48.3', 48.5', 48.7', 49.3', 49.4', 49.5', and 50.2'. From 50.4' - 50.6', grayish-red (10/4) clay seen, moderately soft, highly plastic.

**44.0' - 45.6' HALITE:** Clear halite, coarsely crystalline, moderately hard.

**41.7' - 44.0' ARGILLACEOUS HALITE:** Clear to grayish-brown (50% 3/2) halite, finely to coarsely crystalline, moderately hard. Argillaceous content ranges from 0-15% with clay breaks at 42.0', 42.9', 43.5', 43.7', and 43.9'.

**37.5' - 41.7' POLYHALITE:** Clear to moderate reddish-orange (10/6) halite, polyhalite occurs as isolated flakes.

**36.6' - 37.5' HALITE:** Clear halite, coarsely crystalline, moderately hard, few isolated stringers of gray anhydrite.

**35.9' - 36.6' ANHYDRITE:** (Marker Bed 13B) olive gray (50% 4) anhydrite, hard, dense, microcrystalline, core broken into 1/4" chips.

**35.8' - 35.9' CLAY:** Pale brown (50% 5) clay, moist, moderately soft, moderately plastic.

**27.0' - 35.8' ARGILLACEOUS HALITE:** Clear to swirled pale brown (50% 5) and moderate brown (50% 4) halite, moderately hard, finely to coarsely crystalline. Argillaceous content ranges from 0 to 10%. Clear and clay-free from 29.0' - 30.2'. Broom and gray clay partings and breaks at 27.0', 30.0', 30.2', 30.5', 30.7', 30.9', 31.0', 31.5', 32.0', 32.5', 33.0', 33.3', 33.5', 33.8', 34.0', 34.5', 35.0', 35.5', and 35.6'.

**24.3' - 27.0' HALITE:** Clear halite, moderately hard, medium to coarsely crystalline, few scattered hairline breaks of light gray (50%) anhydrite.
### Rock Coring Log

**WIPP-SPDV**

**Upward Coring**

**Waste Isolation Pilot Plant**

**Boring No.** DH-227  
**Type & Number** None  
**Hole Size** NX  
**Location** East 140 Drift, 3656' S of exploratory shaft centerline, 5' from W rib

**Station** S3656, E147  
**Collar Elev.** 1247.0'  
**Direction of Drilling** Vertical  
**Mine Coordinates** N6030.7, E7041.2  
**Borehole Penetration** 51.7'  
**Drilling Method** Wet (brine)  
**Drill Make/Model** Joy 12B

**Prepared By** JPS/Rechtel  
**Date** 1/28/83

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<th>RUN NUMBER</th>
<th>PENETRATION (ft.)</th>
<th>RECOVERY (%)</th>
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<tbody>
<tr>
<td>12</td>
<td>4.9</td>
<td>98</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>(as below)</td>
<td></td>
</tr>
</tbody>
</table>

**Remarks:**  
50.6' - 51.7' Halite: clear and moderate reddish-orange (10% 6/6) halite, moderately hard, coarsely crystalline. Polyhalite occurs as isolated blite and comprises 3-13% of core.

Total penetration = 51.7'.

Hole completed at 17:30 hours on 28 January 1983.
<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>RECOVERY(%)</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
</table>
| 1          | 0           | 3.0 58      |         | 0.0' - 7.5'  
BALITE: clear and medium gray  
(halite, coarsely crystalline, moderately hard  
with numerous gray clay-filled halite blisters.  
Slightly (1%) argillaceous in part. Few (1%)  
polyhalite blebs and interstitial layers from  
5.9' - 6.2'. |
| 2          | 5           | 5.3 100     |         | 7.3' - 9.4'  
POLYHALITIC BALITE  
clear and  
moderate reddish-orange (10R 6/6) halite,  
moderately hard, medium to coarsely crystalline,  
with grayish-pink (5R 8.5/2) anhydrite striations.  
Polyhalite comprises up to 15% of rock. |
| 3          | 10          | 5.2 100     |         | 10.7' - 11.5'  
ANHYDRITE:  
(Marker Bed 139) light gray  
(11Y) anhydrite, dense, hard,  
microcrystalline, banded medium grey (11Y) in  
part, core broken into 1/8" - 1/16" chips.  
At 11.5', medium gray (4S) clay seams, 1/4" thick,  
soft, moist. |
| 4          | 15          | 5.3 100     |         | 11.5' - 14.4'  
ARGILLACEOUS BALITE:  
clear and  
medium light gray (4S) halite, finely to  
coarsely crystalline with 7-15% argillaceous material.  
Gray clay breaks at 11.7', 12.0', 12.6', 13.5',  
13.8', 14.2', and 14.4'. |
| 5          | 20          | X           |         | 14.4' - 19.4'  
POLYHALITIC BALITE:  
clear and  
moderate reddish-orange (10R 6/6) halite, medium  
to coarsely crystalline, moderately hard.  
Polyhalite comprises 10-15% of core and occurs as  
blebs or interstitial zones. |
| 6          | 25          | X           |         | 19.4' - 21.4'  
ARGILLACEOUS BALITE:  
clear and  
brownish-gray (5YR 4/1) halite, finely to  
coarsely crystalline, moderately hard, few clay breaks  
throughout.  
Clay contains ranges from 0 to 5%.  
At 19.4', 1/2"-chips, very light gray (8) anhydrite  
seams.  
At 19.5', medium gray (4S) clay parting,  
subhorizontal.  
Clay breaks at 20.7' and 21.3'. |

(see description on next sheet)
### WIPP-SPDV ROCK CORING LOG

**WASTE ISOLATION PILOT PLANT**

**BORING NO:** DH-228  
**INSTRUMENT TYPE & NUMBER:** None  
**HOLE SIZE:** NX  
**LOCATION:** East 140 Drift, 3656' S of Exploratory Shaft centerline, 5' from W rib

**STATION:** 3656.0, E147  
**COLLAR ELEV.:** 1237.8'  
**DIRECTION OF DRILLING:** Down  
**MINE COORDINATES:** N6030.7, E7041.2  
**DEPTH OF BOREHOLE:** 50.4'  
**DRILLING METHOD:** Wet (brine)  
**DRILL MAKE/MODEL:** Joy 12B  
**PREPARED BY:** JPS/Bechtel  
**DATE:** 2/2/83  
**SHEET:** 2 OF 3

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>RECOVERY [%]</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>25</td>
<td>100%</td>
<td>X</td>
<td>21.4' - 25.7' POLYHALIC NAPLITE: clear to moderate reddish-orange (10R 6/6) halite, medium to coarsely crystalline, moderately hard. Polyhalite content ranges from 0-10% and occurs as interstitial layers and scattered blebs.</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>30</td>
<td>100%</td>
<td>X</td>
<td>25.7' - 30.7' POLYHALITE: argillaceous, clear and light gray (N7) halite, moderately hard, finely to coarsely crystalline. Clay content ranges from 2-5% with clay breaks at 27.1', 28.8', 29.5', and at 30.1'. Some (5%) interstitial polyhalite from 26.3' to 27.4' at 29.8'.</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>35</td>
<td>100%</td>
<td>X</td>
<td>30.7' - 35.3' POLYHALITE: polyhalite, clear and moderate reddish-orange (10R 6/6) halite, moderately hard, coarsely crystalline, 0-2% polyhalite. At 35.3', light gray (N7) 1/2&quot; horizontal anhydrite seam.</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>40</td>
<td>100%</td>
<td>X</td>
<td>36.3' - 36.5' ANHYDRITE: banded medium dark gray (N4) and very light gray (N8) anhydrite, hard, dense, microcrystalline.</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>45</td>
<td>100%</td>
<td>X</td>
<td>36.5' - 40.1' ARGILLACEOUS NALITE: clear and medium light gray (N6) to grayish-orange (10YR 7/4) halite, finely to coarsely crystalline, moderately hard. Clay content about 5-10%, and clay breaks at 37.3', 38.2', 42.1', 43.3', 46.0', 45.0', and 47.0'. Finely crystalline from 44.1' to 46.4'.</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>50</td>
<td>85%</td>
<td>X</td>
<td>49.1' - 50.4' NAPLITE: clear halite, moderately hard, coarsely crystalline.</td>
<td></td>
</tr>
</tbody>
</table>
# WIPP-SPDV ROCK CORING LOG

**BORING NO.:** DII-228  
**TYPE & NUMBER:** None  
**HOLE SIZE:** NX  
**LOCATION:** East 140 Drift, 3656' S of Exploratory Shaft centerline, 5' from W rib

<table>
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<tr>
<th>STATION</th>
<th>COLLAR ELEV.</th>
<th>DIRECTION OF DRILLING</th>
<th>MINE COORDINATES</th>
<th>DEPTH OF BOREHOLE</th>
<th>DRILLING METHOD</th>
<th>DRILL MAKE/MODEL</th>
<th>PREPARED BY</th>
<th>DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>S3656, E147</td>
<td>1237.8'</td>
<td>Vertical Down</td>
<td>N6030.7, E7041.2</td>
<td>50.4'</td>
<td>Wet (brine)</td>
<td>Joy 12B</td>
<td>JPS/Bechtel</td>
<td>2/2/83</td>
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</tbody>
</table>

### RUN NUMBER | DEPTH (ft.) | % RECOVERED | PROFILE | DESCRIPTION | REMARKS |
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<th></th>
<th></th>
<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>50</td>
<td>4.0 85</td>
<td>(as above)</td>
<td></td>
<td>Hole completed at 21:00 hours on 28 January 1983. Total depth = 50.4'.</td>
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**WIPP**
**WASTE ISOLATION PILOT PLANT**

**INSTRUMENT TYPE & NUMBER**

**HOLE TYPE/SIZE**

**NC CORE**

**BORING NO.** DH-301

**LOCATION** INTERSECTION N150', W170' DRIFTS - ROGE

---

**STATION** N150', W170' **COLLAR ELEV.** 1276.9 **DIRECTION OF DRILLING** VERTICAL **UP**

**MINE COORDINATES** 49830.5', 56724.5' **DEPTH OF BOREHOLE** 50.75'

**DRILLING METHOD** ROTARY AIR **DRILL MAKE/MODEL** CP-65

**DATE STARTED** 8-29-84 **DATE COMPLETED** 8-30-84 **SHEET 1 OF 2**

**LOGGED BY:** J. E. GALLEGAN

---

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>RECOVERY %</th>
<th>RECOVERED</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>7.0</td>
<td>2.0</td>
<td>100</td>
<td>0.0' - 3' HALITE: Clear, setted with blebs of moderate reddish orange polyhalite, coarsest crystalline, 1% polyhalite. [11, 21]</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5.3' - 8.0' HALITE: Clear, some moderate brown (5YR 3/4, 4/4), coarsest crystalline, 1% brown clay. [8, 17]</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>5</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>8.0' - 8.5' HALITE: Clear to moderate reddish orange (10R 6/6), coarsest crystalline, &lt;1% polyhalite and gray clay. [9]</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>10</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>8.9' - 9.15' ANHYDRITE b: Light gray (7), micro-crystalline, faintly laminated, Halite growths within. Trace of gray clay at 8.9'.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>15</td>
<td>4.6</td>
<td>4.6</td>
<td>100</td>
<td>14.3' - 15.65' HALITE: Clear to light moderate reddish orange (10R 6/6), Coarsest crystalline, &lt;1% dispersed polyhalite and gray clay, trace of brown clay. [9]</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>20</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>15.65' - 16.45' ANHYDRITE a: Light (7) to medium light (86), microcrystalline. Faintly laminated. Scattered halite growths, especially at 15.95' - 16.45', Trace of gray clay at 15.65'.</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>21.6</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>16.45' - 20.4' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6), coarsest crystalline. &lt;1% to 3% polyhalite. [7]</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>20.4' - 25.7' HALITE: Clear to moderate brown and reddish orange (10R 4/6, 6/6). Medium to coarsest crystalline, &lt;1% brown clay. 41/2% polyhalite except at 20.4' - 21.9' where polyhalite is 1% to 2%. [17]. 3/4&quot; hard grayish-brown clay seam at 23.65'. Trace of associated anhydrite.</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>25</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>25.7' - 29.4' HALITE: Clear, coarsest crystalline. Scattered white anhydrite stringers. [1]</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>29.4' - 32.1' HALITE: Clear, some moderate brown (5YR 4/4), coarsest crystalline, some fines to medium, &lt;1% brown clay. [8, some 10]</td>
<td></td>
</tr>
</tbody>
</table>

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NC double tube wireline core barrel. NC rods. Total drill time: 26 hrs. 4.

No gas. Dry hole.

30% of core recovered was ≥2 inch length.
<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>RECOVERY</th>
<th>% RECOVERED</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>26.6</td>
<td>26.6</td>
<td>2.0</td>
<td>2.0</td>
<td>100</td>
<td></td>
<td>32.1'-34.05' HALITE: Clear, coarsely crystalline. [1]</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>28.6</td>
<td>3.0</td>
<td>3.0</td>
<td>100</td>
<td></td>
<td>34.05'-39.2' AEGILLOGOUS HALITE: Clear to moderate brown (STR 3/4, 4/4), medium to coarsely crystalline. &lt;1% to 3% brown clay. Clear halite 36.0'-36.25'. [10, 12]</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>30.0</td>
<td>3.0</td>
<td>3.0</td>
<td>100</td>
<td></td>
<td>39.2'-39.7' ANHYDRITE: Light (87) to medium light (86) gray anhydrite, laminated. Scattered halite growths. Trace of grayish-brown clay at 39.2'.</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>35.0</td>
<td>5.0</td>
<td>4.9</td>
<td>98</td>
<td></td>
<td>39.7'-46.75' POLYHALITIC HALITE: Clear to moderate reddish orange (STR 6/4), coarsely crystalline, locally some fine to medium, c1% to 3% polylite to 40.2', &lt;1% polyhalite at 40.5'-41.95' and 42.85' to 44.85'. Trace brown clay at 44.6'2. [2, 5].</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>40.0</td>
<td>4.45</td>
<td>4.45</td>
<td>100</td>
<td>X X</td>
<td>46.75'-47.55' HALITE: Clear to moderate brown, some moderate reddish orange (STR 4/4, 6/4). Medium to coarsely crystalline. &lt;1% brown clay. Parting at 47.55'. [17]</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>43.75</td>
<td>2.0</td>
<td>2.0</td>
<td>100</td>
<td>X X</td>
<td>47.55'-46.75' POLYHALITIC HALITE: Clear to moderate reddish orange (STR 6/4). Coarsely crystalline, &lt;1% to 3% polyhalite. [3, 5, 7]</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>47.75</td>
<td>4.0</td>
<td>4.0</td>
<td>100</td>
<td>X X</td>
<td>49.75'-50.75' HALITE: Clear mottled with moderate brown (STR 4/4), coarsely crystalline. &lt;1% brown clay. [8, 10]</td>
<td></td>
</tr>
</tbody>
</table>
**GEOLOGIC DRILL LOG**

**WASTE ISOLATION PILOT PLANT**

**INSTRUMENT TYPE & NUMBER: **

**HOLE TYPE/ SIZE: **

**NC CORE: **

**BORING NO.: **DH-302

**LOCATION:** INTERSECTION N150, W170 DRIFTS - FLOOR

**STATION:** N150, W170 **COLLAR ELEV.:** 1264.9 **DIRECTION OF DRILLING:** DOWN

**MINE COORDINATES:** M9830.5, E6724.5 **DEPTH OF BOREHOLE:** 50.6'

**DRILLING METHOD:** ROTARY AIR **DRILL MAKE/MODEL:** CP-65

**DATE STARTED:** 8-30-84 **DATE COMPLETED:** 8-30-84 **SHEET 1 OF 2**

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft)</th>
<th>LENGTH CORE RUN</th>
<th>RECOVERY</th>
<th>% RECOVERED</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>1.7</td>
<td>0.6</td>
<td>33.3</td>
<td>X</td>
<td>0.0'-2.8' HALITE: Clear, coarsely crystalline. &lt;1/2% gray clay to 1.7'. &lt;1/2% polyhalite from 1.7' to 2.8'. [7]</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>5</td>
<td>4.9</td>
<td>4.8</td>
<td>97.9</td>
<td>X</td>
<td>2.8'-7.3' POLYHALITE: Clear to moderate reddish orange (10R 6/6), coarsely crystalline. &lt;1% to 3% polyhalite. [7]</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>10</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
<td>7.3'-9.6' MB-139: Mixture of halite and anhydrite to 8.1'. Light gray to light moderate reddish orange. Some &quot;swallet&quot; pattern. From 8.1', very light (88) to medium light (84) gray anhydrite with scattered halite growths. faintly laminated. Trace of gray clay at 9.6'.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>15</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
<td>9.6'-12.9' HALITE: Clear to light moderate reddish orange (10R 6/6), medium to coarsely crystalline, some fine. &lt;1% gray clay and dispersed polyhalite. [8]</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>16.6</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
<td>12.9'-17.0' POLYHALITE: Clear to moderate reddish orange (10R 6/6), coarsely crystalline. &lt;1% to 3% polyhalite. [7] Anhydrite/halite layer at 16.4'-17.0' with 1/4&quot; gray clay @ 17'.</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>20</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
<td>17.0'-20.3' HALITE: Clear, some moderate reddish orange (10R 6/6), medium to coarsely crystalline. &lt;1% gray clay and dispersed polyhalite. [9]</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>21.6</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
<td>19.3'-25.6' POLYHALITE: Clear to moderate reddish orange (10R 6/6), coarsely crystalline to 23.5' then medium to coarse. &lt;1% to 3% polyhalite locally up to 5%. &gt;2% gray clay from 23.2'. [5, 6, 7]</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>25</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
<td>25.6'-29.6' HALITE: Clear, some light bluish gray, medium to coarsely crystalline. &lt;1% gray clay. &lt;1% polyhalite dispersed. [9, some 11]</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>29.6</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
<td>29.6'-34.6' POLYHALITE: Clear to moderate reddish orange (10R 6/6), coarsely crystalline. &lt;1% to 3% polyhalite. [3, 7] Anhydrite layers up to 3/4&quot; thick at 34.4'-34.6'.</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>34.6</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
<td>34.6'-35.7' HALITE: Clear, some light moderate reddish orange, coarsely crystalline. &lt;1% polyhalite. Scattered anhydrite. [2]</td>
<td></td>
</tr>
</tbody>
</table>

**BORING NO.:** DH-302
**WIPP**

**WASTE ISOLATION PILOT PLANT**

**SHEET 2 OF 2 BORING NO. DH-302**

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>RECOVERY %</th>
<th>RECOVERED PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
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<td>7</td>
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<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>30.0</td>
<td>5.0</td>
<td>4.9</td>
<td>98</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

35.7'-35.9' ANHYDRITE: Light (W) to very light (NB) grey microcrystalline anhydrite. Scattered small halite growths. Trace of gray clay at 35.9'.

35.9'-43.3' HALITE: Clear, some moderate reddish orange (10R 6/6) and medium light gray (NB). Coarsely crystalline, some medium and fine. 1% dispersed polyhalite to 38.2', then <1/2% dispersed and blebs. 1% gray clay. Low angle gray clay parting at 43.3'.

43.3'-47.4' HALITE: Clear to moderate reddish orange (10R 6/6). Some moderate brown (5YR 4/4) from 44.6'-45.5'2. Medium to coarsely crystalline. <1% to 2% polyhalite. <1% gray clay except 1% to 2% brown clay at 44.8' to 45.5'.

47.4'-50.6' HALITE: Clear, coarsely crystalline. <1% gray clay. Trace of polyhalite blebs. [1, 11]
# WIPP Geographic Drill Log

**Waste Isolation Pilot Plant**

**Instrument Type & Number:**

**Hole Type/Size:**

**Location:** W170 DRIFT - ROOF

**Station:** S400, W170  
**Collar Elev.:** 1267.2  
**Direction of Drilling:** UP  
**Vertical Depth of Borehole:** 51.4'

**Mine Coordinates:** N9222.3, E626.1

**Drilling Method:** ROTARY AIR  
**Drill Make/Model:** CP-65

**Date Started:** 9-4-84  
**Date Completed:** 9-4-84  
**Sheet:** 1 of 2

**Logged By:** J. E. GALLERANI  
**Date:** 9-4-84

<table>
<thead>
<tr>
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<th>DEPTH (FT.)</th>
<th>LENGTH CORE RUN</th>
<th>CORE RECOVERY</th>
<th>% RECOVERED</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
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<td>2.5</td>
<td>2.5</td>
<td>2.1</td>
<td>100</td>
<td>X</td>
<td>0.0'-5.45' HALITE: Clear, coarsely crystalline. &lt;1/2% scattered polyhalite blebs. [1]</td>
<td>NC double tubs wireline core barrel. NC rods.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>5.45'-8.6' HALITE: Clear with some moderate brown (SVR 4/4). Medium to coarsely crystalline. &lt;1% brown clay [9]. Break at 6.75'. &lt;1/2% dispersed polyhalite at 7.5'-8.6'. [17]</td>
<td>No gas. Dry hole.</td>
</tr>
<tr>
<td>2</td>
<td>5.0</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
<td>8.6'-8.8' ANHYDRITE b: Light to light medium gray (N7, N6). Microcrystalline with scattered halite growths. Trace of gray clay at 8.6'.</td>
<td>48% of recovered core is 32 inch length.</td>
</tr>
<tr>
<td>3</td>
<td>7.5</td>
<td>7.5</td>
<td>7.5</td>
<td>100</td>
<td>X</td>
<td>8.8'-14.5' HALITE: Clear, coarsely crystalline. Scattered white anhydrite stringers. [1]</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>10.0</td>
<td>4.7</td>
<td>4.7</td>
<td>100</td>
<td>X</td>
<td>14.5'-15.75' HALITE: Clear with some light moderate reddish orange (10R 6/6), medium to coarsely crystalline. &lt;1% dispersed polyhalite. &lt;1% gray clay. [9]</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>12.2</td>
<td>12.2</td>
<td>12.2</td>
<td>100</td>
<td>X</td>
<td>15.75'-16.45' ANHYDRITE a: Very light to light medium gray (N8, N6). Microcrystalline. Partially laminated, scattered halite growths. Trace of gray clay at 15.75'.</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>15.0</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
<td>16.45'-20.65' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6), coarsely crystalline. &lt;1% to 3%, average 2% polyhalite. Scattered anhydrite. [2, 3, 5]</td>
<td>Run 4: Core broken last 6&quot; of run.</td>
</tr>
<tr>
<td>7</td>
<td>17.2</td>
<td>17.2</td>
<td>17.2</td>
<td>100</td>
<td>X</td>
<td>20.65'-26.4' HALITE: Clear to light moderate reddish orange (10R 6/6), some medium brown (SVR 4/4). Medium to coarsely crystalline with some fine crystalline. &lt;1/2% dispersed polyhalite. 41% brown clay. &lt;1/2&quot; hard, dry brown clay seams at 20.3'-26.4' with anhydrite associated to 26.4'. [6, 17]</td>
<td>Run 5: Some broken core in polyhalitic halite.</td>
</tr>
<tr>
<td>8</td>
<td>20.0</td>
<td>4.8</td>
<td>4.8</td>
<td>100</td>
<td>X</td>
<td>26.4'-30.7' HALITE: Clear, coarsely crystalline with scattered anhydrite. [1]</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>25.0</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
<td>30.7'-37.7' HALITE: Clear with some medium brown (SVR 3/4). Medium to coarsely crystalline with some fine. None to 41% brown clay with traces of gray. &lt;1/2% polyhalite. [1, 8] with [12] at 30.7'-32.1'.</td>
<td></td>
</tr>
</tbody>
</table>

**Boring No.:** DH-303
<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>% RECOVERED</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>27</td>
<td>39.5-39.5'</td>
<td>4.9</td>
<td>100</td>
<td>ABRILLACIOUS HALITE: Clear to moderate brown STX 4/4, 3/4. Medium to coarsely crystalline with &lt;1/2% dispersed polyhalite. &lt;1% to 3% brown clay with a trace of gray clay. Brown break at 38.3'.</td>
</tr>
<tr>
<td>27</td>
<td>39.5-40.15'</td>
<td>4.9</td>
<td>100</td>
<td>ANHYDRITE: Very light to medium light gray (NP, N6). Scattered halite growths with irregular low angle laminae. 61/2&quot; hard, dry brown clay at 39.5'.</td>
</tr>
<tr>
<td>27</td>
<td>40.15'-44.2'</td>
<td>4.9</td>
<td>100</td>
<td>HALITE: Clear to moderate reddish orange (10R 6/6). Coarsely crystalline with scattered white anhydrite. 61% polyhalite f2, 34 except at 41.3'-42.9' where there is &gt;1% to 3% polyhalite.</td>
</tr>
<tr>
<td>31.9</td>
<td>44.2'-47.3'</td>
<td>5.0</td>
<td>100</td>
<td>HALITE: Clear to moderate brown (STX 4/4, 3/4). Coarsely crystalline with locally fine to medium crystalline. &lt;1% brown clay with trace gray locally. Break at 47.2' with some thin anhydrite stringers at 47.2'-47.3'.</td>
</tr>
<tr>
<td>31.9</td>
<td>47.3'-49.6'</td>
<td>5.0</td>
<td>100</td>
<td>HALITE: Clear, coarsely crystalline with &lt; 1/2% polyhalite. Light trace of very small brown clay blebs from 49.5'.</td>
</tr>
<tr>
<td>31.9</td>
<td>49.6'-51.4'</td>
<td>5.0</td>
<td>100</td>
<td>ABRILLACIOUS HALITE: Clear to moderate brown (STX 3/4, 4/4). Coarsely crystalline with fine to medium crystalline from 51.3'. &lt;1% to 3% brown clay, averaging 1% to 2%. Scattered clay breaks.</td>
</tr>
</tbody>
</table>

Run 8: Isolated broken zones.

Run 9: Some broken core 39.5'-41.9 ft.
# WIPP
## WASTE ISOLATION PILOT PLANT

### GEOLOGIC DRILL LOG

**INSTRUMENT**

**TYPE & NUMBER**

**HOLE**

**TYPE/SIZE**

**NC CORE**

**BORING NO.** DH-304

**LOCATION** S 400, W 170 DRIFT INTERSECTION - FLOOR

---

**STATION** S 400, W 170

**COLLAR ELEV.** 1254.3

**DIRECTION OF DRILLING** VERTICAL

**MINE COORDINATES** N 9225.5, E 5726.1

**DEPTH OF BOREHOLE** 50.5'

**DRILLING METHOD** ROTARY AIR

**DRILL MAKE/MODEL** CP-55

**DATE STARTED** 08/31/84

**DATE COMPLETED** 08/31/84

**SHEET** LOGGED BY: J.E. GALLERANI  DATE: 08/31/84

---

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>CORE RUN LENGTH (ft.)</th>
<th>% RECOVERED</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.0-4.0</td>
<td>5.0</td>
<td>4.9</td>
<td>98</td>
<td>0.0'-4.0' HALITE: Clear to light moderate reddish orange (IOR 6/6), coarsely crystalline. &lt;1% gray clay. &lt;1/2% dispersed polyhalite. [9]</td>
</tr>
<tr>
<td>2</td>
<td>4.9-6.1</td>
<td>1.9</td>
<td>1.9</td>
<td>100</td>
<td>4.0'-6.1' POLYHALITIC HALITE: Clear to moderate reddish orange (IOR 6/6), coarsely crystalline. &lt;1% to &lt;3% polyhalite. [5, 7]</td>
</tr>
<tr>
<td>3</td>
<td>6.1'-8.75</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>6.1'-8.75 MB-139: Mixture of moderate reddish orange (IOR 6/6) halite and anhydrite to 7.15'. Then predominantly light gray, microcrystalline anhydrite with scattered halite growths. Some near-horizontal lighter-dark gray laminae. Gray clay at 8.75'.</td>
</tr>
<tr>
<td>4</td>
<td>8.75'-12.4</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>8.75'-12.4' HALITE: Clear to light moderate reddish orange (IOR 6/6), some light gray (W7). Medium to coarsely crystalline. &lt;1/2% dispersed polyhalite. &lt;1% gray clay. [8]</td>
</tr>
<tr>
<td>5</td>
<td>12.4'-16.3</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>12.4'-16.3' POLYHALITIC HALITE: Clear to moderate reddish orange (IOR 6/6), coarsely crystalline. Scattered anhydrite. &lt;1% to 3% polyhalite. [5, 7]</td>
</tr>
<tr>
<td>6</td>
<td>16.3'-18.6</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>16.3'-18.6' HALITE: Clear to light moderate reddish orange (IOR 6/6), some light gray (W7). Medium to coarsely crystalline, some fine. &lt;1/2% dispersed polyhalite and gray clay. [9]</td>
</tr>
<tr>
<td>7</td>
<td>18.6'-25.5</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>18.6'-25.5' POLYHALITIC HALITE: Clear to moderate reddish orange (IOR 6/6), coarsely crystalline. Scattered anhydrite. &lt;1% to 3% polyhalite [3, 7].</td>
</tr>
<tr>
<td>8</td>
<td>25.5'-29.05</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>25.5'-29.05' HALITE: Clear, some light moderate reddish orange (IOR 6/6) and light gray (W7). Medium to coarsely crystalline, some fine. &lt;1/2% polyhalite and &lt;1% gray clay. Scattered anhydrite. [9]</td>
</tr>
<tr>
<td>9</td>
<td>29.05'-34.7</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>29.05'-34.7' POLYHALITIC HALITE: Clear to moderate reddish orange (IOR 6/6), coarsely crystalline. Scattered anhydrite from 33.8'. [3, 5, 7]</td>
</tr>
<tr>
<td>10</td>
<td>34.7'-35.15</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>34.7'-35.15' ANHYDRITE: Very light gray (W8) to light gray (W7) anhydrite with scattered halite growths. Gray clay parting at 35.15'.</td>
</tr>
</tbody>
</table>

**REMARKS**

NC double tube wireline core barrel. NC rods. Total drill time: 6 hhr. 81% of core recovered is 22 inch length.

No gas. Dry hole.
<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>RECOVERY</th>
<th>% RECOVERED</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>26.9</td>
<td>35.0</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
<td>35.15'-48.2' HALITE: Clear, some light moderate reddish orange (10R 6/6) and light medium bluish grey. Medium to coarsely crystalline, some fine to 37.7', than predominantly coarse, &lt;1/2% dispersed polyhalite, 61% gray clay. (9, 11)</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>30.0</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
<td>48.2'-50.5' HALITE: Clear to moderate reddish orange (10R 6/6), coarsely crystalline, 61% polyhalite and gray clay. (2, 9)</td>
<td></td>
</tr>
<tr>
<td>31.9</td>
<td>35.0</td>
<td>5.1</td>
<td>5.1</td>
<td>100</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>37.0</td>
<td>40.0</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>45.0</td>
<td>4.8</td>
<td>4.8</td>
<td>100</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>42.0</td>
<td>40.0</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>45.0</td>
<td>3.7</td>
<td>3.7</td>
<td>100</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>46.8</td>
<td>50.0</td>
<td>3.7</td>
<td>3.7</td>
<td>100</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>50.0</td>
<td>3.7</td>
<td>3.7</td>
<td>100</td>
<td>X</td>
<td></td>
<td></td>
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</table>

BORING NO. DH-304
<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>CORE RUN LENGTH</th>
<th>RECOVERY</th>
<th>% RECOVERED</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>4.9</td>
<td>3.2</td>
<td>65</td>
<td>X</td>
<td>0.0'-1.9' HALITE: Some moderate reddish orange (10R 6/6). &lt;1/2% gray clay and polyhalite. Recovery poor.</td>
<td></td>
</tr>
<tr>
<td>4.9</td>
<td>2.5</td>
<td>2.2</td>
<td>100</td>
<td>X</td>
<td>2.9'-5.0' MB-139: Mixture of some halite with anhydrite to 4'2. Then light gray to light medium gray (87, 86) microcrystalline anhydrite. Scattered halite growths. Core moist from 4.6'.</td>
<td></td>
</tr>
<tr>
<td>8.4</td>
<td>2.2</td>
<td>2.2</td>
<td>100</td>
<td>X</td>
<td>5.0'-8.7' HALITE: Clear to moderate reddish orange (10R 6/6). Some light gray (87). Medium to coarse crystalline, some fine. &lt;1/2% dispersed polyhalite. &lt;1/2% gray clay, some brown locally.</td>
<td></td>
</tr>
<tr>
<td>10.6</td>
<td>5.0</td>
<td>4.2</td>
<td>84</td>
<td>X</td>
<td>8.7'-10.3' HALITE: Clear to moderate reddish orange (10R 6/6). Coarsely crystalline, 61% polyhalite.</td>
<td></td>
</tr>
<tr>
<td>15.6</td>
<td>4.9</td>
<td>4.7</td>
<td>96</td>
<td>X</td>
<td>10.2'-15.6' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6). Coarsely crystalline to 14'2, then medium to coarse crystalline, some fine. &lt;1/2% polyhalite.</td>
<td></td>
</tr>
<tr>
<td>20.5</td>
<td>4.0</td>
<td>4.0</td>
<td>100</td>
<td>X</td>
<td>15.6'-17.5' HALITE: Clear to lightly moderate reddish orange (10R 6/6). Coarsely crystalline. 61% polyhalite blebs. Graded into unit below.</td>
<td></td>
</tr>
<tr>
<td>24.5</td>
<td>25</td>
<td></td>
<td></td>
<td>X</td>
<td>17.5'-20.7' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6). Coarsely crystalline. &lt;1% to 3% polyhalite.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>20.7'-25.2' HALITE: Clear to light moderate reddish orange (10R 6/6). Coarsely crystalline with some medium. &lt;1% dispersed polyhalite. &lt;1/2% gray clay. Graded between 23.0' and 24.7'.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>25.2'-30.6' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6). Coarsely crystalline. &lt;1% to 3%, average &lt;2% polyhalite.</td>
<td></td>
</tr>
</tbody>
</table>

**Remarks:**
- Water encountered in hole at 21' depth.
- Water level rose to 4'2 from surface immediately after completing each drill run to 20' depth. Flow of water decreased significantly by 9-12-84.
- Source of this water appears to be simply from water dumped in area by contractor and is not natural brine water.

**Date:** 09/11/84 **Date Completed:** 09/12/84 **Sheet:** 1 of 2
<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>RECOVERY</th>
<th>% RECOVERED</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>29.5</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
<td>30.0'-31.0' ANHYDRITE: Very light to light gray (88, 87), microcrystalline. Scattered halite growths especially below 30.75'. No clay evident.</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>34.5</td>
<td>5.0</td>
<td>4.6</td>
<td>92</td>
<td>X</td>
<td>31.0'-39.7' HALITE: Clear to lightly moderate reddish orange (108 6/6). Coarsely crystalline, some medium. &lt;1/2% dispersed polyhalite and gray clay. Anhydrite runs down to 32.5' within halite. [1, some 9, 11]</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>38.5</td>
<td>4.0</td>
<td>1.9</td>
<td>92</td>
<td>X</td>
<td>39.7'-42.3' HALITE: Clear, some moderate brown (5YR 4/4). Coarsely crystalline. 61% brown clay. [8, 10]</td>
<td>Had problems with core recovery in some runs. Core spring not holding core probably due to water in the hole. Had to adjust spring.</td>
</tr>
<tr>
<td>10</td>
<td>41.5</td>
<td>3.0</td>
<td>1.8</td>
<td>60</td>
<td>-</td>
<td>42.3'-44.9' HALITE: Clear, coarsely crystalline. &lt;1% light bluish gray clay.</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>43.0</td>
<td>1.5</td>
<td>1.5</td>
<td>100</td>
<td>-</td>
<td>44.9'-48.0' HALITE: Clear, coarsely crystalline. Slight trace of brownish clay to 45.5' [1]</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>48.0</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>-</td>
<td>48.0'-49.4' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 4/6). Coarsely crystalline. &lt;1% to 2% polyhalite. Trace of anhydrite. [5]</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>52.0</td>
<td>4.0</td>
<td>4.0</td>
<td>100</td>
<td>-</td>
<td>49.6'-52.0' HALITE: Clear to lightly moderate reddish orange and some light bluish gray. Coarsely crystalline, some medium. &lt;1/2% polyhalite dispersed and 61% bluish gray clay. [5]</td>
<td>35% of core recovered was 32 inch length.</td>
</tr>
</tbody>
</table>

Note: Drilled hole DH-306A approximately 10' west of DH-306 to replace upper 8.5' of DH-306 and to check for brine here. DH-306A was a dry hole drilled to 8.5' depth.
**WIPP**

**GEOLOGIC DRILL LOG**

**WASTE ISOLATION PILOT PLANT**

**INSTRUMENT TYPE & NUMBER**

**HOLE TYPE/SIZE**

**INSTRUMENT NC CORE**

**BORING NO.**

**LOCATION**

**S 400 DRIFT - FLOOR**

---

**STATION**

S 400, E125

**COLLAR ELEV.**

1244.0

**DIRECTION OF DRILLING**

DOWN

**MINING COORDINATES**

N9287.4, E7034.0

**DEPTH OF BOREHOLE**

8.5

**DRILLING METHOD**

ROTOR/AIR

**DRILL MAKE/MODEL**

CP-85

---

**DATE STARTED**

09/12/84

**DATE COMPLETED**

09/12/84

**SHEET**

1 OF 1

---

**LOGGED BY:**

J.E. GALLERANI

**DATE:**

09/12/84

---

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>RECOVERY PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.0</td>
<td>X</td>
<td>X X</td>
<td>0.0'-0.7' HALITE: Clear to light moderate reddish orange (10% 6/6), coarsely crystalline. &lt;1% dispersed polyhalite. [1, 2]</td>
<td>NC double tube wireline core barrel. NC rods.</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>4.6</td>
<td>4.6</td>
<td>0.7'-2.1' POLYHALITIC HALITE: Clear to light moderate reddish orange (10% 6/6), coarsely crystalline. &lt;1% to 3% polyhalite, average 2%. [3, 7]</td>
<td>No gas. Dry hole.</td>
</tr>
<tr>
<td></td>
<td>4.6</td>
<td>5</td>
<td>X</td>
<td>2.1'-5.45' MB-139: Very light to medium light (N8, N6) gray microcrystalline anhydrite to 3.9'. Some &quot;swallowtail&quot; pattern in upper 1'. From 3.9' is partially laminated anhydrite. 1 in. hard gray clay seam at lower contact. Contact dips 10° E. Slight moisture along contact.</td>
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</tr>
<tr>
<td></td>
<td>8.5</td>
<td>3.9</td>
<td>3.9</td>
<td>5.45'-8.5' HALITE: Clear to light moderate reddish orange (10% 6/6), medium to coarsely crystalline, &lt;1% dispersed polyhalite. 61% clay, predominantly gray with some brown locally at 6.9'-7.5'.' [9]</td>
<td>This is replacement hole for upper 8.5' of DH-306.</td>
</tr>
</tbody>
</table>
## WIPP
### GEOLGIC DRILL LOG

**WASTE ISOLATION PILOT PLANT**

**INSTRUMENT TYPE & NUMBER**: GE-263  
**HOLE TYPE/SIZE**: NY CORE  
**BORING NO.**: DH-307  
**LOCATION**: INTERSECTION OF E 300; S 400 DRIFTS - ROOF

**STATION**: S 400, E 300  
**COLLAR ELEV.**: 1262.6  
**DIRECTION OF DRILLING**: NIP  
**MINE COORDINATES**: NS 286.7, E 7194.2  
**DEPTH OF BOREHOLE**: 52.0'

**DRILLING METHOD**: ROTARY AIR  
**DRILL MAKE/MODEL**: CP-65

**DATE STARTED**: 08/21/84  
**DATE COMPLETED**: 08/27/84  
**SHEET LOGGED BY**: J.E. Gallaham  
**DATE**: 08/21/84  
**1 OF 2**

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (Ft)</th>
<th>LENGTH CORE RUN</th>
<th>RECOVERY</th>
<th>% Recovered</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0 - 4</td>
<td>0</td>
<td>5.0</td>
<td>1.3</td>
<td>26</td>
<td></td>
<td>0.0' - 4.7' (Core Loss) HALITE: Clear, coarsely crystalline. [1]</td>
<td></td>
</tr>
<tr>
<td>4.2 - 7.5</td>
<td>5.0</td>
<td>3.0</td>
<td>3.0</td>
<td>100</td>
<td></td>
<td>4.7' - 7.5' HALITE: Clear with some light, moderate brown (SYR 4/4). Coarsely crystalline with fine to medium crystalline between 7' - 7.5' [9]. 1% brown clay with some gray clay at 7' - 7.3' [8]</td>
<td></td>
</tr>
<tr>
<td>7.5 - 7.7</td>
<td>6.0</td>
<td>3.0</td>
<td>3.0</td>
<td>100</td>
<td></td>
<td>7.5' - 7.7' ANHYDRITE: Very light to light gray (W, W2). Microcrystalline with scattered halite. Gray clay at 7.5'</td>
<td></td>
</tr>
<tr>
<td>7.7 - 12.95</td>
<td>7.5</td>
<td>3.0</td>
<td>3.0</td>
<td>100</td>
<td></td>
<td>7.7' - 12.95' HALITE: Clear, coarsely crystalline with scattered anhydrite. &lt;1/2% gray clay locally. [1]</td>
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</tr>
<tr>
<td>12.95 - 14.05</td>
<td>8.0</td>
<td>1.0</td>
<td>1.0</td>
<td>100</td>
<td></td>
<td>12.95' - 14.05' HALITE: Clear to lightly moderate reddish orange (10R 6/6) and light medium brown (SYR 4/4). Medium to coarsely crystalline. &lt;1/2% dispersed polyhalite and &lt;1% brown clay. [9, 17]</td>
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</tr>
<tr>
<td>14.05 - 15.0</td>
<td>9.0</td>
<td>2.0</td>
<td>2.0</td>
<td>100</td>
<td></td>
<td>14.05' - 15.0' ANHYDRITE: Clear to light, light gray (W7), microcrystalline anhydrite with scattered irregular lenses in light to darker gray. Halite growths common at 14.5' - 15.0'. Trace of clay at 14.55'</td>
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<tr>
<td>15.0' - 19.3</td>
<td>10.5</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td></td>
<td>15.0' - 19.3' POLYHALITIC HALITE: Clear to moderate reddish orange, coarsely crystalline. &lt;1% to 3% polyhalite, averaging 0%. Scattered anhydrite.</td>
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</tr>
<tr>
<td>19.3' - 24.7</td>
<td>11.5</td>
<td>5.0</td>
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<td>100</td>
<td></td>
<td>19.3' - 24.7' HALITE: Clear to moderate brown (SYR 3/4, 4/4) with light, moderately reddish orange (10R 6/6). Medium to coarsely crystalline with some fine crystalline. &lt;1/2% dispersed polyhalite. 41% brown clay with trace of gray locally. At 24.7' - 24.7' hard, grayish brown clay associated with anhydrite. Core broken up here. [9, 17]</td>
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<tr>
<td>24.7' - 27.1</td>
<td>12.5</td>
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<td></td>
<td>24.7' - 27.1' HALITE: Clear, coarsely crystalline with scattered anhydrite stringers. [1]</td>
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</tr>
<tr>
<td>27.1' - 30.0</td>
<td>13.5</td>
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<td>100</td>
<td></td>
<td>27.1' - 30.0' HALITE: Clear to medium brown (SYR 4/4). Coarsely crystalline, 6% brown clay to 27.9' then &lt;1%. [6, 10]</td>
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</tr>
<tr>
<td>RUN NUMBER</td>
<td>DEPTH (ft.)</td>
<td>LENGTH CORE RUN</td>
<td>RECOVERY</td>
<td>% RECOVERED</td>
<td>PROFILE</td>
<td>DESCRIPTION</td>
<td>REMARKS</td>
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</table>

### DESCRIPTION

#### 30.0'-32.7' HALITE
Clear, coarsely crystalline. [1] (much discing)

#### 32.7'-37.15' HALITE
Clear to medium brown (6YR 4/4, 3/4) with some light moderate reddish orange (10R 6/6). Medium to coarsely crystalline with some fine. Average 61% brown clay to 36.7% gray. Argillaceous halite with 1% to 3% brown clay from 35'-36.8'Z. [9, 12, 17]

#### 37.75'-38.5' ANHYDRITE
Light to very light gray (7, NR). Microcrystalline with scattered halite growths. Up to 1" of hard brown clay at 37.75'.

#### 36.5'-40.1' POLYHALITIC HALITE
Clear to moderate reddish orange (10R 6/6). Coarsely crystalline. <1% to 3% polyhalite with some anhydrite [4, 5]. Much discing.

#### 40.1'-42.0' HALITE
Clear, coarsely crystalline with <1% moderate reddish orange polyhalite blebs. Much discing. [1, 2]

#### 42.0'-45.5' POLYHALITIC HALITE
Clear, mottled with some moderate reddish orange (10R 6/6). Coarsely crystalline with some localized medium and fine crystalline. <1% to 3% polyhalite blebs/patches. <1/2% gray clay locally. Brown clay parting at 44.5' with some anhydrite above. [2, 3, 5]

#### 45.5'-47.7' HALITE
Clear with some light to moderate brown (6YR 4/4). Coarsely crystalline. <1% brown clay. [8]

#### 47.7'-51.7' ARGETILLACEOUS HALITE
Clear to moderate brown (6YR 4/4, 3/4). Medium to coarsely crystalline. <1% to 3% brown clay with scattered breaks and <1/2% dispersed polyhalite. [15, 17]

#### 51.7'-55.0' POLYHALITIC HALITE
Clear to moderate reddish orange (10R 6/6). Coarsely crystalline. 1% to 3% polyhalite. [5]
# WIPP GEOLOGIC DRILL LOG

**INSTRUMENT TYPE & NUMBER:** GE-265  
**HOLE TYPE/SIZE:** NX CORE  
**BORING NO.:** DH-309  
**LOCATION:** INTERSECTION OF E 300, S 700 DRIFTS - ROOF  

**STATION:** S 700, E 220  
**COLLAR ELEV.:** 1259.8  
**DIRECTION OF DRILLING:** UP  
**MINE COORDINATES:** N 8927.1, E 7123.0  
**DEPTH OF BOREHOLE:** 52.3'  
**DRILLING METHOD:** ROTARY AIR  
**DRILL MAKE/MODEL:** CP-65  

**DATE STARTED:** 08/23/84  
**DATE COMPLETED:** 08/23/84  
**LOGGED BY:** J.E. GALLERANI  
**DATE:** 08/28/84  
**SHEET:** 1 OF 2

<table>
<thead>
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</table>

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0'-2.5' HALITE: Clear to light, moderately reddish orange (10R 6/6). Coarsely crystalline with some medium crystalline. C.I/2% dispersed polyhalite. [1]</td>
</tr>
<tr>
<td>1.5'-8.95' HALITE: Clear to moderate brown (5YR 4/4) with some moderate reddish orange (10R 6/6). Coarsely crystalline with some medium crystalline. 61% brown clay. C.I/2% dispersed polyhalite. [8, 17]</td>
</tr>
<tr>
<td>8.95'-9.1' ANHYDRITE: Light to medium light gray (7.5N, 7.5G). Microcrystalline with halite growths common between 9.0'-9.1'. Trace of gray clay at 8.95'.</td>
</tr>
<tr>
<td>9.1'-14.7' HALITE: Clear, coarsely crystalline with scattered anhydrite. [1]</td>
</tr>
<tr>
<td>14.7'-15.75' HALITE: Clear to moderate brown (5YR 4/4). Medium with some coarse crystalline. 61% brown clay with a trace of gray. C.I/2% dispersed polyhalite. Break at 15.05'.</td>
</tr>
<tr>
<td>15.75'-16.35' ANHYDRITE &amp;: Light to medium light gray (7.5N, 7.5G), with scattered laminae. Scattered halite growths. Trace of gray clay at 15.75'.</td>
</tr>
<tr>
<td>16.35'-20.7' POLYHALITE: HALITE: Clear to moderate reddish orange (10R 6/4). Coarsely crystalline. C.I/3% (average 61%) polyhalite. Core broken up, disced. [3, 4]</td>
</tr>
<tr>
<td>20.7'-25.5' HALITE: Clear to light moderate brown (5YR 4/4) with some light moderately reddish orange (10R 6/6). Medium to coarsely crystalline with some fine, 61% brown clay. C.I/2% dispersed polyhalite. 3/4&quot; brown clay seam at 25.45' with some anhydrite stringers above. [8, 10, 17]</td>
</tr>
<tr>
<td>25.5'-28.8' HALITE: Clear, coarsely crystalline with scattered anhydrite. [1]</td>
</tr>
<tr>
<td>28.8'-35.7' HALITE: Clear, some moderate brown (5YR 4/4). Coarsely crystalline with locally medium crystalline. 61% brown clay. Clear 32.1'-33.2'. [1, 8, locally 10]</td>
</tr>
</tbody>
</table>

**REMARKS**
- NW split tube core barrel. NW rods.
- 18% of recovered core is 32 inch length. Overall core quality is poor.
- Runs 4 to 11: Shows much clipping between 12' and 45.5'.
- Accurate logging was difficult where core was badly disced.

**BORING NO.:** DH-309
<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH</th>
<th>CORE RUN</th>
<th>RECOVERY</th>
<th>% RECOVERED</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>26.0</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td>35.7'-39.1' HALITE: Clear to moderate brown (SYR 4/4, 3/4). Medium to coarsely crystalline. 61% brown clay locally argillaceous where 1% to 3% clay at 35.7'-37.3'/5.</td>
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<tr>
<td>31.0</td>
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<td>7</td>
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<td>37.1</td>
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<td>9</td>
<td>1.1</td>
<td>1.1</td>
<td>100</td>
<td>39.65'-44.4' HALITE: Clear with some lightly moderate reddish orange (10R 6/6). Coarsely crystalline. &lt;1%/2% polyhalite [1].</td>
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<td>40.7</td>
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<td>49.0</td>
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<td>12</td>
<td>4.9</td>
<td>4.3</td>
<td>88</td>
<td>44.4'-47.0' HALITE: Clear with some moderate brown (SYR 4/4). Coarsely crystalline 61% brown clay. Breaks at 45.4'-45.5'/5. [8, some 10]</td>
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<tr>
<td>52.3</td>
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<td>X</td>
<td></td>
<td>47.0'-48.4' HALITE: Clear to lightly moderate reddish orange (10R 6/6) with some moderate brown (SYR 4/4). Medium to coarsely crystalline. &lt;1%/2% dispersed polyhalite [17]. Irregular break at 47.9'/5.</td>
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<tr>
<td>53.2</td>
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<td>X</td>
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<td>48.4'-50.5' HALITE: Clear, mottled with some light moderate brown. Coarsely crystalline. &lt;1% brown clay. [8]</td>
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<tr>
<td>55.0</td>
<td></td>
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<td></td>
<td>X</td>
<td></td>
<td>50.5'-52.3' ARGLICIOUS HALITE: Clear to moderate brown (SYR 4/4, 3/4). Coarse with some medium crystalline. &lt;1% to 3% brown clay. &gt;5% brown clay between 51.6'/5 and 51.85'/5. [10, 15]</td>
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</tbody>
</table>

* Six gas flows were encountered during drilling at the following depths: 25.6', 20.6', 25.0', 25.6', 31.5' and 39.1'. Gas flows varied in duration from about 10 seconds to 5 minutes and smelled sweet. Dry hole.
<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>RECOVERY % RECOVERED</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
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<tbody>
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<td>1.6</td>
<td>100</td>
<td>0.0'-2.5' HALITE: Clear, coarsely crystalline. &lt;1/2% gray clay. [1]</td>
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</tr>
<tr>
<td>1</td>
<td>1.6</td>
<td>3.0</td>
<td>73</td>
<td>2.5'-8.4' HALITE: Clear to moderate brown (SYR 4/4), coarsely crystalline. &lt;1% to 2% brown clay. Becomes medium crystalline at 7.7'-8.4' with trace of polyhalite dispersed. [8, 10]</td>
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<tr>
<td>2</td>
<td>5.7</td>
<td>3.0</td>
<td>100</td>
<td>8.4'-8.8' ANHYDRITE b: Very light gray (86) to medium light gray (66). Micromystalline with scattered halite growths especially last 0.2'. Trace gray clay at 8.4'.</td>
<td>No gas. Dry hole.</td>
</tr>
<tr>
<td>3</td>
<td>8.8</td>
<td>3.0</td>
<td>100</td>
<td>8.8'-14.4' HALITE: Clear and coarsely crystalline with scattered white anhydrite/magnesite. [1]</td>
<td>Overall core is poor quality. Much drying in halite. Only 2% of recovered core is 22 inch length.</td>
</tr>
<tr>
<td>4</td>
<td>11.0</td>
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<td>73</td>
<td>14.1'-15.3' HALITE: Clear to moderate brown and moderate yellowish brown (10YR 5/4). Medium crystalline. &lt;1% brown with a trace of gray clay. &lt;1/2% dispersed polyhalite. [17]</td>
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<tr>
<td>5</td>
<td>15.8</td>
<td>4.8</td>
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<td>15.8'-15.8' ANHYDRITE a: Very light to medium light gray (84, 86). Micromystalline anhydrite, partially laminated. White halite pinkish color between 15.4'-15.8'. Trace of clay at 15.1'.</td>
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<tr>
<td>6</td>
<td>18.4</td>
<td>2.3</td>
<td>100</td>
<td>19.5'-25.4' HALITE: Clear to moderate brown (SYR 3/4, 4/4) and light moderate reddish orange. Medium to coarsely crystalline with some fine. &lt;1/2% dispersed polyhalite. &lt;1% brown clay with trace of gray locally. Gray clay seam at 25.2'. Anhydrite laminae mixed with halite to 25.4'. [10, 17] - Some [8]</td>
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<tr>
<td>7</td>
<td>21.5</td>
<td>3.1</td>
<td>100</td>
<td>25.4'-29.0' HALITE: Clear, coarsely crystalline. [1]</td>
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<tr>
<td>8</td>
<td>29.7'-31.0' HALITE: Clear with some moderately brown (SYR 3/4). Coarsely crystalline with some medium to fine. &lt;1/2% brown clay except at 30.2'-30.6' where 2% brown clay. Break at 30.6'. [8, 17]</td>
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<td>RUN NUMBER</td>
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<td>% RECOVERED</td>
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<td>15</td>
<td>4.9</td>
<td>4.5</td>
<td>92</td>
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**WIPP**  
**WASTE ISOLATION PILOT PLANT**  
**GEOLOGIC DRILL LOG**

**INSTRUMENT TYPE & NUMBER**  
**HOLE TYPE/ SIZE**  
**NW CORE**  
**BORING NO.**  
**DH-313**

**LOCATION**  
**INTERSECTION OF E 300; S 3300 DRIFTS**  
**ROOF**

**STATION S 1390; E 300**  
**COLLAR ELEV.**  
**1270.5**  
**DIRECTION OF DRILLING**  
**VERTICAL**

**MINE COORDINATES**  
**N 8885.9; E 7190.6**  
**DEPTH OF BOREHOLE**  
**19.6**

**DRILLING METHOD**  
**ROTARY AIR**  
**DRILL MAKE/MODEL**  
**CP-65**

**DATE STARTED**  
**07/09/84**  
**DATE COMPLETED**  
**07/10/84**  
**SHEET LOGGED BY:**  
**J.E. GALLERANI**  
**DATE:**  
**07/10/84**

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>RECOVERY%</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
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<tbody>
<tr>
<td>0.0</td>
<td>0</td>
<td>5.0</td>
<td>1.7</td>
<td>74</td>
<td>0.0'-7.9' (2.9') HALITE: Clear and coarsely crystalline. 1/2% gray clay and polyhalite locally. From 6.5' (2.0') 5% clay with some medium crystalline.</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>5.0</td>
<td>5.0</td>
<td>3.8</td>
<td>76</td>
<td>7.9'-8.1' ANHYDRITE b: Light gray (N7), microcrystalline. Halite growths with a trace of clay at lower contacts.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td>No gas. Dry hole.</td>
</tr>
<tr>
<td>2</td>
<td>10.0</td>
<td>5.0</td>
<td>3.8</td>
<td>76</td>
<td>8.1'-13.1' HALITE: Clear, coarsely crystalline. 1/2% light gray clay.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>12.1</td>
<td>2.1</td>
<td>2.0</td>
<td>95</td>
<td>13.1'-14.0' HALITE: Clear, fine to medium crystalline with some coarsely crystalline. 1/2% light gray clay.</td>
<td></td>
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<tr>
<td>4</td>
<td>15.3</td>
<td>3.2</td>
<td>3.2</td>
<td>100</td>
<td>14.0'-14.85' ANHYDRITE a: Light gray (N7), microcrystalline with scattered halite growths. Trace of clay at 14.0'.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>19.6</td>
<td>4.3</td>
<td>3.3</td>
<td>77</td>
<td>14.85'-19.6' POLYHALITIC HALITE: Clear to moderate reddish orange (130 6/6). Coarsely crystalline. 1/2% to 3% polyhalite.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>Stopped hole at 19.6 ft due to core loss and poor core quality. Refer to log for replacement hole DH-313A.</td>
<td></td>
</tr>
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14% of core recovered was 22 inch length.
### WIPP
#### GEOLOGIC DRILL LOG

**INSTRUMENT**
**HOLE**
**TYPE & NUMBER**

**LOCATION**

**STATION**
**COLLAR ELEV.**
**DIRECTION OF DRILLING**
**MINE COORDINATES**
**DEPTH OF BOREHOLE**

**DRILLING METHOD**
**DRILL MAKE/MODEL**

**DATE STARTED**
**DATE COMPLETED**
**SHEET**

**LOGGED BY**
**DATE**

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<tr>
<th>RUN NUMBER</th>
<th>DEPTH (FT.)</th>
<th>LENGTH CORE RUN</th>
<th>CORE RECOVERY</th>
<th>% RECOVERED</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
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<tbody>
<tr>
<td>0.0</td>
<td>0</td>
<td>1.8</td>
<td>1.8</td>
<td>100</td>
<td>0.0'-5.2' HALITE: Clear, coarsely crystalline with some fine to medium crystalline locally. &lt;1% polyhalite blebs and gray clay. [1, 11]</td>
<td>NW split tube core barrel. NW rods.</td>
</tr>
<tr>
<td>1.8</td>
<td>2</td>
<td>1.6</td>
<td>1.6</td>
<td>100</td>
<td>5.2'-7.9' HALITE: Clear to moderate brown (SYE 4/4). Medium to coarsely crystalline &lt;1% to 2% brown clay to 7.3', then &lt;1% gray clay. [8, 10, 12]</td>
<td>Total drill time: 12 hrs. Total down time: 5 hrs.</td>
</tr>
<tr>
<td>3.4</td>
<td>3</td>
<td>2.1</td>
<td>2.1</td>
<td>100</td>
<td>7.9'-8.05' ANHYDRITE b: Light gray microcrystalline. Trace of gray clay at 7.9'.</td>
<td>No gas. Dry hole.</td>
</tr>
<tr>
<td>5.5</td>
<td>4</td>
<td>3.0</td>
<td>3.0</td>
<td>100</td>
<td>8.05'-13.3' HALITE: Clear and coarsely crystalline. &lt;1% polyhalite with scattered white strings of anhydrite/magnesite. [1]</td>
<td>Down time due to power outage.</td>
</tr>
<tr>
<td>8.5</td>
<td>5</td>
<td>2.4</td>
<td>1.9</td>
<td>79</td>
<td>13.3'-14.0' HALITE: Clear with medium to coarsely crystalline. &lt;1% gray clay. Gray break at 13.3'.</td>
<td>Broken core, discing between 8.5' and 30.0'.</td>
</tr>
<tr>
<td>10.9</td>
<td>6</td>
<td>1.6</td>
<td>1.6</td>
<td>100</td>
<td>14.0'-15.0' ANHYDRITE a: Light gray microcrystalline anhydrite. Partially laminated. Halite growths increasing in percent from 14.4'. Trace of gray clay at 14.0'.</td>
<td>22% of total core recovered was 42 inch length.</td>
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<tr>
<td>12.5</td>
<td>7</td>
<td>3.35</td>
<td>3.0</td>
<td>90</td>
<td>15.0'-19.0' POLYHALITIC HALITE: Clear to moderately reddish orange. Coarsely crystalline. &lt;1% to 3% polyhalite. Scattered anhydrite mixed with halite to 15.65'-15.85'. [3, 4]</td>
<td></td>
</tr>
<tr>
<td>15.85</td>
<td>8</td>
<td>2.15</td>
<td>1.9</td>
<td>88</td>
<td>19.0'-24.5' HALITE: Clear to moderate brown (SYE 4/4). Medium to coarsely crystalline. &lt;1% brown clay. &lt;1% dispersed polyhalite. Clear halite at 23.9' to 22.35'. [6, 17]</td>
<td></td>
</tr>
<tr>
<td>18.0</td>
<td>9</td>
<td>2.85</td>
<td>2.85</td>
<td>100</td>
<td>24.5'-27.3' HALITE: Clear and coarsely crystalline with scattered anhydrite. [1]</td>
<td></td>
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<tr>
<td>20.85</td>
<td>10</td>
<td>2.65</td>
<td>2.65</td>
<td>100</td>
<td>27.3'-32.35' HALITE: Clear with some moderate brown (SYE 4/4). Coarsely crystalline except fine to medium crystalline between 29.2'-30.3'. &lt;1% brown clay except 30.2'-30.3' where clay is &lt;1%. [1, 6, 10]</td>
<td>Conditional upper contact.</td>
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**BORING NO.**
**DH-313A**
<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH</th>
<th>CORE RUN</th>
<th>% RECOVERED</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
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<tr>
<td>25.85</td>
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<td></td>
<td></td>
<td></td>
<td>32.35'-37.5' ANGILLACEOUS HALITE: Clear to moderate brown (51X 4/4). Medium to coarsely crystalline with some fine. &lt;1% to 2% brown clay with trace of gray clay.&lt;1/2% dispersed polyhalite. [10, 15]</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>25</td>
<td>2.65</td>
<td>2.1</td>
<td>79</td>
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<tr>
<td>28.5</td>
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<td></td>
<td></td>
<td></td>
<td>37.5'-38.2' ANHYDRITE: Light to medium gray micro-crystalline anhydrite. Scattered halite growths especially common to 37.9'-1/2&quot; brown clay seam at 37.5&quot;.</td>
<td></td>
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<tr>
<td>13</td>
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<td>74</td>
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<tr>
<td>30.85</td>
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<td></td>
<td></td>
<td></td>
<td>38.2'-42.25' HALITE: Clear to light moderate reddish orange. Coarsely crystalline. 61% polyhalite with scattered anhydrites to 39.2&quot;. [2, 3]</td>
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</tr>
<tr>
<td>14</td>
<td>15</td>
<td>2.65</td>
<td>2.65</td>
<td>106</td>
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<tr>
<td>33.5</td>
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<td></td>
<td>42.25'-45.7' HALITE: Clear to moderate brown (51X 4/4). Coarsely crystalline. 61% brown clay with 61% between 45.25'-45.7&quot;. [10]</td>
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<tr>
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<td>100</td>
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<tr>
<td>38.5</td>
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<td>45.7'-45.15' HALITE: Clear coarsely crystalline 0% to 1/2&quot; brown clay. [1, 8]</td>
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<tr>
<td>16</td>
<td>45</td>
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<tr>
<td>40.85</td>
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<td></td>
<td></td>
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<td>47.15'-48.7' HALITE: Clear and coarsely crystalline with some medium. &lt;1% brown clay. [10, 17]</td>
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<tr>
<td>17</td>
<td>40</td>
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<td>100</td>
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</tr>
<tr>
<td>18</td>
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<td></td>
<td></td>
<td>48.7'-50.2' HALITE: Clear to moderate reddish orange (101 4/4) and moderate brown (51X 4/4). Medium to coarsely crystalline with some fine. &lt;1/2% dispersed polyhalite. &lt;1% to 2% locally brown clay. [12, 17]</td>
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<tr>
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<td>41</td>
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## WIPP WASTE ISOLATION PILOT PLANT

**GEOLOGIC DRILL LOG**

**INSTRUMENT TYPE & NUMBER**: ____________________________

**HOLE TYPE/SIZE**: NW CORE

**BORING NO.**: DH-314

**LOCATION**: INTERSECTION OF S 1300, E 300 DRIFTS - FLOOR

**STATION**: S1300, E 300

**COLLAR ELEV.**: 1258.3

**DIRECTION OF DRILLING**: VERTICAL DOWN

**MINE COORDINATES**: N 3386.5, E 7189.5

**DEPTH OF BOREHOLE**: 50.75'

**DRILLING METHOD**: ROTARY AIR

**DRILL MAKE/MODEL**: CP-65

**DATE STARTED**: 07/12/84

**DATE COMPLETED**: 07/13/84

**SHEET**: 1 OF 2

**LOGGED BY**: J.E. GALLERANI

**DATE**: 07/13/84

### Table

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<th>RECOVERY %</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
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</tr>
<tr>
<td>1</td>
<td>3.75</td>
<td>3.1</td>
<td>63</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>5.75</td>
<td>2.0</td>
<td>100</td>
<td>X</td>
<td></td>
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<tr>
<td>3</td>
<td>10.7</td>
<td>4.95</td>
<td>100</td>
<td>X</td>
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<tr>
<td>4</td>
<td>15.8</td>
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<td>100</td>
<td>X</td>
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</tr>
<tr>
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<td>20.9</td>
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<td>100</td>
<td>X</td>
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</tr>
<tr>
<td>6</td>
<td>25.1</td>
<td>5.1</td>
<td>100</td>
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**0.0'-1.5' HALITE**: Clear, some moderate reddish orange (10R 6/6). Coarsely crystalline. <1/2% polyhalite. [1, 2]

**1.5'-4.55' POLYHALITIC HALITE**: Clear to moderate reddish orange (10R 6/6). Coarsely crystalline. <1% to 3% polyhalite. <1/2% gray clay locally. [3, 6, 7]

**4.55'-7.6' NS-139**: "Swallowtail" pattern to 5.45'2. Mixture of halite and anhydrite. Moderate reddish orange (10R 6/6) to light gray color. Then light to medium gray anhydrite with scattered halite growths. Scattered laminae. Trace of gray clay at 7.6'. Some grinding evident.

**7.6'-10.3' HALITE**: Clear to light moderate reddish orange (10R 6/6), some light gray (87). Fine to medium crystalline with some coarse. <1% dispersed polyhalite. <1/2% gray clay. [9]

**10.3'-11.8' POLYHALITIC HALITE**: Clear to moderate reddish orange (10R 6/6), some moderate brown (3.5 4/4). Coarsely crystalline. <1% to 3% polyhalite. <1% brown clay. [some 17]

**11.8'-16.1' POLYHALITIC HALITE**: Clear to moderate reddish orange (10R 6/6), coarsely crystalline. <1% to 3% polyhalite. Anhydrite mixed with halite at 15.9'-16.1'. [7]

**16.1'-18.2' HALITE**: Clear to lightly moderate reddish orange (10R 6/6). Medium to coarsely crystalline, some fine. 61% brown and gray clay. <1% dispersed polyhalite. [9, 17]

**18.2'-22.5' POLYHALITIC HALITE**: Clear to moderate reddish orange (10R 6/6), coarsely crystalline. <1% to 3% polyhalite. [7]

**22.5'-26.3' HALITE**: Clear to lightly moderate reddish orange (10R 6/6), some light gray. Fine to coarsely crystalline, 51% dispersed polyhalite and gray clay. Some scattered anhydrite. [9]

**NW split tube core barrel with NW rods.**

**Total drill time: 7 hrs.**

**No gas. Dry hole.**

**Core quality good.**

**46% of core recovered was 22 inch length.**

**BORING NO.**: DH-314
<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>RECOVERY %</th>
<th>RECOVERED</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
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<tbody>
<tr>
<td>1</td>
<td>26.0</td>
<td>5.0</td>
<td>5.9</td>
<td>100</td>
<td>X</td>
<td>28.3'-33.2' POLYHALITIC HYLITE: Clear to moderate reddish orange (10R 6/6). Coarsely crystalline. 6% to 3% polyhalite, generally dispersed. Moderate reddish orange (10R 6/6) anhydrite mixed with halite at 32.45'-33.05'. [7]</td>
</tr>
<tr>
<td>7</td>
<td>31.0</td>
<td>5.0</td>
<td>4.9</td>
<td>98</td>
<td>X</td>
<td>33.2'-33.65' ANHYDRITE: Very light to light gray (8N, 8W). Microcrystalline anhydrite. Scattered halite growths throughout. No clay.</td>
</tr>
<tr>
<td>8</td>
<td>36.0</td>
<td>4.85</td>
<td>4.7</td>
<td>97</td>
<td>X</td>
<td>35.65'-39.25' HALITE: Clear medium to coarsely crystalline. &lt;1% gray clay. [9, 11]</td>
</tr>
<tr>
<td>9</td>
<td>40.85</td>
<td>5.1</td>
<td>5.1</td>
<td>100</td>
<td></td>
<td>39.25'-41.35' HALITE: Clear, some lightly moderate reddish orange (10R 6/6). Coarsely crystalline with some fine to medium. &lt;1% gray clay and dispersed polyhalite.</td>
</tr>
<tr>
<td>10</td>
<td>45.95</td>
<td>4.8</td>
<td>4.8</td>
<td>100</td>
<td>X</td>
<td>41.15'-43.45' HALITE: Clear, some lightly moderate reddish orange (10R 6/4). Medium to coarsely crystalline, some fine. 0% brown clay and 1/2% dispersed polyhalite. [17]</td>
</tr>
<tr>
<td>11</td>
<td>50.75</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>43.45'-46.25' HALITE: Clear, coarsely crystalline with some medium. &lt;1% gray clay. Trace of polyhalite locally. [11]</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>46.25'-50.75' HALITE: Clear, coarsely crystalline. &lt;1/2% polyhalite. Gray clay break at 50.25. [11]</td>
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</table>
### WIPP
#### WASTE ISOLATION PILOT PLANT

**HOLE**
- INSTRUMENT TYPE & NUMBER: [Not provided]
- TYPE/SIZE: NC CORE
- BORING NO.: DH-315
- LOCATION: INTERSECTION OF W 170, S 1300 DRIFTS - ROOF

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#### GEOLOGIC DRILL LOG

**STATION** S 1300, W 170
**COLLAR ELEV.** 1272.1
**DIRECTION OF DRILLING** [Not provided]
**MINE COORDINATES** N 8387.3, E 6725.5
**DEPTH OF BOREHOLE** 50.3'
**DRILLING METHOD** ROTARY AIR
**MAKE/MODEL** CP-65

**DATE STARTED** 09/05/84
**DATE COMPLETED** 09/06/84
**SHEET** 1 OF 2

**LOGGED BY:** J.E. GALLERANI
**DATE:** 09/06/84

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (Ft.)</th>
<th>LENGTH CORE RUN</th>
<th>RECOVERY</th>
<th>% RECOVERED</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>0</td>
<td>1.5</td>
<td>1.1</td>
<td>75</td>
<td>X</td>
<td>0.0'-7.0' HALITE: Clear, coarsely crystalline with some medium. &lt;1/2% polyhalite. &lt;1/2% gray clay locally. [1]</td>
</tr>
<tr>
<td>1.5</td>
<td>5.0</td>
<td>4.5</td>
<td>90</td>
<td></td>
<td>-</td>
<td>7.0'-8.4' HALITE: Clear, some moderate brown (5YR 4/4) and light moderate reddish orange. Medium to coarsely crystalline. &lt;1/2% dispersed polyhalite. &lt;1/2% brown clay to 7.7%, then gray. [5, 17]</td>
</tr>
<tr>
<td>6.5</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td></td>
<td>X</td>
<td>8.4'-8.6' ANHYDRITE a: Very light to medium gray (8B, 8E) microcrystalline anhydrite. Scattered halite within. Hard, dry, gray clay at 8.4'</td>
</tr>
<tr>
<td>10</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td></td>
<td>-</td>
<td>8.6'-14.3' HALITE: Clear, coarsely crystalline. Scattered white anhydrite stringers. [1]</td>
</tr>
<tr>
<td>14.3</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td></td>
<td>X</td>
<td>14.3'-15.1' HALITE: Clear to lightly moderate brown (5YR 4/4), some lightly moderate reddish orange (10R 4/6). Fine to medium crystalline. &lt;1/2% dispersed polyhalite. &lt;1/2% brown clay.</td>
</tr>
<tr>
<td>15.1</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td></td>
<td>X</td>
<td>15.1'-15.95' ANHYDRITE a: Very light to medium light gray (8B, 8E), microcrystalline. Partially laminated. Scattered halite growths especially from 15.5'. &lt;1/4&quot; gray clay at 15.1'.</td>
</tr>
<tr>
<td>16.5</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td></td>
<td>X</td>
<td>15.95'-20.0' POLYHmatic HALITE: Clear to moderate reddish orange (10R 4/4). Coarsely crystalline. &lt;1% to 3% polyhalite, average &lt;1% to 2%. [2, 4, 7]</td>
</tr>
<tr>
<td>20.0</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td></td>
<td>X</td>
<td>20.0'-25.1' HALITE: Clear to light moderate reddish orange (10R 6/4), some moderate brown (5YR 4/4). Medium to coarsely crystalline, some fine. &lt;1% brown clay. &lt;1/2% dispersed polyhalite. Some scattered breaks. [8, 17] &lt;1/4&quot; hard, dry, brown clay at 25.0', with associated anhydrite stringers to 25.1'</td>
</tr>
<tr>
<td>25.1</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td></td>
<td>X</td>
<td>25.1'-29.8' HALITE: Clear, coarsely crystalline. Scattered anhydrite stringers.[1]</td>
</tr>
<tr>
<td>31.5</td>
<td>4.8</td>
<td>4.8</td>
<td>100</td>
<td></td>
<td>X</td>
<td>29.8'-31.5' ARCTILLAGEOUS HALITE: Clear to medium brown (5YR 4/4), fine to medium crystalline, some coarse. &lt;1% to 3% brown clay. [12]</td>
</tr>
</tbody>
</table>

**REMARKS**
- NC double tube wireline core barrel with NC rods. Run 1: Broken core. Run 2: Broken zones within run.
- No gas. Dry hole.
- 39% of recovered core was 22 inch length.
<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>RECOVERY</th>
<th>% RECOVERED</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
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<tbody>
<tr>
<td>26.3</td>
<td>25</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>31.5'-34.7' HALITE: Clear, some moderate brown (SYR 4/4). Coarsely crystalline. 1% brown clay.</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>30</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td></td>
<td>34.7'–39.0' ARGILLACEOUS HALITE: Clear to moderate brown (SYR 4/4, 3/4), some light moderate reddish orange (10R 6/6). Fine to medium crystalline, some coarse. 1% to 3% brown clay.</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>35</td>
<td>4.8</td>
<td>4.8</td>
<td>100</td>
<td></td>
<td>39.45'–40.6' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6). Coarsely crystalline. 1% to 3% polyhalite.</td>
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<tr>
<td>9</td>
<td>40</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>40.6'–43.7' HALITE: Clear, coarsely crystalline. Locally &lt;1/2% polyhalite. Very clear to 41.6'.</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>45</td>
<td>4.9</td>
<td>4.9</td>
<td>100</td>
<td></td>
<td>43.7'–49.1' HALITE: Clear to moderate brown (SYR 4/4), scattered lightly moderate reddish orange (10R 6/6). Coarsely crystalline, some medium. Generally &lt;1% brown clay with zones 1% to 3%. Break at 44.0'-44.1'.</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>50</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>49.1'–50.3' ARGILLACEOUS HALITE: Clear to moderate brown (SYR 3/4). Medium to coarsely crystalline. &lt;1% to 5% brown clay. Break at 50.3'.</td>
<td></td>
</tr>
</tbody>
</table>

Run 9: Broken between 40.0'-41.1'. Scattered broken zones throughout.
## WIPP
### GELOGIC DRILL LOG

**WASTE ISOLATION PILOT PLANT**

**INSTRUMENT TYPE & NUMBER:**

**HOLE TYPE/SIZE:**

**NC CORE BORING NO.:** DH-316

**LOCATION:** INTERSECTION S 1300, W 170 DRIFTS - FLOOR

**STATION:** S 1300, W 170

**COLLAR ELEV.:** 1259.9

**DIRECTION OF DRILLING:** VERTICAL DOWN

**MINE COORDINATES:** N 8387.2, E 5725.3

**DEPTH OF BOREHOLE:** 50.1’

**DRILLING METHOD:** ROTARY AIR

**DRILL MAKE/MODEL:** CP-65

**DATE STARTED:** 09/06/84

**DATE COMPLETED:** 09/06/84

**LOGGED BY:** J.E. GALLERANI

**DATE:** 09/06/84

**SHEET 1 OF 2**

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN (ft.)</th>
<th>RECOVERY % RECOVERED</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
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<tbody>
<tr>
<td>0.0</td>
<td>1</td>
<td>1.6</td>
<td>1.6</td>
<td>100</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>1.6</td>
<td></td>
<td></td>
<td>0.0'-1.7' HALITE: Clear with some moderate reddish orange, (10% 6/6) Coarsely crystalline. c1%/2% polyhalite and gray clay locally. [1], [2]</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>4.9</td>
<td>4.9</td>
<td>4.9</td>
<td>100</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.7'-5.0' POLYHALITIC HALITE: Clear to moderate reddish orange. (10% 6/6) Coarsely crystalline. c1% to 3% polyhalite with scattered anhydrite. [3], [7]</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>3</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5.0'-7.65' WB-139: Mixture of very light to light medium gray anhydrite and moderate reddish orange halite (10% 6/6) to 6.25&quot;. Then predominantly light gray and moderate reddish orange anhydrite mixed with some halite. Low angle irregular layering and laminae throughout. Dry hard gray clay at 7.65'.</td>
<td></td>
</tr>
<tr>
<td>10</td>
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<td>5.0</td>
<td>100</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>7.65'-11.65' HALITE: Clear to lightly moderate reddish orange (10% 6/6). Medium to coarsely crystalline with some fine. c1%/2% polyhalite dispersed and gray clay except locally at 9.2'-10.7' where polyhalite is 1% to 2%. [6]</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>11.5</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td>11.85'-24.0' POLYHALITIC HALITE: Clear to moderate reddish orange (10% 6/6). Coarsely crystalline with some medium crystalline locally. Scattered anhydrite. c1% to 3% polyhalite, locally up to 5%. c1% gray clay below 15.8&quot;. [3], [5], [7]</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>16.5</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>24.0'-25.2' HALITE: Clear to moderate reddish brown (10% 6/6). Coarsely crystalline. 61% polyhalite and brown clay with a trace of gray.</td>
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</tr>
<tr>
<td>15</td>
<td>20.0</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>25.2'-26.95' HALITE: Clear with some moderate brown (Syr Fine to medium, some coarsely crystalline. c1% brown clay. Breaks at 25.2' and 25.25', parting at 25.55' +. [8], [10]</td>
<td>4/4</td>
</tr>
<tr>
<td>21.5</td>
<td>5.0</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>26.95'-33.05' POLYHALITIC HALITE: Clear to moderate reddish orange (10% 6/6). Coarsely crystalline. c1% to 2% polyhalite with scattered anhydrite. 1/2' irregular anhydrite layer at 33&quot;.</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>6</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>33.05'-34.0' HALITE: Clear coarsely crystalline. Scattered white anhydrite stringers. [1]</td>
<td></td>
</tr>
<tr>
<td>RUN NUMBER</td>
<td>DEPTH (ft.)</td>
<td>LENGTH CORE RUN</td>
<td>% RECOVERED PROFILE</td>
<td>DESCRIPTION</td>
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</tr>
<tr>
<td>26.5</td>
<td>30</td>
<td>5.0</td>
<td>100</td>
<td>X X</td>
<td></td>
</tr>
<tr>
<td>31.5</td>
<td>33</td>
<td>5.0</td>
<td>100</td>
<td>X X</td>
<td></td>
</tr>
<tr>
<td>36.5</td>
<td>40</td>
<td>5.0</td>
<td>100</td>
<td>X X</td>
<td></td>
</tr>
<tr>
<td>41.5</td>
<td>45</td>
<td>5.0</td>
<td>100</td>
<td>X X</td>
<td></td>
</tr>
<tr>
<td>46.5</td>
<td>50</td>
<td>3.6</td>
<td>100</td>
<td>X X</td>
<td></td>
</tr>
<tr>
<td>50.1</td>
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<td></td>
<td></td>
<td>X X X</td>
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</tr>
</tbody>
</table>

34.0'-34.4' ANHYDRITE: Very light to light medium gray microcrystalline anhydrite. Scattered halite growths and pods, especially below 34.2'. <1/4' gray clay at 34.4'.

34.4'-39.1' HALITE: Clear to light moderate reddish orange (10R 6/6). Medium to coarsely crystalline with some fine. <1/2% dispersed polyhalite and gray clay.

39.1'-46.1' HALITE: Clear to moderate brown (7.5YR 4/4) with some lightly moderate reddish orange. Medium to coarsely crystalline. <1/2% brown clay. <1/2% polyhalite. [8, 10, 17]

46.1'-47.5' HALITE: Clear with some light bluish gray. Coarsely crystalline, some medium. <1/2% gray clay. <1/2% scattered polyhalite blebs.

47.5'-56.7' HALITE: Clear, coarsely crystalline. <1/2% polyhalite blebs. [1]

48.7'-50.1' POLYHALITIC HALITE: Clear to moderate reddish-orange, coarsely crystalline. <1% to 3% polyhalite. [7]

Run 9: First 2' of run contained locally broken zones.
### GEOLOGIC DRILL LOG

**WIPP**  
**WASTE ISOLATION PILOT PLANT**

**INSTRUMENT**  
**HOLE TYPE & NUMBER**

**TYPE/SIZE**  
**NX CORE**

**BORING NO.**  
**DH-317**

**LOCATION**  
INTERSECTION OF S 1600, W 30 DRIFTS - ROOF

**STATION**  
S 1600, W 33  
**COLLAR ELEV.**  
1271.3  
**DIRECTION OF DRILLING**  
UP

**MINE COORDINATES**  
N 8077.4, E 6875.9  
**DEPTH OF BOREHOLE**  
50.1'

**DRILLING METHOD**  
ROTARY AIR  
**DRILL MAKE/MODEL**  
CP-65

**DATE STARTED**  
07/05/84  
**DATE COMPLETED**  
07/06/84  
**SHEET**  
1 OF 2

**LOGGED BY:**  
J.E. GALLERANI  
**DATE:**  
07/06/84

---

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>RECOVERY</th>
<th>% RECOVERED</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
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<tbody>
<tr>
<td>0.0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>0.0'-7.3' HALITE: Clear, coarsely crystalline to 5.0', then medium to coarsely crystalline. &lt;1%/2% polyhalite and gray clay locally. [1, 11]</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>4.8</td>
<td>4.8</td>
<td>3.2</td>
<td>66</td>
<td>-</td>
<td>7.3'-8.4' HALITE: Clear to moderate reddish orange (10R 6/6), some medium brown (10R 4/4). Medium to coarsely crystalline. &lt;1% brown-gray clay and polyhalite [17]</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>5.0</td>
<td></td>
<td>5.0</td>
<td>100</td>
<td>-</td>
<td>5.4'-8.7' ANHYDRITE b: Very light to medium light gray (8B, 6G). Microcrystalline anhydrite. Scattered halite growths. Trace of gray clay at 8.4'.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>10</td>
<td></td>
<td>1.0</td>
<td>100</td>
<td>X</td>
<td>8.7'-11.8' (50.15') HALITE: Clear, coarsely crystalline. Scattered white anhydrite stringers. [1]</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>15</td>
<td></td>
<td>5.0</td>
<td>100</td>
<td>X</td>
<td>11.8'-12.65' HALITE: Clear; some medium brown (10YR 3/4) and moderate reddish orange (10R 6/6). Medium crystalline, some coarse. &lt;1% brown to gray clay. &lt;1% polyhalite. [9, 17]</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>20</td>
<td></td>
<td>5.0</td>
<td>100</td>
<td>X</td>
<td>12.65'-13.15' ANHYDRITE a: Light gray to medium light gray (8G, 6G). Microcrystalline. Scattered halite growths, trace of clay at 12.65'.</td>
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</tr>
<tr>
<td>6</td>
<td>25</td>
<td></td>
<td>3.0</td>
<td>82</td>
<td>X</td>
<td>13.15'-19.2' HALITE: Clear, trace of medium reddish orange (10R 6/6). Coarsely crystalline. &lt;1%/1% polyhalite. [1, 2]</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>25</td>
<td></td>
<td>4.7</td>
<td>94</td>
<td>X</td>
<td>19.2'-22.9' (20.5') HALITE: Clear, some moderate brown (10YR 4/4) to moderate reddish orange (10R 6/6). Medium to coarsely crystalline. &lt;1% dispersed polyhalite and brown clay. [17]</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>25</td>
<td></td>
<td>5.0</td>
<td>100</td>
<td>X</td>
<td>22.9'-28.4' (20.6') HALITE: Clear, coarsely crystalline. [1] &lt;1%/8% brown clay seam at 24.7', 28.45'. 3/4' anhydrite at 24.75'.</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>25</td>
<td></td>
<td>5.0</td>
<td>100</td>
<td>X</td>
<td>28.65'-30.6' ANHYDRITE: Clear to moderate brown (10YR 4/4). Medium to coarsely crystalline. &lt;1% to 2% brown clay. &lt;1% polyhalite. [10] 4/4' brown clay seam at 30.6', some anhydrite associated.</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>25</td>
<td></td>
<td>3.0</td>
<td>82</td>
<td>X</td>
<td>30.6'-35.6' HALITE: Clear, coarsely crystalline. &lt;1% brown clay. [8, some 10]</td>
<td></td>
</tr>
</tbody>
</table>

**BORING NO.**  
DH-317

**NW split tube core barrel and NW rods. Total drill time: 11 hrs.**

**No gas. Dry hole.**

**Runs 4 and 5 contain discing.**

**18% of core recovered was 22 inch length.**
<table>
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<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH</th>
<th>CORE RUN</th>
<th>% RECOVERED</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
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<td>25.8</td>
<td>25</td>
<td>5.0</td>
<td>3.9</td>
<td>78</td>
<td>35.6'-38.2' ARCTILGEOUS HALITE: Clear to moderate brown (Syr 4/4). Medium to coarsely crystalline. &lt;1% to 3% brown clay, trace gray. (15)</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>30</td>
<td>4.8</td>
<td>4.0</td>
<td>83</td>
<td>38.2'-38.8' ANHYDRITE: Light gray (W7). Micocrystalline. Scattered halite growths. Trace brown clay at 38.2'.</td>
<td></td>
</tr>
<tr>
<td>30.8</td>
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<td></td>
<td></td>
<td></td>
<td>38.8'-40.1' HALITE: Clear, coarsely crystalline. &lt;1% polyhalite. (1)</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>35</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>40.1'-42.4' HALITE: Clear, some moderate reddish orange (10R 8/4). Coarsely crystalline. &lt;1% polyhalite blobs, locally 2%. Gray clay break at 42.4'. (2, 4)</td>
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<tr>
<td>40.6</td>
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<td></td>
<td></td>
<td>42.4'-44.0' HALITE: Clear, some moderate brown (Syr 4/4). Coarsely crystalline. &lt;1% brown clay. (8, 10)</td>
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<tr>
<td>35.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>44.0'-44.7' HALITE: Clear to moderate brown (Syr 3/4). Medium crystalline. &lt;1% to 2% brown clay. &lt;1/2% dispersed polyhalite. (17)</td>
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<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>44.7'-49.2' HALITE: Clear, some medium brown (Syr 4/4). Coarsely crystalline. &lt;1% brown clay. Locally &lt;1/2% polyhalite blobs. (10)</td>
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</tr>
<tr>
<td>40.6</td>
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<td></td>
<td></td>
<td></td>
<td>49.2'-50.1' HALITE: Clear to moderate reddish orange (10R 8/4), medium brown, medium to coarsely crystalline. &lt;1% brown clay and polyhalite. (17)</td>
<td></td>
</tr>
</tbody>
</table>

Because of poor quality and recovery of core, holes DH-317A, 317B were drilled. Refer to logs for these holes.
**GEOLOGIC DRILL LOG**

**WASTE ISOLATION PILOT PLANT**

**HOLE** NW CORE

**BORING NO.** DH-317A

**LOCATION**

**INTERSECTION OF S 1600, W 30 DRIFTS - ROOF**

**STATION** S 1600, W 30

**COLLAR ELEV.** 1271.2

**DIRECTION OF DRILLING** VERTICAL

**MINE COORDINATES** N 8077.5, E 6879.5

**DEPTH OF BOREHOLE** 5.0'

**DRILLING METHOD** ROTARY

**DRILL MAKE/MODEL** CP-65

**DATE STARTED** 07/06/84

**DATE COMPLETED** 07/06/84

**SHEET** 1

**LOGGED BY** J.E. GALLERAN

**DATE:** 07/06/84

**1 OF 1**

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>CORE RUN RECOVERY</th>
<th>% RECOVERED</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.0-5.0' HALITE: Clear, coarsely crystalline. Cl/2% polyhalite and gray clay. (1, 2)</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>2.0</td>
<td>2.0</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td>NW split tube core barrel and NW core. Drill time: 45 minutes. This hole was drilled to replace first run of hole 317.</td>
</tr>
<tr>
<td>2</td>
<td>3.0</td>
<td>2.9</td>
<td>97</td>
<td>X</td>
<td></td>
<td></td>
<td>No gas. Dry hole.</td>
</tr>
<tr>
<td>5.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## WIPP
### GEOLeGIC DRILL LOG

**WASTE ISOLATION PILOT PLANT**

**HOlE:**
- **INSTRUMENT & NUMBER:**
- **TYPe & SIZE:**
- **NC CORE:**
- **BORING NO.:**
- **LOCATION:**

**MINE COORDINATES:** N8080.3, E6681.0
**DEPTH OF BOREHOLE:** 51.0’

**DRILLING METHOD:**
- **ROTARY AIR**
- **DRILL MAKE/MODEL:**

**DATE STARTED:** 09/07/84
**DATE COMPLETED:** 09/07/84
**LOGGED BY:** J.E. GALLERANI
**DATE:** 09/08/84

### Sheet 1 of 2

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>RECOVERY</th>
<th>% RECOVERED</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.75</td>
<td>1</td>
<td>1.75</td>
<td>1.4</td>
<td>95</td>
<td>X</td>
<td>0.0’-5.1’ HAILITE: Clear with some lightly moderate reddish orange (10R 6/6). Coarsely crystalline with some medium. &lt;1% polyhalite.[I]</td>
<td></td>
</tr>
<tr>
<td>6.4</td>
<td>2</td>
<td>4.65</td>
<td>4.65</td>
<td>100</td>
<td>X</td>
<td>5.1’-7.1’ HAILITE: Clear, medium to coarse crystalline. &lt;1% gray clay and dispersed polyhalite.[II]</td>
<td></td>
</tr>
<tr>
<td>11.3</td>
<td>3</td>
<td>4.9</td>
<td>4.9</td>
<td>100</td>
<td>X</td>
<td>7.1’-8.1’ HAILITE: Clear to moderate brown (10YR 4/4) with some light moderate reddish orange (10R 6/6). Medium to coarse crystalline. &lt;1% gray clay. Trace of polyhalite.</td>
<td></td>
</tr>
<tr>
<td>15.1</td>
<td>4</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
<td>8.1’-9.7’ HAILITE: Clear, some lightly moderate reddish orange (10R 6/6). &lt;1% gray clay and polyhalite.</td>
<td></td>
</tr>
<tr>
<td>21.3</td>
<td>5</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
<td>8.7’-8.9’ ANHYDRITE: Very light to medium light gray, microcrystalline anhydrite with growths of halite. 61/4” dry gray clay at 8.7’.</td>
<td></td>
</tr>
<tr>
<td>25.0</td>
<td>6</td>
<td>5.0</td>
<td>4.7</td>
<td>94</td>
<td></td>
<td>8.9’-13.9’ HAILITE: Clear, coarse crystalline with scattered white anhydrite stringers.</td>
<td></td>
</tr>
</tbody>
</table>

**NC double tube wireline core barrel with NC rods. Total drilling time: 12 hrs X. This is a replacement hole for 31F and 31FA. Run 1: 2: broken core. Run 4: Water seepage from hole after rods were broken at end of core. Probably from anhydrite a.**
<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>RECOVERY %</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>26.3</td>
<td>25</td>
<td></td>
<td></td>
<td>X</td>
<td>26.0'-30.1' HALITE: Clear, coarsely crystalline. Scattered white anhydrite stringers. [1]</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>5.0</td>
<td>4.5</td>
<td>90</td>
<td></td>
<td>30.1'-33.8' HALITE: Clear with zones of moderate brown. Coarsely crystalline with some medium. 61% brown clay. [1, 8, some 10]</td>
<td>Run 8: Broken zones of core.</td>
</tr>
<tr>
<td>31.3</td>
<td>30</td>
<td></td>
<td></td>
<td></td>
<td>33.8'-39.4' ARGINOCREN HALITE: Clear to moderate brown (Skn 3/4, 4/4). Coarsely crystalline, some medium. &lt;1% to 3% brown clay. &lt;1/2% dispersed polyhalite. Scattered breaks. [8, 10, 15, 17]</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>5.0</td>
<td>4.6</td>
<td>92</td>
<td></td>
<td>39.6'-40.2' ANHYDRITE: Very light to light medium grey (4N 4/6), microcrystalline anhydrite. Faintly laminated, low angle. Scattered very small halite growths. 63/68' brown clay seam at 39.6'. Dips 15°E.</td>
<td></td>
</tr>
<tr>
<td>36.3</td>
<td>40</td>
<td></td>
<td></td>
<td></td>
<td>40.2'-44.3' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6). Coarsely crystalline. &lt;1% to 3% polyhalite, average &lt;2%. [8, 7]</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>5.0</td>
<td>4.6</td>
<td>92</td>
<td></td>
<td>44.3'-51.0' HALITE: Clear, some moderate brown (Skn 4/4). Coarsely crystalline, locally fine to medium. 61% brown clay. &lt;1/2% polyhalite patches, blebs, locally up to 2%. Scattered brown clay breaks 47.1'-47.7E. Clear halite, scattered polyhalite blebs at 48'-49.1'Z. [1, 8, 10]</td>
<td>Run 10: Broken core beyond 53 ft. Hit gas pocket at 45.9'. No reading on methane detection meter. No sound of gas leak.</td>
</tr>
<tr>
<td>10</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td></td>
<td></td>
<td>34% of recovered core is 22 inch length.</td>
</tr>
<tr>
<td>46.3</td>
<td>30</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>4.7</td>
<td>4.7</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## WIPP GEOLOGIC DRILL LOG

**INSTRUMENT TYPE & NUMBER:**

**HOLE TYPE/SIZE:**

**NX CORE BORING NO.:** DH-318

**LOCATION:** INTERSECTION OF S 1600, V 30 DRIFTS - FLOOR

**STATION:** S 1600, W 30

**COLLAR ELEV.:** 1258.5

**DIRECTION OF DRILLING:** VERTICAL DOWN

**MINE COORDINATES:** N 8077.3, E 6876.1

**DEPTH OF BOREHOLE:** 50.0'

**DRILLING METHOD:** ROTARY AIR

**DRILL MAKE/MODEL:** CP-65

**DATE STARTED:** 07/02/84

**DATE COMPLETED:** 07/03/84

**SHEET LOGGED BY:** J.E. GALLERANI

**DATE:** 07/03/84

---

### LOG

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>RECOVERY %</th>
<th>RECOVERED PROFILE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>0</td>
<td>0</td>
<td>X</td>
<td>X</td>
<td>0.0'-4.75' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6). Coarsely crystalline. Scattered anhydrite. &lt;1% to 2% polyhalite. [7]</td>
</tr>
<tr>
<td>1</td>
<td>4.2</td>
<td>4.2</td>
<td>100</td>
<td>X</td>
<td>4.75'-7.3' MD-139: From 4.75'-5.75' is mixture of anhydrite and halite. Then predominantly anhydrite with scattered halite grains. Light gray with some moderate reddish orange. Gray clay parting at 7.3'.</td>
</tr>
<tr>
<td>2</td>
<td>5.3</td>
<td>5.3</td>
<td>100</td>
<td>X</td>
<td>7.3'-11.0' HALITE: Clear to light gray (7W) and light moderate reddish orange. Medium to coarsely crystalline. &lt;1% gray clay. &lt;1% dispersed polyhalite. Gray clay break at 9'. 43% polyhalite to 7.8'. [9]</td>
</tr>
<tr>
<td>3</td>
<td>10.5</td>
<td>10.5</td>
<td>100</td>
<td>X</td>
<td>11.0'-15.45' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6). Coarsely crystalline. &lt;1% to 2% polyhalite dispersed. Scattered anhydrite. 2/4' anhydrite layer at 15.35'. Gray clay parting at 15.45'. [4, 7]</td>
</tr>
<tr>
<td>4</td>
<td>15.6</td>
<td>15.6</td>
<td>100</td>
<td>X</td>
<td>15.45'-17.2' HALITE: Clear, some light gray (7W) and moderate reddish orange (10R 6/6). Medium to coarsely crystalline. &lt;1/2% dispersed polyhalite. [9]</td>
</tr>
<tr>
<td>5</td>
<td>20.5</td>
<td>20.5</td>
<td>100</td>
<td>X</td>
<td>17.2'-20.5' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6). Coarsely crystalline. 41% gray clay. &lt;1/2% dispersed polyhalite. [5, 6, 7]</td>
</tr>
<tr>
<td>6</td>
<td>25.7</td>
<td>25.7</td>
<td>100</td>
<td>X</td>
<td>20.5'-27.0' HALITE: Clear (some light gray (7W) to lightly moderate reddish orange (10R 6/6). Medium to coarsely crystalline. 4% gray clay, some brown. &lt;1% polyhalite dispersed. Breaks at 21.5' and 21.9'. [9, 17]</td>
</tr>
<tr>
<td>7</td>
<td>30.9</td>
<td>30.9</td>
<td>100</td>
<td>X</td>
<td>27.0'-32.7' HALITE: Clear to moderate reddish orange (10R 6/6). Coarsely crystalline. &lt;1/2% dispersed polyhalite. Trace of gray clay at 27.1'. Up to 1' anhydrite at 22.6'. Scattered anhydrite stringers between 31.6'-32.6'. [4, 4]</td>
</tr>
<tr>
<td>8</td>
<td>35.8</td>
<td>35.8</td>
<td>100</td>
<td>X</td>
<td>32.7'-33.65' HALITE: Clear, medium to coarsely crystalline. &lt;1/2% dispersed polyhalite. [1]</td>
</tr>
</tbody>
</table>

**REMARKS:**

- NV split tube core barrel. NV rods. Scissor lift.
- Total drill time: 7 hrs.
- No gas. Dry hole.
- 33% of core recovered is 42 inch length.
<table>
<thead>
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<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH</th>
<th>CORE RUN</th>
<th>RECOVERY</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>33.65'-33.95' ANHYDRITE: Very light to light gray (88, 87). Microcrystalline. Scattered halite growths. 1/2&quot; halite layer just below upper contact. 61/8&quot; gray clay seam at lower contact. Core grinding here.</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>33.95'-40.3' HALITE: Clear, some mottled reddish orange (12R 6/4). &lt;1/2% polyhalite. &lt;1% gray clay to 34.95'2, then 6 &lt;1/2%. [2], [some 9]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40.3'-44.2' HALITE: Clear, some medium brown (5YR 4/4). Coarsely crystalline, some medium. 42% brown clay. &lt;1/2% polyhalite. [8, 10]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>44.2'-50.0' HALITE: Clear, coarsely crystalline, some medium. Zero to &lt;1% gray clay. &lt;1/2% polyhalite. [1, 11]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### WIPP

**WASTE ISOLATION PILOT PLANT**

**GEOLOGIC DRILL LOG**

**INSTRUMENT TYPE & NUMBER**
- NC CORE

**HOLE TYPE/SIZE**
- INTERSECTION OF S 700, E 300 DRILLS

**LOCATION**
- VERTICAL DIRECTION OF DRILLING

**STATION**
- S 700, E 300

**COLLAR ELEV.**
- 1260.0

**MINE COORDINATES**
- N 8988.1, E 7192.6

**DEPT OF BOREHOLE**
- 51.05'

**DRILLING METHOD**
- ROTARY AIR

**DRILL MAKE/MODEL**
- CP-65

**DATE STARTED**
- 09/10/84

**DATE COMPLETED**
- 09/10/84

**SHEET**
- 1 OF 2

**LOGGED BY**
- J.E. GALLERAY

**DATE**
- 09/10/84

### Run Data

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>CORE RUN RECOVERY</th>
<th>% RECOVERED</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>0</td>
<td>2.0</td>
<td>2.0</td>
<td>100</td>
<td>X</td>
<td>0.0'-5.1' HALITE: Clear to lightly moderate reddish orange (10R 6/6). Coarsely crystalline, some medium locally. &lt;1/2% polyhalite. Trace brown clay from 4.7'.</td>
<td>BU double tube wireline core barrel. No loss.</td>
</tr>
<tr>
<td>0.0</td>
<td>2.0</td>
<td>4.6</td>
<td>4.6</td>
<td>100</td>
<td>X</td>
<td>5.1'-8.45' HALITE: Clear to moderately brown (5YR 4/6). Coarsely crystalline, 4% brown clay, locally up to 2%. Gray clay from 4.05'. Scattered polyhalite. Some anhydrite close to contact at 8.45'. (8, 10)</td>
<td></td>
</tr>
<tr>
<td>0.0</td>
<td>6.6</td>
<td>5.1</td>
<td>5.1</td>
<td>100</td>
<td>-</td>
<td>8.45'-8.6' ANHYDRITE b: Very light to light medium gray (8B 6B). Microcrystalline. Trace gray clay at 8.45'.</td>
<td></td>
</tr>
<tr>
<td>0.0</td>
<td>11.7</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
<td>8.65'-14.3' HALITE: Clear, coarsely crystalline. Scattered white anhydrite. (11)</td>
<td></td>
</tr>
<tr>
<td>0.0</td>
<td>16.7</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
<td>14.3'-18.65' HALITE: Clear, some lightly moderate reddish brown and moderate brown (5YR 4/6). Fine to coarsely crystalline, 4% polyhalite and gray, brown clay. (17)</td>
<td></td>
</tr>
<tr>
<td>0.0</td>
<td>20.0</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
<td>15.65'-16.5' ANHYDRITE a: Very light to medium light gray anhydrite. Scattered halite growths, especially from 15.65'. Trace gray clay at 15.65'. Core grinding evident here.</td>
<td></td>
</tr>
<tr>
<td>0.0</td>
<td>25.0</td>
<td>4.5</td>
<td>4.5</td>
<td>98</td>
<td>X</td>
<td>16.35'-20.85' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6). Coarsely crystalline. &lt;1% to 3% polyhalite. Average 1% to 2%. (3, 4)</td>
<td></td>
</tr>
<tr>
<td>0.0</td>
<td>30.0</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
<td>20.85'-25.35' HALITE: Clear to moderate brown (5YR 4/6). Medium to coarsely crystalline. 63% brown clay, some gray. Trace dispersed polyhalite. (10, 17, some 12) 1/4&quot; hard brown grayish clay seam at 25.35' with associated anhydrite/halite to 25.35'.</td>
<td></td>
</tr>
<tr>
<td>0.0</td>
<td>35.0</td>
<td>4.5</td>
<td>4.5</td>
<td>98</td>
<td>X</td>
<td>25.35'-30.9' HALITE: Clear, coarsely crystalline. Slight trace clay. (11)</td>
<td></td>
</tr>
<tr>
<td>0.0</td>
<td>40.0</td>
<td>4.7</td>
<td>4.7</td>
<td>100</td>
<td>X</td>
<td>30.9'-32.7' AGRICULARIOUS HALITE: Clear to moderate brown (5YR 4/4, 3/4). Medium to coarsely crystalline. Scattered breaks. &lt;1% to 5% brown clay. (10, 15)</td>
<td></td>
</tr>
<tr>
<td>0.0</td>
<td>45.0</td>
<td>4.7</td>
<td>4.7</td>
<td>100</td>
<td>-</td>
<td>32.7'-33.9' HALITE: Clear, coarsely crystalline. (11)</td>
<td></td>
</tr>
<tr>
<td>0.0</td>
<td>50.0</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>X</td>
<td>Run 5: Some broken core.</td>
<td></td>
</tr>
</tbody>
</table>
### WIPP
#### WASTE ISOLATION PILOT PLANT

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>RECOVERY</th>
<th>% RECOVERED</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>26.4</td>
<td>1</td>
<td>4.9</td>
<td>4.9</td>
<td>100</td>
<td>33.9'-36.55' HALITE: Clear, some moderate brown (SYR 4/4). Coarsely crystalline. 4% brown clay. [8, 10]</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>30</td>
<td>4.75</td>
<td>4.75</td>
<td>100</td>
<td>36.55'-40.05' AGRILLACEOUS HALITE: Clear, to moderate brown (SYR 3/4, 4/4). Medium to coarsely crystalline. &lt;1% to 5% brown clay. Scattered breaks. [15]</td>
<td></td>
</tr>
<tr>
<td>31.3</td>
<td>35</td>
<td></td>
<td></td>
<td></td>
<td>40.05'-40.6' ANHYDRITE: Very light to light medium gray (M6, M6). Microcrystalline. Scattered halite growths. Partially laminated. 1/2&quot; halite layer at 40.4'.</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>35</td>
<td></td>
<td></td>
<td></td>
<td>40.6'-40.8' POLYHALITE HALITE: Clear to moderate reddish orange (L0G 6/6). Coarsely crystalline, some fine to medium between 40.8'-40.8'. &lt;1% to 3% polyhalite, locally 5%. Scattered anhydrite. Scattered brown clay 45.8'-46.8'.</td>
<td></td>
</tr>
<tr>
<td>36.05</td>
<td>40</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>40.8'-40.8' POLYHALITE: Clear mottled with moderate brown (SYR 4/4). Coarsely crystalline. &lt;1%, locally 2% brown clay. &lt;1/2% polyhalite blebs.</td>
<td></td>
</tr>
<tr>
<td>41.05</td>
<td>45</td>
<td></td>
<td></td>
<td></td>
<td>48.3'-51.05' HALITE: Clear mottled with moderate brown (SYR 4/4). Coarsely crystalline. &lt;1%, locally 2% brown clay. &lt;1/2% polyhalite blebs.</td>
<td>Run 7: Broken core.</td>
</tr>
<tr>
<td>10</td>
<td>50</td>
<td></td>
<td></td>
<td></td>
<td>48.3'-51.05' HALITE: Clear mottled with moderate brown (SYR 4/4). Coarsely crystalline. &lt;1%, locally 2% brown clay. &lt;1/2% polyhalite blebs.</td>
<td>Run 8: Broken zones within run.</td>
</tr>
<tr>
<td>46.05</td>
<td>50</td>
<td></td>
<td></td>
<td></td>
<td>48.3'-51.05' HALITE: Clear mottled with moderate brown (SYR 4/4). Coarsely crystalline. &lt;1%, locally 2% brown clay. &lt;1/2% polyhalite blebs.</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>55</td>
<td></td>
<td></td>
<td></td>
<td>48.3'-51.05' HALITE: Clear mottled with moderate brown (SYR 4/4). Coarsely crystalline. &lt;1%, locally 2% brown clay. &lt;1/2% polyhalite blebs.</td>
<td>40% of core recovered was 32 inch length.</td>
</tr>
</tbody>
</table>

BORING NO. DH-319
<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (FT.)</th>
<th>LENGTH</th>
<th>CORE RUN</th>
<th>RECOVERY</th>
<th>% RECOVERED</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>0.0'-4.3' HALITE: Clear, coarsely crystalline. &lt;1%/2% polyhalite and gray clay. [1]</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td></td>
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<td>-</td>
<td>4.3'-6.6' HALITE: Clear to moderate brown (5YR 4/4), coarsely crystalline. ≤1% brown clay. [10]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10.0</td>
<td>5.0</td>
<td>100</td>
<td></td>
<td></td>
<td>X</td>
<td>6.3'-7.8' HALITE: Clear to medium light gray (10W) and light moderate reddish orange (10R 6/6). Fine to medium, some coarsely crystalline. &lt;1%/2% dispersed polyhalite. ≤1% gray clay.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>15.0</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
<td></td>
<td></td>
<td>7.8'-8.05' ANHYDRITE: Light gray (10W) microcrystalline, some laminae. Scattered halite growths. Trace of gray clay at 7.8'.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>20.0</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
<td></td>
<td></td>
<td>8.05'-14.0' HALITE: Clear, coarsely crystalline. Scattered white anhydrite stringers. [2]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>25.0</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
<td></td>
<td></td>
<td>14.0'-14.65' HALITE: Clear to moderate brown (5YR 4/4) and light moderate reddish orange (10R 6/6), medium crystalline. ≤1% brown clay. &lt;1%/2% dispersed polyhalite.</td>
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<td></td>
<td>14.65'-15.5' ANHYDRITE: Light to medium gray (10W, 10S) microcrystalline anhydrate. Irregular laminae. Scattered halite growths especially from 15.1'. Trace of gray clay at 14.88'.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>20.0</td>
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<td>100</td>
<td>X</td>
<td></td>
<td></td>
<td>15.0'-19.9' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6), coarsely crystalline. ≤1% to 3% polyhalite. Average ≤1% scattered anhydrate.</td>
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<td></td>
<td>19.9'-22.4' HALITE: Clear to moderate reddish orange (10R 6/6). Some moderate browns. Medium to coarsely crystalline. ≤1% polyhalite and brown clay. [3]</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>25.0</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
<td></td>
<td></td>
<td>22.4'-24.3' HALITE: Clear to light moderate reddish orange and some light bluish gray. Medium to coarsely crystalline. &lt;1%/2% polyhalite. ≤1% gray clay. [9]</td>
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<td>24.3'-29.6' HALITE: Clear, coarsely crystalline. Scattered anhydrite. Up to 1/2&quot; hard brown clay seams at 25.1'. With trace of associated anhydrate. &lt;1%/2% polyhalite locally. [1]</td>
<td></td>
</tr>
<tr>
<td>RUN NUMBER</td>
<td>DEPTH (ft.)</td>
<td>LENGTH CORE RUN</td>
<td>RECOVERY %</td>
<td>PROFILE</td>
<td>DESCRIPTION</td>
<td>REMARKS</td>
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<tr>
<td>11</td>
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<td>100</td>
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</tbody>
</table>

- **29.6'-31.2' ARGLACCIOUS HALITE**: clear-to-moderate brown (5YR 3/4, 4/4), medium to coarsely crystalline, some fine. <1% to 3% brown clay. [12]

- **31.2'-33.3' HALITE**: Clear, coarsely crystalline. [1]

- **33.1'-35.2' HALITE**: Clear, some moderate reddish brown (10R 4/6), coarsely crystalline. None to 4% brown clay [1, 10]

- **35.2'-38.7' ARGLACCIOUS HALITE**: Clear to moderate brown (5YR 4/4, 3/4), medium to coarsely crystalline. <1% to 3% brown clay, trace gray. 1/2" brown clay seam at 37.45'. <1/2% polyhalite dispersed. [14, 17].

- **38.7'-39.4' ANHYDRITE**: Light to medium light gray (87, 86) microcrystalline anhydrite. Partially laminated. 3/4" hard brown clay seam at 38.7'.

- **39.4'-40.2' HALITE**: Clear, coarsely crystalline. <1/2% polyhalite, scattered anhydrite. [1]

- **40.2'-43.0' POLYHALITIC HALITE**: Clear to moderate reddish orange (10R 6/6), some moderate brown (5YR 4/4). Coarsely crystalline with zones of fine-medium. <1% to 2% brown clay. <1% polyhalite. [8, 12].

- **43.0'-47.0' HALITE**: Clear to moderate reddish orange (10R 6/6), some moderate brown (5YR 4/4). Coarsely crystalline with zones of fine-medium. <1% to 2% brown clay. <1% polyhalite. [8, 12].

- **47.0'-48.9' HALITE**: Clear mottled with some moderate reddish orange (10R 6/6), coarsely crystalline. <1% polyhalite. <1/2% gray clay. [1, 3].

- **48.9'-52.0' ARGLACCIOUS HALITE**: Clear to moderate brown (5YR 3/4, 4/4), medium to coarsely crystalline. <1% to 3% brown clay. [10, 15].
## GEOLOGIC DRILL LOG

### WIPP

#### WASTE ISOLATION PILOT PLANT

**INSTRUMENT TYPE & NUMBER** GE-267  
**HOLE TYPE/SIZE** NX  
**BOREHOLE DEPTH** 52.5 FT  
**LOCATION** WASTE SHAFT STATION - ROOF - EAST OF WASTE SHAFT

**STATION** 5600.00  
**COLLAR ELEV.** 1261.2  
**DIRECTION OF DRILLING** VERTICAL UP  
**MINE COORDINATES** N9291.1, E6952.5  
**DEPTH OF BOREHOLE** 52.5 FT

**DRILLING METHOD** ROTARY AIR  
**DRILL MAKE/MODEL** CP-65

**DATE STARTED** 2-22-85  
**DATE COMPLETED** 2-22-85  
**LOGGED BY** J. E. GALLERANI  
**DATE** 2-28-85  

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft)</th>
<th>LENGTH CORE RUN</th>
<th>RECOVERY</th>
<th>% RECOVERED</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3.0</td>
<td>3.0</td>
<td>0.9</td>
<td>30</td>
<td>0.0'-3.6' HALITE: Clear, medium to coarse crystalline.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>4.3</td>
<td>2.7</td>
<td>2.7</td>
<td>100</td>
<td>3.6'-8.6' HALITE: Clear, some moderate brown (2% 4/4); medium to coarse crystalline.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>7.6</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>8.0'-4.3' AMYDRITE &quot;F&quot;: Very light to medium gray amygdrite. Scattered halite growths. Up to 1/2&quot; deck grey clay at 8.0'. Irregular, low angle.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>12.0</td>
<td>5.0</td>
<td>3.5</td>
<td>70</td>
<td>14.5'-15.6' HALITE: Clear to moderate brown (5% 4/4); fine to medium crystalline.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>17.0</td>
<td>2.0</td>
<td>1.1</td>
<td>55</td>
<td>15.6'-16.25' AMYDRITE &quot;A&quot;: Light to light medium gray amygdrite. 1/4&quot; grey clay at 15.6'. Low angle.</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>19.0</td>
<td>2.5</td>
<td>2.5</td>
<td>100</td>
<td>16.25'-20.5' POLYHALITIC HALITE: Clear to moderate reddish orange (10K 4/4); coarse crystalline.</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>21.5</td>
<td>1.5</td>
<td>0.9</td>
<td>60</td>
<td>20.5'-23.5' HALITE: Clear, some moderate brown (5% 4/4); medium to coarse crystalline, some fine.</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>23.0</td>
<td>3.6</td>
<td>1.2</td>
<td>35</td>
<td>23.5'-30.4' HALITE: Clear, coarse crystalline, some medium.</td>
<td></td>
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<tr>
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<td></td>
<td>30.4'-35.4' HALITE: Clear to moderate brown (5% 4/4); medium to coarse crystalline, some fine.</td>
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<td></td>
<td>35.4'-37.8' + 0.5' ABSTILLACEOUS HALITE: Clear to moderate brown (5% 4/4; 3/4), fine to medium crystalline.</td>
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<tr>
<td></td>
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<td></td>
<td>37.8'-38.8' AMYDRITE: Light to medium gray, microcrystalline amygdrite. Up to 1&quot; brown clay at 37.8'. Irregular, undulating surfaced core is dried.</td>
<td></td>
</tr>
</tbody>
</table>

**BORING NO:** DH-323
### WIPP
#### WASTE ISOLATION PILOT PLANT

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>RECOVERY</th>
<th>% RECOVERED</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>26.4</td>
<td>3.4</td>
<td>1.2</td>
<td>35</td>
<td></td>
<td>38.8'-42.0' POLYHALITIC HALITE: Clear to moderate reddish orange/brown (10R 6/6; 4/6). Coarsely crystalline. &lt;1 to 3% polyhalite blebs and patches. Core broken.</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>27.2</td>
<td>0.8</td>
<td>0.6</td>
<td>75</td>
<td></td>
<td>42.0'-50.5' POLYHALITIC HALITE: Clear to moderate brown (5YR 4/4), coarsely crystalline. 5% patches of brown clay, increasing to 1% beyond 48'. Core badly dissected. (4,10)</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>30.4</td>
<td>3.2</td>
<td>1.2</td>
<td>30</td>
<td></td>
<td>50.5'-51.5' ARGLILLACEOUS HALITE: Clear to moderate brown, fine to medium crystalline, some coarse. &lt;1 to 3% brown clay.</td>
<td></td>
</tr>
</tbody>
</table>

Note: Core is badly dissected from about Run 10. It is broken from about 33' to 52.5'. Difficult to log hole due to broken core and core loss.
<table>
<thead>
<tr>
<th>Run</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Run 1 - 4 were not cored with the inner barrel. 0' - 0.9' drilled with 6' single-tube core barrel. Drilling started 09/10 hours, 3 December 1982.</td>
</tr>
<tr>
<td>2</td>
<td>5.0 - 6.9' halite, mottled colorless to gray-brown (SYB 3/2) halite, medium to coarsely crystalline, 2-X dispersed gray-brown and medium light gray (85) clay, 1% polyhalite.</td>
</tr>
<tr>
<td>3</td>
<td>6.9 - 7.0' anhydrite (Anhydrite &quot;A&quot;) light (87) to very light gray (89) microcrystalline anhydrite, dense, 10% halite.</td>
</tr>
<tr>
<td>4</td>
<td>7.0 - 7.9' halite, mottled colorless to medium gray (85) to moderate reddish-orange (10R 6/6) halite, finely to medium crystalline, 1% gray and brown clay, 0.7'-7.1' is pure, medium to coarsely crystalline halite, brown clay break at 7.2', brown and gray clay break at 7.9', 1% polyhalite.</td>
</tr>
<tr>
<td>5</td>
<td>7.9 - 14.8' halite, clear, colorless to moderate reddish-orange (10R 6/6) halite, medium to coarsely crystalline, trace (1-2%) polyhalite from 7.9'-10.8' and 12.1'-14.8', undulatory very light gray (86) anhydrite strings at 11.1' (-1/16'), 11.75' (-1/16'), and 11.55' (-1/16').</td>
</tr>
<tr>
<td>6</td>
<td>14.8' - 16.0' halite, mottled colorless to moderate brown (5YR 3/4) halite, medium crystalline, 5% brown (15.4'-15.5') otherwise polyhalite absent.</td>
</tr>
<tr>
<td>7</td>
<td>16.0' - 16.4' anhydrite (Anhydrite &quot;A&quot;) very light (88) to medium gray (85) microcrystalline anhydrite, 10-20% halite from 16.3'-16.6', light gray (87) clay parting at 16.0'.</td>
</tr>
<tr>
<td>8</td>
<td>21.8' - 26.9' halite, colorless to moderate reddish-orange (10R 6/6) to moderate brown (5YR 3/2) halite, finely to coarsely crystalline, 1% polyhalite, 1% brown and gray clay. Clay is largely interstitial from 21.8'-24.0', in discontinuous layers and breaks from 24.0'-26.9', brown clay break at 25.9'.</td>
</tr>
</tbody>
</table>

Run 8 from 24.0'-25.0' is broken and separated along clay seams. Clay may be washed out.
**WIPP-SPDV ROCK CORING LOG**

**UPWARD CORING**

**BORING NO.** DO-45  **INSTRUMENT** ExtensometerGE-230  **HOLE SIZE** NX

**LOCATION** East 140 Drift, 114' N of N rib of North 140 Drift, midspan

**STATION** N254,E147  **COLLAR ELEV.** 1285.5'  **DIRECTION OF DRILLING** Vertical Up

**MINE COORDINATES** N9941.0, E7041.3  **BOREHOLE PENETRATION** 52.4'

**DRILLING METHOD** Wet (trine)  **DRILL MAKE/MODEL** Joy 12B

**PREPARED BY** RLB/TSC/DDK/Bechtel  **DATE** 1/25/83

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<table>
<thead>
<tr>
<th>RUN</th>
<th>PENETRATION (ft.)</th>
<th>RECOVERY(%)</th>
<th>% RECOVERED</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>50</td>
<td>3.2</td>
<td>100</td>
<td></td>
<td>(see description on next sheet)</td>
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<tr>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td>44.8' - 49.3' HALITE: clear to moderate reddish-orange (10R 6/6) to moderate brown (5YR 3/4) halite, medium to coarsely crystalline, &lt;1x polyhalite, concentration (5-10%) of brown clay at 46.25'-46.5', brown clay break at 46.6', discontinuous break at 48.4', trace to absent clay elsewhere.</td>
</tr>
<tr>
<td>12</td>
<td>3.0</td>
<td>100</td>
<td></td>
<td></td>
<td>43.4' - 44.8' ARGILLACEOUS HALITE: clear to moderate brown (5YR 3/4) halite, medium to coarsely crystalline, 5X brown clay locally concentrated, 1-3X polyhalite, brown clay parting at 43.4', break at 44.7'.</td>
</tr>
<tr>
<td>11</td>
<td>4.8</td>
<td>100</td>
<td></td>
<td></td>
<td>40.0' - 43.6' POLYHALITIC HALITE: clear to moderate reddish-orange (5YR 6/6) halite, coarsely crystalline, 5X polyhalite, clay is absent to 43.0', trace above, anhydrite stringers decreasing in frequency from 40.0' - 41.0'.</td>
</tr>
<tr>
<td>10</td>
<td>4.5</td>
<td>83</td>
<td></td>
<td></td>
<td>29.4' - 40.0' ANHYDRITE: (Marker Bed 13B) very light (N6) to medium gray (N5) microcrystalline anhydrite, 5-10X halite increasing upwards, grades into anhydritic halite above.</td>
</tr>
<tr>
<td>9</td>
<td>4.4</td>
<td>88</td>
<td></td>
<td></td>
<td>35.6' - 39.4' ARGILLACEOUS HALITE: clear to moderate brown (5YR 3/4) halite, coarsely to medium crystalline, fine upwards, 5-10X brown clay locally concentrated, &lt;1X polyhalite, clay is &lt;1X from 38.7' - 39.4', polyhalite is &lt;2X, pale brown (5YR 3/2) clay parting at 39.4'.</td>
</tr>
<tr>
<td>8</td>
<td>5.0</td>
<td>100</td>
<td></td>
<td></td>
<td>32.1' - 35.6' HALITE: clear, coarsely crystalline halite, few blebs of polyhalite, clay is absent 32.1' - 33.0', &lt;1X from 33.0' - 35.6', increasing upsection.</td>
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<td>7</td>
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<td>30.6' - 32.1' ARGILLACEOUS HALITE: clear to moderate brown (5YR 3/4) halite, coarsely crystalline at base, fine upwards to sugery texture, 5-10X clay (mostly brown), brown clay parting at 30.7', break at 32.1', trace polyhalite.</td>
</tr>
<tr>
<td>6</td>
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<td></td>
<td>26.9' - 30.6' HALITE: clear, coarsely crystalline halite, few blebs of polyhalite, discontinuous anhydrite stringers (&lt;1/16') at 27.1' and 28.1'.</td>
</tr>
</tbody>
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**RUN 10 (34.0'-35.4')**
Bottom (around 34.0'-35.0') is more broken up. Cote loss was assumed to be at 34.0'-35.0'.

**RUN 9 (29.0'-34.0')**
Also very broken and clay may have been lost at breaks.
WIPP-SPDV ROCK CORING LOG
UPWARD CORING

BORING NO. DO-45 INSTRUMENT Extensometer
TYPE & NUMBER GE-230 HOLE SIZE NX

LOCATION: East 140 Drift, 114' N of N rib of North 140 Drift, midspan

STATION N254.8147 COLLAR ELEV. 1285.5' DIRECTION OF DRILLING Vertical
MINE COORDINATES N9941.0, E7041.3 BOREHOLE PENETRATION 52.4'
DRILLING METHOD Wet (Brine) DRILL MAKE/MODEL Joy 12B

PREPARED BY RLB/TSC/DGK/Bechtel DATE 1/25/83 SHEET 3 OF 3

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>PENETRATION (ft.)</th>
<th>% RECOVERED</th>
<th>ROD</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>3.2</td>
<td>100</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

52.2' - 52.4' HALITE: clear, coarsely crystalline halite, 1% polyhalite.

49.3' - 52.2' ARGILLACEOUS HALITE: mottled clear to moderate brown (5YR 3/4) to moderate reddish-brown (10R 4/6) halite, finely to coarsely crystalline, 5-10% brown clay, 1-3% polyhalite, pale (10Y 3/4) to moderate reddish-brown (10R 4/6) clay seam at 52.1', brown clay break at 49.4'.

Total penetration = 52.4'.

Hole finished at 15:00 hours, 4 December 1982.
<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>% RECOVERED</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0 - 6</td>
<td>64</td>
<td>X -</td>
<td>0.0' - 7.0' HALITE: clear to brownish-gray (81% of halite, medium to coarsely crystalline, trace (1/2%) of reddish-orange (10% of halite), polyanlite. Clay content up to 5% occurring as diffuse zones or interstitially.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>5 - 10</td>
<td>40</td>
<td>X</td>
<td>7.0' - 8.9' POLYHALITE: clear and moderate reddish-orange (10% of halite), coarsely crystalline, moderately hard. Polyanite occurs interstitially and as scattered blebs from 0.0' to 10.0'. Light gray (N7) clay parting (1/8&quot;) at 7.8&quot;.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>10 - 14</td>
<td>00</td>
<td>X</td>
<td>8.9' - 13.0' ANHYDRITE: (Marker Bed 139) Light gray (N7) anhydrite, microcrystalline, hard, zones of moderate reddish-orange (10% of halite) polyanite from 8.9' - 9.1', halite anhydrite breaks in clear halite matrix at top. Core broke into 1/2&quot; chips from 11.0' - 13.0'. Light gray (N7) clay seam, stiff, at 13.0'.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>14 - 19</td>
<td>86</td>
<td>X</td>
<td>13.0' - 16.4' HALITE: clear, medium to coarsely crystalline halite, with clay and polyanite in discrete bands and interstitially. Several brown clay partings (1/16&quot;) at 12.4' - 13.5', and a brown clay break (1/32&quot;) at 15.2'. Light gray (N7) clay is less abundant and occurs interstitially. Clay content ranges from 0 to 3% and polyanite content to 2%.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>19 - 24</td>
<td>100</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>24 - 27</td>
<td>94</td>
<td>X</td>
<td>16.4' - 27.9' POLYHALITE: clear, medium to coarsely crystalline halite, with 5-10% moderate reddish-orange (10% of halite), brown clay break (1/32&quot;) at 20.6&quot;, trace interstitial gray clay from 20.6&quot; - 21.8&quot; and at 28.7&quot;.</td>
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</tr>
<tr>
<td></td>
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<td></td>
<td>Drilling started 15:20 hours, 4 December 1982. Stopped at 15:40 hours, with 5.0' drilled. End 1 - core loss seems to have occurred at top of core.</td>
</tr>
</tbody>
</table>
## WIPP-SPDV ROCK CORING LOG

**WASTE ISOLATION PILOT PLANT**

**BORING NO.** D0-46  **TYPE & NUMBER** None  **HOLE SIZE** NX

**LOCATION** East 140 Drift, 114' N of N rib of North 140 Drift, midspan

**STATION** N254, E147  **COLLAR ELEV.** 1276.5'  **DIRECTION OF DRILLING** Vertical Down

**MINE COORDINATES** N9941.0, E7041.3  **DEPTH OF BOREHOLE** 51.5'

**DRILLING METHOD** Wet (brine)  **DRILL MAKE/MODEL** Joy 12B

**PREPARED BY** DGK, JPS/Rechtem  **DATE** 1/26/83  **SHEET** 2 OF 3

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>RECOVERY (%)</th>
<th>% RECOVERED</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>25</td>
<td>4.7</td>
<td>94</td>
<td>X X</td>
<td>(as above)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>30</td>
<td>5.2</td>
<td>100</td>
<td>X X</td>
<td>27.4' - 32.4' BAKITE: clear, mottled light gray (97), light brown (5YR 6/4) to moderate reddish-orange (10R 6/6) halite, moderately hard, finely to coarsely crystalline. Orange interstitial polyhalite represents about 2% of unit, gray and brown clay about 2-3%. Brown clay breaks at 28.4', 29.2', 30.2', and 30.3'. Gray clay breaks at 27.9', 28.0', 28.3', 28.5', 29.8', and 30.0'.</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>35</td>
<td>5.0</td>
<td>100</td>
<td>X X</td>
<td>32.6' - 38.7' POLYHALITIC BAKITE: clear and moderate reddish-orange (10R 6/6) halite, coarsely crystalline, with 2-5% polyhalite. Polyhalite is generally interstitial but also occurs as thin layers (1/16&quot;-1/8&quot;). Anhydrite layer (1/16&quot;) at 37.8'.</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>40</td>
<td>5.1</td>
<td>100</td>
<td>X X</td>
<td>38.7' - 38.9' ANHYDRITE: light bluish-gray (3B 7/1), microcrystalline anhydrite, with light gray (97) clay parting (1/8&quot;) at 38.9'.</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>45</td>
<td>4.7</td>
<td>94</td>
<td>X X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>50</td>
<td>5.1</td>
<td>100</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
### ROCK CORING LOG

**WIPP-SPDV**  
WASTE ISOLATION PILOT PLANT

**BORING NO.** 100-46  
**INSTRUMENT** None  
**HOLE SIZE** NX  
**LOCATION** East 140 Drift, 114' N of N rib of North 140 Drift, midspan

---

**STATION** N254, E147  
**COLLAR ELEV.** 1276.5'  
**DIRECTION OF DRILLING** Down  
**MINE COORDINATES** N9941.0, E7041.3  
**DEPTH OF BOREHOLE** 51.5'  
**DRILLING METHOD** Wet (brine)  
**DRILL MAKE/MODEL** Joy 12B

**PREPARED BY** DGK, JPS/Bechtel  
**DATE** 1/26/83

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<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>RECOVERY(%)</th>
<th>RQD</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
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<tbody>
<tr>
<td>11</td>
<td>50</td>
<td>5.1</td>
<td>100</td>
<td>-</td>
<td>- X</td>
<td>as above</td>
</tr>
</tbody>
</table>

Hole finished at 13:30 hours, 5 December 1982.
Total depth = 51.5'.
<table>
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<th>RUN NUMBER</th>
<th>PENETRATION (ft.)</th>
<th>RECOVERY (%)</th>
<th>ROD</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
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</thead>
<tbody>
<tr>
<td>25</td>
<td>5.0</td>
<td>100</td>
<td></td>
<td>22.3’ - 26.8’ Halite: clear to colorless halite, medium to coarse crystalline, few blebs of polyhalite, trace disseminated clay at 25.9’-26.0’, anhydrite stringers (&lt;0.1”) at 22.7’ and 23.9’.</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td>16.8’ - 22.3’ Halite: colorless to moderate reddish-orange (10% 6/6) to moderate brown (5% 3/4) halite, medium to coarse crystalline, 1%-2% polyhalite in bands, anhydrite stringers at 22.2’-22.3’.</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td>12.5’ - 16.8’ Polychalite Halite: colorless to moderate reddish-orange (10% 6/6) halite, coarse crystalline, 2%-10% polyhalite in bands, anhydrite stringers, somewhat diffuse, at 13.7’.</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td>12.0’ - 12.5’ Anhydrite: (Anhydrite “e”) light to very light gray (N7-8), microcrystalline anhydrite, 30-50% halite from 12.4’-12.5’.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td>10.0’ - 12.0’ Halite: marbled clear to moderate reddish-orange (10% 6/6) to moderate brown (5% 3/4) halite, medium crystalline, 5% brown clay, 0-2% polyhalite increasing upward, light gray (N7) clay parting at 12.0’.</td>
<td></td>
</tr>
<tr>
<td>2.0</td>
<td>4.9</td>
<td>98</td>
<td></td>
<td>5.5’ - 10.0’ Halite: clear to moderate reddish-orange (10% 6/6) halite, medium to coarse crystalline, 0-2% polyhalite, anhydrite stringers (1/16”) at 5.6’, 5.9’, 6.7’, 6.9’, and 7.4’.</td>
<td></td>
</tr>
<tr>
<td>1.0</td>
<td>5.0</td>
<td>100</td>
<td></td>
<td>5.3’ - 5.5’ Anhydrite: (Anhydrite “b”) light gray (N7), microcrystalline anhydrite, undulatory bedding, 20-30% halite.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5.0’ - 5.3’ Halite: colorless to clear halite, medium to coarse crystalline, 1%-3% polyhalite, 0-5% brown clay increasing upward, light gray (N7) clay parting at 5.3’.</td>
<td></td>
</tr>
</tbody>
</table>

Most core shows circumferential scoring.

Drilling water was recycled through the drill in such a manner that previous cuttings are pushed back into the hole.

Hole was cored from 2 - 4 November 1982.
**WIPP-SPDV**

**ROCK CORING LOG**

**UPWARD CORING**

**WASTE ISOLATION PILOT PLANT**

**INSTRUMENT**

Extensometer

**BORING NO.**

DD-52

**TYPE & NUMBER**

GE-226

**HOLE SIZE**

NX

**LOCATION**

0 East Drift, 146' N of Exploratory Shaft centerline, midspan

---

**STATION**

N146. W5

**COLLAR ELEV.**

1280.4'

**DIRECTION OF DRILLING**

Vertical

**MINE COORDINATES**

N9832.5', E6890.5'

**BOREHOLE PENETRATION**

51.6'

**DRILLING METHOD**

Water (brine) DRILL MAKE/MODEL

Joy 12.5

**PREPARED BY**

RLB/TSC/DGK/Bechtel

**DATE**

1/25/83

**SHEET**

2 of 3

---

<table>
<thead>
<tr>
<th>Run Number</th>
<th>Recovery</th>
<th>Rod</th>
<th>Description</th>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>50/100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>25/100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>40/100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>78/100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>40/100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>50/100</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>28.5 - 31.0'</td>
<td>Colorless halite, coarse crystalline, few blebs of polyhalite, clay absent to 30.0', increasing to 2% interstitial brown blebs at 31.0'.</td>
</tr>
<tr>
<td>26.8 - 28.5'</td>
<td>Colorless to moderate brown (5YR 3/4) halite, medium to coarse crystalline, 1% polyhalite in 1/8'-1/2' blebs, 3-10% brown clay, brown clay breccia at 27.1', 27.7', 37.8', and 28.4'.</td>
</tr>
</tbody>
</table>

Drill rods stuck at -30' after being left in the hole overnight.

---

<table>
<thead>
<tr>
<th>Run Number</th>
<th>Penetration</th>
<th>% Recovered</th>
<th>Profile</th>
<th>Description</th>
<th>Remarks</th>
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<tr>
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<td></td>
</tr>
<tr>
<td>RUN NUMBER</td>
<td>PENETRATION (ft.)</td>
<td>RECOVERY (lb)</td>
<td>% RECOVERED</td>
<td>RQD</td>
<td>PROFILE</td>
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</tr>
</tbody>
</table>

51.1' - 51.6' 
SALTITE: colorless to moderate reddish-orange (10R 6/6) halite, medium to coarsely crystalline, 1-2% polyhalite, CaCl grey and brown clay, anhydrite stringer (0.1") at 51.25'.

Total penetration = 51.6'.
# WIPP-SPDV ROCK CORING LOG

**WASTE ISOLATION PILOT PLANT**

**BORING NO.** DO-53  **TYPE & NUMBER** None  **HOLE SIZE** NX

**LOCATION** 0 East Drift, 146° N of Exploratory Shaft centerline, midspan

**STATION** N146, W4  **COLLAR ELEV.** 1266.6'  **DIRECTION OF DRILLING** Vertical

**MINE COORDINATES** N9832.5, E6890.5  **DEPTH OF BOREHOLE** 49.2'

**DRILLING METHOD** Wet (brine)  **DRILL MAKE/MODEL** Longyear 38

**PREPARED BY** DGG, JPS/Bechtel  **DATE** 1/26/83  **SHEET** 1 OF 2

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (Ft.)</th>
<th>RECOVERY (%)</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>78</td>
<td>-</td>
<td>0.0' - 4.5' ARCTILACOUS HALITE: clear, coarsely crystalline halite, with some moderate reddish-orange (10R 6/6) to moderate reddish-brown (10R 4/6) polyhalite, and some light gray (N7) clay that occurs in small patches, especially around 3.2'.</td>
<td>O' - 1.0' was drilled with 6&quot; single-tube core barrel.</td>
</tr>
<tr>
<td>1</td>
<td>3.1</td>
<td>50</td>
<td>-</td>
<td>4.9' - 6.5' POLYHALITIC HALITE: clear, coarsely crystalline halite, with abundant polyhalite.</td>
<td>NEN 1 core broken. Impossible to determine location of core loss.</td>
</tr>
<tr>
<td>2</td>
<td>6.5' - 8.6'</td>
<td>XXX</td>
<td>ANHYDRITE: (Marker Bed 129) very light gray (N8), microcrystalline anhydrite, with clear, fine-grained halite. Anhydrite becomes purer with depth. Light gray (N7) clay parting (1/8&quot; - 1/4&quot;) at base of anhydrite.</td>
<td>Drilling was very slow due to problems with the Longyear drill. The first 7 core runs were relatively easy (relative to the last 4 runs). All later cores were completed with great difficulty. The vertical control for the drill was broken so there was no mechanical means of pulling the core barrel. The drilling brine is not filtered.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>8.6' - 12.4'</td>
<td>XXX</td>
<td>HALITE: clear, white, and mottled pale red (10R 6/1) coarsely crystalline halite, with approximately 1% moderate reddish-orange (10R 6/6) polyhalite, and trace (0%) moderate brown (15YR 6/4) interstitial clay.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>15</td>
<td>100</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>4.9</td>
<td>100</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>5.0</td>
<td>100</td>
<td>-</td>
<td>12.4' - 25.2' POLYHALITIC HALITE: clear to moderate reddish-orange (10R 6/6) halite, medium to coarsely crystalline, moderately hard. Polyhalite represents 3-55% of core and occurs as scattered blebs or interstitially. Gray clay parting (1/8&quot; - 1/4&quot;) at 17.1'. Light gray (N7) clay seams at 24.8&quot; - 25.2'.</td>
<td></td>
</tr>
</tbody>
</table>
### ROCK CORING LOG

**WIPP-SPDV**

**WASTE ISOLATION PILOT PLANT**

**BORING NO.** D0-53  
**TYPE & NUMBER** None  
**HOLE SIZE** NX

**LOCATION** 0 East Drift, 146' N of Exploratory Shaft centerline, midsan

**STATION** N146, W4  
**COLLAR ELEV.** 1266.6'  
**DIRECTION OF DRILLING** Vertical Down

**MINE COORDINATES** N9832.5, E6890.5  
**DEPTH OF BOREHOLE** 49.2'

**DRILLING METHOD** Wet (brine)  
**DRILL MAKE/MODEL** Longyear 38

**PREPARED BY** DGK, JPS/Bechtel  
**DATE** 1/26/83

---

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>RECOVERY (ft.)</th>
<th>% RECOVERED</th>
<th>RQD</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>25</td>
<td>5.0</td>
<td>100</td>
<td>-</td>
<td>X-X</td>
<td>(as above)</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>30</td>
<td>4.8</td>
<td>98</td>
<td>-</td>
<td>X-X</td>
<td>25.2'-29.5' Halite: clear, coarsely crystalline halite, with some (10-15%) interstitial moderate brown (5YR 6/4) clay, a light gray (87) clay seam at 26.2', and some (10-15%) polyhalite. Lamintions at 26.2' dip about 10°.</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>35</td>
<td>5.0</td>
<td>100</td>
<td>-</td>
<td>X-X</td>
<td>29.5'-35.5' Polyhalitic Halite: clear, coarsely crystalline halite, with 5-10% moderate reddish-orange (10R 6/6) polyhalite. Polyhalite occurs as discontinuous breaks, blebs or interstitially. Clear halite from 35.0'-35.5'.</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>40</td>
<td>5.0</td>
<td>100</td>
<td>-</td>
<td>X-X</td>
<td>35.0'-35.7' Anhydrite: very light gray (89), microcrystalline anhydrite, with gray clay parting (1/8&quot;) at base.</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>45</td>
<td>4.5</td>
<td>100</td>
<td>-</td>
<td>X-X</td>
<td>35.7'-49.2' Argillaceous Halite: clear halite, finely to medium crystalline, moderately hard, with interbedded brown clay (5Y) and polyhalite (1-6%). Color ranges from medium gray (N5) to light brown (5YR 6/4). Polyhalite occurs as interstitial layers.</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>50</td>
<td>2.9</td>
<td>100</td>
<td>-</td>
<td>X-X</td>
<td>Total depth = 49.2'.</td>
<td></td>
</tr>
</tbody>
</table>
**WIPP-SPDV**

**ROCK CORING LOG**

**UPWARD CORING**

**BORING NO.** DO-56  **TYPE & NUMBER** Ga-234  **HOLE SIZE** NX

**LOCATION** 0 East Drift, 621.3' N of Exploratory Shaft Centerline, 12.5' from E rib

**STATION** N621, EO  **COLLAR ELEV.** 1296.8  **DIRECTION OF DRILLING** Vertical up

**MINE COORDINATES** N10311;8 E6892.3  **BOREHOLE PENETRATION** 52.1'

**DRILLING METHOD** Rotary w/Brine  **DRILL MAKE/MODEL** Joy 12B

**PREPARED BY** JPS/Bechtel  **DATE** 2/4/83  **SHEET** 1 of 3

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>PENETRATION (ft.)</th>
<th>RECOVERY</th>
<th>% RECOVERED</th>
<th>RQD</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
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**20.2'-25.1'**

- **ARGILLACEOUS HALITE:** clear to mottled pale brown (5YR 5/2) and brownish-gray (5YR 4/1), medium to coarsely crystalline and moderately hard. Clay occurs interstitially with some clay breaks and partings and represents from 0-10% of core. From 13.3'-24.1', some of moderate reddish-orange (10R 6/6) interstitial polyhalite. Clay breaks at: 20.3', 20.5', 21.3', 22.0', and 24.5'. At 24.9', 1/4" thick brownish-gray (5YR 4/4) clay partings.

**15.3'-20.2'**

- **POLYHALITE HALITE:** clear and moderate reddish-orange (10R 6/6), finely to coarsely crystalline, moderately hard. Finely crystalline from 19.3'-20.0'. Polyhalite occurs as isolated blebs or interstitially and comprises 5-10% of core.

**14.7'-15.3'**

- **ANHYDRITE:** banded, very light gray (N8) and medium dark gray (N4), microcrystalline, hard, dense. Core broken into 1/2" chips.

**13.5'-14.7'**

- **HALITE:** argillaceous and polyhalite in part. Mottled pale brown (5YR 4/2) and moderate brownish-gray (5YR 4/6) and brownish-gray (5YR 4/1). Finely crystalline, moderately hard. Clay and polyhalite comprise 5-10% of core.

**8.0'-13.5'**

- **HALITE:** clear, medium to coarsely crystalline, moderately hard, few scattered, very light gray (N8) anhydrite stringers throughout.

**7.8'-8.0'**

- **ANHYDRITE:** medium gray (N5), hard, dense, microcrystalline.

**5.8'-7.8'**

- **ARGILLACEOUS HALITE:** clear and brownish-gray (5YR 4/1), medium to coarsely crystalline, moderately hard. Argillaceous content up to 10%.

**0.0'-5.8'**

- **HALITE:** polyhalitic, clear and moderate reddish-orange (10R 6/6), coarsely crystalline, moderately hard. Polyhalite occurs as isolated blebs and comprises up to 3% core.

---

**Core Losses:**

<table>
<thead>
<tr>
<th>Run</th>
<th>Where Lost</th>
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<tbody>
<tr>
<td>2</td>
<td>2.0'-6.0'</td>
</tr>
<tr>
<td>3</td>
<td>11.5'-11.7'</td>
</tr>
<tr>
<td>11</td>
<td>47.1'-47.2'</td>
</tr>
</tbody>
</table>

Hole began at 13:00 hours on 2 February 1983. Cored from 0 to 1.0' using 6" diameter single tube barrel. Cored from 1.0'-52.1' using NX core barrel with brine.
**WIPP-SPDV**  
**WASTE ISOLATION PILOT PLANT**

**BORING NO.** D0-36  
**TYPE & NUMBER** GE-234  
**HOLE SIZE** NX

**LOCATION** 0 East Drift, 621.3' N of Exploratory Shaft Centerline, 12.5' from E rib

**STATION** N621, EO  
**COLLAR ELEV.** 1496.8  
**DIRECTION OF DRILLING** Vertical up

**MINE COORDINATES** N1031'89.8 E6892.3  
**BOREHOLE PENETRATION** 52.1'

**DRILLING METHOD** Rotary w/Brine ORILL MAKE/MODEL Joy 12B

**PREPARED BY** JPS/Bechtel  
**DATE** 2/4/83  
**SHEET** 2 OF 3

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>PENETRATION (ft.)</th>
<th>RECIFICATION</th>
<th>% RECOVERED</th>
<th>ROD</th>
<th>DESCRIPTION</th>
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</tr>
</tbody>
</table>

**47.0'-49.5'**  
**ARGILLACEOUS HALITE:** clear and moderate brown (SYR 3/4), finely to coarsely crystalline, moderately hard. Clay content ranges from 0 to 15%. Clay breaks at: 47.0', 48.5', 48.7', and 49.0'.

**38.0'-47.0'**  
**HALITE:** clear with trace of moderate reddish-orange (10R 4/6) polyhalite blebs throughout. Finely to coarsely crystalline, moderately hard. Polyhalite occurs interstitially or as scattered blebs and comprises up to 5% of core. Anhydrite stringer, 1/2"-3/4" thick at 39.0'. Finely crystalline, eugyry texture from 46.3'-45.0' and argillaceous (2-25). Brown clay breaks at: 46.6', and 46.9'.

**37.5'-38.0'**  
**ANHYDRITE:** light gray (97) to medium dark gray (94), dense, hard, microcrystalline.

**37.5'**  
**CLAY:** pale brown (SYR 5/2), moderately plastic, moderately soft, moist, 1/2" thick seams.

**32.5'-37.5'**  
**ARGILLACEOUS HALITE:** clear to grayish-brown (SYR 3/2), finely to coarsely crystalline, moderately hard. Clay content ranges from 2-10% with clay breaks at: 33.0', 33.5', 33.7', 33.9', 34.2', 34.4', 35.0', 35.6', 36.0', 36.6', and 37.1'. Finely crystalline from 35.2'-37.5'.

**25.1'-32.5'**  
**HALITE:** clear and slightly argillaceous in part. Finely to coarsely crystalline, moderately hard. From 29.0'-31.0' clay content ranges from 0 to 2% with brown clay breaks at: 29.1', 29.9', 30.0', 30.7', and 30.8'.
**WIPP-SPDV**

**ROCK CORING LOG**

**UPWARD CORING**

**WASTE ISOLATION PILOT PLANT**

**INSTRUMENT** Extensometer

**BORING NO.** DO-56  **TYPE & NUMBER** GE-234  **HOLE SIZE** NX

**LOCATION** 0 East Drift, 621.3' N of Exploratory Shaft Centerline, 12.5' from E rib

**STATION** N621, E0  **COLLAR ELEV.** 1296.8  **DIRECTION OF DRILLING** Vertical up

**MINE COORDINATES** N1031161, E6892.3  **BOREHOLE PENETRATION** 52.1'

**DRILLING METHOD** Rotary w/Brine  **DRILL MAKE/MODEL** Joy 12B

**PREPARED BY** JPS/Bechtel  **DATE** 2/4/83  **SHEET** 3 OF 3

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<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>PENETRATION (ft.)</th>
<th>RECOVERY %</th>
<th>RQD</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>50</td>
<td></td>
<td></td>
<td></td>
<td>49.5'-52.1' MALITE: polyhalite, clear and mottled reddish-orange (10R 6/6) and grayish-red (5R 4/2). Finely to medium crystalline, moderately hard. Polyhalite occurs interstitially and as blebs and comprises 0-10X of core. Sugary texture from 50.5'-51.2'.</td>
<td>Hole completed at 22:00 hours on 2 February 1983.</td>
</tr>
<tr>
<td></td>
<td>55</td>
<td>X</td>
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<td>X</td>
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</table>

**Total Penetration = 52.1'**
<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (FT)</th>
<th>% RECOVERED</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
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<tbody>
<tr>
<td>1</td>
<td>1.2</td>
<td>17</td>
<td>-</td>
<td>0.0' - 7.9'</td>
<td>MALITE: clear to pale brown (5YR 5/2); Coarsely crystalline, moderately hard, trace of gray and brown clay throughout.</td>
</tr>
<tr>
<td>2</td>
<td>4.7</td>
<td>94</td>
<td>X</td>
<td>7.9' - 10.1'</td>
<td>POLYHALITIC MALITE: clear and moderate reddish-orange (10YR 5/6), moderately hard, coarsely crystalline.</td>
</tr>
<tr>
<td></td>
<td></td>
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<td>X</td>
<td>10.1' - 12.2'</td>
<td>ANHYDROLITE: banded light gray (10) to olive gray (5YR 4/1), hard, dense, microcrystalline.</td>
</tr>
<tr>
<td></td>
<td></td>
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<td>X</td>
<td>12.2' - 12.3'</td>
<td>CLAY: medium gray (5G) moist, moderately soft, highly plastic.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>12.3' - 13.5'</td>
<td>MALITE: clear and mottled pale brown (5YR 5/2) and pale reddish-brown (10YR 5/4), finely crystalline, moderately hard. Trace of clay and polyhalite throughout, up to 5%, locally; brown clay break at 13.8'.</td>
</tr>
<tr>
<td>3</td>
<td>5.1</td>
<td>100</td>
<td>X</td>
<td>15.5' - 20.2'</td>
<td>POLYHALITIC MALITE: clear and moderate reddish-orange (10YR 5/6), coarsely crystalline, moderately hard.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>20.2'</td>
<td>CLAY: medium gray (5G), moist, highly plastic, moderately soft, 1/2&quot; - 3/4&quot; thick, sub-horizontal.</td>
</tr>
<tr>
<td></td>
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<td>X</td>
<td>20.2' - 22.1'</td>
<td>MALITE: argillaceous, coarsely crystalline, moderately hard. Clay content is 3-5% and occurs interstitially. Clay breaks as: 21.0' and 21.4'. Halite is clear and pale brown (5YR 5/2).</td>
</tr>
<tr>
<td></td>
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<td>X</td>
<td>22.1' - 28.0'</td>
<td>POLYHALITIC MALITE: clear and moderate reddish-orange (10YR 5/6), medium to coarsely crystalline, moderately hard. Polyhalite comprises up to 10% of core and occurs as scattered veins or interstitially. Few isolated seams of polyhalite throughout.</td>
</tr>
<tr>
<td>5</td>
<td>5.1</td>
<td>100</td>
<td>-</td>
<td></td>
<td>Hole begun at 09:30 hours on 3 February 1983. Hole cored from 0' to 7' using NX size drill rods without inner barrel.</td>
</tr>
</tbody>
</table>

**Core Losses:**
- Run 1: Throughout Run
- Run 2: 7.0' - 7.3'
- Run 7: 33.6' - 33.7'
- Run 9: 43.0' - 43.1'

**Sheet 1 of 1**
# WIPP-SPDV Rock Coring Log

**Instrument:**
- Boring No.: 60-57
- Type & Number: None
- Hole Size: 6x
- Location: 0 East Drift, 621.3' N of Exploratory Shaft centerline, 12.5' from E rib
- Station: N621.50
- Collar: Lvl. 1288.1
- Direction of Drilling: Vertical
- Mine Coordinates: N1031.8, E6892.4
- Depth of Borehole: 52.1'
- Drilling Method: Rotary w/brine
- Drill Make/Model: Joy 12B
- Prepared By: JPS/Bechtel
- Date: 2/4/83
- Sheet: 2 of 3

## Rock Description

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH</th>
<th>% RECOVERED</th>
<th>ROD</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
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<tr>
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<td>25</td>
<td>5.1 100</td>
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<td>(as above)</td>
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</tr>
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<td>6</td>
<td>30</td>
<td>5.3 100</td>
<td>X</td>
<td>28.0'-32.8' ARGILLACEOUS HALITE: clear and mottled pale reddish-brown (10R 5/4) and medium light gray (N6), finely to coarsely crystalline, moderately hard. Clay content up to 10% with trace amounts of orange polyhalite throughout. Clay breaks at: 28.0', 28.4', 28.7', 29.2', 29.4', 29.7', 31.5', 32.0', and 32.4'.</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>35</td>
<td>4.9 98</td>
<td>X</td>
<td>32.4'-37.8' POLYHALITIC HALITE: clear and moderate reddish-orange (10R 6/6), finely to coarsely crystalline, moderately hard. Polyhalite comprises up to 15% of core and occurs as isolated blebs or interstitial layers. Polyhalite seams from 36.7'-36.9'.</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>40</td>
<td>0.2 100</td>
<td>-</td>
<td>37.8'-38.1' ANHYDRITE: light gray (N7), hard, dense, microcrystalline.</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>45</td>
<td>4.9 98</td>
<td>-</td>
<td>38.1'-51.3' ARGILLACEOUS HALITE: clear and mottled medium gray (N5), pale brown (3YR 5/2) and grayish-orange (10YR 7/4), finely to coarsely crystalline, moderately hard, clay content varies from &lt; 1% up to 10%. Clay breaks at: 38.3', 47.2', 47.3', 47.7', 48.2', 48.6', 50.0', and 50.8'. Few seams of interstitial, orange polyhalite. Clear halite from 42.4'-45.0'.</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>50</td>
<td>4.1 100</td>
<td>-</td>
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**WIPP-SPDV**  
**ROCK CORING LOG**

**WASTE ISOLATION PILOT PLANT**

**BORING NO.** 70-57  
**TYPE & NUMBER** None  
**HOLE SIZE** 12X

**LOCATION** 0 East Drift, 621.3' N of Exploratory Shaft centerline, 12.5' from E rib

**STATION** N621. E0  
**COLLAR ELEV.** 1288.1  
**DIRECTION OF DRILLING** Down

**MINE COORDINATES** N10311.8 E6892.4  
**DEPTH OF BOREHOLE** 52.1'

**DRILLING METHOD** Rotary w/brine  
**DRILL MAKE/MODEL** Joy 12B

**PREPARED BY** JPS/Bechtel  
**DATE** 2/4/83  
**SHEET** 3 OF 3

<table>
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<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>RECOVERY</th>
<th>% RECOVERED</th>
<th>RQO</th>
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<tr>
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<td>52.1</td>
<td>4.1</td>
<td>100</td>
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<td>51.3'-52.1'</td>
<td>BAIITE: clear, coarsely crystalline, moderately hard.</td>
<td>Hole completed at 14:20 hours on 3 February 1983. Total Depth = 52.1'</td>
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</table>
**WIPP-SPDV**

**ROCK CORING LOG**

**UPWARD CORING**

**BORING NO.** D0-63  
**TYPE & NUMBER** GE-243  
**HOLE SIZE** NX  
**LOCATION** 0 East Drift, 1110' N of Exploratory Shaft centerline, 12½' from E rib  
**STATION** N110, E0  
**COLLAR ELEV.** 1310.6'  
**DIRECTION OF DRILLING** up  
**MINE COORDINATES** N10796.0, E6891.9  
**BOREHOLE PENETRATION** 52.8'  
**DRILLING METHOD** Rotary w/brine  
**DRILL MAKE/MODEL** Joy 128  
**PREPARED BY** JPS/Rechtel  
**DATE** 2/12/83  
**SHEET** 1 of 3

### Profile Description

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<th>RUN NUMBER</th>
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<th>RECOVERY</th>
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**Core Loss**

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<td>3.0'-3.2'</td>
</tr>
<tr>
<td></td>
<td>4.2'-4.5'</td>
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<td>5.1'-5.5'</td>
</tr>
<tr>
<td>3</td>
<td>6.9'-7.0'</td>
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<tr>
<td></td>
<td>7.5'-7.7'</td>
</tr>
<tr>
<td></td>
<td>8.0'-8.1'</td>
</tr>
</tbody>
</table>

**Remarks**

- Began coring at 08:30 hours on 10 February 1983. Cored to 5.8' without inner barrel.
**WIPP-SPDV**

**ROCK CORING LOG**

**UPWARD CORING**

**BORING NO.** D0-63  **TYPE & NUMBER** GE-243  **HOLE SIZE** NY

**LOCATION.** 0 East Drft, 1110' E of Exploratory Shaft centerline, 121 ft from E rib

**STATION.** 1110, 60  **COLLAR ELEV.** 1310.6'  **DIRECTION OF DRILLING** up

**MINE COORDINATES** N10796.0, E6891.9  **BOREHOLE PENETRATION** 52.8'

**DRILLING METHOD** Rotary w/brine  **DRILL MAKE/MODEL** Joy 12B

**PREPARED BY** JPS/Bechtel  **DATE** 2/12/83  **SHEET** 2 OF 3

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>PENETRATION (ft.)</th>
<th>RECOVERY %</th>
<th>PROFILING</th>
<th>DESCRIPTION</th>
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<tbody>
<tr>
<td>12</td>
<td>50</td>
<td>40 100 60</td>
<td></td>
<td>40.4'-50.3' ARGILLACEOUS HALITE: clear to mottled dark gray (93), moderate brown (5YR 3/4) to pale yellowish-brown (10YR 6/2), moderately hard, finely to coarsely crystalline. Finely crystalline from 41.4'-42.5' and from 47.0'-48.3'. Clear halite from 44.0'-45.3'. Clay content ranges from 0-20% with numerous clay breaks throughout. Clay breaks at: 41.4', 42.4', 43.3', 43.8', 44.5', 44.6', 47.0', and 48.5'. Brown clay parting, moist, highly plastic at 50.0'.</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>45</td>
<td>5.1 100 -</td>
<td></td>
<td>36.8'-40.6' HALITE: clear, moderately hard, medium to coarsely crystalline, few stringers of white anhydrite throughout. Slightly polyhalite in part from 38.5'-40.0'.</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>40</td>
<td>5.0 100 -</td>
<td></td>
<td>36.1'-36.8' ANHYDRITE: light gray (97) to medium dark gray (94), hard, dense, microcrystalline, slightly banded in part. Trace of polyhalite at 36.5'.</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>35</td>
<td>5.1 100 -</td>
<td></td>
<td>36.0'-36.1' CLAY: pale brown (5YR 5/2), moderately soft, moist, highly plastic near horizontal.</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>30</td>
<td>5.0 100 -</td>
<td></td>
<td>31.1'-36.8' ARGILLACEOUS HALITE: clear to grayish-brown (5YR 3/2), and moister brown (5YR 3/4), moderately hard, finely to coarsely crystalline; clay content ranges from 0 to 10%. Numerous clay breaks and partings and trace of polyhalite halite at 35.3'. Clay breaks at: 32.0', 33.1', 33.3', 34.8', 36.2', and 35.0'. Brown clay parting at 36.4'.</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>25</td>
<td>5.0 100 -</td>
<td></td>
<td>32.4'-31.1' HALITE: clear, coarsely crystalline, moderately hard, trace of white anhydrite in hairline stringers. From 27.3'-29.3' slightly argillaceous in part, finely crystalline and grayish-brown (5YR 3/2). Brown clay breaks at: 27.4', 27.6', and 29.2'. Trace of orange polyhalite from 28.6'-29.0'.</td>
<td></td>
</tr>
</tbody>
</table>
**WIPP-SPDV**  
**ROCK CORING LOG**  
**UPWARD CORING**

**WASTE ISOLATION PILOT PLANT**

**BORING NO.** D0-63  
**TYPE & NUMBER** GE-243  
**HOLE SIZE** NX

**LOCATION**  
East Drift, 1110' N of Exploratory Shaft centerline, 12' from E rib

**STATION** N1110.80  
**COLLAR ELEV.** 1310.61  
**DIRECTION OF DRILLING** Vertical

**MINE COORDINATES** N10796.0, E6891.9  
**BOREHOLE PENETRATION** 52.8'

**DRILLING METHOD** Rotary w/brine  
**DRILL MAKE/MODEL** Joy 12B

**PREPARED BY** JPS/Rechtal  
**DATE** 2/12/83  
**SHEET** 3 OF 3

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>PENETRATION (ft.)</th>
<th>RECOVERY</th>
<th>RQD</th>
<th>PROFILE</th>
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<tr>
<td>12</td>
<td>50</td>
<td>4.0</td>
<td>100</td>
<td>X</td>
<td>50-52.8' HALITE: polyhalite, clear and moderate reddish-orange (10R 6/6), coarse crystalline, moderately hard. Polyhalite, which comprises about 6-10% of core, occurs interstitially and as isolated blebs.</td>
</tr>
</tbody>
</table>

Hole completed at 14:45 hours on 10 February 1983.  
Total Penetration = 52.8'
### WIPP-SPDV Rock Coring Log

**Waste Isolation Pilot Plant**

**Instrument:** Extensometer

**Boring No.:** 00-64  
**Type & Number:** GE-221  
**Hole Size:** NX

**Location:** 0 East Drift, 1110' N of Exploratory Shaft centerline, 12½' from E rib

**Station:** N1110, E0  
**Collar Elev.:** 1301.5'  
**Direction of Drilling:** Down

**Mine Coordinates:** N10796.0, E6891.6  
**Depth of Borehole:** 52.8'

**Drilling Method:** Rotary w/brace  
**Drill Make/Model:** Joy 12B

**Prepared By:** JPS/Bechtel  
**Date:** 2/12/83  
**Sheet:** 1 of 3

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH</th>
<th>RECOVERY</th>
<th>% RECOVERED</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
</table>
| 0          | 0.0   | 1.0      | 100         | -       | 0.0'-8.0'  
**Halite:** argillaceous and polyhalite in part; clear to medium gray (85) and moderate reddish orange (10R 6/6); moderately hard, finely crystalline with few clay breaks. Clay and polyhalite up to 5% locally. Clay breaks at 1.3', 2.2', 2.5', 3.3', 3.7', 3.9', and 3.5'. |
| 1          | 5.0   | 1.0      | 100         | -       | 6.0'-10.6'  
**Polyhalite:** clear and moderate reddish orange (10R 6/6). Polyhalite occurs as dense isolated stringers and blebs and comprises 15% of core. From 10.0'-10.6' polyhalite is finely crystalline, hard and comprises up to 100% of core. |
| 2          | 10.0  | 6.0      | 98          | XXXX    | 10.6'-12.8'  
**Amphibite:** light gray (87) to light olive-gray (5Y 6/1), moderately hard, micro-crystalline, highly fractured. Core broken into 1/4' - 1/2' chips. |
| 3          | 15.0  | 5.1      | 100         | -       | 15.0'-15.0'  
**Argillaceous Halite:** light gray (87) to medium dark gray (4/4), finely crystalline, moderately hard with clay content up to 20%. Gray clay breaks at 13.2', 13.3', and 13.7'. Numerous interstitial clay layers from 14.0'-15.0'. Gray clay parting at 12.4'. |
| 4          | 20.0  | 5.0      | 100         | -       | 15.0'-35.6'  
**Polyhalitic Halite:** clear and moderate reddish orange (10R 6/6); moderately hard, medium to coarsely crystalline. Polyhalite ranges from 0-15% with polyhalite blebs and interstitial zones. Slightly gray and argillaceous from 19.3' -21.9' and from 27.9' -28.2'. Clay breaks at: 20.9', 21.3', and 25.0'. Clear halite from 20.2'-29.9' and from 31.3'-32.4'. |
| 5          | 25.0  | 5.2      | 100         | -       | 15.0'-35.6'  
**Polyhalitic Halite:** clear and moderate reddish orange (10R 6/6); moderately hard, medium to coarsely crystalline. Polyhalite ranges from 0-15% with polyhalite blebs and interstitial zones. Slightly gray and argillaceous from 19.3' -21.9' and from 27.9' -28.2'. Clay breaks at: 20.9', 21.3', and 25.0'. Clear halite from 20.2'-29.9' and from 31.3'-32.4'.

**Remarks:** Hole began at 15:00 hours on 10 February 1983. Hole cored from 0' to 7' using a 6" core barrel. From 7' to 7' hole cored without inner core barrel.
## WIPP-SPDV ROCK CORING LOG

**WASTE ISOLATION PILOT PLANT**

**BORING NO.** D0-64  
**TYPE & NUMBER** GE-221  
**HOLE SIZE** NX  

**LOCATION** 0 East Drift, 1110' N of Exploratory Shaft centerline, 12½' from E rib  

**STATION** N1110, E0  
**COLLAR ELEV.** 1301.5'  
**DIRECTION OF DRILLING** down  

**MINE COORDINATES** N10796.0, E6891.6  
**DEPTH OF BOREHOLE** 52.8'  

**DRILLING METHOD** Rotary w/brine  
**DRILL MAKE/MODEL** Joy 12B  

**PREPARED BY** JPS/Bechtel  
**DATE** 2/12/83  

**SHEET** 2 OF 3

### Rock Description Table

<table>
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<th>RUN NUMBER</th>
<th>DEPTH (')</th>
<th>RECOVERY</th>
<th>% RECOVERED</th>
<th>ROD PROFILE</th>
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<th>REMARKS</th>
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<td>5</td>
<td>25</td>
<td>5.2</td>
<td>100</td>
<td>X X</td>
<td>(as above)</td>
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</tr>
<tr>
<td>6</td>
<td>30</td>
<td>5.1</td>
<td>100</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>35</td>
<td>5.2</td>
<td>100</td>
<td>X X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>40</td>
<td>4.8</td>
<td>96</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>45</td>
<td>5.2</td>
<td>100</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>50</td>
<td>5.2</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

**Rock Descriptions**

- **35.6'-36.2'**
  - **MINERALS**: Olive gray (3Y 6/1) highly fractured and broken. Microcrystalline. Core broken into 1/2" pieces. Gray clay 1/2" thick at 36.2'.

- **36.2'-43.3'**
  - **MINERALS**: Argillaceous in part, clear and mottled medium gray (N5) to pale yellowish brown (10YR 6/2). Interstitial clay content up to 10% locally. Clay breaks at 39.9' and 40.0'. Few zones of orange interstitial polyhalitic halite at: 37.5', 39.0', 40.1' and 42.7'.

- **43.3'-58.0'**
  - **MINERALS**: Clear and mottled grayish brown (3YR 3/2) and medium gray (N5) moderately hard, finely to coarsely crystalline. Clay content ranges from 1% to 2%. Clay breaks at: 44.0', 44.3', 45.9', 46.5', 47.0', 47.3', 48.1', 48.6', and 49.4'. Few polyhalite stringers at 44.5' and 45.6'.
### ROCK CORING LOG

**WASTE ISOLATION PILOT PLANT**

**BORING NO.**  DC-64  
**INSTRUMENT**  Extensometer GE-221  
**HOLE SIZE**  NX  

**LOCATION**  
12½' from E rib  
0 East Drift, 1110' N of Exploratory Shaft centerline.

**STATION**  N1110.0, E0  
**COLLAR ELEV.**  1301.5'  
**DIRECTION OF DRILLING**  vertical  
**MINE COORDINATES**  N10796.0, E6891.6  
**DEPTH OF BOREHOLE**  52.8'  
**DRILLING METHOD**  Rotary w/brine  
**DRILL MAKE/MODEL**  Joy 12B  

**PREPARED BY**  JPS/Bechtel  
**DATE**  2/12/83  
**SHEET**  3 OF 3

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (')</th>
<th>RECOVERY</th>
<th>% RECOVERED</th>
<th>ROD</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
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<td>5.0</td>
<td>100</td>
<td>-</td>
<td>X</td>
<td>50.0'-52.8'</td>
<td></td>
</tr>
<tr>
<td></td>
<td>55</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>HALLITE: clear, coarsely crystalline, moderately hard. Core broken into 1/4&quot; pieces from 51.5'-52.0'. Slightly polyhalite from 52.3'-52.8'.</td>
<td>Hole completed at 19:00 hours on 10 February 1983</td>
</tr>
</tbody>
</table>

Total Depth = 52.8'
# WIPP ROCK CORING LOG

**WASTE ISOLATION PILOT PLANT**

**BORING NO.** 00-67  
**TYPE & NUMBER** Extensometer GE-220  
**HOLE SIZE** NX

**LOCATION** Test Room 1, Centerline of Room at Station N1265, in Floor 16.5' From E and W Ribs.

**STATION** N1265, W231.5  
**COLLAR ELEV.** 1296.8  
**DIRECTION OF DRILLING** Vertical  
**MINE COORDINATES** N10952.1, E6662.9  
**DEPTH OF BOREHOLE** 51.7'

**DRILLING METHOD** Rotary w/Brine DRILL MAKE/MODEL Joy 12B

**PREPARED BY** IEG  
**DATE** 5/5/83  
**SHEET 1 OF 3**

<table>
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<th>RUN NUMBER</th>
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<th>RECOVERY</th>
<th>% RECOVERED</th>
<th>ROD</th>
<th>PROFILE</th>
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<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>1.0</td>
<td>1.0</td>
<td>X</td>
<td>X</td>
<td>0.0' - 3.7' POLYHALITE: Clear mottled with moderate reddish-orange (10R 6/6), coarsely crystalline, medium hard. Blebs of polyhalite &lt; 3.5% in clay.</td>
<td>Started Drilling at 09:45 hours on 18 April 1983.</td>
</tr>
<tr>
<td>1</td>
<td>3.3</td>
<td>87</td>
<td>-</td>
<td>X</td>
<td>X</td>
<td>3.7' - 6.8' ANHYDRITE: (Marker Bed 139) Very light gray (88) anhydrite mixed with moderate reddish-orange (10R 6/6), and reddish-brown (10R 4/6) polyhalite and polyhalite halite from 3.7' to 6.0', core hard. From 5.0 to 6.0', core is predominantly moderate reddish-brown (10R 4/6) polyhalite. Core broken into &quot;diss-like&quot; pieces as thin as 0.01'. Core medium hard. From 6.0' to 6.8', core is all anhydrites, microcrystalline; hard gray clay at 6.7' to 6.8'.</td>
<td>5 1/2 single-tube barrel used to core 0.0 to 1.0'.</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
<td>1.8</td>
<td>85</td>
<td>-</td>
<td>X</td>
<td>6.8' - 9.8' BARIOLITE: Clear to moderate reddish-orange (10R 6/6) and grayish-brown (5YR 4/1) medium to coarsely crystalline, medium hard, &lt; 1% polyhalite, &lt; 1% gray clay to 8.6', turning to brown clay. Clay paring at 9.1'. Numerous breaks throughout core.</td>
<td>NX single tube barrel used 1.0' to 4.8'.</td>
</tr>
<tr>
<td>3</td>
<td>10</td>
<td>4.8</td>
<td>100</td>
<td>-</td>
<td>X</td>
<td>9.8' - 14.7' POLYHALITE: Clear to moderate reddish-orange (10R 6/6), coarsely crystalline, hard polyhalite generally &lt; 5%, with local zones &gt; 5%. From 14.3' to 14.7' polyhalite 20 to 60%.</td>
<td>NX double tube barrel used 4.8' to 51.7'.</td>
</tr>
<tr>
<td>4</td>
<td>15</td>
<td>5.1</td>
<td>100</td>
<td>-</td>
<td>X</td>
<td>14.7' - 16.6' BARIOLITE: Clear to brownish-gray (5YR 4/1) with some moderate reddish-brown (10R 4/6), medium to coarsely crystalline, medium hard, trace (1%) of gray and brown clay. Trace (4%) polyhalite. Clay breaks at 14.7' and 16.0'.</td>
<td>Moderate gas flow at 6' to 7'. Flow for 1 to 4 minutes, then slowed down appreciably. Methane 3 to 4 1/2 at collar.</td>
</tr>
<tr>
<td>5</td>
<td>20</td>
<td>4.8</td>
<td>100</td>
<td>-</td>
<td>X</td>
<td>16.6' - 20.5' POLYHALITE: Clear to moderate reddish-orange (10R 6/6), coarsely crystalline, hard. &lt; 1% to 5% polyhalite. &lt; 1% gray clay.</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>25</td>
<td>5.1</td>
<td>100</td>
<td>-</td>
<td>X</td>
<td>20.5' - 26.5' BARIOLITE: Clear to moderate reddish-orange (10R 6/6) and moderate reddish-brown (10R 4/6), medium to coarsely crystalline, medium hard. &lt; 1% to 5% polyhalite and 1 to 2% clay. Clay breaks at 20.5', 23.4', 24.4' and 25.2'.</td>
<td></td>
</tr>
</tbody>
</table>
### WIPP

**WASTE ISOLATION PILOT PLANT**

**BOARING NO**: DO-67  
**TYPE & NUMBER**: GE-220  
**HOLE SIZE**: NX

**LOCATION**: Test Room 1, Centerline of room at Station N1265 in Floor 16.5' from E and W Ribs.

**STATION N1265, W231.5**  
**COLLAR ELEV.**: 1296.8  
**DIRECTION OF DRILLING**: Down Vertical  
**MINE COORDINATES**: N10952.1, E6662.9  
**DEPTH OF BOREHOLE**: 51.7'

**DRILLING METHOD**: Rotary w/brine  
**DRILL MAKE/MODEL**: Joy 12B

**PREPARED BY**: JEG  
**DATE**: 5/5/83  
**SHEET**: 2 of 3

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<table>
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<th>RUN NUMBER</th>
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<th>RECOVERY</th>
<th>% RECOVERED</th>
<th>RQD</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
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<tr>
<td>6</td>
<td>25</td>
<td>5.1</td>
<td>100</td>
<td>-</td>
<td>X</td>
<td>As Above</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>30</td>
<td></td>
<td></td>
<td>X</td>
<td>X X</td>
<td>26.5' - 31.6' HALITE: Clear to moderate reddish-orange (10R 6/6), coarse-crystalline, hard shale and patches of polyhalite (1 to 31). Polyhalite from 29.4' to 30.3'. Anhydrite stringers from 30.3' to 30.7'</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>35</td>
<td>4.8</td>
<td>99</td>
<td>-</td>
<td>-</td>
<td>26.6' - 31.9' ANHYDRITE: Very light (NB) to medium dark gray (N4), laminated, micro-crystalline, hard. Trace of clay at 31.9'. Some core grinding evident.</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>40</td>
<td>5.0</td>
<td>100</td>
<td>-</td>
<td>X</td>
<td>31.9' - 36.7' HALITE: Clear to grayish brown (5YR 3/2) and moderate reddish-orange, fine to coarse-crystalline, medium hard. Contains cl to 31 clay and &lt;1% polyhalite. Argillaceous halite from 32.7' to 33.7'.</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>45</td>
<td>5.2</td>
<td>100</td>
<td>-</td>
<td>X</td>
<td>38.7' - 41.5' ANHYDROUS HALITE: Clear to brownish gray (5YR 4/1), coarse-crystalline, medium hard. Gray and brown clay cl to 31. Clay breaks at 39.0', 40.3', 40.5' and 41.0'.</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>50</td>
<td>4.8</td>
<td>96</td>
<td>-</td>
<td>-</td>
<td>41.5' - 51.7' HALITE: Clear to brownish-gray (5YR 4/1) to moderate reddish-orange, medium to coarse-crystalline, medium hard, &lt;1% polyhalite. Clay, generally cl. Zones from 42.4' to 43.3', 47.3' to 47.6' and 49.1' to 49.3' containing clay breaks and up to 31% clay. Core broken up at 44.8' to 47.3' due to erosion from core barrel. Core clear from 44.9' to 47.2'.</td>
<td></td>
</tr>
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</table>
# WIPP

## ROCK CORING LOG

**WASTE ISOLATION PILOT PLANT**

**BORING NO:** D0-67  
**TYPE & NUMBER:** GE-220  
**HOLE SIZE:** NX

**LOCATION:** Test Room 1, Centerline of Room at Station N1265, 16.5' from E and W Ribs.

**STATION:** N1265, W231.5  
**COLLAR ELEV.:** 1296.8  
**DIRECTION OF DRILLING:** Down  
**MINE COORDINATES:** N10932.1, E666.2  
**DEPTH OF BOREHOLE:** 51.7'

**DRILLING METHOD:** Rotary w/Brine  
**DRILL MAKE/MODEL:** Joy 12B

**PREPARED BY:** JEC  
**DATE:** 5/5/83  
**SHEET:** 3 OF 3

<table>
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<th>RECOVERY (%)</th>
<th>% RECOVERED</th>
<th>ROD</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
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<tr>
<td>11</td>
<td>50</td>
<td>4.8</td>
<td>96</td>
<td>-</td>
<td>-</td>
<td>As Above</td>
<td>Completed drilling at 15:25 hours on 16 April 1983. Total penetration = 51.7 feet.</td>
</tr>
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</table>

- Total penetration = 51.7 feet.
**WIPP**

**WASTE ISOLATION PILOT PLANT**

**ROCK CORE CORING LOG**

**UPWARD CORING**

**BORING NO.** D0-69

**INSTRUMENT** Extensometer

**TYPE & NUMBER** GE-218

**HOLE SIZE** NY

**LOCATION** Test Room 1, Centerline of Room at Station Ni265, in Roof

16.5 feet from E and W Ribs.

**STATION** Ni265, W231.5

**COLLAR ELEV.** 1310.1

**DIRECTION OF DRILLING** Vertical Up

**MINE COORDINATES** N10951.9, E6662.5

**BOREHOLE PENETRATION** 51.4'

**DRILLING METHOD** Rotary w/Brine Drill

**MAKE/MODEL** Joy 12B

**PREPARED BY** JEC

**DATE** 5/6/83

**SHEET** 1 OF 3

<table>
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<tr>
<th>RUN NUMBER</th>
<th>PENETRATION (ft.)</th>
<th>RECOVERY</th>
<th>% RECOVERED</th>
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<td>33</td>
<td>60</td>
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<td>Light to moderate gas flow at 7 3/8.  Faint smell. No methane measured at return line. NX double-cube barrel used from 1.0' to 1.0'.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>50</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td>Light to moderate gas flow at 7 3/8.  Faint smell. No methane measured at return line. NX single-cube barrel used from 1.0' to 1.0'.</td>
<td></td>
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<tr>
<td>3</td>
<td>4.8</td>
<td>100</td>
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<td></td>
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<td>Light to moderate gas flow at 7 3/8.  Faint smell. No methane measured at return line. NX double-cube barrel used from 1.0' to 1.0'.</td>
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<tr>
<td>4</td>
<td>4.9</td>
<td>100</td>
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<td>Light to moderate gas flow at 7 3/8.  Faint smell. No methane measured at return line. NX single-cube barrel used from 1.0' to 1.0'.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>5.0</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td>Light to moderate gas flow at 7 3/8.  Faint smell. No methane measured at return line. NX double-cube barrel used from 1.0' to 1.0'.</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>6.0</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td>Light to moderate gas flow at 7 3/8.  Faint smell. No methane measured at return line. NX single-cube barrel used from 1.0' to 1.0'.</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>6.0</td>
<td>100</td>
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<td></td>
<td>Light to moderate gas flow at 7 3/8.  Faint smell. No methane measured at return line. NX double-cube barrel used from 1.0' to 1.0'.</td>
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<tr>
<td>8</td>
<td>6.0</td>
<td>100</td>
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<td></td>
<td>Light to moderate gas flow at 7 3/8.  Faint smell. No methane measured at return line. NX single-cube barrel used from 1.0' to 1.0'.</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>6.0</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td>Light to moderate gas flow at 7 3/8.  Faint smell. No methane measured at return line. NX double-cube barrel used from 1.0' to 1.0'.</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>6.0</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td>Light to moderate gas flow at 7 3/8.  Faint smell. No methane measured at return line. NX single-cube barrel used from 1.0' to 1.0'.</td>
<td></td>
</tr>
</tbody>
</table>

19.6' - 27.0' 

**HALITE:** Clear brownish gray (5YR 4/4), medium to coarse-crystalline, medium hard to hard. Trace of polyhalite 20.6’ to 26.8’ and 22.4’ to 23.0’. Trace (1-22) grey clay at 19.6’ to 21.6’. Brown clay (5Y) mixed with halite at 23.6’ to 24.0’. Clay broken up.

16.4' - 19.6' 

**POLYHALITE HALITE:** Clear yellow with moderate reddish orange (10R 6/6) and moderate reddish brown (10R 4/6) polyhalite, coarse-crystalline, medium hard to hard polyhalite < to 5A. Trace (<1%) clay.

14.9' - 16.4' 

**HALITE:** Clear yellow with moderate reddish orange (10R 6/6) polyhalite, coarse-crystalline, medium hard. Polyhalite <1%.

14.0' - 14.9' 

**ANHYDRITE:** (Anhydrite "a") white, very light (8E) to medium grey (8S), microcrystalline, hard. Trace of halite. Trace of clay at 14.0’.

7.27’ - 14.0’ 

**HALITE:** Clear, medium to coarse-crystalline, hard. Contains minute traces (<1%) of polyhalite, scattered irregular anhydrite stringers. Gray clay break at 13.25’.

7.0’ - 7.27’ 

**ANHYDRITE:** (Anhydrite "a") Light gray (8W), microcrystalline, hard anhydrite mixed with some halite. Trace of gray clay at 7.0’.

6.5’ - 7.0’ 

**ANCILLAROUS HALITE:** Clear to greyish brown (5YR 3/2), medium crystalline, medium hard. Clay predominantly gray with some brown (5YB), clay breaks at 6.7’ to 9.8’.

5.1’ - 6.5’ 

**HALITE:** Clear to brownish gray (5YR 4/1) and medium grey (8S), medium to coarse-crystalline, medium hard. Trace of grey clay (<1%) throughout.

0.0’ - 5.1’ 

**HALITE:** Clear to white with scattered medium reddish brown (10R 6/6) blebs of polyhalite, coarse-crystalline, medium hard to hard, polyhalite <1%.
<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>PENETRATION (ft.)</th>
<th>RECOVERY</th>
<th>% RECOVERED</th>
<th>ROD</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>5.1</td>
<td>100</td>
<td>-</td>
<td>X</td>
<td>As Below</td>
<td></td>
<td></td>
</tr>
<tr>
<td>45.2' - 49.3' ABERILLOUS BARTITE: Clear to dark reddish brown (10R 3/4), medium to coarsely crystalline, medium hard. Brown clay 4% to 10%. Clay breaks throughout.</td>
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</tr>
<tr>
<td>40.7' - 45.2' BARTITE: Clear to grayish brown (5YR 3/2) to moderate reddish brown (10R 5/6) and dark reddish brown (10R 3/4), fine to coarsely crystalline, medium hard. Trace (1%) polyhalite. Predominantly brown clay (4%) with locally &gt;3%. Clay breaks at 42.7' and 43.4'. Broken up at 42.3' to 42.6' probably during removal from barrel.</td>
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<tr>
<td>38.5' - 40.7' POLYHALITIC BARTITE: Clear mottled with moderate reddish orange (10R 6/6) and reddish brown (10R 4/6), coarsely crystalline, medium hard to hard. Polyhalite &lt;1% to 5%. Scattered anhydrite stringers.</td>
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</tr>
<tr>
<td>36.1' - 38.5' BARTITE: Clear to dark reddish brown (10R 3/4), coarsely crystalline, hard. Contains trace of polyhalite, generally &lt;1% but locally &gt;5%. Irregular anhydrite stringers scattered within core. Anhydrite &gt;40% from 36.1' to 37.1'.</td>
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</tr>
<tr>
<td>36.3' - 36.7' ANHYDITITE: (Marker Bed 138): White to very light gray (9G), microcrystalline, hard.</td>
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<td></td>
</tr>
<tr>
<td>32.1' - 36.3' ABERILLOUS BARTITE: Clear to dark reddish brown (10R 3/4), medium to coarsely crystalline, medium hard. Brown clay 2 to 10%. Clay breaks throughout. 1&quot; brown clay seam at 36.3'.</td>
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<td></td>
</tr>
<tr>
<td>29.3' - 32.1' BARTITE: Clear, medium to coarsely crystalline, medium hard to hard. Trace (1%) clay and polyhalite from 31.6'.</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>27.0' - 29.3' POLYHALITIC BARTITE: Clear to grayish brown (5YR 3/2), predominantly coarsely crystalline; fine-medium crystalline from 28.6' to 29.3'; medium hard. Predominantly brown clay 4% to 5%. Clay breaks at 26.6' and 29.3'.</td>
<td></td>
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</tr>
</tbody>
</table>
**WIPP**

**ROCK CORING LOG**

**UPWARD CORING**

**BORING NO.** D0-69  
**TYPE & NUMBER** GE-218  
**HOLE SIZE** NV

**LOCATION** Test Room 1, Centerline of Room at Station N1265, in Roof 16.5 Feet From E and W Ribs.

**STATION** N1265, W231.5  
**COLLAR ELEV.** 1310.1  
**DIRECTION OF DRILLING** Vertical Up

**MINE COORDINATES** N10951.9, E6662.5  
**BOREHOLE PENETRATION** 51.4'

**DRILLING METHOD** Rotary \( \frac{1}{4} \)/Brine Drill  
**MAKE/MODEL** Joy 12B

**PREPARED BY** JEG  
**DATE** 5/6/83

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<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>PENETRATION (ft.)</th>
<th>RECOVERY</th>
<th>% RECOVERED</th>
<th>ROD</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>55</td>
<td>55</td>
<td>100</td>
<td>X</td>
<td></td>
<td>POLYHALITIC HALITE: Clear mottled with moderate reddish orange (10R 6/6) polyhalite, coarsely crystalline, medium hard to hard. Polyhalite averages 1 to 5%, locally up to 25%. Trace (1%) gray clay.</td>
<td></td>
</tr>
</tbody>
</table>

Total penetration = 51.4'.

Drilling completed at 12:30 hours, 13 April 1983.
**WIPP**

**ROCK CORING LOG**

**WASTE ISOLATION PILOT PLANT**

**BORING NO.** 00-77  **TYPE & NUMBER** GE-216  **HOLE SIZE** NX

**LOCATION** Test Room 2, Centerline of Room at Station N1270

in Floor 16.5 Feet From E and W Ribs.

**STATION N1270, W364.5**  **COLLAR ELEV.** 1294.6  **DIRECTION OF DRILLING** Vertical Down

**MINE COORDINATES** N10962.5, E6529.6  **DEPTH OF BOREHOLE** 53.4'

**DRILLING METHOD** Rotary w/Brine  **DRILL MAKE/MODEL** Joy 12B

**PREPARED BY** JEG  **DATE** 3/31/83  **SHEET 1 OF 3**

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (Ft.)</th>
<th>% RECOVERED</th>
<th>ROD</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.0 - 1.0</td>
<td>100</td>
<td>X</td>
<td>X</td>
<td>POLYHALITIC HALITE: clear to moderate reddish-orange (10R 6/6) to moderate reddish-brown (10R 4/6), coarsely crystalline, hard. Polyhalite comprises &lt;5% to 15% of rock.</td>
<td>Started drilling 27 March 1983 at 9:10 a.m. 5 1/2&quot; diameter single-tube core barrel used from 0.0' to 0.8'. NX single-tube core barrel used from 1.0' to 5.6'. NX double-tube core barrel used from 5.6' to 53.4'.</td>
</tr>
<tr>
<td>1</td>
<td>1.0 - 2.0</td>
<td>50</td>
<td>X</td>
<td>X</td>
<td>POLYHALITIC HALITE: clear, coarsely crystalline, moderately hard. Core is broken up, possible core loss. Trace (22) polyhalite beads.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>1.9 - 3.0</td>
<td>66</td>
<td>X</td>
<td>X</td>
<td>ANHYDRITE (Marker Bed 139): moderate reddish-orange (10R 6/6) to moderate reddish-brown (10R 4/6) polyhalite halite, medium to coarsely crystalline, mixed with very light (NS) to light gray (9R) amphydrite from 1.0' to 6.0'. Grades into medium (NS) to very light gray (9R) amphydrite at approximately 6.0'. Mircocrystalline, hard, dense. Trace of gray clay at 7.25'. Core grinding evident within this zone.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>2.0 - 3.0</td>
<td>64</td>
<td>X</td>
<td>X</td>
<td>POLYHALITIC HALITE: clear to moderate reddish-orange (10R 6/6), fine to medium crystalline, hard. Polyhalite averages &lt;5% to 10% with &lt;2% from 14.7' to 17.3'. Gray clay breaks at 7.8', 8.0', 9.8' and 14.5'. Scattered clay breaks at 21.0' to 22.3'. Core contains gray clay (2% to 4%) from 14.4' to 23.0'.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>3.0 - 4.0</td>
<td>100</td>
<td>X</td>
<td>X</td>
<td>ANHYDRITE (Marker Bed 139): moderate reddish-orange (10R 6/6) to moderate reddish-brown (10R 4/6), fine to medium crystalline, hard. Polyhalite averages &lt;5% to 10% with &lt;2% from 14.7' to 17.3'. Gray clay breaks at 7.8', 8.0', 9.8' and 14.5'. Scattered clay breaks at 21.0' to 22.3'. Core contains gray clay (2% to 4%) from 14.4' to 23.0'.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>3.0 - 4.0</td>
<td>100</td>
<td>X</td>
<td>X</td>
<td>POLYHALITIC HALITE: clear and brownish gray (5YR 4/1) to moderate reddish-brown (10R 6/6), fine to coarsely crystalline, hard. Gray clay (&lt;1% to 5%), generally increasing with depth from 26.0'. Scattered clay breaks within core.</td>
<td></td>
</tr>
</tbody>
</table>

Possible Core Loss Zones:
-run 1: Throughout
-run 2: From 7.8' to 4.1'.
-run 3: Throughout
## WIPP
### ROCK CORING LOG

**WASTE ISOLATION PILOT PLANT**

**BORING NO.**  DO-27  
**INSTRUMENT**  Extensometer  
**TYPE & NUMBER**  GE-216  
**HOLE SIZE**  NX  
**LOCATION**  Test Room 2, Centerline of Room at Station N1270  

in Floor 16.5 Feet from E and W Ribs.

**STATION** N1270, W364.5  
**COLLAR ELEV.**  1294.6  
**DIRECTION OF DRILLING**  Vertical Down  

**MINE COORDINATES**  N10962.5, E6529.6  
**DEPTH OF BOREHOLE**  53.4'  
**DRILLING METHOD**  Rotary w/Brine  
**DRILL MAKE/MODEL**  Joy 12R  

**PREPARED BY**  JEG  
**DATE**  3/31/83  
**SHEET**  2 OF 3

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (FT.)</th>
<th>% RECOVERED</th>
<th>RQD</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>25</td>
<td>5.2</td>
<td>100</td>
<td>—</td>
<td>(as above)</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>30</td>
<td>5.2</td>
<td>100</td>
<td>—</td>
<td>27.2' - 31.2' POLYHALITIC HALITE: clear to moderate reddish-orange (10R 6/6) to moderate reddish brown (10R 4/6), coarsely crystalline, hard. Polyhalite occurs as blebs and irregular patches, generally &lt;1% to 5% but locally &gt;15%.</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>35</td>
<td>5.2</td>
<td>100</td>
<td>—</td>
<td>31.2' - 32.1' HALITE: clear, medium to coarsely crystalline, hard. Trace of polyhalite.</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>40</td>
<td>5.1</td>
<td>100</td>
<td>—</td>
<td>32.3' - 36.9' ANHYDRITE: very light gray (8H) to medium light gray (6H), microcrystalline, banded. Trace of clear halite. Trace of clay &lt; 32.3'. Some core grinding evident.</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>45</td>
<td>5.1</td>
<td>100</td>
<td>—</td>
<td>36.9' - 43.5' ANSILLACEOUS HALITE: clear to brownish-gray (SYR 4/1), fine to coarsely crystalline, hard. Brown clay seam (1/4&quot;) at 40.8' and clay parting at 41.3'. Moderate reddish-orange (10R 6/6) polyhalite constitutes 1% to 2% of core. Several clay breaks from 41.0' to 41.7'.</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>50</td>
<td>5.1</td>
<td>100</td>
<td>—</td>
<td>43.5' - 53.4' HALITE: clear to grayish red (10R 4/2), medium to coarsely crystalline, hard. Trace of gray clay and trace of polyhalite blebs. 2% to 2% gray clay from 51.0' to 52.15' and 52.75' to 53.1'.</td>
<td></td>
</tr>
</tbody>
</table>
**WIPP**

**ROCK CORING LOG**

**WASTE ISOLATION PILOT PLANT**

**BORING NO.** DO-77  **TYPE & NUMBER** GE-216  **HOLE SIZE** NX

**LOCATION** Test Room 2, Centerline of Room at Station N1270 in Floor 16.5 Feet From E and W Rib.

**STATION** N1270, W364.5  **COLLAR ELEV.** 1294.6  **DIRECTION OF DRILLING** Vertical Down

**MINE COORDINATES** N10962.5, E6529.6  **DEPTH OF BOREHOLE** 53.4'

**DRILLING METHOD** Rotary w/Brine  **DRILL MAKE/MODEL** Joy 128

**PREPARED BY** JEG  **DATE** 3/31/83

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<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (FT)</th>
<th>RECOVERY</th>
<th>% RECOVERED</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>50</td>
<td>5.1</td>
<td>100</td>
<td>-</td>
<td>43.5' - 53.4' Volatile: clear to grayish red (10R 4/2), medium to coarsely crystalline, hard. Trace of gray clay and trace of polyhalite blains. 11 to 20% gray clay from 51.0' to 52.15' and 52.75' to 53.1'.</td>
<td>Completed drilling 27 March 1983 at 2:00 p.m.</td>
</tr>
</tbody>
</table>

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3 of 3
**WIPP-SPDV**

**ROCK CORING LOG**

**UPWARD CORING**

- **BORING NO.:** DO-79
- **TYPE & NUMBER:** Extensometer GE-214
- **HOLE SIZE:** NX
- **LOCATION:** Test Room 2, Centerline of Room at Station N1270
- **DISTANCE:** In Roof 15.5 Feet From E and W Ribs.
- **STATION N1270, X364.5, COLLAR ELEV.:** 1007.7
- **DIRECTION OF DRILLING:** Vertical Up
- **MINE COORDINATES:** N10562.6, E6529.5
- **BOREHOLE PENETRATION:** 51.8'
- **DRILLING METHOD:** Rotary w/Brine DRILL MAKE/MODEL: Joy 12B
- **PREPARED BY:** JEG
- **DATE:** 3/24/83

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>PENETRATION (ft.)</th>
<th>RECOVERY %</th>
<th>RQD</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.0 - 4.5</td>
<td>X</td>
<td></td>
<td></td>
<td>MALITE: clear to moderate reddish-orange (10R 6/6), medium to coarsely crystalline, moderately hard. Trace of polyhalite blebs and brown argillaceous material found throughout.</td>
</tr>
<tr>
<td>1</td>
<td>1.4</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
</tr>
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<td>5.1</td>
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<tr>
<td>5</td>
<td>4.8</td>
<td>96</td>
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<tr>
<td>6</td>
<td>5.3</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13.3 - 13.8'</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>MALITE: grayish-brown (SR 4/2) to clear, fine to medium crystalline, hard. Contains few gray clay breaks and trace of polyhalite.</td>
</tr>
<tr>
<td>7.35 - 13.3'</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>MALITE: clear with scattered zones of moderate reddish-orange (10R 6/6) and moderate reddish-brown (10R 4/6), medium to coarsely crystalline, moderately hard to hard. Thin, very light gray (N8) to white anhydrite stringers at 8.0', 8.5' and 8.8'.</td>
</tr>
<tr>
<td>7.1 - 7.35'</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>ANHYDRITE: (Anhydrite &quot;a&quot;) light gray (N7) to white, microcrystalline, hard, dense. Trace of gray clay at 7.6'. Some evidence of core grinding.</td>
</tr>
<tr>
<td>4.5 - 7.11'</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>ARGILLACEOUS MALITE: grayish-brown (X9 3/2), predominantly medium crystalline ranging to coarsely crystalline, moderately hard to hard. Trace of reddish-orange polyhalite throughout. Clay content &lt;5%, predominantly gray ranging to brown. Gray clay break at 6.3'. Trace of gray clay at 7.1', with evidence of core grinding.</td>
</tr>
<tr>
<td>0.0 - 4.5'</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>MALITE: clear to moderate reddish-orange (10R 6/6), medium to coarsely crystalline, moderately hard. Trace of polyhalite blebs and brown argillaceous material found throughout.</td>
</tr>
</tbody>
</table>

**Trace of gas at 14'. No methane at end of return line.**

**Possible Core Loss Zones:**
- Run 2: throughout
- Run 5: throughout
- Run 7: 27.9' to 29.8'.

**Nitrogen gas at 7'.** Measured 2% methane at end of return line. Moderate gas flow.

- NX double-tube core barrel used from 2.4' to 51.8'.
- NX single-tube core barrel used from 1.0' to 2.4'.

Drilling began at 11:35 a.m. on 21 March 1983.
### WIPP-SPDV ROCK CORING LOG
### UPWARD CORING

**WASTE ISOLATION PILOT PLANT**

**BORING NO.** 00-19  **TYPE & NUMBER** Extensometer  GE-214  **HOLE SIZE** NX

**LOCATION** Test Room 2, Centerline of Room at Station N1270

in Roof 16.5 Feet From F and W Ribs

**STATION N1270, W364.5**  **COLLAR ELEV. 1307.7**  **DIRECTION OF DRILLING** Vertical Up

**MINE COORDINATES** N10962.6, E6529.5  **BOREHOLE PENETRATION** 51.8'

**DRILLING METHOD** Rotary w/BrinroDILL MAKE/MODEL Joy 12B

**PREPARED BY** JEG  **DATE** 3/24/83  **SHEET** 2 OF 3

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>PENETRATION (ft.)</th>
<th>RECOVERY</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>11</td>
<td>5.2</td>
<td>100</td>
<td>As Above</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>10</td>
<td>5.1</td>
<td>100</td>
<td>44.4'-44.7' HALITE: clear mottled with some moderate reddish-brown (10R 4/6), medium to coarsely crystalline, hard. Trace of brown argillaceous material (112).</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td></td>
<td></td>
<td></td>
<td>40.8'-44.4' HALITE: moderate reddish-brown (10R 4/6) to dark brown (10R 3/4) with some clear halite, fine to coarsely crystalline, moderately hard. Scattered zones of brown clay. Argillaceous content averages (22 but locally 32).</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td></td>
<td>X</td>
<td></td>
<td>37.3'-40.8' HALITE: clear from 37.3' to 38.4'. Clear, mottled with moderate reddish-orange (10R 6/6) and moderate reddish-brown (10R 4/6) comprises remaining portion of section; medium to coarsely crystalline, hard. Trace (32) of polyhalite from 37.3' to 38.4' and 38.4' to 40.8'. Core broken up from 37.4' to 37.9' and 38.1' to 38.2'.</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td></td>
<td>X</td>
<td></td>
<td>36.3'-37.3' ANHYDRITE: (Marker Bed 138) very light gray (10) to medium dark gray (10G) to white, banded, microcrystalline, hard. Clear to reddish-orange (10R 6/6) halite is mixed with anhydrite from 36.9' to 37.3'.</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td></td>
<td></td>
<td></td>
<td>35.4'-36.3' HALITE: clear, coarsely crystalline, hard. Several scattered blebs of grayish-brown argillaceous material.</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td></td>
<td></td>
<td></td>
<td>31.8'-35.4' ARGILLACEOUS HALITE: clear to dark reddish-brown (10R 3/4) to moderate brown (5YR 3/4) to brownish-gray (5YR 4/1) mottled, medium to coarsely crystalline, moderately hard. Brown and gray clay generally 22. Numerous clay breaks.</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td></td>
<td></td>
<td></td>
<td>29.6'-31.8' HALITE: clear, medium to coarsely crystalline, moderately hard. Traces of brown clay (112).</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td></td>
<td>X</td>
<td></td>
<td>27.9'-29.8' HALITE: clear to moderate brown (5YR 3/4), medium to coarsely crystalline, moderately hard. Trace of argillaceous material throughout. Contains thin (F 1/8&quot;) brown clay partings at 29.6&quot;, 29.5&quot;, and 29.8&quot;.</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td></td>
<td></td>
<td></td>
<td>As Below</td>
<td></td>
</tr>
</tbody>
</table>

Air bubbles in return water continuously to 37'. No methane at end of return line.
BOREHOLE PENETRATION: 51.8'

DESCRIPTION:

50.2'-51.8'
Polycrystalline Halite: clear mottled with moderate reddish-orange (10R 6/6) and moderate reddish-brown (10R 6/6) polyhalite blebs and stringers; medium to sparsely crystalline, hard. Polyhalite content <2%.

46.7'-50.2'
Argillaceous Halite: clear to moderate reddish-orange (10R 6/6) mixed with moderate reddish-brown (10R 4/6), fine to coarsely crystalline, moderately hard. Argillaceous content typically <3% but >5% from 46.7' to 47.8'; color of core through this interval mottled dark reddish brown (10R 3/4). Zone of fine crystalline halite mixed with argillaceous material from 49.7' to 50.0'. Clay breaks/partings from 49.1' to 49.2'.
### WIPP ROCK CORING LOG

**UPWARD CORING**

**BORING NO.** DO-88  **TYPE & NUMBER** GE-212  **HOLE SIZE** NV

**LOCATION** Test Room 3, Centerline of Room at Station N1265, in Roof

16.5 Feet From E and W Ribs.

**STATION** N1265, W497.5  **COLLAR ELEV.** 1305.9  **DIRECTION OF DRILLING** Vertical Up

**MINE COORDINATES** N10952.8, E6396.5  **BOREHOLE PENETRATION** 52.7'

**DRILLING METHOD** Rotary w/Brine Drill  **MAKE/MODEL** Joy 12A

**PREPARED BY** JEG  **DATE** 4/16/83  **SHEET** 1/OF 3

---

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>PENETRATION (ft.)</th>
<th>% RECOVERED</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
</table>
| 6          | 25                | 5.0 100     | 19.3' - 24.1' AMMOLACEOUS HALITE: clear to moderate brown (5yr 3/4), medium to coarsely crystalline, hard. Trace of phylloclase. Ammonite stringers at 23.6', 24.6' to 24.1' and scattered traces of ammonite from 21.5' to 22.2'. Clay partings from 23.9' to 24.1'; clay breaks throughout. Clay content 0% to 5%.
| 5          | 20                | 5.2 100     | 14.8' - 19.3' POLYHALITE HALITE: clear to moderate reddish-orange (10R 6/6) and moderate reddish-brown (10R 4/5), medium to coarsely crystalline, hard. Blebs and irregular patches of polyhalite, up to 5%. Scattered ammonite stringers from 15.4' to 16.6'.
| 4          | 15                | 4.8 100     | 14.3' - 14.8' AMMOLITE: (Ammonite "a") very light (47) to medium gray (85), micro-crystalline, hard. Trace of gray clay at 14.3'.
| 3          | 10                | 5.3 100     | 13.4' - 14.3' HALITE: clear to dark reddish brown (10R 3/4), fine to medium crystalline, hard. Contains trace of brown and gray clay, locally up to 3%.
| 2          | 5                 | 1.5 100     | 7.33' - 7.55' AMMOLRUS HALITE: (Ammonite "b") very light (73) to medium gray (85), micro-crystalline, hard. Contains scattered polyhalite halite. Gray clay parting at 7.33'.
| 1          | 1                 | 5.3 100     | 6.25' - 7.33' AMMOLACEOUS HALITE: clear to grayish-brown (5YR 3/2), fine to medium crystalline, hard. Contains brown and gray clay, up to 5%. Clay breaks at 6.3', 7.2', and 7.25'.
| 0          | 0                 | 0.9 100     | 4.7' - 6.25' HALITE: brownish-gray (5YR 4/1) to medium gray (4S), medium to coarsely crystalline, hard. Trace of gray clay scattered throughout.

Gas hit again while drilling. Ammonite "a" (14.3' to 14.8'); 3 to 4% methane at end of return line. Strong flow to 15'; then slowed appreciably.

Gas hit at 7.33'; 2% to 4% methane at end of return line. Moderate to strong gas flow for 3 to 4 minutes, decreasing to light flow with 1 1/2" methane. Gas gave off foul odor.

Drilled in low gear entire hole to minimise rod vibration.

NX double-tube core barrel used from 0.9' to 52.70'.

Drilling begun: 4 April 1983 at 11:00 a.m. 3 1/2" diameter single-tube core barrel used to core from 0.9' to 0.95'.
# WIPP ROCK CORING LOG
## UPWARD CORING

**INSTRUMENT** Extensometer  
**BORING NO** D0-88  
**TYPE & NUMBER** GE-212  
**HOLE SIZE**  
**LOCATION** Test Room 3, Centerline of Room at Station N1265 in Roof  
**16.5 Feet From E and W Bihs**  
**STATION** N1265, W497.5  
**COLLAR ELEV.** 1305.9  
**DIRECTION OF DRILLING** Vertical Up  
**MINE COORDINATES** N10952.8, E6396.5  
**BOREHOLE PENETRATION** 52.7'  
**DRILLING METHOD** Rotary w/Brine Drill  
**MAKE/MODEL** Jay 178  
**PREPARED BY** JEC  
**DATE** 4-14-83  
**SHEET** 2 of 3

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>PENETRATION (ft)</th>
<th>% RECOVERED</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
</table>
| 11         | 50              | 4.4         | 100     | 46.0' - 49.8'  
ARGILLACEOUS HALITE: clear to dark reddish-brown (10R 3/4), fine to coarse, crystalline, moderately hard. Brown argillaceous material generally 1/2 to 1/4. Clay seams and soft clay/halite mixture (clay > 1/2) from 42.7' to 42.9' and 48.5' to 48.8'. Scattered clay breaks throughout. |
| 10         | 50              | 4.5         | 100     | 41.8' - 46.0'  
HALITE: clear to grayish-brown (5YR 3/2) to moderate reddish-brown (10R 4/6) and dark reddish-brown (10R 3/4) fine to coarse, crystalline, hard. Predominantly brown argillaceous material (1X) with 2% locally. Argillaceous halite from 41.8' to 42.7' and 43.8' to 44.6'. Brown clay partings from 44.6' to 44.7' and clay breaks at 44.8' to 44.9'. Trace of polyhalite. |
| 9          | 50              | 5.0         | 100     | 37.15' - 41.8'  
HALITE: clear with moderate reddish-orange (10R 8/6) blebs and irregular stringers of polyhalite. Coarsely crystalline, hard. Polyhalite (1%) to 2%. Trace of argillaceous material (1X) from 41.8' to 41.9'. Scattered irreglar anhydrite stringers from 38.0' to 41.7'. |
| 8          | 50              | 5.2         | 100     | 36.1' - 37.15'  
ANHYDRITE: (Marker Bed 138) very light (10Y) to medium gray (9Y), microcrystalline, hard. Trace (1X) polyhalite. |
| 7          | 50              | 5.0         | 100     | 35.5' - 36.3'  
HALITE: clear, coarse crystalline, moderately hard. Trace of polyhalite blebs and traces of clay (1X) from 36.1' to 36.3'. Brown clay at 36.3'. |
| 6-6        | 50              | 5.0         | X       | 31.9' - 35.5'  
ARGILLACEOUS HALITE: clear to moderate brown (5YR 3/4) coarsely crystalline, moderately hard. Generally 1 to 1/2 brown clay with some gray, but locally 1% clay. Clay breaks throughout. |
| 6          | 50              | 5.0         | X       | 29.6' - 31.9'  
HALITE: clear, coarse crystalline, hard. Trace (1%) argillaceous material from 31.9'. |
| 5-5        | 50              | 5.0         | X       | 27.2' - 29.6'  
ARGILLACEOUS HALITE: dark reddish-brown (10R 4/6) to brown-gray (5YR 4/1). Fine to medium crystalline, hard. Numerous clay breaks. Clay content (1 to 2%) mined brown clay to 29.1', then mixed brown gray. |
| 4          | 50              | 5.0         | X       | 24.1' - 27.2'  
HALITE: clear, coarse crystalline, hard. Slight trace of polyhalite, Anhydrite stringers from 24.3' to 25.0', and 25.8' to 25.83'. |

**DESCRIPTION**

**REMARKS**
**WIPP**

**WASTE ISOLATION PILOT PLANT**

**ROCK CORING LOG**

**UPWARD CORING**

**BORING NO.** DO-88  
**INSTRUMENT** Extensometer  
**TYPE & NUMBER** GE-212  
**HOLE SIZE** NX

**LOCATION** Test Room 2, Centerline of Room at Station N1265, in Roof  
16.5 Feet From E and W Ribs

**STATION** N1265, W497.5  
**COLLAR ELEV.** 1305.9  
**DIRECTION OF DRILLING** Vertical Up

**MINE COORDINATES** N10952.8, E6396.5  
**BOREHOLE PENetration** 52.7

**DRILLING METHOD** Rotary w/Brine DRILL MAKE/MODEL Joy 12B

**PREPARED BY** JEG  
**DATE** 4/14/83  
**SHEET** 3 OF 3

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
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<th>RECOVERY</th>
<th>% RECOVERED</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
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<tr>
<td>11</td>
<td>44</td>
<td>100</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>49.6 - 50.55'</td>
<td></td>
<td></td>
<td></td>
<td>BARTLE: clear, coarsely crystalline, hard.</td>
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</tr>
<tr>
<td></td>
<td>50.55' - 52.70'</td>
<td></td>
<td></td>
<td></td>
<td>POLYHASTIC BARTLE: clear mottled with moderate reddish-orange polyhalite, coarsely crystalline, hard. Polyhalite &lt;1% to 5%. Brown clay breaks from 50.55' to 50.75'.</td>
<td></td>
</tr>
</tbody>
</table>

Drilling completed: 5 April 1983 at 1:10 p.m.  
Total Drilling Time: 8 hrs  
Total Penetration = 52.70'
**WIPP**

**ROCK CORING LOG**

**WASTE ISOLATION PILOT PLANT**

**BORING NO.** DO-90  **TYPE & NUMBER.** GF-210  **HOLE SIZE.** NX

**LOCATION.** Test Room 3, Centerline of Room at Station N1265, in Floor 16.5'

From E and W Ribs.

**STATION.** N1265, W497.5  **COLLAR ELEV.** 1292.1  **DIRECTION OF DRILLING.** Vertical Down

**MINE COORDINATES.** N10952.6, E6396.4  **DEPTH OF BOREHOLE.** 53.6'

**DRILLING METHOD.** Rotary w/Brine  **DRILL MAKE/MODEL.** Joy 128

**PREPARED BY.**  **DATE.** 4/14/83  **SHEET.** 1 OF 3

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft)</th>
<th>RECOVERY</th>
<th>% RECOVERED</th>
<th>ROD</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0.8%</td>
<td>100</td>
<td>X</td>
<td></td>
<td>0.0' - 1.8' HALITE: clear, coarsely crystalline, hard. Trace (&lt;1%) polyhalite.</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1.3</td>
<td>100</td>
<td></td>
<td>X</td>
<td>X</td>
<td>1.8' - 7.65' POLYHALITE: clear, mottled with moderate reddish-orange (1OR 6/6), coarsely crystalline, hard. Blebs of polyhalite (&lt;1' to 5'). Trace of anhydrite from 2.25' to 2.65'.</td>
<td>Started drilling 5 April 1983 at 1:50 p.m. 1 1/2&quot; diameter single-tube core barrel used to drill 0.0' - 0.85'.</td>
</tr>
<tr>
<td>2</td>
<td>1.35</td>
<td>100</td>
<td></td>
<td>X</td>
<td>X</td>
<td>2.65' - 4.45' POLYHALITE: moderate reddish brown (1OR 6/6) polyhalite mixed with very light gray (NB) anhydrite. Fine to micro-crystalline, hard, dense.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>0.95</td>
<td>100</td>
<td></td>
<td>X</td>
<td>X</td>
<td>4.45' - 5.2' ANHYDRITE: (Marker Bed 139) very light (NB) to medium gray (NB), micro-crystalline, hard, dense. Mixed with some polyhalite to 5'. Gray clay seam at 5.7'.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>0.90</td>
<td>82</td>
<td>X</td>
<td></td>
<td>5.2' - 9.25' HALITE: clear with scattered moderate reddish-orange (1OR 6/6) medium crystalline, hard. Scattered polyhalite (&lt;1%) and trace (&lt;1%) gray clay.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>10</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>5.3' - 9.25' POLYHALITE: clear to moderate reddish-orange (1OR 6/6) and grayish-brown (5YR 4/1), medium to coarsely crystalline, hard. Irregular patches and blebs of polyhalite 1' to 5', locally &gt;10'. Gray clay 1' to 2' from 13.7' to 16.0' and 20.35' to 21.35'.</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>15</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td>6.3' - 21.35' POLYHALITE: clear to moderate reddish-orange (1OR 6/6) and grayish-brown (5YR 4/1), medium to coarsely crystalline, hard. Irregular patches and blebs of polyhalite 1' to 5', locally &gt;10'. Gray clay 1' to 2' from 13.7' to 16.0' and 20.35' to 21.35'.</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>20</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td>7.3' - 25.75' HALITE: clear to grayish-red (5R 4/2) medium to coarsely crystalline, moderately hard. Trace of polyhalite, &lt;1' to 2' gray clay with lesser amounts of brown clay.</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>25</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td>8.3' - 25.75' HALITE: clear to grayish-red (5R 4/2) medium to coarsely crystalline, moderately hard. Trace of polyhalite, &lt;1' to 2' gray clay with lesser amounts of brown clay.</td>
<td></td>
</tr>
</tbody>
</table>
## WIPP
### ROCK CORING LOG

**WASTE ISOLATION PILOT PLANT**

**BORING NO.** DO-90  
**INSTRUMENT** Extensometer  
**TYPE & NUMBER** GE-210  
**HOLE SIZE** NX

**LOCATION** Test Room 3, Centerline of Room at Station N1265, in Floor 16.5'  
From E and W Ribs.

**STATION** N1265, W497.5  
**COLLAR ELEV.** 1292.1  
**DIRECTION OF DRILLING** Vertical Down  
**MINE COORDINATES** N10952.6, E6396.4  
**DEPTH OF BOREHOLE** 53.6'

**DRILLING METHOD** Rotary w/Brine  
**MAKE/MODEL** Joy 12B

**PREPARED BY** JEG  
**DATE** 4/14/83  
**SHEET** 2 of 3

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (FT.)</th>
<th>% RECOVERED</th>
<th>ROD</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>25</td>
<td>5.3 100</td>
<td>X</td>
<td>-</td>
<td>See Above</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>30</td>
<td>5.2 100</td>
<td>X</td>
<td>-</td>
<td>31.75' - 31.95' POLYHALITIC HALITE: clear mottled with moderate reddish-orange (10R 6/6), coarsely crystalline, hard. 1% to 5% polyhalite. Scattered irregular blebs and stringers of very light gray (N3) anhydrite from 27.05' to 31.95', one-half inch wide irregular anhydrite seam at 31.0'.</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>35</td>
<td>5.1 100</td>
<td>X</td>
<td>-</td>
<td>31.95' - 32.10' ANHYDRITE: very light gray (N6) to medium gray (N6), microcrystalline, hard, dense. Trace of gray clay at 32.1'.</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>40</td>
<td>5.2 100</td>
<td>X</td>
<td>-</td>
<td>32.10' - 32.5' HALITE: clear to medium gray (N6), fine to coarsely crystalline, hard. Contains trace (&lt;1%) polyhalite locally. Breaks and patches of gray clay (&lt;1 to 3%). Core clear with no argillaceous material from 30.65' to 37.05' and from 39.0' to 39.5'.</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>45</td>
<td>5.25 100</td>
<td>X</td>
<td>-</td>
<td>39.5' - 43.65' ARGILLACEOUS HALITE: clear to brownish-gray (5YR 4/1) medium to coarsely crystalline, moderately hard to hard. Contains &lt;1% to 5% clay (average 2%), predominantly gray in color with lesser amounts of brown. Clay breaks throughout. Trace of polyhalite (&lt;1%).</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>50</td>
<td>5.3 100</td>
<td>X</td>
<td>-</td>
<td>43.65' - 49.50' HALITE: clear, coarsely crystalline, moderately hard. Trace of gray clay (&lt;1%). Trace polyhalite from 44.65' to 44.65'.</td>
<td></td>
</tr>
</tbody>
</table>
## WIPP
### ROCK CORING LOG

**INSTRUMENT**: Extensometer  
**HOLE SIZE**: N/A  
**LOCATION**: Test Room 3, Centerline of Room at Station N1265, in Floor 16.5' from E and W Ribs.  
**STATION**: N1265, W497.5  
**COLLAR ELEV.**: 1292.1  
**DIRECTION OF DRILLING**: Vertical Down  
**MINE COORDINATES**: N10952.6, E6796.4  
**DEPTH OF BOREHOLE**: 53.6'  
**DRILLING METHOD**: Rotary w/Brine  
**MAKE/MODEL**: Joy 12B  
**PREPARED BY**: JEC  
**DATE**: 4/14/85  
**SHEET**: 3 of 3

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (FT)</th>
<th>RECOVERY</th>
<th>RQD</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
</table>
| 13         | 50         | 5.3      | 100 | X       | 49.50' - 52.10' **HALITE**: clear to moderate reddish-orange (10R 6/6) and brownish-grey (5YR 4/1). Contains trace of polyhalite (<1%) and <1% to 3% gray clay. Clay parting at 49.5' and scattered breaks within core. | Drilling completed 7 April 1985 at 11:15 a.m.  
Total drilling time: 5.5 hours.  
Total Depth = 53.60' |
| 14         | 55         | 0.9      | 100 | X       | 52.10' - 53.6' **POLYHALITE HALITE**: clear to moderate reddish-orange (10R 6/6), medium to coarsely crystalline, hard. Polyhalite 1% to 3%. Trace (<1%) of gray clay. | |

- **RQD**: Rock Quality Designation
- **% RECOVERED**: Percentage of core recovered
# WIPP

## ROCK CORING LOG

**WASTE ISOLATION PILOT PLANT**

**BORING NO.** 00-91  
**TYPE & NUMBER** GE-209  
**HOLE SIZE** NX

**LOCATION** Test Room 4, Centerline of Room at Station N1275, in Floor 16.5'

From E and W Ribs

**STATION N1275, W630.5**  
**COLLAR ELEV.** 1292.1  
**DIRECTION OF DRILLING** Vertical Down

**MINE COORDINATES** N10961.5, E6263.9  
**DEPTH OF BOREHOLE** 51.8'

**DRILLING METHOD** Rotary w/Brine DRILL MAKE/MODEL Joy 12B

**PREPARED BY** JEG  
**DATE** 5/5/83  
**SHEET** 1 OF 3

<table>
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<th>RUN NUMBER</th>
<th>DEPTH (ft)</th>
<th>RECOVERY %</th>
<th>RECOVERED ROD</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
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<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>100</td>
<td>X</td>
<td></td>
<td>0.0' - 2.1' HALITE: Clear, coarsely crystalline, medium hard. Contains C12 polyhalite blebs and trace (&lt;12) gray clay.</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>0.6</td>
<td>50</td>
<td>-</td>
<td>-</td>
<td>2.1' - 3.8' POLYHALITE HALITE: Clear mottled with moderate reddish orange (10R 6/6) polyhalite. Polyhalite C1 to 3%. Trace (&lt;12) gray clay.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>0.7</td>
<td>100</td>
<td>X</td>
<td>-</td>
<td>3.8' - 4.8' POLYHALITE: Moderate reddish brown (10R 4/6), very fine to microcrystalline, hard. Trace of anhydrite.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>1.75</td>
<td>76</td>
<td>X</td>
<td>-</td>
<td>4.8' - 7.2' ANHYDRITE: (Marble Red 139) Very light gray (2B), medium gray (5B) to moderate reddish brown (10R 4/6) and moderate reddish orange (10R 6/6) to approximately 6.5', with about 50% polyhalite. Then predominantly very light to medium gray anhydrite mixed with some polyhalite and polyhalitic halite. Cl/8' gray clay parting at 7.2'. Core broken into disc-shaped pieces 3.2' to 6.1'.</td>
<td>Drilling started at 15:05 hours, 28 April 1983.</td>
</tr>
<tr>
<td>4</td>
<td>1.75</td>
<td>100</td>
<td>-</td>
<td>-</td>
<td>7.2' - 11.6' HALITE: Clear to moderate reddish orange (10R 6/6) to light gray (87), fine to coarsely crystalline, medium hard. Contains C11 gray clay with up to 5% locally. Polyhalite C12 to 2%. Polyhalitic halite at 10.0' to 10.3'. Clay break at 7.7'.</td>
<td>5 1/2' single tube barrel used 0.6' to 1.9'.</td>
</tr>
<tr>
<td>5</td>
<td>4.6</td>
<td>100</td>
<td>X</td>
<td>X</td>
<td>11.6' - 15.3' POLYHALITE HALITE: Clear to moderate reddish orange (10R 6/6), medium to coarsely crystalline, medium hard to hard. Polyhalite 31 to &gt;55%. Gray clay breaks at 14.9' and 15.0'. Irregular anhydrite stringers throughout.</td>
<td>5/8 double tube barrel used 1.0' to 5.2'.</td>
</tr>
<tr>
<td>6</td>
<td>5.2</td>
<td>100</td>
<td>X</td>
<td>X</td>
<td>15.3' - 16.9' HALITE: Clear to light gray (87) to moderate reddish orange (10R 6/6), medium to coarsely crystalline, medium hard. Polyhalite C1 to 2%. Gray clay &lt;2%.</td>
<td>Note: Run #3 originally drilled to 4.3'. Core stayed in hole after pulling barrel. Had to redrill to 5.2' and retrieve core.</td>
</tr>
<tr>
<td>7</td>
<td>5.0</td>
<td>100</td>
<td>-</td>
<td>X</td>
<td>16.8' - 23.2' POLYHALITE HALITE: Clear to moderate reddish orange (10R 6/6), coarsely crystalline, hard. Polyhalite average C1 to 3%, locally up to 5%. Trace gray clay at 20.8' to 23.2'. Scattered clay breaks.</td>
<td>Run #6 - core stayed in hole after barrel pulled. Had to return barrel, drill and pull core.</td>
</tr>
<tr>
<td>8</td>
<td>5.1</td>
<td>100</td>
<td>-</td>
<td>X</td>
<td>23.2' - 35.4' HALITE: Clear, coarsely crystalline, hard. Trace (C11) polyhalite and trace gray clay. Clay break at 23.7'.</td>
<td>Small gas flow at 7's. Low flow. No methane. Very slight flow continued until entire hole was drilled.</td>
</tr>
</tbody>
</table>

**Core Loss**  
Run 1. Throughout  
Run 3, Probably from 2.9' to 3.8'.
# WIPP ROCK CORING LOG

**WASTE ISOLATION PILOT PLANT**

- **BORING NO.** DO-91
- **INSTRUMENT** Extensometer
- **TYPE & NUMBER** GE-209
- **HOLE SIZE** NX

**LOCATION** Test Room 4, Centerline of Room at Station N1275, in Floor 16.5'
- From E and W Ribs.

**STATION** N1275, H630.5
- **COLLAR ELEV.** 1292.1
- **DIRECTION OF DRILLING** Vertical Down

**MINE COORDINATES** N10961.5, E6263.9
- **DEPTH OF BOREHOLE** 51.8'

**DRILLING METHOD** Rotary w/Brine DRILL MAKE/MODEL Joy 12B

**PREPARED BY** JEG
**DATE** 5/5/83

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>RECOVERY</th>
<th>% RECOVERED</th>
<th>RQD</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>25</td>
<td>5.1</td>
<td>100</td>
<td>X</td>
<td>X</td>
<td>As Above</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>30</td>
<td>4.9</td>
<td>100</td>
<td>X</td>
<td>X</td>
<td>25.4' - 31.8' POLYTALIC HALITE: Clear to moderate reddish brown (10R 6/6) on moderate reddish brown (10R 4/6), coarsely crystalline, hard. Trace (&lt;1%) gray clay. Polyhalite blebs and patches 1 to 5%, locally &gt;5%. Scattered irregular anhydrite stringers from 27.2'. Polyhalite &gt; 90% from 31.0' to 31.8'.</td>
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<tr>
<td>10</td>
<td>35</td>
<td>4.9</td>
<td>100</td>
<td>X</td>
<td></td>
<td>31.8' - 32.1' ANHYDRITE: Very light (N8) to medium gray (N5), microcrystalline, hard. Mixed with some halite from 31.0'. Trace of clay at 32.1'.</td>
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<tr>
<td>11</td>
<td>40</td>
<td>5.1</td>
<td>100</td>
<td>X</td>
<td></td>
<td>32.1' - 39.7' HALITE: Clear to medium gray (N5) to grayish red (10R 4/2), medium to coarsely crystalline, medium hard. Gray clay &lt;1 to 3%. Trace (4%) polyhalite. Core broken up at 37.2' to 37.3'.</td>
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<tr>
<td>12</td>
<td>45</td>
<td>5.1</td>
<td>100</td>
<td>X</td>
<td></td>
<td>39.7' - 41.8' ARGLICULACEOUS HALITE: Clear to medium gray (N5), medium to coarsely crystalline, medium hard to soft. Some core can be broken in hand with low pressure. Gray clay &lt;1 to 3%. Core broken up at 41.5' to 41.6'.</td>
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<tr>
<td>13</td>
<td>50</td>
<td>4.9</td>
<td>100</td>
<td>X</td>
<td></td>
<td>41.8' - 44.4' POLYTALIC HALITE: Clear to moderate reddish orange (10R 6/6), coarsely crystalline, medium hard. Polyhalite blebs and patches &lt;1 to 5%. Trace of gray clay at 43.3'.</td>
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<td></td>
<td></td>
<td>44.4' - 49.3' HALITE: Clear, coarsely crystalline, medium hard to hard. Trace (&lt;1%) gray clay. Core broken up with trace of clay at 45.5' - 45.8'. Clay parting at 45.3' with up to 3% clay at 48.9' to 49.3'.</td>
<td></td>
</tr>
</tbody>
</table>
### WIPP ROCK CORING LOG

**WASTE ISOLATION PILOT PLANT**

**BORING NO.** DO-91  | **INSTRUMENT** Extensometer  | **HOLE SIZE** NX

**LOCATION** Test Room 4, Centerline of Room at Stations N1275, in Floor 16.5' From E and W Ribs.

**STATION N1275, W630.5**  | **COLLAR ELEV.** 1292.1  | **DIRECTION OF DRILLING** Vertical Down

**MINE COORDINATES** N10961.5, E6263.9  | **DEPTH OF BOREHOLE** 51.8'

**DRILLING METHOD** Rotary w/Brine  | **DRILL MAKE/MODEL** Joy 12R

**PREPARED BY** JEG  | **DATE** 5/5/83  | **SHEET** 3 OF 3

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft)</th>
<th>RECOVERY</th>
<th>% RECOVERED</th>
<th>RQD</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>50</td>
<td>-</td>
<td>4.9</td>
<td>100</td>
<td>X</td>
<td>49.3' - 51.8' HALITE: Clear to moderate reddish orange (10R 6/6), medium to coarsely crystalline, medium hard. Trace (&lt;1%) gray clay. Polyhalite Cr to 3% dispersed throughout.</td>
<td>Hole completed at 14:50 hours, 29 April 1983. Total depth = 51.8'.</td>
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<tr>
<td></td>
<td>55</td>
<td>-</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RUN NUMBER</td>
<td>PENETRATION (ft.)</td>
<td>% RECOVERED</td>
<td>ROD</td>
<td>PROFILE</td>
<td>DESCRIPTION</td>
<td>REMARKS</td>
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<td></td>
</tr>
<tr>
<td>1</td>
<td>0.0</td>
<td>1.0</td>
<td>100</td>
<td>X</td>
<td>0.0' - 4.05' HALITE: Clear with some grayish red (5R 4/2), coarsely crystalline, medium to clay.</td>
<td>NX single tube barrel used 1.0' to 1.8'.</td>
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</tr>
<tr>
<td>2</td>
<td>5.0</td>
<td>4.95</td>
<td>100</td>
<td>X</td>
<td>0.05' - 7.15' HALITE: Clear to medium brown (5YR 4/4) to medium gray (85), medium to coarsely crystalline, medium hard. Trace (1 to 2%) brown and gray clay. Breaks at 5.6' and 7.1'. Trace clay at 7.2'.</td>
<td>5 1/2&quot; single tube barrel used to core 0.0' to 1.0'.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>8.0</td>
<td>7.3</td>
<td>97</td>
<td>X</td>
<td>7.3' - 13.3' HALITE: Clear, coarsely crystalline, hard. Scattered white anhydrite strings. 1/8&quot; anhydrite layer at 7.7'. Trace (1%) polyhalite.</td>
<td>Moderate gas flow at 7.6'. Flow for 5-10 minutes, H2S - 0% and methane 1 to 3 1/2% measured at end of return line. Slight smell to gas. Low flow of gas to 16'. No H2S recorded.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>15.0</td>
<td>15.1</td>
<td>100</td>
<td>X</td>
<td>14.2' - 16.9' ANHYDRITE: (Anhydrite &quot;a&quot;) Very light (88) to medium gray (85), microcrystalline, hard. Some laminae noted. Some very finely crystalline halite mixed with anhydrite.</td>
<td>Drilling began at 11:00 hours, 27 April 1983.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>20.0</td>
<td>20.0</td>
<td>100</td>
<td>X</td>
<td>14.9' - 19.9' POLYHALITE: Clear, mottled with medium reddish orange (10R 6/6) and medium reddish brown (10R 4/6) coarsely crystalline, hard. Scattered white anhydrite strings to 16.4'. Polyhalite beds and irregular patches average 1 to 5% with locally &quot;10&quot; from 14.9' to 16.9'.</td>
<td>Core loss: Run 1, Throughout 48, Throughout 48.</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>25.0</td>
<td>52.100</td>
<td></td>
<td></td>
<td>18.9' - 24.0' ANHYDRIC SALITE: Clear to dark reddish brown (10R 3/4) medium to coarsely crystalline, medium hard. Scattered traces of anhydrite. 1/4&quot; layer anhydrite at 23.9'. Brown clay (1 to 2%). Scattered clay breaks. Portion at 23.9'.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

As Above

WIPP
WASTE ISOLATION PILOT PLANT
ROCK CORING LOG
UPWARD CORING
BORING NO. D0-93 TYPE & NUMBER GE-207 HOLE SIZE NX
LOCATION Test Room 4, Centerline of Room at Station N1275, in Roof 16.5 Feet From East and West Ribs
STATION: N1275, W630.5 COLLAR ELEV. 1304.9 DIRECTION OF DRILLING Vertical Up
MINE COORDINATES N10961.1, E6261.9 BOREHOLE PENETRATION 52.0'
DRILLING METHOD Rotary w/Brine DRILL MAKE/MODEL Joy 12B
PREPARED BY JEG DATE 5/5/83 SHEET 1 OF 3
WIPP
WASTE ISOLATION PILOT PLANT

ROCK CORING LOG
UPWARD CORING

BORING NO. DO-93

INSTRUMENT Extensometer

TYPE & NUMBER GE-207

HOLE SIZE NX

LOCATION Test Room 4, Centerline of Room at Stations N1275, in Roof 16.5 Feet

From E and W Ribs

STATION N1275, W630.5 COLLAR ELEV. 1304.9 DIRECTION OF DRILLING Vertical Up

MINE COORDINATES N10961.1, E6261.9 BOREHOLE PENETRATION 52.0'

DRILLING METHOD Rotary w/Brine DRILL MAKE/MODEL Joy 12B

PREPARED BY JEG

DATE 5/5/83

SHEET 2 OF 3

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>PENETRATION (ft.)</th>
<th>RECOVERY</th>
<th>% RECOVERED</th>
<th>ROD</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>25</td>
<td>5.2</td>
<td>100</td>
<td></td>
<td></td>
<td>24.0' - 27.9' HALITE: Clear, coarsely crystalline, hard. Some scattered white anhydrite stringers to 24.0'.</td>
</tr>
<tr>
<td>7</td>
<td>30</td>
<td>4.8</td>
<td>100</td>
<td></td>
<td></td>
<td>29.7' - 32.2' HALITE: Clear, coarsely crystalline, medium hard to hard. Trace (1%) brown clay from 31.6'.</td>
</tr>
<tr>
<td>8</td>
<td>35</td>
<td>5.0</td>
<td>100</td>
<td></td>
<td></td>
<td>32.3' - 35.5' ARGILLACEOUS HALITE: Clear to medium brown (5YR 3/4), fine to medium crystalline, with some coarse. Soft to medium hardness. Core broken up approximately 32.6' to 33.3'. Brown clay generally 5 to 10% with zones (1%) Argillaceous &gt;4% at 34.3' to 34.8'.</td>
</tr>
<tr>
<td>9</td>
<td>40</td>
<td>5.1</td>
<td>100</td>
<td></td>
<td></td>
<td>36.3' - 37.0' ANHYDRITE: (Marked Red) Very light (58) to medium gray (85), microcrystalline, hard. Some &lt;2% halite mixed with anhydrite 36.4' to 36.6'. Brown clay seam 36.3' to 36.4'.</td>
</tr>
<tr>
<td>10</td>
<td>45</td>
<td>5.1</td>
<td>100</td>
<td></td>
<td></td>
<td>41.2' - 45.9' HALITE: Clear to dark reddish brown (10R 3/4), medium to coarsely crystalline, medium hard to hard. Trace polyhalite. Brown clay averages 1% with local zones &gt;3%. Clay breaks at 41.9' and 43.7'. Argillaceous halite at 41.9' to 42.1', 42.4' to 43.0' and 44.1' to 44.3'.</td>
</tr>
<tr>
<td>11</td>
<td>50</td>
<td>4.8</td>
<td>100</td>
<td></td>
<td></td>
<td>45.9' - 49.8' ARGILLACEOUS HALITE: Clear to medium brown (5YR 3/4), medium to coarsely crystalline, medium hard. Brown clay &lt;1% to &gt;3%. Clay breaks at 47.2', 47.4', 47.7', 48.3', 48.5', 48.9' and 49.3' to 49.4'. 3/4&quot; clay seam at 48.7'.</td>
</tr>
</tbody>
</table>

As Above:

Can be combined in hand with low to moderate pressure due to grain size and clay content.
**WIPP**

**WASTE ISOLATION PILOT PLANT**

**ROCK CORING LOG**

**UPWARD CORING**

**BORING NO.** D0-92  **TYPE & NUMBER** GE-207  **HOLE SIZE** NY

**LOCATION** Test Room 4, Centerline of Room at Station N1275, 50 Feet From E and W Ribs

**STATION** N1275, W630.5  **COLLAR ELEV.** 1304.9  **DIRECTION OF DRILLING** Vertical Up

**MINE COORDINATES** N10962.1, E6263.9  **BOREHOLE PENETRATION** 52.0'

**DRILLING METHOD** Rotary w/Brine  **DRILL MAKE/MODEL** Joy 128

**PREPARED BY** JEC  **DATE** 5/5/83  **SHEET** 3 OF 3

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>PENETRATION (ft.)</th>
<th>RECOVERY %</th>
<th>ROD PROFILE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>17</td>
<td>48</td>
<td>100</td>
<td>X</td>
<td>49.8' - 52.0' BAJITE: Clear to medium reddish orange (10R 6/6). Coarsely crystalline, hard. Polysulfite blebs and patches &lt;1 to 4%. Highest percentage is from 49.8' to 51.0'. A few scattered anhydrite stringers and blebs from 51.0' to 52.0'.</td>
</tr>
</tbody>
</table>

Hole completed at 11:15 Hours, 28 April 1983.
Total penetration = 52.0'.
**WIPP-SPDV**

**ROCK CORING LOG**

**UPWARD CORING**

**BORING NO.** D0-201  
**TYPE & NUMBER** None  
**HOLE SIZE** NX  
**LOCATION** 0 East Drift, 406' S of Exploratory Shaft centerline, midspan

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**STATION** S406, W19  
**COLLAR ELEV.** 1262.2'  
**DIRECTION OF DRILLING** Vertical  
**MINE COORDINATES** N9280.6, E6874.9  
**BOREHOLE PENETRATION** 51.7'  
**DRILLING METHOD** Wet (brine)  
**DRILL MAKE/MODEL** Joy 12B  
**PREPARED BY** JBM, RFM, RLB/TSC/DGK, RMB/Bechtel  
**DATE** 1/25/83

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<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>PENETRATION (ft.)</th>
<th>RECOVERY(%)</th>
<th>ROD</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>20.3' - 23.4' HALLITE: mottled colorless to moderate brown (STR 3/4) halite, finely to coarsely crystalline, -1% polyhalite, 1-5% brown and gray (mostly brown) clay, 5-10% polyhalite from 24.3' - 24.5'; anhydrite/clay zona 25.3' - 25.4'.</td>
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<td>15.3' - 20.3' POLYHALITIC HALLITE: colorless to moderate reddish-orange (10R 6/6) halite, medium to coarsely crystalline, -5% polyhalite, few blebs of clay, anhydrite stringers (G1/16') at 16.1', 16.3', 17.8', and 18.1'.</td>
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<td>14.8' - 15.5' ANHYDRITE: (Anhydrite &quot;a&quot;) light to very light gray (8W-8), microcrystalline anhydrite, 20-30% halite in upper 0.1', trace polyhalite near upper contact.</td>
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<td>14.0' - 14.8' HALLITE: mottled colorless to moderate brown (STR 3/4) halite, finely to coarsely crystalline, 1-2% polyhalite, 1% gray clay, 1-5% brown clay, gray clay parting at 14.8'.</td>
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<td></td>
<td>13.9' - 14.0' HALLITE: colorless to moderate reddish-orange (10R 6/6) halite, medium to coarsely crystalline, 0-1% polyhalite, clay absent below 13.9', -1% gray clay from 13.9' - 14.0', anhydrite stringers (~1/16&quot;) at 9.5' and 9.8'.</td>
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<td>7.7' - 7.9' ANHYDRITE: (Anhydrite &quot;b&quot;) light to very light gray (8W-8), microcrystalline anhydrite, 30-40% halite.</td>
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<td>6.0' - 7.7' HALLITE: clear to mottled colorless and moderate reddish-orange (10R 6/6) halite, medium to coarsely crystalline, 2% polyhalite, 0-1% gray clay, brown clay absent to 4.0', -2% from 4.0' - 7.7', light gray (8G) clay seam at 7.7'.</td>
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<td>Hole began 23 November 1983.</td>
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<td>0' - 0.85' drilled with 6' single-tube core barrel.</td>
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<tr>
<td>RUN NUMBER</td>
<td>PENETRATION (ft)</td>
<td>% RECOVERED</td>
<td>ROD</td>
<td>PROFILE</td>
<td>DESCRIPTION</td>
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</tr>
<tr>
<td>13</td>
<td>5.0</td>
<td>100</td>
<td></td>
<td></td>
<td>(see description on next sheet)</td>
<td></td>
</tr>
</tbody>
</table>
| 12         | 5.0             | 96          |      |         | 46.3'-49.4'  
|            |                 |             |      |         | HALITE: colorless to moderate  |
|            |                 |             |      |         | reddish-orange (10% 6/6) halite,  |
|            |                 |             |      |         | coarseley  |
|            |                 |             |      |         | crystalline,  \(1\%) polyhalite,  |
|            |                 |             |      |         | locally in blebs,  |
|            |                 |             |      |         |  C\(IX\) clay,  |
| 11         | 5.0             | 100         |      |         | 44.4'-46.3'  
|            |                 |             |      |         | HALITE: colorless to moderate  |
|            |                 |             |      |         | brown (1% 3/4) halite, medium to  |
|            |                 |             |      |         | coarseley  |
|            |                 |             |      |         | crystalline,  \(1\%) polyhalite,  |
|            |                 |             |      |         | 1-1% brown clay,  |
|            |                 |             |      |         | brown clay break at 44.8'.  |
| 10         | 5.0             | 100         |      |         | 38.9'-44.4'  
|            |                 |             |      |         | HALITE: colorless to moderate  |
|            |                 |             |      |         | reddish-orange (10% 6/6) halite,  |
|            |                 |             |      |         | coarseley  |
|            |                 |             |      |         | crystalline,  \(1\%) polyhalite,  |
|            |                 |             |      |         | 0-1% clay,  |
|            |                 |             |      |         | anhydrite stringers at 39.0', 39.3', and 40.0'.  |
| 9          | 46              | 92          |      |         | 38.3'-38.9'  
|            |                 |             |      |         | ANHYDRITE: (Marker Bed 138)  |
|            |                 |             |      |         | medium to light gray (89-77),  |
|            |                 |             |      |         | microcrystalline  |
|            |                 |             |      |         | anhydrite, 10-20% halite in upper 0.05'.  |
| 8          | 5.0             | 100         |      |         | 35.2'-36.3'  
|            |                 |             |      |         | ANHYDROUS HALITE: motted  |
|            |                 |             |      |         | colorless to moderate brown (1% 7/4) halite,  |
|            |                 |             |      |         | finely to coarseley crystalline,  \(1\%) polyhalite,  |
|            |                 |             |      |         | 1-10% brown clay locally concentrated, brown clay  |
|            |                 |             |      |         | parting at 37.1', brown clay seams at 38.3'.  |
| 7          | 31.4'-31.2'     | 100         |      |         | HALITE: clear halite,  |
|            |                 |             |      |         | coarseley  |
|            |                 |             |      |         | crystalline,  \(1\%) polyhalite,  |
|            |                 |             |      |         | 1% brown and gray  |
| 6          | 29.4'-31.4'     | 100         |      |         | ANHYDROUS HALITE: colorless to  |
|            |                 |             |      |         | moderate brown (1% 7/4) halite, finely to  |
|            |                 |             |      |         | coarseley crystalline,  \(1\%) polyhalite,  |
|            |                 |             |      |         | 1-3% clay  |
|            |                 |             |      |         | (mostly brown),  |
|            |                 |             |      |         | anhydrite stringers (\(1\% 16\)) at 31.4'.  |
| 5          | 29.4'-29.3'     | 100         |      |         | HALITE: clear halite, medium to  |
|            |                 |             |      |         | coarseley crystalline,  \(1\%) polyhalite,  |
|            |                 |             |      |         | 1% brown and gray clay from 29.3'-29.4', absent elsewhere,  |
|            |                 |             |      |         | anhydrite stringers at 29.6'-29.7', 28.0', and 27.6'.  |

(see below)
<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>PENESSION (ft.)</th>
<th>RECOVERY %</th>
<th>ROD</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>50</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>50</td>
<td></td>
<td>X</td>
<td></td>
<td>49.4' - 51.7' ARCTILLACIOUS HALITE: colorless to moderate brown (3YR 4/6) halite, coarsely crystalline. 1-2% polyhalite, 1-5% brown clay to 50.7', 5-10% from 50.7' to 51.7', brown clay breaks at 49.7', 50.6', 51.1', and 51.7'.</td>
</tr>
</tbody>
</table>

Total penetration = 51.7'.

Hole finished at 13:30 hours, 24 November 1982.
<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>RECOVERY</th>
<th>% RECOVERED</th>
<th>PROFILE</th>
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<tr>
<td>1</td>
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<td>14</td>
<td>70</td>
<td>X</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
<td>45</td>
<td>90</td>
<td>X</td>
</tr>
<tr>
<td>3</td>
<td>10</td>
<td>4.9</td>
<td>98</td>
<td>X</td>
</tr>
<tr>
<td>4</td>
<td>15</td>
<td>4.9</td>
<td>98</td>
<td>X</td>
</tr>
<tr>
<td>5</td>
<td>20</td>
<td>5.1</td>
<td>100</td>
<td>X</td>
</tr>
<tr>
<td>6</td>
<td>25</td>
<td>5.1</td>
<td>100</td>
<td>X</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0'-3.7' HALITE: clear, medium to coarse crystaline halite, with trace (1%) polyhalite, and trace (0.5%) gray clay blebs from 0'-2.0'</td>
</tr>
<tr>
<td>3.7'-4.8' POLYHALITE: moderate reddish-orange (10R 5/6) translucent, coarse crystaline, medium hard halite. Sedimentary lower contact. Clay parting at 4.5' (washed out by drilling)</td>
</tr>
<tr>
<td>4.8'-7.6' ANHYDRITE: (Marker Bed 139) light gray (N7), hard, dense, very thinly bedded to laminated anhydrite. Core is broken &quot;poker-chip&quot; fashion along bedding. Medium light gray (N6), moderately stiff, anhydritic clay seam (~1/2&quot;) at 7.6'</td>
</tr>
<tr>
<td>7.6'-11.3' ARGILLACEOUS HALITE: moderate reddish-orange (10R 6/6) translucent, medium crystaline halite, with some polyhalite (10-20%), some to abundant (about 25-30%) clay, and localized trace light gray (N7) clay blebs. Clay break at 7.8'. Clay parting at 11.1'</td>
</tr>
</tbody>
</table>
| 11.5'-24.3' POLYHALITE: clear, coarse crystalline halite, with 35-40% polyhalite. Polyhalite bands at 12.1', 14.4', 21.8' 
Relatively clear halite from 11.5'-12.1' and 15.5'-17.0' with some (10-15%) clay. |
| Argillaceous zone at 15.7'-15.85' Gray clay parting at 15.95' 
Gray clay break at 16.55' 
Brown clay break at 16.67' |
| Argillaceous zone at 17.5' 
Gray clay break at 22.5' 
Gray clay parting at 23.0' 
Gray argillaceous zone (30-40% clay) at 23.1'-23.3' |

<table>
<thead>
<tr>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drilling started 14:00 hours, 24 November 1982. Coring with brine.</td>
</tr>
<tr>
<td>Core Run #1 - broken in small pieces and partially dissolved. Longest piece = 0.2'.</td>
</tr>
<tr>
<td>Hit pressurised gas around 10'-12'. Drilling fluid bubbled at collar.</td>
</tr>
<tr>
<td>Drilling stopped at 16:00 hours and 12:00 24 November 1982 for Thanksgiving Holiday. Resumed coring at 08:20 hours, 26 November 1982.</td>
</tr>
<tr>
<td>From 12' to 32', drilling averaged 0.2 ft./min.</td>
</tr>
<tr>
<td>Run 6 - Longest piece = 1.3'.</td>
</tr>
<tr>
<td>RUN NUMBER</td>
</tr>
<tr>
<td>------------</td>
</tr>
<tr>
<td>6</td>
</tr>
<tr>
<td>7</td>
</tr>
<tr>
<td>8</td>
</tr>
<tr>
<td>9</td>
</tr>
<tr>
<td>10</td>
</tr>
</tbody>
</table>
**WIPP-SPDV**

**ROCK CORING LOG**

**BORING NO. D0-202**  
**TYPE & NUMBER** None  
**HOLE SIZE** NX  
**LOCATION** 0 East Drift, 406' S of Exploratory Shaft centerline, midspan

---

**STATION** S406, W19  
**COLLAR ELEV.** 1248.6'  
**DIRECTION OF DRILLING** Vertical Down

**MINE COORDINATES** N9280.6, E6874.9  
**DEPTH OF BOREHOLE** 51.4'

**DRILLING METHOD** Wet (brine)  
**DRILL MAKE/MODEL** Joy 128

**PREPARED BY** RMB, JPS/Bechtel  
**DATE** 11/24/82  
**SHEET** 3 OF 3

---

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>RECOVERY(%)</th>
<th>% RECOVERED</th>
<th>ROD</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
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</thead>
<tbody>
<tr>
<td>11</td>
<td>50</td>
<td>41</td>
<td>100</td>
<td></td>
<td>(as above)</td>
<td></td>
<td>Run 11 - pulled at 12:30 hours, 26 November 1982. Total depth = 51.4'.</td>
</tr>
</tbody>
</table>
**WIPP-SPDV**

**ROCK CORING LOG**

**UPWARD CORING**

**BORING NO.** DD-203  
**INSTRUMENT** Extensometer  
**TYPE & NUMBER** GE-235  
**HOLE SIZE** NY  
**LOCATION** East 140 Drift, 624’ N of Exploratory Shaft centerline, 6.8’ from W rib  
**STATION** N624, E140  
**COLLAR ELEV.** 1298.2  
**DIRECTION OF DRILLING** vertical  
**MINE COORDINATES** N10308.6, E7041.7  
**BOREHOLE PENETRATION** 52.0’  
**DRILLING METHOD** Rotary w/brine drill make/model Joy 12B  
**PREPARED BY** JPS/Rechtl  
**DATE** 2/23/83  
**SHEET** 1/ OF 3

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>PENESSION (ft)</th>
<th>RECOVERY</th>
<th>% RECOVERED</th>
<th>RQD</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>25</td>
<td>5.2</td>
<td>100</td>
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<td></td>
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<tr>
<td>5</td>
<td>20</td>
<td>5.1</td>
<td>100</td>
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<td></td>
<td>POLYHALITIC HALITE: clear and moderate reddish-orange (10YR 6/6), medium to coarse crystalline, moderately hard. Polyhalite occurs as blebs and stringers and represents 0-5% of core. Clear halite from 19.8'-20.6'.</td>
<td></td>
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<tr>
<td>4</td>
<td>15</td>
<td>5.2</td>
<td>100</td>
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<td>HALITE: argillaceous, mottled light brownish-gray (5YR 6/1) and pale yellowish brown (10YR 6/2), finely crystalline, moderately hard. Clay content 3-8%. Brown clay breaks at 13.9' and 14.2'.</td>
<td></td>
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<tr>
<td>3</td>
<td>10</td>
<td>2.0</td>
<td>100</td>
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<td></td>
<td>HALITE: clear, medium to coarse crystalline, moderately hard, trace of scattered blebs of orange polyhalite. Few hairline stringers of white (9H) anhydrite.</td>
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<tr>
<td>2</td>
<td>5.2</td>
<td>100</td>
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<td></td>
<td>ANHYDRITE: medium gray (5H), hard, dense, microcrystalline.</td>
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<tr>
<td>1</td>
<td>1.7</td>
<td>35</td>
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<tr>
<td>0</td>
<td>90</td>
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</tbody>
</table>

Began coring at 10:15 hours on 23 February 1983. Cored from 0'-1.0' using 6' single tube barrel. Cored from 1.0'-5.8' without inner core tube.

Core loss in Run 1 occurred throughout core run.

Encountered trace of gas at 14.5'.
**WIPP-SPDV**

**WASTE ISOLATION PILOT PLANT**

**ROCK CORING LOG**

**UPWARD CORING**

**BORING NO.:** DO-203  
**TYPE & NUMBER:** GE-235  
**HOLE SIZE:** NX

**LOCATION:** East 140 Drift, 624' N of Exploratory Shaft centerline, 6.8' from W rib

**STATION:** N624, E140  
**COLLAR ELEV.:** 1298.2  
**DIRECTION OF DRILLING:** Vertical up

**MINE COORDINATES:** N10308.6', E7041.7'  
**BOREHOLE PENETRATION:** 52.0'

**DRILLING METHOD:** Rotary w/brine DRILL  
**MAKE/MODEL:** Joy 12B

**PREPARED BY:** JPS/Bechtel  
**DATE:** 2/23/83  
**SHEET:** 2 of 3

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>PENETRATION (ft.)</th>
<th>RECOVERY</th>
<th>% RECOVERED</th>
<th>RQD</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
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<td>42.4'-50.1'</td>
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<td>AGENILACIOUS HALITE: clear and mottled pale brown (5YR 5/2), pale yellowish-brown (10YR 6/2) and brownish-gray (5YR 4/1). Finely to coarsely crystalline, moderately hard. Clay content from 0 to 25% with brown clay breaks at: 42.3', 45.0', 45.3', 45.8', 46.2', 47.0', 47.2', 48.9', 49.3', and 49.6'. At 45.9', 1/2&quot; thick, moist; brown clay seam.</td>
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<td>37.6'-42.4'</td>
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<td>AGENILACIOUS HALITE: clear, medium to coarsely crystalline, moderately hard. Trace of moderate reddish-orange (10R 6/6) polyhalite stringers from 39.5'-42.0'.</td>
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<td>36.9'-37.6'</td>
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<td>AGENILACIOUS HALITE: medium light gray (86), very hard, dense, microcrystalline. Few clear halite stringers at 37.6'.</td>
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<td>32.0'-36.9'</td>
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<td>AGENILACIOUS HALITE: clear and mottled medium gray (95), brownish-gray (5YR 4/1) and pale yellowish-brown (10YR 6/2). Finely to coarsely crystalline, moderately hard. Finely crystalline from 35.9'-36.9'. Clay content ranges from 0-15% with numerous discontinuous clay breaks throughout. Clay breaks at: 33.0', 33.5', 33.5', 35.6', 35.7'. At 36.9', 1/2&quot; thick, grayish-brown (5YR 3/2) soft, moist clay seam.</td>
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<td>29.8'-32.0'</td>
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<td>HALITE: clear, coarsely crystalline, moderately hard.</td>
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<td>23.2'-29.8'</td>
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<td></td>
<td>AGENILACIOUS HALITE: clear and light brownish-gray (5YR 6/1), moderately hard, medium crystalline. Clay content ranges from 0 to 15% with clay breaks at: 29.0', 29.3' and 29.7'.</td>
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<td>24.0'-28.2'</td>
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<td></td>
<td>HALITE: clear, coarsely crystalline, moderately hard. Few scattered, white (89) anhydrite stringers.</td>
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</table>
**WIPP-SPDV**

WASTE ISOLATION PILOT PLANT

**ROCK CORING LOG**

UPWARD CORING

BORING NO. DG-201  INSTRUMENT Extensometer  HOLE SIZE NY

TYPE & NUMBER GE-235  LOCATION East 140 Drift, 624' N of Exploratory Shaft centerline.

6.8' from W rib

STATION N624, E140  COLLAR ELEV 1298.2  DIRECTION OF DRILLING vertical up

MINE COORDINATES N10308.6, E7041.7  BOREHOLE PENETRATION 52.0'

DRILLING METHOD Rotary w/brine DRILL MAKE/MODEL Joy 12B

PREPARED BY JPS/Bechtel  DATE 2/23/83

SHEET

3 OF 3

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>PENETRATION (ft.)</th>
<th>% RECOVERED</th>
<th>ROD</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>2.9</td>
<td>100</td>
<td>X</td>
<td>50-52</td>
<td>HALITE: clear to moderate reddish-orange (10R 6/6), coarsely crystalline, moderately hard. Trace of orange polyhalite occurs as blebs and stringers</td>
<td></td>
</tr>
</tbody>
</table>

Total Penetration = 52.0'

Hole completed at 19:00 hours on 23 February 1983.
# WIPP-SPDV ROCK CORING LOG

**WASTE ISOLATION PILOT PLANT**

**BORING NO.** DO-204  
**TYPE & NUMBER** None  
**HOLE SIZE** NX  
**LOCATION** East 140 Drift, 624' N of Exploratory Shaft centerline 6.8' from W rib  
**STATION** N640, E140  
**COLLAR ELEV.** 1290.5  
**DIRECTION OF DRILLING** down  
**MINE COORDINATES** N10308.5, E7041.5  
**DEPTH OF BOREHOLE** 51.6'  
**DRILLING METHOD** Rotary w/brine  
**DRILL MAKE/MODEL** Joy 12B  
**PREPARED BY** JPS/Bechtel  
**DATE** 2/24/83  
**SHEET** 1 of 3

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (f)</th>
<th>RECOVERY %</th>
<th>ROD</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>.7 35</td>
<td>-</td>
<td></td>
<td>8.0'-7.1'</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>5</td>
<td>1.9 46</td>
<td>-</td>
<td></td>
<td>7.1'-8.9'</td>
<td>MALITE: polyhedral, clear and moderate reddish-orange (10R 6/6), coarsely crystalline, moderately hard. Polyhalite occurs as scattered stringers and blebs and represents from 0-3% of core. Dense polyhalite seam (1/4&quot;) at 8.9'.</td>
</tr>
<tr>
<td>3</td>
<td>10</td>
<td>4.7 100</td>
<td>-</td>
<td>X</td>
<td>8.9'-11.5'</td>
<td>ANHYDRITE: very light gray (N8) to medium light gray (N9), hard to very hard, dense, microcrystalline. Core broken into 1/8&quot;-1/4&quot; chippy throughout; slightly banded in part.</td>
</tr>
<tr>
<td>4</td>
<td>15</td>
<td>5.0 100</td>
<td>-</td>
<td>X X</td>
<td>11.5'-13.3'</td>
<td>CLAY: medium gray (N5), moist, soft, highly plastic.</td>
</tr>
<tr>
<td>5</td>
<td>20</td>
<td>5.1 100</td>
<td>-</td>
<td>X X</td>
<td>13.3'-15.3'</td>
<td>MALITE: argillaceous, clear and light gray (N7) to grayish orange-pink (5YR 7/2). Trace of polyhalite throughout. Medium to coarsely crystalline, moderately hard. Clay content ranges from 0 to 15% with gray clay breaks at: 11.7', 12.0', 13.0', 13.5', and 14.0'.</td>
</tr>
<tr>
<td>6</td>
<td>25</td>
<td>5.2 100</td>
<td>-</td>
<td>X X</td>
<td>15.3'-27.5'</td>
<td>MALITE: polyhedral, clear and moderate reddish-orange (10R 6/6), and grayish-orange (10YR 7/4). Medium to coarsely crystalline, moderately hard, polyhalite content ranges from 0 to 20% locally and occurs interstitially and as isolated blebs and stringers. Trace of argillaceous halite from 19.0'-21.0'. Clay breaks at: 19.6', 19.7', and 20.0'.</td>
</tr>
</tbody>
</table>

Began coring at 18:15 hrs. on 23 February 1983.  
Cored from 0 to 0.7' with 6" single tube core barrel. Cored without inner tube from 0.3' to 6.4'.

Core Loss:

Run Where Lost  
1 Throughout Run  
2 Throughout Run  
3 0.3' loss between 32.0' to 33.0'
## WIPP-SPDV ROCK CORING LOG

**WASTE ISOLATION PILOT PLANT**

**INSTRUMENT**

**BORING NO.** D0-204 **TYPE & NUMBER** None **HOLE SIZE** NY

**LOCATION** East 140 Drift, 624' N of Exploratory Shaft centerline 6.8'

from W rib

**STATION** N640, E140 **COLLAR ELEV.** 1290.5 **DIRECTION OF DRILLING** down

**MINE COORDINATES** N10308.5, E7041.5 **DEPTH OF BOREHOLE** 51.6'

**DRILLING METHOD** Rotary w/brine **DRILL MAKE/MODEL** Joy 12B

**PREPARED BY** JPS/Bechtel **DATE** 2/24/83 **SHEET**

### Table

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft)</th>
<th>RECOVERY %</th>
<th>RECOVERED</th>
<th>ROD PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>25</td>
<td>52</td>
<td>100</td>
<td>X</td>
<td>(as above)</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>4.9</td>
<td>4.9</td>
<td>100</td>
<td>X</td>
<td>27.9'-31.3' HALITE: argillaceous, clear and light gray (N7) to light brownish-gray (5YR 6/1), fine to medium crystalline, moderately hard. Clay content up to 5% with few isolated blebs of orange polyhalitic halite throughout. Gray clay breaks at 28.3', 30.0', and 31.1'.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>30</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>4.3</td>
<td>4.3</td>
<td>86</td>
<td>X</td>
<td>31.3'-37.2' POLYHALITIC HALITE: clear and moderate reddish-orange (10R 6/6), medium to coarsely crystalline, moderately hard. Polyhalite occurs as dense stringers and isolated blebs and represents 0-10% of core. At 35.7', 1/2&quot; thick, hard, dense polyhalite seam.</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>5.2</td>
<td>5.2</td>
<td>100</td>
<td>X</td>
<td>37.2'-37.4' ANHYDRITE: medium light gray (N6), very hard, dense microcrystalline. At 37.4', medium gray (N5) clay parting.</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>4.8</td>
<td>4.8</td>
<td>100</td>
<td>X</td>
<td>37.4'-49.8' ANILLACEOUS HALITE: clear and mottled light gray (N7), to light brownish-gray (5YR 6/1) to pale yellowish-brown (10YR 6/2), finely to coarsely crystalline, moderately hard. Clay content ranges from 0-25% with trace of interstitial orange polyhalite below 43.9'. Numerous brown and gray clay breaks throughout. Dominant clay breaks at: 37.6', 38.0', 40.1', 44.3', 45.4', 45.5', 45.7', 46.6', 47.0', and 48.9'.</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>5.3</td>
<td>5.3</td>
<td>100</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RUN NUMBER</td>
<td>DEPTH (ft)</td>
<td>RECOVERY %</td>
<td>RQD</td>
<td>PROFILE</td>
<td>DESCRIPTION</td>
<td>REMARKS</td>
</tr>
<tr>
<td>------------</td>
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</tr>
<tr>
<td>11</td>
<td>50</td>
<td>5.3</td>
<td>100</td>
<td>-</td>
<td>49.8'-51.6' HALITE: clear, coarsely crystalline, moderately hard, with trace grey clay in part.</td>
<td>Hole completed at 10:00 hours on 26 February 1983. Total Depth = 51.6'</td>
</tr>
</tbody>
</table>
# WIPP-SPDV ROCK CORING LOG
## UPWARD CORING

**BORING NO.** D0-205  
**TYPE & NUMBER** None  
**HOLE SIZE** NX  
**LOCATION** 0 East Drift, 1410' N of Exploratory Shaft centerline.  
12-1/2' from E rib  
**STATION** N1410, E0  
**ELEV.**  1316.5'  
**DIRECTION OF DRILLING** Vertical  
**MINE COORDINATES** N11095, E6892  
**BOREHOLE PENETRATION** 50.7'  
**DRILLING METHOD** Rotary w/brine drill  
**MAKE/MODEL** Joy 12B  
**PREPARED BY** JPS/Bechtel  
**DATE** 2/19/83  
**SHEET** 1 OF 3

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>PENETRATION (ft.)</th>
<th>RECOVERY %</th>
<th>RECOVERED</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
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<tbody>
<tr>
<td>25</td>
<td>6.1-6.3</td>
<td>97</td>
<td>97</td>
<td></td>
<td>Anhydrite: very light gray (N9), hard, dense, microcrystalline, broken into 1/8&quot; chips. Soft, gray clay parting at 6.1'.</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>5.2</td>
<td>100</td>
<td>97</td>
<td></td>
<td>Anhydrite: medium gray (N3) to very light gray (N9); hard, dense, microcrystalline, slightly banded in part. Moist, gray clay parting at 12.9'.</td>
<td>At 12.9' encountered gas. No detectable gas after 5 minutes.</td>
</tr>
<tr>
<td>5</td>
<td>4.8</td>
<td>100</td>
<td>97</td>
<td></td>
<td>Halite: clear, finely crystalline, moderate hard, few white (N9) hairline anhydrite stringers throughout. Trace polyhalite from 6.3'-7.1'. Finely crystalline above 12.0'. Trace of light gray (N7) interstitial clay moves 12.0'. Gray clay breaks at 12.5' and 12.7'.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>3.0</td>
<td>97</td>
<td>97</td>
<td></td>
<td>Anhydrite: clear, finely crystalline, moderately hard, few white (N9) hairline anhydrite stringers throughout. Trace polyhalite from 6.3'-7.1'. Finely crystalline above 12.0'. Trace of light gray (N7) interstitial clay moves 12.0'. Gray clay breaks at 12.5' and 12.7'.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>2.0</td>
<td>100</td>
<td>97</td>
<td></td>
<td>Anhydrite: argillaceous and polyhalite in part. Clear to moderate reddish-orange (10R 6/6) to light gray (5 YR 6/4) to medium gray (N3). Finely to coarsely crystalline, moderately hard. Finely crystalline above 4.6'. Few gray clay breaks at 4.4', 5.4' and 5.9'. Clay and polyhalite represent 0-3% of core.</td>
<td>Coring began at 09:00 hours on 18 February 1983. Cored from 0'-1.0' with 6&quot; core barrel. From 1.0'-6.1' cored without use of inner core barrel.</td>
</tr>
<tr>
<td>0</td>
<td>0.9</td>
<td>90</td>
<td>90</td>
<td></td>
<td>Anhydrite: clear, finely crystalline, moderate hard, few white (N9) hairline anhydrite stringers throughout. Trace polyhalite from 6.3'-7.1'. Finely crystalline above 12.0'. Trace of light gray (N7) interstitial clay moves 12.0'. Gray clay breaks at 12.5' and 12.7'.</td>
<td></td>
</tr>
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</table>
**WIPP-SPDV**

**ROCK CORING LOG**

**UPWARD CORING**

**WASTE ISOLATION PILOT PLANT**

**INSTRUMENT**

**BORING NO. 20-205**

**TYPE & NUMBER**

**HOLE SIZE**

**LOCATION**

0 East Drift, 1410' N of Exploratory Shaft centerline.

**12½' from E rib**

**STATION** N11095, E6822

**COLLAR ELEV.** 1316.5'

**DIRECTION OF DRILLING**

**BOREHOLE PENETRATION** 50.7'

**DRILLING METHOD** Rotary w/brinedrill

**MAKE/_MODEL** Joy 12B

**PREPARED BY** JPS/Bechtel

**DATE** 2/19/83

**SHEET** 2 OF 3

---

### Description of Core Samples

- **46.1'-49.1'**: Angilaceous Halite: clear to mottled brownish-gray (5YR 4/1) to medium light gray (6/6) to moderate brown (7.5YR 3/6). Finely to coarsely crystalline, moderately hard. Numerous clay breaks and partings with clay composing 0-20% of core. Finely crystalline from 47.8'-48.9'. Brown clay breaks at 46.4', 46.7', 46.9', 47.4', 47.9', 48.0', 48.1', 48.3' and 48.7'. Clay partings at 46.8', 46.8' and 48.9'.

- **43.1'-46.1'**: Halite: clear, medium to coarse crystalline, moderately hard, numerous blebs and stringers of very light gray (7) anhydrite. Trace of orange polyhalite at 43.6'. Trace of brownish-gray (5YR 4/1) clay at 45.6'-45.8'.

- **40.4'-43.1'**: Angilaceous Halite: clear to mottled grayish-brown (5YR 3/2), pale yellowish-brown (10YR 6/2) and moderately reddish-orange (10R 6/6), finely to coarsely crystalline, moderately hard. Finely crystalline from 41.0'-43.0'. Clay content ranges from 0-15% with trace of interstitial polyhalite from 42.2'-43.0'. Clay breaks at 40.7', 40.8', 41.2', 41.4', 41.8', 42.0', 42.3' and 43.0'.

- **36.2'-40.4'**: halite: clear, coarsely crystalline, moderately hard. Trace of polyhalite throughout. Some isolated stringers of very light gray (8) anhydrite.

- **35.4'-36.2'**: Anhydrite: light gray (7) to medium gray (5Y), very hard, dense.

- **35.3'-35.6'**: Clay: grayish brown (5YR 3/2), moist, firm to stiff, highly plastic, dense. Horizontal contact with anhydrite above.

- **31.5'-33.3'**: Angilaceous Halite: clear to pale yellowish-brown (10YR 6/2) and medium gray (8), finely to coarsely crystalline, moderately hard, numerous brown clay breaks throughout; clay represents about 3-12% of core. Clay breaks at 31.5', 31.8', 32.9', 33.6', 33.6' and 34.0'.
<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>PENETRATION (ft.)</th>
<th>RECOVERY</th>
<th>% RECOVERED</th>
<th>ROD</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>4.1</td>
<td>100</td>
<td>17</td>
<td>X</td>
<td></td>
<td>49.1'-50.7' HALITE: polyhalite, clear and moderate reddish orange (10R 6/6), coarsely crystalline, moderately hard. Polyhalite comprises 0-3% of core and occurs as isolated blabe and stringers.</td>
<td></td>
</tr>
</tbody>
</table>

Total Penetration = 50.7'

Completed hole at 15:00 hours on 18 February 1983.
### ROCK CORING LOG

**BORE NUMBER**: 0106  
**TYPE & NUMBER**: None  
**HOLE SIZE**: NX  
**LOCATION**: 0 East Drift, 1410' N of Exploratory Shaft centerline, 124' from E rib

**STATION**: N1410, 00  
**COLLAR ELEV.**: 1308.0'  
**DIRECTION OF DRILLING**: Vertical down  
**MINE COORDINATES**: N11095, E6892  
**DEPTH OF BOREHOLE**: 50.6'  
**DRILLING METHOD**: Rotary w/brine  
**DRILL MAKE/MODEL**: Joy 12B  
**PREPARED BY**: JPS/Bechtel  
**DATE**: 2/22/83  
**SHEET**: 1 of 3

### RUN NUMBER | DEPTH (ft) | RECOVERY % | ROD | PROFILE | DESCRIPTION | REMARKS
--- | --- | --- | --- | --- | --- | ---
1 | 0 | - | X | - | 0.0'-0.5' **HALITE**: argillaceous and polygonal in part. Clear to moderate reddish-orange (10R 6/6) and light gray (N7), finely to coarsely crystalline, moderately hard. Interstitial clay composed up to 12% of core as does isolated blebs and stringers of orange polylite. Clear halite from 8.5'-9.5'. |  
2 | 3.3 | 55 | - | X | 9.5'-13.2' **POLYHALITIC HALITE**: clear and moderate reddish-orange (10R 6/6), coarsely crystalline, moderately hard. Polyhalite is interstitial and locally represents up to 25% of core. Hard polyhalite seam at 13.1'. |  
3 | 6.3 | 100 | - | X | 13.2'-16.6' **ANNIDITE**: light gray (N7) to very light gray (N8) hard, dense, microcrystalline. |  
4 | 17.0 | 100 | - | X | 14.4'-20.4' **POLYHALITIC HALITE**: clear to moderate reddish-orange (10R 6/6), medium to coarsely crystalline, moderately hard. Polyhalite ranges from 0-20X and occurs as blobs and stringers throughout. At 18.0', hard, dense, 1/4" thick polyhalite seam. Trace of clay from 19.5'-19.9' with 1/2" thick gray clay seam at 19.5'. |  
5 | 22.2 | 100 | - | X | 20.6'-21.8' **HALITE**: argillaceous, clear and medium gray (N5), medium to coarsely crystalline, moderately hard. Clay content ranges from 0-5% and occurs interstitially. Gray clay breaks at 20.5', 21.1', 21.2' and 21.3'. |  
6 | 25 | - | X | X | (see description on next sheet) |  

Hole began at 09:30 hours on 21 February 1983. Cored from 0' to 6.0' without inner core barrel.

Core Loss:
- Run Length: T  
  - Throughout Run '3 11.3'-13.2'  
  - Encountered gas at 13.2'.

(x means hole pick did not cut through layer)
## WIPP-SPDV ROCK CORING LOG

**WASTE ISOLATION PILOT PLANT**

**BORING NO.:** DO-206  **TYPE & NUMBER:** None  **HOLE SIZE:** NX

**LOCATION:** 0 East Drift, 1410' N of Exploratory Shaft centerline, 12½' from E rib

**STATION:** N1410, EO  **COLLAR ELEV.:** 1308.0'  **DIRECTION OF DRILLING:** vertical down

**MINE COORDINATES:** NN1095, E6892  **DEPTH OF BOREHOLE:** 50.6'

**DRILLING METHOD:** Rotary w/brine DRILL MAKE/MODEL: Joy 12B

**PREPARED BY:** JPS/Bechtel  **DATE:** 2/22/83  **SHEET:** 2 of 3

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>% RECOVERED</th>
<th>ROD</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>25</td>
<td>5.2</td>
<td>100</td>
<td>-</td>
<td>21.8'-27.2' POLYHALITE: clear and moderate reddish-orange (10R 6/6), medium to coarsely crystalline, moderately hard. Polyalbite comprises up to 25% of core in dense stringers and blebs with some interstitial halite. Trace of clay at 25.3' and 25.9' with gray clay parting at 25.3'.</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>30</td>
<td>5.1</td>
<td>100</td>
<td>-</td>
<td>27.3'-30.9' HALITE: argillaceous and polylalbite, clear and mottled medium gray (NS) to light gray (N7) to moderate reddish-orange (10R 6/6). Finely to medium crystalline, moderately hard. Clay clay represents 3-8% of core and orange polyhalite 1-2%. Clay and polyhalite occur interstitially throughout. Gray clay breaks at 27.3', 27.5', 27.8', 28.6', 29.5', 29.7', 30.0' and 30.7'.</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>35</td>
<td>5.2</td>
<td>100</td>
<td>X X</td>
<td>30.9'-35.9' POLYHALITE: clear and moderate reddish-orange (10R 6/6), medium crystalline, moderately hard. Polyhalite occurs interstitially and as isolated blebs and represents from 0-10% of core. 1/2&quot; thick polyhalite seams at 35.4' and 35.8'.</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>40</td>
<td>5.3</td>
<td>100</td>
<td>-</td>
<td>35.9'-36.9' HALITE: clear, medium to coarsely crystalline, moderately hard; very thin, hairline stringers of anhydrite at 36.5'.</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>45</td>
<td>5.3</td>
<td>100</td>
<td>-</td>
<td>36.9'-37.1' ANHYDRITE: light gray (N7), hard, dense, microcrystalline with medium gray (NS) 1/8&quot; thick, soft, moist, clay parting at 37.1'.</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>50</td>
<td>3.0</td>
<td>100</td>
<td>-</td>
<td>37.1'-50.6' HALITE: argillaceous, clear to mottled brownish-gray (5YR 4/1), light gray (N7) and light brown (5YR 6/4). Medium to coarsely crystalline, moderately hard, trace polyhalite from 43.2' to 46.3'. Clay content ranges from 0-15% and occurs interstitially. Clear halite from 37.5'-38.4', 41.0'-42.0', and 50.3'-50.6'. Gray or brown clay breaks at 38.9', 39.7', 44.3', 45.3', 46.0', 46.3', 46.4', 46.5', 47.3' and 49.0'.</td>
<td></td>
</tr>
</tbody>
</table>
WIPP-SPDV
WASTE ISOLATION PILOT PLANT

BORING NO. 00-206 TYPE & NUMBER None HOLE SIZE NW
LOCATION 0 East Drift, 1410' N of Exploratory Shaft centerline

12½' from E rib
STATION NI610, E0 COLLAR ELEV. 1208.0' DIRECTION OF DRILLING down
MINE COORDINATES NI1095, E6892 DEPTH OF BOREHOLE 50.6'
DRILLING METHOD Rotary w/brine DRILL MAKE/MODEL Joy 12B

PREPARED BY JPS/Bechtel DATE 2/22/83 SHEET 3 of 3

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft)</th>
<th>RECOVERY</th>
<th>% RECOVERED</th>
<th>RQD</th>
<th>PROFILE</th>
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<td>100</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>Total Depth = 50.6'</td>
<td></td>
</tr>
<tr>
<td></td>
<td>55</td>
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<td></td>
<td></td>
<td></td>
<td>Hole completed at 14:30 hours on 21 February 1983</td>
<td></td>
</tr>
</tbody>
</table>
## WIPP-SPDV
### ROCK CORING LOG
#### UPWARD CORING

**BORING NO.** DO-229  
**INSTRUMENT** None  
**TYPE & NUMBER** None  
**HOLE SIZE** NX  
**LOCATION** East 140 Drift, 401’ S of Exploratory Shaft Centerline, 13.7’ from E rib

**STATIONS** 401, E 153  
**COLLAR ELEV.** 1259.8  
**DIRECTION OF DRILLING** Vertical up  
**MINE COORDINATES** N9287 E7049  
**BOREHOLE PENETRATION** 50.6’

**DRILLING METHOD** Rotary w/Brine Drill  
**MAKE/MODEL** Joy 12B

**PREPARED BY** RMB/Bechtel  
**DATE** 3/4/83  
**SHEET** 1 OF 3

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<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>PENETRATION (ft.)</th>
<th>RECOVERY % RECOVERED</th>
<th>RQD PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
</table>
| 8          | 4.0 80           | - X                   | -           | 20.8' - 22.3'  
             |                  |                      |             | ANHYDROUS HALITE: (lower contact approximate) pale brown (5YR 5/2) to moderate brown (5YR 3/4), mottled, medium to coarsely crystalline, moderately hard. Contains 2-5% brown clay, trace only from 20.8' - 21.3'. Contains several clay breaks. | Core Loss:  
             |                  |                      |             | Run 1 - at 1.4'  
             |                  |                      |             | Run 2 - throughout  
             |                  |                      |             | Run 6 - throughout  
             |                  |                      |             | Run 7 - intermittently between 16.4' - 20.0'  
             |                  |                      |             | Run 8 - throughout  

| 7          | 4.5 88           | X                     | X           | 16.4' - 20.8'  
             |                  |                      |             | POLYHYALIC HALITE: clear, mottled with moderate reddish-orange (10R 6/6) polyhalite, medium to coarsely crystalline. Polyhalite content varies from 1 to 3% and occurs as discrete blebs and stringers. Also contains 1-2% very light gray (80), blebs and thin anhydrite stringers. Polyhalite absent from 18.6' to 19.3'. | Stuffing box blown out of coller three times during Run #6, at approximately 12', 15', and 15.9'. Gas has high pressure but low volume. Flow lasted for about one minute in each case.  

| 6          | 4.3 86           | X                     | X           | 15.9' - 16.6'  
             |                  |                      |             | ANHYDROUS: (Anhydrite "a") medium light gray (86) to white, banded, microcrystalline, hard, dense. Trace of gray clay at 15.9'. | Brief flow of gas at moderate pressure at 8.5'.  

| 5          | 5.1 100          | X                     | X           | 8.5' - 8.6'  
             |                  |                      |             | ANHYDROUS: (Anhydrite "b") medium gray (85), banded, hard, dense, microcrystalline. Trace of gray clay at 8.5'. | Inner core barrel was used after 6.3'.  

| 4          | 1.3 100          | - X                   | -           | 5.3' - 8.5'  
             |                  |                      |             | ANHYDROUS HALITE: brownish-gray (5YR 4/1), medium crystalline, moderately hard. 5% clay from 5.3' to 6.8'. 5% clay 6.8' to 8.5'. Brown clay breaks at 6.9', 7.1', 7.8', 7.9', 8.2', 8.3'. | Run #3 was dropped by drillers. Core was not necessarily boxed in order.  

| 3          | 2.4 100          | X                     | X           | 0.0' - 5.3'  
             |                  |                      |             | ANHYDROUS HALITE: clear to moderate reddish-orange (10R 6/6), locally light brownish-gray (5YR 6/1), medium to coarsely crystalline, moderately hard. Trace polyhalite blebs throughout. Anhydrous (52%) from 0.0' to 0.5'. | Core Run #0 is a 5.5" diameter plug 1.0' long drilled out for stuffing box.  

| 2          | 0.6 50           | X                     | X           | -           | Coring began at 10:00 hours, 2 March 1983.  

| 1          | 0.1 75           | - X                   | -           | -           | - |

| 0          | 0.1 100          | - X                   | -           | -           | - |
# WIPP-SPDV ROCK CORING LOG

**BORING NO.** DO-229  
**TYPE & NUMBER** None  
**HOLE SIZE** NX  
**LOCATION** East 140 Drift, 401' S of Exploratory Shaft Centerline, 13.7' from E rib  
**STATION** 401, E 153  
**COLLAR ELEV.** 1259.8  
**DIRECTION OF DRILLING** Vertical up  
**MINE COORDINATES** N9287'-E7049  
**BOREHOLE PENETRATION** 50.6'  
**DRILLING METHOD** Rotary w/Brine DRILL MAKE/MODEL Joy 12B  
**PREPARED BY** RMB/Bechtel  
**DATE** 3/4/83  
**SHEET** 2 of 3

## Core Description

<table>
<thead>
<tr>
<th>RUN (in.)</th>
<th>PENETRATION (ft.)</th>
<th>RECOVERY %</th>
<th>RQD</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
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<tbody>
<tr>
<td>13</td>
<td>50</td>
<td>![X]</td>
<td></td>
<td></td>
<td>(see description on next sheet)</td>
<td></td>
</tr>
<tr>
<td>45.2'-48.1'</td>
<td>HALITE: clear, mottled locally with moderate brown (5YR 3/4) clay, medium to coarsely crystalline, moderately hard. Clay content increases upward: trace brown clay.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45.2'-47.0'</td>
<td></td>
<td>![X]</td>
<td></td>
<td></td>
<td>2% 47.0'-47.6', 10% with clay breaks 47.6'-48.0'. Trace polyhalite blebs 45.2'-47.0'.</td>
<td></td>
</tr>
<tr>
<td>40.4'-45.2'</td>
<td>HALITE: clear, mottled with moderate reddish-orange (10R 6/6) polyhalite, medium to coarsely crystalline, moderately hard. Contains 1-4% polyhalite as discrete blebs and stringers. Also contains trace very light gray anhydrite blebs.</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>39.9'-40.4'</td>
<td>AMNIDITE: medium gray (MS), banded with very light gray (MS), microwhite, hard, dense. Underlain by 1/2&quot; thick brown clay seam.</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>30.4'-39.9'</td>
<td>ANGLICONEOUS HALITE: pale brown (5YR 5/2) to moderate brown (5YR 3/4), locally clear mottled with moderate reddish-orange polyhalite, fine to coarsely crystalline, moderately hard. Clay content about 2-3%. Numerous brown clay breaks. Trace polyhalite without clay from 31.7'-32.2' and 36.8'-39.5'. Clear halite from 32.4'-34.0'.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23.2'-30.4'</td>
<td>HALITE: clear, medium to coarsely crystalline, moderately hard. Traces of polyhalite and brown clay 23.2'-26.5'. Light gray anhydrite seam underlain by brown clay partings 26.5'-26.6'. Very light gray anhydrite seam, 1/8&quot;-1/4&quot;, at 27.6', and a few hairline anhydrite stringers throughout.</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

**Core Loss:**
- Run 9 - intermittently between 26.5'-26.0'
- Run 10 - throughout

**Remarks:**
- Violent bursts of pressurized gas at about 20', and again at about 31'. Stuffing box blown out of collar both times. Very high flow for 30% seconds, then diminished to a strong flow for 2-3 minutes, then dissipated.
**WIPP-SPDV**

**WASTE ISOLATION PILOT PLANT**

**ROCK CORING LOG**

**UPWARD CORING**

**BORING NO.** DO-229  **TYPE & NUMBER** None  **HOLE SIZE** NX

**LOCATION** East 140 Drift, 401' S of Exploratory Shaft Centerline, 13.7' from E rib

**STATION** 401, E 153  **COLLAR ELEV.** 1259’  **DIRECTION OF DRILLING** Vertical up

**MINE COORDINATES** N9287 E7049  **BOREHOLE PENETRATION** 50.6’

**DRILLING METHOD** Rotary w/Brine  **DRILL MAKE/MODEL** Joy 12B

**PREPARED BY** RMB/Bechtel  **DATE** 3/4/83  **SHEET** 3 OF 3

<table>
<thead>
<tr>
<th>PENETRATION (ft.)</th>
<th>RECOVERY</th>
<th>% RECOVERED</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
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<tbody>
<tr>
<td>13</td>
<td>40</td>
<td>100</td>
<td>X</td>
<td></td>
</tr>
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</table>

48.1'-50.6' -- **HALITE**: predominately clear, locally mottled with moderate brown clay and moderate reddish-orange polyhalite, medium to coarsely crystalline, moderately hard. Contains trace polyhalite blebs throughout and trace brown clay 50.4'-50.6'. Possible clay break at 48.4'.

Hole completed at 11:30 hours on 3 March 1983.
### GEOLOGIC DRILL LOG

**WIPP**

**WASTE ISOLATION PILOT PLANT**

**INSTRUMENT TYPE & NUMBER:**

**HOLE TYPE/ SIZE:** 4" CORE

**BORING NO:** OH-9

**LOCATION:** CENTERLINE OF ROOM L-1; TEST ROOM 1 INTERSECTION; ROOF

**STATION:** M1433 W231.5

**COLLAR ELEV:** 1310 ±

**MINE COORDINATES:** N11,125.6 E5662.9

**DEPTH OF BOREHOLE:** 15.4 FT

**DRILLING METHOD:** ROTARY/AIR

**DRILL MAKE/MODEL:** LONGYEAR 65

**DATE STARTED:** 2-27-84 (DAY)

**DATE COMPLETED:** 2-28-84 (DAY)

**LOGGED BY:** J. E. GALLERANI

**DATE:** 2-28-84

---

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (FT.)</th>
<th>LENGTH CORE RUN</th>
<th>CORE RECOVERY</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.0' - 4.2' HALITE: Clear, coarsely crystalline. &lt;1% polyhalite. 1% from 1.0 to 2.0'.</td>
<td>4&quot; dia. thin wall masonry core barrel. Used with NW rods.</td>
</tr>
<tr>
<td>1.85</td>
<td></td>
<td>1.85</td>
<td>1.85</td>
<td>X</td>
<td>4.2' - 7.3' HALITE: Clear, coarsely crystalline to 6.3'. Then medium to coarse. &lt;1% grey inter-crystalline clay. &lt;1/2% dispersed polyhalite.</td>
<td>Hole drilled by SNL.</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>3.75</td>
<td>3.75</td>
<td>X</td>
<td>7.3' - 7.45' ANHYDRITE b: Grey, microcrystalline anhydrite. Up to 1/2&quot; halite layer at 7.4'. Trace of grey clay at 7.3'. Upper contact tightly welded. Intact core.</td>
<td>Dry hole. No gas. Core broken in several places at lower contact of anhydrite b. Unable to determine if any separation exists.</td>
</tr>
<tr>
<td>3.75</td>
<td>3.75</td>
<td>100</td>
<td></td>
<td></td>
<td>7.45' - 13.15' HALITE: Clear; coarsely crystalline. Scattered white stringers.</td>
<td></td>
</tr>
<tr>
<td>9.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>13.15' - 13.95' HALITE: Clear to light grey (N7); medium to coarsely crystalline. &lt;1% grey clay. &lt;1/2% dispersed polyhalite.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>3.05</td>
<td>3.05</td>
<td>X</td>
<td>13.95' - 14.45' ANHYDRITE a: Light grey to white anhydrite with scattered halite growths from 14.15'. Upper contact tightly welded. Lower contact has &lt;1/16&quot; grey clay.</td>
<td>Core broken at 13.95'. Smooth, horizontal break. Unable to determine any separation from core here.</td>
</tr>
<tr>
<td>3.05</td>
<td>3.05</td>
<td>100</td>
<td></td>
<td></td>
<td>14.45' - 15.4' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6); coarsely crystalline. &lt;1 to 3% polyhalite.</td>
<td></td>
</tr>
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**BORING NO:** CH-9
### WIPP GEOLeGIC DRILL LOG

**WASTE ISOLATION PILOT PLANT**

**INSTRUMENT TYPE & NUMBER**

**HOLE TYPE/SIZE** Core

**BORING NO.** OH-11

**LOCATION** CENTERLINE OF ROOM L-2 AND TEST ROOM 2 INTERSECTION; ROOF

---

**STATION** N1433 W564.5

**COLLAR ELEV.** 1308 ±

**DIRECTION OF DRILLING** Vertical Up

**MINE COORDINATES**

**DEPTH OF BOREHOLE** 19.7 FT

**DRILLING METHOD** Rotary/Air

**DRILL MAKE/MODEL** Longyear 65

**DATE STARTED** 2-15-84 (DAY)

**DATE COMPLETED** 2-16-84 (DAY)

**SHEET**

**LOGGED BY:** J. E. GALLERANI

**DATE:** 2-15-84

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<th>LENGTH CORE RUN</th>
<th>RECOVERY %</th>
<th>RECOVERED PROFILE</th>
<th>DESCRIPTION</th>
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<tr>
<td>1</td>
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<td>1.5</td>
<td>1.5</td>
<td>100</td>
<td>X</td>
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<tr>
<td>2</td>
<td>2.5</td>
<td>3.1</td>
<td>3.1</td>
<td>100</td>
<td>X</td>
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<tr>
<td>3</td>
<td>4.6</td>
<td>5.0</td>
<td>5.0</td>
<td>100</td>
<td>X</td>
</tr>
<tr>
<td>4</td>
<td>7.6</td>
<td>2.45</td>
<td>2.83</td>
<td>100</td>
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<tr>
<td>5</td>
<td>10.45</td>
<td>3.65</td>
<td>3.65</td>
<td>100</td>
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<tr>
<td>6</td>
<td>14.1</td>
<td>3.7</td>
<td>3.7</td>
<td>100</td>
<td>X</td>
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<tr>
<td>7</td>
<td>19.7</td>
<td>1.9</td>
<td>1.9</td>
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</table>

**DESCRIPTION**

0.0' - 2.3' HALITE: Clear to moderate reddish orange (10R 6/6); coarsely crystalline. <1 to 2% polyhalite blebs and patches.

2.3' - 5.2' HALITE: Clear, some moderate reddish orange (10R 6/6); medium to coarsely crystalline. <1% polyhalite. Clay break at 3.0 - 3.2'.

5.2' - 7.6' HALITE: Clear mixed with medium light gray (N6); medium to coarsely crystalline. <1% gray clay and polyhalite.

7.6' - 7.8' ANHYDRITE b: White to light gray (N7) anhydrite with scattered halite growths. Slight trace clay at 7.6'. Upper contact is tightly welded. Core intact.

7.8' - 13.0' HALITE: Clear; coarsely crystalline. Scattered white stringers.

13.0' - 14.1' HALITE: Clear to moderate reddish orange (10R 6/6); medium to coarsely crystalline. <1/2% dispersed polyhalite and gray clay.

14.1' - 14.8' ANHYDRITE a: White to light gray (N7) microcrystalline anhydrite with scattered halite growths, especially common from 14.6 - 14.8'. <1/32" gray clay at 14.1'. Upper contact is irregular; tightly welded. Core intact. Grades into polyhalitic halite above.

14.8' - 18.4' POLYHALITIC HALITE: Clear to moderate reddish orange; coarsely crystalline. <1% polyhalite. Anhydrite stringers at 15.0 and 16.05'.

18.4' - 19.7' HALITE: Clear, medium to coarsely crystalline. <1% dispersed gray clay. Break at 18.4'.

**REMARKS**

Used 4" thin wall masonry core barrel with SW rods.

Hole drilled by SML.

Drilling time: 8-1/2 hrs. ±.

Lower contact of anhydrite a shows some core grinding. Trace of gray clay.

Core broken at lower contact of anhydrite a but pieces fit together fairly well.
## GEOLeGEc DRILL LOG

**WASTE ISOLATION PILOT PLANT**

**INSTRUMENT TYPE & NUMBER**

**HOLE TYPE/ SIZE** 4" CORE

**BORING NO.** OH-13

**LOCATION** CENTERLINE ROOM L-1 AND TEST ROOM 1 INTERSECTION; FLOOR

**STATION** N433 W231.5

**COLLAR ELEV.** 1298 +

**DIRECTION OF DRILLING** VERTICAL DOWN

**MINE COORDINATES** N11725.6 E6682.9

**DEPTH OF BOREHOLE** 9.5 FT

**DRILLING METHOD** ROTARY/AIR

**DRILL MAKE/MODEL** LONGYEAR 65

**DATE STARTED** 2-28-84 (DAY)

**DATE COMPLETED** 2-28-84 (DAY)

**SHEET LOGGED BY** J. E. GALLERAN

**DATE: 2-28-84**

**OF 1**

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN</th>
<th>RECOVERY %</th>
<th>RECOVERED PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
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<tr>
<td>1</td>
<td>2.5</td>
<td>2.5</td>
<td>100</td>
<td></td>
<td>0.0'-0.35' FILL</td>
<td>4&quot; dia. wall measure core barrel used with 2&quot; rods.</td>
</tr>
<tr>
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<td></td>
<td>0.15'-1.5' HALITE: Clear, coarsely crystalline. &lt;1% gray intercrystalline clay.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>3.15</td>
<td>3.15</td>
<td>100</td>
<td></td>
<td>1.5'-4.4' HALITE: Clear with some moderate reddish orange (10R 6/6); coarsely crystalline. &lt;1% polyhalite blebs and patches. Gray clay break at 2.5'.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4.4'-4.6' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6); coarsely crystalline. &lt;1% gray clay. 1 to 3% polyhalite. Some anhydrite present.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>5</td>
<td>3.85</td>
<td>100</td>
<td></td>
<td>4.6'-8.1' M1-13: Upper contact. Core is broken at 15&quot;.&lt;1/32&quot; gray clay along it. Mixture of anhydrite and halite to 7.3'. From 7.3' - 7.8' is light gray (N7) to white anhydrite. Irregular pattern of white and gray color. Near-horizontal laminae present. Hard, dry gray clay 7.8 to 8.1' (lower contact dips from 7.95 to 8.1'). 1/16&quot; halite layer at 7.85'.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>9.5</td>
<td>10</td>
<td></td>
<td></td>
<td>8.1' - 8.6' HALITE: Clear to moderate reddish orange (10R 6/6); coarsely crystalline. &lt;1/2% polyhalite. Steeply dipping, clean fracture extends from center of core at 8.0' to outer edge at 8.3'. Core not broken completely along this.</td>
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<td></td>
<td>5.6' - 9.5' HALITE: Clear to light gray (N7), medium to coarsely crystalline, some fine. &lt;1/2% polyhalite. &lt;1% gray intercrystalline clay. Several steeply dipping, clean fractures in core. Core not broken completely along any fractures. Clay breaks at 8.6' and 9.3'.</td>
<td></td>
</tr>
</tbody>
</table>
## WIPP
### WASTE ISOLATION PILOT PLANT

**INSTRUMENT**

**HOLE**

**TYPE & NUMBER**

**TYPE/ SIZE**
- 4” CORE

**BORING NO.**
- OH-14

**LOCATION**
- CENTERLINE OF ROOM 1-2 AND TEST ROOM 2 INTERSECTION, FLOOR

**STATION**
- N1433 W364.5

**COLLAR ELEV.**
- 1296 H

**DIRECTION OF DRILLING**
- DOWN

**MINE COORDINATES**
- N11.125.6
- E6529.6

**DEPTH OF BOREHOLE**
- 9.7 FT

**DRILLING METHOD**
- ROTARY/AIR

**DRILL MAKE/MODEL**
- LONGYEAR 65

**DATE STARTED**
- 2-16-84 (DAY)

**DATE COMPLETED**
- 2-17-84 (DAY)

**SHEET**
- LOGGED BY: J. E. GALLERANI
- DATE: 2-17-84
- 1 OF 1

<table>
<thead>
<tr>
<th>RUN NUMBER</th>
<th>DEPTH (ft.)</th>
<th>LENGTH CORE RUN (ft.)</th>
<th>RECOVERY %</th>
<th>PROFILE</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.0</td>
<td>1.7</td>
<td>100</td>
<td>X</td>
<td>0.0'-1.9' HALITE: Clear to moderate reddish orange (10R 6/6); coarsely crystalline with zones of fine to medium, ≤1% polyhalite. &lt;1/2% gray intercrystalline clay.</td>
<td>4-inch thin wall masonry core barrel used with SW rods. Hole drilled by SNL. Dry hole. No gas. Separation noted in walls of hole at 3.55'. While drilling hole, just below top of NB-139, had some air and drill cuttings coming out of 51X-GE-65262 hole. Coming out of extensometer hole at 4.8' depth. Core at lower contact of NB-139 is broken here. Difficult to determine any separation from looking at core. Put water in OH-14 and it came out in 51X-GE-65262 at 4.8' depth.</td>
</tr>
<tr>
<td>2</td>
<td>1.7</td>
<td>1.8</td>
<td>100</td>
<td>X</td>
<td>1.9'-4.4' POLYHALITIC HALITE: Clear to moderate reddish orange (10R 6/6); coarsely crystalline. ≤1 to 4% polyhalite. Scattered subhalite from 3.8 to 4.4'. Clear, irregular break in core at 3.55'.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>3.5</td>
<td>3.45</td>
<td>100</td>
<td>X</td>
<td>4.4'-6.95' NB-139: White to medium light gray (9G) with some moderate reddish orange (10R 6/6). Microcrystalline halite from 4.4'-5.4'. ≤1/16&quot; halite layer at 4.75' - 5.8'. Continuously through core there is a hairline fracture 1/2&quot; below this halite where core is broken along. Upper contact of NB-139 is tightly closed and dips 15°s. Less than 1/2&quot; below is a parallel break in core. Core pieces fit tightly along this though 1/2 to 3/4&quot; gray clay along lower contact.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>6.95</td>
<td>2.75</td>
<td>100</td>
<td>X</td>
<td>6.95'-9.7' HALITE: Clear to light moderate reddish orange (10R 6/6); coarsely crystalline, some medium. ≤1% dispersed polyhalite. ≤1% gray clay, intercrystalline and scattered breaks.</td>
<td></td>
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</table>
APPENDIX J

GEOMECHANICAL INSTRUMENTATION DATA PLOTS
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<th>Title/Description</th>
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</tr>
<tr>
<td>J-2</td>
<td>Schematic Symbols for Data Plots</td>
</tr>
<tr>
<td>J-3</td>
<td>Description of Instrument Identification</td>
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Figures

See Table J-1 for listing of enclosed figures.
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<tr>
<th>Figure No.</th>
<th>Title</th>
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<tbody>
<tr>
<td>J-1</td>
<td>Piezometer 31X-PE-00201 - Waste Shaft</td>
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<tr>
<td>J-2</td>
<td>Piezometer 31X-PE-00202 - Waste Shaft</td>
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<td>J-3</td>
<td>Piezometer 31X-PE-00203 - Waste Shaft</td>
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<td>Piezometer 31X-PE-00204 - Waste Shaft</td>
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<td>Piezometer 31X-PE-00205 - Waste Shaft</td>
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<td>Piezometer 31X-PE-00206 - Waste Shaft</td>
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<td>J-7</td>
<td>Piezometer 31X-PE-00207 - Waste Shaft</td>
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<td>Convergence Points - 15 Ft North of C &amp; SH Shaft</td>
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<tr>
<td>J-223</td>
<td>Convergence Points - 12 Ft West of C &amp; SH Shaft</td>
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<tr>
<td>J-224</td>
<td>Convergence Points - 18 Ft South of C &amp; SH Shaft</td>
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<tr>
<td>J-225</td>
<td>Convergence Points - 18.5 Ft South of C &amp; SH Shaft</td>
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<tr>
<td>J-226</td>
<td>Convergence Points - 30 Ft South of C &amp; SH Shaft</td>
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<tr>
<td>J-227</td>
<td>Convergence Points - 65 Ft South of C &amp; SH Shaft</td>
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<tr>
<td>J-228</td>
<td>Convergence Points - W30 Drift, South 250 Ft</td>
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<td>Convergence Points - W30 Drift, South 500 Ft</td>
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<tr>
<td>J-230</td>
<td>Convergence Points - W30 Drift - S700 Crosscut Intersection</td>
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<tr>
<td>J-231</td>
<td>Convergence Points - W30 Drift, South 850 Ft</td>
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<tr>
<td>J-232</td>
<td>Convergence Points - W30 Drift - S1000 Crosscut Intersection</td>
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<tr>
<td>J-233</td>
<td>Convergence Points - W30 Drift, South 1141 Ft</td>
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<tr>
<td>J-234</td>
<td>Convergence Points - E140 Drift, North 1266 Ft</td>
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<td>J-235</td>
<td>Convergence Points - E140 Drift, North 626 Ft</td>
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<td>Convergence Points - E140 Drift, South 460 Ft</td>
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<td>Convergence Points - E140 Drift, South 1150 Ft</td>
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<td>Convergence Points - E140 Drift, South 1246 Ft</td>
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<td>Convergence Points - E140 Drift, South 1450 Ft</td>
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<td>Convergence Points - E140 Drift, South 3639 Ft</td>
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<td>Convergence Points - E140 Drift, South 3664 Ft</td>
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<td>Convergence Points - E300 Drift - S700 Crosscut Intersection</td>
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<td>Convergence Points - E300 Drift, South 850 Ft</td>
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<td>Convergence Points - E300 Drift - S1000 Crosscut Intersection</td>
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<td>J-257</td>
<td>Convergence Points - E300 Drift, South 1150 Ft</td>
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<td>Convergence Points - W170 Drift - S700 Crosscut Intersection</td>
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<td>Convergence Points - W170 Drift, South 850 Ft</td>
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<td>Convergence Points - W170 Drift - S1000 Crosscut Intersection</td>
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<td>Convergence Points - N1100 Drift, West 1347 Ft</td>
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<td>Convergence Points - N1100 Drift - Test Room 2 Intersection</td>
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<td>Convergence Points - N1100 Drift, East 80 Ft</td>
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<td>Convergence Points - S1950 Drift, East 523 Ft</td>
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<td>Convergence Points - S1950 Drift, East 586 Ft</td>
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<tr>
<td>J-335</td>
<td>Inclinometer 51X-IG-00226</td>
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</table>
Table J-2

SCHEMATIC SYMBOLS FOR DATA PLOTS

NOT TO SCALE

**Collar (at 1')**

SHAFT IN PLAN, SHOWING EXTENSOMETER AND INSTRUMENT ANCHORS A, B, C, D AT DEPTHS 8, 10, 25, AND 50 FT., RESPECTIVELY.

SHAFT IN PLAN, SHOWING LOCATION OF STRAIN GAUGE.

SHAFT IN PLAN, SHOWING PRESSURE CELL LOCATION.

OPENING CROSS SECTION, SHOWING CONVERGENCE POINTS.

OPENING CROSS SECTION, SHOWING ROCK BOLT LOCATION AND DEPTH IN FT. CLAY PARTING SHOWN AT 3 FT.

OPENING CROSS SECTION, SHOWING EXTENSOMETER IN ROOF AND INSTRUMENT ANCHORS A, B, C, AND D AT DEPTHS 8, 10, 25, AND 50 FT., RESPECTIVELY. CLAY PARTING SHOWN AT 8 FT.

**Drift Intersection in Plan**

DRIFT INTERSECTION IN PLAN, SHOWING LOCATION OF DRIFT CROSS SECTION X-X' AND DIMENSIONS (HEIGHT x WIDTH) OF DRIFTS.

**Plan View**

TEST ROOM CROSS SECTION, SHOWING LOCATION OF CONVERGENCE METER.

**View North**

TEST ROOM CROSS SECTION, SHOWING INCLINOMETER LOCATION AND DEPTH IN FT. POSITIVE VALUE ON PLOT DENOTES UPWARD MOVEMENT.

**View North**

TEST ROOM CROSS SECTION, SHOWING STRESSMETER LOCATION AND DEPTH IN FT. ANHYDRITE BED SHOWN AT 4 TO 7 FT.
Table J-3

DESCRIPTION OF INSTRUMENT IDENTIFICATION

Field Designation (assigned in Bechtel contract packages)

<table>
<thead>
<tr>
<th>Ixx</th>
<th>AB</th>
<th>O02</th>
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Instrument number (01, 02, ...)

Bechtel Drawing No. for contractors which illustrates item (37X-002, 51X-002, ...)

Notation for type of instrument (PE, GE, ...) listed below

General instrument location:

31X Waste shaft
35X Exhaust shaft
37X C & SH shaft
51X Drift level

Type of instrument:

CE Convergence meter
GE Extensometer
IG Inclinometer
NG Rigid-inclusion stressmeter
PE Piezometer
RC Permanent convergence points
TC Temporary convergence points
RS Wall shortening points
WE Pressure cell
WG Rockbolt load cell
ZE Strain gauge

Example Field Designation

51X-GE-00246 is a drift level (51X) extensometer (GE) which may also be referred to as GE-246 on figures and tables in this report. However, convergence points are designated by approximate shaft depth or drift station.
FIGURE J-3
PIEZOMETER 31X-PE-00203
WASTE SHAFT - EL 2798 (MAGENTA)
PRESSURE VS. CALENDAR MONTH

NOTES:
1. CONCRETE LINER WAS PLACED NOV. 1983 THROUGH APR. 3, 1984
NOTES:
2. INSTRUMENT IS CURRENTLY NOT ACCESSIBLE FOR REPAIR.

FIGURE J-5
PIEZOMETER 31X-PE-00205
WASTE SHAFT - EL 2740
PRESSURE VS. CALENDAR MONTH
NOTES:
2. INSTRUMENT IS CURRENTLY NOT ACCESSIBLE FOR REPAIR.

FIGURE J-7
PIEZOMETER 31X-PE-00207
WASTE SHAFT – EL 2692 (CULEBRA)
PRESSURE VS. CALENDAR MONTH
Figure J-8
PIEZOMETER 31X-PE-00208
WASTE SHAFT - EL 2692 (CULEBRA)
PRESSURE VS. CALENDAR MONTH

Notes:
NOTES:
2. INSTRUMENT IS CURRENTLY NOT ACCESSIBLE FOR REPAIR.

FIGURE J-9
PIEZOMETER 31X-PE-00209
WASTE SHAFT - EL 2651
PRESSURE VS. CALENDAR MONTH
NOTES:
1. CONCRETE FOR KEY WAS PLACED MARCH 23 THROUGH APRIL 3, 1984.

FIGURE J-11
PIEZOMETER 31X-PE-00211
WASTE SHAFT KEY - EL 2564
PRESSURE VS. CALENDAR MONTH
FIGURE J-12
PIEZOMETER 33X-PE-00212
WASE SHORE KEEL 3344
PRESSURE VS. CALENDAR MONTH

NOTES
CONCRETE FOR KEY WAS PLACED MARCH 23 THROUGH APRIL 3, 1984.

EXCAVATION CONCRETE INSTRUMENT LEVEL

FLUID PRESSURE, PSI
NOTES

FIGURE J-14
PIEZOMETER 35X-PE-00202
EXHAUST SHAFT - EL 2865
PRESSURE VS. CALENDAR MONTH
NOTES:

FIGURE J-15
PIEZOMETER 35X-PE-00203
EXHAUST SHAFT - EL 2865
PRESSURE VS. CALENDAR MONTH
NOTES

FIGURE J-1B
PIEZOMETER 35X-PE-00206
EXHAUST SHAFT - EL 2794 (MAGENTA)
PRESSURE VS. CALENDAR MONTH
FLUID PRESSURE, PSI

NOTES:

FIGURE J-19
PIEZOMETER 35X-PE-00207
EXHAUST SHAFT - EL 2736
PRESSURE VS. CALENDAR MONTH
FLUID PRESSURE, PSI

DO NOT SCALE

150
125
100
75

JAN FEB MAR APR MAY JUNE JUL AUG SEP OCT NOV DEC JAN FEB MAR APR MAY JUNE JUL AUG SEP OCT NOV DEC JAN FEB MAR APR MAY JUNE JUL AUG SEP OCT NOV DEC JAN FEB MAR APR MAY JUNE JUL AUG SEP OCT NOV DEC

NOTES

FIGURE J-20
PIEZOMETER 35X-PE-00208
EXHAUST SHAFT - EL 2736
PRESSURE VS. CALENDAR MONTH
Figure J-22
Piezometer 35X-PE-00210
Exhaust Shaft - EL 2688 (Culebra)
Pressure vs. Calendar Month

Notes:
1. Concrete liner was placed July 1984 through Nov. 29, 1984.
NOTES:

FIGURE J-23
PIEZOMETER 35X-PE-00211
EXHAUST SHAFT - EL 2688 (CULEBRA)
PRESSURE VS. CALENDAR MONTH
NOTES:
1. CONCRETE FOR KEY WAS PLACED NOV. 19 THROUGH NOV. 29, 1984.

FIGURE J-29
PIEZOMETER 35X-PE-00217
EXHAUST SHAFT KEY - EL 2559
PRESSURE VS. CALENDAR MONTH
FIGURE J-31
PIEZOMETER 35X-PE-00219
EXHAUST SHAFT KEY - EL 2522
PRESSURE VS. CALENDAR MONTH

NOTES:
1. CONCRETE FOR KEY WAS PLACED NOV. 19 THROUGH NOV. 29, 1984.
NOTES
1. STEEL LINER WAS INSTALLED IN NOVEMBER AND DECEMBER 1981.

FIGURE J-34
PIEZOMETER 37X-PE-00201
C & SH SHAFT - EL 2830
PRESSURE VS. CALENDAR MONTH
NOTES:
1. STEEL LINER WAS INSTALLED IN NOVEMBER AND DECEMBER 1981

FIGURE J-36
PIEZOMETER 37X-PE-00203
C & SH SHAFT - EL 2790 (MAGENTA)
PRESSURE VS. CALENDAR MONTH
NOTES
1. STEEL LINER WAS INSTALLED IN NOVEMBER AND DECEMBER 1981.
2. INSTRUMENT IS CURRENTLY NOT FUNCTIONING.

FIGURE J-37
PIEZOMETER 37X-PE-00204
C & SH SHAFT - EL 2790 (MAGENTA)
PRESSURE VS. CALENDAR MONTH
NOTES
1. STEEL LINER WAS INSTALLED IN NOVEMBER AND DECEMBER 1981.

FIGURE J-38
PIEZOMETER 37X-PE-00205
C & SH SHAFT - EL 2719
PRESSURE VS. CALENDAR MONTH
Figure J-39
Piezometer 37X-PE-00206
C & SH Shaft - EL 2719
Pressure vs. Calendar Month

Notes:
1. Steel liner was installed in November and December 1981.
2. Instrument has been removed for repair.
NOTES
1. STEEL LINER WAS INSTALLED IN NOVEMBER AND DECEMBER 1981.
2. INSTRUMENT HAS BEEN REMOVED FOR REPAIR

FIGURE J-43
PIEZOMETER 37X-PE-00210
C & SH SHAFT - EL 2608
PRESSURE VS. CALENDAR MONTH
NOTES:
1. CONCRETE FOR KEY WAS PLACED IN APRIL 1982.
2. INSTRUMENT IS CURRENTLY NOT FUNCTIONING.

FIGURE J-44
PIEZOMETER J7X-PE-00211
C & SH SHAFT KEY - EL 2560
PRESSURE VS. CALENDAR MONTH
NOTES:
1. CONCRETE FOR KEY WAS PLACED IN APRIL 1982.

FIGURE J-45
PIEZOMETER 37X-PE-00212
C & SH SHAFT KEY - EL 2560
PRESSURE VS. CALENDAR MONTH
NOTES:
1. CONCRETE FOR KEY WAS PLACED MARCH 23 THROUGH APRIL 3, 1984.
2. SIZE OF EXCAVATION: 24 FT DIAM.

FIGURE J-48
PRESSURE CELL 31X-WE-00201
WASTE SHAFT - EL Z543 - EAST SIDE
PRESSURE VS. CALENDAR MONTH
CONTACT PRESSURE, PSI

40.0

20.0

0.0

-20.0

-40.0

80.0

100.0

120.0

N

EXCAVATION COMPLETED AT INSTRUMENT LEVEL


NOTES:
1. CONCRETE FOR KEY WAS PLACED NOV. 19 THROUGH NOV. 29, 1984.
2. SIZE OF EXCAVATION: 21 FT DIAM.

FIGURE J-50
PRESSURE CELL 35X-ME-00201
EXHAUST SHAFT KEY - EL 2535 - EAST SIDE
PRESSURE VS. CALENDAR MONTH
FIGURE J-53
PRESSURE CELL 35X-WE-00204
EXHAUST SHAFT KEY - EL 2535 - WEST SIDE
PRESSURE VS. CALENDAR MONTH

NOTES
1. CONCRETE FOR KEY WAS PLACED NOV 19 THROUGH NOV 29, 1984.
2. SIZE OF EXCAVATION: 21 FT DIAM.
NOTES:
1. CONCRETE FOR KEY WAS PLACED IN APRIL 1982.
2. SIZE OF EXCAVATION: 15 FT DIAM.

FIGURE J-54
PRESSURE CELL 37X-WE-00201
C & SH SHAFT KEY - FL 2550 - WEST SIDE
PRESSURE VS. CALENDAR MONTH
NOTES:
1. CONCRETE FOR KEY WAS PLACED IN APRIL 1982.
2. SIZE OF EXCAVATION: 15 FT DIAM.

FIGURE 1-55
PRESSURE CELL 37X-MC-00202
C & SH SHAFT KEY - EL 2550 - SOUTH SIDE
PRESSURE VS. CALENDAR MONTH
NOTES
1. CONCRETE FOR KEY WAS PLACED IN APRIL 1982.
2. SIZE OF EXCAVATION: 15 FT DIAM.

FIGURE J-56
PRESSURE CELL 37X-WE-00203
C & SH SHAFT KEY - EL 2550 - NORTH SIDE
PRESSURE VS. CALENDAR MONTH
NOTES:
1. CONCRETE FOR KEY WAS PLACED IN APRIL 1982.
2. STRAIN SINCE READING ON APR. 22, 1982.
3. GAUGE IS LOCATED 15 IN. FROM INNER FACE ON NW SIDE OF CONCRETE KEY.
4. SIZE OF EXCAVATION: 15 FT DIAM.

FIGURE J-58
WELDED STRAIN GAUGE 37X-ZE-00201
C & SH SHAFT KEY - EL 2553.7
STRAIN VS. CALENDAR MONTH
FIGURE J-60
WELDED STRAIN GAUGE 37X-ZE-00203
C & SH SHAFT KEY – EL 2553.7
STRAIN VS. CALENDAR MONTH

NOTES:
1. CONCRETE FOR KEY WAS PLACED IN APRIL 1982.
2. STRAIN SINCE READING ON APR. 22, 1982.
3. GAUGE IS LOCATED 15 IN. FROM INNER FACE ON SW SIDE OF CONCRETE KEY.
4. SIZE OF EXCAVATION: 15 FT DIAM.
5. INSTRUMENT HAS PERMANENTLY FAILED.
FIGURE J-61
WELDED STRAIN GAUGE 37X-ZE-00204
C & 9H SHAFT KEY - EL 2553.7
STRAIN VS. CALENDAR MONTH

NOTES:
1. CONCRETE FOR KEY WAS PLACED IN APRIL 1982.
2. STRAIN SAME READING ON APR. 22, 1982.
3. GAUGE IS LOCATED 3 IN. FROM INNER FACE ON SW SIDE OF CONCRETE KEY.
4. SIZE OF EXCAVATION: 15 FT DIAM.
5. INSTRUMENT IS CURRENTLY NOT FUNCTIONING.
NOTES
1. CONCRETE FOR KEY WAS PLACED IN APRIL 1982.
2. STRAIN SINCE READING ON APR 22, 1982.
3. GAUGE IS LOCATED 15 IN. FROM INNER FACE ON SE SIDE OF CONCRETE KEY.
4. SIZE OF EXCAVATION: 15 FT DIAM.

FIGURE J-62
WELDED STRAIN GAUGE 37X-ZE-00205
C & SH SHAFT KEY - EL 2553.7
STRAIN VS. CALENDAR MONTH
FIGURE J-63
WELDED STRAIN GAUGE 37X-ZE-00206
C & SH SHAFT KEY - EL 2553.7
STRAIN VS. CALENDAR MONTH

NOTES:
1. CONCRETE FOR KEY WAS PLACED IN APRIL 1982.
2. STRAIN SINCE READING ON APRIL 22, 1982.
3. GAUGE IS LOCATED 3 IN. FROM INNER FACE ON SE SIDE OF CONCRETE KEY.
4. SIZE OF EXCAVATION: 15 FT DIAM.
NOTES:
1. CONCRETE FOR KEY WAS PLACED IN APRIL 1982.
2. STRAIN SINCE READING ON APR. 22, 1982.
3. GAUGE IS LOCATED 15 IN. FROM INNER FACE ON NE SIDE OF CONCRETE KEY.
4. SIZE OF EXCAVATION: 15 FT DIAM.

FIGURE J-64
WELDED STRAIN GAUGE 37X-ZE-00207
C & SH SHAFT KEY – EL 2553.7
STRAIN VS. CALENDAR MONTH
1. CONCRETE FOR KEY WAS PLACED IN APRIL 1982.
2. STRAIN SINCE READING ON APR. 22, 1982.
3. GAUGE IS LOCATED 3 IN. FROM INNER FACE ON NE SIDE OF CONCRETE KEY.
4. SIZE OF EXCAVATION: 15 FT DIAM.
5. INSTRUMENT HAS PERMANENTLY FAILED.

FIGURE J-65
WELDED STRAIN GAUGE 37X-ZE-00208
C & SH SHAFT KEY – EL 2553.7
STRAIN VS. CALENDAR MONTH
FIGURE J-66
EMBEDMENT STRAIN GAUGE 37X-ZE-00209
C & SH SHAFT KEY - EL 2553.7
STRAIN VS. CALENDAR MONTH

NOTES:
1. CONCRETE FOR KEY WAS PLACED IN APRIL 1982.
2. STRAIN SINCE READING ON APR. 22, 1982.
3. GAUGE IS LOCATED 14.5 IN. FROM INNER FACE ON NORTH SIDE OF CONCRETE KEY.
4. SIZE OF EXCAVATION: 15 FT DIAM.
FIGURE J-69
EMBEDMENT STRAIN GAUGE 37X-ZE-00212
C & SH SHAFT KEY - EL 2553.7
STRAIN VS. CALENDAR MONTH

NOTES:
1. CONCRETE FOR KEY WAS PLACED IN APRIL 1982.
2. STRAIN SINCE READING ON APR 22, 1982.
3. GAUGE IS LOCATED 3.5 IN. FROM INNER FACE ON WEST SIDE OF CONCRETE KEY.
4. SIZE OF EXCAVATION: 15 FT DIAM.
Figure J-70
Embedment strain gauge 37X-ZE-00213
C & SH shaft key - EL 2553.7
Strain vs. calendar month

Notes:
1. Concrete for key was placed in April 1982.
3. Gauge is located 14.5 in. from inner face on south side of concrete key.
FIGURE J-71
EMBEDMENT STRAIN GAUGE 37X-ZE-00214
C & SH SHAFT KEY - EL 2553.7
STRAIN VS. CALENDAR MONTH

NOTES:
1. CONCRETE FOR KEY WAS PLACED IN APRIL 1982.
2. STRAIN SINCE READING ON APR. 22, 1982
3. GAUGE IS LOCATED 3.5 IN. FROM INNER FACE ON SOUTH SIDE OF CONCRETE KEY.
4. SIZE OF EXCAVATION: 15 FT DIAM.
FIGURE J-72
EMBEDMENT STRAIN GAUGE 37X-ZE-00215
C & SH SHAFT KEY - EL 2553.7
STRAIN VS. CALENDAR MONTH

NOTES:
1. CONCRETE FOR KEY WAS PLACED IN APRIL 1982.
2. STRAIN SINCE READING ON APR 22, 1982.
3. GAUGE IS LOCATED 14.5 IN. FROM INNER FACE ON EAST SIDE OF CONCRETE KEY.
4. SIZE OF EXCAVATION: 15 FT DIAM.
CONCRETE FOR KEY WAS PLACED IN APRIL 1982.
2. STRAIN SINCE READING ON APR. 22, 1982.
3. GAUGE IS LOCATED 3.5 IN. FROM INNER FACE ON EAST SIDE OF CONCRETE KEY.
4. SIZE OF EXCAVATION: 15 FT DIAM.
NOTES:
1. CONCRETE FOR KEY WAS PLACED IN APRIL 1982.
2. STRAIN SINCE READING ON APR 22, 1982.
3. GAUGE IS LOCATED 15 IN. FROM INNER FACE ON NW SIDE OF CONCRETE KEY.
4. SIZE OF EXCAVATION: 15 FT DIAM.
5. INSTRUMENT IS CURRENTLY NOT FUNCTIONING.

FIGURE J-74
WELDED STRAIN GAUGE 37X-ZE-00217
C & SH SHAFT KEY - EL 2547.6
STRAIN VS. CALENDAR MONTH
NOTES:
1. CONCRETE FOR KEY WAS PLACED IN APRIL 1982
2. STRAIN SINCE READING ON APR 22, 1982
3. GAUGE IS LOCATED 15 IN. FROM INNER FACE ON SW SIDE OF CONCRETE KEY
4. SIZE OF EXCAVATION: 15 FT DIAM.
5. INSTRUMENT HAS PERMANENTLY FAILED.

FIGURE J-76
WELDED STRAIN GAUGE 37X-ZE-00219
C & SH SHAFT KEY – EL 2547.6
STRAIN VS. CALENDAR MONTH
FIGURE J-77
WELDED STRAIN GAUGE 37X-ZE-00220
C & SH SHAFT KEY – EL 2547.6
STRAIN VS. CALENDAR MONTH

NOTES:
1. CONCRETE FOR KEY WAS PLACED IN APRIL 1982.
2. STRAIN SINCE READING ON APR. 22, 1982.
3. GAUGE IS LOCATED 3 IN. FROM INNER FACE ON SW SIDE OF CONCRETE KEY.
4. SIZE OF EXCAVATION: 15 FT DIAM.
1. CONCRETE FOR KEY WAS PLACED IN APRIL 1982.
2. STRAIN SINCE READING ON APR. 22, 1982.
3. GAUGE IS LOCATED 15 IN. FROM INNER FACE ON SE SIDE OF CONCRETE KEY.
4. SIZE OF EXCAVATION: 15 FT DIAM.

FIGURE J-78
WELDED STRAIN GAUGE 37X-ZE-00221
C & SH SHAFT KEY - EL 2547.6
STRAIN VS. CALENDAR MONTH
Figure J-89

1. Strain vs. Calendar Month
2. Strain Key - EL 2547.6
3. EMBEDDING STRAIN GAUGE 37K-ZE-0022

NOTES

1. Concrete was placed in April 1982.
2. Strain since February 1982.
3. Strain is located 2.5 in. from inner face on east side of concrete.
4. Size of excavation - 12 ft. O.A.
5. Instrument is currently not functioning.

MICROSTRAIN (COMPRESSION IS NEGATIVE)
0 500
0 500
0 500
0 500
0 500
0 500
0 500
0 500
0 500
0 500
0 500
Figure 2-91

NOTES:

1. Concrete for key was placed in April 1982.

2. Strain gage readings on Apr 22, 1982.

3. Gauge is located 9 in. from inner face on west side of concrete key.

4. Size of excavation: 12 ft dia.

EMBEDMENT STRAIN GAUGE ZF-ZE-00236

C & SH SHAFT KEY - EL 2553.7

STRAIN VS. CALENDAR MONTH


MICROSTRAIN (COMPRESSION IS NEGATIVE)

1000 750

250 500 750 1000
NOTES:
1. SIZE OF EXCAVATION: 15 FT DIAM.

FIGURE J-113
MULTIPLE-POINT EXTENSOMETER 35X-GE-00207
EXHAUST SHAFT - EL 1343 - N 76 E
MOVEMENT VS. CALENDAR MONTH
FIGURE J-114
MULTIPLE-POINT EXTENSOMETER 35X-GE-00208
EXHAUST SHAFT - EL 1343 - N 45° W
MOVEMENT VS. CALENDAR MONTH

NOTES:
1. SIZE OF EXCAVATION: 15 FT DIAM.
NOTES:
1. INSTRUMENT WAS INSTALLED 314 DAYS AFTER EXCAVATION STARTED ON AUG. 28, 1981.
2. SIZE OF EXCAVATION: 12 FT DIAM

FIGURE J-117
MULTIPLE-POINT EXTENSOMETER 37X-G0-00202
C & SH SHAFT — EL 2337 — N 75 E
MOVEMENT VS. CALENDAR MONTH
NOTES:
1. INSTRUMENT WAS INSTALLED 314 DAYS AFTER EXCAVATION STARTED ON AUG. 28, 1981.
2. SIZE OF EXCAVATION: 12 FT DIAM.

FIGURE J-118
MULTIPLE-POINT EXTENSOMETER 37X-GE-00203
C & SH SHAFT - EL 2337 - S 15 W
MOVEMENT VS. CALENDAR MONTH
FIGURE J-119
MULTIPLE-POINT EXTENSOMETER 37X-GE-00204
C & SH SHAFT - EL 1844 - N 45 W
MOVEMENT VS. CALENDAR MONTH

NOTES:
1. INSTRUMENT WAS INSTALLED 292 DAYS AFTER EXCAVATION STARTED ON SEP. 18, 1981.
2. ADJUSTMENT APPLIED TO ALL CURVES ON JAN 19, 1983.
3. SIZE OF EXCAVATION: 12 FT DIAM.
**FIGURE J-122**

MULTIPLE-POINT EXTENSOMETER 37X-GE-00207

C & SH SHAFT - EL 135? - N 15 W

MOVEMENT VS. CALENDAR MONTH

**NOTES:**

1. INSTRUMENT WAS INSTALLED 266 DAYS AFTER EXCAVATION STARTED ON OCT. 11, 1981.
2. ADJUSTMENT APPLIED TO ALL CURVES ON MAR 18, 1983.
3. SIZE OF EXCAVATION: 12 FT DIAM.
NOTES:
1. INSTRUMENT WAS INSTALLED 268 DAYS AFTER EXCAVATION STARTED ON OCT. 11, 1981.
2. ADJUSTMENT APPLIED TO ALL CURVES ON NOV 25, 1982.
3. SIZE OF EXCAVATION: 12 FT DIAM.

FIGURE J-123
MULTIPLE-POINT EXTENSOMETER 37X-GE-00208
C & SH SHAFT - EL 1351 - S 75 E
MOVEMENT VS. CALENDAR MONTH
NOTES:
1. INSTRUMENT WAS INSTALLED 268 DAYS AFTER EXCAVATION STARTED ON OCT. 11, 1981.
2. ADJUSTMENT APPLIED TO ALL CURVES ON JAN 10, 1983.
3. SIZE OF EXCAVATION: 12 FT DIAM.

FIGURE J-124
MULTIPLE-POINT EXTENSOMETER 37X-GE-00209
C & SH SHAFT - EL 1351 - S 45 W
MOVEMENT VS. CALENDAR MONTH
FIGURE J-125
DOUBLE-POINT EXTENSOMETER 51X-GE-00206
TEST ROOM 4 - E WALL
MOVEMENT VS. TIME SINCE EXCAVATION

NOTES:
1. SIZE OF EXCAVATION: 13 FT X 33 FT.
Elapsed Days Since Excavation at Instrument Location

Notes:
1. Size of Excavation: 13 ft x 33 ft.

Figure J-126
Double-Point Extensometer 51X-GE-00207
Test Room 4 - Roof
Movement vs. Time Since Excavation
NOTES:
1. SIZE OF EXCAVATION: 13 FT X 33 FT.

FIGURE J-127
DOUBLE-POINT EXTENSOMETER 51X-GE-00208
TEST ROOM 4 - W WALL
MOVEMENT VS. TIME SINCE EXCAVATION
1. SIZE OF EXCAVATION: 13 FT X 33 FT.
2. INSTRUMENT HAS PERMANENTLY FAILED.
FIGURE J-130
DOUBLE-POINT EXTENSOMETER 51X-GE-00211
TEST ROOM 3 - E WALL
MOVEMENT VS. TIME SINCE EXCAVATION

NOTES:
1. SIZE OF EXCAVATION: 13 FT X 33 FT.
NOTE:
1. SIZE OF EXCAVATION: 13 FT X 33 FT.

FIGURE J-131
DOUBLE-POINT EXTENSOMETER 51X-CG-00212
TEST ROOM 3 - ROOF
MOVEMENT VS. TIME SINCE EXCAVATION
MOVEMENT RELATIVE TO ANCHOR D, INCHES

ELAPSED DAYS SINCE EXCAVATION AT INSTRUMENT LOCATION

NOTES:
1. SIZE OF EXCAVATION: 13 FT X 33 FT.

FIGURE J-132
MULTIPLE-POINT EXTENSOMETER 51X-GE-00213
TEST ROOM 2 - E WALL
MOVEMENT VS. TIME SINCE EXCAVATION
Figure J-133
Multiple-point extensometer 51X-GE-00214
Test Room 2 - Center Roof
Movement vs. time since excavation

Notes:
1. Size of excavation: 13 ft x 33 ft.

Elapsed days since excavation at instrument location

Movement relative to anchor D: inches


D - 50'
C - 15'
B - 9'
A + 6'
Collar 11'

Grid lines for elapsed days and movement measurements.
NOTES:
1. SIZE OF EXCAVATION: 13 FT X 33 FT.
2. INSTRUMENT HAS PERMANENTLY FAILED.

FIGURE J-136
MULTIPLE-POINT EXTENSOMETER 51X-CE-00216
TEST ROOM 2 - FLOOR
MOVEMENT VS. TIME SINCE EXCAVATION
MOVEMENT RELATIVE TO ANCHOR D. INCHES

ELAPSED DAYS SINCE EXCAVATION AT INSTRUMENT LOCATION

NOTES:
1. SIZE OF EXCAVATION: 13 FT X 33 FT.

FIGURE J-138
MULTIPLE-POINT EXTENSOMETER 51X-GE-00217
TEST ROOM 1 - E WALL
MOVEMENT VS. TIME SINCE EXCAVATION

VIEW NORTH
NOTES:
1. SIZE OF EXCAVATION: 13 FT X 33 FT.
2. INSTRUMENT HAS PERMANENTLY FAILED.

FIGURE J-139
MULTIPLE-POINT EXTENSOMETER 51X-GE-00220
TEST ROOM 1 - FLOOR
MOVEMENT VS. TIME SINCE EXCAVATION
FIGURE J–140
DOUBLE-POINT EXTENSOMETER S1X–GE–00221
EO DRIFT – N1100 DRIFT INTERSECTION – FLOOR
MOVEMENT VS. TIME SINCE EXCAVATION

NOTES:
1. INSTRUMENT HAS BEEN DESTROYED.
MOVEMENT RELATIVE TO ANCHOR D, INCHES

- 0.0
- 1.0
- 2.0
- 3.0
- 4.0
- 5.0
- 6.0
- 7.0
- 8.0

ELAPSED DAYS SINCE EXCAVATION AT INSTRUMENT LOCATION

- 0
- 120
- 240
- 360
- 480
- 600
- 720
- 840
- 960
- 1080
- 1200
- 1320
- 1440
- 1560
- 1680

NOTES:
1. SIZE OF EXCAVATION: 8 FT X 14 FT.

COLLAR

COLLAR (AT 1')

A
B
C

VIEW NORTH

FIGURE J-141
MULTIPLE-POINT EXTENSOMETER 51X-GE-00222
E140 DRIFT, NORTH 1266 FT - E WALL
MOVEMENT VS. TIME SINCE EXCAVATION
MOTION RELATIVE TO ANCHOR D. INCHES

ELAPSED DAYS SINCE EXCAVATION AT INSTRUMENT LOCATION

NOTES:
1. SIZE OF EXCAVATION: 12 FT X 25 FT.

FIGURE J-142
MULTIPLE-POINT EXTENSOMETER 51X-GE-00223
E0 DRIFT, NORTH 626 FT - W WALL
MOVEMENT VS. TIME SINCE EXCAVATION
MOVEMENT RELATIVE TO ANCHOR D INCHES

ELAPSED DAYS SINCE EXCAVATION AT INSTRUMENT LOCATION

NOTES:
1. SIZE OF EXCAVATION: 8 FT X 14 FT.

FIGURE J-144
MULTIPLE-POINT EXTENSOMETER 51X-GE-00225
E140 DRIFT, NORTH 1266 FT - W WALL
MOVEMENT VS. TIME SINCE EXCAVATION
1. INSTRUMENT HAS BEEN DESTROYED.

FIGURE J-145
MULTIPLE-POINT EXTENSOMETER 51X-GE-00226
EDO DRIFT - N140 CROSSTRA CT INTERSECTION - ROOF
MOVEMENT VS. TIME SINCE EXCAVATION
NOTES:
1. SIZE OF EXCAVATION: 15 FT X 30 FT.

FIGURE J-146
MULTIPLE-POINT EXTENSOMETER 51X-GE-00227
35 FT NORTH OF C & SH SHAFT - ROOF
MOVEMENT VS. TIME SINCE EXCAVATION
NOTES:
1. SIZE OF EXCAVATION: 14 FT X 33 FT.
2. INSTRUMENT HAS BEEN DESTROYED.
3. DASHED LINE INDICATES ADJUSTED DATA.

FIGURE J-147
MULTIPLE-POINT EXTENSOMETER 51X-GE-00228
65 FT SOUTH OF C & SH SHAFT - ROOF
MOVEMENT VS. TIME SINCE EXCAVATION
Fig. J-148
Multiple-point extensometer 51X-GE-00229
E140 drift, north 240 ft - W wall
Movement vs. time since excavation

Notes:
1. Size of excavation: 8 ft x 14 ft.

View north
FIGURE J-149
MULTIPLE-POINT EXTENSOMETER 51X-GE-00230
E140 DRIFT, NORTH 240 FT - ROOF
MOVEMENT VS. TIME SINCE EXCAVATION

NOTES:
1. SIZE OF EXCAVATION: 8 FT X 14 FT.
2. INSTALLATION REJECTED. INSTRUMENT REPLACED BY 51X-GE-00255.
NOTES:
1. SIZE OF EXCAVATION: 12 FT X 20 FT.
2. INSTRUMENT HAS BEEN DESTROYED.

FIGURE J-150
MULTIPLE-POINT EXTENSOMETER 51X-GE-00231
7 FT EAST OF WASTE SHAFT - S WALL
MOVEMENT VS. TIME SINCE EXCAVATION
NOTES:
1. SIZE OF EXCAVATION: 12 FT X 20 FT.
2. INSTRUMENT HAS BEEN DESTROYED.

FIGURE J-151
MULTIPLE-POINT EXTENSOMETER 51X-GE-00232
17 FT EAST OF WASTE SHAFT - ROOF
MOVEMENT VS. TIME SINCE EXCAVATION
FIGURE J-153
DOUBLE-POINT EXTENSOMETER 51X-GE-00234
E0 DRIFT, NORTH 626 FT - ROOF
MOVEMENT VS. TIME SINCE EXCAVATION
NOTES:
1. SIZE OF EXCAVATION: 13 FT X 33 FT.

FIGURE J-156
MULTIPLE-POINT EXTENSOMETER 51X-GE-00237
TEST ROOM 2 - W ROOF
MOVEMENT VS. TIME SINCE EXCAVATION
MOBILITY RELATIVE TO ANCHOR D, INCHES

NOTES:
1. SIZE OF EXCAVATION: 13 FT X 33 FT.

ELAPSED DAYS SINCE EXCAVATION AT INSTRUMENT LOCATION

FIGURE J-158
MULTIPLE-POINT EXTENSOMETER 51X-GE-00239
TEST ROOM 1 - E ROOF
MOVEMENT VS. TIME SINCE EXCAVATION
FIGURE J-161
MULTIPLE-POINT EXTENSOMETER 51X-GE-00242
N1100 - TEST ROOM 2 INTERSECTION - FLOOR
MOVEMENT VS. TIME SINCE EXCAVATION
FIGURE J-162
MULTIPLE-POINT EXTENSOMETER 51X-GE-00243
EO DRIFT - N1100 DRIFT INTERSECTION - ROOF
MOVEMENT VS. TIME SINCE EXCAVATION
NOTES:
1. SIZE OF EXCAVATION: 18 FT X 35 FT.
2. INSTRUMENT HAS PERMANENTLY FAILED.

FIGURE J-163
SINGLE-POINT EXTENSOMETER 51X-GE-00244
30 FT SOUTH OF C & SH SHAFT - ROOF
MOVEMENT VS. TIME SINCE EXCAVATION
NOTES:
1. SIZE OF EXCAVATION: 12 FT X 15 FT.
2. INSTRUMENT HAS BEEN DESTROYED.

FIGURE J-164
MULTIPLE-POINT EXTENSOMETER 51X-GE-00245
20 FT WEST OF WASTE SHAFT - ROOF
MOVEMENT VS. TIME SINCE EXCAVATION
FIGURE J-165
MULTIPLE-POINT EXTENSOMETER 51X-GE-00246
E140 DRIFT - S700 INTERSECTION - ROOF
MOVEMENT VS. TIME SINCE EXCAVATION

EXCAVATION OF S700 TO EAST
STARTED ON MAY 26, 1984.
EXCAVATION OF S700 ON WEST
COMPLETED ON AUG. 1, 1985.

PLAN VIEW
EXCAVATION RESUMED NEARBY
COLLAR

SECTION X-X'
FIGURE J-168
MULTIPLE-POINT EXTENSOMETER 51X-GE-00247
E140 DRIFT, SOUTH 1950 FT - ROOF
MOVEMENT VS. TIME SINCE EXCAVATION

NOTES:
1. SIZE OF EXCAVATION: 12 FT X 25 FT.
1. SIZE OF EXCAVATION: 8 FT X 25 FT.
2. INSTRUMENT HAS BEEN DESTROYED.

FIGURE J-167
MULTIPLE-POINT EXTENSOMETER 51X-CF-00248
E140 DRIFT, SOUTH 1950 FT - FLOOR
MOVEMENT VS. TIME SINCE EXCAVATION
FIGURE J-169
MULTIPLE-POINT EXTENSOMETER 51X-GE-00250
E140 DRIFT, SOUTH 3045 FT - FLOOR
MOVEMENT VS. TIME SINCE EXCAVATION

NOTES:
1. SIZE OF EXCAVATION: 8 FT X 25 FT.
FIGURE J-170
MULTIPLE-POINT EXTENSOMETER 51X-GE-00251
18.5 FT SOUTH OF C & SH SHAFT - ROOF
MOVEMENT VS. TIME SINCE EXCAVATION

NOTES:
1. SIZE OF EXCAVATION: 18 FT X 34 FT.
FIGURE J-172
DOUBLE-POINT EXTENSOMETER 51X-GE-00253
30 FT SOUTH OF C & SH SHAFT - FLOOR
MOVEMENT VS. TIME SINCE EXCAVATION

NOTES:
1. SIZE OF EXCAVATION: 18 FT X 35 FT.
ELAPSED DAYS SINCE EXCAVATION AT INSTRUMENT LOCATION

NOTES:
1. SIZE OF EXCAVATION: 8 FT X 14 FT.

FIGURE J-174
MULTIPLE-POINT EXTENSOMETER 51X-GE-00255
E140 DRIFT, NORTH 240 FT - ROOF
MOVEMENT VS. TIME SINCE EXCAVATION
Elapsed Days since Excavation at Instrument Location

Notes:
1. Instrument has been destroyed.

Figure J-176
Multiple-Point Extensometer 51X-GE-00257
E140 Drift - S400 Intersection - Roof
Movement vs. Time since Excavation
Figure J-177
Multiple-Point Extensometer S1X-GE-00258
EO Drift - N1100 Drift Intersection - Floor Movement vs. Time Since Excavation
FIGURE J-182
MULTIPLE-POINT EXTENSOMETER S1X-GE-00263
E300 DRIFT - S400 INTERSECTION - ROOF
MOVEMENT VS. TIME SINCE EXCAVATION
NOTES:
1. SIZE OF EXCAVATION: 12 FT X 33 FT.

FIGURE J-184
MULTIPLE-POINT EXTENSOMETER 51X-GE-00265
S700 CROSSCUT, EAST 220 FT - ROOF
MOVEMENT VS. TIME SINCE EXCAVATION
NOTES:
1. SIZE OF EXCAVATION: 12 FT X 20 FT.

FIGURE J-1B5
MULTIPLE-POINT EXTENSONMETER 51X-GE-00287
30 FT EAST OF WASTE SHAFT - ROOF
MOVEMENT VS. TIME SINCE EXCAVATION
NOTES:
1. SIZE OF EXCAVATION: 13 FT X 33 FT.

FIGURE J-190
CONVERGENCE METER 51X-CE-00201
TEST ROOM 2
CONVERGENCE VS. TIME SINCE EXCAVATION
NOTES:
1. SIZE OF EXCAVATION: 13 FT X 33 FT.

FIGURE J-191
CONVERGENCE METER 51X-CE-00202
TEST ROOM 1
CONVERGENCE VS. TIME SINCE EXCAVATION
NOTES:
1. ROCKBOLT LENGTH: 15 FT.
2. SIZE OF EXCAVATION: 18 FT X 35 FT.

FIGURE J-192
ROCKBOLT LOAD CELL 51X-WG-00201
30 FT SOUTH OF C & SH SHAFT
LOAD VS. TIME SINCE EXCAVATION
Fig. J-193
Rockbolt Load Cell 51X-WG-00202
30 ft South of C & SH Shaft
Load vs. Time Since Excavation

Notes:
1. Rockbolt Length: 15 ft.
2. Size of Excavation: 18 ft x 35 ft.
NOTES:
1. BASED ON WIRE STRESS DIVIDED BY 4.0 (E = 10,900,000 PSI).
2. STRESSMETER DEPTH: 6.5 FT.
3. SIZE OF EXCAVATION: 13 FT X 33 FT.
4. INSTRUMENT HAS PERMANENTLY FAILED.

FIGURE J-198
RIGID STRESSMETER 51X-NG-00252
TEST ROOM 2 - W FLOOR (1 FT FROM WALL)
STRESS VS. TIME SINCE EXCAVATION
FIGURE J-200
RIGID STRESSMETER 51X-NG-00255
TEST ROOM 2 - W FLOOR (1 FT FROM WALL)
STRESS VS. TIME SINCE EXCAVATION

NOTES:
1. BASED ON WIRE STRESS DIVIDED BY 4.0 (E = 10,900,000 PSI).
2. STRESSMETER DEPTH: 6.5 FT
3. SIZE OF EXCAVATION: 13 FT X 33 FT.
FIGURE J-202
CONVERGENCE POINTS
WASTE SHAFT - EL 2338 - BELOW KEY
CONVERGENCE VS. CALENDAR MONTH

NOTES:
1. SIZE OF EXCAVATION: 20 FT DIAM.
2. INSTRUMENT IS CURRENTLY NOT ACCESSIBLE FOR READING.
FIGURE J-205

CONVERGENCE POINTS
C & SH SHAFT - EL 3114 - ABOVE KEY
CONVERGENCE VS. CALENDAR MONTH

NOTES:
1. INSTRUMENT WAS INSTALLED 774 DAYS AFTER EXCAVATION STARTED ON JUL. 12, 1981.
2. SIZE OF EXCAVATION: 12 FT DIAM.
FIGURE J-207

CONVERGENCE POINTS
C & SH SHAFT - EL 2825 - ABOVE KEY
CONVERGENCE VS. CALENDAR MONTH

NOTES:
1. INSTRUMENT WAS INSTALLED 351 DAYS AFTER EXCAVATION STARTED ON JUL. 27, 1981.
2. SIZE OF EXCAVATION: 12 FT DIAM.
NOTES:
1. INSTRUMENT WAS INSTALLED 745 DAYS AFTER EXCAVATION STARTED ON AUG. 14, 1981.
2. SIZE OF EXCAVATION: 12 FT DIAM.

FIGURE J-209
CONVERGENCE POINTS
C & SH SHAFT – EL 2596 – ABOVE KEY
CONVERGENCE VS. CALENDAR MONTH
NOTES:
1. INSTRUMENT WAS INSTALLED 306 DAYS AFTER EXCAVATION STARTED ON SEP. 5, 1981.
2. SIZE OF EXCAVATION: 12 FT DIAM.
3. INSTRUMENT HAS BEEN DESTROYED.

FIGURE J-212
CONVERGENCE POINTS
C & SH SHAFT - EL 2135 - BELOW KEY
CONVERGENCE VS. CALENDAR MONTH
1. INSTRUMENT WAS INSTALLED 292 DAYS AFTER EXCAVATION STARTED ON SEP. 18, 1981.
2. SIZE OF EXCAVATION: 12 FT DIAM.

FIGURE J-213
CONVERGENCE POINTS
C & SH SHAFT - EL 1846 - BELOW KEY
CONVERGENCE VS. CALENDAR MONTH
NOTES:
1. INSTRUMENT WAS INSTALLED 362 DAYS AFTER EXCAVATION STARTED ON OCT. 11, 1981.
2. SIZE OF EXCAVATION: 12 FT DIAM.

FIGURE J-214
CONVERGENCE POINTS
C & SH SHAFT - EL 1353 - BELOW KEY
CONVERGENCE VS. CALENDAR MONTH
NOTES:
1. SIZE OF EXCAVATION: 12 FT X 25 FT.

FIGURE J-217
CONVERGENCE POINTS
EO DRIFT, NORTH 940 FT
CONVERGENCE VS. TIME SINCE EXCAVATION
NOTES:
1. SIZE OF EXCAVATION: 12 FT X 25 FT.

FIGURE J-218
CONVERGENCE POINTS
EO DRIFT, NORTH 626 FT
CONVERGENCE VS. TIME SINCE EXCAVATION

AFTER NOV. 22, 1983
NOTES:
1. SIZE OF EXCAVATION: 12 FT X 25 FT.

FIGURE J-219
CONVERGENCE POINTS
EO DRIFT, NORTH 290 FT
CONVERGENCE VS. TIME SINCE EXCAVATION
NOTES:
1. INSTRUMENT HAS BEEN DESTROYED.

FIGURE J-220
CONVERGENCE POINTS
EO DRIFT - N140 CROSSCUT INTERSECTION
CONVERGENCE VS. TIME SINCE EXCAVATION
FIGURE J-221
CONVERGENCE POINTS
30 FT NORTH OF C & SH SHAFT
CONVERGENCE VS. TIME SINCE EXCAVATION

NOTES:
1. SIZE OF EXCAVATION: 15 FT X 30 FT.
FIGURE J-226
CONVERGENCE POINTS
30 FT SOUTH OF C & SH SHAFT
CONVERGENCE VS. TIME SINCE EXCAVATION

NOTES:
1. SIZE OF EXCAVATION: 18 FT X 35 FT.
FIGURE J-228
CONVERGENCE POINTS
W30 DRIFT, SOUTH 250 FT
CONVERGENCE VS. TIME SINCE EXCAVATION

NOTES:
1. SIZE OF EXCAVATION: 12 FT X 20 FT.
FIGURE J-230
CONVERGENCE POINTS
W30 DRIFT - S700 CROSSCUT INTERSECTION
CONVERGENCE VS. TIME SINCE EXCAVATION

PLAN VIEW
EXCAVATION OF S700 TO EAST
STARTED ON JULY 22, 1985.

SECTION X-X'


CONVERGENCE, INCHES

0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0

ELAPSED DAYS SINCE EXCAVATION AT INSTRUMENT LOCATION

0.0 120. 240. 360. 480. 600. 720. 840. 960. 1080. 1200. 1320. 1440. 1560. 1680.
FIGURE J-231
CONVERGENCE POINTS
W30 DRIFT, SOUTH 850 FT
CONVERGENCE VS. TIME SINCE EXCAVATION

NOTES:
1. SIZE OF EXCAVATION: 12 FT X 14 FT.
NOTES:
1. SIZE OF EXCAVATION: 8 FT X 14 FT.

FIGURE J-234
CONVERGENCE POINTS
E140 DRIFT, NORTH 1266 FT
CONVERGENCE VS. TIME SINCE EXCAVATION
CONVERGENCE POINTS
E140 DRIFT, NORTH 240 FT
CONVERGENCE VS. TIME SINCE EXCAVATION
NOTES:
1. INSTRUMENT HAS BEEN DESTROYED.

FIGURE J-238
CONVERGENCE POINTS
E140 DRIFT - S400 CROSSCUT INTERSECTION
CONVERGENCE VS. TIME SINCE EXCAVATION
FIGURE J-239
CONVERGENCE POINTS
E140 DRIFT, SOUTH 460 FT
CONVERGENCE VS. TIME SINCE EXCAVATION

NOTES:
1. SIZE OF EXCAVATION: 12 FT X 25 FT.
NOTES:
1. SIZE OF EXCAVATION: 12 FT X 25 FT.

FIGURE J-241
CONVERGENCE POINTS
E140 DRIFT, SOUTH 850 FT
CONVERGENCE VS. TIME SINCE EXCAVATION
FIGURE J-244
CONVERGENCE POINTS
E140 DRIFT, SOUTH 1450 FT
CONVERGENCE VS. TIME SINCE EXCAVATION

NOTES:
1. SIZE OF EXCAVATION: 12 FT X 25 FT.
NOTES:
1. SIZE OF EXCAVATION: 12 FT X 25 FT.
2. INSTRUMENT HAS BEEN DESTROYED.

FIGURE J-245
CONVERGENCE POINTS
E140 DRIFT, SOUTH 1879 FT
CONVERGENCE VS. TIME SINCE EXCAVATION
FIGURE J-246
CONVERGENCE POINTS
E-40 DRIFT, SOUTH 2068 FT
CONVERGENCE VS. TIME SINCE EXCAVATION

1. SIZE OF EXCAVATION: 12 FT X 25 FT
2. INSTRUMENT HAS BEEN DESTROYED.

NOTES:

CONVERGENCE INCHES
Figure J-250
Convergence Points
E140 Drift, South 3250 Ft
Convergence vs. Time since Excavation

Notes:
1. Size of Excavation: 8 ft x 25 ft.
FIGURE J-252
CONVERGENCE POINTS
E140 DRIFT, SOUTH 3639 FT
CONVERGENCE VS. TIME SINCE EXCAVATION

NOTES:
1. SIZE OF EXCAVATION: 8 FT X 25 FT.
NOTES:
1. SIZE OF EXCAVATION: 8 FT X 25 FT.

FIGURE J-253
CONVERGENCE POINTS
E140 DRIFT, SOUTH 3664 FT
CONVERGENCE VS. TIME SINCE EXCAVATION
FIGURE J-255
CONVERGENCE POINTS
E300 DRIFT, SOUTH 850 FT
CONVERGENCE VS. TIME SINCE EXCAVATION

NOTES:
1. SIZE OF EXCAVATION: 12 FT X 14 FT.
FIGURE J-257
CONVERGENCE POINTS
E300 DRIFT, SOUTH 1150 FT
CONVERGENCE VS. TIME SINCE EXCAVATION

NOTES:
1. SIZE OF EXCAVATION: 12 FT X 14 FT.
FIGURE J-259
CONVERGENCE POINTS
W170 DRIFT - S700 CROSSCUT INTERSECTION
CONVERGENCE VS. TIME SINCE EXCAVATION
FIGURE J-261
CONVERGENCE POINTS
W170 DRIFT - S1000 CROSSCUT INTERSECTION
CONVERGENCE VS. TIME SINCE EXCAVATION

1. SIZE OF EXCAVATION: 12 FT X 14 FT.
FIGURE J-262
CONVERGENCE POINTS
W170 DRIFT, SOUTH 1150 FT
CONVERGENCE VS. TIME SINCE EXCAVATION
Figure J-264
Convergence Points
N1100 Drift, West 1159 ft
Convergence vs. Time Since Excavation

Notes:
1. Size of Excavation: 8.5 ft x 20 ft.
FIGURE J-266
CONVERGENCE POINTS
N1100 DRIFT, WEST 783 FT
CONVERGENCE VS. TIME SINCE EXCAVATION

NOTES:
1. SIZE OF EXCAVATION: 8.5 FT X 20 FT.
FIGURE J-267
CONVERGENCE POINTS
N1100 DRIFT - TEST ROOM 2 INTERSECTION
CONVERGENCE VS. TIME SINCE EXCAVATION
NOTES:
1. SIZE OF EXCAVATION: 8.5 FT X 14 FT.

FIGURE J-269
CONVERGENCE POINTS
N1100 DRIFT, EAST 319 FT
CONVERGENCE VS. TIME SINCE EXCAVATION
NOTES:
1. SIZE OF EXCAVATION: 8.5 FT X 14 FT.
2. INSTRUMENT HAS BEEN DESTROYED.

FIGURE J-270
CONVERGENCE POINTS
N1100 DRIFT, EAST 691 FT
CONVERGENCE VS. TIME SINCE EXCAVATION
Figure J-272
Convergence Points
N1100 Drift, East 1135 ft
Convergence vs. Time Since Excavation

Notes:
1. Size of excavation: 8.5 ft x 14 ft
FIGURE J-273
CONVERGENCE POINTS
N1100 DRIFT, EAST 1582 FT
CONVERGENCE VS. TIME SINCE EXCAVATION

NOTES:
1. SIZE OF EXCAVATION: 8.5 FT X 14 FT.
FIGURE J-275
CONVERGENCE POINTS
N1420 DRIFT -- TEST ROOM 2 INTERSECTION
CONVERGENCE VS. TIME SINCE EXCAVATION
FIGURE J-276
CONVERGENCE POINTS
N1420 DRIFT, WEST 258 FT
CONVERGENCE VS. TIME SINCE EXCAVATION

NOTES:
1. SIZE OF EXCAVATION: 12 FT X 20 FT.
FIGURE J-277
CONVERGENCE POINTS
N1420 DRIFT - TEST ROOM 1 INTERSECTION
CONVERGENCE VS. TIME SINCE EXCAVATION
FIGURE J-278
CONVERGENCE POINTS
N1420 DRIFT, EAST 304 FT
CONVERGENCE VS. TIME SINCE EXCAVATION

NOTES:
1. SIZE OF EXCAVATION: 12 FT X 14 FT.
FIGURE J-279
CONVERGENCE POINTS
N1420 DRIFT, EAST 716 FT
CONVERGENCE VS. TIME SINCE EXCAVATION

NOTES:
1. SIZE OF EXCAVATION: 12 FT X 14 FT.
FIGURE J-280
CONVERGENCE POINTS
N1420 DRIFT, EAST 1106 FT
CONVERGENCE VS. TIME SINCE EXCAVATION

NOTES:
1. SIZE OF EXCAVATION: 12 FT X 14 FT.
NOTES:
1. SIZE OF EXCAVATION: 12 FT X 14 FT.

FIGURE J-281
CONVERGENCE POINTS
NI420 DRIFT, EAST 1547 FT
CONVERGENCE VS. TIME SINCE EXCAVATION
NOTES:
1. SIZE OF EXCAVATION: 12 FT X 15 FT.
2. INSTRUMENT IS CURRENTLY NOT ACCESSIBLE FOR READING.

FIGURE J-282
CONVERGENCE POINTS
SUBSTATION 2A
CONVERGENCE VS. TIME SINCE EXCAVATION
NOTES
1. SIZE OF EXCAVATION: 13 FT X 33 FT.
FIGURE J-295
CONVERGENCE POINTS
TEST ROOM 3
CONVERGENCE VS. TIME SINCE EXCAVATION

NOTES:
1. SIZE OF EXCAVATION: 13 FT X 33 FT.
FIGURE J-286
CONVERGENCE POINTS
TEST ROOM 4
CONVERGENCE VS. TIME SINCE EXCAVATION

NOTES:
1. SIZE OF EXCAVATION: 13 FT X 33 FT.
NOTES:
1. SIZE OF EXCAVATION: 13 FT X 33 FT.

FIGURE J-287
CONVERGENCE POINTS
ROOM L1, NORTH 1455 FT
CONVERGENCE VS. TIME SINCE EXCAVATION
FIGURE J-288
CONVERGENCE POINTS
ROOM L2, NORTH 1455 FT
CONVERGENCE VS. TIME SINCE EXCAVATION

NOTES:
1. SIZE OF EXCAVATION: 13 FT X 33 FT.
NOTES:
1. SIZE OF EXCAVATION: 12 FT X 20 FT.
2. INSTRUMENT HAS BEEN DESTROYED.

FIGURE J-290
CONVERGENCE POINTS
17 FT EAST OF WASTE SHAFT
CONVERGENCE VS. TIME SINCE EXCAVATION
NOTES:
1. SIZE OF EXCAVATION: 12 FT X 15 FT.
2. INSTRUMENT HAS BEEN DESTROYED.

FIGURE J-291
CONVERGENCE POINTS
20 FT WEST OF WASTE SHAFT
CONVERGENCE VS. TIME SINCE EXCAVATION
CONVERGENCE INCHES

1. SIZE OF EXCAVATION: 12 FT X 33 FT.
2. INSTRUMENT HAS BEEN DESTROYED.

FIGURE J-292
CONVERGENCE POINTS
S700 CROSSCUT, EAST 205 FT
CONVERGENCE VS. TIME SINCE EXCAVATION
FIGURE J-293
CONVERGENCE POINTS
S1600 DRIFT, EAST 311 FT
CONVERGENCE VS. TIME SINCE EXCAVATION
FIGURE J-294
CONVERGENCE POINTS
S1800 DRIFT, EAST 332 FT
CONVERGENCE VS. TIME SINCE EXCAVATION
FIGURE J-297
CONVERGENCE POINTS
S1600 DRIFT, EAST 407 FT
CONVERGENCE VS. TIME SINCE EXCAVATION

NOTES:
1. SIZE OF EXCAVATION: 12 FT X 14 FT.
Elapsed days since excavation at instrument location

Convergence points
S1600 drift, east 432 ft
Convergence vs. time since excavation

Notes:
1. Size of excavation: 12 ft x 14 ft.
**NOTES:**

1. SIZE OF EXCAVATION: 12 FT X 14 FT.

**FIGURE J-299**

CONVERGENCE POINTS
S1600 DRIFT, EAST 457 FT
CONVERGENCE VS. TIME SINCE EXCAVATION
NOTES:
1. SIZE OF EXCAVATION: 12 FT X 14 FT.

FIGURE J-300
CONVERGENCE POINTS
S1600 DRIFT, EAST 482 FT
CONVERGENCE VS. TIME SINCE EXCAVATION
NOTES:
1. SIZE OF EXCAVATION: 12 FT X 14 FT.

FIGURE J-301
CONVERGENCE POINTS
S1600 DRIFT, EAST 507 FT
CONVERGENCE VS. TIME SINCE EXCAVATION
FIGURE J-302
CONVERGENCE POINTS
S1600 DRIFT, EAST 520 FT
CONVERGENCE VS. TIME SINCE EXCAVATION

NOTES:
1. SIZE OF EXCAVATION: 12 FT X 14 FT.

ELAPSED DAYS SINCE EXCAVATION AT INSTRUMENT LOCATION

ROOF-TO-FLOOR

CONVERGENCE, INCHES

PLAN VIEW

SECTION X-X'

8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0

0 120 240 360 480 600 720 840 960 1080 1200 1320 1440 1560 1680
FIGURE J-303
CONVERGENCE POINTS
S1950 DRIFT, EAST 311 FT
CONVERGENCE VS. TIME SINCE EXCAVATION

NOTES:
1. SIZE OF EXCAVATION: 12 FT X 20 FT.
Notes:
1. Size of Excavation: 12 ft x 20 ft.

Figure J-304
Convergence Points
S1950 Drift, East 332 ft
Convergence vs. Time Since Excavation
NOTES:
1. SIZE OF EXCAVATION: 12 FT X 20 FT.

FIGURE J-305
CONVERGENCE POINTS
S1950 DRIFT, EAST 357 FT
CONVERGENCE VS. TIME SINCE EXCAVATION
FIGURE J-306
CONVERGENCE POINTS
S1950 DRIFT, EAST 382 FT
CONVERGENCE VS. TIME SINCE EXCAVATION

NOTES:
1. SIZE OF EXCAVATION: 12 FT X 20 FT.
FIGURE J-307
CONVERGENCE POINTS
S1950 DRIFT, EAST 407 FT
CONVERGENCE VS. TIME SINCE EXCAVATION

NOTES:
1. SIZE OF EXCAVATION: 12 FT X 20 FT.
FIGURE J-308
CONVERGENCE POINTS
S1950 DRIFT, EAST 432 FT
CONVERGENCE VS. TIME SINCE EXCAVATION

NOTES:
1. SIZE OF EXCAVATION: 12 FT X 20 FT.
FIGURE J-310
CONVERGENCE POINTS
S1950 DRIFT, EAST 482 FT
CONVERGENCE VS. TIME SINCE EXCAVATION

NOTES:
1. SIZE OF EXCAVATION: 12 FT X 20 FT.
FIGURE J-311
CONVERGENCE POINTS
S1950 DRIFT, EAST 503 FT
CONVERGENCE VS. TIME SINCE EXCAVATION
FIGURE J-312
CONVERGENCE POINTS
S1950 DRIFT, EAST 523 FT
CONVERGENCE VS. TIME SINCE EXCAVATION

NOTES:
1. SIZE OF EXCAVATION: 12 FT X 20 FT.
FIGURE J-316
INCLINOMETER 51X-IG-00203
TEST ROOM 2 - W ROOF (1 FT FROM WALL)
WEST - EAST DEFLECTION

INITIAL READINGS: APR 5, 1983
JAN 30, 1985  O
NOV 10, 1985  A
DEC 5, 1984  +
NOV 11, 1983  X
MAY 6, 1983  O

GEOLOGIC SYMBOLS MATCH THOSE SHOWN ON THE GEOLOGIC DRILL LOGS.
INITIAL READINGS: APR 5, 1983
JUN 30, 1985
NOV 18, 1985
NOV 20, 1984
OCT 14, 1983
MAY 6, 1983

WEST - EAST DEFLECTION (INCHES)

FIGURE J-317
INCLINOMETER 51X-IG-00204
TEST ROOM 2 - E ROOF (1 FT FROM WALL)
WEST - EAST DEFLECTION

GEOLOGIC SYMBOLS MATCH THOSE SHOWN ON THE GEOLOGIC DRILL LOGS.
FIGURE J-31B
INCLINOMETER 51X-IG-00205
TEST ROOM 1 - W ROOF (1 FT FROM WALL)
WEST - EAST DEFLECTION

GEOLOGIC SYMBOLS MATCH THOSE SHOWN ON THE GEOLOGIC DRILL LOGS.
Initial Readings: April 27, 1983

Jan 8, 1983  O (not plotted - data appears erroneous)
Dec 5, 1984  +
Nov 11, 1985  X
May 26, 1983  

Geologic symbols match those shown on the geologic drill logs.

Figure J-319
Inclinometer 51X-IC-00206
Test Room 1 - E Roof (1 ft from wall)
West - East Deflection
FIGURE J-321
INCLINOMETER 51X-IG-00212
TEST ROOM 2 - E WALL (1 FT FROM FLOOR)
VERTICAL DEFLECTION

INITIAL READINGS: APR 5, 1983
JUN 30, 1986  O
NOV 18, 1985  △
NOV 20, 1984  □
NOV 11, 1983  +
MAY 6, 1983  ×
(NO NOT PLANNED - DATA APPEARS ERRONEOUS)
INITIAL READINGS: APR 5, 1983
JUN 30, 1983 φ
NOV 18, 1983 Δ
NOV 30, 1984 +
NOV 11, 1983 X
MAY 6, 1983 φ

FIGURE J-323
INCLINOMETER 51X-IG-00214
TEST ROOM 2 - W WALL (1 FT FROM FLOOR)
VERTICAL DEFLECTION
FIGURE J-325
INCLINOMETER 51X-IG-00216
TEST ROOM 1 - E WALL (1 FT FROM FLOOR)
VERTICAL DEFLECTION

INITIAL READINGS: APR 27, 1983
JUN 30, 1983 O
NOV 10, 1984 O
NOV 20, 1984 +
NOV 11, 1983 X
MAR 28, 1983 6
FIGURE J-327
INCLINOMETER 51X-IG-00218
TEST ROOM 1 - W WALL (1 FT FROM FLOOR)
VERTICAL DEFLECTION

INITIAL READINGS: APR 27, 1983
JUN 30, 1984 
NOV 18, 1985 
NOV 20, 1984 + (NOT PLOTTED - DATA APPEARS ERRONEOUS)
NOV 11, 1983 X
MAY 26, 1983 

VIEW NORTH

VERTICAL DEFLECTION (INCHES)
0.00 0.20 0.40 0.60 0.80 1.00 1.20

DISTANCE INTO WALL (FEET)
0.00 1.00 2.00 3.00 4.00 5.00 6.00 7.00 8.00 9.00 10.00 11.00 12.00
INITIAL READINGS: APR 12, 1983
JUN 30, 1986  C
NOV 18, 1985  Δ
NOV 20, 1984  +
NOV 11, 1983  X
MAY 6, 1983  O

FIGURE J-330
INCLINOMETER 51X-IG-00221
TEST ROOM 3 - W WALL (1 FT FROM ROOF)
VERTICAL DEFORMATION
INITIAL READINGS: APR 12, 1983
JUN 30, 1983 ☞ (NOT PLOTTED – DATA APPEARS ERRONEOUS)
NOV 10, 1985 ☞
NOV 20, 1984 ☞
NOV 11, 1983 ☞
MAY 19, 1983 ☞

FIGURE J-331
INCLINOMETER 51X-IC-00222
TEST ROOM 3 - W WALL (1 FT FROM FLOOR)
VERTICAL DEFLECTION
INITIAL READINGS: MAY 10, 1983

JUN 20, 1983  
JUN 22, 1983  
NOV 10, 1983  
NOV 20, 1984  
NOV 11, 1984  

DISTANCE INTO WALL (FEET)

0.00  0.20  0.40  0.60  0.80  1.00

VERTICAL DEFLECTION (INCHES)

FIGURE J-333
INCLINOMETER 51X-IG-00224
TEST ROOM 4 - E WALL (1 FT FROM FLOOR)
VERTICAL DEFLECTION
APPENDIX K

ANALYTICAL DATA PLOTS
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<td>Test Room Roof Extensometers - Collar to Deepest Anchor</td>
</tr>
<tr>
<td>K-51</td>
<td>Test Room Floor Extensometers - Collar to Anchor A</td>
</tr>
<tr>
<td>K-52</td>
<td>Test Room Floor Extensometers - Anchor A to Anchor B</td>
</tr>
<tr>
<td>K-53</td>
<td>Test Room Floor Extensometers - Anchor B to Anchor C</td>
</tr>
<tr>
<td>K-54</td>
<td>Test Room Floor Extensometers - Anchor C to Anchor D</td>
</tr>
<tr>
<td>K-55</td>
<td>Test Room Floor Extensometers - Collar to Deepest Anchor</td>
</tr>
</tbody>
</table>
FIGURE K-2
CONVERGENCE POINTS
E140 DRIFT, SOUTH 550 FT
CONVERGENCE RATE VS. TIME SINCE EXCAVATION

NOTES:
1. RATE CALCULATED FOR MINIMUM INTERVALS OF 30 DAYS.
2. SIZE OF EXCAVATION: 12 FT X 25 FT.
NOTES:
1. RATE CALCULATED FOR MINIMUM INTERVALS OF 30 DAYS.
2. SIZE OF EXCAVATION: 12 FT X 25 FT.

FIGURE K-3
CONVERGENCE POINTS
E140 DRIFT, SOUTH 850 FT
CONVERGENCE RATE VS. TIME SINCE EXCAVATION
NOTES:
1. RATE CALCULATED FOR MINIMUM INTERVALS OF 30 DAYS.
2. SIZE OF EXCAVATION: 12 FT X 25 FT.

FIGURE K-5
CONVERGENCE POINTS
E140 DRIFT, SOUTH 1246 FT
CONVERGENCE RATE VS. TIME SINCE EXCAVATION
FIGURE K-7
CONVERGENCE POINTS
E140 DRIFT, SOUTH 1879 FT
CONVERGENCE RATE VS. TIME SINCE EXCAVATION

NOTES:
1. RATE CALCULATED FOR MINIMUM INTERVALS OF 30 DAYS.
2. SIZE OF EXCAVATION 12 FT X 25 FT.
Figure K-9
Convergence Points
E0 Drift, North 626 ft
Convergence Rate vs. Time Since Excavation
CONVERGENCE RATE, INCHES/YEAR

ELAPSED DAYS SINCE EXCAVATION AT INSTRUMENT LOCATION

NOTES:
1. RATE CALCULATED FOR MINIMUM INTERVALS OF 30 DAYS.
2. SIZE OF EXCAVATION: 12 FT X 25 FT.

FIGURE K-10
CONVERGENCE POINTS
E0 DRIFT, NORTH 940 FT
CONVERGENCE RATE VS. TIME SINCE EXCAVATION
FIGURE K-13
CONVERGENCE POINTS
E140 DRIFT, NORTH 240 FT
CONVERGENCE RATE VS. TIME SINCE EXCAVATION

NOTES:
1. RATE CALCULATED FOR MINIMUM INTERVALS OF 30 DAYS.
2. SIZE OF EXCAVATION: 8 FT X 14 FT.
NOTES:
1. RATE CALCULATED FOR MINIMUM INTERVALS OF 30 DAYS.
2. SIZE OF EXCAVATION: 8 FT X 14 FT.

FIGURE K-14
CONVERGENCE POINTS
E140 DRIFT, NORTH 626 FT
CONVERGENCE RATE VS. TIME SINCE EXCAVATION
Figure K-16
Convergence Points
Test Room 1
Convergence Rate vs. Time Since Excavation

Notes:
1. Rate calculated for minimum intervals of 30 days.
2. Size of excavation: 13 ft x 33 ft.
NOTES
1. RAIF CALCULATED FOR MINIMUM INTERVALS OF 30 DAYS.
2. SIZE OF EXCAVATION: 13 FT X 13.5 FT.

FIGURE K-17
CONVERGENCE METER 51X-CE-00201
TEST ROOM 2
CONVERGENCE RATE VS. TIME SINCE EXCAVATION
Figure K-18
Convergence Points
Test Room 2
Convergence Rate vs. Time Since Excavation

Notes:
1. Rate calculated for minimum intervals of 30 days.
2. Size of excavation: 13 ft x 33 ft.
NOTES:
1. RATE CALCULATED FOR INTERVALS OF 30 DAYS
2. SIZE OF EXCAVATION: 13 ft x 33 ft.

FIGURE K-20
CONVERGENCE POINTS
TEST ROOM 4
CONVERGENCE RATE VS. TIME SINCE EXCAVATION

ELAPSED DAYS SINCE EXCAVATION AT INSTRUMENT LOCATION

CONVERGENCE RATE, INCHES/YEAR


0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0

IG-225 IG-223
IG-226 IG-224

VIEW NORTH

ROOF-TO-FLOOR
WALL-TO-WALL
FIGURE K-21
CONVERGENCE POINTS
N1100 DRIFT - TEST ROOM 2 INTERSECTION
CONVERGENCE RATE VS. TIME SINCE EXCAVATION

NOTES
1. RATE CALCULATED FOR MINIMUM INTERVALS OF 30 DAYS.

SECTION X-X'

ROOM 2
(13' x 33')

ROOM J
(12' x 20')

PLAN VIEW

N1100
(12' x 20')

ELAPSED DAYS SINCE EXCAVATION AT INSTRUMENT LOCATION

CONVERGENCE RATE, INCHES/YEAR
FIGURE K-23
MULTIPLE-POINT EXTENSOMETER 51X-GE-00241
N1100 - TEST ROOM 2 INTERSECTION - ROOF
STRAIN VS. TIME SINCE EXCAVATION
FIGURE K-24
MULTIPLE-POINT EXTENSOMETER 51X-GE-00242
N1100 - TEST ROOM 2 INTERSECTION - FLOOR
STRAIN VS. TIME SINCE EXCAVATION
Figure K-25
Multiple-Point Extensometer S1X-GE-00247
E140 Drift, South 1950 ft - Roof
Strain vs. Time Since Excavation

Notes:
1. Size of Excavation: 12 ft x 25 ft
NOTES:
1. SIZE OF EXCAVATION: 8 FT X 25 FT.
2. INSTRUMENT HAS BEEN DESTROYED.

FIGURE K-26
MULTIPLE-POINT EXTENSOMETER 51X-GE-00248
E140 DRIFT, SOUTH 1950 FT - FLOOR
STRAIN VS. TIME SINCE EXCAVATION
Figure K-27
Multiple-Point Extensometer 51X-GE-00250
E140 Drift, South 3045 ft - Floor
Strain vs. Time Since Excavation

Notes:
1. Size of excavation: 8 ft x 25 ft.
NOTES:
1. SIZE OF EXCAVATION: 8 FT X 25 FT.

FIGURE K-28
MULTIPLE-POINT EXTENSOMETER 51X-GE-00249
E140 DRIFT, SOUTH 3080 FT - ROOF
STRAIN VS. TIME SINCE EXCAVATION
FIGURE K-29
DOUBLE-POINT EXTENSOMETER 51X-GE-00234
E0 DRIFT, NORTH 626 FT - ROOF
STRAIN RATE VS. TIME SINCE EXCAVATION

NOTES:
1. RATE CALCULATED FOR MINIMUM INTERVALS OF 30 DAYS.
2. SIZE OF EXCAVATION: 12 FT X 25 FT
FIGURE K-32
MULTIPLE-POINT EXTENSOMETER 5IX-GE-00247
E140 DRIFT, SOUTH 1950 FT - ROOF
STRAIN RATE VS. TIME SINCE EXCAVATION

1. RATE CALCULATED FOR MINIMUM INTERVALS OF 30 DAYS.
2. SIZE OF EXCAVATION: 12 FT X 25 FT.
1. RATE CALCULATED FOR INTERVALS OF 30 DAYS.
2. SIZE OF EXCAVATION: 8 FT X 25 FT.
3. INSTRUMENT HAS BEEN DESTROYED.

FIGURE K-33
MULTIPLE-POINT EXTENSOMETER 51X-GE-00248
E140 DRIFT, SOUTH 1950 FT - FLOOR
STRAIN RATE VS. TIME SINCE EXCAVATION
FIGURE K-34
MULTIPLE-POINT EXTENSOMETER 51X-GE-00250
E140 DRIFT, SOUTH 3045 FT - FLOOR
STRAIN RATE VS. TIME SINCE EXCAVATION

NOTES:
1. RATE CALCULATED FOR MINIMUM INTERVALS OF 30 DAYS.
2. SIZE OF EXCAVATION 8 FT X 25 FT.
**FIGURE K-37**

Test room roof extensometers - anchor A to anchor B

Strain vs. time since excavation.
FIGURE K-40
TEST ROOM ROOF EXTSNOMETERS –
COLLAR TO DEEPEST ANCHOR
STRAIN VS. TIME SINCE EXCAVATION
FIGURE K-41
TEST ROOM FLOOR EXTENSOMETERS - COLLAR TO ANCHOR A
STRAIN VS. TIME SINCE EXCAVATION
Figure Y-42
Test Room Floor Extensometers - Anchor A to Anchor B
Strain vs. Time Since Excavation
FIGURE K-45
TEST ROOM FLOOR EXTENSOMETERS - COLLAR TO DEEPEST ANCHOR STRAIN VS. TIME SINCE EXCAVATION
INSTRUMENT POINT EXCAVATION DATE LOCATION

*5IX-C0-00207 COLLAR-A APR 16, 1983 TEST ROOM 4 - ROOF
*5IX-C0-00212 COLLAR-A MAR 26, 1983 TEST ROOM 3 - ROOF
*5IX-C0-00214 COLLAR-A MAR 10, 1983 TEST ROOM 2 - CENTER ROOF
*5IX-C0-00218 COLLAR-A APR 4, 1983 TEST ROOM 1 - CENTER ROOF
*5IX-C0-00237 COLLAR-A MAR 13, 1983 TEST ROOM 0 - W ROOF
*5IX-C0-00238 COLLAR-A MAR 10, 1983 TEST ROOM 0 - E ROOF
*5IX-C0-00239 COLLAR-A APR 5, 1983 TEST ROOM 1 - E ROOF
*5IX-C0-00240 COLLAR-A APR 6, 1983 TEST ROOM 1 - W ROOF

NOTES:
1. RATE CALCULATED FOR MINIMUM INTERVALS OF 30 DAYS.

FIGURE K-46
TEST ROOM ROOF EXTENSOMETERS - COLLAR TO ANCHOR A STRAIN RATE VS. TIME SINCE EXCAVATION
Figure K-47
Test Room Roof Extensometers - Anchor A to Anchor B
Strain Rate vs. Time Since Excavation

Notes:
1. Rate calculated for minimum intervals of 30 days.
FIGURE K-48
TEST ROOM ROOF EXTENSOMETERS - ANCHOR B TO ANCHOR C
STRAIN RATE VS. TIME SINCE EXCAVATION

NOTES:
1. RATE CALCULATED FOR MINIMUM INTERVALS OF 30 DAYS.
NOTES:
1. RATE CALCULATED FOR MINIMUM INTERVALS OF 30 DAYS.

FIGURE K-49
TEST ROOM ROOF EXTENSOMETERS – ANCHOR C TO ANCHOR D
STRAIN RATE VS. TIME SINCE EXCAVATION
FIGURE K-51
TEST ROOM FLOOR EXTENSOMETERS - COLLAR TO ANCHOR A
STRAIN RATE VS. TIME SINCE EXCAVATION

NOTES:
1. RATE CALCULATED FOR MINIMUM INTERVALS OF 30 DAYS.
NOTES:
1. RATE CALCULATED FOR MINIMUM INTERVALS OF 30 DAYS.

FIGURE K-54
TEST ROOM FLOOR EXTENSOMETERS - ANCHOR C TO ANCHOR D
STRAIN RATE VS. TIME SINCE EXCAVATION
Notes:
1. Rate calculated for minimum intervals of 30 days.

Figure K.53
Test Room Floor Extensometers – Anchor B to Anchor C
Strain Rate vs. Time since Excavation
NOTES
1. RATE CALCULATED FOR MINIMUM INTERVALS OF 30 DAYS.

FIGURE K-55
TEST ROOM FLOOR EXTENSOMETERS - COLLAR TO Deepest ANCHOR
STRAIN RATE VS. TIME SINCE EXCAVATION