

APPENDIX E

WASTE SHAFT
GEOLOGIC LOGS AND MAPS



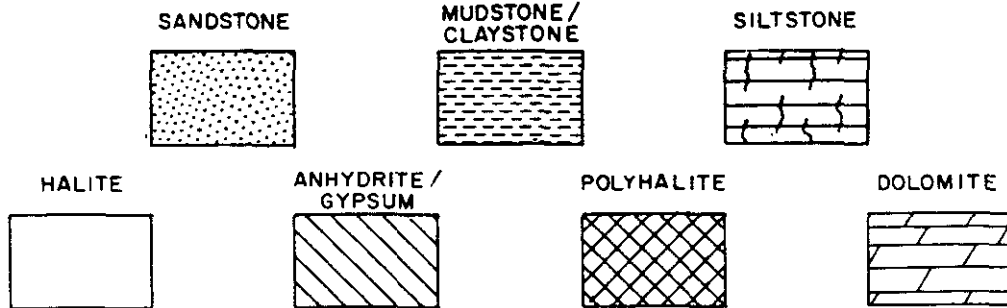
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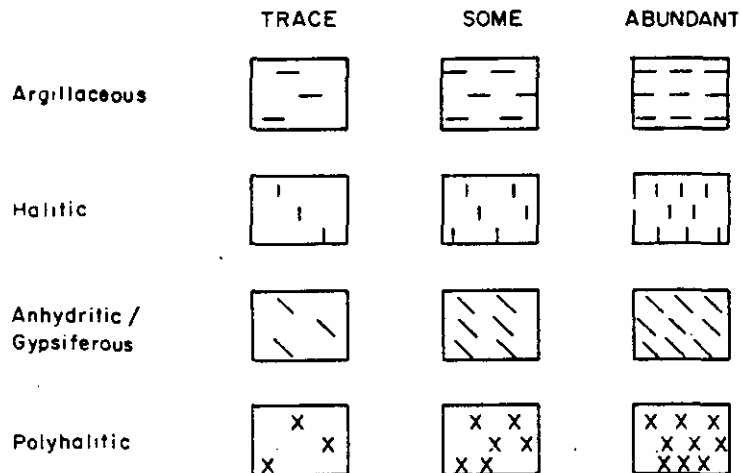
EXPLANATION

ROCK TYPE

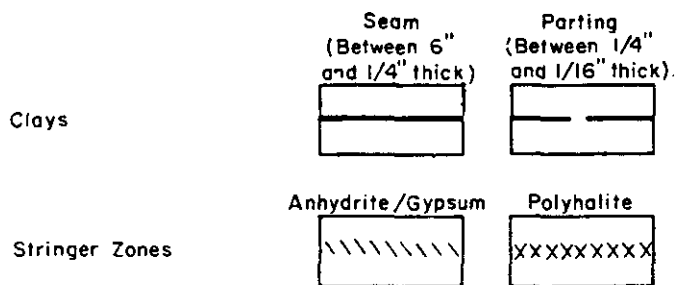


ACCESSORY CONSTITUENTS

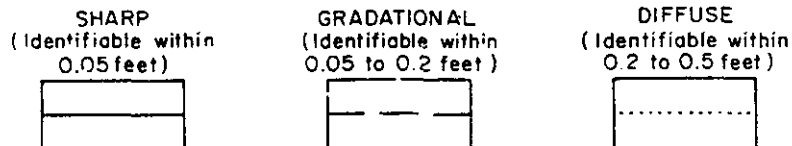
ESTIMATED PERCENTAGE OF ACCESSORY CONSTITUENTS INDICATED AS FOLLOWS



LAMINAR FEATURES



CONTACTS



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-TME-038.

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FIGURE E-1

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

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FIGURE E-1
 WASTE HANDLING SHAFT
 LITHOLOGIC LOG
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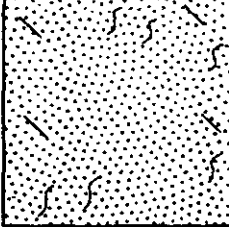

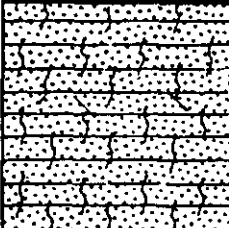
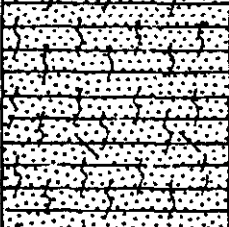
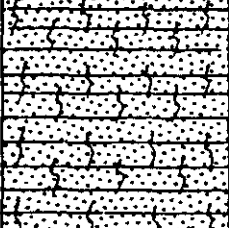
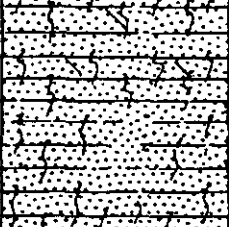
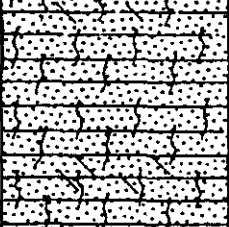
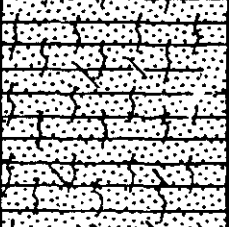
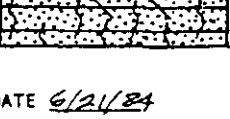

| PRELIMINARY | | STRATIGRAPHIC COLUMN | REMARKS |
|-----------------|-------------|----------------------|---|
| ELEV. (FT. MSL) | DEPTH (FT.) | | |
| | 180 | | As above. |
| 3220 | | | Sandstone, light gray, hard, non-calcareous, fine-grained; irregular, subhorizontal, discontinuous gypsum layers (1/8" - 1/2" thick), 2" - 6" spacing |
| | 190 | | Sandstone, reddish-brown, silty, very fine grained, non-calcareous; gradational contact; gypsum layers; intermittent laminae and cross-bedding. |
| | | | As above, without gypsum layers, laminated, cross-bedded near base. |
| 3210 | 200 | | Sandstone, reddish-brown, silty, minor cross-bedding and laminations; gypsum layers occur 196.9' downward, greenish-gray, irregular, subhorizontal layers: 196.7' - 196.9'; 203.9' - 204.1'; ~211.8'; 230.5'; 243.6' - 243.8'; 249.3'; 253.1' - 253.2'; 253.8' - 255.1'; 265.1' - 265.2', gypsum layers less abundant below 221', average spacing > 1'. |
| 3200 | 210 | | |
| 3190 | 220 | | |
| 3180 | 230 | | |
| 3170 | 240 | | |
| | | | |
| 3160 | 250 | | |
| | | | |
| 3150 | 260 | | |
| | | | |
| | | | |
| | | | Sandstone as above, gypsum layers increase in frequency downward, mostly subhorizontal, up to 1" thick; high angle layers are thinner |
| 3140 | 270 | | Siltstone, reddish-brown, hard. |
| | | | Sandstone, reddish-brown, silty, cross-bedded, and laminated. |

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FIGURE E-1

| PRELIMINARY | | STRATIGRAPHIC COLUMN | REMARKS |
|-----------------|-------------|---|--|
| ELEV. (FT. MSL) | DEPTH (FT.) | | |
| | 270 |  | As above |
| 3130 | 280 |  | Siltstone, reddish-brown, 271.6'-271.7' 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'. |
| | |  | Siltstone, reddish-brown, sandy. |
| 3120 | 290 |  | 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'. |
| 3110 | 300 |  | |
| 3100 | 310 |  | |
| 3090 | 320 |  | |
| 3080 | 330 |  | 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'). |
| 3070 | 340 |  | |
| 3060 | 350 |  | |
| 3050 | 360 |  | |

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FIGURE E-1
 WASTE HANDLING SHAFT
 LITHOLOGIC LOG
 SHEET 4 OF 26

| PRELIMINARY | | STRATIGRAPHIC COLUMN | REMARKS |
|-----------------|-------------|----------------------|--|
| ELEV. (FT. MSL) | DEPTH (FT.) | | |
| | 360 | | As above |
| 3040 | 370 | | Sandstone, reddish-brown, as above, except finely laminated, silty; numerous thin gypsum layers along bedding planes ($<1/8''$), some subvertical; at 416.1, laminae (1-10mm) grade to more massive bedding, soft sediment deformation structures at 391.1-393.1 and 401.1-409.1 |
| 3030 | 380 | | |
| 3020 | 390 | | |
| 3010 | 400 | | |
| 3000 | 410 | | |
| 2990 | 420 | | As above, except massively bedded. |
| 2980 | 430 | | Siltstone, reddish-brown, some very fine sand, hard, massive, occasional thin subhorizontal gypsum partings; spotty gray-green reduced zones ($1/8''-1''$ diam); locally gypsiferous. |
| 2970 | 440 | | Sandstone and siltstone interbedded; numerous greenish-gray reduced zones |
| 2960 | 450 | | Sandstone, reddish-brown, silty, thin, discontinuous gypsum layers, subhorizontal to subvertical, massive, hard, very fine grained; contains siltstone bed, reddish-brown, moderately hard, somewhat friable (447.4-447.7'); reduced zone, greenish-gray, silty, discontinuous blebs in horizontal band (458.5-459.5') |

FIGURE E-1

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| PRELIMINARY | | STRATIGRAPHIC COLUMN | REMARKS |
|--------------------|----------------|----------------------|--|
| ELEV. (FT. MSL) | DEPTH (FT.) | | |
| | 450 | | As above |
| 2950 | 460 | | Siltstone or very silty sandstone, hard, massive; abundant reduced spots at base. |
| 2940 | 470 | | Sandstone, reddish-brown; gypsum layers abundant and prominent, 467.1'-473.1'; sparse greenish-grey reduced spots near top. |
| 2930 | 480 | | Siltstone or silty sandstone, reddish-brown; fewer gypsum layers 473.6'-492.1' |
| 2920 | 490 | | 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. |
| 2910 | 500 | | Siltstone, reddish-brown, sandy, gradational contact, massive, finely bedded at base, hard; thin gypsum layers; sand content increases below about 511.1' |
| 2900 | 510 | | |
| 2890 | 520 | | Sandstone, reddish-brown, massive, silty to very silty, hard; thin gypsum seams; occasional reduced spots of varying size; contacts gradational. |
| 2880 | 530 | | Siltstone, reddish-brown, sandy, massive, hard, very fine sand; thin gypsum layers; At basal contact gypsum layers surround clasts of siltstone; basal 4" to 6" acquires a purplish hue; basal 1" is reduced; basal contact contains soft sediment deformation features. |
| 2870 | 540 | | RUSTLER FORMATION FORTY-NINER MEMBER See description next sheet. |

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FIGURE E-1

| PRELIMINARY | | STRATIGRAPHIC COLUMN | REMARKS |
|--------------------|----------------|----------------------|--|
| ELEV. (FT. MSL) | DEPTH (FT.) | | |
| | 540 | | <p>Anhydrite, light gray, hard, finely crystalline; massive in upper part, grading to banded, light-dark on a 1/2" scale; upper contact undulates up to 8"; 1/2" to 1" wide gypsum filled fractures occur through out, spacing of 9" to 18"; gypsum filled fractures 1/8" to 1/2" wide occur through out, spacing of 1" to 6"; basal 6" is dark brown, coarse crystalline gypsum.</p> <p>As above, with 3"-4" vugs filled with well developed gypsum crystals, at 557.6.</p> |
| 2860 | 550 | | |
| 2850 | 560 | | |
| 2840 | 570 | | Claystone, silty. |
| 2830 | 580 | | <p>Anhydrite, gray or grayish-white, hard, finely crystalline, gypsum-filled fractures and gypsum stringers, banded near 588.0'</p> |
| 2820 | 590 | | |
| 2810 | 600 | | <p><u>MAGENTA DOLOMITE MEMBER</u> Dolomite, with disseminated gypsum (Figure E-2)</p> |
| 2800 | 610 | | <p><u>TAMARISK MEMBER</u> Anhydrite, gray, coarsely crystalline, gypsum occurs in upper part; increasing hardness downward; some high angle gypsum layers; transition to less gypsiferous anhydrite.</p> |
| 2790 | 620 | | |
| 2780 | 630 | | <p>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 mottled gray coloration; becomes slightly argillaceous toward the base.</p> |

FIGURE E-1

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WASTE HANDLING SHAFT
 LITHOLOGIC LOG
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| PRELIMINARY | | STRATIGRAPHIC COLUMN | REMARKS |
|-----------------|-------------|--|--|
| ELEV. (FT. MSL) | DEPTH (FT.) | | |
| | 630 | | As above |
| 2770 | 640 | | |
| 2760 | 650 | | |
| 2750 | 660 | | 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. |
| 2740 | 670 | | As above, except unmottled, sugary, hard, uniformed |
| 2730 | 680 | | Anhydritic claystone |
| | | | Anhydrite |
| | | | Claystone, silty |
| 2720 | 690 | | Anhydrite, light gray, finely crystalline; banded; local black clay laminae; upper 1' gypsiferous, whitish-gray. |
| 2710 | 700 | | Clay seam, dark gray, soft, up to 6"; includes thin, discontinuous gypsum seam Anhydrite, as above. |
| 2700 | 710 | CULEBRA DOLOMITE MEMBER Dolomite, contains abundant gypsum filled vugs. (See Figure E-3) | |
| 2690 | 720 | | |



FIGURE E-1

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

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FIGURE E-1
 WASTE HANDLING SHAFT
 LITHOLOGIC LOG
 SHEET 9 OF 26

| PRELIMINARY | | STRATIGRAPHIC COLUMN | REMARKS |
|-----------------|-------------|--------------------------|---|
| ELEV. (FT. MSL) | DEPTH (FT.) | | |
| | 810 | | As above |
| 2590 | 820 | | |
| 2580 | 830 | | |
| 2570 | 94C | | Argillaceous siltstone |
| | | | Silty claystone, anhydrite, and anhydritic siltstone |
| | | | SALADO FORMATION Claystone, halitic (See Figure B-5) |
| 2560 | 850 | --- Contact Obscured --- | Halite |
| | | --- | Halite, argillaceous |
| | | | Halite |
| 2550 | 86C | | Anhydrite, halitic |
| | | | Halite |
| 2540 | 87C | --- | Halite, argillaceous |
| | | | Halite |
| | | --- | Halite, argillaceous |
| 2530 | 88C | --- | Halite |
| | | | Halite |
| 2520 | 890 | --- | Halite, argillaceous |
| | | --- | Halite, some argillaceous material; transition to clear halite with trace polyhalite, trace argillaceous material, underlain by 1" seam gray green clayey silt. |
| | | --- | Halite, with abundant argillaceous material. |
| 2510 | 900 | X --- | Halite, clear; polyhalite and argillic content increase downward; argillaceous zone (898.2' - 898.3'), with reddish-brown clay blebs and stringers. |

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FIGURE E-1
 WASTE HANDLING SHAFT
 LITHOLOGIC LOG
 SHEET 10 OF 26

| PRELIMINARY | | STRATIGRAPHIC COLUMN | REMARKS |
|-----------------|-------------|----------------------|---|
| ELEV. (FT. MSL) | DEPTH (FT.) | | |
| | 900 | --X | As above |
| | | X | Halite, clear, massive, moderately soft; trace polyhalite |
| | | --X | Halite, argillaceous; trace polyhalite. |
| | | X | Halite, clear; trace polyhalite. |
| 2500 | 910 | -- | Halite, argillaceous; includes clay seam at 906.1' dipping few degrees NE. |
| | | -- | Halite, clear. |
| | | X | Halite, reddish-brown, argillaceous and silty; soft gray-green band near upper contact. |
| | | X | Halite, less argillaceous than above; trace to some polyhalite; blebs of gray-green siltstone; layers (>1') 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") (919.8'-921.6'). |
| 2490 | 920 | X | 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"-1") (922.8'-924.7'). |
| | | X | Halite; argillaceous content increases downward; trace polyhalite; gray-green siltstone blebs or layers, reduced zones. |
| 2480 | 930 | X | Halite, clear, trace argillaceous material and siltstone; argillic content increases downward between 936.3'-940.4'. |
| | | X | Halite, clear, very argillaceous, brown-red; gray-green siltstone at lower contact; undulatory upper contact. |
| 2470 | 940 | X | Halite, brown-red; trace polyhalite, lower argillaceous content than above; gradational contacts. |
| | | X | Halite, brown-red, very argillaceous; many thin (<1/4") polyhalite stringers. |
| 2460 | 950 | X | Halite, red-brown, very argillaceous, soft. |
| | | X | Halite, clear to pale pink, coarse crystals; trace polyhalite increases downward; layer of polyhalite (953.0'-953.2'). |
| | | X | Halite, red to brown red, abundant polyhalite; argillaceous content increases downward, especially 955.6'-955.9'. |
| 2450 | 960 | X | Mudstone, silty or siltstone, brown-red, trace halite; massive, medium soft to soft, harder at upper contact and very hard 2'-3" inside wall; fractures. |
| | | X | As above, except light gray. |
| | | X | Halite, clear to red-brown, some to abundant argillaceous material; some polyhalite, orange to red-brown. |
| | | X | Polyhalite, reddish-orange, massive, medium soft to medium hard. |
| 2440 | 970 | X | Interbedded polyhalite and halite, hard; massive polyhalite; lower portion contains 2'-3" bed of anhydrite. |
| | | X | Halite, red-brown, argillaceous; argillic content decreases with depth and is largely absent below 972.1'; trace polyhalite, increases downward; clear halite alternates with polyhalite and halitic polyhalite in 12"-14" beds near lower contact; hard where argillic content is low. |
| 2430 | 980 | X | Anhydrite, with halite, fine-grained, gray, hard. |
| | | X | Halite, clear, high argillic content, red-brown; some discontinuous argillaceous 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 |
| 2420 | 990 | X | |

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FIGURE E-1

| PRELIMINARY | | STRATIGRAPHIC COLUMN | REMARKS |
|-----------------|-------------|----------------------|--|
| ELEV. (FT. MSL) | DEPTH (FT.) | | |
| | 990 | --- | As above |
| | | X | |
| 2410 | 1000 | X X | Halite, clear; trace polyhalite and argillaceous material in 0.3' bands alternating with discontinuous argillaceous, polyhalitic halite bands, 0.01'; at 999.6, halite bands thicken to -1'; argillaceous content increases downward in halite bands; polyhalite occurs in layers (up to 1") downward. |
| | | X- -X | |
| | | -X | Polyhalite, reddish-orange, thickness ranges 9"-19"; underlain by gray clay seam (1/4") and gray anhydrite and polyhalite (1"-4"). |
| | | X- X- | |
| 2400 | 1010 | ----- | Halite, some argillaceous material; argillaceous content decreases downward; thin (1/4") clay partings at 1010.6' (gray) and at 1012.1' (reddish brown); argillaceous bed (1010.5'-1011.3'). |
| | | ----- | 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'). |
| 2390 | 1020 | ----- | |
| | | ----- | Clay, moderate gray and reddish-brown, soft; halite-filled fractures. |
| | | ----- | Halite, some argillaceous material, disseminated trace polyhalite; decreasing argillaceous material below about 1038.1'; occasional gray blebs in lower portion |
| 2380 | 1030 | ----- | |
| | | ----- | 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. |
| 2370 | 1040 | ----- | |
| | | ----- | 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'. |
| 2360 | 1050 | ----- | |
| | | ----- | 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'. |
| 2350 | 1060 | ----- | |
| | | ----- | 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 gray clay at lower contact. |
| 2340 | 1070 | ----- | |
| | | ----- | 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"). |
| 2330 | 1080 | ----- | |
| | | ----- | Halite; some to abundant argillaceous material; trace polyhalite. |

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FIGURE E-1

| PRELIMINARY | | STRATIGRAPHIC COLUMN | REMARKS |
|-----------------|-------------|----------------------|--|
| ELEV. (FT. MSL) | DEPTH (FT.) | | |
| | 1170 | | As above |
| | | | Halite; trace to some argillaceous material, dark gray clay; trace polyhalite |
| 2230 | | | Halite, argillaceous, decreasing toward base; trace to some polyhalite, layers (1/2") at 1176.1' and 1176.6' continuous gray-reddish-brown clay seam (~5") at 1178.2' - 1178.6'. |
| | 1180 | | Halite, trace polyhalite, disseminated argillaceous material. |
| 2220 | | | Halite, argillaceous, reddish-brown; trace polyhalite; argillaceous content decreases toward the base. |
| | 1190 | | Halite, trace to some argillaceous material, trace polyhalite. |
| 2210 | | | Polyhalite; has irregular contacts; underlain by 1"-2" thick gray clay seam. |
| | 1200 | | Halite; trace polyhalite. |
| 2200 | | | Polyhalite; irregular anhydrite layers with halite crystals. |
| | 1210 | | Halite; trace to some polyhalite. |
| | | | Halite; some argillaceous material; polyhalite bands ≤ 1/4" thick |
| | | | Polyhalite. |
| | | | Halite, clear; trace argillaceous material and polyhalite. |
| | | | Halite, clear. |
| 2190 | | | Halite, some argillaceous material. |
| | 1220 | | Anhydrite, gray, dense. |
| | | | Halite, clear, thin; discontinuous polyhalite bands, 0.2'-0.4' apart. |
| | | | Halite; some polyhalite. |
| | | | Halite; trace argillaceous material, with gray clay stringers. |
| 2180 | | | Halite; abundant argillaceous material; nodules (1/2") of reddish-brown clay; argillaceous content decreases to some (1227.8' - 1234.7'). |
| | 1230 | | Halite, clear. |
| | | | Halite; some polyhalite. |
| 2170 | | | Polyhalite; undulatory upper contact, 0.7' relief; gray clay seam (1"-2" thick) underlies polyhalite. |
| | 1240 | | Halite; trace to some (≤ 10%) polyhalite. |
| | | | Halite, some (~10-15%) argillaceous material, discontinuous stringers and disseminated gray clay; trace polyhalite. |
| | | | Halite, some (10-20%) polyhalite in thin, discontinuous stringers, and interstitially. |
| 2160 | | | Halite, trace polyhalite in thin, relatively continuous stringers; polyhalite blebs and irregular masses (2"-3" diam.) (1250.9' - 1257.5'). |
| | 1250 | | Polyhalite, thickness varies 2"-6", underlain by gray clay seam (1/4"-1/2"); contacts undulatory. |
| 2150 | | | Halite, clear; trace polyhalite. |

FIGURE E-1

PREPARED BY RmH DATE 6/21/84
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| PRELIMINARY | | STRATIGRAPHIC COLUMN | REMARKS |
|-----------------|-------------|----------------------|---|
| ELEV. (FT. MSL) | DEPTH (FT.) | | |
| | 1260 | X X X X | As above |
| | | X X | Polyhalite, 16"-18" thick; thin halite layers at 1265.4'; underlain by gray clay seam (1/2"). |
| | | X X | Halite, clear. |
| 2140 | 1270 | X X | Halite, clear; trace polyhalite |
| | | X X | Halite; some argillaceous material, gray clay. |
| | | X X | Halite; some (10-20%) polyhalite interstitially, in stringers and scattered blebs; continuous band of polyhalite stringers (1272.4'-1272.8'). |
| | | X X | Halite, clear; trace to some polyhalite. |
| 2130 | 1280 | X X | Halite; trace argillaceous material, gray clay. |
| | | X X | Halite, clear; trace polyhalite. |
| | | X X | Halite, some to abundant argillaceous material, reddish-brown clay; reddish-brown clay seam up to 3" thick (1282.4'-1282.5'). |
| | | X X | Halite, clear; trace polyhalite in discontinuous layers (<2") at 2187.5' and 2187.8'. |
| 2120 | 1290 | X X | Polyhalite. |
| | | X X | Halite, clear; trace argillaceous material and polyhalite; banded halite and polyhalite near upper contact (1289.6'-1290.1'). |
| | | X X | Halite, clear; diffuse contact. |
| 2110 | 1300 | X X | Polyhalite, in stringers (1298.5'-1298.9', 1299.4'-1299.5') and layers (2"-6") (1298.9'-1299.4'). |
| | | X X | Halite, clear; trace polyhalite. |
| | | X X | Halite, trace to some polyhalite; several polyhalite layers at 1304.1' (up to ~1/4"), 1304.6' (~1/4"), and 1305.1' (2"). |
| 2100 | 1310 | X X | Halite, clear; gradational upper contact. |
| | | X X | Halite; trace to some argillaceous material, reddish-brown. |
| | | X X | Halite, clear; trace polyhalite. |
| | | X X | Polyhalite; some halite. |
| | | X X | Halite, argillaceous; or halitic clay, gray. |
| 2090 | 1320 | X X | Halite, clear; polyhalite blebs. |
| | | X X | Anhydrite, in bands (~1/2") at 1324.0', 1324.2', 1324.4'. |
| | | X X | Polyhalite; anhydrite in lower 3" (1327.4'-1327.8'). |
| 2080 | 1330 | X X | Halite, clear; trace polyhalite. |
| | | X X | Halite; some to abundant polyhalite. |
| | | X X | Halite, clear; polyhalite stringers and blebs (1333.6'-1336.6'); distinct polyhalite layers (1/4"-1") at 1336.9', 1337.1'. |
| | | X X | Polyhalite; clear halite layer (~4") at 1339.0'-1339.3'; underlain by gray clay seam (1/4"). |
| 2070 | 1340 | X X | Halite, clear; trace polyhalite. |
| | | X X | Mc Nutt Potash Zone |
| | | X X | Halite; trace to some polyhalite. |
| | | X X | Halite; some argillaceous material and polyhalite. |
| | | X X | Halite; abundant argillaceous material; trace to some polyhalite with large polyhalite blebs. |
| 2060 | 1350 | X X | Halite; some to abundant argillaceous material, reddish-brown, including irregular clay masses and clayey silt. |

WIRE MESH

FIGURE E-1

PREPARED BY RmH DATE 6/21/84
 CHECKED BY _____ DATE _____

WASTE HANDLING SHAFT
 LITHOLOGIC LOG
 SHEET 15 OF 26

| PRELIMINARY | | STRATIGRAPHIC COLUMN | REMARKS |
|-----------------|-------------|--|---|
| ELEV. (FT. MSL) | DEPTH (FT.) | | |
| | 1350 | — — — — — — — — — — — — — — — | As above |
| 2050 | | — x — x — x x — x — x | Halite; trace argillaceous material; some polyhalite. |
| | 1360 | XXXXXXXX X X X | Polyhalite Halite; trace to some polyhalite, with stringers in upper 4" (1359.6' - 1360.0'); trace polyhalite below 1360.0'. |
| 2040 | | XXXXXXXXXXXXXXXXXXXX | Halite, clear; trace to some polyhalite in stringers. |
| | 1370 | XXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXX | |
| 2030 | | — — — — — — XXXXXX | Halite, some argillaceous material, red-brown, stringer and blebs of polyhalite. |
| | 1380 | x — — — — x x — — — — x | Halite; polyhalitic, with dark gray clay stringers. |
| 2020 | | — x x — — — — x | Polyhalite; 1"-3" thick. Halite; trace to some polyhalite; trace argillaceous material to 1388.1' only, polyhalite parting (1/8") at 1389.9. |
| | 1390 | | Clay, red-brown, gray, halitic, silty. |
| | | x x | Halite; some argillaceous material, trace polyhalite. |
| 2010 | | x x | Halite, clear; trace polyhalite. |
| | 1400 | x x | |
| | | — x — — x ? — ? — ? | Clay, gray, reddish-brown to grayish-brown. Halite, argillaceous, polyhalitic. |
| 2000 | | x x | ? Halite, clear; trace polyhalite; 1"-2" diam. clay blebs; argillaceous and polyhalite layer (1/2") at 1413.5'. |
| | 1410 | — x — — — x x | Halite, clear; trace to some polyhalite; polyhalite layers (1/16"-2") at 1414.1-1414.3' and at 1415.5' (1/8"). |
| 1990 | | x x | Polyhalite; clay seam (1/2"-3" thick), gray, with halite stringer underlying. |
| | 1420 | x x | Halite, clear; trace to some polyhalite. |
| | | — x x | Polyhalite; irregular (1/4"-3"). |
| 1980 | | x x | Halite, clear; trace to some polyhalite; at about 1425.6' trace gray clay and polyhalite layer; 1" argillaceous halite layer at 1438.0'. |
| | 1430 | x x x x x | |
| 1970 | | x x | |
| | 1440 | | Polyhalite; underlain by 1/2" gray clay seam. |

PREPARED BY RTH DATE 6/21/82
 CHECKED BY _____ DATE _____

FIGURE E-1
 WASTE HANDLING SHAFT
 LITHOLOGIC LOG
 SHEET 16 OF 26



| PRELIMINARY | | STRATIGRAPHIC COLUMN | REMARKS |
|-----------------|-------------|---|---|
| ELEV. (FT. MSL) | DEPTH (FT.) | | |
| | 1440 | As above | |
| | | X X X X X X X | Halite, clear; trace to some polyhalite; polyhalite layers at 1444.9'-1445.0' and 1442.2'-1442.4', locally bifurcate and pinch and swell. |
| 1960 | 1450 | Polyhalite. - - - | Halite, argillaceous, red brown. |
| 1950 | 1460 | X | Halite, clear; some polyhalite. |
| 1940 | 1470 | - - - - - - | Halite, argillaceous; argillaceous content decreases to base. |
| 1930 | 1480 | X - X - X - X - X - X - X - X - X - X - | Halite, clear; trace to some polyhalite, slightly argillaceous. |
| 1920 | 1490 | X X X X X X X X X X X X X X X X X X X | Halite, clear; some polyhalite. |
| 1910 | 1500 | Polyhalite; undulatory upper contact (> 6" relief); clay, gray, underlying (~2"). | |
| | | X X X X X X | Halite, clear to white; trace to some polyhalite. |
| 1900 | 1510 | Polyhalite. X | Halite, clear; trace polyhalite. |
| | | - - - | Halite, argillaceous, reddish-brown. |
| | | - - - | Halite, gray, locally argillaceous. |
| 1890 | 1520 | - - - | Halite, argillaceous, reddish-brown. |
| | | - - - | Halite, locally argillaceous. |
| 1880 | 1530 | - - - | Halite, argillaceous; argillaceous content decreases to base. |

WIRE MESH

PREPARED BY RMH DATE 6/21/84
 CHECKED BY _____ DATE _____



FIGURE E-1
 WASTE HANDLING SHAFT
 LITHOLOGIC LOG
 SHEET 17 OF 26

| PRELIMINARY | | STRATIGRAPHIC COLUMN | REMARKS |
|-----------------|-------------|----------------------|---|
| ELEV. (FT. MSL) | DEPTH (FT.) | | |
| | 1800 | X | Halite, clear; grading downward to polyhalitic halite; polyhalite layer 1801.6' - 1801.7'; halite, clear; trace polyhalite (1801.7' - 1802.1); underlain by gray clay seam (1802.1' - 1802.3'). |
| | | X X X | Halite, clear; trace to some polyhalite. |
| 1600 | | X | Halite, clear, coarsely crystalline; stringers or blebs of polyhalite. |
| | 1810 | XXXXX | |
| | | | Halite, clear; gray clay stringers. |
| 1590 | | | |
| | 1820 | | |
| | | | |
| 1580 | | | |
| | 1830 | ?-?-? | Halite; trace polyhalite. |
| | | X X X | |
| 1570 | | X X X | |
| | 1840 | X X X | |
| | | X X X | |
| 1560 | | X X X | |
| | 1850 | XXXXXXXXXX | Polyhalite; reddish-orange. |
| | | ==?X?==? | Halite; trace polyhalite; gray clay seam (~2") at 1852.2', contains halite crystals, grading downward to argillaceous halite. |
| | | X X X | Halite, clear; trace polyhalite. |
| 1550 | | X X X | |
| | 1860 | ?-?-? | Halite, clear; trace to some polyhalite in stringers. |
| | | XXXX | |
| | | XXXXXX | |
| | | ?-?-? | Halite, clear; polyhalite bands, pale orange to light orange. |
| 1540 | | X | |
| | 1870 | XXXXXXXXXX | Polyhalite. |
| | | - X - | Clay, gray, very stiff, with halite crystals. |
| | | - X - | Halite; abundant argillaceous material; trace polyhalite. |
| | | X - X - | |
| | | X - X - | |
| 1530 | | XXXXXXXXXX | Polyhalite; clear halite above and below polyhalite. |
| | 1880 | (Obscured) | Halite, clear, slightly argillaceous. |
| | | ?-?-? | Halite, clear; trace polyhalite. |
| | | X X X | |
| 1520 | | X X X | |
| | 1890 | X X X | |

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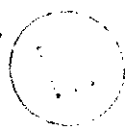
FIGURE E-1
 WASTE HANDLING SHAFT
 LITHOLOGIC LOG
 SHEET 21 OF 26





| PRELIMINARY | | STRATIGRAPHIC COLUMN | REMARKS |
|-----------------|-------------|----------------------|--|
| ELEV. (FT. MSL) | DEPTH (FT.) | | |
| | 1890 | X | As above |
| | | -X ? -X | Halite, polyhalitic, argillaceous. |
| | | X -X -X | |
| | | X -X -X | |
| | | -X -X -X | |
| 1510 | 1900 | | Halite, clear. |
| | | X | Polyhalite; slightly undulatory lower contact; with clay seam (1/4"-1/2") at base. |
| | | X | Halite, clear; trace polyhalite. |
| | | X | |
| | | X | |
| 1500 | 1910 | X | |
| | | X | |
| | | X | |
| | | X | Halite, clear; polyhalite increasing downward. |
| | | X | Halite, polyhalitic halite, and polyhalite, in alternating bands. |
| 1490 | 1920 | XXXXXXXXXXXXXX | Polyhalite, reddish-orange; with discontinuous halite layers at 1920.3'-1920.4' |
| | | -X -X | Anhydrite, gray, finely crystalline; trace polyhalite; underlain by gray clay and reddish-orange polyhalite layer (1921.4'-1921.6'). |
| | | -X -X | Halite; some polyhalite; slightly argillaceous. |
| | | -X -X | Halite; argillaceous; some polyhalite. |
| 1480 | 1930 | -X -X | Halite, slightly argillaceous; some polyhalite. |
| | | -X -X | |
| | | -X -X | |
| | | -X -X | |
| | | -X -X | Halite; argillaceous (gray); slightly polyhalitic. |
| | | -X -X | |
| 1470 | 1940 | -X -X | Halite; argillaceous (gray), content decreases to base. |
| | | -X -X | Polyhalite. |
| | | -X -X | Anhydrite, light orange to gray, polyhalitic; grades downward to gray, with trace polyhalite. |
| | | | Halite, clear. |
| 1460 | 1950 | | Anhydrite, gray, hard. |
| | | | Clay, gray (O.I.), hard. |
| | | | Halite, argillaceous in bands and stringers. |
| | | | |
| | | | |
| 1450 | 1960 | X | Halite, clear; trace polyhalite; at lower contact becomes polyhalitic and anhydritic. |
| | | X | |
| | | X | |
| | | X | |
| | | X | |
| 1440 | 1970 | | Anhydrite, gray, hard; weathered anhydrite or anhydritic clay (4") at lower contact. |
| | | | |
| | | | |
| 1430 | 1980 | | Halite; locally argillaceous in bands, content decreases to base. |

PREPARED BY *RmH* DATE *6/21/84*
 CHECKED BY _____ DATE _____

FIGURE E-1

WASTE HANDLING SHAFT
 LITHOLOGIC LOG
 SHEET 22 OF 26



| PRELIMINARY | | STRATIGRAPHIC COLUMN | REMARKS |
|-----------------|-------------|--|--|
| ELEV. (FT. MSL) | DEPTH (FT.) | | |
| | 1980 | --- | As above |
| 1420 | 1990 | --- | Halite, clear to white; local argillaceous stringers. |
| | |  | Halite, anhydritic; alternating beds. Anhydrite, gray, hard; slightly undulatory lower contact; underlain by clay parting (-1/8") |
| 1410 | 2000 | --- | Halite, clear to white, argillaceous in stringers and bands; some polyhalite near the base. |
| 1400 | 2010 | --- | Halite, clear, trace of gray argillaceous stringers becoming more argillaceous toward the base. |
| 1390 | 2020 | --- | |
| 1380 | 2030 | WIRE MESH ? ? XXXXXXXXXXXX XXXXXXXXXXXX | Halite, polyhalite; uncertain contact. |
| | |  | Anhydrite, gray, hard; undulatory upper contact. |
| 1370 | 2040 | ? ?  | Polyhalitic anhydrite, fine crystalline. |
| | |  | Anhydrite, gray, fine crystalline; clay seam, gray, at 2045.1' - 2045.3 |
| 1360 | 2050 | X X X X X X X X X ? ? X | Halite, clear; trace to some polyhalite; locally argillaceous in stringers. |
| 1350 | 2060 | --- | Halite, clear. |
| | | ? ? ? --- | Halite, clear; trace argillaceous material; trace polyhalite. |
| 1340 | 2070 | --- | |

PREPARED BY RMA DATE 6/21/84
 CHECKED BY _____ DATE _____

FIGURE E-1

WASTE HANDLING SHAFT
 LITHOLOGIC LOG
 SHEET 23 OF 26


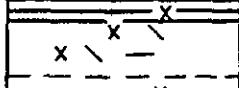
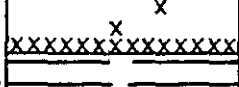
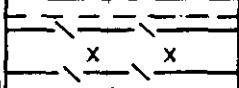
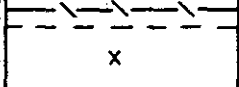
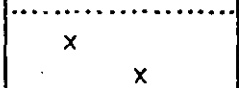
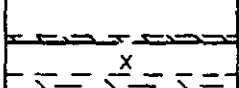
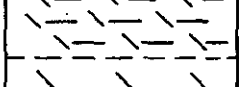

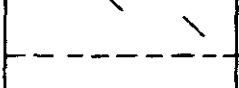
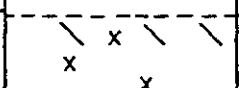
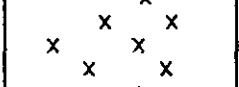
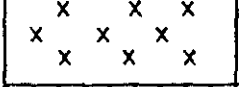


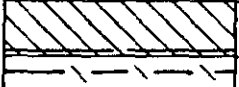

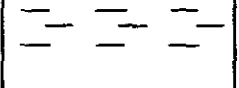
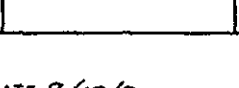
| PRELIMINARY | | STRATIGRAPHIC COLUMN | REMARKS |
|-----------------|-------------|---|---|
| ELEV. (FT. MSL) | DEPTH (FT.) | | |
| | 2160 | As above | Start of sump mapping. Halite, white to reddish orange, coarse to very coarsely crystalline, polyhalitic; undulatory basal contact. |
| 1240 | 2170 |  | 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'. |
| | |  | Halite, white to clear with thin seams or gray clay/anhydrite and irregular seams to clots of orange polyhalitic halite, medium to coarse crystalline, structureless; polyhalite and clay/anhydrite seams content decreases toward base; basal contact gradational. |
| 1230 | 2180 |  | Halite, light pink to orange, medium to coarsely crystalline, polyhalitic; thin (1" - 1.5") polyhalite seam at base, polyhalite dark orange and contains large halite crystals; 1.5' wide shallow dissolution pit at base; basal contact sharp. |
| | |  | Halite, white to light gray with local orange areas, coarse to very coarse crystalline, faintly bedded to structureless; irregular gray clay seams at top and through-out; basal contact gradational. |
| 1220 | 2190 |  | Halite, with some clay/anhydrite; orange to white near top, orange and medium brown near base, coarsely to very coarsely crystalline, faint bedding, polyhalitic; clay/anhydrite becomes more abundant near base; basal contact irregular (2" - 5" vertical variations) and gradational. |
| | |  | Halite, white to orange with some clear halite masses, coarsely to very coarsely crystalline, broadly banded (2" - 4"), trace polyhalite; basal contact irregular over 2" and diffuse. |
| 1210 | 2200 |  | Halite, orange to white with clear irregular masses, coarsely to very coarsely crystalline, trace polyhalite; crudely color banded; poorly defined subhorizontal bedding; basal contact based on color and is gradational. |
| | |  | Halite, 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" 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. |
| 1200 | 2210 |  | Halite, anhydritic and argillaceous; light gray with white and clear zones, crudely bedded; becomes less anhydritic and argillaceous with depth; basal contact gradational. |
| | |  | Halite, 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. |
| 1190 | 2220 |  | Halite, white to very light orange, medium to coarsely crystalline, structureless, sugary texture; basal contact gradational. |
| | |  | Halite, orange and white, finely to medium crystalline at top grades to medium to coarse crystalline at base, indistinct bedding, polyhalitic; horizontal to subhorizontal light gray bands of anhydrite near top; lower 20" - 40" contains masses of coarsely crystalline halite; polyhalite content increases toward base; basal contact sharp. |
| 1180 | 2230 |  | Anhydrite, gray, very finely crystalline, crudely bedded at top, finely bedded at base. |
| | |  | Polyhalite, pink, structureless at top grading to crudely bedded at base. |
| | |  | Clay/anhydrite, gray; basal contact sharp. |
| | |  | Halite, white to light orange, medium to coarse crystalline; basal contact slightly irregular; sharp. |
| 1170 | 2240 |  | Anhydrite, very dark brownish-gray with thin layers (1/5" - 2/5") of light gray to white, microlaminated to thinly bedded; occasionally, white bands are closely spaced and lenticular; 1" - 6" thick bed of gray clay occurs at base; basal contact irregular (erosional?), sharp. |
| | |  | Halite, white to slightly pink; upper 12" - 16" contains gray clay-rich anhydrite in large clots (8" - 12" diameter), smaller clots (<2" diameter), and in thin interbeds; remainder is halite, medium to coarsely crystalline, weakly bedded; lower 1" - 2" is reddish-brown to gray clay; basal contact sharp, undulatory (2" - 4"), slightly periodic (3" - 6"), and truncates bedding in underlying unit. |
| 1160 | 2250 |  | Halite, argillaceous/anhydritic in upper part, lower 20" polyhalitic; thin to medium bedded in upper part; bedding truncated at upper contact. |

FIGURE E-1

PREPARED BY AMH DATE 9/13/88
 CHECKED BY _____ DATE _____

WASTE HANDLING SHAFT
 LITHOLOGIC LOG
 SHEET 25 OF 26

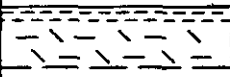

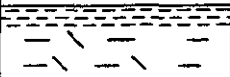
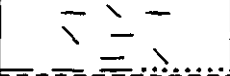
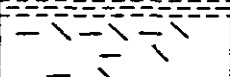
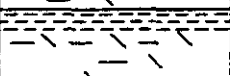
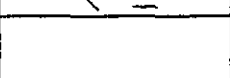
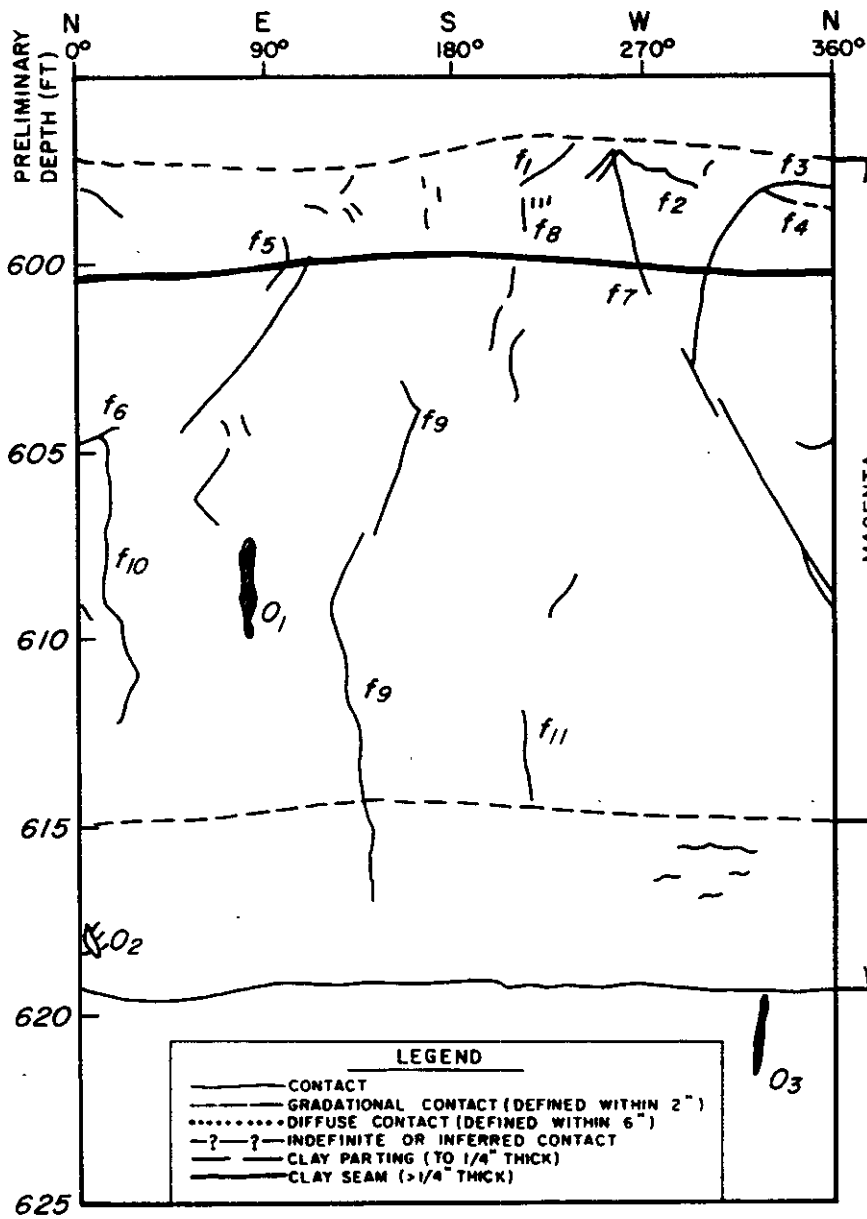
| PRELIMINARY | | STRATIGRAPHIC COLUMN | REMARKS |
|-----------------|-------------|---|--|
| ELEV. (FT. MSL) | DEPTH (FT.) | | |
| | 2250 | XXXXXXXXXXXX | As above |
| | |  | Halite, argillaceous and anhydritic, orange to reddish-brown, medium to coarsely crystalline, bedded; upper 1"-6" reddish-brown to gray halitic claystone; basal contact gradational. |
| | | x | Halite, white to very light orange with discontinuous orange bedding; trace polyhalite; basal contact undulatory (8") and gradational. |
| 1150 | 2260 | XXXXXXXXXXXX | Halite, light pink to orange to light brown; upper part, irregular alteration of pink and brown; lower 3', massive and brown; basal contact gradational to diffuse. |
| | |  | 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. |
| 1140 | 2270 |  | Anhydrite, with some polyhalite, gray to orange; occasionally continuous with overlying polyhalite, very thin gray clay bed at base; basal contact slightly undulatory (4"), sharp. |
| | |  | Halite, similar to halite overlying the above unit; includes irregular zones of clear halite; basal contact sharp. |
| | |  | Halite, argillaceous and anhydritic, white to very light orange to reddish-brown; clay content decreases toward base; upper 2"-3" contains discontinuous reddish-brown mudstone that is disrupted by dissolution pits filled with clear halite; clay rich zones are tabular clots occasionally arranged in crude layers; basal contact gradational to diffuse. |
| 1130 | 2280 |  | Halite, similar to above. |
| | |  | Halite, similar to above. |
| | | | Bottom of waste shaft sump |
| 1120 | 2290 | | |

FIGURE E-1

PREPARED BY RMB DATE 9/13/84
 CHECKED BY _____ DATE _____





Dolomite, light and dark gray, layered or laminated (1/32"-5"), anhydritic, moderately hard, fine grained, vuggy; laminae/layers lie nearly horizontal, or dip slightly north; clay seam at 599.7'-600.3'.

Dolomite, as above, except laminae are distorted and undulatory, and lenses of dolomite are outlined by fine-grained black material; larger lenses pinch and swell; many gypsum stringers, irregular, undulatory, short, near horizontal.

| 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

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

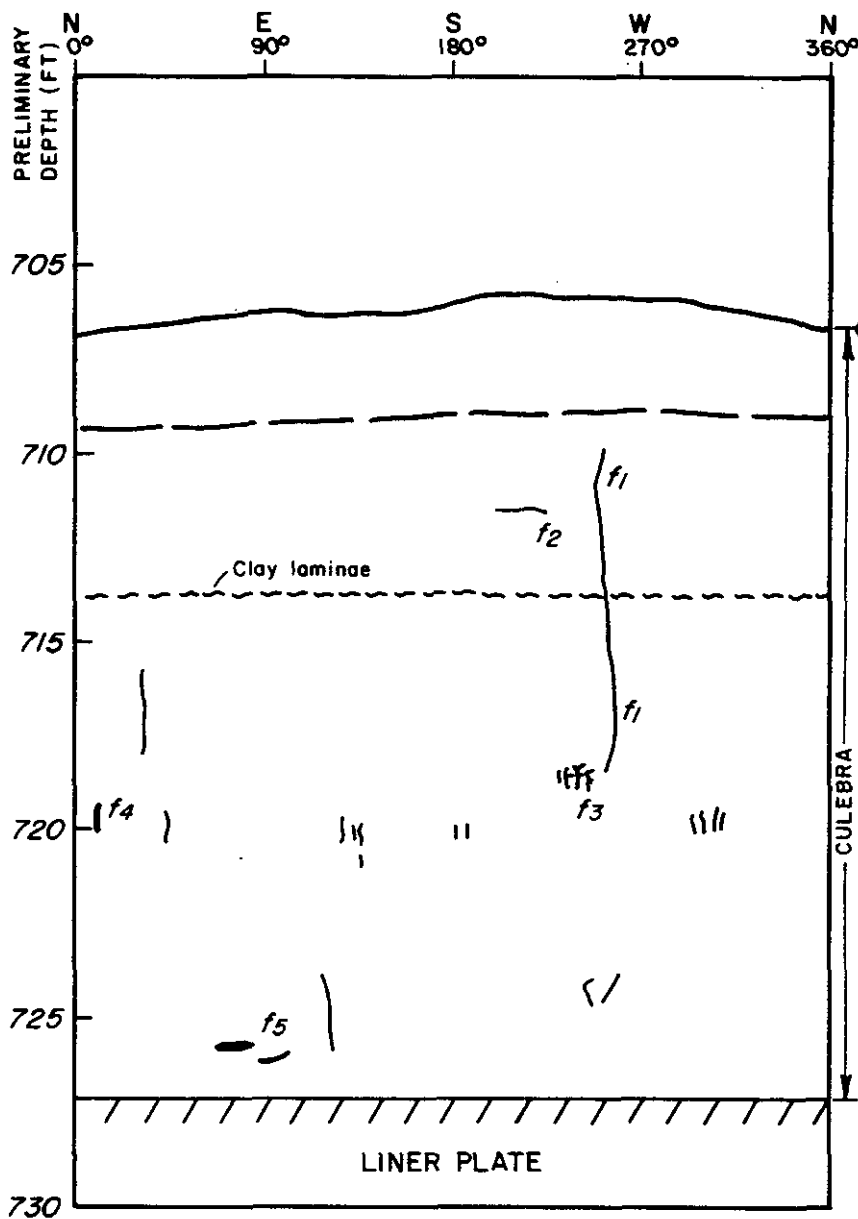
OTHER NOTES

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

REFERENCE:

Geotechnical Field Data Report
No. 4, 1983, 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:

Geotechnical Field Data Report No. 4, 1983, Geologic Mapping and Water Inflow Testing in SPDV Ventilation Shaft.

FRACTURE NOTES

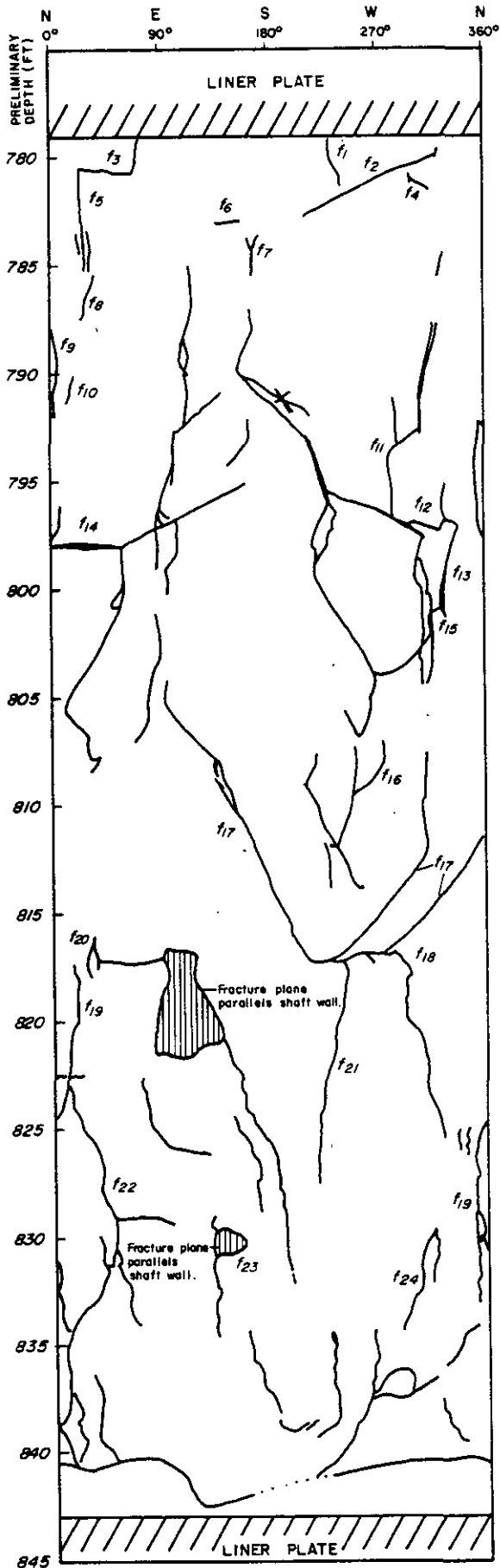
- f1 Closed, tight, clay fill.
- f2 Closed, tight.
- f3 Series of short, hairline fractures; at 718.0' hairline fracture density increases.
- f4 Open, up to 1/8", filled with soft erodable material (clay?).
- f5 Sparry calcite or dolomite, may be fracture fill.

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



Host rock is dark reddish-brown mudstone.

FRACTURE NOTES

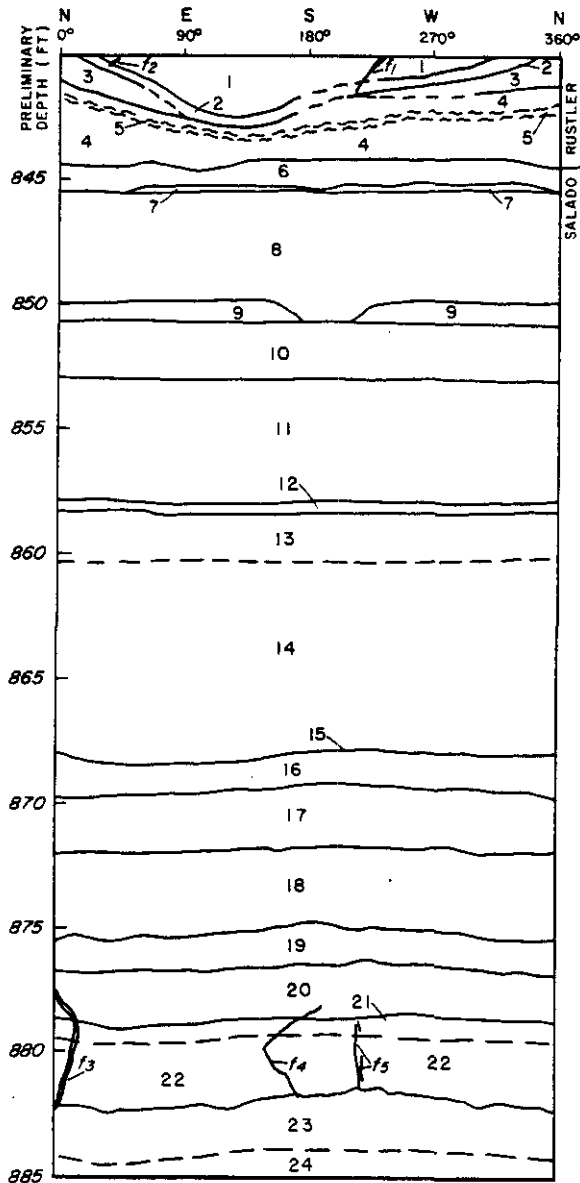
- f1 Open (1/4"-1").
- f2 Open (1/4"-1/2").
- f3 Open (1/4"-1").
- f4 Open.
- f5 Open (1/4").
- f6 Open (1"), 1 1/2" deep into shaft wall.
- f7 Open (1/4").
- f8 Open (1/2").
- f9 Open (1/8"-1"), polyhalitic halite fill.
- f10 Open (1/8").
- f11 Open (1/16") to closed.
- f12 Open (2"); polyhalite and halite fill actively dissolving.
- f13 Open (3/4"); polyhalite and halite fill
- f14 Open (1/8"-2 1/2"), up to 1' deep in shaft wall
- f15 Open (1"), polyhalite fill.
- f16 Open (1/16").
- f17 Open (1/4"-3/4"); halite fill remnants.
- f18 Open (1/4") to closed.
- f19 Open (1/4") to closed
- f20 Open (1/4"-1"); halite fill remnants; curved fracture strike S5E to S25E.
- f21 Open (1/4") to closed.
- f22 Closed; below 830', open (1/8"-1/4"); probable halite fill.
- f23 Fracture plane roughly parallels wall, strike N80E.
- f24 Closed.

REFERENCE:

GEOTECHNICAL FIELD DATA REPORT
NO. 4, 1983, GEOLOGIC MAPPING AND
WATER INFLOW TESTING IN SPDV
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, and softer than 3.
- 5 Anhydrite, light gray; bands (1/8"-1/2") in an ~2" 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"); 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 as surface residue (clay).
- 9 Clayey mudstone or silty claystone, dark reddish-brown, 0-12" 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; clayey residue on shaft wall.
- 17 Halite, polyhalitic; indistinct banding; polyhalite veinlets along crystal boundaries; polyhalite content increases downward.
- 18 Halite, argillaceous material, reddish-brown; clayey residuum on shaft surface.
- 19 Halite; trace polyhalite, trace argillaceous material; irregular upper contact.
- 20 Mudstone, reddish-brown, gray-green mottling with higher silt content, soft where weathered.
- 21 Mudstone, gray-green, sandy to silty, hard.
- 22 Mudstone, reddish-brown, hard.
- 23 Halite, reddish-brown, argillaceous; clay residuum on shaft surface.
- 24 As above; transition to lower argillaceous content.

FRACTURE NOTES

- f1 Open (up to 1/4") to closed; ends with depth
- f2 Open (up to 1/16") to closed, nearby vertical fractures are general closed and discontinuous.
- f3 Strike - N 45°E; halite fill, 1/2" wide, increases downward to 1-1/2" to 2"
- f4 Strike - N 30°E
- f5 Strike - N 60°E; uncertain upward extent

LEGEND

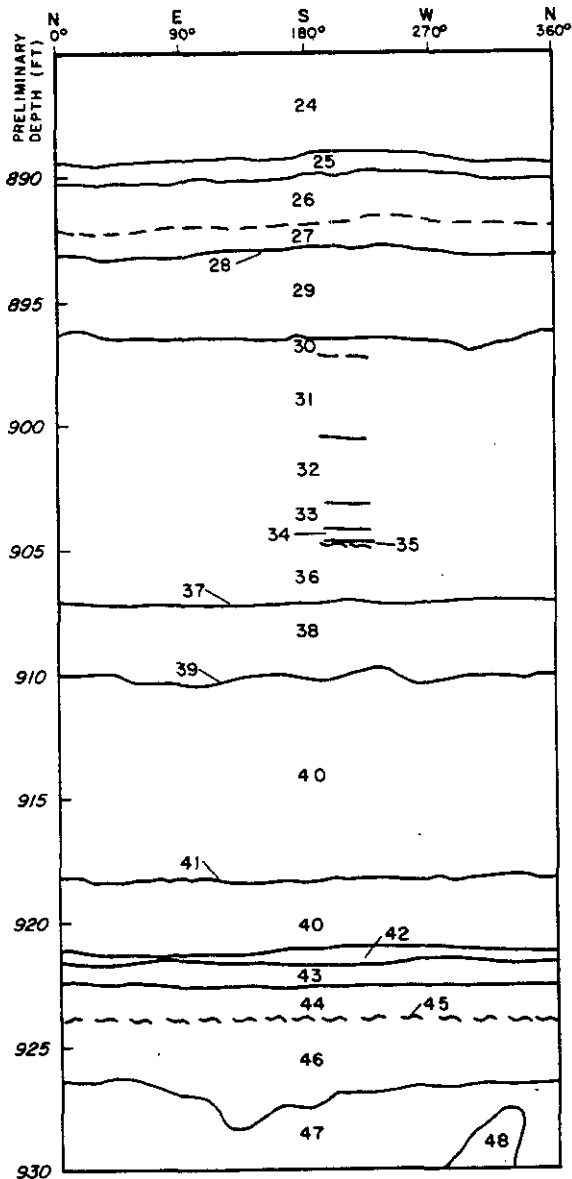
- CONTACT
- - - - GRADATIONAL CONTACT (DEFINED WITHIN 2")
- DIFFUSE CONTACT (DEFINED WITHIN 6")
- ? - ? INDEFINITE OR INFERRED CONTACT
- CLAY PARTING (TO 1/4" THICK)
- CLAY SEAM (> 1/4" THICK)

REFERENCE:

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



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



EXPLANATION

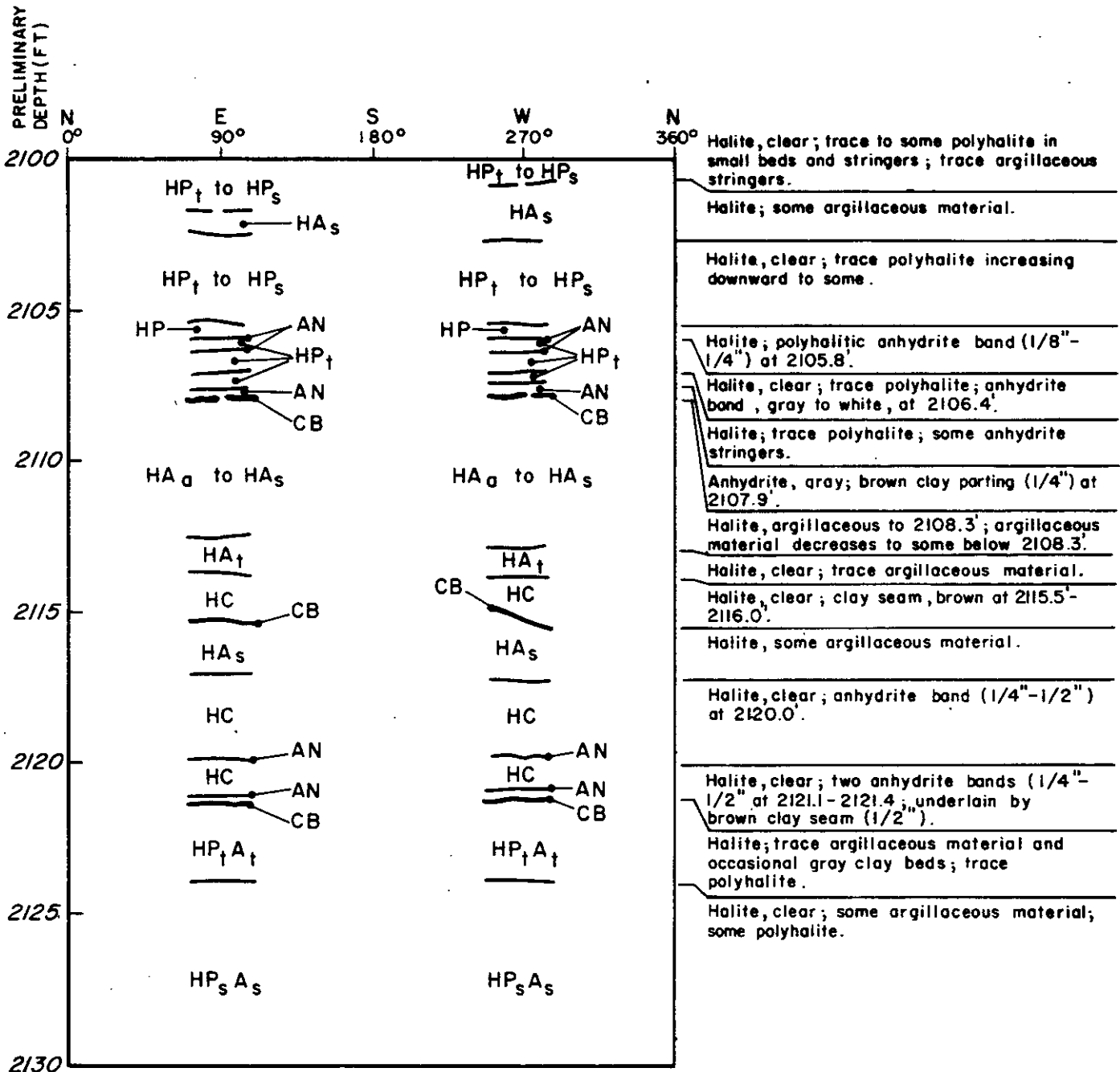
- 25 Halite; argillaceous content higher than 24.
- 26 Halite; some argillaceous material.
- 27 Halite, clear; trace polyhalite and argillaceous material; transition from 26.
- 28 Silt, gray-green, clayey, ~1".
- 29 Halite; some to abundant argillaceous material; clayey residuum on shaft surface.
- 30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

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-5
WASTE SHAFT
RUSTLER/SALADO FORMATION CONTACT
840 TO 930 FEET
SHEET 2 OF 2



LEGEND

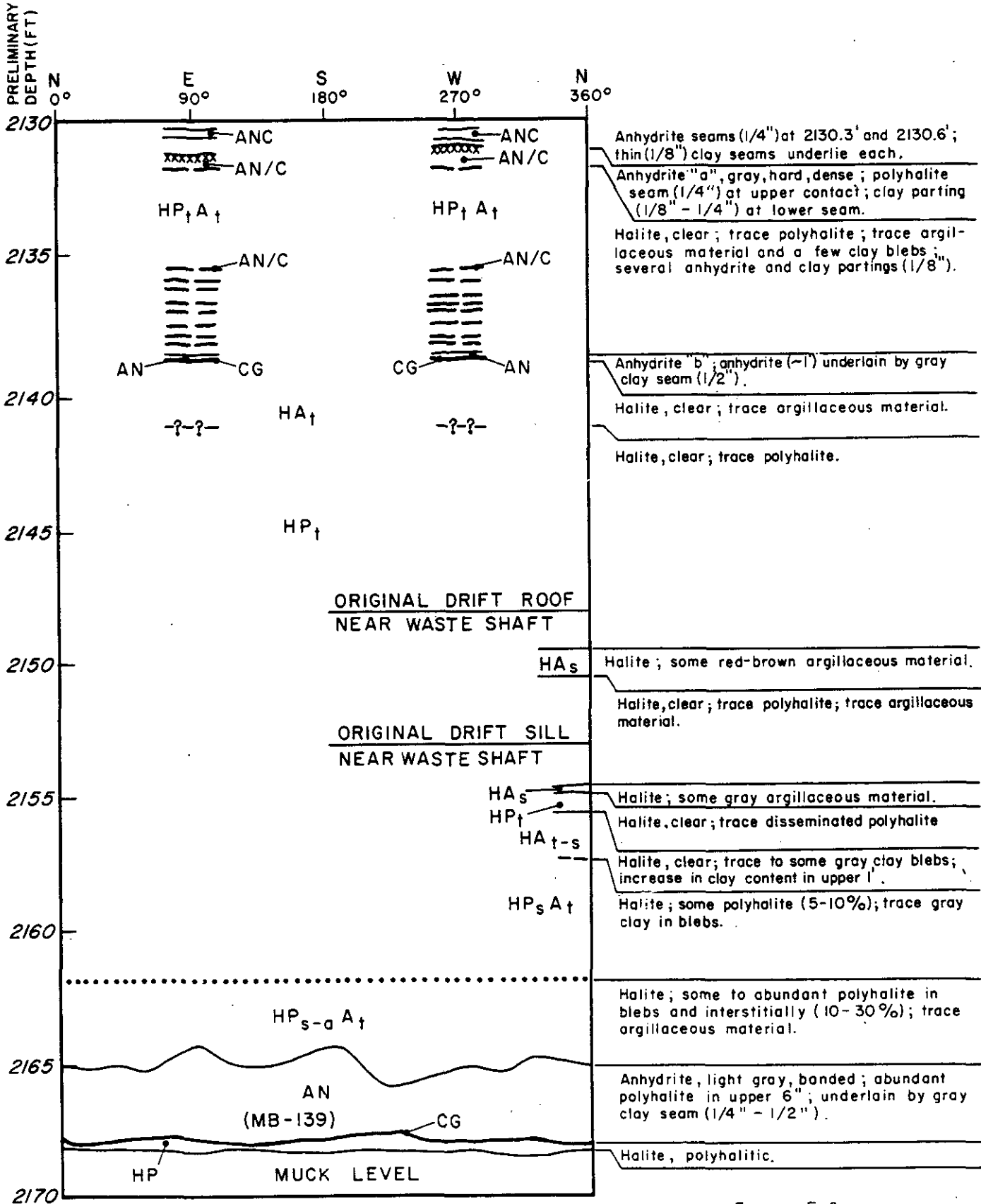
- CONTACT
- GRADATIONAL CONTACT (DEFINED WITHIN 2")
- DIFFUSE CONTACT (DEFINED WITHIN 6")
- ?-?- INDEFINITE OR INFERRED CONTACT
- CLAY PARTING (1/4" TO 1-1/16" THICK)

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



- 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-6
 WASTE SHAFT
 FACILITY LEVEL AREA
 2100 TO 2170 FEET