UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Preliminary stratigraphic and lithologic data from the Delhi-Taylor Oil Company, Shafer No. 1 corehole, San Juan County, Utah.

By
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Open File Report 91-373

This report is preliminary and has not been edited or reviewed for conformity with U. S. Geological Survey standards and stratigraphic nomenclature.

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INTRODUCTION

The Delhi-Taylor Oil Company Shafer No. 1 well was drilled on the crest of the Shafer anticline 22.5 km southwest of Moab, Utah, in section 15, T. 27 S., R. 20 E., San Juan County, Utah (fig. 1). It was drilled to a depth of 1266.7 m and penetrated 11 of the 29 known evaporite cycles in the Paradox basin. Coring started at 658.4 m in limestone of the Honaker Trail Member, which is above the penesaline and clastic interval of the uppermost cycle (cycle 1). The halite bed of cycle 1 is absent in this part of the basin. The interval from just below the top of the halite in cycle 2 to about 6.7 m above the base of the halite in cycle 3 was not cored.

Complete evaporite cycles in the upper part of the Paradox Member of the Hermosa Formation in the Shafer No. 1 core contain a halite bed underlain by a sequence of penesaline and siliciclastic rocks that we collectively refer to as interbeds. Twenty nine cycles have been identified and numbered from top to bottom in the Paradox Member by R. J. Hite (1960). The cycles are separated by erosional or dissolution unconformities that are characterized by sharp, "knife-edge" contacts at the base of the interbeds and the top of the halite beds (Hite, 1970; Hite and Buckner, 1981).

GENERAL CORE DESCRIPTION

The rocks of cycle 1 are represented in this core hole by anhydrite, silty dolomite, organic carbon-rich carbonate shale (black shale), and limestone above the halite bed of cycle 2. The halite bed of cycle 1, which is present in the northeast part of the basin (depocenter), is absent at this location.

The top 7.6 m of the halite bed is the only part of cycle 2 that was cored in this hole.

The bottom 13.7 m of the halite bed and all of the interbeds of cycle 3 were cored in this hole. The interbeds of cycle 3 have the same very regular vertical symmetry as the comparable interval in the Cane Creek No. 1 core (Raup and Hite, 1991). A detailed correlation and comparison of this interval in both wells will be presented later in a paper that is in preparation (Raup and Hite, in preparation).

Both the halite bed and the interbeds in cycle 4 are thin, 9.1 m and 11.3 m respectively. The cycle 4 interbeds are mostly silty dolomite with thin beds of anhydrite at the top and bottom, and very thin black shale beds in the middle.

The cycle 5 halite bed is 65.2 m thick and contains widely disseminated crystals of sylvite. There is no concentration of sylvite in cycle 5 at this locality as there is at Cane Creek No. 1 (Raup and Hite, 1991). The interbeds in this cycle appear to be double. There are two beds of black shale. The upper black shale is both overlain and underlain by dolomite and anhydrite. The lower one is overlain by dolomite and anhydrite, but is underlain only by anhydrite.

The cycle 6 halite bed is one of the thickest (95.1 m) in the upper part of the Paradox Member. The underlying interbeds, on the other hand, are very thin (7 m), containing only anhydrite and dolomite.

Cycle 7 contains a halite bed that is 30.2 m thick. The interbeds at the base are very thin (3 m), and they are mostly anhydrite with a thin dolomite in the middle.

Cycle 8 is similar to cycle 7 in that the interbeds are composed of only anhydrite and dolomite. The halite bed is 21.3 m thick, and the interbeds are 14.3 m thick.

The halite bed of cycle 9 contains a zone of sylvite near the top that is approximately 6 m thick. The halite bed (including the sylvite zone) is 48.1 m thick, and the underlying interbeds are 10.7 m thick. The bottom two-thirds of the interbeds are dolomite, and the upper third is anhydrite. A thin bed of black shale is in the upper part of the dolomite.

The halite bed of cycle 10, which is unusually coarsely crystalline in its upper part, contains several thin zones of anhydrite-halite pseudomorphs after gypsum. This halite bed is 41.1 m thick, and the underlying interbeds are 11 m thick. The interbeds are composed primarily of anhydrite and dolomite and contain three thin zones of black shale near the top.

The cycle 11 halite is only 7.9 m thick. It is underlain, however, by unusually thick interbeds that contain two relatively thick black shale beds and two relatively thin ones. Because the halite of cycle 12 is not present at this location, it is possible that part of these interbeds represent cycle 12. For lack of better information, the base of cycle 11 has been placed at the base of the interbeds.

The halite bed of cycle 13 and a few feet of underlying anhydrite are present in the bottom of this core hole. This halite bed, which is 51.8 m thick, contains thin beds and disseminated crystals of sylvite scattered throughout, expect for a few meters at the base. Small nodules of kieserite occur in a 5-m zone near the middle of the halite bed.

Figure 2 is a generalized stratigraphic column of the Shafer No. 1 core hole. Figure 3 is a lithologic column of the Shafer No. 1 core at a scale of 10 ft / inch with a brief description of the generalized lithologies.

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Hite, R. J., 1960, Stratigraphy of the saline facies of the Paradox Member of the the Hermosa Formation of southeastern Utah and southwestern Colorado, in Four Corners Geological Society 3rd Field Conference Guidebook, Geology of the Paradox fold and fault belt, 1960: p. 86-89.

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_____1970, Shelf carbonate sedimentation controlled by salinity in the Paradox Basin, southeast Utah, in Third Symposium on Salt, Northern Ohio Geological Society, v. 1, p. 48-66.

Hite, R. J., and Buckner, D. H., 1981, Stratigraphic correlations, facies concepts, and cyclicity in Pennsylvanian rocks of the Paradox basin: Rocky Mountain Association of Geologists - 1981 Field Conference, p. 147-159.

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_____ in preparation, Lithologies of evaporite cycles and cycle boundaries in the upper part of the Paradox Member, Hermosa Formation, of Pennsylvanian age in the Paradox basin, Utah. U. S. Geological Survey Bulletin.

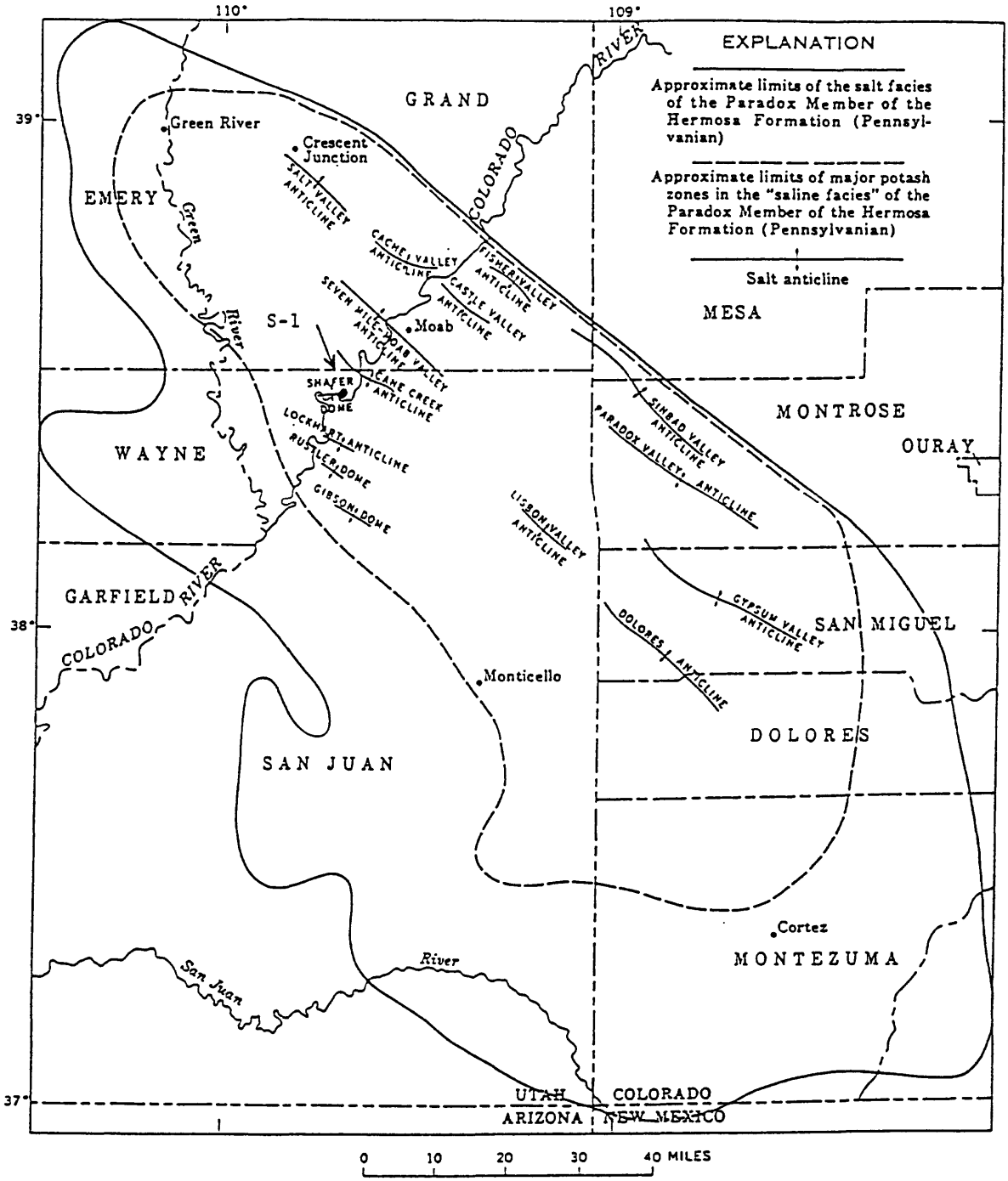


Figure 1. Index map of the Paradox basin, southwestern Colorado and southeastern Utah, showing the location of the Delhi-Taylor Oil Company, Shafer No. 1 (S-1) core hole. Limits of salt and potash from Hite (1961).

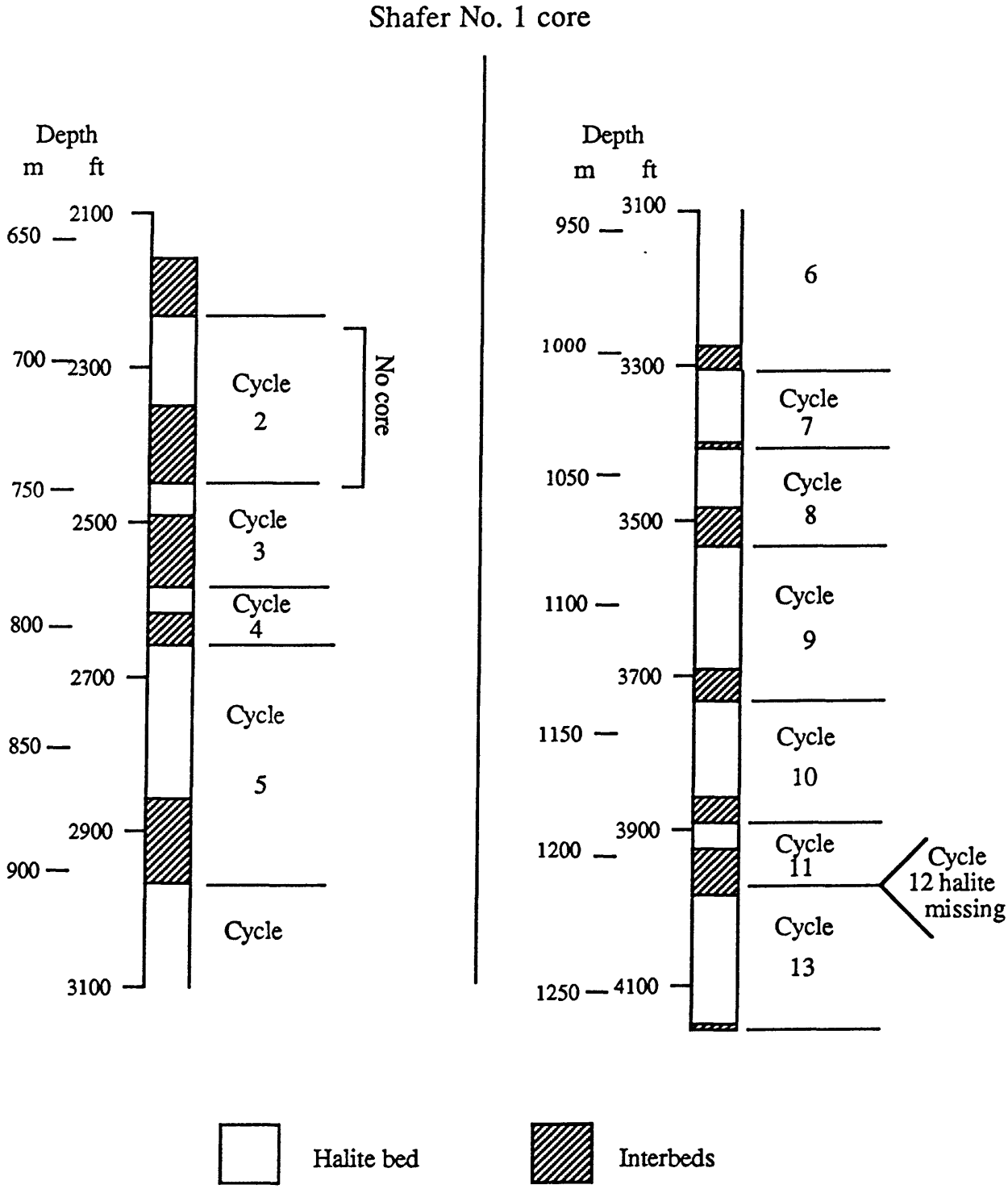
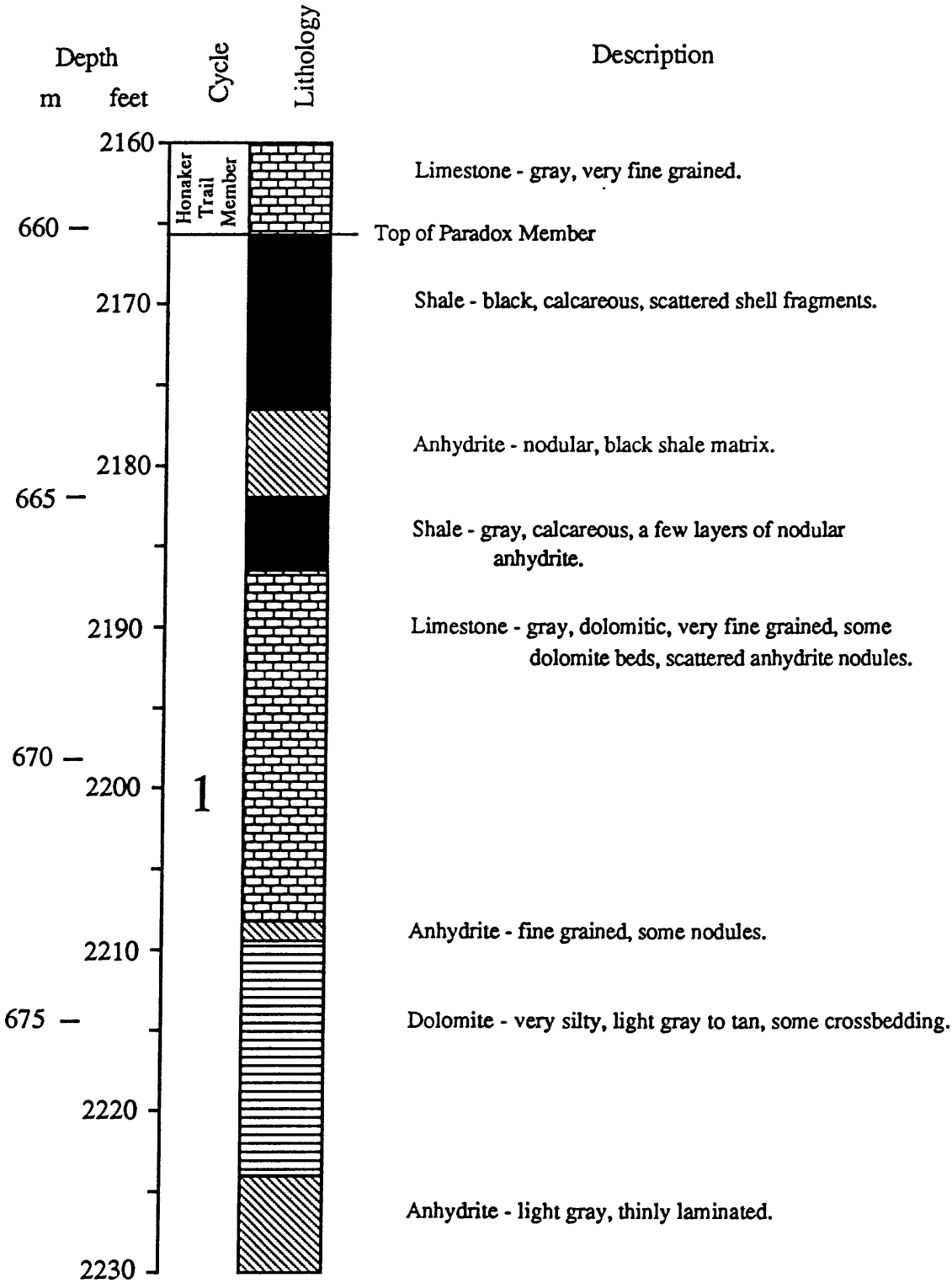
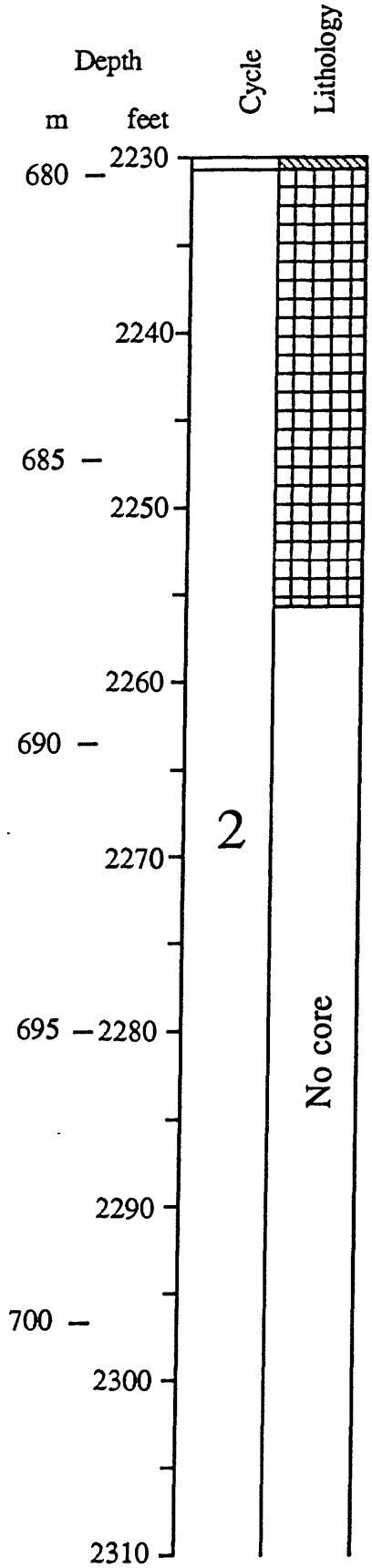


Figure 2. Generalized stratigraphic column of the Shafer No. 1 core at a scale of 200 ft / inch.

Figure 3. Lithologic column of the Shafer No. 1 core at a scale of 10 ft / inch with a brief description of the lithologies.

Shafer No. 1 core 10 ft / in.

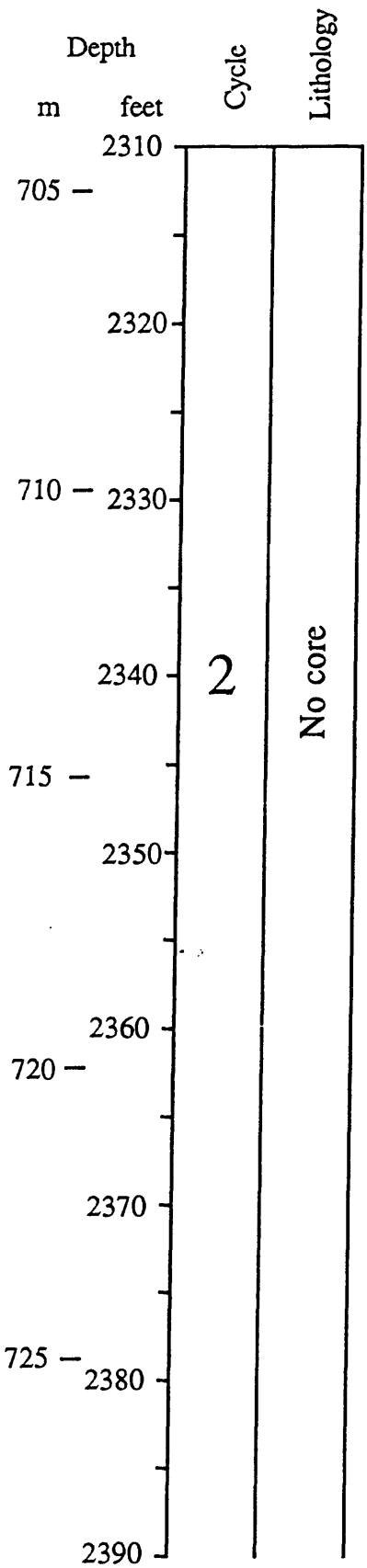




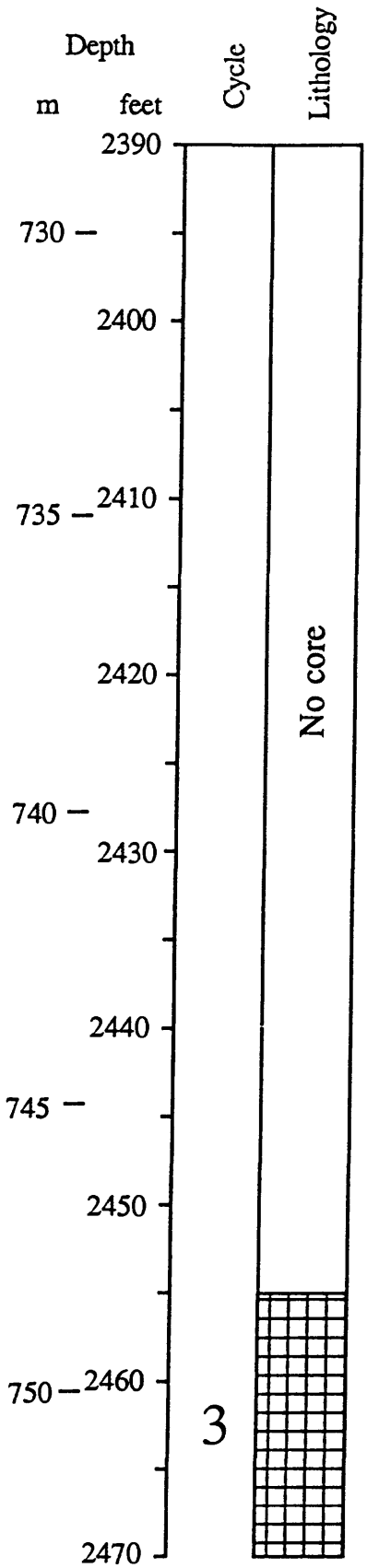
Description

Anhydrite -light gray, thinly laminated.

Halite - light gray, clear, fine grained, laminated by light gray anhydrite with some clay. Laminations are very well defined.

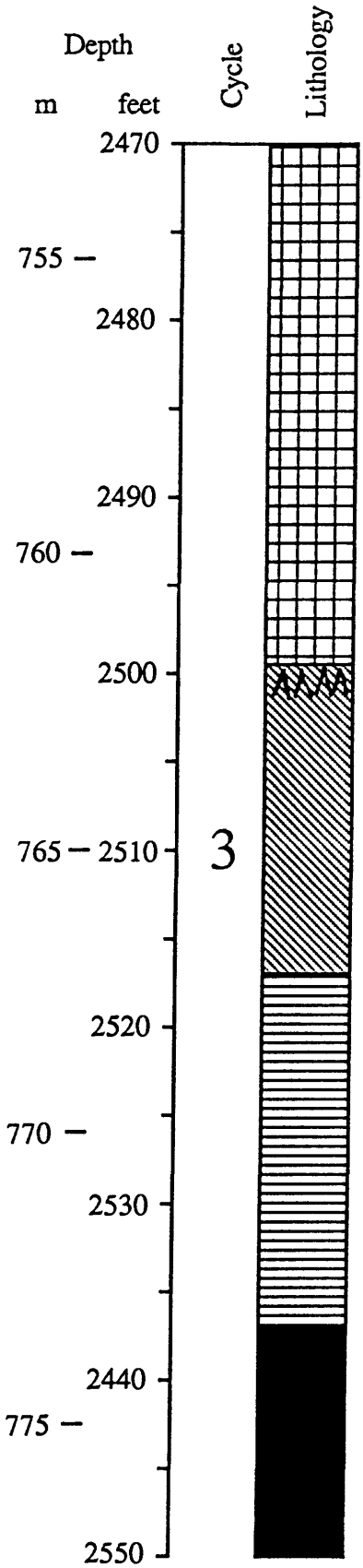


Description



Description

Halite - mostly clear, fine grained. Anhydrite laminations are generally indistinct except for a few intervals of halite and anhydrite pseudomorphs after gypsum.



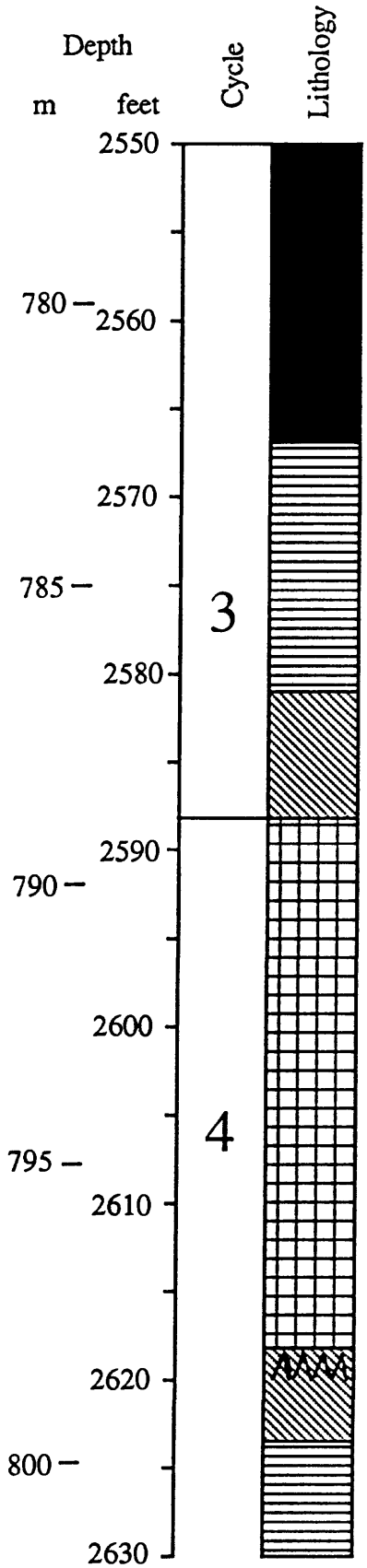
Description

Halite - mostly clear, fine grained. Anhydrite laminations are generally indistinct except for a few intervals of halite and anhydrite pseudomorphs after gypsum.

Anhydrite - light gray. Upper part is coarsely pseudomorphic after gypsum. Lower part is thinly laminated with dolomite. Contacts are gradational upward into halite and downward into dolomite.

Dolomite - light gray to buff. Very silty. No conspicuous bedding. Veins of halite and chalcedony with pyrite.

Shale - gray to black. No conspicuous bedding. Widely spaced veins of halite, scattered nodules of anhydrite, few traces of pyrite. Abrupt upper and lower contacts.



Description

Shale - gray to black. No conspicuous bedding. Widely spaced veins of halite, scattered nodules of anhydrite, few traces of pyrite. Abrupt upper and lower contacts.

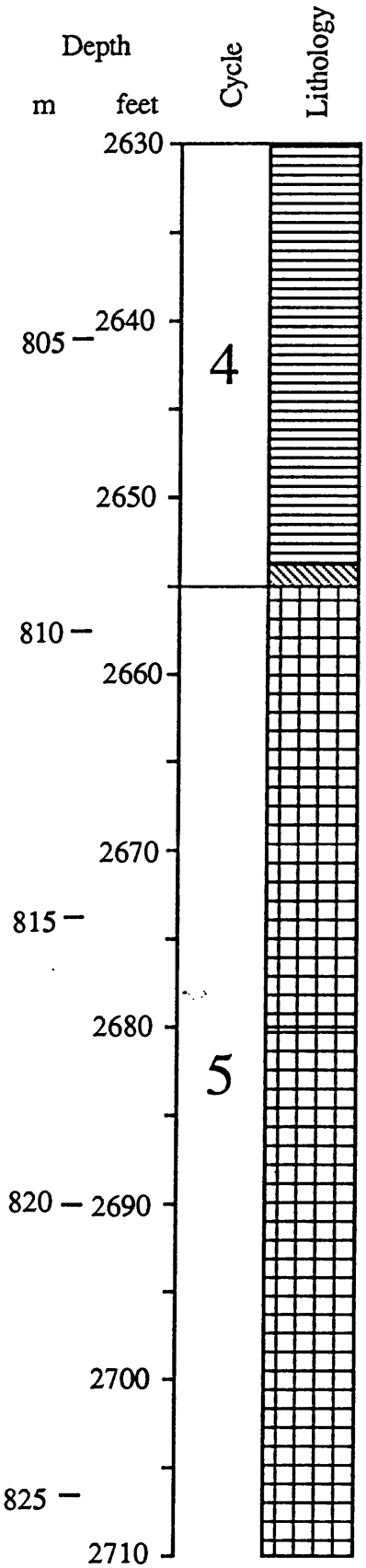
Dolomite - light gray to buff. Very silty. Faintly laminated.

Anhydrite - light bluish gray. Finely laminated at bottom, nodular at top. Sharp contact with underlying halite.

Halite - smoky gray, fine grained. Indistinct anhydrite laminations. Increase of anhydrite from top to bottom. Gradational contact with underlying anhydrite.

Anhydrite - medium to light gray. Nodular laminations at bottom, coarsely pseudomorphic texture of halite and anhydrite after gypsum at the top.

Dolomite - light gray to buff. Silty to shaley. A few halite veins and thin beds of nodular anhydrite. Some thin beds of black carbonaceous shale.

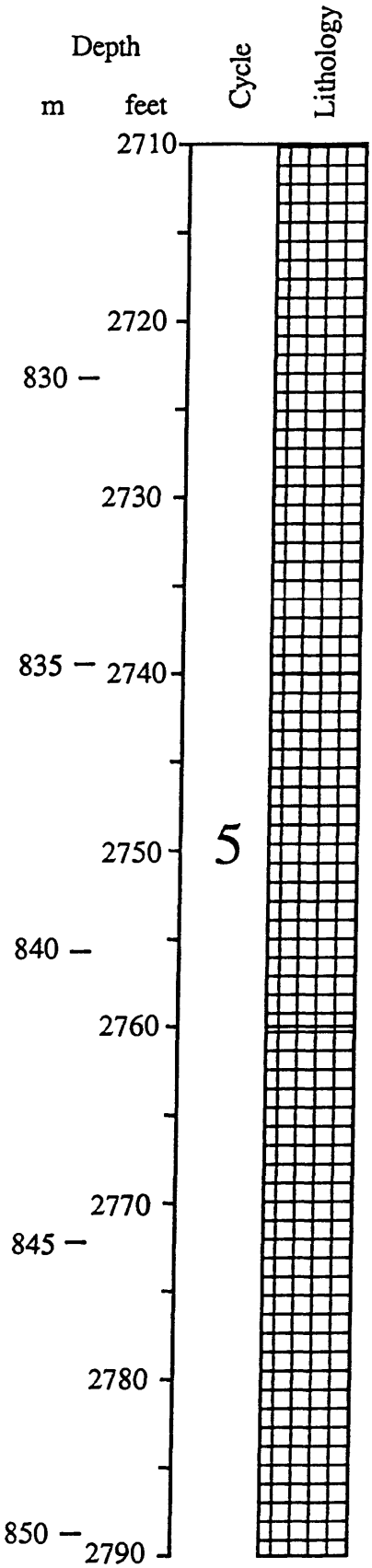


Description

Dolomite - light gray to buff. Silty to shaley. Some halite veins and thin beds of nodular anhydrite. Some thin beds of black carbonaceous shale.

Anhydrite - light to medium gray. Upper part laminated with dolomite. Lower part is dense, thinly laminated.

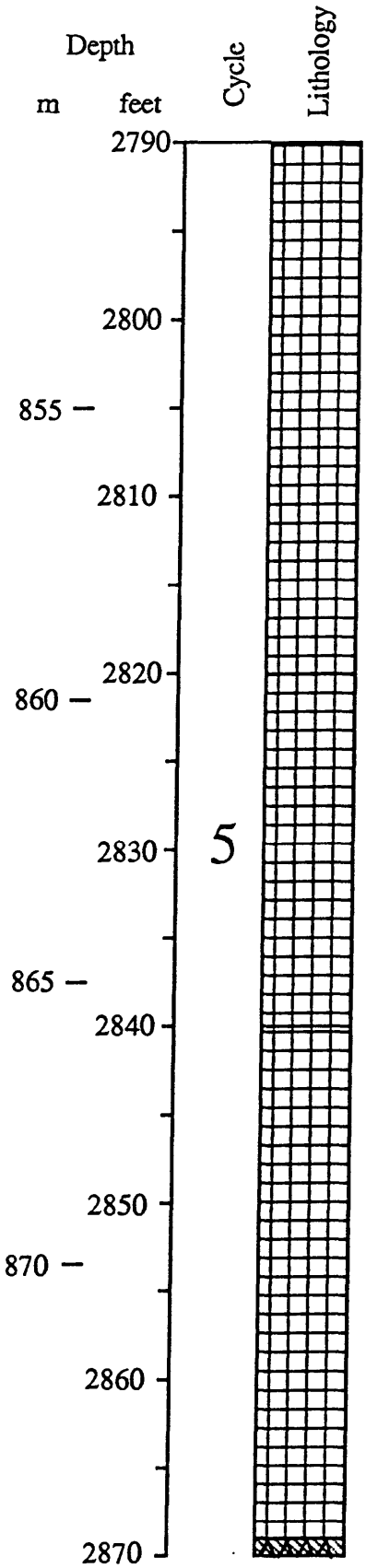
Halite - medium to fine grained. Clear with disseminated orange to red sylvite. Sharp contact with the overlying anhydrite. Anhydrite laminations are indistinct and are 2 to 10 cm apart. Polyhalite crystals occur from 2683 to 2688 ft and at 2808 ft.



Description

Halite - medium to fine grained. Clear to buff color. Space between anhydrite laminations decreases downward, from 6 to 8 cm near the top, 2 to 3 cm near the base.

Sylvite is common but widely disseminated in the halite.

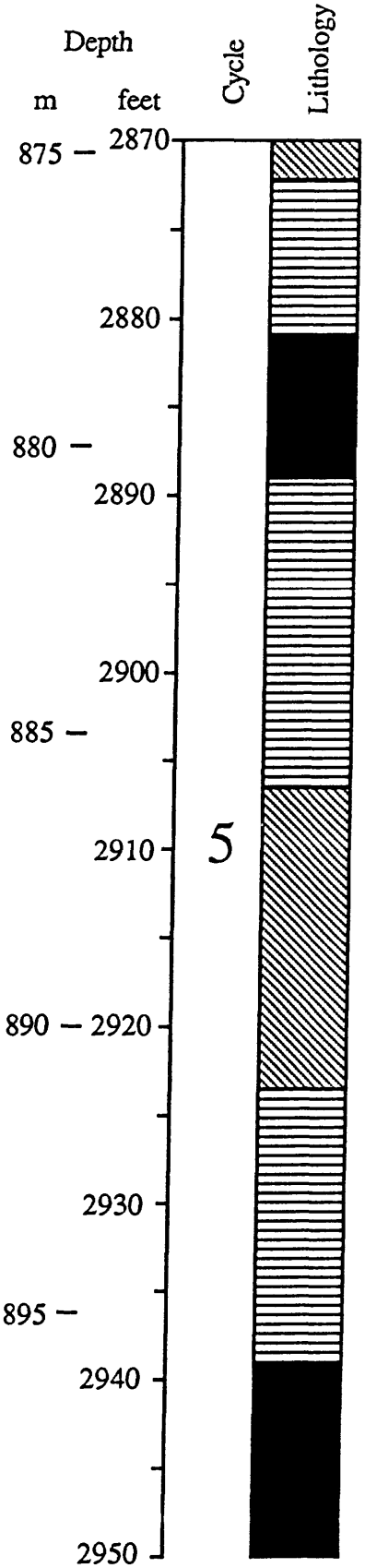


Description

Halite - medium to fine grained. Clear to buff color. Space between anhydrite laminations decreases downward, from 6 to 8 cm near the top, 2 to 3 cm near the base.

Sylvite is common but widely disseminated in the halite.

Anhydrite - gray, coarse pseudomorphs of anhydrite and halite after gypsum.



Description

Anhydrite - gray, pseudomorphs of anhydrite and halite after gypsum.

Dolomite - light brown, very shaley. Occasional halite veins.

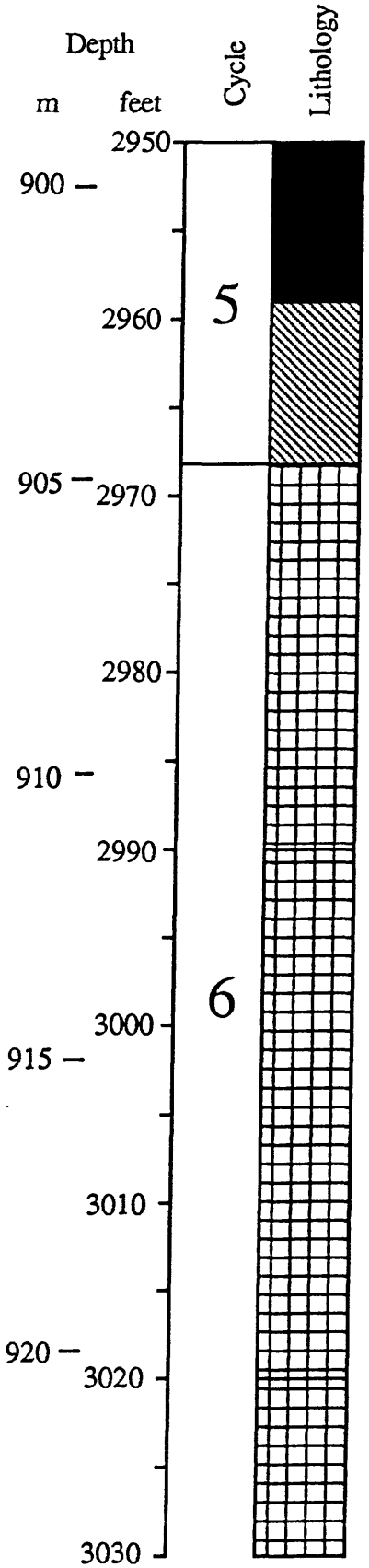
Shale - buff to black, dolomitic. Numerous halite veins.

Dolomite - light brown, silty and shaley. Irregular bedding.

Anhydrite - coarsely nodular at top, grading downward to small nodules. Some parts are laminated and shaley.

Dolomite - gray to buff, silty and shaley, indistinct bedding, a few halite veins.

Shale - black to brown, thin beds, and scattered individual anhydrite nodules.

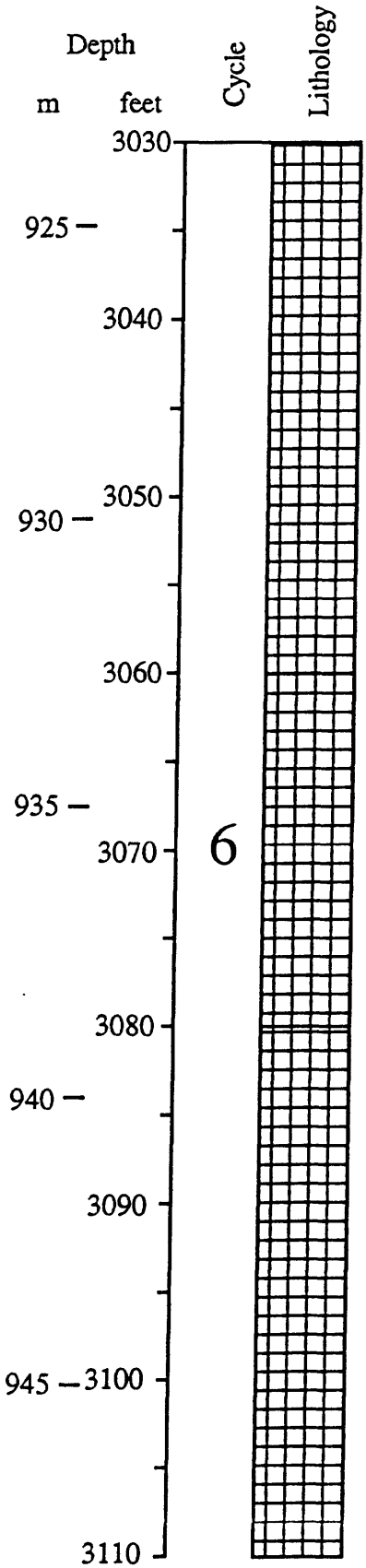


Description

Shale - black to brown, thin beds and scattered individual anhydrite nodules.

Anhydrite - gray, laminated at top with gray shale, becoming more anhydritic downward. Sharp contact with underlying halite.

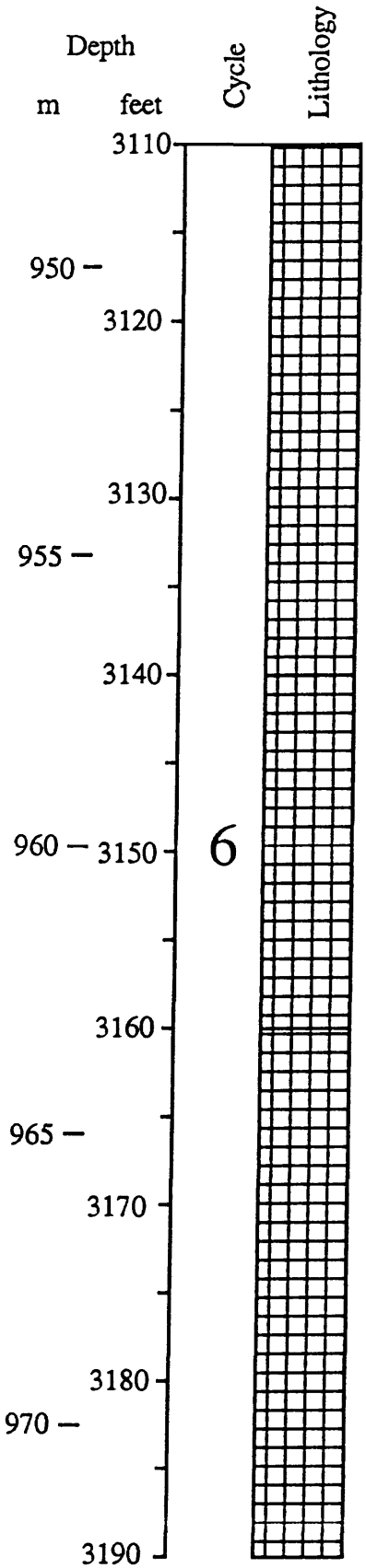
Halite - clear, gray, buff. Distinct but contorted anhydrite laminations 10 - 15 cm apart. Halite is increasingly browner downward to 945 m (3100 ft). Anhydrite laminations are closer spaced downward.



Description

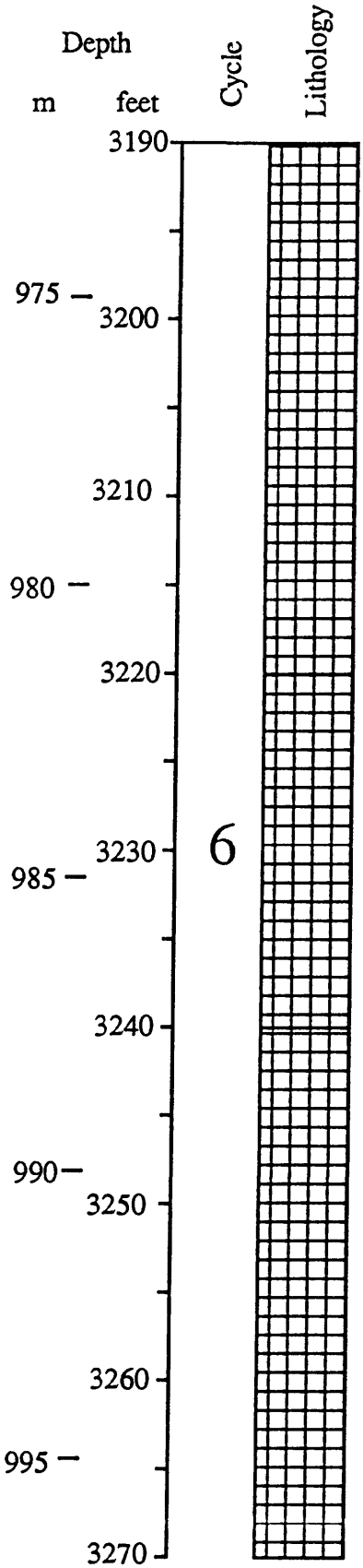
Halite - clear, gray, buff. Halite is darker and browner downward. Indistinct anhydrite laminations are closer spaced downward.

A few crystals of polyhalite.



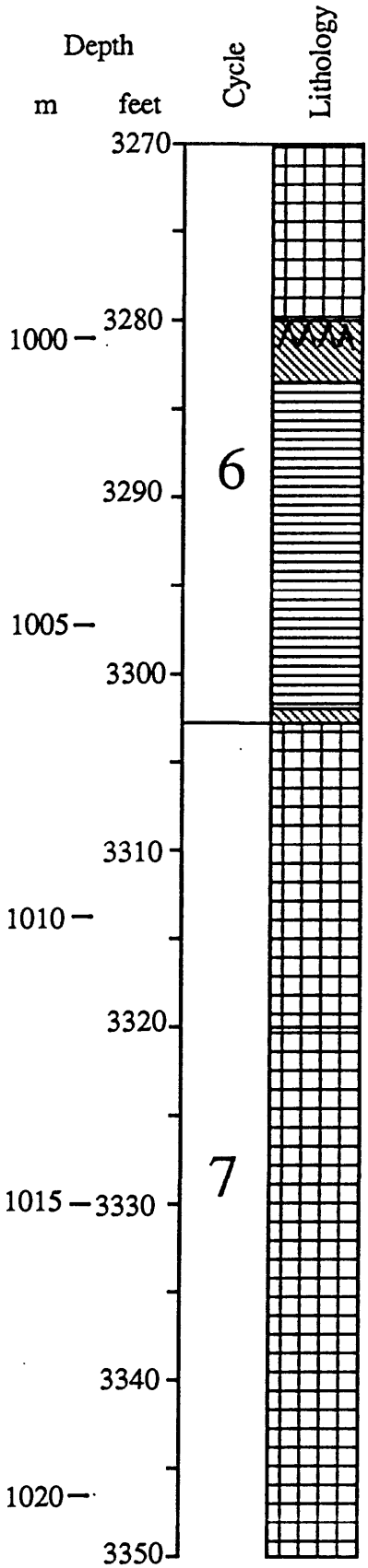
Description

Halite - contains orange and red layers and blebs of sylvite in the interval from 941.8 to 981.8 m (3089.9 - 3221.1 ft).



Description

Halite - smoky gray to slightly orange. Medium to fine grained. Several seams of red sylvite. Indistinct anhydrite laminations. Lower part of halite bed is opaque to transmitted light. Anhydrite laminations near the base are pseudomorphic after gypsum.



Description

Halite - see above.

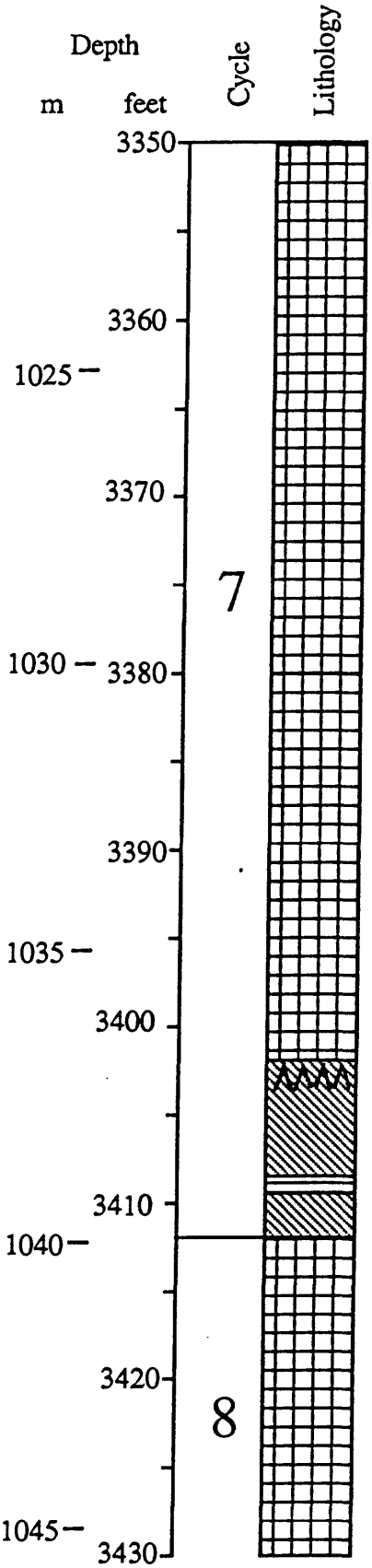
Anhydrite - brecciated, finely laminated. Coarse pseudomorphs of anhydrite and halite after gypsum. Some magnesite.

Dolomite - very shaley and silty. A few beds of black shale and nodular anhydrite.

Anhydrite - gray, finely laminated. Sharp lower contact.

Halite - clear, buff. Anhydrite laminations are distinct in top part of the halite bed. Laminations become less distinct downward. Anhydrite is more disseminated throughout halite downward.

Sylvite occurs as thin beds and blebs in interval from 1011.0 to 1027.2 m (3316.9 to 3370 ft.)



Description

Halite - clear, buff. Anhydrite laminations are distinct in top part of the halite bed. Laminations become less distinct downward. Anhydrite is more disseminated throughout halite downward.

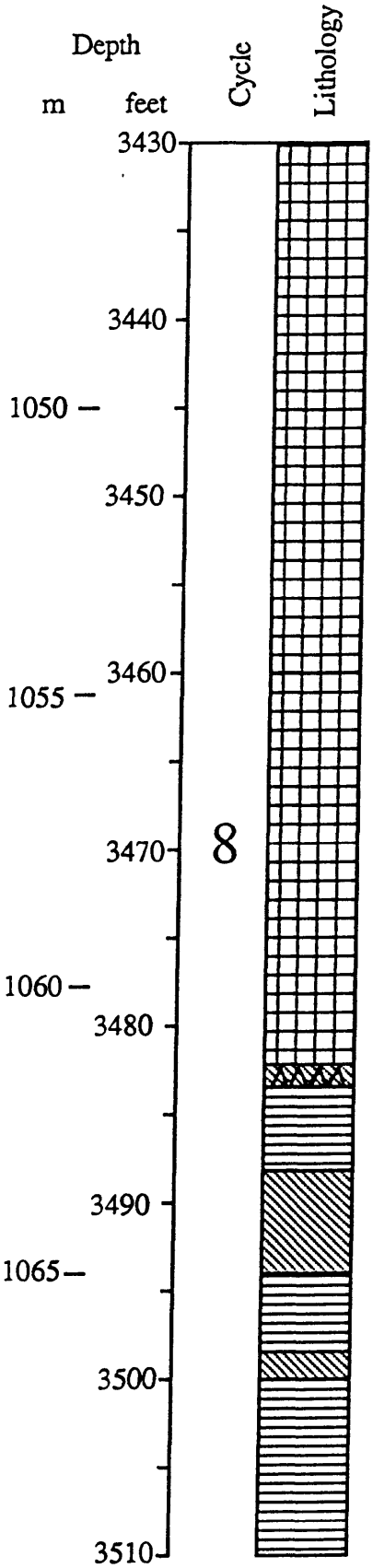
Sylvite occurs as thin beds and blebs in interval from 1011.0 to 1027.2 m (3316.9 to 3370 ft).

Anhydrite - gray, mostly laminated. Coarse pseudomorphs of anhydrite and halite after gypsum at top, layer of black shale at bottom.

Dolomite - gray to buff, silty.

Anhydrite - pseudomorphic texture at top, finely laminated to massive at base. Sharp contact with underlying halite.

Halite - see below.



Description

Halite - clear to gray, very slightly orange tint. Space between anhydrite laminations decreases downward. Dark gray layers (possibly organic matter) appear to be associated with anhydrite laminations. Organic matter increases downward.

Anhydrite - medium gray. Coarse pseudomorphs after gypsum.

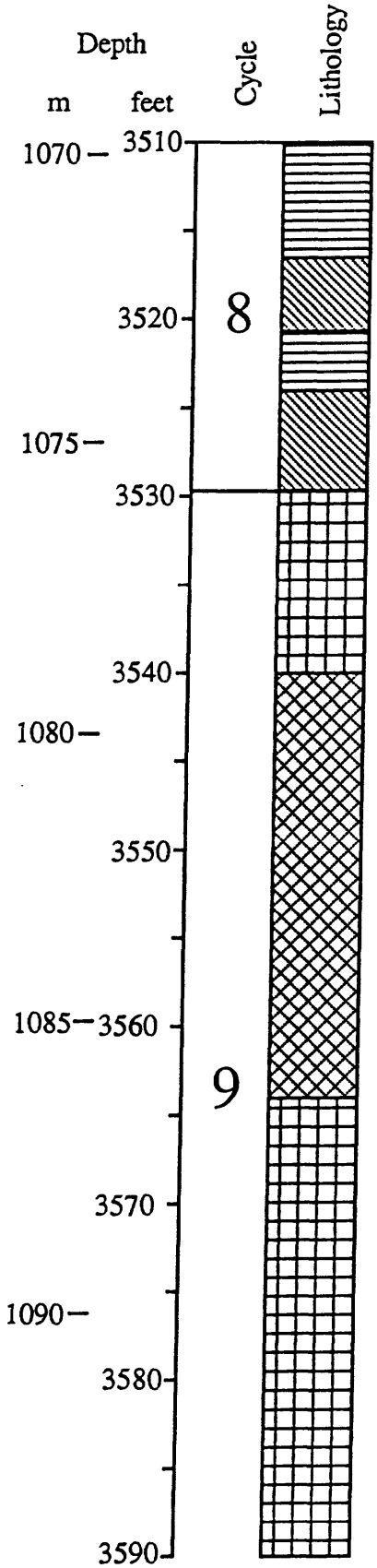
Dolomite - gray, silty. Some thin beds of black shale.

Anhydrite - bluish gray. Laminated and pseudomorphic at base, nodular at top.

Dolomite - medium gray, silty. Contains nodular halite.

Anhydrite - pseudomorphic texture at bottom, laminated at top.

Dolomite - medium gray. Silty and shaley. Indistinct laminations.



Description

Dolomite - medium gray. Silty and shaley. Indistinct laminations

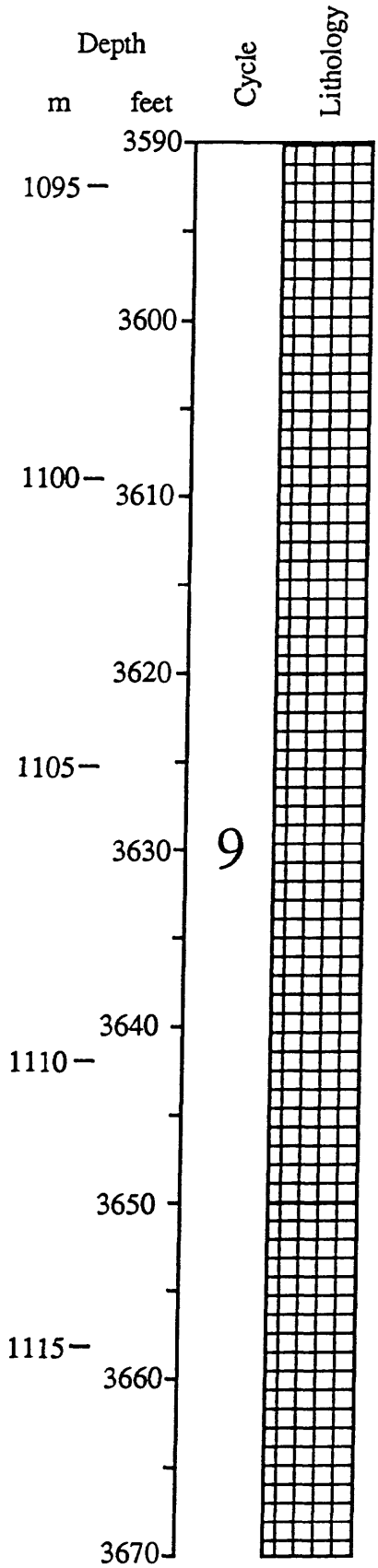
Anhydrite - bluish gray. Mostly nodular, some black shale.

Dolomite - medium gray. Silty and shaley.

Anhydrite - medium gray. Laminated. Nodules of danburite near the base.

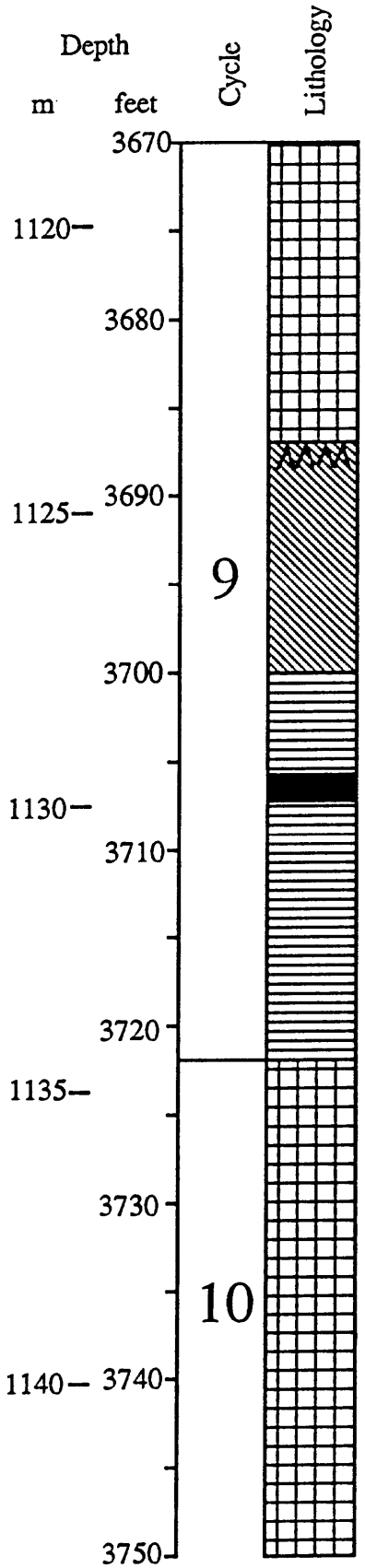
Halite - Light gray, fine to medium grained, very clean. Widely spaced anhydrite laminations 4 - 7 cm apart. Anhydrite laminations become closer spaced and less distinct downward.

Zone of sylvite concentration. Crystals of sylvite are concentrated along the bedding planes of the halite.



Description

Halite - clear, light tan to smoky gray. Medium to small crystal size. Indistinct anhydrite laminations spaced from 2 to 8 cm apart. Disseminated anhydrite increases from 1100 m downward.



Description

Halite - clear, light tan to smoky gray. Medium to small crystal size. Indistinct anhydrite laminations spaced from 2 to 8 cm apart. Disseminated anhydrite increases from 1100 m downward.

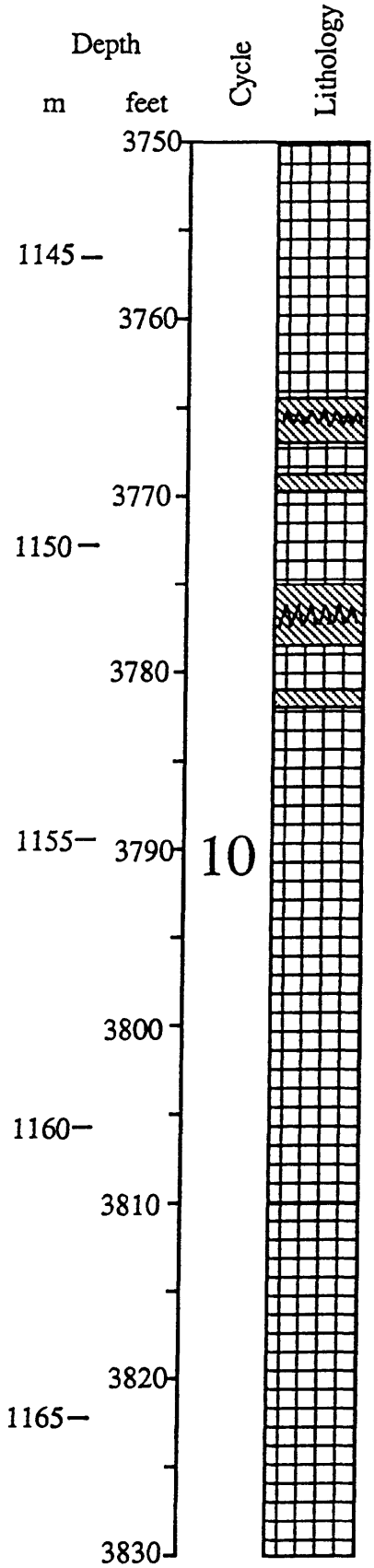
Anhydrite -pseudomorphic texture of anhydrite and halite after gypsum at the top grading upward into the overlying halite. From 1125 m downward it is interlaminated with dolomite. Thin layer of black shale near base.

Dolomite - silty, faintly laminated. Contains halite nodules.

Shale - black, carbonaceous.

Dolomite - silty in upper part to 1133.4 m. Shaley downward to contact with halite A few layers of anhydrite near the base.

Halite - clear to smoky. Very coarsely crystalline from top to 1143.3 m. From there downward crystals decrease in size to medium to fine. Abundant inclusions of organic matter. A few anhydrite laminations are up to 1 cm thick and some have pseudomorphs of anhydrite after gypsum.

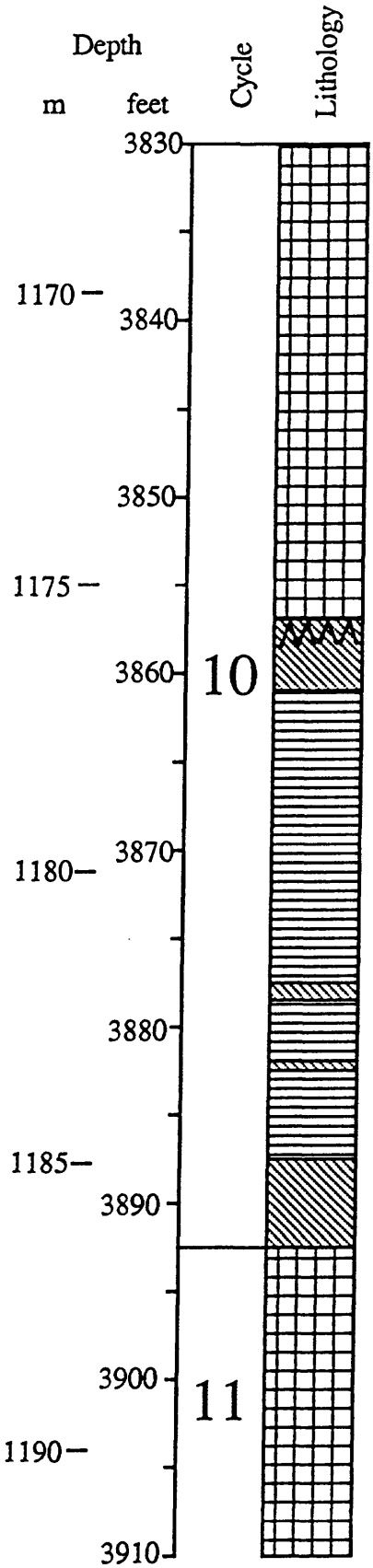


Description

Halite - See above.

Anhydrite - numerous layers of anhydrite ranging in thickness from 3 cm to 1 m in a zone from 1147 to 1153 m. Texture ranges from laminated to coarse pseudomorphs after gypsum.

Halite - clear to gray, medium to fine crystal size. Anhydrite laminations, some distinct, some very indistinct, are spaced 5 to 25 cm apart. Some laminations are accompanied by concentrations of organic matter.



Description

Halite - clear to gray, medium to fine crystal size. Anhydrite laminations, some distinct, some very indistinct, are spaced 5 to 25 cm apart. Some laminations are accompanied by concentrations of organic matter.

Anhydrite - mostly laminated and nodular with thin beds of dolomite and shale. Coarse pseudomorphs of anhydrite and halite after gypsum at top.

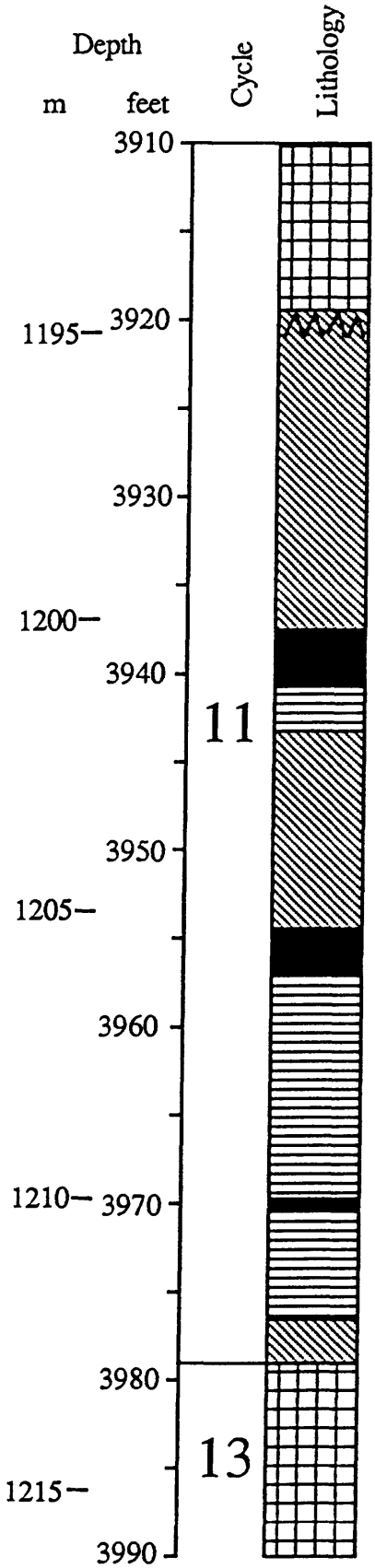
Dolomite - silty at top, shaley below. Numerous thin layers of anhydrite and shale.

Anhydrite - nodular, with a matrix of black shale.

Dolomite - shaley, some silt. Contains 0.3 m bed of nodular anhydrite with shale matrix.

Anhydrite - laminated at base, nodular at top.

Halite - clear to light gray. Medium grain size. Distinct anhydrite laminations in upper part spaced 5 to 15 cm apart. Anhydrite laminations are less distinct in the bottom 1 m where the halite is coarsely crystalline.



Description

Halite - see above

Anhydrite - upper part is coarsely pseudomorphic after gypsum. Two intervals are finely laminated. Abundant halite throughout.

Shale - black at top; gray, silty, carbonaceous at base.

Dolomite - silty and shaley. Fairly coarse quartz grains.

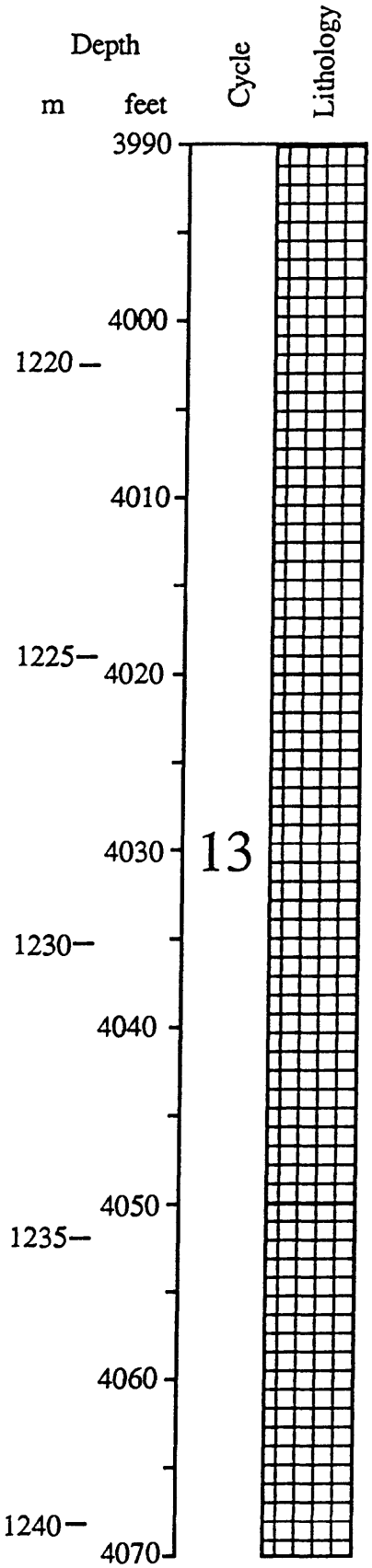
Anhydrite - gradational with overlying dolomite. Much is coarsely nodular. Two prominent black shale beds.

Shale - dark gray, dolomitic.

Dolomite - light tan, shaley, very fissle, some silty layers. Contains a black shale bed at 1210 m. This shale is finely laminated and contains thin layers of dolomite.

Anhydrite - thinly laminated. Layer of dolomite in middle.

Halite, with sylvite. - see below.



Description

Halite, with sylvite

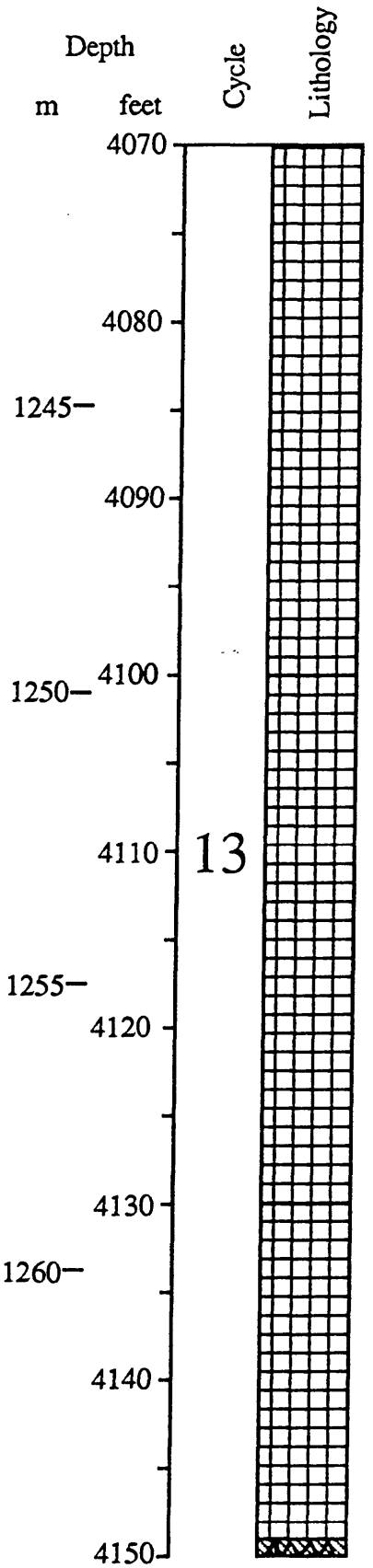
Halite is very fine grained, light tan to light gray.

Sylvite is bright red due to included minute crystals of hematite. From the top of the halite bed to 1223 m, and from 1228 to 1230.5 m, the sylvite is concentrated in individual layers between pairs of anhydrite laminae. From 1230.5 to 1255.8 m the sylvite is disseminated in the halite, giving it an amber color.

Anhydrite is in very thin and closely spaced laminae, ranging from less than 1 mm to 2 cm apart. These laminae become less distinct toward the bottom of the halite bed.

Kieserite nodules are disseminated in halite in the interval 1237 to 1242 m.

Sylvite is absent from 1257 m to the bottom of the halite bed.



Description

Halite, with sylvite

Halite is very fine grained, light tan to light gray.

Sylvite is bright red due to included minute crystals of hematite. From the top of the halite bed to 1223 m, and from 1228 to 1230.5 m, the sylvite is concentrated in individual layers between pairs of anhydrite laminae. From 1230.5 to 1255.8 m the sylvite is disseminated in the halite, giving it an amber color.

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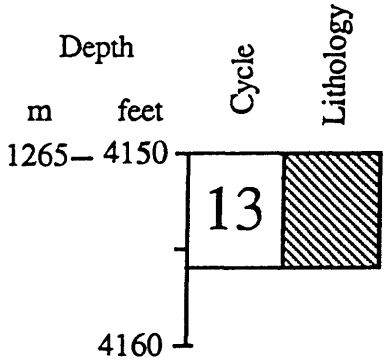
Kieserite nodules are disseminated in halite in the interval 1237 to 1242 m.

Sylvite is absent from 1257 m to the bottom of the halite bed.

Anhydrite - see below.



Description

Anhydrite - coarsely crystalline, with pseudomorphic texture of halite and anhydrite after gypsum. Few thin beds of black shale.

Bottom of core at 1266.7 m (4155.8 ft)