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ELECTROMAGNETIC WAVE PROBING FOR SALT DISCONTINUITIES

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CHAPTER I

TWO-PAGE SUMMARY

This summary can be divided into two parts. The first part concerns our recently completed two-week research trip to Cote Blanche. The second part reviews the literature search accomplished on looking into the possibilities of using sound waves to probe into salt.

On the basis of a few single side band radio transmission tests made in the Cote Blanche salt mine (when owned by Carey Salt) we expected to get good radar transmission and we did. The Charlie II radar gave us the best results we ever achieved. Transmission was excellent and we observed signals out to 2000 ft in salt. In certain places ten signals (reflections from discontinuities in the salt) were seen at ranges up to 1500 ft. This occurred in an area suspected of being a "gouge zone". An effort to probe westward (and up) at the locations of the two shafts was almost completely devoid of signals. The salt appears to be wet here, either inherently or due to fracture porosity induced by the original drilling of the shafts. These are preliminary results because we have just returned yesterday from our trip to Cote Blanche. The salt dome edge is a considerable distance (~ 4000 ft) away and was not "seen" with our Charlie II system. We believe that another trip, in the future, using the high powered Bravo I would be very useful to probe for the dome flanks around the mine perimeter. Also 27 MHz radio transmission is so good in this mine that a complete mine communication system could very well be set up at low cost.

A literature search on the possibilities of using sound waves to probe salt turned up the following information.

1. Many researchers in solid state physics have been studying the mechanical and sound properties of salt, including effects of radiation on the attenuation of sound in salt.

2. Although no direct data in the literature prove low frequency sound probing of salt will be successful, extrapolation of known data to lower frequencies <u>indicate success</u>, provided salt mine salt is equivalent to the salt used in the laboratory.

3. Sound attenuation in our frequency region of interest (6 to 10 kHz) is very dependent on the number and size of dislocations in the salt.

4. We suspect that mine pillars and roofs are replete with dislocations caused by the pressure-release surfaces and the explosives used in mining. Floors might have a smaller number of dislocations.

5. There is solid evidence that salt <u>emits</u> sound (at specific frequencies in the 3 to 20 kHz region) as it plastically flows. This leads to an interesting possibility of listening for impending dangers.

6. Although 2. above indicates we may get low sound attenuation in salt if it were "good", we suspect that the mining process introduces a large number of dislocations, thus causing larger values of sound attenuation. Thus, in probing into salt, the first 5 to 10 feet might be highly absorptive but hopefully the non-relieved salt behind it will have low sound attenuation.