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SUMMARY OF GEOLOGY AT THE ERDA-MAGMA-SDG&E GEOTHERMAL TEST SITE

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The test facility uses four wells in S 1/2 section 33-11S-13E in Imperial County. The Salton Sea Wildlife Refuge adjoins the property on the north edge.

Two shallow wells (Magmamax 1 and Woolsey 1) are planned as producing wells, and two deeper ones (Magmamax 2 and Magmamax 3) are to be used for disposal. These are shown on the attached sections.

The reservoir rocks are a series of sandstones below a shaly sequence. The reservoir sandstones are divided by several major shale beds over 40 feet thick that, in the absence of fracturing, would provide impermeable barriers and separate the reservoir into several separate hydrologic systems. The most important shale occurs at depths between 2000 and 2500' in all four wells. The section below that barrier is called here the 'Lower Reservoir'.

Through casing perforations the wells were completed as follows:

- Magmamax 1 - Upper reservoir
- Woolsey 1 - Upper and lower reservoir and
in the dividing shale
- Magmamax 2 - Lower part of Lower reservoir
- Magmamax 3 - Upper part of Lower reservoir

Production data and analyses come from Magmamax 1 only. Capacity and response to injection of the other 3 wells can only be guessed. This analysis indicates separated systems, unless fracturing provides vertical permeability.

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A shift in the shale S.P. baseline on the electric logs between the 'upper' and 'lower' reservoirs may indicate a change (increase) in water salinity across the impermeable shale barrier.

Structure.

The top of the reservoir sandstone and the several correlation markers get deeper to the west and to the north. The stratigraphic intervals generally also thicken in the same directions.

Faulting is suspected but cannot be proven from well records. Net deepening is 1000 to 1400' per mile to the northwest. This may be partly due to faulting.

Regional Setting.

In a general way, the top of the reservoir sandstones becomes deeper from south to north. (see attached section of the Salton Sea field).

Sandstone development (and reservoir quality) is variable regionally and in detail very irregular even locally. The test site is in an area that appears to have the thickest most continuous reservoir rocks in the field, both in the upper and in the lower reservoir sections.

The upper sandstones pinch out and are replaced by the lower sandstones in the north and northeast parts of the field. Boundaries of the field on both the north and the south are characterized by poor reservoir sandstone development.

Well Production and Completions

Of the test wells, only Magmamax #1 has had measured flow tests. In 1972, it was flowed at 339,000 to 542,000 lb/hr mass flow through an 8" pipe. Wellhead pressures were 96 to 160 psi with steam 10 to 15 percent. Total dissolved solids in the brine at Magmamax #1 is reported at 38,000 to 84,000 p.p.m. This may not be corrected for steam loss. If not, the salinity of the reservoir fluid might have been from 32,000 to 76,000 ppm.

At Woolsey #1, which is perforated opposite both the upper and the lower reservoirs, 99,000 - 151,000 ppm TDS are reported. Correction for steam if any, is unknown.

No salinity data are available for Magmamax #2 and Magmamax #3.

Completions have been by means of slotted production liners hung in the lower part of the holes.

<u>Well</u>	<u>Production Casing</u>		<u>Perforations</u>	<u>Total Depth</u>	<u>Plugged-back Depth</u>
	<u>Size</u>	<u>Depth</u>			
Woolsey #1	8 5/8"	2375'	1866-2375	2400	--
Magmamax #1	8 5/8"	2264	1797-2264	2805	2300
Magmamax #2	9 5/8"	4360	3784-4360	4368	--
Magmamax #3	9 5/8"	3076	2618-3076	4000	3120

Data Sources:

This analysis is from well records, especially electric logs.

Well logs and records are from California Division of Oil and Gas records.

Paul Kasameyer calculated sandstone percentages from electric (Self Potential) logs.

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Oblique projection
(Horizontal and vertical dimensions are true)

D. TOWSE 1-6-76 (preliminary)