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FLUID CONDUCTIVITY IN THE SOUTH ELLWOOD FAULT: COMMUNICATION BETWEEN THE OCEAN AND A HYDROCARBON RESERVOIR AT ONE KILOMETER DEPTH

Methane has leaked from the offshore South Ellwood fault since discovery of the South Ellwood field. The normal fault bounds the low permeability Monterey shale, which is produced from Platform Holly. The reservoir was initially 30% over hydrostatic pressure, but is currently only 10% below hydrostatic. Production fluid in well tubing that connects the platform and reservoir is isolated from the ocean. New data indicate that the ocean is in direct hydraulic communication with the reservoir in the vicinity of the fault.

Quartz pressure sensors were installed at about one km depth in five wells during a 15 day production shut down. A well that intersects the fault at reservoir depth (about one km subsea), shows a pressure variation that matches the frequency of the ocean tide. Within +/- 1 minute, there is no lag between the predicted tide signal and the pressure variation in the well. The pressure change is less than predicted from sea heights, which we attribute to compressibility of the gas in the fault zone. The other wells (160m-1 km from the fault) do not show the tidal signal, indicating that pressure change is not a general effect of the tide on the earth's crust. During testing, fluid pressures increased at a rate of 07 Pa/hr (0.01 psi/hr) in the well adjacent to the fault. We conclude that the pressure recovery from sub-hydrostatic conditions is due to sea water flowing down the fault into the under pressured reservoir. This data will allow calculation of fault permeability.