DISPLAY B6

Triassic reservoir performance in the Heron cluster, ETAP, Central North Sea

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Shell Expro's Heron Cluster fields form part of the Eastern Trough Area Project (ETAP), an integrated development with BP of a total of seven fields. The Heron cluster comprises: Heron (discovered in 1988), Egret (1985) and Skua (1986). These form subsea tiebacks to the Central Processing Facility located over the Marnock Field. The fields are classified as HP/HT reservoirs, with initial pressures and temperatures of 9300-12,900 psi and 300-350 F respectively. The main reservoir within the cluster is the Triassic Skagerrak Formation. Development of these fields initially assumed the Skagerrak would be well connected and likely to have an active aquifer. However, initial production from Heron in 1998 revealed a dramatic pressure decline, indicating that the reservoir was more compartmentalised than anticipated, with little or no aquifer, necessitating a revision to the reservoir model.

The Skagerrak can be subdivided into an upper, more channel-dominated interval and a lower, poorer quality, largely unconfined fluvial section, bounded below by the playa Marnock Shale and above by the lacustrine Heron Shale. The section records the progradation of large terminal fluvial systems, and in detail is composed of discrete channel/terminal splay cycles bounded by a hierarchy of shales. The shales have a variety of origins, ranging from perennial to ephemeral lacustrine to variably drained floodplain, and record regional expansion of the floodbasin facies in response to changes in hinterland runoff and sediment yield. These shales form laterally persistent, effective barriers to vertical flow. Additional perforations in compartments bounded by the shales have encountered near virgin pressures and also subtly differing oil compositions.

Overall the Skagerrak reservoirs in the Heron Cluster appear to have the following common characteristics: good lateral connectivity, but poor to zero vertical connectivity; large faults become 'leaky' with sufficient pressure drawdown, and there appears to be no aquifer support. The short term production behaviour of these reservoirs is not representative of their longer term behaviour, and in particular, short term well tests indicate a level of compartmentalisation which does not materialise during production.

Plate A

Well: UKCS 22/30a-6 Interval: 15625-15637ft

This interval shows the basal section of the Heron Shale. The basal interval was deposited in a palustrine setting prior to major lacustrine flooding (recorded by the main shale section). Root traces, desiccation cracks, wave ripple laminae and delicate mm-scale rhythmites are indicative of fluctuating water levels in a marginal lacustrine setting. Common scour-fills (with mud clast lags) and dewatering fabrics suggest rapid deposition by episodic floods.

Plate B

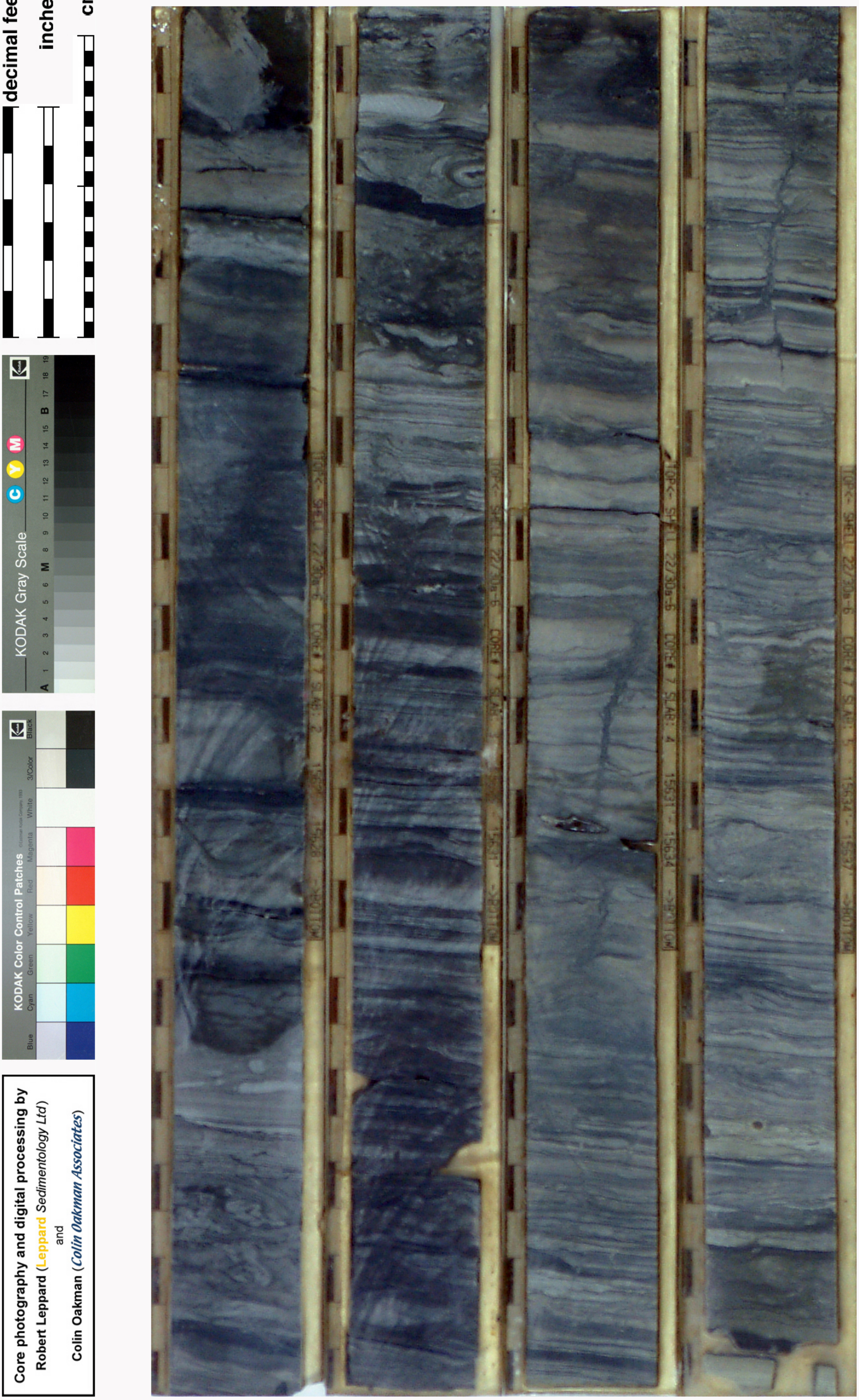
Well: UKCS 22/24d-10 Interval: 14425-14483ft

This interval shows an upper Skagerrak fining-upward stratigraphic cycle. The basal part is composed of cross stratified, channel confined sands with common rip-up clast lags. This passes upwards into a section dominated by plane bedded and massive, unconfined splay sands. Coarsening upward trends within heterolithic intervals suggest progradation into standing water bodies. Towards the top of the cycle palaeosols are present. These are largely poorly drained examples, although local reddening suggests well drained episodes. Insect burrows are present, indicative of high soil moisture (but not subaqueous) conditions. The shale prone sections bounding such cycles are widespread and form flow barriers. They record episodes of increased flood frequency/magnitude, leading to sustained higher water table levels.

Display B6 Plate A

Well UKCS 22/30a-6

15625 ft 15628 ft 15631 ft 15634 ft



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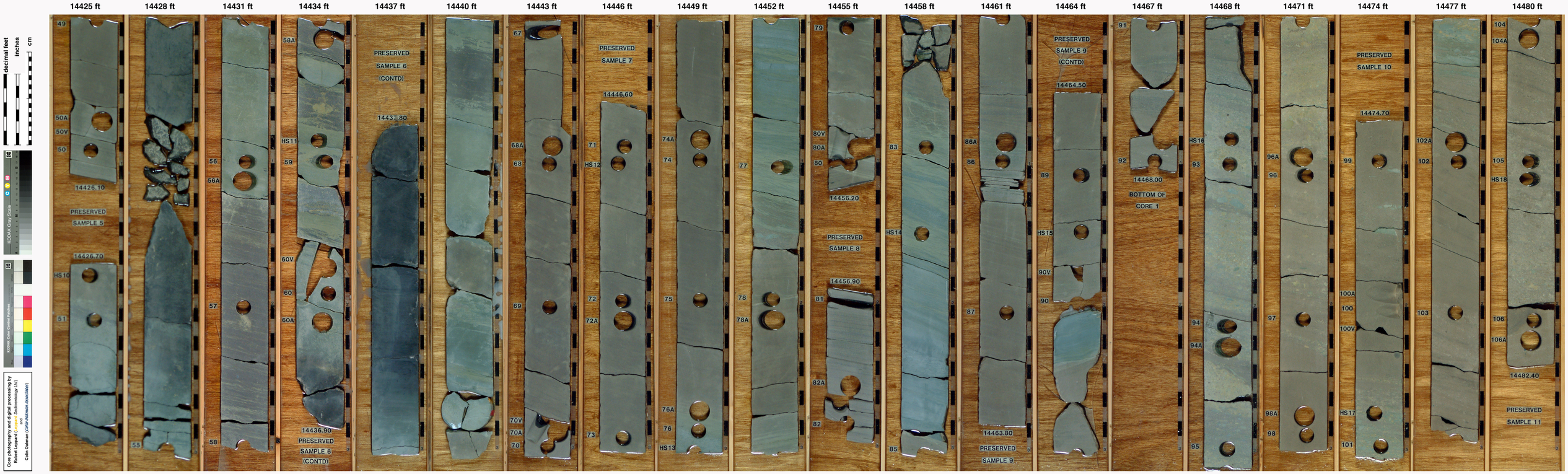
Display B6 Plate B

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