

# Sedimentary logs and thin sections report samples

[Law](#), [Evidence](#)



## **Introduction**

The coastline that stretches from Hastings to Cliff End is dominated by cliffs exposing a significant proportion of the Ashdown Formation. Notably, the cliffs stretching from East Hill in Hasting to Pett Beach that are approximately 7.5 km to the East north-east have been distinguished as Site of Special Scientific Importance (SSSI) due to its geological interest.

Evidently, the cliffs exhibit most absolute sequence of terrestrial Lower Cretaceous rocks and form the principal exposure of the of the renown Ashdown Formation. In this area, the Ashdown Formation is preserved in low amplitude of the Fairlight Anticline which cuts the coast line between Fairlight Cove and Lee Ness Ledge.

Conspicuously, Ashdown Formation consists of sandstones, mudstones and siltstones. It also has lenticular beds of lignite, sphaerosiderite nodules and sideritic mudstone. While siltstones dominate the succession in the east of the region, there is an upper sandy division approximately 30 to 50 meters thick and which can be distinguished from more argillaceous beds that make up the other part of the formation that are locally red-mottled. Notably, the base of the Ashdown Formation is defined from the top of the Greys Limestones.

## **Sedimentary Facies**

These are best examined on the excellent coastal outlines or in cored boreholes (Francus 2000). In the Inland areas Francus (2000) indicates that where exposures are usually poor, it is hard to correlate the evidence from the controlled exposures to sedimentary facies with precision. For instance,

coarsening-upward successions are believed to be available in the Westfield area (Francus, 2000) though it has proved hard to distinguish the style of sedimentation present at the Ashdown Formation more so the Wadhurst Clay Formation boundary. Arguably, more difficulties are experienced with types of clay notable in the upper Ashdown Formation that superficially resemble those in the Wadhurst Clay Formation; i. e. typically, the pale grey mottled silted clays and mudstones on Ashdown Formation weather to ochreous that are readily distinguishable from the greenish grey clays located in the Wadhurst Clay Formation (Francus 2000).

### **Channel-fill deposits**

Conspicuously, broad flat-bottomed channels are present at some horizons in the Ashdown Formation of the Hastings. Radley and Allen (2012a) note that these channels are characteristically floored with a mud-flake conglomerate that consists of crusts of siltstone that contains plant detritus and peculiar bones, ferruginous mudstone and with matrix of inconsistent grain-size. Notably, at this area, sand preponderate large-scale cross-beds that are present while rhythmic variations in grain-size distinguish smoothly grained infill that unmistakably contain copiously comminuted plant detritus. Various dewatering structures hint intervals of fast sedimentations.

### **Coarsening-upwards sequences**

The coarsening-upward sequences are about 3 to 6 meters thick and they have been recognized in the borehole cores and extraordinarily in the coastal sections (Radley & Allen, 2012a). Typically, the under listed lithologies are evident in ascending order;

## **Erosion surface**

- c) Sandstone lignite, that cross-bed and pass down to
- b) Siltstone with variable bioturbated or laminated with estherids that drop down to
- a) Mudstone silty with fragments of plants and roots

## **Erosion surface**

In reference to Radley and Allen (2012b) the siltstone unit may on the other hand consist of rhythmic alterations of dark silty siltstones and mudstones that give a hooped appearance. Radley and Allen (2012b) also note that although the evidence is restrained it is probable that these cycles persist tangentially over some distances.

## **Coarsening-upward sandstones**

In line with Watson and Lydon (2004) the facies is comparable to although coarser-grained than the above (a) and (b) that is condensed or absent. Watson and Lydon (2004) note that sandstones contain augmented mounts of argillaceous substance downward and they are limited with pebble bed and in some cases they are coarse grained towards their tops. In keeping with Watson and Lydon (2004) the beds are laterally persistent and plate like and are characterized by Top Ashdown Sandstone.

## **Red-mottled argillaceous beds**

According to Watson and Lydon (2004) the clays that are found on the lower part of the Ashdown Formation, i. e. the Fairlight Clays typically show color mottling in shades of grey red, green, brown, purple and yellow. Evidently,

the borehole cores the mottling is vertically allied and this implies connection with root formation. Watson and Lydon (2004) further notes that Sphaerosiderite that is plentiful in the lithology is spread out unevenly and is commonly related with roots and forms ovoid aggregates that are up to 0.3 meters in diameter. In references to Watson and Lydon (2004) comparison with comparable lithologies in the Tunbridge Wells Sand Formation; accordingly, colour mottling of argillaceous beds is particularly feeble and may stretch to grey beds.

## **Lower Ashdown Formation**

Markedly, the lower boundary is evidently conformable with the fundamental Purbeck Group at the alteration from the finely-bedded mudstone of the casually named Greys Limestones in to sandstones and siltstones of the Ashdown formation. Watson and Lydon (2004) notes that the Wealden Series includes a succession of sandstones, mudstones and siltstones that lie between the Weald's lower Greensand and the Purbeck Beds. Additionally, these strata have been stratigraphically divided into Weald Clay and the Hasting Beds. Watson and Lydon (2004) also note that then series is classified into sand prone or mud prone divisions.

According to Radley and Allen (2012b) the total thickness of Hastings beds is approximately 380 metres at protrusion in the western side of the district. Radley and Allen (2012b) further indicate that in the east, at Dungeness, a reduced thickness of just 165 metres is indicated by trial boreholes. Radley and Allen (2012b) note that Wealden sediments are deposited in the predominantly freshwater environment in the lagoon that has occupied much

of the Hampshire Basin and then extends eastwards to the Paris Basin. In keeping with Radley and Allen (2012b) the sediments are mainly derived from sources areas; arguably, Cornubia to the west and London-Brabant massif to the north. However, there is some evidence of American Massif (Southerly derivation) for some strata (Radley & Allen, 2012a). These are possibly consequent on rejuvenation of the source areas by blocking increased precipitation with the climatic fluctuations. Radley and Allen (2012b) explains that most of the clay rocks that are laid down in distal environment comprise of bays and lagoons that are deposited in further proximal fluvial overbank areas. In keeping with Radley and Allen (2012b) the large-scale cyclical sedimentation that is located within Hasting Beds that are originally suggested that sandstone and siltstone within them were deposited in a sequence of protruding deltas that follow typical cyclothem is repeated numerous times. Gilbert (2003) note that the sharp breaks with erosion follow the following sequence;

viii). Thick dark Ostracod clays these are Beds of Neomiodon

vii). Neomiodon shell beds that are thin

vi). Thin dark clay

v). Equisetites soil bed that are on top of interchanging series of siltstones, thin cross-laminated lenticular sandstone, and clay that form faultless passage from (iv) to (vi)

iv). Pebble bed that are thinly graded (sharp break with erosion)

iii). Thick sandstone

ii). Silty clays and Lenticular Siltstone that form passage upwards to (iii)

i). Thick silty clays. These are red mottled and grades upward to (ii)

The red mottled clays, according to Gilbert (2003) can be taken to insinuate periodic emergent condition that led to partial oxidation that resulted to development of sphaerosiderite and soil profiles. Radley and Allen (2012a) further notes that the red mottled clays that occur in the Tunbridge Wells and the Ashdown Formation are different in their level of development as well as, in the presence of sphaerosiderite to those on top of argillaceous formation that are thin and noticeably lack sphaerosidite. In reference to Gilbert (2003) sphaerosiderite is evident in radically crystalline sphere, they have a diameter of about 1mm and are commonly intimately associated with root traces of fossils, in the rocks that closely look like coal.

## **Upper Ashdown Formation**

Watson and Lydon (2004) explains that the upper boundary of Ashdown Formation is conformable at the Top Ashdown Sandstone where they are identified or at the basal bed of the Wadhurst Clay Formation are they are informally referred to as Top Ashdown Pebble Bed. Generally, the top of formation has been taken at the change from the core sandstone under the dark grey silty mudstones (Watson & Lydon 2004). Watson and Lydon (2004) notes that the massive sandstone are typified by the Top Ashdown Sandstone as well as, the overlying pebble beds that are taken to present significant transgressive occurrence. Gilbert (2003) notes that three core cyclothems located in the wealden essentially pairs of muddy and sandy formations. They comprise of Wadhurst Clay and Ashdown Beds; the Grinstead Clay, Weald Clay, Lower Tunbridge Wells and upper Tunbridge Wells

At the point of the overlying Wadhurst Clay Formation is common though not always present. Arguably, this is the Upper Ashdown Sandstone which is about 10 meters thick. In reference to Gilbert (2003) the overlying Top Ashdown Pebble Bed has been described as the Wadhurst Clay Formation basal bed. Gilbert (2003) further notes that even though the formation encompasses an expansive outcrop in the Hastings; it is hard to determine the entire succession at any given location. In the coast-section Gilbert (2003) notes that east of Hastings about top 130 meters are exposed, slightly below Lee Ness Sandstone. Gilbert (2003) confirms that the basal beds surround the Purbeck inliers in the inland; however, elsewhere less than 100 meters of the upper beds are evidently present at the outcrop.

## References

- Francus P. 2000. An image-analysis technique to measure grain-size variation in thin sections of soft clastic sediments Original Research Article. *Sedimentary Geology*, Volume 121, Issues 3-4, Pages 289-298
- Gilbert O. 2003. The lichen flora of unprotected soft sea cliffs and slopes Original Research Article. *The Lichenologist*, Volume 35, Issue 3, May 2003, Pages 245-254
- Radley J & Allen P. 2012a. The Wealden (non-marine Lower Cretaceous) of the Weald Sub-basin, southern England Original Research Article. *Proceedings of the Geologists' Association*, Volume 123, Issue 2, Pages 245-318
- Radley J & Allen P. 2012b. The non-marine Lower Cretaceous Wealden strata of southern England Original Research Article. *Proceedings of the Geologists'*



Association, Volume 123, Issue 2, Pages 235-244

Watson J & Lydon S. 2004. The bennettitalean trunk genera *Cycadeoidea* and *Monanthesia* in the Purbeck, Wealden and Lower Greensand of southern England: a reassessment Original Research Article. *Cretaceous Research*, Volume 25, Issue 1, Pages 1-26