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Weymouth Relief Road: temporary excavations in Jurassic and Cretaceous strata (August 2009)

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Foreword

This report provides a brief account of temporary excavations seen in August 2009 in connection with the construction of the new Weymouth Relief Road. A previous report (Woods, 2009) described the details of some temporary exposures visible in May 2009.

Acknowledgements

Skanska (UK) Ltd and Jamie Codd (Amey) kindly assisted with access to the site. Jamie Codd also provided geological information about the identity of stratigraphical units in the Corallian Group and Kimmeridge Clay Formation.

Contents

FIGURES

Summary

This report gives a stratigraphical overview of some temporary exposures created during construction of the Weymouth Relief Road. It updates and augments an earlier report describing the geology of this construction site seen in May 2009 (Woods, 2009). At the time of report compilation, the main stratigraphical units visible are Corallian Group, Kimmeridge Clay Formation, Purbeck Group and Chalk Group.

1 Introduction

Construction on the new Weymouth Relief Road began in early 2009. Major excavation works were undertaken in April 2009, and some details of these were previously reported by Woods (2009). This report provides a stratigraphical overview of the geological succession seen in August 2009. Details of the stratigraphical units currently visible are described in turn below.

Author citations for fossil species are given in Appendix 1. The stratigraphy of the Corallian Group referred to in this report is shown on Figure 1, and the stratigraphy of the Chalk Group referred to in this report is shown on Figure 2.

2 Corallian Group

Exposures of Corallian Group were seen in excavations extending south-westwards of Littlemoor, between [SY 67457 83469] and [SY 67257 83120] (Fig. 3). The oldest part of the succession currently visible comprises the dark grey weathering mudstones of the Nothe Clay Member [SY 67257 83120], overlain by the orange-yellow weathering sandstones of the Bencliff Grit Member [SY 67290 83183]. These units form the upper part of the Redcliff Formation, in the lower part of the Corallian Group. The middle part of the Corallian Group, represented by the Osmington Oolite Formation, occurs slightly further to the north-east [SY 67314 83295], comprising pale-coloured oolitic limestones interbedded with units of dark grey mudstone. A prominent fault cuts the Osmington Oolite at [SY 67294 83293]. The hard, richly bioclastic limestones of the Clavellata Formation, in the higher part of the Corallian Group, were previously seen at [SY 67424 85147] (Woods, 2009), and these units have now been more extensively excavated. These limestones are orange-brown weathering, but the unweathered limestones in the newly created exposures are dark, bluish-grey, with bands of orange iron-staining. The top of the Corallian Group, represented by a couple of metres of pale grey weathering mudstones of the Ringstead Clay Member, was seen at [SY 67457 83469], overlain by dark grey mudstones of the Kimmeridge Clay Formation. The Ringstead Clay forms the upper part of the Sandsfoot Formation. Neither the Sandsfoot Clay (upper Clavellata Formation) or Sandsfoot Grit (lower Sandsfoot Formation) are visible in the currently available exposures.

(NB: some stratigraphical details supplied by Jamie Codd (Amey))

3 Kimmeridge Clay Formation

The higher part of the Kimmeridge Clay Formation was seen at [SY 67346 84232] to [SY 67298 84385] (Fig. 4); the contact with the overlying Portland Group is slightly north of the last mentioned NGR. The dark grey mudstone succession includes several marker beds, including (in ascending stratigraphical order) the Blackstone [SY 67346 84232], the White Stone Band [SY 67335 84307] and the Middle White Stone Band [SY 67332 84347].

(NB: marker-bed identifications supplied by Jamie Codd (Amey))

4 Purbeck Group

The exposure of the Purbeck Group previously described by Woods (2009) at [SY 67424 85147] has been considerably modified. The section now more clearly exposes the Cinder Bed (Fig. 5).

5 Chalk Group

The Chalk Group seen in the main Ridgeway cutting between [SY 67389 85411], at the southern end, and [SY 67178 85761], at the northern end, belongs to the Lewes Nodular Chalk, Seaford Chalk and Newhaven Chalk formations (Fig. 6). The strata dip very steeply northward in the southern part of the cutting, but more gently northwards at the northern end. The interval of cutting separating these regions of contrasting dip contains a major solution pipe, which may be developed along a major fracture zone/fault (Fig. 6). Lithostratigraphical and biostratigraphical observations made along the cutting at 7 localities are described below:

(1) NGR: SY 67389 85411

Specimen Nos: WMD 14759 – 14760

Brash includes evidence of the Lewes Tubular Flints (Fig. 6), suggesting the middle part of the Lewes Nodular Chalk Formation. The ex situ fauna includes the brachiopod *Orbirhynchia reedensis* and the echinoid *Plesiocorys* (*Sternotaxis*) *plana*, which is consistent with the lithostratigraphical evidence. The in situ chalk at this locality is very strongly nodular.

Conclusion: Middle Lewes Nodular Chalk; *P*. (*S*.) *plana* Zone

(2) NGR: SY 67358 85439

Specimen nos: WMD 14761 – 14763

The fauna includes the echinoids *Echinocorys gravesi*, *Micraster normanniae* and *M. precursor* (sensu Drummond).

Conclusion: Middle Lewes Nodular Chalk; upper *P*. (*S*.) *plana* Zone or lower *M. cortestudinarium* Zone.

(3) NGR: SY 67344 85477

Specimen nos: WMD 14764 – 14766

The fauna comprises common thick shelled specimens of the inoceramid bivalve *Platyceramus*. This is the first up-section record of this bivalve, and is almost certainly indicative of the lower part of the *M. coranguinum* Zone, and by inference, the lower part of the Seaford Chalk Formation (= Belle Tout Beds of Mortimore, 1986).

The chalk associated with the fauna contains abundant slickensides and is strongly fractured. Parts of the succession appear to be nodular, and there is a possible record of a glauconitised horizon. Nodularity and glauconite may be indicative of the influence of synsedimentary structural activity on local chalk sedimentology.

Conclusion: Lower Seaford Chalk Formation (Belle Tout Beds); lower *M. coranguinum* Zone.

(4) NGR: SY 67345 85528

Specimen no.: WMD 14771

The specimen is a possible fragment of a calyx plate of the crinoid *Marsupites testudinarius*.

Conclusion: ?Lower Newhaven Chalk Formation; ? *M. testudinarius* Zone.

(5) NGR: SY 67282 85618

Specimen no.: WMD 14770

The specimen is the echinoid *Offaster pilula*.

Conclusion: Upper Newhaven Chalk Formation; *O. pilula* Zone

(6) NGR: SY 67223 85656

Specimen nos: WMD 14767 – 14768

The specimens are fragments of the echinoid *Offaster pilula*.

Conclusion: Upper Newhaven Chalk Formation; *O. pilula* Zone

(7) NGR: SY 67178 85761

Specimen no.: WMD 14769

The specimen is the echinoid *Echinocorys cincta*.

Conclusion: Upper Newhaven Chalk Formation; *O. pilula* Zone, Subzone of abundant *O. pilula*, Belt of *E. cincta*.

Appendix 1 – Author citations for fossil species

Echinocorys cincta Brydone, 1912

Echinocorys gravesi (Desor, 1847)

Marsupites testudinarius (Schlotheim, 1820)

Micraster normanniae Bucaille, 1883

Micraster precursor sensu Drummond, 1983

Offaster pilula (Lamarck, 1816)

Orbirhynchia reedensis (Etheridge, 1881)

Plesiocorys (Sternotaxis) plana (Mantell, 1822)

References

British Geological Survey holds most of the references listed below, and copies may be obtained via the library service subject to copyright legislation (contact libuser@bgs.ac.uk for details). The library catalogue is available at: http://geolib.bgs.ac.uk.

MORTIMORE, R N. 1986. Stratigraphy of the Upper Cretaceous White Chalk of Sussex. *Proceedings of the Geologists' Association*, Vol. 97, 97 – 139.

WOODS, M A. 2009. Weymouth Relief Road: temporary excavations in Jurassic and Cretaceous strata (August 2009). *British Geological Survey Technical Report*, OR/09/035.

Sandsfoot Formation	Osmington Mills Ironstone Mbr
	Ringstead Clay Mbr
	Sandsfoot Grit Mbr
Clavellata Formation	Sandsfoot Clay Mbr
	Clavellata Mbr
Osmington Oolite Formation	Nodular Rubble Mbr
	Shortlake Mbr
	Upton Mbr
Redcliff Formation	Bencliff Grit Mbr
	Nothe Clay Mbr
	Preston Grit Mbr
	Nothe Grit Mbr

Figure 1. The stratigraphy of the Corallian Group referred to in this report.

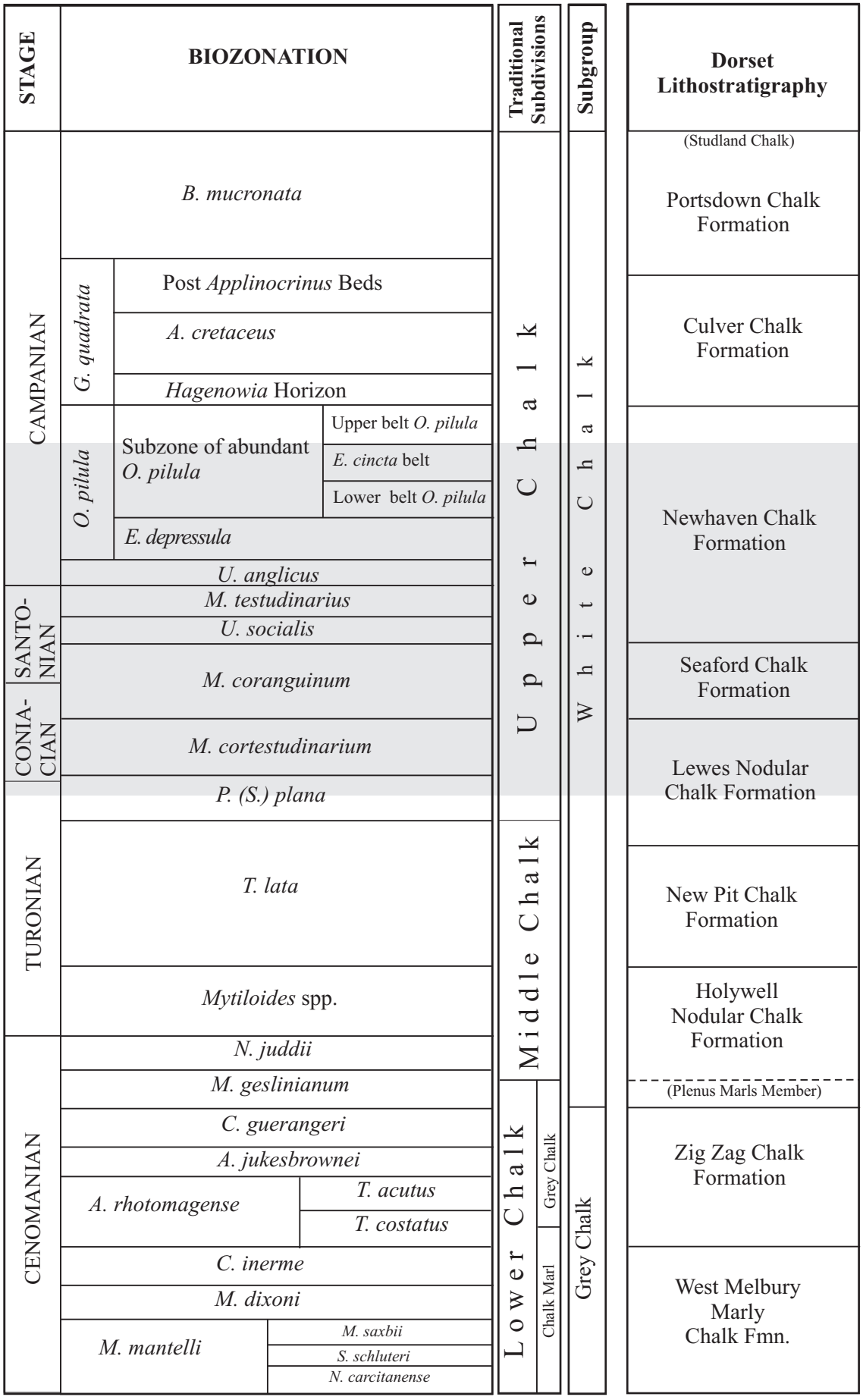


Figure 2. The stratigraphy of the Chalk Group. Grey shading shows the stratigraphical range currently visible (August 2009) in the Weymouth excavations.

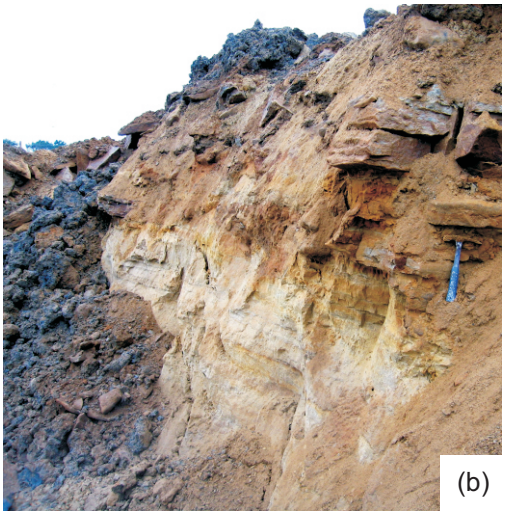
(see overleaf for figure)

Figure 3. Corallian Group.

(a) Dark mudstones of the Nothe Clay Member (Redcliff Formation) [SY 67257 83120].
(b) Orange-yellow sandstones of the Bencliff Grit Member (Redcliff Formation) [SY 67290 83183].
(c) Faulted Osmington Oolite Formation on east side of cutting [SY 67333 83223].
(d) Close-up of faulted Osmington Oolite Formation on west side of cutting [SY 67294 83293].
(e) Dark grey mudstones and pale weathering oolitic limestones of the Osmington Oolite Formation [SY 67314 83295].
(f) Unweathered exposures of hard, bioclastic limestones of the Clavellata Formation [SY 67339 83325].
(g) Pale grey weathering mudstones of the Ringstead Clay Member (Sandsfoot Formation) (1) overlain by dark mudstones of the Kimmeridge Clay Formation (2) [SY 67457 83469].

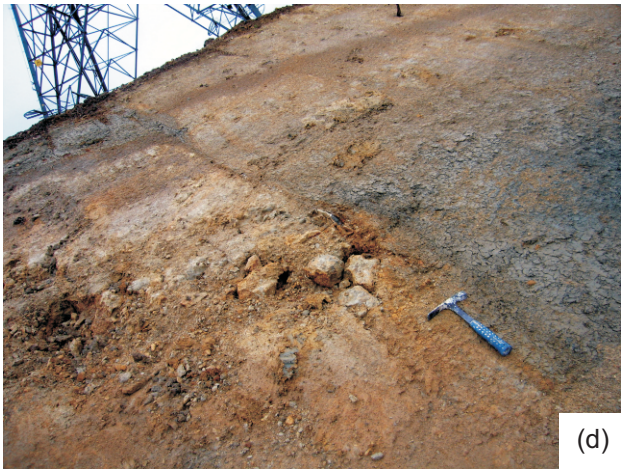
Length of hammer is 0.3 m. Height of red notebook is 0.19 m.

(a)



(b)

(c)



(d)

(e)

(f)

(g)

Figure 4. Kimmeridge Clay Formation.

(a) View northwards along Weymouth Relief Road excavation from [SY 6729 8454] showing dark mudstones of the Kimmerdge Clay Formation in immediate foreground (1), graded cutting in the Portland Group in middle ground (2) and Chalk Group in the Ridgeway cutting in the far distance (3).
(b) Middle White Stone Band, upper Kimmeridge Clay Formation [SY 67332 84347].
(c) White Stone Band, upper Kimmeridge Clay Formation [SY 67335 84307].
(d) Blackstone, upper Kimmeridge Clay Formation [SY 67346 84232].

Geological hammer is 0.3 m long.

Figure 5. Purbeck Group at [SY 67424 85147]. (a) close-up detail of Cinder Bed (basal Stair Hole Member, basal Durlston Formation). (b) In situ outcrop of the Cinder Bed.

(a)

(b)

(c)

Figure 6. The Chalk Group in the Ridgeway cutting.

(a) Lewes Tubular Flints seen at the southernmost end of the cutting [SY 67389 85411]. Hammer head is 0.16 m.
(b) General view southwards along Ridgeway cutting.
(c) General view northwards along Ridgeway cutting. The area of dark soil on the left hand side of the image (1) marks the location of a deep solution pipe, north of which the dip of the Chalk becomes significantly less steep.