The Town and Country Planning Act 1990

Appeal Reference: APP/C1435/W/23/3321978

Planning Appeal by Gleeson Land

LAND AT DOWNLANDS FARM, UCKFIELD

Proof of Evidence

Dr. Alan Thompson

Director, Cuesta Consulting Limited

on Behalf of the Downlands Action Group



Geology, Geomorphology and the Water Environment in North Uckfield

22nd September 2023

Cuesta Consulting Limited

[redacted]

Email: [redacted]

Cuesta

Environmental Geology Consultants

Qualifications and Experience

I am a Chartered Geologist (C.Geol.), Fellow of the Geological Society of London (FGS) and Chartered Town Planner (MRTPI), with almost 40 years' professional research and consultancy experience.

I hold a Bachelor of Science degree in Physical Geography and Geology (1978) and a PhD in Geomorphology (1984), both from the University of Liverpool.

I am the Director of Cuesta Consulting Limited, an independent consultancy firm which I established in January 2005, dealing with all aspects of geology, geomorphology, minerals and the water environment. Through Cuesta I have undertaken numerous research-based projects for a wide range of Clients including DEFRA, Natural England, the Welsh Government, local planning authorities, mineral operators and private developers.

Prior to June 2012 I was also employed as the Director of Earth Sciences at Capita Symonds Limited in East Grinstead, West Sussex (originally known as Travers Morgan Limited, which I joined as Senior Geomorphologist in 1989). During that period I led numerous geological and planning policy research projects for central Government departments and agencies in England & Wales and was the lead author of several good practice guidance documents. These related, amongst other things, to the use of Earth Science information in Land Use Planning and to dealing with the impacts of mineral development on various aspects of the water environment.

I am a former resident of Uckfield (from 1989 to 2014) and was periodically involved, during that time, with local community conservation initiatives relating to Lake Wood and the West Park Local Nature Reserve. Following the October 2000 floods in Uckfield, I was also involved as a member of the Uckfield Flood Action Group (UFAG), providing advice and support to Wealden District Council. In 2003 I was briefly involved in providing advice on flood risk assessment at Downlands Farm to the Trustees of the Clarence Preston Will Trust. This afforded me the opportunity to study the site in some detail and (through liaison with Dr. Martyn Stenning at that time) to appreciate the potential impacts of such development on the local ecology.

Since moving to Somerset in 2014, I have retained an interest in the Uckfield area and have been providing specific support to the Downlands Action Group since 2021.

Summary

Concerns have been expressed about the threat posed by the proposed Downlands Farm housing development to the ecology of the area, including extensive tracts of Ancient and long-established Woodland and to the special characteristics of Lake Wood, Longwood Gill and the Shortbridge Stream. Part of that threat relates to the flow of water between the site and these sensitive receptors. The Appellant's consultants have categorically denied the existence of any 'material hydrological link' between the proposed development site and Lake Wood and have played down the likely implications of other changes to the hydrological regime.

This Proof of Evidence demonstrates that there are both surface water (hydrological) and groundwater (hydrogeological) processes which provide pathways and mechanisms for the proposed development to affect sensitive habitats and species within all of these areas. The rationale claimed by the Appellant's consultants for dismissing these potential impacts is therefore inaccurate, unreliable and misleading.

Whilst some degree of mitigation has been proposed for the discharge of surface runoff into the woodland ghylls, via detention ponds, no evidence has been put forward to demonstrate the effectiveness of those proposals in mimicking the natural hydrological regime, either in terms of flow rates or water quality. Moreover, no mitigation whatsoever has been offered in respect of surface water flows into Lake Wood, or in respect of sub-surface (groundwater) flows into any of the sensitive receptors. Dismissing the likelihood of such flows on the basis of inadequate evidence is no excuse for failing to address the issue.

For these reasons, in combination with the ecological importance of the ancient woodlands and other features that would be affected, it is my firm contention that this Appeal should be dismissed.

Introduction

1. Concerns have been expressed, by Wealden District Council (WDC), Dr. Martyn Stenning (2022, 2023), the Downlands Action Group (2023) and others, about the threat posed by the proposed Downlands Farm housing development to the ecology of the area, including extensive areas of Ancient and long-established Woodland (both within and directly adjacent to the site) and to the special characteristics of Lake Wood, Longwood Gill and the Shortbridge Stream.

2. Aspect Ecology (2022) and Sylvan Consulting Ltd. (2022), on behalf of the Appellant, have sought to play down some of these potential impacts, suggesting that they have been '*screened-out as non-significant in nature*' and have categorically denied the existence of any '*material hydrological link'* between the proposed development site and each of these sensitive receptors.

3. This Proof of Evidence demonstrates that such ***hydrological*** (surface water) and ***hydrogeological*** (groundwater) links between Downlands Farm and sensitive ecological receptors do exist and that the rationale claimed by Aspect and Sylvan for dismissing these potentially serious impacts is inaccurate, unreliable and misleading.

Topography, Geology and Geomorphology of the Site.

4. The proposed development site at Downlands Farm occupies an area of sloping topography drained by a number of deeply-incised short valleys, known locally as 'ghylls' (Plates 1 and 2) which flow westwards to join the Shortbridge Stream, which was protected under the Water Framework Directive (WFD) for its freshwater fish habitat (cyprinid and salmonid) (Environment Agency 2009), now covered by the 2017 Water Environment Regulations. The largest of the ghylls, located directly to the south of Downlands Farm, but originating in the south-eastern part of the site itself, is that of Lake Wood, which contains a partially spring-fed and low-pH peat-fed lake (Plate 3).



Plate 1: Longwood Ghyll seen from the East (December 2002)



Plate 2: Longwood Ghyll in Winter (December 2002).



Plate 3: Lake Wood – the largest of the ghyll valleys (September 2023)

5. As illustrated on Figures 1 and 2, the site is underlain almost entirely by the Cretaceous **Ardingly Sandstone** which, in the southern and eastern parts of the site, is concealed beneath the **Grinstead Clay**. Locally, on higher ground, the clay is capped by the **Upper Tunbridge Wells Sand** and the whole sequence is underlain by a series of sands, silts and clays known as the **Lower Tunbridge Wells Sand**. The strata are tilted gently towards the north-west, forming the dip slope of an escarpment.

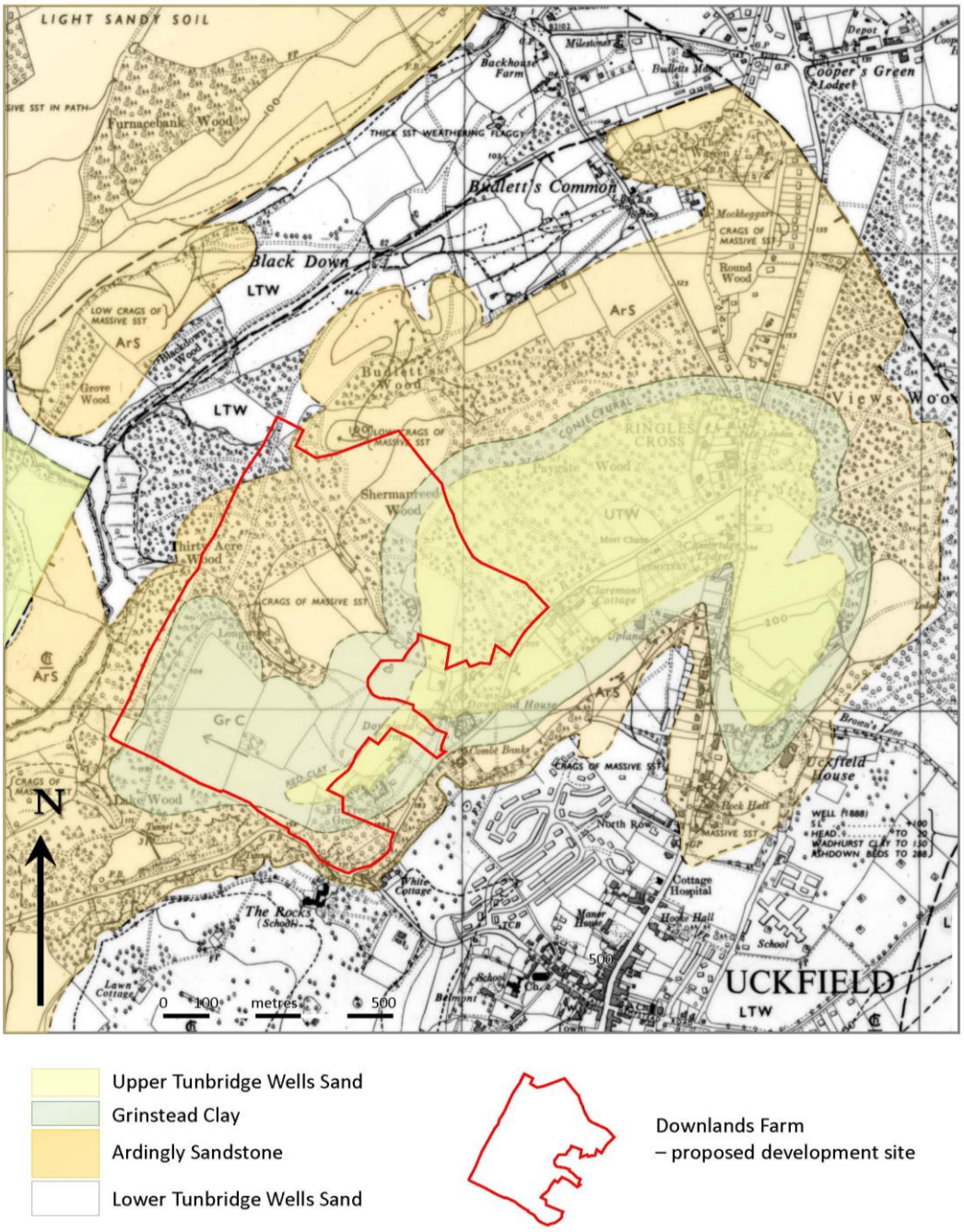
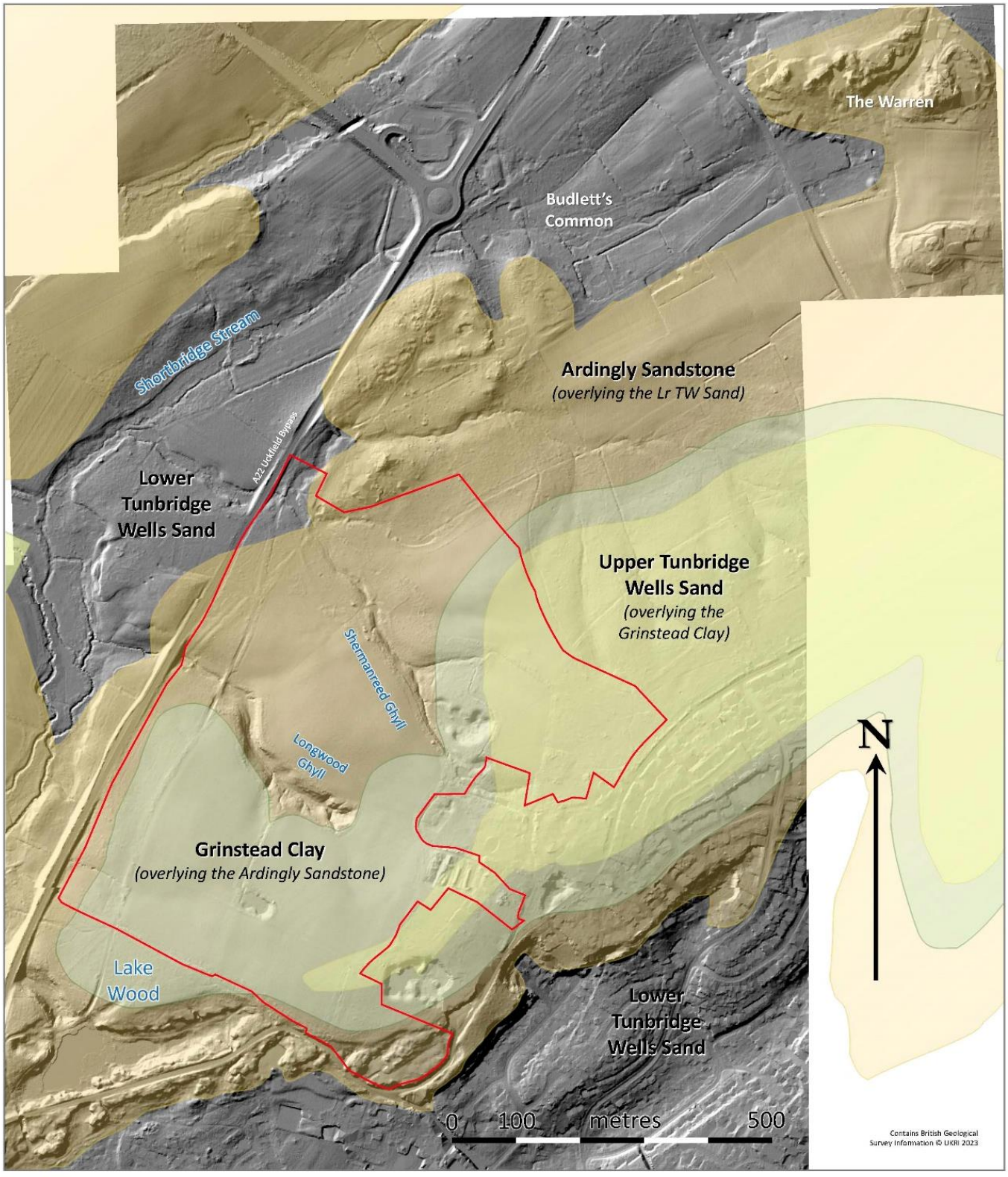


Figure 1: Extract from the BGS 6-inch geological map of the area (colouring of outcrops added for clarity)



Bedrock Geology, copied from BGS '6-inch' geological map

- Upper Tunbridge Wells Sand
- Grinstead Clay
- Ardingly Sandstone
- Lower Tunbridge Wells Sand

Downlands Farm – proposed development site



LiDAR Digital Terrain Model, showing topographic features

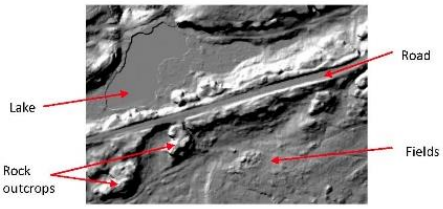


Figure 2: Geology and Topography of Downlands Farm and Surrounding Areas

6. Outcrops and crags of the Ardingly Sandstone occur within the ghyll valleys and, more extensively, around Lake Wood (Figure 3), where they provide components of two separate Local Geological Sites (LGS) – **Lake Wood Rocks LGS**, to the north of Rocks Road (Anderton, 2011a), and **Rocks Park LGS**, on the southern side of the road (Anderton, 2011b). In these areas they reveal, amongst other things, geomorphological evidence of disruption by a process known as '**cambering**', which occurred during former glacial periods. Further details are given below.

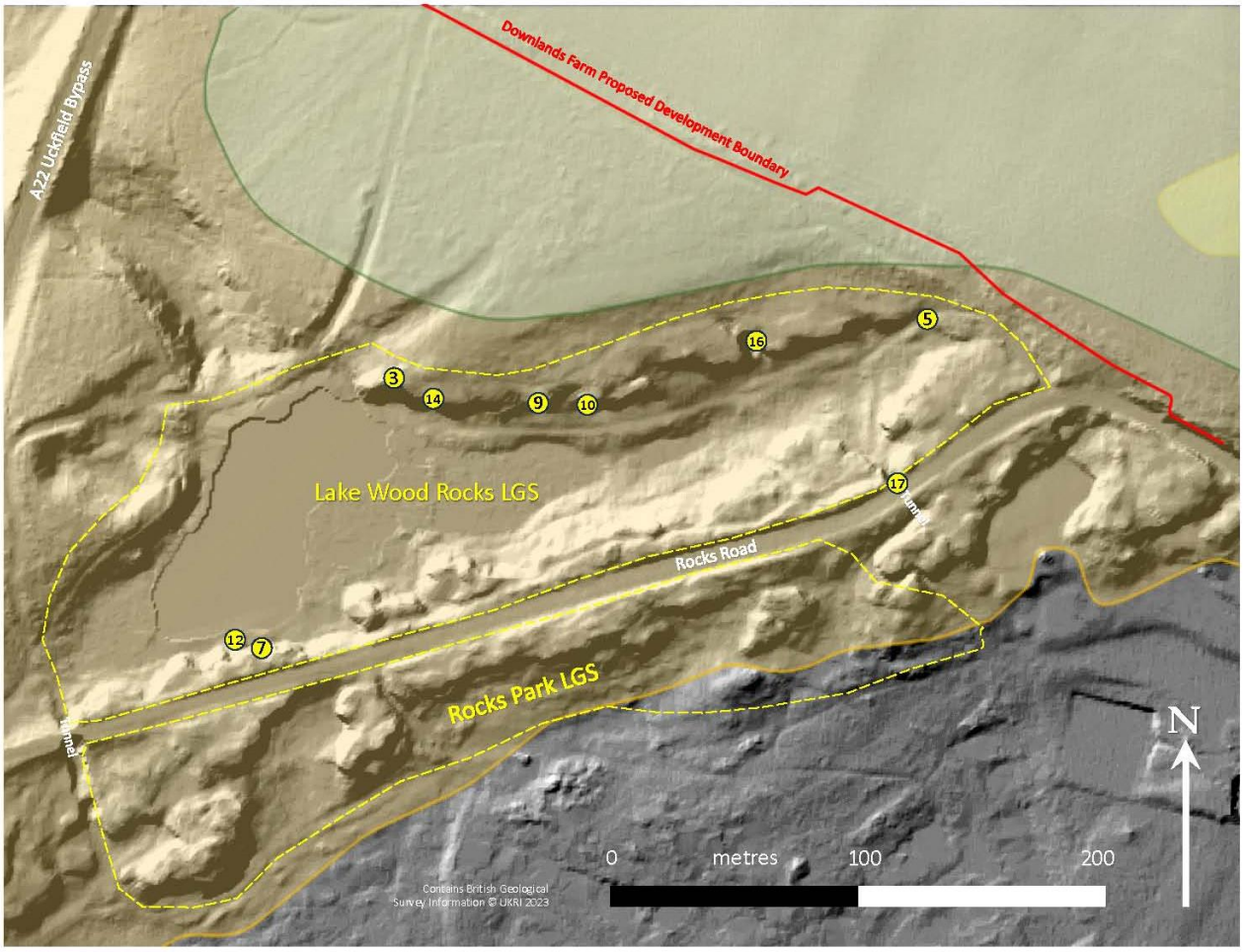


Figure 3: Detail of Geology and Geomorphology around Lake Wood (Geological key as for Figure 2). Numbers indicate the locations from which some of the Plates in this proof were taken.

Geology and Hydrogeology – Detail.

7. **The Grinstead Clay** has been shown (by boreholes drilled for the Appellant in September 2020) to vary from 1.1 to 5.5m in thickness, within the site, and is generally described in the logs as a silty clay which, in places, is slightly sandy and may also contain some gravel. More generally, as described in the British Regional Geology Memoir for The Weald (Gallois, 1965), the Grinstead Clay is said to comprise *"shales, mudstones and silty mudstones with subordinate beds of silt, clay ironstone and shelly limestones"*. In the British Geological Survey's online Lexicon of Named Rock Units, the Grinstead Clay is described as "*Grey to greenish grey mudstones, commonly very silty with subordinate thin beds of siltstone, nodular clay ironstone and shelly limestone*". As clearly illustrated by these accounts, it is not simply a clay, and several historical iron ore pits along the outcrop of this unit within the Downlands Farm site testify to this fact.

8. Hydrogeologically, the Grinstead Clay has been described, in the British Geological Survey's Minor Aquifers Property Manual (Jones *et al,* 2000) as an '***aquiclude***' (i.e. a geological formation which is impermeable to the flow of water). Very few natural materials are completely impermeable, however and, given the lithological descriptions noted above, my contention is that the Grinstead

Clay should more accurately be regarded as an '***aquitard***', with limited permeability. In an aquitard, some degree of infiltration and percolation of rainwater through the clay is possible, albeit limited and slow.

9. During heavy rainfall the area underlain by the Grinstead Clay on Downlands Farm quickly becomes saturated, giving rise to seasonal waterlogging at the surface and to rapid surface runoff and throughflow (the lateral flow of water through the soil) – especially on steep slopes. Substantial and rapid flows have been witnessed within the site during storm events (Plates 4 to 6).



Plate 4: Overland Flow on Downlands Farm. (Winter 2022)

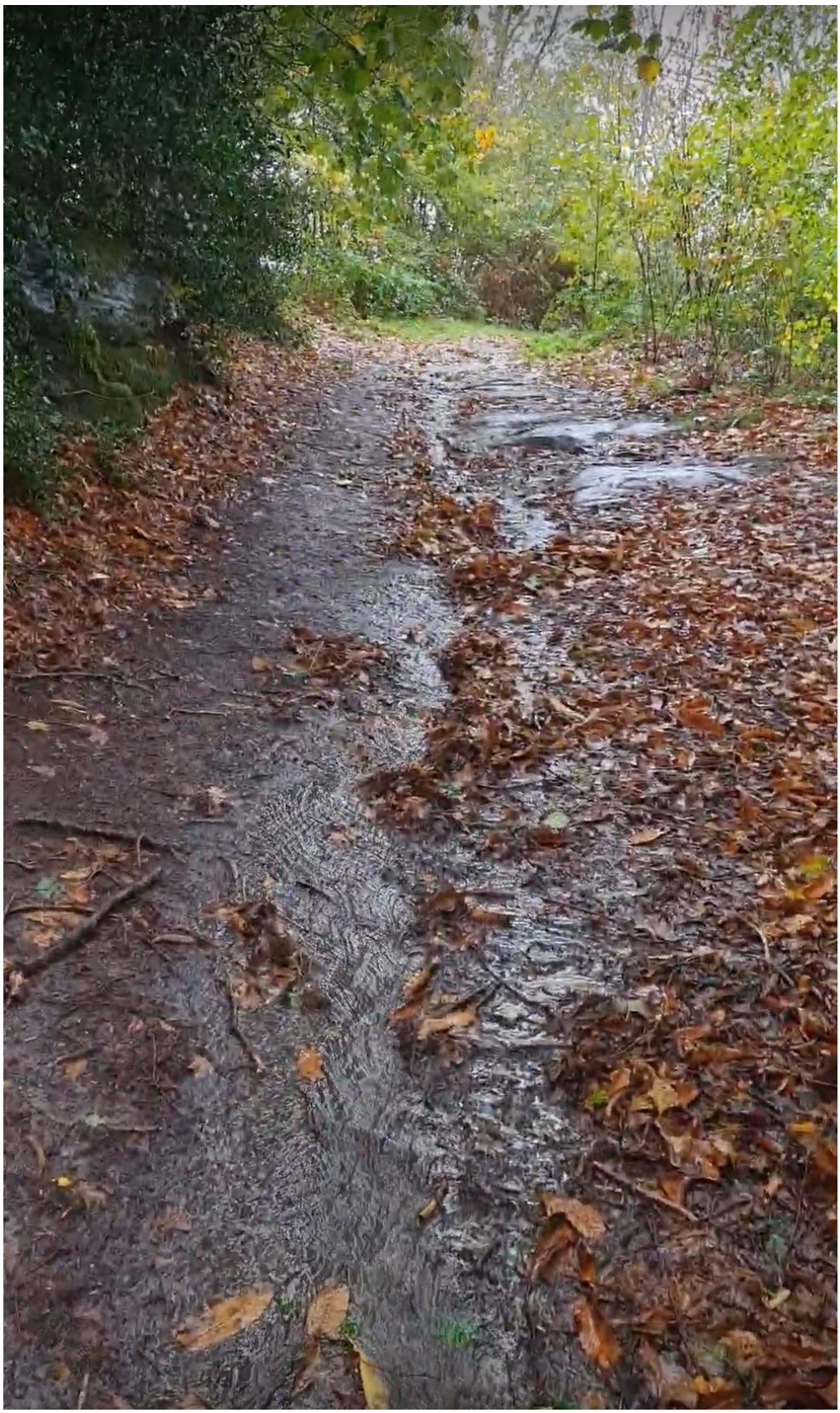


Plate 5: Overland Flow from Downlands Farm into Lake Wood.



Plate 6: Throughflow into Longwood Gill, over the Ardingly Sandstone outcrop (December 2002).



Plate 6a: Same location as Plate 6 during higher flow conditions (Winter, 2022)

10. The Appellant's Flood Drainage Strategy (Part 1) report (Waterman Infrastructure & Environment Limited, May 2022) acknowledges that, with respect to Longwood Gill, "*There are existing incisions into the flanks of the woodland, indicating existing overland inflows into the watercourse. These inflows were visible in their channel-like appearance as well as having a particular type of water-compatible fern growing along the incision, indicating the flow of water in these locations*". With respect to Shermanreed Ghyll, the same report notes that: *"the existing inflows are from overland flows driven by topography and shallow infiltration*" and also that: "*Along the central section of Shermanreed Wood there is an existing inflow into the brook in the form of a steep channel observed during the site visit*". Taken together, these observations demonstrate very clear surface water links between the development site and the woodland ghylls and thus into the continuous areas of ancient and long-established woodland which connect them. This includes demonstrable links (illustrated in Plate 5) between the site and Lake Wood. As noted in Dr. Stenning's first submission in response to the original planning application (Stenning 2022), the flows into Lake Wood from Downlands Farm pass through an area of Sphagnum peat bog before reaching the lake.

11. The Sylvan (2022) report makes reference to the soakage (infiltration) testing carried out as part of the Geo-environmental Site Investigation, noting that soil permeability was found to be too low to successfully support infiltration as a means of disposing of storm water via soakaways. Whilst that observation is not disputed, it does NOT demonstrate, as claimed by Sylvan, that "*a material hydrological link between Downlands Farm and Lake Wood is absent*" – only that the subsurface (hydrogeological) component of this would seem to be limited and slow. Some vertical percolation of water through the Grinstead Clay is considered likely to be possible, however, particularly in zones where the clay is more sandy or even gravelly, and in areas where the clay is thin or where there are vertical cracks and fissures. This is considered likely to be sufficient to allow for a steady, year-round movement of water down into underlying strata, adding to that which is able to infiltrate more readily where the Ardingly Sandstone crops out at the surface (see below) . Such percolation will help to recharge the underlying aquifer and to maintain the 'baseflow' component of water supply into the ghylls, the lake and ultimately into the WFD-protected Shortbridge Stream, during dry weather.

12. In this regard it is pertinent to note that the various forms of hydrophilic vegetation which are present on rock surfaces within Lake Wood and the ghylls, as well as the Sphagnum peat bog within Lake Wood, are all reliant upon the gradual, slow delivery of moisture rather than rapid flows. Groundwater seepage is therefore very important in maintaining the ecology of these areas and any significant changes to either the rate of flow or its chemical composition could be detrimental.

13. **The Ardingly Sandstone** is a thick unit of cross-bedded fluvial sandstone exposed in a series of crags and cliffs, up to several metres in height, within the woodlands that surround the proposed development site (Plates 7 and 8). It crops out at the surface in the northern part of the site (Figures 1 and 2) and extends beneath the Grinstead Clay in the south and east. It also crops out at higher elevations on the escarpment to the east of Downlands Farm. Borehole investigations carried out on behalf of the Appellant enable the interface between the Ardingly Sandstone and the Grinstead Clay to be plotted and this reveals that the strata dip gently towards the north-west, throughout the site, thus confirming the geological cross section shown in Figure 2 of our Statement of Case (Downlands Action Group, 2023).

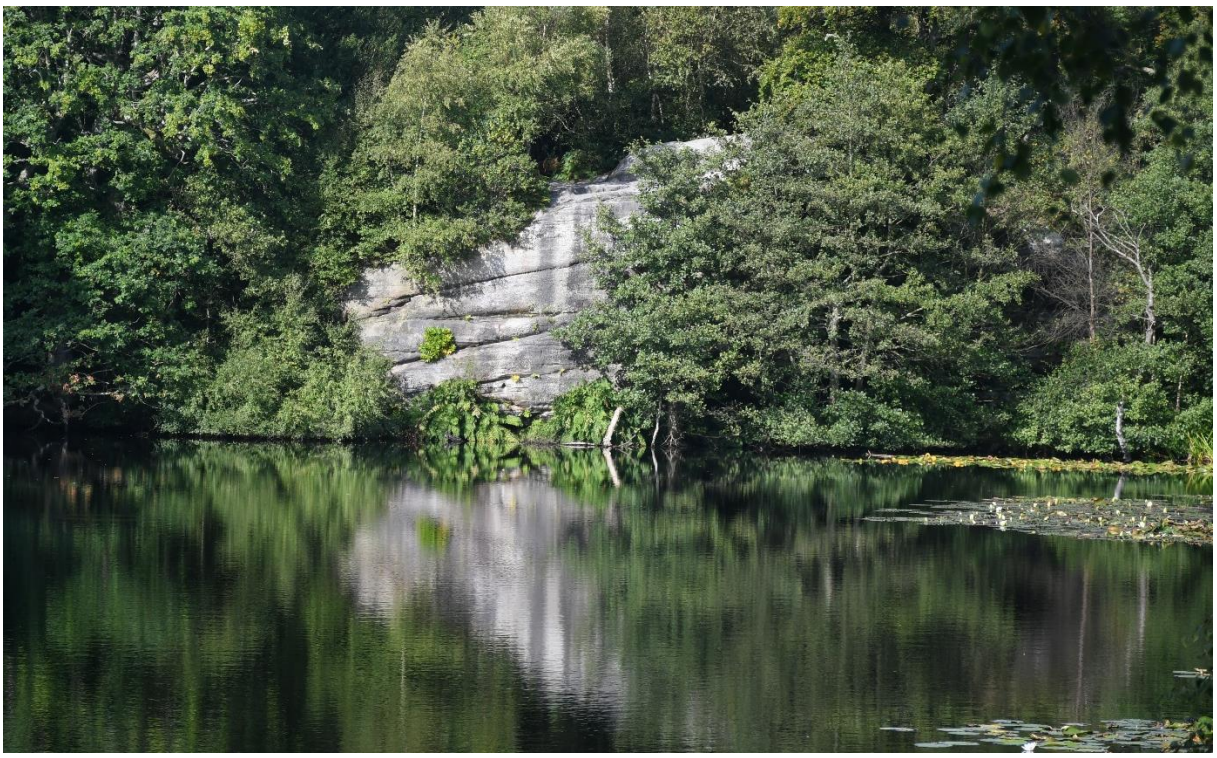


Plate 7: Ardingly Sandstone Outcrop on the northern side of Lake Wood (September 2023)



Plate 8: Low outcrops of Ardingly Sandstone at Budletts Common. (September 2023)

14. The sandstone forms a defined unit within the Tunbridge Wells Sand ***aquifer*** (i.e. a geological formation which is able to both store and transmit groundwater). The BGS Minor Aquifers Property Manual (Jones *et al,* 2000) notes that larger yields are generally obtained from this part of the aquifer than from the overlying Upper Tunbridge Wells Sand. The manual observes (in section 5.3.3.5) that groundwater flow within the aquifer comprises both inter-granular flow (movement of water between individual sand grains) and fracture flow (moving preferentially along fractures and bedding planes within the rock). It also notes (in section 5.3.3.4) that groundwater tends to flow down-dip within the aquifer, but also along vertical fissures.

15. Rainwater is able to percolate directly into the aquifer wherever it crops out at the surface but also, as described above, at a much slower rate where it infiltrates through cracks, fissures and zones of higher permeability within the overlying Grinstead Clay, especially where the clay is relatively thin.

16. As noted above, groundwater within the sandstone is likely to move preferentially along natural bedding planes within the rock (that is, predominantly from south-east to north-west), but also along numerous joints and fissures. Evidence of groundwater flow within the sandstone is seen both directly (in terms of recorded observations of water seeping out of the rock – Plates 9 and 10) and indirectly (in terms of weathering features seen on vertical rock faces – Plates 11 and 12). The weathering features include water-worn embayments in the rock and numerous, much smaller-scale holes. The latter often appear in rows along bedding planes within the rock (Plates 12 and 13) but in places grade into wider patterns of 'honeycomb' weathering (Plate 14). Such weathering is generally caused by the expansion of salts within surface layers of the sandstone and is commonly seen in coastal or even desert conditions, but they also occur elsewhere and have been shown to result from the seepage of water through the rock (Bruthans *et al*, 2018; Weiss, 2019).



Plate 9: Groundwater Seepage through Ardingly Sandstone Outcrop between Downlands Farm and Lake Wood. (November 2022)



Plate 10: Groundwater Seepage through Ardingly Sandstone Outcrop between Downlands Farm and Lake Wood. (November 2022)



Plate 11: Preferential weathering along bedding planes in the Ardingly Sandstone, at The Warren.
(September 2023)



Plate 12: Groundwater Seepage Holes along Bedding Planes in Ardingly Sandstone outcrop, Lake Wood.
(September 2023)



Plate 13: Lines of Groundwater Seepage Holes along Bedding Planes in Ardingly Sandstone at Budletts Common Rocks Local Wildlife Site. (September 2023)



Plate 14: Honeycomb Weathering in Ardingly Sandstone in Lake Wood. (September 2023)

17. Further evidence of groundwater seepage through the sandstone is seen in the presence of saturated hydrophilic vegetation including mosses (e.g. *Mneum hornum*) and liverworts (*Pellia epiphylla* and *Calypogeia muelleriana*) clinging to the lower rock faces on many outcrops (Plates 15 and 16). This evidence, demonstrated to me by Dr. Stenning on a recent site visit, blatantly contradicts that offered in support of the Appellant by Sylvan (2022, paragraphs 4.1 to 4.4) which claimed there to be no such vegetation and '*no signs of water flowing over, through or under*' the sandstone bluffs. The latter may have been a reflection of the fact that Sylvan's field observations were made in early October 2022, following a prolonged period of drought and very low water tables across the south-east. This calls into question the reliability of Sylvan's evidence and fully supports the observations made previously by Dr. Stenning.



Plate 15: Swan's-neck thyme-moss *Mneum hornum* **growing on a ghyll rock outcrop on Downlands Farm.** (September 2023, Dr. Martyn Stenning)



Plate 16: *Pellia epiphylla* **a moisture-loving liverwort that clings to the dampest rocks, seen on a sandstone outcrop on the north side of Lake Wood.** (September 2023, Dr. Martyn Stenning)

18. Movement of groundwater within the Ardingly Sandstone is further evidenced by the presence of localised 'iron-pans' within the rock: zones in which iron oxide, having been leached out of the sandstone at higher levels by percolating, slightly acidic groundwater, have accumulated lower down. This is seen most clearly in the private tunnel which connects Buckswood Grange to Lake Wood (Plate 17), but can also be found elsewhere, and has been noted in the condition monitoring reports for the Lake Wood Rocks and Rocks Park Local Geological Sites (Anderton, 2011a, b).



Plate 17: Iron pan within the Ardingly Sandstone, exposed in the vertical wall of the private tunnel between Buckswood Grange and Lake Wood.

19. Another important feature of the Ardingly Sandstone is that it has demonstrably been affected, in the past, by a process known as '***cambering***', whereby the originally continuous beds of rock have been disrupted into separate blocks which have moved apart, under periglacial (permafrost) conditions, during former glacial periods during the Quaternary era. This has been specifically noted in the condition monitoring report for the Lake Wood Rocks LGS (Anderton 2011a). It is evidenced most obviously at outcrop, where gaps between the blocks – known as '***gulls***' – are well-displayed (Plates 12, 18 and 19), but it is considered likely that the process will also have taken place in areas where the sandstone is concealed beneath the thin cover of Grinstead Clay, giving rise to localised deformation of the clay as well. The process is likely to have created localised zones of weakness and increased vertical permeability in the clay in those areas.

20. The latter cannot be proved, without access to large-scale 2-dimensional face exposures in the clay, but it is entirely plausible and, just as importantly, it is not *disproved* by the boreholes which provide only limited, 1-dimensional views at certain points.



Plate 18: Gull, formed by Periglacial Cambering in Ardingly Sandstone, Lake Wood.



Plate 19: Gull, formed by Periglacial Cambering in Ardingly Sandstone, The Warren.

Lake Wood

21. The Woodland Trust Management Plan for Lake Wood (2016-2021) notes that: *"The landscaping of Lake Wood occurred in the late eighteenth and early nineteenth century after the site became part of the Rocks Estate, owned by the Streatfield family, in 1789. An existing spring-fed pond was enlarged by the building of the dam"*.

22. This statement is quoted in the Sylvan Report as evidence that the lake cannot therefore be fed by surface water from Downlands Farm via the Sphagnum peat bed. In fact, it provides no such evidence at all: it merely suggests that the lake is partially supported by springs (either around the perimeter of the lake or beneath it). This does not preclude additional inputs from periodic surface water runoff, such as that seen in Plate 5, above. It is clear that some, at least, of the water flowing into the lake, whether from groundwater and/or surface water sources, flows through the Sphagnum bed. The lake is therefore correctly described as being, at least partially, a 'peat-fed lake'. Such lakes are rare in southern England.

23. The notion of springs flowing into the lake also raises the question of where the spring water originates from. The only feasible answer to this is the local groundwater system which, as described above, receives recharge from rainfall within the local outcrop of the Ardingly Sandstone and (to a more limited extent) the Grinstead Clay – both of which lie, to a large extent, within the proposed development site of Downlands Farm.

24. The evidence presented in the foregoing account, specifically including Plates 5, 9, 10, 14 and 16, bear testimony to the fact that there are both hydrological (surface water) and hydrogeological (groundwater) linkages between the Downlands Farm site and the lake.

Conclusion

25. **The inescapable conclusion from all of this, is that, in direct contradiction of the claims made by both Aspect Ecology and Sylvan Consulting Ltd, on behalf of the Appellant, there are undeniably both surface water (hydrological) and groundwater (hydrogeological) processes which provide pathways and mechanisms for the proposed development to affect sensitive habitats and species within adjoining areas - specifically including Lake Wood, the Longwood Gill and Shermanreed Ghyll valleys, Budletts Wood, the Ancient Woodlands within and between all of these and, ultimately, the Shortbridge Stream**.

26. The Appellant has therefore failed to take account of these potential impacts. Whilst some degree of mitigation has been proposed for the discharge of surface runoff into the woodland ghylls, via detention ponds, no evidence has been put forward to demonstrate the effectiveness of these proposals in mimicking the natural hydrological regime, either in terms of flow rates or water quality. Moreover, no mitigation whatsoever has been offered in respect of surface water flows into Lake Wood, or in respect of sub-surface (groundwater) flows into any of the sensitive receptors. **Dismissing the likelihood of such flows on the basis of inadequate evidence is no excuse for failing to address the issue**.

27. **For these reasons, in combination with the ecological importance of the Ancient Woodlands and other features that would be affected (as evidenced by Dr. Martyn Stenning (2023) and others), it is my firm contention that this Appeal should be dismissed**.

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