# CHAPMAN GEOTECHNICAL

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Our Ref: **1097-R-001** 8th June 2023

Client: **Mr & Mrs Maunder**

Project: **Proposed Extensions and Alterations**

Site: **Brook House, Whalley Lane, Lyme Regis, DT7 3UP**

## Ground Stability Assessment

### Introduction

In accordance with Mr & Mrs Maunder's instructions, I have carried out a geotechnical assessment for the proposed development at Brook House on Whalley Lane in Uplyme, Lyme Regis, in particular with respect to how the proposals may affect the stability of the site and surrounding area.

The proposals, shown on Inside Out Your Space's Drawings 168 STEP 2_.01 to 08, comprise replacing existing extensions at the rear and side of the house with new extensions that cover a greater floor area.

The assessment has been based on a study of various geotechnical and historical records, including my knowledge of past ground investigations carried out in the area and the drilling of hand augered boreholes at the rear of the house to check on ground conditions at shallow depth.

Whalley Lane runs off Lyme Road relatively high up the southern valley side of the River Lim in Uplyme. Brook House is located off Whalley Lane to the rear of properties that front Lyme Road. The ground in the vicinity slopes down from the south, at the rear of the property, to the north at the front of the property. Vehicular access is off Whalley lane is on the western side. The new side extension is to be on the west side, it is to include a double garage and have some accommodation in the roof space. The rear extension is to be 2 storeys in height and extend slightly further to the rear than the existing two storey extension it replaces. The main house is to have a new roof with accommodation provided in the roof space.

Brook House has been altered and extended at various times in the past. Old Ordnance Survey plans show the house to have been present in 1888. It was then accessed by the footpath off Lyme Road and a well is shown in the corner of the property adjacent to Whalley Lane where, currently, the drive is located. The plans show the old railway line that once served Lyme Regis. This crossed Whally lane and was built on an embankment about 20m further up the valley side.



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Inspection

An inspection of the external wall faces and immediate area for cracking or distortion was made on 25th May 2023. The house, including the extensions, are rendered and painted. The existing single storey side extension is of modern construction and shows no signs of cracking or distortion. The rear extension appears to have originally been single storey and has had another storey added at some time in the past. This has four large masonry buttresses added at the rear. Measurements with a spirit level indicate the original rear walls of the extension to be leaning out by about 50mm per metre height. Measurements taken on the front wall of the house indicate it to be leaning back by about 20mm/m, whilst the two side walls appear to be plumb. Apart from a vertical crack at the chimney location on the eastern side wall of the house there were no significant cracks that would indicate recent foundation movement.

The inspection, therefore, indicates that the house and rear extension leans back into the slope with the rear extension leaning back much more than the house. Concern regarding the lean of the extension is likely to be the reason for the buttresses being added in the past. The vertical crack on the east side wall may be associated with the foundation movement. However, it could also be associated with the chimney construction within the wall, which is often an area prone to cracking due to the action of the flue gasses and temperature variations on the masonry. On balance, it appears that the distortion to the house and rear extension is predominantly historic with little indication of existing movement.

At the rear of the house there are stepped retaining walls, totalling about 1.5 to 1.7m in height, where the natural slope has been cut into to provide a level area around the house. These are directly below the boundary with the uphill neighbouring property, High Meadow. This is a modern house built between Brook House and the embankment of the former railway line. There were no signs of movement having affected the retaining walls or the immediate surroundings of the house.

Geology

The 1:50,000 British Geological Survey plan for the area indicates the site to, initially, be underlain by ancient landslip materials. Beneath the landslip materials Jurassic age Lias Clay is shown to be present, with the overlying Upper Greensand strata of Cretaceous age outcropping further up the valley side. The Lower Lias generally comprises clays and mudstones with thin bands of limestone, while the Upper Greensand generally comprises silty fine sands with gravel and cobbles of chert in a sandy clay matrix.

The landslip materials are superficial deposits, very similar to a material known as ‘Head’, these were formed during glacial times, and they cover the valley slopes in the Lyme Regis area below the junction between the ‘solid’ Cretaceous and Jurassic strata. That junction is shown slightly further up the valley side from the site in the vicinity of the old railway line. The Head was created by severe weathering and subsequent downslope movement of outcropping materials under periglacial freeze/thaw conditions. Head produced in the area is named either Lias Head or Cretaceous Head depending on the predominant strata from which it is derived. Generally, the Cretaceous Head initially takes the form of sandy silty clay with much angular chert gravel and cobbles, and this often overlies a greenish brown silty fine sand. This sandy Head material is colloquially known as ‘greensand’. It often contains

groundwater and can be very troublesome in excavations. The Lias Head generally comprises grey mudstone and limestone fragments in a soft to firm remoulded and fissured clay matrix. When both types of Head are present on a site the Cretaceous Head usually overlies the Lias Head.

Under present-day conditions slopes are relatively stable but are particularly prone to instability should topography or groundwater conditions be significantly detrimentally altered i.e. significantly increasing or reducing the load on the slope by filling/removal of material or an introduction of excessive groundwater.

As the inspection revealed a significant distortion affects the house and rear extension, ground investigation was carried out to the rear to check on ground conditions. A trial pit excavated on the rear extension foundation revealed it to be an old stone foundation extending to about 0.5m below ground level (bgl). It was underlain by a thin, approximate 100mm, layer of soft, wet, gravelly, clayey Cretaceous Head, with soft, wet sandy Cretaceous Head below that. A hand augered borehole was drilled through the base of the pit and this showed the sandy Head or 'Greensand' to become firmer at about 0.9m bgl and to extend to at least 1.5m bgl. A trial pit dug further back on the line of the wall of the proposed extension encountered the sandy Head directly below initial layers of concrete surfacing. There was no water present here and the sandy Head was initially soft to firm, then gradually becoming firmer with depth.

The investigation did not reveal any obvious causes for the significant foundation movement that has occurred. On the basis of the information available at the moment, I think the cause could well be differential settlement due to the likely differing ground conditions beneath foundations. The sloping nature of the ground results in the rear foundations likely to be deeper within the natural ground than the front. Often, this would mean the rear foundations would be in the better ground. However, in this case the front foundations could be founding above a significant depth of gravelly clay Head over the sandy Head, whilst at the rear the foundations are very close to the junction between the two, putting the soft and wet 'greensand' only short distance below the rear foundation, whilst at the front it is deeper, and the house loads are spread through the stronger gravelly clay. This would cause the foundation at the rear to settle much more than the front.

## Conclusions and Recommendations

The assessment and investigation have shown the property to be underlain by ancient landslip materials deposited on the valley side. These could be prone to movement should the proposals result in significantly increasing or reducing the load on the slope or by an introduction of excessive groundwater. The existing house has been affected by significant differential foundation movement that may be a result of past landslip movement, but more likely to be due to differential settlement due to the variation in materials at foundation level.

Two existing extensions, plus large masonry buttresses are to be replaced with new extensions covering larger areas. The floor level of the extensions will be lower than the existing ground levels, particularly at the south-west corner. As a result, the load from the new extensions will be roughly balanced by the loss of load due to removal of material, resulting in no significant change in load as far as long-term slope stability is concerned.

In the short-term, during construction, there will be a reduction in load that has the potential to affect the slope above the site and the stability of the existing retaining walls, which I understand are, for the most part, to remain. In order to reduce these risks, the depth and extent of excavations needs to be kept to a minimum. I would, therefore, recommend that suitably extended, reinforced, and thickened, ground floor slabs (rafts) are used as foundations. The raft foundations will also serve to control differential settlements due to the likely variability in the natural materials. Land drains may well be required to control groundwater that may be present within formations for the rafts. However, the reinforcement within the rafts will give them the ability to span over any drains required.

As the investigation has so far been very limited in extent it would be advisable to re-assess ground conditions when the existing extensions have been demolished and ground levels have been reduced to proposed formation levels.

On the basis of the above, I consider that the construction of the proposed extensions and alterations are unlikely to affect the overall stability of the site or surrounding area, either, in the long-term, or in the short-term during construction.

Due to the recognised risks of slope instability in the Lyme Regis area, it is accepted good practice not to use soakaways for the disposal of surface water. All surface water, requiring disposal, should be taken to a suitable piped disposal system. It would be advisable to take the opportunity to check that the existing drainage in the vicinity is functioning adequately.

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