Chartered Loss Adjusters
Subsidence Engineers

ANALYSIS OF SITE INVESTIGATION DATA

Client Name	Ecclesiastical Insurance Group
Reference	409161
Name of Insured	Christ Church in the Diocese of London
Policy Number	04XPG282187
Risk Address	Christ Church, Chalk Lane, Cockfosters, Barnet, Hertfordshire, EN4 9JQ

GHG Reference	L/2020/62087/S
Date of Report	26 November 2020

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1. Introduction

As reported previously we have been asked to investigate damage at the above property and our recent Report recorded our initial findings and views in connection with this matter. This Supplementary Report is issued following the receipt of further investigation data.

50 mm diameter disturbed soil samples were retrieved from the borehole that was sunk to the rear left hand corner of the rear single storey extension of this property on 21 October 2020.

The samples were deposited with a testing laboratory with instructions to determine the index properties of the soils.

The purpose of these tests is to establish whether the soils exhibit any signs of root or drought induced desiccation, and if so, whether the potential exists for significant progressive movement.

2. Soil Properties

The retrieved soil samples have been tested by an independent testing laboratory and this has revealed that they have what are known as highly plastic plasticity index properties.[1]

As an example, in the sample taken from Borehole number 01 at 1.7m below ground level the liquid limit is shown to be 54%, the plastic limit is 16% and the plasticity index (which is the difference between the two) is 38%.

Higher plasticity clays, similar to London or Weald type, generally show they have high to very high potential for volumetric changes in relation to the moisture content. That is, they shrink when moisture content is reduced and swell when the moisture content is increased.

Reference was made in our initial Report to the recent drought summers and there is little doubt that this would have had an influence.

[1]Table 1, Chapter 4.2, Para 2.3 of N.H.B.C. Standards, 1986.

3. Moisture Content

Using criteria put forward by Driscoll[2] it is suggested that clay soils are desiccated if the moisture content is less than 40% of the liquid limit. In addition he suggested for certain clays only that a further indicator of desiccation exists if the moisture content is less than 2% above the plastic limit.

The latter method is rarely used, however, as it applies to certain clays only and also the method of determining the plastic limit is less reliable than the method of determining the liquid limit.

In this case the lowest moisture content is seen to be 18% in the sample taken from Borehole number 01 at a depth of 1.7m below ground level.

This is clearly less than 40% of the liquid limit (54% x 40%) being 21.6% which does suggest that the soil in this area is desiccated

[2] Driscoll (1983) "The Influence of Vegetation on the Swelling & Shrinking of Clay Soils in Britain". Geotechnique. Vol. 33.

4. Heave Potential

It is slightly overstated to suggest that soil mechanics is a science. Purely because of the variable nature of the soils and the environment in which they exist any estimate of heave must be at best little better than a guess.

London clays tend to be more homogenous than other clays found in the south of England and most current research has been conducted in the South-East area of England. Estimates of heave used in the compilation of this Report are based upon a design guide put forward by M. Crilley[3] for discussion purposes only. In this case we estimate the potential for heave occurring following the removal of vegetation is low because the trees do not appear to pre date the construction of the building.

[3] Crilley. M., Foundation Engineering Department, B.R.E., Garston. Personal Communication.

5. Root Identification

At the time of excavating the trial pits and boreholes a number of root samples were taken for identification analysis. These have been sent to an appropriate specialist and we have now received the results which indicate that the roots belong to shrubs and possibly an ash tree which have been referred to previously.

Root Number	Borehole	Depth	Root Type
1	01	Underside of foundation 1400mm	Shrubs x 3 – root diameter from less than 1mm to 1mm – starch test positive indicating root is live
2	01	Underside of foundation 1400mm	Likely Ash – 1mm diameter roots – starch test is negative indicating root is dead.

6. Discussion

1. From the physical evidence obtained at the time of our visit to the property and the combined investigation results which we have now received we are strongly of the opinion that the damage to this property results from desiccation of the clay sub soil during the dry weather.

2. We believe that the soil exhibits sufficiently high index properties to confirm that it will be moisture dependent, that there is a moisture deficiency as shown by the various tests referred to in the Report and further that roots from adjacent vegetation were located within the samples.

3. In view of these results we are satisfied that the damage has occurred as a result of root aggravated clay shrinkage subsidence due to nearby vegetation and the former ash tree.

7. Recommendations

1. We believe that the appropriate remedial action on this occasion is to arrange for the vegetation adjacent to the rear of the affected rear extension to be removed or substantially reduced/maintained to allow for the soil to rehydrate.

2. To establish the extent of vegetation management required we recommend the appointment of an arboriculturalist to survey the vegetation surrounding the property and to give recommendations to mitigate the current subsidence damage and to reduce the future risk of subsidence damage.

3. Once vegetation has been removed /reduced we recommend that the cracked areas are crack width monitored to confirm the trend of movements and hopefully the return of stability following the autumn/winter rehydration of the clay soils and the subsequent recovery of the foundations.

4. Providing the crack width monitoring exercise confirms the return of stability to the affected area superstructure crack repairs and redecoration works should be all that is required to reinstate the subsidence damaged areas.

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1. Soil Results, including Graphs
2. Tree Root Identification Results