

ADDENDUM TECHNICAL REPORT

Crawford Reference: SU1700265

Leisurelands
Gutner Lane
Hayling Island
Hampshire
PO11 0RN



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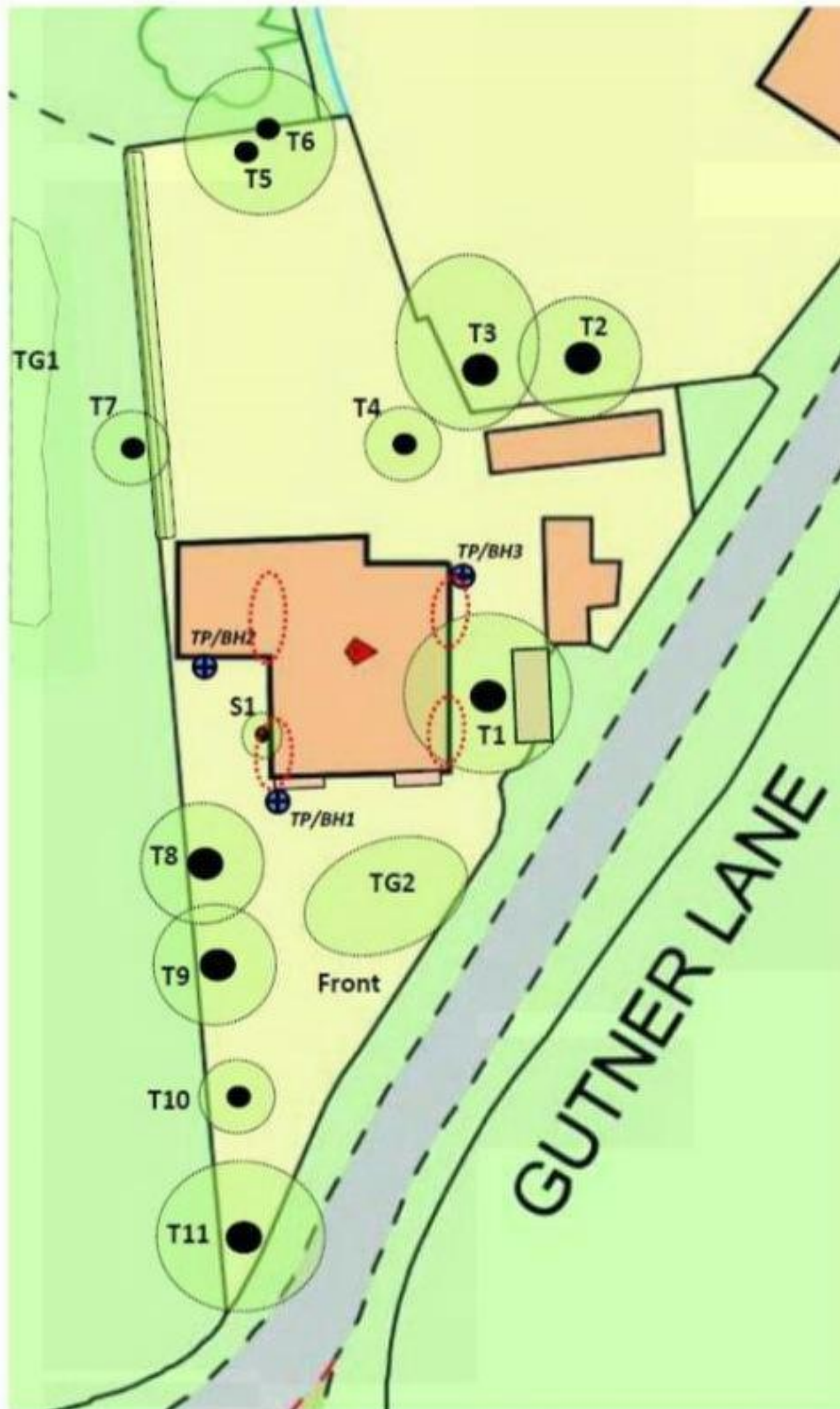
SUBSIDENCE CLAIM

17th December 2018


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Plan not to scale – indicative only



Approximate areas of damage

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INTRODUCTION

We have been instructed by insurers to investigate a claim for subsidence at the above property. The area of damage, timescale and circumstances are outlined in our initial Technical Report. This report should be read in conjunction with that report.

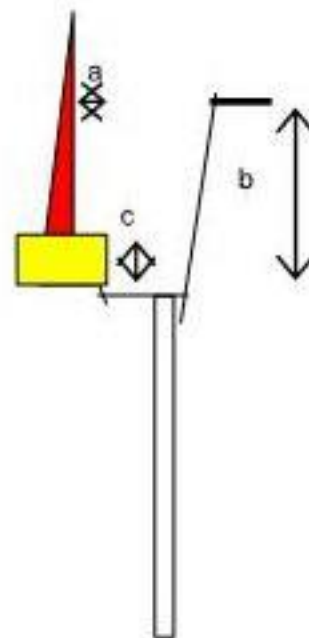
To establish the cause of damage, further investigations have been undertaken and these are described below.

INVESTIGATIONS

The following investigations were undertaken to identify the cause of movement.

TRIAL HOLES

Three trial holes were excavated to expose the foundations - see site plan for location and the diagram below for details.



Foundation Details

No.	Borehole Depth	Footing (a)	Underside (b)	Thickness (c)
TH1	3.00 m.	470 mm.	550 mm.	550 mm.
TH2	3.00 m.	160 mm.	800 mm.	270 mm.
TH3	3.00 m.	170 mm.	400 mm.	250 mm.

AUGERED BOREHOLES

A 50mm diameter hand auger was sunk in each trial pit from underside of foundations to completion at 3.0m below external ground level - see site plan for location(s).

In TH/BH1 the concrete strip type footing was cast on a 450mm thick layer of made ground overlying a firm to stiff clay. Roots were encountered below underside of foundation to approx. 2.50m depth. Standing water was encountered at 2.50m.

In TH/BH2 the concrete strip type foundation was cast on a stiff becoming firm, moist clay soil to termination. There was no evidence of roots or standing water in the excavation.

TH/BH3 showed the concrete footing cast on firm to stiff, moist silty clay with roots of live appearance beneath the foundations. There was no evidence of standing/water ingress in the excavation.

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LABORATORY SOIL TESTING

Soil samples were retrieved from the boreholes at 500mm intervals below underside of foundation, before being bagged and deposited with a testing laboratory the same day.

All the samples tested with the singular exception of that taken from 3m depth in BH2, returned plasticity indices between 20 – 40%.

Atterberg Limits. Results indicate that the clay subsoil can be classified as high plasticity clay in accordance with the Casagrande chart.

Classified in accordance with Table 1 Chapter 4.2 of the NHBS Standards, the clay soil has a MEDIUM swell/shrinkage potential.

In addition to the above suction testing was carried out on the soil samples. The results of this test shows suction pressures in the range of 8 – 65 kPa

ROOTS

Roots were retrieved from TH/BH 1 & TH/BH 3 were submitted to a botanist for identification.

The samples from TH1 were either too juvenile or decayed for positive identification. In any case the starch tests which is an indicator of whether the sample was alive at the time of collection was negative.

Roots from TH/BH 3 were identified as *Quercus* spp. (Oak) and *Salix* spp. (Willow). All samples taken from this borehole were found to be alive at the time of collection.

DRAINS

A CCTV survey of the drainage serving the property was undertaken. The pipe material was a mixture of pitch fibre, pvc and vitrified clay. There was no evidence of any significant defect in the pipework allowing water to escape to the surrounding soil. However, mass root intrusion was encountered in Run 2 about 3m downstream of MH2. This is considered sufficiently remote from the building as not to be a contributing factor causing subsidence damage. All surface water pipe runs surveyed were silted and unserviceable due to lack of maintenance.

Soil erosion via leaking drains has been dismissed as a possible cause. The trial pit/ borehole investigations did not reveal any suggestion that potential leakage is adversely affecting the property. The monitoring shows a seasonal pattern of movement which is consistent with root induced clay shrinkage during the summer months and recovery ground movement during the winter period.

ARBORICULTURAL REPORT AND TREE WORK

Independent arboricultural experts at MWA Arboriculture provided a report and identified both the Oak tree (T1) and Willow tree (T3) as the joint principal cause of movement and damage. The Willow (T3) was removed to ground level in March 2018.

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LEVEL MONITORING

Cyclical movement has been recorded from October 2017 to October 2018, with the damaged areas of the property moving upward during the wet winter period of 2017 / 2018 (soil rehydration / recovery) and downward through the dry summer period of 2018 (root induced clay shrinkage). This pattern of movement can only be created by clay shrinkage subsidence followed by rehydration of the clay soil. There is no other explanation available for this pattern of movement. Despite the removal of T3 Willow in March 2018, downward movement returned which points to the remaining Oak tree (T1) as the cause. As the movement and damage is not uniform around the property, general subsidence of the site due to normal seasonal movement can be discounted as a potential cause.

DISCUSSION

The results of the investigations confirm that the cause of the subsidence is due to root-induced clay shrinkage. The Oak tree (T1) and Willow tree (T3) have been identified as the effective and substantive cause of the movement and damage. This view is supported by the following investigation results:-

- The moisture content profile indicates a reduction in moisture content at a depth of 1m, 2m and 2.5 which is indicative of desiccation at this level. This is also co-incident with the depth of root activity from the Oak and Willow trees.
- Atterberg limit testing indicates that the soil can be classed as high plasticity and hence will shrink and swell with changes in moisture content.
- Quercus (Oak) and Salix (Willow) roots were found below the foundation of the property to a depth of 2.5m.
- Level monitoring between October 2017 and October 2018 indicates seasonal cyclical movement with downward movement during the summer months (as the clay shrinks) and upward movement in the winter months (as the clay swells).

RECOMMENDATION

Property stability is expected following the removal of the remaining Oak tree (T1).

Arboricultural experts at MWA have considered the efficacy of reduction works and confirmed that such measures will not be sufficient to create property stability. In the view of the arboricultural experts, the only viable long term solution is for T1 to be removed in full. Based on our analysis, we are satisfied there is no adverse heave risk to the property.

Repairs are estimated to be in the region of [REDACTED] provided that the tree work is completed promptly, before the vegetation is able to cause more damage. Due to the proximity of the tree to the main dwelling, a root barrier is likely to either destabilise the Oak tree due to root severance or potentially compromise the foundation of the property. As such, in the event that the tree work is blocked, a stabilisation scheme would be required. On the basis of the current damage we estimate that an appropriate underpinning scheme to counter the influence of the Oak tree would likely [REDACTED]

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