

ADDENDUM TECHNICAL REPORT

Crawford Reference: SU2003018

38 Holyrood Close, Reading, RG4 6PZ



prepared for

RSA – Nationwide, 3rd Floor, Bowling Mill, Dean Clough, Halifax, HX3 5WA

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Claim Reference 202008010011

SUBSIDENCE CLAIM

DATE 22 November 2021



Crawford and Company

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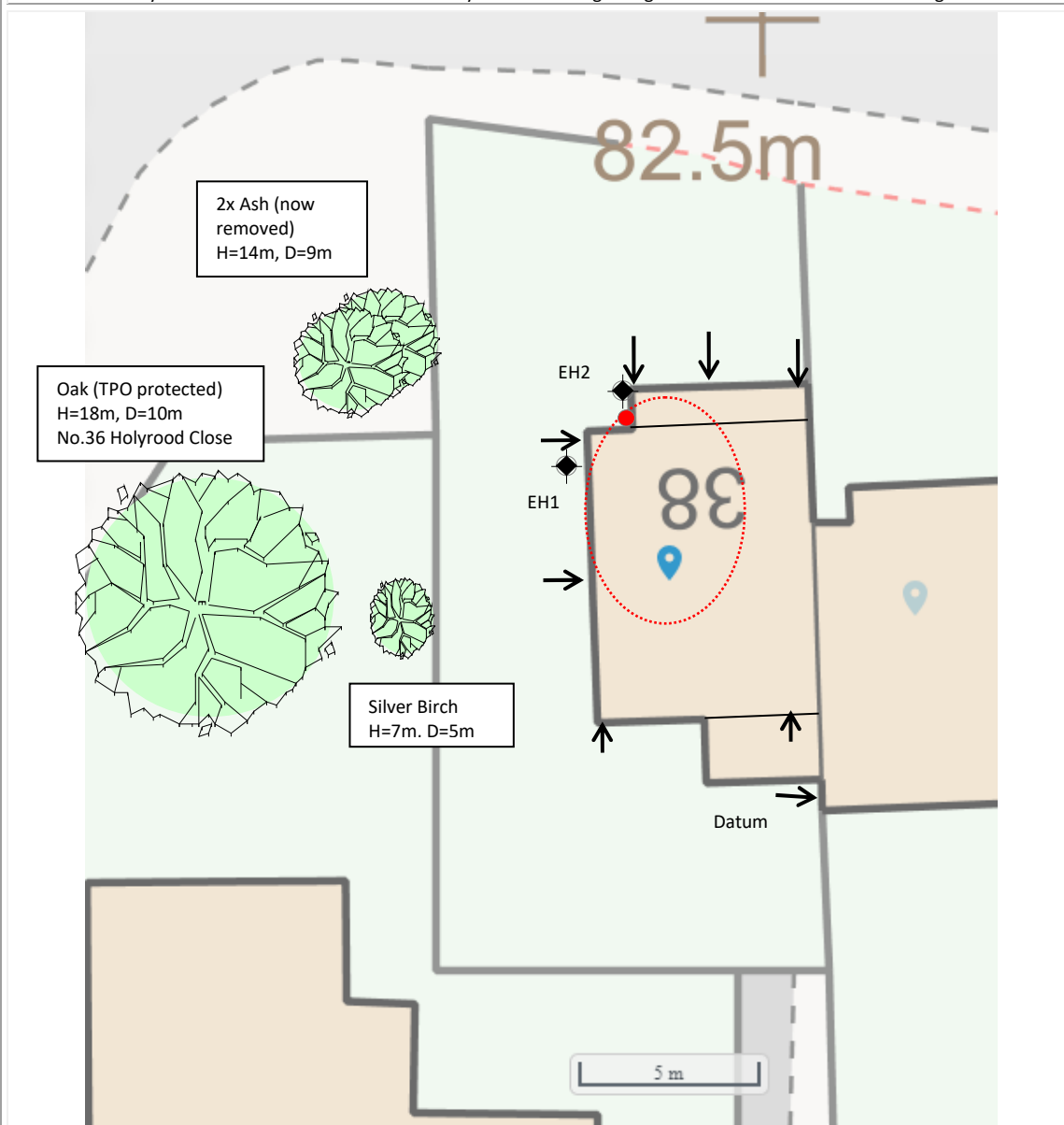
E Mail subsidence@crawco.co.uk

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Site Plan

This plan is Not to Scale

This plan is diagrammatic only and has been prepared to illustrate the general position of the property and its relationship to nearby trees etc. The boundaries are not accurate, and do not infer or confer any rights of ownership or right of way. Position of utilities is only indicative and contractors must satisfy themselves regarding actual location before commencing works.



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Key:

	Tree: Deciduous		Tree: Conifer		Shrub
	Hedge		Area of Damage		Bore Hole
	Trial Hole		Trial & Bore Hole		Level Monitoring
	Rain Water Manhole		Rain Water Gully		Rain Water Pipe
	Waste Water Manhole		Waste Water Gully		Toilet Pipe
	Rain Water Drain		Waste Water Drain		Electricity Cable

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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.

To establish the cause of damage, further investigations have been undertaken as follows :-

1. Site Investigation & Laboratory Testing by CET dated 6/11/20
2. Level Monitoring by Crawford & Company
3. Heave Analysis by Crawford & Company
4. Arboricultural Report by MWA Arboriculture
5. Arboricultural Report by Property Risk Inspection Ltd (for No.40)

Copies of the above results are attached to this report.

This Report provides a summary of the investigation findings and interpretation in the context of subsidence to the property. The Report further provides recommendations on how to address the cause of subsidence to stabilise the property and an outline indication of the scope of remedial works required.

The level monitoring was undertaken jointly with Insurers of the neighbouring property, No.40 Holyrood Close, who are also investigating a subsidence claim at their property. They had previously removed trees within the confines of their land (see recommendations in their Arboricultural Report) but movement continued and they suspected influence of the TPO protected Oak tree in No.36 Holyrood Close.

SITE INVESTIGATIONS

The following investigations were undertaken to identify the cause of movement. The full factual site investigation report by CET is attached. A summary of the findings is presented below including interpretation.

TRIAL PIT/BOREHOLES

Two trial pits were excavated and extended by hand augering techniques. TP1 at the front right corner of the house and TP2 at the front right of the porch.

Both revealed 150mm thick concrete strip footings at c.900mm below ground level. The underlying ground was a stiff, grey silty CLAY to the full depth of the boreholes at 3m. Both boreholes remained dry and stable on completion. A thin 200mm layer of medium dense, silty sandy clayey GRAVEL was found immediately below the footing in TP1.

In-situ shear vane testing in both boreholes gave values >130kPa which equates to a 'very stiff' consistency. Roots were found to 2.2m in TP1 and 1.8m in TP2.

SOILS TESTING

Moisture Content

Values ranged from 17% to 25% in both boreholes. No discernible moisture content profile could be surmised from readings, albeit the lower readings would suggest evidence of desiccation.

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Atterberg Limits

Results indicate that the clay subsoil can be classified as an intermediate to very plasticity clay in accordance with the Casagrande chart. Most tests were high to very high, indicating a clay of medium to high shrinkability.

Suction Tests

Suction tests on disturbed samples is a recognised method of assessing clay desiccation. Normally, suction tests are carried out on two boreholes; one in the area of perceived desiccation and another in an area that is thought to be unaffected by tree-related desiccation – the 'control' borehole.

Unfortunately, no control borehole was possible due to the number of trees in proximity of the building and site restrictions. However, based on the estimated equilibrium suction profile, results indicated excess suction over the full depth of the borehole which would equate to very severe desiccation in accordance with BRE Digest 412 'Desiccation in clay soils'.

Root Analysis

Roots in TP1 were identified as Fraxinus (Ash) and Quercus (Oak). Starch was present which indicates that the roots were alive at the time of retrieval.

Roots in TP2 were identified as Quercus (Oak). Starch was present which indicates that the roots were alive at the time of retrieval.

DRAINAGE

A CCTV survey of drainage in the vicinity of damage was carried out at the time of initial site investigations. This revealed root ingress to the run at the front of the property but no significant defects that would be allowing fluid to escape and influence the subsoil in the area of subsidence.

LEVEL MONITORING

Level monitoring on both properties has been undertaken from January 2021 to November 2021, using a datum point on the left side of No.40 furthest away from the trees.

Front of No.40 (Points 2-5)

These indicate cyclical movement with c.6mm of upward movement over Winter 20/21 followed by 2mm downward movement in late Summer 2021. The exception was Point 2 (front left of No.40) which did not move downwards this summer.

Front and right elevation of No.38 (Points 6-10)

These indicate cyclical movement with 7-10mm of upward movement over Winter 20/21 followed by 3-9mm downward movement in late Summer 2021. The greatest movements were at Points 7 & 8 at the front right of No.38. It is worth noting that the downward movement continued between 24 August and 5 October readings, despite removal of the Ash trees on 5th August 2021. After the 5 October readings, all points have started to move upwards again.

Rear Elevations of No.38 & No.40 (Points 11-13)

These showed upward movement c. 4-6mm over Winter 20/21 but general stability/negligible movement over late summer 2021.

INTERPRETATION

The results of the site investigations confirm that the cause is tree-related clay shrinkage subsidence. Roots abstract moisture from the clay causing it to shrink during the summer and swell during the winter as the tree stops drawing moisture. This is supported by the following investigation results:-

- The foundations are at a depth of 0.9m which is below the level that normal seasonal movement would occur. Nominal clay shrinkage can be discounted as a cause.
- Atterberg limit testing indicates that the soil has an high to very high plasticity and hence will shrink and swell with changes in moisture content.
- Suction tests indicate desiccation over the full depth of the borehole which would correlate with very severe desiccation (BRE Digest 412).
- Level monitoring indicates seasonal cyclical movement with downward movement in the summer months (as the clay shrinks) and upward movement in the winter months (as the clay swells). This sort of movement can only be attributed to clay shrinkage subsidence. Moreover, the movement is more severe towards the trees.

ARBORICULTURAL REPORT

On the basis of the investigation results, an arboricultural report was commissioned to advise on the scope of tree management required to stabilize the property. A copy of the Report by MWA Arboriculture is attached.

The Report recommends removal of T2 Birch, T3 Oak and Ash tree group TG2 in the rear garden of No.36. The Report further notes that the Oak is subject to a Preservation Order and that the necessary statutory application will be required to the Local Authority to seek consent to fell. This should be supported by appropriate investigations which are included within this Report.

Ash tree group TG2 and T2 Birch were removed on 5 August 2021. Despite these measures, downward movement was recorded between late August 2021 and October 2021 which demonstrates that the Oak tree remains a factor.

HEAVE ANALYSIS

Whilst no control borehole was possible, the laboratory test results still allow an estimation of heave by using the moisture content method in BRE Digest 412 using a conservative estimated equilibrium moisture content of 25%. In both boreholes, this gave an estimated heave value of 30mm (29mm in TP2 & 32mm in TP1).

Since the date of testing, levels have shown c.10mm of uplift movement at the TP locations, so the true estimated heave is c.20mm. Taking into account the type of structure and existing distortions, we are satisfied that such heave movement could be accommodated by the structure without any adverse heave risk.

On the basis of the above investigations, we are satisfied that the property can be stabilized through appropriate tree management. With the exception of the protected Oak (T3), the recommended tree works have been completed. Monitoring has shown further subsidence subsequent to these tree works, so we conclude that the Oak must be a dominant factor and should be removed as per the recommendations. As such, a statutory application will be submitted to the Local Authority through MWA Arboriculture.

Should the application be successful, the tree will need to be felled and the property be monitored until we are satisfied stability has been achieved. Structural repairs and redecoration of the affected area would then be carried out.

We would estimate budget costs of £7-10K for the repairs to No.38. We understand the cost of repairs in No.40 would be of a similar order.

If the application is rejected, consideration can be given to Appeal or a further Application.

Alternatively, it should be possible to install a root barrier which would be estimated to cost an additional £35K due to its length and depth requirement. This would also require a subsequent period of monitoring to confirm stability before repairs are carried out.

A final alternative is to consider underpinning. The current level of desiccation would suggest a mass concrete scheme would be viable but would need to encompass the front elevation of both houses, the flank elevation of No.38 and part of the rear of No.38. Costs would be estimated as an additional £130,000 for underpinning. It would also be noted that this would have a significantly higher environmental impact due to the volume of concrete produced than removal of the Oak tree.

In this instance, given the depth of desiccation, we would estimate a piled scheme encompassing the whole extension. Budget costs of c.£55K would be expected.

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22 November 2021

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Supplementary Information – September 2022

Following this report, a TPO application was submitted. The Council Tree Officer raised various points and it was agreed to withdraw the application and wait for monitoring readings over this Summer (2022). These results are now available.

In addition, the homeowner has reported an escalation of damage in the property over July and August 2022 to the extent that doors and windows cannot be closed and there are concerns that the gas supply could be ruptured by the movement. We are arranging temporary repairs to make the house safe. Further photos and details are available on request from the Council Tree Officer.

The further monitoring graphs are reproduced overleaf. It is noted there has been significant downward movement of all Points between 22 June and 9th August 2022 except at Points 13, which shows an upward movement of 4mm and Point 2, which shows no movement. The reason for the upward movement at Point 13 is that Point 1, which was taken as the datum, is clearly also suffering downward movement. If we correct the results assuming Point 13 is stable, the downward movements are as follows:

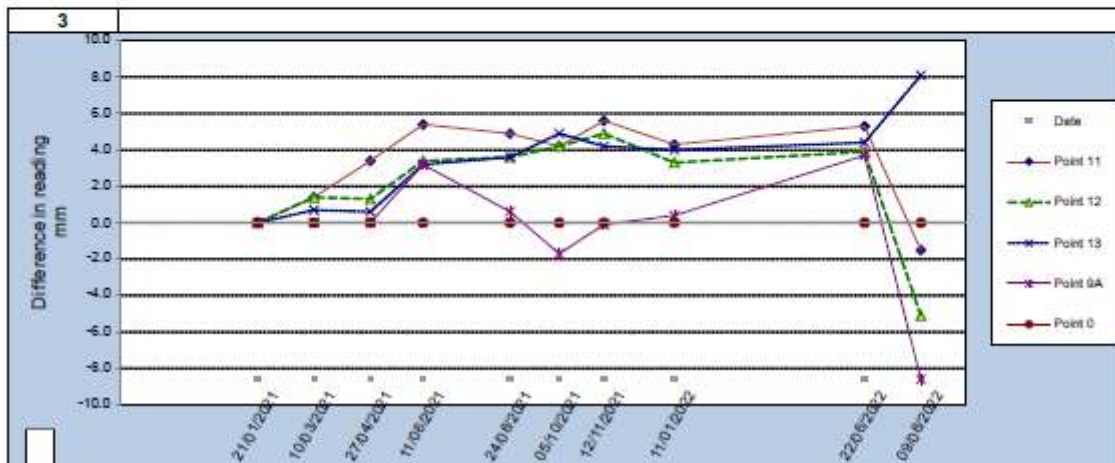
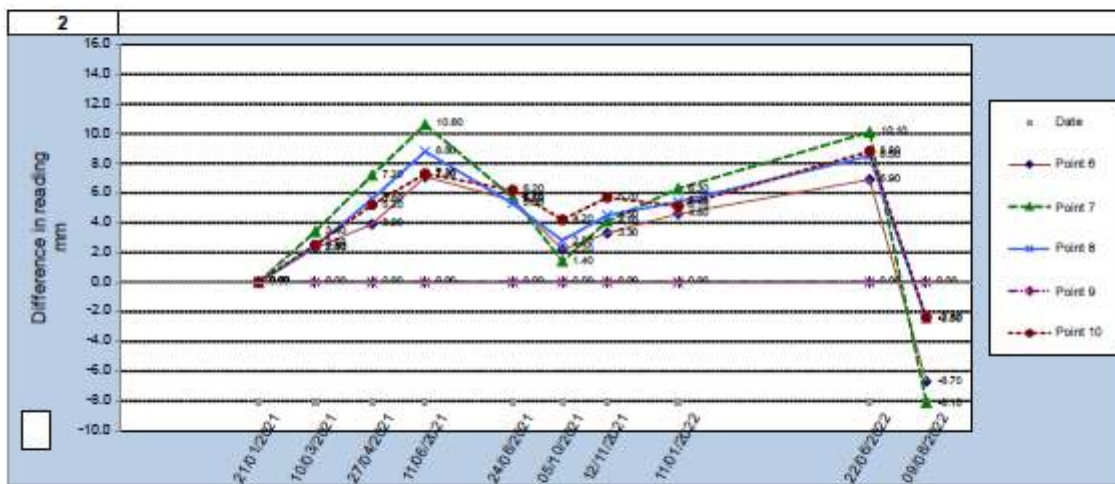
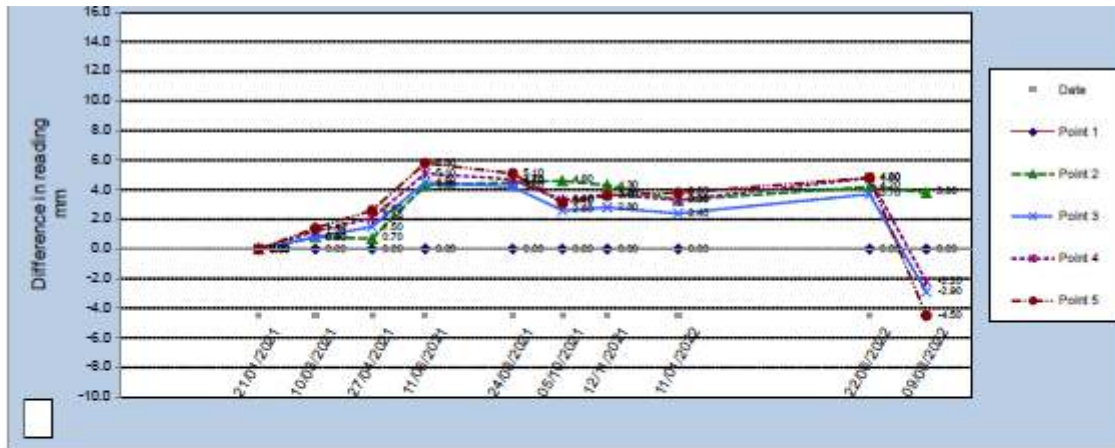
1	4mm
2	4mm
3	11mm
4	11mm
5	14mm
6	17mm
7	22mm
8	15mm
9	16mm
10	15mm
11	11mm
12	13mm

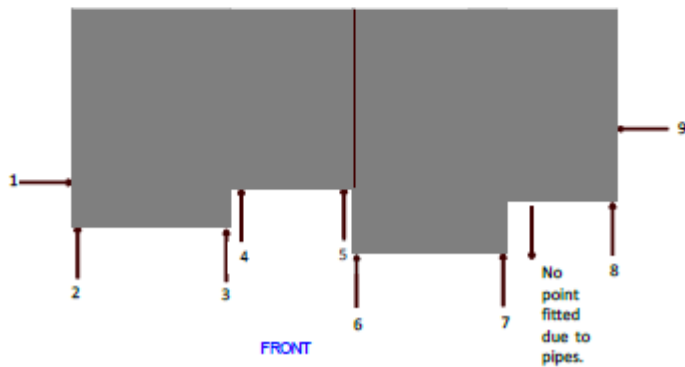
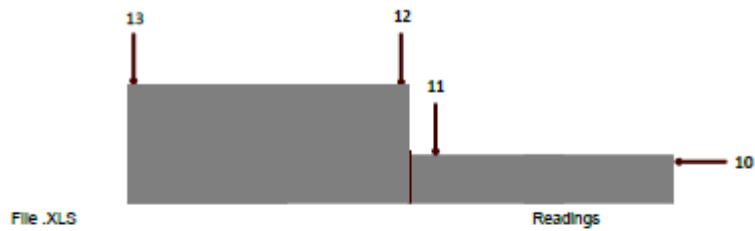
The monitoring together with the further damage in the summer months, provides further evidence that the Oak tree is causing the subsidence and mitigation action is now a priority.

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28 September 2022

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