Statement of Work

Optera Structural Solutions

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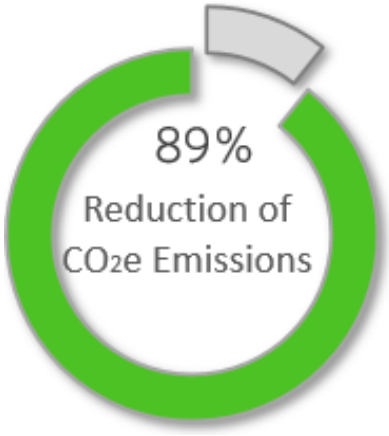
OPT-20188 Agreement to install a root barrier for Graham High Group Ltd

CLIENT NAME:	**Graham High Group Ltd**
CLIENT ADDRESS:	**Barclay House, 20-24 Upper Market Street, Eastleigh, Hampshire, SO50 9FD**
POLICY HOLDER:	**Mr Peter Sims**
POLICY HOLDER ADDRESS:	**Oak Tree House, Wood Lane, Ruislip. HA4 6EY**
CLIENT REFERENCE:	**S2516983**
OUR REFERENCE:	**OPT-20188**
PROJECT MANAGER:	**Paul Milliam**
DATE	**16/10/2025**
ETSIMATED DURATION:	**3- 4weeks**

Specifications of Barrier					
Barrier Type	length	Max Root Depth from SI	Minimum depth to be achieved with barrier	Distance between tree / Vegetation and barrier	shortest distance between barrier and foundation
Copper	**15m**	**3m**	**4m**	**4.5m+**	**0.3m+**



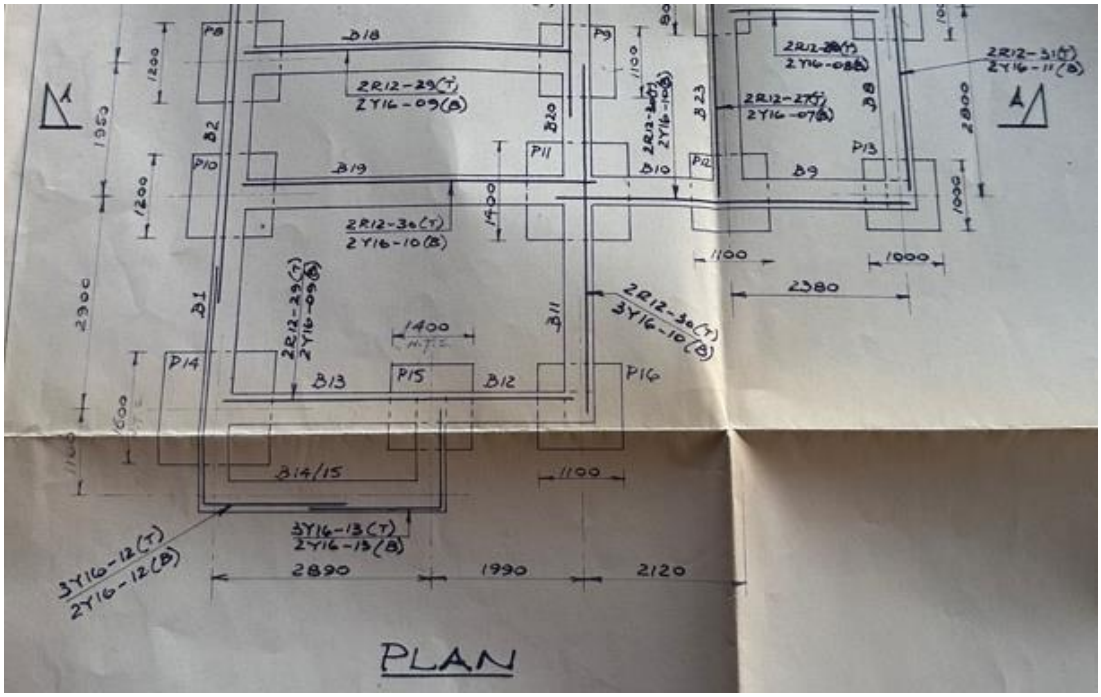
Aerial plan indicating proposed 16m length and alignment of barrier.

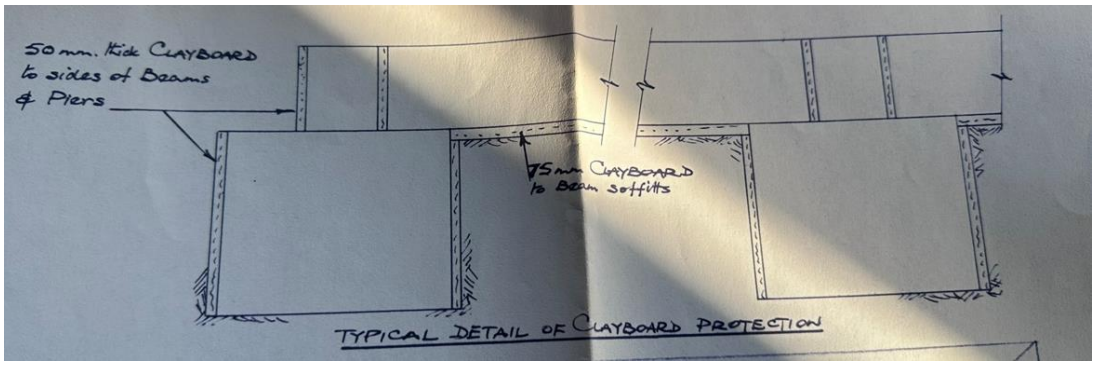
Instruction

Optera have been instructed to assist in developing a stabilisation scheme for the above property suffering the effects of root induced clay shrinkage subsidence. We have been asked in the first instance to consider the feasibility of a root barrier and give consideration to alternative options should this not be possible.

Claim History

The property is a detached house built c1980 by the Insured. The Oak tree at the front was present at the time of construction and therefore it was built off of a Engineered design pad and beam foundation system where deep pads are installed at strategic positions with concrete beam connecting. The homeowner was able to show us the original drawings and whilst these do not confirm the depth of the pads they do show there positions. It is worth noting that the current movement predominantly affects the front porch that appears from the drawings to cantilever out from the front pads to the left corner. Mr Sims did confirm that anti-heave provisions were allowed for during construction and were noted on the drawings, see below.





The property previously suffered subsidence affecting the front porch. Investigations undertaken on behalf of the original Loss Adjuster confirmed root induced clay shrinkage to be the cause. This was promoted by moisture extraction from the Oak tree located on the front boundary junction with the pavement. Roots where found 2m below ground level emanating from the Oak tree. Attempts were made to get the Oak tree removed but due to its protected status this was denied by the Council.

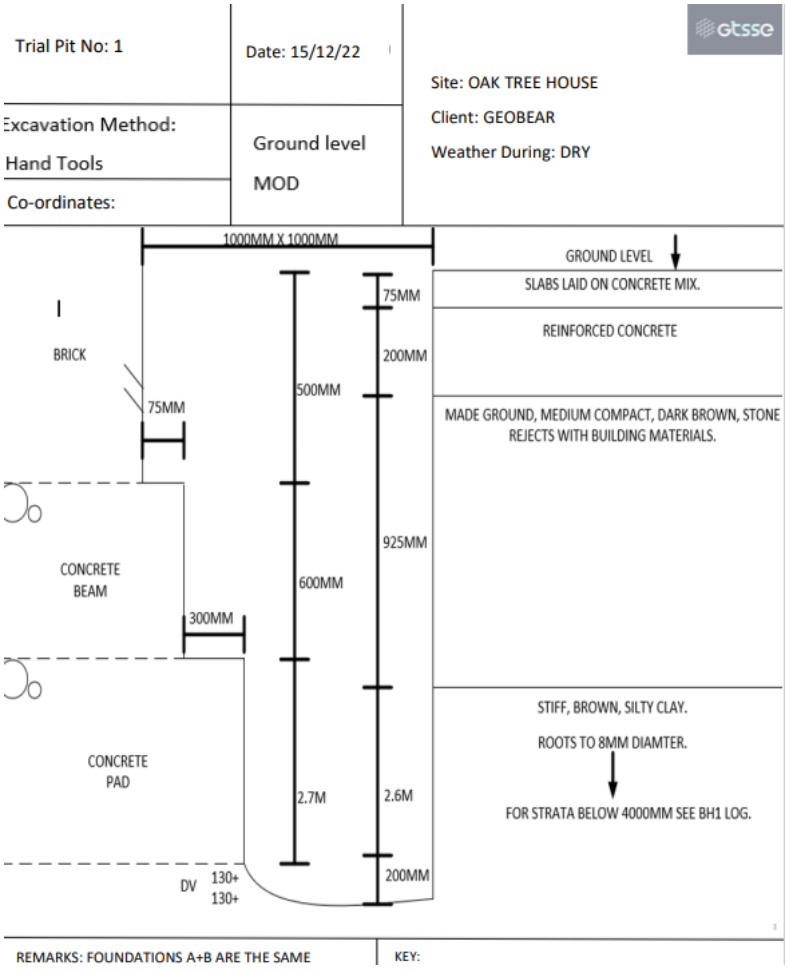
Due to the Oak tree remaining the decision was made to stabilise the front porch by geopolymer ground injection undertaken by Geobear. A site investigation was undertaken by Geobear that confirmed a high plasticity clay soil with Oak roots found to 3m below ground, this being 1m deeper than previous investigations. We have not seen any specification or drawings to show the location and extent of ground injection but understand this was installed in July 2024. Further movement was recorded only a few months later in September 2024.

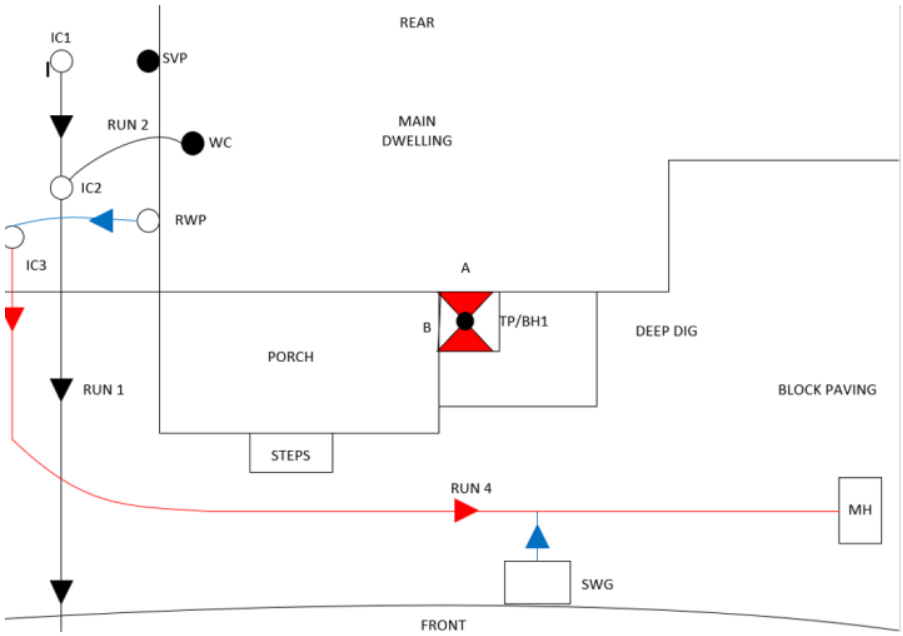
Considerations

GHG have concluded from there recent inspection of the property that damage has again resulted from root induced clay shrinkage subsidence due to nuisance from the nearby Oak tree. In this regard further stabilisation options for the front porch are sought.

We attend the property, met the homeowner and reviewed the factual data and original design drawings. We agree with the conclusion by GHG that damage will have resulted from continued nuisance from the Oak tree.

The site investigation undertaken by Gtsse 15/12/2022 shows the foundation detail to the front right side of the porch at its junction with the main house. The investigations show the pad foundation to be 2.7m deep supporting a 600mm concrete beam. No roots were found below 3m. Drainage was found to extend down the left side with foul drains running out to the highway and the surface water drain sweeping across the front of the property to a manhole within the driveway. The drains have been surveyed and dismissed as being causal.





During our inspection we observed cracking to the front porch as well as cracking to the front elevation and left flank wall. Cracking was also noted to the stairwell flank wall tapering down from its abutment with the front partition wall, as well as minor cracking noted below the lounge window.

Crack on flank wall of stairwell

Crack below front lounge window

The investigations proved that Oak roots have extended below the pad foundation and will have induced shrinkage of the clay that caused the pad to drop. The two nearest pads appear to have been affected at present, and this is supported by the cracking that has occurred not only to the porch but the main house as well. As the pads lose support the connecting beams spanning to the opposing pads will also have dropped causing the damage further back along the flank wall and front elevation.

We have not been provided with an Arborist report and consider at this stage damage is solely influenced by the Oak tree at the front. This trees stands 5m from its center to the closest front right corner of the porch. The tree is a significant and mature specimen standing c18m high and protected with a TPO.

No level monitoring data has been provided and therefore it is considered damage is affecting the front porch area only and that the remaining areas of the property remain stable.

Front view of property and Oak tree

Oak tree position to front porch.

Design Rational

Given the above considerations we suggest an Optera compact root barrier be considered in the first instance as a primary solution. However, the Oak tree is protected and stands just under 5m from the nearest point of the property. As the tree is protected, we will need to gain a root severance agreement (RSA) from the Local Authority Planning Department. Ordinarily they require the barrier to be no closer than 5m to minimise any damage and harm to the protected tree, although we have in the past been provided permission where only a slight breach occurs. In this regard discussion will need to take place as the barrier with careful design will only encroach the 5m radius for a short section. The Council may require a slight reduction of the tree in order to reduce its sail effect when the barrier is installed or may require further investigations to be undertaken so that they can understand the root system better.

If the RSA can be obtained then the barrier will need to extend from the left hand boundary across the face of the porch kicking back to extend across the main house and garage. To facilitate the barrier installation the front step will need to be removed the crazy paving lifted along the barrier line. Nearby conflicting drainage will need to be cut through and reinstated once the barrier has been installed. The water main run in from the left side of the driveway and will be cut and reconnected. Gas and electrical services are understood to enter from the right side boundary and are considered appropriately spaced to allow the barrier to be installed. This will need to be confirmed prior to works starting along with Sonde mapping of the drains.

The investigations to the front of the porch in 2022 recorded no roots below 3m. It is therefore proposed to allow a barrier depth of 4m and for this to extend 15m across the front of the property.

Method Statement

Pre Works

- Root severance agreement to be obtained. (WHC)
- Services Search (WHC)
- Party wall as required. (Sedgwick)
- Undertake site inspection, confirm location of incoming services, lift manholes and sonde drains to map exact location. (WHC)
- Obtain parking licences for side road for Opera Vehicles.

Barrier Works

- Set up site including compound within front driveway area to be agreed with the client. This will be boarded, protected, and secured with site fencing.
- Breakout entrance step.
- Lift crazy paving along barrier line and set aside for later relaying.
- Breakout paving sub-base assumed crushed stone only.
- Board and protect along the barrier line and tracked route into and out of site.
- CAT scan the barrier line, any services identified are to be hand dug and exposed prior to machine excavation.
- Mobilise 0.8t excavator to site to assist with removing made ground.
- Mobilise auger rig and set up.
- Break out and cut through existing drainage allowing barrier installation. Assumes <0.75m deep.
- Form barrier using a series of augered boreholes with a specialist auger rig to make a secant trench 15m length and 4.0m deep.
- Excavated material to be tracked barrowed to skip on driveway compound.
- Insert copper cored geotextile backed fabric panels using tracked drop hammer rig. Fabric barrier panels overlap 100mm to form continuous barrier defence.
- Backfill with pea shingle to 200mm of surface.
- Reconnect and reinstate drainage and water main.
- Fill top 200mm of trench with MOT type 1 well compacted.
- Reinstate paving and hard standing.
- Off hire and clear plant and equipment from site and clean down site.

Notes and Assumptions

- **The project Fee is valid for 60 days from the date of this report, after which we reserve the right to review the scheme and costs accordingly.**
- The barrier has been designed to defend against the implicated Oak tree at the front of the property only.
- It is assumed that the excavations will be undertaken in virgin ground with no requirement for trench support, dewatering, or additional protections.
- No allowance has been made for the temporary disconnection or relocation of services.
- The location of services is considered such that they will not frustrate installation of the barrier.
- Pavement closure, skip licences, council permissions, conservation area agreement, BON, AC Specialist will be charged at cost plus 20%.
- Pre start site investigation to map drains, hand dig and expose services by WHC £1,215 + VAT
- A full site inspection will need to be undertake and the drains mapped and the manholes inspected to confirm full feasibility of the scheme.
- We have not allowed for any additional works that may result from previous ground injection. If encountered these will be reported along with any additional costs.

Alternate Underpinning Scheme

We have been asked to consider what an alternate underpinning stabilisation scheme would look like. Given the non-traditional foundation any enhancement or underpinning will be a complex scheme. The failure of the front pads will require them to be stabilised by installing 220mm diameter 8m piles, adjacent to the existing pads allowing a connection to be made into the concrete pad and under the spanning beams. The issue that arises is that we would not be able to introduce heave protection to the underside of the pads so works would need to be undertaken during the hydrated season of the clay soil. In this regard additional site investigations would be required to assess the potential behavior of the soil. If this is significant and unacceptable then additional pile and beam support with anti-heave will need to be offered and the existing pads isolated and cut away. It also needs to be considered that the behavior of the clay may be influenced by previous ground injection with a geopolymer. We would consider costs for a piled solution would be c£80k - £120k depending on the scheme chosen following site investigations.

Warranty Details

All Optera whole life scheme designed barriers are issued with a 10 year company warranty, the details of which are seen below:

Warranty Note

Building Repair Warranty

Contractor	Optera Ltd.
Warranty Reference Number	xxxx
Supplier Registered Office Address	Seven Stars House, 1 Wheler Road, Coventry, England, CV3 4LB
Supplier Company Number	07468088
Supplier Job Reference Number	xxxx
Commencement Date	xxxx
Expiry Date	xxxx
Homeowner's Name	xxxx
Location of Works	xxxxx
Description of works undertaken and Warranted the "Works"	Works completed pertaining to Optera's Statement of Work. Dated xxxxx

Signed for and on behalf of Optera Ltd:-

Name:	Spencer Caizley
Sign:	Spencer Caizley
Position:	Director
Date:	xxxxx

Intervention Explained

Clay-shrinkage subsidence is typically related to the encroachment of tree roots into the clay soils beneath the foundations of the property.

To ameliorate tree-root induced clay-shrinkage subsidence, the first option is generally removal of the implicated tree(s). However, where the tree(s) cannot be felled, for whatever reason, the next option would be to sever the roots between the tree and the property and form a barrier to prevent reestablishment of the roots.

The barrier will be positioned between the offending tree(s) and the affected part of the building, and will be installed to a depth designed to cut the tree(s) roots between the tree and the foundations; the act of excavation severs the roots, causing any roots beneath the foundations to wither and die. This prevents the tree(s) from extracting moisture from the clay supporting the foundations, allowing the clay to rehydrate and recover their natural moisture levels. Naturally, there is a period of time required for the recovery process to take place, but repairs can typically be undertaken shortly after the installation is complete.

The root barrier material favoured by Optera is a tough, copper impregnated geotextile membrane. This is normally installed using an excavator measuring no more than 2m in width. A trench is formed with the excavator and the arisings are either disposed of off-site or are stored on-site for use as backfill material.

The barrier is typically formed in 5m sections. Once the first 5m of the trench is excavated, the leading edge is bunded with a trench-sheet and the copper impregnated bio-barrier is installed, before backfilling with free-draining stone, or excavated arisings as appropriate to the site. Where 'as-dug' material is used, the backfill is placed in layers and consolidated with a compactor plate attached to the excavator. The process is then repeated until all of the designated barrier has been installed. If reinstatement works are to be undertaken by another contractor, Optera will fill the trench to the surrounding surface as a temporary measure to allow consolidation and avoid a trip-hazard until the permanent reinstatement can be completed. Any excess spoil will be cleared from site along with the plant, welfare, and protections.

How do Copper Root Barriers work?

In the UK the shrinking and swelling of clay soils, particularly when influenced by trees, is the single most common cause of foundation movement that damages domestic buildings.

Trees are known to cause clay soils to shrink by drawing water through their roots, predominantly during the Spring and Summer months. The shrinkage results in both vertical and horizontal ground movement that, when transmitted to a building's foundations, cause damage to the building's structure. The amount of shrinkage depends on the type of clay soil, the type and size of vegetation, and on weather patterns.

The moisture content of clay soil tends to vary with depth. Closer to the surface there can be relatively large changes in soil moisture content between summer and winter as a result of evaporation from the ground surface, the drying effect of the Sun and general vegetation, including grasses. Such variations are normally confined to the upper 1m of the ground. However, where trees are growing within influencing distance of a building, then the soil moisture profiles will fluctuate much more widely through the seasons and to a much greater depth; in response, soil volume changes are amplified, and consequential building movements will be far greater.

It is quite possible that a building will coexist with nearby trees for many years without any noticeable damage, so what is the trigger for the onset of damaging levels of movement? The answer is usually a combination of the tree(s) getting bigger and developing larger leaf areas, but very often it is linked with a particularly hot, dry period of weather.

The process of clay-shrinkage subsidence is a reversable one and buildings experiencing damage in response to a period of hot, dry weather will typically see an improvement (crack widths will reduce) following a corresponding period of cooler, wetter weather when the clay is able to recover its moisture levels and swell back to its former volume.

The intention of the Bio-root barrier is to divorce the building (or more specifically the clay soils supporting the building's foundations) from the influence of the trees and thereby stop the seasonal soil moisture fluctuations, allowing the building to remain stable throughout the year.

The bio-root barrier is strong and flexible, with very high tear resistance, as well as being water-permeable, thus allowing the natural movement of water through the ground without impediment. The Copper contained within the core of the membrane also acts as a chemical repellent to the roots without constituting a hazard to plants or animals. The Copper foil securely bonded within the porous geotextile membrane, releases Copper ions into the adjacent soil by forming Copper Carbonate (verdigris); these signal adverse conditions to any roots growing towards the barrier, preventing a proliferation of roots close to the barrier. The levels of Copper generated do not constitute a burden on the eco-system or impact groundwater quality.

Outdated, impervious barriers divert rather stop roots and may prevent the movement of groundwater causing unintended consequences. The use of Optera's permeable barrier stops roots both by forming a physical impenetrable obstacle and by acting as a chemical inhibitor to the reestablishment of roots.

The multi layered membrane is welded together, retaining its flexible qualities, allowing it to be cut and effectively resealed to fit round buried services. The barrier material itself has a 60 year service life expectancy.

The chemical inhibitor effect prevents the proliferation of root against the barrier face, which was often a problem associated with conventional barriers, where increased moisture levels could encourage root growth.

Following installation of the root barrier, the trench may be backfilled with 20mm single sized stone, alternatively, and dependent upon site conditions, backfilling could be done with as-dug material, which would be placed and compacted with a plate-compactor mounted on the excavator arm. In specific circumstances, we may also use no-fines concrete on the structure side of the shield.

Some degree of surface settlement can be experienced following completion, where this happens, Optera will return to top-up the trench; typically this occurs within the first six months of installation.