

# Optera Structural Solutions

Oxburgh – The Barn, Fosse Way, Stretton-On-Dunsmore, Warwickshire. CV23 9JF



## SOW 7581 Root barrier quotation on behalf of GHG Solutions Ltd.

Date

July 3, 2023

Services Performed By:

Optera Structural Solutions  
Oxburgh – The Barn, Fosse Way,  
Stretton-On-Dunsmore,  
Warwickshire. CV23 9JF

Services Performed For:

**POLICY HOLDER:** Mrs K Parker  
**POLICY HOLDER ADDRESS:** 11 Ketcher Green, Binfield, RG42 5TA  
**CLIENT REFERENCE:**  
**OUR REFERENCE:** [Redacted]  
**PROJECT FEE:**

**PROJECT MANAGER:** Spencer Caizley

*This scheme quotation is strictly confidential and for the sole benefit of Optera’s client, shown above. This document must not be passed in full or in part to another person, party, or organisation without the express written agreement of Optera, other than the Policyholder and insurance company responsible for the respective claim.*

Specifications of Barrier					
Barrier Type	Length (m)	Max Root Depth from SI (m)	Minimum depth to be achieved with barrier (m)	Shortest distance between vegetation and barrier (m)	Shortest distance between barrier and foundation (m)
Copper	35	3.3	3.7	4	1







**Aerial plan of proposed 35m barrier option to the rear of the risk address.**

## Project Description

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Optera have been asked to provide a quote based on a substructure stabilisation scheme, at the above property and based on the submission of technical investigations and photos provided. Optera have carried out a site visit to collate information and provide the attached proposal. We were also provided with the information below which sets out the technical parameters affecting the property and which form the basis of our solution. The information we have received at this time is: -

- Site Investigation report by Prosite Ref DWS027 Dated 02/02/2023
- Arborists report by MWA Ref SUB221207-11606 Dated 16/01/2023
- Level monitoring by GHG Ref L/2019/54264/S Dated 24/05/2023
- Engineers Report by GHG Ref L/2018/54264/S/DE Dated 16/10/2018

The property is a detached house of cavity construction, surmounted by a pitched tiled roof. Originally, it would have had a detached garage, but has subsequently been extended to add a conservatory to the rear and an extension to the left-hand side which now attaches the garage to the main property. The insured advises that the property has also been extended to the front right-hand side and this is most recent and was formed on a piled footing which shows no movement.

The property is located within a quiet residential cul de sac and was built approximately 30 years ago. Damage was first noticed in 2018 and was concluded to arise as a result of root induced clay shrinkage subsidence. Investigations indicated that the cause was oak, and ash trees. There are multiple trees around both the rear and left-hand sides



which are owned and managed by the local authority as the property abuts an open green space which is surrounded with trees. Whilst the local authority agreed to remove one smaller Ash tree, there is a much larger Ah tree where movement is most noted on the level monitoring and other oak species were also noted to remain. We understand that the local authority have refused to undertake any more works at this time.



**View of the front elevation,**

The reports provided suggest the damage is focused on the left-hand side and rear of the property. The crack damage reciprocates the evidence with diagonal tapered fractures in the external masonry which all tend towards the left-hand side. We understand that these have been previously repaired, from conversations with the insured although the cause of damage remains.

The site investigation do not confirm the foundation details of the property but we anticipate the majority to be founded on a concrete strip footing, between 1-2m in depth as would be typical for a property of this age and construction. We understand that the local authority building control insisted on the front extension to be founded on piles but this is a more recent addition and shows little if any movement by comparison to the remaining areas.

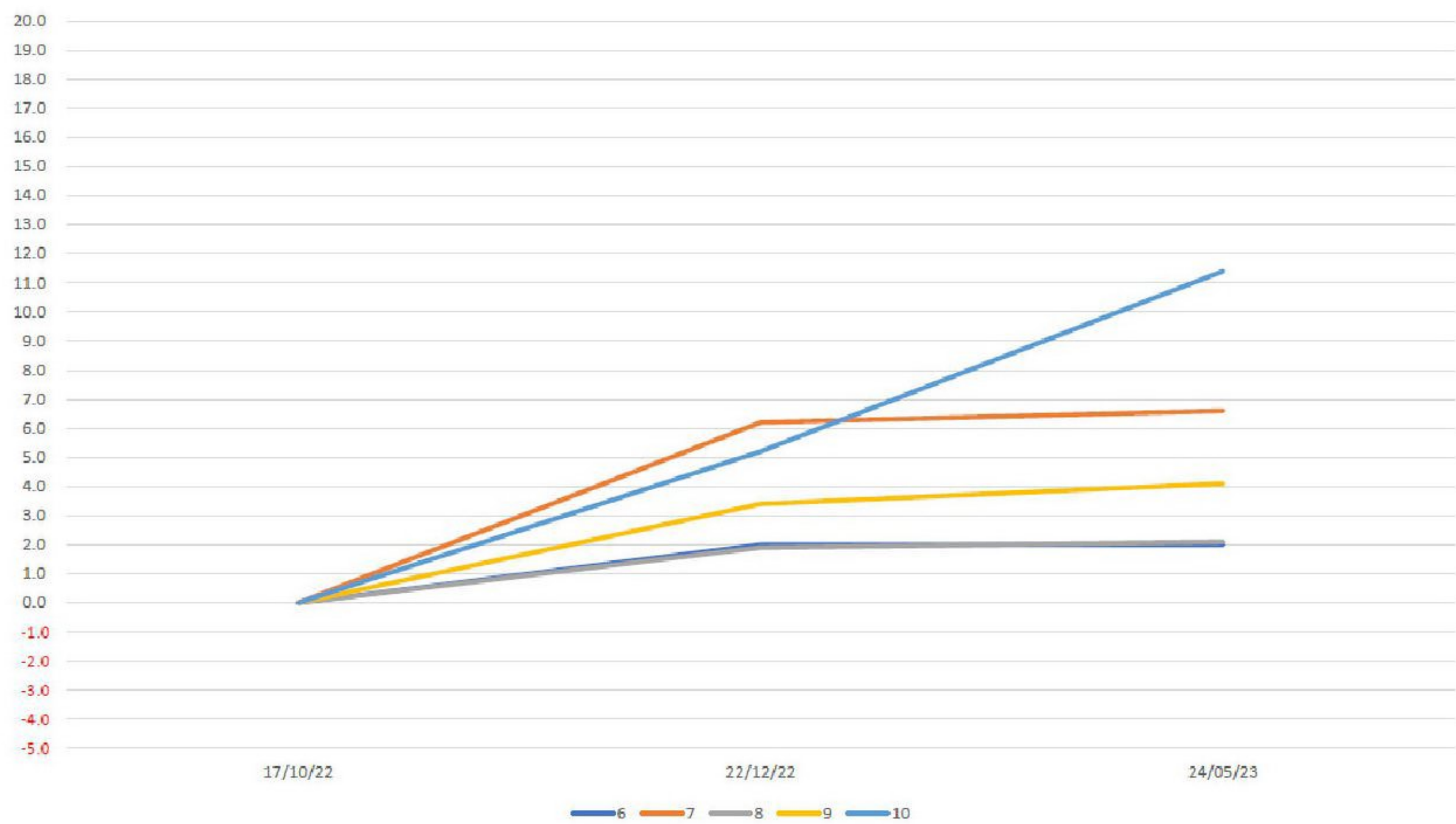
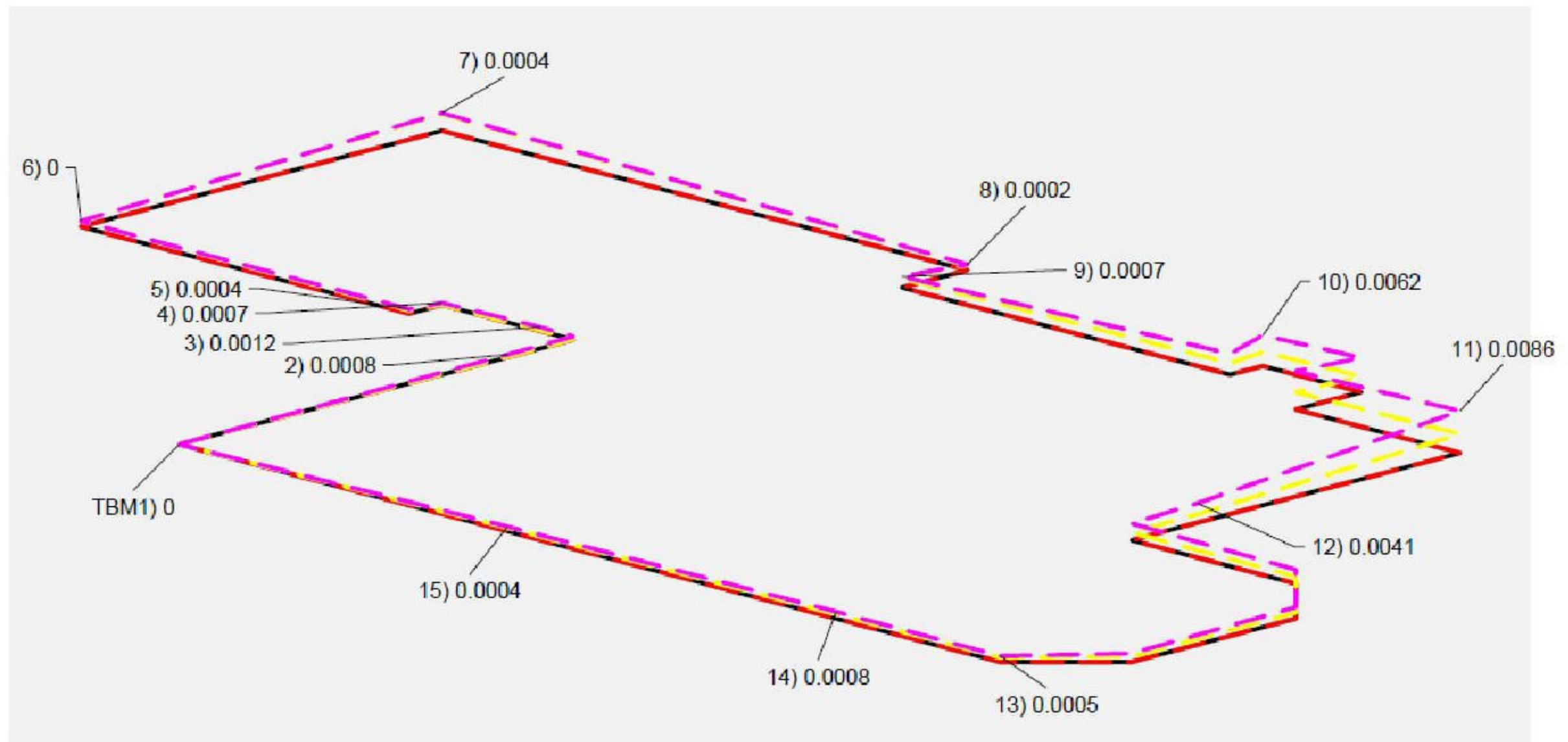
A recent site investigation involved the drilling of 3 boreholes around the left-hand side of the house. All of these were undertaken mechanically to a depth of 5m. The soil samples were subsequently tested within the laboratory and confirmed the clay to be of high plasticity with some modest bands of intermediate plasticity. The PI ranges from 19-42%. High plasticity soil is volumetrically unstable and will shrink and swell with changes in moisture content beyond a critical point.

Roots of live appearance were noted within the clay samples, and these were subsequently identified under microscope as belonging to Sycamore and Ash trees. The trees in question are located within the adjacent local authority parkland. The roots were noted at depths not exceeding 3.3m BGL.

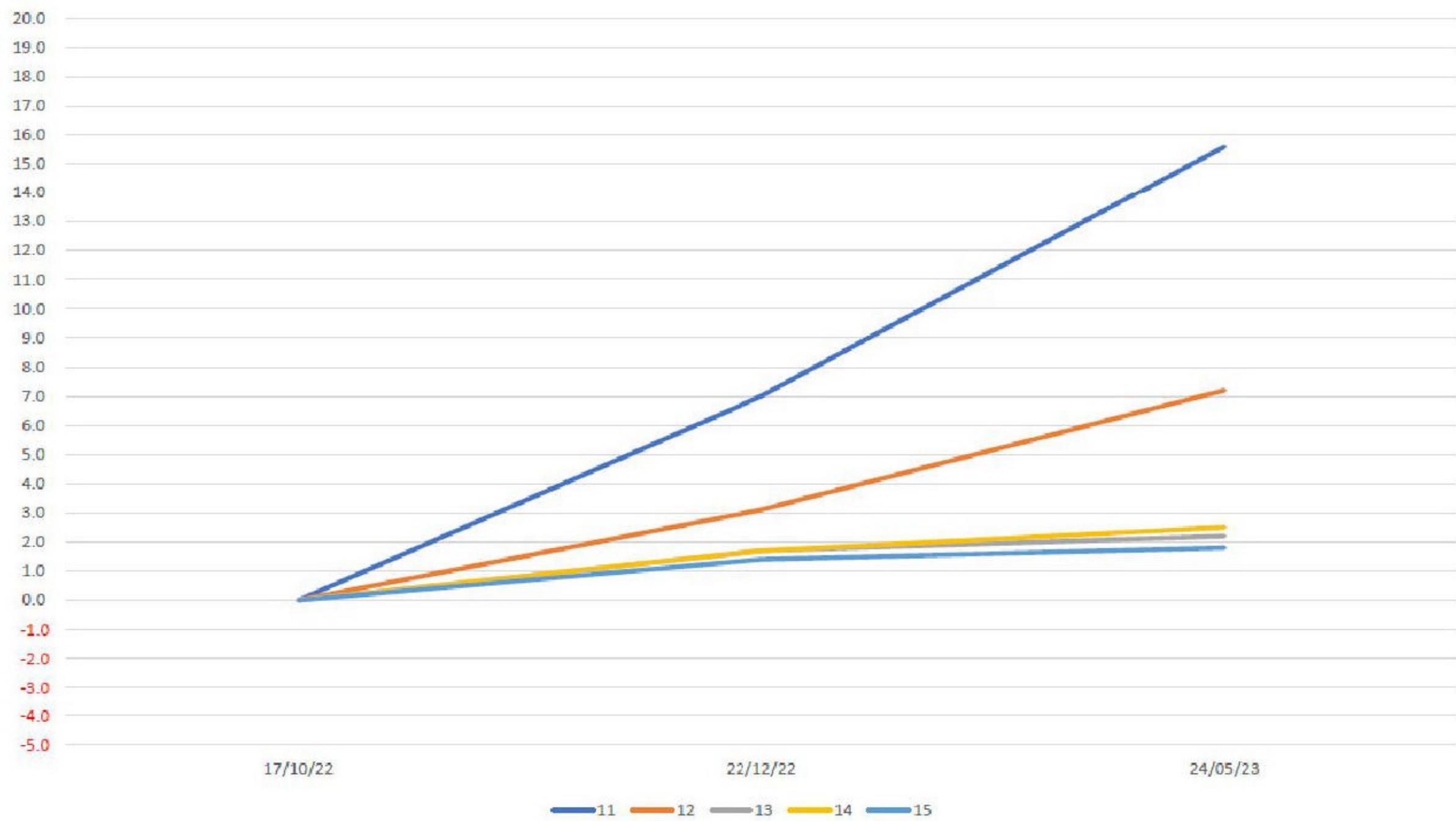


Level monitoring has been ongoing since October 2022 when the most recent movement was noted, following the previous repairs. This shows a marked upward movement, particularly focused around points 10 and 11. The upward movement is only relevant in terms of the timing of the readings. The monitoring was initiated too late in the year to detect downward movement and the upward recovery is assumed to correlate with the areas which experienced the most downward during the preceding summer period.

Upward movement is only witnessed in clay soils and is confirmatory of the cause as root induced clay shrinkage.







## Root Barrier Design options

Based on the information provided, the current issues appear to arise from the presence of tree roots which have grown into the clay soils directly below the foundations of the property. To abate the nuisance, it is prudent to either fell the trees in question or sever the roots between the tree and the property and provide protection against further growth.

Given the length of the time of the claim and re-occurrence of issues, it is felt on this occasion that, given there is a clear causal link between vegetation which remains and was considered causal at the outset of the claim, that pursual of vegetation removal is unlikely to be quick or successful, given the previous reluctance of the local authority to act. To this end, tree felling, whilst desirable is not foreseen, the next option for consideration is severing and defending against the actions of the roots of the trees. Our proposal involves the formation of a root barrier.

We have not been advised if the property is in a conservation area or the Ash tree has a tree preservation order but have assumed this isn't the case for the purpose of the quote at this time. The trees are owned and managed by the local authority, so this is unlikely to be the case but requires confirmation before the works are progressed.

The location of the barrier is targeted at the roots between the trees and foundations, and the act of excavation will sever them, causing the roots under the foundation to wither and die. The absence of water demand from the clay below the footings will allow the clay to rehydrate and recover. Whilst a period of recovery is anticipated, repairs can be typically undertaken shortly after the installation is complete.

The barrier is within the back garden which is land locked to plant of the required size. In this instance, it will be necessary to crane the excavator over the garage at the start of the project and removal in the same manner at the



end. Whilst it is conceivably possible to access the rear of the property via the public green space, we would need to damage some more minor vegetation to gain access, and this would only gain access to a raised patio area. The damage caused and its subsequent repair, is likely to exceed the cost of craneage on this occasion.

## Method Statement

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Upon instuction, Optera will carry out the requisitie searches, and as necessary, submit a tree root severance application if reuquired. The barrier will be marked out on the ground and the area CAT scanned to determine the location of incoming gas, electric and waster services which are all noted to be entering along the left hand side, adajcent to the works area. These will be hand dug and exposed prior to machine excavation.

The shed to the left hand side of the house will reuquire removal by others prior to works commencing. The paving to the left hand side of the house, will be lifted and set aside and the barrier marked out on the ground. A 450mm trnech will be formed to a dpeth of 3.7m with the arisings placed to one side of the trench. Once the first five metres has been excavated, we will bund the leaidng edge with sheet piles and line the trench with the copper impregnated bio-barrier. The trench will be backfilled with as dug arisings, in layers and comapcted with a hydraulic compactor attachment to the excavator arm. The excavation will be backfilled to within 200mm of the surface.

The process is then repeated until all 35m of the barrier has been dug and installed. Any residual spoil will be loaded into tracked barrow and conveyed to the front of the property where it will be sotred on boards and periodiclaly collected by grab lorry. The trench will be topped up across the patio area with compacted type 1 MOT stone to formation level and across the lawn with compacted topsoil. The trecnh will be seeded with grass seed across the lawn and the slabbed area will be relaid with a full mortar bed. The slabs will be pointed with a resin pointing compound.

All boards and protection will be lifted and removed and the site left clean and tidy. The digger will be lifted out of the site and rmeoved from the project and the driveway cleared down.





**Photo shows the paving down the left hand side of the house which will need to be lifted and relaid.**



**Shed to be moved and reinstated by others.**



## Proposed Plan of Works for 7581

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START DATE: We anticipate that works could commence within 4-6 weeks of approval.

COMPLETION DATE. The works are expected to take 5 weeks to complete.

## Completion Criteria

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Contractor shall have fulfilled its obligations when:

- Contractor accomplishes the Contractor activities described within this SOW.
- The Policy Holder agrees that works have been carried out as per the agreed specification to an acceptable standard.
- Agreement that works have been carried out as per the agreed specification to an acceptable standard by the appropriate GHG Solutions Ltd Engineer
- Site has been vacated and all plant and materials removed for which Optera are responsible.

## Project Variation Procedure

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The following process will be followed if a change to this SOW or a Variation of works is required:

- A project variation request will be submitted to GHG Solutions Ltd. The variation must describe the change, the rationale for the change, and the effect the change will have on the project.
- The designated Technical Manager for OPTERA will review the proposed change and determine whether to submit the request to the other party.
- If variation works are agreed, works will be booked in at the request of the GHG Solutions Ltd engineer and OPTERA will seek formal approval via GHG Solutions Ltd.
- Upon completion of the variation works, these will be invoiced separately to the initial authorized project.



# 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 Wheeler 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

### Warranty

The Contractor warrants that for a period of 10 years from the date of completion of the Works detailed above, the Works undertaken and/or the materials installed shall be free from defect. In the event of a failure, proven to be due to faulty workmanship by the Contractor, or materials supplied and installed by the Contractor, the Contractor will make or cause to be made, all repairs necessary to enable performance in accordance with this warranty.

Any dispute as to whether any defect or failure is attributable to faulty or sub-standard workmanship or materials shall be referred to an arbitrator, who should be a suitably qualified and experienced Chartered Engineer, or Chartered Surveyor (i.e. a chartered civil, or structural engineer (MICE/StructE), or a chartered building surveyor (RICS)).

This warranty is specific to the location and Works as detailed above and is subject to the following qualifications and conditions:

### Qualifications

The Homeowner acknowledges that the Contractor shall not be responsible for remediation of any of, or any combination of the following causes:

1. The cost of routine maintenance, overhaul or modifications or loss or damage arising therefrom, or for which compensation/recourse is provided by legislation such as the Consumer Credit Act 1974;
2. Any wilful acts or wilful omissions of the Homeowner or persons acting on their behalf
3. Any loss of use, any consequential or economic loss of any kind or description whatsoever including, but not limited to loss, costs, damages, expenses or penalties for any reason;
4. Any damage caused by war risks, sonic booms or nuclear radiations;
5. Any damage or defect caused by wear and tear, sunlight, normal deterioration, neglect in maintenance, any change in colour, texture, opacity or discolouration or staining or superficial deterioration or marring of finishings or surface appearance or aging process;
6. Any claims first notified outside the period of this warranty or any claims for any defects that the Homeowner should reasonably have been aware of any defects for which the Homeowner receives a discount/reduction in the cost of the Works;
7. The use of the Works for any purpose other than that for which they were originally intended and as stated in this document;
8. Any claim, loss or damage caused by or consequent upon a peril that can be insured under a Household or Commercial Buildings or Property Owners Insurance policy whether insured or not, other than in respect of subsidence, heave or landslip as a direct result of defective workmanship or materials in the Works herein warranted;
9. Placement, erection or construction of anything on or through the Works without the written permission of the contractor;
10. Any costs, losses, expenses or damages for death, bodily injury, disease, illness or injury to mental health;

11. Any abnormal use of the Works or the imposition of any load greater than that for which the Works were designed in whole or in part, structural alterations, repairs, modifications to the Works during the period of this warranty unless agreed in writing by the Contractor;
12. Any claim, loss, destruction or damage caused by pollution or contamination;
13. Any claim involving cosmetic cracking or blemishes that do not affect the performance of the Works;
14. Any claim, loss, destruction or damage due to defective design;
15. Any issues caused by the materials after expiry of the manufacturers product guarantee.

### Conditions

- A. The Homeowner shall notify the Contractor in writing of any defect within 21 days of discovery and give the Contractor reasonable opportunity to inspect the alleged defect and the area affected. During such an inspection, the Contractor shall be permitted to take such notes, photographs and/or samples as he deems necessary
- B. In the event of a failure attributable to workmanship, the Contractor's sole responsibility shall be limited to the costs of making good such repairs as necessary to enable the Works to perform as originally warranted.
- C. Any work carried out to rectify any failure or deterioration covered by this warranty shall not extend the duration of this warranty.
- D. If an alleged failure or deterioration is proven to not be the responsibility of the Contractor, then all costs associated with the investigation of such failure shall be borne by the Homeowner.
- E. This warranty does not become valid or enforceable until such time as payment in full for the Works has been received by the Contractor.



# Intervention Explained

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## How do Copper Root Barriers work?

In the UK the shrinkage 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 spring and summer. This shrinkage results in both vertical and horizontal ground movements that, when transmitted to a building's foundations, cause damage to the building structure. The amount of shrinkage depends on the type of clay soil, the type and size of vegetation, and on climate. Trees growing under grass cover are forced to compete for their water and to extract water from greater depths than they might otherwise do, as is the case in this instance.

The water content of a shrinkable clay soil will vary with depth, remote from and near to a large tree. Near the ground surface there can be relatively large changes in soil water content between summer and winter as a result of evaporation from the ground surface and transpiration by the grass. Such variations are normally confined to the top 1-1.5m of the ground, possibly less adjacent to buildings. Where mature trees grow at the same location, then the water-content profiles will vary and the seasonal fluctuations in soil water content are both larger and extend to a greater depth. Soil volume changes and hence ground movements will be greater.

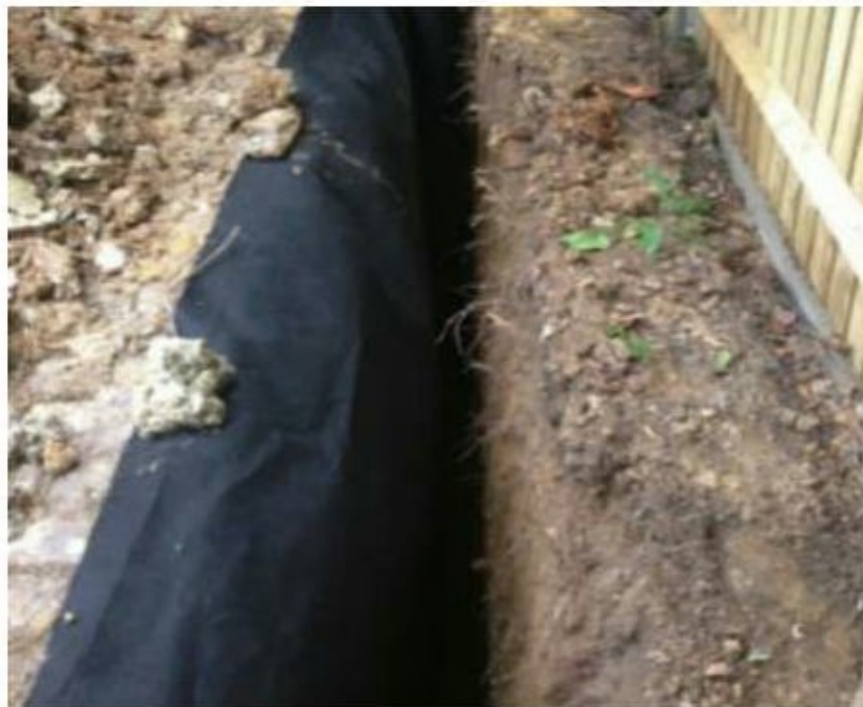
A crack due to differential foundation movement occurring after a tree has reached maturity, there being no cracks up to that time, means it is probable that an exceptionally long dry spell has also had an influence. But cracks will recover when ground moisture contents recover and will not recur to any greater width in future. BRE Cracking in Buildings. The intention of the Bio-root shield is to mitigate against this periodically damaging effect. The solution adopted in this case seeks to decrease water uptake by the trees thereby lessening subsidence risk by conserving soil moisture and reducing clay subsoil shrinkage. This aim is to achieve an impairment to root growth by the focused introduction of a proprietary Bio-root-shield that offers all the benefits of being both flexible and permeable. In addition, it works as a biological repellent.

The Copper signal barrier details a copper foil securely bonded between porous geotextile, releasing copper ions and forming copper carbonate (verdigris) that signals an adverse reaction to roots deflecting them away from the barrier. The presence of copper does not constitute an eco-system burden or impact on groundwater





This solution is multipurpose and ideally suited to the current application. Traditional impervious barriers divert rather than stop roots and may block moisture movement. Also, roots getting under such barriers can grow back to the surface. Therefore, the use of this permeable barrier stops roots either by engaging and constricting them or by chemically inhibiting them.



The benefits of such a shield are its dual protection both physical and biological. The multi layered sheets can be welded together whilst retaining its flexible qualities, i.e. can be cut and effectively resealed to fit round services and foundations, inert with a 60 year service life expectancy. Equally the solution inhibits root growth on the barrier face which is often problematic with conventional barriers where increased moisture levels can cause root growth to become more prolific on the face of a traditional barrier. Research has shown that the use of the recommended style of copper based screening has greatly reduced the effects of root growth when compared to other traditional physical barrier installations



Following the installation of the shield the trench will be backfilled and compacted mechanically with 20mm single sized stone. Alternatively, dependent upon site conditions backfill using lean mix concrete will be utilised on the structure side of the shield. On occasions some natural settlement is anticipated following completion. In all instances the project envisages a return visit to the property to affect any required maintenance of the surface of the reinstatement routinely programmed within 6 months following completion of the installation.