

Optera Structural Solutions

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SOW 7962 Scheme proposal for the installation of a root barrier to front of property suffering subsidence on behalf of Questgates

Date

December 18, 2023

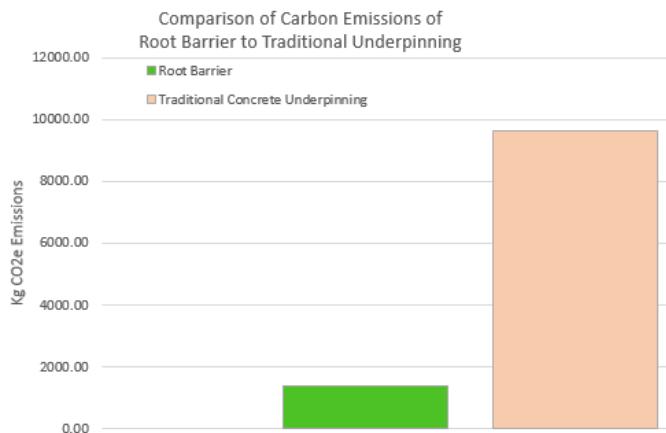
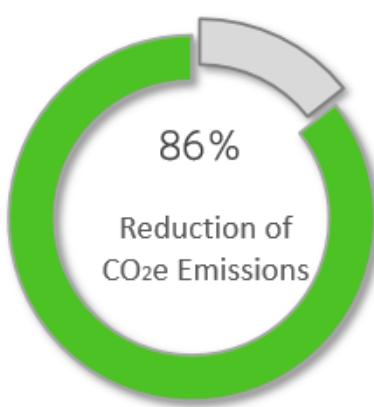
Services Performed For:

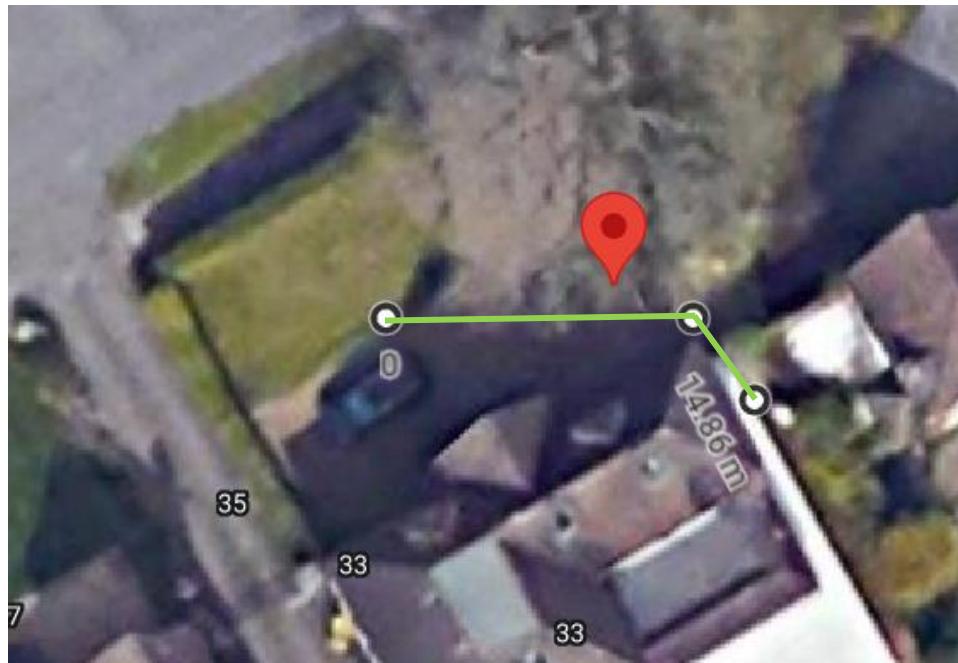
Questgates Ltd (Surveying Services)
Benchmark House, Folds Point, Bolton. BL1 2RZ
Tel: 01204 869 806

POLICY HOLDER:	Mr Nikesh Damanai
POLICY HOLDER ADDRESS:	31 Copse Wood Way, Northwood, Harrow. HA6 2TZ
CLIENT REFERENCE:	QG1S1210326
OUR REFERENCE:	7962
PROJECT MANAGER:	Paul Milliam
ROOT BARRIER PROJECT FEE:	£33,766.92 + VAT.

Specifications of Barrier

Barrier Type	Length	Max Root Depth	Minimum depth to be achieved. with barrier	Distance between tree / Vegetation and barrier	Shortest distance between barrier and foundation
Copper	15m	1.3m	3m	5m+	1m+





Aerial plan indicating proposed 8m length and alignment of barrier.

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.

Report

Optera have been asked to provide a quotation for the installation of a root barrier scheme to the front of the property affected by subsidence. The cause of damage has been attributed to root nuisance from the Oak tree to the front left corner. We have been provided with the following information:

- MHN – Level Monitoring Results – 17/04/2023 to 13/09/2023
- Auger –Site Investigation Report – 22/03/2023
- MWA - Arborist Report – 03/08/2023

Property Details

The property is a large two storey plus attic conversion, 5 bedroom detached property, with cavity brick external walls under a pitched tiled roof. The property has been extended to the rear. The house sits within a residential street slightly elevated from the road.



Road side view of the property, note Oak tree to front left.

Site Investigation Results

The site investigation carried out by Auger 10/02/23 comprised one trail pit/borehole investigation near to the front left corner on the front elevation. The main house has a concrete strip foundation extending 1300mm below ground level. The foundation to the property rests upon a moist very stiff brown fine to medium gravelly clay. The soil remains fairly consistent to the termination of the borehole at 3.3m. Roots were found under the main house to a depth of 1.3m. Roots retrieved were tested and identified as emanating local shrubs with no positive identification being made from any Oak roots.

Crack monitoring

Level monitoring of the property has shown most noticeable movement to the front left corner pt 4 with lesser movement recorded across the front. Monitoring demonstrates a downward movement over the summer months consistent with clay shrinkage. On-going monitoring is likely to show a cyclical pattern of movement further confirming root induced clay shrinkage to be the cause. It will also show the efficacy of the root barrier installed and confirm when stability has been regained.

Arboricultural Recommendations

The MWA Arboricultural Report assesses the vegetation around the site and the influence that it may have on the movement under investigation. The arborist considers T1 Oak to be the primary cause of damage at the front and recommends felling and removal. The implicated Oak has tree a TPO and therefore a root severance agreement will need to be obtained before the root barrier can be installed. Whilst visiting we noted a Laurel H=3m/D=3m to the left flank and a Conifer H=5/D=3.5m both sit at an invert of c1.6m. These trees have not be implicated by the Arborist.

Table 1 **Current Claim - Tree Details & Recommendations**

Tree No.	Species	Ht (m)	Dia (mm)	Crown Spread (m)	Dist. to building (m)	Age Classification	Ownership
T1	Oak	19.9	675 *	20.2	9.4	Older than Property	Policy Holder
Management history		No significant recent management noted.					
Recommendation		Remove (fell) to near ground level and treat stump to inhibit regrowth.					

Ms: multi-stemmed

* Estimated value

Statutory Controls		Mitigation (Current claim tree works)	
TPO current claim	Yes – T1	Policy Holder	Yes
TPO future risk	No		No
Cons. Area	No		No
Trusts schemes	No		No
Local Authority: -	London Borough of Hillingdon		

Tree Root barriers Explained in Brief

The current issues 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 necessary to either fell the tree in question or sever the roots between the tree and the property and provide protection against further growth. In this regard we consider a root barrier to be the most appropriate solution. Underpinning could be undertaken but this would need to extend across the front elevations and part way down the flank wall and would be considerably more expensive than a root barrier..

The location of the barrier is targeted at the roots between the implicated tree T1 and the 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 will need to be a hybrid scheme utilising a traditional barrier across the front and part compact barrier down the side. The traditional barrier is installed using a 5t excavator forming a 300mm wide trench that is lined with the barrier and then backfilled with 20mm stone well compacted with the barrier folded back over the trench and then covered with MOT type 1 and paved over.

Where the barrier extends down the side, restricted access promotes the use of a compact barrier. Optera developed the compact barrier that uses a modified mini piling rig that will fit through a standard gate.

The compact root barrier is installed with a tracked rig that is only 800mm in width and can be run along track boards reducing the impact on any landscape. The amount of excavated spoil is significantly reduced, allowing wheel barrows to be used for the removal of spoil and loaded directly into skips positioned to the front of the property on the highway. However the haul route in this instances is extended due to the elevated position and need to track to the end of the pathway and back to skips on the highway. The working area is also reduced allowing the ground to be protected with boards, reducing the reinstatement cost. However, the offset to installing a compact root barrier is that it takes much longer to install, than by the open trench method and so time related costs are higher.

The barrier is marked out along the proposed route, and CAT scanned for services. Services identified are hand excavated to expose, prior to excavation of the barrier trench line. The compact root barrier is then installed by drilling a secant trench that allows 600mm copper impregnated woven fabric sheets to be driven to the base of the trench. Each barrier sheet is lapped 100mm with the previous to provide a continuous barrier defence. The open void is then filled with pea gravel, compacted, with the barrier folded back across the trench. Topsoil is then laid over and the affected generously grass seeded or turfed, or where placed under hard landscaping the barrier will be topped out with MOT type 1 before paving is re-laid.

Barrier Design

The barrier has been designed based on the technical information provided and advice that that damage has been caused by root induced clay shrinkage and T1 is the main cause of movement. The barrier proposed is to be 15m long and 3.7m deep running across the front and down the side. Whilst roots were only found to 1.3m Oak tree roots can extends to a significant depth and therefore the barrier design takes this into consideration.

To facilitate the barrier installation a section of the block paved driveway will need to be lifted and the blocks set aside. Down the left side passage the white porcelain tiles will need to lifted and are unlikely to be salvaged. In this regard we would leave the tiling to be reinstated by the superstructure contractor who will need to undertake additional repairs in this area.

We would advise that the left side passage has a retaining wall to support the split in levels. This wall shows evidence of failure, but at the time of inspection appeared in suitable condition to allow the barrier installation. Optera take no responsibility for any progression or failure of this wall following installation of the barrier. We have assumed the house foundation and retaining wall have foundations that will not frustrate the installation of the compact barrier.

Method Statement

It is assumed for the purpose of the quote that the installation of the barrier and site compound is agreed with by the owner. The quotation allows for reinstatement of the block paved driveway, but not the tiling of the side passage that is to be done by others. Due to the protected nature of the Oak tree a Root Severance Agreement will be required before works start.

Works in Brief

1 - Pre-Start:

- Undertake services search (Optera)
- Gain Root Severance Agreement (WHC)

2 – Barrier Installation:

- Set up site, including compound area agreed with the customer. This area will be boarded, protected and secured with site fencing.
- The barrier will be marked out on the ground and the area CAT scanned prior to mechanical excavation.
- Any detected services within 1.0m are to be hand excavated and exposed prior to machine excavation.
- Take down gate and section of fence to allow barrier installation.
- Carefully remove lift and set aside block paviors.
- Form a trench 300mm wide to the target depth of 3.7m across the front of the property as shown on the plan and remove arisings to compound area on driveway.
- Where drainage intersects the barrier at the front these will be cut and the barrier installed before being reconnected using rubber collars and surrounded in pea shingle.
- Once the first section has been dug and formed, line the trench with the copper impregnated bio barrier and backfill with 20mm angular stone to within 200mm of the surface.
- As the remaining section of barrier is to go down the side passage way that is narrow and restricted, we will revert to a compact barrier at this point.
- Mobilise auger rig and set up.
- Form barrier using a series of augered boreholes with a specialist auger rig to make a secant trench to target depth of 3.7m.
- Excavated material to be tracked barrowed to compound area.
- Insert copper cored geotextile backed fabric panels using tracked drop hammer rig. Fabric barrier panels to overlap 100mm to form continuous barrier defence.
- Backfill with pea shingle, well compacted and fold over barrier across trench.
- Backfill remaining 200mm with MOT type 1 where barrier runs below hard landscaping.
- Reinstate block paviors. Leave side passage to re-tiled by others.
- Reinstate fences, gates, etc. as specified and clean down the site.
- Once the barrier has been fully installed protective fencing, welfare and plant will be off hired and cleared from site and the area left tidy on completion.

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 cost accordingly.**
- It is assumed that the excavations will be undertaken in virgin ground with no allowance for trench support or additional protections.
- No allowance has been made for the temporary disconnection or relocation of services or drainage other than where stated.
- There is no allowance for any Local Authority Imposed costs, which would be charged at Cost + 20%. This may include parking bay suspensions, hoarding licences, welfare licence etc

- We have not allowed for additional sheet piling/shoring or dewatering of the trench should excess ground water be encountered.
- The location of services is considered such that they will not frustrate installation of the barrier. Services are assumed to enter the property on the left side of the entrance path.
- Root severance agreement to be obtained WHC and will be charged at cost plus 20%.

Proposed Plan of Works for 7962

START DATE: Within 4 weeks of approval.

COMPLETION DATE: Within 2-3 weeks of starting the works.

Completion Criteria

Contractor shall have fulfilled its obligations when:

- Contractor accomplishes the Contractor activities described within this SOW.
- The Policy Holder agrees that works have been conducted 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 Engineer.
- Site has been vacated and all plant and materials removed.

Project Variation Procedure

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 the handling adjustor. 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 handling Adjustor/Engineer and OPTERA will seek formal approval via the adjusting company.
- Upon completion of the variation works, these will be invoiced separately to the initial authorised 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 xxxx

Signed for and on behalf of Optera Ltd:-

Name: Spencer Caizley

Sign: **Spencer Caizley**

Position: Director

Date: xxxx

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

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.

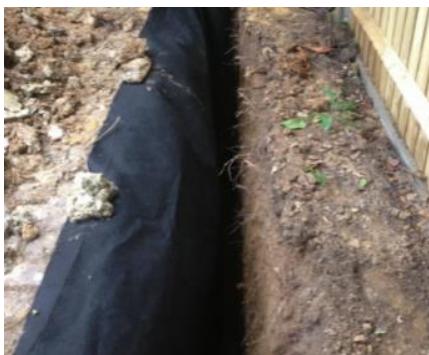
The water content of a shrinkable clay soil will vary with depth, remote from and near to a large tree. Near the ground surface there can be relatively large changes in soil water content between summer and winter as a result of evaporation from the ground surface and transpiration by the grass. Such 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 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.