Statement of Work

Optera Structural Solutions

Oxburgh – The Barn, Fosse Way, Stretton-On-Dunsmore, Warwickshire. CV23 9JF
tel: 02476 553776 fax: 08447 746370

SOW 6251 Quotation to install root barrier along the rear of the property for Tree Law on behalf of others unnamed.

Date	Services Performed By:	Services Performed For:
February 21, 2022	Optera Structural Solutions Oxburgh – The Barn, Fosse Way, Stretton-On-Dunsmore, Warwickshire. CV23 9JF tel: 02476 553776 fax: 08447 746370	Tree Law 9 Hazel Tree Grove, Newport NP20 5EW Tel: 01633 267650

POLICY HOLDER:	**TBC**
POLICY HOLDER ADDRESS:	**9 Barnard Way, Peterborough, Cambridgeshire, PE3 9YZ**
CLIENT REFERENCE:	**6871066**
OUR REFERENCE:	**6251**
ANTICIPATED START DATE:	**TBC**
PROJECT MANAGER:	**Spencer Caizley**

This scope of works # 6251 (hereinafter called the "SOW"), effective as of February 21, 2022, on approval by Sedgwick is entered into by and between Contractor and Client.

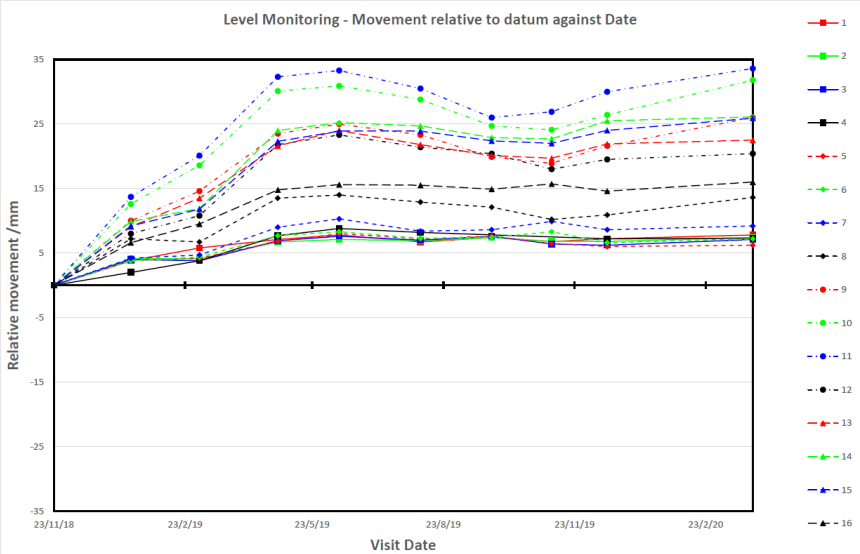
Project Description

Optera have been asked to provide quote for the provision of a tree root barrier to protect the property form the ongoing effects of tree root induced clay shrinkage subsidence. We understand that the owners submitted a claim following cracking in 2018 and the claim appears to be managed by Sedgwick. The property is a detached property of traditional cavity masonry construction, surmounted by a pitched tiled roof. The property occupies a relatively level site and is located at the end of a quiet residential cul de sac. To the rear of the estate is a large arterial A road with a roundabout which is lined with vegetation and some established trees which we understand are owned and managed by the local authority.

Investigations so far include level monitoring, a soils investigation and an arborists report. The site investigation, undertaken by Auger in February 2019 confirms the main property is founded on a concrete strip footing 1100mm thck, bearing onto a stiff, brown, gravelly, silty, sandy CLAY at a depth of 1800mm BGL and roots were discovered at the front left hand corner of the property to a depth of 2.5m BGL. There is a conservatory to the rear of the property which is founded on a concrete strip footing, 450mm thick, bearing on to stiff, brown, gravelly, silty, sandy

CLAY with roots noted to 1.5m BGL. Both boreholes were terminated at 3m BGL and were undertaken by hand auger. The disparity between root depth at the front and rear is anomalous and we would anticipate that roots at the rear of the property would be as deep as they are recorded at the front of the property given that the trees are located at the rear and root depth generally increases with proximity.

The level monitoring has been undertaken by CET over an extended period and indicates a cylical pattern of movement. In fact the recovery of the ground following the dry summer of 2018 is most notable during the winter of 2018/19 with upward movements in excess of 30mm recorded in the conservatory and around the rear of the property which is entirely consistent with clay shrinkage subsidence.



Since the first winters recovery, we have scene a fairly sedate cyclical pattern of movement, consistent with the more benign weather patterns since the extremes of 2018. The more significant movement however is recorded towards the rear of the property.

The arboricultural report produced by PRI, dated, July 2019 recommends that T1 and T2, Oak trees are felled and the stumps treated to prevent re-growth. The site plan indicates their relative positions to the property:

Given the position of T2, offset to the left of the property, a barrier would need to extend into the left hand neighbouring property to provide holistic protection and to prevent this being outgrown by the tree roots. A barrier is formed by excavating a 300mm wide trench to the prescribed depth. In this instance, we would suggest 3.5m. The spoil will be transferred to a dumper and conveyed to the driveway of the risk where it will be stockpiled on boards and periodically collected by grab lorry. The barrier is progressed in 5m sections to minimise the impact on prevailing weather on the stability of the trench. Once the first section is excavated, we will line the trench with the copper impregnated bio-barrier and backfill with 20mm single sized angular stone to within 200mm of the surface. The leading edge of the excavation is bunded with sheet piles to prevent the stone migrating into the active excavation and the process is repeated until all of the barrier is installed. Once complete, the trench will be topped up with lightly compacted topsoil and the turf reinstated. The site will be cleaned down and the area left tidy.

In this instance, our estimate is based upon a desktop assessment of information collated and supplied by Tree Law. It is unclear how much enabling and hard landscaping is required, but it appears minimal within the risk address with paved areas visible within the neighbouring property. It is impossible to ascertain the works involved from the aerial images available and we have assumed a turf based excavation for the purpose of the quote. The aerial image below indicates the size and position of the proposed barrier:

Works in Brief for barrier

- Board and protect the drive and area adjacent to the road for storage of spoil and materials

- CAT scan all working areas and determine the line of any incoming services and mark clearly on the ground. Any conflicting services are to be hand excavated and exposed prior to any machine excavation.
- Remove and set aside a section of fence between the two properties and place to one side for later reinstatement.
- Mobilise plant and delineate works area with herras fencing.
- Commence machine excavation of the trench, digging a 300mm wide trench to 3.5m in depth and all arisings are to be transferred to a dumper and conveyed to the spoil storage area. This will be periodically cleared by grab lorry.
- Once the first 5m has been excavated, line the trench with the copper impregnated bio-barrier and backfill with 20mm single sized, angular stone. The leading edge of the excavation is to be bunded with sheet piles to prevent stone migrating into the active excavation.
- Repeat the process until all 33m of the barrier is excavated and installed.
- Once all of the barrier has been installed, the trench will be topped up with compacted topsoil and new turf placed over the trench. .
- All waste, welfare and protections are to be lifted and removed and the fence reinstated. The site will be left tidy upon completion. We assume access to water and electric for the duration of the works.

Project Fee

- The total value for the services detailed in this SOW, including contract management, all labor, plant and materials (unless detailed via a PC SUM) totals
- Root barrier installation: **£36,700+VAT**

Completion Criteria

Contractor shall have fulfilled its obligations when:

- Contractor accomplishes the Contractor activities described within this SOW
- The Policy Holder is in agreement 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 Sedgwick Engineer
- Site has been vacated and all plant and materials removed for which Optera are responsible

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 Sedgwick. 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 Sedgwick engineer and OPTERA will seek formal approval via Sedgwick
- Upon completion of the variation works, these will be invoiced separately to the initial authorized project.

Intervention Explained

How do Copper Root Barriers work ?

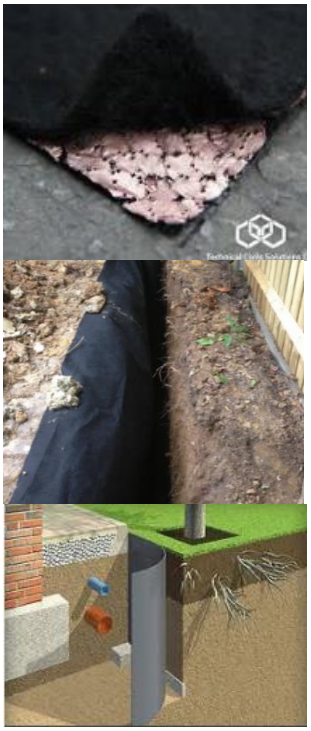
In the UK the shrinkage and swelling of clay soils, particularly when influenced by trees, is the single most common cause of foundation movements that damage domestic buildings.

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 Bioroot 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 Bioroot-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 cooper 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 50-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 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.

Specification 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	33m	2.5m	3.5m	5m	4m