A.T.K. PARTNERSHIP

CIVIL & STRUCTURAL ENGINEERING
CONSULTANTS

REVISION A – NOVEMBER 2023

STRUCTURAL APPRAISAL ON FOUNDATION OPTIONS

PROJECT : PROPOSED HOUSE at EAST END, LOCHWINNOCH

CLIENT : Mr D JOHNSTON

PROJECT REF NO : 16781

DATE : DECEMBER 2022

33 UNION STREET
GREENOCK
PA16 8DN

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Email: mail@atk-partnership.co.uk

1.0 Introduction

1.1 ATK Partnership were invited to review the options available to form the foundations for the proposed house with particular attention being paid to the close proximity to the existing trees.

2.0 Scope of the report

2.1 The scope of the following report was to investigate the various foundations readily available and to advise on the best solution. A site inspection was carried out on the 8th December 2022.

2.2 The investigation comprised a visual non-disruptive inspection of the site and no trial pits or boreholes were carried out.

2.3 A topographical survey was made available along with a tree condition report prepared by Ayrshire Tree Surgeons.

2.4 Photographs are also included which help to identify the density of the present growth on site.

3.0 Observations

3.1 The site comprises a long almost rectangular shaped site with a broader triangular shaped section to the rear. It lies opposite the church known as Auld Simon and at the junction of Johnshill and East End.

3.2 The proposed house will be detached, probably a one and a half storey built in timber frame construction and located as shown on the attached plan.

3.3 The main trees which will be closely affected are shown on the site plan along with others lying outwith the building area.

3.4 The construction using timber frame will be fairly light around 35kN/m and may have a brick outer cladding but also may have a timber cladding as an alternative.

3.5 The ground floor construction is likely to be a suspended concrete floor with integral insulation to help form the U-values.

3.6 Since the tree survey report some of the badly affected (rotted) trees have been taken down in line with the recommendations of the tree report.

4.0 Foundation options

4.1 **Traditional strips**

4.2 On the basis that the soil conditions are favourable and ordinary strip foundations are possible these would be expected to be constructed at around 600mm down from the proposed ground.

4.3 However the foundations will be prone to damage by the remaining roots of the trees and in line with guidance by the NHBC consideration must be given to the use

of trench fill concrete to take the excavations below the level of anticipated damage. Along with the use of trench fill it would be sensible to use a root barrier system to help prevent damage to the founds.

4.4 The excavations for the foundations may also do damage to the root infestation locally within the house footprint with any remaining trees also affected by this root loss.

4.5 **Raft Slab**

4.6 Due to the light loads involved a simple slab raft would also be a suitable option sitting on a cushion of compacted hardcore.

4.7 However due to the preferred detail of having a limited excavation the existing roots will still exist under the raft slab, probably through the hardcore, and may lead to structural damage to the slab in time.

4.8 **Piling**

4.9 Piling would be solution by excluding the loads being taken down on to the immediate sub-surface soils. Due to the nature of the piles involved the loads would be taken further down into the sub-soils and below the level of the expected root bowl. The perimeter walls and any internal loadbearing lines would be supported on concrete ground beams spanning between the piles.

4.10 The ground floor would be constructed with either a cast in-situ concrete slab supported on a permanent steel sheet formwork such as Holorib or Ribdeck. This would help to support the floor and span across the top of any root system below the footprint of the house. An alternative could the use of beam and block flooring which is a sectional floor system but again spanning clear between the ground beams.

4.11 There are various piling systems available using driven steel tubes or continuous flight auger piles which all do the same job of transferring the loads below the sensitive areas.

5.0 Recommendations

5.1 On the basis of the above options and trying to limit the damage on site we are of the opinion that a system of piling using Shire stabilisers or similar would prove to be the best option. These are small scale piles developed for the domestic market and do not require heavy specialist plant that could damage shallow roots.

5.2 The advantage of using such a system is the small scale nature of the piles which are driven in manually without the need for heavy plant traversing the site. Should tree roots appear within the piling area it should be easy to move the location of the piles to miss these.

5.3 From the information available at this stage we are of the opinion that a suitable footprint of around 10 x 7m should be capable of fitting between the remaining trees. A final design can be agreed in due course.

5.4 Following recent discussions with Shire Structural Solutions, it has been suggested that fewer number, larger diameter mini-piles would be an effective solution to avoid the roots, thereby minimising damage to the mature trees. These piles would be positioned on site outwith locations which would compromise tree integrity. A reinforced concrete floor slab would span between ground beams, which would be designed to cantilever across the piles, facilitating changes to the pile setting-out on site.

"*Assuming a larger diameter pile supporting a flat RC slab (say with anti-heave measures) is proposed, this would result in minimal disturbance. However, when we are this close to trees and piling under the tree canopies, there is a risk of obstructions from roots. This may make it necessary to change the pile locations on site to avoid the larger roots, which may incur additional costs.*"

Darren Whitehouse, Shire-UK, 17.11.23

5.5 Exploring the use of a piled system, Shire Structural Solutions have provided the following.

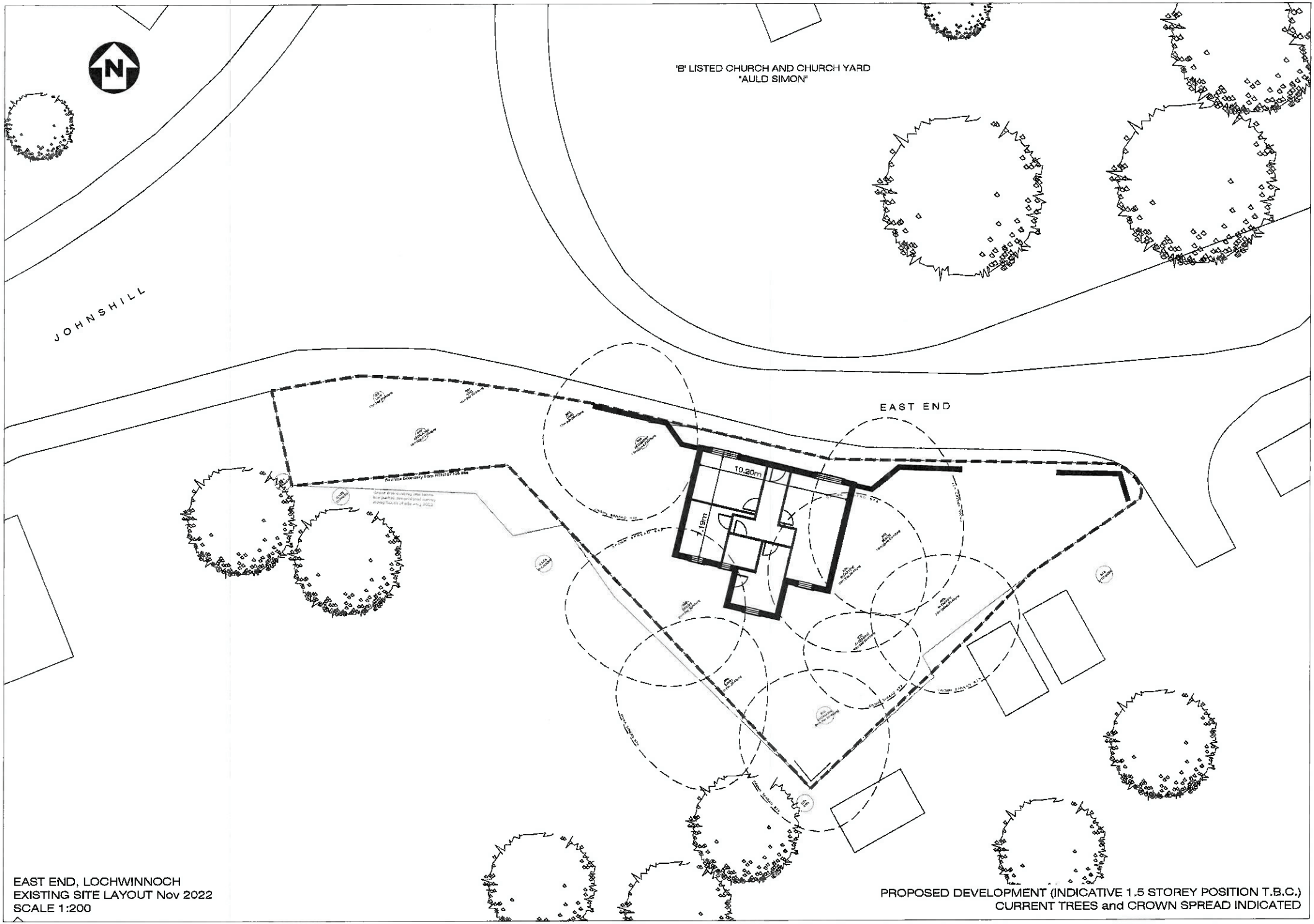
"Tracked rig specification attached, this is a mid-range sized rig, so could be a little bigger depending on the soils we are drilling into. Generally these rigs require around 2.4 to 2.9m head room to set up for the drilling.

These rigs can be manoeuvred through properties so I don't see there being a problem with access through the trees…"

Darren Whitehouse, Shire-UK, 23.11.23

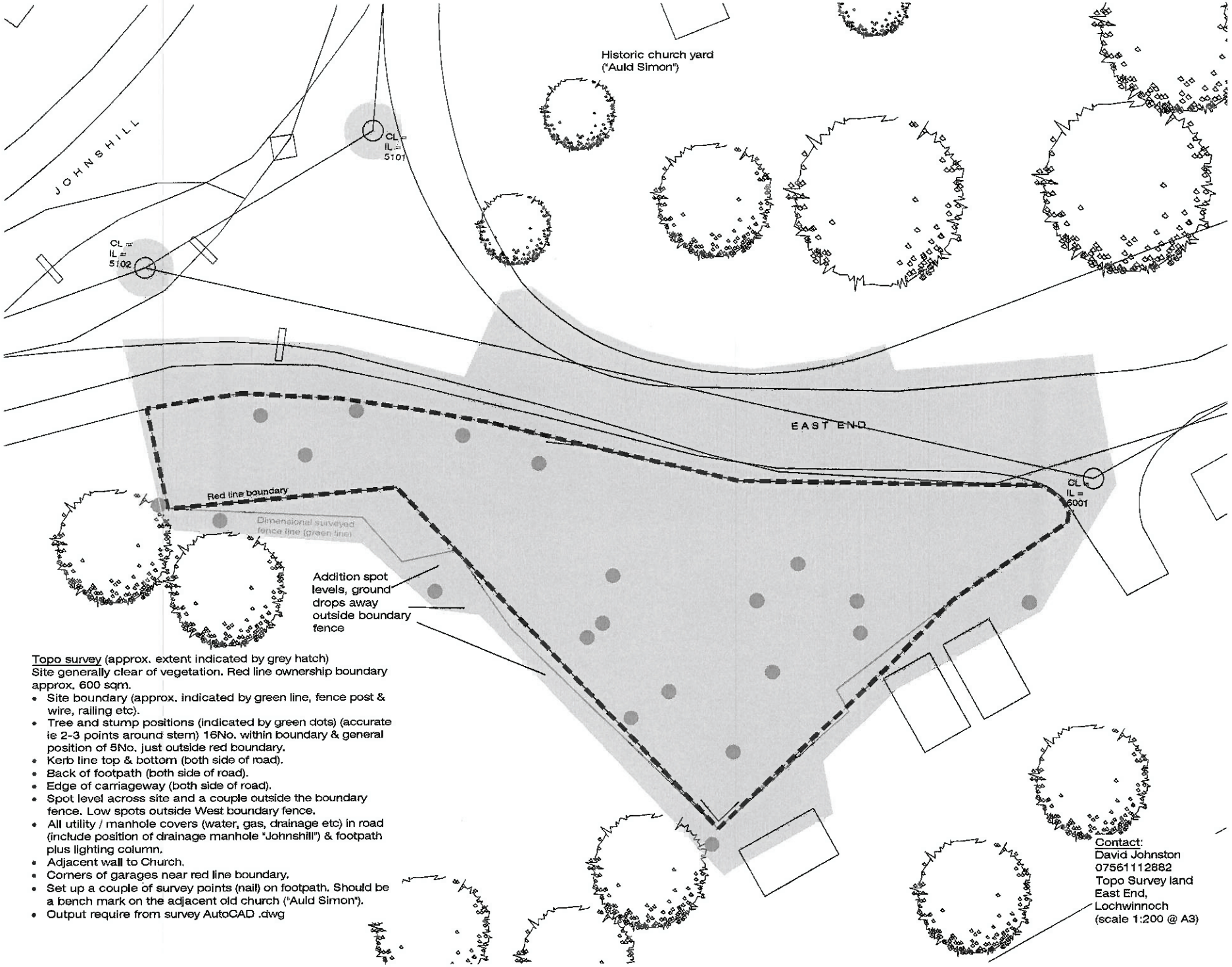
As discussed, drilling rig specification attached, of which it should be noted that this is capable of working within confined spaces.

5.6 To conclude the recent design review carried out, we are of the opinion that using a piled solution would allow the foundations to be carefully set out in a manner to avoid damaging any of the large trees and associated roots across the site. The method of using mini-piles would result in a lightly loaded rig with a low clearance height that would not breach the tree canopy.



EAST END, LOCHWINNOCH
EXISTING SITE LAYOUT Nov 2022
SCALE 1:200

PROPOSED DEVELOPMENT (INDICATIVE 1.5 STOREY POSITION T.B.C.)
CURRENT TREES and CROWN SPREAD INDICATED



Topo survey (approx. extent indicated by grey hatch)
Site generally clear of vegetation. Red line ownership boundary approx. 600 sqm.

- Site boundary (approx. indicated by green line, fence post & wire, railing etc).
- Tree and stump positions (indicated by green dots) (accurate ie 2-3 points around stem) 16No. within boundary & general position of 5No. just outside red boundary.
- Kerb line top & bottom (both side of road).
- Back of footpath (both side of road).
- Edge of carriageway (both side of road).
- Spot level across site and a couple outside the boundary fence. Low spots outside West boundary fence.
- All utility / manhole covers (water, gas, drainage etc) in road (include position of drainage manhole "Johnshill") & footpath plus lighting column.
- Adjacent wall to Church.
- Corners of garages near red line boundary.
- Set up a couple of survey points (nail) on footpath. Should be a bench mark on the adjacent old church ("Auld Simon").
- Output require from survey AutoCAD .dwg

Contact:
David Johnston
07561112882
Topo Survey land
East End,
Lochwinnoch
(scale 1:200 @ A3)

16781 – Proposed dwellinghouse at East End, Lochwinnoch – Site photos 8 / 12 / 22

View along East End looking towards Johnshill (Main Street)

View of possible development area with some trees felled in the distance

Tree Condition Survey

Land adjacent to the Old Simon Kirk, Johnshill
East end, Lochwinnoch

14th June 2022

Prepared for
Mr & Mrs Johnston

Prepared by
C. A. Calvey, P.T.I., Tech.Cert (Arbor.A), Cert.Arb (RFS), BA Hons.
Principal Arboricultural Consultant
Ayrshire Tree Surgeons Ltd


View from tree 862 towards East End Road


Ash 867 for removal

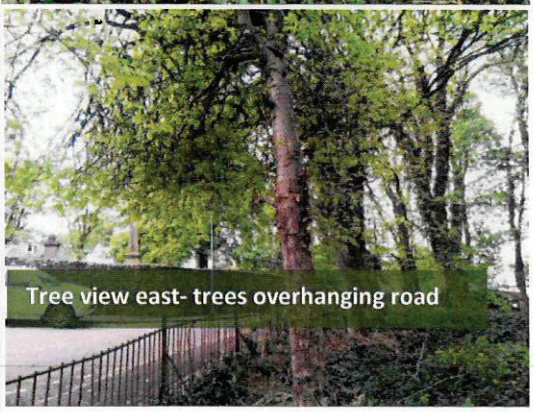

876 with basal decay for removal


Tree 870


Tree view south from East end road


Tree view west


Tree view south west from East end road

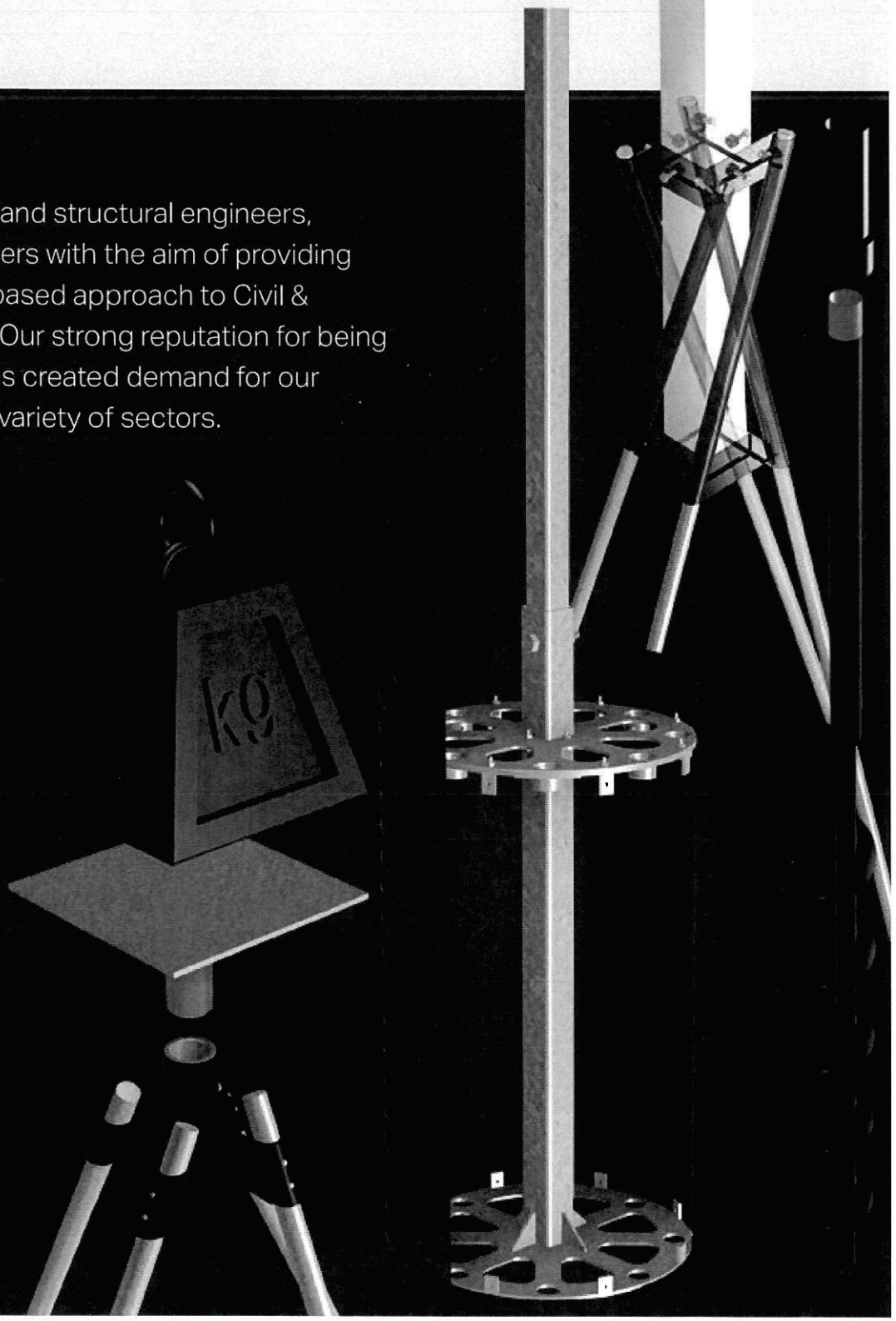

Tree view east- trees overhanging road

Shire

Innovation in Foundations

Bringing fresh thinking to civil & structural engineering

Shire are a team of civil and structural engineers, consultants and designers with the aim of providing a responsive, solution-based approach to Civil & Structural Engineering. Our strong reputation for being "Thinking Engineers" has created demand for our services across a wide variety of sectors.



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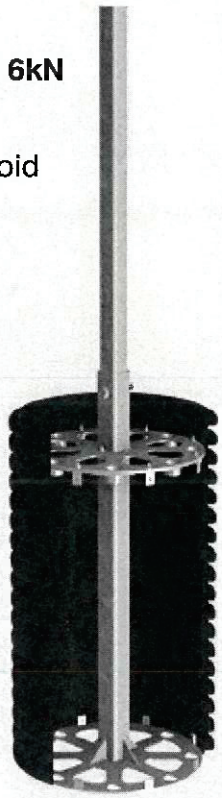
ShireGroundfillBase

SUPPORTS SIGNS UP TO 1MX1M INSTALLED IN 1 HOUR

- Tested with lateral forces of **6kN**
- No concrete
- Spoil is backfilled into the void
- Reusable and recyclable

- Designed to loading & ground conditions
- Installed with hand-held equipment
- Also available in 1.5m, 2m, 2.5m & 3m ground anchors
- Height adjustable

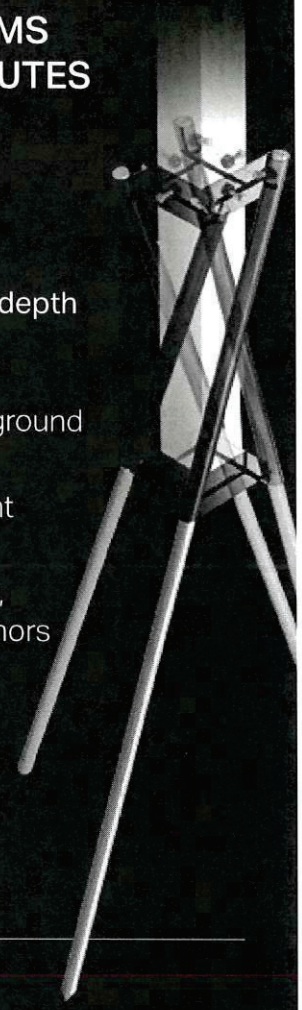


ShireRootBase *D-Range*

SUPPORTS PLATFORMS INSTALLED IN 30 MINUTES

- Fast installation time
- No concrete
- Reusable
- installed below typical depth of services

- Designed to loading & ground conditions
- Installed with lightweight post driver
- Available with 1.5m, 2m, 2.5m & 3m ground anchors
- 700mm height



ShirePile

SUPPORTS LOADS UP TO 7 TONNES INSTALLED IN 1 HOUR

- Fast installation time
- A solution for all soil types
- Unique patented design
- Instant load capacity

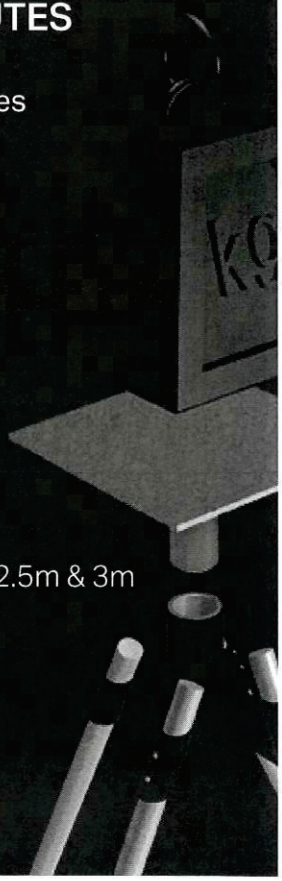
- Installed in confined spaces
- Low ground disturbance
- Up to 10m deep
- Available with 1m, 1.5m & 2m helical bases

ShireRootBase *S-Range*

SUPPORTS LOADS UP TO 8 TONNES INSTALLED IN 15 MINUTES

- Tested with vertical forces of **over 8 tonnes**
- Available in over 10 configurations
- No concrete
- Reusable

- Designed to loading & ground conditions
- Installed with lightweight post driver
- Available with 1.5m, 2m, 2.5m & 3m ground anchors
- Compact size



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RAILWAY INDUSTRY SUPPLIER QUALIFICATION SCHEME
RISQS
AUDITED

What our clients think...

> The team could not have been more helpful

> I am very pleased. Very efficient, sincere & hard working. They explained every step within the works - well done to you all

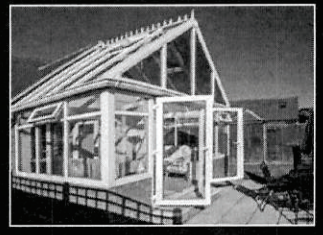
> The work on site was excellent, it was kept so clean & tidy

Applications

Garden rooms

SIPS panels

Single storey extensions



Conservatories / Orangeries

About Shire

The QuickBase Foundation System was designed by Structural Engineers at Shire and patented in 2008. Since it's launch, 12 million m2 have been installed across the UK. QuickBase is a multi-award-winning flooring, beam and pile system. A totally unique foundation system for conservatories and single-storey structures, revolutionising conventional construction methods.

Shire

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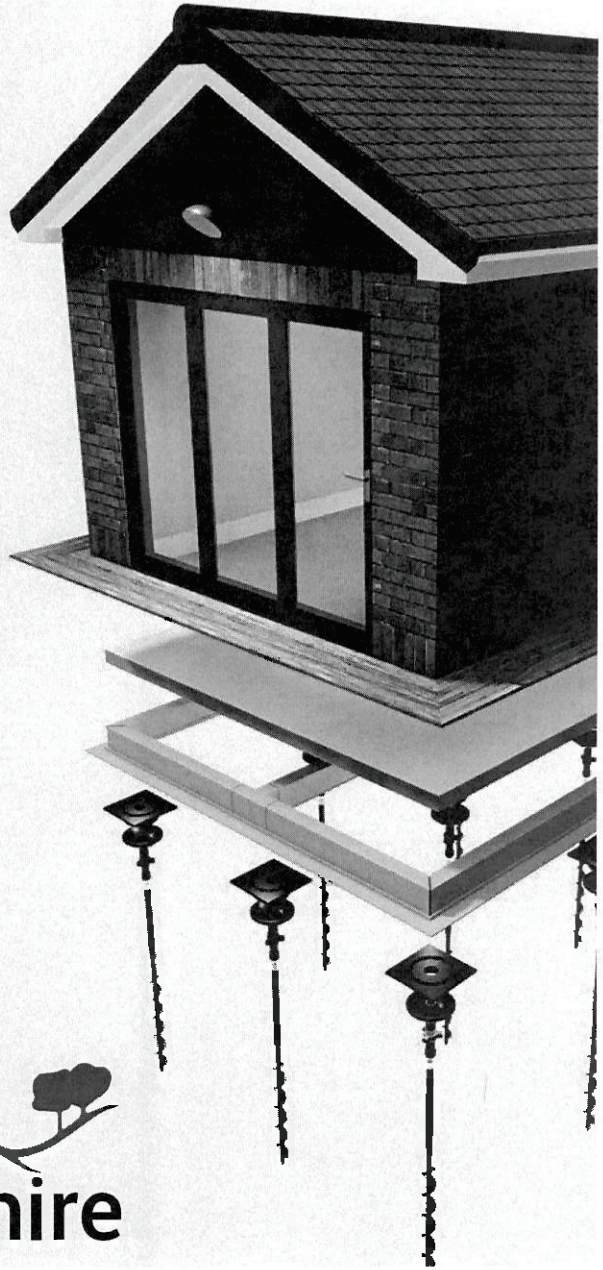
RICS CHAS The Institution of Structural Engineers ice institution of Civil Engineers SafeContractor APPROVED

QuickBase Foundation Systems

Foundations to protect your investment



Shire

Why?

Protecting your investment - what steps can be put in place to prevent foundation problems occurring?

Below are 4 practical steps to consider:

- Don't accept a 'one size fits all' foundation
- Take reasonable precautions to mitigate against the effects of nearby trees and soft soils
- Choose the right kind of foundation for your building
- Consider access requirements & restrictions. Ask for advice if needed

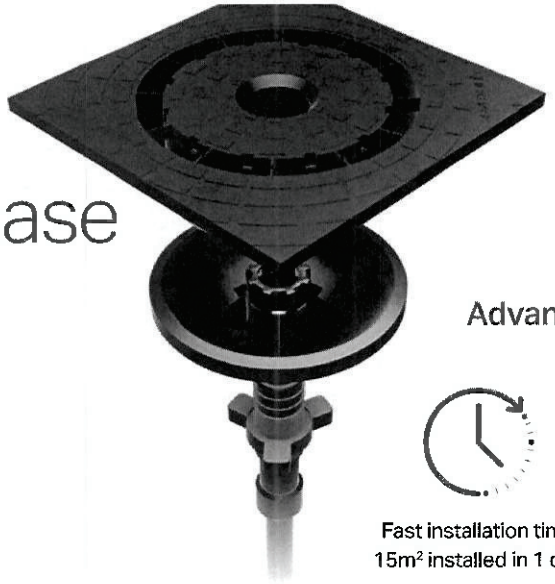
The foundations are one of the most important parts of your building investment. Often more time is spent considering the type of floor tiles than the foundation type. Foundations are often specified as a standard design 'to be confirmed on site'. This can lead to inappropriate foundations being constructed. It is essential that adequate thought is given to the foundation type and depth before work starts on site.

At Shire we design foundation systems for a wide range of project types. We have developed patented systems like QuickBase giving deep piled foundations that can be taken down to depths below the zone of influence of any tree roots or down to 20m in soft soils to find 'good ground'. QuickBase has also been designed to be installed in areas where parking & access is restricted. Foundations are installed quickly, often leading to cost reductions in the overall schedule.

Where there are unknown ground conditions, our geotechnical team can investigate and give advice on the appropriate solution. For more information, including a detailed guide contact engineers@shire-uk.com

ShirePile >
Supports loads of up to 70kN

ShireQuickBase



About the system

- Designed by Structural Engineers
- Made in the UK
- Unique patented design
- Achieves U-values of 0.02 W/m2K
- Combined floor, beam & pile solution
- Installed on a Shire Pile as standard

The modular system is based on helical screw piles, which support lightweight, part-recycled plastic ground beams connected via a series of push-fit joints to form a frame. The ground beam is then filled with a specially formulated non-shrink grout to give a high strength composite beam. The frame carries the load of the building through the piles to suitable bearing strata, uniquely removing the need for mass concrete foundations. It is then fitted with a premanufactured damp proof floor slab onto which the inner wall of the conservatory or extension is built.

QuickBase is particularly cost effective when working in confined spaces, where soil conditions would usually require deep excavation, where limited parking restricts the ability to remove the spoil associated with deep excavation and where trees are near the built site.

The QuickBase system doesn't require wet trade finishing, so labour costs are cheaper and build time is faster. The foundations can be quickly installed rapidly with up to 15m2 installed in a day.

Unlike traditional foundations, QuickBase is ideal for less than perfect ground. The piles are generally driven to 4m depth (deeper if required), guaranteeing suitable load-bearing strata, and avoiding troublesome tree roots.

QuickBase is fully compliant with Building Regulations and designed to meet Local Building Control standards. Our Engineers work in partnership with both Local Authority and Private Building Control to ensure all requirements are met. We also offer technical CPD's to any teams not familiar with the system.

Advantages of the system

Fast installation time
15m² installed in 1 day

No need for mass concrete foundations

Reduces site excavation work

Minimises spoil to landfill

Other piling systems available

ShireClayPile
Anti-heave engineering

ShireRootBase
Installed in 15 minutes

Hydraulic Large Plant
HP-T5000
Tracked Auger Rig

Plant No:	HP-T5000
Supplier/Manufacturer:	G P Services Seafire Works Henstridge Industrial Estate Henstridge Templecombe Somerset, BA8 0TN Tel: 01963 363866 (Dave in Sales)
S/M Ref No:	ce. 903906
Description:	Tracked Auger Rig Can be used with different augers.
Maintained By:	
Attachments:	Big Hydraulic Power Pack Augers
PPE:	Standard Site PPE
COSHH:	Hydraulic Fluid
Weight:	1350kg (rig only)
Ancillaries	1.5m “Travel” hoses 10m Hoses (x4) [LP018] 25m Hoses (x4) [LP013]

The T5000 consists of a 1.0 tonne robust drill rig mounted on extendible rubber tracks with the added feature of a hydraulic mast 'jack down' for added stability when piling. The T5000 is capable of working within a confined width of 720mm and can easily be maneuvered through a standard household doorway. When operating in unrestricted working areas the T5000 opens up to 1020mm in width. The minimum working height required is 2250mm with the capabilities of installing up to a 320mm diameter pile to a maximum depth of 12.0 meters. The T5000 has a torque capability of up to 0.3 tonnes. The T5000 also has the capability to tilt its mast angle from -5 to +90 degrees which gives the advantage of enabling the machine to carry out horizontal drilling. With the aid of a bolt-on air flush assembly the rig can also be easily transformed into a DTH System. The T5000 Piling Rig comes complete with a super silenced 30kW power pack which can be detached and used up to a distance of 50.0 meters away. This feature is particularly useful when working within restricted or limited access areas where operating space is an issue.

T5000

view technical specification click here

Full Specification

HEIGHT WHEN DRILLING	2200mm
MINIMUM WIDTH	720mm
MAXIMUM WIDTH	1020mm
WEIGHT	1300kg
MAST LENGTH	2200mm
FEED STROKE	1350mm
RECOMMENDED DRILL TUBE LENGTH	1.0 metre
ROTARY HEAD	90rpm
MAXIMUM TORQUE	5000Nm
TEAR OUT FORCE ON MAIN RAM	2500kg
MAST ANGLE	-5 + 90 Degrees
TRACK WIDTH ADJUSTMENT	Hydraulic
HYDRAULICS	4 Hose System
HYDRAULIC HOSES	15.0 metres
POWER PACK (SUPER SILENCED & TOWABLE)	DEUTZ BF41011
POWER OUTPUT	30kw @ 2500rpm
WIDTH OF POWER PACK	1400mm
LENGTH OF POWER PACK	1800mm
HEIGHT OF POWER PACK	1600mm

close window