

2.8 SOIL RESOURCE SURVEY

The following is a summary of the Soil Resource Survey Report, December 2016, by TOHA, Ref- TOHA/16/3995/CS

TOHA evaluated the nature of the soils by firstly conducting a desk study review of available information (soil and ecological maps). This was followed by assessing a number of key chemical and physical soil properties by a combination of on-site investigation and laboratory analysis.

The site assessment found the soils to be variable in texture over the site, with 3 typical soil profiles encountered, as outlined below (refer to plan opposite):

- Profile 1 – Light to Medium Textured Soils. Sandy loam topsoil over sandy loam or sandy clay loam subsoil. This was the most commonly recorded profile and was found at TH1 – TH4, TH19 and TH21 – TH32.
- Profile 2 – Woodland Soils. Similar to Profile 1, including a distinct surface humic layer. Observed within the areas of woodland at TH5 – TH8 and TH15 – TH18.
- Profile 3 – Heavy Textured Soils. Clay loam topsoil over clay loam or clay subsoil. Recorded within the southern part of the site towards the River Thames at TH9 – TH11 and TH20.

CONCLUSIONS FOR THE RE-USE OF THE SITE SOILS

Considerations of Profile 1 and 2 Soils:

- Prone to structural degradation
- Care to be taken with soil handling
- Sufficient soil structure to enable satisfactory drainage and aeration
- Texture is suitable for most general landscape applications, including shrub planting, native transplants and grass establishment
- Suitable for smaller sized rootballed tree planting
- Imported topsoil recommended for larger rootballed trees
- Glass found in profile 2 samples - appropriate safety precautions would need to be adhered to during any vegetation clearance and subsequent cultivation/ planting works
- Strongly acid to slightly acid (occasionally slightly alkaline) soil reaction (topsoil and subsoil) means that the species selected should ideally have a wide pH tolerance, or have a preference for acidic soils. If it is desired to plant species that prefer or require alkaline soils, a suitable application of lime may be required in the locality of these specimens. However, it would not be practical to amend the pH of the subsoil and therefore, the planting

of species that specifically demand alkaline soil is not recommended within the majority of the Park.

Considerations of Profile 3 Soils:

- Prone to seasonal waterlogging following periods of prolonged or heavy rainfall
- Prone to structural degradation during landscape preparation and planting works which will further reduce their permeability
- Require careful handling and sensitive soil management to ensure they are fit for planting or seeding.
- Suitable for a range of planting types, provided species tolerant of moisture retentive soils are selected
- The heavy texture is not ideal for large rootballed tree planting and as such, suitable imported soils are recommended for this purpose
- Soils were alkaline to strongly alkaline in reaction and, as such, specimens planted in the locality of these soils should be tolerant of alkaline soil conditions.

Fertility Status:

- Topsoils across the site contained sufficient reserves of organic matter and as such, no applications of organic ameliorant (e.g. compost) would be required.
- The samples contained sufficient levels of total nitrogen and magnesium, with significant deficiencies in extractable phosphorus and potassium recorded within the majority of the samples.

Further work recommended:

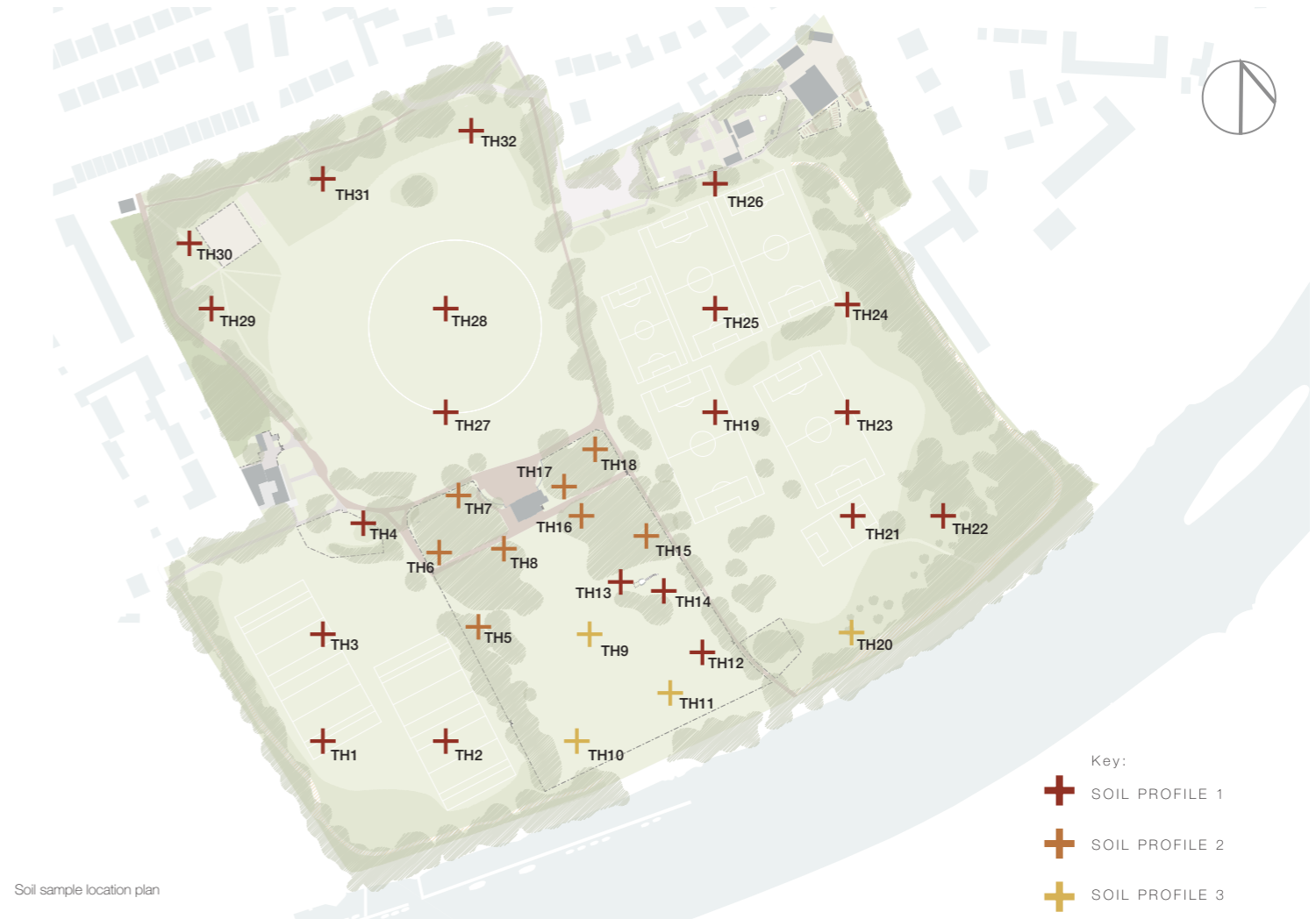
- Soakage tests are recommended for any zones of new tree planting to determine any necessary drainage requirements, particularly if large semi-mature specimens or demanding species are to be selected.
- An additional soil investigation is recommended for the grass areas that are used for events to identify what measures can be taken to improve the physical properties and wear tolerance of the soils. This could also provide input into a grass management plan for these areas.

UXO

Marble Hill Park has been identified as a site requiring a UXO threat mitigation strategy in place following the report prepared by CET, Explosive Ordnance Threat Assessment (EOTA) January 2017.

Generic Human Health Assessment

In December 2016 CET were instructed to undertake an



assessment of shallow soils located beneath two portions of the Marble Hill House study site. The aim of the investigation was to ascertain whether soils exposed by proposed construction works could be impacted by contamination and have the potential to pose a significant risk to human receptors including construction workers and future visitors to Marble Hill House. The portion of the site adjacent to Marble Hill House within which TP06 to TP08 were formed is earmarked for landscaping inclusive of the cultivation of edible plants.

In this instance the assessment criteria that consider a sensitive 'residential with home grown produce' (RwHP) end use have been selected to perform a screen of the data. The recorded concentrations of the various determinants tested were relatively low in all instances and did not exceed the corresponding threshold criteria for either of the end use

scenarios considered. Furthermore, asbestos was not encountered in any of the eight samples of Made Ground scheduled for laboratory inspection. Based on the results obtained it is judged that the tested soils are unlikely to pose significant risk to future site users.

Notwithstanding the above it should be noted that a fragment of asbestos was encountered by others in an archaeological trench formed to the immediate east of Marble Hill House. This asbestos is judged to have the potential to pose a risk to future site users by the dust inhalation exposure pathway. In order to provide a better understanding of the risks posed by asbestos in soils we would recommend a supplementary phase of targeted ground investigation to enable to recovery of additional soil samples within the affected area to the east of Marble Hill House.

2.9 SPORTS PITCH AGRONOMY SURVEY

Football pitches

The football pitches are currently hired by around 17 different teams, ranging from under 8's up to senior age groups, with varying frequency throughout the year. Four senior sized pitches, one junior and one 5-a-side pitch are currently marked out for hire in the east meadow. The pitches do not suffer from flooding problems, however would benefit from pitch leveling and grass sward improvements. A complementary summer sports programme would enable an extended period of activity and revenue generation on these fields. This programme will be worked up in the development phase.

Rugby pitches

The rugby pitches are hired regularly by three senior teams. There are two rugby league pitches marked out in the west meadow. The pitches do suffer from flooding, making them unusable in some cases. The pitches would benefit from field drainage, decompaction and grass sward improvements.

Cricket pitch

The cricket pitch is currently hired by twelve teams with varying frequency. One pitch is marked out on the Great Lawn to the north of the House and has a synthetic wicket. The pitch would benefit from decompaction and grass sward improvements.

Hard tennis courts (x2)

Two tennis courts are located in the north-west corner of the park. They can be hired on a casual basis, but are also frequently used by private tennis coaches. The synthetic court surface is beginning to deteriorate and would benefit from improvements.

Cricket nets (x2)

Two practice cricket nets are available for hire. The wickets and nets are in need of refurbishment. The nets like the tennis enclosure are visually intrusive and require screening to more sensitivity integrate them into the park landscape.



Sport pitch studies, winter configuration option one - existing



Sports fields in the east meadow

The following is a summary of the Sports Pitch Agronomy Survey Report, December 2016, by TOHA.

In December 2016, TOHA carried out an agronomic assessment to ascertain the current condition of the existing pitches and cricket field in line with Sport England guidelines to assess surface evenness, rooting depths, ground cover, weeds, pests and disease.

The survey included a reinterpretation of the findings from the existing Soil Resource Survey (ref. TOHA/16/3995/CS, dated 03/11/2016), to provide information on soil fertility, soil depths and types, compaction and aeration. In-situ topsoil infiltration tests have also been carried out as part of the site work.

RECOMMENDATIONS

Levels and Microrelief

- Major modifications to the overall levels of the pitches are not required
- Selective re-grading is recommended, particularly across the football pitches

Flooding

- South-western part of the site is susceptible to flooding which can disrupt use of the rugby pitches
- If a drainage system is to be installed in this zone, it would be sensible to allow for the re-installation of secondary drainage (e.g. sand grooves) following flooding events to maintain the surface connection with the primary drains.

Shade

- The rugby pitches and many of the football pitches may be susceptible to shade and leaf fall.
- Selection of additional seed mixes and maintenance operations would need to take this into account

Pitch Orientation

- The current orientation of Pitch 6 (Junior 7 v 7 pitch) would fall outside the recommended range, however, nearby mature trees to the south alongside the river and to the west may mitigate the effects of low sun in the west.

Soil Quality

- Soils typically have low structural strength and are prone to structural degradation and compaction
- These conditions affect the function and usage of the sports pitch
- The overall proportions of stone should not constitute a

limitation for the sports pitches, provided the soil profile remains undisturbed and good grass cover is maintained. If any regrading is proposed in future, it may be prudent to carry out a stone reduction exercise during the works.

- The chemical composition of the soils is generally acceptable for sports pitch grass cultivars, provided the nutrient levels are supplemented by an appropriate annual fertiliser regime
- The soil pH in the cricket outfield area was found to be strongly acid (pH 5.0) and as such, application of agricultural grade lime could be beneficial. Perennial ryegrass typically prefers a slightly acid to slightly alkaline pH range (pH 5.5 – 7.5).

Turf Quality

- The overall quality of the turf is moderately high in relation to use for the sports catered for
- Evidence of wear was observed in play 'hotspots', such as football goal mouths and centre circles.
- Significant surface undulations were recorded within these hotspots and as such, localised infilling and regrading may be necessary here
- The existing maintenance schedule is fairly comprehensive and includes important operations such as aeration, overseeding, localised topdressing and a fertiliser regime.
- A more intensive maintenance programme may be considered to further improve the resilience of the sward and complement any new drainage infrastructure
- The overall condition and quality of the existing sports pitches was good, with satisfactory overall ground cover, soil depths, root development and grass species.

In summary recommendations include:

- Selective regrading of football pitches to include stone reduction.
- Drainage to south west pitches and ongoing maintenance of connections to primary drainage.
- Overseed with shade tolerant seed mixes.
- Manage tree canopy to avoid shade issues.
- Fertilize soils.
- Intensify maintenance regime to supplement existing good practice.

Please refer to section 4.6 for sports pitch proposals.



Sport pitch studies, pitch study numbering and infiltration locations



Plate 13: Slight wear in goal mouth – Pitch 4



Plate 15: Minor undulation <5 mm



Plate 14: Undulation > 25mm depth – centre circle



Plate 16: Patchy grass colour – cricket outfield

Pitch analysis

2.10 TOPOGRAPHY AND FLOOD RISK ASSESSMENT

Marble Hill Park sits on a plateau of land above 7m AOD, terracing quickly down towards the Thames in the southern Pleasure Grounds and West Meadow to around 4m AOD. The Great Lawn and Sweet Walk to the north is in the main level. In the East Meadow, the land dips into a bowl to around 6m AOD, making the football pitches un-level in places. Accessibility throughout the park is largely unimpeded with regard to landform, the main north south path to the east of Pleasure Grounds with the steepest gradient within the park is DDA compliant. Access to the Grotto is currently only possible via steps.

The original Flood Risk Assessment was carried out by Peter Brett Associates, on behalf of Land Use Consultants in October 2006 for English Heritage. Below is a summary of the report findings.

The Flood Risk Assessment found that the lower southern areas of the park frequently flood, reportedly up to 20 times per year. The report suggests that flooding occurs in four ways, outlined below:

- Increase of surface water run-off flowing intense rainfall events; the water then becomes trapped within the park due to lack of drainage
- Assumed overland flow originating from the lower land along Orleans Road
- Seepage path through the embankment when the river level rises above 4m AOD
- Over-topping of the embankment, which initially occurs at the low point of the embankment near the Warren Path gated entrance.

Peter Brett Associates have revised their Flood Risk Assessment in 2018, to take into account the project proposals and updated Environment Agency data.

SUMMARY

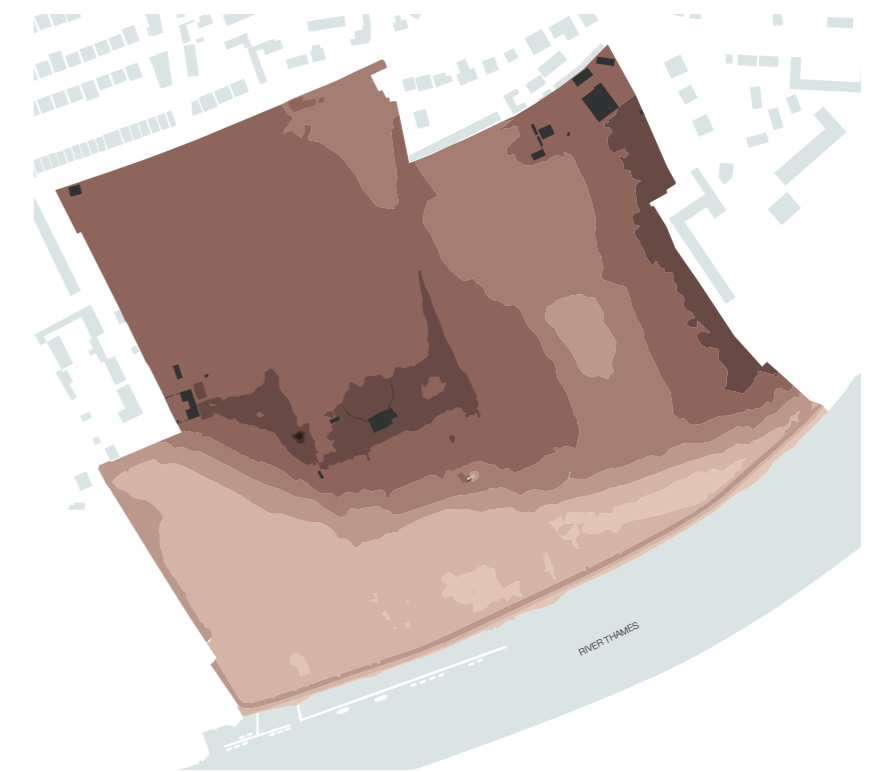
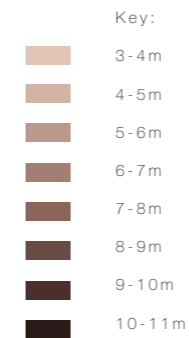
The Revised Flood Risk Assessment concludes that:

- The majority of the site is in Flood Zone 1. The south and southwest of the site are within Flood Zone 3. This has been confirmed by the EA modelling and the SFRA.
- In the modelled MLWL 2100 flood event, the majority of the site is not impacted, however the south and southwest is impacted by flood water depths up to a maximum of 2.3 m.
- Continuous dry safe access from the site is provided at the 1 in 100 annual probability plus climate change flood level via Richmond Road.
- The additional impermeable area associated with the café extension will drain via infiltration (subject to soakaway tests) into the adjacent ground.

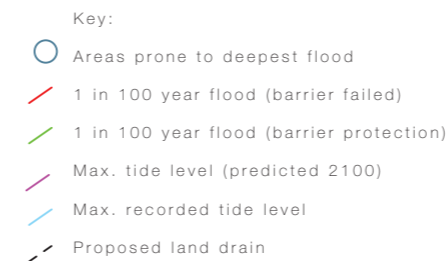
A Sequential approach has been followed for the proposed works at Marble Hill Park; the proposed 'Less vulnerable' café development has been allocated within Flood Zone 1 and the proposed 'Water Compatible' landscaping works have been allocated within Flood Zones 1, 2 and 3.

In conclusion, the future users of the proposed development will be safe from flooding and there will be no detrimental impact on third parties. The proposal complies with the National Planning Policy Framework (NPPF) and local planning policy with respect to flood risk and is an appropriate development at this location.

The full Flood Risk Assessment can be found in the appendices accompanying this application.



Topographic analysis



Flood Risk analysis

2.11 MARBLE HILL HOUSE LANDSCAPE INVESTIGATIONS

The following is a summary and extracts from the Marble Hill House Landscape Investigations, November 2015 to Feb 2017, by Historic England, authored by; Magnus Alexander and Edward Carpenter with Matthew Bristow, Gill Campbell, Matt Canti, Zoë Hazell, Neil Linford, Paul Linford, Andrew Payne, Cara Pearce Nicky Smith, and Sharon Soutar. Ref - ISSN 2059-4453.

The report provides a synthesis of the story of Marble Hill.

The research topics included:

- Lidar survey and analysis
- Analytical Earthwork Survey
- Coring
- Survey and identification of tree stumps within the quarters
- Geophysics

The report is structured to focus on the history and development of the park.

Conclusions of the research are presented in a narrative form and geographically, historically referenced to background information, including details of underpinning research.

Main points for consideration that expand on previously understood information specifically with reference to the Pleasure Grounds and Sweet Walk and notable commonalities between the design attributed to Pope (c.1724) and the c.1749 plan are summarised below.

The main common elements include:

- The approach from the east to an approximately semi-circular area in front of the house.
- The east-west walk south of the house.
- The north-south walk at its eastern end.
- The central lawn to the south of the house.
- The symmetrical curving features to either side of this (although on the c.1724 plan they appear to comprise a crescent shaped parterre bed with a path outside this and a wall beyond, there appears to be an arcade running around outside this; note what appear to be arches at the entrances off the lawn to north and south of the parterres).
- The general arrangement of quarters to either side of the house and to either side of the lawn.
- The presence of sinuous paths within the main eastern quarter.
- The extension south of this same quarter relative to that to the west.

- All of the above appear to be of a very similar scale to the c.1749 plan.

Lidar Survey and analysis

- Refer to report illustrative material.

Analytical Earthwork Survey

- Refer to report for detailed descriptions relating to scarps, ridges and topographic anomalies.

Coring

- Coring was carried out in December 2015 to determine the origin of the large, rectangular, sunken area to the east of the house.

Tree stumps

North West Quarter -

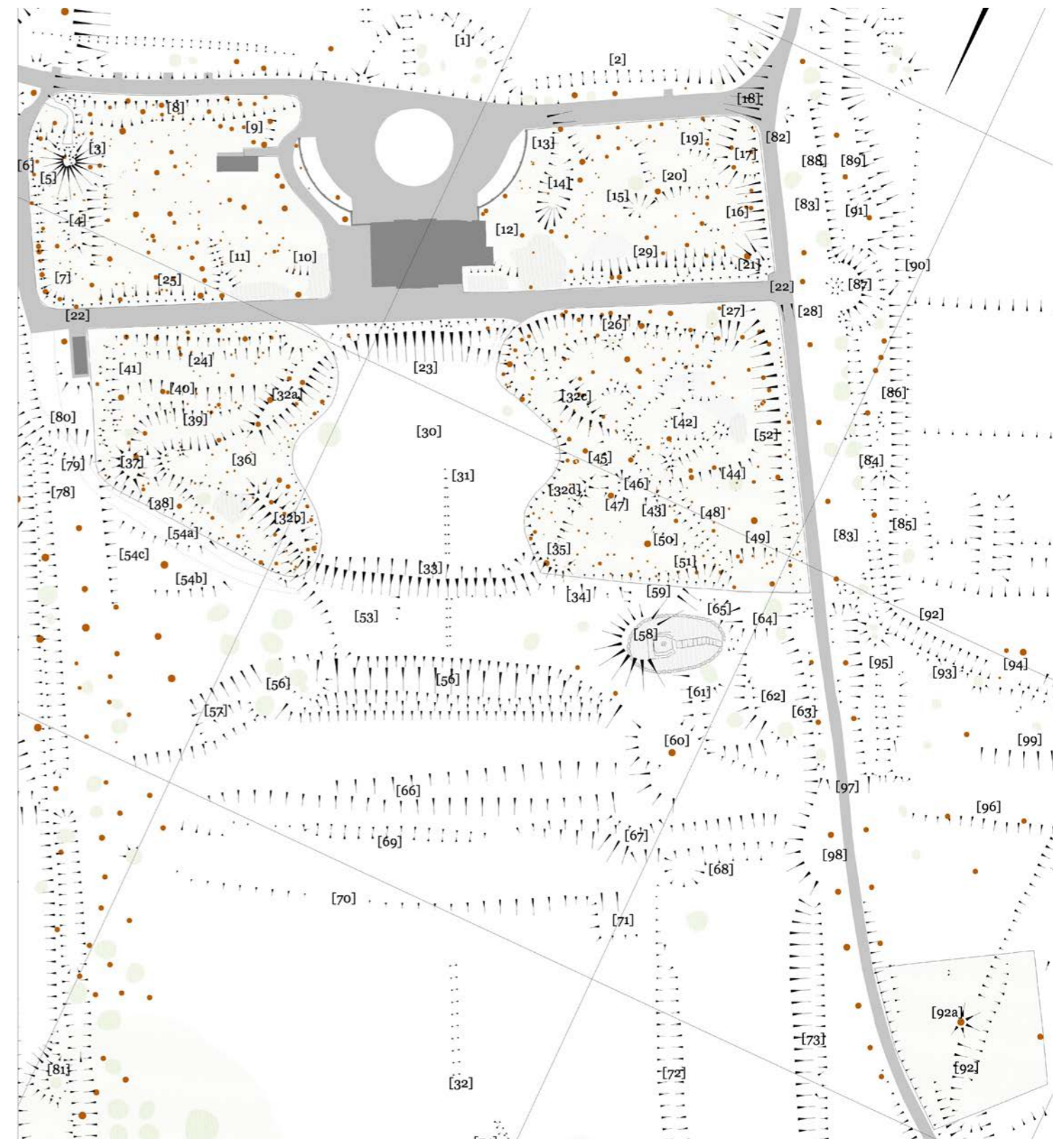
- Evidence of yew stumps throughout often under planted with butchers broom. The arrangement of which suggests that it was formally an evergreen screen or hedge.
- Box of considerable age was also recorded.
- Italian lords and ladies to the north and large lilac.
- Further evidence of evergreen screening to the eastern edge.
- Large specimen deciduous oak stump recorded.
- Small elm stumps observed with some self regeneration.

North East Quarter -

- Dominated by evergreen planting including yew and holly.
- Deciduous oak and elm stumps recorded suggesting former larger specimen tree species.
- False Acacia and Horse Chestnut also recorded to the edge of the quarter.
- Regenerated Holm Oak noted from older parent material.
- Former woodland planting evidenced with a single Italian lords and ladies surviving along with a comfrey and elder seedling. This suggests that woodland once extended beyond the current fencing since Italian lords and ladies tends to spread vegetatively by short creeping rhizomes.

West Quarter -

- Yew and holly under-planted with butcher's broom lining the eastern side and laurel predominate.
- Saplings and small dead elms were identified on the eastern side of the planting.
- Three oak stumps were also identified within the interior of the area, along with a single dead ash and a recently removed hornbeam (tree 1534).



Scrapes and ridges identified during the analytical earthworks survey
Extract from Marble Hill House Landscape Investigations, Historic England