Tree Radar UK Ltd

Root investigation by TreeRadar

SITE

Keats House
10 Keats Grove,
Hampstead,
London,
NW3 2RR

CLIENT

The City of London Corporation

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DATE: 26.08.2020
OUR REF: TRUK 0089

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EXECUTIVE SUMMARY

This report provides information on the root spread of a line of trees growing within the grounds of Keats House, 10 Keats Grove, Hampstead, London, where it is proposed to replace the existing roadside boundary fence with a low brick wall to match the properties to the east.

The scan lines do not cover the full RPAs of the subject trees, but concentrate on the paths either side of the boundary, in order to try to determine the likely distribution and depths of roots extending beneath the boundary where the new wall is to be constructed.

The soils beneath the survey area contain a number of metals, services and other non-root reflectors, with the soil horizons poorly defined in areas. This indicates areas of soil disturbance, typical of urban sites which have been occupied over a long period of time. In particular an area of metal reflections are found inside the entrance gate in the north east corner of the site and a likely service run extending across the pavement and into the site through the small gate in the north west section of the site.

The results show that the trees growing within the site do extend their roots beyond the boundary line and beneath the pavement, but at a reduced density. The number of shallower roots indicates that a large number of the root detections beneath the footpath are associated with the boundary yew hedge rather than the larger London plane and lime trees.

The levels within the site appear to be lower than that of the pavement surfacing, with the difference increasing as you travel from the main gate and head west. In addition, concrete blocks were observed beneath the fence in some areas, supporting the fence line. Details of these are not known. With the raising of levels in comparison to the levels at which the trees are growing and the presence of the concrete blocks, it again increases the likelihood that the majority of roots from the subject trees would be found deeper, with the shallower roots beneath the pavement growing from the yew hedge, located 0.5m from the 0001 scan series.

The final design, specification and construction methodology of the proposed new replacement wall is not known at the time of writing this report, however, co-operative use of the results between the arboricultural consultant and the design team will enable the design to minimise the impact of the proposed development upon the subject trees and increase their chance of successfully being protected in a sympathetic design.

Contents

1. INTRODUCTION: -

1.1. This report provides information on the root spread of a line of trees growing within the grounds of Keats House, 10 Keats Grove, Hampstead, London, where it is proposed to replace the existing roadside boundary fence with a low brick wall to match the properties to the east.

1.2. The survey was carried out on 5th August 2020 using TreeRadar, which identifies locations of roots with a diameter greater than 20mm along the scan lines. The scan line results show their depth and location. Determination of root diameter is difficult (other than it being above 20mm), but new software will be released shortly which will provide this detail. This report provides technical details of root locations, and the use of this in developing any designs and assessing the arboricultural impact will be carried out by the project arboricultural consultant and the wider design team.

2. CURRENT SITE DESCRIPTION: -

2.1 The site of the survey is the path and pavement either side of the northern boundary of the gardens of Keats House, which borders Keats Grove. The gardens consist primarily of lawns, which host an array of outdoor events for the historic house and museum, with a line of trees growing within a bed on the northern side edge of the lawns. This line of trees includes mature and early mature limes, a mulberry and a London plane, which is the primary subject of this report. Between the line of trees and the boundary is a 1m wide footpath, with a yew hedge on the northern side backing on to the boundary fence and pavement.

2.2 A full tree survey is maintained by the site owners, The City of London Corporation, as part of their on-going management of the site. Details of the trees have been covered within their reports and the information will not be repeated within this report, as it is outside the remit of the TreeRadar survey. For ease of reference their numbering system will be used within this TreeRadar report. The trees of particular interest for this TreeRadar survey are identified as T2819 a lime and T2821, a very large London plane, both of which are growing in the shrub bed.

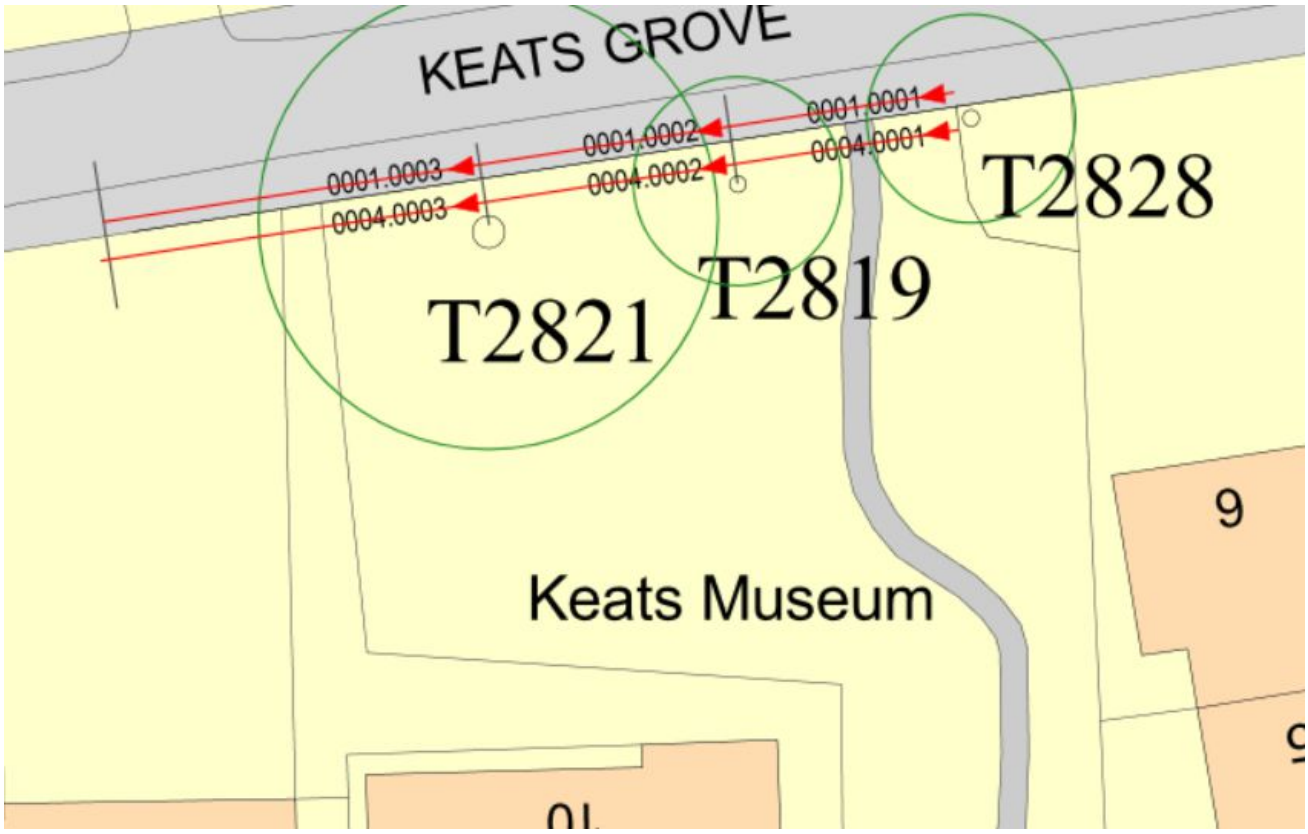
3. METHODOLOGY: -

3.1 This report identifies locations of roots with a diameter greater than 20mm along scan lines. The TreeRadar unit is a scanning cart with a 400MHz antenna which sends a beam every 1cm down to a depth prescribed by the operator (usually between 2 - 3m, which is the maximum depth). The reflection is recorded in a field computer and then analysed by the latest software, TBA. Water and metal reflect, therefore the machine records live roots which contain moisture, and cannot detected dead dried out roots. For each scan line a 'virtual trench' is produced which shows all roots with a diameter greater than 20mm. The machine cannot determine root diameter, other than it being greater than 20mm, due to the lack of correlation between the amounts of live root tissue in a root compared to the thickness of a root. For example, a large root may have a partially desiccated or dysfunctional central core with low moisture content and so give a relatively weak radar return, while a smaller root may be filled with water molecules and give a much stronger return. An anticipated update of the software is expected to begin to address this issue.

Photo of the TreeRadar cart (in a different setting)

3.2 Scanning conditions were relatively straight forward for the survey, though as is typical of urban areas, there were a number of non-root reflectors, services and other objects found within the results, which were filtered out of the data as far as was reasonably practical. This may slightly affect the accuracy of the results, but we are experienced at looking at data in these situations. The scan lines do not cover the full RPAs of the subject trees, but concentrates on the paths either side of the boundary, in order to try to determine the likely distribution and depths of roots extending beneath the boundary where the new wall is to be constructed.

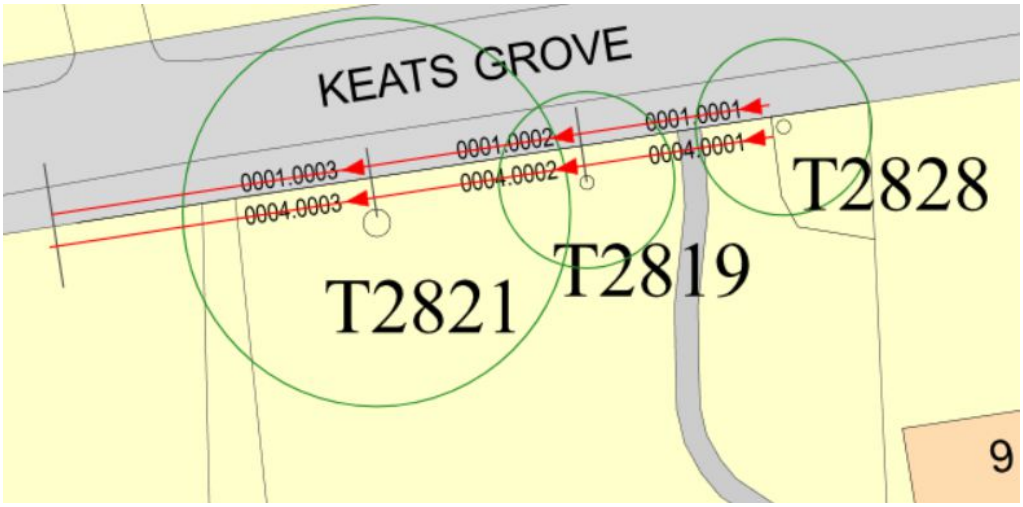
3.3 The locations of the scan lines are found at Appendix 1 on the TreeRadar plan (reference *TRUK 0089 TR,* extracts below), and the results super-imposed on the base plan (*TRUK 0089 TRR).* Top down views for the roots at various depths, along with the cross sections for each scan line are found at section 8. Details of how to read the results are found at section 7.



Plan 1 – extract from TRUK 0089 TR showing the survey area. Do not scale. North is vertical. Red lines are the scan lines.

4. RESULTS: -

4.1 **Scan lines 0001.0001-0003** – Scan lines 0001.0001-0003 are a series of lines forming a single continuous line running east to west within the pavement, parallel to the northern site boundary. Scan line 0001.0001 is located 0.5m from the fence line and starts level with the corner of the bin store, running west for a length of 9m to end level with the trunk of T2819. Scan line 0001.0002 continues this line, starting level with the trunk of T2819 and ending level with the trunk of T2821, before 0001.0003 further continues the line for another 15m. An extract from the tree radar plan *TRUK 0089 TR* below shows the locations of the scan lines.



Plan 2. Extract from TreeRadar plan TRUK 0089 TR showing location of scan lines 0001.0001-0003 and 0004.0001-0003. Do not scale. North is vertical

Photo 2. View of the area for scan lines 0001.0001-0003 within the pavement.

4.1.1. **Results:** Roots are initially found in moderate density along line 0001.0001, rising to high along 0001.0002 and falling back to moderate/low along line 0001.0003. Most of the roots are found in a very unevenly distributed band between 30-100cm deep, though some roots extend as deep as 170cm. The roots are found in higher densities closer to the trunks of the larger trees and drops away rapidly to the west of T2821. Given the number of shallow roots and the proximity of the hedge, it is highly likely that a large number of the shallow roots are associated with the yew hedge, rather than the larger subject trees.

4.2. Scan lines 0004.0001-0003 – Scan lines 0004.0001-0003 are a series of lines forming a single continuous line running east to west within the pavement, parallel to the northern site boundary and with the same start and end points as their relative numbered lines in the 0001 series. The scan lines are located 0.5m from the northern edge of the path. The extract from the tree radar plan *TRUK 0089 TR* on the previous page shows the locations of the scan lines.

Photo 3. View of the area for scan lines 0004.0001.

Photo 4. View of the area for scan lines 0004.0002.

Photo 5. View of the area for scan lines 0004.0003.

4.2.1. Results: Roots are initially found in moderate to high rooting densities along 0004.0001, rising to very high along 0004.0002 between the trees, falling to high along 0004.0003. The majority of the roots are found in an unevenly distributed band between 20-100cm deep. The densities along the 0004.0003 scan line are significantly higher than the density within the pavement at the same point. This shows that very few of the roots from the smaller tree are extending into the pavement.

5. CONCLUSIONS: -

5.1. The TreeRadar unit picks up roots with a diameter greater than 20mm but does not detect smaller roots. However, where a large clump or mat of roots creates sufficient mass, this may be detected. The radar unit is also unable to determine which tree the roots are associated with, and it is the experience of the operator and arboricultural consultant to determine the most likely source.

5.2. Non-root reflectors within the data can initially provide false positives within the results, which are identified and removed by the operator during the analysis process as far as possible. This can leave false positives within the data, but not false negatives.

5.3. The soils beneath the survey area contain a number of metals, services and other non-root reflectors, with the soil horizons poorly defined in areas. This indicates areas of soil disturbance, typical of urban sites which have been occupied over a long period of time. In particular an area of metal reflections is found inside the entrance gate in the north east corner of the site and a likely service run extending across the pavement and into the site through the small gate in the north west section of the site.

5.4. The scan lines do not cover the full RPAs of the subject trees, but concentrates on the paths either side of the boundary, in order to try to determine the likely distribution and depths of roots extending beneath the boundary where the new wall is to be constructed.

5.5. The results show that the trees growing within the site do extend their roots beyond the boundary line and beneath the pavement, but at a reduced density. The number of shallower roots indicates that a large number of the root detections beneath the footpath are likely associated with the boundary yew hedge rather than the larger London plane and lime trees.

5.6. The levels within the site appear to be lower than that of the pavement surfacing, with the difference increasing as you travel from the main gate and head west. In addition, concrete blocks were observed beneath the fence in some areas, supporting the fence line. Details of these are not known. With the raising of levels in comparison to the levels at which the trees

are growing and the presence of the concrete blocks, it again increases the likelihood that the majority of roots from the subject trees would be found deeper, with the shallower roots beneath the pavement growing from the yew hedge, located 0.5m from the 0001 scan series.

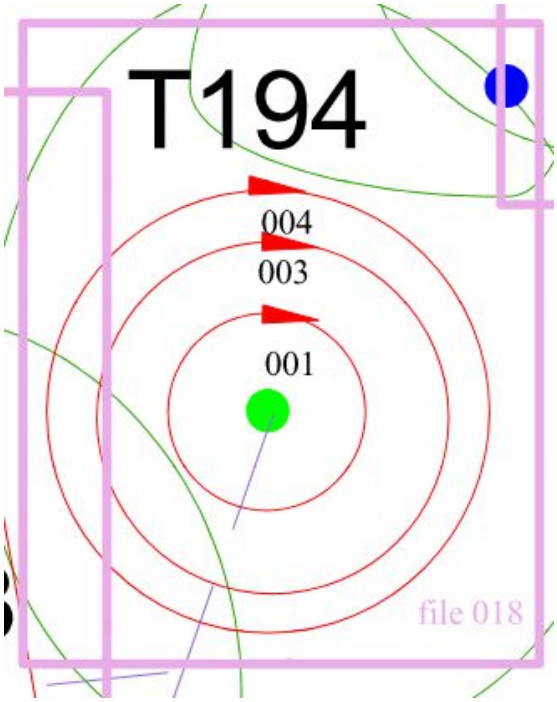
5.7. The final design, specification and construction methodology of the proposed new replacement wall is not known at the time of writing this report, however, co-operative use of the results between the arboricultural consultant and the design team will enable the design to minimise the impact of the proposed development upon the subject trees and increase their chance of successfully being protected in a sympathetic design.

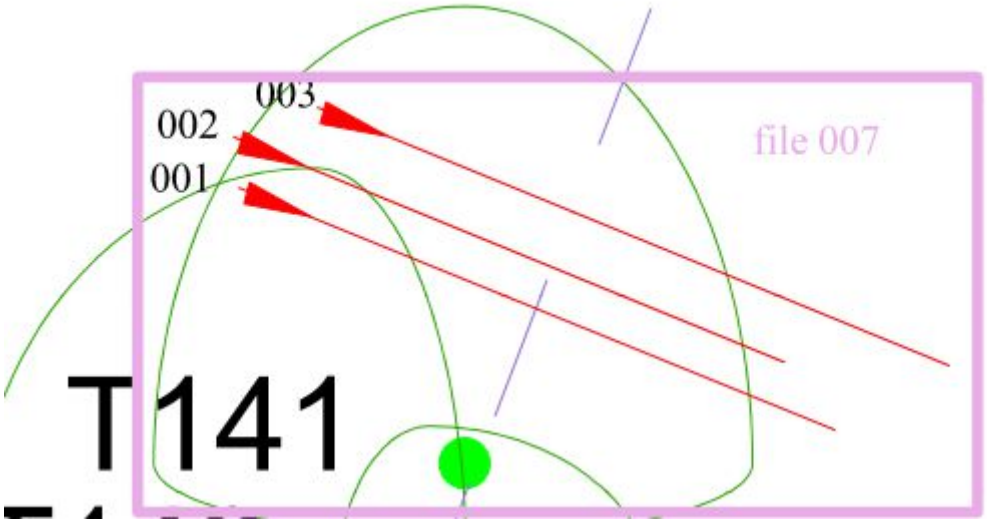
6. APPENDIX 1 – TREE RADAR PLAN TRUK 0089 TR AND TREERADAR RESULTS PLAN TRUK 0089 TRR

7. HOW TO READ THE SCAN LINES

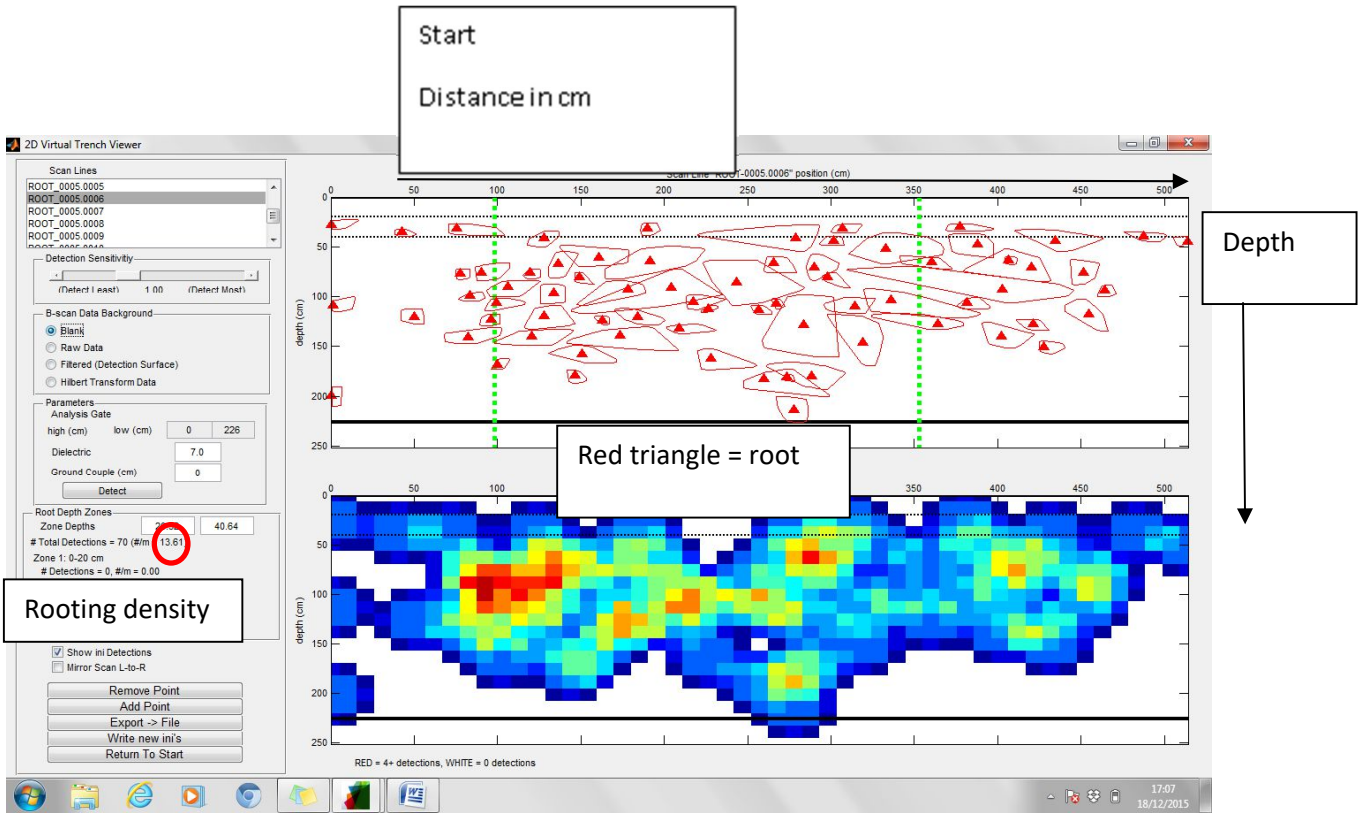
The results are shown as a top down view (plan), and a cross section of each scan line. This is an extract of the plan, a scaled copy of which is found at appendix 1. The plan extracts in appendix 7 are not to scale. The locations of the scan lines are based on the plotting from the survey, and the length of the line on the plan by the exact length of the scan. Circular scans are clockwise, starting on the northern side of the tree and are at 1m intervals unless otherwise shown.

Scan lines are shown red, with the direction by red arrows. Each scan line has a scan number. An example from a different site is shown below.





The cross section of each scan line shows where the roots are in relation to depth and distance. The coloured splodges are root density (relative to the scan area). An example is shown below:

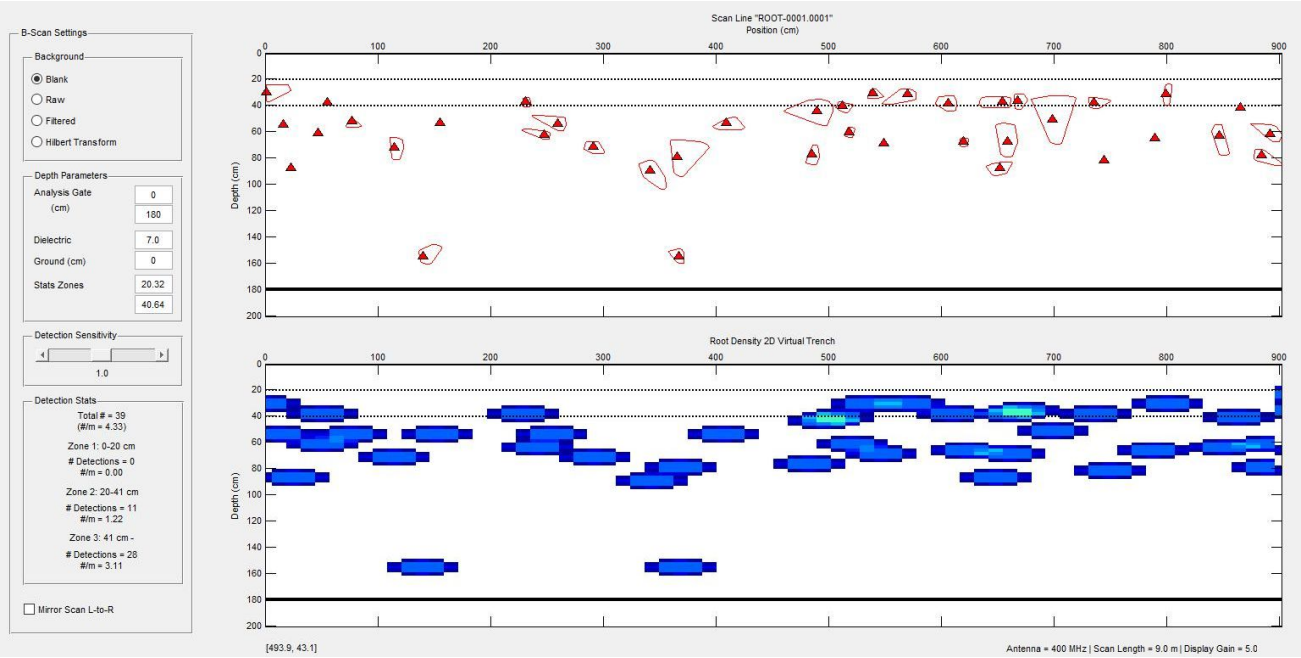


Green and blue triangles represent larger roots or areas of higher biological matter.

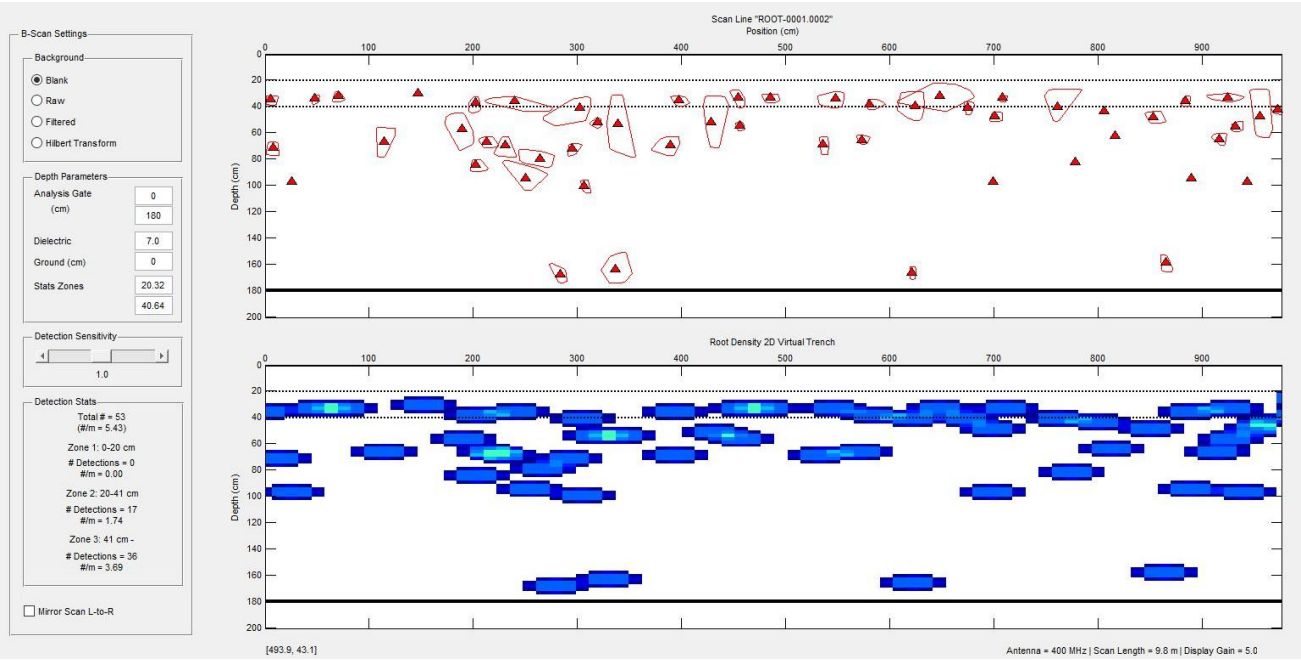
8. INDIVIDUAL SCAN LINE RESULTS

SCAN LINES 0001.0001-0003 – A SERIES OF LINES FORMING A SINGLE CONTINUOUS LINE WITHIN THE PAVEMENT TO THE NORTH OF THE SITE, 0.5M FROM THE BOUNDARY LINE AND PARALLEL TO IT.

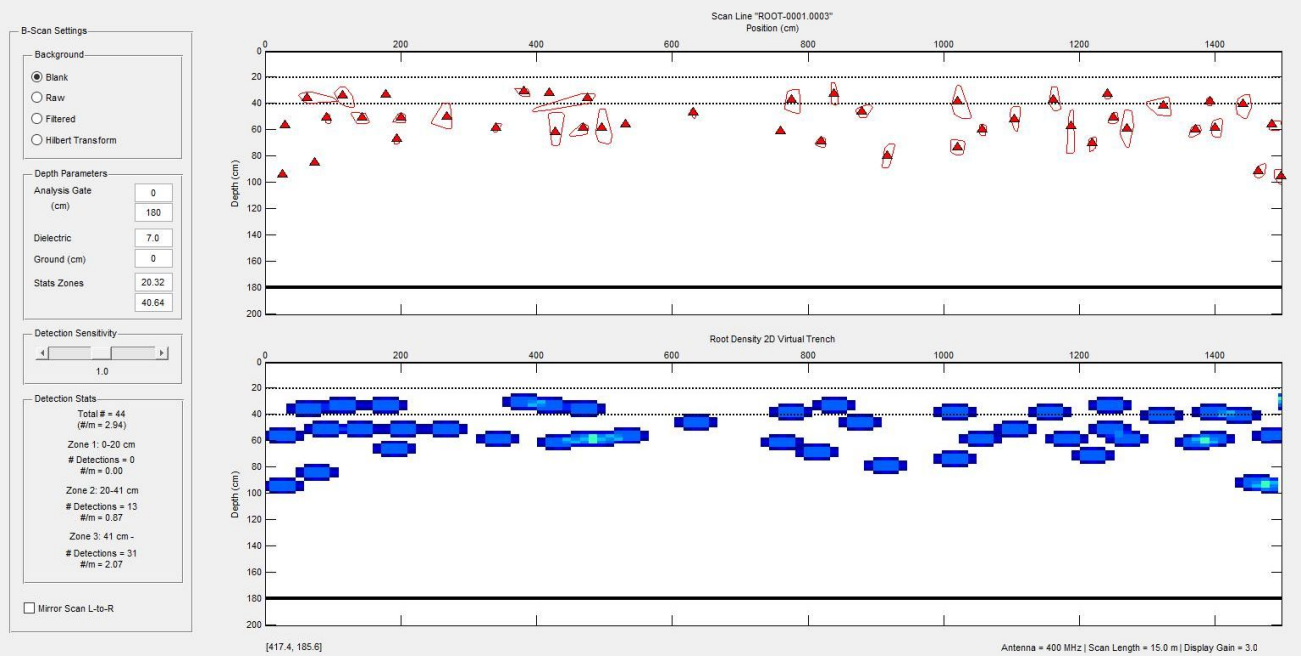
Scan line 0001.0001 From level with the edge of the bin store to level with the trunk of T2819



Scan line 0001.0002 from level with the trunk of T2819 to level with the trunk of T2821

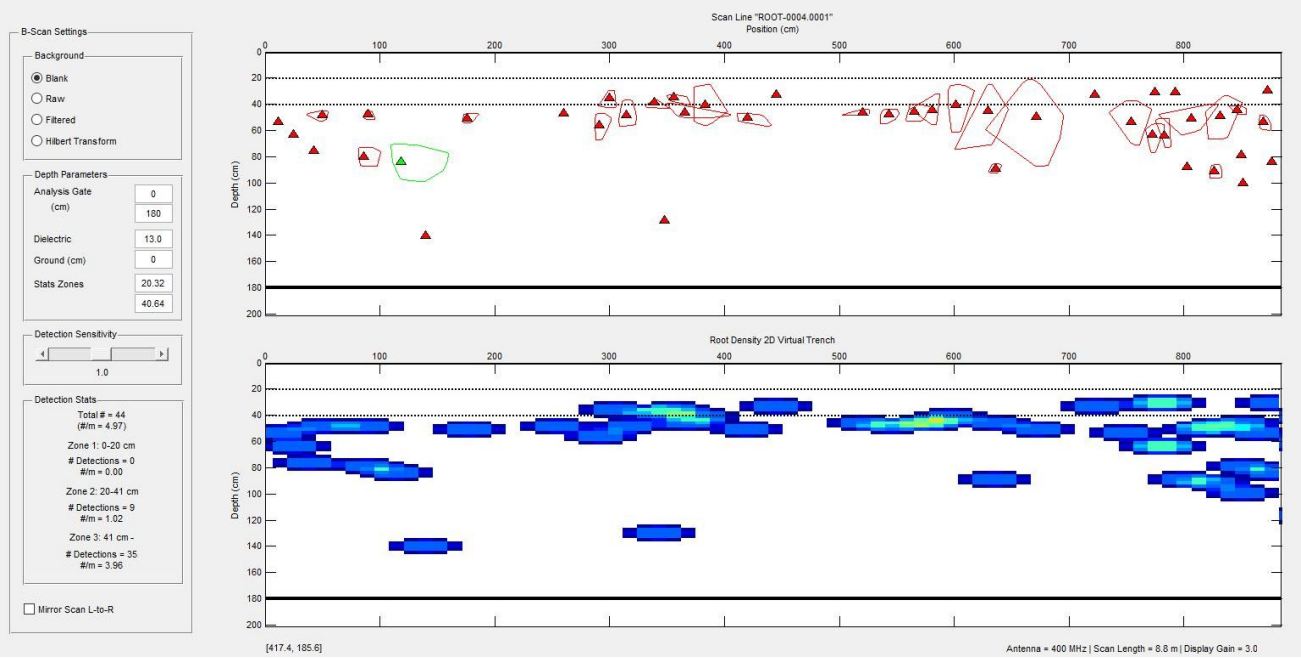


Scan line 0001.0003 level with the trunk of T2821 and running west for 15m

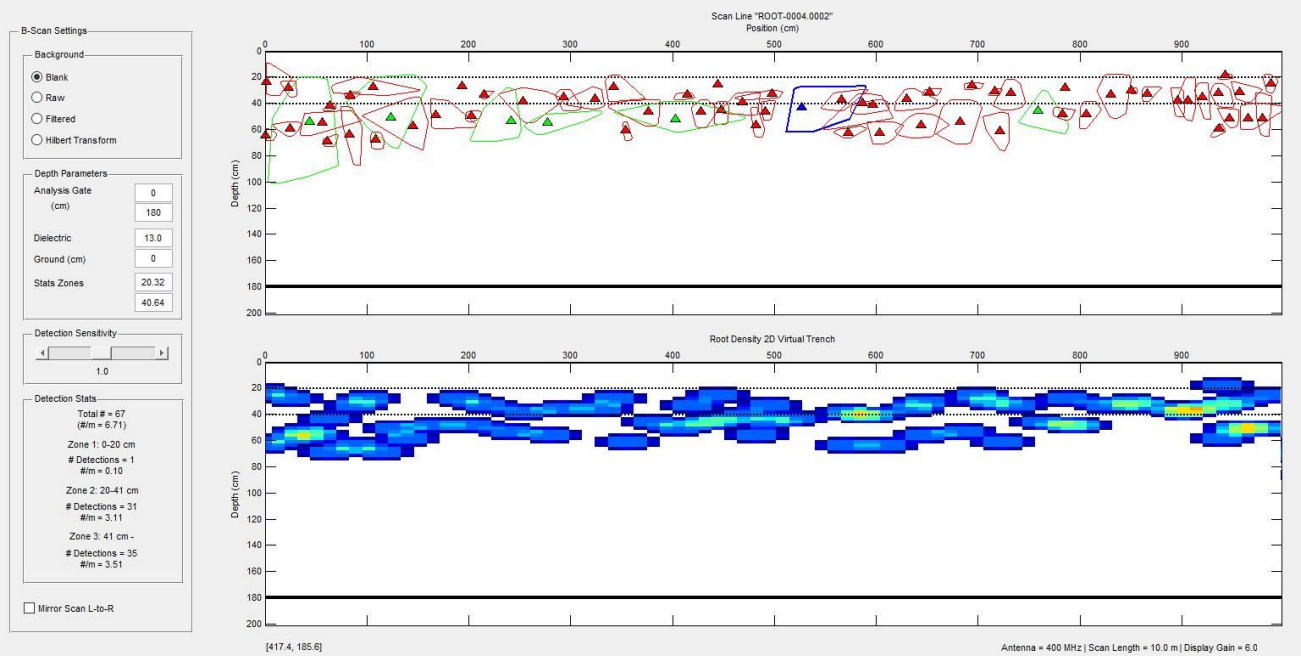


SCAN LINES 0004.0001-0003 – A SERIES OF LINES FORMING A SINGLE CONTINUOUS LINE WITHIN THE INTERNAL PATH ADJACENT TO THE NORTHERN BOUNDARY, 0.5M FROM THE NORTHERN EDGE OF THE PATH AND PARALLEL TO IT.

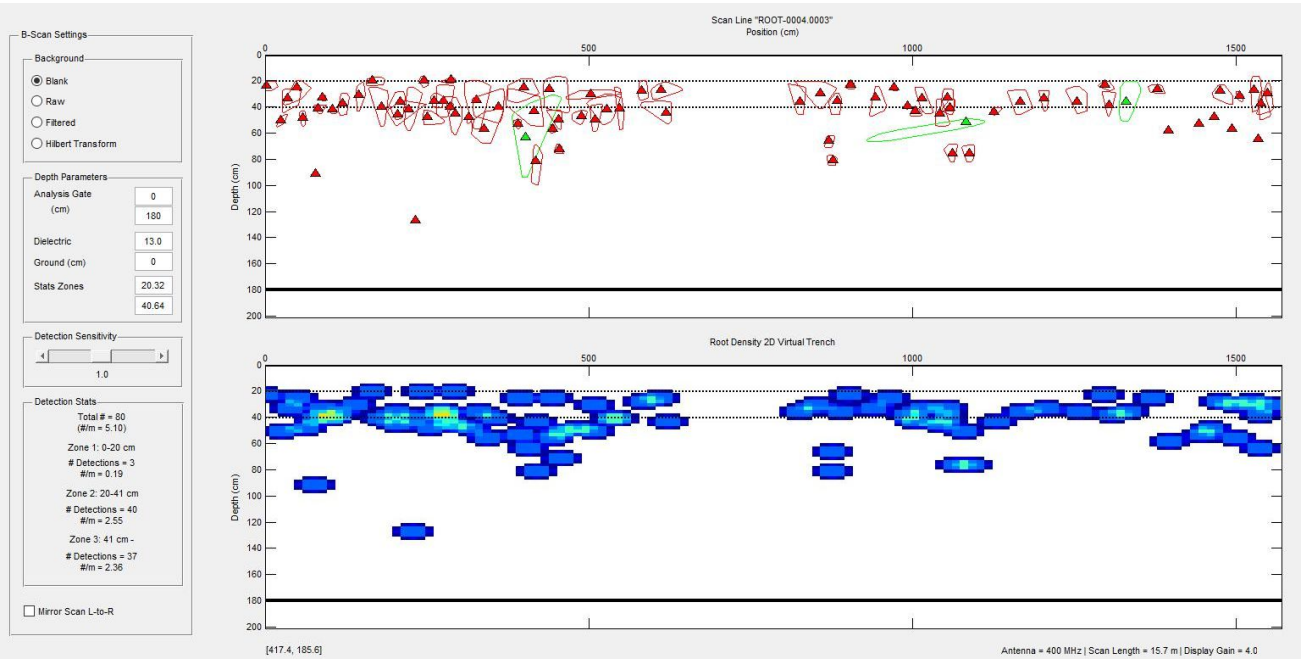
Scan line 0004.0001 From the edge of the bin store to level with the trunk of T2819



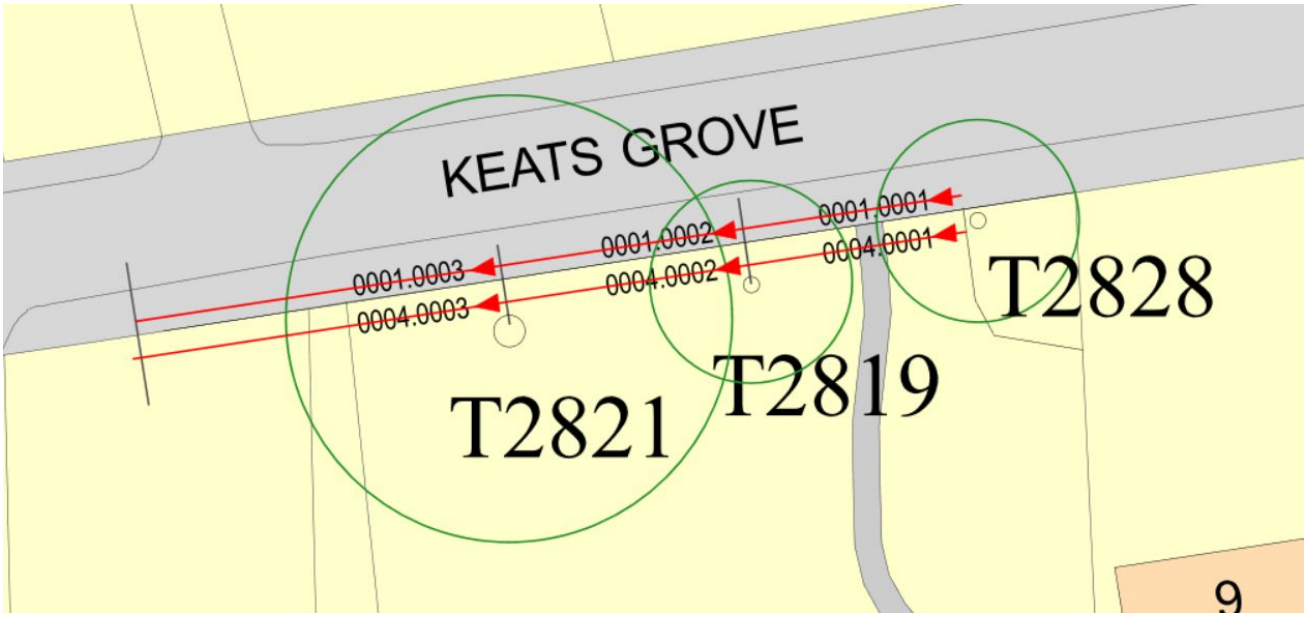
Scan line 0004.0002 from level with the trunk of T2819 to level with the trunk of T2821



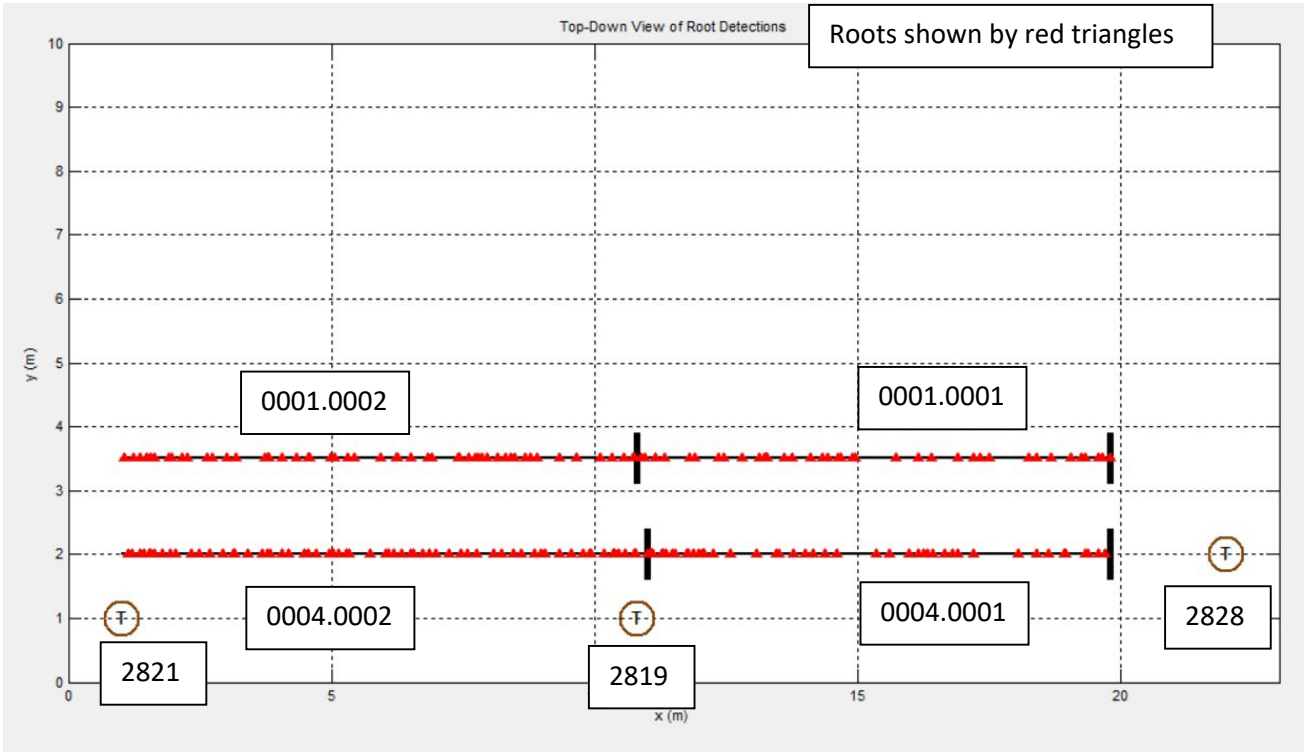
Scan line 0004.0003 level with the trunk of T2821 and running west for 15m



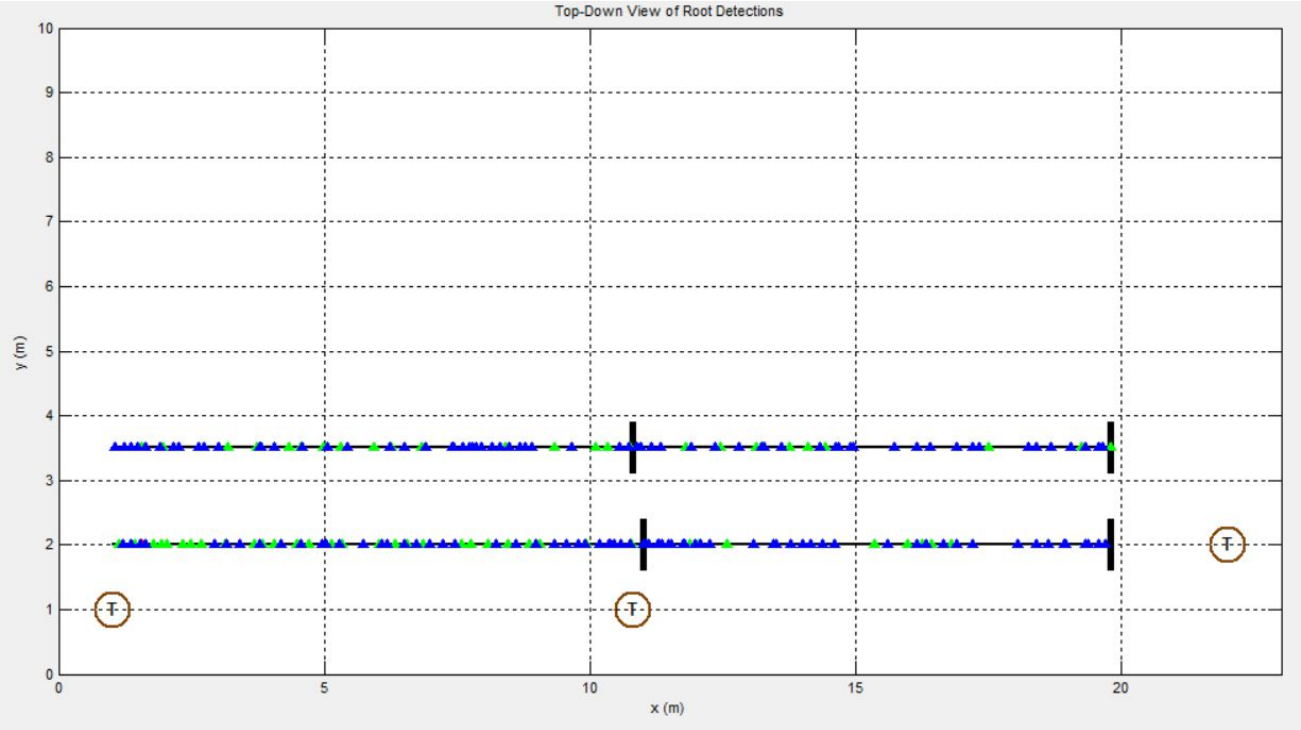
SCAN LINES 0001.0001-0003 AND 0004.0001-0003 - LOCATIONS (DO NOT SCALE)



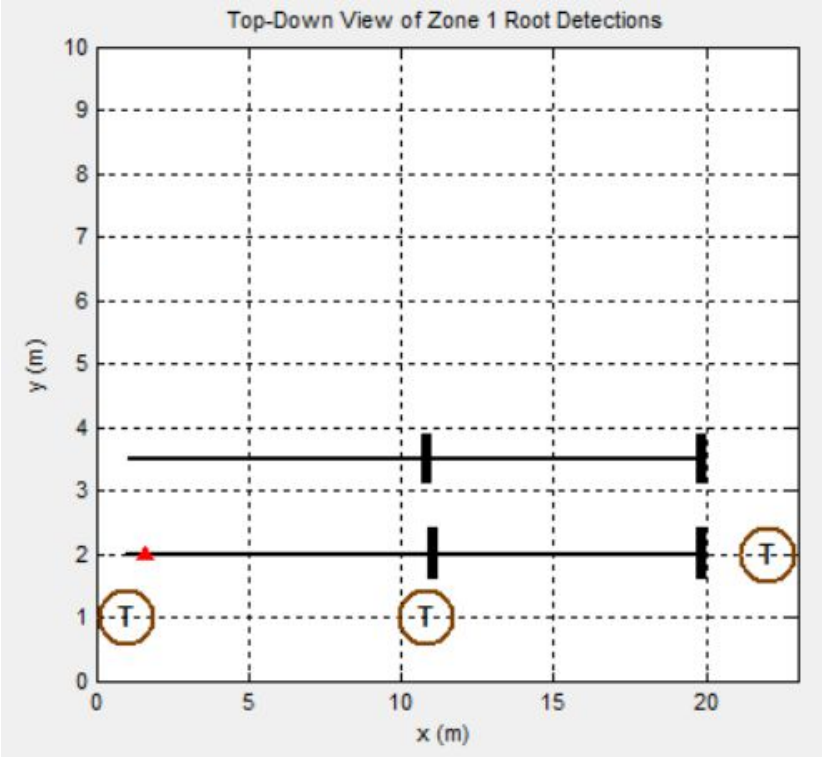
SCAN LINES 0001.0001-0002 AND 0004.0001-0002 - ROOTS (WITH A DIAMETER GREATER THAN 20MM) AT ALL DEPTHS



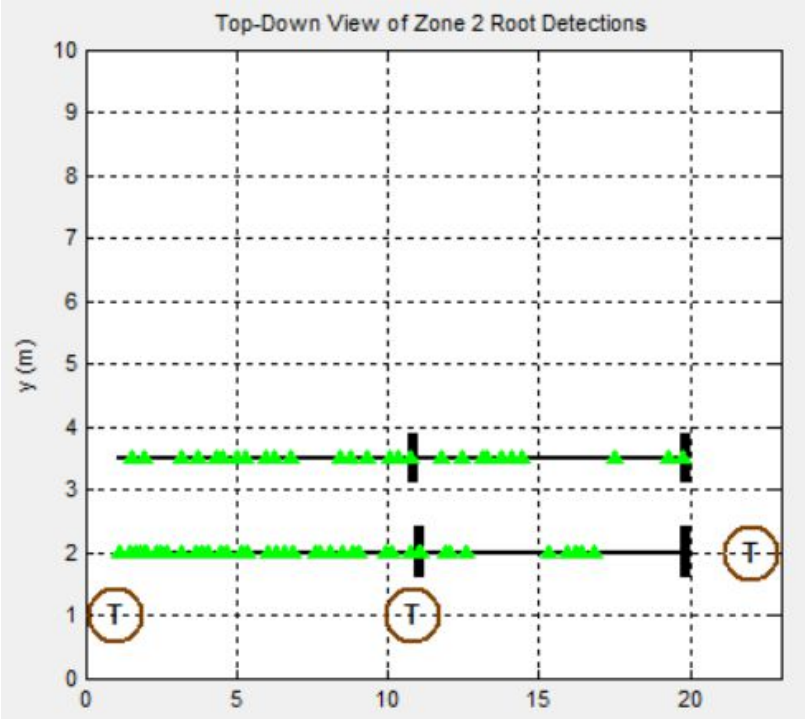
SCAN LINES 0001.0001-0002 AND 0004.0001-0002 - ROOTS (WITH A DIAMETER GREATER THAN 20MM) AT ALL DEPTHS RED = 0-20CM GREEN=20-40CM BLUE=40-250CM



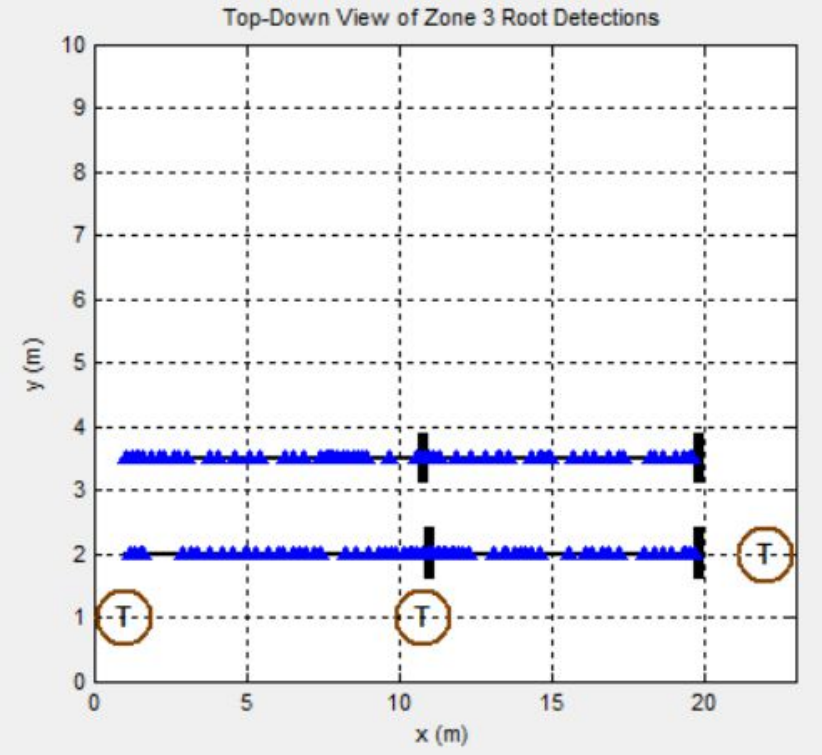
SCAN LINES 0001.0001-0002 AND 0004.0001-0002 - ROOTS (WITH A DIAMETER GREATER THAN 20MM) AT DEPTHS RED = 0-20CM



SCAN LINES 0001.0001-0002 AND 0004.0001-0002 - ROOTS (WITH A DIAMETER GREATER THAN 20MM) AT DEPTHS GREEN=20-40CM

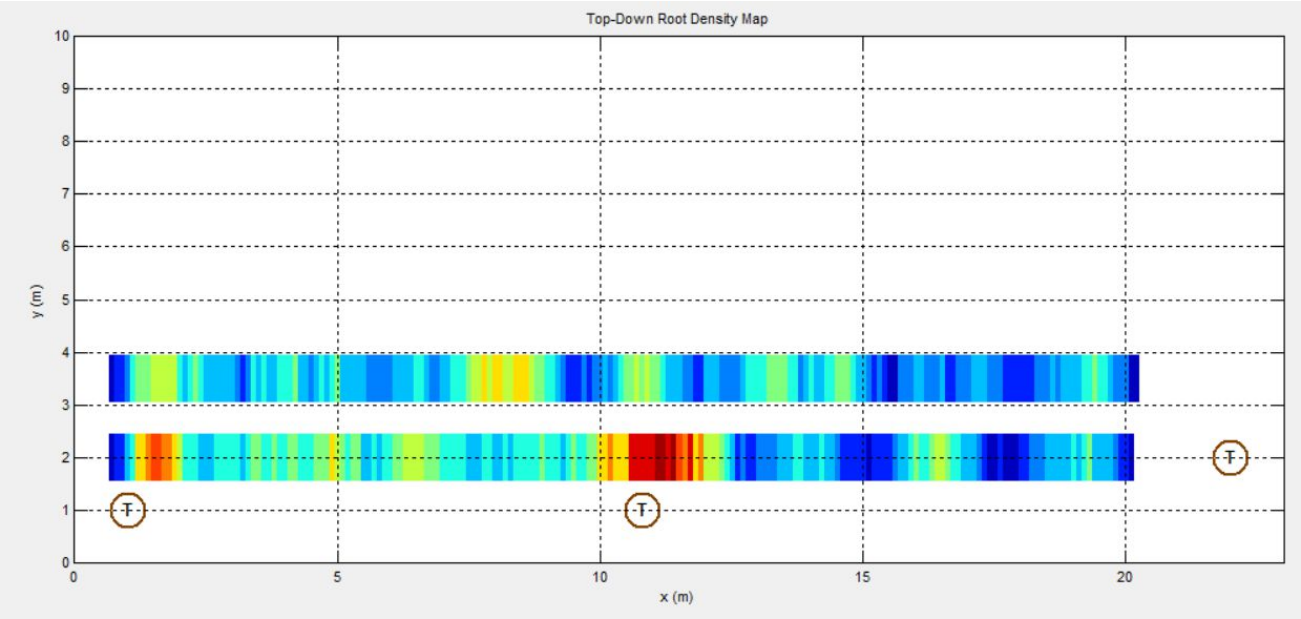


SCAN LINES 0001.0001-0002 AND 0004.0001-0002 - ROOTS (WITH A DIAMETER GREATER THAN 20MM) AT DEPTHS BLUE=40-250CM

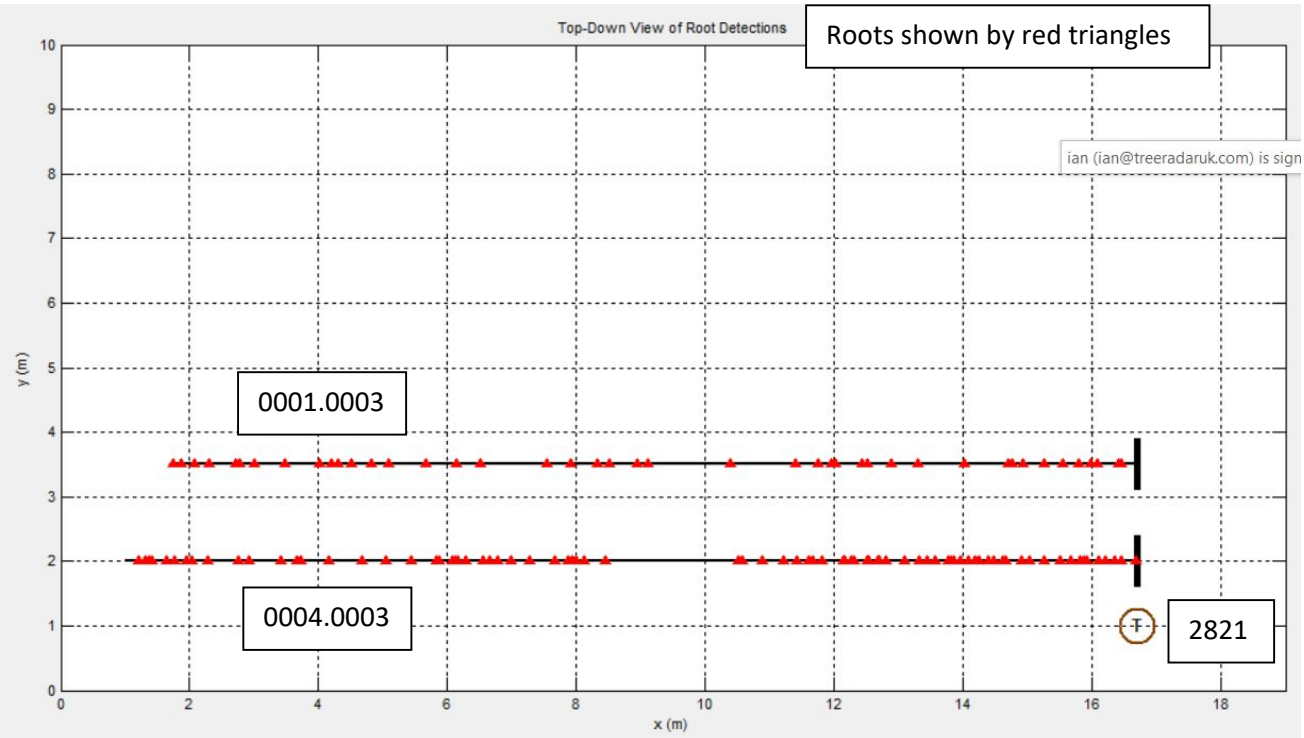


SCAN LINES 0001.0001-0002 AND 0004.0001-0002 - ROOTS (WITH A DIAMETER GREATER THAN 20MM) AT ALL DEPTHS - DIAGRAMMATIC REPRESENTATION OF ROOT DENSITY.

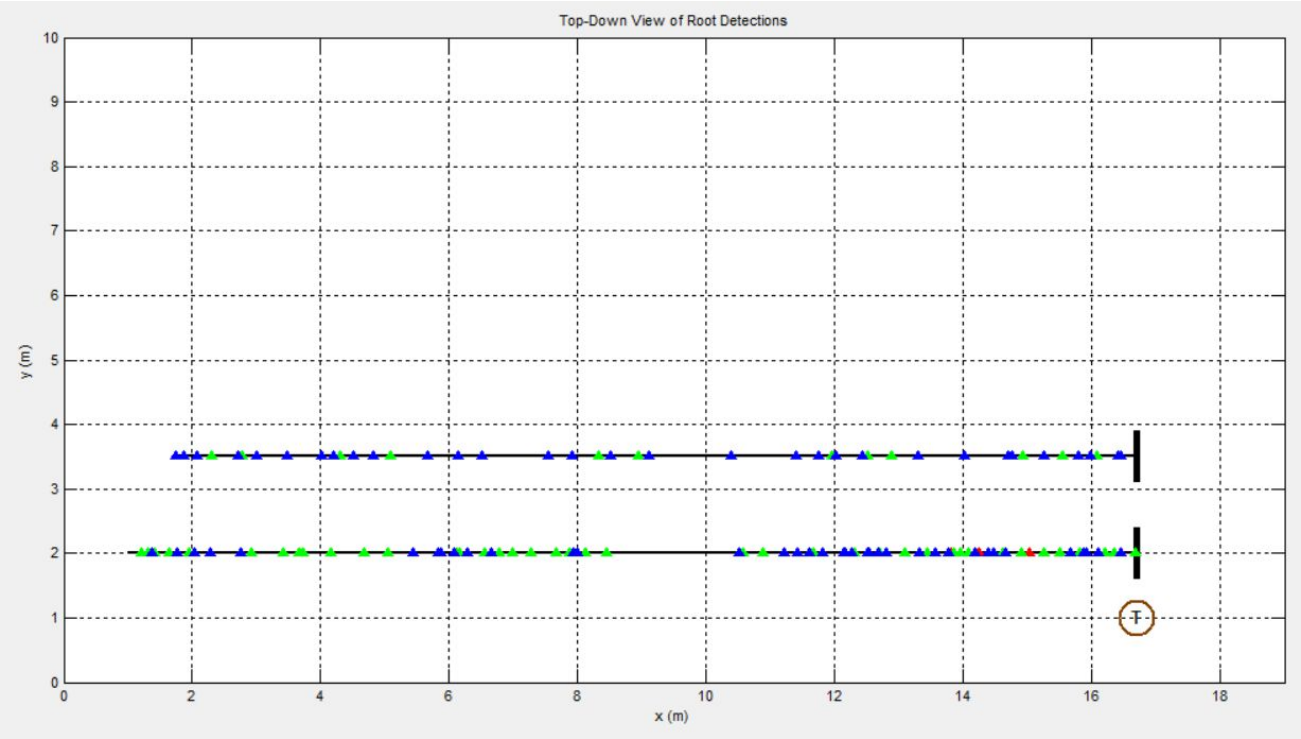
RED =RELATIVELY HIGH, BLUE = RELATIVELY LOW, WHITE = NO ROOTS



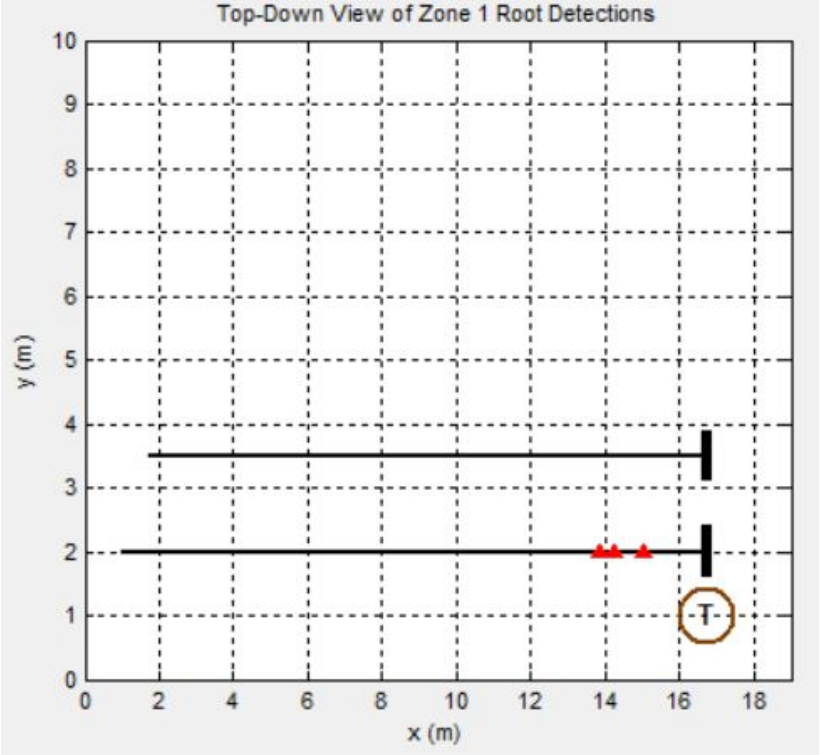
SCAN LINES 0001.0003 AND 0004.0003 - ROOTS (WITH A DIAMETER GREATER THAN 20MM) AT ALL DEPTHS



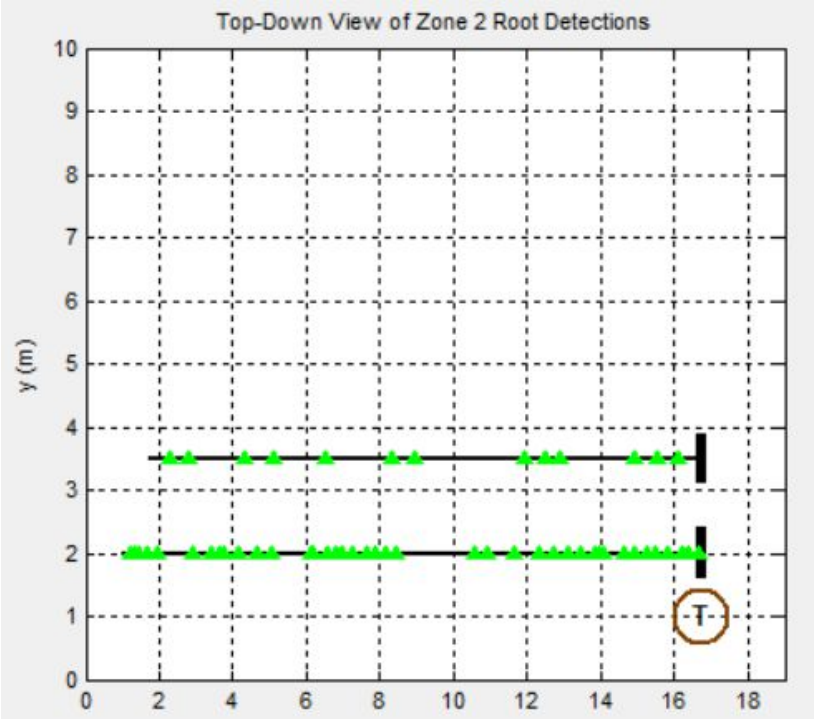
SCAN LINES 0001.0003 AND 0004.0003 - ROOTS (WITH A DIAMETER GREATER THAN 20MM) AT ALL DEPTHS RED = 0-20CM GREEN=20-40CM BLUE=40-250CM



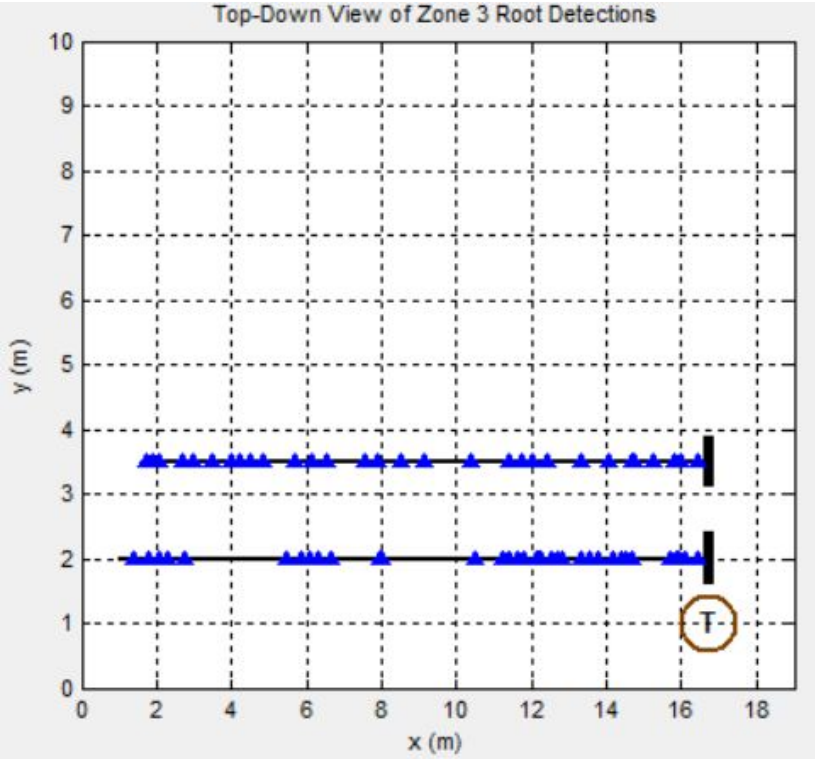
SCAN LINES 0001.0003 AND 0004.0003 - ROOTS (WITH A DIAMETER GREATER THAN 20MM) AT DEPTHS RED = 0-20CM



SCAN LINES 0001.0003 AND 0004.0003 - ROOTS (WITH A DIAMETER GREATER THAN 20MM) AT DEPTHS GREEN=20-40CM

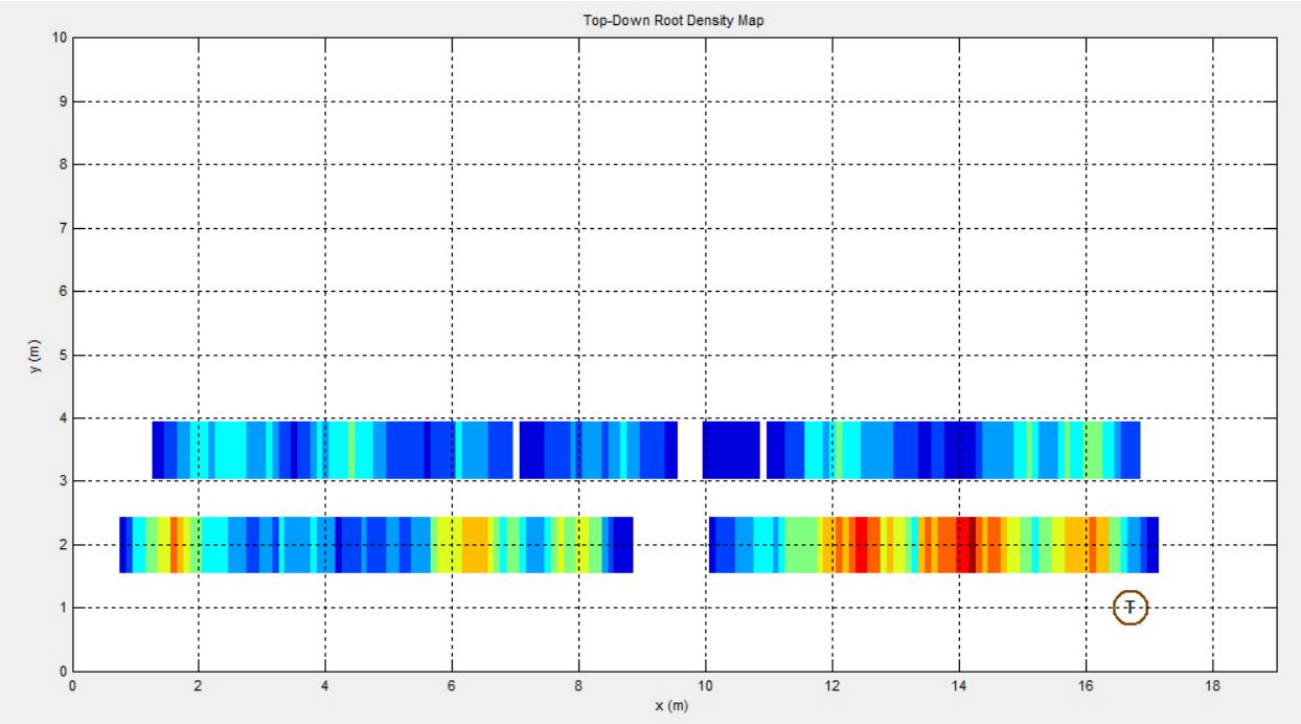


SCAN LINES 0001.0003 AND 0004.0003 - ROOTS (WITH A DIAMETER GREATER THAN 20MM) AT DEPTHS BLUE=40-250CM



SCAN LINES 0001.0003 AND 0004.0003 - ROOTS (WITH A DIAMETER GREATER THAN 20MM) AT ALL DEPTHS - DIAGRAMMATIC REPRESENTATION OF ROOT DENSITY.

RED =RELATIVELY HIGH, BLUE = RELATIVELY LOW, WHITE = NO ROOTS



9. CAVEATS & EXCLUSIONS:-

Specific report caveats

1. The survey is concerned solely with TreeRadar.
2. Scan line location measurements were taken on-site using fixed structures such as fences and trees. As no topographical survey is available and no plan available showing the location of the bin stores or trees, these structures were plotted onto the plans using measurements and notes from the TreeRadar data. No liability is accepted for the accuracy of the plotting of the trees or the tree radar scan lines. These measurements should be checked on-site.
3. Any changes in ground level, or excavations near to tree roots not discussed within this report may change the stability and condition of the trees and a further examination would be required.
4. As trees are a dynamic living organism this report is only valid for a period of 12 months, in respect to their health and condition.
5. Only the trees and areas listed in this report have been examined by TreeRadar.
6. All arboricultural issues other than tree roots in the area covered specifically within this report are outside the remit of this report and should be assessed by the project arboricultural consultant.
7. Scanning conditions were relatively straightforward for the majority of the site, with a good contact between the radar antennae and the ground. As is typical of urban areas there were a large number of non-root reflectors due to rubble, metals and other objects, which were filtered out of the data as far as was reasonably practical. This may slightly affect the accuracy of the results.

10. BACKGROUND and STATEMENT OF METHODOLOGY

A TreeRadar investigation was carried out by Ian Lee on 5th August 2020. The locations of the scan lines are found at appendix one, drawing reference *TRUK 0089 TR,* and the results are found in the report at section 4. The location of the scan area was identified by David Humphries of the City of London Corporation during the initial quoting process and whilst on-site during the survey.

The individual scan lines were measured from the tree and/or other fixed points. Photographs were taken and the lines plotted on a plan and described in survey tables. Each group or individual tree (as appropriate) has a unique file number (e.g. 0005) and each scan within that file has a unique reference number (e.g. 0002). The lines are shown on a digital plan.

The TreeRadar unit is a scanning cart with a 400MHz antenna which sends a beam every 1cm down to a depth prescribed by the operator (usually between 2 - 3m, which is the maximum depth). The reflection is recorded in a field computer and then analysed by the latest software, TBA. Water and metal reflect, therefore the machine records live roots which contain moisture, and cannot detect dead, dried out roots. For each scan line a 'virtual trench' is produced which shows all roots with a diameter greater than 20mm. The machine cannot determine root diameter, other than it being greater than 20mm, due to the lack of correlation between the amounts of live root tissue in a root compared to the thickness of a roots. For example, a large root may only have a live central core.

For each group of roots, the scans are organized into a 'top down ' root morphology plan which is to scale.

Documents received

Tree management plan extract

11. MY EXPERIENCE & QUALIFICATIONS: -

PROFILE: Ian Lee

MICFor MArborA BSC (Hons) Tech Cert (Arbor A)

Ian has fourteen years' experience as an arboricultural consultant in the private and public sector. Ian is a professional member of the Arboricultural Association, a Chartered member of the Institute of Chartered Foresters and has a degree in Forestry. Ian has considerable expertise in problem solving in relation to trees and the planning process and complex construction issues.

Ian has a deep understanding and knowledge on the operation and interpretation of TreeRadar © and has carried out two research and development visits with Sharon Hosegood Associates in 2016. This research has continued in 2019 with international colleagues.

Ian has managed a team delivering volume tree surveys and has produced woodland management plans.

Specialities

- Trees in relation to development, including appeals and planning hearings
- Tree root investigations, including TreeRadar©
- Tree hazard evaluation
- Tree preservation orders
- Manager of volume tree surveys

Professional bodies:

- Chartered member of the Institute of Chartered Foresters (ICF)
- Professional member of the Arboricultural Association

Qualifications:

- Arboricultural Associations Technicians Certificate
- BSc (Hons) Forestry and Forest Products
- Lantra Visual Tree Assessment

Tree Radar UK Ltd

Root investigation by TreeRadar

SITE
10 Keats Grove,
Hampstead,
London,
NW3 2RR

CLIENT
The City of London Corporation

Ian Lee

MICFor MArborA BSC (Hons) Tech Cert (Arbor A)

DATE: 26.08.2020
OUR REF: TRUK 0089

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