

Date: 05th August 2024
Ref: 17-510-L2

On behalf of the Land Owner
Fisher German LLP
Centurion House
129 Deansgate
Manchester
M3 3WR

REMEDIATION STRATEGY TUPA, PENLEY

1. BACKGROUND

E3P has been instructed by Fisher German LLP on behalf of their client (the landowner) to develop a remediation and enabling works strategy for the proposed residential development at Land off Penley Hall Drive, Penley, Wrexham, LL13 0JP.

This report has been prepared to address Planning Conditions pertaining to a planning application for the site (Outline planning – P/2019/0835). It is intended for submission to the regulatory bodies to outline the necessary remediation and enabling works required to render the site suitable for future residential development.

The development of the risk management strategy for the subject sites includes the following tasks:

-  Identification of the relevant pollutant linkages;
-  Review of site characteristics;
-  Development of remedial objectives;
-  Selection of appropriate remedial technology; and
-  Development of remedial strategy.



1.1. PREVIOUS WORK0020S

The following phases of desk study have previously been carried out at the site:

-  **E3P** – Phase I Geoenvironmental Site Assessment. Report Ref. 17-510-R1, dated March 2024, Prepared for Fisher German LLP.

The following phases of Geoenvironmental investigations and assessments have previously been carried out at the site:

-  **E3P** – Phase II Geoenvironmental Site Assessment. Report Ref. 17-510-R2, dated June 2024, Prepared for Fisher German LLP.

To inform the assessment of the potential risk to contaminated land within the context of the proposed residential development and to inform the preparation of the remediation strategy, the pertinent points from the above Geo-environmental Investigation letter reports are summarised within Section 1.2 below.

For the avoidance of any doubt, the E3P Geo-Environmental Site Investigation Letter Reports should be read both as a precursor to and in conjunction with this document.

1.2. SITE SUMMARY

TABLE 1.1 SITE SUMMARY

Site Address	Penley Hall Drive, Penley, Wrexham, LL13 0JP
Proposed Development	The landowner intends to construct a 9 unit low-rise residential development associated gardens, estate roads and infrastructure.
Occupancy/Use	The subject site is an irregular-shaped parcel of land that can be accessed via a single-track lane off Winston Way. A single-storey brick structure with a potential ACM cement sheet roof is located in the centre of the site. This structure is formed of two elongated wings connected by a narrow brick corridor in the centre. No other structures have been noted onsite. Vehicular access to the site can be gained via a field gate that is located on the northwestern boundary of the site. This can be accessed via a single-track lane to the north Winston Way. There is no current pedestrian access to the site with all gates being overgrown. Scrub vegetation is present across the site with several sporadic semi-mature and mature trees also observed. The northeast corner of the site is overgrown with dense woodland. Localised areas of the south, west and east of the site are also overgrown. The presence of dense vegetation was a constraint to the ground investigation. No surface water features are noted on site; however, surface water pooling and boggy ground have been noted in the southern sector of the site. The building on site has a cement-bound corrugated roof. Due to the age of the structure, the noted cement sheeting and other building fabrics may comprise asbestos-containing material.



Environmental Setting	Drift Geology	Glacial Till - DIAMICTON
	Bedrock Geology	Helsby Sandstone Formation - SANDSTONE, Gravelly
	Hydrogeology	A Secondary (undifferentiated) Aquifer has been recorded on site in the drift geology with a Principal Aquifer in the bedrock geology.
	Hydrology	A small pond is located roughly 20 m to the northeast of the site.
Site History	An examination of the relevant historical Ordnance Survey maps circa 1873 shows that the site comprised undeveloped land that formed part of the wider Penley Hall estate. Several trees are noted across the site and a pond is noted in the southern sector of the site. The pond is an elongated water body that extends off the southern boundary to the east. By 1954, the large pond located in the southern sector of the site had been infilled and was no longer mapped. During this time period several small rectangular structures have been constructed, along with the construction of roads and footpaths in the west of the site. These are believed to form part of a Polish Hospital that is mapped to the west of the site. Through to the 1990s buildings across the site have been constructed and then subsequently removed, along with a tennis court in the southeastern sector of the site. During the early 2000s through to the present day, the site has been left abandoned and the site has become heavily overgrown.	
Landfill Sites and Ground Gases	No landfill sites (current or historic) are located within 250 m of the Site. In the southern sector of the site, there is an infilled pond, and in this area, there is the potential for Made Ground infill as well as organic-rich alluvium deposits to be present. Made Ground deposits may produce hazardous ground gases such as methane and carbon dioxide.	
Radon	Lower Probability Area (<1% affected) - No radon protection measures required.	
Ground Conditions	Made Ground: Made Ground deposits were encountered within the south (TP105) and the south-east (WS101 and TP101) to depths of between 0.30 m and 0.50 m bgl although, in general, Made Ground was not encountered within any of the other exploratory hole locations. Deposits within TP105 are believed to be in the position of the former pond feature and comprise a reworked silty, sandy clay topsoil above brown sandy gravels of sandstone and brick with cobbles of whole brick identified within the matrix. Between 0.40 and 0.50 m bgl, an organic odour has been noted within the Made Ground deposits. WS101 and TP101 were advanced in the position of the former tennis courts in the south east and with a thin layer of tarmacadam (up to 0.05 m in thickness) overlying reworked sandy gravels of mudstone, sandstone and fragments of brick. Within TP101 between 0.05–0.20 m bgl black sandy gravel of ash and clinker has been identified.	



Ground Conditions	<u>Topsoil:</u> Topsoil deposits have been encountered in the majority of locations with the exception of WS101, TP101 and TP105 between ground level and depths of 0.20 m bgl to a maximum of 0.50 m bgl (TP106). Topsoil encountered comprised predominantly dark brown silty sandy CLAY with the exception of TP102, where topsoil was encountered as dark brown clayey silty gravelly SAND, with fine gravels of sandstone. No topsoil has been identified on-site. <u>Drift Deposits:</u> Drift deposits were encountered within all exploratory hole locations between 0.20 m bgl to a maximum proven depth of 4.39 m bgl within WS102. The drift deposits were generally consistent, comprising firm to very stiff brown slightly gravelly sandy CLAY with gravel of sandstone and mudstone. Within WS105 between 0.50–1.20 m bgl, firm light brown sandy CLAYs have been encountered. <u>Bedrock:</u> No solid geology was encountered during E3P’s intrusive investigation. E3P has reviewed online records and there are no freely available borehole records within 200 m of the site boundary, thus the depth to bedrock on site is unknown. <u>Groundwater:</u> Groundwater was encountered as seepages throughout site from depths between 0.30–1.00 m bgl. Perched water strikes have been located on site during the investigation, these were typically associated with natural granular overlying cohesive which created a perched waterbody.
Human Health Risk Assessment	Limited non-volatile PAH impact has been identified within an isolated pocket of shallow ashy Made Ground deposits in TP101 in the position of the former tennis courts in the south east of the site. All of the identified elevated concentrations have primary exposure pathways related to dermal contact and ingestion of soils (PL2), inhalation of particulate (PL3) and consumption of homegrown vegetables (PL1). The risk to chronic human health associated with the elevated concentrations of non-volatile PAH compounds can be mitigated through the installation of a suitable cover system in areas where Made Ground deposits are present to remove any potential for direct exposure to impacted soils. Made Ground has been identified in the position of proposed plots 4 & 5. The specific design and installation process for the appropriate cover systems will be clearly defined within the site remediation and enabling works strategy. Chemical analysis of the topsoil deposits and the natural clay drift deposits across the site has identified these soils to be acceptable for use as subsoil within the proposed garden areas, however, further chemical validation samples may be required to meet regulatory sampling frequency.



Controlled Waters Risk Assessment	The ICSM developed within the context of the site setting has identified that there is a limited pollutant pathway due to the presence of CLAY that offers protection to the underlying principal aquifer. The groundwater sampling undertaken by E3P has not recorded exceedances when compared to DWS values. However, leachate analysis has identified exceedances of Arsenic, Lead, Nickel, and Zinc within TP105 at 0.50 m bgl when compared to DWS values. The leachate assessment often overestimates the risk and soil analysis from the same sample has not identified an exceedance of chromium. Thus there is no observed source and the current risk to controlled waters is considered to be low.
Ground Gas	The ground gas monitoring undertaken as part of this investigation suggests that the site can be classified as Characteristic Situation (CS)1 – Very Low Gas Risk.
Potable Water Supply	Based on the assessment of current site conditions it is unlikely that barrier pipe will be required at the proposed development.

It is concluded that the site will be suitable for the proposed residential development subject to the completion of the supplementary assessments and management of the marginal non-volatile PAH exceedances noted within the Made Ground in the position of the former tennis courts.

In relation to the marginal non-volatile PAH exceedance the following build-phase mitigation options are to be considered:

-  **Option A:** Management of soils to ensure that all materials impacted by PAHs are either removed from the site or placed in areas of low sensitivity area of the site during the site enabling works.
-  **Option B:** Construction of a 600 mm clean cover system to gardens and landscaped areas where Made Ground deposits are present on site in accordance and marginal non-volatile PAH exceedances have been identified. Made Ground has been identified in the position of proposed plots 4 & 5. Refer to Section 6 for details in regard to cover system specifications.



2. SITE REMEDIATION AND ENABLING WORKS

2.1. SUMMARY OF REMEDIATION OPTIONS

It is considered that the following combination of remediation technologies provides the most sustainable, viable and economic solutions that will ultimately result in the successful remediation for the site(s):

- ✿ Installation of a suitable **cover system** in proposed and landscaped areas where Made Ground deposits are present to remove any potential for direct exposure to impacted soils if Option B is adopted.

2.2. OVERVIEW OF WORKS

Prior to the commencement of works on-site, the contractor must establish all necessary plant, equipment, and site welfare facilities as is necessary to complete the contract within the agreed timescales to the rationale as outlined in the following subsections.

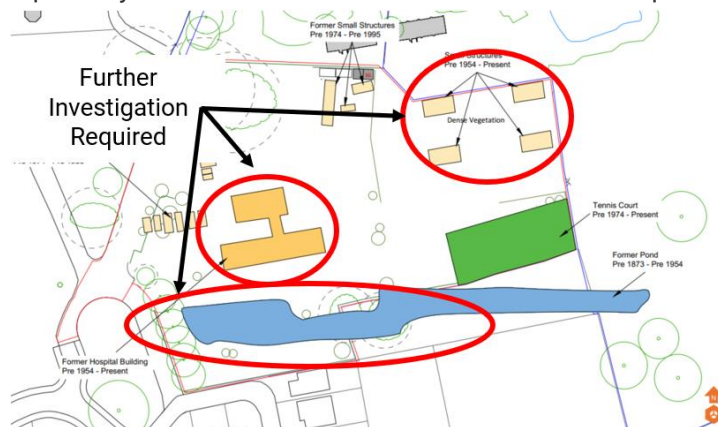
For the avoidance of any doubt, the proposed operations as set out herein document the required performance objectives and validation sampling protocols; however, the specific methods of work deployed to ensure the remediation objectives are achieved in a compliant manner on-site will be the responsibility of the appointed contractor.

RE-1 – PRE-COMMENCEMENT SUPPLEMENTARY SITE INVESTIGATION

Following the demolition and removal of all structures across the site, supplementary investigation and soil sampling is recommended. Mechanically excavated trial pits will be advanced with additional chemical analysis of the soils completed to confirm no unacceptable risk to human health and controlled waters.

Additional site investigation works are required in the southern sector of the site, in the position of the former pond. These works are required to investigate the nature of the Made Ground deposits and to assess the geotechnical properties of the infilled material.

If any as yet unidentified contamination is identified, this will be the subject of further investigation including laboratory analysis and subsequent assessment of risk within the context of the agreed parameters. Where a theoretical risk to either human health, controlled waters or the wider environs is identified, appropriate remediation works are to be instigated by the placement of clean cover systems to break the pathway or delineation and source removal where required.



RE-2 – PRE-COMMENCEMENT REGULATORY COMPLIANCE

Prior to commencement of any works on site, all reports relating to the assessment of risk to contaminated land should be submitted to the regulatory authorities to gain written approval. These reports will be submitted in relation to the outline Planning Application ref: P/2019/0835.

All relevant Standard Rules Permits should be registered with the Environment Agency by the contractor.

The LAPC Part B Notification for deployment of mobile crushing plant should be implemented prior to the establishment of equipment on site.

If the proposed volume of soils to be reused (excluding crushed materials) exceeds the parameters of the Standard Rules Permit, a CL:AIRE Materials Management Plan (MMP) qualified declaration should be made by the contractor, having obtained full written approval for the remediation strategy from the Local Planning Authority and Environment Agency.

RE-3 – INDEPENDENT VALIDATION AND SITE SUPERVISION

It will therefore be necessary to instigate the site-wide remediation and enabling works with advice from a suitably qualified and independent specialist that is familiar with this report. The specialist is required to attend the site on a part-time basis in order to record ground conditions and to monitor progress and quality of works completed by the contractor.

Frequencies of site attendance may need to change depending on specific operations that are being completed.

RE-4 – ENVIRONMENT AND NUISANCE CONTROL

The LC:RM requires that due consideration be given to the following key issues which will impact the appropriate selection of suitable remediation options.

Management of all works is required to ensure that no environmental nuisance is created through dust emissions, noise or vibration levels.

All works are to be completed in a manner so as not to create any structural risk to the adjacent highways.

Temporary works are to be implemented as necessary to support excavations throughout the works.

In the event that a complaint is made with respect to dust emissions, noise or vibration levels, remedial measures and a programme of ongoing monitoring should be agreed upon with the local authority and implemented on-site.

RE-5 – RISK TO INFRASTRUCTURE CLEARANCE OPERATIONS

Site works should be completed in a manner that ensures no risk of disturbance to adjacent infrastructure.



RE-6 – SITE CLEARANCE OPERATIONS

Large areas of the site are currently overgrown with self-seeded vegetation with several above-ground structures noted across the site; this material should be removed in a controlled manner with full compliance with any ecological mitigation measures that are required for the works. Any such measures are outside the scope of this report.

Any above-ground waste/fly tipping – contractor should visit site and determine waste materials and responsible.

All vegetation should either be stockpiled at a pre-agreed location or alternatively removed from site in accordance with waste permitting regulations.

RE-7 – IDENTIFICATION, ISOLATION AND TREATMENT OF INVASIVE PLANTS

The remediation contractor must satisfy themselves with respect to the extent of all species deemed invasive prior to the commencement of works on site. The contractor shall employ a suitably qualified expert to investigate the presence of invasive plant species on or adjacent to the site. Once all invasive plant species are identified, these will be treated in strict accordance with an approved method statement to be submitted to the supervising consultant for review before the instigation of any works.

Where invasive plant species are identified at the site boundary, a suitable barrier shall be installed to prevent any future reinfestation of the subject site.

Upon completion of the eradication of all invasive species, a validation report should be prepared documenting all identified invasive plant species, their location and the treatment methodology. Where materials are removed from site, all waste transfer notes/duty of care certificates should be included within the validation statement.

RE-8 – RECOVERY OF NATURAL TOPSOIL

The site investigation report has identified natural organic soils (topsoil) are present at the near-surface across much of the site. The contractor should seek to maximise the recovery of this material to promote sustainable construction through careful segregation and subsequent stockpiling of the natural soils.

All recovered topsoil should be covered with a suitable geotextile to limit cross-contamination from anthropogenic elements during remediation, enabling and construction. This will significantly contribute to maximising the recovery and reuse of material. Careful management of organic topsoil is required with topsoil carefully stripped on-site to ensure sustainable reuse. All material will be subject to validation testing by the supervising consultant in accordance with the testing specification set out herein.



RE-9 – EXCAVATION, BREAKING AND PROCESSING OF ALL ABOVE AND BELOW GROUND STRUCTURES

Obstructions, relict foundations and infrastructure (apart from live services) are to be removed from the areas of proposed residential development, including plot footprints, rear gardens, private driveways, adopted highway and utility infrastructure (road box) in their entirety.

Artificially hard materials should be broken out and crushed. Stockpiles will be made, validation testing undertaken, and site-won material reused on-site where required.

The E3P drawings denote the extent of known historic features with obstructions; however, it will be the contractor's responsibility to remove all obstructions.

Obstructions encountered within the near-surface soils will be chased to their full depth and removed; if not possible, the obstruction must be surveyed with the location communicated to E3P, the client and the developer.

Where natural soils are present at a relatively shallow depth, extreme care should be taken to ensure that the natural cohesive deposits remain undisturbed with a full reduced-level survey to be completed to map the depth of filled/processed material.

RE-10 – DELINEATION, EXCAVATION AND TREATMENT OF INFILLED HISTORICAL PONDS

Prior to the commencement of the main earthworks (where possible), all known former infilled ponds should be identified and demarked and investigated to assess the nature of materials and the extent of any deleterious elements.

The location of known historic infilled ponds are identified within the E3P Historical Features Plan (Drawing 17-510-003 in APPENDIX III).

All materials that are deemed to be organic – and thus exhibiting unsatisfactory geotechnical properties must be removed, with the resulting excavation to be backfilled with materials deemed geotechnically suitable with appropriate compaction for the intended land use.

A suitably qualified geotechnical engineer will need to monitor the works and confirm when all unsuitable material has been excavated and removed from beneath any proposed structure or infrastructure.



RE-11 – PREPARATION OF COVER SYSTEM

If Option B is adopted onsite, it will be the contractor's responsibility to prepare the area to facilitate the placement of the clean cover system during the development phase of the works.

The preparation of the areas requiring clean cover is critical in ensuring delivery of the site in a manner that will ensure no risk to the proposed end users.

Where Made Ground is deemed unsuitable for retention in a garden, the area will be subject to a reduced-level dig to remove unsuitable material to a level that would allow the placement of the cover system or verified natural stratum (whichever is the shallower).

Excavated soil will be stockpiled pending the results of the appropriate validation testing (to be completed in accordance with this specification) prior to reuse in an area of no sensitivity or, where necessary, this material will be removed from the site following UK waste management legislation.

The placement of certified subsoil and topsoil will be completed as part of the developer works/build-phase mitigation plan. All garden areas where a cover system is required will be subject to plot-specific independent validation by E3P.

The DEFRA / Environment Agency guidance states 'that conflicts of interest in verification should be avoided. A contractor certifying their own work is considered to be a conflict of interest and is not good practice. If verification is carried out by the same company (or related company) that carried out the work, then the process, results and report will need to be audited by an independent consultant' (Environment Agency, 2010a).

RE-12 – PROVISION OF SUBSOIL

The shallow natural drift deposits (predominantly cohesive soils) are deemed suitable for use within the clean cover system to areas of soft landscaping. It is therefore deemed viable to reuse materials that are cut as part of the wider earthworks or through a soil inversion (regulated by an MMP) to generate the required volumes of material.

Materials generated from the 'site strip' operation can be subdivided into topsoil and sub-soil, with sand and clay loam soils within the lower 50% of the site strip likely to be classified as a sub-soil material. These soils can be sustainably segregated, tested, and stockpiled for re-use as sub-soil.

The garden and landscaped areas will require depth validation to satisfy the requirement of the Council of Mortgage Lenders (CML) in order to demonstrate that the appropriate thickness has been provided as a growing medium.

Sub-soil stockpiles should be placed in areas that will ensure no 'cross contamination' from materials with significant anthropogenic influence on-site.



RE-13 – WASTE SOILS SURPLUS TO REQUIREMENTS

In the event that a surplus of excavation material is present on site, this, in most cases, will be deemed to be a waste in accordance with the Waste Framework Directive (Article 3(1) Waste Framework Directive 2008/98/EE). The waste producer – but ultimately, the landowner – is responsible for the compliant disposal of such materials.

A formal waste classification assessment must be undertaken, irrespective of any future options or considerations for those materials that will be removed from the site. Waste classification should only be made following the Environment Agency Technical Guidance WM3 – Guidance on the Classification and Assessment of Waste.

To remove the surplus material from the site it will either need to be sent to a disposal site (landfill), to a permitted treatment facility or, dependent on the waste classification assessment, it may be suitable for use on a permitted land improvement or restoration operation.

Subject to suitability, these soils can be transferred to the receiving site, subject to an approved permit or materials management plan following guidance in the CL:AIRE Definition of Waste: Code of Practice.

RE-14 – REMEDIAL VERIFICATION REPORT

Collation of information relating to site clearance, chemical testing, remedial works, remedial verification, material movements and waste transfer documentation is required, where appropriate.

Complete remedial validation is to be reported in line with regulatory guidance. This will include a detailed risk assessment. The report will be submitted to the local authority for approval following completion.

The Verification Report will conclude the site remediation and enabling works with the Build Phase validation to be produced separately.

RE-12 – REMEDIATION PROJECT CHANGE, ADJUSTMENT AND UPDATES TO REQUIRED WORKS

LCRM states the following with respect to the completion of remediation works:

- ✳ Ensure remediation is done in line with the remediation strategy and regulatory controls
- ✳ React to testing results or monitoring data promptly
- ✳ Manage unexpected contamination
- ✳ Allow time to get and interpret the data without delaying progress
- ✳ Use a different solution or contingency measure if the data shows that the remediation is not working
- ✳ Ensure any method statements are correct and kept up to date

Remediation work is an iterative process, and as such, it will be managed by the specialist contractor on site, the supervising engineer, the professional project team and the client.

Where possible, regulatory authorities will be informed of ongoing changes to the project and specific remediation requirements; however, works must be allowed to proceed under professional judgment without the requirement to revise the formal remediation strategy.



All project adjustments will be fully documented and detailed within the validation report. For absolute clarity, professional judgement will be made by Chartered professionals supervising the remediation works. It is considered that there is no requirement for any revision to a Remediation Strategy on the basis that adjustments are made due to unforeseen circumstances, which are reviewed and approved by a Chartered professional within the project team. The approved remediation strategy is an iterative document that allows flexibility and changes based on specific circumstances.

2.3. VALIDATION SAMPLING PROTOCOL

In accordance with the current requirements of the regulatory authorities, validation samples will be collected from all materials that are to be subject to movement under the protocols outlined within this remediation and enabling works strategy, or for materials to be imported onto site to facilitate the proposed residential development.

Soil samples destined for chemical analysis will be collected at regular intervals in appropriate sampling containers. All samples will subsequently be stored in cooled boxes prior to submission to a UKAS/MCERTS accredited laboratory.

All samples will be collected using appropriate personal protective equipment (PPE) and sampling equipment, which will be cleaned at each sampling location.

A detailed copy of E3P Ltd sampling methodology, QA procedures and laboratory chain of custody forms will be documented within the site records and presented with the final validation report for the site.

Where material is found to contain concentrations of potential contaminants at levels in excess of the site-specific screening criteria (as detailed within the enclosed appendices), E3P will undertake further assessment and recommendations on the appropriate use for the material in question, which may involve the disposal of such materials off-site to a suitable waste management facility.

The sampling frequency for materials to be managed under the remediation strategy is presented within Table 2.1.

TABLE 2.1 SPECIFICATION OF CHEMICAL VALIDATION LABORATORY ANALYSIS

MATERIAL USE	TESTING FREQUENCY	SUITE OF ANALYSIS
Site-Generated		
Site-Generated 6F2	1 Sample per 1000 m ³	A/B/C/D
Site-Won MADE GROUND General Backfill	1 Sample per 250 m ³ where visual and/or olfactory impact is identified	G
Site-Won MADE GROUND General Backfill	1 Sample per 1000 m ³	A/B/C/D
Site-Won MADE GROUND General Backfill	1 Sample per 2000 m ³	I
Site-Won Natural Backfill	1 Sample per 2000 m ³	A/B/C/D
Site-Generated Subsoil (150 mm Landscaped Cover)	1 Sample per 250 m ³	A/B/C/D
Site-Generated Topsoil Cover (150 mm Landscaped Cover)	1 Sample per 50 m ³	A/B/C/D
Hotspot Validation Samples	1 Sample per 10 m of linear excavation to base and sidewall	E/G



Remediation Strategy Letter

Tupa, Penley

August 2024

MATERIAL USE	TESTING FREQUENCY	SUITE OF ANALYSIS
Imported		
6F2	1 Sample per 1000 m ³	A/B/C/D
Subsoil Greenfield Source (150 mm Landscaped Cover)	1 Sample per 200 m ³	A/B/C/D
Subsoil Brownfield Source (150 mm Landscaped Cover)	1 Sample per 50 m ³	A/B/C/D
Topsoil Greenfield Source (150 mm Landscaped Cover)	1 Sample per 200 m ³	A/B/C/D
Topsoil Brownfield Source (150 mm Landscaped Cover)	1 Sample per 50 m ³	A/B/C/D
General Engineering Fill (Class 1 and 2 Soil)	1 Sample per 1000 m ³	A/B/C/D

Notes

Suites of Analysis:

- A. Speciated PAH.
- B. Speciated TPH (C5-C35).
- C. Asbestos (ID).
- D. CLEA Inorganic Heavy Metals.
- E. Speciated PAH, Banded TPH and VOCs.
- F. SVOC/Speciated TPH.
- G. On-Site Screening for VOC Using Calibrated PID.
- H. Leachate 2:1 Speciated PAH and Banded TPH.
- I. Leachate Analysis of Inorganic Heavy Metals, TPH, Sulphate and PAH.

All analysis prescribed above to be completed by UKAS-accredited laboratory.

2.4. REMEDIATION CONTRACTORS SITE MANAGEMENT AND RESPONSIBILITY

The appointed remediation contractor will take full and overarching responsibility for all methods of work required to complete the site remediation and enabling operations to ensure the delivery of the site and the completion of the objectives in a safe, legislatively compliant manner that ensures no pollution to the subject site or the wider environs.

For individual remediation operations as set out within this performance specification, the contractor will provide site-specific methods of work for individual operations pertaining to the removal and treatment of contaminated liquids and soils. For each and every operation as set out herein, the contractor will provide a written methodology of works to be supplied to the supervising geo-environmental engineer prior to the instigation of operations on-site.

The site manager will be responsible for documentation of each day's activities with a full recorded schedule of works completed and corresponding site-specific method statements that have been utilised to ensure the completion of the task to the required standard.



3. ENVIRONMENTAL MONITORING AND VALIDATION

3.1. SITE MANAGEMENT

The tracking of materials will be based on the following hierarchy:

- ✿ The principal contractor will have the responsibility for setting out areas of the site on the basis of the contract specification.
- ✿ Operatives will have instructions only to excavate and to emplace materials in specified areas as assigned by the site manager/foreman.
- ✿ The site manager (employed by the principal contractor) will issue daily instructions to drivers regarding the placement of materials sourced from specific stockpiles or areas, ensuring that appropriate documentary evidence is collected that details which materials are going where and why.
- ✿ An E3P consultant, who will be in attendance as required, will:
 - Inspect the excavation areas and certify that the correct materials are being excavated;
 - Conduct spot checks on loaded vehicles to ensure compliance with this remediation strategy; and,
 - Ensure that any loads that fail visual, olfactory or spot checks either remain on the vehicle or, if unloaded, are excavated and set aside. This material will be treated according to the recommendations of the E3P site engineer.
- ✿ E3P will conduct an audit of waste consignment notes. All material imported and removed from site will have duty of care/consignment notes, copies of which will be retained on-site by the site manager.
- ✿ Materials directly reusable will be incorporated into the earthworks, subject to operational conditions and phasing of excavations, in which case they will be stockpiled prior to final placement.

3.2. COMPLETION

Following the completion of the remediation works, a report will be compiled by the environmental consultant detailing all site enabling works undertaken, waste consignment notes, and all site investigations, laboratory test certificates and validation testing undertaken.

A certificate of completion of earthworks should be included within the report which should then be issued to the local authority for their approval.

E3P considers that with the adoption of the above best practices the site can be safely redeveloped. The site enabling works process and presence of any residual contamination (if this is the case) should be recorded for future reference by landowners/occupiers. Future development at the site where this may result in penetration of new areas of hardstanding should be subject to no-less-stringent measures with respect to assessment and, where appropriate, monitoring, than those set out herein.



3.3. MITIGATION OF RISK FROM SOILS WITH ASBESTOS FIBRES

3.3.1. PRE-COMMENCEMENT WORKS

Prior to the commencement of works the following requirements must be satisfied:

- ✚ Induction of all people that will be involved with the proposed site works; and
- ✚ All methodologies must be agreed upon by all parties involved.

3.3.2. CONTROL, MONITORING AND REPORTING OF GENERAL AERIAL EMISSIONS FROM DUSTS AND PARTICULATES

DAMPING DOWN OF SOILS – MITIGATE PARTICULATE (DUST) EMISSION

During excavation, as outlined within the detailed working methodologies, soils will be regularly damped down using water to control the generation of dust (this may also comprise precipitation). The contractor will determine the best form of dust suppression to be used when a detailed programme has been issued.

If any previously unidentified asbestos-containing materials are identified, these should be dealt with in strict accordance with the *Control of Asbestos Regulations* (2012) and industry best practice as detailed in CIRIA 733.

GENERAL CONTROL OF DUST

The following control measures should be utilised to ensure that dust levels are kept to a minimum at all times:

- ✚ Where necessary, haul road, work areas and stockpiles will be damped down with water spray.
- ✚ The application of water to haul roads, work areas and stockpiles should be closely monitored by the resident engineer to ensure that soils are not saturated and, therefore, that the potential for water run-off is appropriately mitigated.
- ✚ Once completed, any stockpiles will be sealed by compacting at the surface.
- ✚ Vehicle speeds and movements on-site will be kept to a minimum (< 5 mph) during civil excavation works to reduce the potential to generate dust.



PERSONAL PROTECTIVE EQUIPMENT (PPE)

In accordance with the HSE *Guidance Note em6: Asbestos Essentials, Personal protective equipment (including RPE)*, E3P recommend that all site operatives present within the work area where potential asbestos-impacted soils are being excavated are supplied with the following personal protective equipment:

Overalls:

- ✳ Disposable overalls.
 - Type 5 (BS EN ISO 13982-1) are suitable.
 - Cotton overalls hold dust and need specialist laundering.
- ✳ Waterproof overalls for outdoor work.
- ✳ Use oversized overalls - this will help to prevent ripping at the seams.
- ✳ If the cuffs are loose, seal them with tape.
- ✳ Avoid wearing a long-sleeved shirt as these are difficult to cover properly.
- ✳ Wear the overall legs over footwear as tucking them in lets dust into footwear.
- ✳ Wear the hood over the RPE straps.

Failure to utilise and correctly employ PPE will result in immediate cessation of works. Works will not be permitted to recommence until the individual has undergone further training in the use of PPE or the individual is removed from the works area.

At this current time, with the levels of ACM identified within the soils, the above-listed PPE is not considered to be required for all site personnel during the entire management of these soils.

When handling asbestos-impacted soils during the enabling works, asbestos monitoring works should be conducted in accordance with, but not limited to, the following HSE legislation and guidance:

- ✳ *Health & Safety at Work Act 1974;*
- ✳ *The Control of Asbestos Regulations 2012;*
- ✳ CL:AIRE, 2016. *Control of Asbestos Regulations 2012 - Interpretation for Managing and Working with Asbestos in Soil and Construction and Demolition Materials: Industry guidance;*
- ✳ *Approved Code of Practice L143 Work with materials containing asbestos;*
- ✳ *Management of Health and Safety at Work Regulations 1999;*
- ✳ *HSE Guidance Note HSG248 Asbestos, the analysts guide to sampling and analysis;*
- ✳ *HSE Guidance Note HSG247 Asbestos: The licensed contractors' guide;* and
- ✳ *CIRIA 733 Asbestos in soil and made ground: a guide to understanding and managing risks.*



If required, air monitoring in accordance with HSG248 will be undertaken intermittently throughout the duration of the works at a frequency to be determined by the contractor, entirely dependent on whether asbestos-impacted soils are being handled at any given time. In general terms, during any one monitoring period, ten standard monitoring pumps will be run throughout the day, for the appropriate time period to achieve the required limit of detection. These slides will be analysed immediately by the on-site UKAS-accredited laboratory.

Once any monitoring has been analysed by the on-site UKAS-accredited laboratory, the results will be delivered to the resident engineer who will then follow the correct site procedure. The results will then be included within the verification report.

4. RECORD-KEEPING AND VERIFICATION

4.1. RECORD-KEEPING

During the course of the remediation and site enabling works, the on-site E3P consultant will undertake the following record-keeping protocols:

- ✳ Detailed daily site diary including material movements;
- ✳ Sampling register, testing results, photographs, details of locations of hydrocarbon-impacted soils (drawings), details of hotspot removals, details of consignment notes of any hydrocarbon-impacted material that is required to be disposed of off-site; and
- ✳ Detailed surveys (volumes).

Record-keeping on-site, in particular movements and analysis of specific material types, will be in the form of site diaries and a remediation excavation record. This record will remain on-site and will be completed by the E3P on-site engineer during the course of the remediation and site enabling works.

4.2. VERIFICATION

The records listed above will then be compiled into a validation report produced by E3P on completion of the remediation and site enabling works, clearly referencing the origin of the materials used and testing carried out to confirm its suitability for use, where required. E3P will also prepare an as-built development drawing clearly detailing the materials present on-site to be cross referenced with the supporting validation documentation.

The validation report will include the following:

- ✳ Remediation strategy (including copies of confirmation from regulatory authorities agreeing criteria);
- ✳ Detailed surveys of all excavations and production of as-built drawings for the earthworks;
- ✳ Copy of consignment notes relating to the movement of wastes to a licensed waste management facility;
- ✳ Detailed drawings showing all sampling locations for both chemical and geotechnical testing;
- ✳ Chemical test results;



- ✦ Geotechnical test results;
- ✦ Details of qualified persons signed declaration; and
- ✦ Monitoring results if undertaken (e.g., asbestos in air, gas water).

5. CONTINGENCY PLAN

5.1. PREVIOUSLY UNIDENTIFIED CONTAMINANTS

Should significantly impacted material be encountered during the development, then it will be excavated and stockpiled on an impermeable material and sampled and tested for an appropriate range of determinants.

Once the laboratory analysis of the material is available, an assessment will be undertaken to determine whether it can be retained on-site as part of the material management plan or whether it should be disposed of off-site.

Depending on the nature of any such impact, it may be necessary to undertake validation testing of the excavation faces in order to demonstrate that no such materials are left in situ.

6. SECOND PHASE MITIGATION AND MANAGEMENT – BUILD PHASE

This document details the construction works that are required to ensure full compliance with the remediation Strategy, Regulatory Authorities, Building Control & Warranty Providers;

The following should be implemented during the build phase of the development:

- ✦ Laboratory testing of topsoil deposits;
- ✦ Chemical validation of any additional subsoil imported for use within landscaping areas;
- ✦ Placement and validation of subsoil (clean material) in a 450 mm layer within any gardens and landscaped areas where Made Ground deposits are present on site;
- ✦ Placement and chemical validation of at least 150 mm imported topsoil within any gardens and landscaped areas where Made Ground deposits are present on site;
- ✦ Installation and validation of potable water supply infrastructure that will be compliant with United Kingdom Water Infrastructure Risk (UKWIR) assessment criteria

The validation protocols are presented within the E3P Remediation and Enabling Works Strategy and are presented below.



6.1. PLACEMENT OF COVER SYSTEM – IF REQUIRED

The Remediation and Enabling Works Strategy for the site, with respect to human health of the future site users includes the provision of a chemically suitable clean material to be installed in any gardens and landscaped areas where Made Ground deposits are present on site; the construction of the clean cover / placement of clean material shall consist of:

🔸 450 mm subsoil; and,

🔸 150 mm topsoil.

In accordance with the current requirements of the regulatory authorities, validation samples will be collected from all materials that are to be imported or re-used on-site to confirm the proposed development will pose no unacceptable risk to human health or the wider environ.

Subsoil and topsoil shall be free of any deleterious materials, such as buildings materials, timber, plastics etc and conform to the requirements of BS 3882:2007.

Testing requirements for topsoil and subsoil are presented in Table 6.1.

TABLE 6.1 SPECIFICATION FOR SOIL TESTING

MATERIAL USE	TESTING FREQUENCY	SUITE OF ANALYSIS
Subsoil Greenfield Source (150 mm Landscaping Cover)	1 Sample per 200 m ³	A/B/C/D
Subsoil Brownfield Source (150 mm Landscaping Cover)	1 Sample per 50 m ³	A/B/C/D
Topsoil Greenfield Source (150 mm Landscaping Cover)	1 Sample per 200 m ³	A/B/C/D
Topsoil Brownfield Source (150 mm Landscaping Cover)	1 Sample per 50 m ³	A/B/C/D
General Engineering Fill (Class 1 and 2 Soil)	1 Sample per 1000 m ³	A/B/C/D

Notes

Suites of Analysis:

- A. Speciated PAH.
- B. Speciated TPH (C5-C35).
- C. Asbestos (ID).
- D. CLEA Inorganic Heavy Metals.

6.1.1. PROCEDURE FOR PLACEMENT OF CHEMICALLY SUITABLE COVER SYSTEM

Made Ground soils are to be stripped from beneath proposed areas of landscaping to a minimum of 300 mm bgl.

Landscaped areas need to be backfilled with 150 mm chemically validated subsoil, with 150 mm topsoil overlaying this. Topsoil is required to be confirmed as chemically suitable prior to placement. Where subsoil is not placed during Remediation & Enabling works, E3P will be required to return to site and undertake independent validation of the correct placement of subsoil.

The placement of 300 mm of clean material will be undertaken during the build phase works of the project.



Remediation Strategy Letter

Tupa, Penley

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The placement of subsoil and corresponding validation will be documented within the Landscaping Validation Letters (to be issued on completion of the contractor's works).

If proposed utilities are to be placed within the cover system, the clean cover should be placed prior to installation of these utilities.

If natural drift deposits are encountered within the 300 mm strip, then excavations can cease here.

E3P will collect photographic evidence of the placement of 150 mm of certified topsoil and 150 mm of subsoil on completion of construction works. This element will also be checked by the Building Control Officer as part of the site completion prior to issuing of a CML certificate.

The landscaping validation procedure is detailed in Table 6.2.

TABLE 6.2 LANDSCAPING VALIDATION PROCEEDURE

PROCEDURE	METHOD
Chemical Validation	Imported subsoils and topsoil will need to be chemically analysed to confirm suitability for use with the proposed cover system prior to installation and completion of the landscaping systems. E3P will issue an email to the appropriate party with an assessment of the chemical suitability of both subsoil and topsoil. If acceptable the materials can be installed to the required depth at which time the landscaping areas will be deemed complete following a validation procedure by a suitability qualified E3P engineer.
Trial Holes	Trial holes are deemed necessary for all landscaping areas given that the 300 mm cover system will need to be placed on each landscaping area during the build phase.
Validation	Photographic evidence will be taken by E3P of the topsoil placement demonstrating the depth of topsoil and practical completion of works are required for each and every landscaping area. For landscaping areas where subsoil depths require validation by E3P during the build phase, photographs will be taken and collated by E3P.
Validation Certificate	Once the photographs of the placement of topsoil (over the clean material) have been provided, E3P will issue a validation certificate to demonstrate that the required subsoil and topsoil has been placed in the required landscaped areas along with the chemical analysis.
Completion Report	Upon completion of all landscaping areas within the development, a Completion Report will be issued providing the confirmation that all remediation requirements have been achieved.

Plate 1 provides an example of validation photographs that will be required for each area of landscaping.



PLATE 1 EXAMPLE COVER SYSTEM VALIDATION

Plot Validation

20 / 20 (100%)

Plot Validation 1

5 / 5 (100%)

Plot Number

117

Is Plot Ready

Yes

Installation Standard

Pass

Depth of Cover System Materials (record the depth and support with Photo down the hole)

1000



Photo 1



Photo 2

Depth of Topsoil (mm)

150

Depth of Subsoil (mm)

850

Depth of Cover System at Ground Level (Photo)

Photo 3

Depth of Cover System in Relation to Plot (Ensure the whole plot can be seen in the photo)

Photo 4

Soil suitable

Yes

Geotextile membrane present

N/A



Remediation Strategy Letter

Tupa, Penley

August 2024

We trust this information is satisfactory to your requirements, and should I be able to be of any further assistance, please do not hesitate to contact me.

Yours sincerely,

For and on behalf of E3P Ltd

Matt Jackson
Geoenvironmental Project Manager
(BSc Hons, MSc, FGS, GMICE)

Alex Smith
Associate Director
(BSc (Hons), FGS, MEnvSc, CEnv)



Enclosed

Appendix I Drawings

17-510-002 – Proposed Development Plan
17-510-005 – Exploratory Hole Location Plan
17-510-007 – Depth of Topsoil Plan
17-510-015 – Development Constraints Plan
17-510-023 – Soil Contamination Plan

Appendix II E3P Remediation / Validation Criteria



APPENDIX I

DRAWINGS





Notes:					
P1	REVA	07.03.2024	OW	JW	MJ
Phase	Issue	Date	Drawn	Checked	PM

Client:	Fisher German LLP
	Tupa, Pensley

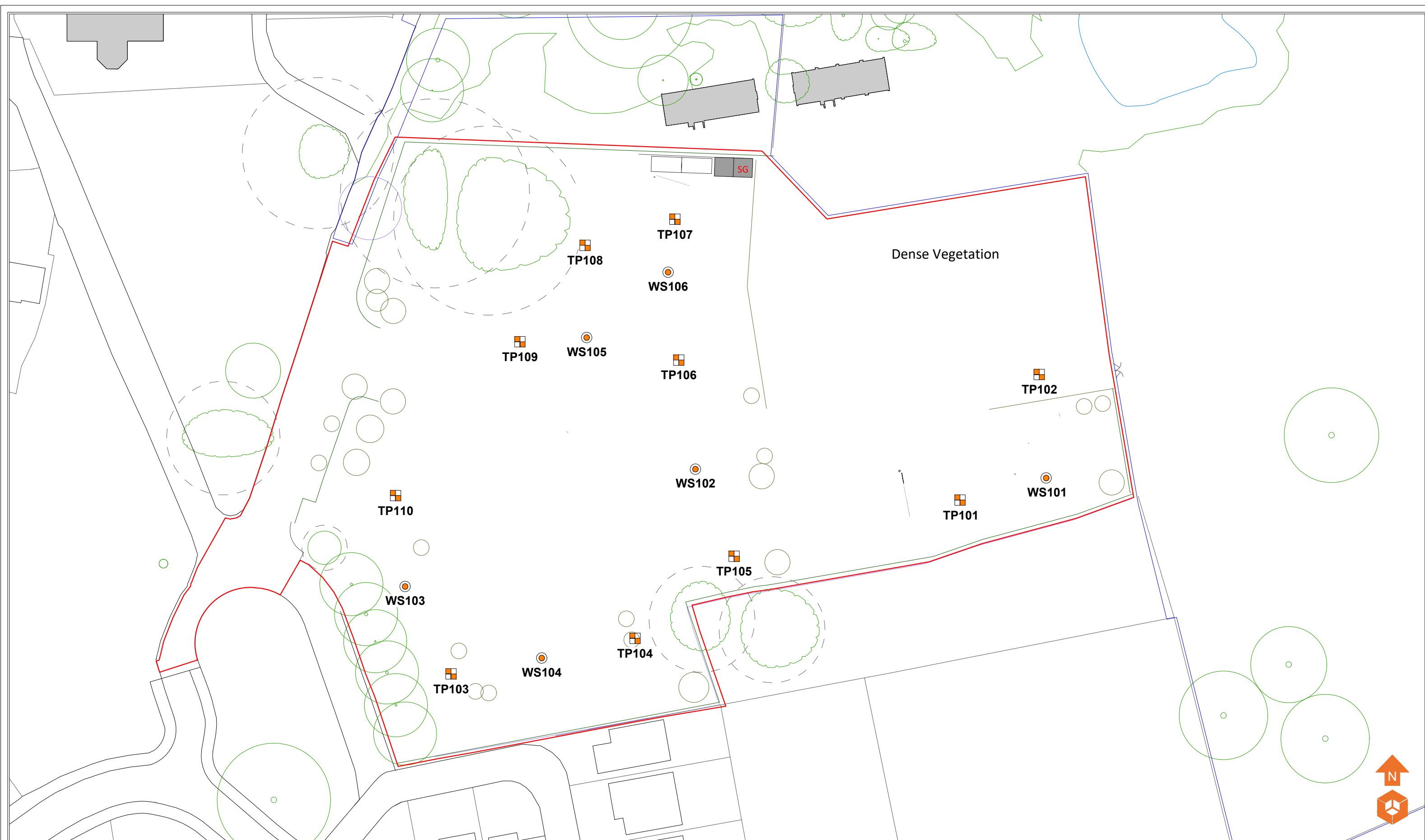
Job No:	17-510
Drawing No:	002

Date:	07.03.2024
Scale:	1:1000 @ A3



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Location Symbols

-  Approximate Window Sample Probehole Location (E3P March 2024)
-  Approximate Trial Pit Location (E3P March 2024)

Notes:

P1	REVA	02.04.2024	EB	JW	MJ
Phase	Issue	Date	Drawn	Checked	PM

Client:

Fisher German LLP

Job Title:

Tupa, Pensley

Job No:

17-510

Drawing No:

005

Date:

02.04.2024

Scale:

NTS@ A3



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Location Symbols

Approximate Window Sample Probehole Location (E3P March 2024)

Approximate Trial Pit Location (E3P March 2024)

Topsoil Depth (m)

Depth of Topsoil 0.10 - 0.19m

Depth of Topsoil 0.20 - 0.29m

Depth of Topsoil 0.30 - 0.39m

Depth of Topsoil 0.40 - 0.49m

Notes:

P1	REVA	02.04.2024	EB	JW	MJ
Phase	Issue	Date	Drawn	Checked	PM

Client:

Fisher German LLP

Job Title:

Tupa, Pensley

Job No:

17-510

Drawing No:

007

Date:

02.04.2024

Scale:

NTS@ A3

e3p

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Site Features

- Dense Vegetation
- Former Tennis Court
- Former Hospital Building
- Inspection Chamber
- Flooded Vegetated Area
- Footpath
- Hardstanding Area (Concrete)
- Large Mature Trees

Notes:

P1	REVA	02.04.2024	EB	JW	MJ
Phase	Issue	Date	Drawn	Checked	PM

Client:

Fisher German LLP

Tupa, Pensley

Job No:

17-510

Drawing No:

015

Date:

02.04.2024

Scale:

NTS@ A3

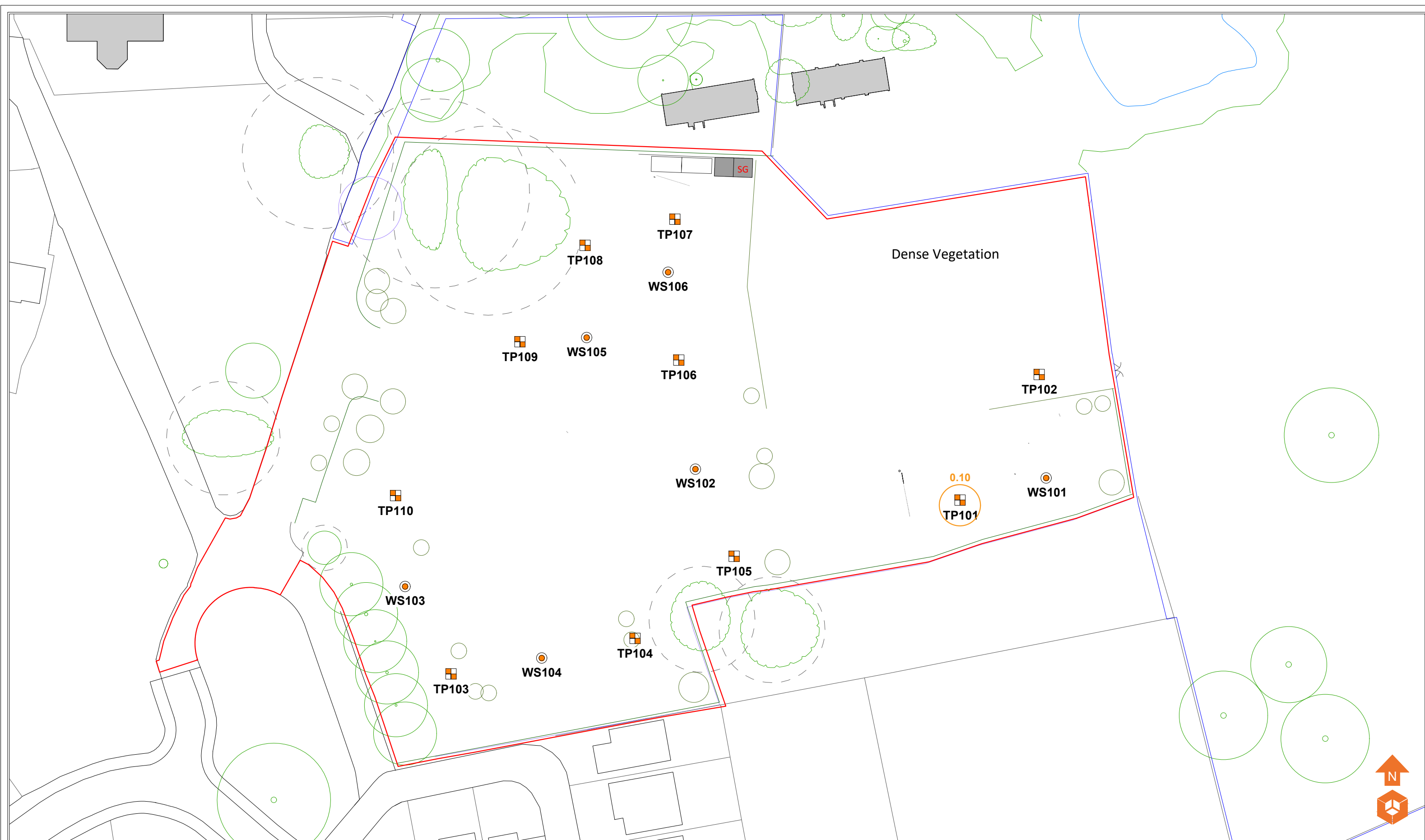


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Drawing Title:

Development Constraints
Plan

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Location Symbols

- WS101: Approximate Window Sample Probehole Location (E3P March 2024)
- TP101: Approximate Trial Pit Location (E3P March 2024)

Soil Contamination

- PAH: Polycyclic Aromatic Hydrocarbons

Notes:

Client:

Fisher German LLP

Job No:

17-510

Date:

22.04.2024

Drawing No:

023

Scale:

NTS@ A3



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Notes:

Job Title:

Tupa, Pensley

Drawing Title:

Soil Contamination Plan

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P1	REVA	22.04.2024	OW	JW	MJ
Phase	Issue	Date	Drawn	Checked	PM

APPENDIX I

E3P REMEDIATION/ VALIDATION CRITERIA



Remediation Strategy Letter

Tupa, Penley

August 2024

HUMAN HEALTH REMEDIATION TARGETS – LOW-RISE RESIDENTIAL END USE

DETERMINAND	UNITS	WITHIN 600 mm COVER SYSTEM (GARDEN)	HARD STANDING AND >600 mm OF COVER	PUBLIC OPEN SPACE 300 mm COVER	PUBLIC OPEN SPACE > 300 mm	PATH- WAY
Arsenic	mg/kg	37 ⁽ⁱ⁾	40 ⁽ⁱⁱ⁾	79 ⁽ⁱⁱⁱ⁾	170 ^(iv)	1
Cadmium	mg/kg	11 ⁽ⁱ⁾	85 ⁽ⁱⁱ⁾	120 ⁽ⁱⁱⁱ⁾	532 ^(iv)	1
Chromium (Hexavalent)	mg/kg	6 ⁽ⁱ⁾	6 ⁽ⁱⁱ⁾	7.7 ⁽ⁱⁱⁱ⁾	220 ^(iv)	1
Lead	mg/kg	200 ^(vi)	310 ^(vii)	630 ^(viii)	1300 ^(viii)	1
Elemental Mercury	mg/kg	1.2 ⁽ⁱ⁾	1.2 ⁽ⁱⁱ⁾	16 ⁽ⁱⁱⁱ⁾	30 ^(iv)	2
Nickel	mg/kg	130 ⁽ⁱ⁾	180 ⁽ⁱⁱ⁾	230 ⁽ⁱⁱⁱ⁾	800 ^(iv)	1
Selenium	mg/kg	250 ⁽ⁱ⁾	430 ⁽ⁱⁱ⁾	1100 ⁽ⁱⁱⁱ⁾	1800 ^(iv)	1
Copper	mg/kg	2400 ⁽ⁱ⁾	7100 ⁽ⁱⁱ⁾	12,000 ⁽ⁱⁱⁱ⁾	44,000 ^(iv)	1
Zinc	mg/kg	3700 ⁽ⁱ⁾	40,000 ⁽ⁱⁱ⁾	81,000 ⁽ⁱⁱⁱ⁾	170,000 ^(iv)	1
Phenol	mg/kg	120 ^{(i)(xi)}	440 ^{(xiv)(xi)}	440 ^{(iii)(xi)}	440 ^{(iv)(xi)}	2
Naphthalene	mg/kg	2.3 ^{(i)(xi)}	2.3 ^{(xiv)(xi)}	1200 ^{(iv)(xi)}	1200 ^{(iv)(xi)}	2
Acenaphthylene	mg/kg	170 ^{(i)(xi)}	500 ^(v)	15,000 ^{(iii)(xi)}	29,000 ^{(iv)(xi)}	3
Acenaphthene	mg/kg	210 ^{(i)(xi)}	500 ^(v)	15,000 ^{(iii)(xi)}	29,000 ^{(iv)(xi)}	1
Fluorene	mg/kg	170 ^{(i)(xi)}	500 ^(v)	9900 ^{(iii)(xi)}	20,000 ^{(iv)(xi)}	1
Phenanthrene	mg/kg	95 ^{(i)(xi)}	500 ^(v)	3100 ^{(iii)(xi)}	6200 ^{(iv)(xi)}	3
Anthracene	mg/kg	500 ^{(i)(xi)}	500 ^(v)	74,000 ^{(iii)(xi)}	150,000 ^{(iv)(xi)}	3
Fluoranthene	mg/kg	280 ^{(i)(xi)}	500 ^(v)	3100 ^{(iii)(xi)}	6300 ^{(iv)(xi)}	3
Pyrene	mg/kg	500 ^{(i)(xi)}	500 ^(v)	7400 ^{(iii)(xi)}	15,000 ^{(iv)(xi)}	3
Benzo(a)Anthracene	mg/kg	7.2 ^{(i)(xi)}	11 ^{(ii)(xi)}	29 ^{(iii)(xi)}	49 ^{(iv)(xi)}	3
Chrysene	mg/kg	15 ^{(i)(xi)}	30 ^{(ii)(xi)}	57 ^{(iii)(xi)}	93 ^{(iv)(xi)}	3
Benzo(b)Fluoranthene	mg/kg	2.6 ^{(i)(xi)}	3.9 ^{(ii)(xi)}	7.1 ^{(iii)(xi)}	13 ^{(iv)(xi)}	3
Benzo(k)Fluoranthene	mg/kg	77 ^{(i)(xi)}	110 ^{(ii)(xi)}	190 ^{(iii)(xi)}	370 ^{(iv)(xi)}	3
Benzo(a)Pyrene	mg/kg	2.2 ^{(i)(xi)}	3.2 ^{(ii)(xi)}	5.7 ^{(iii)(xi)}	11 ^{(iv)(xi)}	3
Indeno(123-cd)Pyrene	mg/kg	27 ^{(i)(xi)}	45 ^{(ii)(xi)}	82 ^{(iii)(xi)}	150 ^{(iv)(xi)}	3
Dibenzo(a,h)Anthracene	mg/kg	0.24 ^{(i)(xi)}	0.31 ^{(ii)(xi)}	0.57 ^{(iii)(xi)}	1.1 ^{(iv)(xi)}	3
Benzo(ghi)Perylene	mg/kg	320 ^{(i)(xi)}	360 ^{(ii)(xi)}	640 ^{(iii)(xi)}	1400 ^{(iv)(xi)}	3
TPH C ₅ -C ₆ (aliphatic)	mg/kg	42 ^{(i)(xi)}	42 ^{(ii)(xi)}	42 ^{(ii)(xi)}	10,000 ^{(xiv)(xi)}	2
TPH C ₆ -C ₈ (aliphatic)	mg/kg	100 ^{(i)(xi)}	100 ^{(ii)(xi)}	100 ^{(ii)(xi)}	10,000 ^{(xiv)(xi)}	2
TPH C ₈ -C ₁₀ (aliphatic)	mg/kg	27 ^{(i)(xi)}	27 ^{(ii)(xi)}	27 ^{(ii)(xi)}	10,000 ^{(xiv)(xi)}	2
TPH C ₁₀ -C ₁₂ (aliphatic)	mg/kg	130 ^{(i)(xi)}	130 ^{(ii)(xi)}	130 ^{(ii)(xi)}	10,000 ^{(xiv)(xi)}	2
TPH C ₁₂ -C ₁₆ (aliphatic)	mg/kg	1000 ^{(xiv)(xi)}	1000 ^{(xiv)(xi)}	1000 ^{(xiv)(xi)}	10,000 ^{(xiv)(xi)}	2
TPH C ₁₆ -C ₂₁ (aliphatic)	mg/kg	1000 ^{(xiv)(xi)}	1000 ^{(xiv)(xi)}	1000 ^{(xiv)(xi)}	10,000 ^{(xiv)(xi)}	1
TPH C ₂₁ -C ₃₅ (aliphatic)	mg/kg					1
TPH C ₅ -C ₇ (aromatic)	mg/kg	70 ^{(i)(xi)}	370 ^{(ii)(xi)}	370 ^{(ii)(xi)}	10,000 ^{(xiv)(xi)}	2
TPH C ₇ -C ₈ (aromatic)	mg/kg	130 ^{(i)(xi)}	860 ^{(ii)(xi)}	860 ^{(ii)(xi)}	10,000 ^{(xiv)(xi)}	2
TPH C ₈ -C ₁₀ (aromatic)	mg/kg	34 ^{(i)(xi)}	47 ^{(ii)(xi)}	47 ^{(ii)(xi)}	10,000 ^{(xiv)(xi)}	2
TPH C ₁₀ -C ₁₂ (aromatic)	mg/kg	74 ^{(i)(xi)}	250 ^{(ii)(xi)}	250 ^{(ii)(xi)}	10,000 ^{(xiv)(xi)}	2
TPH C ₁₂ -C ₁₆ (aromatic)	mg/kg	140 ^{(i)(xi)}	1800 ^{(ii)(xi)}	1800 ^{(ii)(xi)}	10,000 ^{(xiv)(xi)}	1



Remediation Strategy Letter

Tupa, Penley

August 2024

DETERMINAND	UNITS	WITHIN 600 mm COVER SYSTEM (GARDEN)	HARD STANDING AND >600 mm OF COVER	PUBLIC OPEN SPACE 300 mm COVER	PUBLIC OPEN SPACE > 300 mm	PATH- WAY
TPH C ₁₆ -C ₂₁ (aromatic)	mg/kg	260 ^{(i)(xi)}	1900 ^{(ii)(xi)}	1900 ^{(ii)(xi)}	10,000 ^{(xiv)(xi)}	1
TPH C ₂₁ -C ₃₅ (aromatic)	mg/kg	1000 ^{(xiv)(xi)}	1900 ^{(ii)(xi)}	1900 ^{(ii)(xi)}	10,000 ^{(xiv)(xi)}	1
Asbestos	Fibres Volume Weight (%)	NFD	0.001%	NFD	0.001	4

Notes 1

NFD = No Fibres Detected

Asbestos will be screened visually on-site by a qualified environmental consultant and where potential ACM is identified, representative samples will be subject to quantitative analysis of % volume by weight.

Should any ACM be identified within the soil matrices, further detailed % assessment would be required when the reported laboratory result exceeds the limit of detection for the analytical method at 0.01% by volume (weight).

Notes 2

Excludes matrices where free product is observed.

No viable exposure pathway beneath hardstanding and cover system.

Notes 3

Main exposure pathways: 1 = soil ingestion, 2 = vapour inhalation (indoor), 3 = dermal contact and ingestion, 4 = dust inhalation.

Abbreviations: GAC = general assessment criteria, n = number of samples, MC = maximum concentration, N/A = Not Applicable (no exceedance of assessment criteria), Loc of MC = location of exceedances.

- i. Value derived from LQM Sutable 4 Use Levels (S4ULs) for residential end use with plant uptake.
- ii. Value derived from LQM Sutable 4 Use Levels (S4ULs) for residential end use without plant uptake – these levels used below 600 mm cover system within residential gardens as soils will be present within a residential setting yet soils will not be disturbed and garden plants will not reach these soils.
- iii. Value derived from LQM Sutable 4 Use Levels (S4ULs) for public open space (POS) residential.
- iv. Value derived from LQM Sutable 4 Use Levels (S4ULs) for public open space (POS) park – these levels used below 300 mm POS cover system as soils will not be disturbed by any future site users and exposure to these soils will be similar to a park end use.
- v. Value derived from LQM Sutable 4 Use Levels (S4ULs) alongside assessment with WM3 to ensure that materials remaining on-site do not exceed the WM3 toxicity criteria for hazardous waste.
- vi. Value derived from Category 4 Screening Levels (C4SL) for residential land use with homegrown produce.
- vii. Value derived from Category 4 Screening Levels (C4SL) for residential land use without homegrown produce.
- viii. Value derived from Category 4 Screening Levels (C4SL) for public open space (POS) residential.
- ix. Value derived from Category 4 Screening Levels (C4SL) for public open space (POS) park.
- x. Mercury – based on elemental mercury.
- xi. PAH and TPH levels used are for 1% SOM.
- xii. Xylenes based on p-xylene (o-xylene 2600 mg/kg, m-xylene 3500 mg/kg) and is capped by its solubility.
- xiii. Value derived from LQM Sutable 4 Use Levels (S4ULs) for residential end use with plant uptake due to the volatilisation risk.
- xiv. BTEX is not SOM-related due to inhalation pathway.

