



e3p

REMEDIATION & ENABLING WORKS STRATEGY

Belle Vue Manchester

Prepared for:

**Countryside Properties Plc
&
SCP Investments Ltd**

E3P Report: 12-123-R2 Rev 4

Issued: June 2021



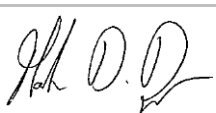
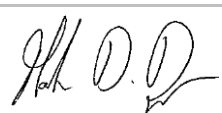
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EXECUTIVE SUMMARY

Site Address	Belle Vue Greyhound Stadium, Kirkmanshulme Lane, Manchester, M18 7BD
National Grid Reference	E387870, N396070
Site Area	4.67 Ha
Background	E3P has been instructed by Countryside Properties to develop a Remediation Strategy and Enabling Works Performance Specification for the proposed residential development at the subject site. The strategy has been produced in due consideration of the Geo-Environmental Site Investigation and Contaminated Land Assessments previously undertaken by E3P and DB Remediation. Countryside Properties intend to construct a low-rise residential development with associated garden and landscaped areas, access road and infrastructure. The site is currently an operational greyhound and stock car racing track with a number of buildings present within the northern, eastern, western sectors of the site. An Electric Substation is still present within the north-eastern sector. An active groundwater abstraction borehole is present within the northeastern sector of the site.

Contaminated Land Assessment

Human Health Risk Assessment	The Tier I human health risk assessment has identified the presence of elevated concentrations inorganic heavy metals, PAH compounds and trace asbestos fibres within shallow Made Ground deposits. The shallow Made Ground is therefore not suitable for use within proposed garden and landscaped areas where a direct exposure pathway exists. All gardens will require the placement of a 600mm chemically suitable cover system (comprising 450mm subsoil and 150 topsoil) to remove the exposure pathway and ensure no unacceptable risk to the human health receptors. Where the Made Ground is <600mm below final garden levels, the cover system should only extend to the natural stratum to ensure adequate mitigation of all perceived risk. Asbestos fibres were identified within the Made Ground across the site. This material will require careful management and subsequent placement in an area of no future sensitivity in accordance with the E3P developed CSM. Elevated concentrations of volatile TPH and naphthalene have been identified in TP106 and is considered a localised hotspot. Therefore, during the enabling works, the hotspots should be delineated and removed with remaining soils chemically validated to assess chemical suitability for retention on site. Excavated soils should be assessed and either retained in an area of no future sensitivity, treated or disposed off-site. Localised, as yet unidentified contaminant impact cannot be discounted, therefore the site remediation and enabling works will be completed under the supervision of an independent Geo-Environmental Engineer. In the event any as yet unidentified / unexpected source impact is observed, samples will be subject to laboratory testing to inform robust risk assessment and where necessary remediation action.
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EXECUTIVE SUMMARY

Controlled Waters Risk Assessment	The Tier 1 controlled waters risk assessment has not identified any significant source of potential contamination or dissolved phase impact within the groundwater samples or within leachate tests completed on selected Made Ground samples. The developed conceptual site model did not identify a potentially complete pollutant linkage and as such the site is deemed to pose no significant risk to controlled waters or the wider environ. However, as discussed above, as yet unidentified contaminant impact cannot be discounted, therefore the site remediation and enabling works will be completed under the supervision of an independent Geo-Environmental Engineer.
Ground Gas	Based on the monitoring results to date (3 No. Surveys by E3P) the site would be classified as CS1 / Green for the vast majority of the proposed development area. Within one isolated location (WS109), CS2 was determined due to the maximum concentration for CO₂ exceeding the action threshold due to a recorded concentration of 5.3% v/v. It is therefore recommended that dwellings in the proximity of WS109 are constructed with mitigation measures that are compliant for CS2 / Amber 1 to mitigate CO₂ ingress
Coal Mining & Historical Workings	A review of the Coal Authority GIS system, has indicated that there are no coal outcrops in close proximity of the site with any coal present beneath the site, likely present at a significant depth and therefore not considered to pose an unacceptable risk to the proposed development.
Invasive Plants	Japanese knotweed has been identified on the bunds in the eastern and western sectors of the site. These areas will require removal or treatment in accordance with the latest guidance.
Geotechnical Considerations	The remediation and enabling works will be delivered in a manner that will seek to ensure:  Remove extensive relict sub-structures, infrastructure and materials deemed geotechnically unsuitable;  Protection of the sub-grade to minimise disturbance and promote sustainable infrastructure construction;  Where shallow stratum suitable of supporting a shallow spread foundation, care should be taken to protect to minimise the disturbance to natural drift deposits;  Where deep Made Ground is present (>1.50m) the stratum should be prepared in a manner that will facilitate re-engineering using a Vibro Stone Column (VSC);  If VSC is proposed for plots located within the influence of trees, the stratum should be prepared to mitigate the potential risk associated within volumetric instability in cohesive soils;  Engineer all up-filled materials beneath highways to sub-grade in accordance with the requirements of this specification to ensure a CBR >5% in the sub-grade.
Summary of Site Remediation & Enabling Works	The site Remediation / Enabling Works Strategy provides a comprehensive specification for the regeneration of the land to negate identified pollutant linkages and construct a development platform that

EXECUTIVE SUMMARY

Summary of Site Remediation & Enabling Works

will be geotechnically suitable for the proposed end use. The salient features of the Remediation & Enabling Works Strategy are summarised below:

-  Implement all works in strict accordance with UK Environmental Permitting and Local Planning Authority Requirements.
-  Controlled removal of all trees and vegetation;
-  Removal and treatment of all Japanese Knotweed in the eastern and western sectors in accordance with specialist contractor method statement, validation and independent certification;
-  Demolition and removal of all relict foundations and buried features in their entirety;
-  Excavation and processing of Made Ground in a controlled manner with the sorting, processing and segregation of identified deleterious materials;
-  Excavation, delineation and validation of the identified volatile TPH and naphthalene impact in TP106,
-  Management of all anthropogenic material impacted by trace asbestos fibre in controlled and legislatively compliant manner;
-  Removal of all materials considered geotechnically deleterious;
-  Validation sampling and leachate testing to confirm material retained on-site pose no unacceptable risk to the residential end users, controlled waters or wider environ;
-  Importation of suitable material (if required) to achieve the required development levels.

Replacement of material in accordance with the E3P enabling specification & engineering requirements.

Summary of Build Phase Mitigation Requirements

The developer's works will also include the completion of the following additional elements:

-  Provision of a 600mm cover system using certified material with appropriate validation within proposed garden areas, comprising 450mm subsoil (potentially site won natural drift deposits) overlain by 150mm topsoil; and,
-  Provision of a 300mm cover system using certified material with appropriate validation within proposed areas of Public Open Space and soft landscaping.
-  Installation of ground gas mitigation measures for affected plots.
-  Construction of appropriate potable water supply infrastructure.

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Drawing No 12-123-001 – Site Location Plan

Drawing No 12-123-002 – Site Features Plan

Drawing No 12-123-003 – Historical Features Plan

Drawing No 12-123-004 – Proposed Development Plan

Drawing No 12-123-005 – Exploratory Hole Location Plan

Drawing No 12-123-006 – Development Constraints Plan

Drawing No 12-123-007 – Depth of Made Ground Plan

Drawing No 12-123-008 – Depth of Founding Strata Plan

Drawing No 12-123-010 – Remediation Issues Plan

Drawing No 12-123-011 – Build Phase Mitigation Plan

Appendix IV E3P Remediation / Validation Criteria

Appendix V E3P Material Import Criteria

Appendix VI Contractor Pre-Commencement Check Sheet

Appendix VII Contractor Completion Check Sheet

1. INTRODUCTION

1.1 Background

E3P has been instructed Countryside Properties to develop a Remediation Strategy and Enabling Works Performance Specification for the proposed residential development at the site known as Belle Vue Greyhound Stadium located to the south of Kirkmanshulme Lane and southwest of Hyde Road (A57), Belle Vue, Manchester.

1.2 Report Objectives

The objectives of this report are to:

-  Prepare overview of Contaminated Land Remediation requirements;
-  Evaluate feasible remedial technologies;
-  Assess the most appropriate earthworks solution to ensure the delivery of the optimum development platform;
-  Define validation criteria to demonstrate the successful implementation of a site Remediation & Enabling works plan;
-  Specify Geotechnical Engineering Performance Requirements; and,
-  Ensure the safe, cost effective and regulatory compliant redevelopment of the site.

1.3 Scope of Works

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

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

1.4 Previous Works

The following phases of Geo-Environmental investigations have previously been carried out at the site:

DB Remediation: *Site Investigation, Belle Vue.* Ref: Report No. R1010-2014, dated 2014

E3P: *Geo-Environmental Site Investigation Report (ref:12-123-R1) dated August 2019.*
Prepared for: Countryside Properties.

E3P: *Supplementary Geoenvironmental Site Investigation (ref:12-123-L5) dated April 2021.*
Prepared for: Countryside Properties.

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 reports are summarised within Section 2.0.

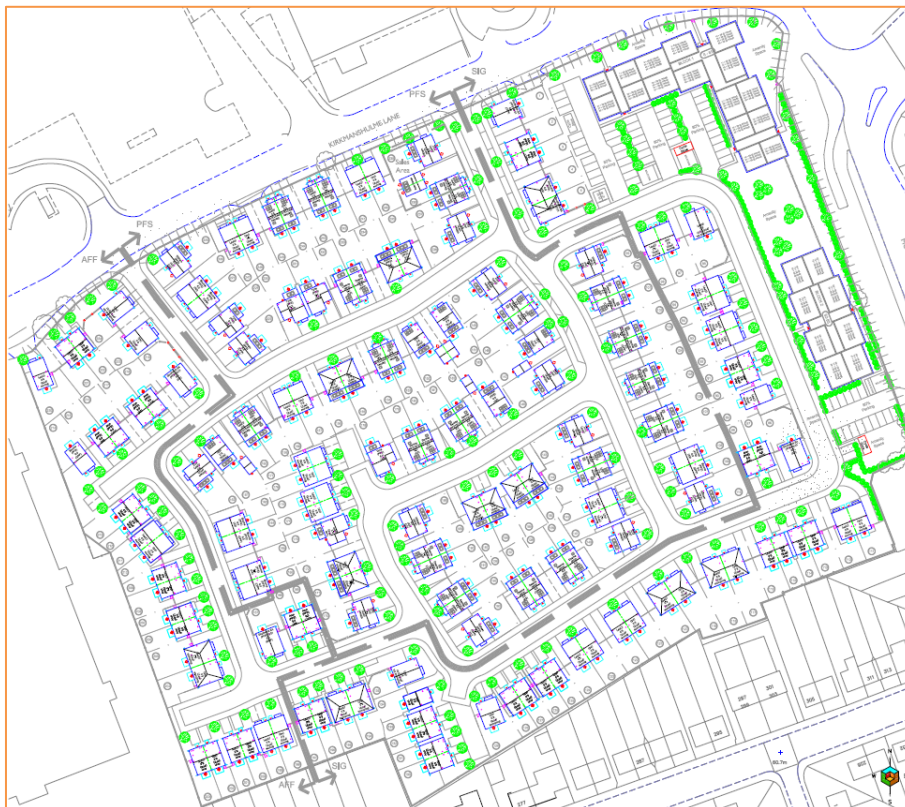
For the avoidance of any doubt, the E3P Geo-Environmental Site Investigation Report should be read both as a precursor and in conjunction with this document.

1.5 Redevelopment Plan

Countryside Properties intends to construct a low-rise residential development comprising residential dwellings with associated gardens, estate roads and infrastructure.

A snapshot of the proposed development layout is indicated in Figure 1.1

Figure 1.1 *Proposed Development*



1.6 Summary of Parties Involved

FUNCTION / INTEREST	NAME OF PARTY
Local Planning Authority	Manchester City Council
Developer	Countryside Properties
Geo-Environmental Consultant	E3P
Main Contractor	Countryside Properties
Remediation / Enabling Works Contractor	Urban Regen
Human Health Regulator	Manchester City Council
Controlled Waters & Waste Regulator	Environment Agency
Highways Adoption Authority	Manchester City Council

1.7 Regulatory Correspondence

Countryside Properties are in the process of submitting a detailed Planning Application to the Local Planning Authority for the proposed redevelopment of the site for low rise residential housing with associated adopted estate roads and infrastructure.

It is presumed that as part of the planning approval process, the Planning Authority will undertake consultation with the pertinent statutory consultees which will include:

-  Environmental Health / Contaminated Land Officer at the Local Authority (or external advisor);
-  Environment Agency Planning Liaison; and,
-  The Coal Authority.

1.8 Site Details

Site Address	Belle Vue Greyhound Stadium, Kirkmanshulme Lane, Manchester, M18 7BD
National Grid Reference	E 387870, N 396070
Site Area	4.67 Ha

All acronyms used within this report are defined in the Glossary presented in Appendix II.

A site location map is presented in Appendix III as Drawing 12-123-001.

1.9 Site Summary

SITE DESCRIPTION & SETTING	
Occupancy/use	The subject site is a relatively regular shaped parcel of land that is predominantly occupied by the Belle Vue Greyhound Stadium with associated car parking and ancillary infrastructure. The Stadium itself comprises a single large multi-storey building with, sand greyhound racetrack and dirt car race track. Pit garages and a refuelling area bound the western side of track. The southern and eastern sides of the track are bounded by concrete hardstanding for standing viewing areas. The northern sector of the site is overlain by asphalt hardstanding with the old entrance gate located on the northeastern boundary of the site. Part of the carpark is currently utilised by a motorbike test centre. The eastern sector of the site is utilised as waste storage and a soil bund is present with dense Japanese Knotweed present on the mound. The southern sector of the site is vacant and overlain with soft standing. The western sector is overlain by hardstanding and utilised as a pit garage and fuelling area for the motorbikes and cars used for racing. One large stand is also present in this sector of the site.
Environmental Setting	<i>Drift Geology</i> Glacial Till - Clay with Sand & Gravel.
	<i>Bedrock Geology</i> Chester Formation - Sandstone.
	<i>Hydrogeology</i> Secondary A Aquifer (Drift) over Principal Aquifer (Bedrock) There are two groundwater abstractions on site (presumed to be the same abstraction) utilised for dust suppression.
	<i>Hydrology</i> The nearest surface watercourse is located 240m southwest of the site.
	<i>Flood Risk</i> The site is not located within an identified flood risk zone.
	<i>Subsidence Hazard</i> No hazard identified in data searches.
Site History	Historical maps indicate that the site was undeveloped land in 1893 with assumed farm buildings in the north and southeast of the site named 'Higher Catsknowl' and 'Lower Catsknowl'. The map of 1908 shows the centre of the site to be labelled as marsh land. Two small ponds are identified in the northeast and south western sectors present in the mid-19th century. The site remained largely unchanged until pre 1950 when the 'Belle Vue Greyhound Race Course' was constructed with associated stands and a composite yard in the southeast of the site. The stadium was partially expanded by 1978 and an electricity sub-station was constructed in the east of the site. The site topography in the east and southwest is artificially raised by the placement of filled materials to create a terrace area formally used to view the track. In the last few years, the stadium has been consolidated with the demolition and removal of the former east and southernmost stand, albeit the relict foundations / sub-structure remains in-situ.
Landfill Sites & Ground Gases	The Envirocheck report for the site identifies an historical landfill located approximately 60m south of the site. The landfill waste including household waste. Furthermore, a large infilled former boating lake is present immediately north of the site. There are no other recorded landfills within 250m of the site.

SITE DESCRIPTION & SETTING

	The subject site is considered to be at a potential risk from hazardous ground gases originating from these nearby landfill sites, therefore a ground gas risk assessment will be required to confirm the ground gas regime for the site.
Radon	The property is in a lower probability radon area, as less than 1% of homes are above the action level.

1.10 Summary of Reported Ground Conditions

E3P has prepared a detailed Site investigation report (Ref: 12-123-R1) dated March 2018, the summary of reported ground conditions is summarised below.

SUMMARY OF GROUND CONDITIONS

Made Ground	Made Ground was encountered within all exploratory hole locations to a maximum depth in excess of >5.45m, however the Made Ground is typically 1.00m to 1.50m bgl. Made Ground deposits across the site are generally granular and comprise brown gravelly sand over a gravel sub-base to 0.20m bgl. This is then underlain by a black ashy gravel containing mainly building materials to circa 1.50m. However, porcelain tiles, timber and glass are present in a minority of the holes toward the southeast of the site. Black sandy silty clay with cobbles of brick and mudstone is present in thin layers at shallow depths 0.10m to 1.50m in isolated areas across the site. A 2.0m high bund is located in the eastern and western sectors of the site, however E3P did not excavate into these due to the knotweed present at the surface.
Topsoil	No topsoil that would be deemed suitable for re-use has been identified within any of the exploratory hole locations.
Drift	The drift deposits were encountered within all exploratory holes where the full depth of Made Ground was penetrated and generally it comprises a firm low strength silty CLAY with an organic odour to circa 1.3m which is underlain by a firm to stiff medium to high strength slightly gravelly CLAY. The gravel is medium coarse sub-angular to sub-rounded of mudstone. This stratum was encountered to bedrock at circa 15.00m bgl. Fibrous PEAT was encountered in TP101 between 1.30m and 1.70m bgl. It must be noted a large portion of the central sector could not be investigated and the historical maps show this sector to be former marsh. Therefore, it is anticipated that further organic soils will be encountered within this area of the site.
Bedrock	The cable percussive boreholes encountered weathered red SANDSTONE at 15.10m bgl in BH101 and 16.60m bgl in BH102.
Groundwater	Groundwater strikes were encountered at 13.00m bgl in BH101 and at depths between 0.40m and 1.30m bgl in the window sample probeholes and mechanically excavated trial pits.

2. E3P CONTAMINATION RISK ASSESSMENT

2.1 Background

E3P has completed a Tier 1 Qualitative Contaminated Land Risk Assessment to determine the potential risk to human health, controlled waters and the wider environment. This assessment is documented in full within the E3P Geo-Environmental Site Investigation Report and for clarity is summarised below.

2.2 Human Health Risk Summary

The E3P Tier 1 Qualitative Human Health Risk Assessment identified concentrations of the following determinants at or above the screening criteria for the assessment of no unacceptable degree of risk to human health:

-  Lead
-  Arsenic
-  Naphthalene
-  Phenanthrene
-  Benzo(a)anthracene
-  Chrysene
-  Benzo(a)pyrene
-  Benzo(b)Fluoranthene
-  Indeno(123-cd)pyrene
-  Dibenzo(a,h)Anthracene
-  Hydrocarbon Fractions C12-C16 (aromatic)
-  Hydrocarbon Fractions C16-C35 (aromatic)
-  Mercury
-  Chrysotile

In the case of heavy metals, non-volatile PAH compounds the viable exposure pathway is associated direct contact, inhalation of particulates, consumption of home-grown vegetables and ingestion of soil. The proposed development of the site will include hard cover and the importation of certified sub-soil and topsoil soil in areas of private gardens and landscaping, thus removing this pathway.

With regards to the elevated TPH and naphthalene at TP106, TP215 and TP303 this presents a potential volatilisation to indoor air risk. These elevated concentrations have only been identified within one area of the site and is considered to be a localised hotspot. Therefore, during a process of cut fill enabling works, a hotspots removal should be undertaken where these soils may be chemically validated to assess chemical suitability for retention on site in an area of no future sensitivity.

Asbestos was identified during the supplementary works carried out by E3P in November 2020 at TP303 (12-123-L5). Asbestos fibres are also anticipated within the fabric of the current structures due to their age. However no visible signs of asbestos were noted during the E3P site investigation and only trace levels of asbestos are anticipated.

The Made Ground soils and demolition arisings will require validation sampling in order to determine the potential presence of asbestos fibres. Should asbestos be identified these materials will require careful management to ensure soils are placed at depth in order that they do not pose an unacceptable risk to future site users. Any asbestos identified at concentrations >0.001% will require excavation, careful management and placement in areas of POS in accordance with the Asbestos CSM as shown in Figure 2.1 (overleaf).



FIGURE 2.1 ASBESTOS CONCEPTUAL SITE MODEL

Figure A1 Asbestos in Soils Conceptual Site Model Residential Development

Notes:

N.D. – None Detected

0.001% - Soils may contain 50.001% asbestos using composite testing to ensure there is no potential risk to human health. This value is present within areas where there may be short term low level exposure of soils containing trace asbestos fibres by construction workers where an appropriate level of asbestos management is employed (dust suppression).

0.1% - Soils at a depth of >1.00m bgl may contain <0.1% asbestos using composite testing where they will be not likely to be disturbed in the future and will therefore be in an area of low sensitivity. Risk assessment completed in accordance with the Asbestos JIWG risk assessment tools.

Undefined – This will be dependent upon soils encountered during the earthworks, which may be placed at these depths to ensure no potential risk to human health.



Due to the anthropogenic nature of the shallow material, this is not deemed suitable for retention and re-use in gardens, therefore a 600mm clean cover system (450mm subsoil, 150mm topsoil) is required in all private garden areas. A 300mm clean cover system can be utilised in landscaped areas. This will ensure that the future site users will be at no unacceptable risk from the identified contaminant exceedances.

It is concluded that the site will be suitable for the proposed residential end use subject to the completion of the afore mentioned supplementary assessments and the following build phase mitigation items:

-  Post demolition investigation of ground conditions beneath buildings and structures present at the time of the site investigation.
-  Supplementary sampling upon removal of the sub-station to assess potential for PCB impact;
-  Management of soils to ensure all materials impacted by asbestos fibres are placed in areas of low sensitivity during the site enabling works;
-  Use of potable water supply infrastructure that will be compliant with UKWIR assessment criteria;
-  Construction of proposed dwellings with correct ground gas mitigation measure requirements of BS8485; and,
-  Construction of a 600mm clean cover system to all areas of private garden in accordance with the detailed methodologies herein.

2.3 Controlled Waters Contamination Risk Summary

The site sensitivity with respect to controlled waters is summarised within Table 2.1

Table 2.1 Summary of Controlled Water Sensitivity

RISK PROFILE	DISCUSSION	SENSITIVITY RATING
Groundwater Source Protection Zone or Drinking Water Safeguard Zone	The site does not lie within a Groundwater Source protection zone.	LOW
Distance to the closest groundwater abstraction point.	There are two groundwater abstractions on-site for use as dust suppression. There are no nearby abstractions for drinking water	MODERATE
Aquifer Classification in Superficial Drift Deposits.	The underlying superficial deposits are likely to comprise clayey glacial till and are classified as a Secondary A Aquifer	MODERATE
Aquifer classification in Bedrock.	Principal Aquifer	HIGH
Viability for Anthropogenic soil in direct contact with aquifer (drift or bedrock).	BGS boreholes records confirm 32m of predominantly cohesive deposits over bedrock.	LOW
Is the site located within 50m of a surface watercourse?	The risk to surface water is negligible given the absence of a viable receptor within influencing distance of the site.	LOW
Summary The ICSM developed within the context of the site setting has only identified a single viable pollutant risk which would be the downward migration of potentially mobile phase soluble contaminants towards the underlying Principal Aquifer. However, the overall sensitivity of this receptor is reduced given the presence of low permeability drift beneath the site, and thus the potential for the creation of a complete pollutant linkage.		

In due consideration of the identified pollutant linkage, a Tier 1 controlled water risk assessment was completed by E3P as part of the E3P Geo-Environmental Site Investigation, the findings of which are summarised below:

The direct comparison of groundwater samples recovered from dedicated monitoring wells has not identified any elevated concentrations of determinants that exceed the screening criteria. Arsenic and zinc were identified within the E3P supplementary investigation leachate testing during November 2020 (12-123-L5). Given the site is underlain by circa 15 m of low permeable clay and nearest groundwater abstraction borehole for drinking water is over 1 km away, a complete pollutant linkage cannot be made. As the site is located within a low sensitivity location with respect to controlled waters there is not considered to be a significant risk to controlled waters.

The area around the existing stadium structure that has not been investigated due to access constraints still requires further assessment

Further assessment will be necessary following demolition activities.

2.4 Ground Gas

Based on the monitoring results the site can be predominantly classified as Green and in these areas, it is considered that gas protection measures will not be required. However, localised



areas of the site have been assessed as being Amber 1 which will require specialist mitigation measures to be constructed in accordance with BS8485 (2015) as summarised in Table 2.3 overleaf:

British Standard BS8485 (2015) provides two types of residential property that require assessment. These building types are:

-  **Type A building:** private ownership with no building management controls on alterations to the internal structure, the use of rooms, the ventilation of rooms or the structural fabric of the building. Some small rooms present. Probably conventional building construction (rather than civil engineering). Examples include private housing and some retail premises.
-  **Type B building:** private or commercial property with central building management control of any alterations to the building or its uses but limited or no central building management control of the maintenance of the building, including the gas protection measures. Multiple occupancy. Small to medium size rooms with passive ventilation of rooms and other internal spaces throughout ground floor and basement areas. May be conventional building or civil engineering construction. Examples include managed apartments, multiple occupancy offices, some retail premises and parts of some public buildings (such as schools, hospitals, leisure centres) and parts of hotels.

Based on the ground gas risk assessment and the proposed Type A Building, it is envisaged that a point score of 3.5 will be required for affected properties where the calculated CSV for CO₂ exceeds the action criteria as summarised in Table 2.2.

Table 2.2 BS8485 (2015) Points Required for Type A and B Building

CHARACTERISTIC SITUATION	NHBC TRAFFIC LIGHT SYSTEM	MINIMUM GAS PROTECTION SCORE (POINTS)	
		High Sensitivity	
		Type A building	Type B building
1	Green	0	0
2	Amber 1	3.5	3.5
3	Amber 2	4.5	4
4	Red	6.5	5.5
5	N/A	—	6.5
6	N/A	—	—

3.5 points must be achieved by installation of a suitable combination of measures detailed Table 2.3

A drawing detailing the plots requiring gas mitigation protection measures is attached to this report.

Table 2.3 BS8485 (2015) Point Score Summary

GAS PROTECTION SCORES FOR THE STRUCTURAL BARRIER	SCORE
a) Floor and substructure design	
Precast suspended segmental subfloor (i.e., beam and block).	0
Cast in situ ground bearing floor slab (with only nominal mesh reinforcement.	0.5
Cast in situ monolithic reinforced ground bearing raft or reinforced cast in situ suspended floor slab with minimal penetrations.	1 or 1.5

Basement floor and walls conforming to BS 8102:2009, Grade 2 waterproofing.		2
Basement floor and walls conforming to BS 8102:2009, Grade 3 waterproofing.		2.5
PROTECTION ELEMENT SYSTEM	SCORE	COMMENTS
Gas protection scores for ventilation protection measures		
(a) Pressure relief pathway (usually formed of low fines gravel or with a thin geocomposite blanket or strips terminating in a gravel trench external to the building)	0.5	Whenever possible a pressure relief pathway (as a minimum) should be installed in all gas protection measures systems. If the layer has a low permeability and / or is not terminated in a venting trench (or similar), then the score is zero.
Gas protection score for the gas resistant membrane		
(b) Passive sub floor dispersal layer: Media used to provide the dispersal layer are:  Clear void  Polystyrene void former blanket  Geocomposite void former blanket  No-fines gravel layer with gas drains  No-fines gravel layer	Very good performance Good performance	2.5 1.5
(c) Active dispersal layer, usually comprising fans with active abstraction (suction) from a sub floor dilution layer, with roof level vents. The dilution layer may comprise a clear void or be formed of geocomposite or polystyrene void formers.	1.5 to 2.5	This system relies on continued serviceability of the pumps; therefore alarm and response systems should be in place. There should be robust management systems in place to ensure the continued maintenance of the system, including pumps and vents. Active ventilation should always be designed to meet at least “good performance”.
(d) Active positive pressurization by the creation of a blanket of external fresh air beneath the building floor slab by pumps supplying air to points across the central footprint of the building into a permeable layer, usually formed of a thin geocomposite blanket.	1.5 to 2.5	This system relies on continued operation of the pumps; therefore alarm and response systems should be in place. The score assigned should be based on the efficient “coverage” of the building footprint and the redundancy of the system. Active ventilation should always be designed to meet at least “good performance”.
(e) Ventilated car park (floor slab of occupied part of the building under consideration is underlain by a basement or undercroft car park)	4	Assumes that the car park is vented to deal with car exhaust fumes, designed to <i>Buildings Regulations 2000, Approved Document F [9]</i> .
Gas resistant membrane meeting all of the following criteria:  Sufficiently impervious to the gases with a methane gas transmission rate <40.0 ml/day/m²/atm (average) for sheet and joints (tested in accordance with BS ISO 15105-1 manometric method_;	2	The performance of membranes is heavily dependent on the quality and design of the installation, resistance to damage after installation and integrity of joints. For example, a minimum 0.40mm thickness (equivalent to 370g/m² for polyethvlene) reinforced membrane

 Sufficiently durable to remain serviceable for the anticipated life of the building and duration of gas emissions;  Sufficiently strong to withstand in-service stresses (e.g., settlement if placed below a floor slab);  Sufficiently strong to withstand the installation process and following trades until covered (e.g., penetration from steel fibres in fibre reinforced concrete, penetration of reinforcement ties, tearing due to working above it, dropping tools etc);  Capable, after installation, of providing a complete barrier to the entry of the relevant gas; and,  Verified in accordance with CIRIA C735.		(virgin polymer) meets the performance criteria opposite. If a membrane is installed that does not meet all the criteria opposite, then the score is zero.
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3. SITE REMEDIATION & ENABLING WORKS

3.1 REMEDIATION TECHNOLOGY

Taking into account the site-specific conditions including the nature of the identified impacts, the geology and the objectives of the remediation, the most appropriate soil remedial technologies are considered to be:

-  Confirmation sampling within is of sub-station to demonstrated absence of PCB impact or define requirement for any remediation works;
-  Management of all soils impacted by trace asbestos fibres;
-  Delineation, excavation and removal of discreet contaminant hotspot at TP106 as identified within the Tier 1 human health risk assessment as unsuitable for use. Resulting material to be placed within area of no future exposure and in compliance with SSRT's;
-  Further investigation of ground conditions beneath buildings and structures post-demolition;
-  Validation of soils to show all residual soil concentrations are below the SSRT's for the protection of human health, controlled waters and the wider environ;
-  Construction of a suitable 600mm cover system (150mm topsoil, 450mm subsoil) to mitigate the risk associated with non-volatile / insoluble compounds; and,
-  Installation of appropriate ground gas protection measures to ensure compliance with BS8485 (2015) with independent validation of each unit.

It is considered that these technologies and methodologies will address the identified active pollutant linkages in the following manner:

Contaminants of Concern (CoC)

Metals, non-volatile PAHs & Hydrocarbon (petroleum range) Compounds

The human health risk drivers for the carcinogenic PAHs and metal CoC are:

-  Direct contact with the soil source by future on site residents; and,
-  Ingestion of impacted soils by future on site residents.

Therefore, a cover system is considered to be an appropriate remediation technique to address these impacts, as the installation of a cover system to un-surfaced areas of the site will sever the pathway of contact for human health receptors. A cover system is not considered to be required in future hard-standing areas or beneath buildings, as it can reasonably be assumed that the presence of a hard-standing will prevent direct contact.

Volatile PAH & TPH

With regards to the elevated TPH compounds and naphthalene, this presents a potential volatilisation to indoor air risk. These elevated concentrations have only been identified within one area of the site, in TP106. During a process of cut fill enabling works, impacted material will require delineation with impacted soils removed and assessed for retention, treatment or disposal.



Asbestos

Asbestos trace fibres have been identified within shallow Made Ground at two locations. All ACM impacted soils must be managed so as to ensure no airborne fibre release during construction or placement of impacted material in such a manner to ensure no future exposure risk.

Soils will be placed in areas of no unacceptable future risk in accordance with the E3P validation method.

If any visible pieces of Asbestos Containing Material (ACM) are identified during the site Remediation and Enabling Work, this material must be dealt with in strict accordance with the Control of Asbestos Regulations (CAR) 2012, UK Waste Management Legislation and the Environmental Protection Act 1994.

Due to the close proximity of residential dwellings, asbestos in air monitoring in accordance with HSG248 may be required to confirm that no asbestos fibres have been generated from the enabling works activities.

Should off-site disposal be required, then additional asbestos quantification and waste classification testing should be undertaken to ensure that it is classified correctly and disposed at a suitably licenced facility.

3.2 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 Table 3.1 (below).



TABLE 3.1 ENABLING WORKS SCHEDULE

RE-1	Pre-Commencement Supplementary Site Investigation Structures were still present in the north, south, east and west of the site during the E3P site investigation in 2018. These buildings include:  Grandstand and offices in the northern sector  Inspection pit/ garages and scoreboard associated with the former speedway use in the western sector  Greyhound and stock car racing track at the centre of the site.  Grandstand and electrical substation in the eastern sector  Former ticket office and entrance at the north eastern site boundary  Former garages in the south eastern corner of the site As part of the site inspection and watching brief during demolition, it will be necessary to undertake a supplementary phase of sampling within these areas to clearly delineate the extent of any impacted soils, assess the statistical relevance of any elevated concentrations within the isolated areas and determine options for excavation, ex-situ treatment on-site and replacement within an area of no future sensitivity. Where a potentially unacceptable degree of risk is identified, the impacted soils should be remediated by delineation, excavation and removal to a suitably licensed facility with subsequent validation sampling.
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. All relevant Standard Rules Permits should be registered with the EA. 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 re-used (excluding crushed materials) exceeds the parameters of the Standard Rules Permit, a CL:AIRE MMP Qualified Declaration should be made by the contractor having obtained full written approval for the Remediation Strategy from the LPA and Environment Agency. It is not anticipated that there will be any requirement to treat any materials on-site (such as hydrocarbon impact soil or groundwater), however should any previously unidentified contractor must either notify the EA of their intention to complete a minor works operation or arrange for the deployment of the appropriate Environmental Permit for the specified operation.
RE-3	Environment & Nuisance Control Management of all works so as to ensure that no environmental nuisance is created through dust emissions, noise or vibration levels. Ensure that all works are completed in a manner so as not to create any structural risk to the adjacent highways. Implement all temporary works as necessary to support excavations throughout the duration of the works. In the event that a complaint is made in respect of dust emissions, noise or vibration levels, remedial measures and a programme of ongoing monitoring should be agreed with the local authority and implemented on site.

RE-4	Risk to Infrastructure Site works should be completed in a manner that ensures no risk of disturbance to the adjacent infrastructure.
RE-5	Identification, Isolation and Treatment of Invasive Plants Japanese Knotweed infestations were noted in the eastern and western sectors of the site. As part of the proposed Remediation & Enabling Works, all areas of invasive plants must be clearly identified, with appropriate eradication to ensure removal of all plant debris and root systems from within any area of proposed development. The contractor shall employ a suitably qualified expert to investigate the presence of invasive plant species on or adjacent to the site. If invasive plant species are identified, these will be treated in strict accordance with an approved method statement. A suitable barrier shall be installed to prevent any future re-infestation of the subject site. If any invasive species are treated, 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-6	Site Clearance and Demolition Operations Demolition of on-site structures and general site clearance & provision of welfare, offices and site security as per the contract requirements. The site is currently overgrown with self-seeded vegetation; 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. All vegetation should either be stockpiled at a pre-agreed location or alternatively removed from site in accordance with Waste Permitting Regulations.
RE-7	Delineation, Excavation and Treatment of Identified Asbestos Impact Detectable asbestos fibres have been identified in TP303 (0.30 m) during supplementary investigation by E3P in November 2020. However, due to the nature and age of the filled material, it must be assumed that trace fibres are present throughout the Made Ground and within the fabric of the structures on site. The E3P Developed Conceptual Site Model demonstrates a suitable method for management of soils to negate any future risk. The contractor must ensure that all personnel working on-site are trained in the identification of ACM and the risk associated with impacted soils. Where any visual evidence of ACM is identified, these materials should be carefully segregated and removed from the soil matrices (if / where possible). Validation sampling of the processed Made Ground should be completed to demonstrate compliance with the Developed Conceptual Site Model. This process should be completed under strict controls to be devised and employed by the nominated contractor to ensure no potential for fibre release into ambient air. If necessary, reassurance air testing in accordance with the requirements of HSG 248 should be completed during the operation to move the soils to demonstrate the deployment of the required control procedures and safe working methods.
RE-8	Delineation, Excavation, Treatment & Disposal of Volatile Impacted Material Prior to the commencement of the main earthworks (where possible) all known contamination hotspots should be clearly identified and demarked to facilitate the

safe, legislatively compliant and sustainable removal and treatment of the area of concern.

Elevated concentrations of semi-volatile / soluble hydrocarbon compounds and naphthalene have been identified in TP106, TP215 (0.70 m) and TP303 (0.30 m) and will need to be excavated and delineated to remove the source material is removed, to ensure that there is no unacceptable risk to human health.

Elevated concentrations of non-volatile TPH has been identified within TP215, TP309. Impacted material should be removed at each location, where these soils may be chemically validated to assess chemical suitability for retention on site in an area of no future sensitivity.

Elevated total mercury was identified during supplementary investigation carried out in November 2020 at TP215 (0.70 m bgl). During remediation, speciated mercury analysis should be completed to assess whether elemental mercury is present which may pose a risk to future site users through vapour inhalation. If elemental mercury is identified, it may be necessary to delineate and excavate the soils as a hotspot and place in an area of low sensitivity such as POS. Alternatively, if it is proven that there is no elemental mercury, a clean cover system will be sufficient.

In the event that any as yet unidentified contaminant 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.

Where visual and olfactory evidence of hydrocarbon impacted is identified through either visual or olfactory observations or as a result of notable PID readings (>50ppm), they will be excavated and stockpiled on an impermeable membrane. The membrane will be placed upon a clay containment bund and covered to negate the risk of soils leaching and dispersal of any odours and/or vapours.

An E3P engineer will regularly monitor the stockpiled material with a PID to determine the need for boundary monitoring (albeit not anticipated). This material will then be subject to detailed laboratory analysis to determine the suitability for re-use or the requirements for off-site disposal.

Upon completion of the delineation and excavation, the sides and base of the resulting void(s) will be chemically validated to confirm no impacted materials remain in situ.

Validation samples will be collected at 10 linear meter centres from the side and base of the excavation.

The results of this validation testing will be directly compared to the Site Specific Remediation Targets (as defined within Appendix IV of this report) to demonstrate that no unacceptable level of risk to human health, controlled waters or the wider environment remains.

RE-9	Excavation, Breaking and Processing of All Above & Below Ground Structures Obstructions, relict foundations and infrastructure (apart from live services) are to be removed from the areas of proposed residential development to include plot footprints, rear gardens, private driveways, adopted highway and utilities 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. Materials will be processed as per the E3P chemical and geotechnical specification using licensed plant. 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	Decommissioning of Abstraction Borehole The groundwater abstraction borehole located in the north-eastern sector of the site will require decommissioning in accordance with the Environment Agency best practise.
RE-11	Cut & Filling of Made Ground to Development Levels The Made Ground is noted to be present to substantial depth in some areas of the site (>2.0m), is considered that it will be possible to utilise Vibro Replacement Stone Columns (VRSC) within areas of segregated and placed granular Made Ground to treat the currently unknown potential for differential settlement and ensure a uniform safe ABP in the order of 125kN/m². Where the proposed enabling works levels require the current landform to be cut, extreme care should be taken so as not to disturb the underlying stratum prior to the placement of the appropriate platform in compliance with the E3P Geotechnical Specification. Where the development levels require material to be filled, site derived Made Ground must be sorted in a controlled manner prior to replacement in accordance with the requirements of this specification for the intended land use. The maximum dry density must be determined in laboratory conditions utilising UKAS accredited testing prior to the commencement of filling and compaction works. In-situ density testing is required to demonstrate compliance with the E3P Geotechnical Performance Specification.
RE-12	Construction of Temporary Working Platform Where plots are to be prepared in a manner that will facilitate Ground Improvement by Vibro Stone Column, a Temporary Working Platform will be constructed. The specific design for such a platform should be obtained from E3P, however as a minimum this will comprise: Proof rolling of the sub-grade to ensure a CBR >5%; Placement of 300mm of certified 6F2 to be rolled and compacted to ensure a CBR >15%.

RE-13	Replacement of Materials Geotechnical Engineering Requirements		
	Material is to be backfilled in strict compliance with the E3P Geotechnical Engineering Specification as presented in detail within Section 6 of this report which generally requires the following reinstatement and compaction criteria.		
	Unless specific instruction is issued from the client, plots should be prepared for a strip foundation where the target founding stratum is identified to be present at a depth of 1.50m below FFL. Consideration is to be given to the need to construct a strip foundation ~200-400mm into the natural stratum and the contractor remediation elevations:		
	LAND USE	CONSTRUCTION REQUIREMENT	REQUIREMENT
	Footprint of proposed structure (2.0m on all elevations).	Pile Foundation	Backfill using general Method Compaction to CBR of 5%
		Vibro Stone Column	Granular backfill with suitably graded granular aggregate with <10% fines. CBR >5% with suitable pile mat.
		Traditional Spread Foundation	Ensure no disturbance of natural soil at shallow depth.
Highways	Adopted Estate Road / Drainage	Method Compaction using DOT ensure CBR >5% in sub-grade (engineered fill)	
Driveways	Private Drives & Car Parking	Method Compaction to CBR >5%	
Gardens & POS	N/A	Method Compaction to ensure no settlement.	
RE-14	Preparation of Ground for Vibro Stone Columns within Tree Influence		
	Where trees are present or within their total zone of influence the contractor must ensure that all cohesive soils are removed to the required depth with the subsequent replacement with granular a granular blanket to fully mitigate the potential for volumetric instability in the clay soils.		
	The zone of tree influence will be indicated within the Foundation Zoning Plan and all resultant excavations and subsequent backfilling must be inspected and approved by E3P.		
RE-15	The depth of the granular blanket required will be determined prior to the commencement of the works and in full agreement of the client but will nominally be equal to or in excess of 2.5 x foundation width.		
	Construction of Temporary Working Platform		
	Where plots are to be prepared in a manner that will facilitate Ground Improvement by Vibro Stone Column, a Temporary Working Platform will be constructed. The specific design for such a platform should be obtained from E3P, however as a minimum this will comprise:		
		Proof rolling of the sub-grade to ensure a CBR >5%; and,	
		Placement of 300mm of certified 6F2 to be rolled and compacted to ensure a CBR >5%.	

RE-16	Investigation and Removal of Compressible Peat A localised area of peat has been identified in TP101 (1.30m bgl – 1.70m bgl) in the north eastern sector of the site. This material is potentially compressible and as such will require further delineation prior to excavation from beneath all areas of sensitive infrastructure. Historical maps indicate the presence of historical marsh land beneath the current stadium building and racetrack and further peat deposits may be present in this area which was not previously investigated due to access restrictions. A suitably qualified geotechnical engineer will need to monitor works in this area to identify any further compressible peat deposits and oversee their removal from beneath any proposed structures or infrastructure. Foundations will be transferred to the underlying competent stratum in accordance with the structural engineer's design with floor slabs to be suspended.
RE-17	Chemical Validation of the Electrical Substation An electrical substation is present in the eastern sector of the site. When the substation is decommissioned and removed in a controlled manner (contractors' site specific method statement), samples will be collected to assess the potential presence of any PCB that would represent a chronic risk to human health or the wider environs.
RE-18	Importation of Bulk Fill Where there is a net shortfall of material required to achieve the proposed ground levels, it will be necessary to import natural inert soils and aggregate as per the engineering requirements (Section 6). Imported material must be certified as suitable for use in strict accordance with the E3P chemical and geotechnical performance criteria in conjunction with the required duty of care notes and waste transfer exemption. If recycled aggregates are imported laboratory testing should be completed to demonstrate compliance with the WRAP Protocol. Where inert soils are imported laboratory testing should be completed in accordance with the requirements of the pertinent Environmental Permit (i.e., U1 Standard Rules) or CL:AIRE MMP for the re-use of clean naturally occurring soils.
RE-19	Preparation of Garden for Cover System As part of the land remediation works, garden areas will be prepared in a manner that will 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 minimum depth of 600mm below finished garden level 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 re-use in an area of no sensitivity or where necessary, this material will be removed from site in accordance with UK Waste Management Legislation. The placement of certified sub-soil 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.

RE-20	Provision of Subsoil Chemical analysis of the natural drift deposits undertaken during the site investigation suggests that the material is suitable for use within the upper 600mm of clean cover to residential gardens. However further chemical validation of the natural drift deposits is required during the enabling works to fully determine suitability for future use. Proposed subsoil material (natural drift deposits) will require testing in line with the schedule present in Section 3.6 and Table 3.2. It is therefore deemed viable to re-use chemically suitable 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. The garden and landscaped areas will require depth validation to satisfy the requirement of the Council Mortgage Lenders (CML) in order to demonstrate that the appropriate thickness has been provided as a growing medium.
RE-21	Provision of Topsoil No material that would be deemed suitable for use as topsoil is present on-site and as such there will be requirement to import suitable material for use within the proposed development. Topsoil will require testing in line with the schedule present within Section 3.6 and Table 3.2. The garden and landscaped areas will require depth validation to satisfy the requirement of CML in order to demonstrate that the appropriate thickness has been provided.
RE-22	Remedial Verification Report Collation of information relating to site clearance, chemical testing, remedial works, remedial verification, material movements and waste transfer documentation where appropriate. Complete remedial validation 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.

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.

3.3 Second Phase Mitigation & Management – Build Phase

A second post Remediation & Enabling phase of works will be required to ensure the proposed development is constructed in a manner that incorporates the required mitigation measures to ensure the development is compliant with UK Building Regulations and the Local Authority Planning requirements.

Once the ground has been stabilised and rendered suitable for development, the builder will be required to undertake a second phase of remediation works to mitigate the identified theoretical risk to human health.

-  Provision of a 600mm cover system over Made Ground encountered across the site, using certified material with appropriate validation within proposed garden areas. Natural drift deposits encountered within the upper 600mm of finished ground levels can be directly overlain with a suitable cover (minimum 150mm topsoil).
-  Provision of 300mm certified cover system to all areas of soft landscaping and POS.
-  Provision of appropriately assessed water supply pipes.
-  Construction of dwellings in the vicinity of WS109 with the appropriate ground gas mitigation measures and corresponding independent validation.

3.4 Gas Mitigation Measures

Ground gas monitoring suggests that the site can be predominantly classified as Green and in these areas, it is considered that gas protection measures will not be required. However, localised areas of the site have been assessed as being Amber 1.

The validation inspection is to include verification of the items below for each and every plot, verification is to be undertaken by suitably trained independent persons.

INSPECTION	METHOD
Product Verification	Confirmation that suitable products have been installed to consist of photographs of product types, labels on packaging and delivery tickets.
Wall Cavity Inspection	Confirmation that gas membrane spans the external wall cavity above the periscopic vents.
General Condition	The membrane is to be inspected to ensure there are no tears, punctures or rips.
Jointing	The engineer is to check the overlaps between membranes are correctly sealed with sufficient overlaps.
Service Entry Points	Verification of the presence of preformed top hats sealed to the pipe and membrane as per the construction detail.
Passive Venting Systems	The engineer should verify the presence of vents at 2m centres on at least 3 of the external walls. Verification of the stone venting layer and presence of pipes to be supplied by photographic records from site.

Examples of gas membrane verification (photographs include different membrane types for demonstrative purposes only – gas membranes are site specific):



Photographs 1 and 2: Check general condition of membrane for punctures / tears etc



Photograph 3: Confirm membrane product type and check joints between rolls of membrane to ensure 150mm overlap and presence of double sided butyl tape (by touch – may not be visible) and girth jointing tape.



Photograph 4: Check top hat is sealed to membrane and pipework. If the formed top hat is not tight to the pipework then also confirm presence of jubilee clip beneath butyl tape.

3.5 Water Pipeline Risk Assessment

A Pipeline Risk Assessment will be completed by E3P to fully inform the design of potable water infrastructure.

3.6 Chemical Analysis of Clean Cover System

The Remediation 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 all garden and landscaped areas; the construction of the clean cover / placement of clean material shall consist of:

-  450mm subsoil; and,
-  150mm 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.

The testing of all sub-soil will be completed as part of the remediation works undertaken. Therefore, the only requirement for further analysis of sub-soil would be in the event of importation of additional material during construction.

The agreed sampling frequency for these materials is presented in Table 3.2 below.

Table 3.2 - Specification of Materials Validation Laboratory Analysis

Material Use	Testing Frequency	Suite of Analysis
Site generated Sub-Soil (450mm garden cover)	1 Sample Per 250m ³ (minimum 3 samples*)	A / B / C / D
Imported Topsoil (150mm garden cover)	1 sample per 50m ³ (minimum 3 samples*)	A / B / C / D
Imported Sub-Soil (450mm garden cover)	1 Sample Per 250m ³ (minimum 3 samples*)	A / B / C / D

Notes – Table 4.1

*Sample frequency in accordance with Manchester Contaminated Land Strategy March 2011.

Suites of Analysis

A) Speciated PAH

B) Banded TPH (C5-C35)

C) Asbestos (ID)

D) CLEA Inorganic

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

Source testing certificates and validation testing of the imported materials shall be provided and is required to comply with the criteria set out in Table 3.3 overleaf.

Table 3.3 Remediation Targets-Low rise residential end use

Determinant	Units	Within 600mm Cover System (Garden)	Hard Standing and >600mm of cover system	Public Open Space 300mm Cover	Public Open Space >300mm	Pathway
Arsenic	mg/kg	37 ⁽ⁱ⁾	40 ⁽ⁱⁱ⁾	79 ⁽ⁱⁱⁱ⁾	640 ^(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	210 ^(vi)	330 ^(vii)	760 ^(viii)	760 ^(viii)	1
Elemental Mercury	mg/kg	1.2 ⁽ⁱ⁾	1.2 ⁽ⁱⁱ⁾	16 ⁽ⁱⁱⁱ⁾	30 ^(iv)	2
Nickel	mg/kg	180 ⁽ⁱ⁾	180 ⁽ⁱⁱ⁾	230 ⁽ⁱⁱⁱ⁾	3400 ^(iv)	1
Selenium	mg/kg	250 ⁽ⁱ⁾	430 ⁽ⁱⁱ⁾	1100 ⁽ⁱⁱⁱ⁾	1800 ^(iv)	1
Copper	mg/kg	2400 ⁽ⁱ⁾	7100 ⁽ⁱⁱ⁾	12000 ⁽ⁱⁱⁱ⁾	44000 ^(iv)	1
Zinc	mg/kg	3700 ⁽ⁱ⁾	40000 ⁽ⁱⁱ⁾	81000 ⁽ⁱⁱⁱ⁾	170000 ^(iv)	1
Phenol	mg/kg	280 ^{(i)(xi)}	280 ^{(xiv)(xi)}	760 ^{(iii)(xi)}	760 ^{(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)	15000 ^{(iii)(xi)}	29000 ^{(iv)(xi)}	3
Acenaphthene	mg/kg	210 ^{(i)(xi)}	500 ^(v)	15000 ^{(iii)(xi)}	29000 ^{(iv)(xi)}	1
Fluorene	mg/kg	170 ^{(i)(xi)}	500 ^(v)	9900 ^{(iii)(xi)}	20000 ^{(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)	74000 ^{(iii)(xi)}	150000 ^{(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)}	15000 ^{(iv)(xi)}	3
Benzo(a)Anthracene ⁽ⁱ⁾	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 ⁽ⁱⁱⁱ⁾	mg/kg	2.6 ^{(i)(xi)}	3.9 ^{(ii)(xi)}	7.1 ^{(iii)(xi)}	13 ^{(iv)(xi)}	3
Benzo(k)Fluoranthene ⁽ⁱⁱⁱ⁾	mg/kg	77 ^{(i)(xi)}	110 ^{(ii)(xi)}	190 ^{(iii)(xi)}	370 ^{(iv)(xi)}	3
Benzo(a)Pyrene ^(vii)	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)}	10000 ^{(xiv)(xi)}	2
TPH C ₆ -C ₈ (aliphatic)	mg/kg	100 ^{(i)(xi)}	100 ^{(ii)(xi)}	100 ^{(ii)(xi)}	10000 ^{(xiv)(xi)}	2
TPH C ₈ -C ₁₀ (aliphatic)	mg/kg	27 ^{(i)(xi)}	27 ^{(ii)(xi)}	27 ^{(ii)(xi)}	10000 ^{(xiv)(xi)}	2
TPH C ₁₀ -C ₁₂ (aliphatic)	mg/kg	130 ^{(i)(xi)}	130 ^{(ii)(xi)}	130 ^{(ii)(xi)}	10000 ^{(xiv)(xi)}	2
TPH C ₁₂ -C ₁₆ (aliphatic)	mg/kg	1000 ^{(xiv)(xi)}	1000 ^{(xiv)(xi)}	1000 ^{(xiv)(xi)}	10000 ^{(xiv)(xi)}	1
TPH C ₁₆ -C ₂₁ (aliphatic)	mg/kg	1000 ^{(xiv)(xi)}	1000 ^{(xiv)(xi)}	1000 ^{(xiv)(xi)}	10000 ^{(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)}	10000 ^{(xiv)(xi)}	2
TPH C ₇ -C ₈ (aromatic)	mg/kg	130 ^{(i)(xi)}	860 ^{(ii)(xi)}	860 ^{(ii)(xi)}	10000 ^{(xiv)(xi)}	2
TPH C ₈ -C ₁₀ (aromatic)	mg/kg	34 ^{(i)(xi)}	47 ^{(ii)(xi)}	47 ^{(ii)(xi)}	10000 ^{(xiv)(xi)}	2
TPH C ₁₀ -C ₁₂ (aromatic)	mg/kg	74 ^{(i)(xi)}	250 ^{(ii)(xi)}	250 ^{(ii)(xi)}	10000 ^{(xiv)(xi)}	2
TPH C ₁₂ -C ₁₆ (aromatic)	mg/kg	140 ^{(i)(xi)}	1800 ^{(ii)(xi)}	1800 ^{(ii)(xi)}	10000 ^{(xiv)(xi)}	1
TPH C ₁₆ -C ₂₁ (aromatic)	mg/kg	260 ^{(i)(xi)}	1900 ^{(ii)(xi)}	1900 ^{(ii)(xi)}	10000 ^{(xiv)(xi)}	1
TPH C ₂₁ -C ₃₅ (aromatic)	mg/kg	1000 ^{(xiv)(xi)}	1900 ^{(ii)(xi)}	1900 ^{(ii)(xi)}	10000 ^{(xiv)(xi)}	1
Asbestos	Fibres Volume Weight	NFD	0.001%	NFD	0.001	1

3.7 Placement of Chemically Suitable Cover System

Proposed garden and landscaped areas within the residential development require a chemically suitable cover system in order to break the exposure pathway between the end user and the contaminants.

Procedure for Placement:

-  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, excavation can cease here;
-  Garden and landscaped areas need to be backfilled with 450mm chemically validated subsoil, with 150mm topsoil overlaying this.

Garden Validation Procedure

The placement of 600mm of clean material will be undertaken during the build phase works of the project.

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

E3P will collect photographic evidence of the placement of 150mm of certified topsoil and 450mm 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.

Table 3.4 Garden Validation Procedure

PROCEDURE	METHOD
Chemical Validation	Subsoil and topsoil utilised within the cover system are required to be confirmed as chemically suitable prior to installation of the cover system. Materials should be stockpiled in a dedicated lay down area pending inspection by E3P and chemical analysis Site generated sub-soils will be analysed to confirm suitability for use with the results documented in the Remediation Validation Report. If additional sub-soil is required, this will be independently verified and analysed by E3P in accordance with the specification documented herein. Imported topsoil will need to be chemically analysed to confirm suitability for use with the proposed cover system prior to installation and completion of the garden systems. E3P will issue an email to the Countryside Properties Development Engineer with an assessment of the chemical suitability of both sub soils and top soils. If acceptable the materials can be installed to the required depth at which time the plot will be deemed complete following a validation procedure by a suitability qualified E3P engineer.
Trial Holes	The trial holes within garden and landscaped areas must be excavated to the full depth of the cover system.
Validation	E3P will attend site and measure the thickness of the cover system, providing an assessment to the site manager whilst on site. Photographic evidence will be taken of the cover system, demonstrating the depth and materials that make up the cover system and the location of the trial hole in relation to the plot.

PROCEDURE	METHOD
Validation Certificate	E3P will issue a plot specific validation certificate to demonstrate that the required subsoil and topsoil has been placed in each garden, along with the chemical analysis.
Completion Report	Upon completion of all garden and landscaped areas within the development, a Completion Report will be issued providing the confirmation that all remediation requirements have been achieved.



Photographs 1 and 2: Examples of validation photographs demonstrating clean cover.

3.5 Materials Management & Legislative Compliance

The processing of recycled aggregates will be completed using LAPC Part B Licensed Plant with the appropriate deployment notification to the Local Authority prior to commencement of works. All materials that are recovered as recycled aggregate will be compliant with the requirements of the WRAP protocol and the E3P validation testing requirements and as such would not be deemed to be a waste material.

A U1 Standard Rules Permit will be registered for the site which allows the re-use of up to 5000T of prescribed material within construction with up to 25,000T of material permissible to be re-used in the construction of roads. It should be noted that only 1000T of material described as sand, stones or clay soil classified as waste can be re-used with a U1.

A T5 Standard Rules permit allows the screening and recovery of up to 3000m³ of permissible material for sub-sequent re-use in construction will also be registered.

All materials that are recovered under the WRAP Protocol, U1 or T5 exemptions must be analysed to demonstrate that they are both chemically and structurally suitable for use within the context of the development.

The relevant LAPC, U1, T5 and WRAP Licenses, Exemption and Protocols provides the legislative framework for material compliance during the site remediation and enabling works to be completed by the specialist contractor under the supervision or E3P.

Where necessary operations as outlined in detailed within the Remediation Enabling Works Rationale summarised above may be subject to regulation using the appropriate Environmental Permit, Standard Rules Exemption and 'Materials Management Plan' (MMP) to be created in accordance with Version 2 of the CL:AIRE Definition of Waste - Industry Code of Practice.

It is noted that if material is to be imported utilising the CL:AIRE Code of Practise from an alternative development site, only chemically certified, clean, naturally occurring material can be transferred.

If required, the MMP will be created with due consideration of all proposed remediation and enabling works operations prescribed within this document and will be undertaken by a Qualified Person and a signed declaration submitted to the EA prior to re-use of materials on the site.

The importation of material for use within the proposed construction of a development platform will be subject to the compliance with the E3P Protocol for the importation of materials as set out within the specification for material import included within the Appendix of this report.

3.6 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 Strategy, or for materials to be imported onto site to facilitate the proposed residential development.

Upon removal of the hotspot of unsuitable made ground in the northern sector, validation samples will be collected from the base (2 No.) and sidewalls (4 No.) of the excavation to reasonably demonstrate no residual impact to the underlying strata.

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 PPE and sampling equipment that 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 within 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 Appendix IV), 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 3.5 (overleaf).



Table 3.5 **Specification of Chemical Validation Laboratory Analysis**

MATERIAL USE	TESTING FREQUENCY	SUITE OF ANALYSIS
Site Generated		
Site Generated 6F2	1 Sample Per 2000m ³ (minimum 3 samples*)	A / B / C / D
Site Won Made Ground General Backfill	1 Sample Per 2000m ³ (minimum 3 samples*) ³	G
Site Won Made Ground General Backfill	1 Sample Per 1000m ³ (minimum 3 samples*)	A / B / C / D
Site Won Made Ground General Backfill	1 Sample Per 1000m ³ (minimum 3 samples*)	I
Site Won Natural Backfill	1 Sample Per 2000m ³ (minimum 3 samples*)	A / B / C / D
Site generated Sub-Soil (450mm garden cover)	1 Sample Per 250m ³ (minimum 3 samples*)	A / B / C / D
Site Generated Topsoil Cover (150mm garden cover)	1 Sample per 250m ³ (minimum 3 samples*)	A / B / C / D
Hotspot Validation Samples	1 Sample per 10m of linear excavation to base and sidewall.	E / G
Imported		
6F2	1 Sample Per 1000m ³ (minimum 3 samples*)	A / B / C / D
Subsoil Greenfield Source (450mm garden cover)	1 Sample per 200m ³ (minimum 3 samples*)	A / B / C / D
Subsoil Brownfield Source (450mm garden cover)	1 Sample per 50m ³ (minimum 3 samples*)	A / B / C / D
Topsoil Greenfield Source (150mm garden cover)	1 Sample per 200m ³ (minimum 3 samples*)	A / B / C / D
Topsoil Brownfield Source (150mm garden cover)	1 Sample per 50m ³ (minimum 3 samples*)	A / B / C / D
General Engineering Fill (Class 1 & 2 Soil)	1 Sample Per 1000m ³ (minimum 3 samples*)	A / B / C / D

Notes

- 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) Lechate 2:1 Speciated PAH and Banded TPH
- I) Lechate analysis of Inorganic heavy metals, TPH, sulphate and PAH.

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

3.7 Remediation Contractors Site Management & 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 a safe, legislative 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 engineering 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.



4. ENVIRONMENTAL MONITORING AND VALIDATION

4.1 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 those details which materials are going where and why;
-  The strategy for each day's work will be agreed with the Site Manager, who will be in attendance. The Site Manager 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;
 - Ensure that any loads which 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.
-  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; and,
-  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.

4.2 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 hard standing should be subject to no less stringent measures with respect to assessment, and, where appropriate, monitoring than those set out above.

4.3 Mitigation of Risk from Soils with Asbestos Fibres

Pre-Commencement Works

Prior to the commencement of works the following activities will be undertaken:

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

Control, Monitoring and Reporting of General Aerial Emissions; 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 practise as detailed in CIRIA733.

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 the potential for water run-off is appropriately mitigated;
-  Once completed, any stockpiles will be sealed by compacting at the surface; and,
-  Vehicle speeds and movements on site will be kept to a minimum (<5mph) during civil excavation works to reduce the potential to generate dust.

Personal Protective Equipment (PPE)

In accordance with the HSE Guidance Note EM6 (non-licensed asbestos works), 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 - these are difficult to cover properly;
-  Wear the overall legs over footwear. Tucking them in lets dust into footwear; and
-  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 removed from 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'; and,
-  HSE Guidance Note HSG247 'Asbestos: The licensed contractors' guide'.
-  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 one time. In general terms, during anyone monitoring period, ten standard monitoring pumps will be run throughout the day, for the appropriate time period to achieve the required Limit of Detection (LOD). 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.

5. GEOTECHNICAL ENGINEERING SPECIFICATION

5.1 E3P Geotechnical Engineering Specification

The overarching philosophy of the site enabling works will be the delivery of the following:

-  Preparation of plot footprint (+2.0m on all elevation) to be suitable for Ground Improvement by Vibro Stone Column where depth of stiff clay / medium dense sands exceeds 1.50m from proposed Finished Floor Level;
-  Preparation of plots to be suitable for construction with shallow spread foundation where firm to stiff clay and medium dense sands are present at a depth <1.50m from proposed FFL across the complete plot; and,
-  Engineer all areas of proposed adopted road and private drive to be compliant with the E3P Geotechnical Specification with CBR and elevation defined by the client.

In the event that it is not possible to prepare the site in a manner that will achieve the required foundation solution, the Supervising Engineer and Client should be contacted at the first available opportunity.

The contractor should employ a suitably experienced engineer to be present on site during these earthwork operations to ensure soil suitability, placement, compaction and testing is undertaken in accordance with this specification and to ensure that any unforeseen circumstances, such as adverse weather, do not compromise the earthworks process.

Works should be halted during periods of intermittent or prolonged rainfall to ensure the materials are not placed in a manner that would result in softening of either the formation or the newly placed material. It will be the contractor's responsibility to determine appropriate weather conditions and determine the suitability of works.

Particular attention must be given to variable weather conditions when re-engineering clay soils as a moisture content fluctuation (2%+/-) of the tolerable limit will result in unacceptable degree of compaction loss.

5.2 Locally Won Fill Material

It is proposed to up-fill and level the site with material won from the development area. From the site-specific investigations undertaken to date, it is expected that the majority of the soils won from the processing of demolition material will be granular and cohesive soil matrixes.

Due to climatic weather conditions and variance in long term differential settlement associated with even well compacted granular soils and the need to facilitate the future re-engineering using Vibro Replacement Stone Columns to support a shallow Re-Enforced Strip Foundation, it is essential that the cut and fill process is well controlled, and materials are placed / Compacted in accordance with this specification.

Where site won materials are to be used as fill to achieve the required development platform, they must be compacted to ensure in-situ densities that are in excess of 95% of the Maximum Dry Density as determined using a 4.5kg laboratory Procter Test.

Materials should only be compacted when the actual moisture content is within 2% (+/-) of the optimum for the soil matrices as determined by laboratory bench testing.



5.3 Classification of Fill Material

This Specification should be read in conjunction with the following:

-  The Manual of Contract Documents for Highway Works, Volume 1, Specification for Highway Works, Series 600, Earthworks as amended in November 2005; and,
-  Soils for Civil Engineering Purposes, BS1377, 1999.

5.3.1 General Classification

The contractor should ensure that all earthworks' materials comply with Clause 601 of the Specification for Highway Works and shall fall into one of the other of the following general classifications as defined in Table 6/1 of the Specification for Highway Works.

-  General granular fill (Class 1),
-  General cohesive fill (Class 2), excluding class 2A and 2E,
-  Selected granular fill (Class 6).



Table 5.1 Specification for Backfill Compaction

E3P EARTHWORKS GEOTECHNICAL COMPACTION SPECIFICATION					
SOIL / MATERIAL TYPE	CLASS	DESCRIPTION	COMPACTION EQUIPMENT	LAYER THICKNESS	ROLLER PASSES
Granular Fill (Sand & gravel Matrices)	1 A	Sandy Gravel with some cobbles	>5000kg Vibrating Roller	225mm	4
	1 B	Sand or Gravel of same grading size	>5000kg Vibrating Roller	250mm	10
	1 C	Coarse gravels with many cobbles	>5000kg Vibrating Roller	400mm	5
Cohesive Fill (Clay with minor sand and gravel component)	2 A	Wet Clays	>100kg Metric Ton Vibrating Tamping Roller (Sheep Foot ONLY)	100-225mm	3
	2 B	Dry Clay	>5000kg Vibrating Roller or 1400kg Tamping (Trench Roller)	225mm or 125mm	4 or 12
	2 C	Gravelly Clay	>5000kg Vibrating Roller or 1400kg Tamping (Trench Roller)	225mm or 125mm	4 or 12
	2 D	Silty / sandy Clay	>5000kg Vibrating Roller or 1400kg Tamping (Trench Roller)	225mm or 125mm	4 or 12
Recycled Aggregate Crush. (<125mm Well Graded)	6F2	Any combination of inert hard materials other colliery spoil or rock with substantial amounts of clay like component.	>5000kg Vibrating Roller	250mm	6

5.3.2 Use of Fill Materials

In addition to any grading requirement the maximum particle size of any fill material shall be no more than two-thirds of the compacted layer thickness except that cobbles having an equivalent diameter of more than 150mm shall not be deposited within the restored surface level unless directed otherwise by the Engineer. Un-burnt colliery spoil, pulverised fuel ash or furnace bottom ash shall not be used as a fill material.

5.4 General Requirements

The contractor shall employ only plant and working methods which are suited to the materials to be handled and traversed. He shall be responsible for maintaining the nature of the acceptable material so that when it is placed and compacted it remains acceptable in accordance with the Contract.

For the purposes of this contract, the proposed earthworks requirements have been split into distinct end use categories with the corresponding requirements for the earthworks specification assigned to individual areas.

Table 5.2 Compaction / Backfill Requirements

LAND USE	COMPACTION METHODOLOGY & GENERAL PERFORMANCE CRITERIA
Traditional Spread Foundation	Ensure no disturbance of natural soil at shallow depth.
Re-engineering of soils using Vibro Replacement Stone Column (VRSC) to limit differential settlement and increase net Allowable Bearing pressure (ABP). Building Structure Footprint +2.0m on all elevations	Materials to be placed in a controlled manner to facilitate the construction of Vibro Replacement Stone Columns (VRSC). Material must be 90% granular in composition with less than 10% fines which are classified as materials <0.60micron's in size. No material greater than 125mm in size is permitted with 90% of the soils placed conforming to grading <90mm. Material to be placed when actual moisture content is within tolerable limits of the optimum with specific attention to and soils which are notably wet of the optimum. Material to be placed in a manner so as to ensure a minimum CBR of 5% at formation to facilitate machine movement and piling mat construction. Where site won materials are used to up-fill levels must be compacted to an 'end product' performance specification where the in-situ density exceeds 95% of the maximum (determined by laboratory conditions). Where rock is present at a shallow depth, the remediation contractor will ensure the sub-stratum is prepared to ensure a minimum of 1000mm of appropriately graded granular material is present to the underside of the proposed doubly reinforced concrete strip foundation. The sub-stratum must be prepared to ensure a vibro stone column treatment depth is not less than 80% of the immediate adjacent profile.
Piled Foundation	All plot footprint (+2.0m) must be free of any deleterious elements, tree roots and obstructions >150mm. Where upfill is proposed, material to be placed using method Compaction Specification to achieve CBR as required by developer for piling mat construction. Piling mat to be placed and constructed in accordance with approved geotechnical engineer's temporary works design.
Adopted Highways (+2.0m from back of footpath).	Method Compaction – Highways Design Manual Series 600 with in-situ Validation Testing to meet requirement of adoptions authority. CBR >5% at sub-grade formation (prior to placement of Capping).
Estate Roads	Method Compaction – Highways Design Manual Series 600 with CBR >5%.

Gardens, POS & Other External Areas

Material is to be placed in layers not exceeding 300mm and must be rolled using dedicated plant (no earth moving equipment) and in general compliance with the requirements of Highways Design Manual Series 600.

Acceptability shall be determined in accordance with Table 6/1 of the Highway Specification.

Laboratory testing for the purposes of determining acceptability and compaction requirements will be conducted by the Engineer.

Haulage of material to embankments or other areas of fill shall proceed only when sufficient spreading and compaction. Plant is operating at the place of deposition to ensure compliance with Clause 612 of the Highways specification.

No excavated acceptable material or unacceptable material required to be processed, other than surplus to the requirements of the Contract, shall be removed from the site.

Where the excavation reveals a combination of acceptable and unacceptable materials the Contractor shall carry out the excavation in such a manner that the acceptable materials are excavated separately for use in the Permanent Works without contamination by the unacceptable materials. Unless otherwise described in the Contract classes of fill material required to be deposited separately shall be excavated separately without contamination by other classes of material.

The Contractor shall make his own arrangements for stockpiling of acceptable material, and unacceptable material to be processed, and for the provision of site for purpose.

The Contractor shall ensure that he does not adversely affect the stability of excavations or fills by his methods of stockpiling materials, use of plant or sitting of temporary buildings or structures.

Topsoil shall wherever practicable be used immediately after its stripping and if not shall be stored in stockpiles of heights not exceeding 2.0m; topsoil shall not be stockpiled for more than two years. Topsoil shall not be unnecessarily trafficked either before stripping or when in a stockpile. Stockpiles shall not be surcharged or otherwise loaded and multiple handling shall be kept to a minimum.

Excavations requiring backfilling shall remain open only for the minimum period necessary.

The Contractor shall keep earthworks free of water including:

- (i) Arranging the rapid removal of water:
 - (a) shed on to the earthworks
 - (b) entering the earthworks from any source
- (ii) Provide where necessary temporary watercourses, drains, pumping and the like:
- (iii) Discharge accumulated water and groundwater into the permanent outfalls of the drainage system where practicable
- (iv) Provide adequate means for trapping silt on temporary systems discharging into permanent drainage systems.

The Contractor shall carry out and maintain and groundwater lowering or other treatment required.

Where materials are designated either Class U1B or Class U2 (according to the Highways Specification), the Contractor shall carry out any special requirements for their handling. Where such materials are encountered during the progress of the Works, the Contractor shall make all necessary arrangements for their safe handling and disposal after consultation with the appropriate environmental authority.

5.4.1 Construction of Fills – Highways

All fills shall be constructed:

- (i) In the locations as shown in the contract drawings to the lines and levels stated therein;
- (ii) Of classes of material complying with this specification;
- (iii) By deposition, as soon as practicable after excavation, in layers to meet the compaction requirements as required for each Class of material as specified.
- (iv) To the requirements of this clause and any other requirements for fill in this Specification.

Before commencing work on any area of fill the Contractor shall ensure that:

- (i) The base is sound and stable by excavating and removing any topsoil as soft subsoil.
- (ii) Base layers are not exposed until the fill layer is ready for placement.
- (iii) Un-compacted material on the side slopes of previously backfilled zones shall be removed and benches of between 1.0m and 1.5m height cut in compacted fill immediately prior to deposition of the new fill to ensure that the new backfill placed against the slope is properly integrated.

Whenever fill is to be placed on surfaces inclined at 1 vertical to 7 horizontal or steeper, the surface shall be benched immediately prior to deposition of the fill in order to achieve horizontal basal surfaces. The benches shall be between 1.0m and 1.5m in height.

Areas of fill shall, unless otherwise permitted by the Engineer, be constructed evenly over their fullest possible extent and the Contractor shall carefully control and direct construction plant and other vehicular traffic uniformly over the area of compacted fill. The minimum plan dimensions of any one panel of backfilling shall be properly integrated with areas of previous backfilling. Damage by construction plant and other vehicular traffic shall be made good by the Contractor with material having the same characteristics and strength as the material had before it was damaged.

Temporary slopes within compacted and un-compacted backfill shall be formed at gradients which ensure stability.

5.4.2 Construction of Fills – Adopted Highways, Estate Roads & Car Park

The Contractor shall carry out compaction upon the materials which require to be compacted, as soon as practicable after deposition.

Compaction shall be either method as required for the classes of fill in Table 6/1 which requires to be compacted.

The Contractor shall obtain permission from the Overseeing Organisation before carrying out compaction requirements as listed in Table 6/1 for the Class of material being compacted.

Method compaction shall be undertaken using the plant and methods appropriate to the compaction requirements as listed in Table 6/1 for the Class of material being compacted.

Earthmoving plant shall not be accepted as compaction equipment nor shall the use of a lighter category of plant to provide any preliminary compaction to assist the use of heavier plant to be taken into account when assessing the amount of compaction required for any layer.

If more than one class of material is being used in such a way that it is not practicable to define the areas in which each class occurs, the Contractor shall compact with plant operating as if only the material which required the greater compaction effort is being compacted.

If the results of field tests show densities which indicate the state of the compaction to be inadequate, if this is due to failure on the Contractor to comply with requirements of the Contract, the Contractor shall carry out such further work as is required to comply with the contract.

Refer to Clause 612/10 of the Highway specification for definition of plant to be used in accordance with this specified works.

The Contractor will be responsible for assessing the Class of Fill in accordance with Table 6/1 of the Highways Specification. Table 6/4 of the Highways Specification should then be employed to assess the method of compaction to be employed. The test results and method statements shall be submitted to the Consulting Engineers for approval.

5.5 Earthworks Material Tests

Prior testing of the potential sources of fill shall be undertaken by the Contractor and submitted to the Consulting Engineers for approval. This testing shall include, but not necessarily be limited to the compaction and backfill requirements detailed in Table 5.2.

Table 5.2 **Compaction / Backfill Requirements**

LAND USE	COMPACTION METHODOLOGY & GENERAL PERFORMANCE CRITERIA
Liquid and plastic limits	BS1377: Part 2
Grading	BS1377: Part 2
Uniformity Co-efficient	Calculated from grading curve
Moisture content	BS1377: Part 2
Organic Matter (maximum 2.5% total organic content)	BS1377: Part 3
Water soluble sulphate	TRL Report 447 test No 1

LAND USE	COMPACTION METHODOLOGY & GENERAL PERFORMANCE CRITERIA				
Total sulphate content	TRL Report 447 Test No 4				
Earthwork In-situ Tests Subsequent to the filling and compaction of the material a series of in-situ tests shall be undertaken to confirm the success of the compaction process. This testing shall include but necessarily be limited to, the following: <table border="1"> <thead> <tr> <th>TEST</th><th>TEST METHOD</th></tr> </thead> <tbody> <tr> <td>Plate load tests (equivalent CBR of 5%)</td><td>BS1377: Part 9</td></tr> </tbody> </table> Disposal of Materials The contractor shall be responsible for the safe disposal of any excess of unsuitable material found on the Site. Multi Point Moisture Condition Value (MCV) (to assess optimum moisture content)	TEST	TEST METHOD	Plate load tests (equivalent CBR of 5%)	BS1377: Part 9	Clause 632 (BS1377: Part 4)
TEST	TEST METHOD				
Plate load tests (equivalent CBR of 5%)	BS1377: Part 9				
Proctor compaction testing	BS1377: Part 4				

5.6 Specification for Ground Improvement by Vibro Stone Column

Proposed Vibro plots may be separated into the following categories:

-  **V1** Structures located within the conjectured zone of potential tree influence where cohesive soils present at the near surface. For these plots, the Remediation & Enabling Works Contractor will be required to remove the cohesive soils to the depths as specified within future Foundation Zoning Plans (provided on completion of further ground investigation). The resulting excavation will be upfilled with material that has been selected by the Contractor in the correct manner with placement and engineering to the required standard with validation testing as required; and,
-  **V2** Structures to be constructed within areas of the site where suitable founding stratum is not present within the near surface to facilitate a shallow spread foundation, therefore the Made Ground will be subject to Ground Improvement by VSC. Within areas of former development, all subterranean structures will be removed in compliance with the E3P Remediation & Enabling Works Performance Specification prior to the backfill of the resulting excavation with selected material to ensure compliance with the requirements for VSC.

The specification for the placement and compaction of non-compliant material where the fine constituent (<0.63micron) exceeds that standard requirements for Ground Improvement by VSC is shown below:

Table 3.3 *Compaction & Validation of Non-Standard Material Backfill to VSC*

Required parameters	The compaction must achieve the following material parameters:	
Verification Testing & Report	Bulk Density (□b)	95% of the maximum dry density and must be within 3% of the optimum moisture content
	All materials used for upfilling must be durable and inert.	
	In order to verify that the aforementioned material parameters have been attained, representative sampling and testing must be undertaken. All testing will be in accordance with BS EN ISO 17892-1:2014 and BS EN ISO 17892-2:2014. Furthermore all testing is to be undertaken by a laboratory with the relevant UKAS accreditation. The following tests are required:	
	Bulk Density (□b).	Approved methods of in situ testing(i.e. calibrated nuclear density probe (NDP), sand replacement test).
	Moisture Content	Moisture content test
	Bulk density testing on every 500m³ and in each layer of upfill well spread over site within and around the proposed structures' footprint. Testing must be from a range of depths throughout the treated fill. A minimum of six samples must be taken and tested. A drawing depicting the location of each sample and test point must be provided along with a list of each point and the relevant test/sample depth. A list of all geotechnical testing results for each sample and test must be provided along with the relevant test certificates. If the soils are not suitable due to the moisture content being higher than the optimum moisture content then Lime Modification may also be required. The above is given strictly on the basis that it does not conflict with other elements of the project specific requirements.	

6. RECORD KEEPING & VERIFICATION

6.1 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.

6.2 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 (i.e. asbestos in air, gas water etc.)

7. CONTINGENCY PLAN

7.1 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 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.

END OF REPORT

APPENDIX I LIMITATIONS



1. This report and its findings should be considered in relation to the terms of reference and objectives agreed between E3P and the Client as indicated in Section 1.2.
2. For the work, reliance has been placed on publicly available data obtained from the sources identified. The information is not necessarily exhaustive and further information relevant to the site may be available from other sources. When using the information it has been assumed it is correct. No attempt has been made to verify the information.
3. This report has been produced in accordance with current UK policy and legislative requirements for land and groundwater contamination which are enforced by the local authority and the Environment Agency. Liabilities associated with land contamination are complex and requires advice from legal professionals.
4. During the site walkover reasonable effort has been made to obtain an overview of the site conditions. However, during the site walkover no attempt has been made to enter areas of the site that are unsafe or present a risk to health and safety, are locked, barricaded, overgrown, or the location of the area has not been made known or accessible.
5. Access considerations, the presence of services and the activities being carried out on the site limited the locations where sampling locations could be installed and the techniques that could be used.
6. Site sensitivity assessments have been made based on available information at the time of writing and are ultimately for the decision of the regulatory authorities.
7. Where mention has been made to the identification of Japanese Knotweed and other invasive plant species and asbestos or asbestos-containing materials this is for indicative purposes only and do not constitute or replace full and proper surveys.
8. The executive summary, conclusions and recommendations sections of the report provide an overview and guidance only and should not be specifically relied upon without considering the context of the report in full.
9. E3P cannot be held responsible for any use of the report or its contents for any purpose other than that for which it was prepared. The copyright in this report and other plans and documents prepared by E3P is owned by them and no such plans or documents may be reproduced, published or adapted without written consent. Complete copies of this may, however, be made and distributed by the client as is expected in dealing with matters related to its commission. Should the client pass copies of the report to other parties for information, the whole report should be copied, but no professional liability or warranties shall be extended to other parties by E3P in this connection without their explicit written agreement there to by E3P.
10. New information, revised practices or changes in legislation may necessitate the re-interpretation of the report, in whole or in part.



APPENDIX II GLOSSARY

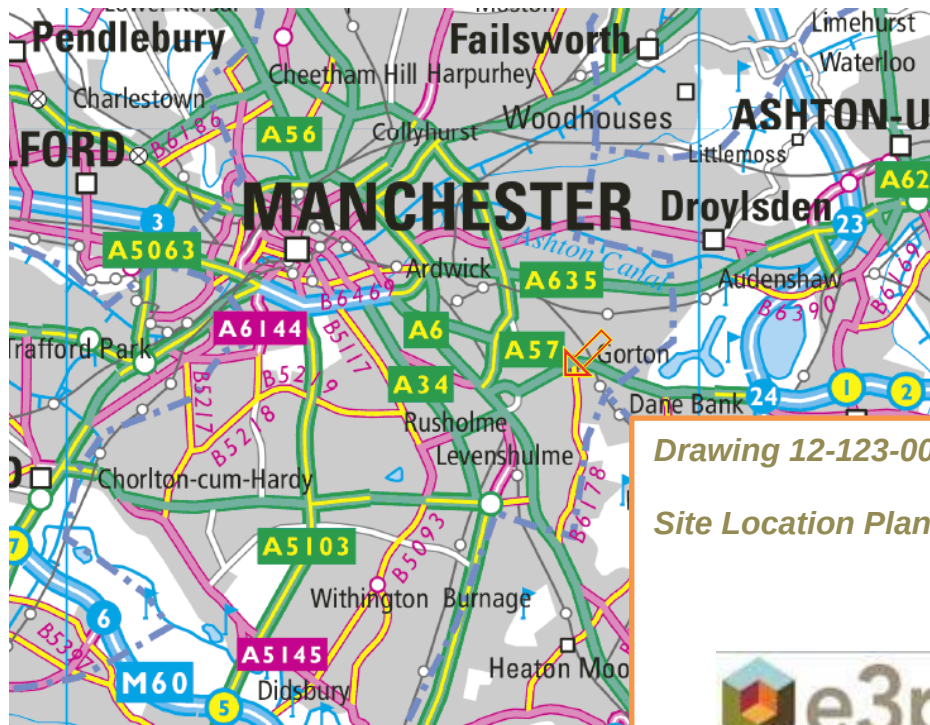
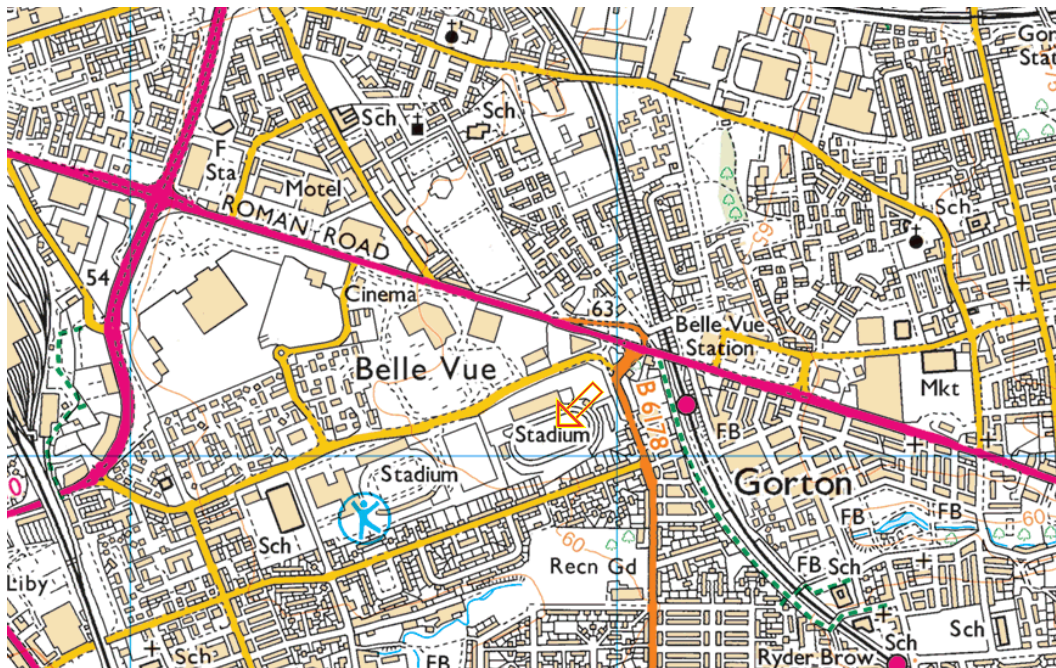


TERMS

AST	Above Ground Storage Tank	SGV	Soil Guideline Value
BGS	British Geological Survey	SPH	Separate Phase Hydrocarbon
BSI	British Standards Institute	TPH CWG	Total Petroleum Hydrocarbon (Criteria Working Group)
BTEX	Benzene, Toluene, Ethylbenzene, Xylenes	SPT	Standard Penetration Test
CIEH	Chartered Institute of Environmental Health	SVOC	Semi Volatile Organic Compound
CIRIA	Construction Industry Research Association	UST	Underground Storage Tank
CLEA	Contaminated Land Exposure Assessment	VCCs	Vibro Concrete Columns
CSM	Conceptual Site Model	VOC	Volatile Organic Compound
DNAPL	Dense Non-Aqueous Phase Liquid (chlorinated solvents, PCB)	WTE	Water Table Elevation
DWS	Drinking Water Standard	m	Metres
EA	Environment Agency	km	Kilometres
EQS	Environmental Quality Standard	%	Percent
GAC	General Assessment Criteria	%v/v	Percent volume in air
GL	Ground Level	mb	Milli Bars (atmospheric pressure)
GSV	Gas Screening Value	l/hr	Litres per hour
HCV	Health Criteria Value	µg/l	Micrograms per Litre (parts per billion)
ICSM	Initial Conceptual Site Model	ppb	Parts Per Billion
LNAPL	Light Non-Aqueous Phase Liquid (petrol, diesel, kerosene)	mg/kg	Milligrams per kilogram (parts per million)
ND	Not Detected	ppm	Parts Per Million
LMRL	Lower Method Reporting Limit	mg/m³	Milligram per metre cubed
NR	Not Recorded	m bgl	Metres Below Ground Level
PAH	Polycyclic Aromatic Hydrocarbon	m bcl	Metre Below Cover Level
PCB	Poly-Chlorinated Biphenyl	mAOD	Metres Above Ordnance Datum (sea level)
PID	Photo Ionisation Detector	kN/m²	Kilo Newtons per metre squared
QA	Quality Assurance	µm	Micro metre
SGV	Soil Guideline Value		

APPENDIX III DRAWINGS

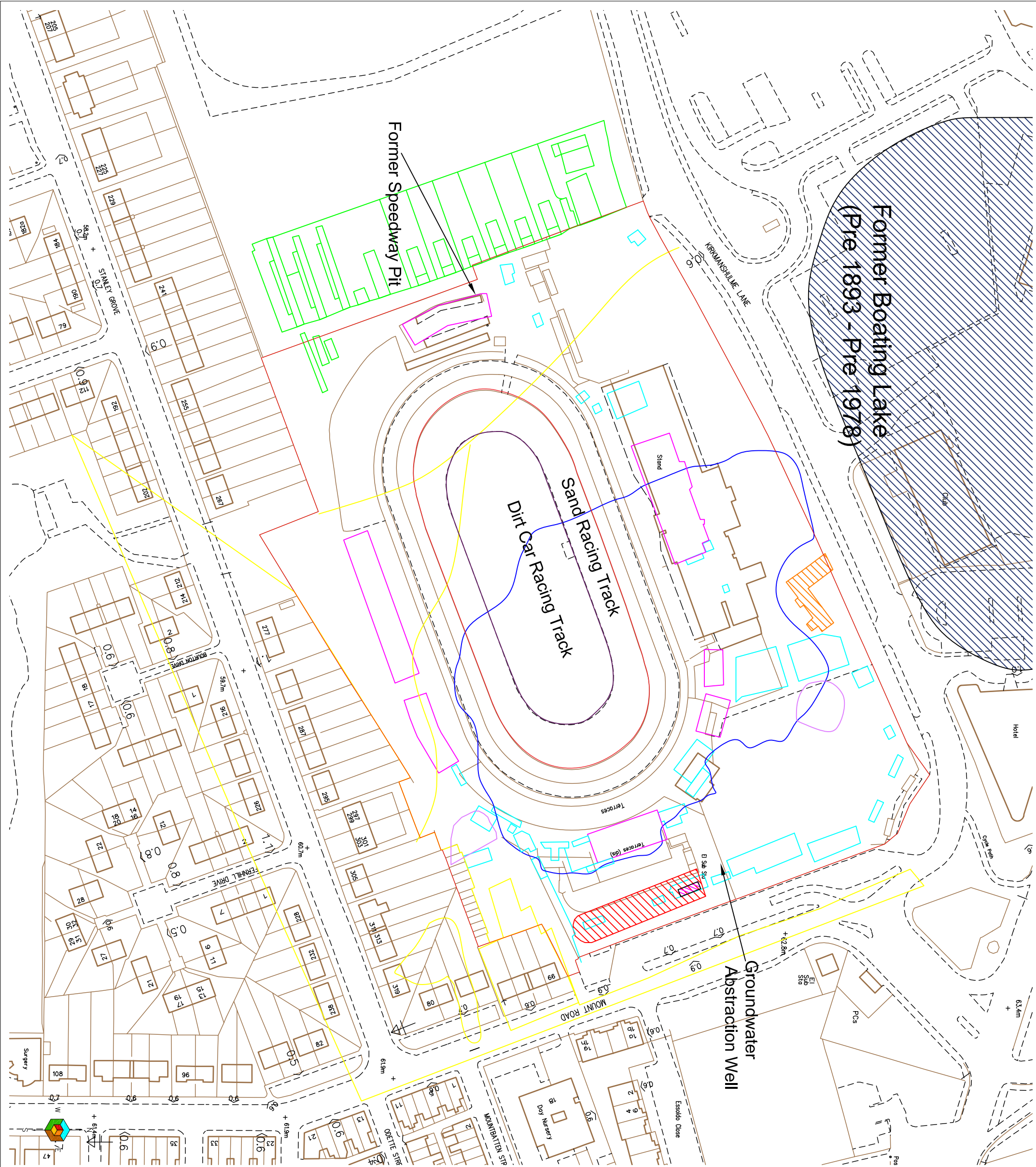




Drawing 12-123-001

Site Location Plan





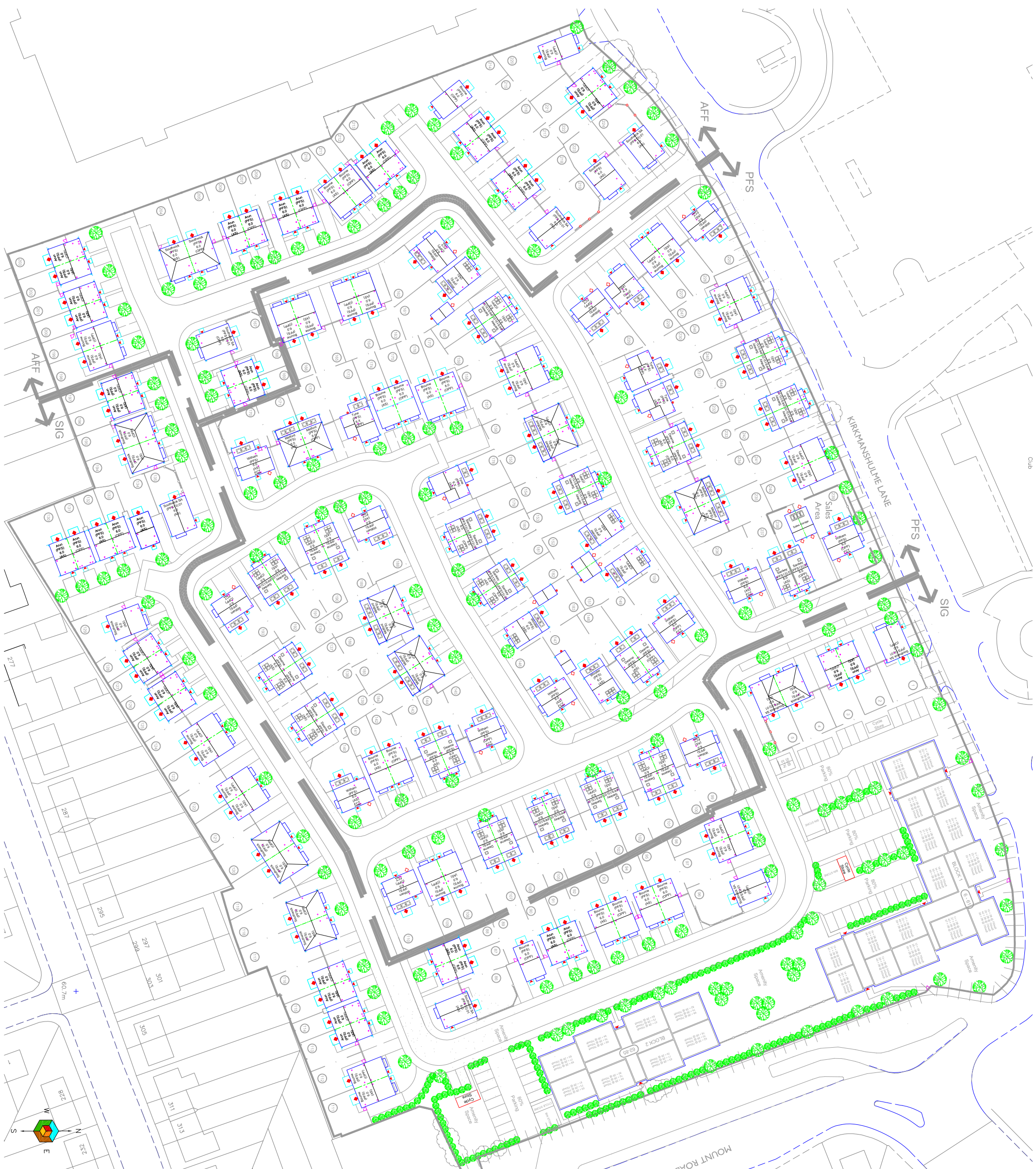
- Historical Features**
- Stands (Pre 1950 - Pre 2017)
 - Kennels (Pre 1950 - Present)
 - Former Buildings (Pre 1950 - Pre 1983)
 - Former Field Boundary (Pre 1848 - Pre 1893)
 - Former Marshland (Pre 1908 - Pre 1950)
 - Former Building (Pre 1848 - Pre 1991)
 - Former Building (Pre 1893 - Pre 1908)
 - Sand Racing Track (Pre 1950 - Present)
 - Dirt Stock Car Racing (Pre 1950 - Present)
 - Former Pond (Pre 1893 - Pre 1950)
 - Former Boating Lake (Pre 1893 - Pre 1978)
 - Electricity Substation (Pre 1978 - Present)

Notes			
P1			
Phase	-	07.03.2018	DRAFT
Revision			TP
Date			MD
Client		Job No.	Date
Countryside Properties		12-123	07.03.2018
		Drawing No.	Scale
		003	NTS
Job Title:		Drawing Title:	
Belle Vue Stadium		Historical Features Plan	



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P1	-	27.02.2019	DRAFT	HM	SE
			Issue	Drawn	Authorised
Phase	Revision	Date			
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Country-side Properties			12-123	27.02.2019	
			Drawing No:	Scale:	
			004	NTS	

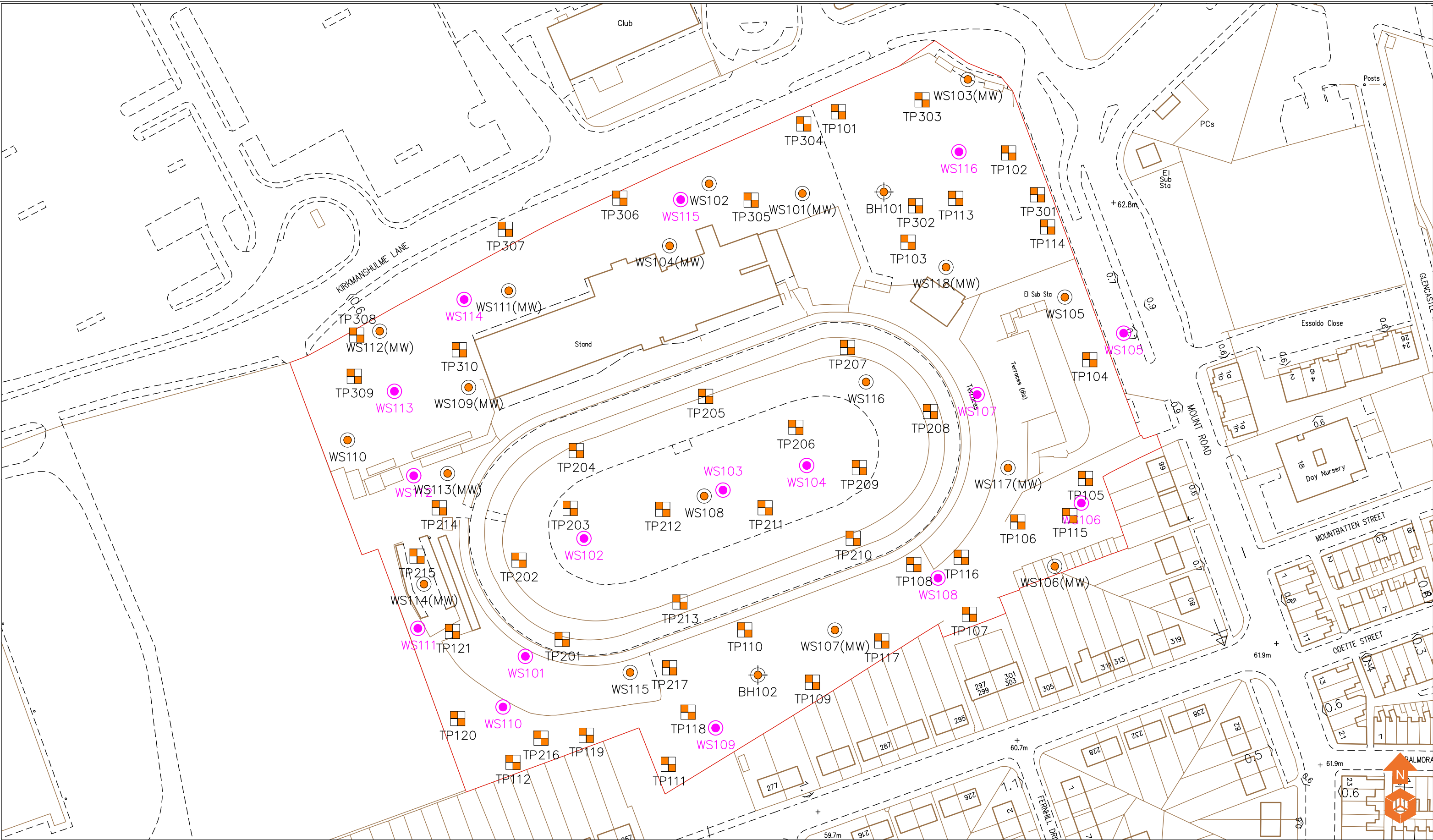
Job Title: Belle Vue Stadium	Drawing Title: Proposed Development Layout
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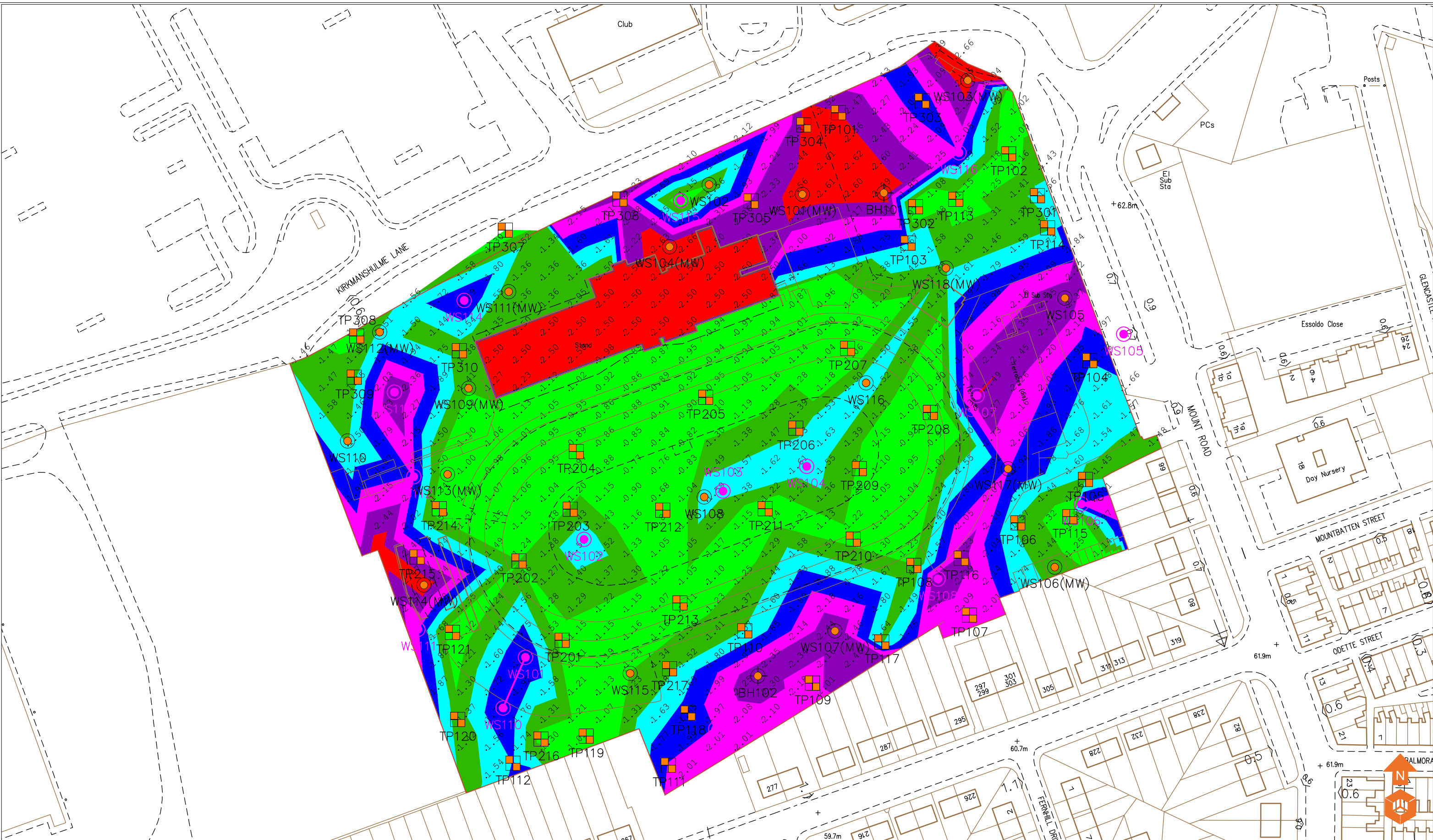
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Location Symbols WS101 Approximate Window Sample Probehole Location WS101(MW) Approximate Window Sample Probehole Location with Install TP101 Approximate Trial Pit Location CP101 Approximate Cable Percussive Borehole Location WS101 Approximate DB Window Sample Probehole Location					Notes:					Client: Countryside Properties		Job No: 12-123		Date: 18.12.2020		e3p Environmental Engineering Partnership Ltd Taylor Road, Trafford Park Urmston, Manchester, M41 7JQ Tel: 0161 707 9612 E-mail: info@e3p.co.uk Website: www.e3p.co.uk															
									Drawing No: 005		Scale: NTS																				
<table><tr><td>P1</td><td>REVC</td><td>18.12.2020</td><td>HM</td><td>SE</td></tr><tr><td>P1</td><td>REVB</td><td>26.10.2020</td><td>HM</td><td>MJ</td></tr><tr><td>P1</td><td>REVA</td><td>16.02.2018</td><td>HM</td><td>MD</td></tr><tr><td>Phase</td><td>Issue</td><td>Date</td><td>Drawn</td><td>Checked</td></tr></table>					P1	REVC	18.12.2020	HM	SE	P1	REVB	26.10.2020	HM	MJ	P1		REVA	16.02.2018	HM	MD	Phase	Issue	Date	Drawn	Checked	Job Title: Belle Vue Stadium		Drawing Title: Exploratory Hole Location Plan		The client must not amend any drawing, design or other intellectual property produced by E3P Ltd without permission in writing from E3P Ltd in advance of any amendments being made. In the event that such written permission is not obtained in advance of the amendments being made, E3P Ltd shall not be liable for any damage and/or losses occurring as a result of the amended drawing, design or intellectual property.	
P1	REVC	18.12.2020	HM	SE																											
P1	REVB	26.10.2020	HM	MJ																											
P1	REVA	16.02.2018	HM	MD																											
Phase	Issue	Date	Drawn	Checked																											



Location Symbols

- Approximate Window Sample Probehole Location
- Approximate Window Sample Probehole Location with Install
- Approximate Trial Pit Location
- Approximate Cable Percussive Borehole Location
- Approximate DB Window Sample Probehole Location

Shallow Spread Footings

- Depth to Founding Strata 0.00 - 1.24m
- Depth to Founding Strata 1.25 - 1.49m

Mass Trench Fill Footings

- Depth to Founding Strata 1.50 - 1.74m
- Depth to Founding Strata 1.75 - 1.99m
- Depth to Founding Strata 2.00 - 2.24m

Engineered Footings

- Depth to Founding Strata 2.25 - 2.49m
- Depth to Founding Strata >2.50m

Notes:

P1	REVC	04.01.2021	HM	SE
P1	REVB	26.10.2020	HM	MJ
P1	REVA	16.02.2018	HM	MD
Phase	Issue	Date	Drawn	Checked

Client:

Countryside Properties

Job Title:

Belle Vue Stadium

Job No:

12-123

Drawing No:

008

Drawing Title:

Depth to Founding Strata Plan

Date:

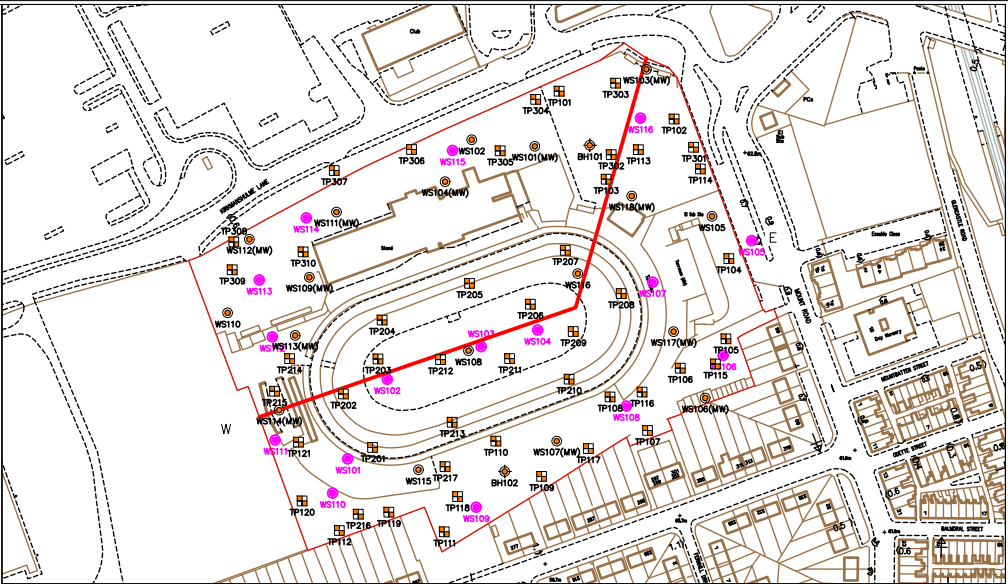
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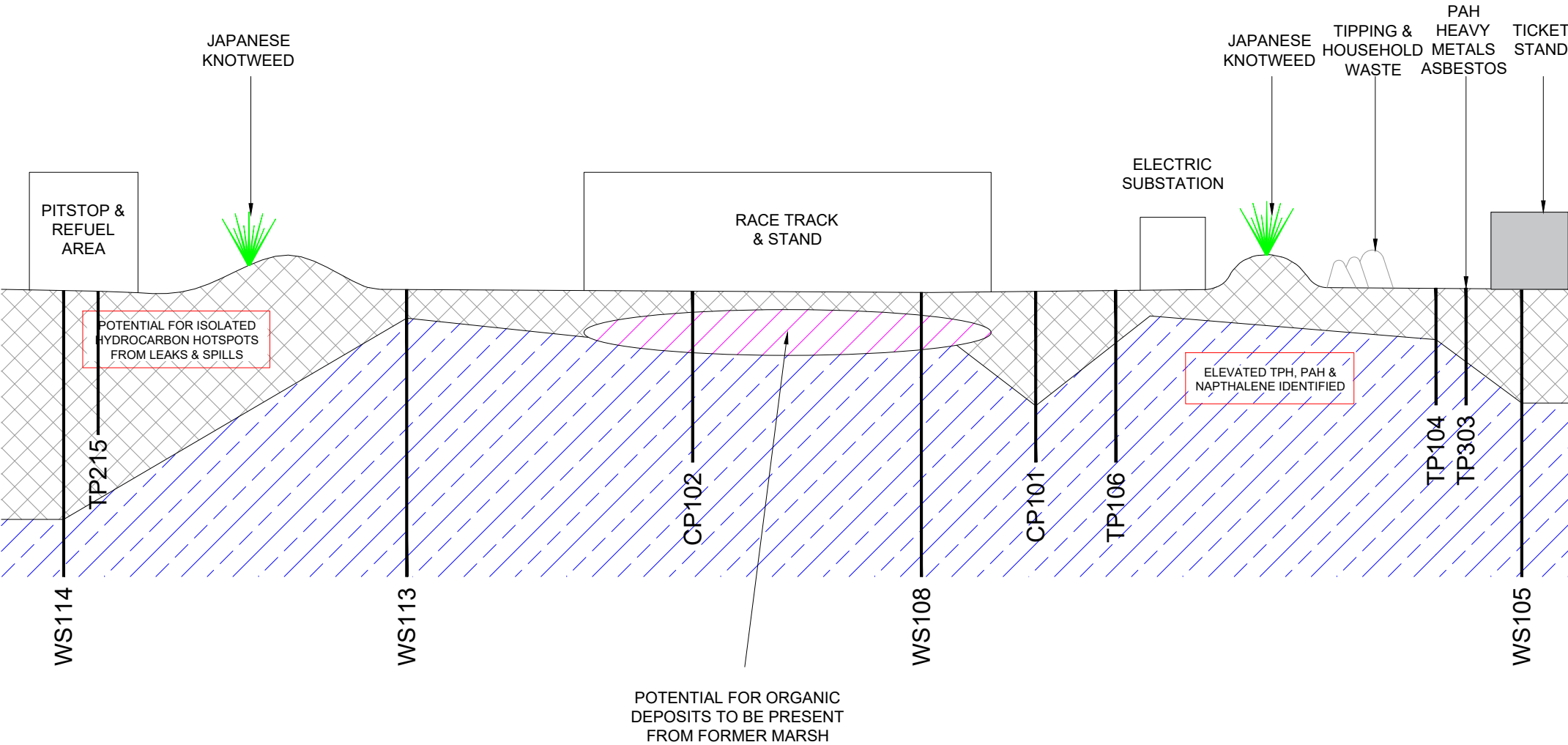
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Urmston, Manchester, M41 7JQ
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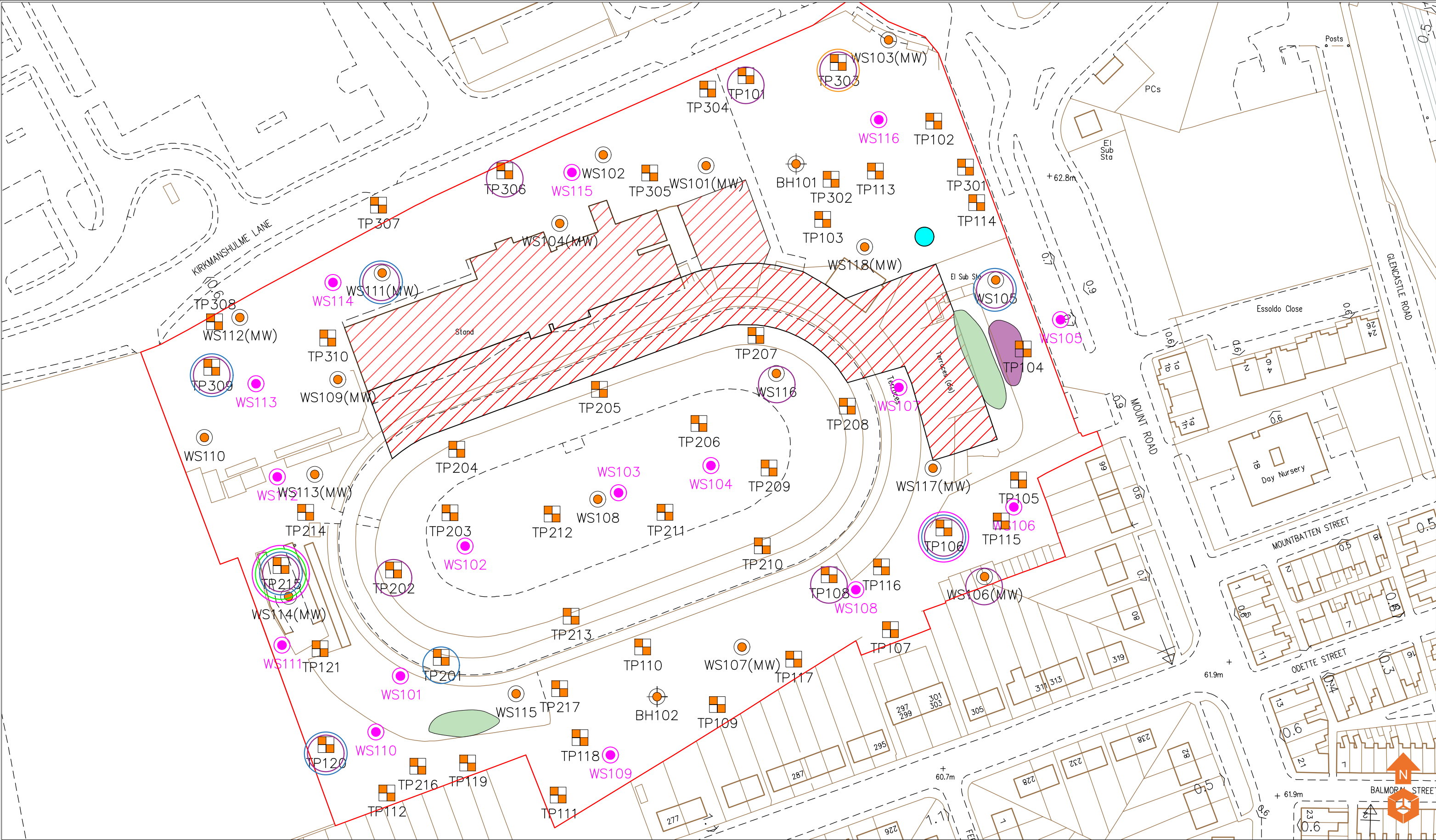


W

NE



Geological Features Clay Made Ground Potential For Organic Deposits to be Present from Former Marsh Japanese Knotweed	Notes:					Client:	Countryside Properties	Job No:	12-123	Date:	04.01.2021	e3p Environmental Engineering Partnership Ltd Taylor Road, Trafford Park Urmston, Manchester, M41 7JQ Tel: 0161 707 9612 E-mail: info@e3p.co.uk Website: www.e3p.co.uk
								Drawing No:	009	Scale:	NTS	
						Job Title:	Belle Vue Stadium	Drawing Title:	Conceptual Site Model	The client must not amend any drawing, design or other intellectual property produced by E3P Ltd without permission in writing from E3P Ltd in advance of any amendments being made. In the event that such written permission is not obtained in advance of the amendments being made, E3P Ltd shall not be liable for any damage and/or losses occurring as a result of the amended drawing, design or intellectual property.		
	P1 P1	REVB REVA	04.01.2021 26.03.2018	HM RW	SE MD	Phase	Issue	Date	Drawn			



Location Symbols

Approximate Window Sample Probehole Location

Approximate Window Sample Probehole Location with Install

Approximate Trial Pit Location

Approximate Cable Percussive Borehole Location

Approximate DB Window Sample Probehole Location

Exceedances

Elevated Heavy Metals and non volatile PAHs identified

Elevated Mercury Identified

Asbestos Identified

TPH C16-C35

Elevated Volatile organic compounds and TPH C5-C16 Identified

Area Not Investigated

Area of Japanese Knotweed

Area of Fly Tipping

Abstraction Boreholes

Notes:

P1	REVB	06.01.2021	LM	SE
P1	REVA	04.01.2021	HM	SE
Phase	Issue	Date	Drawn	Checked

Client:

Countryside Properties

Job Title:

Belle Vue Stadium

Job No:

12-123

Drawing No:

010

Drawing Title:

Remediation Issues Plan

Date:

06.01.2021

Scale:

NTS

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