

OUR REF: L-25-08-22-Louisa Street-A4755-LA-Comms-V2

22nd August 2025

Paul Sinclair
Westchurch Homes
Kennedy House
31 Stamford Street
Altrincham
Cheshire
WA14 1ES

By Email ([REDACTED])

Dear Paul,

Land at Louisa Street, Openshaw

Thank you for sending us correspondence via email (dated 21st August 2025) from Manchester City Council (Reference: ADDITIONAL INFO JOB 134775/FO/2022: 142788/JO/2025: CDN/25/0545 Land at Louisa Street) regarding our recent Garden/Soft Landscaping Validation Letter Report (Reference: A4755/25/VR/Apartments, Plots 20 to 29 & Substation/V2, 19th August 2025) for the site located off Louisa Street in Openshaw.

Following are our responses to the queries raised, regarding Discharge of Condition 12 (ground conditions) attached to planning permission 142788/JO/2025.

Further Details Regarding Previous Environmental Health Comments Regarding CDN/24/1021

The following section has been written using additional information from the following reports, not previously included within the EEG validation reports:

Desk Study Report for Inverbeg Drive, Bolton by Betts Geo Environmental Ltd, dated October 2020. Reference: 20WCH012/DS.

Ground Investigation Report for Inverbeg Drive, Bolton by Betts Geo Environmental Engineers Ltd, dated November 2021. Reference 20WCH012/GI.

Phase II Geoenvironmental Site Assessment by E3P, dated November 2023. Reference: 17-114-R1-2.

The executive summary of each report has been included within Appendices A to C of this letter for reference.

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Greenfield Status & Site History

At Inverbeg Drive, although the site was used as a football ground since the 1920s with later associated pavilion buildings, the ground investigations found predominantly natural clay/till with only shallow localised made ground. During the ground investigation and subsequent stockpile sampling, no widespread contamination was identified. One sample of an isolated stockpile contained minor amounts of asbestos, however, this entire stockpile was disposed of off-site and witnessed by EEG.

At Charter Lane, historic mapping shows the site has been predominantly agricultural pastureland with two small ponds and some limited farm structures/stables. No record of heavy industrial use, landfilling, or significantly contaminative activity was identified.

Due to the limited past disturbance, no significant industrial history, and low likelihood of contamination beyond minor isolated and removed materials, both sites can be considered greenfield-equivalent in terms of risk.

Imported Soil Quality

Both source locations for the soil material used at Louisa Street underwent intrusive ground investigation and stockpile sampling prior to material being designated for reuse. The Phase II ground investigations confirmed that natural topsoil and superficial deposits were chemically suitable for use as topsoil/subsoil, with no asbestos detected and no unacceptable risks to human health.

At Inverbeg Drive, a total of 35 chemical samples were collected from stockpiles. Only one sample recorded a marginal asbestos presence, which resulted in the entire stockpile being excluded from reuse and removed from site under EEG supervision (Report Ref. A5882-24, dated 16th June 2024). This precautionary action ensured that no asbestos-impacted soils entered the reuse stream. The minor brick/rubble fragments referred to in Environmental Health's earlier comments are considered incidental, introduced from site haulage or nearby construction activity, and do not pose a chemical risk.

At Charter Lane, intrusive sampling and Phase II assessment confirmed that the natural soils were free from asbestos and contaminant concentrations were below residential thresholds. The materials were therefore deemed chemically suitable for use in gardens and soft landscaping.

To further support the suitability of the soil material for use on Louisa Street, an in-situ chemical testing regime has been implemented for all material placed within gardens/soft landscaping. This was carried out at a frequency exceeding 1:50m³, which is consistent with and exceeds the approved Remediation Strategy and requirements of MCC Planning & Contaminated Land Technical Guidance.

Representative Sampling & Soil Allocation

With regards to Inverbeg Drive, we note the concern that stockpile labels were unclear and that allocation to Louisa Street was not explicit. At the time of sampling, the allocation of the stockpiles depended on the analysis, to be decided by Westchurch Homes. The material was intended for use at multiple Westchurch Homes developments, if deemed chemically suitable, with Louisa Street being one of these sites. All samples across the ground investigation and later stockpile sampling of material designated for reuse, were deemed chemically suitable for

residential use. The minorly asbestos impacted subsoil stockpile was positively identified and removed from site, ensuring it could not be reused.

At Charter Lane, sampling was carried out during two phases of investigation, supplemented by specific additional stockpile sampling of materials allocated for Louisa Street. All of these samples confirmed chemical suitability for residential reuse.

To further reinforce and supplement the previous source testing, an in-situ validation testing regime has been implemented for all materials once placed within gardens/soft landscaping. This was carried out at a frequency in excess of 1:50m³, more than suitable given the source of the soil material. This dual approach, validation at source and in-situ validation on site, goes beyond the minimum requirements of MCC's own Planning & Contaminated Land Technical Guidance, as well as the EEG remediation strategy, and ensures that the actual soils placed at Louisa Street have been directly tested and confirmed suitable. This methodology has already been accepted by MCC under the approved validation report for Plots 1 to 19 (A4755/23/VR/Plots 1 to 19/V2, dated 24th February 2025).

Addressing Previous Environmental Health Comments Regarding CDN/24/1021

We note that these points were originally raised by the EHO in relation to the earlier original Plots 1–19 validation report (A4755/23/VR/Plots 1 to 19, dated 16th December 2024), which was subsequently revised and accepted. For clarity, the same in-situ validation regime has been applied again throughout the remainder of the site.

As you will recall, that revised report was re-issued as A4755/23/VR/Plots 1 to 19/V2, dated 24th February 2025, and this version was subsequently accepted by MCC. Since then, and in direct response to the initial feedback, an in-situ chemical testing regime has been implemented for all material used within the growing medium. This has been undertaken at a frequency in excess of 1:50m³, stated to be acceptable for even imported materials from brownfield or unknown soil sources, in line with Manchester City Council's *Planning & Contaminated Land Technical Guidance*, as well as in line with the approved remediation strategy.

This approach goes beyond source validation alone, ensuring that material has been chemically verified both at source and after placement within the designated garden and landscaped areas. On this basis, EEG's position is that the concerns originally raised with respect to the December 2024 validation report have been addressed by the in-situ testing regime, and indeed, the in-situ testing methodology has already been accepted for this site under the approved Plots 1 to 19 validation report (A4755/23/VR/Plots 1 to 19/V2).

Appropriate Disposal of Waste Materials from Areas Designated WS1, WS5 and TP1

During our investigative works around WS1, WS5 and TP1 (originally reported in A4755/22/SI, June 2022), only one sample, from TP1, was classified as hazardous in line with the Environment Agency's WM3.1 waste classification guidance. Further delineation and stockpile sampling was subsequently undertaken around WS1, WS5 and TP1 (reported in A4755/23, October 2023). None of these additional delineation samples contained contaminant concentrations that met hazardous thresholds under WM3.1, including those adjacent to TP1.

Following submission of the chemical testing results, the waste management company reviewed the data and handled the materials in accordance with their regulatory compliance obligations. On this basis, the majority of soils were accepted and disposed of as inert, while

the material arising from TP1 was identified and exported under the “Contaminated Soil” category. Any potentially contaminated materials were separated out of the bulk material and exported under separate waste transfer notes (numbered 923105 to 923108).

It should be noted that this approach is precautionary, as any residual impact from the TP1 location would have been negligible when considered within the wider volume of non-hazardous soils. Nonetheless, classification and disposal were carried out strictly in accordance with WM3.1, and in consultation with the receiving facility, ensuring that all soils were directed to the appropriate disposal route.

It is therefore the opinion of EEG that the waste material has been classified and disposed of correctly and fully in compliance with the relevant regulatory requirements and our remediation strategy.

In light of all of the above, EEG confirm the gardens and landscaped areas to be fit for purpose, utilise clean materials and represent no risk to the end-users. The in-situ sampling gives reassurance that the soils are clean and that the growing medium has been implemented in compliance with the approved remediation strategy.

We trust this letter assists Westchurch Homes through the Planning Process and helps the discharge of conditions.

If you are satisfied with this letter, please issue to the planners and copy EEG in on the correspondence. Should you have any comments or queries with respect to this letter report please do not hesitate to contact me.

Yours Sincerely,



Luke Glover
Principal Geo-Environmental Consultant
For and on behalf of Earth Environmental & Geotechnical Ltd

Appendix A Summary of Betts Geo Desk Study Report for Inverbeg Drive, Bolton
Appendix B Summary of Betts Geo Ground Investigation Report for Inverbeg Drive, Bolton
Appendix C Summary of E3P Phase II Geoenvironmental Site Assessment for Charter Lane

APPENDIX A

**SUMMARY OF BETTS GEO DESK STUDY REPORT FOR
INVERBEG DRIVE, BOLTON**

Westchurch Homes

Desk Study Report

For

Inverbeg Drive, Bolton

October 2020

REPORT NO: 20WCH012/DS

- *Desk Studies and Site Walkovers*
- *Intrusive Contaminated Land Investigations*
- *Geotechnical Appraisals and Ground Investigations*
- *Landfill Gas Assessments and Remedial Design*
- *Remediation Design and Implementation*
- *Remediation Project Management and Supervision*
- *Site Abnormal Assessments (Foundations and Contaminated Land)*

GEOTECHNICAL - CONTAMINATED LAND - FLOOD RISK

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1 EXECUTIVE SUMMARY

Note – The following summary is not exhaustive and is to be used for guidance purposes only. The full report should be consulted for full details.

Site Location

The site is located south of Inverbeg Drive, Bolton, BL2 6NA. The coordinates on the British National Grid CRS are 375076, 408854. The proposed site is approximately 2.09 hectares in total.

Proposed Development

The proposed construction of a proposed residential development.

Site Description

On Site

The site is currently home to Bolton Wyresdale Amateur Football Club and is roughly rectangular in plan form with a general slope from north to south with the southern end lying a circa 100m AOD and the northern end at 108m AOD. Site is accessed from the north via Inverbeg Drive through a steel palisade fence onto a gravel hardstanding carpark. A single storey brick with flat roof pavilion building is present in the northwest corner of site flanked by two locked shipping containers. Three containers of roofing bitumen were present however no leakage was evident. The majority of site is taken up by two laid out football pitches which have been landscaped cut and fill to provide a more level playing surface. A earth bund and heras fence was present between the carpark and the first cut slope of the pitch areas with a further smaller cut slope between the two pitches. A third shipping container was present roughly halfway down the eastern boundary. The south-east corner of site was noted to be wet and soft underfoot. Along most of the western boundary and half of the eastern boundary are areas of overgrown vegetation with some access gates leading from adjoining gardens to the west.

Site History

On Site

The earliest available map of site is the 1850 1:10,560 map which shows site occupying a field with a Tram Road crossing the south of site serving nearby coal pits to the south, west and east of site before terminating at Bury Road. A track is also shown onsite in the north corner of site and running along the west boundary of site.

No further major changes occur onsite until the 1890 1:2,500 map when the Tram Road is no longer shown, a foot path crosses the south-east corner of site and a field boundary is shown in the centre north dividing site into two fields. No further major changes occur onsite until the 1908 1:10,560 map when the field boundary is no longer shown.

No further major changes occur onsite until the 1927 – 1928 1:10,560 map when site is marked as a Football Ground. No further major changes occur onsite until the 1974 – 1977 1:10,560 map when two buildings one marked Pavilion are shown in the north of site. No further major changes occur onsite until the 1980 – 1988 1:10,000 map when the smaller building at the west boundary is no longer shown.

No further major changes up to present.

Published Geology

The BGS map shows the geology (1:10,000) beneath the site as the following:

- Artificial Ground and Landslip – None Recorded.
- Drift – Till – Diamicton
- Bedrock – North Portion of Site – Pennine Lower Coal Measures Formation – Mudstone, Siltstone & Sandstone
- South Portion of Site – Trencherbone Rock – Sandstone

Hydrogeology and Hydrology

- The Superficial deposits of the Till is designated as a Secondary Aquifer – Undifferentiated.
- The bedrock deposits are designated as a Secondary A aquifer.
- The site does not lie within Groundwater Source Protection Zone as defined by the Environment Agency.
- There are no licenced water abstractions within 250m of site.

- The nearest surface water feature is Blackshaw Brook at 217m East of site.

Radon Protection

The site lies within a low-risk area of radon where less than 1% of homes are estimated to be above the action level, therefore no radon protection measures are required for new dwellings or extensions.

Summary of Environmental Data

Possible Contamination Sources;

- Current Site Use – Football Ground – Significant Risk; Possible.
- Historical Site Use – Agricultural & Tram Road – Significant Risk; Possible (Localised).
- Current Surrounding Land Uses – Residential & Limited Commercial/Light Industrial – Significant Risk; No.
- Former Sewage Works – 19m SW – Significant Risk; Unlikely.
- Electricity Substations – From 60m W – Significant Risk; Unlikely.
- Former Coal Pits – From 100m All Around Site – Significant Risk – Unlikely.
- Former Starmount Print Works - ~300m E – Significant Risk; Unlikely.

Pathways and Receptors;

- Aquifers – Below Site – Significant Risk; Low.
- Blackshaw Brook – 217m E – Significant Risk; Low.

Qualitative Risk Assessment:

In this qualitative risk assessment, a generally Low – Moderate risk for contamination and ground gas. SI is required to confirm the risk potential and design remedial actions where necessary.

Proposed Ground Investigation Scope:

On assessing the potential risks on site, we have compiled the following recommendations for initial investigation;

- Six (6 No.) window sample boreholes to 3.0mbgl all with gas monitoring installs targeting made ground near offsite shafts and achieving site spread.
- Six (6 No.) ground gas/water monitoring visits over 3 months at varying barometric pressures.
- One (1 No.) days of mechanically excavated trial pits for assessment of shallow soils both for geotechnical suitability and chemical assessment targeting former building, car park and pitch locations and achieving site spread.
- Twenty (20 No.) soil samples taken for chemical assessment - depending on ground conditions encountered this should include testing (topsoil, made ground and natural) to benchmark contamination levels across the site. Proposed testing will include but not be limited to the following; heavy metals suite (comprising; As, Cd (low level), Cr Vi, Pb, Hg, Se, Ni, Cu, Zn), Organic Matter, Sulphate, pH, speciated polycyclic aromatic hydrocarbons and TPH CWG. Asbestos testing within topsoil and Made Ground (if present) with quantification for positive samples.
- Five (5 No.) samples taken for geotechnical analysis if clay strata is encountered (anticipated) for tree heave protection and concrete design classification.
- Six (6 No.) Rotary boreholes for coal investigation (subject to CA licence) to identify shallow workings.

The scope of works should be agreed with the Local Authority prior to the intrusive ground investigation and as such may change.

Additional SI may be required following completion of the initial SI.

APPENDIX B

**SUMMARY OF BETTS GEO GROUND INVESTIGATION REPORT
FOR INVERBEG DRIVE, BOLTON**

Westchurch Homes

Ground Investigation Report

for

Inverbeg Drive, Bolton

June 2021

REPORT NO: 20WCH012/GI

- *Desk Studies and Site Walkovers*
- *Intrusive Contaminated Land Investigations*
- *Geotechnical Appraisals and Ground Investigations*
- *Landfill Gas Assessments and Remedial Design*
- *Remediation Design and Implementation*
- *Remediation Project Management and Supervision*
- *Site Abnormal Assessments (Foundations and Contaminated Land)*

GEOTECHNICAL - CONTAMINATED LAND- FLOOD RISK

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1 EXECUTIVE SUMMARY

Note – The following summary is not exhaustive and is to be used for guidance purposes only. The full report should be consulted for full details.

1. Site Location

The site is located south of Inverbeg Drive, Bolton, BL2 6NA. The coordinates on the British National Grid CRS are 375076, 408854. The proposed site is approximately 2.09 hectares in total.

2. Site Description On Site

Site was visited by a geo-environmental engineer on 19th October 2020 and the following section outlines the main features identified.

The site is currently home to Bolton Wyresdale Amateur Football Club and is roughly rectangular in plan form with a general slope from north to south with the southern end lying at a circa 100m AOD and the northern end at 108m AOD. Site is accessed from the north via Inverbeg Drive through a steel palisade fence onto a gravel hardstanding carpark. A single storey brick with flat roof pavilion building is present in the northwest corner of site flanked by two locked shipping containers. Three containers of roofing bitumen were present however no leakage was evident. The majority of site is taken up by two laid out football pitches which have been landscaped cut and fill to provide a more level playing surface. A earth bund and heras fence was present between the carpark and the first cut slope of the pitch areas with a further smaller cut slope between the two pitches. A third shipping container was present roughly halfway down the eastern boundary. The south-east corner of site was noted to be wet and soft underfoot. Along most of the western boundary and half of the eastern boundary are areas of overgrown vegetation with some access gates leading from adjoining gardens to the west.

3. Proposed Development

The proposed development is residential housing with associated infrastructure.

4. Site History

The earliest available map of site is the 1850 1:10,560 map which shows site occupying a field with a Tram Road crossing the south of site serving nearby coal pits to the south, west and east of site before terminating at Bury Road. A track is also shown onsite in the north corner of site and running along the west boundary of site. No further major changes occur onsite until the 1890 1:2,500 map when the Tram Road is no longer shown, a foot path crosses the south-east corner of site and a field boundary is shown in the centre north dividing site into two fields. No further major changes occur onsite until the 1908 1:10,560 map when the field boundary is no longer shown. No further major changes occur onsite until the 1927 – 1928 1:10,560 map when site is marked as a Football Ground. No further major changes occur onsite until the 1974 – 1977 1:10,560 map when two buildings one marked Pavilion are shown in the north of site. No further major changes occur onsite until the 1980 – 1988 1:10,000 map when the smaller building at the west boundary is no longer shown.

5. Published Geology

The BGS map shows the geology beneath the site as the following:

- **Drift** – Till, Devensian - Diamicton
- **Bedrock** – Northern Portion of Site – Pennine Lower Coal Measures Formation – Mudstone, Siltstone & Sandstone, South Portion of Site – Trencherbone Rock – Sandstone

Radon

The site lies within a low-risk area of radon where less than 1% of homes are estimated to be above the action level, therefore no radon protection measures are required for new dwellings or extensions.

6. Summary of Environmental Data

Possible Contamination Sources and risk levels are shown below;

- **Current / Historical Site Use** – Football ground - Possible
- **Former use as agricultural field and tram track** – Onsite – Possible (localised)

- **Current surrounding uses – residential and limited industrial** - All around – No
- **Former sewage works** – 19m SW – Unlikely
- **Electrical Substation** – 60 m W – Unlikely
- **Former Coal Pits** – >100 m SE – Unlikely
- **Historical Print Works** – 300 m E – Unlikely

Pathways and Receptors;

- **Aquifers** – Below Site – Low
- **Blackshaw Brook** – 217 m east – Low

In this qualitative risk assessment, a generally Low – Moderate risk for contamination and ground gas. SI is required to confirm the risk potential and design remedial actions where necessary.

7. Scope of Betts Investigation

The fieldwork was carried out the 13th April and 17th May 2021, the investigations comprised:

- 9 No. trial pits to a maximum depth of 3 m bgl
- 6 No. window samples to a maximum depth of 3 m bgl
- 6 No. rotary open holes to 30m depth under Coal Authority Permit
- Chemical analysis (Metals, PAH's, asbestos and TPH's) of 12 No. samples.
- 4pt Atterberg testing and moisture content on 6 No. samples

8. Ground Conditions Encountered

Generally, there was topsoil across the site from 0 m bgl to a maximum depth of 0.7 m bgl (except for WS01 and WS03) which was in turn underlain by cohesive clay natural ground to 3.0 m bgl. There was Made Ground at ground level in WS01 to 0.5 m bgl and WS03 to 0.3 m bgl and beneath the topsoil in TP01, TP02, TP05, TP06, TP07, TP08 and TP09.

Groundwater Fieldwork

Groundwater was encountered in four locations from 0 (surface saturation) – 1.9 m bgl.

9. Specialist Ground Gas Measures

No significant ground gas has been encountered on site during the six visits. WS04 could not be located on the first three visits and then was noted to be destroyed on the fourth visit. The WS05 well was destroyed by the third visit. The WS03 well was flooded on the final visit. Further monitoring needs to be carried out within the areas which have currently not been investigated if significant Made Ground is encountered.

As six visits have been undertaken to date, this confirms that the site is classified as Green / CS1.

It should be noted that the final monitoring visit noted a slightly elevated carbon dioxide concentration (7.1%) and a significantly low oxygen concentration (6.7%). This is highly likely to be as a result of the period of high rainfall shortly before the final gas monitoring visit. When looking at the flow rates, there is a maximum flow of 0.1l/hr within this well, therefore the GSV falls into the Green/CS1 category. There was also no obvious source of ground gas identified in WS02 during the exploratory works.

10. Contamination Assessment and Remedial Actions

There are no exceedances of the generic assessment criteria which suggests that the remaining site can adopt 300mm clean and inert growing medium. Reuse of site won soils is anticipated (other than the asbestos containing soils as detailed above). 300mm growing medium required in landscaped areas. However, further site investigation within the football pitches is required as most of the site still requires investigation.

Groundwater and Aquifer Risk

Due to the site being underlain by low permeability Till and the overall very low level localised contamination (in areas

investigates so far) there is unlikely to be a risk to groundwater or aquifers.

11. Off-Site Disposal of Surplus Soil

All material proposed for off-site disposal (e.g. during future construction works) should be given a proper description and waste classification assessment as required by the Environmental Protection Duty of Care Regulations (Ref. 14), and in accordance with WM3 and the Environment Agency Technical Guidance on the assessment and classification of Hazardous Waste.

It is recommended that the results of the contamination testing (including the history of the site) be presented to the proposed landfills to obtain their acceptance of the information to date. However, further testing maybe required to fully assess the waste classification of the soils requiring offsite disposal.

12. Foundations

Founding strata can generally be described as firm to stiff sandy CLAY.

The following allowable pressures can be assumed on dry natural undisturbed materials described below;

- Firm to stiff CLAY - 100 kN/m²

Made Ground has been recorded to depths between 0.3 – 0.9 m bgl in isolated areas. Occasional land drains should be anticipated.

It is likely that strip footings and trench fill will be the most viable foundation option.

13. Concrete Design

It is considered for concrete design purposes that a brownfield site and static groundwater conditions are applicable. During the Betts investigation all 12 No. samples were tested for pH and water soluble sulphates Design Sulphate class DS-1 and an Aggressive Chemical Environment for Concrete (ACEC) class of AC-1s, in accordance with BRE Special Digest 1.

14. Heave / Shrinkage Potential

The results of the Atterberg Limits testing confirmed that the soils are generally of Low Volume Change Potential in accordance with the classification system utilised by the LABC / NHBC industry guidance. Although there is one location with medium volume change potential. Foundation design for tree heave protection should be designed accordingly following discussion with the NHBC. Piled foundations may be requested by the NHBC where depth is extended greater than 2.5m due to tree influence and or additional desiccation testing may also be requested.

15. Ground Floor Construction

Shrinkable soils and/or made ground are present across the site and it is therefore recommended that suspended floor construction (e.g. either in-situ RC slabs or block and beam flooring) is adopted in accordance with NHBC guidance.

16. Control of Groundwater

Groundwater was recorded from 0.45m bgl during the post fieldwork monitoring (most probably perched upon the clay geology). It is likely that provision of pumping / shuttering will be necessary during excavation of foundation during wet weather and to deeper excavations for sewers etc. It is good practice to have such equipment on standby in case of seasonal / abnormal weather conditions.

Should sewers / excavations deeper than the boreholes / trial pits undertaken be required, further SI will be needed.

17. Highway

Based upon the Plasticity of the clay we would advise the same 2.5%. In favourable construction conditions / weather 3 to 5% could be expected.

18. Coal Mining Findings

Shafts 375408-003 and -019 are located 30m east of the site and form part of a group of 5 recorded shafts in a north-

APPENDIX C

**SUMMARY OF E3P PHASE II GEOENVIRONMENTAL
SITE ASSESSMENT FOR CHARTER LANE**



PHASE II GEOENVIRONMENTAL SITE ASSESSMENT

Charter Lane
Charnock Richard
Chorley
PR7 5LZ

Prepared for:

Westchurch Homes



Report Ref: 17-114-R1-2

Date Issued: 16 November 2023

EXECUTIVE SUMMARY

Site Address	Land off Charter Lane, Charnock Richard, Chorley, PR7 5LZ	
Grid Reference	E 355688, N 415579	
Site Area	2.07 Ha.	
Proposed Development	Westchurch Homes Ltd intend to construct a low-rise residential development with associated gardens, estate roads, and infrastructure. At present, a proposed development layout has not been finalised.	
Current Site Use	The site is an irregularly shaped parcel of land located to the east of Charter Lane. The site can be accessed via a locked gate off Charter Lane along the western boundary, with a further gate present along the southern boundary. However, this was not accessible during the investigation works. There is little topographic variance, with levels noted to generally be between 70.5 m AOD and 71.50 m AOD. The site comprises overgrown grassland with an area of trees and brambles near the entrance in the west of the site. Brambles, semi-mature and mature trees are present along all site boundaries, with larger areas noted in the north-eastern corner and south-east of the site. Areas of Himalayan Balsam were identified within the north-eastern and south-eastern corners of the site.	
Site History	A review of the pertinent Ordnance Survey mapping dating from circa 1849 to the present day confirmed the following land use: - From the earliest mapping dated 1849 the site comprised three fields separated by hedgerows with two ponds onsite in the north-eastern corner and the south-east of the site. The pond in the northeast of the site was noted as marshy ground, possibly infilled from circa 1959 until 1990 when it was no longer marked. The pond in the southeast of the site was no longer recorded from circa 1990. Field boundaries appear to have been removed pre-1959. - A small building was noted in the west of the site associated with neighbouring properties between pre-1849 and 1893. A yard was noted in this area from circa 1909-1910, where, by 1959 a rectangular building, likely stables, was then present. A further building was present in this area of the site by mapping dated 1961- 1965, with a small structure constructed along the western boundary pre-1977-1979. All buildings were no longer present on site from circa 2001.	
Environmental Setting	Drift Geology	Glacial Till (CLAY, SAND, and GRAVEL).
	Bedrock Geology	Pennine Lower Coal Measures Formation (MUDSTONE, SILTSTONE and SANDSTONE) across the majority of the site. Milnrow Sandstone (SANDSTONE) in the southwestern sector of the site.
	Faults	A fault is located circa 30 m west of the site, trending in a north-to-south trajectory.
Environmental Setting	Hydrogeology	Secondary undifferentiated strata (Drift); and secondary A aquifer (Solid).



		No groundwater abstractions have been identified within a 1 km radius.
	Hydrology	A small confined ditch has been noted along part of the southern boundary. A further ditch has been noted along the northern boundary of the site near the site entrance. The closest surface water features are circa 81 m southwest of the site.
	Flood Risk	The site is situated within a Flood Risk Zone 1, therefore, the site is considered to be unaffected by fluvial flooding.
Natural Landform and Geomorphology	The site consists of even topography across the majority of the site, with a small elevation change noted towards the eastern site boundary. Based on the surrounding topography, it is likely the current topography represents the natural geomorphology of the site.	
Previous Reports	The following previous reports have been completed for the site:  bEk Enviro Ltd – Phase 1 - Preliminary Risk Assessment & Mining Assessment (Report Ref: BEK-20832-1-Rev A, dated February 2021), prepared for Conlon Living.  E3P – Phase II Geoenvironmental Site Assessment (Report Ref: 16-343-R1-1, dated June 2023), prepared for Duchy Homes. A full summary of findings is provided in Section 2.1 of this report.	
Utility Locations	Utility infrastructure is present throughout Charter Lane to the west of the site.	
Landfill Sites and Ground Gases	There are no current or historical landfills within 250 m of the subject site. The closest historical landfill to the site is located 374 m southeast, known as Darlington Sidings which accepted inert and industrial waste between 1960 and 1970. On-site infilled ponds are likely to be a ground gas source at the site.	
Radon	The site is situated within an area where less than 1% of homes require protection. Therefore, it is deemed the site is unaffected and no special precautions are required.	
Coal Mining/Land Stability	The site is located within a Coal Authority defined Coal Mining Reporting Area, however, the site is not located within a development high-risk area. There are no mine entries, coal outcrops, past or probable shallow mine workings onsite or in close proximity. The bEk Enviro Ltd report has concluded that no further consideration of the risks from coal mining is required.	
Hazardous Installations	No hazardous installations that could potentially prejudice the proposed construction of highly sensitive residential dwellings have been identified within influencing distance of the subject site.	



GROUND INVESTIGATION

Ground Investigation Works	E3P has completed an intrusive ground investigation comprising: ✿ 13 x mechanically excavated trial pits; ✿ 6 x window sample boreholes; ✿ Falling Head Permeability Testing; and ✿ Construction of environmental monitoring installations.
Ground Conditions	Made Ground – 0.00 m bgl to 2.00 m bgl Made Ground was encountered within TT101 and WS104 in the location of the infilled pond in the southeast sector. Made Ground was identified to a maximum depth of 2.00 m bgl, comprising reworked topsoil overlying black very sandy slightly gravelly organic clay with mudstone, slate and siltstone. An organic odour was noted and the material contained organic detritus plant material. Previously, within the intrusive site investigation outlined within 16-343-R1-1 (June 2023), Made Ground was encountered within two exploratory hole locations towards the southwest of the site. The Made Ground deposits comprised reworked topsoil of slightly gravelly sandy to very sandy clay with gravel of mudstone and sandstone, and cobbles of sandstone and timber. TOPSOIL – 0.00 m bgl to 0.40 m bgl Natural topsoil was encountered within the majority of exploratory hole locations to depths of between 0.20 m and 0.40 m bgl. Topsoil generally comprises dark brown slightly sandy CLAY with rootlets. DRIFT – 0.20 m bgl to 5.45 m bgl Drift deposits were encountered within all exploratory locations to depths in excess of 5.45 m bgl. The drift deposits are uniform, generally comprising firm to very stiff, medium to very high strength, brown-grey mottled CLAY with gravel of sandstone, and mudstone. The clay is locally interbedded with grey, silty, sandy CLAY within the upper 0.50 m bgl within the majority of exploratory hole locations. These deposits are prevalent towards the east of the site, with the exception of TP108 situated towards the centre of the site. During the previous investigation, within exploratory hole locations predominantly towards the eastern sector of the site, CLAY deposits were interbedded with a slightly clayey, occasionally gravelly fine to medium SAND, where gravel is of sandstone and mudstone at varying depths ranging from 0.70 to 3.80 m bgl. SOLID – Not Encountered Solid geology was not encountered during this phase, or previous phases of intrusive investigation. There are no BGS borehole records in the vicinity of the site. GROUNDWATER – 0.60 – 2.60 m bgl Groundwater strikes were encountered within five exploratory hole locations at depths ranging from 0.60 – 2.60 m bgl. All groundwater strikes were encountered as seepages within the natural CLAY stratum. Monitoring recorded groundwater between 0.93 and 4.36 m bgl.



CONTAMINATED LAND ASSESSMENT

Human Health	No elevated concentrations of potential contaminants of concern have been identified when compared with generic assessment criteria (GAC) values for residential end use with plant uptake. Asbestos has not been detected in any of the samples submitted for analysis. In addition, the previous investigation did not identify any elevated concentrations of contaminants of concern. Based on the above, there is no unacceptable level of risk to human health. The site will require a 150 mm growing medium directly overlying the natural drift deposits in proposed gardens, landscaping and public open space. Where Made Ground remains, provision of 150 mm subsoil and 150 mm topsoil is recommended. Further investigation is required in the location of the former ponds in the northeast and former structures in the northwest to confirm the ground conditions in these locations. Chemical analysis of the natural clay drift deposits and natural topsoil has identified these soils to be acceptable for use as subsoil within the proposed garden areas. Further investigation is required in the location of the former pond towards the northeast and former structures in the northwest to confirm the ground conditions in these locations.
Controlled Waters	Historically the site has predominantly remained undeveloped primarily utilised as agricultural land with limited changes noted on site. Therefore, there are no significant sources of mobile contamination. The identified heavy metals are generally of low solubility and mobility which suggests that these are not likely to migrate to controlled waters receptors. With the exception of minor exceedances of copper, all elevated concentrations have been identified in leachate and groundwater samples from WS104, located within the location of the infilled pond in the southeast sector. Therefore, the exceedances are considered to be associated with perched water and are not considered to represent the true groundwater. During the previous investigation, elevated heavy metals were identified within groundwater, leachate and surface water analysis. The Metal Bioavailability Assessment Tool (M-BAT) has been used to predict the potential risk posed by metals in the aquatic environment. This assessment confirmed copper, nickel, and zinc are not bioavailable and therefore pose no unacceptable risk to the adjacent drainage ditches. The site is underlain by low permeability cohesive drift deposits to depths in excess of 5.45 m bgl which will inhibit the migration of any potentially mobile contaminants towards the controlled waters receptors. Based on the above, there is considered to be no unacceptable level of risk to the controlled water receptors.



Ground Gas	Current monitoring data indicates the site may be classified as Characteristic Situation (CS)1 – Very Low Gas Risk. Monitoring during this and the previous investigation has identified occasional elevated carbon dioxide concentrations and sporadic high flow rates. Plots within proximity of the infilled pond in the north (not investigated) should be constructed with CS2 protection measures, subject to further assessment once areas are made accessible. Based on the current development plan, this would apply to Plots 18-23, 30-31 and 34-37. Final conclusions may vary following the completion of the monitoring and further investigation of the northern pond.
Potable Water Infrastructure	It is considered likely a polyethene pipe will be suitable, however, this will be confirmed following post-remediation and enabling works ground conditions may be different from those identified during this site investigation.

GEOTECHNICAL ASSESSMENT

Underground Obstructions	Works were restricted in the northwest of the site in the vicinity of former farm buildings due to the overgrown vegetation and trees. Obstructions may be present in this area. During a phase of cut-and-fill enabling works to create a development platform, all below-ground obstructions will require grubbing out to the base of the Made Ground to enable the construction of proposed plots.
Allowable Bearing Pressure	The underlying natural clay drift deposits have been assessed as being firm medium strength to stiff high strength with a net allowable bearing pressure (ABP) in the order of 100 kN/m² at circa 1 m bgl increasing to 150–200 kN/m² at circa 2.00 m bgl. Very stiff very high strength CLAY was identified at circa 5.00 m bgl with an ABP of between 426–428 kN/m².
Foundation Options	Depending on development levels, it is likely that plots could be constructed using traditional strip or trench fill foundations bearing on the firm to very stiff CLAY. The exception to this would be in the location of the infilled ponds and within areas of soft clays. Depending on development levels, plots in these locations may require an engineered foundation solution such as driven piles. Foundation depths within the conjectured influence of former, existing or proposed trees will need to be deepened to ensure that structural loading bears within the underlying target founding stratum, which cannot be subject to volumetric instability associated with fluctuation in moisture content. Further investigation into the areas of the former pond towards the northeast and former structures in the northwest is required to confirm the ground conditions in these locations.
Building Floor Slabs	Ground-bearing floor slabs are unlikely to be viable given the anticipated depths or reworked Made Ground > 600 mm and shallow cohesive soils.
Heave Precautions	The clay soils are classified as Low to Medium Volume Change Potential and where present at a shallow depth within the conjectured zone of potential tree influence, heave precautions will be required within the construction of a shallow foundation and to the underside of residential floor slabs.



Soakaway Drainage	The falling head tests and the previously completed soakaway tests suggest that soakaway drainage will not be feasible.
Sulphate Assessment	The concrete classification has been determined as DS-1 AC-1s. Concrete specifications should be designed with the classifications.
CBR Design %	Natural clay soils will provide a CBR in the order of 3–5% during drier climatic periods. Granular soils can be re-engineered to ensure 2–4% within the subgrade during favourable climatic conditions. Any geotechnically suitable organic/peat deposits (if encountered in areas of former ponds) will require excavation below highways and utility infrastructure due to the risk of settlement. In-situ testing using a TRL probe or plate load test will be required to determine the CBR of the existing subgrade.
Cut/Fill	Development levels are unknown at this time; however, an element of cut-and-fill work is likely to be required to prepare the development platform on a plot by plot basis.
Civil Engineering Excavations	Made Ground was not encountered during this phase of investigation with minimal deposits identified within previous investigations. Trial pits were stable in natural strata; as such, it is considered that near-surface excavations will be feasible. Site observations indicated that excavations should be feasible in the near surface with normal plant; however, excavation within the very stiff CLAY stratum was slow at greater depths. Due to the presence of low permeability cohesive deposits across the site, it is considered that dewatering may be required, especially following periods of heavy rainfall. Removal of surface water and water within trenches should be possible with conventional sump pumping. Discharge of any water should be agreed with the relevant regulatory body and be undertaken under a trade effluent discharge, where required. Measures to remove silt and suspended solids may be required and consideration should be given to the provision of space for settling tanks or an attenuation pond to form sewerage and drainage infrastructure and foundations.
Waste Characterisation	Any material that is to be disposed off-site should undergo assessment using Technical Guidance WM3: <i>Waste Classification – Guidance on the classification and assessment of waste</i> .

RECOMMENDATIONS

Based on the findings of the geoenvironmental site assessment, the following additional works are recommended to be completed in due course:

- ✳ Further investigation of inaccessible areas. Refer to development constraints plan (drawing no. 17-114-015).
- ✳ Plot-specific foundation schedule (upon receipt of the final development levels).
- ✳ Arboricultural survey.
- ✳ Limited geotechnical enabling earthworks strategy (topsoil strip, vegetation clearance, removal of geotechnically unsuitable material from beneath highways/hardstanding, preparation of formation levels and highways engineering specification).

