

Our ref: JC/MP/MW/LD10162/LET-006-REV D

Date: 04th December 2020

Digital ref:

Your ref:

Mr K Moore
Nuvu Developments Ltd
c/o Your Housing Group
602 Aston Avenue
Birchwood
Warrington
WA63 6AN

Dear Mr Moore,

LAND AT TEN ACRES LANE, NEWTON HEATH

OUTLINE REMEDIATION STRATEGY

Following your recent instructions, we are pleased to provide our outline remediation strategy in relation to the above site.

Introduction

The site is located between Ten Acres Lane and Mitchell Street, Newton Heath, Manchester at National Grid Reference E387599, N400309 and is located as shown on Drawing LD10162-001. The site is roughly rectangular in shape and comprises approximately 19 hectares of derelict land that is proposed for a residential-led development of approximately 817 three to five storey houses with associated roads, driveways, gardens, areas of Public Open Space (POS) and a school with associated playing fields. The proposed development layout is as indicated in the enclosed third-party "Illustrative Masterplan Sketch".

Numerous stages of historical site investigation works have been undertaken at the site and this included an extensive site investigation by Celtic Technologies Ltd. in 2007 and a supplementary geotechnical investigation by Wardell Armstrong (WA) in 2019. A gap analysis was undertaken by WA in June 2020 and this informed the site investigation works that were undertaken at the site by WA between September and November 2020. These works were undertaken to provide further assessment of the ground and groundwater conditions and to

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provide information to enable for the development of the final remediation strategy. Results from further fieldwork monitoring, sampling and testing will be provided throughout the course of the application for any outstanding items that would require approval by the EA and Local Authority Contaminated Land Officer.

Based on the ground conditions that have been encountered during the recent 2020 WA site investigation and from previous investigations it is envisaged that the remediation of the site would include the elements in this outline remediation strategy and that this information, subject to regulatory approval, can be used to support the submission of a planning application for future remedial works at the site.

Previous and Current Investigations

The site has been the subject of several desk studies and site investigations undertaken by WA and other third parties with reporting being available from July 2006 to July 2019. These investigations have included assessments of potential risk from contaminated land including soils, surface water, groundwater, ground gases and vapours and are as follows:

- Celtic Technologies Ltd (July 2006), Desk Study - Ten Acres Lane, Newton Heath, Greater Manchester (report ref. R1077/06/2958);
- Celtic Technologies Ltd (February 2008), Interpretative Report (Geoenvironmental Assessment) - Former Jacksons Brick Works, Ten Acres Lane, Newton Heath, Greater Manchester (report ref. R1077/08/3328);
- Wardell Armstrong LLP (July 2019), Factual Site Investigation Report – Land Between Ten Acres Lane and Mitchel Street, Newton Heath, Manchester (report ref. SH12254 RPT-001);
- GL Hearn: “Environmental Statement, Former Jacksons Brickworks, Ten Acres Lane, Newton Heath, Manchester”.

A review of the available information was undertaken by WA in July 2020 in the form of a gap analysis report (ref: JC/MP/SH12254/LET-003). The aim of this report was to review the previous works that had been undertaken at the site, to identify development abnormal items and to outline what further works would be required to ascertain the extent and significance of these items.



WA were appointed in August 2020 to carry out further site investigation works to partially address those abnormal items identified from the gap analysis report. The intrusive investigations were undertaken between September and November 2020 with the post fieldwork monitoring, sampling and testing currently ongoing.

A combined Draft Phase 1 and Phase 2 Ground Investigation Report has been produced for the site investigation outlined above and this includes a review of previous investigations undertaken at the site. The report presents the findings of the further site investigation works and includes preliminary risk assessments and evaluations. All this information has been used to refine the existing Conceptual Site Model that has historically been proposed from previous phases of investigation. The risk to human health and water resources has been updated and this information is used in the following sections to provide an outline remedial strategy for the site.

All previous works relating to the site should be read in conjunction with this outline remediation strategy.

Remedial Summary

Human Health

Several phases of work have been undertaken at the site relating to contamination and human health risk assessment. Based on a review of the available information to date and our own previous investigations at the site, it is envisaged that for human health a clean cover pathway break is likely to be required across most of the site to break direct contact pathways associated with the source contaminants.

The final thickness and composition of the clean cover pathway break will need to be robust (possibly greater than the standard 600mm) to ensure no physical exposure of receptors to any made ground materials. The inclusion of any hardstanding areas as pathway breaks will need to be agreed with the Local Authority Contaminated Land Officer and the NHBC (or other warranty provider).

Should the installation of the cover system within gardens and areas of soft landscaping not be possible due to constraints on ground levels, it is recommended that any Made Ground is removed to a depth that will allow placement of the cover system.



Further assessments are currently being undertaken that incorporate previous third-party data and the data collected from the most recent stage of site investigations undertaken by WA. These assessments will need to be completed before the risk to human health can be quantified further and suitable remedial measures ascertained.

Ground Gas

Further ground gas monitoring is currently being undertaken to establish the ground gas regime with subsequent risk assessments being undertaken in accordance with C665, BS8576 and BS8485. A preliminary review of the initial ground gas monitoring data collected to date indicates that ground gas concentrations (e.g. methane) have decreased since the ground gas monitoring that was undertaken by Celtic in 2007.

However, further assessment will be required to confirm the above. The requirements for any ground gas protection measures will be determined following completion of the ground gas monitoring programme and following agreement with the regulatory authorities.

This further monitoring incorporates at least 9 visits over a period of 6-month period and includes monitoring around the perimeter of the site to assess the integrity of those natural barriers to gas migration that are indicated to be present.

Vapours

Based on the ground conditions encountered and a preliminary review of the most recent site investigation data, vapour issues are to be dealt with by the inclusion of passive vapour protection measures within new buildings, which is line with previous third-party assessments.

However, further detailed risk assessment will be required in line with current guidance to specify the precise requirements for vapour protection. The final choice for mitigation will be in conjunction with specialist remediation contractors and will be subject to agreement with relevant regulators.

Controlled Waters

Previous third-party site investigations indicated that there was limited evidence to suggest that significant contaminants were leaching from Made Ground into shallow and deeper groundwaters at the site and the assessments undertaken to date generally concur with these findings. While it has been confirmed that pathways are present in places between the



perched groundwaters within Made Ground and underlying Glacial Till; continuity with groundwaters within the Principal Aquifer is considered to be highly unlikely due to the significant thickness of overlying low permeability Glacial Till (up to 40m in places).

While seepage of shallow perched groundwaters could occur at the surface, this will naturally be mitigated by means of the adoption of a suitable Construction Environmental Management Plan (CEMP) that would be required for the remediation works (outlined in further detail below). Following development of the site a betterment is envisaged as infiltration of rainwater into the ground would be reduced due to increased hardstanding areas and / or with any surface waters being captured by drainage.

Further groundwater monitoring, sampling and subsequent laboratory analysis is currently being undertaken to fully quantify the risks to controlled waters, to determine the risk of groundwater migration and any impact on perched shallow groundwaters during development of the site.

Following the completion of the groundwater assessments Detailed Quantitative Risk Assessment can be undertaken, if required, to determine remedial targets and any subsequent mitigation. The final choice of technique(s) will be determined after further works and liaison with specialist contractors and regulators have been undertaken.

Site Remediation

The exact requirements of the remedial strategy are dependent on the completion of those assessments that are currently being undertaken, and the resulting remedial strategy ultimately adopted by the Client appointed remediation contractor.

Based on the site information held to date, the outline remedial strategy is to be as follows:

Pre-Construction Phase

The outline / preliminary strategy for the Pre-Construction site remediation works is to comprise, but not be limited to the following:

Management:

- Implementing the works with appropriate consultancy supervision so that the works can be fully validated, together with verification reporting, to the satisfaction of the Local Planning Authority;



- Management of all works by means of a suitable CEMP that is prepared by the remediation contractor to ensure that adverse effects to the existing environment and surrounding community are either mitigated. At this preliminary stage it is envisaged that the CEMP could include, but not be limited to the following:
 - General site management that includes compound layout and parking; security; site access and egress; traffic management and designated pedestrian routes; site speed limits; construction vehicles / vehicle movements; site offices, cabins and welfare facilities; storage of fuels, oils and building chemicals; and road / highway cleanliness.
 - Management of material delivery and storage, including the delivery of fuels and hazardous liquids.
 - Water management that includes adequate prevention measures to protect identified controlled water receptors and suitable measures to deal with any contaminated waters.
 - Waste management that includes segregation of waste; recording of all waste movements, the use of Duty of Care Consignment notes; and suitable mitigating measures (e.g. closed skips, suitable waste storage areas, works managed by means of a Materials Management Plan).
 - The management of air quality and particulate matter (dust) generally in accordance with the WA Draft Air Quality Statement (enclosed) and /or other measures (e.g. air and dust monitoring);
 - The management of noise, vibrations, odour and vapours (e.g. site operations in accordance with agreed working hours, plant to be fitted with silencers, noisy operations being undertaken away from residential properties).
 - The management of any land contamination issues by ensuring appropriate health and safety measures are in place (e.g. the use of appropriate Personal Protective Equipment); and employing monitoring and mitigation measures throughout the works (e.g. the monitoring and dust and debris).
 - Measures to avoid creating visual impacts during construction (e.g. public



roads providing access to the site to be maintained free of dust and mud).

- Community liaison with relevant parties being contacted prior to commencement on-site, management during the works and measures to address any complaints.
- Environmental reporting that could take the form of Monthly Environmental Reporting by subcontractors.
- Monitoring and compliance in accordance with the remediation contractors procedures.
- Inspection of all works by a suitably qualified geo-environmental engineer to confirm the suitability of material for re-use; and
- Development of a comprehensive validation report to document the successful completion of the works.

Remedial Approach:

- Re-use of suitable materials on site in accordance with the CL:AIRE DoWCoP and a Material Management Plan (MMP), including any clean & natural site-won clays for re-use in the proposed clean cover system;
- General site clearance and legislatively complaint removal and disposal of vegetation and trees, fly-tipped materials and surface debris. Further site investigation may be required following this exercise to further delineate potential contamination hotspots previously not accessible;
- Identification, management and appropriate removal of any asbestos containing materials by a suitably licensed contractor and in accordance with the 'Control Of Asbestos Regulations 2012';
- A legislatively compliant Invasive Non-Native Species Management Plan covering in particular Japanese knotweed, as well as other species, together with suitable monitoring, validation and management of the remedial works themselves to deal with the Japanese Knotweed and associated infested soils that are present at the site.
- Break out of hardstanding areas and grubbing out of any subsurface features including foundations, drainage and any other buried obstructions / oversized materials



(possible screening and crushing for re-use as appropriate) in accordance with the WRAP protocol for Aggregate from Inert Waste Care should be taken to not cause any “shock” contamination whilst carrying out these works (e.g. rupturing pipes).

- Processing of crushed concrete, bricks and other appropriate materials in accordance with a detailed earthworks specification and with requisite validation testing.
- In-situ turnover of the top 2-3m of Made Ground across the entire site with removal of any deleterious, oversized and contaminated materials that could pose an unacceptable risk to those identified receptors for the site. This is required in order to create a clean ‘buffer zone’ to protect future receptors from any deeper underlying contamination and for geotechnical purposes. This is likely to include some off-site disposal for untreatable materials or those that cannot be engineered. Limited removal of deeper contamination (say to 5m depth) in certain ‘hot spot’ areas where shallow contaminated perched waters are indicated.
- Overdig for some areas of deeper Made Ground (~ 5m depth) where mostly “inert” materials have been encountered to allow for recompaction as engineered fill or for re-use elsewhere on the site subject to an appropriate earthworks specification.
- Subject to discussions with specialist contractors and regulators and the outcomes of those outstanding assessments, a suitable treatment method will be required for contaminated soils that takes into account the presence of the Japanese Knotweed, any uncertainties associated with ground variability and to enable for the re-use of materials in appropriate areas of the site. Possible off-site disposal may be required for untreatable materials.
- Possible dewatering / shallow perched groundwater treatment with the control / management of leachate / perched waters during earthworks and disposal of any treated water. Depending on the outcome of those assessments that are currently being undertaken, more extensive groundwater remediation may be required.
- Possible installation of a lined and bunded water treatment area to facilitate the treatment of any surface water which will require discharge from the site. A leachate collection system may be required for the south western part of the site where shallow perched waters are indicated to be present, subject to discussions with specialist contractors and regulators. Cut and fill earthworks balance to achieve final



development levels in line with a suitable earthworks and drainage strategy for the site.

- Importation of inert clean cover soil material for gardens, soft landscaping etc. Laboratory testing will be required for imported topsoil to confirm its chemical suitability and that it conforms to regulatory requirements.
- Importation of inert and geotechnically suitable material, if required. Laboratory testing of all imported material to confirm their chemical suitability for re-use. Geotechnically suitable criteria should be confirmed by the geotechnical / structural engineer and outlined in a suitable earthworks specification;
- Excavation and treatment / removal of all previously unidentified materials deemed to be either a potential risk to the identified receptors or the built environment;
- Possible surcharging of deeper landfill materials with settlement monitoring.
- Possibly ground improvement in some areas of the site (e.g. vibrostone columns or vibrocompaction).

Please be aware that this outline remediation strategy covers those items that a site of this nature might generally involve, and the specifics will be defined as further information becomes available.

Construction Phase:

The outline strategy for the Construction Phase site remediation works are likely to comprise:

- Ground gas / vapour mitigation for new buildings. This could involve the installation of compliant ground gas and / or vapour protection measures in structures in affected areas;
- Installation of a clean cover pathway break in all gardens and soft landscaping areas. The extent and composition to be determined by supplementary site investigation and subsequent risk assessment.
- Whilst not a specific remediation measure, the installation of services including water pipes and drains as per UKWIR guidance.

Post Construction Phase:

The outline strategy for the Construction Phase site remediation works is likely to comprise:



- Independent validation of any ground gas and/or vapour protection measures carried out in accordance with current guidance; and
- Chemical and physical validation of clean cover systems in garden and soft landscaping areas (as relevant).
- Verification and validation of all remedial works that have been completed.
- If groundwater remediation is required, then compliance monitoring may be also required.

Record Keeping and Verification

The final remedial strategy will provide greater detail on responsibilities for record keeping and verification of the remedial works. In the absence of these documents we envisage that record keeping and verification during the works will include as a minimum the following elements.

It will be the responsibility of the Remediation Contractor during the works to ensure the tracking of material movements is carried out in accordance with the relevant documentation and to undertake appropriate record keeping during the works. This is to ensure that an independent Validation Report can be produced on completion of the remediation and site enabling works, which clearly references the origin of the materials used and testing carried out to confirm their suitability for use, where required. The contractor will more than likely need to prepare an as-built drawing to be cross-referenced with the supporting validation documentation.

The Validation Report will require the following information as a minimum:

- A full written description of the works, detailing how the objectives and requirements of the detailed Remediation Strategy (once prepared and agreed with the regulatory authorities) have been achieved;
- Copies of regulatory correspondence;
- A photographic record of works undertaken;
- Detailed surveys of all excavations and production of “as-built” drawings for the earthworks;
- Copies of Consignment Notes relating to material movements of wastes to a licensed



waste management facility;

- Detailed drawings showing all sampling locations for chemical testing;
- Chemical test results;
- Validation records in relation to gas/vapour protection measures;
- Details of the MMP and Qualified Person signed declaration.

Summary

Previous third party and WA site investigation works have identified that contamination is present across the site within soils and groundwaters. The site has historically been a landfill that received waste from the Manchester area over many decades and there is always going to be some level of uncertainty regarding the ground conditions at the site.

A detailed remediation strategy will be required to address the above and will ultimately need to take these uncertainties into account. The exact requirements of the remedial strategy are also dependent on the completion of those assessments that are currently outstanding and the Client's appointed remediation contractor's preferred methodology, that will feed into the final remediation strategy submitted to the Local Authority for approval.

The implemented remedial measures will require independent verification / validation, confirmed by the submission of a verification report to the Local Authority, Environment Agency and Warranty Provider. Materials movement and reuse should be undertaken in accordance with appropriate legislation and industry guidance.

The outline remediation approaches described in this report are at this stage are indicative, and will be subject to review, revision and refinement following the completion of ongoing ground investigations and risk assessments. The findings of this work will inform the detailed remediation strategy, which will be agreed with the regulatory authorities prior to remediation commencing.

Yours sincerely,



**Jonathan Currie,
Principle Engineering Geologist
for Wardell Armstrong LLP**

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Drawing No. LD10162-001

Illustrative Masterplan Sketch

Gap Analysis Report (ref: JC/MP/SH12254/LET-003).

Draft Air Quality Statement (ref: LD10162/SKL/MTW/AQA-001)

Illustrative Masterplan



Our ref: JC/MP/SH12254/LET-003

Date: 04th June 2020

Digital ref:

Your ref:

Mr K Moore
Nuvu Developments Ltd
c/o Your Housing Group
602 Aston Avenue
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Warrington
WA63 6AN

Dear Mr Moore,

LAND AT TEN ACRES LANE, NEWTON HEATH

GAP ANALYSIS AND INDICATIVE SCOPE OF FURTHER WORKS

Following your recent instructions and our review of the available information, we are pleased to provide the findings of our gap analysis and an indicative scope of further site investigation works for the Ten Acres site. These supplementary site investigation works are required to provide an outline approach for the remediation of the site to increase the cost certainty and the cost effectiveness of any future development works that would be required for what is understood to be a mixed residential and commercial end use.

Introduction

The site is located between Ten Acres Lane and Mitchell Street, Newton Heath, Manchester at National Grid Reference E387599, N400309 and is located as shown on Drawing SH12254-010. The site is roughly rectangular in shape and comprises approximately 19 hectares of derelict land that comprises woodland, scrub and neutral grassland with some areas of fly tipped materials.

Since the early 1890's the site operated as a brickworks with two large clay extraction pits. From the late 1940's onwards the clay extraction pits are indicated to have been a licensed landfill and were infilled with variable wastes including construction and demolition waste,

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foundry sand, industrial non-hazardous waste, slag and boiler/flue cleanings. The site has remained derelict to the present day.

Previous Investigations

The site has been the subject of several desk studies and site investigations, and these are summarised in the table below:

TABLE 1: SOURCES OF INFORMATION		
Date	Author & Title	Details
December 2001	WS Atkins Consultants Ltd: "Former Jackson Brickworks, Manchester – Desk Study Report and Preliminary Environmental Liability Assessment"	This report was not available for review but is mentioned in the Celtic desk study report (see below). Celtic stated that this report included a summary of several other investigation reports (also not made available for review) that were undertaken for the site.
July 2006	Celtic Technologies Ltd: "Desk Study, Ten Acres Lane, Newton Heath, Greater Manchester" (report ref: R1077/06/2958)	A desk study report was undertaken for the site and this included a summary of the findings (e.g. ground conditions and contamination) from the WS Atkins report noted above.
February 2008	Celtic Technologies Ltd: "Interpretative Report, Former Jacksons Brickworks, Ten Acres Lane, Newton Heath, Greater Manchester" (report ref: R1077/08/3328)	This report outlines the findings of an intrusive site investigation, subsequent risk assessment (generic quantitative risk assessment detailed quantitative risk assessment) and evaluation that was undertaken for the site. The site investigation works comprised: • 70 No. trial pits, 22 No. windowless sample boreholes, 20 No. cable percussive boreholes, 6 No. rotary boreholes and 2 No. trial trenches (the locations are shown on Drawing No. SH12254-005); all with associated soil sampling, in-situ testing and subsequent laboratory testing. • 33 No. groundwater and ground gas monitoring wells were installed and were monitored and sampled on 3 No. occasions. • A trial geophysical investigation was also undertaken.
February 2012	GL Hearn: "Environmental Statement, Former Jacksons Brickworks, Ten Acres Lane, Newton Heath, Manchester" (report ref: 098689/OO/2012/N1).	An Environmental Statement was prepared for the site to accompany an outline planning application for a mixed residential and commercial end use (ref: 098689/OO/2012/N1). The ground conditions section largely summarises the findings of the Celtic reports. Relevant information pertaining to ecology, flooding and archaeology were also included.



TABLE 1: SOURCES OF INFORMATION		
Date	Author & Title	Details
July 2019	Wardell Armstrong LLP: "Factual Site Investigation Report, Land Between Ten Acres Lane and Mitchell Street, Newton Heath, Manchester" (report ref: SH12254 RPT-001)	This report outlines the findings of a limited site investigation that was undertaken at the site to supplement and confirm previous site investigation works. These works comprised: • 35 No. trial pits, 6 No. cable percussive boreholes and 3 No. windowless sample boreholes (the locations are shown on Drawing No. SH12254-005); all with associated soil sampling, in-situ testing and subsequent laboratory testing. • 4 No. groundwater and ground gas monitoring wells were installed.

Data Gap Analysis

Based on a review of the available information to date and our own investigation at the site, the following data gaps have been identified.

Areas not Previously Investigated

Large areas of the site have not been investigated or have been sparsely investigate due to dense vegetation. These areas are indicated in Drawing No. SH12254-06 and include the central north western, central north eastern, central south western, central south eastern, north easternmost and north westernmost sections of the site.

Further areas of deleterious / problematic waste materials, unrecorded contamination and other abnormal ground conditions could be present, and these areas will require further investigation to quantify the risk.

Contamination Hotspots

During previous site investigations several areas of potential hydrocarbon contamination and possible free product were identified from visual and olfactory evidence. Other areas of visual and olfactory evidence were also characterised by red dyes, acrid odours, asbestos containing materials and sewage / sulphur odours. These areas are outlined in Drawing No. SH12254-07.

Laboratory analysis indicates the presence of elevated concentrations of total petroleum hydrocarbons (TPH), polycyclic aromatic hydrocarbons (PAH), metals, sulphates and other non-organic contaminants that were generally found as hotspot areas within shallow Made



Ground deposits (<1m depth) and occasional extended into deeper made ground (>1m depth). In some instances, the elevated concentrations correlated with the visual and olfactory areas of contamination. Contaminant levels were found to be low or insignificant within deeper natural ground.

Further investigation should be undertaken to delineate the hotspot areas and analytically validate the areas of visual and olfactory evidence of contamination, so that the risks to human health and controlled waters can be quantified.

Asbestos

While historical investigations did not identify asbestos within the Made Ground from laboratory testing, the screening tests undertaken were not as sensitive as they are currently and therefore the presence of asbestos cannot be ruled out. An area of asbestos containing materials was also identified within the north eastern section of the site (see Drawing No. SH12254-07).

Further laboratory testing of Made Ground materials from across the site should be undertaken to quantify the risk.

Ground Gas

Monitoring of ground gases during previous investigations of the site recorded concentrations of carbon dioxide between <0.1% and 14.3% (typically between <0.1% and 9.8%), methane concentrations up to 30.5% (typically <0.1%) and gas flow rates of up to 2.3 l/hr. However, only three visits were undertaken and for a proposed residential end use this is likely to be insufficient to satisfy regulatory authorities.

Furthermore, large areas of the site have not been previously investigated and it is possible that greater flow rates and higher ground gas concentrations may be encountered; particularly if further areas of deleterious / problematic waste materials are encountered.

Conversely, ground gas assessments at the time were conservative and ground gas concentrations are likely to have decreased in the 12 years since the assessment was undertaken. It is also likely that following remediation / earthworks of the site ground gas concentrations could decrease due to the removal of shallow deleterious / problematic waste materials.



Further ground gas monitoring wells should be installed across the site and further monitoring undertaken (incorporating existing monitoring wells, where possible) to confirm the ground gas regime at the site and to allow for an updated ground gas risk assessment to be undertaken, so that the need for ground gas protection measures can be determined.

Groundwater

A shallow perched water table (with visual and / or olfactory evidence of contamination) was encountered within the south western section of the site. This area is noted by third parties to be susceptible to seepage of water at the surface during periods of heavy rainfall (see Drawing SH12254-007). Groundwater monitoring should be undertaken along the sites south western boundary to establish the perched shallow groundwater regime in this area as mitigation measures (e.g. dewatering and / or pumping and treating) may be required during the development of the site.

While previous site investigations suggest that there is no evidence of significant contaminants leaching from Made Ground into shallow and deeper groundwaters, testing was limited, visual and olfactory evidence has been noted in places and continuity is indicated between perched waters within Made Ground and shallow groundwaters within natural superficial deposits. Continuity may also exist between natural superficial deposits and groundwater within the underlying Principal Aquifer.

The installation of additional monitoring wells, further groundwater sampling and subsequent laboratory analysis should be undertaken to validate the findings of the previous stages of site investigation works, establish hydraulic continuity, confirm the groundwater flow direction and to quantify the risks to controlled waters (likely to be the main driver behind the risk assessments at the site as the site is underlain by a Principal Aquifer and a groundwater abstraction point is located approx. 700m to the south west of the site).

Groundwater flow directions are indicated to be towards the south west and sub-artesian conditions are indicated (this could prevent the downward migration of contamination into the Principal Aquifer), but this will need to be confirmed and it will need to be ascertained if the fault that is located on-site is acting as a barrier to groundwater flow.

Deleterious / Waste Materials

High proportions of deleterious / problematic waste materials (e.g. degradable constituents) were encountered within the south western section of the site, with localised occurrences



elsewhere (see Drawing SH12254-007). Large areas of the site have also not been investigated where anecdotal information indicates that these materials could be present (see Drawing SH12254-006).

These types of materials should be identified and delineated, as they may be susceptible to decay and / or decomposition, be contaminated, have unfavourable geotechnical properties, generate ground gas and will likely need to be treated and / or removed from site.

Vapours

While previous investigations have determined that there is no risk to critical receptors from indoor or outdoor vapour exposure from soil sources, it has been assumed that passive vapour protection measures would be installed in buildings and that most of the PAH and TPH fractions were insufficiently volatile to not warrant assessment.

Further assessment will be required as attitudes towards vapor assessments have changed, significant visual and olfactory evidence of hydrocarbon contamination (including free product) and elevated concentrations of TPH and PAH have been recorded. If the deeper Made Ground materials are to be left in-situ following the remediation of site this would require specific further testing as testing within the deeper strata is limited.

Made Ground Thickness

Substantial variation in thickness in Made Ground occurs as a result of backfill of previous quarried clay pits across the site. These excavations formerly occupied > 85% of the current site layout and some pits are believed to overlap. Depths in Made Ground are extremely variable over small lateral distances and thus, show no consistent depth across the site.

WA have previously produced a Made Ground Contour Plan (Drawing No. SH12254-08) for the site and further targeted works should be undertaken to further refine this model. This will enable for foundation zoning planning, the identification of highwalls from the former clay pits and to further refine the conceptual site model.



Ground Aggressive to Concrete

Third party data indicates that the Made Ground deposits encountered across the site may be aggressive to concrete and a Design Sulphate Class (DS) of “DS3” and an Aggressive Chemical Environment for Concrete (ACEC) of “AC-3” have been determined.

However, only limited testing has been undertaken for some parts of the site and an extensive area of colliery spoil has been identified within the north eastern section of the site that may contain sulphides that will require an assessment for total potential sulfate and oxidisable sulfides. The heave potential of these materials may also need to be considered if oxidisable sulfides are found to be present.

Further sulphate testing will be required to allow for a detailed risk assessment to be undertaken.

Obstructions

Obstructions have been encountered at the locations of the former brickworks buildings located within the easternmost and north westernmost sections of the site. While these would likely be removed as part of the remediation earthworks it would be useful to obtain further information to inform remediation costs and to ascertain if any significant obstructions could be present that extend to depth (e.g. basements or chimney bases).

Collapse Compression

An extensive area of colliery spoil has been identified within the north eastern section of the site and high proportions of degradable / waste constituents are present in places across the site. Consideration should be given to the potential for collapse compression at the site. It is recommended that wetting / loading tests and laboratory compaction tests are undertaken to quantify the risk.

Depth to Bedrock and Faulting

Only five rotary boreholes have proven rockhead across the site and no testing has been undertaken. A fault is also noted to cross the south western section of the site and results in a change in the solid geological strata, with only a single rotary hole being undertaken to investigate this change in strata. Rock quality may be significantly reduced in the vicinity of the fault and weathering could extend to considerable depths. The fault could also act as a



barrier to groundwater flow and this could have implications for any future controlled waters risk assessments.

Further investigation will be required, and this may require additional site investigation works in the form of rotary boreholes with subsequent geotechnical laboratory testing to derive geotechnical parameters.

Combustion

If the colliery spoil material is to be excavated and stockpiled for reuse across the site there is a risk that it could be susceptible to combustion. While previous investigations indicate that coal contents are relatively low, this should be supplemented with calorific content tests to quantify the risk.

Ecology

WA have previously undertaken a Preliminary Ecological Appraisal of the site and it was recommended that further detailed assessments would be required in order to inform development and mitigation proposals. This included Phase II surveys for badgers, bats, great crested newts, reptiles, breeding birds and an invasive non-native species survey.

Archaeology

An archaeological desk-based assessment has previously been undertaken for the site by a third party in November 2011. It recommends that further intrusive works are undertaken to establish the potential for industrial archaeological relating to the brickworks sites. The requirement for these works was to be addressed by condition.

Japanese Knotweed

Significant stands of Japanese Knotweed have been identified across the site. Clearance of Japanese Knotweed and / or treatment of affected soils will be required prior to development.

It is recommended that these works are undertaken prior to further site investigation works at the site, so that all areas are freely accessible.

Unexploded Ordnance

The site lies within an area identified as having a moderate risk for unexploded ordnance (UXO) and within an area where bomb strikes have been recorded. While UXO are considered



unlikely within the landfill materials (due to the age of the deposits), they may still be present within the underlying natural superficial deposits.

The possibility of UXO being encountered on a site constitutes a potentially significant risk under CDM guidance and this will require further consideration if intrusive activities are undertaken which extend into the underlying natural superficial deposits (e.g. boreholes or piled foundations).

Rochdale Canal

Due to the Rochdale Canal forming the sites northern boundary it is recommended that consultations are undertaken with the Canals and Rivers Trust to confirm the requirement for any easements and to ensure that the stability of the canal is taken into consideration during any future development works.

Recommendations for Further Investigation, Monitoring and Reporting

Previous assessments undertaken at the site are now in excess of 12 years old and guidance has since changed. Further investigation, monitoring, testing and associated assessments (including the reassessment of existing data in line with current guidance) will be required to demonstrate to the planning authority (and hence the Environment Agency) that the site does not present a risk to future site users or controlled waters.

The site investigation works outlined below have been designed to address those abnormal items identified from the gap analysis exercise and are hence largely of a targeted nature. However, for those areas where investigation has not been previously undertaken, positions have largely been located on spatial basis to provide an assessment in terms of both environmental and geotechnical site parameters.

Generally, the site investigation works should comprise of the following activities:

- 50 No. trial pits to further establish the thickness, extent and characteristics of the underlying Made Ground and natural superficial deposits beneath the site, to delineate contamination hotspot areas, delineate areas of “waste” materials and to identify any significant obstructions.
- 15 No. cable percussive boreholes primarily to verify the depth of the Made Ground across the central areas of the site and to allow for the installation of ground gas and groundwater monitoring wells. Secondly, to establish the thickness, extent and



characteristics of the underlying natural superficial deposits and whether any continuity exists between the various groundwaters at the site.

- 12 No. window sample holes primarily to allow for the installation of ground gas and groundwater monitoring wells around the periphery of the site. These wells will be dual purpose in that they will allow for an assessment of ground gas to off-site receptors and allow for an assessment of the shallow perched groundwater table within the south western section of the site.
- 10 No. rotary boreholes (a mixture of open hole and core recovery) to primarily establish the depth to bedrock and allow for the installation of groundwater monitoring wells within the underlying Principal Aquifer. Secondly, to establish whether the fault that crosses the site is acting as an impermeable barrier to groundwater flow and to determine rock quality for any deep foundations that may be required.
- Consideration should be given to the use of falling head tests within boreholes and window sample holes to obtain permeability parameters for the various materials at the site.
- Consideration should also be given to the use of cone penetration testing (CPT) in conjunction with membrane interface probes to delineate and map out areas of contamination. The use of this technique will need to be discussed with CPT contractors to determine if the ground conditions at the site are suitable.
- Environmental sampling and testing of soils from exploratory hole positions to assess the extent of the contamination across those areas that have previously not been investigated and to delineate / validate the hotspot areas that have been identified during previous investigation, so that the risks to human health and controlled waters can be quantified.
- In-situ testing (e.g. hand shear vane and SPT test), sampling and subsequent geotechnical laboratory testing of the underlying natural superficial deposit and Made Ground, to obtain outline geotechnical parameters (includes BRE suites to assess the grounds aggressivity to concrete).
- Full time supervision by suitably qualified and experienced Wardell Armstrong geoenvironmental / geological engineers.



Generally, the post site investigation works should comprise of the following:

- Groundwater monitoring and sampling from those monitoring wells that have been installed at the site (and existing wells, where possible) with subsequent environmental laboratory testing to validate the findings of the previous stages of site investigation works, confirm the groundwater flow direction and to quantify the risks to controlled waters.
- Ground gas monitoring should be undertaken for a period of at least 6 months with between at least 9 to 12 visits as outlined in current guidance. This will allow for a ground gas risk assessment to be undertaken and the need for any ground gas protection measures to be established. The period of monitoring may be able to be reduced if post remediation / earthworks monitoring is undertaken.
- A series of inundation tests and laboratory compaction tests should be undertaken to assess the potential for collapse compression with the area of colliery spoil that has been identified at the site. Similar testing may also need to be undertaken for some of the more problematic Made Ground materials. Preferably, these should be completed once the final formation level has been established but could also be undertaken as part of the SI works to obtain outline information.

Generally, the reporting elements should comprise the following:

- The production of a Combined Phase 1 Desk Study and Phase 2 Ground Investigation Report that includes updated desk study information (this will be required for planning), a detailed review of previous investigations undertaken at the site, the findings of the proposed site investigation and subsequent risk assessments and evaluations. All of this information would then be used to compile an updated CSM for the site.
- If necessary, the production of a new Detailed Quantitative Risk Assessment (DQRA) for the site, that considers all the available data. For a site of this nature, this will almost certainly be required for planning purposes.
- Depending on the outcome of the DQRA we would then produce a Remediation Strategy Report, which will include an options appraisal to determine viable remediation options for the site and detail the chosen remediation strategy for the site.



Other items that require consideration are as follows:

- Completion of a preliminary UXO Risk Assessment to comply with CDM regulations and assess the risk posed by UXO at the site. Depending on the findings a detailed UXO risk assessment may be required.
- The completion of the requisite ecological and archaeological surveys that are indicated to be required. Wardell Armstrong have in house capabilities to complete these works, if required.

Please refer to Drawing No. SH12254-009 for the positions of the proposed exploratory hole locations.

The above scope of works is preliminary in nature and is naturally subject to your agreement that of the local authority (and hence the Environment Agency) and is subject to the clearance of vegetation, the consideration of ecological constraints and the clearance / treatment of Japanese Knotweed.

We trust that the above is suitable for your current purposes. However, if you have any queries please don't hesitate to contact me.

Yours sincerely

**Jonathan Currie, Senior Engineering Geologist
for Wardell Armstrong LLP**

Enc.

Drawing No. SH12254-005

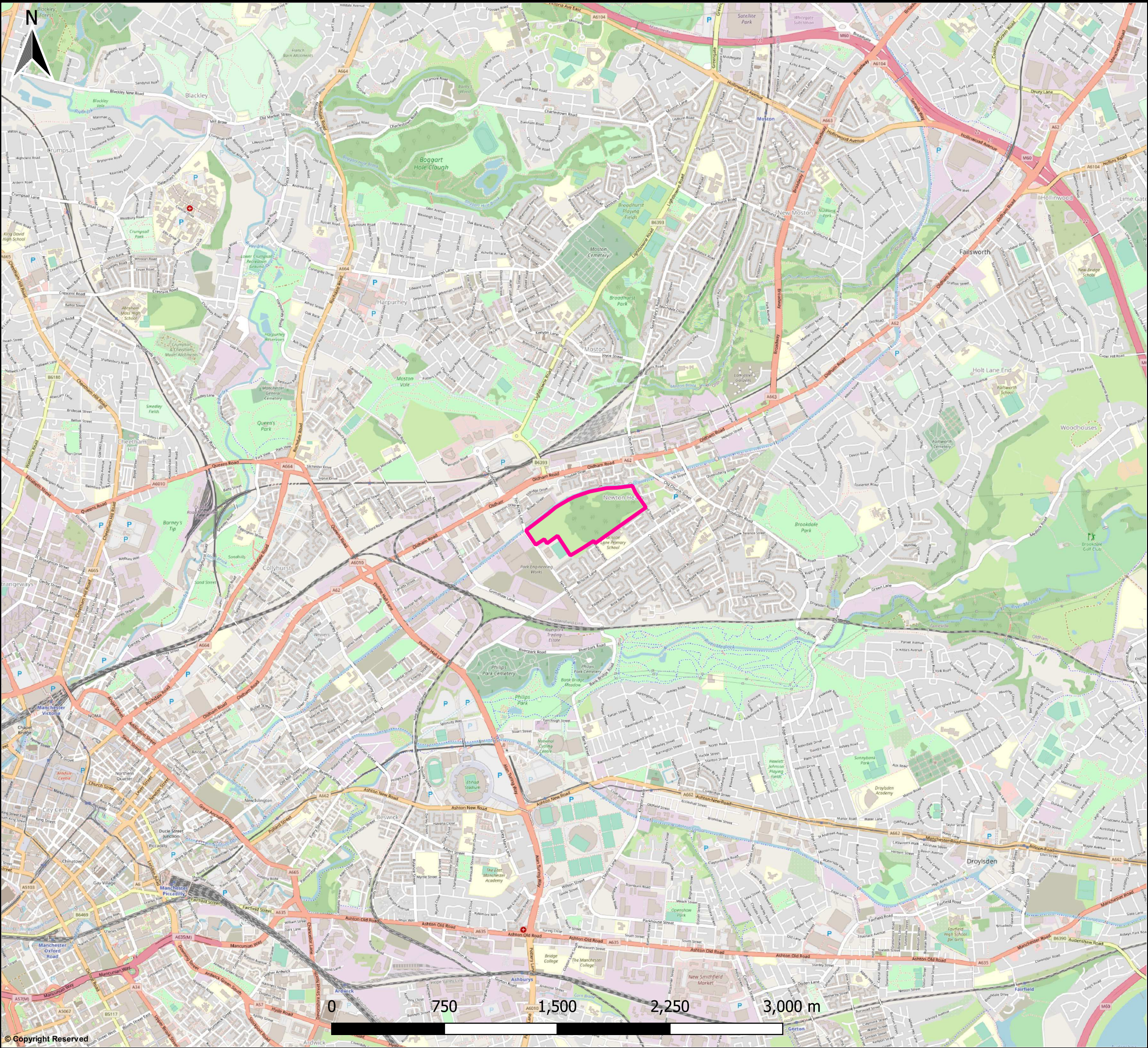
Drawing No. SH12254-006

Drawing No. SH12254-007

Drawing No. SH12254-008

Drawing No. SH12254-009

Drawing No. SH12254-010



DO NOT SCALE FROM THIS DRAWING

Legend

Site Boundary

Notes

Map data: Contains OS open data © Crown copyright and database right (2020). Open Government License.

REVISION	DETAILS				DATE	DRN	CHKD	APPD
CLIENT								
NUVU DEVELOPMENTS LTD								
PROJECT								
TEN ACRES LANE, NEWTON HEATH								
DRAWING TITLE								
SITE LOCATION PLAN								
DRG No. SH12254-010						REV		
DRG SIZE A3			SCALE 1:25,000			DATE 03/06/2020		
DRAWN BY JC			CHECKED BY MP			APPROVED BY MP		
 LEEDS TEL 0113 831 5533 WWW.WARDELL-ARMSTRONG.COM ☐ BIRMINGHAM ☐ BOLTON ☐ CARLISLE ☐ EDINBURGH ☐ GLASGOW ☐ LONDON ☐ MANCHESTER ☐ NEWCASTLE UPON TYNE ☐ CARDIFF ☐ STOKE ON TRENT								



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Legend

- Site Boundary
- Third Party Exploratory Hole Locations
- Wardell Armstrong Exploratory Hole Locations 2019

Notes

TP = Trial Pit
BH = Cable Percussive Borehole
WS = Window Sample Borehole
R = Rotary Borehole
Exploratory hole locations are approximate only.
BING imagery reproduced under license. Aerial imagery shown for context purposes only.

REV A		08/07/19			
REVISION	DETAILS	DATE	DRN	CHKD	APP'D

CLIENT	NUVU DEVELOPMENTS LTD
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PROJECT	TEN ACRES LANE, NEWTON HEATH
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DRAWING TITLE	EXPLORATORY HOLE LOCATION PLAN
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DRG No.	SH12254-005	REV	
DRG SIZE	A3	SCALE	1:3,000
		DATE	02/06/2020
DRAWN BY	JC	CHECKED BY	MP
		APPROVED BY	MP



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Legend

- Site Boundary
- Areas Not Previously Investigated
- Areas Sparsley Investigated
- Third Party Exploratory Hole Locations
- Wardell Armstrong Exploratory Hole Locations

Notes

TP = Trial Pit
BH = Cable Percussion Borehole
WS = Window Sample Boreholes
R = Rotary Borehole

Exploratory hole positions are indicative only.
BING imagery reproduced under license. Boundaries are indicative. Aerial imagery

REVISION	DETAILS			DATE	DRN
CLIENT		NUVU DEVELOPMENTS LTD			
PROJECT		TEN ACRES LANE, NEWTON HEATH			
DRAWING TITLE		AREAS REQUIRING FURTHER INVESTIGATION			
DRG No.		SH12254-006			REV
DRG SIZE		A3	SCALE	1:2,750	DATE
DRAWN BY		JC	CHECKED BY	MP	APPROVED BY
					MP
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Legend

- Site Boundary
- Third Party Exploratory Hole Locations
- Wardell Armstrong Exploratory Hole Locations
- Area of Anecdotal Groundwater Seepage
- Area of Suspected ACM
- Area of Significant Visual/Olfactory Contamination
- Area of Elevated TPH & PAH Concentrations
- Area of Elevated Metal Concentrations
- Area of Suspected Waste Materials

Notes

TP = Trial Pit
BH = Cable Percussion Borehole
WS = Window Sample Borehole
R = Rotary Borehole

Exploratory hole positions are approximate only.
Areas defined are indicative and are for illustrative purposes only.
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REVISION	DETAILS			DATE	DRN
CLIENT		NUVU DEVELOPMENTS LTD			
PROJECT		TEN ACRES LANE, NEWTON HEATH			
DRAWING TITLE		CONTAMINATION SITE FEATURES PLAN			
DRG No.		SH12254-007		REV	
DRG SIZE		A3	SCALE	1:2,750	DATE
DRAWN BY		JC	CHECKED BY	MP	APPROVED BY
					MP
LEEDS TEL 0113 831 5533 WWW.WARDELL-ARMSTRONG.COM ☐ BIRMINGHAM ☐ BOLTON ☐ CARLISLE ☐ EDINBURGH ☐ GLASGOW ☐ LONDON ☐ MANCHESTER ☐ NEWCASTLE UPON TYNE ☐ CARDIFF ☐ STOKE ON TRENT					



DO NOT SCALE FROM THIS DRAWING

Legend

- ◆ Wardell Armstrong Exploratory Hole Locations
- ◆ Third Party Exploratory Hole Locations

Made Ground Contour mbgl

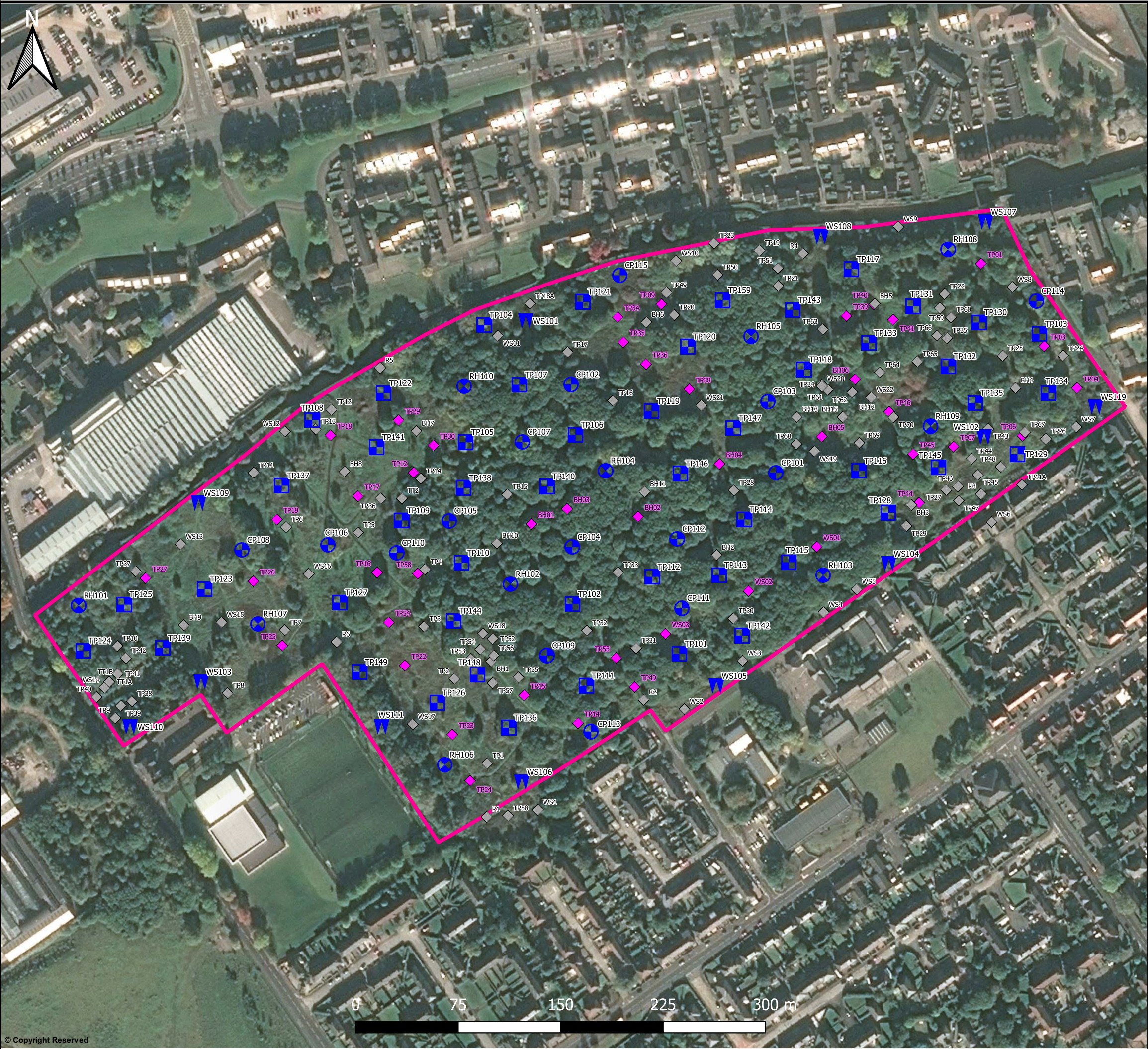
- 0.30 - 1.00
- 1.00 - 1.70
- 1.70 - 2.40
- 2.40 - 3.10
- 3.10 - 3.80
- 3.80 - 4.50
- 4.50 - 5.20
- 5.20 - 5.90
- 5.90 - 6.60
- 6.60 - 7.30
- 7.30 - 8.00
- 8.00 - 8.70
- 8.70 - 9.40
- 9.40 - 10.10
- 10.10 - 10.80
- 10.80 - 11.50
- 11.50 - 12.20
- 12.20 - 12.90

Notes

TP = Trial Pit
BH = Cable Percussive Borehole
WS = Window Sample Borehole
R = Rotary Borehole

Exploratory hole locations are approximate only.
Third party data from previous site investigation works in the public domain has been used in the production of this contour plan. The accuracy of any third party data cannot be guaranteed.
Only exploratory holes that have proved natural ground have been used in the production of this contour plan.
BING imagery reproduced under license. Boundaries are indicative. Aerial imagery shown for context purposes only.

REVISION	DETAILS				DATE	DRN	CHKD	APPD
CLIENT								
NUVU DEVELOPMENTS LTD								
PROJECT								
TEN ACRES LANE, NEWTON HEATH								
DRAWING TITLE								
MADE GROUND BASE CONTOUR PLAN								
DRG No.						REV		
SH12254-008								
DRG SIZE			SCALE			DATE		
A3			1:2,750			03/06/2021		
DRAWN BY			CHECKED BY			APPROVED BY		
JC			MP			MP		
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DO NOT SCALE FROM THIS DRAWING

Legend

- Site Boundary
- Third Party Exploratory Hole Locations
- Wardell Armstrong Exploratory Hole Locations 2019
- Proposed Trial Pit Locations
- Proposed Cable Percussive Borehole Locations
- Proposed Window Sample Borehole Locations
- Proposed Rotary Boreholes

Notes

TP = Trial Pit
BH = Cable Percussive Borehole
WS = Window Sample Borehole
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REV A		08/07/19			
REVISION	DETAILS	DATE	DRN	CHKD	APP'D
CLIENT					
NUVU DEVELOPMENTS LTD					
PROJECT					
TEN ACRES LANE, NEWTON HEATH					
DRAWING TITLE					
PROPOSED EXPLORATORY HOLE LOCATION PLAN					
DRG No.		SH12254-009		REV	
DRG SIZE		SCALE		DATE	
A3		1:2,750		03/06/2020	
DRAWN BY		CHECKED BY		APPROVED BY	
JC		MP		MP	
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Our ref: LD10162/SKL/MTW/AQA-001
Your ref:

Date: 17th December 2020

Kieron Moore
Your Housing Group
Apex House
266 Moseley Road
Manchester
M19 2LH

Dear Kieron,

Ten Acres Lane, Newton Heath Remediation Phase – Air Quality Statement

Wardell Armstrong LLP have been instructed to provide an air quality statement for the remediation phase of the proposed development site situated off Ten Acres Lane, Newton Heath. To the north, the site is bound by the Leeds-Liverpool Canal with industrial premises and residential dwellings beyond. To the east, the site is bound by residential dwellings. To the south and west, the site is bound by residential dwellings, Briscoe Lane Academy School, Ten Acres Lane Sports Complex and Ten Acres Lane.

This air quality statement discusses the potential for air quality impacts during the remediation phase of the proposed development site. Specifically, the statement considers pollutant emissions from (i) vehicles travelling to and from the site to support the remediation works and (ii) the remediation activities themselves.

Emissions from Supporting Traffic

The Institute of Air Quality Management (IAQM) have published indicative screening criteria for when an air quality assessment may be required¹. Given that the proposed development site is situated within close proximity the Greater Manchester Air Quality Management Area, declared for exceedance of the annual air quality objective, the relevant criteria for the remediation phase of the proposed development are as follows:

- A change of ≥ 100 LDV (vehicles less than 3.5 tonnes in weight) AADT; or
- A change of ≥ 25 HDV (vehicles greater than 3.5 tonnes in weight) AADT.

Consultation with the appointed transport team for the proposed development (Vectos) has indicated that as the supporting traffic will be travelling to and from the development site via the A62 Oldham Road, the number of heavy vehicles accessing the site throughout the remediation phase will typically be approximately twelve per day. This implies that the AADT for HDVs will be just below the IAQM screening criterion of 25. Furthermore, the transport team confirmed that the number of light vehicles accessing the site throughout the remediation phase is expected to be below the 100 AADT criterion.

It is acknowledged that the number of daily HDVs accessing the site may deviate from twelve on occasion, in accordance with the demands of the remediation works. However, it is considered that

¹ Institute of Air Quality Management, Land-Use Planning and Development Control: Planning for Air Quality, January 2017





the short-term nature of the remediation works is such that any impacts on local annual air quality will be not significant overall.

Emissions from the Remediation Activities

It is considered that the required risk assessment for the remediation strategy, to be completed by the appointed remediation contractor, will comprise the primary method by which the potential risks associated with dust and pollutant emissions to air during the remediation phase will be determined. In addition, the risk assessment should determine where appropriate mitigation is required. It is considered that detailed approval of the remediation strategy, and associated risk assessment, will be secured by way of a condition.

Example dust suppression measures², which could be included within the remediation strategy (subject to the approval of the appointed remediation contractor), are as follows:

- Protection of surfaces and exposed material from winds until disturbed areas are sealed and stable;
- Avoidance of activities that generate large amounts of dust during windy conditions;
- Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper to be in use continuously;
- Ensure vehicles entering and leaving the site are covered to prevent escape of materials during transport;
- Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable);
- Minimisation of vehicle movements and limitation of vehicle speeds – the slower the vehicle speeds, the lower the dust generation;
- Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever the site size and layout permits; and
- Access gates to be located at least 10m from receptors, where possible.

All dust and air quality complaints should be recorded and appropriate measures be taken to identify causes, and reduce emissions, in a timely manner. Exceptional incidents which cause dust and/or emissions, and the action taken to resolve the situation, should be recorded in a logbook and made available to Manchester City Council on request.

Yours sincerely
for Wardell Armstrong LLP

DR STEVEN LEES
Associate Director (Air Quality)
slees@wardell-armstrong.com

MALCOLM WALTON
Technical Director
mwalton@wardell-armstrong.com

² Institute of Air Quality Management, Guidance on the Assessment of Dust from Demolition and Construction, June 2016