NEW VICTORIA OFFICE BLOCK, MANCHESTER

REMEDIATION STRATEGY FOR ALAN JOHNSTON PARTNERSHIP LTD ON BEHALF OF MORGAN CAPITAL

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This report has been prepared in accordance with GRM's Accredited Quality Procedures

If you have any queries regarding this report please contact the project manager in the first instance.

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Issue	Description of Revision	Signature
RS.2	Changes to depth of clean cover and water supply barrier pipe	

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1 INTRODUCTION

1.1 PREAMBLE

GRM Development Solutions Limited (GRM) has been appointed by Alan Johnston Partnership Ltd (Client's Agent), on behalf of Morgan Capital (Client), to produce a Remediation Strategy for the commercial development at 'New Victoria Office Block, Manchester'.

GRM standard limitations of reporting are provided in Appendix A of this report.

The following report has been used in the preparation of this document:

- Phase II Site Appraisal Report – Ref: GRM/P10056/PIISAR.1, dated August 2022.

The development proposals for the site comprise the construction of a new office building within the wider New Victoria residential development. The office building comprises 13 accessible levels including a basement and mezzanine. Soft landscaping as part of the development will be restricted to three separate areas around the new office building. The proposed development layout plans provided by the Client, on which this report is based, are presented in Appendix B.

1.2 OBJECTIVES OF THE SITE APPRAISAL

The principal aims of this document are as follows:

a) Assess the existing information relating to the soil and groundwater conditions within the area of the site.

b) Determine a cost and time effective remedial strategy.

c) Set out the remediation and validation processes to be followed on site to ensure the site developed does not pose a risk to human health and controlled waters.

Whilst every effort has been made to pre-empt the likely requirements of the Local Authority and the Environment Agency, they are likely to have specific requirements that will need to be discussed and addressed at a later date.

2 PHASE I DESK STUDY SUMMARY AND SITE OBSERVATIONS

A summary of the desk study information for the site, based on the information obtained from the relevant report referenced in Section 1.1, is presented below.

Project Name.	New Victoria Office Block, Manchester.
Project Reference.	P10056.
Client's Agent.	Alan Johnston Partnership Ltd.
Client.	Morgan Capital.
Site Location (address).	Land off Corporation Street (adjacent to Victoria Railway Station), Manchester, M31NX. See Appendix C for a site location and boundary plan.
National Grid Reference.	SJ840989.
Site Area.	0.21 Ha.
Summary of Proposed Development.	Office building development to include 13 accessible levels including a basement and mezzanine. Limited soft landscaped areas.
Client Supplied Information.	Proposed Development Plans including proposed landscape site plan.
Site Setting.	The site is situated within the construction compound for the adjacent residential development. The northern site boundary is constrained by the Network Rail owned culvert, the eastern boundary is constrained by the new residential development, the southern boundary is constrained by the Corporation Street adopted highway, and the western boundary is constrained by the Metrolink tram lines with Victoria Station beyond. The construction compound site area is predominantly covered by hardstanding with cabins / offices, skips, small scale fuel storage, material storage / stockpiles, car parking and a large newly built substation located in the north east of the site. There are no trees or landscaped areas within the site area. Numerous underground utility services are present.
Site History.	From the earliest OS mapping (1850), Long Millgate (road) is shown running through the middle of the site with commercial buildings on either side. The site is surrounded by primarily commercial and industrial premises, with the River Irk located just to the north of the site along with Victoria Station beyond. By 1908, the northern half of the site is now shown as being part of Victoria Station. Land to the north and west of the site is now entirely occupied by Victoria Station, with the River Irk in a culvert. By the 1980s, the site no longer contains any buildings (with Victoria Station scaled back) although Long Millgate is still

	present with car parking either side. By 2020/2021, the construction compound now occupies the site area.
Geology.	Made ground (locally deep) can be expected. Based on the historical development of the site, unknown buried structures or obstructions are possible. No superficial deposits are recorded. Solid geology of the Chester Formation (red, fine to coarse grained sandstone).
Groundwater.	The underlying bedrock strata (Chester Formation) is recorded as a Principal Aquifer. There are no recorded groundwater / potable water abstraction licenses within 250m of the site. The closest abstractions relate to operations at Strangeways Brewery approximately 350m north west of the site. The site is not recorded to be within a Groundwater Source Protection Zone.
Surface Water Features.	No water features identified within the site area. The culverted River Irk is present adjacent to the northern site boundary.
Flooding.	The site is not recorded to be in an area at risk from flooding by rivers or the sea and is not recorded to be within an area at risk from surface water flooding.
Coal Mining	The site is not within an area recorded to require a Coal Authority mining report and shallow coal bearing strata are not recorded to underlie the site. Therefore, the risk from historic coal mining is considered to be negligible.
Non-coal Mining and Quarrying.	There is no evidence of any non-coal mineral extraction (via quarrying) having taken place within, or close to, the site area.
Other Environmental Information.	No recorded licensed landfills or waste management sites are located within 250m of the site area. No recorded pollution incidents to controlled waters within 250m of the site area. There are nineteen active discharge consents recorded within 250m of the site; all relate to storm sewer overflow into the River Irk.
Unexploded Ordnance (UXO)	The potential for unexploded ordnance (UXO) is deemed as moderate via the freely available risk maps provided by Zetica. Given that the surrounding area has been extensively developed in the recent past and previous site investigation works on this site have not encountered any UXO, it is considered that the risk of encountering any UXO is actually low. However, vigilance should be maintained during any groundworks at the site and consideration should be given to Site Specific UXO Aware Briefings being provided to all site personnel.
Potential Soil Contamination Sources.	The presence of made ground associated with the historical development of the site (including Victoria Station) is a potential source of soil contamination.

	The use of the site as a car park is also a potential source of soil contamination due to the impact from petroleum hydrocarbons.
Potential Ground Gas Sources (including Radon).	Made ground. The site has been assessed following the guidelines in 'Radon: guidance on protective measures for new dwellings' (BR211 2015). The site is not within an area recorded to require radon protection measures.

3 PHASE II GROUND INVESTIGATION

3.1 FIELDWORK

The ground investigation has been designed in accordance with the general comments outlined in Appendix A (iv).

The ground investigation fieldwork was conducted between the 20th and 29th July 2022. A total of twenty exploratory holes were completed, comprising ten trial pits (TP01-TP10 inclusive), seven rotary open-hole boreholes (ROH1-ROH7 inclusive) and three rotary cored boreholes (ROC1-ROC3 inclusive). The trial pits were progressed to a maximum depth of 3.2m below existing ground level (begl), whilst the rotary boreholes were progressed to a maximum depth of 31.0m begl.

The exploratory holes were positioned to provide an adequate coverage of the site and to provide information with regard to the ground conditions for the proposed structure. Due to the active nature of the site area and lack of space, there were severe restrictions regarding where exploratory holes could be positioned, particularly regarding the location and extent of the trial pits.

Five gas and groundwater monitoring standpipes were installed during the site works. The response zones were targeted at both the natural strata and the made ground, to determine the ground gas regime beneath the site area.

3.2 ENCOUNTERED GROUND CONDITIONS

The following ground conditions were encountered during the investigation fieldwork:

- Made Ground.
- Chester Formation.

Made Ground

Made ground was encountered in all of the exploratory holes undertaken and the depth generally varied between 1.0m and 7.5m begl, with a general thickness recorded (where proven) of 3.3m.

The made ground generally comprised:

- Asphalt / tarmacadam, concrete, cobbled stone and gravel hardcore formed the hardstanding surface across the site area, with a general thickness of 0.1-0.2m begl.
- Dense, brown, gravelly cobbly SAND. Gravel is fine to coarse, angular to subrounded of brick, concrete, asphalt/tarmac, tile, timber, plastic, quartzite and sandstone. Cobbles of whole bricks, concrete and asphalt/tarmac.
- Medium dense to very dense, brown mottled dark brown / reddish brown / black, slightly clayey, sandy cobbly GRAVEL. Gravel is fine to coarse, angular to subrounded of brick, concrete, asphalt/tarmac, clinker, slag, timber and sandstone. Cobbles of whole bricks and concrete.

The presence of buried concrete floor slabs and brick walls within the made ground fill has been confirmed at depths of between 0.8m and 2.3m begl. In addition, a suspected void was recorded at one exploratory location between 3.5m and 4.5m begl.

Chester Formation

These strata were encountered in all of the rotary boreholes and only proven in one trial pit. The full thickness of these strata was not proven.

The strata encountered typically comprised:

- Brown / reddish brown, gravelly SAND / sandy GRAVEL of sandstone.
- Weak becoming moderately strong with depth, thinly to thickly laminated, reddish brown, variably fine to coarse SANDSTONE with pebbles and interbedded mudstone laminations.

The bedrock deepens from south to north, and its depth varied between 1.3m and 7.5m begl.

3.3 GROUNDWATER OBSERVATIONS

No groundwater ingresses were encountered in any of the trial pits or rotary openhole boreholes. However, in the rotary cored boreholes, groundwater strikes were recorded at three locations at depths of between 16.0m and 16.5m begl.

Four groundwater monitoring visits were initially undertaken between the 1st August and 24th August 2022, which confirmed that standing water was not detected in any installation, on any of the monitoring visits.

Three further groundwater monitoring visits have since been undertaken, between 20th October and 22nd November 2022. Due to site activities, two of the five monitoring installations have been lost. A standing water level of between 4.8m and 4.9m begl has been recorded in one of the remaining installations, with the other two installations not recording any standing water.

3.4 CONTAMINATION OBSERVATIONS

The only visual evidence of potential contamination observed within the made ground, was the occasional presence of clinker, asphalt/tarmac, slag or metal fragments.

Olfactory evidence of petroleum hydrocarbon contamination was not encountered during the fieldwork.

3.5 CHEMICAL ANALYSIS

The chemical analysis as part of the investigation works comprised:

Contaminant(s)	Number Of Samples
Metals	25
Inorganics	25
Speciated PAH	25
Speciated Hydrocarbons (TPHCWG)	25
Asbestos	25
WAC	12

3.6 RISK ASSESSMENT FOR SOILS CONTAMINATION

3.6.1 Human Health

End Users

The material on site identified as being the most likely to be contaminated was the made ground.

The rationale for the end use specific Tier 1 Acceptance Criteria (TAC) used by GRM is outlined in Appendix A (vi) and for this site (based on the development proposals) the chemical analysis results were compared against the TAC for a commercial / industrial end use. In order to adopt a conservative approach a Soil Organic Matter (SOM) content of 6% was used to assess the made ground, as this closely reflects the vast majority of the samples tested. To provide an initial assessment, benzo(a)pyrene has been used as a surrogate marker compound for genotoxic PAHs with the exception of naphthalene.

Whilst the number of samples tested (25 in total) is considered sufficient to characterise the made ground, it is not considered appropriate to carry out statistical analysis on this data set. Therefore, the results for the made ground have been compared directly against the TAC for a commercial / industrial end use.

GRM General Suite
Twenty-five representative samples of the made ground were analysed for a general suite of contaminants. The recorded concentrations of all the contaminants were below the relevant TAC for a commercial / industrial end use, except for Lead. Two of the samples tested had recorded Lead concentrations of between 2600mg/kg (TP07) and 2800mg/kg (TP09), above the TAC of 2330mg/kg.

Asbestos Screening
Twenty-five representative samples of the made ground have been screened for the presence of asbestos. No asbestos has been detected in any of the samples.

Petroleum Hydrocarbons
Twenty-five representative samples of the made ground were tested for banded TPHCWG so that the risk to end users from potential petroleum hydrocarbons could

be assessed. The sample analysis did not reveal elevated concentrations of either Aliphatic or Aromatic hydrocarbons in excess of the relevant TAC.

In conclusion, remediation will be required for the Lead contaminated made ground.

Site Workers

The investigation has not revealed any specific contamination risk to site workers; however, the general comments outlined in Appendix A (vii) should be considered when site specific risk assessments are completed. The use of suitable PPE should be enforced during the ground works stage of construction.

3.6.2 Controlled Waters

The primary receptor for the site is the Chester Formation (Principal Aquifer), which underlies the made ground.

There are no recorded groundwater / potable water abstraction licenses within 250m of the site and the site is not recorded to be within a Groundwater Source Protection Zone. Apart from the culverted River Irk adjacent to the northern site boundary, there are no surface water features in close proximity.

No groundwater ingresses were encountered in any of the trial pits or rotary openhole boreholes. However, in the rotary cored boreholes, groundwater strikes were recorded at between 16.0m and 16.5m begl. The groundwater monitoring has only detected standing water in one installation at a depth of between 4.8m and 4.9m begl.

As the vast majority of the contaminated made ground will be excavated and removed as part of the construction works, and there is a lack of groundwater at shallow depths (<3m begl) within the made ground, the risk posed to the underlying Principal Aquifer is considered negligible.

3.6.3 Water Supply Pipes

It is considered that, based on the UKWIR guidance, the concentrations of contaminants recorded to date are such that Barrier Type water supply pipes should be used on the site.

However, it is recommended that the local water supply company for the site be contacted to confirm their requirements with regard to pipe materials.

A United Utilities risk assessment for water pipes form has been completed and this confirms that Barrier Type water supply pipes are required. This recommendation will need to be confirmed by the local water supply company.

3.7 RISK ASSESSMENT FOR GROUND GAS

Gas monitoring is currently on-going, and a ground gas risk assessment will be reported under separate cover.

Initial indications are that gas protection measures will not be required, although this will need to be confirmed following completion of the gas monitoring programme. A Gas Protection Measures Design and Verification Plan may need to be produced if it is determined that gas protection measures are required, together with independent validation of the gas membrane installation.

From the investigation works completed the following Phase II Conceptual Model has been produced:

3.8 PHASE II CONCEPTUAL MODEL

HUMAN HEALTH			
Source	**Pathway**	**Receptor**	**Remedial Solution**
Made ground (Elevated Lead & Benzo(a)Pyrene).	Indoor and outdoor inhalation of soil dust; the ingestion of, and dermal contact with, contaminated soil and soil dust (limited soft landscaped areas only).	End users.	Removal of all made ground below footprint of new building / Remediation required in soft landscaped areas comprising soil capping.
		Construction workers.	
No significant source identified.	Inhalation of ground gas.	End users.	Gas precautions are not required.
Made Ground (Elevated TPH).	Migration of contamination through leaks and joints, degradation of water pipe materials.	End Users.	Barrier Type water supply pipes and clean backfill required (to be confirmed by water supply company).

CONTROLLED WATERS			
Made Ground.	Leaching of contaminants and vertical migration to the groundwater restricted by hardstanding across vast majority of site.	Principal Aquifer (Chester Formation).	No remediation is considered necessary.

4 REMEDIAL STRATEGY FOR SOIL CONTAMINATION

The works outlined below are those considered necessary to commence the development of the site in accordance with the requirements of the Local Authority. It is the responsibility of the Client to ensure that the recommendations given, and the risk assessment on which they have been based, have been approved by the Local Authority prior to development taking place.

The areas requiring remediation are identified on the Remedial Extents Plan, included as Appendix D.

4.1 HUMAN HEALTH

Remediation to protect End-Users

Based on the recorded levels of soil contamination (Lead) within the made ground, remediation will be required to protect end users of the proposed development.

As the made ground will be excavated and removed within the footprint of the new building to allow construction of a basement and hardstanding will be present throughout the majority of the development, remedial works are not considered to be necessary except for the limited soft landscaped areas. For the limited soft landscaped areas (identified on the Remedial Extents Plan), placement of topsoil as an appropriate capping layer and to provide a growing medium will be sufficient.

It is considered that the use of a 300mm thick clean soil capping layer in the soft landscaped areas to break the source-pathway-receptor linkage would currently represent a suitable form of remediation. Where shrubs or trees are to be planted within the soft landscaped areas, then the soil capping layer will need to be increased to 450mm for shrubs and up to 1.2m for any tree planting. The capping layer should comprise topsoil (imported), with a geotextile marker layer at the base of the capping layer. No capping would be required below areas of hardstanding, as the hard cover will remove the possibility of a plausible linkage being present by removing the pathway.

No topsoil was present within the site area, and therefore importing topsoil material for the soft landscaped areas will be required.

Asbestos containing materials (ACMs) are not anticipated to be present within the made ground however, should such materials be suspected then safe disposal by suitably qualified contractors should be undertaken. Any visible fragments of asbestos are to be hand-picked by suitably qualified contractors and the collected materials removed from site to a suitable waste facility.

Remediation to protect Site Workers

The use of suitable PPE and adoption of appropriate working protocols should be enforced during the ground works stage of construction.

Should any suspected ACMs be encountered on the site, then works should cease until they have been dealt with by specialist contractors.

4.2 CONTROLLED WATERS

Remedial measures with regard to controlled waters are considered not to be required.

4.3 CONSTRUCTION MATERIALS

It is considered that, based on the UKWIR guidance, the concentrations of contaminants recorded to date are such that Barrier Type water supply pipes should be used on the site.

However, it is recommended that the local water supply company for the site be contacted to confirm their requirements with regard to pipe materials. Completion of a United Utilities Risk Assessment will be required.

4.4 UNEXPECTED CONTAMINATION

Should any material suspected of being significantly contaminated be encountered during the redevelopment of the site, GRM shall be contacted to undertake additional investigation, if necessary. The local Environmental Health Officer will be contacted and informed of any additional remedial work required.

5 DISPOSAL AND CLASSIFICATION

Based on the chemical test results, the soils at the site have been classified using the HazWaste Online software, should they require disposal offsite. At least 50% of the made ground tested has been classified as hazardous, due to either copper, lead, zinc, pH or hydrocarbons.

In summary, the WAC test results have confirmed that the vast majority of the samples that were classified as non-hazardous have failed the inert landfill criteria and therefore would normally need to be disposed of to a non-hazardous landfill. A WAC analysis undertaken on one of the samples classified as hazardous, confirmed it had failed the hazardous WAC criteria and therefore would require treatment before going to a hazardous landfill. The WAC testing has confirmed that the vast majority of the samples that were classified as hazardous, would be suitable for disposal as hazardous waste without further treatment.

It should be noted that as all the made ground is similar (e.g. granular in nature) and cannot be segregated, and also that the waste classification assessment is representative of the made ground as a whole unit, all the made ground will need to be treated as hazardous waste at this stage and an allowance made for this. It is recommended that any materials to be exported are stockpiled and tested again prior to removal from site, to confirm the waste classification at the point of disposal.

Care should be taken to keep any natural arisings separate from the made ground and construction materials, as natural soils mixed with made ground and / or construction materials may attract additional disposal costs.

Consideration should also be given to sending soils to a treatment facility as this may prove to be more cost effective than disposal.

6 POST REMEDIATION VALIDATION

The proposed remedial works will be validated as outlined below. GRM's Tier 1 Assessment Criteria values (Remedial Targets for a Public Open Space (residential) end use) are presented in Appendix E.

Imported topsoil will require chemical validation to confirm that it is suitable for use. Samples of this material will need to be analysed for a suite of contaminants including metals, inorganics, speciated PAHs and other contaminants such as, speciated hydrocarbons and asbestos depending on the source. The number of samples that require analysis will depend on the volume imported and the source of the materials. Typically, an analysis rate of one sample per 50m^3 and one sample per 250m^3 (minimum of three samples per source and material type) applies for generated and virgin soils respectively.

The made ground in the proposed soft landscaped areas should be removed to a depth of 0.3m below finished ground level. Where shrubs or trees are to be planted within the soft landscaped areas, then the made ground will need to be removed to a depth of 0.45m where shrubs are to be planted and up to 1.2m where trees are to be planted. The thickness of the soil capping layer will need verifying by way of hand dug pits or by survey records of the formation levels. Test pits will be excavated, and photographic evidence of the layer thickness and nature of the capping material will be collected for inclusion in the validation report.

During the excavation and removal of the made ground within the footprint of the new building, site personnel will confirm the visual presence or absence of contamination via a watching brief. Photographic evidence of the base of the completed basement excavation, prior to placement of stone, will be required.

As part of the validation works, there will be a requirement to verify that the correct water supply barrier pipe has been used within a suitable trench. Photographic evidence will be needed, and this is likely to be undertaken during the groundworks contract. However, the local water supply company for the site should be contacted to confirm their requirements with regard to pipe materials. Completion of a United Utilities Risk Assessment will be required.

7 REPORTING

A Remediation Validation Completion Report will be required by the Local Authority to confirm that the remedial strategy has been implemented appropriately. The report should include the following:

- Confirmation of the removal of the contaminated made ground within the soft landscaped areas to allow placement of the clean topsoil capping layer, by way of photographic evidence and verifying the capping layer thickness.
- Details of the source, chemical composition and thickness of any soils imported to form the capping layer in the areas of soft landscaping, including confirmation that they are suitable for use.
- Photographic evidence of the base of the completed basement excavation and removal of all made ground within the footprint of the new building.
- Verification required to confirm that the correct water supply barrier pipe has been used within a suitable trench.
- If encountered during construction, details of any unexpected contamination including, location of material and photographs confirming the remediation and/or disposal.
- Additionally, copies of haulage notes confirming the import / export of any soils (including any contaminated arisings) will also be required.

The validation report confirming all the above measures have been undertaken should be submitted to the Local Authority.

APPENDIX A

GENERAL APPRAISAL COMMENTS

i INFORMATION SOURCES

Where available the following sources have been used for the identification and assessment of potential ground hazards:

- Relevant British Standards
- British Geological Survey (BGS) Geology Map Scale 1:10,000 for local area
- British Geological Survey (BGS) Geology Map Scale 1:50,000/1:63,320
- BGS Memoir
- BGS Borehole Records
- BGS online viewer: http://www.bgs.ac.uk/data/mapViewers/home.html
- Environment Agency Groundwater Vulnerability Maps
- Historical Ordnance Survey (OS) Maps
- Environmental Data Report
- Environment Agency Website: http://www.environment-agency.gov.uk/
- Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites, UKWIR, 2010.
- Coal Authority Records / Coal Mining Report
- DEFRA/Environment Agency Contaminated Land publications and DoE Industry Profiles
- BRE Guide BR211 (2015), 'Radon: Guidance on protective measures for new buildings'
- HPA-RPD-033 (2007), 'Indicative Atlas of Radon in England and Wales'
- PHE-CRCE-032 (PHE, 2017), Radon in Homes in England: 2016 Data Report
- CIRIA C665 'Assessing risks posed by hazardous ground gases to buildings'
- BS8485:2015, 'Code of Practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings'
- Other technical references used throughout this document are detailed in the text.

ii CONTAMINANTS OF CONCERN

The DoE Industry Profiles are normally used to assess likely contaminants from past land use and potential nearby industrial sources. For land uses where no profile is available, likely contaminants of concern are selected by GRM based on past experience of similar sites, a general screening suite of contaminants covered by CLEA and common contaminants from the Industry Profiles.

- Arsenic
- Cadmium
- Chromium
- Lead
- Mercury
- Selenium
- Copper
- Nickel
- Zinc
- Phenols
- cyanide (total)
- pH
- Water soluble sulphate
- PAH (polycyclic aromatic hydrocarbons)

Asbestos and PCBs are listed in the vast majority of profiles. PCBs are listed as the profiles expect electricity substations and switch boxes on all industrial sites. There is the potential for asbestos containing material to be mixed up with made ground, following any demolition works.

iii CONCEPTUAL MODEL METHODOLOGY

The consideration of contamination is based upon the principles of risk assessment, using the 'source-pathway-receptor' model in order to establish the presence, or potential presence, of a pollutant linkage.

To create a risk, contamination must have the potential to cause harm to susceptible targets or receptors such as humans, the water environment or the built environment. The potential for harm to occur requires three conditions to be satisfied to form a pollutant linkage:

- The presence of substances that may cause harm (SOURCE).
- The presence of a target which may be harmed (RECEPTOR).
- The existence of a plausible migration route between the source and the receptor (PATHWAY).

In the absence of a plausible pollutant linkage there is no risk. Where a potential linkage is identified in order for it not to pose a risk to the identified receptor it must be broken.

iv INTRUSIVE INVESTIGATION SAMPLING METHODOLOGY

The ground investigation (including fieldwork, sampling, monitoring and laboratory analyses) has been designed to identify and assess potential ground related problems and to allow cost effective solutions to be advised. It has been planned on the basis of the desk study, site inspection and the proposed development layout (where available). All fieldwork and soil descriptions were carried out in general accordance with relevant British Standards.

The exploratory holes have been positioned and advanced to depths to determine the general ground/groundwater/gas conditions below the site. A general grid pattern has been adopted, where possible, to provide sufficient information based on the current proposed layout scheme. Some holes have been targeted at particular hazards identified in the Phase I assessment. The resultant exploratory hole density is considered to be commensurate with the complexity of the site conditions and detail of information required for this phase of the investigation.

v GROUND GAS RISK ASSESSMENT METHODOLOGY

Gas monitoring programmes undertaken by GRM are designed to broadly comply with the recommendations outlined in CIRIA Report C665 'Assessing risks posed by hazardous ground gas to buildings' (2007) and BS8576 'Guidance on Investigations for ground gas – Permanent gases and Volatile Organic Compounds (VOCs) (2013).

To assess the risks posed by ground gases such as radon, carbon dioxide and methane, the relevant current guidance has been used. For radon the site has been assessed following the guidelines in 'Radon: guidance on protective measures for new dwellings (BR211: 2015)'. For methane and carbon dioxide the primary guidance document used to determine if protection measures are required is *BS8485:2015 Code of practice for the design of protective measures from methane and carbon dioxide ground gases for new buildings*. This uses hazardous gas flow rates (Q_{hg}), which are gas concentrations multiplied by borehole flow rates, to derive a Gas Flow Rate (GSV) for the site. The gas regime is then determined based on the GSV and other limiting factors such as gas concentrations.

Where flow is not recorded during the monitoring a default flow rate of 0.1l/hr will be used in the assessment to produce a positive result.

vi HUMAN HEALTH RISK ASSESSMENT METHODOLOGY

Guidance contained in the Environment Agency's CLEA Reports has been used to assess the risks posed to human health.

For residential developments that include domestic gardens the default Tier 1 Assessment Criteria (TAC) for 'residential land with plant uptake' are used, i.e. a female with a start age class of one and an end age class of six. All pathways are considered including the consumption of home-grown vegetables.

For residential developments that do not include domestic gardens the default Tier 1 Assessment Criteria (TAC) for 'residential land without plant uptake' are used, i.e. a female with a start age class of one and an end age class of six. All pathways are considered except the consumption of home-grown vegetables. For commercial/industrial developments the default Tier 1 Assessment Criteria (TAC) for 'commercial/industrial' are used, i.e. a female with a start age class of sixteen and an end age class of eighteen. All pathways are considered except the consumption of home-grown vegetables.

The TAC used by GRM include Category 4 Screening Levels (C4SLs) published by DEFRA, values calculated by GRM using the CLEA v1.071 risk assessment, and values and Suitable for Use Levels (S4UL) developed by LQM/CIEH. The TAC used in the assessment are selected based on the lowest site specific SOM values returned as part of the chemical analysis.

Where soil chemical analysis results are found to exceed the TAC, Site-Specific Risk Assessments may be undertaken using the CLEA v1.071 risk assessment software using the age classes and pathways described above.

vii RISK TO SITE WORKERS – GENERAL COMMENTS

The risks to site workers are similar to those posed to site end users, although likely to be less severe due to the site workers' shorter exposure to the identified contamination. However, site workers (particularly groundworkers) are more likely to come into direct contact with contaminated soils due to the nature of their work. On this basis ground and construction workers should be provided with basic Personal Protective Equipment based on the site's general health and safety risk assessment, but including as a minimum safety footwear, gloves and overalls.

A site specific risk assessment should be carried out for all hazards identified within the ground investigation in accordance with current health and safety legislation. This assessment should identify any measures required to further reduce risks i.e. providing further Personal Protective Equipment, welfare facilities and if necessary preventing access to certain areas.

Demolition and dismantling of existing structures on the site must be carried out to a safe and acceptable standard, in accordance with current UK guidance and best practice. Whilst not ground related, asbestos and hazardous substances surveys should be conducted prior to any demolition.

Any unusual colours, odours and suspicious ground should be reported immediately to site management and then GRM.

Whilst this appraisal has considered the long-term effects of contamination, GRM can also help during the formulation of Health and Safety documentation, if required.

viii CONTROLLED WATERS RISK ASSESSMENT METHODOLOGY

Where the desk study and fieldwork do not reveal a potential source of contamination no leachate or groundwater testing will be performed. Where a potential source is identified the testing will comprise leachate testing on the material considered most likely to pose a risk, groundwater testing will be undertaken if water is present at shallow depth.

The UK Drinking Water Standards (UKDWS) or Environmental Quality Standards (EQS) are usually adopted for comparison with the leachate/groundwater test results. When the most sensitive receptor is considered to be the aquifer (groundwater) UKDWS will be adopted as the Initial Tier 1 screening values. Where the most sensitive receptor is a surface water feature the EQS values will be used as Initial Tier I Screening values.

ix CONSTRUCTION MATERIALS RISK ASSESSMENT METHODOLOGY

The 'screening levels' adopted for the assessment of risk to construction materials are taken from the following documents:

- UK Water Industry Research (UKWIR) Contamination thresholds for sub-surface water pipes, for the protection of buried pipes.
- Building Research Establishment (BRE) Special Digest SD1 (2005), 'Concrete in Aggressive Ground', for the protection of buried concrete.

x WASTE DISPOSAL, SITE WASTE MANAGEMENT PLANS AND MATERIAL MANAGEMENT PLANS

Under current Waste Management Regulations, waste soil materials produced from the site will require characterisation to enable it to be disposed of correctly.

The chemical analysis results included in this report should be provided to the relevant landfill operators to establish the characterisation of the waste, confirm its suitability for landfill disposal and provide estimated costings. If material is classified as hazardous, then the site will need to be registered with the Environment Agency prior to the movement of the waste. Depending on the receiving landfill's current permit, further chemical analysis, incorporating Waste Acceptance Criteria (WAC) leachate analysis, may be required.

All materials removed from the site will be classified as 'waste' and therefore must be removed by a suitably licensed carrier of waste. This applies whether or not the waste is contaminated. All waste removed to landfill will attract Landfill Tax.

The developer/builder is likely to be classed as the waste producer and therefore, has a duty of care to ensure that all waste is disposed of appropriately. This includes ensuring the waste carrier is licensed and disposes of the waste to a suitably licensed landfill site. They are also required to keep a paper trail from 'cradle to grave' including copies of the waste disposal tickets.

Efficient materials management on site is recommended as it can lead to significant cost savings when compared to the traditional side casting or single stockpile of arisings. GRM can assist in the production of Material Management Plans under the CL:AIRE Definition of Waste: Code of Practice. The DoWCoP enables:

- The direct transfer and re-use of clean naturally occurring soil materials between sites, and
- The re-use of both contaminated and uncontaminated materials on their site of origin and between sites within defined Cluster projects.

GRM can also undertake the role of Qualified Person and submit the DoW CoP project Declaration.

Likewise making the site as volume neutral as possible will reduce the costs of development. Whilst not a statutory requirement, Site Waste Management Plans allow better waste management practices, help to reduce the amount of waste produced and identify best environmental disposal options. Implementing a Site Waste Management Plan (SWMP) can reduce costs (increasing business profits) and maximise resource efficiency.

xi GEOTECHNICAL ASSESSMENT GENERAL COMMENTS

Where finished floor levels of proposed structures have not been provided by the Client, then for the purposes of initial assessment, GRM will assume that finished levels will not vary appreciably from the existing ground levels. If the depths of any underground engineering works (i.e. sewers, pumping stations

etc.) are unknown they will not be taken in to account in the assessment and it will be assumed that any such works will not compromise foundation or ground stability.

Should the development proposals or finished levels be different from these assumptions then the comments/recommendations in the Geotechnical Assessment may require revising.

It should be noted that the results of window sampling and/or cable percussive boreholes may not give a true indication of a soils actual engineering properties (i.e. stability, mass structure etc). GRM consider that that prior to development trial pitting should be undertaken to confirm the recommendations in the Geotechnical Assessment.

xii GEOTECHNICAL ASSESSMENT – ENGINEERING GROUND TREATMENT

Near surface soils have the potential to be disturbed by weathering and site traffic. Precautions should always be taken to avoid this, as excessive disturbance may leads to more onerous floor slab designs, road cap thickness and increased amounts of off-site disposal etc.

Near surface soils may need treatment or reinforcing to allow safe movement of construction plant and labour. An assessment by the contractor should be undertaken once the type of machinery/plant needed to complete the development is known.

xiii GEOTECHNICAL ASSESSMENT – EXCAVATIONS

Excavation instability (over-break) can result in damage to existing services or structures (e.g. foundations, roads or boundary walls/fences) both on and off-site, as well as increased foundation concrete costs. In order to minimise this, all excavations deeper than 1.2m deep (or any excavation within 1.5m of any existing structure or service) should be supported. Full support should be provided to the full depth of all near vertically sided excavations in made ground, soft and very soft clays and granular soils. A reduction to intermediate support should be acceptable within firm and stiffer natural clays.

Wherever possible, man entry into excavations should be prevented; however, where this is not possible, entry to, and time spent in, excavations should be kept to a minimum.

The build program should be tailored to reflect the impact that deep excavations through potentially unstable strata can have on adjacent properties, so that they are not undermined.

All excavations on site should be in accordance with HSE guidelines and stability should be practically maintained at all times. Reference should be made to HSE construction information sheet No. 8 (Revision 1) 'Safety in Excavations'.

Care should be taken to ensure that falls from excavation faces do not adversely affect the integrity of foundation concrete.

If contaminated water enters excavations it should be removed and transported to an appropriate treatment facility by a suitably licensed carrier before construction begins.

xiv GEOTECHNICAL ASSESSMENT – SUBSTRUCTURES

Where practicable, existing buried construction should be fully removed; however, if this is not practicable all new foundations should be carried down to fully penetrate it and it should be broken well away from all new structures.

There may be existing structures and/or infrastructure in close proximity to the proposed development. New build foundations may be constructed next to pavements with existing underground services beneath them, or excavations may be required near existing footings associated with adjacent properties. These potential hazards need to be taken into consideration when designing foundations and the groundworker needs to be made aware of their potential impact during the redevelopment works. Foundations close to existing underground services or buildings may require alternative foundation techniques (such as piling) to protect the integrity of these structures.

The contractor for the works should carry them out in such a fashion so as to not cause excessive overbreak, concrete usage or undermine existing buildings/roads/ services that are to be retained.

xv GEOTECHNICAL ASSESSMENT – SOAKAWAYS

Soakaway testing in trial pits by GRM is broadly carried out in accordance with BRE DG 365 (2016). The testing comprises the excavation of a test pit to a suitable depth, and the placement of water into the pit. The level of water present is then monitored over time. For borehole installations, the permeability testing (falling head/rising head) is undertaken in accordance with BS5930.

If it is decided to proceed with the use of soakaway drainage, then the following general points should be noted:

- Soakaways should not be placed so that water can be discharged through potentially contaminated made ground.
- The Environment Agency may require soakaways to be sealed systems such that only roof run off falls to soakaway.
- Interceptors are likely to be required for soakaways for highway drainage. The adopting authority for the highways should be consulted at the earliest opportunity regarding the use of soakaways for highways drainage.
- Consideration of site levels and slopes should be taken into account during the design.
- The construction of all soakaways should be in accordance with the current building regulations.
- Soakaways should not be placed within 5m of a proposed building.
- Placement of soakaways needs to be considered so as to avoid ponding of water down slope.
- The base of a soakaway should not be below the highest recorded water level.
- The Environment Agency prefer 1m of dry soil to be present between the base of a soakaway and the water table to provide attenuation for contamination.

xvi GEOTECHNICAL ASSESSMENT – FOUNDATIONS

If soft or hard spots are encountered during foundation excavation then they should be replaced with suitably compacted material or the footings deepened to suitable strata, to avoid differential settlement.

If strata of differing bearing character (e.g. sand and clay) are encountered at foundation levels within the excavations for a single plot then the excavation depths should be altered as appropriate to ensure the foundations rest on a single stratum, or strata that will not induce differential settlement. Where this is impractical then GRM should be contacted to assess a reinforced concrete detail or an alternative foundation solution (e.g. piles or vibro-replacement).

NOTES ON LIMITATIONS

General

GRM Development Solutions Limited has prepared this report solely for the use of the Client and those parties with whom a warranty agreement had been executed, or with whom an assignment had been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from GRM Development Solutions Limited; a charge may be levied against such approval.

GRM Development Solutions Limited accepts no responsibility or liability for:

a) the consequences of this document being used for any purpose or project other than for which it was commissioned, and

b) the consequences of this document being used by any third party with whom an agreement has not been executed.

Phase I Environmental Audits/ Desk Studies

The work undertaken to provide the basis of this report comprised a study of available documented information from a variety of sources (including the Client), together with (where appropriate) a brief walk over inspection of the site and meetings and discussions with relevant authorities and other interested parties. The opinions given in this report have been dictated by the finite data on which they are based and are relevant only to the purpose for which the report was commissioned. The information reviewed should not be considered exhaustive and has been accepted in good faith as providing true and representative data pertaining to site conditions. Should additional information become available which may affect the opinions expressed in this report, GRM Development Solutions Limited reserves the right to review such information and as considered necessary and appropriate to modify the opinions accordingly. It should be noted that any risks identified in a Phase 1 report are perceived risks based on the information reviewed; actual risks can only be assessed following a physical investigation of the site.

Phase II Environmental Audits (Contamination Investigations)

The investigation of the site has been carried out to provide sufficient information concerning the type and degree of contamination, ground and groundwater conditions to allow a reasonable risk assessment to be made. The objectives of the investigation have been limited to establishing the risks associated with potential human targets, building materials, and controlled waters.

The amount of exploratory work and chemical testing undertaken has necessarily been restricted by the short timescale available, and the locations of exploratory holes have been restricted to the areas unoccupied by the building(s) on the site and by buried services. A more comprehensive investigation may be required if the site is to be redeveloped as, in addition to risk assessment, a number of important engineering and environmental issues need to be resolved.

For these reasons if costs have been included in relation to site remediation these must be considered as provisional only and must, in any event, be confirmed by a commercial adviser.

The exploratory holes undertaken, which investigate only a small volume of the ground in relation to the size of the site, can only provide a general indication of site conditions. Whilst exploratory testing is intended to gain an accurate representation of the site, the very nature of sampling and testing is such that it cannot ensure that all localised conditions are detected

The risk assessment and opinions provided take in to consideration, inter alia, currently available guidance relating to acceptable contamination concentrations; no liability can be accepted for the retrospective effects of any future changes or amendments to these values.

Phase II Geo-environmental Investigations (Combined Geotechnical and Contamination Investigations)

The investigation of the site has been carried out to provide sufficient information concerning the type and degree of contamination, geotechnical characteristics, and ground and groundwater conditions to provide a reasonable assessment of the environment risks together with engineering and development implications. If costs have been included in relation to site development a commercial adviser must confirm these.

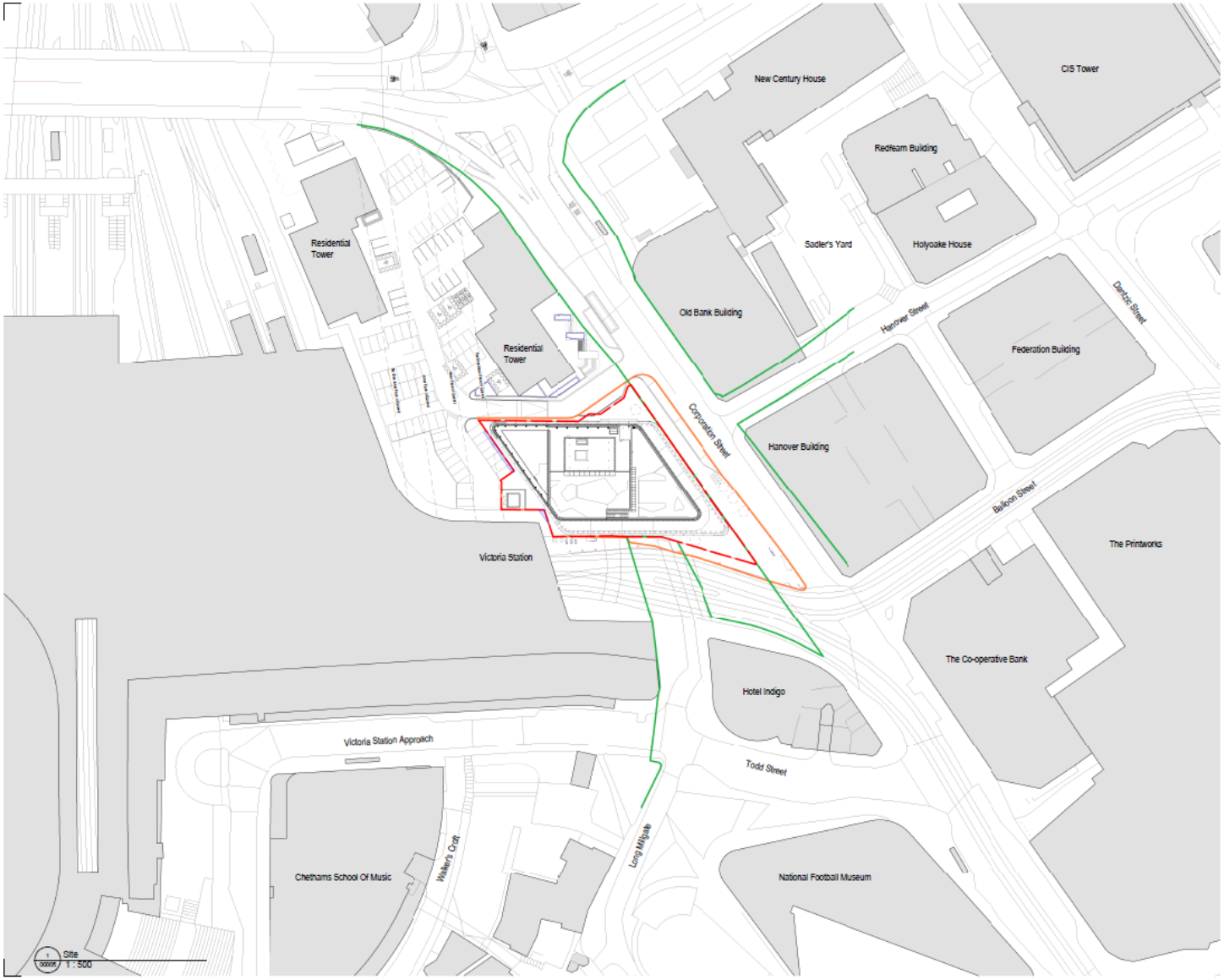
The exploratory holes undertaken, which investigate only a small volume of the ground in relation to the size of the site, can only provide a general indication of site conditions. The opinions provided and recommendations given in this report are based on the ground conditions apparent at the site for each of the exploratory holes. There may be exceptional ground conditions elsewhere on the site which have not been disclosed by this investigation and which have therefore not been taken into account in this report.

The comments made on groundwater conditions are based on observations made at the time the site work was conducted. It should be noted that groundwater levels will vary owing to seasonal, tidal and weather related effects.

The scope of the investigation was selected on the basis of the specific development proposed by the Client and may be inappropriate to another form of development or scheme.

The risk assessment and opinions provided take in to consideration, inter alia, currently available guidance relating to acceptable contamination concentrations; no liability can be accepted for the retrospective effects of any future changes or amendments to these values.

APPENDIX B



Piercy&Company

Client
Tortview Ltd

Project
Land At Corporation Street "New Victoria Phase 2" Manchester M3 1NX

Drawing Title
Proposed Site Plan

Drawing Status	Drawing Checked	Revision
S3	GM NH	A

Date 26/05/23

Drawing No. NV-PCO-ZZZ-XXX-DR-A-00005

DO NOT SCALE

NOTES:

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info@grm-uk.com www.grm-uk.com

CLIENT:
AJP / Vinci Construction (on behalf of Morgan Capital)

PROJECT:
New Victoria Office Block, Manchester

TITLE:
Proposed Development Plan – Proposed Site Layout

SCALE@SIZE :	ISSUE:
NTS	FINAL
DESIGN/DRAWN :	DATE:
RHC	May 2023
PROJECT No:	DRAWING No:
P10056	Figure 1a

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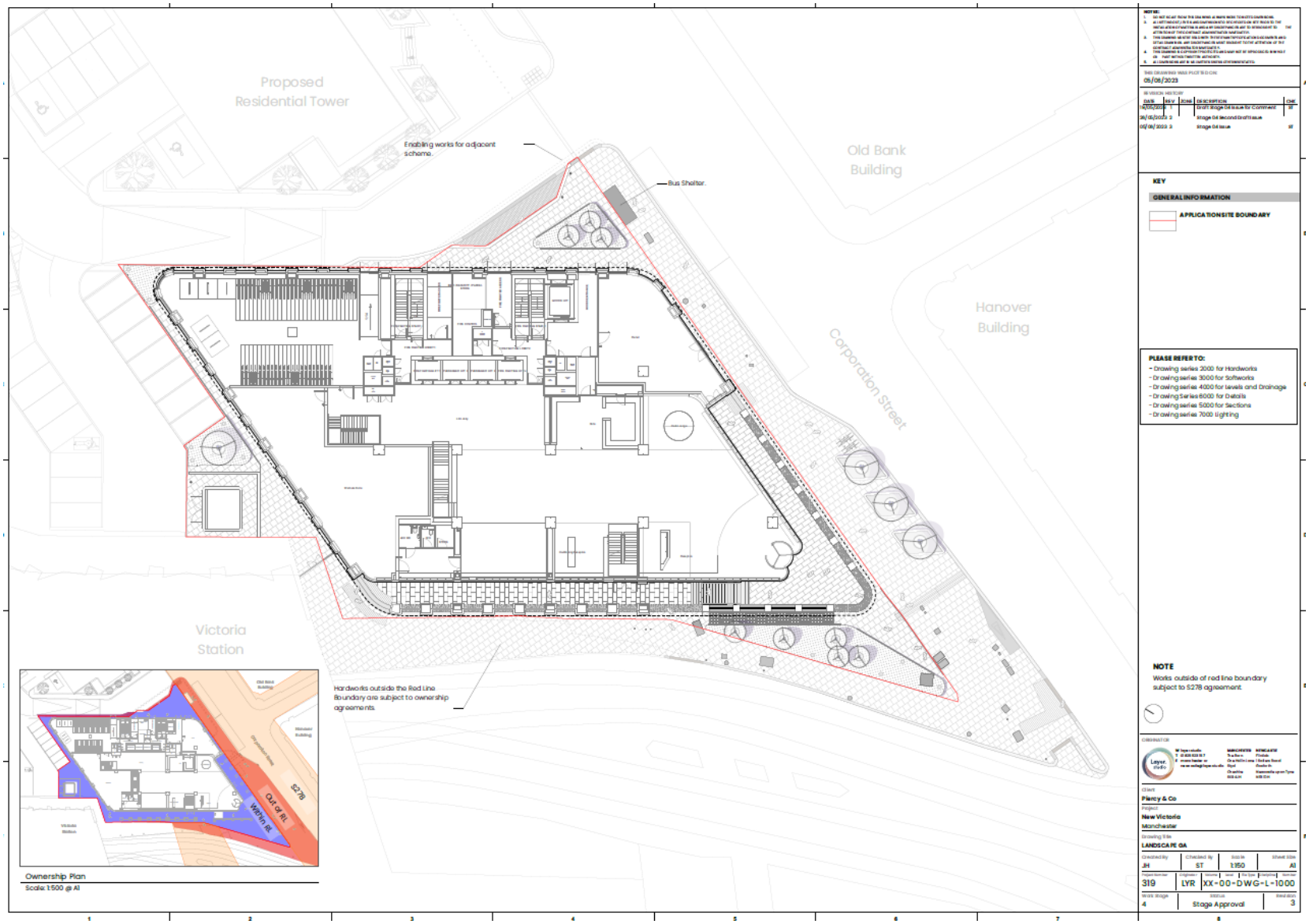

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CLIENT:

AJP / Vinci Construction (on behalf of Morgan Capital)

PROJECT:

New Victoria Office Block, Manchester

TITLE:

Proposed Development Plan – Landscape Proposals

SCALE@SIZE :	ISSUE:
NTS	FINAL
DESIGN/DRAWN :	DATE:
RHC	May 2023
PROJECT No:	DRAWING No:
P10056	Figure 1b

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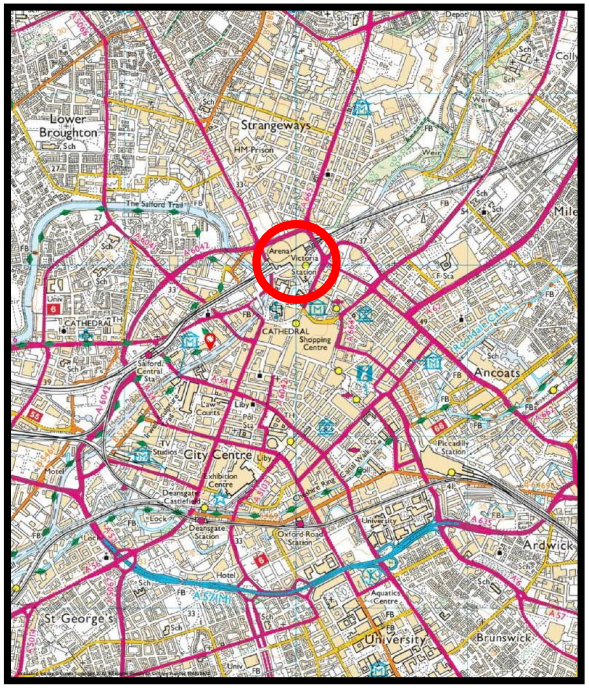
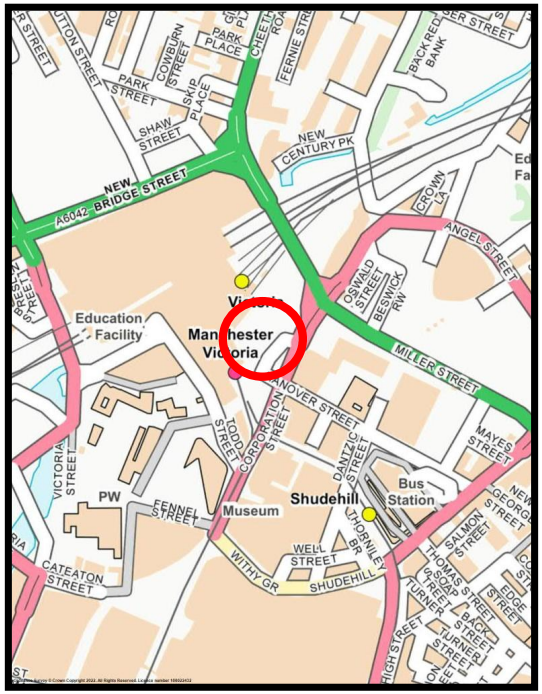
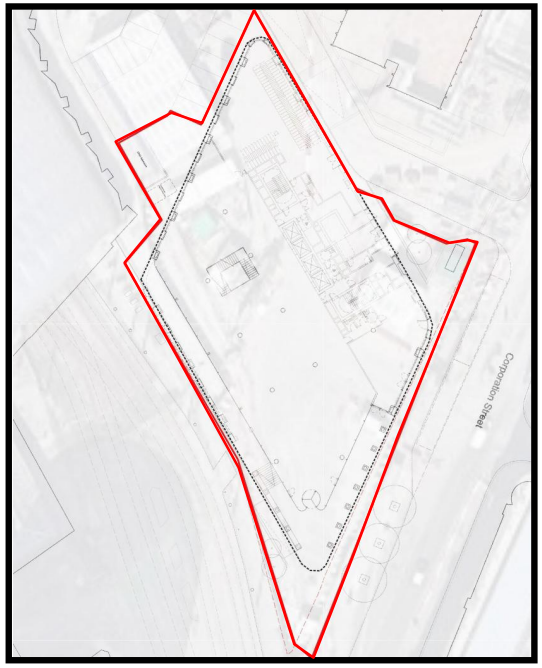
APPENDIX C







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NOTES:

Approximate site location

Approximate site boundary

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PROJECT:

New Victoria Office Block, Manchester

TITLE:

Site Location and Boundary Plan

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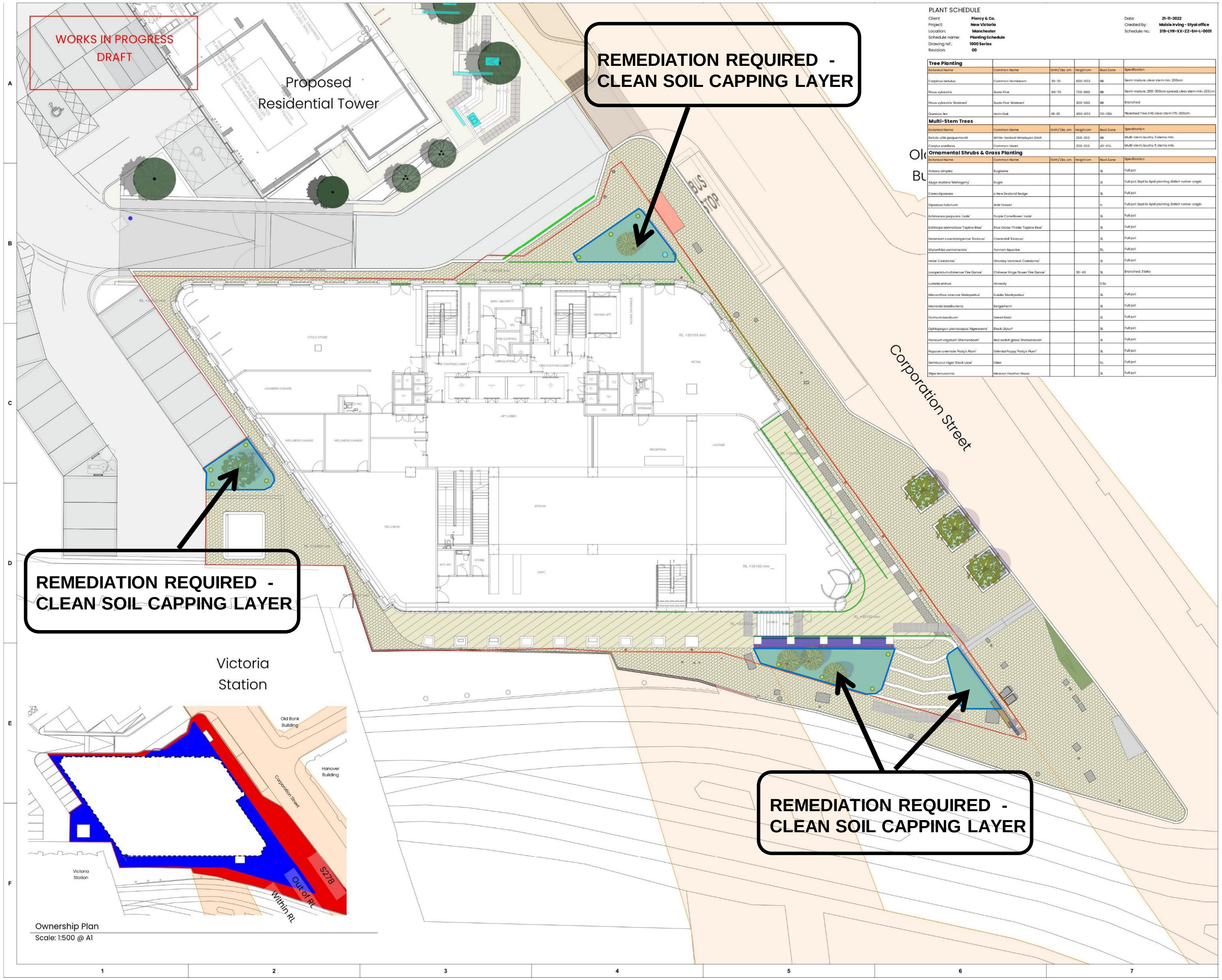
APPENDIX D



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CLIENT:
AJP / Vinci Construction (on behalf of Morgan Capital)

PROJECT:
New Victoria Office Block, Manchester

TITLE:
Remedial Extents Plan

SCALE@SIZE :	ISSUE:
NTS	FINAL
DESIGN/DRAWN : RHC	DATE: Dec 2022
PROJECT No: P10056	DRAWING No: Figure 3

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APPENDIX E

	GRM TIER 1 ASSESSMENT CRITERIA		
LAND USE	Commercial Industrial		
CONTAMINANT	**1%**	**2.50%**	**6%**
a Arsenic	640	640	640
a Cadmium	410	410	410
b Chromium III	8600	8600	8600
a Chromium VI	49	49	49
a Lead	2330	2330	2330
b/c Mercury	1100	1100	1100
b Selenium	12000	12000	12000
b Nickel	980	980	980
b Phenols	760	1500	3200
b Copper	68000	68000	68000
b Zinc	730000	730000	730000
d Cyanide	280	280	280
b Benzene	27	47	90
b Toluene	56000	110000	180000
b Ethylbenzene	5700	13000	27000
b *o* - xylene	6600	15000	33000
b *m* - xylene	6200	14000	31000
b *p* - xylene	5900	14000	30000
Non Genotoxic PAHs			
b Acenaphthene	84000	97000	100000
b Acenaphthylene	83000	97000	100000
b Anthracene	520000	540000	540000
b Fluoranthene	23000	23000	23000
b Fluorene	63000	68400	70800
b Naphthalene	190	460	1100
b Phenanthrene	22000	22000	23000
b Pyrene	54000	54000	54000
Genotoxic PAHs			
a/e Benzo(a)pyrene	76	76	76
ALIPHATIC HYDROCARBONS			
b C5-C6	3200	5900	12000
b C6-C8	7800	17000	40000
b C8-C10	2000	4800	11000
b C10-C12	9700	23000	47000
b C12-C16	59000	82000	90000
b C16-35	1600000	1700000	1800000
AROMATIC HYDROCARBONS			
b C5-7 (benzene)	26000	46000	86000
b C7-8 (toluene)	56000	110000	180000
b C8-C10	3500	8100	17000
b C10-C12	16000	28000	34000
b C12-C16	36000	37000	38000
b C16-C21	28000	28000	28000
b C21-C35			

Notes

a C4SL - SP1010 (2014) - Benzene and Benzo(a)pyrene values for 1% and 2.5% SOM have been calculated using default C4SL parameters in CLEA v1.07

b LQM/CIEH S4UL values (2015).

c S4UL for inorganic Hg used.

d Atkins ATRISKsoil Value

e Benzo(a)pyrene is a surrogate marker for the 8 genotoxic PAHs (Benzo(a)pyrene, Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(ghi)perylene, Benzo(k)fluoranthene, Chrysene, Dibenzo(ah)anthracene, Ideno(1,2,3-cd)pyrene)

GRM TAC 11-2016

	GRM TIER 1 ASSESSMENT CRITERIA		
LAND USE	Public Open Space 1 (residential)		
CONTAMINANT	**1%**	**2.50%**	**6%**
e Arsenic	79	79	79
e Cadmium	220	220	220
b Chromium III	1500	1500	1500
e Chromium VI	23	23	23
e Lead	630	630	630
b/c Mercury	120	120	120
b Selenium	1100	1100	1100
b Nickel	230	230	230
b Phenols	760	1500	3200
b Copper	12000	12000	12000
b Zinc	81000	81000	81000
d Cyanide	34	34	34
b Benzene	140	140	140
b Toluene	56000	56000	56000
b Ethylbenzene	24000	24000	25000
b *o* - xylene	41000	42000	43000
b *m* - xylene	41000	42000	43000
b *p* - xylene	41000	42000	43000
Non Genotoxic PAHs			
b Acenaphthene	15000	15000	15000
b Acenaphthylene	15000	15000	15000
b Anthracene	74000	74000	74000
b Fluoranthene	3100	3100	3100
b Fluorene	9900	9900	9900
b Naphthalene	4900	4900	4900
b Phenanthrene	3100	3100	3100
b Pyrene	7400	7400	7400
Genotoxic PAHs			
a/e Benzo(a)pyrene	10	10	10
ALIPHATIC HYDROCARBONS			
b C5-C6	570000	590000	600000
b C6-C8	600000	610000	620000
b C8-C10	13000	13000	13000
b C10-C12	13000	13000	13000
b C12-C16	13000	13000	13000
b C16-35	250000	250000	250000
AROMATIC HYDROCARBONS			
b C5-7 (benzene)	56000	56000	56000
b C7-8 (toluene)	56000	56000	56000
b C8-C10	5000	5000	5000
b C10-C12	5000	5000	5000
b C12-C16	5100	5100	5000
b C16-C21	3800	3800	3800
b C21-C35			

Notes

a C4SL - SP1010 (2014) - Benzene and Benzo(a)pyrene values for 1% and 2.5% SOM have been calculated using default C4SL parameters in CLEA v1.07

b LQM/CIEH S4UL values (2015).

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GRM TAC 11-2016