PROPOSED RESIDENTIAL DEVELOPMENT AT PLENDER STREET, CAMDEN, LONDON FOR HIGGINS CONSTRUCTION PLC REMEDIATION METHOD STATEMENT

REPORT NUMBER 13804RS

MARCH 2016

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Drawing No.

13804RS/1

C6398-CE8_A

PROPOSED DEVELOPMENT LAYOUT

WALKER ASSOCIATES REMEDIATION DRAWING

13804RS - Report, CJS, JEC, LMA - 21-03-16 - Vers.1

1. INTRODUCTION

A scheme has been undertaken developing a site on the southern side of Plender Street, Camden, London, NW1 0LG. The development comprises a five storey development with communal space on the ground floor, residential flats above and limited areas of soft landscaping to the rear of the property. The ground floor scheme is shown in drawing number 13804RS/1.

At the time of writing this Remediation Method Statement the majority of the work had been completed including construction of the building and implementation of the majority of soft landscaped areas. This report describes the methods which should have been undertaken during remediation works. It is recommended that this report is read in conjunction with the previous site investigation reports issued for the site by RSA Geotechnics Ltd including a Phase 1 and Phase 2 investigation with report reference 13804SI dated March 2014; a supplementary ground investigation with report reference 13804GI dated May 2014, a second supplementary investigation with report reference 13804GI2 dated November 2015; and reference should be made to a remediation drawing produced by Walker Associates on the basis of remediation advice contained within the RSA Geotechnics Ltd report 13804GI2 with drawing reference C6398 – CE8_A_Remediation Plan For Approval dated 25 November 2015. At the time of writing a clean cover validation letter report had already been issued by RSA Geotechnics Limited with reference 13804VA dated March 2016.

Although works at the development site have progressed and are close to completion it is understood that the Local Authority requires the formal submission of an RMS, to allow for discharge of associated planning conditions. As a result this document has been produced retrospectively of the majority of remedial works which have already been completed on site.

This Remediation Method Statement has been prepared for the sole internal use and reliance of Higgins Construction PLC. It shall not be relied upon by other parties without the express written authority of RSA Geotechnics Limited. If an unauthorised party comes into possession of this report they rely on it at their own risk and the authors owe them no duty of care and skill.

Instruction to proceed with the Remediation Method Statement (RMS) for the development at Plender Street was given by Shawn Nudd of Higgins Construction PLC in an email dated 11 March 2016.

2. SITE DESCRIPTION

2.1 Site Location

The site was located at the south of Plender Street, about 900 m north west of London St Pancras railway station. It can be approximately located by National Grid Reference TQ 293 835.

2.2 Site Description

Between January 2014 and February 2016 RSA Geotechnics Limited has visited the site on several occasions and a brief overview of site developments is presented in this section.

January 2014

The site was situated in a predominantly residential area although the north western portion of the site comprised of a row of low rise commercial properties (Figure 1). The site comprised a 'T' shaped parcel of land measuring approximately 85 m north east to south west and 80 m north west to south east, bounded by Plender Street to

the north, Camden Street to the east and a former public house with a beer cellar to the west (Figure 2). The southern portion of the site extended along Bayham Place adjacent to existing tennis courts/school playground which were to



Figure 1

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the east and Rainham House, a high block of flats, to the west (Figure 3).





Figure 2

Figure 3

The eastern portion of the site comprised a one storey temporary building (Figure 4) used as changing rooms for the tennis courts located immediately south east of the site (Figure 5). The tennis courts formed part of the Richard Cobden Primary School playground, but were understood to be used by members of the general public during evenings and weekends. This area of the site was relatively flat and was bounded by wire mesh fencing approximately 3 m in height that surrounded the entire school tennis pitch area.

A row of mature trees suspected to be London Planes grew in the pavement immediately to the north of the changing rooms (Figures 4 and 5).



Figure 4



Figure 5

The north western portion of the site was occupied by a terrace of five single storey brick built shops formerly occupied from west to east by an off licence, a newsagents, a halal butchers, a hair salon and a laundrette/dry cleaners. Adjoining the eastern end of the terrace of shops was a two storey brick building formerly used

as a doctor's surgery (Figure 6), and attached to the western end was a three storey former public house. The public house was understood to have a beer cellar and was apparently built in 1861, based upon the date over the corner entrance doorway.



Figure 6

An emergency access road to the flats was located between the changing rooms and the surgery where a pair of locked metal gates approximately 2.2 m in height prevented both vehicular and pedestrian access (Figure 7). Beyond the gate were thirteen terraced garages adjacent and backing onto the tennis courts (Figure 8). The blockwork constructed garages with cast in-situ concrete floors had been recently renovated with corrugated metal roofs.





Figure 7

Figure 8

The site had been taken over by Higgins Construction PLC and hoarding was located around the site perimeter. The changing rooms at the eastern end of the site had been demolished and the northernmost tennis courts belonging to the school had been commandeered by Higgins Construction PLC to locate their site offices. Demolition of the western part of the site had started.

November 2015

The development had been constructed across the east and west (Figure 9) limbs of the site and work was being undertaken on the southern limb of the site to construct areas of soft landscaping (Figure 10). No soft landscaping had been installed.



Figure 9



Figure 10

February 2016

Soft landscaped areas had been installed across the southern (Figure 11) and western (Figure 12) areas of the site and work was continuing across the central access road.



Figure 11



Figure 12

3. SUMMARY OF RISK ASSESSMENT

3.1 Background Information

The recommended remedial measures for the completed development were derived from a qualitative risk assessment of the site, based on the source-pathway-receptor approach, as directed in the 1995 Environment Act, which forms Part 2A of the Environmental Protection Act of 1990.

The development comprises a five storey mixed commercial and residential building with limited areas of soft landscaping.

For risk assessment purposes reference was made to a 'residential without plant uptake' end use in order to take into consideration the more sensitive end users of the development.

The initial risk assessment was detailed in RSA Geotechnics Limited Phase 1 and Phase 2 report number 13804SI dated March 2014. Subsequent supplementary ground investigations were undertaken to further assess the risk of asbestos encountered across the site and was discussed in reports 13804GI dated May 2014, and 13804GI2 dated November 2015. The resulting Conceptual Model is tabulated later in subsection 3.3 of this Remediation Method Statement.

3.2 Risk Assessment Summary from Ground Investigation Works

This section summarises the findings of the development assessment and provides general comment on how the identified risks to site receptors were to be mitigated. Full details on how the mitigation and remediation of the development area were to be achieved is covered in the Remediation Method Statement (RMS) section of this report.

The initial site investigation identified elevated concentrations of lead, benzo(a)pyrene, and the presence of asbestos within the made ground. A potential risk from asbestos containing materials (ACM) within the former buildings located on site was also identified.

Following the initial site investigation further testing was conducted across the eastern limb of the site to assess the risk posed by ACM previously identified in this area. The findings were presented in report number 13804GI and identified a moderate risk to groundworkers due to the presence of loose fibres of chrysotile, amosite and crocidolite and bound materials containing amosite and chrysotile. The eastern limb of the site would be almost entirely covered by the buildings footprint, which would reduce the exposure to end users, however due to the amount of asbestos encountered it was recommended that either the ground was capped subject to the Local Authority's approval, or the soils be removed.

It was recommended that when access was available to the western and southern limbs of the site that further assessment was undertaken for ACM within the made ground in these areas also. When access was available to the southern limb of the site a further supplementary ground investigation was undertaken which was discussed within report reference 13804Gl2 dated November 2015. At the time of the investigation the western limb of the site had been fully developed. The investigation identified ACM within the upper 0.55 m of made ground beneath which was a former road. The soils beneath the road did not identify any ACM, and it was considered that the road pre-dated the bulk use of ACM within the UK and therefore a negligible risk existed from the soils beneath this road.

Walkers Associates produced a Remediation Plan Drawing with reference C6398 – CE8 dated 25 November 2015 which is appended to this report. The drawing identified the soft landscaped areas across the site which would require remediation to a depth of at least 550 mm based upon recommendations in the more recent RSA Geotechnics Limited report with reference 13804GI2 dated November 2015.

After the various phases of investigation the risk assessment indicated that end users were at a potential risk from elevated concentrations of lead, benzo(a)pyrene and asbestos containing materials (ACM), identified within the made ground.

Elevated levels of phytotoxins were also found in the vicinity of WS4 and WS8 with regards to topsoil use; however both of these exploratory holes were located underneath the proposed buildings footings and therefore would not require remediation.

Gas Screening Values (GSV) were calculated based on the maximum methane and carbon dioxide concentrations at the maximum gas flow rate encountered. A worst case GSV of less than 0.07 l/hr for carbon dioxide was calculated, characterising the site as a Characteristic Situation 1 (very low risk), where no special gas precautionary measures were required for adoption in the development.

The risk assessment also identified a potential risk to groundworkers from contamination recorded in the soils (lead, PAH and ACM). Suitable precautions were to be undertaken to reduce the identified risk.

Neighbouring properties and the general public were considered to be potentially at risk from windblown dust and from soil attached to wheels of vehicles leaving the site during construction. A low risk was initially identified for this receptor, however following the subsequent investigations which identified significant amounts of ACM this was upgraded to a moderate risk.

A low risk was identified for below ground concrete, due to water soluble sulphate concentrations recorded on site.

Potable water pipes were considered to be at a negligible risk from organic determinands however this was to be further assessed once the route of potable pipework was known.

The site has been identified in an Explosive Ordnance Desk Study to pose a medium risk to human site receptors from unexploded ordnance.

Recommendations to manage the risk were presented in EOD Contracts Ltd's report number 14019 dated February 2014.

Further assessment beneath the shops along the western side of the site was recommended once access was possible post-demolition particularly due to the amount of asbestos identified across the eastern limb of the site during the supplementary investigation with report reference 13804GI2.

3.3 <u>Refined Conceptual Model</u>

The refined conceptual model represents the characteristics of the site that show the plausible relevant pollutant linkages as defined by the results of the various intrusive investigations. Negligible and discounted risks have not been included.

Source	Contaminants	Pathway	Receptor
Made Ground	Lead and PAH	Direct contact	End users Groundworkers Building materials
		Ingestion Inhalation	End users Groundworkers
		Leaching and migration via groundwater	Controlled Waters Off-site receptors
	Asbestos	Inhalation of fibres	End users Groundworkers Off-site receptors
	Acidity, Sulphate	Direct contact	Building materials
Unexploded ordnance	Heavy metals	Direct contact	End users Groundworkers
		Ingestion Inhalation	End users Groundworkers
		Migration via groundwater	Controlled Waters Off-site receptors
	Explosion	Direct contact	Groundworkers Off-site receptors
Existing buildings	Asbestos	Inhalation of fibres	End users

Table 3.3 - Res

Groundworkers Off-site receptors

4. REMEDIATION METHOD STATEMENT

The risk assessment has identified that remedial requirements for the site relate to the protection of end users, and groundworkers during construction, with a limited amount of remedial work relating to off-site receptors and building materials. Therefore the following remedial recommendations will need to be implemented throughout the development of the project.

The following sections include considerations for the protection of the identified site receptors and have been listed in chronological order of the activities likely to take place on site.

4.1 <u>Pre-Construction Activities</u>

4.1.1 Site Clearance Considerations

Following further investigation of the eastern limb of the site it was recommended that a supplementary investigation was undertaken across the western and southern limbs of the site following demolition. This was recommended primarily based upon the frequency and depth that ACM was encountered within the made ground across the eastern limb of the site.

The existing buildings across the northern area of the site contained asbestos containing materials as identified in a pre-demolition asbestos survey provided by the Client. Prior to demolition of the buildings the safe removal of all asbestos containing materials from within the buildings fabric should have been undertaken.

The site works also included the removal of small areas of hardstanding and flexible surfacing and potentially fill materials. The waste materials resulting from the removal of any flexible surfacing should have been kept separate from any other waste materials, and have been disposed of to a waste facility that was suitably licensed to accept flexible surfacing waste.

Waste removed off-site would have been accompanied by waste transfer documentation, which was to be copied to the geoenvironmental engineer for inspection as evidence of appropriate disposal.

Depending on the final volumes of materials requiring removal off-site and the requirements of the receiving landfill, further waste acceptance criteria testing may have be required to classify the soils for waste disposal.

It was recommended that the soils containing significant amounts of asbestos across the eastern limb of the site were either capped in place subject to approval from the Local Authority, or that all of the made ground was removed and disposed of accordingly to remediate this area.

4.2 **During Construction Activities**

4.2.1 Piling Mat Considerations

Where materials were imported onto site for use as a piling mat (or for other purposes), consideration should have been to the environmental impact the

imported materials would have once placed on site, as well as their geotechnical properties.

Materials comprising a recycled aggregate, such as demolition rubble, should have undergone analytical testing to confirm the materials were free from asbestos containing materials and did not contain elevated concentrations of contaminants that could pose an unacceptable risk to the identified site receptors.

Construction materials from a 'clean' quarry source, such as crushed granite or natural sand and gravel would not require analytical testing however, information regarding the source of the material should have been provided by the supplier.

4.2.2 Protection of Groundworkers

All workers should have been made aware of the identified lead, benzo(a)pyrene and asbestos contamination on the site, and the potential risk of encountering contamination not already identified by the site investigation. To prevent direct contact with the made ground soils groundworkers were to wear protective clothing, in accordance with Health and Safety Regulations. Workers should have been properly equipped with dust masks, safety boots, gloves, hard hats and overalls and provided with adequate washing facilities. All site workers were to wash their hands before eating, drinking or smoking, and site visitors should have been supervised and protected as necessary. Removal of asbestos containing materials should have been undertaken by a competent and experienced contractor with suitable PPE, including disposable gloves and overalls, and a fitted face mask with minimum of a P3 filter.

Confined spaces which personnel may have been required to enter, such as excavations, should have been monitored in accordance with the appropriate Health and Safety Guidelines prior to entry, and continuously during work, to ensure a safe working atmosphere.

4.2.3 **Protection of Off-Site Receptors**

A potential risk to off-site receptors was identified from the soils on site during construction.

Care was to be taken to prevent off-site pollution during construction either by dirty vehicles or by nuisance dust in order to protect the general public and neighbouring properties. Due to the presence of loose asbestos fibres within the soil it was considered necessary to dampen down the site surface to control dust and potential asbestos fibre release and to provide a wheel wash for vehicles leaving the site where a risk of soils migrating off site was identified. Due to the significant presence of asbestos identified in the soils during pre-construction works air quality monitoring should have been installed around the site perimeter to ensure that implemented safety procedures were providing necessary protection.

4.2.4 Building Materials

A potential risk to below ground concrete and potable water supply pipes was identified by the risk assessment.

A worst case Design Sulphate Class of DS-3 with an Aggressive Chemical Environment for Concrete (ACEC) Class of AC-2s was recommended for below ground concrete structures.

A potential risk to potable water pipes was identified from recorded concentrations of PAH in the made ground. Water supply pipes and backfill materials used on site should comply with the recommendations of the local water supply company.

4.2.5 Watching Brief

During the groundworks activities on site a watching brief was to be carried out to identify any previously undiscovered contamination. Groundworkers were to be made aware of the watching brief, and unexpected contamination identified during activities such as the drilling for pile installation were to be reported to the site manager.

Vigilance was to be maintained by the groundworkers for the following evidence of contamination:-

- Dark staining of soils, or unusual colouration
- Hydrocarbon odours
- Suspected asbestos containing materials (ACM).

Should any previously undiscovered contamination be found the site manager was to contact the geoenvironmental engineer involved in the project, who was to attend site to inspect and carry out any necessary sampling and testing for risk assessment purposes. Further work within the area of the identified contamination would cease, until the risk assessment and/or any remedial works that were required indicated that the residual risk was acceptable. Any further risk assessment and remedial works were to be reported to the Environmental Health Department at Camden Council.

A record of any previously undiscovered contamination identified during the groundworks was to be kept by the site works manager. The records were to include the date, location of contamination, the identified materials, what activities were taking place, when the material was identified and approximately how large an area the identified contamination affected. Photographs of the contamination were also to be obtained.

A record was also to be maintained by the geoenvironmental engineer involved in the project. These records would include the above, plus any analytical test results and risk assessment works that were carried out as a result of the discovery.

Statements and photographic records kept either by the site manager, the geoenvironmental engineer, or both, depending of the outcome of the watching brief, were to be submitted to Camden Council as part of the validation works for the site. These were to be included within the final Verification Report for the site.

4.3 Post Construction Activities

4.3.1 Protection to End Users

To protect end users from the residual made ground, any potential asbestos, a clean cover system was to be placed in all soft landscaping areas to act as a physical barrier to prevent end users of the site coming in direct contact with the made ground. The clean cover was also to provide a suitable growing medium for vegetation, as the made ground on site was not considered physically suitable.

It was concluded that across the southern limb of the site remediation should occur with the removal of at least 550 mm of soil, which was to be replaced with a clean cover system and either a highly visible geogrid membrane beneath or a layer of clean crushed concrete. The clean cover was to be provided within all soft landscaping areas as identified on drawing number C6398 – CE8_A Remediation Plan, produced by Walker Associates and attached to this report.

The implementation of the clean cover system could be achieved by the placement of topsoil/subsoil on top of existing ground levels, the removal of 300 mm from the required areas and replacement, or a combination of the two approaches.

Imported topsoil/subsoil (if being used) was to be accompanied by compliance certification providing evidence that the materials had originated from a clean, uncontaminated source and had been analytically tested and found to be potentially suitable for use in the proposed residential/commercial development.

Once on site the imported topsoil and subsoil was to be subject to independent validation sampling and testing to confirm the delivered materials were chemically suitable for use.

The collected topsoil and subsoil samples were to be analysed for a range of commonly occurring contaminants including heavy metals, phenol, cyanide, PAH, and asbestos screening if considered necessary. The results of the analyses should have been compared against Tier 1 screening values derived for a 'residential without plant uptake' end use. The exact Tier 1 screening values used would be dependent on the percentage of soil organic matter content within the soils, which will be taken into consideration at the time of assessing the soil results.

A general guide of one sample per 20 m³ was considered an acceptable validation rate of sampling for imported bulk materials. Therefore, this was the initial sampling strategy that was adopted for the site.

Inspection of the placed material was to involve the hand digging of small exploratory holes and recording of the clean cover thickness with a tape measure. The documentation of the placement of the clean cover system should have included photographic evidence of inspections and plans illustrating the locations inspected. All inspection data and photographs were to be provided in the final verification report for the development of the site.

4.4 Waste Disposal

Based on the results of the contamination testing, one sample of made ground from WS4 was classified as Hazardous waste, the remainder were classified as Non-Hazardous. The sample classified as Hazardous waste contained elevated lead and copper concentrations.

Additional WAC testing was carried out on composite samples, including WS3, WS4, WS5, WS7, WS8 and WS10 and the results indicated that the soils from these locations should be classified as Non-Hazardous due to elevated sulphate levels.

For the soils contaminated with asbestos, any materials containing significant concentrations of asbestos (>0.1% by weight), or any visible fragments of asbestos, would typically be regarded as Hazardous Waste and therefore would be subject to the consignment note procedures given in the Hazardous Waste Regulations. Asbestos containing materials would generally be considered to be 'Stable Non-Reactive Hazardous' (SNRH) waste and would therefore need to be disposed of at a Hazardous landfill or a Non-Hazardous landfill which has separate cells to take

SNRH waste. However, if the amount of asbestos present as fibres within the soils constitutes less than 0.1% by weight, the soils would not necessarily need to be classed as Hazardous, subject to the agreement of the receiving facility.

Classification of the soils was to be confirmed with the receiving landfill prior to removal off site, with further testing undertaken as necessary.

Copies of all waste transfer notes will need to be copied to the Geoenvironmental Engineer for inspection as part of the validation process. The destination of the waste, the type of waste and volume of material removed off site should all be provided clearly as evidence that waste materials have been removed off site and disposed of to a suitably licensed waste disposal or management facility.

5. VERIFICATION PLAN

In order to verify that the remediation that should have been carried out in accordance with the recommendations made in previously issued reports 13804SI, 13804GI and 13804GI2, which have been summarised in this Remediation Method Statement, a programme of validation inspection and testing should have been carried out, which should have include the following:-

- Further investigation post demolition beneath the locations of the former shops;
- Asbestos surveys of buildings prior to demolition works;
- Inspection of compliance certificates, and if required, testing of imported piling mat materials;
- Confirmation of the type of potable water pipes provided within the final development of the site;
- Inspection of compliance certificates for imported topsoil and subsoil to be used in landscaped areas;
- Sampling and testing of imported topsoil and subsoil to confirm the soils would be chemically suitable for use in a residential/commercial development;
- Inspection of the reduced dig, including the deter to dig layer, in soft landscaping areas, and inspection of the thickness of the placed clean cover system;

- Inspection of waste transfer notes for all materials exported off site and conveyance notes for materials imported onto site as part of the redevelopment.

Supervision of the remedial works summarised in the Validation Plan should have been carried out by an experienced Geoenvironmental Engineer, who should have been notified at the appropriate points when site was ready for these inspections.

Validation of the recommendations relating to construction worker health and safety, off site receptors and building materials should have been carried out by third parties.

Prior to the writing of this report, a validation letter report discussing the inspection of the clean cover system provided for the areas of soft landscaping across the southern and western limbs of the site as presented in report number 13804VA dated March 2016. This report should be read in conjunction with the verification report.

The validation letter report concluded that based upon the testing and inspections carried out, the topsoil and crushed aggregate inspected within the areas detailed are appropriate for their proposed end use, with respect to human health.

The remaining information and analytical data that should have been collected during the remediation of the site will need to be provided in a final Verification Report, which will need to be submitted to the Environmental Health Officer at Camden Council for review.

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