Jack Straw's Castle
North End Way
London
NW3 7ES

Remediation Method Statement

Albany Homes (UK) Ltd

January 2023

J22407
Rev 0

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1.0 Introduction

Consideration is being given to the construction of two new three-storey houses at this site, each with a single-storey basement. Parking is proposed in the eastern section of the site, with some limited areas of soft landscaping around the eastern boundary of the site.

A ground investigation and basement impact assessment has previously been carried out by GEA (Report Ref J16284 Issue 6, dated 25 March 2020). The ground investigation did not encounter any elevated concentrations of contaminants when compared to residential end use with plant uptake, but a slight hydrocarbon odour was noted in the made ground associated with localised black staining in one of the boreholes. Although no contaminants were found to be elevated, preliminary recommendations of how to protect site workers and services from unknown contamination were included in the report.

This report sets out a formalised Remedial Method Statement and should be read in conjunction with the previous report.

1.1 Limitations

The conclusions and recommendations made in this report are limited to those that can be made on the basis of the investigations carried out. The results of the work should be viewed in the context of the range of data sources consulted, the number of locations where the ground was sampled and the number of soil, gas or groundwater samples tested; no liability can be accepted for information in other data sources or conditions not revealed by the sampling or testing. Any comments made on the basis of information obtained from the client or other third parties are given in good faith on the assumption that the information is accurate; no independent validation of such information has been made by GEA.

2.0 The Site

2.1 Site Description

The site is located within the London Borough of Camden, approximately 700 m north of Hampstead London Underground station and adjacent to the southern side of Hampstead Heath. It is bounded by North End Way to the east, Heath Brow to the north and by a raised planting area and gravel surfaced public car park to the west. It is bounded to the south by Jack Straw's Castle, which is a three-storey to four-storey former Grade II Listed public house which has been converted to a gymnasium and apartment building. The site may additionally be located by National Grid Reference 526230, 186460.

The site is rectangular in shape, measuring approximately 15 m north-south by 30 m east-west and is currently occupied by a hard surfaced car park, used by the residents of Jack Straw's Castle. The site is broadly level, but the surrounding topography falls gently to the west. A small retaining wall bounds the perimeter of the site on its northern and eastern flanks, and a larger retaining wall, with a height of 2.2 m bounds the site to the west. No signs of gross contamination were observed during the walkover.

2.2 Background Information

The earliest historical map studied, dated 1850, shows the site to comprise open fields and that the existing road network had been established. By 1879 the site comprised part of the grounds of Jack Straw's Castle Hotel, which had been constructed adjacent to the south and southwest of the site, and a row of small buildings had been constructed around the eastern perimeter of the site. The small buildings on site had been demolished by 1915, and another building had been constructed in the northeastern corner of the site.

By 1954 the hotel and the majority of the buildings to the southwest had been demolished, with one of the former buildings marked as a 'ruin'. Online sources indicate that the buildings were severely damaged by bombing in 1941. The existing hotel was built in 1963, and the site and surrounding area have since remained largely unchanged, although in 1991 the hotel was purchased and converted to the existing use.

At the desk study stage GEA assessed the site as having LOW risk of significant contamination, as it has only been used as a hotel or small car park for its entire developed history. No significant on-site or off-site potential sources of contamination were identified, and there was not assessed to be a soil gas risk to the site.

3.0 Ground Model

The desk study findings indicate that the site does not generally have a contaminative history, on the basis that it has been occupied by a hotel followed by a car park for its entire developed history. On the basis of the fieldwork, the ground conditions at this site can be characterised as follows:

- below a limited thickness of made ground, the Bagshot Formation was encountered and proved to the maximum depth investigated, of 8.70 m;
- the made ground comprises dark brown to brown silty sand with variable amounts of extraneous material and extends to a depth of 1.80 m;
- a slight hydrocarbon odour was noted associated with a parting of black staining in a single location in the made ground, at a depth of 0.50 m, but PID testing did not record any hydrocarbon vapours;
- the Bagshot Formation comprises slightly clayey, gravelly sand with occasional flint cobbles, with blow counts suggesting this stratum extends to the maximum depth investigated, of 8.70 m;
- groundwater was not encountered during the investigation or during the subsequent monitoring; and
- contamination testing has not indicated any elevated concentrations of contaminants in the two samples of made ground tested.

4.0 Risk Assessment

The table below sets out the risk pathways that could potentially be present following the redevelopment of the site, which will have a residential without plant uptake end use. This conceptual model is based upon the findings of the ground model developed in the light of the investigation findings and highlights areas where remedial work should be considered.

SOURCE	RECEPTOR	PATHWAY	COMMENT
Unidentified contamination in the made ground	End users	Direct soil and dust ingestion, skin contact with soils and dust and inhalation of dust and vapours	The current landscaping proposals indicate that there will be planting beds around the eastern perimeter of the site, but no private gardens are proposed. The made ground on site has not been found to contain contamination and the hardstanding across most of the site will isolate end users from unidentified contaminants. Any soils imported to site for new planting beds should be certified as clean to ensure no new contaminants are introduced to the site.
	Vegetation	Uptake via soil through roots in landscaped area	
	Ground workers and future site workers	Accidental ingestion of soil and inhalation and ingestion of soil derived dust, direct contact with contaminated soils	Skin contact with soil will be minimized through the use of appropriate PPE and washing facilities will be provided. Soil will be kept damp to prevent fugitive dust emissions. A discovery strategy should be in place in case unidentified contamination is encountered, particularly in areas of the site not previously investigated.
	Groundwater	Percolation and leaching of surface run-off in areas of soft landscaping and permeable paving	No leachable contaminants have been identified in the made ground, so it is unlikely that there will be leaching of contaminants from the made ground into adjacent sites or down to the groundwater. Groundwater was not encountered in the investigation, and the desk study indicates that groundwater levels may be around 10 m below the site. The site is underlain at depth by the London Clay, which has extremely low vertical permeability, thus the risk posed to the groundwater within the deep aquifer is considered to be minimal.
	Adjacent sites	Migration through made ground and Bagshot Formation	
	Buried services	Direct contact	Based on results of the contamination testing, it is considered unlikely that the made ground will pose a risk to buried plastic services, therefore there should not be a requirement for protection measures for new services.
Ground Gas	End users	Inhalation or explosion	The desk study has not identified any sources of landfill gases onsite or in the immediate surroundings. Additionally, the ground investigation encountered a maximum thickness of 1.8 m of made ground which was measured as having a low organic content. The site will be open to the atmosphere during excavation and ground works so any soil gases can dissipate.
	Site Workers	Inhalation	

5.0 Remedial Objectives

Based on the above risk assessment the following remedial objectives have been established for this development;

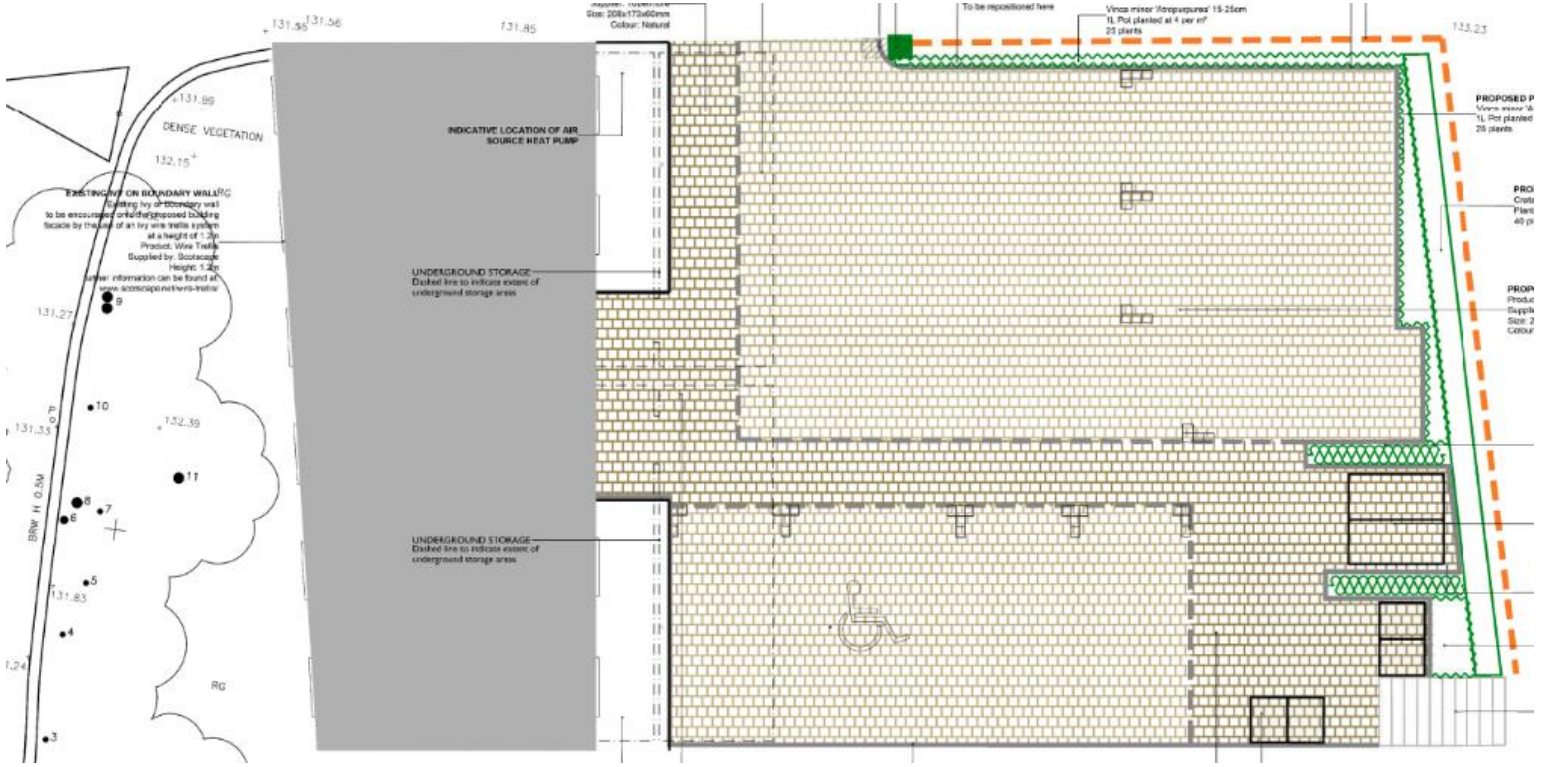
- minimise the potential chronic human exposure pathways in soft landscaping areas, and protection of residential end users and ecological receptors on site; and
- protect ground workers and future site workers who will be exposed to the soil.

6.0 Remedial Recommendations

To address the remedial objectives the remedial measures will include;

- any imported soils required to form areas of soft landscaping will be tested to confirm the soil is free from contamination; and
- the adoption of appropriate working practices to minimise dust generation and minimise site workers' contact with the soil to protect adjacent end users and site workers

The details of these remedial measures are set out below in the Verification Plan. An extract of the proposed landscaping plan is presented below and indicates the areas of proposed soft landscaping and permeable paving.



7.0 Verification Plan

This section sets out how the remedial measures will be achieved and validated.

7.1 Soft Landscaped Areas

Prior to the importation of any topsoil for use within the planting beds, certification will be provided by the supplier and approved by GEA. The suitability of the material to be free of contaminants will be assessed against the GEA Screening Values, which are based on C4SL or LQM/CIEH S4UL for a residential without plant uptake end use, a copy of which is enclosed. The suitability of the soil with regard to nutrient levels specific to the planting scheme will be assessed by the landscape architect.

As the site has not been found to be contaminated, there is not considered to be a requirement for a specified minimum thickness of imported soil, however it is recommended that the landscape architect is consulted about a suitable thickness of soil to promote plant growth in the proposed planting beds.

Insitu validation of imported soil

Photographs of the installation will be taken by the contractor along with records of the levels before and after installation, and these will be included in the validation report.

In addition to the above, the installation of the clean imported soil will be validated by a series of trial holes and / or hand auger boreholes undertaken by GEA. In support of the visual examination, further samples of the material will be taken by GEA for laboratory testing and assessment against the adopted screening values for residential end use with plant uptake. Confirmatory soil samples will be taken at a rate of one sample per $50m^3$ to $100m^3$ of certified material and a minimum of three samples per source.

Documentation

The validation report will include waste transfer documents for all exported and imported material, details of the certified imported soil and the results of the validation testing.

7.2 Site Workers

Site workers will be made aware of the potential for contamination in the soils and a programme of working will be identified to protect workers handling any soil. The method of site working will be in accordance with guidelines set out by HSE and CIRIA. Washing facilities will be provided and site workers will be encouraged to wash prior to eating and to use appropriate PPE when on site to minimise skin contact with the soil.

7.3 Unknown Contamination

Prior to the commencement of ground works a site induction meeting will be held, attended by the developer and site workers, where the appointed geoenvironmental engineer will brief the workers on the history of the site and the nature of any contaminated soils they may encounter. This information will be included in the Discovery Strategy which will also be displayed in the site office, along with the contact names and numbers of the geoenvironmental engineers, so that contact can easily be made if any suspicious substances are encountered.

If, during development, contamination not previously identified is found to be present at the site, the Council will be informed immediately and no further development (unless otherwise agreed in writing by the Council) will be carried out until a report indicating the nature of the contamination and how it is to be dealt with is submitted to, and agreed in writing by, the Council. A copy of the discovery strategy is included in the attached appendix.

In the event that contamination is not encountered, a statement to this effect by a suitably qualified and experienced individual will be provided.

7.4 Reporting

On completion of the remedial works, a report will be prepared documenting the satisfactory undertaking of the remediation proposals and of any duty of care under the waste management legislation, together with an assessment of the suitability of the soils remaining beneath the site in respect of the proposed residential development. The report will include written and photographic records of the site inspections carried out, together with the results of the validation analyses and will present an assessment of the condition of the remediated site with respect to the end use.

Appendix

Discovery Strategy
Generic Risk Based Screening Values

Geotechnical &
Environmental
Associates

Herts:

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DISCOVERY STRATEGY - GROUNDWORK PHASE
POTENTIALLY CONTAMINATED GROUND

Project name: Jack Straw's Castle, North End Way, Hampstead NW3 7ES **Project Ref:** J22407
Date prepared: January 2023 **Project engineer:** Heather Baker **Supervising engineer:** Steve Branch

This Discovery Strategy must be complied with fully.

1.0 INTRODUCTION

The site is to be redeveloped through the construction of two new three-storey houses, each with a single storey basement, with associated parking and planting beds, and a Discovery Strategy is to be implemented during the construction phase of the programme. Its purpose is to define the process to be undertaken on site in the event that previously unidentified pockets of contamination or suspicious objects are discovered during the redevelopment of the site. It is intended to be understood and followed by all on-site workers and for all new site workers to be made aware of the procedure.

2.0 HOW TO IDENTIFY POTENTIAL CONTAMINATED MATERIAL

- Malodorous or oddly coloured soil
- Silvery metal liquid (mercury)
- Looks oily and has an oily odour
- Solvent, organic type of odour
- Man made materials in fill such as paint cans, car parts, glass fragments
- Contains fragments of white asbestos sheeting, lagging or insulation, coal/coke clinker
- Subsurface concrete / metal structures including buried tanks

(Examples only – this list is not exhaustive. If in any doubt ask)

3.0 PROCEDURE

On the discovery of any suspicious pockets of material during the redevelopment the following procedure should be followed:

- Stop Work
- Site personnel to immediately inform the Site Manager. Do not investigate it yourself.
- The Site Manager will initially decide if the material is potentially contaminated and will inform GEA. The area will be cordoned off and work will cease in the vicinity.
- GEA will attend site to sample material for laboratory testing and will attempt to quantify the volume. The Local Authority Environmental Health Officer will then be notified that potentially contaminated material has been discovered and will be forwarded laboratory data and a remedial strategy for their approval in the event that the material is to be classified as contaminated.
- Work may only recommence once written approval has been received from the Local Planning Authority

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Generic Risk-Based Soil Screening Values

Site	Jack Straw's Castle, North End Way, Hampstead, London NW3 7ES	**Job Number** J22407
Client	Albany Homes (UK) Ltd	**Sheet** 1 / 2
Engineer	Quinlan Terry Architects LLP	

Proposed End Use Residential without plant uptake

Soil Organic Matter content % 1.0

Contaminant	Screening Value mg/kg	Data Source
Metals		
Arsenic	40	C4SL
Cadmium	149	C4SL
Chromium (III)	910	S4UL
Chromium (VI)	21	C4SL
Copper	7,100	S4UL
Lead	310	C4SL
Elemental Mercury	1.2	S4UL
Inorganic Mercury	56	S4UL
Nickel	180	S4UL
Selenium	595	SGV
Zinc	40,000	S4UL
Anions		
Soluble Sulphate	500 mg/l	Structures
Sulphide	50	Structures
Chloride	400	Structures
Others		
Organic Carbon (%)	6	Methanogenic potential
Total Cyanide	140	WRAS
Total Mono Phenols	310	SGV
PAH		
Naphthalene	2.33	S4UL
Acenaphthylene	2,900	S4UL
Acenaphthene	3,000	S4UL
Fluorene	2,800	S4UL
Phenanthrene	1,300	S4UL
Anthracene	31,000	S4UL
Fluoranthene	1,500	S4UL
Pyrene	3,700	S4UL
Benzo(a)anthracene	11.0	S4UL
Chrysene	30	S4UL
Benzo(b)fluoranthene	3.9	S4UL
Benzo(k)fluoranthene	110.0	S4UL
Benzo(a)pyrene	4.65	C4SL
Indeno(1 2 3 cd)pyrene	45.0	S4UL
Dibenz(a h)anthracene	0.32	S4UL
Benzo (g h i)perylene	360	S4UL
Total PAH Screen	**66.4**	B(a)P / 0.15

Contaminant	Screening Value mg/kg	Data Source
Hydrocarbons		
Banded TPH (8-10)	72	Calc1
Banded TPH (10-12)	385	Calc1
Banded TPH (12-16)	2769	Calc1
Banded TPH (16-21)	2923	Calc1
Banded TPH (21-35)	2923	Calc1
Benzene	0.89	C4SL
Toluene	120	SGV
Ethyl Benzene	65	SGV
Xylene	42	SGV
Aliphatic C5-C6	42	S4UL
Aliphatic C6-C8	100	S4UL
Aliphatic C8-C10	27	S4UL
Aliphatic C10-C12	130	S4UL
Aliphatic C12-C16	1100	S4UL
Aliphatic C16-C35	65,000	S4UL
Aromatic C6-C7	See Benzene	S4UL
Aromatic C7-C8	See Toluene	S4UL
Aromatic C8-C10	47	S4UL
Aromatic C10-C12	250	S4UL
Aromatic C12-C16	1800	S4UL
Aromatic C16-C21	1900	S4UL
Aromatic C21-C35	1900	S4UL
PRO (C_5 –C_{10})	337	Calc2
DRO (C_{12} –C_{28})	69,800	Calc2
Lube Oil (C_{28} –C_{44})	66,900	Calc2
TPH	**500**	Trigger to consider speciated testing
Chlorinated Solvents		
1,1,1 trichloroethane (TCA)	9	S4UL
tetrachloroethane (PCA)	1.5	S4UL
tetrachloroethene (PCE)	0.32	C4SL
trichloroethene (TCE)	0.0097	C4SL
1,2-dichloroethane (DCA)	0.16	C4SL
vinyl chloride (Chloroethene)	0.015	C4SL
tetrachloromethane (Carbon tetra	0.026	S4UL
trichloromethane (Chloroform)	1.2	S4UL

Notes

Concentrations measured below these screening values may be considered to represent 'uncontaminated conditions' which pose a 'LOW' risk to human health. Concentrations measured in excess of these values indicate a potential risk which require further, site specific risk assessment.

C4SL - Defra Category 4 Screening value based on Low Level of Toxicological Risk

SGV - Soil Guideline Value, derived from the CLEA model and published by Environment Agency 2009 - where not superseded by C4SL

S4UL - LQM/CIEH Suitable for use Level (2015) based on 'minimal' level of risk

Calc1 - sum of thresholds for Ali & Aro fractions - assuming a 35% Aro:65% Ali ratio as is commonly encountered in the soil

Calc2 - sum of nearest available carbon range specified including BTEX for PRO fraction

Total PAH based on B(a)P / 0.15 - GEA experience indicates that Benzo(a) pyrene rarely exceeds 15% of the total PAH concentration

GEA

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Generic Risk-Based Soil Screening Values

Site	Jack Straw's Castle, North End Way, Hampstead, London NW3 7ES
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Engineer	Quinlan Terry Architects LLP

Job Number J22407

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Proposed End Use **Residential without plant uptake**

The key generic assumptions for this end use are as follows;

- that groundwater will not be a critical risk receptor;
- that the critical receptor for human health will be a young female aged 0 to 6 years old;
- that the exposure duration will be six years;
- that the building type equates to a terraced house.
- that the critical exposure pathways will be direct soil and indoor dust ingestion, skin contact with soils and dust, and inhalation of dust and vapours;

Where contaminant concentrations are measured at concentrations below the generic screening value it is considered that they pose an acceptable level of risk and thus further consideration of these contaminant concentrations is not required. However, where concentrations are measured in excess of the generic screening value there is considered to be a potential that they could pose an unacceptable risk and thus further action will be required which could include:

- additional testing to zone the extent of the contaminated material and thus reduce the uncertainty with regard to its potential risk;
- site specific risk assessment to refine the assessment criteria and allow an assessment to be made as to whether the concentration present would pose an unacceptable risk at this site; or
- soil remediation or risk management to mitigate the risk posed by the contaminant to a degree that it poses an acceptable risk.