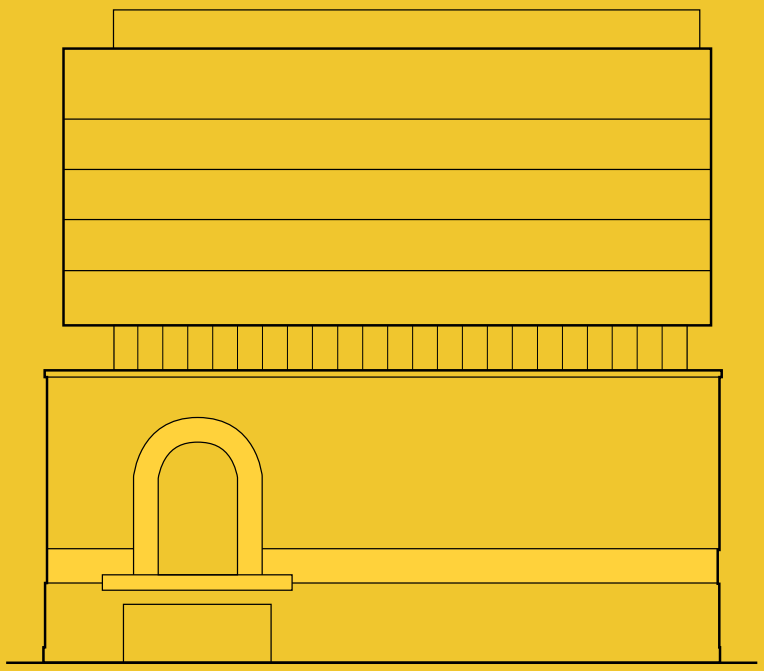

SAVILLE THEATRE

135 SHAFTESBURY AVENUE

LAND CONTAMINATION RISK MANAGEMENT - PRELIMINARY RISK ASSESSMENT

105465-PEF-ZZ-XX-RP-GG-600001_P02 SAVILLE THEATRE PRA

PELL FRISCHMANN

Report Ref.	**105465-Pef-Zz-Xx-Rp-Gg-600001_P02 Saville Theatre Pra**
File Path	https://pellf.sharepoint.com/sites/A1BuildingsStructuresandFire/Shared Documents/General/01 - WIP/Documents/GG Geoenv/01 Reports/105465-PEF-ZZ-XX-RP-GG-600001_P02 Saville Theatre PRA.docx

Rev	Suit	Description	Date	Originator	Checker	Approver
P01	S2	First issue	10-Jan-2024	I Blissett	A Boucher	A Boucher
P02	S2	Updated to team/client comments	24-Jan-2024	A Murray	A Boucher	A Boucher

Ref. reference. Rev revision. Suit suitability (S2 – suitable for information)

Prepared for

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Contents

Figures

Tables

Executive Summary

Site name	Saville Theatre		
Location	135 Shaftesbury Avenue, London, WC2H 8AH, UK		
Development proposals	Part demolition, restoration and refurbishment of the existing Grade II listed building, roof extension, and excavation of basement space, to provide a theatre at lower levels, with ancillary restaurant / bar space (Sui Generis) at ground floor level; and hotel (Class C1) at upper levels; provision of ancillary cycle parking, servicing and rooftop plant, and other associated works.		
Site history	The site was occupied by terraces of commercial properties (with residential accommodation above) prior to the Theatre opening in 1931. The Grade II listed Building was developed in the early 1930s and opened as 'Saville Theatre' in 1931. The theatre was internally redeveloped in 1970 to a cinema with four screens. The multi screen cinema was subsequently altered in the early 2000's. The site remains unchanged to present day.		
Geology and hydrogeology	*Geology*		*Hydrogeology*
	Superficial	Lynch Hill Gravel member	Secondary A Aquifer
	Bedrock	London Clay Formation	Unproductive strata
Hydrology	River Thames (786m southeast)		
Unexploded ordnance (WW2)	Several high explosive bombs are known to have fallen near the site during WW2. Evidence of WW2 bomb damage has also been identified onsite and in close proximity to the site. A Preliminary Desk Study Assessment from Zetica recommends that a detailed desk study is undertaken to assess, and potentially zone, the Unexploded Ordnance hazard level onsite.		
Preliminary risk assessment summary	Significant sources of onsite and office contamination have not been identified. The nature and thickness of Made Ground that has been identified on/near the site is considered typical for this part of London. Based on the recorded depth of Made Ground (circa 3.5-3.9mbgl) and the existing double storey basement onsite most of the Made Ground is likely to have been removed from within the site boundary prior to 1931. Additional Made Ground will be removed as part of the proposed basement extension. Limited sampling and geochemical analysis from two Made Ground samples collected from a borehole adjacent to the site: ➢ Did not reveal any contaminants of concern with respect to human health, ➢ Notably, 'asbestos is soils' was not detected, ➢ Elevated concentrations of heavy metals were not identified and detectable concentrations of hydrocarbons were not recorded with respect to controlled waters. The proposed development will continue to occupy the plan area of the site and will likely remove most if not all of the residual Made Ground towards the site parameters as the basement levels are extended (out and down). Due to the limited nature/lack of contamination sources and the lack of viable exposure pathways land contamination risks during the use and operation of the proposed development have not been identified. Residual risks to the health and safety of construction workers (during excavation of Made Ground) are likely to be limited and manageable through good practice and awareness.		

1 Introduction

1.1 Commission

Pell Frischmann has been commissioned by YC Saville Theatre Limited (the *client*) to prepare this land contamination Preliminary Risk Assessment (PRA) for the proposed 'Saville Theatre' redevelopment (the *site*), at 135-149 Shaftesbury Avenue, Camden, London, as shown in Figure 1-1.

The aim of this preliminary risk assessment is to identify potential land contamination risks and geoenvironmental constraints which could impact upon or restrict the proposed redevelopment.

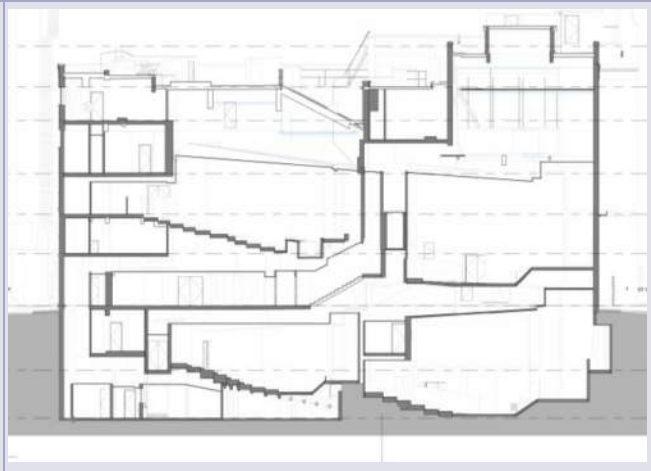
Figure 1-1 Site location

Site location	
	
Ordnance Survey (OS) Open Mapping	Google Satellite Image

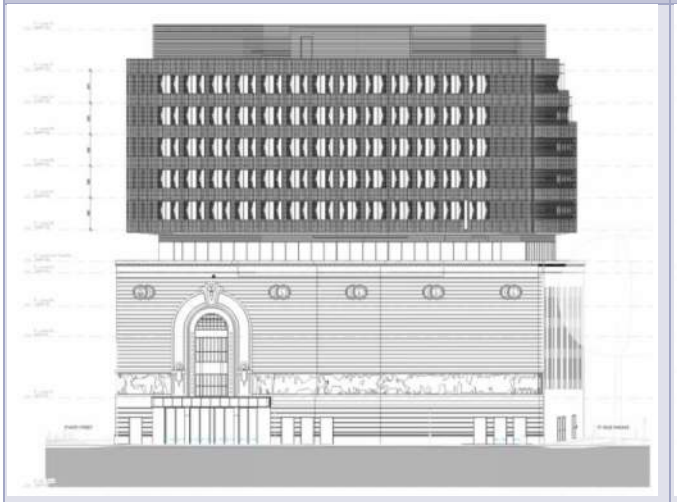
1.2 Proposed development

The proposed redevelopment includes demolishing the internal walls/structure, removing and reinstating the north façade whilst retaining the remainder of existing external façades and extending/deepening the existing basement (from two to four storeys) to facilitate the construction of a new multi-storey hotel and performance auditorium area with associated front of house facilities for both. Masterplan extracts are included in Figure 1-2 and Appendix A.

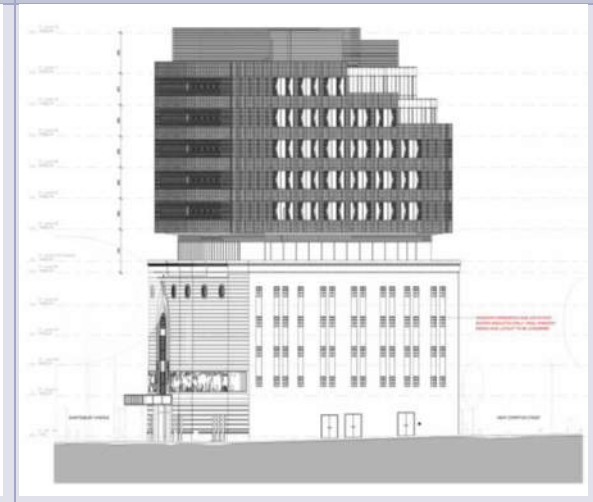
Figure 1-2 Development proposals

Plans and images	
	
Current (http://www.modernistlondon.co.uk/saville-theatre.html)	Existing building cross section (looking northeast).

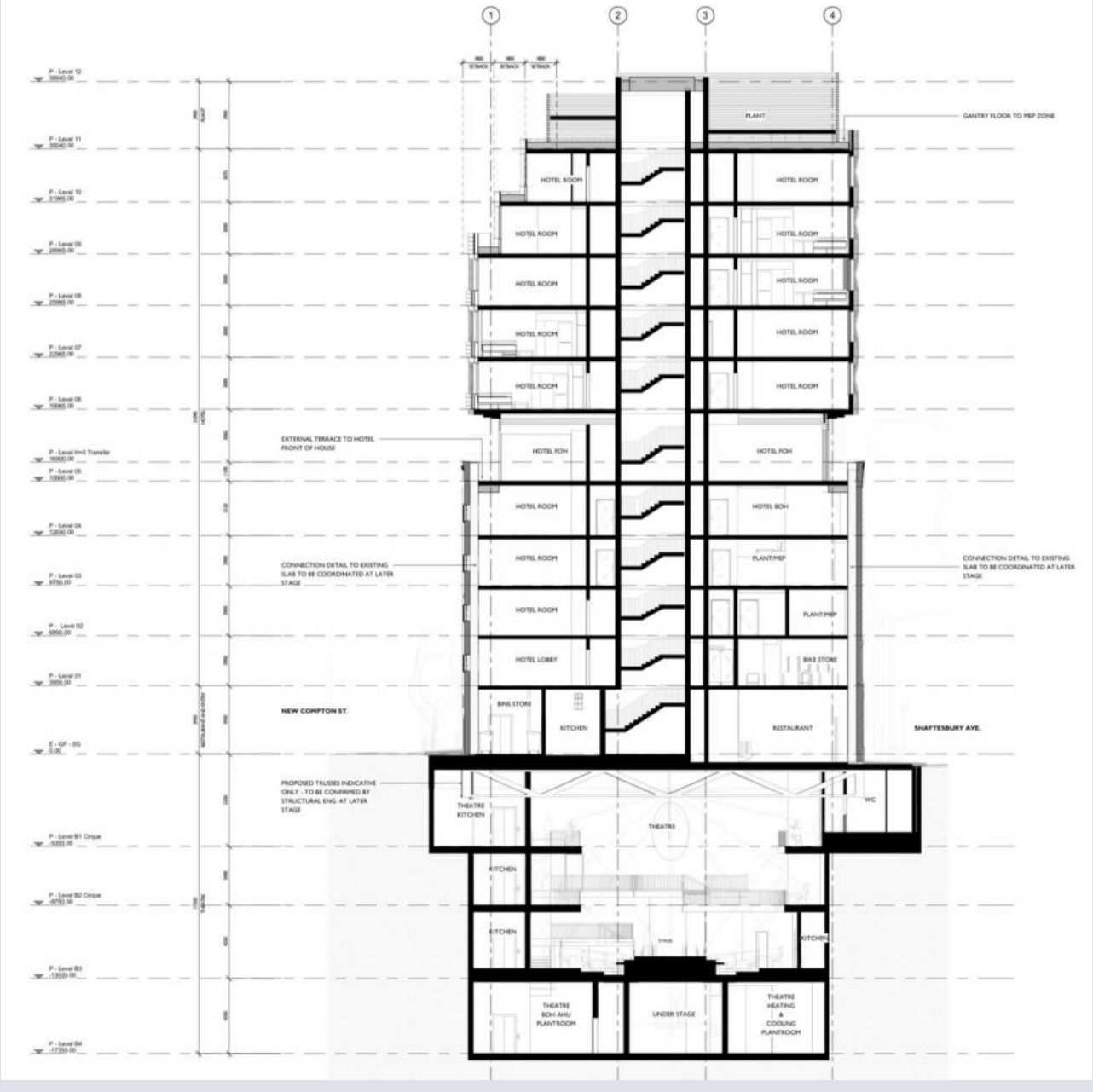
Plans and images

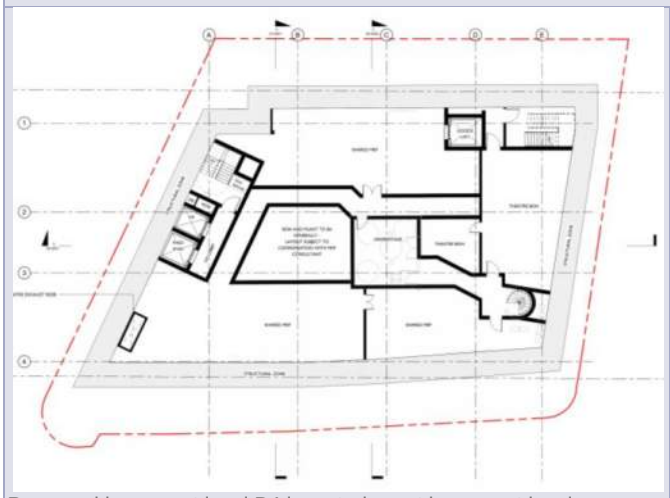
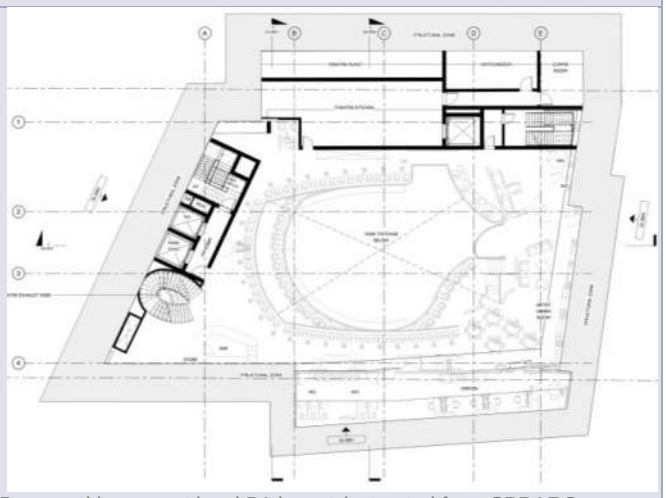


Proposed Southeast Elevation -Shaftesbury Avenue (extracted from SPPARC drawing 2111-SPP-ST-ZZ-DR-A-25-3001- P0.01 dated January 2024).



Proposed Northeast Elevation -St Giles Passage (extracted from SPPARC drawing 2111-SPP-ST-ZZ-DR-A-25-3004- P0.01 dated January 2024).



Plans and images	
East facing section; (extracted from SPPARC drawing 2111-SPP-ST-ZZ-DR-A-26-2002- P0.02; Jan-2024)	
	
Proposed basement level B4 layout - lowest basement level (extracted from SPPARC drawing 2111-SPP-ST-B4-DR-A-20-1000-P0.02 dated January 2024).	Proposed basement level B1 layout (extracted from SPPARC drawing 2111-SPP-ST-B1-DR-A-20-1003- P0.02 dated January 2024). Showing largest plan extent of the basement.

1.3 Scope of work

1.3.1 Land Contamination Risk Management

The Environment Agency (EA) Land Contamination Risk Management guidance (LCRM), sets out the process that should be followed for managing the risk from land contamination. This includes ensuring that the site will be 'suitable for its proposed use' in line with National Planning Policy (NPPF). The process of LCRM should be used to:

- *Identify and assess if there is an unacceptable risk*
- *Assess what remediation options are suitable to manage the risk*
- *Plan and carry out remediation*
- *Verify that remediation has worked*

LCRM includes three risk-based stages (1) risk assessment, (2) options appraisal, and (3) remediation and verification. The process commences with a Preliminary Risk Assessment (PRA), which defines the scope and extent of effort required for the subsequent LCRM stages. Table 1-1 presents Pell Frischmann's simplified summary of the LCRM process.

Table 1-1 Land contamination risk management - simplified

1 Risk Assessment		2 Options appraisal	3 Remediation and verification	
Preliminary risk assessment → Site investigation scheme → Quantitative risk assessment		Remediation options appraisal	Remediation strategy & verification plan	Remediation Verification
PRA	Quantitative risk assessment	**LC**ROA	**LC**RS	LCRV
Desk study to identify sources of contamination and sensitive receptors. PRA to identify potential S-P-R contamination linkages (CLs) **[this report]**	**SIS**: Investigate potential sources and receptors **GQRA/DQRA**: Quantitative risk assessment to assess risks for each CL to identify and assess unacceptable risks	Identify remediation option to address unacceptable risks	Strategy: steps and measures required to implement remediation onsite. Verification plan: activities and records that must be kept during remediation	Record of all remediation activities as evidence that remediation has been successful

1.3.2 Preliminary risk assessment (including land contamination desk study)

Pell Frischmann have been commissioned to prepare a Preliminary Risk Assessment for the proposed development. The main steps of a PRA are summarised in Figure 1-3 and described below.

Figure 1-3 LCRM - preliminary risk assessment

A land contamination desk study (LCDS) and a walkover survey will be undertaken to:

- identify potential contaminants or '*sources*' of contamination in, on or under the land (this process includes identifying potentially contaminative past and present land-uses onsite and in the surrounding area),
- identify '*receptors*' that could be adversely affected by a contaminant, and
- identify exposure '*pathways'* – a route by which a receptor is or could be adversely affected by a contaminant.

A Conceptual Site Model (CSM) will be developed, summarising the potential 'source-pathway-receptor' contaminant linkages (CLs) that have been identified for the proposed development. Each *potential* contaminant linkage (pCL) is assigned a qualitative level of risk and the CSM is updated before considering what further action is needed. The CSM should be used as the basis upon which future intrusive site investigation activities are designed and land contamination risk assessment is undertaken.

2 The site

2.1 Site location and description

The site is bound by the following roads New Compton Street (northwest), St Giles Passage (northeast), Shaftesbury Avenue (southeast) and Stacey Street (southwest) and mainly surrounded by commercial buildings except for the park to the northwest (beyond New Compton Street); as shown in Figure 2-1. The site is in the London Borough of Camden, London.

The 'Odeon Convent Garden' cinema onsite comprises a seven-storey building (including a double storey basement) which occupies the entire site area. Ordnance Survey (OS) mapping indicates that Shaftesbury Avenue lies at an elevation of between 22.6 and 22.7mAOD (above Ordnance Datum) adjacent to the site.

Figure 2-1 Site location and description

Location plans and images	
	
3D images of the site (google earth pro)	
	
Southeast side of the building, showing the main entrance.	Northwest side of the building and New Compton Street.

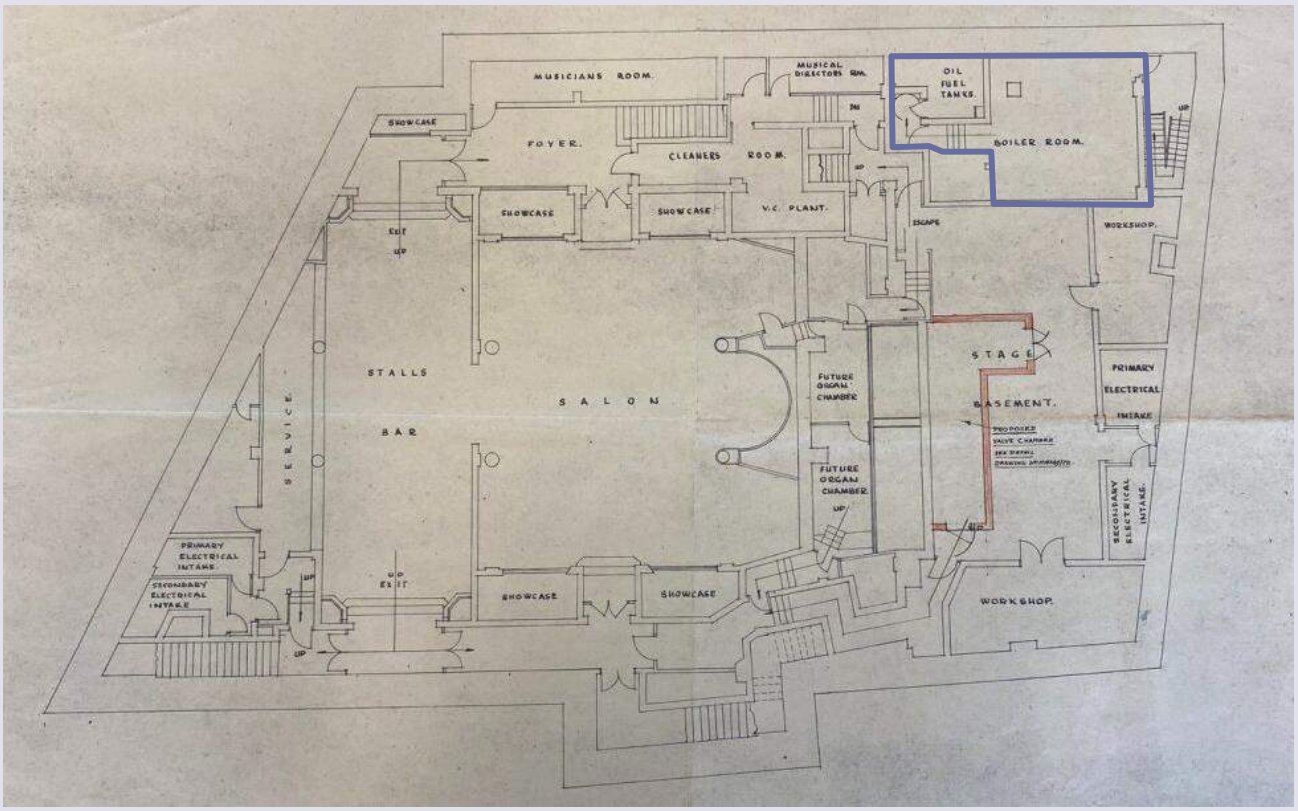
Site area	National Grid Reference (NGR)	Nearest postcode	Local authority
989m^2	529981, 181144	WC2H 8AH	London Borough of Camden

2.2 Walkover survey

Site visits have been undertaken by Pell Frischmann engineers in July and November 2021. Photographs from these site visits have been reviewed as part of this land contamination desk study. The main aims of the review were to consider the current/recent site conditions, features of geoenvironmental significance and identify potentially contaminative land-uses/sources onsite. Several historic plans were observed during the site visits. A selection of photographs taken during these site visits (including photos of site plans) are presented in Figure 2-2.

Figure 2-2 Walkover survey photographs

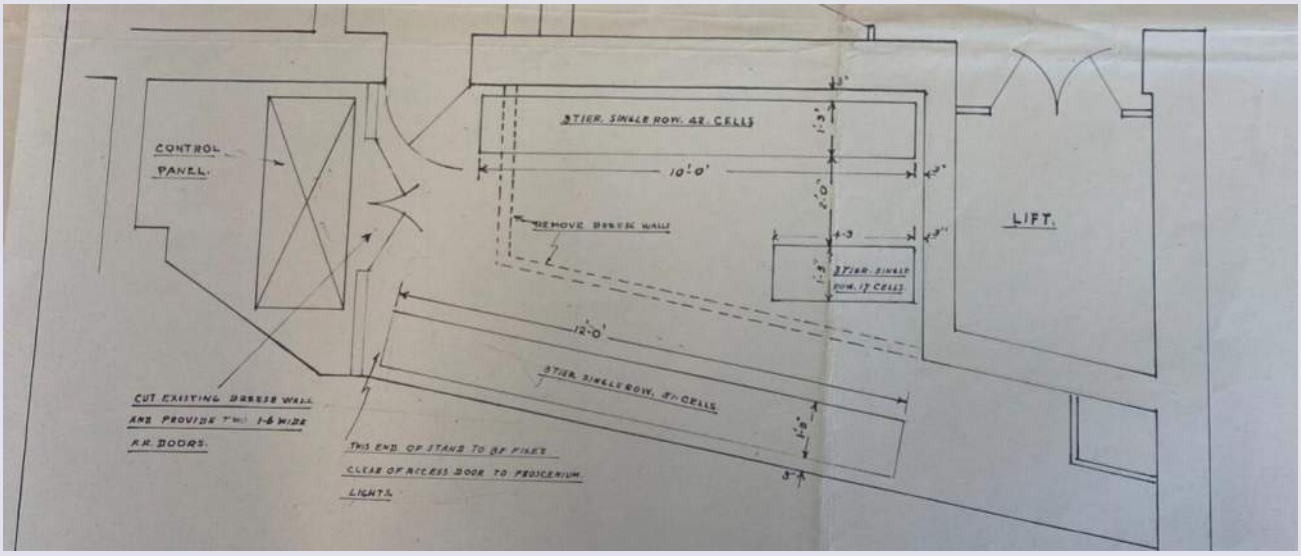
Walkover photographs



Basement plan (May 1950) showing boiler room and oil fuel tank locations (top right of this plan)

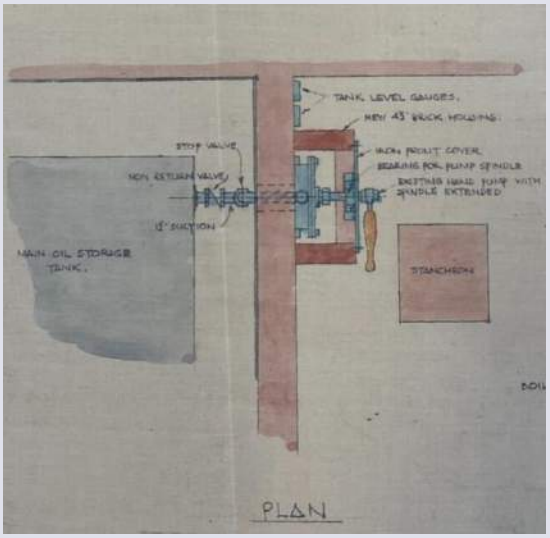
Fuel tank in basement (above and right)

Walkover photographs



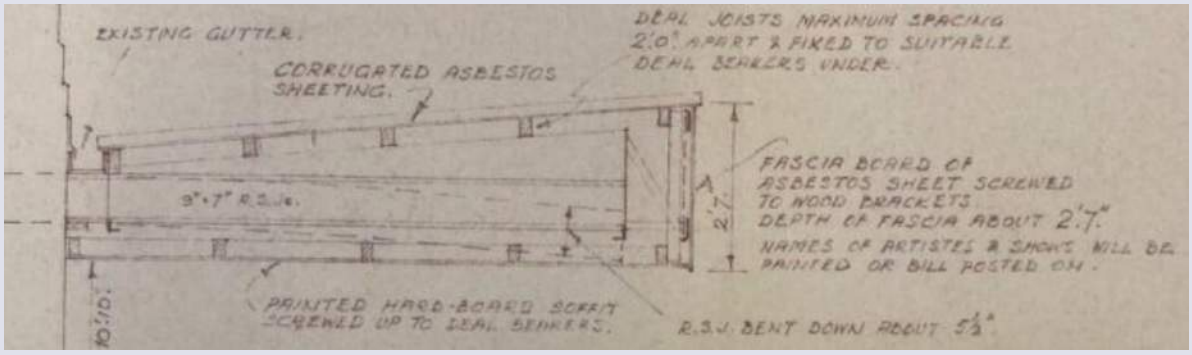
'1951/1964 *Proposed layout of secondary lighting battery'* storage areas indicating '51 cells, '17 cells' and '42 cells' (10 July 1951)

Bioscope and rewinding rooms, indicating a generator (13 Sept 1930)



Plan for the method for isolating oil pump and connections from the oil storage tank and boiler room (May 1950)

Asbestos sheeting (29 March 1941) (below)



3 Land contamination desk study

3.1 Sources

The following 'desk-based' geoenvironmental data sources have selectively been reviewed with respect to the geoenvironmental setting of the site and its surroundings to aid in identifying potential land contamination sources-pathways and receptors:

- Historic and current Ordnance Survey maps,
- Historic and current aerial photographs (Google imagery and Envirocheck),
- British Geological Survey (BGS) maps and records,
- Environment Agency (EA) data,
- EA River Basin Management Plans (RBMPs),
- Commission specific geoenvironmental database search results (Envirocheck), and
- Relevant internet-based data sources (e.g. MAGIC).

Relevant information is presented and discussed in this report.

3.2 Envirocheck report

As part of the data search, an Envirocheck (Site Sensitivity) Report, Geology Report and a set of historic maps have been procured from Landmark Information Group (Landmark). Copies of the Landmark products in the form of datasheet reports and maps are available on request and extracts of these products are included in Appendix B (historic maps) and Appendix C (datasheets and maps). Table 3-1 summarises key information topics included within the Envirocheck Report and Geology Datasheet.

Relevant information from the Landmark products has been considered in conjunction with the findings of the other desk study data sources and the collated findings are presented in the following sub-sections of this report chapter. Where Landmark information is referenced, the distances quoted to the identified features are from the nearest point on the subject site boundary, unless stated otherwise. The on-line Envirocheck Analysis tool has also been used to review, combine and extract relevant information from the Landmark products including several of the map extracts presented in this report.

Table 3-1 Landmark topics

Envirocheck Report	Geology Report
➢ Environment Agency records ➢ Hydrology and hydrogeology ➢ Waste ➢ Hazardous substances ➢ Industrial land uses ➢ Sensitive land uses	➢ Artificial ground and landslip map ➢ Superficial geology map ➢ Bedrock and faults map ➢ Combined geology map
Energy and Transport (GroundSure)	
➢ London Underground and DLR ➢ Active railways and railway projects	➢ Stations ➢ Abandoned and historical railways

3.3 Site history

The following historic records have been reviewed to provide an overview of the site's history and to help identify potentially contaminative historic land uses both onsite and in the immediately surrounding area:

- Historic County Series and Ordnance Survey (OS) map editions (Appendix B),
- Historic building plans (Appendix B); and
- Historic and recent aerial photographs (source: Google & Landmark).

A selection of historic maps and aerial photograph extracts are presented in Figure 3-1. In summary, the historic information indicates the following:

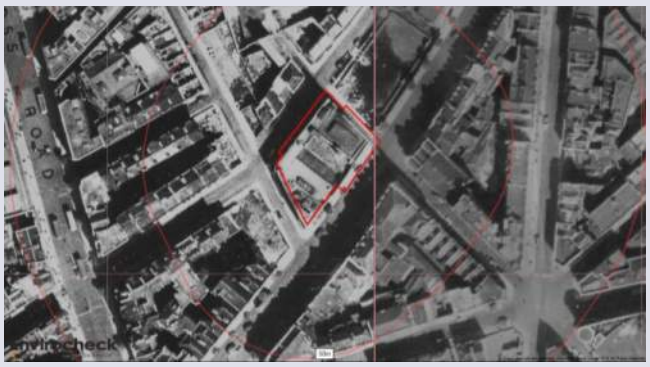
Onsite: The present-day cinema occupies the former Saville Theatre building (which includes a double-storey basement). Saville Theatre opened in October 1931, the former theatre is listed as a Grade II Listed Building for its architectural and historic interest. Reference to the listing details and historicengland.org.uk indicates that the theatre was built between 1930 and 1931 and comprised a three-tiered auditorium with a stage, designed to accommodate a total capacity of 1,530, making it one of the largest theatres in the West End when opened. The conversion of Saville Theatre into a cinema was carried out in 1970.

Prior to the 1930s mapping, the site was occupied by commercial properties often with residential accommodation above, as shown in the historic building plan extract in Appendix B and historic maps from the late 1880s. Old maps (viewed online from Layers on London) indicate that the site and the surrounding areas was developed hundreds of years earlier including as far back as the 1680s.

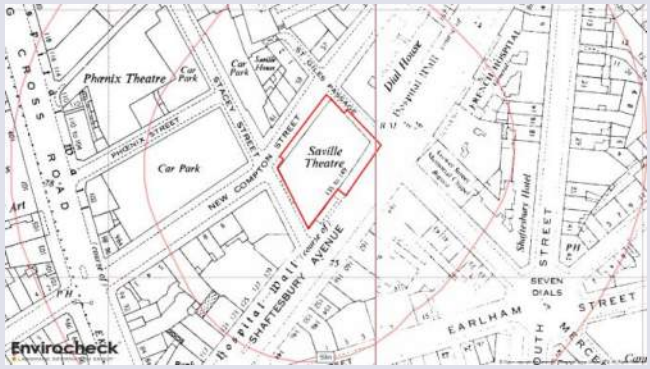
Offsite: From the 1800s, the site is surrounded by a mixture of residential and commercial properties, including a Chapel (20m E) and a church with a recreational field (30m N). Aerial photographs during World War 2 (WW2) show significant local bomb in particular to the west of Stacey Street and circa 10m west of the site at the closest point, subsequent mapping shows several missing buildings (early 1940s) followed by redevelopment of these areas. By the 1960s, local redevelopment includes several car parks (W and NW). In the 1980s, the buildings in the SW and W were redeveloped to one large building, and the playground (30m N) extended south.

Figure 3-1 Historic maps and images

1916



1947



1961

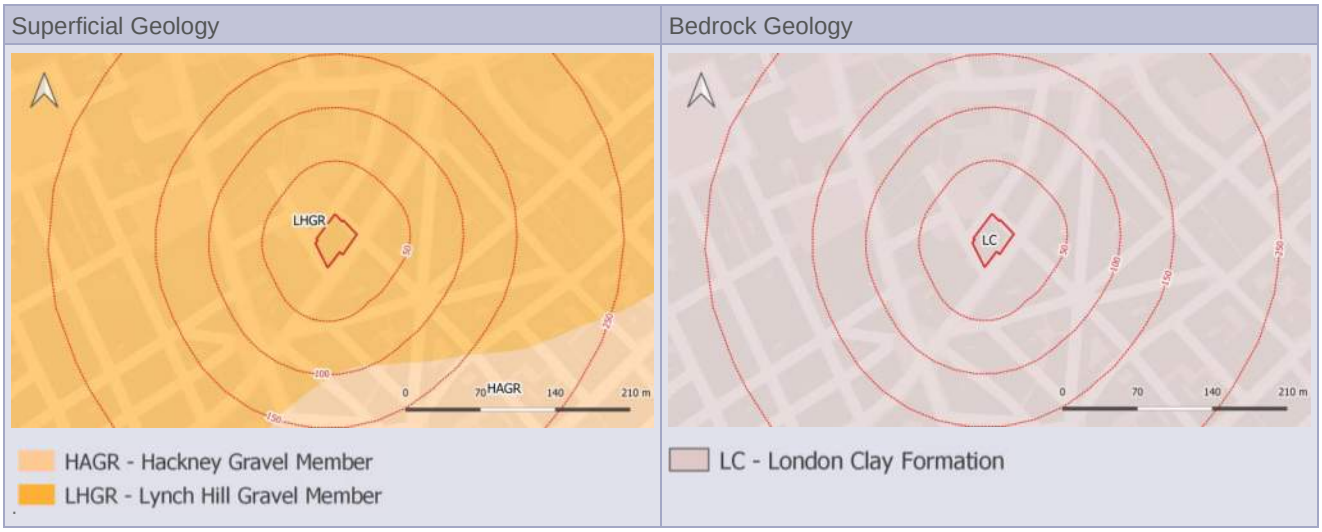
1994

3.4 Geology

3.4.1 Published geology

The published geology of the area is shown on the geological map for North London (Sheet 256, scale 1:50,000), published by the British Geological Survey (BGS), the digital BGS maps are shown Figure 3-2. Derivatives of the BGS mapping are included in the Geology Report (Landmark) and further geological information has been obtained from the BGS website.

Figure 3-2 Published geology



The geological mapping indicates that the site is underlain by the following sequence of superficial deposits and bedrock strata (the descriptions for each stratum are taken from the BGS):

- **Lynch Hill Gravel Member** (superficial): Sand and gravel, locally with lenses of silt, clay or peat.
- **London Clay Formation** (bedrock): bioturbated or poorly laminated, blue-grey or grey-brown, slightly calcareous, silty to very silty clay, clayey silt and sometimes silt, with some layers of sandy clay.

There are no BGS mapped records of artificial ground or linear geological features onsite.

3.4.2 Borehole records

The BGS maintains an archive of historic boreholes, the locations of the closest available borehole records are shown in Figure 3-3. There are no records of historic boreholes onsite but several records around the site. The records are generally consistent with the mapped geology and indicate a layer of Made Ground, underlain by gravel deposits and London Clay, as summarised in Figure 3-3.

Figure 3-3 Historic borehole records

Locations

Key

- Depth 0 - 10m
- Depth 10 - 30m
- Depth 30m+
- Depth unknown
- Confidential

Borehole	Location	Made Ground	Gravel	London Clay	*London clay thickness*	Lambeth Group	Base of BH
TQ28SE1748	21m N	3.9m bgl	4.4m bgl	34.5m bgl	*30.1m*	>34.75m bgl	34.75m bgl
TQ38SW2331	40m SE	1.1m bgl	1.3m bgl	>25.0m bgl	*23.7m*	-	25m bgl
TQ38SW3600	50m NE	2.7m bgl	-	35.0m bgl	*32.3m*	>36.5m bgl	36.5m bgl
TQ38SW2330	58m SE	1.9m bgl	-	>25m bgl	*>23.1m*	-	25m bgl
TQ38SW2332	68m SE	1.9m bgl	-	>25m bgl	*>23.1m*	-	25m bgl

3.4.3 Ground stability and mining

The Landmark Envirocheck and Geology Reports indicates that there is **one moderate natural ground stability hazard onsite associated with shrinking or swelling clay** (London Clay bedrock), as summarised in Table 3-2.

Table 3-2 Ground stability hazards

Natural ground stability hazard	No hazard	Very low	Low	Moderate	High
Collapsible deposits		✓			
Compressible deposits	✓				
Ground dissolution	✓				
Landslide		✓			
Running sand		✓			
Shrinking or swelling clay				✓	
The hazard ratings relate to the mapped geology.					
Mining and cavities					
Natural cavity records	None recorded within 500m				
Man-made cavity records	No records within 1km				
Non-coal mining areas	No hazard				
Coal mining affected areas	In an area that might not be affected by coal mining				
BGS mineral sites	No records within 1km				

3.4.4 Radon

The UK Health Security Agency (UKHSA) interactive 'UK maps of radon' (www.ukradon.org) and the Envirocheck Report indicates that the site is in a 'Lower' probability radon area (i.e. less than 1% of homes are at or above the Radon Action Level) where '*no radon protection is needed'*.

3.5 Hydrology and hydrogeology

3.5.1 Hydrology

The nearest surface water features and active licenced surface water abstractions and discharges are summarised in Table 3-3.

Table 3-3 Surface water features, abstractions and discharges

Hydrology information	Records
Nearest surface waters	River Thames (786m SE)
Licenced surface water abstractions	There are no active surface water abstractions recorded within 500m.
Surface water discharge consents	There are no active discharge consents to surface waters recorded within 500m.

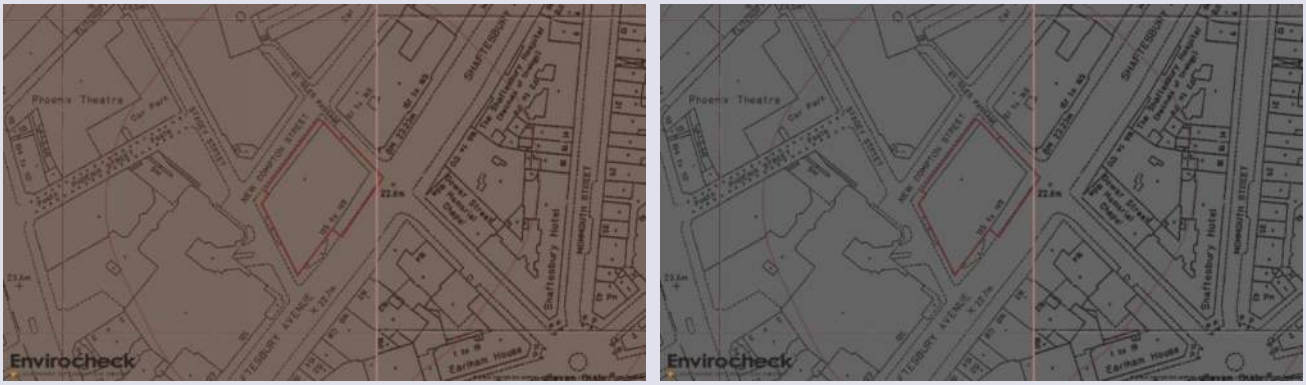
Reference to information about the Lost Rivers of London and historic mapping, does not indicate the likely presence of below ground waterways on site or within 100m of the site.

3.5.2 Hydrogeology

The Environment Agency aquifer designations for the underlying superficial deposits and bedrock, and the associated groundwater vulnerability classifications for these strata are summarised in Figure 3-4.

Figure 3-4 Aquifer designations and groundwater vulnerability mapping

Aquifer designation



Stratum	Aquifer designation	Hydraulic characteristics and groundwater vulnerability
Lynch Hill Gravel Member (superficial)	Secondary A aquifer	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.
		Groundwater vulnerability: **Medium** 'areas that offer some groundwater protection. Intermediate between high and low vulnerability'.
London Clay Formation (bedrock)	Unproductive strata	Largely unable to provide usable water supplies and are unlikely to have surface water and wetland ecosystems dependent on them.

3.5.3 Groundwater abstractions and SPZs

Table 3-4 summarises the available records relating the groundwater abstraction and use within the local site area including active licenced groundwater abstractions and discharges (based on Environment Agency data from the Envirocheck Report).

Table 3-4 Groundwater source protection zones and abstractions

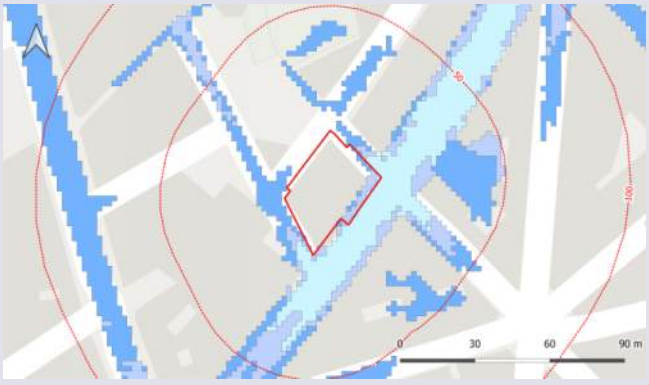
Hydrology information	Records
Source Protection Zone (SPZ)	The site is not within a Total Catchment SPZ and there are no SPZs within 1km of the site.
Licenced groundwater abstractions	Two active groundwater abstraction boreholes are recorded within 250m (115m and 132m NW), both are covered by a single abstraction licence for a heat pump water for Soho Estates Limited. There are no active abstractions within 250 and 500m and several active groundwater abstractions between 500m and 1km.
Groundwater discharge consents	There are no active discharge consents to groundwater within 500m.

3.5.4 Flooding information

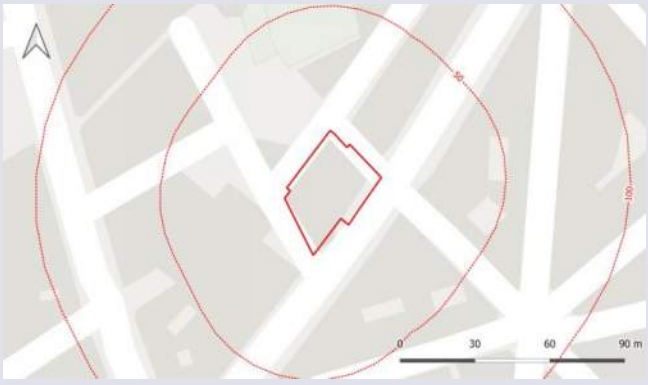
Extracts of the surface water flood risk and flood zone maps are included in Figure 3-5. Further consideration of flood risk is beyond the scope of this report. The BGS groundwater flooding susceptibility map (also included in Figure 3-5) indicate that site is within an area with the potential for groundwater flooding to occur for 'property situated below ground level' across most of the site at 'at surface' in the east of the site.

Figure 3-5 Flood risk mapping (Envirocheck)

Risk of flooding from surface water

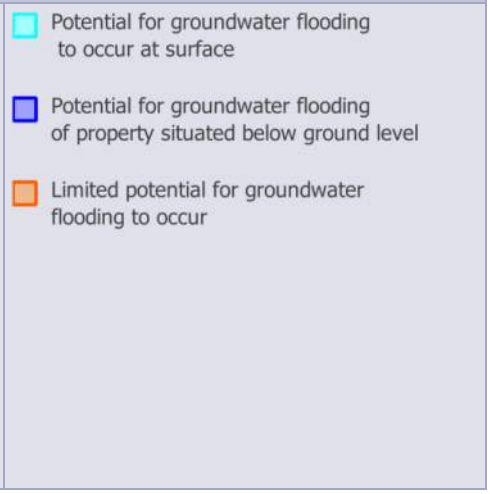


Flood zones



BGS Groundwater flooding risk map

Key



3.6 Waste records

The 'waste records' within the Envirocheck report indicates the following:

- There are no historic or active landfills within 500m of the site.
- There are no historic or current waste transfer, waste treatment or waste management facilities within 500m of the site; except of a Mobile Plant record for the treatment of soils 422m northeast.

3.7 BGS surface geochemistry of the UK

The Geochemical Baseline Survey of the Environment (G-BASE) project is a major British Geological Survey (BGS) project that surveyed the surface geochemistry of the UK between the 1960s and 2014. In urban environments, soil samples were collected at a density of four samples per 1 km^2. The published geochemical maps provide interpolated data for areas between point sample locations and measured topsoil concentrations ('point data') are included in the Envirocheck maps and datasheets in Appendix C. Table 3-5 summarises the average concentrations presented in the Envirocheck datasheet.

Table 3-5 Estimated average background concentrations based on the G-BASE data

Contaminant	Arsenic	Lead	Cadmium	Chromium	Nickel
Published average concentration (mg/kg)	17	280	0.9	79	280

3.8 Additional geoenvironmental records

The Envirocheck Report indicates that the site is not on the Contaminated Land Register (i.e. the site is not within land determined as 'contaminated land' under Part 2A of the Environmental Protection Act 1990) and there are no Contaminated Land Register Entries within 1km of the site.

- **Onsite**: review of the Envirocheck Report did not identify additional records of geoenvironmental significance onsite.
- **Offsite**: no active fuel stations are recorded within 1km of the site. A former/historic fuel station is noted 675m north.

3.9 Potential ecological system receptors

Table 3-6 summarises whether the site is within a location or proximity to a location where potential ecological system receptors may be present with respect to contamination in line with "*The Environmental Protection Act 1990: Part 2A, Contamination Land Statutory Guidance (Department for Environment Food and Rural Affairs, Defra, 2012*)".

Table 3-6 Ecological system receptors

Receptor	Onsite	Offsite within 1km
Marine nature reserves or European marine site	No	None recorded within 1km
Nature reserve (local or national)	No	None recorded within 1km
Ramsar site	No	None recorded within 1km
Site of Special Scientific Interest (SSSI)	No	None recorded within 1km
Special Area of Conservation (SACs)	No	None recorded within 1km
Candidate Special Areas of Conservation (cSACs)	No	None recorded within 1km
Special Protection Areas (SPAs)	No	None recorded within 1km
Potential Special Protection Areas (pSPAs)	No	None recorded within 1km
Geoenvironmental constraint rather than land contamination receptor		
Areas of outstanding natural beauty	No	None recorded within 1km
World Heritage Sites	No	None recorded within 1km

3.10 Underground tunnels

Due to the likely proximity of the site to underground tunnels a Groundsure energy and transportation report has been procured for the site. The transportation section indicates that the site lies within 250m of several active, proposed and abandoned underground tunnels, as summarised in Table 3-7 and shown in Figure 3-6:

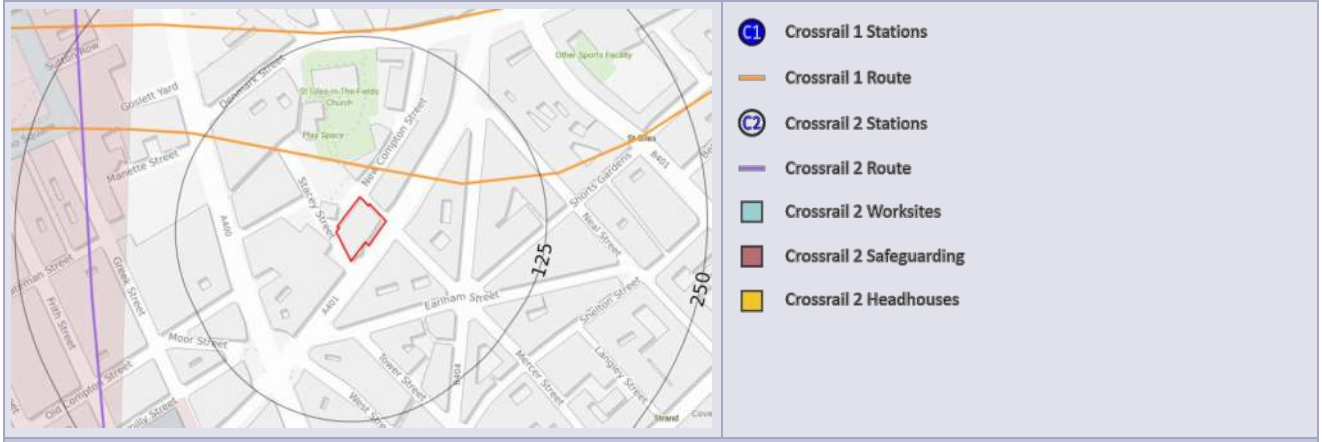
Table 3-7 Underground tunnels

Location	Direction	Item	Type	Details	Status	Figure 3-6 Key
24m	North	Tunnel	Crossrail 1	Elizabeth underground line	Complete	▪▪▪▪ and —
82m	North	Tunnel	Underground	Northern Line	Active	
129m	North	Tunnel	Crossrail 1	Elizabeth underground line	Complete	▪▪▪▪ and —
193m	West	Tunnelled route	Crossrail 2	Section – central core	Proposed	—
198m	*North*	*Station*	*Stations*	*Tottenham Court Road*	*Active*	
240m	North	Tunnel	Underground	Central line	Active	
247m	North	Tunnels	Royal mail	(Abandoned railway)	Disused	

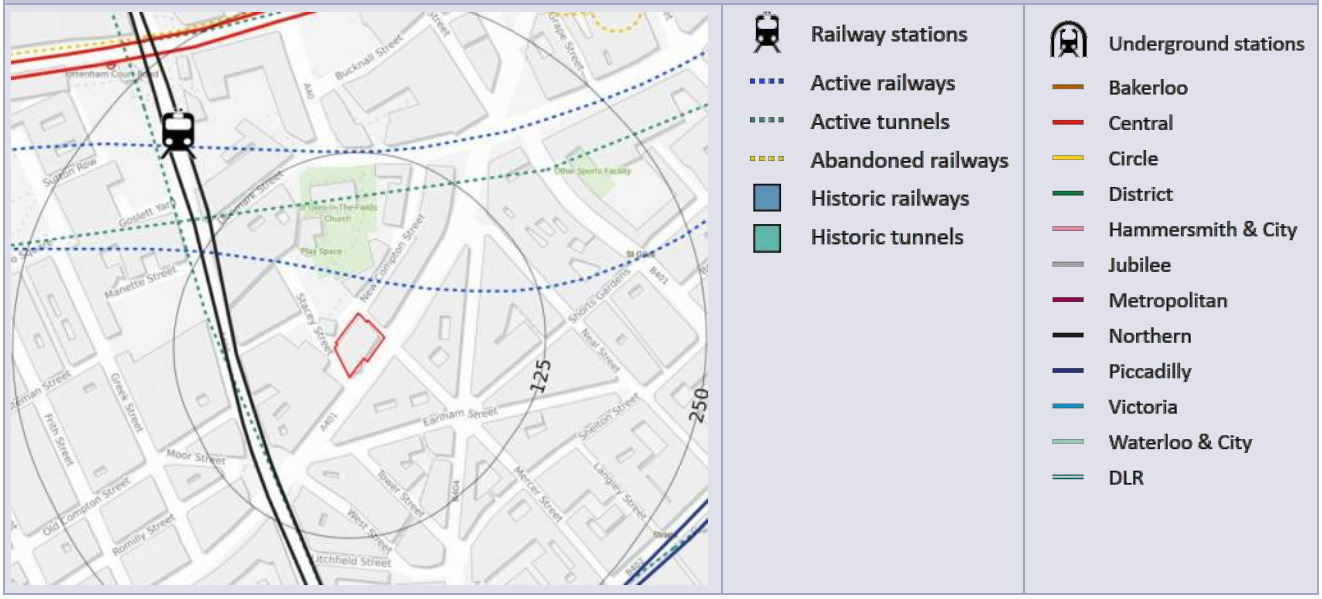
A copy of the Groundsure report is included in Appendix D.

Figure 3-6 Groundsure transportation map extracts

Crossrail



London Underground, DLR and Active Railways Map

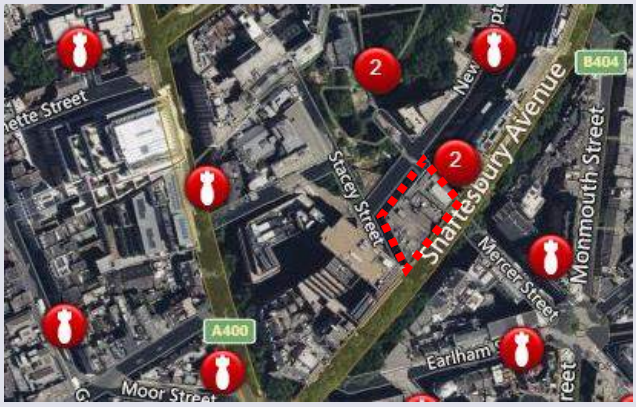


3.11 Unexploded ordnance (UXO)

Parts of London were heavily bombed during World War 2 (WW2); a significant number of bombs did not detonate on impact and some of these bombs may still be in the ground. As an initial step towards a preliminary UXO risk assessment (in line with CIRIA report C681, 2009), a non-specialist screening exercise has been carried out for the site, as summarised below:

- Evidence of local WW2 bomb damage has been identified within 10m of the site from historic maps/images.
- The London County Council WW2 Bomb Damage Map 61 shows bomb damage to southern corner of the building **onsite** and extensive damage around the site (Figure 3-7).
- WW2 bomb census mapping for the London Blitz (between Oct-1940 and Jun-1941), collated by the Bomb Sight project): indicates that several high explosive bombs fell in close proximity to the site including two high- bomb-strikes just northeast of the site which align with the bomb damage identified in the historic maps/images (Figure 3-7).
- A site-specific **pre-desk study assessment (PDSA)** ordered from Zetica: states "*It is recommended that a detailed desk study is commissioned to assess, and potentially zone, the Unexploded Ordnance (UXO) hazard level on the Site*" (see Appendix D).

Figure 3-7 UXO screening information

London County Council bomb damage maps 1939-1945, **Map 61**	Bomb census mapping: Bomb Sight Project http://bombsight.org/
	

3.12 Previous geoenvironmental reports

A combined geotechnical/geoenvironmental - desk study and interpretive ground investigation report was produced in 2017 as part of an earlier planning application, as listed in Table 3-8.

Table 3-8 Previous geoenvironmental report

Report title and reference	*Originator*	*Source*	*Date*
Desk Study & Ground Investigation report (*ref.* J17183)	Geotechnical and Environmental Associates Limited	Previous planning information	Dec-2017

The 2017 report was produced prior to the introduction of the current EA Land Contamination Risk Management guidance that was introduced in October 2020. The report includes site investigation information from a single cable percussive borehole that was advanced to a depth of 35m bgl within a parking bay on New Compton Street in October 2017. A single trial pit was also planned within the basement but was 'abandoned due to the thickness of concrete encountered'. *(Note: EA LiDAR Data indicates likely ground elevations circa. 23.3m AOD on New Compton Street).*

The borehole encountered the following ground conditions:

- Made Ground comprised '*dark brown silty sandy very gravelly clay with brick and concrete fragments and occasional coal fragments and extended to a depth of 3.50m bgl'.*
- Lynch Hill Gravel comprised '*medium dense orange-brown coarse gravelly sand with abundant fine to medium subangular to angular flint gravel and extended to a depth of 4.70m bgl'.*
- London clay *comprised 'firm becoming very stiff high to extremely high strength dark brownish grey silty slightly sandy becoming very sandy clay with frequent fine selenite crystals, occasional partings of light brown and orange-brown fine sand and silt, claystones, lignite, trace fossils and shell fragments and pyrite nodules and was encountered to a depth of 34.4m bgl'* (29.7m thick).
- Lambeth Group comprised '*very stiff extremely high strength greenish grey and bluish grey mottled reddish brown and brown very silty, slightly sandy clay* and was encountered to the based on the borehole that was terminated at 35.0m bgl.

A groundwater monitoring well was installed across the Made Ground and Lynch Hill Gravel to 5mbgl. Subsequent ground water level monitoring recorded groundwater at 4.39m bgl. (A piezometer was also installed with a response zone in the London Clay at 19.21m bgl, recording an average groundwater level of 5.27mbgl).

The report includes geochemical results from two Made Ground soil samples, the results were compared against published human health generic assessment criteria for a commercial land use and the available results passed the assessment, i.e. the recorded concentrations were below the GAC threshold contractions for each of the contaminants screened.

4 Preliminary Risk Assessment (PRA)

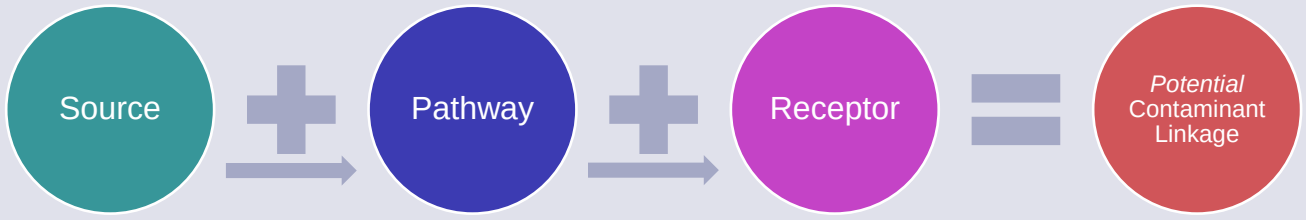
4.1 Introduction

The land contamination desk study, summarised in Chapter 3, has been undertaken to begin to identify potential land contamination risks and geoenvironmental constraints which could significantly impact or restrict the proposed redevelopment and to inform the preliminary risk assessment process. The preliminary risk assessment process is based on the available data presented in this report and has been progressed using qualitative judgement only.

The preliminary risk assessment (PRA) includes the development of an 'outline' or preliminary conceptual site model (CSM) for the proposed development. A conceptual site model shows the possible relationships between contaminants, pathways and receptors based on the source-pathway-receptor (S-P-R) approach, as shown in Figure 4-1.

Figure 4-1 Contaminant Linkages (S-P-R)

Contaminant Linkage - Source-Pathway-Receptor relationships



Term	Definition
Source	A contaminant that is in, on or under the land and has the potential to cause harm or pollution
Pathway	A route by which a receptor is or could be affected by a contaminant
Receptor	Something that could be adversely affected by a contaminant for example a person, controlled waters, an organism, an ecosystem or Part 2A receptors such as buildings, crops or animals.
Contaminant Linkages	The presence and S-P-R relationship between contaminants, pathways and receptors.

All three elements (S-P-R) of a contaminant linkage must be present for a land contamination risk to exist, i.e. even if a contaminant has been identified but there is no receptor or no pathway then the S-P-R linkage is incomplete and there is not a risk - "*A contaminant linkage must be present for there to be a S-P-R relationship. Without a linkage, there is not a risk – even if a contaminant is present*" (LCRM, 2020).

4.2 Potential sources

Table 4-1 summarises the potentially contaminative land-uses or potential contaminant sources that have been identified onsite and in proximity to the site that have been considered for inclusion in the conceptual site model.

Table 4-1 Potential sources

Onsite	Offsite
➢ Made Ground has been recorded up to 3.5m bgl adjacent to the site (under New Compton Street, 2017 investigation) ➢ Leaks and spills associated with the onsite oil fuel tank and boiler room in the basement (see note 1) and historic battery storage onsite.	Significant sources of off-site contamination have not been identified.

Note 1: the fuel tank, boiler room and battery storage identified in this report were located within the basement and building above the substantial concrete floor slab so the potential for ground contamination is considered highly unlikely.

4.3 Potential receptors

Table 4-2 summarises the potential receptors that have been identified with respect to the site and the proposed development, in line with the contaminated land statutory guidance (Part 2A, 2012). Where the future end-uses are known and when changes to the end-uses are likely to result from the proposed development of the site, it is important that these future receptors are also considered within the Conceptual Site Model.

Table 4-2 Potential receptors

Receptor	Details
Human health - end users	No (viable exposure pathways will not exist)
Human health - during site preparation and construction	Yes – limited to basement extension groundworks
Controlled waters	
Surface water	No
Groundwater	Superficial strata - Secondary A Aquifer.
Other	
Buildings and structure (ground gas only)	No
Ecological systems	No

4.4 Conceptual site model and preliminary risk ratings

A conceptual site model can be presented as a written description, a tabular or matrix description, a drawing/ diagrammatic illustration, or any combination of these formats. The *preliminary* Conceptual Site Model for the proposed development (in tabular format) summarising the *potential* contaminant linkages is presented in Table 4-3 overleaf. During the risk assessment stage, the term '*potential'* contaminant linkage is used which reflects that these CLs are not confirmed.

The preliminary CSM has also been used to summarise uncertainties and gaps in information and includes recommendations for further investigation and assessment to address them, which may include intrusive site investigation and monitoring followed by quantitative risk assessment.

Potential risk ratings have been assigned for each *potential* contaminant linkage as part of the preliminary risk assessment process and are presented within the CSM table overleaf. These ratings are based on the available data presented in this report and qualitative judgement only. Each risk rating considers the 'severity of the consequence' and the 'probability of the likelihood' as shown in the risk matrix overleaf (Table 4-4).

The CSM is an iterative process that needs to be updated as a project progresses through land contamination risk management, this may result in potential CLs being discounted/closed in the future and for other CLs the risk ratings may need to be refined. As stated in the LCRM guidance, the CSM should be used to "*inform the basis of your initial assessment and all future decisions as you progress through Land Contamination Risk Management*" (LCRM, 2020).

Table 4-3 Preliminary conceptual site model and preliminary risk ratings

pCL	Source/s	Pathway/s	Receptor/s	Probability	Consequence	Risk rating	Comments
101	Contaminants within Made Ground onsite	Ingestion, inhalation and dermal contact	Human health of end users	No linkage	-	No linkage = no risk pCL to be closed.	The single borehole log from 2017 recorded a thickness of Made Ground (just north of the site under New Compton Street) of up to 3.5m bgl), local historic BGS borehole records recorded a similar thickness of Made Ground (3.9m) 21m north of the site. The nature and depth of the Made Ground is typical for this part of London that was originally developed centuries ago. Geochemical data for two Made Ground samples from 2017 did **not** identified contaminants of concern. In addition, most of the Made Ground will have been removed from site during the 1930s excavation and construction of the double basement and additional Made Ground will be removed to facilitate the lateral extension of upper basement level. Most of the basement walls and floor slabs will lie within the underlying natural strata, including London Clay. Therefore, it is considered unlikely that the Made Ground onsite will be a viable/significant source of contamination with respect to the proposed redevelopment. The substantial structural walls of the new basement will also break any viable exposure pathways for ingestion, inhalation or dermal contact. Therefore, land contamination risks have not been identified and this potential Contaminant Linkage can be discounted. **Recommend**: watching brief during excavation earthworks for unexpected contamination.
201	Asbestos within the Made Ground onsite	No viable exposure pathways have been identified for the *'inhalation of liberated respirable fibres'*	Human health of end users	No exposure pathway	-	No linkage = no risk pCL to be closed	The Asbestos Refurbishment Survey indicates that asbestos containing materials (ACM) are present within the building. It is considered unlikely that asbestos will have been incorporated into the Made Ground onsite during construction of the theatre in the 1930s, however, limited residual asbestos may have been presented within commercial/residential buildings that would have been demolished to clear the site for the construction of the Saville Theatre. The two Made Ground samples from 2017 were screened for 'asbestos in soils' and the results confirm that asbestos was '**not detected**'. As described above, only limited volumes of Made Ground are likely to exist onsite and viable exposure pathways will not exist onsite. **Recommend**: watching brief during excavation earthworks for visually identifiable Asbestos Containing Material (ACM) within the soil matrix.
401	Contaminants within Made Ground	Migration through the unsaturated zone	Underlying groundwater Secondary A aquifer within superficial deposits	See notes	-	Linkage considered unlikely	The Made Ground onsite will be almost entirely excavated/removed to facilitate the proposed basement extension. The 2017 Made Ground geochemical results did not detect hydrocarbons within the Made Ground or elevated concentrations of heavy metals. On this basis, the residual Made Ground (if present) is unlikely to present a viable source of contamination for the underlying aquifer. The superficial deposits across most of the site will have been excavated in the 1930s for the double storey basement, therefore superficial deposits are only likely to be present towards the edges of the site. Therefore land contamination risks to controlled water are highly unlikely with respect to the Made Ground onsite. **Recommend**: no further assessment considered warranted.
A01	*Contaminants within Made Ground onsite*	*Ingestion, inhalation and dermal contact*	*Health and safety (H&S) of site preparation and construction workers*	*Unlikely*	*Medium*	*Very low*	Made Ground is likely to be encountered during excavation for the proposed extension of the B1 basement level including along the southeast wall. The geochemical data from 2017 did not identify contaminants of concern (i.e. the geochemical data did not include detectable concentration of hydrocarbons and elevated concentrations of heavy metals/metalloids were not recorded. (Note: the 2017 data was limited to two samples only therefore the geochemistry of the local Made Ground may vary). **Recommend**: contractor to undertake activity specific H&S risk assessments.
A02	*Asbestos within the Made Ground onsite*	*Inhalation of liberated respirable fibres*	*H&S of site preparation and construction workers*	*Low likelihood*	*Medium*	*Moderate/low*	The Asbestos Refurbishment Survey indicates that asbestos containing materials (ACM) are present within the existing building. It is considered unlikely that asbestos will have been incorporated into the Made Ground onsite during construction of the theatre in the 1930s, however, limited residual asbestos may have been presented within commercial/residential buildings that would have been demolished to clear the site for the construction of the Saville Theatre. The two Made Ground samples from 2017 were screened for 'asbestos in soils' and the results confirm that asbestos was '**not detected**'. **Recommend**: contractor to undertake activity specific H&S risk assessments and watching brief during excavation earthworks for visually identifiable Asbestos Containing Material (ACM) within the soil matrix.

Table 4-4 Risk matrix

Risk = probability x consequence		Consequence			
		Severe	Medium	Mild	Minor
Probability	High likelihood	Very high	High	Moderate	Moderate/ low
	Likely	High	Moderate	Moderate/ low	Low
	Low likelihood	Moderate	Moderate/ low	Low	Very low
	Unlikely	Moderate/ low	Low	Very low	Very low
	No linkage	Without a linkage, there is not a risk – even if a contaminant is present (LCRM 2020)			

Based on the CIRIA good practice guide (C552, 2001).

5 Conclusions and recommendations

The plan area of the site has been occupied by the same building since the 1930s. The Grade II listed Building opened as 'Saville Theatre' in 1931. The building was converted to a cinema in the 1970s. The cinema has evolved and been updated over the years and currently operates as the 'Odeon Covent Garden' cinema.

Mapping from the late 1880s and early 1910s indicate that the site was previously occupied by terraces of commercial properties (with residential accommodation above). Due to the sites' location within London it is anticipated that the site was developed for hundreds of years before modern mapping began (as can be seen in old maps online). This history is reflected in the depth of Made Ground that has been recorded onsite (2017) and in local historic borehole records published by the BGS (circa 3.5 to 3.9m bgl).

The development of the former Saville Theatre included a double storey basement that incorporates most of the site's plan area. As a result, a significant volume of the historic Made Ground will have been excavated and removed from the site in the 1930s. Additional Made Ground will be removed to facilitate the lateral extension of the upper basement levels. Most of the basement walls and floor slabs will lie within the underlying natural strata, including London Clay.

Significant sources of onsite and office contamination have not been identified by the desk-study review part of this preliminary risk assessment. The sources included in the preliminary conceptual site model are limited to the residual Made Ground that may exist towards the site perimeter only. It is considered that the nature and depth of the Made Ground is typical for this part of London. Geochemical data for two Made Ground samples from 2017 did not identify contaminants of concern with respect to human health nor contamination that would likely pose risks to controlled waters. Based on the nature of the proposed development including the substantial structural walls of the new basement it is considered that very few if any viable contamination exposure pathways will exist once the development is complete.

Limited recommendations for the construction phase are summarised in the conceptual site model 'comments' above. Residual risks to the health and safety of construction workers (during excavation of Made Ground) are likely to be limited and manageable through good practice and awareness.

Based on the results of this preliminary risk assessment it is considered that the land contamination risk management process does not need to progress to quantitative risk assessment.

6 Limitations and liabilities

This report has been prepared by Pell Frischmann with reasonable skill, care and diligence, and taking account of the manpower and resources devoted to it by agreement with the Client in accordance with the agreed scope of services.

This report has been prepared to provide design stage geoenvironmental and land contamination information for the redevelopment of Saville Theatre. The report contents should only be used in that context and Pell Frischmann disclaims any responsibility to the client and others in respect of any matters outside the agreed scope of the work.

The report details the findings of work carried out by Pell Frischmann during a study period from December 2023 to January 2024. The report has been prepared on the basis of available information obtained during that study period. Information provided by the referenced third parties has been used in good faith and is taken at face value; however, Pell Frischmann cannot guarantee its accuracy or completeness.

Although every reasonable effort has been made to gather all relevant information within the context of the agreed scope of work, all potential environmental constraints or liabilities associated with the site may not have been revealed. Should additional Information become available (including new legislation and changed practices), after the date of the report submission, Pell Frischmann reserves the right to reconsider the recommendations and alter the report accordingly.

Notwithstanding any site observations concerning the presence or otherwise of archaeological sites, asbestos-containing materials or invasive weeds such as Japanese knotweed, this report does not constitute a formal or specific survey of these potential development hazards. Unless otherwise stated, no assessment has been made for the presence of radioactive substances or unexploded ordnance.