Phase I - II
Geo-Environmental Site Assessment

182-184 Bitterne Road, Southampton, Hampshire, SO18 1BE

Prepared for:
SC Architecture
Anchor House
School Lane
Chandlers Ford
SO53 4DY

December 2022

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Phase I-II Geo-Environmental Assessment

Geo-Environmental

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Executive Summary	
Site Address	182-184 Bitterne Road West, Southampton, Hampshire, SO18 1BE
National Grid Reference	444035, 113297
Site Area	0.02ha
Current Site Use	A secure parcel of land that has recently had two (2no.) previous structures demolished. There was hardstanding in the north and centre of the site and soft landscaping in the south. Multiple stockpiles of waste, presumed fly-tipped, were noted to be present within the site boundary.
Site History	From the earliest mapping dated 1896 the site was undeveloped land, until 1908 when a road running northwest to southeast was noted across the centre of the site. From 1932 two (2no.) semi-detached buildings are present onsite. The site walkover has shown these buildings are now demolished.
Geology & Hydrogeology	British Geological Survey Map (Southampton, Sheet 315, Solid and Drift Edition at a scale of 1: 50,000, 1987) indicates that the site is underlain by the following geological sequence: Superficial deposits of River Terrace Deposits overlying Bedrock deposits of London Clay Formation. Groundwater vulnerability data indicates that the superficial River Terrace Deposits are classified as a Secondary A Aquifer with medium groundwater vulnerability. Bedrock of the London Clay Formation is classified as Unproductive Strata and therefore has no groundwater vulnerability classification. Intrusive works identified Made ground between 0.15-1.00m bgl, overlying superficial deposits of River Terrace, further overlying London Clay formation. The base of the London Clay Formation was not proven during this investigation, which was consistent with BSG mapping of the site. The site is not located within a groundwater Source Protection Zone. There are no active or historical water abstractions are located within 250m of the site. There are no active or historical potable water abstractions are located within 250m of the site. Based on local topography and the location of surface watercourses it is considered that shallow groundwater, if present, will follow local topography and flow in a southerly and westerly direction towards the River Itchen.
Hydrology & Flooding	The Groundsure report identifies a number of inland watercourses to the north, south and west of the site. These are classified as inland rivers that are not influenced by normal tidal action with the closest being 44m north. It is considered these are all tributaries of the River Itchen. The River Itchen is situated from 186m southwest, which is classified as a Tidal River. This is also known as 'Southampton Water' by the Water Framework Directive. This surface water body had a chemical rating of 'fail' and an ecological rating of 'moderate' with an overall rating of 'moderate' measured in 2019 by the Environment Agency. The site is also located within the groundwater body for the Central Hants Bracklesham Group. This was noted as having chemical and ecological ratings of 'good', with an overall rating of 'good' measured in 2019 by the Environment Agency. No surface water abstraction licences were identified on-site or within a 250m radius. The site is at a negligible risk of surface water flooding. Within 50m of the site, there are small patches where there is a 1 in 250-year return period of a flood event at depths 0.1 – 0.3m.

	The site is not designated as being within a Flood Zone as per the Environment Agency classifications. However, land 43m north is designated as Flood Zone 2, and land approximately 50m north is Flood Zone 3.
Landfill Sites & Ground Gases	The Groundsure Report identified no records of historic landfill sites or historic waste treatment sites within 250m of the subject site, closest record is 301m southwest. The Groundsure Report identified no active or recently closed licensed waste sites within 250m of the site boundary.
Radon	The site lies within an area where less than 1% of the properties are above the Action Level. At these levels BRE publication BR211 indicates that no special radon protective measures are required in the construction of new extensions or dwellings.

Revised Conceptual Site Model

Following the completion of a Phase II Ground Investigation and Tier I human health risk assessment no elevated concentrations of contaminants were identified in the underlying soils with no elevated concentrations of ground gases identified during return monitoring visits.

Based on the available data, the site is not considered to have the potential to present a significant risk to human health.

Ground Gas Classification

Ground Gas Classification is CS-1 under BS8485:2015 and therefore required no gas protection measures.

Concrete Classification

River Terrace Deposits – as the site is classified as DS-1, Aggressive Chemical Environment for Concrete Classification (ACEC) AC-1 for brownfield locations.

London Clay Formation – The site is classified as DS-4, Aggressive Chemical Environment for Concrete Classification (ACEC) AC-4 in accordance with the recommendations provided in BRE Special Digest 1 (2005).

As set out in Section 11.4, it is considered likely that shallow founding within the underlying superficial deposits will be achievable and as such, the concrete classification at an anticipated founding depth of 1.00m bgl will be **DS1 AC-1**. However, should deepening of foundations be required into the underlying London Clay Formation then consideration should be given to elevating the concrete classification to **DS-4 AC-4,** as per the summary table below.

Geotechnical Assessment

Within the loose material with the southern part of the site (WS103-WS104) It is considered a traditional strip foundation of 1.00m width at a depth 1.00m bgl provides a presumed bearing capacity of approximately 50-150kN/m^2 for the south of the site.

Medium to dense sands were encountered in the north of the site (CP101, WS101-WS102), It is considered a traditional strip foundation of 1.00m width at a depth 1.00m bgl provides a presumed bearing capacity of approximately 150-500kN/m^2 in the north of the site.

A minimum foundation depth of 0.75m bgl is anticipated for a Low Change Volume soil within the River Terrace Deposits outside of the zone of tree influence, in accordance with NHBC. Where foundations are likely to be within the influence of trees foundation depths will require locally deepening. The extent to which they should be deepened should be in accordance with NHBC guidance, Chapter 4.2 – Building Near Trees.

Should loadings exceed those set out above then alternative founding solutions will need to be explored. Preliminary piling information is set out above should deep foundations be required.

Conclusions and Recommendations

Environmental

If during the development stage any evidence of contamination is identified, works should be halted, and contact made with a suitably qualified Environmental Consultant. As determined appropriate by the Consultant, further investigation and sampling may be required to determine the appropriate actions. Upon completion contact should be made with the regulator to achieve sign off of the works.

Geotechnical

Should loadings exceed those set out above then alternative founding solutions will need to be explored. Preliminary piling information is set out above should deep foundations be required.

Subject to regulatory requirements, the potential requirement exists to calculate bearing capacities and undertaken settlement analysis for foundations through production of a Geotechnical Design Report (GDR) which would provide calculations to current guidance, UK National Annex to EC7. Foundation design should be completed by a suitably qualified Structural Engineer, with specific consideration given to the variability in soil strengths.

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1 INTRODUCTION

1.1 Background

Omnia have been commissioned by SC Architecture to undertake a Phase I-II Geo-Environmental Investigation at the site of 182-184 Bitterne Road, Southampton, Hampshire, SO18 1BE to assist with the discharge of Condition 19 (Parts 1 and 2) of the planning application detailed below.

A site location plan is presented as Figure 1.0 within Appendix III.

1.2 Proposed Development

It is understood that a planning application has been submitted to Southampton City Council Reference 21/00412/FUL for the *'Erection of a part 3 part 4 storey building with roof terrace, for use as specialist supported accommodation comprising 5 no.1-bed flats within use class C3, with associated communal accommodation and staff office at ground floor level, bin store and parking, following demolition of the existing building'.*

As per the Decision Notice under the planning application, Condition 19 (Parts 1 and 2) must be addressed prior to development of the site. Condition 19 (Parts 1 and 2) is detailed below:

'19. Land Contamination investigation and remediation (Pre-Commencement & Occupation) Prior to the commencement of development approved by this planning permission (or such other date or stage in development as may be agreed in writing with the Local Planning Authority), a scheme to deal with the risks associated with contamination of the site shall be submitted to and approved by the Local Planning Authority. That scheme shall include all of the following phases, unless identified as unnecessary by the preceding phase and approved in writing by the Local Planning Authority:

1. A desk top study including; - historical and current sources of land contamination - results of a walk-over survey identifying any evidence of land contamination - identification of the potential contaminants associated with the above - an initial conceptual site model of the site indicating sources, pathways and receptors - a qualitative assessment of the likely risks - any requirements for exploratory investigations.

2. A report of the findings of an exploratory site investigation, characterising the site and allowing for potential risks (as identified in phase 1) to be assessed.'

The outline proposed site layout is presented as Figure 2.0 (Appendix III).

1.3 Objectives

The objectives of the Phase I-II Geo-Environmental Site Assessment are to:

- Undertake a site walkover and inspection, including interviews with site representatives if available;
- Review historical plans, site investigations, geology, hydrogeology, site sensitivity, floodplain issues, mining records and any local authority information available in order to complete a Desk Study in line with the Environment Agency (EA) document *Land Contamination Risk Management (LCRM);*
- Undertake an assessment of the near surface through intrusive site investigation;

- Assess the implications of any potential environmental risks, liabilities and development constraints associated with the site in relation to the future use of the site and in relation to off-site receptors; and,
- Provide a factual and interpretative report relating to the site and provide recommendations on any potential development issues with consideration of residential and environmental receptors.

1.4 Sources of Information

Background information was sought from the following sources:

- Groundsure Environmental Database Search (GS-9152418);
- Historical Ordnance Survey Mapping (1869 –2022);
- The British Geological Survey (BGS) map for the site (Southampton, Sheet 315, Solid and Drift Edition at a scale of 1: 50,000, 1987);
- Environment Agency flood designations, aquifer designations and groundwater source protection zones (https://magic.defra.gov.uk/MagicMap.aspx) [Accessed: 2022/11/29];
- Zetica UXO Risk Maps (https://zeticauxo.com/downloads-and-resources/risk-maps); [Accessed: 2022/11/29]
- British Standard BS10175:2011+A2:2017 – Investigation of Potentially Contaminated Sites – Code of Practice;
- British Standard BS5930:2015+A1:2020 – *Code of Practice for Ground Investigations;*
- British Standard BS1377-9:1990 Incorporating Amendment No. 1 – *Methods of Test for Soils for Civil Engineering Purposes – Part 9: In-situ Tests;*
- British Standard BS8485:2015+A1:2019 – *Code of Practice for the Design of Protective Measures for Methane and Carbon Dioxide Ground Gases for New Buildings;*
- CIRIA Publication C665 (2007). *Assessing Risks Posed by Hazardous Ground Gases to Buildings;*
- BRE DG365 (2016). *Soakaway Design;*
- BRE Special Digest 1 (2005). *Concrete in Aggressive Ground*;
- Tomlinson, M.J. (2001). *Foundation Design and Construction*. 7th Edition. Pearson Prentice;
- NHBC Standards (2019). Chapter 4.2 – *Building Near Trees* (2020); and,
- British Standard BS8004:2015 - *Code of Practice for Foundations.*

1.5 Limitations

The limitations of this report are presented in Appendix I.

1.6 Confidentiality

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

2 SITE SETTING

2.1 Site Details

Table 2-1 Site Details

Site Address	182-184 Bitterne Road West, Southampton, Hampshire, SO18 1BE
National Grid Reference	444035, 113297
Site Area	0.02ha

All acronyms used within this report are defined in the Glossary presented in Appendix II.

A site location plan is presented as Figure 1.0 (Appendix III).

2.2 Current Site Use

2.2.1 Site Description

The area of investigation is located within the borough of Bitterne which was situated approximately 2.50km north east of Southampton City Centre. The site was irregular in shape covering an area of 0.02ha. Access was from the south-western corner which exits onto Athelstan Road to the west.

At the time of the site walkover the site was accessed via a white metal gate with wheels, which was secured with a key padlock (Photograph 1). Tarmacadam pavement ran the around the boundary of the entire site boundary and was to be in good visual condition.

With the north and centre of the site was concrete (Photograph 2) which was noted to be in good condition. In the south of the site was soft landscaping, which had overgrown grass vegetation (Photograph 3). A manhole cover (Photograph 4) was noted with the south-eastern corner of the site, which was presumed to be drainage. Additionally, an electrical box (Photograph 5) with no lid was noted with the north-western corner.

Two (2no.) stockpiles were noted with the south-eastern corner of the site one of which contained approximately five (5no.) corrugated cement roof sheeting which are considered to have the potential contained asbestos, three (3no.) drawers, a baby bath, two (2no.) cardboard boxes, and a metal chair, with the stockpile approximately 2.00x2.00x1.00m in size (Photograph 6 and labelled as Stockpile 1 on Figure 2.1). The second contained a stockpile of wood approximately 1.00x1.00x1.00m in size (Photograph 7 and labelled as stockpile 2 on Figure 2.1).

Along the north-eastern boundary were a stockpile of two (2no.) fridges and a freezer, a door frame, and two (2no.) corrugated cement roof sheeting which are considered to have the potential (Photograph 8).

Along the northern boundary of the site was a window frame on the tarmacadam pavement.

Along the western boundary of the site was two (2no.) chapter 8 fence panels which were laid on the tarmacadam pavement.

The general topography of the site was flat.

The site boundary was noted to be surrounded on all sides by heavy duty plastic base metal security fencing which was noted to be in good condition, with the metal gate assessed from the southwestern corner of the site.

An annotated site location plan showing observations from the walk-over survey is presented as Figure 2.1 (Appendix III). Relevant photographs from the site walk-over survey are located in Appendix IV.

2.2.2 Hazardous Materials Storage

None recorded in the site walkover.

2.2.3 Potential Asbestos Containing Material (PACM)

A total of seven (7no.) corrugated cement sheets which are considered to have the potential to contain Asbestos were noted around site, presumably fly-tipped.

2.2.4 Waste Storage

Within the site multiple stockpiles of presumably fly-tipped waste were observed as set out below:

- Two (2no.) stockpiles were noted within the south-eastern corner of the site one (1no.) of which contained approximately five (5no.) corrugated cement sheets considered to have the potential to contain asbestos, three (3no.) draws, a baby bath, two (2no.) cardboard boxes, and a metal chair, this stockpile measuring approximately 2.00mx2.00mx1.00m (Photograph 6 and labelled as stockpile 1 on Figure 2.1). The second comprised a stockpile of wood approximately 1.00mx1.00mx1.00m in size(Photograph 7 and labelled as stockpile 2 on Figure 2.1).
- Along the north-eastern boundary was a stockpile comprising two (2no.) fridges and one (1no.) freezer, a door frame, and two (2no.) potentially asbestos containing corrugated cement roofing sheets.
- Along the northern boundary of the site was a window frame;
- Along the western boundary of the site was two (2no.) chapter 8 fences panels which were stacked on the tarmacadam pavement.

Given the disused nature of the site, it is considered likely that the above piles of waste are the result of fly-tipping.

2.2.5 Tree Species

No vegetation was present onsite other than overgrown grass within the soft landscaping in the south of the site.

2.2.6 Potential Invasive Species

None noted within the site walkover. However, it should be noted that the site walkover was conducted during autumn/winter months, and it is recommended that a further inspection is undertaken during the growing season.

2.3 Surrounding Area

The surrounding land uses are summarised in Table 2-2 below:

Table 2-2 Land Use

Direction	Land Use
North	Car Garage and residential housing with the Itchen River beyond
East	Commercial and residential properties
South	Residential properties and Itchen River beyond
West	Residential housing with petrol station and garages beyond

3 SITE HISTORY

3.1 Site History

A review of historical land use pertinent to the site and within a 250m radius is summarised in Table 3-1.

Table 3-1 Historical Land Use

Map Edition	Historical Land Use	
	On Site	Off Site
1869 (1:10,560) (1:2,500)	Undeveloped land.	Road running east to west 12m north. Railway line from 61m west with associated cuttings. Assumed watercourse situated approximately 80m north of site. Gravel pit 114m west. Railway Station denoted as Bitterne Station 145m northwest. Ordinary Tide Line marked approximately 150m southwest with marshy ground and tidal channels mapped.
1870 (1:2,500)	Partial Mapping. Only mapping from 150m southwest visible.	Partial Mapping. Only mapping from 150m southwest visible. No significant change in the southwest.
1871 (1:10,560)	No significant change.	No significant change
1896-1897 (1:10,560) (1:2,500)	No significant change.	Residential housing from 81m north. Gravel pit 114m west no longer present. “Mud” mapped from 150m southwest.
1908-1910 (1:10,560) (1:2,500)	Possible track running northwest to southeast through site.	Track indicated on a northwest-southeast aligned embankment extending from the site towards a small gravel pit approximately 500m southwest. Greenhouses 181m and 245m northeast, 208m north. Circular structure (assumed tank) located 250m north of the site, assumed to be associated with the nearby greenhouse. Increase in residential houses to the north.
1932-1933 (1:10,560)	Two (2no.) semi-detached buildings in the northern extent of the site.	Increase in residential development in all compass directions.

Map Edition	Historical Land Use	
	On Site	Off Site
(1:2,500)		Road denoted as Athelstan Road running northwest to southeast along the western boundary of the site. Allotment Gardens from 67m west.
1938-1940 (1:10,560) (1:2,500) 1941 (1:2,500)	No significant change.	No significant change
1948-1949 (1:1,250)	Glazed Roofed Building indicated adjacent to the northern boundary of the site.	Three (3no.) garages present 34m north of the site. Watercourse approximately 80m north depicted as flowing from east to west.
1950-1957 (1:10,560) (1:2,500)	No significant change.	Partial mapping, no mapping from 22m west. No significant change.
1960-1965 (1:10,560) (1:2,500)	Glazed Roofed Building no longer identified on 1964-1965 large scale mapping. No other significant change.	Greenhouse 57m north. Depot 68m and 190m northwest. Watercourse 80m north is no longer depicted (potentially culverted) and is now situated from 130m northeast. Only two (2no.) garages depicted north of the site. Greenhouses from 132m north and 190m northwest. Unspecified works 190m west and 219m southwest. Builders Yard 221m northwest
1966-1969 1966-1967 (1:2,500)	No Significant Change	Garage depicted approximately 250m west of the site.
1977-1983 (1:10,000) (1:1,250)	No significant change.	Allotment Gardens from 67m southwest now development in the south into residential housing. Depot 72m northwest now denoted as Warehouse. Electrical substation 78m southwest and 90m southwest.

Map Edition	Historical Land Use	
	On Site	Off Site
		Builder's Yard 145m northwest. Unspecified works 234m southwest. Tanks associated with Depot and Works 240m west.
1989-1993 (1:10,000) (1:1,250)	No significant change.	School 143m west.
1993-1994 (1:1,250)	No significant change.	No significant change.
2001 (1:10,000)	No significant change.	No significant change.
2003 (1:1,250)	No significant change.	No significant change.
2010 (1:10,000)	No significant change.	No significant change.
2022 (1:10,000)	No significant change.	No significant change.

A selection of historical maps are presented in Appendix V.

3.2 Historical Tank Database

The Groundsure Report identified three (3no.) records of historical tanks within 250m of the study site.

- 225m west – Unspecified Tank (1994);
- 236m west – Tank (1977-1979); and,
- 249m north – Unspecified Tank (1910).

It is considered that all three (3no.) tanks mentioned above, are those that were identified on historical mapping within Section 3.1.

Due to the direction from the site, the anticipated groundwater flow to the south and west of the site, the two identified tanks to the west are not considered to have the potential to impact the subject site and have therefore not been considered further.

3.3 Historical Energy Features Database

The Groundsure Report identified two (2no.) Historical energy features within a 250m radius of the subject site.

- 47m southwest – Electricity Substation (1977-1994); and,
- 77m southwest – Electricity Substation (1979-1994).

It is considered that both electricity substations mentioned above, are those that were identified on historical mapping within Section 3.1.

Due to the direction from the site, the anticipated groundwater flow to the south and west of the site and the low mobility of PCBs, the identified electricity sub stations are not considered to have the potential to impact the subject site and have therefore not been considered further.

3.4 Historic Garages and Petrol Stations

The Groundsure Report did not identify any historical petrol stations within a 250m radius of the site. Seven (7no.) records of garages have been identified within 250m, related to three (3no.) separate garages:

- 35-72m north and northeast – Garage (4no. records) – (1955-1967);
- 218m northwest – Garage (1no. record) - (1948); and,
- 244m west – Garage (1no. record) - (1964-1979).

It is considered that all three (3no.) garages mentioned above, are those that were identified on historical mapping within Section 3.1.

Due to the distance from site and the expected groundwater flow to the south and west, it is considered that the garages located 218m northwest and 244m west do not have the potential to impact the subject site and have therefore not been considered further.

3.5 Historic Industrial Land Uses

The Groundsure Report identified twenty- five (25no.) records of historical industrial land uses within 250m of the study site, upon further review these relate to seven (7no.) separate historical land uses.

The identified land uses are:

- 50-192m south – south and southwest – Cuttings (7 records) – (1896-1977);
- 106m west – Refuse Heap (1 record) - (1869);
- 134-174m northwest – Railways Station (8 records) (1896-1990);
- 161m west – Unspecified depot (2 records) (1983-1990);
- 166-176m northwest – Railway Sidings (4 records);
- 192m northwest – Railway Building (1 record) - (1968);
- 217m southwest – Unspecified works (2 records) (1977-1990).

Due to the distance from site, the expected groundwater flow (to the south and west), and the industrial use profiles listed, none of the above land uses are considered to have the potential to impact the subject site and have therefore not been considered further.

3.6 Planning History

A review of the online planning portal of Southampton City Council identified in excess of fifty (50no.) planning applications attributed to the site postcode.

Numerous applications relate to change of use from residential to commercial, consisting of takeaway shops, hairdressers etc, but the most pertinent planning applications associated with the development of the site are summarised in the sections below.

Planning Reference	E01/1672
Date	04/12/1985
Proposal	Provision of mot motorcycle testing area to existing motorcycle shop
Decision	Refused
Notes	Documents include multiple maps and a decision notice, application refused due to 'unneighbourly form of development'. No Contaminated land information noted.

Historic Planning Applications relating to the subject site:

Planning Reference	1482/E25
Date	25/10/1974
Proposal	Use as dental laboratory and repairs.
Decision	Approve with Conditions
Notes	Documents include a decision notice – no contaminated land conditions noted.

Planning Reference	1484/E26
Date	15/11/1974
Proposal	Use as betting shop.
Decision	Refused
Notes	Documents included a decision notice; application was refused due to 'undesirable business'.

3.7 Unexploded Ordnance Risk Assessment

A review of publicly available information (provided by Zetica UXO) shows the site as having a 'high risk' associated with bombing density and bomb risk, and UXO finds have been identified within a 500m radius.

The site is consequently considered **High Risk** with regards to unexploded ordnance.

Due to the site being of High UXO risk it is recommended that contact is made with a suitably qualified UXO specialist to assess the site in further detail prior to the commencement of any development works.

4 ENVIRONMENTAL SETTING

4.1 Geology and Hydrogeology

British Geological Survey Map (Southampton, Sheet 315, Solid and Drift Edition at a scale of 1: 50,000, 1987) indicates that the site is underlain by the following geological sequence:

Table 4-1 Geology

Geological Unit	Formation Name	Description	Aquifer Classification
Superficial	River Terrace Deposits	Sand & Gravel	Secondary A
Bedrock	London Clay Formation	Clay, Silt and Sand	Unproductive Strata

The Groundsure report records no data for Artificial and Made Ground on the proposed site. However, Made Ground was identified from 217m west of the site, which is considered to be related to land reclamation to form Tower Wharf and landing stages along the riverside identified on historical mapping dated 1932.

Review of the environmental database indicates that the site is not located within a groundwater Source Protection Zone. There are no active or historical water abstractions are located within 250m of the site. The closest active surface water abstraction is located 1622m southwest. There are no active or historical potable water abstractions are located within 250m of the site.

Groundwater vulnerability data indicates that the site is underlain by Bedrock of the London Clay Formation classified as Unproductive Strata, as well as a Secondary A Superficial Aquifer classified as having medium vulnerability.

Based on local topography and the location of surface watercourses it is considered that shallow groundwater within the superficial River Terrace Deposits, if present, will follow local topography and likely flow in a southerly or westerly direction towards the River Itchen.

4.1.1 Groundwater Flooding

The Groundsure report indicates that the majority of the site is at moderate risk of groundwater flooding. The southern boundary lies within an area that is classified as moderate to high. Land within 50m north and south of the site are classified as having a moderate to high risk.

4.2 Hydrology and Flooding

The Groundsure report identifies a number of inland watercourses to the north, south and west of the site. These are classified as inland rivers that are not influenced by normal tidal action with the closest being 44m north. It is considered these are all tributaries of the River Itchen.

The River Itchen is situated from 186m southwest, which is classified as a Tidal River. This is also known as ‘Southampton Water’ by the Water Framework Directive. This surface water body had a chemical rating of ‘fail’ and an ecological rating of ‘moderate’ with an overall rating of ‘moderate’ measured in 2019 by the Environment Agency.

The site is also located within the groundwater body for the Central Hants Bracklesham Group. This was noted as having chemical and ecological ratings of 'good', with an overall rating of 'good' measured in 2019 by the Environment Agency.

No surface water abstraction licences were identified on-site or within a 250m radius.

The site is at a negligible risk of surface water flooding. Within 50m of the site, there are small patches where there is a 1 in 250-year return period of a flood event at depths 0.1 – 0.3m.

The site is not designated as being within a Flood Zone as per the Environment Agency classifications. However, land 43m north is designated as Flood Zone 2, and land approximately 50m north is Flood Zone 3.

4.3 Geotechnical Data

Geotechnical Data presented within the Groundsure Report identifies the following potential ground hazards which are summarised in Table 4-2 below:

Table 4-2 Geotechnical Data

Hazard	Designation
Shrink-Swell Clay	Negligible – Ground conditions predominantly non-plastic.
Landslides	Very Low – Slope instability problems are not likely, but consideration should be given.
Ground Dissolution	Negligible – Soluble rocks are not thought to be present with the ground.
Compressible Ground	Negligible – Compressible strata are not thought to occur.
Collapsible Deposits	Very Low – Deposits with potential to collapse when loaded and saturated are unlikely to be present.
Running Sand	Very Low – Running sand conditions are unlikely.

4.4 Mining and Ground Workings

The site is not located within an area that is affected by coal mining and therefore no Coal Authority mining report was obtained for the purposes of this report.

However, the Groundsure report identified thirteen (13no.) records of other surface ground working activities within 250m of the site, which relate to two (2no.) features detailed below:

- 50-192m south to southwest – Cuttings (1869-1990) (12no. records);
- 106m west – Refused Heap (1869) (1no. record).

Additionally,, within the historical mapping (Section 3.1) a Gravel Pit 114m west was identified dating between 1869-1897.

Made Ground was also identified from 233m west of the subject site associated with historical works, which is classified as artificial deposits.

4.5 Radon Risk Potential

The site lies within an area where less than 1% of the properties are above the Action Level. At these levels BRE publication BR211 indicates that no special radon protective measures are required in the construction of new extensions or dwellings.

4.6 Current Industrial Land Uses

The Groundsure Report identified seventeen (17no.) current industrial land uses within a 250m radius of the subject site, detailed below:

- 12m south – Gas governor- *Not considered to present a significant risk to human health, due to this forming part of the present gas supply network and therefore subject to regular maintenance by a professional body;*
- 26-194m west to southeast – Crystal Clear (Industrial Products);- *Not considered to present a significant risk to human health, due to this commercial products of the industry referring to signage and fliers*
- 34m north – Telecommunication mast - *Not considered to present a significant risk to human health, due to this being regularly maintained by a professional body;*
- 47m north – Hand car wash – *Not considered to present a significant risk to human health due to the profile of this land use and the low likelihood of producing potentially harmful chemicals;*
- 52m west – Electrical substation - *Not considered to present a significant risk to human health, due to the distance and direction of the source, the anticipated groundwater flow to the south and west, and the low mobility of PCBs as discussed within Section 3.3;*
- 58m and 83m northeast – Vehicle repair services;
- 88m southwest – Electrical substation - *Not considered to present a significant risk to human health, due to the distance and direction of the source, the anticipated groundwater flow to the south and west, and the low mobility of PCBs as discussed within Section 3.3;*
- 145m east – Industrial coating and finishings businesses;
- 155m northwest – Bitterne Rail Station - *Not considered to present a significant risk to human health, due to the direction of the source and the anticipated groundwater flow to the south and west;*
- 182m southeast – Construction services - *Not considered to present a significant risk to human health, due to the distance and direction of the source, and the anticipated groundwater flow to the south and west;*
- 190m west – Petrol Station - *Not considered to present a significant risk to human health, due to the direction of the source and the anticipated groundwater flow to the south and west;*
- 196m west – Vehicle recovery services - *Not considered to present a significant risk to human health, due to the distance and direction of the source, and the anticipated groundwater flow to the south and west;*
- 210m northwest – Electrical Substation - *Not considered to present a significant risk to human health, due to the distance and direction of the source, the anticipated groundwater flow to the south and west, and the low mobility of PCBs as discussed within Section 3.3;*
- 220m west – Works - *Not considered to present a significant risk to human health, due to the distance and direction of the source, and the anticipated groundwater flow to the south and west;*
- 237m west – Works - *Not considered to present a significant risk to human health, due to the distance and direction of the source, and the anticipated groundwater flow to the south and west; and,*
- 247m west – Camping equipment business- *Not considered to present a significant risk to human health, due to the industry use profile, distance and direction of the source and the anticipated groundwater flow to the south and west.*

4.7 Sensitive Land Uses

The Groundsure report indicates that the site is located within a currently defined Nitrate Vulnerable Zone (NVZ) associated with the Hamble Estuary.

The Groundsure report identified the following sensitive land uses within a 250m radius of the site.

- 162m southwest - one (1no.) Site of Special Scientific Interest (SSSI);
- 162m southwest - one (1no.) conserved wetland site (Ramsar site);
- 162m southeast - one (1no.) Special Protection Areas (SPA); and,
- 162m southwest - one (1no.) Local Nature Reserve (LNR).

These all are associated with Lee-on-the-Solent to Itchen Estuary, The Solent and Southampton Water and Chessel Bay.

The site is also located within a SSSI Impact Risk Zone (On-site) relating to Chessel Bay.

4.7.1 Sites of Special Scientific Interest (SSSI) Impact Risk Zones

The Groundsure Report identified that the site is located within an SSSI Impact Risk Zone associated with Chessel Bay.

The Groundsure Report states that any residential developments with a total net gain in residential units will require consultation and it is recommended that contact should be made with a suitably qualified planning consultant for further information.

4.7.2 Nitrate Vulnerable Zone (NVZ)

The site lies within the Hamble Estuary Eutrophic Nitrate Vulnerable Zone and due to site lying within a SSSI Impact Risk Zone, the nutrient contents of all discharges, including those to the main sewer, need to be considered in combination for impacts on the surrounding area and Solent Water.

It is considered likely that a nitrate balance report will be required as part of the planning application to assess the potential risk posed from the proposed development on nitrates entering surrounding waters.

4.8 Site Sensitivity Assessment

Based on the information presented in the sections above, the site is considered as being located within a Low to Moderate sensitivity setting due to the following reasons:

- Underlying Secondary A Aquifer within superficial deposits with bedrock deposits classified as Unproductive Strata;
- Granular superficial deposits across the site, with underlying cohesive bedrock;
- Site located within a SSSI (Chessel Bay);
- Site is within a Nitrate Vulnerable Zone (NVZ);
- Designated areas of sensitive land use withing 250m (Ramsar, SPA, and LNR); and,
- Moderate to high groundwater flooding risk.

5 CONSULTATIONS

5.1 Contaminated Land Officer

Contact was made with Southampton City Council via email in November 2022 regarding whether the council were aware of any environmental issues pertaining to the site.

At the time of writing a response has yet to be received and should any environmentally pertinent information be received then it will be issued as an addendum to this report.

5.2 Landfill and Waste Treatment Sites

The Groundsure Report identified no records of historic or active landfill sites or historic waste treatment sites within 250m of the subject site, the closest record is 301m southwest.

The Groundsure Report identified no active or recently closed licensed waste sites within 250m of the site boundary.

5.3 Potentially Infilled Land

The Groundsure report identified no areas of infilled land within 250m of the site. However, a review of Section 4.4 indicates historical ground workings and a historical gravel pit that have the potential to have been infilled.

5.4 Regulatory Database

The following information has been obtained from a commercially available environmental database. The summary table (Table 5-1) only includes records not otherwise detailed in the report. Where more than two entries have been identified, the Table summarises the closest two entries to the site.

Table 5-1 - Summary of Groundsure Data

	0-249m	250-500m	Details
Sites Determined as Contaminated Land	0	0	N/A
Control of Major Accident Hazards (COMAH)	0	0	N/A
Regulated Explosive Sites	0	0	N/A
Hazardous substance storage/usage	0	0	N/A
Historical licensed Industrial Activities (IPC)	0	0	N/A
Licensed Industrial Activities (Part A(1))	0	0	N/A
Licensed Pollutant Release (Part A(2)/B)	0	3	259m west – Part B – Unloading of Petrol into Storage at Service Stations – No Enforcements Notified 335m west – Part B – Non-ferrous Metal Foundry Processes – No Enforcement Notified
Radioactive Substance Authorisations	0	0	N/A
Licensed discharges to controlled waters	0	8	245m southwest – Sewage storm/overflow discharges into Saline Estuary under Permit Number H01183 – revoked 31/03/2018

	0-249m	250-500m	Details
			302m east – Sewage storm/overflow discharges into River Midden under Permit Number A00981 – revoked 30/03/2018
Pollutant release to surface water (Red List)	0	0	N/A
Pollutant Release to public sewer	0	0	N/A
List 1 Dangerous Substances	0	0	N/A
List 2 Dangerous Substances	0	0	N/A
Pollution Incidents (EA/NRW)	5	5	31m west Dated: 24/06/2002 Specific Waste Materials (Household) Land Impact: Significant No impact to air or water 49m northeast Dated: 13/05/2016 Atmospheric Pollutants (Smoke and Chemical Odour) Land and Air Impact: Significant Water Impact: Minor
Pollution Inventory Substances	0	0	N/A
Pollution Inventory Waste Transfers	0	0	N/A
Pollution Inventory Radioactive Waste	0	0	N/A

6 CONCEPTUAL SITE MODEL (CSM)

6.1 Initial CSM

In accordance with Environment Agency, CLR 11 (2004) and BSI 10175 (Code of Practice for Investigation of Potentially Contaminated Land), Omnia Environmental Consulting have developed an initial CSM to identify potential contamination sources, migration pathways and receptors within the study area. A residential end use has been adopted given the proposed site development.

6.1.1 On-site Potential Sources

- Made Ground from historical development of the site; and,
- Current stockpiled waste on-site (including PACM).

6.1.2 Off-site Potential Sources

- From 34m north – Historical and Current Garages (1948- present);
- From 54m north - Historical Greenhouses (1908-1993)
- 58-83m northeast –Vehicle Repair Shop;
- 114m north – Historical Gravel Pit (1869-1879);
- 147m east – Current Industrial coating and finishing workshop; and,
- 249m north – Unspecified Tank (1910).

6.1.3 Potential Pathways

- Inhalation and ingestion of impacted soils and dusts;
- Dermal contact with impacted soils;
- Inhalation of vapours;
- Vertical and lateral migration; and,
- Migration of gas into confined spaces.
- Inhalation of asbestos fibres

6.1.4 Potential Receptors

- Future Site Users.
- Controlled Waters
    - Groundwater in underlying Secondary A Aquifer;
    - Surface Water in the Itchen River.

Construction workers are not considered to be a plausible receptor due to management of their exposure through the use of suitable PPE and hygienic working practices as required under HSE/CDM regulations. Furthermore, the length of any exposure is considered to be very short in comparison to the criteria for which the adopted end use has been derived.

An Initial Conceptual Site Model has been prepared for the site and is presented overleaf within Table 6-1.

Table 6-1 Initial Conceptual Site Model

Source	Contaminant	Potential Migration Pathway	Potential Receptors	Likelihood of Occurrence	Magnitude of Occurrence	Overall Risk Rating	Active/Inactive
On-Site Potential Sources							
Made Ground from historical development	Asbestos	Inhalation of fibres	Future site users	Moderate	Moderate	Moderate	**Potentially Active-** Further Investigation Required
	Metals (As, B, Cd, Cr, Pb, Hg, Se, Ni, Zn)	Dermal contact with Impacted soils and dust	Future Site Users	Moderate	Moderate	Moderate	
		Ingestion of Impacted soils and dust	Future Site Users	Moderate	Moderate	Moderate	
		Vertical & Lateral Migration	Controlled Waters	Low	Minor	Low	
	Ground Gas (CH_4 and CO_2)	Vertical and Lateral Migration into confined spaces	Future site users	Low	Severe	Moderate	
	Polycyclic Aromatic Hydrocarbons (PAH)	Dermal contact with Impacted soils and dust	Future Site Users	Moderate	Moderate	Moderate	
		Ingestion of Impacted soils and dust	Future Site Users	Moderate	Moderate	Moderate	
		Vertical & Lateral Migration	Controlled Waters	Low	Minor	Low	
	Total Petroleum Hydrocarbons (TPH)	Ingestion of Impacted soils and dust	Future Site Users	Moderate	Moderate	Moderate	
		Vertical & Lateral Migration	Controlled Waters	Moderate	Minor	Low/Moderate	
		Inhalation of Vapours	Future Site Users	Low	Moderate	Low/Moderate	
Stockpiles and waste currently on-site	Asbestos	Inhalation of fibres	Future site users	Moderate	Moderate	Moderate	**Potentially Active-** Further Investigation Required
	Metals (As, B, Cd, Cr, Pb, Hg, Se, Ni, Zn)	Dermal contact with Impacted soils and dust	Future Site Users	Moderate	Moderate	Moderate	
		Ingestion of Impacted soils and dust	Future Site Users	Moderate	Moderate	Moderate	
		Vertical & Lateral Migration	Controlled Waters	Low	Minor	Low	
	Total Petroleum Hydrocarbons (TPH)	Ingestion of Impacted soils and dust	Future Site Users	Moderate	Moderate	Moderate	
		Vertical & Lateral Migration	Controlled Waters	Moderate	Minor	Low/Moderate	

Source	Contaminant	Potential Migration Pathway	Potential Receptors	Likelihood of Occurrence	Magnitude of Occurrence	Overall Risk Rating	Active/Inactive
		Inhalation of Vapours	Future Site Users	Moderate	Moderate	Moderate	
Off-Site Potential Sources							
From 34m north – Historical and Current Garages (1948- present)	Polycyclic Aromatic Hydrocarbons (PAH)	Lateral Migration (Groundwater Flow)	Future Site Users	Low	Moderate	Low/Moderate	**Potentially Active-** Further Investigation Required
	Total Petroleum Hydrocarbons (TPH)	Lateral Migration (Groundwater Flow)	Future Site Users	Moderate	Moderate	Moderate	
	Metals (As, B, Cd, Cr, Pb, Hg, Se, Ni, Zn)	Lateral Migration (Airbourne Dust)	Future Site Users	Low	Moderate	Low/Moderate	
From 54m north - Historical Greenhouses (1908-1993)	Metals (As, B, Cd, Cr, Pb, Hg, Se, Ni, Zn)	Lateral Migration (Airbourne Dust)	Future Site Users	Low	Moderate	Low/Moderate	**Inactive-** Due to the distance and age of the sources from site, it is not considered to have the potential to pose significant harm to human health and therefore has not been considered further.
	Polycyclic Aromatic Hydrocarbons (PAH)	Lateral Migration (Groundwater Flow)	Future Site Users	Low	Moderate	Low/Moderate	
	Herbicides and Pesticides	Lateral Migration (Airbourne Dust)	Future Site Users	Low	Moderate	Low/Moderate	
		Lateral Migration (Groundwater Flow)	Future Site Users	Low	Moderate	Low/Moderate	
58-83m northeast – Current Vehicle Repair shop	Metals (As, B, Cd, Cr, Pb, Hg, Se, Ni, Zn)	Lateral Migration (Airbourne Dust)	Future Site Users	Low	Moderate	Low/Moderate	**Potentially Active-** Further Investigation Required
	Polycyclic Aromatic Hydrocarbons (PAH)	Lateral Migration (Groundwater Flow)	Future Site Users	Low	Moderate	Low/Moderate	
	Total Petroleum Hydrocarbons (TPH)	Lateral Migration (Groundwater Flow)	Future Site Users	Moderate	Moderate	Moderate	
114m north – Historical Gravel Pit (1869-1879)	Ground Gas (CH_4, CO_2)	Vertical and Lateral Migration into confined spaces	Future site users	Low	Severe	Moderate	**Inactive-** Due to the age of the source and distance from the site, it is likely that ground gas generation will have ceased

Source	Contaminant	Potential Migration Pathway	Potential Receptors	Likelihood of Occurrence	Magnitude of Occurrence	Overall Risk Rating	Active/Inactive
							and therefore this source is not considered to have the potential to pose a significant risk to human health.
147m east – Current Industrial coating and finishing workshop	Metals (As, B, Cd, Cr, Pb, Hg, Se, Ni, Zn)	Lateral Migration (Airbourne Dust)	Future Site Users	Very Low	Moderate	Low	**Potentially Active-** Further Investigation Required
	Polycyclic Aromatic Hydrocarbons (PAH)	Lateral Migration (Groundwater Flow)	Future Site Users	Very Low	Moderate	Low	
	Total Petroleum Hydrocarbons (TPH)	Lateral Migration (Groundwater Flow)	Future Site Users	Low	Moderate	Low/Moderate	
249m north – Unspecified Tank (1910)	Total Petroleum Hydrocarbons (TPH)	Lateral Migration (Groundwater Flow)	Future Site Users	Low	Moderate	Low/Moderate	**Inactive-** Due to the distance and age of the source from site, it is not considered to have the potential to pose significant harm to human health and therefore has not been considered further.

7 SITE INVESTIGATION

7.1 General

A ground investigation was designed based on your requirements and the proposed site development as shown in Figure 2.0 (Appendix III).

Following completion of the desk study and a review of the available data, ground investigation works were required on site to investigate the potential for impacted materials to be present on-site from identified on-site and nearby off-site potential sources.

Exploratory fieldwork was conducted over two (2no.) working days, commencing on 31st October 2022 and comprised the following:

Table 7-1 Site Investigation Summary

Potential Source/Rationale	Location Hole	Type	Maximum Depth (m bgl)	Borehole Response Zone (m bgl)
To investigate the depth and make-up of the Made Ground onsite from previous developments. To collect environmental and geotechnical samples to allow for the assessment of potential contamination and geotechnical characterisation of deeper soils. Target below to proposed footprint of the development to allow for in-situ SPT Testing to facilitate foundation designs.	CP101	Cable Percussion	13.50	N/A
Investigate the potential contamination from northern off-site sources, e.g., garages. Installation of ground gas monitoring wells for follow on gas monitoring to assess the ground gas regime on site. To collect environmental and geotechnical samples to allow for the assessment of potential contamination and geotechnical characterisation of deeper soils. Target below to proposed footprint of the development to allow for in-situ SPT Testing to facilitate foundation designs.	WS101	Window Sampling	2.00	1.00-1.80
Investigate the potential contamination from northern off-site	WS102		2.00	N/A

Potential Source/Rationale	Location Hole	Type	Maximum Depth (m bgl)	Borehole Response Zone (m bgl)
sources, e.g., garages. To collect environmental and geotechnical samples to allow for the assessment of potential contamination and geotechnical characterisation of deeper soils. Target below to proposed footprint of the development to allow for in-situ SPT Testing to facilitate foundation designs.				
To collect environmental and geotechnical samples to allow for the assessment of potential contamination and geotechnical characterisation of deeper soils. Target below to proposed footprint of the development to allow for in-situ SPT Testing to facilitate foundation designs. Installation of ground gas monitoring wells for follow on gas monitoring to assess the ground gas regime on site.	WS103		2.00	1.00-2.00
	WS104		2.00	1.00-2.00

Positions were limited to areas where no potentially asbestos containing materials were identified and therefore the southern corner of the site had no investigation due to the health and safety concern of the crew.

CP101 was terminated early, due to sands encountered at 12.00m bgl with the addition of water during drilling becoming running sands. SPT results were considered to be enough information to provide pile calculations by Omnia.

The exploratory hole locations are illustrated on Figure 3.0 (Appendix III). The ground conditions encountered are indicated on the exploratory hole logs, which are provided in Appendix VI.

7.2 Laboratory Analysis

Selected soil samples were submitted for a range of chemical analysis including:

- CLEA Metals;
- Asbestos fibres in soil;
- Speciated Polycyclic Aromatic Hydrocarbons (PAHs);
- Banded Total Petroleum Hydrocarbons (TPHs);
- Total Cyanide;
- Total Organic Carbon;
- pH; and,
- Phenols.

Element Materials Technology of Deeside undertook the analytical work in accordance with UKAS accreditation where applicable and the laboratory analysis certificates are presented as Appendix VII and discussed in Section 9.

Selected soil samples were submitted to I2 Analytical for a range of geotechnical testing, in accordance with UKAS methodology where applicable, comprising:

- Moisture content;
- pH;
- Water Soluble Sulphate;
- Atterberg 4-point Limit;
- Particle Size Distribution (Wet Sieve); and,
- Unconsolidated Undrained Shear Strength.

The geotechnical analysis certificates are presented in Appendix IX.

7.3 Ground Gas and Groundwater Monitoring

Concentrations of methane (CH_4), carbon dioxide (CO_2) and oxygen (O_2) were measured using an infrared gas analyser (GA5000), calibrated to a reference standard (before and after each survey) and gas flow rates were measured using an internal flow pod.

Gas concentrations were recorded at thirty second intervals until gas concentrations stabilised for three (3no.) consecutive readings (a minimum of ninety seconds) at each location, at which point the maximum concentrations of CH_4 and CO_2, together with the lowest concentration of O_2 were recorded.

Groundwater monitoring was undertaken using an electronic dip tape to record the depth to groundwater. Ground gas and groundwater results are presented in Section 8.3.2 and discussed in Section 9.3.

8 GROUND AND GROUNDWATER CONDITIONS

8.1 Summary of Ground Conditions

British Geological Survey (BGS) map for the site (Southampton, Sheet 315, Solid and Drift Edition at a scale of 1: 50,000, 1987) indicates that the superficial geology on-site comprises River Terrace Deposits of sand and gravel across the site. Bedrock Deposits are recorded as the London Clay Formation across the entire site.

Geology encountered on site generally corresponds with that highlighted within BGS Mapping and the findings have been outlined below.

8.1.1 Made Ground

Made Ground was identified within all locations (WS101-WS104 and CP101) to a maximum depth of 1.00m bgl within WS104.

The Made Ground was found to comprise yellowish brown concrete within CP101, WS101-WS102, where the hardstanding Made Ground ranged from 0.15-0.25m bgl.

Made Ground was also identified within the soft landscaping areas of the site ranging between 0.30 (WS103) and 1.00m bgl (WS104) comprising brown clayey sandy fine to coarse subangular to subrounded GRAVEL of flint and brick. Sand was fine to coarse.

The base of the Made Ground was proven within all intrusive locations.

8.1.2 Superficial Deposits

8.1.2.1 River Terrace Deposits

Superficial deposits of the River Terrace Deposits were identified within all intrusive locations. The thickness of superficial deposits ranged from 1.00m (WS103) to 4.85m (CP101). Please note the base of the superficial deposits was not proven within WS101-WS104.

The superficial deposits were generally found to comprise orangish brown slightly clayey gravelly SAND, SAND & GRAVEL, or slightly gravelly sandy CLAY with low cobble content. Sand was fine to coarse. Gravel was fine to coarse subangular to rounded flint. Cobbles were subangular to rounded flint.

8.1.3 Bedrock Deposits

8.1.3.1 London Clay Formation

The London Clay Formation was identified within CP101 only and was present to the base of the bore at a depth of 13.50mbgl. The base of the London Clay Formation Bedrock was not proven during this intrusive investigation.

The bedrock deposits were typically encountered as firm bluish grey, slightly sandy CLAY. Sand was fine. From 12.00m bgl the recovery was described as dark grey clayey fine to coarse SAND.

8.1.4 Groundwater Conditions

No groundwater strikes were encountered during intrusive works. However, over the monitoring periods Groundwater was identified within WS103 and WS104 between 0.78-1.60m bgl.

8.2 Laboratory Classification Analysis

Soil classification testing, including Atterberg Limits, Moisture Content, Particle Size Distribution, pH and Sulphate, Unconsolidated Shear Strength results are summarised in Table 8-1– Table 8-7 analysis certificates presented in Appendix VIII.

8.2.1 Soil Plasticity

Three (3no.) samples taken from cohesive deposits across the site were submitted to the laboratory for laboratory plasticity analysis. The results of this analysis have been summarised in Table 8-1 below.

Table 8-1. Summary of Soil Plasticity

Location	Depth (m bgl)	Geology	Natural Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Percentage passing 425µm sieve (%)	Modified Plasticity Index	Plasticity	Volume Change Potential
CP101	5.50-6.00	LCF	34	55	23	32	89	28.48	High	Medium
CP101	11.00	LCF	25	40	19	21	99	20.79	Medium	Medium
WS103	1.50-1.60	RTD	22	35	16	19	99	18.81	Medium	Low

**LCF = London Clay Formation; RTD = River Terrace Deposits*

The results presented in Table 8-1 indicate that the plasticity of the River Terrace Deposits is Medium, and the volume change potential Low.

The plasticity of the London Clay Formation ranges between Medium and High and the volume change potential is Medium.

8.2.2 Particle Size Distribution Analysis

One (1no.) soil sample was submitted to the laboratory for Particle Size Distribution (PSD) analysis, with the results presented below in Table 8-2. The result is consistent with the on-site observations and descriptions.

Table 8-2. Summary of Particle Size Distribution

Location	Depth (m bgl)	Granulometric Composition (%)				
		Laboratory Description	Fines (<0.063mm)	Sand	Gravel	Cobbles
WS101	0.50-1.00	Brown sandy clayey GRAVEL	11	24	65	0

8.2.3 Moisture Content

Five (5no.) samples taken from deposits across the site were submitted to the laboratory for moisture content analysis. The results of this analysis have been summarised in Table 8-3 below.

Table 8-3. Summary of Moisture Content

Location	Depth (m bgl)	Natural Moisture Content (%)	Lab Description
CP101	5.50-6.00	26	Brown clay
	10.50-10.95	16	Brown clay with gravel
	11.00	17	Brown clay and sand
WS101	0.50-1.00	8.6	Brown silt with gravel
WS103	1.50-1.60	14	Brown clay, sand and gravel

8.2.4 pH and Sulphate

Chemical analysis for pH and soluble sulphate content are summarised in Table 8-4 below with analysis certificates presented as Appendix VII and IX.

Table 8-4. Summary of pH and Sulphate Data

Location	Depth (m bgl)	SO_4 in 2:1 water / soil (mg/l)	pH Value
Made Ground			
WS103	0.00-0.30	38.6	8.12
WS104	0.30-0.60	3.4	8.03
River Terrace Deposits			
CP101	0.30-0.60	64.4	7.13
WS101	0.30-0.60	21.5	7.65
	0.50-1.00	22	7.8
	0.60-1.00	21.5	7.65
WS103	1.50-1.60	16	7.8
London Clay Formation			
CP101	5.50-6.00	340	7.7
	6.00	692	7.2
	10.50-10.95	230	8.3
	11.00	290	7.4

River Terrace Deposits

Due to the size of the dataset (<5 samples), characteristic pH and SO_4 values were calculated using the highest sulphate result and the lowest pH value as stated in the BRE Special Digest (2005), producing a site characteristic value for sulphate of 22 mg/l and a pH value of 7.65.

This therefore classifies the site as DS-1, Aggressive Chemical Environment for Concrete Classification (ACEC) AC-1 for brownfield locations.

London Clay Formation

Due to the size of the dataset (<5 samples), characteristic pH and SO_4 values were calculated using the highest sulphate result and the lowest pH value as stated in the BRE Special Digest (2005), producing a site characteristic value for sulphate of 692 mg/l and a pH value of 7.2.

No Pyrite was identified within the London Clay Formation during the site investigation; however, the London Clay is known to be a sulphate and sulphide bearing bedrock strata. Therefore, to be conservative a pyritic pH and soluble sulphate content suite has been undertaken within one (1no.) sample as detailed in Table 8-5 below.

Table 8-5 Summary of BRE SD1 Suite Results

Location	Depth (m bgl)	pH Value	Water Soluble SO_4 (mg/l)	Acid Soluble Sulphate (%)	Total Sulphur (%)	Total Potential Sulphate (%)	Oxidisable Sulphates (%)
CP101	6.00	7.2	692	0.11	0.886	2.658	2.548

With reference to Table 8-4 the London Clay tested from depths of 5.50 – 11.00m bgL is classified as DS-2, Aggressive Chemical Environment for Concrete Classification (ACEC) AC-2 based on the characteristic pH and soluble sulphate content, in accordance with the recommendations provided in Table C1 of BRE Special Digest 1 (2005).

With reference to Table 8-5 and BRE SD1 (2005) it can be seen that the calculated Oxidisable Sulphate value exceeds 0.3% indicating that Pyrite is likely present within the sample, with the calculated Total Potential Sulphate value of 2.658% suggesting a Design Sulphate Class of DS-5.

However, as the initial water soluble SO_4 concentrations results in a Sulphate Class of DS2 the London Clay Formation can be classified as DS-4, Aggressive Chemical Environment for Concrete Classification (ACEC) AC-4, as set out in BRE SD1 (2005), the classification based on Total Potential Sulphate is typically highly conservative together with the fact that not all of the Pyrite present will be oxidised and only a part will be taken into solution by groundwater.

Therefore, it is considered likely that the London Clay Formation present beneath the site has the potential to be classified as DS-4, Aggressive Chemical Environment for Concrete Classification (ACEC) AC-4. However, it should be noted this assessment is based on one sample.

As set out in Section 11.4, it is considered likely that shallow founding within the underlying superficial deposits will be achievable and as such, the concrete classification at an anticipated founding depth of 1.00m bgl will be **DS1 AC-1**. However, should deepening of foundations be required into the underlying London Clay Formation then consideration should be given to elevating the concrete classification to **DS-4 AC-4**, as per the summary table below.

Table 8-6 Summary of Concrete Classification within London Clay Formation

Geology	Depth (m bgl)*	Design Sulphate Class	Aggressive Chemical Environment for Concrete (ACEC)
Superficial Deposits	1.00 – 5.00	DS-1	AC-1
London Clay Formation	5.00– 13.50	DS-4	AC-4

*Approximate depths for concrete classification – minimum and maximum depths provided.

8.2.5 Undrained Shear Strength

One (1no.) sample was scheduled to undergo laboratory unconsolidated undrained triaxial compression testing (UUT). The results are presented within Appendix IX and summarised in Table 8-7 below.

Table 8-7 - Summary of Triaxial Compression Testing Results.

Location	Depth (m bgl)	Geology Member	Bulk Density (Mg/m^2)	Moisture Content (%)	Dry Density (Mg/m^3)	Undrained Shear Strength (kPa)	Mode of Failure
CP101	10.50-10.95	LCF	0.12	21	0.10	181	Compound

** LCF = London Clay Formation*

8.3 In-Situ Testing

8.3.1 Standard Penetration Tests (SPT)

Standard Penetration Tests (SPT) were carried out in all windowless sampling and cable percussive boreholes in accordance with techniques outlined in BS1377, to assess the strength/density of the underlying strata. The 'N' value (number of blows per 300mm penetration) was recorded for each test. The results of these in-situ tests, including full blow counts, are presented on the borehole logs within Appendix VI.

8.3.2 Ground Gas

Three (3no.) ground gas and groundwater monitoring visits have been undertaken across three (3no.) monitoring wells at the site between 17/11/2022 and 01/12/2022. The results of the gas and groundwater monitoring are presented in Table 8-8 overleaf.

Table 8-8. Summary of Ground Gas and Groundwater Monitoring Results

Well	Date	CH_4 Peak %v/v	CH_4 Steady %v/v	CH_4 GSV l/hr	CO_2 Peak %v/v	CO_2 Steady %v/v	CO_2 GSV l/hr	O_2 %v/v	Atmos (mb)	Atmos. Dynamic	Flow (l/hr)	Depth to Base (m bgl)	Depth to Water (m bgl)
WS101	17/11/2022	<0.1	<0.1	0.0004	<0.1	<0.1	0.0004	19.2	988	Rising	0.4	1.80	Dry
	22/11/2022	0.3	0.3	0.0003	1.2	1.2	0.0012	20.1	990	Steady	0.1	1.78	Dry
	01/12/2022	<0.1	<0.1	0.0002	0.9	0.9	0.0018	20.6	1029	Rising	0.2	1.70	Dry
WS103	17/11/2022	<0.1	<0.1	0.0003	<0.1	<0.1	0.0003	19.6	988	Rising	0.3	1.70	1.60
	22/11/2022	0.2	0.2	0.0004	0.7	0.7	0.0014	19.8	990	Steady	0.2	1.65	1.53
	01/12/2022	0.2	0.2	0.0004	0.9	0.9	0.0036	20.3	1029	Rising	0.4	1.57	1.55
WS104	17/11/2022	<0.1	<0.1	0.0003	<0.1	<0.1	0.0003	18.0	988	Rising	0.3	1.75	1.00
	22/11/2022	0.2	0.2	0.0006	0.9	0.9	0.0027	20.3	990	Steady	0.3	1.76	1.08
	01/12/2022	<0.1	<0.1	0.0003	1.0	1.0	0.003	22.0	1023	Rising	0.3	1.69	0.78

9 TIER 1 QUALITATIVE CONTAMINATED LAND RISK ASSESSMENT

Omnia has undertaken a Tier 1 qualitative risk assessment to determine if any potential contaminants within the underlying soils pose an unacceptable level of risk to the identified receptors.

9.1 Human Health Risk Assessment

At a Tier 1 stage the long term (chronic) human health toxicity of the soil has been assessed by comparing the on-site concentrations of organic and inorganic compounds with reference values published by the EA (Contaminated Land Exposure Assessment (CLEA) Soil Guideline Values (SGV)) and where absent, Generic Assessment Criteria (GACs) published by LQM/CIEH Suitable for Use Levels (S4UL) 2015. Based on the proposed development comprising 'Erection of a part 3-, part 4-storey building with roof terrace, for use as specialist supported accommodation comprising 5 no.1-bed flats within use class C3, with associated communal accommodation and staff office at ground floor level, bin store and parking, following demolition of the existing building', Omnia has adopted screening values for a residential end use with home grown produce to be conservative. The origin of the GAC values are presented within Appendix VIII.

The results of this comparison have been summarised within Table 9-1.

Table 9-1. Summary of Inorganic and Hydrocarbon Toxicity Assessment for a Residential End Use with Home Grown Produce

Determinant	Units	GAC	n	MC	Loc. of Ex	Pathway	Assessment
Inorganics							
Metals							
Arsenic	mg/kg	37	4	16.2	N/A	1	No Further Action
Beryllium	mg/kg	1.7	4	1	N/A	1	No Further Action
Boron	mg/kg	290	4	0.8	N/A	1	No Further Action
Cadmium	mg/kg	11	4	<0.1	N/A	2	No Further Action
Chromium (III)	mg/kg	910	4	83.8	N/A	1	No Further Action
Chromium (VI)	mg/kg	6	4	<0.3	N/A	2	No Further Action
Copper	mg/kg	2,400	4	22	N/A	2	No Further Action
Lead	mg/kg	200	4	191	N/A	1	No Further Action
Mercury	mg/kg	40	4	0.4	N/A	1	No Further Action
Nickel	mg/kg	180	4	13.3	N/A	1,2	No Further Action
Selenium	mg/kg	250	4	<1	N/A	1,2	No Further Action
Vanadium	mg/kg	410	4	36	N/A	2	No Further Action
Zinc	mg/kg	3,700	4	84	N/A	2	No Further Action
General Inorganics							
Asbestos	%	0.001 Chrysotile	4	NAD	N/A	5	No Further Action
Total Cyanide *	mg/kg	50	4	<0.5	N/A	1	No Further Action
Organics							
General Organics							
Phenol	mg/kg	280	4	<0.5	N/A	2	No Further Action
PAH							
Naphthalene	mg/kg	2.3	4	0.05	N/A	2	No Further Action
Acenaphthylene	mg/kg	170	4	0.2	N/A	2	No Further Action
Acenaphthene	mg/kg	210	4	<0.05	N/A	2	No Further Action
Fluorene	mg/kg	170	4	0.13	N/A	2	No Further Action
Phenanthrene	mg/kg	95	4	0.68	N/A	2	No Further Action
Anthracene	mg/kg	2,400	4	0.19	N/A	2	No Further Action

Determinant	Units	GAC	n	MC	Loc. of Ex	Pathway	Assessment
Fluoranthene	mg/kg	280	4	1.15	N/A	1,2	No Further Action
Pyrene	mg/kg	620	4	1.03	N/A	1,2	No Further Action
Benzo(a)Anthracene	mg/kg	7.2	4	0.64	N/A	1	No Further Action
Chrysene	mg/kg	15	4	0.92	N/A	1	No Further Action
Benzo(b)Fluoranthene	mg/kg	2.6	4	1.2	N/A	1	No Further Action
Benzo(k)Fluoranthene	mg/kg	77	4	0.47	N/A	1	No Further Action
Benzo(a)Pyrene	mg/kg	2.2	4	0.85	N/A	1	No Further Action
Indeno(123-cd)Pyrene	mg/kg	27	4	0.73	N/A	1	No Further Action
Dibenzo(a,h)Anthracene	mg/kg	0.24	4	0.09	N/A	1	No Further Action
Benzo(ghi)Perylene	mg/kg	320	4	0.63	N/A	1	No Further Action
Banded TPH							
TPH EC 5-6**	mg/kg	42	4	1.2	N/A	4	No Further Action
TPH EC >6-8**	mg/kg	100	4	1.2	N/A	4	No Further Action
TPH EC >8-10**	mg/kg	27	4	<5	N/A	4	No Further Action
TPH EC> 10-12**	mg/kg	74	4	<10	N/A	2	No Further Action
TPH EC> 12-16**	mg/kg	140	4	<10	N/A	2	No Further Action
TPH EC> 16-21**	mg/kg	260	4	16	N/A	1	No Further Action
TPH EC> 21-35**	mg/kg	1,100	4	100	N/A	1	No Further Action
TPH EC> 35-44**	mg/kg	1,100	4	<10	N/A	1	No Further Action

Notes
Main Exposure Pathways: 1 = Ingestion of Soil & Indoor Dust, 2 = Consumption of Homegrown Produce & Attached Soil; 3 = Dermal Contact (Indoor & Outdoor); 4 = Inhalation of Vapour (Indoor & Outdoor); 5 = Inhalation of Dust (Indoor & Outdoor), 6 = Inhalation of Fibres

Abbreviations: GAC = General Assessment Criteria, n = number of samples, MC = Maximum Concentration; Loc of Ex = Location of Exceedance.
Total cyanide Tier 1 GAC is taken from the Dutch Intervention Value (2010) for complex cyanide.

** The Tier 1 GAC for the banded hydrocarbon fraction is derived from the CIEH/S4UL assessment for petroleum hydrocarbons Criteria Working Group (CWG) for both aliphatic and aromatic compounds. Omnia has utilised the lowest of the aliphatic and aromatic chain lengths in order to adopt a conservative approach, which is considered satisfactory for the protection of human health.

(sol) – GAC presented exceeds the solubility saturation limit.
(vap) – GAC presented exceeds the vapour saturation limit.

Referring to Table 9-1 above, the result of this direct comparison indicates that there have been no exceedances of adopted Tier 1 screening criteria.

9.2 Controlled Waters Assessment

The site is considered to present a low risk to controlled waters for the following reasons:

- No identification of significantly elevated concentrations or exceedances of mobile contaminants were identified, with all Tier 1 values passing the most conservative screening values;
- No Groundwater abstraction licences within 250m of the site;
- No potable water supply abstractions within 250m of the site;
- Subject site not within a Source Protection Zone;
- Building footprint covers majority of the site and therefore prevent infiltration
- Groundwater identified within the ground gas monitoring visits.

- Underlying Secondary A Aquifer within superficial deposits and Unproductive Strata within the bedrock deposits
- Granular superficial deposits across the site, with underlying cohesive bedrock.
- Site located within a SSSI (Chessel Bay)
- The site located within river and coastal Flood Zone 2.
- Designated areas of sensitive land use withing 250m (Ramsar, SPA, and LNR)
- Moderate groundwater flooding risk.

Given the above factors and the ground conditions encountered we do not consider that the proposed development will result in a risk to controlled waters.

9.3 Ground Gas Assessment

The potential impact on the development from ground gases has been assessed with reference to standards and guidelines published in CIRIA Report C665 (*Assessing risks posed by hazardous ground gases to buildings*, 2007). However, it is recommended that the full ground gas assessment and any recommended protection measures are agreed with the local authority prior to the adoption of any protection measures on-site. Furthermore, the installation of any gas protection measures should be validated by a suitably qualified engineer.

The results of the ground gas monitoring and calculated Gas Screening Values (GSVs) are presented in Table 8-8.

Three (3no.) ground gas monitoring visits have been undertaken at locations WS101, WS103 and WS104. CH_4 concentrations were recorded to a maximum concentration of 0.3% v/v at location WS101. CO_2 concentrations were recorded to a maximum of 1.2% v/v at location WS101. Ground gas flow rates were recorded across the site, with a maximum flow rate of 0.4l/hr recorded at WS101 and WS103.

In accordance with the methodology outlined within the CIRIA publication C665, Omnia have utilised the results of the ground gas monitoring surveys to calculate a tentative Gas Screening Value (GSV). The maximum GSV calculated for methane was 0.0012l/hr whilst the maximum GSV for carbon dioxide was 0.0048l/hr.

It is understood that the proposed development is for a residential end use through the construction of a part 3-, part 4-storey building with roof terrace, for use as specialist supported accommodation comprising 5 no.1-bed flats within use class C3, with associated communal accommodation and staff office at ground floor level, bin store and parking, following demolition of the existing building.

Therefore, the proposed development is composed of high-rise residential dwellings assessed under a managed apartment building with central building management assessed under BS8485(2015)+A1(2019) classed as a **Type B** building.

9.3.1 BS 8485:2015 – Type B building- Private Ownership with Central Building Management

Guidance set out in BS 8485(2015)+A1(2019), which is equivalent to the Characteristic Situations of the modified Wilson & Card classification established in CIRIA Publication C665, stipulates a site characteristic GSV of <0.07 l/hr, with typical permissible concentrations of 1%v/v (CH_4) and 5% v/v (CO_2), for classification as Characteristic Situation 1 (CS-1); a very low hazard potential.

The maximum recorded CH_4 and CO_2 concentrations of 0.3% v/v and 1.2% v/v respectively fall below the typical permissible concentrations of 1% (CH4) and 5% (CO2) for classification as CS-1. The maximum GSV guidance value of <0.07l/hr was also not exceeded for both CH_4 (0.0.0012l/hr) and CO_2 (0.0048l/hr).

Given that the typical permissible concentrations of CH_4 and CO_2 and the guidance GSV values for CH_4 and CO_2 have fallen below both, a Characteristic Situation 1 (CS-1) classification is adopted for the site.

Classification as CS-1 would not require the installation of ground gas protection measures within any new buildings constructed.

10 REVISED CONCEPTUAL SITE MODEL

Following completion of the Tier 1 risk assessment no active pollution pathways have been identified based on a residential with homegrown produce end use.

11 GEOTECHNICAL ASSESSMENT

11.1 Proposed Development

'Erection of a part 3-, part 4-storey building with roof terrace, for use as specialist supported accommodation comprising 5no. 1-bed flats within use class C3, with associated communal accommodation and staff office at ground floor level, bin store and parking, following demolition of the existing building'

11.2 Site Preparation

The site should be cleared of any vegetation below the areas of proposed development and stripped in accordance with Series 200 of Specification of Highway Works.

Any roots present below the footprint of proposed structures and infrastructure should be grubbed out and the resulting voids in-filled with suitable compacted material. This should also be undertaken for any redundant or re-routed services.

11.3 Ground Profile

Based on the findings on the current ground investigation, ground conditions at the site comprise Made Ground overlying superficial deposits of River Terrace Deposits, further underlain by bedrock attributed to London Clay Formation to the full depth of the ground investigation, discussed in 8.1. Site ground conditions are summarised in Table 11-1.

Table 11-1 Summary of site ground conditions

Borehole	Made Ground Thickness (m)	Superficial Deposits	Bedrock	Groundwater (m bgl)
		River Terrace Deposits Thickness (m)	London Clay Formation Thickness (m)	
CP101	0.15	4.85	8.50	-
WS101	0.25	1.75	-	-
WS102	0.20	1.80	-	-
WS103	0.30	1.70	-	-
WS104	1.00	1.00	-	-

11.4 Shallow Foundations

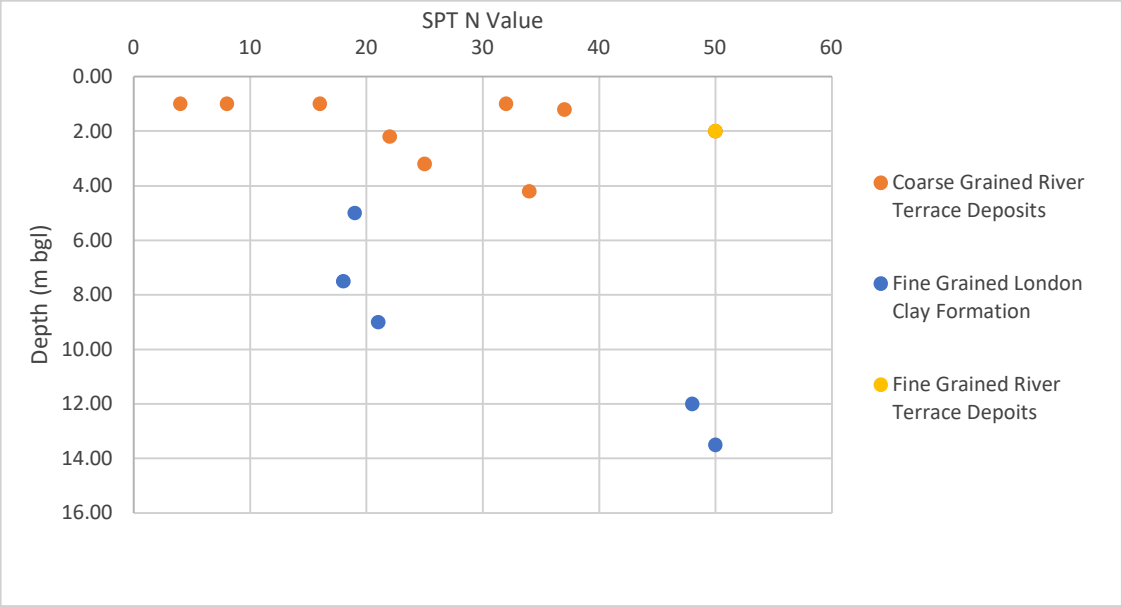
The following geotechnical assessment has been undertaken based on in-situ testing, laboratory analysis, and descriptions on the underlying geology. Foundation depths presented are indicative only based on a minimum presumed bearing value for a particular foundation type. Line loadings have not been made available such that the final depth and type of foundation required following design could vary.

It is considered that Made Ground would not form a suitable founding stratum due to characteristic variability and the associated potential for differential settlement. As such it is recommended that loads are transferred through the Made Ground to a depth at which competent geology, sufficient to support the proposed load, is encountered.

11.4.1 In Situ-Testing

Standard Penetration Testing was undertaken throughout the coarse-grained River Terrace Deposits and the fine- grained London Clay Formation. The results are presented in Graph 11-1 below:

Graph 11-1 SPT vs Depth



The SPT data shows an increase in N-value with depth from N=4 at 1.20mg to N>50 at 2.00mbgl for the River Terrace Deposits.

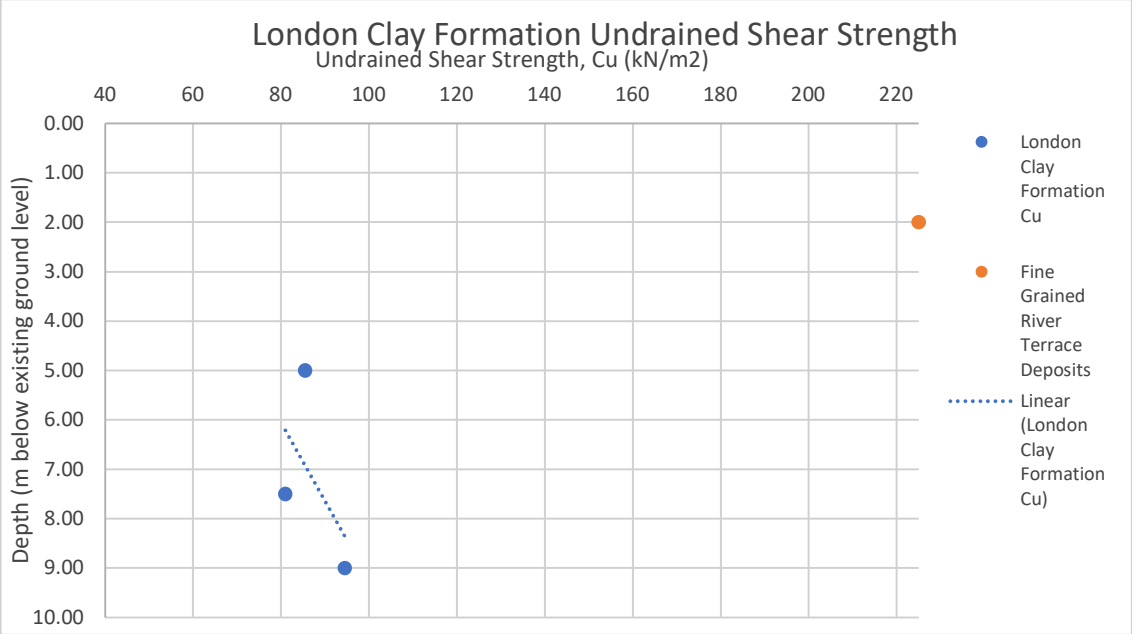
11.4.2 Shear Strength

The undrained Shear Strength of the fine-grained London Clay Formation have been determined by using the widely accepted empirical relationship, where f_1 is based on the correlation factor based on the plasticity index of the soil (Stroud, 1974):

$$C_u = f_1 \times SPTN$$

Using a correlation factor of 4.5 gives characteristic undrained shear strengths (C_{uk}) of 225kN/m² at 2.00m bgl, 85kN/m^2 at 5.00m bgl rising to 94.5kN/m^2 at a depth of 9.00m bgl, represented in Graph 11-2 below. These values are consistent with the formation becoming medium strength material.

Graph 11-2 Shear Strength vs Depth



11.4.3 Bearing Capacities

11.4.3.1 River Terrace Deposits

Indicative Bearing Capacity at 1.00m bgl

At a depth of 1.00m bgl within the coarse-grained soils of the River Terrace Deposits, SPT N values recorded as N=4 and N=8, indicating loose material with the southern part of the site (WS103-WS104). It is considered a traditional strip foundation of 1.00m width at a depth 1.00m bgl provides a presumed bearing capacity of approximately 50-150kN/m^2 for the south of the site.

Medium to dense sands were encountered in the north of the site (CP101, WS101-WS102), providing SPT N values of N=16 – N=37. It is considered a traditional strip foundation of 1.00m width at a depth 1.00m bgl provides a presumed bearing capacity of approximately 150-500kN/m^2 in the north of the site.

Indicative Bearing Capacity at 2.00m bgl

At a depth of 2.00m bgl within the coarse-grained soils of the River Terrace Deposits, SPT N values range of N=22-N>50, indicating medium strength material with the central part of the site (CP101) and Very dense material within the northern and southern parts of the site. It is considered a traditional strip foundation of 1.00m width at a depth 2.00m bgl provides a presumed bearing capacity of approximately 150-500kN/m^2 across the site.

At a depth of 2.00m bgl within the fine-grained soils of the River Terrace Deposits, SPT N value of N=50, indicating high strength material with the northeastern part of the site (WS101). It is considered a traditional strip foundation of 1.00m width at a depth 2.00m bgl provides a presumed bearing capacity of approximately 100-200kN/m^2 across the site.

11.5 Deep Foundations

Where bearing capacities are considered insufficient for larger structures, piled foundations could be considered. Depending on foundation column load requirements, a choice of pile lengths and diameters can be designed to bear into the London Clay Formation. The proven ground conditions would indicate that continuous flight auger (CFA) piles could be employed to provide a suitable foundation solution although this is for discussion purposes only. Where groundwater and/or unstable ground conditions are encountered, casing should be considered for CFA piles.

The competency of the soil profile used for the preceding calculations is based on in-situ testing, principally SPT's, and where applicable laboratory testing.

In order to provide indicative single working pile capacities a series of calculations, based on the total end-bearing capacity value and the sum of shaft capacities across varying strata (consisting of a base and shaft component), have been undertaken.

Table 11-2 Summary of pile foundation bearing capacities.

Pile Length (m)	Pile Type and Diameter		
	0.30m CFA	0.45m CFA	0.60m CFA
	Axial Pile Capacity (kN)	Axial Pile Capacity (kN)	Axial Pile Capacity (kN)
	Total	Total	Total
6.00	134	236	361
8.00	253	414	598
10.00	371	592	835

It is recommended that the advice of a specialist foundation contractor is sought to further discuss proposed pile layout and confirm capacity with regards to the encountered ground conditions.

Please note that these values for piled foundations should not be considered as design values and are provided for information purposes such that they should not be relied upon without review and consultation with a design engineer.

11.6 Groundwater Levels

Consideration should also be given to shallow groundwater encountered across the site. Groundwater was not encountered across the site, during the site works, however during the ground gas monitoring groundwater has been identified within WS103 and WS104 in the south of the site between 0.78-1.60m bgl. If groundwater is below the base of the foundation at a depth of less than the width of the proposed foundation, then groundwater can significantly reduce the bearing capacity of fine-grained soils.

11.7 Building Near Trees

11.7.1 NHBC Minimum Depth to Foundations

The shallow fine-grained soils attributed to the River Terrace Deposits have been shown via laboratory analysis to be of medium plasticity and low volume change potential. The London Clay Formation (encountered from 5.00m bgl) has shown to be of medium to high plasticity and medium volume change potential.

As the London Clay Formation was encountered at 5.00m bgl within CP101, it has not been included in the below assessment.

It is considered that soils of the upper weathered horizons of the River Terrace Deposits are predominantly Low Volume Change Potential. NHBC guidance offers two foundation depth scenarios dependant on future planting regimes for Low Volume Change Soils which utilises Tables 4 and 5 of NHBC Chapter 4.2 – Building Near Trees, summarised in and Table 11-4 below.

Table 11-3 Minimum depth of foundations (after NHBC 2021)

Volume change potential	(A) Minimum foundation depth (m) (allowing for restricted new planting)	(B) Minimum foundation depth (m) (where planting is outside the zone of influence of trees)
High	1.50	1.00
Medium	1.25	0.90
Low	1.00	0.75

Table 11-4 New tree planting (after NHBC 2021)

Water demand	No tree planting zone for column A in *Table 11-3*	No tree planting zone / zone of influence for column B in *Table 11-3*
High	1.0 x mature height	1.25 x mature height
Moderate	0.5 x mature height	0.75 x mature height
Low	0.2 x mature height	0.50 x mature height

NHBC guidance indicates a minimum foundation depth of 0.75m bgl for low volume change soils outside of the zone of tree influence (Column B, *Table 11-3*), which is dependent on the tree species but may be up to 0.50 x mature tree height (Table 11-4). Foundation depths will need to be increased within the zones of influence of existing or recently removed trees, as set out by NHBC Guidance (Chapter 4.2 – Building near Trees).

11.7.2 Lateral pressure and heave

Where foundations are more than 1.5m deep, within the influence of trees which are to remain or be removed, and may be subject to heave, they should be protected by voids, void formers or compressible materials to be take into account the effects of lateral swelling of soils. Minimum thicknesses of voids are set out in Table 7 of NHBC Chapter 4.2 – Building Near Trees.

Guidance is set out in NHBC the basic requirement is that compressible material or void former should be installed on the inside faces of external foundation walls. With piled foundation additional voids

are required below ring beams. Position of heave precautions are set out in Table 8 of NHBC Chapter 4.2 – Building Near Trees.

11.8 Shallow Excavations

Particular consideration should be made when excavating due to high groundwater levels being encountered during and the follow-on monitoring visits, which may cause pit instability within granular deposits. Where sand deposits are encountered with high groundwater, running sands may be encountered, which may require the local deepening of foundations. It is recommended that special construction techniques are utilised, when necessary, when excavating foundations, such as dewatering and pit stabilisation.

11.9 Ground Floor Slabs

Due to the variability of ground conditions across the site/Made Ground in excess of 600mm thickness soil it is considered that ground floor slabs are not suitable for adoption and therefore a suspended floor slab should be adopted in accordance with NHBC Chapter 5.2 to mitigate against the effects of differential settlement.

If levels were to be changed on site requiring steps in the substructure, further consideration should be given to the adoption of floor slabs, with reference to NHBC Standards (2011) 5.1 – *Substructure and ground bearing floors*.

11.10 Concrete Durability

River Terrace Deposits

The site is classified as DS-1, Aggressive Chemical Environment for Concrete Classification (ACEC) AC-1 for brownfield locations.

Preliminary London Clay Formation

The site is classified as DS-1, Aggressive Chemical Environment for Concrete Classification (ACEC) AC-1 for brownfield locations within the shallow soils on-site.

However, as set out in Section 8.2.4, should the deepening of foundations into the underlying London Clay Formation be required then consideration should be given to elevating the concrete classification to DS-4 AC-4.

11.11 Discussion

Within the loose material with the southern part of the site (WS103-WS104) It is considered a traditional strip foundation of 1.00m width at a depth 1.00m bgl provides a presumed bearing capacity of approximately 50-150kN/m^2 for the south of the site.

Medium to dense sands were encountered in the north of the site (CP101, WS101-WS102), It is considered a traditional strip foundation of 1.00m width at a depth 1.00m bgl provides a presumed bearing capacity of approximately 150-500kN/m^2 in the north of the site.

Preliminary pile calculations have been provided in Table 11-2 should the loadings exceed those set out within section 11.4.

A minimum foundation depth of 0.75m bgl is anticipated for a Low Change Volume soil within the River Terrace Deposits outside of the zone of tree influence, in accordance with NHBC. Where foundations are likely to be within the influence of trees foundation depths will require locally deepening. The extent to which they should be deepened should be in accordance with NHBC guidance, Chapter 4.2 – Building Near Trees (Tables 4 and 5). Existing mature trees that are presumed to be remaining along the boundary where tree segregate the northwest fields from the southern and eastern fields.

Shallow groundwater was identified with WS103 and WS104 during the return monitoring between 0.78-1.60m bgl, which may cause pit instability within granular deposits. Where sand deposits are encountered with high groundwater, running sands may be encountered, which may require the local deepening of foundations. It is recommended that special construction techniques are utilised, when necessary, when excavating foundations, such as dewatering and pit stabilisation.

Should loadings exceed those set out above then alternative founding solutions will need to be explored. Preliminary piling information is set out above should deep foundations be required.

Subject to regulatory requirements, the potential requirement exists to calculate bearing capacities and undertaken settlement analysis for foundations through production of a Geotechnical Design Report (GDR) which would provide calculations to current guidance, UK National Annex to EC7. Foundation design should be completed by a suitably qualified Structural Engineer, with specific consideration given to the variability in soil strengths.

12 CONCLUSIONS AND RECOMMENDATIONS

Revised Conceptual Site Model
Following the completion of a Phase II Ground Investigation and Tier I human health risk assessment no elevated concentrations of ground gases were identified during return monitoring visits and is not considered to have the potential to present a significant risk to human health.
Ground Gas Classification
Ground Gas Classification is CS-1 under BS8485:2015 and therefore required no gas protection measures.
Concrete Classification
River Terrace Deposits – as the site is classified as DS-1, Aggressive Chemical Environment for Concrete Classification (ACEC) AC-1 for brownfield locations. **London Clay Formation –** The site is classified as DS-4, Aggressive Chemical Environment for Concrete Classification (ACEC) AC-4 in accordance with the recommendations provided in BRE Special Digest 1 (2005). As set out in Section 11.4, it is considered likely that shallow founding within the underlying superficial deposits will be achievable and as such, the concrete classification at an anticipated founding depth of 1.00m bgl will be **DS1 AC-1**. However, should deepening of foundations be required into the underlying London Clay Formation then consideration should be given to elevating the concrete classification to **DS-4 AC-4**, as per the summary table below.
Geotechnical Assessment
Within the loose material with the southern part of the site (WS103-WS104) It is considered a traditional strip foundation of 1.00m width at a depth 1.00m bgl provides a presumed bearing capacity of approximately 50-150kN/m^2 for the south of the site. Medium to dense sands were encountered in the north of the site (CP101, WS101-WS102), It is considered a traditional strip foundation of 1.00m width at a depth 1.00m bgl provides a presumed bearing capacity of approximately 150-500kN/m^2 in the north of the site. Preliminary pile calculations have been provided in Table 11 2 should the loadings exceed those set out within section 11.4. A minimum foundation depth of 0.75m bgl is anticipated for a Low Change Volume soil within the River Terrace Deposits outside of the zone of tree influence, in accordance with NHBC. Where foundations are likely to be within the influence of trees foundation depths will require locally deepening. The extent to which they should be deepened should be in accordance with NHBC guidance, Chapter 4.2 – Building Near Trees (Tables 4 and 5). Existing mature trees that are presumed to be remaining along the boundary where tree segregate the northwest fields from the southern and eastern fields. Should loadings exceed those set out above then alternative founding solutions will need to be explored. Preliminary piling information is set out above should deep foundations be required.
Recommendations
Environmental If during the development stage any evidence of contamination is identified, works should be halted, and contact made with a suitably qualified Environmental Consultant. As determined appropriate by the Consultant, further investigation and sampling may be required to determine the appropriate actions. Upon completion contact should be made with the regulator to achieve sign off of the works. **Geotechnical** Should loadings exceed those set out above then alternative founding solutions will need to be explored. Preliminary piling information is set out above should deep foundations be required. Subject to regulatory requirements, the potential requirement exists to calculate bearing capacities and undertaken settlement analysis for foundations through production of a Geotechnical Design Report (GDR) which

would provide calculations to current guidance, UK National Annex to EC7. Foundation design should be completed by a suitably qualified Structural Engineer, with specific consideration given to the variability in soil strengths.

APPENDIX I - LIMITATIONS

1. This report and its findings should be considered in relation to the terms of reference and objectives agreed between Omnia and the Client as indicated in Section 1.2.

2. For the work, reliance has been placed on publicly available data obtained from the sources identified. The information is not necessarily exhaustive and further information relevant to the site may be available from other sources. When using the information, it has been assumed it is correct. No attempt has been made to verify the information.

3. This report has been produced in accordance with current UK policy and legislative requirements for land and groundwater contamination, which are enforced, by the local authority and the Environment Agency. Liabilities associated with land contamination are complex and requires advice from legal professionals.

4. During the site walkover reasonable effort has been made to obtain an overview of the site conditions. However, during the site walkover no attempt has been made to enter areas of the site that are unsafe or present a risk to health and safety, are locked, barricaded, overgrown, or the location of the area has not been made known or accessible.

5. Access considerations, the presence of services and the activities being carried out on the site limited the locations where sampling locations could be installed and the techniques that could be used.

6. Site sensitivity assessments have been made based on available information at the time of writing and are ultimately for the decision of the regulatory authorities.

7. Where mention has been made to the identification of Japanese Knotweed and other invasive plant species and asbestos or asbestos-containing materials this is for indicative purposes only and do not constitute or replace full and proper surveys.

8. The executive summary, conclusions and recommendations sections of the report provide an overview and guidance only and should not be specifically relied upon without considering the context of the report in full.

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10. New information, revised practices or changes in legislation may necessitate the re-interpretation of the report, in whole or in part.

APPENDIX II – GLOSSARY

AST	Above Ground Storage Tank
BGS	British Geological Survey
BSI	British Standards Institute
BTEX	Benzene, Toluene, Ethylbenzene, Xylenes
CIEH	Chartered Institute of Environmental Health
CIRIA	Construction Industry Research Association
CLEA	Contaminated Land Exposure Assessment
CSM	Conceptual Site Model
DNAPL	Dense Non-Aqueous Phase Liquid (Chlorinated Solvents, PCB)
DWS	Drinking Water Standard
EA	Environment Agency
EQS	Environmental Quality Standard
GAC	General Assessment Criteria
GL	Ground Level
GSV	Gas Screening Value
HCV	Health Criteria Value
ICSM	Initial Conceptual Site Model
LNAPL	Light Non-Aqueous Phase Liquid (Petrol, Diesel, Kerosene)
ND	Not Detected
LMRL	Lower Method Reporting Limit
NR	Not Recorded
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Poly-Chlorinated Biphenyl
PID	Photo-Ionisation Detector
QA	Quality Assurance
SGV	Soil Guideline Value
SPH	Separate Phase Hydrocarbon
TPH (CWG)	Total Petroleum Hydrocarbon (Criteria Working Group)
SPT	Standard Penetration Test
SVOC	Semi Volatile Organic Compound
UST	Underground Storage Tank
VCCS	Vibro Concrete Columns
VOC	Volatile Organic Compound
WTE	Water Table Elevation

UNITS

M	Metres
KM	Kilometres
%	Percent
%V/V	Percent Volume in Air
MB	Milli Bars (Atmospheric Pressure)
L/HR	Litres Per Hour
µG/L	Micrograms Per Litre (Parts Per Billion)
PPB	Parts Per Billion
MG/KG	Milligrams Per Kilogram (Parts Per Million)
PPM	Parts Per Million
MG/M^3	Milligram Per Metre Cubed
M BGL	Metres Below Ground Level
M BCL	Metres Below Cover Level

MAOD	Metres Above Ordnance Datum (Sea Level)
KN/M^2	Kilo Newtons Per Metre Squared
µM	Micrometre

APPENDIX III - DRAWINGS

Key

Site Boundary

0 0.075 0.15 km

Scale	Paper Size
1:3,500	A4

Omnia Consulting, 3-6 The Quarterdeck, Port Solent,
Portsmouth, Hampshire, PO6 4TP
T: (01489) 808 088
E: info@omnia-consulting.co.uk
W: www.omnia-consulting.co.uk

OMNIA

Job Title: 182-184 Bitterne Road	Client: SC Architecture	Project Number: A11950	Date: 30/11/2022	Drawing Title: Figure 1.0 Site Location Map
		Drawn By: H. Spurling	Authorised By: O. Maxwell	

Key

Site Boundary

1 0 1 2 3 4 m

Scale	Paper Size
1:105	A4

Omnia Consulting, 3-6 The Quarterdeck, Port Solent,
Portsmouth, Hampshire, PO6 4TP
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OMNIA	Job Title: 182-184 Bitterne Road	Client: SC Architecture	Project Number: A11950	Date: 30/11/2022	Drawing Title: Figure 2.0 Proposed Development Plan
			Drawn By: H. Spurling	Authorised By: O. Maxwell	

Key

- Site Boundary
- Chap 8 fencing
- window
- Fridge and Freezer Stockpile
- Stockpile 2
- Stockpile 1
- Man hole cover
- Electrical Box

10

Scale	Paper Size
1:110	A4

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Hampshire,
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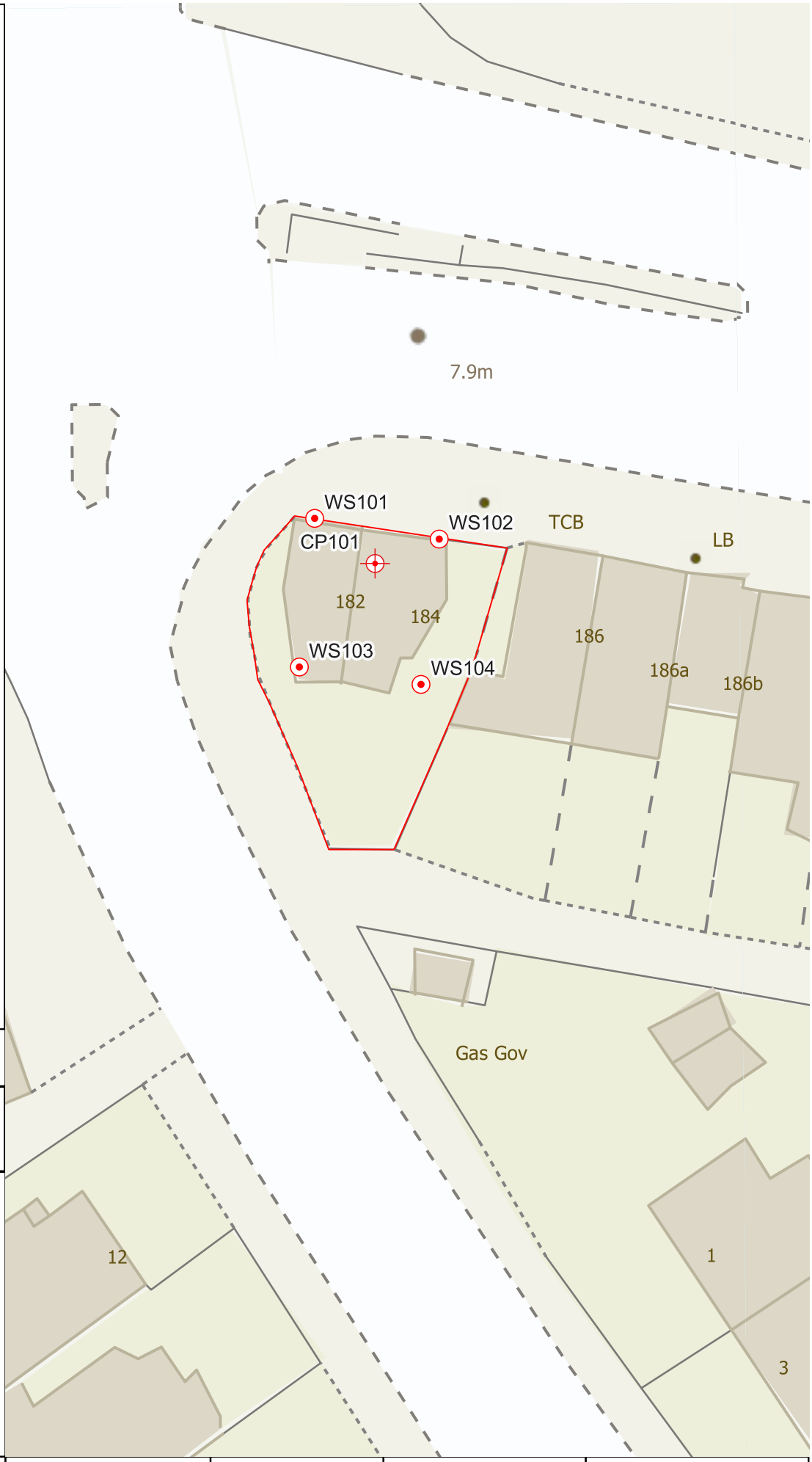
OMNIA

Project Number: A11950	Client: SC Architecture	Drawn By: H. Spurling	Drawing Title: Figure 2.1 Site Walkover Plan
Job Title: 182-184 Bitterne Road	Date: 30/11/2022	Authorised By: G. Wass	

Key

- WS Locations
- CP Location
- Site Boundary



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Scale	Paper Size
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Hampshire,
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W: www.omnia-consulting.co.uk

OMNIA

Project Number: A11950	Client: SC Architecture	Drawn By: H. Spurling	Drawing Title: Figure 3.0 Intrusive Location Plan
Job Title: 182-184 Bitterne Road	Date: 30/11/2022	Authorised By: G. Wass	

APPENDIX IV - PHOTOGRAPHS

Photograph 1- Access via Metal secured gate, facing northeast.

Photograph 2- Hardstanding concrete, in the north of the site. Facing northwest

Photograph 3- Soft landscaping to the south of the site. Facing Southwest.

Photograph 4- Exposed manhole cover, presumed drainage.

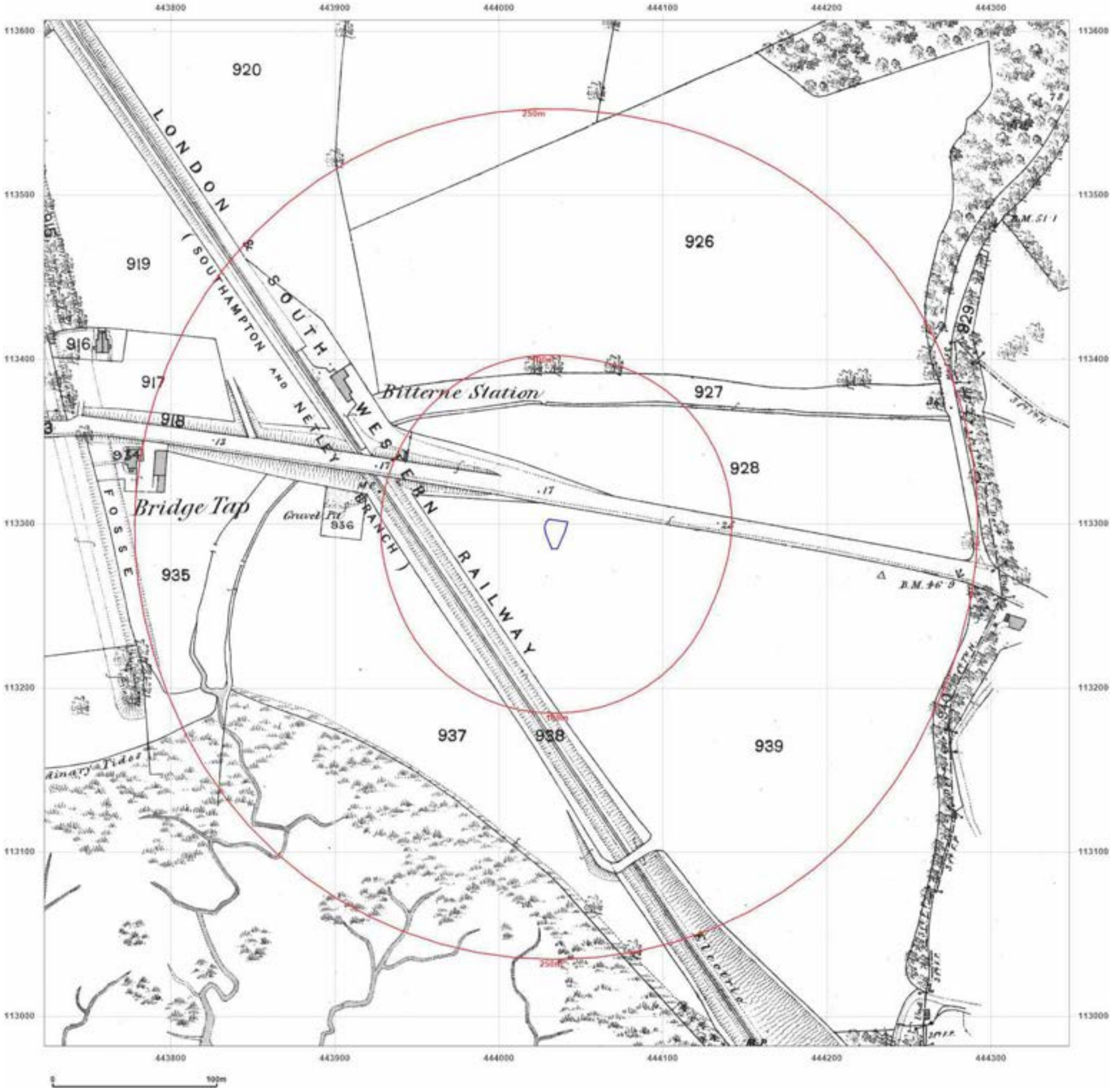
Photograph 5- Electrical box identified within the north-western corner of the site.

Photograph 6 – South-eastern corner stockpile, containing PACM.

Photograph 7- Stockpile of wood in the south of the site.

Photograph 8- Fridge and freezer stockpile on eastern boundary. Facing North.

APPENDIX V - HISTORICAL MAPS



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Report Ref: GS-9152417
Grid Ref: 444035, 113294

Map Name: County Series
Map date: **1869**
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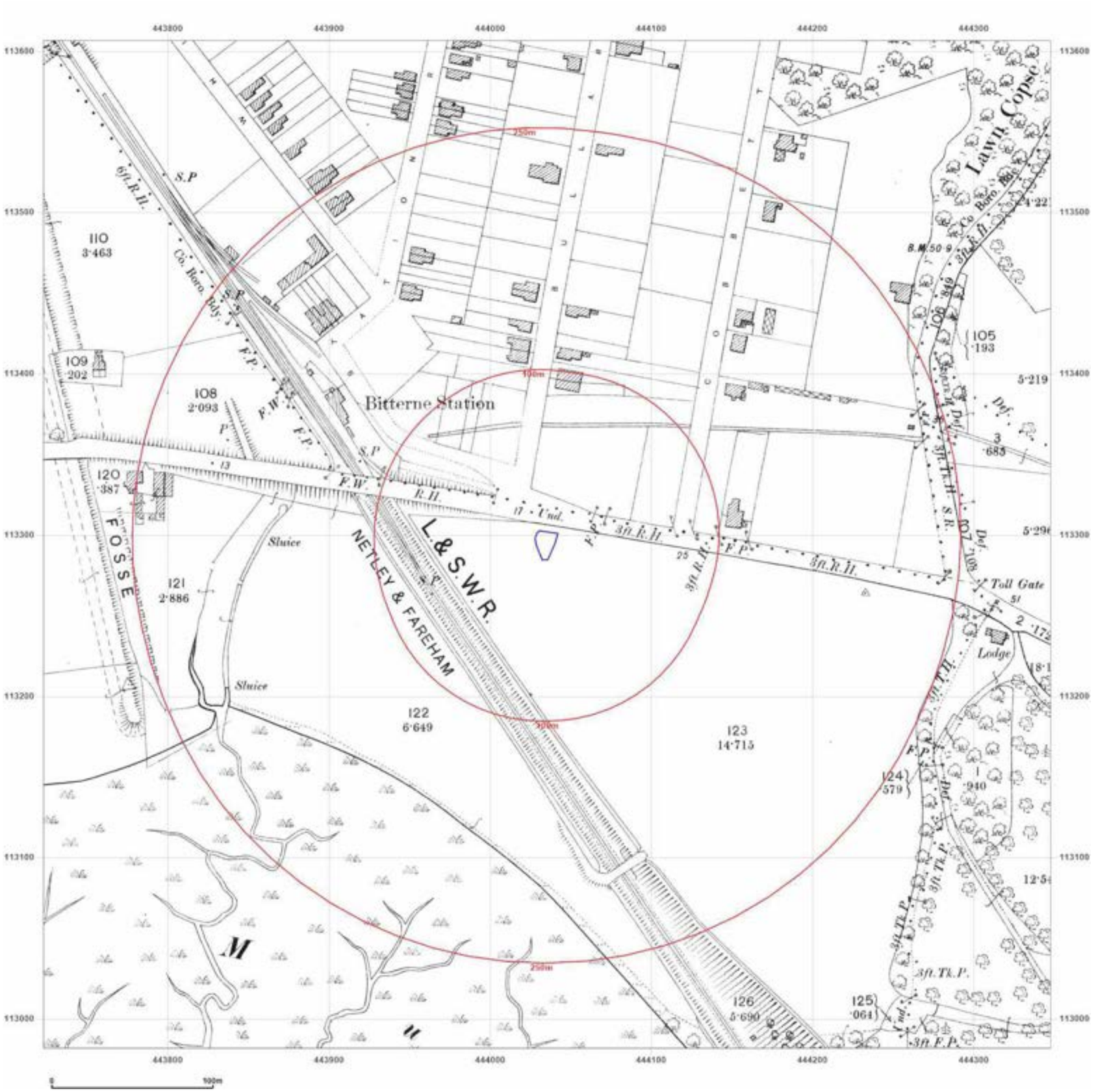

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Report Ref: GS-9152417
Grid Ref: 444035, 113294

Map Name: County Series
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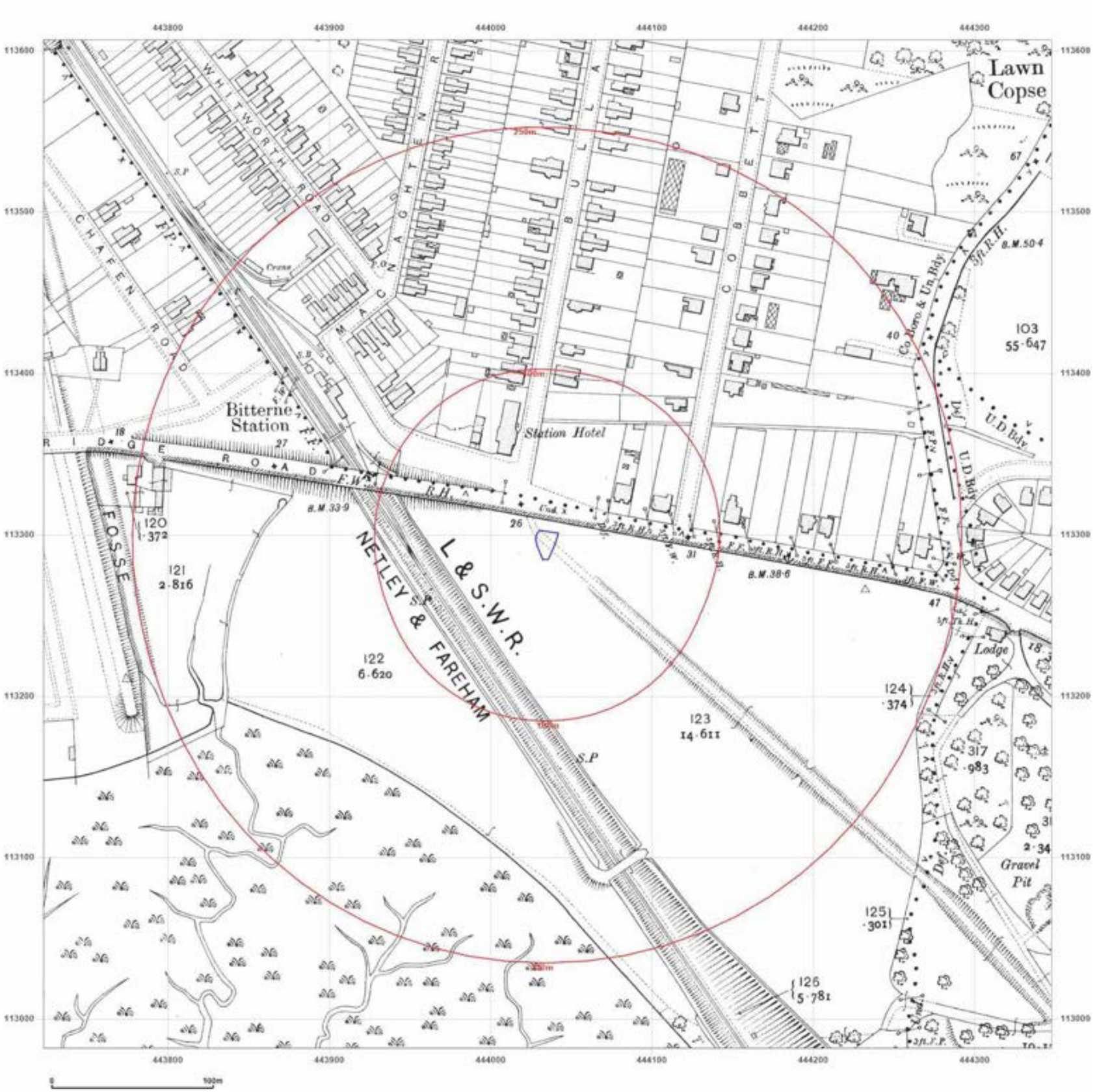

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Client Ref: A11950
Report Ref: GS-9152417
Grid Ref: 444035, 113294

Map Name: County Series

Map date: **1910**

Scale: 1:2,500

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Report Ref: GS-9152417
Grid Ref: 444035, 113294

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Client Ref: A11950
Report Ref: GS-9152417
Grid Ref: 444035, 113294

Map Name: County Series

Map date: **1941**

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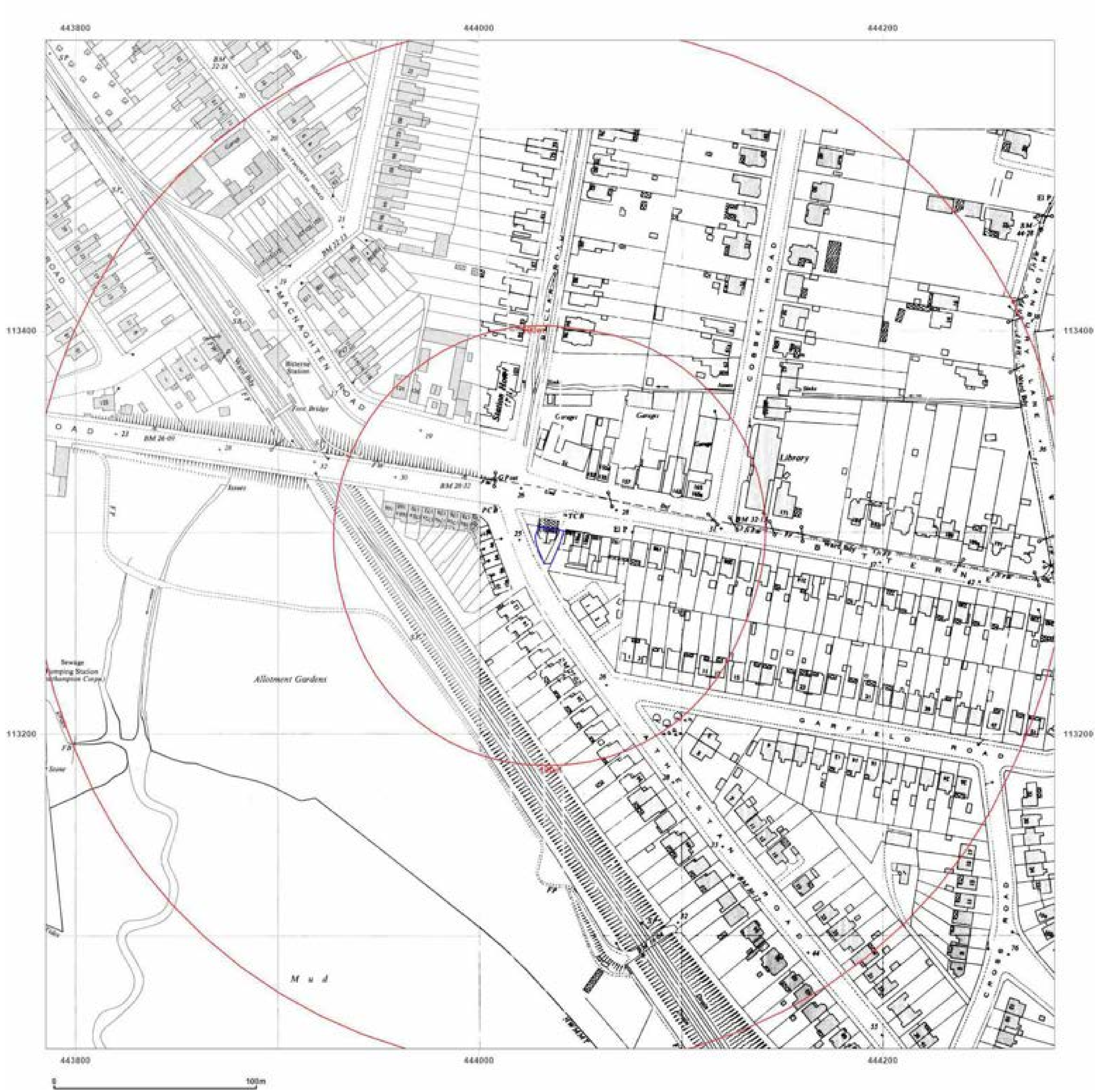

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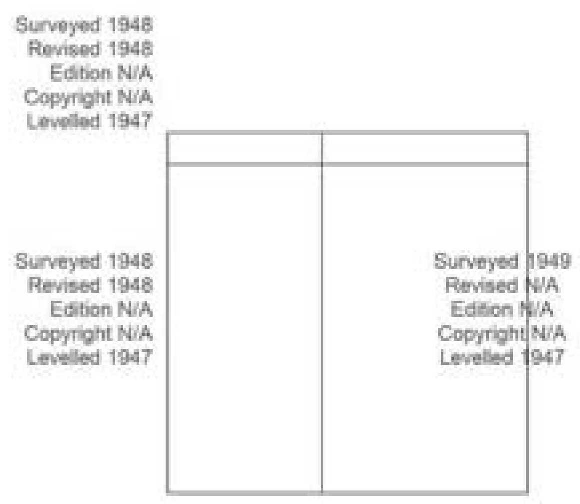

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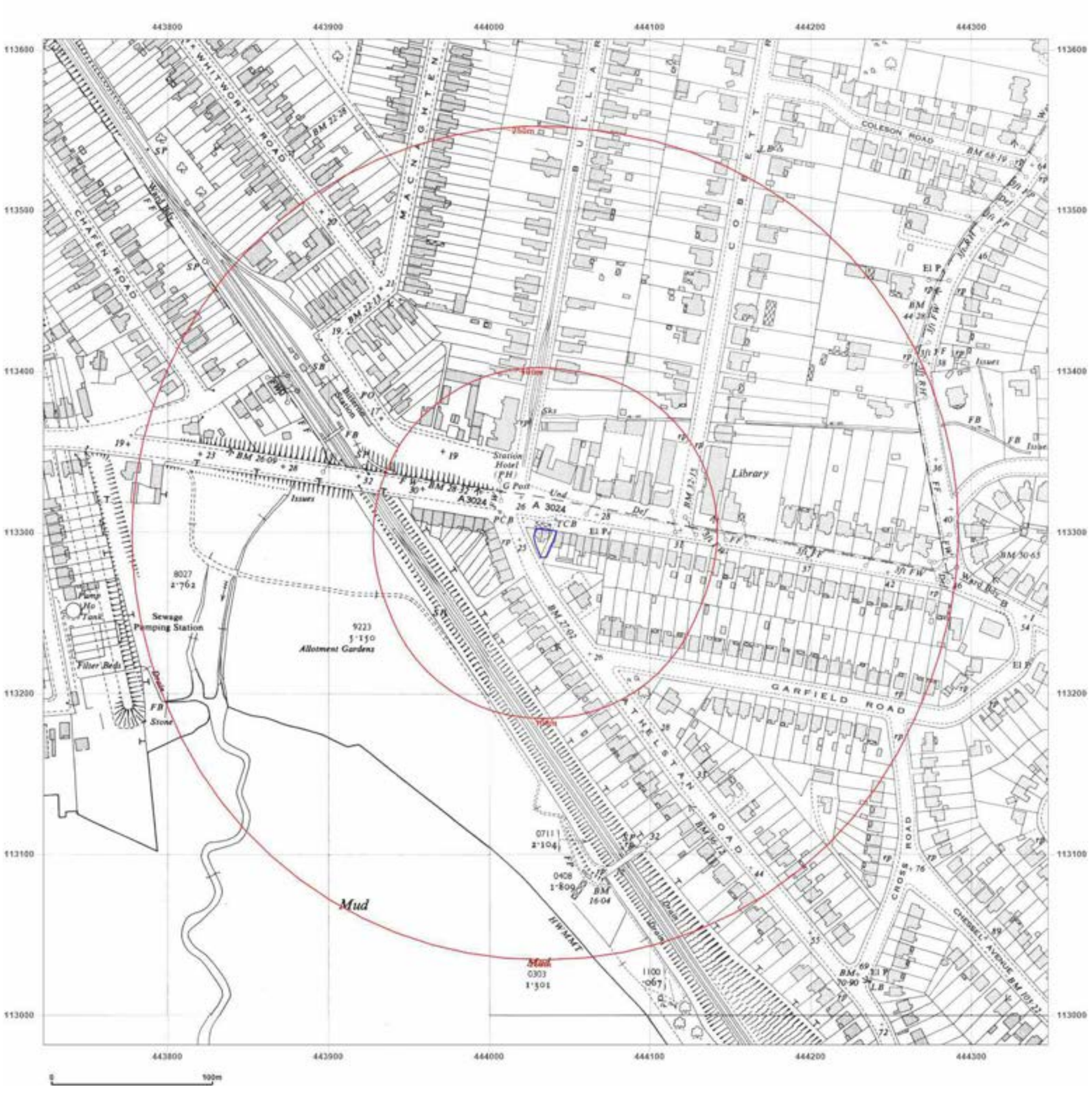

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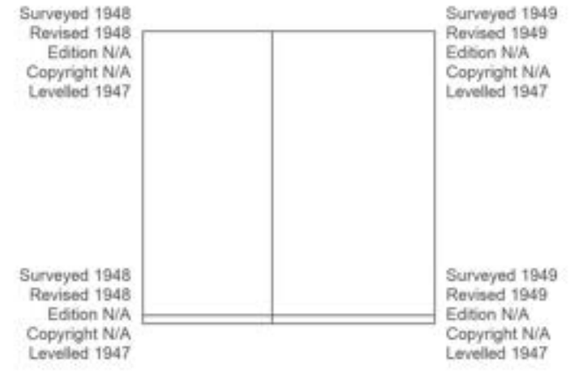

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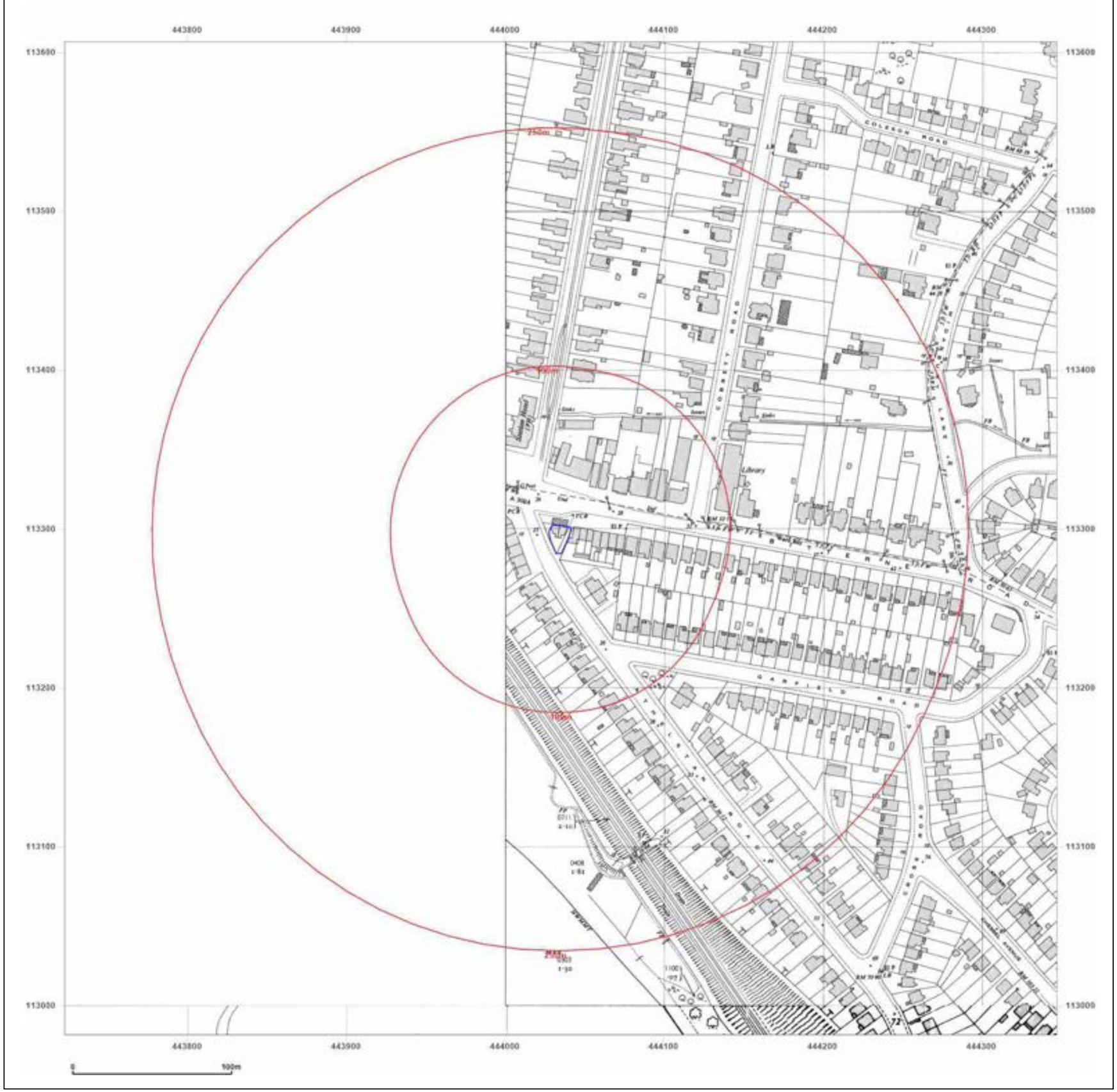

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Report Ref: GS-9152417
Grid Ref: 444035, 113294

Map Name: National Grid

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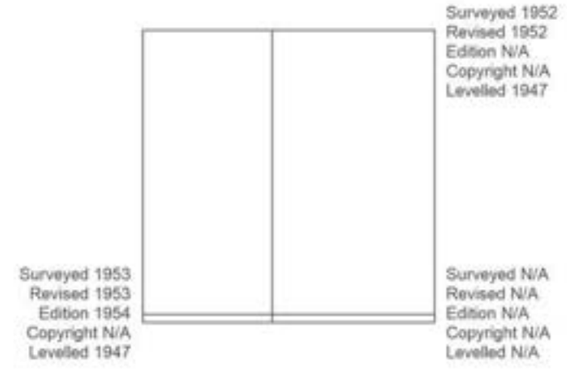

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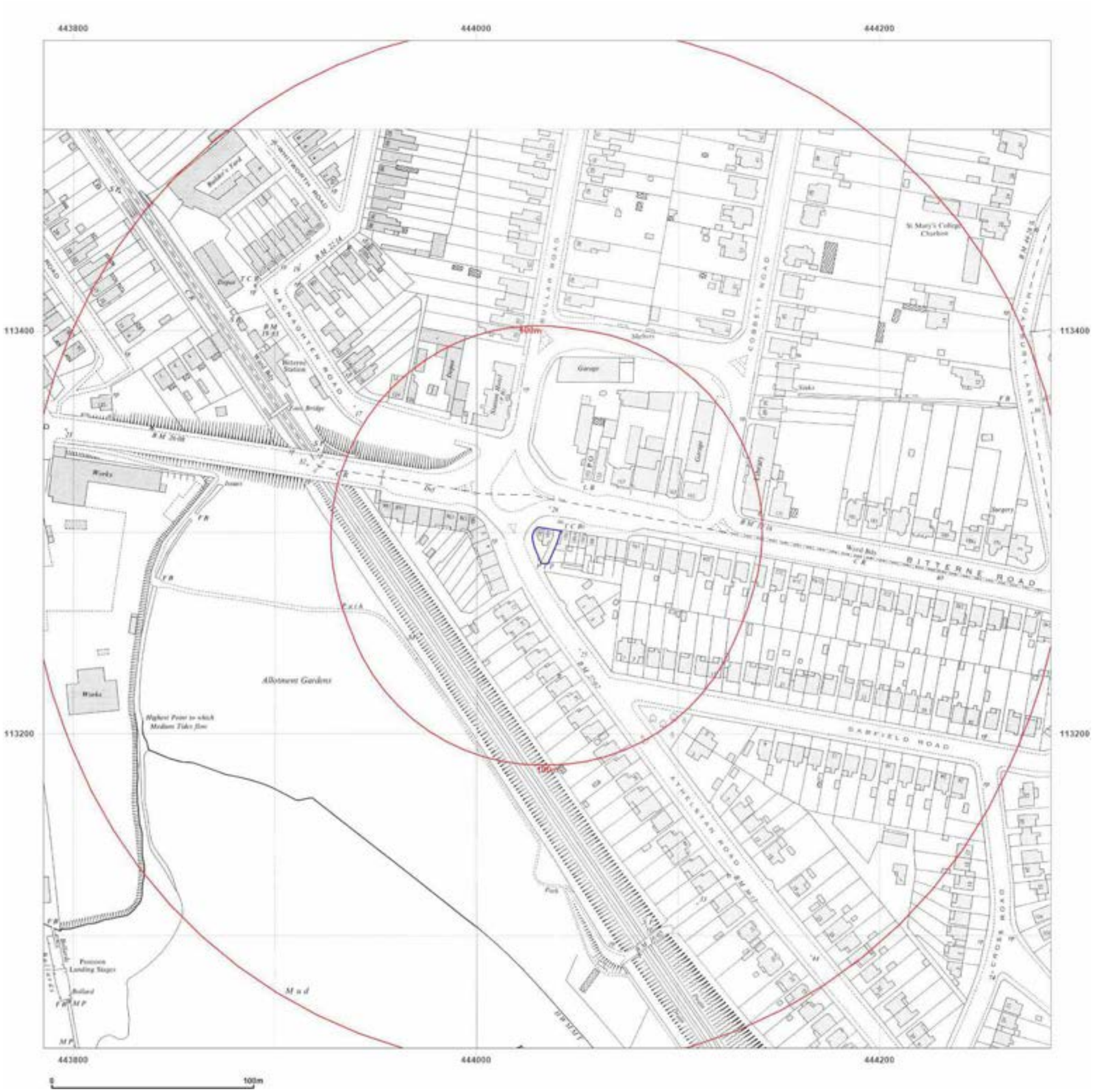

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Map Name: National Grid

Map date: **1964-1965**

Scale: 1:1,250

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Surveyed 1949
Revised 1964
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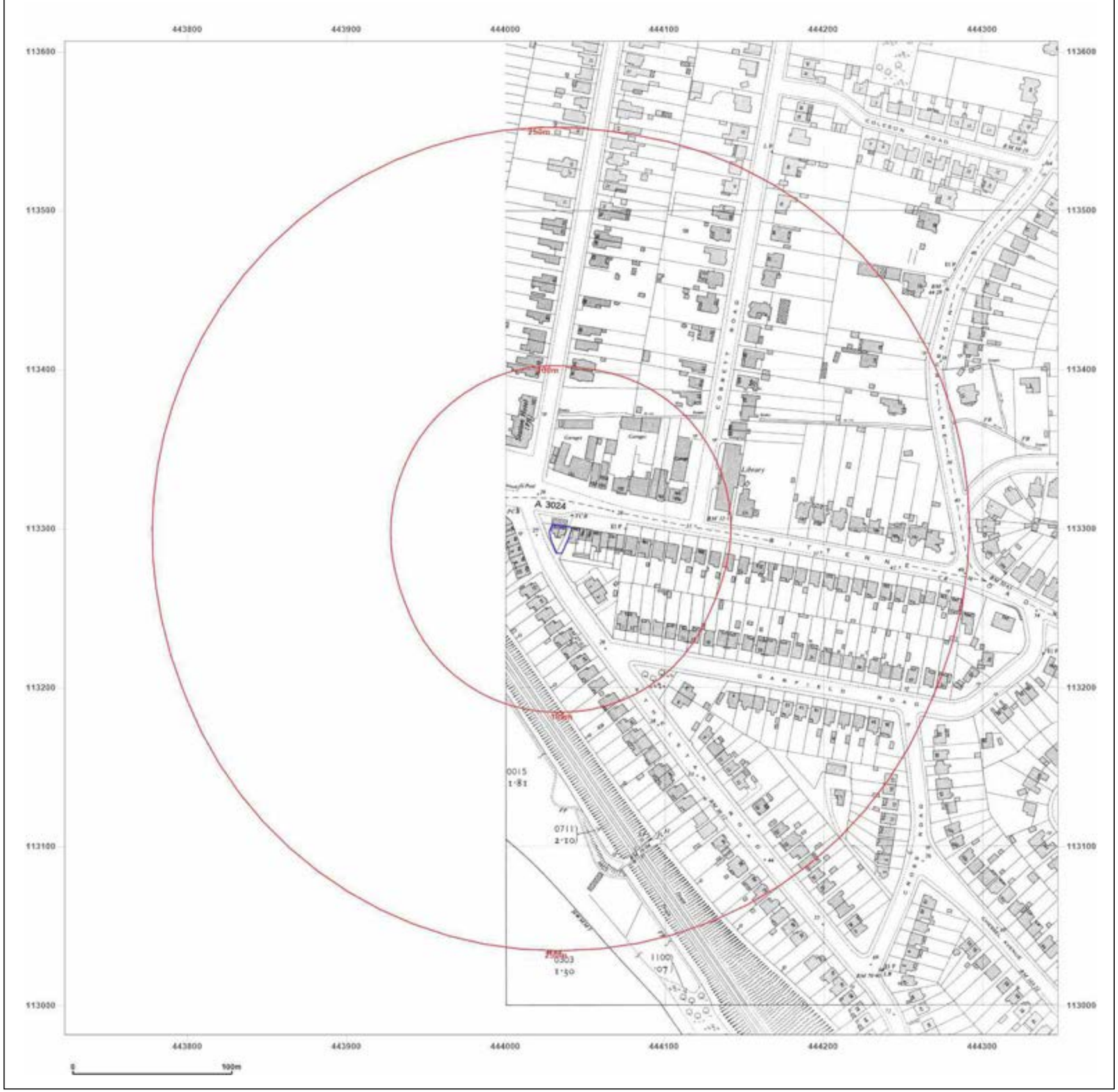

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Client Ref: A11950
Report Ref: GS-9152417
Grid Ref: 444035, 113294

Map Name: National Grid

Map date: **1960-1965**

Scale: 1:2,500

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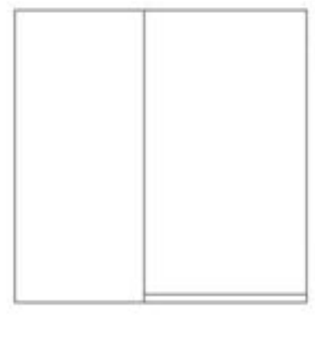

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Grid Ref: 444035, 113294

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Scale: 1:2,500

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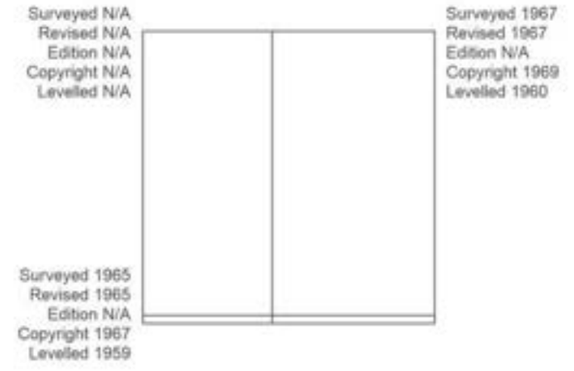

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Report Ref: GS-9152417
Grid Ref: 444035, 113294

Map Name: National Grid

Map date: **1979-1983**

Scale: 1:1,250

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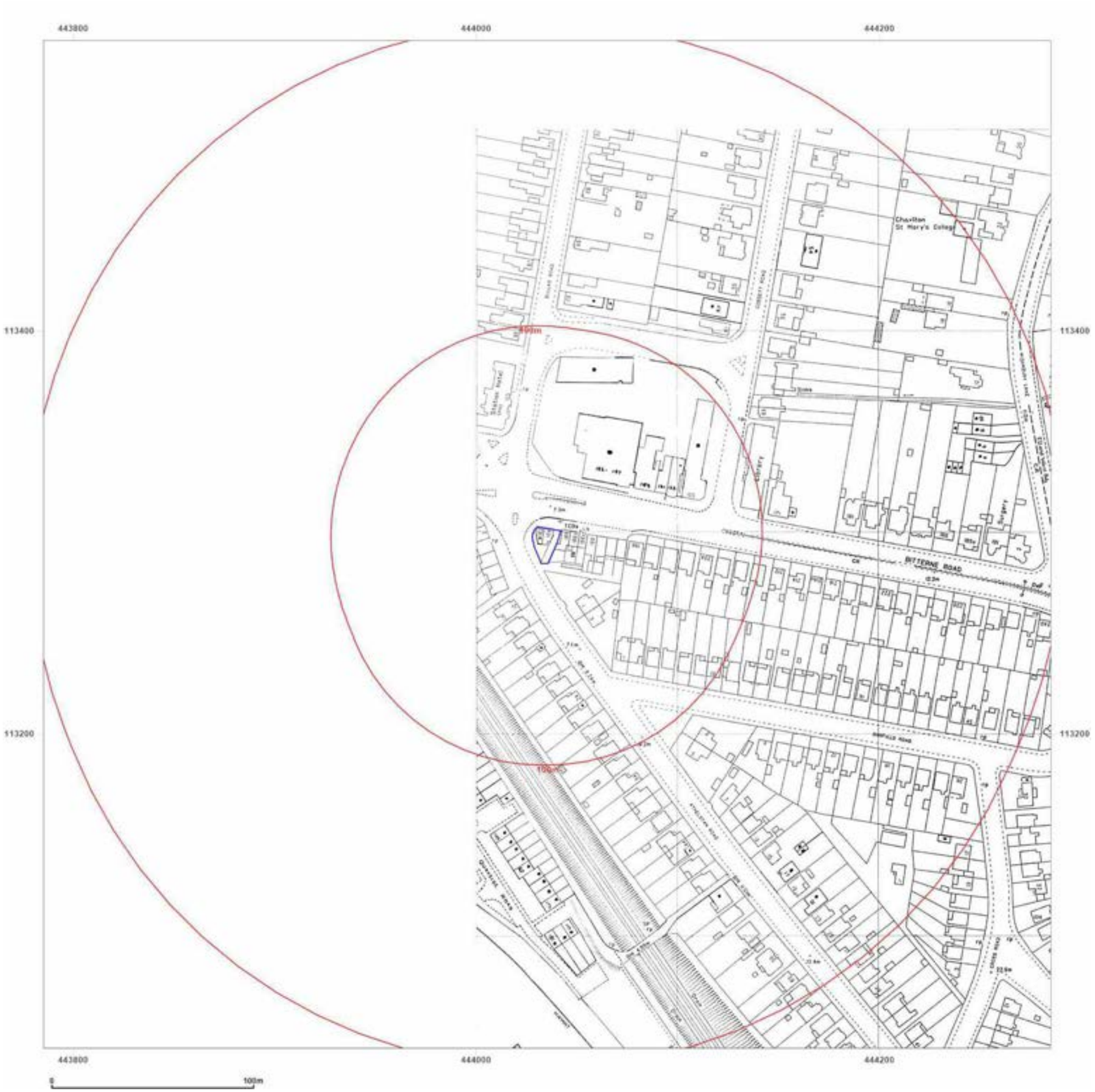

Groundsure INSIGHTS

Site Details:

182-184, BITTERNE ROAD
WEST, SOUTHAMPTON, SO18
1BE

Client Ref: A11950
Report Ref: GS-9152417
Grid Ref: 444035, 113294

Map Name: National Grid

Map date: **1983**

Scale: 1:1,250

Printed at: 1:2,000

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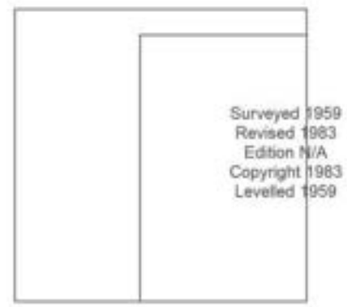

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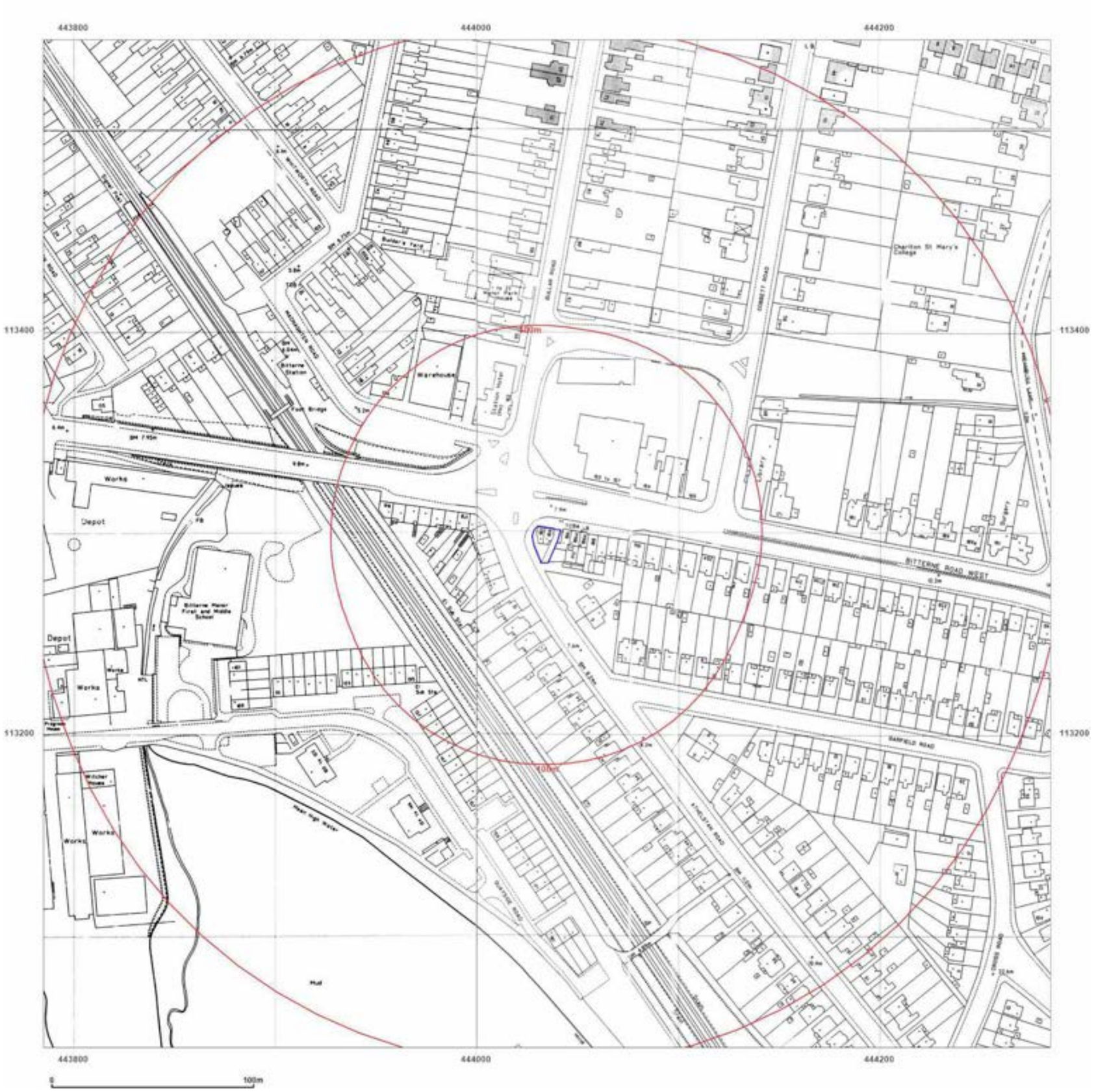

Groundsure INSIGHTS

Site Details:

182-184, BITTERNE ROAD WEST, SOUTHAMPTON, SO18 1BE

Client Ref: A11950
Report Ref: GS-9152417
Grid Ref: 444035, 113294

Map Name: National Grid

Map date: **1989-1992**

Scale: 1:1,250

Printed at: 1:2,000

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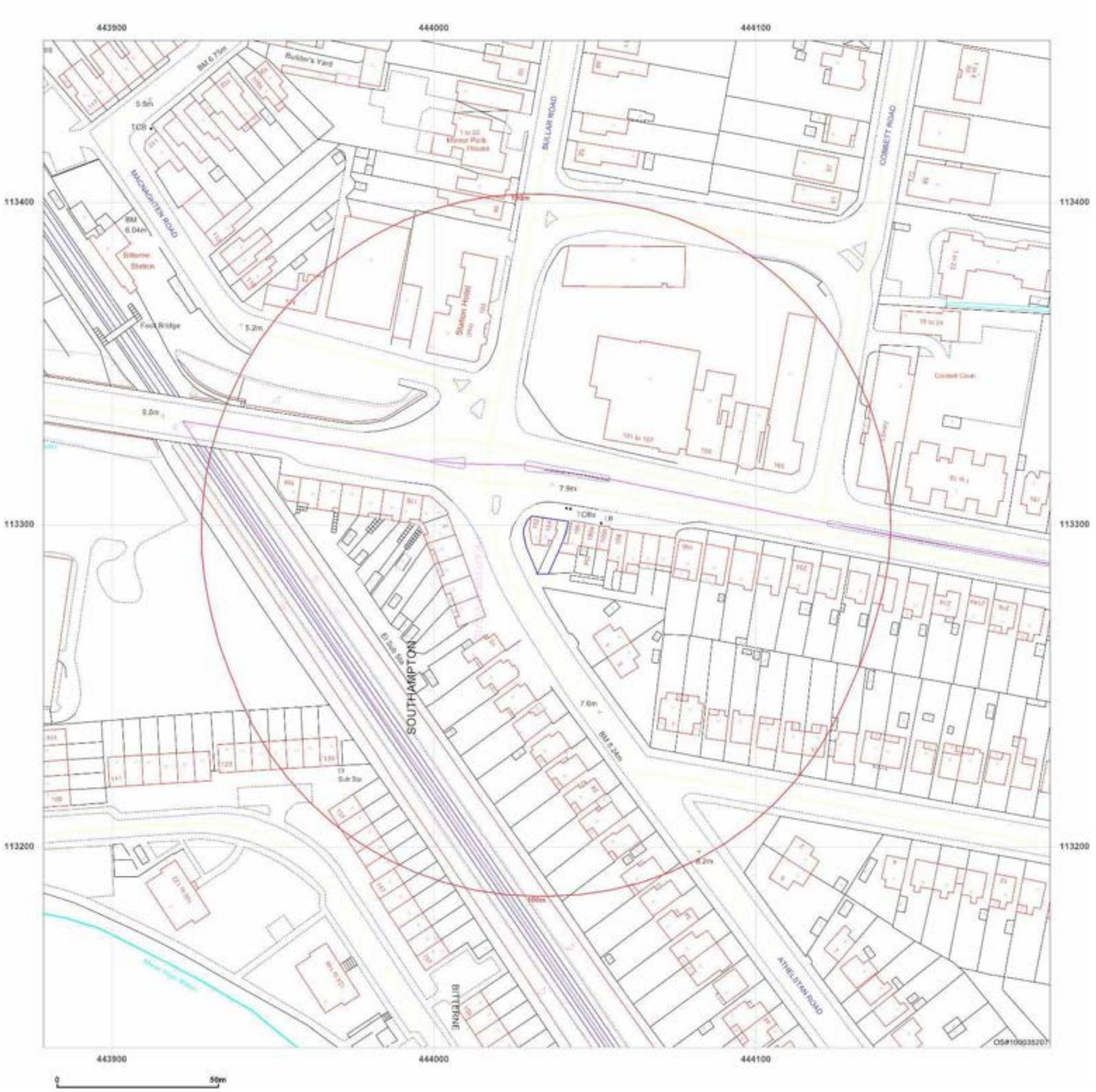

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Site Details:

182-184, BITTERNE ROAD
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1BE

Client Ref: A11950
Report Ref: GS-9152417
Grid Ref: 444035, 113294

Map Name: LandLine
Map date: **2003**
Scale: 1:1,250
Printed at: 1:1,250

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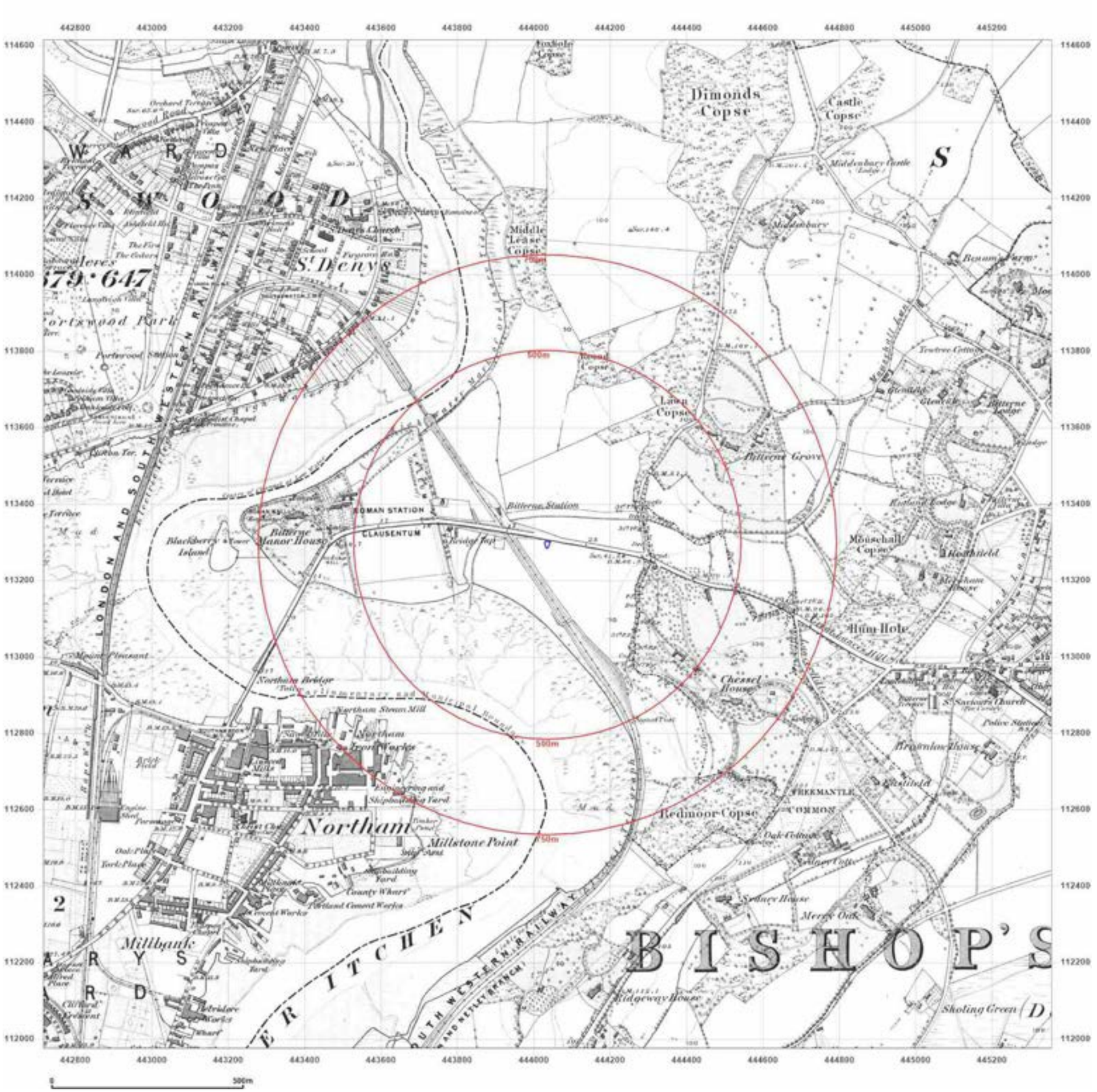

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Client Ref: A11950
Report Ref: GS-9152417
Grid Ref: 444035, 113294

Map Name: County Series

Map date: **1869**

Scale: 1:10,560

Printed at: 1:10,560

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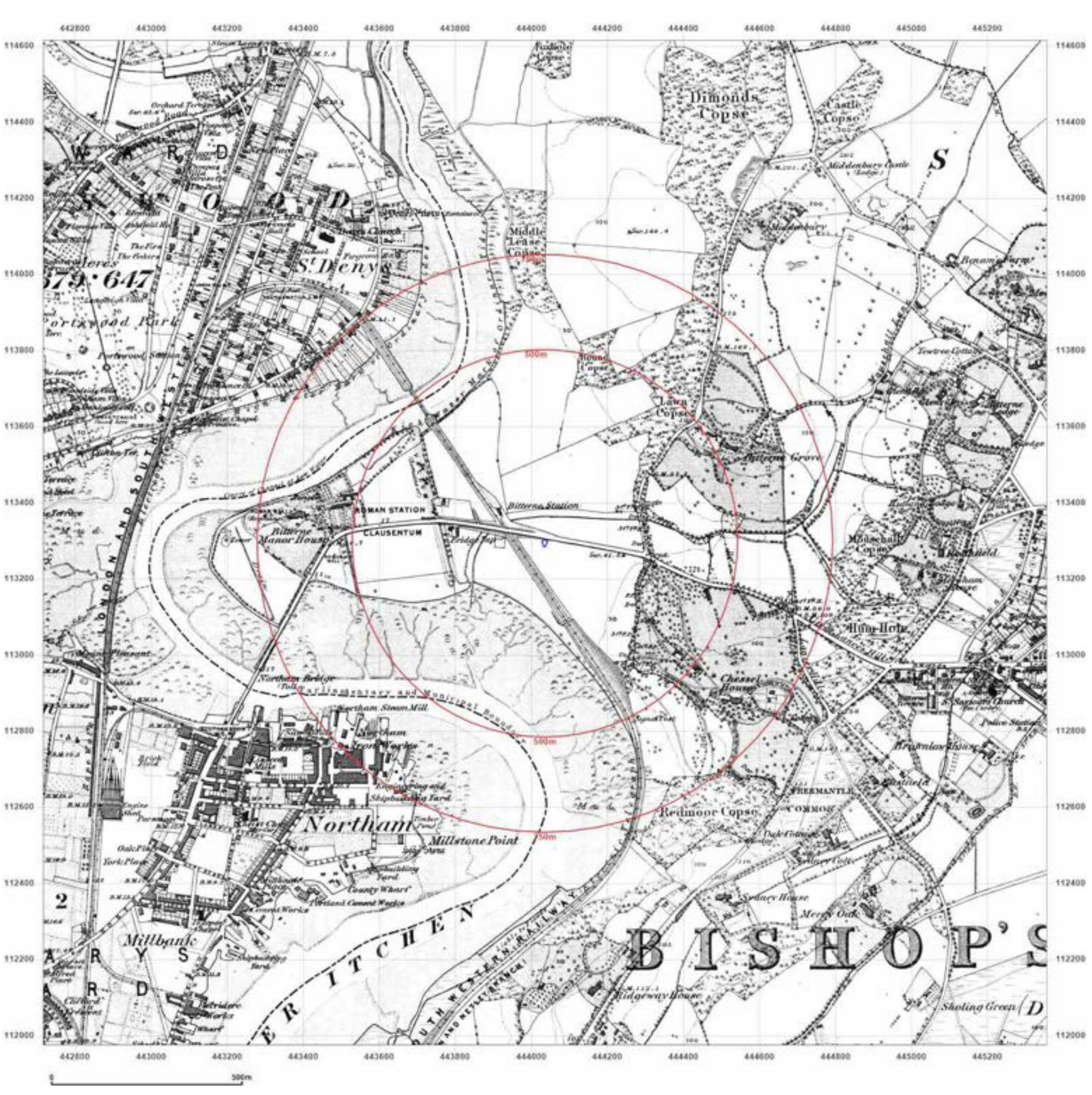

Groundsure INSIGHTS

Site Details:

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Client Ref: A11950
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Grid Ref: 444035, 113294

Map Name: County Series

Map date: **1871**

Scale: 1:10,560

Printed at: 1:10,560

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Client Ref: A11950
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Grid Ref: 444035, 113294

Map Name: County Series

Map date: **1871**

Scale: 1:10,560

Printed at: 1:10,560

N
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Surveyed 1869
Revised N/A
Edition 1871
Copyright N/A
Levelled N/A

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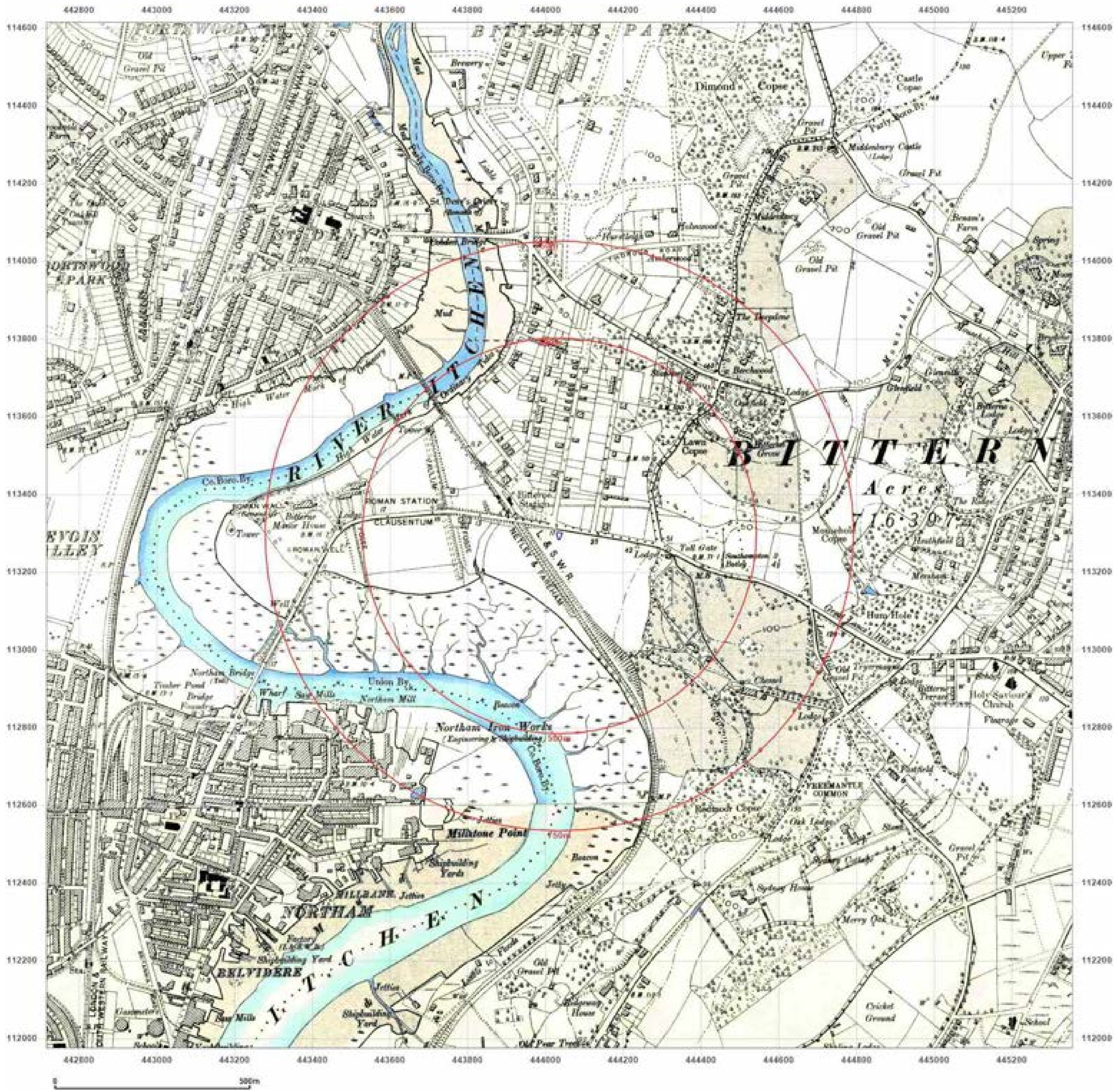
Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Site Details:

182-184, BITTERNE ROAD WEST, SOUTHAMPTON, SO18 1BE

Client Ref: A11950
Report Ref: GS-9152417
Grid Ref: 444035, 113294

Map Name: County Series

Map date: **1896**

Scale: 1:10,560

Printed at: 1:10,560

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Surveyed N/A
Revised 1896
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1868
Revised 1896
Edition N/A
Copyright N/A
Levelled N/A

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Production date: 25 October 2022

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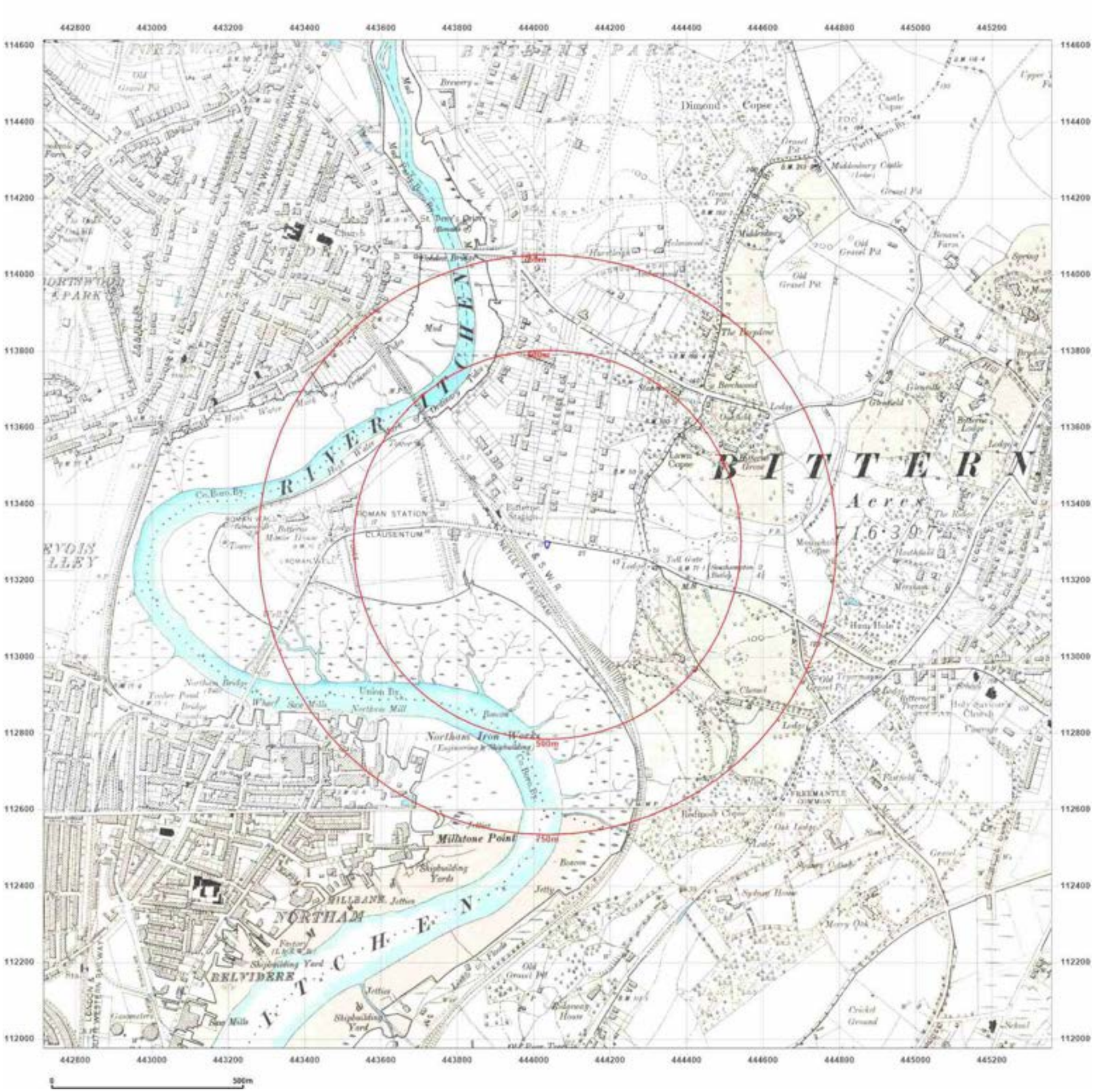

Groundsure INSIGHTS

Site Details:

182-184, BITTERNE ROAD WEST, SOUTHAMPTON, SO18 1BE

Client Ref: A11950
Report Ref: GS-9152417
Grid Ref: 444035, 113294

Map Name: County Series

Map date: **1896**

Scale: 1:10,560

Printed at: 1:10,560

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Surveyed 1868
Revised 1896
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1868
Revised 1896
Edition N/A
Copyright N/A
Levelled N/A

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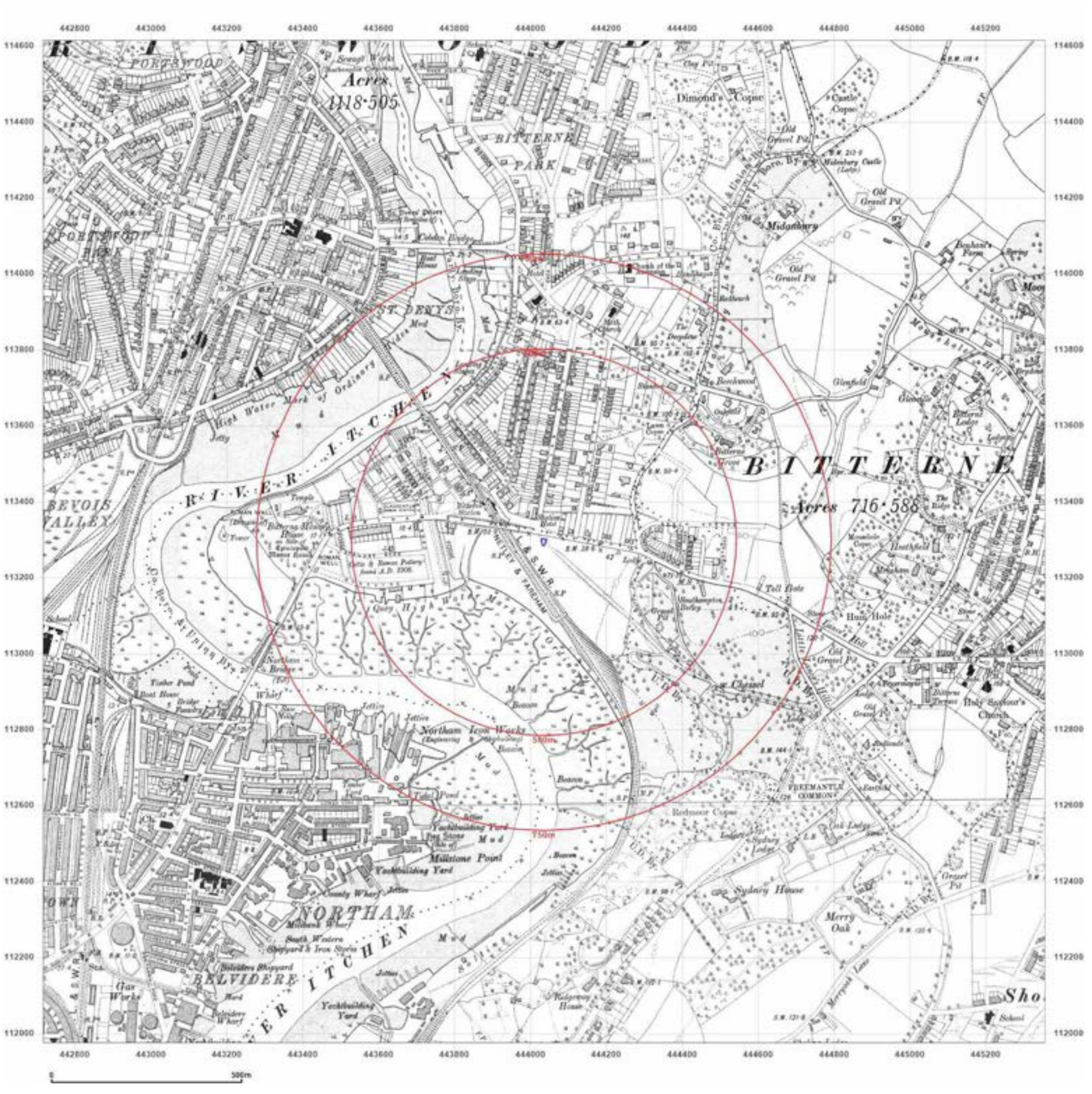
Production date: 25 October 2022

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Groundsure INSIGHTS

Site Details:

182-184, BITTERNE ROAD
WEST, SOUTHAMPTON, SO18
1BE

Client Ref: A11950
Report Ref: GS-9152417
Grid Ref: 444035, 113294

Map Name: County Series

Map date: **1908-1910**

Scale: 1:10,560

Printed at: 1:10,560

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Surveyed 1867
Revised 1908
Edition 1910
Copyright N/A
Levelled N/A

Surveyed 1867
Revised 1908
Edition N/A
Copyright N/A
Levelled N/A

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Map legend available at:
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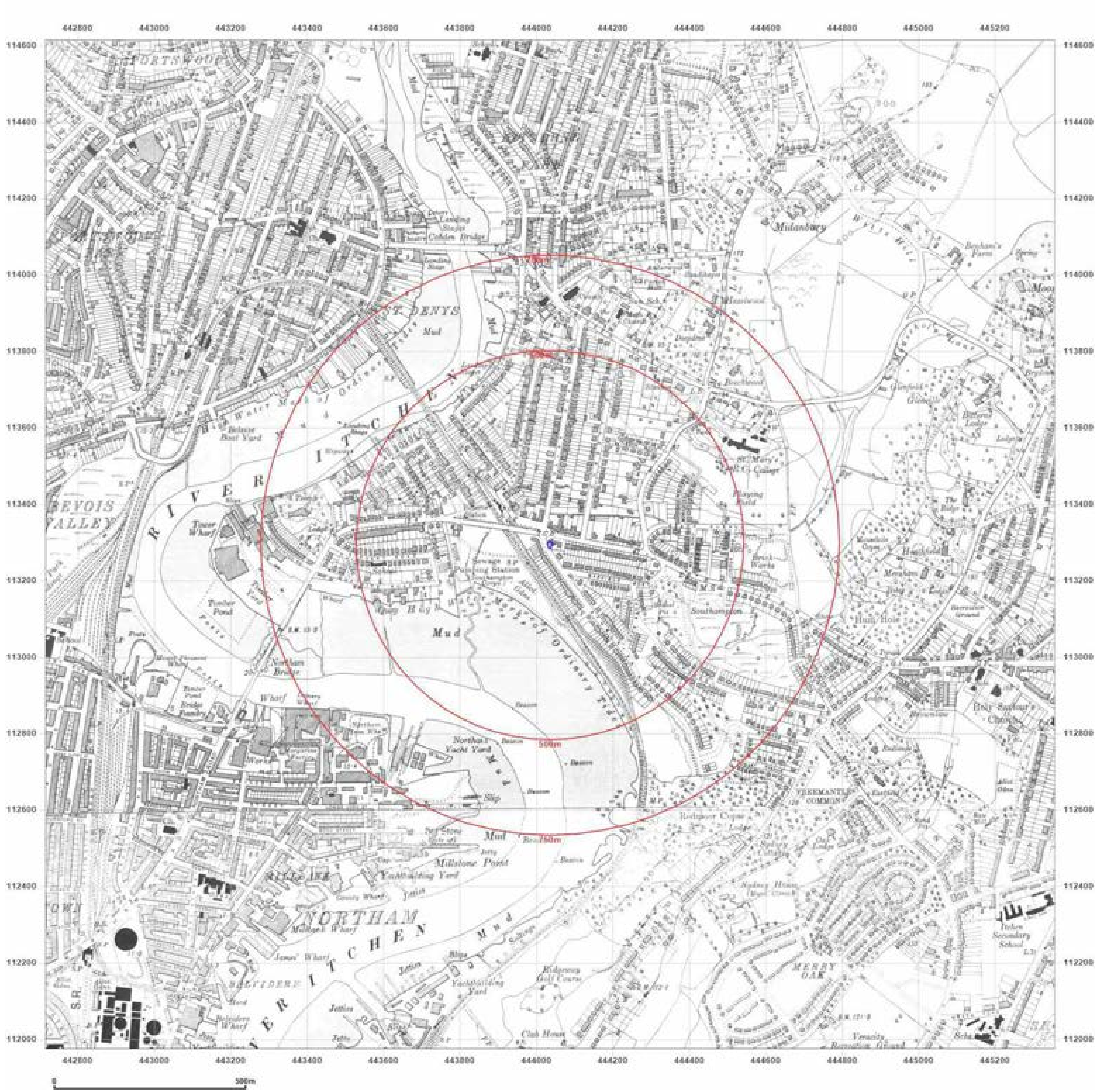

Site Details:

182-184, BITTERNE ROAD WEST, SOUTHAMPTON, SO18 1BE

Client Ref: A11950
Report Ref: GS-9152417
Grid Ref: 444035, 113294

Map Name: County Series

Map date: **1932**

Scale: 1:10,560

Printed at: 1:10,560

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Surveyed 1867
Revised 1932
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1867
Revised 1932
Edition N/A
Copyright N/A
Levelled N/A

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Groundsure INSIGHTS

Site Details:

182-184, BITTERNE ROAD WEST, SOUTHAMPTON, SO18 1BE

Client Ref: A11950
Report Ref: GS-9152417
Grid Ref: 444035, 113294

Map Name: County Series
Map date: **1938**
Scale: 1:10,560
Printed at: 1:10,560

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Surveyed 1867
Revised 1932
Edition N/A
Copyright 1938
Levelled 1907

Surveyed 1867
Revised 1938
Edition 1938
Copyright N/A
Levelled N/A

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Groundsure INSIGHTS

Site Details:

182-184, BITTERNE ROAD WEST, SOUTHAMPTON, SO18 1BE

Client Ref: A11950
Report Ref: GS-9152417
Grid Ref: 444035, 113294

Map Name: County Series

Map date: **1938**

Scale: 1:10,560

Printed at: 1:10,560

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Surveyed 1867
Revised 1938
Edition 1938
Copyright N/A
Levelled N/A

Surveyed 1867
Revised 1938
Edition N/A
Copyright N/A
Levelled N/A

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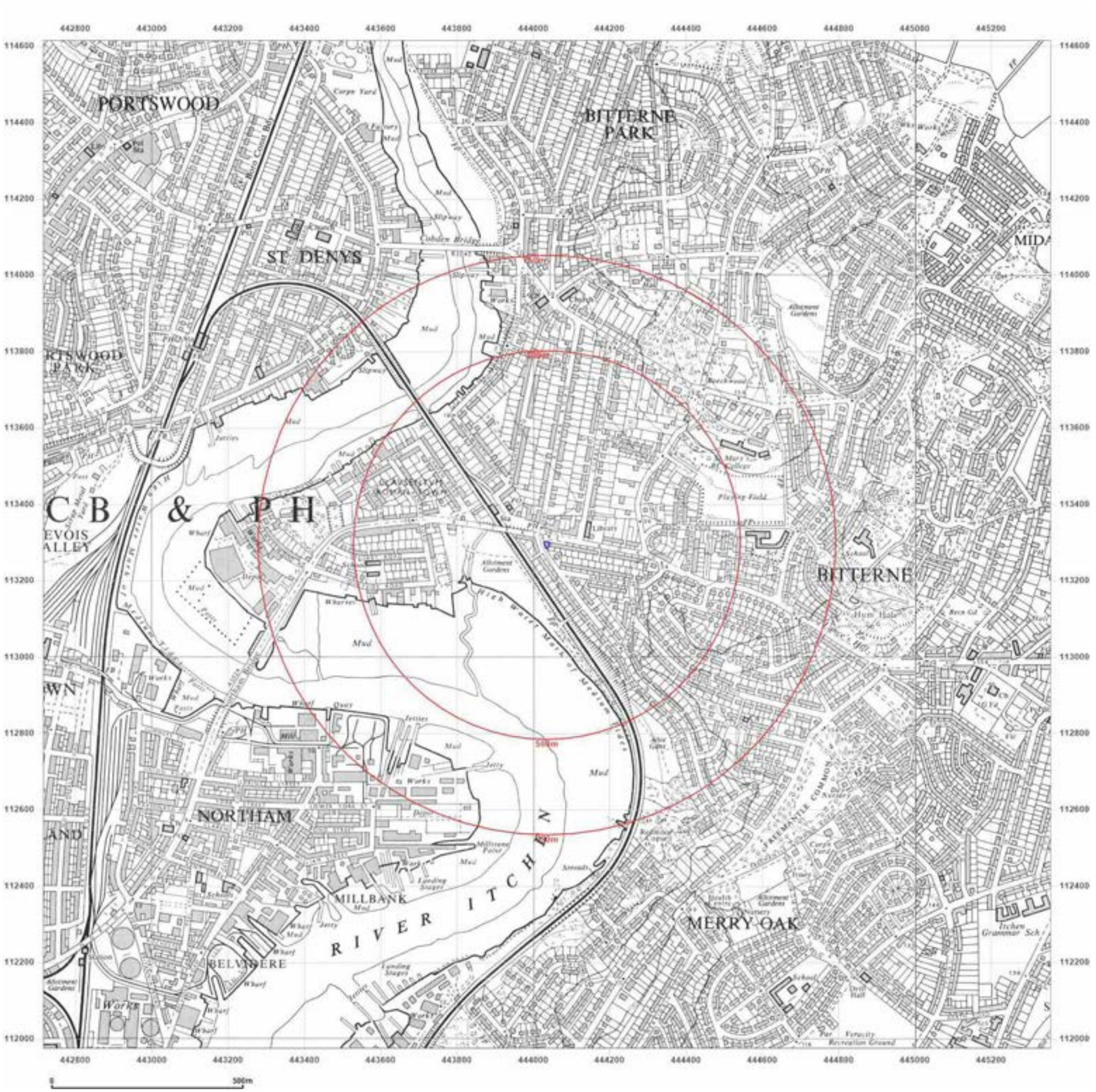

Groundsure INSIGHTS

Site Details:

182-184, BITTERNE ROAD
WEST, SOUTHAMPTON, SO18
1BE

Client Ref: A11950
Report Ref: GS-9152417
Grid Ref: 444035, 113294

Map Name: Provisional
Map date: **1957**
Scale: 1:10,560
Printed at: 1:10,560

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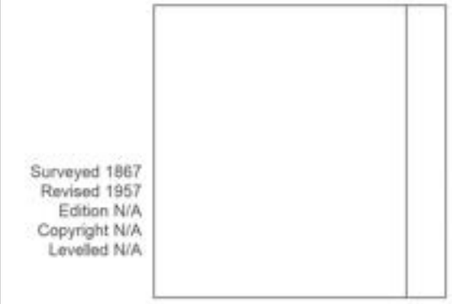

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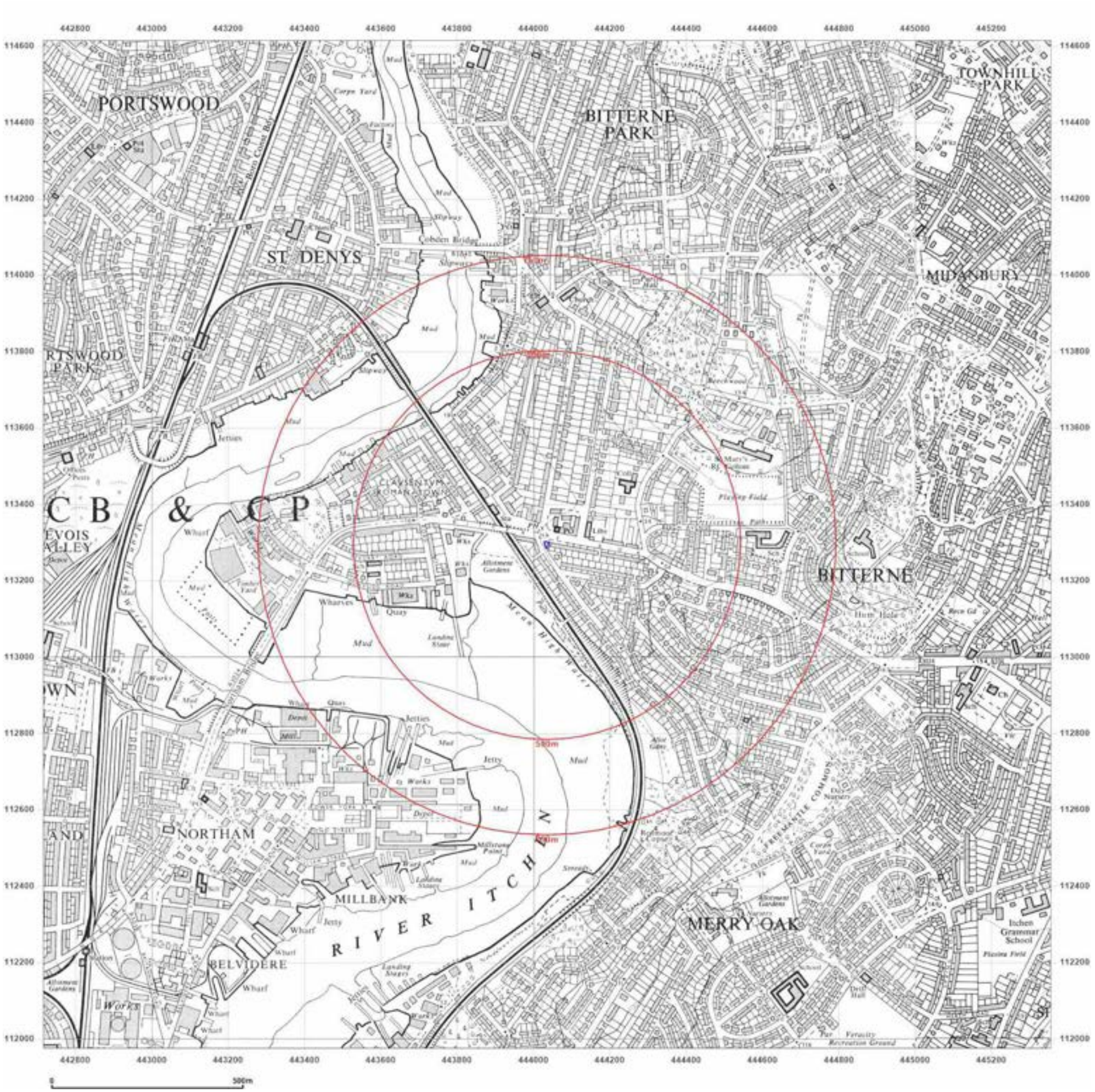

Groundsure INSIGHTS

Site Details:

182-184, BITTERNE ROAD
WEST, SOUTHAMPTON, SO18
1BE

Client Ref: A11950
Report Ref: GS-9152417
Grid Ref: 444035, 113294

Map Name: Provisional
Map date: **1967-1968**
Scale: 1:10,560
Printed at: 1:10,560

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Surveyed 1968
Revised 1968
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1967
Revised 1967
Edition N/A
Copyright N/A
Levelled N/A

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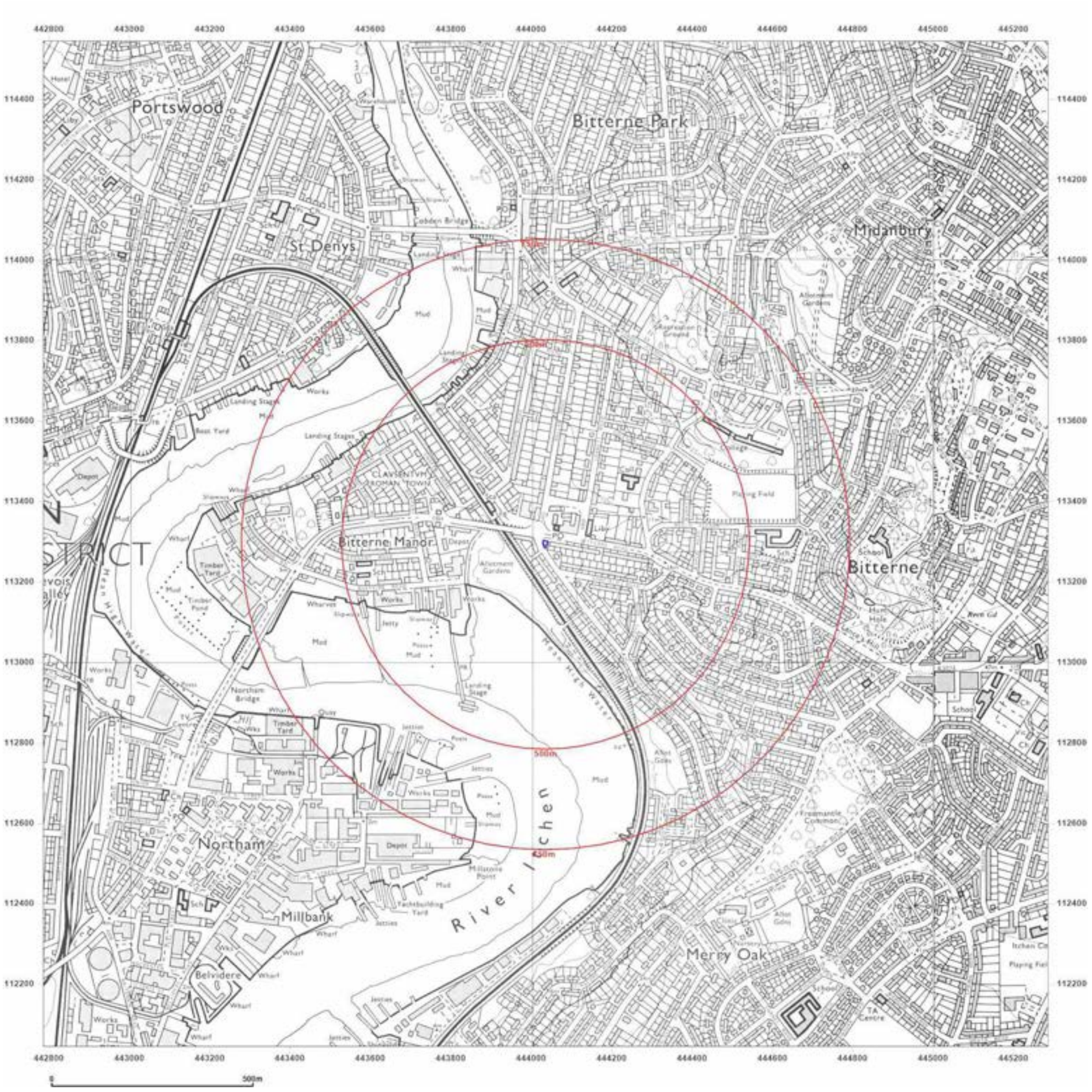

Groundsure INSIGHTS

Site Details:

182-184, BITTERNE ROAD
WEST, SOUTHAMPTON, SO18
1BE

Client Ref: A11950
Report Ref: GS-9152417
Grid Ref: 444035, 113294

Map Name: National Grid

Map date: **1978-1979**

Scale: 1:10,000

Printed at: 1:10,000

N
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Surveyed 1977
Revised 1979
Edition N/A
Copyright 1979
Levelled 1971

Surveyed 1976
Revised 1978
Edition N/A
Copyright 1978
Levelled 1973

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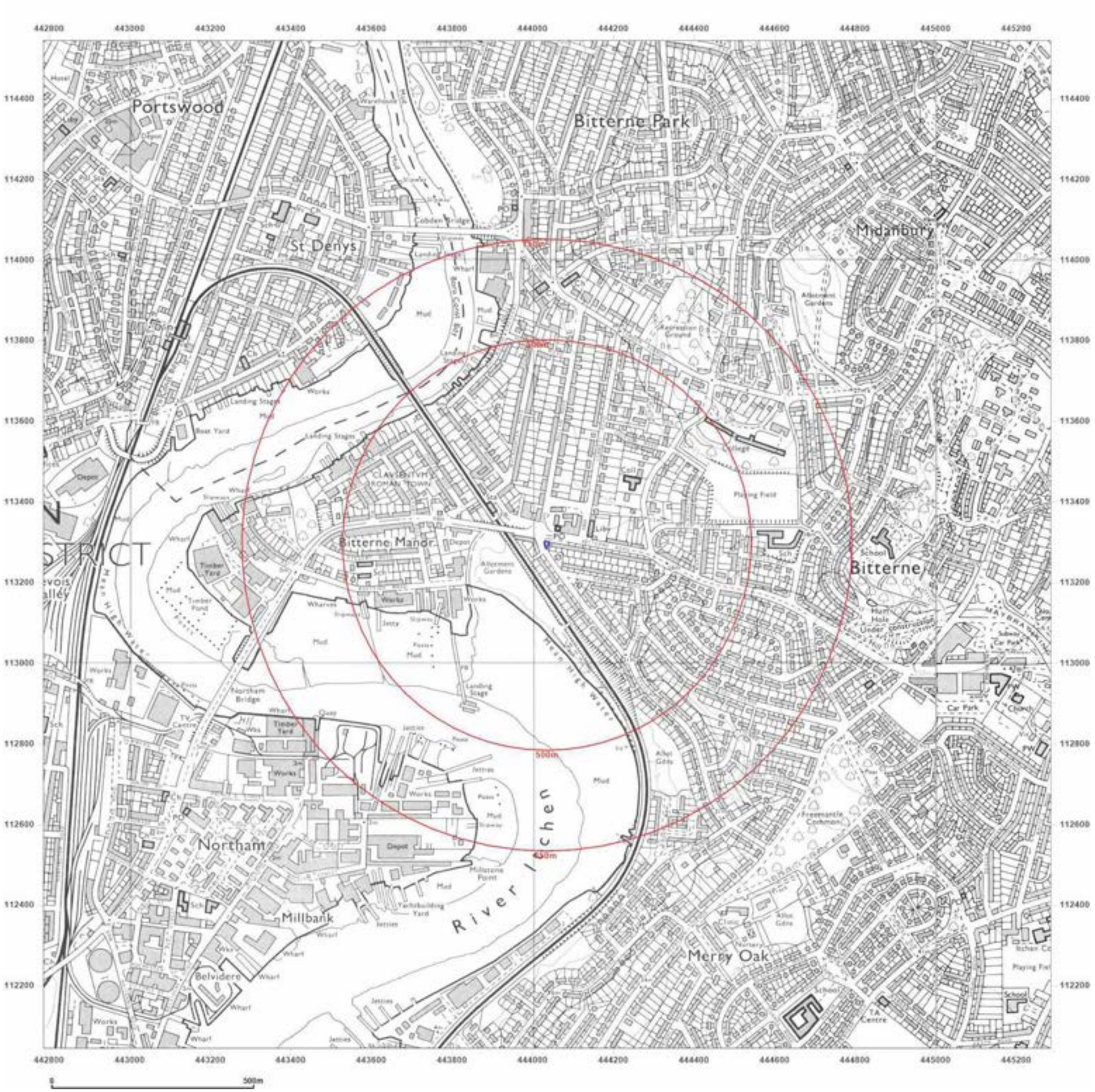

Groundsure INSIGHTS

Site Details:

182-184, BITTERNE ROAD
WEST, SOUTHAMPTON, SO18
1BE

Client Ref: A11950
Report Ref: GS-9152417
Grid Ref: 444035, 113294

Map Name: National Grid

Map date: **1983-1987**

Scale: 1:10,000

Printed at: 1:10,000

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Surveyed 1977
Revised 1983
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1985
Revised 1987
Edition N/A
Copyright N/A
Levelled N/A

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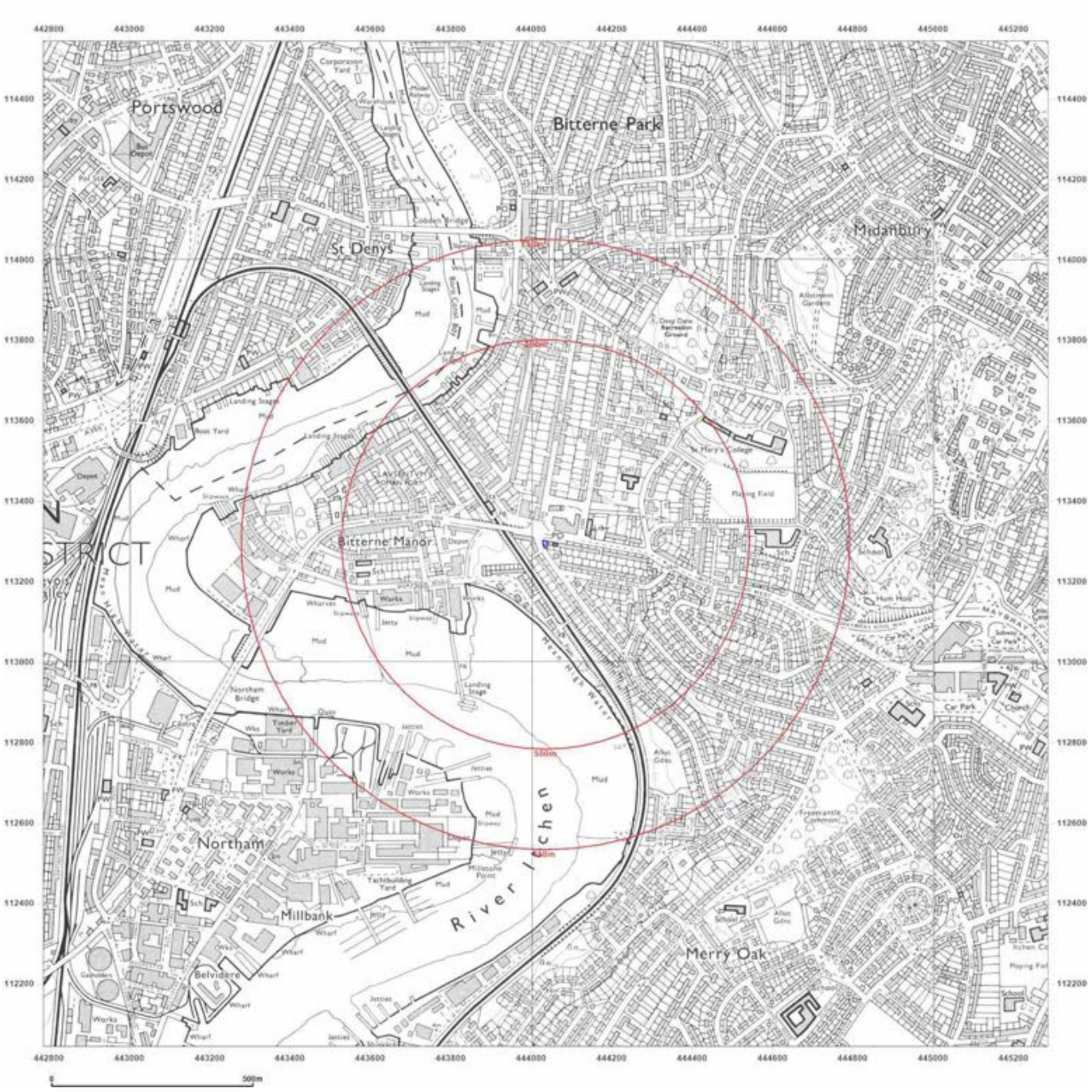

Groundsure INSIGHTS

Site Details:

182-184, BITTERNE ROAD
WEST, SOUTHAMPTON, SO18
1BE

Client Ref: A11950
Report Ref: GS-9152417
Grid Ref: 444035, 113294

Map Name: National Grid

Map date: **1990-1993**

Scale: 1:10,000

Printed at: 1:10,000

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Surveyed 1984
Revised 1990
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1991
Revised 1993
Edition N/A
Copyright N/A
Levelled N/A

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Production date: 25 October 2022

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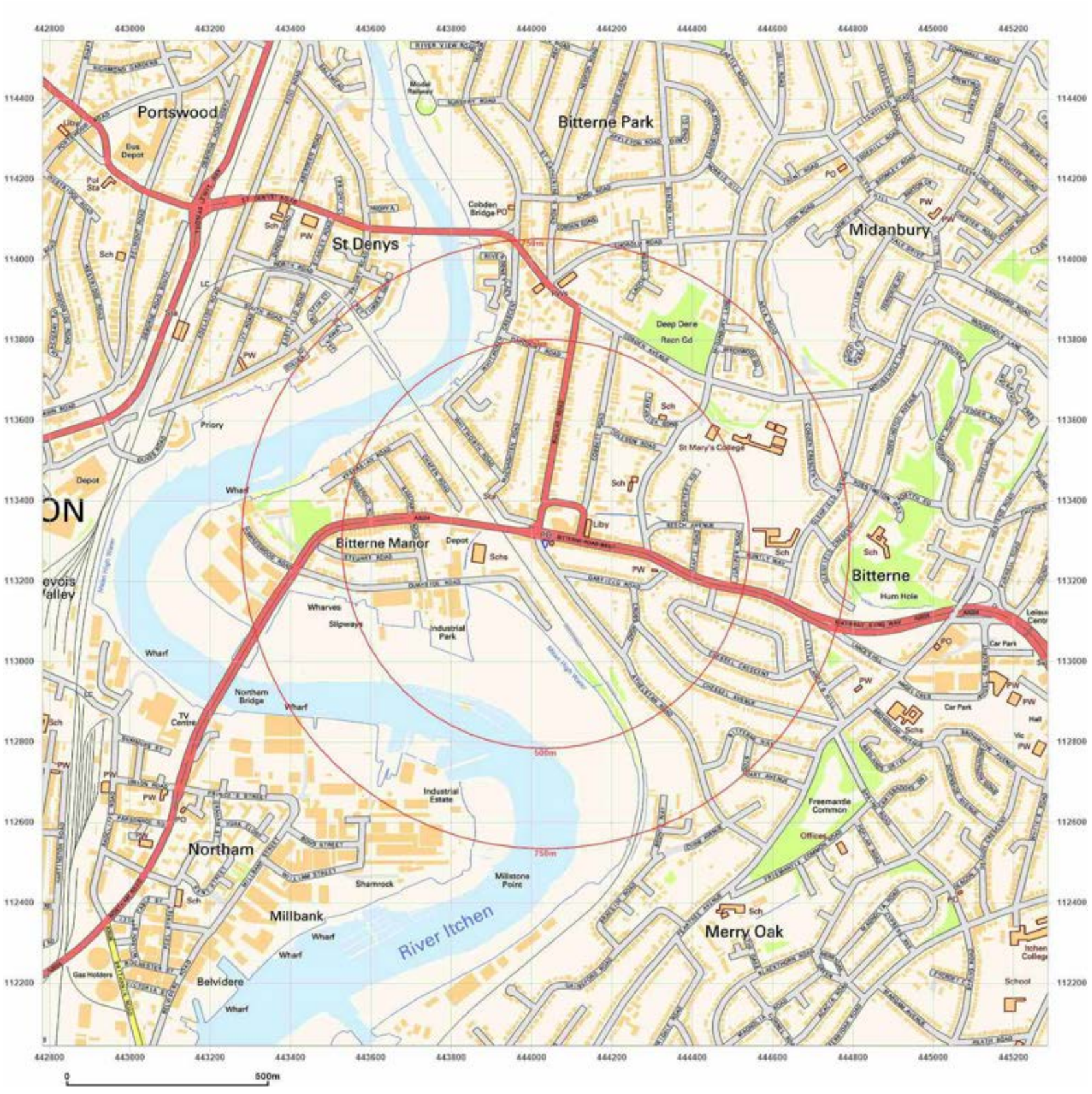

Groundsure INSIGHTS

Site Details:

182-184, BITTERNE ROAD WEST, SOUTHAMPTON, SO18 1BE

Client Ref: A11950
Report Ref: GS-9152417
Grid Ref: 444035, 113294

Map Name: National Grid
Map date: **2001**
Scale: 1:10,000
Printed at: 1:10,000

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Production date: 25 October 2022

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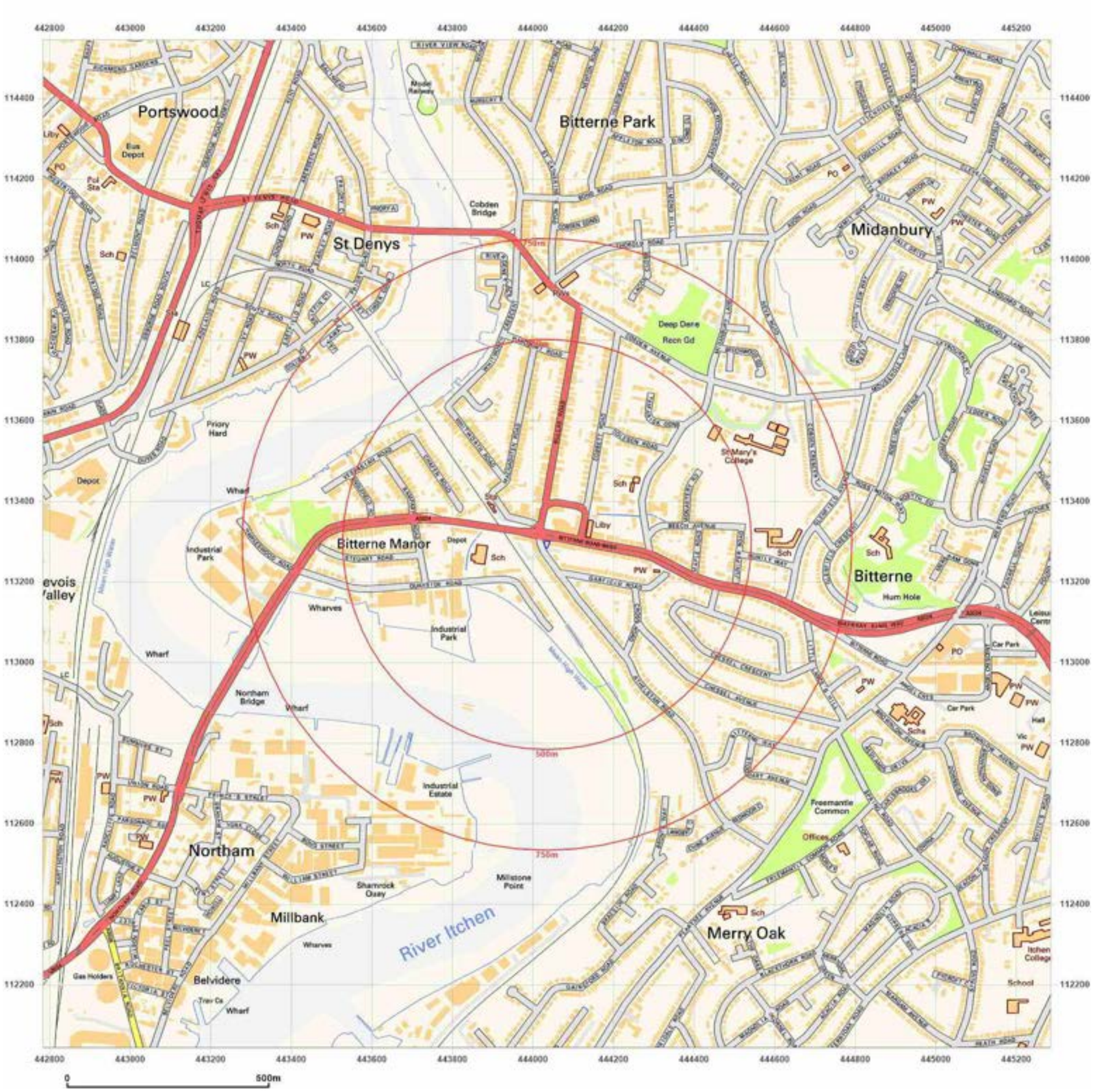

Groundsure INSIGHTS

Site Details:

182-184, BITTERNE ROAD WEST, SOUTHAMPTON, SO18 1BE

Client Ref: A11950
Report Ref: GS-9152417
Grid Ref: 444035, 113294

Map Name: National Grid
Map date: **2010**
Scale: 1:10,000
Printed at: 1:10,000

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Production date: 25 October 2022

Map legend available at:
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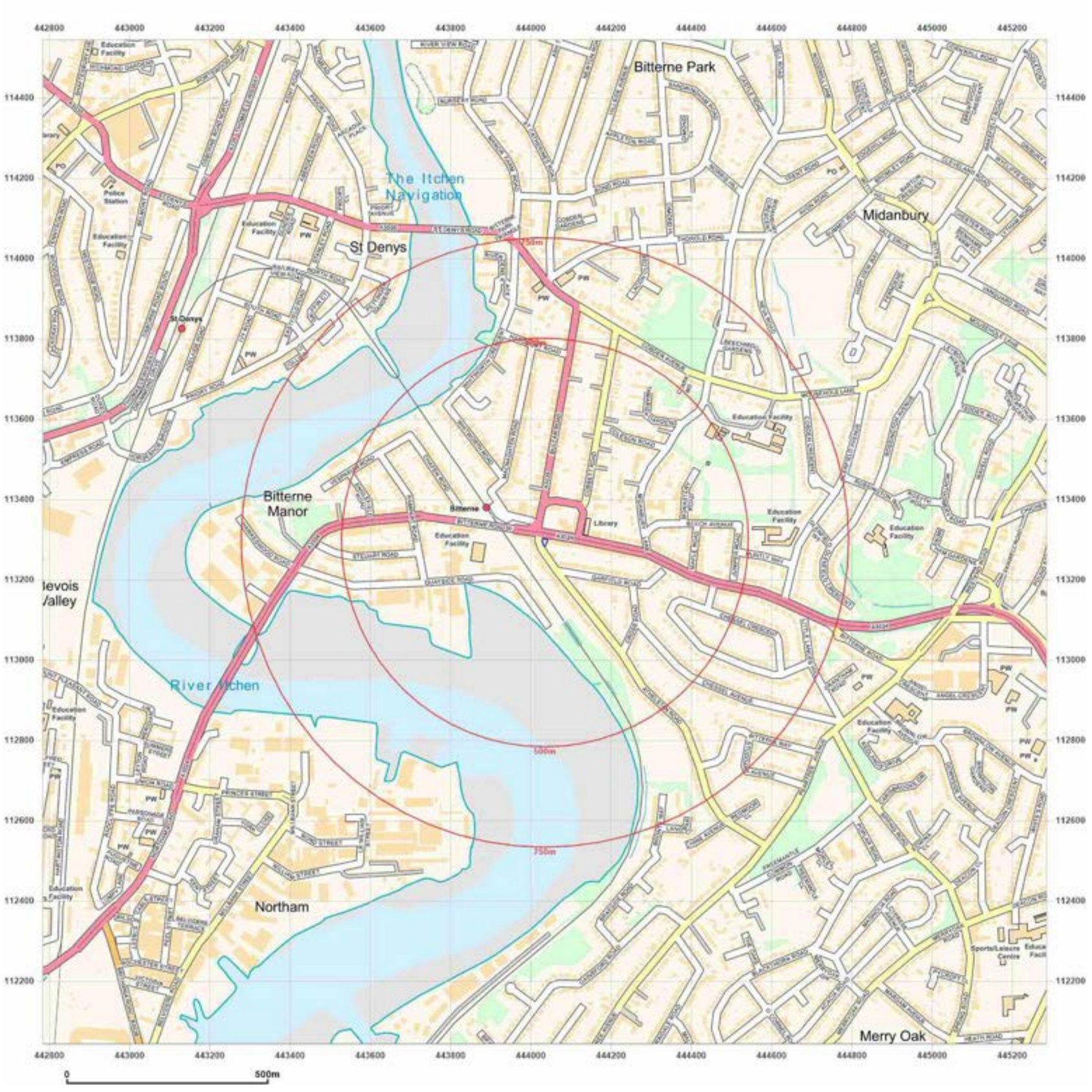

Groundsure INSIGHTS

Site Details:

182-184, BITTERNE ROAD WEST, SOUTHAMPTON, SO18 1BE

Client Ref: A11950
Report Ref: GS-9152417
Grid Ref: 444035, 113294

Map Name: National Grid

Map date: **2022**

Scale: 1:10,000

Printed at: 1:10,000

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APPENDIX VI - EXPLORATORY HOLE LOGS

OMNIA 3-6 The Quarterdeck Port Solent Portsmouth PO6 4TP	**Borehole Log**		Borehole No. **CP101** Sheet 1 of 2
Project Name: 182-184 Bitterne Road West	Project No. A11950	Co-ords: 444035.00 - 113299.00	Hole Type CP
Location: Southampton, Hampshire, SO18 1BE		Level:	Scale 1:50
Client: SC Architecture		Dates: 31/10/2022 - 31/10/2022	Logged By HS

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.00 - 0.15	ES		0.15			Yellowish brown concrete. [MADE GROUND]
		0.30 - 0.60	ES		0.30			Brown gravelly fine to coarse SAND. Gravel is fine to coarse subangular to subrounded flint. [RIVER TERRACE DEPOSITS]
		0.50 - 1.00	B					
		0.60 - 0.90	ES					Brown slightly clayey gravelly fine to coarse SAND. Gravel is fine to coarse subangular to subrounded flint with low cobble content of rounded flint. [RIVER TERRACE DEPOSITS]
		1.20		N=37 (1,3/5,7,11,14)	1.20			Orange and bluish grey clayey fine to coarse SAND. [RIVER TERRACE DEPOSITS]
					1.50			Orangeish brown clayey gravelly fine to coarse SAND. Gravel is fine to coarse subangular to subrounded flint. [RIVER TERRACE DEPOSITS]
		2.20		N=22 (4,5/6,6,5,5)				
		3.20		N=25 (4,5/6,6,7,6)				
		4.20		N=34 (6,7/8,8,9,9)				
		5.00		N=19 (2,3/4,5,5,5)	5.00			
		5.00 - 5.50	B					Firm bluish grey slightly sandy CLAY. Sand is fine. [LONDON CLAY FORMATION]
		6.00 - 6.45	U					
		6.45 - 6.50	D					
		7.50		N=18 (2,3/4,4,5,5)				
		9.00		N=21 (3,3/5,5,5,6)				*From 9.00-12.00m bgl CLAY becomes stiff to very stiff.*

Continued on next sheet

Remarks
1. Position scanned with calibrated CAT & 'Genny' prior to excavation. No Groundwater encountered.

AGS

OMNIA 3-6 The Quarterdeck Port Solent Portsmouth PO6 4TP	# Borehole Log		Borehole No. **CP101** Sheet 2 of 2
Project Name: 182-184 Bitterne Road West	Project No. A11950	Co-ords: 444035.00 - 113299.00	Hole Type CP
Location: Southampton, Hampshire, SO18 1BE		Level:	Scale 1:50
Client: SC Architecture		Dates: 31/10/2022 - 31/10/2022	Logged By HS

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		10.95 - 11.00	D					*From 11.00-12.00m bgl fine white and cream shell fragments noted.*
		12.00		N=48 (5,7/9,11,13,15)	12.00			Dark grey clayey fine to coarse SAND. [LONDON CLAY FORMATION] *At 12.00m bgl rare dark grey medium subrounded mudstone gravel noted.*
		13.50		N=50 (7,9/50 for 260mm)	13.50			End of borehole at 13.50 m

Remarks
1. Position scanned with calibrated CAT & 'Genny' prior to excavation. No Groundwater encountered.

AGS

OMNIA

3-6 The Quarterdeck
Port Solent
Portsmouth
PO6 4TP

Borehole Log

Borehole No.
WS101
Sheet 1 of 1

Project Name: 182-184 Bitterne Road West	Project No. A11950	Co-ords: 444031.00 - 113302.00	Hole Type WS
Location: Southampton, Hampshire, SO18 1BE		Level:	Scale 1:25
Client: SC Architecture		Dates: 31/10/2022 - 31/10/2022	Logged By HS

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.00 - 0.15	ES					Yellowish brown concrete. [MADE GROUND]
		0.30 - 0.60	ES		0.25			Orangeish brown slightly clayey sandy fine to coarse subangular to subrounded GRAVEL of flint. Sand is fine to coarse. [RIVER TERRACE DEPOSITS]
		0.50 - 1.00	B					
		0.60 - 1.00	ES					
		1.00		N=16 (3,3/5,4,4,4,3)				
		1.00 - 1.50	B					
		1.50 - 1.80	D		1.50			Soft orange and brown slightly gravelly sandy CLAY. Gravel is fine to medium subangular to subrounded flint. Sand is fine to medium. [RIVER TERRACE DEPOSITS]
		2.00		50 (9,16/50 for 225mm)	2.00			End of borehole at 2.00 m

Remarks
1. Position scanned with calibrated CAT & 'Genny' prior to excavation. No Groundwater encountered.

AGS

OMNIA
3-6 The Quarterdeck
Port Solent
Portsmouth
PO6 4TP

Borehole Log

Borehole No.
WS102
Sheet 1 of 1

Project Name: 182-184 Bitterne Road West	Project No. A11950	Co-ords: 444038.00 - 113302.00	Hole Type WS
Location: Southampton, Hampshire, SO18 1BE		Level:	Scale 1:25
Client: SC Architecture		Dates: 31/10/2022 - 31/10/2022	Logged By HS

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.00 - 0.20	ES					Yellowish brown concrete. [MADE GROUND]
					0.20			
		0.30 - 0.60	ES					Brown slightly clayey gravelly fine to coarse SAND. Gravel is fine to coarse subangular to subrounded flint. [RIVER TERRACE DEPOSITS]
		0.50 - 1.00	B					
		0.60 - 1.00	ES					
		1.00		N=32 (3,4/8,8,8,8)				
		1.00 - 1.50	B					
		2.00		N=50 (4,5/10,12,14,14)	2.00			End of borehole at 2.00 m

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Remarks
1. Position scanned with calibrated CAT & 'Genny' prior to excavation. No Groundwater encountered.

AGS

OMNIA

3-6 The Quarterdeck
Port Solent
Portsmouth
PO6 4TP

Borehole Log

Borehole No.
WS103
Sheet 1 of 1

Project Name: 182-184 Bitterne Road West	Project No. A11950	Co-ords: 444031.00 - 113295.00	Hole Type WS
Location: Southampton, Hampshire, SO18 1BE		Level:	Scale 1:25
Client: SC Architecture		Dates: 31/10/2022 - 31/10/2022	Logged By HS

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.00 - 0.30	ES					Brown clayey sandy fine to coarse subangular to subrounded GRAVEL of flint and brick. Sand is fine to coarse. [MADE GROUND]
		0.30 - 0.60	ES		0.30			Brown clayey sandy fine to coarse subangular to subrounded GRAVEL of flint. Sand is fine to coarse. [RIVER TERRACE DEPOSITS]
		0.50 - 1.00	B					
		0.60 - 1.00	ES		0.60			Orangeish brown fine to coarse SAND and fine to coarse subangular to subrounded GRAVEL of flint with low cobble content of subangular to subrounded flint. [RIVER TERRACE DEPOSITS]
		1.00		N=8 (1,1/1,1,3,3)				
					1.30			Soft orangeish brown sandy CLAY. Sand is fine to medium. [RIVER TERRACE DEPOSITS]
		1.50 - 1.60	D					
		1.70 - 2.00	B		1.70			Orangeish brown fine to coarse SAND and fine to coarse subangular to subrounded GRAVEL of flint. [RIVER TERRACE DEPOSITS]
		2.00		N=50 (4,8/12,12,14,12)	2.00			End of borehole at 2.00 m

Remarks
1. Position scanned with calibrated CAT & 'Genny' prior to excavation. No Groundwater encountered.

AGS

OMNIA

3-6 The Quarterdeck
Port Solent
Portsmouth
PO6 4TP

Borehole Log

Borehole No.
WS104
Sheet 1 of 1

Project Name: 182-184 Bitterne Road West	Project No. A11950	Co-ords: 444038.00 - 113295.00	Hole Type WS
Location: Southampton, Hampshire, SO18 1BE		Level:	Scale 1:25
Client: SC Architecture		Dates: 31/10/2022 - 31/10/2022	Logged By HS

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.00 - 0.30	ES					Soft dark brown slightly gravelly sandy CLAY. Gravel is fine to coarse angular to subangular flint and brick. Sand is fine. [MADE GROUND]
		0.30 - 0.60	ES					
		0.50 - 1.00	B					
		1.00		N=4 (1,1/1,1,1,1)	1.00			
		1.00 - 1.50	B					Orangeish brown slightly gravelly fine to coarse SAND. Gravel is fine to medium angular to subangular flint. [RIVER TERRACE DEPOSITS]
		1.50 - 1.70	D					
		2.00		N=50 (5,7/12,16,18,4)	2.00			End of borehole at 2.00 m

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Remarks
1. Position scanned with calibrated CAT & 'Genny' prior to excavation. No Groundwater encountered.

AGS

APPENDIX VII - CHEMICAL ANALYSIS CERTIFICATES

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Omnia
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Port Solent
Portsmouth
PO6 4TP

Attention :	Tim Mitchell
Date :	9th November, 2022
Your reference :	A11950
Our reference :	Test Report 22/18075 Batch 1
Location :	182 - 184 Bittern Road, Southampton
Date samples received :	3rd November, 2022
Status :	Final Report
Issue :	1

Four samples were received for analysis on 3rd November, 2022 of which four were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:

Bruce Leslie
Project Manager

Client Name: Omnia
Reference: A11950
Location: 182 - 184 Bittern Road, Southampton
Contact: Tim Mitchell
EMT Job No: 22/18075

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	1-3	4-6	7-9	10-12							LOD/LOR	Units	Method No.
Sample ID	CP101	WS101	WS103	WS104									
Depth	0.30-0.60	0.60-1.00	0.00-0.30	0.30-0.60									
COC No / misc													
Containers	V J T	V J T	V J T	V J T									
Sample Date	31/10/2022	01/11/2022	01/11/2022	01/11/2022									
Sample Type	Soil	Soil	Soil	Soil									
Batch Number	1	1	1	1									
Date of Receipt	03/11/2022	03/11/2022	03/11/2022	03/11/2022									
Arsenic #	12.8	13.2	10.1	16.2							<0.5	mg/kg	TM30/PM15
Barium #	30	24	46	56							<1	mg/kg	TM30/PM15
Beryllium	0.9	0.9	0.6	1.0							<0.5	mg/kg	TM30/PM15
Cadmium #	<0.1	<0.1	<0.1	<0.1							<0.1	mg/kg	TM30/PM15
Chromium #	60.1	73.5	83.8	50.5							<0.5	mg/kg	TM30/PM15
Copper #	13	9	18	22							<1	mg/kg	TM30/PM15
Lead #	52	22	152	191							<5	mg/kg	TM30/PM15
Mercury #	0.2	<0.1	0.4	0.3							<0.1	mg/kg	TM30/PM15
Nickel #	10.8	12.6	10.4	13.3							<0.7	mg/kg	TM30/PM15
Selenium #	<1	<1	<1	<1							<1	mg/kg	TM30/PM15
Vanadium	32	36	28	36							<1	mg/kg	TM30/PM15
Water Soluble Boron #	0.3	0.2	0.8	0.6							<0.1	mg/kg	TM74/PM32
Zinc #	34	33	47	84							<5	mg/kg	TM30/PM15
PAH MS													
Naphthalene #	0.05	<0.04	<0.04	<0.04							<0.04	mg/kg	TM4/PM8
Acenaphthylene	0.14	<0.03	<0.03	0.20							<0.03	mg/kg	TM4/PM8
Acenaphthene #	<0.05	<0.05	<0.05	<0.05							<0.05	mg/kg	TM4/PM8
Fluorene #	0.13	<0.04	<0.04	<0.04							<0.04	mg/kg	TM4/PM8
Phenanthrene #	0.68	<0.03	0.09	0.34							<0.03	mg/kg	TM4/PM8
Anthracene #	0.19	<0.04	<0.04	0.17							<0.04	mg/kg	TM4/PM8
Fluoranthene #	0.34	<0.03	0.30	1.15							<0.03	mg/kg	TM4/PM8
Pyrene #	0.42	<0.03	0.25	1.03							<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene #	0.22	<0.06	0.25	0.64							<0.06	mg/kg	TM4/PM8
Chrysene #	0.21	<0.02	0.21	0.92							<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene #	0.27	<0.07	0.38	1.67							<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene #	0.16	<0.04	0.18	0.85							<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene #	0.11	<0.04	0.14	0.73							<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene #	<0.04	<0.04	<0.04	0.09							<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene #	0.09	<0.04	0.10	0.63							<0.04	mg/kg	TM4/PM8
PAH 16 Total	3.0	<0.6	1.9	8.4							<0.6	mg/kg	TM4/PM8
Benzo(b)fluoranthene	0.19	<0.05	0.27	1.20							<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	0.08	<0.02	0.11	0.47							<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	90	95	93	83							<0	%	TM4/PM8
EPH >C8-C10 (EH_1D_Total) #	<5	<5	<5	<5							<5	mg/kg	TM5/PM8
EPH >C10-C12 (EH_1D_Total) #	<10	<10	<10	<10							<10	mg/kg	TM5/PM8
EPH >C12-C16 (EH_1D_Total) #	<10	<10	<10	<10							<10	mg/kg	TM5/PM8
EPH >C16-C21 (EH_1D_Total) #	<10	<10	16	16							<10	mg/kg	TM5/PM8
EPH >C21-C35 (EH_1D_Total) #	26	<10	23	100							<10	mg/kg	TM5/PM8
EPH >C35-C44 (EH_1D_Total)	<10	<10	<10	<10							<10	mg/kg	TM5/PM8
EPH >C8-C44 (EH_1D_Total)	<30	<30	39	116							<30	mg/kg	TM5/PM8
GRO (>C4-C6)	1.2	<0.1	<0.1	<0.1							<0.1	mg/kg	TM36/PM12

Element Materials Technology

Client Name: Omnia
Reference: A11950
Location: 182 - 184 Bittern Road, Southampton
Contact: Tim Mitchell
EMT Job No: 22/18075

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	1-3	4-6	7-9	10-12							LOD/LOR	Units	Method No.
Sample ID	CP101	WS101	WS103	WS104									
Depth	0.30-0.60	0.60-1.00	0.00-0.30	0.30-0.60									
COC No / misc													
Containers	V J T	V J T	V J T	V J T									
Sample Date	31/10/2022	01/11/2022	01/11/2022	01/11/2022									
Sample Type	Soil	Soil	Soil	Soil									
Batch Number	1	1	1	1									
Date of Receipt	03/11/2022	03/11/2022	03/11/2022	03/11/2022									
GRO (>C6-C8) (HS_1D_Total) #	<0.1	<0.1	<0.1	<0.1							<0.1	mg/kg	TM36/PM12
GRO (>C4-C8)	1.2	<0.1	<0.1	<0.1							<0.1	mg/kg	TM36/PM12
Total Phenols HPLC	<0.15	<0.15	<0.15	<0.15							<0.15	mg/kg	TM26/PM21B
Natural Moisture Content	13.9	10.3	14.9	15.9							<0.1	%	PM4/PM0
Hexavalent Chromium #	<0.3	<0.3	<0.3	<0.3							<0.3	mg/kg	TM38/PM20
Sulphate as SO4 (2:1 Ext) #	0.0644	0.0215	0.0386	0.0034							<0.0015	g/l	TM38/PM20
Chromium III	60.1	73.5	83.8	50.5							<0.5	mg/kg	NONE/NONE
Total Cyanide #	<0.5	<0.5	<0.5	<0.5							<0.5	mg/kg	TM89/PM45
Total Organic Carbon #	0.75	-	1.27	-							<0.02	%	TM21/PM24
pH #	7.13	7.65	8.12	8.03							<0.01	pH units	TM73/PM11

Please see attached notes for all abbreviations and acronyms

Client Name: Omnia
Reference: A11950
Location: 182 - 184 Bittern Road, Southampton
Contact: Tim Mitchell

Note:

Asbestos Screen analysis is carried out in accordance with our documented in-house methods PM042 and TM065 and HSG 248 by Stereo and Polarised Light Microscopy using Dispersion Staining Techniques and is covered by our UKAS accreditation. Detailed Gravimetric Quantification and PCOM Fibre Analysis is carried out in accordance with our documented in-house methods PM042 and TM131 and HSG 248 using Stereo and Polarised Light Microscopy and Phase Contrast Optical Microscopy (PCOM). Asbestos sub-samples are retained for not less than 6 months from the date of analysis unless specifically requested.

The LOQ of the Asbestos Quantification is 0.001% dry fibre of dry mass of sample.

Where the sample is not taken by a Element Materials Technology consultant, Element Materials Technology cannot be responsible for inaccurate or unrepresentative sampling.

Where trace asbestos is reported the amount of asbestos will be <0.1%.

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analyst Name	Date Of Analysis	Analysis	Result
22/18075	1	CP101	0.30-0.60	3	Catherine Coles	08/11/2022	**General Description (Bulk Analysis)**	soil,stone
					Catherine Coles	08/11/2022	**Asbestos Fibres**	NAD
					Catherine Coles	08/11/2022	**Asbestos ACM**	NAD
					Catherine Coles	08/11/2022	**Asbestos Type**	NAD
22/18075	1	WS101	0.60-1.00	6	Catherine Coles	08/11/2022	**General Description (Bulk Analysis)**	soil,stone
					Catherine Coles	08/11/2022	**Asbestos Fibres**	NAD
					Catherine Coles	08/11/2022	**Asbestos ACM**	NAD
					Catherine Coles	08/11/2022	**Asbestos Type**	NAD
22/18075	1	WS103	0.00-0.30	9	Catherine Coles	08/11/2022	**General Description (Bulk Analysis)**	soil,stone
					Catherine Coles	08/11/2022	**Asbestos Fibres**	NAD
					Catherine Coles	08/11/2022	**Asbestos ACM**	NAD
					Catherine Coles	08/11/2022	**Asbestos Type**	NAD
22/18075	1	WS104	0.30-0.60	12	Catherine Coles	08/11/2022	**General Description (Bulk Analysis)**	soil,stone
					Catherine Coles	08/11/2022	**Asbestos Fibres**	NAD
					Catherine Coles	08/11/2022	**Asbestos ACM**	NAD
					Catherine Coles	08/11/2022	**Asbestos Type**	NAD

Client Name: Omnia
Reference: A11950
Location: 182 - 184 Bittern Road, Southampton
Contact: Tim Mitchell

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 22/18075						

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.
Only analyses which are accredited are recorded as deviating if set criteria are not met.

EMT Job No.: 22/18075

SOILS and ASH

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. Asbestos samples are retained for 6 months.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C. Ash samples are dried at 37°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

STACK EMISSIONS

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation for Dioxins and Furans and Dioxin like PCBs has been performed on XAD-2 Resin, only samples which use this resin will be within our MCERTS scope.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.
Laboratory records are kept for a period of no less than 6 years.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

Customer Provided Information

Sample ID and depth is information provided by the customer.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above calibration range, the result should be considered the minimum value. The actual result could be significantly higher.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

HWOL ACRONYMS AND OPERATORS USED

HS	Headspace Analysis.
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent.
CU	Clean-up - e.g. by florisil, silica gel.
1D	GC - Single coil gas chromatography.
Total	Aliphatics & Aromatics.
AL	Aliphatics only.
AR	Aromatics only.
2D	GC-GC - Double coil gas chromatography.
#1	EH_Total but with humics mathematically subtracted
#2	EU_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +).
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry.

EMT Job No: 22/18075

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465:1993(E) and BS1377-2:1990.	PM0	No preparation is required.			AR	
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM21	Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil, March 2012 v4.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.	Yes		AD	Yes
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM21B	As Received samples are extracted in Methanol: Water (60:40) by reciprocal shaker.			AR	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.			AD	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes		AD	Yes
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results will be re-run using GC-MS to double check, when requested.	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes

EMT Job No: 22/18075

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results will be re-run using GC-MS to double check, when requested.	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013I	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AD	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013I	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AR	Yes
TM65	Asbestos Bulk Identification method based on HSG 248 Second edition (2021)	PM42	Modified SCA Blue Book V.12 draft 2017 and WM3 1st Edition v1.1:2018. Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No
TM74	Analysis of water soluble boron (20:1 extract) by ICP-OES.	PM32	Hot water soluble boron is extracted from dried and ground samples using a 20:1 ratio.	Yes		AD	Yes
TM89	Modified USEPA method OIA-1667 (1999). Determination of cyanide by Flow Injection Analyser. Where WAD cyanides are required a Ligand displacement step is carried out before analysis.	PM45	As received solid samples are extracted with 1M NaOH by orbital shaker for Cyanide, Sulphide and Thiocyanate analysis.	Yes		AR	Yes
NONE	No Method Code	NONE	No Method Code			AD	Yes

APPENDIX VIII - ORIGIN OF GAC VALUES

Determinant	Unit	GAC	Exposure Pathway	Origin of Risk Assessment Value
Metals				
Arsenic	mg/kg	37	1	LQM CIEH Suitable for Use Levels (S4UL) 2015- Inorganic Arsenic
Beryllium	mg/kg	1.7	1	LQM CIEH Suitable for Use Levels (S4UL) 2015
Boron	mg/kg	290	1	
Cadmium	mg/kg	11	2	
Chromium (III)	mg/kg	910	1	
Chromium (VI)	mg/kg	6	2	
Copper	mg/kg	2,400	2	
Lead	mg/kg	200	1	Category 4 Screening Level (C4SL) utilising exposure parameters from CLEA SR3 report.
Mercury	mg/kg	40	1	LQM CIEH Suitable for Use Levels (S4UL) 2015- Inorganic Mercury
Nickel	mg/kg	180	1,2	LQM CIEH Suitable for Use Levels (S4UL) 2015
Selenium	mg/kg	250	1,2	
Vanadium	mg/kg	410	2	
Zinc	mg/kg	3,700	2	
General Inorganics				
Total Cyanide*	mg/kg	50	1	Dutch Intervention Values 2010
Asbestos	%	0.001%	6	OEC Derived Value based on ICRCL
General Organics				
Phenol	mg/kg	280	2	LQM CIEH Suitable for Use Levels (S4UL) 2015 1%SOM
PAHs				
Naphthalene	mg/kg	2.3	2	LQM CIEH Suitable for Use Levels (S4UL) 2015 based on a sandy loam as defined in SR3 (EA 2009) 1% SOM
Acenaphthylene	mg/kg	170	2	
Acenaphthene	mg/kg	210	2	
Fluorene	mg/kg	170	2	
Phenanthrene	mg/kg	95	2	
Anthracene	mg/kg	2,400	2	
Fluoranthene	mg/kg	280	1,2	
Pyrene	mg/kg	620	1,2	
Benzo(a)Anthracene(	mg/kg	7.2	1	
Chrysene	mg/kg	15	1	
Benzo(b)Fluoranthene	mg/kg	2.6	1	
Benzo(k)Fluoranthene	mg/kg	77	1	
Benzo(a)Pyrene	mg/kg	2.2	1	
Indeno(123-cd)Pyrene	mg/kg	27	1	
Dibenzo(a,h)Anthracene	mg/kg	0.24	1	

Determinant	Unit	GAC	Exposure Pathway	Origin of Risk Assessment Value
Benzo(ghi)Perylene	mg/kg	320	1	
BTEX & MTBE				
Benzene	mg/kg	0.087	4	LQM CIEH Suitable for Use Levels (S4UL) 2015 1%SOM
Toluene	mg/kg	130	2,4	
Ethylbenzene	mg/kg	47	2,4	
Xylenes	mg/kg	56	2,4	LQM CIEH Suitable for Use Levels (S4UL) 2015 1% SOM o-Xylene
MTBE	mg/kg	49	4	Soil Generic Assessment Criteria for Human Health Risk Assessment (2010)
TPH-CWG				
Aliphatic				
Aliphatic EC 5-6	mg/kg	42	4	LQM CIEH Suitable for Use Levels (S4UL) 2015 based on a sandy loam as defined in SR3 (EA 2009) 1% SOM
Aliphatic EC >6-8	mg/kg	100	4	
Aliphatic EC >8-10	mg/kg	27	4	
Aliphatic EC >10-12	mg/kg	130(vap)	4	
Aliphatic EC > 12-16	mg/kg	1,100(sol)	4	
Aliphatic EC > 16-35	mg/kg	65,000(sol)	1	
Aliphatic EC >35-44	mg/kg	65,000(sol)	1	
Aromatic				
Aromatic EC 5-7	mg/kg	70	4	LQM CIEH Suitable for Use Levels (S4UL) 2015 based on a sandy loam as defined in SR3 (EA 2009) 1% SOM
Aromatic EC>7-8	mg/kg	130	4	
Aromatic EC> 8-10	mg/kg	34	4	
Aromatic EC> 10-12	mg/kg	74	2	
Aromatic EC> 12-16	mg/kg	140	2	
Aromatic EC> 16-21	mg/kg	260	2	
Aromatic EC> 21-35	mg/kg	1,100	1	
Aromatic EC> 35-44	mg/kg	1,100	1	
Banded TPH				
TPH EC 5-6**	mg/kg	42	4	LQM CIEH Suitable for Use Levels (S4UL) 2015 based on a sandy loam as defined in SR3 (EA 2009) 1% SOM, utilising the most conservative of the Ali/Aro chain lengths.
TPH EC >6-8**	mg/kg	100	4	
TPH EC >8-10**	mg/kg	27	4	
TPH EC> 10-12**	mg/kg	74	2	
TPH EC> 12-16**	mg/kg	140	2	
TPH EC> 16-21**	mg/kg	260	1	
TPH EC> 21-35**	mg/kg	1,100	1	

Determinant	Unit	GAC	Exposure Pathway	Origin of Risk Assessment Value
TPH EC> 35-44**	mg/kg	1,100	1	

Notes
Abbreviations: GAC = General Assessment Criteria, n = number of samples, MC = Maximum Concentration; Loc of Ex = Location of Exceedance.

Main Exposure Pathways: 1 = Ingestion of Soil & Indoor Dust, 2 = Consumption of Homegrown Produce & Attached Soil; 3 = Dermal Contact (Indoor & Outdoor); 4 = Inhalation of Vapour (Indoor & Outdoor); 5 = Inhalation of Dust (Indoor & Outdoor), 6 = Inhalation of Fibres

* Total cyanide Tier 1 GAC is taken from the Dutch Intervention Value (2010) for complex cyanide.

** The Tier 1 GAC for the banded hydrocarbon fraction is derived from the CIEH/S4UL assessment for petroleum hydrocarbons Criteria Working Group (CWG) for both aliphatic and aromatic compounds. OEC has utilised the lowest of the aliphatic and aromatic chain lengths in order to adopt a conservative approach, which is considered satisfactory for the protection of human health.

(sol) – GAC presented exceeds the solubility saturation limit.
(vap) – GAC presented exceeds the vapour saturation limit.

APPENDIX IX - GEOTECHNICAL ANALYSIS CERTIFICATES

TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS
Tested in Accordance with:BS 1377-2:1990:Clause 4.4 and 5

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

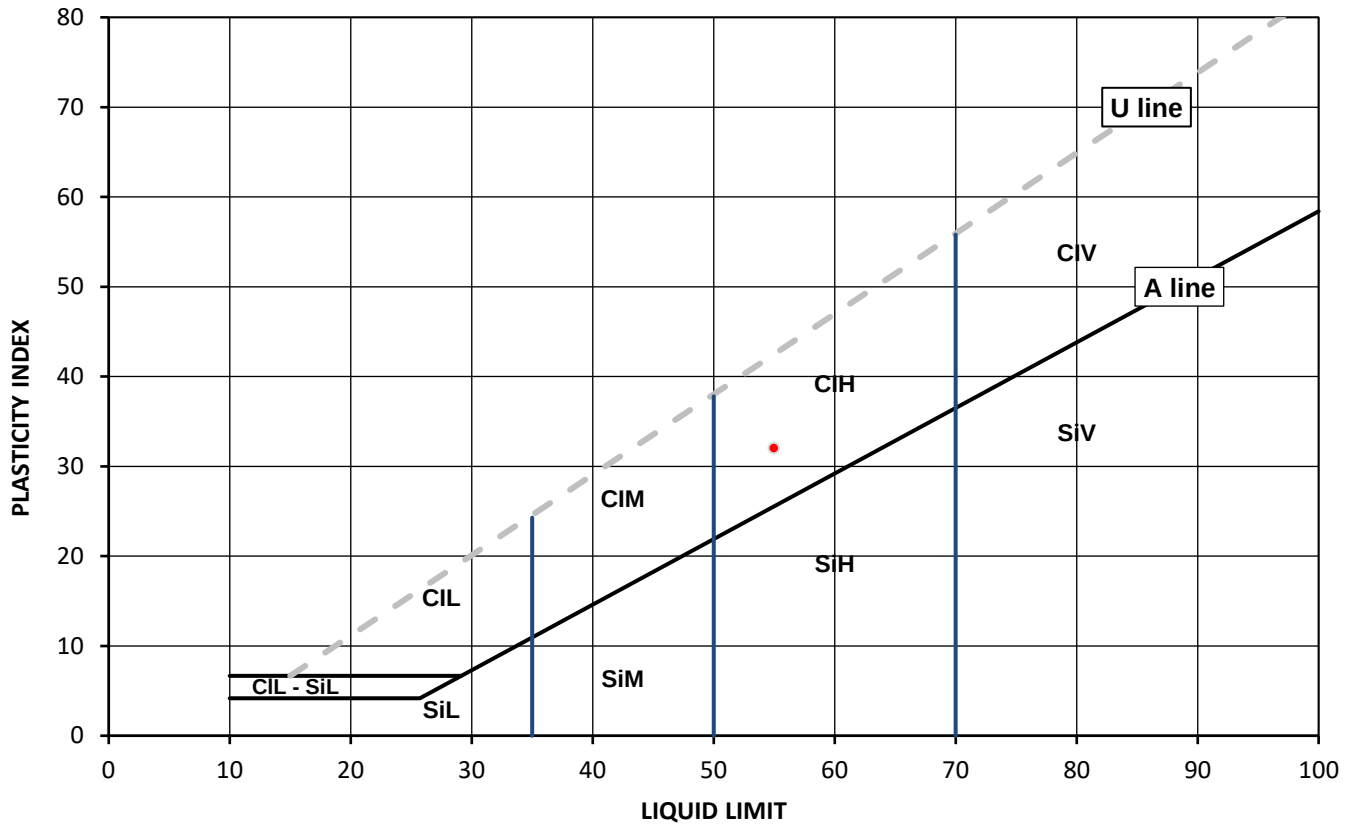
Client:	Omnia Environmental Consulting	Client Reference:	A11950
Client Address:	12 High Pavement, Lace Market, NG1 1HN	Job Number:	22-95143
		Date Sampled:	31/10/2022
		Date Received:	04/11/2022
Contact:	Hannah Spurling	Date Tested:	11/11/2022
Site Address:	182-184 Bittern Road Southampton	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	2490796	Depth Top [m]:	5.50
Hole No.:	CP101	Depth Base [m]:	6.00
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Brownish grey slightly gravelly slightly sandy CLAY		
Sample Preparation:	Tested after >425um removed by hand		

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
34	55	23	32	89



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed:

Monika Siewior
Reporting Specialist
for and on behalf of i2 Analytical Ltd

Date Reported: 25/11/2022

GF 232.12

TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS
Tested in Accordance with:BS 1377-2:1990:Clause 4.4 and 5

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

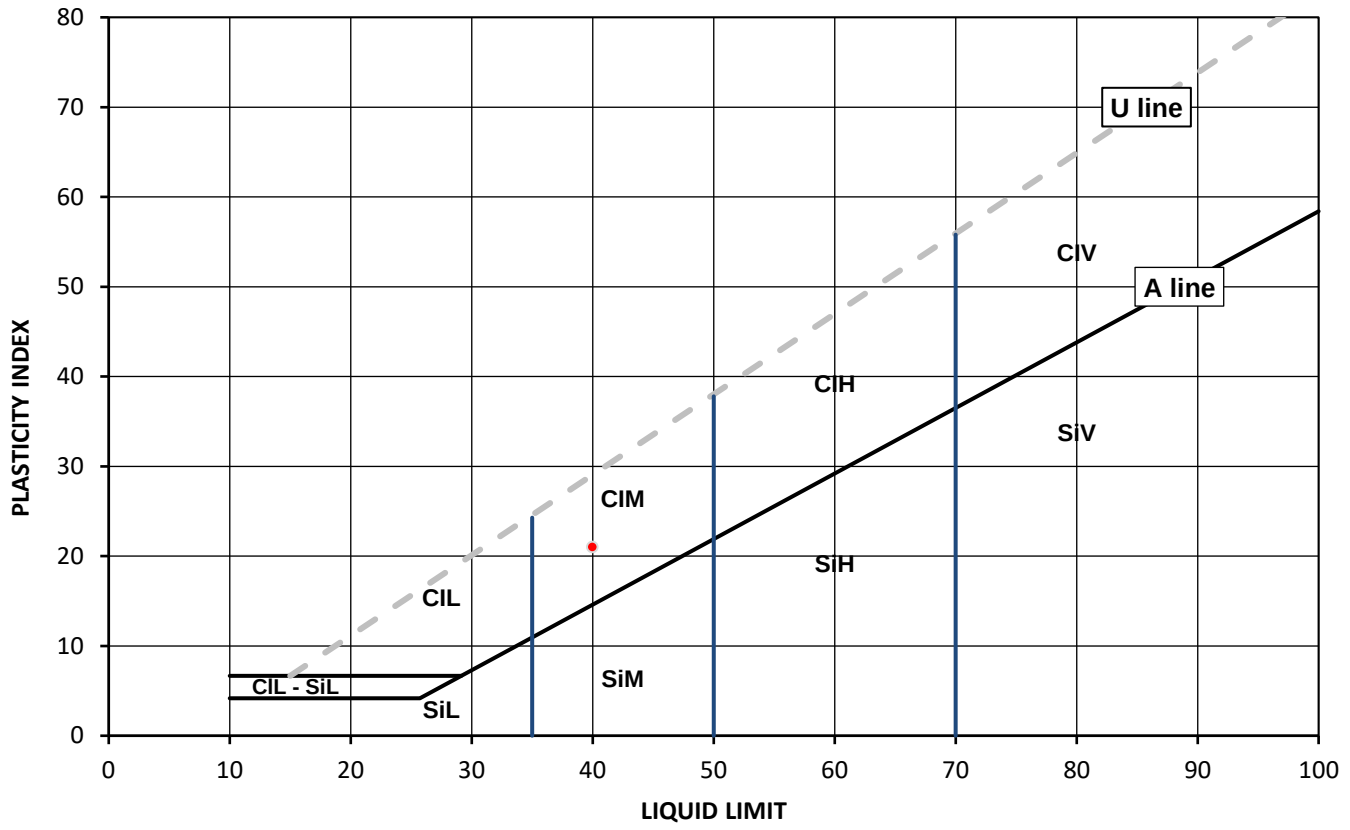
Client:	Omnia Environmental Consulting	Client Reference:	A11950
Client Address:	12 High Pavement, Lace Market, NG1 1HN	Job Number:	22-95143
		Date Sampled:	31/10/2022
		Date Received:	04/11/2022
Contact:	Hannah Spurling	Date Tested:	14/11/2022
Site Address:	182-184 Bittern Road Southampton	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	2490798	Depth Top [m]:	11.00
Hole No.:	CP101	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Greyish brown slightly gravelly sandy CLAY		
Sample Preparation:	Tested after >425um removed by hand		

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
25	40	19	21	99



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed:

Monika Siewior
Reporting Specialist
for and on behalf of i2 Analytical Ltd

Date Reported: 25/11/2022

GF 232.12

TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS
Tested in Accordance with:BS 1377-2:1990:Clause 4.4 and 5

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

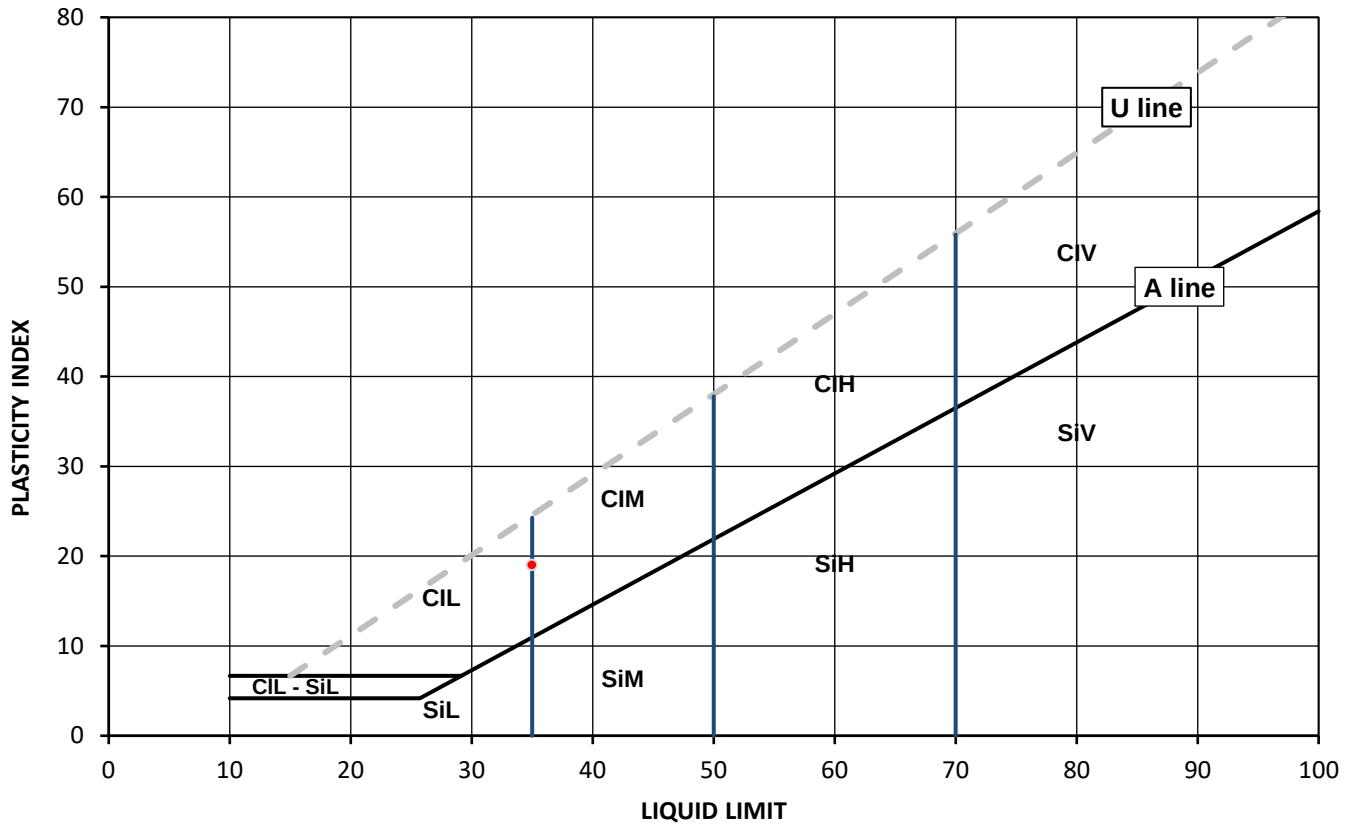
Client:	Omnia Environmental Consulting	Client Reference:	A11950
Client Address:	12 High Pavement, Lace Market, NG1 1HN	Job Number:	22-95143
		Date Sampled:	31/10/2022
		Date Received:	04/11/2022
Contact:	Hannah Spurling	Date Tested:	14/11/2022
Site Address:	182-184 Bittern Road Southampton	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	2490800	Depth Top [m]:	1.50
Hole No.:	WS103	Depth Base [m]:	1.60
Sample Reference:	Not Given	Sample Type:	D
Sample Description:	Brownish grey slightly gravelly sandy CLAY		
Sample Preparation:	Tested after >425um removed by hand		

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
22	35	16	19	99



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed:

Monika Siewior
Reporting Specialist
for and on behalf of i2 Analytical Ltd

Date Reported: 25/11/2022

GF 232.12

SUMMARY REPORT

SUMMARY OF CLASSIFICATION TEST RESULTS

Tested in Accordance with:

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Client: Omnia Environmental Consulting

Client Address: 12 High Pavement, Lace Market, NG1 1HN

Contact: Hannah Spurling

Site Address: 182-184 Bittern Road Southampton

Water Content by BS 1377-2:1990: Clause 3.2; Atterberg by BS 1377-2: 1990: Clause 4.3 (4 Point Test), Clause 4.4 (1 Point Test) and 5; PD by BS 1377-2: 1990: Clause 8.2

Client Reference: A11950
Job Number: 22-95143
Date Sampled: 31/10/2022
Date Received: 04/11/2022
Date Tested: 11/11 - 14/11/2022
Sampled By: Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks	Water Content BS 1377-2 [W]	Water Content BS EN ISO 17892-1 [W]	Atterberg				Density			Total Porosity#		
		Reference	Depth Top	Depth Base	Type					% Passing 425um	WL	Wp	Ip	bulk	dry	PD			
			m	m				%	%	%	%	%	%	Mg/m3	Mg/m3	Mg/m3	%		
2490796	CP101	Not Given	5.50	6.00	B	Brownish grey slightly gravelly slightly sandy CLAY	Atterberg 1 Point	34		89	55	23	32						
2490798	CP101	Not Given	11.00	Not Given	B	Greyish brown slightly gravelly sandy CLAY	Atterberg 1 Point	25		99	40	19	21						
2490800	WS103	Not Given	1.50	1.60	D	Brownish grey slightly gravelly sandy CLAY	Atterberg 1 Point	22		99	35	16	19						

Note: # Non accredited; NP - Non plastic

Comments:

Signed:

Monika Siewior
Reporting Specialist
for and on behalf of i2 Analytical Ltd

Date Reported: 25/11/2022

GF 234.14

SUMMARY REPORT

DETERMINATION OF WATER CONTENT

Tested in Accordance with: BS 1377-2: 1990: Clause 3.2

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Client: Omnia Environmental Consulting

Client Address: 12 High Pavement, Lace Market, NG1 1HN

Contact: Hannah Spurling

Site Address: 182-184 Bittern Road Southampton

Client Reference: A11950
Job Number: 22-95143
Date Sampled: 31/10/2022
Date Received: 04/11/2022
Date Tested: 11/11 - 14/11/2022
Sampled By: Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks	WC	Sample preparation / Oven temperature at the time of testing			
		Reference	Depth Top m	Depth Base m	Type			%				
2490796	CP101	Not Given	5.50	6.00	B	Brownish grey slightly gravelly slightly sandy CLAY		34	Sample was quartered, oven dried at 108.9 °C			
2490798	CP101	Not Given	11.00	Not Given	B	Greyish brown slightly gravelly sandy CLAY		25	Sample was quartered, oven dried at 106.2 °C			
2490800	WS103	Not Given	1.50	1.60	D	Brownish grey slightly gravelly sandy CLAY		22	Sample was quartered, oven dried at 106.2 °C			

Comments:

Signed:

Monika Siewior
Reporting Specialist
for and on behalf of i2 Analytical Ltd

Date Reported: 25/11/2022

GF 099.16

TEST CERTIFICATE

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Tested in Accordance with: BS 1377-2: 1990

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

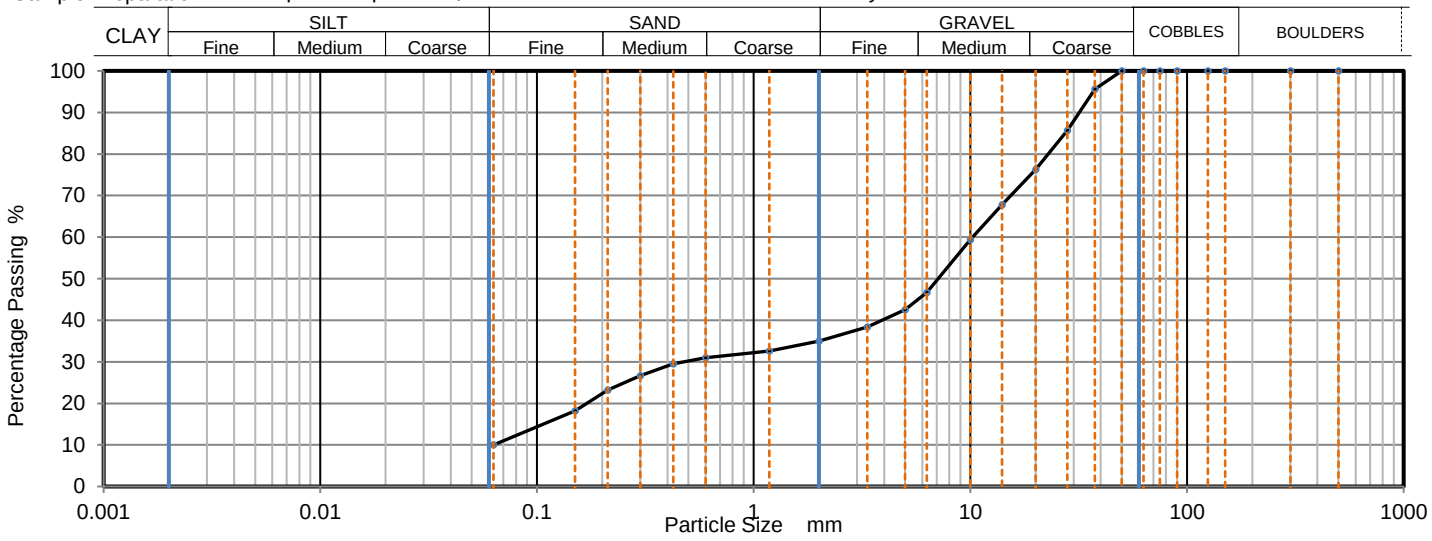
4041

Client:	Omnia Environmental Consulting	Client Reference:	A11950
Client Address:	12 High Pavement, Lace Market, NG1 1HN	Job Number:	22-95143
		Date Sampled:	31/10/2022
		Date Received:	04/11/2022
Contact:	Hannah Spurling	Date Tested:	11/11/2022
Site Address:	182-184 Bittern Road Southampton	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	2490799	Depth Top [m]:	0.50
Hole No.:	WS101	Depth Base [m]:	1.00
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Brown sandy clayey GRAVEL		
Sample Preparation:	Sample was quartered, oven dried at 108.7 °C and broken down by hand.		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
150	100		
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	96		
28	86		
20	76		
14	68		
10	59		
6.3	47		
5	43		
3.35	38		
2	35		
1.18	33		
0.6	31		
0.425	30		
0.3	27		
0.212	23		
0.15	18		
0.063	11		

Sample Proportions	% dry mass
Very coarse	0
Gravel	65
Sand	24
Fines <0.063mm	11

Grading Analysis		
D100	mm	50
D60	mm	10.2
D30	mm	0.475
D10	mm	
Uniformity Coefficient		> 160
Curvature Coefficient		

Uniformity Coefficient calculated in accordance with BS EN ISO 14688-2:2018

Note: Tested in Accordance with BS1377:Part 2:1990, clause 9.2

Remarks:

Signed: Monika Siewior

Monika Siewior
Reporting Specialist
for and on behalf of i2 Analytical Ltd

Date Reported: 25/11/2022

GF 100.21

TEST CERTIFICATE

DETERMINATION OF THE UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT MEASUREMENT OF PORE PRESSURE

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Tested in Accordance with: BS 1377-7: 1990: Clause 8

Client:	Omnia Environmental Consulting	Client Reference:	A11950
Client Address:	12 High Pavement, Lace Market, NG1 1HN	Job Number:	22-95143
		Date Sampled:	31/10/2022
		Date Received:	04/11/2022
Contact:	Hannah Spurling	Date Tested:	23/11/2022
Site Address:	182-184 Bittern Road Southampton	Sampled By:	Not Given

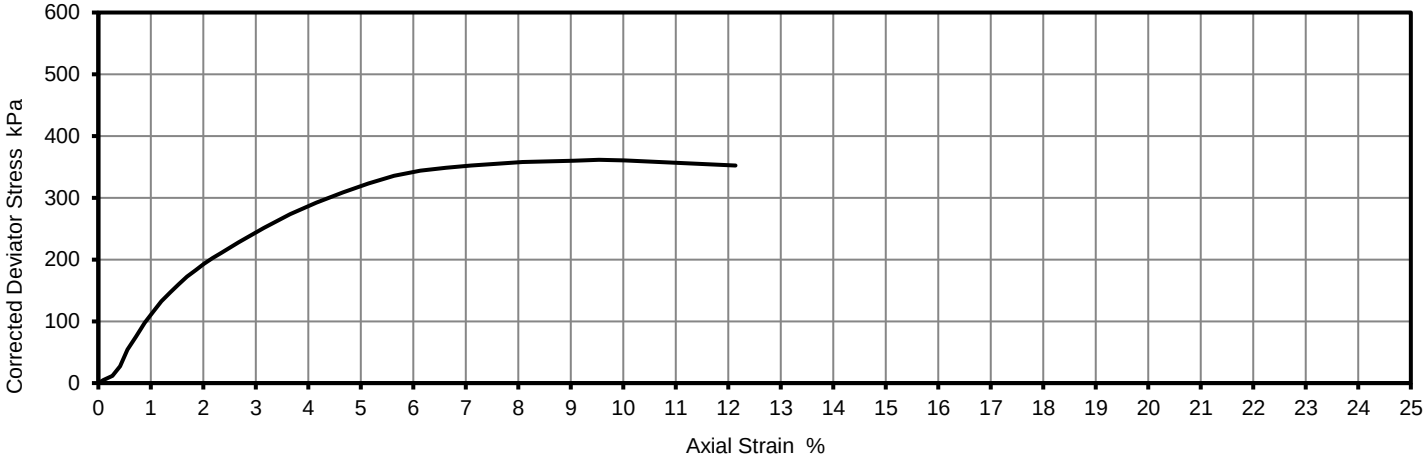
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

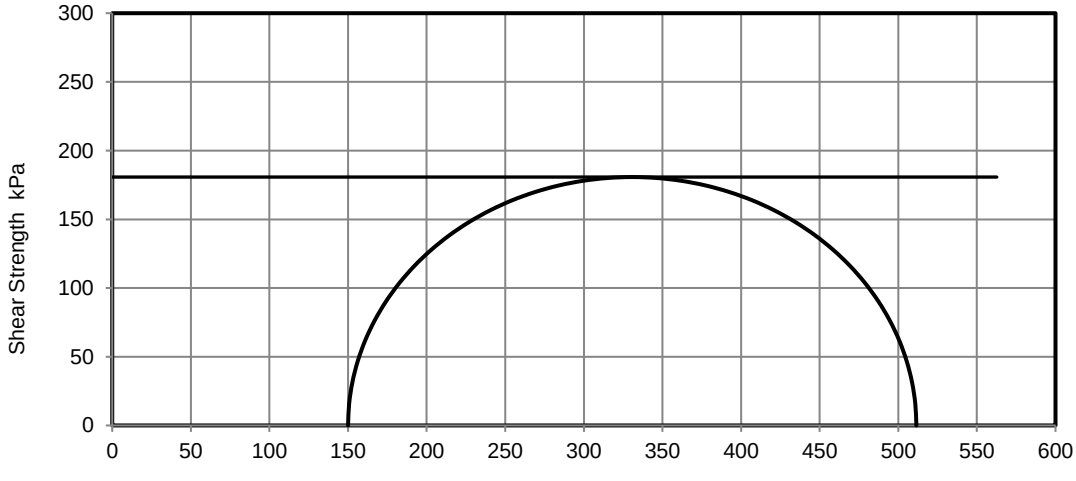
Laboratory Reference:	2490797	Depth Top [m]:	10.50
Hole No.:	CP101	Depth Base [m]:	10.95
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Brownish grey slightly silty CLAY with fragments of shells		
Sample Preparation:	Sample prepared in accordance with BS 1377-1:2016 Clause 9.1.1.		

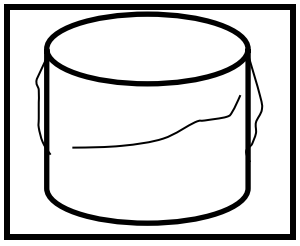
Test Number	1		Rate of Strain	2.00	%/min
Length	199.73	mm	Cell Pressure	150	kPa
Diameter	103.25	mm	Axial Strain at failure	9.5	%
Bulk Density	0.12	Mg/m3	Deviator Stress, (σ1 - σ3)f	362	kPa
Moisture Content	21	%	Undrained Shear Strength, cu	181	kPa ½(σ1 - σ3)f
Dry Density	0.10	Mg/m3	Mode of Failure	Compound	
Membrane Correction	0.56	kPa	Membrane thickness	0.27	mm

Deviator Stress v Axial Strain

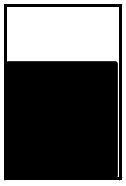


Mohr Circles





Position within sample



Note: Deviator stress corrected for area change and membrane effects. Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

Remarks: Unable to take a photo.

Signed: Monika Siewior

Monika Siewior
Reporting Specialist
for and on behalf of i2 Analytical Ltd

Date Reported: 25/11/2022

GF 184.12

Hannah Spurling
Omnia Environmental Consulting
12 High Pavement
Lace Market
NG1 1HN

e: hannah.spurling@omnia-consulting.co.uk

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 22-95146

Project / Site name:	182-184 Bittern Road Southampton	**Samples received on:**	04/11/2022
Your job number:	A11950	**Samples instructed on/ Analysis started on:**	04/11/2022
Your order number:	PO001587	**Analysis completed by:**	18/11/2022
Report Issue Number:	1	**Report issued on:**	18/11/2022
Samples Analysed:	5 soil samples		

Signed:

Elżbieta Suchy
Junior Reporting Specialist
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 22-95146
Project / Site name: 182-184 Bittern Road Southampton

Lab Sample Number				2490818	2490819	2490820	2490821	2490822
Sample Reference				CP101	CP101	CP101	WS101	WS103
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				5.50-6.00	10.50-10.95	11.00	0.50-1.00	1.50-1.60
Date Sampled				31/10/2022	31/10/2022	31/10/2022	31/10/2022	31/10/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	48	< 0.1
Moisture Content	%	0.01	NONE	26	16	17	8.6	14
Total mass of sample received	kg	0.001	NONE	0.6	0.3	0.4	0.4	0.4

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	7.7	8.3	7.4	7.8	7.8
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.34	0.23	0.29	0.022	0.016

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number : 22-95146
Project / Site name: 182-184 Bittern Road Southampton

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2490818	CP101	None Supplied	5.50-6.00	Brown clay.
2490819	CP101	None Supplied	10.50-10.95	Brown clay with gravel.
2490820	CP101	None Supplied	11	Brown clay and sand.
2490821	WS101	None Supplied	0.50-1.00	Brown silt with gravel and stones.**
2490822	WS103	None Supplied	1.50-1.60	Brown clay and sand with gravel.

**Non MCERTS Matrix.

Analytical Report Number : 22-95146
Project / Site name: 182-184 Bittern Road Southampton

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL or B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Samples
Omnia Environmental Consulting
3-6 The Quarterdeck
Port Solent
Portsmouth
PO6 4TP

e: samples@omnia-consulting.co.uk

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 22-12987

Project / Site name:	182-184 Bittern Road, Southampton	**Samples received on:**	22/11/2022
Your job number:	A11950	**Samples instructed on/ Analysis started on:**	13/12/2022
Your order number:	PO-001587	**Analysis completed by:**	28/12/2022
Report Issue Number:	1	**Report issued on:**	28/12/2022
Samples Analysed:	1 soil sample		

Signed:

Dominika Warjan
Junior Reporting Specialist
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 22-12987
Project / Site name: 182-184 Bittern Road, Southampton
Your Order No: PO-001587

Lab Sample Number				2531169
Sample Reference				CP101
Sample Number				None Supplied
Depth (m)				6.00
Date Sampled				31/10/2022
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	
Stone Content	%	0.1	NONE	< 0.1
Moisture Content	%	0.01	NONE	18
Total mass of sample received	kg	0.001	NONE	0.9

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	7.2
Total Sulphate as SO4	%	0.005	MCERTS	0.11
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.69
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	692
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	30
Total Sulphur	%	0.005	MCERTS	0.886
Water Soluble Nitrate (2:1) as N (leachate equivalent)	mg/l	2	NONE	< 2.0

Heavy Metals / Metalloids

Magnesium (water soluble)	mg/kg	5	NONE	120
Magnesium (leachate equivalent)	mg/l	2.5	NONE	62

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

Analytical Report Number : 22-12987
Project / Site name: 182-184 Bittern Road, Southampton

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2531169	CP101	None Supplied	6	Brown clay.

Analytical Report Number : 22-12987
Project / Site name: 182-184 Bittern Road, Southampton

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Magnesium, water soluble, in soil	Determination of water soluble magnesium by extraction with water followed by ICP-OES.	In-house method based on TRL 447	L038-PL	D	NONE
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total Sulphate in soil as %	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Total Sulphur in soil as %	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Water Soluble Nitrate (2:1) as N in soil	Determination of nitrate by reaction with sodium salicylate and colorimetry.	In-house method based on Examination of Water and Wastewatern & Polish Standard Method PN-82/C-04579.08, 2:1 extraction.	L078-PL	W	NONE
Chloride, water soluble, in soil	Determination of Chloride colorimetrically by discrete analyser.	In house method.	L082-PL	D	MCERTS
Sulphate, water soluble, in soil	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL or B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Sample Deviation Report

Analytical Report Number : 22-12987

Project / Site name: 182-184 Bittern Road, Southampton

This deviation report indicates the sample and test deviations that apply to the samples submitted for analysis.Please note that the associated result(s) may be unreliable and should be interpreted with care.

Key: a - No sampling date b - Incorrect container c - Holding time d - Headspace e - Temperature

Sample ID	Other ID	Sample Type	Lab Sample Number	Sample Deviation	Test Name	Test Ref	Test Deviation
CP101	None Supplied	S	2531169	c	Chloride, water soluble, in soil	L082-PL	c
CP101	None Supplied	S	2531169	c	Water Soluble Nitrate (2:1) as N in soil	L078-PL	c
CP101	None Supplied	S	2531169	c	pH in soil (automated)	L099-PL	c