PHASE I GEO-ENVIRONMENTAL SITE ASSESSMENT

LAND AT FORMER NOVARTIS SITE
WIMBLEHURST ROAD, HORSHAM, RH12 5AB

REC REFERENCE: 1CO105712/P1/R0

REPORT PREPARED FOR: HAMPSHIRE COUNTY COUNCIL

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National Consultancy, Locally Delivered

A CONCEPT LIFE SCIENCES COMPANY

QUALITY ASSURANCE

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EXECUTIVE SUMMARY

Site Address	Land at Former Novartis Site, Wimblehurst Road, Horsham, RH12 5AB
National Grid Reference	517811, 131776
Site Area	7.67 ha
Current Site Use	The site comprises large open space with three number buildings present. 2no. gatehouses the western entrance to site and a central 3no storey building dated circa 1930s with a 5no storey annex built onto this data circa 2000. The majority of the site is capped with demolition crush material. The site is disused except for occasional police and fire brigade training.
Proposed Use	REC understands that this report is required in order to support a potential land purchase for use as a mixed residential and commercial area.
Environmental Setting	Site underlain by the bedrock of the Upper Tunbridge Wells Sand – Sandstone and Mudstone, which is considered a Secondary 'A' Aquifer. The site is not located within a Groundwater Source Protection Zone (SPZ) and there are no active groundwater abstractions within 1km of the site. The nearest surface water feature is an un-named river located 327m north east.
Site History	The site has historically comprised an industrial land use from circa 1930. In recent years the site has been used as a pharmaceutical production and research centre.
Initial Conceptual Site Model (CSM)	**On-site** ▶ Railway Sidings; ▶ Pharmaceutical Works including unspecified laboratories and unspecified works; ▶ Made Ground associated with historical development, old clay pit, unspecified pit and cuttings; ▶ Tanks; ▶ Electricity Substation; and, ▶ Chimney. **Off-site** ▶ Made Ground associated with cuttings, brick field, unspecified pits, and unspecified ground workings (nearest located 2m south west); ▶ Railway Sidings and Buildings and Engine Shed (nearest located 5m south west); ▶ Unspecified works including timber yard, builders yard, industrial estate, engineering works, unspecified commercial/ industrial, brick works and unspecified factory (nearest located 33m east); ▶ Unspecified Tanks (nearest located 40m east); ▶ Metal works including Horsham Sheet Metal, Metal Components Ltd and iron works (nearest located 43m east); ▶ Depot and warehouses (nearest located 50m east); ▶ Garages including Horsham Car Centre and P M A Motor factors Ltd (nearest located 91m east); ▶ Electricity Substation (nearest located 98m east); ▶ Goods Shed (nearest located 147m south west); and, Landfill and Waste site (nearest located 412m east)
Overall Risk Assessment	**Moderate to High**
Conclusions and Recommendations	It is recommended that a Phase II intrusive investigation is undertaken to assess the contamination linkages identified within the Conceptual Site Model (CSM).

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APPENDICES

1.0 INTRODUCTION

1.1 Background

Resource and Environmental Consultants Ltd (REC) has been commissioned by Hampshire County Council, 'the Client', to undertake a Phase I Geo-Environmental Site Assessment at Land at Former Novartis Site, Wimblehurst Road, Horsham, RH12 5AB 'the site'.

1.2 Proposed Development

REC understands that this report is required in order to support a potential land purchase for use as a mixed residential and commercial area.

1.3 Objectives

The objectives of the desk based study are to:

- Undertake a site walkover to identify any current areas of potential environmental concern in order to establish the source, pathway, receptor conceptual site model (CSM);
- Review historical plans, geology, hydrogeology, site sensitivity, flood-plain issues, mining records and any local authority information available in order to complete a Phase I Desk Study in line with Environment Agency (EA) document Model Procedures for the Management of Contaminated Land (Contaminated Land Report 11 (CLR11));
- 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 potential off-site receptors;
- Provide preliminary recommendations on any potential development issues; and,
- Provide recommendations regarding future works required.

1.4 Sources of Information

Background information was sought from the following sources:

- Groundsure database search (reports GS-5101587 & GS-5101588);
- Historical mapping dated 1874 to 2014. A selection of historical map excerpts are reproduced in Appendix V;
- Online planning records held by Horsham District Council;
- Environment Agency Groundwater Vulnerability Map (www.environment-agency.gov.uk/wiyby);
- Radon: Guidance on protective measures for new buildings (BRE Document BR 211, 2015) and HPA Indicative Radon Atlas for England and Wales); and,
- British Geological Survey Online Mapping (http://www.bgs.ac.uk).

1.5 Risk Classification

REC Ltd has utilised the available data to classify the site on the basis of its likely contaminated land liability and potential for geotechnical constraints in relation to the property development. The risk classification definitions are summarised below:

Risk	Definition
Low	There are unlikely to be significant contaminated land liabilities/geotechnical constraints associated with the property.
Low-Moderate	There are unlikely to be significant contaminated land liabilities/geotechnical constraints associated with the property with regard to the proposed use. However, minor issues may require further consideration in the event of a future redevelopment of the site etc.
Moderate	Some potential contaminated land liabilities/geotechnical constraints are likely to affect the property as a result of historical and/or current activities. The risks identified are unlikely to pose an immediate significant issue but the purchaser/developer may wish to make further enquiries of the vendor or undertake further environmental improvements. Redevelopment of the site will likely require further site investigation.
Moderate-High	Some potentially significant contaminated land liabilities/geotechnical constraints have been identified at the property that requires further assessment including intrusive ground investigations.
High	Significant potential contaminated land liabilities/geotechnical constraints have been identified at the property. Further assessment including intrusive ground investigation will be required to determine to level of risk and associated liability.

1.6 Limitations of the Study

The full limitations of this report are presented in Appendix I.

1.7 Confidentiality

REC 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 REC. A charge may be levied against such approval.

2.0 SITE SETTING

2.1 Site Details

Table 2.1 Summary of Site Details

Site Address	Land at Former Novartis Site, Wimblehurst Road, Horsham, RH12 5AB
National Grid Reference	517811, 131776
Site Area	7.67 ha

A site location plan is presented in Appendix III as Drawing No. 1CO105712-001.

2.2 Current Site Use

Site Walkover Brief

A site walkover was undertaken on 7th June 2018 and the following site description comprises the site layout and features based on the REC Engineer's observations at the time. Selected photographs from the site walkover are presented in Appendix IV.

The subject site was irregular in shape and approximately 7.67 hectares in size bounded by '*Parsonage Road*' and '*Wimblehurst Road*' to the North and North West, with the railway forming the Eastern and South Western boundary. The site primarily comprised large areas of demolition rubble where buildings associated with the production, research, storage and disposal of pharmaceutical products once stood. It is understood that this demolition took place recently.

The site was generally capped in demolition crush material, with areas of asphalt and concrete hardstanding associated with roadways, pathway and loading areas. Three structures were present within the north western portion of the site. The main structure comprised a 1930s large commercial/ industrial building with associated basement. This was 4no. storeys inc. attic space. At the time of the walkover the basement was noted to have been significantly flooded due to high water levels in the area and failure of the wet proofing of the retaining walls. Adjoined to this is a later structure (circa 2000) comprising 5no. storeys (Building 36). It is understood that this structure is proposed to be demolished based on anecdotal information provided during the walkover.

The sites topography was identified to slope from North West to South East. It was also noted that the land to the North of the site running adjacent to Parsonage Road was at a lower level. Typically, the site was flat with occasional depressions believed to be associated with previous demolition works and excavations.

Sewage was identified noted to be pumped from the structure using UST septic tanks located adjacent to the north of Building 36.

The surrounding land uses comprised an industrial estate to the East comprising various industrial uses such as Hanson concrete production, car dealership, timber yards, and a brewery.

Hazardous Materials Storage

No above ground storage tanks were found on site during the walkover. It is understood that the site did historically contain above ground storage tanks (ASTs) which were used for storage of water, oils and LPG. These have since been removed during the demolition of the area.

No visual identifiers of further Underground Storage Tanks (USTs) were identified on site in addition to the anecdotal evidence detailing the site use of septic tanks.

Polychlorinated Biphenyls (PCBs)

No equipment that may potentially contain PCBs was observed on site albeit anecdotal evidence identified that an electricity substation was once present on site but has since been decommissioned and demolished. It is likely that PCB containing materials may be located off site associated with the railway to the East.

Asbestos Containing Material (ACM)

No suspected ACMs were identified on-site, however, it is understood that due to the age of the existing buildings on site it is likely that ACM is present within these. It is understood that post demolition stage on the site, an asbestos contractor was appointed to clear the site of asbestos fragments. Despite this it is considered that occasional asbestos loose fibres may be present still within the made ground covering across the site.

Waste Storage

Underground septic tanks are located to the north of *'Building 36'*. No other existing waste storage areas were identified on site, however it was noted at an incinerator and historic waste storage areas were located to the south and south east of site prior to its demolition.

2.3 Surrounding Area

The surrounding land uses are summarised below:

Table 2.2 Summary of Surrounding Land Uses

Direction	Land Use
North	Residential properties (currently in development).
East	Industrial estate and multi-line railway.
South	Multi-line railway and school playing field.
West	Residential estate.

3.0 SITE HISTORY

3.1 Historical Maps

A review of historical maps pertinent to the site is summarised in Table 3.1 below:

Table 3.1 Summary of Potentially Contaminative Historical Land Uses

Map Edition	Historical Land Use
1874 - 1938 (1:1,250, 1:2,500 & 1:10,560)	The majority of the site comprises open space with a *'clay pit'* located in the south. The surrounding area comprises open space to the north with railway lines adjacent south and west. Additionally, a *'brick field'* is located 20m south and *'clay pit'* 70m south. From 1897 the surrounding area comprises of railway sidings adjacent south of the site, *'Horsham Iron Works'* is 40m east, a *'brick field'* is adjacent west, an *'engine shed'* 50m south, a *'nursey'* 120m west and *'allotments'* 100m west. From 1911 an *'engineering works'* is located 40m east and a nursey is located 40m west.
1938-1962 (1:1,250, 1:1,250 & 1:10,000)	A single structure is located in the centre of the site and is labelled *'laboratory'*.
1962-1974 (1:1,250, 1:1,250, 1:10,000 & 1:10,560)	Nine structures are located on the site and the site is labelled *'unspecified works'*. Off site within the surrounding area an *'unspecified works'* is located between 110m to 150m east, and a *'factory'* is located 150m east.
1974- 2014 (1:1,250, 1:1,250, & 1:10,000)	A very large structure has been constructed in the east of the site and is labelled *'pharmaceutical works'*. Off site from 1982 a *'builders yard'* is located 30m east, a *'depot'* 30m east, *'tanks'* 30m east and an *'electricity substation'* is located 150m east.
2014- Present (1:10,000)	The large pharmaceutical works building has been demolished.

3.2 Historical Database

A review of potentially contaminative land uses identified on historical Ordnance Survey maps within a 150m radius of the site is summarised below in Table 3.2:

Table 3.2 Summary of Potentially Contaminative Historical Land Uses

Surrounding Feature	Distance (m)	Dates	Direction
Railway Sidings	0	1876-1992	On Site
Unspecified Commercial / Industrial	0	1961-1992	On Site
Old Clay Pit	0	1896	On Site
Unspecified Works	0	1979-1992	On Site
Cuttings	0	1876-1896	On Site
Unspecified Pit	0	1876	On Site

Surrounding Feature	Distance (m)	Dates	Direction
Unspecified Laboratories	0	1938	On Site
Unspecified Tanks	0	1991-1994	On Site
Electricity Substation	0	1972-1993	On Site
Cuttings*	2-9	1909-1961	SW
Railway Sidings	5-18	1938-1966	SW
Railway Sidings	7-32	1966	E
Railway Sidings	13	1966	W
Brick Field	14-19	1876-1896	E
Railway Building	14	1909-1932	E
Unspecified Pit	18-124	1896	E
Unspecified Ground Workings	18-45	1909-1966	E
Railway Building	20	1896	N
Unspecified Pit	33	1876	SE
Unspecified Works	33-142	1979-1992	E
Unspecified Heap	33	1909	E
Timber Yard	35-140	1932-1979	SE
Engine Shed	35	1909	SE
Railway Building	36-78	1938-1966	W
Industrial Estate	36	1992	E
Unspecified Tanks*	40-92	1932-1994	E
Depot	50	1966	E
Railway Building	59	1938	SE
Unspecified Works	60	1992	W
Engineering Works	68	1909-1938	E
Unspecified Commercial/ Industrial	69	1966	E
Iron Works	70	1896	E
Railway Building	73-78	1896-1966	SW
Electricity Substation*	98-99	1985-1994	E
Railway Building	99-136	1909-1996	S
Brick Works	120-122	1876-1896	SW
Nursey	124-126	1896-1938	E
Unspecified Factory	142	1979	E
Nursey	144	1909	SE
Goods Shed	147-149	1909-1966	SW

* only nearest off site electricity substation, tanks and cuttings listed.

3.3 Planning History

REC has undertaken a review of online planning records held by Horsham Borough Council and identified that there are 59 planning application records associated with the site. The pertinently contaminative applications are:

- The demolition of buildings 6,7, 8, 17, 30, 31, 32 and 42 dated September 2015;
- Erection of liquid CO_2 store adjacent to building 42 dated August 2011;
- Erection of liquid nitrogen storage tank dated February 2009;
- A gas bottle store enclosure adjacent to building 38 dated November 2005; and,
- Erection of gas cylinder store dated November 1993.

4.0 ENVIRONMENTAL SETTING

4.1 Geology & Hydrogeology

The British Geological Survey (BGS) memoirs with respect to the site area indicates that the site is underlain by the following geological sequence:

Table 4.1 Summary of Geology and Aquifer Designations

Geological Unit	Classification	Description	Aquifer Classification	Permeability	Sensitivity	Colour Reference
Bedrock	Roffey Park Sandstone	Sandstone	Secondary A	High to Low	Low	
Bedrock	Upper Tunbridge Wells Sand	Mudstone	Unproductive	Low to Very Low	Very Low	

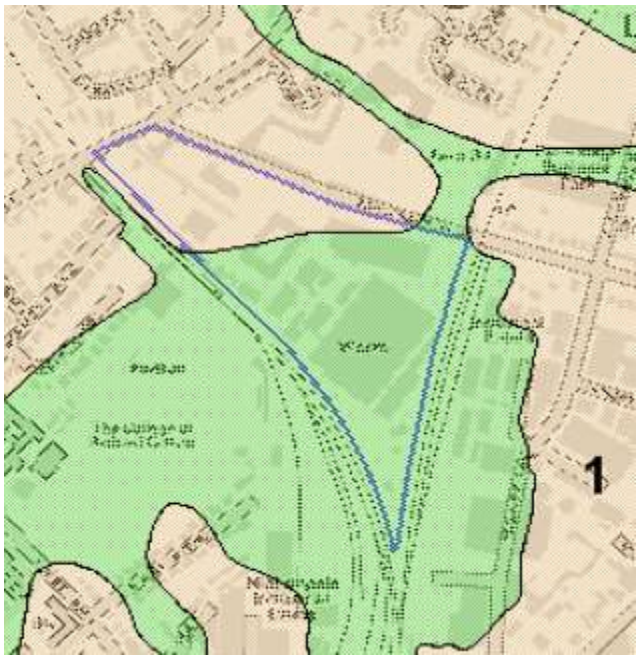

Figure 1 – Geological Classifications

There is a single historical borehole dated 1937 located in the east of the site. This borehole (TQ13SE156) indicates the following geological sequence

Topsoil	Ground Level	0.30mbgl
Tunbridge Wells Sand (Sandstone and Mudstone)	0.30mbgl	76.30mbgl

Groundwater was encountered at a depth of 28.30mbgl with groundwater rising to 17.00mbgl.

Figure 2 – Aquifer Designation and Abstractions

Aquifer designations detailed within Table 4.1 and displayed in Figure 2 above indicates that the Roffey Park Sandstone is classified as a Secondary (A) Aquifer, whereas the Upper Tunbridge Wells Sand is classified as an unproductive aquifer.

The data search report indicates that there is a historical groundwater abstraction licence on site **(A)** for general use relating to secondary category (medium loss). There are no other groundwater abstraction licences within a 1km radius of site. In addition, no potable water abstractions are within 1km of the site

The site does not lie within a groundwater Source Protection Zone.

The surface soil on site is classified as having a high leaching potential; these soils are therefore assumed to be highly permeable in the absence of site-specific information.

4.2 Geotechnical Data

Geotechnical Data presented within the Groundsure report identifies the following ground conditions relating to natural ground subsidence:

Table 4.2 Summary of Geotechnical Data

Hazard	Designation (Roffey Park Sandstone)	Designation (Upper Tunbridge Wells Sandstone)
Shrink-Swell Clay	Negligible	Very Low
Landslides	Very Low	Very Low
Ground Dissolution	Negligible	Negligible
Compressible Ground	Negligible	Negligible

Collapsible Deposits	Very Low	Very Low
Running Sand	Very Low	Negligible

It should be noted that this data is qualitative and based on anticipated ground conditions only and not on any other topographical information such as trees.

4.3 Mining

The site is in an area which is not affected by coal mining and therefore no Coal Authority Coal Mining Report was obtained for the purposes of this assessment.

4.4 Railways and Tunnels

Adjacent east and south of the site is an active railway and historical railway, where sidings were historically located onsite. The site is not located within 250m of current or historical tunnels.

4.5 Hydrology

The nearest surface water feature is an unknown river within the Rother and Arun catchment are located 327m north east.

The nearest active abstraction is located 923m north west at Warnham Mill Pond for spray irrigation. The site is not located within an Environment Agency Floodplain Zone and has a very low risk from flooding from rivers and seas (RoFRaS). However site is within a groundwater flooding susceptibility area relating to Clearwater flooding.

4.6 Radon Risk Potential

The site is not situated within a radon affected area as less than 1% of properties are above the action level, and therefore no radon protective measures are necessary in the construction of new buildings.

4.7 Industrial Land Uses

According to historical mapping, the site has comprised industrial land uses since 1938. Available records identify 12 current industrial land uses within 150m radius of the study site which are potentially contaminative as presented in the table below:

Table 4.3 Summary of Industrial Land Uses

Company	Activity	Distance (m)	Direction
Works*	Unspecified Works or Factories	0	On Site
Electricity Substation*	Electrical Features	0	On Site
Chimney*	Chimneys	0	On Site
Horsham Sheet Metal	Metalworkers including Blacksmiths	43	E

Tanks**	Tanks	45	E
Works	Unspecified Works or Factories	52	E
Horsham Car Centre	Vehicle Repair Testing and Servicing	91	E
Metal Components Ltd	Metalworkers including Blacksmiths	93	E
Electricity Substation**	Electrical Features	98	E
P M A Motor Factors Ltd	Vehicle Parts and Accessories	102	NE
Warehouse	Container and storage	131	W

*It is understood that these contaminative land uses have been recently demolished
**nearest off site substation and tank only listed

4.8 Sensitive Land Uses

The following sensitive land uses have been identified within 1km of the site;

- The site is located within a nitrate vulnerable zone;
- Warnham Local Nature Reserve is located 651m north west; and,
- An Unnamed Ancient Woodland is located 863m north east.

4.9 Site Sensitivity Assessment

The site is considered to be located within a **low to moderate** sensitivity.

5.0 CONSULTATIONS

5.1 Contaminated Land Officer

A request for information pertaining to the site was sent to the Contaminated Land Team at Horsham District Council. However, further discussions indicated that the information provided by Horsham District Council would have been a duplication of the information gained from the data search and was therefore not obtained.

5.2 Landfill Sites and Waste Treatment Sites

A review of available information indicates that there are 2 records of Environmental Agency historic and active landfill sites and waste sites within a 1km radius of the site. The details of these records are shown in Table 5.1 below.

Table 5.1 Landfill and waste treatment sites

Site	Waste Type	Distance (m)	Direction	Details
Personage Farm Scrapyard	Unknown	412	E	Historical Mapping Records
Units 2 & 3, Personage Way	Unknown	437	E	Metal Recycling Facility

5.3 Regulatory Database

The following information has been obtained from a commercially available environmental database. The summary table only includes records not otherwise detailed in the report.

Table 5.2 Summary of Data Search Regulatory Data

Activity	0 - 249m	250 - 500m	Details
Licensed Discharge Consents	3	7	The nearest licensed discharge is located 31m south at foundry lane for miscellaneous discharges.
Part B Activities	4	3	The nearest part B activity is located 33m east of site at Hanson Concrete for the use of bulk cement.
COMAH and NIHHS Sites	1	0	The single record is located 88m south west at Firmin Coates & Sons.
Hazardous Substance Consents	2	0	The nearest hazards substance consent is located 89m east at Floline Logistics Ltd for the storage of LPG.
Pollution Incidents	5	4	The nearest pollution incident occurred on 17/01/02 located 109m south west of site. The pollutant involved was contaminated water. No impact was recorded to land or air. A Category 3 (minor) impact was recorded to water.
Radioactive Substances Authorisations	0	9	All 9 records relate to a radioactive substance authorisation located 311m south west at Novartis Pharmaceuticals UK Ltd for the disposal of radioactive waste and keeping of radioactive wastes.

6.0 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), REC Ltd has developed an initial CSM to identify potential contamination sources, migration pathways and receptors within the study area.

6.2 Contaminant Sources

On-site Potential Sources

Potential sources of contamination identified on site include:

- Railway Sidings;
- Pharmaceutical Works including unspecified laboratories and unspecified works;
- Made Ground associated with historical development, old clay pit, unspecified pit and cuttings;
- Tanks;
- Electricity Substation; and,
- Chimney.

Off-site Potential Sources

Potential sources of contamination identified off site include:

- Made Ground associated with cuttings, brick field, unspecified pits, and unspecified ground workings (nearest located 2m south west);
- Railway Sidings and Buildings and Engine Shed (nearest located 5m south west);
- Unspecified works including timber yard, builders yard, industrial estate, engineering works, unspecified commercial/ industrial, brick works and unspecified factory (nearest located 33m east);
- Unspecified Tanks (nearest located 40m east);
- Metal works including Horsham Sheet Metal, Metal Components Ltd and iron works (nearest located 43m east);
- Depot and warehouses (nearest located 50m east);
- Garages including Horsham Car Centre and P M A Motor factors Ltd (nearest located 91m east);
- Electricity Substation (nearest located 98m east);
- Goods Shed (nearest located 147m south west); and,
- Landfill and Waste site (nearest located 412m east).

6.3 Potential Pathways

Receptors may be potentially at risk from the identified potential sources of contamination via the following pathways:

- Migration of mobile contaminants on or off site via services, sewers and manmade conduits;
- Direct contact, ingestion and inhalation of contaminants on site;
- Migration of contaminated dusts during earthworks;
- Migration of mobile contaminants into groundwater and transport into surface waters;
- Migration of hazardous gases; and,
- Uptake of toxins/phytotoxins by plants.

6.4 Potential Receptors

Human Receptors

REC has identified the following potential receptors:

- Future users of the site and buildings; and
- Users of adjacent areas due to off-site migration of vapours or contaminated dust.

Construction workers are not considered to be a plausible receptor as exposure will managed through the use of appropriate PPE and hygienic working practices, as required under HSE/ CDM regulations. Furthermore exposure is likely to be for a short duration.

Controlled Waters

- Secondary 'A' Aquifer contained within the underlying bedrock geology within the North of the Site; and,
- A surface water feature located 327m north east.

6.5 Risk Assessment

CIRIA 552: Contaminated Land Risk Assessment 'A Guide to Good Practice' provides guidance on risk assessment taking into account factors such as severity of the potential harm that may arise from a successful pollutant linkage, potential magnitude of the hazard, and the sensitivity of the target receptor. Risk assessment is initially assessed by determining the severity of the potential hazard, which takes into account receptor sensitivity and the magnitude of the potential impact as detailed in Tables 6.1 & 6.2 below.

6.5.1 Severity

Table 6.1 Receptor sensitivity

Category	Human sensitivity	Environmental sensitivity
Very Low	Ground workers	Non-sensitive water course
Low	Commercial / Industrial	Secondary Aquifer
Moderate	Residential without plant uptake	Principal Aquifer / Sensitive Watercourse
High	Residential with plant uptake	Groundwater Source Protection Zone

Table 6.2 Magnitude of Impact

Category	Example
No Impact	No identified or potential pollutants present / Greenfield site
Slight Impact	Minor leaks and spills from fuel infrastructure, inert landfills / Residential, retail or Offices
Moderate Impact	Major leaks and spills from fuel infrastructure / Railways, Collieries, Scrapyards
Gross Impact	Heavily contaminated industrial sites, hazardous landfills / Gas works, Chemical Works

Severity is subsequently assessed considering the potential receptor and magnitude of impact as outlined within Table 6.3.

Table 6.3 Determination of level of severity for potential hazards

	Receptor Sensitivity			
	Very Low	Low	Moderate	High
No Impact	Minor	Minor	Minor	Minor
Slight Impact	Minor	Minor	Minor	Mild
Moderate Impact	Minor	Minor	Mild	Medium
Gross Impact	Minor	Mild	Medium	Severe

6.5.2 Likelihood

The likelihood of an event is assessed while considering the potential for presence of a contaminant, presence of receptor, and the substantiality of the pollutant pathway. Likelihood is broken down into four separate categories within the CSM as shown in Table 6.4 below:

Table 6.4 Definitions of likelihood categories

Category	Definition
Unlikely	Pollutant linkage may be present, but the circumstances under which harm would occur are improbable.
Low Likelihood	Pollutant linkage may be present, and there is a possibility of the risk occurring, although there is no certainty that it will do so.
Likely	Pollutant linkage may be present, and it is probable that the risk will occur over the long term.
High Likelihood	Pollutant linkage may be present, and risk is almost certain to occur in long term, or there is evidence of harm to the receptor.

6.5.3 Risk Rating

Table 6.5 demonstrates the methodology used to provide an overall risk rating within the preliminary CSM with respect to any potential sources of contamination that may affect the site. An overall risk rating is assigned to each potential contaminant considering the assessed likelihood and severity as determined using the methodologies within Tables 6.1 to 6.4.

Table 6.5 Level of risk rating for hazard definition

	Severity			
	Minor	**Mild**	**Medium**	**Severe**
Unlikely	Very Low	Very Low	Low	Low / Moderate
Low Likelihood	Very Low	Low	Low / Moderate	Moderate
Likely	Low	Low / Moderate	Moderate	High
High Likelihood	Low / Moderate	Moderate	High	Very High

6.6 Conceptual Site Model

A site specific CSM has therefore been created using the above information and is provided on the following page

Given that the site is to comprise a mixed residential commercial end use REC have utilised the most conservative assessment criteria assuming a residential end use with plant uptake for determining receptor sensitivity:

Table 6.6 Conceptual Site Model (CSM) Table

Source	Contaminant	Potential migration pathway	Potential Receptors	Likelihood of Occurrence	Severity	Overall Risk Rating	Active / Inactive
On-Site							
Railway Sidings	Heavy Metals (As, Cd, Cr, Pb, Hg, Se, Ni)	Ingestion of soils Dermal contact with soils	Future site users	**Likely**	**Medium**	**Moderate**	**Potentially Active – further investigation recommended**
			Controlled waters		**Minor**	**Low**	
	Asbestos Fibres in Soil	Inhalation of fibres	Future site users	**Likely**	**Medium**	**Moderate**	
	Total Petroleum Hydrocarbons (TPH) inc. MTBE and BTEX	Ingestion of soils Dermal contact with soils Inhalation of ground gases	Future site users	**Likely**	**Medium**	**Moderate**	
			Controlled waters		**Minor**	**Low**	
	Polycyclic Aromatic Hydrocarbons (PAH)	Ingestion of soils Dermal contact with soils Inhalation of ground gases	Future site users	**Likely**	**Medium**	**Moderate**	
			Controlled waters		**Minor**	**Low**	
Pharmaceutical Chemical Works	Heavy Metals (As, Cd, Cr, Pb, Hg, Se, Ni)	Ingestion of soils Dermal contact with soils	Future site users	**Likely**	**Severe**	**Low/Moderate**	**Potentially Active – further investigation recommended**
			Controlled waters		**Minor**	**Low**	
	Total Petroleum Hydrocarbons (TPH) inc. MTBE and BTEX	Ingestion of soils Dermal contact with soils Inhalation of ground gases	Future site users	**Likely**	**Severe**	**High**	
			Controlled waters		**Mild**	**Low/Moderate**	
	Polycyclic Aromatic Hydrocarbons (PAH)	Ingestion of soils Dermal contact with soils Inhalation of ground gases	Future site users	**Likely**	**Severe**	**High**	
			Controlled		**Mild**	**Low/Moderate**	

			waters				
	(Semi) Volatile Organic Compounds	Ingestion of soils Dermal contact with soils Inhalation of ground gases	Future site users	**Likely**	**Severe**	**High**	
			Controlled waters		**Mild**	**Low/Moderate**	
	Halogenated Solvents	Ingestion of soils Dermal contact with soils Inhalation of ground gases	Future site users	**Likely**	**Severe**	**High**	
			Controlled waters		**Mild**	**Low/Moderate**	
	Asbestos in soil from former insultation purposes	Inhalation of fibres	Future site users	**Likely**	**Severe**	**High**	
Made Ground associated with historical development, old clay pit, unspecified pit and cuttings	Heavy Metals (As, Cd, Cr, Pb, Hg, Se, Ni)	Ingestion of soils Dermal contact with soils	Future site users	**Likely**	**Medium**	**Moderate**	**Potentially Active – further investigation recommended**
			Controlled waters		**Minor**	**Low**	
	Total Petroleum Hydrocarbons (TPH)	Ingestion of soils Dermal contact with soils Inhalation of ground gases	Future site users	**Likely**	**Medium**	**Moderate**	
			Controlled waters		**Minor**	**Low**	
	Polycyclic Aromatic Hydrocarbons (PAH)	Ingestion of soils Dermal contact with soils Inhalation of ground gases	Future site users	**Likely**	**Medium**	**Moderate**	
			Controlled waters		**Minor**	**Low**	
	Asbestos fibres in soil	Inhalation of fibres	Future site users	**Likely**	**Medium**	**Moderate**	
	Ground Gas	Inhalation of gases	Future site users	**Likely**	**Medium**	**Moderate**	

Tanks	Total Petroleum Hydrocarbons (TPH) inc. MTBE and BTEX	Ingestion of soils Dermal contact with soils Inhalation of ground gases	Future site users	**Likely**	**Mild**	**Low/Moderate**	**Potentially Active – further investigation recommended**
			Controlled waters		**Minor**	**Low**	
	Polycyclic Aromatic Hydrocarbons (PAH)	Ingestion of soils Dermal contact with soils Inhalation of ground gases	Future site users	**Likely**	**Mild**	**Low/Moderate**	
			Controlled waters		**Minor**	**Low**	
	(Semi) Volatile Organic Compounds)	Ingestion of soils Dermal contact with soils Inhalation of ground gases	Future site users	**Likely**	**Mild**	**Low/Moderate**	
			Controlled waters		**Minor**	**Low**	
Electricity Substation	PCBs	Ingestion of soils Dermal contact with soils	Future site users	**Low Likelihood**	**Mild**	**Low**	**Potentially Active – further investigation recommended**
			Controlled waters		**Minor**	**Very Low**	
Chimneys	Heavy Metals, TPH and PAH	Ingestion of soils Dermal contact with soils Inhalation of gases	Future site users	**Low Likelihood**	**Mild**	**Low**	**Potentially Active – further investigation recommended**
			Controlled waters		**Minor**	**Very Low**	
Off-Site							
Made Ground (2m south west)	Heavy Metals, TPH, PAH and Ground Gasses	Vertical and lateral migration	Future site users	**Likely**	**Mild**	**Low/Moderate**	**Potentially Active – further investigation recommended**
			Controlled waters		**Minor**	**Low**	

Railway Sidings and Buildings and Engine Shed (5m south west)	Heavy Metals, TPH, PAH, and (S)VOC	Vertical and lateral migration	Future site users	**Likely**	**Medium**	**Moderate**	**Potentially Active – further investigation recommended**
			Controlled waters		**Minor**	**Low**	
Unspecified Works (33m east)	Heavy metals, TPH and PAH	Vertical and lateral migration	Future site users	**Likely**	**Medium**	**Moderate**	**Potentially Active – further investigation recommended**
			Controlled waters		**Minor**	**Low**	
Unspecified Tanks (40m east)	TPH, PAH, (S)VOCs BTEX and MTBE	Vertical and lateral migration	Future site users	**Likely**	**Mild**	**Low/Moderate**	**Potentially Active – further investigation recommended**
			Controlled waters		**Minor**	**Low**	
Metal Works (43m east)	Heavy Metals, TPH, PAH BTEX, MTBE and Organic Solvents	Vertical and lateral migration	Future site users	**Likely**	**Medium**	**Moderate**	**Potentially Active – further investigation recommended**
			Controlled waters		**Minor**	**Low**	
Depot and Warehouses (50m east)	Heavy Metals, TPH and PAH	Vertical and lateral migration	Future site users	**Likely**	**Mild**	**Low/Moderate**	**Potentially Active – further investigation recommended**
			Controlled waters		**Minor**	**Low**	
Garages (91m east)	Heavy Metals, TPH and PAH	Vertical and lateral migration	Future site users	**Likely**	**Mild**	**Low/Moderate**	**Potentially Active – further investigation recommended**
			Controlled waters		**Minor**	**Low**	
Electricity Substation (98m north west)	PCBs	Vertical and lateral migration	Future site users	**Unlikely**	**Mild**	**Very Low**	**Inactive –** due to the relatively poor mobility of PCB contaminants within ground, it is unlikely that PCBs would have migrated to
			Controlled waters		**Minor**	**Very Low**	

							the site and pose a significant risk to receptors.
Goods Shed (147m south west)	Heavy Metals, TPH and PAH	Vertical and lateral migration	Future site users	**Low Likelihood**	**Medium**	**Low/Moderate**	**Potentially Active – further investigation recommended**
			Controlled waters		**Minor**	**Very Low**	
Waste Sites (412m east)	Ground Gases	Vertical and lateral migration	Future site users	**Unlikely**	**Medium**	**Low**	**Inactive** -Given that the sites comprise waste sites and not landfills, it is unlikely that ground gasses would be produced that migrate laterally the distance required to prose a significant risk to the future site users

Note: PAH- Polycyclic Aromatic Hydrocarbon, TPH –Total Petroleum Hydrocarbon

7.0 CONCLUSIONS & RECOMMENDATIONS

7.1.1 Human Health

The potential risk posed to human health from **on-site** sources is considered to be **Low / Moderate to High**, whilst the risk posed by various **off-site** sources is considered to be **Very Low to Moderate.**

7.1.2 Controlled Waters

The potential risk posed to controlled waters is considered to be **Very Low to Low/Moderate**.

7.1.3 Overall Environmental Risk Assessment

Overall, the preliminary risk classification of the site in relation to the proposed redevelopment is considered to be **Moderate to High**.

8.0 RECOMMENDATIONS

It is recommended that a Phase II intrusive site investigation is undertaken to assess the contamination linkages identified within the Conceptual Site Model (CSM). Particular consideration should be taken to investigating the potential sources of contamination on and off site including Made Ground, railway sidings, pharmaceutical works, tanks, electricity substation, chimneys, unspecified works, metal works, warehouse and garages.

APPENDIX I

LIMITATIONS

1. This report and its findings should be considered in relation to the terms of reference and objectives agreed between REC Ltd 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 be 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.

9. REC cannot be held responsible for any use of the report or its contents for any purpose other than that for which it was prepared. The copyright in this report and other plans and documents prepared by REC is owned by them and no such plans or documents may be reproduced, published or adapted without written consent. Complete copies of this may, however, be made and distributed by the client as is expected in dealing with matters related to its commission. Should the client pass copies of the report to other parties for information, the whole report should be copied, but no professional liability or warranties shall be extended to other parties by REC in this connection without their explicit written agreement there to by REC.

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

APPENDIX II

GLOSSARY

TERMS

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	Poly Aromatic Hydrocarbon
PCB	Poly-Chlorinated Biphenyl
PID	Photo Ionisation Detector
QA	Quality Assurance
SGV	Soil Guideline Value
SPH	Separate Phase Hydrocarbon
Sp.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

APPENDIX III

DRAWINGS

KEY:

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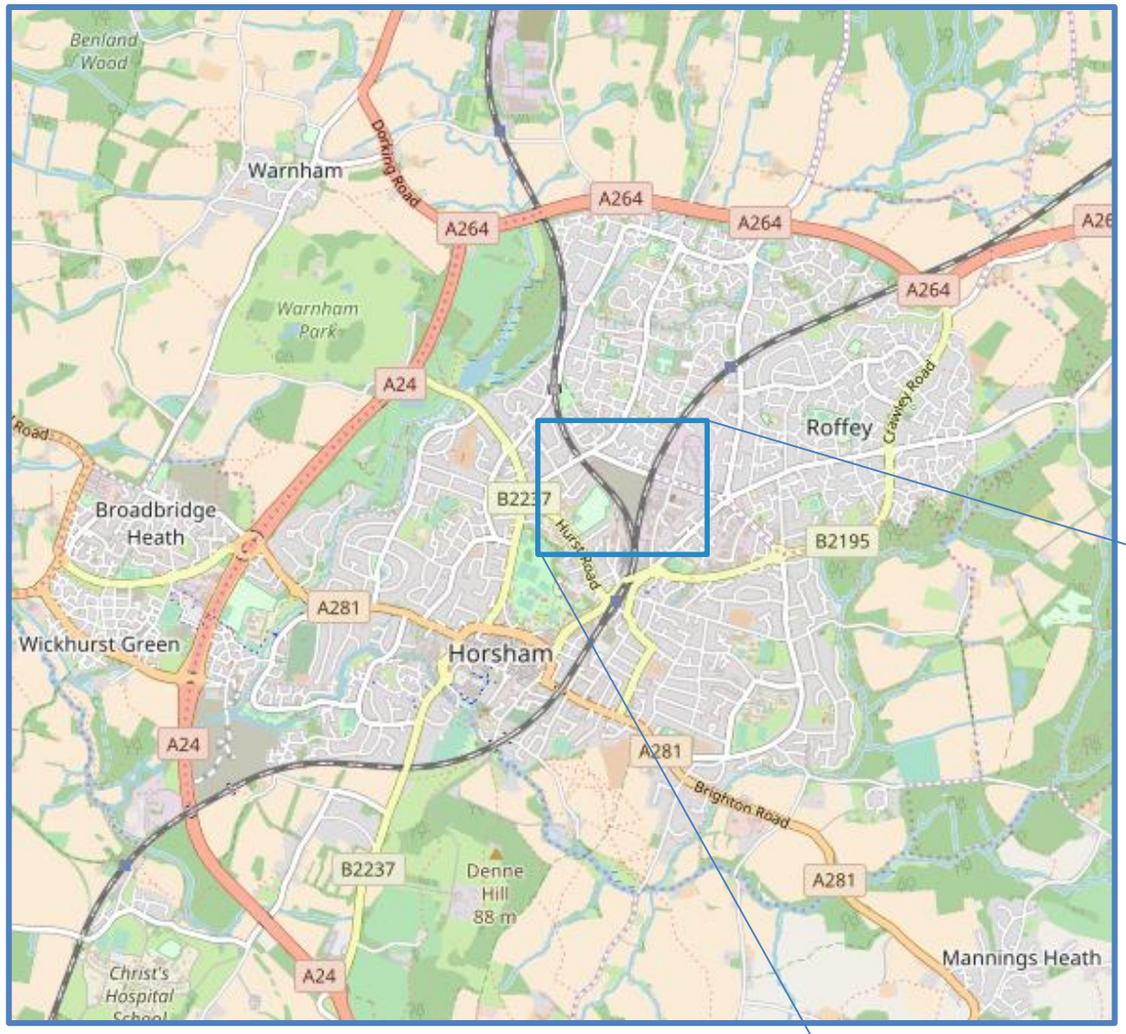
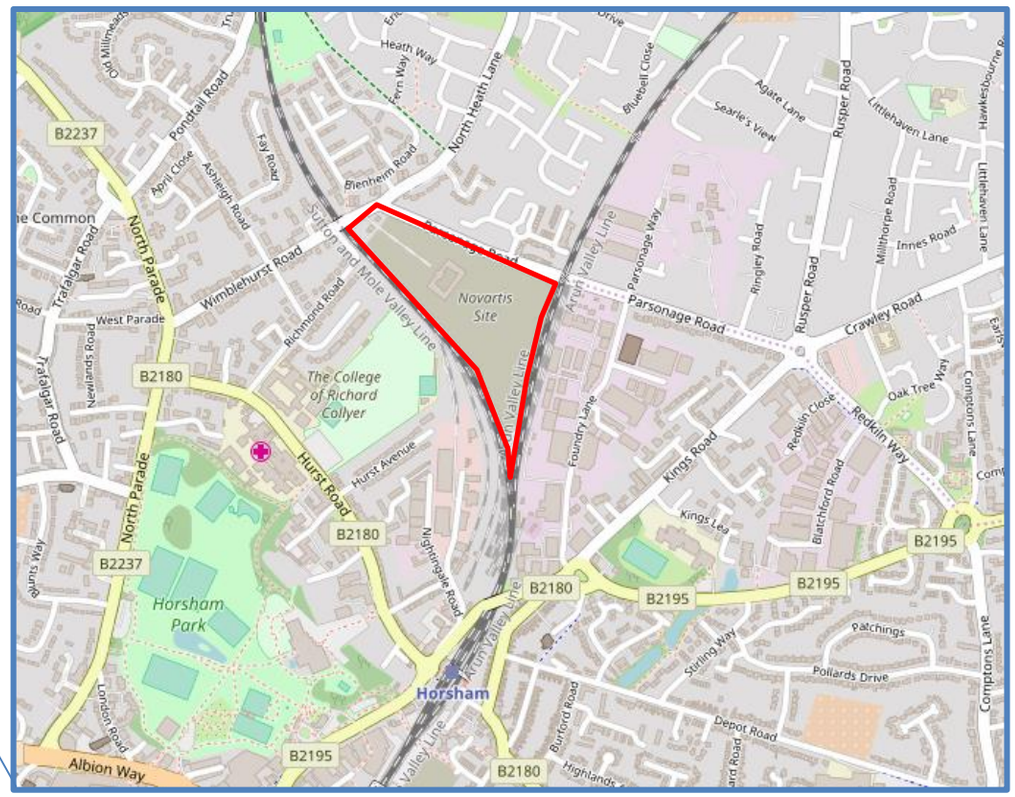
Site Location





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Job No. & Title:

1CO105712
Land at
Former Novartis Site

Client:

Hampshire County Council

Drawn by: **EC**

Approved by:

Date: **June 2018**

Notes:

Not To Scale

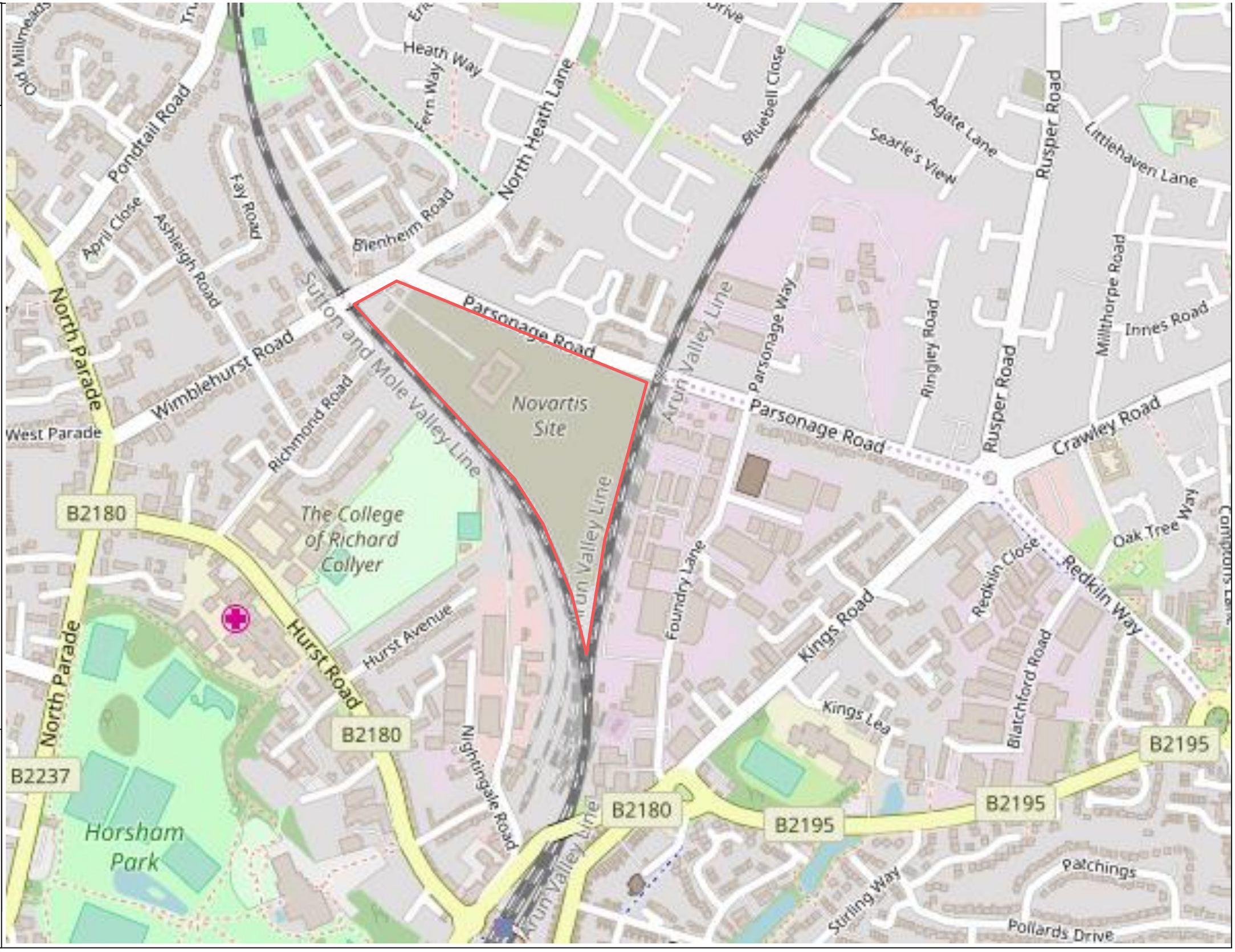
Drawing Title:

1CO105712-001
Site Location Plan

KEY:

N

Site Location



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1CO105712
Land at
Former Novartis Site

Client:
Hampshire County Council

Drawn by: **EC**
Approved by:
Date: **June 2018**

Notes:
Not To Scale

Drawing Title:
1CO105712-002
Site Boundary Plan

APPENDIX IV

PHOTOGRAPHS

Photo 1 – Image showing the front of the circa 1930 existing main building on site.

Photo 2 – Image showing the attached newer circa 2000 5no. storey building to the rear of the original structure.

Photo 3 – Image showing extent of exiting main building on site.

Photo 4 – Image showing rear layout of exiting main building.

Photo 5 – Image showing typical concrete hardstanding on site.

Photo 6 – Image showing areas of made ground rubble and road stone infill in areas which were excavated. Image looking north west across the site.

Photo 7 – Image showing south west view across the site.

Photo 8 – Image showing eastern border of site orientated southwards.

Photo 9 – Image showing south eastern area of site.

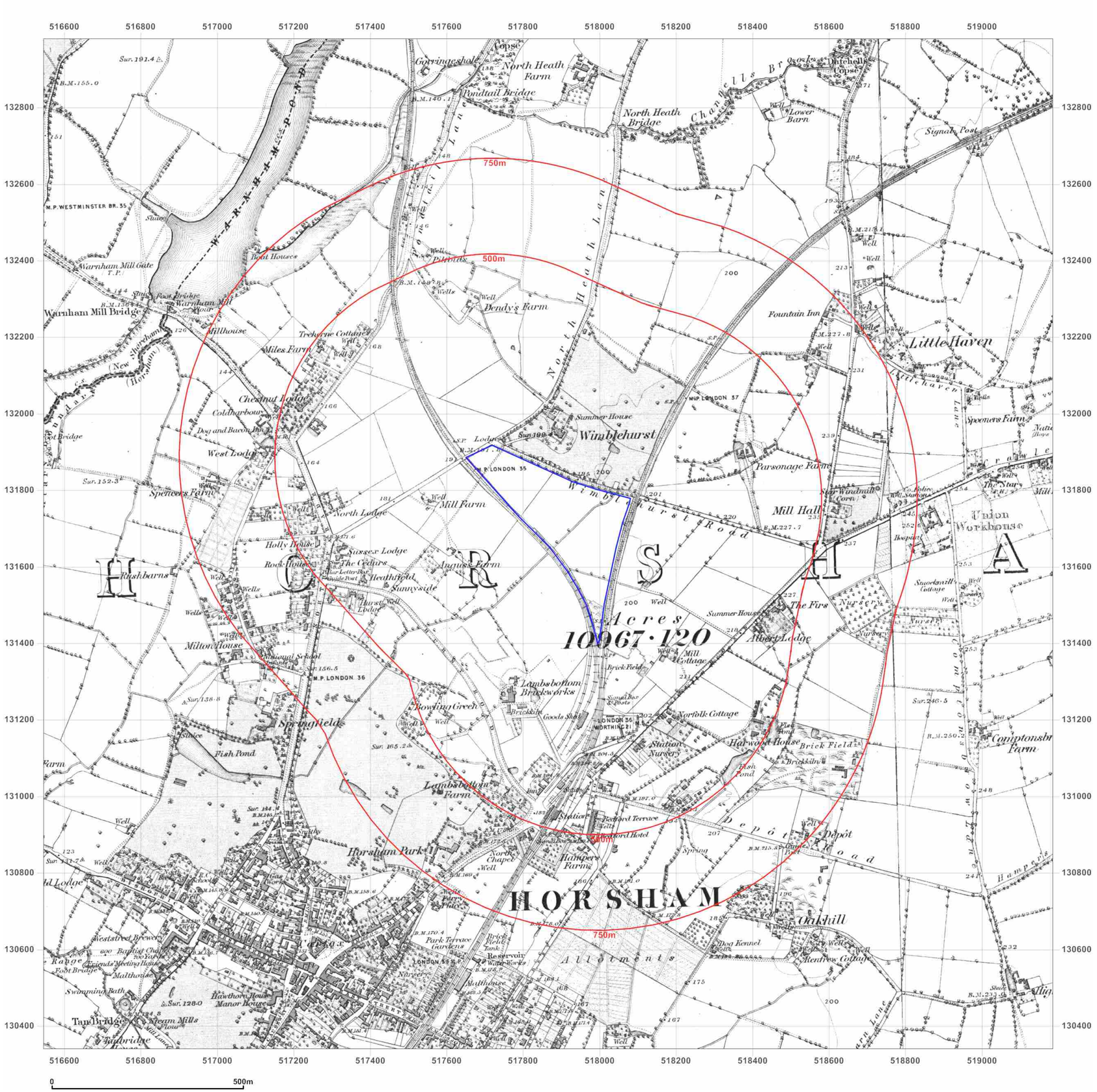
Photo 10 – Image showing eastern border of site orientated northwards.

Photo 11 – Image showing southern border of site and close proximity to rail lines.

Photo 12 – Image showing view from main building looking west.

APPENDIX V

HISTORICAL MAPS



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Grid Ref: 517865, 131659

Map Name: County Series

Map date: **1874-1876**

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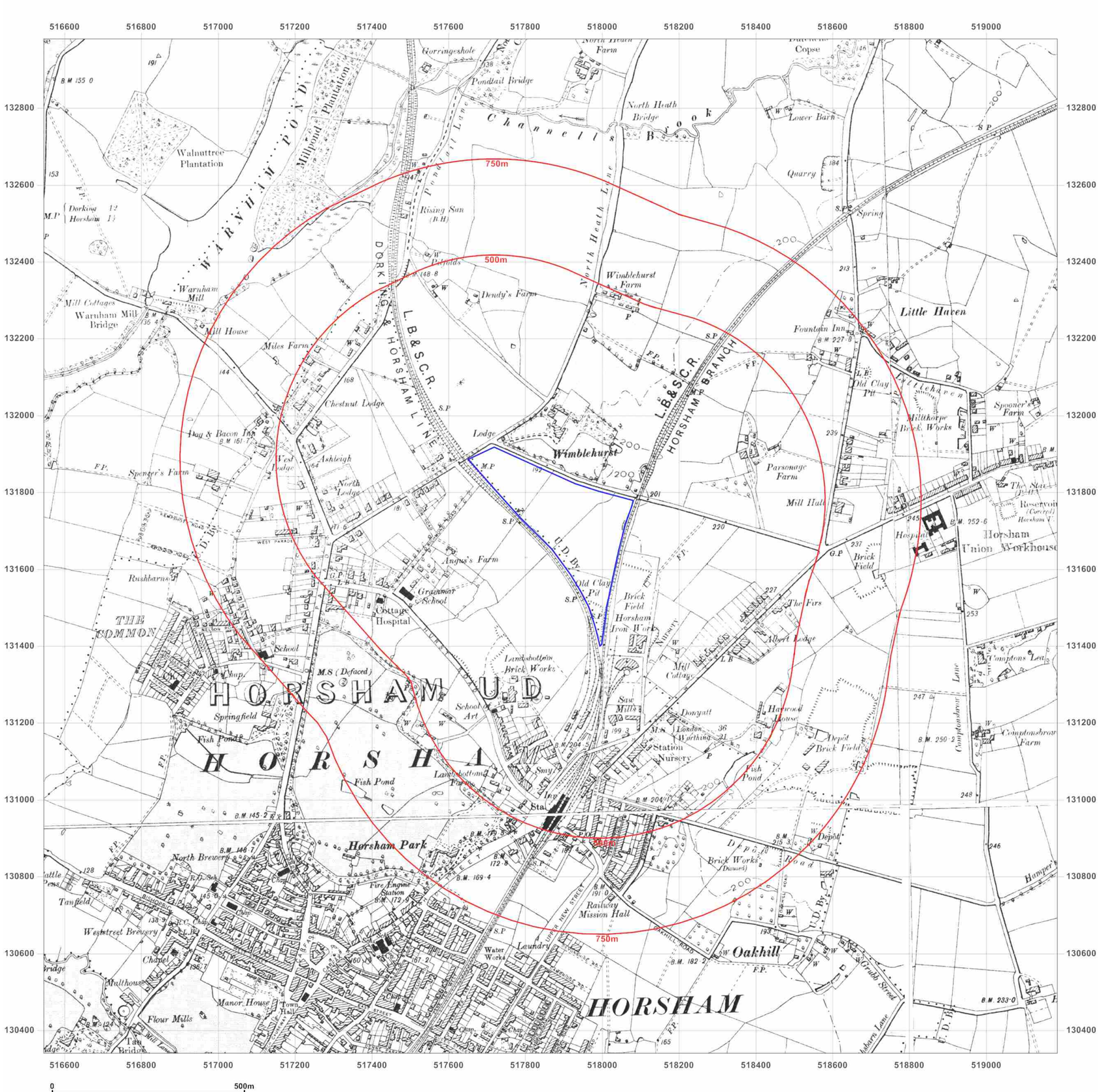

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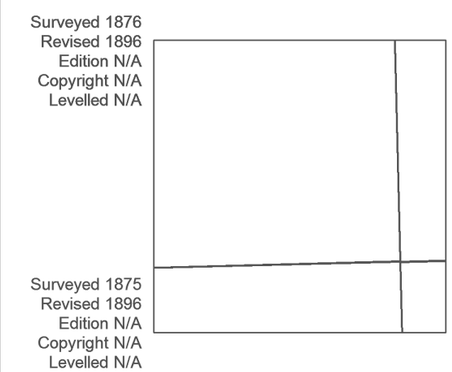

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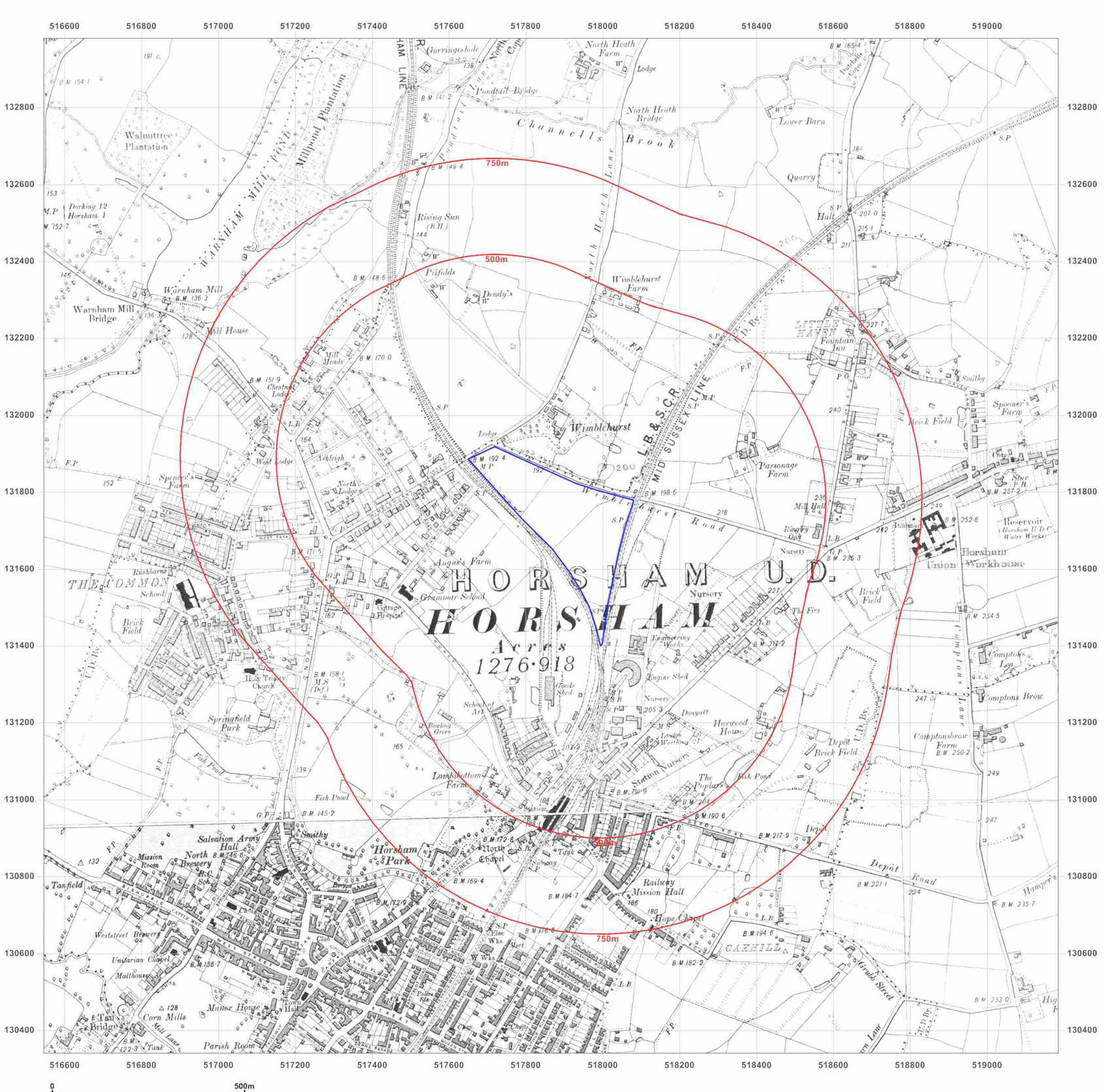

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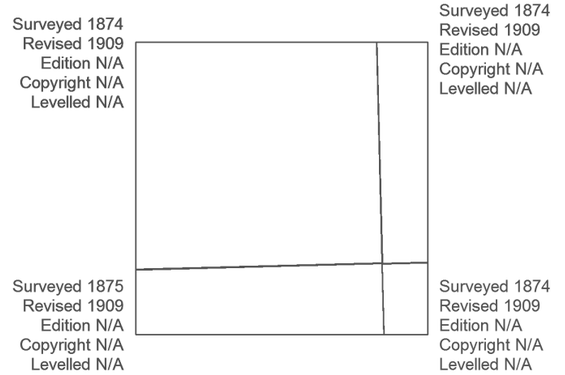

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Surveyed 1874
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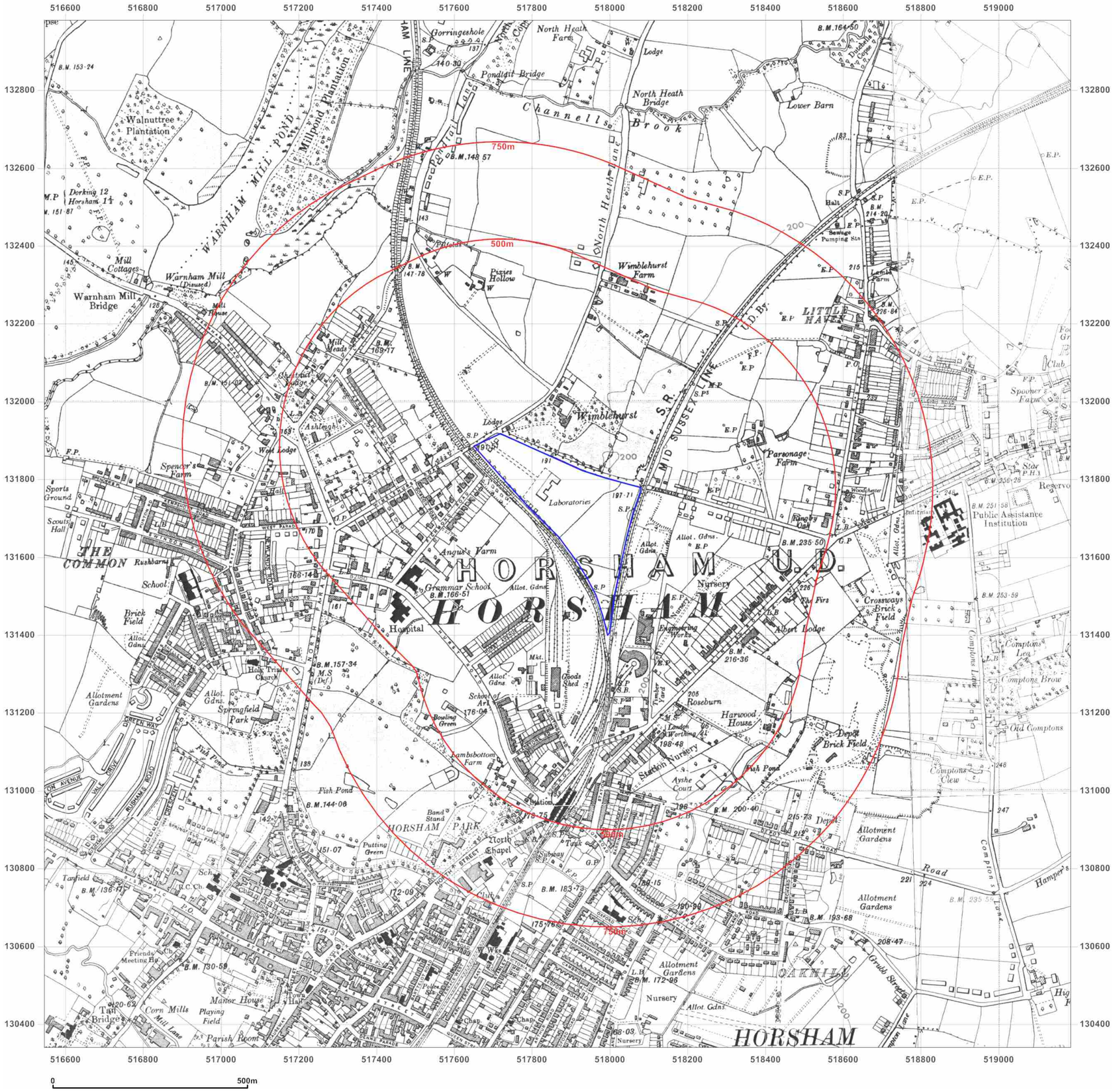

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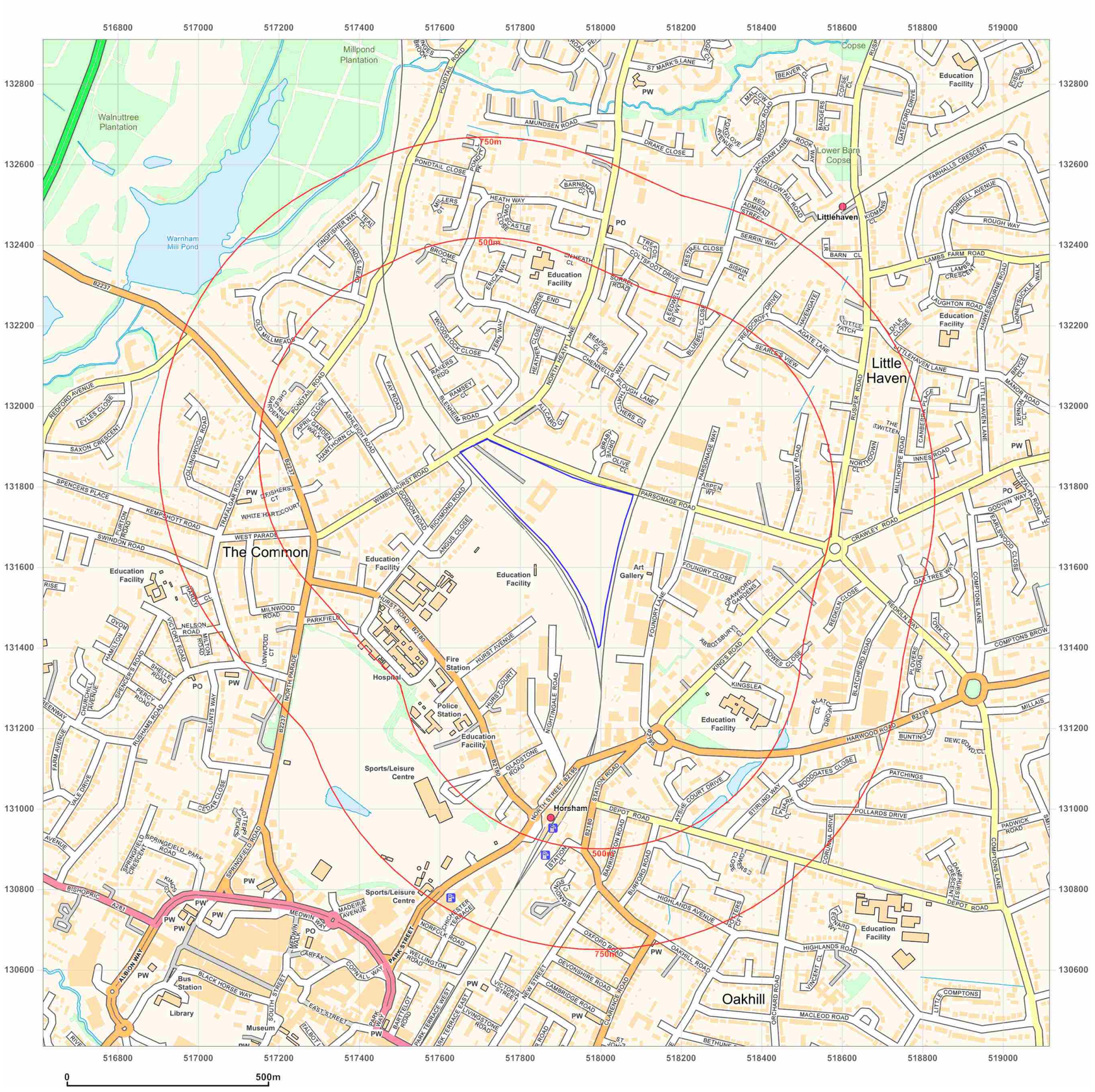

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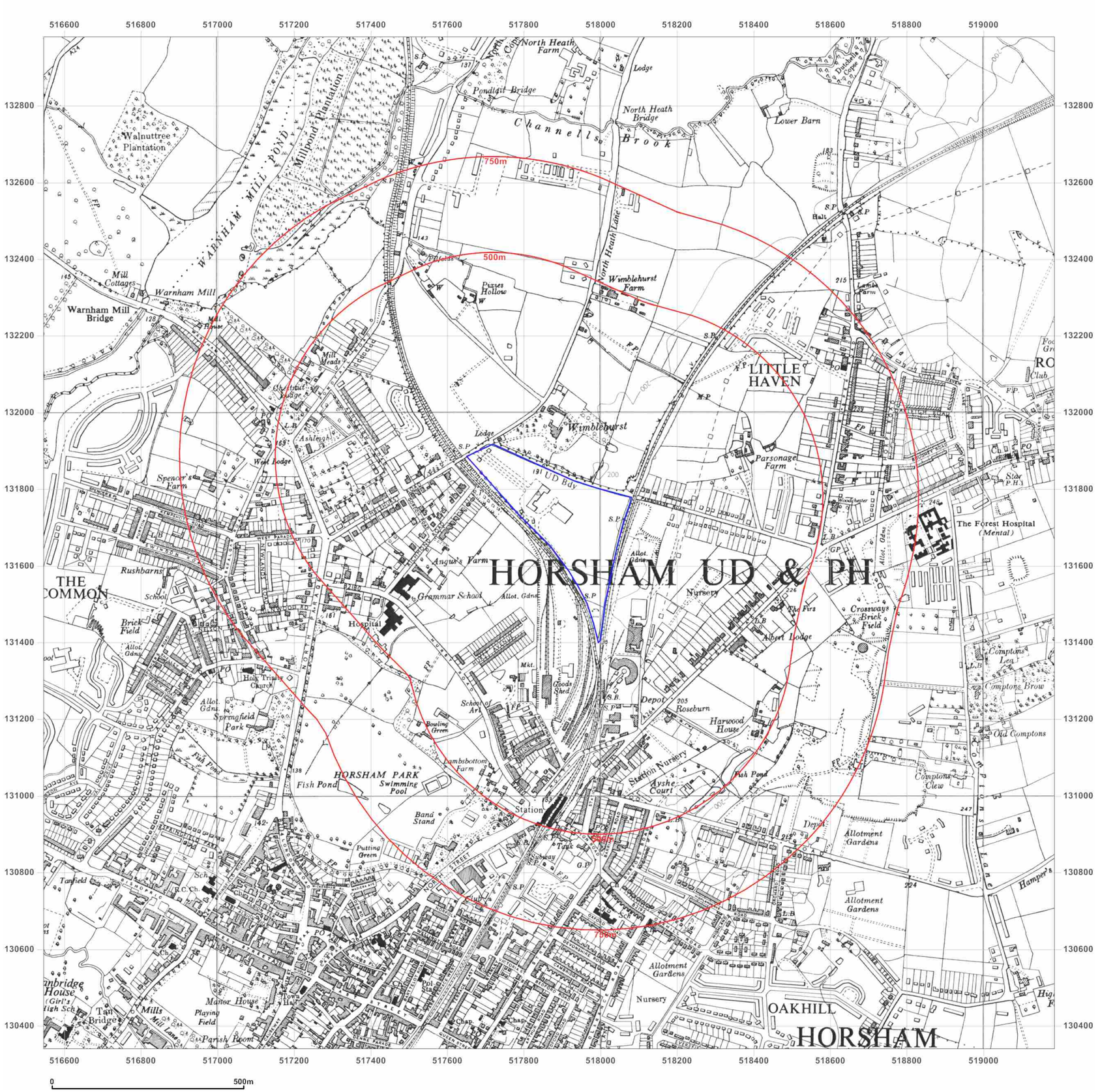

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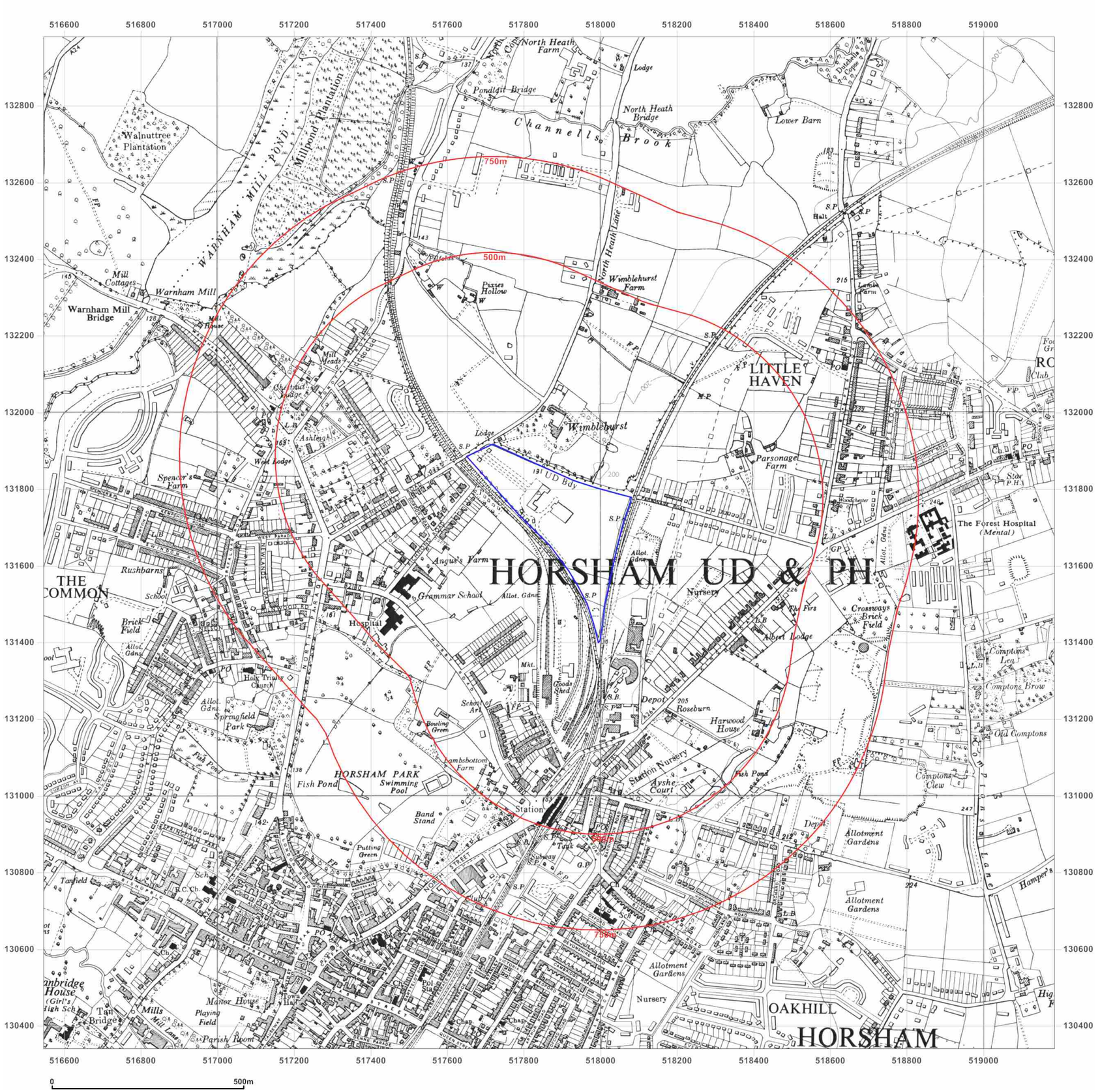

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