

PHASE I DESK STUDY  
&  
PHASE II GROUND INVESTIGATION

AT

FORMER ROSE N CROWN PUBLIC HOUSE  
KNOWL ROAD, GOLCAR

FOR

SOVEREIGN DEVELOPMENT GROUP LTD

REPORT REF: SDG 3534

Engineering Geologists and Environmental Scientists



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FEBRUARY 2024

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## QUALITY MANAGEMENT FOR REPORT

Project	Former Rose n Crown Pub, 132 Knowl Road, Golcar, HD7 4AN		
Client	Sovereign Development Group Ltd		
Date	February 2024		
Version	Issue 1		
Prepared by	Frances A Bennett	BSc (Hons), CGeol, FGS, FIMMM, C.WEM, MCIWEM, CEnv, MIEEnvSci	Director Ashton Bennett Ltd
	Tristan Bennett	BSc (Hons)	Environmental Engineer



## 1. INTRODUCTION

This report describes the results of a Phase 1 Desk Study and Phase II Ground Investigation undertaken on the site previously known as The Rose n Crown Pub at 132 Knowl Road in Golcar, West Yorkshire. The work was commissioned by Northern Design Partnership Ltd for their client Sovereign Development Group Ltd and was carried out by the Ashton Bennett Consultancy.

It is proposed to construct seven residential properties with landscaped gardens and hard covered parking.

The purpose of this Phase 1 Study was to collate and assess information on the site including geological, hydrogeological and mining information, archival maps and historical review to determine past use, a database review, environmental data on water and soil, and to undertake a site reconnaissance to enable a desk top assessment of pathways of migration and potentially sensitive receptors, and to determine solutions to any geotechnical, environmental and mining concerns to the redevelopment of the site for residential use with landscaped gardens and hard covered parking.

The purpose of the Phase II Ground Investigation was to assess the groundwater, geotechnical and environmental conditions beneath the site in order to determine the most suitable foundation design for the proposed development and address any potential environmental or geotechnical concerns.

This report describes the research work carried out, presents the results of the desk study and ground investigation and from these results and the conceptual model of the site makes recommendations for solutions to foundation design and any environmental, geotechnical and mining concerns to the proposed development.

In addition, the scope of the investigation has used the extensive knowledge and experience of the staff of Ashton Bennett Consultancy to assess the data and to interpret the findings. The information for this report is from sources recommended by the Institute of Civil Engineers (ICE), the Association of Geotechnical and Geoenvironmental Specialists (AGS), Construction Industry Research and Information Association (CIRIA) and the Department of the Environment Transport and the Regions (DETR). The report has been compiled in accordance with the latest ICE, DETR, Department of Environment, Food and Rural Affairs (DEFRA), British Standard Draft Documents and British Standards, CIRIA, CLR 11 & other CLEA Reports and Eurocode 7, and the Verification Requirements for Cover Systems, Technical Guidance for Developers, Landowners and Consultants, Yorkshire and Lincolnshire Pollution Advisory Group November 2017.

In addition, the scope of the investigation has used the extensive knowledge and experience of the staff of Ashton Bennett Consultancy to assess the data and to interpret the findings.

### 1.1 Site Address and Planning Reference

The site address is formerly known as The Rose n Crown Pub, 132 Knowl Road, Golcar, West Yorkshire, HD7 4AN.

### 1.2 Responsible Persons

This report was prepared by Frances A Bennett an engineering geologist who has a degree in Geology, a postgraduate qualification in Soil Mechanics and is a Chartered Geologist CGeol, Chartered Environmentalist CEnv and Chartered Water and Environmental Manager

C.WEM and FIMMM with 45 years of experience in the fields of geology, geotechnical engineering, slope stability, hydrogeology, contamination, mining, waste disposal and site management.

## 2. THE SITE

### 2.1 Site Description

The site comprises land situated to the north of Knowl Road in Golcar, West Yorkshire. The site is accessed from Knowl Road to the immediate south of the site area.

The site is currently occupied by an old public house, two storey, with large hard covered car parking to the east and rear of the property.

The site is bounded to the north by wooden fencing with a bowling green beyond. To the east the site is bounded by wooden fencing with residential gardens and houses beyond. To the west the site is bounded by wooden fencing with residential houses and gardens beyond. To the south the site is unbounded in the west looking onto Knowl Road, to the east the site is fenced with hard covered parking and a community centre/club beyond looking onto Knowl Road.

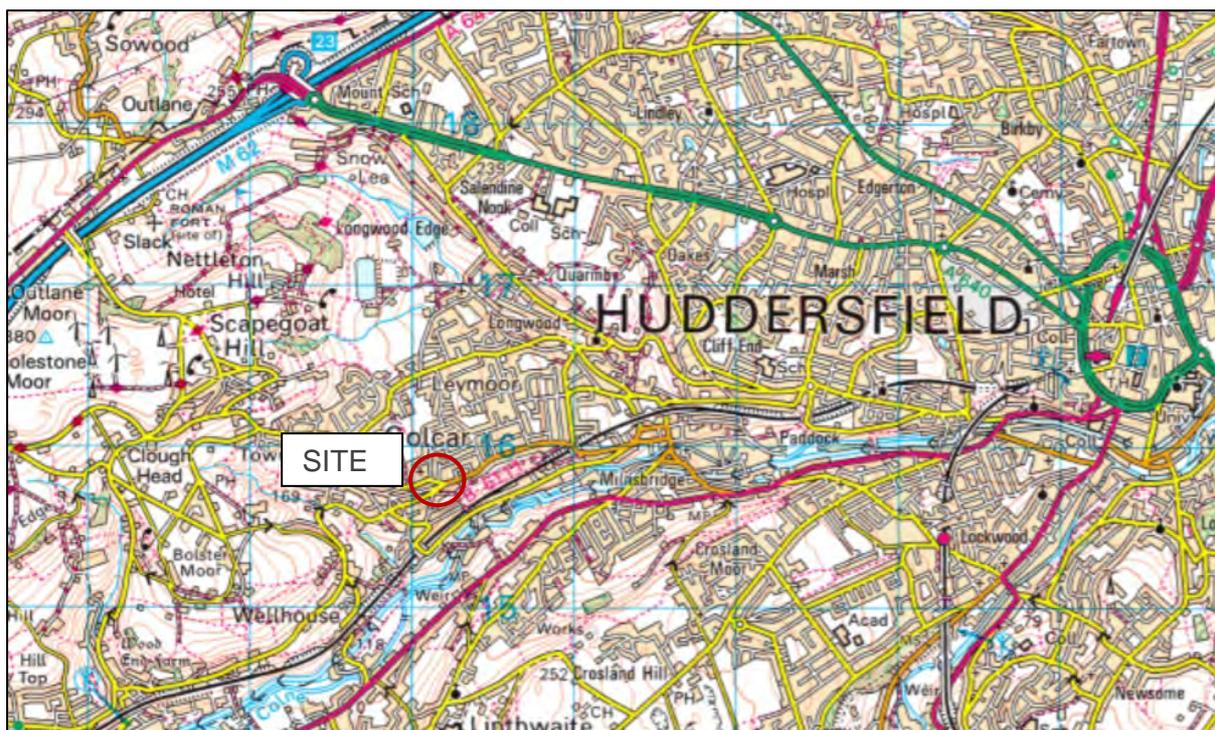
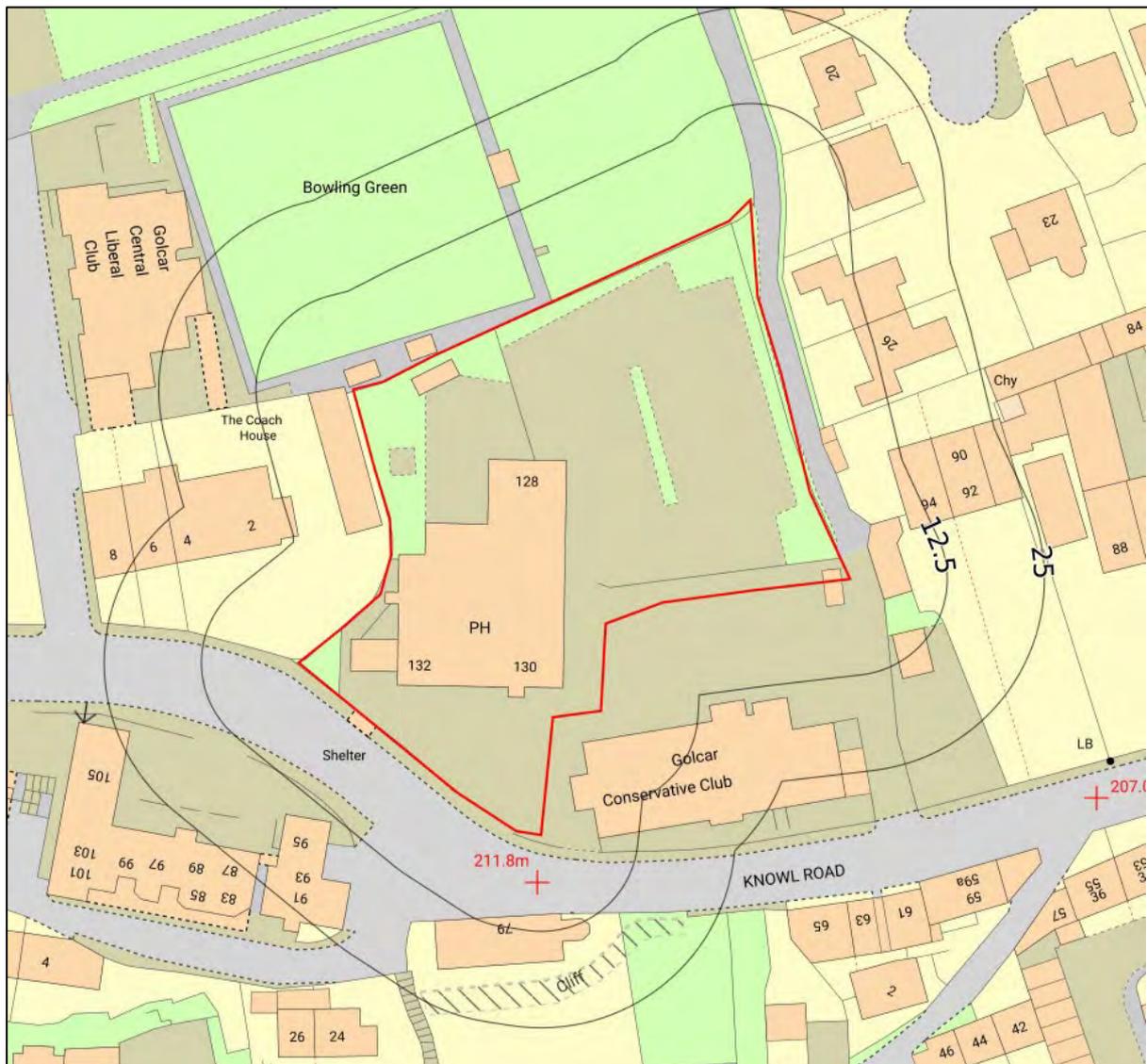


Figure 1A

Site Location Plan

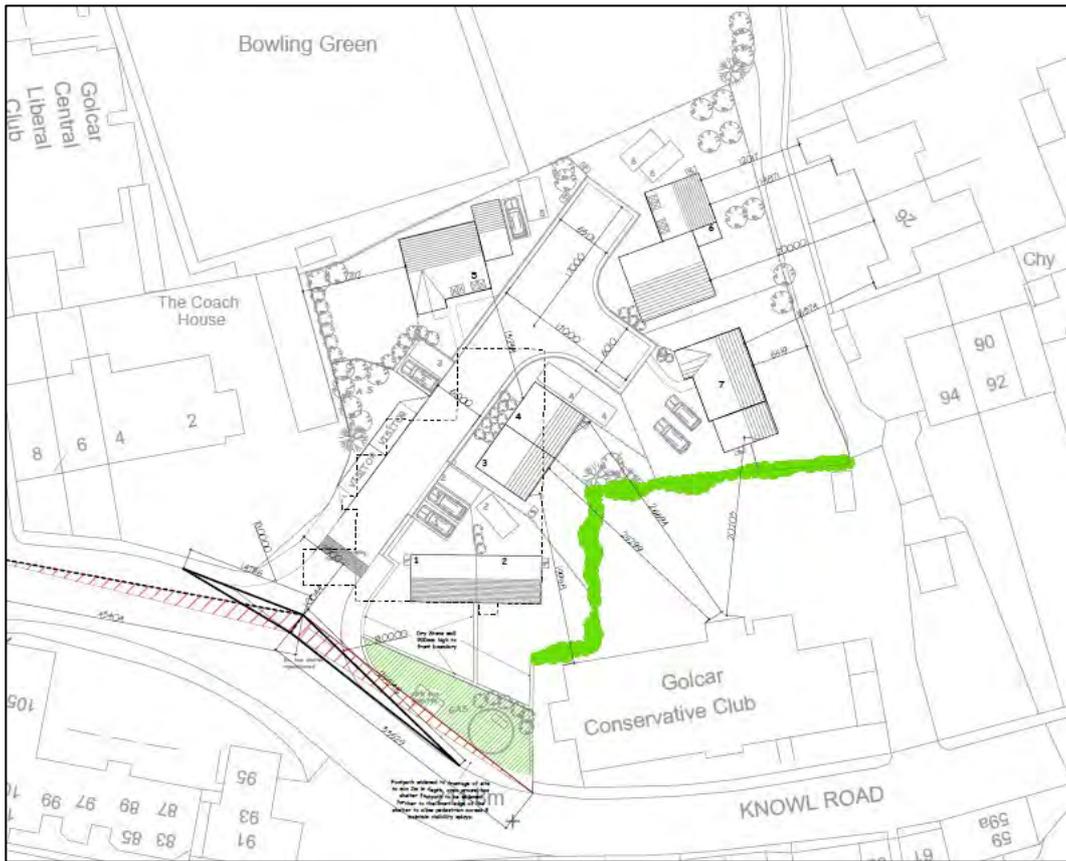


**Figure 1B Detailed Site Location Plan (green boundary)**

The site lies around National Grid Reference 409914E 415777N at a height of 212m above Ordnance Datum. A Site Location Plan is presented as Figure 1A and a Detailed Site Location Plan is presented as Figure 1B. A Proposed Development Plan is presented as Figure 2. Historic Industrial Land Use Plan is presented as Figure 3, Waste and Landfill Sites as Figure 4 and Artificial and Made Ground as Figure 5 and Current Industrial Land Use Plan as Figure 6.

A Geological Faults and Bedrock Geology Plan is presented as Figure 7. A Hydrology Plan is presented as Figure 8. A Hydrogeology of Bedrock is presented as Figure 9 and a Source Protection Zones and Abstractions Plan is presented as Figure 10 and a Window Sampler Borehole Location Plan is presented as Figure 11.

Archival Maps are presented in Appendix A and photographs are presented in Appendix B. A Coal Authority Report and a Conceptual Model are presented in Appendix C, and Borehole Logs are presented in Appendix D with Environmental and Geotechnical Test Results in Appendix E.



**Figure 2 Proposed Development Plan**

### 3 SITE HISTORY, HISTORIC and CURRENT INDUSTRIAL LAND USE

#### 3.1 Historic Mapping

The following maps and plans were inspected to assess the history of the site and its past environments. The archival Ordnance Survey maps are presented in Appendix A.

**TABLE 1  
Historical Maps Inspected**

DATE	SCALE	DESCRIPTION	
		SITE	SURROUNDING AREA
1854	1:10,560	The site is occupied by The Rose n Crown Public House during this time and the site boundaries are evident as of this day. The building is located in the south west corner of site next to the road. Likely the same building that exists today. Some smaller structures are shown in the centre and west of the site, while the north and east appear untouched.	The surrounding area is largely agricultural to the north while Golcar Edge exists to the south/ Knowl Road runs west to east to the immediate south of the site. In the far surrounding areas annotated are toughs, tenters and sandstone quarries. London and Northwestern Railways runs southwest to north east to the south of site together with the Huddersfield Canal and the River Colne.
1892-3 1905 & 1906	1:2,500 & 1:10,560	The site buildings are clearly shown as a large L shaped main building with thin rectangular structure	The surrounding area remains largely unchanged. Manor Mill(Drysaltery) is annotated to the north west of site and Albion Mill(Woollen) to the south west. The remaining surrounding area is largely residential

DATE	SCALE	DESCRIPTION	
		SITE	SURROUNDING AREA
		connecting in the south west corner next to the road while a thin rectangular building is located in north west corner of site.	including a chapel, church, Sunday school, farm and club.
1918-9 1930 1932 & 1938	1:2,500 & 1:10,560	The site area remains unchanged during this time.	The surrounding area remains largely unchanged during this time. A smithy is annotated to the west of site in Golcar. Manor Mill is now annotated as disused. Large scale develop is evident in the far surrounding area to the south and east of site, especially along the canal and railway tracks. Minor residential development to the north of site. Bowling green to immediate north.
1948 1955-6 1960-1 & 1960-3	1:10,560 1:1,250 & 1:2,500	The site remains unchanged during this time.	Residential development is clearly evident in the surrounding area.
1966-9 1975-8 1976-8 & 1978-82	1:10,000 1:1,250 & 1;10,560	The site area remains largely unchanged during this time. The south west corner of the building may have been added to or rebuild.	The surrounding area remains largely unchanged. A junior and infant school has been constructed to the north of the site, north of the bowling greens.
1988-92 1988-93 & 1993-4	1:10,000 & 1:1,250	The site area remains unchanged during this time, the building on site is still annotated as a public house. The small rectangular structures on the north west boundary of site are no longer evident by 1994.	The surrounding area is largely unchanged during this time. A warehouse is annotated to the south west of site, immediately south of Knowl Road.
2001 2003 2010 & 2024	1:10,000 & 1:1,250	This map indicates no change to the site area.	This map indicates no change to the immediate surrounding area.

In summary, the area is shown on the OS maps to have been occupied by the existing building prior to 1854. The site building has always been annotated as Rose n Crown Public House. It is only recently that the pub closed. The surrounding area is predominately residential. A club existing to the immediate east of site and bowling greens to the north. Knowl Road is located to the immediate south and railway tracks, River Colne and a canal to the far south.

### 3.2 Historic Industrial Land Use

The site has previously not been occupied by any recorded industrial land uses.

In the surrounding area there has historically been 5 industrial land uses the closest a police station circa 1967-78 located 12m to the west of site. The remaining four are unspecified mills located 91m to 102m to the west of site, circa 1890 – 1993 intermittently.

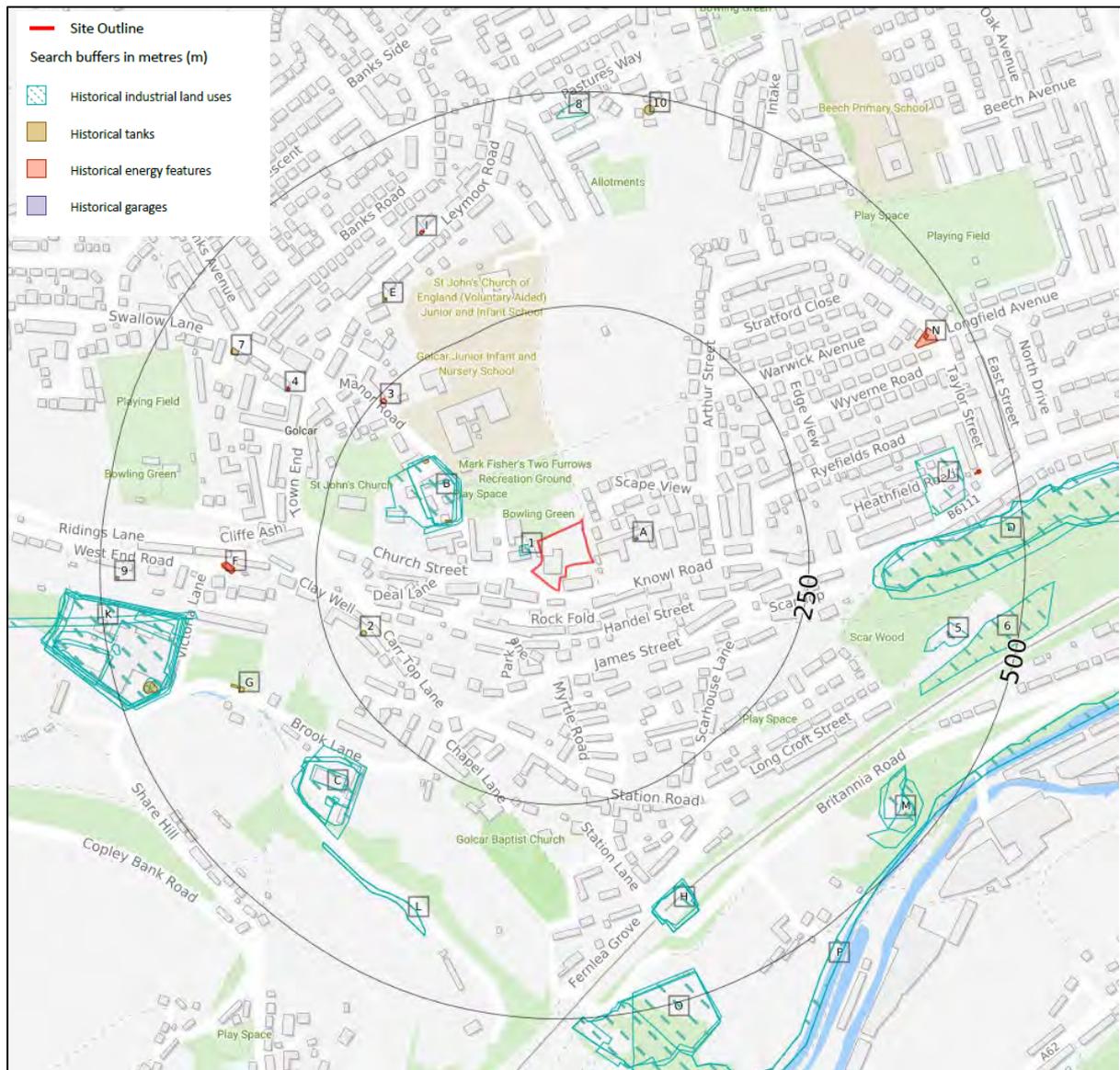
Eight historical tanks existed on site circa 1893 at the earliest and 1999 more recently. All tanks are noted as unspecified with the closest and next four 55m to the east and 56m east. The remaining three are 104m to the west, 157m to the north west of site and 205m west of site, all unspecified tanks.

One historical energy feature existed in the form of an electricity sub station 239m to the north west of site circa 1982 to 1993.

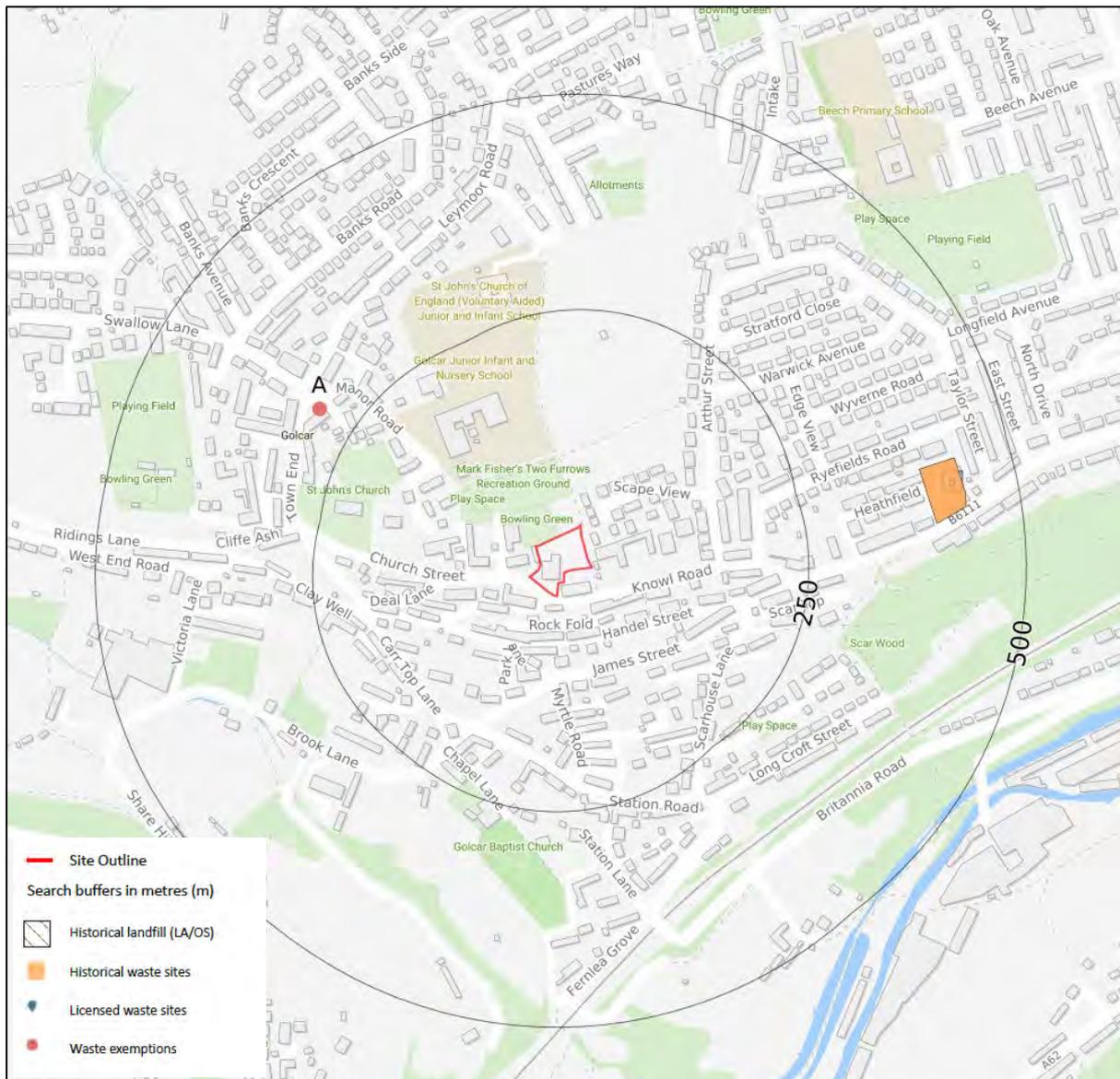
There are no surrounding historical petrol stations or historical garages within 500m of the site area.

There has been no historical military land within 500m of the site area.

The historic land uses within 100m are unlikely to have detrimentally affected the soils on the site.



**Figure 3 Historic Industrial Land Use Plan**



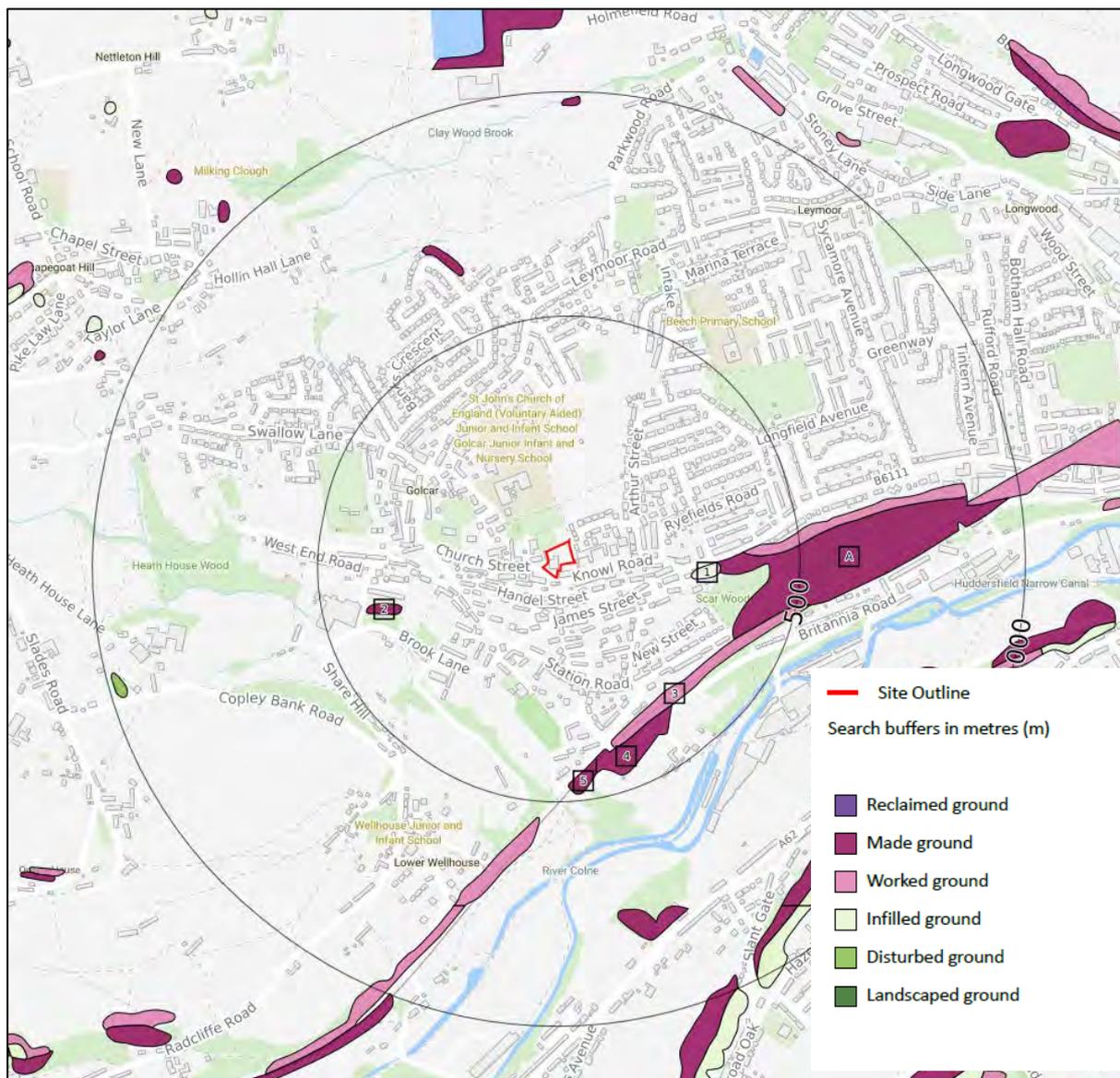
**Figure 4 Waste and Landfill Sites**

There are no active or recent landfill sites within 500m of the site. There existed no historical LA and EA/NRW landfills within 500m of the site area.

There were no historical waste sites within 390m of the site, the closest located 393m to the east noted as waste works. There are no licenced waste sites located within 500m of the site.

There are no waste exemption licences within 250m of the site area. The closest is located 296m to the north west categorised as treating waste exemption, sorting and de-naturing of controlled drugs for disposal.

Infilled ground, made ground, reworked or reclaimed ground is not recorded within 250m of the site. Artificial or made ground is not shown to be within the site area although made ground may be present.



**Figure 5 Artificial and Made Ground**

### 3.3 Current Industrial Land Use

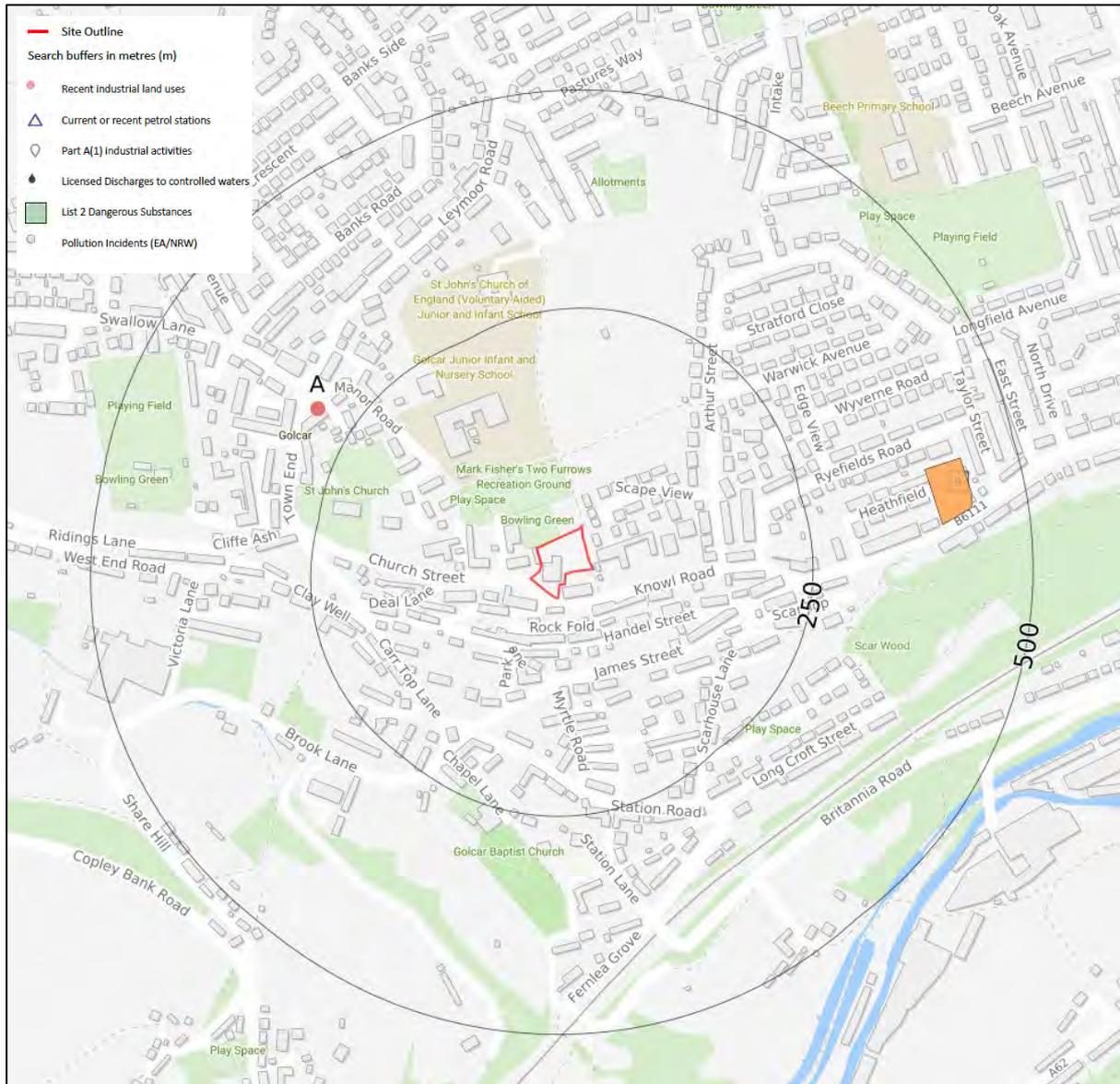
The site is currently no longer in use having previously been a public house with hard cover car parking. There is no current industrial land use within 100m of the site.

Potentially contaminating industrial land use is evident within 250m of the site area. 29m to the east of site is a chimney and 62m to the east, a tank. 172m to the south and 233m to the north west of site is an electricity sub station.

Current industrial land uses beyond 100m are unlikely to detrimentally affect the site.

There are no local current or recent petrol or fuel stations exist within 500m of the site area.

There are no sites determined as contaminated land, National Grid High Voltage underground electricity transmission cables or high pressure gas transmission pipelines on, or within 500m of the site.



**Figure 6 Current Industrial Land Use Plan**

## 4. REGULATED INDUSTRIES AND INFRASTRUCTURE

### 4.1 Authorisations, Incidents and Registers

Results of searches for regulated industries are presented in Table 2.

**TABLE 2  
Authorisations, Incidents and Registers**

	On SITE	Within 250m	DETAILS
Potentially Contaminative Uses identified in mapping	No	No	
Historical Tanks	None	8	On Site: - Surrounding: 55m & 56m East – Unspecified Tanks

	On SITE	Within 250m	DETAILS
			104m West – Unspecified Tanks 157m Northwest – Unspecified Tanks 205m West – Unspecified Tanks
Historical Energy Features	None	3	239m NW, 241m SE, Electricity Sub Station
Historical Petrol/Fuel Site	None	None	-
Historical Garage/Motor Vehicle Repair	None	None	-
Potentially infilled land	None	None	-
Historic IPC Authorisations	None	None	-
Part A(1) and IPPC Authorised Activities	None	None	-
Records of Red List Discharge Consents	None	None	-
Records of List 1 Dangerous Substances Inventory Sites	None	None	-
Records of List 2 Dangerous Substances Inventory Sites	None	None	-
Records of Part A(2) and Part B activities and enforcements	None	None	-
Records of Category 3 or 4 Radioactive Consents	None	None	-
Records of Licensed Discharge Consents	None	None	-
Records of Planning Hazardous Substance Consents and Enforcements	None	None	-
Records of COMAH and NIHHS sites	None	None	-
Records of National Incidents Recording System List 2	None	None	-
Records of National Incidents Recording System List 1	None	None	-
Records from EA landfill Data	None	None	-
Records of Operational Landfill Sites	None	None	-
Records of EA historic landfill sites	None	None	-
Records of non operational landfill sites	None	None	-
Records of local authority landfill sites	None	None	-
Records of operational and non operational waste treatment, transfer, exemptions or disposal sites	None	None	Detailed in Section 4
Records of EA licensed waste sites	None	None	-
Current Industrial Land Use	None	4	Detailed in Section 4
Petrol and Fuel Sites	None	None	-
Underground High Pressure Oil and Gas Pipelines	None	None	-
Residential Property (within 250m)	No	Yes	Yes, residential properties within 250m of the site to the west, east, north west, north east and south of site.
Radon Protection Required	Yes	Yes	Radon protection is NOT required according to BR211 by the Building Research Establishment.
Registered as Contaminated Land under Part IIA EPA 1990	No	No	-

Results of searches for regulated industries, pollution incidents and registered authorisations are presented in Table 2 above and indicate that the site is unlikely to be affected by current off-site activity.

Radon is a radioactive gas derived from naturally occurring uranium found in small quantities in soils and rock. The National Radiological Board recommends that where radon concentration exceeds the Action level of 200 Bqm<sup>-3</sup> the householder should take measures to reduce it.

According to the BGS the site is in an area where basic radon protection measures are not required in new buildings. According to the National Radiological Protection Board, the site lies within an area where between 1-3% of houses lie above the action level in the north of the site.

## 5. ENVIRONMENTALLY SENSITIVE SITES

The site does not lie within or within 2000m of a National Nature Reserve, a Special Area of Conservation, a Special Protection Area, a RAMSAR site, a World Heritage Site, an Environmentally Sensitive Area, an Area of Outstanding Natural Beauty, a Local Nature Reserve, Conservation Area, or a Nitrate Sensitive Area.

The site does not lie within a Nitrate Vulnerable Zone.

Green Belt Land exists 242m to the south west of site. Ancient Woodland exists 1845m to the north of site as Ancient replanted Woodland.

The site does lie within an SSSI Impact Risk Zone with regard to the construction of airports, helipads and other aviation proposals, minerals, oil and gas, air pollution and combustion. The site is unlikely to detrimentally affect these environmentally sensitive areas due to distance.

## 6. POTENTIAL CONTAMINATION

The site area has not previously been occupied by industrial land uses while the closest previous industrial land was a police station. The site has been used as a public house prior to 1854 to date 2024.

The sources of potential contamination from the past and present uses of the site are those associated with the uses mentioned and may include:

1. Hydrocarbons in fuel and oil from customer vehicles and deliveries
2. Asbestos in pipe lagging, building materials and brake shoes
3. Unknown contamination in waste/fly tipping/cooking waste

This list does not imply that these potentially contaminating materials are present on the site and it is possible that other potentially contaminating materials not listed may be present. This list does not imply that these materials are on site in contaminating levels.

## 7. SITE GEOLOGY

### 7.1 Geology

The published British Geological Survey Map (BGS) shows the site to be underlain by mudstone, siltstones, sandstones and coal seams of the Carboniferous Millstone Grit Formation. Superficial deposits are not indicated to overlie the solid strata. The maps indicate the site to be immediately underlain by The Huddersfield White Rock Sandstone dipping to the north west at shallow angles of 4 to 6 degrees to the horizontal.

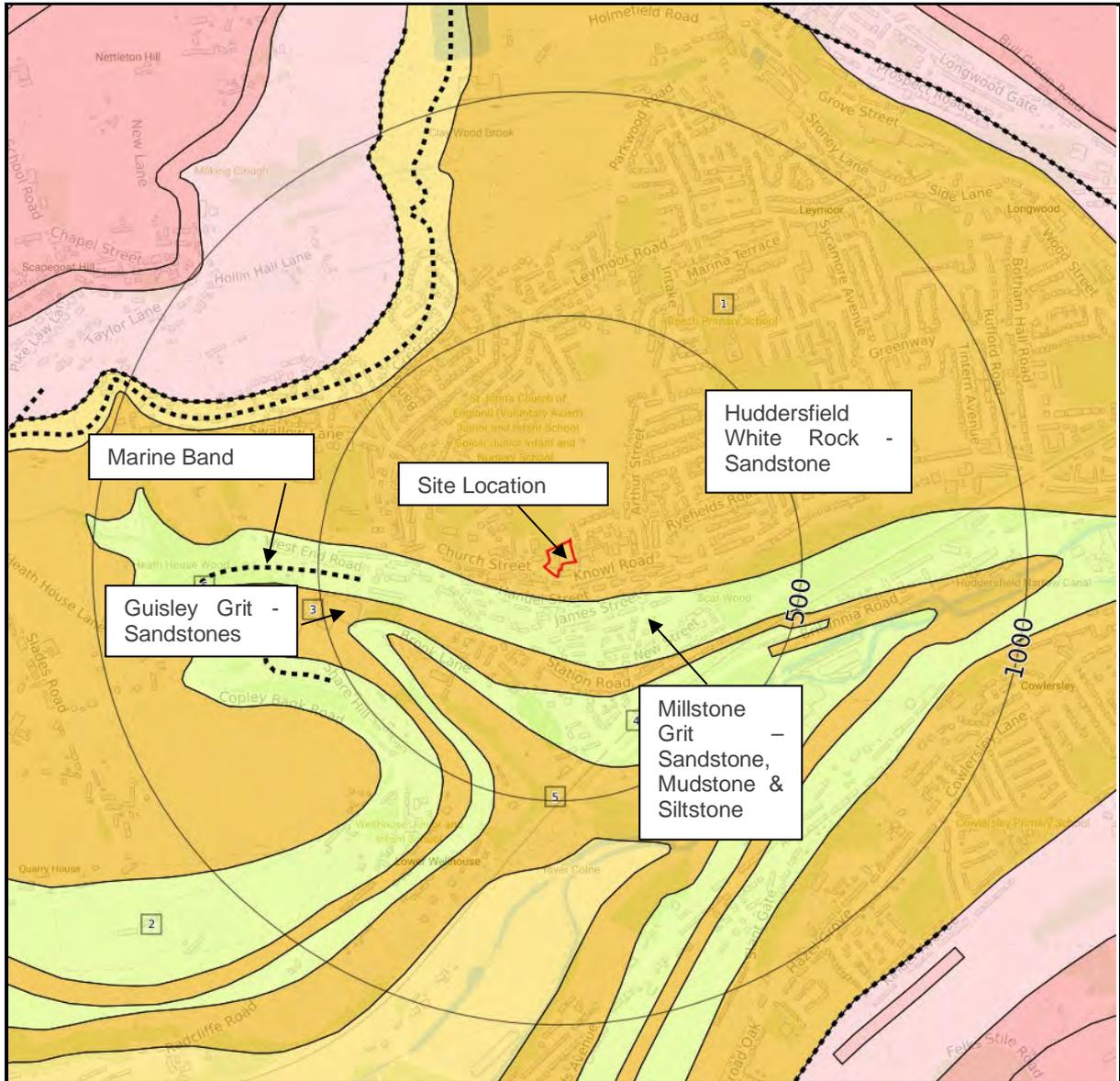
The site geology is presented in Figure 7.

### 7.2 Geological Faults

The BGS map does not indicate the presence of any geological faults within 1000m of the site area. It is possible that smaller faults sub parallel to these may exist in the strata causing fissuring and fracturing to the rock. Due to the cessation of tectonic activity in the area, faulting is unlikely to detrimentally affect the site stability.

### 7.3 Engineering Geology

Made ground may be present on the site. The strata of the Millstone Grit provides good bearing strata where unweathered and unfaulted for carrying the bearing pressures imposed by low rise development without undue settlement.



**Figure 7 Geological Faults and Bedrock Geology Plan**

### 7.4 Geological Hazards

According to the British Geological Survey there is a very low risk of collapsible deposits and landslides. There is a negligible risk of shrink and swell hazard from clays, ground dissolution of soluble rocks, running sands and compressible deposits. This is based on the geology and excludes made ground.

## 7.5 Previous Boreholes

There are previous boreholes held by the BGS to the immediate north of site which indicate sandy clay with sandstone fragments overlying sandstone bedrock. Older water wells to the west and east on Brook Lane and Britannia Road encountered 7.5m and 183.49m respectively of coarse sandstone (Grit) and shale. No coal seams were encountered.

## 8. HYDROLOGY AND HYDROGEOLOGY

### 8.1 Hydrology

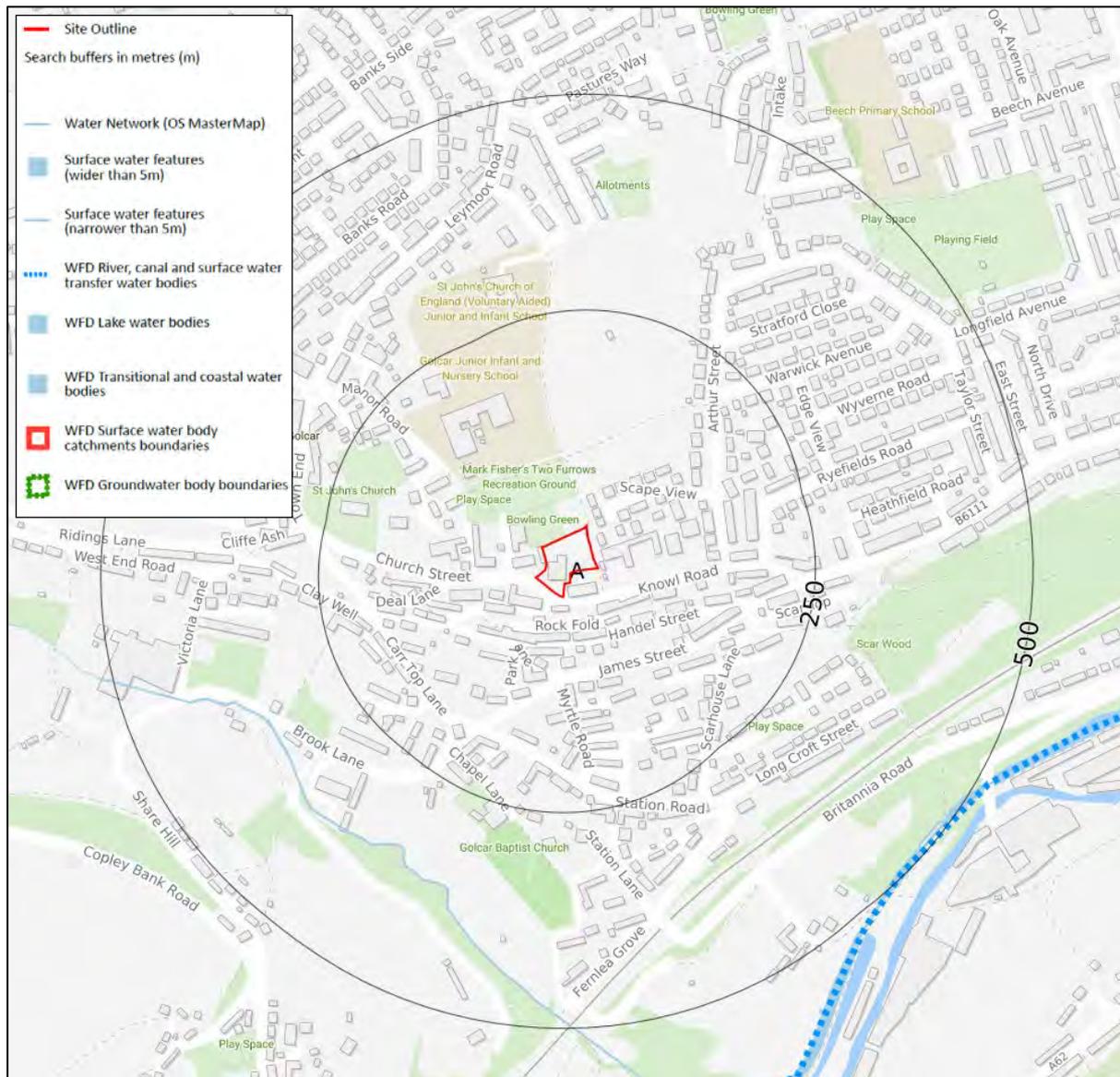
The closest surface water feature and surface water river network, manmade watercourse for water transfer, is located 500m to the south east of site as shown on Figure 8. This is the River Colne.

The site is on land designated as WFD Surface Water body catchment for the River Colne from Wessenden Brook to River Holme and on land designated WFD Groundwater Bodies for Aire and Calder Carb Limestone/Millstone Grit/Coal Measures.

The site is shown by the Environment Agency to not lie within a fluvial Flood Zone, flooding is unlikely to occur. There are no areas benefitting from flood storage within 250m of the site. There is no risk according to RoFRaS of flooding from rivers and seas. There is a negligible risk of flooding on site and within 50m of site in the event of 1 in 30 year to 1 in 1000year rainfall events.

There are no recorded surface water abstractions within 500m of the site. The closest is located 654m to the south east of site, currently active, it is used as process water taken from the River Colne. There are a further 27 surface water abstractions from 660 to 2000m distant from site.

It is important that any contamination found on site is not allowed to detrimentally affect any watercourses or ponds. It is unlikely, due to distance, that the site could be detrimentally affecting water courses.



**Figure 8 Hydrology Plan**

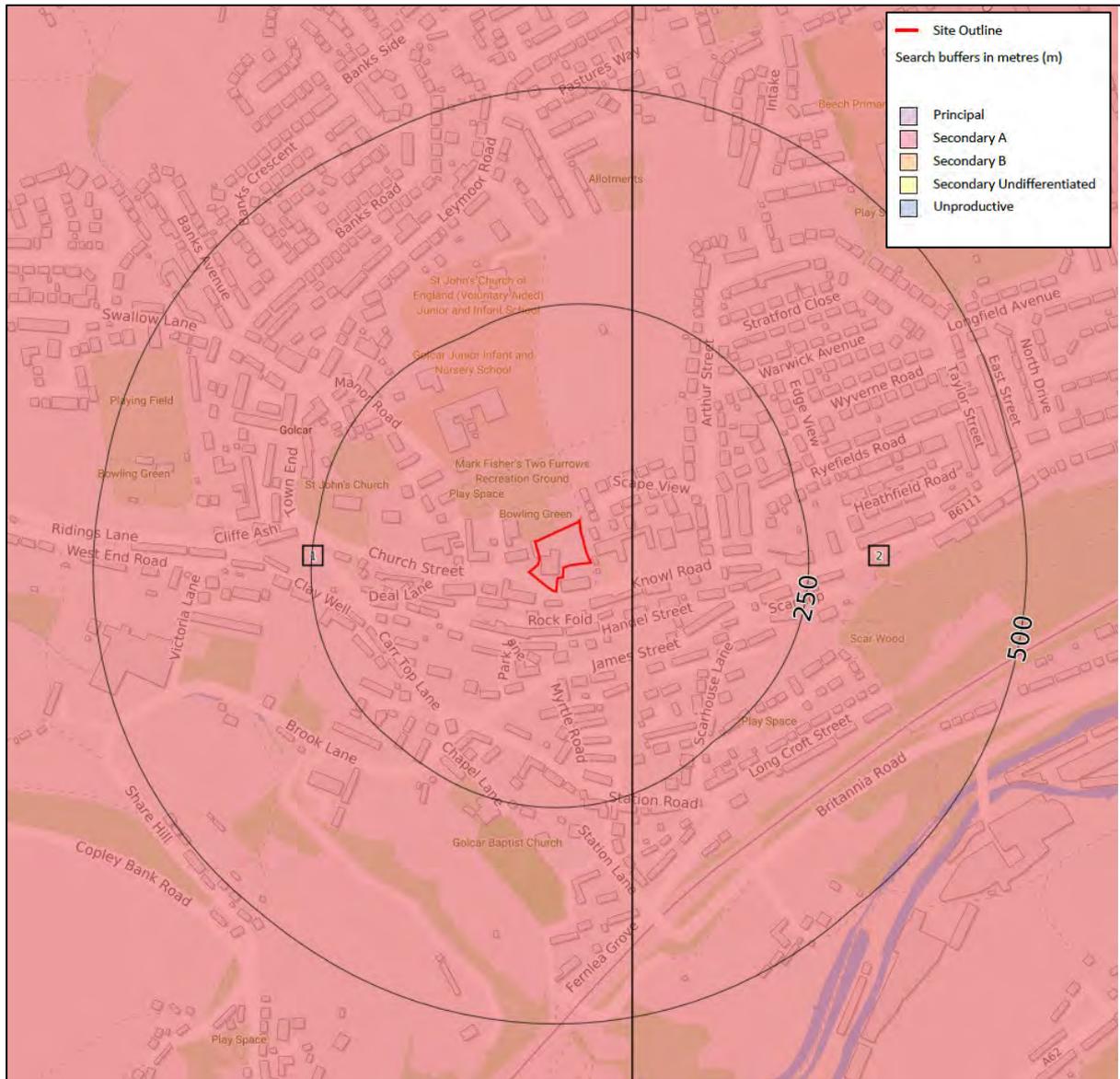
## 8.2 Hydrogeology

The geological maps produced by the BGS indicate the site to be underlain by sandstone of the Millstone Grit. The bedrock is not overlain by superficial clay deposits. A Secondary A Aquifer is held within the bedrock beneath the site. This is predominantly permeability layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.

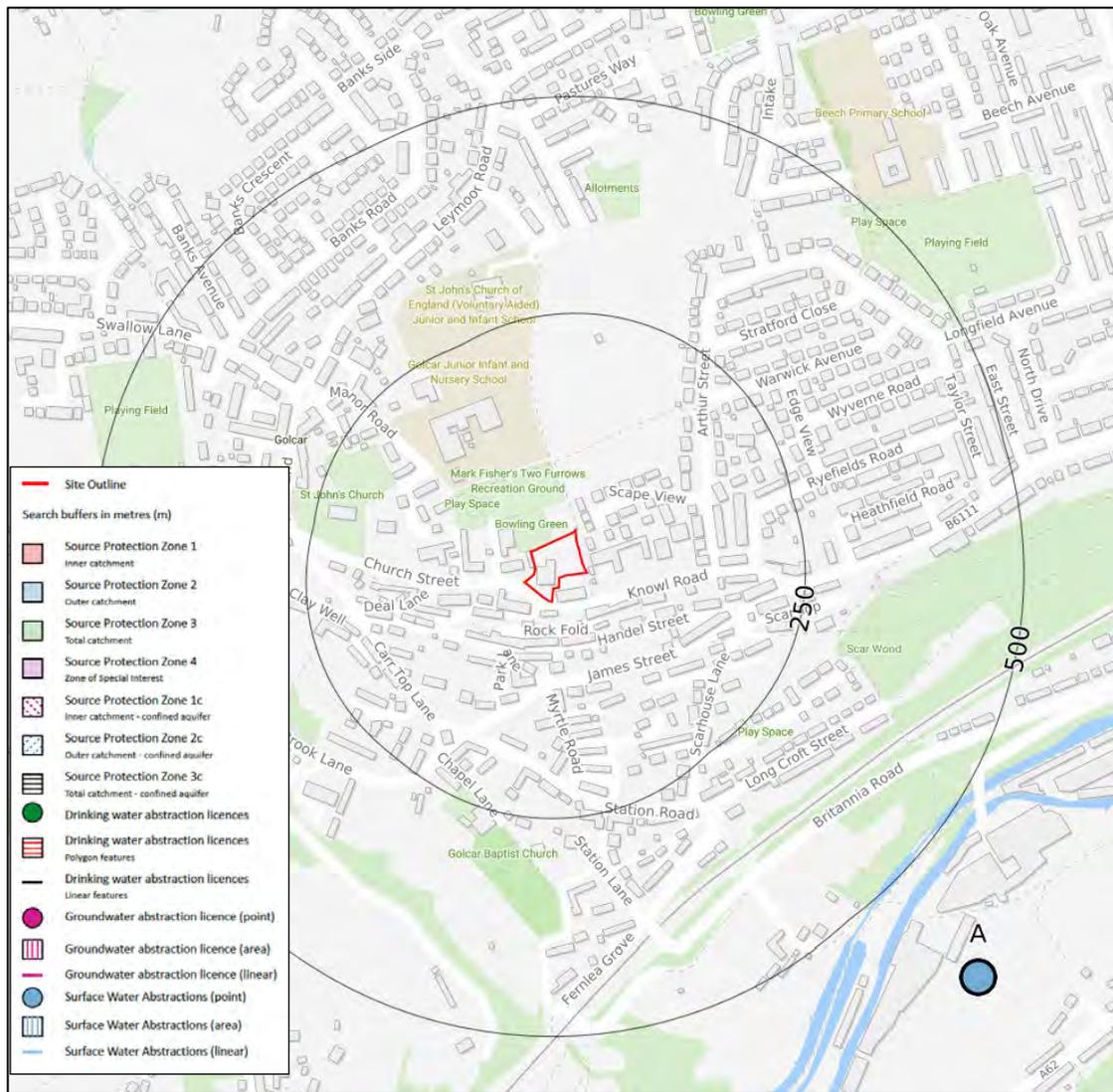
There are no recorded potable water and groundwater abstractions within 1000m of the site. All abstractions are located 1000-1700m distant from site used for drinking, cooking, sanitary, washing and a potable water supply from reservoirs and River Colne.

The site is shown to not lie within a Source Protection Zone Outer catchment or an Inner Catchment.

Other unrecorded or unlicensed wells may be present close to the site. Historic wells may exist within 500m of the site. As the local groundwater may be utilised for abstraction from old unlicensed wells, it is important that it is protected from pollution. It is an offence to pollute the groundwater, whether or not it is used for abstraction.



**Figure 9 Hydrogeology of Bedrock**



**Figure 10 Source Protection Zones and Abstractions**

## 9. QUARRYING AND MINING

### 9.1 Quarrying

The OS plans viewed indicate sandstone quarries on the far surrounding area, though none were shown close to site. The British Geological Survey Mines and Quarries Survey 1998 does not indicate any existing quarries within 250m of the site. However this does not imply that local quarrying for stone has not taken place on or close to the site in the past.

### 9.2 Coal Mining

The property is not within the area of any coal mining. According to the information held by the Coal Authority there are no known past, present or proposed workings of coal within the surface area of the property.

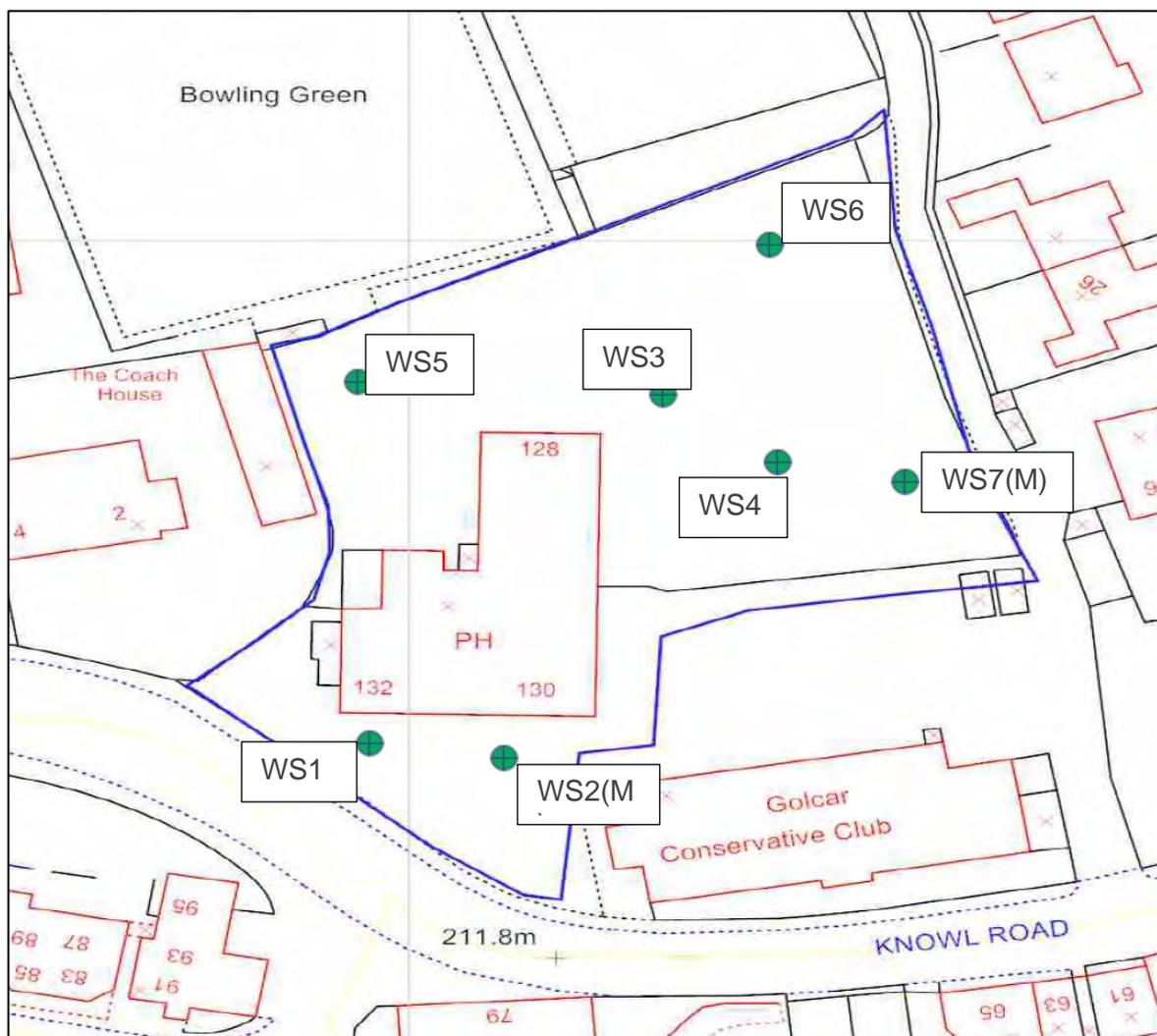
A Coal Authority No Search Certificate is available in Appendix C.

**10 SITE INVESTIGATION**  
**10.1 Introduction**

A ground investigation was undertaken by Ashton Bennett on the site, Reference SDG 3534 on January 25<sup>th</sup> 2024 and comprised the drilling of seven percussion boreholes numbered WS1 to WS7 by means of a windowless sampler rig. The boreholes were extended to depths of refusal at the bedrock to assess ground conditions and to collect soil samples for environmental and geotechnical testing. The soil samples were sent to NAMAS and UKAS accredited laboratories for testing for environmental nature and geotechnical properties.

Fourteen soil samples were tested for the presence of contamination and assessed against the standards described. The soil samples were collected from window sampler boreholes at depths varying from ground level to 0.80m bgl. Fourteen soils were tested for the DETR screen to check for contamination, three were tested for Total Petroleum Hydrocarbons (TPH), three for speciated Polyaromatic Hydrocarbons (PAH) and four for asbestos.

Two boreholes, WS2 and WS7 were fitted with standpipes following drilling to enable measurements of groundwater levels. A borehole location plan is presented as Figure 11.



**Figure 11 Window Sampler Borehole Location Plan**

## 10.2 Ground Conditions

Made ground was encountered to depths of 0.40m to 1.30m bgl but was generally 0.50 to 1.00mbgl. WS1 and WS2 in the south of site next to the site entrance encountered made ground 0.40m and 0.55m bgl while WS4 and WS7 in the east of site encountered made ground of 1.25m and 1.30m bgl respectively. WS5 in the north of the site encountered 0.90m bgl.

The made ground generally comprised reworked brown clay with sand and gravel of stones and sandstone with occasional cobbles of sandstone and brick fragments. In the deeper made ground loose ash and clinker and occasional coal fragments were evident in black gravelly reworked clay.

Standard Penetration Tests in the made ground at depths of less than 2.0m bgl gave N values of 12 and 14 in WS4 and WS7.

Clay was encountered beneath the made ground in all the boreholes with the exception of WS3. The clay was encountered from depths of 0.40m to 1.30m bgl. The clay consisted of yellow brown silty very sandy clay with sand, sandstone gravel and occasional sandstone cobbles/boulders. Standard Penetration Tests were not undertaken in the clay due to the limited thickness of 0.10 to 0.50m of strata found prior to the bedrock.

The bedrock encountered in all the boreholes comprised unweathered sandstone. The bedrock was encountered in all boreholes between 0.50m bgl in WS1 and 1.80m bgl in WS7. Standard Penetration Tests in the sandstone all gave N values of >50 indicating a strong bedrock.

**TABLE 3**  
**Ground Conditions**

BH No	MADE GROUND	BEDROCK	
	Concrete/clay/brick /ash	Bedrock weathered to Clay	Sandstone Bedrock
WS1	GL-0.40	0.40-0.50	0.50+
WS2	GL-0.55	0.55-0.70	0.70+
WS3	GL-0.70	-	0.70+
WS4	GL-1.25	1.25-1.55	1.55-1.60+
WS5	GL-0.90	0.90-1.00	1.00+
WS6	GL-0.65	0.65-0.95	0.95+
WS7	GL-1.30	1.30-1.80	1.80+

## 10.3 Groundwater Conditions

Groundwater was not encountered during the drilling of any of the boreholes. During and after heavy rainfall small seepages may be encountered in the made ground where it overlies the less permeable mudstone.

It is considered that special precautions will not be required for groundwater control during construction at levels that cannot be dealt with by sump pumping. Water levels recorded in the standpipes on three occasions in January and February 2024, varied from dry to 5.58 in WS2 and level at 0.64m bgl in WS7.

## 10.4 Geotechnical Testing

In situ shear strength tests were undertaken in selected boreholes to assess the engineering properties of the strata. Results indicated the made ground to be in a very loose to loose state of compaction, and the bedrock to be strong.

**TABLE 4**  
**Standard Penetration Test N Values**

Depth in mbgl	MADE GROUND	CLAY	SANDSTONE
GL-1.00			>50, >50, >50
1.00-2.00	12, 14		>50, >50, >50, >50

Five soil samples at depths varying from 0.80m to 1.70-1.80m in the natural strata were tested for plasticity. The results gave Liquid Limits of 29% to 37% and Plastic Limits of 16% to 23% and Plasticity Index of 10% to 18%. The results indicate that the clays are clays of low to intermediate plasticity and are unlikely to swell and shrink under varying moisture conditions.

**TABLE 5**  
**Tests for Plasticity**

GQF-008-48 Issue 01 - Oct 22		Summary of Classification Test Results												
Project No. J261052		Project Name GOLCAR Ashton Bennett Consultancy												
Hole No.	Sample				Soil Description	Density		w	Passing 425µm	LL	PL	PI	Particle density	Remarks
	Ref	Top	Base	Type		bulk Mg/m <sup>3</sup>	dry							
WS4		1.50	1.60	B	Brown sandy slightly gravelly CLAY				98	33	18	15		
WS5		0.90	1.00	B	Brown sandy slightly gravelly CLAY				55	33	21	12		
WS6		0.80		B	Orange brown gravelly sandy CLAY				45	33	23	10		
WS7		1.50		B	Light brown slightly sandy slightly gravelly CLAY				99	29	16	13		
WS7		1.70	1.80	B	Brwon slightly sandy slightly gravelly CLAY				94	37	19	18		

Moisture content within the fourteen environmental samples gave values varying from 7.5% to 24.5%

Tests undertaken for soluble sulphate on two soil samples at WS2 - 0.35m and WS5 - 0.70m indicate results of 34mg/l and 31mg/l with pH values of 6.3 and 6.3.

## 10.5 Gas Conditions

As there is no landfill, made ground, worked or reclaimed ground within 250m of the site there was no requirement to monitor the site for toxic gases.

## 10.6 Environmental Test Results

### 10.6.1 Standards

There are no definitive legal standards for contaminated land in the United Kingdom, although the Government Department of the Environment in the late 1970's published guidance on a restricted number of contaminants. Further guidance was published in March 2002 as the Contaminated Land Exposure Assessment (CLEA) by the Department of Environment, Food and Rural Affairs (DEFRA). These were withdrawn in August 2008 and new guidelines for some compounds were released in 2009. The UK Risk Assessment Framework is based on a tiered approach, Tier 1 being a risk screening or qualitative risk assessment, Tier 2 is a generic quantitative risk assessment and Tier 3 is a detailed quantitative risk assessment. Where the Tier 2 identifies a potentially unacceptable risk to human health either a Tier 3 Detailed Quantitative Risk Assessment (DQRA) is undertaken or risk management action recommended to remove the pathway and the risk.

For this site both a Tier 1 and Tier 2 assessment have been undertaken using generic assessment criteria and site specific assessment criteria based on CLEA 2009 and ATRISK 2017 which are based on the new CLEA guidance 2008 and 2009 (SC050021/SR3 (the CLEA Report) and SC050021/SR2 (the TOX report), SC050021/SR4, CLEA Software version 1.071 (2015) and toxicological reports and SGV technical notes (2009)). The figures used for assessment of lead are from DEFRA(2014b), Category 4 Screening Levels, which are based on the 'low level of toxicological concern (LLTC)'. C4SLs are 'estimates of contamination concentration in soil that present acceptable risk within the context of Part 2A'. In addition, assessment has used the LQM/CIEH S4ULs (2014) for Human Health Risk Assessment. The S4ULs are based on the principles of 'minimal' or 'tolerable' risk enshrined in SR2 (EA2009A), which has not been withdrawn and are based on the EA software. The guidance set out in these documents has been used to establish a conceptual model of the risks on the site.

The site will be used for the high risk residential use with landscaped gardens and hard covered parking. The risk assessment has used a scenario of residential use as the model for assessment. In deriving the SSVs a child has been chosen as the critical receptor with exposure over a lifetime being the most appropriate and conservative scenario.

The assessment of the risks to users on the site has been undertaken within the framework set out in guidance published by DEFRA and the Environment Agency for the assessment of risks to human health associated with chronic long term exposure to contaminated soils. The guidance set out in this documentation has been used to establish a conceptual model of the risks on the site following redevelopment. The Contaminated Land Exposure Assessment (CLEA) model provides a means of establishing concentrations of contamination in soils at a site. If results exceed these concentrations then further assessment or intervention by mitigation or remediation may be required to reduce risks to human health.

It is also possible to derive C4SLs for BaP as a surrogate marker for genotoxic PAHs, in line with the relevant HPA Contaminated Land Information Sheet (HPA 2010). This approach enables land contamination risk assessors to consider the combined carcinogenic risk associated with all genotoxic PAHs that might be present at a site, despite the absence of toxicological information for many of them, on an individual basis. Further information on the surrogate marker approach, including how and when it should be used, is provided in HPA.

HPA, Table 2.5: Profile of the genotoxic PAHs relative to BaP in the Culp et al study along with the order of magnitude upper and lower limits.

PAH	Mean ratio to BaP	Lower limit	Upper limit
Benz[a]anthracene	1.24	0.12	12.43
Chrysene	1.16	0.12	11.61
Benzo[b]fluoranthene	1.08	0.11	10.85
Benzo[k]fluoranthene	0.37	0.04	3.72
Dibenz[ah]anthracene	0.14	0.01	1.38
Indeno[123-cd]pyrene	0.73	0.07	7.27
Benzo[ghi]perylene	0.82	0.08	8.22

### 10.6.2 Environmental Tests on Soils

Fourteen soil samples were tested for the presence of contamination and assessed against the standards described. The soil samples were collected from window sampler boreholes at depths varying from ground level to 0.80m bgl. Fourteen soils were tested for the DETR screen to check for contamination, three were tested for Total Petroleum Hydrocarbons (TPH), three for speciated Polyaromatic Hydrocarbons (PAH) and four for asbestos.

**TABLE 6**  
**Results of Environmental Tests on Soils**

Compound	No of samples tested	Min value mg/kg	Max value mg/kg	LQM guideline Residential Use With Plant Uptake mg/kg	Samples exceeding SSV guidelines
<b>Phytotoxic</b>					
Copper	6	5.8	117.3	2400	None
Nickel	6	9.7	34.6	180	None
Zinc	6	27.2	516.7	3700	None
Boron	6	<0.5	1.1	290	None
<b>Metals</b>					
Arsenic	6	<1.8	31.4	37**	None
Selenium	6	<3	<3	250	None
Cadmium	6	<1.6	1.7	22**	None
Chromium	6	36.5	49.2	910	None
Chromium VI	6	<0.04	<0.04	20.5**	None
Lead	6	17.6	629	200**	WS3@0.6-0.7 WS5@0.5-0.55
Mercury	6	<0.7	1	52.2	None
<b>Others</b>					
Sulphate water soluble mg/l	2	31	34	<500mg/l	None
pH	2	6.3	6.3	5-9	None
Asbestos	4	NAD	NAD	NAD	NAD

Red Highlight = Exceeds Guidelines

\*BRE Special Digest 2007

\*\* DETR SP1010 guideline for C4SLS(2014)

NAD=No Asbestos Detected

**TABLE 7**  
**Results of Tests for Polyaromatic Hydrocarbons**

Polyaromatic Hydrocarbons	Polyaromatic Hydrocarbons In mg/kg		LQM S4UL guideline Residential Use With Plant Uptake mg/kg	Samples exceeding LQM S4UL guidelines
	Min Value	Max Value		
Anthracene	0.07	0.83	11000	None
Acenaphthene	0.03	0.35	1100	None
Acenaphthylene	<0.02	0.09	920	None
Benzo(a)anthracene	0.44	2.45	13	None
Benzo(a)pyrene	0.50	2.81	4.95**	None
Benzo(b)fluoranthene	0.53	2.64	3.7	None
Benzo(ghi)perylene	0.32	1.69	350	None
Benzo(k)fluoranthene	0.22	1.11	100	None
Chrysene	0.51	2.41	27	None
Dibenzo(ah)anthracene	0.08	0.47	0.3	WS1 0.15m
Fluoranthene	0.81	4.29	890	None
Fluorene	0.02	0.26	860	None
Indeno (1,2,3,cd)pyrene	0.29	1.63	41	None
Naphthalene	0.04	0.46	13	None
Phenanthrene	0.36	2.66	440	None
Pyrene	0.72	3.78	2000	None
<b>TOTAL PAH</b>	4.96	26.6		

Red Highlight = Exceeds ATRISK / LQM

NGV=no guide line value available

\*\* DETR SP1010 guideline for C4SLS(2014)

**TABLE 8**  
**Results of Tests for Total Petroleum Hydrocarbons**

Total Petroleum Hydrocarbons	Total Petroleum Hydrocarbons In mg/kg		LQM S4UL guideline Residential Use SOM 2.5% mg/kg	Samples exceeding LQM S4UL guidelines
	Min Value	Max Value		
TPH aromatic C5-C7	<0.01	<0.01	300	None
TPH aromatic C7-C8	<0.01	<0.01	660	None
TPH aromatic C8-C10	<0.01	<0.01	190	None
TPH aromatic C10-C12	<0.5	1	380	None
TPH aromatic C12-C16	<1	6	660	None
TPH aromatic C16-C21	<2	35	930	None
TPH aromatic C21-C35	7	141	1700	None
TPH aliphatic C5-C6	<0.1	<0.1	160	None
TPH aliphatic C6-C8	<0.1	<0.1	530	None
TPH aliphatic C8-C10	<0.1	<0.1	150	None
TPH aliphatic C10-C12	<0.5	<0.5	760	None
TPH aliphatic C12-C16	<0.5	<0.5	4300	None
TPH aliphatic C16-C35	<4.5	13	110000	None
<b>TOTAL TPH</b>	-	-		

Heavy metals tested all fell within government guidelines for residential use with plant uptake with the exception of lead in WS3 at 0.60-0.70m and WS5 at 0.50-0.55m which gave results of 527.8mg/kg and 629.0mg/kg respectively, above the guideline of 200mg/kg.

One polyaromatic hydrocarbon fell slightly above guidelines at 0.47mg/kg against the guideline of 0.30mg/kg in WS1 at 0.15m bgl.

All of the samples tested fell within the government guidelines for Total Petroleum Hydrocarbons for residential use with plant uptake.

### 10.6.3 Environmental Test Results on Groundwater

Groundwater was not encountered during the drilling of the boreholes, and insufficient was found during monitoring to enable testing.

## 10.7 Environmental Risk

### 10.7.1 General

Sources of contamination were investigated through the desk study. The environmental liabilities of the site and risk assessments have been undertaken for residential use with landscapes ground and hard cover car parking. If the site use changes then a further risk assessment may be required.

Environmental risk considerations on the site have been assessed by adopting a site specific qualitative approach to identify the risk, if any, of environmental harm. In accordance with the DETR Draft Statutory Guidance on Contaminated Land the approach is by identifying a hazardous source and establishing possible links between the source via exposure pathways to a potential receptor.

The hazard is a contaminant or potentially polluting substance that is in, on or under the land and which has the potential to cause harm or to cause pollution to controlled waters. The receptor is a living organism or organisms, an ecological system or piece of property, which is being harmed, interfered with or polluted by the contaminant. The pollutant linkage is by means of the pathway which is one or more routes by or through which that receptor is being, or could be, exposed to, or affected by, that contaminant. Thus the presence of a hazard on a site does not necessarily mean that there are risks unless pathways and receptors are present and are receptive to being affected by that specific hazard or contaminant.

- SOURCE - release of pollutant - eg. oil spills
- PATHWAY - route to receptor - eg. permeable strata
- RECEPTOR eg. - river

The likelihood of contamination affecting the environment depends on the migration and persistence of contaminants which varies with the nature of the contaminant and the ground and groundwater conditions, and the presence of sensitive receptors.

The following tables (Tables 9, 10, 11 and 12) which are extracted from CIRIA C552 'Contaminated Land Risk Assessment – A Guide to Good Practice' have been used to assess the risk to sensitive receptors from site contamination. Any category which shows as medium risk or above may require investigation and if high risk is proven, remediation may be required following investigation.

**TABLE 9**  
Risk Matrix – Comparison of Consequence and Probability

Risk = Probability x Consequences		Consequence			
		Severe	Medium	Mild	Minor
Probability	High Likelihood	Very High Risk	High Risk	Moderate Risk	Moderate / Low Risk
	Likely	High Risk	Moderate Risk	Moderate / Low Risk	Low Risk
	Low Likelihood	Moderate Risk	Moderate / Low Risk	Low Risk	Very Low Risk
	Unlikely	Moderate / Low Risk	Low Risk	Very Low Risk	Very Low Risk

**TABLE 10**  
Classification of Probability

Probability Classification	Definition
High Likelihood	There is a pollution linkage and an event that either appears very likely in the short term and almost inevitable over the long term or there is evidence at the receptor of harm or pollution.
Likely	There is a pollution linkage and all the elements are present and in the right place, which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short term and likely over the long term.
Low Likelihood	There is a pollution linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such event would take place, and is less likely in the shorter term.
Unlikely	There is a pollution linkage but circumstances are such that it is improbable that an event would occur even in the very long term.

TABLE 11  
Classification of Consequence

Classification	Definition	Examples
Severe	Short-term (acute) risk to human health likely to result in “significant harm” as defined by the Environment Protection Act 1990, Part IIA. Short-term risk of pollution (note: Water Resources Act contains no scope for considering significance of pollution) of sensitive water resource. Catastrophic damage to buildings/property. A short-term risk to a particular ecosystem or organisation forming part of such ecosystem (note: the definitions of ecological systems within the Draft Circular on Contaminated Land, DETR, 2000).	High concentrations of cyanide on the surface of an informal recreation area. Major spillage of contaminants from site into controlled water. <b>Explosion, causing building collapse (can also equate to a short-term human health risk if buildings are occupied).</b>
Medium	Chronic damage to Human Health (“significant harm” as defined in DETR, 2000). Pollution of sensitive water resources (note: Water Resources Act contains no scope for considering significance of pollution). A significant change in a particular ecosystem or organism forming part of such ecosystem, (note: the definitions of ecological systems within Draft Circular on Contaminated Land, DETR, 2000).	Concentration of a contaminant from site exceeds the generic or site-specific assessment criteria. Leaching of contaminants from a site to a major or minor aquifer. Death of a species within a designated nature reserve. <b>Lesser toxic and asphyxiate effects of carbon dioxide</b>
Mild	Pollution of non-sensitive water resources. Significant damage to crops, buildings, structures and services (“significant harm” as defined in the Draft Circular on Contaminated Land, DETR, 2000). Damage to sensitive buildings/structures/services or the environment.	Pollution of non-classified groundwater. Damage to building rendering it unsafe to occupy (e.g. foundation damage resulting in instability).
Minor	Harm, although not necessarily significant harm, which may result in a financial loss or expenditure to resolve. Non-permanent health effects to human health (easily prevented by means such as personal protective clothing, etc). Easily repairable effects of damage to buildings, structures and services.	The presence of contaminants at such concentrations that protective equipment is required during site works. The loss of plants in a landscaping scheme. Discoloration of concrete.

TABLE 12  
Classification of Risks and Likely Action Required

Risk Classification	Definition
Very High Risk	There is a high probability that severe harm could arise to a designated receptor from an identified hazard OR there is evidence that severe harm to a designated receptor is currently happening. This risk, if realised, is likely to result in a substantial liability. Urgent investigation (if not undertaken already) and remediation are likely to be required.
High Risk	Harm is likely to arise to a designated receptor from an identified hazard. Realisation of the risk is likely to present a substantial liability. Urgent investigation (if not undertaken already) is required and remedial works may be necessary in the short term and are likely over the longer term.
Moderate Risk	It is possible that harm could arise to a designated receptor from an identified hazard. However, it is relatively unlikely that any such harm would be severe. If any harm were to occur, it is more likely that the harm would be relatively mild. Investigation (if not already undertaken) is normally required to clarify the risk and to determine the potential liability. Some remedial works may be required in the longer term.
Low Risk	It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst be mild.
Very Low Risk	There is a low possibility that harm could arise to a receptor. In the event of such harm being realised, it is not likely to be severe.

Any category which shows as moderate risk or above may require investigation and possibly subsequent remediation.

### 10.7.2 Sources of Contamination

There is a low risk that contamination exists on the site based on its past uses. Based on our investigation, lead and one PAH was detected in two locations, probably derived from spilled old petrol. The PAH is likely to derive from waste tarmac.

### 10.7.3 Potential Pathways for Migration

a) Ingestion of and/or skin contact with contamination in the soil

Low Likelihood to Unlikely – There is a low potential for ingestion/skin contact with the lead and PAH contamination in soil. There may be a risk to workmen which could be mitigated by appropriate use of Personal Protective Equipment. The site will be mostly hard covered with low availability for skin contact with the soil. Any gardens and landscaped ground should be covered in 600mm of tested as uncontaminated topsoil.

b) Ingestion of contamination and uptake of contamination in plants/vegetables/animals/pets

Low likelihood to Unlikely - Vegetables and plants may be grown on the site. It is considered that animals in the food chain and pets may be present on site. The site will have gardens and landscaped ground and hard covered, It is unlikely that there will be any uptake of contamination in plants as lead in the soil can not easily be taken up by plants.

c) Ingestion of contaminated drinking water through leaching of contamination into groundwater flowing to underlying aquifers/water abstractions

Low Likelihood to Unlikely – Leaching of any contamination is unlikely to detrimentally affect groundwater. The site does not lie within a Source Protection Zone for potable groundwater abstractions. There are no potable/groundwater abstractions within 1000m of the site. The site is unlikely to detrimentally affect water due to previous site hard covered with drainage, and substantial distance to local abstractions.

d) Inhalation of vapours produced by landfill/radon/hydrocarbons/old mines

Low Likelihood to Unlikely – There were no historic recorded landfill sites, made ground, infilled or worked ground within 250m of the site. The site does not lie within a radon protection area. Coal mining does not affect the site or surrounding area. The site does not lie in an area where methane or radon protection is required.

e) Inhalation of contaminated airborne dust

Low Likelihood to Unlikely – The appropriate safety measures must be exercised to protect both the workers and the local residents from dust during construction. Provided this work is carried out diligently, the ongoing risk is low. Asbestos was not detected on the site.

f) Contamination of controlled waters

Low Likelihood to Unlikely – Leaching of contamination from the site into the closest surface water on site is unlikely. Surface water exists >500m to the south east of site. There is a low potential for leaching of any contaminates into groundwater and underlying Secondary A aquifer within the bedrock.

### 10.7.4 Potential Sensitive Receptors

Potential Sensitive Receptors to the contamination detected and any undetected contamination on the site could include workmen and future occupants of the buildings. Partial hard cover over the site will reduce the liability and landscaped areas and gardens should be protected by a cover system.

## 10.8 Summary of Environmental Risk

By considering where a viable pathway exists which connects a source to a receptor, this assessment will identify where pollutant linkages may exist. If there is no pollutant linkage, then theoretically there is no risk. Therefore, only where a viable pollutant linkage is established does this assessment go on to consider the level of risk. On this site there is lead detected contamination. The site will be used in the future for the high sensitivity land use scenario of residential use with landscaped ground, gardens and hard cover car parking.

The risk is assessed by the combination of the probability of the risk and the severity of the risk in line with CIRIA recommendations and the risks are presented in Table 13. If any material is likely to be removed from site for development, then Waste Categorisation and Waste Acceptance Criteria Tests will be required to categorise the soils.

**TABLE 13**  
**Risk Assessment for Residential Use with Plant Uptake**

Pathways	Receptors	Perceived Risk	Probability of Risk	Consequence of Risk	RISK
<b>Environmental</b>					
Inhalation of vapours such as methane from landfill and hydrocarbons from ground contamination	Existing/future occupants of the buildings and workmen.	Methane & Carbon Dioxide	Low Likelihood to Unlikely	Severe-Methane can be explosive in air. Carbon dioxide can be fatal. Hydrocarbon can have long term health effects.	Low – No Historic landfill not within 250m Hydrocarbons not present. No Mining in area.
Ingestion of and/or skin contact from contaminated soil	Existing/future occupants of the building and workmen	Contaminated Soil	Low Likelihood To Unlikely	Mild	Low – Due to lack of significant contamination
Ingestion of contaminated drinking water	Local abstraction wells	Contamination of potable water	Low likelihood to Unlikely	Medium-prosecution can occur if site is affecting controlled waters	Low - Potable boreholes located >1000m. Site does not lie in a source protection zone for potable water abstracted from strata below strata on site.
Transportation by surface and/or groundwater	Groundwater	Contamination of shallow groundwater by hydrocarbons	Low Likelihood to Unlikely	Medium-prosecution can occur if site is affecting controlled waters.	Low - It is unlikely that contamination could be affecting groundwater. Closest groundwater abstraction >1000m Low- Due to lack of contamination detected Surface water >500m to the South East
	Surface Water	Contamination of surface water	Unlikely		
Ingestion and uptake of contamination in plants/animals/vegetables.	Future occupants	Ingestion of contamination via home grown produce	Low Likelihood to Unlikely	Medium	Low – vegetables and plants may be grown on site. Gardens and landscaped ground to have a cover system
Inhalation of airborne dust	Workmen, occupants of building,	Dust during any future demolition or construction.	Low likelihood to Unlikely	Medium	Low - provided good construction practice

	neighbouring users				on site. No asbestos detected on site.
Irradiation	Humans	Radon gas	Unlikely	Mild	Low-Radon protection not required in buildings
<b>Geotechnical</b>					
Fire and Explosion	Buildings and humans	Methane gas from made ground/coal seams	Low Likelihood to Unlikely	Severe	Low – Landfill and mining not beneath site. Risk further reduced by use of methane resistant membrane
Settlement or Heave	Buildings and car park	Damage to hard and surface buildings	Unlikely	Medium	Low – provided foundations placed on high strength sandstone
Landslip	Buildings	Level site	Unlikely	Severe	Low risk – site is mostly level or very slight undulation.
Chemical attack	Buildings	Sulphate can, under certain conditions, attack concrete.	Low to medium likelihood	Medium	Low – Low levels of sulphate no special precautions required for underground concrete
Groundwater	Buildings	Rising groundwater	Unlikely	Medium	Low
<b>Mining</b>					
Fire and Explosion	Buildings and humans	Methane gas from made ground/coal seams	Low Likelihood to Unlikely	Medium to severe	Low – Coal not present beneath site.
Shallow Mining	Land and Structures	Damage to hard and surface buildings	Likely to Low Likelihood	Medium to severe	Low – No Shallow mining
Deep Mining	Buildings	Damage to hard and surface buildings	Unlikely	Severe	Low – No deep mining

The potential sensitive receptors on the site which could be detrimentally affected by any contamination, mining and geotechnical risks are assessed in Table 13. The risk assessment has been based on the future use of the site for residential use with landscaped ground, gardens and hard cover car parking. If the site is to be used for any other purpose a reassessment of the risk may be necessary.

In line with CIRIA, a risk assessment has indicated that there is a low risk of the contamination detrimentally affecting humans or the environment. Due to the depth to groundwater and the distance to surface water, increased hard cover, the site is unlikely to detrimentally affect controlled waters.

Workmen should take the usual precaution of wearing gloves when handling soil, and the gardens and landscape ground should have a cover system.

## 11. ASSESSMENT AND RECOMMENDATIONS

### 11.1 Introduction

A Desk Study and ground investigation have been undertaken to assess the geotechnical, mining and environmental conditions for the proposed development of the site for residential use with landscaped ground, gardens and hard cover car parking.

The desk study and ground investigation have been sufficient to allow an assessment of the site conditions.

This section of the report provides an interpretation of the findings in the form of a ground model, and provides advice and recommendations with respect to the proposed development.

### **11.2 Geology and Groundwater**

The site is underlain by Made Ground to depths varying 0.40m to 1.30m bgl, but generally 0.50m to 1.00m bgl, comprising reworked clay with stones and sand and gravel of sandstone with occasional sandstone boulders, concrete, red brick, coal and ash and clinker. This is underlain by silty very sandy gravelly clay overlying Millstone Grit sandstone at depths of 0.50m to 1.80m bgl.

It is not expected that groundwater will be a concern during development, and any water after heavy rainfall is expected to be dealt with by sump pumping.

### **11.3 Mining**

The property is not within a surface area that could be affected by underground mining from past, present or future coal workings.

### **11.4 Contamination and Toxic Gas**

There is a low level of contamination on the site and it is a low risk of any detected or undetected contamination could detrimentally affect humans. Due to the depth to groundwater and distance to surface water, it is unlikely to detrimentally affect controlled waters.

There are no recorded abstraction licences which could be detrimentally affected by the site. The underlying aquifer of the permeable strata within the Millstone Grit Sandstone is present at such depth beneath the site that it is unlikely to be detrimentally affected by the site.

As a precaution all builders should also use gloves when handling soil for Health and Safety and work in accordance with HSE and CIRIA guidelines.

There is no recorded landfill, made ground, worked or remediated ground within 250m and therefore no precautions are required to mitigate toxic gases.

Basic radon protection measures are not required on this site according to BRE BR211.

### **11.5 Excavations**

Excavations for services could be achieved by mechanical excavator. All excavations for foundations and services will require temporary support for construction in the short and long term.

Groundwater may be encountered especially during and after heavy rainfall. If rainwater falls into the excavations it is expected to be easily dealt with by sump pumping. If this occurs, the softened surface of the strata should be removed prior to any pouring of concrete.

### **11.6 Underground Concrete**

Tests undertaken for water soluble sulphate in the soil indicated levels where special precautions are not required for design of underground concrete.

### **11.7 Waste Disposal**

Any spoil arising from excavations or landscaping works will need to be disposed of to a licensed tip in accordance with the EP (Duty of Care) Regs 1991 and Landfill (England and Wales) Regulations (2002) amended. Under the European Waste Directive landfills are classified as accepting inert non-hazardous or hazardous wastes in accordance with the EU Waste Directive. The local waste regulation department of the Environment Agency (EA) should be contacted to obtain details of tips that are licensed to accept the soil represented by the test results and the waste categorisation.

### **11.8 Foundation Recommendations**

It is proposed to construct residential houses with hard cover and gardens and landscaped areas.

Any made ground encountered is unsuitable material on which to construct foundations due to its low strength and variable nature both laterally and vertically. The underlying clay is thin and inconsistent and not suitable for supporting foundations.

It is recommended that foundations are placed on the higher strength sandstone bedrock with a bearing capacity of 150kN/m<sup>2</sup>.

If during and after heavy rainfall the surface of excavations in the weathered sandstone are softened, then the softened material should be removed before pouring of concrete.

Care should be taken to ensure foundations are constructed on similar strata to avoid differential settlement due to varying ground settlement.

## **12. GENERAL REMARKS**

This report truly reflects the conditions found during the desk study and ground investigation. Whilst the desk study and ground investigation were undertaken in a professional manner taking due regard of additional information which became available as a result of ongoing research, the results portrayed only pertain to the information attained, and it is possible that other undetected information and undetected ground and gas conditions, undetected mining conditions and undetected contamination may exist. The desk study and ground investigation were only undertaken within the site boundaries and should not be used for interpretation purposes elsewhere. These conclusions are only a brief summary of the report, and it is recommended that the report is read in full to ensure that all recommendations have been understood.

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Tristan T A Bennett  
BSc

Frances A Bennett  
BSc, CGeol, FGS, FIMMM, C.WEM, MCIWEM, CEnv, MIEnvSci.

# Appendix A



**Site Details:**

Rose and Crown Pub, Golcar

**Client Ref:** CMAPS-CM-1143526-4873-100124  
**Report Ref:** CMAPS-CM-1143526-4873-100124HIS  
**Grid Ref:** 409916, 415772

**Map Name:** County Series

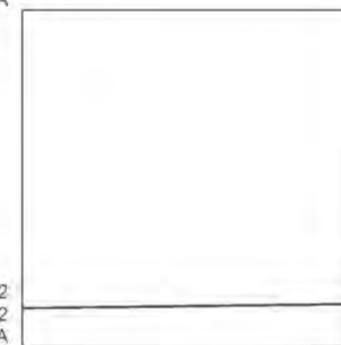
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**Scale:** 1:2,500

**Printed at:** 1:2,500



Surveyed 1893  
 Revised 1893  
 Edition N/A  
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 Revised 1892  
 Edition N/A  
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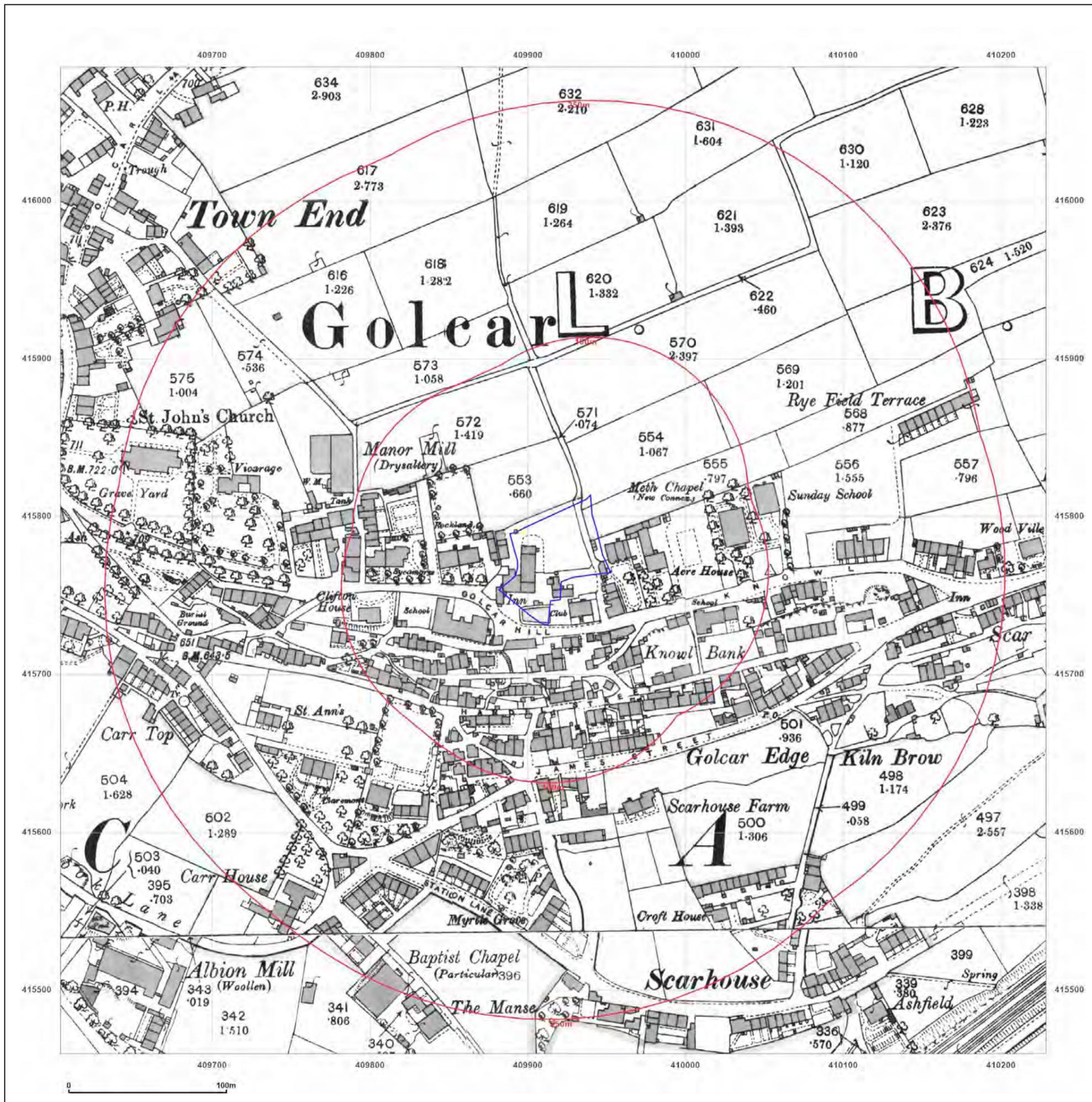


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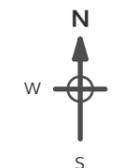
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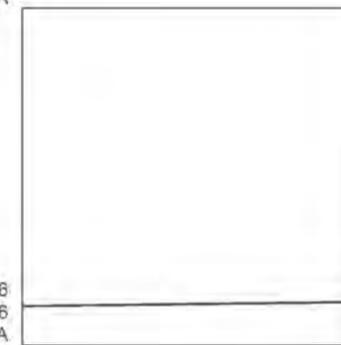
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**Scale:** 1:2,500

**Printed at:** 1:2,500



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 Revised 1906  
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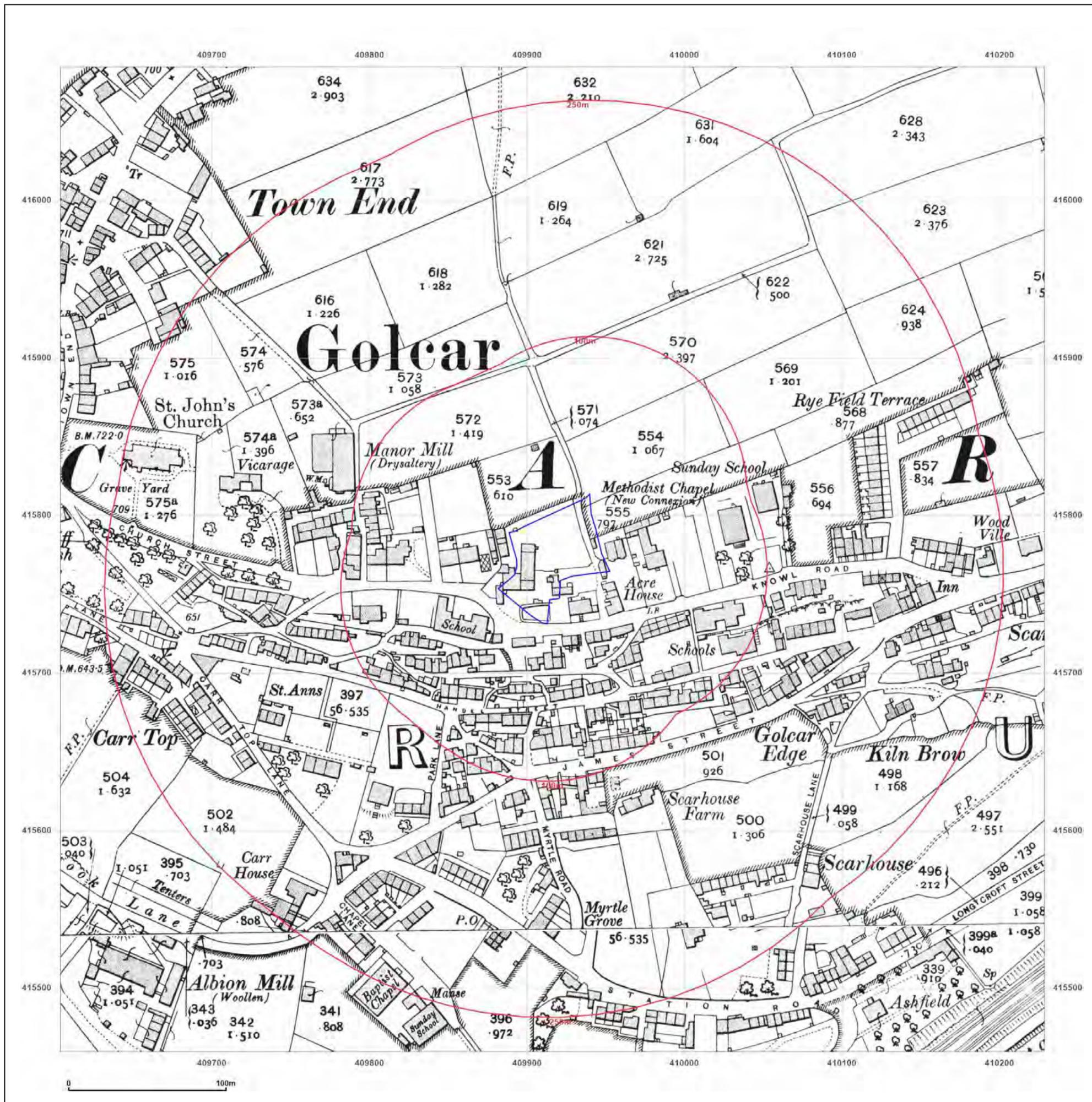


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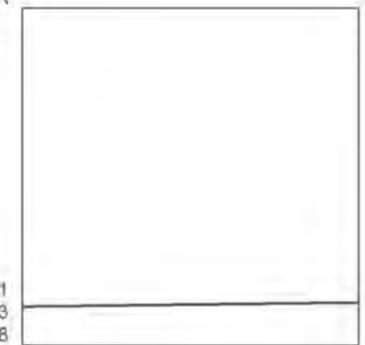
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 Revised 1913  
 Edition 1918  
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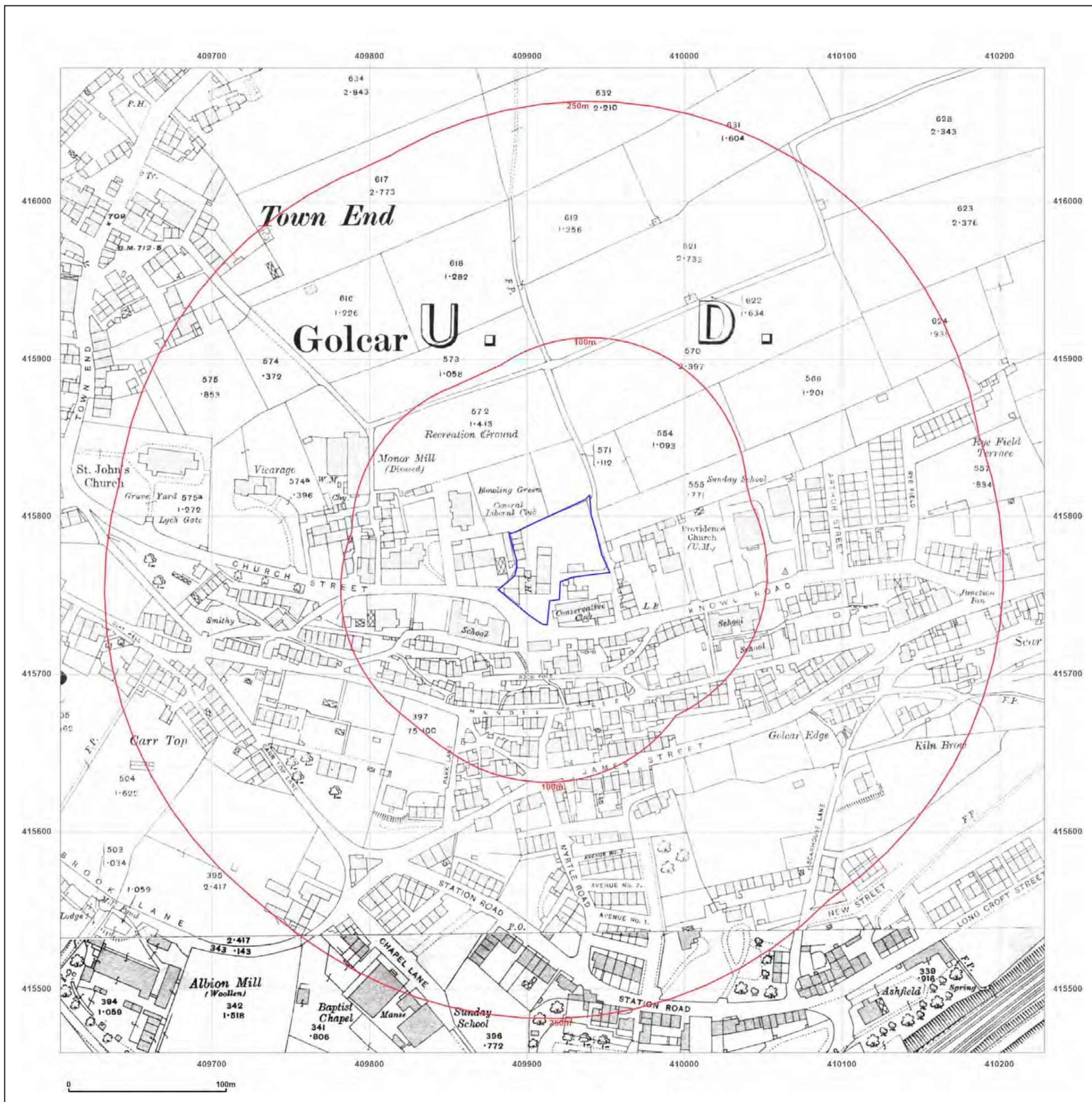


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**Map Name:** National Grid

**Map date:** 1960-1961

**Scale:** 1:1,250

**Printed at:** 1:2,000



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Edition N/A  
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Revised 1960  
Edition N/A  
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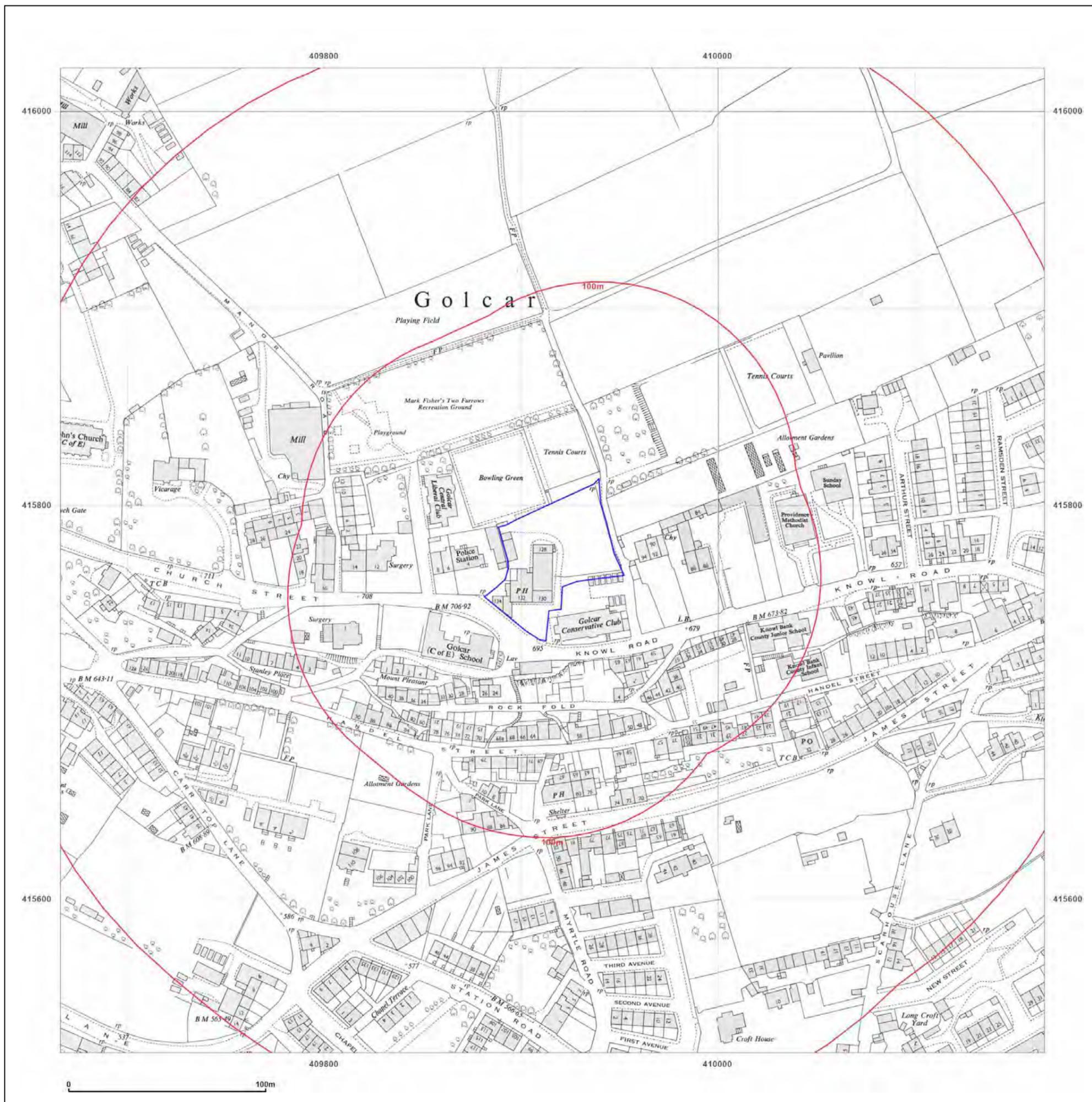


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**Map date:** 1960-1963

**Scale:** 1:2,500

**Printed at:** 1:2,500



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 Edition N/A  
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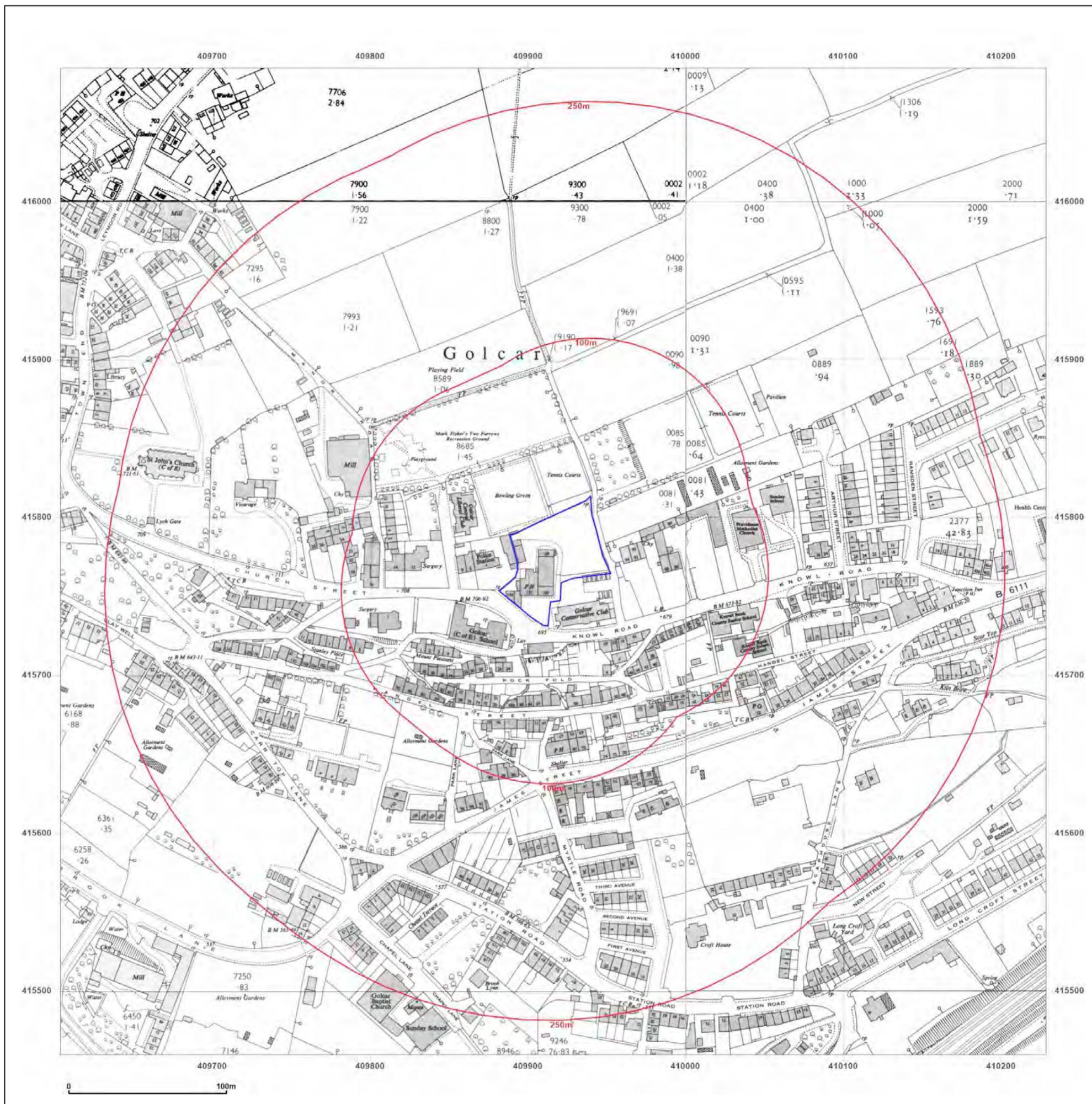


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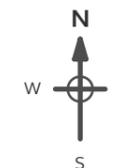
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**Map Name:** National Grid

**Map date:** 1988-1993

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**Printed at:** 1:2,000



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Edition N/A  
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**Map Name:** National Grid

**Map date:** 1993-1994

**Scale:** 1:1,250

**Printed at:** 1:2,000



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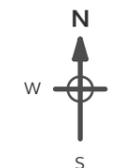
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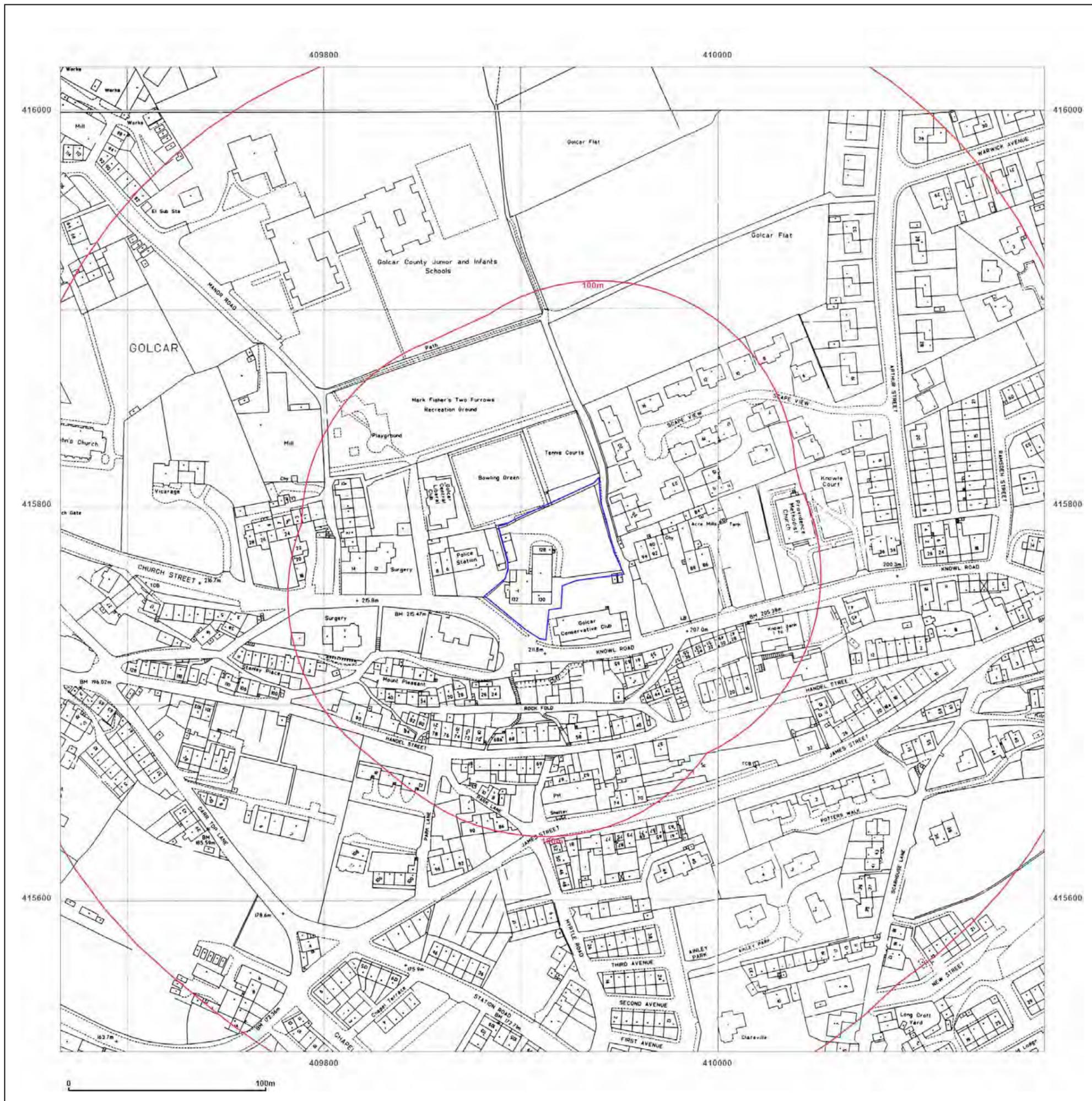


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**Map Name:** LandLine

**Map date:** 2003

**Scale:** 1:1,250

**Printed at:** 1:1,250



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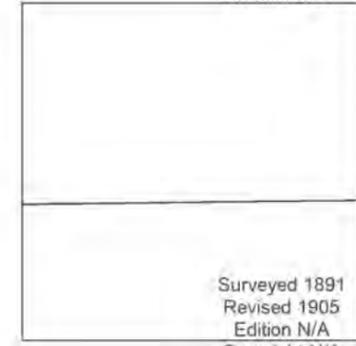
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Revised 1905  
Edition N/A  
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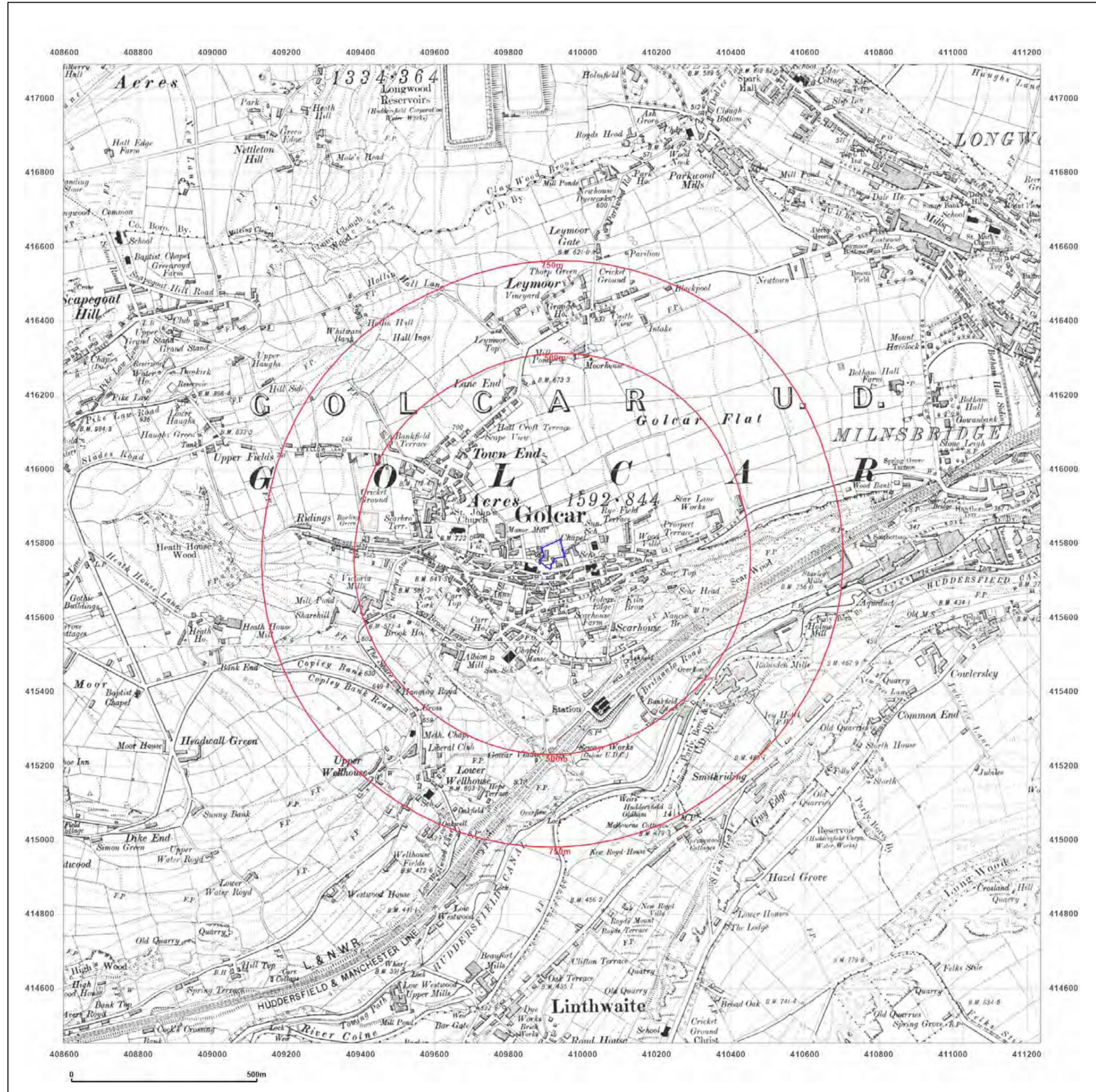


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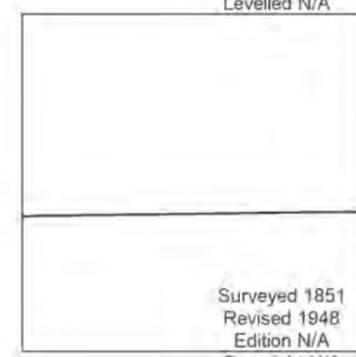
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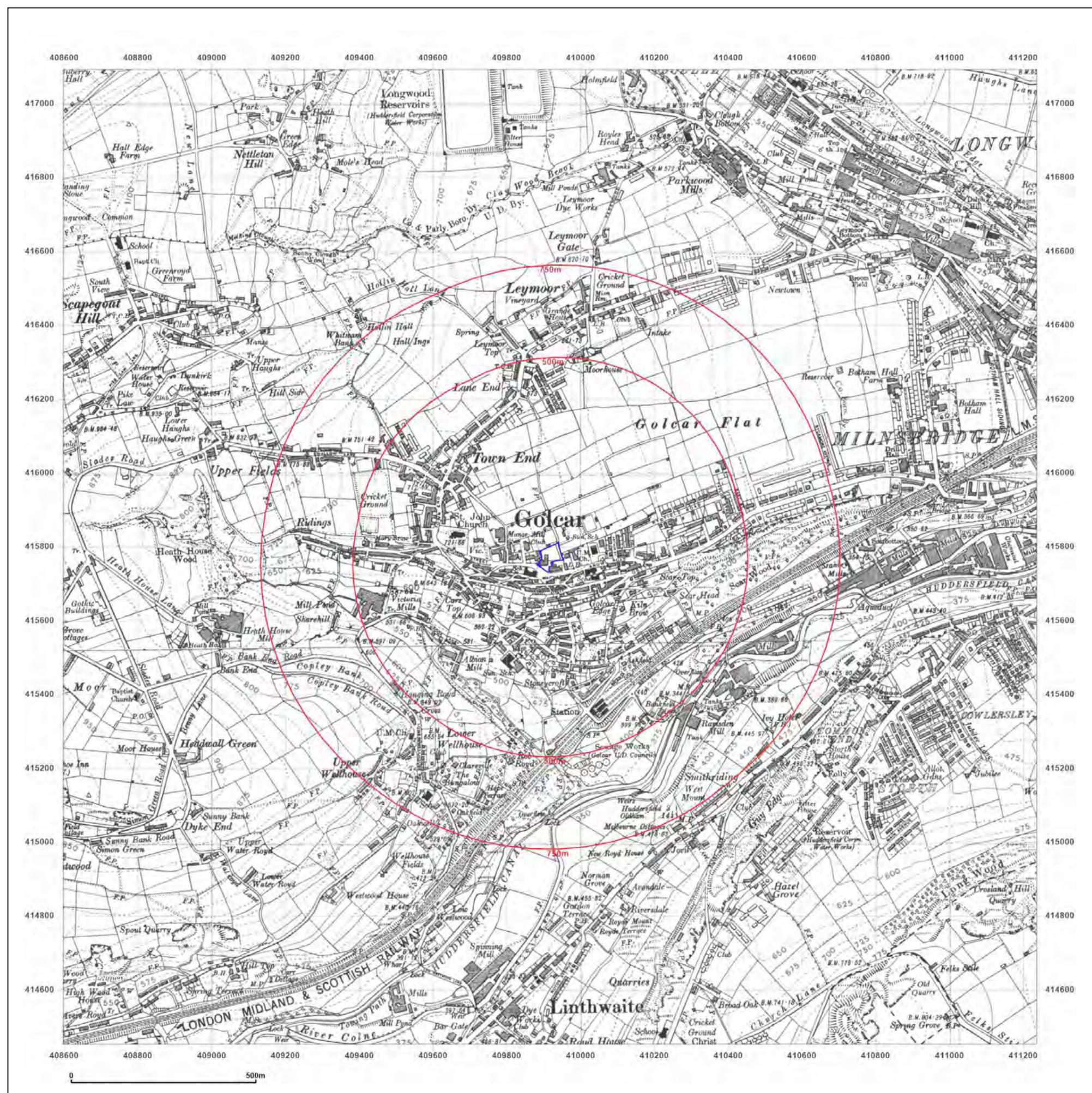


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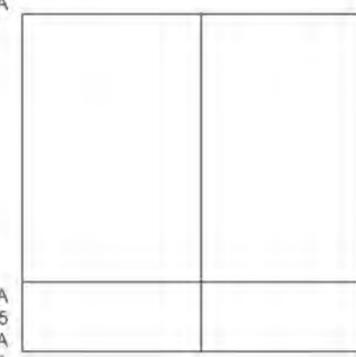
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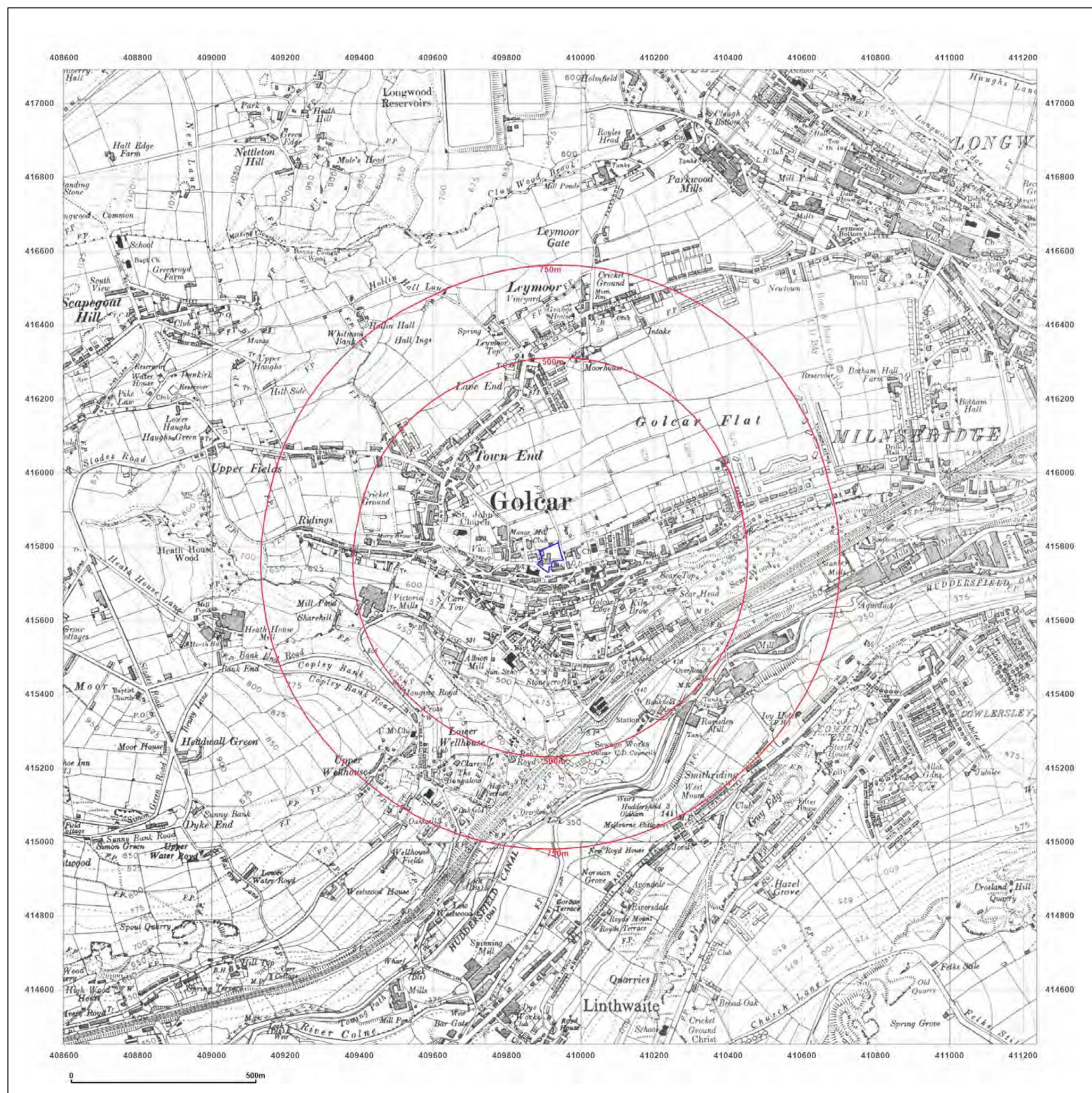


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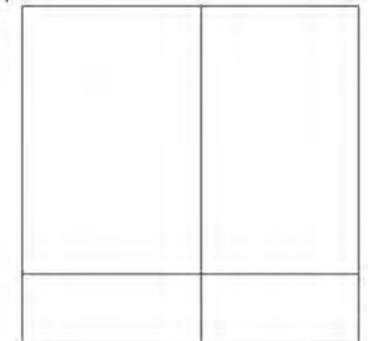
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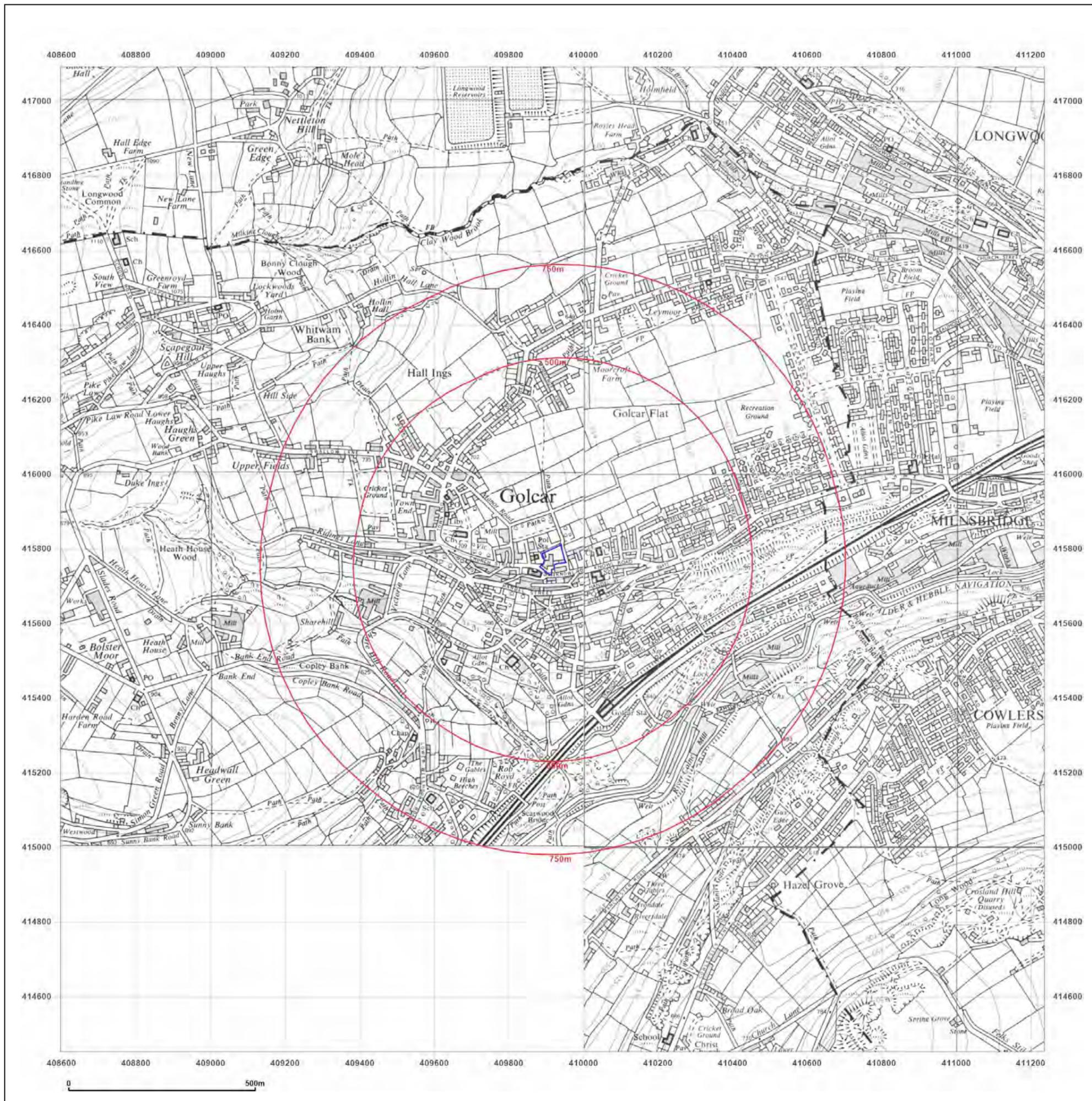


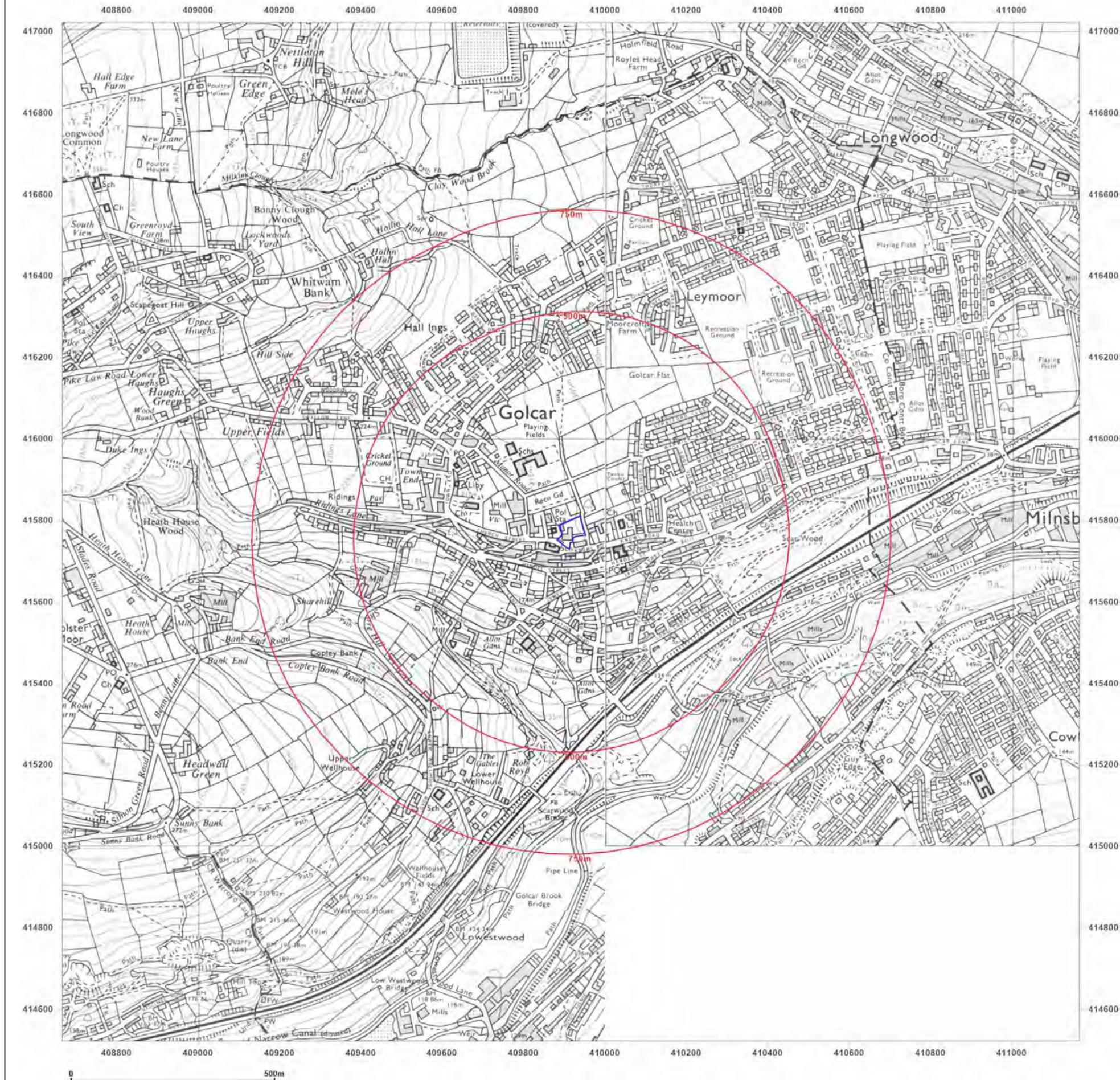
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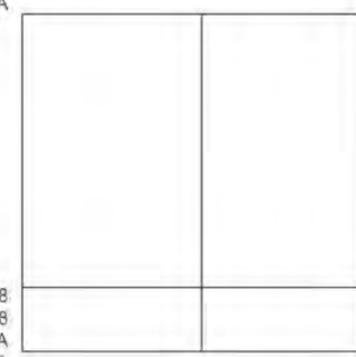
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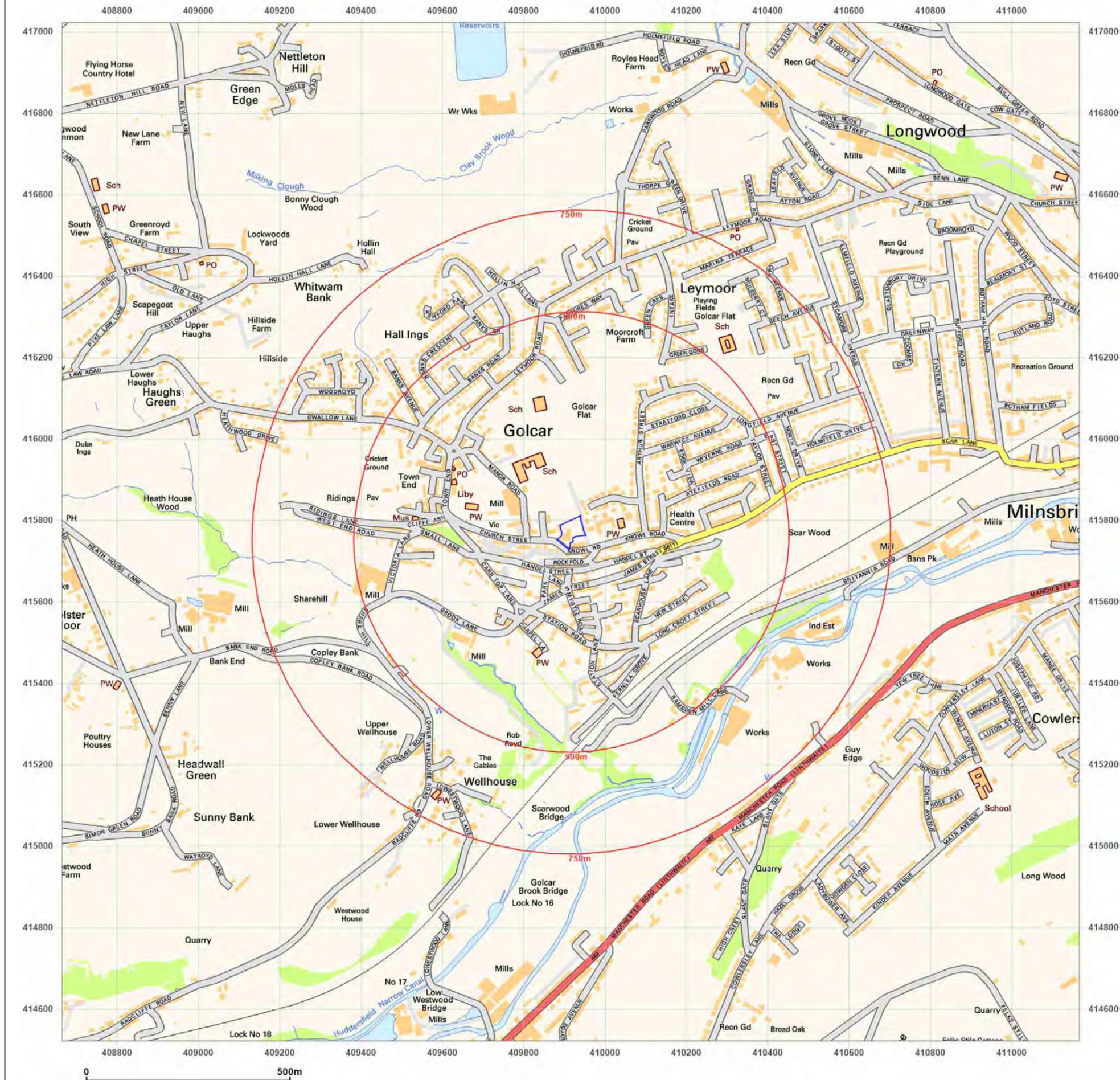


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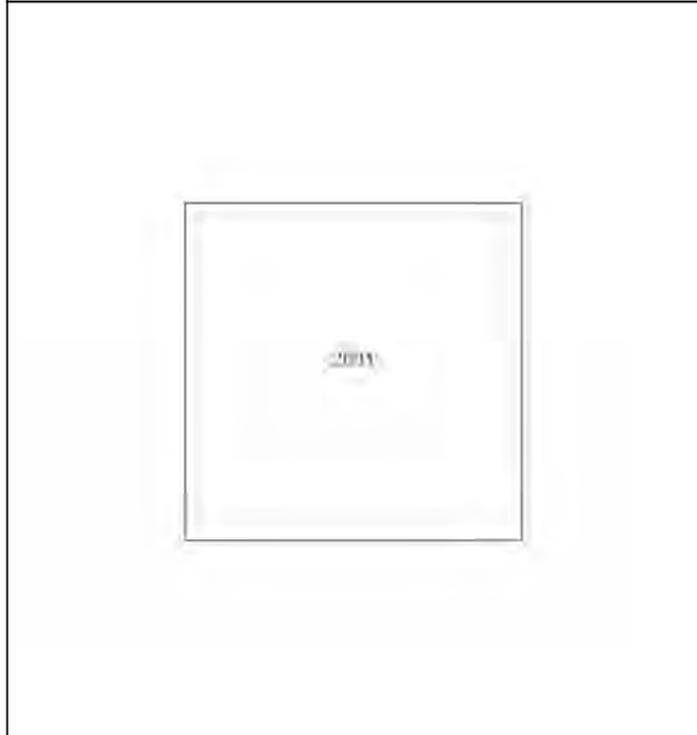
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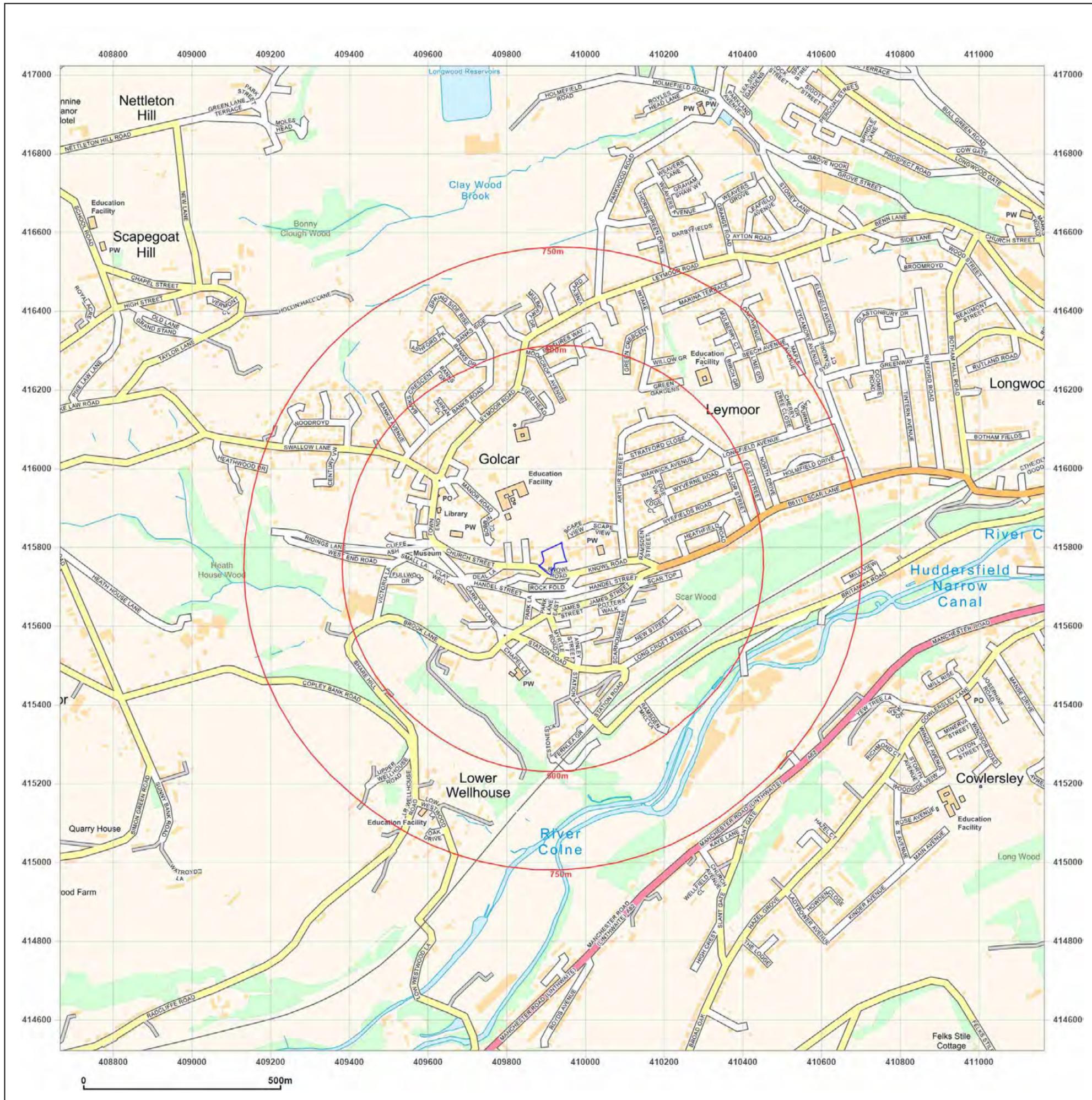


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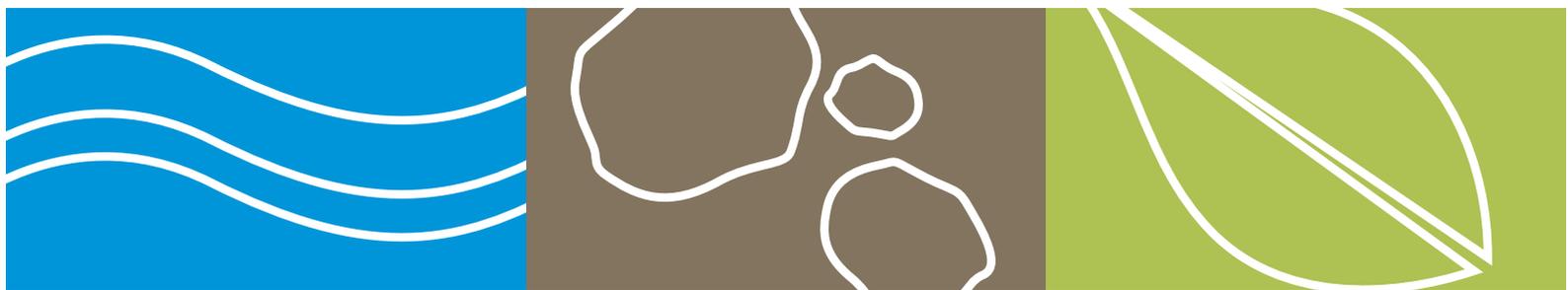
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[www.centremapslive.com](http://www.centremapslive.com)  
[groundsure@centremaps.com](mailto:groundsure@centremaps.com)

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Production date: 10 January 2024

Map legend available at:  
[www.groundsure.com/sites/default/files/groundsure\\_legend.pdf](http://www.groundsure.com/sites/default/files/groundsure_legend.pdf)

# Appendix B





View of Rose n Crown from Knowl Rd & locations of WS1(L) and WS2(R)



View of entrance to rear of site and view of car parking area in rear



View of north west corner of site & location of WS5 in grass

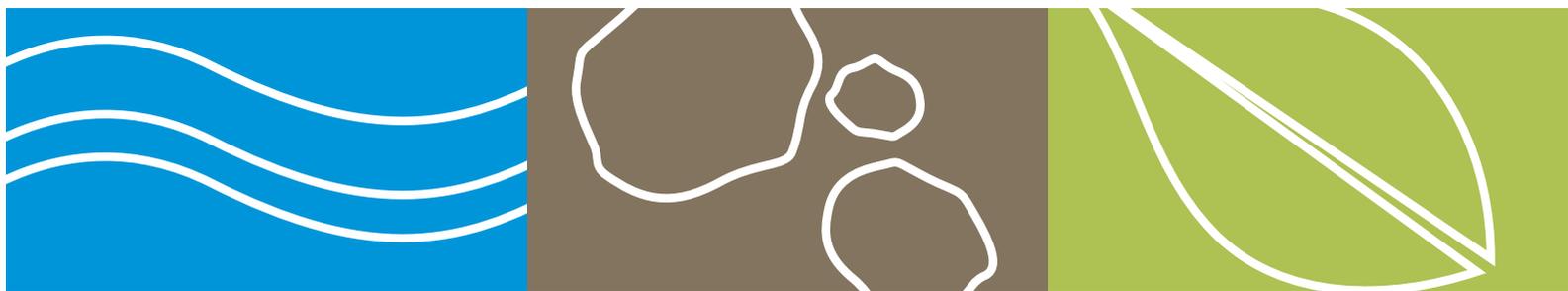


View of centre of site & location of WS3



View of north east corner and eastern corner of site & locations of WS6(L) and WS7(R)

# Appendix C





The Coal  
Authority

# Non-Residential No Search Certificate

KNOWL ROAD, GOLCAR, WEST YORKSHIRE

ASHTON BENNETT CONSULTANCY

According to the information held by the Coal Authority there are no known past, present or proposed workings of coal within the surface area of the property.

Please note - this certificate is based on the property boundary supplied when the report was ordered.

## Alternative formats

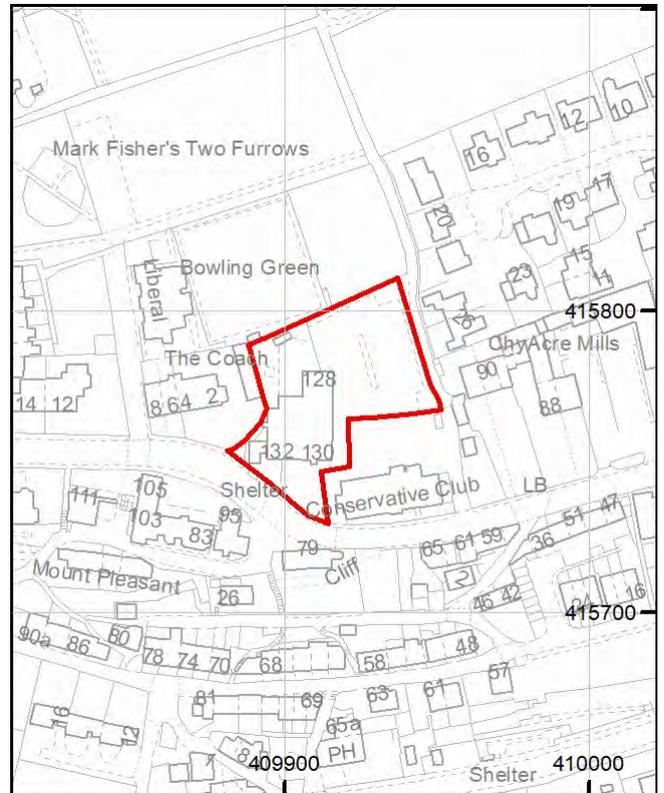
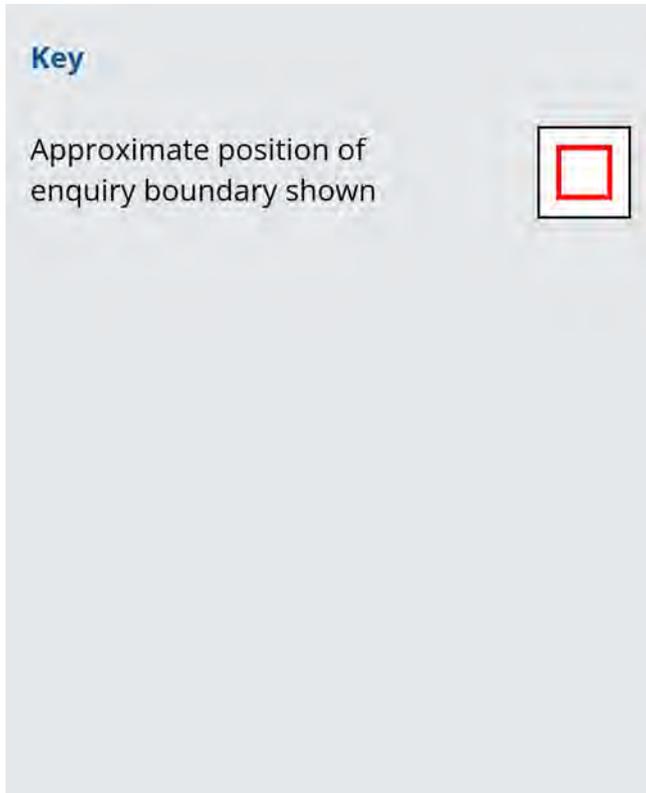
If you would like this information in an alternative format, please contact our communications team on 0345 762 6848 or email [communications@coal.gov.uk](mailto:communications@coal.gov.uk).

Date of enquiry:	10 January 2024
Date enquiry received:	10 January 2024
Issue date:	10 January 2024

Our reference:	51003398524001
Your reference:	3534

# Non-Residential No Search Certificate

This report is based on the geography of the property boundary supplied by you when the report was ordered.



## How to contact us

0345 762 6848 (UK)  
+44 (0)1623 637 000 (International)

200 Lichfield Lane  
Mansfield  
Nottinghamshire  
NG18 4RG

[www.groundstability.com](http://www.groundstability.com)

 [@coalauthority](https://twitter.com/coalauthority)

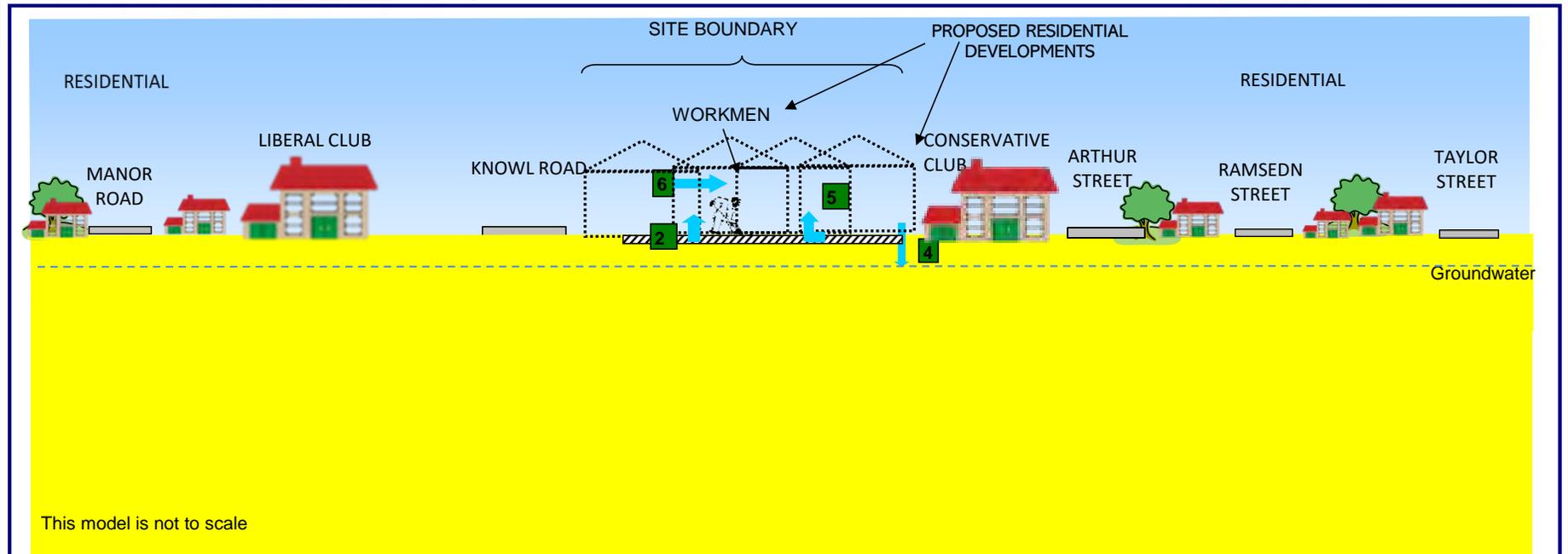
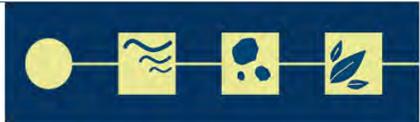
 [/company/the-coal-authority](https://www.linkedin.com/company/the-coal-authority)

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SOURCES	PATHWAYS	RECEPTORS	RISK	GEOLOGY
HISTORICAL USE AS PUBLIC HOUSE BUILDINGS NEIGHBOURING ACTIVITIES LOCAL CLUBS BOWLING GREENS SCHOOL POLICE STATION	1 Inhalation of vapours	Workmen/future occupants	Low. No landfill or mining.	 MADE GROUND   MILLSTONE GRIT SANDSTONE (HUDDERSFIELD WHITE ROCK)
	2 Ingestion or skin contact	Workmen/future occupants	low - No Gwater. Lead contam, 600mm clean topsoil in gardens	
	3 Ingestion of drinking water	Potable borehole	Low-due to dist to pot bhole. Soakaway needs investigation	
	4 Leaching to surface/groundwater	Groundwater and surface water	Low-due to dist to pot bhole. Soakaway needs investigation	
	5 Ingestion of plants/ animals/ veg	Future site occupants	Low - Gardens or landscaped ground. Clean imported topsoil	
	6 Inhalation of dust	Workmen & neighbouring land use	Low - provided precautions taken during construction.	
	7 Ground subsidence	Possible shallow mining on site.	Very Low - Stable ground. no shallow or deep coal.	
				Drg. No. SDG 3534

# Appendix D





# Percussion Drilling Log

Project Name: Rose n Crown		Client: Sovereign Development Group Ltd		Date: 25/01/2024	
Location: Golcar, West Yorkshire		Contractor: Geospek Ltd		Co-ords: E409910.25 N415747.91	
Project No. : 3534		Crew Name:		Drilling Equipment:	
Borehole Number WS2	Hole Type WLS	Level 211.76m AoD	Logged By	Scale 1:15	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.02	211.74		Tarmac
					0.05	211.71		Tarmac gravel and stones
		0.25	ES					Reworked yellow brown black very sandy clay with stones and sandstone
		0.30	D					
		0.35	ES					
		0.55 - 0.60	D		0.55	211.21		Yellow brown orange very sandy CLAY with coarse sand and sandstone boulders
		0.70	SPT	18 (25,32/18 for 30mm)	0.68 0.70	211.08 211.06		Yellow orange grey coarse grained SANDSTONE
								End of Borehole at 0.880m

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks



# Percussion Drilling Log

Project Name: Rose n Crown		Client: Sovereign Development Group Ltd		Date: 25/01/2024	
Location: Golcar, West Yorkshire		Contractor: Geospek Ltd		Co-ords: E409921.84 N415775.03	
Project No. : 3534		Crew Name:		Drilling Equipment:	
Borehole Number WS3	Hole Type WLS	Level 211.52m AoD	Logged By	Scale 1:15	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
		Depth (m)	Type	Results						
[Pattern]		0.20	D		0.02	211.50	[Pattern]	Tarmac		
					0.10	211.42		Tarmac gravel and stones		
								Orange yellow sand with sandstone boulders		
				0.60 0.60 - 0.65 0.65 0.70	ES D ES SPT	50 (25 for 85mm/50 for 50mm)	0.40	211.12	[Pattern]	Reworked black odorous gravelly clay with stones and red brick and occasional coal and ash and clinker
							0.69	210.83		Yellow orange white coarse grained SANDSTONE
							0.70	210.82		
							End of Borehole at 0.910m			
								1		
								2		
								3		

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks



# Percussion Drilling Log

Project Name: Rose n Crown		Client: Sovereign Development Group Ltd		Date: 25/01/2024	
Location: Golcar, West Yorkshire		Contractor: Geospek Ltd		Co-ords: E409931.96 N415775.22	
Project No. : 3534		Crew Name:		Drilling Equipment:	
Borehole Number WS4	Hole Type WLS	Level 210.98m AoD	Logged By	Scale 1:15	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
1		0.02			210.96		Tarmac	
		0.10			210.88		Tarmac gravel and stone	
		0.15	D		210.84		Reworked brown sandy clay with red brick	
							Red brick and red brick gravel	
					0.30	210.68		Concrete boulder with stones and red brick and black clay and sandstone
		0.75	ES		0.75	210.24		Reworked black becoming brown clay with stones and sand
		0.80	D					
		0.85	ES					
		1.00	SPT	N=12 (2,2/2,3,3,4)				
		1.25			1.25	209.74		Orange brown silty CLAY with coarse grained sand bands and sandstone boulders
	1.50 - 1.60	D		1.55	209.44		Yellow orange coarse grained SANDSTONE	
	1.60	SPT	N=50 (9,11/50 for 195mm)	1.60	209.38			
	End of Borehole at 2.020m							2
								3

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks



# Percussion Drilling Log

Project Name: Rose n Crown		Client: Sovereign Development Group Ltd		Date: 25/01/2024	
Location: Golcar, West Yorkshire		Contractor: Geospek Ltd		Co-ords: E409896.92 N415786.38	
Project No. : 3534		Crew Name:		Drilling Equipment:	
Borehole Number WS5	Hole Type WLS	Level 212.45m AoD	Logged By	Scale 1:15	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
Well					0.10	212.35		Grass with TOPSOIL	
					0.20	212.25		Sand with stones and sandstone boulders	
		0.35	D					Large sandstone boulder with sand	
		0.50 - 55.00	D		0.45	212.00		Reworked black brown gravelly clay with stones and sandstone boulders and occasional coal and ash and clinker	
		0.70	ES						
		0.80	ES						
		0.90 - 1.00	D		0.90	211.55			
		1.00	SPT	50 (10,10/50 for 180mm)	0.97 1.00	211.48 211.45		Orange brown silty very sandy CLAY with sandstone boulders and gravel Yellow orange SANDSTONE	1
								End of Borehole at 1.330m	
									2
								3	

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks



# Percussion Drilling Log

Project Name: Rose n Crown		Client: Sovereign Development Group Ltd		Date: 25/01/2024	
Location: Golcar, West Yorkshire		Contractor: Geospek Ltd		Co-ords: E409930.18 N415796.35	
Project No. : 3534		Crew Name:		Drilling Equipment:	
Borehole Number WS6	Hole Type WLS	Level 210.69m AoD	Logged By	Scale 1:15	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
[Pattern]					0.01	210.68		Tarmac	1
					0.10	210.59		Tarmac gravel with stones and sand and occasional clay	
		0.25	D					Reworked brown orange gravelly clay with stones and sandstone	
		0.40	ES						
						0.50	210.19	Large sandstone boulder	
						0.65	210.04	Orange brown very sandy silty CLAY with sandstone gravel and boulders	
		0.80 - 0.85	D						
					0.95	209.74	Yellow white SANDSTONE	2	
	1.00	SPT	50 (5,11/50 for 220mm)	1.00	209.69				
							End of Borehole at 1.370m	3	

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks



# Percussion Drilling Log

Project Name: Rose n Crown		Client: Sovereign Development Group Ltd		Date: 25/01/2024	
Location: Golcar, West Yorkshire		Contractor: Geospek Ltd		Co-ords: E409940.94 N415779.82	
Project No. : 3534		Crew Name:		Drilling Equipment:	
Borehole Number WS7	Hole Type WLS	Level 210.43m AoD	Logged By	Scale 1:15	Page Number Sheet 1 of 1

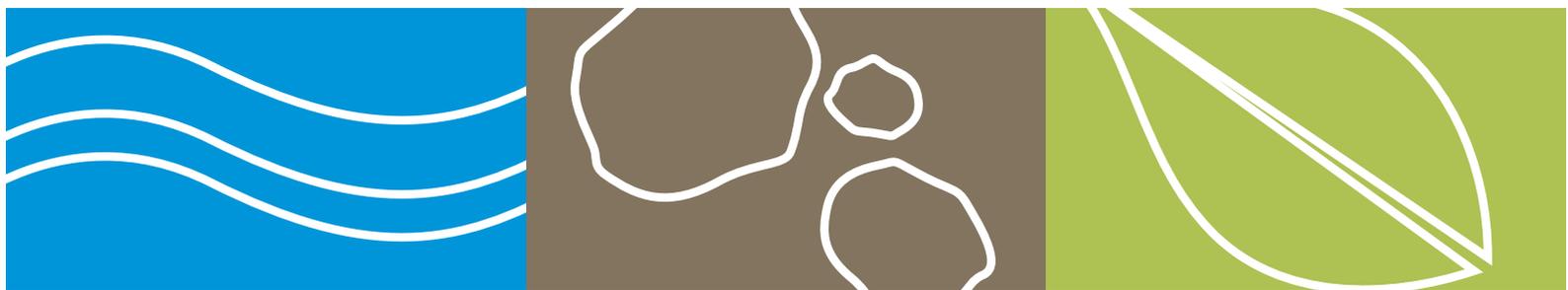
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.01	210.42		Tarmac
					0.10	210.33		Tarmac gravel and stones and sand
								Orange yellow sand and stones and sandstone
		0.30	ES		0.35	210.08		Yellow sandstone boulders with sand
		0.90	ES		0.85	209.58		Reworked black becoming brown clay with stones and sandstone boulders
		1.00	SPT	N=14 (3,3/3,3,3,5)				
					1.30	209.13		Grey orange brown very silty sandy CLAY with sand
		1.45 - 1.50	D					
		1.70 - 1.80	D		1.65	208.78		Yellow orange grey brown sandy CLAY with large sandstone boulders
	1.80	SPT	N=50 (10,10/50 for 290mm)	1.78 1.80	208.65 208.63		Yellow white SANDSTONE	
							End of Borehole at 2.240m	

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks



# Appendix E



# Chemtech Environmental Limited

## TEST REPORT REVISIONS



### ANALYTICAL TEST REPORT

**Contract no:** 130047 (1)

**Contract name:** Rose n Crown - Golcar

**Client reference:** 3534

**Clients name:** Ashton Bennett

**Clients address:** 131 Huddersfield Road  
Holmfirth  
West Yorkshire  
HD9 3TW

**Samples received:** 30 January 2024

**Analysis started:** 30 January 2024

**Analysis completed:** 08 February 2024

**Report issued:** 12 February 2024

This is a supplementary report to report number 130047 issued 6th Feb 2024

**Key**

U	UKAS accredited test
M	MCERTS & UKAS accredited test
\$	Test carried out by an approved subcontractor
I/S	Insufficient sample to carry out test
N/S	Sample not suitable for testing
NAD	No Asbestos Detected

Redacted

**Approved by:** \_\_\_\_\_

130047 (1)  
Rose N Crown - Golcar  
3534

Page 1 of 14 Pages

# Chemtech Environmental Limited

## TEST REPORT REVISIONS

Samantha Rogerson  
Reporting Manager

Unit 6 Parkhead, Greencroft Industrial Park, Stanley, County Durham, DH9 7YB  
Tel 01207 528578 Email customerservices@chemtech-env.co.uk  
Vat Reg No. 772 5703 18 Registered in England number 4284013

# Chemtech Environmental Limited

## TEST REPORT REVISIONS

### MCERTS (Soils):

Soil descriptions are only intended to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions. MCERTS accreditation applies for sand, clay and loam/topsoil, or combinations of these whether these are derived from naturally occurring soils or from made ground, as long as these materials constitute the major part of the sample. Other materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

Lab ref	Sample id	Depth (m)	Sample description	Material removed	% Removed	% Moisture
130047-1	WS1	0.20	Sandy Loam with Gravel	-	-	16.0
130047-3	WS1	0.15	Sandy Loam with Gravel	-	-	16.9
130047-4	WS2	0.35	Sandy Loam with Gravel	-	-	14.4
130047-5	WS2	0.30	Sandy Clayey Loam with Gravel	-	-	13.0
130047-7	WS3	0.60	Sandy Loam with Gravel	-	-	24.5
130047-8	WS3	0.65	Sandy Loam with Gravel	-	-	24.1
130047-9	WS3	0.60-0.70	Sandy Loam with Gravel	-	-	22.8
130047-11	WS4	0.80	Sandy Clayey Loam with Gravel	-	-	23.5
130047-12	WS4	0.75	Sandy Clayey Loam with Gravel	-	-	24.2
130047-13	WS5	0.35	Sandy Clayey Loam with Gravel			7.5
130047-14	WS5	0.70	Sand with Gravel & Roots	-	-	16.6
130047-15	WS5	0.50-0.55	Sandy Loam with Gravel & Roots	-	-	14.6
130047-16	WS6	0.40	Sandy Loam with Gravel & Roots	-	-	17.6
130047-17	WS7	0.30	Sandy Loam with Gravel & Roots	-	-	8.9

# Chemtech Environmental Limited

## TEST REPORT REVISIONS

Lab number			130047-1	130047-2	130047-3	130047-4	130047-5	130047-6
Sample id			WS1	WS1	WS1	WS2	WS2	WS3
Depth (m)			0.20	0.10	0.15	0.35	0.30	0.20
Date sampled			25/01/2024	25/01/2024	25/01/2024	25/01/2024	25/01/2024	25/01/2024
Test	Method	Units						
Boron (water soluble)	CE063 <sup>U</sup>	mg/kg B	-	-	-	-	<0.5	-
Chromium (VI)	CE263	mg/kg CrVI	-	-	-	-	<0.04	-
Arsenic (total)	CE264 <sup>M</sup>	mg/kg As	-	-	-	-	3.9	-
Cadmium (total)	CE264 <sup>M</sup>	mg/kg Cd	-	-	-	-	<1.6	-
Chromium (total)	CE264 <sup>M</sup>	mg/kg CrVI	-	-	-	-	38.2	-
Copper (total)	CE264 <sup>M</sup>	mg/kg Cu	-	-	-	-	27.0	-
Lead (total)	CE264 <sup>U</sup>	mg/kg Pb	-	-	-	-	42.2	-
Mercury (total)	CE264 <sup>U</sup>	mg/kg Hg	-	-	-	-	<0.7	-
Nickel (total)	CE264 <sup>M</sup>	mg/kg Ni	-	-	-	-	10.2	-
Selenium (total)	CE264	mg/kg Se	-	-	-	-	<3	-
Zinc (total)	CE264 <sup>M</sup>	mg/kg Zn	-	-	-	-	27.2	-
pH	CE004 <sup>M</sup>	units	-	-	-	6.3	-	-
Sulphate (2:1 water soluble)	CE061 <sup>U</sup>	mg/l SO <sub>4</sub>	-	-	-	34	-	-
<b>PAH</b>								
Naphthalene	CE087 <sup>M</sup>	mg/kg	-	-	0.31	-	-	-
Acenaphthylene	CE087 <sup>M</sup>	mg/kg	-	-	0.05	-	-	-
Acenaphthene	CE087 <sup>M</sup>	mg/kg	-	-	0.35	-	-	-
Fluorene	CE087 <sup>U</sup>	mg/kg	-	-	0.26	-	-	-
Phenanthrene	CE087 <sup>M</sup>	mg/kg	-	-	2.66	-	-	-
Anthracene	CE087 <sup>U</sup>	mg/kg	-	-	0.83	-	-	-
Fluoranthene	CE087 <sup>M</sup>	mg/kg	-	-	3.96	-	-	-
Pyrene	CE087 <sup>M</sup>	mg/kg	-	-	3.34	-	-	-
Benzo(a)anthracene	CE087 <sup>U</sup>	mg/kg	-	-	2.45	-	-	-
Chrysene	CE087 <sup>M</sup>	mg/kg	-	-	2.06	-	-	-
Benzo(b)fluoranthene	CE087 <sup>M</sup>	mg/kg	-	-	2.64	-	-	-
Benzo(k)fluoranthene	CE087 <sup>M</sup>	mg/kg	-	-	1.07	-	-	-
Benzo(a)pyrene	CE087 <sup>U</sup>	mg/kg	-	-	2.81	-	-	-
Indeno(123cd)pyrene	CE087 <sup>M</sup>	mg/kg	-	-	1.63	-	-	-
Dibenz(ah)anthracene	CE087 <sup>M</sup>	mg/kg	-	-	0.47	-	-	-
Benzo(ghi)perylene	CE087 <sup>M</sup>	mg/kg	-	-	1.69	-	-	-
PAH (total of USEPA 16)	CE087	mg/kg	-	-	26.6	-	-	-
<b>TPH</b>								
VPH Aromatic (>EC5-EC7)	CE067	mg/kg	<0.01	-	-	-	-	-
VPH Aromatic (>EC7-EC8)	CE067	mg/kg	<0.01	-	-	-	-	-
VPH Aromatic (>EC8-EC10)	CE067	mg/kg	<0.01	-	-	-	-	-
EPH Aromatic (>EC10-EC12)	CE250	mg/kg	1	-	-	-	-	-
EPH Aromatic (>EC12-EC16)	CE250	mg/kg	4	-	-	-	-	-
EPH Aromatic (>EC16-EC21)	CE250	mg/kg	32	-	-	-	-	-
EPH Aromatic (>EC21-EC35)	CE250	mg/kg	141	-	-	-	-	-
EPH Aromatic (>EC35-EC44)	CE250	mg/kg	18	-	-	-	-	-
VPH Aliphatic (>C5-C6)	CE067	mg/kg	<0.1	-	-	-	-	-

# Chemtech Environmental Limited

## TEST REPORT REVISIONS

Lab number			130047-1	130047-2	130047-3	130047-4	130047-5	130047-6
Sample id			WS1	WS1	WS1	WS2	WS2	WS3
Depth (m)			0.20	0.10	0.15	0.35	0.30	0.20
Date sampled			25/01/2024	25/01/2024	25/01/2024	25/01/2024	25/01/2024	25/01/2024
Test	Method	Units						
VPH Aliphatic (>C6-C8)	CE067	mg/kg	<0.1	-	-	-	-	-
VPH Aliphatic (>C8-C10)	CE067	mg/kg	<0.1	-	-	-	-	-
EPH Aliphatic (>C10-C12)	CE250	mg/kg	<0.5	-	-	-	-	-
EPH Aliphatic (>C12-C16)	CE250	mg/kg	<0.5	-	-	-	-	-
EPH Aliphatic (>C16-C35)	CE250	mg/kg	<4.5	-	-	-	-	-
EPH Aliphatic (>C35-C44)	CE250	mg/kg	<1	-	-	-	-	-
Subcontracted Analysis								
Asbestos (qualitative)	\$	-	-	NAD	-	-	-	NAD

# Chemtech Environmental Limited

## TEST REPORT REVISIONS

Lab number			130047-7	130047-8	130047-9	130047-10	130047-11	130047-12
Sample id			WS3	WS3	WS3	WS4	WS4	WS4
Depth (m)			0.60	0.65	0.60-0.70	0.15	0.80	0.75
Date sampled			25/01/2024	25/01/2024	25/01/2024	25/01/2024	25/01/2024	25/01/2024
Test	Method	Units						
Boron (water soluble)	CE063 <sup>U</sup>	mg/kg B	-	-	1.1	-	0.6	-
Chromium (VI)	CE263	mg/kg CrVI	-	-	<0.04	-	<0.04	-
Arsenic (total)	CE264 <sup>M</sup>	mg/kg As	-	-	31.4	-	11.3	-
Cadmium (total)	CE264 <sup>M</sup>	mg/kg Cd	-	-	1.7	-	<1.6	-
Chromium (total)	CE264 <sup>M</sup>	mg/kg CrVI	-	-	46.5	-	42.2	-
Copper (total)	CE264 <sup>M</sup>	mg/kg Cu	-	-	117.3	-	40.9	-
Lead (total)	CE264 <sup>U</sup>	mg/kg Pb	-	-	527.8	-	151.3	-
Mercury (total)	CE264 <sup>U</sup>	mg/kg Hg	-	-	1.0	-	<0.7	-
Nickel (total)	CE264 <sup>M</sup>	mg/kg Ni	-	-	34.6	-	16.1	-
Selenium (total)	CE264	mg/kg Se	-	-	<3	-	<3	-
Zinc (total)	CE264 <sup>M</sup>	mg/kg Zn	-	-	516.7	-	138.9	-
pH	CE004 <sup>M</sup>	units	-	-	-	-	-	-
Sulphate (2:1 water soluble)	CE061 <sup>U</sup>	mg/l SO <sub>4</sub>	-	-	-	-	-	-
<b>PAH</b>								
Naphthalene	CE087 <sup>M</sup>	mg/kg	-	0.46	-	-	-	-
Acenaphthylene	CE087 <sup>M</sup>	mg/kg	-	0.09	-	-	-	-
Acenaphthene	CE087 <sup>M</sup>	mg/kg	-	0.24	-	-	-	-
Fluorene	CE087 <sup>U</sup>	mg/kg	-	0.19	-	-	-	-
Phenanthrene	CE087 <sup>M</sup>	mg/kg	-	2.27	-	-	-	-
Anthracene	CE087 <sup>U</sup>	mg/kg	-	0.49	-	-	-	-
Fluoranthene	CE087 <sup>M</sup>	mg/kg	-	4.29	-	-	-	-
Pyrene	CE087 <sup>M</sup>	mg/kg	-	3.78	-	-	-	-
Benzo(a)anthracene	CE087 <sup>U</sup>	mg/kg	-	2.26	-	-	-	-
Chrysene	CE087 <sup>M</sup>	mg/kg	-	2.41	-	-	-	-
Benzo(b)fluoranthene	CE087 <sup>M</sup>	mg/kg	-	2.49	-	-	-	-
Benzo(k)fluoranthene	CE087 <sup>M</sup>	mg/kg	-	1.11	-	-	-	-
Benzo(a)pyrene	CE087 <sup>U</sup>	mg/kg	-	2.50	-	-	-	-
Indeno(123cd)pyrene	CE087 <sup>M</sup>	mg/kg	-	1.50	-	-	-	-
Dibenz(ah)anthracene	CE087 <sup>M</sup>	mg/kg	-	0.36	-	-	-	-
Benzo(ghi)perylene	CE087 <sup>M</sup>	mg/kg	-	1.58	-	-	-	-
PAH (total of USEPA 16)	CE087	mg/kg	-	26.0	-	-	-	-
<b>TPH</b>								
VPH Aromatic (>EC5-EC7)	CE067	mg/kg	<0.01	-	-	-	-	<0.01
VPH Aromatic (>EC7-EC8)	CE067	mg/kg	<0.01	-	-	-	-	<0.01
VPH Aromatic (>EC8-EC10)	CE067	mg/kg	<0.01	-	-	-	-	<0.01
EPH Aromatic (>EC10-EC12)	CE250	mg/kg	1	-	-	-	-	<0.5
EPH Aromatic (>EC12-EC16)	CE250	mg/kg	6	-	-	-	-	<1
EPH Aromatic (>EC16-EC21)	CE250	mg/kg	35	-	-	-	-	<2
EPH Aromatic (>EC21-EC35)	CE250	mg/kg	98	-	-	-	-	7
EPH Aromatic (>EC35-EC44)	CE250	mg/kg	15	-	-	-	-	2
VPH Aliphatic (>C5-C6)	CE067	mg/kg	<0.1	-	-	-	-	<0.1

# Chemtech Environmental Limited

## TEST REPORT REVISIONS

Lab number			130047-7	130047-8	130047-9	130047-10	130047-11	130047-12
Sample id			WS3	WS3	WS3	WS4	WS4	WS4
Depth (m)			0.60	0.65	0.60-0.70	0.15	0.80	0.75
Date sampled			25/01/2024	25/01/2024	25/01/2024	25/01/2024	25/01/2024	25/01/2024
Test	Method	Units						
VPH Aliphatic (>C6-C8)	CE067	mg/kg	<0.1	-	-	-	-	<0.1
VPH Aliphatic (>C8-C10)	CE067	mg/kg	<0.1	-	-	-	-	<0.1
EPH Aliphatic (>C10-C12)	CE250	mg/kg	<0.5	-	-	-	-	<0.5
EPH Aliphatic (>C12-C16)	CE250	mg/kg	<0.5	-	-	-	-	<0.5
EPH Aliphatic (>C16-C35)	CE250	mg/kg	<4.5	-	-	-	-	<4.5
EPH Aliphatic (>C35-C44)	CE250	mg/kg	<1	-	-	-	-	<1
Subcontracted Analysis								
Asbestos (qualitative)	\$	-	-	-	-	-	NAD	-

# Chemtech Environmental Limited

## TEST REPORT REVISIONS

Lab number			130047-13	130047-14	130047-15	130047-16	130047-17
Sample id			WS5	WS5	WS5	WS6	WS7
Depth (m)			0.35	0.70	0.50-0.55	0.40	0.30
Date sampled			25/01/2024	25/01/2024	25/01/2024	25/01/2024	25/01/2024
Test	Method	Units					
Boron (water soluble)	CE063 <sup>U</sup>	mg/kg B	<0.5	-	<0.5	-	<0.5
Chromium (VI)	CE263	mg/kg CrVI	<0.04	-	<0.04	-	<0.04
Arsenic (total)	CE264 <sup>M</sup>	mg/kg As	<1.8	-	16.1	-	<1.8
Cadmium (total)	CE264 <sup>M</sup>	mg/kg Cd	<1.6	-	<1.6	-	<1.6
Chromium (total)	CE264 <sup>M</sup>	mg/kg CrVI	36.5	-	49.2	-	37.8
Copper (total)	CE264 <sup>M</sup>	mg/kg Cu	7.6	-	58.8	-	5.8
Lead (total)	CE264 <sup>U</sup>	mg/kg Pb	19.5	-	629.0	-	17.6
Mercury (total)	CE264 <sup>U</sup>	mg/kg Hg	<0.7	-	<0.7	-	<0.7
Nickel (total)	CE264 <sup>M</sup>	mg/kg Ni	9.7	-	24.0	-	10.5
Selenium (total)	CE264	mg/kg Se	<3	-	<3	-	<3
Zinc (total)	CE264 <sup>M</sup>	mg/kg Zn	32.1	-	132.1	-	31.5
pH	CE004 <sup>M</sup>	units	-	6.3	-	-	-
Sulphate (2:1 water soluble)	CE061 <sup>U</sup>	mg/l SO <sub>4</sub>	-	31	-	-	-
<b>PAH</b>							
Naphthalene	CE087 <sup>M</sup>	mg/kg	-	-	-	0.04	-
Acenaphthylene	CE087 <sup>M</sup>	mg/kg	-	-	-	<0.02	-
Acenaphthene	CE087 <sup>M</sup>	mg/kg	-	-	-	0.03	-
Fluorene	CE087 <sup>U</sup>	mg/kg	-	-	-	0.02	-
Phenanthrene	CE087 <sup>M</sup>	mg/kg	-	-	-	0.36	-
Anthracene	CE087 <sup>U</sup>	mg/kg	-	-	-	0.07	-
Fluoranthene	CE087 <sup>M</sup>	mg/kg	-	-	-	0.81	-
Pyrene	CE087 <sup>M</sup>	mg/kg	-	-	-	0.72	-
Benzo(a)anthracene	CE087 <sup>U</sup>	mg/kg	-	-	-	0.44	-
Chrysene	CE087 <sup>M</sup>	mg/kg	-	-	-	0.51	-
Benzo(b)fluoranthene	CE087 <sup>M</sup>	mg/kg	-	-	-	0.53	-
Benzo(k)fluoranthene	CE087 <sup>M</sup>	mg/kg	-	-	-	0.22	-
Benzo(a)pyrene	CE087 <sup>U</sup>	mg/kg	-	-	-	0.50	-
Indeno(123cd)pyrene	CE087 <sup>M</sup>	mg/kg	-	-	-	0.29	-
Dibenz(ah)anthracene	CE087 <sup>M</sup>	mg/kg	-	-	-	0.08	-
Benzo(ghi)perylene	CE087 <sup>M</sup>	mg/kg	-	-	-	0.32	-
PAH (total of USEPA 16)	CE087	mg/kg	-	-	-	4.96	-
<b>TPH</b>							
VPH Aromatic (>EC5-EC7)	CE067	mg/kg	-	-	-	-	<0.01
VPH Aromatic (>EC7-EC8)	CE067	mg/kg	-	-	-	-	<0.01
VPH Aromatic (>EC8-EC10)	CE067	mg/kg	-	-	-	-	<0.01
EPH Aromatic (>EC10-EC12)	CE250	mg/kg	-	-	-	-	<0.5
EPH Aromatic (>EC12-EC16)	CE250	mg/kg	-	-	-	-	<1
EPH Aromatic (>EC16-EC21)	CE250	mg/kg	-	-	-	-	<2
EPH Aromatic (>EC21-EC35)	CE250	mg/kg	-	-	-	-	40
EPH Aromatic (>EC35-EC44)	CE250	mg/kg	-	-	-	-	9
VPH Aliphatic (>C5-C6)	CE067	mg/kg	-	-	-	-	<0.1

# Chemtech Environmental Limited

## TEST REPORT REVISIONS

Lab number			130047-13	130047-14	130047-15	130047-16	130047-17
Sample id			WS5	WS5	WS5	WS6	WS7
Depth (m)			0.35	0.70	0.50-0.55	0.40	0.30
Date sampled			25/01/2024	25/01/2024	25/01/2024	25/01/2024	25/01/2024
Test	Method	Units					
VPH Aliphatic (>C6-C8)	CE067	mg/kg	-	-	-	-	<0.1
VPH Aliphatic (>C8-C10)	CE067	mg/kg	-	-	-	-	<0.1
EPH Aliphatic (>C10-C12)	CE250	mg/kg	-	-	-	-	<0.5
EPH Aliphatic (>C12-C16)	CE250	mg/kg	-	-	-	-	<0.5
EPH Aliphatic (>C16-C35)	CE250	mg/kg	-	-	-	-	13
EPH Aliphatic (>C35-C44)	CE250	mg/kg	-	-	-	-	1
Subcontracted Analysis							
Asbestos (qualitative)	\$	-	NAD	-	-	-	-

# Chemtech Environmental Limited

## TEST REPORT REVISIONS

METHOD	SOILS	METHOD SUMMARY	SAMPLE	STATUS	LOD	UNITS
CE264	Arsenic (total)	Aqua Regia Extraction, ICPOES	Dry	M	1.8	mg/kg As
CE063	Boron (water soluble)	Hot water extract, ICP-OES	Dry	U	1	mg/kg B
CE264	Cadmium (total)	Aqua Regia Extraction, ICPOES	Dry	M	1.6	mg/kg Cd
CE263	Chromium (VI)	Discrete Analyser	Dry		0.04	mg/kg CrVI
CE264	Copper (total)	Aqua Regia Extraction, ICPOES	Dry	M	1.6	mg/kg Cu
CE264	Lead (total)	Aqua Regia Extraction, ICPOES	Dry	U	2.3	mg/kg Pb
CE264	Mercury (total)	Aqua Regia Extraction, ICPOES	Dry	U	0.7	mg/kg Hg
CE264	Nickel (total)	Aqua Regia Extraction, ICPOES	Dry	M	2.1	mg/kg Ni
CE264	Selenium (total)	Aqua Regia Extraction, ICPOES	Dry	U	3	mg/kg Se
CE264	Zinc (total)	Aqua Regia Extraction, ICPOES	Dry	M	4	mg/kg Zn
CE004	pH	Based on BS 1377, pH Meter	As received	M	-	units
CE049	Sulphate (2:1 water soluble)	Aqueous extraction, IC-COND	Dry	U	10	mg/l SO <sub>4</sub>
CE087	Naphthalene	Solvent extraction, GC-MS	As received	M	0.016	mg/kg
CE087	Acenaphthylene	Solvent extraction, GC-MS	As received	M	0.015	mg/kg
CE087	Acenaphthene	Solvent extraction, GC-MS	As received	M	0.013	mg/kg
CE087	Fluorene	Solvent extraction, GC-MS	As received	U	0.013	mg/kg
CE087	Phenanthrene	Solvent extraction, GC-MS	As received	M	0.014	mg/kg
CE087	Anthracene	Solvent extraction, GC-MS	As received	U	0.017	mg/kg
CE087	Fluoranthene	Solvent extraction, GC-MS	As received	M	0.017	mg/kg
CE087	Pyrene	Solvent extraction, GC-MS	As received	M	0.016	mg/kg
CE087	Benzo(a)anthracene	Solvent extraction, GC-MS	As received	U	0.012	mg/kg
CE087	Chrysene	Solvent extraction, GC-MS	As received	M	0.028	mg/kg
CE087	Benzo(b)fluoranthene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Benzo(k)fluoranthene	Solvent extraction, GC-MS	As received	M	0.025	mg/kg
CE087	Benzo(a)pyrene	Solvent extraction, GC-MS	As received	U	0.019	mg/kg
CE087	Indeno(123cd)pyrene	Solvent extraction, GC-MS	As received	M	0.019	mg/kg
CE087	Dibenz(ah)anthracene	Solvent extraction, GC-MS	As received	M	0.017	mg/kg
CE087	45334.0	Solvent extraction, GC-MS	As received	M	0.019	mg/kg
CE087	plementary report to report number 130047 issu	Solvent extraction, GC-MS	As received		0.028	mg/kg
CE067	VPH Aromatic (>EC5-EC7)	Headspace GC-FID	As received		0.01	mg/kg
CE067	VPH Aromatic (>EC7-EC8)	Headspace GC-FID	As received		0.01	mg/kg
CE067	VPH Aromatic (>EC8-EC10)	Headspace GC-FID	As received		0.01	mg/kg
CE250	EPH Aromatic (>EC10-EC12)	Solvent extraction, GCxGC-FID	As received		0.5	mg/kg
CE250	EPH Aromatic (>EC12-EC16)	Solvent extraction, GCxGC-FID	As received		1	mg/kg
CE250	EPH Aromatic (>EC16-EC21)	Solvent extraction, GCxGC-FID	As received		2	mg/kg
CE250	EPH Aromatic (>EC21-EC35)	Solvent extraction, GCxGC-FID	As received		5	mg/kg
CE250	EPH Aromatic (>EC35-EC44)	Solvent extraction, GCxGC-FID	As received		1.5	mg/kg
CE067	VPH Aliphatic (>C5-C6)	Headspace GC-FID	As received		0.1	mg/kg
CE067	VPH Aliphatic (>C6-C8)	Headspace GC-FID	As received		0.1	mg/kg
CE067	VPH Aliphatic (>C8-C10)	Headspace GC-FID	As received		0.1	mg/kg
CE250	EPH Aliphatic (>C10-C12)	Solvent extraction, GCxGC-FID	As received		0.5	mg/kg
CE250	EPH Aliphatic (>C12-C16)	Solvent extraction, GCxGC-FID	As received		0.5	mg/kg
CE250	EPH Aliphatic (>C16-C35)	Solvent extraction, GCxGC-FID	As received		4.5	mg/kg
CE250	EPH Aliphatic (>C35-C44)	Solvent extraction, GCxGC-FID	As received		1	mg/kg

# Chemtech Environmental Limited

## TEST REPORT REVISIONS

METHOD	SOILS	METHOD SUMMARY	SAMPLE	STATUS	LOD	UNITS
\$	Asbestos (qualitative)	HSG 248, Microscopy	Dry	U	-	-
\$	Asbestos (quantitative)	HSG 248, Microscopy & Gravimetry	Dry	U	0.001	% w/w

# Chemtech Environmental Limited

## TEST REPORT REVISIONS

### Comments

Sample deviation is determined in accordance with the UKAS note "Guidance on Deviating Samples" and based on reference standards and laboratory trials.

For samples identified as deviating, test result(s) may be compromised and may not be representative of the sample at the time of sampling.

Chemtech Environmental Ltd cannot be held responsible for the integrity of sample(s) received if Chemtech Environmental Ltd did not undertake the sampling. Such samples may be deviating.

### Key

N	No (not deviating sample)
Y	Yes (deviating sample)
NSD	Sampling date not provided
NST	Sampling time not provided (waters only)
EHT	Sample exceeded holding time(s)
IC	Sample not received in appropriate containers
HP	Headspace present in sample container
NCF	Sample not chemically fixed (where appropriate)
OR	Other (specify)

Lab ref	Sample id	Depth (m)	Deviating	Tests (Reason for deviation)
130047-1	WS1	0.20	N	
130047-3	WS1	0.15	N	
130047-4	WS2	0.35	N	
130047-5	WS2	0.30	N	
130047-7	WS3	0.60	N	
130047-8	WS3	0.65	N	
130047-9	WS3	0.60-0.70	N	
130047-11	WS4	0.80	N	
130047-12	WS4	0.75	N	
130047-13	WS5	0.35	N	
130047-14	WS5	0.70	N	
130047-15	WS5	0.50-0.55	N	
130047-16	WS6	0.40	N	
130047-17	WS7	0.30	N	

# Chemtech Environmental Limited

## TEST REPORT REVISIONS

### Notes

Opinions and interpretations expressed herein are outside the UKAS accreditation scope.

Unless otherwise stated, Chemtech Environmental Ltd was not responsible for sampling.

All testing carried out at Unit 6 Parkhead, Stanley, DH9 7YB, except for subcontracted testing.

Methods, procedures and performance data are available on request.

Results reported herein relate only to the material supplied to the laboratory.

This report shall not be reproduced except in full, without prior written approval.

Soil/Solid samples will be disposed of 4 weeks from initial receipt unless otherwise agreed.

Waters and leachate samples will be disposed of 2 weeks from report issue unless otherwise agreed.

DEFRA Licence for the introduction and movement within England of prohibited soil for chemical and physical analysis Licence No: 132693/469907-0

For soils and solids, all results are reported on a dry basis. Samples dried at no more than 30°C in a drying cabinet.

For soils and solids, analytical results are inclusive of stones, where applicable.

Moisture Content Calculated on a Wet Weight basis

# Chemtech Environmental Limited

## TEST REPORT REVISIONS

The table below identifies amendments that have been made to this test report for each revision.

Test Report Reference	Details of amendments to test report	Issue Date
130047	Original report issued	6th Feb 2024
130047 (1)	Contract Name Amended	13th Feb 2024

## Estimate and Specification:

Geo Technical Soils

### For:

Ashton Bennett

### At:

Golcar

Golcar

### Ref:

E158393

### Prepared By:

Mark Dawkins on 29/01/2024

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## Client Contact Details:

Company Name: Ashton Bennett  
Contact Name: Frances A Bennett  
Contact Tel No: **Redacted**  
Contact E-Mail: **Redacted**  
Contact Address: Bridge Mills, Huddersfield Road, Holmfirth, West Yorkshire, HD9 3TW

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## Contents:

Section 1 - Contract Sum/Terms and Conditions  
Section 2 - Objective Client/Contractor Obligations  
Section 3 - Method  
Section 4 - Reporting  
Section 5 - Code of Conduct



## Section 1 – Contract Sum/Terms and Conditions

<u>Qty</u>	<u>Service</u>	<u>Price</u>	<u>Total</u>
5	<b>Atterberg Limits (Four point LL)</b> <i>Atterberg Limits (one point LL)</i>	<b>£26.00</b> <i>£24.00</i>	<b>£130.00</b>
1	<b>*Analytical - pH value</b>	<b>£5.00</b>	<b>£5.00</b>
1	<b>*Analytical - Sulphate (water sol 2:1)</b>	<b>£13.00</b>	<b>£13.00</b>
	<b>The following variations are applicable to all test types</b>		
	<i>Preparation charge e/o routine i.e. crushing/trimming blocks/lathing</i>	<i>£27.48</i>	
	<i>Charge where sample unsuitable after prep</i>	<i>£5.50</i>	
	<i>Disposal charge</i>	<i>£1.10</i>	

Items in *Italics* are variations that may be charged if they are required by the test above them.

Total Net: **£148.00**  
Total VAT @ **20.0000 %** : **£29.60**  
Total Gross Value: **£177.60**

All invoices are to be paid within 14 days unless extended credit terms are agreed prior to the survey being undertaken.

Any tests marked with \* will be subcontracted to a UKAS Accredited Laboratory for testing unless we have instruction and the equipment to perform the test in-house non-accredited otherwise see Section 3 - Method.

Where a sample is concluded to be unsuitable for a particular test, according to the relevant standard or specification and where it is practical to provide a reasonable result, TTL reserve the right to undertake testing as a "Deviation from Standard" and this will be stated within the report. This may result in chargeable time.

For Atterberg tests if no method is provided on the Testing Schedule, TTL shall carry out a 4 Point Test as Standard.

If Sedimentation is scheduled but the provided testing schedule does not state the percentage to perform a sedimentation for passing the 0.063mm sieve, TTL will carry out sedimentations for any with >10% passing 0.063mm sieve.

### **What we would require from you, the client:**

- Ensure the desk top study has been undertaken and any hazardous materials have been made safe prior to shipment/dispatch to TTL and TTL has full knowledge of any such contaminants.

All prices quoted are exclusive of VAT, which would be charged at the current rate at the time of invoice. All invoices are to be paid within 14 days, unless extended credit terms are agreed prior to the testing being undertaken.

Take advantage of our special price guarantee - we promise to match any other genuine, like for like written estimate, so long as we receive your order today and a copy of the alternative estimate within 3 days.

All reports and documentation issued remain the property of The Testing Lab PLC until all outstanding amounts are settled. Passing of information to a third party will be deemed as acceptance and liability of the report.

Our standard terms are 14 days from date of invoice unless previously agreed. All prices quoted exclude VAT which would be charged at the current rate at the time of invoice.

### **Pro-Forma Payment Options:**

- BACS Transfer - Free
- Card - £10 administration charge
- Cheque - Free (must be cleared by bank before works commence)

The estimate does not include any retention of any kind to be withheld from the invoiceable amount.



To place an order, please email [info@thetestinglab.eu](mailto:info@thetestinglab.eu), and we will process the order and arrange collection/delivery.



## Section 2 – Objective

TTL PLC carry out Geotechnical Soil Testing to the relevant BS standards and in house procedures as dictated below within our 'Methods' section.

The overall purpose is to produce test results for interpretation by the client and external engineers which enables decisions on design at an early stage.



## Section 3 – Method

### **BS1377:Part 2: 1990 Method**

Moisture content

Dry density and saturation moisture content for chalk

Atterberg Limits (One point LL)

Atterberg Limits (Four point LL)

Density by linear measurement

Density by immersion in water or water displacement

Particle density by gas jar or pycnometer

Particle size distribution by wet sieving

Particle size distribution by dry sieving

Linear Shrinkage

### **BS1377: Part 3: 1990 Method**

Resistivity - Wenner Probe Method

### **BS1377: Part 4: 1990 Method**

California Bearing Ratio on recompacted disturbed sample

Moisture Condition Value at natural moisture content

Moisture Condition Value/moisture content relationship

Dry density/moisture content relationship using 2.5 kg rammer

Dry density/moisture content relationship using 4.5 kg rammer

Dry density/moisture content relationship using vibrating rammer

Maximum and minimum dry density for granular soils

Chalk crushing value (single specimen)

### **BS1377: Part 5: 1990 Method**

One-dimensional consolidation properties, test period 5 days

Measurements of swelling pressure, test period 1 day

Measurement of swelling, test period 2 days

### **BS1377: Part 6: 1990 Method**

Isotropic Consolidation Properties Using a Triaxial Cell - Test Period 4 Days

Permeability in a triaxial cell, test period 4 days

The Environment Agency R&D Technical Report P1-398/TR/2 Method

Accelerated Permeability in a triaxial cell, test period 4 days

### **BS1377: Part 7: 1990 Method**

Undrained shear strength of a set of three 38 mm diameter specimens in triaxial compression without the measurement of pore pressure

Undrained shear strength of a single 100 mm diameter specimen in triaxial compression without the measurement of pore pressure

Undrained shear strength of single 100 mm diameter specimen in triaxial compression with multistage loading and without measurement of pore pressure

Unconfined Compressive Strength of Soil - Load Frame Method

Shear strength of a set of three 60 mm × 60 mm square specimens by direct shear, test duration not exceeding 1 day per specimen

Residual shear strength of a set of three 60 mm × 60 mm square specimens by direct shear, test duration not exceeding 4 days per specimen

### **BS1377: Part 8: 1990 Method**

Consolidated undrained triaxial compression test with measurement of pore pressure (set of three 38 mm specimens), test duration not exceeding 4 days per specimen

Consolidated undrained triaxial compression test with measurement of pore pressure (single-stage or multi-stage test using 100 mm diameter specimen) not exceeding 4 days per specimen.

Consolidated drained triaxial compression test with measurement of volume change (set of three 38 mm specimens), test duration not exceeding 4 days per specimen

Consolidated drained triaxial compression test with measurement of volume change single stage or multi-stage test using 100 mm diameter specimen, test duration not exceeding 4 days

### **BSEN 933-11:2009**

Constituents of coarse recycled aggregate.



## **Section 4 – Reporting**

Reporting will be in the form of PDF documents containing the results of the tests performed.

A itemised invoice will be supplied after completion of the job.

