

PHASE I ENVIRONMENTAL AUDIT.
Land off Healey Lane, Rochdale. OL12 0SW.

Client:	Mr & Mrs Noakley.
Date:	Feb 2020.
Version:	rev1.
Reference:	rep-tjba-noakley-healey ln-phs I env-031116.docx

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1. INTRODUCTION.

T. J. Booth Associates have been appointed by Mr & Mrs Noakley to undertake a Phase I Environmental Audit to the above Development Site and surrounding area.

The Development Site is located in a semi-rural part of Rochdale and comprises a vacant plot of land formerly nestled between developments and historically used as agricultural land.

Outline planning permission for the Site was obtained in July 2013, ref No: 12/56293/OUT. A reserved matters consent was secured in October 2016, ref No: 16/00777/REM. Condition 3 of the original planning consent specified the requirement for an environmental assessment and stated:

- 3 No development shall take place until an investigation and risk assessment, in addition to any assessment provided with the planning application, has been completed to assess the nature and extent of any contamination on the site, whether or not it originates on the site. The investigation and risk assessment must be undertaken by competent persons and a written report of the findings must be produced and shall have been first submitted to and approved in writing by the Local Planning Authority before development takes place. The report of the findings must include:
- i) a survey of the extent, scale and nature of contamination
 - ii) an assessment of the potential risks to:
 - human health,
 - property (existing or proposed) including buildings, crops, livestock, pets, woodland, and service lines and pipes,
 - adjoining land,
 - groundwaters and surface waters,
 - ecological systems,
 - archaeological sites and ancient monuments;
 - iii) where unacceptable risks are identified, an appraisal of remedial options and proposal of the preferred option(s)

Due to a lapse of the previous permissions, a new planning application will be submitted circa February 2020 based on the original application. The application will invite the same environmental consultation and assessment requirements.

This report provides a desk based environmental study local to the Site on the potential for contamination via the source-pathway-receptor methodology using current environmental databases, in addition to a site walkover in line with current guidance. Recommendations in line with current best practice shall be put forward at the end of the report.

2. PROPOSED DEVELOPMENT.

The proposed development is for a detached 2 storey residential stone dwelling which will be located to the N side of the plot.

It will be accessed from the W side via a driveway to the S side of the dwelling. There will be soft landscaping/garden areas to the remainder of the property.

3. MAP REVIEW.

3.1. Historic Maps.

DATE	ON-SITE	OFF-SITE/SURROUNDING AREA
c1850	Site is part of agricultural land.	Surrounding area is predominantly rural/agricultural. There are some buildings indicated to the N, mainly farmhouses. Minor sandstone quarries 280m N, 200m NW & minor gravel pit 200mSE. Colliery noted 280m N.

c1890	No change.	Quarry Mill and associated bunded reservoir 110m SE. Brick field 120m SE. Minor quarry 200m NE. Old coal shafts noted 260m N, and 350m NW.
c1910	No change.	Quarry Mill & brick yard noted as disused. All quarries and coal shafts locally noted as old.
c1930	No change.	Quarry Mill noted as cotton mill. No overall change.
c1940s	No change.	Some minor local development but no overall change.
c1960s	No change.	Ponds noted 100m N of the site, to the N side of Quarry Hill.
c1970-73	Outbuilding noted to NW site corner.	No overall change.
c1974-89	Site boundary as in present day.	Complete urban infill. Housing estates erected to the E & W, local amenities such as schools etc within the local area. Area predominantly residential.

3.2. Present Day Maps.

PRESENT DAY MAPPING DATA SUMMARY	
Site Boundaries, Outlines of Structures and Buildings:	No buildings noted within the Site curtilage. Site demarcated by Healey Lane to the W side, residential gardens and housing to the N and E sides. Presently the Site is heavily vegetated with mature trees around the perimeter.
Ground Contours, Natural Drainage Features:	The Site is in an elevated position on the side of a hill with falls to the S. It is retained by a dry stone retaining wall from Healey Lane to the W and Whitworth Road to the S. A topographic survey indicates a level of approx. 196.50m aOD to the N falling to 189.20m aOD. There is a fall of approx. 2m to the bottom of the retaining wall to Healey Lane and Whitworth Road. Natural drainage is to the S. Locally, SW rainfall is intercepted by man-made drainage & sewerage systems.
Water Courses:	Nearest watercourses are Syke Brook 650m NE & River Spodden approx. 1100m SW.
Below Ground Obstructions:	There is a 225dia SW sewer flowing across the N side of the plot nominally to the NE corner, and then flows S down the E side through a 300dia pipe.

3.3. Geological Maps.

GEOLOGY DATA SUMMARY	
Bedrock Geology:	The local area is underlain by the Carboniferous Westphalian Lower Coal Measures. A fault through the Site delineates the ground surface trending NW-SE, resulting in the N side being underlain by the Helpet Edge Rock, and the S side being underlain by Milnrow Sandstone. Dip locally is approx 5-8° S.
Superficial Geology:	The Site is underlain by Devensian Till (generally clay with intermixed sands). There is an area of no cover ~80m N.
Coal Seams.	There are coal seams that subcrop approx 300m NW, 375m NW.

4. ENVIRONMENTAL DATA SEARCH.

4.1. Environment Agency Records.

ENVIRONMENT AGENCY DATA SUMMARY	
Flood zone:	Flood zone 1.
EA Recorded Landfill:	1 landfill site within 250m of the development named as Stoneyhey Farm 210m N. Inert & industrial wastes buried between Jan 1940 & Dec 1984, tipping wastes were inert moulding sand and slag from the former Holroyd Foundry.
Groundwater source protection zone:	Not in protection zone.
Superficial aquifer:	Secondary Undifferentiated.
Bedrock aquifer:	Secondary A.

4.2. BGS Boreholes Records.

A search of the BGS borehole data service revealed no relevant boreholes in the local area.

BGS BOREHOLE DATA SUMMARY		
Borehole Ref	Distance	Comments
N/A	N/A	N/A

4.3. Coal Authority Report.

COAL AUTHORITY DATA SUMMARY	
Mine Shafts, Pits, Adits/Entries:	Nearest shaft approx 275m N.
Past/Present Deep Underground Mining.	No recorded deep underground workings.
Past Underground Shallow Workings:	Within the adjacent site but does not encroach onto the Development Site (nominally 10-20m N from the boundary).
Probable Shallow Underground Workings:	Nearest is 350m E.
Past/Present Surface Mining:	None locally.
Development High Risk Area:	Not within area.
Mining Geology and Subsidence:	None noted.
Hazards and Mine Gas:	None noted.

4.4. BGS/HPA Radon Records.

The Site is not within a radon protection area as less than 1% of homes are above the action level. No protective measures needed.

5. FIELDWORK.

5.1. Site Reconnaissance.

A Site reconnaissance was undertaken on the 17th December 2012. The weather was mild and overcast with spells of drizzle.

SITE RECONNAISSANCE SUMMARY	
Details of Existing Structures:	The Site was densely vegetated with brambles and juvenile/mature tree species. The W boundary of the Site was enclosed with a stone retaining

	wall with a nominal 2m fall to Healey Lane. There was also a retaining wall to the top (N side) of the site with a panel fence to the top. Various fencing was employed to the E boundary with the residential gardens beyond. Some minor tipping was noted to the E boundary.
Adjacent Properties:	Residential properties to the N & E. Healey lane to the W, Whitworth Road to the S.
Water Levels, Directions of Flow and Rates in Rivers:	None noted.
Old Mine or Quarry Workings:	None noted.
Obvious/Immediate Hazards to Health/Safety:	None noted.
Areas of Discoloured Soil, Polluted Water, Vegetation, and Significant Odours:	None noted.
Relevant Ground Levels, Ground Water Levels, Positions of Wells and Springs:	Natural fall from N-S in the order of 5-6m.

6. DISCUSSION FROM THE DESK STUDY AND FIELDWORK.

6.1. Preliminary Conceptual Model.

6.1.1. Introduction.

The Development Site is located in a rural/semi-rural part of Rochdale and is a plot of land nestled in between old & modern developments. The Site itself was historically part of agricultural land but has never been developed. However, there is a SW sewer which runs across the N side of the site before flowing down the east side connecting in to the combined sewer in Whitworth Road. With the surrounding developments and the surface water sewer, there is a possibility of imported soil/made ground which could contain contaminants harmful to human receptors.

Historic mapping data did indicate a small outbuilding or shed to the NW corner of the plot c1960-70. which no longer remains on the site.

Although the local area is predominantly residential, there has been some local industry historically. Collieries were noted to the N & NW fringes of the area, and workings are noted to have been beneath the adjacent sites to the N & worked in 1910, however little risk to the Development Site was noted in the desk study.

There is a historic landfill in the local area approx 210m to the N where inert/industrial tipping was undertaken until 1984. Local knowledge indicates tipping was from the Holroyd Foundry and comprised inert moulding sand and slag.

6.1.2. Potential Contaminants.

The desk study has revealed the following sources (not an exhaustive list but a summary of the main points):

SOURCE/S	CONTAMINANT/S
Upper MADE GROUND	Metals, PAH, sulphates, inorganics, asbestos.

6.1.3. Potential Pathways.

The potential pathways to/from the development include the following (not an exhaustive list but a summary of the main points):

PATHWAY	MEDIA	PRESENT
Soil and dust ingestion	Soil and indoor dust	YES
Consumption of home grown fruit and vegetables	Produce	YES

Skin contact (indoors)	Indoor dust	YES
Skin contact (outdoors)	Soil	YES
Inhalation of dust (indoors)	Air	YES
Inhalation of dust (outdoors)	Air	YES
Vapours (indoors)	Air	No
Vapours (outdoors)	Air	No

6.1.4. Potential Receptors.

Receptors include workers in the construction phase, and inhabitants for the end use.

6.1.5. Potential Pollutant Linkages.

Below is a tabulated form of the conceptual model:

	SOURCE	PATHWAY	RECEPTOR	PRESENT
1	On site surface soils.	Direct ingestion, aerial ingestion, dermal contact, drinking water.	Site construction operatives & future occupants.	YES
2	Subsoils.	Contact with potential hazards.	Site buildings.	YES
3	Ground gas from geological strata.	Diffusion through soil, aerial inhalation.	Future occupants. Explosion, suffocation.	NO
4	Ground gas from waste, landfill or other sources in made ground.	Diffusion through soil, aerial inhalation.	Future occupants. Explosion, suffocation.	NO
5	Contaminated ground and surface water.	Permeation through soils into excavations / basements, dermal contact & ingestion.	Site construction operatives & future occupants.	NO
6	Aerial contaminants.	Dermal contact & aerial inhalation.	All site users / occupants.	NO

7. CONCLUSIONS.

7.1. Preliminary Contaminant Risk Assessment.

Regarding potential pollutant linkage 1 & 2, upper soils are considered to pose a risk. There has been demolition and erection of residential dwellings on adjacent property and although the Site has not been developed, tipping is likely to have occurred. Also, there is excavation and backfilling involved with the SW sewer pipe which runs through the site.

Regarding potential pollutant linkage 3, contaminant sources from local geology such as coal/radon etc were not considered to pose a risk. The Site is not within a Development High Risk Area, and not within a Radon Protection Area.

Ground gas sources such as waste & landfill sites in potential pollutant linkage 4 are not considered to pose a risk. The closest landfill to the development was approximately 210m distant but comprises inert fill. In addition, the Site is within an area of superficial Devensian till, mostly clays which present a tortuous pathway. Thus there is no credible pollutant link with source and pathway discounted.

Regarding potential pollutant linkage 5, ground/surface water contamination is not considered a risk to or from the Site. The Site not within a SPZ, no nearby potable abstractions, groundwater has a low vulnerability rating. No watercourses or aquatic habitats locally.

Potential pollutant linkage 6 is considered to pose a low risk. Present legislation regarding the release of aerial contaminants is regulated although past contamination which was unregulated would now be recorded in potential pollutant linkage 1 as shallow ground contamination.

8. RECOMMENDATIONS/SITE INVESTIGATION STRATEGY.

Overall the Site is considered to be suitable for the associated end use with some exceptions which will need addressing before it is inhabited, indicated below.

8.1. Shallow Soil Contamination:

The end use of the site will be for a residential use with soft landscaping areas/lawns. Due to the site sensitivity and risk of made ground within it, it is recommended that soil sampling be undertaken representative of the upper soil/MADE GROUND.

BS10175:2011+A1:2013 & R&D TECHNICAL REPORT P5-066/TR considers the upper 500mm is sufficient to categorise the site soils with respect to:

- human/animal intake arising from ingestion and dermal contact
- potential for wind entrainment leading to inhalation (of contaminated soils and dusts)
- or deposition onto neighbouring land
- surface water run-off (e.g. due to flash flooding)
- uptake by shallow rooting plants (e.g. crops, ornamental and wild species)
- surface leaching to groundwater

There is no definitive guidance on the number of samples required for soil representation in current guidance. However, R&D TECHNICAL REPORT P5-066/TR indicates that sample spacing should be between 10-25m for residential applications.

Considering the site area, 3 soil samples representative of the upper 500mm of MADE GROUND would satisfy current guidance criteria for sampling.

Soil testing suites should comprise metals, speciated PAH, inorganics, sulphates, SOM, & asbestos screen. Sample results should be analysed against Defra Category 4 Screening Levels (C4SLs) where available, and then to the LQM/CIEH (S4ULs), for use in a residential end use setting.

The above should be analysed by suitably qualified professionals and reported upon accordingly, indicating further recommendations where necessary in a Phase II Report.

8.2. Gas Risk:

No credible gas risk was found to the local area. Thus no special gas protection measures are required within the development.

8.3. Additional Notes:

Before any further work is undertaken, this report should be submitted to and agreed by the RMBC Contaminated Land Officer.

We trust the above is clear, however, should you require any further information please contact the undersigned.

Signed.....

D.S.Slattery BSc (Hons).

T J Booth Associates.

Authorised.....

T J Booth BSc (Hons), C. Eng. C. Env. MICE.

T J Booth Associates.

9. REFERENCES.

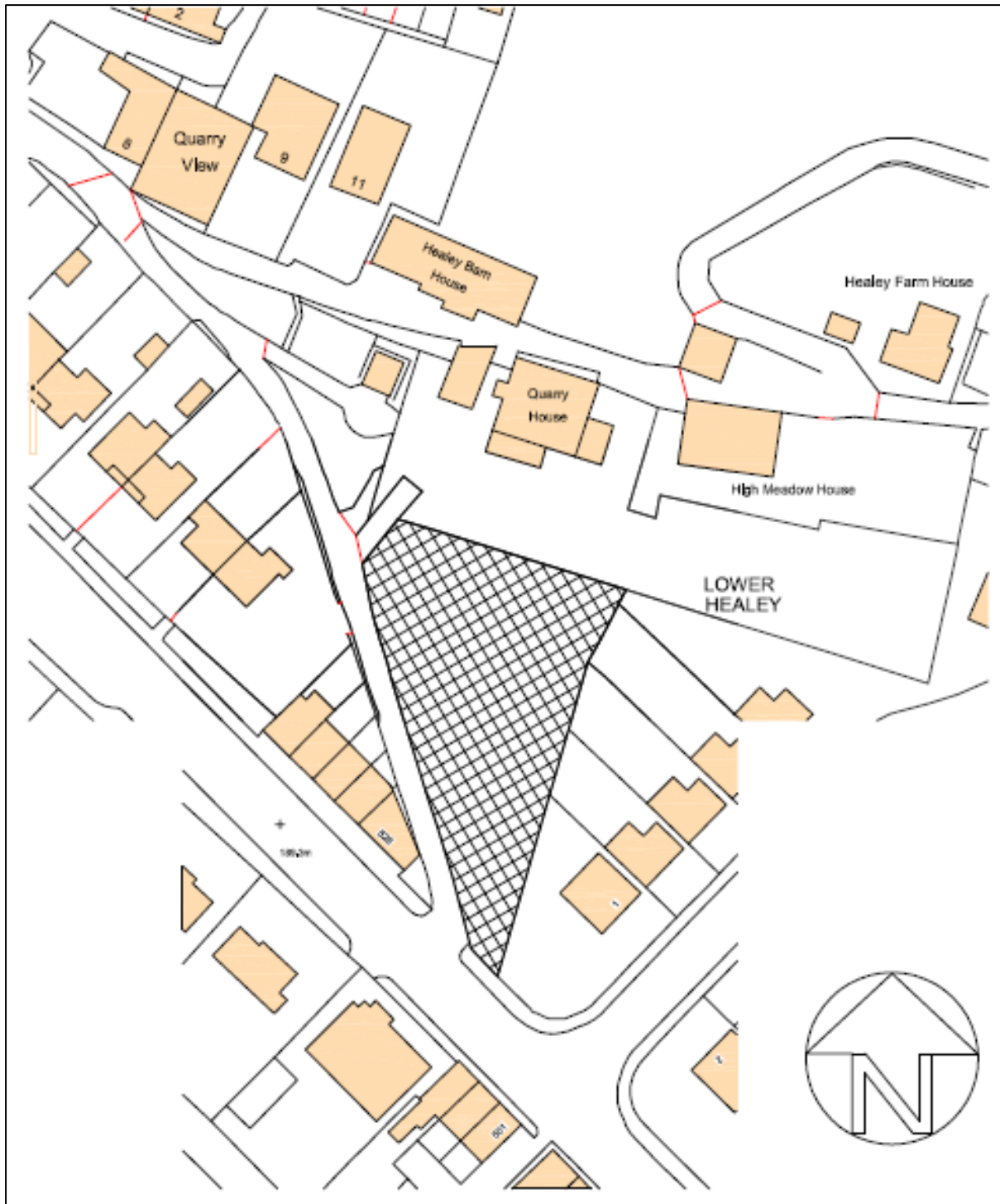
- BSI. 2013. BS 10175:2011+A1:2013. Investigation of Potentially Contaminated Sites – Code of Practice.
- Environment Agency. 2005. Secondary Model Procedure for the Development of Appropriate Soil Sampling Strategies for Land Contamination. R&D Technical Report P5-066/TR
- CL:AIRE. 2012. Research Bulletin-RB17-A Pragmatic Approach to Ground Gas Risk Assessment.
- NHBC. 2007. Guidance on Evaluation of Development Proposals on Sites Where Methane and Carbon Dioxide are Present.
- CIRIA. Report C665.
- CIRIA. Report 130.
- CIRIA. Report SP32.
- BRE 414. 2001. Protective Measures for Housing on Gas Contaminated Land.
- ICE Manual of Geotechnical Engineering Volume I. 2012.

10. APPENDIX A: PHOTOGRAPHS & FIGURES.

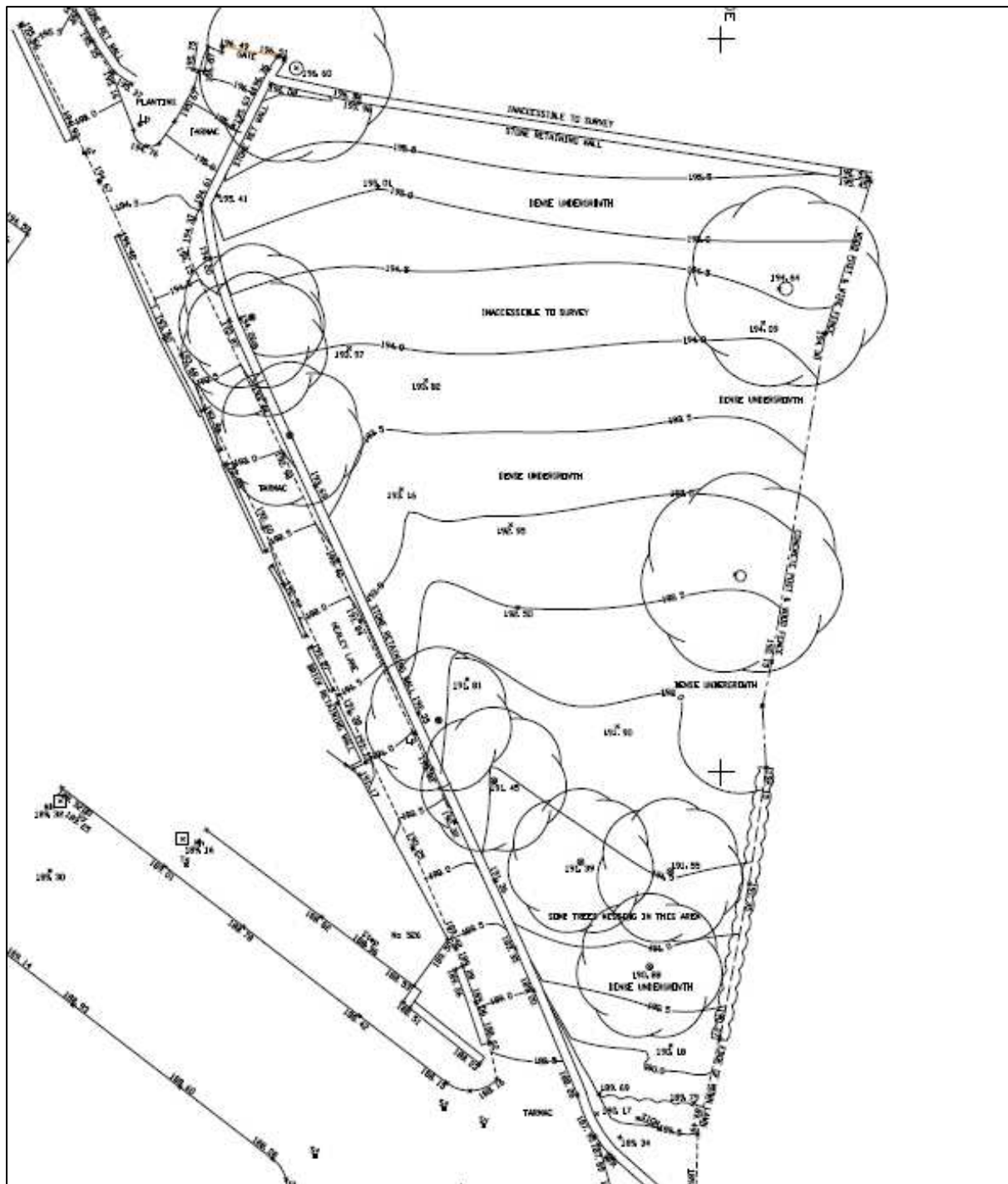
10.1. Photographs.



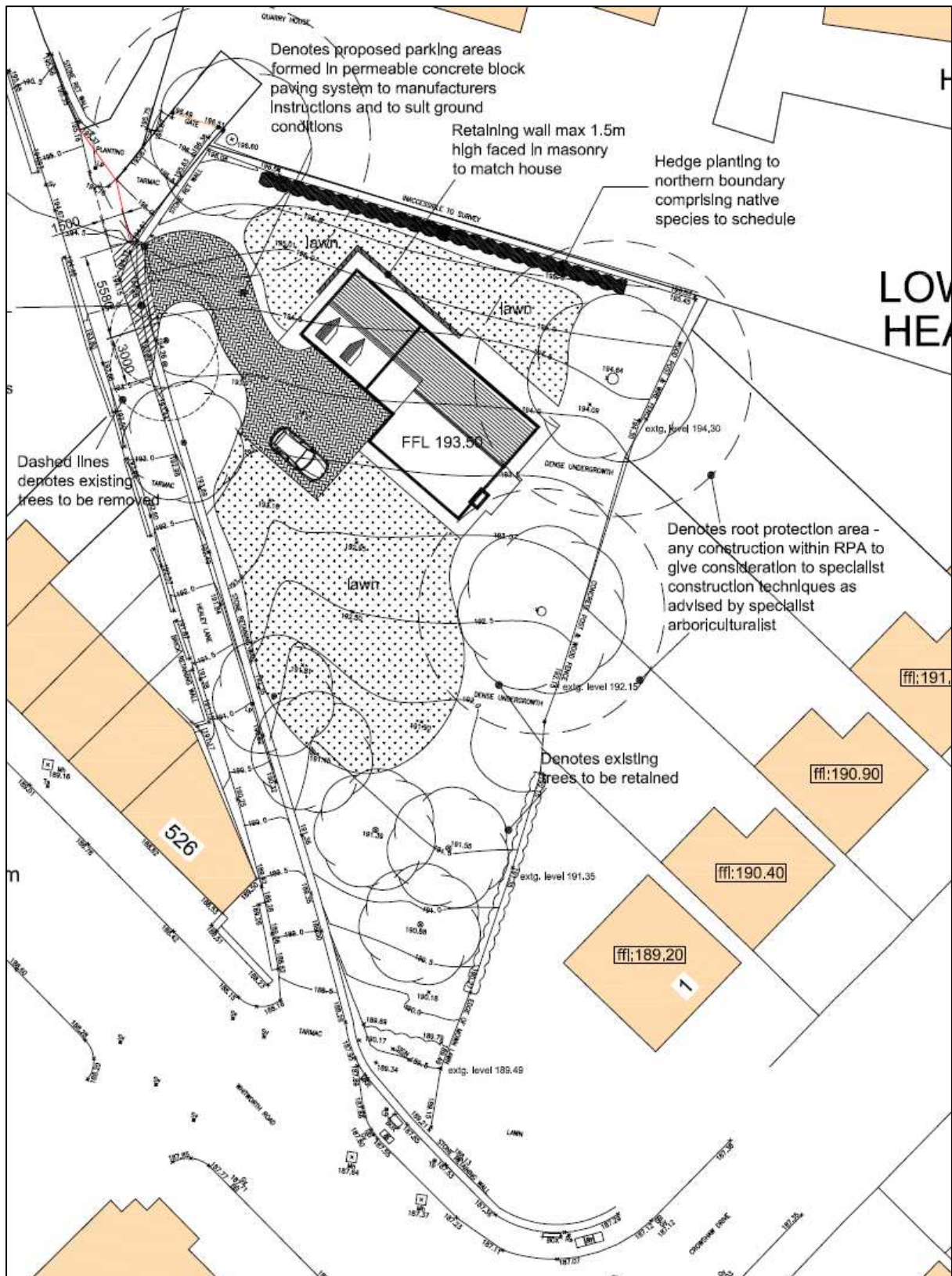
10.2. Location Plan.



10.3. Site Reconnaissance Sketch.



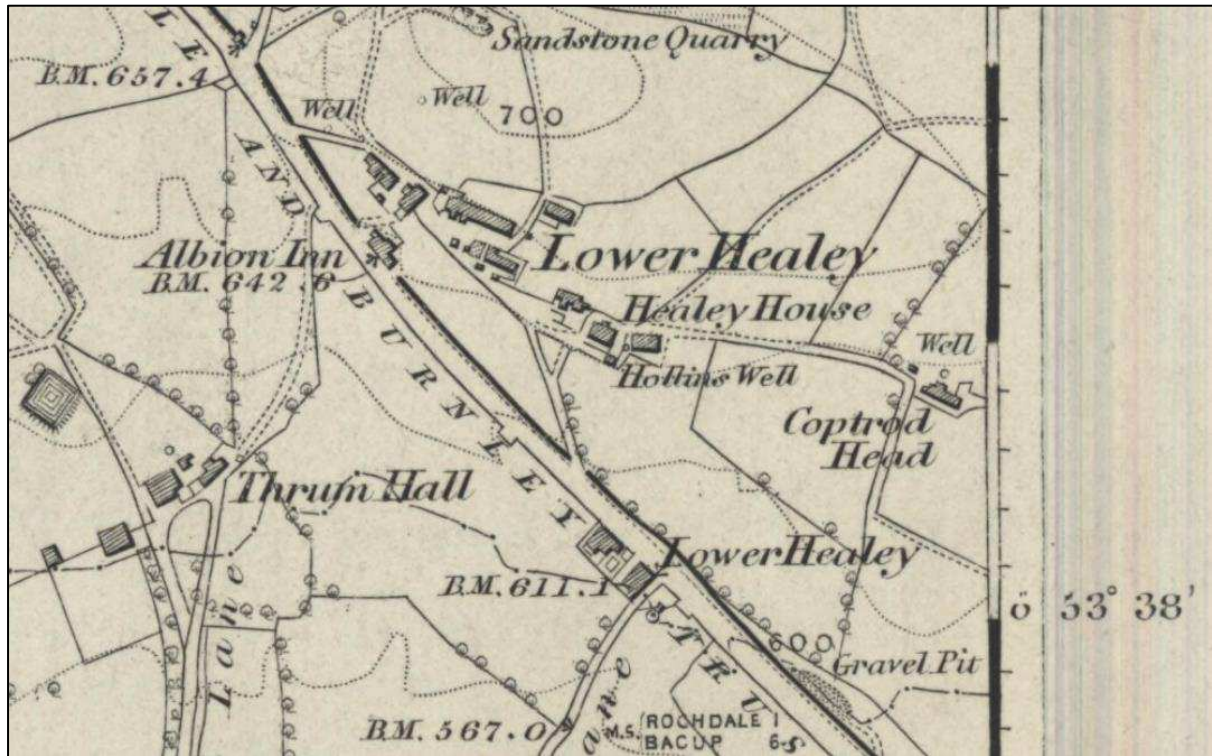
10.4. Proposed Site Plans.



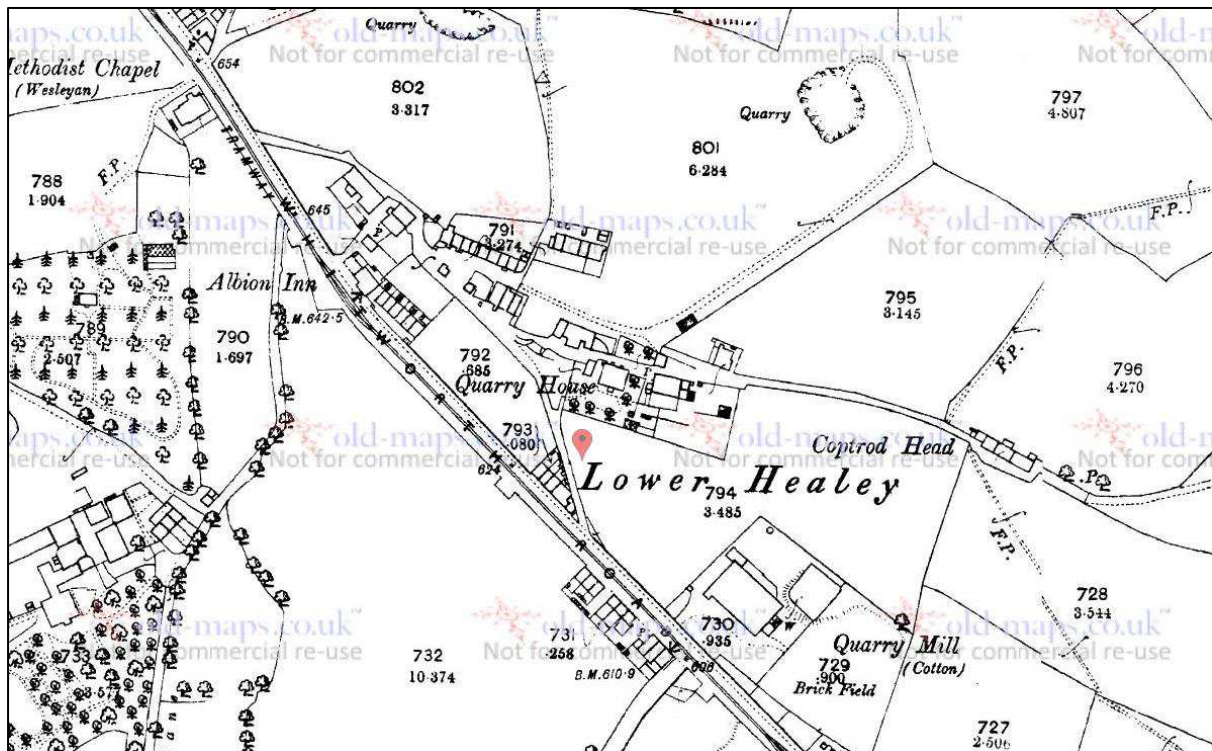
11. APPENDIX B: MAPS.

11.1. Historic Maps.

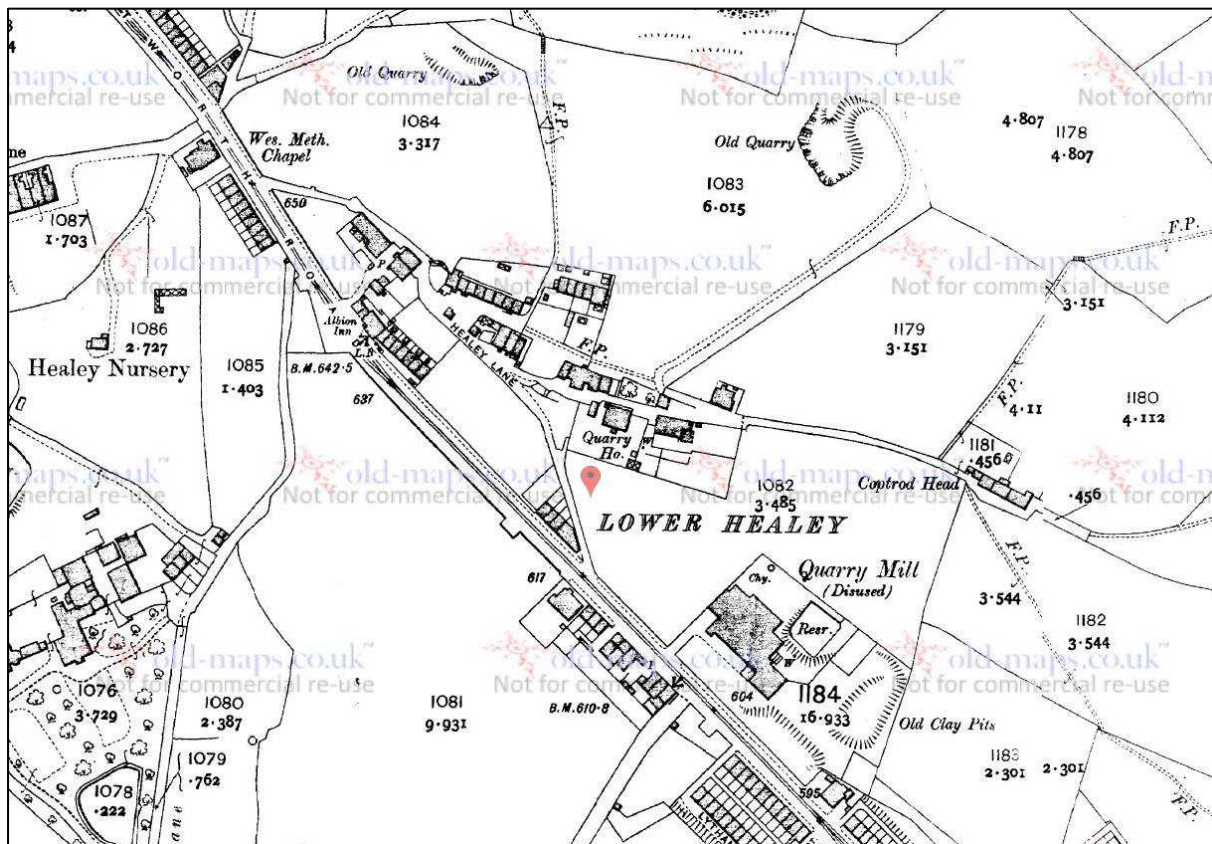
11.1.1. Ordnance Survey c1850.



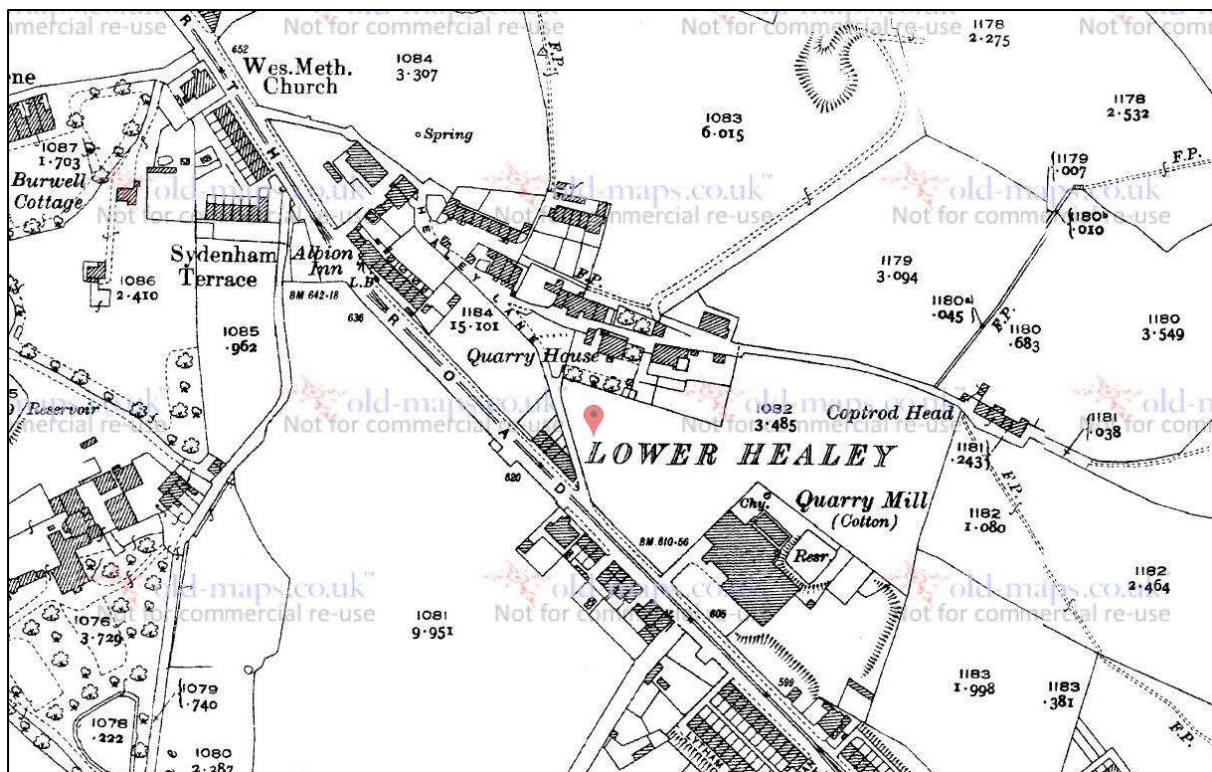
11.1.2. Ordnance Survey c1890.



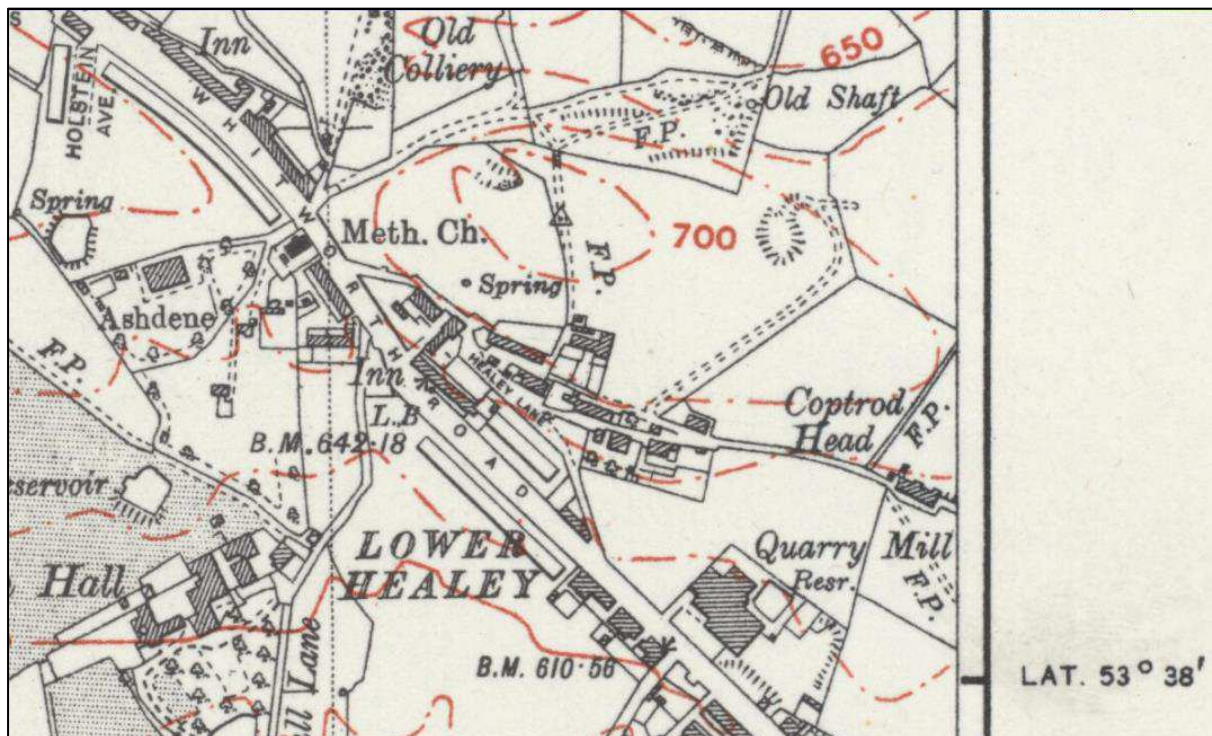
11.1.3. Ordnance Survey c1910.



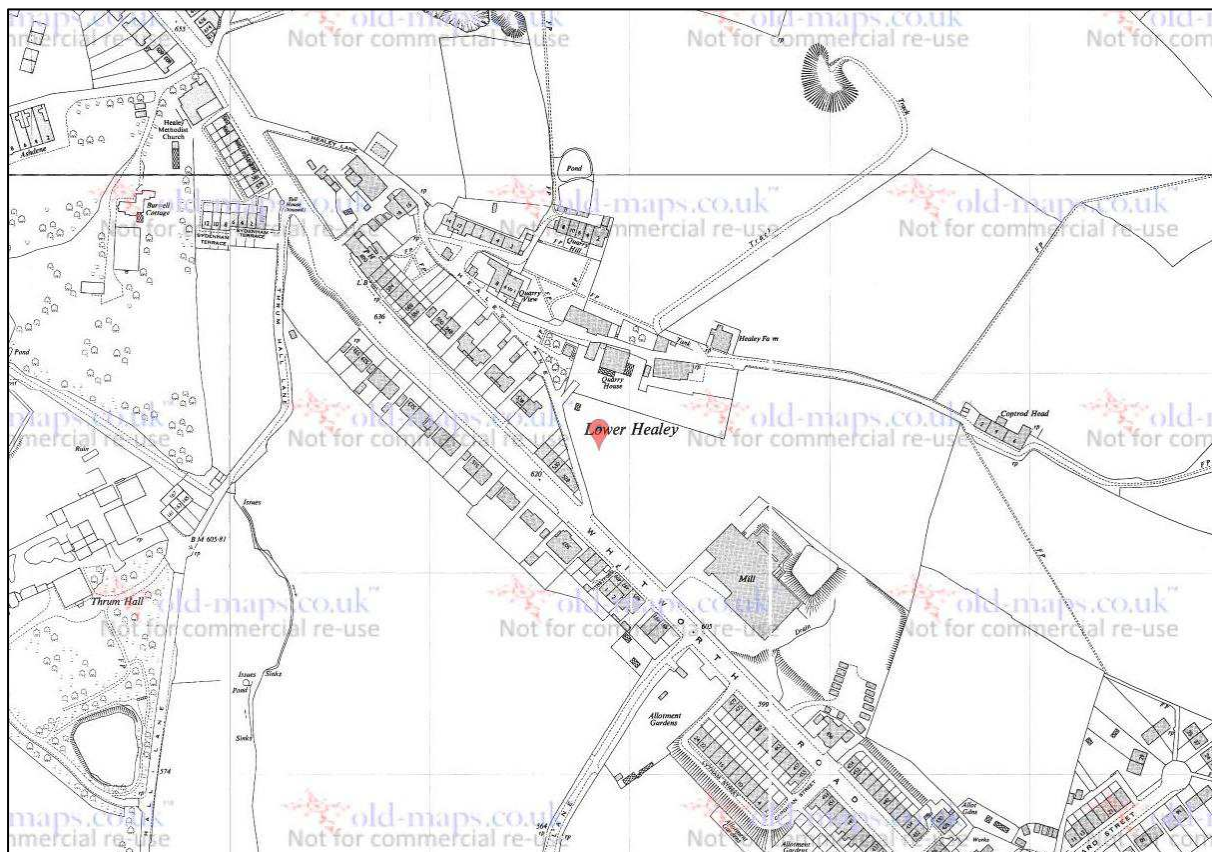
11.1.4. Ordnance Survey c1930.



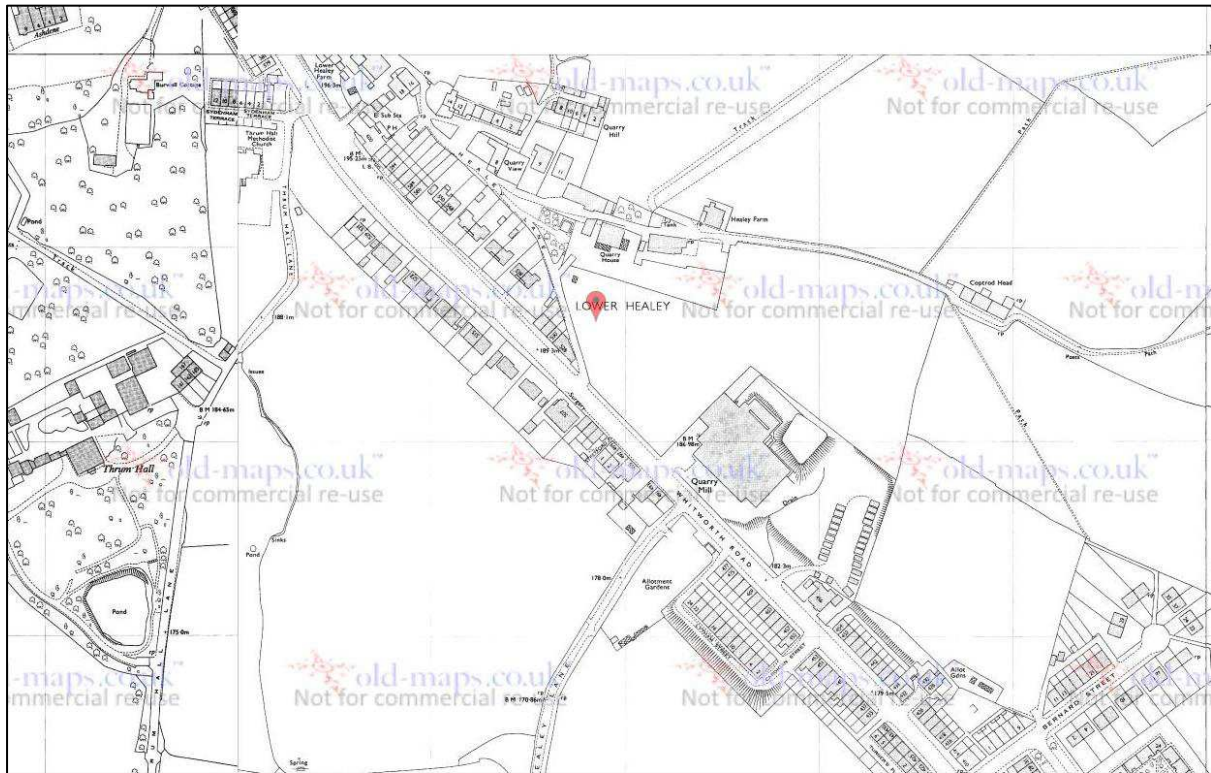
11.1.5. Ordnance Survey c1940.



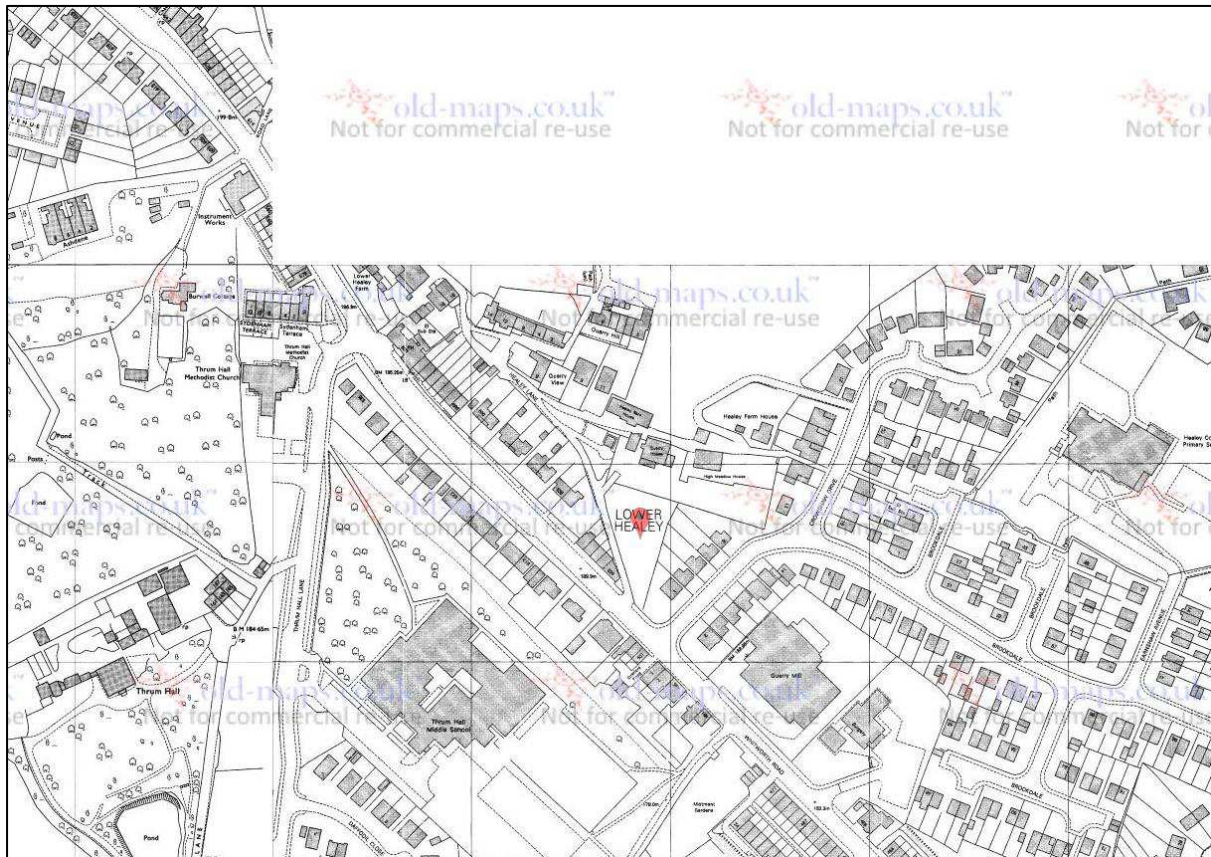
11.1.6. Ordnance Survey c1960.



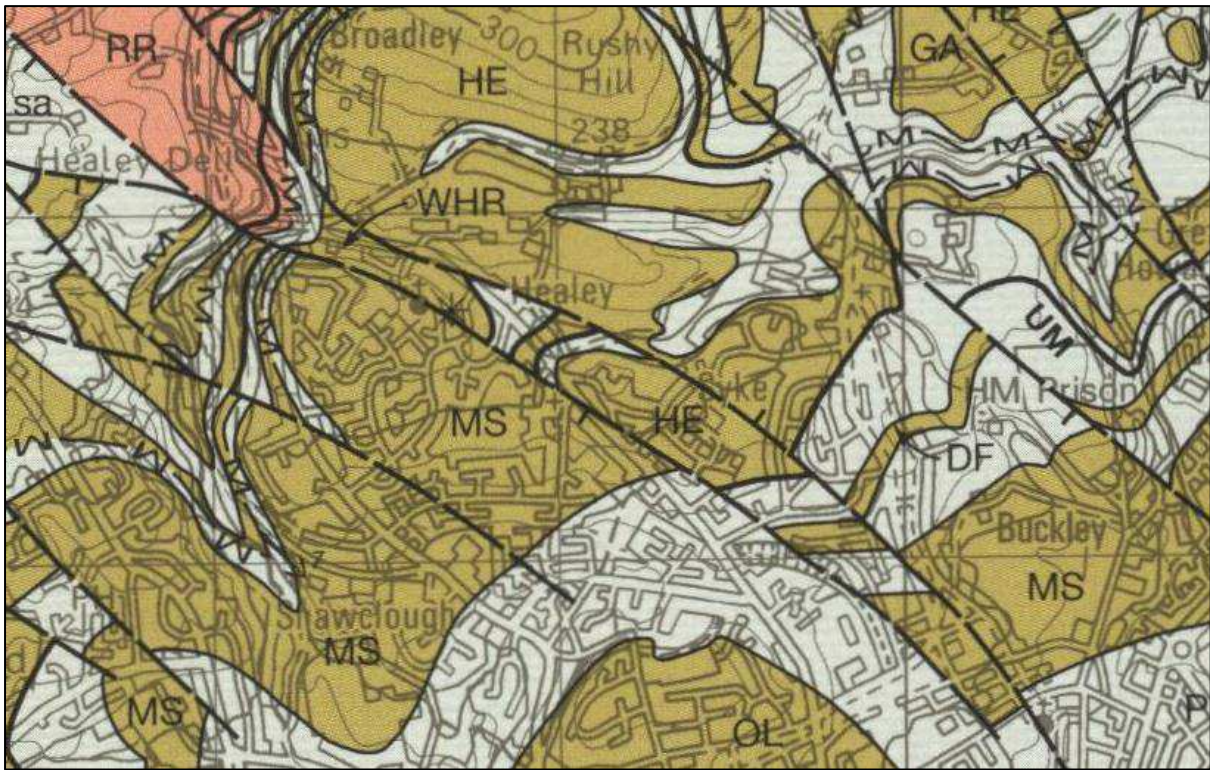
11.1.7. Ordnance Survey c1970-73s.



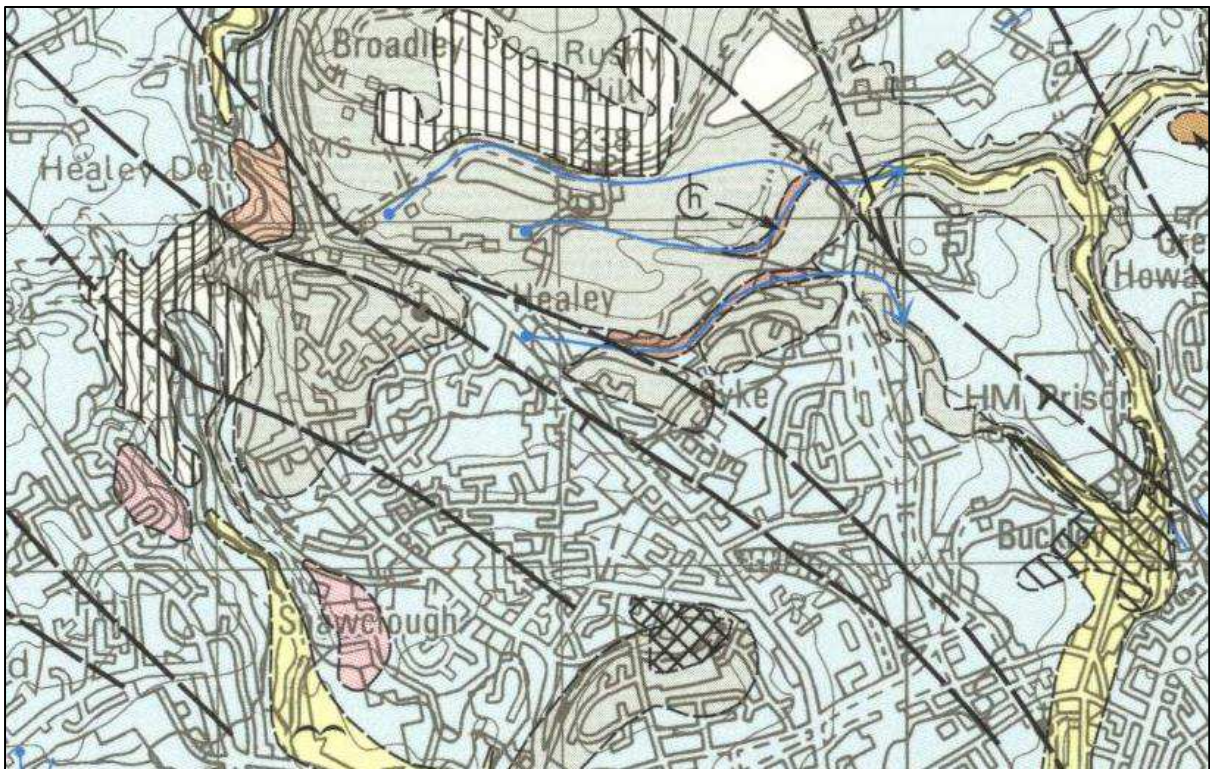
11.1.8. Ordnance Survey c1974-89.



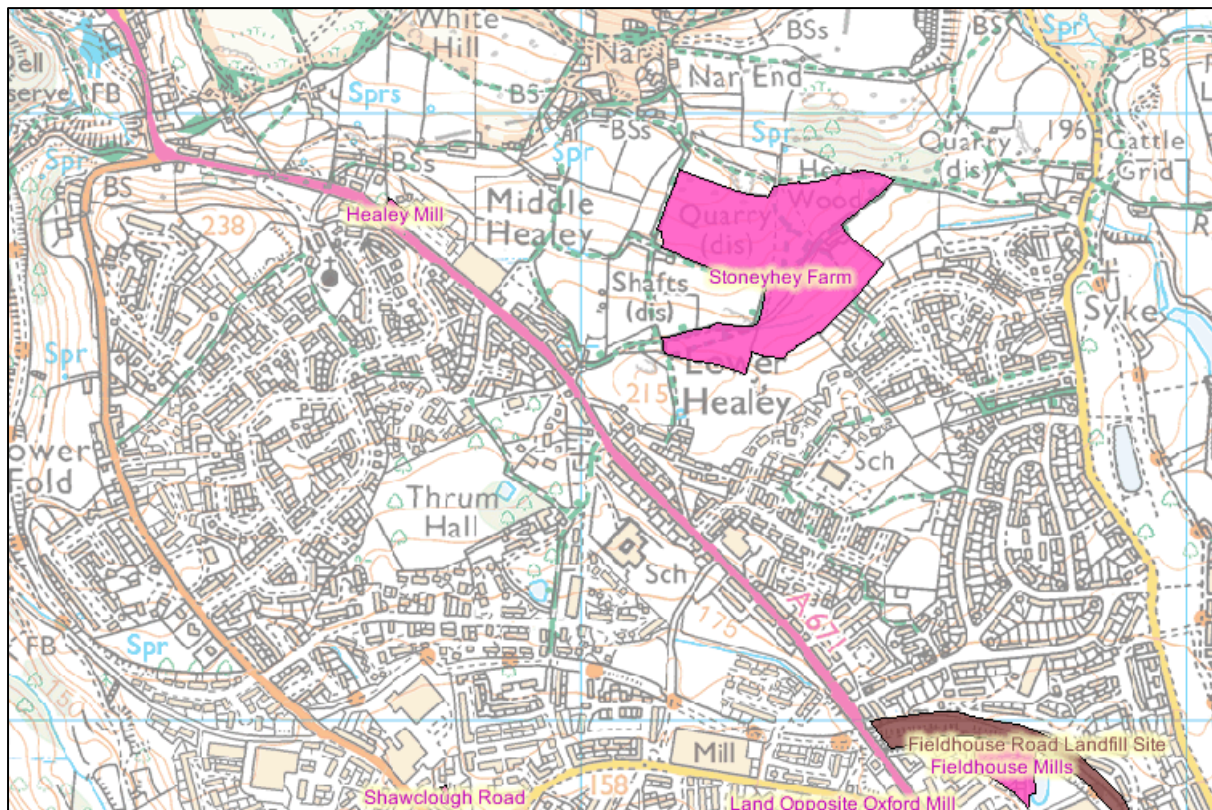
11.2.BGS Geological Map (Solid).



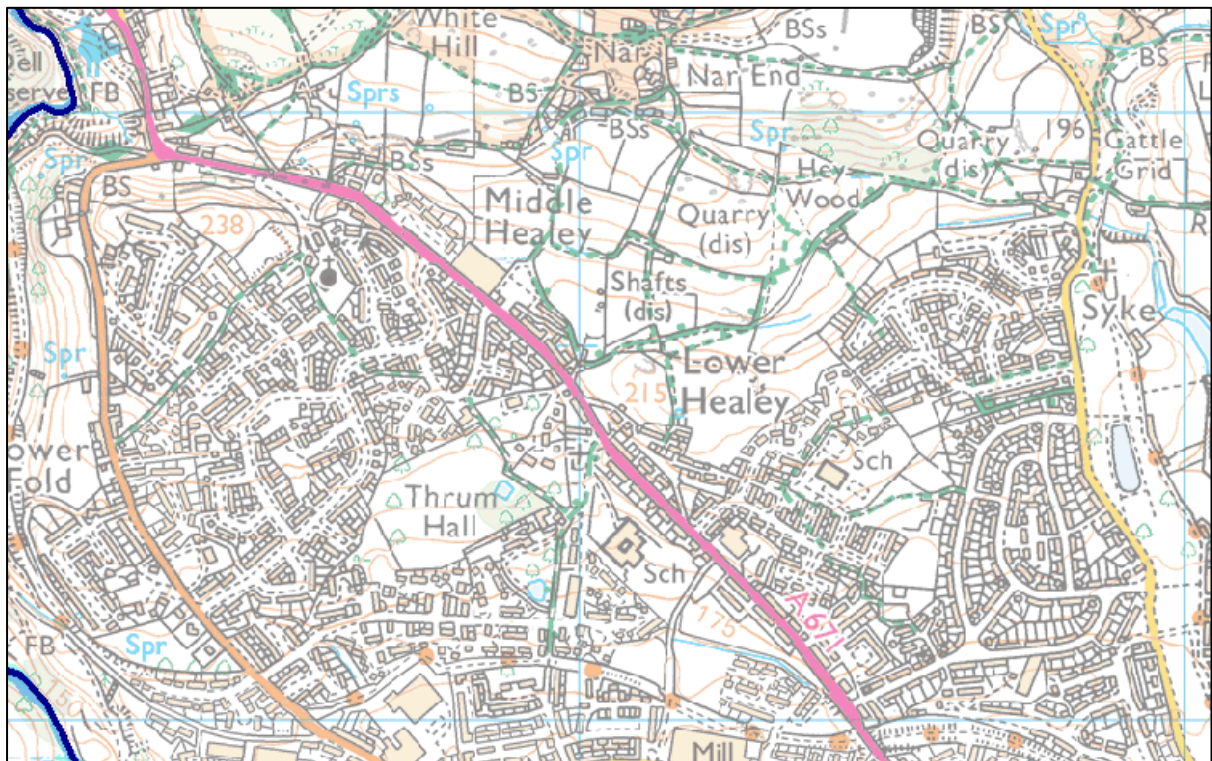
11.3.BGS Geological Map (Solid).



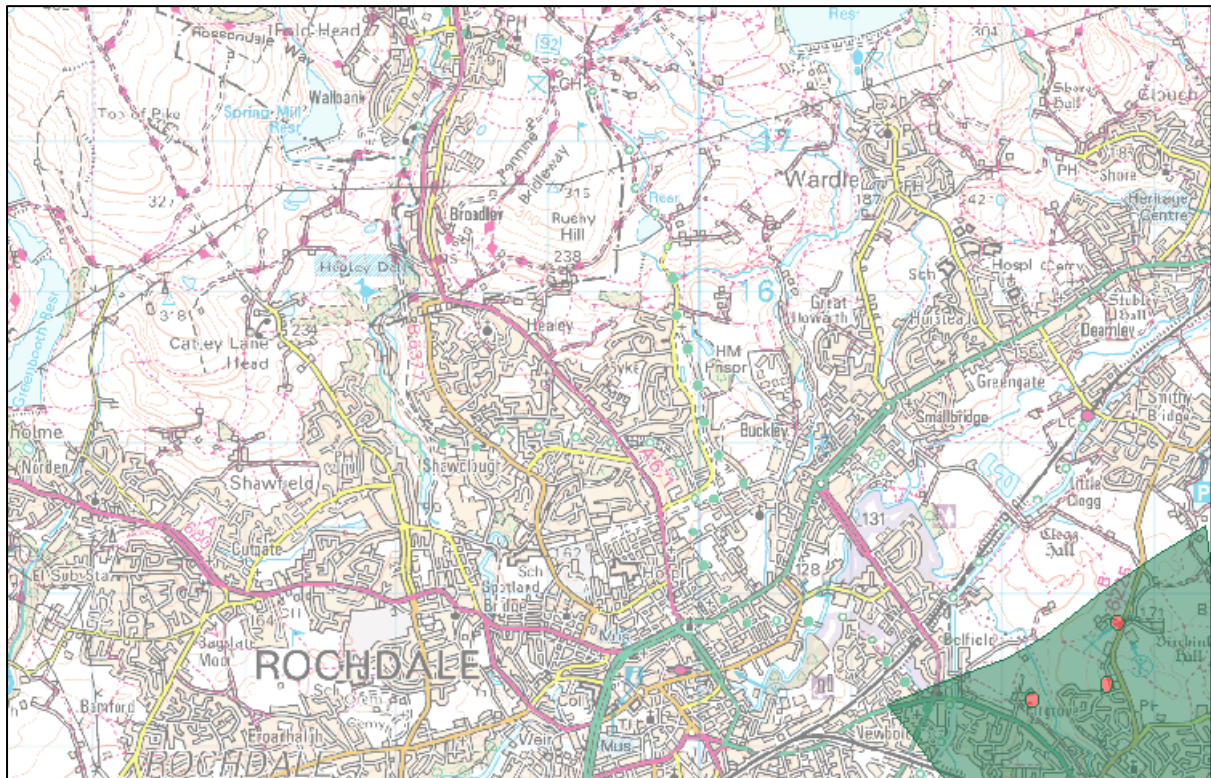
11.4.Environment Agency Landfill Map.



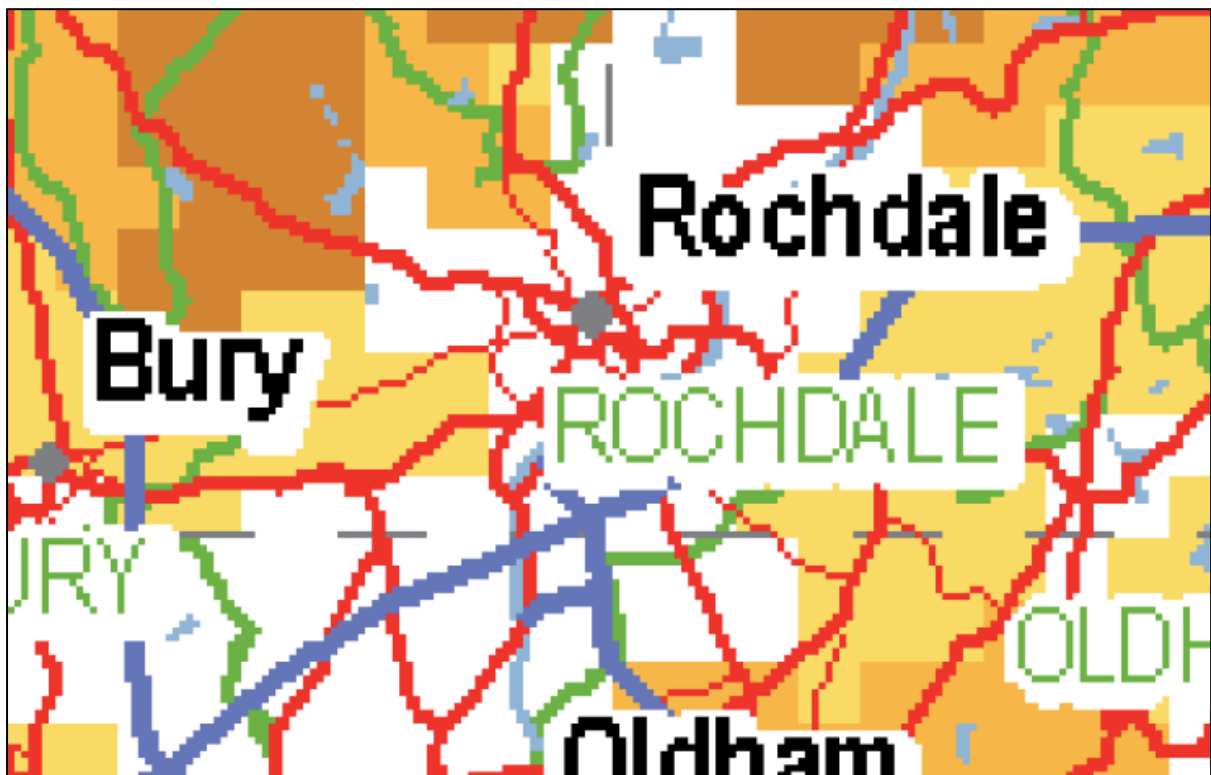
11.5.Environment Agency Flood Risk Map.



11.6.Environment Agency Source Protection Zone Map.



11.7.UK Radon Map.



12. APPENDIX C: TABLES.

12.1. CIRIA SP 78, TABLE 15, Contaminant Hazards Related to End Use.

	Targets and associated hazards ¹						
	1	2	3	4	5	6	7
	Site works	Water resources	Buildings and services	Buildings and services	Garden amenities	Allotments, agriculture	Plant growing
Critical Contamination ²	Harm to workers ³	Leachate pollution ⁴	Fire and explosion	Corrosion or expansion damage ⁴	Harm to children ⁵	Crop uptake of contaminant ⁴	Phyto-toxicity ⁴
Arsenic	○	○			●	○	
Cadmium		○			●	● ¹⁵	
Lead		○		○ ¹¹	●	● ¹⁵	
Cyanide	○	●			● ¹⁴		
PAH ⁶	●		○		●		○
Phenols	●	●		●	●		○
Copper		○		○ ¹¹	○		● ¹⁵
Nickel		○		○ ¹¹			● ¹⁵
Zinc		○		○ ¹¹			● ¹⁵
Sulphate		●		● ¹²	●		○
Sulphide		○		●			
Chloride		○		●			○
Mineral oils	● ⁸	○	○	●	○		
Ammoniumion				●			
Methane	○ ⁹		● ⁹				○
Sulphur			●	○ ¹³			
Combustibles	○		● ⁷				
Oily, tarry substances	●	○	○	●			○
Asbestos	●	○ ¹⁰					
Radioactive materials	●	○			○	○	
Soluble metals		●		○	○		
pH	○	●		●		●	●
Solvents and organics	○	○	○				
Boron		○					○
Expansives				○ ¹⁷			

● Listed contamination hazards (from BS, DD 175 1988, and ICRL Note 59/83 2nd edition 1987).
 ○ Non-listed contamination hazards.

Notes.

1. Combinations of hazards may need investigation.
2. Local factors may involve other contaminants.
3. Workers at risk from contact, inhalation, explosion, fire and ground pH.
4. Soil pH affects incidence of these hazards.
5. Children at risk from inhalation, ingestion and contact.
6. PAH polynuclear aromatic hydrocarbons.
7. Combustibles include coal, oils, tars, refuse, rubber, etc Determine calorific value, loss on ignition, ash and volatile contents, total organic carbon.
8. Mineral oils are industrial hygiene problem, with or without PCB contamination.
9. Continuous on-site monitoring.
10. Hazard if run-off carries friable asbestos into streams.
11. Electrolytic action if free metal present.
12. Total and soluble sulphate (See also Section 1 1.4.4).
13. Corrosion induced by sulphur consuming bacteria.
14. Free cyanide.
15. Total and 'plant-available' metals.
16. Total, 'plant-available' and 'zinc equivalent' values.
17. Expansives include: blast-furnace and steel slags, mining spoils and pyritic materials. Determine: total sulphur and acid soluble sulphate, calcite, and calcium as CaO.

12.2.CLR 8, Table2.1.

Table 2.1 Potential inorganic contaminants for the assessment of industrial land and their receptors

Contaminants ^{a, b}	Receptors			
	Humans	Water	Vegetation and the ecosystem	Construction materials
Metals				
Barium		✓		
Beryllium	✓	✓	✓	
Cadmium	✓	✓	✓	
Chromium	✓	✓		
Copper		✓	✓	
Lead	✓	✓	✓	
Mercury	✓	✓	✓	
Nickel	✓	✓	✓	
Vanadium	✓	✓		
Zinc		✓	✓	
Semi-metals and non-metals				
Arsenic	✓	✓		
Boron		✓	✓	
Selenium	✓	✓	✓	
Sulphur	✓		✓	✓
Inorganic chemicals				
Cyanide (complex)	✓	✓	✓	✓
Cyanide (free) ^c	✓	✓	✓	
Nitrate		✓		
Sulphate		✓	✓	✓
Sulphide		✓	✓	✓
Other				
Asbestos	✓			
pH (acidity/alkalinity)	✓	✓	✓	✓

Notes

^a The list should not be regarded as a comprehensive list that should be taken into account in any particular site investigation. Some contaminants will be of no importance on certain types of site, while some sites may be contaminated by elevated concentrations of particular substances, which may not be selected because of their infrequent occurrence generally.

^b For references to synonyms of substances refer to Appendix C.

^c Free cyanide is broadly equivalent to "easily liberatable cyanide", which covers compounds that can release hydrogen cyanide at pH 4 and 100°C (see paragraph B.15 in Appendix B).

12.3.CLR 8, Table2.2.

Table 2.2 Potential organic contaminants for the assessment of industrial land and their receptors

Contaminants ^{a, b}	Receptors			
	Humans	Water	Vegetation and the ecosystem	Construction materials
Acetone	✓	✓		
Oil/fuel hydrocarbons	✓	✓	✓	✓ ^c
<i>Aromatic Hydrocarbons</i>				
Benzene	✓	✓	✓	✓ ^c
Chlorophenols	✓	✓	✓	✓ ^c
Ethylbenzene	✓	✓	✓	✓ ^c
Phenol	✓	✓	✓	✓ ^c
Toluene	✓	✓	✓	✓ ^c
<i>o</i> -Xylene	✓	✓	✓	✓ ^c
<i>m,p</i> -Xylene	✓	✓	✓	✓ ^c
Polycyclic Aromatic Hydrocarbons	✓	✓		
<i>Chlorinated Aliphatic Hydrocarbons</i> ^d				
Chloroform	✓	✓	✓	
Carbon tetrachloride	✓	✓	✓	✓ ^c
Vinyl chloride	✓	✓		
1,2-Dichloroethane	✓	✓	✓	✓ ^c
1,1,1-Trichloroethane	✓	✓	✓	✓ ^c
Trichloroethene	✓	✓	✓	✓ ^c
Tetrachloroethene	✓	✓	✓	✓ ^c
Hexachlorobuta-1,3-diene	✓	✓	✓	
Hexachlorocyclohexanes	✓	✓	✓	
Dieldrin	✓	✓	✓	
<i>Chlorinated Aromatic Hydrocarbons</i>				
Chlorobenzenes	✓	✓	✓	
Chlorotoluenes	✓	✓	✓	
Pentachlorophenol	✓	✓	✓	
Polychlorinated biphenyls ^e	✓	✓	✓	
Dioxins and furans ^f	✓	✓	✓	
<i>Organometallics</i>				
Organolead compounds	✓		✓	
Organotin compounds	✓	✓		

Notes

^a The list should not be regarded as a comprehensive list that should be taken into account in any particular site investigation. Some contaminants will be of no importance on certain types of site, while some sites may be contaminated by elevated concentrations of particular substances, which may not be selected because of their infrequent occurrence generally.

^b For references to synonyms of substances refer to Appendix C.

^c The impact of chlorinated hydrocarbons and other organic substances is probably limited to concentrations in the free phase.

^d Some chlorinated aliphatic hydrocarbons are considered to be of secondary importance (see paragraphs B.16 and B.17 in Appendix B) and are therefore excluded because they are less toxic, highly volatile or have limited industrial use. However, some highly volatile substances may be significant due to their solubility and are not excluded on grounds of volatility alone.

^e There are 209 polychlorinated biphenyl (PCB) congeners, the significance of which can be expressed using toxic equivalency factors (TEFs) relative to the best-characterised member of the group.

^f There are 210 possible isomers of chlorinated dioxins and furans, of which the most studied and most toxic representative of the group is 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (2,3,7,8-TCDD). Other dioxins and furans could be expressed in terms of TEFs relative to 2,3,7,8-TCDD.

12.4.CIRIA (Report c665) Wilson and Card Classification.

Modified Wilson and Card classification

	Characteristic situation (CIRIA R149)	Comparable classification in DETR et al (1999)	Risk classification	Gas screening value (GSV) (CH ₄ or CO ₂) (l/hr) ¹ Threshold	Additional factors	Typical source of generation
	1	A	Very low risk	<0.07	Typically methane <1 % and/or carbon dioxide <5 %. Otherwise consider increase to Situation 2	Natural soils with low organic content "Typical" made ground
	2	B	Low risk	<0.7	Borehole air flow rate not to exceed 70 l/hr. Otherwise consider increase to characteristic Situation 3	Natural soil, high peat/organic content. "Typical" made ground
	3	C	Moderate risk	<3.5		Old landfill, inert waste, mineworking flooded
	4	D	Moderate to high risk	<15	Quantitative risk assessment required to evaluate scope of protective measures.	Mineworking – susceptible to flooding, completed landfill (WMP 26B criteria)
	5	E	High risk	<70		Mineworking unflooded inactive with shallow workings near surface
	6	F	Very high risk	>70		Recent landfill site

Notes on the use of Table 8.5

- 1 Gas screening value: (Litres of gas/hour) is calculated by multiplying the maximum gas concentration (%) by the maximum measured borehole flow rate (l/hr) – see Glossary.
- 2 Site characterisation should be based on gas monitoring of concentrations and borehole flow rates for the minimum periods defined in Table 5.5.
- 3 Source of gas and generation potential/performance should be identified.
- 4 Soil gas investigation should be in accordance with guidance provided in Chapters 4 to 6.
- 5 If there is no detectable flow, use the limit of detection of the instrument.
- 6 The boundaries between the Partners in Technology classifications do not fit exactly with the boundaries for the CIRIA classification.

12.5.CIRIA (Report c665) Wilson and Card Protective Measures.

Typical scope of gas protective measures

Characteristic situation	Residential building (not those which belong to Situation B) ¹		Office/commercial/industrial development	
(From Table 8.5)	Number of levels of protection	Typical scope of protective measures	Number of levels of protection	Typical scope of protective measures
1	None	No special precautions	None	No special precautions
2	2	a. Reinforced concrete cast in situ floor slab (suspended, non-suspended or raft) with at least 1200 g DPM and underfloor venting. b. Beam and block or pre-cast concrete and 2000 g DPM/reinforced gas membrane and underfloor venting. All joints and penetrations sealed.	1 to 2	a) Reinforced concrete cast in situ floor slab (suspended, non-suspended or raft) with at least 1200 g DPM. b) Beam and block or pre-cast concrete slab and minimum 2000 g DPM/reinforced gas membrane. c) Possibly underfloor venting or pressurisation in combination with a) and b) depending on use. All joints and penetrations sealed.
3	2	All types of floor slab as above. All joints and penetrations sealed. Proprietary gas resistant membrane and passively ventilated or positively pressurised underfloor sub-space.	1 to 2	All types of floor slab as above. All joints and penetrations sealed. Minimum 2000 g/reinforced gas proof membrane and passively ventilated underfloor sub-space or positively pressurised underfloor sub-space.
	3	All types of floor slab as above. All joints and penetrations sealed. Proprietary gas resistant membrane and passively ventilated underfloor sub-space or positively pressurised underfloor sub-space, oversite capping or blinding and in-ground venting layer.	2 to 3	All types of floor slab as above. All joints and penetrations sealed. Proprietary gas resistant membrane and passively ventilated or positively pressurised underfloor sub-space with monitoring facility.
	4	Reinforced concrete cast in situ floor slab (suspended, non-suspended or raft). All joints and penetrations sealed. Proprietary gas resistant membrane and ventilated or positively pressurised underfloor sub-space, oversite capping and in-ground venting layer and in-ground venting wells or barriers.	3 to 4	Reinforced concrete cast in-situ floor slab (suspended, non-suspended or raft). All joints and penetrations sealed. Proprietary gas resistant membrane and passively ventilated or positively pressurised underfloor sub-space with monitoring facility. In ground venting wells or barriers.
	5	Not suitable unless gas regime is reduced first and quantitative risk assessment carried out to assess design of protection measures in conjunction with foundation design.	4 to 5	Reinforced concrete cast in-situ floor slab (suspended, non-suspended or raft). All joints and penetrations sealed. Proprietary gas resistant membrane and actively ventilated or positively pressurised underfloor sub-space with monitoring facility, with monitoring. In ground venting wells and reduction of gas regime.

Note:

- 1 For low rise traditional housing with ventilated clear underfloor void (ie Situation B. See Table 8.7, Box 8.4 and Section 8.3.2).

12.6.BGS/HPA report IR/11/044 – Radon Potential Class.

Radon Potential Class*	Is the property in a Radon Affected Area?	Additional information
1	No	The property is in a Lower probability radon area (less than 1% of homes are estimated to be at or above the Action Level). The property is not in a radon affected area.
2	Yes	The property is in an Intermediate probability radon area (1 to 3% of homes are estimated to be at or above the Action Level). The property is in a radon affected area.
3	Yes	The property is in an Intermediate probability radon area (3 to 5% of homes are estimated to be at or above the Action Level). The property is in a radon affected area.
4	Yes	The property is in an Intermediate probability radon area (5 to 10% of homes are estimated to be at or above the Action Level). The property is in a radon affected area.
5	Yes	The property is in a Higher probability radon area (10 to 30% of homes are estimated to be at or above the Action Level). The property is in a radon affected area.
6	Yes	The property is in a Higher probability radon area (more than 30% of homes are estimated to be at or above the Action Level). The property is in a radon affected area.

12.7.BGS/HPA report IR/11/044 – Radon Potential Class/Protection Measures.

Radon Potential Class*	What level of radon protective measures are required for new buildings in England and Wales?	What level of radon protective measures are required for new dwellings in Scotland?
1	None**	None**
2	None	Stage 1
3	Basic	Stage 1
4	Basic	Stage 1
5	Full	Stage 2
6	Full	Stage 2