

Redrow

Land off Manchester Road, Rochdale

Flood Risk Assessment

680671-R1(01)-FRA
December 2022

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Author	R Whitfield	**Technical reviewer**	K Jackson
Signature		Signature	
Date:	March 2023	Date:	March 2023

Project Manager	C Whittingham
Signature	
Date:	March 2023

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Where field investigations have been carried out, these have been restricted to a level of detail required to achieve the stated objectives of the work.

This work has been undertaken in accordance with the quality management system of RSK LDE Ltd.

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1 INTRODUCTION

RSK Land and Development Engineering Ltd were commissioned by Redrow (the client) to provide a Flood Risk Assessment (FRA) to support the planning application at land off Manchester Road, Rochdale (the site). Development proposals include the development of residential units.

The purpose of the FRA is to establish the risk associated with the proposed development and to propose suitable mitigation, if required, to reduce the flood risk to a more acceptable level. The FRA must demonstrate that the development will be safe from a flood risk perspective for its lifetime (in this case assumed to be 100 years) taking account of the vulnerability of its users, without increasing flood risk elsewhere.

This document has been produced to assess the flood risk from tidal, fluvial, surface water, groundwater, sewer and artificial sources in line with the National Planning Policy Framework (NPPF)[1] and its corresponding Planning Practice Guidance (PPG)[2]. It includes a summary of the proposed surface water drainage strategy, showing how Sustainable Drainage Systems (SuDS) have been used to demonstrate surface water is appropriately managed on-site, with the aim that there is no increased risk of flooding on-site or elsewhere as a result of the development.

This assessment has been undertaken in consultation with the relevant authorities, and with reference to data, documents and guidance published by the Environment Agency (EA), the Lead Local Flood Authority (Rochdale Borough Council), the Local Planning Authority (LPA) (Rochdale Borough Council), and the Water Authority (United Utilities).

The comments given in this report and opinions expressed are subject to RSK Group Service Constraints provided in **Appendix A**.

[1] Communities and Local Government, 'National Planning Policy Framework', published March 2012 and last updated July 2021.

[2] Communities and Local Government, 'Planning Practice Guidance - Flood Risk and Coastal Change, ID 7', published March 2014 and last updated August 2022. http://planningguidance.planningportal.gov.uk/blog/guidance/flood-risk-and-coastal-change/..

2 SITE DESCRIPTION & PROPOSALS

2.1 Existing site

2.1.1 Site description

Site Address: Land off Manchester Road,

Rochdale

M24 2SB (Nearest)

Site National Grid Reference: 389068 E, 409291 N

The site is located towards the south of Rochdale at land off Manchester Road and west of the A627(M). The site is comprised of several adjoined fields and the gardening centre with a total site area of 88.5Ha, this area excludes a parcel for Thornfield Farm and St John's Church.

Table 2.1, below, provides a description of the immediate surroundings of the site. **Figure 2.1** shows a Site Location Map.

Table 2.1: Site setting

Direction	Characteristic
North	The northern boundary of the site is defined by Thornham New Road and a vehicular track which extends eastwards from the road. The topography slopes steeply down towards the M62 north of the track. There is a treed area north west of the site.
East	The site generally has an upward sloping topography towards the eastern boundary. The A627(M) defines the eastern boundary and is within a cutting so is lower than the site. Thornham Fields Farm is encompassed by the site boundary towards the east of the site.
South	The site boundary is intersected by Thornham Lane towards the south of the site. The A664 to A627(M) highway defines the southern boundary of the wider site area.
West	Land to west of the site is generally the urban extents of Castleton and Slattocks. St John Thornham Church is encompassed by the site boundary towards the south-western extent of the site.



Figure 2.1: Site location map

2.1.2 Topography

The topography of the site has been assessed using the topographic survey available in **Appendix B**. Generally, the site has a topographical fall downwards in a westwards direction, though the site is characterised by an undulating topography. There are several high points through the site, predominately along the eastern border. Localised depressions direct surface water runoff to a watercourse which forms within the site boundary.

The gardening centre provides the main contribution to the existing impermeable area on the site. The remaining site is greenfield. The approximate land uses of the site is as follows:

Table 2.2: Existing site land uses

Land use	Area (Ha)	Percentage (%)
Impermeable	1.65	1.9
Permeable	86.85	98.1
Total	88.50	100

As the site is of mixed use as both undeveloped and previously developed land the site is considered as predominantly greenfield with some brownfield land.

2.1.3 Existing drainage

2.1.3.1 Public

The existing drainage on site and in the immediate surroundings has been assessed using the topographic survey (**Appendix B**) and the sewer records (**Appendix C**), the drainage details are as follows:

- 225mm diameter public combined sewer outside the north-western boundary of the site along Thornham New Road. The sewer flow westwards away from the site;
- A 225mm diameter public combined sewer outside the north-western boundary of the site along Croydon Avenue. The sewer flows to Chesham Avenue;
- A 225mm diameter public combined sewer outside the western boundary of the site along Carnforth Avenue. The sewer flows to Chesham Avenue;
- Where the 225mm diameter sewers from Croydon Avenue and Carnforth Avenue meet at Chesham Avenue, they join a 300mm combined sewer which flows westwards away from the site;
- Along Rochdale Road there are two public combined sewer systems, outside Sautridge Close a head of system for a 225mm diameter combined sewer flows northwards along Rochdale Road. Adjacent to this a head of system for a 225mm diameter combined sewer flows southwards along Rochdale Road;
- A 225mm diameter public combined sewer flows along Church Avenue, west of the site, and connections to the combined sewer on Rochdale Road;
- Towards the southern extents of the site a 300mm diameter public combined sewer flows westwards along Thornham Road and joins the combined sewer along Rochdale Road.

2.1.3.2 Private

The drainage details for private drainage within the site are as follows:

- There are land drains within the site boundary shown within **Appendix D**. The landowner confirmed they maintain the land drains to ensure good drainage of the fields which are agriculturally worked year round;
- The gardening centre within the site at the western boundary has a foul and surface water private drainage system. A summary of a drainage survey provided in **Appendix E** shows the flows from the site are ultimately drained to the public combined sewer on Rochdale Road;
- There are no other known private sewers within the site boundary.

2.2 Development proposals

The proposed development is for a residential end use across the site. The Phase 1 of the proposed development is generally located at the western extent of the site, a site layout for Phase 1 in included in **Appendix F.**

The remaining site area is outlined as residential development for future Phases, a conceptual plan of the proposed development is included in **Appendix F** (this is also the whole site drainage strategy drawing).

Land south of Thornham Lane will be retained as greenfield and will provide ecological and amenity value to the proposed development.

3 ENVIRONMENTAL SETTING

3.1 Hydrology

3.1.1 Main River

The closest EA designated 'Main River' is an upstream tributary of Whit Brook approximately 0.3km south-west from the site. It is thought that the ordinary watercourse which starts within the site boundary is the upstream source of Whit Brook. The 'Main River' designation of Whit Brook starts at the culvert below the Rochdale Road/A627(M) roundabout and flows southwards in a culvert below Whitbrook Way and Rochdale Canal. The culvert issues west of Rochdale Canal.

Another EA designated 'Main River' is Trub Brook approximately 0.5km north-west from the site. The river appears to start as an outflow from Rochdale Canal and flows westwards towards a railway culvert.

The watercourses above have been described using mapping provided by the Environment Agency Statutory Main River Map (accessed November 2022).

3.1.2 Ordinary watercourses

There is a watercourse which starts within the site boundary which is referred to by the landowner as 'The Dell' (starting point at 388810 E, 409189 N). The Dell issues from a series of land drains, evidenced by the land drain plan drawn and provided by the land owner, in **Appendix D**. The land drains are connected by a series of manholes within the site and are noted on the topographic survey with 150mm diameter drains within the manholes. The landowner describes the land drains as being connected to the Dell by a '12 inch' culvert which passes under an area of high ground and issues from a steep bank into the watercourse. The high ground is comprised of a vehicular access road to the farm and underlain with a 300mm diameter watermain so is not considered to be part of the natural topography of the site.

The Dell flows south westwards and is culverted below Thornham Cricket Ground. The land owner described the culvert as twin '10 inch' drains with a manhole located within the cricket grounds. The topographic survey indicates the drains are a 300mm culvert, though not clear if this is singular or twin.

The outfall from the cricket pitch culverts is located within the site south of the cricket pitches. The outfall location is unclear from the topographic survey though it is clear where the watercourse channel is located. The watercourse flows south for a short 60m section and then enters a 525mm diameter concrete culvert for a 22m meter length and issues into the site again, flows southwards along the boundary and leaves the site over the boundary.

Off site the watercourse enters a culvert below Number 800 Rochdale Road, flows under Thornham Road and continues southwards as a culvert below Hopwood House (garage). The clearance works drawing sheet provided by Rochdale Council (**Appendix G**) best represents the assumed route of the culvert and identifies the known issues with the blocking of the culvert.

3.1.3 Other Waterbodies

There is a short length of ditch close to the north-western boundary of the site, this is shown on 'Sheet 6 of 9' of the topographic survey (**Appendix B**). The ditch starts at a manhole (cover level: 158.72mAOD) with a water level of 157.97mAOD recorded within the ditch. There is a 150mm diameter pipe at the downstream extent of the ditch with an invert level of 157.32mAOD. The landowner has stated this is a spring which supplies water to the adjacent farm south from the manhole.

There is a ditch on the north western boundary of the site shown on 'Sheet 6 of 9' and 'Sheet 8 of 9' of the topographic survey. The ditch has no apparent flow direction according to the bed levels and there are no pipes noted at either extent of the ditch. It is assumed the ditch is intended for use as an interception ditch to prevent overland runoff from the field east of the ditch from flowing over into the residential areas to the west of the site.

On 'Sheet 8 of 9' of the topographic survey there is a short section of ditch aligned east to west containing water with a depth of approximately 30mm. The levels in the ditch would suggest the water is flowing from east to west though there are no formal inflows or outflows to the ditch. It is possible the ditch represents where perched groundwater issues from the ground and sinks again. This would be evidenced by the fact the area of the ditch is within an area once used as a former sand quarry. Anecdotally the land owner stated that the quarry ceased once all sands had been excavated from the site.

On 'Sheet 8 of 9' of the topographic survey there is a ditch within a dense grouping of trees at the northern boundary of the site. The ditch appears to extend south from the trees and across the site aligned south to north. There is water recorded within the ditch with an approximate depth of 20mm, the water levels suggest a northwards flow into the grouping of trees. The ditch does not appear to correlate with any site boundaries and there are no formal vehicular or crossing points over the ditch. The ditch is assumed to be another overland flow interception feature.

Within the southern parcel of the site (south of Thornham Road) there is a large shallow pond shown on aerial photographic mapping to be surrounding by denser vegetation compared to the surrounding grassland. The pond appears to be fed from surface water runoff from the surrounding sloping topography. The outfall from the pond is formalised into a channel at the western extent of the parcel.

There is a large pond shown on 'Sheet 3 of 9' of the topographic survey (at coordinates: 388713 E, 409249 N). The pond is on the western boundary of the site and adjacent to 'The Dell' ordinary watercourse. The landowner confirmed that the pond is likely to have originated from a historical excavation of clay though it is unknown how the pond is fed water. At the time of the survey the water level in the pond was approximately 147.49mAOD.

There is a large pond shown on 'Sheet 4 of 9' of the topographic survey (at coordinates: 389028 E, 408999 N). The pond has a water level of 152.01mAODm, though has no apparent inflows or outflow.

There are further waterbodies and watercourses within the wider vicinity of the site.

3.2 Geology

3.2.1 Desk Study

Based on published geological records for the area (British Geological Survey online mapping), the site exhibits the following geology:

- Superficial Geology:
  - (north and eastern site areas) Glaciofluvial Sheet Deposits, Devensian - Sand and gravel. Sedimentary superficial deposit formed between 116 and 11.8 thousand years ago during the Quaternary period.
  - (southern and western site areas) Till, Devensian - Diamicton. Sedimentary superficial deposit formed between 116 and 11.8 thousand years ago during the Quaternary period.
- Bedrock Geology: Pennine Lower Coal Measures Formation - Mudstone, siltstone and sandstone. Sedimentary bedrock formed between 319 and 318 million years ago during the Carboniferous period.

BGS Borehole data records were searched for nearby trial/borehole logs that may give relevant information regarding the on-site geology. The closest borehole log was located at Grange Road off Church Avenue, at the western boundary of the site. The borehole log from 1913, undertaken for Chamber Colliery Co Ltd, (BGS Reference: SD80NE3) describes the following strata:

- Soil to 0.45mbgl (“1 ft 6 inches”);
- Boulder clay to 12.19mbgl (“40ft”);
- Sand to 15.8mbgl (“52ft”);
- The borehole log continues to a depth of 142m (“468ft”) with varying strata of clays, shale, sandstone and coal.

Groundwater was not recorded in the borehole.

A second borehole was recorded outside of the western boundary of the site, at the service station on Rochdale Road, close to Thornham Road. The borehole log is from 1998 (SD80NE293) and describes the following strata:

- Made Ground to 1.25mbgl;
- Claybound silty sand with sandstone fragments and some fine gravel to borehole completed at 4.10mbgl.

Groundwater was struck within the borehole at 2.0mbgl and rose to 1.44mbgl within 40 minutes.

3.3 Hydrogeology

Hydrogeological information was obtained from the online Magic Maps service. These maps indicate that the site is underlain with bedrock is designated as a Secondary A Aquifer. The underlying superficial deposits are designated as Secondary A aquifers.

The site is not located within a Groundwater Source Protection Zone.

The site is not located within a Drinking Water Safeguard Zone (Surface Water), or Drinking Water Safeguard Zone (Ground Water).

4 SOURCES OF FLOOD RISK

4.1 Criteria

In accordance with the NPPF and advice from the EA, an assessment of the risk associated with various flooding sources is required along with consideration of the effects of climate change over the design life of the development (in this case assumed to be 100 years).

The EA's most recent climate change guidance, published in May 2022[3], should be referenced in order to identify the appropriate peak river flow and rainfall intensity allowances for the scheme. The appropriate allowance for peak river flow is based on the site's location in the country, the lifetime of development, the relevant flood zone and the vulnerability of the proposed end use.

The flood risk elements that need to be considered for any site are defined in BS 8533 'Assessing and managing flood risk in development Code of practice'[4] as the "Forms of Flooding" and are listed as:

- Flooding from rivers (fluvial flood risk);
- Flooding from the sea (tidal flood risk);
- Flooding from the land;
- Flooding from groundwater;
- Flooding from sewers (sewer and drain exceedance, pumping station failure etc); and
- Flooding from reservoirs, canals and other artificial structures.

The following section reviews each of these in respect of the subject site.

4.2 Definitions of Risk

Table 5.1: Flood Map for Planning Risk Zoning

Flood Zone	Description
Flood Zone 1	Land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%)
Flood Zone 2	Flood Zone 2 - land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% – 0.1%), or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5% – 0.1%) in any year

[3] Environment Agency, 'Guidance: Flood Risk Assessments: Climate Change Allowances'. https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances, May 2022.

[4] BSI, 'BS 8533-2017 Assessing and managing flood risk in development Code of practice', December 2017.

Flood Zone	Description
Flood Zone 3	Land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%), or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.
Flood Zone 3b	Land having the potential to flood for storm events up to the 1 in 20 year return period (>5% annual probability of flooding occurring). It is classified as 'functional floodplain'

Table 5.2: Flood Risk from Rivers or the Sea and Flood Risk from Surface Water

Flood Risk	Description
High	High risk means that each year this area has a chance of flooding of greater than 3.3%. This takes into account the effect of any flood defences in the area. These defences reduce but do not completely stop the chance of flooding as they can be overtopped, or fail.
Medium	Medium risk means that each year this area has a chance of flooding of between 1% and 3.3%. This takes into account the effect of any flood defences in the area. These defences reduce but do not completely stop the chance of flooding as they can be overtopped, or fail.
Low	Low risk means that each year this area has a chance of flooding of between 0.1% and 1%. This takes into account the effect of any flood defences in the area. These defences reduce but do not completely stop the chance of flooding as they can be overtopped, or fail.
Very Low	Means that each year this area has a chance of flooding of less than 0.1%. This takes into account the effect of any flood defences in the area. These defences reduce but do not completely stop the chance of flooding as they can be overtopped, or fail.

Table 5.3: Flood Risk category matrix from Reservoirs, Groundwater, sewers and other artificial sources

Threat Probability	Low Impact	Medium Impact	High Impact
High	Medium	Medium	High
Medium	Low	Medium	Medium
Low	Low	Low	Medium
Very Low	Very Low		

4.3 Flooding from rivers (fluvial flood risk)

4.3.1 Main Rivers

The EA Flood Zone mapping study for England is available on their website at: https://flood-map-for-planning.service.gov.uk.

The latest EA published flood zone map (**Figure 5.1**) shows that the site lies within Flood Zone 1.

In December 2013, the EA released an additional form of mapping 'Risk of Flooding from Rivers and Sea', which is available at:

https://flood-warning-information.service.gov.uk/long-term-flood-risk

The latest 'Risk of Flooding from Rivers and Sea' flood map (**Figure 5.2**), which shows the EA's assessment of the likelihood of flooding from rivers and the sea at any location and is based on the presence and effect of all flood defences, predicted flood levels, and ground levels, indicates that the site is entirely designated as '**very low**' risk of flooding.

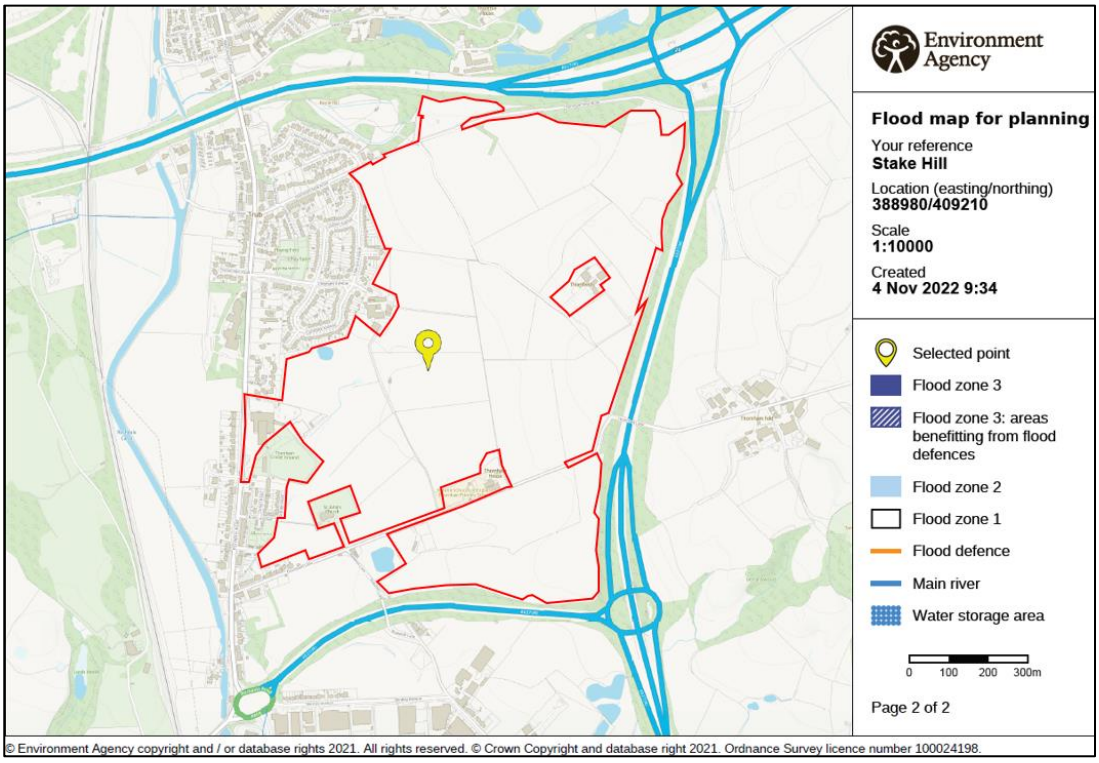


Figure 5.1: Environment Agency 'Flood map for planning'

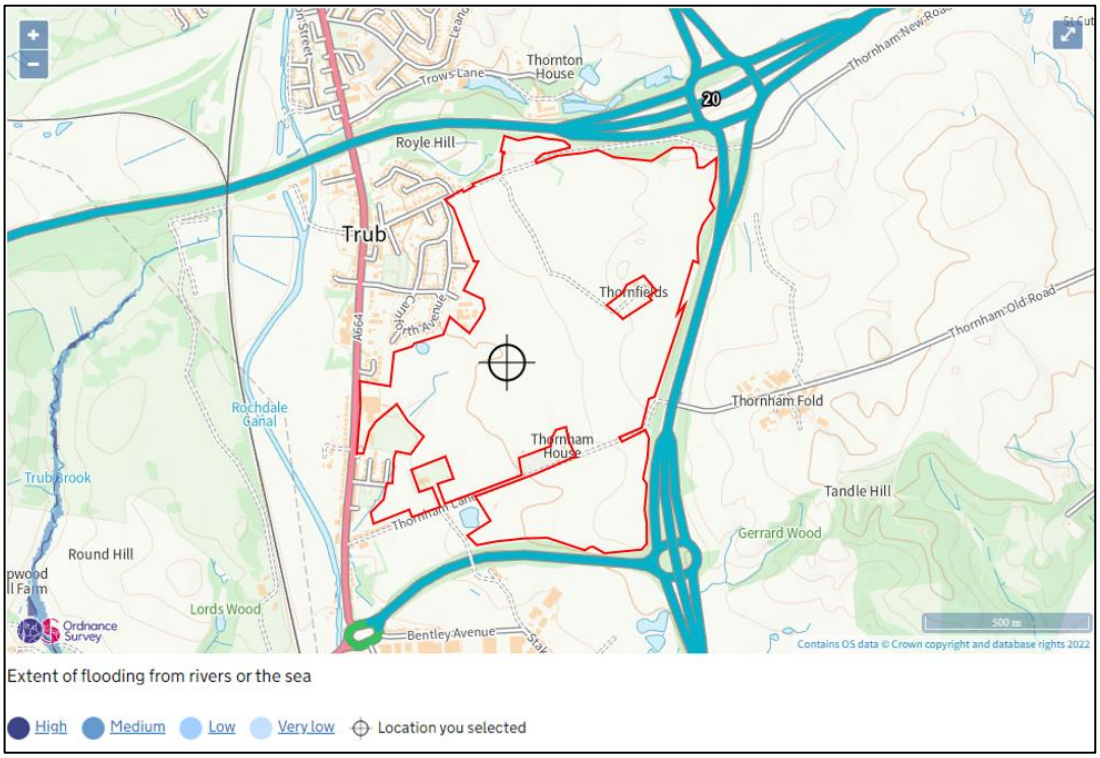


Figure 5.2: Environment Agency 'Flood risk from rivers or the sea' map (accessed November 2022)

4.3.2 Ordinary Watercourse

The ordinary watercourse referred to as 'The Dell' is within a steep sided channel at the lowest areas of the site and is unlikely to present any significant risk to the proposed development. The flood risk would likely seem greatest at the upstream extent of the culvert at the cricket pitches where The Dell channel becomes more shallow and the culverts may potentially act as a bottleneck for the flows in the watercourse. The topographic levels would suggest exceedance of the channel would result in flooding of the cricket pitch.

The Dell then flows on to a 525mm diameter concrete culvert below the access to the church from Church Avenue. The pre-development drainage enquiry response provided by Rochdale Council LLFA (**Appendix H**) notes that this culvert is prone to blockage and flooding due to the size and length.

The culvert under Thornham Road and Hopwood house is shown within **Appendix H** to frequently flood the highway. It is noted in the response that this is due to poor maintenance and an inadequate culvert as evidenced by the clearance works in **Appendix G**.

There is potential flood risk from the Dell , but likely to be of minimal impact to the proposed development, the flood risk from ordinary watercourse is considered **low**.

4.3.3 Climate Change

Fluvial flooding is likely to increase as a result of climate change. A greater intensity and frequency of precipitation is likely to raise river levels and increase the likelihood of a river overtopping its banks. Climate change guidance for river modelling was updated by the EA in May 2022. No model re-runs have been undertaken as part of this site-specific FRA. The impact upon the site should be negligible given its location within Flood Zone 1 and low risk of ordinary watercourse flooding.

The overall risk of fluvial flooding is considered to be **very low**.

4.4 Flooding from the sea (tidal flood risk)

The site is not considered to be at risk from tidal flooding due to its inland and elevated location.

4.5 Flooding from the land (surface water flood risk)

If intense rain is unable to soak into the ground or be carried through manmade drainage systems, for a variety of reasons, it can run off over the surface causing localised floods before reaching a river or other watercourse.

Generally, where there is impermeable surfacing or where the ground infiltration capacity is exceeded, surface water runoff can occur. Excess surface water flows from the site are believed to drain naturally to the eastern boundary, either by overland flow or through infiltration.

The EA's surface water flood map (**Figure 5.3**) shows that the site is predominantly at very low risk from surface water flooding. However, given the undulating topography of the site there is a central surface water flow path that flows from Thornfields Farm through to the raised track/watermain aligned north to south through the site. The raised track interrupts the flow path and is shown within the surface water modelling to backlog and pond within a low point on the eastern side of the raised track.

The surface water path aligns with the land drainage network constructed by the landowner (or previous land owners) suggesting that surface water runoff within this flow path is actively drained to the Dell as currently existing despite the physical barrier caused by the raised track/watermain. The land drain sketch from **Appendix D** has been reproduced and overlain over the high-low surface water flood risk extent layers for context and is shown in **Figure 5.4**.

There eastern extent of the proposed Phase 1 development is within close proximity of the area of ponding associated with the surface water flow path. Ensuring that finished floor levels remain above the existing ground levels and ensuring the existing land drains are maintained or realigned to suit the proposed development will ensure that the risk of surface water ponding is reduced.

Once future phases of development to the east of Phase 1 are under construction, the contributing areas of runoff from greenfield to the surface water flow path will be reduced

and the risk from the flow path will lessen as surface water runoff from hardstanding is managed by a drainage system.

There are several isolated areas of surface water flood risk through the site which are associated with shallow depressions and the interception ditches discussed in Section 3.1.3. The shallow depressions are likely to be removed as part of earthworks for the development of the site and will not be a present risk to the proposed development.

There is a surface water flow path through the southern parcel, as it is not proposed to develop the land south of Thornham Road, besides potential landscaping works, the risk from the surface water flow path is considered to be low.

Surface water flooding is likely to increase as a result of climate change in a similar ratio to fluvial flooding. Increased intensity and frequency of precipitation is likely to lead to reduced infiltration and increased overland flow. Climate change guidance was updated by the EA in May 2022. Revised allowances for climate change have been included in the indicative drainage strategy below.

The overall risk of surface water flooding at the site is considered to be **low** provided it can be shown that the central surface water flow path can be managed until further phases of development beyond Phase 1 can reduce the contributing areas of runoff to the flow path.

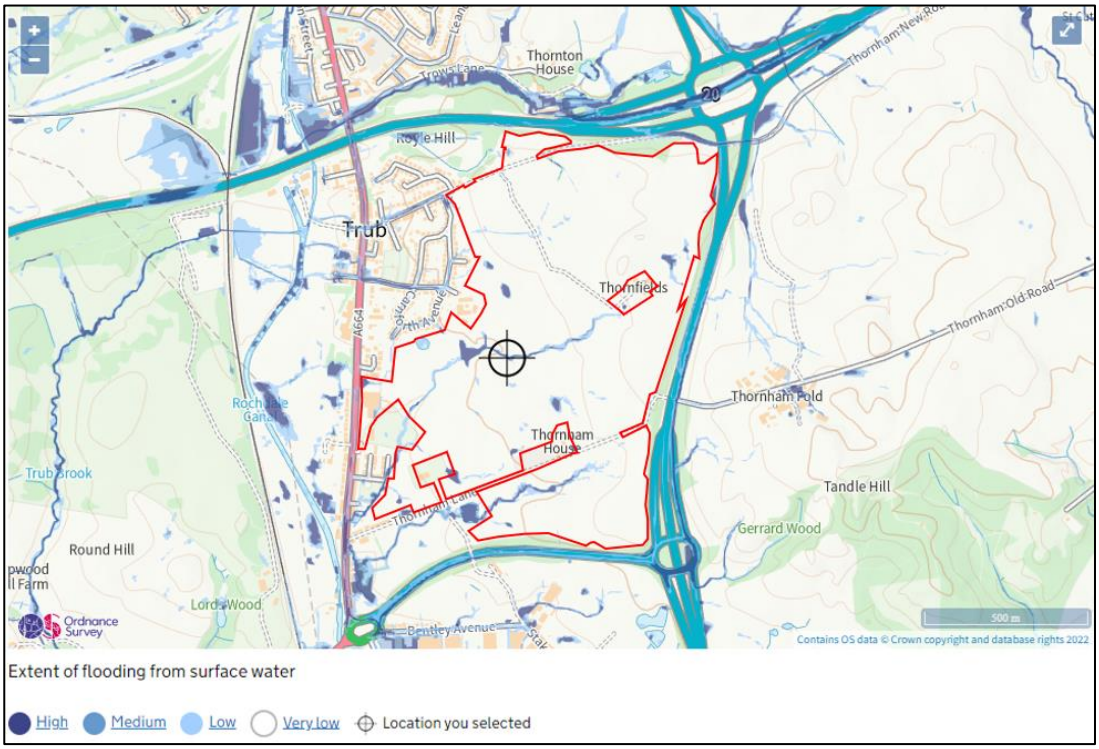


Figure 5.3: Environment Agency 'Flood risk from surface water' map (accessed November 2022

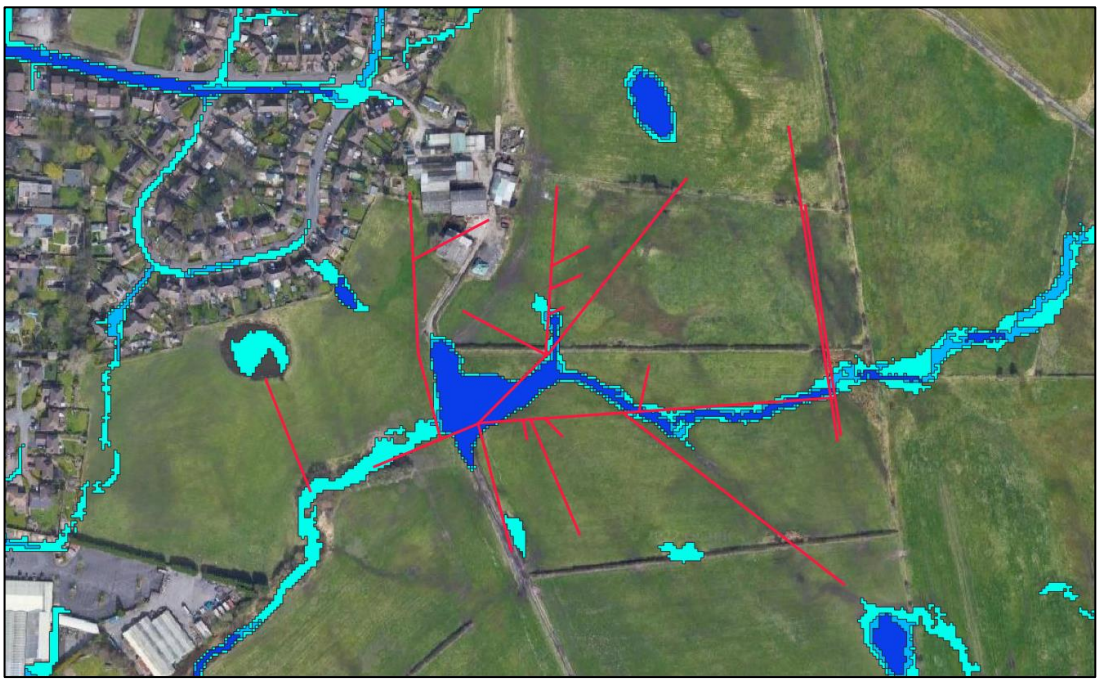


Figure 5.4: Environment Agency 'Flood risk from surface water' extents (blue shading) with potential land drain locations (red lines)

4.6 Flooding from groundwater

Groundwater flooding tends to occur after long periods of sustained high rainfall. Higher rainfall means more water will infiltrate into the ground and cause the water table to rise above normal levels. Groundwater tends to flow from areas where the ground level is high, to areas where the ground level is low. In low-lying areas the water table is usually at shallower depths anyway, but during very wet periods, with all the additional groundwater flowing towards these areas, the water table can rise up to the surface causing groundwater flooding.

The historical borehole log described in Section 3.2 notes that there is likely groundwater between 1.44mbgl – 2.0mbgl, however the borehole log was undertaken at an area lower than the site. Depths of the groundwater on site are unconfirmed without site specific testing.

The presence of springs onsite recorded by historical maps indicate perched or high groundwater. Given the geology of the site according to BGS mapping and the stratum described in the historical borehole log on Church Avenue, the presence of springs may be the result of superficial sand and gravel stratum over cohesive clay lenses preventing infiltration of groundwater.

The proposed development does not include any basement proposals. Therefore, aside from shallow foundations works, the proposals will have no material impact on the risk of

groundwater flooding both to and from the development. The resulting risk of groundwater flooding to the site is assessed as low.

Climate change could increase the risk of groundwater flooding as a result of increased precipitation filtering into the groundwater body. If winter rainfall becomes more frequent and heavier, groundwater levels may increase. Higher winter recharge may however be balanced by lower recharge during the predicted hotter and drier summers. This is less likely to cause a significant change to flood risk than from other sources, since groundwater flow is not as confined. It is probable that any locally perched aquifers may be more affected, but these are likely to be isolated. The change in flood risk is likely to be low.

The overall groundwater flood risk is considered to be **low**.

4.7 Flooding from sewers

Flooding from artificial drainage systems occurs when flow entering a system, such as an urban storm water drainage system, exceeds its conveyance capacity, the system becomes blocked or it cannot discharge due to a high water level in the receiving watercourse. A sewer flood is often caused by surface water drains discharging into the combined sewer systems; sewer capacity is exceeded in large rainfall events causing the backing up of floodwaters within properties or discharging through manholes.

Most adopted surface water drainage networks are designed to the criteria set out in DCG Sewerage Sector Guidance[5]. One of the design parameters is that sewer systems be designed such that no flooding of any part of the site occurs in a 1 in 30 year rainfall event. By definition a 1 in 100 year event would exceed the capacity of the surrounding sewer network as well as any proposed drainage.

Climate change is likely to result in an increase in flooding from sewers. Increased rainfall and more frequent flooding put existing sewer and drainage systems under additional pressure resulting in the potential for more frequent surcharging and potential flooding. This would increase the frequency of local sewer flooding but would not be significant in terms of the proposed development.

There are several sewers surrounding the site though these are limited to outside the western boundary. As the western boundary is generally the lowest area of the site then exceedance flow paths from sewer manholes are unlikely to flow any further into the site.

The resultant sewer flood risk is considered to be **very low**.

4.8 Flooding from reservoirs

Flood events can occur from a sudden release of large volumes of water from reservoirs, canals and artificial structures.

[5] Design and Construction Guidance Sewerage Sector Guidance, Appendix C, May 2021.

The EA reservoir flood map (reproduced as **Figure 5.5**) shows the largest area that might be flooded if a reservoir were to fail and release the water it holds. Since this is a prediction of a worst-case scenario, it is unlikely that any actual flood would be this large.

The EA mapping was updated in 2021 to demonstrate the potential maximum extent of flooding for two scenarios - a "dry day scenario" in which river levels are "normal", and a "wet day scenario" where the flooding from the reservoir coincides with flooding from rivers.

The EA mapping shows the site is outside of the area of flood risk from reservoirs.

Reservoir flooding is extremely unlikely. There has been no loss of life in the UK from reservoir flooding since 1925. Since then reservoir safety legislation has been introduced to ensure reservoirs are maintained.

Reservoirs can be managed over time, controlling inflow/outflow of water and therefore there is the capacity to control the effects of climate change. Increased rainfall has the potential to increase base flow, but this should be minimal. It is unlikely that there will be a substantial change to the risk of flooding for this site as a result of climate change.

The resultant flood risk is considered to be **very low**.

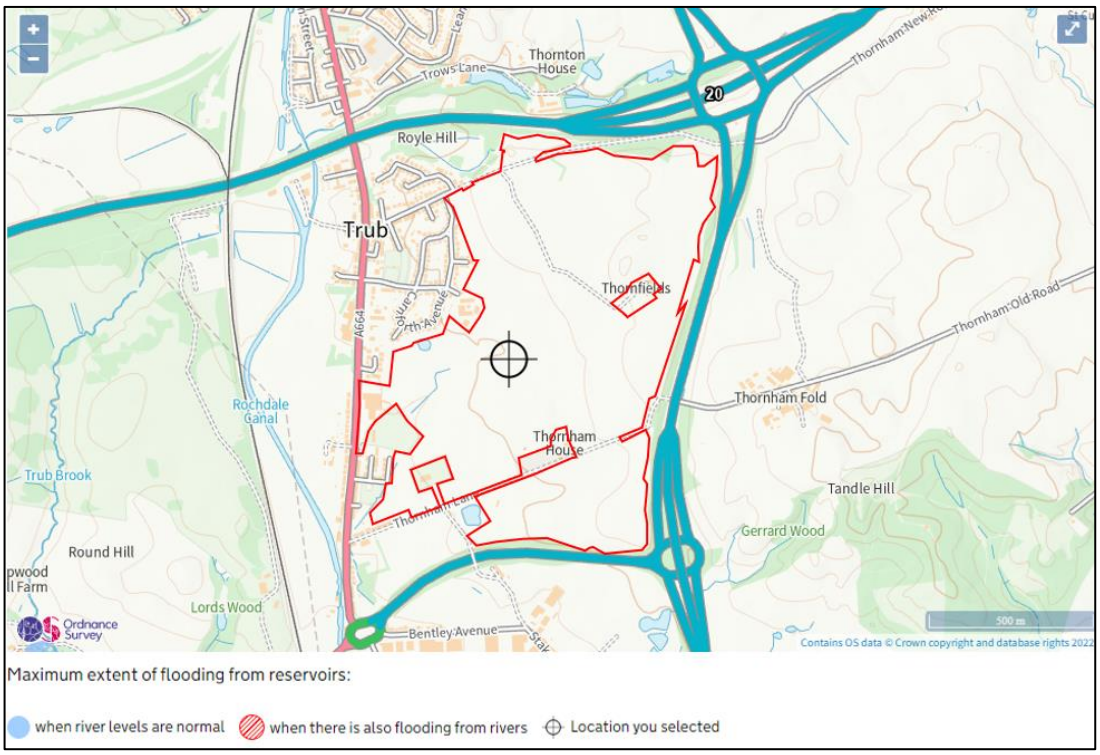


Figure 5.5: Environment Agency 'Flood risk from reservoirs' map

4.9 Other sources of flooding

4.9.1 Canals

The Rochdale Canal is outside of the western boundary of the site, and west of Rochdale Road. The canal flows north to south via a series of locks outside of the south-west of the site. A section of the canal is raised higher than Rochdale Road, though not higher than the site.

It is unlikely that flooding from the canal in the event of exceedance or a breach will be a flood risk to the site.

There are no other canals in the area therefore the flood risk from this source is considered **very low**.

4.9.2 Other artificial features

No other artificial features with the potential to result in a flood risk to the site have been identified.

5 FLOOD MITIGATION MEASURES

5.1 Overview

The developable area lies wholly within Flood Zone 1 and the risk of flooding from other sources is assessed as very low or low. To facilitate the development of the site a surface water drainage strategy has been designed, as discussed in Section 7.

5.2 Overland flow route

There is an overland surface water flow path through the centre of the site. The Phase 1 development encroaches onto the downstream extent of the flow path where the flows pond at the raised track. The development proposals should ensure that the ponding water does not result in flood risk to the development. It is recommended that the land drainage network which actively drains the surface water flow into the Dell is either maintained or realigned to suit the proposed development. Severing of the existing culvert could result in an increased frequency of flooding on the eastern side of the raised track until future phases of the development begin.

No further overland flow control measures are proposed as all surface water runoff up to the 1 in 100 year climate change storm will be stored on-site and discharged to the nearby watercourses. Surface flows may be generated due to drainage capacity exceedance, which can be conveyed into the SuDS features via surface flows along the new roads.

5.3 Finished floor levels

As the developable area will not be affected by fluvial flooding there is no need to incorporate any freeboard levels into the finished floor levels of the design. Low lying areas that could lead to ponding of surface flows will be avoided by careful design of finished levels.

It is recommended that finished floors levels are set a minimum of 150mm above the local ground level in line with best practice to mitigate against the risk of surface water runoff.

5.4 Easements

Under the Water Resources Act 1991 and associated byelaws, works in, over, under or adjacent to main rivers require the consent of the EA and works in, over, under or adjacent to ordinary watercourses will require IDB, Local Authority or LLFA consent. This is to ensure that they neither interfere with the EA/LLFA's work nor adversely affect the environment, fisheries, wildlife and flood defence in the locality.

It is recommended development proposals retain the Dell and provided an easement from the watercourse.

5.5 Safe access/egress

The developable area lies outside of the 1 in 1000 year fluvial flood extent, with the access road also located outside this flood extent, therefore safe access and egress will be available up to this storm event.

6 PLANNING CONTEXT

6.1 Land use vulnerability

Table 2 of the PPG indicates the compatibility of various land uses in each flood zone, dependent on their vulnerability to flooding. Table 6.1 below is reproduced from Table 2 of PPG.

Table 6.1: Flood risk vulnerability and flood zone 'compatibility'

Flood Risk Vulnerability Classification		Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone	Zone 1	Appropriate	Appropriate	Appropriate	**Appropriate**	Appropriate
	Zone 2	Appropriate	Appropriate	Exception Test Required	Appropriate	Appropriate
	Zone 3a	Exception Test Required	Appropriate	Should not be permitted	Exception Test Required	Appropriate
	Zone 3b functional floodplain	Exception Test Required	Appropriate	Should not be permitted	Should not be permitted	Should not be permitted

With reference to Table 2 of the PPG, the proposed development, based on its residential use, is classed as 'more vulnerable'. This classification of development is appropriate for areas within Flood Zone 1 and therefore appropriate for the subject site.

6.2 Sequential Test

The Sequential Test aims to direct new development to areas with the lowest probability of flooding. The developable area of the site has been identified as located within Flood Zone 1 with no other significant flooding issues from other. It is therefore considered the site would pass the Sequential Test.

6.3 Exception Test

In accordance with Table 6.1, there is no requirement to apply the Exception Test for a 'more vulnerable' development within Flood Zone 1.

7 SURFACE WATER DRAINAGE ASSESSMENT

7.1 Scope

In accordance with the Defra Non-Statutory Technical Standards[6], the surface water drainage strategy should seek to implement a SuDS hierarchy that aspires to achieve reductions in surface water runoff rates to greenfield rates. Where a reduction to the greenfield rate is not practicable, the proposed surface water drainage strategy should not exceed the existing runoff rate.

In addition, Building Regulations Part H[7] requires that the first choice of surface water disposal should be to discharge to an adequate soakaway or infiltration system, where practicable. If this is not reasonably practicable then discharge should be to a watercourse, the least favourable option being to a sewer (surface water before combined). Infiltration techniques should therefore be applied wherever they are appropriate.

This assessment includes an overview and comparison of the existing greenfield scenario and proposed development scenario.

7.2 Pre-development situation

The pro-rata IoH 124 method has been used to estimate the Greenfield surface water runoff for the site (88.50Ha), using the Windes Source Control Greenfield runoff rate estimation tool. Calculations are contained in **Appendix I**.

Table 7.1: IOH 124 surface water runoff (greenfield) (88.50Ha)

Return period	Peak flow (l/s)
QBar	609.7
1 in 1 year	530.5
1 in 30 year	1033.7
1 in 100 year	1268.2

[6] DEFRA, 'Sustainable Drainage Systems - Non-statutory technical standards for sustainable drainage systems', March 2015.

[7] HM Government (2010 with 2013 amendments), 'The Building Regulations 2010: Approved Document H - Drainage and Waste Disposal (2002 Edition incorporating 2010 amendments)'.

Additionally the runoff rates have been calculated for 1ha which can be used pro-rata for the developable areas of proposed development and provide an estimate of greenfield runoff rates. Calculations are contained in **Appendix J**.

Table 7.2: IOH 124 surface water runoff (greenfield) (1Ha)

Return period	Peak flow (l/s/ha)
QBar	7.3
1 in 1 year	6.3
1 in 30 year	12.3
1 in 100 year	15.1

The rate of 7.3l/s per hectare of developable land has been agreed as an acceptable rate (for Phase 1) as per correspondence in the LLFA response in **Appendix H**.

7.3 Off-site discharge options and limits

The proposed development is for a residential end use. This will result in an increase in impermeable area and surface water runoff across the site. It will therefore be necessary to manage surface water on-site through conveyance towards the proposed point of discharge, whilst providing sufficient attenuation for all events up to the 1 in 100 year event inclusive of 45% climate change.

7.3.1 Point of discharge

Discharge options from the site have been considered in line with the SuDS hierarchy, as follows.

Infiltration

Infiltration should be considered as the primary option to discharge surface water from the developed study area. The effectiveness of infiltration is completely dependent on the physical conditions at the study area. Potential obstacles include:

- Local variations in permeability preventing infiltration - It is understood from the online geological mapping that the site is underlain with till. Anecdotally, the land owner has confirmed the sands at the northern section of the site have been removed as part of historic quarrying of the sand at the north of the site. The till geology is likely to be of a cohesive nature owing to clay lenses and likely to exhibition poor percolation rates;
- Shallow groundwater table - For infiltration drainage devices, Building Regulation approved document H states that these *"should not be built in ground where the water table reaches the bottom of the device at any time of the year"*. The nearby borehole log suggested groundwater close to the surface groundwater, albeit the borehole was recorded on land with a lower topographic elevation than the site;
- Source Protection Zones - The study area is not located within a Groundwater Source Protection Zone.

From the information available it would seem unlikely that infiltration can be considered a viable option as part of the drainage strategy.

Discharge to watercourse

There is a watercourse (the Dell) located within the site boundary which can be used to discharge surface water runoff to.

The existing development area of Phase 1 is shown to clearly drain to the Dell via topographic falls towards the western boundary.

The surface water flow path and land drainage evidenced in this report would suggest that contributing areas to the surface water flow path from future phases also discharge to the Dell.

It is recommended in the LLFA correspondence (**Appendix H**) that discharge to the Dell should be limited to the downstream extent of the cricket grounds culvert where possible due the unreliability of the culverts for flow conveyance.

The LLFA correspondence notes that careful consideration needs to be given to the discharge rates due to the frequent flooding of Rochdale Road and Thornham Road caused by the culvert below Hopwood farm house land.

Discharge to surface water sewer

There are no surface water sewers present which could be discharged to.

7.4 Post-development situation

It is proposed to provide a surface water drainage strategy which will closely mimic the pre-development surface water drainage of the site. Therefore, following the suitable options on the SuDS Hierarchy, surface water discharge from the site will be to on site watercourse (the Dell).

7.4.1 Discharge Rate

It is proposed to limit discharge from the site the Phase 1 development to 7.3l/s per developable hectare in line with an agreed rate with the LLFA which will restrict runoff to greenfield runoff rates. Surface water discharge will be to the Dell.

Future phases of development will discharge to the Dell at greenfield runoff rates. Rates are to be finalised following more detailed layout proposals.

7.4.2 Proposed drainage strategy

The proposed drainage strategy is outlined within **Appendix F**. The drainage strategy shows attenuation will be provided in a series of basins across the site on the periphery of development parcels. The indicative drawing shows the basins will include for a permanent water level to increase amenity value.

Discharge from the basins will be to the central onsite watercourse at rates outline above.

Due to the ground levels, the surface water drainage at the site access is shown to drain to a proposed culvert within Manchester Road and flow southwards to a connection point at an existing culvert manhole.

8 CONCLUSIONS AND RECOMMENDATIONS

This FRA complies with the NPPF and Planning Practice Guidance and demonstrates that flood risk from all sources has been considered in the proposed development. It is also consistent with the Local Planning Authority requirements with regard to flood risk.

The proposed development site lies in an area designated by the EA as Flood Zone 1, and is outlined to have a chance of flooding of less than 1 in 1,000 (<0.1%) in any year.

The NPPF sets out a Sequential Test, which states that preference should be given to development located within Flood Zone 1 and at the lowest risk of flooding from all sources. This FRA demonstrates that the requirements of the Sequential Test have been met. The proposed development is classified as 'more vulnerable' and therefore considered appropriate within Flood Zone 1 without application of the Exception Test.

This FRA has considered multiple sources of flooding and concluded the following:

Table 8.1: Flood risk summary

Source	Level of risk	Mitigation
Fluvial (Main River)	Very Low	Developable area is shown to be wholly within Flood Zone 1.
Fluvial (Ordinary)	Low	Areas of the site close to the lower level western boundary may be subject to flooding, this is thought to be exacerbated by culverting of the watercourse in several locations. The proposed development is unlikely to be at risk of flooding.
Tidal	Very Low	The site is inland and elevated.
Surface water	Very Low - Low	The central surface water flow path may impact on the eastern extents of the Phase 1 development until future phases of development reduce the contributing catchment to the surface water flow path. Consideration needs to be given to the floor levels and maintaining the land drainage at the raised track.
Groundwater	Low	Groundwater levels may be close to the surface but unlikely to be a risk to the proposed development.
Sewers	Very Low	Sewer records indicate sewer are located west of the site on lower ground.

Source	Level of risk	Mitigation
Reservoir	Very Low	The site is not within an area of reservoir flooding.
Other sources	Very Low	There are no confirmed sources of artificial flood risk.

The proposals will follow best practice regarding site drainage to ensure that any surface water runoff from the development is managed, ensuring flood risk is not increased elsewhere.

In order to prevent flooding on site attenuation and controlled discharge will be utilised to control surface water flows to greenfield rates. These features will be designed to store the volume of water associated with a 1 in 100-year rainfall event, plus an additional allowance to account for increased rainfall due to climate change.

Overall, taking into account the above points, the development of the site should not be precluded on flood risk grounds.

APPENDIX A
RSK GROUP SERVICE CONSTRAINTS

1. This report and the drainage design carried out in connection with the report (together the "Services") were compiled and carried out by RSK LDE Ltd (RSK) for Redrow (the "client") in accordance with the terms of a contract between RSK and the "client" dated August 2022. The Services were performed by RSK with the skill and care ordinarily exercised by a reasonable civil engineer at the time the Services were performed. Further, and in particular, the Services were performed by RSK taking into account the limits of the scope of works required by the client, the time scale involved and the resources, including financial and manpower resources, agreed between RSK and the client.

2. Other than that expressly contained in paragraph 1 above, RSK provides no other representation or warranty whether express or implied, in relation to the Services.

3. Unless otherwise agreed in writing, the Services were performed by RSK exclusively for the purposes of the client. RSK is not aware of any interest of or reliance by any party other than the client in or on the Services. Unless expressly provided in writing, RSK does not authorise, consent or condone any party other than the client relying upon the Services. Should this report or any part of this report, or otherwise details of the Services or any part of the Services be made known to any such party, and such party relies thereon that party does so wholly at its own and sole risk and RSK disclaims any liability to such parties. Any such party would be well advised to seek independent advice from a competent environmental consultant and/or lawyer.

4. It is RSK's understanding that this report is to be used for the purpose described in the introduction to the report. That purpose was a significant factor in determining the scope and level of the Services. Should the purpose for which the report is used, or the proposed use of the site change, this report may no longer be valid and any further use of or reliance upon the report in those circumstances by the client without RSK's review and advice shall be at the client's sole and own risk. Should RSK be requested to review the report after the date of this report, RSK shall be entitled to additional payment at the then existing rates or such other terms as agreed between RSK and the client.

5. The passage of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the report inaccurate or unreliable. The information and conclusions contained in this report should not be relied upon in the future without the written advice of RSK. In the absence of such written advice of RSK, reliance on the report in the future shall be at the client's own and sole risk. Should RSK be requested to review the report in the future, RSK shall be entitled to additional payment at the then existing rate or such other terms as may be agreed between RSK and the client.

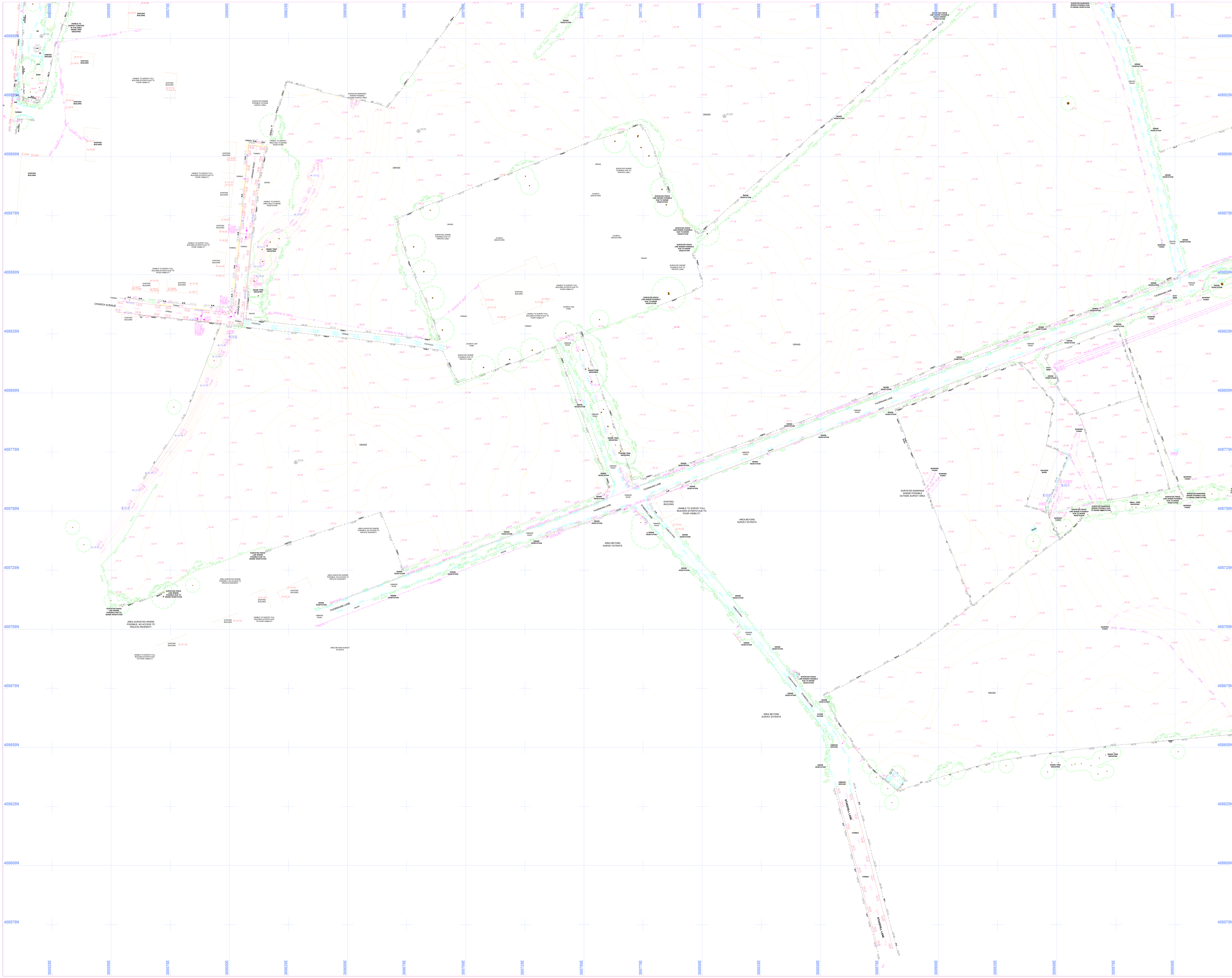
6. The observations and conclusions described in this report are based solely upon the Services, which were provided pursuant to the agreement between the client and RSK. RSK has not performed any observations, investigations, studies or testing not specifically set out or required by the contract between the client and RSK. RSK is not liable for the existence of any condition, the discovery of which would require performance of services not otherwise contained in the Services. For the avoidance of doubt, unless otherwise expressly referred to in the introduction to this report, RSK did not seek to evaluate the presence on or off the site of asbestos, electromagnetic fields, lead paint, heavy metals, radon gas or other radioactive or hazardous materials.

7. The Services are based upon RSK's observations of existing physical conditions at the site gained from a walk-over survey of the site together with RSK's interpretation of information including documentation, obtained from third parties and from the client on the history and usage of the site. The Services are also based on information and/or analysis provided by independent testing and information services or laboratories upon which RSK was reasonably entitled to rely. The Services clearly are limited by the accuracy of the information, including documentation, reviewed by RSK and the observations possible at the time of the walk-over survey. Further RSK was not authorised and did not attempt to independently verify the accuracy or completeness of information, documentation or materials received from the client or third parties, including laboratories and information services, during the performance of the Services. RSK is not liable for any inaccurate information or conclusions, the discovery of which inaccuracies required the doing of any act including the gathering of any information which was not reasonably available to RSK and including the doing of any independent investigation of the information provided to RSK save as otherwise provided in the terms of the contract between the client and RSK.

8. The phase II or intrusive environmental site investigation aspects of the Services is a limited sampling of the site at pre-determined borehole and soil vapour locations based on the operational configuration of the site. The conclusions given in this report are based on information gathered at the specific test locations and can only be extrapolated to an undefined limited area around those locations. The extent of the limited area depends on the soil and groundwater conditions, together with the position of any current structures and underground facilities and natural and other activities on site. In addition chemical analysis was carried out for a limited number of parameters [as stipulated in the contract between the client and RSK] [based on an understanding of the available operational and historical information,] and it should not be inferred that other chemical species are not present.

9. Any site drawing(s) provided in this report is (are) not meant to be an accurate base plan, but is (are) used to present the general relative locations of features on, and surrounding, the site. Features (boreholes, trial pits etc) annotated on site plans are not drawn to scale but are centred over the appropriate location. Such features should not be used for setting out and should be considered indicative only.

APPENDIX B
TOPOGRAPHIC SURVEY



N
W E
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SURVEY ORIENTATED TO OS GRID (OSGB36-15)

SURVEY LEGEND

FEATURES

- TOP OF BANK
- BOTTOM OF BANK
- SURVEY STATION
- TREE
- HEDGE
- TREE CANOPY
- BUSHES
- VEGETATION

BOUNDARY ANNOTATIONS

BARB WIRE FENCE	BW.F
CHAIN LINK FENCE	C/L.F
CONC POST AND PANEL	CP&P.F
CONC POST TIMB PANEL	CP&TP.F
ELECTRIC FENCE	EL.F
HERAS FENCE	HER.F
IRON RAIL FENCE	IR.F
KNEE RAIL FENCE	KR.F
MISCELLANEOUS FENCE	MISC.F
POST AND WIRE FENCE	P&W.F
RANCH STYLE FENCE	RS.F
SECURITY FENCE	SEC.F
TIMBER FENCE	T.F
BRICK WALL	B.W
BLOCK WALL	BL.W
CONCRETE WALL	C.W
GABIEN WALL	G.W
MISCELLANEOUS WALL	MISC.W
RETAINING WALL	R.W
RETAINING LOG WALL	RL.W
STONE WALL	S.W

LEVEL PREFIX ANNOTATIONS

ASL	ARCH SPRING LEVEL
BL	BED LEVEL
BD	BACK DROP
CL	COVER LEVEL
DH	TOP OF DOOR
DTC	DEPTH TO CROWN
FFL	FINISHED FLOOR LEVEL
IL	INVERT LEVEL
PL	PARAPET LEVEL
RL	ROOF/RIDGE LEVEL
SL	SOFFIT LEVEL
TOF	TOP OF FENCE
TOP	TOP OF PIPE
TOW	TOP OF WALL
TRH	TREE HEIGHT
THR	THRESHOLD LEVEL
WL	WATER LEVEL
WS	WINDOW SILL
WSF	WINDOW SOFFIT

SURVEY ANNOTATIONS

AV	AIR VALVE
B	BOLLARD
BS	BUS STOP
BT	BRITISH TELECOM IC
CPS	CONCRETE PAVING SLABS
CP	CATCH PIT
DR	DRAIN
EB	ELECTRIC CONTROL BOX
EL	ELECTRICAL IC
EP	ELECTRICITY POLE
ER	EARTH ROD
FH	FIRE HYDRANT
FP	FLAG POLE
G	GULLY
GH	GREENHOUSE
GP	GATE POST
GV	GAS VALVE
IC	INSPECTION COVER
JB	JUNCTION BOX
JKW	JAPANESE KNOT WEED
KO	KERB OUTLET
LH	LAMP HOLE
LP	LAMP POST/LIGHT COLUMN
MH	MANHOLE
MP	MONITOR POINT
NP	NAME PLATE
OHC	OVERHEAD CABLES
PB	POST BOX
PM	PARKING METER
PS	POST
PYL	ELECTRICITY PYLON
RE	RODDING EYE
RS	ROAD SIGN
RWP	RAIN WATER PIPE
ST	STOP TAP
SM	SERVICE MARKER
SP	SIGN POST
SV	STOP VALVE / SLUICE VALVE
SVP	SOIL VENT PIPE
TB	TELEPHONE BOX
TL	TRAFFIC LIGHTS
TM	TELEPHONE MAST
TP	TELEGRAPH POLE
TPS	TACTILE PAVING SLABS
VP	VENT PIPE
WM	WATER METER
WO	WASH OUT
UTL	UNABLE TO LIFT
UTS	UNABLE TO SURVEY

GEOTECHNICAL INFORMATION

TRIAL HOLE / PIT	TH
BORE HOLE	BH
WINDOW SAMPLE	WS
MONITORING POINT	MP
PROBE HOLE	PH

DISCLAIMER:

ONLY MANHOLES AND SERVICES SHOWN WERE VISIBLE AT THE TIME OF SURVEY.

MAN ENTRY TO SEWERS HAS NOT BEEN UNDERTAKEN, DEPTHS, PIPESIZES ETC ARE MEASURED FROM GROUND LEVEL.

DRAINAGE INFORMATION MUST BE CHECKED AND VERIFIED PRIOR TO ANY WORK COMMENCING.

BOUNDARIES SHOWN ARE PHYSICAL AND MAY NOT REPRESENT LEGALLY CONVEYED OWNERSHIP.

TREE SPREADS ARE SYMBOLIC ONLY AND ARE REPRESENTATIVE OF THE AVERAGE SPREAD, THE TREE CANOPY LAYER DENOTES THE TREES EXTREMITY.

SURVEY NOTES

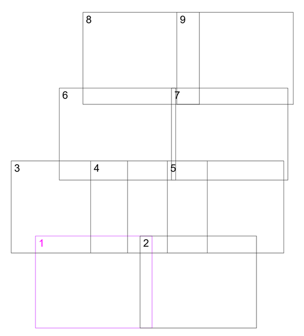
ALL LEVELS ARE RELATED TO O.S DATUM (OSGB36-15)
ESTABLISHED AT SE1 USING THE LEICA SMARTNET GPS NETWORK

SURVEY STATIONS

Name	Easting	Northing	Height
JLP3	388515.361	409056.102	136.906
JLP4	388506.061	409113.493	137.730
SE100	388555.825	409114.292	138.312
SE100A	388535.318	409137.996	137.290
SE101	388610.101	409105.572	139.691
SE102	388655.748	409091.445	141.149
SE103	388622.476	409074.464	140.117
SE104	388595.781	409060.886	139.082
SE105	388577.929	409043.503	138.661
SE106	388556.724	409049.396	138.347
SE107	388532.802	409049.557	137.993
SE107A	388518.736	409057.467	137.339
SE108	388534.959	409006.697	137.397
SE109	388520.522	408951.012	136.335

SURVEY STATIONS

Name	Easting	Northing	Height
CT1A	389482.335	409798.138	172.464
CT2A	388690.234	409010.898	140.259
CT3A	388618.508	409224.043	144.482
SE22A	388628.092	408770.621	135.266
SE22B	388679.971	408910.823	140.134
SE22B1	388809.400	408917.121	142.037
SE22C	388692.317	409051.544	140.275
SE22D	388719.907	409071.468	141.335
SE22E	388735.327	409086.867	141.889
SE22F	388762.280	409114.534	143.901
SE22G	388775.412	409137.625	144.719
SE22H	388776.138	409157.310	146.396
SE22I	388795.170	409167.539	147.503
SE22J	388821.878	409175.446	148.438
SE22L	388926.849	409428.459	157.917
SE22M	388774.428	409243.694	149.380
SE22N	388879.533	409524.183	157.533
SE22P	388882.561	409464.231	156.659
SE23	389065.931	408870.666	151.884
SE24	389399.772	408994.334	168.400
SE25	389436.611	409093.778	171.186
SE27	389401.722	409447.231	173.364
SE27A	389365.539	409415.804	172.582
SE30	388842.412	409747.884	159.070
SE31	388783.695	409720.398	155.482



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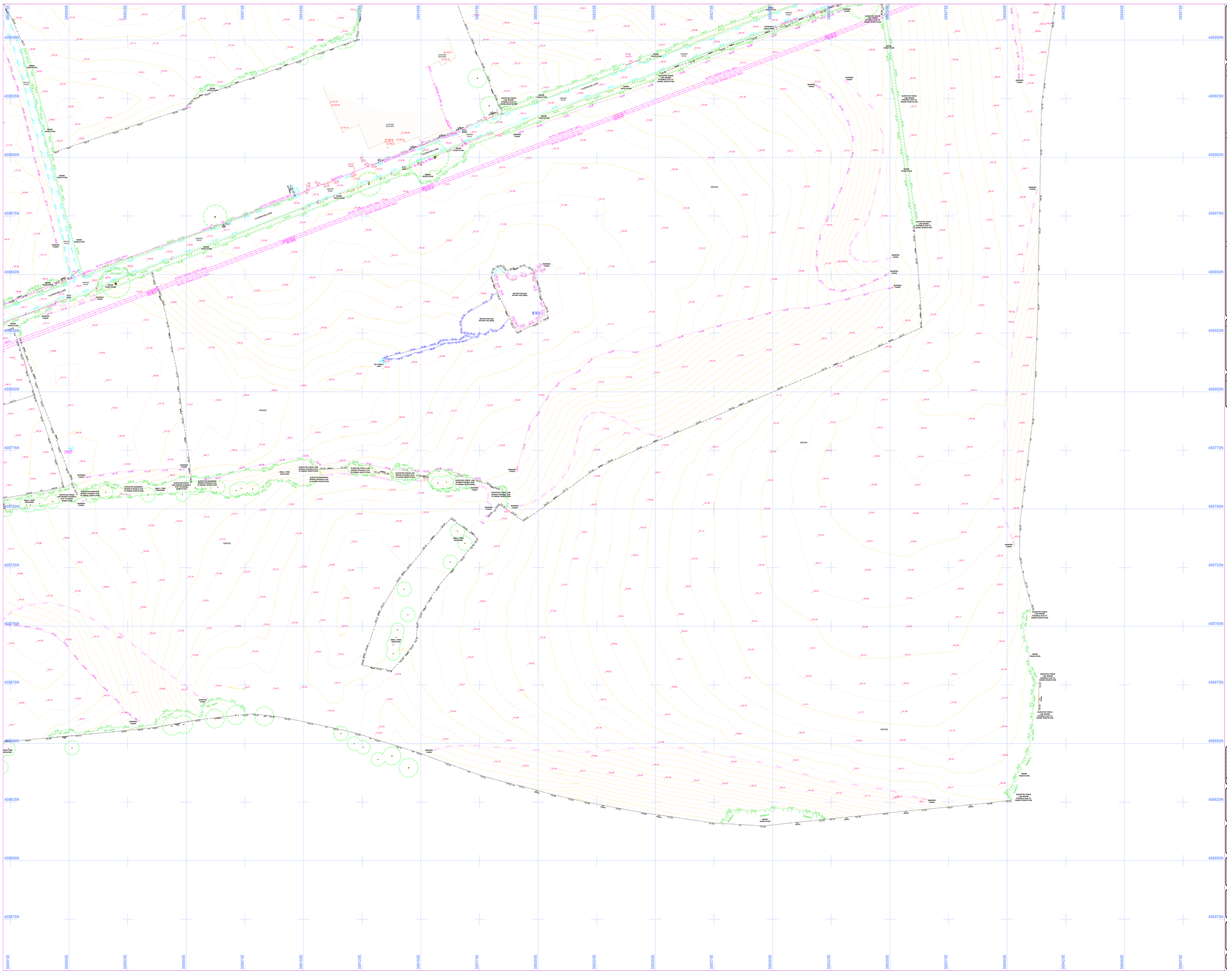
SurveyEng Ltd
Land Surveyors & Engineers
14 GREEN MILL
WESTHOUGHTON
BOLTON
LANCS
BL5 3GE
TEL/FAX: 0800 772 3040
MOB: 07850069993
info@surveyeng.co.uk

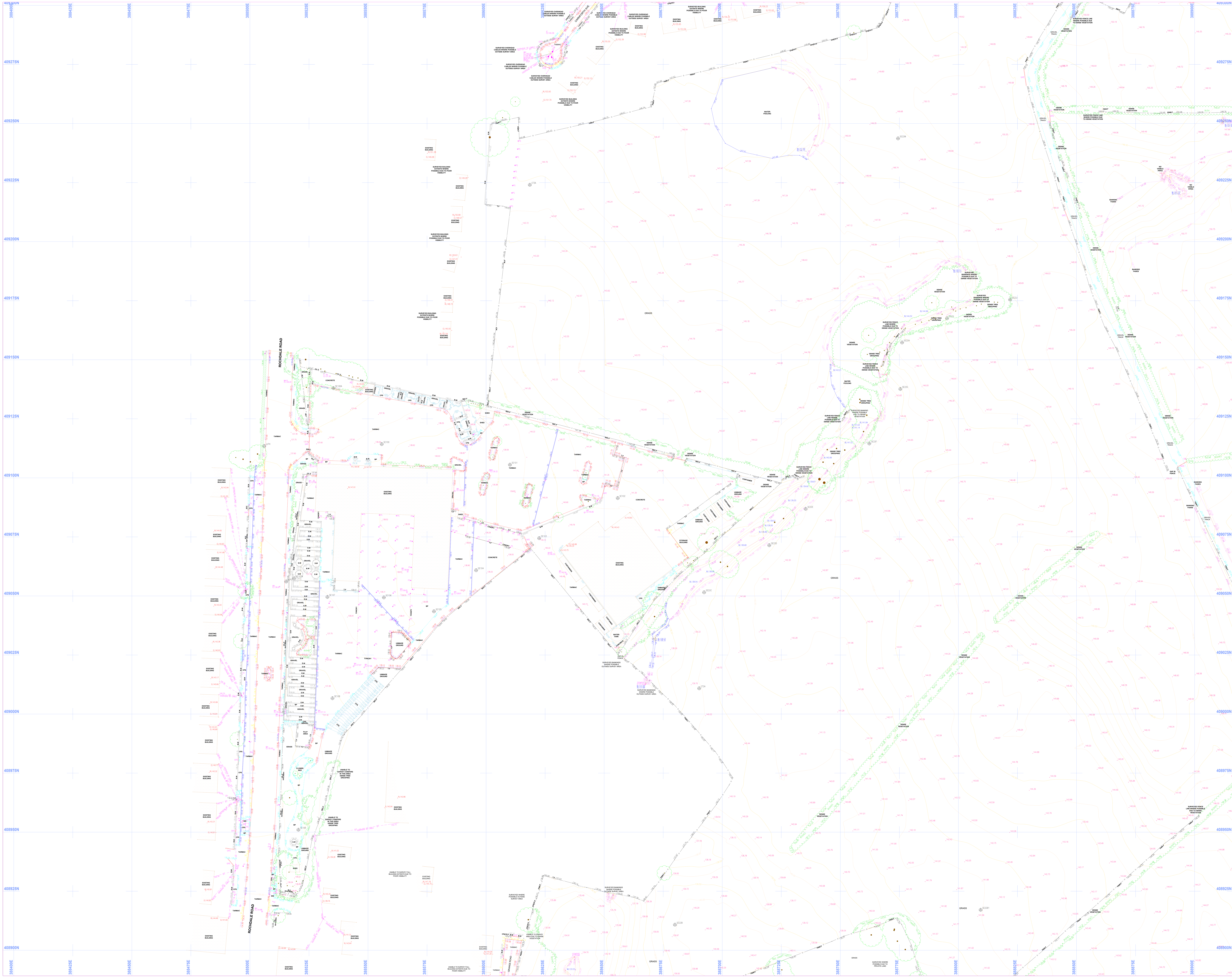
CLIENT
REDROW

PROJECT TITLE
ROCHDALE ROAD, MIDDLETON

DRAWING DETAIL
TOPOGRAPHICAL LAND SURVEY
SHEET 1 OF 9

PROJECT ENGINEER	MM/DS	DATE	19.03.2021
DRAWN	DH/DS	SCALE	1:500@A0
DRAWING NUMBER	RH.TS.21	REVISION	A


N
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S
SURVEY ORIENTATED TO OS GRID (OSGB36-15)
SURVEY LEGEND
FEATURES
TOP OF BANK
BOTTOM OF BANK
SURVEY STATION
TREE
HEDGE
TREE CANOPY
BUSHES
VEGETATION
SURVEY ANNOTATIONS
AV AIR VALVE
B BOLLARD
BS BUS STOP
BT BRITISH TELECOM IC
CPS CONCRETE PAVING SLABS
CP CATCH PIT
DR DRAIN
EB ELECTRIC CONTROL BOX
EL ELECTRICAL IC
ES ELECTRICITY POLE
ER EARTH ROD
FH FIRE HYDRANT
FP FLAG POLE
G GULLY
GH GREENHOUSE
GP GATE POST
GV GAS VALVE
IC INSPECTION COVER
JB JUNCTION BOX
JKW JAPANESE KNOT WEED
KO KERB OUTLET
LH LAMP HOLE
LP SERVICE/STREET/LIGHT COLUMN
MH MANHOLE
MP MONITOR POINT
NP NAME PLATE
OHC OVERHEAD CABLES
PB POST BOX
PM PARKING METER
PS POST
PYL ELECTRICITY PYLON
RE RODDING EYE
RS ROAD SIGN
RWP RAIN WATER PIPE
ST STOP TAP
SM SERVICE MARKER
SP STOP POST
SV STOP VALVE / SLUICE VALVE
SVP SOIL VENT PIPE
TB TELEPHONE BOX
TL TRAFFIC LIGHTS
TM TELEPHONE MAST
TP TELEGRAPH POLE
TPS TACTILE PAVING SLABS
VP VENT PIPE
WM WATER METER
WO WASH OUT
UTL UNABLE TO LIFT
UTS UNABLE TO SURVEY
BOUNDARY ANNOTATIONS
BARB WIRE FENCE BW.F
CHAIN LINK FENCE C/L.F
CONC POST AND PANEL CP&P.F
CONC POST TIMB PANEL CP&TP.F
ELECTRIC FENCE EL.F
HERAS FENCE HER.F
IRON RAIL FENCE IR.F
KNEE RAIL FENCE K/R.F
MISCELLANEOUS FENCE MISC.F
POST AND WIRE FENCE P&W.F
RANCH STYLE FENCE R/S.F
SECURITY FENCE SEC.F
TIMBER FENCE T.F
BRICK WALL B.W
BLOCK WALL BL.W
CONCRETE WALL C.W
GABION WALL G.W
MISCELLANEOUS WALL MISC.W
RETAINING WALL R.W
RETAINING LOG WALL RL.W
STONE WALL S.W
LEVEL PREFIX ANNOTATIONS
ASL ARCH SPRING LEVEL
BL BED LEVEL
BD BACK DROP
CL COVER LEVEL
DH TOP OF DOOR
DTC DEPTH TO CROWN
EL ELECTRICAL CONDUIT LEVEL
IL INVERT LEVEL
PL PARAPET LEVEL
RL ROOF/RIDGE LEVEL
SL SOFFIT LEVEL
TOF TOP OF FENCE
TOP TOP OF PIPE
TOW TOP OF WALL
TRH TREE HEIGHT
THR THRESHOLD LEVEL
WL WATER LEVEL
WS WINDOW SILL
WSF WINDOW SOFFIT
GEOTECHNICAL INFORMATION
TRIAL HOLE / PIT TH
BORE HOLE BH
WINDOW SAMPLE WS
MONITORING POINT MP
PROBE HOLE PH
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SURVEY NOTES
ALL LEVELS ARE RELATED TO O.S DATUM (OSGB36-15)
ESTABLISHED AT SE1 USING THE LEICA SMARTNET GPS NETWORK
SURVEY STATIONS
Name | Easting | Northing | Height
JUP3 | 388515.361 | 409056.122 | 136.906
JUP4 | 388506.081 | 409113.483 | 137.730
SE1CP | 388535.048 | 409127.596 | 137.290
SE1DA | 388535.518 | 409137.896 | 131.290
SE101 | 388610.101 | 409155.572 | 139.691
SE102 | 388655.748 | 409081.445 | 141.148
SE103 | 388622.476 | 409074.464 | 140.117
SE104 | 388595.781 | 409060.856 | 139.092
SE105 | 388577.929 | 409043.592 | 138.641
SE106 | 388556.724 | 409049.396 | 138.347
SE107 | 388518.802 | 409048.512 | 137.833
SE107A | 388518.829 | 409057.467 | 137.839
SE108 | 388534.959 | 409065.667 | 137.397
SE109 | 388520.522 | 409051.012 | 136.335
SURVEY STATIONS
Name | Easting | Northing | Height
CT1A | 389462.335 | 409798.138 | 172.464
CT2A | 388690.234 | 409610.896 | 140.259
CT3A | 388618.508 | 409224.043 | 144.482
SE22A | 388628.092 | 408770.821 | 135.266
SE22B | 388679.971 | 408910.823 | 140.134
SE22BT | 388609.400 | 408977.123 | 142.037
SE22C | 388662.317 | 409051.344 | 140.275
SE22D | 388718.907 | 409091.468 | 141.885
SE22E | 388757.280 | 409116.564 | 143.301
SE22F | 388782.280 | 409114.534 | 143.901
SE22G | 388775.412 | 409137.625 | 144.719
SE22H | 388776.138 | 409157.310 | 146.396
SE22I | 388795.170 | 409167.539 | 147.503
SE22J | 388821.878 | 409175.446 | 148.438
SE22L | 388926.849 | 409428.459 | 157.917
SE22M | 388774.428 | 409243.894 | 149.320
SE22N | 388819.533 | 409324.183 | 154.659
SE23 | 389065.931 | 408870.666 | 151.884
SE24 | 389399.772 | 408994.334 | 168.400
SE25 | 389436.611 | 409093.778 | 171.186
SE27 | 389401.722 | 409447.231 | 173.364
SE27A | 389365.539 | 409413.804 | 172.582
SE30 | 388842.412 | 409747.884 | 159.070
SE31 | 389783.695 | 409725.398 | 155.482
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REV | DESCRIPTION | DATE | DRWN | APPR
A | TOPO SURVEY UPDATED | 21.01.22 | DH/MP
SurveyEng Ltd
Land Surveyors & Engineers
14 GREEN MILL
WESTHOUGHTON
BOLTON
LANCS
BL5 3GE
TEL/FAX: 0800 772 3040
MOB: 07850066983
info@surveyeng.co.uk
CLIENT
REDROW
PROJECT TITLE
ROCHDALE ROAD, MIDDLETON
DRAWING DETAIL
TOPOGRAPHICAL LAND SURVEY
SHEET 2 OF 9
PROJECT ENGINEER MM/DS
DRAWN DH/DS
DATE 19.03.2021
SCALE 1:500@A0
DRAWING NUMBER RH.TS.21
REVISION A



N
W E
S

SURVEY ORIENTATED TO OS GRID (OSGB36-15)

SURVEY LEGEND

FEATURES

- TOP OF BANK
- BOTTOM OF BANK
- SURVEY STATION
- TREE
- HEDGE
- TREE CANOPY
- BUSHES
- VEGETATION

BOUNDARY ANNOTATIONS

BARB WIRE FENCE	BW.F
CHAIN LINK FENCE	C/L.F
CONC POST AND PANEL	CP&P.F
CONC POST TIMB PANEL	CP&TP.F
ELECTRIC FENCE	EL.F
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KNEE RAIL FENCE	KR.F
MISCELLANEOUS FENCE	MISC.F
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RANCH STYLE FENCE	RS.F
SECURITY FENCE	SEC.F
TIMBER FENCE	T.F
BRICK WALL	B.W
BLOCK WALL	BL.W
CONCRETE WALL	C.W
GABIEN WALL	G.W
MISCELLANEOUS WALL	MISC.W
RETAINING WALL	R.W
RETAINING LOG WALL	RL.W
STONE WALL	S.W

LEVEL PREFIX ANNOTATIONS

ASL	ARCH SPRING LEVEL
BL	BED LEVEL
BD	BACK DROP
CL	COVER LEVEL
DH	TOP OF DOOR
DTC	DEPTH TO CROWN
FFL	FINISHED FLOOR LEVEL
IL	INVERT LEVEL
PL	PARAPET LEVEL
RL	ROOF/RIDGE LEVEL
SL	SOFFIT LEVEL
TOF	TOP OF FENCE
TOP	TOP OF PIPE
TOW	TOP OF WALL
TRH	TREE HEIGHT
THR	THRESHOLD LEVEL
WL	WATER LEVEL
WS	WINDOW SILL
WSF	WINDOW SOFFIT

SURVEY ANNOTATIONS

AV	AIR VALVE
B	BOLLARD
BS	BUS STOP
BT	BRITISH TELECOM IC
CPS	CONCRETE PAVING SLABS
CP	CATCH PIT
DR	DRAIN
EB	ELECTRIC CONTROL BOX
EL	ELECTRICAL IC
EP	ELECTRICITY POLE
ER	EARTH ROD
FH	FIRE HYDRANT
FP	FLAG POLE
G	GULLY
GH	GREENHOUSE
GP	GATE POST
GV	GAS VALVE
IC	INSPECTION COVER
JB	JUNCTION BOX
JKW	JAPANESE KNOT WEED
KO	KERB OUTLET
LH	LAMP HOLE
LP	LAMP POST/LIGHT COLUMN
MH	MANHOLE
MP	MONITOR POINT
NP	NAME PLATE
OHC	OVERHEAD CABLES
PB	POST BOX
PM	PARKING METER
PS	POST
PYL	ELECTRICITY PYLON
RE	RODDING EYE
RS	ROAD SIGN
RWP	RAIN WATER PIPE
ST	STOP TAP
SM	SERVICE MARKER
SP	SIGN POST
SV	STOP VALVE / SLUICE VALVE
SVP	SOIL VENT PIPE
TB	TELEPHONE BOX
TL	TRAFFIC LIGHTS
TM	TELEPHONE MAST
TP	TELEGRAPH POLE
TPS	TACTILE PAVING SLABS
VP	VENT PIPE
WM	WATER METER
WO	WASH OUT
UTL	UNABLE TO LIFT
UTS	UNABLE TO SURVEY

GEOTECHNICAL INFORMATION

- TRIAL HOLE / PIT — TH
- BORE HOLE — BH
- WINDOW SAMPLE — WS
- MONITORING POINT — MP
- PROBE HOLE — PH

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SURVEY NOTES

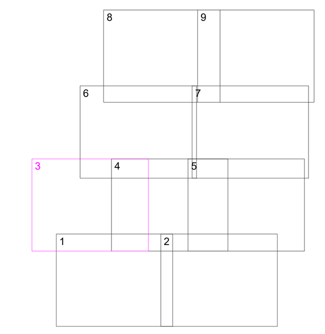
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ESTABLISHED AT SE1 USING THE LEICA SMARTNET GPS NETWORK

SURVEY STATIONS

Name	Easting	Northing	Height
JLP3	388515.361	409056.102	136.906
JLP4	388506.061	409113.493	137.730
SE100	388555.825	409114.292	138.312
SE100A	388535.318	409137.996	137.290
SE101	388610.101	409105.572	139.691
SE102	388655.748	409091.445	141.149
SE103	388622.476	409074.464	140.117
SE104	388595.781	409060.886	139.082
SE105	388577.929	409043.503	138.661
SE106	388556.724	409049.396	138.347
SE107	388532.802	409049.557	137.993
SE107A	388518.736	409057.467	137.339
SE108	388534.959	409006.697	137.397
SE109	388520.522	408951.012	136.335

SURVEY STATIONS

Name	Easting	Northing	Height
CT1A	389482.335	409798.138	172.464
CT2A	388690.234	409010.898	140.259
CT3A	388618.508	409224.043	144.482
SE22A	388628.092	408770.621	135.266
SE22B	388679.971	408910.823	140.134
SE22B1	388809.400	408917.121	142.037
SE22C	388692.317	409051.544	140.275
SE22D	388719.907	409071.468	141.335
SE22E	388735.327	409086.867	141.889
SE22F	388762.280	409114.534	143.901
SE22G	388775.412	409137.625	144.719
SE22H	388776.138	409157.310	146.396
SE22I	388795.170	409167.539	147.503
SE22J	388821.878	409175.446	148.438
SE22L	388926.849	409428.459	157.917
SE22M	388774.428	409243.694	149.380
SE22N	388879.533	409524.183	157.533
SE22P	388882.561	409464.231	156.659
SE23	389065.931	408870.666	151.884
SE24	389399.772	408994.334	168.400
SE25	389436.611	409093.778	171.186
SE27	389401.722	409447.231	173.364
SE27A	389365.539	409415.804	172.582
SE30	388842.412	409747.884	159.070
SE31	388783.695	409720.398	155.482



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TOPO SURVEY UPDATED	A	21.01.22	DH/MP	-

SurveyEng Ltd
Land Surveyors & Engineers
14 GREEN MILL
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LANCS
BL5 3GE
TEL/FAX: 0800 772 3040
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info@surveyeng.co.uk

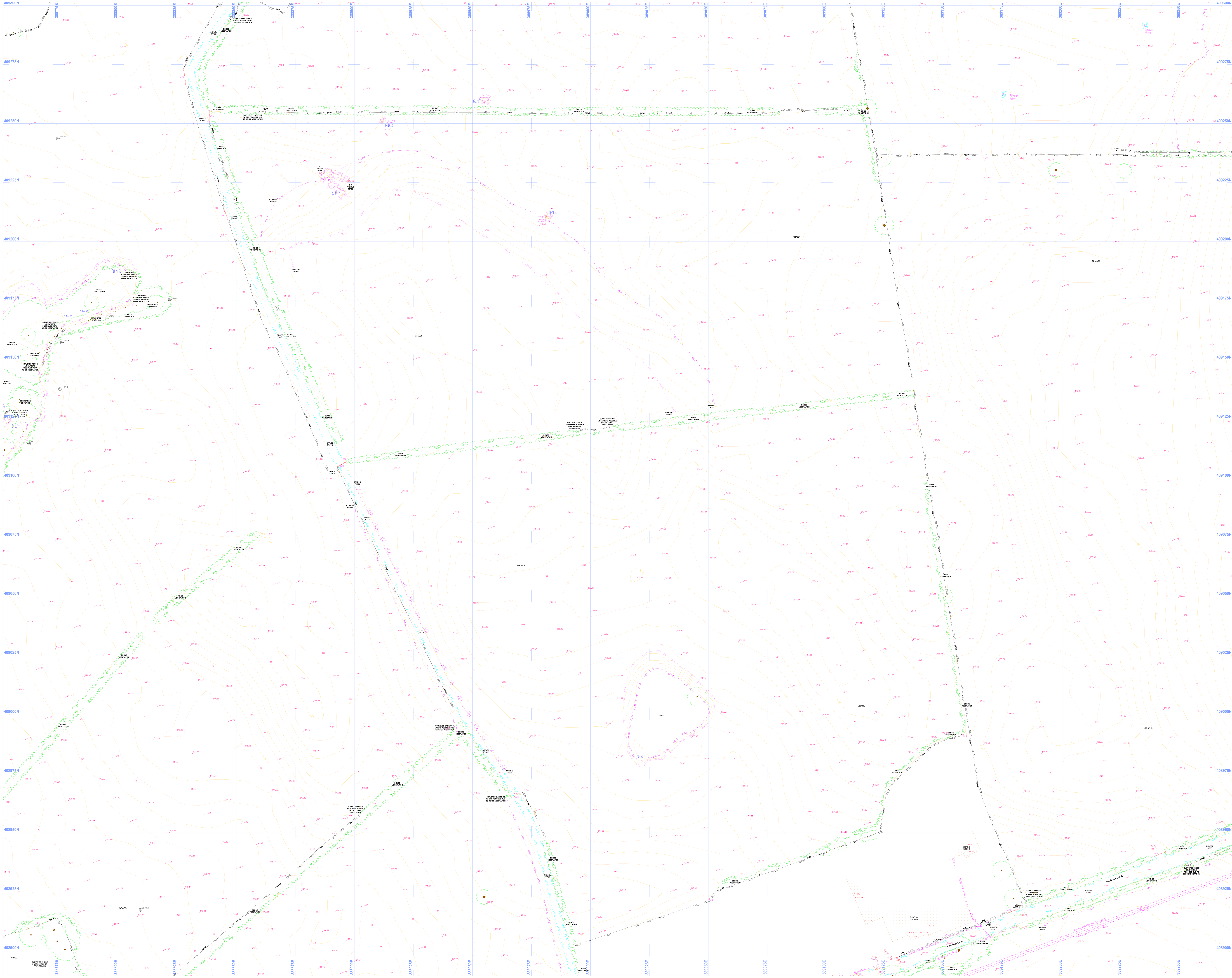
CLIENT
REDROW

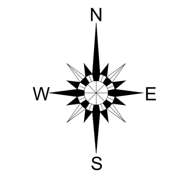
PROJECT TITLE
ROCHDALE ROAD, MIDDLETON

DRAWING DETAIL
TOPOGRAPHICAL LAND SURVEY
SHEET 3 OF 9

PROJECT ENGINEER	MM/DS	DATE	19.03.2021
DRAWN	DH/DS	SCALE	1:500@A0

DRAWING NUMBER	REVISION
RH.TS.21	A





SURVEY ORIENTATED TO OS GRID (OSGB36-15)

SURVEY LEGEND

FEATURES

TOP OF BANK
BOTTOM OF BANK
SURVEY STATION
TREE
HEDGE
TREE CANOPY
BUSHES
VEGETATION

BOUNDARY ANNOTATIONS

BARB WIRE FENCE — BW.F
CHAIN LINK FENCE — C/L.F
CONC POST AND PANEL — CP&P.F
CONC POST TIMB PANEL — CP&TP.F
ELECTRIC FENCE — EL.F
HERAS FENCE — HER.F
IRON RAIL FENCE — IR.F
KNEE RAIL FENCE — KR.F
MISCELLANEOUS FENCE — MISC.F
POST AND WIRE FENCE — P&W.F
RANCH STYLE FENCE — RS.F
SECURITY FENCE — SEC.F
TIMBER FENCE — T.F
BRICK WALL — B.W
BLOCK WALL — BL.W
CONCRETE WALL — C.W
GABIEN WALL — G.W
MISCELLANEOUS WALL — MISC.W
RETAINING WALL — R.W
RETAINING LOG WALL — RL.W
STONE WALL — S.W

LEVEL PREFIX ANNOTATIONS

ASL ARCH SPRING LEVEL
BL BED LEVEL
BD BACK DROP
CL COVER LEVEL
DH TOP OF DOOR
DTC DEPTH TO CROWN
FFL FINISHED FLOOR LEVEL
IL INVERT LEVEL
PL PARAPET LEVEL
RL ROOF/RIDGE LEVEL
SL SOFFIT LEVEL
TOF TOP OF FENCE
TOP TOP OF PIPE
TOW TOP OF WALL
TRH TREE HEIGHT
THR THRESHOLD LEVEL
WL WATER LEVEL
WS WINDOW SILL
WSF WINDOW SOFFIT

SURVEY ANNOTATIONS

AV AIR VALVE
B BOLLARD
BS BUS STOP
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MH MANHOLE
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RS ROAD SIGN
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UTS UNABLE TO SURVEY

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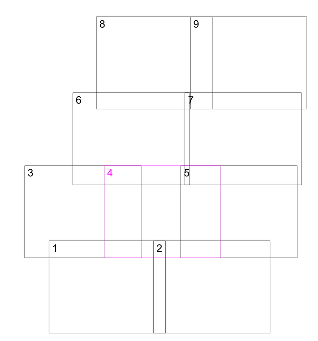
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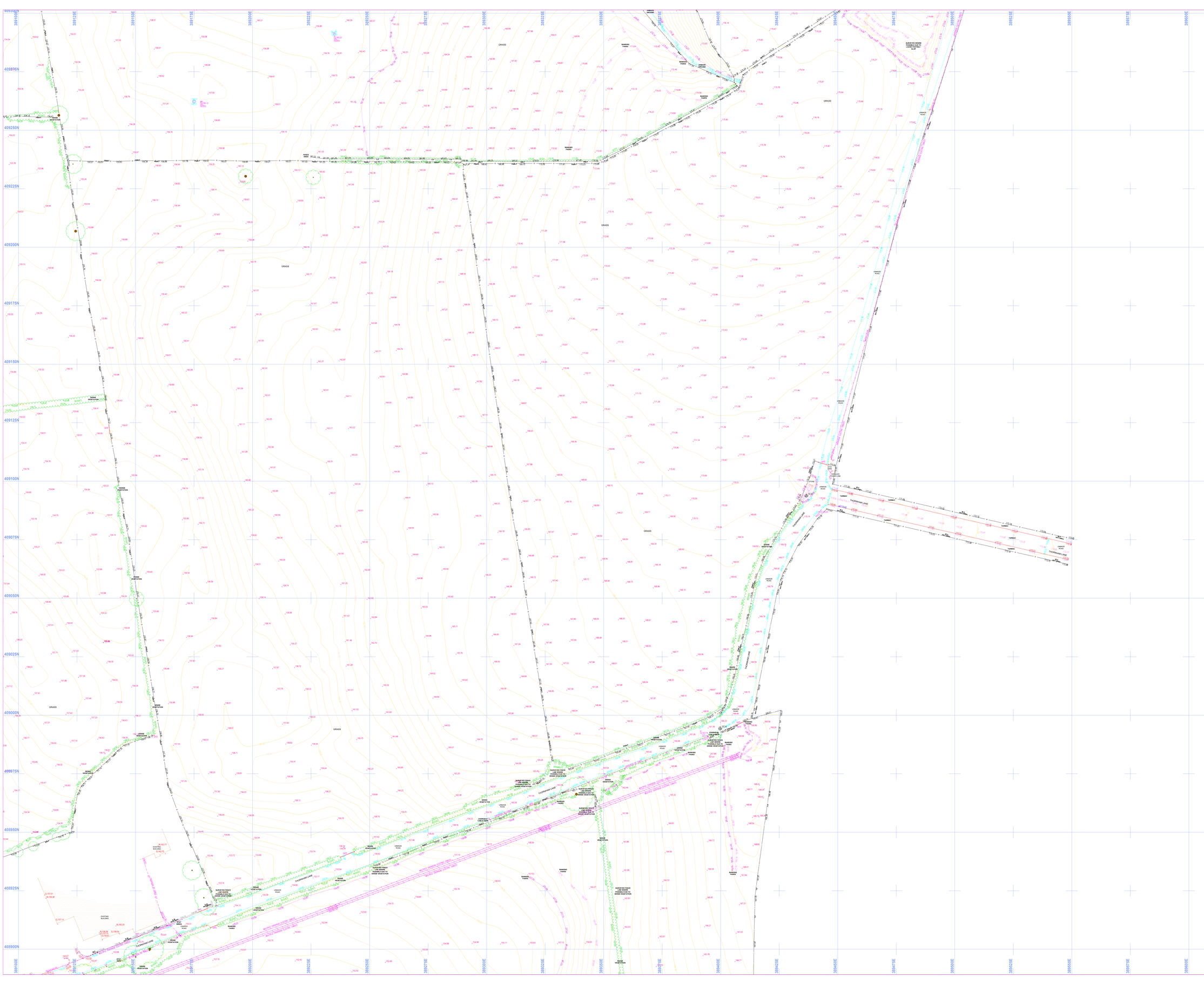
CLIENT
REDROW

PROJECT TITLE
ROCHDALE ROAD, MIDDLETON

DRAWING DETAIL
TOPOGRAPHICAL LAND SURVEY
SHEET 4 OF 9

PROJECT ENGINEER	MM/DS	DATE	19.03.2021
DRAWN	DH/DS	SCALE	1:500@A0

DRAWING NUMBER	REVISION
RH.TS.21	A



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S

SURVEY ORIENTATED TO OS GRID (OSGB36-15)

SURVEY LEGEND

FEATURES

TOP OF BANK

BOTTOM OF BANK

SURVEY STATION

TREE

HEDGE

TREE CANOPY

BUSHES

VEGETATION

BOUNDARY ANNOTATIONS

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LEVEL PREFIX ANNOTATIONS

ASL	ARCH SPRING LEVEL
BL	BED LEVEL
BD	BACK DROP
CL	COVER LEVEL
DH	TOP OF DOOR
DTC	DEPTH TO CROWN
EL	EXISTING GROUND LEVEL
IL	INVERT LEVEL
PL	PARAPET LEVEL
RL	ROOF/RIDGE LEVEL
SL	SOFFIT LEVEL
TOP	TOP OF FENCE
TOP	TOP OF PIPE
TOW	TOP OF WALL
TRH	TREE HEIGHT
THR	THRESHOLD LEVEL
WL	WATER LEVEL
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WSF	WINDOW SOFFIT

SURVEY ANNOTATIONS

AV	AIR VALVE
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BT	BRITISH TELECOM IC
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G	GULLY
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JB	JUNCTION BOX
JKW	JAPANESE KNOT WEED
KO	KERB OUTLET
LH	LAMP HOLE
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MH	MANHOLE
MP	MONITOR POINT
NP	NAME PLATE
OHC	OVERHEAD CABLES
PB	POST BOX
PM	PARKING METER
PS	POST
PYL	ELECTRICITY PYLON
RE	RODDING EYE
RS	ROAD SIGN
RWP	RAIN WATER PIPE
ST	STOP TAP
SM	SERVICE MARKER
STP	STUMP
SV	STOP VALVE / SLUICE VALVE
SVP	SOIL VENT PIPE
TB	TELEPHONE BOX
TL	TRAFFIC LIGHTS
TM	TELEPHONE MAST
TP	TELEGRAPH POLE
TPS	TACTILE PAVING SLABS
VP	VENT PIPE
WM	WATER METER
WO	WASH OUT
UTL	UNABLE TO LIFT
UTS	UNABLE TO SURVEY

GEOTECHNICAL INFORMATION

TRIAL HOLE / PIT	TH
BORE HOLE	BH
WINDOW SAMPLE	WS
MONITORING POINT	MP
PROBE HOLE	PH

DISCLAIMER:

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DRAINAGE INFORMATION MUST BE CHECKED AND VERIFIED PRIOR TO ANY WORK COMMENCING.

BOUNDARIES SHOWN ARE PHYSICAL AND MAY NOT REPRESENT LEGALLY CONVEYED OWNERSHIP.

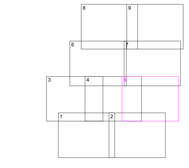
TREE SPREADS ARE SYMBOLIC ONLY AND ARE REPRESENTATIVE OF THE AVERAGE SPREAD. THE TREE CANOPY LAYER DENOTES THE TREES EXTREMITY.

SURVEY NOTES

ALL LEVELS ARE RELATED TO O.S DATUM (OSGB36-15)
ESTABLISHED AT SE1 USING THE LEICA SMARTNET GPS NETWORK

SURVEY STATIONS			
Name	Easting	Northing	Height
JUP3	388515.361	409056.102	136.906
JUP4	388506.061	409113.463	137.730
SE100	388535.001	409116.896	137.290
SE100A	388535.518	409117.596	131.290
SE101	388610.101	409155.572	139.691
SE102	388655.748	409081.445	141.148
SE103	388622.476	409074.464	140.117
SE104	388595.781	409060.856	139.262
SE105	388577.929	409043.502	138.661
SE106	388556.724	409049.396	138.347
SE107	388532.862	409049.557	137.993
SE107A	388518.736	409057.467	137.339
SE108	388534.959	409058.697	137.397
SE109	388520.522	408951.012	136.535

SURVEY STATIONS			
Name	Easting	Northing	Height
CTIA	388482.335	409798.138	172.464
CTIA	388690.234	409610.898	140.259
CTIA	388628.592	409234.043	144.482
SE22A	388628.092	408770.821	135.266
SE22B	388679.971	408910.823	140.134
SE22B1	388509.400	408977.121	142.037
SE22C	388692.317	409051.544	140.275
SE22D	388719.907	409071.468	141.335
SE22E	388752.387	409114.554	142.801
SE22F	388763.125	409174.824	143.901
SE22G	388775.412	409137.825	144.719
SE22H	388778.138	409157.310	146.396
SE22I	388795.170	409167.539	147.553
SE22J	388801.878	409175.446	148.436
SE22L	388926.849	409428.459	157.917
SE22M	388774.428	409243.894	149.380
SE22N	388879.533	409524.183	157.533
SE22P	388961.501	409670.166	161.884
SE23	389067.691	409870.666	151.884
SE24	389399.772	408994.334	168.400
SE25	3844.56.611	409053.738	171.186
SE27	389401.722	409447.331	173.364
SE27A	389365.539	409413.804	172.582
SE30	388842.412	409747.884	159.070
SE31	389783.695	409720.398	155.482



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REV	DATE	DRWN	APPR
A	21.01.22	DH/MP	-

DESCRIPTION: TOPO SURVEY UPDATED

SurveyEng Ltd
Land Surveyors & Engineers
14 GREEN MILL
WESTHOUGHTON
BOLTON
LANCS
BL5 3GE
TEL/FAX: 0800 772 3040
MOB: 07800069965
info@surveyeng.co.uk

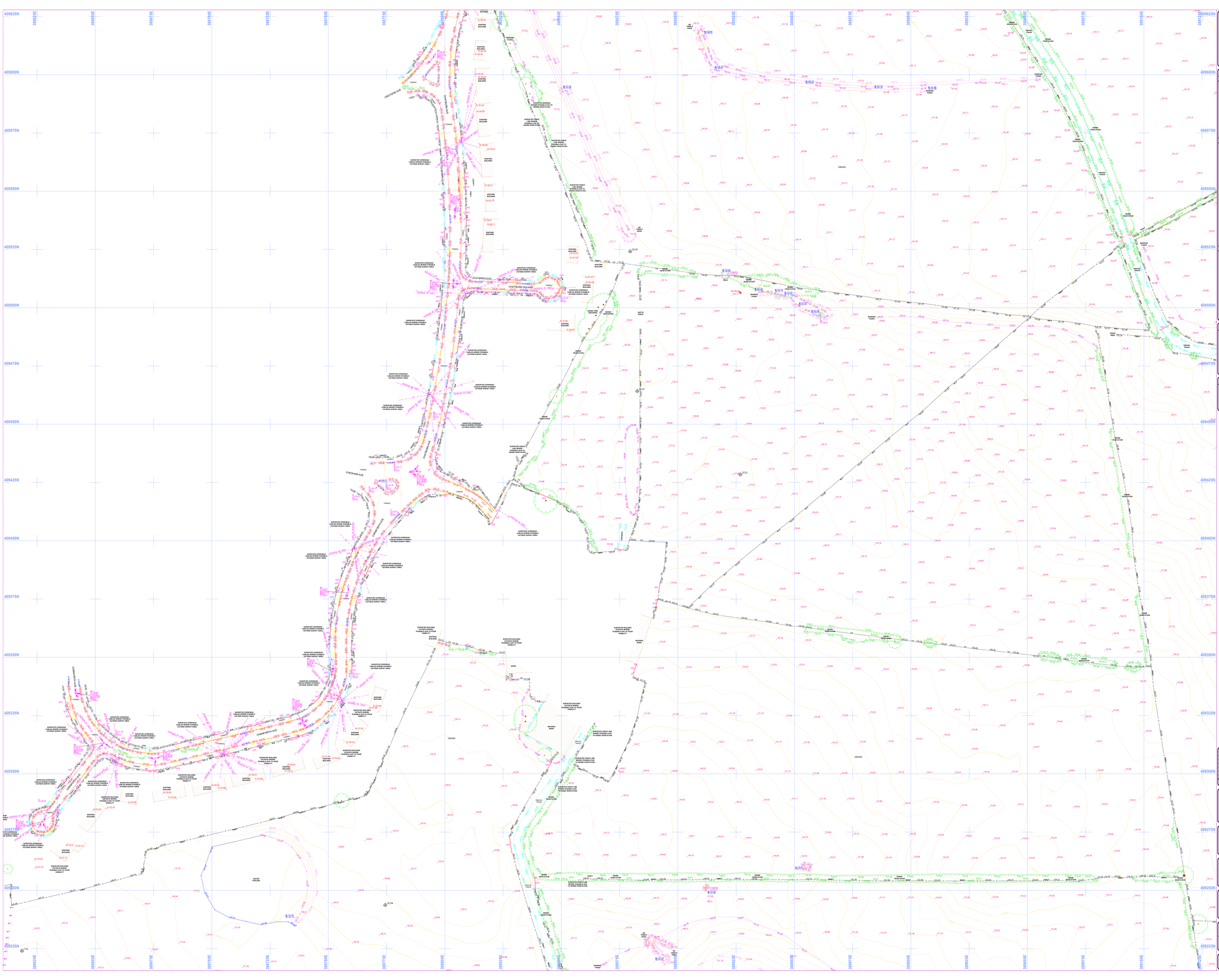
CLIENT
REDROW

PROJECT TITLE
ROCHDALE ROAD, MIDDLETON

DRAWING DETAIL
TOPOGRAPHICAL LAND SURVEY
SHEET 5 OF 9

PROJECT ENGINEER	MM/DS	DATE	19.03.2021
DRAWN	DH/DS	SCALE	1:500@A0

DRAWING NUMBER	REVISION
RH.TS.21	A



SURVEY LEGEND

FEATURES

TOP OF BANK
BOTTOM OF BANK
SURVEY STATION
TREE
HEDGE
TREE CANOPY
BUSHES
VEGETATION

BOUNDARY ANNOTATIONS

BARB WIRE FENCE	BW.F
CHAIN LINK FENCE	CL.F
CONC POST AND PANEL	CP&P.F
CONC POST TIMB PANEL	CP&TP.F
ELECTRIC FENCE	EL.F
HERAS FENCE	HER.F
IRON RAIL FENCE	IR.F
KNEE RAIL FENCE	KR.F
MISCELLANEOUS FENCE	MISC.F
POST AND WIRE FENCE	P&W.F
RANCH STYLE FENCE	RS.F
SECURITY FENCE	SEC.F
TIMBER FENCE	T.F
BRICK WALL	B.W
BLOCK WALL	BL.W
CONCRETE WALL	C.W
GABION WALL	G.W
MISCELLANEOUS WALL	MISC.W
RETAINING WALL	R.W
RETAINING LOG WALL	RL.W
STONE WALL	S.W

LEVEL PREFIX ANNOTATIONS

ASL	ARISH SPRING LEVEL
BL	BED LEVEL
BD	BACK DROP
CL	COVER LEVEL
DH	TOP OF DOOR
DTC	DEPTH TO CROWN
EL	EXISTING GROUND LEVEL
IL	INVERT LEVEL
PL	PARAPET LEVEL
RL	ROOF/RIDGE LEVEL
SL	SOFFIT LEVEL
TOP	TOP OF FENCE
TOP	TOP OF PIPE
TOW	TOP OF WALL
TRH	TREE HEIGHT
THR	THRESHOLD LEVEL
WL	WATER LEVEL
WS	WINDOW SILL
WSF	WINDOW SOFFIT

SURVEY ANNOTATIONS

AV	AIR VALVE
B	BOLLARD
BS	BUS STOP
BT	BRITISH TELECOM IC
CPS	CONCRETE PAVING SLABS
CP	CATCH PIT
DR	DRAIN
EB	ELECTRIC CONTROL BOX
EL	ELECTRICAL IC
ELP	ELECTRICITY POLE
ER	EARTH ROD
FH	FIRE HYDRANT
FP	FLAG POLE
G	GULLY
GH	GREENHOUSE
GP	GATE POST
GV	GAS VALVE
IC	INSPECTION COVER
JB	JUNCTION BOX
JKW	JAPANESE KNOT WEED
KO	KERB OUTLET
LH	LAMP HOLE
LP	LAMP POST/LIGHT COLUMN
MH	MANHOLE
MP	MONITOR POINT
NP	NAME PLATE
OHC	OVERHEAD CABLES
PB	POST BOX
PM	PARKING METER
PS	POST
PYL	ELECTRICITY PYLON
RE	RODDING EYE
RS	ROAD SIGN
RWP	RAIN WATER PIPE
ST	STOP TAP
SM	SERVICE MARKER
SP	SIGN POST
SV	STOP VALVE / SLUICE VALVE
SVP	SOIL VENT PIPE
TB	TELEPHONE BOX
TL	TRAFFIC LIGHTS
TM	TELEPHONE MAST
TP	TELEGRAPH POLE
TPS	TACTILE PAVING SLABS
VP	VENT PIPE
WM	WATER METER
WO	WASH OUT
UTL	UNABLE TO LIFT
UTS	UNABLE TO SURVEY

GEOTECHNICAL INFORMATION

TRIAL HOLE / PIT — TH
BORE HOLE — BH
WINDOW SAMPLE — WS
MONITORING POINT — MP
PROBE HOLE — PH

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SURVEY NOTES

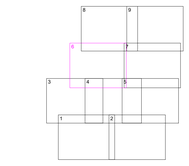
ALL LEVELS ARE RELATED TO O.S DATUM (OSGB36-15)
ESTABLISHED AT SE1 USING THE LEICA SMARTNET GPS NETWORK

SURVEY STATIONS

Name	Easting	Northing	Height
JP3	388515.361	409056.102	136.906
JP4	388506.061	409113.463	137.730
SE100	388535.048	409117.196	139.290
SE100A	388535.518	409137.994	131.290
SE101	388610.101	409155.572	139.691
SE102	388655.748	409051.445	141.148
SE103	388622.476	409074.464	140.117
SE104	388595.781	409060.898	139.282
SE105	388577.929	409043.502	138.681
SE106	388552.113	409049.557	137.961
SE107	388532.802	409049.557	137.961
SE107A	388518.736	409057.467	137.339
SE108	388534.959	409058.687	137.397
SE109	388520.522	409951.012	136.335

SURVEY STATIONS

Name	Easting	Northing	Height
OT1A	389482.335	409798.138	172.464
OT3A	389590.234	409610.898	140.259
OT3B	389618.508	409224.043	144.482
SE22A	388628.092	408770.821	135.266
SE22B	388679.971	408910.823	140.134
SE22C	388679.971	408910.823	140.134
SE22D	388692.317	409051.544	140.575
SE22D	388719.907	409071.468	141.335
SE22E	388735.327	409086.867	141.899
SE22F	388762.280	409114.534	143.901
SE22G	388775.412	409131.825	144.719
SE22H	388776.138	409157.310	146.398
SE22I	388791.170	409161.539	147.523
SE22J	388821.878	409175.446	148.418
SE22K	388837.828	409193.894	149.351
SE22M	388714.428	409243.694	149.380
SE22N	388879.533	409524.183	151.533
SE22P	388882.561	409464.231	156.659
SE23	389065.931	408870.666	151.884
SE24	389339.772	408994.534	168.420
SE25	389436.611	409093.778	171.186
SE27	389401.722	409447.231	173.564
SE21k	389365.539	409415.804	172.582
SE30	389543.421	409171.884	155.482
SE31	388783.685	409720.248	155.482



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TOPO SURVEY UPDATED	A	21.01.22	DHMP	-

SurveyEng Ltd
Land Surveyors & Engineers
14 GREEN MILL
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LANCS
BL5 3GE
TEL/FAX: 0800 772 3065
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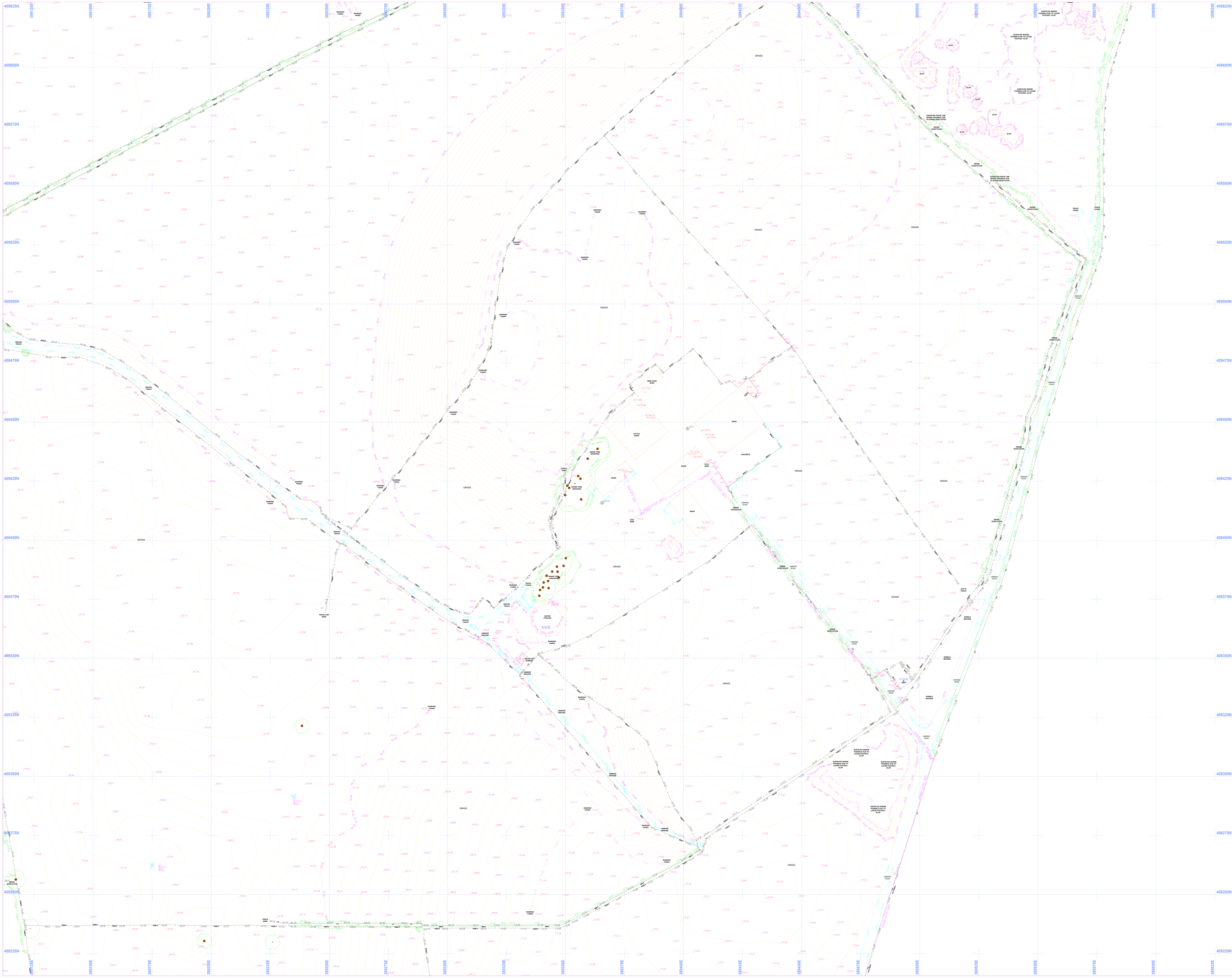
CLIENT
REDROW

PROJECT TITLE
ROCHDALE ROAD, MIDDLETON

DRAWING DETAIL
TOPOGRAPHICAL LAND SURVEY
SHEET 6 OF 9

PROJECT ENGINEER	MM/DS	DATE	19.03.2021
DRAWN	DH/DS	SCALE	1:500@A0

DRAWING NUMBER	REVISION
RH.TS.21	A



N
W E
S

SURVEY ORIENTATED TO OS GRID (OSGB36-15)

SURVEY LEGEND

FEATURES

TOP OF BANK
BOTTOM OF BANK
SURVEY STATION
TREE
HEDGE
TREE CANOPY
BUSHES
VEGETATION

BOUNDARY ANNOTATIONS

BARB WIRE FENCE	BW.F
CHAIN LINK FENCE	C/L.F
CONC POST AND PANEL	CP&P.F
CONC POST TIMB PANEL	CP&TP.F
ELECTRIC FENCE	EL.F
HERAS FENCE	HER.F
IRON RAIL FENCE	IR.F
KNEE RAIL FENCE	KR.F
MISCELLANEOUS FENCE	MISC.F
POST AND WIRE FENCE	P&W.F
RANCH STYLE FENCE	RS.F
SECURITY FENCE	SEC.F
TIMBER FENCE	T.F
BRICK WALL	B.W
BLOCK WALL	BL.W
CONCRETE WALL	C.W
GABIEN WALL	G.W
MISCELLANEOUS WALL	MISC.W
RETAINING WALL	R.W
RETAINING LOG WALL	RL.W
STONE WALL	S.W

LEVEL PREFIX ANNOTATIONS

ASL	ARCH SPRING LEVEL
BL	BED LEVEL
BD	BACK DROP
CL	COVER LEVEL
DH	TOP OF DOOR
DTC	DEPTH TO CROWN
FFL	FINISHED FLOOR LEVEL
IL	INVERT LEVEL
PL	PARAPET LEVEL
RL	ROOF/RIDGE LEVEL
SL	SOFFIT LEVEL
TOF	TOP OF FENCE
TOP	TOP OF PIPE
TOW	TOP OF WALL
TRH	TREE HEIGHT
THR	THRESHOLD LEVEL
WL	WATER LEVEL
WS	WINDOW SILL
WSF	WINDOW SOFFIT

SURVEY ANNOTATIONS

AV	AIR VALVE
B	BOLLARD
BS	BUS STOP
BT	BRITISH TELECOM IC
CPS	CONCRETE PAVING SLABS
CP	CATCH PIT
DR	DRAIN
EB	ELECTRIC CONTROL BOX
EL	ELECTRICAL IC
EP	ELECTRICITY POLE
ER	EARTH ROD
FH	FIRE HYDRANT
FP	FLAG POLE
G	GULLY
GH	GREENHOUSE
GP	GATE POST
GV	GAS VALVE
IC	INSPECTION COVER
JB	JUNCTION BOX
JKW	JAPANESE KNOT WEED
KO	KERB OUTLET
LH	LAMP HOLE
LP	LAMP POST/LIGHT COLUMN
MH	MANHOLE
MP	MONITOR POINT
NP	NAME PLATE
OHC	OVERHEAD CABLES
PB	POST BOX
PM	PARKING METER
PS	POST
PYL	ELECTRICITY PYLON
RE	RODDING EYE
RS	ROAD SIGN
RWP	RAIN WATER PIPE
ST	STOP TAP
SM	SERVICE MARKER
SP	SIGN POST
SV	STOP VALVE / SLUICE VALVE
SVP	SOIL VENT PIPE
TB	TELEPHONE BOX
TL	TRAFFIC LIGHTS
TM	TELEPHONE MAST
TP	TELEGRAPH POLE
TPS	TACTILE PAVING SLABS
VP	VENT PIPE
WM	WATER METER
WO	WASH OUT
UTL	UNABLE TO LIFT
UTS	UNABLE TO SURVEY

GEOTECHNICAL INFORMATION

TRIAL HOLE / PIT	TH
BORE HOLE	BH
WINDOW SAMPLE	WS
MONITORING POINT	MP
PROBE HOLE	PH

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SURVEY NOTES

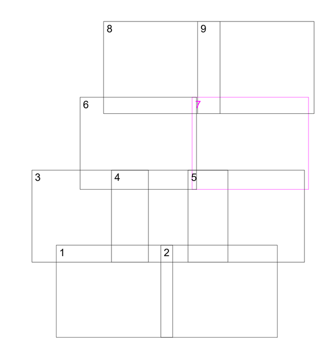
ALL LEVELS ARE RELATED TO O.S DATUM (OSGB36-15)
ESTABLISHED AT SE1 USING THE LEICA SMARTNET GPS NETWORK

SURVEY STATIONS

Name	Easting	Northing	Height
JLP3	388515.361	409056.102	136.906
JLP4	388506.061	409113.493	137.730
SE100	388555.825	409114.292	138.312
SE100A	388535.318	409137.996	137.290
SE101	388610.101	409105.572	139.691
SE102	388655.748	409091.445	141.149
SE103	388622.476	409074.464	140.117
SE104	388595.781	409060.886	139.082
SE105	388577.929	409043.503	138.661
SE106	388556.724	409049.396	138.347
SE107	388532.802	409049.557	137.993
SE107A	388518.736	409057.467	137.339
SE108	388534.959	409006.697	137.397
SE109	388520.522	408951.012	136.335

SURVEY STATIONS

Name	Easting	Northing	Height
CT1A	389482.335	409798.138	172.464
CT2A	388690.234	409010.898	140.259
CT3A	388618.508	409224.043	144.482
SE22A	388628.092	408770.621	135.266
SE22B	388679.971	408910.823	140.134
SE22B1	388809.400	408917.121	142.037
SE22C	388692.317	409051.544	140.275
SE22D	388719.907	409071.468	141.335
SE22E	388735.327	409086.867	141.889
SE22F	388762.280	409114.534	143.901
SE22G	388775.412	409137.625	144.719
SE22H	388776.138	409157.310	146.396
SE22I	388795.170	409167.539	147.503
SE22J	388821.878	409175.446	148.438
SE22L	388926.849	409428.459	157.917
SE22M	388774.428	409243.694	149.380
SE22N	388879.533	409524.183	157.533
SE22P	388882.561	409464.231	156.659
SE23	389065.931	408870.666	151.884
SE24	389399.772	408994.334	168.400
SE25	389436.611	409093.778	171.186
SE27	389401.722	409447.231	173.364
SE27A	389365.539	409415.804	172.582
SE30	388842.412	409747.884	159.070
SE31	388783.695	409720.398	155.482



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14 GREEN MILL
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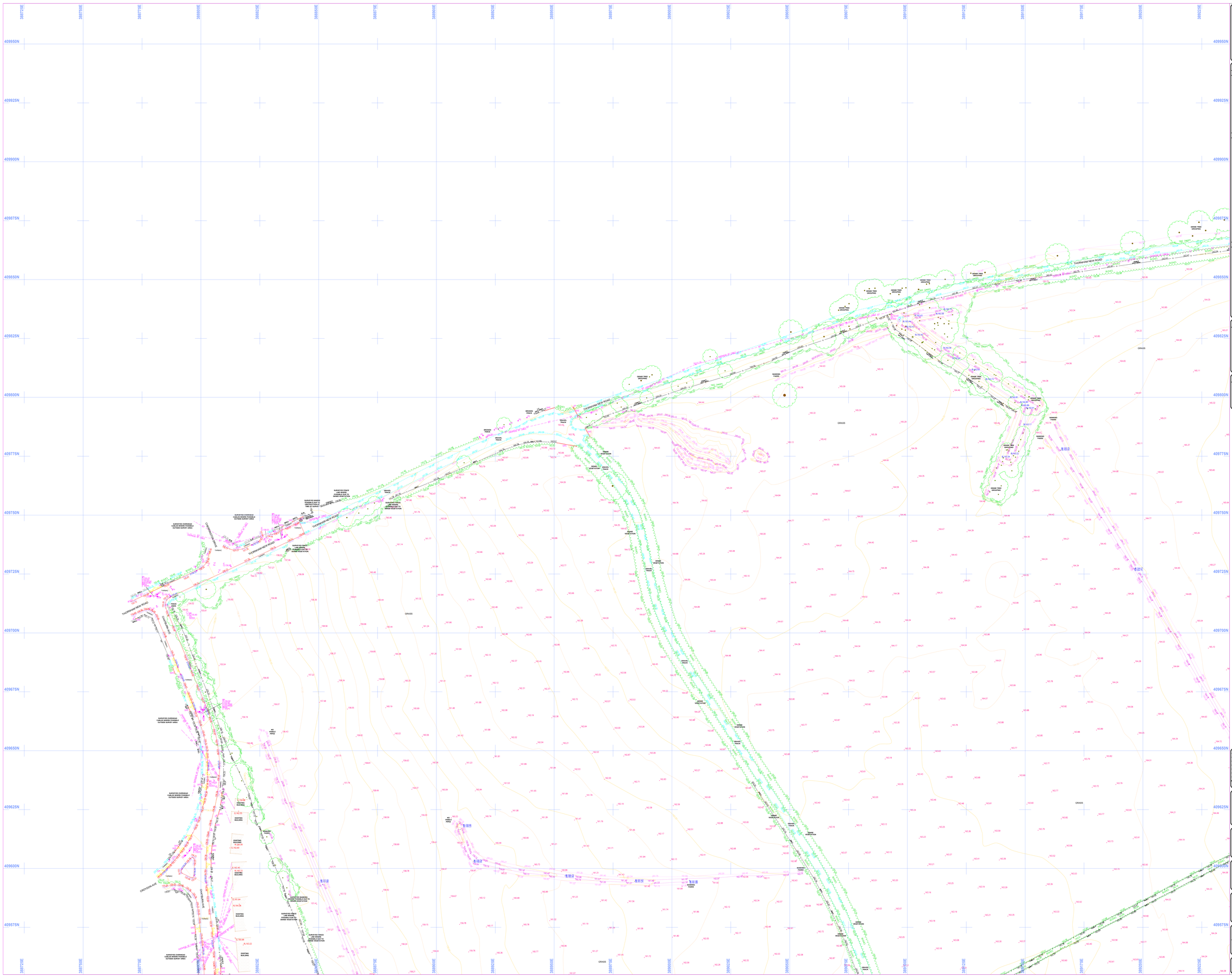
CLIENT
REDROW

PROJECT TITLE
ROCHDALE ROAD, MIDDLETON

DRAWING DETAIL
TOPOGRAPHICAL LAND SURVEY
SHEET 7 OF 9

PROJECT ENGINEER	MM/DS	DATE	19.03.2021
DRAWN	DH/DS	SCALE	1:500@A0

DRAWING NUMBER	REVISION
RH.TS.21	A



N

W E

S

SURVEY ORIENTATED TO OS GRID (OSGB36-15)

SURVEY LEGEND

FEATURES

TOP OF BANK

BOTTOM OF BANK

SURVEY STATION

TREE

HEDGE

TREE CANOPY

BUSHES

VEGETATION

BOUNDARY ANNOTATIONS

BARB WIRE FENCE	BW.F
CHAIN LINK FENCE	C/L.F
CONC POST AND PANEL	CP&P.F
CONC POST TIMB PANEL	CP&TP.F
ELECTRIC FENCE	EL.F
HERAS FENCE	HER.F
IRON RAIL FENCE	IR.F
KNEE RAIL FENCE	KR.F
MISCELLANEOUS FENCE	MISC.F
POST AND WIRE FENCE	P&W.F
RANCH STYLE FENCE	RS.F
SECURITY FENCE	SEC.F
TIMBER FENCE	T.F
BRICK WALL	B.W
BLOCK WALL	BL.W
CONCRETE WALL	C.W
GABION WALL	G.W
MISCELLANEOUS WALL	MISC.W
RETAINING WALL	R.W
RETAINING LOG WALL	RL.W
STONE WALL	S.W

LEVEL PREFIX ANNOTATIONS

ASL	ARCH SPRING LEVEL
BL	BED LEVEL
BD	BACK DROP
CL	COVER LEVEL
DH	TOP OF DOOR
DTC	DEPTH TO CROWN
EL	EXISTING GROUND LEVEL
IL	INVERT LEVEL
PL	PARAPET LEVEL
RL	ROOF/RIDGE LEVEL
SL	SOFFIT LEVEL
TOP	TOP OF FENCE
TOP	TOP OF PIPE
TOW	TOP OF WALL
TRH	TREE HEIGHT
THR	THRESHOLD LEVEL
WL	WATER LEVEL
WS	WINDOW SILL
WSF	WINDOW SOFFIT

SURVEY ANNOTATIONS

AV	AIR VALVE
B	BOLLARD
BS	BUS STOP
BT	BRITISH TELECOM IC
CPS	CONCRETE PAVING SLABS
CP	CATCH PIT
DR	DRAIN
EB	ELECTRIC CONTROL BOX
EL	ELECTRICAL IC
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JKW	JAPANESE KNOT WEED
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LH	LAMP HOLE
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STD	STUD POST
SV	STOP VALVE / SLUICE VALVE
SVP	SOIL VENT PIPE
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BORE HOLE BH

WINDOW SAMPLE WS

MONITORING POINT MP

PROBE HOLE PH

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SURVEY NOTES

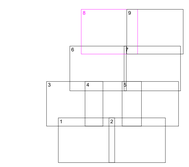
ALL LEVELS ARE RELATED TO O.S DATUM (OSGB36-15)
ESTABLISHED AT SE1 USING THE LEICA SMARTNET GPS NETWORK

SURVEY STATIONS

Name	Easting	Northing	Height
JUP3	388515.361	409056.122	136.806
JUP4	388506.081	409113.483	137.730
SE100	388535.000	409117.000	137.290
SE100A	388535.518	409137.994	131.290
SE101	388610.101	409155.572	139.691
SE102	388655.748	409081.445	141.148
SE103	388622.476	409074.464	140.117
SE104	388595.781	409060.886	139.262
SE105	388577.929	409043.502	138.681
SE106	388552.803	409049.550	137.863
SE107	388532.802	409049.552	137.863
SE107A	388518.736	409057.467	137.339
SE108	388534.959	409058.687	137.397
SE109	388520.522	408951.012	136.335

SURVEY STATIONS

Name	Easting	Northing	Height
OT1A	389482.335	409798.138	172.464
OT2A	388690.234	409013.898	140.259
OT3A	388618.508	409224.043	144.482
SE22A	388628.092	408770.621	135.299
SE22B	388679.971	408910.823	140.134
SE22BS	388809.400	408971.131	142.027
SE22C	389692.317	409051.544	140.275
SE22D	388719.907	409071.468	141.325
SE22E	388735.327	409086.867	141.889
SE22F	388747.321	409104.264	142.519
SE22G	388775.413	409137.825	144.719
SE22H	388776.138	409157.310	146.396
SE22I	388795.170	409167.539	147.503
SE22J	388821.878	409175.446	148.438
SE22L	389926.849	409428.459	157.917
SE22M	388774.428	409243.694	149.380
SE22N	388879.533	409524.183	157.533
SE22P	389662.561	409464.231	156.659
SE23	389339.000	409894.000	168.000
SE24	389309.772	409894.334	168.402
SE25	389436.611	409930.778	171.186
SE27	389401.722	409447.231	173.364
SE27A	389365.539	409415.804	172.582
SE30	388842.412	409747.864	159.070
SE31	388783.695	409720.398	155.482



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REV	DATE	DRWN	APPR
A	21.01.22	DH/MP	-

TOPO SURVEY UPDATED

SurveyEng Ltd
Land Surveyors & Engineers
14 GREEN MILL
WESTHOUGHTON
BOLTON
LANCS
BL5 3GE
TEL/FAX: 0800 772 3040
MOB: 07850069969
info@surveyeng.co.uk

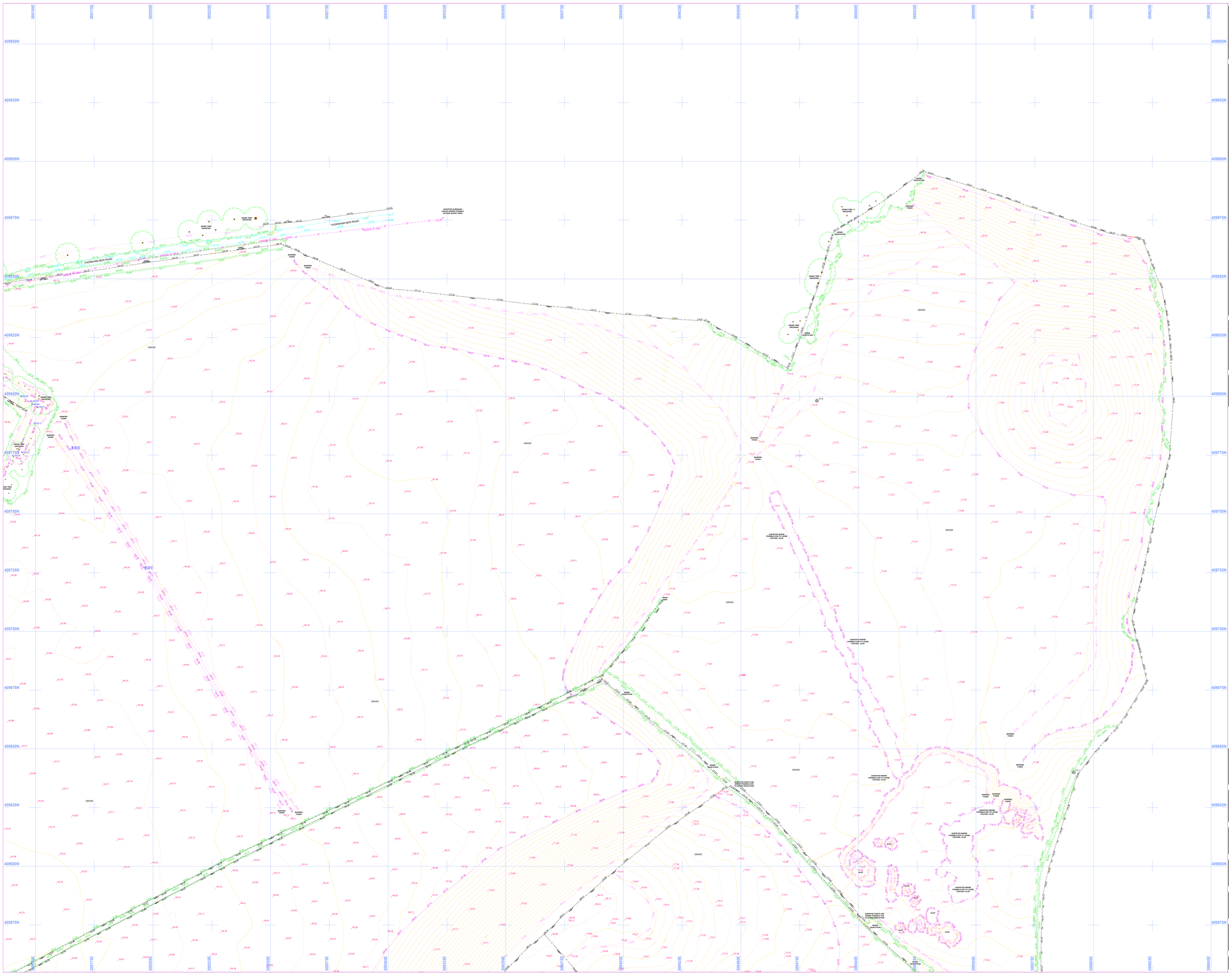
CLIENT
REDROW

PROJECT TITLE
ROCHDALE ROAD, MIDDLETON

DRAWING DETAIL
TOPOGRAPHICAL LAND SURVEY
SHEET 8 OF 9

PROJECT ENGINEER	MM/DS	DATE	19.03.2021
DRAWN	DH/DS	SCALE	1:500@A0

DRAWING NUMBER	REVISION
RH.TS.21	A



N

W E

S

SURVEY ORIENTATED TO OS GRID (OSGB36-15)

SURVEY LEGEND

FEATURES

TOP OF BANK

BOTTOM OF BANK

SURVEY STATION

TREE

HEDGE

TREE CANOPY

BUSHES

VEGETATION

BOUNDARY ANNOTATIONS

BARB WIRE FENCE	BW.F
CHAIN LINK FENCE	CL.F
CONC POST AND PANEL	CP&P.F
CONC POST TIMB PANEL	CP&TP.F
ELECTRIC FENCE	EL.F
HERAS FENCE	HER.F
IRON RAIL FENCE	IR.F
KNEE RAIL FENCE	KR.F
MISCELLANEOUS FENCE	MISC.F
POST AND WIRE FENCE	P&W.F
RANCH STYLE FENCE	RS.F
SECURITY FENCE	SEC.F
TIMBER FENCE	T.F
BRICK WALL	B.W
BLOCK WALL	BL.W
CONCRETE WALL	C.W
GABION WALL	G.W
MISCELLANEOUS WALL	MISC.W
RETAINING WALL	R.W
RETAINING LOG WALL	RL.W
STONE WALL	S.W

LEVEL PREFIX ANNOTATIONS

ASL	ARCH SPRING LEVEL
BL	BED LEVEL
BD	BACK DROP
CL	COVER LEVEL
DH	TOP OF DOOR
DTC	DEPTH TO CROWN
EL	EXISTING GROUND LEVEL
IL	INVERT LEVEL
PL	PARAPET LEVEL
RL	ROOF/RIDGE LEVEL
SL	SOFFIT LEVEL
TOP	TOP OF FENCE
TOP	TOP OF PIPE
TOW	TOP OF WALL
TRH	TREE HEIGHT
THR	THRESHOLD LEVEL
WL	WATER LEVEL
WS	WINDOW SILL
WSF	WINDOW SOFFIT

SURVEY ANNOTATIONS

AV	AIR VALVE
B	BOLLARD
BS	BUS STOP
BT	BRITISH TELECOM IC
CPS	CONCRETE PAVING SLABS
CP	CATCH PIT
DR	DRAIN
EB	ELECTRIC CONTROL BOX
EL	ELECTRICAL IC
ES	ELECTRICITY POLE
ER	EARTH ROD
FH	FIRE HYDRANT
FP	FLAG POLE
G	GULLY
GH	GREENHOUSE
GP	GATE POST
GV	GAS VALVE
IC	INSPECTION COVER
JB	JUNCTION BOX
JKW	JAPANESE KNOT WEED
KO	KERB OUTLET
LH	LAMP HOLE
LP	LAMP POST/FLIGHT COLUMN
MH	MANHOLE
MP	MONITOR POINT
NP	NAME PLATE
OHC	OVERHEAD CABLES
PB	POST BOX
PM	PARKING METER
PS	POST
PYL	ELECTRICITY PYLON
RE	RODDING EYE
RS	ROAD SIGN
RWP	RAIN WATER PIPE
ST	STOP TAP
SM	SERVICE MARKER
SP	STOP VALVE
SV	STOP VALVE / SLUICE VALVE
SVP	SOIL VENT PIPE
TB	TELEPHONE BOX
TL	TRAFFIC LIGHTS
TM	TELEPHONE MAST
TP	TELEGRAPH POLE
TPS	TACTILE PAVING SLABS
VP	VENT PIPE
WM	WATER METER
WO	WASH OUT
UTL	UNABLE TO LIFT
UTE	UNABLE TO SURVEY

GEOTECHNICAL INFORMATION

TRIAL HOLE / PIT	TH
BORE HOLE	BH
WINDOW SAMPLE	WS
MONITORING POINT	MP
PROBE HOLE	PH

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ONLY MANHOLES AND SERVICES SHOWN WERE VISIBLE AT THE TIME OF SURVEY.

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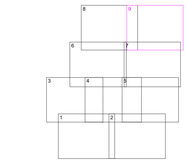
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SE228	388679.971	409013.823	140.134
SE228I	388809.400	408917.121	142.037
SE229	388662.317	409051.544	140.275
SE220	388719.907	409071.468	141.535
SE225	388735.327	409086.867	141.899
SE22F	388762.280	409114.534	143.901
SE22G	388775.412	409137.825	144.719
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SE22I	388795.170	409167.539	147.523
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SE226	388879.533	409524.183	157.533
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SE30	388842.412	409747.884	159.070
SE31	388783.695	409720.398	155.482



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SurveyEng Ltd
Land Surveyors & Engineers
14 GREEN MILL
WESTHOUGHTON
BOLTON
LANCASHIRE
BL5 3QE
TEL/FAX: 0800 772 3040
MOB: 07850068993
info@surveyeng.co.uk

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REDROW

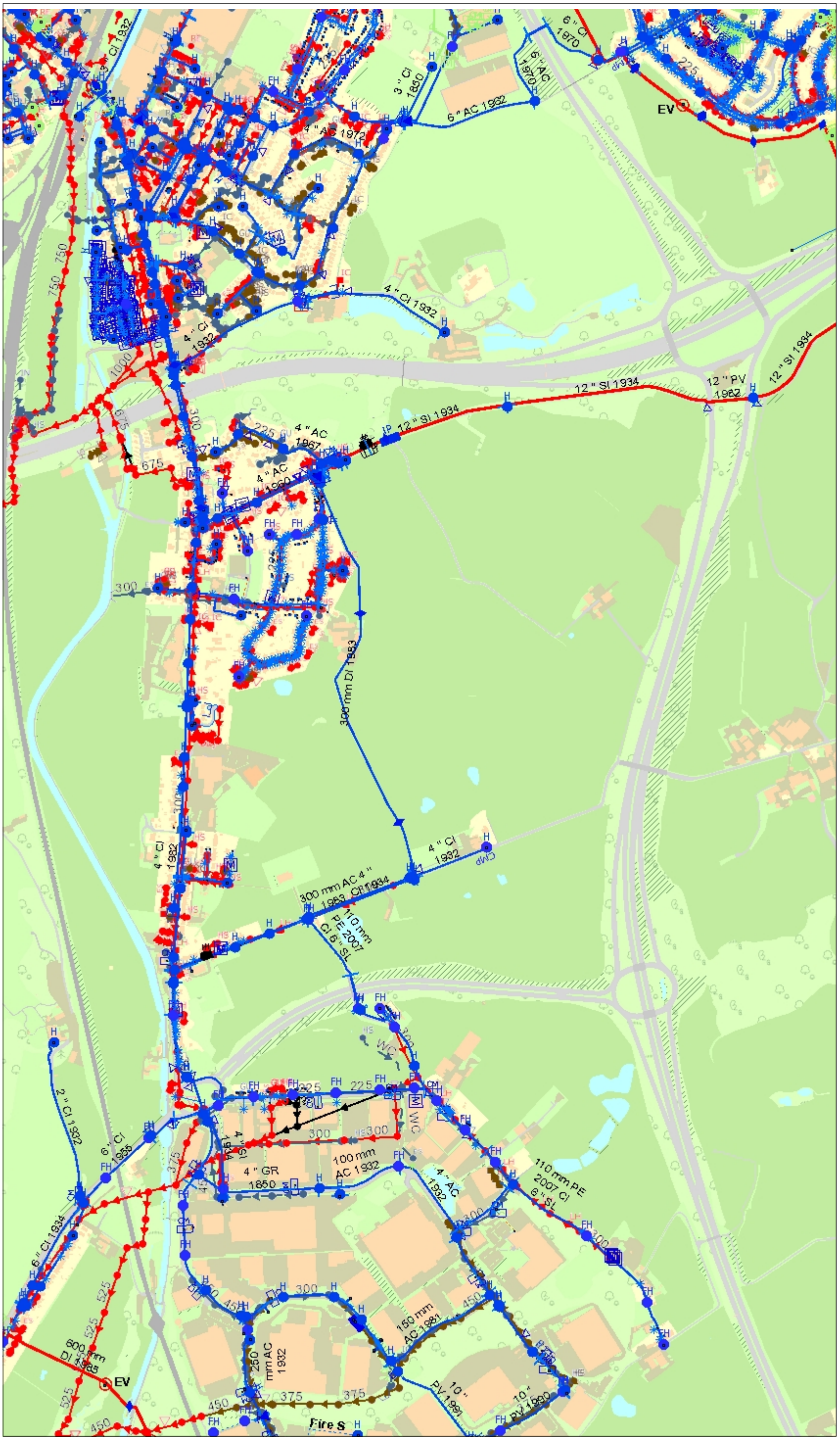
PROJECT TITLE
ROCHDALE ROAD, MIDDLETON

DRAWING DETAIL
TOPOGRAPHICAL LAND SURVEY
SHEET 9 OF 9

PROJECT ENGINEER	MM/DS	DATE	19.03.2021
DRAWN	DH/DS	SCALE	1:500@A0

DRAWING NUMBER	REVISION
RH.TS.21	A

APPENDIX C
SEWER RECORDS



United Utilities Maps for Safe Dig

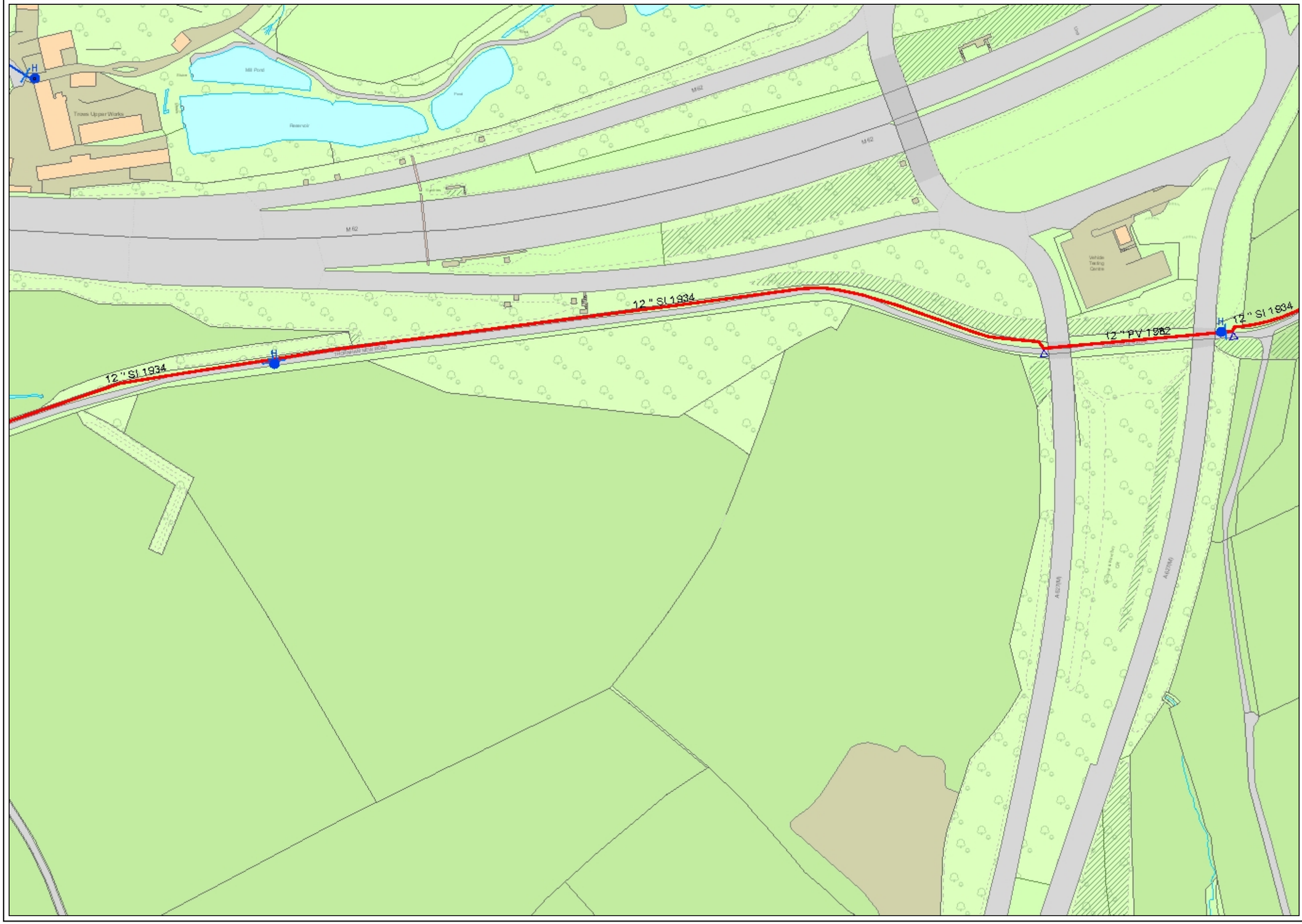
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Extract from maps of United Utilities' Underground Assets

The position of the underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available. The actual positions may be different from those shown on the plan and private service pipes may be shown by a blue broken line. United Utilities Water will not accept liability for any damage caused by the actual position being different from those shown.

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United Utilities
Water for the North West



United Utilities Maps for SafeDig

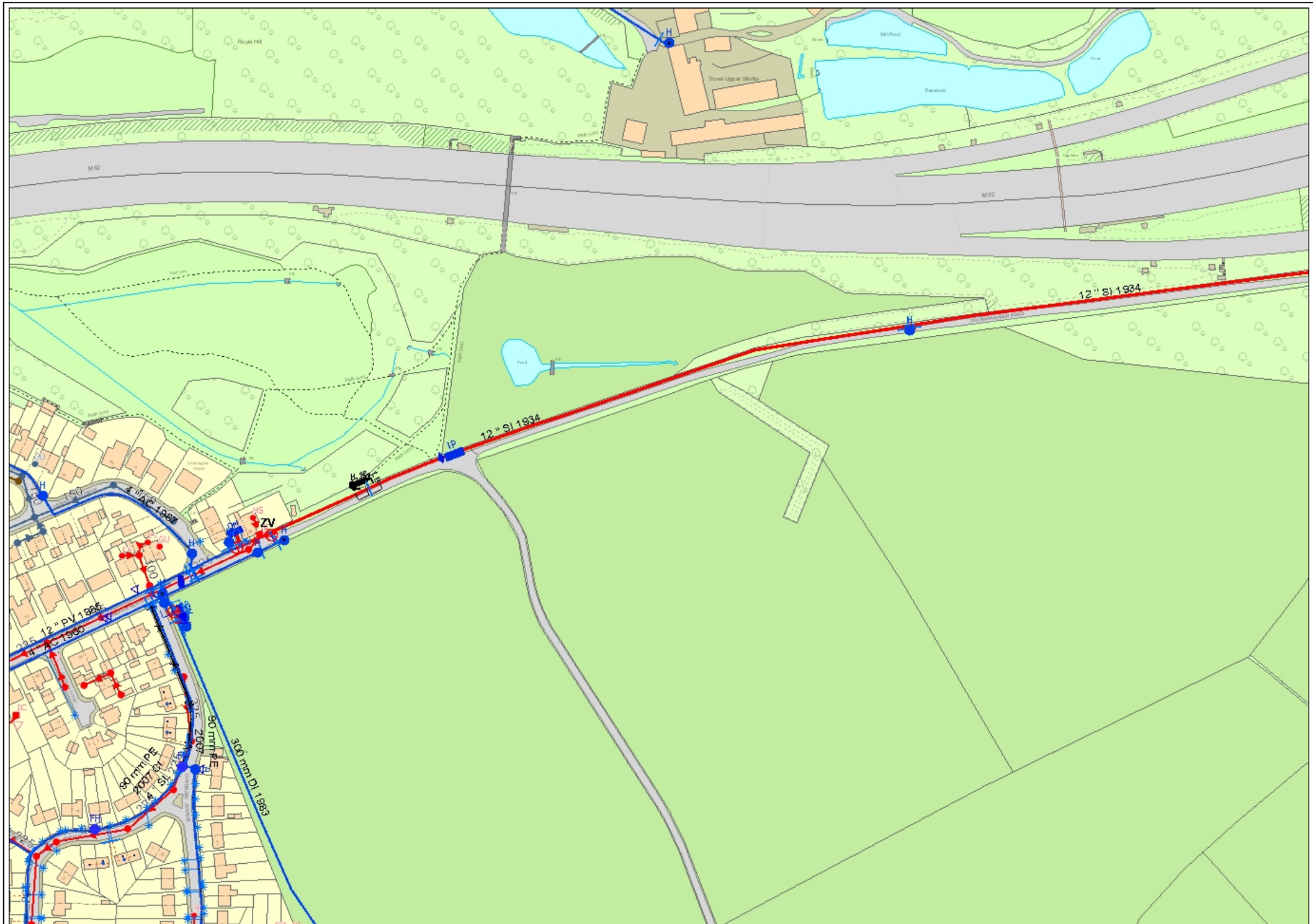
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Extract from maps of United Utilities' Underground Assets

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United Utilities Maps for SafeDig

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Extract from maps of United Utilities' Underground Assets

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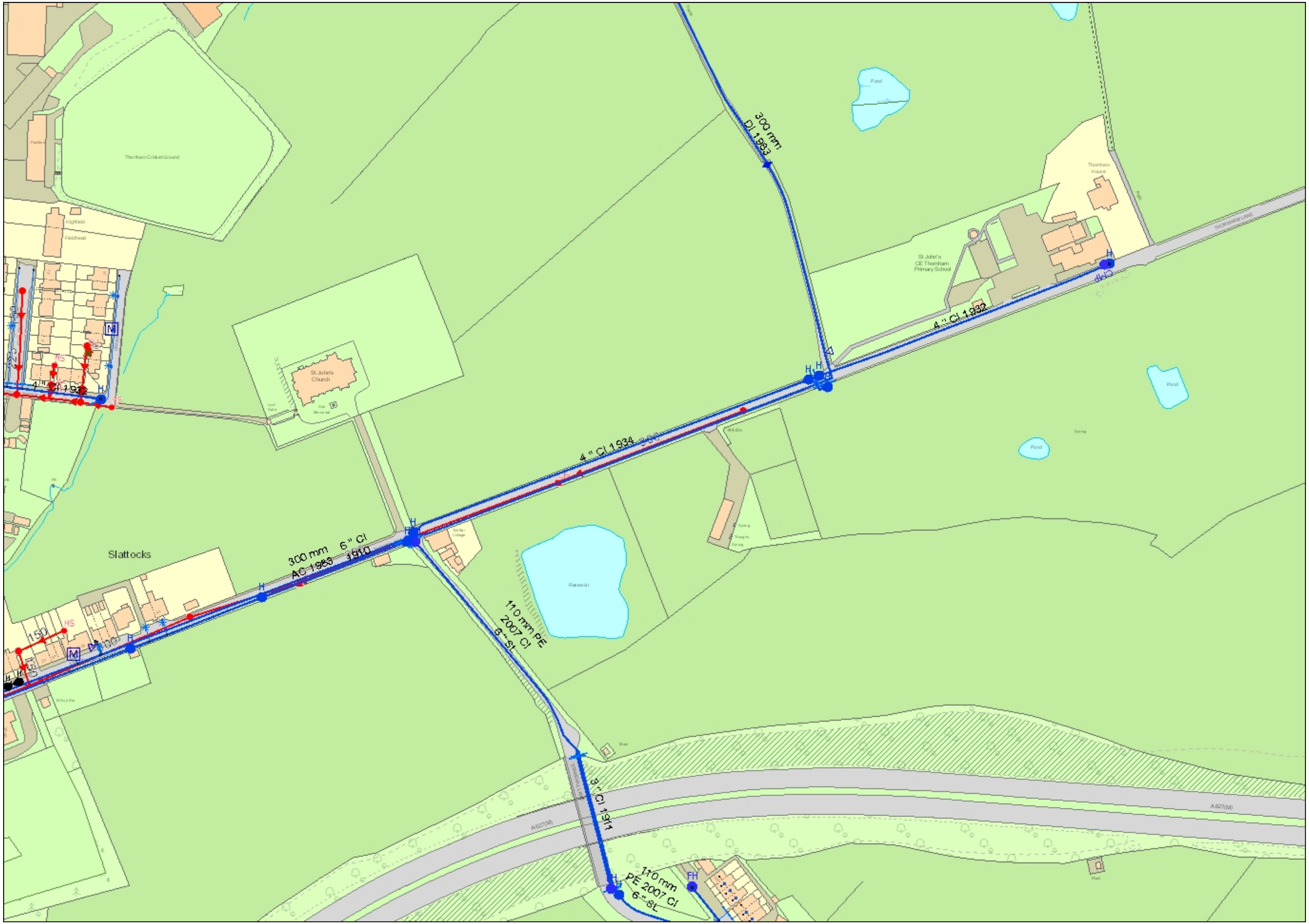
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Extract from maps of United Utilities' Underground Assets

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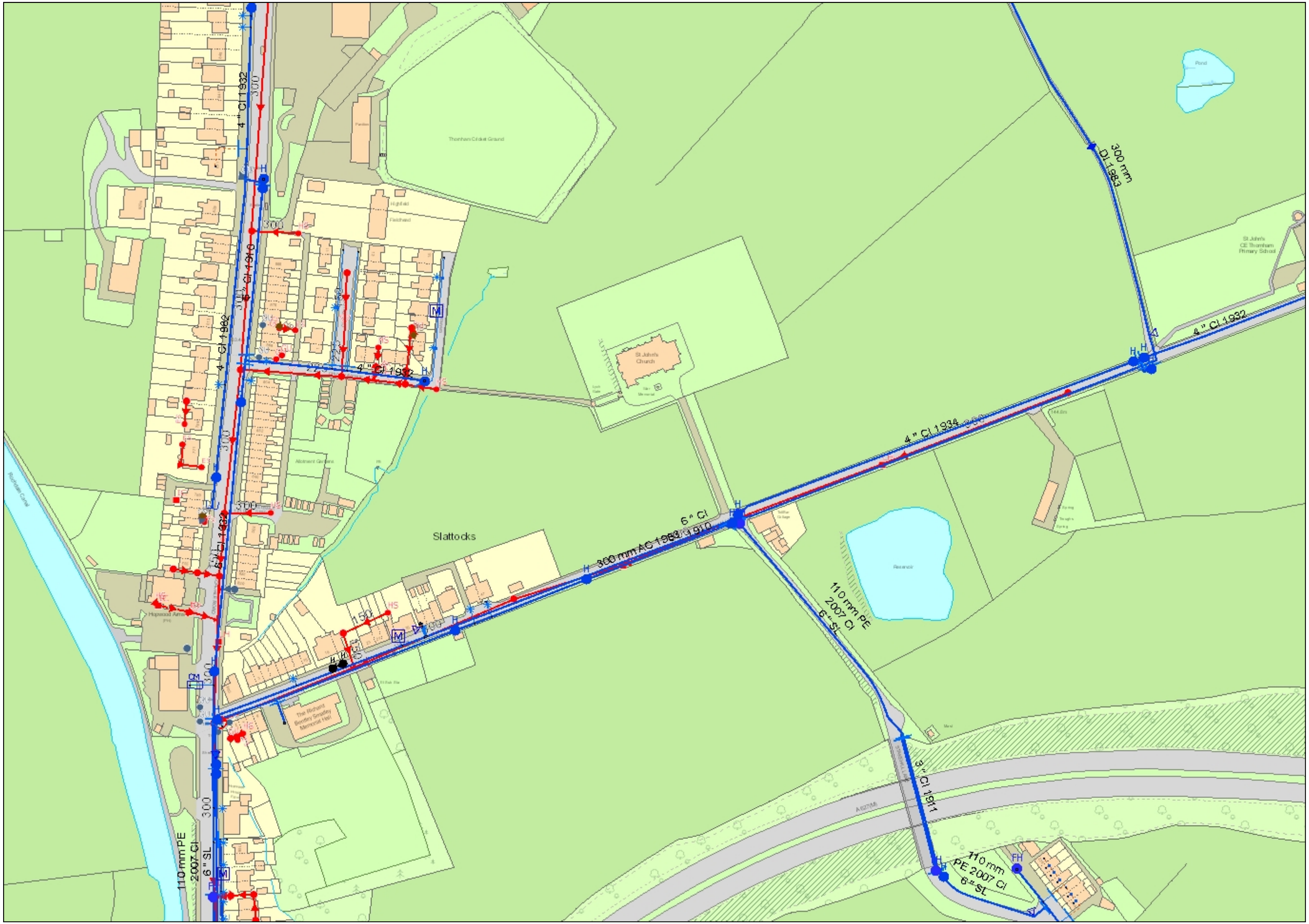
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Extract from maps of United Utilities' Underground Assets

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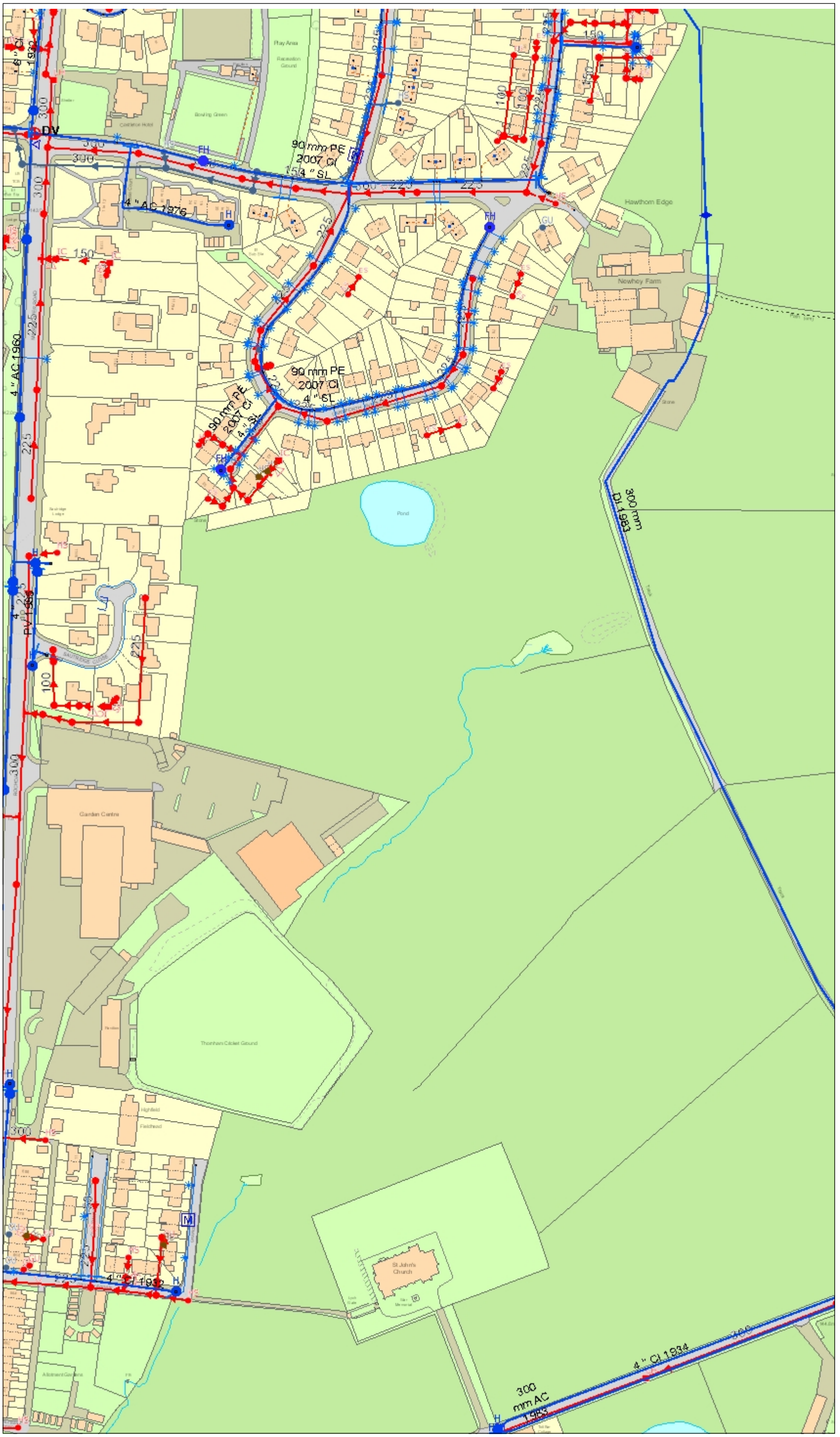
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Extract from maps of United Utilities' Underground Assets

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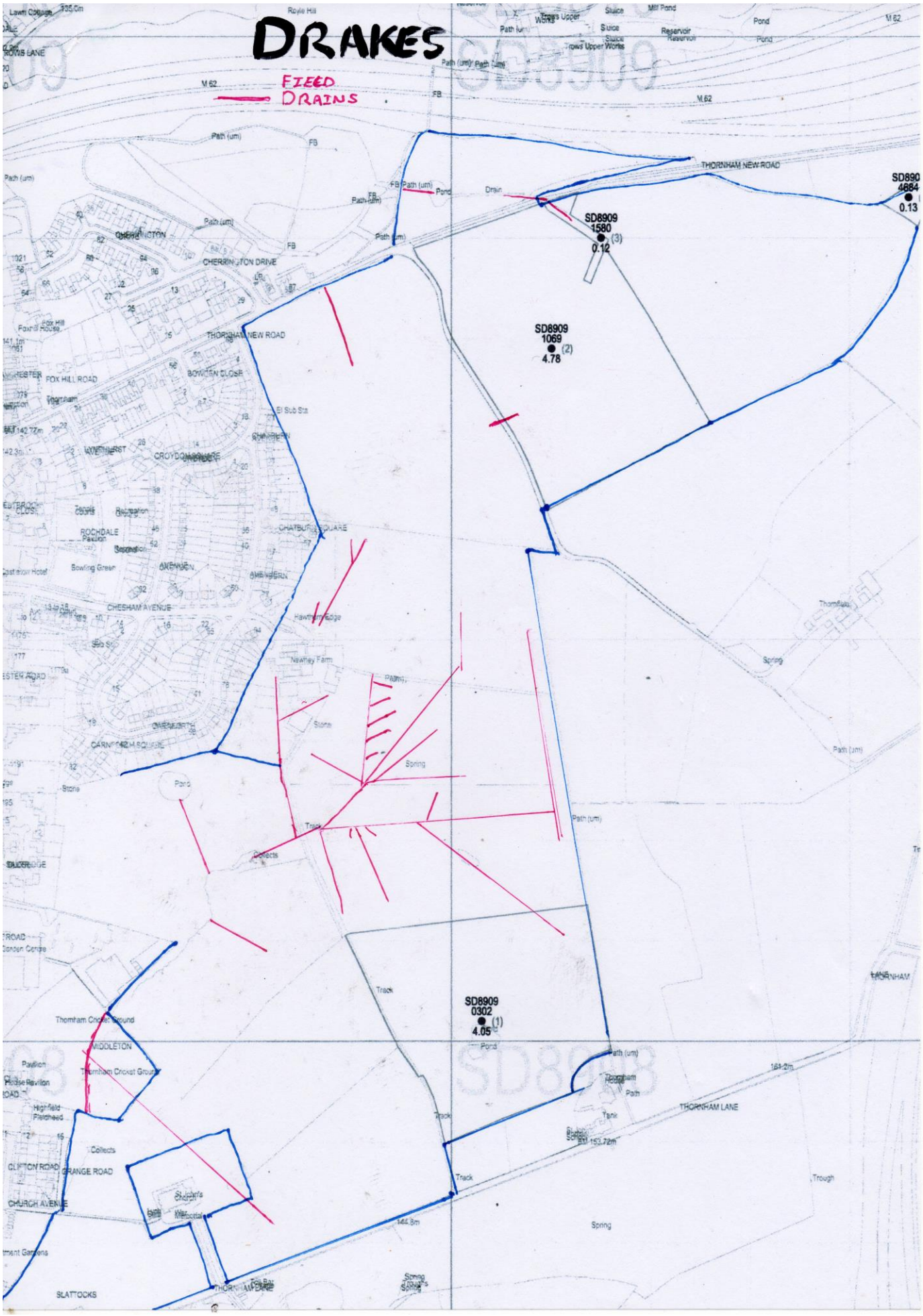
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Water for the North West

APPENDIX D
LAND DRAINAGE SKETCH PLAN

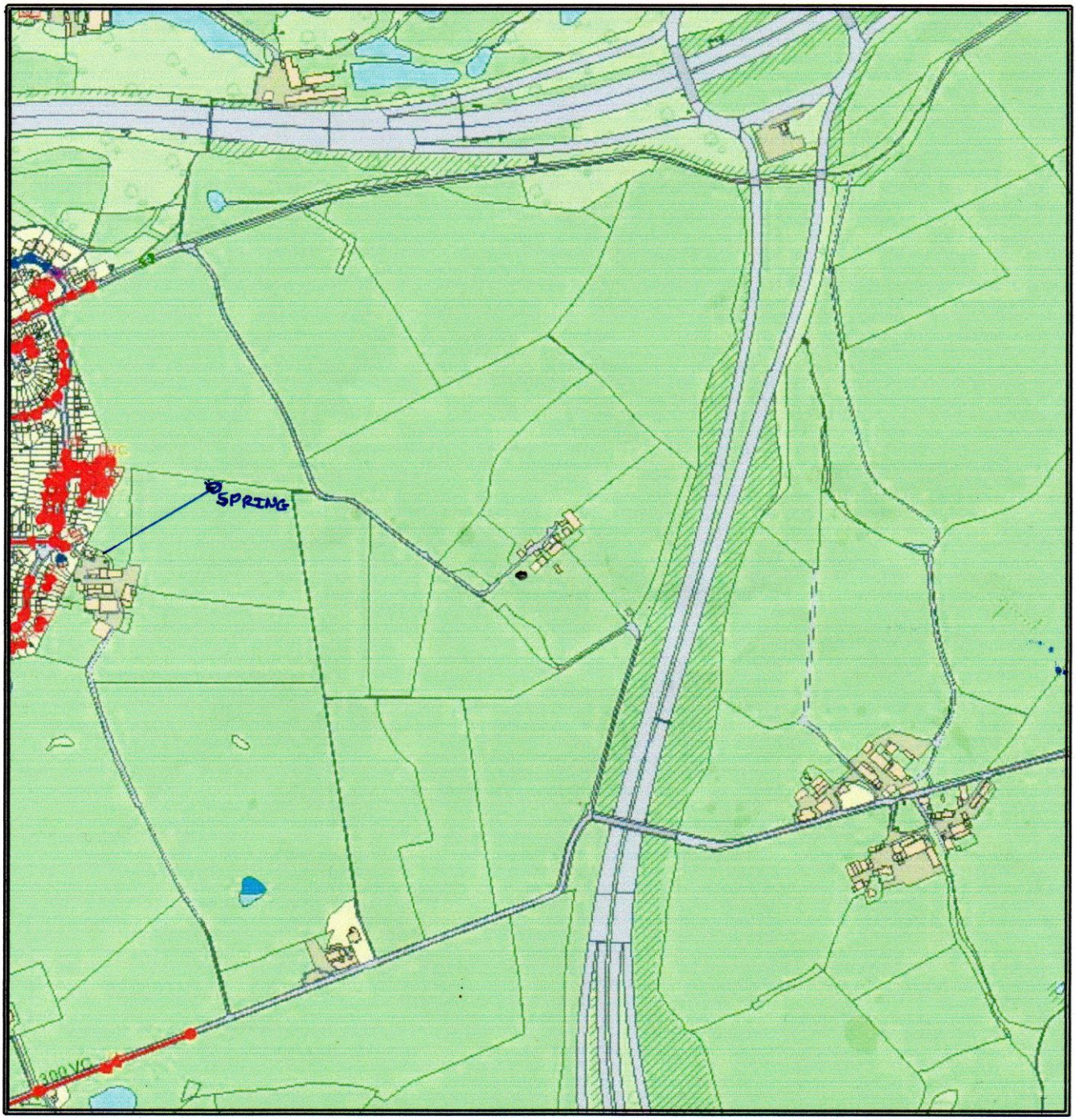

DRAKES
FIELD DRAINS
THORNHAM NEW ROAD
SD8909 1580 (3) 0.12
SD8909 1069 (2) 4.78
SD8909 0302 (1) 4.05
SD890 4684 0.13
CHERRINGTON DRIVE
FOX HILL ROAD
CHESHAM AVENUE
CLIFTON ROAD
GRANGE ROAD
CHURCH AVENUE
THORNHAM LANE
SLATTOCKS
Thornham Cricket Ground
Pavilion
Drain
Pond
Track
Spring
Stone
Trough
Collects
Path (um)
FB

United Utilities

DRAKES

COMMERCIALDW
DRAINAGE AND WATER ENQUIRY

SEWER RECORD LAND EDGED RED THORNFIELDS THORNHAM NEW ROAD CASTLETON, MIDDLETON ROCHDALE



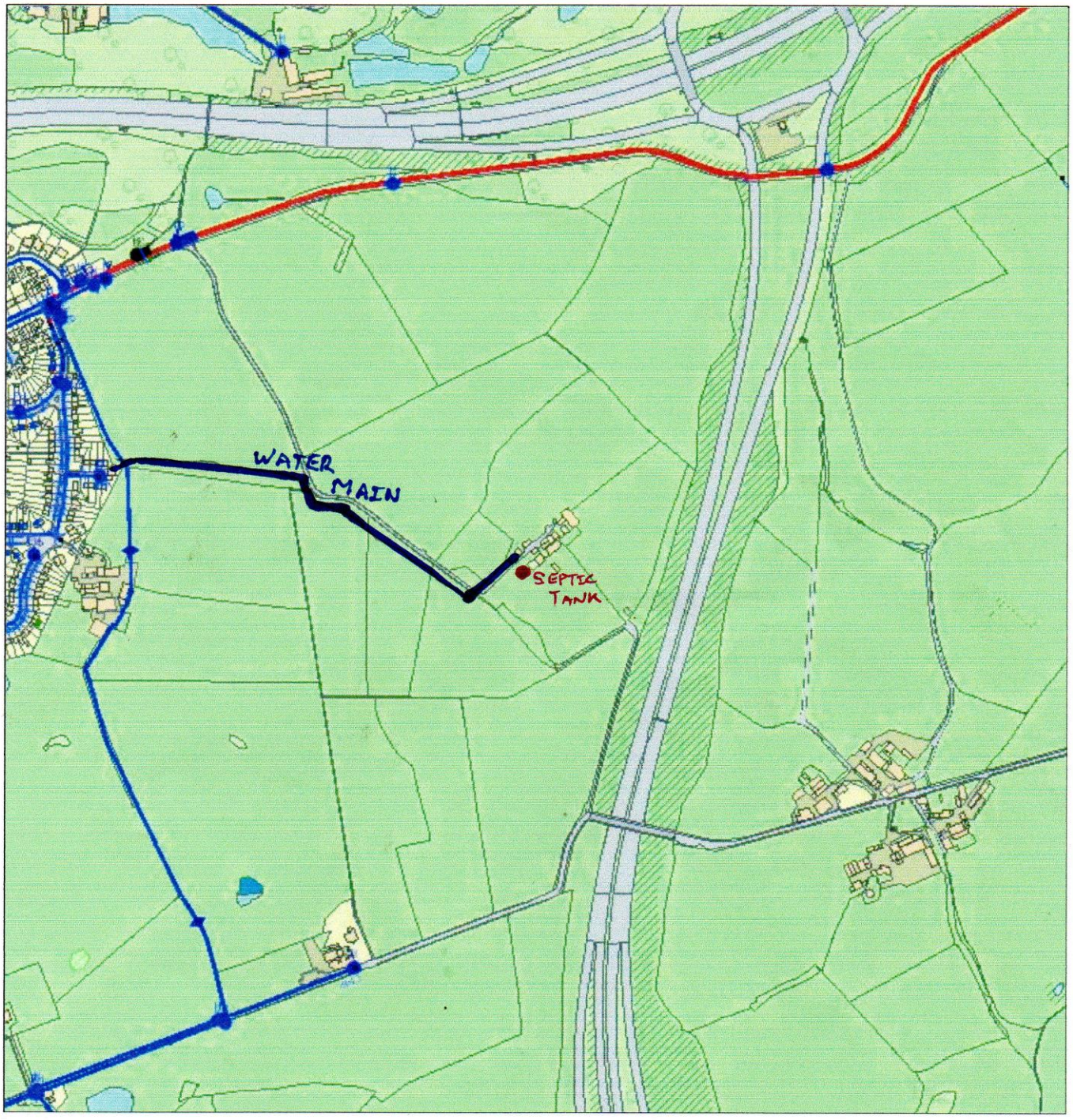
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United Utilities ALIGNS

COMMERCIALDW
DRAINAGE AND WATER ENQUIRY

WATER RECORD LAND EDGED RED THORNFIELDS THORNHAM NEW ROAD CASTLETON, MIDDLETON ROCHDALE



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APPENDIX E
CCTV SURVEYING LAYOUT PLAN


utl
utl
MH WL TO HIGH to get cctv footage
MH1
MH3 FULL OF DEBRIS
MH2 utl
utl
utl
utl
MH4
MH5
MH6
MH8
MH7
MH9
CP7
electric inside mh

APPENDIX F
PHASE 1 LAYOUT AND ENGINEERING APPRAISAL

Surface water outfall connection to existing watercourse

Surface water outfall connection to existing watercourse

Surface water outfall connection to existing watercourse

Surface water outfall connection to existing manhole on line of culverted watercourse

KEY

- 172 — Indicative Regrade Contour
- Surface Water Drainage Strategy
- Development Areas
- Ponds / Permanent bodies of Water (Indicative)

Revision	Date	Amendment	By	Check
-	---	-	---	---

Designers' Risk Assessment

	Comment
1.	---
2.	---
3.	---

Development	Stakehill		
Location	Manchester Road, Middleton		
Marketing Name	----		
Drawing Title	Preliminary Regrade Contours & Ponds		
Drawing Number	4159 / Eng / 100	Revision	-
Drawn By	JGM	Scale @ A1	1:1250
Checked by	AB	First Issue	23.02.2023

REDROW

Redrow Homes Lancashire
Redrow House, 14 Eaton Avenue, Buckshaw Village, Chorley, PR7 7NA
Tel: 01772 643700 Fax: 01772 643701 Web: www.redrow.co.uk

Legal Disclaimer TBC

This layout has been designed after due consideration of our Context & Constraints Plan

APPENDIX G
THORNHAM ROAD CULVERT CLEARANCE DRAWING

SCALE WITH CAUTION AS DISTORTION CAN OCCUR

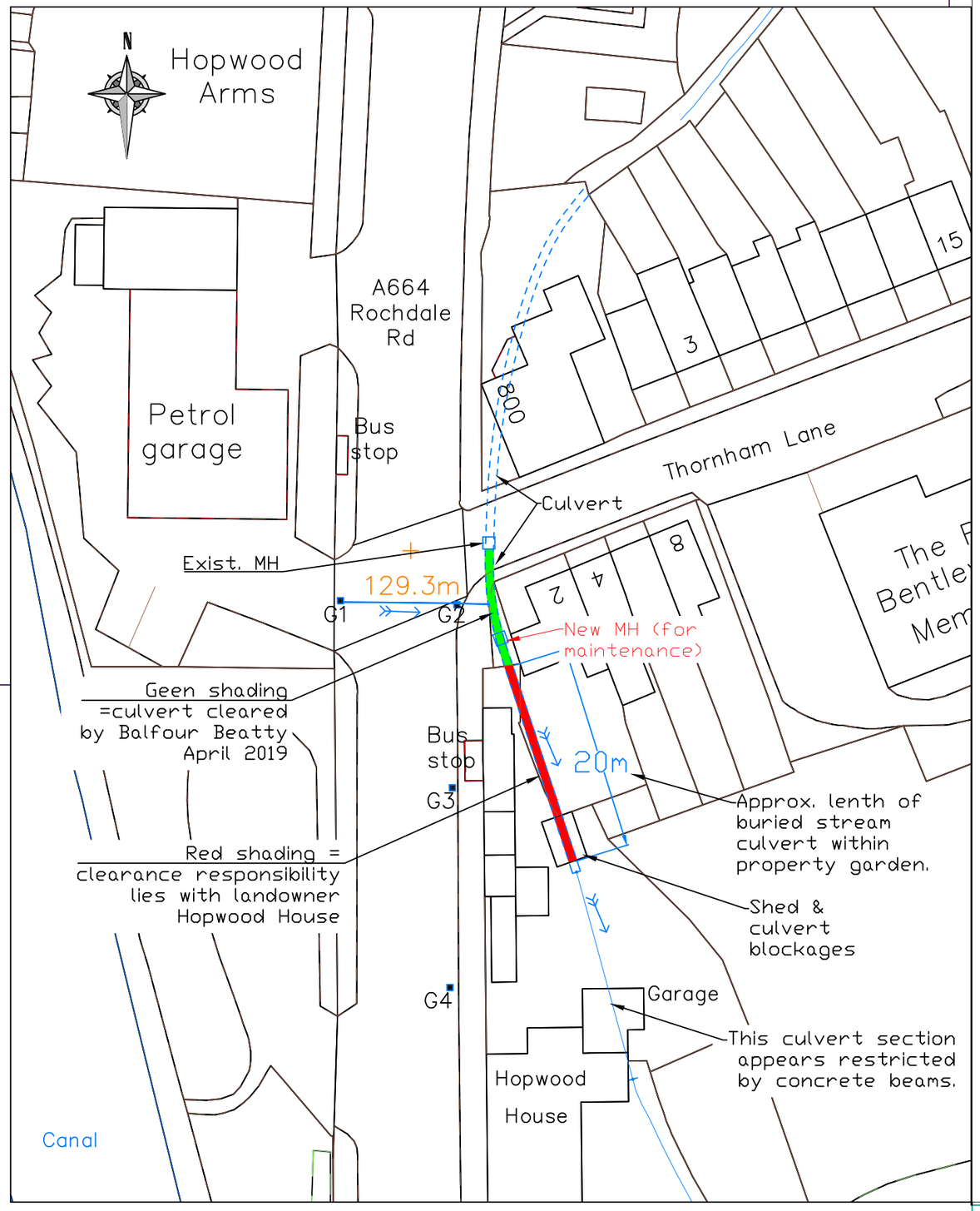




Photo 1: of silt looking towards Hopwood House. 70cm deep silt & 30cm freeboard (clear)



Photo 2:- Deep layer of silt still in culvert under Hopwood House 'garden' (April 2019).



Photo 3: Steel drooping into culvert under shed (Hopwood House)



Photo 5: Beam partially blocking culvert under garage (Hopwood House)

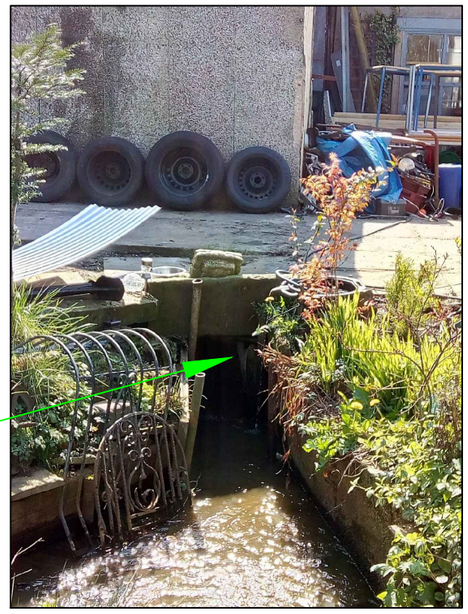


Photo 4: Culvert goes under garage (Hopwood House)

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NEIGHBOURHOODS
Director: M. Widdup

HIGHWAYS & PROPERTY
Assistant Director: D. Bowler

Project: Thornham La. Culvert

Title: Clearance Works April 2019

Drawn:	Check'd & Approv'd:	Safety Audit Check
SMcC	*	*

Scale:	Date:
1:1000	02/05/19

Dwg No.: A3/ThornhamLa/01

A3

APPENDIX H
LLFA CORRESPONDENCE

ROCHDALE BOROUGH COUNCIL

Highways and Engineering Service - Economy and Environment

DRAINAGE CONSULTATION ON PREAPP/00091/22

Consultation Response on behalf of Head of Highways and Engineering

Date of Response: 2nd Nov 2022

LOCATION & APPLICATION DETAILS:

Land at Stakehill, Middleton. Hybrid planning permission is sought for up to 1500 dwellings, a new local centre, land reserved for the extension of St John's Primary School, a landscaping scheme & sustainable drainage measures.

DOCUMENTS REVIEWED

- Site Boundary Plan
- Letter to Planning from Stantec, the Planning Agent
- Concept Masterplan by Stantec dated Sept 2022
- Correspondence and enquiries from RSK's Hydrologist
- Stakehill Phase 1 Site Layout – by Redrow, dated Sept 2022

GENERAL DRAINAGE COMMENTS

Phase 1 Drainage Viability:- The land contours may be interpreted to conclude that most of the land within Phase 1 of the site falls within the catchments of the unnamed stream on the western boundary of the site.

There are existing issues with the three downstream sections of the unnamed streamway – with the issues highlighted on the Council's Annotated drawing that accompanies this Drainage Consultation.

Although the Applicant may argue that poor maintenance and inadequate culvert provision in the 3 locations is not something for the Applicant to resolve. However, it does mean that the Council will be looking very carefully about any flow discharge rates that are proposed by the Applicant to the unnamed SW stream, because high flows could result in flooding of the highway – as shown in the Photo 1 below.

Later Phases Drainage Viability:- I doubt that any other parts of the site in later phases can be legitimately claimed to drain to the unnamed western streamway. It is therefore not at all clear how any sustainable drainage would be implemented for any later phases of the site' development, because there is no known stream and no current SW drainage pipes.

No indication of methods of dealing with attenuated SW has been presented for either Phase 1 or Phase 2 to the Planning Authority, as of 3rd Nov 2022.

Greenfield Runoff rate discussion – Phase 1: A rough estimate (from overlaying the Redrow plan of the development onto an AutoCAD plan indicates that the area of the housing development would be approximately 10 hectares within a boundary of approximately 21 hectares.

The Drainage Designer RSK for the Applicant has asked if the Qbar (Average annual) Greenfield runoff rate of 7.3 l/s would be an acceptable design value. The Drainage Officer notes that this calculation is correct as provided by *Windes Source Control Rural Runoff calculator.* RSK has asked if the allowed runoff rate from the development (Phase 1) can be pro-rata to the hectares of the Developable land. It depends what is meant by 'developable' land. I would argue that only the paved areas should be counted, which would probably amount to about 9 hectares for Phase 1 i.e. 7.3 x 9 = 66 l/s.

Culverts on the western boundary of the site:-

Cricket Culvert:- The first culvert on the site is a very long one, under the cricket club. It looks as though a pipe was laid at the time of the cricket club construction. The condition and viability of the culvert is somewhat

unknown; it is long and therefore susceptible to blockage and it too long to be rodded. Whether this existing cricket field culvert could reliably carry larger, newer flows from the housing development site is highly questionable. Perhaps a ditch to the side of the cricket pitch would be a much better option and could easily be constructed by the Applicant's contractor as a stream ditch?

Culvert under corner of Church Ave /Grange Rd:- this culvert is known to block. The culvert starts in the land that is owned by the Applicant. I would argue that a new culvert route should be made, by the applicant, by extending the ditch until the church footpath and then installing a very short concrete pipe at least 600mm dia. under the footpath – no screen would be needed (because no-one would remember to clean it). This would completely resolve the current flooding issue.

Culvert under Thornham Rd and under Hopwood farm house land:- There are issues with poorly maintained parts of this culvert, particularly under Hopwood farm house, where the current owner appears to be oblivious to his responsibilities to allow the stream to flow freely. In the past this has caused regular flooding of the main road. There is a report – by the Drainage Officer –which highlights the ongoing issue. The Drainage Officer is re-raising this issue with Highway Maintenance so that they are aware that ongoing flooding could become more frequent and that enforcement action may be considered if highway flooding can be linked to the poorly maintained and inadequate culvert on Hopwood Farm House Land.



Photo 1. Highway flooding that used to occur regularly before the major works to desilt the culvert under Thornham Rd was undertaken by the Council Highways team. This could easily recur because the culvert in Hopwood Farm house land has not be adquately desilted and is not very accessible for desilt activities.

DRAINAGE ENQUIRIES FROM RSK TO COUNCIL DRAINAGE OFFICER

Email enquiries received from Ryan Whitfield, Hydrologist of RSK in Oct 2022

Please could I check with you the runoff rates attached/below will be acceptable for our drainage strategy. Based on Windes Source Control Rural Runoff calculator for the National Grid coordinates 388,409 we get a discharge rate of 7.3l/s/ha.

This would look in line with BGS geological map which suggests Hummocky superficial geology on site.

We are proposing a runoff rate equivalent to 7.3l/s/ha pro rata to the developable area of the site (to be confirmed). Attenuation will be provided for 1 in 100yr from the impermeable area, plus a 45% allowance for climate change. I assume 10% urban creep would be required as per the North West Suds Proforma?

ROCHDALE BOROUGH COUNCIL

Many thanks, ***Ryan Whitfield***
Hydrologist BSc(Hons) MSc MCIWEM

From: Ryan Whitfield <RWhitfield@rsk.co.uk>
Sent: 26 October 2022 09:34
To: Stephen McCann <Stephen.McCann@Rochdale.Gov.UK>
Subject: RE: Stakehill area - Culvert info

Thanks for the information supplied. I showed this to the land owner on the site visit who did confirm they know of frequent flooding on the highway. As the bottle neck appears to be immediately downstream of the site it might seem like we have a limited number of tools to deal with the flooding besides restricting runoff. Though perhaps if the flooding is caused by reduced capacity of the culvert from siltation, then it could be argued development of the site will reduce silt reaching the watercourse with the use of attenuation basins which will encourage some settlement prior to discharge.

Has there been a reduction in flooding here since the clearing works in 2019?

I've seen your email to the planning department and I've been able to dig out the Waterco FRA (2020) from the mass of old reports the client has sent us. Attached for your record.

From talking to the land owner and site observations there is a watercourse (the landowner calls 'The Dell/Del') which issues from a '12 inch drain' at coordinates 388822 E, 409179 N. The drain is fed from a network of 150mm diameter land drains upstream.

The current proposals are for anything upstream of The Dell (at 388822 E, 409179 N) to be developed and provide positive drainage from impermeable areas to attenuation features and discharge at GRR QBar to The Dell (at 388822 E, 409179 N). Development downstream of the Dell (at 388822 E, 409179 N) will be offset from the watercourse and the Dell will be retained through the site as existing.

I've also attached a DWG topo to help inform with any information you are able to provide, but I can provide as PDFs if required.

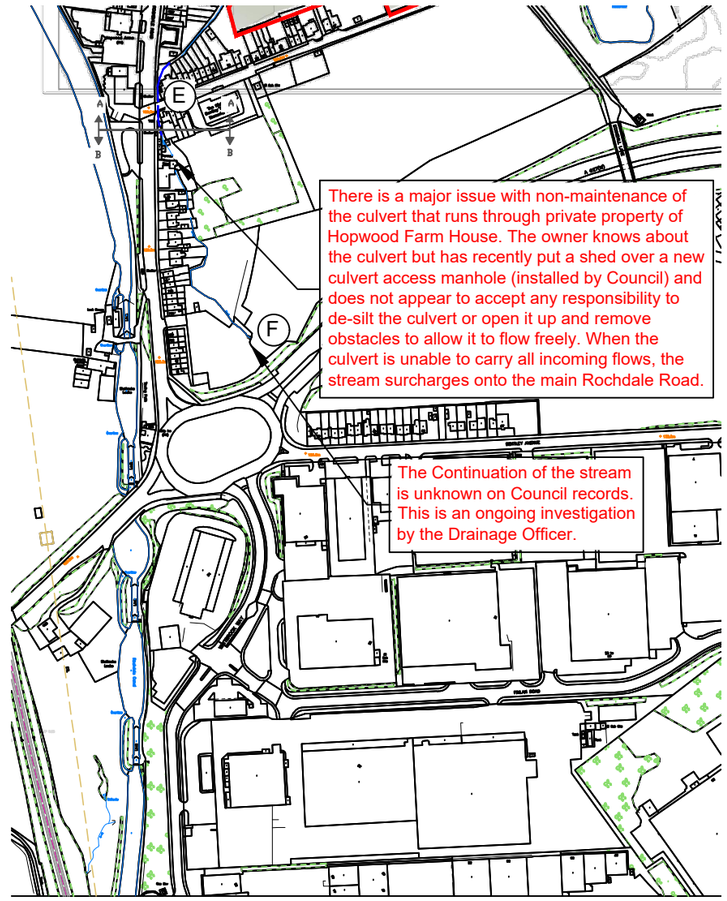
The current development plans are high level so I don't have anything else to send at this time which won't change. But let me know if there's anything further to these points you'd like to discuss.

Refer also to the Drainage Plan with Notes issued by Stephen McCann

This Drainage Consultation was compiled by Stephen McCann
Drainage & Flooding Officer
07552 570262 01706 924606 stephen.mccann@rochdale.gov.uk

SCALE WITH CAUTION AS DISTORTION CAN OCCUR 0 1 2 3 4 5 6 7 8 9 10cm





NOTES:

1. The Council's Planning Authority should take note that there is an ongoing issue regarding lack of maintenance of the private watercourse culvert through the grounds of Hopwood Farm house. If the Stakehill development goes ahead, then significant rainwater flows will be discharged to the stream & culvert. Main road flooding is very likely to occur, which is a safety hazard.

2. In 2019, the Council Highways completed a major desilt of the culvert under the public footpath, and beyond into the private garden and installed a new chamber with an access cover. Highways are unlikely to be willing to get involved in future repeated desilting of the Hopwood farm house culvert, which remains a very constricted 'ad–hoc' channel.

3. The Planning Officer should check with the a Senior Highway Officer as to whether there are any concerns regarding new flows to the culvert and whether a formal legal letter should be issued to the owner at Hopwood farm house, reminding them of their responsibilities to 'maintain and allow free flow of the ordinary watercourse through their land' – TO MITIGATE AGAINST HIGHWAY FLOODING on the Rochdale Rd.

ROCHDALE BOROUGH COUNCIL
NEIGHBOURHOODS
Director: M. Widdup
HIGHWAYS & PROPERTY
Assistant Director: D. Bowler

Project: STAKEHILL AREA OS MAP BACKGROUND	Drawn: S McCann
	Check'd & Approv'd: *
Title: DRAINAGE NOTES on Redrow phase 1	Scale: See Scalebar
	Date: 02/11/22
	Dwg No.: RBC STH/01

1 2 3 4 5 6 7 A3

APPENDIX I
TOTAL SITE GREENFIELD RUNOFF CALCULATIONS

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.450
Area (ha)	88.500	Urban	0.000
SAAR (mm)	1085	Region Number	Region 10

Results	**l/s**
QBAR Rural	609.7
QBAR Urban	609.7
Q100 years	1268.2
Q1 year	530.5
Q30 years	1033.7
Q100 years	1268.2

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APPENDIX J
1HA GREENFIELD RUNOFF CALCULATIONS

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.450
Area (ha)	1.000	Urban	0.000
SAAR (mm)	1078	Region Number	Region 10

Results l/s

QBAR Rural	7.3
QBAR Urban	7.3
Q100 years	15.1
Q1 year	6.3
Q30 years	12.3
Q100 years	15.1

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