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Quality Assurance Record

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3	20/06/2023	A. Osborne	C. Townsend	C. Townsend	3 rd Issue

Limitation of Liability and Use

The work described in this report was undertaken for the party or parties stated; for the purpose or purposes stated; to the time and budget constraints stated. No liability is accepted for use by other parties or for other purposes, or unreasonably beyond the terms and parameters of its commission and its delivery to normal professional standards.

1. INTRODUCTION

1.1 Purpose of this Report

Townsend Water Engineering Ltd. has been appointed by Mr. Mark Russel at Stonebond Limited for a Flood Risk Assessment (FRA) of a development of approximately 49 residential units with associated landscaping, parking and access roads at Edenfield Road, Norden, OL12 7SP (Grid Ref: 385715, 414727). This report has been prepared in support of the planning permission for the aforementioned development.

The report is based on the available flood risk information for the site detailed in Section 1.2 and prepared in accordance with the planning policy requirements set out in Section 1.3. The scope of the FRA is consistent with the 'Site Specific Flood Risk Assessment Checklist' from the National Planning Policy Framework (NPPF) and accompanying Planning Practice Guidance (PPG):

<https://www.gov.uk/guidance/flood-risk-and-coastal-change#Site-Specific-Flood-Risk-Assessment-checklist-section>

1.2 Sources of Information and Consultation

This Report has been informed by:

- Existing Site Plan drawings and respective topographic plan delivered by Stonebond Limited;
- EA Product 4 data;
- Modelling undertaken to investigate the flooding of the surrounding area;
- BGS website <http://mapapps.bgs.ac.uk/geologyofbritain/home.html?mode=boreholes>;
- Cranfield University Soil Mapping <http://www.landis.org.uk/soilscapes/>;
- The EA online flood maps;
- <https://flood-map-for-planning.service.gov.uk/>; and
- <https://flood-warning-information.service.gov.uk/long-term-flood-risk/>.

1.3 Policy Context

This report has been prepared in accordance with the relevant national, regional and local planning policy and statutory guidance as follows:

- National policy contained within the National Planning Policy Framework (NPPF) dated July 2021, issued by Communities and Local Government with reference to Section 14 'Meeting the challenge of climate change, flooding and coastal change';
- The NPPF Planning Practice Guidance (PPG) released in March 2014 ('Flood Risk and Coastal Change' section) and updated in February 2016 to incorporate the EA 'Flood Risk Assessments: Climate Change Allowances' guidance; and,
- Rochdale Borough's Strategy for Flood Risk Management 2013-2023 (Consultation Draft) October 2013.

1.4 Structure of this Report

The Report has been prepared based on the following structure:

- Section 2 refers to spatial planning considerations by reference to the proposed land use, flood zoning and NPPF vulnerability;
- Section 3 presents the assessment of existing flood risk at the site;
- Section 4 presents the proposed development and findings of flooding; and
- Section 5 provides a summary of the assessments.

Additional Appendices are provided that deal with the following:

- Appendix A NPPF Flood risk assessment template;
- Appendix B: Flood Modelling from the Environment Agency
- Appendix C: Proposed Layout

2. SPATIAL PLANNING CONSIDERATION

2.1 Location and Background

The location of the proposed development site is shown in Figure 1 and Figure 2, with location details found in Table 1. The site is located on Edenfield Road, Norden, OL12 7SP (Grid Ref: 385715, 414727). (Table 1: Site Details). The proposed site is currently a mix of derelict hardstanding industrial areas to the East and West of the site and a forested area in the centre.

The development involves the building of 49 residential units. The nett area is approximately 1.08ha.

The watercourse '*Naden Brook*' runs along the sites Southern border. It flows from West to East and exiting the site in the South-East. The watercourse appears to have a build-up of buildings around it. '*Woodhouse Lane Brook*' crosses the site from the North, running into *Naden Brook* in the South.

The watercourse *Naden Brook* is a main river under the Flood and Water Management Act 2012. Therefore any works within 8m of the top of bank or toe of the landward side of the river defence will require a flood permit from the Environment Agency. *Woodhouse Lane Brook* is an ordinary watercourse and therefore if any works are required that affect the flow then a land drainage consent will be required.

'*Doctor Dam*' (a reservoir) is approximately 150m North of the site. Further North, approximately 420m from the site, is '*Greenbooth Reservoir*'.

To the North of the site is a forested area and fields. To the East of the site is a residential area. To the South of the site is *Edenfield Road*, further South is a residential area. To the West of the site is *Greenbooth Road*, further West is a forested area and further West again is a residential area. Please see Figure 1 and Figure 2.

Table 1: Site Details

Reference	Value
OS X (Eastings)	385715
OS Y (Northings)	414727
Nearest Post Code	OL12 7SP
Nat. Grid	SD 857147

Grid reference details taken from Grid Reference Finder



Figure 1: Site location (Source: Bing Map)

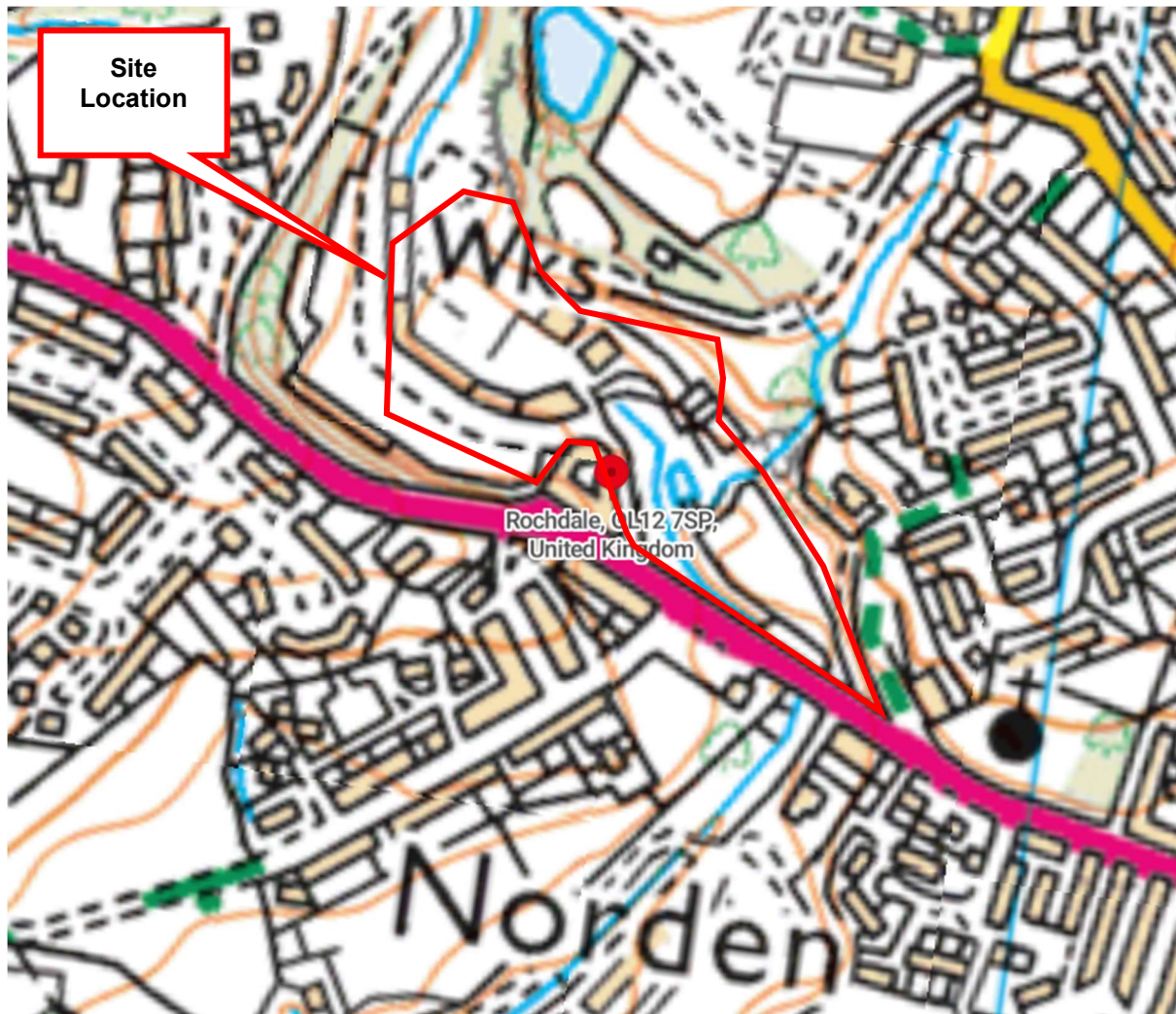


Figure 2: Ordnance Survey view of the site (Source: Bing Maps)

2.2 Topography

The existing ground elevations on site is shown in the topographic drawing (Figure 3: Site Existing Topography). They indicate that the site is uneven, sweeping down with high ground bounded to the North-West and low ground to the South-East. Ground levels vary between 170.13mAOD and 160.78mAOD. The ground levels drop towards the watercourse *Naden Brook*. A full Topography can be found in appendix A.

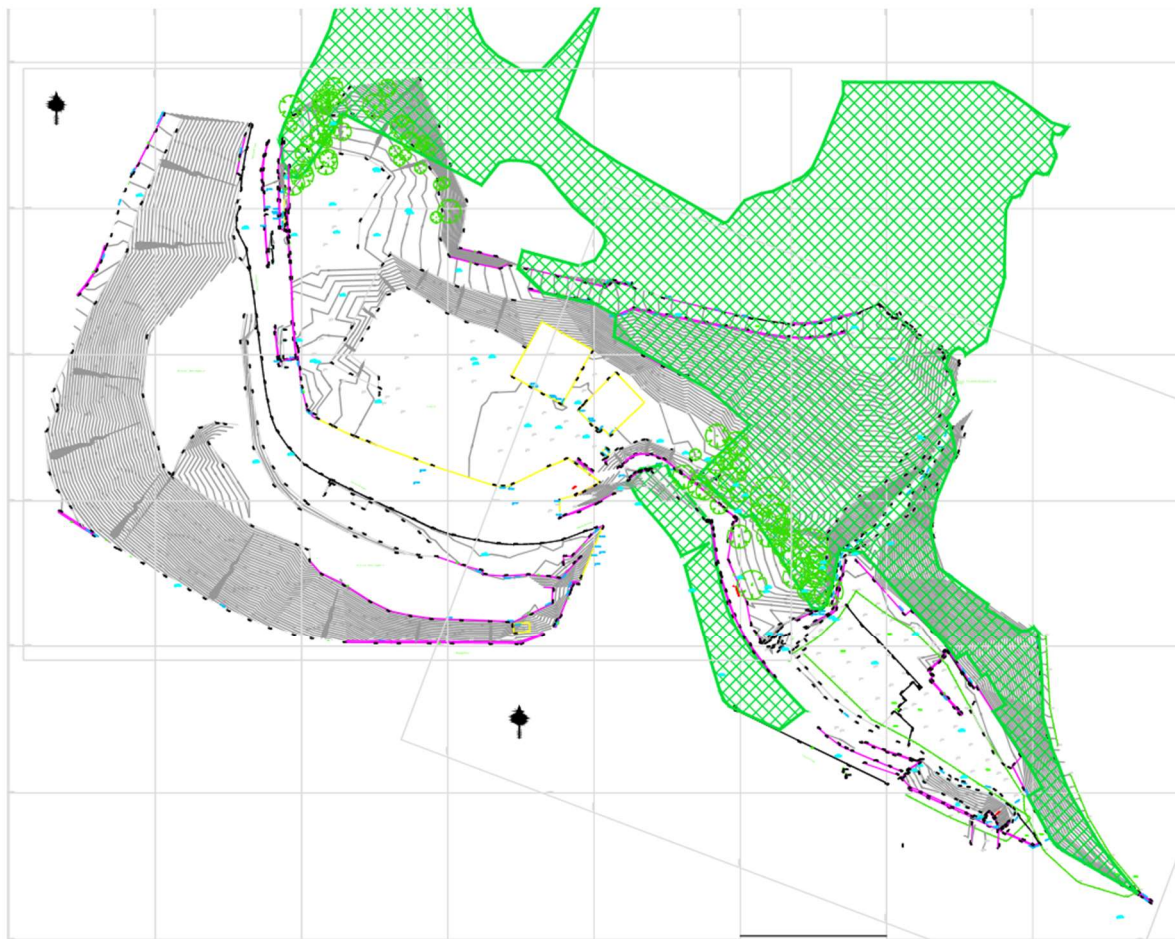


Figure 3: Site Existing Topography (Source: Client)

2.3 Geology and Soil

The geology at the site has been obtained from the British Geological Survey (BGS) website. The bedrock beneath the site is described as '*Rough Rock - Sandstone. Sedimentary bedrock*'. The superficial geology of the site is described as '*Till, Devensian- Diamicton. Sedimentary superficial deposit*'. Please see Figure 4.

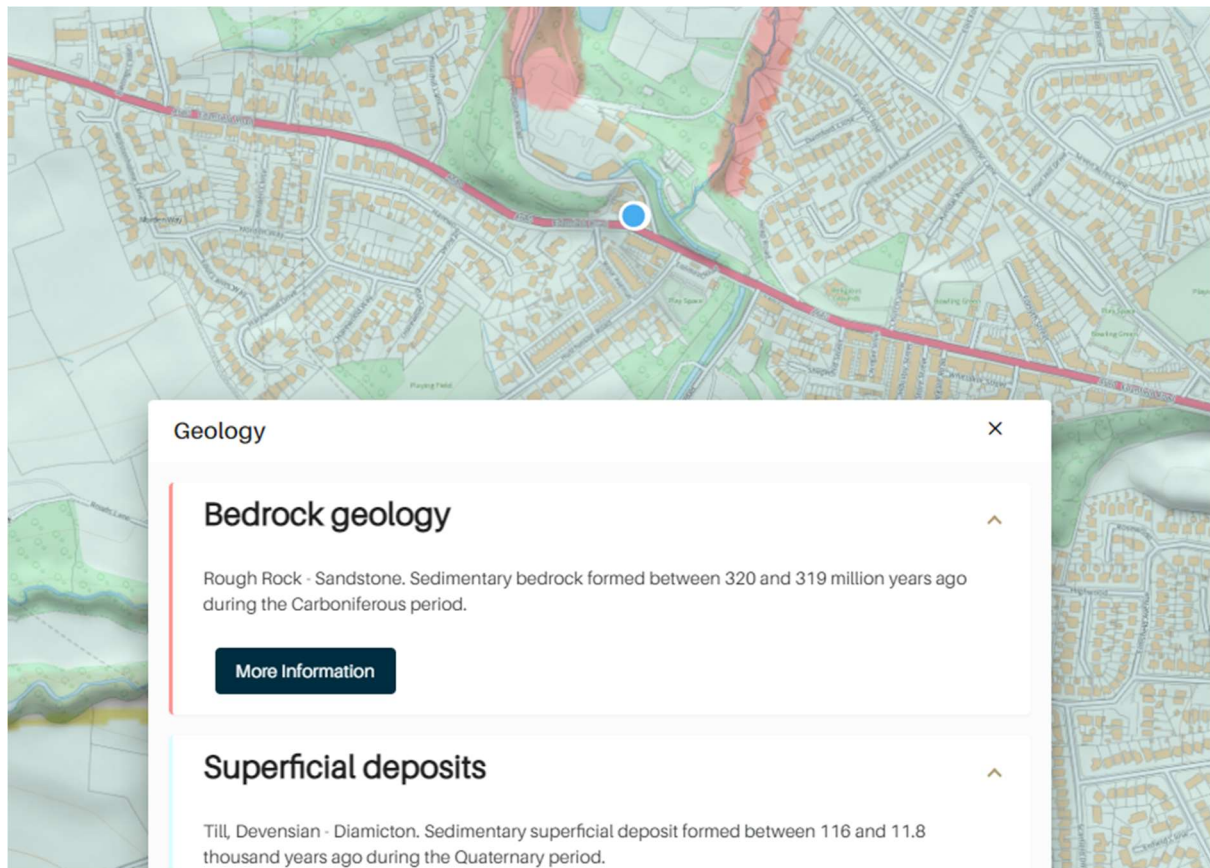


Figure 4: Bedrock & Superficial Deposits underneath the Site (Source: BGS Bedrock Geology Mapping)

Soils at the site are described on the Cranfield University 'Soilscapes' website mostly as, 'Slowly permeable, seasonally wet, acid loamy and clayey soils.'

Furthermore parts of the site are at risk of flooding and soakaways should not be placed in Flood Zone areas.

This suggest that the site is unlikely to be suitable for infiltration.

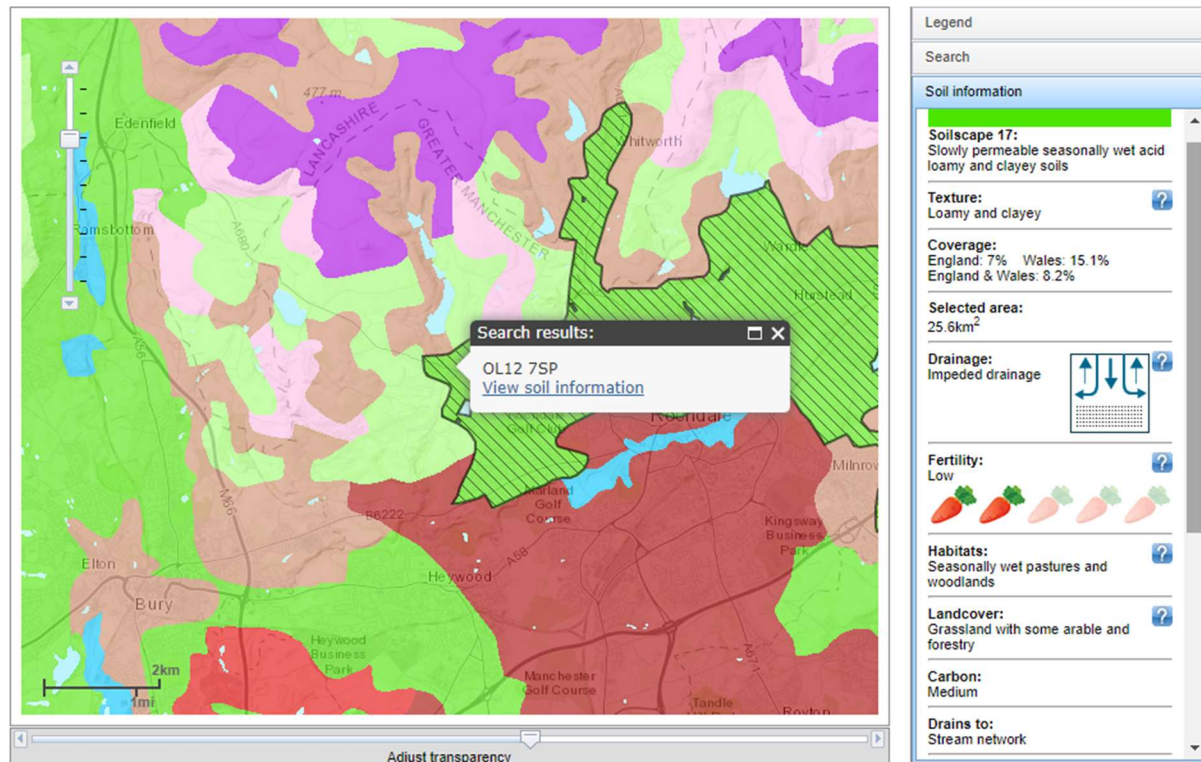


Figure 5: Soil Map of the Site (Source: Cranfield University Soil Mapping)

2.4 Flood Zone

The existing site is partially within Flood Zone 3. Flood Zone 3 is an area at risk of fluvial flooding up to and greater than the 1 in 100 year event. This suggests that parts of the site are at high risk of fluvial flooding. Please see Figure 6 below.

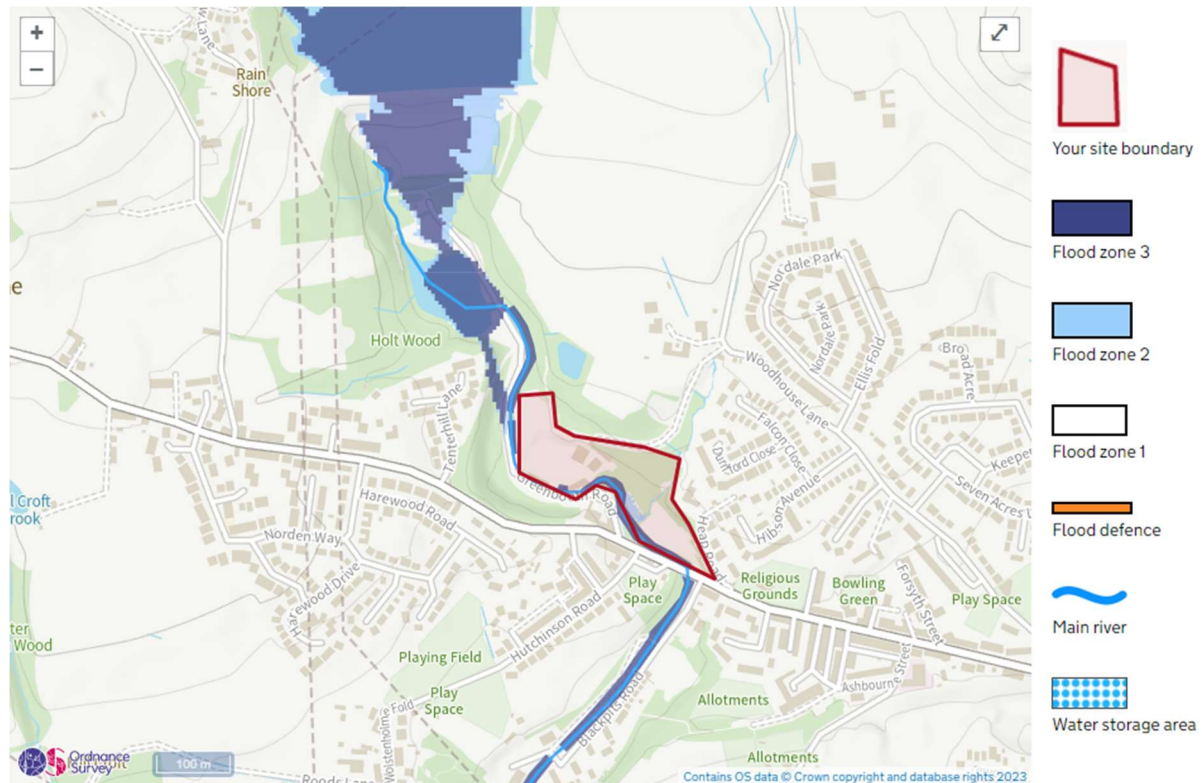


Figure 6: Flood Risk Maps

2.5 NPPF Vulnerability

The development will be classed as 'More Vulnerable' under the NPPF vulnerability classification (Table 2). The flood risk vulnerability and flood zone compatibility are displayed in Table 2. As noted in Section 2.4, the site is partially within Flood Zone 3 according to the EA flood risk map for planning.

Table 2: Flood Risk Vulnerability Classification (Source: NPPF Technical Guide)

More vulnerable (MV)
Hospitals, residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels
Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels.
Non-residential uses for health services, nurseries and educational establishments.
Landfill and sites used for waste management facilities for hazardous waste ⁶ .
Sites used for holiday or short let caravans and camping, subject to a specific warning and evacuation plan. ⁷

Table 3: Flood Risk Vulnerability and flood zone compatibility (Source: NPPF Technical Guide)

Flood Zone	Definition	Essential Infrastructure	Water compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
1	$T > 1,000$	✓	✓	✓	✓	✓
2	$100 < T_{\text{fluv}} < 1,000$ $200 < T_{\text{tidal}} < 1,000$	✓	✓	Exc. Test	✓	✓
3a	$T_{\text{fluv}} < 100$ $T_{\text{tidal}} < 200$	Exc. Test	✓	✗	Exc. Test	✓
3b (functional floodplain)	$T_{\text{fluv}} < 20$	Exc. Test	✓	✗	✗	✗

The houses are to be built within the Flood Zone 1 area of the site. This will be further explained in section 4. Therefore, the proposed housing is outside of Flood Zone 3 and is actually in Flood Zone 1. The proposed development passes the sequential test.

2.6 Climate Change Allowances for Peak Rainfall Intensity

The Environment Agency and NPPF require a consideration of the impacts of climate change in Flood Risk Assessments (FRA). In February 2016, the Environment Agency updated the climate change allowances required in Flood Risk Assessments (Environment Agency, 2016); this advice updates previous climate change allowances to support the NPPF (DCLG, 2012).

The rainfall guidance recommends a progressive increase, reaching 45% for the 'Upper End' allowance by 2070 in this area. This allowance would be recommended for this proposed development, which is classified as 'More Vulnerable' and has been taken to have a 100-year design life. The 45% climate change allowance is based on the 90th percentile, meaning that there is a 90% chance that rainfall will not increase by more than the 45% increment. Please see Figure 7 below.

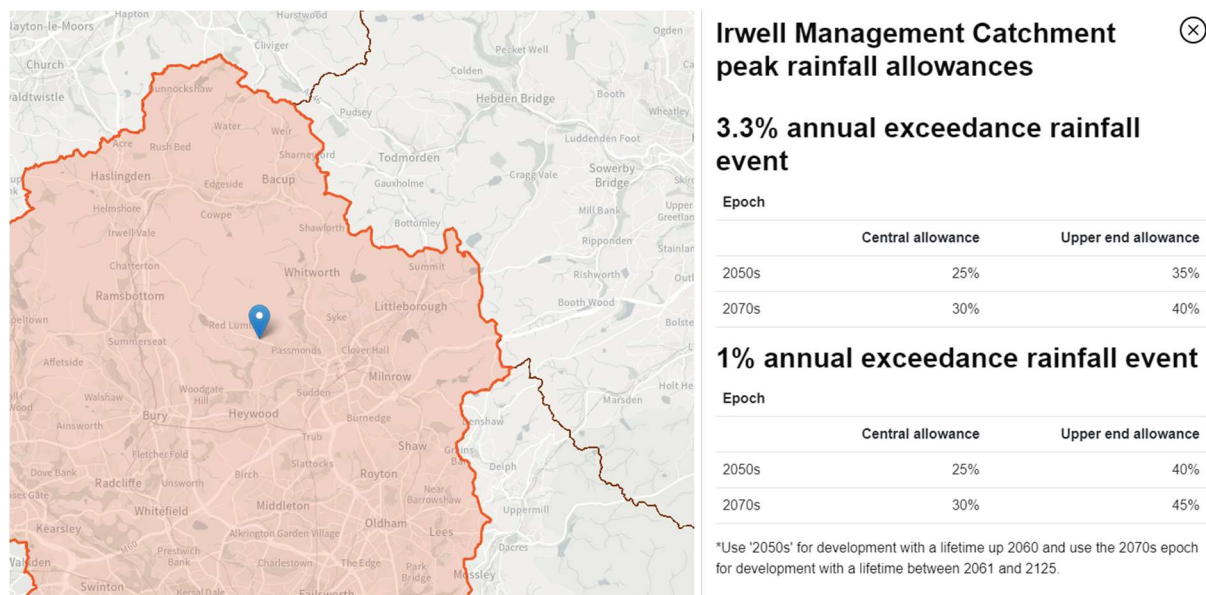


Figure 7: Flood Risk Assessment Climate Change Map Peak Rainfall Allowances

2.7 Climate Change Allowances for Peak River Flow

The river flow guidance recommends a progressive increase, reaching 35% for the 'Central' allowance by 2080 in this area. This allowance would be recommended for this proposed development, which is classified as 'More Vulnerable' and has been taken to have a 100-year design life. The 35% climate change allowance is based on the 90th percentile, meaning that there is a 90% chance that rainfall will not increase by more than the 35% increment. Please see Figure 8 below.

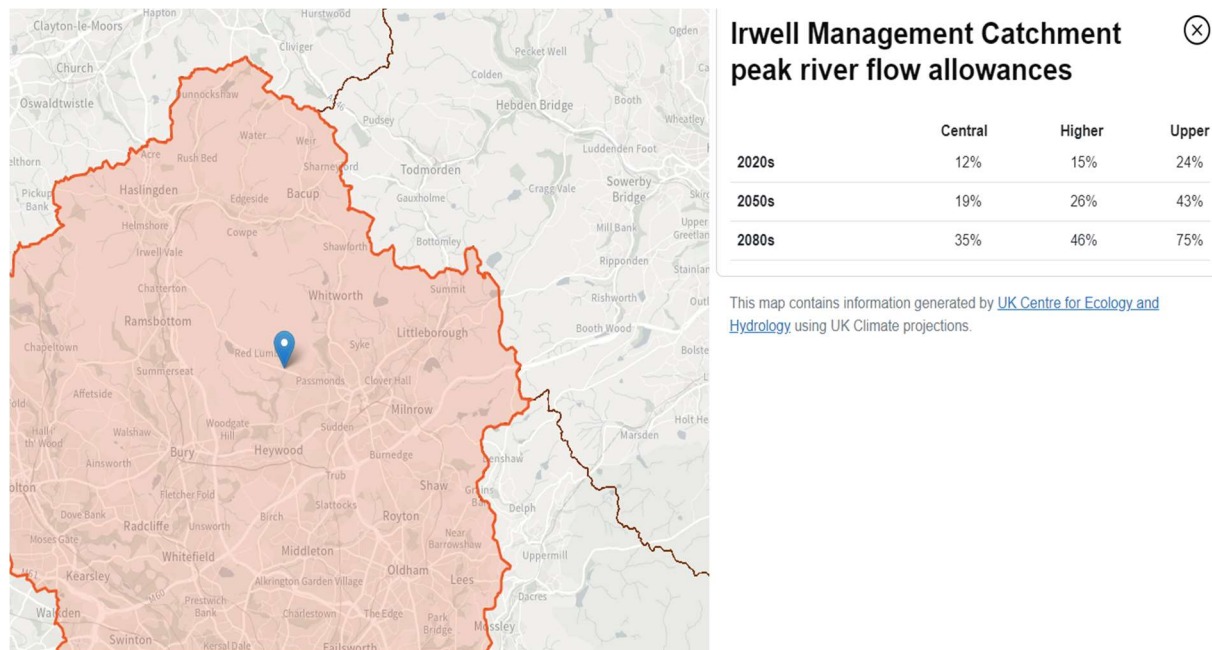


Figure 8: : Flood Risk Assessment Climate Change Map Peak River Flow Allowances

The Environment Agency do not have 1 in 100 year event plus 35% flood levels. Therefore the levels have been extrapolated from the flood's levels provided, this is discussed in section 3.1.1.

3. FLOOD HAZARD FOR EXISTING SITE

3.1 Source of Flood Risk

Flood sources and their possibilities at the site is listed and described below.

3.1.1 Flood Risk from Fluvial Sources

Parts of the proposed development are situated within a Flood 3 (an area at high flood risk).

Townsend Water Engineering obtained flood levels from the Environment Agency and have compared the flood levels to the topographical survey, the findings indicate that the houses and plots are outside of the 1000yr CC fluvial event. Please see Figure 9 & Table 2. Appendix B for the full results

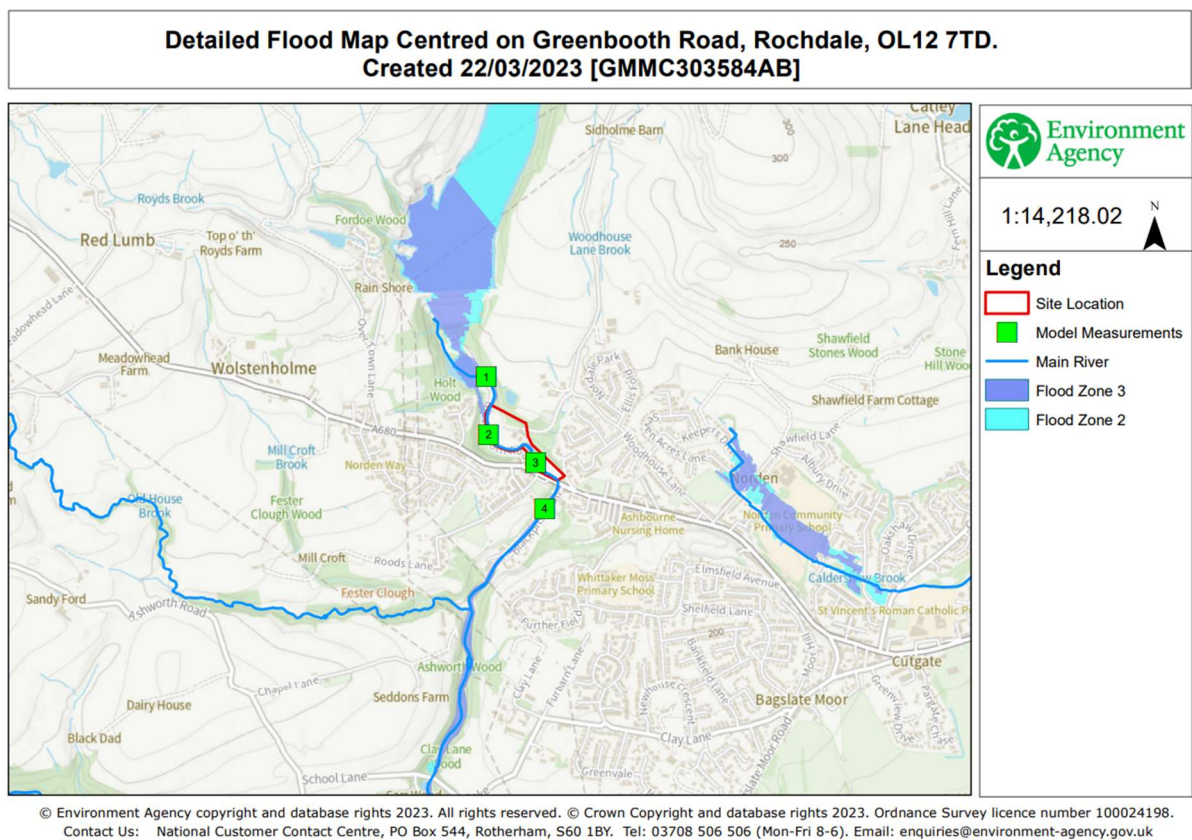


Figure 9: Environment Agency Flood Maps for the Site

Table 2: Cross-Section of Site Topographical Levels Compared to EA Flood Levels

Cross-Section	Site Topographical Levels (mAOD)	EA Flood Levels (100yr+20% CC) (mAOD)	Extrapolated (100 yr. plus 35% CC) (mAOD)	EA Flood Levels (1 in 1000yr) (mAOD)
2	165.91	165.18	165.28	165.44
3	160.94	157.99	158.08	158.26

The 1 in 100 year event plus 35% has been extrapolated from the 1 in 100 year event and the 1 in 1000 year event. It is a ratio between the two events.

According to the topographical survey the bottom of *Greenbooth Lane* is above the 1 in 1000 year level. It is recommended a full topographical survey is undertaken to review the culverts and the levels on the site.

However with the information provided it would appear that the proposed developable land area is flood free up to and including the 1 in 1000 year event.

3.1.2 Surface Water

The *EA* surface flood extents have been obtained from the *EA* open dataset. The majority of the development site is in the very low risk zone (i.e., less than 0.1% AEP).

There is an area along the Southern boundary that is shown to be of high risk, meaning that this area has a chance of flooding of greater than 3.3% each year. However this area appears to follow the watercourse (*Naden Brook*). The proposed layout does not place any buildings in the areas of high risk surface water flooding, therefore risk of flooding from surface water is believed to be low. Please see Figure 10.

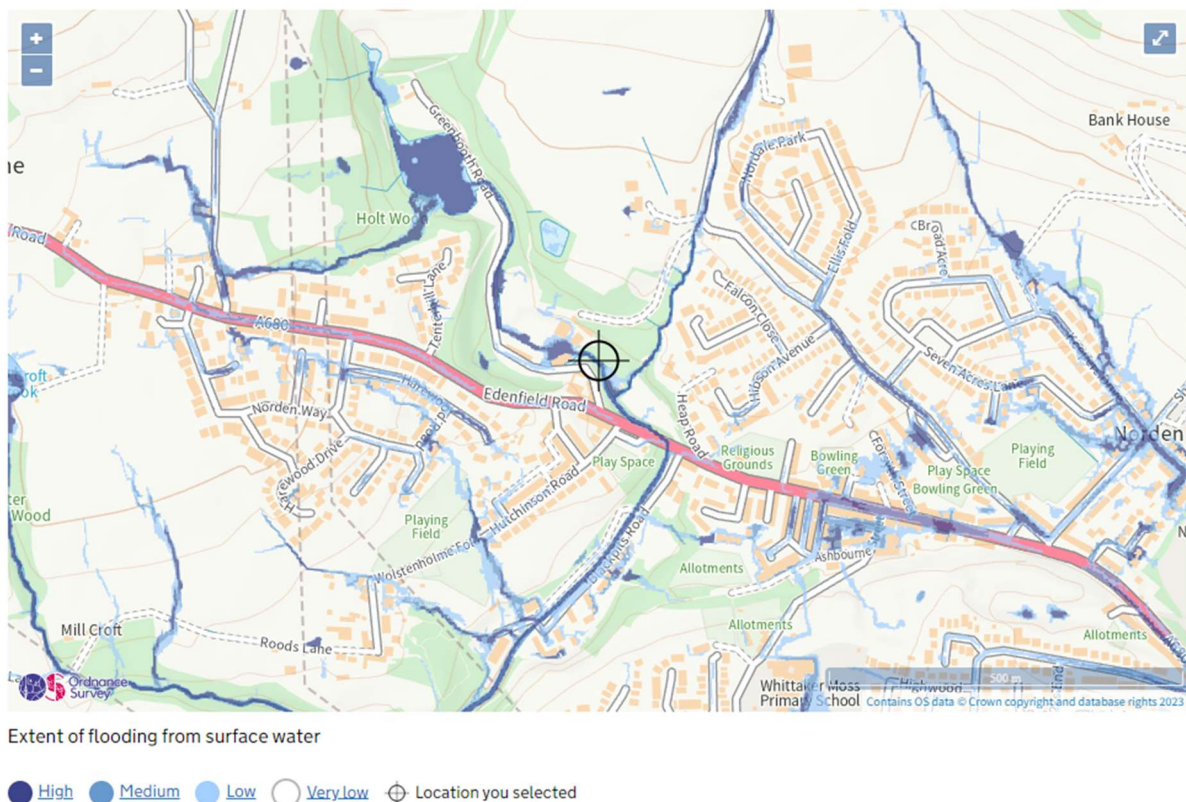


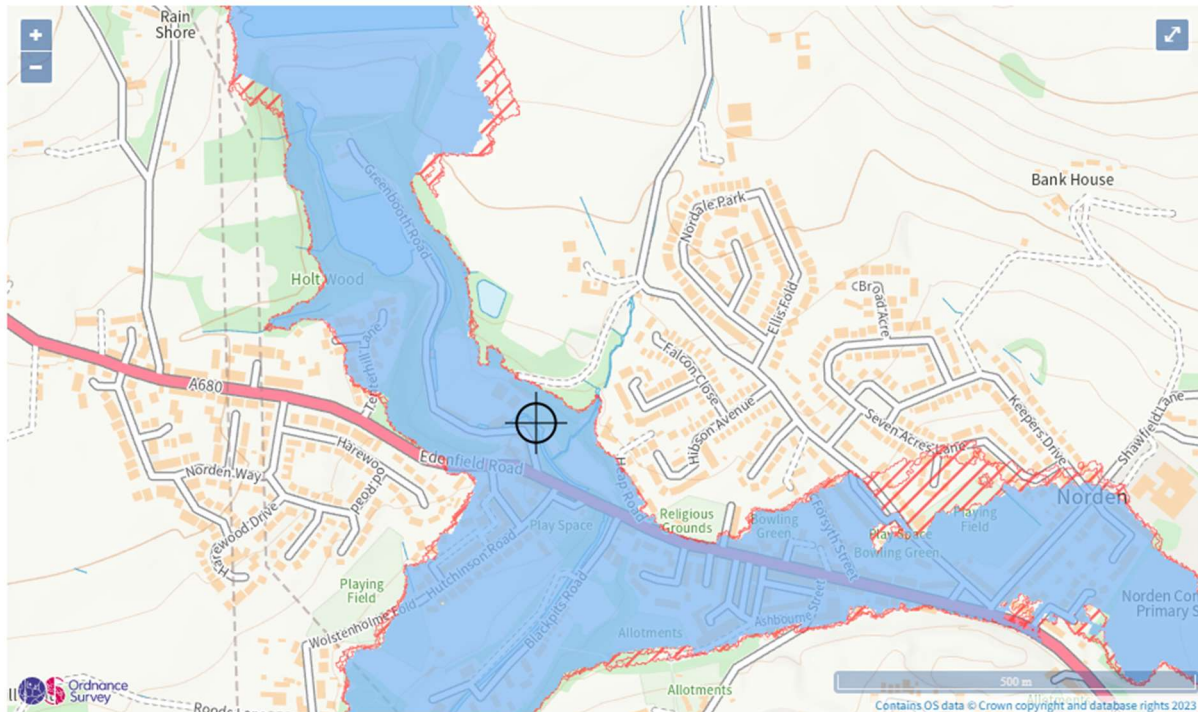
Figure 10: 1% AEP Surface Water Depth (Source: EA Open Dataset)

3.1.3 Flood Risk from Reservoir /Canals / Other Artificial Sources

The *EA* Extent of Flooding from Reservoirs map (Figure 11), based only on large reservoirs (over 25,000 m³ of water), shows that there is risk of flooding from reservoirs. Flooding from reservoir is

considered to be extremely unlikely, however in the event of a reservoir breach, the risk of flooding to the site from reservoir flooding is considered to be high.

There is no flood risk from canals or other artificial sources as there are no canals or artificial sources within the vicinity of the site.



Maximum extent of flooding from reservoirs:

● when river levels are normal ■ when there is also flooding from rivers ⊕ Location you selected

Figure 11: Extent of Flooding from Reservoirs (Source; EA Flood Warning Information Service)

3.1.4 Flood Risk from Groundwater

According to 'Rochdale Borough's Strategy for Flood Risk Management 2013-2023', at medium risk of flooding.

The proposed development will not have any cellars or below ground rooms. Therefore the risk of flooding is low.

Please see Figure 12.

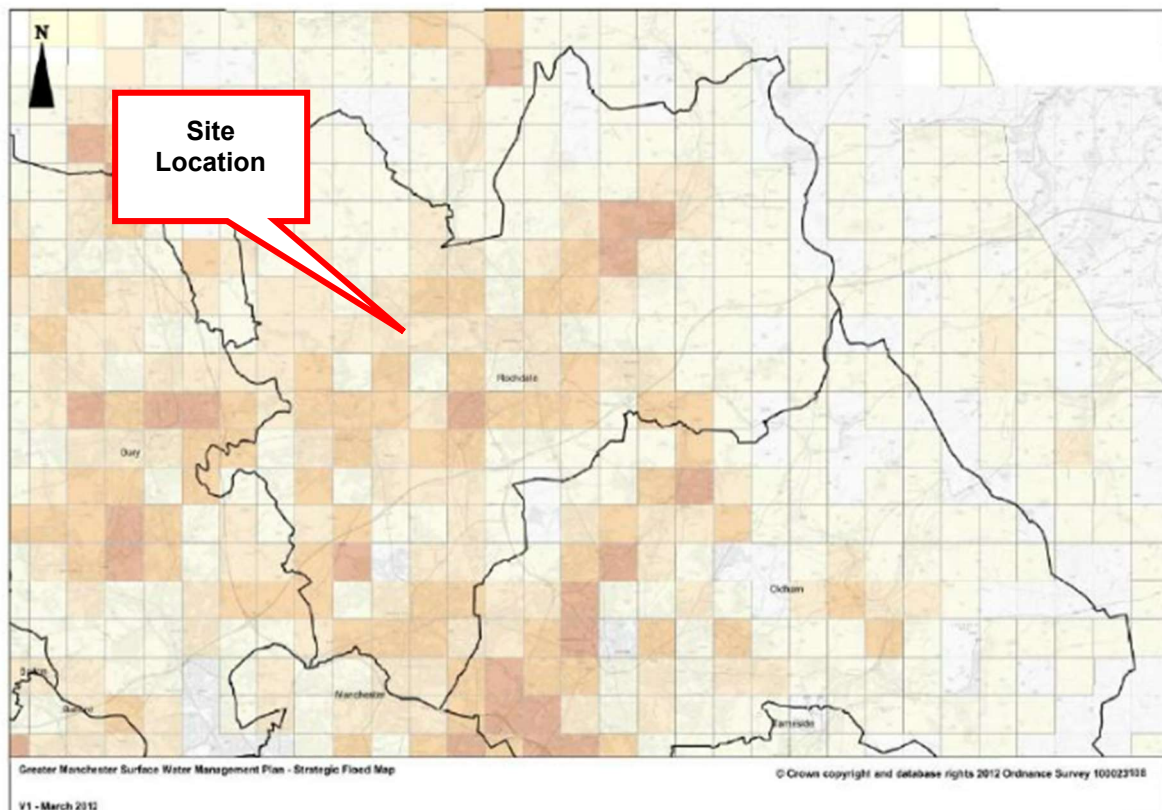


Figure 12: Areas susceptible to Groundwater Flooding in Rochdale Area

3.1.5 Flood Risk from Sewers

According to the sewer map there is a combined sewer running down *Greenbooth Road*. An easement of 3m should be provided. If the sewer is moved a section 180 application should be made to *United Utilities*. Please see below figure 13 showing the combined sewer.



Figure 13: Sewer Map

4. ASSESSMENT OF FLOOD RISK FOR PROPOSED DEVELOPMENT

4.1 Development Proposals

It is proposed to create 49 dwellings at land at *Edenfield Road, Norden*, as shown on the indicative masterplan Figure 14. Each plot will have a private driveway constructed from impermeable materials, with shared access roads. Please see appendix C.

The proposed impermeable area is 0.82ha according to *Stonebond Limited drawing*. The existing impermeable area is 0.82ha.

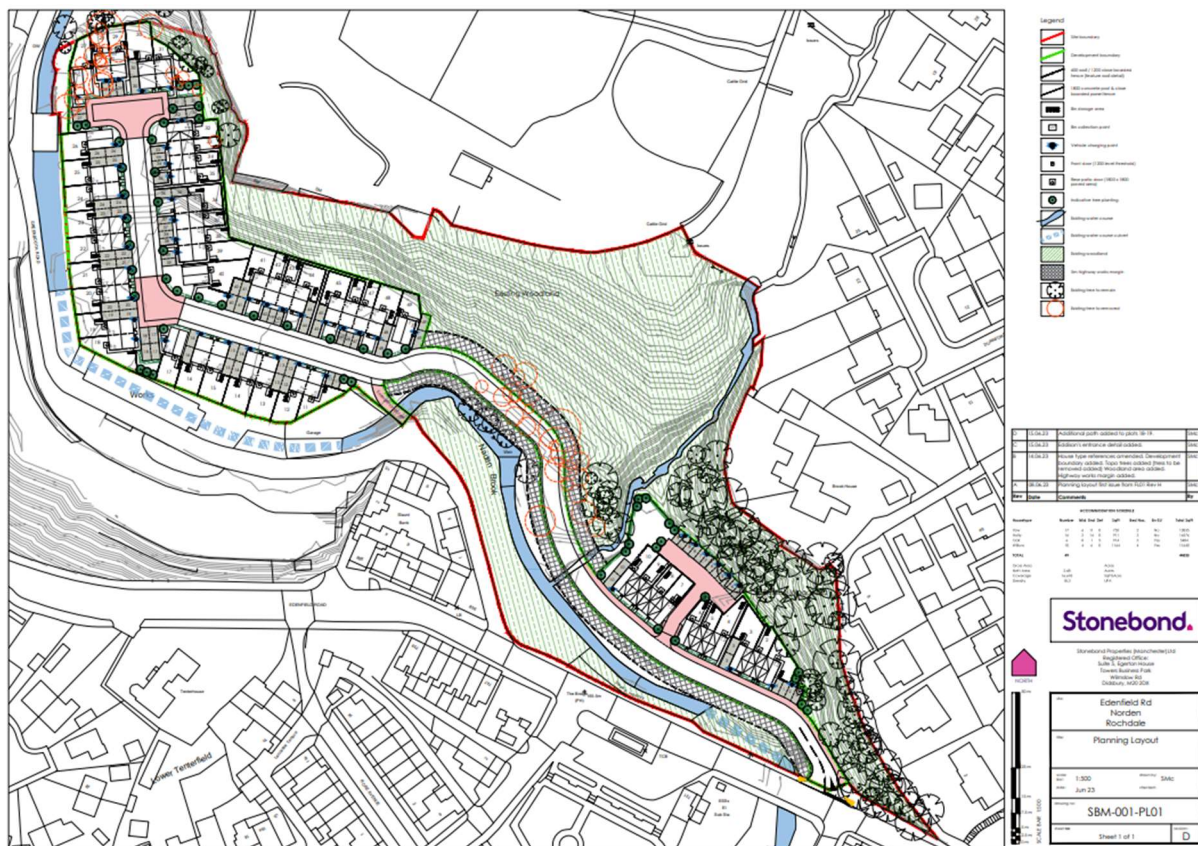


Figure 14: Proposed Site (Source: Client)

4.2 Fluvial Flood Management

The site is mostly within a Flood Zone 1, parts of the site that follow the water course *Naden Brook*, on the Southern boundary, are in a flood zone 3.

However, as discussed in section 3.1.1, *Townsend Water Engineering* have compared the flood levels from the *Environment Agency* to the topographical survey, the findings indicate that the houses and plots are outside of the 1000 fluvial event, as *Greenbrook Road* protects the site.

It is recommended that a survey of the culverts and topography is undertaken to confirm these levels.

Rochdale's guidance is that floor levels should be at the 1 in 100 year event plus climate change and then flood proof to the 1 in 1000 year event. As this is social housing the finished floor levels will be set at the 1 in 1000 year event which is shown in figure 15, the houses are outside of the floodplain and do not require compensatory storage:

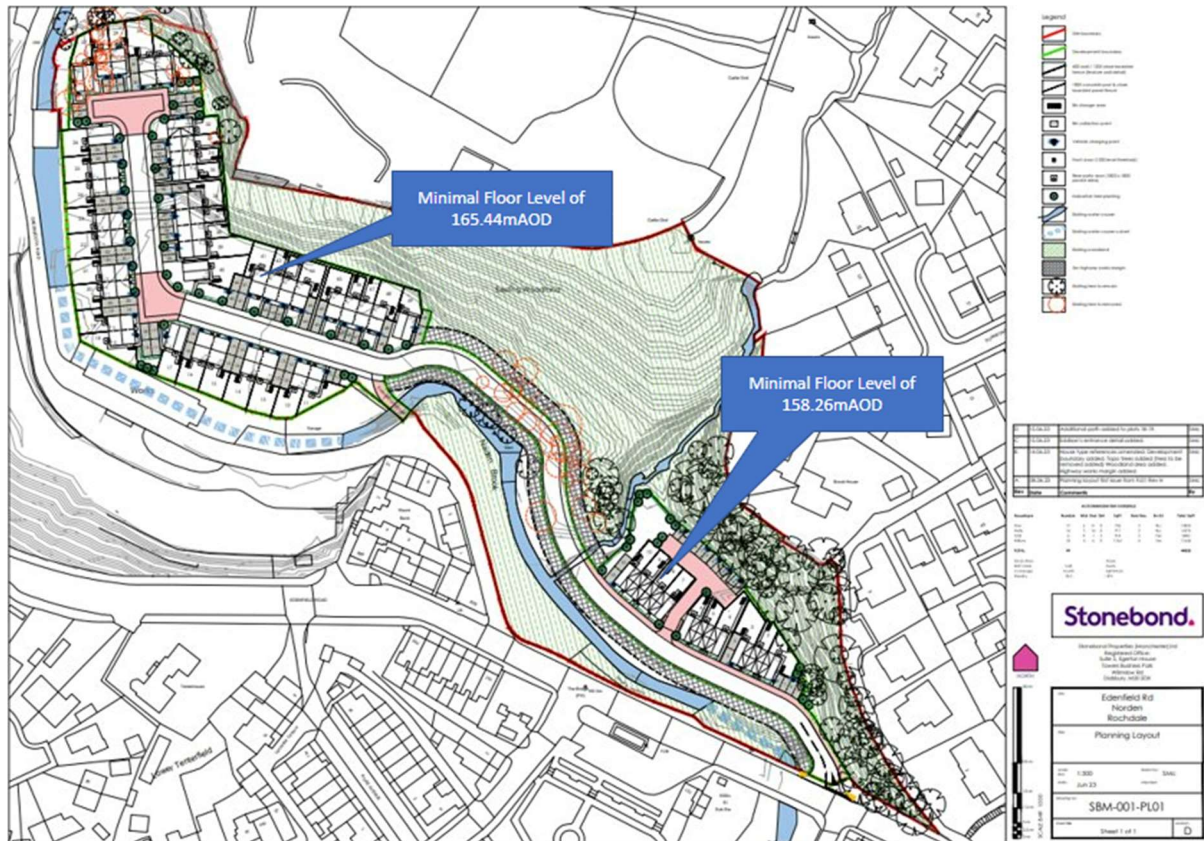


Figure 15: Minimum Floor Levels

The entrance to the site in the South-East is approximately 163m AOD and therefore, is above the 1 in 100 year event plus climate change and so the site has dry access and egress. As the site has dry access and egress the site does not require a flood warning.

Therefore, it is believed the site is at low risk of fluvial flooding.

4.3 Surface water Flooding

According to the Surface Water Flood map there are some areas at high risk of surface water flooding on the site. As discussed in section 3.1.2, it is believed that these areas follow the water course *Naden Brook*, therefore, the houses have not been situated near this area of flooding.

A new drainage system will be designed with a capacity to hold the 1 in 100 year event plus climate change of 45%. This will ensure the site is unlikely to flood in the 1 in 100 year event plus climate change event.

With the above mitigation the risk of flooding is believed to be low.

4.4 Groundwater Flooding

According to the 'Rochdale Borough's Strategy for Flood Risk Management 2013-2023', the risk of groundwater flooding to the site is medium. There will be no below ground buildings on the site.

Therefore the risk of flooding from groundwater is believed to be low.

4.5 Infrastructure Flooding

Greenbooth Reservoir is approximately 420m from the site and the site falls within the area at risk of flooding from a reservoir breach. Although flooding from reservoirs is very rare, it is believed that the consequences of a breach would be high.

Furthermore the houses have been raised to the 1 in 1000 year event which is 158.26mAOD for Phase 1 and Phase 2 it is 165.44mAOD. This will provide some protection from a reservoir flooding. The levels of the development are higher than the surrounding ground level so in theory the water would be funnelled down the road and the channel itself.

Due to the unlikelihood of a reservoir failing, the likelihood of flooding from reservoirs is low.

5. DRAINAGE STRATEGY

6. DRAINAGE STRATEGY

6.1 Existing Drainage Arrangements

6.1.1 Surface Water

The existing site is a brownfield site. The surface water is assumed to go discharge into Norden Brook

6.2 Infiltration Rates

It is considered that infiltration is unlikely to be feasible. According to the BGS website the proposed site is underlain by glacial till.

6.3 Run-off

The peak rates have been agreed with the Lead Local Flood Authority and the discharge has been set at a brownfield rate of 128l/s. Please see in table 4 the allowable discharge rates off the site:

Please see appendix D for the confirmation of the discharge.

6.4 Surface water drainage strategy

6.4.1 Hierarchy of Discharge

As detailed in section 3.3 infiltration is not feasible at this site. As noted previously there is a main watercourse on the southern border. Therefore the surface water from the site will discharge to Narden Brook.

6.4.2 Sizing of SUDS features

As discussed in section 4.1 of this report, the proposed impermeable surface area of the dwellings and associated features is 0.82ha. It is intended that the proposed surface water system will be adopted by the United Utilities. Infiltration SUDS systems have been discounted as the ground does not infiltrate. Attenuation basins have been placed in the public open spaces.

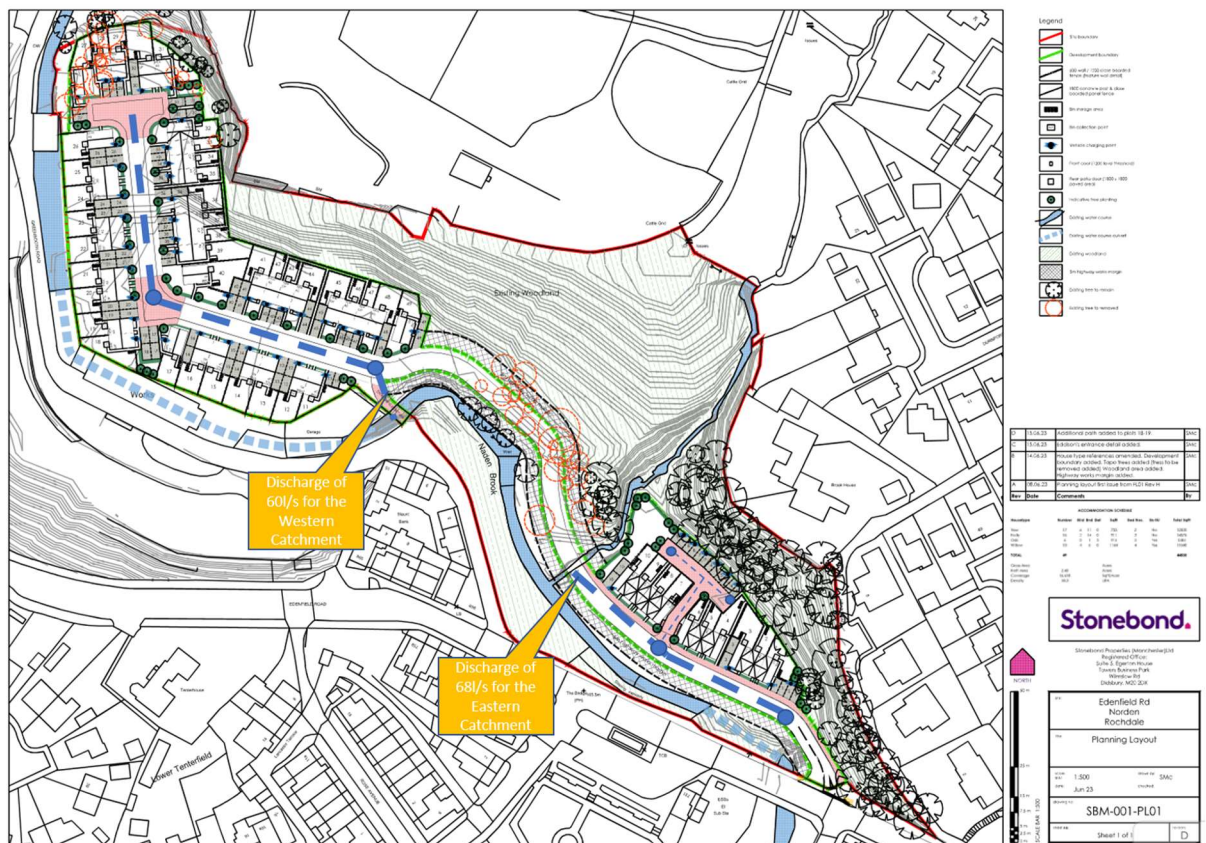
The drainage will be split into 2 catchments, one will be for the eastern housing area called Phase 1 and the other will be for the housing to the west (Phase 2). Both discharges will not exceeding the discharge of 128l/s as agreed with LLFA for the entire site.

The entire discharge for the site will be restricted to a total of 128l/s via Hydrobreaks up to and including the 1 in 100 year event plus climate change (45%). The maximum discharge for the Phase 1 catchment of the site will be 60l/s. The discharge for the Phase 2 section will be 68l/s. The storage will be held in oversized pipes up to and including the 1 in 100 year event plus 45% climate change.

Modelling of the surface water runoff to the design parameters was carried out using the Source Control of Info Drainage, an industry leading software which allows design and analysis of SuDS features. Micro Drainage modelling results. Appendix E The following conservative assumptions and design parameters have been set within the Hydraulic model for the housing section of the site:

- Dwellings, walkways, parking spaces and access roads area equals 0.82ha.

- Rainfall intensity was obtained using the Flood Studies Report (FSR) methodology, and increased by 45%, the upper end allowance for climate change over the 100 years design life of the proposed residential development, in line with the requirements of the NPPF;
- No runoff loss have been assumed in the modelling, therefore all the design rainfall landing on the impermeable surfaces is expected to reach the detention basin;
- As per the conclusions in Section 3.3, the soil has been modelled with an infiltration rate of zero (0.0) m/hr;
- A Hydro-Breaks have been used to restrict the total discharge from the site to 128l/s. The Eastern catchment will drain at 60l/s and the Western catchment will drain at 68l/s.
- The required storage will be between 17-69m³ for the Phase 1, and between 9 and 58m³ for Phase 2 up to and including the 1 in 100 year event plus climate change.



It is recommended that a filter drain is placed at the bottom of the hill at Phase 2. This will collect any surface water runoff from the hill going into Phase 2 back gardens.

6.4.3 Maintenance Plan

Structures which manage surface water runoff require little maintenance, however a regular maintenance schedule e.g., after heavy rainfall, should be established by the site owners to reduce the risk of blockage within the drainage system and ensure the design remains in good working order. It is proposed to offer this up for adoption:

Table 3: Operation and Maintenance Requirements for Oversize Pipes

TABLE 21.3	Operation and maintenance requirements for attenuation storage tanks		
	Maintenance schedule	Required action	Typical frequency
	Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually
		Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
		For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary.	Annually
		Remove sediment from pre-treatment structures and/or internal forebays	Annually, or as required
	Remedial actions	Repair/rehabilitate inlets, outlet, overflows and vents	As required
	Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually
		Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required

7. SUMMARY & CONCLUSIONS

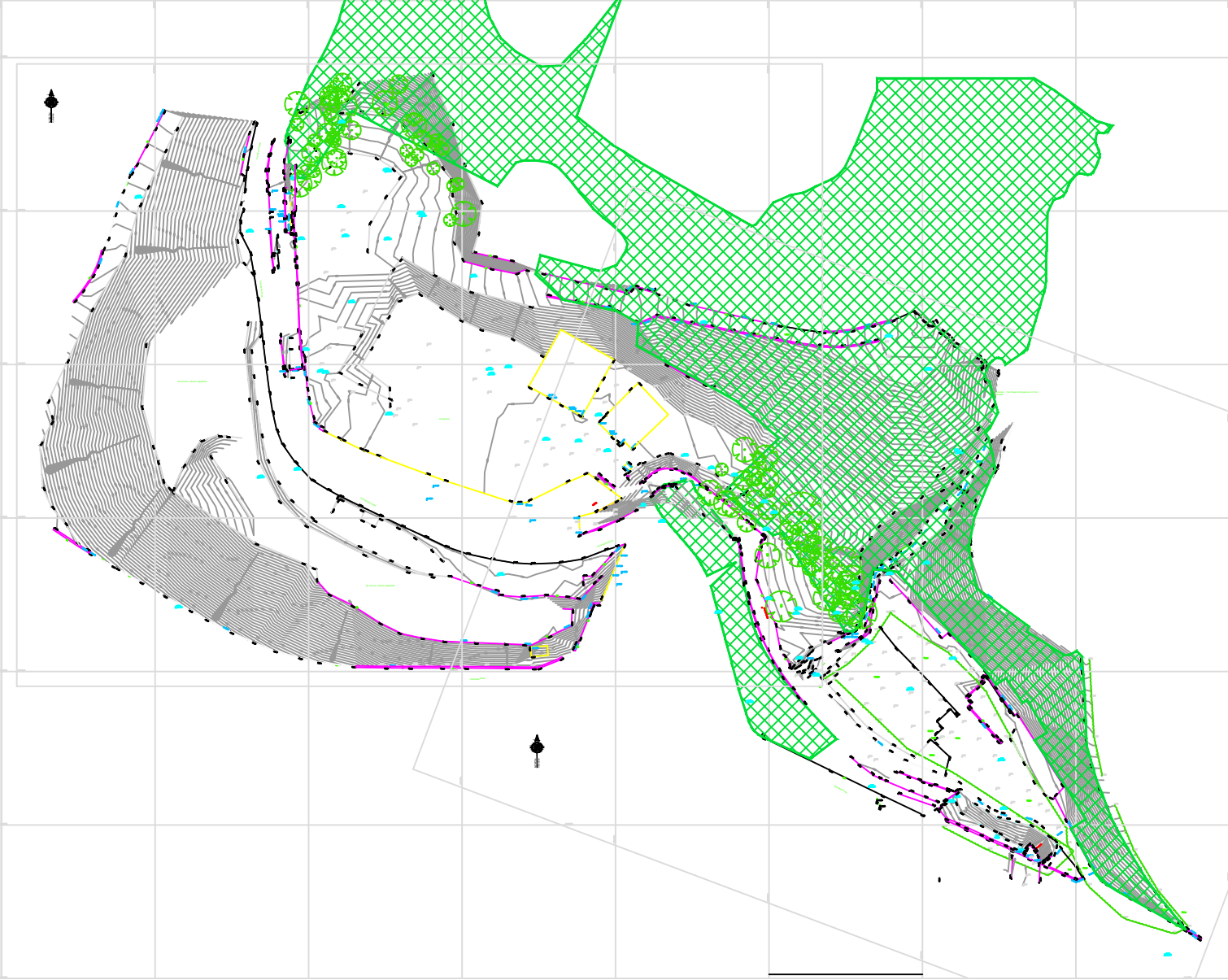
A summary of the main conclusions for the FRA is presented below:

- Development proposals are for a development of approximately 49 residential units at land at Edenfield Road, Norden, OL12 7SP;
- The development nett area is approximately 1.08ha;
- The site is mostly within a Flood Zone 1; an area at low risk of fluvial flooding. The Southern boundary of the site is within a flood zone 3; an area at high risk of fluvial flooding. *Townsend Water Engineering* compared the *EA* flood levels to the sites topographical levels and found *Greenbooth Road* levels are higher than the flood levels. *Greenbooth Road* is on the Southern boundary of the site and therefore, block the flood waters up to and including the 1 in 1000 year event. This needs to be confirmed with topographical levels;
- The majority of the site is not at risk of surface water flooding according to the flood maps. The Southern border following the watercourse *Naden Brook* is at high risk of flooding from surface water, however as mentioned in section 3.1.2, we will not be building in this area;
- The proposed development passes the sequential test as the proposed development is within Flood Zone 1, please note that parts of the site are within flood zone 3 but these area will not have housing within them;
- The site is at medium risk of groundwater flooding, the proposed development will not have cellar or below ground buildings therefore, it is believed the development is at low of flooding;
- A topographical survey of the culvert and the entire site is required;
- The site is approximately 420m from *Greenbooth Reservoir* and 150m from *Doctor Dam*;
- The site is not suitable for infiltration;
- Finished floor levels will be raised to the 1 in 1000 year event level, this will ensure the proposed development is at minimal risk of flooding; and
- The access road on and off the site is above 163mAOD and therefore, is above the 1 in 100 year event plus climate change. This means the site has dry access and egress.
- The ground is not permeable.
- It is recommended that a filter drain is placed at the bottom of the hill at Phase 2. This will collect any surface water runoff from the hill going into Phase 2 back gardens.
- The site will drain via two outfalls into *Naden Brook*. The Western Catchment will discharge at 68l/s and the eastern catchment will discharge at 60l/s.
- The storage will be kept within oversized pipes and tanks up to and including the 1 in 100 year event plus climate change.

8. REFERENCES

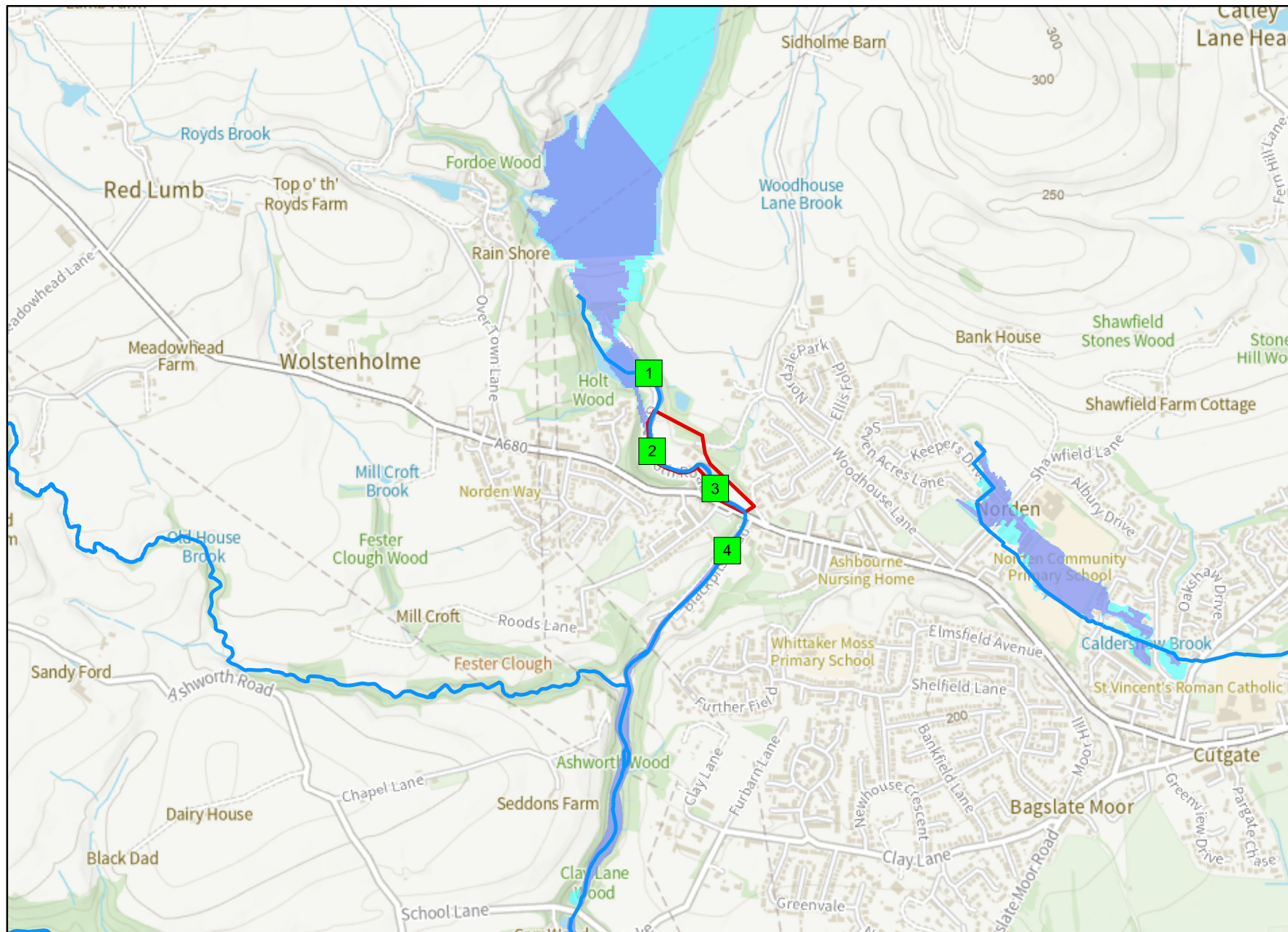
Author	Date	Title/Description
Department for Communities and Local Government	Mar 2012	Technical Guidance to the National Planning Policy Framework
Ministry of Housing, Communities and Local Government.	Feb 2019	National Planning Policy Framework
Rochdale Borough Council	October 2013	Rochdale Borough's Strategy for Flood Risk Management 2013-2023
MacLean Solutions	September 2020	Design & Access Statement - Former Tack Lea Works & Shephard Mill, Rochdale Proposed Residential Development

Appendix A: Topographical Survey



Appendix B: Flood Modelling from the Environment Agency

Detailed Flood Map Centred on Greenbooth Road, Rochdale, OL12 7TD. Created 22/03/2023 [GMMC303584AB]



1:14,218.02



Legend

-  Site Location
-  Model Measurements
-  Main River
-  Flood Zone 3
-  Flood Zone 2

Undeveloped												
Map Reference	Model Node Reference	Easting	Northing	Data	20 % AEP (1 in 5 year)	10 % AEP (1 in 10 year)	5 % AEP (1 in 20 year)	2 % AEP (1 in 50 year)	1.33 % AEP (1 in 75 year)	1 % AEP (1 in 100 year)	1 % AEP (1 in 100 year) + Climate Change*	0.1 % AEP (1 in 1000 year)
1	ea013_0217_NADE01_3957	385635	414951	Modelled Water Level (m aodN)	173.23	173.31	173.39	173.50	173.55	173.59	173.71	173.92
				Modelled Flow (cumecs)	6.36	7.56	8.84	10.74	11.69	12.39	14.87	19.64
2	ea013_0217_NADE01_3760	385645	414749	Modelled Water Level (m aodN)	164.63	164.72	164.81	164.94	165.00	165.04	165.18	165.44
				Modelled Flow (cumecs)	6.58	7.82	9.14	11.11	12.09	12.82	15.38	20.31
3	ea013_0217_NADE01_16	385807	414652	Modelled Water Level (m aodN)	157.41	157.50	157.60	157.73	157.79	157.84	157.99	158.26
				Modelled Flow (cumecs)	6.58	7.82	9.14	11.11	12.09	12.82	15.38	20.19
4	ea013_0217_NADE01_3313d	385840	414491	Modelled Water Level (m aodN)	153.94	154.03	154.13	154.26	154.32	154.37	154.51	154.74
				Modelled Flow (cumecs)	8.06	9.59	11.21	13.63	14.82	15.72	18.87	24.78

Model data taken from Naden Brook 2017

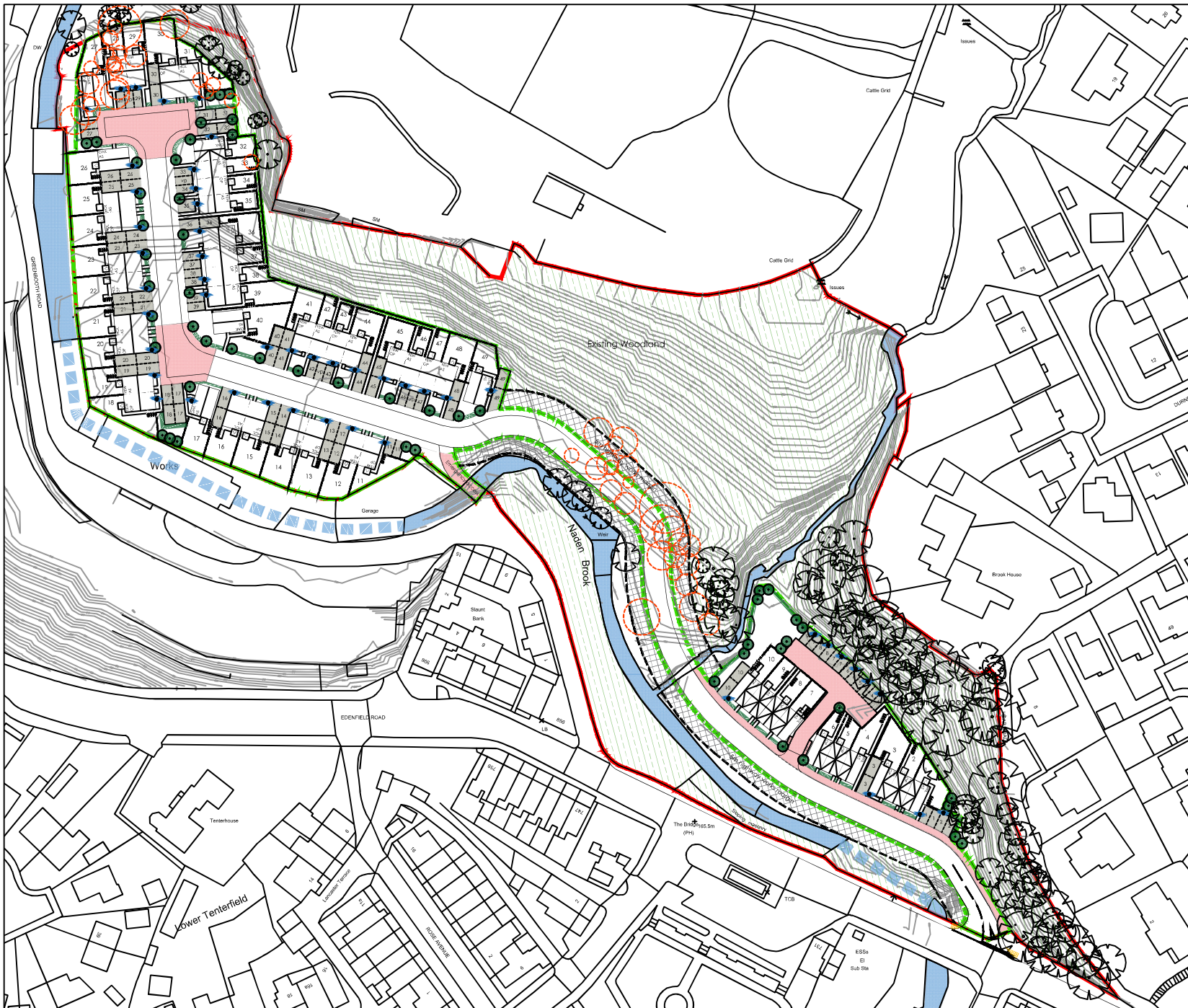
AEP - Annual Exceedence Probability

m aodN - metres above ordnance datum Newlyn

cumecs - cubic metres per second

Notes: *Climate Change Scenario - We only hold climate change measurements based on the previous climate change guidance (20% increase in flow). The new climate change guidance is available at <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>. The location of the site and the type (vulnerability) of development determine the climate change allowances to consider in any flood risk assessment.

Appendix C: Proposed Layout



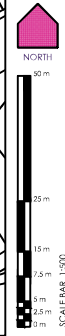
- Legend
- Site boundary
 - Development boundary
 - 600 wall / 1200 close boarded fence (feature wall detail)
 - 1800 concrete post & close boarded panel fence
 - Bin storage area
 - Bin collection point
 - Vehicle charging point
 - Front door (200 level threshold)
 - Rear patio door (1800 x 1800 paved area)
 - Indicative tree planting
 - Drifting water course
 - Drifting water course culvert
 - Drifting woodland
 - 5m Highway works margin
 - Existing tree to remain
 - Existing tree to be removed

Rev	Date	Comments	By
D	15.06.23	Additional path added to plots 18-19.	SMC
C	15.06.23	Edison's entrance detail added.	SMC
B	14.06.23	House type references amended. Development boundary added. Topo trees added (trees to be removed added) Woodland area added. Highway works margin added.	SMC
A	08.06.23	Planning layout first issue from FLO1 Rev H	SMC

ACCOMMODATION SCHEDULE							
House type	Number	Mid	End	Det	Bed Nos.	En-SU	Total Sqft
Two	17	4	11	6	755	2	12035
Three	16	2	14	6	911	3	14076
Four	6	0	1	5	914	3	5484
Five	10	4	6	0	1164	4	11640
TOTAL	49						48835
Gross Area					Acres		
Nett Area	2.48				Acres		
Coverage					Sqft/Acre		
Density	18.3				UFA		



Stonebond Properties (Manchester) Ltd
Registered Office:
Suite 5, Egerion House
Towers Business Park
Wilmslow Rd
Didsbury, M20 2DX



Edenfield Rd Norden Rochdale	
Planning Layout	
Scale 1:500	drawn by SMC
Date Jun 23	checked
drawing ref SBM-001-PL01	
Sheet no. Sheet 1 of 1	revision D

Appendix D: Confirmation of Discharge rate for the site

Charles Townsend

From: Stephen McCann <Stephen.McCann@Rochdale.Gov.UK>
Sent: 12 June 2023 14:22
To: Charles Townsend
Subject: RE: Edenfield Road, Norden, OL12 7SP.

External (stephen.mccann@rochdale.gov.uk)

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Hello Charles,

You've re-produced the table from the Site Wide Drainage Strategy by Renaissance for the planning app. 20/01170/FUL. This table has 3 rates of discharge.

If flows were going to combined sewer, I would regard Qbar value (2.3 year return period) as the defining flow control, not the 1 in 100 year flow control. However, since the flows are going to stream rather than sewer so I can relax the control requirements, but it should be for the 1 in 30 year storm, which is 128 l/s (rounded up).

You can make provision for storing flood waters on the site, away from dwellings for the extra runoff flows up to 1 in 100 + 30% or 40% climate change allowance (there isn't much in the two values).

I regard 128 l/s as the flow control value, not 159 l/s. This is part way towards your requested value. If you wish to dispute this, please provide rationale.

regards

Stephen McCann

Drainage & Flooding Engineer

Network Improvement/Development/Flooding



☎ 01706 924606

📠 07552 570262

✉ stephen.mccann@rochdale.gov.uk

Rochdale Borough Council
Floor 2, Number One Riverside
Smith Street, Rochdale, OL16 1XU

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Please consider the environment before printing this email.

From: Charles Townsend <charles@townsendwaterengineering.co.uk>
Sent: 12 June 2023 11:47
To: Stephen McCann <Stephen.McCann@Rochdale.Gov.UK>
Subject: RE: Edenfield Road, Norden, OL12 7SP.

Dear Stephen,

This make its very simple our site is the same redline boundary as the planning permission given at 20/01170/FUL. Please see the layout attached including the redline boundary.

As our red line boundary is the same, please could we have the same discharge rate you agreed for the last planning permission as the hard standing and greenfield is the same and I can't see any change in legislation. The discharge that was agreed last planning permission is show below.

Return Period	Q50% Brownfield (l/s)	Q Greenfield (l/s)	Qtotal (l/s)
1 in 1 year	43.3	15.8	59.1
1 in 30 year	101.3	26.3	127.6
1 in 100 year	130.6	28.3	158.9

Please can you confirm that we can have a discharge of 158.9l/s as per the previous planning permission 20/01170/Ful that you agreed?

As you can see on the layout the main spine road crosses the little stream. We would like to use a box culvert under the road to cross it. We will be obviously getting a land drainage consent but what will you require from us in regards to information for the box culvert for this land drainage consent. I'm going to site on Wednesday so if there anything else you would like information about please do not hesitate to contact me.

If you have any queires please do not hesitate to contact me.

Kind regards
Charles

Charles Townsend BSc (Hons) CIWEM CSci
Townsend Water Engineering
charles@townsendwaterengineering.co.uk
Tel: 07786912617

From: Stephen McCann <Stephen.McCann@Rochdale.Gov.UK>
Sent: Friday, May 19, 2023 12:19 PM
To: Charles Townsend <charles@townsendwaterengineering.co.uk>
Subject: Edenfield Road, Norden, OL12 7SP.

Hello Charles,

Here is the info you requested. I notice that you sent me something 29.9.22 (appended). That format is more 'professional looking' than my excel spreadsheet.

I included also the Drainage Strategy for application 20/01170/FUL which you could have downloaded from the planning website. My consultation says that I agreed with it, in which 50% Brownfield reduction was required. 30% is a bit 'out of date'.

Does your client own one of the land areas in red line in the appended "land areas" image? Or what is the area?

regards
Stephen McCann
Drainage & Flooding Engineer
Network Improvement/Development/Flooding

☎ 01706 924606

☎ 07552 570262

✉ stephen.mccann@rochdale.gov.uk

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Please consider the environment before printing this email.

From: Stephen McCann

Sent: 18 May 2023 09:56

To: 'Charles Townsend' <charles@townsendwaterengineering.co.uk>

Subject: Topo was already done: Edenfield Road, Norden, OL12 7SP.

Hello Charles,

I notice that you mention that you / your client is commissioning a Topo. One was done before on the previous FRA. This should be available in pdf format on the Planning Website but I've included a copy here. The Topo is in the appendices.

It would be less expensive to pay the Topo sub-contractor to send me their CAD version than commission a new one?

Re: 30%/ 50% brownfield reduction and Rational Method:- any practical measures that a Developer would propose would be looked at in a generous light because this is a derelict site. To my mind the most important aspect is to remove the structures/ building that obstruct the stream.

Feel free to call me:- I'm in meetings from 10 am until 12 today. I don't generally have very many meeting and will always pick up mobile if I'm free.

Stephen McCann

Drainage & Flooding Engineer

Network Improvement/Development/Flooding

☎ 01706 924606

☎ 07552 570262

✉ stephen.mccann@rochdale.gov.uk

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Please consider the environment before printing this email.

From: Charles Townsend <charles@townsendwaterengineering.co.uk>
Sent: 17 May 2023 10:28
To: Stephen McCann <Stephen.McCann@Rochdale.Gov.UK>; Alice Osborne
<alice.osborne@townsendwaterengineering.co.uk>
Subject: Re: Edenfield Road, Norden, OL12 7SP.

:CAUTION: This email originated from outside of the organisation. Do not click links or open attachments unless you recognise the sender and know the content is safe.

Hi Stephen, great to hear from you and thanks for your speedy response. The culverts we were alluding to were the buildings that are built over the watercourse. It's good to see we have the same concerns. A topographical survey is being undertaken and we are picking up these buildings to find out what is going on with the watercourse in this area.

In regards to surface water can I still use the rational method and take 30% off. Or has it changed recently. I will give you a formal number next week once I have a better topographical survey.

Kind regards
Charles

Sent from [Outlook for iOS](#)

From: Stephen McCann <Stephen.McCann@Rochdale.Gov.UK>
Sent: Monday, April 3, 2023 10:43:11 PM
To: Alice Osborne <alice.osborne@townsendwaterengineering.co.uk>; Charles Townsend
<charles@townsendwaterengineering.co.uk>
Subject: RE: Edenfield Road, Norden, OL12 7SP.

Hello Alice and Charles,

There was a planning application for this site with Planning ref. 20/01170/FUL Some of the application information is available on the public planning website:

documents.rochdale.gov.uk/pav/planapp.aspx?MyQueryID=108&OBKey_705_1=20/01170/OUT

I visited the site and wrote the appended Drainage Consultation.
At the time, I visited the site and took photos. I remember visiting this site.

You have written:- *"There appears to be a culvert next to the site"*.

I observed that the stream had been constricted on this site. I didn't see any significant additional culvert-drain. Perhaps you have a Topo with your 'culvert'?

Stephen McCann
Drainage & Flooding Engineer
Network Improvement/Development/Flooding



☎ 01706 924606
📠 07552 570262
✉ stephen.mccann@rochdale.gov.uk

From: Alice Osborne <alice.osborne@townsendwaterengineering.co.uk>
Sent: 31 March 2023 14:32
To: Stephen McCann <Stephen.McCann@Rochdale.Gov.UK>
Cc: Charles Townsend <charles@townsendwaterengineering.co.uk>
Subject: Edenfield Road, Norden, OL12 7SP.

Hi Stephen, hope you are well.

I'm currently investigating flood risks to the site location Edenfield Road, Norden, OL12 7SP. Are you aware of any flooding in this area? There is a culvert next to the road, is the council aware or have any drawings of this culvert.

And do you know of any policies that I should be aware of on top of the SFRA and the NPPF?

The area is a brownfield site, please may I use the rational method to calculate the drainage? And could you clarify your methodology for calculating discharge rates to me please?

There appears to be a culvert next to the site, I don't suppose you have any information on it? Or are aware of any historical flooding?

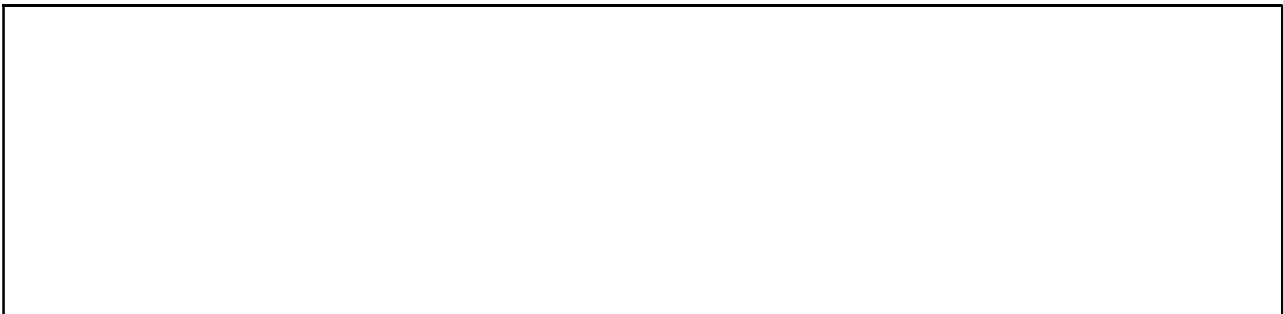
Please find attached the site layout plan.

Thanks for your time, I look forward to your response.

Warm Regards,

Charles Townsend.

Sent from [Mail](#) for Windows



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Appendix E: Infodrainage Calculations

Phase 1

Please see below the storage calculation for the 1 in 100 year event plus climate change

The screenshot displays the 'Quick Storage Estimate' software window. The 'Input' tab is active, showing various parameters for a storage calculation. The parameters are as follows:

Parameter	Value
Input Type	User Input
Area (ha)	0.273
Volumetric Runoff Coefficient	0.750
Discharge Rate (L/s)	60.0
Infiltration Rate (m/hr)	0.0
Safety Factor	2.0
Method	FSR
Number of Storms	38
Max. Run Time (mins)	20160

Additional interface elements include a 'Calculate' button, a 'Quick' dropdown menu, and a 'From Library' section with checkboxes for 'All' and 'FSR'. The bottom of the window features a 'Create New' button and a 'Help' icon.

Quick Storage Estimate

Input

Results

2D Graph

Results

Quick Storage Estimate variables require approximate storage of between 17m³ - 69m³.

These values are estimates only and should not be used for final design purposes.

OK

Cancel

Create New

Help

Phase 2 1 in 100 year event plus climate change

Quick Storage Estimate

Input

Input Type

User Input

Area (ha)

0.259

Volumetric Runoff Coefficient

0.750

Discharge Rate (L/s)

68.0

Infiltration Rate (m/hr)

0.0

Safety Factor

2.0

Quick

Calculate

Create New

From Library

All

FSR

Method

FSR

Number of Storms

38

Max. Run Time (mins)

20160

Input

Results

2D Graph

OK

Cancel

Create New

Help

June 2023

Page 35 of 36

Quick Storage Estimate

Results

Quick Storage Estimate variables require approximate storage of between 9m³ - 58m³.

These values are estimates only and should not be used for final design purposes.

Input

Results

2D Graph

OK

Cancel

Create New

Help