FLOOD FLOW LTD
CONSULTING CIVIL AND STRUCTURAL ENGINEERS
Tel 07940 523819
Website: www.floodflow.co.uk
Email: mail@floodflow.co.uk

NEW PITCH AT SACRED HEART CATHOLIC PRIMARY SCHOOL, THORNTON-CLEVELEYS

FLOOD RISK ASSESSMENT
& DRAINAGE STRATEGY
IN ACCORDANCE WITH NPPF (FEB 2019)

FLOOD FLOW LTD
CONSULTING CIVIL AND STRUCTURAL ENGINEERS
Tel 07940 523819
Website: www.floodflow.co.uk
Email: mail@floodflow.co.uk

Flood Flow Limited
36 Holdenbrook Close
Leigh
WN72HL

21148/JJ

Report Title: *Land at Sacred Heart Catholic Primary School, Thornton-Cleveleys*

Client: *School Governors, Sacred heart Catholic Primary School*

Report Status: *First issue*

***Date of First Issue**:* *11th June 2021*

***Date of Last Issue**:* *11th June 2021*

Version	Date	Initials	Comments
01	11.06.2021	JJ	First Issue

Limitations

All findings, recommendations and conclusions contained in this report are based on information provided to us during investigations. Flood Flow Ltd has created the report based on the assumption that all the information is accurate and accepts no liability should additional information exist or become available.

Unless otherwise requested by the client, Flood Flow Ltd is not obliged to and disclaims any obligation to update the report for events taking place after the date noted on the report.

Flood Flow Ltd makes no representation whatsoever concerning the legal significance of its findings or the legal matters referred to in the report. The information presented and conclusions drawn are based on statistical data and are for guidance purposes only. The study provides no guarantee against the flooding of the study site or elsewhere, nor of the absolute accuracy of water levels, flow rates, and associated probabilities.

This report has been prepared for the sole use of the client. No other third parties may rely upon or reproduce the contents of this report without the written permission of Flood Flow Ltd.

CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

SECTION 1 EXECUTIVE SUMMARY

1.1. Flood Flow Ltd has been instructed to prepare a Flood Risk Assessment and Surface Water Disposal Strategy in support of a planning application for the proposed new pitch at Sacred Heart Catholic Primary School, Thornton-Cleveleys.

1.2. The subject site location is illustrated in Appendix A with a site grid reference NGR E 333735 , N 443241.

1.3. At present the site to contain the new playing space is classed as greenfield including trees and shrubs with a permanent access to the site from Heys Street.

1.4. The Flood Risk Assessment has been undertaken with information compiled from Environment Agency sources. This assessment has concluded that the proposed development is located within Defended Flood Zone 3. This means the land is assessed as having a high probability of river flooding, which is greater than 1 in 100 (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%).

1.5. The site has been shown to be at low risk of flooding from groundwater and therefore no further mitigation measures are considered necessary for the proposed development.

1.6. The assessment has determined the site as More Vulnerable by NPPF and as it lies within Defended Flood Zone 3 the development proposed is appropriate within this zone.

1.7. The proposed drainage and associated works for the development site will have a net improvement to the localised drainage as it imitates the existing localised natural catchment process whilst allowing more effective management of the system, with additional benefits to some adjacent properties.

SECTION 2 POLICY AND GUIDANCE

NATIONAL PLANNING POLICY FRAMEWORK & TECHNICAL GUIDANCE

2.1. The National Planning Policy Framework (NPPF) was published in England in February 2019. As a result, all previous Planning Policy Guidance (PPG) and Planning Policy Statements (PPS) were superseded. This included PPS25: Development and Flood Risk. One of the key aims of the NPPF is to ensure that flood risk is taken into account at all stages of the planning process to avoid inappropriate development in areas at risk of flooding and directing development away from areas of high risk. It advises that where development is necessary in areas of higher risk, it should be safe and that flood resilience should also be incorporated into the design. It also advises of the fact that new developments should not increase flood risk elsewhere and new development should aid in mitigating flood risk to the wide area.

PLANNING PRACTICE GUIDANCE – CLIMATE CHANGE, FLOOD RISK & COSTAL CHANGE

2.2. The NPPF is also accompanied by a Technical Guidance document which borrows heavily from the superseded PPS 25 document with regards to:

- Climate change uplift usage classification
- Flood zone categories
- Flood zone / Usage Compatibility
- The sequential test
- The exception test

WYRE LOCAL PLAN 2011-2031

2.3. On the 28 February 2019 Wyre Council adopted Wyre's local plan 2011–2031, which replaced the saved policies of the 1999 Wyre Local Plan and the Fleetwood-Thornton Area Action Plan 2009. The Wyre Borough Council Area Action Plan (September 2009) identifies in detail the planning process relating to flood risk within Fleetwood and Thornton, the extract below has been taken from 'Policy 1: Environmental Quality and Protection'.

2.4. It is recognised that flooding is a major environmental constraint in the Area, it is therefore important to consider flood mitigation measures and the principles of PPS25 in the design and allocation of new development. New development should

therefore incorporate soft landscaping and sustainable drainage systems to contribute to flood mitigation in addition to mitigating against other effects of climate change such as the provision of carbon sinks. As part of the SFRA a sequential approach needs to be taken to demonstrate the availability of sites.

2.5. This sequential risk-based approach to determining the suitability of land for development in flood risk areas is central to PPS25. It aims to steer new development to areas at the lowest probability of flooding and its application at all levels of the planning process is required, particularly in relation to the identification of land for development. An exceptions test is introduced for situations where the sequential test has shown that it is not possible for the development to be located in zones of lower probability of flooding.

2.6. As stated above an SFRA has been carried out to inform the preparation of the AAP which is shown in Appendix C. The majority of the Area falls within flood zone 3a. In accordance with the principles of PPS25 the sequential test has been applied as has an exceptions test (Appendix D) which demonstrates that the development proposed passes the Exceptions Test as detailed in Appendix D and PPS25 paragraph D9. If the decision was taken not to develop this area, then alternative sites for housing development elsewhere in the Borough may result in the release of greenfield land in less sustainable locations.

SOURCES OF FLOODING

Rivers (fluvial): Flooding occurs when flow within river channels exceeds capacity; and the type of flood event experienced e.g. flash flooding; depends upon the characteristics of the river catchment.

The Sea (tidal): Flooding at low lying coastline and tidal estuaries is caused by storm surges and high tides; with overtopping and breach failure of sea defences possible during extreme storm events.

2.7. **Pluvial (surface flooding or overland flows):** Heavy rainfall, which is unable to soak away via infiltration or enter drainage systems can flow overland, resulting in localised flooding. Topography generally influences the direction and depth of flooding caused by this mechanism.

Groundwater: Caused when ground water levels rise to the surface; and is most likely to occur in low lying areas underlain by aquifers.

Sewers and drains: Generally occurs in more urban areas; where sewers and drains are overwhelmed by heavy rainfall or blocked pipes and gullies.

Artificial Sources (reservoirs, canals, lakes and ponds): Reservoir and canal flooding may occur as a result of capacity exceedance or structural failure.

WYRE BOROUGH COUNCIL STRATEGIC FLOOD RISK ASSESSMENT (SFRA)

2.8. Local Planning Authorities are required to produce Local Development Frameworks, which are a portfolio of Local Development Documents that collectively deliver the spatial planning strategy.

2.9. The Wyre Borough Council Level 1 Strategic Flood Risk Assessment (SFRA) assesses the risk of risks associated with all types of flooding from all sources to an area, taking account of the impacts of climate change, and to assess the impact that land use changes and development in the area will have on flood risk, now and in future.

2.10. Due to the high levels of flood risk in some areas of the Borough, the Council has produced a Level 2 SFRA to supplement the Level 1 SFRA. The Level 2 SFRA provides detailed assessments of the suitability of potential development site allocations across the Borough in terms of flood risk.

2.11. The Level 1 SFRA was prepared for Wyre Borough Council who is the lead Flood Authority and issued in July 2016. Level 2 SFRA was issued in October 2016.

CIRIA GUIDANCE - C624 DEVELOPMENT AND FLOOD RISK

2.12. The CIRIA Guidance publication "C624 Development and Flood Risk – Guidance for the Construction Industry" defines 3 levels of FRA, which can be undertaken:

- Level 1 – Screening Study
- Level 2 – Scoping Study
- Level 3 – Detailed Study

For this proposed development a Level 2 Scoping Study Flood Risk Assessment (FRA) is considered appropriate.

CIRIA GUIDANCE - C753 THE SUDS MANUAL

2.13. This document provides best practice guidance on the planning, design, construction, operation and maintenance of sustainable drainage systems (SuDS). This document provides details on all the typical sustainable drainage systems and details on how they can be interconnected to not only provide the required drainage performance but to also act as pollution control while enhancing the site wide Masterplan proposals.

2.14. On this site where the ground conditions have been reviewed, it has been ascertained that the use of infiltration as a method of disposal of surface water is not appropriate. This is due to low permeability glacial clays, consisting of Tidal Flat Deposits – Clay and Silt, sitting just beneath the surface.

2.15. The next alternative to infiltration is to drain to a watercourse or canal; the Royles Brook and River Wyre to the East of the proposed development is not considered as a viable alternative without substantial cost and land agreement/ acquisitions.

2.16. There are numerous culverts associated with Royles Brook upstream of the proposed development site. An initial assessment has identified that the watercourse is recognised as a 'Main' river and therefore the Environment Agency have certain responsibilities. The nearest culvert to the proposed development is located south of Trunnah Road approximately 120m south east at the bottom of the car park associated with Sandyfort Arms.

2.17. Our preferred option is to discharge surface water to public surface water sewer.

2.18. The statement above is based on Environment Agency online information and the British Geological Society (BGS) online information.

SUSTAINABLE DRAINAGE SYSTEMS, NON-STATUTORY TECHNICAL STANDARDS

2.19. Within this document, it is defined how the surface water discharge rates from the development should be derived and provides desirable discharge rates based on storm events. Peak flow rates and volume controls are discussed, and consideration needs to be given within the design of the surface water system to ensure that both peak flows and volumes do not exceed that of the predevelopment case.

RESERVOIR ACT 1975

2.20. The site will be limited to and will not exceed the existing discharge rate and will therefore require attenuation. The attenuation proposals will limit storage volumes to below 10000 cubic metres so as to ensure that the requirement of the Reservoir Act 1975 and subsequent amendments are not applicable.

EXISTING SITE DESCRIPTION & LOCATION

2.21. The site for which the FRA has been commissioned is located at Sacred Heart Catholic Primary School, Thornton-Cleveleys, FY5 4HL and is predominantly a large expanse of previously undeveloped land.

2.22. The development site grid reference used is NGR E 333735 , N 443241 and has a site area of 0.24 ha.

2.23. The existing access to the site is from Heys Street that will be used for the proposed development.

2.24. Directly north of the site is the main Sacred Heart Catholic Primary School building and a paved playground area and residential developments, beyond which is residential developments and Crabtree Road.

2.25. Directly east of the site is the part of the existing grass playing field, beyond which is existing maintenance area, access and building, Heys Street and Royles Brook. Further afield is Great Arley School and industrial developments leading to the River Wyre.

2.26. Directly south of the site is a part of the existing grass playing field, bounded by a brick wall and metal fencing. Beyond is Trunnah Road and residential/commercial developments.

2.27. Directly west of the site is a brownfield area bounded by Fleetwood Road North, beyond which are residential developments.

2.28. A spot level survey undertaken and identified levels on the site to range from 4.89m AOD located in the north eastern part of the site to 5.48m AOD at the south western corner of the proposed development. This is provided within Appendix A. Five spot levels across the development site were taken to produce an average ground level of 5.16m AOD (based on the levels provided) for use within the flood risk assessment.

2.29. Reference to the extract of the online Gov.uk flood risk map – see below - confirms the site is within an area classified at Defended Flood Zone 3 – This means the land

is assessed as having a high probability of river flooding, which is greater than 1 in 100 (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%).

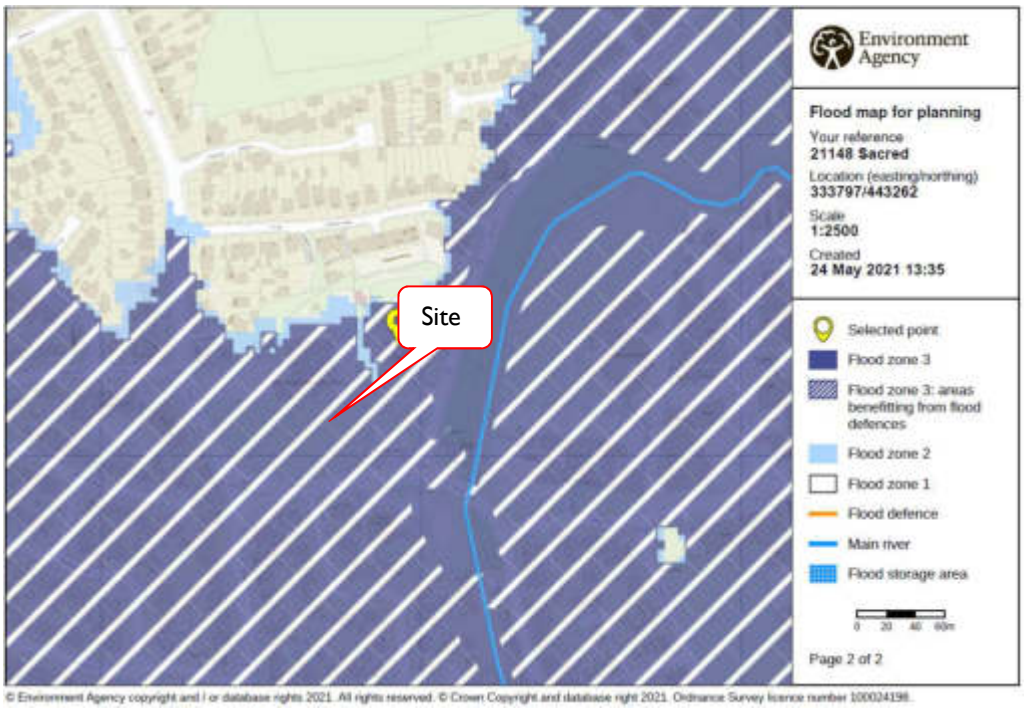


Figure 2.1 EA Flood Map for Planning

2.30. Reference to the online British Geological Survey Online Viewer – extract below - confirms the site is Kirkham Mudstone Member - Mudstone, whilst the superficial deposits comprise Tidal Flat Deposits – Clay and Silt. The Cranfield University Soilscapes online viewer_ indicates that the local ground is, "Loamy and clayey soils of coastal flats with naturally high groundwater".

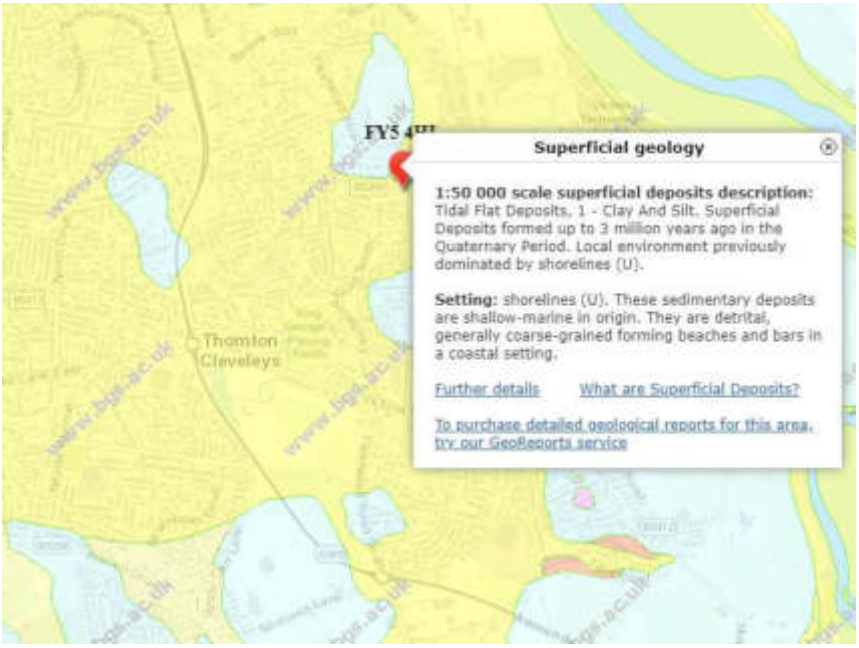


Figure 2.2 BGS Bedrock Geology

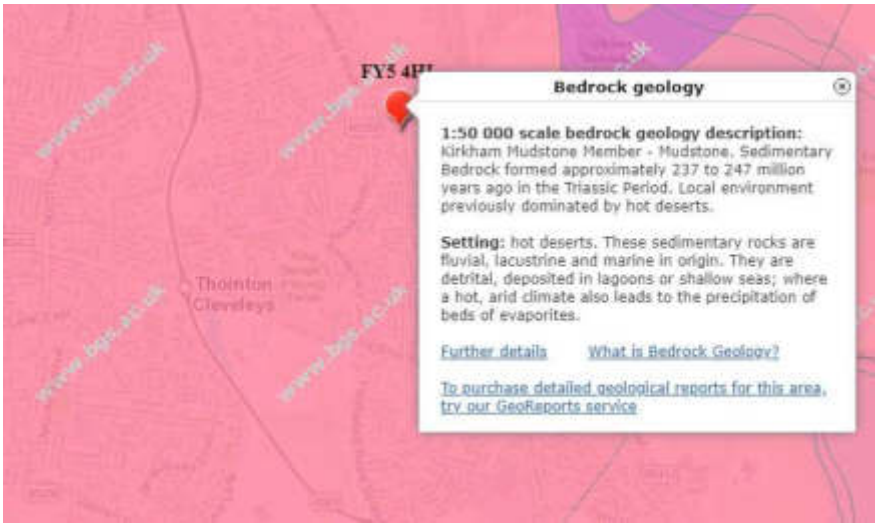


Figure 2.3 BGS Superficial Geology

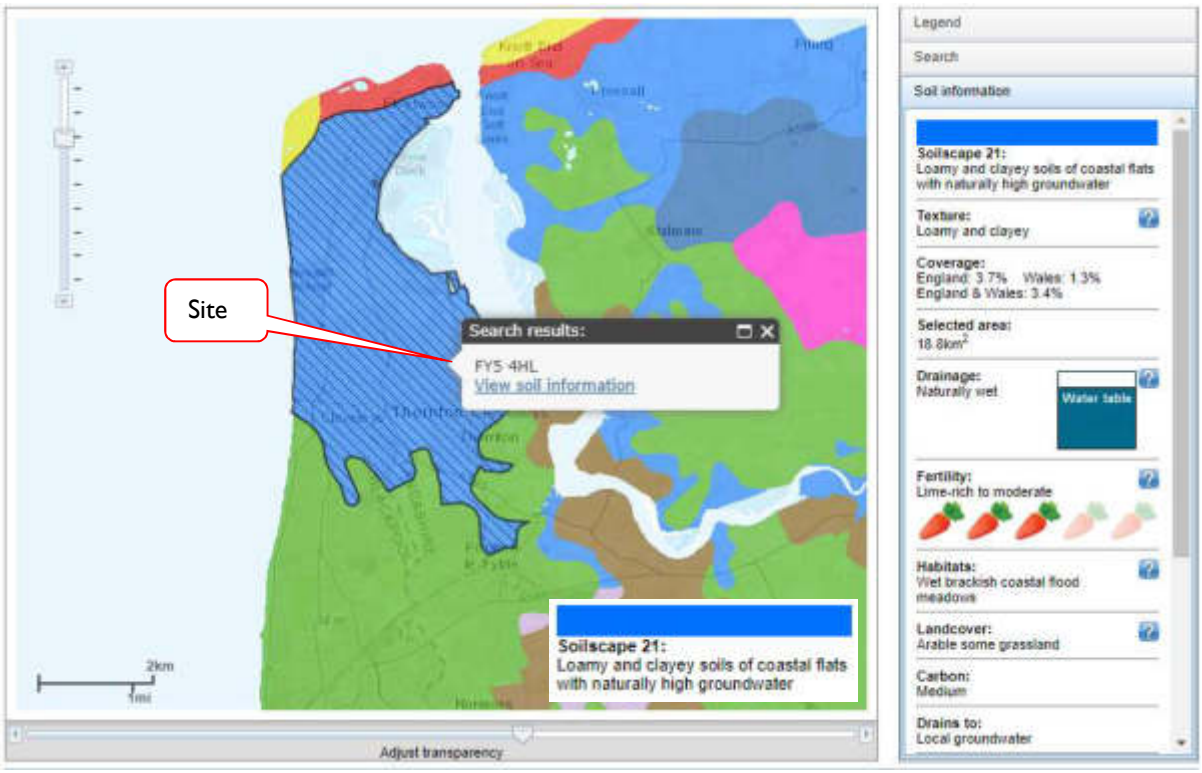


Figure 2.4 Cranfield University Soilscapes Map

2.31. Reference to Magic online mapping confirms the site is not within a groundwater source protection zone although it does lie in an area of a secondary aquifer. However, as discharge to ground is likely to be impeded it is not likely the aquifer will be contaminated.

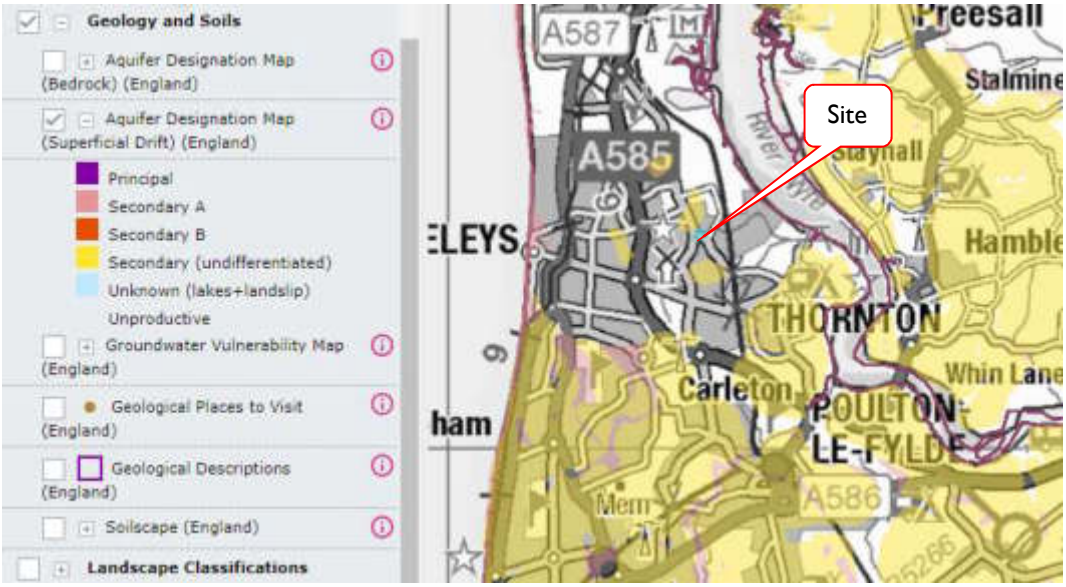


Figure 2.5 Aquifer Designation Map

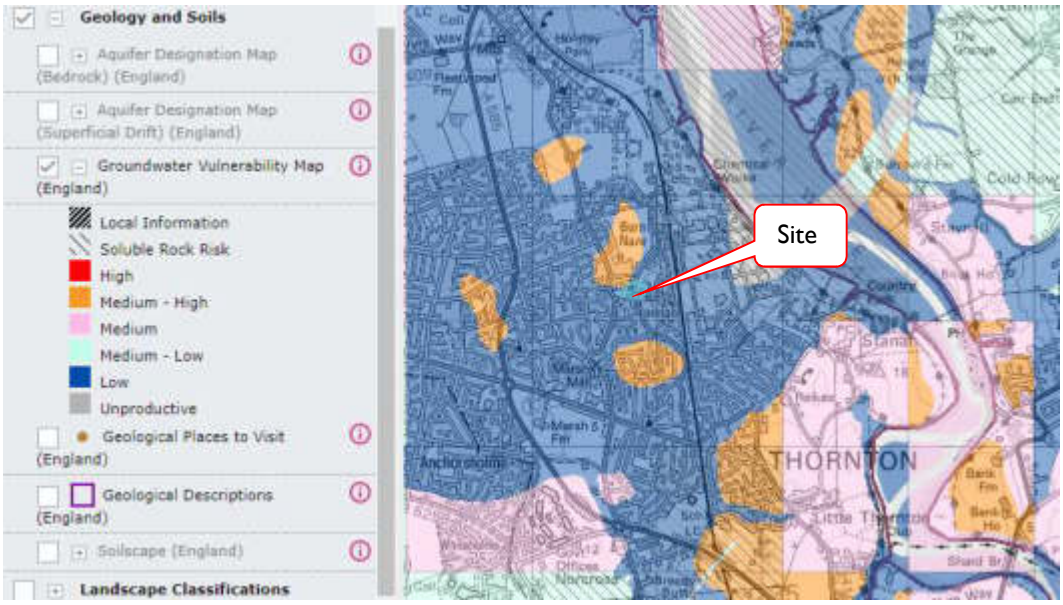


Figure 2.6 Groundwater Vulnerability Map

2.32. The existing impermeable drained area is not significant and is assumed to discharge to ground. The public sewer is located in Heys Street and Fleetwood Road. It is proposed not to exceed the existing discharge rate.

EXISTING PEAK RUNOFF RATE (GREENFIELD)

2.33. The general requirement set out by the NSSDS 2011 and NSTSSD 2015 technical documents is that "the development must not increase the risk of flooding elsewhere". In practical terms, this means that the proposed development runoff rate must provide a betterment or be equal to the calculated Greenfield.

2.34. The Institute of Hydrology Report 124 Flood Estimation for Small Catchments has been used to calculate the mean annual flood flow from the catchment.

	m^2	ha
Existing Site Area	2400	0.24
Existing Site Impermeable Area	0	0

Table 2.7 Existing Site Analysis

Volume Wallingford Variables	Value
M5-60 minute rainfall depth	18.0mm
Ratio of M5-60 to M5-2 day rainfalls	0.24mm
Average Annual Rainfall (SAAR)	913mm
Winter Rain Acceptance Potential (SOIL)	Soil Type 4 (0.45)

Table 2.8 Wallingford Procedure Volume 3 Variables

GROWTH CURVE FACTOR

2.35. Growth curve factors have been derived for each of the 10 hydrological regions of the UK. These are based on the work carried out by the Flood Studies research and assists in calculating multiple peak runoff rates for different events using the estimate QBAR value.

Hydrological Region	10		
Estimated QBAR Value	1.4		
Growth Curve Year	1	30	100
Greenfield Peak Runoff (l/s)	1.3	2.4	3.0

Table 2.9 Peak Greenfield Runoff Rates

PUBLIC SEWERS

2.36. The public sewers in the area are owned and maintained by United Utilities (UU). A copy of their records has been included in **Appendix B.**

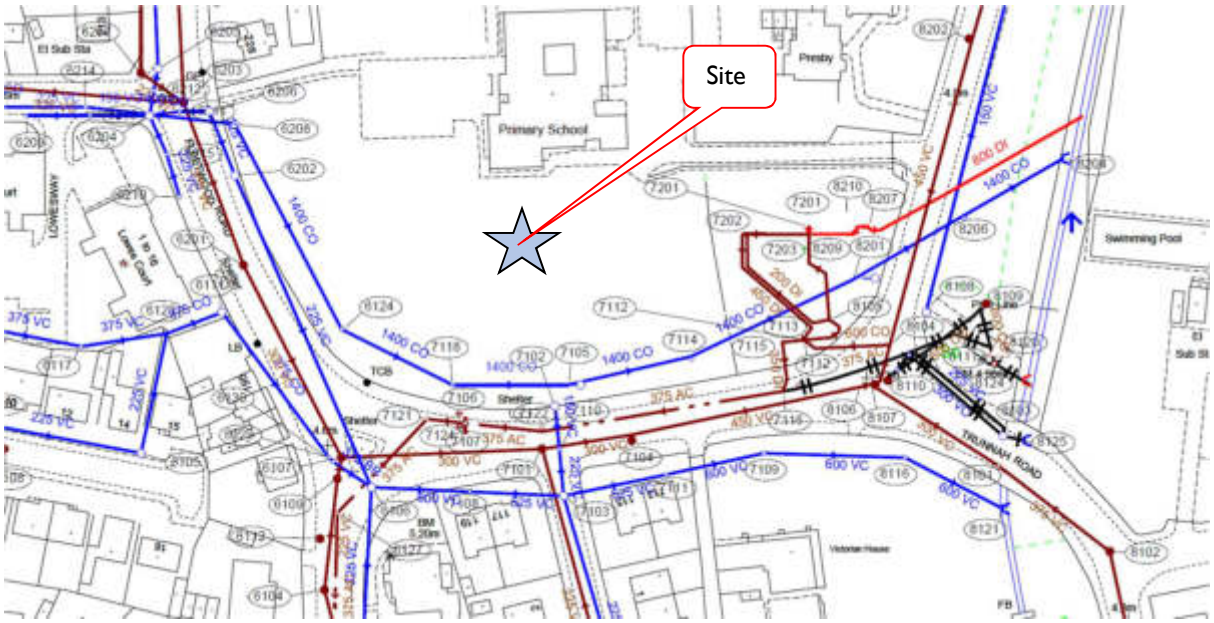


Figure 2.10 United Utilities Records (UU)

2.37. There is a 1400mm diameter culverted public surface water sewers and a 600mm diameter public combined sewer running within Heys Street.

PRIVATE DRAINAGE

2.38. Following a visual inspection there is evidence of private drainage, however, no records have been received.

INFILTRATION EXPECTATIONS

2.39. There are five bands of soil classes in England which roughly describe the infiltration potential of an area. It is derived from factors such as soil permeability, topography and the likelihood of impermeable layers.

2.40. The soil classification (BGS) for the site is indicated to be Tidal Flat Deposits – Clay and Silt *(*Naturally wet very acid sandy and loamy soils*)* - Type 4. Thus, the use of infiltration to discharge surface runoff is not likely to be practical.

Soil	WRAP[1]	Runoff	Soil Value	Soil Characteristics
1	Very High	Very Low	0.15	Sandy, well drained
2	High	Low	0.30	Intermediate soils (sandy)
3	Moderate	Moderate	0.40	Intermediate soils (silty)
4	Low	High	0.45	Clayey, poorly drained
5	Very Low	Very High	0.50	Steep, rocky areas

Table 2.11 Soil Classification

[1] *Winter Rainfall Acceptance Potential*

2.41. Discharge to ground is the preferred option for the proposed development but is not deemed likely due to soil characteristics.

SECTION 3 DEVELOPMENT PROPOSALS

3.1. At present the site is in an urban location and the land is to be developed to include a new playing space, which will be substantial, 60m x40m allowing school sports activities to be catered for. There is an existing access off Heys Street that will be used for the proposed development.

3.2. The total existing development site area is 0.24 ha and the proposed development impermeable area is approximately 2400m^2, which is more than the existing impermeable area. The artificial playing surfacing is considered impermeable due to the compacted hardcore construction in the subbase. However, alternative subbase construction is discussed in **Section 9**.

3.3. The proposed layout is included in **Appendix A**.

3.4. With development elements classified as non-residential use for educational establishment, it is considered the development falls within the "More Vulnerable" flood risk classification as defined in Table 2 of the Guidance below.

More vulnerable

- 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]

Figure 3.1 Flood risk vulnerability classification (NPPF Technical Guidance, Table 2)

SEQUENTIAL & EXCEPTIONS TEST

3.5. Under the requirements of PPG "Flood Risk and Coastal Change", the local authority is required to apply a risk based sequential test to new developments. This allows the local authority to direct development to areas which are at the lowest probability of flooding.

3.6. As this development falls within Defended Flood Zone 3, in accordance with Table 3 of the Guidance shown below, the proposed development will require both a Sequential Test and an Exceptions Test.

3.7. It is understood that a Sequential Test has been undertaken by Cassidy & Ashton and submitted to the Local Planning Authority.

Flood Zone	Flood Risk Vulnerability Classification				
	Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water Compatible
1	✓	✓	✓	✓	✓
2	✓	Exception Test Required	✓	✓	✓
3a	Exception Test Required	x	Exception Test Required	✓	✓
3b	Exception Test Required	x	x	x	✓

Figure 3.2 Flood risk vulnerability and flood zone `compatibility` (NPPF Technical Guidance, Table 3)

DEVELOPMENT AND FLOOD RISK

3.8. Table 1 of the NPPF Technical Guidance states that for development proposals sited in Defended Flood Zone 3 comprising of under one hectare, the vulnerability to flooding from other sources and the effect of the new development on surface water runoff are incorporated in the Flood Risk Assessment.

FINISHED LEVEL RESTRICTIONS

3.9. For Flood Zone 3 the finished level should be constructed to the level proposed in Section 10.

FLOOD COMPENSATION

3.10. If the proposals are constructed within Flood Zone 3 and below the advised Finished Flood Level a flood compensation volume, location and level should be agreed with the Environment Agency.

FLOOD RESILIENT CONSTRUCTION

3.11. This application is in Flood Zone 3 - see Section 10.

EMERGENCY SAFE ACCESS AND EGRESS (FLOOD EVENT)

3.12. This is applicable for Flood Zone 3, see below for proposed flood evacuation routes.

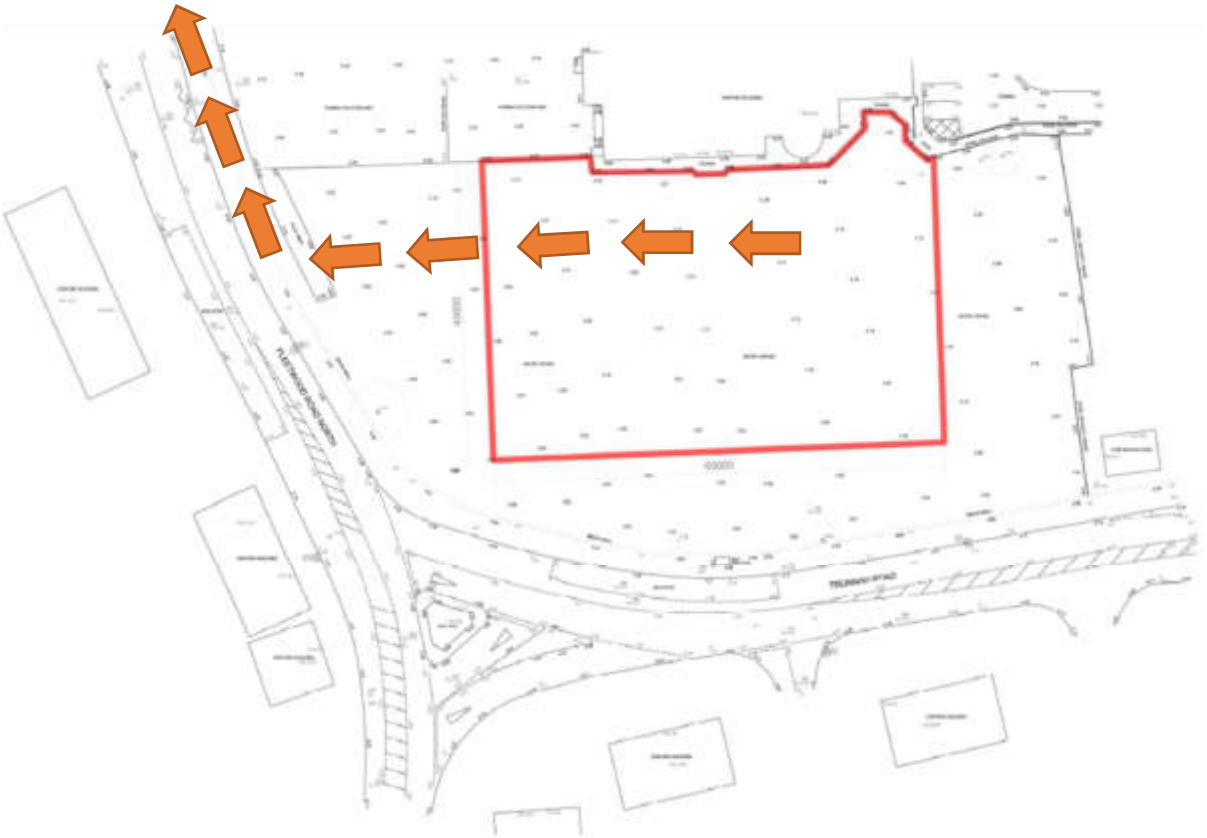


Figure 3.3 Proposed Evacuation Route

SECTION 4 HISTORIC FLOODING

ONLINE SEARCH

4.1. An online search has revealed that a major flash flooding has occurred in large areas of Fleetwood, Blackpool, Thornton, Cleveleys, Garstang and Bispham on 22nd – 23rd November 2017, leaving over 500 homes with no power and/or flooded and with extensive damage. As reported by Blackpool Gazette on 23rd November 2017, there was widespread flooding in Thornton between Crabtree Road and Heys Street, where cars were stranded and vulnerable residents were rescued by the fires service's inflatable boat.

4.2. In August 2018 United Utilities issued a Report of the above flood event (United Utilities Flooding Report 22nd and 23rd November), which suggests that the flooding occurred due to a combination of events: considerable rainfall, leading to Fylde Tunnel system completely filling and giving rise to spill operation from all three pumping stations; rainfall filling the local watercourses and leading to the ground saturation, known hydraulic problems on the two watercourses of Royles Brook and Hillylaide brookcourse, which in turn led to inability for UU surface water sewers to discharge to the already full watercourses.

4.3. Previously, two accounts of flooding were reported in the Thornton Cleveleys area between the 21st and 24th January 2008 Fleetwood Weekly News reported areas affected by flooding included Manor Drive, Cleveleys and Heys Street, Thornton on 24th January 2008. The Blackpool Gazette reported flooding from the Fylde area to Thornton on 21st January 2008. The flood event caused residents to experience low or no water pressure in their homes as well as damage to properties. However the articles do not state the specific details relating to time and locations of the flood event and therefore the extent of the flood event cannot be quantified.

4.4. More recently flooding has been reported on Underbank Road and Stanah Road in Thornton Cleveleys, with roads closed in both directions due to flooding from Raikes Road to River Road. This was due to severe weather and rainfall occurring during Storm Christoph on 19th January 2021.

4.5. Wyre has a long history of flood events which have affected various parts of the Borough The historical flooding events tabulated below were taken from Figure 7-1 of the Wyre Borough Council SFRA's 'Historic Flooding' chapter:

Year	Season	Comments / Quotation	Watercourse / Area
2013/14	Winter	Severe storm conditions in December 2013 and January 2014 led to significant damage to the beach management timber groyne structures in Cleveleys and Fleetwood, resulting in losses to the barrier beaches along the Wyre coastal frontage. The Winter event of 2013 was of similar conditions to those observed in 1977.	Sea
2012	Summer	Heavy persistent rain resulted in 80% of the average monthly rainfall falling on Monday 24th into Tuesday 25th September. 12 properties in Hambleton were flooded due to flow from the highway drainage and sewer networks, and 7 properties in Preesall suffered flooding as a result of excess discharges to a culvert. Extensive field flooding also reported.	
2002	Winter	Tidal event on 1st February 2002. Predicted tide 4.9m at 13.42 hrs, wind force gale 8. No flooding to properties but road on St. Bernard's Road (sandbagging of properties by Wyre BC), affected and promenade.	Sea
		Ramper Pot Key – no properties actually flooded, but were surrounded – breach in bank.	
		Tidal event on 1st February 2002, Hambleton area. Kiln Lane flooded, flooding directly from Wardleys Pool.	
2000	Winter	2 properties reported flooded. Extensive	Ainspool

Year	Season	Comments / Quotation	Watercourse / Area
		flooding to frontages of Ainspool Lane in the village. Ainspool running full & water level higher than the A586 so suspect that surface water drainage prevented from working.	
		Almond's Farm flooded for several days. Water overtopped primary defence of flood basin in November 2000. The farm has a secondary defence for its individual protection. Water overtopped this also.	Whites Brook
		Myerscough Microlight Centre – extensive flooding to the hangers & offices of the centre. 8 caravans and 2 tractors underwater in November 2000. Flooding believed to be due to overtopping of Withney Dyke	Withney Brook
1998	Winter	Large tree bow (0.4m dia x 5m length) jammed in tidal door. A road gully discharging into Main Dyke was also without a flap as the casting had corroded. Gardens, road and garage flooded.	Main Dyke
1995	Winter	Important rainfall event: during this period the flood alleviation basins (Garstang and Catterall) operated near to full capacity and no property at risk has been reported.	Wyre
1983	Winter	In October 1980 and again in December 1983, heavy rainfall caused widespread flooding in the Wyre catchment.	Wyre
1982		Catterall and Garstang flood basins were constructed.	Wyre
1980	Winter	Swollen river and high tide push the water level to worrying heights at Shard Bridge. The village of St. Michaels on Wyre was cut off from the world in November 1980 when the Wyre twice broke its banks. The fold cost millions of pounds.	Wyre
		In October 1980 heavy rainfall caused widespread flooding in the Wyre catchment. At Abbeystead 223mm fell within a six day period. Flooding resulted primarily from a fallen tree, which breached the flood embankment. Altogether 2000ha of land and over 400 houses were affected.	
		Flooded areas of St. Michaels, Garstang and Great Eccleston.	
1977	Winter	Storm on 11th/12th November 1977. Flooding at	Wyre

Year	Season	Comments / Quotation	Watercourse / Area
		Fleetwood West Shore and Cleveleys Frontage, estimated as 1:100 event in report by Lewis and Duvivier 'Borough of Wyre – Extension of Sea Defences – First Report – March 1978'.	
1959	Winter	There was a 'remarkable' fall at Garstang [Scorton], north Lancashire, when approximately 50mm of rain was recorded in 60 minutes.	Wyre
1958	Winter	Some of the worst flooding occurred in the Blackpool. One of the most seriously affected areas was the Mere Road district of Blackpool; flood water was waist deep soon after the commencement of the hour-long storm.	Wyre
1914	Winter	Abbeystead Reservoir, River Wyre: "The particulars that have been supplied by the Water Engineer show that the highest water level attained in the reservoir has been 1.05m above the overflow sill. This was during the flood of 9th January 1914, when 65mm of rain was recorded in 24 hours at the Abbeystead Reservoir gauge".	Wyre
1891	Summer	1891 August rainfall observer at Garstang (Calder Mount). Rain 245mm; the previous wettest month in 24 years being September 1872, when 242mm fell.	Wyre
1860		Abbeystead Reservoir was constructed and then further enlarged in 1881.	
1853	Winter	Around 1853 a serious flood overcharged the mill pond at Barton Corn Mill and the weir gave way.	Wyre
1787	Winter	On the 20th October there was a great flood when three bridges, Lee, Abbeystead and Stairs, were washed away and Dolphinholme and Street bridges were greatly damaged.	Wyre
1787	Summer	On the 10th August Damas Ghyll overflowed much land and washed a deal of hay away. The Wyre washed the company's Dolphinholme weir out and the factory weir fender mouth and thirty yards of earth and did a great deal of damage besides.	Wyre

Table 4.1 Wyre Historical Flood Events

4.6. The 1977 winter flood event is reiterated within the River Wyre Catchment Flood Management Plan.

SECTION 5 DEFINITION OF FLOOD HAZARD

5.1. Reference has been made to: -

- Environment Agency (EA) online data.
- National Planning Policy Framework (February 2019)
- EA Adapting to Climate Change
- Flood Risk Assessments: Climate Change Allowances (Updated July 2020)
- Wyre Borough Council Strategic Flood Risk Assessment – July 2016 (SFRA)
- Adopted Wyre Local Plan 2011-2031
- Wyre Borough Council Land Drainage Strategy August 2004
- British Geological Survey online data.
- EA/DEFRA Document SC030219 Rainfall Runoff Management for New Development

5.2. The site could be at risk of flooding caused by flooding from local sewers that are blocked or have insufficient capacity.

5.3. The site could be at risk of flooding caused by flooding from highway infrastructure and local ordinary watercourses.

5.4. The site could be at risk of flooding from surface waters flowing onto the site from other areas.

5.5. The site could be at risk of flooding because of groundwater levels reaching and exceeding existing ground levels on site.

5.6. The site could be at risk of flooding caused by failure of local infrastructure such as mains water pipes or failure of other local industrial and historical processes.

5.7. Any increase in impermeable areas within the development site will increase the risk of overland flooding. The current proposal does the existing impermeable but runoff will mimic the existing, therefore does increase the existing flood risk of overland flows.

5.8. The site could be at risk of flooding caused by site drainage or failing culverts which are not properly maintained, or which are subjected to flows greater than those for which it was designed.

SECTION 6 FLOOD RISK OVERVIEW

6.1. The potential sources of flooding which could be experienced have been summarised in **Table 6.1**. Those posing the greatest flood risk to the site have been investigated further in **Section 7** to determine possible mitigation measures.

Source of Flooding	Potential Flood Risk					Site Description
	High	Med	Low	None	Information Not Available	
Fluvial	X					Defended Flood Zone 3 (SFRA & EA). This means the land is assessed as having a high probability of river flooding, which is greater than 1 in 100 (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%).
Tidal	X					River Wyre.
Canal				X		Not applicable.
Ground Water		X	X			The site is at low risk of groundwater flooding (LFRMS). SFRA indicates no results of groundwater flooding. Concluded medium-low, see **Section 7**.
Artificial Waterbodies				X		The site is located outside of any reservoir flood route (Gov UK).
Pluvial Runoff				X		The Gov UK Map indicates no risk onsite from Pluvial flooding.
Critical Drainage Areas					X	This site is not believed to be within a CDA.

Table 6.1 Potential Sources of Flooding Overview

SECTION 7 PROBABILITY OF FLOODING

7.1. A site classified within Environment Agency Defended Flood Zone 3. This means the land is assessed as having a high probability of river flooding, which is greater than 1 in 100 (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%).

ROYLES BROOK

7.2. The nearest watercourse to the application site is Royles Brook located approximately 150m east of Sacred Heart Catholic Primary School and is considered to be a 'Critical Ordinary' watercourse.

7.3. The Wyre Borough Council Land Drainage Strategy describes the watercourse as being part of a large land drainage system that serves the area, the total length of the land drainage network is approximately 37km long and approximately 5.1km culverted.

7.4. Due to the proximity of Royles Brook to the proposed development flooding from this mechanism will be evaluated further.

RIVER WYRE

7.5. The River Wyre is located approximately 1.1km north west of the proposed development site and is considered to be a 'Main' river.

7.6. The River Wyre is a river in Lancashire which flows into the Irish Sea at Fleetwood, it is approximately 28 miles in length.

7.7. Due to the development being located within Flood Zones 2 and 3 of the Environment Agency's Flood Map and being within a catchment that outfalls within the tidal extent of the River Wyre, flooding from this mechanism will be evaluated further within this report.

Figure 7.1 Flood Risk from Rivers or the Sea, Extent of Flooding

7.8. There is a mention in the Wyre Borough Council Strategic Flood Risk Assessment (SFRA) of flooding events associated Thornton but not specifically to the proposed development site.

7.9. Reference to the online Environment Agency surface water flood risk map – see Figure 6.2 to 6.4 - indicates that a section of the development site has no risk of surface water flooding.

7.10. The highway in Heys Street does benefit from typical highway drainage (i.e. gully and pipe network).

7.11. Whilst the level at which groundwater occurs is subject to seasonal and other variations, there is no visible evidence of groundwater issues on site. However, during a site walkover survey, it was revealed that existing ground was generally well constructed, however, isolated depressions in the land are likely to amass surface water. The proposed levels strategy will be formed in such a manner as to alleviate

potential surface water flooding and dispose of surface water into the preferred surface water discharge option.

7.12. The new artificial playing surface will be designed and installed to current standards thereby presenting only low risk of flooding due catastrophic failure of the playing surface construction.

7.13. There are no other local industry activities or reservoirs identified whose infrastructure failure could cause flooding on site and therefore the risk of consequential flooding on site is low.

7.14. The development site (0.24 ha) will have a potential gross drained area of approximately 2400m^2 including a new playing space, however the proposed impermeable area is more than that of the existing and the discharge from the site will be restricted to greenfield runoff rates. On that basis, the risk of overland surface water flooding will be increased and mitigation measures are required.

7.15. A properly designed and maintained site drainage system will meet the requirements of the sewerage provider in that the pipelines will not flood at the critical 30-year (3.33%) rainfall event. NPPF requires that all exceedance flows either infiltrate to ground or are contained safely on site or within underground storage, or such that there will be no risk of flooding of vulnerable or critical areas on site and there will only be low risk of flows from the site causing flooding to other nearby areas.

7.16. The online Environment Agency surface water flood risk map for depth – see below – indicates that the vast majority of the current arrangement of the site is no risk.

7.17. Regarding groundwater flooding Section 10 of the SFRA states the following in relation to groundwater flooding within the 'Core Area Lower Estuary':

7.18. 'The area is also susceptible to flooding from fluvial sources due to the low gradients and difficulty in discharging into the estuary, the various watercourses that drain the land. Similarly sewer flooding, groundwater and highway drainage systems can result in flooding problems as they are interconnected to the watercourses.'

7.19. The SFRA does not specifically identify any areas that have been affected by groundwater flooding, an internet search for historic groundwater flooding incidents also came back with no results.

7.20. Borehole logs from the website www.bgs.ac.uk taken from Hampton Place approximately 450m east of the site indicated that water was struck within the borehole at approximately 2.0m below surface level during November 1992.

7.21. It is anticipated that this level will rise over time and during the winter months, however the proposed development is not located within a topographical valley, this combined with the implementation of mitigation measures i.e. raising finished levels will reduce the risk of flooding from this mechanism.

7.22. In conclusion groundwater flooding from this mechanism is regarded as medium to low.

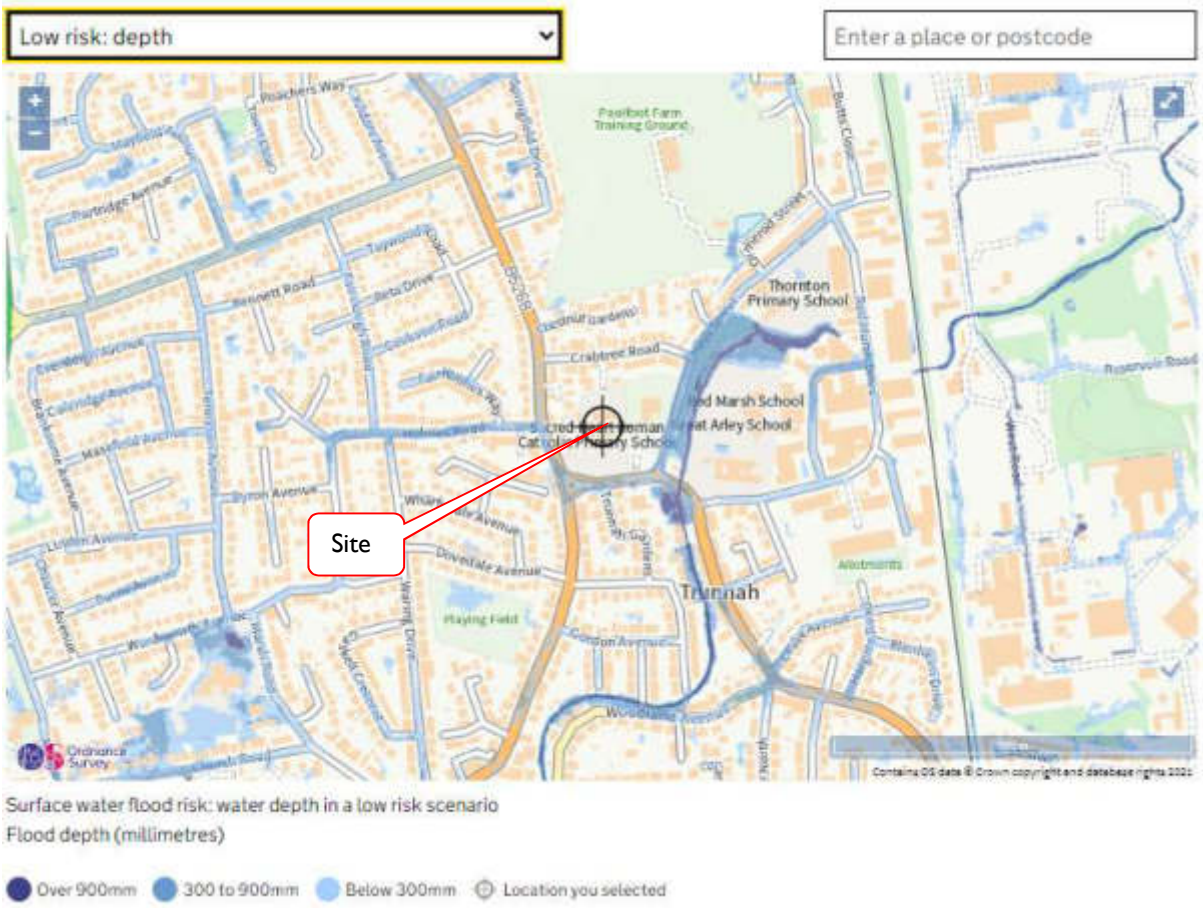


Figure 7.2 Flood Risk from Surface Water - Low Risk: Depth

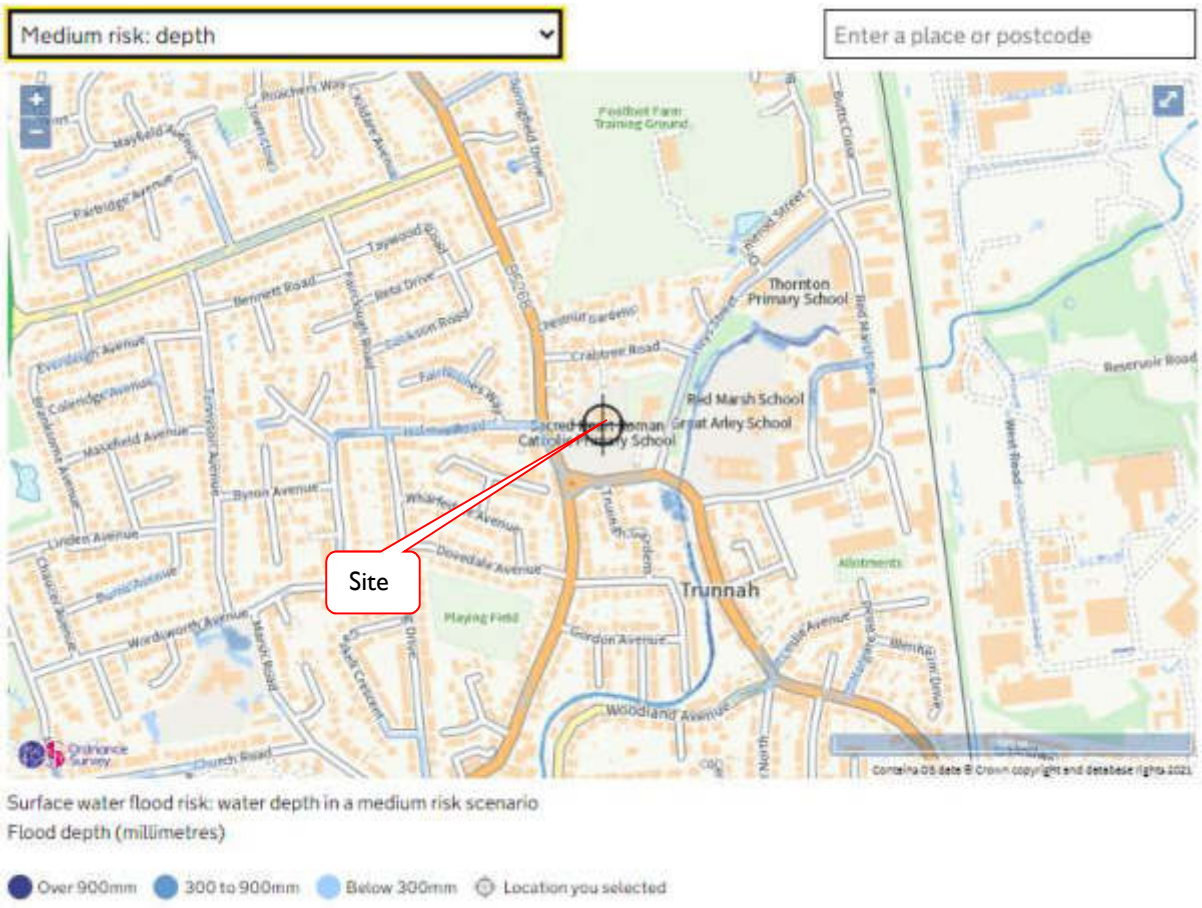


Figure 7.3 Flood Risk from Surface Water – Medium Risk: Depth

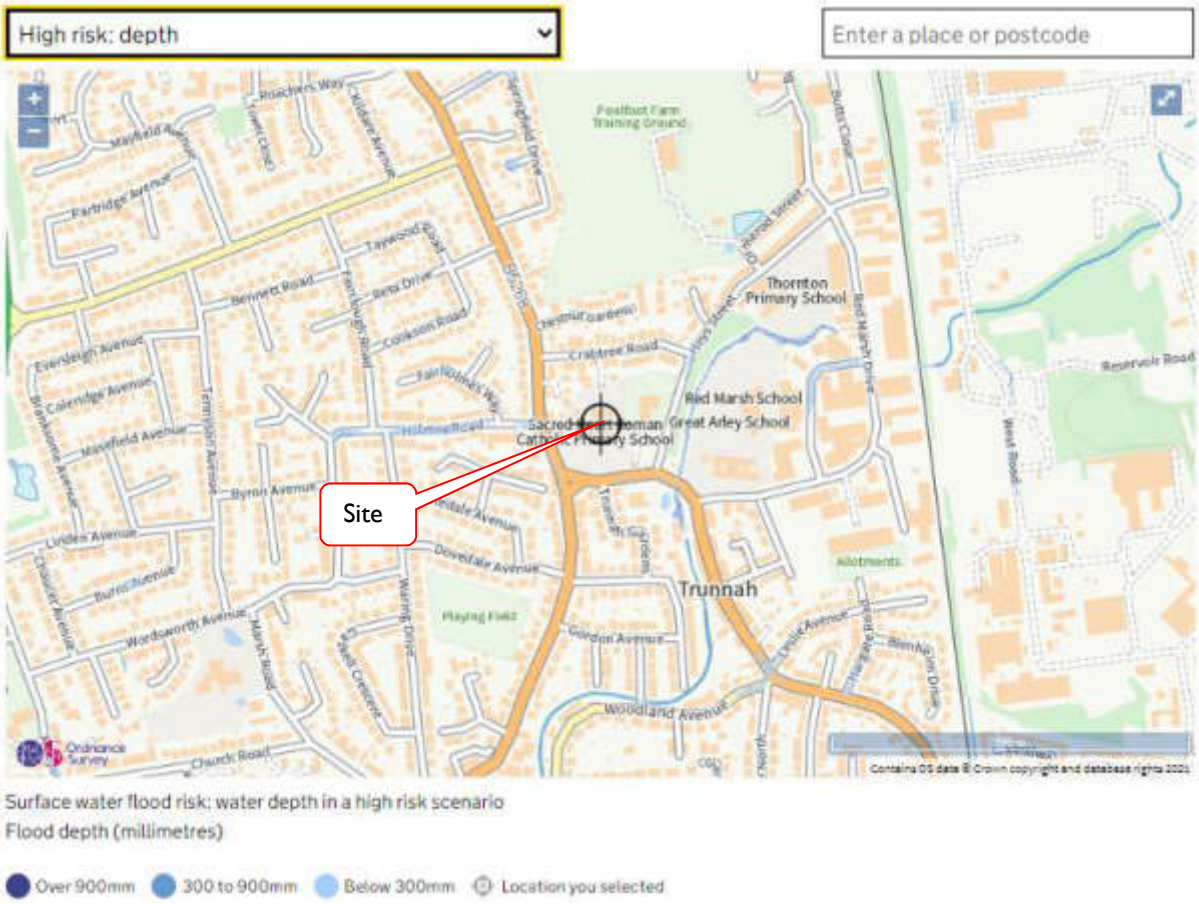


Figure 7.4 Flood Risk from Surface Water – High Risk: Depth

SECTION 8 CLIMATE CHANGE

8.1. An allowance for climate change should be included to help minimize vulnerability and provide resilience to flooding. According to the 'Flood Risk Assessments: Climate Change Allowances' guidance, **both** the "Upper End" and "Central" allowances should be applied to Rainfall Intensity.

8.2. The "Central" allowance should be applied to the surface water drainage network/design to assess its performance and ability to contain critical events. The "Upper End" allowance should be applied to assess the potential flood risk implications to the site and to ensure that flooding is wholly contained onsite.

8.3. For the proposed developments, the following climate change allowances should be;

- School playing area +20% to +40% Allowance.

Applies across all of England	Potential Change anticipated for the 2020s	Potential Change anticipated for the 2050s	Potential Change anticipated for the 2080s
Upper End	+10%	+20%	+40%
Central	+5%	+10%	+20%

Table 8.1 Recommended Climate Change Guidance (EA)

8.4. Climate change for a development of this nature is based on the design life and whether the development will still be operational after the year 2085. If the design life assumes that the development will not be functioning after 2085, then a climate change allowance of 20% should be added to the 1 in 100yr storm event. If it is believed that the development will continue to function after 2085 then a 40% climate change should be added to the 1 in 100yr storm event.

CLIMATE CHANGE RECOMMENDATION

8.5. Flood Flow Ltd would recommend that the drainage serving the newly developed areas is designed to contain (without surface flooding) a 1 in 100 year 6-hour rainfall event with an "Upper End" allowance included.

SECTION 9 SURFACE WATER MANAGEMENT STRATEGY

9.1. A preliminary drainage strategy has been produced to identify any major issues that may affect the surface water drainage for the proposed development. Note that all recommendations are preliminary and should be developed/investigated further during the detailed design stage.

SURFACE WATER DISCHARGE HIERACHY

9.2. The National Standards for Sustainable Drainage Systems (NSSDS) and National Planning Practice Guidance set out the following hierarchy of surface water runoff destinations;

- 1st Choice Discharge into the ground (infiltration)
- 2nd Choice Discharge to a surface water body
- 3rd Choice Discharge to a surface water sewer
- 4th Choice Discharge to a combined sewer

9.3. The exisitng site is currently drained to a watercourse . The hierarchical approach to dealing with surface water requires that consideration be first given to soakaways.

9.4. At this stage investigations have yet to be undertaken on site to establish the potential for disposal of surface water via infiltration. However, based on the indicators from information on BGS website, the superficial deposits at the site comprise Tidal Flat Deposits – Clay and Silt overlying Kirkham Mudstone Member - Mudstone. This is supported by the Cranfield University Soilscapes online viewer, which indicates that the local ground is, "Loamy and clayey soils of coastal flats with naturally high groundwater". Therefore infiltration techniques are not likely to be a viable drainage solution.

9.5. The use of SuDs techniques such as filter strips and a permeable playing surface should be considered with the aim of limiting surface water run-off to the current levels. The proposed layout will increase the impermeable areas should a permeable surface not be implemented. Typical construction of the playing surface is as shown in Figure 9.1 below.

9.6. The stone base is an integral part of the overall system, as it ensures the integrity of some of the most essential properties of the system, such as long-term surface stability and drainage properties mimicking the existing situation.

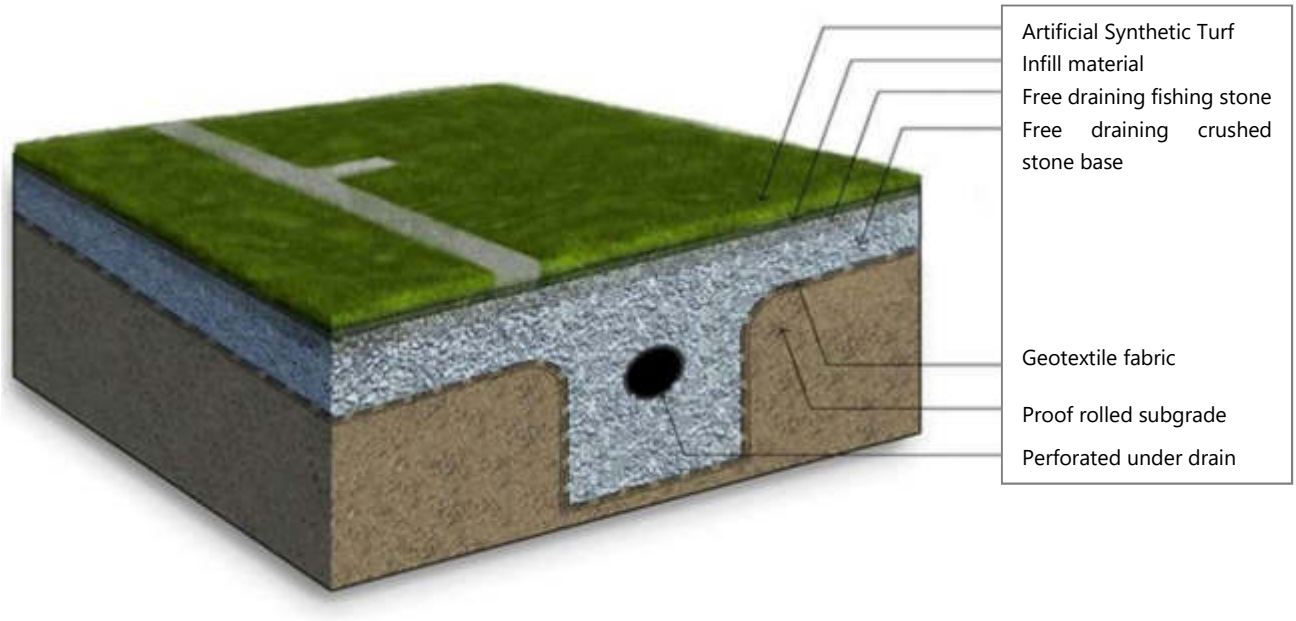


Figure 9.1 Artificial pitch with free draining crushed stone base

9.7. The nearest watercourse to the application site is Royles Brook located approximately 150m east of Sacred Heart Catholic Primary School and therefor it is recommended that surface water is connected to the existing system serving Sacred Heart Catholic Primary School which is anticipated to dispose of surface water into Royles Brook.

9.8. There are numerous culverts associated with Royles Brook upstream of the proposed development site. An initial assessment has identified that the watercourse is recognised as a 'Main' river and therefore the Environment Agency have certain responsibilities. The nearest culvert to the proposed development is located south of Trunnah Road approximately 120m south east at the bottom of the car park associated with Sandyfort Arms.

9.9. The culvert is approximately 2.0m wide and 1.6m high to soffit, and spans across Trunnah Road, furthermore the car park of Sandyfort Arm is in excess of 2.0m below the proposed development site.

9.10. A review of the Wyre Borough Council Land Drainage Strategy identifies the authorities responsible for maintenance as:

- Wyre Borough Council
- Lancashire County Council
- Environment Agency
- NPL
- Riparian Owners

9.11. As well as the different types of maintenance that are currently scheduled to be undertaken at present and in the future for Royles Brook. Further advise on maintenance regimes for Main Rivers can be sourced from the Environments Agency.

9.12. It must be emphasised that the culvert is located approximately 120m away from the proposed development and at a level in excess of 2.0m below the site. If the culvert was to become blocked flood water would flow over the road and re-enter back into Royles Brook downstream of the culvert, before migrating over the proposed development.

9.13. As such flooding related to blockage of the culvert under Trunnah Road has been evaluated and is considered to pose a low risk to the proposed development at Sacred Heart Catholic Primary School.

9.14. Reviewing the Wyre Borough Council Land Drainage Strategy determined that Sacred Heart School has a storage tank (approximately 2000m^3 in size) to store water prior to disposing it into Royles Brook, the acritical is shown below. This tank will not be affected as part of the drainage strategy.

Figure 5.5: WBCLDS Tank Details

Issues	
1.	Condition of tidal flaps with maintenance aspect.
2.	Very low land levels.
3.	Destruction of water vole habitats etc.
4.	Impact resulting from discharge from combined sewage overflows or cross connected sewers. Design work is currently underway to reduce the frequency of operation of the from overflow at Heys Street. A storm water detention tank near Sacred Heart School will hold 2,000m³ of sewage during the height of the storm, this will be in addition to an uprating of the capacity of the pumping station to further reduce the volume of sewage likely to be discharged in heavy storm.
5.	Climate change.

Source: WBCLDS

Figure 9.2 Sacred Heart Primary School WBCLDS Tank Details

9.15. An indicative SuDS drainage layout including the surface water network design can be see below in Figure 9.3.

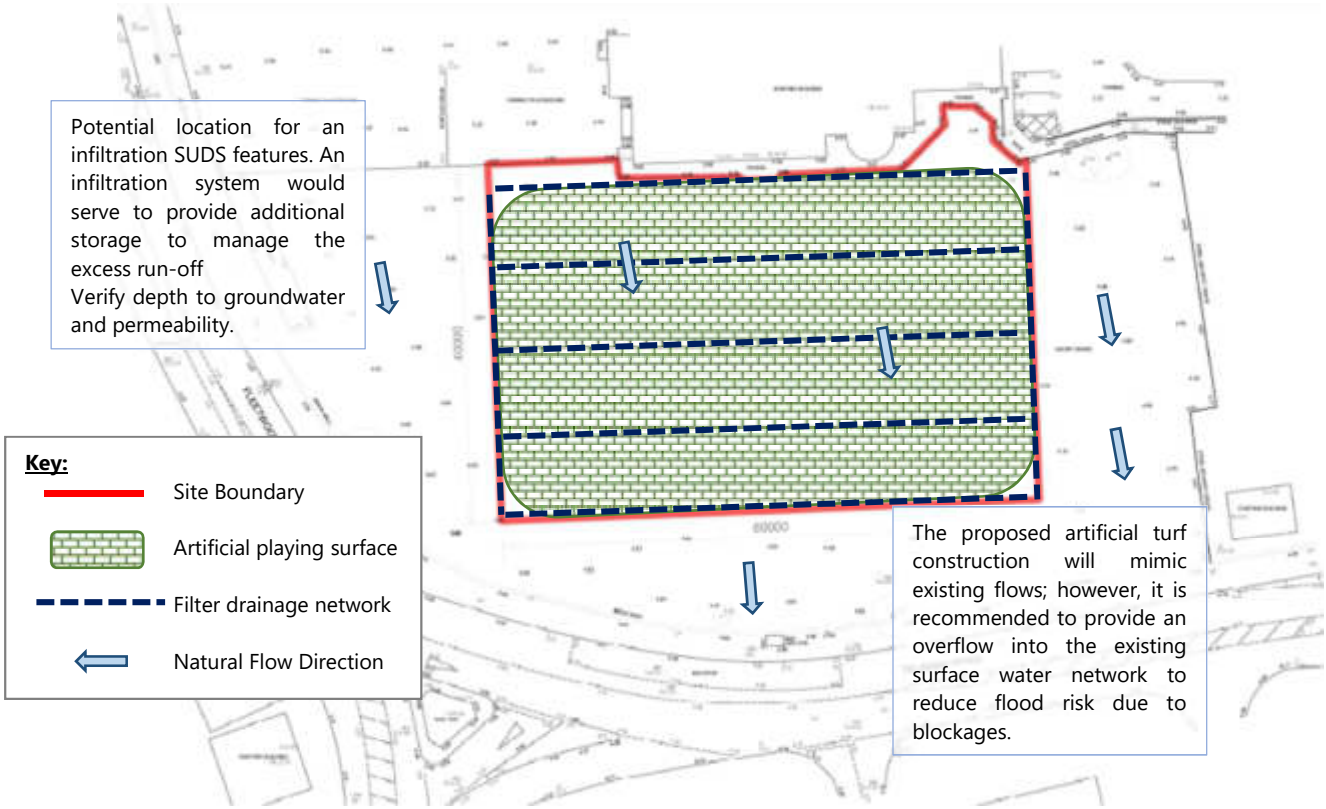


Figure 9.3 Indicative SuDS Drainage Layout

DRAINAGE APPROVAL

9.16. The above strategy will be initially passed for review to Wyre Borough Council in their role as Lead Flood Authority.

SECTION 10 ASSESSMENT OF PREDICTED FLOOD LEVELS

10.1. The watercourse is classified as a 'Main' river which is protected by a small earth embankment less than 1 metre height along the west bank.

10.2. Modelled water levels associated with the Royles Brook have been provided by the Environment Agency, theses flood levels have been compared with levels onsite to identify if the site will become flooded during various return periods.

10.3. The Environment Agency data provides levels associated with 5 No. nodes for both the defended and undefended scenarios along the stretch of Royles Brook east of the site, in order to undertake a direct comparison during the worst case scenario the node with the highest water levels has been used i.e. Node 1 during the undefended scenario.

Return Period	Flood Level (m AOD)
1 in 100 Year	4.50
1 in 100 Year + Climate Change	4.38
1 in 1000 Year	4.40

Table 10.1 Flood Levels Associated with Node 1

1 IN 100 YEAR EVENT UNDEFENDED

10.4. The water level within Royles Brook at Node 1 during the undefended 1 in 100 year event is shown to be at a level of 4.50m AOD.

10.5. The lowest surveyed level on site has been taken as 4.890m AOD, therefore during this event the site is elevated by 0.390m.

10.6. As such the proposed development site will not be encroached during the undefended 1 in 100 year event flood event associated with Royles Brook.

1 IN 100 YEAR PLUS CLIMATE CHANGE EVENT UNDEFENDED

10.7. At Node 1 the water level within Royles Brook 1 during the undefended 1 in 100 year plus climate change event is at a level of 4.38m AOD.

10.8. The lowest surveyed level on site has been taken as 4.890m AOD, therefore during this event the site is elevated by 0.510m.

10.9. As such the proposed development site will not be encroached during the undefended 1 in 100 year event flood event associated with Royles Brook.

1 IN 1000 YEAR EVENT UNDEFENDED

10.10. The water level within Royles Brook at Node 1 during the undefended 1 in 1000 year event is at a level of 4.400m AOD.

10.11. The lowest surveyed level on site has been taken as 4.890m AOD, therefore during this event the site is elevated by 0.490m.

10.12. As such the proposed development site will not be encroached during the undefended 1 in 1000 year event flood event associated with Royles Brook.

TIDAL: RIVER WYRE

10.13. The River Wyre is located approximately 1.1km north west of the proposed development site and is considered to be a 'Main' river.

10.14. The proposed development is located within the 'Core Area Lower Estuary'. Section 18 of the SFRA identifies that due to the limited hydraulic gradient the flood risk from a breach of the existing coastal or estuary defences.

10.15. The SFRA also states that the River Wyre is tidally influenced up to the area known as Stanah. Royles Brook joins another drain named Hillylaid Pool with its confluence approximately 1.1km east of the site in an area to the rear of a pumping station on South Road.

10.16. Hillylaid Pool then continues to be pumped east for approximately 900m where it outfalls into the River Wyre located within the area of Stanah, the figure below is a picture taken at the location where Hillylaid Poll joins the River Wyre.

Figure 10.1 Hillylaid Pool Outfall into River Wyre

10.17. The watercourse is classified as a 'Main' river which does appear to be protected by formal flood defences.

10.18. Modelled flood level data has been provided by the Environment Agency for the undefended scenario at Sacred Heart School associated with the River Wyre, no information for the defended scenario was included only the following statement:

10.19. *'No on-site flooding is shown in the defended scenarios, so levels have not been provided'.*

Return Period	Flood Level (m AOD)
1 in 200 Year	5.63
1 in 200 Year + Climate Change	6.23
1 in 1000 Year	5.86

Table 10.2 Flood Levels Associated with the River Wyre

1 IN 200 YEAR EVENT

10.20. The current 1 in 200 year event associated with the River Wyre is 5.630m AOD. The lowest level on site has been identified to be 4.890m AOD. As such during the 1 in 200 year event associated with the River Wyre the proposed development site will become encroached up to a depth of 0.740m.

1 IN 200 YEAR EVENT PLUS CLIMATE CHANGE

10.21. The current 1 in 200 year plus climate change event associated with the River Wyre is 6.23m AOD. The lowest level on site has been identified to be 4.89m AOD. As such during the 1 in 200 year event associated with the River Wyre the proposed development site will become encroached up to a depth of 1.34m.

1 IN 1000 YEAR EVENT

10.22. The current 1 in 1000 year event associated with the River Wyre is 5.86m AOD. The lowest level on site has been identified to be 4.890m AOD. As such during the 1 in 200 year event associated with the River Wyre the proposed development site will become encroached up to a depth of 0.970m.

SECTION 11 PROPOSED FLOOD RESISTANCE & RESILIENCE

11.1. It is further recommended that flood resistance and resilience are set at a level of 5.34m AOD, which is 450mm above the finished level at the lowest point of 4.89m AOD, in keeping with the existing topography.

11.2. Flood proofing is defined as any structural or non-structural measures intended to prevent damage from flooding to a building. However, as the proposal is for an open playing space and it is expected that the structure will withstand effects of flooding.

11.3. As noted above, the finished level is as the existing topography and does not include an additional 300mm, which is typically used for building flood resilience. However, this would not provide protection for the 1 in 1000 year event, which mimics the existing situation.

11.4. For Environment Agency Data see **Appendix C**.

SECTION 12 FLOOD RISK MANAGEMENT MEASURES

12.1. The Environment Agency is the lead organisation for flood forecasting and flood warning in England and Wales. The EA currently offers a 3-stage warning service to properties at risk of flooding.

12.2. The Environment Agency currently only issues direct flood warnings to properties at risk of flooding. The "Floodline Warnings Direct" (FWD) system automatically telephones the occupants of properties where flood forecasts predict flooding is likely.

12.3. The site is located within a Flood Warning Area or the adjacent Flood Alert Area associated with the River Wyre and Royles Brook. The Flood Warning and Alert areas are shown below in a purple hatch pattern.

Figure 11.1 – Environment Agency, Flood Alert Map

12.4. In the event of extreme emergency, the local authority and other emergency services also have contingency plans for dealing with the consequences of flooding.

12.5. Setting finished level of the playing area to 300mm above the existing surrounding external ground would reduce the risk of flood damage. However, as the applicant is a primary school, raising the level in parts of the existing paying field may present a safety hazard to the occupants (i.e. primary school age children), and therefore may not be recommended. This should be further discussed with The Council's Drainage Consultee.

12.6. The design of surface water drainage will ensure that there are no uncontrolled off-site overland flood flows created by the proposed development. Where possible, site surfaces will be modelled so that flood flows generated on site from events beyond the stipulated drainage design criteria will flow to, and be contained on site within, landscaped or filter strips such that there is no increased risk of flooding to buildings and other vulnerable areas. Such flood flows will not be allowed to flow from the site onto adjoining property or highways.

12.7. Development owners will be responsible for the maintenance of private drainage systems to ensure satisfactory performance.

12.8. Any surface water flows onto the site from adjoining property will either be retained on site safely or be encouraged to pass across the site such that there is no increased risk of flooding to buildings and other vulnerable areas.

SECTION 13 OFF-SITE IMPACTS

13.1. The surface water from the site is proposed to discharge to ground, filter drainage systems to a surface water network mimicking greenfield runoff and it is considered that these measures will mitigate flood risk to other land.

13.2. Proposed on-site drainage will be designed and constructed in accordance with current best practices and The Building Regulations as appropriate.

13.3. There will be no significant off-site impacts because of this development and therefore the proposal satisfies paragraph 103 of the Framework as it will not increase flood risk elsewhere.

SECTION 14 RESIDUAL RISKS

14.1. The development and its drainage system will be designed to cope with intense storm events up to and including the 1 in 100 year return period rainfall event, which includes an allowance for climate change. If an extreme rainfall event occurs, which exceeds this event, then it is likely that there will be an increase in overland flows due to the additional rain water being unable to enter the drainage network. It is therefore important that these potential overland flows are catered for within the design of the external areas and any reconstruction of existing land drains to be reinstated with the original capacity.

14.2. Any overland flows generated by the proposed development must be directed away from any properties and towards the highway network, where it can follow the natural topography.

14.3. As with any drainage system, blockages within the network have the potential to cause flooding and disruption. It is important that any drainage system not offered for adoption has appropriate maintenance regime included within the operation and maintenance (O & M) manuals for the development.

SECTION 15 CONCLUSION

15.1. A Flood Risk Assessment is required to satisfy all requirements of the National Planning Policy Framework (NPPF), Flood Risk and Coastal Change Planning Practice Guidance (PPG).

15.2. This FRA as far as reasonably practical determines the potential flood risk associated with the site and has concluded the following:

a) The proposed development is located wholly within the "high probability" Defended Flood Zone 3.

b) Modelled flood levels provided by the Environment Agency has determined that the flood risk associated with the Royles Brook is considered to be low.

c) Modelled flood levels associated with the River Wyre are considered to present a low risk during the defended scenario, however the risk increases to medium to high during breach or failure.

d) It is recommended that surface water is connected to the existing system serving Sacred Heart Catholic Primary School which is anticipated to dispose of surface water into Royles Brook. This is discussed further in **Section 9**.

e) Setting finished level of the playing area to 300mm above the existing surrounding external ground would reduce the risk of flood damage. However, as the applicant is a primary school, raising the level in parts of the existing paying field may present a safety hazard to the occupants (i.e. primary school age children), and therefore may not be recommended. This should be further discussed with The Council's Drainage Consultee. This is discussed in **Section 12**.

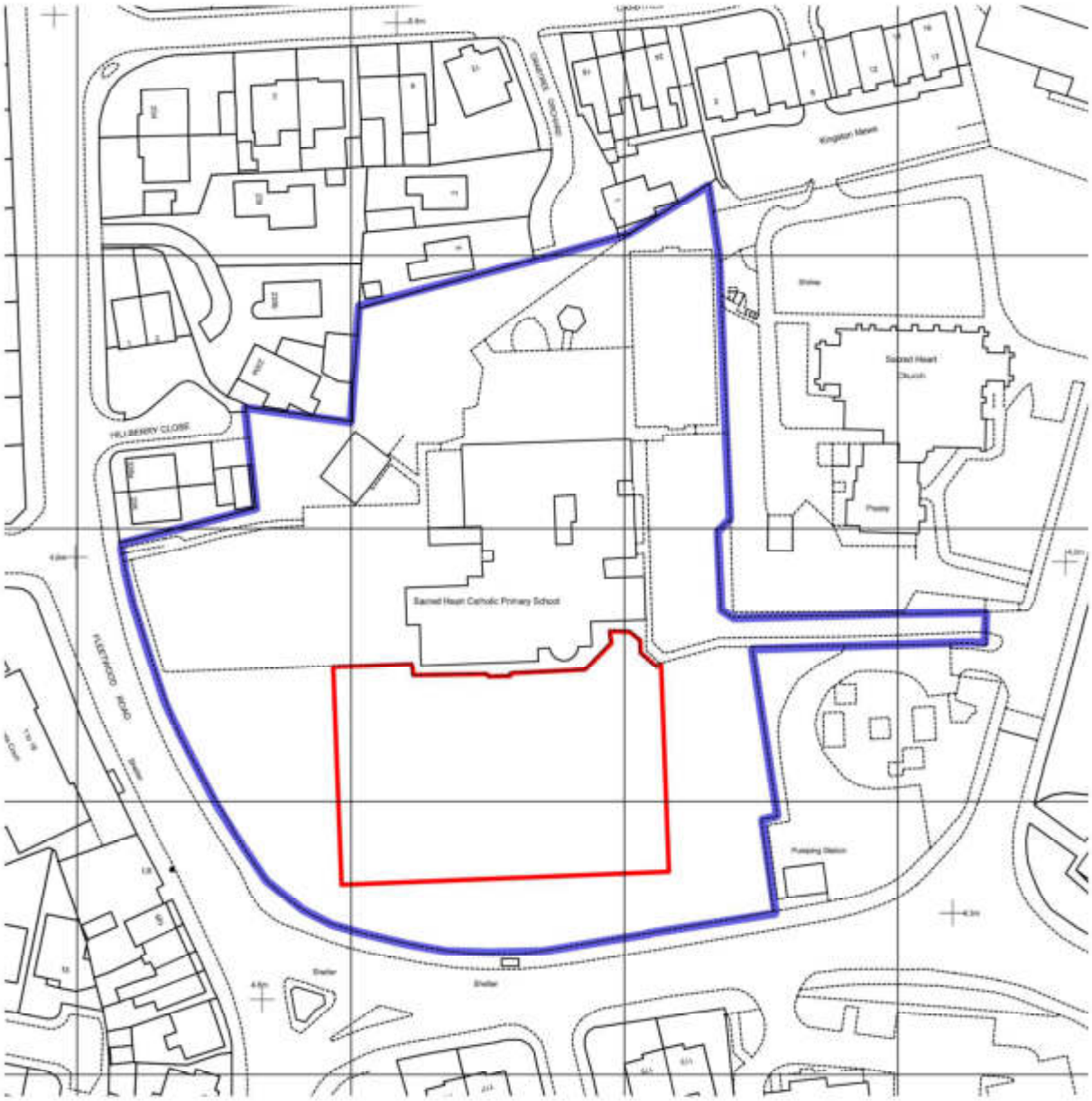
f) Flood levels associated with a 1 in 200 year flood events including Climate Change will exceed the proposed ground level. In flood emergencies school staff and pupils should take refuge with the main school or higher ground until emergency services or the Environments Agency permit it is safe to leave the premises.

g) The proposed onsite drainage system must not contribute to any flood risk or overland flow risk. Any residual risk will be effectively managed on the site with the use of appropriate drainage and/or topographical level consideration.

h) The proposed development of the site should not commence until a detailed scheme for surface water drainage has been submitted to and approved by the Local Planning Authority.

15.3. Flood Flow Ltd recommends that the Local Planning Authority accept this Flood Risk Assessment and Drainage Strategy in support of the Planning Applications.

APPENDIX A

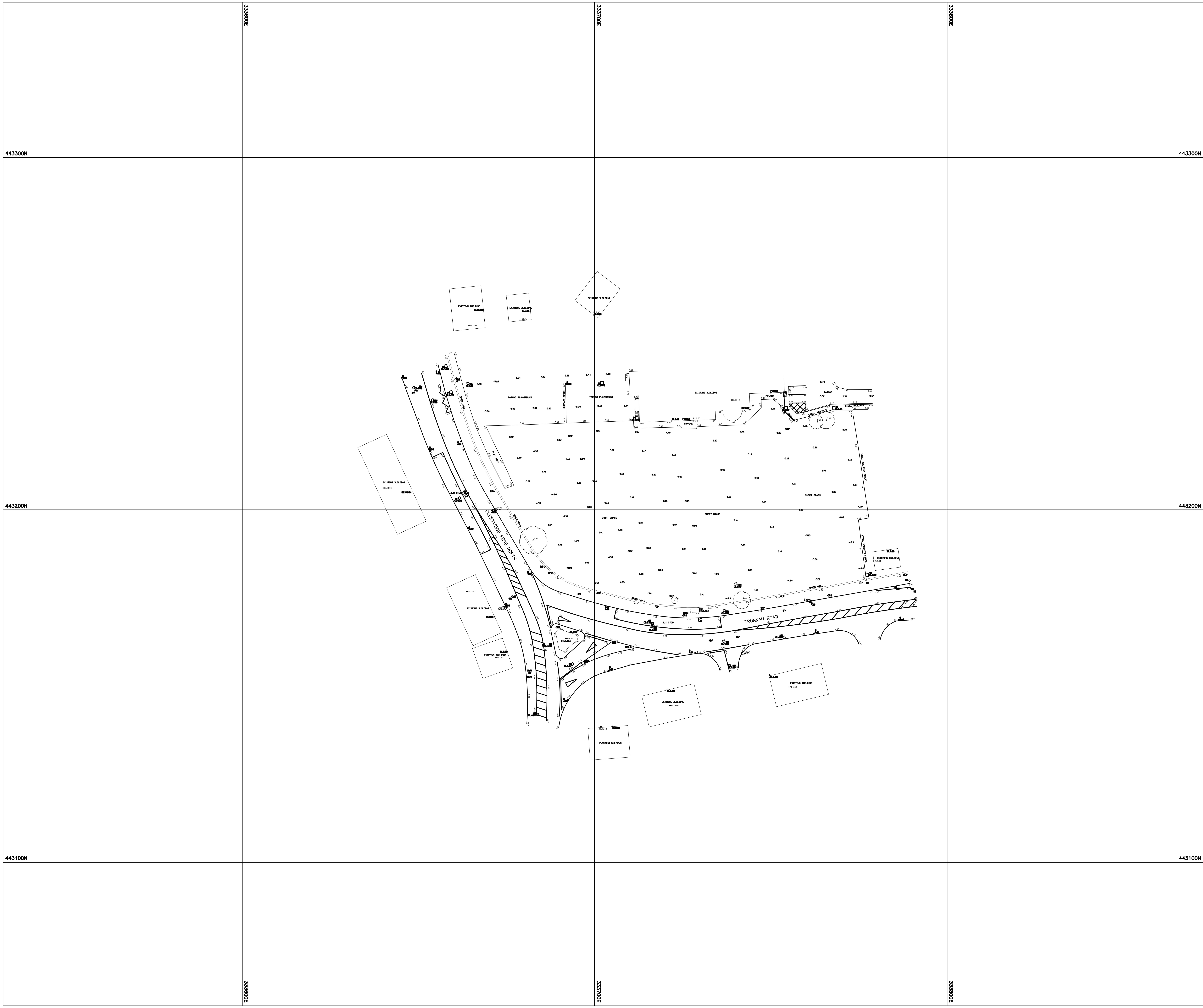


1:1250
0 10 20 30 40 50m

Project:	Address:
Sacred Heart Primary School	Heys Street, Thorton-Cleveleys FY5 4HL

Title:	Scale:	Drawing by:	Date:
Location Plan	1:1250 @A4	LA	Feb 2021

Rod Ainsworth Architect



COORDINATED STATIONS

STATION	EASTING	NORTHING	LEVEL (m)
A	333671.826	443200.089	4.412
B	333761.033	443174.195	4.314
1	333742.151	443159.389	4.333
2	333674.452	443172.168	4.259

ABBREVIATIONS

AV	AIR VALVE/VENT	IC	INSPECT CHAMBER
BOL	BOLLARD	IL	INVERT LEVEL
BB	BELISHA BEACON	JKW	JAPANESE KNOTT WEED
BM	BENCH MARK	LH	LAMP HOLE
BL	BED LEVEL	LP	LAMP POST
BS	BUS STOP	NP	NAME PLATE
BT	BRITISH TELECOM	MH	MANHOLE
CL	COVER LEVEL	PS	POST/SIGN POST
Dil	DILAPIDATED	PB	POST BOX
Dis	DISUSED	PX	UNKNOWN SERVICE
EL	EAVES LEVEL	RE	RODDING EYE
ELE	ELEC JUNCT. BOX	RL	RIDGE LEVEL
EP	ELECTRICITY POLE	RS	ROAD SIGN
FH	FIRE HYDRANT	ST	STOP TAP
FL	FLOOR LEVEL	TH	TRIAL HOLE
FOS	FULL OF SEDIMENT	TL	TRAFFIC LIGHT
FP	FLAG POLE	TP	TELEGRAPH POLE
G	GULLY	TV	CABLE TV BOX
GM	GAS METER	Utl	UNABLE TO LIFT
GV	GAS VALVE	WM	WATER METER

SYMBOLS

SURVEY STATION
TREE
— E — O\H ELEC CABLE
BENCH MARK
— T — O\H PHONE LINE
TRIAL PIT
CANOPY\HEDGE
BOREHOLE

NOTES

A) ONLY MANHOLES AND SERVICES VISIBLE AT TIME OF SURVEY SHOWN

B) O/S USED AND ORIENTATED TO TRUE NORTH

C) LEVELS IN METRES RELATED TO G.P.S.

D) DRAINAGE INFORMATION TAKEN FROM LOCAL AUTHORITY RECORDS. INFORMATION MUST BE CHECKED PRIOR TO WORK COMMENCING

Rev	Description	Date

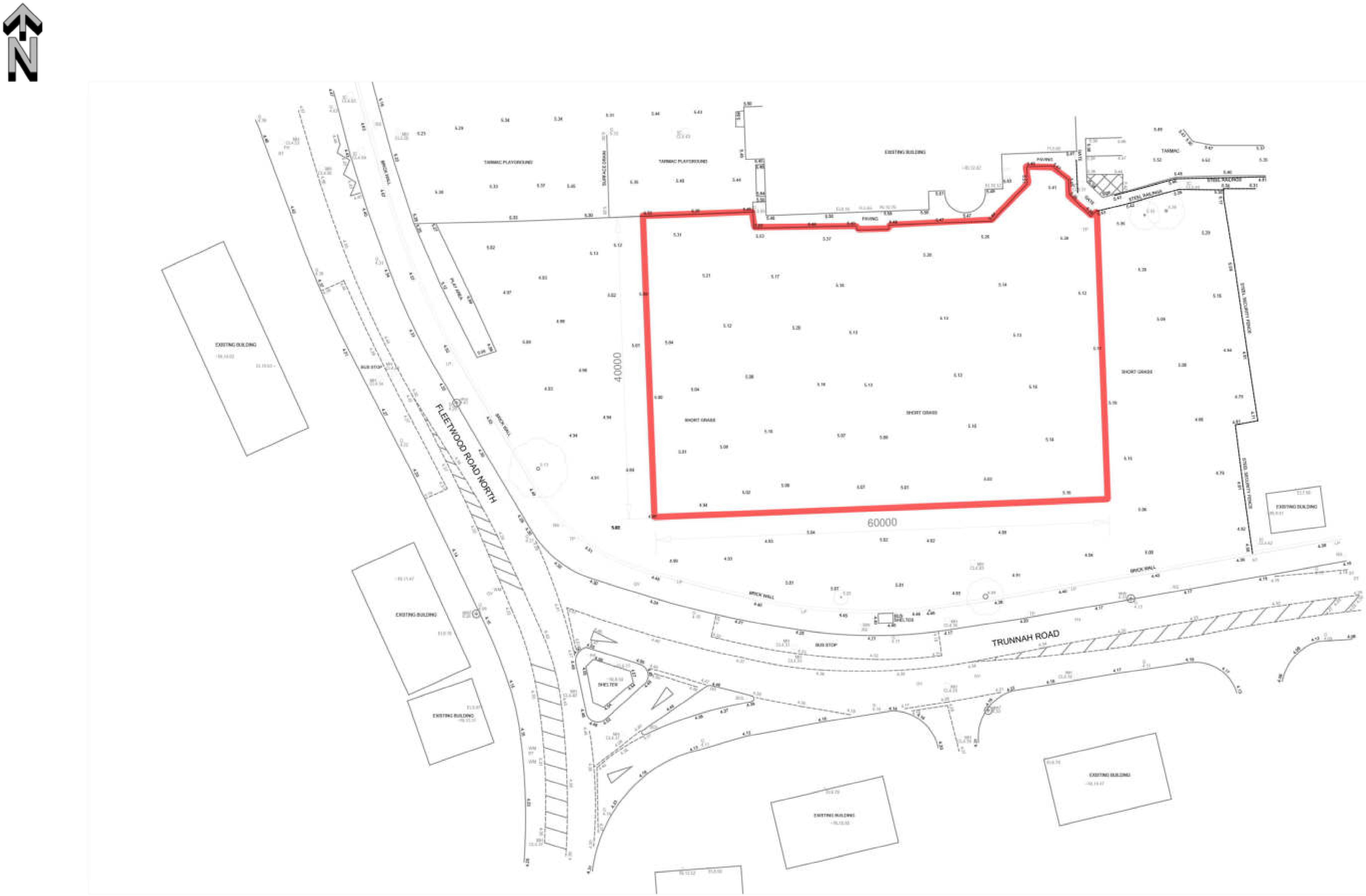
PROPOSED DEVELOPMENT AT SACRED HEART PRIMARY SCHOOL, THORNTON CLEVELEYS

AINSWORTH ARCHITECTS

TOPOGRAPHICAL SURVEY

AA006/TOO		
	Surveyed	I. GREEN
	Drawn	I. GREEN
	Date	MARCH 2021
	Scale	1:500 @ A1

RJP Surveying Consultants Ltd
LAND SURVEYORS & SITE ENGINEERS
AYREFIELD COTTAGE
AYREFIELD ROAD
ROBY MILL
UPHOLLAND
LANCASHIRE
WN8 0QP
TEL: 01257 251554
MOBILE: 07710 308709
WEBSITE : www.rjpsurveyors.co.uk
E-MAIL: mail@rjpsurveyors.co.uk

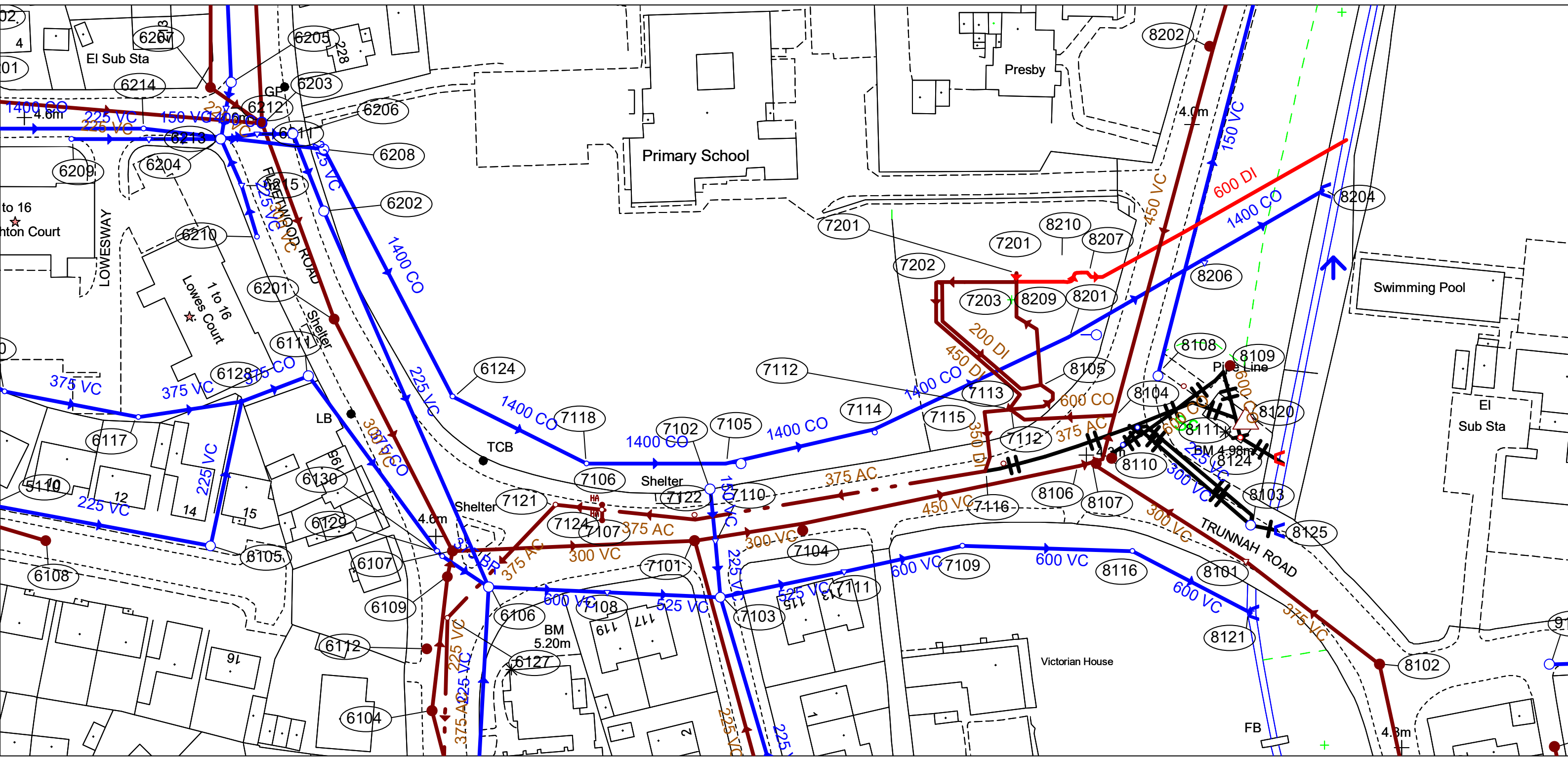


Project:	Address:		
2584	Sacred Heart CPS,Heys St, FY5 4HL		
Title:	**Scale:**	**Drawing by:**	**Date:**
Site Plan	1:500 @A4	LA	Mar 2021

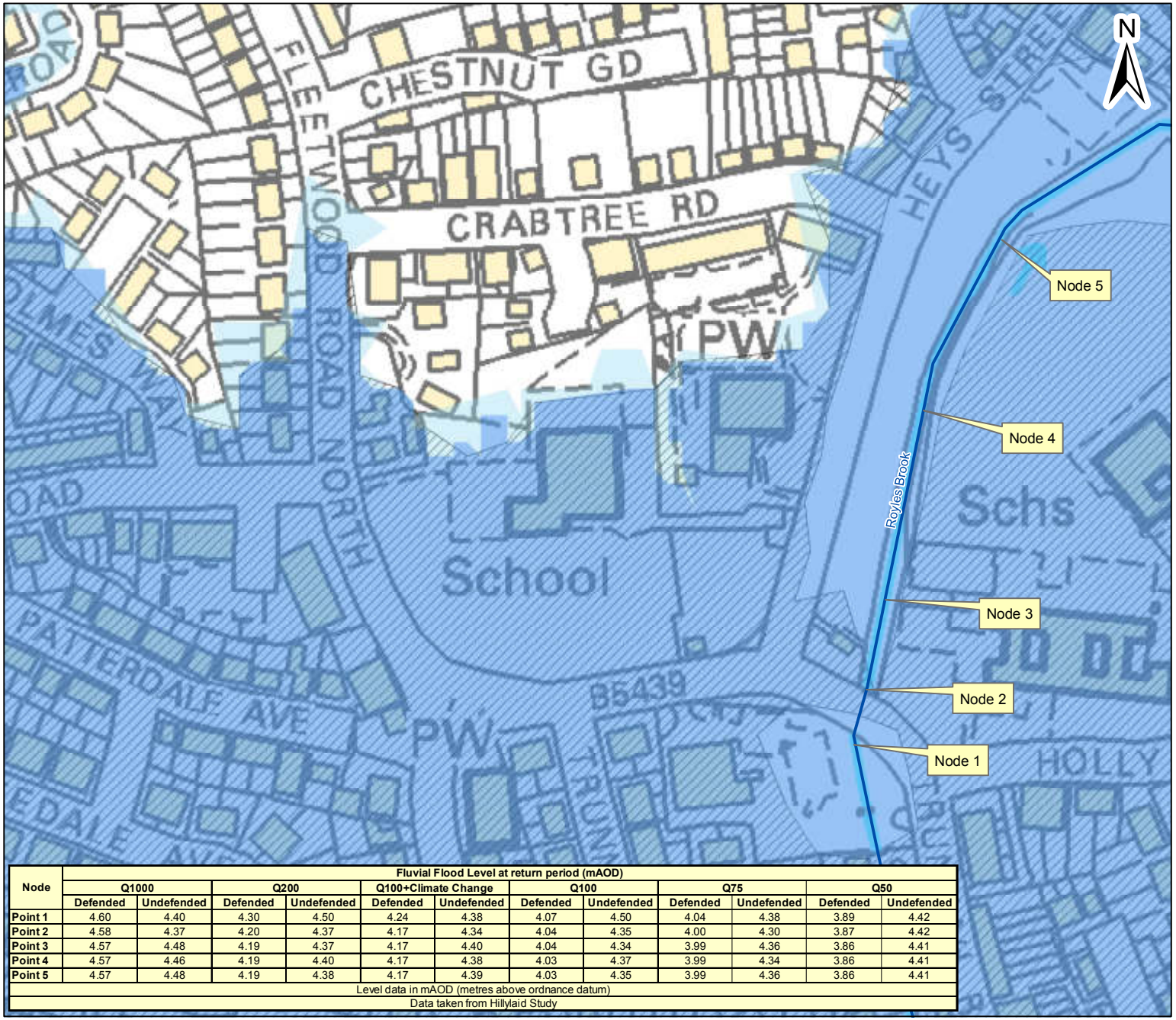
1:500
0 5 10 15 20 25m

Rod
Ainsworth
Architect

APPENDIX B


Primary School
Presby
Swimming Pool
El Sub Sta
El
Sub Sta
TRUNNAH ROAD
LOWESWAY
1 to 16
Lowes Court
Victorian House
Shelter
TCB
LB
GP
BM
5.20m
BM 4.96m
FB
Pipe Line
4.6m
4.0m
4.3m
1400 CO
600 DI
450 VC
150 VC
225 VC
375 VC
375 AC
300 VC
600 VC
525 VC
600 CO
200 DI
450 DI
350 DI
6202
6203
6204
6205
6206
6208
6209
6210
6212
6214
6201
6124
6117
6130
6129
6105
6107
6108
6109
6112
6104
6106
6127
7201
7202
7203
7112
7113
7114
7115
7116
7118
7102
7105
7106
7121
7122
7124
7107
7108
7101
7104
7103
7109
7110
7111
8202
8204
8210
8207
8209
8201
8206
8105
8108
8109
8104
8120
8124
8110
8103
8106
8107
8125
8101
8116
8121
8102

APPENDIX C



Node	Fluvial Flood Level at return period (mAOD)											
	Q1000		Q200		Q100+Climate Change		Q100		Q75		Q50	
	Defended	Undefended	Defended	Undefended	Defended	Undefended	Defended	Undefended	Defended	Undefended	Defended	Undefended
Point 1	4.60	4.40	4.30	4.50	4.24	4.38	4.07	4.50	4.04	4.38	3.89	4.42
Point 2	4.58	4.37	4.20	4.37	4.17	4.34	4.04	4.35	4.00	4.30	3.87	4.42
Point 3	4.57	4.48	4.19	4.37	4.17	4.40	4.04	4.34	3.99	4.36	3.86	4.41
Point 4	4.57	4.46	4.19	4.40	4.17	4.38	4.03	4.37	3.99	4.34	3.86	4.41
Point 5	4.57	4.48	4.19	4.38	4.17	4.39	4.03	4.35	3.99	4.36	3.86	4.41

Level data in mAOD (metres above ordnance datum)
Data taken from Hillylaid Study

Environment Agency

Fluvial Flood Level Map: Sacred Heart Primary School, Thornton Cleveleys

Produced: 5 October 2015
Our Ref: CL4869
NGR: SD 33797 43262

Key

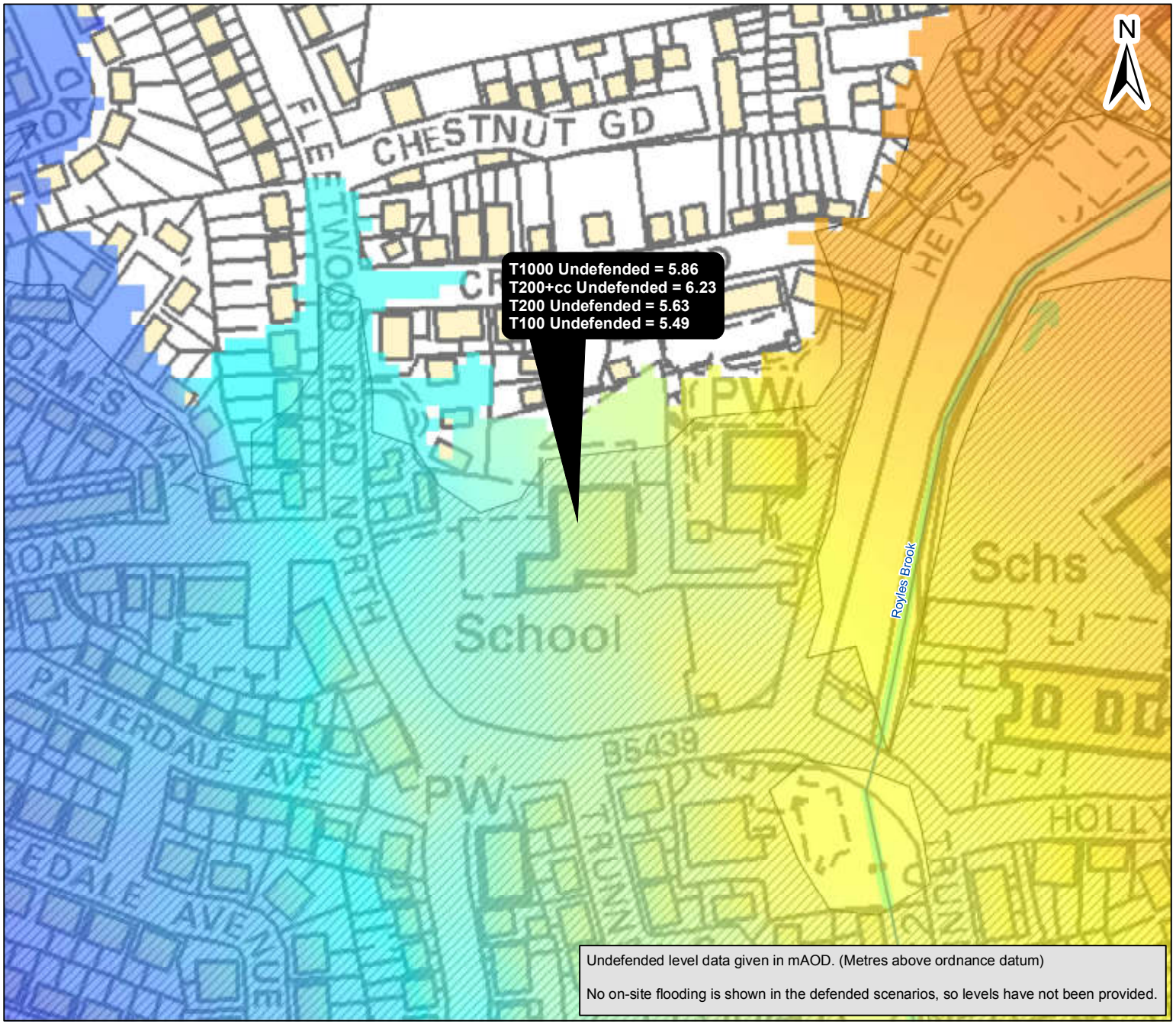
- Main River
- Flood Zone 3
- Flood Zone 2
- Areas Benefitting from Defences

Flood Zone 3 shows the area that could be affected by flooding:
- from the sea with a 1 in 200 or greater chance of happening each year
- or from a river with a 1 in 100 or greater chance of happening each year.

Flood Zone 2 shows the extent of an extreme flood from rivers or the sea with up to a 1 in 1000 chance of occurring each year.

ABDs (Areas Benefiting from Defences) show the area benefiting from defences during a 1 in 200 tidal, or 1 in 100 fluvial flood event.

Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk



Environment Agency

Tidal Flood Level Map: Sacred Heart Primary School, Thornton Cleveleys

Produced: 5 October 2015
Our Ref: CL4869
NGR: SD 33797 43262

Key

T200+CC (Undefended)

mAOD

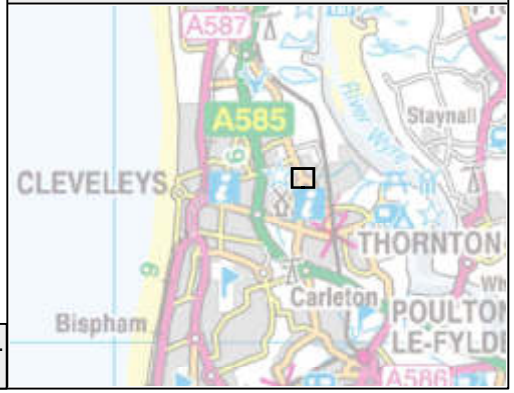
High : 6.4

Low : 6.05

Main River

Areas Benefitting from Defences

ABDs (Areas Benefiting from Defences) show the area benefiting from defences during a 1 in 200 tidal, or 1 in 100 fluvial flood event.



Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

APPENDIX D

Flood map for planning

Your reference	Location (easting/northing)	Created
21148 Sacred	**333797/443262**	**24 May 2021 13:35**

Your selected location is in flood zone 3 – an area with a high probability of flooding that benefits from flood defences.

This means:

- you may need to complete a flood risk assessment for development in this area
- you should ask the Environment Agency about the level of flood protection at your location and request a Flood Defence Breach Hazard Map (You can email the Environment Agency at: enquiries@environment-agency.gov.uk)
- you should follow the Environment Agency's standing advice for carrying out a flood risk assessment (find out more at www.gov.uk/guidance/flood-risk-assessment-standing-advice)

Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

Environment Agency

Flood map for planning

Your reference
21148 Sacred

Location (easting/northing)
333797/443262

Scale
1:2500

Created
24 May 2021 13:35

- Selected point
- Flood zone 3
- Flood zone 3: areas benefitting from flood defences
- Flood zone 2
- Flood zone 1
- Flood defence
- Main river
- Flood storage area

0 20 40 60m

APPENDIX E

SACRED HEART SCHOOL, HEYS STREET, THORNTON-CLEVELEYS, FY5 4HL

Rivers and sea risk	**Very low risk** Very low risk means that each year this area has a chance of flooding of less than 0.1%.
Surface water risk	**Very low risk** Very low risk means that each year this area has a chance of flooding of less than 0.1%. Lead local flood authorities (LLFA) manage the risk from surface water flooding and may hold more detailed information. Your LLFA is **Lancashire**.
Reservoir risk	There is no risk of reservoir flooding
Groundwater risk	No risk of groundwater flooding

APPENDIX F

SD348W 3266 4321 203

STRATA SURVEYS LTD.,
Telephone: 0606 834637 Fax: 0606 836657

Borehole Number : 3
Sheet 1 of 2.

Job Number : 6807 Location : Hampton Place, Cleveleys
Client : Wells Shackleton

Dia. & Drilling Methods
light cable percussion
150mm diameter

Description of Strata	Red. Level	Legend	Thick -ness	Depth m	Sample Depths	Sample Types	N Value	Cu	m	Water Level	Piezo -meter	Daily Prog.
	6.90			0.00								
TOPSOIL	6.50		(0.40)	0.40								
Soft to firm brownish grey sandy slightly gravelly CLAY (Marine Alluvium)			(1.60)		0.50 - 0.95	U 1		38	0			AMS
					1.00	D 1						
					1.50 - 1.95	U 2						
	4.90			2.00	2.00	D 2		41	0	▼ 1+1		
Firm to stiff dark brown sandy slightly gravelly CLAY (Boulder Clay)					2.00	W 1				13-11		
			(1.00)		2.50	U 3						
	3.90			3.00						▼ and		
Medium dense brown clayey fine to medium grained SAND			(1.00)		3.50 - 3.95	S 1	N 15			13-11		
	2.90			4.00								
Firm to stiff dark brown sandy slightly gravelly CLAY ...becoming very stiff below 9.50m					4.50 - 4.95	U 4		22	12			
					5.50	D 3						
					6.00 - 6.45	U 5						
					6.50	D 4						
			(8.00)									
					7.80 - 8.25	U 6						
					8.30	D 5						
					9.50 - 9.95	U 7						
Borehole Continued				10.00				102	33			

General Remarks :
Water struck at 3.00m rising to 2.00m after 20 mins.

Dates : 13-Nov-92
Driller : T.B
Engineer: G.L

Coordinates :