Gibbons Way
North Cornelly

Flood Consequence Assessment

HSP2020-C3341-C&S-FRAS1-7
August 2020

hsp consulting

CIVIL | STRUCTURAL | GEOTECHNICAL & ENVIRONMENTAL | TRAFFIC AND TRANSPORT

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Signed for and on behalf of HSP Consulting:

Mike Baker, Director

Issue & Revision History

Revision	Status	Originator	Checked	Approved	Date
-	-	J Melbourne BEng (Hons)	M Blackburn BEng (Hons)	P Daykin BSc(Hons) MCIHT MCIOB CEnv	18.08.20
Project Number: C3341			Document Reference: HSP2020-C3341-C&S-FRAS1-7		

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1 Introduction

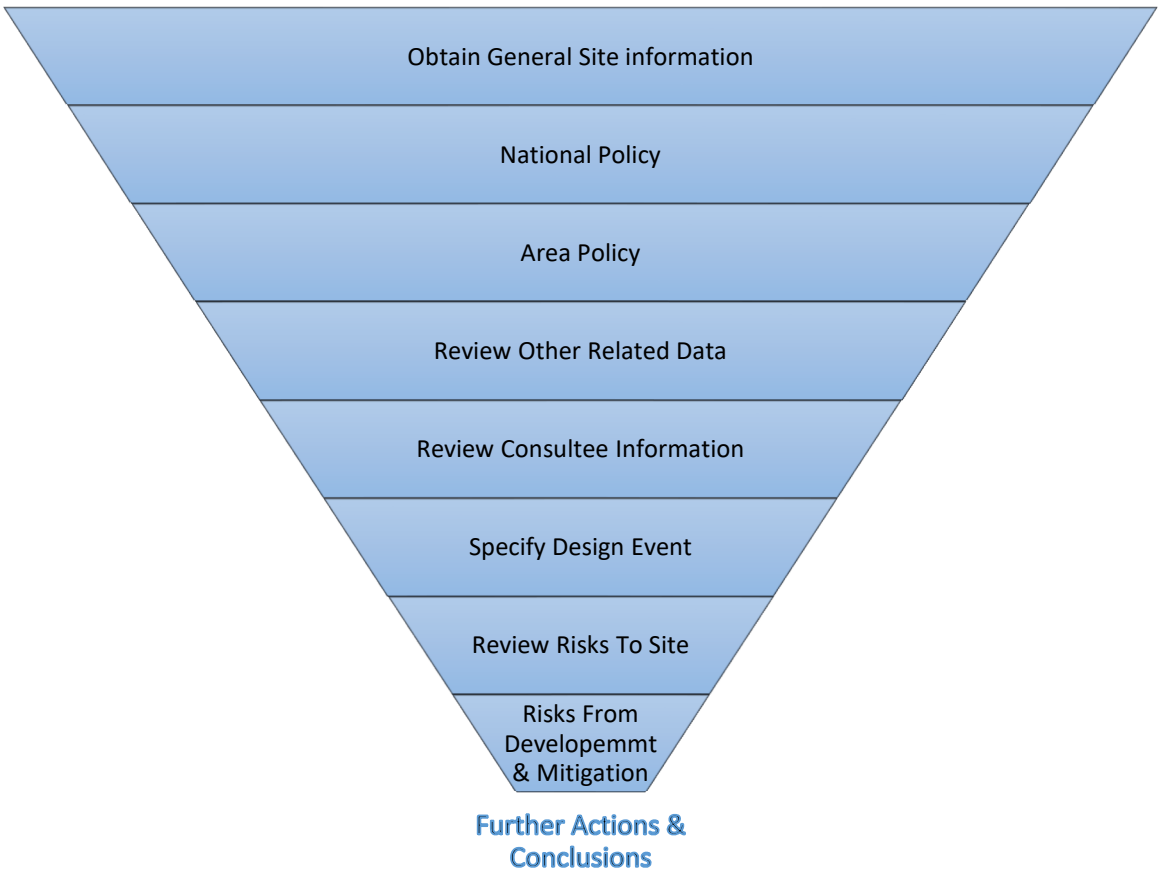
1.1 General

1.1.1 HSP Consulting has been commissioned by Gleeds Management Services Ltd to provide technical studies to investigate the feasibility of construction of an educational facility in North Cornelly, Bridgend.

1.1.2 The Flood Consequence Assessment (FCA) reported herein is a component of a series of studies commissioned from HSP Consulting, such as geo-environmental desk study (Phase I), which are referenced throughout this document.

1.2 Format of this Report

1.2.1 This is a Stage 1, desk-based assessment; that is, it does not include for site specific flood modelling works. This report is reliant upon publicly available information and/or that provided by Consultees which is then reviewed, in outline terms, in accordance with the graphic below:



1.3 Sources of Data

1.3.1 This report is based on information from the following principal sources of information:

i. Natural Resources Wales Development Advice Map

ii. Planning Policy Wales TAN 15: Development and Flood Risk

iii. Natural Resources Wales

iv. Bridgend Flood Risk Management Plan

v. Preliminary Flood Risk Assessment and 2017 Addendum

2 Site Location, Description & Proposed Development

2.1 Site Location

2.1.1 The site is located at National Grid reference (NGR) E282100, N181900 (approximately).

2.1.2 The address of the site is:

Gibbons Way
North Cornelly
Bridgend
CF33 4ND

2.1.3 A site location plan is included within Appendix 1 of this document.

2.1.4 The relevant planning authority is Bridgend County Borough Council.

2.2 Description

2.2.1 The overall site area is irregular in shape and is approximately 2.06 ha in area.

2.2.2 The site is located to the north east of North Cornelly Village, approximately 9 km north east of Bridgend.

2.2.3 Gibbons Way traverses the north of the site. This highway enters the north eastern apex of the site and extends to the south of the site and terminates with a turning circle.

2.2.4 To the east of Gibbons Way, and within the site boundary, there are units occupied by “Cornelly & District Development Trust” (CDDT). These are provided with approximately 40 vehicle parking bays.

2.2.5 Also within the site boundary, a hard surface play area is located to the south of the CDDT units

2.2.6 The centre of the site has a metalled/tarmacadam surfaced quadrant which is inferred to have served as parking to a row of shops which have now been demolished. The area of the former shops is now grassed.

2.2.7 The remainder of the site is largely grassland with pathways between residential housing linking the centre quadrant. However, a vehicle turning circle serving Plas Morlais is present in the south of the site.

2.2.8 The immediate area surrounding the site can be characterised as being typically urban-residential.

2.2.9 Boundaries are formed as follows:

- North west: Residential properties (off Gibbons Way) with access roads and soft landscaping areas.
- North east: Pill-Y-Cynffig (highway) with residential properties and garden areas.
- South: Undeveloped land with residential properties and garden areas beyond.
- South/South west: Heol-Y-Parc (highway) and Newland (highway) with residential properties associated with them. A children's centre, recreational facilities and Corneli Primary School are also evident to the west.
- South east: Plas Morlais (highway) with residential dwellings located off it.

2.2.10 A topographic survey was undertaken in August 2020; See appendix 1.

2.2.11 This illustrates the site to be typically elevated within 30 mAOD and 40 mAOD, with a fall from the south east to north west. The south/south east of the site is notably higher than the north with steep batters being evident in the vegetated areas which surround Plas Morlais' turning circle. Elsewhere, gradients are relatively slack.

2.3 Proposed Development

2.3.1 A detailed development layout was not available for review.

2.3.2 However, a 'test to fit' layout indicates a primary school teaching unit, parking, and extensive outdoor play facilities. Refer to Appendix 2 for illustrative proposals.

2.3.3 In the absence of a detailed site proposal commentary provided herein is offered for guidance and is subject to review following receipt of detailed proposals.

3 Geology, Hydrogeology, Hydrology

3.1 Site Investigation

3.1.1 At the time of preparation, an intrusive site investigation was not available for review. However, HSP Consulting carried out a non-intrusive desk study which is/was being prepared contemporaneously with this appraisal. Content from the desk study is reproduced and/or paraphrased within this section.

3.1.2 The following sub-sections provide a review of publicly available reference material in order to provide an insight into the local and/or wider environmental setting. This should be viewed as informative only and not a substitute for site specific, intrusive investigation.

3.2 Geology

3.2.1 Made Ground

3.2.1.1 British Geological Society (BGS) mapping does not indicate any made ground on the site. However, given the historical development surrounding the site some made ground may be encountered.

3.2.2 Superficial Deposits

3.2.2.1 BGS mapping indicates the majority of the site to be underlain by superficial Till deposits.

3.2.2.2 No superficial deposits are expected to be encountered to the south eastern corner of the site.

3.2.3 Bedrock Geology

3.2.3.1 BGS bedrock mapping indicates the majority of the site is underlain by the Mercia Mudstone Ground – Mudstone of the Triassic Period, described by the BGS as "*Dominantly red, less commonly green-grey, mudstones and subordinate siltstones with thick halite-bearing units in some basinal areas. Thin beds of gypsum/anhydrite widespread; sandstones are also present.*"

3.2.3.2 The BGS bedrock mapping indicates the south eastern corner of the site is underlain by the Blue Anchor Mudstone Formation Mudstone of the Triassic Period. These deposits are described by the BGS as "*typically comprises pale green-grey, dolomitic silty mudstones and siltstones with thin arenaceous lenses and a few thin, commonly discontinuous beds of hard, dolomitic, pale yellowish-grey, porcellanous mudstone and siltstone.*"

3.3 Hydrogeology

3.3.1 The Groundwater Vulnerability Map of Wales and the Natural Resources Wales website have been reviewed to determine the aquifer designations.

3.3.2 These sources indicate that:

i. No Source Protection Zones have been identified within 500m radius of the site.

ii. The soils on the south eastern section of the site are recorded to be of high vulnerability which is described as areas able to easily transmit pollution to groundwater. They are likely to be characterised by high leaching soils and the absence of low permeability superficial deposits.

iii. The remainder of the soils on the site are recorded to be of medium vulnerability which is described as intermediate risk of transmitting pollution to groundwater due to the variability of the underlying soils.

iv. The site has been identified as having a low risk of very soluble rocks beneath the site. These rocks are likely to be present with a high possibility of localised subsidence or dissolution-related degradation of bedrock occurring naturally, especially in adverse conditions such as concentrated surface or sub-surface water flow.

3.3.3 No groundwater abstraction licences have been identified within 250m of the site.

3.3.4 No potable abstractions have been identified within 2km of the site boundary.

3.4 Hydrology

3.4.1 Online mapping shows that there are no main river or ordinary watercourses within the site boundary.

3.4.2 The closest surface water feature, identified as Afon Fach, is located 225m north of the site. This is a main river which is not understood to be influenced by tidal action. Afon Facck is inferred to be culverted beneath the railway, approximately 250m to the north of the site.

3.4.3 An additional main river, Afon Cynffig, which at its closest is located approximately 400m northern of the site.

3.4.4 The Afon Fach flows westwards to its confluence with Afon Cynffig approximately 800 m north east of the site.

3.4.5 No licensed surface water abstraction points are recorded within a 250m radius of the site.

4 National Planning Framework

4.1 General

4.1.1 Flood Risk Assessments in Wales are undertaken using the prescriptive procedures and guidance within the Planning Policy Wales (PPW) Technical Advice Note (TAN) 15,

"Development and Flood Risk", in addition to the details set out in BS 8533:2017 "Assessing and managing flood risk in development - Code of practice".

4.1.2 PPW provides a directive which seeks to ensure that new development is directed away from those areas which are at high risk of flooding. PPW acknowledges that where development has to be considered in high risk areas, only those developments which can be justified on the basis of the tests outlined in Section 6 and 7 of TAN 15 are located within such areas.

4.2 Development Advice Maps

4.2.1 The aim of the Development Advice Maps (DAM) is to highlight areas susceptible to fluvial flooding.

4.2.2 Figure 1 of "Technical Advice Note 15: Development and Flood Risk", reproduced below, provides the outline mechanism for assessing the suitability of a development within a specific Flood Zone.

Reproduction of Figure 1 of "Technical Advice Note 15: Development and Flood Risk"		
Description of Zone		**Use within the precautionary framework**
Considered to be at little or no risk of fluvial or tidal/flooding.	A	Used to indicate that justification test is not applicable and no need to consider flood risk further.
Areas known to have been flooded in the past evidenced by sedimentary deposits.	B	Used as part of a precautionary approach to indicate where site levels should be checked against the extreme (0.1%) flood level. If site levels are greater than the flood levels used to define adjacent extreme flood outline there is no need to consider flood risk further.
Based on Natural Resources Wales extreme flood outline, equal to or greater than 0.1% (river, tidal or coastal)	C	Used to indicate that flooding issues should be considered as an integral part of the decision making by the application of the justification test including assessment of consequences.
Areas of the floodplain which are developed and served by significant infrastructure, including flood defences.	C1	Used to indicate that development can take place subject to application of justification test, including acceptability of consequences.
Areas of the floodplain without significant flood defence infrastructure.	C2	Used to indicate that only less vulnerable development should be considered subject to application of justification test, including acceptability of consequences. Emergency services and highly vulnerable development should not be considered.

4.3 The Justification Test

4.3.1 TAN 15 states that new development should be directed away from zone C and towards suitable land in zone A, otherwise to zone B, where river or coastal flooding will be less of an issue. In zone C the tests outlined in section 6 and 7 will be applied, recognising however, that highly vulnerable development and emergency services in zone C2 should not be permitted. All other new development should only be permitted within zones C1 and C2 if determined by the planning authority to be justified in that location. Development, including transport infrastructure, will only be justified if it can be demonstrated that:

i. Its location in zone C is necessary to assist, or be part of, a local authority regeneration initiative or a local authority strategy required to sustain an existing settlement; or

ii. Its location in zone C is necessary to contribute to key employment objectives supported by the local authority and other key partners, to sustain an existing settlement or region; and,

iii. It concurs with the aims of PPW and meets the definition of previously developed land (PPW fig 2.1); and,

iv. The potential consequences of a flooding event for the particular type of development have been considered, and in terms of the criteria contained in section 5, 7 and Appendix 1 of TAN 15 to be acceptable.

4.4 Acceptability of Consequences

4.4.1 Where development is justified the assessment can be used to establish whether suitable mitigation measures can be incorporated within the design to ensure that development is as safe as possible and there is:

i. Minimal risk to life;

ii. Minimal disruption to people living and working in the area;

iii. Minimal potential damage to property;

iv. Minimal impact of the proposed development on flood risk generally; and,

v. Minimal disruption to natural heritage.

4.5 Land Use and Development

4.5.1 The “Summary of Policy Requirements” table from “Technical Advice Note 15: Development and Flood Risk”, reproduced below, provides the outline mechanism for assessing the suitability of a development within a specific Flood Zone.

Reproduction of "Summary of Policy Requirements" from "Technical Advice Note 15: Development and Flood Risk"				
DAM	**Development Type**	**Planning Requirements**	**Acceptability Criteria**	**Development Advice**
A	Emergency services Highly vulnerable development Less vulnerable development Other	Justification test not applicable Refer to surface water requirements	No increase in flooding elsewhere	No constraints relating to river or coastal flooding, other than to avoid increasing risk elsewhere.
B	Emergency services.	If site levels are greater than the flood levels used to define adjacent extreme flood outline there is no need to consider flood risk further Refer to surface water requirements	Acceptable consequences for nature of use. Occupiers aware of flood risk. Escape/evacuation routes present. Effective flood warning provided. Flood emergency plans and procedures. Flood resistant design. No increase in flooding elsewhere.	Generally suitable for most forms of development. Assessments, where required, are unlikely to identify consequences that cannot be overcome or managed to an acceptable level. It is unlikely, therefore, that these would result in a refusal of planning consent on the grounds of flooding.
	Highly vulnerable development		Acceptable consequences for nature of use. Occupiers aware of flood risk. Escape/evacuation routes present. Effective flood warning provided. Flood emergency plans and procedures. No increase in flooding elsewhere.	
	Less vulnerable development		Occupiers aware of flood risk. No increase in flooding elsewhere.	
	Other	Refer to surface water requirements	No increase in flooding elsewhere.	

Reproduction of "Summary of Policy Requirements" from "Technical Advice Note 15: Development and Flood Risk"				
C1	Emergency services Highly vulnerable development Less vulnerable development	Application of justification test, including acceptability of consequences. Refer to surface water requirements.	Acceptable consequences for nature of use. Flood defences adequate. Agreement for construction and maintenance costs secured. Occupiers aware of flood risk. Escape/evacuation routes present. Effective flood warning provided. Flood emergency plans and procedures. Flood resistant design. No increase in flooding elsewhere.	Plan allocations and applications for all development can only proceed subject to justification in accordance with TAN 15 section 6 and acceptability of consequences in accordance with TAN 15 section 7 and TAN 15 Appendix 1.
	Other	Application of acceptability of consequences. Refer to surface water requirements.	Acceptable consequences for nature of use. Occupiers aware of flood risk. Desirable if effective flood warning and evacuation routes/provided depending on nature of proposal. No increase in flooding elsewhere.	Plan allocations and applications for development should only be made if considered acceptable in accordance with TAN 15 section 7 and TAN 15 Appendix 1.
C2	Emergency services Highly vulnerable development	The flooding consequences associated with emergency services and highly vulnerable development are not considered to be acceptable. Plan allocations should not be made for such development and planning applications not proposed.		

Reproduction of "Summary of Policy Requirements" from "Technical Advice Note 15: Development and Flood Risk"				
	Less vulnerable development	Application of justification test, including acceptability of consequences. Refer to surface water requirements.	Acceptable consequences for nature of use. Flood defences adequate. Agreement for construction and maintenance costs secured. Occupiers aware of flood risk. Escape/evacuation routes present. Effective flood warning provided. Flood emergency plans and procedures.	Plan allocations or applications for less vulnerable development can only proceed subject to justification in accordance with section 6 and acceptability of consequences in accordance with TAN 15 section 7 and TAN 15 Appendix 1.
	Other	Application of acceptability of consequences Refer to surface water requirements.	Flood resistant design. No increase in flooding elsewhere. Acceptable consequences for nature of use. Occupiers aware of flood risk. Effective flood warning provided. No increase in flooding elsewhere.	Plan allocations and applications for development should only be made if considered acceptable in accordance with TAN 15 section 7 and TAN 15 Appendix 1.

4.5.2 For guidance, Figure 2 of "Technical Advice Note 15: Development and Flood Risk", is reproduced below to illustrate Flood Risk Vulnerability classifications.

Reproduction of Figure 2 of "Technical Advice Note 15: Development and Flood Risk"	
Development category	**Types**
Emergency services	Hospitals, ambulance stations, fire stations, police stations, coastguard stations, command centres, emergency depots and buildings used to provide emergency shelter in time of flood.
Highly vulnerable development	All residential premises (including hotels and caravan parks), public buildings (e.g. schools, libraries, leisure centres), especially vulnerable industrial development (e.g. power stations, chemical plants, incinerators), and waste disposal sites.
Less vulnerable development	General industrial, employment, commercial and retail development, transport and utilities infrastructure, car parks, mineral extraction sites and associated processing facilities

4.6 Surface Water

4.6.1 TAN15 Section 8 and Appendix 4 provides guidance in respect of the management of surface water. "Technical Advice Note (TAN)15: Development and Flood Risk, Natural Resources Wales Guidance for Staff" also comments as follows:

"*Surface water drainage from developments can, if not properly controlled, significantly increase the frequency and size of floods in the watercourses that receive the surface water drainage. Development must not materially increase flood risk for other people or property - irrespective of the zone.*

TAN15 (paragraph 8.4) promotes the use of sustainable drainage systems (SuDS). It states that if sustainable drainage systems cannot be implemented, a conventional drainage system will need to improve on the status quo.

The provision of attenuation measures or sustainable drainage systems within a scheme should be subject to a planning condition and / or a Section 106 agreement that addresses the financial responsibility for long-term maintenance.

Where surface water disposal would materially increase flood risk for other people or property and this cannot be satisfactorily managed through planning conditions, we [NRW] will normally object to the proposed development…" (Para 2.3.1)

4.6.2 Development tends to increase the quantity of impermeable area with a corresponding increase in the rate and volume of runoff generated. Traditionally, piped drainage networks were largely designed based upon conveyance; that is, it's capacity to move water away from its source. This may adversely impact offsite/downstream areas.

4.6.3 Sustainable drainage systems use techniques to control surface water runoff as close to its origin as possible. This may require limiting the use of traditional piped drainage systems to engineering solutions that mimic natural drainage processes.

4.6.4 TAN15, Appendix 4 offers the following (but not necessarily limited to) options for consideration in preference to traditional piped drainage systems:

i. Preventive measures - e.g. rain-water recycling, good-practice design and maintenance;

ii. Filter strips and swales – vegetated landscape features with smooth surfaces and a gentle downhill gradient to drain water evenly off impermeable surfaces, mimicking natural drainage patterns;

iii. Filter drains and permeable and porous pavements – permeable surfaces to allow rainwater and run-off to infiltrate into permeable material placed below ground to store water prior to discharge;

iv. Infiltration devices - below-ground or surface structures to drain water directly into the ground (soakaways, infiltration trenches, swales with infiltration and infiltration basins), which may be used at source or the runoff may be conveyed to the infiltration area in a pipe or swale; and

v. Basins and ponds – structures designed to hold water when it rains; basins are free from water in dry weather, ponds contain water at all times and are designed to hold more when it rains; examples include retention basins, balancing/attenuation ponds, flood storage reservoirs, lagoons, retention ponds and wetlands/reed beds.

5 Local Planning Framework

5.1 Local Flood Risk Management Strategy (LFRMS) 2013

5.1.1 Bridgend County Borough Council's (BCBC) website notes:

"*The Local Flood Risk Management Strategy was approved by the Minister for Natural Resources and Food in September 2013.*"

However, no document identified simply as Local Flood Risk Management Strategy was identified in a search of published information.

5.1.2 BCBC's website does provide links to "Bridgend Flood Risk Management Plan" and "Habitats Regulation Assessment Screening of the Local Flood Risk Management Strategy"

5.1.3 The FRMP was the subject of 29 November 2016 Report of the Corporate Director which notes:

"[Purpose of Director's Report] *To provide Cabinet with an update on the Council's drafting of its Flood Risk Management Plan (FRMP), its implications, and to seek authorisation to consult the public on the draft FRMP*"

"*Within Bridgend County Borough Council there are currently no "Blue Squares" that identify Flood risk areas… Funding was provided to all local authorities to produce a FRMP*"

"*The draft FRMP identifies a number of locations within Bridgend that are likely to be highlighted in a future review of Flood Risk Areas and as such the Plan proposed is not only of importance for the future, but identifies best practice for departments currently responsible for flood risk at this time.*"

"*The guidance for the production of a FRMP indicates that it should be presented for public scrutiny and as such it is proposed to publish this on the BCBC website under its consultation web pages and a Welsh version of the document will also be produced."*

5.1.4 It is concluded that a current FRMP is not available for public review.

5.2 Bridgend Flood Risk Management Plan (2016)

5.2.1 Produced by Capita in 2016, the FRMP is sub-titled Local Flood Risk Investigation Areas and notes the following as its aim:

"*Flood Risk Management Plans (FRMPs) are designed to highlight hazardous areas and areas at risk of flooding from surface water, rivers, tidal, groundwater and reservoirs...*

To assist the Bridgend County Borough Council (BCBC) to complete their FRMP, Capita was commissioned to highlight the areas at most risk from surface water flooding and ordinary watercourses in the BCBC area, draw conclusions from these risks and set out the measures the BCBC should hope to undertake over the next 6 years to mitigate these risks and make communities more resilient." (Page 1)

"*This report focuses on the flood risk posed to people, economic activity and the natural and historic environment at 10 Local Flood Risk Investigation Areas (LFRIAs)*" (Page 1)

5.2.2 The subject site is not located within a LFRIA and the FMRP provides no substantive information in relation to the subject site.

5.3 Habitats Regulation Assessment Screening of the Local Flood Risk Management Strategy (2013)

5.3.1 This document was Produced in 2013 by Capita Symonds for BCBC.

5.3.2 No information of relevance to the subject site was noted within the "Habitats Regulation Assessment Screening of the Local Flood Risk Management Strategy"

5.4 Preliminary Flood Risk Assessment (PFRA) 2011

5.4.1 PFRAs are intended to provide a high-level overview of flood risk and identify areas of significant risk that should be subject to further investigation.

5.4.2 As a Lead Local Flood Authority (LLFA), Bridgend County Borough Council prepared a PFRA in 2011 to assess the risk of flooding from surface water, ground water, ordinary watercourses and small reservoirs.

5.4.3 Under the Flood Risk Regulations (2009), each LLFA is required to undertake a PFRA every six years.

5.4.4 The following observations are based upon Bridgend County Borough Council's 2011 PFRA, as more contemporary documentation could not be obtained during the preparation of this appraisal. However, as noted within a subsequent sub-section, a minor addendum was published in 2017.

5.4.5 Distribution of Historic Surface Water Flooding Incidents (Map 4.3)

Map 4.3 illustrates that parts of North Cornelly may lie within an "area of historical surface water flooding". However, due to the limitations in the scale and resolution of the map, the extents of this area could not be accurately determined.

5.4.6 Distribution of Historic Sewer Flooding Incidents (Map 4.4)

The site or vicinity of the site is not depicted as being within an area which has historically be subject to historic sewer flooding.

5.4.7 Flooding from Surface Water 1 in 200 chance depth > 0.3m (Map 5.1)

The site is not inferred to be located within an area impacted by surface water flooding.

However, as noted elsewhere, the scale of the map precludes making definitive conclusion in respect of the proximity to the site and risk of flooding are inferred to be present in the area.

5.5 Preliminary Flood Risk Assessment (PFRA) 2017 Addendum.

5.5.1 In 2017, a single page addendum to the original, 2011 PFRA was published. The following salient extracts of this latter PFRA document are reproduced for guidance:

"Future flood risk

There has been no new information identified since the publication of the first Preliminary *Flood Risk Assessment Report in 2011 that has led to a change in understanding of future flood risk.*."

5.6 Surface Water Management Plan (SWMP)

5.6.1 No surface water management plan was identified and/or made available for review during the preparation of this assessment.

5.7 Strategic Flood Risk/Consequence Assessment (SFRA/SFCA)

5.7.1 A SFRA/SFCA was not available for review during the preparation of this report.

6 Miscellaneous References and/or Reports

6.1 In respect of drainage, the following is reproduced from the BCBC website:

"*From 7 January 2019, new developments of at least two properties or over 100m^2 of construction area will require sustainable drainage to manage on-site surface water. The surface water drainage systems must be designed and built in accordance with standards for sustainable drainage."*

"These systems must be approved by the SuDS Approving Body (SAB) before construction work begins."

"Sustainable drainage systems (SuDS) are drainage systems that improve or do not harm the environment. They efficiently and sustainably drain surface water, while minimising pollution and managing the impact on water quality of local water bodies."

"If you are a developer, agent or individual seeking planning permission for a development, you must seek approval independently from your planning application. This applies if your development is of two properties or more, or over 100m^2 of construction area. Construction can only begin once both planning permission and drainage approval has been granted"

"There will be a pre-application service to discuss your site, drainage requirements and what needs to be submitted as part of your application. There will be a charge for this service."

The above taken from https://www.bridgend.gov.uk/residents/recycling-waste-and-environment/environment/flooding/sustainable-drainage-systems/

7 Consultation Responses

7.1 Public Sewers/Local Drainage Infrastructure

7.1.1 Public sewer records (Dwr Cymru Welsh Water) have been reviewed to determine sewer locations.

7.1.2 Public sewers are evident around the periphery of the site. These include:

i. East: Combined sewer which then turns and flows into the sewer at the south.

ii. South: 375 mm diameter Combined sewer. This passes through the site, between the turning circles of Gibbons Way and Pal Morlais.

iii. West: 150mm diameter foul sewer within Heol-Y-Parc. A 150mm diameter also runs parallel to and within the site's western boundary.

7.1.3 Private sewers are also evident. This includes:

i. Private Foul Sewer Transfers within Gibbons Way and which extend into the subject site.

ii. Private Combined sewers within Gibbons Way.

7.1.3.2 Public Sewer Records do not illustrate the presence of an extensive surface water drainage network. The limited surface water infrastructure shown is typically south and south west of the site and discharges into a Section 24 sewer west of Heol-Y-Parc.

7.1.4 In the absence of site proposals, sewer capacity enquiries have not been made with the Undertaker.

7.1.5 The Dwr Cymru Welsh Water Public Sewer Plan is included in Appendix 3.

7.2 Natural Resources Wales

7.2.1 Natural Resources Wales (NRW) was consulted during the preparation of this report. Their response (reproduced within Appendix 4) provided web-site links to flood risk related information.

7.2.2 These links indicate that:

i. The area is not shown to be at risk of flooding on National Flood Risk Mapping.

ii. The site and its vicinity is located within DAM A/Flood Zone 1; that is the category with the lowest conjectural risk of flooding.

iii. The site and its vicinity is not located within a Flood Alert or Flood Warning area.

iv. There are no flood defences within the vicinity of the site.

v. The site and its vicinity is not at risk of surface water flooding or flooding from small watercourses.

vi. The site and its vicinity is not at risk of flooding from reservoirs.

7.2.3 Refer to Appendix 4 for a reproduction of the Natural Resources Wales' flood risk mapping.

7.3 Lead Local Flood Authority (LLFA)

7.3.1 As Lead Local Flood Authority, Bridgend County Borough Council was consulted during the preparation of this report.

7.3.2 No formal response has been received. When available, the LLFA response will be reproduced within Appendix 5.

8 Planning Policy & Compatibility of the Proposed Development

8.1 Table 2 of “Technical Advice Note (TAN)15: Development and Flood Risk, Natural Resources Wales Guidance for Staff” categorises schools as “Highly Vulnerable” development.

8.2 Highly vulnerable developments are compatible with Flood Zone 1/DAM A and the Justification Test is not required.

9 Existing Drainage

9.1 Site Specific Existing Surface Water Drainage

9.1.1 The site is a mixture of greenfield and brownfield with a significant hard paved content. Using the topographic survey, and excluding small paths, it is estimated that approximately 6,900 m^2 of the site is hard paved.

9.1.2 The Topographic and Utilities Survey (Appendix 1) indicates that an extensive network of surface water drains are present on site. Gullies are evident in all 'hard areas' and it is reasonable to assume that the rainwater collection systems are 'live' throughout the site.

9.1.3 Where recorded, pipework is small diameter and typically less than 2m deep. The survey information help does not record the presence of flow controls or attenuation.

9.1.4 It is inferred that discharge is ultimately made into the Section 24 sewer at the west of the site.

9.2 Site Specific Existing Foul Water Drainage

9.2.1 Foul drain runs are evident within the site boundary; see Appendix 1, Topographic and Utilities Survey.

9.2.2 It is inferred that the assets depicted are public sewers, and/or private sewer transfers; see also Appendix 3.

9.2.3 A private sewer in the north of the site noted as being 'combined' upon the public sewer records but 'surface water' on the utility survey. It is considered likely that Welsh Water's records are more reliable in respect of the sewer type. However, it would be beneficial to carry out further intrusive investigation works to validate the respective types.

10 Climate Change and Design Event

10.1 Lifetime of Development

10.1.1 Technical Advice Note 15: Development and Flood Risk (TAN15) states that it is necessary to take account of the potential impact of climate change over the lifetime of a development. This is reiterated within Policy Clarification Letter CL-03-16, which also advises:

"Residential development is assumed to have a lifetime of 100 years while a lifetime of 75 years is assumed for non-residential developments."

10.1.2 Based upon the above, for the purpose of this FCA the design life is assumed to be 75 years.

10.2 Climate Change

10.2.1 "Adopting to Climate Change Guidance for Flood and Coastal Erosion Risk Management Authorities in Wales" published by the Welsh Government in 2017 provides guidance for fluvial risk management schemes, coastal risk management schemes and projections for future rainfall events.

10.2.2 Given the low tidal and fluvial flood risks, the following is considered to be the most salient information in respect of the subject site and is applicable to small catchments and urban/local drainage:

Applies across all of Wales	Total potential change anticipated by the '2020s' (2015 to 2039)	Total potential change anticipated by the '2050s' (2040 to 2069)	Total potential change anticipated for the '2080s' (2070 to 2115)
Upper estimate	10%	20%	40%
Central estimate	5%	10%	20%

10.2.3 Given the nature/lifetime of the development it is considered likely a climate change allowance of 40% will be prescribed during the Regulator appraisal process.

10.3 Design Event

10.3.1 Notwithstanding the design life, using the precautionary principal and the anticipated Regulators prescriptive requirements, it is considered appropriate to study the development, and in particular the surface water drainage design, relative to the 1 in 100 year event, including an uplift of 40% for the effects of climate change.

10.3.2 It should be noted that this analysis must determine if the impacts of the 40% allowance are significant and lead to any unacceptable flood risks (it is not normally expected that the site would not flood in this scenario, only that if this storm were to occur the impacts would be minimal). The design may need to be modified to avoid any unacceptable risks, but may also need additional mitigation allowances, for example a higher freeboard on attenuation features and/or provision of exceedance routes.

10.3.3 It should also be noted that an additional allowance for urban creep may be requested by the LLFA; albeit this request is more typically made on residential developments. Rainfall Runoff Management for Developments, jointly published Department for Food & Rural Affairs and the Natural Resources Wales, recommends the following:

"*Urban creep is now an acknowledged issue which results in an increase in runoff from an estate over time. An allowance should be made by factoring the impermeability percentage by 1.1 (10% increase) …*"

11 Potential Sources of Flooding

11.1 General

11.1.1 BS 8533: 2011 "Assessing and managing flood risk in development – Code of practice" provides recommendations and guidance the assessment and management of flood risk for proposed development within the UK.

11.1.2 Assessment should include an appraisal of risk both to- and from- the development from all sources of flooding, including:

i. Tidal and fluvial flooding – flooding from main rivers, ordinary watercourses and the sea.

ii. Surface water flooding – flooding from overland flow due to rainfall.

iii. Flooding from sewers and drains – flooding from surcharging of below ground drainage systems.

iv. Groundwater flooding – flooding related to the water table, where ground water levels rise above surface levels.

v. Flooding caused by the failure of infrastructure, such as from reservoir, canal or land drainage infrastructure, usually as a result of catastrophic failure.

12 Flooding Risks to the Development

12.1 Tidal Flood Risk & Fluvial Flood Risk

12.1.1 Published information illustrate the site to be outside of the conjectural flood risk envelope (i.e. it is located with Flood Zone A). The site is therefore not considered to be at risk of fluvial or tidal flooding.

12.2 Reservoir Flooding

12.2.1 The site is not depicted upon consultee and/or publicly available information as being at risk of flooding as a result of the failure of a reservoir.

12.3 Groundwater Flooding

12.3.1 GroundSure mapping, provided with HSP's Phase 1 Geo-environmental appraisal, indicates the risk of groundwater flooding on site is:

i. North western two thirds: 'low'.

ii. South eastern third: 'negligible'.

12.3.2 No instances of groundwater flooding have been identified during the research undertaken for this appraisal. However, an absence of identified reports should not be interpreted as a definitive statement on risk.

12.3.3 The impact of groundwater will be most onerous and/or prohibitive where it can influence:

i. Excavations

ii. Basements

iii. Dispersal assets, e.g. soakaways

iv. Attenuation assets, e.g. floatation on cellular storage and/or entry into basins and swales.

12.3.4 Intrusive, site specific investigation works are required to definitively define the risk of groundwater flooding. However, given that the wider area is developed, the absence of recorded incidents and GroundSure classification, it is considered unlikely that groundwater flooding will impact upon the site.

12.4 Pluvial Flood Risk

12.4.1 The development site is located within an area identified as being outside of the surface water flood risk envelope illustrated upon NRW mapping; that is, the most accurate mapping available for review.

12.4.2 Localised pockets of elevated risk are evident on the wider area which are assumed to relate to topography.

12.4.3 Overall, pluvial/surface water flooding is not considered to present a risk to the proposed development.

12.5 Sewer Flooding

12.5.1 No specific evidence of public sewer flooding impacting the site has been obtained during the preparation of this appraisal. Likewise, the PFRA does not depict the site to be within an area that has historically been impacted by sewer flooding.

12.5.2 The site is bounded by residential property which may not benefit from the pro-active and re-active maintenance associated with strategic public sewers. Flooding from such sources, should it occur, is likely to be small scale and its impacts relatively confined.

12.5.3 In overall terms, given the positive gradient across the site and a peripheral highway network that will intercept flows, the risk of sewer flooding to the site is considered to be low.

12.6 Infrastructure/Reservoir Flood Risk

12.6.1 As noted within section entitled "*Consultation Responses*". The online mapping does not illustrate the Site to be at risk from flooding from reservoirs.

13 Effect of Development on Flooding & Design Inclusions

13.1 Surface Water Drainage

13.1.1 Given the underlying geology and potential/undetermined groundwater influence, it is considered likely that surface water will be discharged to public sewer, as existing

13.1.2 At the time of preparation, detailed site proposals were not available for comment.

13.1.3 Approximately 6,900 m^2 of hard area is present upon the site and is positively drained to sewer. While development proposals were not available at the time of writing, it is considered likely that any future development works will increase the drained area.

13.1.4 It is anticipated that mitigation measures will be required to negate the potential adverse effects of additional runoff.

13.1.5 Potential exists for design inclusions (e.g. flow controls and attenuation) to mimic the existing regime or provide a betterment.

13.1.6 All connections to the public sewer, whether made directly to the sewer or indirectly via existing private pipework, can only be legally made with the permission of the Undertaker/Regulator. Such permission will not be given where this presents an unacceptable risk to the receiving sewer/watercourse. Where there is insufficient capacity, the applicant may be required to contribute to public sewer reinforcements.

13.1.7 Assuming on-parcel drainage is appropriately managed the development will not have an adverse impact on the site or surrounding area.

13.1.8 Appropriate management will require consideration of discharge:

i. Rate

ii. Quantity

iii. Quality

13.1.9 Section 14 provides additional guidance and commentary on surface water drainage.

13.2 Foul Water Drainage

13.2.1 In the absence of a development proposal, detailed commentary on foul water drainage cannot be provided.

13.2.2 Nevertheless, given the urban location and the presence of public sewers in the area it is considered likely that a discharge to public sewer can be made. No comment is made in respect of the site/unknown layout to be serviced by a gravity drainage solution.

13.2.3 Notwithstanding the above, once anticipated discharge rates can be confirmed confirmation of capacity and/or sewer reinforcement requirements should be sought from the Undertaker.

13.2.4 As with surface water discharges to sewer, it should be noted that all connections to the public sewer, whether made directly to the sewer or indirectly via existing private pipework, can only be legally made with the permission of the Undertaker. Such permission will not be given where this presents an unacceptable risk to the receiving sewer. Where there is insufficient capacity, the applicant may be required to contribute to public sewer reinforcements.

13.2.5 Assuming on-parcel drainage is designed:

i. In accordance with good practice; and,

ii. Legally discharge flows to the existing public sewer (where required);

the proposed works are not considered likely to adversely impact on offsite flood risk as a result of foul water drainage.

13.3 Overland Flows

13.3.1 Based upon available information, the site is does not present itself as being an identified overland surface water flow route(s) for off parcel derived watershed. It is therefore considered unlikely that the development of the subject parcel will have an adverse post-development effect as a result of displaced or obstructed watershed.

13.4 Floodplain/Displacement of Floodwaters

13.4.1 The site is not located within an identified floodplain.

13.4.2 Floodwaters will therefore not be displaced by the development and compensatory storage is not considered to be a prerequisite of the proposals.

13.5 Means of Access/Egress

13.5.1 The site is not located within or in proximity to an identified floodplain.

13.5.2 A means of dry access/egress will therefore be afforded at all times and so abnormal design inclusions are considered necessary.

13.6 Groundwater

13.6.1 Uncertainty exists in respect of groundwater.

13.6.2 It is considered unlikely that the site will impact upon groundwater; however, intrusive investigation works are required in order to appraise potential impacts.

13.7 Flood Resistant/Resilient Construction

13.7.1 The site is not located within an identified floodplain.

13.7.2 Specific flood resistant/resilient are not considered necessary. However, mindful of the absence of a detailed proposal and detailed knowledge of the groundwater regime, the following items may require additional consideration where they are to be included:

i. Earthworks cuttings

ii. Basements

iii. Floatation of buried surface water attenuation devices

iv. Groundwater ingress into surficial attenuation features (e.g. swales)

14 Proposed Drainage Strategy

14.1 Disposal of Surface Water

14.1.1 The management and/or disposal of surface water is a material planning matter.

14.1.2 Building Regulations (Part H) and other contemporary guidance requires that surface water should be disposed according to the following hierarchy:

i. Infiltration to Ground.

ii. Discharge to a local Watercourse.

iii. Discharge to the local sewerage network.

14.1.3 At the time of preparation there was a paucity of information in respect of the infiltration potential of the underlying soils and groundwater.

14.1.4 Based upon the outline geology/hydrogeology information which is held and precedence established by the existing surface water drainage system, it is considered likely that

surface water will continue discharge to sewer; however, the use of other disposal solutions cannot be definitively discounted at this time.

14.1.5 It is inferred that the existing surface water drainage may discharge into the s24 sewer to the west of the site.

14.1.6 While no discharge rate has been formally approved, it is considered unlikely that a free discharge will be permitted. The spatial requirements of attenuation arising from a restricted discharge may impact upon layout. The following commentary is therefore provided to aid the understanding of site feasibility and, where necessary, site ranking where alternatives are being considered. The commentary does not purport to nominate a means of disposal or present an engineering proposal.

14.2 Strategy Preamble

14.2.1 The following paraphrased position statement is anticipated in respect of the SuDS Approval Body (SAB) and Lead Local Flood Authority (LLFA):

Before making pre-planning enquiries it is highly recommended that the SAB is engaged with to establish if a surface water connection to the public sewer is the most appropriate means of disposal.

Drainage systems should be considered at the earliest stages of site design and may influence the layout of the roads, buildings and public open spaces.

Planning of a new site layout should be informed by the topography and the requirements of surface water management systems to both effectively drain and treat the runoff.

Any existing watercourses, ditches, and other drainage features both within and adjoining the site should help inform proposals. By doing so, biodiversity, amenity and cost effectiveness can be maximised through using areas of land for a range of multifunctional purposes in addition to surface water management e.g. landscaping, car parking, recreational areas, rainwater harvesting etc. Early conceptual design will require that infiltration tests are also undertaken early to inform the conceptual design of the drainage system.

Applications should be accompanied by proposals for a maintenance plan and the means of funding for the scheme for its design life. Applicants seeking SuDS Approval Body (SAB) Approval must demonstrate how they have complied with these principles or provide justification for any departure.

14.3 Sustainability: Discharge Rate

14.3.1 In order to mitigate offsite flood risk, surface water runoff generated by new development should mimic greenfield runoff rates as far as possible for all events up to and including the climate adjusted 1 in 100 year (1% AEP) design event.

14.3.2 HR Wallingford's online tool has been used to estimate the greenfield runoff using the IH124 methodology from the existing site. The results are summarised in the table below:

Period	Greenfield Runoff Discharge l/s/ha
Qbar	3.2
1 year	2.8
30 year	5.7
100 year	7.0
All values based upon 1 ha and are to be applied on a pro-rata basis, where practical, on the proposed development	

14.3.3 Refer to Appendix 6 for reproductions of calculations.

14.3.4 When considering surface water discharge rates, Qbar is usually utilised as the '*greenfield*' value for design purposes on simple controls.

14.3.5 The redevelopment of previously developed/brownfield sites normally requires that surface water runoff management provides a "betterment". No specific guidance has been provided by the LLFA/Regulators in this instance. However, on recent schemes a reduction in runoff rate of 30% (at least) was required; however, greenfield rates remain the aspiration goal where it can be achieved.

14.3.6 Using the precautionary principal and in the absence of a proposed layout, in order to provide sensible worst case and/or comparative site information it is assumed that the proposed works will be limited to greenfield rates.

14.3.7 Simple flow controls are those which are based purely on a maximum flow rate; that is, the discharge rate is not designed to rise based upon return period. As a result, where simple controls are used the discharge form the site may be significantly less than 'greenfield' during severe storms.

14.4 Sustainability: Attenuation Volume

14.4.1 For guidance and assuming a discharge to sewer can be practically achieved, a range of attenuation scenarios have been calculated using Causeway Flow Storage Estimate tool:

Drained Area (m^2/ha)	Discharge Rate* (l/s)	100 year + 40% Attenuation ** (m^3)
5,000/0.5	2*	411 - 525
10,000/1.0	3.2	885 - 1071
15,000/1.5	4.8	1327 - 1606
*2 l/s assumed as practicable minimum. Where rate exceeds 2 l/s it is to be based upon a pro-rata allowance of Qbar for the development area. Simple, single rate control used. **Based upon FSR inputs.		

14.4.2 Refer to Appendix 6 for reproductions of calculations.

14.4.3 The attenuation estimate is based upon Flood Studies Report (FSR) inputs. Where the site is to be designed with reference to Flood Estimation Handbook (FEH) derived storm events the attenuation is typically in the range of 10% to 20% greater than those for FSR events. However, during detailed design it is often found that FEH attenuation provisions are typically at the upper range of the generic FSR estimates.

14.4.4 Moreover, it should also be noted the estimates above are based upon a simple control; that is, the outfall rate is fixed at a single rate. Where a complex control is proven to be feasible during the detailed design (e.g. rising discharge rate to mimic the variation currently experienced during differing return period) the attenuation requirements may reduce. See also subsequent comments made in respect of discharge volume.

14.4.5 With respect to minimum outfall rates, some guidance documents and tools nominate 5 l/s as the minimum practical discharge rate. However, in recent times many Regulatory bodies have sought to improve upon that.

14.4.6 For the purpose of this appraisal, and in the absence of agreement to the contrary, a minimum discharge rate of 2 l/s is suggested as the practical minimum that can be achieved without risk of blockage etc; however, this should be confirmed at detailed design as interdependent factors such as head and orifice size may materially impact the achievable outflow rate.

14.4.7 Actual requirements will vary and be may also influenced by the ethos of the drainage design. For example, the use of swales may reduce the volume of centralised attenuation in comparison to a piped drainage solution.

14.5 Sustainability: Discharge Volume

14.5.1 Unless infiltration drainage systems can be used, where the is a significant increase in drained area there is likely to be a proportional increase in discharge volume.

14.5.2 Reducing the rate of discharge from the site, particularly during severe storm events, may assist in mitigating off-site impacts. As is evident from the table above, the use of a simple, single rate control which discharges significantly less than greenfield rates during, for example, the 100 year event will be of greater benefit than a complex control.

14.5.3 The use of green roofs to capture, for example, the first 5 mm of rainfall and rainwater harvesting are features which may also assist in minimising discharge volume.

14.5.4 Assuming the absence of infiltration, the use of swales and basins increase evapo-transpirational loss and may similarly assist in minimising the surface water discharge volume.

14.5.5 In the absence of development proposals, including economic constraints, detailed commentary upon design inclusions cannot be provided.

14.6 Discharge Quality

14.6.1 The management of water quality is an issue for consideration, particularly where significant areas of vehicle parking/access are proposed.

14.6.2 Particularly where a traditional pipe and storage drainage network is proposed, it is envisaged that measures such as petrol interceptors will be required. However, specific comment cannot be provided at this time.

14.6.3 It should also be noted surficial attenuation/conveyance features, such as swales and basins, are preferred due to their potential sustainability and ecological benefits. Specific comment cannot be provided on the practicability of including such features. However, such features are not usually considered viable on a *typical* school sites due to perceived issues associated with maintenance and surficial water and children. Given their potential environmental and ecological benefits it is recommended that their viability is evaluated when developing a proposed layout.

14.7 Operation and Maintenance

14.7.1 The long-term efficacy of any installed drainage system will be compromised by a lack of maintenance.

14.7.2 During the detailed design stage, consideration should be given to the maintenance of any proposed system. It is recommended that a drainage maintenance regime is developed and provided in an “Operation and Maintenance Manual” for the scheme.

14.7.3 The maintenance regime should conform to the requirements set out within CIRIA C753 The SuDS Manual.

14.7.4 For guidance, Appendix 7 illustrates typical maintenance considerations

15 Further Actions

15.1 Infiltration Potential

15.1.1 While it is considered unlikely that the underlying soils will support the use of infiltration drainage systems, this assertion has not been definitively proved/disproved.

15.1.2 The Regulators may require the infiltration potential of the underlying soils to be investigated in order to inform and define the preferred method of surface water disposal.

15.1.3 As noted previously, the generic data indicates that the site may have a risk of very soluble rocks beneath the site. While the risk is very low, where soils are found to support the use of infiltration drainage the underlying geology should be investigated/specialist advice sought in respect of the potential for soakaways to cause localised subsidence.

15.2 Groundwater Monitoring

15.2.1 While not considered significant, the depth to groundwater should be investigated to confirm assertions made in respect of the risk presented to the site.

15.2.2 Ideally, monitoring should be long term and include the winter months to ensure that peak levels are identified.

15.3 Sewerage Undertaker/Drainage Regulator/Drain Owner

15.3.1 The Sewerage Undertaker should be contacted in order to formally confirm locations, depths and capacity of the public sewer network.

15.3.2 Additional consideration/liaison may also be required where it is necessary to diver existing assets which cross the site.

15.4 Design Co-ordination

15.4.1 The management of surface water will require the provision of significant assets, each with their own constraints. For example, soakaways require offsets from foundations; basins require access for maintenance equipment, etc.

15.4.2 Similarly, extensive assets are present upon the site (eg drainage) which may constrain the proposed layout.

15.4.3 It is recommended that the impact of the existing assets and the provision of drainage is considered during the evolution of the design for the proposed school to ensure that an appropriate compromise between cost, performance and environmental responsibility can be provided.

16 Conclusions

16.1 The site is irregularly shaped and occupies a plan area of approximately 2.06 ha.

16.2 The proposed development site lies within an area categorised as Flood Zone A; that is, an area with a low probability of flooding.

16.3 Based upon its end use as a school, the proposed development is classified as *Highly Vulnerable*.

16.4 Planning Policy Guidance considers *Highly Vulnerable* uses within Flood Zones A as being appropriate.

16.5 No watercourses are evident within the subject site.

16.6 The nearest watercourse is the Afon Fach. This is located approximately 225m north of the site.

16.7 For the purpose of this assessment the Design Event is considered to be the 100 year plus 40% event and is likely to be a principal constraint in the design of surface water drainage systems.

16.8 Intrusive site investigation works have not been undertaken.

16.9 Public sewer records indicate the presence of infrastructure in and around the site.

16.10 The site is brownfield with metalled surfacing evident to the north east, central and southern regions. Hard plan areas and commercial 'buildings' are also present.

16.11 Approximately 6,900 m^2 of hard area is currently present. A utility survey indicates the presence of drainage infrastructure which services the hard area. Surface water discharges are made to the north and south of the site.

16.12 At the time of preparation, a proposed layout was not available. However, there is potential that the proposed development works will increase the hard paved/drained area.

16.13 Based upon NRW, there is no significant risk of tidal, fluvial, reservoir or surface water flooding at the site. A means of dry access/egress is likely to be available during the extreme/design storm event.

16.14 Planning documents, such as the PFRA, include flood risk mapping and suggest that the area may have, historically, been subject to surface water flooding. However, the scale and resolution of such sources is such that site specific conclusions cannot be reliably made. The NRW mapping is considered to be a more reliable source.

16.15 While not considered to be significant risk, further site investigation works are recommended in order to fully assess the potential for groundwater to impact upon the site.

16.16 Similarly, further site investigation is required to fully assess the potential for disposal of surface water via infiltration.

16.17 However, it is considered likely that surface water will be discharged to public sewer, as per the existing.

16.18 It is similarly inferred that the foul water currently discharges to public sewer.

16.19 Capacity enquiries should be made with the Sewerage Undertaker to ensure that any increase in discharge can be accommodated/managed.

16.20 The most significant flood risk component upon which the proposed development may have an adverse impact is the management of surface water. Assuming the proposed drainage is designed in accordance with good practice, there will be no increased risk of flooding as a result of the proposed development.

16.21 While brownfield, for the purpose of this appraisal it is assumed that the Regulators will require surface water disposal to be restricted to greenfield rates. Where this is demonstrably not practicable, it may be possible to negotiate a higher rate of discharge commensurate with the brownfield nature of the site.

16.22 Given the anticipated increase in hard area and restricted discharge, surface water will require attenuation. Quality controls (e.g. interceptor) will also be required. In the absence of detailed proposals, specific guidance cannot be provided. For guidance, discharge rates and attenuation scenarios are presented within Section 14.

16.23 Overall, with respect to flood risk, the site is summarised as follows:

i. To be at low risk of flooding from all sources;

ii. Compatible with planning objectives; and

iii. Will require management of surface water runoff.

Further site investigation is recommended, if only to disprove the viability of alternative disposal methods to the Regulators.

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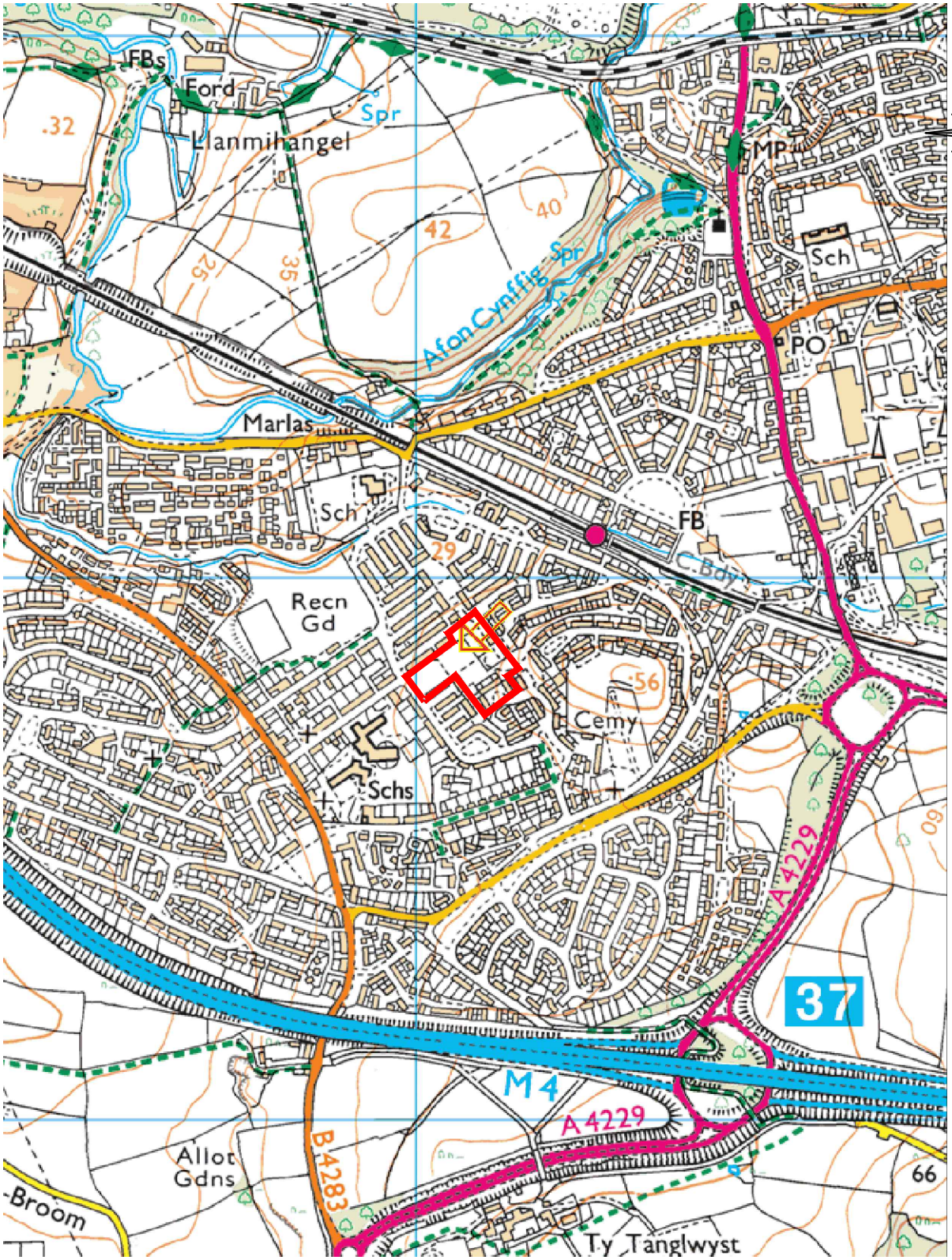
Appendix 1

- Site Location Plan
- Topographic and Utilities Survey



CLIENT Gleeds Management Services Ltd	SCALE (A4) NTS	REV / BY / DATE / DETAILS / CKD	
	DATE 25.06.2020	STATUS	Preliminary
PROJECT Gibbons Way, North Cornelly Bridgend	DRAWN BY CJ		
	CHECKED BY PRD		
TITLE Site Location Plan	DRAWING NO. C3341-SK01	REV -	

hsp consulting
Lawrence House, 6 Meadowbank Way, Eastwood, Nottingham, NG16 3SB
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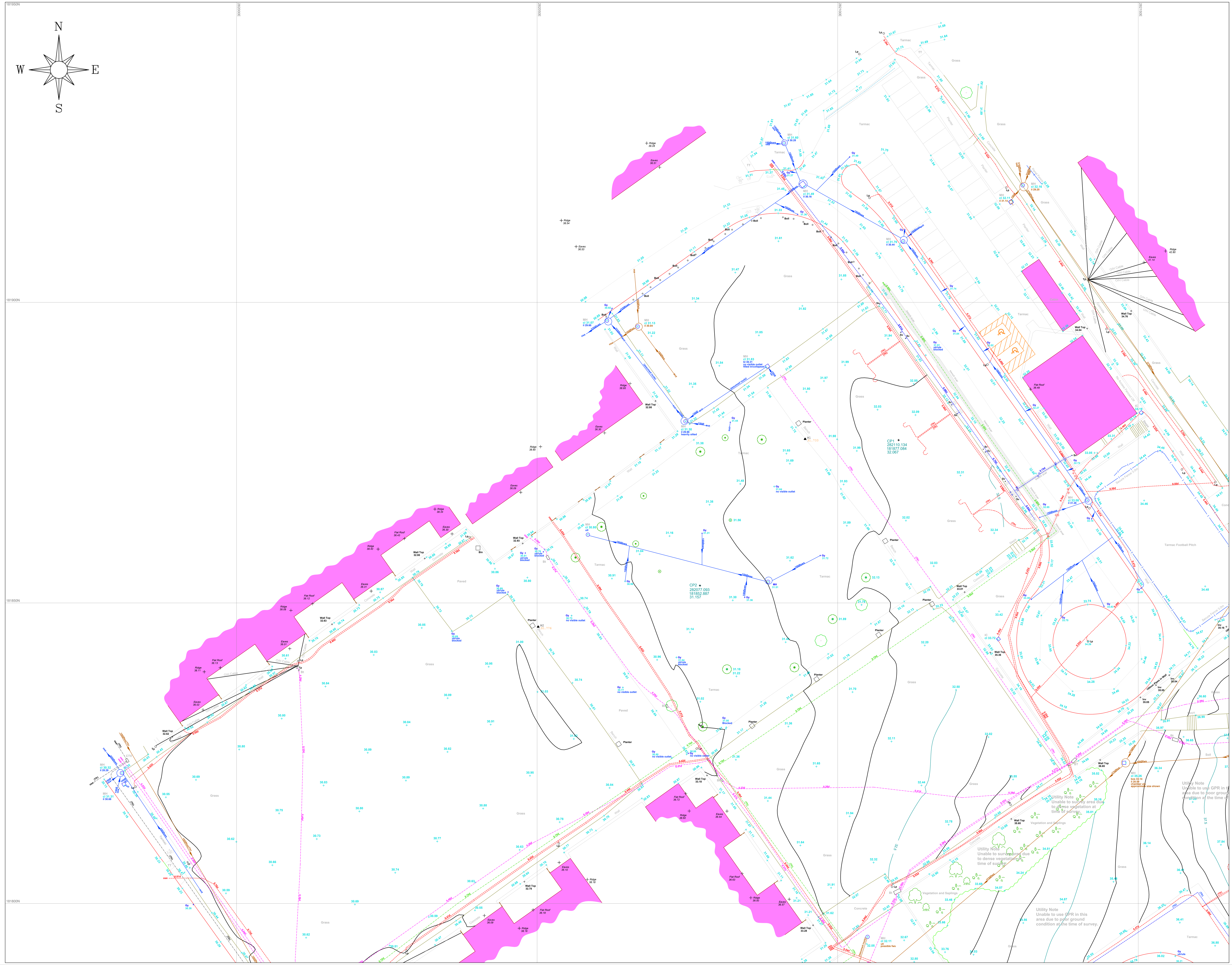


KEY FOR UNDERGROUND SERVICES

Foul water
Surface water
Other
Gas
Electric
Telephone
Cable TV
Unidentified
Water
Closed Circuit TV
Communications
Heating Pipe
Empty Duct
Fibre Optics
Vents
Pipe
Traffic Signal
Gauge Lines
Vapor Recovery
Offsets
Fuel

Where chamber extents are significantly greater than the cover size, their approximate extents are shown thus;

ABBREVIATION KEY

AR	assumed route	PTG	pipe to ground
BD	base bend	PTS	pipe to surface
BD	backdrop	RE	rodding eye
BL	bed level	RWP	rainwater pipe
CL	cover level	SV	stop valve
CR	cable riser	SVP	soil vent pipe
DP	down pipe	TE	trapped exit
EOT	end of trace	TFR	taken from records
EP	electricity pole	TP	telegraph pole
FH	fire hydrant	UTF	unable to find
G	gully	UTL	unable to lift
GV	gas valve	UTS	unable to survey
HOR	head of run	UTT	unable to trace
HL	high level	VP	vent pipe
IC	inspection chamber	WL	water level
IL	invert level	WM	water meter
MH	manhole	WO	wash out valve
PR	pipe riser	D	depth

UTILITY SURVEY NOTES

ELECTROMAGNETIC AND/OR GROUND PENETRATING RADAR TECHNIQUES HAVE BEEN USED TO LOCATE AND MAP UNDERGROUND UTILITIES AND FEATURES ON THIS DRAWING. MAPMATIC HAVE MADE EVERY ENDEAVOUR TO MAKE SURE THAT THE INFORMATION CONTAINED WITHIN THIS DRAWING IS ACCURATE AND OF THE HIGHEST QUALITY. HOWEVER, THE RESULTS FROM THESE TYPES OF SURVEYS ARE NOT INFALLIBLE AND SHOULD THE LOCATION OR DEPTH OF SERVICES/FEATURES BE OF PARTICULAR IMPORTANCE TO A PROJECT, THEN IT IS STRONGLY ADVISED THAT TRIAL EXCAVATIONS SHOULD BE UNDERTAKEN TO CONFIRM SURVEY RESULTS.

MAPMATIC HAVE USED ALL RECORD DRAWINGS THAT WERE AVAILABLE TO US BY THE CLIENT OR BY THE STATUTORY UTILITY PROVIDERS AT THE TIME OF THE SURVEY. ANY INFORMATION TAKEN FROM THESE DRAWINGS (IE PIPE SIZES, MATERIAL) IS NOT GUARANTEED. SERVICES LOCATED FROM RECORD DRAWINGS WILL BE SHOWN AND ANNOTATED AS TAKEN FROM RECORDS (TFR). HISTORIC RECORD INFORMATION IS OFTEN INCOMPLETE/INACCURATE AND CANNOT BE RELIED UPON.

A SINGLE LINE INDICATING A UTILITY MAY INDICATE THE PRESENCE OF MULTIPLE SERVICES WITHIN CLOSE PROXIMITY TO EACH OTHER. WHERE A SINGLE LINE TYPE IS SHOWN WE RECOMMEND HAND DIGGING WITHIN 0.5m, TO EXPOSE HIDDEN SERVICES.

WHERE QUOTED, DEPTH INFORMATION OF UNDERGROUND SERVICES/FEATURES IS STATED. DEPTHS ARE GENERALLY WITHIN +/- 10% ACCURATE, BUT CANNOT BE GUARANTEED. ANY DEPTHS SHOWN ARE USUALLY TO THE TOP OF THE SERVICE/FEATURE. GRAVITY SEWERS AND DRAINS ARE USUALLY TO INVERT (BASE OF DRAINAGE CHANNEL) UNLESS OTHERWISE STATED.

AT MAPMATIC WE USE SKILLED STAFF AND MODERN CALIBRATED EQUIPMENT TO PERFORM OUR SURVEYS. HOWEVER, THE COMPLETENESS OF ANY UNDERGROUND SURVEY CANNOT BE 100% GUARANTEED AND WE CANNOT BE HELD RESPONSIBLE FOR ANY INACCURACIES BEYOND THOSE THAT COULD BE REASONABLY EXPECTED BY A COMPETENT COMPANY.

CONTRACTORS UTILIZING OUR DRAWINGS FOR INTRUSIVE WORK SHOULD TAKE ALL REASONABLE MEASURES TO WORK SAFELY IN ACCORDANCE WITH HSG47 GUIDELINES "AVOIDING DANGER FROM UNDERGROUND SERVICES".

SITE SPECIFIC NOTES-

GAS MAIN ON SITE WAS LOCATED IN PARTS USING GPR & RADIO DETECTION. WHERE UNABLE TO LOCATE THE POSITION OF THE MAIN HAS BEEN ADDED FROM RECORDS WHICH IS TO BE USED AS A GUIDE ONLY AND NOT TO BE TREATED AS ACCURATE.

THERE ARE A NUMBER OF ELECTRIC STRINGS WITHIN THE SURVEY AREA THAT WERE UNABLE TO TRACE USING BOTH GPR AND RADIO DETECTION, ALL OF WHICH HAVE BEEN ADDED TO THE DRAWING FROM RECORDS AND ARE TO BE USED AS A GUIDE ONLY AND ARE NOT TO BET TREATED AS ACCURATE.

MAPMATIC WOULD RECOMMEND THAT TRIAL PITS ARE CARRIED OUT ON SITE TO CONFIRM THE LOCATION OF ANY SERVICES TAKEN FROM RECORDS BEFORE ANY SITE WORK TAKES PLACE.

DUE TO THE HISTORY OF THE SITE WITH PREVIOUS RESIDENTIAL AND COMMERCIAL PROPERTIES THERE IS AN EXTREMELY HIGH POSSIBILITY OF COMING ACROSS OLD DISUSED SERVICES DURING EXCAVATION.

ANY SERVICE SHOWN ON THE DRAWING WITH EITHER TFR (TAKEN FROM RECORDS) OR AR (ASSUMED ROUTE) IS TO BE USED AS A GUIDE ONLY AND IS NOT TO BE TREATED AS ACCURATE.

THE UTILITY SURVEY AREA IS INDICATED ON THE DRAWING WITHIN THE LAYER UG-SURVEY BOUNDARY.

IT WAS NOT POSSIBLE TO USE THE GROUND PENETRATING RADAR IN ALL AREAS OF THE SITE DUE TO POOR GROUND CONDITION, ALL SUCH AREAS HAVE BE INDICATED ON THE DRAWING.

THERE AREA SEVERAL GULLIES WITHIN THE AREA THAT THE DIRRECTION OF FLOW/DISCHARGE IS UNABLE TO ROD DUE NOT HAVING AN ACCESSIBLE OR VISIBLE OUTLET.

Key:

FL: Floor level
CL: Ceiling level
SusCL: Suspended ceiling level
U/S: Underside level
SHL: Sill height level
HHL: Head height level
SPR: Spring Point

Building line
Beam
Window
Dimension

Sanitary ware
Heater / radiator
Ground light
Door / sliding door
Inspection cover

Av	Air valve	G:	Girth circumference	Sv	Stop valve
Bg	Back gully	Gy	Gully	TCB	Telephone call box
BH	Borehole	Ht.	Height	TTL:	Tree top level
BM	Benchmark	IC	Inspection cover	THL	Threshold level
Boll	Bollard	IFL	Internal floor level	TCB	Telephone call box
Bs	Bus stop	IL	Invert level	TL	Traffic light
BT	British Telecom	Lb	Letter box	THL	Threshold level
Bg	Back Gully	Lp	Lamp Post	Tp	Telegraph post
CL	Cover Level	MG	Multigirth	Ts	Traffic signal
CBX	Control box	MH	Manhole	TT	Tactile paving
CPS	Concrete paving slab	Mkr	Marker post	Twl:	Top of wall level
CTV	Cable TV cover	NVP	No visible pipes	UTL	Unable to lift
Elc	Electric cover	PInv	Pipe invert	WL	Water level
Ep	Electricity post	Pb	Post box	Wm	Water meter
Er	Earth rod	Re	Rodding eye	Wo	Wash out
Fh	Fire hydrant	Sp	Sign post		
Fs	Flagstaff	St	Stop tap		

Road
Drop Kerb
Verge Tarmac
Verge Concrete
Verge Grass
Verge
Tops
Bottoms

Ordnance Survey information is provided for a guide only.
OS BUILDING OUTLINE
OS DETAIL

Station	Easting (m)	Northing (m)	Level (m)
M1	282094.581	181877.264	31.733
M2	282050.179	181846.029	30.776

Sheet 1
Sheet 2
Sheet Location Plan (N.T.S.)

REV	BY	DATE	DETAILS	CKD
-				

STATUS FINAL

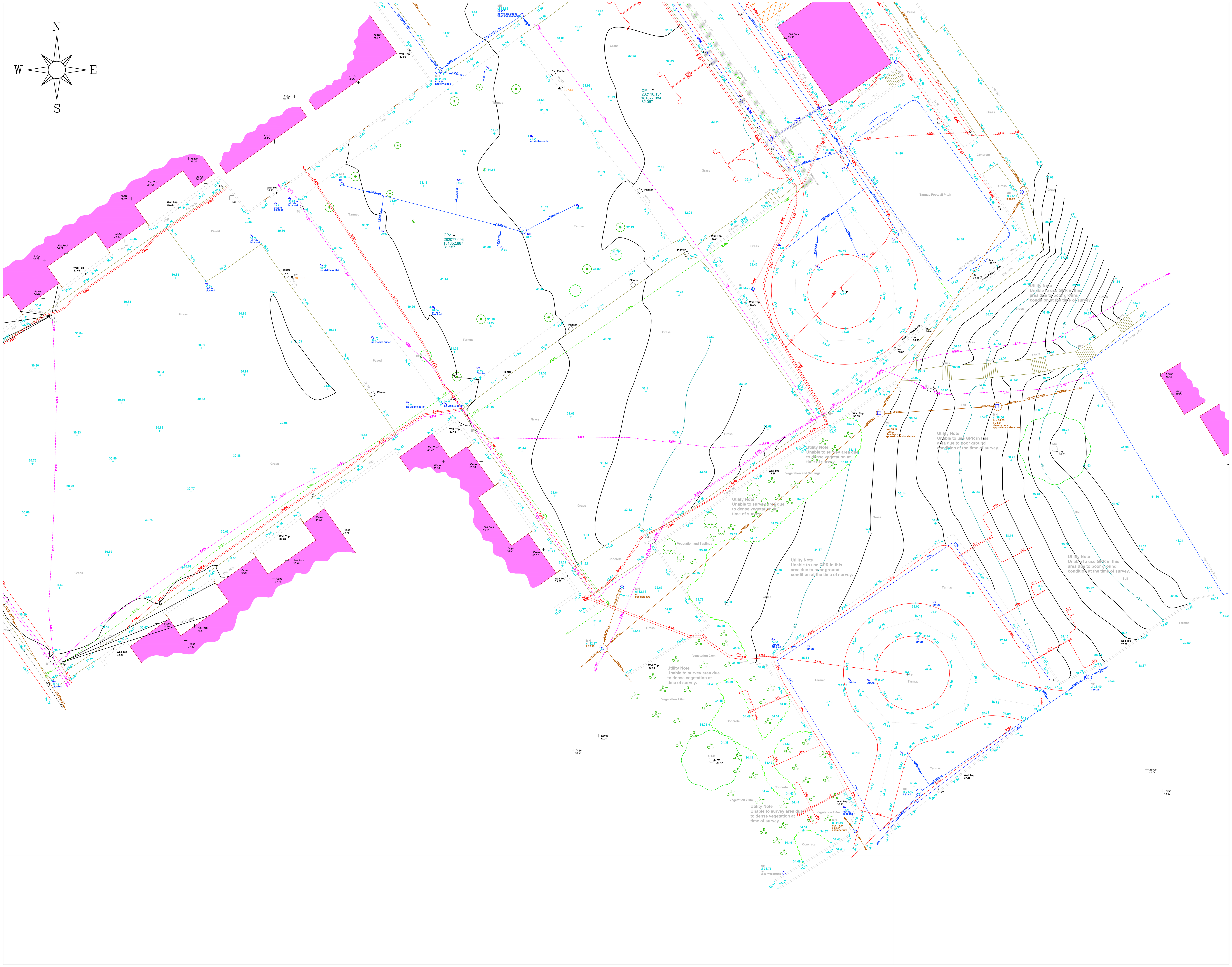
CLIENT
Gleeds Management Services

PROJECT
Gibbons Way, Corneli, Bridgend CF33 4LW

TITLE
Topographical and Utility Survey Sheet 1

hsp consulting
Lawrence House, 6 Meadowbank Way, Eastwood, Nottingham, NG16 3SB
Tel: 01773 535555 www.hspconsulting.com

SCALE	SHEET SIZE A0	
1:200		
DATE	DRAWN	CHECKED
August 2020	MB	LAB
PROJECT NO.	DRAWING NO.	REV
C3341	501	-



KEY FOR UNDERGROUND SERVICES

Foul water
Surface water
Other
Gas — GAS
Electric — E
Telephone — BT
Cable TV — CATV
Unidentified — U
Water
Closed Circuit TV — CCTV
Communications — COM
Heating Pipe — HP
Empty Duct — ED
Fibre Optics — FO
Vents — V
Pipe — PIPE
Traffic Signal — TS
Gauge Lines — G
Vapor Recovery — VR
Offsets — O
Fuel — F

Where chamber extents are significantly greater than the cover size, their approximate extents are shown thus;

ABBREVIATION KEY

AR	assumed route	PTG	pipe to ground
BD	base bend	PTS	pipe to surface
BD	backdrop	RE	rodding eye
BL	bed level	RWP	rainwater pipe
CL	cover level	SV	stop valve
CR	cable riser	SVP	soil vent pipe
DP	down pipe	TE	trapped exit
EOT	end of trace	TFR	taken from records
EP	electricity pole	TP	telegraph pole
FH	fire hydrant	UTF	unable to find
G	gully	UTL	unable to lift
GV	gas valve	UTS	unable to survey
HOR	head of run	UTT	unable to trace
HL	high level	VP	vent pipe
IC	inspection chamber	WL	water level
IL	invert level	WM	water meter
MH	manhole	WO	wash out valve
PR	pipe riser	D	depth

UTILITY SURVEY NOTES

ELECTROMAGNETIC AND/OR GROUND PENETRATING RADAR TECHNIQUES HAVE BEEN USED TO LOCATE AND MAP UNDERGROUND UTILITIES AND FEATURES ON THIS DRAWING. MAPMATIC HAVE MADE EVERY ENDEAVOUR TO MAKE SURE THAT THE INFORMATION CONTAINED WITHIN THIS DRAWING IS ACCURATE AND OF THE HIGHEST QUALITY. HOWEVER, THE RESULTS FROM THESE TYPES OF SURVEYS ARE NOT INFALLIBLE AND SHOULD THE LOCATION OR DEPTH OF SERVICES/FEATURES BE OF PARTICULAR IMPORTANCE TO A PROJECT, THEN IT IS STRONGLY ADVISED THAT TRIAL EXCAVATIONS SHOULD BE UNDERTAKEN TO CONFIRM SURVEY RESULTS.

MAPMATIC HAVE USED ALL RECORD DRAWINGS THAT WERE AVAILABLE TO US BY THE CLIENT OR BY THE STATUTORY UTILITY PROVIDERS AT THE TIME OF THE SURVEY. ANY INFORMATION TAKEN FROM THESE DRAWINGS (IE PIPE SIZES, MATERIAL) IS NOT GUARANTEED. SERVICES LOCATED FROM RECORD DRAWINGS WILL BE SHOWN AND ANNOTATED AS TAKEN FROM RECORDS (TFR). HISTORIC RECORD INFORMATION IS OFTEN INCOMPLETE/INACCURATE AND CANNOT BE RELIED UPON.

A SINGLE LINE INDICATING A UTILITY MAY INDICATE THE PRESENCE OF MULTIPLE SERVICES WITHIN CLOSE PROXIMITY TO EACH OTHER. WHERE A SINGLE LINE TYPE IS SHOWN WE RECOMMEND HAND DIGGING WITHIN 0.5m, TO EXPOSE HIDDEN SERVICES.

WHERE QUOTED, DEPTH INFORMATION OF UNDERGROUND SERVICES/FEATURES IS STATED. DEPTHS ARE GENERALLY WITHIN +/- 10% ACCURATE, BUT CANNOT BE GUARANTEED. ANY DEPTHS SHOWN ARE USUALLY TO THE TOP OF THE SERVICE/FEATURE. GRAVITY SEWERS AND DRAINS ARE USUALLY TO INVERT (BASE OF DRAINAGE CHANNEL) UNLESS OTHERWISE STATED.

AT MAPMATIC WE USE SKILLED STAFF AND MODERN CALIBRATED EQUIPMENT TO PERFORM OUR SURVEYS. HOWEVER, THE COMPLETENESS OF ANY UNDERGROUND SURVEY CANNOT BE 100% GUARANTEED AND WE CANNOT BE HELD RESPONSIBLE FOR ANY INACCURACIES BEYOND THOSE THAT COULD BE REASONABLY EXPECTED BY A COMPETENT COMPANY.

CONTRACTORS UTILIZING OUR DRAWINGS FOR INTRUSIVE WORK SHOULD TAKE ALL REASONABLE MEASURES TO WORK SAFELY IN ACCORDANCE WITH HSG47 GUIDELINES "AVOIDING DANGER FROM UNDERGROUND SERVICES".

SITE SPECIFIC NOTES–

GAS MAIN ON SITE WAS LOCATED IN PARTS USING GPR & RADIO DETECTION. WHERE UNABLE TO LOCATE THE POSITION OF THE MAIN HAS BEEN ADDED FROM RECORDS WHICH IS TO BE USED AS A GUIDE ONLY AND NOT TO BE TREATED AS ACCURATE.

THERE ARE A NUMBER OF ELECTRIC STRINGS WITHIN THE SURVEY AREA THAT WERE UNABLE TO TRACE USING BOTH GPR AND RADIO DETECTION, ALL OF WHICH HAVE BEEN ADDED TO THE DRAWING FROM RECORDS AND ARE TO BE USED AS A GUIDE ONLY AND ARE NOT TO BET TREATED AS ACCURATE.

MAPMATIC WOULD RECOMMEND THAT TRIAL PITS ARE CARRIED OUT ON SITE TO CONFIRM THE LOCATION OF ANY SERVICES TAKEN FROM RECORDS BEFORE ANY SITE WORK TAKES PLACE.

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Key:

FL:	Floor level	Building line	
CL:	Ceiling level	Beam	
SusCL:	Suspended ceiling level	Window	
U/S:	Underside level	Dimension	10.00m
SHL:	Sill height level		
HHL:	Head height level		
SPR:	Spring Point	Ground light	
	Sanitary ware	Door / sliding door	
Heater	Heater / radiator	Inspection cover	

Av	Air valve	G:	Girth circumference	Sv	Stop valve
Bg	Back gully	Gy	Gully	TCB	Telephone call box
BH	Borehole	Ht.	Height	TTL:	Tree top level
BM	Benchmark	IC	Inspection cover	THL	Threshold level
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CL	Cover Level	MG	Multigirth	Ts	Traffic signal
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Er	Earth rod	Re	Rodding eye	Wo	Wash out
Fh	Fire hydrant	Sp	Sign post		
Fs	Flagstaff	St	Stop tap		

Road
Drop Kerb
Verge Tarmac
Verge Concrete
Verge Grass
Verge
Tops
Bottoms

Ordnance Survey information is provided for a guide only.
OS BUILDING OUTLINE
OS DETAIL

Station	Easting (m)	Northing (m)	Level (m)
M1	282094.581	181877.264	31.733
M2	282050.179	181846.029	30.776

Sheet 1
Sheet 2
Sheet Location Plan (N.T.S.)

REV	BY	DATE	DETAILS	CKD
-				

STATUS: FINAL

CLIENT
Gleeds Management Services

PROJECT
Gibbons Way, Corneli, Bridgend CF33 4LW

TITLE
Topographical and Utility Survey Sheet 2

hsp consulting
Lawrence House, 6 Meadowbank Way, Eastwood, Nottingham, NG16 3SB
Tel: 01773 535555 www.hspconsulting.com

SCALE	SHEET SIZE A0	
1:200		
DATE	DRAWN	CHECKED
August 2020	MB	LAB
PROJECT NO.	DRAWING NO.	REV
C3341	502	-

Appendix 2

- Proposed Layout

Subterranean service

No structures within this zone - proximity to neighbouring properties

Red line boundary

Pedestrian Access

Vehicular Access

Current Access Points

Main Vehicular Route

Drainage Ditches

Existing Trees

Existing Hedgerow

Noise

Overhead Cables

Foot Bridge

Existing Right of Way

Building for Demolition

1

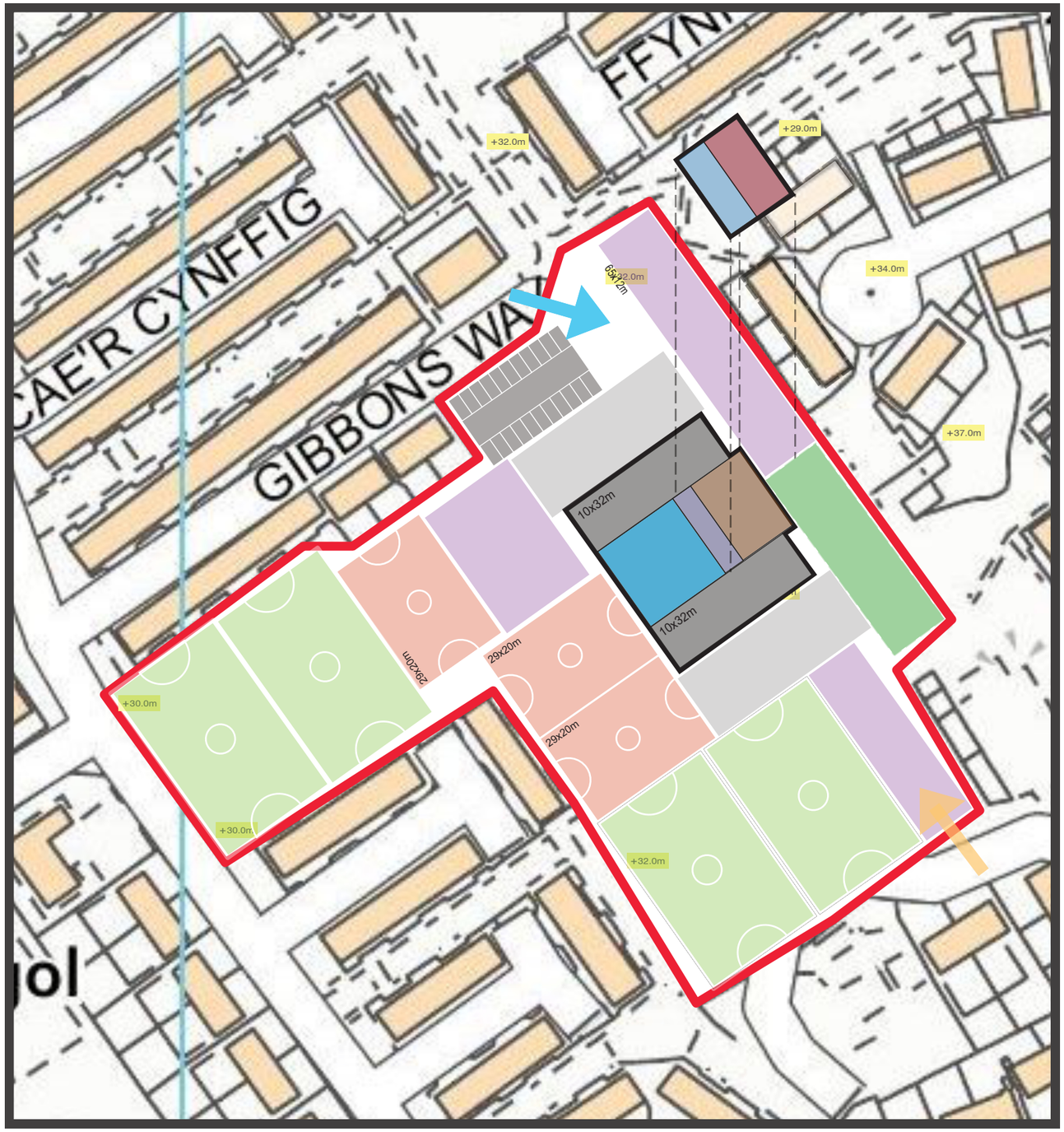
Photo View

Gradient / Embankment

+39.0m

Level

N



Marlas Primary School			
School Specifics:			
No. of pupils	420		
FTE staff	19.2		
Total Building Area m2			
Generated from BB99	2.770	Test Scheme	Difference
Childcare	0	0	0
Basic Teaching	1267	1270	3
Hall	325	325	0
Learning resources	112	112	0
Staff & Admin	164	164	0
Storage	216	220	4
Float	147	151	4
Total	2.230	2.242	12
BB99 External Spaces m2			
Pitches	8,400	4000	-4,400
Soft play	1,850	1678	-172
Games courts	1,440	1740	300
Hard play	1,030	1036	6
Habitat	620	516	-104
Float	2,100	0	-2,100
Total Net	**15,440**	8970	-6470
Parking			
No. of Spaces	22	22	0
Min Other	2.360		
Max Other	4.820		
Childcare			
Min Total Gross	17,320		
Max Total Gross	19,300		

Points of Note.

- School located as far away from surrounding buildings as possible
- Site boundary amended to exclude the residential blocks for demolition, and extended to the south east.
- School areas shown are based on BB99 Gross Floor areas.
- Adjacencies have yet to be resolved.
- School based on a two storey design, in response to surrounding buildings. This looks like it needs to go two storey to achieve external areas.

Site Access.

- Vehicular access off Gibbons Way.
- Pedestrian access opportunities aviailable from all sides.
- Propose pedestrian access on south east side, opposite main vehicular access.

Phasing and Delivery.

- To be considered in conjunction with the new school at Cornelly.
- Marlas to be built, then facilitating decant from Cornelly School from the other site, into this school.
- This site: demolition of existing vacant residential blocks at the north east end of the site to take place first.

Utilities:

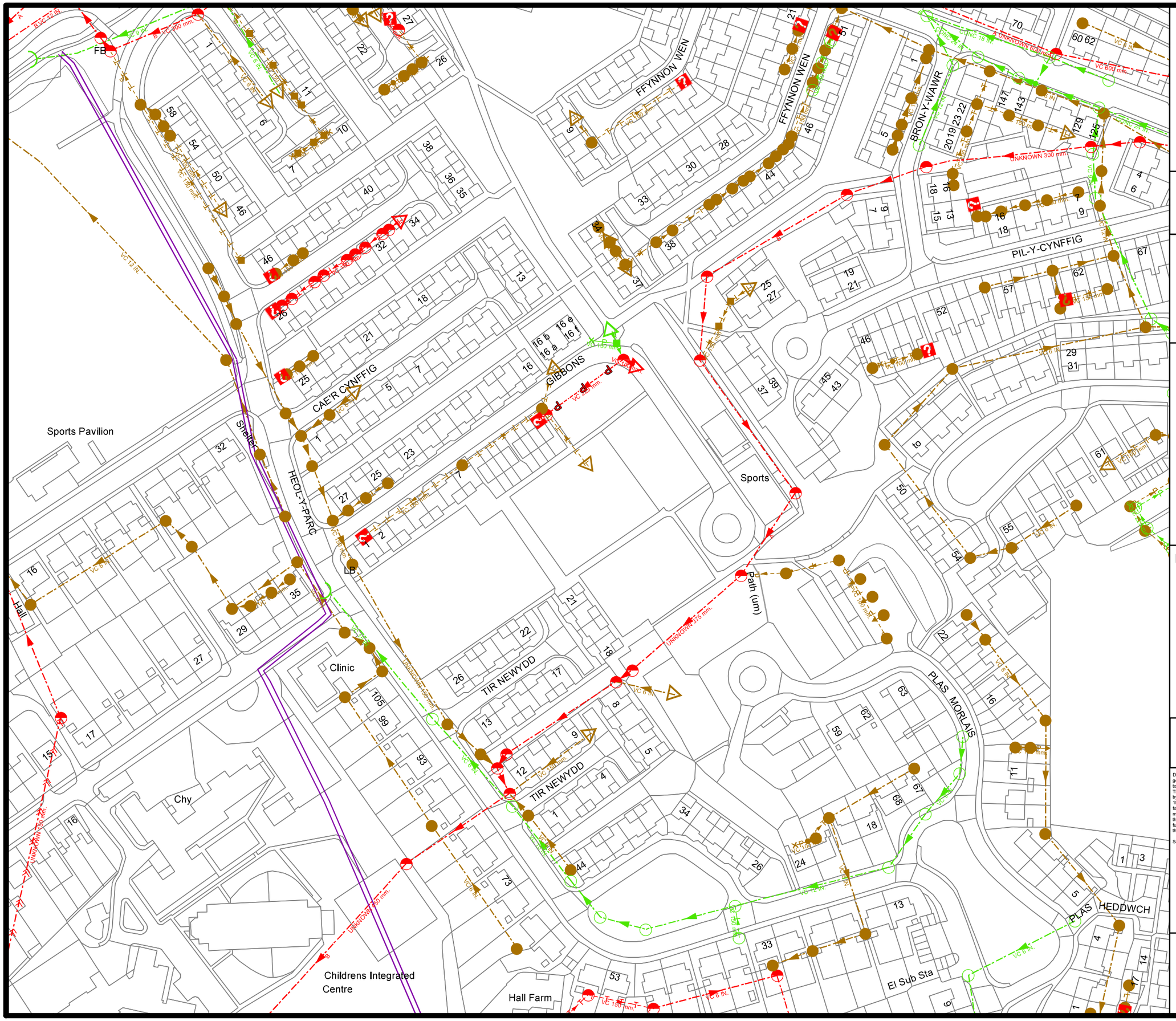
- Not currently known.

Scale: 1:1000 @ A3

0 5m 10m 20m 50m

Appendix 3

- Statutory Undertaker Information



Dŵr Cymru
Welsh Water

Gibbons Way, Bridgend

N
W E
S

LEGEND(Representative of most common features)

Waste network:

	Foul chamber		Outfall
	Surface water chamber	LH	Lamphole
	Combined chamber		Storm Overflow
C O	Combined sewer overflow		Rising main
SPC	Special purpose chamber		Gravity sewer
	Treatment works	P	Private sewer
	Pumping station	S 104	Private sewer subject to Sect. 104 adoption agreement
			Private Sewer Transfer
			Lateral Drain
			Inspection Chamber

NB: Sewer symbol colour indicates the type.
RED - Combined
GREEN - Surface Water
BROWN - Foul
Purple - Former S24 sewers (for indicative purposes only)

Notes:

Whilst every reasonable effort has been taken to correctly record the pipe material of DCWW assets, there is a possibility that in some cases pipe material (other than Asbestos Cement or Pitch Fibre) may be found to be asbestos cement (AC) or Pitch Fibre (PF) . It is therefore advisable that the possible presence of AC or PF pipes be anticipated and considered as part of any risk assessment prior to excavation

EXACT LOCATIONS OF ALL APPARATUS TO BE DETERMINED ON SITE.

Map Ref:	282082,181852
Map scale:	1:1500
Printed by:	John Emma
Printed on:	13 Jul 2020

Appendix 4

- NRW Consultation Response
- Flood Risk Mapping

Paul Daykin

From: Data Distribution <datadistribution@cyfoethnaturiolcymru.gov.uk>
Sent: 24 June 2020 16:15
To: Robert Hopkinson
Subject: RE: C3341: Gibbons Way, Cornelli, Bridgend, CF33 4ND

Dear Mr Hopkinson,

Thank you for your email enquiry concerning the above site. Some of the information you have requested is proactively published on the 'Lle' website and of particular interest would be the following:

1. Details of flood defences (if any); - http://lle.gov.wales/Catalogue?lang=en&text=defences
2. Historic floodplain information, modelled and non-modelled flood levels; - http://lle.gov.wales/catalogue/item/HistoricFl/?lang=en
3. Property flooding history for the proposed site and any nearby sites if available. – See above.
4. Current modelling data and proximity to future modelling proposals; - We will advise.
5. Proximity to hydrometric sites giving flood levels and flows; - https://nrfa.ceh.ac.uk/ or https://naturalresources.wales/riverlevels?lang=en
6. Level, flow and return period information relating to the worst recorded event; - Please specify requested data in the following criteria:

- Data Type (e.g. Rainfall, Level Data, Flow Data, Groundwater)
- Location (Grid Ref or Postcode)
- Date From
- Date To
- Resolution (e.g. 15min/ Day Total/Day Mean etc)
- Station Name - only if known. Can be found on NRFA website https://nrfa.ceh.ac.uk/ or NRW'S RLOI website https://naturalresources.wales/riverlevels?lang=en

7. Survey data which you may hold, e.g. aerial photography, photogrammetry, etc; - http://lle.gov.wales/Catalogue?lang=en&text=lidar
8. Anecdotal information; - Please specify what you might expect to receive.
9. Surface water attenuation/discharge conditions, should we wish to discharge to a nearby ditch; and, - http://lle.gov.wales/catalogue/item/RiskOfFloodingFromSurfaceWater/?lang=en & http://lle.gov.wales/catalogue/item/ConsentedDischargesToControlledWatersWithConditions/?lang=en
10. Useful contacts, e.g. Internal Drainage Boards. - https://naturalresources.wales/flooding/managing-flood-risk/drainage-districts/what-is-a-drainage-district/?lang=en & https://www.ada.org.uk/idb-map/
11. Any constraints should we wish to discharge surface water via infiltration within the site - https://naturalresources.wales/guidance-and-advice/business-sectors/planning-and-development/advice-for-developers/?lang=en

This information should help you to answer most of your queries; apart from any response we will receive from you concerning level and flow data, after you have read the above.

We look forward to hearing from you, concerning the remaining elements of your enquiry.

Yours sincerely,

Tîm Cyswllt Cyfoeth / Customer Hub Team

E-bost / E-mail: datadistribution@cyfoethnaturiolcymru.gov.uk
Gwefan / Website: https://naturalresources.wales/?lang=en
Ewch i / Browse our Data Services Webpage

Yn falch o arwain y ffordd at ddyfodol gwell i Gymru trwy reoli'r amgylchedd ac adnoddau naturiol yn gynaliadwy.
Proud to be leading the way to a better future for Wales by managing the environment and natural resources sustainably.

Ffoniwch ni ar 03000 65 3000 (24-awr) i roi gwybod am ddigwyddiadau amgylcheddol / Call us on 03000 65 3000 (24-hour) to report environmental incidents

---

From: Robert Hopkinson <Robert.Hopkinson@hspconsulting.com>
Sent: 24 June 2020 16:09
To: Data Distribution <datadistribution@cyfoethnaturiolcymru.gov.uk>
Subject: C3341: Gibbons Way, Cornelli, Bridgend, CF33 4ND

Dear Sirs,

PROPOSED SCHOOL, GIBBONS WAY, CORNELLI, BRIDGEND, CF33 4ND
FLOOD CONSEQUENCE ASSESSMENT: PRE-PLANNING ENQUIRY
APPROXIMATE NGR: 282076,181855

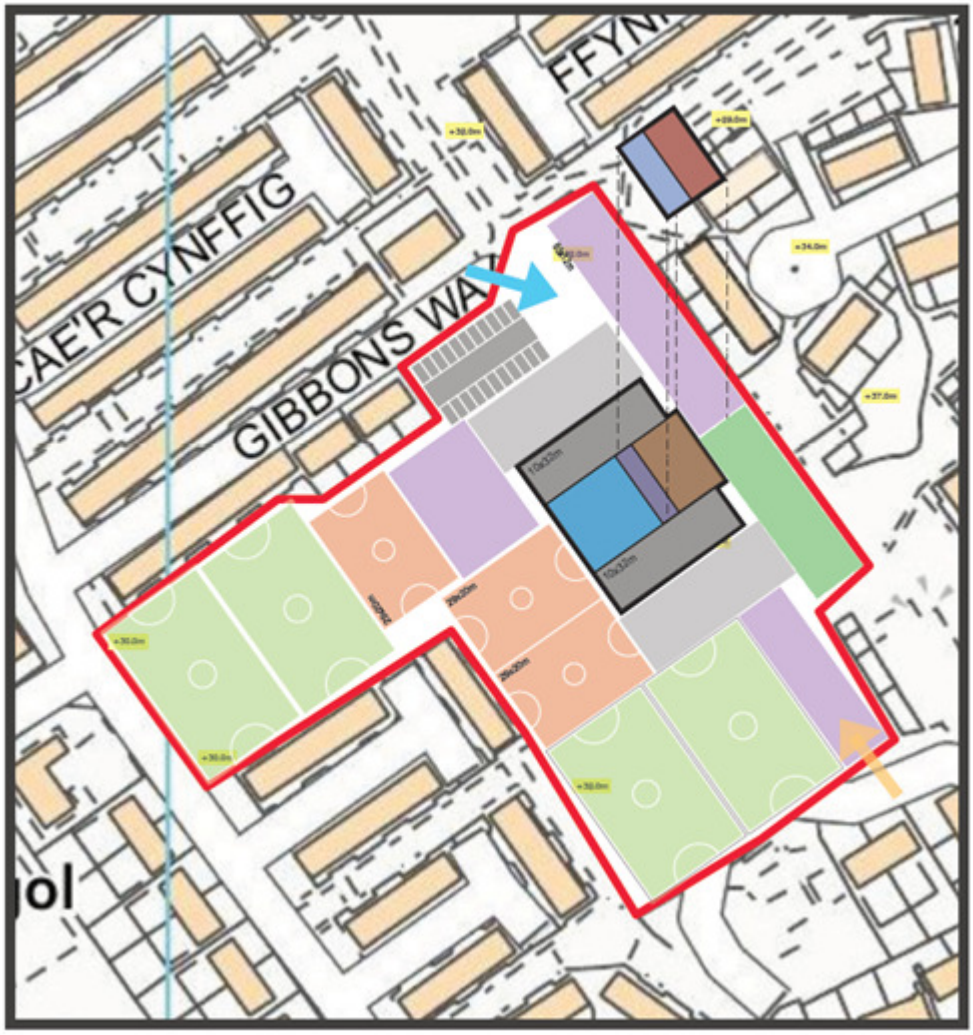
Our Client is pursuing the above development and we have been instructed to undertake a Flood Consequence Assessment and are currently in the process of canvassing consultees.
I would therefore be grateful if you could supply any information relevant to the study, together with details of any particular requirements that you may have in respect of the site and/or its assessment. Referring to your online mapping, we can confirm that:

1. The site is located within Flood Zone 1/A.
2. The site is considered to be at a range of **very low to low risk** of surface water flooding.

If you could confirm any particular known concerns for the site so that we can appropriately focus the flood assessment works.
Of particular interest are:

1. Details of flood defences (if any);
2. Historic floodplain information, modelled and non-modelled flood levels;
3. Property flooding history for the proposed site and any nearby sites if available.
4. Current modelling data and proximity to future modelling proposals;
5. Proximity to hydrometric sites giving flood levels and flows;
6. Level, flow and return period information relating to the worst recorded event;
7. Survey data which you may hold, e.g. aerial photography, photogrammetry, etc;
8. Anecdotal information;
9. Surface water attenuation/discharge conditions, should we wish to discharge to a nearby ditch; and,
10. Useful contacts, e.g. Internal Drainage Boards.
11. Any constraints should we wish to discharge surface water via infiltration within the site.

Please see indicative site layout below.



If you have any queries please do not hesitate to contact me. Similarly, if this site is known to you and you would like to discuss things on either a formal or informal basis please do not hesitate to telephone me on 01773 535555.

Kind regards,

Rob Hopkinson BEng(Hons) EngTech MICE
Civil Engineer
T: 01773 535 555
M: 07951 997 455

Visit out twitter page and latest news here

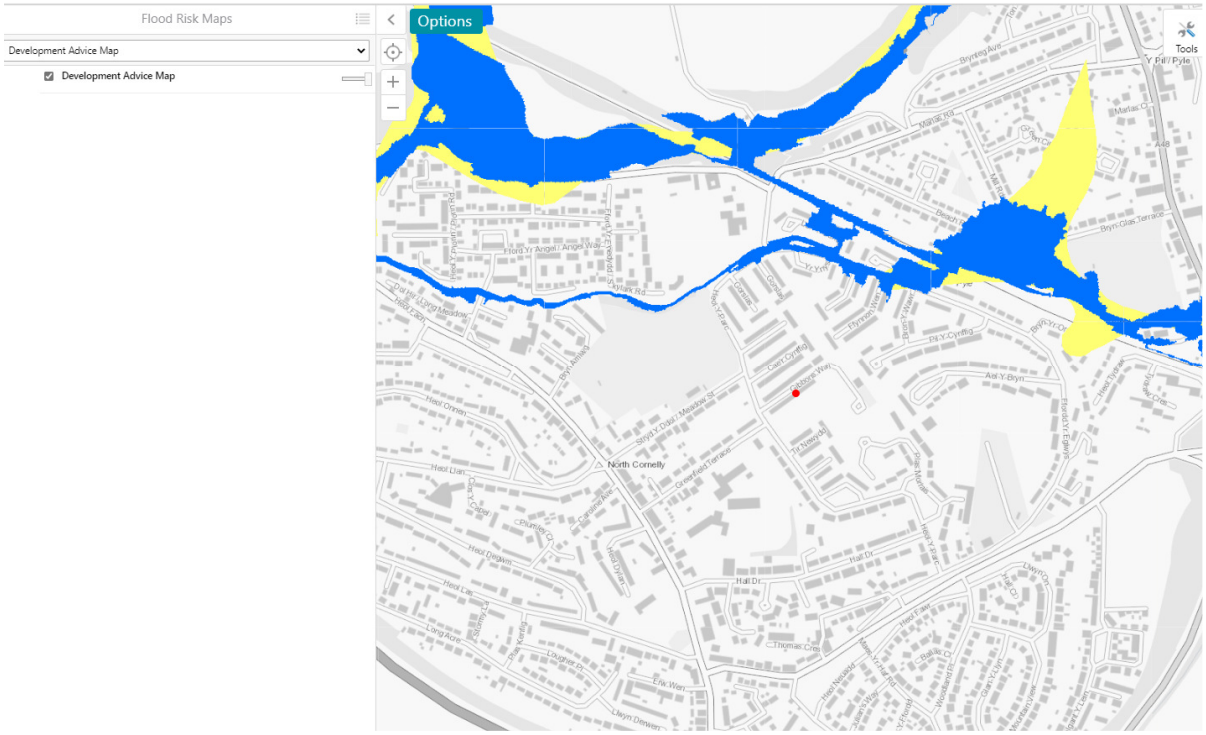
hsp consulting
CONSULTING CIVIL, STRUCTURAL, TRAFFIC & TRANSPORT, GEOTECHNICAL & ENVIRONMENTAL ENGINEERS

Nottingham Office:
Lawrence House,
6 Meadowbank Way,
Eastwood,
Nottingham,
NG16 3SB
T: 01773 535 555

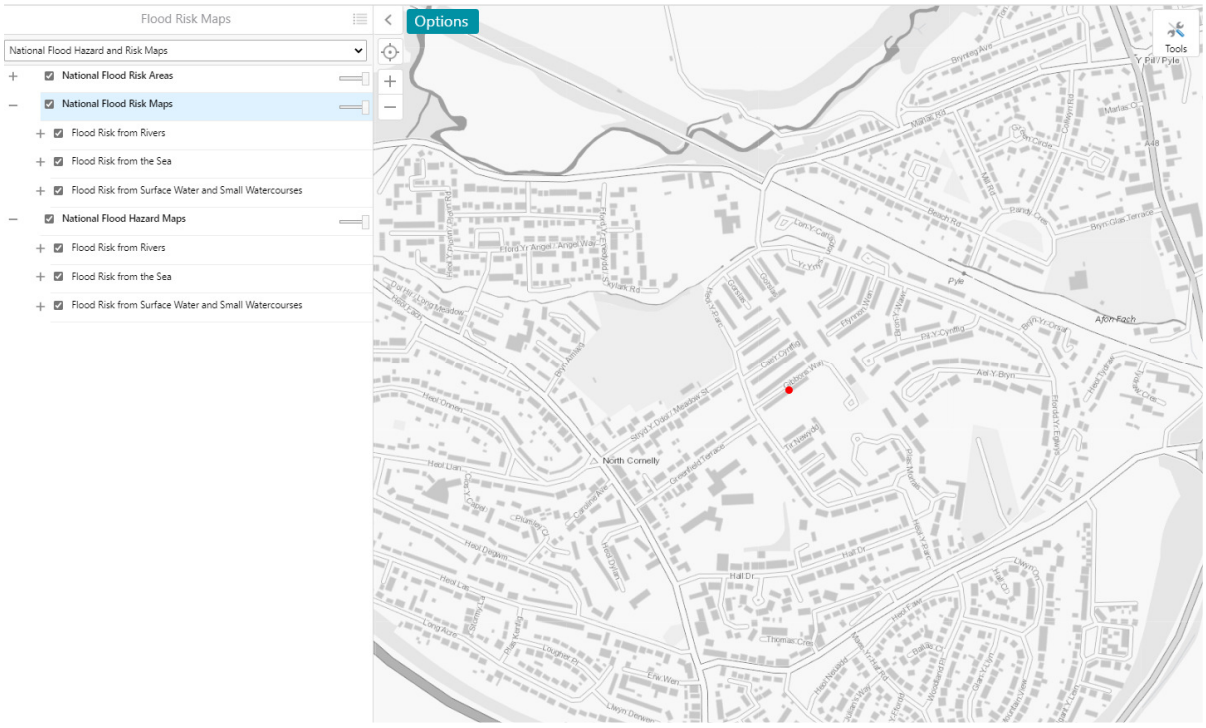
Birmingham Office
The Colmore Building,
20 Colmore Circus,
Queensway,
Birmingham,
B4 6AT
T: 0121 262 4027

Extracts from https://maps.cyfoethnaturiolcymru.gov.uk/

Development Advice Map (DAM)

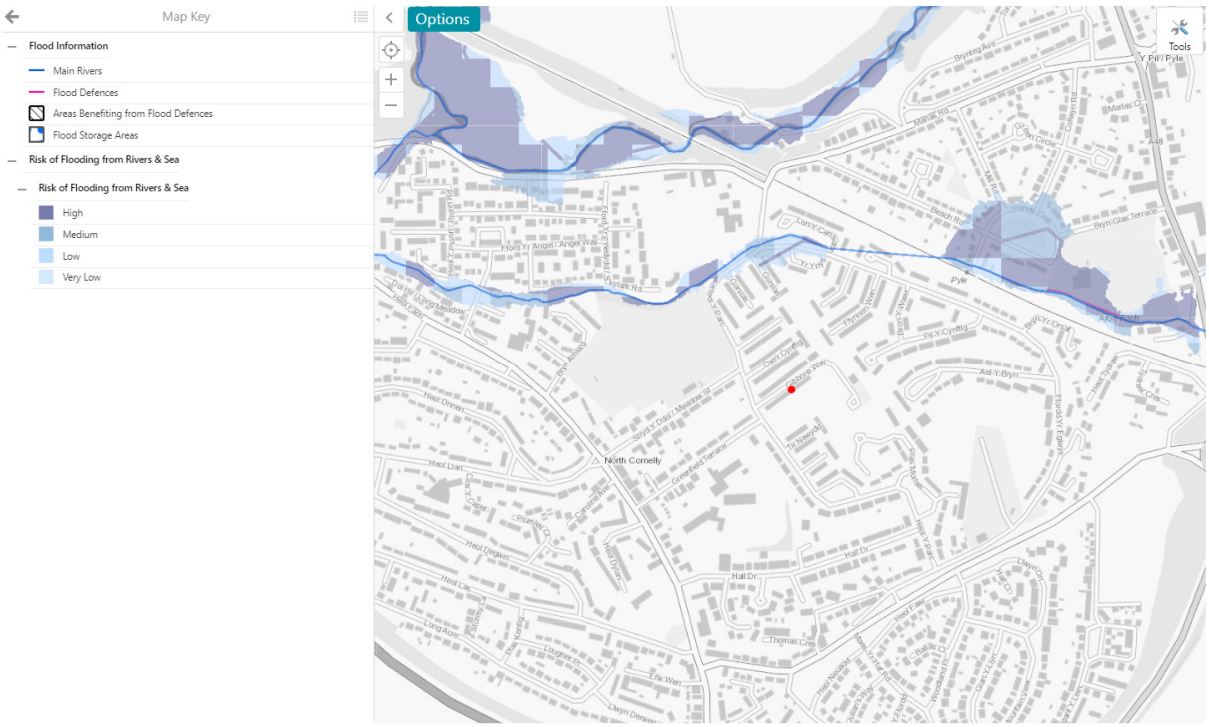


National Flood Risk Mapping

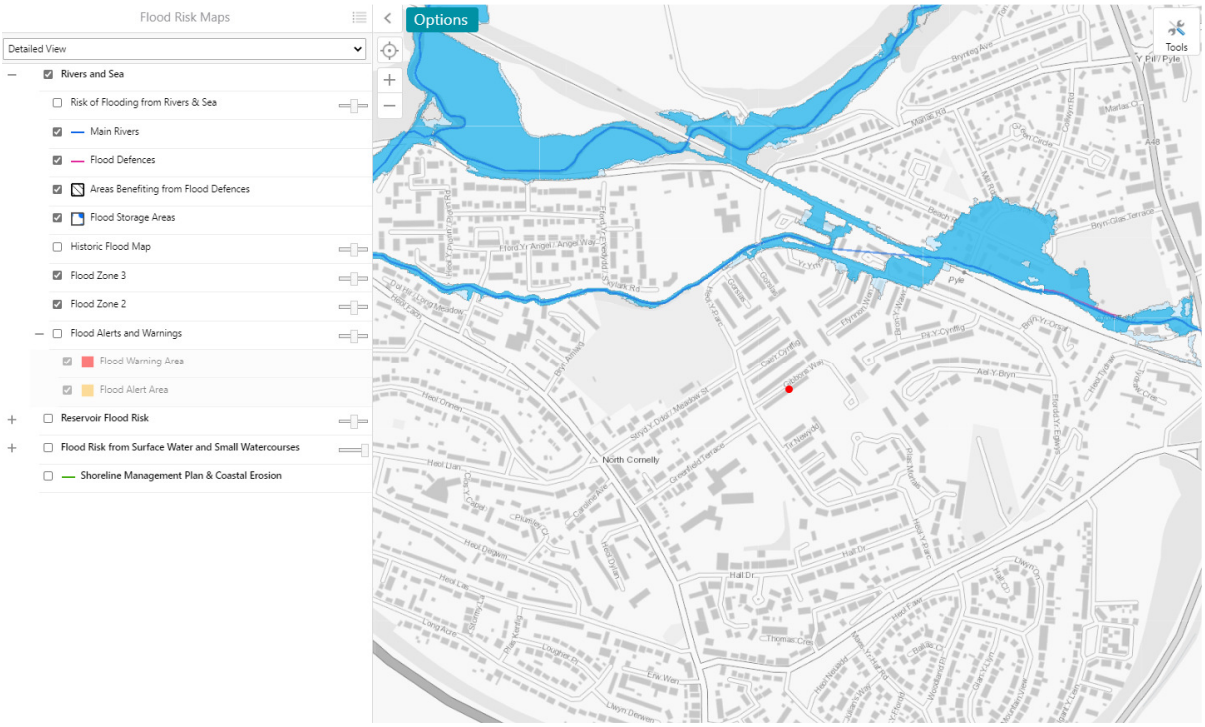


Extracts from https://maps.cyfoethnaturiolcymru.gov.uk/

Main Rivers Delineation & Risk of Flooding

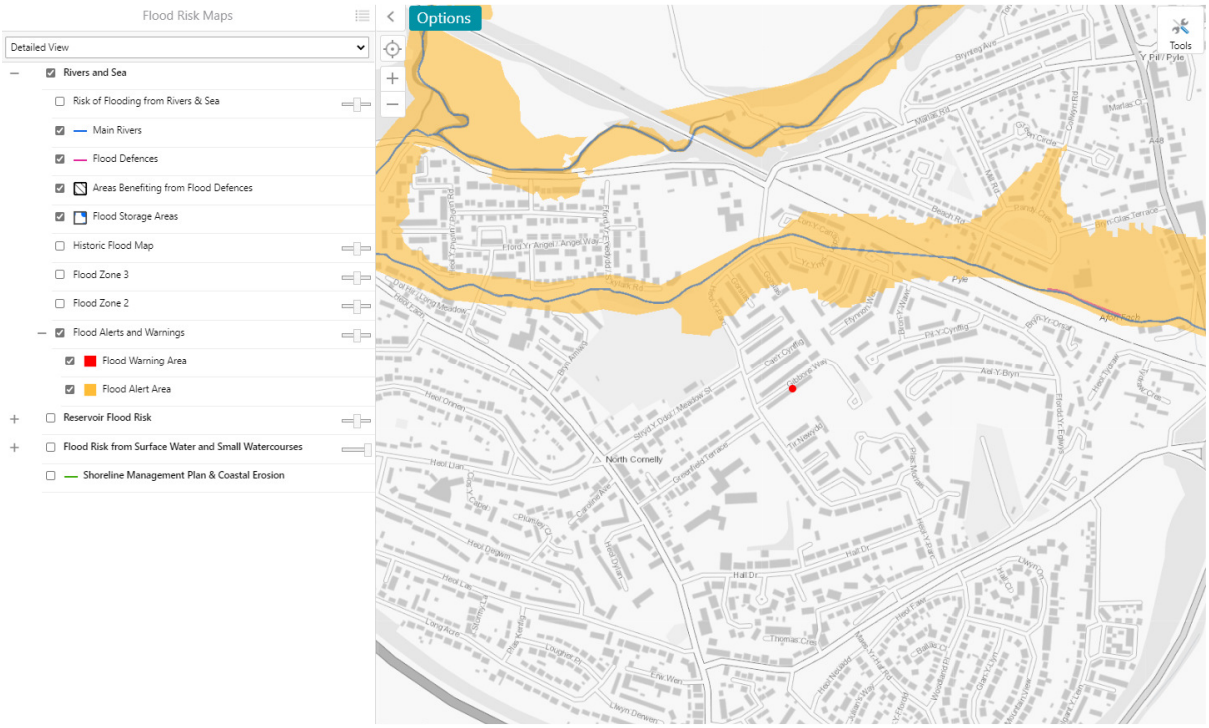


Flood Zones 2 & 3

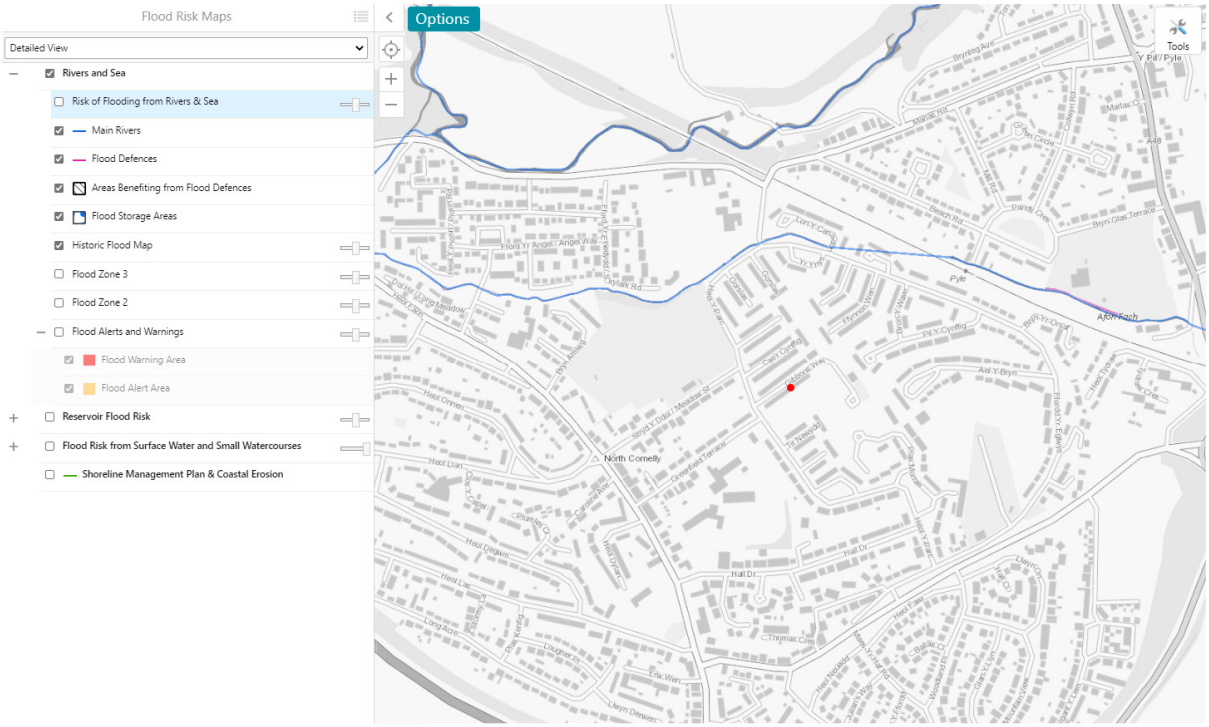


Extracts from https://maps.cyfoethnaturiolcymru.gov.uk/

Flood Alert and Warning Areas

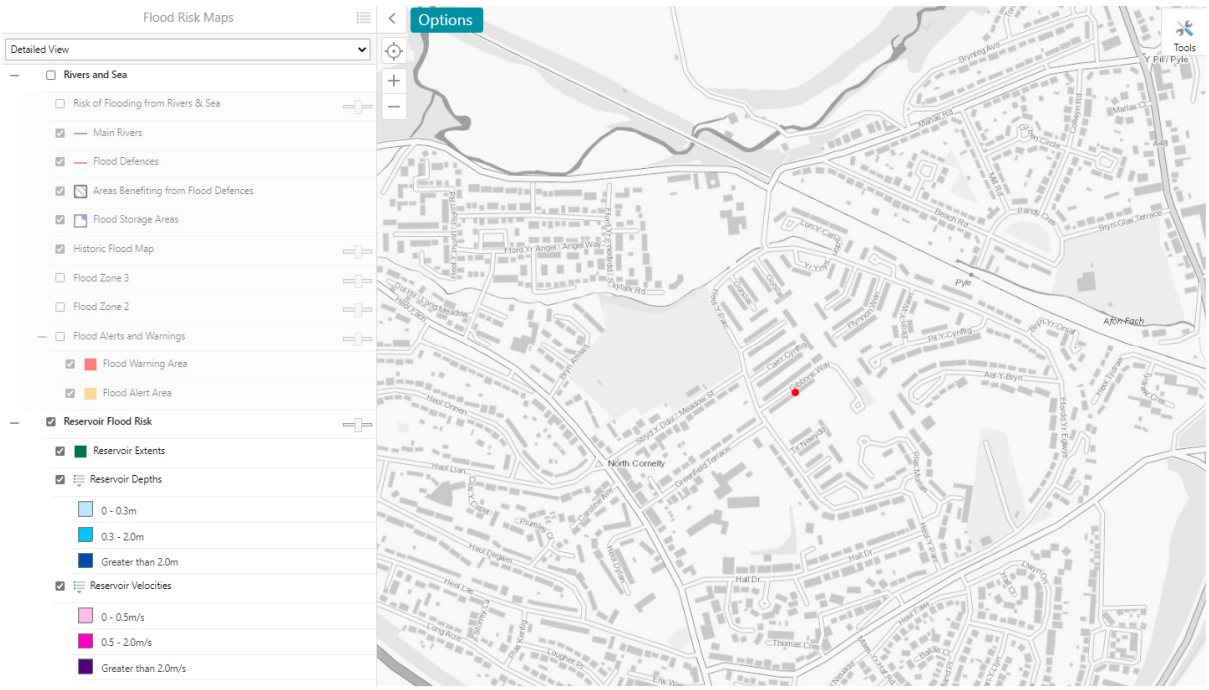


Flood Storage Areas & Flood Defences

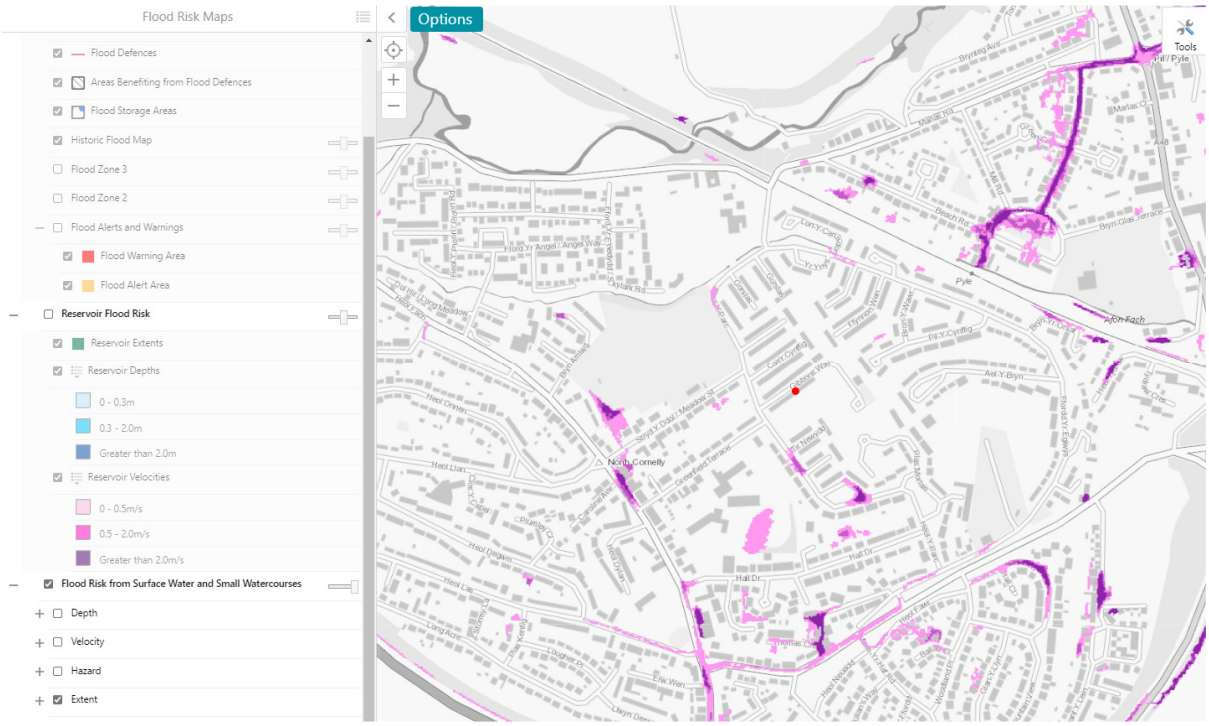


Extracts from https://maps.cyfoethnaturiolcymru.gov.uk/

Risk of Flooding from Reservoirs



Risk of Surface Water & Small Watercourse Flooding



Appendix 5

- Lead Local Flood Authority Information (Blank at this time)

Appendix 6

- Drainage Calculations

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Paul Daykin
Site name:	Gibbons Way
Site location:	North Cornelly

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	51.52330° N
Longitude:	3.70108° W
Reference:	2911725510
Date:	Aug 09 2020 21:01

Runoff estimation approach

IH124

Site characteristics

Total site area (ha): 1.0

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	2	2
HOST class:	N/A	N/A
SPR/SPRHOST:	0.3	0.3

Hydrological characteristics

	Default	Edited
SAAR (mm):	1133	1133
Hydrological region:	9	9
Growth curve factor 1 year:	0.88	0.88
Growth curve factor 30 years:	1.78	1.78
Growth curve factor 100 years:	2.18	2.18
Growth curve factor 200 years:	2.46	2.46

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	3.2	3.2
1 in 1 year (l/s):	2.82	2.82
1 in 30 years (l/s):	5.7	5.7
1 in 100 year (l/s):	6.98	6.98
1 in 200 years (l/s):	7.88	7.88

Appendix 7 ▪ Sample Operation and Maintenance Details

Manholes and Inspection Chambers

Description

Manholes providing rodding and jetting access to pipe work.

Typically manholes, in distinction to inspection chambers, are designed to allow for operatives to access. Manholes should only be accessed following a risk assessment, and the specification of the safe system of work, paying regard to confined space risks.

Maintenance Issues

Manholes are unlikely to present maintenance issues in themselves. However, they provide access to the drainage infrastructure and allow visual inspection from the surface of any major maintenance issues.

Schedule	Action Required	Frequency
Routine/regular maintenance (including inspections and monitoring)	Lift covers and ensure that there are no blockages. Inspect and identify any parts that are not operating correctly and remediate.	For 3 months following installation
	Ensure covers are in a good state of repair.	Monthly
	Inspect manholes, and inspection chambers, to ensure that the drainage is running freely.	Six Monthly and every autumn after leaf fall
Occasional maintenance	Suction sweeping and cleansing (to Water Jetting Association standards) and CCTV where necessary.	Every 2 – 4 Years
Remedial maintenance	• Silt removal. • Inlet/outlet repair. • Erosion repairs. • System rehabilitation following a pollution event. • Manhole Cover Replacement. • Repairs to brickwork or concrete. • Chanel repair.	As required (tasks to repair problems due to wear, damage or vandalism).

Catchpits

Description

Catchpits are similar to manholes but include a sump to the base which is designed to capture silt and prevent it reaching other parts of the drainage network. Catchpits provide a convenient location to remove silt for drainage networks. Catchpits should only be accessed following a risk assessment, and the specification of the safe system of work, paying regard to confined space risks.

Maintenance Issues

If the silt captured in catchpits is not removed regularly it will cause silt to migrate downstream to other part of the drainage network, some of which may be less accessible, or inaccessible.

Maintenance Regime

Schedule	Action Required	Frequency
Routine/regular maintenance (including inspections and monitoring)	Lift manhole covers and ensure that there are no blockages. Inspect and identify any parts that are not operating correctly and remediate. Inspect silt storage in sump. Remove silt as required using subcontractor with vacuum extraction plant.	For 3 months following installation
	Ensure covers are in a good state of repair. Repair/replace as necessary.	Monthly
	Inspect catchpits to ensure that the drainage is running freely, and free of debris. Inspect silt storage in sump. Remove silt as required using subcontractor with vacuum extraction plant.	Six Monthly and every autumn after leaf fall
Occasional maintenance	Suction sweeping and cleansing (to Water Jetting Association standards) and CCTV where necessary. Remediate any chamber structural defects, or any defects that may reduce the free flow of water.	Every 2 – 4 Years
Remedial maintenance	• Silt removal. • Inlet/outlet repair. • Erosion repairs. • System rehabilitation following a pollution event. • Manhole Cover Replacement. • Repairs to brickwork or concrete.	As required (tasks to repair problems due to wear, damage or vandalism).

Linear Drains

Description

Surface Water is drained over impermeable areas towards grated, or slot-type linear drains at low points and water is conveyed to below ground pipework.

Maintenance Issues

Linear drains can become blocked by silt or debris, causing flooding.

Linear drains often include silts traps at outlets which can cause siltation of downstream drainage infrastructure if not maintained adequality.

Maintenance Regime

Schedule	Action Required	Frequency
Routine/regular maintenance (including inspections and monitoring)	Inspect linear drains to ensure that there are no blockages at surface level. Lift covers to outflow boxes and check for blockages or siltation. Inspect and identify any parts that are not operating correctly and remediate.	For 3 months following installation
	Inspect linear drains to ensure that there are no blockages at surface level.	Monthly
	Lift covers to outflow boxes and check for blockages or siltation.	Six Monthly and every autumn after leaf fall
Occasional maintenance	Jetting of linear drains and suction vacuuming of outlet boxes (to Water Jetting Association standards). CCTV where necessary.	Every 1 – 2 Years
Remedial maintenance	• Silt removal. • Inlet/outlet repair. • Erosion repairs. • System rehabilitation following a pollution event. • Linear drain cover replacement. • Chanel repair. • Ensure that impermeable surfaces surrounding linear drains have not settled below top of linear drain level, causing ponding.	As required (tasks to repair problems due to wear, damage or vandalism).

Gullies

Description

Surface Water is drained over impermeable areas towards grated gullies at low points and water is conveyed to below ground pipework.

Maintenance Issues

Gullies can become blocked by silt or debris, causing flooding.

Gullies include integral silt traps which can cause siltation of downstream drainage infrastructure if not adequality maintained.

Gullies often include a trapped outlet which prevents liquids lighter than water (ie oil and fuel) leaving the gully. If silt and light liquids are not removed regularly silt and oil will migrate downstream to other part of the drainage network, some of which may be less accessible, or inaccessible.

Maintenance Regime

Schedule	Action Required	Frequency
Routine/regular maintenance (including inspections and monitoring)	Inspect to ensure that there are no blockages at surface level, and that the outfall is operating effectively. Inspect and identify any parts that are not operating correctly and remediate.	For 3 months following installation
	Ensure that there are no blockages at surface level.	Monthly
	Lift covers to check for blockages or siltation.	Six Monthly and every autumn after leaf fall
Occasional maintenance	Remove oil and silt using specialist vacuum extraction plant.	Every 1 – 2 Years
Remedial maintenance	• Silt removal. • Inlet/outlet repair. • Erosion repairs. • System rehabilitation following a pollution event. • Cover replacement. • Structural failure of gully pot. • Ensure that impermeable surfaces surrounding linear drains have not settled below top of gully cover level, causing ponding.	As required (tasks to repair problems due to wear, damage or vandalism).

Pipework

Description

Below ground drainage pipework connects drainage inlets (gullies, linear drains etc) to manholes and also provides connections between manholes.

Maintenance Issues

Pipes can become blocked by silt, debris fat, grease, or collapse. It is also possible for pipe joints to become displaced or for roots to grow from the surrounding ground into pipes.

These factors cause a reduction in, or loss of, the hydraulic capacity of the pipes which can in turn cause flooding to land and buildings.

Defects in pipes can also cause a reduction in stability to ground underlying foundations, which can cause settlement and damage to buildings and external surfaces.

The material of pipes and associated couplings can be degraded if aggressive liquids are passed through the pipes.

It is recommended that trees are not planted within 3m of pipes to minimise the risk of root ingress.

Maintenance Regime

Schedule	Action Required	Frequency
Routine/regular maintenance (including inspections and monitoring)	Inspect and identify any parts that are not operating correctly and remediate.	For 3 months following installation
	Monitor working of drainage at ground level. Evidence of damage to pipework my include localised flooding or emission of smells.	Monthly
	Lift manholes covers to check for blockages.	Six Monthly
Occasional maintenance	CCTV pipework, clean to WRC Sewer Jetting Code of Practice. Remediate as necessary.	Every 1 – 2 Years
Remedial maintenance	• Silt removal. • Fat and Grease removal. • Erosion repairs. • Joint displacement. • Structural failure, cracking or collapse. • System rehabilitation following a pollution event.	As required (tasks to repair problems due to wear, damage or vandalism).

Vortex Controls

Description

Vortex controls, often called Hydrobrakes, are installed in some manholes to restrict the rate of flow. Vortex controls are usually constructed in steel installed in a manhole with a sump.

Maintenance Issues

Vortex controls can become blocked by debris, plastic bags or other sheet material. If silt is allowed build up in the sump the operation of the device can be hampered causing flooding upstream.

Maintenance Regime

Schedule	Action Required	Frequency
Routine/regular maintenance (including inspections and monitoring)	Refer to manufacturer's specification. Inspect and identify any parts that are not operating correctly, consult supplier and remediate as required.	For 3 months following installation
	Monitor working of drainage at ground level. If there is localised flooding check the condition of all system elements.	Monthly
	Lift manholes covers to check for blockages. Remove sediment from pre-treatment structures, gullies, catchpits etc.	Six Monthly and every autumn after leaf fall
Occasional maintenance	Clean to WRC Sewer Jetting Code of Practice. Remediate as necessary.	Every 1 – 2 Years
Remedial maintenance	Inspect, and carry out remediation works to ensure that the features are in fully working order.	As required (tasks to repair problems due to wear, damage or vandalism).

Geocellular Attenuation Storage

Description

Fat and Grease separators, separate fat and grease from oil emitting facilities such as kitchens and factories. This prevents fat and grease entering the public sewerage network. Preventing fat and grease is a requirement of Building Regulations (Part H), The Water Industry Act (1991).

Maintenance Issues

For a fat and grease separator to operate effectively, and prevent pollutants leaving a site, it is necessary to remove the contained fat and grease on a regular basis. It is recommended that maintenance is proactive, rather than waiting for any installed alarm to highlight the need for emptying. The party responsible for maintenance, usually the owner or occupier, should consult the manufacturer to determine a suitable maintenance regime. Fat and Grease should only be removed by a licenced contractor.

Maintenance Regime

Schedule	Action Required	Frequency
Regular Maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	For 3 months following installation, then annually.
	Remove debris from the catchment surface (where it may cause a risk to performance)	Monthly
	For systems where rainfall infiltrate 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.	Annual, or as required
Remedial Actions	Repair/rehabilitate inlets, outlets, 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 five years or as required

Petrol Interceptors/Oil Separators

Description

Petrol interceptors, also called oil separators, separate out light liquids, such as oil or fuel, and silt and grit. The purpose of the separation is to prevent oil and silt (which may contain heavy metals) polluting watercourses downstream.

Maintenance Issues

For a separator to operate effectively, and prevent pollutants leaving a site, it is necessary to remove the contained oil and silt on a regular basis. It is recommended that maintenance is proactive, rather than waiting for any installed alarm to highlight the need for emptying. The party responsible for maintenance, usually the owner or occupier, should consult the manufacturer to determine a suitable maintenance regime. Oil and silt should only be removed by a licenced contractor.

Maintenance Regime

Activity	Action Required	Frequency
Routine/regular maintenance (including inspections and monitoring)	Refer to manufacturer's specification. Inspect and identify any parts that are not operating correctly and remediate.	For 3 months following installation
	Monitor working of drainage at ground level. If there is localised flooding check the condition of all system elements.	Monthly
Routine/regular maintenance (including inspections and monitoring)	• Check volume of sludge/silt. • Check thickness of light liquid. • Check function of automatic closure device. • Empty the separator, if required. • Check the coalescing material and clean or change if necessary (Class 1 only). • Check the function of the warning device (if fitted).	Six Monthly and every autumn after leaf fall
Occasional maintenance	• Consult manufacturer to obtain details of an approved separator maintenance contractor. • Check watertightness of system. • Check structural condition. • Check internal coatings. • Check built-in parts • Check electrical devices and installations. • Adjust automatic closure devices.	5 Yearly Maximum
Remedial maintenance	Inspect, and carry out remediation works to ensure that the features are in fully working order.	As required

Filter Drains

Description

Filter drains are shallow trenches filled with stone/gravel that create temporary subsurface storage for the attenuation, conveyance and filtration of surface water. The stone may be contained in a simple trench lined with a geotextile, geomembrane or impermeable liner. Often filter drains have a 50mm-100mm depth of permeable material that is separated from the main gravel/stone trench by a permeable geotextile. This top layer is intended to be sacrificial, collecting silt over time and requiring replacement every 5 – 10 years, or as required if ponding is evident.

Maintenance Issues

Over time the top permeable material layer will trap silt and other materials. On a highway the trapped material may include heavy metals. The top layer, and associated geotextile, will become less permeable with time and should be replaced as set out below.

If the filter drain includes pipework it may become blocked over time. The pipe should be kept clear of silt and debris.

If the main filter material becomes silted up there may be a requirement to excavate and replace the entire filter drain.

Any material removed should be tested and may require disposal at landfill.

Maintenance Regime

Activity	Action Required	Frequency
Regular maintenance	Remove litter (including leaf litter) and debris from filter drain surface, access chambers and pre-treatment devices	Monthly (or as required)
	Inspect filter drain surface, inlet/outlet pipework and control systems for blockages, clogging, standing water and structural damage	Monthly
	Inspect pre-treatment systems, inlets and perforated pipework for silt accumulation, and establish appropriate silt removal frequencies	Six monthly
	Remove sediment from pre-treatment devices	Six monthly, or as required
Occasional maintenance	Remove or control tree roots where they are encroaching the sides of the filter drain, using recommended methods (eg NJUG, 2007 or BS 3998:2010)	As required
	At locations with high pollution loads, remove surface geotextile and replace, and wash or replace overlying filter medium. This may also be necessary where there are high silt loads.	Five yearly, or as required
	Clear perforated pipework of blockages	As required

Swales and Ditches

Description

Swales are shallow flat bottomed, vegetated open channels designed to convey, treat and often attenuate surface water runoff. Swales can include some planting, but this must be specified not in impede the flow in the channel.

Maintenance Issues

Sufficient access to the swales should be provided. The grass at the base of the swale should be cut to a length of between 75mm and 100mm. Grass clippings/cuttings should be removed to prevent nutrients/pollutants entering the drainage system.

Occasionally sediment will need to be removed (eg once deposits exceed 25mm in depth).

Maintenance Regime

Activity	Action Required	Frequency
Regular maintenance	Remove litter and debris	Monthly, or as required
	Cut grass – to retain grass height within specified design range (typically 75-100mm)	Monthly (during growing season), or as required
	Manage other vegetation and remove nuisance plants	Monthly at start then as required
	Inspect inlets, outlets and overflows for blockages, and clear if required	Monthly
	Inspect infiltration surfaces for ponding, compaction, silt accumulation, record areas where water is ponding for > 48 hours	Monthly, or when required
	Inspect vegetation coverage	Monthly for 6 months, quarterly for 2 years, then half yearly
	Inspect inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies	Half yearly
Occasional maintenance	Reseed areas of poor vegetation growth, alter plant types to better suit conditions, if required	As required or if bare soil is exposed over 10% or more of the swale treatment area
Remedial actions	Repair erosion or other damage by re-turfing or reseeding	As required
	Relevel uneven surfaces and reinstate design levels	As required
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface	As required
	Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip	As required
	Remove and dispose of oils or petrol residues using safe standard practices	As required

Sewage treatment plants

Description

Sewage treatment plants are bespoke items of equipment. Operation and maintenance must be undertaken in accordance with the manufacturer's requirements.

Particular care may be required following initial installation to ensure that they are operating effectively and within the anticipated parameters.

It is understood that some systems may require an '*initial period*' during which the appropriate enzymes, bacteria, or similar, reach the desired operating '*window*'. During this period, it may be necessary to introduce secondary treatment systems to ensure the downstream environment is not harmed. The manufacturer's recommendations in respect of the '*initial period*' should be sought and followed.

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