EXPEDITE

FLOOD CONSEQUENCE ASSESSMENT

PROJECT BLUE DRAGON SITE 2

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EXPEDITE

Proposed Development

Project Blue Dragon Site 2

FLOOD CONSEQUENCE ASSESSMENT

Issued by:	Expedite 35 Southernhay East Exeter EX1 1NX
Client:	Cardiff 6th Form College
Project Reference:	ES21.22
Project Title:	Cardiff 6th Form College
Revision:	B
Date:	07th December 2022
Prepared by:	Annabel Skidmore
Checked by:	Ben Fleming
Approved by:	Simon Lancaster

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Sections

Appendices

1 Introduction

1.1 The purpose of this Flood Consequence Assessment (FCA) is to assess the risk of flooding to the proposed development and where possible provide sufficient mitigation to demonstrate that the future users of the development would remain safe throughout its lifetime, that the development would not increase flood risk on site and elsewhere and, where practicable, that the development would reduce flood risk overall.

1.2 This report has been prepared with reference to Technical Advice Note 15 (TAN 15) which supplements Planning Policy Wales.

1.3 The general approach is to advise caution in respect of new development in respect of new developments in areas at high risk of flooding by setting out a precautionary framework to guide planning decisions. The overarching aim of the precautionary framework is, in order of preference, to:

- Direct new development away from those areas which are at high risk of flooding.
- Where development has to be considered in high risk areas (Zone C) only those developments which can be justified on the basis of the tests outlined in TAN 15 are located within such areas.

1.4 The purpose of this report is to provide clear and pragmatic advice regarding the nature and potential significance of flood hazards which may be present at the site.

Site Proposals

1.5 The proposed development comprises of a mixed-use development off Pierhead Street, Cardiff. This will comprise of leisure spaces, student accomodation, and storage, and is as part of an education facility. A copy of the proposed development drawings is included within **Appendix A**. The education facility will provide benefits to the wider community.

2 Site Characteristics

Site Location and Composition

2.1 The approximate co-ordinates for the centre of the site are E: 319426; N: 174704, with the nearest postcode of CF10 4AA. The approximate location of the site is shown in **Figure 2.1**.

2.2 The current site comprises of a car park. The site is bound to the west by a hotel building, to the north by a multi-storey car park, to the east by a canal feeder, and to the south by Pierhead Street.

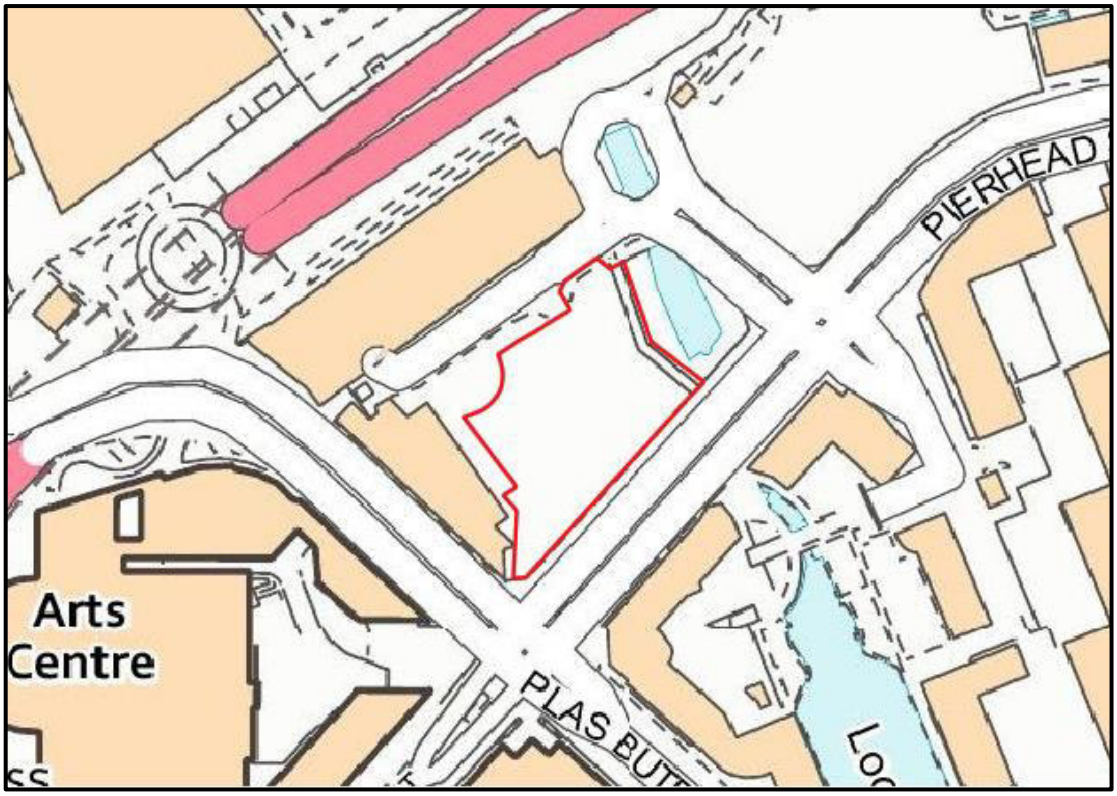

Figure 2.1 Site Location

Topography

2.3 A detailed topographic survey was carried out for the site, a copy of which is included within **Appendix B**. This indicates ground levels fall in a south-easterly direction from 9.97 metres Above Ordnance Datum (mAOD) to 9.12 mAOD.

Ground Conditions

2.4 Geological data held by the British Geological Survey (BGS)[1] shows that the bedrock geology underlying the site is Mercia Mudstone Group – Mudstone. Superficial deposits are recorded as Tidal Flat Deposits – Clay, silt and sand.

2.5 The nearest borehole log with freely available information is located at the centre of the site and was recorded to a depth of 14.5m, obtained via online BGS maps. The borehole log reference number is ST17SE259. The log identifies presence of gravel , silt, and clay.

2.6 Soilscapes mapping[2] indicates the underlying soil as loamy and clayey soils of coastal flats with naturally high groundwater.

Existing Drainage & Hydrology

2.7 The site is located approximately 250m north-northeast of Cardiff Bay and 770m east of the River Taff. A canal feeder is located 3m east of the site boundary.

2.8 Welsh Water sewer records indicate there is a 375mm public foul sewer within Pierhead Street along the southeast border of the site, alongside a 300mm combined sewer. These are connected at a pumping station on the south-eastern border of the site. A 1,500mm surface water sewer is located at the southern corner of the site. Welsh Water sewer records are provided in **Appendix C**.

[1] https://geologyviewer.bgs.ac.uk/?_ga=2.54316200.1622516172.1658142495-970462165.1658142495
[2] http://www.landis.org.uk/soilscapes/

3 Development Vulnerability & Flood Zone Classification

3.1 TAN 15 categorises flood zones into

- Zone A – considered to be at little or no risk of fluvial or tidal/coastal flooding
- Zone B – Areas known to have been flooded in the past evidenced by sedimentary deposits.
- Zone C – Based on Environment Agency extreme flood outline, equal to or greater than 0.1% (river, tidal or coastal)
- Zone C1 – Areas of the floodplain which are developed and served by significant infrastructure, including flood defences
- Zone C2 - Areas of the floodplain without significant flood defence infrastructure

3.2 These flood zones are reflected in the development advice maps which are based on Natural Resources Wales Flood Risk Maps supplemented by sediment data, held by the British Geographic Society (BGS), of historical flooding. The maps adopt the precautionary principle and are based on the best-known information available at the time; however, a detailed examination of a site can refine an area's risk of flooding.

3.3 The proposed development is considered to be 'highly vulnerable' in terms of its land use type flood risk vulnerability as shown in TAN 15 and is located in Zone B, as shown on **Figure 3.1**. Therefore, development would be considered acceptable.

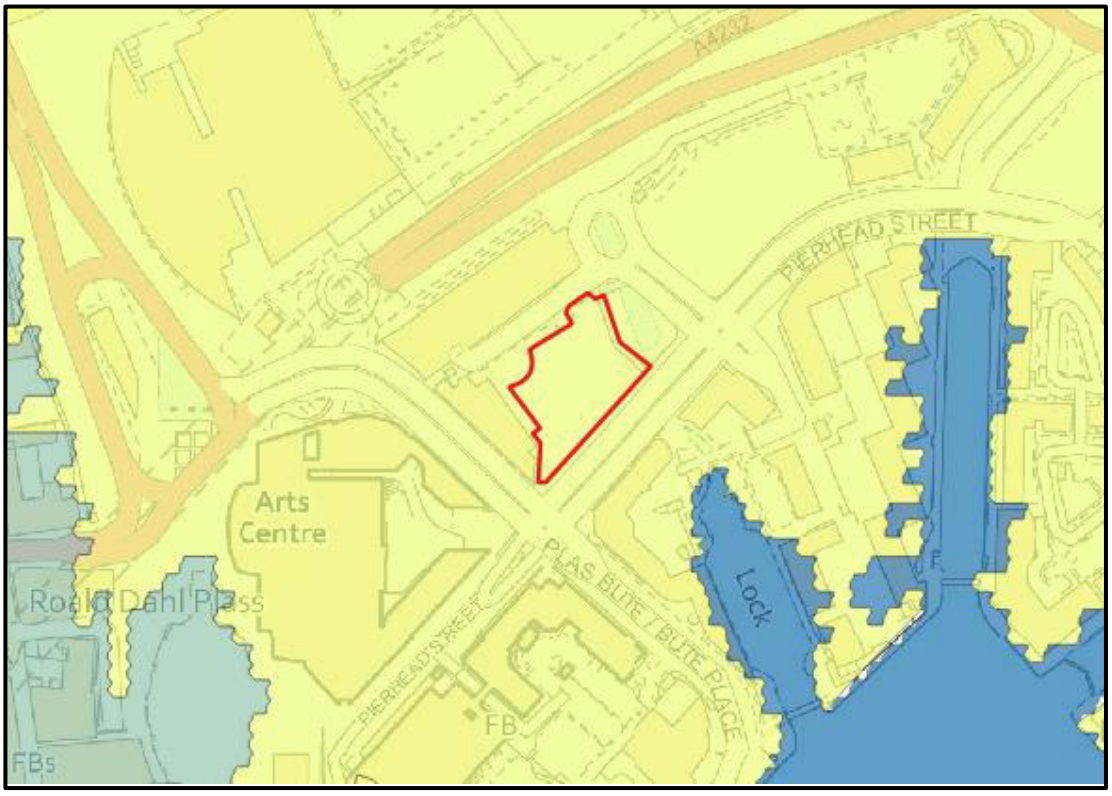

Figure 3.1 Site Location

4 Site Specific Flooding

Historic Flooding

4.1 Natural Resources Wales mapping of historic flood extents does not indicate that the site has been previously impacted by any recent prior flooding incidents.

4.2 The Cardiff City Council Strategic Flood Consequence Assessment (SFCA) (2009)[3] states that within the region of Cardiff Bay, there are numerous historical records of flooding including in 1607, 167, 1770 and 1809. No specific information pertaining to any previous instances of flooding at or within the nearby vicinity of the site are made.

Tidal Flooding

4.3 Inundation of low-lying coastal areas by the sea may be caused by seasonal high tides, storm surges and storm driven wave action. Tidal flooding is most commonly a result of a combination of two or more of these mechanisms, which can result in the overtopping or breaching of sea defences. River systems may also be subject to tidal influences.

4.4 The Flood Risk Assessment Wales Mapping (Figure 4.1) indicates that there are no watercourses/waterbodies in the vicinity of the site that pose a tidal risk to the site. The risk of tidal flooding is therefore negligible.

[3] https://docplayer.net/24872339-Cardiff-strategic-flood-consequences-assessment.html

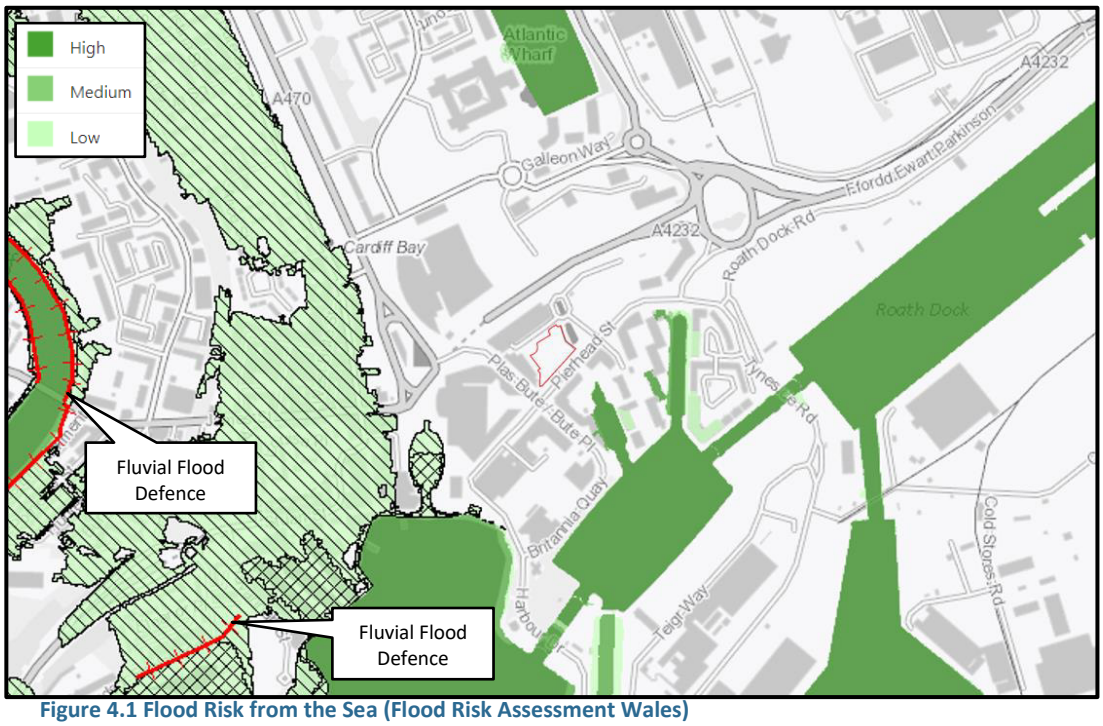

Figure 4.1 Flood Risk from the Sea (Flood Risk Assessment Wales)

Fluvial Flooding

4.5 Flooding from watercourses occurs when flows exceed the capacity of the channel, or where a restrictive structure is encountered, which leads to water overtopping the banks into the floodplain. This process can be exacerbated when debris is mobilised by high flows and accumulates at structures.

4.6 The site is shown to be located outside of the high, medium, and low risk river flood zones on the Flood Risk Assessment Wales mapping (**Figure 4.2**). As a result, the development of the site will result in no loss of fluvial floodplain.

4.7 No additional information alluding to fluvial flooding having occurred at or within the nearby vicinity of the site in recent years was provided in the Cardiff Council SFCA (2009).

4.8 Fluvial flood risk for the proposed development is considered to be low.

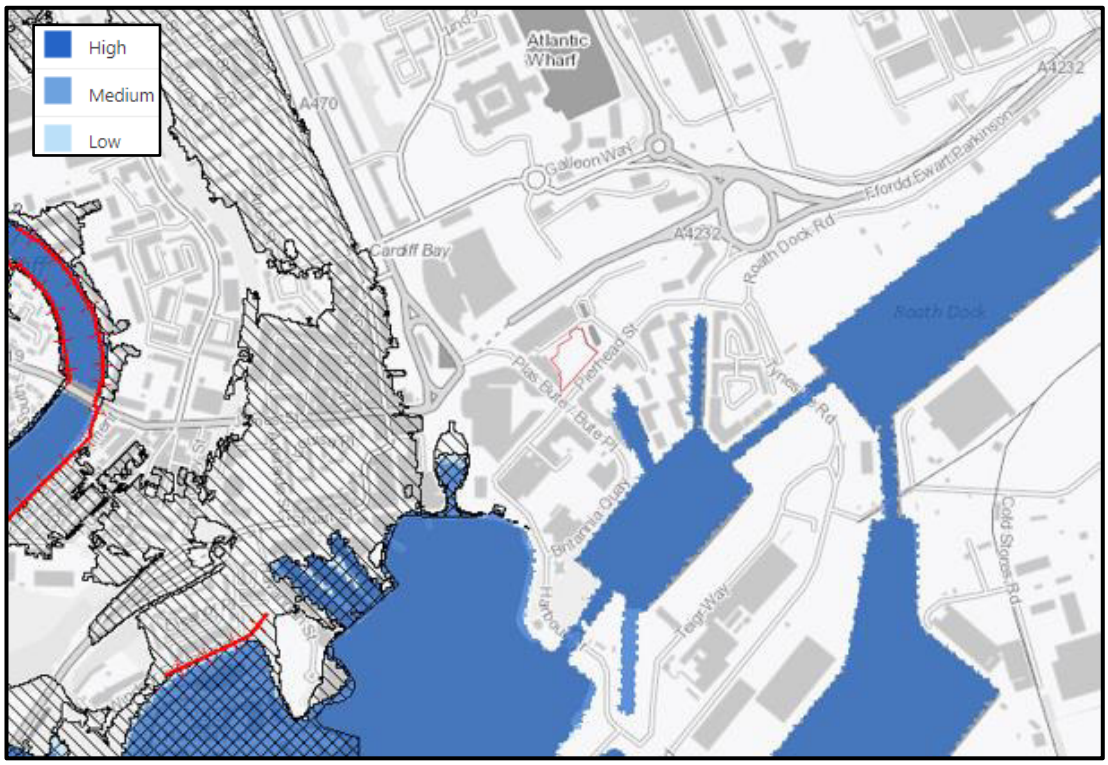

Figure 4.2 Flood Risk from Rivers (Flood Risk Assessment Wales)

Pluvial and Small Watercourses Flooding

4.9 Pluvial flooding can occur during prolonged or intense storm events when the infiltration potential of soils, or the capacity of drainage infrastructure is overwhelmed leading to the accumulation of surface water and the generation of overland flow routes.

4.10 Risk of flooding from surface water and small watercourses mapping has been prepared, this shows the potential flooding which could occur when rainwater does not drain away through the normal drainage systems or soak into the ground but lies on or flows over the ground instead.

4.11 The surface water (pluvial) and small watercourses flood map produced by Natural Resources Wales (**Figure 4.3**) indicates a small area of low risk pluvial flooding in the northeast of the site. **Figure 4.3** also indicates that there is an area of low risk to pluvial flooding on the canal feeder – this is 3m east of the site.

4.12 No information pertaining to incidents of flooding from surface water or small watercourses is provided in the Cardiff City Council SFCA (2009).

4.13 The risk of flooding from small watercourses and surface water to the site is considered to be low.

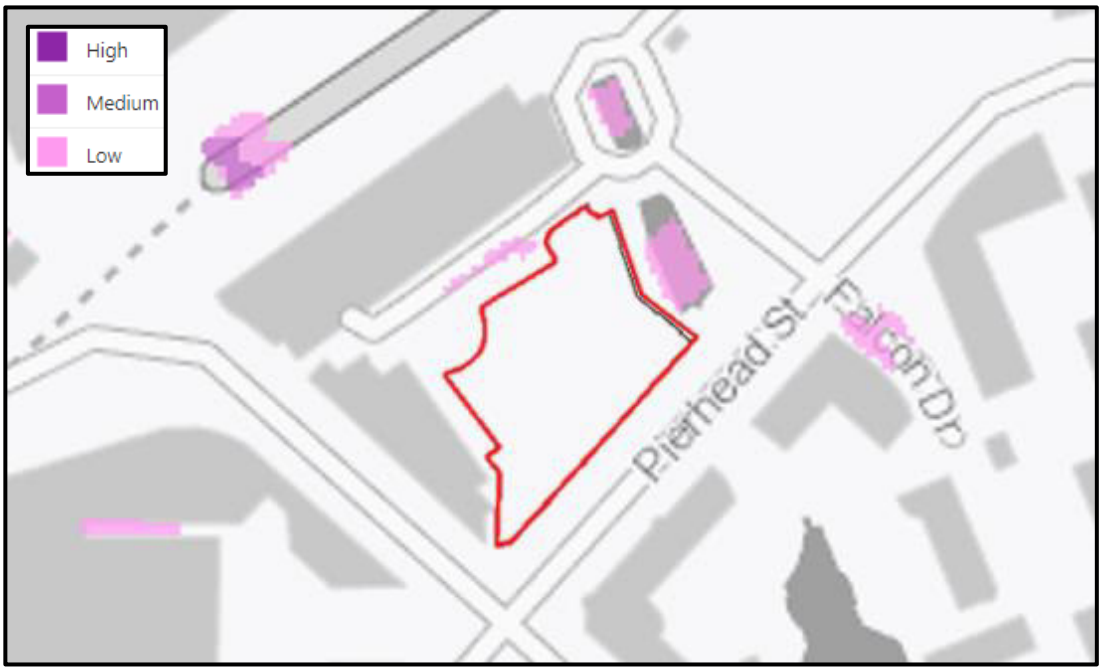

Figure 4.3 Flood Risk from Surface Water and Small Watercourses (Flood Risk Assessment Wales)

Groundwater Flooding

4.14 Groundwater flooding occurs when the water table rises above ground elevations. It is most likely to happen in low lying areas underlain by permeable geology. This may be regional scale chalk or sandstone aquifers, or localised deposits of sands and gravels underlain by less permeable strata such as that in a river valley.

4.15 The Cardiff City Council FRMP (2015) states there is no information on historic groundwater flooding within the city. No information pertaining to groundwater flooding is provided in the Cardiff City Council SFCA (2009).

4.16 The risk of flooding from groundwater at this stage is considered to be low.

Sewer Flooding

4.17 Sewer flooding can occur when the capacity of the infrastructure is exceeded by excessive flows, or as a result of a reduction in capacity due to collapse or blockage, or if the downstream system becomes surcharged. This can lead to sewers flooding onto the surrounding ground via manholes and gullies which can generate overland flows.

4.18 Welsh Water sewer records (**Appendix C)** indicate there is a 375mm public foul sewer within Pierhead Street along the southeast border of the site, alongside a 300mm combined sewer. These are connected at a pumping station on the south-eastern border of the site. A 1,500mm surface water sewer is located at the southern corner of the site.

4.19 Sewer flooding incidents recorded by Welsh Water are noted in the Cardiff City Council SFCA (2009), no instances of flooding are stated to have occurred at or within the nearby vicinity of the site.

4.20 The risk of sewer flooding to the site is therefore considered to be low.

Flooding from Artificial Sources

Reservoirs

4.21 Flooding can occur from large waterbodies or reservoirs if they are impounded above the surrounding ground levels or are used to retain water in times of flood. Although unlikely, reservoirs and large waterbodies could overtop or breach leading to rapid inundation of the downstream floodplain.

4.22 To help identify this risk, reservoir failure flood risk mapping has been prepared, this shows the larger area that might be flooded if a reservoir were to fail and release the water it holds. The map displays a worst case scenario and is only intended as a guide. This identifies that the site isn't at risk form this source.

4.23 The development is considered to be at low risk of flooding from reservoirs.

5 Flood Mitigation Measures

Introduction

5.1 It is important to demonstrate that future users will not be at risk from flood hazards during the lifetime of the development, as well as ensuring that flood risk is not increased elsewhere.

Assessment Findings and Implications

5.2 This assessment undertaken has identified the site to be at low risk from all sources of flooding. The following measures are set out below to further protect the development during its lifetime.

Finished Floor Levels (FFLs)

5.3 It is recommended that FFLs be set a minimum of 150-300mm above the proposed ground levels to provide protection against flooding from surface water runoff.

Ground Levels

5.4 Ground levels should be finished so that overland runoff is encouraged to flow away from the proposed new buildings and directed to the nearest on-site drainage system runoff collection point.

Access and Egress

5.5 Safe pedestrian access/egress is available onto Pierhead Street and the car park access point to access the wider road/street network to the southeast of the site and land to outside the floodplain.

Groundwater

5.6 The potential for shallow groundwater should also be considered during the construction phase of the development, particularly during the excavations. It is recommended that groundwater levels are monitored during the construction phase, and where groundwater is encountered appropriate dewatering should be employed.

Drainage

5.7 To mitigate the proposed developments impact on the current runoff regime through the increased rate of runoff that would result due to the impermeable areas introduced; it is proposed to incorporate surface water attenuation and storage as part of the development proposals. The proposed drainage strategy is discussed within the Drainage Strategy and SAB Technical Note provided separately.

6 Summary and Conclusions

Summary

6.1 This assessment has considered the risk of all types of flooding to the site including tidal, fluvial, surface water, groundwater, sewer and artificial sources and provides measures to ensure that the flood risk to the site is minimised and that flood risk off-site is not increased.

Conclusions

6.2 The site is shown to be located in Zone B. This area is deemed acceptable for development as site levels are greater than flood levels in the extreme (0.1%) flooding event. The site is indicated to be at low risk of flooding from all sources of flooding based on Flood Risk Assessment Wales mapping.

6.3 Profiled ground levels and raised finished floor levels of the proposed buildings will protect the development from any further risk.

6.4 Suitable pedestrian access is available to and from the site to areas outside of the floodplain.

Appendix A – Proposed Development Plans

Figured dimensions only are to be taken from this drawing. All dimensions are to be checked on site before any workis put in hand.

N

0m 5m 10m 15m 20m 25m

VISUAL SCALE 1:250 @ A1

Revision	Description	Date	Issued
01	Issued for comment	25.11.22	ML

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RIBA Chartered Practice

Client's Name
Cardiff 6th Form College

Job Title
Cardiff 6th Form Boarding Hub

Status
Planning

Suitability
S2

Scale
1 : 250 @ A1

Document Reference
21.65-EDS-XX-ZZ-DR-A-(00)201

Drawing Title
Proposed Site Plan

Drawing Number
(00)201

Revision
01

Figured dimensions only are to be taken from this drawing. All dimensions are to be checked on site before any workis put in hand.

0m 2m 4m 6m 8m 10m

VISUAL SCALE 1:100 @ A1

Zone Legend

- Commercial
- House Parent
- Shared
- Staff

Revision	Description	Date	Issued
02	Issued for comment	25.11.22	ML
01	Issued for comment	18.11.22	ML

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Planning

Suitability
S2

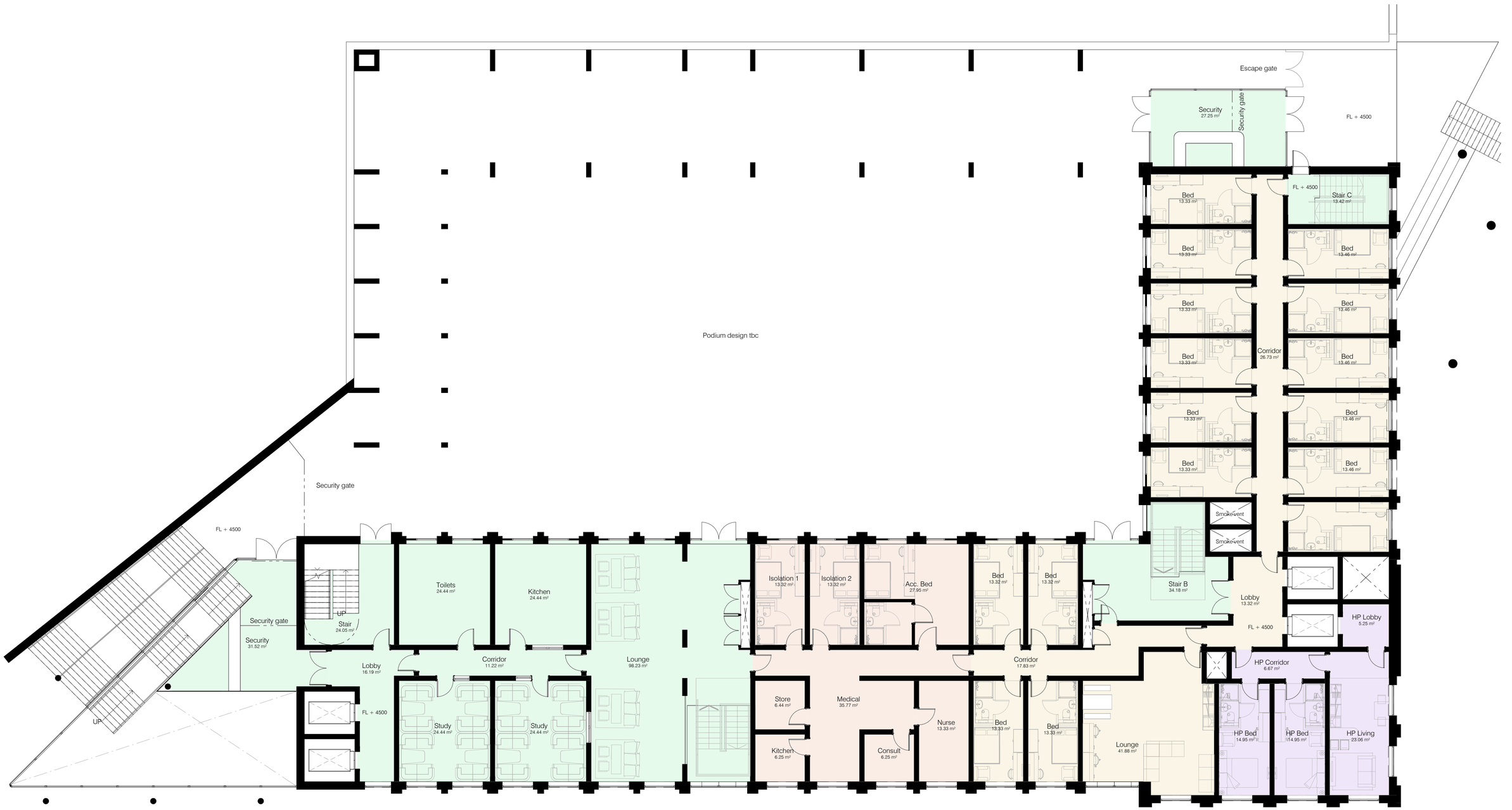
Scale
1 : 100 @ A1

Document Reference
21.65-EDS-XX-00-DR-A-(01)200

Drawing Title
Proposed Ground Floor Plan

Drawing Number
(01)200

Revision
02



Figured dimensions only are to be taken from this drawing. All dimensions are to be checked on site before any workis put in hand.

0m 2m 4m 6m 8m 10m

VISUAL SCALE 1:100 @ A1

Zone Legend

- A-Level
- House Parent
- Shared
- Staff

Revision	Description	Date	Issued
02	Issued for comment	25.11.22	ML
01	Issued for comment	18.11.22	ML

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Status
Planning

Suitability
S2

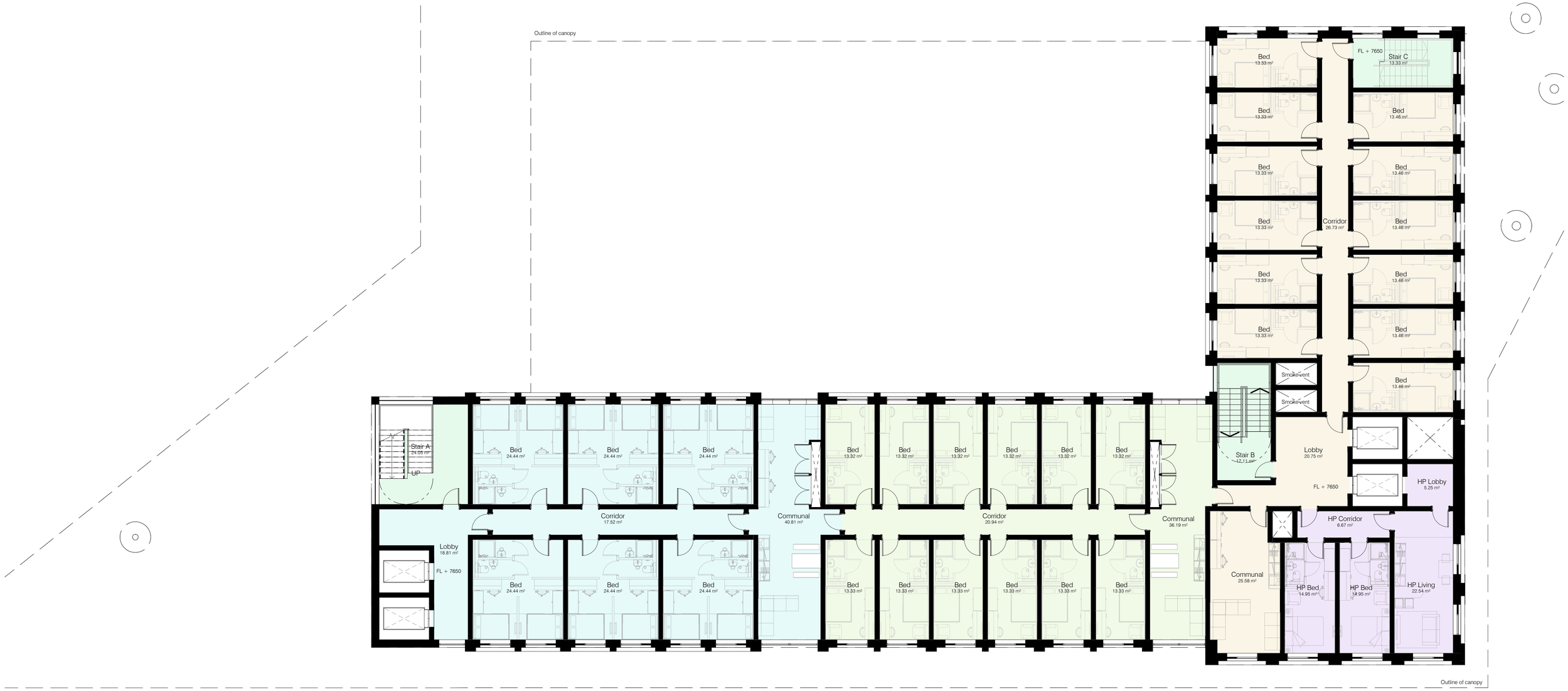
Scale
1 : 100 @ A1

Document Reference
21.65-EDS-XX-01-DR-A-(01)201

Drawing Title
Proposed First Floor Plan

Drawing Number
(01)201

Revision
02



Figured dimensions only are to be taken from this drawing. All dimensions are to be checked on site before any workis put in hand.

0m 2m 4m 6m 8m 10m

VISUAL SCALE 1:100 @ A1

Floor plan repeated from second to ninth floor

Floor Levels
+7650 - Second Floor
+10800 - Third Floor
+13950 - Fourth Floor
+17100 - Fifth Floor
+20250 - Sixth Floor
+23400 - Seventh Floor
+26550 - Eight Floor
+29700 - Ninth Floor

Zone Legend
- A-Level
- GCSE (Single)
- GCSE (Twin)
- House Parent
- Shared

Revision	Description	Date	Issued
02	Issued for comment	25.11.22	ML
01	Issued for comment	18.11.22	ML

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Status
Planning

Suitability
S2

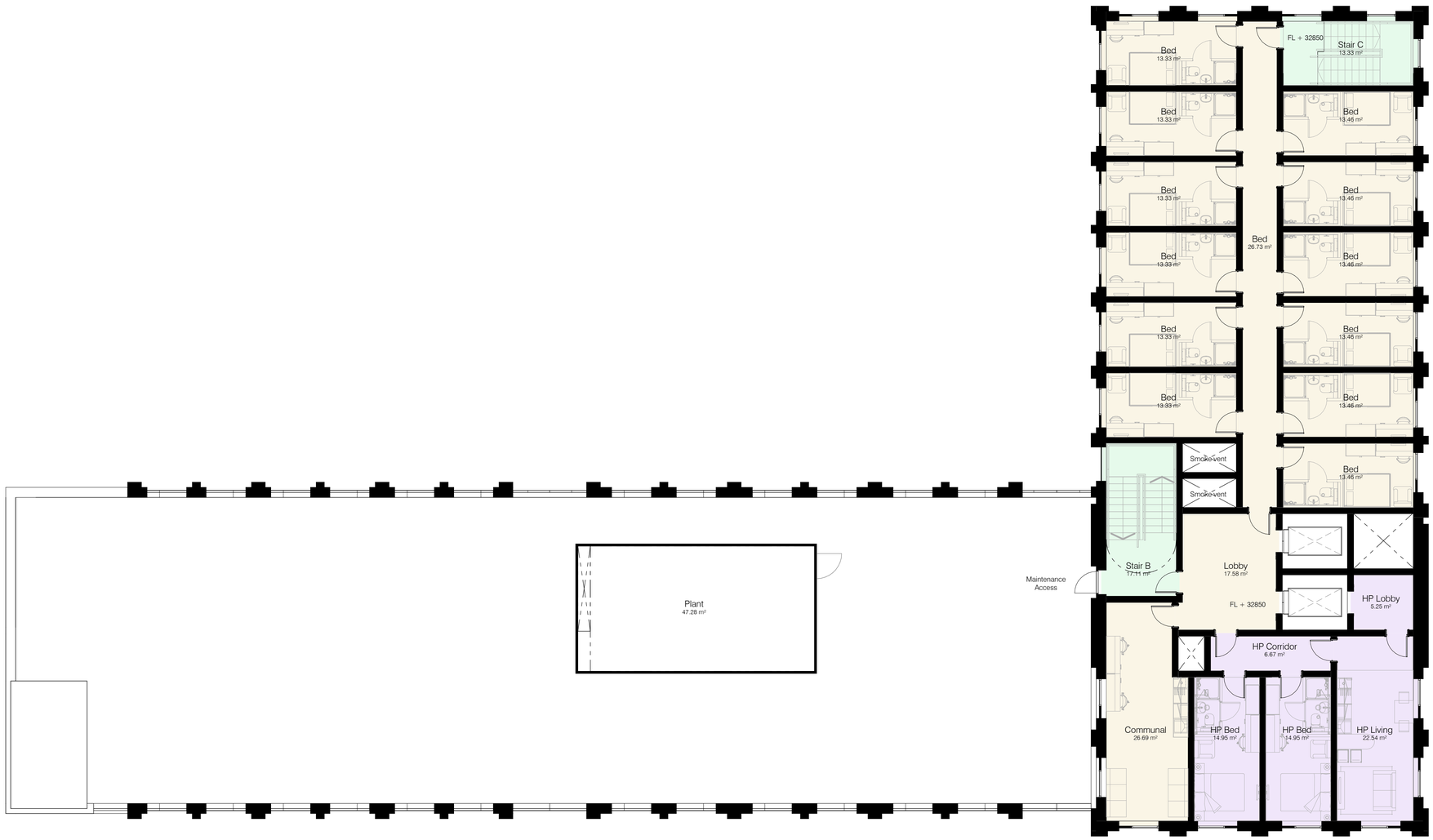
Scale
1 : 100 @ A1

Document Reference
21.65-EDS-XX-02-DR-A-(01)202

Drawing Title
Proposed Second Floor Plan

Drawing Number
(01)202

Revision
02



Figured dimensions only are to be taken from this drawing. All dimensions are to be checked on site before any workis put in hand.

0m 2m 4m 6m 8m 10m

VISUAL SCALE 1:100 @ A1

Zone Legend

- A-Level
- House Parent
- Shared

Revision	Description	Date	Issued
02	Issued for comment	25.11.22	ML
01	Issued for comment	18.11.22	ML

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Cardiff 6th Form Boarding Hub

Status
Planning

Suitability
S2

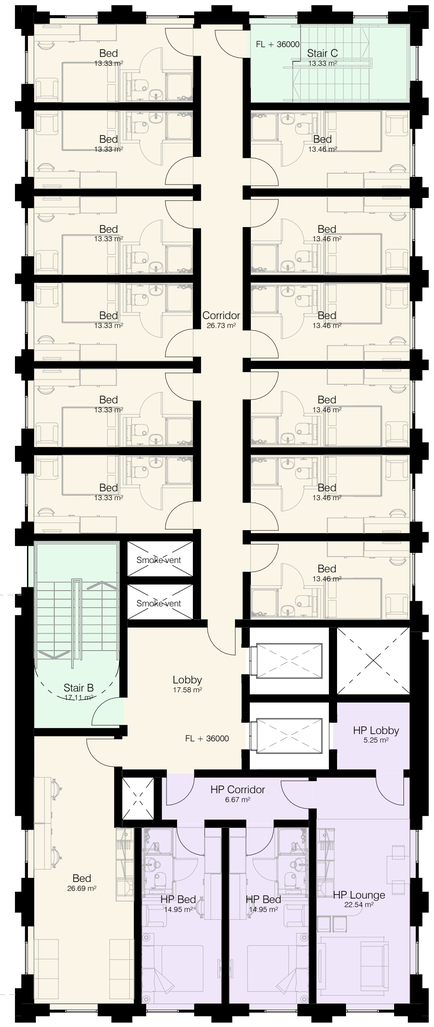
Scale
1 : 100 @ A1

Document Reference
21.65-EDS-XX-02-DR-A-(01)210

Drawing Title
Proposed Tenth Floor

Drawing Number
(01)210

Revision
02



Outline of lower building

Figured dimensions only are to be taken from this drawing. All dimensions are to be checked on site before any workis put in hand.

0m 2m 4m 6m 8m 10m

VISUAL SCALE 1:100 @ A1

Zone Legend

- A-Level
- House Parent
- Shared

Floor plan repeated from eleventh to seventeenth floor

Floor Levels
+36000 - Eleventh Floor
+39150 - Twelfth Floor
+42300 - Thirteenth Floor
+45450 - Fourteenth Floor
+48600 - Fifteenth Floor
+51750 - Sixteenth Floor
+54900 - Seventeenth Floor (top accommodation level)
+58450 - Roof Level

Revision	Description	Date	Issued
01	Issued for comment	25.11.22	ML

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Client's Name
Cardiff 6th Form College

Cardiff 6th Form Boarding Hub

Status
Planning

Suitability
S2

Scale
1 : 100 @ A1

Document Reference
21.65-EDS-XX-02-DR-A-(01)211

Drawing Title
Proposed Eleventh Floor Plan (Typical Tower Floor)

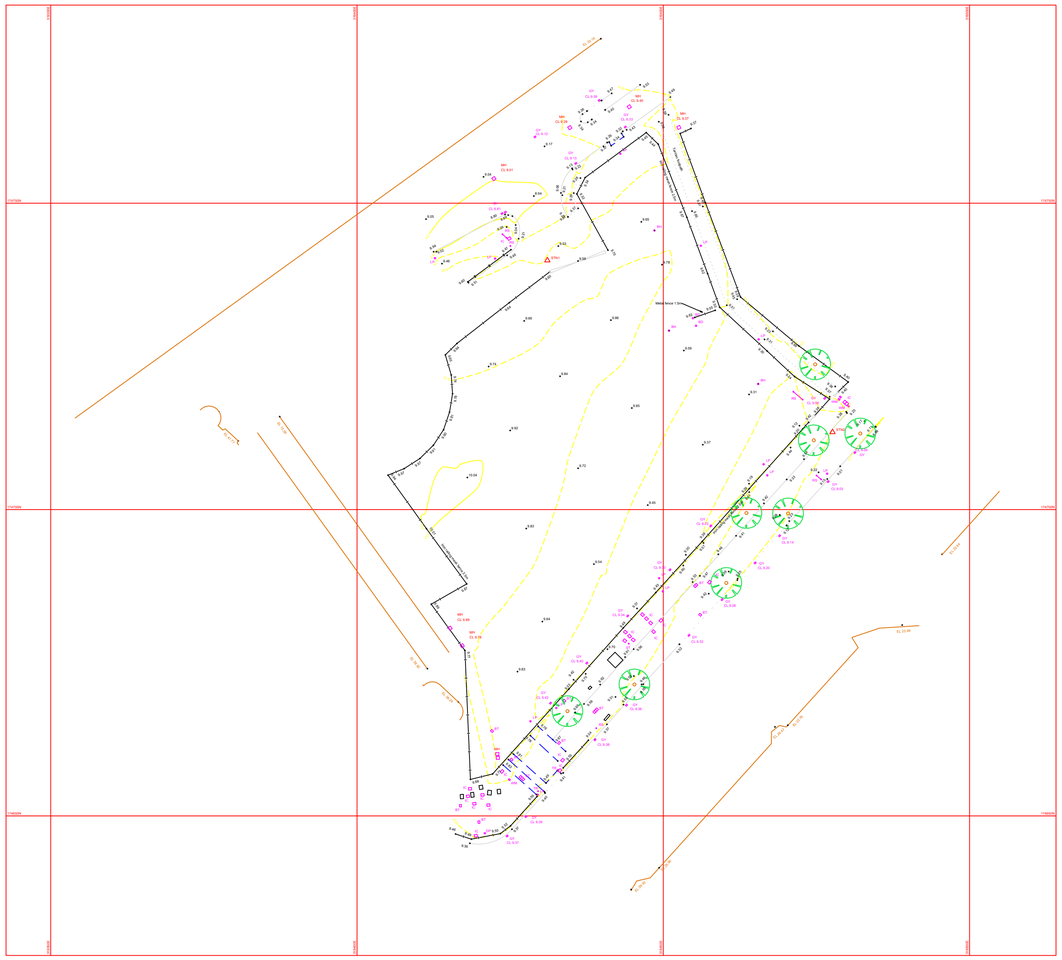
Drawing Number
(01)211

Revision
01

EXPEDITE

Appendix B – Topographical Survey

N



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Abbreviations

BD: Bollard	RW: Retaining Wall	RS: Road Sign
ER: Earth Rod	PR: Post & Rail	IR: Iron Railings
DP: Drain Pipe	BT: British Telecom	WL: Wall
TR: Traffic Lights	PW: Post & Wire	EL: Eaves Level
FH: Fire Hydrant	IC: Inspection Cover	RL: Ridge Level
GY: Road Gulley	ST: Stop Tap	TH: Threshold
MH: Manhole	GV: Gas Valve	FL: Floor Level
LP: Lamp Post	WM: Water Meter	PB: Post Box
BH: Borehole	CB: Crash Barrier	BN: Bin

Topographical Survey

Levels related to OS using GPS equipment

Issue	Remarks	Date

Project
Plot 5
Pierhead Street, Cardiff

Drawn: HJ

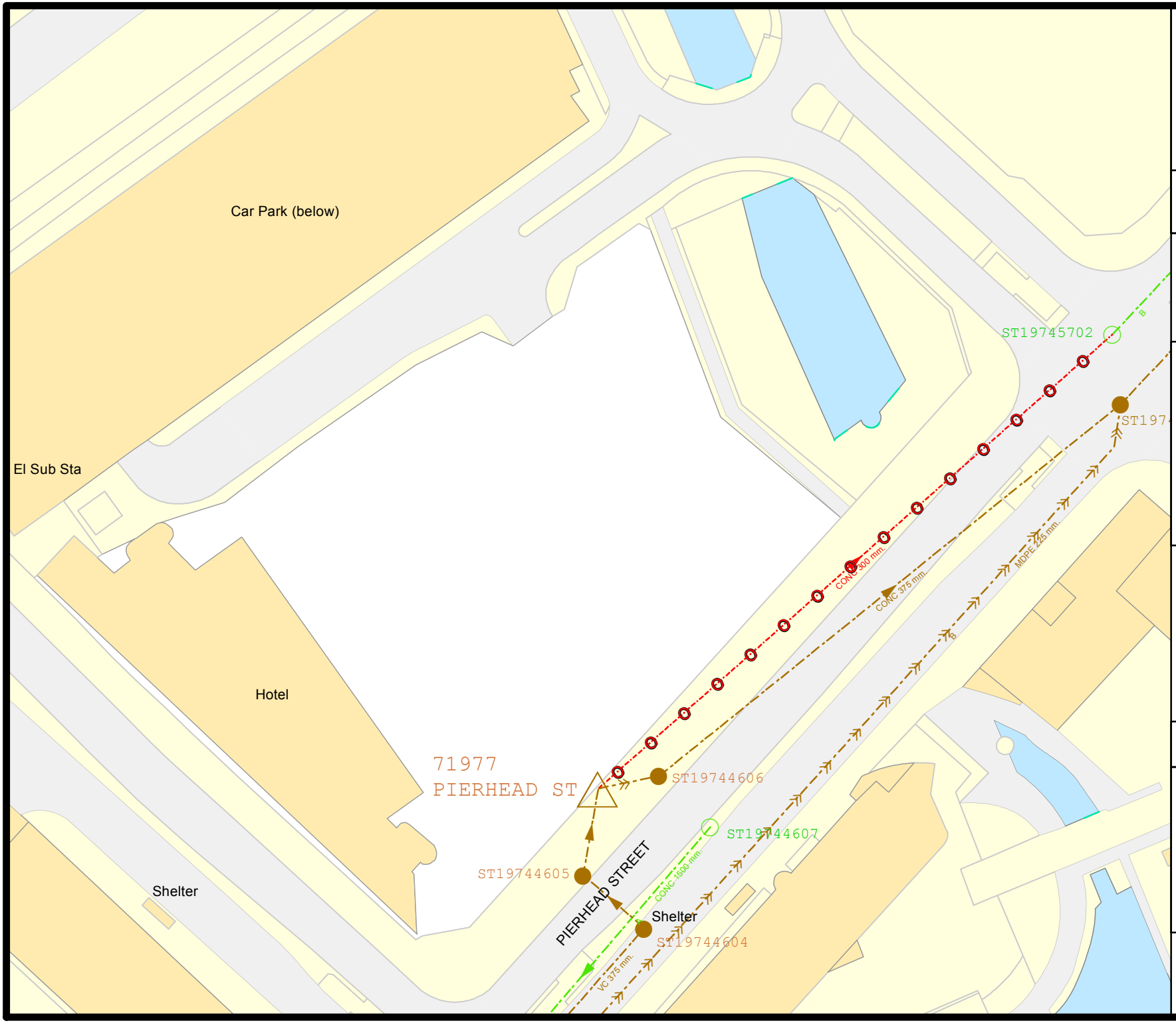
Date: 29/11/21

Scale: A1 1 : 300

Drawing Number: 7021

Client
Expedite

Appendix C – Sewer Records



Dŵr Cymru
Welsh Water

PPA0006629

N
W E
S

LEGEND(Representative of most common features)

Waste network:

- Foul chamber
- Surface water chamber
- Combined chamber
- Combined sewer overflow
- Special purpose chamber
- Treatment works
- Pumping station
- Outfall
- Lamphole
- Storm Overflow
- Rising main
- Gravity sewer
- Private sewer
- 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

Dŵr Cymru Cyfyngedig ('the Company') gives this information as to the position of its underground apparatus by way of general guidance only and on the strict understanding that it is based on the best information available and no warranty as to its correctness is relied upon in the event of excavations or other works made in the vicinity of the company's apparatus. The onus of locating apparatus before carrying out any excavations rests entirely on you. The information which is supplied by the Company, is done so in accordance with statutory requirements of sections 198 and 199 of the Water Industry Act 1991 which is based upon the best information available and, in particular, but without prejudice to the generality of the foregoing, it should be noted that the records that are available to the Company may not disclose the existence of a water main, service pipe, sewer, lateral drain or disposal main and any associated apparatus laid before 1 September 1989, or, if they do, the particulars thereof including their position underground may not be accurate. It must be understood that the furnishing of this information is entirely without prejudice to the provision of the New Roads and Street Works Act 1991 and the Company's right to be compensated for any damage to its apparatus.

Service pipes are not generally shown but their presence should be anticipated.

EXACT LOCATIONS OF ALL APPARATUS TO BE DETERMINED ON SITE.

Map Ref:	319440,174719
Map scale:	1:750
Printed by:	Sara Edwards
Printed on:	28 Apr 2022