Flood Risk and Drainage Assessment

Commercial Development

Dexa, Weston Super Mare

17 Nov 2023

ENVIRONMENTAL AND
SUSTAINABILITY CONSULTANTS

encon associates

Report Reference Number: A6328

Document Control				
Date of first Issue	**Revision**	**Date of Revision**	**Author**	**Checked by**
17 November 2023	-	-	RH	PB

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1.0 Introduction and Site Context

1.1 AAH Consultants have been commissioned to undertake a Flood Risk Assessment (FRA) in support of an outline planning application for a commercial development at Coniston Cresent, Dexa, Western-super-Mare BS23 3SJ (the 'Site'). The development is seeking to build and additional facility opposite the For All Healthy Living Centre(the 'Development').

1.2 As required by the National Planning Policy Framework (NPPF 2019), a site-specific Flood Risk Assessment is required for sites with an area greater than 1 hectare in Flood Zone 1 or development located in Flood Zones 2 or 3.

1.3 The information presented is as follows:

- A background to the site
- An assessment of existing flood risk
- Development proposals
- Surface water management
- Foul water management

The Site

1.4 The Site is located at Coniston Cresent, Dexa, Western-super-Mare, and measures approximately 0.12 ha. The Site lies within the administrative area of North Somerset Council as Local Planning Authority (LPA), North Somerset Council as Lead Local Flood Authority (LLFA), Water is provided by Bristol Water and Sewerage by Wessex Water.

Topography

1.5 The Site topography is gently sloping from the South to the North. Levels fall from approximately 6.10mAOD in the South to approximately 5.38mAOD in the North. A copy of the topographic survey is included in Appendix A.

Geology

1.6 According to British Geological Society (BGS) 1:50,000 scale mapping, the site is generally underlain by bedrock geology of Mercia Mudstone Group – Mudstone and halite-stone. Superficial geology is present across the majority of the Site and is comprised of Tidal Flat Deposits – Clay, silt and sand.

Hydrogeology

1.7 According to BGS 1:625,000 scale mapping, the Site is underlain by a Secondary B bedrock aquifer containing permeable layers capable of supporting water supplies at a local rather than strategic scale.

Hydrology

1.8 A main Flood Risk in the area is the Bristol Channel (River Severn) is situated 1.27 km west of the Site boundary. There is also a water course (Uphill Great Rhyne)150m to the West of the site, which is a tributary of the River Axe.

Environmental Designations

1.9 There are no statutory environmental designations within 1km of the Site boundary.

2.0 Development Proposals

2.1 The Development proposal is to provide an additional annex to the Health Centre. The residential element of the Development is classed as ‘more vulnerable’ in terms of flood risk.

2.2 Please note the Development proposals are very high level at this point. These are shown in Appendix A.

3.0 Existing Flood Risk

3.1 The NPPF sets strict tests to protect people and property from flood risk, which all local planning authorities are expected to follow. Where these tests are not met, national policy is clear that new development should not be allowed.

3.2 For the purposes of applying the NPPF, "flood risk" is a combination of the probability and the potential consequences of flooding from all sources – including from rivers and the sea (fluvial flooding), directly from rainfall on the ground surface (surface water or pluvial flooding) and rising groundwater (groundwater flooding), overwhelmed sewers and drainage systems (sewer flooding), and from reservoirs, canals and lakes and other artificial sources (artificial flooding).

3.3 The following assesses the potential for flood risk from all sources to determine the overall flood risk to the Site. Please note as the extension is below 250m^2, a sequential test is not a requirement in this case.

Fluvial Flood Risk

3.4 According to the Environment Agency's (EA) Flood Map for Planning service (extract provided in **Figure 1 & 2** and full map provided in **Appendix B**), the site lies primarily within Flood Zone 3. The North Sommerset SFRA (Level 1) describes the area at risk from tidal flooding.

Figure 1: Environment Agency Flood Map (Site indicated in red)

3.5 Flood defences are illustrated on the side of the bank of the Uphill Great Rhyne but are not designated as flood defences as they are only basic ground level defences. The Site is designated as an area benefitting from flood defences.

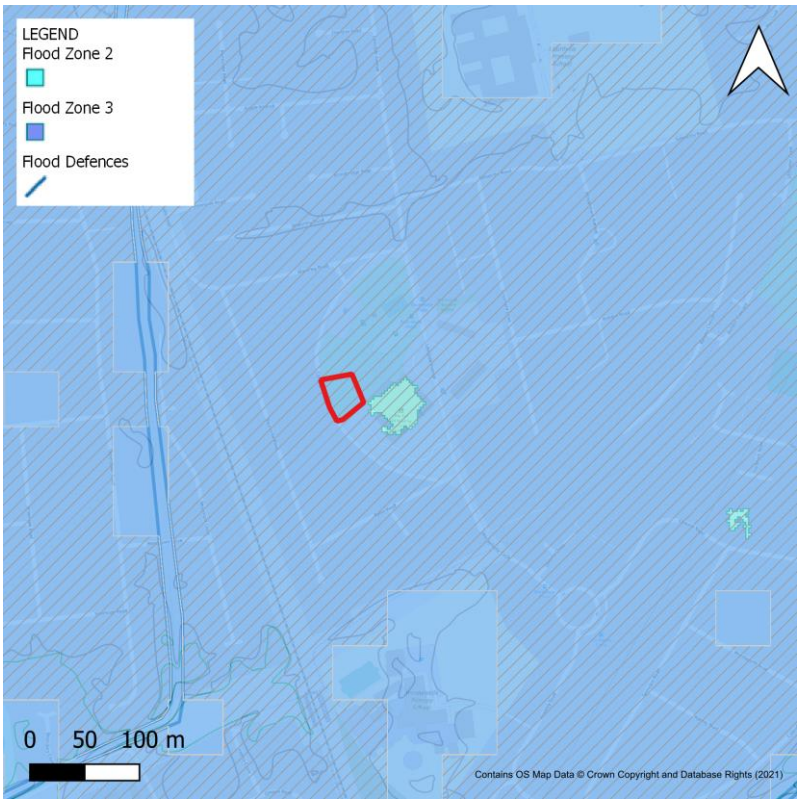


Figure 2 Flood Zones including area benefiting from flood defences (Hatched)

3.6 Steps will be taken in the design to further reduce the risk of flooding to dwellings. The Environment Agency's standing advice for vulnerable developments has been adhered to for the Development's surface water management, access and evacuation and setting of floor levels. For Surface water management, refer to Section 4.0.

Access and Evacuation

3.7 An emergency flood plan should be prepared for users of the Development in the event of a flood defence breach. Flood defence breaches can be caused, generally, for two reasons: failure of a flood defence or inundation of a flood defence by an exceedance flood.

3.8 Failure of flood defences is often unpredictable and sudden. Ongoing monitoring of flood defences helps to identify maintenance requirements; however, there may not be adequate time between the failure of parts of the tidal flood defences and rapid inundation of flood water on the Site to allow sufficient warning for users to evacuate. In this instance, users of the Development should move to higher ground within the buildings to avoid the effects of flood water potentially entering the ground floor.

3.9 Exceedance flood events can be predicted to a degree; however, there is often only days or hours between the prediction of such an event and flooding occurring. The EA work closely with the Met Office to understand when these events are likely to occur and, subsequently, to provide flood warnings, particularly to occupants of properties within flood warning areas.

3.10 The Environment Agency provide three tiers of flood warning, as below (**Figure 3**). In the event of a flood warning or severe flood warning, the emergency flood plan should be enacted.

Figure 3: Environment Agency Flood Warnings

3.11 The emergency flood plan has been outlined below and should be refined through the design and construction process to ensure that it meets the requirements of end users for the final Development:

- Dangers from flooding are always reduced in areas of higher ground level. If there is sufficient warning time, then consideration should be given to relocating from premises to temporary accommodation in a lower flood risk area. A suggested emergency evacuation route to the closest area of Flood Zone 1 is illustrated in **Figure 4**.

- At no point should users venture outside of the building to areas that are flooded. Flood water can create hidden obstacles, such as missing manhole covers and large debris. In rapid inundation and channelised areas, debris and vehicles can be mobilised, which creates further hazards. These hazards can lead to serious injury or death. In all flood events, users should listen to the messages relayed from emergency services and the Environment Agency.

3.12 Access and evacuation from the Development can be gained from the primary route via Coniston Cresent/ Waverley Road/ Bournville Road (Heading North)/ Crossing at the railway bridge/ Dumfries Place/ North on Malvern Road.

3.13 The area is covered by the Environment Agency's flood warning service. As this is a proposed commercial development, all property managed should sign up for the flood warning service to ensure that any necessary action can be taken in the event of a predicted flood.

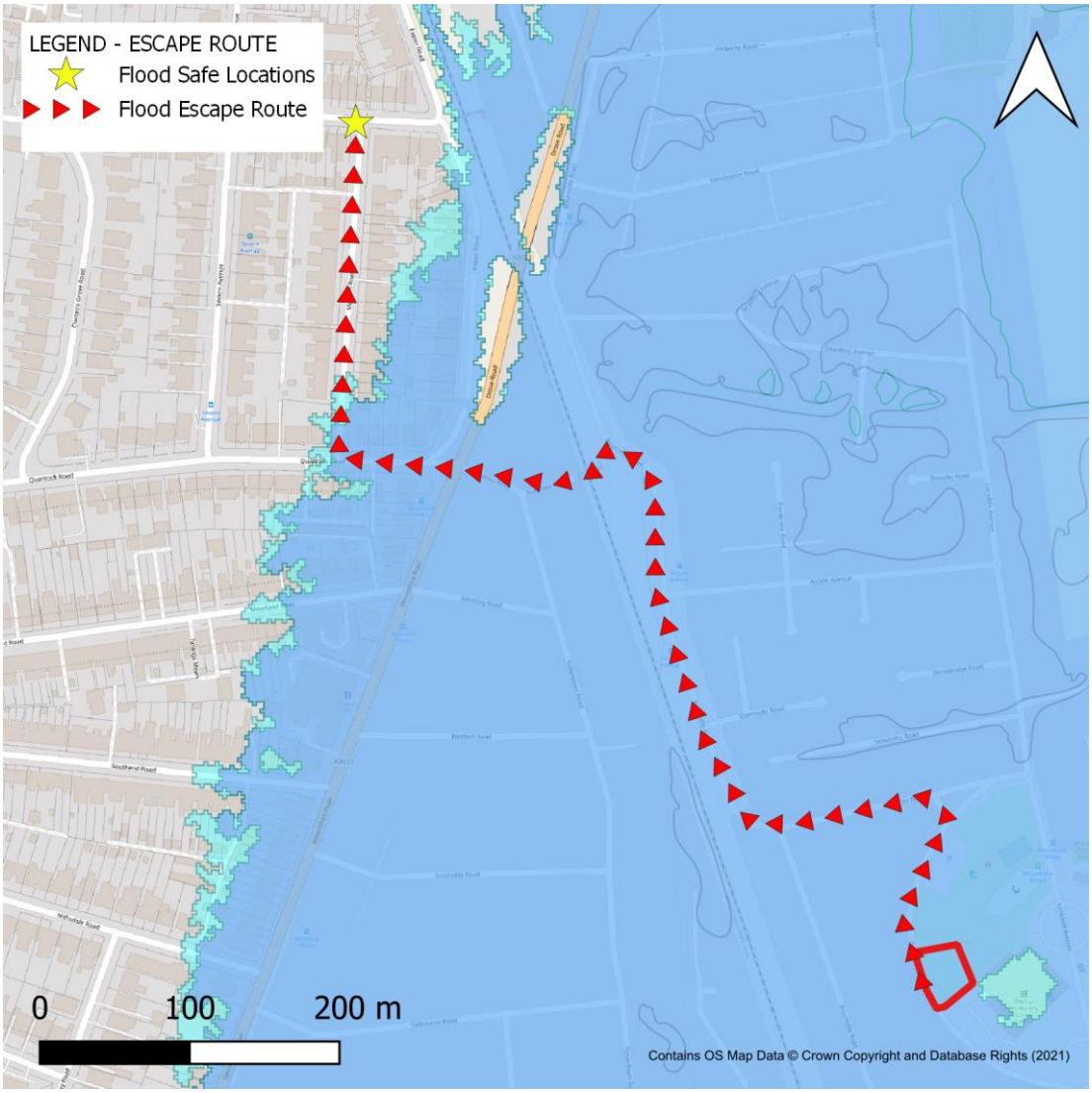


Figure 4: Indicative emergency evacuation route

Finished Floor Levels

3.14 A Freedom of Information request was made to the Environment Agency in Oct 2023 for Product 4 flood risk assessment information. Predicted flood levels were provided by the Environment Agency in November 2023, and a full set of the data provided is contained in Appendix B.

3.15 The maximum predicted flood levels are shown in the table below and occur based on the boundary of Site. In line with the standing advice, finished ground floor levels should be a

minimum of 600mm above the average ground level of the Site, the adjacent road level or the estimated river or sea flood level, whichever is higher. The Flood Zone 3 flood level is approximately 6.35mAOD based on lidar for a 1 in 1000 year event (0.1%AEP), therefore we recommend that the finished floor levels are 6.95mAOD.

3.16 As can be seen by **Figure 5,** the building is close to being affected by a 1 in 200 event corrected with climate change to the year 2118 year event with a breach to the defences. The likelihood of this happening is very low as the defences are checked yearly. We would still suggest that the building ensure that flood resistance and resilience measures are put in place as additional protection.

Return Period Per year (AEP)	Modelled Water Level Level (mAOD) Defended	Modelled Water Level Level (mAOD) Undefended
1in5 (20%)	0	5.95
1in200 (0.5%)	0	6.2
1in200 (0.5%) +2068 CC	0	6.39
1in200 (0.5%) +2118 CC	5.67	6.92
1in1000 (0.1%)	0	6.35

Figure 5 Flood Levels for return periods

Flood Resistance and Resilience Measures

3.17 To mitigate against damage to buildings and contents in more extreme flooding events, buildings should be made appropriately flood resistant and resilient by the incorporation of the following techniques where reasonably practicable:

- Using flood resistant materials that have low permeability (such as ceramic/porcelain floor tiles, waterproof plaster and waterproof skirting boards) to at least 600mm above the estimated flood level.
- Ensuring that any openings within the building fabric (such as doors, windows, ventilation openings and service penetrations) are flood resistant to at least 600mm above the estimated flood level.
- Raising all electrically sensitive equipment, wiring, components and sockets to at least 600mm above the estimated flood level. This should also include fuse boxes (or consumer units) and electric meters where possible.

- Ensuring that all internal waste drainage pipes are fitted with backflow prevention devices (or non-return valves) and that these are located in positions that are easily accessible for inspection and maintenance.
- Ensuring that there is adequate access to all spaces that are at risk of flooding to enable drying and cleaning following a flood.
- Ensuring that floors are flat and sealed or that sumps and pumps are fitted to facilitate the removal of water following a flood.

3.18 The above recommendations do not comprise an exhaustive list of the measures that can be incorporated. Standards for the installation and retrofit of resistance measures are available in British Standard 851188-1:2019+A1:2021, and a full suite of good practice flood resilience measures is available in CIRIA C790A, C790B and C790C.

3.19 Standards for materials and design approaches that will speed the recovery of buildings after flooding are available in British Standard 85500:2015.

3.20 It is recommended that flood resistance and resilience measures are considered during the design process, discussed with the building contractor and coordinated with all contractors to ensure that the effects of flooding on the building and users are minimised.

Pluvial and Sewer Flood Risk

3.21 Intense rainfall, particularly in urban areas, can create run-off, which temporarily overwhelms the capacity of the local drainage systems. Under these conditions, localised 'flash' flooding can occur. In addition, surface water sewers can flood into foul sewers and overload both the surface water and combined sewer networks. This type of flooding is especially problematic when these systems become overloaded simultaneously.

3.22 The EA flood map for surface water (FMfSW) divides England and Wales into areas with a very low, low, medium and high risk of pluvial flooding. 'Very low' means that each year this area has a chance of flooding of less than 1 in 1000 (0.1%). 'Low' means that each year this area has a chance of flooding of between 1 in 1000 (0.1%) and 1 in 100 (1%), 'Medium' means that each year this area has a chance of flooding of between 1 in 100 (1%) and 1 in 30 (3.3%) and 'High' means that each year this area has a chance of flooding of greater than 1 in 30 (3.3%).

3.23 According to the available data (**Figure 6 & Appendix B**), the Site is at low risk of pluvial flooding, just catching one corner of the site at 1in1000 (0.1%AEP). This can be managed via the surface water drainage design

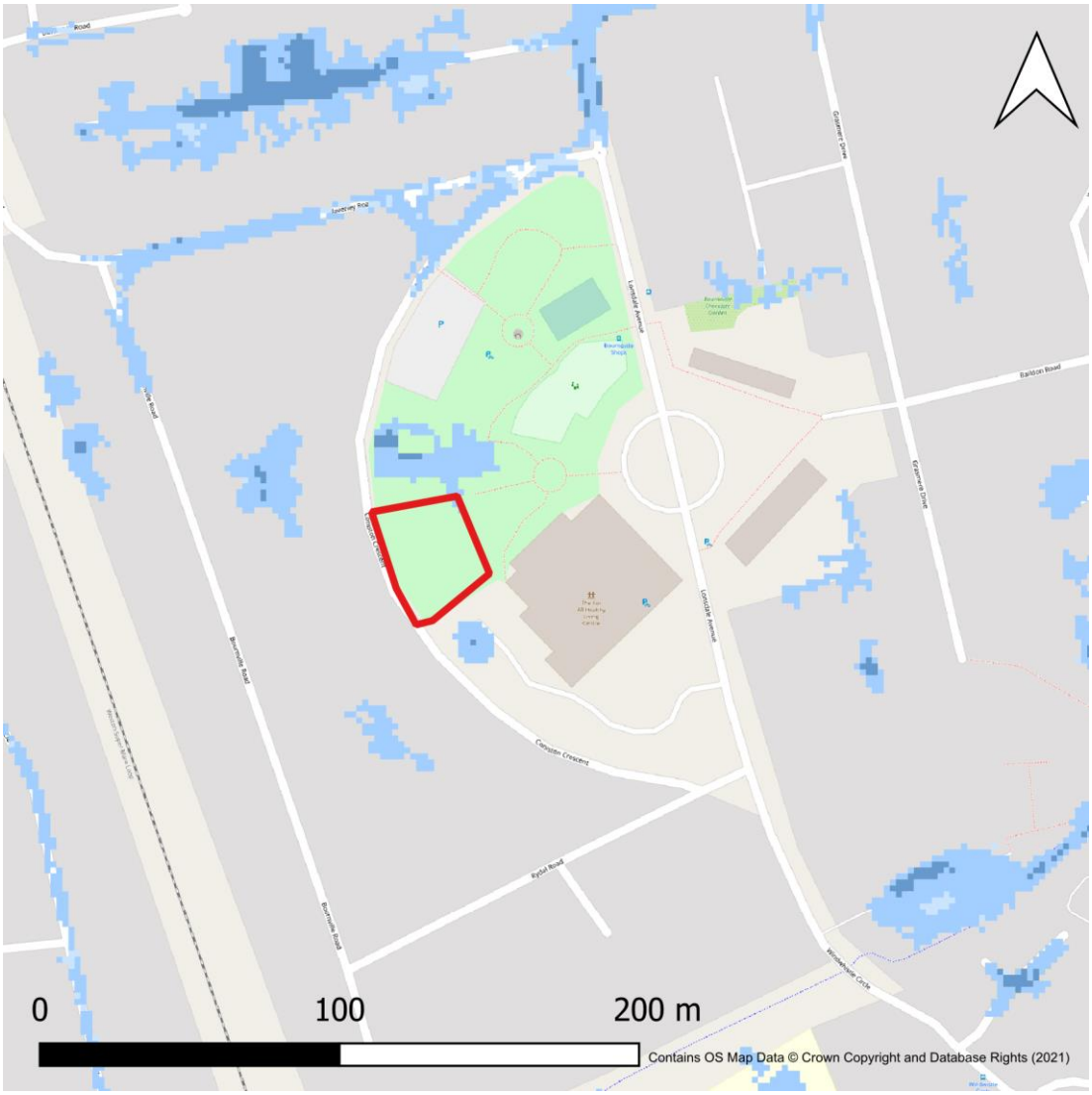


Figure 6: Flood Risk from Surface Water (Site indicated in red)

Groundwater Flood Risk

3.24 Groundwater flooding is most commonly caused by rainfall, which causes the groundwater table beneath a site to rise and eventually exceed ground level. Groundwater flooding can also occur where the water table is sufficiently close to the site surface that it inundates subterranean development. Like other sources of flooding, groundwater flooding will be affected by increased rainfall attributable to climate change.

3.25 According to the North Summerset Council Level 1 Strategic Flood Risk Assessment, there have been no recorded instances of groundwater flooding within the district, but rates the risk from >25% to = <50%. This does not mean that groundwater flooding has not occurred, but rather that it has not been reported.

3.26 Due to the proximity of Bristol Channel and the ground makeup of the soil, it is likely that the groundwater level within the Site soils will correlate partially with the level of water in the

Bristol Channel. As such, it should be assumed that groundwater could be present near the ground surface, particularly during winter months.

3.27 In the event that groundwater emerges at the surface level, it is likely to be exhibited as overland surface water flow and would follow the topography to the lower elevations within the south of the Site.

Artificial Flood Risk

3.28 The EA 'Risk of Flooding from Reservoirs' map indicates areas where peoples' lives would be in danger as a result of an uncontrolled release of water from a reservoir or static body of water. The EA risk of flooding from reservoirs map indicates that the Site is not at risk from this source. As such, the risk of flooding from reservoirs is deemed to be low.

Overall Flood Risk

There is an overall existing flood risk to the Site from tidal flooding on the location this area is protected by defences. [Additional info from Product 4 required]

4.0 Surface Water Drainage

Surface Water Existing

4.1 The site has a small car park to the front and the units to the back, therefore, the site will have small swales to the back of the car parking spots, which will attenuate through a permeable paving system under the car parking area. This will then be collected through a number of transmission pipes to a hydrobrake, which will restrict flows into the main SW sewer in the road to 3l/s (This is to prevent the hydrobrake being too small and below 75mm i.e. size of a coke can). A new connection will have to be made to the Bristol Water 300mm SW sewer.

SuDS Management Train

4.2 The SuDS Manual C753 emphasises the multiple benefits that Sustainable Drainage Systems (SuDS) can provide. The underlying requirements of SuDS are to deliver reduced water quantity to receiving waters, improve water quality for receiving waters, provide high-quality amenity value to local residents and provide biodiverse habitats for wildlife. The SuDS components presented below have been chosen based on the characteristics of the Site and the Development proposals. Despite the method of surface water disposal chosen, SuDS features should be incorporated to provide a holistic, sustainable drainage system.

Permeable Paving

4.3 Permeable paving should be considered for use on the access roads, private drives and curtilage driveways. The local highway authority may have specific requirements for the design, specification and construction of permeable paving within the adopted highway. Permeable paving provides direct treatment of surface water run-off within the most contaminated areas of a residential development, namely the carriageway. Permeable paving can also provide conveyance and attenuation (with due regard to check dams) of surface water and maintain surface water drainage at and near the surface. Permeable paving provides water quality benefits by passively filtering suspended solids, hydrocarbons and heavy metals from the collected surface water.

Bioretention Systems

4.4 Roof water can be collected and conveyed through traditional rainwater downpipes, which are then disconnected at ground level to discharge into a rain garden or bioretention features within private gardens. Highway run-off can be directed over flush kerb edges into bioretention features to aid in treatment, volume reduction and attenuation of stormwater. Pre-treatment can be provided by filter strips, and bioretention features can be drained with

filter drains to the base. Rain gardens can be used as a source control method to reduce flow velocities, provide attenuation storage at source and maintain surface water collection and conveyance at surface level.

Hydraulic Design

4.5 A surface water drainage system will be required to accommodate storm return periods up to 1 in 100 year + 40% climate change allowance without any flooding leaving the Development boundary. Run-off generated from storms up to 1 in 30 year return period must be contained below ground or within designated open water features.

4.6 Allowance should be included for urban creep to accommodate minor extensions to dwellings and driveways. For a spacious development, an urban creep factor of 10% should be applied to the impermeable area.

4.7 Surface water drainage should be designed in accordance with the Water UK Sewerage Sector Guidance and, particularly, the Design and Construction Guidance to conform with the best practice requirements for adopting WaSCs.

Water Quality

4.8 The water quality treatment train has been determined based on the CIRIA SuDS Manual. The appraisal of the Site's characteristics and suitable suggested SuDS components is presented below, demonstrating that the relevant indices can be met. The use of SuDS will also assist in improving water quality within the Source Protection Zone.

Minimum water quality management requirements for discharges to receiving surface waters and groundwater (SuDS Manual, 2015, Table 4.3)		
Land use	**Pollution hazard level**	**Requirement for discharge to surface waters and groundwater**
Residential roofs	Very low	Removal of gross solids and sediments only
Individual property driveways, residential car parks, low traffic roads (e.g. cul de sacs, home zones, general access roads)	Low	Simple index approach
Steps in the simple index approach (SuDS Manual, 2015, Box 26.2): 1. *Allocate suitable pollution hazard indices for the proposed land use* 2. *Select SuDS with a total pollution mitigation index that equals or exceeds the pollution hazard index* 3. *Where the discharge is to protected surface waters or groundwater, consider the need for a more precautionary approach*		
Pollution hazard indices for different land use classifications (SuDS Manual, 2015, Table 4.3)		

Land use	Pollution hazard level	Total suspended solids TSS	Metals	Hydrocarbons
Residential roofs	Very low	0.2	0.2	0.05
Individual property driveways, residential car parks, low traffic roads (e.g. cul de sacs, home zones, general access roads)	Low	0.5	0.4	0.4
Indicative SuDS mitigation indices for discharges to surface waters (SuDS Manual, 2015, Table 26.3)				
Type of SuDS component		**TSS**	**Metals**	**Hydrocarbons**
Permeable Pavement		0.7	0.6	0.7
Bioretention Systems		0.8	0.8	0.8

Maintenance Plan

4.9 It is prudent as part of the planning application to consider the future maintenance and operation of SuDS, including the continued realisation of any non-drainage related benefits such as visual amenity, habitat and biodiversity. This section outlines the maintenance arrangements and the requirements for key SuDS components.

Management Arrangements

4.10 **Developer Maintenance**; because the proposals are for residential dwellings, which it is anticipated would be sold on a freehold basis, it is improbable that the developer/Site owner will be in a position to undertake maintenance of SuDS in perpetuity. Should the developer wish to retain responsibility for the maintenance of SuDS, the Local Authority would require details of how this future maintenance is to be funded without imposing unfair charges on owners/occupiers in the associated planning application.

4.11 **Service Management Companies;** Responsibility for maintenance of drainage systems could be subcontracted and included within the responsibilities of a service management company, as is often the case for the management of public spaces within new developments. Funding for SuDS maintenance would be included within the regular maintenance fees payable by the owners/occupiers. The developer is responsible for demonstrating that there is a binding requirement on owners/occupiers to pay the required fee, common for the provision of an agreement to be secured by planning condition. It is proposed that the use of a service management company would be most suitable for this Development.

Key Component Requirements

4.12 To ensure that SuDS components operate efficiently over the lifetime of the Development it is fundamental that routine maintenance duties are undertaken. The areas of the Site drainage system which require regular maintenance are those where silt and debris

accumulate, limiting the storage or conveyance function of individual components, which in turn exacerbates the probability of drainage system failure. Regular maintenance requirements broadly relate to the following components:

- Permeable Pavement
- Bioretention Systems

4.13 The provision of the final maintenance schedule will, in the first instance, be reliant on the type of SuDS ultimately incorporated into the scheme, and subsequently, matters such as a legal agreement for maintenance funding in perpetuity. While the provision of a detailed SuDS management/maintenance schedule should be secured through planning condition, a typical example is outlined below (including **Table 1, Table 2**) for each of the key components. Ultimately, the developer is responsible for ensuring that full instructions for maintenance, along with the details of any parts that may need to be replaced, are provided to the appropriate person(s).

Table 1: Permeable Paving Maintenance Requirements

Maintenance Schedule	Required Action	Typical frequency
Regular Maintenance	Remove litter and debris	Monthly (or as required)
	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this is most likely to collect the most sediment
Occasional Maintenance	Stabilise and mow contributing adjacent areas	As required
	Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than spraying	As required, once per year on less frequently used pavements
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50mm of the level of the paving.	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation

	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly, 48 hours after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

Table 2: Bioretention Systems Maintenance Requirements

Type	Required Action	Typical frequency
Regular Inspections	Inspect infiltration surfaces for silting and ponding, record de-watering time of the facility and assess standing water levels in underdrain (if required) to determine if maintenance is required.	Quarterly
	Check operation of underdrains by inspection of flows after rain.	Annually
	Assess plants for disease, infection, poor root growth, invasive species etc and replace as necessary.	Quarterly
	Inspect inlets and outlets for blockage	Quarterly
Regular Maintenance	Remove litter, surface debris and weeds	Quarterly (or more frequently for tidiness or aesthetic reasons)
	Replace any plants to maintain planting density	As required
	Remove sediment, litter and debris build up from around inlets	Quarterly to biannually
Occasional Maintenance	Infill any holes or scour in the filter medium, improve erosion protection if required	As required
	Repair minor accumulations of silt by raking away surface mulch, scarifying surface of medium and replacing mulch	As required
Remedial Actions	Remove and replace filter medium and vegetation above	As required but likely to be > 20 years

Development Flood Risk

4.14 The incorporation of a Sustainable Drainage System, coupled with infiltration disposal or restricted discharge rates to the current and the enaction of long term maintenance plans, flood risk from the Development is considered very low. Flood risk from the proposed Development to the Site and elsewhere will not be increased as a result of the proposals.

5.0 Foul Water Drainage

5.1 Foul water is proposed to be disposed of to the Bristol Water public foul sewer network. The existing main runs from the back of the site, this will need to be located/ checked before connection is made.

5.2 It is estimated that a maximum flow of 4000 litres per dwelling per day will be disposed of to the foul sewer (taken from the Water UK Sewerage Sector Guidance). This equates to an average discharge rate of 0.046l/s.

5.3 Foul water drainage should be designed in accordance with the Water UK Sewerage Sector Guidance and, particularly, the Design and Construction Guidance to conform with the best practice requirements for adopting WaSCs.

6.0 Conclusion

6.1 A Flood Risk Assessment has been produced in accordance with guidance within the National Planning Policy Framework (August 2022).

6.2 The site lies primarily within a Tidal Flood Zone 3.

6.3 Flood defences are illustrated on either side of the bank of the Uphill Great Rhyne, but are not regarded as official flood defences. The Site is designated as an area benefitting from flood defences.

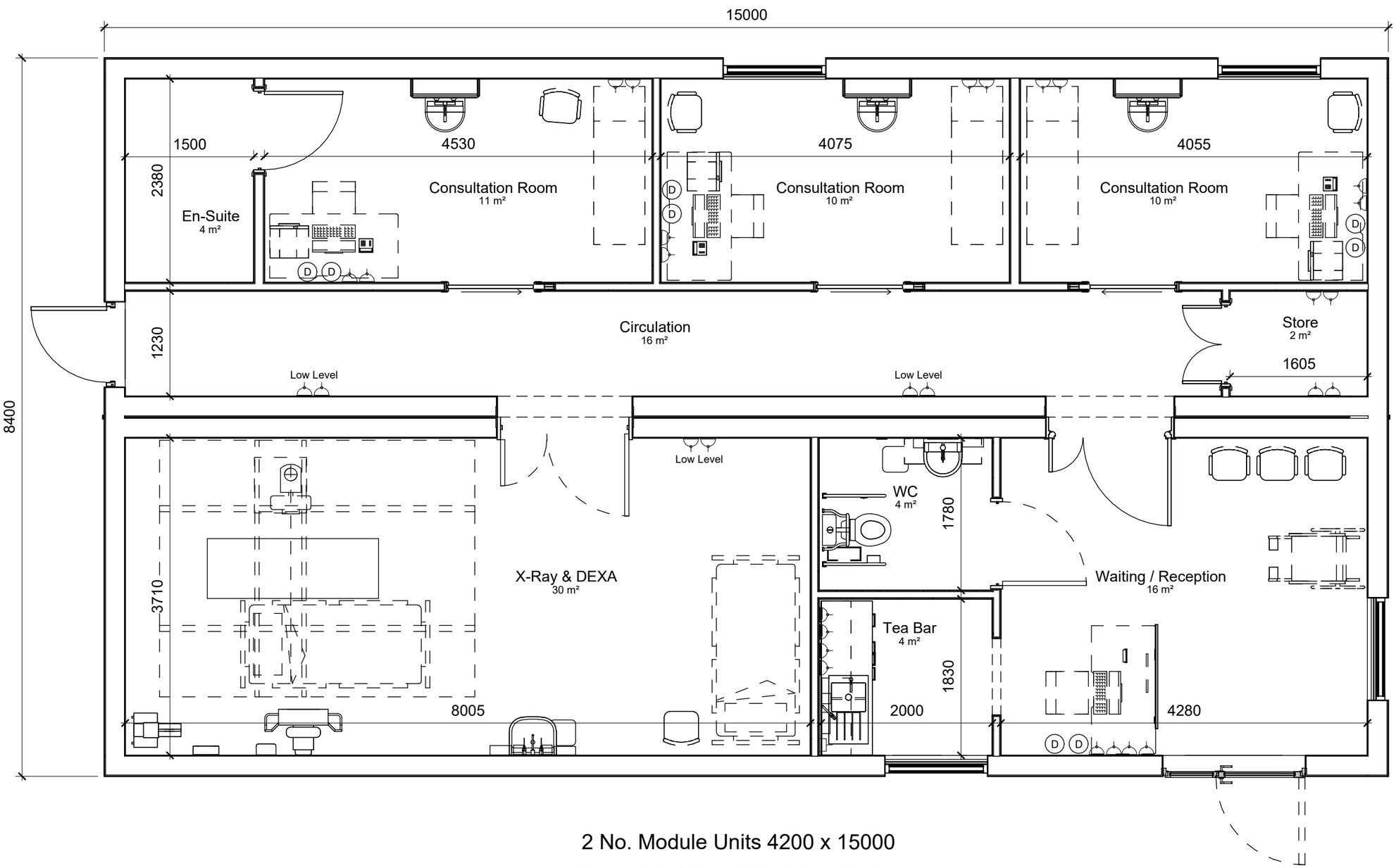
6.4 The site is primarily within Flood Zone 3, based on the failure of the flood defences on a 1 in 1000 year event, therefore a resilient design will be proposed, with appropriate FFL.

6.5 Flood risk from the proposed Development to the Site and elsewhere will not be increased as a result of the proposals.

6.6 Sustainable Drainage System (SuDS) features should be incorporated into the design to achieve the underlying principles of SuDS: reduction of water volume, improvement of water quality, high-value amenity and increased biodiversity.

APPENDIX A:

INITIAL SITE PROPOSALS



Electrical Key

- D — Data Socket
- Fused Spur
- Double Socket

0 0.5m 1.5m 2.5m

Scale: 1:50

2 No. Module Units 4200 x 15000

Exernal Walls 244mm Width (Actiform Standard).
Internal Walls 100mm Width (Actiform Standard).

Note.
Furniture & Fixings for illustration purposes only and only to be used as a guide.

Actiform
www.Actiformgroup.co.uk
Queens Buildings, Lowlands Road, Mirfield
West Yorkshire, WF14 6LX
01924 498557
Modular Buildings Designed For A Changing World

Actiform Project Name:	Actiform Project Number:
2 Bay	6990
Client Organisation:	**Project Address:**
InHealth	

Drawing / Information Description:

Proposed Layout

Unique ID:

Project:		Originator		Functional		Spatial		Form		Discipline		Number
6690	-	ACT	-	XX	-	XX	-	DR	-	A	-	0001

Status:		Revision
Code:	Purpose:	Code:
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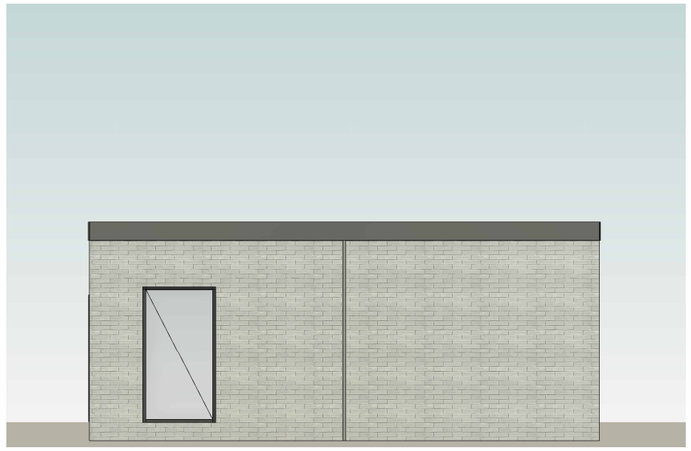

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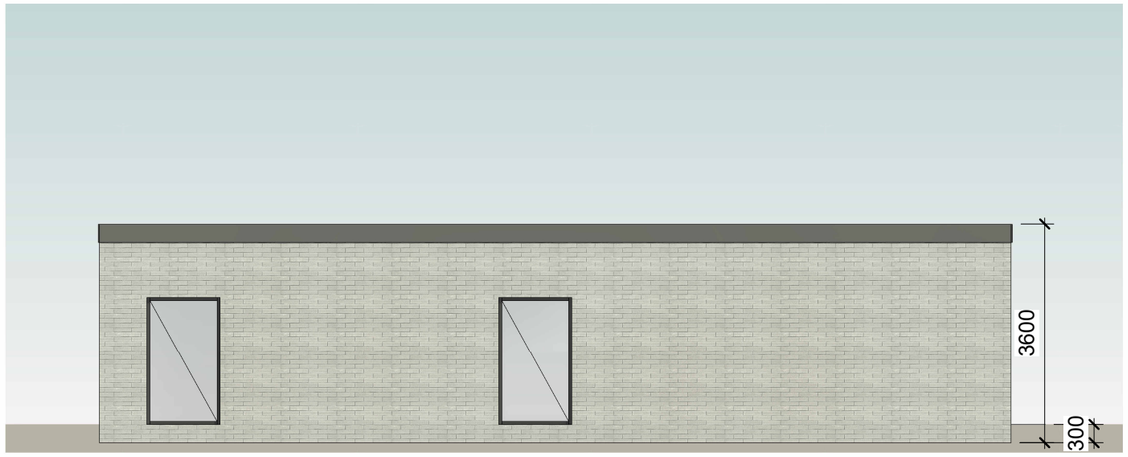
1 : 100



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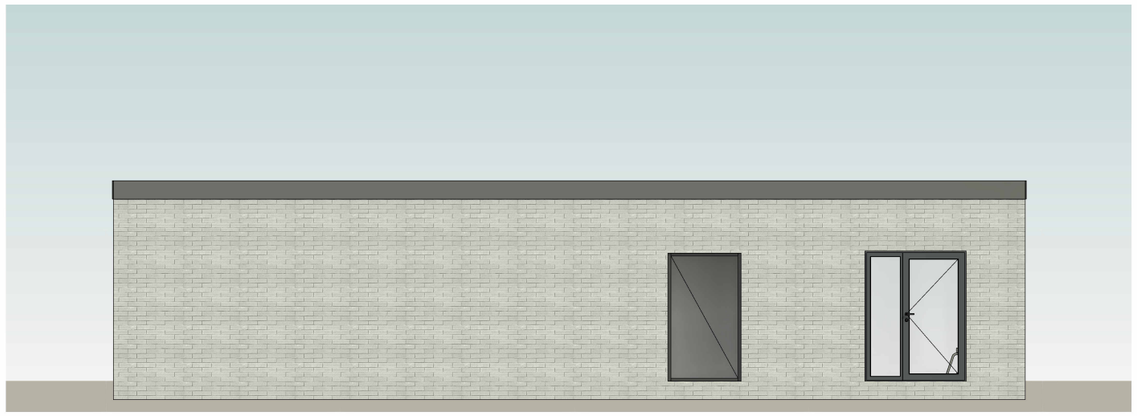

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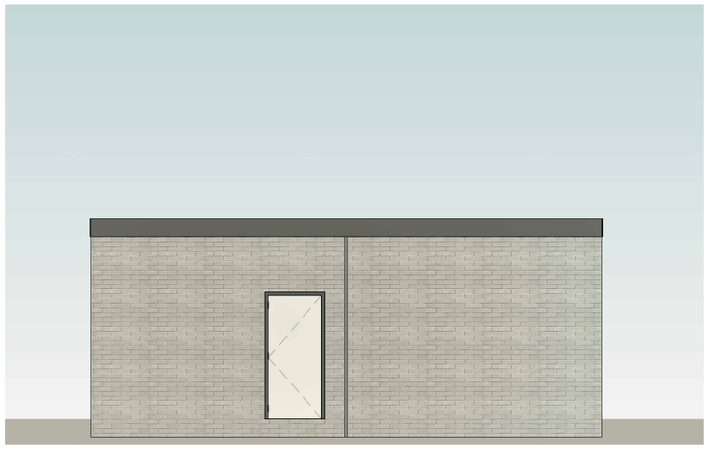

4 West
1 : 100

VOX

Brick Effect External
Wall Cladding

Options

Bristol

Coventry

Dorset

York

Exeter

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Actiform Project Name:	Actiform Project Number:
2 Bay	6990
Client Organisation:	**Project Address:**
InHealth	

Drawing / Information Description:
Proposed Elevations

Unique ID:

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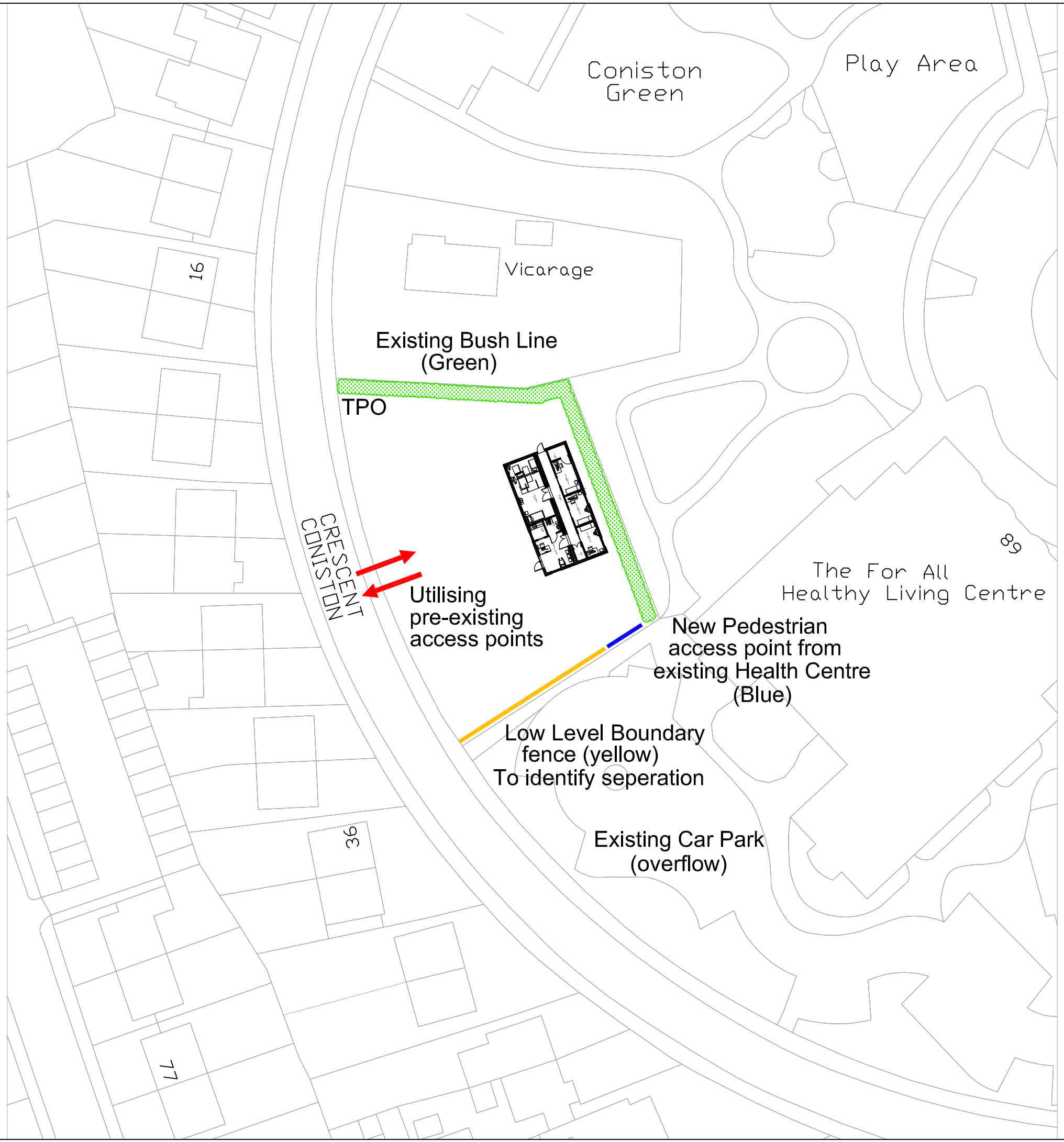

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Actiform Project Name:	Actiform Project Number:
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In Health	Conistone Crescent Weston-Super-Mare

Drawing / Information Description:

Proposed Outline Site Plan

Unique ID:

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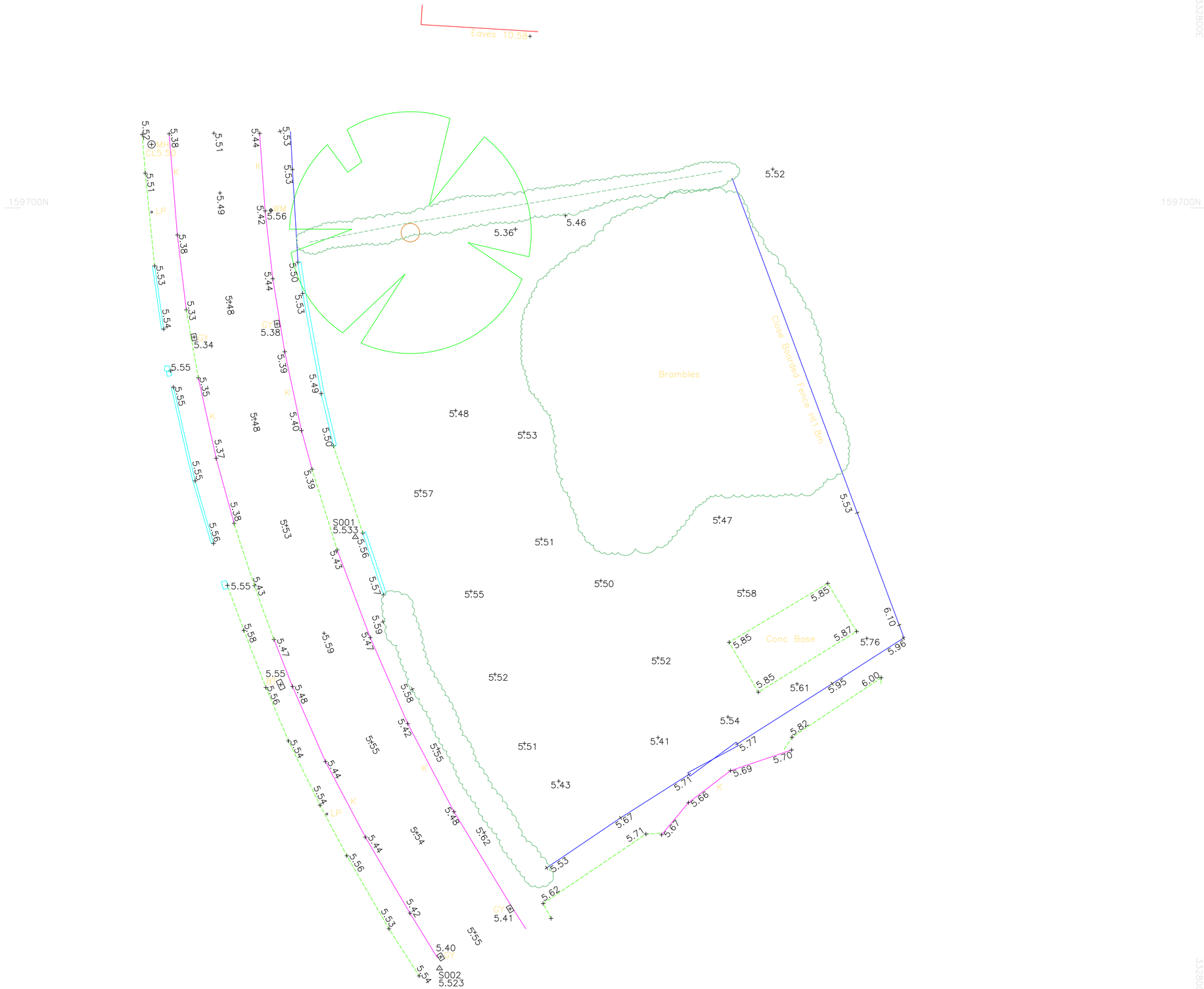
1:500

APPENDIX B:

TOPOGRAPHIC SURVEY



ABBREVIATIONS

A/C	AIR CONDITIONING
AH	ARCH HEIGHT
BT	BRITISH TELECOMMUNICATIONS
C	WINDOW CILL HEIGHT
Cab	CABINET
CBF	CLOSE BOARDED FENCE
CL	COVER LEVEL
DP	DISCHARGE PIPE
DC	DIAMOND CABLE COVER
DK	DROP KERB
FP	FOOTPATH
G	GULLY
GV	GAS VALVE
IC	INSPECTION CHAMBER
K	KERB
LP	LAMP POST
MH	MANHOLE
PCL	POST & CHAIN LINK FENCE
RWP	RAIN WATER PIPE
SA	SECURITY ALARM
SBM	SITE BENCH MARK
SH	SPRING HEIGHT
TP	TELEGRAPH POLE
WP	WASTE PIPE

LEGEND

DRAWING ISSUE STATUS

Issue	Details	By	Date
A	Original Survey	ATR	02/11/23

SHEET LAYOUT

THIS SURVEY HAS BEEN CARRIED OUT TO AN ACCURACY CONSISTENT WITH A PRESENTATION SCALE OF 1:200 INTERROGATED DIMENSIONS WILL BE WITHIN THE TOLERANCE ASSOCIATED WITH THIS AND SMALLER SCALES ONLY.

ALL LEVELS AND CO-ORDINATES RELATE TO VRS Now OS NETWORK 2015

ALL CRITICAL DIMENSIONS SHOULD BE VERIFIED ON SITE PRIOR TO ANY DESIGN OR CONSTRUCTION WORKS.

Encon Associates

The Nook
10 Chapel Lane
Nottingham
NG5 7DR

Former Church Site
Coniston Close
Westerm Super Mare

Topographical Survey

SURVEYED AND DRAWN BY
RAMOWSKI BANNER LIMITED
6 Dovecote Drive
Wollaton
Nottingham
NG8 2NB
Tel: (0115) 9289091

email: mail@ramowski-clarke.com

SCALE 1:200 @ A2

DATE OF ISSUE NOVEMBER 2023

RBL JOB No. 4052 | CHECKED ATR

DRAWING No. 4052-01-a | ISSUE A

APPENDIX C:

ENVIRONMENT AGENCY PRODUCT 4 DATA

creating a better place

Environment Agency

Richard Harlow
AAH Consultants
AAHPlanning-Infrastructure@outlook.com

Our ref: 331162-WX
Date: 10th November 2023

Dear Richard Harlow,

Thank you for your enquiry which was received on 23rd October 2023. We respond to requests under the Freedom of Information Act 2000 and Environmental Information Regulations 2004.

Abstract

Name	Product 4
Description	Detailed Flood Risk Assessment Map for **Dexa, Coniston Crescent, Weston-super-Mare, BS23 3RX** **NGR: ST3275859678**
Licence	Open Government Licence
Information Warnings	*The mapping of features provided as a background in this product is © Ordnance Survey. It is provided to give context to this product. The Open Government Licence does not apply.*
Attribution	Contains Environment Agency information © Environment Agency and/or database rights. Contains Ordnance Survey data © Crown copyright 2019 Ordnance Survey 100024198.

Flood Map for Planning

The Flood Map for Planning is now classed as Open Data. It can be downloaded free of charge under an open data licence from the following weblink:
https://data.gov.uk/publisher/environment-agency

If you search for the 'flood map for planning' in the search box the following datasets will be available for you select and download the data:

- Flood Map for Planning (Rivers and the Sea) – Flood Zones 2 and 3
- Flood Map for Planning (Rivers and Sea) – Areas Benefiting from Defences
- Flood Map for Planning (Rivers and Sea) Flood Storage Areas
- Flood Map for Planning – Spatial Flood Defences (without Standard attributes)
- Recorded Flood Outlines
- Historic Flood Map
- Risk of Flooding from Surface Water Extent for:
  - → 3 percent annual chance
  - → 1 percent annual chance
  - → 0.1 percent annual chance

If you have requested this information to help inform a development proposal, then you should also note the detail in the attached advisory text on the use of Environment Agency Information and Further Guidance for FRAs.

Flooding History

We no longer produce pdf copies of the Historic Flood Map. This information is available to search select, and download free of charge as part of the Government's 'open data' as

- Recorded Flood Outlines
- the Historic Flood Map

These are GIS layers and can be downloaded from: https://data.gov.uk/publisher/environment-agency

Please note we cannot guarantee that this is an exhaustive list of all past flood events in this location. All reasonable care has been taken to ensure that the historical flood event data is as accurate as possible. The Environment Agency will update its records if new evidence emerges.

Strategic Flood Risk Assessment (SFRA)

When preparing a FRA to support a development proposal in this location you should refer to North Somerset's Council's SFRA website, which is available via the following link: https://www.n-somerset.gov.uk/my-services/planning-building-control/planning-policy/supplementary-plans-guidance/strategic-flood-risk-assessment.

Planning

If you have questions regarding the planning nature of your enquiry, or require advice on floor levels, please contact our Sustainable Places team on NWX.SP@environment-agency.gov.uk. Please be aware that we now charge for planning advice when consulted on pre-application enquiries. This new approach provides advice to developers in two ways. Firstly, there is the provision of 'free' advice available to everyone where we give a preliminary opinion on a proposed development. This sets out the environmental constraints together with any issues this raises for us. Should you wish us to review in detail any of these issues then we can do this through a chargeable scheme aimed at recovering our costs.

Flood Levels

Coastal/tidal flood levels and depths

The tables below show the maximum modelled tidal flood levels and depths for defended (actual situation) and undefended (natural floodplain) scenarios taken from our 2020 Woodspring Bay modelling. The annual exceedance probability (AEP) is given.

*Please note. We have provided you with climate change data based on National Planning and Policy Framework (NPPF) guidance. We advise that this data is suitable for the use in an FRA, but we also have climate change data based on UK Climate Projections 2009 (UKCP09) if required.

We advise that the extracted level and depth data provided below is suitable for use in an FRA. If you require level and depth data from additional return periods, these .asc grids can be requested as part of a Product 6.

Defended

AEP	Maximum depth (in metres)	Maximum level (mAOD)
0.1% (1 in 1000)	0.00	0.00
0.5% (1 in 200)	0.00	0.00
0.5% with CC 2068 added	0.00	0.00
0.5% with CC 2118 added	0.40	5.67
20% (1 in 5)	0.00	0.00

Customer & Engagement, Wessex
Rivers House, East Quay, Bridgwater, Somerset, TA6 4YS
Email: wessexenquiries@environment-agency.gov.uk
www.environment-agency.gov.uk

Undefended

AEP	Maximum depth (in metres)	Maximum level (mAoD)
0.1% (1 in 1000)	1.07	6.35
0.5% (1 in 200)	0.92	6.20
0.5% with CC 2068 added	1.12	6.39
0.5% with CC 2118 added	1.65	6.92
20% (1 in 5)	0.67	5.95

N.B. Levels and depths have been extracted based upon the site boundary plan provided.

Flood Defences
Please find enclosed details of Flood Defences within the vicinity of the site boundary. This information has been taken from our Asset Information Management System database (AIMS).

Please note that flood defences can increase water levels elsewhere e.g., through channels being restricted by defences, or because defences prevent flood water flowing back into the river channel.

Extreme Tide Level (Still Water) Information

IMPORTANT. If you are carrying out a Flood Risk Assessment you should also review the Still Water Tide Level data from the Coastal Flood Boundary Study 2018. You should be mindful that in some locations the predicted Still Water Tide Levels are higher than the locally modelled water levels provided above. When this is the case the higher water levels should be taken into account in your Flood Risk Assessment.

For more information on climate change allowances please see guidance on the Gov.UK website here: Flood risk assessments: climate change allowances - GOV.UK

The updated Still Water Tide Level Data (baseline 2017) from the Coastal Flood Boundary Study 2018 is also available to download from our data.gov.uk site. Please search for 'Coastal Design Sea Levels'.

For your information you can view the Coastal Flood Boundary Study 2018 technical summary report and the user guide below.
https://www.gov.uk/government/publications/coastal-flood-boundary-conditions-for-uk-mainland-and-islands-design-sea-levels

Environmental Permit for Flood Risk Activities
In addition to any other permission(s) that you may have already obtained e.g. planning permission, you may need an environmental permit for flood risk activities (formerly known as Flood Defence Consent prior to 06 April 2016) if you want to do work:

- in, under, over or near a main river (including where the river is in a culvert)
- on or near a flood defence on a main river
- in the flood plain of a main river
- on or near a sea defence

For further information and to check whether a permit is required please visit:
https://www.gov.uk/guidance/flood-risk-activities-environmental-permits.

For any further advice, please contact your local Environment Agency Office, at
bridgwater.frap@environment-agency.gov.uk.

Further Information

Customer & Engagement, Wessex
Rivers House, East Quay, Bridgwater, Somerset, TA6 4YS
Email: wessexenquiries@environment-agency.gov.uk
www.environment-agency.gov.uk

We advise that you also contact the Flood Risk Department, floodrisk@n-somerset.gov.uk, telephone 01934 888888, at North Somerset Council, Town Hall, Walliscote Grove Road, Weston-super-Mare, BS23 1UJ. For land drainage consents please contact 01275 884 574 or landdrainage@n-somerset.gov.uk, as they may be able to provide further advice with respect to localised flooding and drainage issues.

Further details about the Environment Agency information supplied can be found on our website:
https://www.gov.uk/browse/environment-countryside/flooding-extreme-weather

If you have requested this information to help inform a development proposal, then you should note the information on GOV.UK on the use of Environment Agency Information for FRAs:
https://www.gov.uk/planning-applications-assessing-flood-risk
https://www.gov.uk/government/publications/pre-planning-application-enquiry-form-preliminary-opinion

We hope you find this information helpful, and it is provided subject to the guidance below, which we strongly recommend you read.

Yours sincerely,

Nicola Jess

Customer & Engagement, Wessex
Rivers House, East Quay, Bridgwater, Somerset, TA6 4YS
Email: wessexenquiries@environment-agency.gov.uk

Enc: Use of Environment Agency Information for Flood Risk Assessments (below)
UKCP18 Climate Change Briefing Note
331162-WX Defence Map
331162-WX Defence Data

Use of Environment Agency Information for Flood Risk Assessments (FRAs)

Important
Use of Environment Agency data: you should note that

1. Information supplied by the Environment Agency may be used to assist in producing a Flood Risk Assessment (FRA) where one is required, but the use of Environment Agency information does not constitute such an assessment on its own.

2. As part of your data request, we have provided all of the modelled data we hold for your location. Please note that some of our modelled information may have been produced for purposes other than for flood zone generation. This may mean that some of the modelled data you have been provided with has a lower confidence level, and has not been used in producing our flood map, nor definitively reflects the predicted flood water level at the property/development site scale. To check the suitability of the use of this information in your FRA please contact your local Partnership & Strategic Overview (PSO) team.

3. This information covers flood risk from main rivers and the sea, and you will need to consider other potential sources of flooding, such as groundwater or surface water runoff. The information produced by the Local Planning Authority and the Lead Local Flood Authority (LLFA) may assist in assessing other sources of flood risk.

4. Where a planning application requires a FRA and this is not submitted or deficient, the Environment Agency may well raise an objection.

5. For more significant proposals in higher flood risk areas, we would be pleased to discuss details with you ahead of making any planning application, and you should also discuss the matter with your Local Planning Authority.

Pre-Planning Advice from the Environment Agency
If you have requested this information to help inform a development proposal, then we recommend that you undertake a formal pre-application enquiry using the form available from our website:

Pre-application Preliminary Opinion:
https://www.gov.uk/government/publications/pre-planning-application-enquiry-form-preliminary-opinion

Pre-application Charged Service:
https://www.gov.uk/government/publications/planning-advice-environment-agency-standard-terms-and-conditions

Depending on the enquiry we may also provide advice on other issues related to our responsibilities, including flooding, waste, land contamination, water quality, biodiversity, navigation, pollution, water resources, foul drainage or Environmental Impact Assessment.

Flood Risk Assessment (FRA) Guidance
You should refer to the Planning Practice Guidance of the National Planning Policy Framework (NPPF) and the Environment Agency's Flood Risk Standing Advice for information about Flood Risk Assessment (FRA) for new development in the different Flood Zones. These documents can be accessed via:

National Planning Policy Framework Planning Practice Guidance:
http://planningguidance.planningportal.gov.uk/

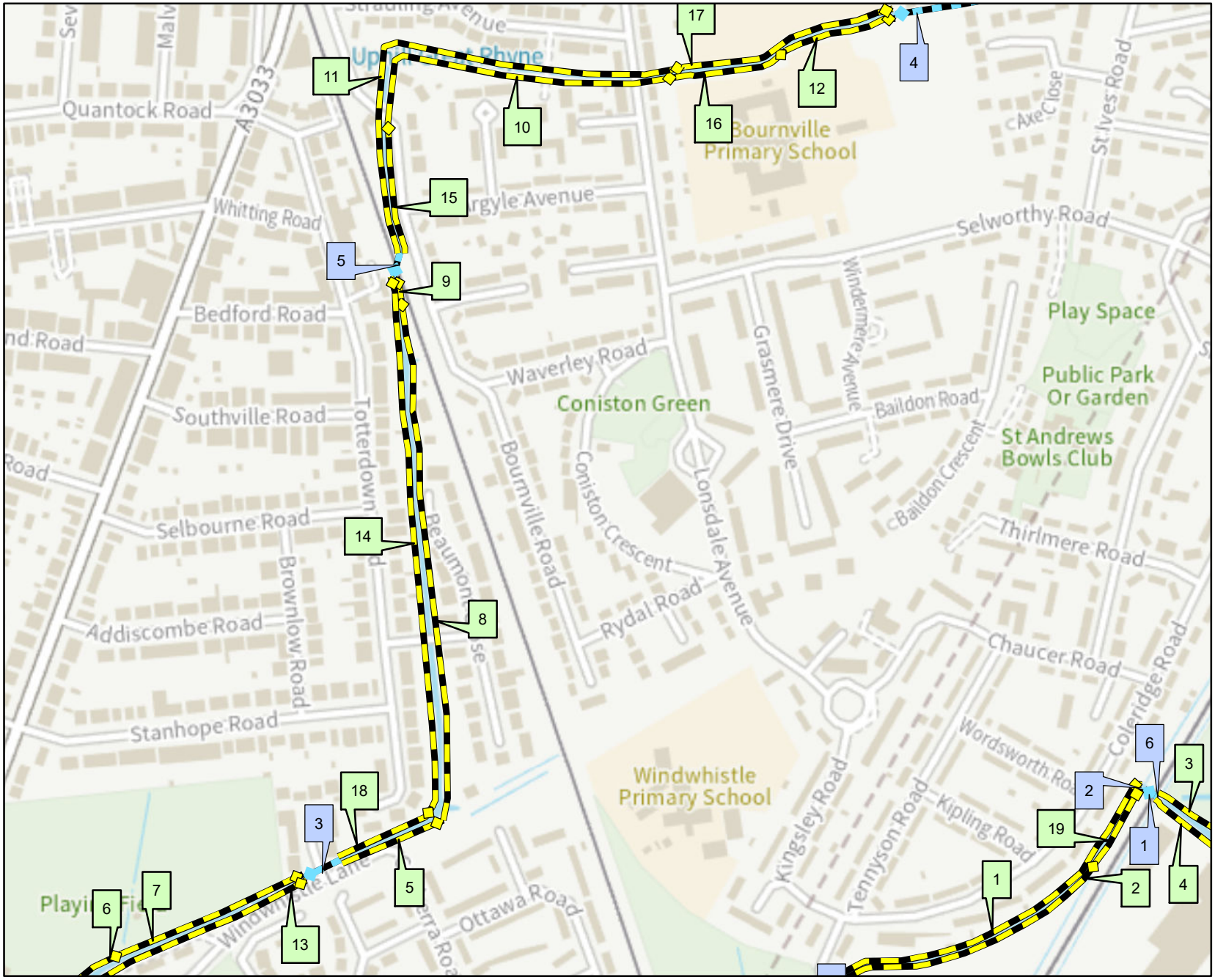
Customer & Engagement, Wessex
Rivers House, East Quay, Bridgwater, Somerset, TA6 4YS
Email: wessexenquiries@environment-agency.gov.uk
www.environment-agency.gov.uk

Environment Agency advice on FRAs:
https://www.gov.uk/flood-risk-assessment-for-planning-applications#when-to-follow-standing-advice

https://www.gov.uk/government/publications/planning-applications-assessing-flood-risk

Customer & Engagement, Wessex
Rivers House, East Quay, Bridgwater, Somerset, TA6 4YS
Email: wessexenquiries@environment-agency.gov.uk
www.environment-agency.gov.uk

Current Flood Defences centered on NGR ST 32758 59678 Created 25/10/2023 Ref: 331162-WX



Environment Agency

Scale: 1:5,000

N W E S

Legend

Defences

- Barrier Beach
- Beach
- Bridge Abutment
- Cliff
- Demountable Defence
- Dunes
- Embankment
- Engineered High Ground
- Flood Gate
- Natural High Ground
- Promenade
- Quay
- Spillway
- Wall

Culverts

- Simple Culvert
- Complex Culvert

This data has been extracted from the Asset Information Management System (AIMS OM) which was created to draw various data sources into one database and has been populated with information of varying quality.

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

Product 4 - AIMS Information **331162-WX** **Date:** **25/10/2023**

Map Ref	Asset ID	Asset Type	Right or left bank	Asset Description	Approx length (m)	Actual fluvial downstream crest level (mAOD)	Actual fluvial downstream crest level accuracy	Actual fluvial upstream crest level (mAOD)	Actual fluvial upstream crest level accuracy	Actual fluvial coastal crest level (mAOD)	Actual fluvial coastal crest level accuracy	NGR	Most recent inspection	Overall condition
1	101431	Natural High Ground	Right	Natural bank	353.86	DNR	DNR	DNR	DNR	DNR	DNR	ST33125928	12/05/2022	3 - Fair
2	101432	Natural High Ground	Left	Natural bank	275.06	5.82	4 - +/- 0.75m or more vertical accuracy	5.40	4 - +/- 0.75m or more vertical accuracy	DNR	DNR	ST33105927	12/05/2022	3 - Fair
3	101434	Natural High Ground	Right	Natural bank	357.69	5.44	4 - +/- 0.75m or more vertical accuracy	5.77	4 - +/- 0.75m or more vertical accuracy	DNR	DNR	ST33355933	12/05/2022	2 - Good
4	101435	Natural High Ground	Left	Natural bank.	349.94	DNR	DNR	DNR	DNR	DNR	DNR	ST33355931	12/05/2022	3 - Fair
5	132497	Natural High Ground	Left	Earth Bank	98.91	5.77	4 - +/- 0.75m or more vertical accuracy	5.09	4 - +/- 0.75m or more vertical accuracy	DNR	DNR	ST32565936	12/05/2022	3 - Fair
6	1459	Natural High Ground	Right	Earth Bank	321.57	5.16	4 - +/- 0.75m or more vertical accuracy	5.22	4 - +/- 0.75m or more vertical accuracy	DNR	DNR	ST32275919	12/05/2022	3 - Fair
7	1460	Natural High Ground	Right	Embankment	178.16	5.22	4 - +/- 0.75m or more vertical accuracy	5.29	4 - +/- 0.75m or more vertical accuracy	DNR	DNR	ST32405929	12/05/2022	3 - Fair
8	2737	Natural High Ground	Left	Earth Bank	474.19	5.10	4 - +/- 0.75m or more vertical accuracy	5.42	4 - +/- 0.75m or more vertical accuracy	DNR	DNR	ST32585971	12/05/2022	3 - Fair
9	2738	Natural High Ground	Left	Steel Piling Wall	19.64	5.42	4 - +/- 0.75m or more vertical accuracy	4.55	4 - +/- 0.75m or more vertical accuracy	DNR	DNR	ST32575986	12/05/2022	3 - Fair
10	2857	Natural High Ground	Left	Natural Bank	313.09	5.51	4 - +/- 0.75m or more vertical accuracy	5.19	4 - +/- 0.75m or more vertical accuracy	DNR	DNR	ST32666005	12/05/2022	3 - Fair
11	2858	Natural High Ground	Right	Natural Bank	462.73	5.38	4 - +/- 0.75m or more vertical accuracy	5.15	4 - +/- 0.75m or more vertical accuracy	DNR	DNR	ST32566008	13/05/2022	3 - Fair
12	2859	Natural High Ground	Left	Embankment	103.72	5.65	4 - +/- 0.75m or more vertical accuracy	5.97	4 - +/- 0.75m or more vertical accuracy	DNR	DNR	ST32976009	12/05/2022	3 - Fair
13	41320	Natural High Ground	Left	Earth Bank	488.30	6.20	4 - +/- 0.75m or more vertical accuracy	5.86	4 - +/- 0.75m or more vertical accuracy	DNR	DNR	ST32285919	12/05/2022	3 - Fair
14	41321	Natural High Ground	Right	Natural Bank	481.01	5.09	4 - +/- 0.75m or more vertical accuracy	5.27	4 - +/- 0.75m or more vertical accuracy	DNR	DNR	ST32575968	12/05/2022	3 - Fair
15	41322	Natural High Ground	Left	Sheet Pile Wall (anchored) & Bank	120.07	5.34	4 - +/- 0.75m or more vertical accuracy	5.53	4 - +/- 0.75m or more vertical accuracy	DNR	DNR	ST32565992	12/05/2022	3 - Fair
16	41364	Natural High Ground	Left	Earth Bank Adjacent Playing Fields	104.40	5.16	4 - +/- 0.75m or more vertical accuracy	5.65	4 - +/- 0.75m or more vertical accuracy	DNR	DNR	ST32866005	12/05/2022	3 - Fair
17	52929	Natural High Ground	Right	Earth Bank	198.31	4.98	4 - +/- 0.75m or more vertical accuracy	5.21	4 - +/- 0.75m or more vertical accuracy	DNR	DNR	ST32926008	12/05/2022	3 - Fair
18	79709	Natural High Ground	Right	Earth Bank	96.89	5.29	4 - +/- 0.75m or more vertical accuracy	5.09	4 - +/- 0.75m or more vertical accuracy	DNR	DNR	ST32595938	12/05/2022	3 - Fair
19	99494	Natural High Ground	Left	Natural Bank	76.45	DNR	DNR	DNR	DNR	DNR	DNR	ST33225938	12/05/2022	3 - Fair

Map Ref	Asset ID	Asset Type	Right or left bank	Asset Description	Approx length (m)	Actual fluvial downstream crest level (mAOD)	Actual fluvial downstream crest level accuracy	Actual fluvial upstream crest level (mAOD)	Actual fluvial upstream crest level accuracy	Actual fluvial coastal crest level (mAOD)	Actual fluvial coastal crest level accuracy	NGR	Most recent inspection	Overall condition
1	101433	Simple Culvert	DNR	Railway Culvert	11.28	DNR	DNR	DNR	DNR	DNR	DNR	ST33245940	12/05/2022	2 - Good
2	109497	Simple Culvert	DNR	Culvert (extension)	4.59	DNR	DNR	DNR	DNR	DNR	DNR	ST33235940	12/05/2022	3 - Fair
3	2736	Simple Culvert	DNR	Culvert	35.02	DNR	DNR	DNR	DNR	DNR	DNR	ST32505933	12/05/2022	3 - Fair
4	41365	Simple Culvert	DNR	Culvert Wall	1876.03	DNR	DNR	DNR	DNR	DNR	DNR	ST33186058	12/05/2022	2 - Good
5	58102	Simple Culvert	DNR	Railway Culvert Side Wall	22.30	DNR	DNR	DNR	DNR	DNR	DNR	ST32565988	12/05/2022	2 - Good
6	99493	Simple Culvert	DNR	Culvert (extension)	3.15	DNR	DNR	DNR	DNR	DNR	DNR	ST33255940	12/05/2022	2 - Good

Notes
* Overall Condition has been taken from the most recent inspection
* Inspections are of a purely visual nature and do not necessarily reflect the true condition of the asset

Map Ref	Asset ID	Asset Type	Right or left bank	Asset Description	Approx length (m)	Actual fluvial downstream crest level (mAOD)	Actual fluvial downstream crest level accuracy	Actual fluvial upstream crest level (mAOD)	Actual fluvial upstream crest level accuracy	Actual fluvial coastal crest level (mAOD)	Actual fluvial coastal crest level accuracy	NGR	Most recent inspection	Overall condition
* Condition: 1 = very good, Condtion 2 = good, Condition 3 = fair, Condition 4 = poor, Condition 5 = very poor * Crest level accuracy: 1 = ± 0.01 to 0.05m, 2 = ± 0.05 to 0.15m, 3 = ± 0.15 to 0.75m, 4 = ± 0.75 or greater														

Using ‘Flood risk assessments: climate change allowances’ following publication of new climate projections in UKCP18

Who are these messages for?

These messages are for local planning authorities and developers preparing Strategic Flood Risk Assessments (SFRAs) and site specific flood risk assessments (FRAs).

How to use these messages

These messages advise developers who need to prepare site specific flood risk assessments and all local planning authorities how to use ‘Flood risk assessments: climate change allowances’ (published 2016) to account for the impact of climate change on flood risk now UKCP18 has been published.

Main messages

- UKCP18 was published on 26th November 2018.
- UKCP18 is the official source of information on how the climate of the UK may change over the rest of this century. The UKCP18 projections replace the UKCP09 projections.
- The allowances in ‘Flood risk assessments: climate change allowances’ (published Feb 2016) are still the best national representation of how climate change is likely to affect flood risk for:
    - peak river flow
    - peak rainfall intensity
- Research that is due to be published in 2019 may result in changes to these allowances[1]. We will provide customers with more information regarding the need to update peak river flow and peak rainfall intensity allowances in due course.
- The climate change allowances for sea level rise in ‘Flood risk assessments: climate change allowances’ will be updated and published as early as possible in 2019. Until then, it is reasonable to continue to use the sea level rise allowances in ‘Flood risk assessments: climate change allowances’ (published in 2016) for planning decision making, because the allowances that have been used to date represent the high end of the range of sea level rise projected by UKCP18.

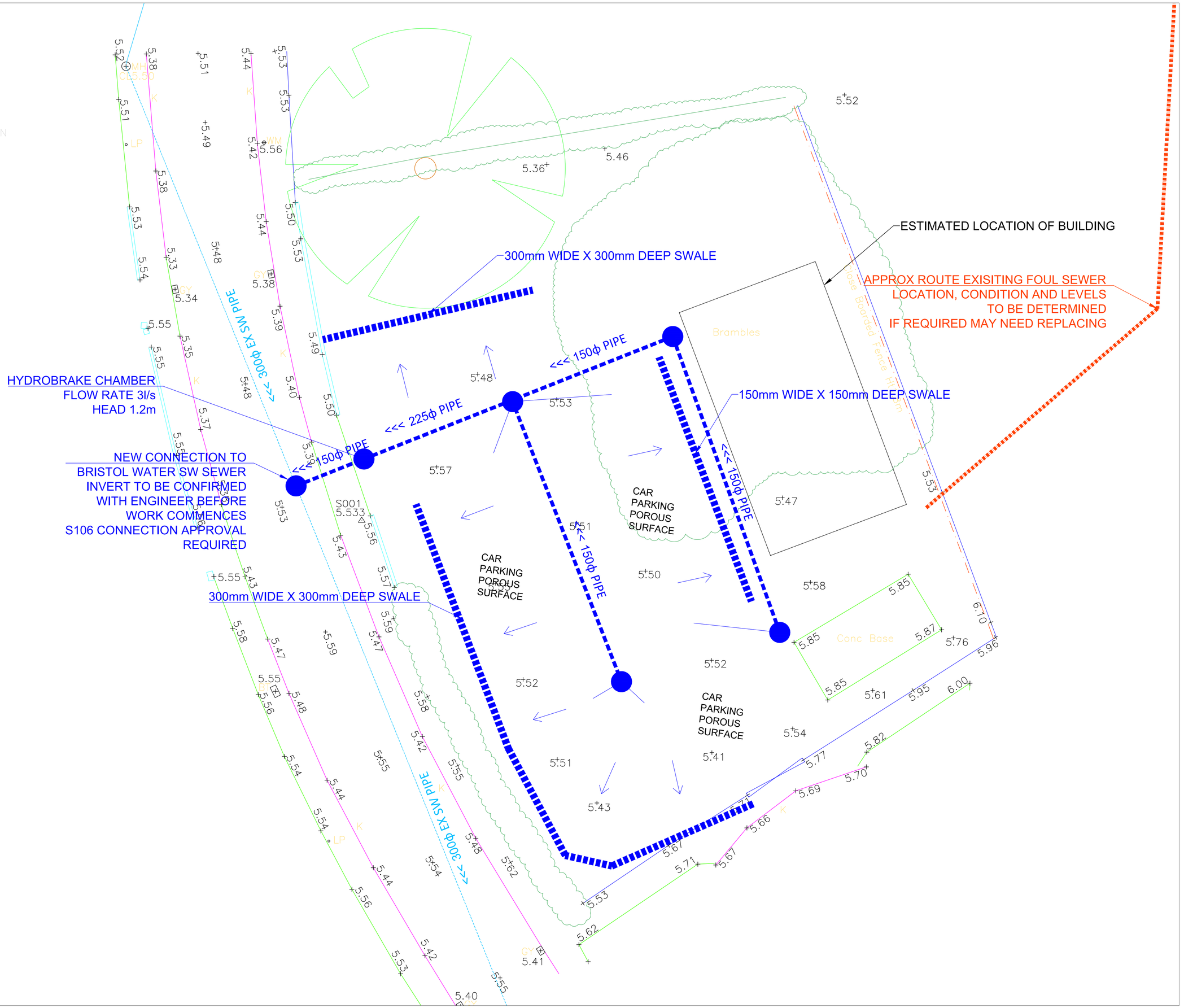
[1] High resolution mapping providing peak river flow allowances at 1km grid resolution due to be published Spring 2019. We do not expect the peak river flow allowances provided at a regional scale in ‘Flood risk assessments: climate change allowances’ to change as a result of this information, however, planners and developers may need to take account of this information where it shows a significant difference to the regional allowances. High resolution (daily and sub daily) rainfall projections is due to be published in the second half of 2019. These are used to understand the impact of climate change on peak rainfall. Following this, the peak rainfall allowances in ‘Flood risk assessments: climate change allowances’ may need to be updated, but this will not be until late 2019 at the earliest.

- However, in exceptional cases where developments are very sensitive to flood risk and have a lifetime of at least 100 years[2], we recommend you assess the impact of both the current allowance in 'Flood risk assessments: climate change allowances' and the 95th percentile of UKCP18 'RCP 8.5' scenario (high emissions scenario) **standard method** sea level rise projections of UKCP18, and plan according to this assessed risk. You will need to calculate sea level rise allowances beyond 2100 by extrapolating the UKCP18 dataset. The Environment Agency will check your extrapolation methodology and provide advice.
- UKCP18 provides sea level rise projections for 2100 – 2300. The update of 'Flood risk assessments: climate change allowances' will include advice on using these projections. In the meantime, for development with a longer than 100 year lifetime e.g. large urban extensions, new settlements, major infrastructure, you should contact your local the Environment Agency office for advice on how to calculate such allowances.
- Where it is appropriate to use the sea level rise information in UKCP18 as described in this briefing note, planning decisions should do so from now onwards, in order to ensure planning decisions are in line with policies in the National Planning Policy Framework. However, where local plans or development proposals and associated flood risk assessments are well advanced, it will usually be acceptable make decisions based on the allowances and advice in 'Flood risk assessments: climate change allowances' (published Feb 2016) in the following circumstances:
    - local plan has been submitted for examination (before or on the day UKCP18 is published); or
    - development proposals are well advanced or where a valid planning application has already been submitted to the local planning authority (before or on the day UKCP18 is published).
- When the climate change allowances are updated, the supporting guidance will be updated at the same time to address user feedback collated since Feb 2016.
- Once 'Flood risk assessments: climate change allowances' has been updated, over time we will update our flood risk modelling to reflect the revised climate change projections. This modelling work is principally done to inform our flood risk management activities, but we will continue to share this work with planners (for SFRAs) and developers (for site-specific FRAs) when it becomes available. Where the modelling needed by planners and developers has not yet been undertaken, we may be able to work together to do this work more quickly and to share the costs. Where this is not possible, the onus will be on planners and developers to undertake the necessary work at their own cost. Contact your local Environment Agency office to find out when they plan to update their flood risk modelling and to discuss working together.

[2] Such as infrastructure projects or developments that significantly change existing settlement patterns including urban extensions and new settlements

APPENDIX D:

STRATEGIC DRAINAGE DRAWING



Notes:

1. This drawing to be read in conjunction with all relevant architects and engineers drawings and specifications.
2. Levels shown are metres above ordnance datum, dimensions are in millimetres, unless noted otherwise. Positions of rwps and discharge stacks are shown indicatively and are assumed based on preliminary floor layouts.

HEALTH AND SAFETY

3. All work shall be carried out in accordance with all pertinent health and safety regulations.
4. Existing below ground services are to be accurately located prior to excavation. Appropriate clearances and methods as required by the asset owners guidance shall be maintained to avoid strikes, damage or undermining.

Key:

- Proposed Surface Water Sewer
- Existing Foul Water Sewer
- Existing SW SEWER
- Surface water Flow Direction (Surface to swales then into porous paving then into piped system)

Rev.	Date	Description	Drwn	Chk

Drawing No. **A6328-DR-IN-1001** Revision **P01**

Date	**17/11/2023**	Drawn	**RH**
Scale @ A1	**1:200**	Checked	**EL**

Site Address
DEXA
CONISTON CRESENT
WESTERN-SUPER-MARE

Purpose of Issue
For Approval

Drawing Title
STRATEGY DRAINAGE DRAWING

AAH consultants
1 BAR LANE
YORK
NORTH YORKSHIRE
YO1 6JU
TEL: 01904 897276
EMAIL: INFO@AAHPLANNING.COM

AAHCONSULTANTS.CO.UK

APPENDIX E:

DRAINAGE CALCULATIONS

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	30	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.450	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
1	0.015	5.00	5.685	1200	332767.344	159671.522	1.394
2	0.031	5.00	5.477	1200	332761.065	159688.587	1.307
3	0.014	5.00	5.521	1200	332751.845	159684.900	1.496
4			5.485	1200	332743.225	159681.396	1.810
5			5.507	1200	332739.399	159680.013	1.873
6	0.021	5.00	5.518	1200	332758.299	159668.720	1.300

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	1	2	18.184	0.600	4.291	4.170	0.121	150.3	150	5.37	50.0
1.001	2	3	9.930	0.600	4.170	4.104	0.066	150.0	150	5.57	50.0
1.002	3	4	9.305	0.600	4.025	3.963	0.062	150.0	225	5.72	50.0
1.003	4	5	4.068	0.600	3.675	3.634	0.041	99.2	150	5.79	50.0
2.000	6	3	17.420	0.600	4.218	4.102	0.116	150.0	150	5.35	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
1.000	0.817	14.4	2.0	1.244	1.157	0.015	0.0
1.001	0.818	14.5	6.2	1.157	1.267	0.046	0.0
1.002	1.065	42.3	11.0	1.271	1.297	0.081	0.0
1.003	1.009	17.8	11.0	1.660	1.723	0.081	0.0
2.000	0.818	14.5	2.9	1.150	1.269	0.021	0.0

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	18.184	150.3	150	Circular	5.685	4.291	1.244	5.477	4.170	1.157
1.001	9.930	150.0	150	Circular	5.477	4.170	1.157	5.521	4.104	1.267
1.002	9.305	150.0	225	Circular	5.521	4.025	1.271	5.485	3.963	1.297
1.003	4.068	99.2	150	Circular	5.485	3.675	1.660	5.507	3.634	1.723

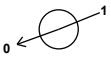
Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	1	1200	Manhole	Adoptable	2	1200	Junction	
1.001	2	1200	Junction		3	1200	Manhole	Adoptable
1.002	3	1200	Manhole	Adoptable	4	1200	Manhole	Adoptable
1.003	4	1200	Manhole	Adoptable	5	1200	Manhole	Adoptable

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
2.000	17.420	150.0	150	Circular	5.518	4.218	1.150	5.521	4.102	1.269

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
2.000	6	1200	Junction		3	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
1	332767.344	159671.522	5.685	1.394	1200				
						0	1.000	4.291	150
2	332761.065	159688.587	5.477	1.307	1200	1	1.000	4.170	150
									
						0	1.001	4.170	150
3	332751.845	159684.900	5.521	1.496	1200	1	2.000	4.102	150
							2	1.001	4.104	150
						0	1.002	4.025	225
4	332743.225	159681.396	5.485	1.810	1200	1	1.002	3.963	225
									
						0	1.003	3.675	150
5	332739.399	159680.013	5.507	1.873	1200	1	1.003	3.634	150
									
6	332758.299	159668.720	5.518	1.300	1200				
						0	2.000	4.218	150

Simulation Settings

Rainfall Methodology	FSR	Skip Steady State	x
FSR Region	England and Wales	Drain Down Time (mins)	240
M5-60 (mm)	20.000	Additional Storage (m³/ha)	20.0
Ratio-R	0.450	Check Discharge Rate(s)	x
Summer CV	0.750	Check Discharge Volume	x
Analysis Speed	Normal		

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
2	0	0	0
30	0	0	0
100	0	0	0
100	40	0	0

Node 4 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	3.675	Product Number	CTL-SHE-0082-3000-1000-3000
Design Depth (m)	1.000	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	3.0	Min Node Diameter (mm)	1200

Node 6 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	4.218	Slope (1:X)	500.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	0	Depth (m)	0.600
Safety Factor	2.0	Width (m)	5.000	Inf Depth (m)	
Porosity	1.00	Length (m)	22.500		

Node 2 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	4.170	Slope (1:X)	500.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	0	Depth (m)	0.600
Safety Factor	2.0	Width (m)	5.000	Inf Depth (m)	
Porosity	1.00	Length (m)	15.000		

Results for 1 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	10	4.331	0.040	2.1	0.0536	0.0000	OK
30 minute summer	2	22	4.210	0.040	5.6	1.9196	0.0000	OK
30 minute summer	3	27	4.100	0.075	4.3	0.0995	0.0000	OK
30 minute summer	4	28	4.103	0.428	4.3	0.4840	0.0000	SURCHARGED
15 minute summer	5	1	3.634	0.000	3.0	0.0000	0.0000	OK
30 minute summer	6	22	4.245	0.027	2.6	0.9119	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	1	1.000	2	2.1	0.681	0.144	0.0593	
30 minute summer	2	1.001	3	2.2	0.589	0.153	0.0373	
30 minute summer	3	1.002	4	4.3	0.670	0.101	0.1740	
30 minute summer	4	Hydro-Brake®	5	3.0				6.3
30 minute summer	6	2.000	3	1.0	0.471	0.069	0.0369	

Results for 2 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	10	4.336	0.045	2.7	0.0610	0.0000	OK
30 minute summer	2	22	4.217	0.047	7.2	2.4345	0.0000	OK
30 minute summer	3	25	4.225	0.200	5.6	0.2630	0.0000	OK
30 minute summer	4	25	4.224	0.549	5.7	0.6210	0.0000	SURCHARGED
15 minute summer	5	1	3.634	0.000	3.0	0.0000	0.0000	OK
30 minute summer	6	22	4.249	0.031	3.4	1.1795	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	1	1.000	2	2.7	0.742	0.186	0.0720	
30 minute summer	2	1.001	3	3.1	0.636	0.213	0.0976	
30 minute summer	3	1.002	4	5.7	0.698	0.135	0.3583	
30 minute summer	4	Hydro-Brake®	5	3.0				8.1
30 minute summer	6	2.000	3	1.3	0.498	0.091	0.1557	

Results for 30 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	10	4.354	0.063	5.1	0.0846	0.0000	OK
60 minute summer	2	51	4.271	0.101	14.4	6.4965	0.0000	OK
60 minute summer	3	51	4.270	0.245	8.9	0.3235	0.0000	SURCHARGED
60 minute summer	4	51	4.270	0.595	5.5	0.6730	0.0000	SURCHARGED
15 minute summer	5	1	3.634	0.000	3.0	0.0000	0.0000	OK
60 minute summer	6	47	4.271	0.053	4.7	3.4355	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	1	1.000	2	5.1	0.878	0.351	0.1279	
60 minute summer	2	1.001	3	-4.4	0.627	-0.302	0.1500	
60 minute summer	3	1.002	4	5.5	0.682	0.130	0.3701	
60 minute summer	4	Hydro-Brake®	5	3.0				18.8
60 minute summer	6	2.000	3	2.2	0.501	0.155	0.2016	

Results for 100 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	10	4.364	0.073	6.7	0.0981	0.0000	OK
60 minute summer	2	55	4.298	0.128	17.1	8.5377	0.0000	OK
60 minute summer	3	59	4.297	0.272	9.3	0.3591	0.0000	SURCHARGED
60 minute summer	4	59	4.297	0.622	5.7	0.7036	0.0000	SURCHARGED
15 minute summer	5	1	3.634	0.000	3.0	0.0000	0.0000	OK
60 minute summer	6	58	4.298	0.080	7.6	6.4590	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	1	1.000	2	6.6	0.930	0.460	0.1695	
60 minute summer	2	1.001	3	-4.7	0.627	-0.324	0.1669	
60 minute summer	3	1.002	4	5.7	0.681	0.135	0.3701	
60 minute summer	4	Hydro-Brake®	5	3.0				24.7
60 minute summer	6	2.000	3	-3.3	0.500	-0.226	0.2361	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	10	4.380	0.089	9.4	0.1200	0.0000	OK
60 minute summer	2	61	4.345	0.175	19.3	12.1038	0.0000	SURCHARGED
60 minute summer	3	60	4.344	0.319	8.3	0.4208	0.0000	SURCHARGED
60 minute summer	4	61	4.344	0.669	5.8	0.7566	0.0000	SURCHARGED
15 minute summer	5	1	3.634	0.000	3.0	0.0000	0.0000	OK
60 minute summer	6	62	4.345	0.127	13.0	11.7617	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	1	1.000	2	9.2	0.984	0.640	0.2310	
60 minute summer	2	1.001	3	5.6	0.644	0.385	0.1748	
60 minute summer	3	1.002	4	5.8	0.676	0.137	0.3701	
60 minute summer	4	Hydro-Brake®	5	3.0				34.5
60 minute summer	6	2.000	3	-5.7	0.494	-0.394	0.2915	