Newport Harbour Flood Risk Assessment

Final Report

November 2021

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Revision History

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S1-P01 22/09/2021	Draft Report	Chris Mills (IoW Council)
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Contract

This report describes work commissioned by Isle of Wight Council by an email dated 2nd December 2020. Isle of Wight Council's representative for the contract was Chris Mills. James Fitton and Alistair Clark of JBA Consulting carried out this work.

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Purpose

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Abbreviations

BGS	British Geological Survey
DTM	Digital Terrain Model
EA	Environment Agency
FAS	Flood Alleviation Scheme
FRA	Flood Risk Assessment
FMfP	Flood Map for Planning
LiDAR	Light Detecting and Ranging
LLFA	Lead Local Flood Authority
LPA	Local Planning Authority
NPPF	National Planning Policy Framework
OS	Ordnance Survey
PPG	Planning Practice Guidance
RoFSW	Risk of Flooding from Surface Water
SFRA	Strategic Flood Risk Assessment
SuDS	Sustainable Drainage Systems
SWMP	Surface Water Management Plan

1 Introduction

JBA Consulting were commissioned by Isle of Wight Council to undertake a Flood Risk Assessment (FRA) to support their masterplan for the re-development of the Newport Harbour area. The site is currently a mixed development, and the proposal is for a range of uses including Residential, Commercial and leisure.

This FRA provides information pertaining to the nature of flood risk at the site and follows the National Planning Policy Framework (NPPF)[1] and associated Planning Practice Guidance (PPG)[2] with regards to development and flood risk. It also considers the most appropriate flood risk mitigation options available for the proposed development.

No site walkover has been carried out at this stage in the commission. The flood risk to and from the site has been determined based a combination of publicly available information, Environment Agency Product 7 data, a review of the site topography and the Newport Harbour Masterplan.

1.1 FRA Requirements

It is a requirement for development applications to consider the potential risk of flooding from various sources to a proposed development over its lifetime and possible impacts on flood risk elsewhere as a result of the development.

Where appropriate, the following aspects of flood risk should be addressed:

- The nature and expected lifetime of the development and the extent to which the development is designed to deal with flood risk;
- The area liable to flooding from various sources;
- The probability of the current and future flood risk;
- The extent and standard of existing flood defences and their effectiveness over time;
- The likely depth of flooding;
- The rates of predicted flows;
- The likelihood to impacts on other areas, properties and habitats;
- The effects of climate change.

Flood risk to and from the site has been determined based on, Environment Agency (EA) LiDAR Digital Terrain Model (DTM) and Product 7 data, publicly available information, a review of Ordnance Survey (OS) maps, and the Newport Harbour Masterplan.

The revised NPPF advocates a risk-based approach to flood risk management in terms of appraising, managing and reducing the consequences of flooding both to and from a development site. The flood risk for the site has been assessed in line with Environment Agency (EA) requirements and in conjunction with the Client. The primary objectives of this FRA are to determine the following:

- Whether the site is at significant risk from any form of flooding;
- If the site is at risk of flooding, determine if safe access to and from the site can be achieved and maintained;
- If the site is at risk of flooding, determine mitigation measures to alleviate flood risk on the site.

1 Department for Communities and Local Government, (March 2012), National Planning Policy Framework (NPPF)

2 Department for Communities and Local Government, Planning Practice Guidance (PPG) Flood risk and coast change

2 Site Details

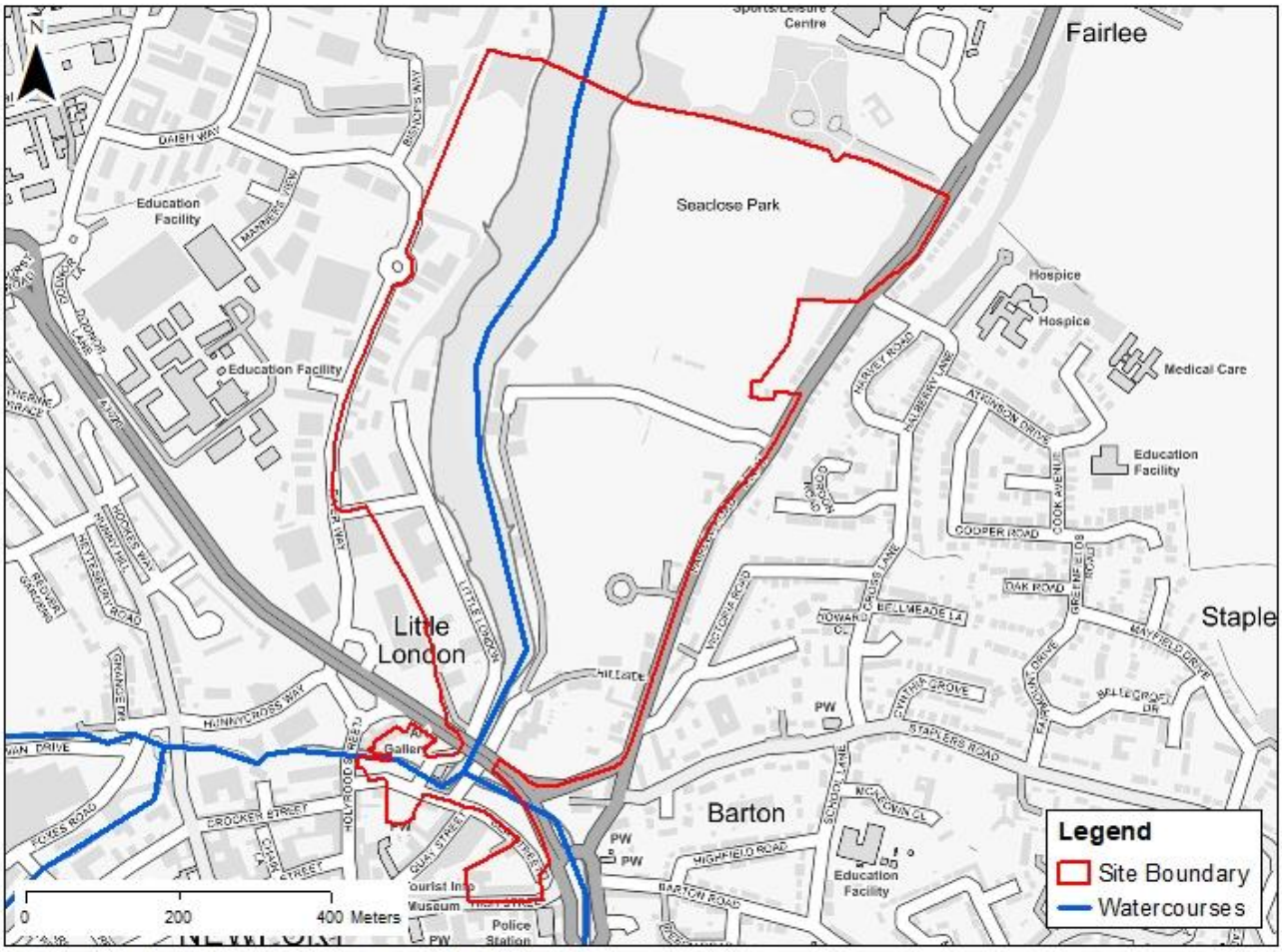
2.1 Current Site Description

The site is located in the centre of Newport, divided by the tidal reach of the River Medina which runs through the centre of the site. The site currently include several land uses including mainly commercial, retail and employment to the west of the Medina, with greenspace and the Newport Cemetery to the east of the Medina. Along the banks of the Medina is the harbour and wharf areas. Within the site to the south of the A3020 the land use is predominantly car parking and the confluence of the River Medina and Lukely Brook.

The site is currently a mixture of developed and greenfield land and is approximately 44ha in size.

Table 2-1: Summary of site details

Site Location	City Square House, Leeds
Site Area	44ha
Existing Land Use	Previously developed and greenfield land
Proposed Land Use	Mixed use (residential, commercial, recreational)
OS NGR	SZ 50217 89580
Country	England
Local Planning Authority (LPA)	Isle of Wight Council
Lead Local Flood Authority (LLFA)	Isle of Wight Council



Source: EVB-JBAU-XX-XX-M2-EN-0007-P01.01-Site_Location
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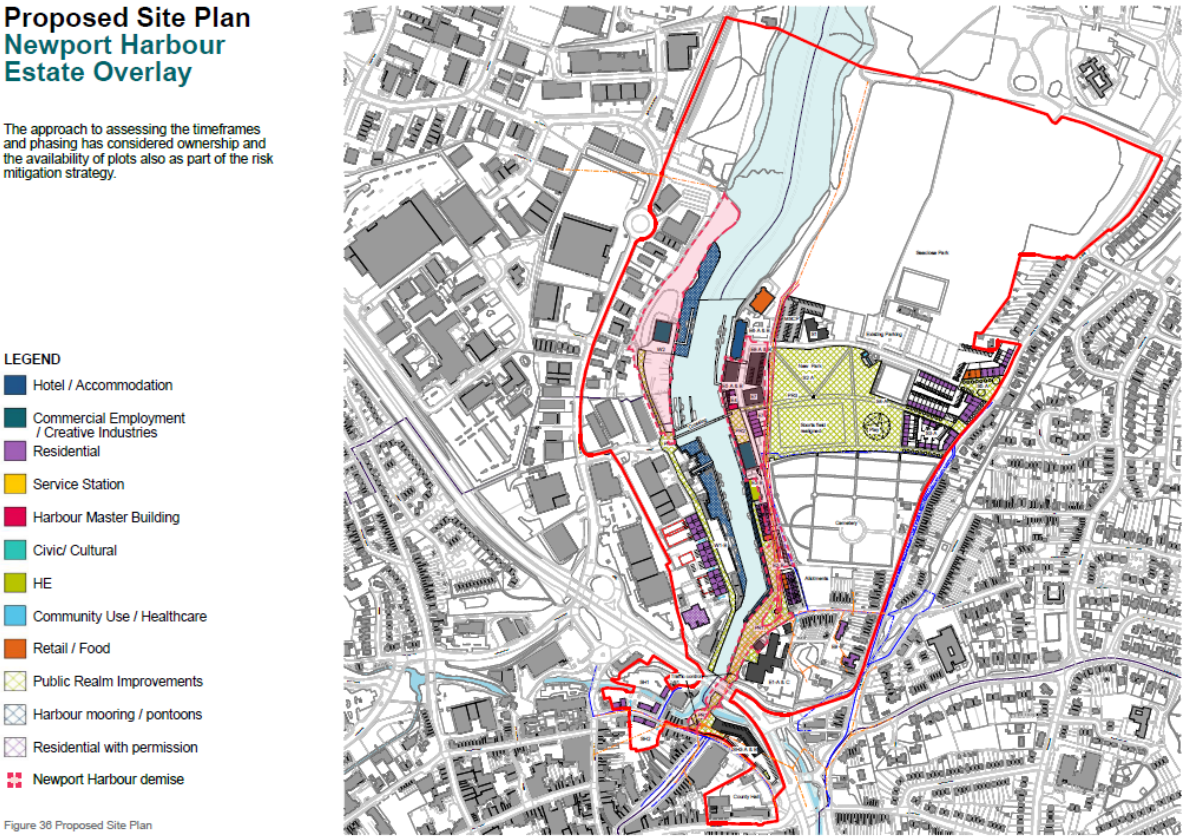
2.2 Proposed Development

The proposal for the Newport Harbour area focusses on several different locations: developments in the South Harbour, West Harbour, East Harbour and Seaclose Park. The masterplan aims to:

- Use land use efficiently to provide development and public space.
- Build on existing employment activities and flexible spaces for a variety of employment uses.
- Create 500 jobs.
- Deliver 200-300 well designed mixed tenure new homes.

The masterplan implementation is split into three 5-year phases to be implemented over the next 15 years. The proposed site plan is shown in Figure 2-1 below.

Figure 2-1: Proposed site layout (ground floor)

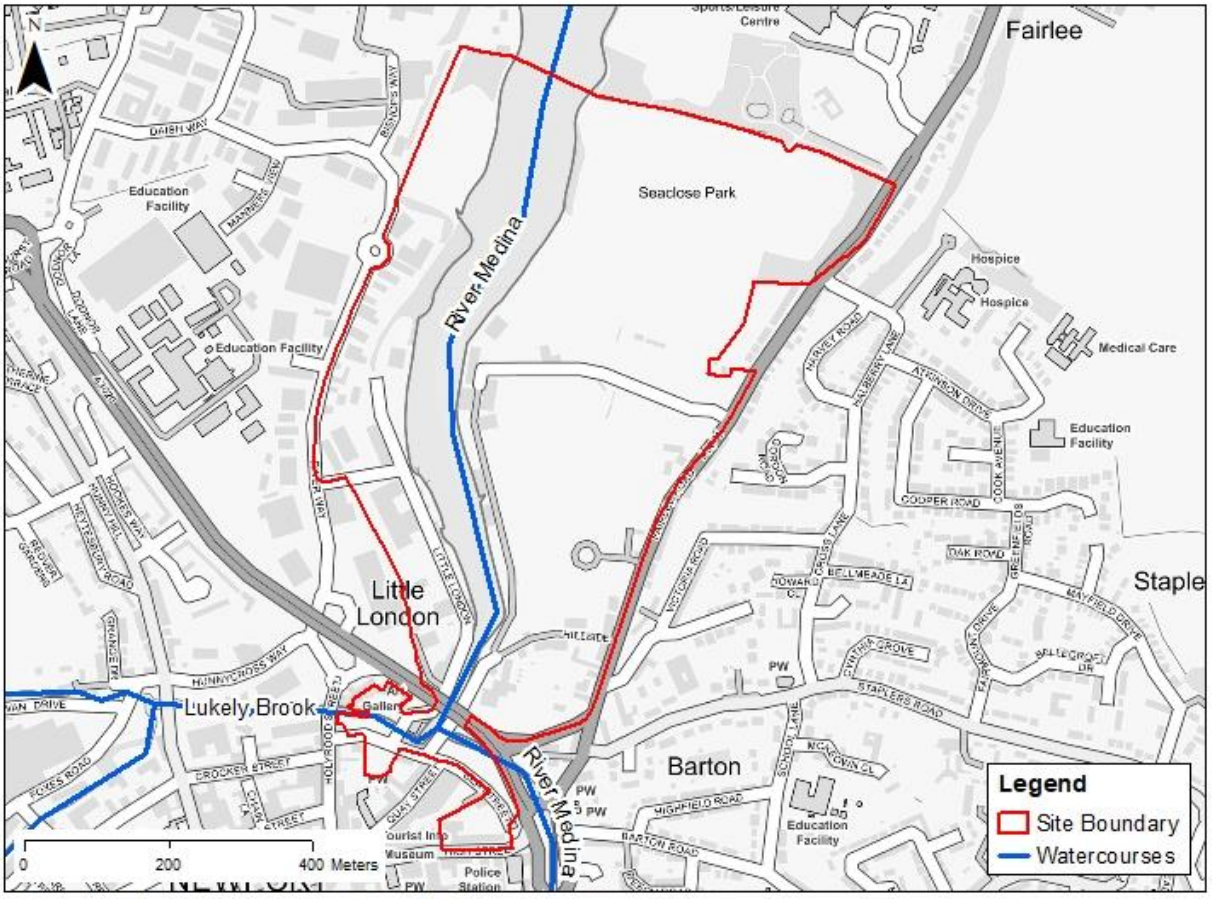


Further information about the proposal at Newport Harbour can be found in the Newport Harbour Masterplan (https://www.iow.gov.uk/documentlibrary/view/newport-harbour-masterplan-report-draft).

2.3 Watercourses

The River Medina flows from south to north through the centre of the site dividing the site into 2 halves downstream of the A3020 bridge. Upstream of the A3020, in the south of the site, the River Medina is joined by one of its tributaries, the Lukely Brook, which flows in an easterly direction towards its confluence with the Medina. Within the south of the site there are several structures including bridges and culverted sections of channel. An ordinary watercourse, the Fairlee Hole Stream discharges into the Medina approximately 280m downstream of the A3020 bridge. This watercourse takes surface water from the Summerfields area, east of Barton, towards the Medina. The watercourses within the vicinity of the site are shown in Figure 2-2.

Figure 2-2: Watercourses in the vicinity of the site



Source: EVB-JBAU-XX-XX-M2-EN-0008-P01.01-Watercourses
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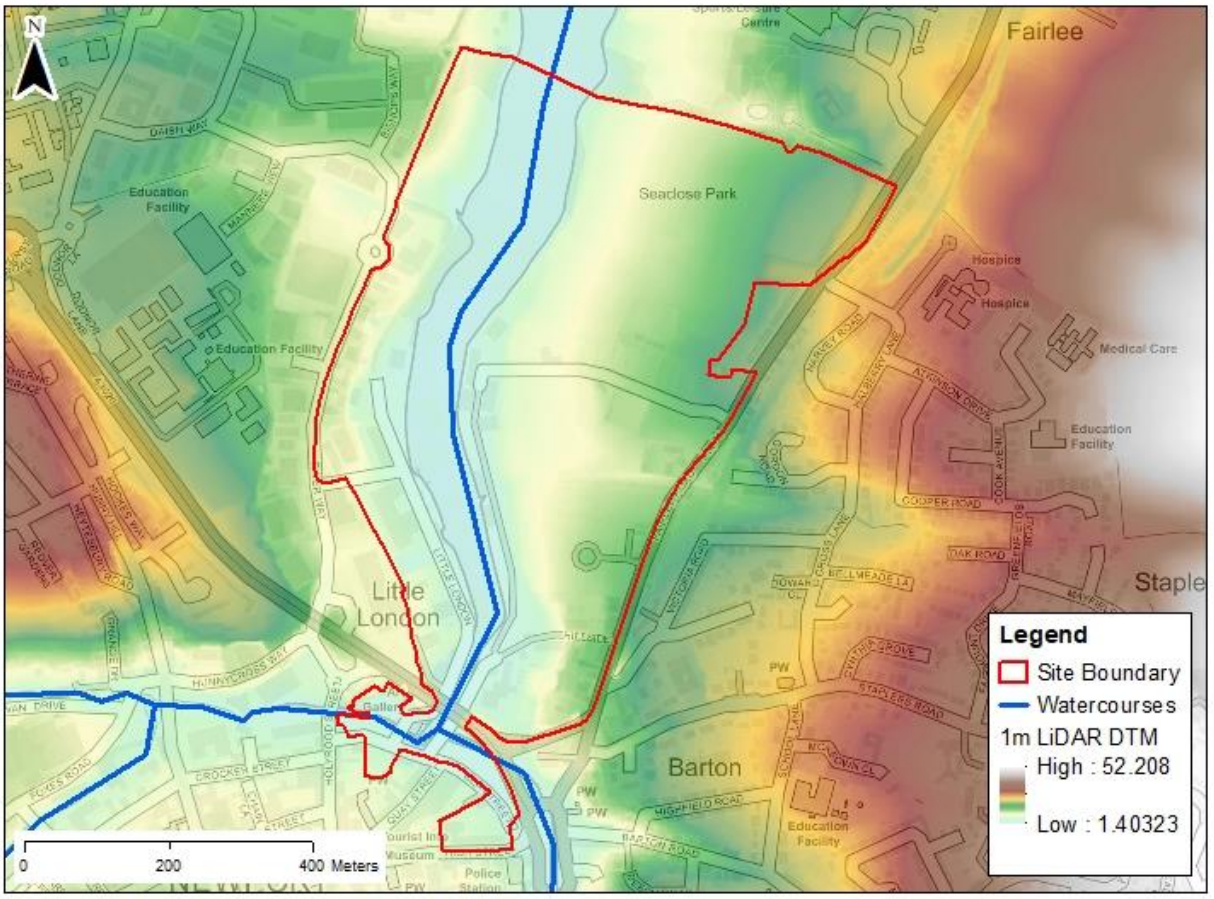
2.4 Site Topography

The EA's 1m resolution LiDAR data was used to determine approximate levels at the site and in the surrounding area. Ground levels vary across the site with ground levels in the north generally sloping towards the River Medina. To the east of the Medina, ground levels are greatest along the site boundary at Fairlee Road at approximately 12-20m AOD and slope westwards. To the west of the Medina, the greatest ground levels are approximately 8-10m AOD along the western boundary of the site and slope eastwards. In the south of the site, ground levels are generally between 2-4m AOD.

The LiDAR DTM coverage of the site is shown in Figure 2-3.

Figure 2-3: EA LiDAR data at the site



Source: EVB-JBAU-XX-XX-M2-EN-0009-P01.01-LiDAR
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2.5 Site Geology

The bedrock geology at the site is part of the Solent Group, which consists of clay silt and sand. There are no superficial deposits at the site.

There are multiple borehole records within the site boundary and several borehole records around the site. Several of these boreholes experienced water seepage at 2-3m below the surface. The site is not located in a groundwater source protection zone.

3 Planning Policy and Flood Risk

3.1 Applicable Planning Policy

The NPPF was introduced by the Department for Communities and Local Government in March 2012 and was most recently updated in July 2021[3]. The revised NPPF considers flood risk to developments using a sequential characterisation of risk, based on planning zones and the EA Flood Map for Planning. The revised NPPF should be used in conjunction with the Planning Practice Guidance (PPG)[4], which gives further information on the assessment of flood risk.

The main FRA requirement is to identify the Flood Zones and vulnerability classification relevant to the proposed development, based on an assessment of current and future conditions.

3.2 Development Site Flood Zones

The Environment Agency (EA) states that the flood risk is a function of:

- *"The likelihood of a particular flood happening, best expressed as a chance or probability over a period of one year. For example, 'There is a 1 in 100 chance of flooding in any given year in this location'.*
- *The impact or consequences that will result if the flood occurs."*

The EA categorises the risk into a series of Flood Zones; a definition of the Flood Zone can be found in Table 3-1. The EA has developed a Flood Map which shows the risk of flooding in England for different return period events. This map provides the basis for the assessment of flood risk and development suitability to NPPF. Table 3-3 below shows how the Flood Zones relate to a sequential planning response, as advised by the NPPF.

The site includes areas of Flood Zone 1, 2 and 3 and as such is ranges from low to high risk of fluvial and/or tidal flooding as discussed further in Section 4. The site does not benefit from flood defences.

3.3 NPPF Flood Zones

Table 3-1 shows how the Flood Zones relate to a sequential planning response. There are advisory notes placed upon this type of development, which are detailed in Table 3-2. Details of permitted development and Exception Test requirements are provided in Table 3-3.

3 Accessed at: https://www.gov.uk/guidance/national-planning-policy-framework

4 Accessed at: https://www.gov.uk/guidance/flood-risk-and-coastal-change

Table 3-1: NPPF Flood Zones

Zone 1: Low Probability	
Land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding in any year (<0.1%).	**Appropriate uses** All uses of land are appropriate in this zone. **FRA requirements** For development proposals on sites comprising one hectare or above the vulnerability to flooding from other sources as well as from river and sea flooding, and the potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off, should be incorporated in a FRA. This need only be brief unless factors above or other local considerations require particular attention. **Policy aims** Developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development, and the appropriate application of sustainable drainage systems.
Zone 2: Medium Probability	
Land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% – 0.1%) or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5% – 0.1%) in any year.	**Appropriate uses** The water-compatible, less vulnerable and more vulnerable uses of land and essential infrastructure in Table 3-2 are appropriate in this zone. Highly vulnerable uses in Table 3-2 are only appropriate in this zone if the Exception Test is passed. **FRA requirements** All proposals in this zone should be accompanied by a FRA. **Policy aims** Developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area through the layout and form of the development, and the appropriate application of sustainable drainage techniques.
Zone 3a: High Probability	
Land assessed as having a 1 in 100 or greater probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.	**Appropriate uses** The water-compatible and less vulnerable uses of land in Table 3-2 are appropriate in this zone. The highly vulnerable uses in Table 3-2 should not be permitted in this zone. The more vulnerable and essential infrastructure uses in Table 3-2 should only be permitted in this zone if the Exception Test is passed. Essential infrastructure permitted in this zone should be designed and constructed to remain operational and safe for users in times of flood. **FRA requirements** All proposals in this zone should be accompanied by a FRA. **Policy aims** Developers and local authorities should seek opportunities to: reduce the overall level of flood risk through the layout and form of the development and the appropriate application of sustainable drainage techniques; relocate existing development to land in zones with a lower probability of flooding; create space for flooding to occur by restoring functional floodplain and flood flow pathways and by identifying, allocating and safeguarding open space for flood storage.

Zone 3b: High Probability	
Land where water *has* to flow or be stored in times of flood. Local Planning Authorities should identify in their SFRAs areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. The identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. But land which would flood with an annual probability of 1 in 20 (5%) or greater in any year, or is designated to flood in an extreme (0.1%) flood, should provide a starting point for consideration and discussions to identify functional floodplain.	**Appropriate uses** Only the water-compatible uses and the essential infrastructure listed in Table 3-2 that has to be there should be permitted. It should be designed and constructed to: remain operational and safe for users in times of flood; result in no net loss of floodplain storage; not impede water flows; and not increase flood risk elsewhere. Essential infrastructure in this zone should pass the Exception Test. **FRA requirements** All proposals in this zone should be accompanied by a FRA. **Policy aims** In this zone, developers and local authorities should seek opportunities to: reduce the overall level of flood risk through the layout and form of the development and the appropriate application of sustainable drainage techniques; relocate existing development to land with a lower probability of flooding.

Table 3-2. Flood Risk Vulnerability Classification

Vulnerability class	Description
Essential Infrastructure	Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk. Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood. Wind turbines.
Highly Vulnerable	Police stations, Ambulance stations and Fire stations and Command Centres and telecommunications installations required to be operational during flooding. Emergency dispersal points. Basement dwellings. Caravans, mobile homes and park homes intended for permanent residential use (Sequential and Exception Tests required for any change of land use to these sites). Installations requiring hazardous substances consent (Where there is a demonstrable need to locate such installations for bulk storage of materials with port or other similar facilities, or such installations with energy infrastructure or carbon capture and storage installations, that require coastal or water-side locations, or need to be located in other high flood risk areas, in these instances the faculties should be classified as "Essential Infrastructure").
More Vulnerable	Hospitals. Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels. Buildings used for: dwelling houses; student halls of residence; drinking establishments; nightclubs; and hotels Non-residential uses for health services, nurseries and educational establishments Landfill and sites used for waste management facilities for hazardous waste. Sites used for holiday or short-let caravan and camping, *subject to a specific warning and evacuation plan.*
Less Vulnerable	Police, ambulance and fire stations which are *not* required to be operation during flooding. Buildings used for: shops; financial, professional and other services; restaurants and cafes; hot food takeaways; offices; general industry; storage and distribution; non-residential institutions not included in 'more vulnerable'; and assembly and leisure. Land and buildings used for agriculture and forestry. Waste treatment (except landfill and hazardous waste facilities). Minerals working and processing (except for sand and gravel

	working). Water treatment works and which do *not* need to remain operation during times of flood. Sewerage treatment works (if adequate measures to control pollution and manage sewage during flooding events are in place).
Water-compatible Development	Flood control infrastructure. Water transmission infrastructure and pumping stations. Sewage transmission infrastructure and pumping stations. Sand and gravel workings. Docks, marinas and wharves. Navigation facilities. MOD defence installations. Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location. Water-based recreation (excluding sleeping accommodation). Lifeguard and coastguard stations. Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms. Essential ancillary sleeping or residential accommodation for staff required by uses in this category, *subject to a specific warning and evacuation plan.*

Notes:

1. This classification is based partly on Defra/Environment Agency research on Flood Risks to People (FD2321/TR2) and also on the need of some uses to keep functioning during flooding.

2. Buildings that combine a mixture of uses should be placed into the higher of the relevant classes of flood risk sensitivity. Developments that allow uses to be distributed over the site may fall within several classes of flood risk sensitivity.

3. The impact of a flood on the particular uses identified within this flood risk vulnerability classification will vary within each vulnerability class. Therefore, the flood risk management infrastructure and other risk mitigation measures needed to ensure the development is safe may differ between uses within a particular vulnerability classification.

Table 3-3. Flood Risk Vulnerability and Flood Zone 'compatibility'

Vulnerability Classification (**Table 3-2**)		Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone	1	✓	✓	✓	✓	✓
	2	✓	✓	Exception Test	✓	✓
	3a	Exception Test	✓	×	Exception Test	✓
	3b	Exception Test	✓	×	×	×

Notes to Table 3-3*:*

This table does not show the application of the Sequential Test which should be applied first to guide development to Flood Zone 1, then Zone 2, and then Zone 3; nor does it reflect the need to avoid flood risk from sources other than rivers and the sea;

The Sequential and Exception Tests do not need to be applied to minor developments and changes of use, except for a change of use to a caravan, camping or chalet site, or to a mobile home or park home site;

Some developments may contain different elements of vulnerability and the highest vulnerability category should be used, unless the development is considered in its component parts.

† In Flood Zone 3a essential infrastructure should be designed and constructed to remain operational and safe in times of flood.

** In Flood Zone 3b (functional floodplain) essential infrastructure that has to be there and has passed the Exception Test, and water-compatible uses, should be designed and constructed to:*

- *remain operational and safe for users in times of flood;*
- *result in no net loss of floodplain storage;*
- *not impede water flows and not increase flood risk elsewhere.*

3.4 Requirements for Sequential and Exception Tests at the Site

The revised NPPF requires that the Sequential and Exception Tests should be applied when choosing the location of new development and the layout of the development site. The Sequential Test aims to promote development in low flood risk areas. The Exception Test is used where no suitable development areas can be found in low risk zones.

3.4.1 Sequential Test

The Local Planning Authority's (LPA's) Strategic Flood Risk Assessment (SFRA) is produced to help guide development and forms the basis for the application of the Sequential Test.

When planning a development, a sequential approach should be applied to identify suitable sites which are at the lowest risk from flooding, avoiding Flood Zones 2 and 3 where possible. The overall aim of decision-makers should be to steer new development to Flood Zone 1. If no suitable areas can be identified in Flood Zone 1 then sites with the lowest flood risk should be considered next.

As the site is partially located within Flood Zones 2 and 3, development of these areas should limited where possible, or the Exception test set out below should be applied to these areas.

3.4.2 Exception Test

The proposed site encompasses multiple land use types and as such, the vulnerability of the developments varies across the site.

The NPPF classifies commercial developments as 'Less Vulnerable' and their construction is permitted in Flood Zone 3a.

Residential developments and hotels are classified as "More Vulnerable" and their construction is permitted in Flood Zone 3a, provided the exception tests is passed. As such residential developments need to:

- Provide wider sustainable benefits to the community that outweigh flood risk.
- Ensure the development will be safe for its lifetime, without increasing flood risk elsewhere, and where possible reduce flood risk elsewhere.

3.5 Environment Agency Climate Change Allowances (last updated July 2021)

The revised NPPF and supporting PPG on Flood Risk and Coastal Change explain when and how flood risk assessments should be used. This includes demonstrating how flood risk will be managed now and over the development's lifetime, taking climate change into account.

On 27th July 2021, the Environment Agency released updated guidance on climate change allowances to support NPPF, which links the allowances to River basin districts, available at https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances.

As areas of the site are within Flood Zones 2 and 3, the impact of climate change on fluvial flood risk and predicted tidal levels has been assessed using outputs from the Environment Agency's hydraulic model of the River Medina and coastal modelling.

3.6 Policy and Guidance Review

3.6.1 Preliminary Flood Risk Assessment (2017)

The Isle of Wight Preliminary Flood Risk Assessment (PFRA) was published in 2011 and updated in 2017. The PFRA provides a high-level summary of the flood risk within the council areas based on readily available data; it considers flooding from surface run-off, groundwater, sewers and ordinary watercourses. The purpose of the document is to identify the areas where flood risk is most significant, known as Flood Risk Areas.

The 2017 addendum notes that no Indicative Flood Risk Areas have been identified in the Isle of Wight by the EA.

3.6.2 Strategic Flood Risk Assessment (2010 / 2018)

The Isle of Wight Strategic Flood Risk Assessment (SFRA) was produced in 2010 and appraises flood risk from all sources and informs development control policies in Local Plans within the Isle of Wight. The SFRA provides guidance, recommendations for site specific FRAs for proposed developments in the different Flood Zones within the area, an assessment of all sources of flooding including the impact of climate change, and an assessment of locations where development may increase flood risk.

The Level 2 SFRA was published in 2018 and appraises flood risk to Local Plan sites. The Newport Harbour site was assessed in the 2018 report and in the 2021 site summary sheet addendum produced by JBA to support the 2021 Local Plan consultation.

3.6.3 Local Flood Risk Management Strategy (2016)

The Isle of Wight Council Local Flood Risk Management Strategy was produced in 2016. The strategy specifies the objectives for managing local flood risk on the island, measures to achieve the objectives, how and when they will be implemented, the costs and benefits, and how the strategy contributes to the achievement of wider environmental objectives.

3.6.4 Catchment Flood Management Plan (2009)

The Catchment Flood Management Plan (CFMP) aims to help understand the scale and extent of flooding now and in the future and set policies for managing flood risk within the

catchment. The site is located within the Lower River Medina and Gunard Luck sub catchment and covered by policy 4:

- "Areas of low, moderate or high flood risk where we are already managing the flood risk effectively but where we may need to take further actions to keep pace with climate change"

Within this area flood risk management activities will need to respond to the potential increases in flood risk due to climate change.

3.6.5 Shoreline Management Plan

The River Medina lies within Policy Development Zone 1 – Cowes and Medina Estuary. The overarching aims of this zone are:

- To sustain and adapt the important centres of economic activity including the Cowes waterfront and gateways to the Island and the access and use of the Medina Estuary and Newport Harbour.
- To support adaptation of the town centres of Cowes, East Cowes and Newport quay to reduce flood risk.
- To support water use and navigation in the area, taking account of the internationally important water sport activities and ferry links to the island.
- To support adaptation of local communities at Gurnard Luck.
- To maintain important access along the seafront and shoreline use of the area.
- To support opportunity for adaptation supporting and enhancing the nature conservation value of the Medina.
- To sustain the historic landscape and environment where practicable.
- To maintain the important landscape subject to natural change.

4 Assessment of Flood Risk

All new developments must comply with the flood risk guidance set out in the revised NPPF.

As the site is located in Flood Zones 2 and 3 and considered a 'major development' an FRA is required.

In addition, the site may be at risk of flooding from surface water, groundwater or artificial sources and therefore a Flood Risk Assessment (FRA) considering all sources of flooding including fluvial, pluvial and groundwater is required.

The revised NPPF advocates a risk-based approach to flood risk management in terms of appraising, managing and reducing the consequences of flooding both to and from a development site. The primary objectives of this FRA are to determine the following:

- Whether the site is at significant risk from any forms of flooding;
- The risks of all forms of flooding to and from the development, and to demonstrate how these flood risks will be managed so that the development remains safe throughout its lifetime, taking climate change into account;
- Determine if safe access to and from the site will be maintained during an extreme flood event;
- The impact of the development on flood risk elsewhere.

4.1 Historical Flooding

The EA's Historic Flood Map shows no historic flood events within the site boundary. The closest outline to the site is located approximately 150m to the west of the site, along the Lukely Brook, and occurred in 1993. The source of the flooding is not recorded.

The L1 SFRA identifies previous flood events along the River Medina have occurred in 1934, 1951, 1660/1 (flooding 150 properties), 1993, 1999, and 2000/1 (flooding 8 properties). The cause of the 2000/1 flooding was a combination of fluvial events and tide locking. A S19 flood investigation was undertaken by Isle of Wight Council in 2014 to investigate flooding experienced along the Lukely Brook in December 2013.

4.2 Sources of Flooding

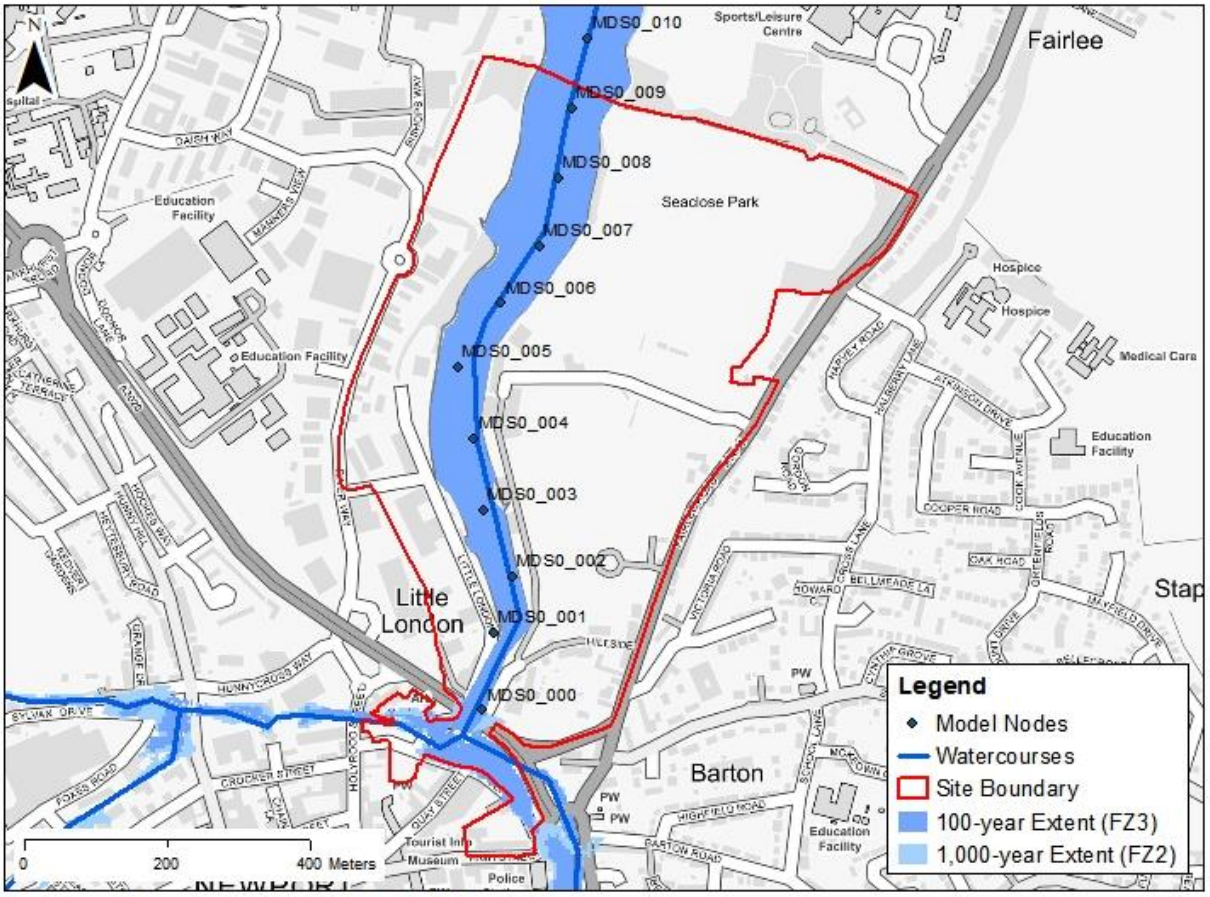
4.2.1 Fluvial Flood Risk

A review of the EA's Flood Map for Planning shows that the site is partially located within Flood Zones 2 and 3. Figure 4-1 shows the outputs from the fluvial Medina hydraulic model.

As shown in Figure 4-1 the fluvial flood risk to the site is low. This is due to the tidal influence on flooding along this reach of the Medina and is highlighted by the 1D representation of the channel downstream of the A3020 bridge in the hydraulic model. Peak water levels within the channel downstream of the A3020 at node MDS0_000 are 2.717m AOD during the 1 in 100-year event. Along the northern boundary of the site, peak water levels are 2.342m AOD at model node MDS0_009 during the 1 in 100-year event. Based on LiDAR, there may be a small amount of overtopping downstream of the A3020, along the left and right bank of the Medina, between MDS0_000 and MDS0_ 001.

The peak modelled fluvial water levels at each model node for the 1 in 100-year event are shown in Table 4-1. The locations of each model node are shown in Figure 4-1.

Figure 4-1: Fluvial flood risk to the site



Source: EVB-JBAU-XX-XX-M2-EN-0013-P01.01-Flood Zones - Fluvial

Table 4-1: 100-year fluvial water levels

Model Nodes	100-year water level (m AOD)
MDS0_000	2.717
MDS0_001	2.615
MDS0_002	2.550
MDS0_003	2.523
MDS0_004	2.507
MDS0_005	2.490
MDS0_006	2.468
MDS0_007	2.430
MDS0_008	2.383
MDS0_009	2.342
MDS0_010	2.273

The 1 in 20-year fluvial flood extent (Flood Zone 3b) along the Lukely Brook remains within channel in the south-west of the site and as such, is unlikely to impact the residential developments proposed here.

Within the north of the site, based on 1D water levels within the channel, the 1 in 20-year flood extent does not impact the proposed developments on either side of the Medina and

remains mostly in channel downstream of the A3020. The peak modelled fluvial water levels at each model node during the 1 in 20-year event are shown in Table 4-2.

Table 4-2: 20-year fluvial

Model Nodes	20-year water level (m AOD)
MDS0_000	1.991
MDS0_001	1.861
MDS0_002	1.782
MDS0_003	1.740
MDS0_004	1.716
MDS0_005	1.698
MDS0_006	1.689
MDS0_007	1.678
MDS0_008	1.664
MDS0_009	1.618
MDSO_010	1.549

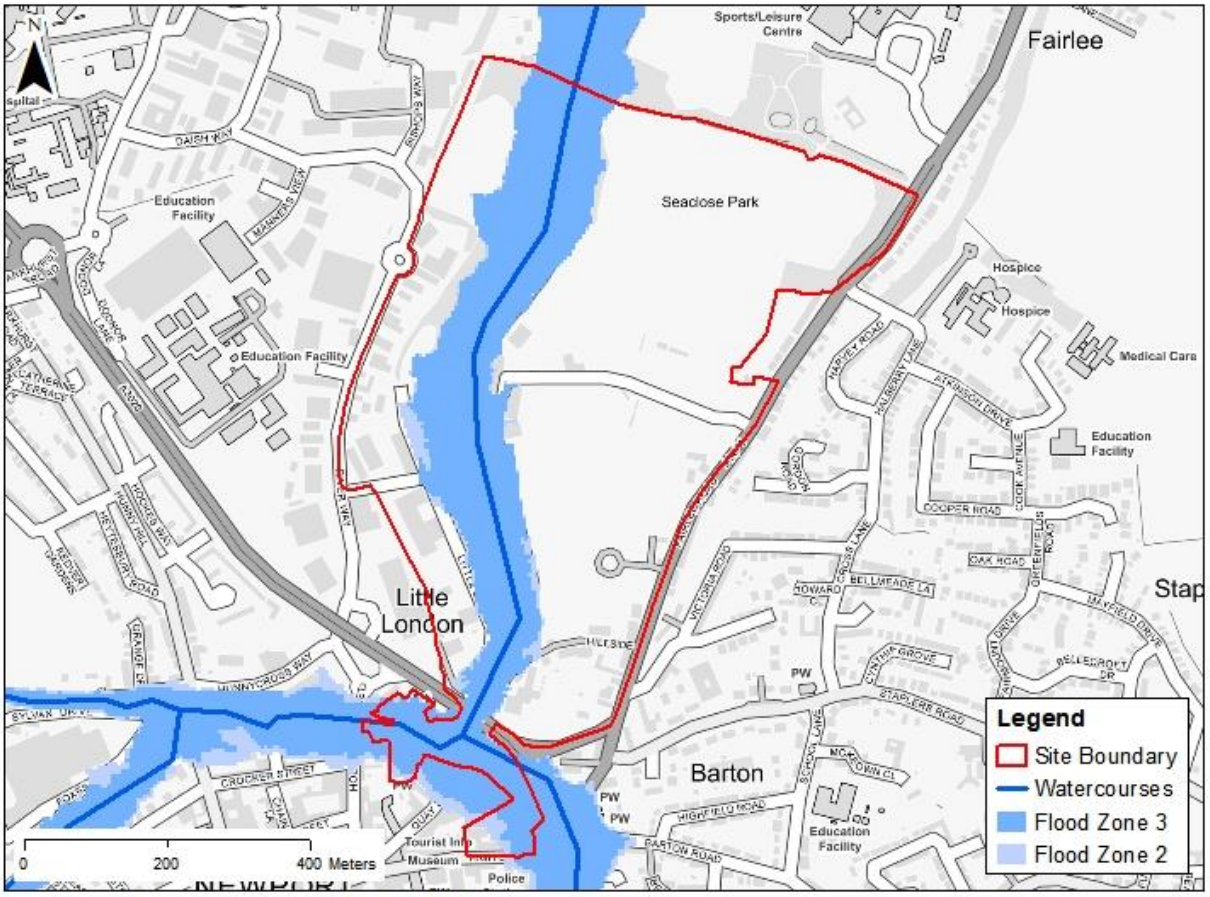
If development is to occur within areas of fluvial Flood Zone 3 (i.e., within the 1 in 100-year fluvial flood extent) then compensatory floodplain storage should be provided, however this is not expected to be relevant for most of the Masterplan area.

4.2.2 Tidal flood risk

As shown in the historical flood events in this area, flood risk to the site often occurs due to a combination of high tides and a fluvial flood event occurring at the same time. This causes water levels to rise within the channel and can lead to overtopping of the harbour walls.

JBA undertook tidal modelling of the Medina and several other coastal regions in the Isle of Wight in 2015. Outputs from this model have been used to view the impact of a tidal event and fluvial event along the Medina and alongside the Flood Zones have been used to assess flood risk to the site and are shown in Figure 4-2.

Figure 4-2: Environment Agency Flood Zones (includes tidal extent)



Source: EVB-JBAU-XX-XX-M2-EN-0014-P01.01-Flood Zones - Tidal
Contains OS data © Crown copyright and database right 2021
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As shown in Figure 4-2, the Flood Zones within the site are greater than the fluvial flood extents from the latest modelling. This is most predominant within the south of the site which is almost entirely located within both Flood Zones, however it is understood that this is due to the fact that the fluvial modelling outputs have yet to be incorporated into the Flood Zone. In the tidal reach of the river, downstream of the A3020, the flood extents do extend onto the keyside, however this is limited due to the steep nature of the local topography. This is further supported by the limited change between the Flood Zone 3 and Flood Zone 2 extents. A larger map of the Flood Zones at the site is presented in Appendix B.1.

The 2010 SFRA identifies the following flood risk issues associated with the River Medina:

- Tidal flooding.
- Problems with intervention in the channel impeding free drainage.
- High water levels within the Lukely Brook.

Whilst fluvial flood risk on its own to the site is generally low, the site is at risk of flooding from a combination of both high tides and a fluvial flood event, where fluvial flows become "tidelocked" and this is likely to impact the proposed development areas of the site close to the Medina.

Based on the Newport Harbour Masterplan proposed site layout, the southern section of the site (upstream of the A3020) is proposed for car parking and residential dwellings. Whilst car parking is water compatible and permitted within Flood Zones 2 and 3, residential dwellings are not. To mitigate the impact of flooding to the residential developments, the buildings are to be three stories with a less vulnerable ground floor land use. A less vulnerable land use is permitted within Flood Zone 3 and this will reduce the footprint of

the ground floor and its impact on flood depths. The less vulnerable ground floor use can be combined with flood resilience measures to allow the ground floor to flood, which will reduce the impact on flooding from the development.

In the north of the site, to the west of the Medina, the edge of the Flood Zone 2 and 3 extents partially enter the proposed residential developments. To the east of the Medina the residential developments and several commercial developments are also located within the Flood Zone 3 extent. Similarly to the south of site, these residential dwellings are part of multistorey buildings which will have less vulnerable development types occupying the ground floor spaces, such as shops which can be allowed/designed to flood. The proposed use of ground floor space is likely to vary between developments and is subject to change during the detailed design phases. Detailed flood risk assessments for the proposed buildings should identify the finalised development types for the ground floor.

Whilst the residential developments will not be directly impacted by flooding, access routes to these buildings may be impacted by flood waters and as such will require flood evacuation plans specific to each building, detailing how the impact of flooding will be mitigated.

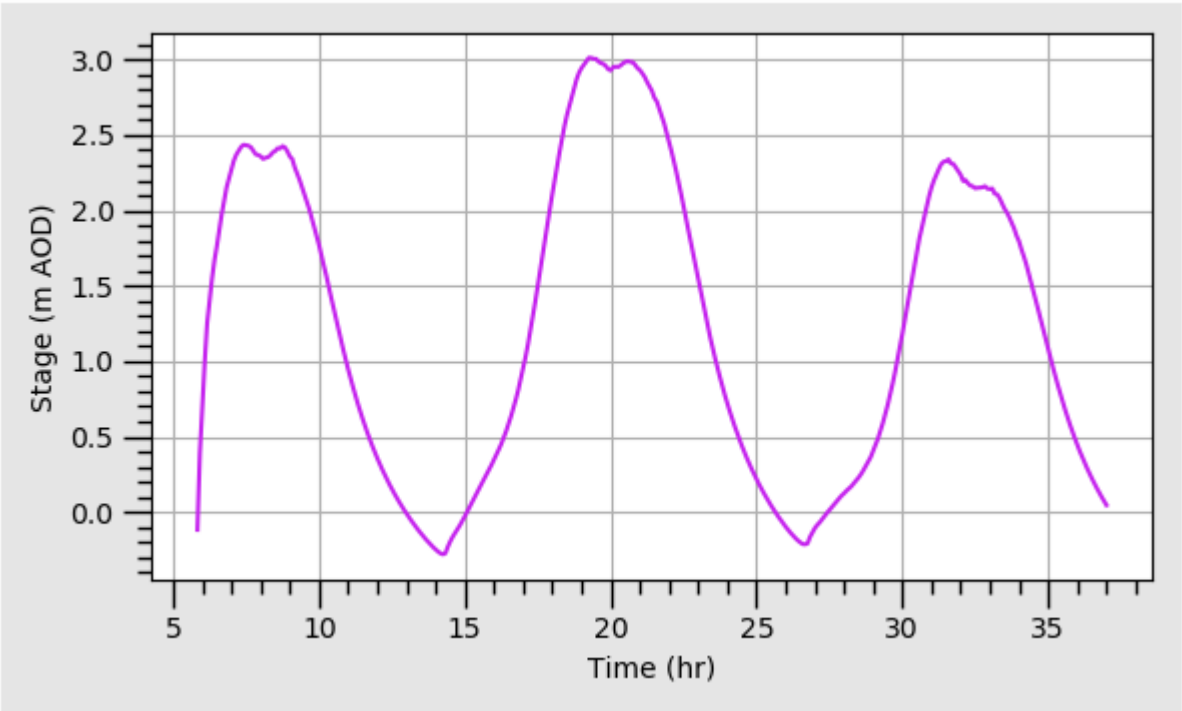
The height of the harbour walls varies within the site and as such the elevations generally range between 2.5m AOD to 2.9m AOD. Based on the 1 in 200-year results limited overtopping is predicted to occur at 7 hours into the simulation, lasting for less than 1.5 hours around the tidal peak. Stage time plots within the channel at these locations suggest overtopping occurs at areas less than 2.5m AOD.

At approximately 18 hours into the simulation, the most significant overtopping begins, continuing for approximately 2.5 hours when water levels peak, and have receded by 22.25 hours into the simulation.

A time series, taken in the channel around points B and C (see Figure 4-5), which are located in the vicinity of the proposed developments along the Medina, is provided in Figure 4-3 and shows the tidal cycle for the 1 in 200-year tide.

Appendix B.2 shows a comparison of the flood zones against the proposed site layout.

Figure 4-3: Stage-time plot within the Medina during the 1 in 200-year scenario



4.2.3 Flood Defences

The EA's spatial flood defence map shows no formal flood defences within the vicinity of the site. The site does not fall within an area benefitting from defences. The majority of the site is protected by high ground from the quay and harbour walls.

Development of the land adjacent to the harbour walls should take into account the existing defence assets.

4.2.4 Surface Water Flood Risk to the Development

Surface water flood risk is generated when rain falls on impermeable surfaces or saturated ground, generating overland flows and/or local ponding. It can be exacerbated when the capacity of local drainage systems is exceeded or when groundwater is high. This can pose a risk to the site but also to the adjacent sites as a result of increased areas of impervious surface resulting from the development site.

Surface water flood risk to the site was assessed using the Environment Agency's 'Risk of Flooding from Surface Water' (RoFSW) maps which show the extent of surface water flooding within the vicinity of the site. The recurrence of surface water flooding can be classified into risk categories, as shown below:

- High – an area has a chance of flooding of greater than 1 in 30 each year
- Medium – an area has a chance of flooding of between 1 in 30 and 1 in 100 each year
- Low – an area has a chance of flooding of between 1 in 100 and 1 in 1,000 each year
- Very Low – an area has a chance of flooding of less than 1 in 1,000 each year

The RoFSW mapping information shows that areas of the site are at risk of flooding from surface water.

There are several surface water flow paths within the site, with the largest located in the east of the site. This flow path travels through the residential area to the east of Fairlee Road and into the site along the northern boundary of the cemetery towards the River Medina. This flow path will affect the site from the 1 in 30-year event upwards. Depths within the site are up to 0.6m during the 1 in 1,000-year event. If not mitigated, this flow path is likely to impact the residential developments proposed to the north of the cemetery and the residential and commercial areas at the harbour, near the proposed footbridge. It is noted that the flow from the east is conveyed through the site in a culvert that discharges into the Medina at this location. Structures such as culverts of this type are not representing directly within the national scale RoFSW mapping and therefore this flow is likely to be under estimated and the overland flows may be conservative in this location.

Along the northern boundary of the site, to the east of the Medina, there is a small flow path where ponding occurs from the 1 in 30-year event upwards.

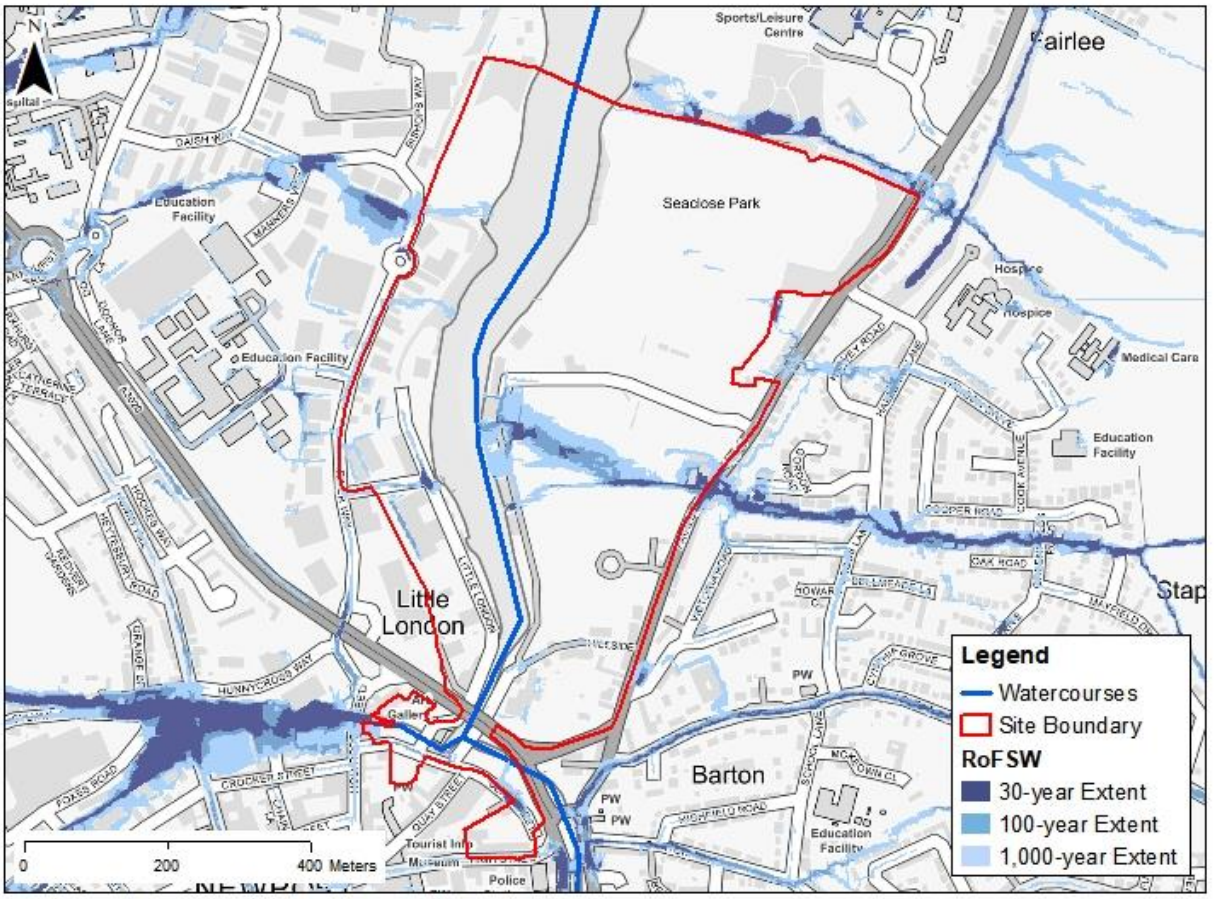
To the west of the River Medina, there are several smaller flow paths that enter the site from River Way during the 1 in 1,000-year event. At the junction of Hurstake Road and London Road surface water ponds from the 1 in 30-year event upwards. Depths at the junction are between 0.15m and 0.6m during the 1 in 30-year event.

Within the south of the site, ponding occurs along Sea Street from the 1 in 30-year event upwards. Depths here range between 0.15m to 0.6m during the 1 in 30-year event to up to 0.9m during the 1 in 1,000-year event. To the west of this part of the site, there is very high surface water risk associated with the Lukely Brook.

Several of the surrounding roads are at risk of flooding from surface water. The most heavily impacted are Fairlee Road, Staplers Road, East Street, and around Hunny Hill which are impacted from the 1 in 30-year event upwards. Many of the roads to the south of the site are impacted from the 1 in 100-year event upwards.

The RoFSW at the site is shown in Figure 4-4.

Figure 4-4: Risk of Flooding from Surface Water



Source: EVB-JBAU-XX-XX-M2-EN-0011-P01.01-RoFSW

Several areas of the proposed development are at risk of surface water flooding. The proposed site layout and RoFSW layer are shown in Appendix B.3. The main flow path that impacts development areas is from the east of the site. This flow path flows through proposed residential dwellings to the north of the cemetery and towards residential and commercial developments on the right bank of the Medina. A detailed surface water strategy should be produced that demonstrates how surface water will be managed within the site including how SuDS will be implemented into the design.

4.2.5 Surface Water Flood Risk from the Site

To manage the potential increase in surface water runoff generated by the development of the site, an overarching drainage strategy should be produced that focusses on managing surface water risk within the entire site. It is noted that discharge from the site will be to the tidal reach, and as such the potential for tide locking and its impact on drainage and possible storage should be considered as part of any scheme.

4.2.6 Climate Change

Climate change is likely to impact the site. The Environment Agency released updated guidance and uplifts for climate change allowances on the 20th July 2021. Whilst the Isle of Wight is located within the 'South East' River Basin District (RBD), allowances are now allocated to catchments of which the Isle of Wight is its own. Table 4-3 details the change in peak river flow allowances.

Table 4-3: Peak river flow allowances

Allowance (2080s)	Old Uplift (RBD)	New Uplift (Catchment)
Central	35%	33%
Higher Central	45%	49%
Upper End	105%	99%

This guidance was published after the latest EA hydraulic model data was released, however a comparison between the previous allowances and the latest uplifts shows that the previous allowances are greater than the previous uplift with the exception of the 'higher central' allowance. This, therefore provides a conservative estimate of future flood risk and the outputs are deemed appropriate for the purpose of this study.

The River Medina within the vicinity of the site is tidally influenced and as such the increases in sea level in Table 4-4 are relevant to the site.

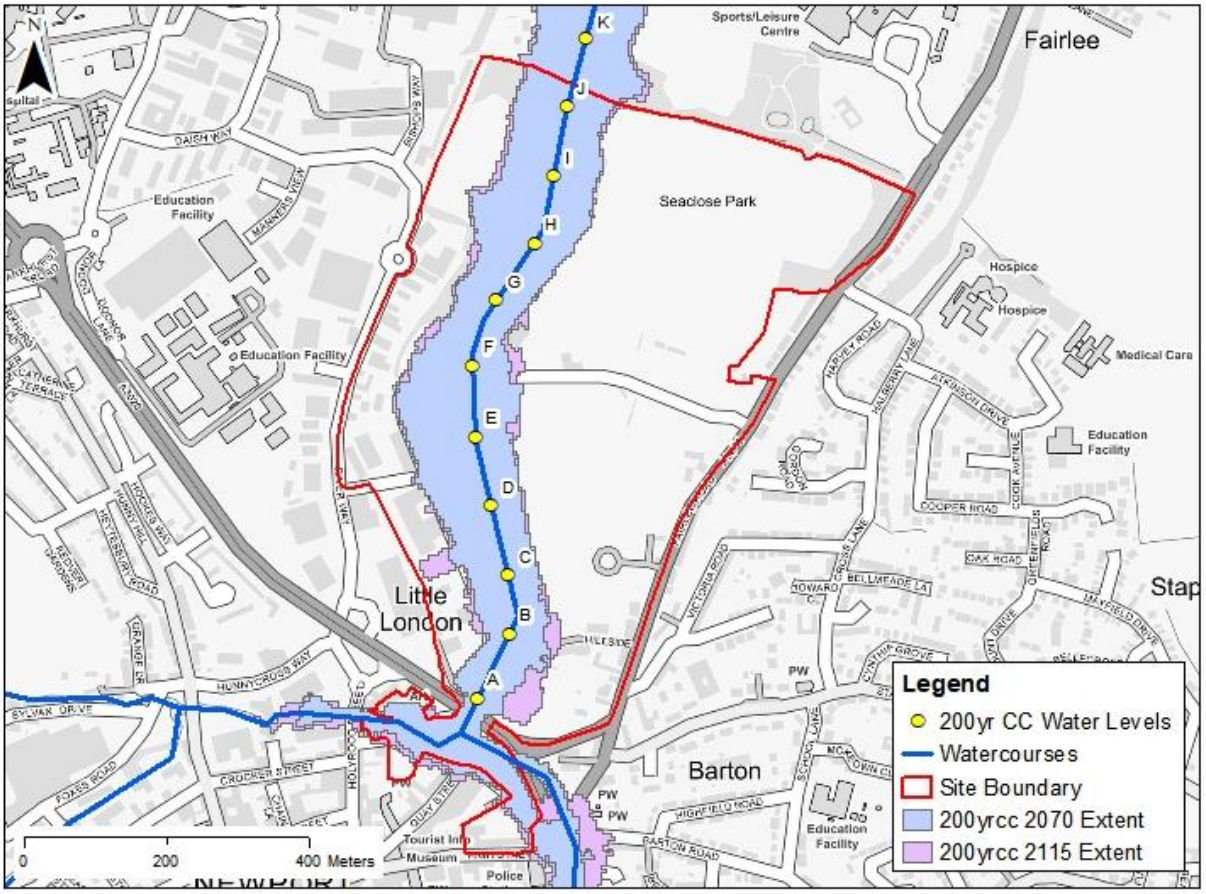
Table 4-4: Sea level allowances

Allowance	Total sea level rise (mm)				Cumulative rise (m)
	2000 to 2035	2036 to 2065	2066 to 2099	2096 to 2125	2000 to 2125
Higher Central	200	261	348	393	1.20
Upper End	242	339	474	546	1.60

The 2010 SFRA identifies areas of Newport which may be vulnerable to the impacts of climate change. Areas within the site, such as at both banks of the Medina downstream of the A3020 are likely to be impacted by climate change.

Based on outputs from the 2015 coastal modelling, the 1 in 200-year water levels for the years 2070 and 2115 at the site are presented in Table 4-5. The flood extents for both scenarios are shown in Figure 4-5.

Figure 4-5: 200-year plus climate change flood extents



Source: EVB-JBAU-XX-XX-M2-EN-0017-P01.01-Flood Zones - Tidal CC

Table 4-5: Peak water levels during the tidal 1 in 200-year climate change scenarios

Model Node	1 in 200-year 2070 water level (m AOD)	1 in 200-year 2115 water level (m AOD)
A	3.49	4.11
B	3.49	4.11
C	3.49	4.10
D	3.49	4.10
E	3.49	4.10
F	3.49	4.10
G	3.49	4.10
H	3.49	4.10
I	3.49	4.10
J	3.48	4.10
K	3.48	4.10

During fluvial events, climate change is likely to increase the 1 in 100-year peak water levels within the Medina by up to 0.07m during the 100-year plus 105% climate change scenario. The increase in water levels is greatest at Model Node B (MDSO_001) and this decreases downstream towards the northern site boundary. The change in fluvial water levels is shown in Table 4-6.

Table 4-6: Peak water levels during the 1 in 100-year and 1 in 100-year plus 105% climate change scenarios

Model Node	1 in 100-year water level (m AOD)	1 in 100-year plus 105% climate change water level (m AOD)
A	1.986	2.051
B	1.856	1.926
C	1.778	1.836
D	1.738	1.787
E	1.714	1.76
F	1.697	1.741
G	1.688	1.731
H	1.678	1.717
I	1.663	1.699
J	1.617	1.649
K	1.549	1.578

Within the south-east of the site, climate change is likely to create small increases in the 100-year flood extent. Within the south-west of the site, there is a greater increase in flood extent than in the south-east which is likely to impact several of the proposed residential developments.

4.2.7 Groundwater Flood Risk

Groundwater flooding occurs when the water table rises above ground level, especially after a period of prolonged rainfall. This is most likely to occur in low-lying areas that are underlain by permeable bedrock and superficial geology. Unlike other forms of flooding, groundwater flooding does not pose a significant risk to life, however it can cause serious damage to property.

The site is not located within a groundwater Source Protection Zone. The Environment Agency Groundwater Vulnerability Map shows the majority of the site is within a "high" vulnerability area. Within the north of the site around Seaclose Park groundwater vulnerability is "medium".

There are several boreholes close to the site. Several of these boreholes, on the west bank of the Medina, experienced water seepage at 2-3m below the surface. Further investigations into groundwater levels within the site should be undertaken prior to development to identify areas which may experience high groundwater levels.

If the proposed development is to include basements, their design and construction materials should ensure that in the event of groundwater levels rising, there will be no ingress into the building.

4.2.8 Reservoir Flood Risk

Reservoir flood risk is associated with overtopping of a reservoir (residual risk) or failure (breach). In the unlikely event of a reservoir dam failing, a large volume of water would escape at once and flooding could happen with little or no warning. This is a worst-case scenario as reservoirs are designed to a 10,000-year standard of protection (under the Reservoir Act 1975 in England), and it is therefore unlikely that any actual flood would be this large.

When considering the probability of a reservoir breach, the EA website states that reservoir flooding is extremely unlikely to occur and there has been no loss of life since 1925[5]. Strict regulations and maintenance schedules should help operators identify any issues or changes in behaviour before these become an issue which may compromise the safety of a reservoir.

The site is not at risk of reservoir flooding.

5 Environment Agency SC080046 Lessons Learnt from Dam Incidents at: http://evidence.environment-agency.gov.uk/FCERM/en/Default/FCRM/Project.aspx?ProjectID=f7fd7100-9a12-46ee-907d-e102d88c61c0&PageID=56bad68e-dcb1-4bf8-84cc-cbfd03ab63a2

5 Construction (Design Management) Compliance

Under the Construction (Design and Management) Regulations 2015 (CDM 2015) it is the designer's duty to:

- Eliminate foreseeable health and safety risks to anyone affected by the project;
- Take steps to reduce or control any risks that cannot be eliminated;
- Communicate, cooperate and coordinate with the client, other designers and contractors involved in the project so that designs are compatible, and health and safety risks accounted for during the project and beyond

The following hazards associated with the construction, operation and maintenance of the mitigation measures have been identified during the preliminary site assessment.

- Surface water flood risk: the site is at moderate risk of surface water flooding.
- Groundwater flood risk: the site is at moderate to high risk of groundwater flooding.
- Fluvial flood risk: the site is at high risk of fluvial/tidal flooding.
- Underground services, including electrical supply and sewerage
- Live vehicular traffic: the site is located off Fairlee Road, Quay Street, and Little London Road.
- Environmental: excavations within current site and use of construction machines are not expected to pose a significant risk of pollution to the water environment, but are a hazard to site staff. Appropriate mitigation measures will therefore be required.

It should be noted that the potential hazards have been identified through a desk study of currently available information and this list should not be considered as exhaustive. A detailed site survey should be undertaken prior to any construction / installation activities commencing to confirm the presence of potential unidentified hazards on and in the immediate vicinity of the site.

6 Flood Risk and Mitigation Measures

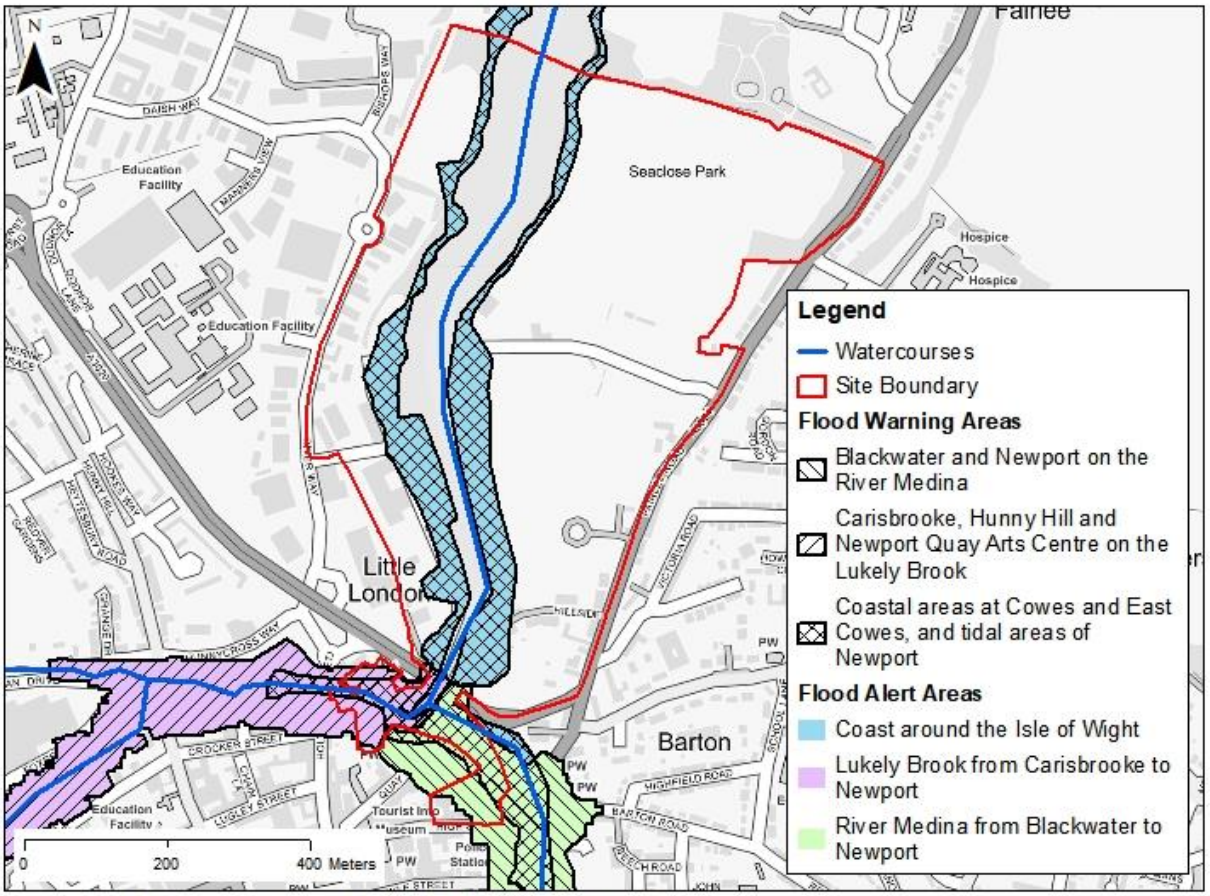
In accordance with the NPPF and the associated PPG, it must be demonstrated that the proposed development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

The recommendations in the following sections should be incorporated into the development to make the site flood resilient.

6.1 Flood Warning and Alerts

The site is located within several flood warning and alert areas, as outlined below and shown in Figure 6-1.

Figure 6-1: Flood Warning Areas



Source: EVB-JBAU-XX-XX-M2-EN-0012-P01.01-Flood_Warning_Areas

As shown in Figure 6-1:

- The south-west corner is located within the "Lukely Brook" Flood Alert Area and the "Carisbrooke and Honey Hill on the Lukely Brook" Flood Warning Area.
- The south-east corner is located within the "Blackwater and Newport on the River Medina" Flood Alert Area and the "River Medina" Flood Warning Area.
- The centre and north are located within the "Cowes, East Cowes, and Newport" Flood Alert Area and the "Isle of Wight coast" Flood Warning Area.

It is recommended that the site manager registers to receive these notifications. Further information can be found here: https://www.gov.uk/sign-up-for-flood-warnings?_ga=2.57425001.2115800370.1607678319-858055322.1596120840

6.2 Sequential Approach

A sequential approach to locating development in flood risk areas is required under NPPF and a whole site approach should be taken to locating development within the site and the planning of parcels of development/phases. Whilst the current site area is large, the area of developable land is significantly lower as areas including the cemetery and Seaclose Park are not included as part of the proposed development. Within the south of the site, tidal flood risk is very high with the majority of the site inundated and high fluvial flood risk in the south-east side of the site. As such the proposed developments are currently located in the south-west of the site, which is the lowest risk area of the southern half of the site.

In the north of the site, most of the proposed developments are located within the tidal flood extents. Currently there is a food/retail unit proposed which falls in an area of lower tidal flood risk. Switching the location of this unit with a residential unit would maximise the use of lower risk land for higher risk development types.

Elsewhere in the site, the more vulnerable development types are located above the ground floor and are therefore at a reduced flood risk, providing safe access and egress can be maintained and suitable resilience measures are in place.

6.3 Access and Egress

There are several access routes across the site for both vehicles and pedestrians. The Environment Agency's Flood Zone and RoFSW layers, hydraulic model results and the Masterplan movement strategy have been used to assess the impacts of flooding on access and egress to the site.

6.3.1 South Harbour

Within the south of the site, the land use is predominantly water compatible car parking with several residential units, which are classified as more vulnerable development types. Based on the EA's Flood Zones, the South Harbour part of the site is almost entirely located within Flood Zones 2 and 3. As such access to the site from Quay Street and Holyrood Street is likely to be impacted. The Newport Harbour Masterplan movement strategy identifies these routes as key pedestrian routes and secondary vehicle routes.

During fluvial events the east side of this part of the site (car park SH3-A & B) and part of Sea Street are likely to be inundated from the 1 in 5-year event upwards. From the 1 in 100-year event upwards, flood waters spread further west along Sea Street to the junction at Quay Street which will impact access to the residential units on the western side from both by vehicle and on foot from this direction. Access to the western side would remain from Holyrood Street during the modelled fluvial scenarios.

During surface water events, Sea Street is likely to be impacted from the 1 in 100-year event upwards and Holyrood Street during the 1 in 1,000-year event. Depths along Sea Street are less than 0.15m within the vicinity of the residential developments and up to 0.6m at the entrance to car park SH3-A & B during the 1 in 100-year event.

6.3.2 West Harbour

To the west of the Medina the proposed land use is residential and commercial developments. Surface water flood risk within this part of the site is generally low. This part of the site is likely to be accessed from River Way which is partly impacted during the 1 in 1,000-year event. At the junction of Hurstake Road and Little London Road surface water ponds from the 1 in 30-year event upwards with depths of between 0.15 to 0.6m during the 1 in 30-year event.

Little London Road is likely to be impacted during a tidal event which will affect vehicular and pedestrian access to the residential developments. Climate change is likely to increase the extent of tidal flooding along Little London Road and around the developments during the 1 in 200-year event.

6.3.3 East Harbour

The eastern side of the harbour is proposed to contain both residential and commercial developments and are likely to be accessed via The Quay and Public Footpath N120 which run parallel to the Medina. Within the vicinity of the developments, the access routes are likely to be impacted during tidal flood events.

In the far east of the site, between Seaclose Park and the Newport Cemetery are proposed residential developments. There is a surface water flow path which flows from the east through this area which will impact pedestrian access to several of the developments from the 1 in 30-year event upwards. The flow path crosses Fairlee Road into the site and is likely to flood from the 1 in 30-year event upwards. Depths along are Fairlee Road are up to 0.6m during the 1 in 30-year event and up to 0.9m during the 1 in 1,000-year event. Ponding in this area occurs around the service station to the south of the access road off Fairlee Road. Travelling north, Fairlee Road remains dry up to the 1 in 1,000-year event where depths are up to 0.15m.

To the east of the proposed footbridge across the Medina, surface water ponds around several of the residential and commercial development locations from the 1 in 100-year event upwards which may impact access to these development types.

6.3.4 Seaclose Park

Seaclose Park is located in the north-east of the site. This part of the site is not located within the fluvial or tidal flood extent. There are surface water flow paths to the north and south of the park, however these are unlikely to impact access to the park.

6.3.5 Safe haven

The development proposals include a number of mixed-use buildings within Flood Zones 2 and 3, with less vulnerable development types proposed for the ground floor and the upper floors proposed for residential dwellings, which are considered more vulnerable. In the event that safe egress from the residential areas is limited, safe spaces should be created within each development with suitable facilities to provide safety for individuals until flood waters recede and safe egress is possible.

As set out in Section 4 and highlighted in Section 4.2.2 the most significant source of flood risk within the development area and particular in the area adjacent to the harbour is from a tidal event. Due to the cyclical nature of tides a safe haven would be required for a period of 4-8 hours in the 1 in 200-year event to allow for drainage of flood waters following an extreme high tide and therefore suitable facilities should be made available. As shown in Figure 4-3 it is unlikely that a subsequent high tide will result in further inundation, however this may limit discharge of remaining flood water, and this should be considered as part of any drainage design for the site.

Climate change is also predicted to increase the underlying sea level and this in turn will increase the frequency and duration of tidal flooding. This should be considered as part of a detailed flood plan for each development area as the impact on access and egress from the site will vary as set out above.

6.4 Final Floor Levels

The site is shown to be located in Flood Zone 3 and at risk of tidal flooding. The Isle of Wight SFRA states finished floor levels should be set above the 1 in 200-year predicted tide levels for the year 2115 and should include a freeboard. Where lower vulnerability development is proposed for ground floor development, or where existing buildings are to be redeveloped, flood resilience measures such as flood doors or barriers or water compatible uses could be considered to minimise the impact of any flood risk.

For development located outside of flood risk areas it is recommended that the FFL is set to at least 150mm above adjacent ground levels to prevent ingress of stormwater.

FFLs of each individual unit should be set at the detailed flood risk assessment stage for each development.

6.5 Surface Water Risk Management

There is currently a risk of surface water ponding and flow routes entering the site and impacting proposed development areas. A surface water drainage strategy should outline the proposed means of managing surface water onsite, in line with industry standards, national guidance, and Lead Local Flood Authority requirements.

Discharge from the site should take into account the receiving waterbody and flood conditions that may be experienced along the watercourse. For example the onset of flooding within the site and inundation times, and tide levels. This is likely to vary within different areas of the site, and as such measures should be specific to each type of development in the site.

7 Conclusions

This FRA has reviewed the potential flood risk at the site, following government planning guidance and local planning authority policy.

7.1 Assessment of Flood Risk

There are two watercourses that flow through the site. The Lukely Brook flows into the south-west of the site and the River Medina flows through the south east of the site. The two watercourses converge south of the A3020 and the River Medina continues through the north of the site.

The north of the site is at low risk of fluvial flooding and the south of the site is at high risk of fluvial flooding. This is due to the tidal influence of the Medina. The south of the site and along the banks of the Medina in the north of the south are at high risk of tidal flooding.

The site is at moderate risk of surface water flooding. There are several flow paths that enter the site, the largest located to the north of the Newport Cemetery which flows westwards towards the River Medina.

The proposed site consists of both residential (more vulnerable) and commercial (less vulnerable) developments. Much of this development is located along the banks of the Medina and located within flood risk areas. To mitigate the impact of flooding the site is to be designed with less vulnerable development located on the ground levels and more vulnerable development located on the upper stories.

A detailed flood evacuation plan should be produced for any buildings located within flood risk areas, detailing how safe access and egress to the buildings will be maintained, or where appropriate safe haven provided as part of the development.

The site is at high groundwater vulnerability and detailed investigations should be undertaken to identify high groundwater areas within the site.

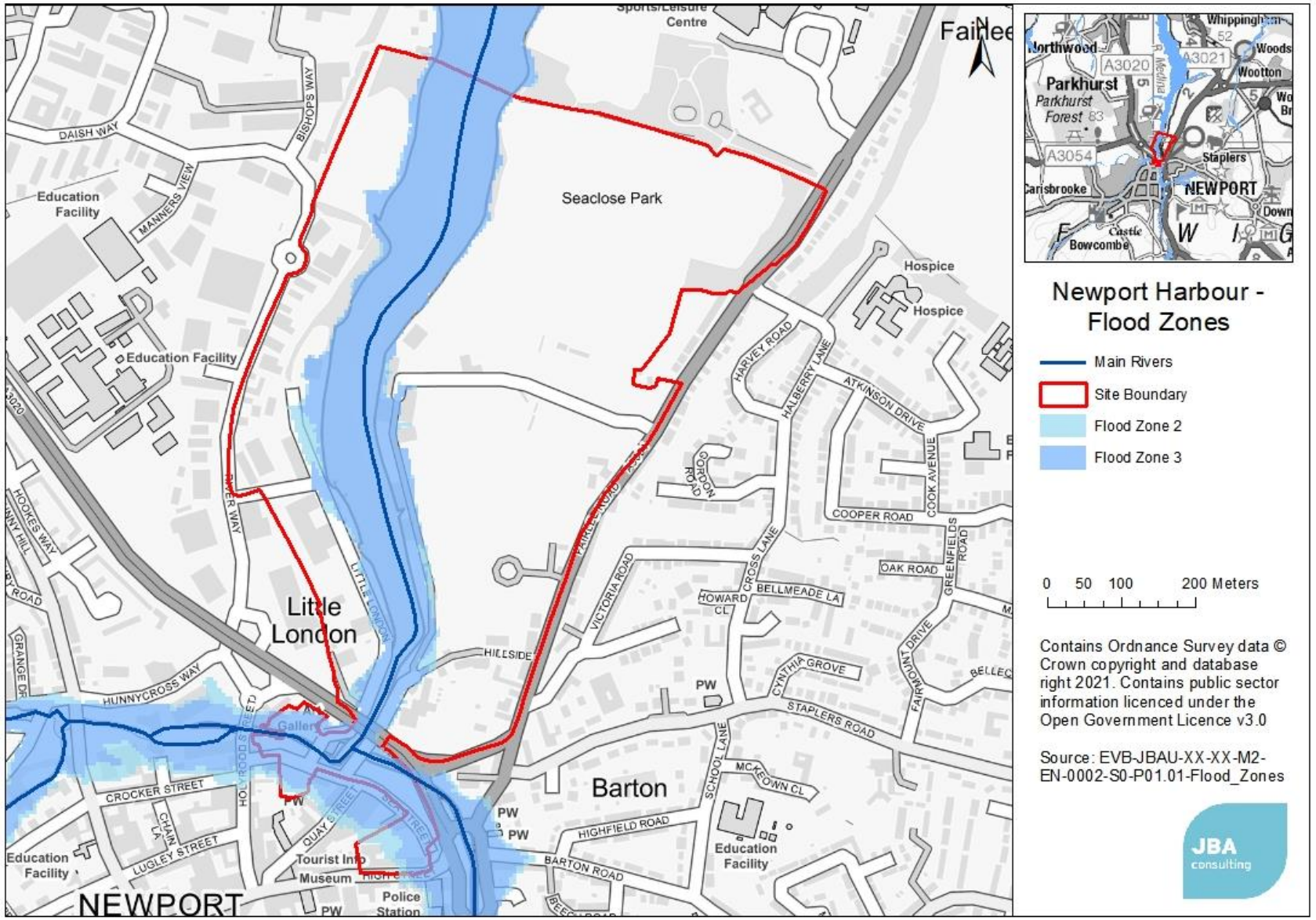
A detailed surface water drainage strategy should be produced which details how surface water will be managed on site and off site.

Appendices

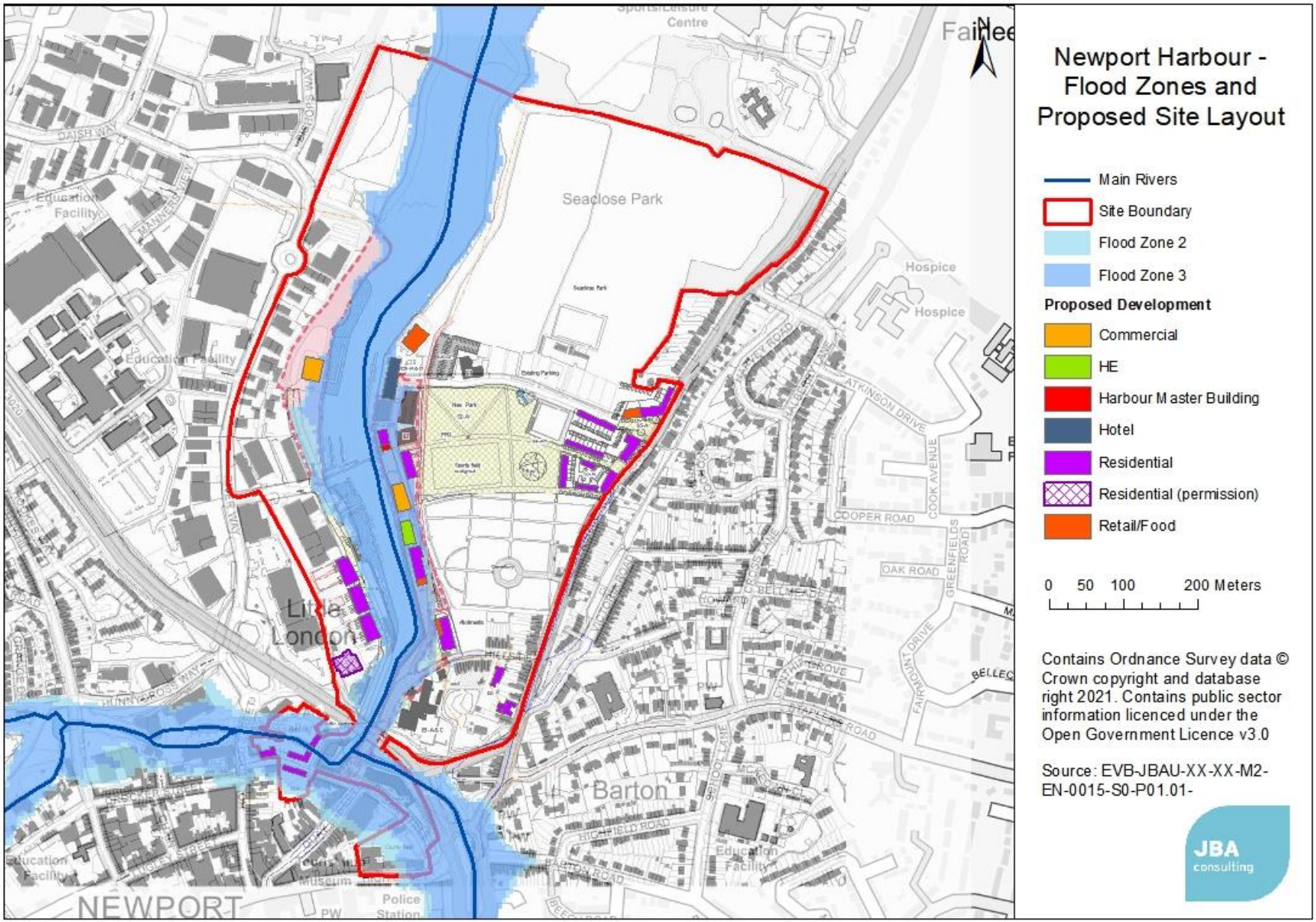
A Proposed Site Layout

B Flood Risk Maps

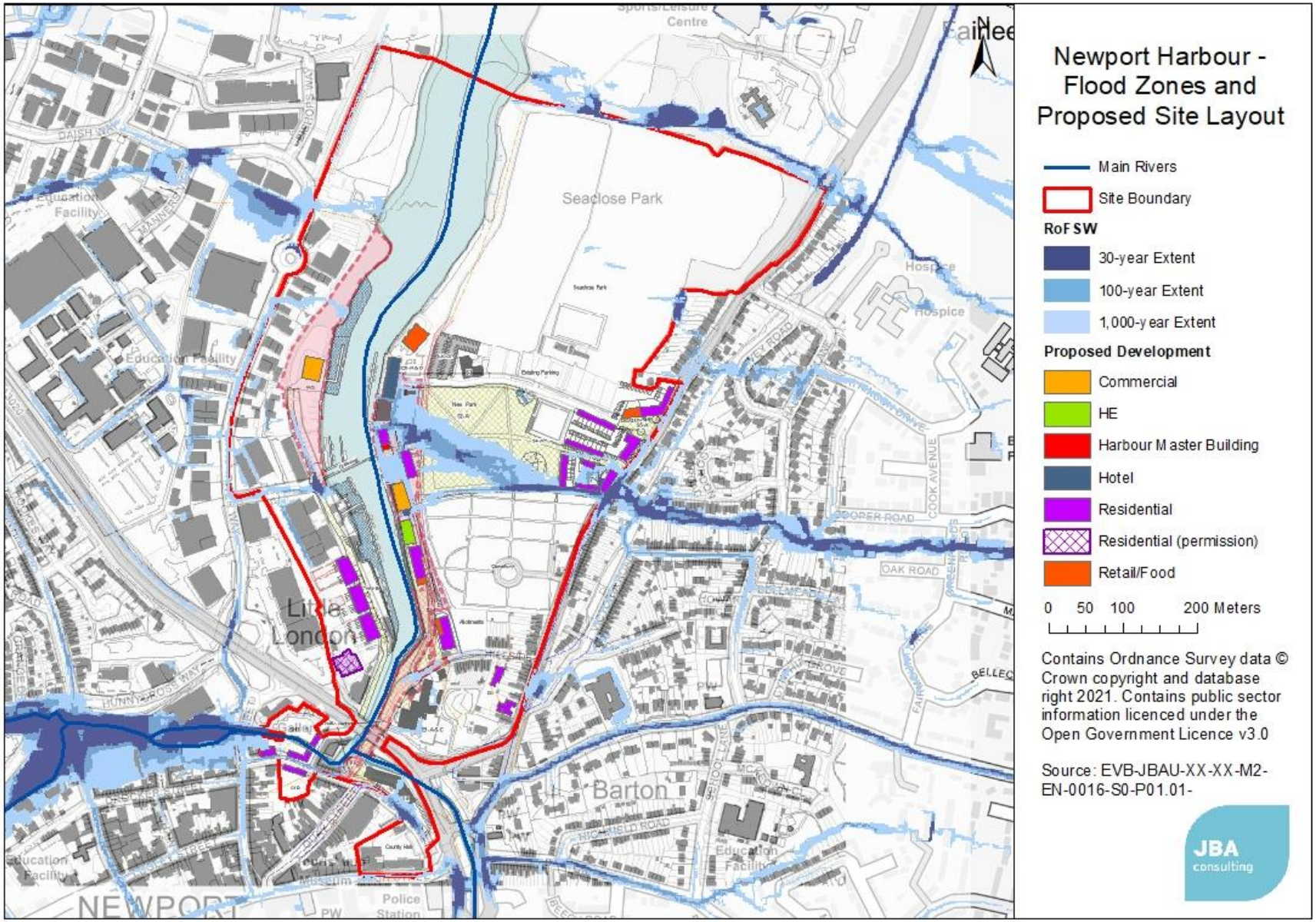
B.1 Flood Zones



B.2 Flood Zones and Proposed Site Layout



B.3 RoFSW and Proposed Site Layout



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