Appendix A **Pre and Post Development Permeable Area Plans**

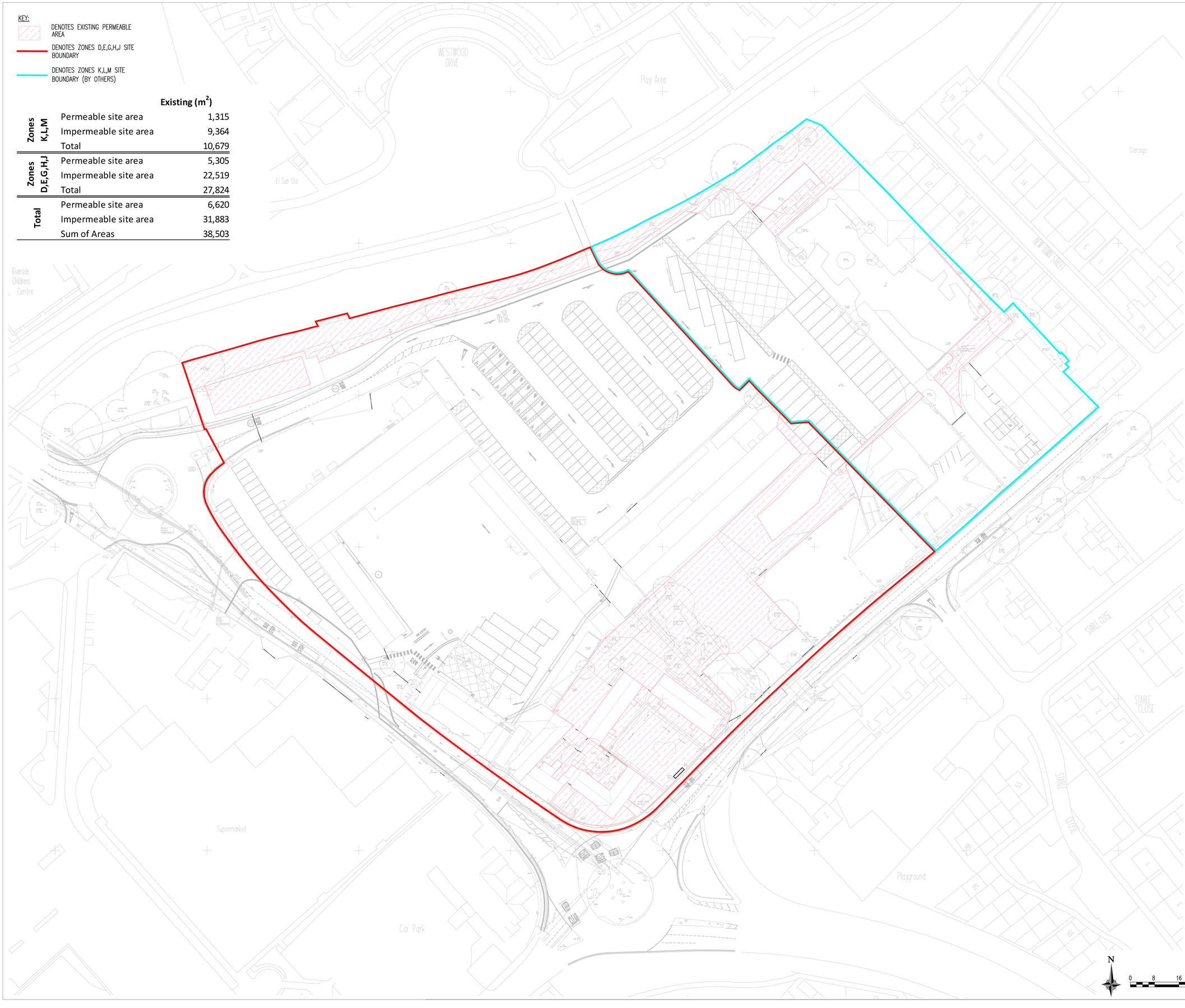
KEY:

DENOTES EXISTING PERMEABLE AREA

DENOTES ZONES D,E,G,H,J SITE BOUNDARY

DENOTES ZONES K,L,M SITE BOUNDARY (BY OTHERS)

		Existing (m^2)
Zones K,L,M	Permeable site area	1,315
	Impermeable site area	9,364
	Total	10,679
Zones D,E,G,H,J	Permeable site area	5,305
	Impermeable site area	22,519
	Total	27,824
Total	Permeable site area	6,620
	Impermeable site area	31,883
	Sum of Areas	38,503



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Rev	DESCRIPTION	Status	DRW/APP	DATE
P01	FIRST ISSUE	S3	EB/HW	13.12.19

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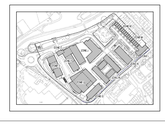
KEY PLAN



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ORIGINATOR REFERENCE: 5196

PROJECT

CANTERBURY RIVERSIDE
STURRY ROAD

DRAWING TITLE

EXISTING PERMEABLE AREAS PLAN

BIM FILE NAME

CRS-WAL-XX-XX-M3-D-3001

PROJECT STAGE: STAGE 4

FIRST ISSUE DATE: 13/12/2019

STATUS CODE: S3 : SUITABLE FOR REVIEW & COMMENT

SCALE: 1:400 @ A0

PROJECT	ORIGINATOR	ZONE	LEVEL	TYPE	ROLE	NUMBER	REV
CRS	WAL	XX	XX	DR	D	003001	P01

N

0 8 16 24 32 40

1:400

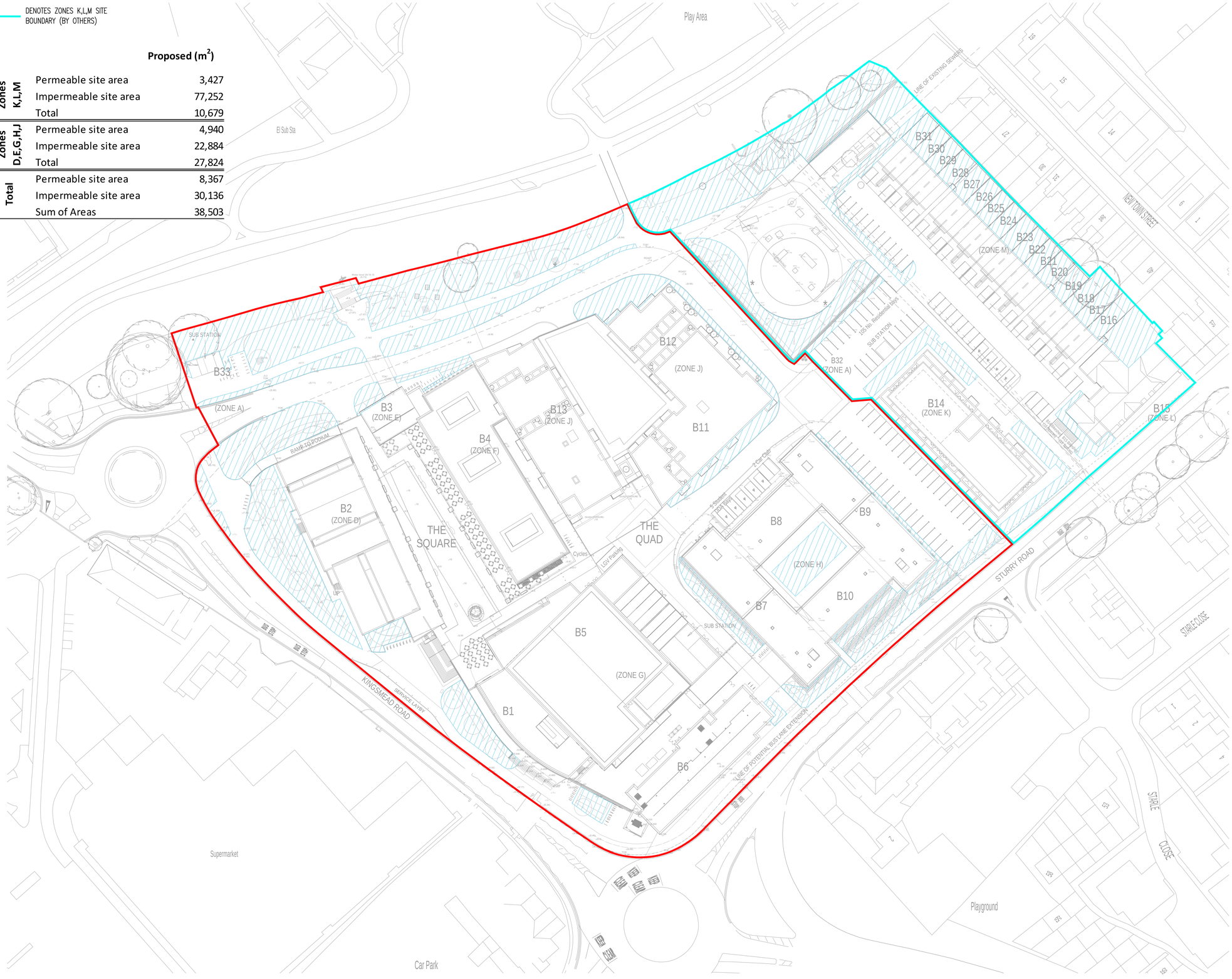
KEY:

DENOTES PROPOSED PERMEABLE AREAS

DENOTES ZONES D,E,G,H,J SITE BOUNDARY

DENOTES ZONES K,L,M SITE BOUNDARY (BY OTHERS)

		Proposed (m^2)
Zones K,L,M	Permeable site area	3,427
	Impermeable site area	77,252
	Total	10,679
Zones D,E,G,H,J	Permeable site area	4,940
	Impermeable site area	22,884
	Total	27,824
Total	Permeable site area	8,367
	Impermeable site area	30,136
	Sum of Areas	38,503



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1:400

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Rev	DESCRIPTION	Status	DRW / APP	DATE
P01	FIRST ISSUE	S3	EB / HW	13.12.19

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ORIGINATOR REFERENCE: 5196

PROJECT

CANTERBURY RIVERSIDE
STURRY ROAD

DRAWING TITLE

PROPOSED PERMEABLE AREAS PLAN

BIM FILE NAME

CRS-WAL-XX-XX-M3-D-3002

PROJECT STAGE	FIRST ISSUE DATE
STAGE 4	13/12/2019
STATUS CODE	SCALE
S3 : SUITABLE FOR REVIEW & COMMENT	1:400 @ A0

PROJECT	ORIGINATOR	ZONE	LEVEL	TYPE	ROLE	NUMBER	REV
CRS	WAL	XX	XX	DR	D	003002	P01

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Appendix B **Flood Risk and Drainage Assessment**

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Flood Risk & Drainage Assessment

Canterbury Riverside (Site 9 Kingsmead)
Kingsmead Road & Sturry Road
Canterbury
CT1 1SZ

Prepared for:

BY Development Ltd.
Denne Court
Hengist Field
Borden
Sittingbourne
Kent
ME9 8FH

EPS Project Reference:	UK15.2042
Date Issued:	25th August 2017
Report Status:	Issue 1.3

KINGSMEAD ROAD, CANTERBURY

NON-TECHNICAL CLIENT SUMMARY

This report is a combined Flood Risk and Drainage Assessment which examines the risk of flooding at the site in the context of the proposed development and makes recommendations for any further assessment or precautionary control measures that may be necessary to avoid or mitigate flooding issues. The following points present a simple overview of the key findings and conclusions that have been established through this investigation:

- Flood maps provided by the Environment Agency (EA) and Canterbury City Council (CCC) show the site to span flood zone 1 (low risk) to flood zone 3 (high risk). The area of flood zone 3 covers the central-northern part of the site and it represents the 1 in 100yr floodplain from the River Great Stour.
- Modelled flood depths for the River Great Stour were obtained from the EA . This confirmed that the central-northern area lies within the floodplain, and that the depth of potential floodwater within this area could reach up to 520mm during a 1 in 100yr event (including an allowance for climate change). During a 1 in 1000yr event up to 720mm of floodwater could affect the northernmost part of the site.
- Following discussions with the EA, the 100yr flood level for the site (including an allowance for climate change) was determined as 7.34mAOD. In addition, the EA specified that finished floor levels for general accommodation should be set at a minimum of 7.64m AOD and for habitable rooms at a minimum of 7.90m AOD.
- Given that proposals for development include provision of some gardens and landscaping, it is likely that there will be a reduction in the amount of surface water generated so no attenuation should be necessary. It is also understood that regulatory authorities agreed that existing disposal routes for surface water, (direct discharge to the River Great Stour) could be retained subject to appropriate pollution prevention controls.
- Whilst the finished floor level to the undercroft car park will be raised within a small area of the site, additional floodplain will be created where ground levels are lowered and where existing buildings are removed. A floodplain storage compensation report has outlined that the proposed development will significantly improve the flood storage volume available and decrease the risk of flooding downstream.
- In order to mitigate against an extreme flood event from the River Great Stour it has been recommended that flood resilient materials are incorporated into the canoe store and car park areas. Additional recommendations have been made for development of a flood evacuation procedure, emergency access from the undercroft car park, provision of bollards to prevent cars being moved off site during a flood. A permit may also be required for location of a canoe launch pontoon within 8m of the watercourse.

The above points represent a simplified summary of the findings of this assessment and should not form the basis for key decisions for the proposed development. A thorough review of the details contained within the following report, or discussion with EPS is recommended.

Project Reference:	UK15.2042	
Title:	Flood Risk & Drainage Assessment Canterbury Riverside	
Client:	BY Development Ltd.	
Date:	25th August 2017	
EPS Contact Details:	7B Caxton House Broad Street Cambourne Cambridge CB23 6JN	T: 01954 710666 F: 01954 710677 E: info@epstrategies.co.uk W: www.epstrategies.co.uk
Status:	Issue 1.3	

Author:	**Reviewed:**	**Authorised:**
		
Rob Allen	Giles Lock	Giles Lock
Principal Consultant	Director	Director

The report has been written, reviewed and authorised by the persons listed above. It has also undergone EPS' in house quality management inspection. Should you require any further assistance regarding the information provided within the report, please do not hesitate to contact us.

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1.0 INTRODUCTION

In October 2015, Environmental Protection Strategies Ltd (EPS) was commissioned by BY Development Ltd. to undertake an appropriate Flood Risk Assessment (FRA) at Canterbury Riverside (Site 9 Kingsmead), Kingsmead Road & Sturry Road, Canterbury, CT1 1SZ ('the site').

The work was commissioned to support a new planning application for the construction of a mixed-use development, to include a cinema, restaurants, retail units, residential and student accommodation.

1.1 Objectives

In accordance with the National Planning Policy Framework (NPPF), Technical Guidance to the NPPF and other industry guidance (CIRIA), the objectives of this assessment are as follows:

- Identify the potential sources of flood water at the site.
- Examine the circumstances under which the site may flood accounting for climate change.
- Provide information on existing surface water management.
- Assess all information collected and provide recommendations for any additional drainage or management systems required to compensate for additional flood risks posed by the proposed development, or to reduce overall flood risk for the property where feasible.

1.2 Scope of Work

The following tasks were performed at the site in order to meet the objectives for the assessment:

<u>Desk Work:</u>

- Collection of site plans, records and historic information.
- Study of existing geological, hydrogeological, and topographical maps of the area.
- Review of the indicative development proposals for the site.

<u>Site Work</u>

- Site visit and collection of photographic evidence.

<u>Reporting:</u>

- Data collation and interpretation.
- Reporting.

The findings and conclusions of this investigation are presented in the following sections.

1.3 Limitations and Constraints

The purpose of this report is to present the findings of risk assessment work completed for the location(s) specified. When examining the data presented and the conclusions drawn through this assessment, Environmental Protection Strategies Ltd (EPS) makes the following statements:

The principal of any risk assessment is to provide a measure of the likelihood and severity of a future event by consideration of previous experiences and / or current observations and pertinent data available. The accuracy of any assessment will be dependent upon the reliability and quantity of the acquired data and the manner in which it is used.

This report represents an assessment of the risk to property and life from flooding at the location specified, by consideration of or, if necessary, modelling of critical flooding events that may occur from identified sources over a specific period of time in future. It does not provide a factual account of all future flooding events and their effects during the lifetime of the property use / development. No method exists to predict flooding events at a property during its lifetime and therefore floods of greater magnitude than the critical return period stated in this report may occur during the lifetime of the property use / development.

The method of risk assessment is recognised as the most appropriate means to examine the risks from flooding for planning purposes. The scale of the risk assessment provided in this report is considered to be appropriate to the scale of the specified site under examination and has been produced in accordance with relevant published guidance and policy in practice in England at the time the report was written. Where possible, the approach and methods have been agreed with relevant regulatory authorities during production of the report.

2.0 BACKGROUND TO FLOOD RISK AND REGULATORY CONTEXT

The following section has been prepared to provide a brief summary of the various aspects of flood risk assessment, which must be considered when planning to develop green or brownfield land in England.

2.1 Current Policy (England)

Planning policy guidance with regard to flood risk in England is currently documented in the NPPF and its associated technical guidance, which was published in March 2012 and supersedes Planning Policy Statement 25 (PPS25) *Development and Flood Risk*. Whilst PPS25 has now been withdrawn, it is generally recognised by both the EA and local authorities to continue to represent good practice and much of the NPPF guidance is taken from this document.

The purpose of the NPPF is to ensure that flood risk is taken into account at all stages of the planning process through appraisal, management, and reduction of flood risks at all levels. Its overall aims are as follows:

1) To identify land areas with risks associated with flooding.
2) To avoid non-essential development in areas of potential flood risk and to manage any residual risks associated with development where it is either unavoidable, or of great benefit, accounting for climate change.
3) To protect land from development where it is required for current or future flood management and;
4) To reduce flood risk, where possible, in developments by using sustainable drainage systems.

Under this strategy, areas of land throughout England and Wales are designated according to the potential flood risks from rivers or the sea, ignoring any existing flood defences, into zones 1, 2, 3a and 3b respectively. The areas are defined by maps compiled by the Environment Agency (EA) into representative zones of increasing flood risk; Zone 1 poses the lowest potential risk whilst Zone 3b, an active floodplain, poses the greatest risk.

Where planning permission is being sought for a particular site within one of the zones, the owner / developer has a duty to demonstrate that the proposed development will be safeguarded from flooding and ensure that the development does not exacerbate flooding elsewhere. To do this the developer must provide an appropriate level of FRA for regulatory approval, which demonstrates the following:

1) Within the site, the most vulnerable development is located in areas of lowest flood risk unless there are overriding reasons to prefer a different location; and
2) Development is appropriately flood resilient and resistant including safe access and escape routes where required, and that any residual risk can be safely managed, including by emergency planning; and it gives priority to the use of sustainable drainage systems.

2.2 The Sequential Test

The NPPF and the accompanying technical guidance highlight the need for a sequential risk based approach to determine the suitability of land in flood risk areas. It is a central policy within the NPPF and should be applied at all levels of the planning process prior to undertaking a site-specific flood risk assessment. During the assessment process for any given development, the following sequential aspects of flooding should be evaluated:

- Regional Spatial Strategies by way of Regional Flood Risk Appraisals
- Local Development Documents by way of Strategic Flood Risk Assessments (SFRA) or Environment Agency Flood Zone maps
- Site specific planning application by way of FRAs.

The aim is for development to be steered towards areas of low flood risk (Flood Zone 1) and away from areas of high flood risk (Flood Zone 3) these zones are detailed further within Table 1 of the NPPF technical guidance. The sequential test must also consider the vulnerability of the development and locate new developments accordingly i.e. police stations are highly vulnerable and water treatment plants are less vulnerable to the risk of flooding, (Table 2 of NPPF technical guidance).

2.3 The Exception Test

Where development cannot be achieved in areas of low flood risk, the Exception Test must also be satisfied (Table 3 of NPPF technical guidance). The test provides a method of managing flood risk while still allowing necessary development to occur. Further details on application of the exception test can be found in PPS25 which details the test to comprise 3 parts, ALL of which must be satisfied.

a) It must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk, informed by a SFRA where one has been prepared.
b) The development should be on developable, previously developed land or, if it is not on previously developed land, that there are no reasonable alternative sites on developable, previously developed land; and
c) A FRA must demonstrate that the development will be safe, without increasing flood risk elsewhere, and, where possible will reduce flood risk overall.

If an exception test is required, the purpose of this FRA is to satisfy part C only. Further supporting information should be contained within the planning application.

3.0 SITE SETTING

Various physical and social features are important when assessing flood risk at a particular location. The features relevant to this assessment of flooding at this site are discussed below:

3.1 Site Location

The site is located in northeast Canterbury, approximately 50m from the city centre and around National Grid Reference 615382 158609. The application area is roughly rectangular in shape and measures approximately 41,000m^2.

The site is bound to the east by residential properties along New Town Street and to the west by a Sainsbury's supermarket, located beyond Kingsmead Road. Residential properties along Sturry Road are located adjacent to the south, and the site is bound to the north by the River Great Stour.

The approximate topographic elevation across the site ranges between approximately 6.6m-11.5m Above Ordnance Datum (AOD) and the topography of the site and surrounding area falls gently towards the northwest.

A site location plan is included as Figure 1.

3.2 Existing Site Description

A site walkover was undertaken on 12th November 2015 whereby the site was found to be occupied by a variety of land uses.

The central north of the site is occupied by a large asphalt surfaced car / coach park, with an access road located to the northwest leading off Kingsmead Road. Three separate areas make up the eastern section comprising a small fenced compound to the north east, currently occupied by steel storage containers, an obsolete builders yard and associated brick built building in the central east, whilst a garage service is located to the south east, fronting onto Sturry Road.

Adjacent to the garage is an obsolete petrol filling station and associated land, which is currently used for car sales / car washing. The south-western corner of the site is occupied by residential land use, a number of council flats, a detached house and their gardens making up the area.

The western portion is occupied by a refuse lorry depot, with an associated central yard, refuelling area, maintenance buildings, offices and car parking. A rectangular building located in the centre of the site is currently used by the Canterbury Archaeological Trust with associated yard areas present surrounding, currently used for storage.

A current site layout plan is included as Figure 2 and selected site photographs are included as Appendix A.

3.3 Proposed Development Layout

As described in section 1.0, development proposals for the site include the construction of a mixed-use development. This will include an undercroft car park within the central-northern area of the site, which is accessed via Kingsmead road to the west. Above this car park a number of commercial units are proposed at the western end of the site, with a cinema complex to the southwest. A variety of accommodation is proposed across the central and eastern parts of the site, comprising student flats, apartments and affordable housing.

Indicative proposed development plans for the site are included as Appendix B.

3.4 The Sequential Test

The following section is supporting information to assist the Local Authority when applying the sequential and / or exception test.

The site is shown on the EA detailed flood map to span flood zones 1-3. Flood zone 1 is defined in the NPPF as an area where the probability of flooding from fluvial and / or tidal sources is lowest of all designated flood zones at less than 0.1% per annum, (flood return period of 1 in 1,000 years). However, flood zone 3 is defined as an area where the probability of flooding is high, with a probability of 1% or greater per annum, (flood return period of up to 1 in 100 years) for fluvial events or greater than 0.5% per annum (up to 1 in 200 years) for tidal events. A copy of the EA flood map is included as Appendix C of this report.

The application area falls within the administrative area of Canterbury City Council (CCC) and where a Strategic Flood Risk Assessment (SFRA) is available, this information should be used for the purposes of the sequential test in preference to the EA flood zone maps. This is generally because the SFRA takes into account site specific issues and accounts for the presence of flood defences.

Flood maps provided within the CCC SFRA, which include an allowance for climate change, also show the site to span flood zones 1-3. A copy of this flood map is included as Appendix D.

The proposed development includes a mixed, commercial and residential land use and the most sensitive of these uses (residential) falls into the 'more vulnerable' category within the vulnerability classification table (Table 2) of the NPPF technical guidance. Given that the site spans flood zones 1-3, a sequential test may be required, (if this has not already been completed by CCC) in order to demonstrate that there are no reasonable alternative development sites within the surrounding area which lie in areas of lower potential flood risk.

3.5 The Exception Test

The vulnerability classification within the NPPF technical guidance categorises the most sensitive proposed land use, (buildings used for: dwelling houses) as 'more vulnerable'. This combination of vulnerability classification (more vulnerable) and the highest flood zone present at the site (3) deems that the exception test may be required, (see Table 3 within the NPPF technical guidance).

The purpose of this FRA is to satisfy part C of the exception test, (further supporting information to parts A and B should be contained within the application). However, it is likely that development proposals will satisfy part A given that regeneration of the site for housing is likely to provide benefits to the community, and will satisfy part B, given that the site has been previously developed.

The following sections within this FRA aim to satisfy part C of the exception test by showing that the development will be safe, without increasing flood risk elsewhere and where possible, will reduce flood risk.

4.0 POTENTIAL SOURCES OF FLOODING

Current guidance requires that all sources of flooding to the site must be considered, when undertaking a FRA.

The following subsections provide a summary of available information regarding the potential sources of flooding at the property and the nature, likelihood, and extent of flooding from each identified source.

4.1 Historic Evidence

The EA was consulted with regard to any historic evidence of flooding at, or nearby to the site. An historic flood map was provided which showed that the site has not been affected by flooding in the past, however an area of flooding was reported adjacent to the west of the site, beyond Kingsmead Road in February 2001. A copy of the historic flood map provided by the EA is included as Appendix E.

This historic flood event was also confirmed within the CCC SFRA.

4.2 Rivers

The River Great Stour is located adjacent to the north of the site, which is classified by the EA as a main river and flows in a predominantly north-easterly direction.

The site is shown to span flood zones 1 – 3 as defined by the EA published flood zone maps. These flood maps are designed to be used to indicate if a detailed FRA is required at a site-specific level and are therefore often protectively conservative. Current guidance specifies the 1 in 100yr flood level, (including a factor for climate change) to be critical when assessing the suitability of proposed residential development over a forecast lifetime of 100 years. This level, when compared with a site specific topographic survey is a more accurate method of defining the site's flood risk than the published flood zone maps.

In order to determine if the proposed development lies above or below the critical 1 in 100yr flood level, (accounting for climate change) EPS contacted the EA to obtain site specific flood level data derived by detailed hydraulic models for the River Great Stour. A 2D TuFLOW model is available for this area, which presents flood levels and depths across the floodplain, rather than within the channel of the watercourse. This data is presented within Appendix F of this report and a summary of the critical levels are presented within Table 1 below.

Table 1 – Summary of Modelled Flood Levels & Depths – Defended

Watercourse	Node	100 Yr Level (mAOD)	100 Yr + Climate Change Level (mAOD)	1000 Yr Level (mAOD)	100Yr + Climate Change Depth (m)
Great Stour	3	n/a	n/a	7.48	n/a
Great Stour	4	7.08	7.22	7.39	0.27
Great Stour	5	7.13	7.29	7.48	0.52
Great Stour	6	7.13	7.31	7.51	0.40

Watercourse	Node	100 Yr Level (mAOD)	100 Yr + Climate Change Level (mAOD)	1000 Yr Level (mAOD)	100Yr + Climate Change Depth (m)
Great Stour	7	n/a	n/a	7.51	n/a
Great Stour	10	n/a	n/a	7.55	n/a
Great Stour	11	n/a	n/a	7.55	n/a
Great Stour	13	n/a	n/a	7.69	n/a
Great Stour	14	n/a	n/a	7.81	n/a
Great Stour	15	n/a	n/a	7.89	n/a
Great Stour	18	n/a	n/a	7.96	n/a
Great Stour	19	n/a	n/a	7.97	n/a
Great Stour	20	7.35	7.50	7.67	0.62
Great Stour	22	7.31	7.46	7.63	0.45

Notes

1. 'n/a' This node lies outside the floodplain for the associated return period.
2. Level information is only provided for nodes which lie within the floodplain.
3. Given that this section of the watercourse does not benefit from any defences, both the defended and undefended model results are the same.

Based on the precautionary principle behind FRA it is usually prudent to apply the most conservative flood level for the site, and include an allowance for climate change.

However, in addition to review of the above information, the Environment Agency was contacted with regard to the design flood levels for this site. The 1 in 100yr design flood level (including an allowance for climate change) was confirmed as 7.34mAOD by Sophie Page by email on 28th July 2016. The 1 in 1000yr flood level was confirmed as 7.96mAOD, also by Sophie Page by email on 20th October 2016.

In order to assess the potential risks to the site from floodwater arising at this elevation, a topographic survey was carried out in November 2015 by MK Surveys and a copy was provided to EPS. A copy of the topographic survey is presented as Appendix G. Comparison of the EA 1 in 100yr climate change flood level (7.34m AOD), with the topographic survey indicates that this contour corresponds with the 1 in 100yr climate change outline as defined by the EA mapping, and therefore does present an accurate representation of the extent of the area which could be affected. The extent of this 1 in 100yr floodplain is presented within Appendix F.

Comparison of the flood levels with the survey data show that the central-northern area of the site, (the existing car-park area) is likely to be worst affected during a 1 in 100yr flood, (including an allowance for climate change) with flooding of up to around 520mm in depth.

During a 1 in 1000yr flood, the central and western areas of the site are shown to be affected by floodwater, including the central car park and the yard and buildings currently occupied by a waste merchant's depot. Flooding of these areas is shown to be up to around 720mm during an event of this magnitude.

4.3 Local Surface Watercourses

Through review of 1:25,000 Ordnance Survey maps for the local area and the site walkover, very few surface watercourses have been reported within the surrounding area. The closest

ordinary watercourse is likely to be an unnamed drain associated with Reed Pond, located approximately 1.2km to the east of the site.

On this basis, the proposed development is not considered to be at significant risk of flooding from local surface watercourses, and the primary risk of flooding to the site is considered to be from the River Great Stour.

4.4 Sea (Tidal)

The site is located inland, approximately 16km from the coast. The tidal extent of the River Great Stour is at Fordwich Bridge (downstream of the site) and therefore the site is not considered to be at risk of tidal flooding.

4.5 Land (Overland Flow)

Through review of 1:25,000 Ordnance Survey maps for the local area and the topography survey completed for the site, the local topography slopes gently towards the northwest.

The surrounding area to the southeast comprises predominantly residential areas, which do have the potential to generate overland flow which could move towards the site. However, it is likely that any large volumes of surface water would be intercepted prior to reaching the site by surface water drainage systems located around Sturry Road and Tourtel Road.

Surface water mapping provided by the EA, reports the majority of the site to lie within an area with a very low risk of surface water flooding. However, a small area within the central-northern part of the site (currently occupied by car-parking) is reported to be at high risk of surface water flooding, where flood depths could be up to 900mm.

4.6 Groundwater

Geological maps of the area report the site to lie within an area of relatively complex geology. Superficial deposits are reported to comprise Alluvium within the area adjacent to the river to the northwest with Head Deposits across the south-eastern area. The underlying solid geology comprises Thanet Sands across the majority of the site, with the north-western corner underlain by the Seaford Chalk Formation.

A site-specific ground investigation was carried out by EPS in November 2015 which found ground conditions across the site to be relatively consistent with geological maps of the area. Upon investigation, ground conditions were reported to be a surface of concrete / asphalt underlain by Made Ground. Beneath this, superficial deposits of peaty alluvium and / or sandy silty clay (Head) were encountered with gravelly River Terrace Deposits underlain by bedrock of the Seaford Chalk Formation extending to the base of boreholes. A borehole log, representative of the ground conditions encountered is included as Appendix H.

The EA reports the alluvium and Thanet Sands to be classified as a secondary aquifer, with the Seaford Chalk classified as a principal aquifer. The CCC SFRA reports the Thanet Sands located to the south of the River Great Stour to be at medium risk of groundwater flooding, however the SFRA does not report any historic instances of groundwater flooding either at the site or in the surrounding area.

Given the topographic elevation of the site and the underlying geology, it is considered likely that any shallow groundwater present beneath the site would be hydraulically connected with the adjacent surface watercourse. Whilst it is possible that there may be fluctuation in groundwater levels throughout the year, given that groundwater is likely to be closely associated with the level of the adjacent River Great Stour, the risks are likely to have been already taken into consideration by the modelling carried out in the area.

On this basis, flooding risks arising at the site from fluctuation in groundwater elevation are not considered significant in the context of flooding from other sources.

4.7 Sewers

It is possible that silting / blockage or excessive flow within drainage channels within the area could cause localised flooding. An underground public sewerage asset utility map for the site was obtained from Southern Water and has been reproduced as Appendix I of this report for illustration.

Southern Water assets located at the site are detailed as follows:

- An 825mm diameter foul sewer located along the northern side of the site, flowing in an easterly direction and discharging into the River Great Stour.
- An 825mm diameter foul sewer located along the northern side of the site, flowing off-site in a north-easterly direction.
- A 300mm diameter foul sewer located within the eastern part of the site, flowing in a northerly direction and discharging into the River Great Stour.
- A 1000mm diameter surface water sewer located within the eastern part of the site, flowing in a northerly direction and discharging into the River Great Stour.

The sewers shown are adopted by Southern Water and will therefore be maintained by them to an appropriate standard, in line with Sewers for Adoption 7th Edition. Therefore, the risk of flooding to the site is deemed acceptable as it is within current restrictions. Records for private water and sewerage connections between these public utilities and local properties are not held by Southern Water.

4.8 Other Sources of Flooding

4.8.1 Reservoirs

There are no reservoirs upstream of the site, which are likely to affect the site if breached.

4.8.2 Canals

There are no canals within close proximity of the site which will influence the site drainage or flood risk.

4.8.3 Other

There are no other features of significance which are likely to significantly affect the risk of flooding to the site.

5.0 PROPOSED DEVELOPMENT FLOOD RISK IMPLICATIONS

The following section provides an interpretation of the data collected in context with the proposed development at the site.

5.1 Predicted Surface Water Run-off

Development proposals for the site include construction of a mixed commercial and residential development.

Should the overall impermeable area of the site be increased, a greater amount of surface water run-off will be created during critical storm events, which could increase the risks of flooding elsewhere.

Current guidance highlights that any proposal should not be at risk of flooding nor increase flooding elsewhere. Whilst an increase in impermeable area will not increase the overall volume of water entering the natural drainage system, it will intensify the peak discharge rate, i.e. the water will enter the system sooner, having not soaked through the ground. This may increase flooding in receiving systems downstream of the site. It is therefore essential that an appropriate method of surface water disposal is incorporated into the development.

The site is currently surfaced almost entirely with hardstanding. It is therefore unlikely that the development will lead to an increase in the amount of surface water runoff, and given the proposed domestic gardens and landscaping, the overall surface water runoff from the site is likely to be reduced. These proposals for redevelopment are likely to fall in line with the principles of the NPPF which seeks, where possible to achieve betterment which regard to site runoff.

However, should any additional attenuation of surface water be required by the local planning authority, preliminary calculations have been undertaken, (using Windes and the Flood Estimation Handbook) to ascertain the volume of water, which would be required to be stored on site if discharging to a local watercourse.

The model shows that the natural current runoff rate, the Greenfield Run-off rate (GRR) is 0.4l/s/ha for a 1 in 1 year storm, using Institute of Hydrology (IOH) 124 methodology as recommended by the Interim Code of Practice for SuDS.

With an allowable pro-rata discharge of 0.04l/s for every 0.1 ha increase in impermeable area, up to 129m^3 of storage would be required for a 1 in 100yr critical storm where discharging to a watercourse.

To account for the potential increase in rainfall intensities over the forecast lifetime of the development (100 years), a factor of 40% should be added to current rainfall estimates for the area when designing the capacity of the surface water / rainfall run-off discharge systems. This is based upon updated climate change allowances published by the EA in February 2016.

The site is considered to fall into the 'upper end' allowance (based upon the site's classification as more vulnerable development within flood zone 3) and given the anticipated lifetime of the development the allowance for the period 2070-2115 is considered most appropriate.

Therefore, for every 0.1ha net increase in impermeable area, up to 183m^3 will need to be accommodated, for the critical storm, when allowing for climate change for the lifetime of development. The Windes calculations are contained within Appendix J.

6.0 RISK MANAGEMENT BY DEVELOPMENT DESIGN

Current guidance highlights the need to consider all flood events including extreme events greater than a 1 in 100 year event including an allowance for climate change. This consideration should be incorporated into the development design where appropriate.

A discussion of appropriate mitigation techniques is considered within the following section.

6.1 Ensuring the Development is Safe

In order to minimise risks to the proposed building from flooding, it is standard practice to raise floor levels accordingly, by adding a 300mm freeboard to the 1 in 100-year climate change level.

However, following correspondence received from the EA it is understood that finished floor levels should be set in accordance with the vulnerability of the development. Finished floor levels for the various types of development which would be acceptable to the EA are stated as follows:

Acceptable Finished Floor Level (mAOD)	Type of Development
7.64	Less vulnerable (i.e. general accommodation and commercial use)
7.90	More vulnerable (i.e. habitable rooms)

Furthermore, for areas located above 7.9m AOD, floor levels for newly constructed buildings should be set at least 150mm above the existing site levels, (in line with building regulations) to provide a sufficient freeboard, were the area to flood in events in excess of 1 in 100 years.

6.1.1 Development Proposals

Development proposals for the site were revised in 2017, which resulted in the removal of the student general accommodation and commercial areas from the proposed ground floor areas. These areas have been replaced with a larger, undercroft car park and small canoe store, which would be affected by floodwater during the 1 in 100yr climate change and 1 in 1000yr flood events. This area has been proposed on the understanding that floodwater would be able to move into and out of this area freely during a flood event.

On this basis, it is recommended that flood resilient materials are incorporated into the undercroft car park and canoe store, so that this area could be restored quickly and without significant expense should an extreme flood event occur.

Section 7 of the document *'Flood Resistant and Resilient Construction - Guide to Improving the flood performance of buildings'* (British Standard 85500:2015) provides guidance on resistant and resilient design and construction which may help with the selection of appropriate materials.

Through correspondence with the client, proposed Finished Floor Levels for the various parts of the development have been obtained, these are summarised within the table below. A detailed development plan with proposed Finished Floor Levels marked by area is presented as Appendix K.

Area	Finished Floor Level (mAOD)
Undercroft Car Park & Canoe Store	6.95
Commercial (N)	10.0
Cinema	10.0
Retail	9.5
Residential Apartments (N)	11.0
Residential Apartments (E)	10.6
Residential Properties	From 7.8*
Student (Habitable Rooms)	10.0
Student (General Accommodation)	9.8

* Only the two northernmost residential properties have a finished floor level set at 7.8mAOD, with the floor levels to the remaining residential properties set at or above 8.250mAOD. Whilst this level is lower than the minimum floor level specified by the EA for more vulnerable development (i.e. residential), the sleeping accommodation to these properties would not be located at ground level and on this basis the finished floor level to these two dwellings is considered appropriate.

6.2 Safe Access

It is important that site occupiers are able to exit the site safely during a flood event, without putting additional pressure on emergency services. Ideally the access should be dry, although a depth of 0.2m would be acceptable at up to a 0.5m/s velocity (Table 13.1 of DEFRA/EA Research & Development Technical Report FD2320/TR2 *Flood Risk Guidance for New Development*).

Proposed development plans for the site indicate that the main vehicular access will be via Kingsmead Road to the west. Vehicular access is likely to be available into the site during the 1 in 100yr event (including an allowance for climate change) given that the site access and Kingsmead road to the west lie above 7.34mAOD. However, access within the site is likely to be affected during an event of this magnitude, which may prevent access to specific areas of the development (such as the residential properties at the eastern end of the site). However, access from all parts of the development would be available on foot to either Kingsmead Road to the west or Sturry Road to the north

An area of the proposed undercroft car park is likely to be affected by floodwater during a 1 in 100yr flood and on this basis, emergency exit routes should be available along the southern side of this area, so that any people using this area during a flood event can exit the area safely.

6.3 Flood Warning and Evacuation

The Environment Agency provides flood warnings for the River Great Stour as it passes the site, it is therefore recommended that the future residents and businesses register for this flood warning service.

A flood evacuation procedure should also be developed for each area of the proposed development to ensure that future residents and staff leave the site safely and in good time. Further information on how to make an emergency flood plan is available on the Environment Agency's website http://www.environment-agency.gov.uk and via the Floodline on 0345 988 11 88.

This would provide an improvement to the current flood risk implications as promoted by the NPPF.

6.4 Floodplain Compensation

Any development within a 1 in 100yr floodplain will require compensation on a level for level, volume for volume basis or should provide an overall improvement.

The area which lies within the 1 in 100yr floodplain, (including an allowance for climate change) currently comprises a car-park, and this use will be retained as part of the proposed development, (as an undercroft carpark area situated beneath the residential and commercial areas above). Following correspondence with the client it is understood that ground levels throughout this area will be retained at or around the existing ground level of 6.95mAOD and floodwater would be able to move freely into and out of this area.

It should be noted that a small area of the existing car park within the central-northern area of the site lies below 6.95mAOD and a small canoe store will also be located within the 1 in 100yr floodplain, which is likely to result in displacement of floodwater.

After the Environment Agency reviewed Issue 1.1 of this report it was agreed that a detailed assessment would be carried out for the canoe store to measure any potential loss of flood storage from the proposed development. A Flood Storage Compensation Report has subsequently been prepared and it identified that by allowing the lower ground floor parking area to flood during an extreme event, a net increase in the available floodplain storage volume would be achieved in excess of 1000m^3 per 200mm flood band above existing site levels. On this basis, the development was considered to represent a significant improvement to the existing storage volume, ensuring a decrease in the downstream flood risk.

A copy of the full Flood Storage Compensation Report is included as Appendix L.

6.5 Methods to Accommodate Surface Water Runoff

As detailed in section 5.1, development proposals included are not likely to lead to an increase in the amount of impermeable area at the site due to the likely creation of additional garden and landscaped areas. This is likely to result in overall betterment in the volume of surface water runoff generated.

Following correspondence with the client it is understood that, an agreement in principle has been reached with the relevant regulatory authorities for continued disposal of surface water in the existing method, (i.e. unregulated discharge into the River Great Stour). It is therefore recommended that this is implemented subject to appropriate pollution prevention controls (such as oil water separators) where necessary.

Should unregulated discharge into the adjacent watercourse not be approved, the EA strongly supports the usage of SuDS for disposal of surface water run-off. Therefore, the use of soakaways could be investigated. If required, the use of soakaways should be confirmed through soakaway testing, (in line with BRE 365).

Following the drainage hierarchy set out by Building Regulations, should neither of the above options be feasible, consideration could be given to disposal of surface water runoff into the adjacent surface watercourse at a controlled rate. It's likely that an area of storage would need to be provided such as a balancing pond, or underground storage crates, providing a capacity of 183m^3 for every 0.1ha of additional impermeable area, discharging at a controlled rate of 0.04l/s. Careful consideration will need to be given to the method of controlling the flow, as small outlet controls are prone to blockage.

All drainage designs and calculations should be provided by a suitably qualified drainage engineer commissioned during the construction of the site. A surface water and fowl Drainage Statement and associated designs have been provided by Kirk Saunders Associates and this information is included as Appendix M.

6.5.1 Maintenance

All surface water management systems should be maintained in perpetuity of the development to ensure that any flood risk mitigation methods are operating, as designed, for the development's lifetime.

6.6 Maintenance of the Area Adjacent to the Watercourse

Correspondence received by the EA indicates that in accordance with regional bylaws, the EA will seek an undeveloped margin between the new development and the river edge.

Following correspondence with the client, it is understood that the only development within 8m of the watercourse will be a small canoe launch pontoon. An Environmental Permit for development adjacent to a Main River will be sought from the EA for this small structure. Landscaping drawings confirming the proposed development along the edge of the River Great Stour are included as Appendix N.

7.0 SUMMARY OF KEY FINDINGS

Through assessment of the information gathered during this investigation, EPS has identified the following main issues regarding flood risk at the proposed development over its critical development lifetime period of 100 years:

- The site lies adjacent to the River Great Stour. Flood maps, provided by both the EA and CCC area show the site to span flood zone 1 (low risk) to 3 (high risk).

- Comparison of modelled flood levels for the River Great Stour, (including an allowance for climate change), available across the floodplain show that the central-northern area of the site is likely to fall within 1 in 100yr floodplain and the central and western areas of the site are likely to fall within the 1 in 1000yr floodplain.

- The principal risk of flooding to the site is considered to be from the River Great Stour and other sources of flooding are not considered likely to affect the site including flooding from the sea, ordinary watercourses, or groundwater.

- Given that the site is currently almost entirely covered with hardstanding, it is unlikely that the development will lead to an increase in surface water runoff from the site.

- A floodplain storage compensation report has been undertaken for the site which outlined that the proposed development will significantly improve the flood storage volume available and decrease the risk of flooding downstream.

- During a 1 in 100yr event dry vehicular access would be available into parts of the site from Kingsmead Road to the west. Dry pedestrian access to the site would be available from all parts of the site onto Sturry Road to the south.

8.0 RECOMMENDATIONS

On the basis of the data examined during this assessment and of its findings, EPS makes the following recommendations for the purposes of planning to avoid any potential flooding events at the site, which may impact socially or structurally upon the site or its neighbouring properties:

- Finished floor levels for the proposed development should be set in accordance with recommendations made by the EA, i.e. 7.64m AOD for less vulnerable development (i.e. commercial) and 7.9m AOD for more vulnerable development (i.e. residential/habitable rooms).

- It is recommended that the site subscribes to the Environment Agency's flood warning service and a basic flood evacuation procedure should be developed for use within each area of the site to ensure that residents and users can prepare for and, if necessary, leave the area safely before or during an extreme flood event.

- Surface water runoff from the site should continue to be disposed of in the existing manner, subject to agreement with regulatory authorities and appropriate pollution prevention controls.

- All surface water management systems should be maintained in perpetuity of the development to ensure that any flood risk mitigation methods are operating, as designed, for the development's lifetime.

- It is recommended that flood resilient materials are incorporated for use within the undercroft carpark, and canoe club building so that these areas can be restored quickly after a flood. Section 7 of the document *'Flood Resistant and Resilient Construction - Guide to Improving the flood performance of buildings'* (British Standard 85500:2015) provides guidance on resilient design and construction which may help in the selection of appropriate materials.

- Ground raising should not be undertaken along the bank of the river Great Stour, so that floodwater can move freely into, and out of the undercroft car-park area during a flood event. An engineered solution will also be required to prevent any vehicles within this area being swept away.

- Emergency access routes should be available within the proposed undercroft car park so that site users can exit this area on foot safely during a flood event.

- It is understood that the only development within 8m of the watercourse will be a small canoe launch pontoon. If an Environmental Permit for this development is required by the EA then it is recommended that this should be obtained prior to commencement of the development.

- It is recommended that a copy of this report is forwarded to CCC and the EA for consideration alongside any new application.

9.0 BIBLIOGRAPHY

1) Planning Policy Statement 25: Development and Flood Risk (DTLR – 2010).

2) National Planning Policy Framework (NPPF – March 2012).

3) Planning Policy Statement 25: Development and Flood Risk Practice Guide (DTLR – 2009).

4) Development and Flood Risk – Guidance for the Construction Industry (CIRIA C624 – 2004).

5) Interim Code of Practice for Sustainable Drainage Systems (ODPM- July 2004).

6) Flood Estimation for Small Catchments- (Institute of Hydrology- 1994).

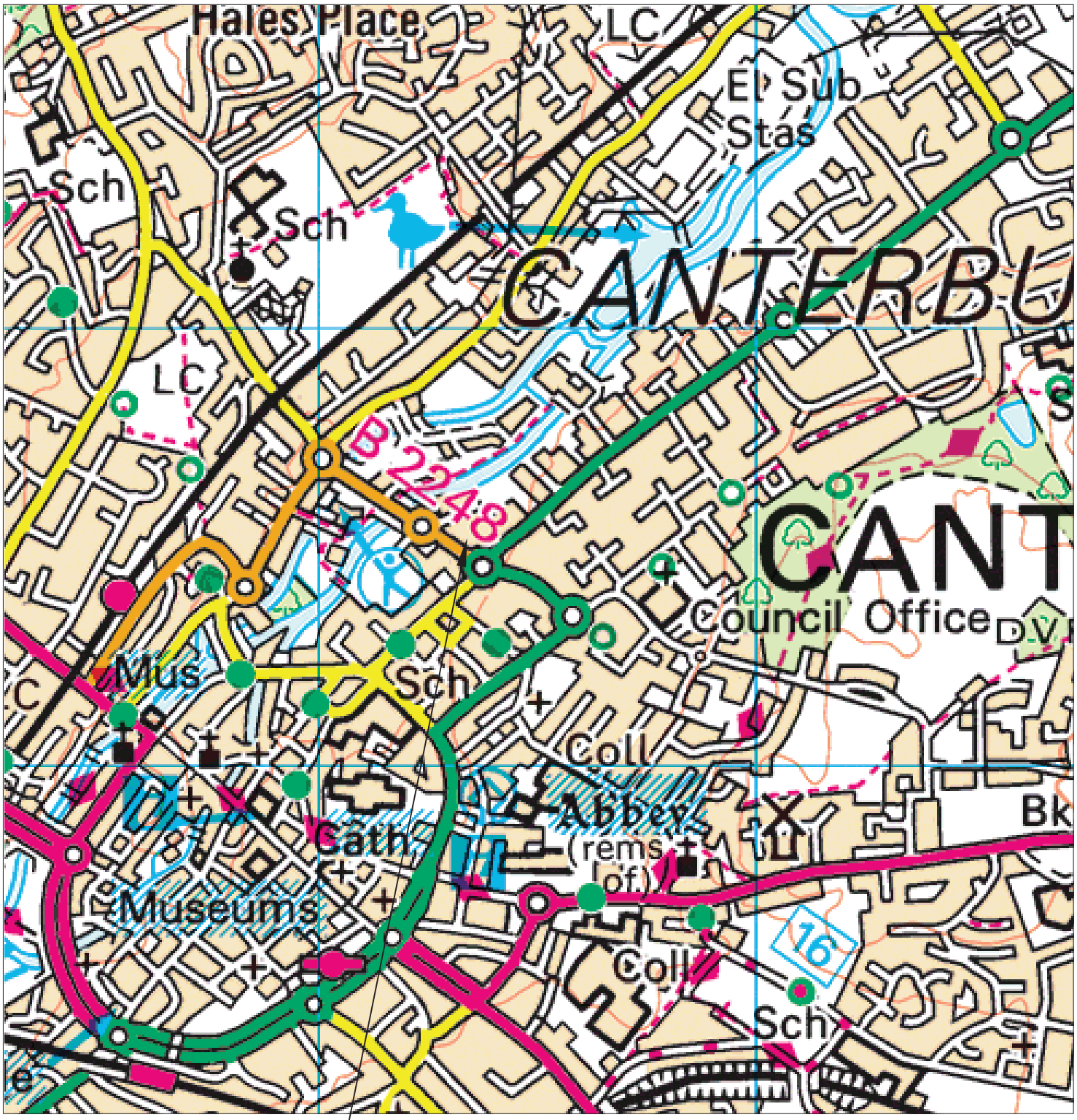
7) Flood Estimation Handbook (Institute of Hydrology- 1999).

8) Soakaway Design 365 (BRE 1991).

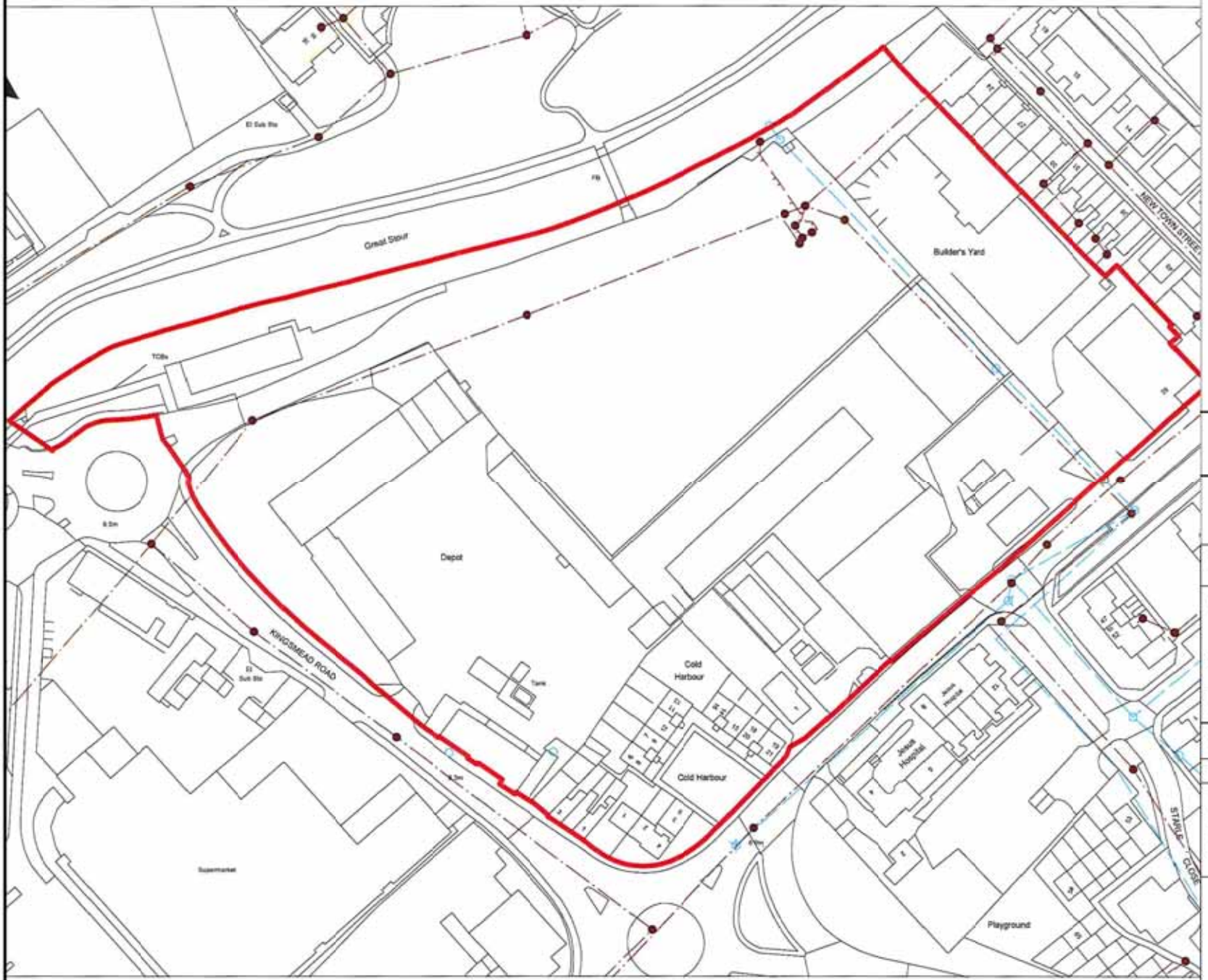
9) Sewers for Adoption, 7th Edition (WRc May 2012).

10) Strategic Flood Risk Assessment – Canterbury City Council (Herrington Consulting Ltd., August 2011).

FIGURES



Title:	Site Location Plan		
Project:	Land at Kingsmead/Sturry Road, Canterbury, Kent, CT1 1SZ	Scale:	NTS
Client:	Bouygues UK	Drawn By: TA	Approved By: SB
Fig No:	1	Job No:	UK15.2042
		Dwg No:	BouyguesUK/Riverside/1115/1
		Date:	November 2015



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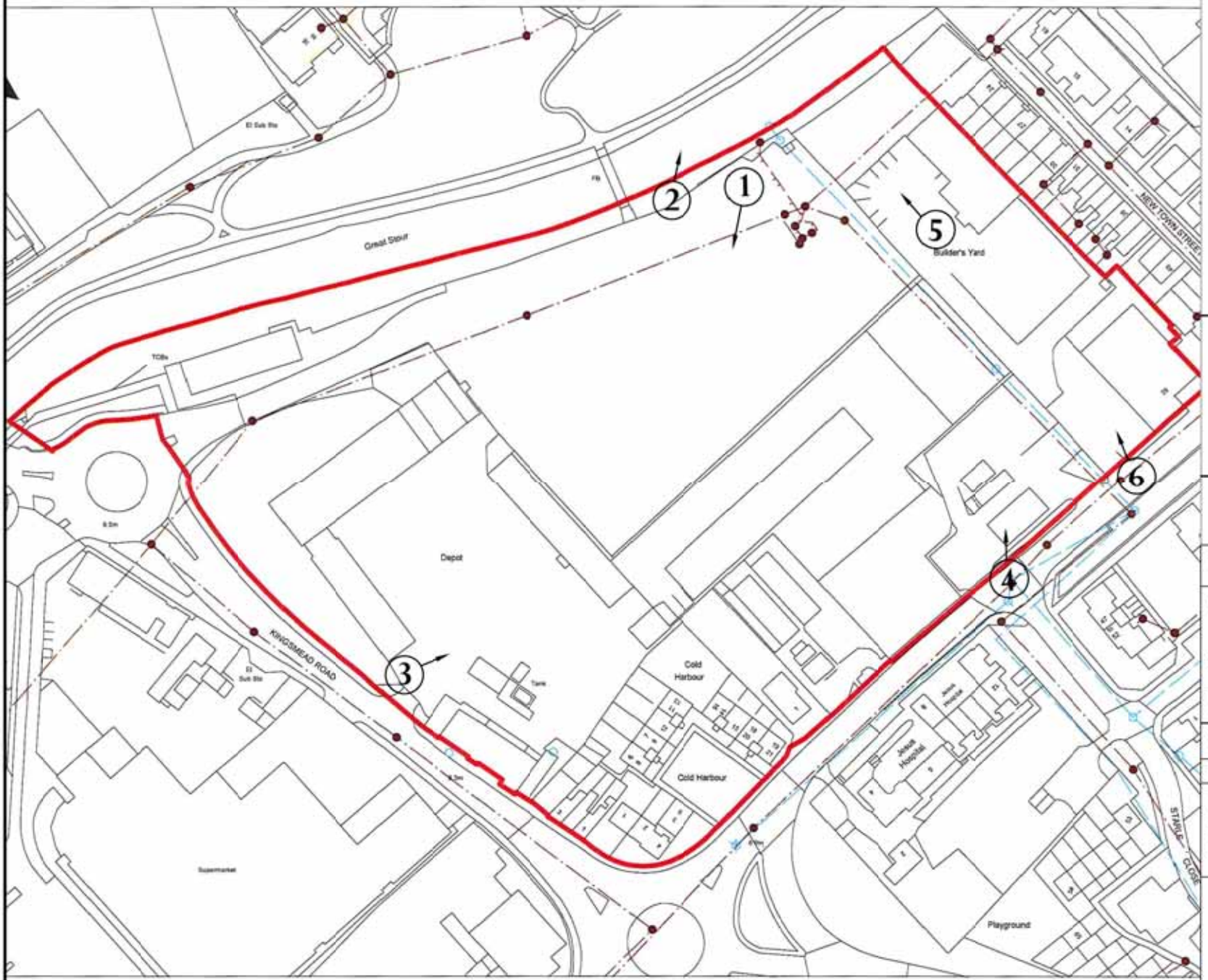
Approximate Site Boundary

Title:	**Current Site Layout Plan**
Project:	Land at Kingsmead/Sturry Road, Canterbury, Kent, CT1 1SZ
Client:	Bouygues UK
Fig No:	2
Scale:	NTS - For Indicative Purpose
Drawn By:	GW
Approved By:	SB
Job No:	UK15.2042
Dwg No:	BouyguesUK/Riverside/1215/02
Date:	December 2015

APPENDICES

APPENDIX A

Selected Site Photographs



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Key:

① Approximate Photo Location

Approximate Site Boundary

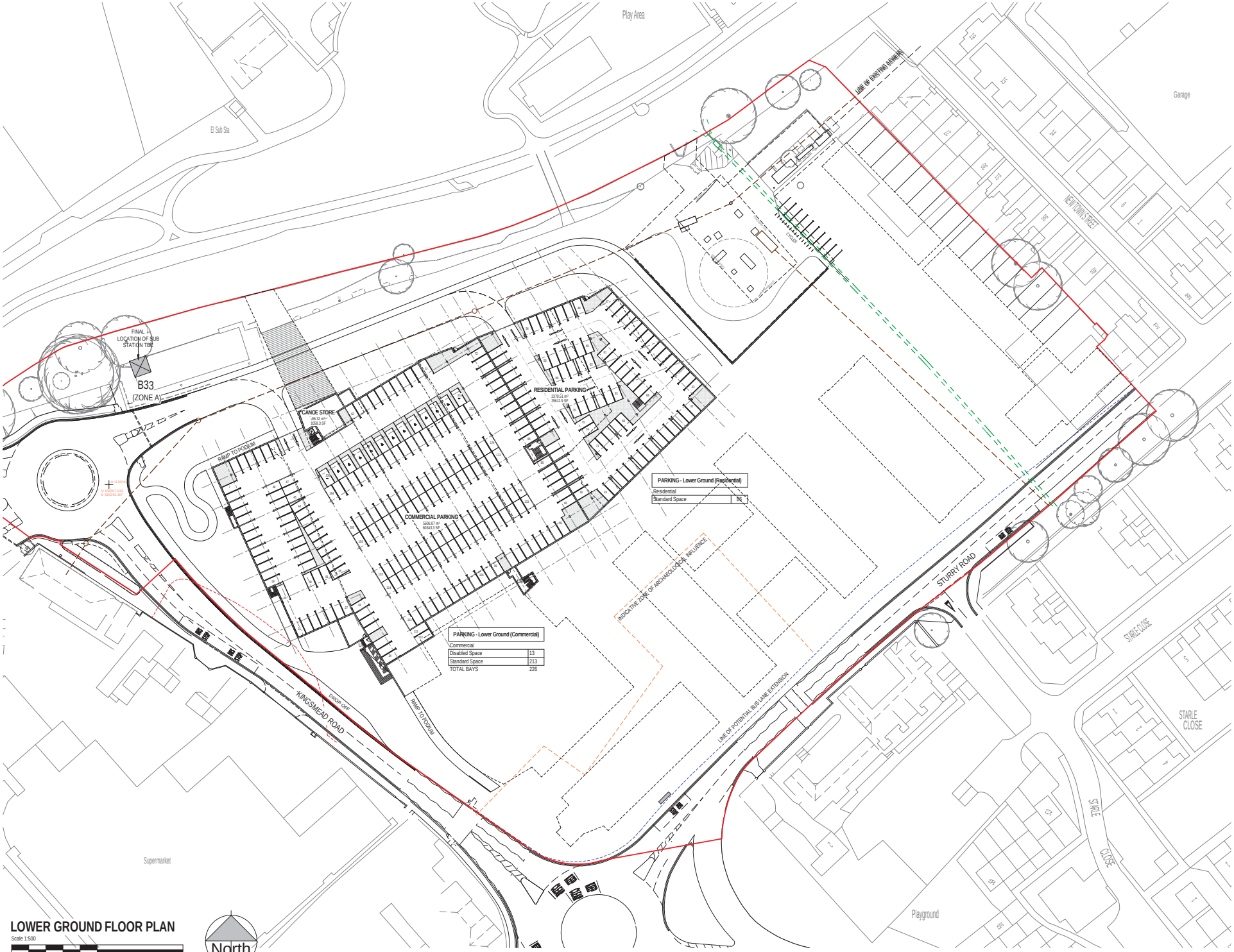
Title:	**Photo Location Plan**
Project:	Land at Kingsmead/Sturry Road, Canterbury, Kent, CT1 1SZ
Client:	Bouygues UK
Fig No:	**A**
Scale:	NTS - For Indicative Purpose
Drawn By:	GW
Approved By:	SB
Job No:	UK15.2042
Dwg No:	BouyguesUK/Riverside/1215/A
Date:	December 2015

eps

Photo 1: View south west across the car/coach park	Photo 2: The River Great Stour, directly north of the site.
	
Photo 3: The yard within Serco waste depot	Photo 4: Current car dealership/former petrol filling station
	
Photo 5: View north within the obsolete builder's yard. Location of former brewery/mineral water depot	Photo 6: Current vehicle tyre garage services – ATS
	

APPENDIX B

Indicative Proposed Development Plans



LOWER GROUND FLOOR PLAN

Scale 1:500

0 25 50 m

North

Figured dimensions only are to be used. All dimensions to be checked onsite. Differences between drawings and between drawings and specification or bills of quantities to be reported to the PRC Group.

Revisions:		Drawn/Chkd:	Date:
A	General Updates	CL	03/02/16
B	General Updates	CL	24/02/16
C	Updates to Zone F, H, J & D	GW	11/04/16
D	General Updates	CL	21/04/16
E	General Updates	CL	26/04/16
F	Building 3 & 4 Revised, Lower ground floor parking area revised to suite	GW	17/05/16
G	Revision to basement shell at B1 & B3 and parking revised to suite	GW	03/06/16
H	General Updates	CL	08/06/16
I	Extent of parking area revised and Bike store		13/06/16
J	Landscaping & podium edge between B2 & B3 revised	GW	15/06/16
K	General Updates	CL	16/06/16
L	Room Areas Omitted	GW	24/06/16
M	Motorcycle bays indicated and ventilations openings revised along riverside and kingsmead elevations	GW	28/06/16
N	DDA Bays Revised and circulation space moved between grids 14 & 15	GW	29/06/16
O	Residential Parking layout revised, Position of B32 substation, Ramp between B2 & B3 Altered and Levels for residential roads indicated	GW	02/08/16
P	Grids and Parking below Zone D Updated. General Update to students areas	GW	26/08/16
1	New Scheme	CL	29/03/17
2	MOE's revised and parking numbers revised to accomodate	GW	08/05/17
3	General Updates	CL	13/05/17

Client:
Bouygues Development

Project:
Canterbury Riverside

Sturry Road

Drawing Title:
PROPOSED SITE - LOWER GROUND PLAN

Scale @ A1:	Checked by:	Date:
1 : 500	CL	16/12/2015

Job No:	Stage:	Drawing No:	Rev:
10253	PL	101	3

Issue Status:
Construction ☐ Preliminary ■
Information ☐ Approval ☐
Tender ☐

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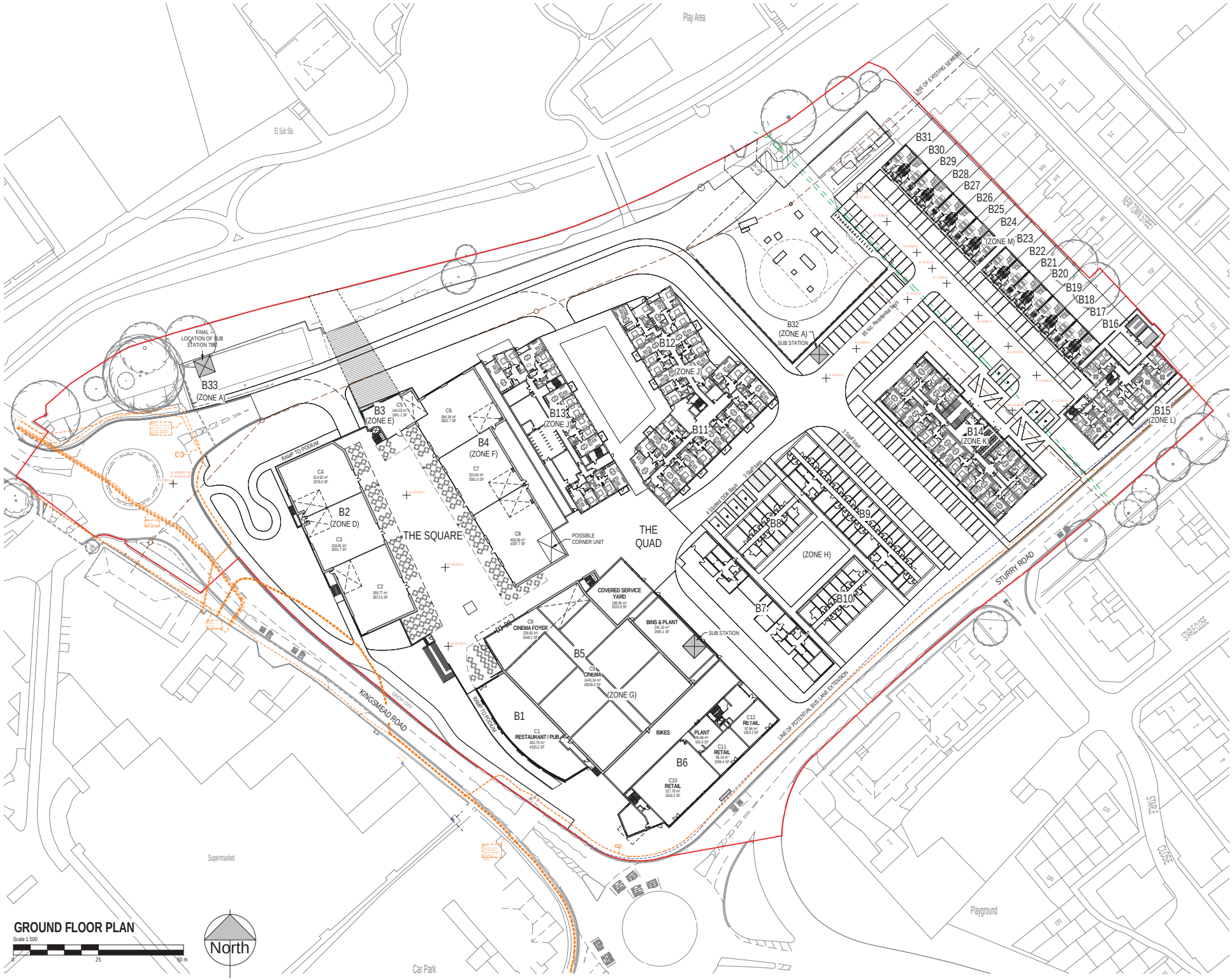

GROUND FLOOR PLAN

Scale 1:500

0 25 50 m

North

Figured dimensions only are to be used. All dimensions to be checked onsite. Differences between drawings and between drawings and specification or bills of quantities to be reported to the PRC Group.

Revisions:		Drawn/Chkd:	Date:
A	General Updates	CL	03/02/16
B	Road Layout Update	CL	29/02/16
C	Updates to Zone F, H, J & D	GW	11/04/16
D	General Updates	CL	21/04/16
E	General Updates	CL	26/04/16
F	Building 3 & 4 Revised, Lower ground floor parking area revised to suite	GW	17/05/16
G	Alterations to B3, Unit B and ramp to podium altered due to changes	GW	03/06/16
H	General Updates	CL	08/06/16
I	Landscaping & podium edge between B2 & B3 revised	GW	15/06/16
J	General Updates	CL	16/06/16
K	Room Areas Omitted	GW	24/06/16
L	Landscaping and Site Works updated	GW	11/07/16
M	Additional DDA Bay at student parking and trees removed from the podium in the square	GW	12/07/16
N	Parking revisions to residential buildings	GW	21/07/16
O	Residential Parking layout revised, Position of B32 substation, Ramp between B2 & B3 Altered and Levels for residential roads indicated	GW	02/08/16
P	Disabled Ramp Updated	GW	03/08/16
Q	Resi & Student Parking Revised, Retaining wall and Landscaping at Water reserve	GW	05/08/16
R	Room size. Zone H & J	CL	15/08/16
S	Roof Plant areas Indicated, and General Updates to Student Res Layouts	GW	26/08/16
T	Update to parking layout to accommodate revisions to entrance of Building 15	GW	13/09/16
1	New Scheme	CL	29/03/17
2	Building 4 Extents revised. Ramp to podium adjacent to Building 2 Revised. interface between B3 & B4	GW	26/04/17
3	General Updates	CL	13/05/17

Client:
Bouygues Development

Project:
Canterbury Riverside

Sturry Road

Drawing Title:
PROPOSED SITE - GROUND FLOOR PLAN

Scale @ A1:	Checked by:	Date:
1 : 500	CL	16/12/2015

Job No:	Stage:	Drawing No:	Rev:
10253	PL	102	3

Issue Status:
Construction ☐ Preliminary ■
Information ☐ Approval ☐
Tender ☐

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PRC Architecture & Planning

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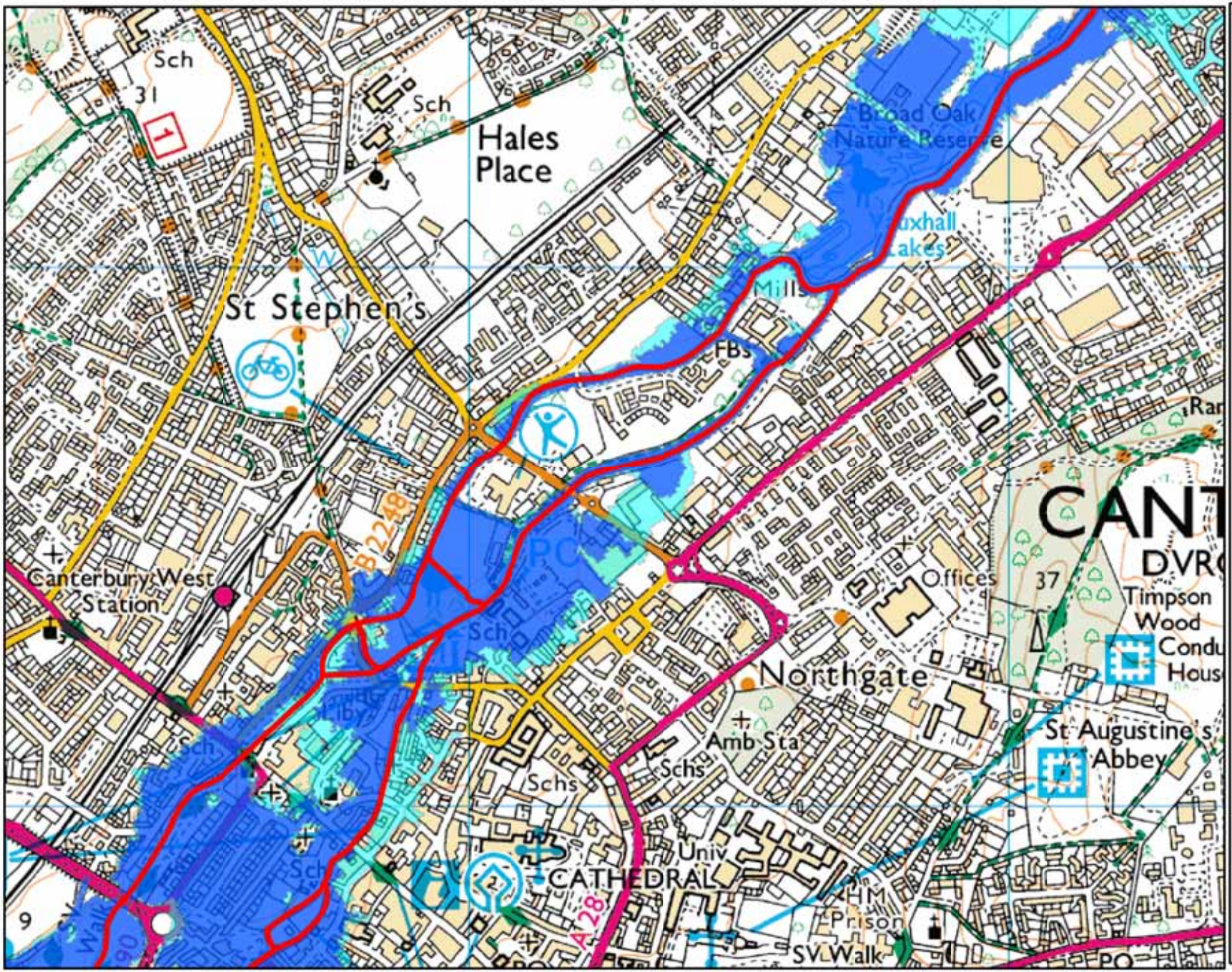
APPENDIX C

Environment Agency Flood Zone Map

Flood Map Centred on Kingsmead Road
Created 5th November 2015 (KSL151023TT154)



Environment Agency

N

Legend

- Main River
- Flood Defences
- Flood Storage Area
- Areas Benefiting From Flood Defence
- 1% AEP of Fluvial Flooding
- 0.1% AEP of Flooding

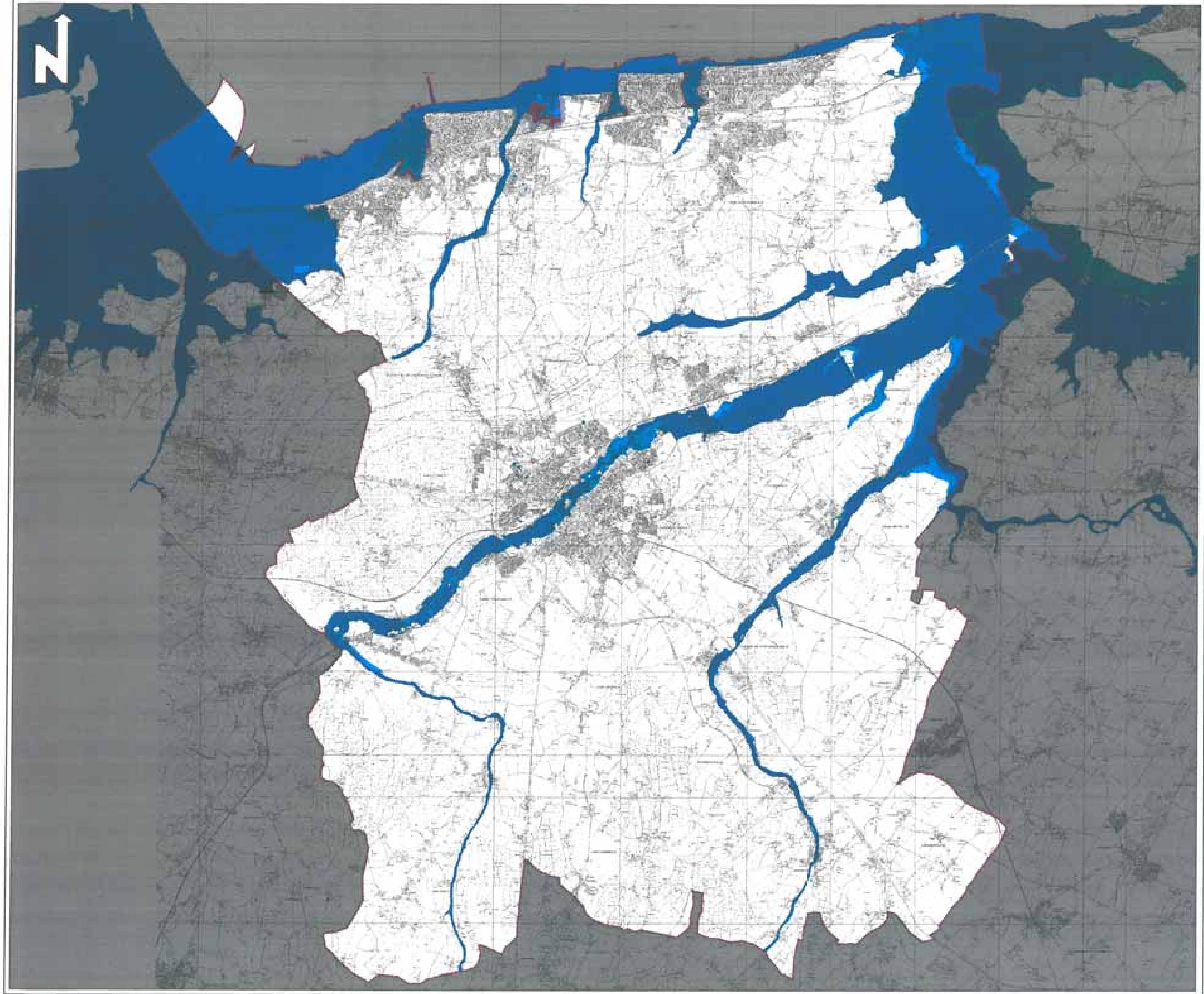
Annual Exceedance Probability (AEP) The probability of a flood of a particular magnitude, or greater occuring in any given year.

Scale 1:10000

0 105 210 420 Meters

APPENDIX D

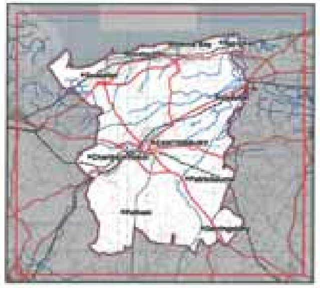
Canterbury City Council Strategic Flood Risk Assessment Map



It should be noted that certain locations not shown may be at risk of flooding from other sources (piped drain systems, watermains etc) and from other watercourses not shown in this study.

FLOOD ZONE MAPS

Canterbury City Council
Strategic Flood Risk Assessment



Flood Zone Map Legend

Flood Zone

- Flood Zone 2 [2010]
- Flood Zone 3 [2010]
- Flood Zone 2 [2110]
- Flood Zone 3 [2110]

Boundary

- Canterbury City Council Boundary

The maps shown are based on the Environment Agency Flood Maps. Flood Zones including Climate Change have been modelled for Coastal Zones, without the presence of defences. Flood Zones for Fluvial Watercourses have not been modelled for climate change and therefore have not been mapped.

Flood Zone Map [2110]

The maps shown are based on the Environment Agency Flood Maps and this plan has been produced in accordance with Planning Policy Statement 25 - development and flood risk. Because the information is indicative rather than specific, local planning authorities will nevertheless need to consult the Environment Agency on individual applications. Users should note that the flood plain extents were mapped at 1:10,000 scale, as appropriate to the level of investigation and are based on information available at the time of survey. Amendments will be required in future to account for information gathered subsequently e.g. changes in hydrological river response or observations following flood events. When in doubt the Environment Agency should be consulted.

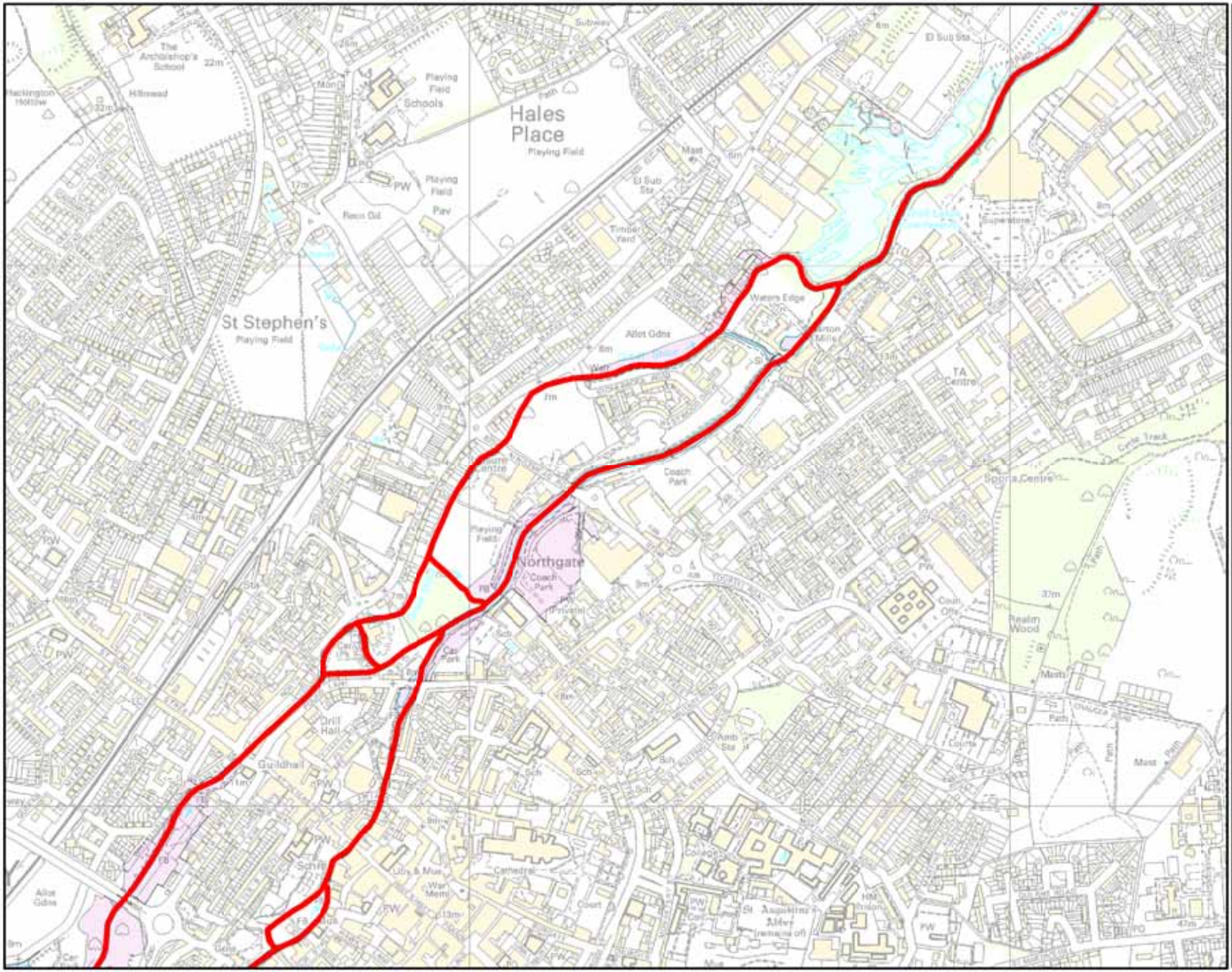
Refer to EA website for periodic updates to the Flood Maps.

herrington

APPENDIX E

Historic Flood Map

Historic flood map Centred on Kingsmead Road
Created 5th November 2015 (KSL151023TT154)



Environment Agency

N

Legend

- Main River
- Feb 2001
- Nov 2000

Annual Exceedance Probability (AEP) The probability of a flood of a particular magnitude, or greater occuring in any given year.

Scale 1:10000

0 105 210 420 Meters

APPENDIX F

Information Provided by the Environment Agency

Product 4 (Detailed Flood Risk) for: Land at Kingsmead Road, Canterbury, Kent, CT1 1SZ
Requested by: Rob Allen
Reference: KSL 43247 LB
Date: 13 April 2017

Contents

The information provided is based on the best data available as of the date of this letter.

You may feel it is appropriate to contact our office at regular intervals, to check whether any amendments/ improvements have been made to the data for this location. Should you contact us again, after a period of time, please quote the above reference in order to help us deal with your query.

Please refer to the Open Government Licence which explains the permitted use of this information.

Orchard House, Endeavour Park, London Road, Addington, West Malling, Kent, ME19 5SH.
Email: kslenquiries@environment-agency.gov.uk

Flood Map Confirmation

The Flood Map:

Our Flood Map shows the natural floodplain for areas at risk from fluvial and tidal flooding. The floodplain is specifically mapped ignoring the presence and effects of flood defences. Although flood defences reduce the risk of flooding they cannot completely remove that risk as they may be overtopped or breached during a flood event.

The Flood Map describes flood risk using Annual Exceedance Probability (AEP) - the probability of a flood of a particular magnitude, or greater, occurring in any given year. The Flood Map indicates areas with a 1% AEP of flooding from rivers (0.5% in tidal areas) (Flood Zone 3), and up to a 0.1% AEP of flooding from both rivers and the sea (Flood Zone 2), in any given year. The flood map also shows the location of flood defences and the areas that benefit from them.

The Flood Map is intended to act as a guide to indicate the potential risk of flooding. When producing it we use the best data available to us at the time of completion, taking into account historic flooding and local knowledge. The Flood Map is updated on a quarterly basis to account for any amendments required. These amendments are then displayed on the internet at www.gov.uk/prepare-for-a-flood.

At this Site:

The Flood Map shows that parts of this site lie within the outline of the 1% (Flood Zone3) chance of flooding from rivers in any given year.

Enclosed is an extract of our Flood Map which shows this information for your area.

Method of production

The Flood Map at this location has been derived using detailed fluvial modelling of the Great Stour, completed by Jeremy Benn Associates Consulting in 2013.

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Model Output Data

You have requested flood levels and depths for various return periods at this location.

A 2D TuFLOW model has been used to represent the floodplain as a grid. The flood water levels and depths have been calculated for each grid cell. The modelled flood levels and depths presented here are for the closest most appropriate model grid cells. Any additional information you may need to know about the modelling from which they are derived and/or any specific use or health warnings for their use are set out below.

A map showing the location of the points from which the data is taken is enclosed. Please refer to the Open Government Licence which explains the permitted use of this information.

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Table 1: Modelled fluvial flood levels for various Annual Exceedance Probability (AEP) events, shown in metres above ordnance datum (mAOD)

Point ID	National Grid Reference		Modelled Fluvial Flood Levels for Annual Exceedance Probability (AEP) events shown (metres AOD)										
			Undefended			Defended							
	Easting	Northing	5% AEP	1% AEP	0.1% AEP	20% AEP	5% AEP	2% AEP	1.33% AEP	1% AEP	1% + CC	0.4% AEP	0.1% AEP
1	615472	158563	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	615442	158595	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	615413	158621	0.00	0.00	7.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.48
4	615390	158644	0.00	7.08	7.39	0.00	0.00	7.00	7.05	7.08	7.22	7.20	7.39
5	615353	158625	0.00	7.13	7.48	0.00	0.00	7.02	7.08	7.13	7.29	7.27	7.48
6	615373	158598	0.00	7.13	7.51	0.00	0.00	7.01	7.07	7.13	7.31	7.29	7.51
7	615397	158568	0.00	0.00	7.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.51
8	615427	158531	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	615392	158499	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	615361	158550	0.00	0.00	7.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.55
11	615319	158591	0.00	0.00	7.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.55
12	615237	158586	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	615285	158562	0.00	0.00	7.69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.69
14	615305	158533	0.00	0.00	7.81	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.81
15	615331	158503	0.00	0.00	7.89	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.89
16	615378	158478	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	615482	158538	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	615315	158493	0.00	0.00	7.96	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.96
19	615260	158533	0.00	0.00	7.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.97
20	615202	158581	7.07	7.35	7.67	6.75	7.07	7.23	7.29	7.35	7.50	7.48	7.67
21	615167	158594	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	615266	158613	7.03	7.31	7.63	0.00	7.03	7.19	7.25	7.31	7.46	7.45	7.63

Data taken from the fluvial modelling of the Great Stour, completed by Jeremy Benn Associates in 2013.

Climate change (CC) data represents modelled levels and depths with a 20% increase in river flows.

Values of 0.00 indicate locations at which the selected points lie outside of a particular modelled flood extent.

There are no health warnings or additional information for these levels or the model from which they were produced.

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Table 2: Modelled fluvial flood depths for various Annual Exceedance Probability (AEP) events, shown in metres above ordnance datum (mAOD)

Point ID	National Grid Reference		Modelled Fluvial Flood Depths for Annual Exceedance Probability (AEP) events shown (metres)										
			Undefended			Defended							
	Easting	Northing	5% AEP	1% AEP	0.1% AEP	20% AEP	5% AEP	2% AEP	1.33% AEP	1% AEP	1% + CC	0.4% AEP	0.1% AEP
1	615472	158563	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	615442	158595	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	615413	158621	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13
4	615390	158644	0.00	0.14	0.45	0.00	0.00	0.06	0.10	0.14	0.27	0.25	0.45
5	615353	158625	0.00	0.36	0.70	0.00	0.00	0.24	0.30	0.36	0.52	0.50	0.70
6	615373	158598	0.00	0.22	0.59	0.00	0.00	0.10	0.16	0.22	0.40	0.38	0.59
7	615397	158568	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05
8	615427	158531	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	615392	158499	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	615361	158550	0.00	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14
11	615319	158591	0.00	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14
12	615237	158586	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	615285	158562	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03
14	615305	158533	0.00	0.00	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.18
15	615331	158503	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04
16	615378	158478	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	615482	158538	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	615315	158493	0.00	0.00	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12
19	615260	158533	0.00	0.00	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.19
20	615202	158581	0.51	0.58	0.67	0.43	0.51	0.56	0.57	0.58	0.62	0.62	0.67
21	615167	158594	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	615266	158613	0.12	0.31	0.72	0.00	0.12	0.20	0.26	0.31	0.45	0.43	0.72

Data taken from the fluvial modelling of the Great Stour, completed by Jeremy Benn Associates in 2013.

Climate change (CC) data represents modelled levels and depths with a 20% increase in river flows.

Values of 0.00 indicate locations at which the selected points lie outside of a particular modelled flood extent.

There are no health warnings or additional information for these levels or the model from which they were produced

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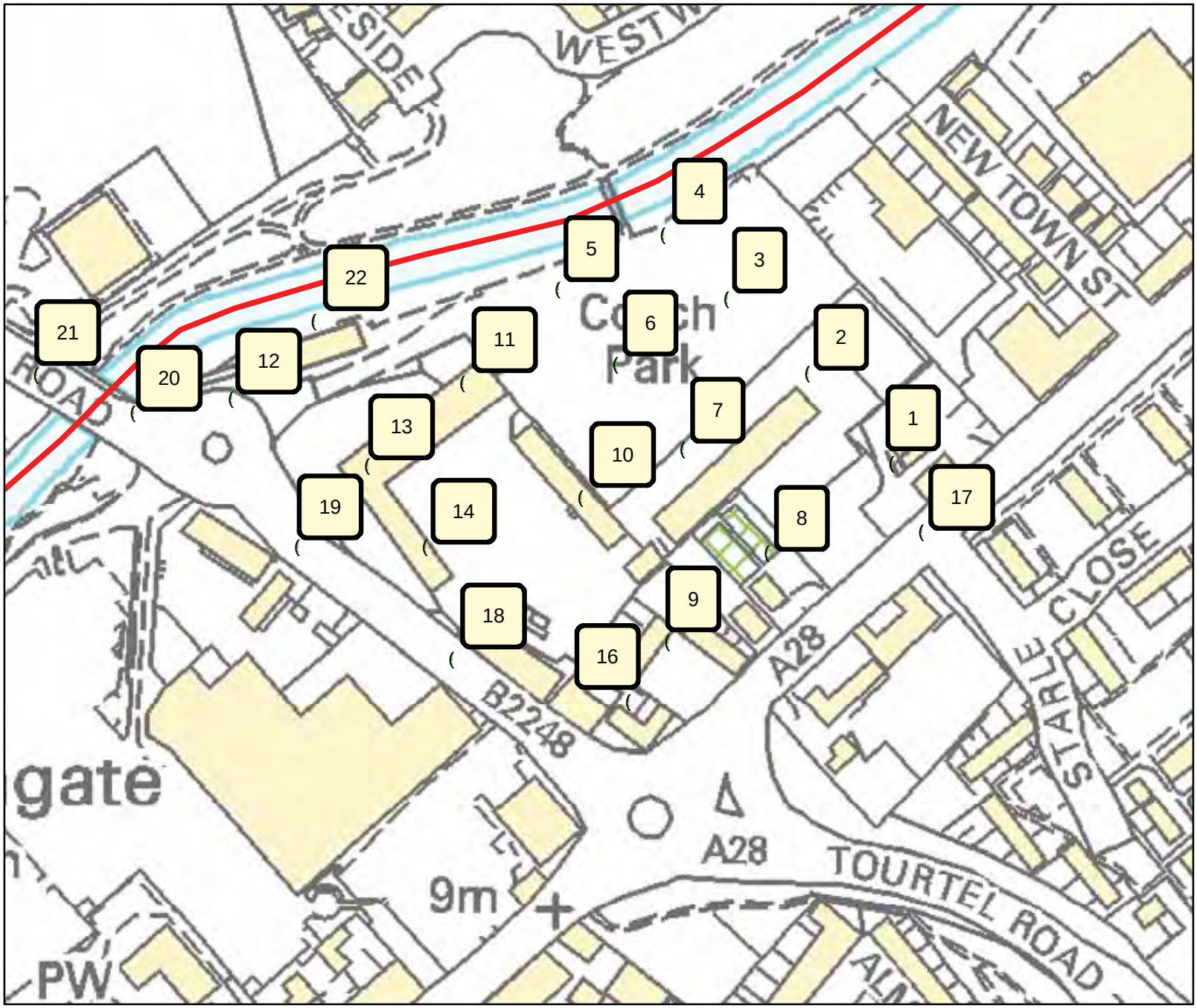
Data points map centred on Land at Kingsmead Road, Canterbury, Kent, CT1 1SZ. Created 10 April 2017 (Ref: KSL 43247 LB).



Environment Agency

Legend

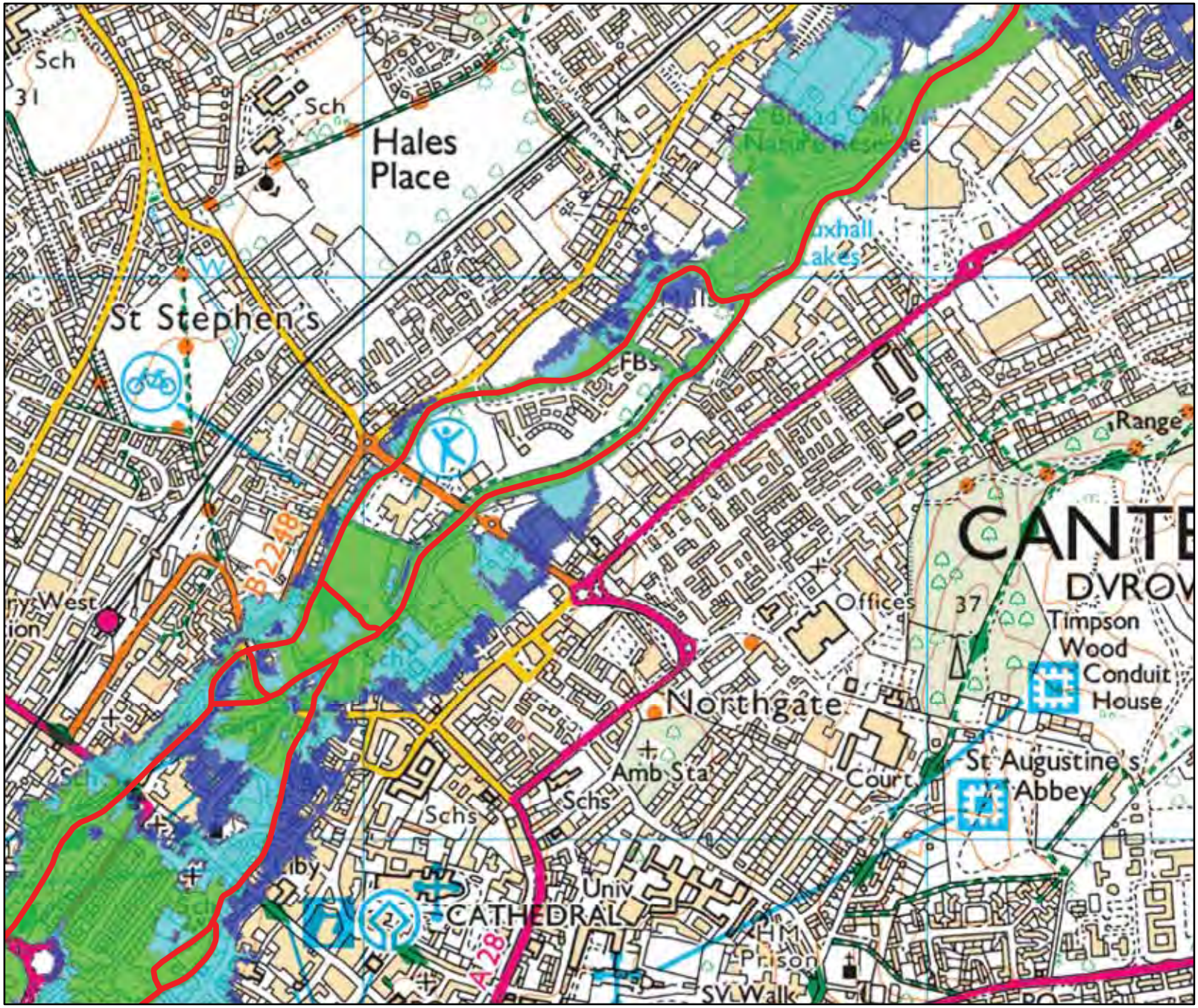
Main Rivers

(data_points

Scale 1:2,000

0 10 20 40 60 80
Meters

Undefended fluvial outlines map centred on Land at Kingsmead Road, Canterbury, Kent, CT1 1SZ. Created 10 April 2017 (Ref: KSL 43247 LB).



Environment Agency

Legend

- Main Rivers

Undefended fluvial flood extents

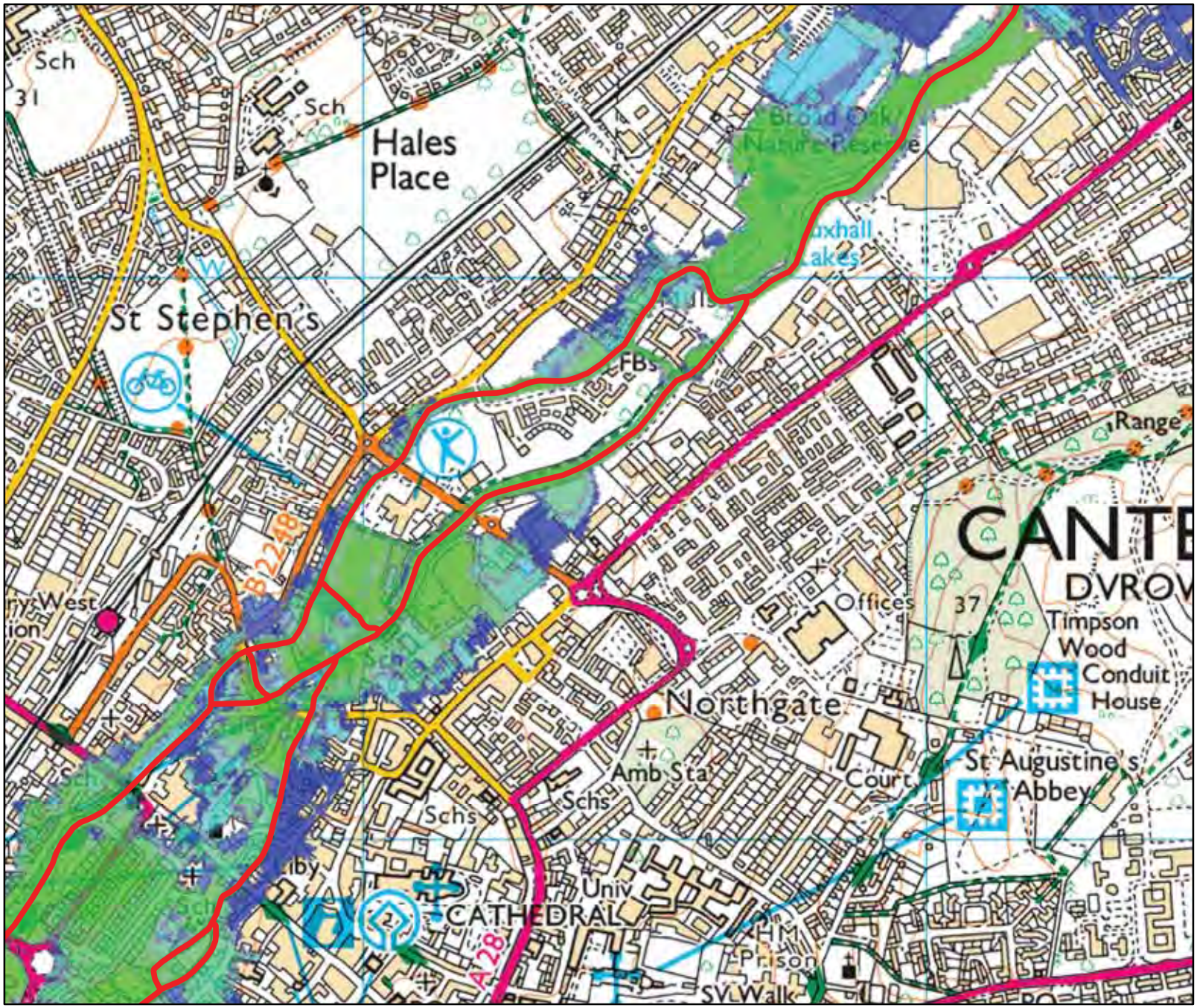
- 5% AEP
- 1% AEP
- 0.1% AEP

Annual Exceedance Probability (AEP). The probability of a flood of a particular magnitude, or greater, occuring in any given year.

Scale 1:10,000

0 55 110 220 330 440 Meters

Defended fluvial outlines map centred on Land at Kingsmead Road, Canterbury, Kent, CT1 1SZ. Created 10 April 2017 (Ref: KSL 43247 LB).



Environment Agency

Legend

- Main Rivers

Defended fluvial flood extents

- 20% AEP
- 5% AEP
- 2% AEP
- 1% + CC AEP
- 1% AEP
- 0.4% AEP
- 1.33% AEP
- 0.1% AEP

Annual Exceedance Probability (AEP). The probability of a flood of a particular magnitude, or greater, occuring in any given year.

Climate Change (CC) extent based on an increase of 20% in river flows.

Scale 1:10,000

0 55 110 220 330 440 Meters

It should also be noted that climate change allowances have changed since 2004. On 19/02/2016 new allowances for climate change were published on gov.uk. The fluvial climate factors are now more complex and are based on a regional river basin district. You can view the new allowances at 'Flood risk assessments: climate change allowances'. The data provided in this product does not incorporate the new allowances. We will incorporate the new allowances into future modelling studies.

Defence Details

There are no formal flood defences owned or maintained by the Environment Agency in the area of this site. The Great Stour in this location is confined within an open channel consisting of natural high ground. No information is available for the standard of protection offered by natural channels in this area

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Historic Flood Data

We hold records of historic flood events from rivers and the sea. Information on the floods that may have affected the area local to your site are provided below and in the enclosed map (if relevant).

Flood Event Data

Dates of historic flood events in this area – November 2000 and February 2001

Please note that our records are not comprehensive. We would therefore advise that you make further enquiries locally with specific reference to flooding at this location. You should consider contacting the relevant Local Planning Authority and/or water/sewerage undertaker for the area.

We map flooding to land, not individual properties. Our historic flood event record outlines are an indication of the geographical extent of an observed flood event. Our historic flood event outlines do not give any indication of flood levels for individual properties. They also do not imply that any property within the outline has flooded internally.

Please be aware that flooding can come from different sources. Examples of these are:

- from rivers or the sea;
- surface water (i.e. rainwater flowing over or accumulating on the ground before it is able to enter rivers or the drainage system);
- overflowing or backing up of sewer or drainage systems which have been overwhelmed,
- groundwater rising up from underground aquifers

Currently the Environment Agency can only supply flood risk data relating to the chance of flooding from rivers or the sea. However you should be aware that in recent years, there has been an increase in flood damage caused by surface water flooding or drainage systems that have been overwhelmed.

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Additional Information

Use of Environment Agency Information for Flood Risk / Flood Consequence Assessments

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.

In **England**, you should refer to the Environment Agency's Flood Risk Standing Advice, the technical guidance to the National Planning Policy Framework and the existing PPS25 Practice Guide for information about what flood risk assessment is needed for new development in the different Flood Zones. These documents can be accessed via:

https://www.gov.uk/government/publications/flood-risk-standing-advice-for-local-planning-authorities-frsa
http://planningguidance.planningportal.gov.uk/

You should also consult the Strategic Flood Risk Assessment produced by your local planning authority.

You should note that:

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

2. 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 overland runoff. The information produced by the local planning authority referred to above may assist here.

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

4. 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.

Please refer to the Open Government Licence which explains the permitted use of this information.

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Updated climate change requirements for flood risk assessments

On 19/02/2016 the 'Flood risk assessments: climate change allowances' were published on gov.uk. You can view the new allowances at 'Flood risk assessments: climate change allowances'. This replaces the previous guidance Climate Change Allowances for Planners.

The data provided in this product does not include the new allowances. You will need to consider this data and factor in the new allowances to demonstrate the development will be safe from flooding. The fluvial climate change factors are now more complex reflecting the fact that the latest information shows that a single uplift percentage across England cannot be justified.

The Environment Agency will incorporate the new allowances into future modelling studies.

It remains the applicant's responsibility to demonstrate through their proposals and flood risk assessments that new development will be safe in flood risk terms for its lifetime.

Surface Water

We have provided two national Surface Water maps, under our Strategic Overview for flooding, to your Lead Local Flood Authority, who are responsible for local flood risk (i.e. surface runoff, ground water and ordinary watercourse), which alongside their existing local information will help them in determining what best represents surface water flood risk in your area.

Your Lead Local Flood Authority have reviewed these and determined what it believes best represents surface water flood risk. You should therefore contact this authority so they can provide you with the most up to date information about surface water flood risk in your area.

You may also wish to consider contacting the appropriate relevant Local Planning Authority and/or water/sewerage undertaker for the area. They may be able to provide some knowledge on the risk of flooding from other sources. We are working with these organisations to improve knowledge and understanding of surface water flooding.

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