Burford Car Park
Flood Risk Assessment

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EdenvaleYoung

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i. Quality Assurance

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The consultant will follow accepted procedure in providing the services but given the residual risk associated with any prediction and the variability which can be experienced in flood conditions, the consultant takes no liability for and gives no warranty against actual flooding of any property (client's or third party) or the consequences of flooding in relation to the performance of the service.

iii. Glossary of Terms

+CC – Return period inclusive for the predicted effects of Climate Change

1D – One-Dimensional

2D – Two-Dimensional

AMAX –A series containing the peak flows recorded at a gauge from each year

AOD – Above Ordnance Datum (0m sea level, Newlyn, UK)

CC – Climate Change

Channel Cross Section – A profile view of a river channel, normally obtained by surveying a line across the watercourse

Critical Storm – A storm that produces peak run off in the watershed

Culvert – A device used to channel water, similar to a pipe though may be larger

DC – Distict Council

Defended– A scenario in which river defences are used

ESTRY - 1D network dynamic flow software. It is suitable for modelling of open channel riverine and catchment flooding, operated control structures or urban underground pipe networks.

FEH – Flood Estimation Handbook

Fluvial – Referring to the processes associated with rivers and streams

FRA – Flood Risk Assessment

GIS – Geographic Information System

Hydraulic Model – The mathematical process of analysing the interaction of water and the connected environment

Hydrology – The calculation of catchment-based flow rates

Inflow – Source of water within a modelled domain

FMP – One-Dimensional hydraulic model – Representation of watercourses

FMP-TUFLOW – Hydraulic program that dynamically links ISIS and TUFLOW (1D-2D)

LiDAR – Light Detection And Ranging, remote sensing technology to measure distance typically used to obtain topographic data over a large area

LPA – Local Planning Authorities

NPPF - National Planning Policy Framework

Outflow – The method by which water may leave a modelled area

Overtopping – Where water has passed over a feature that might ordinarily prevent flow

Q100 – 1% annual probability fluvial event

Q1000 – 0.1% annual probability fluvial event

Q100CC – 1% annual probability fluvial event with an allowance for the predicted effects of climate change

QMED - The median of the set of annual maximum flow data (AMAX)

SFRA – Strategic Flood Risk Assessment

TUFLOW Software – Two-Dimensional hydraulic model – Representation of floodplain

Undefended – A scenario in which river defences are ignored

WO – West Oxfordshire

iv. Contents

v. Figures

1 Introduction

1.1 Background

Edenvale Young Associates Ltd. has been commissioned by Windrush AEC Ltd to undertake a Flood Risk Assessment (FRA) for Burford Car Park extension works. The location of the site is shown in Figure 1-1.

The site is located to the North of the existing Car Park, to the East of The Mill Stream and to the West of the River Windrush. It also has a field drain to the North (Unknown 2) and one to the South (Unknown 3).

The proposal is to extend the car park northwards and provide capacity for 168 extra vehicles. The Location Plan shows the expansion area with a red outline and the existing West Oxfordshire District Council owned car park with a blue outline. The temporary car park, for which planning permission has been granted is also edged in blue.

The car park expansion proposal is a Burford Town Council project.

The existing car park and the proposed site for the extension are currently classified as within Flood Zone 3.

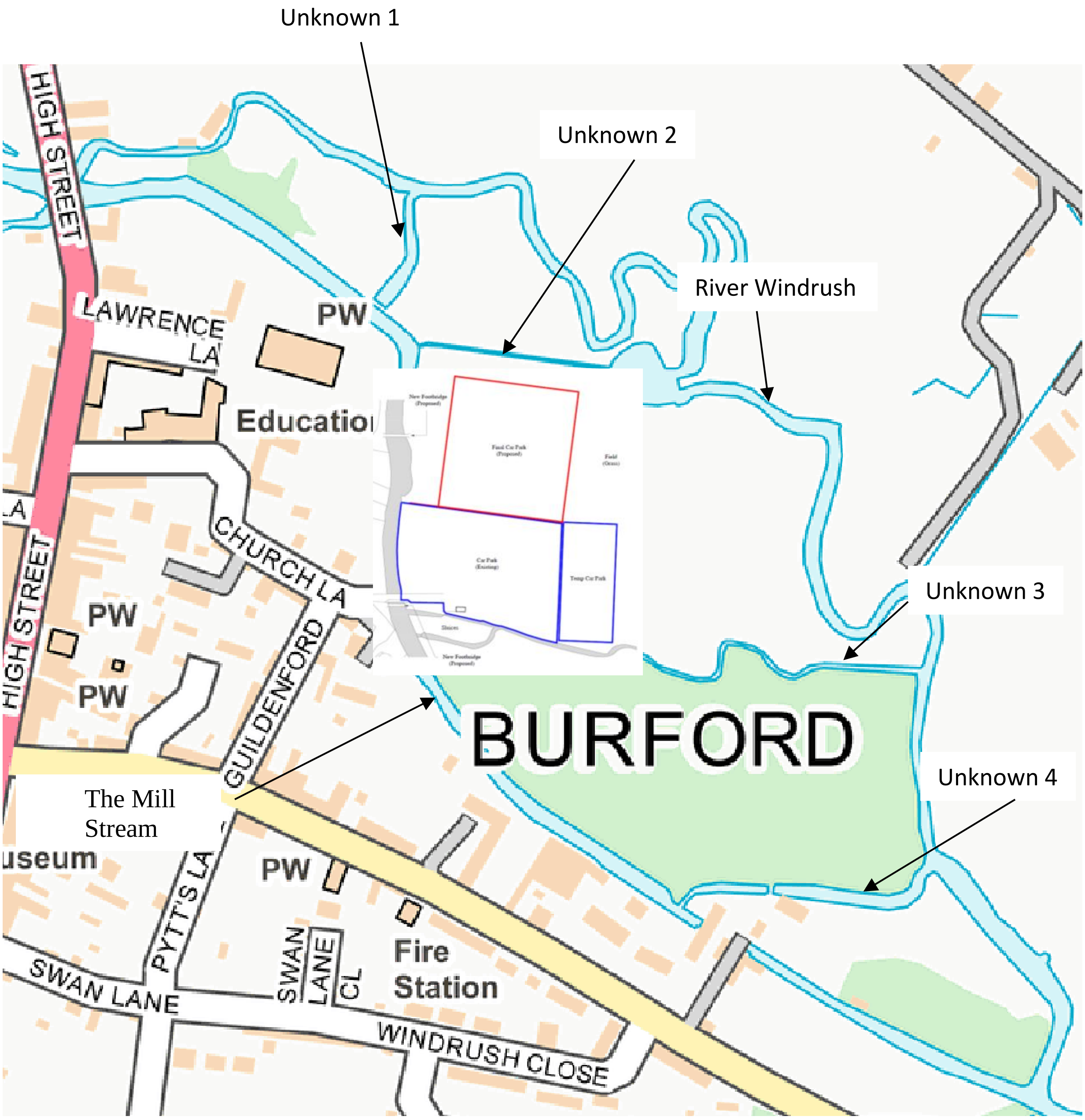

Figure 1-1 |PROPOSED CAR PARK EXTENSION

1.2 Hydraulic modelling

A 1D-2D ESTRY TUFLOW Model has been built and run for the 5%, 1% and 0.1% AEP design events, and the 1% design event with two climate change scenarios for both the existing condition (baseline scenario) and proposed development (post development scenario). This modelling was undertaken to inform the understanding of flood risk to the site and surrounding area.

The hydraulic modelling report is included as Appendix B and the further discussion on fluvial flood risk is given in Section 5.2.

1.3 Objectives

The aim of this report is to demonstrate that the development can be managed to ensure that:

- The development will remain safe during the lifetime of the development
- The impact on third parties as a result of the development are minimal.

2 The development

This study addresses the extension of an existing car park in the field known as Bury Orchard, shown in Figure 1-1. The area is located to the North of the West Oxfordshire District Council owned car park. The area is broadly flat land with an easily drained gravel substrate.

There are four parts to the design,

1- A new 1.5m wide footbridge located on West Oxfordshire District Council land will be included on the downstream side of the existing access bridge so that the existing bridge can be used by two-way traffic passing.

2- The millstream bank northwards from the existing car park shall be modelled to form a 16 m wide flat grassy bank at its narrowest point. The most northerly point will be the edge of the channel into the Unknown 1. The millstream bank at the edge may be strengthened with mesh or gabion baskets to prevent erosion but left wild as at present for wildlife and aesthetic reasons.

3- The parking area shall be fully permeable with slightly sunken shrubberies in the centre to further assist permeability and drainage under flood conditions. This parking area shall extend 72 m from the existing car park and 70 m eastwards as per Figure 1-2. Access to the permeable parking areas shall be by cambered tarmac roadways with absorption drainage either side as for the existing extension section to the current car park.

4- A swale or land drain shall exist between the existing and new car parks to carry any flood water from millstream overflow point "A" to the field swale already in existence at "B" (See Figure 1-2). The remaining area described will not change significantly.

The proposed development is shown in Figure 1-2.

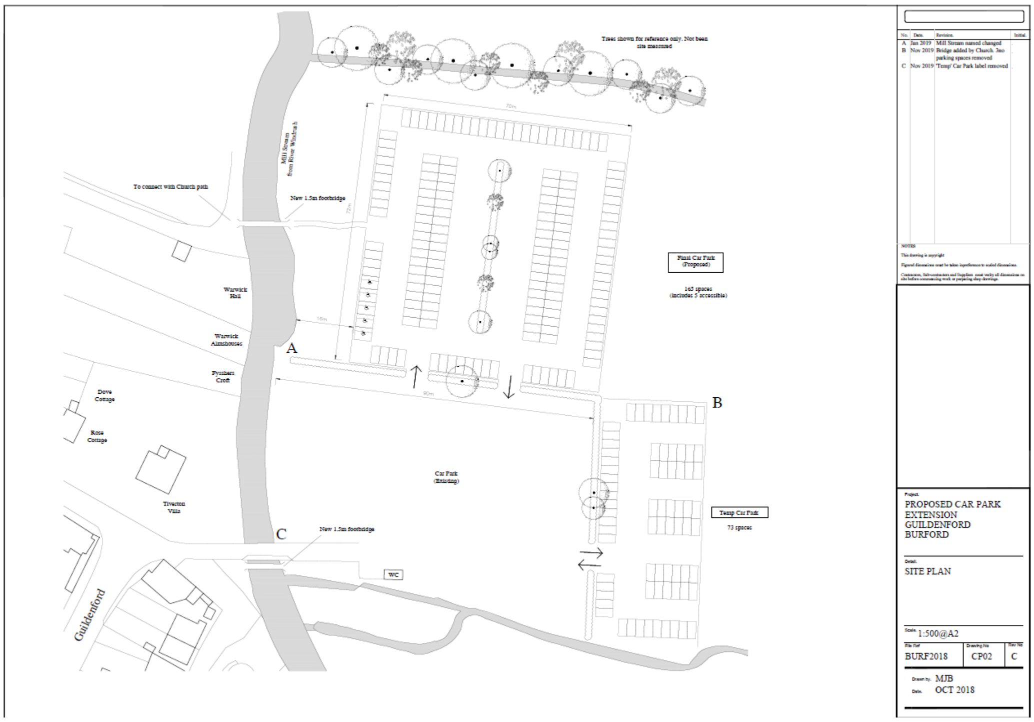

Figure 1-2 | PROPOSED CAR PARK EXTENSION GUILDENFORD BURFORD, DRWG NO CP02

3 Background and Previous Studies

3.1 Environment Agency Flood Maps

The latest EA Flood Map is shown in Figure 1-3 and confirms that the site is at high risk of flooding from rivers and is therefore in flood zone 3 (dark blue areas).

Figure 1-3| EA Flood Map at this location

Figure 1-4 shows that the surface water flood extents. These flood extents do not follow the watercourses and appear to suffer from a poor DTM. However, if the high risk is meant to be the Mill Stream, all other areas are described as low or very risk.

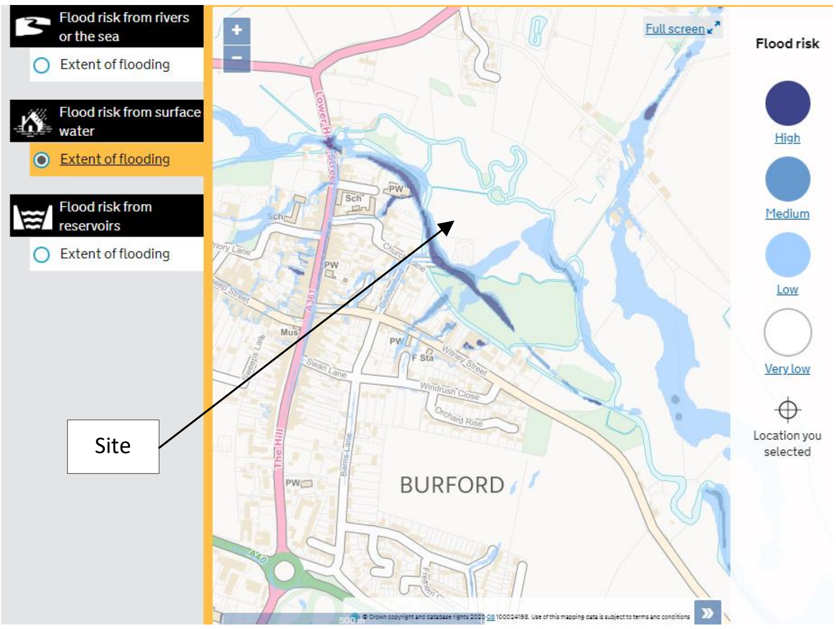

Figure 1-4| EA Surface Water Flood Risk Map

3.2 West Oxfordshire District Council

- West Oxfordshire District Council Strategic Flood Risk Assessment Update Report November 2016
- Parish Flood Report: Burford July 2008

3.3 Windrush AEC

- Design Access Statement Guildenford Car Park
- Controlled Watercourse Assessment: Proposed Extension to Burford Car Park

4 Policy Framework

The planning policy for the development comprises the National Planning Policy Framework (NPPF) and the Strategic Flood Risk Assessment (2016). The NPPF sets out a number of tests and/or criteria which must be passed in order for development to take place in areas at risk of flooding.

NPPF replaces the former document Planning Policy Supplement 25 (PPS25). The primary differentiation, as indicated by Environment Agency guidance, involves the designation of functional flood plains. The guidance included within the NPPF states that:

"The definition of Flood Zone 3b explains that local planning authorities should identify areas of functional floodplain in their Strategic Flood Risk Assessments in discussion with the Environment Agency and the lead local flood authority. The identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. However, land which would naturally flood with an annual probability of 1 in 20 (5%) or greater in any year, or is designed to flood (such as a flood attenuation scheme) in an extreme (0.1% annual probability) flood, should provide a starting point for consideration and discussions to identify the functional floodplain".

A functional floodplain is a very important planning tool in making space for flood waters when flooding occurs. Generally, development should be directed away from these areas using the Environment Agency's catchment flood management plans, shoreline management plans and local flood risk management strategies produced by lead local flood authorities.

The area identified as functional floodplain should take into account the effects of defences and other flood risk management infrastructure. Areas which would naturally flood, but which are prevented from doing so by existing defences and infrastructure or solid buildings, will not normally be identified as functional floodplain. If an area is intended to flood, eg an upstream flood storage area designed to protect communities further downstream, then this should be safeguarded from development and identified as functional floodplain, even though it might not flood very often.

West Oxfordshire SFRA states that all new development within Flood Zone 3 must not result in a net loss of flood storage capacity. Section 8.6.1 say that:

"Where car parks are specified as areas for the temporary storage of surface water and fluvial floodwaters, flood depths should not exceed 300mm given that vehicles may be moved by water of greater depths. Where greater depths are expected, car parks should be designed to prevent the vehicles from floating out of the car park. Signs should be in place to notify drivers of the susceptibility of flooding and a flood alert provide some advance warning time that a car park could become inundated."

Furthermore, NPPF states in Section 11, Item 118, item d that planning policies and decisions should promote and support the development of under-utilised land and buildings, especially if this would help to meet identified needs for housing where land supply is constrained and available sites could be used more effectively (for example converting space above shops, and building on or above service yards, car parks, lock-ups and railway infrastructure).

4.1 NPPF Sequential Test

The NPPF Sequential Test is used to, where possible, steer development to sites at a lesser risk of flooding.

The above Guildenford location is regarded as the only option available for expanding off street car parking capacity in Burford. A search has been conducted for other sites with the following results:

- Facilities at the recreation ground and Bowls Club in Tanners Lane. There is a car park already which has been signposted for many years. Visitors do not use it as it is remote and uphill from the shopping area.
- Land west of the doctors' surgery in Sheep Street. Not available as this is productive arable land and will not be released for development by the landowner for a car park as it is described in WODC SHLAA as suitable for housing.
- Land north of Witney Street adjacent to the 30mph signs. Not available, the landowner is adamant that the field will not be released as a car par. A flat refusal in strenuous terms.
- Land north of the River Windrush in Fulbrook parish. Not favoured as this would put expose users to the hazards of the single carriageway Burford Bridge when walking into town and returning to their vehicles.

More details are given in the Sequential Test document.

4.2 NPPF Exception Test

The Exception Test, as set out in paragraph 160 of the Framework, is a method to demonstrate and help ensure that flood risk to people and property will be managed satisfactorily, while allowing necessary development to go ahead in situations where suitable sites at lower risk of flooding are not available.

Essentially, the 2 parts to the Test require proposed development to show that it will provide wider sustainability benefits to the community that outweigh flood risk, and that it will be safe for its lifetime, without increasing flood risk elsewhere and where possible reduce flood risk overall.

The proposal is the extension of an existing car park.

Most types of development proposals are specifically mentioned in Table 2 of the Technical Guidance (NPPG - Flood Risk Vulnerability Classification), however car parks are not specifically categorised.

Table 3 of the NPPF Technical Guidance, reproduced as Figure 4-5 below, shows the compatibility of types of development within particular Flood Zones. This table indicates that a development located within Flood Zone 3b is required to either pass an Exception Test or to be Water Compatible.

Flood Zones	Flood Risk Vulnerability Classification				
	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a †	Exception Test required †	✗	Exception Test required	✓	✓
Zone 3b *	Exception Test required *	✗	✗	✗	✓*

Key:

✓ Development is appropriate

✗ Development should not be permitted.

Figure 4-5| Flood Risk Vulnerability Classification reproduced from NPPF

Examples of water-compatible developments from the NPPF Guidance Table 2 are shown below,

- Flood control infrastructure.
- Water transmission infrastructure and pumping stations.
- Sewage transmission infrastructure and pumping stations.
- Sand and gravel working.
- Docks, marinas and wharves.
- Navigation facilities.
- Ministry of Defence 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.

The proposed development is considered to fall within the 'water-compatible' vulnerability classification.

This is further supported by The Sequential Test made by South Northamptonshire Council, where it is stated that:

"The Flood Risk Assessment (FRA) submitted with the application demonstrates that the land levels are within the 5% AEP flood levels. By definition, this puts the majority of the site within the functional floodplain – zone 3b (Table 1 of the NPPG), albeit this was not specifically referenced in the Flood Risk Assessment. Within flood zone 3b, only 'essential infrastructure' or 'water compatible' development is acceptable. The FRA concluded that a car park was 'less vulnerable' development which is not compatible in zone 3b and has resulted in the objection from the Environment Agency.

However, as advised by the Environment Agency, it is for the Local Planning Authority to determine the flood risk vulnerability classification of development proposals. Most types of development proposals are specifically mentioned in Table 2 of the Technical Guidance (NPPG - Flood Risk Vulnerability Classification), however car parks are not specifically categorised.

In the opinion of the Local Planning Authority, and with reference to Table 2 of the NPPG, the proposed development is considered to fall within the 'water-compatible' vulnerability classification. This is on the basis that the site is largely designed to be permeable and it can still be allowed to flood if needs be, providing there are appropriate flood control measures in place, which could be secured by a planning condition in liaison with advice from the Environment Agency."

The extension of the carpark 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.

5 Sources of Flood Risk

5.1 Introduction

The following sections include consideration of fluvial flooding, surface water flooding, sewer flooding, groundwater flooding and tidal inundation in order to give a comprehensive overview of flood risk to the extension of the car park.

5.2 Fluvial Flooding

5.2.1 Introduction

An ESTRY-TUFLOW (1D-2D) hydraulic model of the River Windrush, the Mill Stream and 4 Unknown water courses has been built for this project, since no hydraulic models of the area were available. The hydraulic model has been used to assess flood risk from the previously mentioned watercourses to evaluate assess the flood risk in the area and to understand the impact of the development on flood risk. Modelling has been undertaken for the pre and post development scenarios for the following fluvial flow events:

- 5% AEP (1 in 20 year);
- 1% AEP (1 in 100 year);
- 1% AEP (1 in 100 year) with of 35% and 70% climate change allowance on flows and
- 0.1% AEP (1 in 1,000 year).

The objective of the modelling was to assess whether there are any third-party impacts associated with the construction of the development and to determine whether the development is safe. Hydraulic modelling was undertaken for the pre and post development cases through the introduction of the topographic survey and the development to the model.

Details of the modelling and Hydrological Study are shown in Appendix B: Model Report.

The model results show that the existing and proposed car park flood for all return periods considered. However, the depth of flooding is shallow and the hazard estimated is low for all return periods considered.

The sources of flooding are The Mill Stream to the west and the Unknown 2, to the North. Furthermore, as mentioned in the Model Report, two baselines have been considered to assess the flood risk: one with the sluice into the Unknown 1 open (Scenario A) and one closed (Scenario C). Scenario C considers the full capacity of the hydraulic structures and is therefore used as the most representative baseline to analyse the impact of the flood risk in the site.

5.2.2 5% AEP Modelling (1 in 20-year event)

The maximum depth within the boundaries of the proposed car park for the 1 in 20 years return period baseline scenario (C) is 33mm, with an average depth of 8mm and a standard deviation of 7mm (See Figure 5-6 and Figure 5-7).

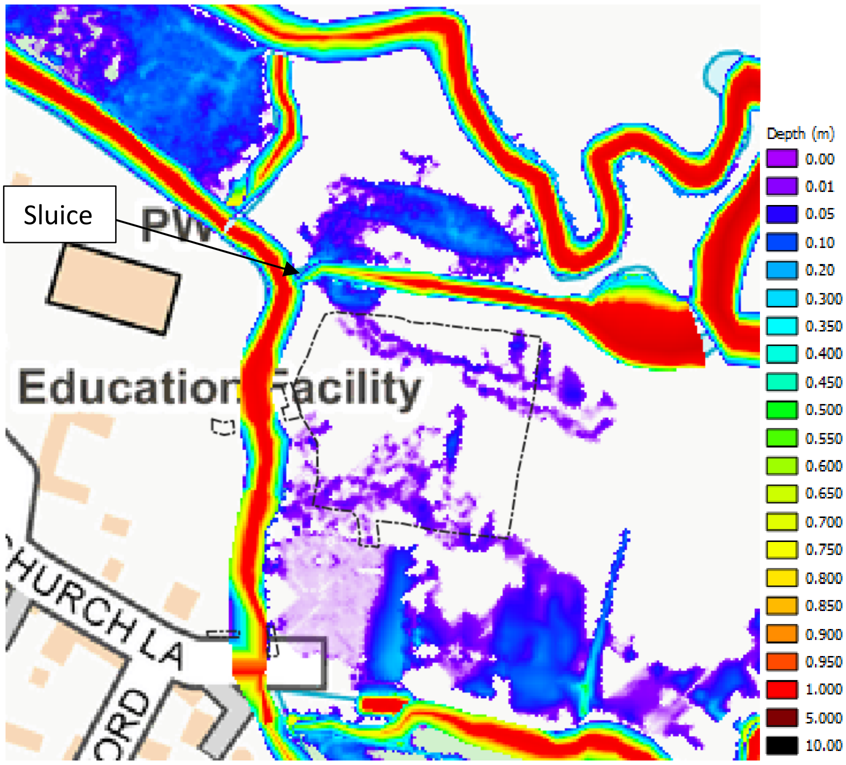

Figure 5-6 | 1 in 20 years Return Period Baseline (Scenario C)

The post-development scenario changes the roughness of the terrain and evens the ground levels slightly to be able to use it as a car park, as a result, the deeper flooding is removed, as shown in Figure 5-7.

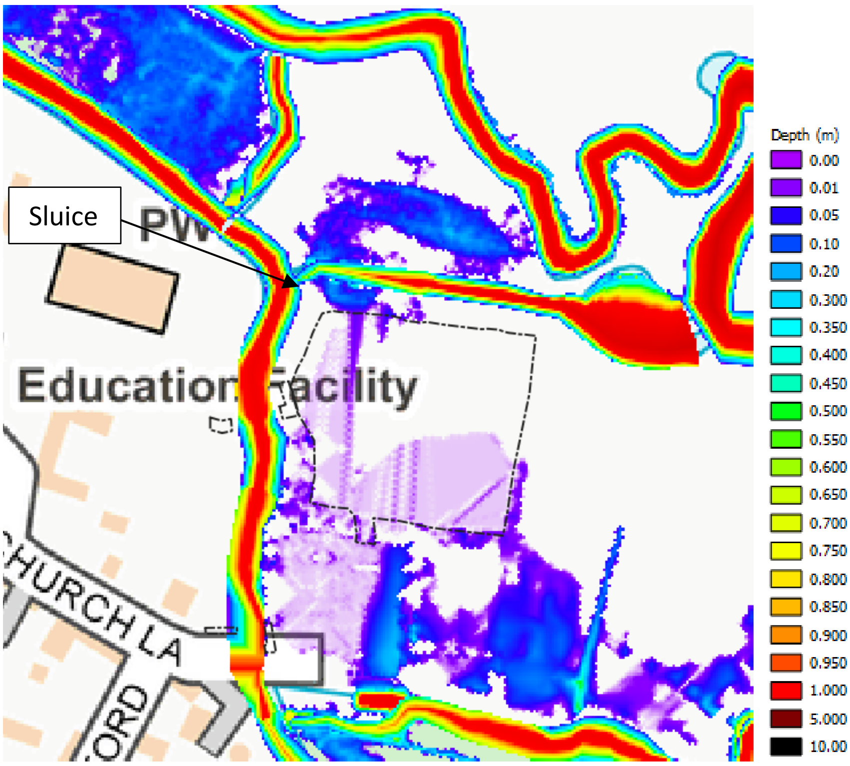

Figure 5-7 | 1 in 20 years Return Period Post Development (Scenario E)

When the modelling was carried out, a smooth impermeable asphalt surface was assumed. Later design details of the car park refer to a fully permeable cambered tarmac road ways.

Furthermore, a swale (1m x 1m) or land drain shall exist between the existing and new car parks to carry any flood water from the Mill Stream to an existing swale. These changes do not modify the conclusions of the modelling study but do suggest the modelling may overestimate the flood depths slightly (if at all), and are as a result more conservative.

5.2.3 Fluvial Flooding Modelling Results

Table 5-1 shows the minimum, maximum and average depth within the boundaries of the car park extension. As mentioned previously, the changes made to the car park for the post development scenario as minimal and the impact shows a slight reduction in the flood depths.

Table 5-1 | Baseline and Post Development Depths

Return Period	Scenario	Minimum depth (mm)	Maximum depth (mm)	Average (mm)
20	Baseline (C)	0.3	33.2	8.9
100	Baseline (C)	0.3	167.8	53.1
1000	Baseline (C)	0.3	262.2	108.4
20	Post Development (E)	0.2	8.1	2.3
100	Post Development (E)	0.3	98.9	15.3
1000	Post Development (E)	0.3	171.0	47.2

Figure 5-8, Figure 5-9, Figure 5-10, Figure 5-11 and Figure 5-12 show the depth maps of the Baseline Scenario (C), version 09. Figure 5-13, Figure 5-14, Figure 5-15, Figure 5-16 and Figure 5-17 show the depth maps of the Post Development Scenario (E), version 09. Version 09 refers to the latest version of the model and is the only version reported in this document and the Model Report.

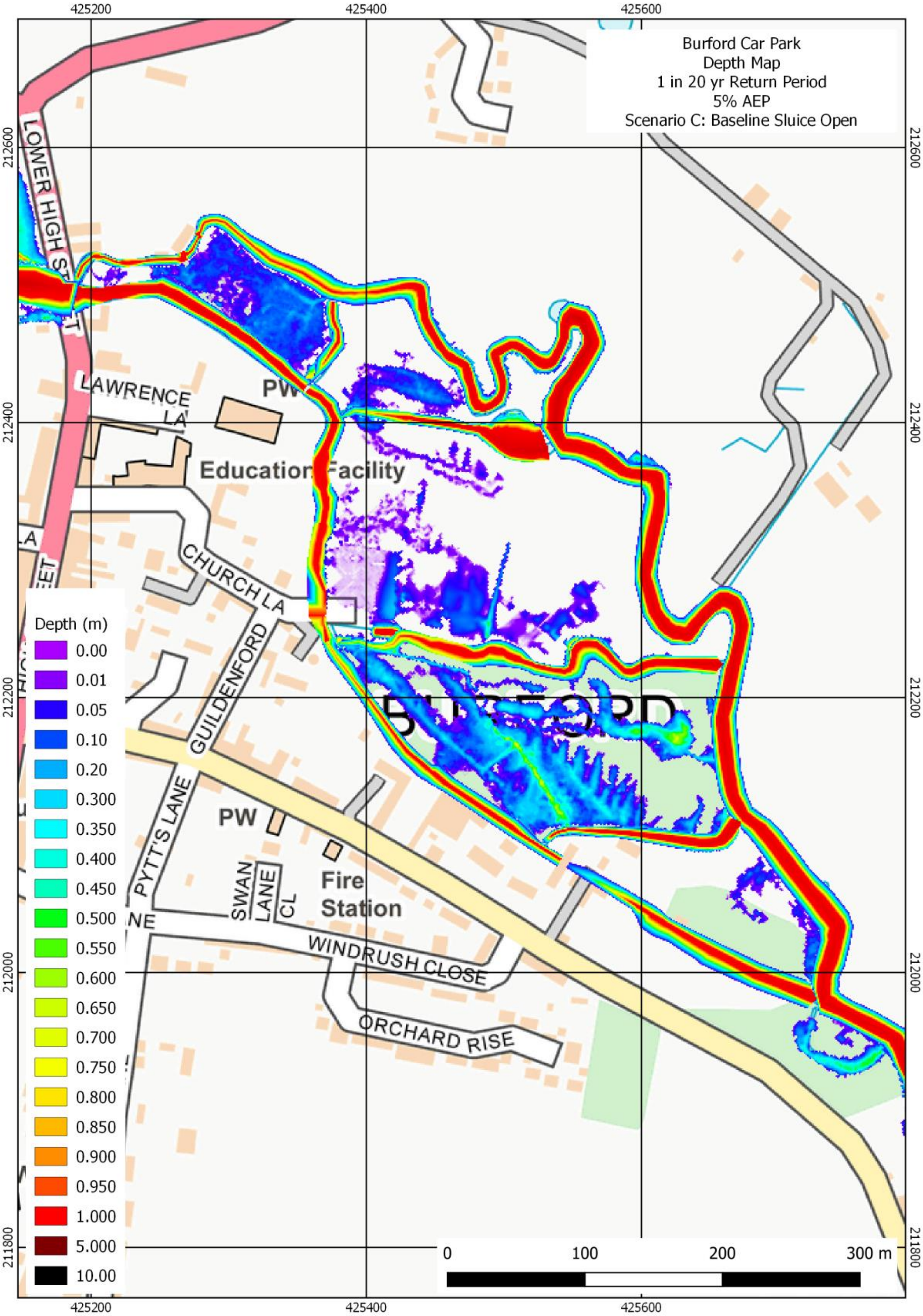

Figure 5-8| Hydraulic Model Results: Baseline (C) Flood Depth: 5% AEP

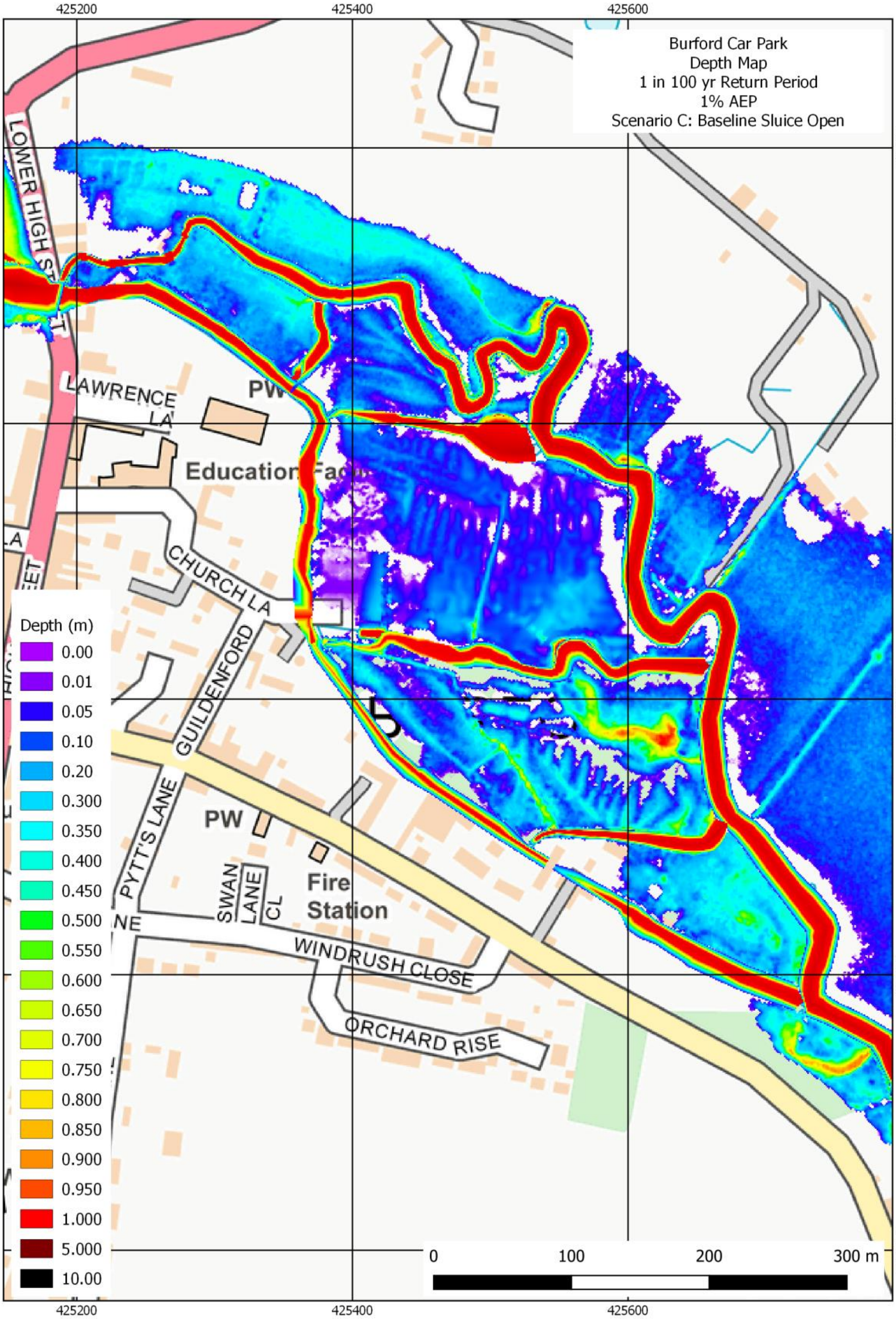

Figure 5-9| Hydraulic Model Results: Baseline (C) Flood Depth: 1% AEP

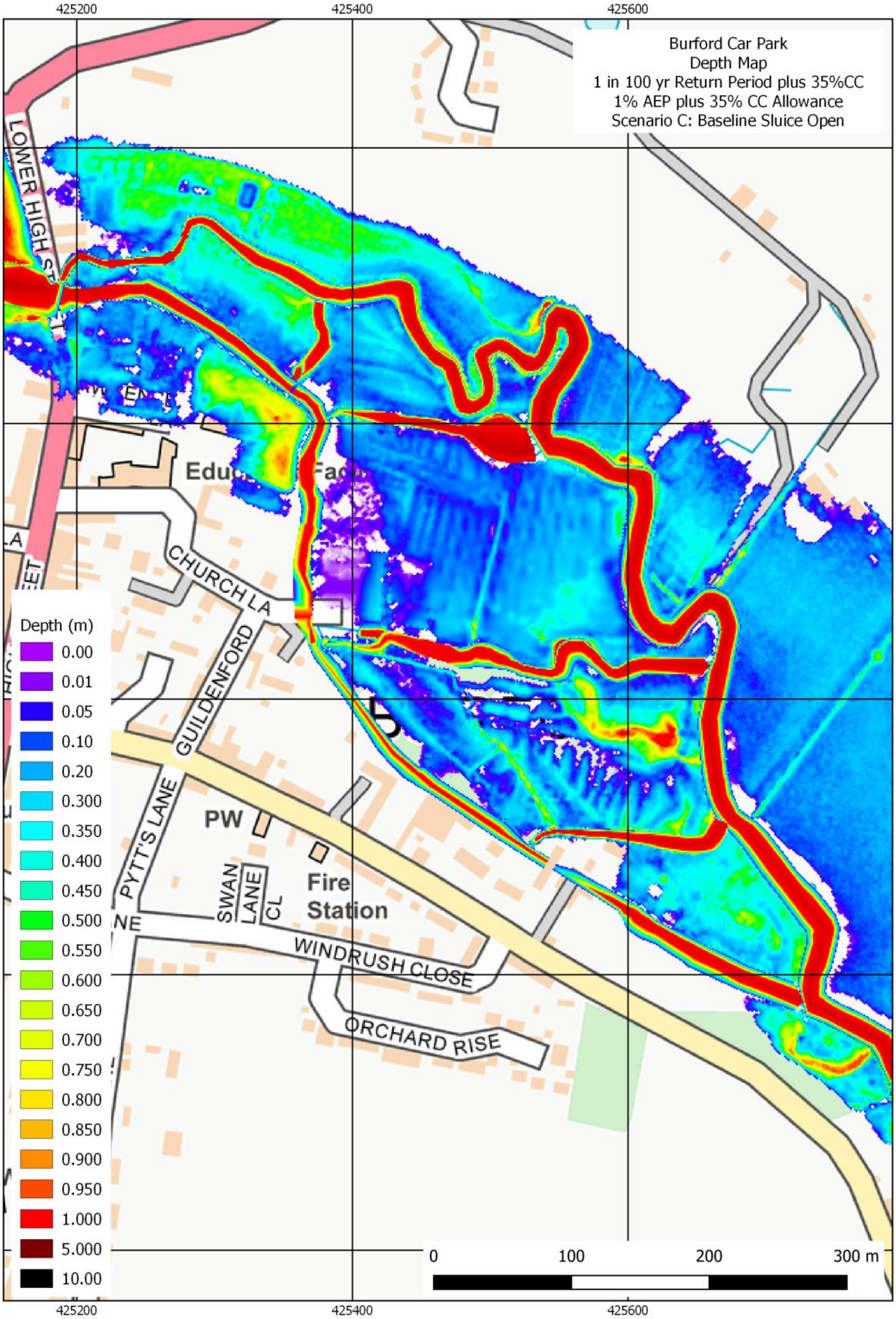

Figure 5-10| Hydraulic Model Results: Baseline (C) Flood Depth: 1% AEP + 35% CC

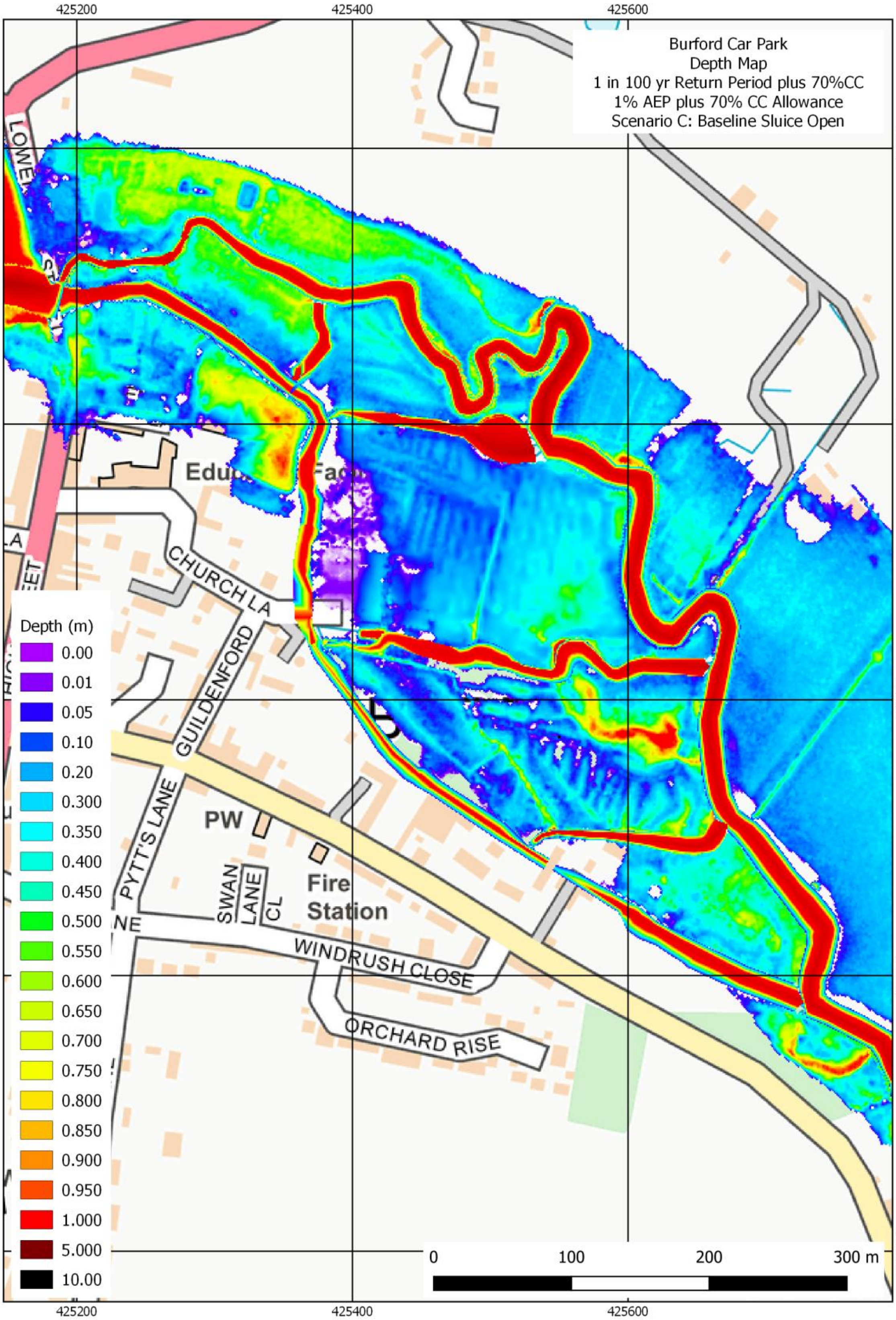

Figure 5-11| Hydraulic Model Results: Baseline (C) Flood Depth: 1% AEP + 70% CC

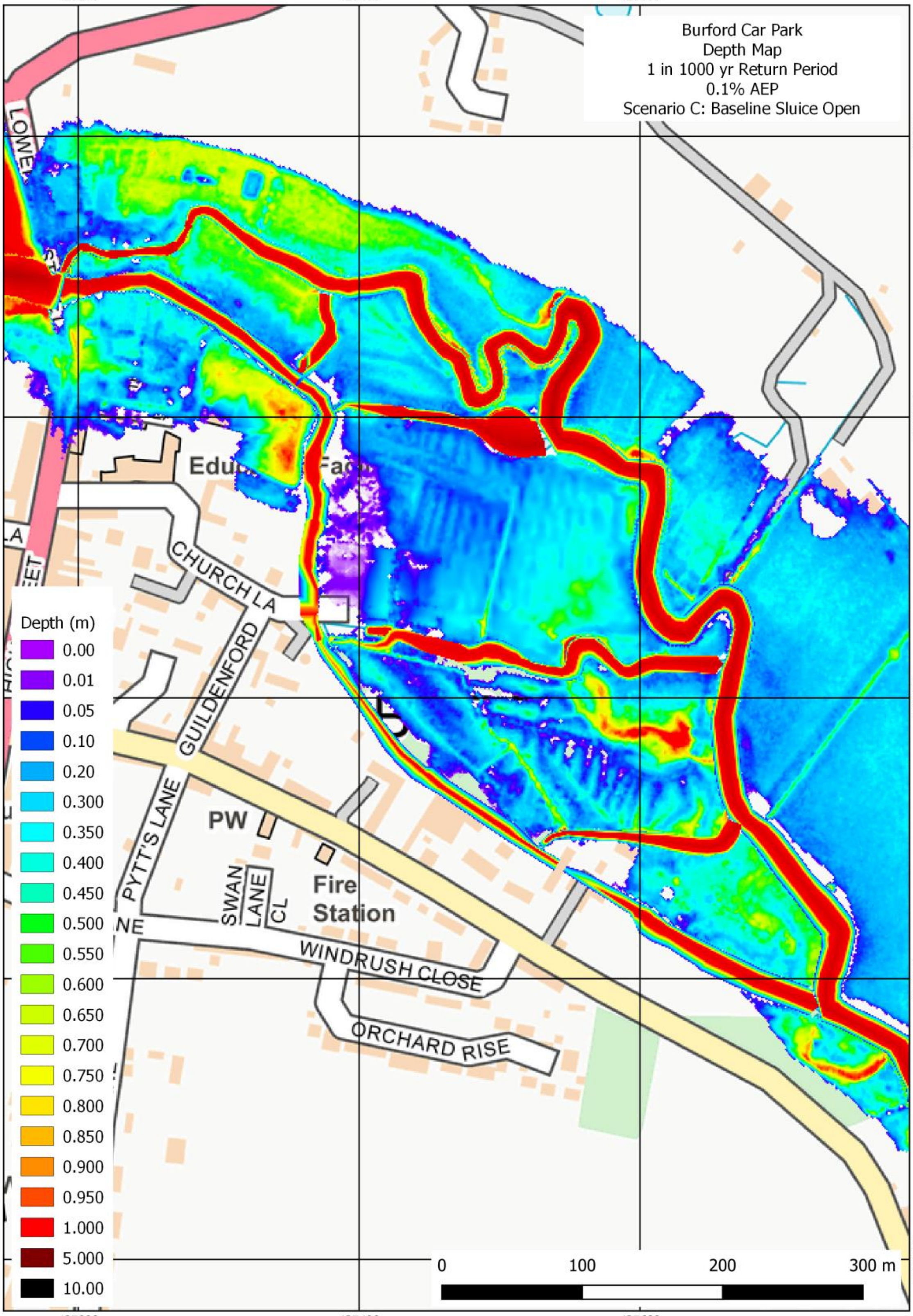

Figure 5-12| Hydraulic Model Results: Baseline (C) Flood Depth: 0.1% AEP

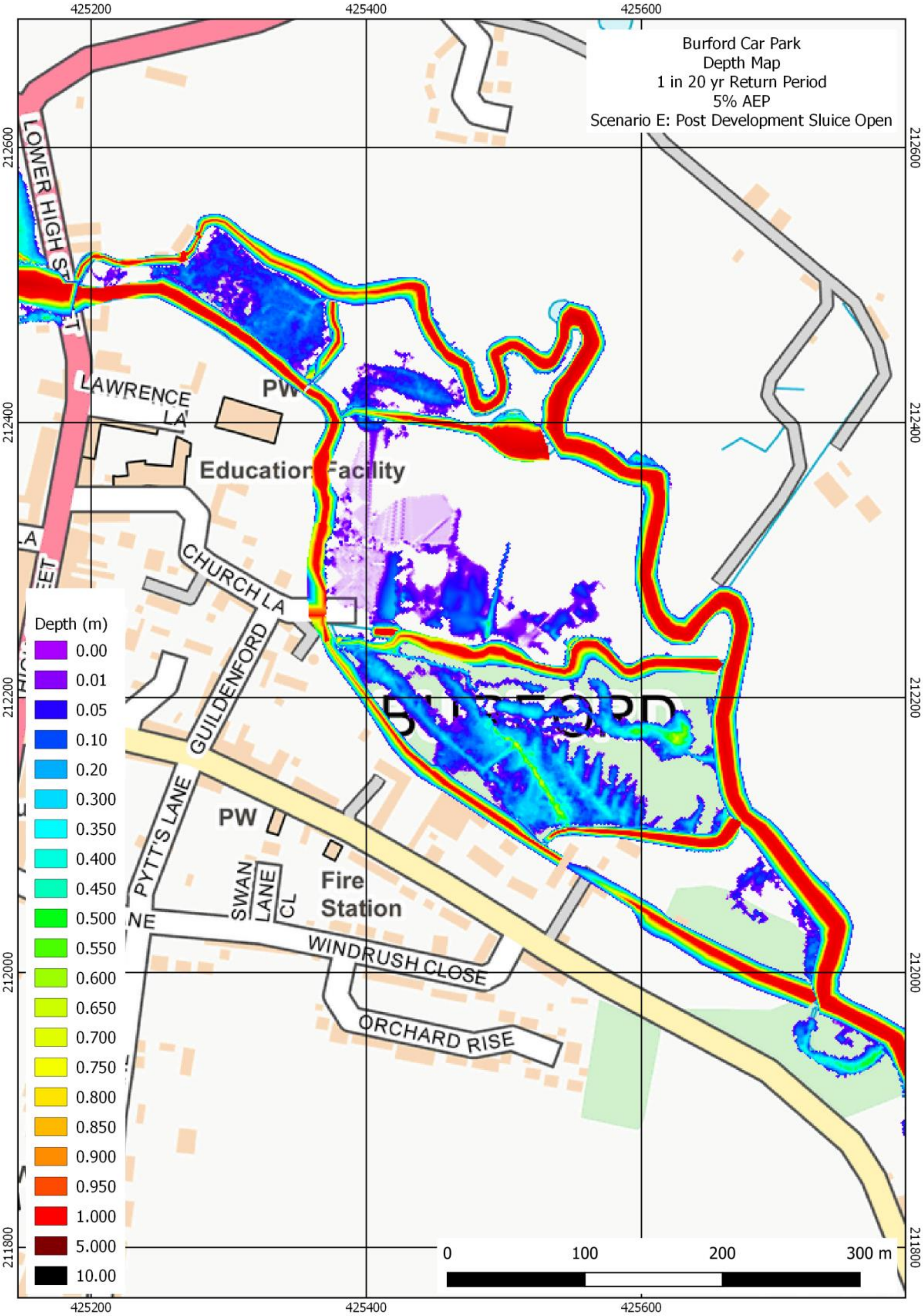

Figure 5-13| Hydraulic Model Results: Post–development Flood Depth: 5% AEP

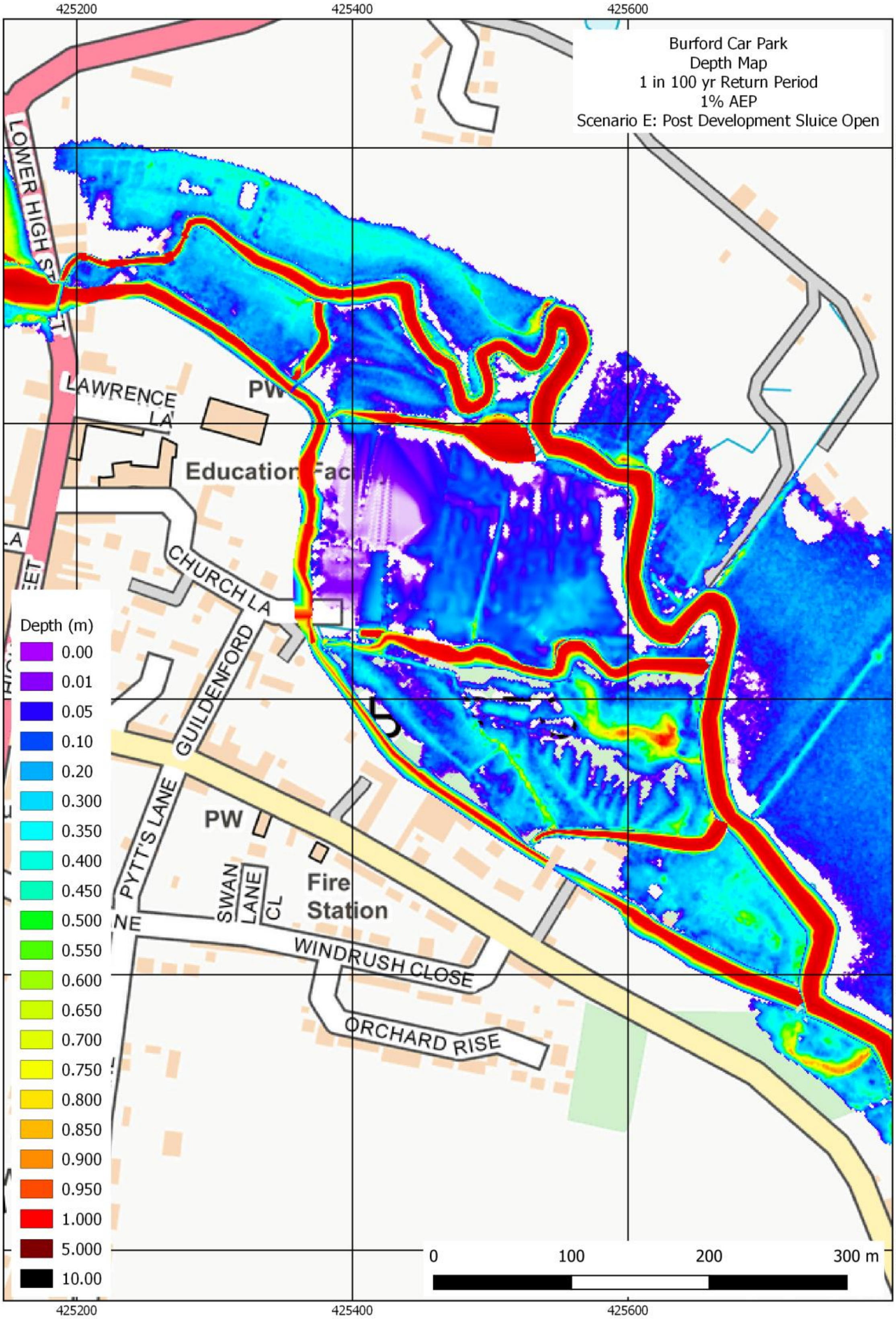

Figure 5-14| Hydraulic Model Results: Post–development Flood Depth: 1% AEP

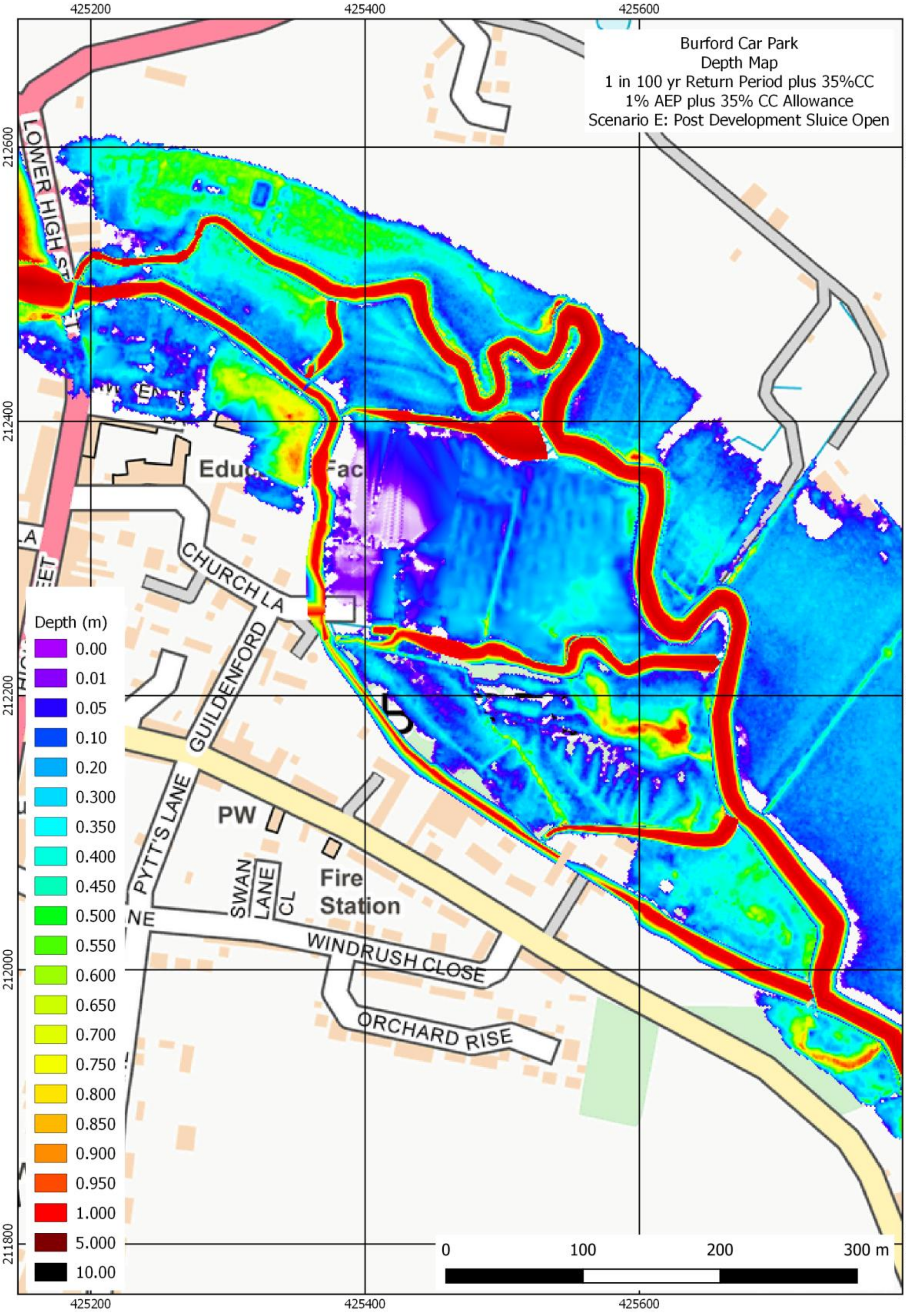

Figure 5-15| Hydraulic Model Results: Post–development Flood Depth: 1% AEP + 35% CC

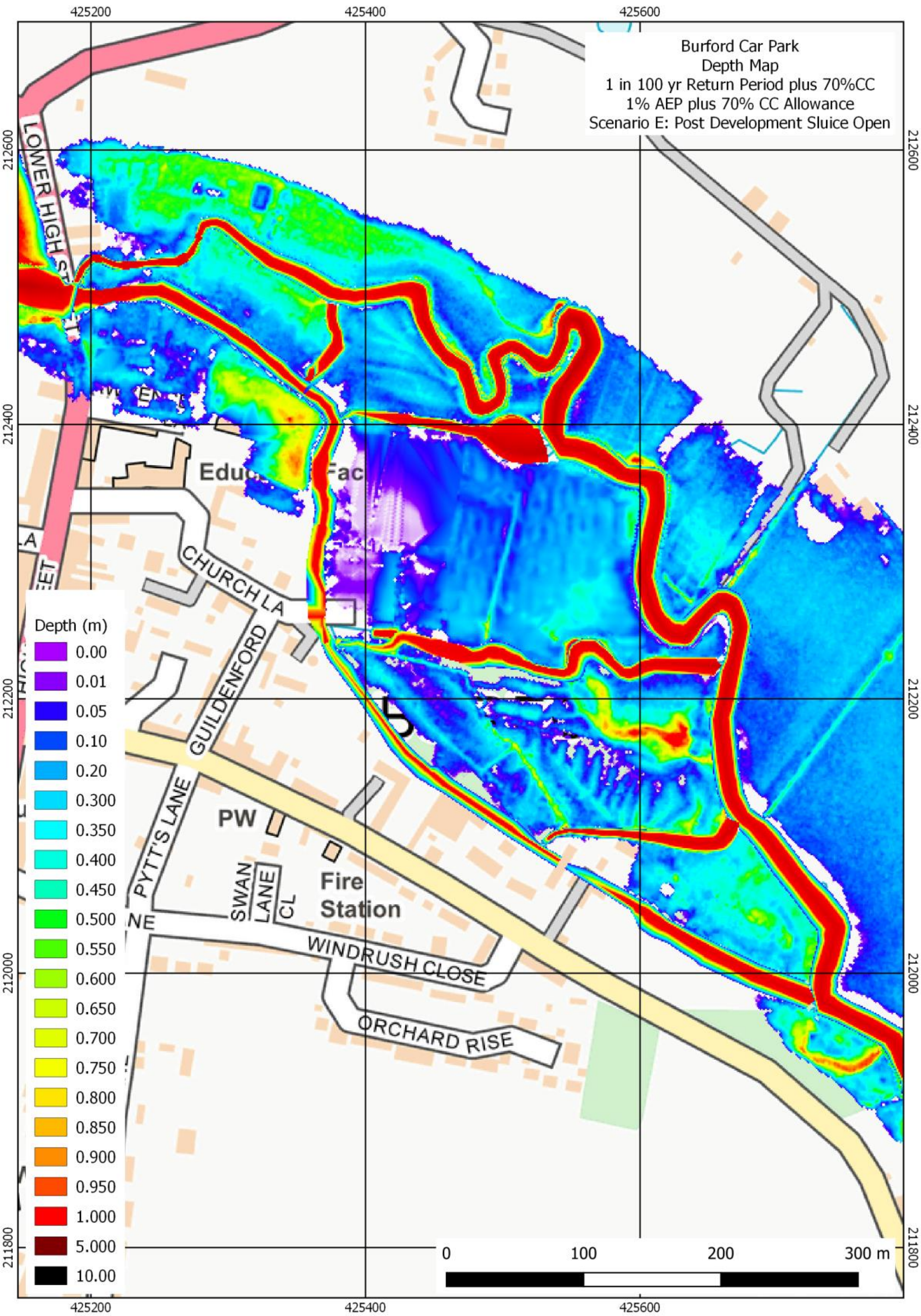

Figure 5-16| Hydraulic Model Results: Post–development Flood Depth: 1% AEP + 70% CC

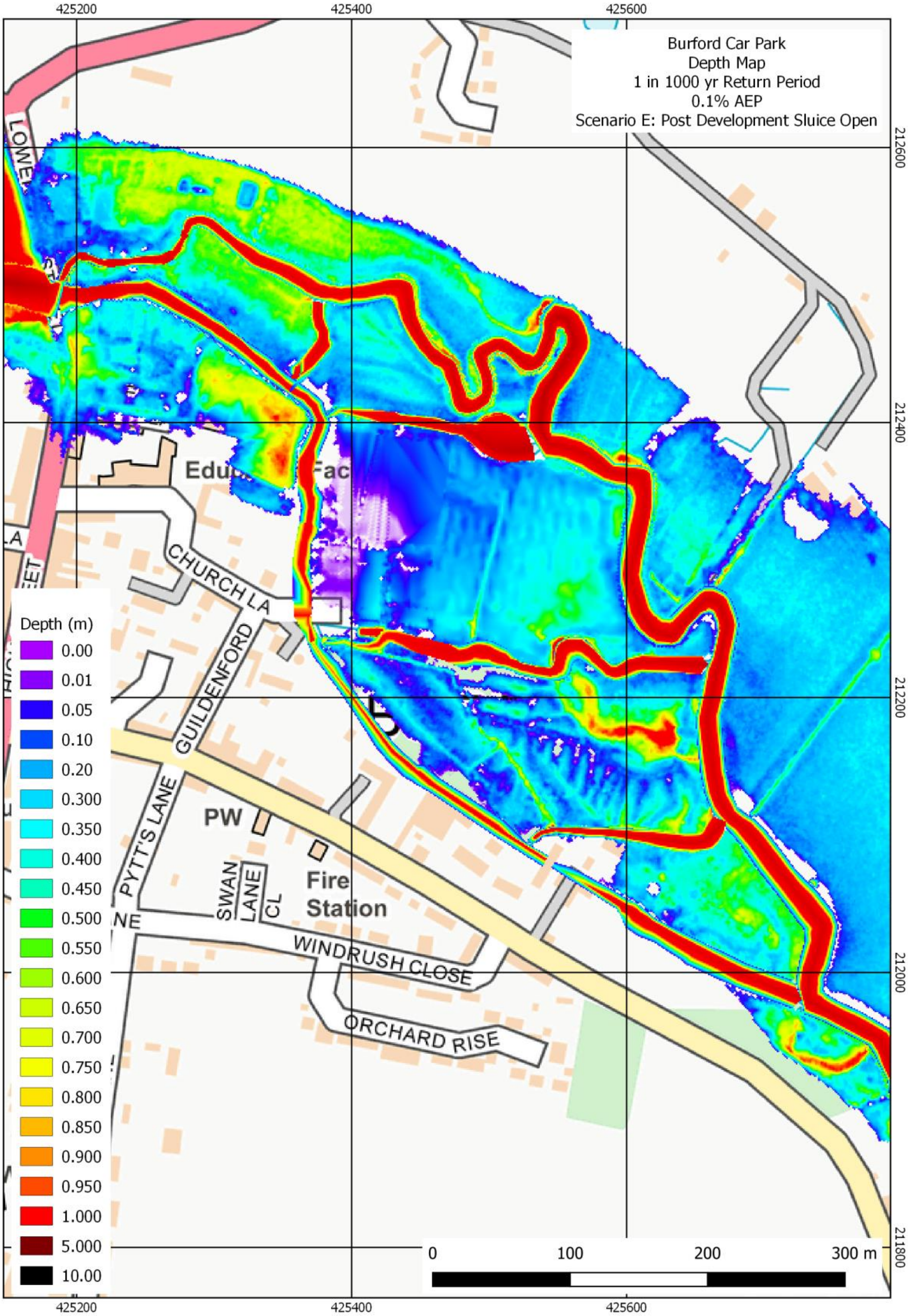

Figure 5-17| Hydraulic Model Results: Post–development Flood Depth: 0.1% AEP

5.2.4 Flood Risks and Damage to Property

In terms of damage, the existing and proposed car parking are resilient to flooding with minimal damage expected to the surfacing and parking areas.

Furthermore, Table 5-1 shows a maximum flood depth of less than 300mm. As mentioned in Section 4, West Oxfordshire SFRA Section 8.6.1 sets this maximum depth of 300 mm in car park areas for the temporary storage of floodwaters so vehicles may be not be moved by the water.

5.2.5 Flood Hazard and Risks to People

Danger to people is assessed through the concept of hazard. Hazard combines flow velocity and depth. This approach recognises the fact that both deep-still and shallow-fast flowing flood water can be dangerous. Figure 5-18 to Figure 5-22 shows the results of the peak hazard analysis for the proposed development.

All scenarios fall into the category of Low Hazard, this is described as: Caution “Flood zone with shallow flowing water or deep standing water”. In this case it is clearly, very shallow.

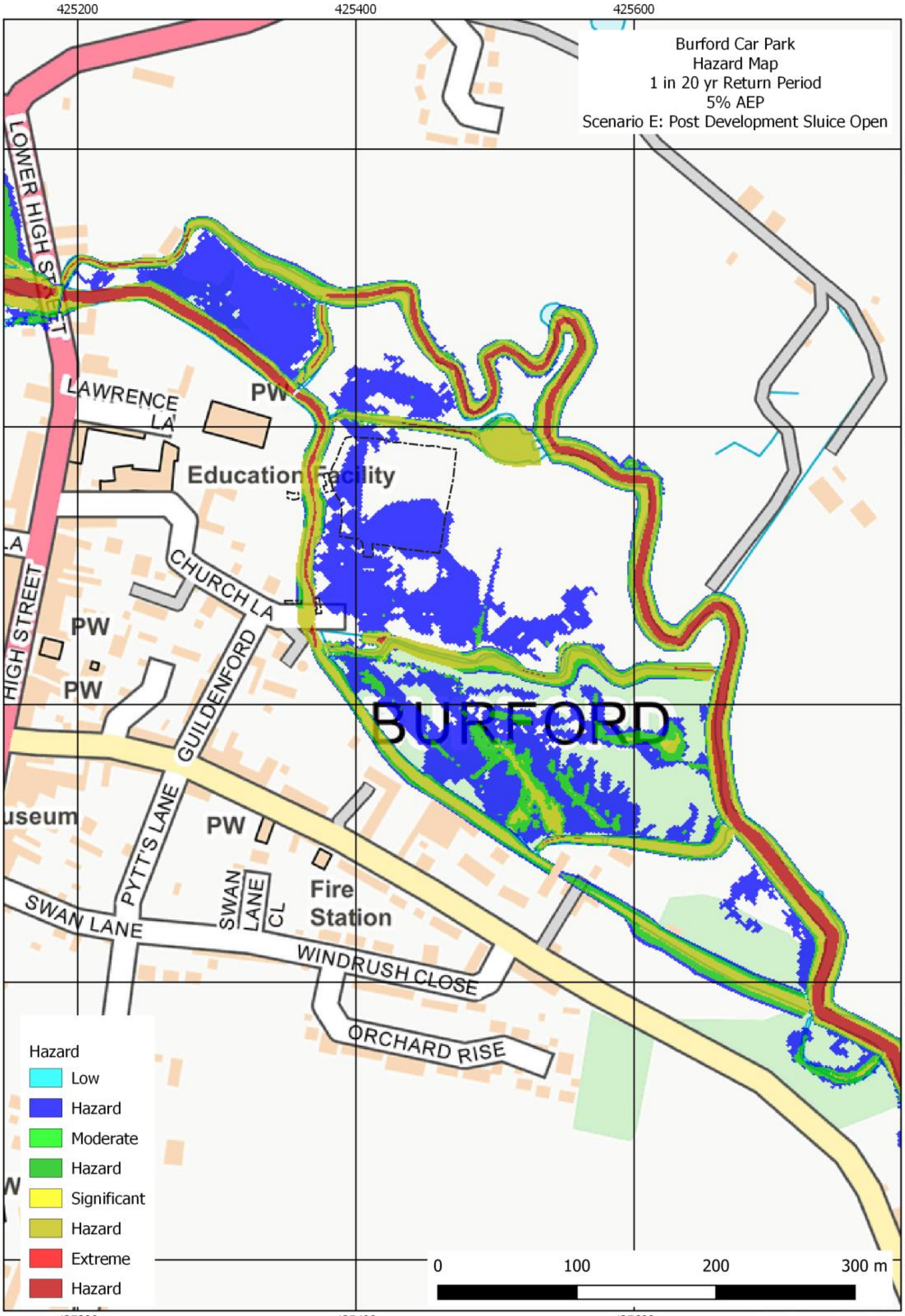

Figure 5-18| Hydraulic Model Results: Post–development Flood Hazard: 5% AEP

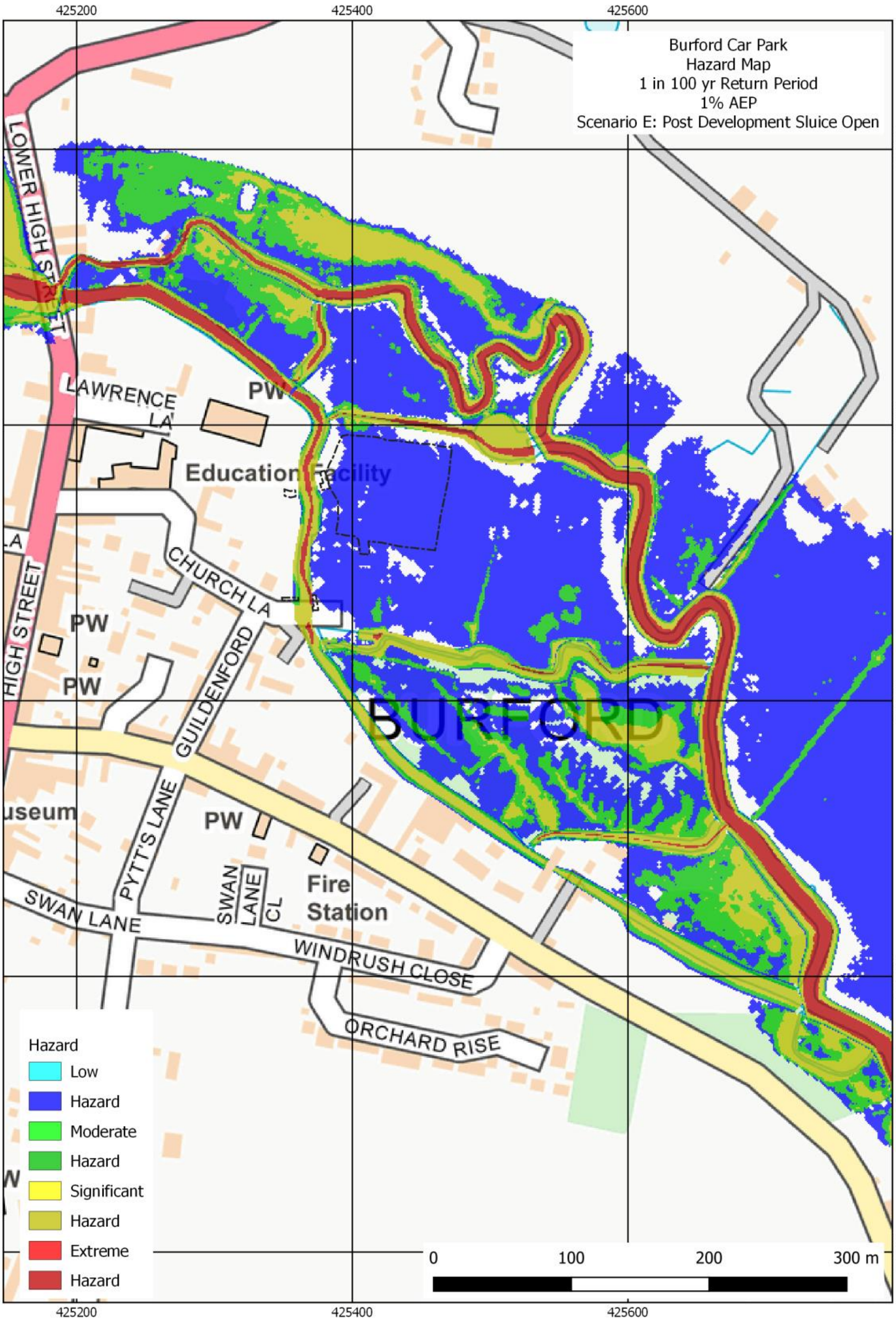

Figure 5-19| Hydraulic Model Results: Post–development Flood Hazard: 1% AEP

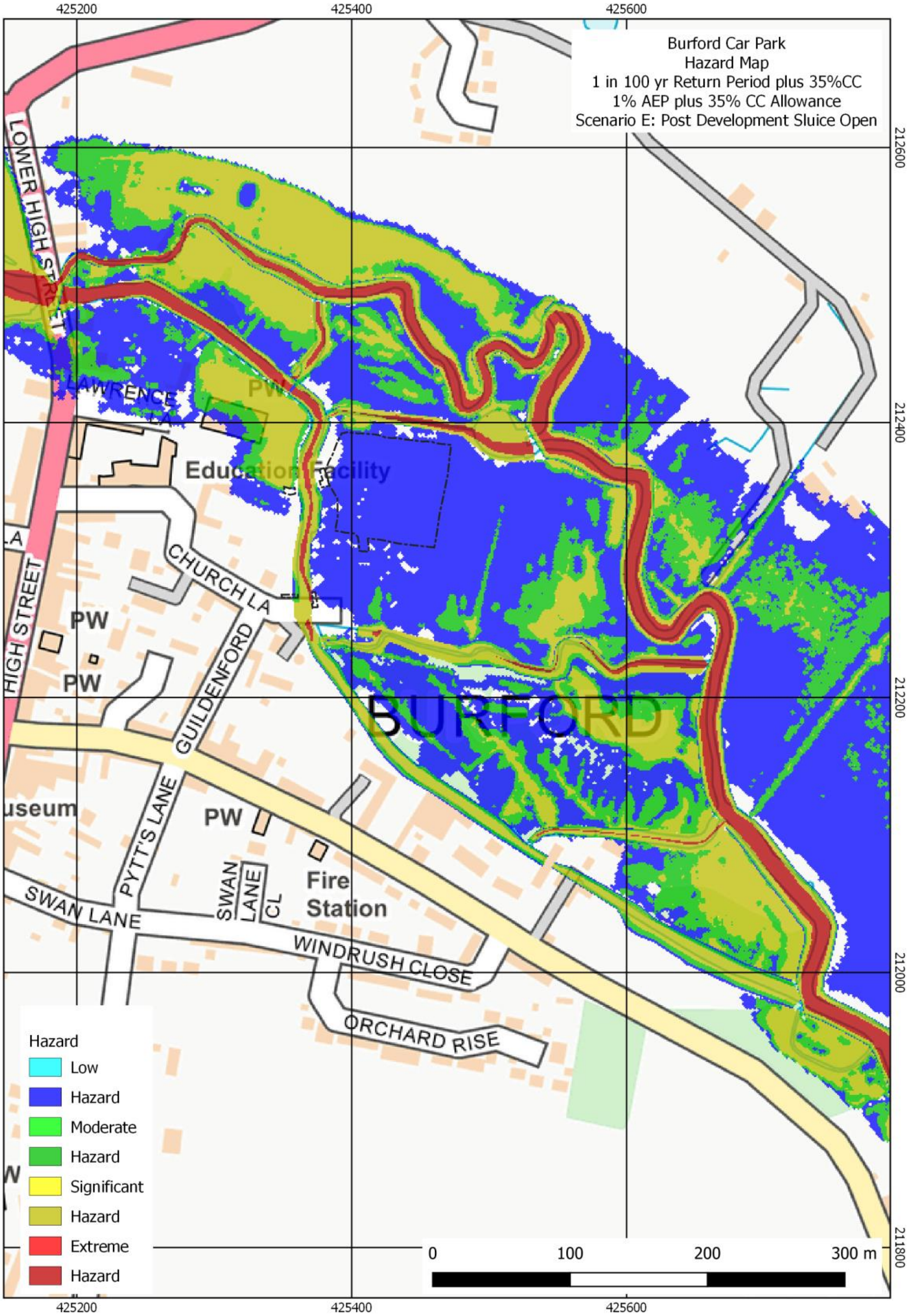

Figure 5-20| Hydraulic Model Results: Post–development Flood Hazard: 1% AEP + 35% CC

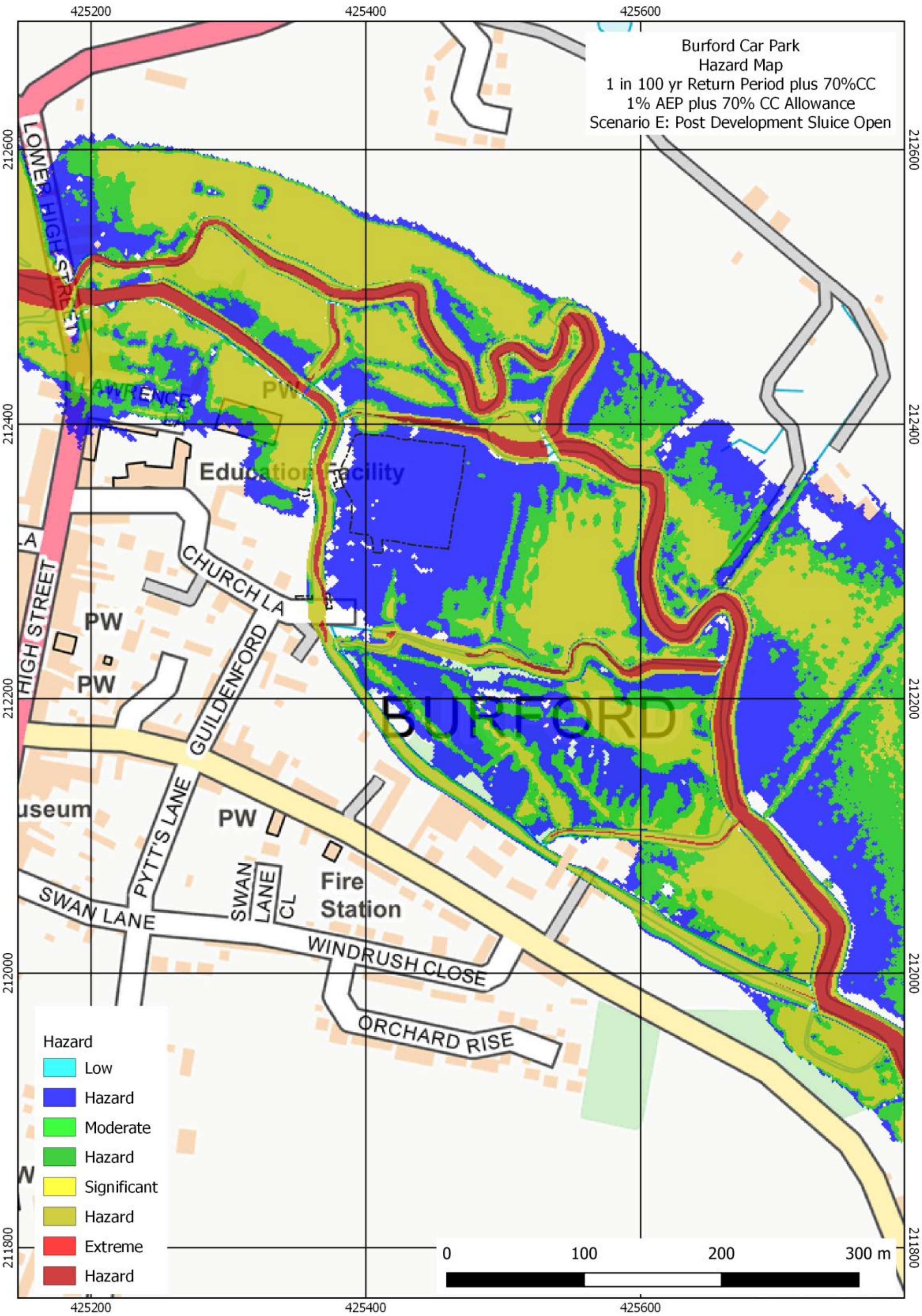

Figure 5-21| Hydraulic Model Results: Post–development Flood Hazard: 1% AEP + 70% CC

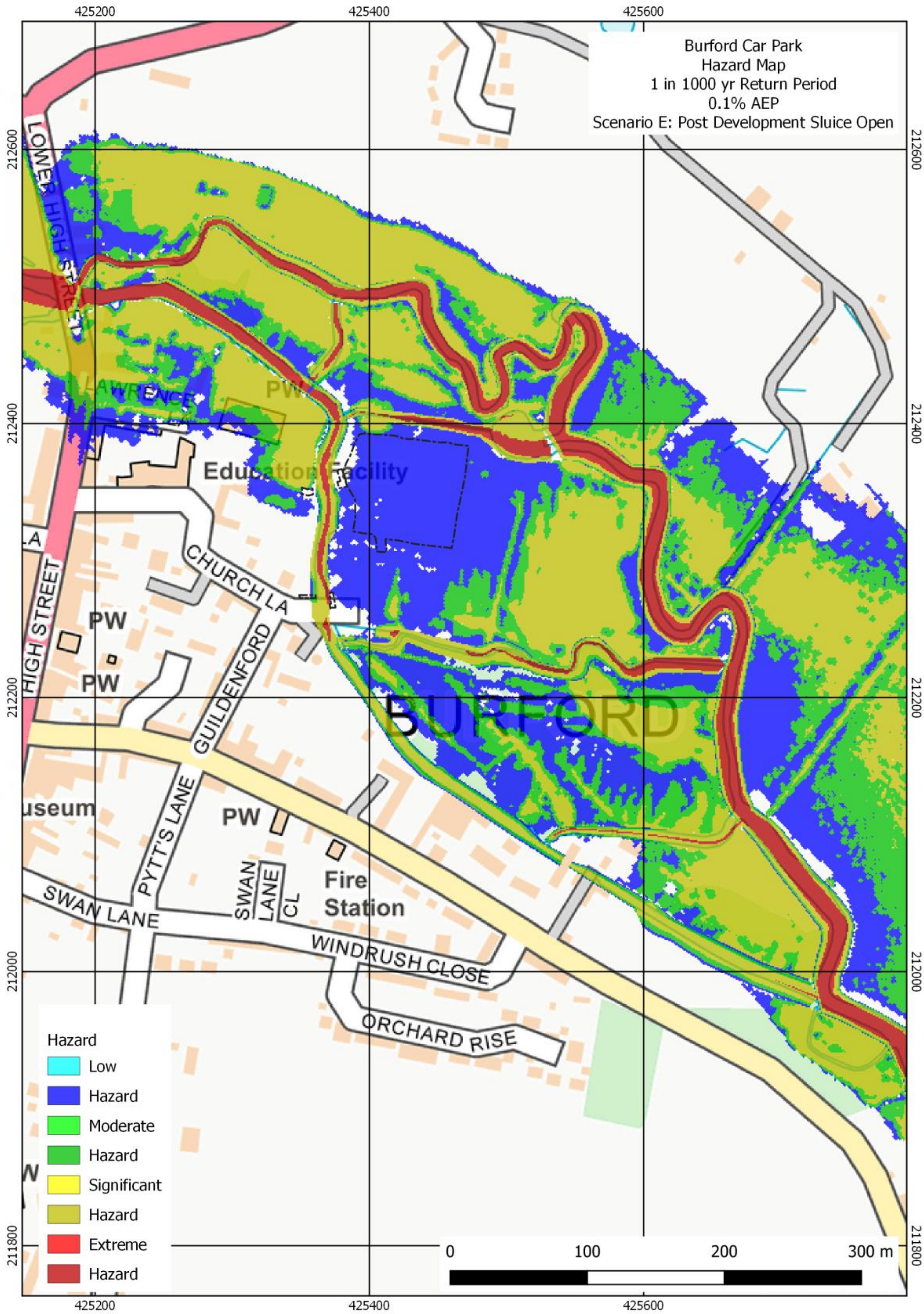

Figure 5-22| Hydraulic Model Results: Post–development Flood Hazard: 0.1% AEP

5.2.6 Third Party Dis-benefits

Third party dis-benefits have been assessed using difference maps. The 1 in 100 years event baseline and the proposed development maximum water levels have been compared to see where water levels are changed to ascertain whether there has been any negative impact to third parties. This has been mapped in *Figure 5-23*.

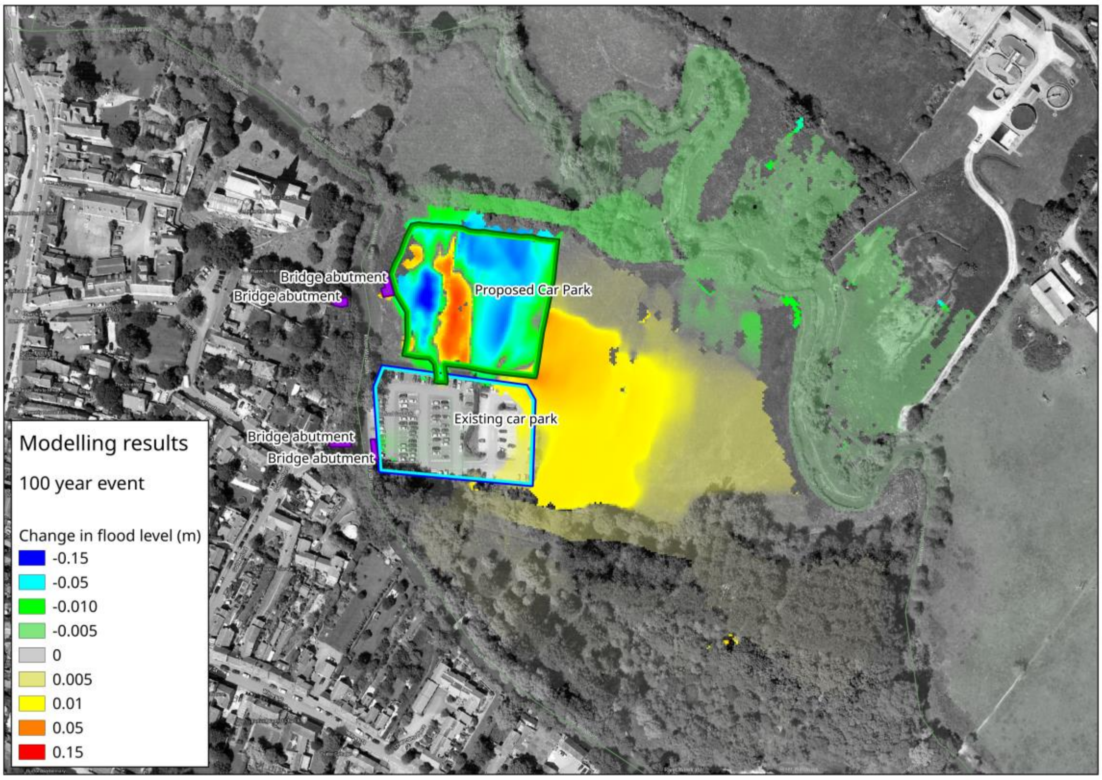

Figure 5-23 | The Impact of the Development, 1 in 100 years Return Period

Areas in yellow-red colouring show locations where the flood water levels have increased by approximately 10 mm because of the conceptual development, while green-blue areas have had flood levels reduced. The area for which levels have increased has been contained to within the extent of the field, which is under the control of West Oxfordshire District Council, and does not extend onto third party land. There is a minor reduction in flooding to land on the opposite side of the Windrush to the east.

5.3 Surface water flooding

Surface water flooding occurs following intense rainfall events, when water is unable to infiltrate the ground or cannot discharge to a watercourse.

Figure 5-24 shows EA modelled surface water flood extents. These flood extents do not follow the watercourses and appear to suffer from a poor DTM. However, if the high risk is meant to be the Mill Stream, all other areas (including the proposed site) are described as low or very risk.

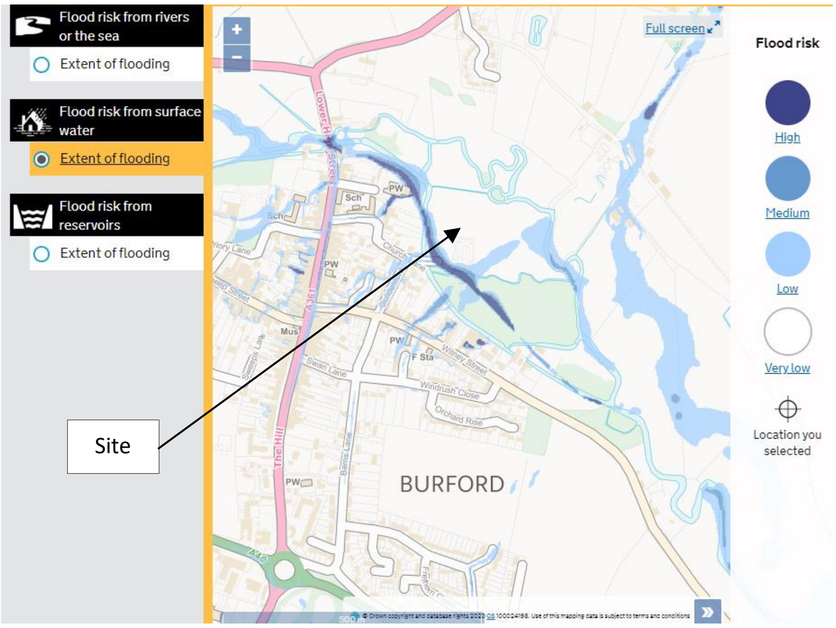

Figure 5-24| EA Risk of Surface Water Flooding Map

5.4 Sewer flooding

Sewer flooding generally results in localised short-term flooding caused by intense rainfall events overloading the capacity of sewers. WO District Council SFRA specifies that it should be noted that much of the sewer network dates back to Victorian times, some of which is of unknown capacity and condition. More recent sewers are likely to have been designed to the guidelines in 'Sewers for Adoption' (WRC, 2006). These sewers tend to have a design standard of up to the 1 in 30 year storm event (equating to approximately a 1 in 5 year flood flow), although in many cases, it is thought that this design standard is not achieved, especially in privately owned systems.

It is therefore likely that parts of the sewer system will surcharge during large, high intensity rainstorm events resulting in frequent flooding, particularly if the systems are combined and if climate change forecasts are correct. Due to the limited capacities and design standards, the level of risk posed by and probability of sewer flooding is therefore greater than that of fluvial flooding, where the SFRA examines the 1 in 100 and 1 in 1000 year return periods.

Flooding can also occur as a result of blockage, poor maintenance or structural failure.

Figure 5-25 has been extracted from WODC SFRA and shows the Historical Sewage Flooding Incidents. The mapping indicates that in the area of Burford there have been 1 to 5 instances of surface water flooding from sewers. Sewer flooding is therefore not considered to be a significant issue at this location. More information can be found in the Appendix A: WODC SFRA.

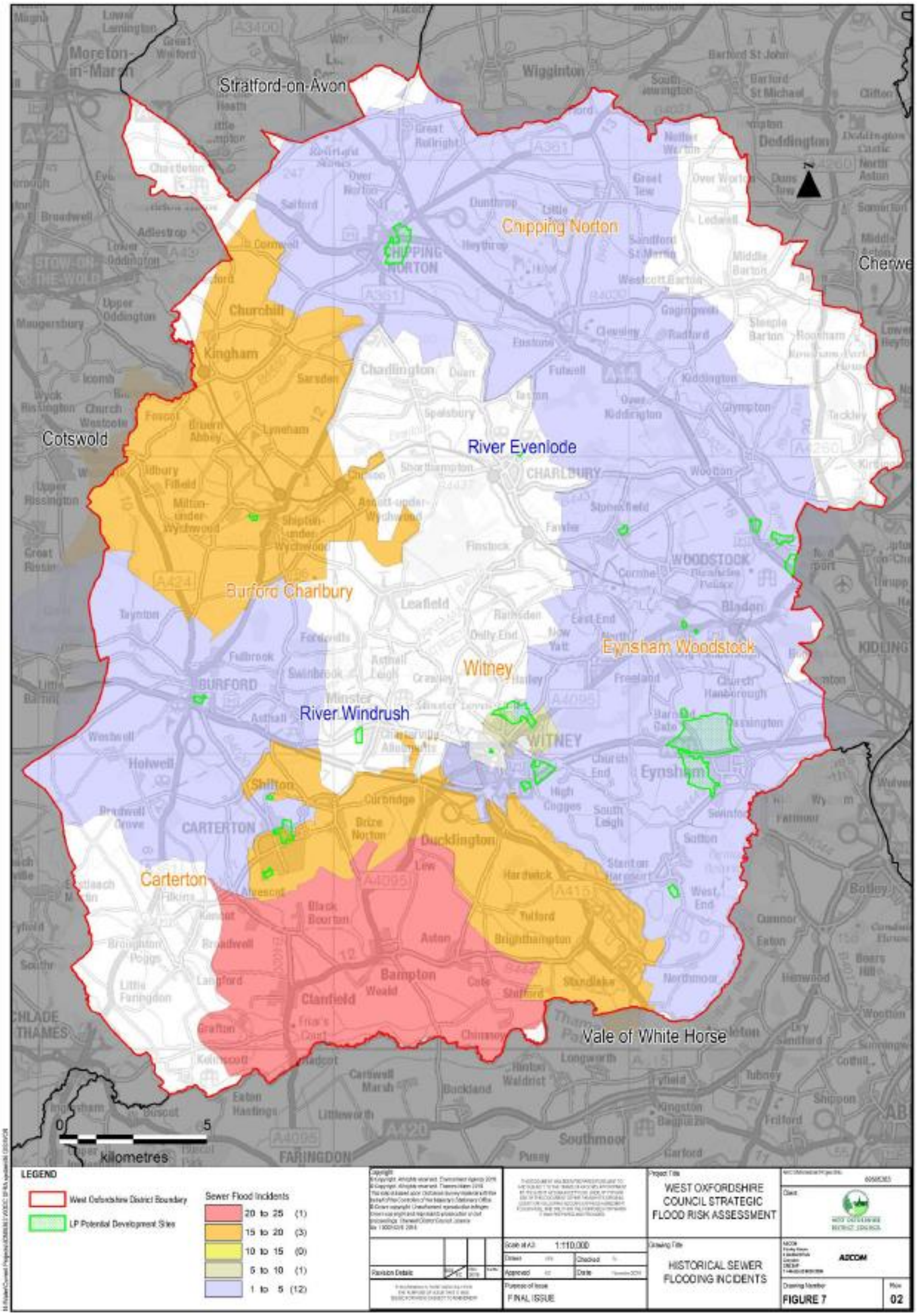

Figure 5-25 | Historical Sewage Flooding Incidents, Figure 7 West Oxfordshire DC SFRA

5.5 Groundwater flooding

WO District Council SFRA report states that groundwater flooding is unlikely to be a significant issue. However, the potential for groundwater flooding is greater in Carterton, Witney, Eynsham and Woodstock where the underlying geological conditions are more permeable.

The character of West Oxfordshire is predominantly based around the underlying geology and is split into four distinct character areas namely Thames Vale, Limestone Wolds, Ironstone Valleys and Ridges and the Northern Valleys and Ridges. Figure 5-26 shows the Bedrock geology in Burford and surrounding areas. The geology in the Burford- Charlbury Sub-Area is,

- Superficial - the sub-area is underlain by superficial deposits in some areas – this includes Alluvium (Clay, Silt And Sand), River Terrace Deposits (undifferentiated) (Sand And Gravel) and Glacial Sand and Gravel at Burford, Charlbury and Kingham, plus Till (Diamicton) south of Kingham.

- Bedrock – the underlying bedrock consists of Great Oolite Group (Sandstone, Limestone And Argillaceous Rocks), Lias Group (Mudstone, Siltstone, Limestone And Sandstone) and Inferior Oolite Group (Limestone, Sandstone, Siltstone And Mudstone).

Groundwater flooding usually occurs in low lying areas underlain by permeable rock and aquifers that allow groundwater to rise to the surface through the permeable subsoil following long periods of wet weather. Low lying areas may be more susceptible to groundwater flooding because the water table is usually at a much shallower depth and groundwater paths tend to travel from high to low ground.

'Susceptibility to Groundwater Flooding' is a dataset produced by the British Geological Society showing areas susceptible to groundwater flooding on the basis of geological and hydrogeological conditions. This layer is divided into three classes – High, Medium and Low risk. The highest risk areas are those with the potential for groundwater flooding to occur at the surface, medium risk are those which may experience groundwater flooding of property situated below the ground surface i.e. basements; and low risk are those with limited potential for groundwater flooding to occur.

The Burford- Charlbury Sub-Area is mainly at low risk (>25% susceptible) to groundwater flooding, however, surrounding the River Windrush between Bruern Abbey and Shipton-under-Wychwood there is elevated risk, as shown in Figure 5-27.

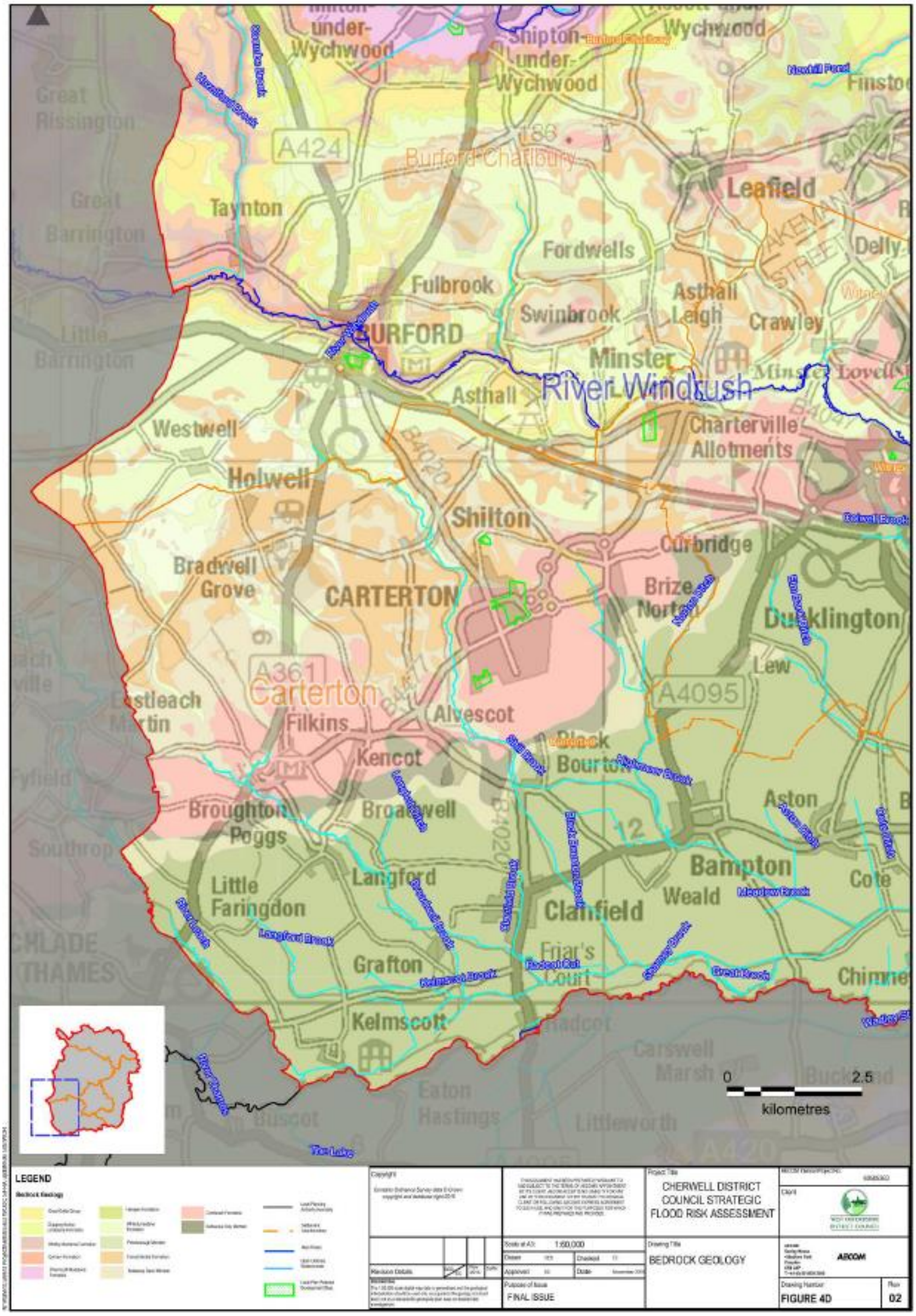

Figure 5-26 | Bedrock Geology, WODC SFRA, Figure 4D

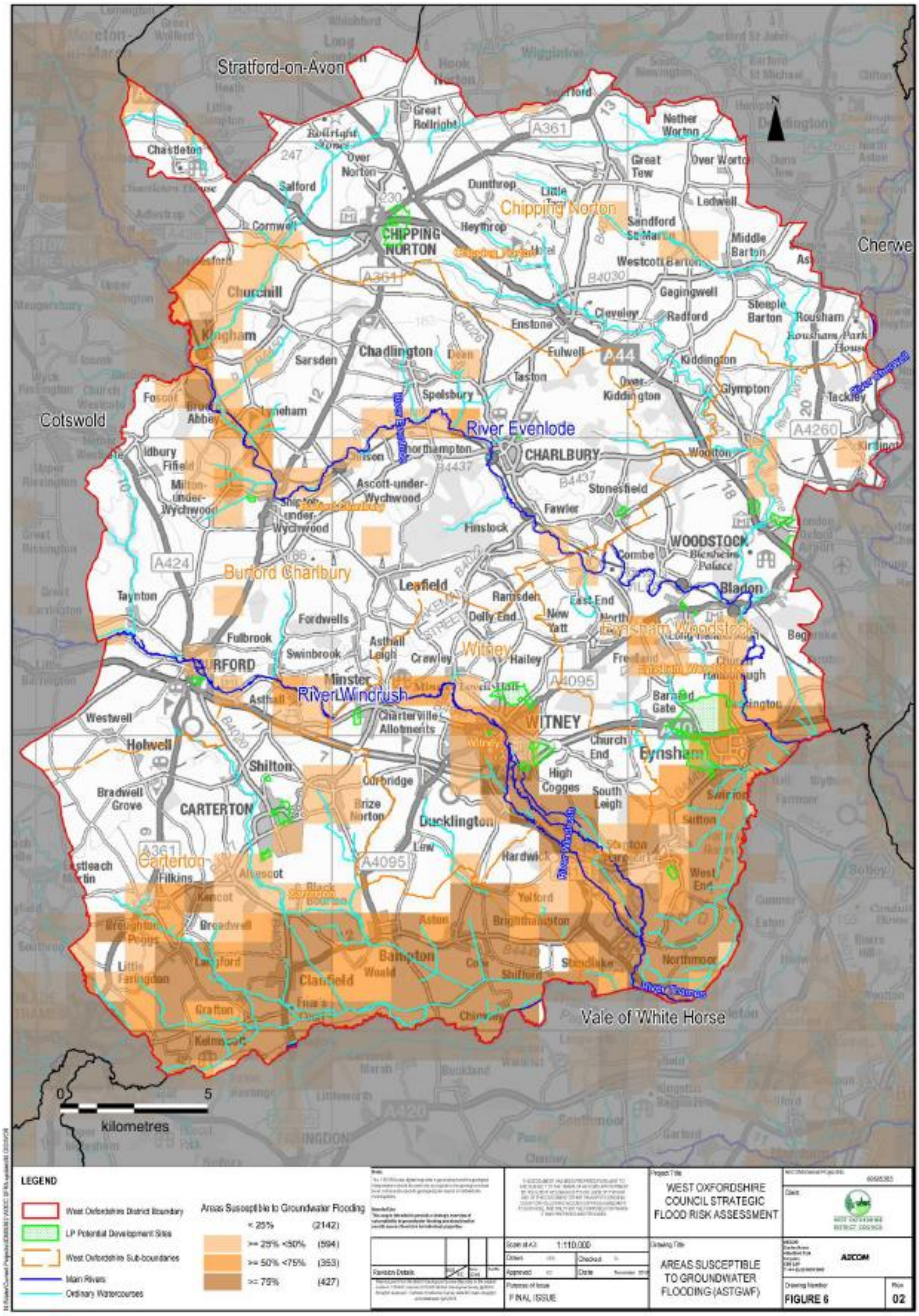

Figure 5-27 | Areas Susceptible to Groundwater Flooding, Figure 6 WODC SFRA

5.6 Tidal Inundation

Tidal Inundation is not considered to be relevant.

6 Surface Water Management

West Oxfordshire District Council Strategic Flood Risk Assessment states that, "*A Surface Water Management Plan is a plan which outlines the preferred surface water management strategy in a given location; where surface water is defined as flooding from sewers, drains, groundwater and runoff from land small watercourses and ditches that occurs as a result of heavy rainfall. The aim of a SWMP is to establish a long-term action plan to manage surface water in an area to be used to influence future capital investment, drainage maintenance, public engagement and understanding as well as informing future development. There is no statutory requirement for WODC to create a SWMP.*"

It is recommended to implement a sustainable drainage system to manage surface water on the site. In accordance with NPPF, the development will incorporate a surface water management strategy to reduce surface water run-off and ensure that flood risk is not increased elsewhere.

In terms of the development, the extension of the existing site is car park will not increase impermeable surfacing and will add a swale. Surface water management will conform to the requirements of the SuDS guidance which indicate that the rate and volume of discharge should not increase from the pre-development condition.

7 Conclusions and Recommendations

EVY were commissioned by Windrush AEC Ltd to complete an FRA for the extension of Burford Guildenford Car Park. Based on the analysis contained in this document, the following conclusions have been drawn and recommendations made:

- The development site is located in Flood Zone 3b.
- There has been no significant alteration to national policy (i.e. the NPPF) which has had an impact on the designation of flood Zones 3a and 3b.
- The proposed extension to the existing Burford Guildenford Car Park will make minimal changes to the existing terrain geometry, has been designed to be permeable and can still be allowed to flooded if needs be.
- The NPPF considers that 'water-compatible' infrastructure is appropriate within Flood Zone 3b.
- The hydraulic modelling used as evidence shows very shallow depths (less than 300mm) for all modelled return periods with less than 50mm in the 5% AEP event.
- The hydraulic modelling used as evidence show Low Hazard (Caution) for all return periods.
- Hydraulic modelling has confirmed that the changes in flood depth within the site are negligible and that there is no measurable change in flood risk to third parties as a result of the extension of Burford Guildenford Car Park except for some reduction in flood water levels to land in the eastern side of the Windrush.
- Implementation of a SuDS system should serve to reduce surface water run-off from the site, whereby not increasing flood risk elsewhere.
- The flood risk from Surface water, sewers and groundwater have been evaluated and are not considered significant.

Appendix A – West Oxfordshire District Council Strategic Flood Risk Assessment

EdenvaleYoung

Appendix B – Hydraulic Modelling Report, including Hydrology Analysis and FEH Proforma