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Mr. David Roberts
Planning Policy Team
South Cambridgeshire District Council
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Cambridgeshire
CB23 6EA

25 October 2016

Dear David,

SOUTH CAMBRIDGESHIRE LOCAL PLAN – PROPOSED EXTENSION TO CBC

I write in respect of the above and the draft Proposed Modification (PM/SC/8/A) to the submission draft of the Local Plan that would provide for a Phase 3 expansion of the Cambridge Bio-Medical Campus onto land owned by Cambridgeshire County Council.

Supporting representations to the Proposed Modification were submitted by Carter Jonas on behalf of the County Council in January 2016. The representations were supplemented by a report on Flood Risk Constraints prepared by PBA (report reference 36873/4001 Rev A). Subsequently, following discussions with officers, it was agreed that further technical work should be undertaken to demonstrate the feasibility of the development of a Phase 3 expansion of the Cambridge Bio-Medical Campus as anticipated in the proposed modification.

Appended to this letter are the following documents and drawings:

1. Indicative Masterplan prepared by FPCR reference 7307-L-02 Rev D
2. Section A drawing prepared by FPCR reference 7307-L-03
3. Flood Modelling & Drainage Strategy Report by PBA reference 36873/2001 Rev D
4. Preliminary Site Access Study by PBA reference 36873/2001/001 Rev B
5. Landscape & Visual Appraisal by FPCR reference 7307/LVA Rev B
6. Ecological Appraisal by FPCR Rev B
7. Arboricultural Assessment by FPCR

Indicative Masterplan and Section A Drawing

The Indicative Masterplan (7307-L-02 Rev D) accompanying this note illustrates a site area of 8.91 Ha (22.02 acres) resulting in a developable area of 5.24 Ha (12.94 acres). The indicative layout has been guided by the recommendations of the landscape study and infrastructure requirements including sustainable drainage.

Carter Jonas commercial advice has recommended a development density per acre set at 15,000 square feet (35% site coverage). The Indicative Masterplan illustrates the provision of 330,300 square feet in total of laboratory / office space at a ratio of 65:35, i.e. 214,691 square feet of laboratory space, and 115,609 square feet of office space.

The layout illustrates buildings that have been designed on a 9m grid and are a maximum 18m in their width. As such, every floor of each building offers 6,975 square feet of gross internal floor area.

The Indicative Masterplan shows 16 laboratory / office units and assumes that all buildings are three storeys in height. The buildings that are located within the adjoining Phase 2 development are to be six storeys and to provide a gradation in building height as development progresses in a southerly direction.

As advised by the local highway authority, one car park space is advised per 40 square metres worth of gross floorspace and as such the proposed development makes provision for 768 car park spaces. With standard car park space and circulation sizes considered, circa 168,500 square feet of car park is required on site and this is illustrated on the Indicative Masterplan as being provided by two multi storey car parks of four storeys in height circa 21,000 square feet each in footprint. A four storey car park would be similar in height to a three storey laboratory / office building.

The Indicative Masterplan layout is landscape-driven and a suitable reflection of the Phase 2 extension development located to the north of the site. Wide buffers are provided to the boundaries and these areas will also include elements of the SuDS arrangements. The Section A drawing illustrates the disposition of development with on-site Green Infrastructure and the proposed SuDS arrangement at its closest point to the Nine Wells LNR.

Flood Modelling & Drainage Strategy

The flood modelling has shown that surface water run-off from adjacent areas is a source of potential flood risk at the site. Flooding was predicted to occur in the 30 year event and all more extreme flood events. Flood enters the site from the south and eastern boundaries, and flows in a south-westerly direction across the site.

However the modelling has also demonstrated that the flood risk can be mitigated by construction of a perimeter ditch to catch the surface water run-off and convey it to the main drainage network. Mitigation measures including flow control and an appropriate storage volume will be required to prevent any detrimental impact on water levels and flows downstream. Storage could be provided in the form of attenuation ponds, online weirs with widened ditches, or in combination with the on-site surface water drainage system. Off-site measure to contain overland flow might also be considered with the landowners landholdings.

Geotechnical desk study assessment indicates that the groundwater underlying the site does not contribute to the Nine Wells spring line. As the site is not connected to the Nine Wells aquifer, any minor residual impact on ground recharge rates from the site will not impact on the spring flows.

Additional surface water run-off will be generated by the impermeable surfaces of the proposed development. A maximum allowable discharge of 2 l/s/ha is suggested, in line with adjacent developments and consultation with Cambridge City Council. A management train of SuDS measures is strongly recommended to promote water quality as a primary driver and mitigate the impacts on water quality and quantity of the receptor watercourse from the Nine Wells Spring. A large storage pond in the lowest western corner of the site is suggested, with water conveyed to the pond via a conveyance ditch, swales, rills and rain gardens that further supplement the storage. This arrangement is reflected in the Indicative Masterplan.

Preliminary Site Access Study

The findings of Preliminary Site Access Study may be summarised as follows:

- The proposed development site can accommodate approximately 30,685 square metres of Laboratory and Office land use.
- Vehicular access to the proposed development can be provided via two priority T Junctions from Dame Mary Archer Way. Dame Mary Archer Way was constructed in 2013 to provide access to

future development in the area and is considered to be of a good quality and well aligned in the vicinity of the site.

- The existing cycle and pedestrian facilities in the vicinity of the site will ensure that the proposed development can be accessed sustainably and be well connected to existing and future developments adjacent to the site.
- Nearby bus stops at Addenbrooke's Hospital will ensure that the development will have excellent public transport access to Cambridge and the wider area, including access to the Cambridge Guided Busway that provides fast and frequent services around the city.
- Based on the multi modal analysis and the applied modal splits, the proposed development is forecast to generate 171 and 146 car driver trips during the AM and PM peak hours, and 931 car driver trips over the course of a typical day.
- The addition of vehicle trips associated with the proposed development on Dame Mary Archer Way is forecast to have a minimal impact on the operation of the east and west Phase 2 site access junctions as both are predicted to operate with a considerable amount of spare capacity in all scenarios assessed.

Taking into account the findings in the Preliminary Access Study it is concluded that the proposed site is considered to be suitable for development from a highway and transport perspective.

Landscape & Visual Appraisal

A Landscape and Visual Appraisal has assessed landscape character and visual amenity and the resulting landscape and visual effects of the proposed development on the receiving landscape and visual resource. The landscape and visual effects have been considered in relation to the scheme as illustrated on the Indicative Masterplan.

Whilst there would inevitably be some adverse landscape and visual effects at the outset (year of completion) it is judged that the effects of the proposed development and the consequential effects would, however, be localised and limited in their extent.

The proposed development will comprise of a number of office blocks/laboratories up to three storeys with associated parking and green infrastructure, including a 5 – 15m landscape buffer around the boundaries, tree planting and SUDS features. Existing hedgerows and trees of value will be retained where possible.

Overall, the effects of the proposed development on the landscape character and landscape features for the site and immediate context ranges from moderate adverse – negligible initially. However once the development and associated green infrastructure has become established the effects in general would have lessened as the new buildings would have become softened within the landscape. The introduction of SUDS and green infrastructure will initially have a minor adverse effect; however once established, they will provide minor beneficial effects for the site and proposed development. Due to the location on the edge of Cambridge, adjacent to an area of existing and permitted development, the proposed allocation site is influenced by the settlement edge and would appear in context. The overall effect on landscape character and landscape features is considered to be minor adverse.

The Visual Envelope for the site is well contained due to the flat topography combined with intervening tree cover and buildings, as a result there are no long range visual receptors and the majority of visual receptors are in relatively close proximity to the site.

Visual effects range from moderate adverse to minor adverse – negligible upon completion with the greatest effect of the proposed allocation upon those receptors immediately adjacent to the site including: users of footpaths and Public Right of Way 39/8 and residents of residential properties to the west of Babraham Road. The users of the roads, residents of properties off Babraham Road and Addenbrooke's Road and the users of the Cambridge Bio-Medical Campus and Addenbrooke's Hospital will have lesser effects due to distance, intervening buildings and filtered views.

Effects will reduce further by year 10 once the landscape buffer planting and green infrastructure around the development has become established assisting with filtering of views. Effects are likely to reduce to moderate – minor adverse for those receptors adjacent to the site with the remainder of receptors reducing to minor adverse to negligible, resulting in an overall minor adverse effect upon visual receptors.

In conclusion, it is assessed that the landscape character and visual amenity of the site has the ability in which to absorb change through the introduction of high quality development. The proposed allocation for a number of laboratories/office buildings up to three[1] storeys with associated green infrastructure would be appropriate within this landscape context and it is judged that the effects, as a result of the proposed allocation, would not give rise to any unacceptable landscape and visual harm.

Ecological Appraisal

An extended Phase 1 habitat survey and desk study has been undertaken. The desk study has confirmed there are two nationally valuable statutory designated sites and six non-statutory designated sites located within the local area. A number of local protected and notable species records were also returned from the local area, including bats, otter, water vole and bird species typical of urban edge and farmland habitats.

The majority of the site comprises arable habitat of generally low ecological value although it supports a number of farmland bird species through the year. The site is partially bounded by a damp ditch and established hedgerows and off-site woodland blocks that provided species and structural diversity. These features are hence considered to be of local ecological value and will be retained and buffered within a continuous broad corridor of shrub, tree and grassland planting, providing enhanced foraging and commuting opportunities for a range of local fauna at the site level including foraging and commuting bats, and tree/shrub nesting birds.

Precautionary mitigation measures are recommended to ensure site preparation and construction works minimise the risk of adverse impacts to nesting birds during the breeding season. Further recommendations are made to ensure that works proceed in line with best practice to minimise the risk of an adverse impact to local watercourses, including those associated with local non-statutory sites.

A minor adverse impact is predicted on local farmland birds of species that utilise open arable habitats, due to the loss of this habitat from the site. Given the size and location of the site and the continued availability of similar habitat within the wider landscape residual effects due to displacement are not considered to be significant. No other impacts on protected species are considered likely to occur as a result of the proposed scheme.

Recommendations are made for habitat enhancement at the site level, with suitable species for inclusion within the planting scheme provided. The scheme will additionally provide two permanent ponds, a balancing facility and areas of more formal planting to provide a net biodiversity gain across the site.

The scheme has been designed to provide a strong ecological buffer to the neighbouring offsite Nine Wells Local Nature Reserve that will simultaneously both deter pedestrian access from the site and provide alternative opportunities for recreation and amenity within the site boundary, including a network of pathways through landscaped areas, and features of interest including the ponds and more formal planted areas.

Given the generous green infrastructure proposed on site, careful scheme design and adherence to best practice construction methods, no impact is anticipated to the integrity of the neighbouring Nine Wells Local Nature Reserve or any other designated site.

[1] The proposed multi storey car parks at four storeys are assessed as the same height as three storey B1 R&D/Office buildings

Arboricultural Assessment

The Indicative Masterplan allows for existing tree cover to be retained, incorporated and enhanced through new planting that will complement the current vegetation and increase the net canopy cover considerably. The proposals should be considered a significant improvement on the current situation in terms of arboriculture which will not only increase tree cover but will also provide greater habitat biodiversity and landscape screening between the proposed development and surrounding landscape.

Summary and Conclusion

The County Council has commissioned further technical studies with a particular focus on matters of concern identified in the representations received commenting and objecting upon the proposed modification allocation site; namely drainage, landscape and visual impact, ecology, highways and trees. The technical studies have enabled the formulation of a scheme that would provide a meaningful quantum of new laboratory / office buildings, accommodating associated infrastructure including car parking and SuDS provision, within a substantial and high quality landscaped setting. The site's location will enable high quality sustainable transport connections to be made with the surrounding area and the City.

The technical studies demonstrate that with appropriate mitigation, the Indicative Masterplan represents the basis of a scheme that may be developed without unacceptable or significant adverse impacts. It is concluded that the work undertaken provides a suitable evidence base for the proposed modification of the submitted Local Plan to provide for an extension to the Bio-Medical Campus as envisaged in PM/SC/8/A.

I hope that you find this information of assistance. Should you have any queries, please do not hesitate to contact me.

Yours sincerely,

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Partner

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Public Right of Way (Footpath 39/47)

Public Right of Way (Footpath 39/8)

Public Right of Way (Footpath 198/2)

Scale 1:2000 @ A2

0 50 100 150 200m

- Site Boundary 8.91Ha
- Phase Two Boundary
- Developable Area 5.24Ha
- Landscape Buffer
- Existing Vegetation
- Public Rights Of Way
- Indicative Road Network
- Indicative Lab / Office Blocks (Mostly 3 Storey)
- Indicative Car Parks 1.56Ha (* 4 Storey Multi-Storey)
- Attenuation Basin & Ditches
- Perimeter Ditch
- Permanent Formal Ponds
- Hard Landscaped Areas

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Bio-Medical Campus
Cambridge
Cambridgeshire

INDICATIVE MASTERPLAN

1:2000 @ A2
20 September 2016 CMW / MGH
7307-L-02 rev. **D**

fpcr

masterplanning
environmental assessment
landscape design
urban design
ecology
architecture
arboriculture

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Extension to Bio-Medical Campus, Cambridge

Flood Modelling and Drainage Strategy Report

On behalf of **Carter Jonas**

Project Ref: 36873/2001 | Rev: D | Date: October 2016

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Document Control Sheet

Project Name: **Extension to Bio-Medical Campus, Cambridge**
Project Ref: **36873/2001D**
Report Title: **Flood Modelling and Drainage Strategy Report**
Date: **October 2016**

	Name	Position	Signature	Date
Prepared by:	C Waller S Faulkner	Senior Hydrologist Assistant Engineer		14/09/16
Reviewed by:	Å Söderberg	Associate		14/09/16
Approved by:	S Darch	Equity Director		14/09/16
For and on behalf of Peter Brett Associates LLP				

Revision	Date	Description	Prepared	Reviewed	Approved
A	14/09/16	First Draft	CW/SF	AS	SD
B	13/10/16	Amended further to planning consultation.	SF	SD	SD
C	21/10/16	Hydrology and results update	CW	SD	SD
D	25/10/16	Appendices update	CW	SD	SD

Contents

Figures

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Appendices

1 Background

1.1 Commission

1.1.1 Peter Brett & Associates LLP ("PBA") were commissioned by Cambridgeshire County Council via Carter Jonas to undertake work to provide an evidence base in support of site promotion and demonstrating deliverability for a proposed extension to the Bio-Medical Campus at Addenbrookes, Cambridge, promoted as a modification to the South Cambridgeshire Local Plan (provisional proposed modification PM/SC/8/A).

1.1.2 This report was prepared against an agreed brief and in accordance with PBA's Fee Proposal and Terms and Conditions. This report is not intended for and should not be relied on by any third party (i.e. parties other than the Client). PBA accepts no duty or responsibility (including in negligence) to any party other than the Client and disclaims all liability of any nature whatsoever to any such party in respect of this report.

1.2 Site of Interest

1.2.1 The site of interest is shown in Figure 1. It is proposed to be an extension to the Bio-Medical Campus at Addenbrookes, Cambridge. Masterplanning is at an early stage, however it is anticipated that the development will comprise in the order of 65% laboratory and 35% office development, of density 15,000sqft per acre, with associated car parking and infrastructure.

1.2.2 The published Environment Agency Flood Zone Map (Figure 1) shows that part of the site is within Flood Zone 3. The Environment Agency's flood zones were generated using simplistic JFLOW modelling and are known to have low accuracy in this area. The flood pathway shown does not relate well to the topography of the local area and does not follow the known drainage pathways. There is therefore low confidence in the Flood Zone Map for this site.

1.2.3 Surface water flooding has been investigated in the Cambridge and Milton Surface Water Management Plan (2011). The site lies just within the boundaries of the study area. Modelling of the 200 year (0.5% AEP) event indicates a surface water flow path through the site, with flooding depths of up to 0.5m on the site (Figure 2), affecting up to 50% of the site area. The same patterns of flooding are shown on the Environment Agency's surface water flood risk map. The location of the site close to the boundary of the SWMP study area gives some uncertainty in the results, as surface water flowing overland from the hills to the south is not taken account of. Taking these into account could further increase the risk of surface water flooding.

1.3 Scope of Study

1.3.1 The purpose of this study is to quantify surface water flood risk and surface water drainage for the purposes of establishing existing conditions at the site, informing site masterplanning and demonstrating in outline the viability of any required mitigation. This study does not constitute a Flood Risk Assessment but provides supporting information for the future evidence base in support of an application.

1.3.2 A previous scoping exercise (Flood Risk Constraints and Opportunities Report, PBA, January 2016) indicated that fluvial flood risk is less of a concern than suggested by published mapping. However, further work to appraise surface water risks is required.

1.3.3 The scope of work for this study is therefore as follows:

- Construct a 2D hydraulic model of the catchment terrain, estimating rainfall, surface water runoff and flows for the 100 year and 1000 year flood events, and mapping surface water flood areas for these events. This will quantify the surface water overland flow that is implied by the published surface water risk mapping.

- Undertake sensitivity testing of the impacts of climate change in accordance with the EA's new guidance document issued in February 2016.
- Estimate the increase in post-development surface water run-off, making general assumptions regarding impermeable surface coverings.
- Identifying, in concept, a combined scheme to address any required safe routing of surface water flooding through the site, and attenuation of run-off from the site. Amending the hydraulic model to demonstrate the viability of the scheme.
- Liaison to allow the masterplan to be developed with adequate space for water, and the integration of the above measures into the landscape proposals.

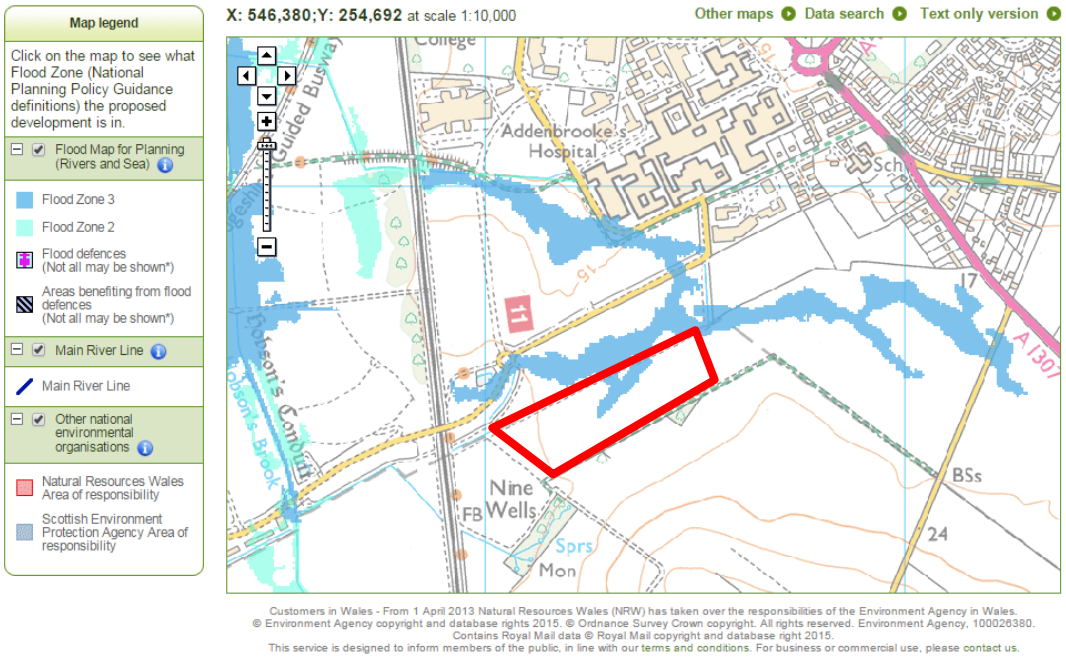

Figure 1: Environment Agency Flood Map for Planning.

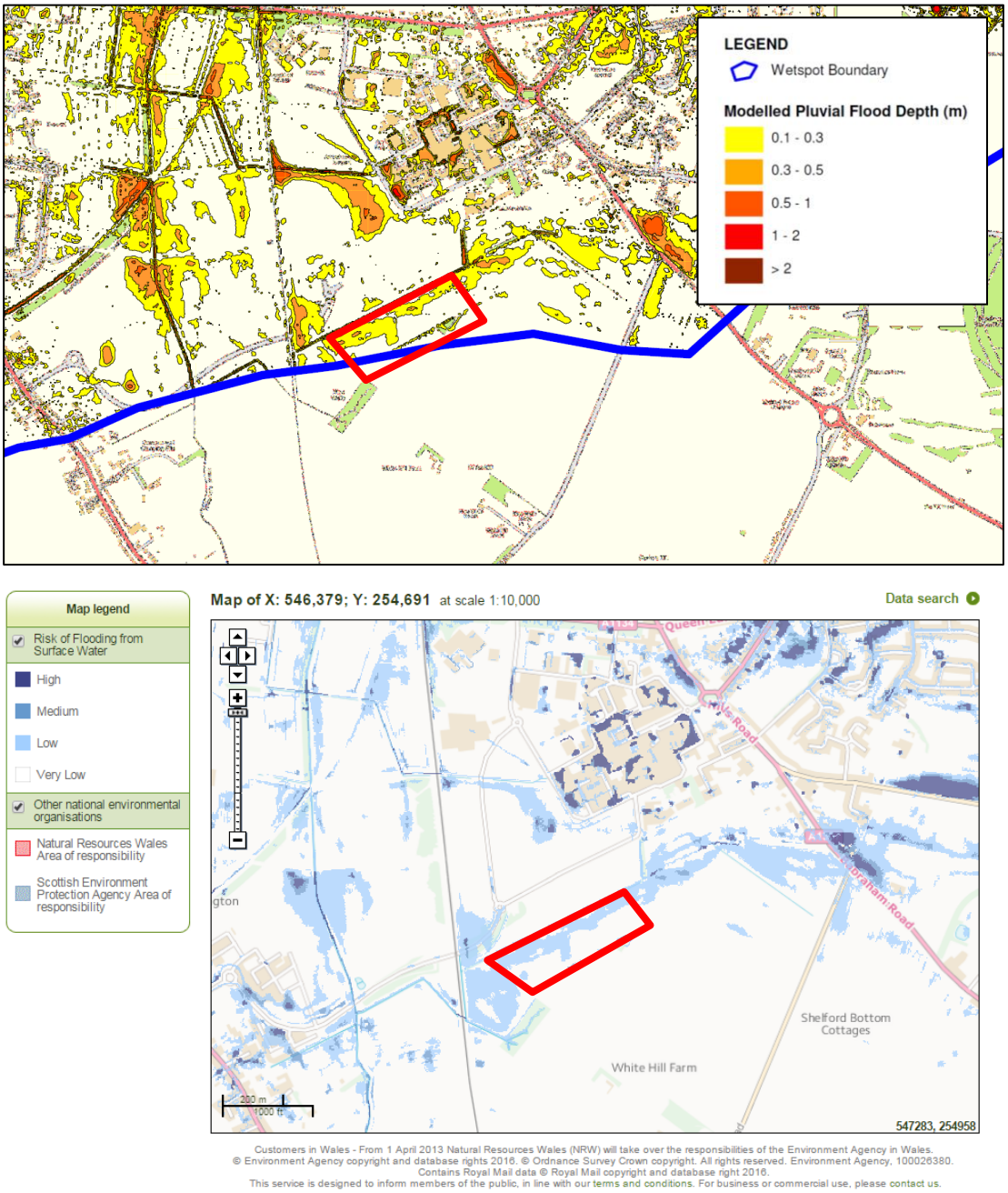

Figure 2: Extract from Cambridge SWMP, and Environment Agency surface water flood map.

2 Site Characteristics

2.1 Existing Drainage

2.1.1 The site currently drains northwards and westwards into a field ditch. This flows beneath the railway line, joining spring flows from Nine Wells Spring, into Hobson's Brook. This flows northwards through Cambridge via Vicar's Brook and Hobson's Conduit, into the River Cam (Figure 3). Nine Wells is a Local Nature Reserve. Hobson's Conduit and Vicar's Brook have City Wildlife Site Status, and Hobson's Conduit is a Scheduled Ancient Monument. They are managed by Cambridge City Council and Hobson's Conduit Trust, who hold title on the bed of the watercourse.

2.1.2 Hobson's Conduit and Vicar's Brook discharge surface water into the River Cam, including from new developments at the Cambridge BioMedical Campus, Addenbrookes, Glebe Farm and Clay Farm. The brooks are regularly monitored with an ongoing programme of flow and water quality monitoring to assess the impact of the residential and Bio-Medical developments. To the south-west of the site, the brook fed by Nine Wells is highly regarded as a chalk stream and is of significant heritage value. The brook feeds into the conduit which historically provides water to urban features in the city, the Botanical Gardens and college gardens, and provides a valuable wildlife corridor to the city.

2.2 Soils and Geology

2.2.1 The site is underlain by Chalk bedrock. British Geological Survey maps indicate that the site overlies the boundary between three Chalk types: the upper Zig Zag Formation, the middle Totternhoe Stone Member and the lower West Melbury Marly Chalk Formation (Figure 4). There are no superficial deposits. As the underlying Marly Chalk Formation is less permeable, rainwater percolates through the upper Chalk deposits before flowing through the Totternhoe Stone and emerging as a spring. The site overlies this spring line.

2.2.2 Boreholes are available via the British Geological Survey website. Two available boreholes immediately to the north of the site, in the Marly Chalk formation, show groundwater levels between 6 and 9 m below ground level, adjusted to 1.7 – 1.9 m below ground level for piezometric head. Given the complex site geology, on-site boreholes would likely be required at the planning application stage.

2.2.3 Groundwater monitoring of Nine Wells spring was undertaken for the Addenbrooke's Access Road project (referenced in the Clay Farm Development Groundwater Assessment Report, AECOM Environmental, May 2010). The initial findings showed that:

- The springs at Nine Wells are fed by groundwater draining from the north-east, through the Totternhoe Stone from the overlying chalk deposits.
- The groundwater levels respond to seasonal changes in rainfall and evaporation, with some limited response to heavier rainfall events superimposed upon the baseline (dampened by the presence of the surface discharge zone).
- Groundwater contained at depth may be confined and under pressure.

2.2.4 The Cranfield University Soilscapes Map describes soils at the site as "shallow lime-rick soils over chalk or limestone", freely draining and vulnerable to erosion.

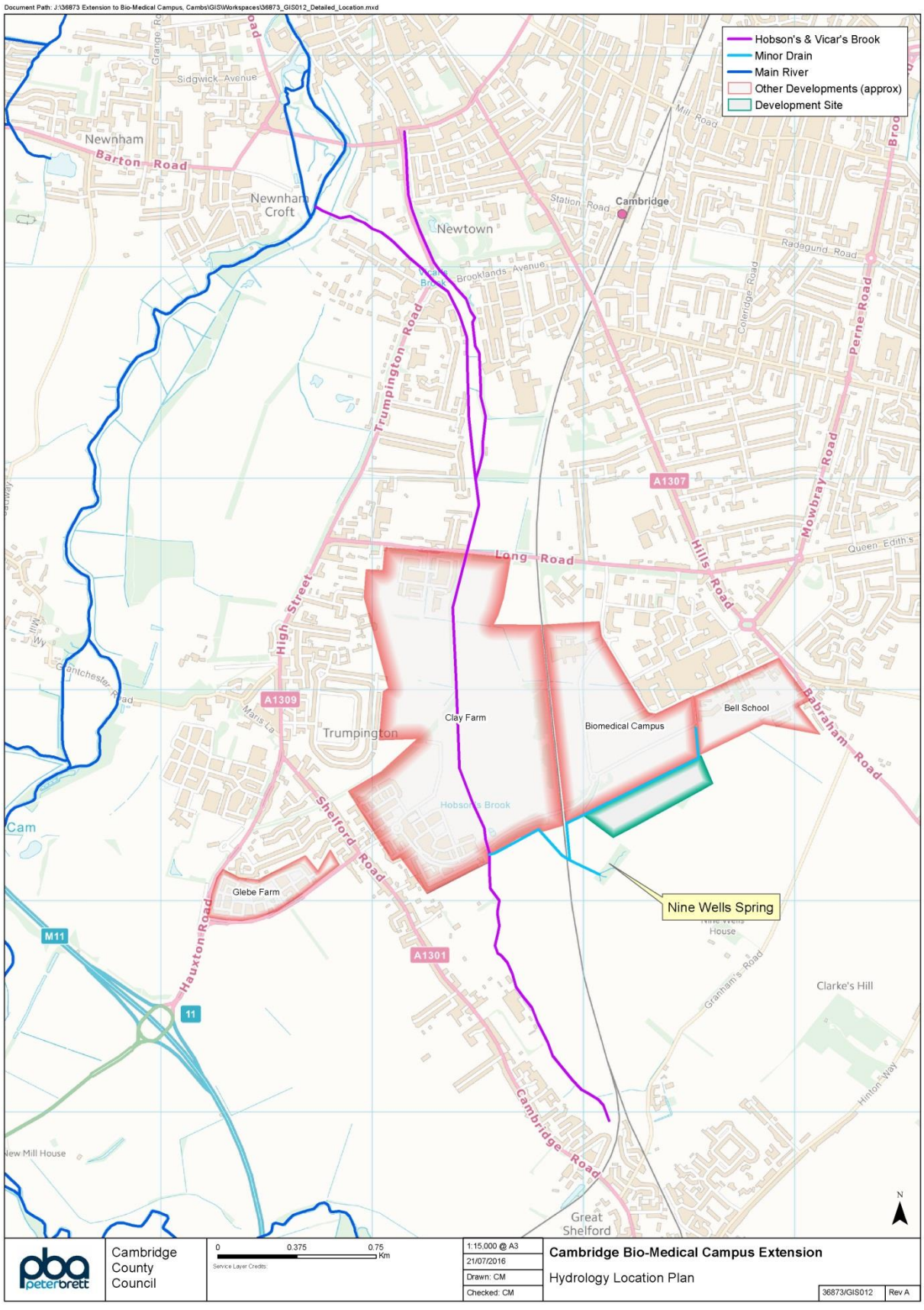

Figure 3: Detailed location plan.

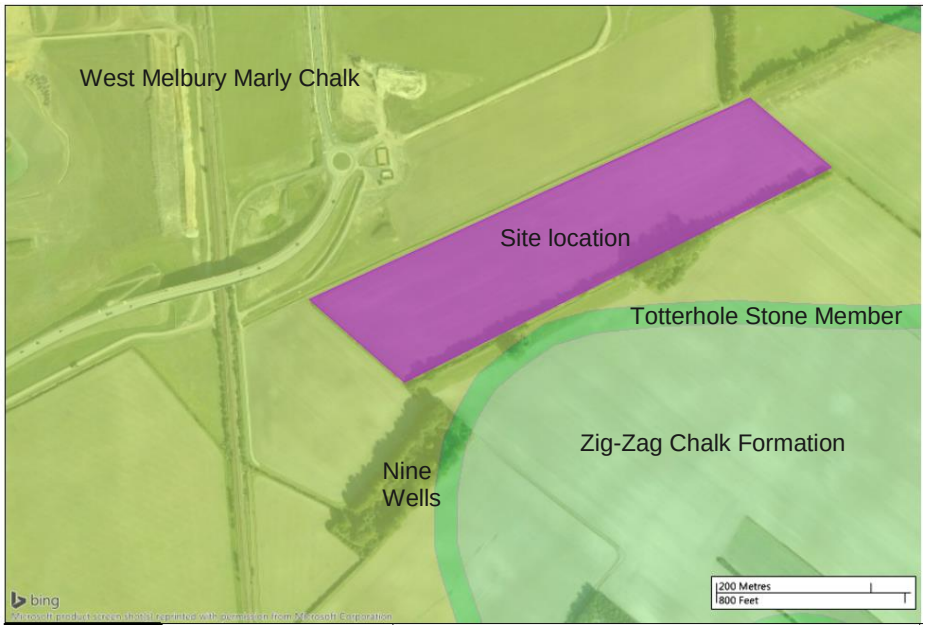

Figure 4: Geology plan.

2.3 Flood Zone Classification

2.3.1 As discussed earlier, the published Environment Agency Flood Zone Map (Figure 1) shows that part of the site is within Flood Zone 3. The Environment Agency's flood zones were generated using simplistic JFLOW modelling and are known to have low accuracy in this area. The flood pathway shown does not relate well to the topography of the local area and does not follow the known drainage pathways. There is therefore low confidence in the Flood Zone Map for this site.

2.3.2 The Flood Risk Assessment for the Cambridge Bio-Medical Campus to the north of the site investigated and discounted these Flood Zones, showing through numerical modelling that the Bio-Medical Campus site was not within Flood Zones 2 or 3. The model was audited and accepted as part of the planning process.

2.3.3 That model did not extend to the current site under consideration. However we anticipate that extension and investigation of fluvial flood risk to this site would provide a similar evidence base to demonstrate that the Flood Zone 2 and 3 extents are smaller or not present here. The primary risk is surface water run-off resulting in overland flow and this has been appraised in detail through additional modelling; this modelling provides assessment of the fluvial flood risk from the watercourses and demonstrates a re-classification as Flood Zone 1.

3 Surface Water Flood Modelling

3.1 Model Development and Scenario Testing

3.1.1 A linked 1D-2D model of the catchment and drain adjacent to the site was constructed using FloodModellerPro (FMP) software. Rainfall was estimated using the FEH13 data set. Rainfall losses were set at 82.5% following sensitivity testing against a ReFH2 flow analysis. Full details of model development and flow estimation are included in Appendix B and Appendix C The following scenarios were tested:

- Baseline “as existing” scenario:
  - 30 year, 100 year, 100 year plus climate change and 1000 year flood events.
  - Sensitivity to rainfall loss parameter.
- Post-development scenario:
  - 30 year, 100 year, 100 year plus climate change and 1000 year flood events.
  - 100 year event with 50% rainfall loss.

3.2 Baseline Scenario

3.2.1 Figure 5 shows the estimated flood depths across the catchment for the 100 year event. Flood waters drain in an easterly direction from the Gog Magog hills, with localised pockets of deep water becoming trapped adjacent to roads. This pattern matches the Environment Agency’s surface water flood maps well.

3.2.2 Flows within the development site enter from two directions:

a. From the north-east, flowing in a south-westerly direction across the site. This is the main flow path.

b. From the hills to the south, flowing in a northerly direction. These flows are trapped by a ridge of high ground / hedgerows immediately to the south of the site, with localised low spots allowing a few flow paths to develop across the site.

3.2.3 Figure 6 shows the estimated flood depths at the development site for the 30, 100, 100 + climate change and 1000 year events. The site is at risk of surface water flooding in all of these events.

3.2.4 Water depths in the ditch remain below the site bank level for the 100 year and 1000 year events. The ditch does not therefore overtop and cause fluvial flooding. This indicates that the site should be classified as Flood Zone 1 for flood zoning purposes and development allocation. However, the development will need to be protected against flooding from surface water overland flow across the site.

Sensitivity to Rainfall Loss Parameter

3.2.5 Figure 7 shows how the estimated flood depths at the development site vary according to rainfall percentage loss. If a lower rainfall loss is applied, flood depths across the site increase significantly. This is reflected in the peak flows in the ditch, which are of a magnitude higher for when the standard EA (39%) and Cambridge SWMP (50%) losses are applied, compared to this study’s estimate of 82.5%.

3.2.6 The significant flood depths for lower rainfall losses are due to a lack of watercourses in the catchment to catch and convey surface water runoff. This is a reflection of the highly permeable nature of the catchment, and is further physical evidence of the very low surface water runoff rates within the catchment.

3.2.7 The choice of rainfall loss parameter remains an area of high uncertainty in this study. While the 82.5% rainfall loss recommended here is supported by FEH flow estimate calculations, there is no gauged data for comparison. It is therefore recommended that a lower rainfall loss of 50% is used to sensitivity test mitigation measures as a precautionary measure.

3.3 Post-Development Scenario

3.3.1 For the post-development scenario, the model was amended to include a ditch around the perimeter of the site to intercept overland flows from surrounding areas and route them into the existing drain at the western corner of the site. Post-development run-off from the site was included at attenuated rates. See Appendix B Appendix B for further details.

3.3.2 Initial model tests indicated that the perimeter drains resulted in a small increase in peak flows downstream due to more efficient capture and conveyance of flood flows (approx. 0.4 m^3/s). Therefore flapped orifice units with 0.12 m^2 bore area were used to simulate a limited outflow from the perimeter drains to ensure no increase in peak flows downstream (Figures 8 and 9).

3.3.3 The size of the perimeter ditch was iteratively amended to provide sufficient storage for the 100 year plus climate change event, with a freeboard. This could be provided as a series of stepped weirs along the length of a widened ditch. The masterplan has made allowance for this feature, though the detailed design will look to combine this with the wetland feature for on-site surface water attenuation for the development run-off to provide a more integrated approach with the landscape objectives. The interceptor ditch will also strengthen both the landscape buffer and amenity function, deterring encroachment of users towards the nature reserve. Other off-site measures will also be considered at detailed design stage to better manage and control surface water overland flow within the landowners ownership, and further reduce the impact downstream.

Site Boundary
Catchment Boundary
Depth (m)
0.01 - 0.05
0.05 - 0.1
0.1 - 0.15
0.15 - 0.2
0.2 - 0.25
0.25 - 0.3
0.3 - 0.35
0.35 - 0.4
0.4 - 0.45
0.45 - 0.5

Cambridge Bio-Medical Campus Extension

Service Layer Credits:
0 0.075 0.15 0.3 0.45 0.6
Km

pba peterbrett

Client
Cambridge County Council

1:10,000 @ A3
19/07/16
Drawn: CM
Checked: CM

100 year flood depths
82.5% rainfall loss

36873/GIS008 | Rev A

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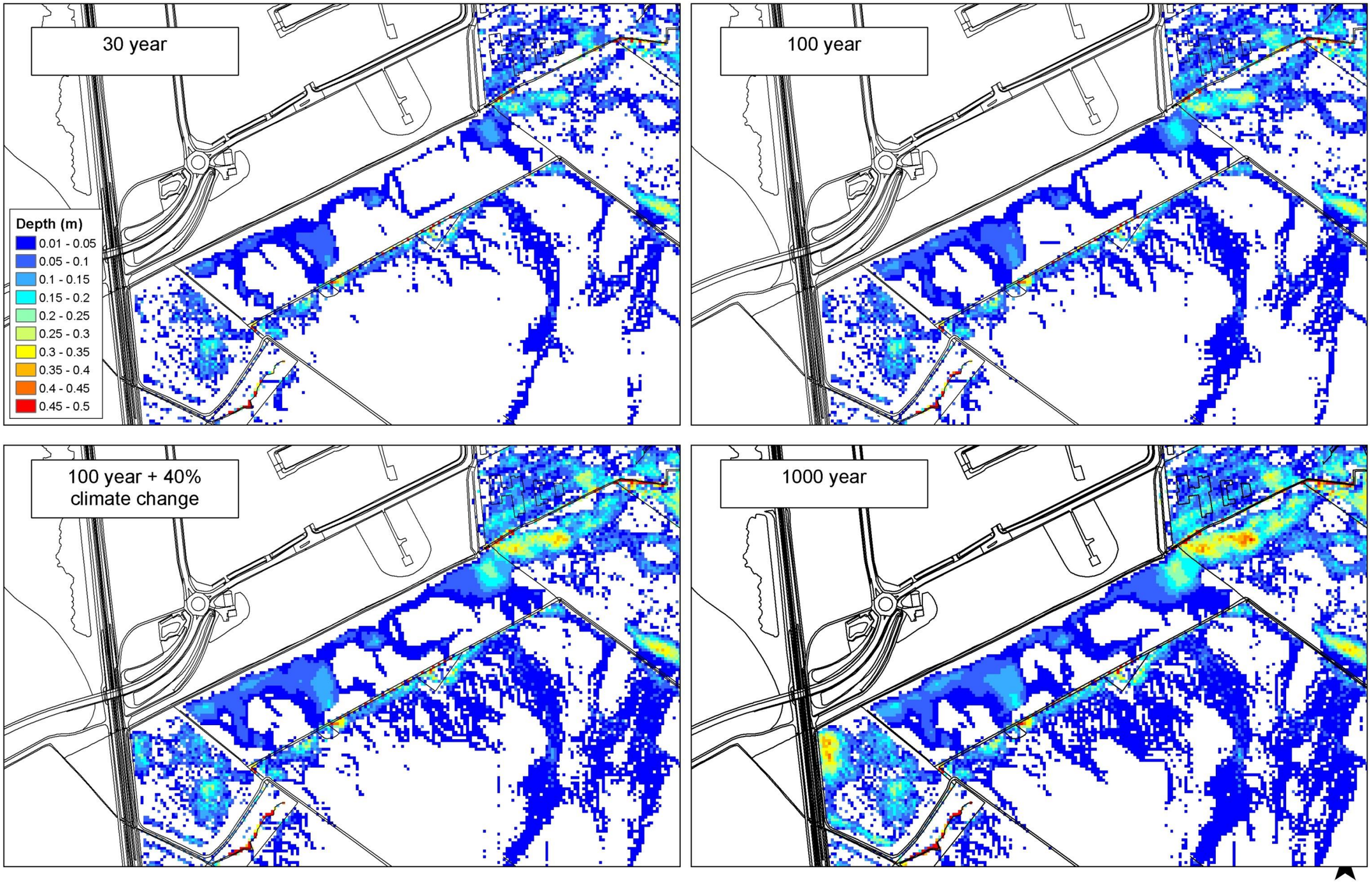
Figure 5: 100 year flood depths, Baseline scenario, 82.5% rainfall loss.



Cambridge Bio-Medical Campus Extension	Service Layer Credits: 0 0.05 0.1 0.2 0.3 0.4 Km	pba peterbrett	Client Cambridge County Council	1:6,000 @ A3 19/07/16 Drawn: CM Checked: CM	30, 100, 100+cc and 1000yr flood depths 82.5% rainfall loss 36873/GIS009 Rev A

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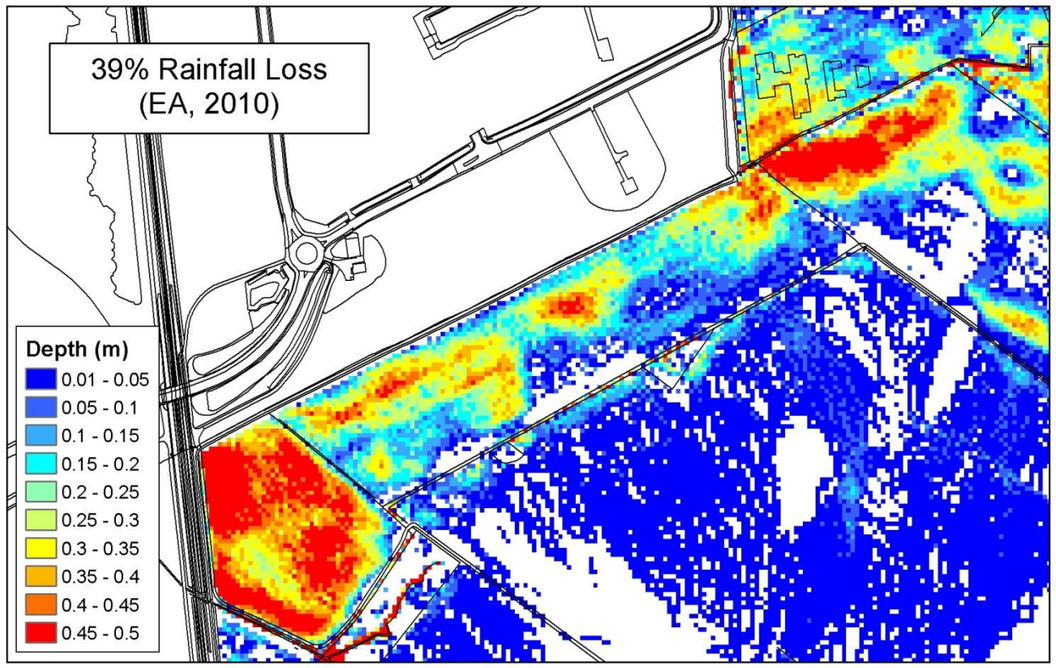
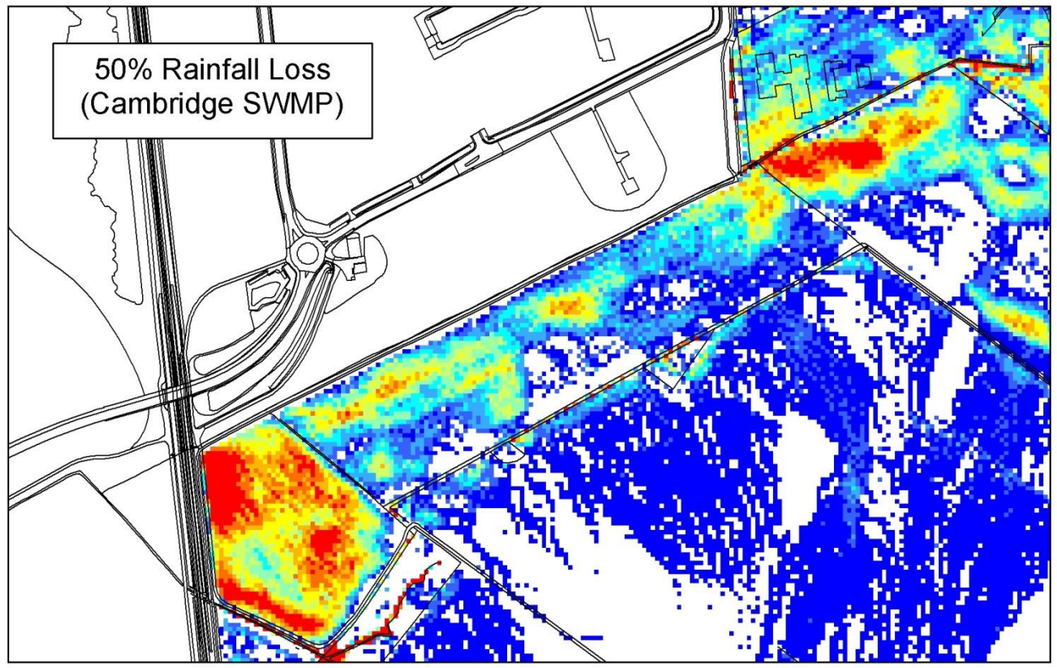
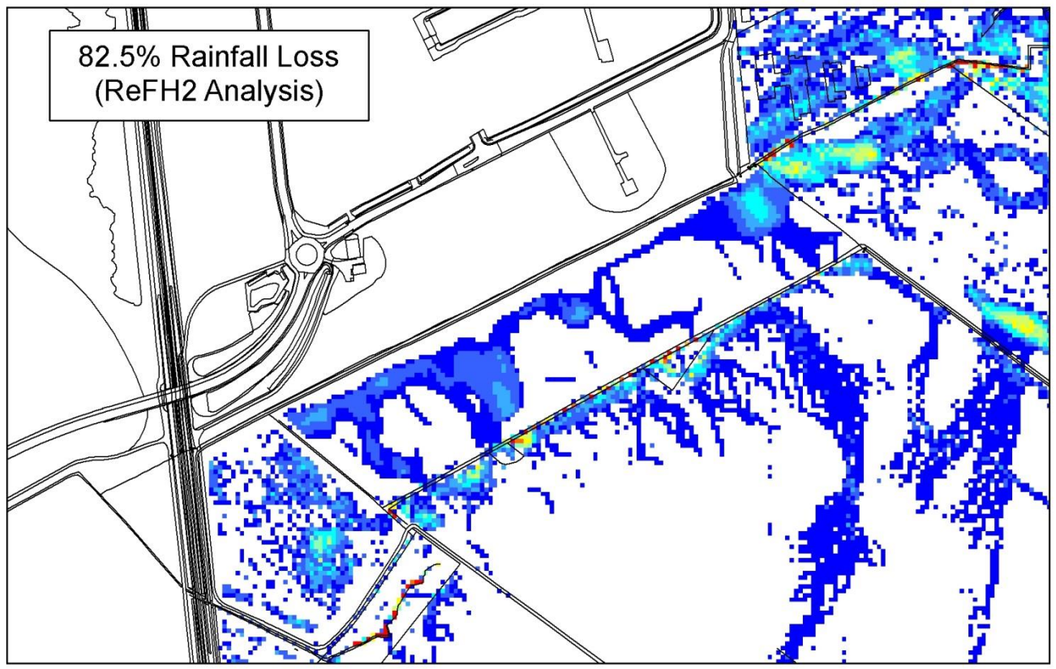
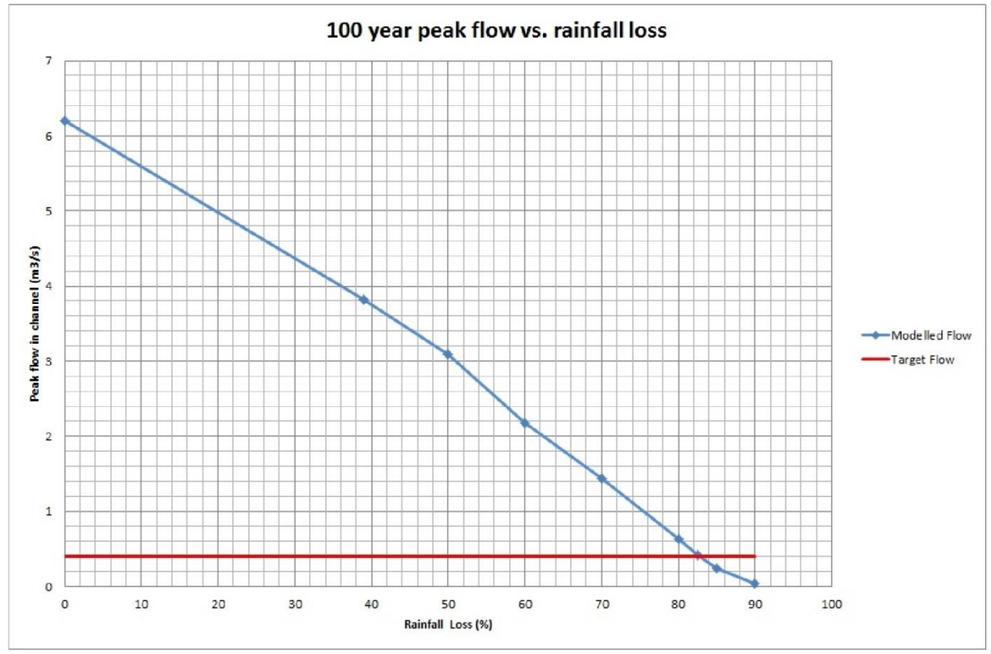
Figure 6: Baseline scenario: 30 to 1000 year flood depths, 82.5% rainfall loss.









Cambridge Bio-Medical Campus Extension	Service Layer Credits: 0 0.05 0.1 0.2 0.3 0.4 Km	pba peterbrett	Client Cambridge County Council	1:6,000 @ A3 19/07/16 Drawn: CM Checked: CM	100 year flood depths Sensitivity to Rainfall Loss	36873/GIS010 Rev A

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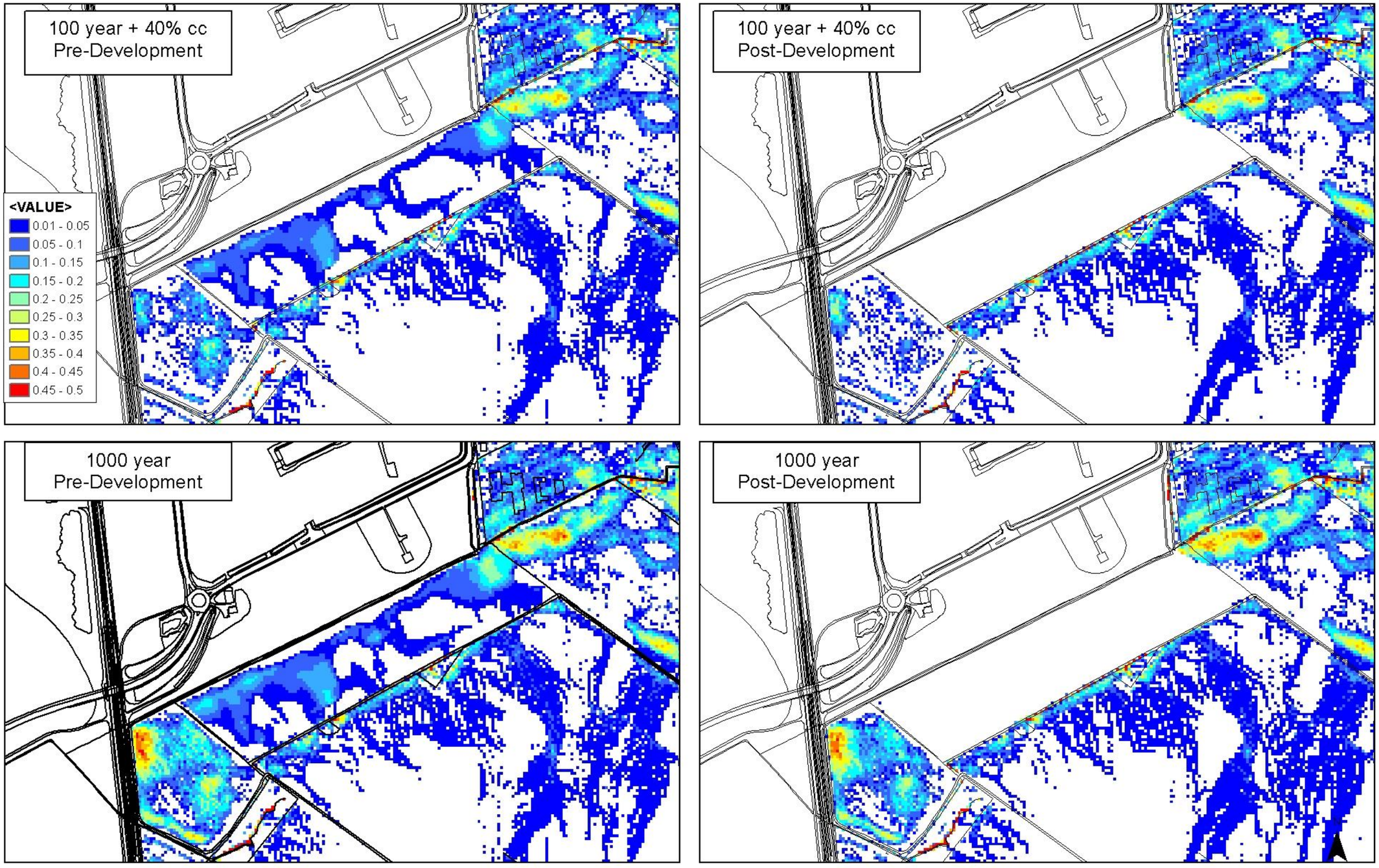
Figure 7: Sensitivity of baseline flood depths to rainfall loss parameter.



Cambridge Bio-Medical Campus Extension

Scale Bar Credits:

0 0.05 0.1 0.2 0.3 0.4 Km

peterbrett

Client
Cambridge County Council

1:6,000 @ A3
21/10/16
Drawn: CM
Checked: CM

100+cc and 1000yr flood depths
82.5% rainfall loss
Pre. vs. Post. Development

36873/GIS014 | Rev A

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Figure 8: Pre- and Post- Development Flood Extents (100 year plus climate change and 1000 year events). Differences in the 0.01 – 0.05 m depth band are within model tolerances and uncertainties.

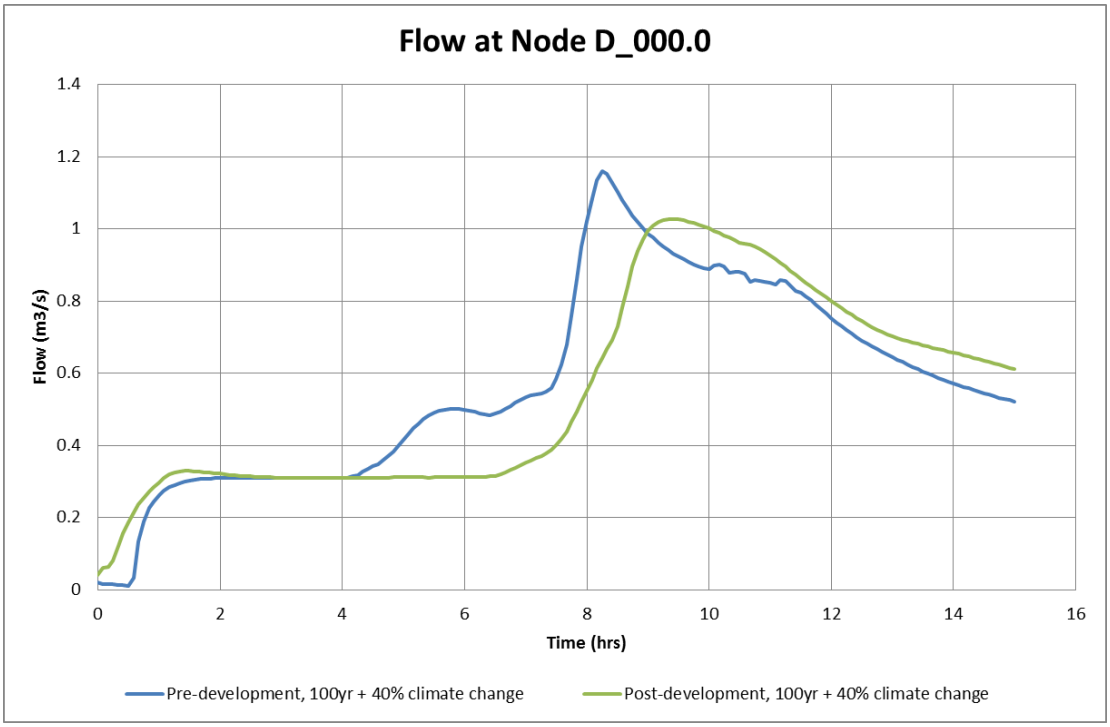

Figure 9: Pre- and post- development hydrographs for node D_000.0 (ditch at the corner of the railway line), for the 100 year plus 40% climate change event.