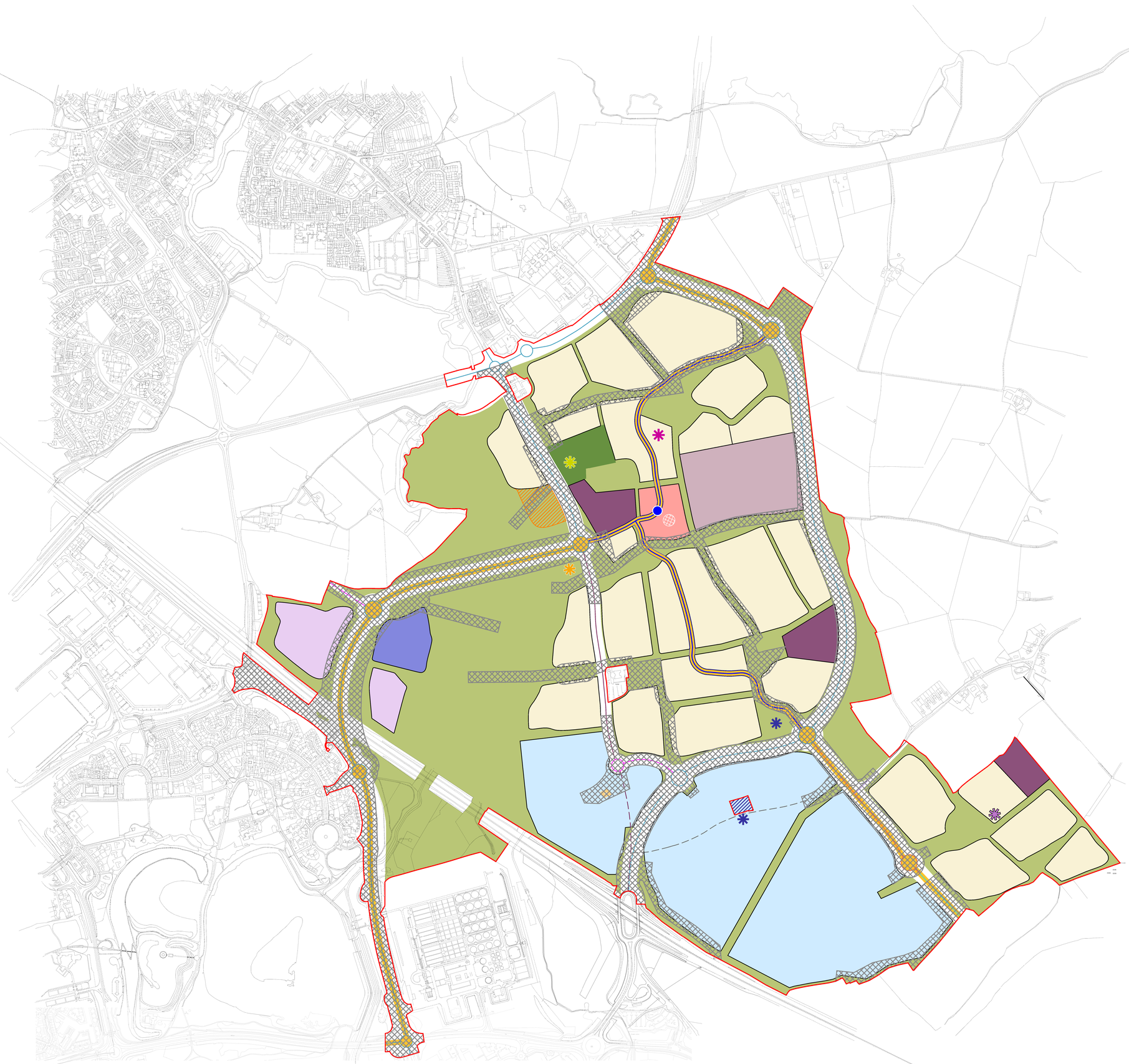

Notes:
Do not scale from this drawing.
All contractors must visit the site and be responsible for taking and checking Dimensions.
All construction information should be taken from figured dimensions only.
Any discrepancies between drawings, specifications and site conditions must be brought to the attention of the supervising officer.

This drawing is for planning purposes only. It is not intended to be used for construction purposes. Whilst all reasonable efforts are used to ensure drawings are accurate, JTP accept no responsibility or liability for any reliance placed on, or use made of, this plan by anyone for purposes other than those stated above.

Key

- Redline boundary
- Detailed application zone, all information within these zones is illustrative only (for proposed detail refer to WSP drawings as scheduled in MKE-Dwgs-Pfg-Rev 1)
- Residential use (C2, C3) including homes for the elderly, secondary and tertiary streets, footways / cycleways, incidental open space, drainage features, and children's play areas
- Mixed use community hub including residential (C3), commercial, businesses and services (E, F1), health hub (E) and community hall (F2)
- Indicative location of local centre (C2, C3, E)
- Employment (E, B2, B8), or residential (C2, C3) including homes for the elderly, secondary and tertiary streets, footways / cycleways, incidental open space, drainage features, and children's play areas
- Employment (E, B2, B8), or residential (C2, C3) including homes for the elderly, secondary and tertiary streets, footways / cycleways, incidental open space, drainage features, and children's play areas
  Should residential be provided, a minimum buffer of 25m from the boundary along the M1 would be required, subject to detailed acoustic testing
- Employment use (E, B2, B8)
- Location of existing furniture warehouse (building to be retained (with access retained from internal estate road) or demolished)
- Existing pumping station, to be retained or relocated (24/7 access maintained from estate road)
- Indicative location(s) of alternative potential primary sub-station
- Primary school and playing fields (F1)
- Secondary school and playing fields (F1)
- Indicative location of homes for the elderly (C2, C3)
- Formal sports pitches and associated parking (F2)
- Indicative location for community sports pavilion (F2)
- Indicative location for community building / visitor centre (F2)
- Open space (including waterbodies, drainage features, footpaths / cycleways, vegetation / planted areas, play areas, retained trees and hedgerows, burial grounds, community woodlands, orchards and allotments, community gardens, and some elements of primary, secondary and tertiary roads)
- Open space with retained archaeology in-situ or, subject to detailed archaeological investigation, residential (C2, C3) or sports provision (F2)
- Indicative location of community square
- Route safeguarded for possible Mass Rapid Transit (MRT) scheme
- Primary street corridor (with +/- 30m limit of deviation from centre line along route shown)
- Indicative location of transport interchange
- Grid road corridor
- Highway corridor safeguarded for grid road status
- Highway corridor safeguarded for future Cranfield bypass (with +/- 30m limit of deviation from centre line along route shown)
- Road corridor (with +/- 30m limit of deviation from centre line along route shown)
- Downgraded A509 road corridor (with +/- 30m limit of deviation from centre line along route shown)
- Indicative existing alignment of Newport Road
- Connection to Newport Road (with +/- 30m limit of deviation from centre line along route shown)
- No vehicular access (existing Newport Road)
- No vehicular access (existing A509)

Note: The redline and associated area shown in this drawing are based on guidance provided by others. JTP accept no responsibility or liability for reliance placed on, or use made of, this plan by anyone for purposes other than planning.

Note: All features and areas are subject to a lateral tolerance of +/- 10m unless stated otherwise.

Note: Access arrangements into the site will need to accord with the approved detailed planning application drawings.

Rev	Date	Description	Drawn	Chkd
D7	22.02.21	amended following client/consultant comments	LB	AH
D6	17.02.21	amended following client/consultant comments	LB	AH
D5	15.01.21	amended following client/consultant comments	LB	AH
D4	18.12.20	amended following client/consultant comments	LB	AH
D3	15.12.20	amended following client/consultant comments	LB	AH
D2	17.11.20	amended for graphical purposes	LB	AH
D1	13.11.20	first issue for comment	LB	AH

Drawing Status
DRAFT

Client
St James

JTP Studios
Unit 5, The Rum Warehouse
Pennington Street
London, E1W 2AP
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Project
Milton Keynes East

Drawing Title
Land Use Parameter Plan

Scale @ A0 1:5000
Job Ref. 01312
Drawing No. 01312 _PP_01
Revision D7
Scale Bar
0 50 100 150 200 250m

Appendix F

POST-DEVELOPMENT BLOCKAGE SENSITIVITY TESTING RESULTS

488000 488500 489000

242500 242000 241500 241000 240500

R05 8.43Ha
NP1
LP1 0.26Ha
R04 3.53Ha
PF01 3.20Ha
R06a 5.38Ha
PS1 2.10Ha
CH02 0.50Ha
R10 1.04Ha
R13 5.58Ha
R01 4.63Ha
R02 3.79Ha
R11 3.56Ha
LP3 0.26Ha
NP3 0.60Ha
R03a 1.70Ha
R03b 0.31Ha
H01 0.95Ha
NP4 0.60Ha
R12 4.91Ha
R20 3.81Ha
A01 0.80Ha
E01 16.88Ha
Coldecote
60m

100 0 100 200 300 400 m

KEY:

Red line boundary

Depth difference (m)

- < -0.6
- -0.6 to -0.3
- -0.3 to -0.1
- -0.1 to -0.01
- Negligible change (<+/-0.01)
- +0.01 to +0.1
- +0.1 to +0.25
- +0.25 to +0.4
- +0.4 to +0.55
- > +0.55

Change in flood extent

- Extent decreased
- Extent increased

REV	DATE	DRW	DESCRIPTION	CHK	APP
A	16/09/20	CD	FIRST ISSUE	AS	AS

STATUS: FOR INFORMATION ONLY

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Bristol, BS2 0HQ
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CLIENT: BERKELEY ST JAMES

ARCHITECT: -

PROJECT: MILTON KEYNES EAST

TITLE: DEPTH DIFF. - POST-DEVELOPMENT BLOCKAGE - 1 IN 100 YEAR

DRAWN:	CHECKED:	APPROVED:
CD	CD	AS

QGIS FILE:	SCALE @A3:	DATE:
	1:6723	17/02/21

PROJECT No:	DRAWING No:	REV:
70051078	BLOCKAGE_PD_0100	A

488000
488500
489000
242500
242000
241500
241000
240500

R05
8.43Ha
NP1
LP1 0.60
0.26Ha
R04
3.53Ha
PF01
3.20Ha
R06a
5.38Ha
CH02
0.50Ha
PS1
2.10Ha
R10
1.04Ha
Coldecote
River Ouzel or Lovat
R01
4.63Ha
R02
3.79Ha
R13
5.58Ha
R11
3.56Ha
LP3
0.26Ha
NP3
0.60Ha
R03a
1.70Ha
R03b
0.31Ha
NP4
0.60Ha
H01
0.96Ha
R12
4.91Ha
R20
3.81Ha
A01
0.80Ha
E01
16.88Ha
60m
PINCHAM
Cotton Valley Sewage Works

100 0 100 200 300 400 m

KEY:

Red line boundary

Depth difference (m)

- < -0.6
- -0.6 to -0.3
- -0.3 to -0.1
- -0.1 to -0.01
- Negligible change (<+/-0.01)
- +0.01 to +0.1
- +0.1 to +0.25
- +0.25 to +0.4
- +0.4 to +0.55
- > +0.55

Change in flood extent

- Extent decreased
- Extent increased

REV	DATE	DRW	DESCRIPTION	CHK	APP
A	16/09/20	CD	FIRST ISSUE	AS	AS

STATUS: FOR INFORMATION ONLY

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CLIENT: BERKELEY ST JAMES

ARCHITECT: -

PROJECT: MILTON KEYNES EAST

TITLE: DEPTH DIFF. - POST-DEVELOPMENT BLOCKAGE - 1 IN 100 YEAR + 35% CC

DRAWN:	CHECKED:	APPROVED:
CD	CD	AS
QGIS FILE:	SCALE @A3:	DATE:
	1:6723	17/02/21
PROJECT No:	DRAWING No:	REV:
70051078	BLOCKAGE_PD_CC35	A

488000 488500 489000

242500 242000 241500 241000 240500

R05 8.43Ha
NP1
LP1 0.60
0.26Ha
R04 3.53Ha
PF01 3.20Ha
R06a 5.38Ha
Coldecote
River Ouzel or Lovat
CH02 0.50Ha
PS1 2.10Ha
R10 1.04Ha
R13 5.58Ha
R01 4.63Ha
R02 3.79Ha
R11 3.56Ha
LP3 0.26Ha
NP3 0.60Ha
R03a 1.70Ha
NP4 0.60Ha
H01 0.95Ha
R12 4.91Ha
R03b 0.31Ha
R20 3.81Ha
A01 0.80Ha
E01 16.88Ha
60m

100 0 100 200 300 400 m

KEY:

Red line boundary

Depth difference (m)

- < -0.6
- -0.6 to -0.3
- -0.3 to -0.1
- -0.1 to -0.01
- Negligible change (<+/-0.01)
- +0.01 to +0.1
- +0.1 to +0.25
- +0.25 to +0.4
- +0.4 to +0.55
- > +0.55

Change in flood extent

- Extent decreased
- Extent increased

REV	DATE	DRW	DESCRIPTION	CHK	APP
A	16/09/20	CD	FIRST ISSUE	AS	AS

STATUS: FOR INFORMATION ONLY

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CLIENT: BERKELEY ST JAMES

ARCHITECT: -

PROJECT: MILTON KEYNES EAST

TITLE: DEPTH DIFF. - POST-DEVELOPMENT BLOCKAGE - 1 IN 100 YEAR + 65% CC

DRAWN:	CHECKED:	APPROVED:
CD	CD	AS
QGIS FILE:	SCALE @A3:	DATE:
	1:6723	17/02/21
PROJECT No:	DRAWING No:	REV:
70051078	BLOCKAGE_PD_CC65	A

Appendix G

ENVIRONMENT AGENCY LETTER OF SUPPORT

Andy Smith
WSP UK Limited
WSP UK CPL
PO Box 240
Leeds
LS11 1ED

Our ref: AC/2018/127701/05-L01
Your ref: ENVPAC/1/EAN/00168

Date: 15 March 2021

Dear Mr Smith

MILTON KEYNES EAST STRATEGIC URBAN EXTENSION DEVELOPMENT MILTON KEYNES

We are providing this letter at your request, to confirm our support for the Milton Keynes SUE development. We have no in principle objections to the scheme, subject to the receipt of a satisfactory Flood Risk Assessment at the formal planning application stage.

We appreciate the active and positive working relationship we have had to date, to ensure flood risk is sufficiently covered in line with the National Planning Policy Framework and Planning Practice Guidance and we look forward to commenting on the formal stages of the application.

Yours sincerely

Neville Benn
Senior Planning Advisor
Sustainable Places
Direct dial 0203 0251906
Direct e-mail neville.benn@environment-agency.gov.uk

3RD Floor, Kings Orchard
1 Queen Street
Bristol
BS2 0HQ

wsp.com

Appendix L2
Surface Water Strategy

Berkeley St James Group Limited

MILTON KEYNES EAST

Drainage Technical Note

MKE-WSP-XX-XX-C-RP-0001
MARCH 2021

PUBLIC

Berkeley St James Group **Limited**

MILTON KEYNES EAST

Surface Water Drainage Technical Note

REPORT (RV1) PUBLIC

PROJECT NO. 70057521

OUR REF. NO. MKE-WSP-XX-XX-C-RP-0001

DATE: MARCH 2021

WSP

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QUALITY CONTROL

Issue/revision	First issue	Revision 1	Revision 2	Revision 3
Remarks				
Date	26/03/2021	30/03/2021		
Prepared by	Daniel Flello	Daniel Flello		
Signature				
Checked by	Bahadir Uyduran	Bahadir Uyduran		
Signature				
Authorised by	Simon Purcell	Simon Purcell		
Signature				
Project number	70057521	70057521		
Report number	DR001	DR001		
File reference	MKE-WSP-XX-XX-C-RP-0001-P01	MKE-WSP-XX-XX-C-RP-0001-P02		

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EXISTING AND PROPOSED OVERLAND FLOW ROUTES

APPENDIX F

SUPPORTING CALCULATIONS

EXECUTIVE SUMMARY

This surface water drainage strategy has been produced to provide further information and context to the integration of the highway, residential and commercial drainage to provide an integrated drainage strategy for the site. This strategy is prepared to accompany the hybrid planning application for the proposed strategic development of Milton Keynes East.

Item	Overview
Site Location	The site is located between the M1 which largely forms the southern boundary of the site and the A422 which forms the northern boundary. The grid reference for the site is 488630, 241770, with a nearest postcode of MK15 9LZ. The site is allocated for strategic development under the local plan.
Development Proposals	The masterplan for the development is still being refined, however under the local plan allocation, at least 4,000 new homes are to be delivered within the plan period, with 105 hectares of land allocated for mixed employment uses. Associated infrastructure including primary and secondary education, community facilities, health, retail, local services and a hotel will be incorporated into the development. The development will also include the creation of a linear park along f the River Ouzel, along with a new highway link across the floodplain with a 30m bridge opening centred on the River Ouzel.
Environment Agency Flood Zone(s)	The majority of the site is located in Flood Zone 1 based on the Environment Agency's Flood Map for Planning. The land adjacent to the River Ouzel is located in Flood Zone 3. There is also a small area in the south of the site within Flood Zone 3, located next to Broughton Brook.

1. INTRODUCTION

1.1. BACKGROUND

1.1.1. WSP UK Ltd (WSP) has been appointed by Berkeley St James Group Ltd (St James) to prepare a Drainage Strategy to support the planning application for a large mixed use development located on the land to the east of the M1 Motorway at Milton Keynes, (Approximate Post Code: MK15 9LZ).

1.1.2. The proposed development, referred to as Milton Keynes East (MKE) will consist of at least 4,000 homes, with approximately 85 hectares of land for a mix of employment uses, along with associated community facilities and infrastructure.

1.1.3. The objective of the study is to demonstrate that the site can be drained appropriately with sustainability in mind.

1.2. LIMITATIONS

1.2.1. WSP has prepared this report in accordance with the instructions of their client for their sole and specific use relating solely to the above site. Any person who uses any information contained herein does so at their own risk and shall hold WSP harmless in any event.

1.2.2. Whilst this report was prepared using the reasonable skill, care and diligence ordinarily exercised by engineers practicing under similar circumstances and reasonable checks have been made on data sources and the accuracy of the data, WSP accepts no liability in relation to the report should any data, information or condition be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed to WSP. In any event, WSP shall not be liable for any loss or damages arising under or in connection to the use of this report

2. SITE SETTING

2.1. LOCATION

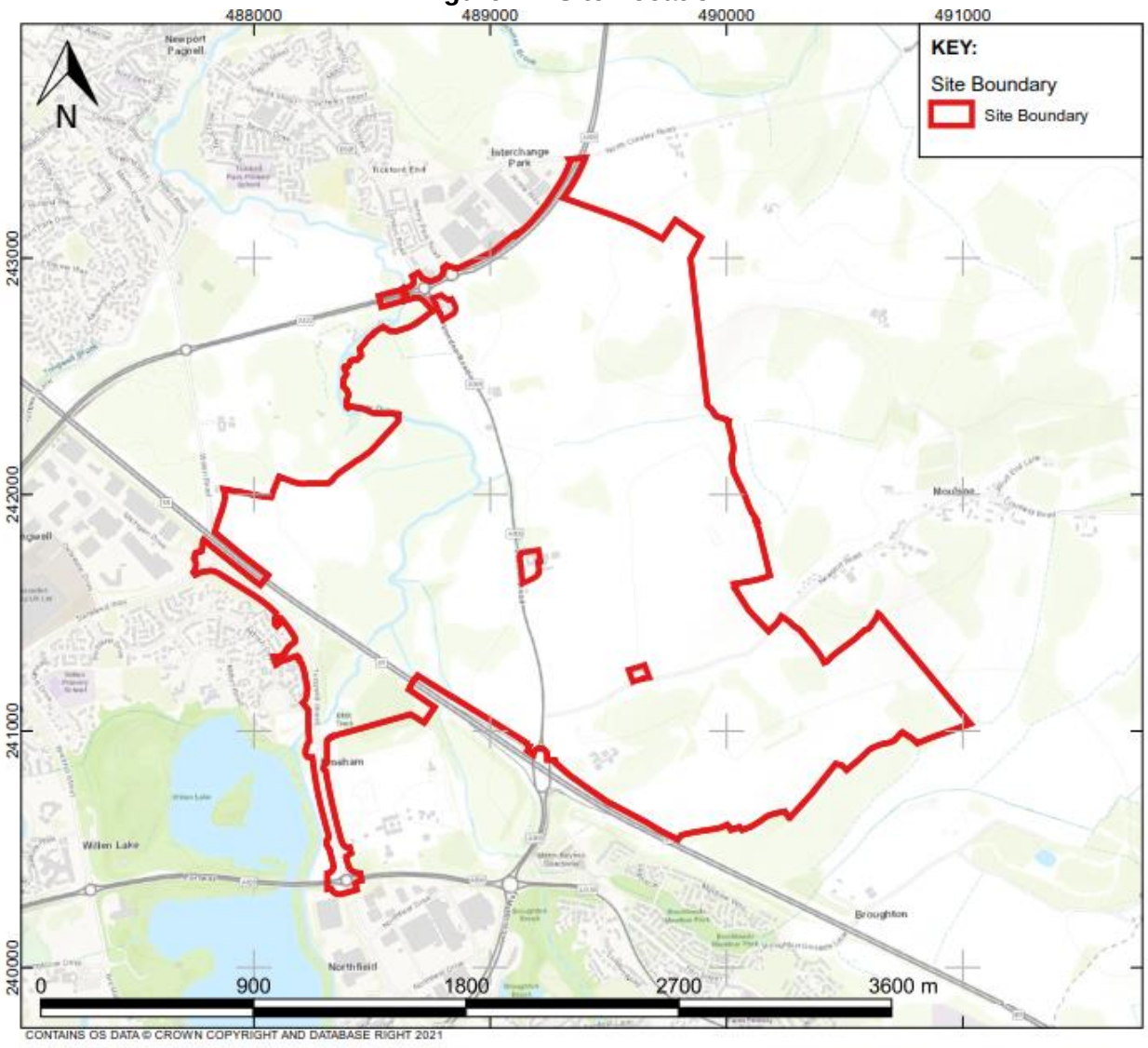
2.1.1. The site is located between the M1 which largely forms the southern boundary of the site and the A422 which forms the northern boundary. The grid reference for the site is 488630, 241770, with a nearest postcode of MK15 9LZ. The Site has an area of 436 hectares.

2.1.2. The Site largely consists of undeveloped land predominantly in agricultural use and is bordered by:

- The A422 to the north;
- Agricultural land to the east;
- The M1 Motorway to the south; and
- Willen Road to the west.

2.1.3. The site location plan is shown in Figure 1**.**

Figure 1 – Site Location



2.2. DEVELOPMENT PROPOSALS

2.2.1. ‘Milton Keynes East’ (MKE) has been identified as an allocation for a strategic urban extension within Plan:MK and Milton Keynes Council’s (MKC) aspirations for the allocation is set out within Policy SD12 of Plan:MK.

2.2.2. The masterplan for the Scheme is shown in Figure 2 and shows the large-scale mixed-use urban extension (creating a new community) including:

- Approximately 4,000 upt to a maximum of 4,600 homes;
- Up to 403,650sq.m of employment floorspace;
- A community hub containing a range of commercial and community uses;
- Associated services, amenities and open space; and
- New road and redway extensions, including a new bridge over the M1 motorway and works to the Tongwell Street corridor.

2.2.3. A hybrid planning application for the site will be submitted in April 2021. This will consist of an outline application for the main part of the development as described above and a detailed application for the main highway infrastructure.

Figure 2 – Masterplan

Source: JTP

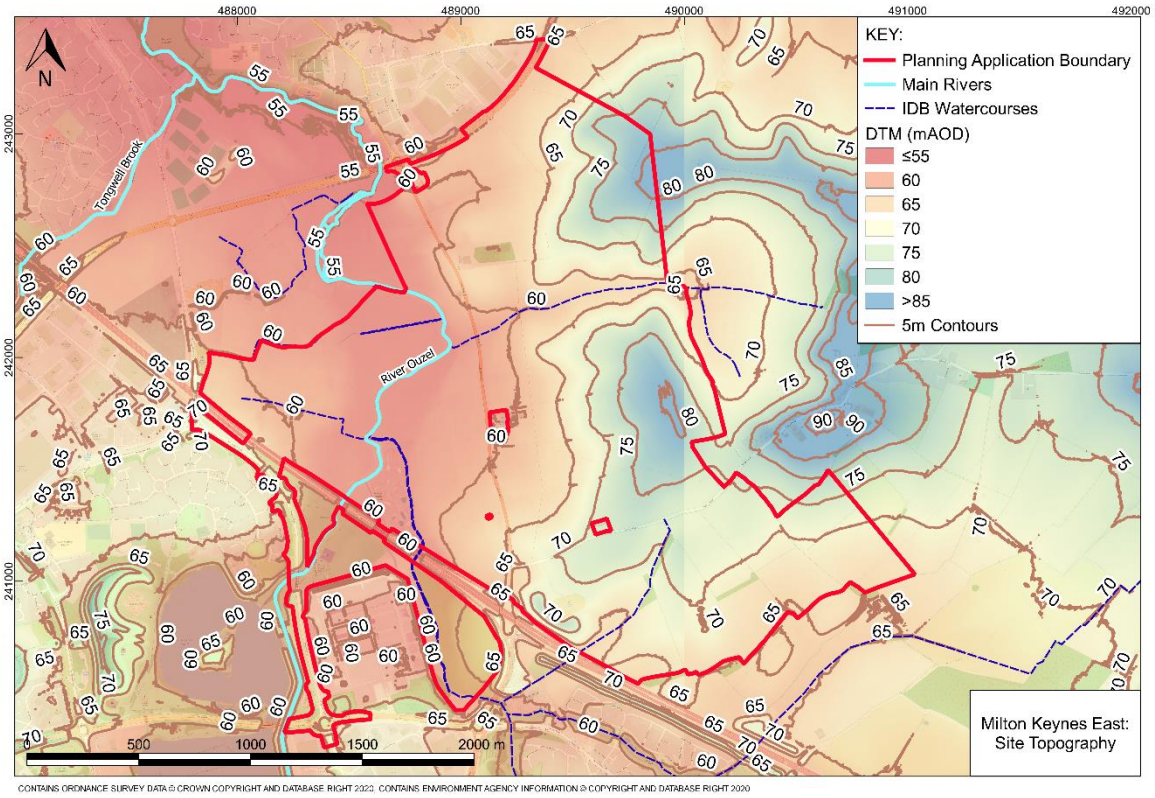
2.3. TOPOGRAPHY

2.3.1. Environment Agency 1m DTM LiDAR has been used to assess the topography at the site, as shown in Figure 3. Detailed topographical survey is available along the route of the main road infrastructure.

2.3.2. There is a gentle slope from south to north through the site, along the channel route of the River Ouzel, from approximately 60mAOD in the south of the site down to approximately 55mAOD in the north of the site.

2.3.3. The land either side of the River Ouzel significantly elevated above the floodplain, rising to a high point of approximately 80mAOD to the east of the site, with a high point in the land to the west of the Ouzel of approximately 70mAOD.

Figure 3 - Site Topography



2.4. GEOLOGICAL AND HYDROGEOLOGICAL CONTEXT

Geology

2.4.1. The British Geological Survey (BGS) GeoIndex indicates that the majority of the site is underlain by Mudstone bedrock from the Peterborough Member.

2.4.2. In the northwest of the site the bedrock comprises of Sandstone, Siltstone and Mudstone from the Kellaways Formation. To the east of the site, towards Moulsoe, the site is underlain by bedrock from the Stewartby Member Mudstone.

2.4.3. Superficial Head and Alluvium deposits are present across the floodplain of the River Ouzel and the Broughton Brook. There is also an area of superficial sand and gravel deposits to the west of the site, with superficial Diamicton deposits from the Oadby member present in the east of the site towards Moulsoe.

2.4.4. A Site Investigation has been undertaken to support the design of the strategic highway infrastructure and provide information on soakage rates across the main development.

Hydrogeology

2.4.5. According to the Source Protection Zone map provided by the Environment Agency, the site does not lie within any Source Protection Zones.

2.4.6. According to the Environment Agency's aquifer designation map, the bedrock to the west of the site is classified as a Secondary A Aquifer, whilst the bedrock to the east of the site is classified as

Unproductive Strata. The superficial alluvium and head deposits associated with the floodplain of the River Ouzel and its tributaries are categorised as Secondary A aquifers.

2.4.7. Secondary A aquifers are defined as permeable layers capable of supporting water supplies at a local rather than strategic scale, in some cases forming an important source of base flow to rivers.

3. PLANNING POLICY CONTEXT

3.1. NATIONAL PLANNING POLICY FRAMEWORK 2019

3.1.1. The National Planning Policy Framework (NPPF) as updated in February 2019, sets out the Government's national policies for flood risk management in a land use planning context within England.

3.1.2. Paragraph 155 of the NPPF states "*Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk (whether existing or future). Where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere."*

3.1.3. The guidance further states that local planning authorities should "*ensure that flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific flood-risk assessment."*

3.1.4. Allocation and planning of development must therefore be considered against a risk-based search sequence as provided by the guidance.

3.1.5. A sequential risk-based approach to determining the suitability of land for development in flood risk areas is central to the policy statement and should take into account the current and future impacts of climate change (Para. 157). This includes the intent to steer the most vulnerable parts of the development to the areas that experience the least, or an acceptable, degree of flood risk.

3.2. LOCAL PLANNING POLICY

Local Plan

3.2.1. Policy FR1 of Milton Keynes Council's local plan (Plan:MK 2016-2031[1]) sets out the council's current approach to flood risk management. Policy FR1 states that:

3.2.2. *"All new development must incorporate a surface water drainage system with acceptable flood control and demonstrate that water supply, foul sewerage and sewage treatment capacity is available or can be made available in time to serve the development. Suitable access is safeguarded for the maintenance of water supply and drainage infrastructure.*

Plan:MK will seek to steer all new development towards areas with the lowest probability of flooding. The sequential approach to development, as set out in national guidance, will therefore be applied across the Borough, taking into account all sources of flooding as contained within the Council's Strategic Flood Risk Assessment (SFRA).

Development within areas of flood risk from any source of flooding, will only be acceptable if it is clearly demonstrated that it is appropriate at that location, and that there are no suitable available alternative sites at a lower flood risk."

[1] Milton Keynes Council (2019) Plan:MK Adopted Version. Available online: https://www.milton-keynes.gov.uk/assets/attach/59718/PlanMK-Adoption-Version-March-2019-.pdf

3.2.3. Policy FR2 of the local plan sets out the requirement for new developments to incorporate Sustainable Drainage Systems (SuDS) and to take an integrated approach to flood risk management.

3.2.4. Policy FR3 (Protecting and Enhancing Watercourses) states that "*all new development must be set back at a distance of at least 8 metres from any main rivers, at least 9 metres from all other ordinary watercourses, or at an appropriate width as agreed by the Environment Agency, Lead Local Flood Authority or Internal Drainage Board".*

3.2.5. Surface Water Drainage Guidance for Developers (January 2020) sets out the Lead Local Flood Authorities (LLFA) role as a statutory consultee in regard to planning. This document sets out the level of information the LLFA expects to be submitted as part of a planning application

4. DRAINAGE STRATEGY

4.1. EXISTING DRAINAGE REGIME

4.1.1. The site currently drains via a series of ordinary watercourses and field ditches to the Buckikngham and River Ouzel Internal Drainage Board (IDB) maintained watercourses referenced as the Caldecote Stream, the Moulsoe stream, the Hermitage Stream and the Brooklands stream as shown on Figure 3. These watercourses discharge to the River ouzel. The ouzel is classified as a main river on the EA main River Mapping

4.1.2. From site visits it has been shown that the ordinary watercourses and Moulsoe Stream, field drain 1 and field drain 2 are dry apart from storm events.

4.1.3. Figure 5 shows the surface water flood map. This map demonstrates that the overland flow routes are concentrated around the IDB watercourses and the River Ouzel.

Figure 4 – Watercourse Features

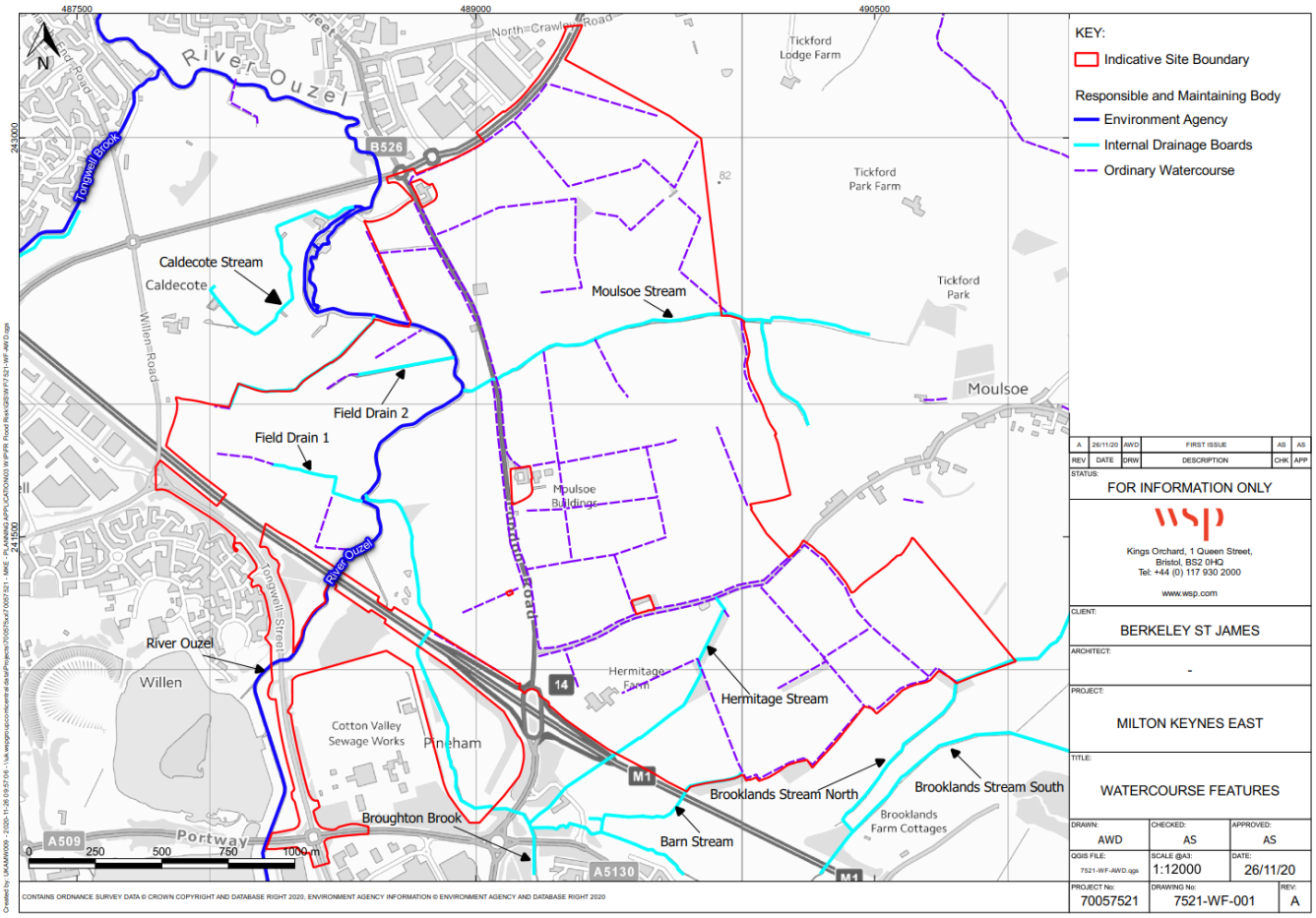
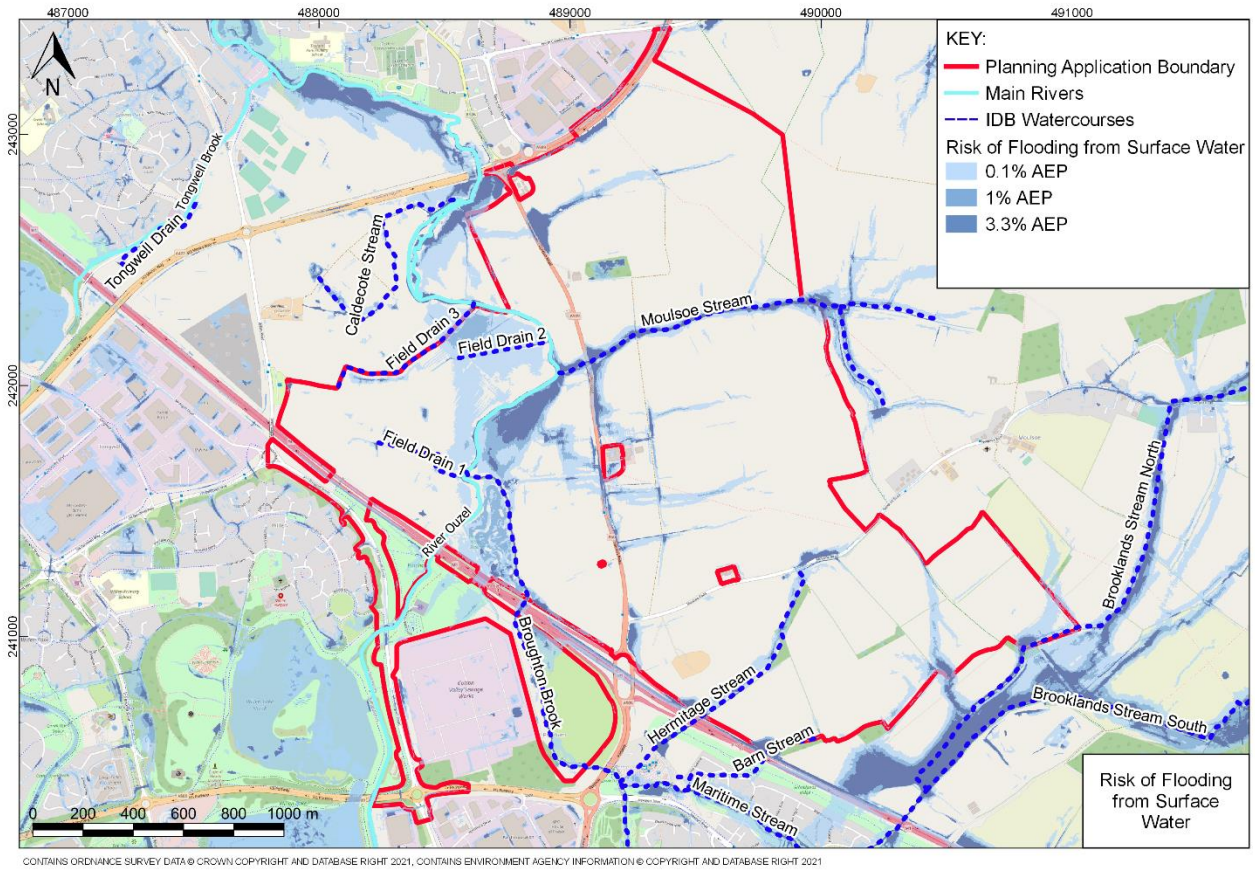


Figure 5 – Surface Water Flood Map



POST-DEVELOPMENT WATERCOURSE STRATEGY

4.1.4. To mitigate the risk of surface water flooding to the development a comprehensive drainage / SuDS strategy had been developed. This strategy involves attenuating the surface water runoff at source, attenuating in ponds and swales, prior to discharge to the River Ouzel or the Broughton Brook.

4.1.5. The SuDS Strategy has been developed in accordance with the policies set out within Plan MK, this requires the Scheme to continue the exemplar sustainable drainage model of Milton Keynes, with drainage infrastructure to be provided as strategically as possible and as part of a maintained, multi-functional blue-green infrastructure. The drainage strategy is being developed under these principles.

4.1.6. The development is following a holistic flood and water management approach that is designed to reduce flood risk, provide resilience and enhance bio-diversity.

4.1.7. Watercourses will be maintained and enhanced within the development wherever possible. The future maintenance regime associated with these watercourses is currently under review with the relevant stakeholders to ensure that drainage, flood risk, bio-diversity and amenity requirements are aligned.

4.1.8. There may be a range of small field drains / ordinary watercourses which are removed / realigned to become part of the SuDS strategy as a result of the Scheme, however, this will be determined during the detailed design phase and permission will be sought as part of the reserved matters applications.

4.2. SURFACE WATER DRAINAGE DISCHARGE OPTIONS

4.2.1. The Building Regulations Approved Document H and the Surface Water Drainage Guidance for Developers (January 2020) stipulates that rainwater from roofs and paved areas should discharge to one of the following, listed in order of priority:

1) an adequate soakaway or some other adequate infiltration system,

2) a watercourse or, where that is not practicable,

3) a sewer.

4.2.2. Option 1 – Infiltrate to Groundwater

Based on the geotechnical information obtained from BGS OpenGeoscience which classifies the underlying rock to be mudstone for the majority of the site and as such infiltration is not likely to be feasible. Soakage tests in accordance with BRE Digest 365 will be undertaken to confirm this.

4.2.3. Option 2 – Discharge into the Existing Watercourses/Ditches

In order to replicate the existing drainage regime, the development site would need to discharge into the existing IDB water courses and the River Ouzel.

4.2.4. Option 3 – Discharge into Public/Private Sewer(s)

There are no public surface water sewers within the site boundary. As there is opportunity to discharge into water courses this option has been discounted. It should be noted that under the Flood and Water Management Act 2010, there is no longer an automatic right of connection to the existing surface water sewer network.

4.2.5. Option 2 is the preferred method of surface water runoff discharge from the site. The drainage strategy will involve discharging to existing IDB and EA watercourses.

4.3. DRAINAGE DESIGN PARAMETERS

The proposed surface water drainage strategy has been designed in accordance with the following guidance:

- Design and Construction Guidance for foul and surface water sewers March 2020 that superseded Sewers for Adoption 7th Edition
- Milton Keynes Surface Water Drainage Guidance for Developers January 2020
- Non-statutory technical standards for sustainable drainage systems March 2015
- CIRIA SuDS Manual C753
- Building Regulation Approved Document H

4.3.1. The drainage system will be designed such that there will be no surcharging of pipes for a 1 in 2 year event, no flooding of the sewer system for 1 in 30 year event and all water will be contained on site for the 1 in 100 year plus 40% climate change event.

4.3.2. In line with best practice FEH rainfall data has been used to assess the site.

4.3.3. The proposed drainage strategy has been designed to manage as much water as possible at source on residential parcels whilst providing multiple benefits such as water quality management, amenity and biodiversity.

4.3.4. To manage water on site a discharge rate of 4 l/s/impermeable ha will be used. This has been agreed in principle with the IDB and is a betterment over the greenfield QBAR which would be 4 l/s/developable ha. Calculations for the greenfield QBAR are in Appendix A.

4.3.5. The objectives of this drainage strategy are to outline the approach for sustainable system that will:

- Prevent water from entering the system through the use of appropriate on plot design and measures that will hold water at source such as rainwater harvesting.
- Control the water at source through measures such as rain gardens to improve water quality and reduce hydraulic peaks.
- Treat the water prior to discharge into a water course via three treatment trains wherever possible.
- Incorporate the drainage into the wider site so that the attenuation basins and other methods fit in with the surrounding site

4.3.6. For the drainage strategy design it has been assumed that all highways will be 100% impermeable, the residential plots will be 60% impermeable with a 10% allowance for development creep for a total of 66% and the commercial plots will be 90% impermeable. The detailed catchment plan can be seen in Appendix B.

4.3.7. A different approach is required for each land use type.

4.3.8. Highway corridors will require surface water runoff to shed as quickly as possible to ensure the safety of all users. Any roadside SuDS will need to have a maximum depth of 150mm to ensure the safety of all users is not compromised in the case of any errant vehicles. This leads to sustainable storage options being limited' hence 100% of the runoff volume attenuation will be provided in a pond. Following consultation with MK Highways department, Mk have advised that all highway drainage should be provided by traditional measures ie pipe and gully networks. MK have advised they consider the use of highways SuDS features to be an unsustainable maintenance cost

4.3.9. Ther drainage of residential development plots will include source control features along with ponds storing runoff up to a depth of 2m in accordance the MK design guidance. This allows greater opportunity to integrate SuDS into the landscape a provide a holistic solution. It will be the intention to use as much of the SuDS toolkit as practicable. It is anticipated that up to 40% of attenuation storage can be addressed by use of source control techniques such as swales, filter drains, filter strips, porous/permeable surfaces, water butts and rain gardens with the remainder (60%) of runoff being collected and conveyed to regional treatment and storage ponds.

4.3.10. Surface water runoff from the commercial development plots will be drained via a variety of techniques including piped systems and conveyance channels Discharge of surface water to

receiving watercourses will be managed by a mixture of above and below ground attenuation facilities. Commercial development will utilise urban channels, permeable paving and below ground attenuation upstream of attenuation ponds to ensure water quality standards are met.

4.4. DRAINAGE STRATEGY OPTIONS

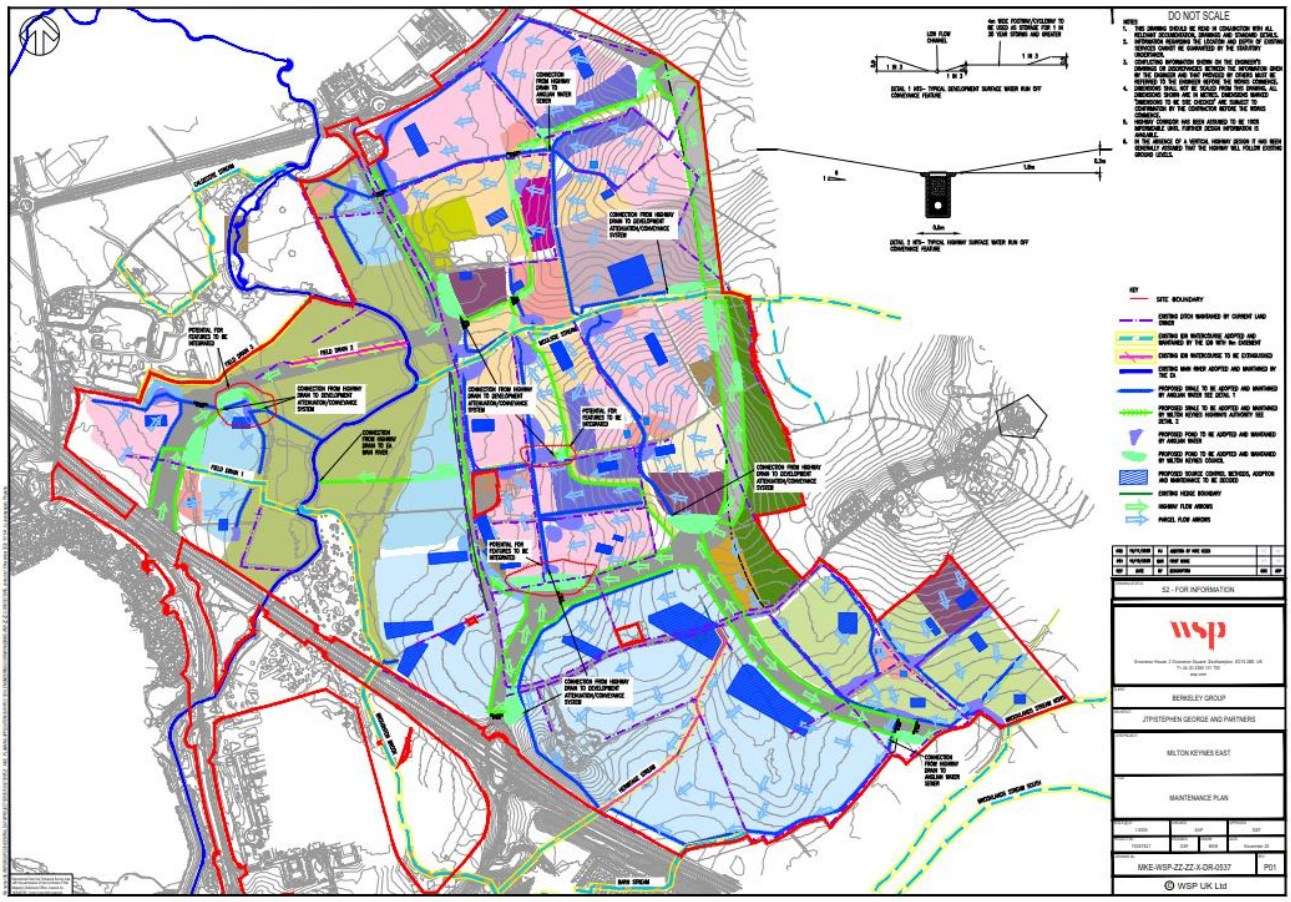
4.4.1. The drainage strategy has evolved throughout the design process, with the approach to be adopted to be confirmed at the relevant detailed design phase. At present there are two main options under consideration (segregated and integrated), these are presented below with the preference being the more holistic integrated drainage strategy.

4.4.2. The objectives of this drainage strategy are to outline the approach for sustainable system that will:

- Prevent water from entering the system through the use of good site design and measures that will hold water at source such as rainwater harvesting.
- Control the water at source through measures such as rain gardens to improve water quality and reduce hydraulic peaks.
- Treat the water prior to discharge into a water course via three treatment trains wherever possible.
- Incorporate the drainage into the wider site so that the attenuation basins and other methods fit in with the surrounding site

OPTION 1 SEGREGATED DRAINAGE STRATEGY

Figure 6– Segregated Drainage Strategy – Full size in Appendix C



4.4.3. In accordance with the above objectives a segregated drainage strategy has been considered.ie the highway drainage is completely segregated from the development parcel runoff This follows more traditional design methods to enable adoption of the highways and residential networks by separate authorities.

4.4.4. This design methodology allows the highways adoption authority to be responsible for the highways run off by managing the capture, flow and storage of highways runoff before discharging it to the wider strategic network.

4.4.5. Within this strategy each development parcel is also segregated with each development parcel becoming responsible for managing surface water runoff.

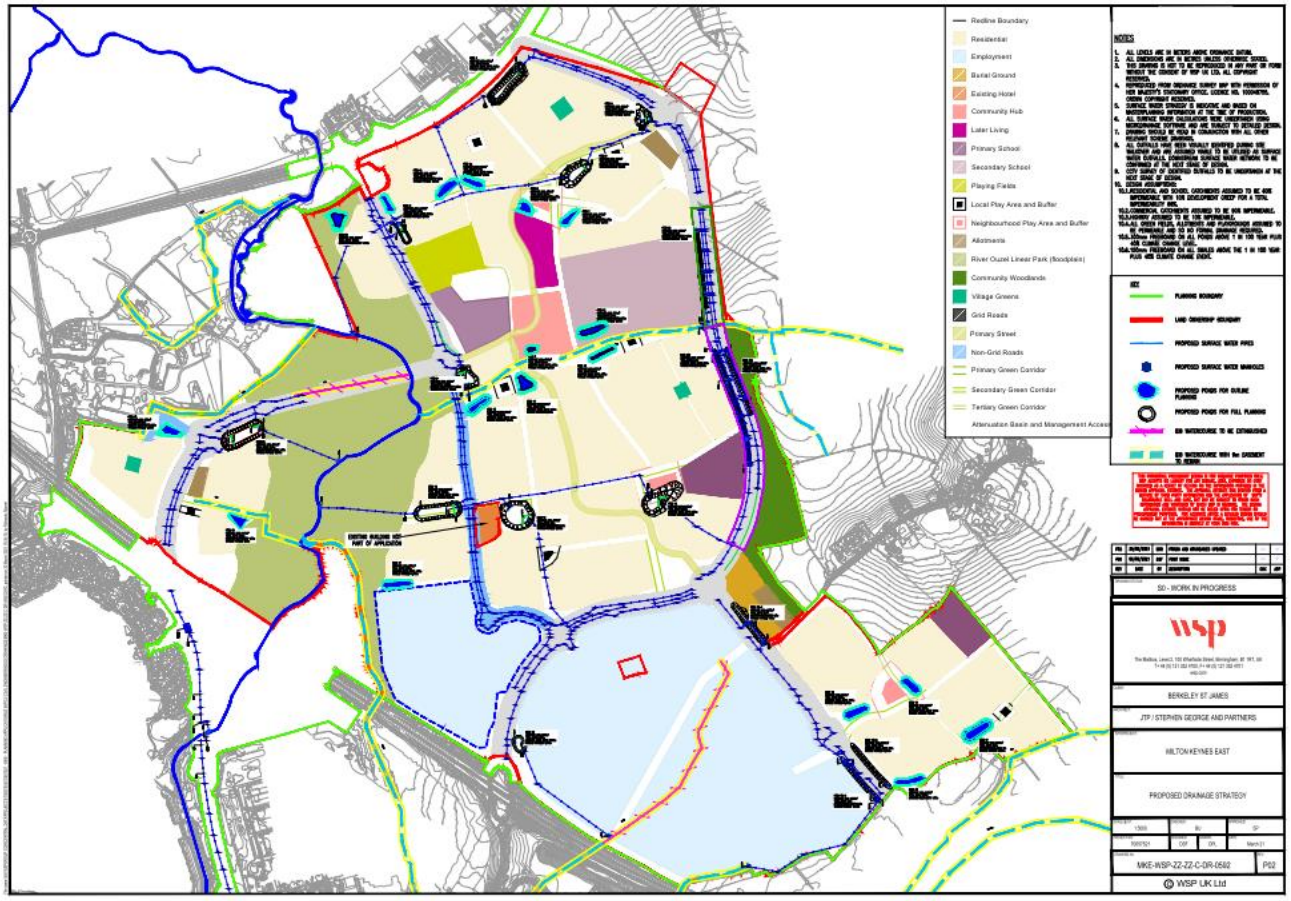
4.4.6. Following on from consultation with MK highways under this segregated strategy highway drainage would be drained by a traditional piped system out falling to attenuation ponds located within the designated transport corridor. This is then discharged to a strategic network at 4l/s/Impermeable HA.

4.4.7. The treatment train would be achieved via trapped gulley's, catchpits and forebays within the pond. The final outfall for each section would be a swale to add some additional polishing of the water. Should assessments show that this isn't sufficient then hard measures such as bypass interceptors and downstream defenders will be included

4.4.8. The challenge with this strategy is creating a holistic design that makes the attenuation features work within the development from a landscaping perspective. Extensive and divided maintenance responsibilities will create a long-term challenge.

INTEGRATED DRAINAGE STRATEGY

Figure 7– Integrated Drainage Strategy – Full size in Appendix D



4.4.9. Building on the segregated drainage strategy, a rationalisation of the attenuation design was undertaken leading to highway and residential runoff being managed within combined attenuation facilities ie an integrated approach. This is in accordance with the Surface Water Drainage Guidance for Developers (January 2020).

4.4.10. This integrated approach allows the incorporation of the drainage attenuation facilities within a landscape corridor thereby increasing the potential for bio diversity whilst including the attenuation facilities within a wider amenity corridor. It also means the overall number of drainage attenuation facilities can be reduced thereby decreasing maintenance requirements whilst maximising wider environmental benefits

4.4.11. The design methodology is very similar to the segregated strategy in using ponds and conveyance channels to store and treat the runoff. However, it has a greater focus on dealing with water at source and combining storage features where possible.

4.4.12. Within the integrated drainage strategy, it has been assumed that 40% of water falling on the residential parcels will be dealt with at source or on plot. Potential methods for this are discussed in

detail in paragraph 4.6.3 this approach follows best practice design and avoids a pipe to pond design.

Table 1 – Catchment Table

Catchment Reference (refer to Appendix B)	Total Area (ha)	Total Impermeable Area (ha)	Allowable Discharge Rate (l/s)	Attenuation Storage Required (m^3)
1	11.48	8.6	34.4	6,800
2	2.5	2.5	10	2,100
3	4.38	3.08	12.3	2,500
4	9.39	6.2	24.8	4,900
5	7.82	6.16	24.6	4,800
6	2.7	1.8	7.2	1,500
7	4.7	3.1	12.4	2,500
8	3.41	2.43	9.7	2,000
9	6.5	5.16	20.6	4,100
10	4.78	3.15	12.6	2,600
11	9.6	6.7	26.8	5,300
12	11.85	7.81	31.3	6,200
13	11.68	7.7	30.8	6,100
14	9.6	6.6	27.2	5,400
15	20.40	15.44	61.8	12,100
16	7.2	6.1	24.4	4,900
17	4.3	2.8	11.2	2,300
18	6.44	4.25	12.8	3,500
18A	5.95	5.95	23.8	4,800
19	5.2	3.4	13.6	2,800
20	4.9	3.2	12.8	2,600
21	6.85	4.52	18.1	3,600
22	5.38	3.69	14.8	3,000

23	11.2	9.9	39.6	7,800
24	1.63	1.08	4.3	1,000
25	1.32	1.32	5.28	1,200
Commercial 1	61.8	55.62	222.5	44,100
Commercial 2	17.1	15.39	61.6	13,150

4.5. OVERLAND FLOW ROUTES

4.5.1. Any rainfall event with intensity in excess of that of the design capacity of the development surface water drainage network may result in temporary above ground flooding, potentially giving rise to overland flows.

4.5.2. Overland flows in excess of the capacity of the positive drainage system will be routed away from buildings towards the less vulnerable highways, open space and surface water attenuation provision.

4.5.3. Existing and proposed overland flow routes can be seen in Appendix E.

4.6. SUDS TOOLKIT

4.6.1. Milton Keynes Council Surface Water Drainage Guidance for Developers requires that all new developments implement Sustainable Drainage Systems (SuDS) as the primary means of controlling surface water run-off in order to maintain flow rates and volumes discharged to the identified receptor post development.

4.6.2. In addition to the water control benefits, The SuDS Manual (CIRIA C753) states that “SuDS can treat and clean surface water runoff from urban areas so that the receiving environment is protected, while at the same time conveying, storing and infiltrating surface water to protect flood risk, river morphology and water resources, and delivering amenity and biodiversity value for the development.”

4.6.3. At the proposed site, a drainage strategy has been prepared in conjunction with the masterplan development thus making space for multi-function SuDS within the site boundary. Table 2 below provides a summary of the SuDS selection process and measures that will be introduced into the development

Table 2 - Summary of SuDS Selection

Feature	Description	Selection
Green Roofs	Green roofs are systems which cover a building's roof with vegetation. They are laid over a drainage layer, with other layers providing protection, waterproofing and insulation.	✓ Green roofs have the potential to be used within the commercial land and for any school or community type development areas.
Filter Strips	These are wide, gently sloping areas of grass or other dense vegetation that treat runoff from adjacent impermeable areas.	✓ Filter strips have the potential to be used within all settings
Pervious Surfaces	Pervious surfaces allow rainwater to infiltrate through the surface into an underlying storage layer, where water is stored before infiltration to the ground, reuse, or release to surface water.	✓ Pervious surfaces have the potential to be used within communal parking areas across all types of development
Bio-retention / raingardens	Bioretention systems are areas of vegetation into which rainwater and runoff can be directed. These are particularly affected at providing water quality improvements.	✓ These have potential to be used within the residential setting.
Swales	Swales are broad, shallow channels covered by grass or other suitable vegetation. They are designed to convey and/or store runoff and can infiltrate the water into the ground (if ground conditions allow).	✓ Swales have potential to be used adjacent to highways and within the residential development. MK highways have however stated they will not accept swales as a methodology for draining adoptable highways
Infiltration Basins	Infiltration basins are depressions in the surface that are designed to store runoff and infiltrate the water to the ground. They may also be landscaped to provide aesthetic and amenity value.	× Infiltration is not deemed to be a likely option on this site.
Wet Ponds	Wet ponds are basins that have a permanent pool of water for water quality treatment. They provide temporary storage for additional storm runoff above the permanent water level. Wet ponds may provide amenity and wildlife benefits.	✓ It is the intention to have some of the ponds on site within the residential green corridors as wet ponds.
Detention Basins	Detention basins are normally dry, though they may have small permanent pools at the inlet and outlet. They are designed to detain a certain volume of runoff as well as providing water quality treatment.	✓ Detention pond will be used where wet ponds aren't viable for the strategic network and also have the potential to be used within residential developments

		as smaller basins in communal areas.
Geocellular Storage	Geocellular storage structures are below-ground attenuation features. These are typically formed using crates which provide a high void space for attenuation and water quantity control.	✓ Geocellular storage has the potential to be used where space is constrained such as within the commercial areas.

4.6.4. The SuDS Manual (CIRIA C753) states the SuDS Management Train is a central design concept for SuDS. SuDS should not be thought of as an individual component, but as an interconnected system designed to manage, treat and make best use of surface water, from where it falls as rain to the point at which it is discharged into the receiving environment beyond the boundaries of the site.

4.6.5. There are six specific functions provided by SuDS components (rainwater harvesting, pervious surface systems, infiltration systems, conveyance systems, storage systems and treatment systems), which are not independent with one component being able to provide two or more functions.

4.6.6. There are many types of SuDS components which means that SuDS can be delivered anywhere, tailored to individual local contexts. Wherever possible, runoff should be managed at source with residual flows then conveyed downstream to further storage or treatment components.

4.6.7. Treatment design should implement SuDS components that use a range of treatment processes to reduce contaminant level in runoff to acceptable levels. This can be facilitated by the SuDS management train of a number of components in series that provide a range of treatment processes, delivering gradual improvement in water quality and providing an environmental buffer for accidental spills or unexpected high pollutant loadings from the site

4.6.8. The above has been considered in applying SuDS into the proposed development to help provide; prevention in terms of pollution, source control and site controls.

4.6.9. The toolkit of SuDS provided above is intended to allow a range of options to be selected that works for each site with a preference towards open vegetated solutions due the opportunity to generate additional benefits beyond water control.

4.7. MAINTENANCE AND MANAGEMENT

4.7.1. The proposed on-site surface water drainage network will be designed to the current version og the Design and Construction Guidance, Surface Water Drainage Guidance for Developers and CIRIA SuDS Manual C753 and will be offered for adoption by Anglian Water

4.7.2. The proposed on-site foul drainage network will be designed to the current version of Design and Construction Guidance and will be offered for adoption by Anglian Water.

4.7.3. With regards to SuDS, in view of the central government decision not to create SAB's, some uncertainty remains regarding by whom and how these features will be adopted and maintained. With the above in mind, it is likely that, should the SuDS be offered to the council (Parks Trust) for adoption and maintenance, commuted sums will be required for all adoptable SuDS processes.

4.7.4. As an alternative, it is becoming increasingly common for SuDS features to be operated and maintained by a third-party private maintenance company. Should this be necessary, a third-party

management company would be established to maintain the features in perpetuity. An adoption agreement between the final site developer and Maintenance Company would be based upon the CIRIA ICoP MA2 SuDS Maintenance Framework Agreement.

4.7.5. In addition, Sewerage Sector Guidance has come into force during 2020. This gives the ability for sewerage undertakers to adopt SuDS features under certain conditions such as conveying flows. There may therefore be the potential for SuDS features to be adopted by Anglian Water.

4.7.6. It is currently proposed that i) Piped drainage systems within the highway and draining the highway only will be offered to the highway authority for adoption II) attenuation facilities that drain the highway only will be offered to the highway authority iii) Piped networks within adopted highway or public open space will be offered to the sewerage undertaker for adoption iv) the attenuation facilities will be offered to the Parks trust v) the maintenance of the watercourses within the site boundary is currently the subject of discussions between MKC/ the Parks Trust and the IDB. Ideally the maintenance of these watercourses should be under one body to ensure they are maintained appropriately for their setting. Final maintenance responsibility will be determined during the planning determination period.

4.7.7. A typical maintenance schedule of the attenuation and flow control devices proposed on site are shown in tables below.

Permeable Paving Indicative Maintenance Schedule

Frequency	Action
Monthly	▪ Refer to manufacturer specifications ▪ For sealed systems, inspections of outfalls should be undertaken
Six Monthly	▪ Brushing and vacuuming to manufacturer requirements. Re-grit where necessary
Annually	▪ N/A
As Required	▪ Inspect/check all inlets, outlets, inspection chambers, surface and overflows (where required) to ensure that they are in good condition, free from blockages and operating as designed. Take action where required (for 3 months following installation)
Following all significant storm events	▪ Inspect and carry out essential recovery works to return feature to full working order.

Attenuation Tank Indicative Maintenance Schedule

Frequency	Action
Monthly	▪ Inspect and identify any areas that are not operating correctly. If required, take remedial action (for three months following installation).
Six Monthly	▪ Inspect and identify any areas that are not operating correctly. If required, take remedial action (following initial 3 month period)
Annually	▪ Remove sediment from pre-treatment structures
As Required	▪ De-silt as required
Following all significant storm events	▪ Inspect and carry out essential recovery works to return feature to full working order.

Flow Control (e.g Hydrobrake) Indicative Maintenance Schedule

Frequency	Action
Monthly	▪ Inspect and identify any areas that are not operating correctly. If required, take remedial action (for three months following installation)
Six Monthly	▪ Inspect and identify any areas that are not operating correctly. If required, take remedial action. ▪ Remove sediment from pre-treatment structures
Annually	▪ N/A
Following all significant storm events	▪ Inspect and carry out essential recovery works to return the feature to full working order.

Green Roof Indicative Maintenance Schedule

Frequency	Action
Monthly	▪ Mow grasses (where required) and remove resultant clippings (during ▪ growing season only). ▪ I During establishment, replace dead plants as required (for 12 months following installation)
Six Monthly	▪ Remove fallen leaves and debris from deciduous plant foliage. ▪ Remove nuisance and invasive vegetation, including weeds. ▪ Remove debris & litter to prevent clogging of inlet drains and interference with plant growth. ▪ Noxious weed treatment (3 times a year).
Annually	▪ Replace dead plants as required (typically in the Autumn). ▪ Inspect all components including soil substrate, vegetation, drains, irrigation systems (if applicable), membranes, and roof structure for proper operation, integrity of waterproofing and structural stability, take action where required. ▪ Inspect soil substrate for evidence of erosion channels and identify any sediment sources, take action where required. ▪ Inspect drain inlets to ensure unrestricted runoff from the drainage layer to the conveyance or roof drain system, take action where required. ▪ Inspect underside of roof for evidence of leakage, take action where required. ▪ Inspect and document the presence of wildlife.
Following all significant storm events	▪ Inspect and carry out essential recovery works to return the feature to full working order.

Filter Drain Indicative Maintenance Schedule

Frequency	Action
Monthly	▪ Litter and debris removal. ▪ Mow grasses (where required to promote lateral runoff inflow) and remove resultant clippings (during growing season only). ▪ Remove nuisance and invasive vegetation (for 12 months following installation). ▪ Inspect/check all inlets, outlets, surface and overflows (where required) to ensure that they are in good condition, free from blockages and operating as designed. Take action where required.
Six Monthly	▪ N/A
Annually	▪ Remove nuisance and invasive vegetation ▪ Inspect and document the presence of wildlife

As-Required	▪ Repair erosion or other damage by re-turfing, reseeding or replacing filter material ▪ Re-level uneven surfaces and reinstate design levels (typically every 60 month period) ▪ Remove and replace top 300 – 500mm of gravel, clean and replace where required (typically every 60 month period) ▪ Remove and dispose of oils or petrol residues using safe standard practices
Following all significant storm events	▪ Inspect and carry out essential recovery works to return the feature to full working order.

Swale Indicative Maintenance Schedule

Frequency	Action
Monthly	▪ Litter and debris removal. ▪ Mow grasses (where required to promote lateral runoff inflow) and remove resultant clippings (during growing season only). ▪ Remove nuisance and invasive vegetation (for 12 months following installation). ▪ Inspect/check all inlets, outlets, surface and overflows (where required) to ensure that they are in good condition, free from blockages and operating as designed. Take action where required.
Six Monthly	▪ Remove nuisance and invasive vegetation.
Annually	▪ Check for poor vegetation growth due to lack of sunlight or dropping of leaf litter and cut back adjacent vegetation where required. ▪ Re-seed areas of poor vegetation growth. Alter plant types to better suit conditions, where required. ▪ Inspect and document the presence of wildlife.
As-Required	▪ Repair erosion or other damage by re-turfing, reseeding or replacing filter material. ▪ Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface where required. ▪ (typically every 60 month period). ▪ Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip, where required. ▪ Remove and dispose of oils or petrol residues using safe standard practices.

Following all significant storm events	▪ Inspect and carry out essential recovery works to return the feature to full working order.

Detention Basin Indicative Maintenance Schedule

Frequency	Action
Monthly	▪ Litter and debris removal. ▪ Mow grasses (where required to promote lateral runoff inflow) and remove resultant clippings (during growing season only). ▪ Remove nuisance and invasive vegetation (for 12 months following installation). ▪ Inspect/check all inlets, outlets, surface and overflows (where required) to ensure that they are in good condition, free from blockages and operating as designed. Take action where required.
Six Monthly	▪ Remove nuisance and invasive vegetation.
Annually	▪ Remove all dead growth prior to the start of growing season. ▪ Re-seed areas of poor vegetation growth. Alter plant types to better suit conditions, where required. ▪ Inspect and document the presence of wildlife. ▪ Remove sediment from inlets, outlet and forebay ▪ Manage wetland plants, where required
As-Required	▪ Prune and trim trees and remove cuttings. ▪ Remove sediment from forebay, when 50% full and from micropools if volume reduced by more than 25% ▪ Repair erosion or other damage by re-turfing or reseeding ▪ Re-level uneven surfaces and reinstate design levels (typically once every 60 month period) ▪ Remove and dispose of oils or petrol residues using safe standard practices
Following all significant storm events	▪ Inspect and carry out essential recovery works to return the feature to full working order.

Rain Garden Indicative Maintenance Schedule

Frequency	Action
Monthly	▪ Litter and debris removal. ▪ Mulching (where required) ▪ Inspect/check all inlets, outlets, surface and overflows (where required) to ensure that they are in good condition, free from blockages and operating as designed. Take action where required

Six Monthly	▪ Remove nuisance and invasive vegetation.
Annually	▪ Pruning and trimming of trees. ▪ Inspect and document the presence of wildlife. ▪ Check for poor vegetation growth due to lack of sunlight or dropping of leaf litter, and cut back adjacent vegetation where required.
As-Required	▪ Repair erosion or other damage by re-mulching or re-seeding. ▪ Re-seed areas of poor vegetation growth. Alter plant types to better suit conditions, if required. ▪ Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface (typically every 60 month period). ▪ Remove build-up of sediment, reinstate design levels (typically every 60 month period). ▪ Remove and dispose of oils or petrol residues using safe standard practices.
Following all significant storm events	▪ Inspect and carry out essential recovery works to return the feature to full working order.

4.7.8. The proposed maintenance regimes for the devices should be in accordance with The SuDS Manual (CIRIA C753) and other best practice guidelines and in accordance with manufacturer's recommendations. This will ensure the design performance, structural integrity and where applicable-appearance of each feature is maintained throughout its lifetime.

4.7.9. The details of the party responsible for maintenance of each feature will be confirmed prior to occupation of the proposed development. Until such times as this may be determined.

5. CONCLUSIONS

5.1.1. Based on the above the following is concluded

- It is proposed to drain the site by using an integrated drainage system to serve both the highways and the individual development parcels
- Rainfall will be managed at source and will utilise the SuDs train in accordance with best practise
- Priority will be given to above ground green storage systems where possible
- The discharge rate for all events up to and including the 1 in 100 year +40% climate change event will be 4l/s/impermeable hectare
- The drainage system will have no flooding above ground for the 1 in 30 year event and no uncontrolled flooding off site for the 1 in 100 year plus 40% climate change event with an allowance for 10% development creep in residential areas
- 40% of residential run off will be dealt with using the toolkit above to avoid a pipe to pond solution and retain water as close to the source as practicable
- It is proposed that Milton Keynes Council will adopt and maintain drains and ponds serving highway only drainage and that the Parks Trust will maintain all other ponds that serve both highways and residential drainage with Anglian Water responsible for any sewers. IDB will maintain jurisdiction over watercourses but the maintenance will be undertaken by the Parks Trust
- During exceedance events surface water will be directed along highways and towards open attenuation facilities

Appendix A

GREENFIELD CALCULATIONS

IH 124 Mean Annual Flood

Input

Return Period (years)	1	Soil	0.450
Area (ha)	50.000	Urban	0.000
SAAR (mm)	650	Region Number	Region 4

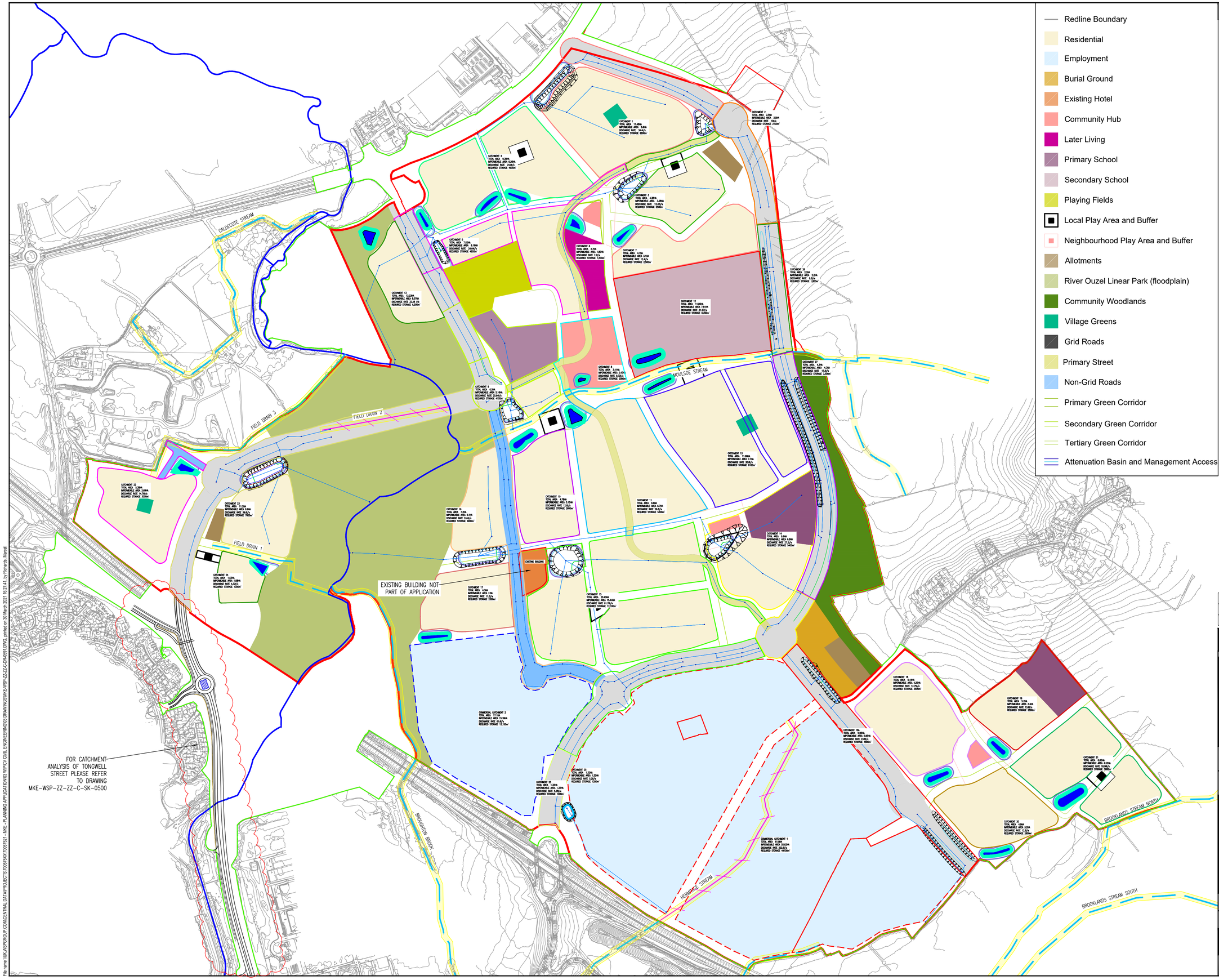
Results l/s

QBAR Rural	201.4
QBAR Urban	201.4
Q1 year	167.2
Q1 year	167.2
Q2 years	180.5
Q5 years	247.7
Q10 years	300.1
Q20 years	358.0
Q25 years	378.3
Q30 years	394.6
Q50 years	443.5
Q100 years	517.6
Q200 years	608.3
Q250 years	638.5
Q1000 years	837.9

201.4/50 = 4.028l/s/ha

Appendix B

CATCHMENT PLAN



NOTES

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2. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED.
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7. DRAWING SHOULD BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT SCHEME DRAWINGS.
8. ALL OUTFALLS HAVE BEEN VISUALLY IDENTIFIED DURING SITE WALKOVER AND ARE ASSUMED VIABLE TO BE UTILISED AS SURFACE WATER OUTFALLS. DOWNSTREAM SURFACE WATER NETWORK TO BE CONFIRMED AT THE NEXT STAGE OF DESIGN.
9. CCTV SURVEY OF IDENTIFIED OUTFALLS TO BE UNDERTAKEN AT THE NEXT STAGE OF DESIGN.
10. DESIGN ASSUMPTIONS:
    - 10.1. RESIDENTIAL AND SCHOOL CATCHMENTS ASSUMED TO BE 60% IMPERMEABLE WITH 10% DEVELOPMENT CREEP FOR A TOTAL IMPERMEABILITY 66%.
    - 10.2. COMMERCIAL CATCHMENTS ASSUMED TO BE 90% IMPERMEABLE.
    - 10.3. HIGHWAY ASSUMED TO BE 10% IMPERMEABLE.
    - 10.4. ALL GREEN FIELDS, ALLOTMENTS AND PLAYGROUNDS ASSUMED TO BE PERMEABLE AND SO NO FORMAL DRAINAGE REQUIRED.
    - 10.5. 300mm FREEBOARD ON ALL PONDS ABOVE 1 IN 100 YEAR PLUS 40% CLIMATE CHANGE LEVEL.
    - 10.6. 150mm FREEBOARD ON ALL SWALES ABOVE THE 1 IN 100 YEAR PLUS 40% CLIMATE CHANGE EVENT.
    - 10.7. INFORMATION PROVIDED ON THIS DRAWING IS FOR OUTLINE PLANNING ONLY. WHERE DETAILED/FULL PLANNING INFORMATION IS REQUIRED PLEASE REFER TO THE DETAILED LAYOUT DRAWINGS DR-0501-0542.

KEY

- PLANNING BOUNDARY
- LAND OWNERSHIP BOUNDARY
- PROPOSED SURFACE WATER PIPES
- PROPOSED SURFACE WATER MANHOLES
- INDICATIVE PROPOSED PONDS
- IDB WATERCOURSE TO BE EXTINGUISHED
- IDB WATERCOURSE WITH 9m EASEMENT TO REMAIN

REV	DATE	BY	DESCRIPTION	CHK	APP
P02	29/03/2021	MAR	CATCHMENT INFORMATION UPDATED	PU	SP
P01	05/03/2021	DSF	FIRST ISSUE	PU	SP

DRAWING STATUS: S0 - WORK IN PROGRESS

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CLIENT: BERKELEY ST JAMES

ARCHITECT: JTP / STEPHEN GEORGE AND PARTNERS

SITE/PROJECT: MILTON KEYNES EAST

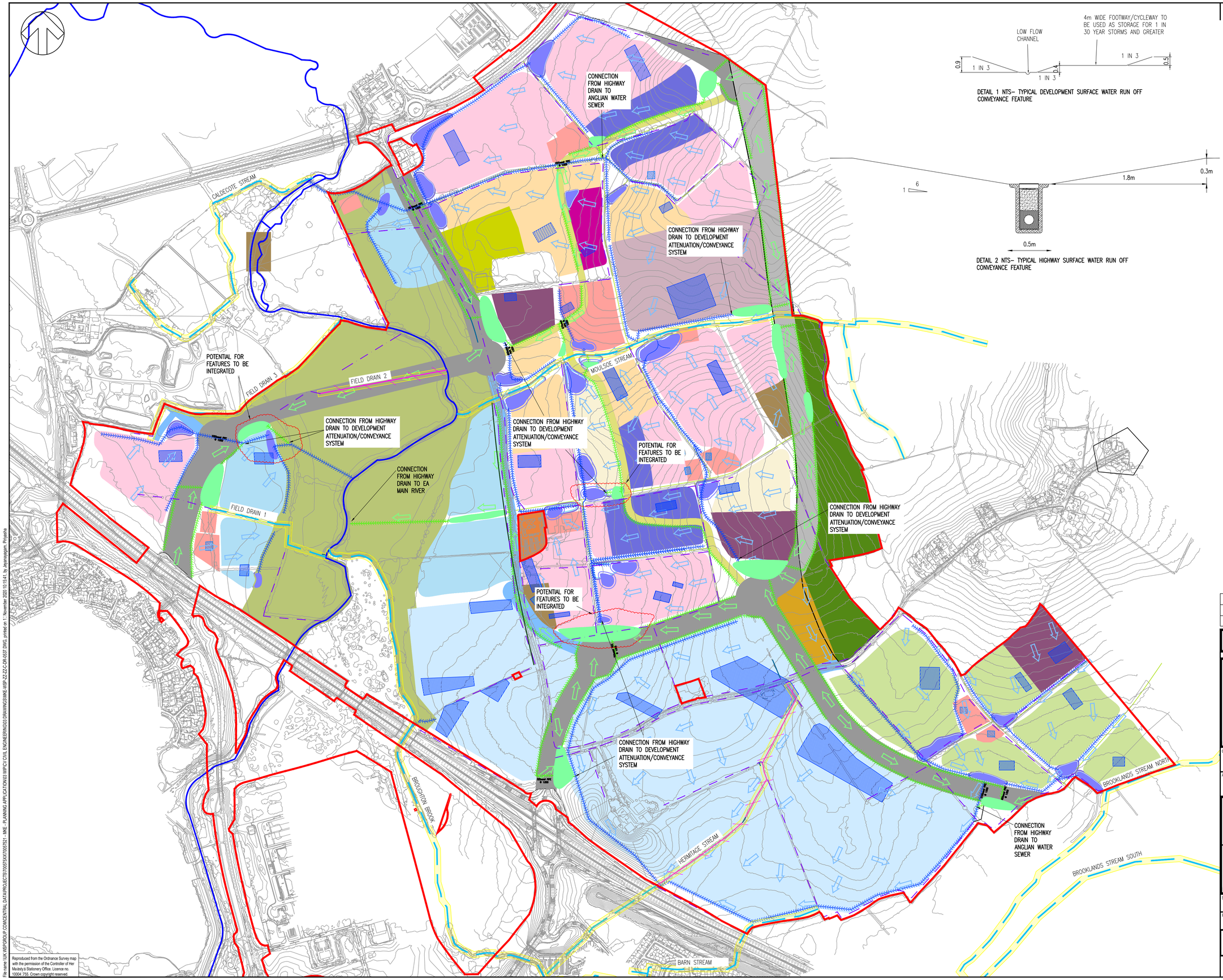
TITLE: PROPOSED CATCHMENT PLAN

SCALE @ A1:	CHECKED:		APPROVED:
1:5000	BU		SP
PROJECT NO:	DESIGNED:	DRAWN:	DATE:
70057521	DSF	OPL	March 21

DRAWING No: MKE-WSP-ZZ-ZZ-C-DR-0591 REV: P02

Appendix C

SEGREGATED DRAINAGE STRATEGY



LOW FLOW CHANNEL

4m WIDE FOOTWAY/CYCLEWAY TO BE USED AS STORAGE FOR 1 IN 30 YEAR STORMS AND GREATER

0.9 1 IN 3 0.4 1 IN 3 1 IN 3 0.5

DETAIL 1 NTS– TYPICAL DEVELOPMENT SURFACE WATER RUN OFF CONVEYANCE FEATURE

1 6 1.8m 0.3m 0.5m

DETAIL 2 NTS– TYPICAL HIGHWAY SURFACE WATER RUN OFF CONVEYANCE FEATURE

DO NOT SCALE

NOTES

1. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH ALL RELEVANT DOCUMENTATION, DRAWINGS AND STANDARD DETAILS.
2. INFORMATION REGARDING THE LOCATION AND DEPTH OF EXISTING SERVICES CANNOT BE GUARANTEED BY THE STATUTORY UNDERTAKER.
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5. HIGHWAY CORRIDOR HAS BEEN ASSUMED TO BE 100% IMPERMEABLE UNTIL FURTHER DESIGN INFORMATION IS AVAILABLE.
6. IN THE ABSENCE OF A VERTICAL HIGHWAY DESIGN IT HAS BEEN GENERALLY ASSUMED THAT THE HIGHWAY WILL FOLLOW EXISTING GROUND LEVELS.

KEY

- SITE BOUNDARY
- EXISTING DITCH MAINTAINED BY CURRENT LAND OWNER
- EXISTING IDB WATERCOURSE ADOPTED AND MAINTAINED BY THE IDB WITH 9m EASEMENT
- EXISTING IDB WATERCOURSE TO BE EXTINGUISHED
- EXISTING MAIN RIVER ADOPTED AND MAINTAINED BY THE EA
- PROPOSED SWALE TO BE ADOPTED AND MAINTAINED BY ANGLIAN WATER SEE DETAIL 1
- PROPOSED SWALE TO BE ADOPTED AND MAINTAINED BY MILTON KEYNES HIGHWAYS AUTHORITY SEE DETAIL 2
- PROPOSED POND TO BE ADOPTED AND MAINTAINED BY ANGLIAN WATER
- PROPOSED POND TO BE ADOPTED AND MAINTAINED BY MILTON KEYNES COUNCIL
- PROPOSED SOURCE CONTROL METHODS, ADOPTION AND MAINTENANCE TO BE DECIDED
- EXISTING HEDGE BOUNDARY
- HIGHWAY FLOW ARROWS
- PARCEL FLOW ARROWS

REV	DATE	BY	DESCRIPTION	CHK	APP
P02	18/11/2020	PJ	ADDITION OF PIPE SIZES	S	PM
P01	16/10/2020	MAR	FIRST ISSUE	S	S P

DRAWING STATUS: S - OR IN ORM ION

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CLIENT: BERKELEY GROUP

ARCHITECT: JTP/STEPHEN GEORGE AND PARTNERS

SITE/PROJECT: MILTON KEYNES EAST

TITLE: MAINTENANCE PLAN

SCALE @ A1:	CHECKED:		APPROVED:
1:5000	SAP		DSF
PROJECT NO: 70057521	DESIGNED: DSF	DRAWN: MAR	DATE: November 20

DRAWING No: MKE-WSP-ZZ-ZZ-X-DR-0537 REV: P01

File name: \\UK.WSPGROUP.COM\CENTRAL DATA\PROJECTS\70057521\70057521 - MKE - PLANNING APPLICATION\03 WIP\01 CIVIL ENGINEERING\03 DRAWINGS\MKE-WSP-ZZ-ZZ-DR-0537.DWG, printed on 11 November 2020 10:15:41, by Jeyanayagan, Priyatha

Appendix D

INTEGRATED DRAINAGE STRATEGY

EXISTING BUILDING NOT PART OF APPLICATION

- Redline Boundary
- Residential
- Employment
- Burial Ground
- Existing Hotel
- Community Hub
- Later Living
- Primary School
- Secondary School
- Playing Fields
- Local Play Area and Buffer
- Neighbourhood Play Area and Buffer
- Allotments
- River Ouzel Linear Park (floodplain)
- Community Woodlands
- Village Greens
- Grid Roads
- Primary Street
- Non-Grid Roads
- Primary Green Corridor
- Secondary Green Corridor
- Tertiary Green Corridor
- Attenuation Basin and Management Access

NOTES

1. ALL LEVELS ARE IN METERS ABOVE ORDNANCE DATUM.
2. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED.
3.
4.
5. SURFACE WATER STRATEGY IS INDICATIVE AND BASED ON MASTERPLANNING INFORMATION AT THE TIME OF PRODUCTION.
6. ALL SURFACE WATER CALCULATIONS WERE UNDERTAKEN USING MICRODRAINAGE SOFTWARE AND ARE SUBJECT TO DETAILED DESIGN.
7. DRAWING SHOULD BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT SCHEME DRAWINGS.
8. ALL OUTFALLS HAVE BEEN VISUALLY IDENTIFIED DURING SITE WALKOVER AND ARE ASSUMED VIABLE TO BE UTILISED AS SURFACE WATER OUTFALLS. DOWNSTREAM SURFACE WATER NETWORK TO BE CONFIRMED AT THE NEXT STAGE OF DESIGN.
9. CCTV SURVEY OF IDENTIFIED OUTFALLS TO BE UNDERTAKEN AT THE NEXT STAGE OF DESIGN.
10. DESIGN ASSUMPTIONS:
    - 10.1. RESIDENTIAL AND SCHOOL CATCHMENTS ASSUMED TO BE 60% IMPERMEABLE WITH 10% DEVELOPMENT CREEP FOR A TOTAL IMPERMEABILITY 66%.
    - 10.2. COMMERCIAL CATCHMENTS ASSUMED TO BE 90% IMPERMEABLE.
    - 10.3. HIGHWAY ASSUMED TO BE 10% IMPERMEABLE.
    - 10.4. ALL GREEN FIELDS, ALLOTMENTS AND PLAYGROUNDS ASSUMED TO BE PERMEABLE AND SO NO FORMAL DRAINAGE REQUIRED.
    - 10.5. 300mm FREEBOARD ON ALL PONDS ABOVE 1 IN 100 YEAR PLUS 40% CLIMATE CHANGE LEVEL.
    - 10.6. 150mm FREEBOARD ON ALL SWALES ABOVE THE 1 IN 100 YEAR PLUS 40% CLIMATE CHANGE EVENT.

KEY

- PLANNING BOUNDARY
- LAND OWNERSHIP BOUNDARY
- PROPOSED SURFACE WATER PIPES
- PROPOSED SURFACE WATER MANHOLES
- PROPOSED PONDS FOR OUTLINE PLANNING
- PROPOSED PONDS FOR FULL PLANNING
- IDB WATERCOURSE TO BE EXTINGUISHED
- IDB WATERCOURSE WITH 9m EASEMENT TO REMAIN

REV	DATE	BY	DESCRIPTION	CHK	APP
P02	29/03/2021	MAR	PONDS AND BOUNDARIES UPDATED	PU	SP
P01	05/03/2021	DSF	FIRST ISSUE	PU	SP

DRAWING STATUS: S0 - WORK IN PROGRESS

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ARCHITECT: JTP / STEPHEN GEORGE AND PARTNERS

SITE/PROJECT: MILTON KEYNES EAST

TITLE: PROPOSED DRAINAGE STRATEGY

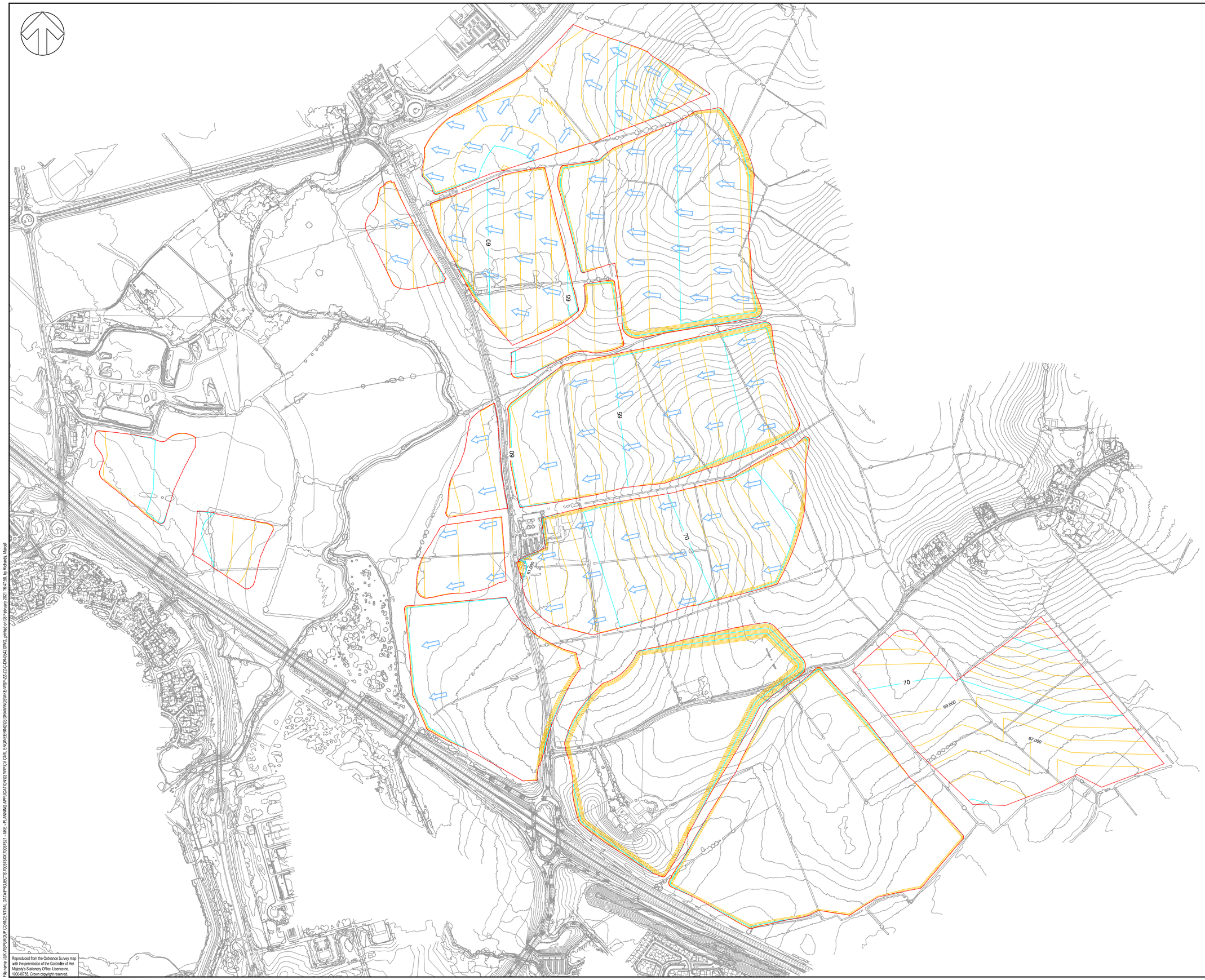
SCALE @ A1:	CHECKED:		APPROVED:
1:5000	BU		SP
PROJECT NO: 70057521	DESIGNED: DSF	DRAWN: OPL	DATE: March 21

DRAWING No: MKE-WSP-ZZ-ZZ-C-DR-0592 REV: P02

File name: \\UK.WSPGROUP.COM\CENTRAL DATA\PROJECTS\70057521\70057521 - MKE - PLANNING APPLICATION\03 WIP\CV CIVIL ENGINEERING\03 DRAWINGS\MKE-WSP-ZZ-ZZ-C-DR-0592.DWG, printed on 30 March 2021 16:34:15, by Roberts, Marcel

Appendix E

EXISTING AND PROPOSED OVERLAND FLOW ROUTES



DO NOT SCALE

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6. IN THE ABSENCE OF A VERTICAL HIGHWAY DESIGN IT HAS BEEN GENERALLY ASSUMED THAT THE HIGHWAY WILL FOLLOW EXISTING GROUND LEVELS.

REV	DATE	BY	DESCRIPTION	CHK	APP
P01	XX/XX/2021	MAR	FIRST ISSUE	DSF	SAP

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CLIENT:
BERKELEY GROUP

ARCHITECT:
JTP/STEPHEN GEORGE AND PARTNERS

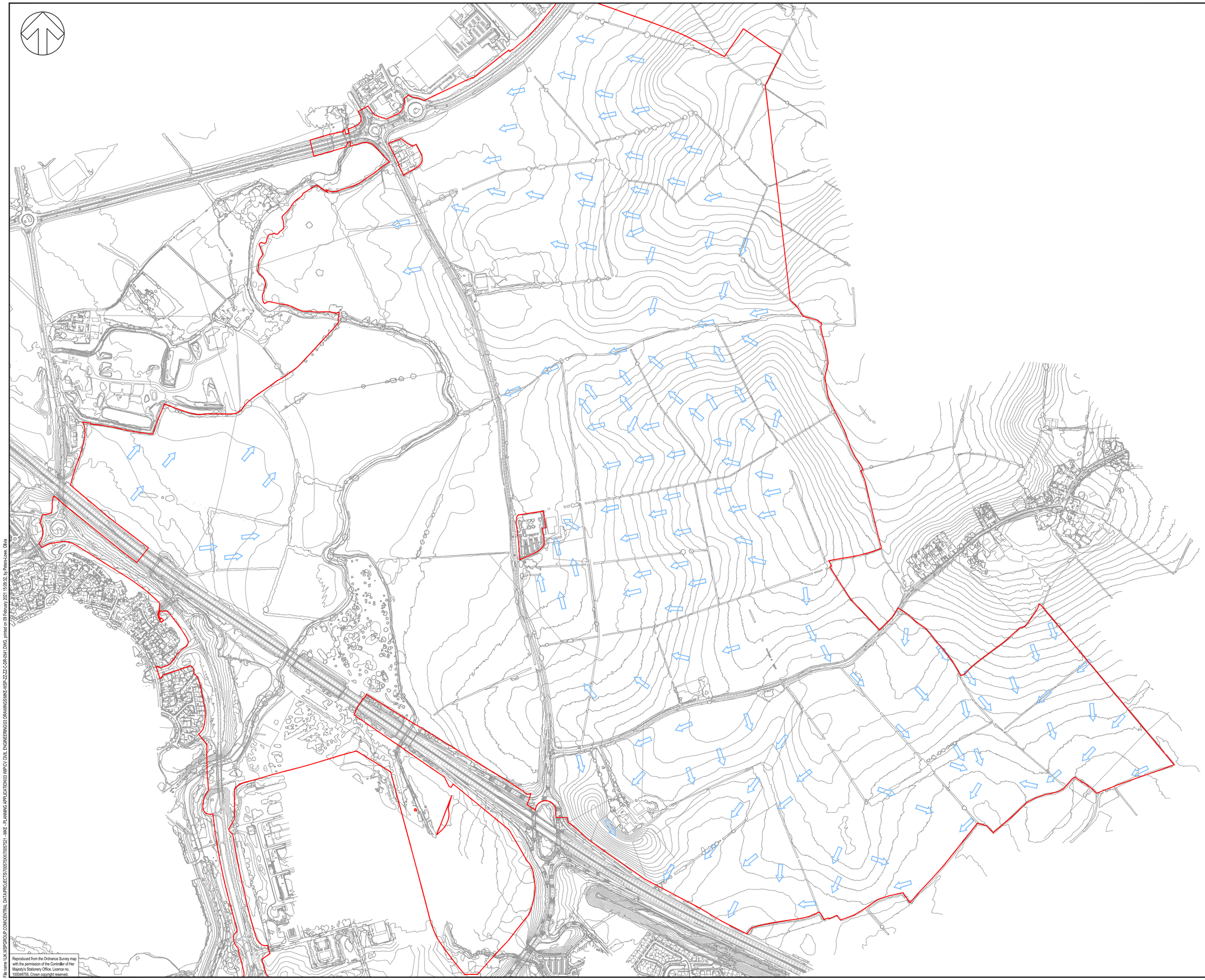
SITE/PROJECT:
MILTON KEYNES EAST

TITLE:
PROPOSED EXCEEDANCE FLOW ROUTE PLAN

SCALE @ A1:	CHECKED:		APPROVED:
1:5000	SAP		DSF
PROJECT NO:	DESIGNED:	DRAWN:	DATE:
70057521	DSF	MAR	February 21

DRAWING No: MKE-WSP-ZZ-ZZ-X-DR-0542 REV: P01

File name: I:\UK-VS\SP\GROUP COM\CENTRAL DATA\PROJECTS\70057521\70057521 - MKE - PLANNING APPLICATION\03 WIP\CIV CIVIL ENGINEERING\03 DRAWINGS\MKE-WSP-ZZ-ZZ-C-DR-0542.DWG, printed on 08 February 2021 16:47:58, by Richards, Manpal



DO NOT SCALE

NOTES

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2. INFORMATION REGARDING THE LOCATION AND DEPTH OF EXISTING SERVICES CANNOT BE GUARANTEED BY THE STATUTORY UNDERTAKER.
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6. IN THE ABSENCE OF A VERTICAL HIGHWAY DESIGN IT HAS BEEN GENERALLY ASSUMED THAT THE HIGHWAY WILL FOLLOW EXISTING GROUND LEVELS.

KEY

SITE BOUNDARY

DIRECTION OF FLOW

REV	DATE	BY	DESCRIPTION	CHK	APP
P01	XX/XX/2021	MAR	FIRST ISSUE	DSF	SAP

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ARCHITECT:
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SITE/PROJECT:
MILTON KEYNES EAST

TITLE:
EXISTING EXCEEDANCE FLOW ROUTE PLAN

SCALE @ A1:	CHECKED:		APPROVED:
1:5000	SAP		DSF
PROJECT NO:	DESIGNED:	DRAWN:	DATE:
70057521	DSF	MAR	February 21

DRAWING No: MKE-WSP-ZZ-ZZ-X-DR-0541 REV: P01

Appendix F

SUPPORTING CALCULATIONS

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.193	0.193	25.2	2437.8	O K
30 min Summer	0.247	0.247	33.4	3128.2	O K
60 min Summer	0.299	0.299	34.2	3796.6	O K
120 min Summer	0.363	0.363	34.4	4621.1	O K
180 min Summer	0.400	0.400	34.4	5099.3	O K
240 min Summer	0.424	0.424	34.4	5406.8	O K
360 min Summer	0.450	0.450	34.4	5749.0	O K
480 min Summer	0.462	0.462	34.4	5903.6	O K
600 min Summer	0.467	0.467	34.4	5964.9	O K
720 min Summer	0.467	0.467	34.4	5973.2	O K
960 min Summer	0.462	0.462	34.4	5897.0	O K
1440 min Summer	0.441	0.441	34.4	5623.5	O K
2160 min Summer	0.417	0.417	34.4	5313.0	O K
2880 min Summer	0.399	0.399	34.4	5077.7	O K
4320 min Summer	0.372	0.372	34.4	4734.9	O K
5760 min Summer	0.351	0.351	34.4	4466.2	O K
7200 min Summer	0.335	0.335	34.4	4251.7	O K
8640 min Summer	0.321	0.321	34.3	4078.9	O K
10080 min Summer	0.311	0.311	34.3	3942.6	O K
15 min Winter	0.216	0.216	29.4	2729.4	O K
30 min Winter	0.277	0.277	33.9	3506.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	152.119	0.0	1242.4	23
30 min Summer	98.091	0.0	1735.2	38
60 min Summer	59.966	0.0	2911.6	68
120 min Summer	36.932	0.0	3648.2	126
180 min Summer	27.466	0.0	4068.8	186
240 min Summer	22.073	0.0	4337.0	246
360 min Summer	15.975	0.0	4638.2	366
480 min Summer	12.562	0.0	4783.5	484
600 min Summer	10.371	0.0	4854.6	604
720 min Summer	8.843	0.0	4882.8	722
960 min Summer	6.842	0.0	4860.9	962
1440 min Summer	4.743	0.0	4657.8	1244
2160 min Summer	3.288	0.0	6739.8	1580
2880 min Summer	2.547	0.0	6871.5	1964
4320 min Summer	1.811	0.0	7027.1	2768
5760 min Summer	1.443	0.0	8513.5	3568
7200 min Summer	1.224	0.0	8978.7	4328
8640 min Summer	1.080	0.0	9422.7	5104
10080 min Summer	0.980	0.0	9813.2	5856
15 min Winter	152.119	0.0	1448.4	23
30 min Winter	98.091	0.0	1988.7	37

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Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	0.335	0.335	34.4	4258.8	O K
120 min Winter	0.407	0.407	34.4	5189.0	O K
180 min Winter	0.449	0.449	34.4	5732.0	O K
240 min Winter	0.476	0.476	34.4	6082.9	O K
360 min Winter	0.506	0.506	34.6	6473.8	O K
480 min Winter	0.519	0.519	35.0	6652.7	O K
600 min Winter	0.525	0.525	35.2	6728.8	O K
720 min Winter	0.526	0.526	35.3	6747.1	O K
960 min Winter	0.522	0.522	35.1	6685.1	O K
1440 min Winter	0.501	0.501	34.4	6415.8	O K
2160 min Winter	0.469	0.469	34.4	5989.0	O K
2880 min Winter	0.443	0.443	34.4	5648.5	O K
4320 min Winter	0.400	0.400	34.4	5094.2	O K
5760 min Winter	0.365	0.365	34.4	4639.8	O K
7200 min Winter	0.336	0.336	34.4	4267.8	O K
8640 min Winter	0.313	0.313	34.3	3965.2	O K
10080 min Winter	0.294	0.294	34.1	3724.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	59.966	0.0	3303.7	66
120 min Winter	36.932	0.0	4098.3	124
180 min Winter	27.466	0.0	4535.1	184
240 min Winter	22.073	0.0	4801.0	242
360 min Winter	15.975	0.0	5083.0	360
480 min Winter	12.562	0.0	5201.2	476
600 min Winter	10.371	0.0	5240.6	592
720 min Winter	8.843	0.0	5234.5	706
960 min Winter	6.842	0.0	5140.0	934
1440 min Winter	4.743	0.0	4804.5	1368
2160 min Winter	3.288	0.0	7538.3	1708
2880 min Winter	2.547	0.0	7672.9	2140
4320 min Winter	1.811	0.0	7801.0	3024
5760 min Winter	1.443	0.0	9568.3	3856
7200 min Winter	1.224	0.0	10099.1	4616
8640 min Winter	1.080	0.0	10609.0	5368
10080 min Winter	0.980	0.0	11065.2	6152

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 489026 242081 SP 89026 42081
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 8.600

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	4.300	4	8	4.300

Model Details

Storage is Online Cover Level (m) 1.000

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	12500.0	0.700	13346.2	1.000	13717.3

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0258-3440-0500-3440
Design Head (m)	0.500
Design Flow (l/s)	34.4
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	258
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	300
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.500	34.4
Flush-Flo™	0.340	34.4
Kick-Flo®	0.459	33.0
Mean Flow over Head Range	-	24.1

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	8.3	1.200	52.4	3.000	81.8	7.000	123.0
0.200	26.5	1.400	56.5	3.500	88.1	7.500	127.4
0.300	34.2	1.600	60.2	4.000	94.1	8.000	131.7
0.400	34.0	1.800	63.8	4.500	99.6	8.500	135.8
0.500	34.4	2.000	67.1	5.000	104.9	9.000	139.8
0.600	37.5	2.200	70.3	5.500	108.8	9.500	143.6
0.800	43.1	2.400	73.4	6.000	113.7		
1.000	48.0	2.600	76.3	6.500	118.4		

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.057	0.057	2.0	711.9	O K
30 min Summer	0.073	0.073	3.2	916.5	O K
60 min Summer	0.089	0.089	4.5	1116.6	O K
120 min Summer	0.109	0.109	6.2	1364.4	O K
180 min Summer	0.120	0.120	7.2	1509.8	O K
240 min Summer	0.128	0.128	7.8	1604.6	O K
360 min Summer	0.136	0.136	8.4	1713.8	O K
480 min Summer	0.140	0.140	8.7	1768.0	O K
600 min Summer	0.143	0.143	8.9	1795.4	O K
720 min Summer	0.144	0.144	8.9	1807.7	O K
960 min Summer	0.144	0.144	8.9	1806.1	O K
1440 min Summer	0.140	0.140	8.7	1764.4	O K
2160 min Summer	0.136	0.136	8.4	1716.6	O K
2880 min Summer	0.134	0.134	8.3	1688.8	O K
4320 min Summer	0.132	0.132	8.1	1664.6	O K
5760 min Summer	0.131	0.131	8.1	1653.4	O K
7200 min Summer	0.131	0.131	8.1	1648.3	O K
8640 min Summer	0.131	0.131	8.1	1647.9	O K
10080 min Summer	0.131	0.131	8.1	1651.3	O K
15 min Winter	0.064	0.064	2.5	797.2	O K
30 min Winter	0.082	0.082	3.9	1026.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	152.119	0.0	143.2	23
30 min Summer	98.091	0.0	217.3	38
60 min Summer	59.966	0.0	481.7	68
120 min Summer	36.932	0.0	645.2	128
180 min Summer	27.466	0.0	745.5	186
240 min Summer	22.073	0.0	812.9	246
360 min Summer	15.975	0.0	893.6	366
480 min Summer	12.562	0.0	936.4	484
600 min Summer	10.371	0.0	960.3	604
720 min Summer	8.843	0.0	973.2	724
960 min Summer	6.842	0.0	978.8	962
1440 min Summer	4.743	0.0	951.7	1346
2160 min Summer	3.288	0.0	1498.0	1672
2880 min Summer	2.547	0.0	1500.8	2048
4320 min Summer	1.811	0.0	1465.9	2856
5760 min Summer	1.443	0.0	2138.6	3688
7200 min Summer	1.224	0.0	2230.2	4472
8640 min Summer	1.080	0.0	2306.2	5272
10080 min Summer	0.980	0.0	2356.2	6056
15 min Winter	152.119	0.0	173.2	23
30 min Winter	98.091	0.0	260.7	38

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Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	0.100	0.100	5.4	1249.9	O K
120 min Winter	0.122	0.122	7.3	1527.5	O K
180 min Winter	0.134	0.134	8.3	1690.4	O K
240 min Winter	0.143	0.143	8.9	1796.8	O K
360 min Winter	0.152	0.152	9.5	1919.8	O K
480 min Winter	0.157	0.157	9.7	1981.2	O K
600 min Winter	0.160	0.160	9.8	2013.2	O K
720 min Winter	0.161	0.161	9.8	2028.3	O K
960 min Winter	0.161	0.161	9.8	2029.8	O K
1440 min Winter	0.158	0.158	9.7	1988.4	O K
2160 min Winter	0.152	0.152	9.5	1916.4	O K
2880 min Winter	0.149	0.149	9.3	1873.9	O K
4320 min Winter	0.144	0.144	9.0	1815.9	O K
5760 min Winter	0.141	0.141	8.7	1772.6	O K
7200 min Winter	0.138	0.138	8.6	1739.4	O K
8640 min Winter	0.136	0.136	8.4	1714.5	O K
10080 min Winter	0.135	0.135	8.3	1695.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	59.966	0.0	567.7	68
120 min Winter	36.932	0.0	754.8	126
180 min Winter	27.466	0.0	868.0	184
240 min Winter	22.073	0.0	943.3	242
360 min Winter	15.975	0.0	1032.4	360
480 min Winter	12.562	0.0	1078.9	476
600 min Winter	10.371	0.0	1104.1	592
720 min Winter	8.843	0.0	1117.0	708
960 min Winter	6.842	0.0	1120.7	934
1440 min Winter	4.743	0.0	1087.0	1370
2160 min Winter	3.288	0.0	1714.9	1712
2880 min Winter	2.547	0.0	1718.0	2164
4320 min Winter	1.811	0.0	1677.1	3072
5760 min Winter	1.443	0.0	2431.0	3928
7200 min Winter	1.224	0.0	2536.4	4824
8640 min Winter	1.080	0.0	2624.4	5624
10080 min Winter	0.980	0.0	2683.0	6448

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 489026 242081 SP 89026 42081
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 2.500

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	1.250	4	8	1.250