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Independent Flood Review

Milton Keynes – 27th May 2018 Flood Event

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FINAL

Quality information

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Revision	Revision date	Details	Authorised	Name	Position
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Appendix H - Economic Costs

1 Methodology

Impact categories

1.1 This section describes the method used to produce a high-level economic estimate of the costs resulting from the May 2018 flood in Milton Keynes. The approach adopted in this study is based on the methodology set up in the Multi-Coloured Manual (MCM), using values from the last updated version of the handbook (May 2019[1]).

1.2 Different levels of appraisal are recommended in the MCM, depending on the type, the scale, and the complexity of the required analysis as well as the level of details of available data. This study gives a high level estimate of the economic costs, based on an overview appraisal. Unless otherwise stated, all figures in this report are presented to a base date of 2019.

1.3 Economic damages for flood events are estimated for a suite of impact categories. These are then aggregated to give the total damages whilst avoiding any potential double counting.

1.4 The economic damage estimates of the following impact categories were included in this report:

- Residential property damages: physical damages to residential properties and contents;
- Non-residential properties damages (including business property damages): physical damage to non-residential properties and contents;
- Evacuation and temporary accommodation costs;
- Vehicle damages: physical damages to vehicles;
- Intangible health impacts: Intangible impacts of flooding (stress, anxiety…);
- Local authorities, emergency services and recovery costs: additional costs incurred by a number of organisations in tackling flood incidents and in the recovery process.

1.5 The economic damages associated with the following impact categories were not estimated quantitatively due to lack of sufficient data to make estimates. These damages are however discussed in qualitative terms in this study:

- Education: losses due to the flooding of schools;
- Public Health: losses due to the flooding of hospital services;
- Transport: damages requiring repairs and induced losses from disrupted journeys for roads;
- Utilities: damages requiring repairs and induced losses caused by loss and/or interrupted utility services for water and wastewater, electricity and gas.

[1] Penning-Rowsell et al. (2019). MultiColoured Manual Handbook for Economic Appraisal. Flood and Coastal Erosion Risk Management.

Economic damages

1.6 The estimates for these categories were calculated through using data obtained from different sources, including residents and businesses surveys, data provided by MKC internal officers, the National Receptor Dataset (NRD 2014) and the Multi-Coloured Handbook (MCH, 2019).

1.7 ***Multi - Coloured Handbook***: The methodology set up in the Multi-Coloured Manual and the values provided in the latest version of the Manual's handbook (2019) were used to estimate the economic damages of the 27th May 2018 flooding event.

1.8 ***Residents and business surveys:*** specific questions were included in the survey questionnaire in order to understand the economic impacts of the flooding event. The residents and business surveys responses informed the economic analysis by bringing together critical data related to flood type (i.e. internal/external), flood depth, house type, business sector, floor area, whether people were aware of a risk of flooding, potential damages to vehicles, requirement of temporary accommodation, etc. An example of each of the survey questionnaires is provided in Appendix B and Appendix C.

1.9 ***Data provided by MKC***: Milton Keynes internal officers from the emergency planning team kept records of properties and roads reported as being affected by the flooding at the time of the event and during the recovery phase. A long list of critical infrastructure damaged by the flooding was also provided. These data were included in the economic analysis and were used to complement information received by the respondents. Care was taken to avoid any double counting of affected properties.

1.10 ***National Receptor Dataset***: NRD is a spatial dataset which contains a number of GIS layers categorised into various themes. Amongst these, data relating to the type of building (type of houses or business sector) were of particular interest to the study. The data collected from the survey responses and by MKC internal officers were matched to the information contained in the NRD, after being geo-referenced. This has helped to complete the initial database used for the economic costs analysis where data was missing and to double check the reliability of available data.

2 Damage estimates by impact category

Damage to residential properties

2.1 **490 residential properties** located in the Borough of Milton Keynes were reported as having experienced internal flooding. The best estimate for residential property damages is **£4,716k** with a range of £1,749k to £8,018k.

2.2 Residential property damages consist of direct damages to building fabric, damage to inventory items, and clean-up costs. Ideally, to assess residential property damages, it is necessary to know the number of properties affected and either the flood depth or the average loss per property type. In this study these variables are difficult to determine accurately due to errors, inconsistencies and/or lack of detailed enough data.

2.3 Direct flood damages to residential properties reported as having experienced internal flooding were estimated using the relationship between flood level (depth) and incurred cost damages: the flood depth – damages curve for major flood storm of short duration as presented in the MCM (2019).

2.4 Within the flood depth damages curves available, house type is also taken into consideration for a more accurate estimate of the damages costs. Residential properties are classified into five categories: Detached, Semi-Detached, Terrace, Bungalow and Flat.

2.5 Data received from respondents were crossed check with info contained in the NRD GIS layer. In case of mismatch, values of damage associated to “residential sector average” were used. This was the case for 59 properties out of 490 reported. When the property type data was missing from respondents and/or other sources, the NRD info was used.

2.6 Data relating to the flood depth from respondents (25% of properties flooded) and from MKC were used to understand the relevant damages associated to the flood depth. When flood depth was missing for a specific property but info relating to flood depth was available for houses located on the same street, an average of the flood depths experienced locally was taken as a proxy. When no information was available locally, but properties were reported as having experienced internal flooding, a flood depth of 0.05m was assumed. Applying 0.05m is a low depth and therefore conservative. Sensitivity testing for unknown depth, using the average flood depth reported for the whole Milton Keynes area (0.096m), gives an estimate for residential properties damages of £4,837k (equivalent to 2.5% increase relative to the best estimate).

2.7 Sensitivity testing was also carried out on the flood depth for all properties, allowing for the economic costs to be calculated for a flood depth varying from a range of -0.1m to +0.1m relatively to the flood depth value used for the best estimate.

Damage to non-residential properties

2.8 **17 non-residential properties** (including businesses and critical infrastructure) were reported as having experienced internal flooding during the May 2018 flood. The best estimate for non-residential property damages is **£1,295k** with a range of £623k to £2,536k.

2.9 Non-residential property damages consist of direct damages to building fabric, damage to inventory items, and clean-up costs. Ideally, to assess these damages, it is necessary to know the number of properties affected and either the flood depth, the sector type, and the floor area or the average loss per non-residential property. These variables are difficult to determine accurately due to errors, inconsistencies and/or lack of detailed enough data.

2.10 Direct flood damages to non-residential properties reported as having experienced internal flooding were estimated using the relationship between flood level (depth) and incurred cost damages: a flood depth – damages curve for short duration flood with no flood warning as presented in the MCM (2019).

2.11 The flood depth damage curve estimates the direct damages (in £ per square metre) depending on the flood depth and the property type. There are 15 different sector types for non-residential property in the MCM.

2.12 Data received from respondents were cross-checked with info contained in the NRD GIS layer. When the property type and/or floor area data were missing from respondents and/or other sources, the NRD info was used.

2.13 Data relating to the flood depth from respondents and from MKC were used to understand the relevant damages associated to the flood depth. When flood depth was missing but non-residential were reported as having experienced internal flooding, a flood depth of 0.05m was assumed.

2.14 Sensitivity testing was carried out on the flood depth, allowing for the economic costs to be calculated for a flood depth varying from a range of -0.1m to +0.1m relative to the flood depth value used for the best estimate.

Damage to vehicles

2.15 The best estimate for damage to vehicles is **£64k** with a range of £50k to £121k.

2.16 A number of vehicles were reported as damaged during the flood event by respondents. Ideally, to assess damages to vehicles, it is necessary to know the number of damaged vehicles and the loss per vehicle. These data were not available from all sources.

2.17 Data held and provided MKC does not contain information on vehicles damages. Out of 191 properties reported internally flooded in the survey responses, 9 vehicles were reported to have been damaged. The number of damaged vehicles was equivalent to 4.7 % of the number of properties flooded. Extrapolating this proportion to the 490 internally damaged properties, it was estimated that 23 vehicles were likely damaged during the flooding event.

2.18 Given the uncertainty on the exact number of damaged vehicles and associated damaged, the estimate of damage to vehicles was calculated using the MCM methodology.

2.19 The MCM recommends estimating the number of damaged vehicle using the number of properties having experienced a flood depth greater than 0.35m only. During the May 2018 flood, 18 properties reported a flood depth greater than 0.35m. This corresponds reasonably well to the estimated 23 vehicles flooded by extrapolating the survey results. Research for the MCM (Penning-Rowsell et al. 2013) has ascertained the average value for a typical motor vehicle in the UK to be £3,100 (2013 price). Based on Department for Transport figures, the average number of vehicles per household is 1.15 (Department for Transport, 2011). The average value of damages to vehicles per residential properties is therefore £3,600 (£3,100*1.15(rounded)).

Evacuation and temporary accommodation costs

2.20 The best estimate of economic costs of temporary accommodation is **£529k** with a range of £233k to £975k.

2.21 During the flood event, people required accommodation whether in the short-term (evacuation centre set up by Milton Keynes Council, hotels, etc.) or longer term in temporary residences. Based on available data 66 households were in the need of temporary accommodation, 83 households did not have to evacuate their property, data were missing for 341 households. Datasets relating to costs were also not complete enough to provide an accurate estimate.

2.22 In absence of specific costs data and due to the lack of information regarding the exact number of households that received a temporary accommodation, the best estimate of economic costs of temporary accommodation has been calculated following the MCM methodology.

2.23 The cost of evacuation depends on many variables. However, a direct link between the flood depth inside a property and the evacuation rate and time was established. Evacuation and accommodation costs were estimated as a function of the flood depth and the property type. Depending on these the MCM guidance provides a range of values per property between £0.6-9.5k.

2.24 Sensitivity testing was carried out on the flood depth, allowing for the economic costs to be calculated for a flood depth varying from a range of -0.1m to +0.1m relatively to the flood depth value used for the best estimate.

Health impacts

2.25 The best indicative estimate for health impacts is **£119k** with a range of £101k to £136k.

2.26 Health impacts are recognised as significant intangible effects of flooding. Defra and the Environment Agency have funded research to establish an economic valuation of the intangible health impacts of flooding. This research confirmed the significance of the health impacts of flooding (Defra, 2004).

2.27 Some respondents to the survey reported to suffer from stress and anxiety following the May 2018 and previous flooding events. Estimating the costs of these impacts is however extremely difficult. The MCM suggests a value of £243 per property per year for intangibles. Recent research carried out by Middlesex University and the Environment Agency indicates that the actual damages due to stress and anxiety may be different than the values presented in the MCM. Therefore, in the future the guidance for valuation of these parameters could change.

2.28 Sensitivity testing was carried out on the number of properties affected, allowing for the economic costs to be calculated for a range from -15% to +15% relatively to the number of residential properties reported as having experienced internal flooding.

Local Authority, emergency services and recovery costs

2.29 The best estimate for local authority, emergency services and recovery costs is **£338k** with a range of £134k to £594k.

2.30 The local authority, emergency services and recovery costs represent 5.6% of the total economic property losses (for residential and non-residential properties), value recommended as being the best estimate in the MCM.

2.31 These economic costs refer to the additional costs incurred by a number of organisations in tackling flood incidents and in the recovery process. Depending upon the severity of the flood event, several emergency services may be involved in both emergency works and clean-up operations, during and after the flood event. Extra staff time and materials may be required, and additional administrative costs may be involved. The independent investigation showed that the authorities and bodies that provided emergency services include, but are not limited to, the following: local authorities, police, fire and rescue services, ambulance operations, the Environment Agency, voluntary services.

Transport (road and rails)

2.32 Milton Keynes Council as the Highways Authority informed the investigation by reporting a number of roads were either damaged or closed.

2.33 With the information available it has not been possible to estimate road damages. Flood modelling or more precise information on the locations and duration of the road closures would be required to make this assessment.

2.34 Even though the economic costs were not estimated for this impact category, it is important to note direct damages to road infrastructure, and indirect losses due to road traffic disruption occurred.

2.35 The following roads (or sections) were reported as damaged or closed by the Police of MKC Highway Department:

- Grace Avenue Oldbrook – Damage to roadway and waist high water;
- V8 Campbell Park – closed;
- V7 Near Tesco;
- H6 Campbell Park to V8;
- B526 Stoke Goldington to Eakley/Salcey Forest turn;
- Wolverton Road, Newport Pagnell;
- V8 (H5 to H6);
- H6 (V8 to South Enmore Roundabout);
- V7 (V4 to Denbigh Roundabout);
- V8 (H5 to H6);
- A421;
- A422 (A509 To County Boundary) Astwood;
- B526 (Stoke Goldington to County Boundary).

Utilities (water, electricity and telecom)

2.36 17% of the survey's respondents reported to have experienced utilities outages for an average duration of 43 hours. Residents were mainly affected by electricity outages and reported to have turned off electricity for security reasons.

Education

2.37 St Paul's Catholic School and Milton Keynes College were reported to MKC as having experienced internal flooding.

2.38 Direct damages that occurred due to the flooding of school buildings were included in estimates for damages to non-residential properties.

2.39 The flooding event occurred on the 27th May on the eve of a bank holiday. This is likely to have limited impacts on potential indirect economic losses caused by disruption to education (i.e. education days lost and parents 'absenteeism from work while they care for children who are unable to attend school).

Public Health

2.40 Milton Keynes University NHS Foundation Trust experienced internal flooding.

2.41 Direct damages that occurred due to the flooding of the hospital buildings were included in estimates for damages to non-residential properties, section 1.

2.42 Hospitals are complex facilities to investigate; dependency and interconnectivity of services makes hospitals particularly susceptible to the impacts of flooding. This also means that it can be extremely difficult to appraise indirect damages (i.e. losses due to the flooding of hospital services), such as disruption and/or cancellation of operations. Therefore, a qualitative description of losses is presented in this study.

2.43 During the flood investigation process, a discussion took place with the Emergency Planning Officer to better understand the various impacts of the flooding event.

2.44 It was reported that the Emergency Department, the IT/Computers Room and offices as well as the Resuscitation department were affected by the flooding. Even though the Resuscitation Department was flooded, the Hospital managed to contain all patients within the A&E Department. Ambulance services were diverted to other hospitals and non-urgent operations and treatments were cancelled.

Appendix I - Asset Management and Maintenance

1 Environment Agency

1.1 The Environment Agency takes a strategic overview of the management of all sources of flooding and coastal change. It also has an operational role and is the lead authority for managing the risk of flooding from main rivers, reservoirs, estuaries and the sea. The latter two are not applicable within MK.

1.2 There are 295 Environment Agency owned flood defences within MK. These include a range of features consisting of purpose made and natural defences. The Environment Agency's 'Spatial Flood Defences' dataset identifies the condition of these assets following routine assessments by the Environment Agency. 96.6% have been assessed at condition grade 3 or better which is the general target for flood defences.

1.3 The frequency of condition assessments is dependent on the type of asset, its associated consequence of failure and the condition following the previous assessment. The Environment Agency employ trained inspectors to undertake assessments and record the observations within its asset information management system (AIMS).

1.4 The responsibility for maintenance of main rivers and associated defences primarily rests with landowners, although the Environment Agency may and do decide to exercise permissive powers to undertake such works in the interest of flood risk management. This only extends to informal defences such as embankments, and does not include formal, hard infrastructure.

1.5 It is understood routine inspections and maintenance were undertaken by the Environment Agency before and after the flood event. It is reported that minimal maintenance was required after the event.

1.6 The ten defences which are identified below the target condition grade are not within proximity of the flood affected areas, and the condition is understood to have not raised concerns during the flood event.

1.7 According to the Environment Agency's 'Spatial Flood Defences' dataset, there are 21 'formal' flood defences including embankments, flood walls and bridge abutments within MK (Figure I- 1). Nineteen of these have a design Standard of Protection (SoP) of 2% AEP (1 in 50 year) and two have SoP of 0.5% AEP (1 in 200 year).

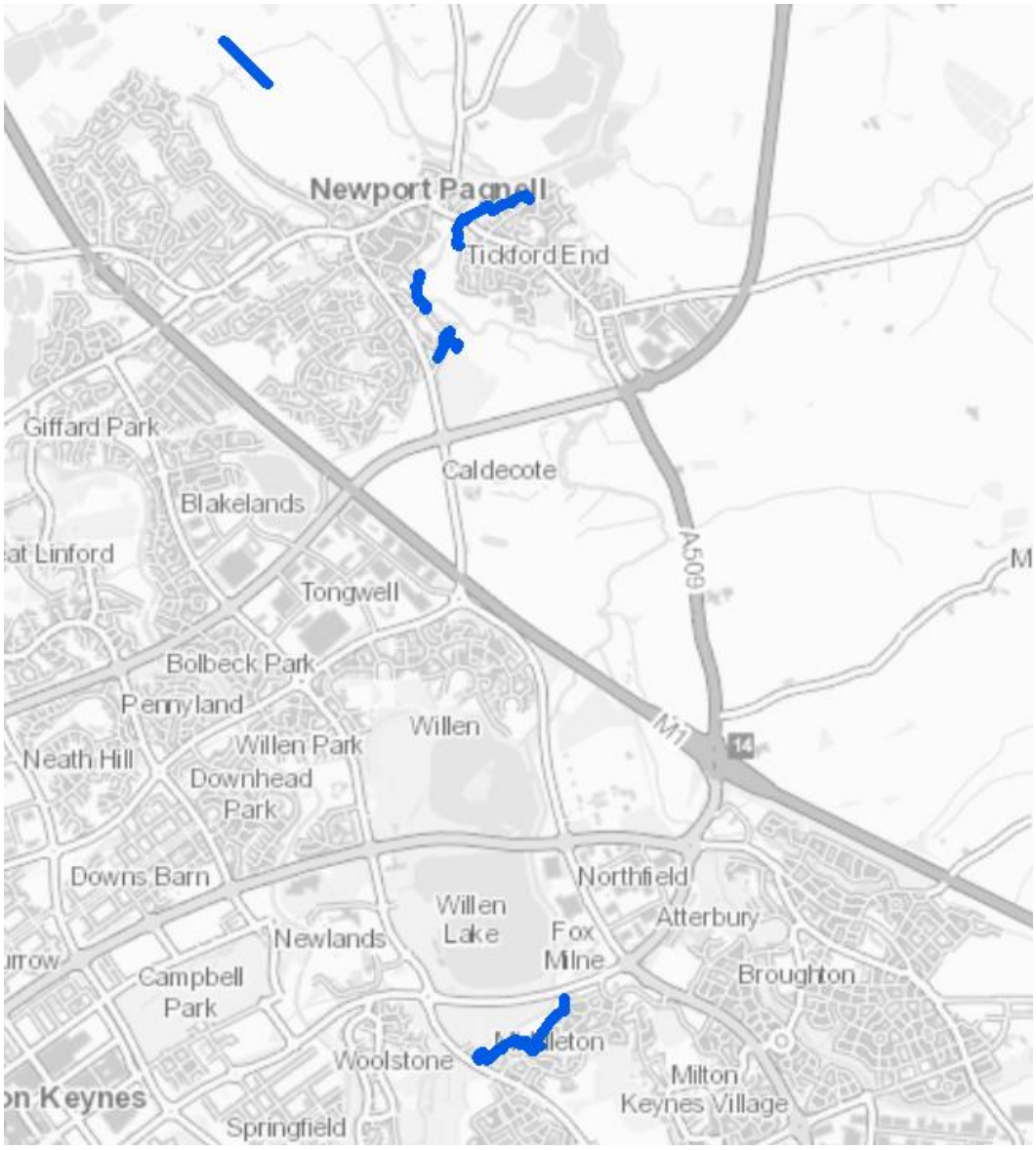

Figure I- 1: Location of formal flood defences with 2% SoP or better

Contains OS data © Crown Copyright and database right 2019

1.1.1 Willen, Walton and Caldecotte lakes are all identified by the Environment Agency as features that provide flood storage for the River Ouzel. Tongwell Lake provides the same for Tongwell Brook (Figure I- 2). Their purpose is to attenuate an incoming flood peak to a flow level that can be accepted by the downstream channel. It may also delay the timing of a flood peak so that its volume is discharged over a longer time interval. Whilst these are not primarily maintained by the Environment Agency, alterations would require Environment Agency consent.

1.1.2 The capacity of these lakes and how the storage provision for fluvial and surface water sources interacts has not been established within this IFR.

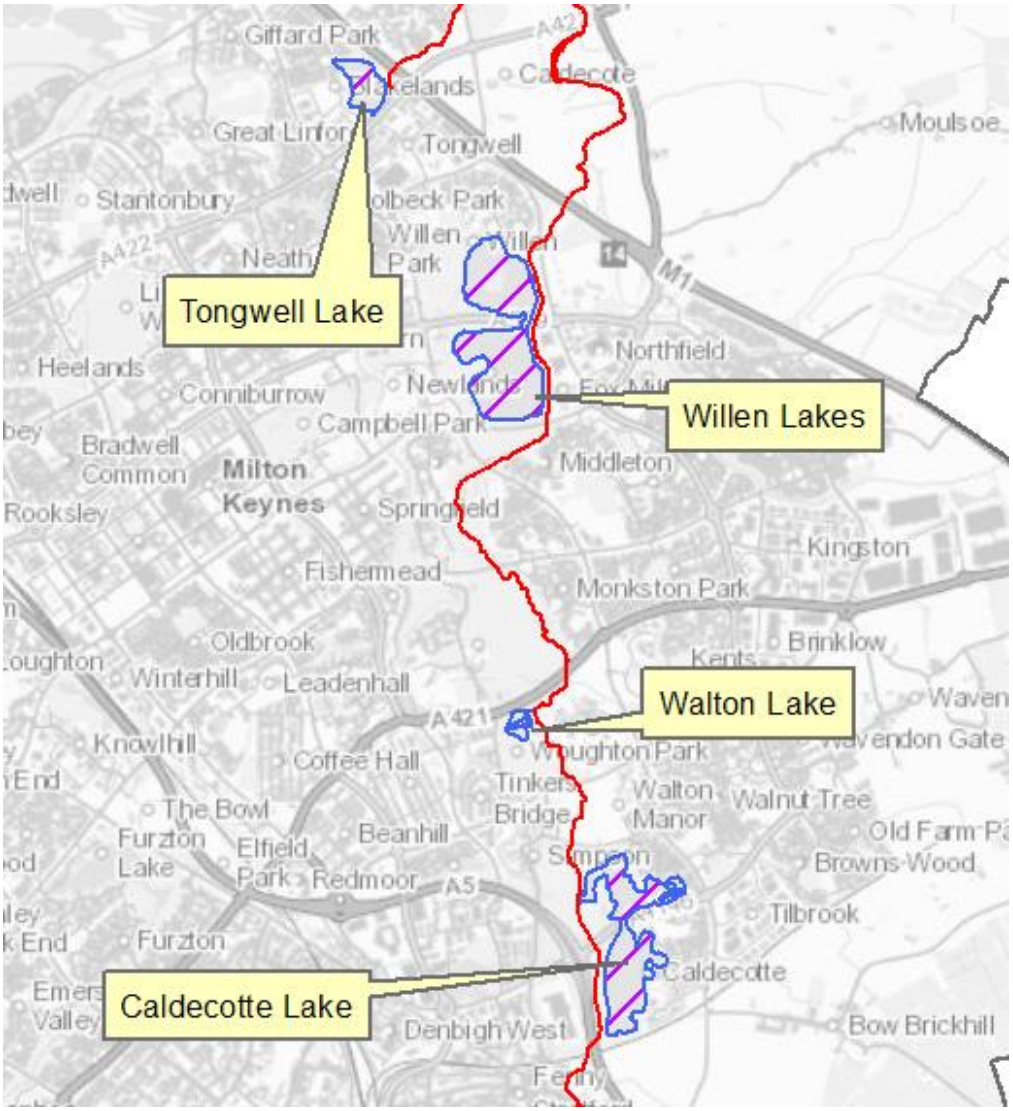

Figure I- 2: Location of main river flood storage areas

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2 Bedford Group of Drainage Boards

2.1 BGDB is the organisation which advises and represents the Buckingham and River Ouzel Internal Drainage Board (IDB). The assets which the IDB operates within MK are identified in Figure I- 3.

2.2 MKC hold data from the IDB in relation to its assets. From this data it has been established there are 175 sections of IDB watercourse within MK and 420 structures.

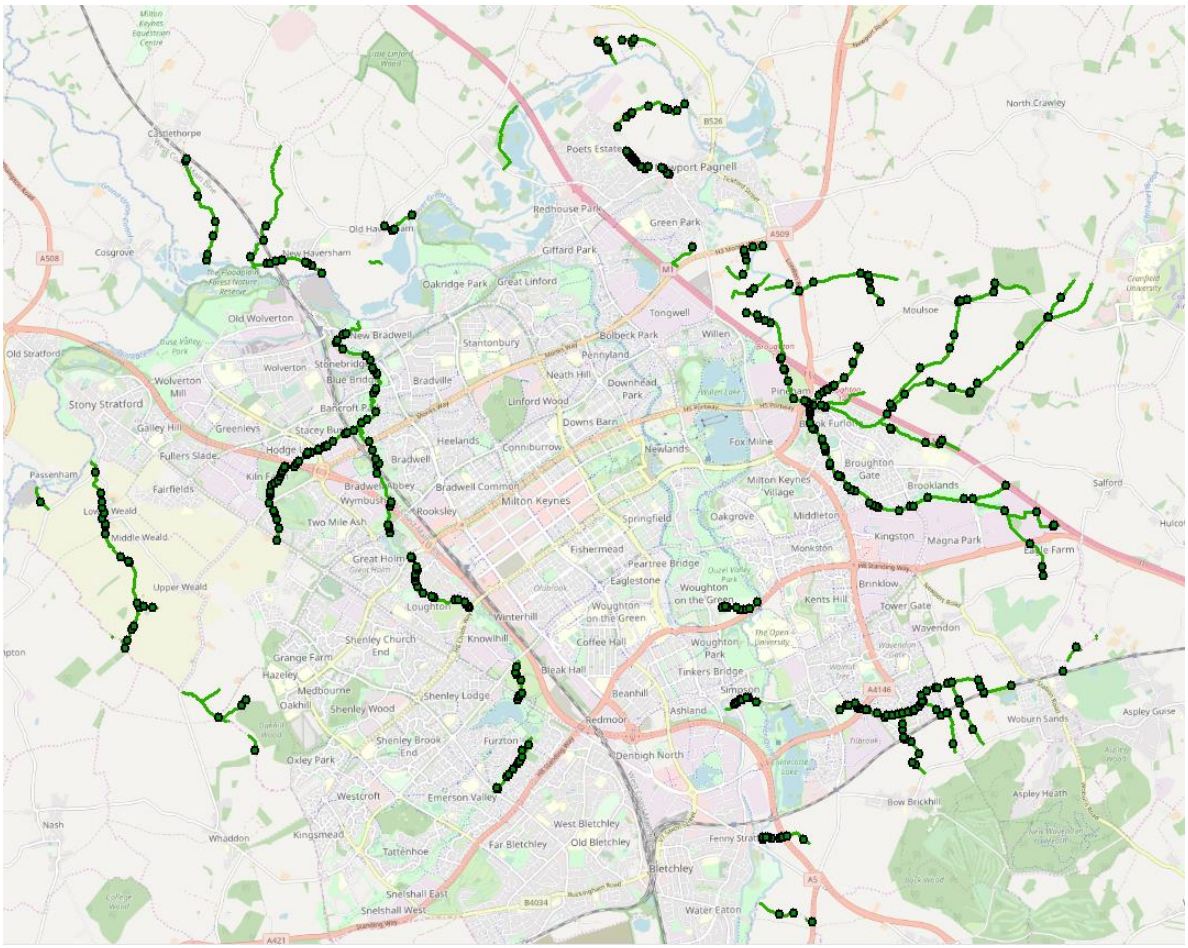

Figure I- 3: Buckingham and River Ouzel IDB operational area

© OpenStreetMap

2.3 Prior to the May 2018 flood event, the IDB reports to have undertaken inspections `in known flood hotspot locations within its operational area following receipt of a weather warning. It is understood that all inspected assets were operational.

2.4 During the flood event in May 2018 the IDB watercourses were not reported to have been a source of flooding. The IDB and BGDB therefore had limited input during or after the event.

3 Milton Keynes Park Trust

3.1 The assets MKPT maintains are predominantly landscape features such as swales and ponds that have been constructed to serve various developments. These features take surface water flows from roads and driveways and temporarily store runoff to attenuate the flow rate before the water is released into local watercourses. In all cases, it is understood these features are contained within areas of parkland or green infrastructure. To support the IFR, MKPT has provided a list of these features including location and summary details (Table I- 1).

3.2 MKPT also owns (leasehold) and manages the land surrounding the large strategic balancing lakes and attenuation basins in MK. The responsibility for the maintenance and operation of the structures such as; dams, control structures, and spillways, is understood to rest with AWS. These sites are listed below and a map identifying their location in Figure 7-4.

- Ashlands Lakes (Ashland/Simpson balancing reservoir)
- Blue Bridge Balancing Lake

- Caldecotte Lake
- Furzton Lake
- Lodge Lake
- Teardrop Lakes
- Walton Lake
- Willen Lake
- Wolverton Mill Balancing lake

Table I- 1: MKPT Managed Assets

Location	Grid Reference	Year adopted by Parks Trust	Summary details
Brooklands: Brooklands Meadows Linear Park	SP 89762 40267	2018	On-line surface water attenuation reservoir within an area of linear park. The Parks Trust manages the landscape within and surrounding the reservoir basin. However, the main retaining dam and culverts fall outside of the Trust's ownership boundary and are owned by the Highway Authority (Milton Keynes Council) and maintained by the Buckingham & River Ouzel Internal Drainage Board under a management agreement.
Broughton: Ferry Meadows/Pye Bridge End residential development, Broughton	SP 89158 39787 (centre of development)	2010	Small system of swales and ponds taking surface water from adjoining roads and car parks. These attenuate the flow rate of surface water before it discharges into the adjacent wetland complex.
Broughton: Broughton Brook Linear Park between Tanfield Lane & Milton Road	SP 89498 39554 (centre of development)	2010	Various swales and small attenuation ponds located along the linear park. These accept run-off from the adjacent roads.
Broughton: Ulverston Crescent	SP 89881 39090	2011	Large swale attenuating surface water flows from estate roads to the Broughton Brook.
Broughton Gate/Broughton Brook Linear Park	SP 89896 39328 & SP 90225 38968	2012	Two surface water attenuation ponds located in the Linear Park. These are controlled by hydro-brake chambers adopted and maintained by Anglian water (outflow to Broughton Brook).
Kingsmead South residential development	SP 82502 33925 (centre of development)	2012	Swales and attenuation pond receiving surface water run-off from roads and driveways in this residential development.
Magna Park distribution/industrial estate SuDS	SP 91635 38703 (centre of development)	Phase 1 2012 Phase 2 2017	Swales and attenuation ponds/lake receiving surface water run off from roads and car parks in the distribution park. Phase 2 (extension to the Broughton Brook Linear Park) contains a balancing lagoon which receives and attenuates the flow rate from the park before discharge via a culvert pipe into the Broughton Brook. The rate of flow into the culvert is controlled by a fixed orifice plate across the culvert inlet.
Oakridge Park	SP 84549 42188 (ponds located in Stonepit Field Park)	2008	SuDS ponds receiving and attenuating the flow rate of surface water from the roads and driveways in the Oakridge Park Estate. The outfall from the ponds to the adjacent watercourse are via pipe culverts.

Location	Grid Reference	Year adopted by Parks Trust	Summary details
Oxley Park east	SP 82180 35220 (centre of development)	2012	A network of swales and ponds taking surface water from roads, driveways and roofs in the residential development. The system includes underground rate-control chambers located between the ponds. These chambers require active maintenance and are inspected on a 6-monthly cycle.
Shenley Wood	SP 82626 35802 (centre of development)	2012	Network of swales and ponds taking surface water from roads, driveways and roofs in the mixed commercial/residential (retirement village) development. Flow rates are partially controlled by slot weirs within the chain if ponds. The outfall to the adjacent watercourse is via a pipe culvert.
Tattenhoe Park	SP 82898 33272	2012	Network of swales and ponds taking surface water from roads, driveways and roofs in the residential development (undergoing construction). Includes underground chambers with internal weirs which receive the outfall to control outflow rates to the Loughton Brook.
Westcroft: Mapperton Close/Frampton Grove	SP 82653 34306	2009	Small system of swales and attenuation ponds within residential development. Flow rates between the ponds are controlled by a number of slot weirs.
Whitehouse Park, Whitehouse (Western Expansion Area)	SP 81138 37314	2019	Attenuation basin within park. The Trust maintains the landscape within and around of the basin. The inlet and outlet structures are adopted by Anglian Water.

Appendix J – MKC Highway Department Gully Emptying Schedule

2017
JUNE
BLETCHLEY WEST
FISHERMEAD

2017
JULY
BLETCHLEY FAR
BLETCHLEY OLD
BLETCHLEY EAST
DENBIGH HALL
GRANBY

2017
AUG
OLNEY
DENBIGH-EAST
DENBIGH-WEST
DENBIGH-NORTH
ENFIELD PARK
THE BOWL
COFFEE HALL

2017
SEPT
GALLEY HILL
HAZELEY
MOULSOE
OAKGROVE
PINEHAM
STONY STRATFORD
TONGWELL
COLD BRAYFIELD

2017
OCT
EMERSON VALLEY
KINGSMEAD
LEADENHALL
WOOLSTONE

2017
NOV
OAKHILL
OLDBROOK
SPRINGFIELD
WINTERHILL
OXLEY PARK
SNELSHALL EAST
SNELSHALL WEST

2017
DEC
FURZTON
FURZTON LAKE
WEST CROFT

2018
JAN
SHENLEY BROOK END
SHENLEY CHURCH END

2018
FEB
SHENLEY LODGE
TATTENHOE
CASTLETHORPE

2018
MARCH
GIFFARD PARK
ASHLAND
BLAKELANDS
GREAT LINFORD
LINFORD WOOD

2018
APRIL
BANCROFT
BANCROFT PARK
BLUE BRIDGE
BOLBECK PARK
HAVERSHAM
HANSLOPE
WILLEN PARK

2018
MAY
HEELANDS
DOWNHEAD PARK
GRANGE FARM
WILLEN
WILLEN LAKE

2018
JUNE
CROWNHILL
GREAT HOLM
LOUGHTON LODGE
TILBROOK
WALTON PARK
NETHERFIELD
BEANHILL

2018
JULY
KENTS HILL
KENTS HILL PARK
LOUGHTON
REDMORE
ROOKSLEY

2018
AUG
BLETCHLEY LAKES
SHENLEY WOOD
BROWNS WOOD
CALDECOTTE
FULLERS SLADE
FOXMILE

2018
SEPT
BRADWELL
BRADWELL COMMON
WAVERDON GATE

2018
OCT
TWO MILE ASH
WALNUT TREE

2018
NOV
CONNIBURROW
EMBERTON
FOXMILE
BRINKLOW
KILN FARM
KINGSTON
MONKSTON PARK

2018
DEC
LAVENDON
WESTON UNDERWOOD
RAVENSTONE
WYMBUSH
NORTHFIELD
SIMPSON
OLD FARM PARK

2019
JAN
TINKERS BRIDGE
PASSMORE
PEARTREE BRIDGE
NEW BRADWELL
BLEAKHALL

2019
FEB
OLD WOLVERTON
STACEY BUSHES
STONE BRIDGE
WOLVERTON MILL SOUTH
HODGE LEA
EAGLESTONE

2019
MARCH
UPPER WEALD
NEATH HILL
MOUNT FARM
PENNYLAND
LITTLE LINFORD

2019
APRIL
ASTWOOD
BOW BRICKHILL
BROUGHTON
FILGRAVE
LATHBURY
NORTH CRAWLEY
WALTON
WAVERDON

2019
MAY
SHERRINGTON
STOKE GOLDINGTON
TYRINGHAM
WALTON HALL
WOBURN SANDS
LITTLE BRICKHILL
EAGLESTONE-WEST

2019
JUNE
MONKSTON
BRADVILLE
GREENLEYS

2019
JULY
NEWPORT PAGNELL

2019
AUG
NEWPORT PAGNELL

2019
SEPT
CMK

2019
OCT
STANTONBURY
STANTONBURY FIELDS
CMK

2019
NOV
ATTERBURY
CAMPBELL PARK
CHICHELEY
CLIFTON REYNES
NEWTON BLOSSONVILLE
HARDMEAD
DOWNS BARN
NEWLANDS
TATTENHOE PARK
WOUGHTON ON THE GREEN
WOUGHTON PARK
KNOWHILL

2019
DEC
BLETCHLEY - FENNY STRATFORD
BLETCHLEY - WATER EATON

2020
JAN
BLETCHLEY CENTRAL

2020
FEB
MK VILLAGE & MIDDLETON
WOLVERTON
WOLVERTON MILL
WOLVERTON MILL EAST
WOODHILL

2020
MARCH
CALVERTON
MIDDLE WEALD
LOWER WEALD
TATHALL END
GAYHURST
BRADWELL ABBEY
WEST ASHLANDS
WEST ROOKSLEY
WHITE HOUSE

2020
APRIL
BROOKLANDS
BROUGHTONFURLONG
BROUGHTON GATE
REDHOUSE PARK
WARRINGTON
TOWER GATE

2020
MAY
FENNY LOCK
MAGNA PARK
MEDBOURNE
NEWTON LEYS
OAKRIDGE
WEST ROOKSLEY

Appendix K – Existing key actions from reviewed documents

Document	Action	Findings from IFR
LFRMS	• The MK Drainage Study produced by Halcrow in 2000 requires updating.	• An updated study has not been located. MKC must review progress.
	• MKC committed to providing in-house training for planning officers to improve awareness of what constitutes and causes groundwater flooding.	• Unknown. MKC must review progress.
	• MKC committed to educate staff on the benefits of using SuDS as well as understanding the costs associated with the implementation over traditional drainage.	• Training undertaken with planning officers in July 2019 on SuDS and the planning system
	• Measure 2.3: MKC would 'look to prioritise modelling of ordinary watercourses which could impact new development areas or have known flooding problems'.	• No OW modelling found during the IFR. MKC must review progress.
	• MKC committed to developing site-specific SuDS case studies to improve understanding of maintenance.	• No evidence found of case studies under preparation. MKC must review progress.
	• MKC committed to reviewing potential funding opportunities for flood and/or water management initiates every six months.	• MKC must review progress.
	• MKC to collate all existing hydraulic models and hydrological studies through partnership working to improve understanding of the catchment and would share this information between partner organisations to identify gaps within existing datasets and in understanding catchment processes.	• MKC must review progress.
	• 'Improve communications between asset owners and build on existing partnership working' (as per objective 6)	• Some evidence of improvement but more required. This should be further considered in context of Section 7.5 recommendations.
SWMP	• A number of 'quick wins' were identified; a. Implement a standardised Flood Incident Log to record and investigate future flooding incidents across Milton Keynes Borough. b. Raise Community Awareness - Identify areas where Community Flood Plans may be effective and consider opportunities to develop these, in conjunction with the local community. c. Councils should consider enforcing tighter restrictions on surface water discharge limits. Local Planning Policies could be created for development within CDCs to reduce runoff rates to a minimum level of 50% of existing runoff rates to alleviate flood risk created by the site.	a. A flood incident spreadsheet has been developed. This should be reviewed in the context of the findings in Section 5. b. Initial meetings held with two community groups regarding development of community flood plans (Stoke Goldington and Woughton). c. Policy in Plan:MK refers to CDCs; however future policy could be strengthened to specify required reduction rates. In the interim, the updated guidance for developers (July 2019) requires developments to reduce existing runoff rates to

Document	Action	Findings from IFR
	d. Update existing policies that state the use of SuDS within new development to highlight the preferred SuDS mechanisms used for the control of surface water runoff generated from the site. To facilitate this the Council must educate/train their staff to ensure that planning officers can deliver planning policy relating to SuDS effectively. e. Put forward priority capital schemes for FDGiA funding. f. Review and update the draft Action Plan in conjunction with MKC wide annual action plans.	greenfield rates where possible and sites in CDCs are specifically referenced. d. Policy FR2: of Plan:MK specifically relates to SuDS in new developments. Training was provided by the LLFA to planning officers in July 2019 to ensure flood risk and drainage policies are understood and implemented. e. Capital schemes have been put forward (Section 8). This action is likely to be ongoing as the understanding of the risk from flooding is improved. f. This should be undertaken to reflect the findings of this IFR.
	• One of the 'Borough wide actions' identified as part of the SWMP related to 'Ongoing improvements to maintenance of drainage network'.	• MKC Highway Department has been undertaking drainage improvement works in known flooding areas, described in Section 8.
	• The overarching Action Plan for the SWMP included a number of actions relating specifically to planning policy (Actions 5-11 & Action 13). Consideration should be given as to whether these actions have been completed successfully.	• Planning policy has been updated since the production of the SWMP however not all recommendations for policy updates have been included. MKC must review progress.