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Surface Water Management Strategy

for Proposed Variation No. 7 (Monasterevin Settlement Plan) of the Kildare County Development Plan 2023-2029 (as varied)

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ACRONYMS

AEP	Annual Exceedance Probability
CDP	County Development Plan
CIRIA	Construction Industry Research and Information Association
DHLGH	Department of Housing, Local Government and Heritage
DTM	Digital Terrain Model
EPA	Environmental Protection Agency
GDSDS	Greater Dublin Strategic Drainage Study
HEFS	High-End Future Scenario
IoH124	Institute of Hydrology report no. 124
KCC	Kildare County Council
mOD	metres Ordnance Datum
LiDAR	Light Detection and Ranging
MRFS	Mid-Range Future Scenario
OPW	Office of Public Works
SAAR	Standard Average Annual Rainfall
SFRA	Strategic Flood Risk Assessment
SuDS	Sustainable Drainage Systems
SWMS	Surface Water Management Strategy
WRAP	Winter Rainfall Acceptance Potential

1 INTRODUCTION

1.1 Terms of Reference

This Surface Water Management Strategy (SWMS) was commissioned by Kildare County Council (KCC) to inform the Proposed Variation No. 7 (Monasterevin Settlement Plan) of the Kildare County Development Plan (CDP) 2023-2029 (as varied). The proposed variation is hereafter referred to as 'Proposed Variation No. 7 (Monasterevin Settlement Plan)'.

The lands at Monasterevin, County Kildare are hereafter referred to as 'the Plan Area'. This SWMS should be read in conjunction with the Strategic Flood Risk Assessment (SFRA) prepared to inform Proposed Variation No. 7 (Monasterevin Settlement Plan).

1.2 Statement of Authority

This SWMS has been prepared and reviewed by the following qualified professionals:

- Joanna Poprawa BEng (Hons) MSc – Flood Analyst with experience in flood risk assessment and surface water management.
- Duncan Hartwick *BEng (Hons) BSc (Hons) PEng* – Senior Engineer specialising in hydrology, flood risk assessment, hydraulic modelling, surface water management, and Sustainable Drainage Systems (SuDS) design.
- Paul Singleton *BEng (Hons) MSc CEng MIEI* – Associate Director and Chartered Engineer specialising in flood risk assessment, hydrology, surface water management, and SuDS design, and a recognised industry professional providing training courses on these topics to the public and private sectors in Ireland and the UK.

1.3 Purpose and Scope

The purpose of the SWMS is to set out a framework for the delivery of Sustainable Drainage Systems (SuDS) to manage surface water within the Plan Area in a way that provides maximum water quantity, water quality, amenity, and biodiversity benefits.

The SWMS is ultimately intended to inform 'plan making', not to define outline and detailed drainage layouts, which would be prepared as part of SuDS strategies / plans developed to support planning application(s) at later stages.

Included with the SWMS (see Appendix A) is a SuDS concept masterplan indicating the preferred approach for integrating multi-functional SuDS components within the Plan Area to control the quantity and quality of runoff and to create and sustain amenity and biodiversity space. While any development proposal(s) for the Plan Area should carefully consider the findings and recommendations of the SWMS when developing outline and detailed drainage layouts, the SuDS concept masterplan is not fixed, and there is flexibility in terms of how the final layout is defined.

1.4 Applicable Guidance

The SWMS aims to ensure relevant policies / objectives from the Kildare CDP 2023-2029 (as varied) and other applicable guidance documents are followed. SuDS are referred to extensively in the following chapters of the Kildare CDP 2023-2029 (as varied):

- Chapter 2: Core Strategy and Settlement Strategy
- Chapter 3: Housing
- Chapter 5: Sustainable Mobility and Transport
- Chapter 6: Infrastructure and Environmental Services
- Chapter 12: Biodiversity and Green Infrastructure
- Chapter 14: Urban Design Placemaking and Regeneration
- Chapter 15: Development Management Standards

The 'Strategic Flood Risk Assessment for the Kildare CDP 2023-2029 (as varied)' states that any surface water drainage design should be compliant with the following to ensure drainage from the Plan Area is managed sustainably:

- LAWPRO Implementation of Urban Nature-based Solutions Guidance Document for Planners, Developers and Developer Agents (January 2025)
- Department of Housing, Local Government and Heritage (DHLGH) Rainwater Management Plans – Guidance for Local Authorities (May 2024)
- DHLGH Nature Based Management of Urban Rainwater and Urban Surface Water Discharges – A National Strategy (May 2024)
- KCC Sustainable Drainage Systems Guidance Document (2024)
- DHLGH Nature-based Solutions to the Management of Rainwater and Surface Water Runoff in Urban Areas – Water Sensitive Urban Design Best Practice Interim Guidance Document (March 2022)
- CIRIA SuDS Manual C753 (2015)
- Greater Dublin Regional Code of Practice for Drainage Works (2012)
- Greater Dublin Strategic Drainage Study (GDSDS) (2005)

The KCC Sustainable Drainage Systems Guidance and the associated SuDS Retrofit Design Note sets out key principles and design requirements that any surface water management strategy within the Plan Area should adhere to in order to ensure sustainable and effective drainage solutions, in accordance with the following documents:

- Greater Dublin Strategic Drainage Study (GDSDS) (2005)
- Greater Dublin Regional Code of Practice for Drainage Works (2012)
- Building Regulations Technical Guidance – Document H
- CIRIA SuDS Manual C753 (2015)
- Design Manual for Urban Roads and Streets – Advice Note 5: Urban Drainage

It is noted that updates to the above documents and/or new published documents during the lifetime of the Kildare CDP 2023-2029 (as varied) are to be implemented as part of future schemes where appropriate.

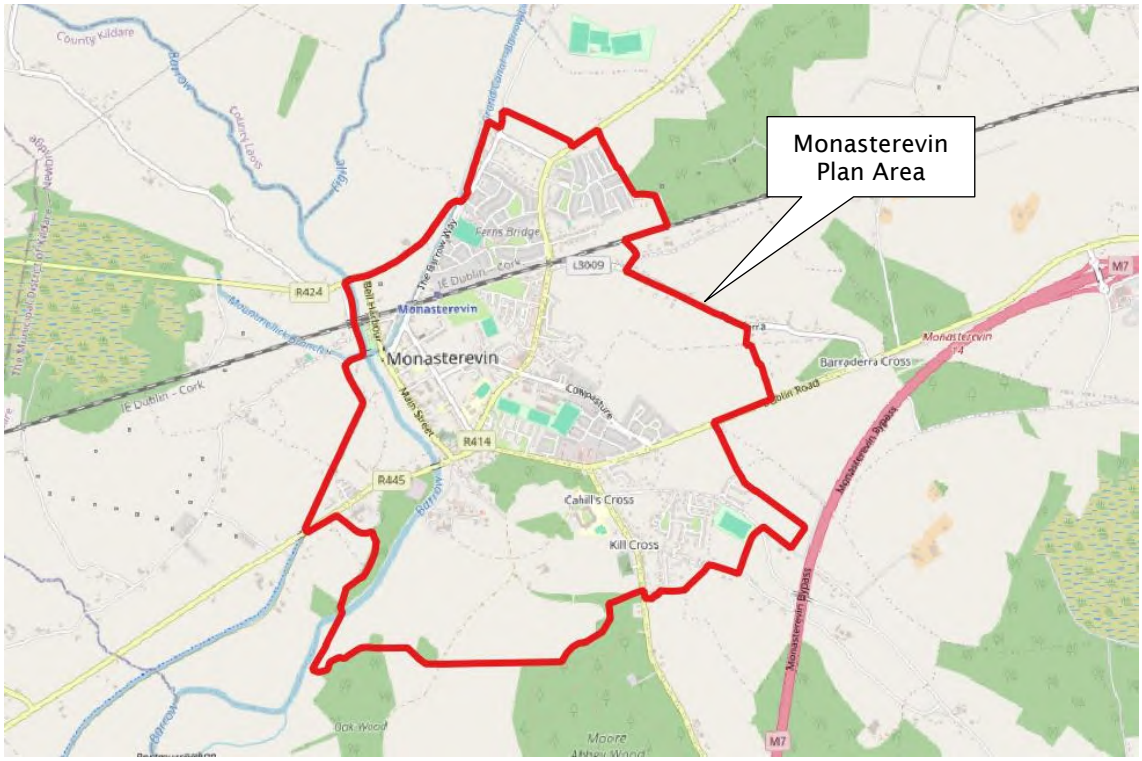
2 PLAN AREA INFORMATION

2.1 Location and Boundary

Monasterevin is situated along the Grand Canal and the River Barrow, in the low-lying agricultural landscape of County Kildare. The town lies approximately 13 km west of Kildare Town and 63 km southwest of Dublin.

The Plan Area encompasses the town of Monasterevin and outer environs, as shown in Figure 2.1.

Figure 2.1: Monasterevin Plan Area Boundary



2.2 Existing Land Use

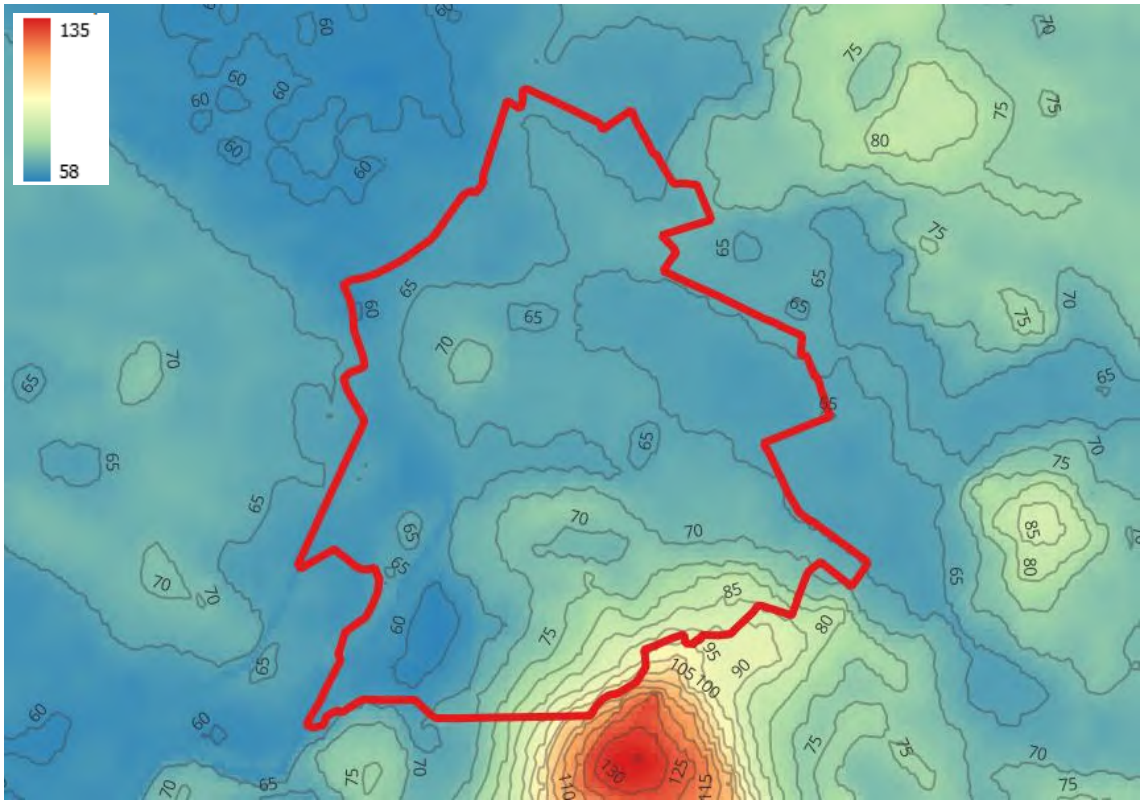
The Plan Area currently comprises residential and commercial areas with some agricultural lands, amenity spaces and woodland areas as shown in Figure 2.2.

Figure 2.2: Existing Land Use

2.3 Topography

Based on 25 m DTM height data, existing ground levels within the Plan Area range from c. 60 mOD in the northeast to c. 105 mOD in the south, as shown in Figure 2.3.

Figure 2.3: Plan Area Topography



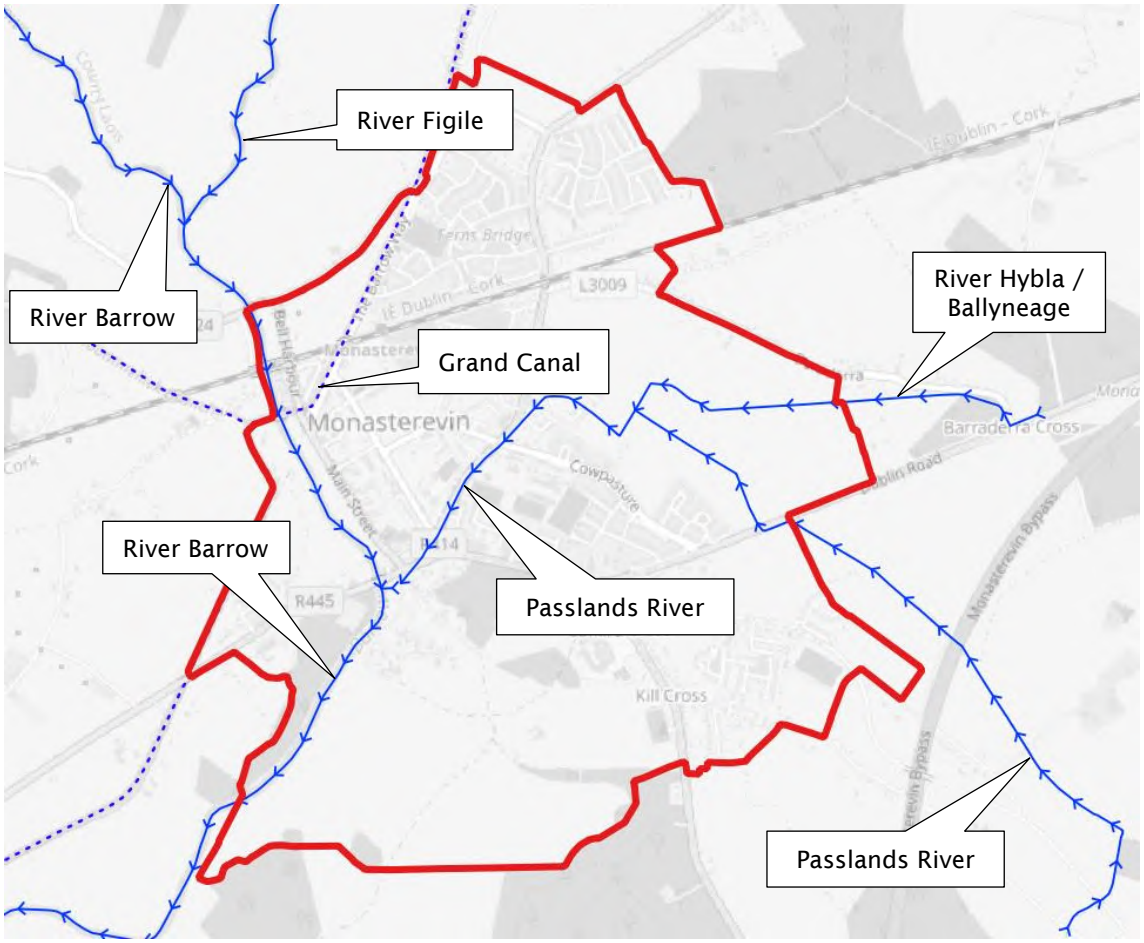
2.4 Watercourses

Environmental Protection Agency (EPA) 'Flow Network' data is presented in Figure 2.4 and has been found to be consistent with OPW FSU 'Rivers' data and KCC watercourses records. It is acknowledged that the EPA watercourse dataset is not intended to be exhaustive and does not capture all open water bodies within the Plan Area as there are minor streams and ditches which will not have been captured / included.

The River Barrow flows from north to south through the Plan Area. A number of tributaries of the River Barrow flow through Monasterevin including the Passlands River which runs from east to west through the town.

The Grand Canal runs from north to south along the western boundary of the Plan Area.

Figure 2.4: EPA Watercourse Map



2.5 Geology and Hydrogeology

No site investigation / infiltration testing has been conducted for the Plan Area. Table 2.1 summarises geological and hydrogeological data taken from Geological Survey of Ireland (GSI) mapping that is considered pertinent to the Plan Area.

Table 2.1: Geological and Hydrogeological Data

GSI Data Type	Summary
Overlying Soil / Existing Land Use	• Primarily agricultural / undeveloped land to the south, east and to the north west • Extensive residential developments are located to the east-southeast and in the central part of the area extending northwards from the centre along R414 Regional Road • Areas of commercially developed land along R424 Regional Road and south of Canal Harbour Road
Subsoil Geology	• Moderate subsoil permeability in the majority of the Plan Area with an exception of low permeability to the east and part of high permeability to the north west • The central area from north to south is covered by till derived from limestones, alluvium and gravels derived from limestones running along the western boundary. Cut raised peat extends from the north-central part to the eastern boundary line
Bedrock Geology	• Majority of Allenwood Formation – thick-bedded limestone, locally peloidal • Boston Hill Formation to the south east – Nodular and muddy limestone and shale
Groundwater Body	• Bagenalstown Upper Groundwater Body • Regionally Important Aquifer - Karstified (diffuse)
Groundwater Vulnerability	• Low to the central east • Moderate in from the centre to the west • High to the north and northeast and High to Extreme to the south
Groundwater Drinking Water Protection Area	• N/A

2.6 Existing Utilities

Limited records of existing underground utilities have been found or made available as part of this SWMS. However, the existing parts of the settlement are understood to be served by both combined and separate sewerage infrastructure.

Any existing utilities found at a later stage that cannot be relocated or abandoned will need to be considered in individual planning applications prior to progressing outline and detailed designs (including SuDS designs) within the Plan Area.

2.7 Zoning Objectives

Proposed Variation No. 7 (Monasterevin Settlement Plan) sets out a range of land use zonings and zoning objectives, as shown in Table 2.2, and mapped within the Settlement Plan documentation. The land use zoning mapping has been used to inform concept layouts presented within the SWMS.

Table 2.2: Proposed Variation No. 7 (Monasterevin Settlement Plan) Land Use Zoning Objectives

Ref	Use	Land Use Zoning Objective
A	Town Centre	To protect, improve and provide for the future development of the town centre.
B	Existing Residential / Infill	To protect and enhance the amenity of established residential communities and promote sustainable intensification.
C	New Residential	To provide for new residential development. • C*(1) – C(10): Refer to Table 2.4 Estimated Residential Development Capacity. • Refer to Section 10.2 for Key Development Areas (KDAs). <u>Site Specific Objective</u> C*(1): This site is identified for the purposes of securing the regeneration and sensitive redevelopment of 'The Hulk' and its surrounding lands as a high-quality, integrated residential neighbourhood, while conserving and enhancing the site's significant architectural, historical, archaeological and natural heritage. Development shall support the conservation and adaptive reuse of the former Charter School and its associated structures and walled garden for appropriate community, cultural, tourism, employment or other complementary uses (residential use may be considered), alongside a sensitively designed residential development that respects the site's historic character and setting.
E	Community and Education	To provide for community, recreation and educational facilities. <u>Site Specific Objectives</u> E(1): This site is identified to facilitate the continued operation of Monasterevin Cemetery along with its planned expansion. E(2): This site is identified to support the continued operation of St Paul's Secondary School along with any planned expansion of the school and/or ancillary facilities. E(3): This site is identified for the provision of a new primary school.

Ref	Use	Land Use Zoning Objective
F	Open Space and Amenity	To protect and provide for open space, amenity and recreation provision. Site Specific Objective F(1): These lands at Moore's Lock are identified for the development of Monasterevin Water Sports Hub, as per the Part 8 Planning Scheme granted under Plan Ref. 23/60116.
H	Industry and Warehousing	To provide for manufacturing, warehousing and industrial development. Site Specific Objectives H(1)– H(4): Site-specific design, layout and landscaping will be an important consideration on these lands which are located on approach roads to the town from the east and south-east (refer to Section 10.3.8).
I	Agriculture	To retain and protect agricultural uses.
L	Leisure and Tourism	To provide for leisure and tourism facilities.
MA	Moore Abbey Masterplan	To support the preparation and implementation of a masterplan for Moore Abbey. To ensure that Moore Abbey House and the other existing buildings within the demesne are maintained and do not fall into neglect, dilapidation, or dereliction. Appropriate meanwhile uses and other community / recreational uses will be permitted pending the finalisation of the Moore Abbey Masterplan. Such uses shall not adversely impact on the vitality or viability of the town centre and should be compatible with the future potential uses for Moore Abbey, outlined in Section 10.1.4. Existing uses associated with the ongoing activities of the Muiríosa Foundation within Moore Abbey will also be permitted. A Site-Specific Flood Risk Assessment (SSFRA) shall be prepared to inform the masterplan with water compatible uses only proposed for lands identified as at risk of flooding (Map V2-MN-9.2a), in accordance with the provisions of the Planning System and Flood Risk Management – Guidelines for Planning Authorities (DECLG and OPW, 2009). Site Specific Objective MA*: This site within Moore Abbey Demesne is identified as an indicative location for a new fire station.

Ref	Use	Land Use Zoning Objective
R	Retail and Commercial	To support continued operation of existing retail and commercial uses.
U	Transport and Utilities	To provide for and improve public infrastructure utilities.

2.8 Plan Area Constraints

Table 2.3 summarises the constraints / parameters that will inform the development of the SWMS.

Table 2.3: Plan Area Constraints / Parameters

Potential Constraint	Comment	Confidence (L / M / H)	Constraint on SuDS Design?
Flood Risk	Flood risk at the Plan Area is assessed in the SFRA.	H	Fluvial flooding at the site is set out in the SFRA under separate cover. SuDS design shall take account of the delineated flood extents within the Plan Area.
Drainage Infrastructure	The Grand Canal, River Barrow and a number of tributaries flow through the Plan Area. Existing open channel drains are also present within the Plan Area.	M	A detailed SuDS Strategy will be required to ensure that any existing drainage function is preserved.
Underground Utilities	Limited records of existing underground utilities have been found or made available but sewerage does serve existing development.	M	CAT scan / trial pits will be required, the extent of which will depend on options taken to detailed design.
Topography	Based on LiDAR height data, existing ground levels range from c. 105 to c. 60 mOD, falling generally from the south of the Plan Area towards the north.	M	The topography of the Plan Area will influence the existing flow routes and therefore the preferred SuDS management train. Detailed design should be based on area-specific topographic survey.
Existing and Proposed Land Use	The Plan Area currently comprises the existing town of Monasterevin and areas of undeveloped land. Land use zonings would allow a range of mixed-use development.	M	SuDS components and design should be compatible with the design and landscape characteristics associated with commercial / industrial and/or residential development.

Potential Constraint	Comment	Confidence (L / M / H)	Constraint on SuDS Design?
Size of Plan Area	The Plan Area has an area of c. 4.13 km^2 (413 ha).	H	N/A
Ground Contamination	No site investigation / testing has been conducted for the Plan Area.	L	Ground contamination issues at the Plan Area are unknown. Site investigation / testing is required, the extent of which will depend on options taken to detailed design.
Infiltration Potential	No site investigation / infiltration testing has been conducted at the Plan Area.	L	The Plan Area primarily has a Winter Rainfall Acceptance Potential (WRAP) class of 2 with some areas with a class of 3, which indicates relatively free draining soil. However, GSI mapping indicates moderate permeability subsoil.
Archaeological and Architectural Heritage	The National Monuments Service 'Historic Environment Viewer' indicates numerous archaeological / architectural heritage sites / monuments within the Plan Area. No further details have been made available as part of this assessment.	L	Potential impacts on archaeological / architectural heritage sites / monuments should be considered as part of any detailed design within the Plan Area.
Local Authority Requirements	KCC has not expressed any specific requirements at this stage in addition to those already set out in the Kildare CDP 2023-2029 and KCC SuDS Guidance Document (2024).	M	Future detailed SuDS design should consider any further Local Authority requirements, such as taking-in-charge and maintenance issues.

3 SuDS STRATEGY

The SuDS strategy outlines the preferred approach for managing rainfall runoff within the Plan Area to ensure no increase in flood risk to any development within the Plan Area or elsewhere while delivering wider water quality, amenity, and biodiversity benefits. The approach follows the guidance in the CIRIA SuDS Manual, which may be summarised as follows:

- Identify existing and modified flow routes.
- Identify a suitable mechanism for surface water discharge to allow for Plan Area drainage.
- Allocate a SuDS management train and appropriate number of subcatchments to provide collection, conveyance, storage, and treatment of runoff throughout the Plan Area.
- Identify a range of SuDS components that are in keeping with the proposed landscape character and other objectives for the Plan Area. At this stage, any definition of SuDS features for specific areas of the Plan Area should not be treated as 'fixed' aspects of the design.

3.1 Flow Route Analysis

3.1.1 Existing Flow Routes

Flow route analysis was carried out to determine existing runoff characteristics at the Plan Area. General existing flow routes that enter and exit the Plan Area are shown in Figure 3.1.

The topography of the Plan Area is such that overland runoff would primarily flow from the outskirts towards the middle of the town of Monasterevin in the direction of the River Barrow and Passlands River that flow through the town. The watercourses provide significant hydraulic breaks while key surface water flow paths would be provided by roads within or adjacent to the Plan Area. Other tributaries and local open channel drains will also provide conveyance pathways for surface water runoff.

Detailed SuDS design for the Plan Area will need to consider how surface water runoff along these flow routes will be managed.

3.1.2 Existing Subcatchments

The existing flow route analysis has been used to delineate existing / natural surface water subcatchments within and across the Plan Area as presented in Figure 3.2.

As shown, subcatchments generally follow the outline of existing development in the centre of the Plan Area and natural topography / features towards the outer parts of Monasterevin. Subcatchment boundaries also follow local roads and the rivers where surface water runoff from a number of areas is likely to meet and be conveyed along the existing flow routes.

3.1.3 Modified Flow Routes

Modified flow route analysis identifies how existing / pre-development flow routes are modified by any proposed development and, as such, creates a framework for the selection of suitable SuDS components. Due to the absence of proposals for the Plan Area, it is not possible to undertake a modified flow route analysis at this stage. This should be carried out at outline / detailed design stage.

As discussed in Table 2.3, there may be potential for infiltration within the Plan Area. However, no site investigation / infiltration testing data is currently available. Assessment of modified flow routes at a future stage should consider the potential for infiltration as well as surface water runoff and discharge.

Figure 3.1: Existing Flow Routes

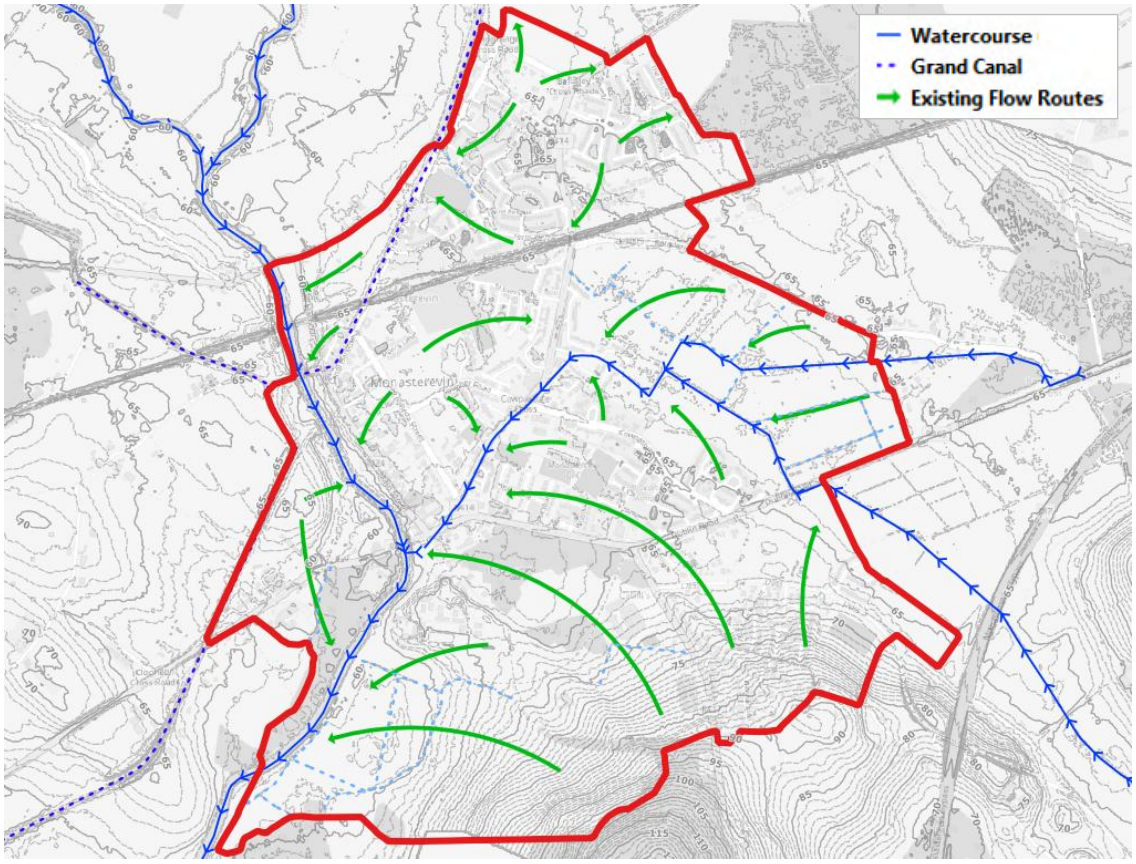
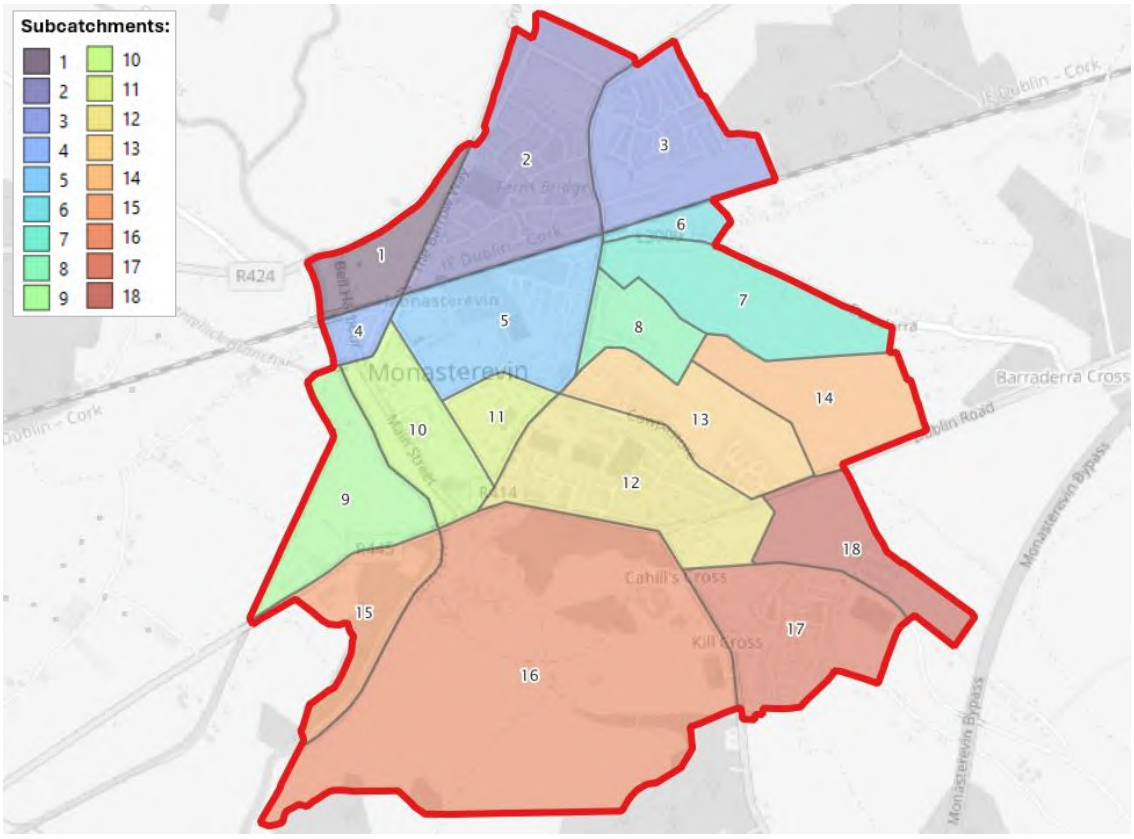


Figure 3.2: Existing Subcatchments



3.2 Drainage Hierarchy

The way surface water runoff is dealt with within the Plan Area should adhere to the following drainage hierarchy (in order of decreasing preference):

1. Reuse / Rainwater Harvesting
2. Infiltration
3. Watercourse
4. Surface Water Sewer
5. Combined Sewer

In line with the hierarchy presented above, the preferred discharge mechanism from the Plan Area will be infiltration into the ground, where the outcome of a site investigation / infiltration testing indicates sufficient permeability.

3.3 Water Quantity

Sufficient attenuation is to be provided to ensure future development is protected, no unpredictable flooding within the Plan Area, and no increase in flood risk elsewhere. Flows can be temporarily stored at collection points (i.e. source controls) along the conveyance route and at points of proposed storage.

Where infiltration is deemed suitable through site investigation / infiltration testing, sufficient storage shall be provided to accommodate up to the 1% AEP rainfall runoff with allowance for climate change. In this scenario, discharge from the Plan Area would only occur in the event of the design horizon being exceeded. Exceedance flow routes shall be considered as part of designs.

Where infiltration is deemed unsuitable through site investigation / infiltration testing, flows will be attenuated throughout the Plan Area with final flows attenuated to the rates prescribed in Table 3.1.

3.3.1 Controlled Flow Rates

The flow rates shown in Table 3.1 are in accordance with the requirements of the GDSDS and KCC guidance for restriction of post-development runoff to greenfield rates. They provide guidance on the extent to which flows should be controlled from any proposed development within the Plan Area if infiltration is deemed not feasible / not possible.

Greenfield rates were calculated using the Institute of Hydrology (IoH124) methodology with catchment-specific characteristics, including a winter rainfall acceptance potential (WRAP) class 2 and standard annual average rainfall (SAAR) depth of 797 mm.

Table 3.1: Attenuation Flow Rates

Return Period	Greenfield Attenuation Rate * (l/s/ha)	Controlled Attenuation Rate ** (l/s/ha)
Qbar (1 in 2.33 year)	1.51	2
3.33% AEP (1 in 30 year)	3.48	2
1% AEP (1 in 100 year)	4.30	2

** Long Term Storage provided (i.e. volume is controlled to greenfield volumes) – flows attenuated to respective greenfield rate*

*** Long Term Storage not provided (i.e. volume is not controlled to greenfield volumes) – all return periods attenuated to Qbar or 2 l/s/ha (whichever is greater)*

3.3.2 Storage of Runoff and Discharge

Runoff should be attenuated within each subcatchment of the Plan Area (refer to Figure 3.2 for an example of how runoff from the Plan Area may be managed in subcatchments). SuDS components for collection, storage, and conveyance of flows should be selected based on their suitability for proposed development designs, with consideration given to relevant constraints.

A review of available soil data for the site suggests that infiltration may be an option for discharge of some or all the runoff from the proposed development. However, as this will be confirmed at a later stage as part of detailed design, specification for an attenuation only system (that complies with KCC surface water drainage requirements) has also been considered and presented.

Where discharge is via infiltration, flows will be discharged to the ground at the respective infiltration locations. Attenuation features will control flow across a site / catchment from one component to another.

3.3.2.1 Infiltration

In line with the drainage hierarchy outlined in Section 3.2, infiltration is the preferred method for disposal of surface water. Available data suggests relatively good permeability across the Plan Area so infiltration should be achievable. Infiltration volumes will be sized for the 1% AEP critical rainfall event with allowance for climate change.

Table 3.2 presents indicative storage volumes for infiltration features in Monasterevin. It is noted that these are based on an assumed infiltration rate and all features should be subject to detailed design based on site-specific infiltration test results.

Table 3.2: Indicative Infiltration Storage Volumes

Return Period	Indicative Infiltration Volume * (m^3 storage / m^2 development)
Qbar (1 in 2.33 year)	0.020
3.33% AEP (1 in 30 year)	0.031
1% AEP (1 in 100 year) + CC	0.051

** Infiltration rate based on typical infiltration coefficient of $1x10^{-5}$ m/s for moderately-drained soil (per Table 25.1 in the CIRIA SuDS Manual)*

3.3.2.2 *Attenuation*

If infiltration is not feasible (e.g. due to impermeable soils, contaminated land etc.), attenuation storage will be sized for the 1% AEP critical rainfall event with allowance for climate change. The attenuation storage volumes shown in Table 3.3 are indicative only and assume no infiltration.

Table 3.3: Indicative Attenuation Storage Volumes

Return Period	Indicative Attenuation Volume * (m^3 storage / m^2 development)
Qbar (1 in 2.33 year)	0.024
3.33% AEP (1 in 30 year)	0.039
1% AEP (1 in 100 year) + CC	0.063

* *All return periods attenuated to greenfield runoff (i.e. Long Term Storage provided)*

3.3.3 Designing for Exceedance

Overland flow routes should be managed in a safe manner using the drainage systems, roads, and public spaces to convey and control floodwater during exceedance events (i.e. events exceeding the 1% AEP design rainfall event). Plan Area levels and landscaping should be designed to route exceedance flows away from buildings. Exceedance outflows from the Plan Area should be designed to mimic the existing flow patterns and ensure that there is no increased risk to others outside the Plan Area.

3.3.4 Climate Change

The future impacts of climate change on rainfall should be accounted for in the design of all drainage schemes. Requirements for climate change allowances are set out in the OPW's 'Climate Change Sectoral Adaptation Plan' published in 2019, which recommends a 20% uplift in extreme rainfall depths for the Mid-Range Future Scenario (MRFS) and a 30% uplift for the High-End Future Scenario (HEFS).

In line with current Kildare CDP 2023-2029 (as varied) guidance, the MRFS allowance is applied for climate change calculations carried out for this SWMS.

3.3.5 Urban Creep

Urban creep is defined by Uisce Éireann as "*the conversion of existing permeable areas within an agglomeration to impermeable surfaces*".

The increasing pattern of urban creep has long been identified as having the potential to have a significant impact on the drainage networks of urban agglomerations. Works such as building extensions, garden paving, conversion of lawns to hard standing for car parking or any such works that convert a permeable surface to an impermeable surface can all be considered to be urban creep.

As such, urban creep can increase the impermeable area of a development over time and should be accounted for as part of detailed design calculations per Uisce Éireann[1] and other available guidance.

[1] https://www.water.ie/sites/default/files/iwstandards/IW-TEC-800-14.pdf

3.4 Water Quality

3.4.1 Water Quality Requirements

Proposals for the Plan Area are likely to comprise commercial, industrial and residential development and are therefore considered to be medium risk in relation to water quality. Treatment requirements are as follows:

- Roof only runoff – removal of solids.
- Roads used for vehicular movement – one to two stages of treatment dependant on SuDS component selected.

Design of individual SuDS components for water quality treatment should comply with the criteria set out in the CIRIA SuDS Manual (refer to the relevant chapter for each SuDS component).

Where site investigation / infiltration testing indicates that existing ground conditions have sufficient capacity for infiltration, groundwater risk screening should be undertaken to demonstrate manageable risk (as set out in Chapter 26, Tables 26.5 and 26.6 of the CIRIA SuDS Manual).

If infiltration is deemed suitable or if attenuation is proposed with a positive discharge point from the Plan Area, the 'Simple Index Approach' should be used to validate designs for water quality treatment (as set out in Section 26.7 of the CIRIA SuDS Manual). Application of treatment indices applied in the Simple Index Approach will depend on whether the proposed system is attenuation or infiltration (refer to Sections 26.3 and 26.4 of the CIRIA SuDS Manual, respectively).

Sufficient treatment is to be provided prior to flows being attenuated in any SuDS areas being promoted for amenity and biodiversity functions.

3.4.2 Construction Management

A Construction Management Plan will be required to outline how surface water runoff will be managed during construction and to ensure appropriate mitigation is in place to minimise risk of flooding and pollution during construction.

3.5 Amenity

Amenity focuses on the usefulness and aesthetic elements of SuDS design associated with features at or near the surface and considers both multi-functionality and visual quality.

The following characteristics are highlighted for consideration as part of the development of the SuDS design:

- SuDS should be 'legible' (i.e. understandable in terms of their operation to people using the area and to maintenance personnel).
- The visual character of any SuDS component will enhance the development.
- Spaces and connecting routes are multi-functional and can be used when not providing a SuDS function for surface water management.
- Designs should ensure proposed developments are generally accessible and 'safe by design' (i.e. a design approach that naturally eliminates or minimises risk such as deep water rather than mitigation via 'engineered' features such as fences / barriers).
- Consideration should be given to information boarding to inform Plan Area users of the benefits of the SuDS scheme and also give guidance to the potential of temporary or permanent presence of surface water storage.

3.6 Biodiversity

Biodiversity must be considered in the design at a catchment scale to create sympathetic blue-green infrastructure and at local scale to provide habitat and connectivity linkages within and around the Plan Area. The following are highlighted for consideration as part of the development of any SuDS design:

- Ensure water quality within the water environment by following the steps of the simple index approach (as set out in Chapter 26, Box 26.2 of the CIRIA SuDS Manual).
- Demonstrate ecological design and the creation of habitats within the SuDS corridor.
- Keep water at or near the surface as it flows through the SuDS management train towards to wider landscape to ensure habitat connectivity.
- Confirm management practices to enhance habitat development during maintenance.

3.7 SuDS Component Audit

Table 3.4 presents a comprehensive audit of potential SuDS components deemed suitable based on the characteristics of the Plan Area. It is noted that this is not an exhaustive list, and further information relating to the Plan Area is likely to result in refinement.

Table 3.4: SuDS Component Audit

SuDS Component	Description	Suitability	Rationale
Green / Blue Roofs	Green / blue roofs are areas of living vegetation installed on the top of buildings.	Yes	Proposed roofs have potential for green / blue roof solutions to reduce runoff, attenuate peak flows, and promote biodiversity. This would satisfy objectives of the Kildare CDP 2023-2029 (as varied) (Objectives HO O50, IN O23), which require the use of green roofs, particularly on commercial buildings, as part of the overall surface water management strategy for each development, where appropriate. It is noted that the use of green roofs may be influenced by the required landscape character for the Plan Area.
Infiltration Systems	Infiltration systems allow surface water runoff to infiltrate and filter through to the sublayer layer before returning to the water table.	Yes	GSI data and the presence of open channel watercourses / drains indicate that the Plan Area may be suitable for infiltration. In line with the drainage hierarchy, infiltration should be prioritised over discharge to surface water bodies or sewers where possible, subject to site investigation / infiltration testing.
Filter Strips	A strip of vegetation being an impermeable surface and SuDS components.	Yes	There is potential to incorporate filter strips into development proposals to collect and treat surface water runoff.
Filter Drains	Filter drains, also known as French drains, are open trenches filled with stones.	Yes	There is potential to incorporate filter drains into development proposals to collect and treat surface water runoff.
Swales	Swales are shallow, flat-bottomed vegetated channels that collect, treat, convey, and store runoff.	Yes	Swales could be suitable to convey flows between different SuDS components and connect separate areas of green space.
Bioretention Systems and Rain Planters	Bioretention systems are shallow landscaped depressions containing engineered soils and vegetation, used to reduce runoff rates and volumes and to treat pollution. Rain planters are a type of raised bioretention system.	Yes	There is potential to incorporate bioretention systems and rain planters into development proposals to collect and attenuate roof and road runoff, treat surface water, and provide amenity and biodiversity benefits.

SuDS Component	Description	Suitability	Rationale
Trees and Tree Pits	Trees and tree pits attenuate surface water runoff using the void space in each tree's root zone.	Yes	There is potential to incorporate trees and tree pits into development proposals.
Permeable Pavements	Permeable pavements allow rainwater to infiltrate through the surface into underlying structural layers where it is temporarily stored before infiltrating into the ground or being discharged downstream.	Yes	New roads and hardstanding areas will inevitably be provided as part of development proposals and, as such, there is scope to include permeable pavements. KCC currently supports the use of permeable paving (Objective IN O23). This requires consideration in terms of maintenance.
Rainwater Harvesting	Rainwater harvesting involves the collection and reuse of rainwater runoff from roofs.	Yes	Rainwater harvesting could be used to reduce surface water runoff and demand on potable water supplies. While it is unlikely to yield sufficient decreases in runoff rates to satisfy the requirements of the drainage strategy, it may be considered at the discretion of developers. This would satisfy objectives of the Kildare CDP 2023-2029 (as varied), which require the consideration of rainwater harvesting systems in new commercial developments.
Attenuation Tanks	Attenuation tanks are used to provide below-ground storage for before infiltrating into the ground or controlled release or use.	Possible	It is noted that removal of silt ingress from attenuation tanks is a significant maintenance risk due to the lack of direct accessibility associated with below-ground features. Below-ground storage tanks should therefore only be used as a last resort where it has been demonstrated that other green infrastructure / SuDS measures are not feasible. Kildare CDP 2023-2029 (as varied) also states: *"in the event that underground attenuation storage structures are required, they will not be accepted under areas of public open space, save in exceptional demonstrable situations".* Preference should be given to above-ground attenuation SuDS components to maximise benefits for water quality, amenity, and biodiversity and to satisfy the objectives set out in the Kildare CDP 2023-2029 (as varied). This SWMS has found no reason why above-ground SuDS components would not be feasible within the Plan Area.

SuDS Component	Description	Suitability	Rationale
Detention Basins	Detention basins are landscaped depressions that are normally dry except during and immediately after rainfall events.	Yes	There is potential to incorporate detention basins into development proposals to attenuate flows, reduce runoff rates, and improve water quality prior to discharge. They can be multi-functional, doubling as open amenity space. This would satisfy objectives of the Kildare CDP 2023-2029 (as varied), which encourage the incorporation of SuDS into all parts of a development.
Ponds and Wetlands	Ponds and wetlands are features with a permanent pool of water that provide attenuation and treatment of surface water runoff.	Yes	There is potential to incorporate ponds and wetlands into development proposals in line with Kildare CDP 2023-2029 (as varied) objectives. Ponds with a permanent water level would provide amenity and biodiversity benefits within areas of open green space and can be designed to also provide a surface water storage and treatment benefit.

4 SUMMARY AND RECOMMENDATIONS

4.1 Summary

This SWMS outlines the approach and criteria that should be followed when developing a SuDS design as part of any future development proposals for the Plan Area. The report includes design considerations to ensure quantity, quality, amenity, and biodiversity benefits. It also highlights existing flow routes and subcatchments within the Plan Area.

The SuDS approach outlined in this document should be developed through outline and detailed design in parallel with development and finalisation of future proposed development layouts.

4.2 SuDS Concept Masterplan

A SuDS concept masterplan indicating the preferred approach for integrating multi-functional SuDS components within the Plan Area in line with the above principles / criteria is included in Appendix A. It is noted that in line with the drainage hierarchy (see Section 3.2), storage features should infiltrate where feasible and discharge via a controlled rate to an open water body or sewer where infiltration has been ruled out.

While any development proposal(s) for the Plan Area should carefully consider the findings and recommendations of this SWMS when developing outline and detailed drainage layouts, it should be noted that the SuDS concept masterplan is not fixed, and there is flexibility in terms of how the final layout is defined.

4.3 Recommendations

In addition to the general design criteria outlined in this SWMS, the following recommendations are made for future SuDS strategies / plans for the Plan Area.

- The Plan Area has been identified as having potential for infiltration, subject to site investigation / infiltration testing. Where infiltration is not feasible, provision of attenuation storage with positive discharge outlet will be required.
- KCC will be required to be satisfied through demonstration (i.e. site investigation and risk screening / assessment) that there is sufficient capacity within the Plan Area geology to infiltrate and that the risk to receiving groundwater can be suitably managed.
- Future proposed development layouts shall consider the existing flow route analysis and be undertaken in conjunction with SuDS designs to facilitate consideration of modified flow routes.
- SuDS strategies / plans shall provide a management train through definition of subcatchments to maximise treatment and storage capacity.
- Application of greenfield runoff rate, dependent on adequate provision of long-term storage / losses is to be agreed with KCC.
- Developed SuDS designs shall demonstrate that there is no increased flood risk to others, including residual risk from exceedance flow paths.
- Ownership and maintenance obligations for surface water drainage features shall be established and provision made by the relevant party for preventative inspection and maintenance.
- A Construction Management Plan will be required to ensure appropriate mitigation is in place to minimise risk of flooding and pollution during construction.

Appendix A

SuDS Concept Masterplan

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OVERVIEW

LEGEND

- STUDY AREA BOUNDARY
- DRAIN / OTHER WATERCOURSE
- GRAND CANAL
- WATERCOURSE
- PROPOSED SuDS STORAGE FEATURE (E.G., INFILTRATION OR ATTENUATION BASIN)*

*INDICATIVE LOCATION ONLY BASED ON TOPOGRAPHICAL AND LAND USE FEASIBILITY

PROJECT LOCATION		
MONASTEREVIN, CO. KILDARE		
DRAWING TITLE		
SURFACE WATER MANAGEMENT STRATEGY		
DRAWN BY	**CHECKED BY**	**REVISION**
DH	PS	4
FIGURE NO.		**DATE**
M02215-11_FIG_DNG01		20/08/2026

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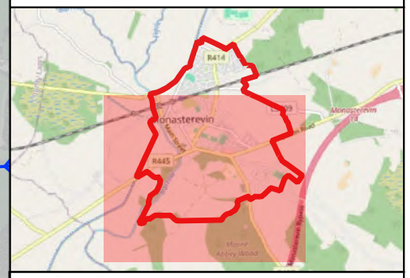
OVERVIEW



LEGEND

- STUDY AREA BOUNDARY
- DRAIN / OTHER WATERCOURSE
- GRAND CANAL
- WATERCOURSE
- PROPOSED SuDS STORAGE FEATURE (E.G., INFILTRATION OR ATTENUATION BASIN)*

*INDICATIVE LOCATION ONLY BASED ON TOPOGRAPHICAL AND LAND USE FEASIBILITY

PROJECT LOCATION
MONASTEREVIN, CO. KILDARE

DRAWING TITLE
SURFACE WATER MANAGEMENT STRATEGY

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FIGURE NO.	DATE
M02215-11_FIG_DNG02	20/08/2026

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