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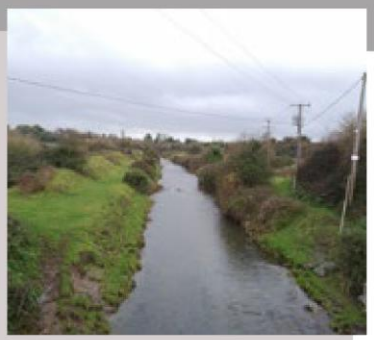

South Dublin County Council

Development Hydromorphological Assessment Guidance

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1. INTRODUCTION

This technical note has been prepared to aid applicants in meeting the objectives of the County Development Plan 2022-2028 (G13: 1-4) and associated Strategic Flood Risk Assessment as they relate to Hydromorphological Assessments. The introduction of hydromorphological assessment is key to ensuring that the objectives of the Water framework Directive WFD) are met. As per the County Development Plan Policy GI3 (Sustainable Water Management) states:

> *Protect and enhance the natural, historical, amenity and biodiversity value of the County's watercourses. Require the long-term management and protection of these watercourses as significant elements of the County's and Region's Green Infrastructure Network and liaise with relevant Prescribed Bodies where appropriate. Accommodate flood waters as far as possible during extreme flooding events and enhance biodiversity and amenity through the designation of riparian corridors and the application of appropriate restrictions to development within these corridors.*
>
> *GI3 Objective 1: To ensure that hydromorphological assessments are undertaken where proposed development is within lands which are partially or wholly within the Riparian Corridors identified as part of this Development Plan.*
>
> *GI3 Objective 2: To require development proposals that are within riparian corridors to demonstrate how the integrity of the riparian corridor can be maintained and enhanced having regard to flood risk management, biodiversity, ecosystem service provision, water quality and hydromorphology.*
>
> *GI3 Objective 3: To promote and protect native riparian vegetation along all watercourses and ensure that a minimum 10m vegetated riparian buffer from the top of the riverbank is maintained/reinstated along all watercourses within any development site.*
>
> *GI3 Objective 4: To uncover existing culverts where appropriate and in accordance with relevant river catchment proposals to restore the watercourse to acceptable ecological standards for biodiversity wherever possible improving habitat connection and strengthening the County's GI network.*

This Technical Note sets out the Importance of Riparian Corridors (Section 2), the Assessment Process (Section 3) and Example Restoration Measures (Section 4).

2. RIPARIAN CORRIDORS

2.1 The Need for Riparian Corridor Assessments

Riparian Corridors protect watercourses and their natural processes including: ecological, biogeochemical, hydromorphological and flood resilience in the face of climate change. These zones act as the interface between rivers and adjoining lands and are key to managing flood risk within catchments of all sizes. Maintaining and enhancing Riparian Corridors creates "room for the river" and the benefits that entails including reducing risk to persons and property from flooding. The sustainable management of riparian zones is crucial to meeting our objectives under the Water Framework and Floods Directives.

Recent decades have seen an increased awareness of the role of riparian zones in controlling the movement and processing of waterborne pollutants. This research was built upon growing interest in the interactions along aquatic-terrestrial fringes initially in relation to fisheries and more recently the effect of ecosystem diversity and resilience to climate change. The relationship between Riparian Corridors and nutrient processing is widely known, by acting as buffers between upland areas and open water, they help treat pollutants.

2.2 Riparian Vegetation

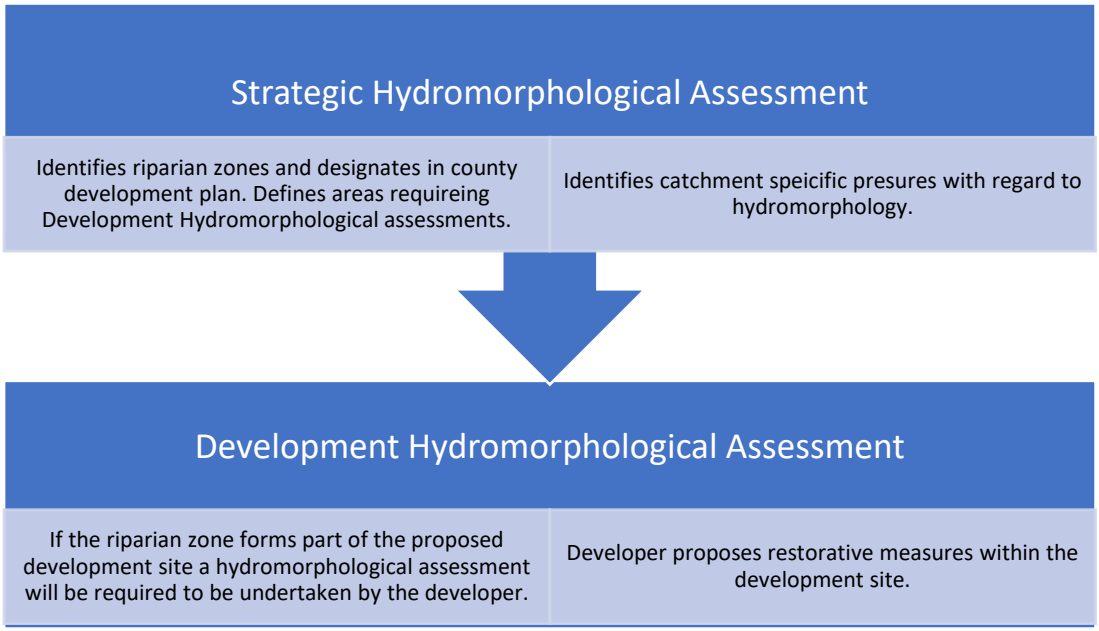
Riparian vegetation acts with flow, sediment and topography to influence channel form, instream habitat, nutrient dynamics, temperature and flow patterns. Therefore, removal of upland and riparian vegetation through agriculture and urbanisation disrupts land-water linkages leading to reductions in water quality, simplification of stream channels, less stable thermal and flow regimes, and ultimately, reduced ecosystem integrity. Riparian vegetation is a key source of beneficial in-stream nutrients and carbon, provides shade aiding thermally sensitive species (e.g. salmonids) and directly influences channel morphology (bank stabilisation, source of Large Woody Debris).

Designating and maintaining riparian corridors along the along major watercourses and their tributaries is key to maximising ecosystem services provided by the watercourses. Vegetative riparian buffers ecosystem services include:

- Interception and reduction of potential pollutants from both agricultural and urban sources,
- Attenuating flood waters,
- Bank stabilisation,
- Reducing runoff volumes
- Habitat provision and refuge,
- Ecological corridors
- Vegetal debris that falls into the watercourse is an important source of nutrients for instream biota.
- Thermal shading of watercourse,
- Amenity value.

3. DEVELOPMENT HYDROMORPHOLOGICAL ASSESSMENT PROCESS

The strategic assessment undertaken as part of the County Development Plan Strategic Flood Risk Assessment has informed the requirements for Development Hydromorphological assessments as outlined in the figure below.



An assessment of the existing river reach, identify existing hydromorphological pressures, determine deviation from a "Natural" form and propose restorative measures to improve Hydromorphological integrity and resilience throughout the river reach.

Key principles that should be considered when undertaking a hydromorphological Assessment are identified below:

- Be proportionate to the scale, nature and location of the development;
- Be undertaken by competent people, such as a suitably qualified professional (e.g. hydrologist or geomorphologist);
- Be undertaken as early as possible in the planning process;
- Give reference to the enabling, construction, operation and decommission phases of the proposed development or engineering activity where relevant;
- Consider not only new developments but also retrofit and maintenance of existing developments;
- Consider Climate change and how this might alter the impact of the proposed development.

The process for undertaking a Development Hydromorphological Assessment comprises three stages:

i. Stage 1 Screening

Determine whether the proposed development is partially or wholly within the Riparian Corridors identified as part of the Development Plan.

ii. Stage 2 Scoping

Identify existing pressures and the likely effects of the proposed development determine if a proposed development may result in adverse effects to the waterbody.

iii. Stage 3 Detailed Assessment

Quantitatively assess the impact of the proposed development and any mitigation measures required.

The requirements for each stage are detailed below.

3.1 Stage 1 Screening

Development Hydromorphological Assessments are to be undertaken where lands are partially or wholly within the Riparian Corridors identified as part of the Development Plan. Is the proposed development within the Riparian Corridor?

No, the proposed development site is not within a Riparian Corridor.

Screen for Flood Risk in accordance with 'The Planning System and Flood Risk Management Guidelines for Planning Authorities' as published by the Office of Public Works (OPW) and Department of Environment, Heritage and Local Government (DoHLG) in 2009.

Implementation of SuDS (based on local needs and local pressures) in line SDCC SuDS Guidance[1] to a suitable scale for the proposed development. Where the proposed development is a brownfield development or extensions to exist development the applicating should retrofit SuDS where possible.

Yes, the proposed development site is within a Riparian Corridor.

Where the proposed development is within a riparian corridor there is the potential for adverse impacts to hydromorphology and the assessment process will progress to Stage 2 to identify the existing pressures within the subject reach of the watercourse and potential effect of the proposed development on these pressures.

3.2 Stage 2 Scoping

The scoping stage considers the pressures that have the potential to directly or indirectly affect hydromorphology. The assessment of pressures should identify driver, pressure, state, impact and response in accordance with CIS Guidance Document No.3[2].

A Stage 2 assessment is to include a qualitative assessment of the likely positive and negative impacts of the development on existing pressures. The morphological pressures relevant to the proposed development should be identified and should also consider the development phase (i.e. construction, operation/maintenance, demolition). Pressures that should be considered are listed in the Water Information System for Europe (WISE). The effect (positive/neutral/negative), duration and significance are to be considered. Examples of interventions and their likely impact are presented in Table 1 below.

[1] Sustainable Drainage Explanatory Design & Evaluation Guide 2022
[2] Common Implementation Strategy for the Water Framework Directive (2000/60/EC) Guidance document No 3. Analysis of Pressures and Impacts

If the planning authority is satisfied that there is no potential risk of adverse impacts to the hydromorphology of the subject reach from the proposed development, the process can conclude at Stage 2. However, where there are likely significant impacts (positive or negative) the assessment process will progress to Stage 3 Detailed Assessment to quantify the potential impact to the reach hydromorphology.

3.3 Stage 3 Detailed Assessment

Stage 3 Detailed Assessment is undertaken to quantitatively assess the impact of the proposed development and any mitigation measures required. This will typically involve site walkover using River Hydromorphology Assessment Technique (RHAT)[3] The RHAT method was developed for WFD classification, but it also has other applications including assessing morphological pressures at a site or reach scale. The RHAT can be used as a tool to determine remedial/restoration work required to improve the river habitat as well as determine deviation from a "Natural" form. It can also be used to assess conditions before and after such works are carried out. The stage 3 assessment must be undertaken by a suitably qualified person (e.g. hydrologist or geomorphologist) that will identify whether RHAT will be required, given the characteristics of the proposed development. Attributes considered as part of a RHAT survey are listed below:

(1) Channel form and flow types
(2) Channel vegetation
(3) Substrate condition
(4) Barriers to continuity
(5) Bank structure & stability
(6) Bank vegetation
(7) Riparian land use
(8) Floodplain connectivity

The RHAT concludes by defining a WFD Hydromorphological Status (i.e. Bad, Poor, Moderate, Good, High). This stage takes into consideration mitigation measures and is an iterative process whereby a mitigation measure can be assessed to determine the most appropriate for the proposed development. The potential impact of the proposed development should be assessed and considered in sufficient detail to define the likely Hydromorphological Status post development. A proposed development will be accepted if post-mitigation there is no adverse change in hydromorphological Status (i.e. from Good to Moderate) of any reach directly or indirectly impacted by the proposed development.

[3] River Hydromorphology Assessment Technique (RHAT) Training Manual - Version 2

Table 1 Interventions and Likely Impacts

Likely Positive Impact	Intervention	Note
Direct channel interventions	• De-culverting of Watercourses • Introduction of Large Woody Debris, • Establishment of in-stream vegetation, • New meander in impounded river channel, • Reconnecting a remnant meander, • Current deflectors, • Narrowing channel with aquatic ledges, • Creating a sinuous low-flow channel in an over-widened channel, • Creation of on-line bays, • Fixing whole trees into the river bank for flow diversity, • Gravel reworking to restore a low-flow channel, • Weir removal	Supports Objectives GI3 2-4 The impact of these measures on the current channel morphology and maintenance practices varies significantly. Options such as introducing Large Woody Debris would likely have a minimal impact on flooding while providing substantial benefits in the form of flow heterogeneity and habitat creation. Due to the in-stream nature of these interventions a Stage 3 Detailed Hydromorphological Assessment will be required to confirm the impact of these measures. Nonetheless these interventions have the potential to have a significant positive impact at a catchment scale and should be considered for all developments.

Likely Positive Impact	Intervention	Note
	 © Woodland Water & Gardens and D.Longley *Figure 1 Re-nationalising plan form channel can be accommodated in constrained environments. Significant benefits to water quality, sediment regime, habitat potential in addition to visual amenity.*	
Riparian Corridor	• Maintain or increase the width of riparian buffers. • Active Native Vegetation Restoration • Floodplain Identification and Avoidance. • Sustainable Agriculture Practices	Supports Objectives GI3 2-3 Where no riparian buffers are in place a minimum 10m vegetated riparian buffer from the top of the riverbank is to be reinstated along all watercourses within any development site. Interventions to improve the quality of riparian vegetation should be considered for all developments. Measures are discussed further in Section 4.

Likely Positive Impact	Intervention	Note
	 *Figure 2 Vegetated banks provide a multitude of benefits including flow and sediment control as well as habitat potential.*	
Direct channel interventions	• Culverting of Watercourse or new watercourse crossing • Channel straightening • Reinforcement of river bank or bed materials. • Construction of or amendment to weir or fish pass • Works requiring construction in stream or within 5m of the top of bank.	Mandatory requirement for Stage 3 Detailed Assessment.

Figure 3 Ineffective culverts become barriers to flow and negatively affect sediment regime.

Likely Positive Impact	Intervention	Note
	 *Figure 4 Watercourse has been cut off from riparian lands. Degrades water quality and habitat potential. Likely increases flood risk elsewhere.*	
Riparian Corridor	• Limiting Floodplain connectivity/ displacement of Flood Waters either by building in riparian zone or providing hard flood defences that limit floodplain connectivity. • Replacement of established native vegetated land cover*.	Mandatory requirement for Stage 3 Detailed Assessment. *May not require further assessment as long as appropriate SuDS measures are incorporated in the design and a native riparian buffer is reinstated. Grass lawns have low biodiversity value and are not considered native riparian vegetation.

Likely Positive Impact	Intervention	Note
	 *Figure 5 Riparian lands have been sterilised by hardstanding. Limits natural treatment process effecting water quality. Diminishing ability to attenuate flood flows.*	

4. RESTORATIVE MEASURES

In general restorative measures should create "Room for the River" and in time allow river systems to return to a state of equilibrium with rich biodiversity, developed ecosystem service provision and resilience to future shocks such as climate change. Potential restorative measures are described below.

4.1 Avoiding Development within Floodplains

Lateral connectivity should be maintained where possible throughout catchments. Assessing and zoning floodplains throughout the catchment is key to defining appropriate land use practices and future sustainable development. Much of the historic floodplains within the South Dublin are defined as part of previous flood studies (e.g. CFRAMS). Nonetheless, the impacts of climate change should be taken into account as the areas liable to flood in the near future may increase significantly over present-day extents and within the Riparian Corridors identified within this SFRA.

4.2 Riparian Buffer

The immediate riparian buffer should be "re-wilded" as much as possible. Any development within the riparian buffer strip, including pedestrian/cycle paths and highly managed parkland, should be minimised. Within these riparian buffer zones explicit care should be given to the variety of plant species. The vegetation within the riparian buffer should be native and appropriate to the location and soil water regime, preferably from a local source. Inclusion of riparian trees is important as currently the majority of catchments in the Dublin region have very little tree cover.

Providing buffer strips adjacent to the watercourses and limiting instream works maintains existing flow/flood regimes as well as important ecological corridors for aquatic and terrestrial flora and fauna.

4.3 Sustainable Agriculture Practices

The nature of land ownership in Ireland means that the majority of riparian land is privately owned. As such educating and involving riparian landowners is key to enhancing riverine environments. This includes:

- Educating farmers on the correct use of nitrates and agricultural fertilisers,
- Use of stock fencing to minimize livestock access pressure have been seen to result in:
    - a decrease in sediment loads
    - woody vegetation cover increases,
    - increase resistance to erosion,
    - increase in vegetation increases roughness,
    - trapping sediment, which builds banks;
- Designated crossing / access points for livestock along the banks of a watercourse will aid in reducing bank erosion and sediment from entering the watercourse. At such points, the banks could be reinforced to aid in the prevention of bank erosion.
- The provision of riparian buffers and Integrated Constructed Wetlands (ICW) systems adjacent to rivers has been seen to greatly reduce pollutants in agricultural runoff (e.g. effluent, fertilisers & pesticides, etc.) from entering freshwater systems.

- The provision of ICW systems on agricultural lands within the LAP can provide storage to agricultural runoff, slow runoff, create aquatic and riparian habitat and absorb and/or retain CO2, however incentives would possibly need to be in place for the general public to adopt such systems.

4.4 Appropriate Scale of Restoration Measures

It is recognised that the impact of a development is highly dependant on the scale and nature of the scheme overall. Restorative measures should be proportionate to the works being proposed e.g. restorative measures required as part of single house extension are likely less intensive than a large housing or commercial development. Table 2 below presents various scales of developments and likely restorative measures required.

Table 2 Scale of Restoration Measures

Intervention	Potential Effect	Restoration Measures
Development Outside Riparian Corridor Or Within Riparian Corridor But Not Directly Adjacent To Watercourse.		
Greenfield site development	Traditional drainage likely to increase flow volume, peak discharge rates and fine sediment discharge to receiving waterbody	Implementation of SuDS (based on local needs and local pressures) to control flow, volumes and sediments. Refer to SDCC SuDS Guidance.
Brownfield site development / extension of existing development	Existing drainage likely to be increasing flow volume, peak discharge rates and fine sediment discharge to receiving waterbody above natural levels.	Implementation of SuDS and where possible retrofit of existing drainage to control flow, volumes and sediments. Refer to SDCC SuDS Guidance.
Watercourse crossing	Poorly designed river crossings can: • lead to the degradation of biodiversity; • create a barrier to the movement of fish and other wildlife; • adversely effect sediment and nutrient regimes • increase flood risk.	Culverting of streams is to be avoided and de-culverting undertaken where possible. Remove derelict or unnecessary watercourse crossings where possible, Repair watercourse crossing where crossing required. Minimise number of crossings in new development, Single span bridges are the preferred type of crossing. This has the least impact on the natural fluvial regime, maintaining existing in-stream and bank side habitats. Sediment transport and migration of aquatic species can be maintained.
Greenfield site development	Traditional drainage potential to increase flow volume, peek discharge rates and fine sediment discharge to receiving waterbody. Interfere with flood flows increasing flood risk on site and in the vicinity of the development. Degradation of biodiversity through habitat removal, limiting connectivity along the riparian corridor and introduction of invasive species	Implementation of SuDS (based on local needs and local pressures) to control flow, volumes and sediments. Refer to SDCC SuDS Guidance. Maintain or reinstate native vegetation riparian buffer a minimum of 10m from top of bank either side of watercourse.
Brown field site development / extension of existing development	Existing drainage likely to be increasing flow volume, peek discharge rates and fine sediment discharge to receiving waterbody above natural levels.	Implementation of SuDS (based on local needs and local pressures) and where possible retrofit of existing drainage to control flow, volumes and sediments. Refer to SDCC SuDS Guidance.

Intervention	Potential Effect	Restoration Measures
Development Outside Riparian Corridor Or Within Riparian Corridor But Not Directly Adjacent To Watercourse.		
	Mobilise contaminants present on site e.g. sediments within the drainage network. Watercourses through brown field sites may have significant modifications to the main channel already present.	Clean and safely remove contaminated materials from site prior to construction. Where possible, remove artificial channels e.g. concrete banks and beds. Re-naturalise the bank cross section and vegetation. Remove excess silts and restore bed sediments. Where channel form part of land boundaries, improvements to the one bank within the applicants control is still likely to have a beneficial effect Maintain or reinstate native vegetation riparian buffer a minimum of 10m from top of bank either side of watercourse.
Note: The OPW should be consulted prior to any proposed alterations to watercourse crossings, weirs or channels managed under the Arterial Drainage Act 1945.		

5. SUMMARY

This document has presented the development level hydrographical assessment process. This process will aid in meeting objectives (GI3 1-4) stated in the county development plan and subsequently our objectives under the WFD by assessing and mitigating impacts to hydromorphology within riparian lands.

South Dublin County Council is aware of the "Technical Guidance to Morphological Risk Assessment of Rivers Guidelines For Planning Authorities" currently being developed by the Department of Housing, Planning and Local Government. Once published these guidelines can be revisited.