



Carrickmines-Shanganagh River Flood Relief Scheme

Otter Conservation Plan

Final Report

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www.jbaconsulting.ie

www.egis-group.com



JBA Project Director

Bernadette O'Connell
2nd Floor
Lincoln House
Lincoln Lane
Arran Quay
DUBLIN

Egis Project Manager

Eoin Dunphy
Classon House
Dundrum Business Park
Dundrum Road
Dublin 14

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Contract

This report relates to the Carrickmines-Shanganagh River Flood Relief Scheme commissioned by Dún Laoghaire-Rathdown County Council (DLRCC), on behalf of the Office of Public Works (OPW). William Mulville and Patricia Byrne of JBA Consulting compiled this report.

Purpose

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Abbreviations

BAP	Biodiversity Action Plan
CIEEM	Chartered Institute of Ecology and Environmental Management
DLRCC	Dún Laoghaire-Rathdown County Council
DoHLGH	Department of Housing, Local Government, and Heritage
ECow	Ecological Clerk of Works
EU	European Union
FRS	Flood Relief Scheme
IFI	Inland Fisheries Ireland
LA	Local Authorities
NBAP	National Biodiversity Action Plan
NBDC	National Biodiversity Centre Ireland
NPWS	National Parks and Wildlife Service
OPW	Office of Public Works
pNHA	Proposed Natural Heritage Areas
RFI	Request for Further Information
RPS	Record of Protected Structures
WFD	Water Framework Directive

1 Introduction

1.1 Background

JBA Consulting Engineers and Scientists Ltd. (hereafter JBA) was commissioned by Dún Laoghaire-Rathdown County Council (DLRCC), on behalf of the Office of Public Works (OPW) to produce an Otter Conservation Plan as part of a Request for Further Information (RFI) for the proposed Carrickmines-Shanganagh River Flood Relief Scheme at sites in the townlands of Woodside, Kilgobbin, Carrickmines, Brennanstown, Shankill, Loughlinstown, Shanganagh and Hackettsland. See below for the specifics of Item 8a from An Coimisiún Pleanála's RFI:

'Submit an Otter Conservation Plan for the proposed flood relief scheme incorporating provision for undertaking new otter surveys of the sections of the Carrickmines and Shanganagh river system to be affected by the planned flood defence works and at least 200m upstream and downstream of these works.'

1.2 Legislative Context

Policy and legalisation for nature conservation; and protected and priority species, i.e., Otter *Lutra lutra*, relevant to the proposed scheme is provided below.

1.2.1 Biodiversity Policy and Guidance

Ireland's 4th National Biodiversity Action Plan 2023-2030 (NBAP) (DoHLGH, 2024) sets the national biodiversity agenda for the period 2023-2030 and aims to deliver the transformative changes required to the ways in which we value and protect nature.

The 4th NBAP endeavours for a "whole of government, whole of society" approach to the governance and conservation of biodiversity. The aim is to ensure that every citizen, community, business (including developers), local authority, semi-state and state agency has an awareness of biodiversity and its importance, and of the implications of its loss, while also understanding how they can act to address the biodiversity emergency as part of a renewed national effort to "act for nature".

This NBAP 2023-2030 builds upon the achievements of the previous Plan. It will continue to implement actions within the framework of five strategic objectives, with the first two objectives of particular relevance to the production of this Otter Conservation Plan:

- Objective 1 - Adopt a Whole of Government, Whole of Society Approach to Biodiversity
- Objective 2 - Meet Urgent Conservation and Restoration Needs
- Objective 3 - Secure Nature's Contribution to People
- Objective 4 - Enhance the Evidence Base for Action on Biodiversity
- Objective 5 – Strengthen Ireland's Contribution to International Biodiversity Initiatives.

The Wildlife (Amendment) Act 2023 introduced a new public sector duty on biodiversity. The legislation provides that every public body, as listed in the Act, is obliged to have regard to the objectives and targets in the National Biodiversity Action Plan.

As part of the Action Plan process Local Authorities (LA) must produce Biodiversity Action Plans (BAP). BAPs highlight local biodiversity issues and set out a series of objectives and action plans for the conservation of priority species and habitats where they occur in each district or county.

1.2.2 Irish Wildlife Acts

A number of species, including Otter, are protected under Irish legislation, including Otter. In Ireland, primary protection is provided under the Wildlife Acts 1976-2021 and the Wildlife (Amendment) Act 2023.

1.2.3 EU Habitats Directive

The Habitats Directive (Council Directive 92/43/EEC) was adopted in 1992 and transposed into Irish legislation in 1997. This directive outlines protection for over 1000 species and 230 habitat types across Europe, including Otter and its associated habitats. Otter is specifically afforded protection under Annex II (requiring Special Areas of Conservation) and Annex IV (strict protection).

2 Scheme Description

2.1 Flood Relief Scheme Location

The development will consist of a series of flood defences positioned along the banks of the Carrickmines-Shanganagh river system as it flows from the R117 Enniskerry Road towards the Irish Sea, where it discharges at Killiney Bay (Figure 2-1). The defences comprise new and upgraded flood walls, culvert adjustments, and instream works.

The proposed scheme includes interventions on rivers and streams including: Kilgobbin Stream, Ballyogan Stream, Carrickmines River, Brides Glen River and Shanganagh River. The Carrickmines-Shanganagh River catchment is approximately 36km² and encompasses a wide variety of land uses ranging from rural mountainous areas in the west, to urban residential areas in the east. The proposed development will be situated primarily in the built-up residential parts of the catchment. The description of the works locations follows reads from west to east below (upstream to downstream).

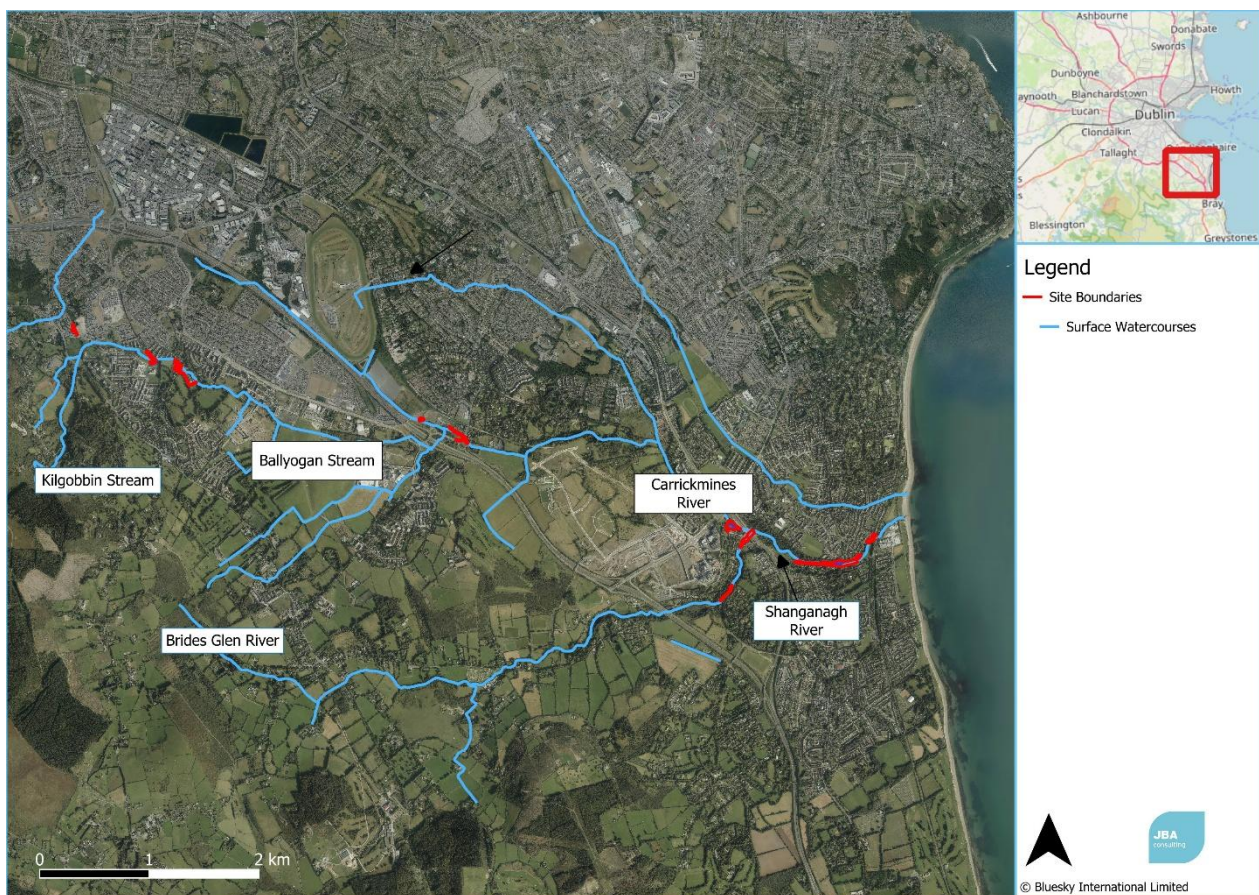


Figure 2-1: Overview of Project Location

Clon Brugh

Clon Brugh (Figure 2-2) is a residential estate situated just east of the R117 Enniskerry Road. It comprises a mix of 3-4 storey apartment blocks and houses, with small green areas, car parking, and footpaths. The proposed works in this area will be located along an area of linear green space and footpath. The area surrounding Clon Brugh is also primarily residential, with green space to the west and south in the Dublin mountains foothills.



Figure 2-2: Clon Brugh Site Location

Belarmine Park

Belarmine Park (Figure 2-3) is a small public park surrounded by residential areas to the north, east, west, and southwest, and a school to the southeast. The Kilgobbin Stream flows through the park from roughly west to east through a wooded area, with grassy areas to the north and south. A small pond or wetland is also within the park. The stream enters a culvert at the eastern end of the park and emerges approx. 80m upstream of Kilgobbin Road. Works will be taking place at the boundary wall between the park and houses to the north in Sandyford Hall Grove and Sandyford Hall Crescent.

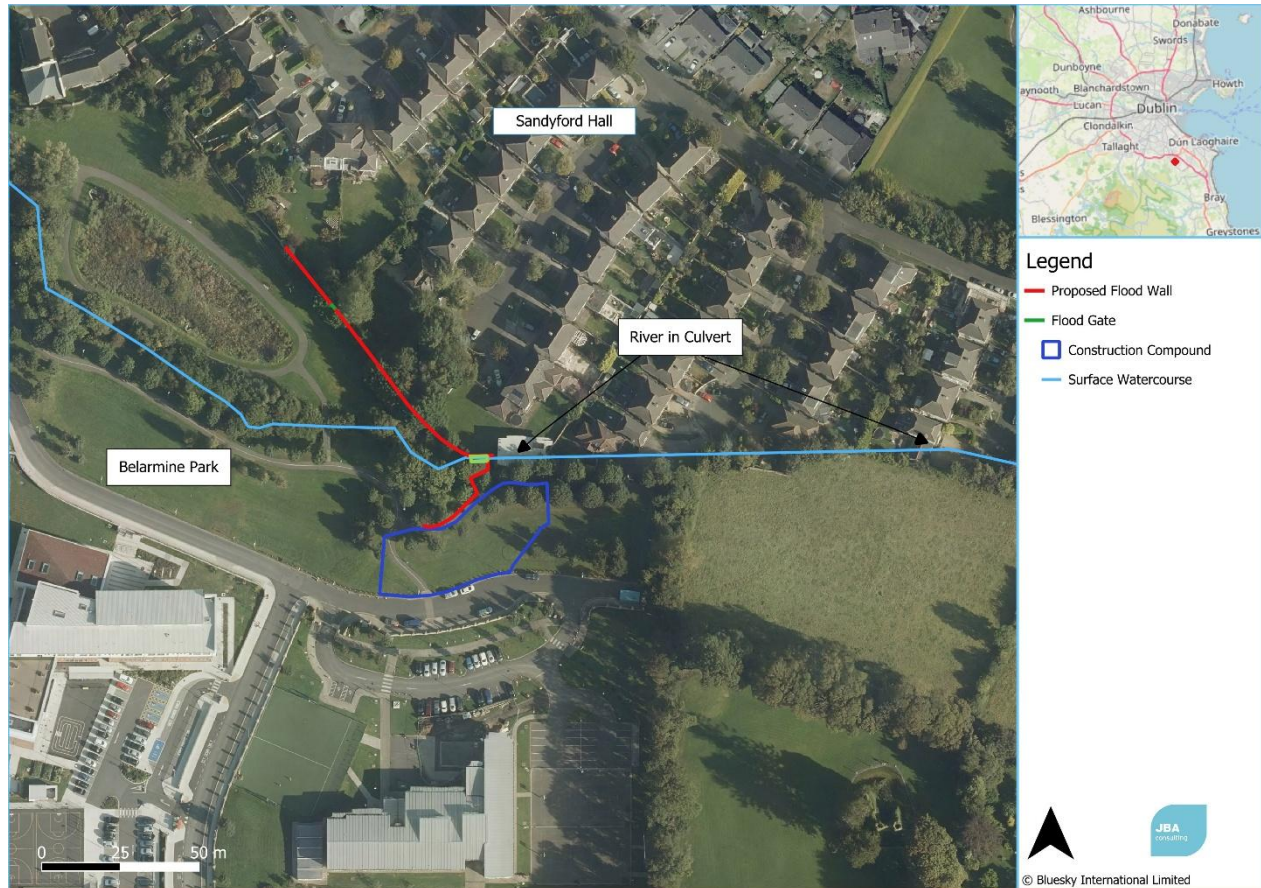


Figure 2-3: Belarmine Park Site Location

Kilgobbin Road

Kilgobbin Road (Figure 2-4) is a small road lined with trees and stone walls, with a narrow footpath on one side for much of its length. The works in this area will take place along the boundaries of two houses on the western side of the road, before running beneath the road and turning east down a narrow laneway, finally running across an area of open space to join back with the river approx. 220m downstream. The houses in this area are all detached, on large plots of land. Kilgobbin House is a protected structure (RPS No.1684) whose stone wall boundary will be removed and reconstructed as a flood wall.



Figure 2-4: Kilgobbin Road Site Location

Glenamuck Road North

The works at the Glenamuck Road North (Figure 2-5) are centred around Glenamuck Road North Roundabout, Ballyogan Grove/Castle View, and Priorsland. Works will be in close proximity to Carrickmines Castle (DU026-005001) and in view of houses along Ballyogan Grove/Castle View and Priorsland. Glenamuck Road North is a busy link road between Carrickmines and the M50 Junction 15, with access also to the Carrickmines Luas Park and Ride, and Leopardstown Racecourse. The proposed works along the northern side of the roundabout are adjacent to an existing footpath and segregated two-way cycle lane, while those along Ballyogan Grove/Castle View are adjacent to the existing road surface, and will replace an existing low stone wall.

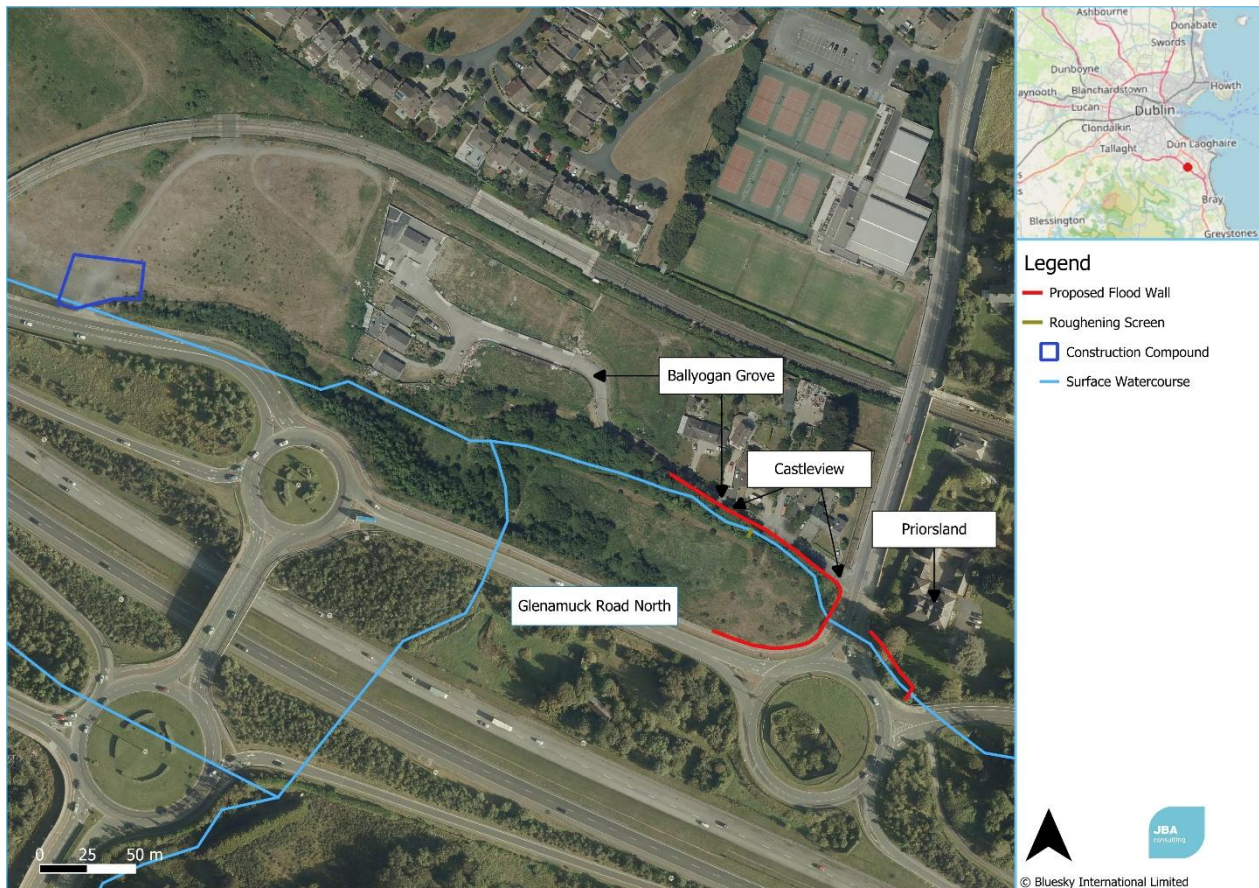


Figure 2-5: Glenamuck Road North Site Location

Cherrywood Road

Cherrywood Road (Figure 2-6) is a tree-lined local road with detached houses on either side. It is situated between the M50 to the west and the N11 to the east, with the Cherrywood Strategic Development Zone (SDZ) to the north. Land use in this area is primarily residential, with large green spaces separating individual houses. The proposed works will take place within the property of three houses, adjacent to the river. The river has a riparian corridor here consisting of mature trees and other vegetation. Immediately downstream of this point, the river flows beneath the Cherrywood Viaduct, which is a protected structure (RPS No. 1783).



Figure 2-6: Cherrywood Road Site Location

Bray Road

The works at Bray Road (Figure 2-7) will take place on the Carrickmines River, between a green field to the west and the rear of buildings on Bray Road to the east. Bray Road is a cul-de-sac adjacent to the N11 with a mix of commercial and residential buildings. The buildings back on to the river which flows south before crossing under the N11 in a culvert. A mix of trees line the river, with an open green field on its western side.

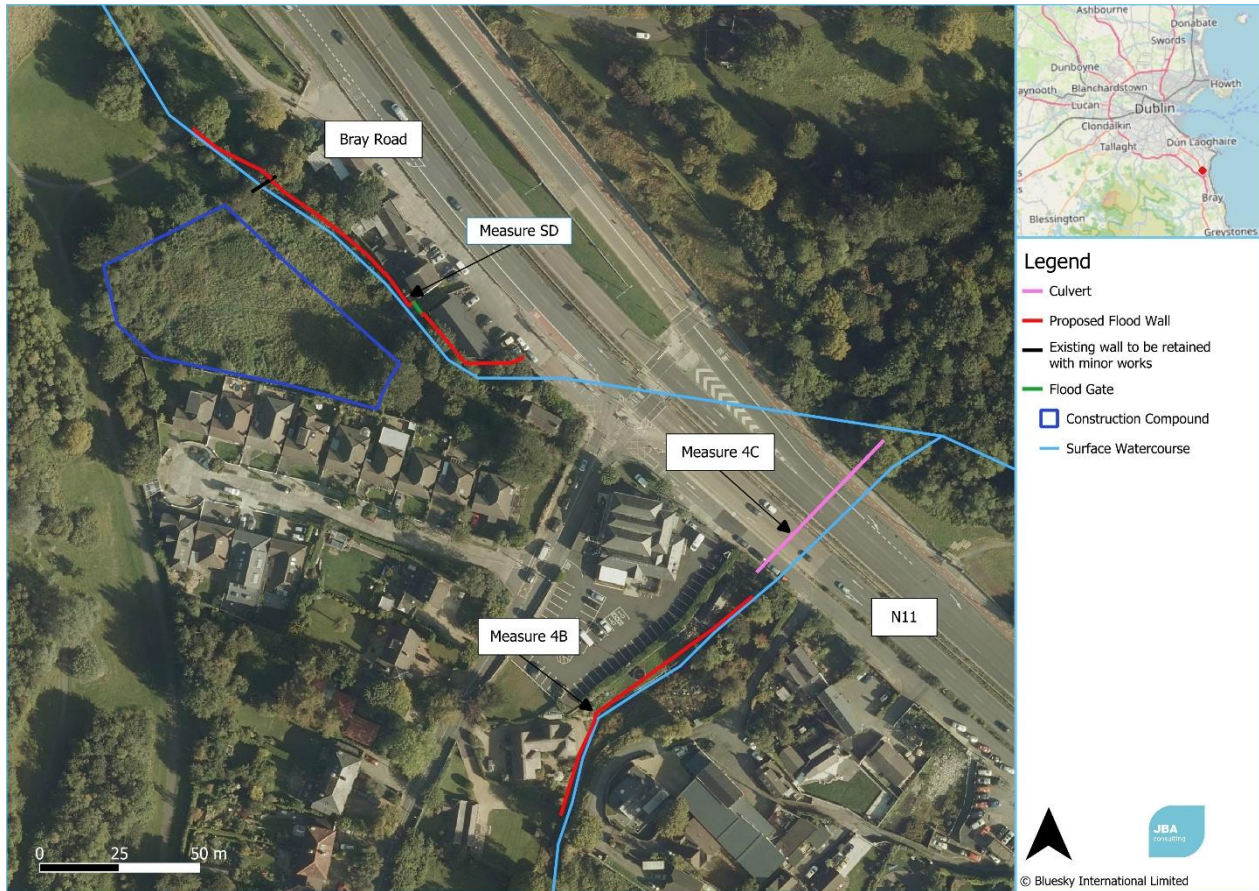


Figure 2-7: Bray Road and Lower Brides Glen Site Locations

Lower Brides Glen

Approximately 100m southeast of the Bray Road works at Lower Brides Glen (Figure 2-7), works will take place within the garden of a private residence called Waterfall Cottage, and to the culvert beneath the N11. The N11 is a busy road corridor and changes to the M11 motorway approx. 500m south of the works area. The downstream end of the N11 culvert overflow works is within Loughlinstown Woods, a densely wooded area which is also designated as a proposed Natural Heritage Area (pNHA).

Commons Road, River Lane and Brookdene

Works at the Commons Road, River Lane and Brookdene Site Location (Figure 2-8) will take place along the Shanganagh River as it flows from west to east along Commons Road, under the Shanganagh Road Bridge, and between Shanganagh Wood and Brookdene. Upstream of the bridge, Commons Road has residential development along its south side, with the river adjacent to the north. The northern side of the river at this point is wooded, with one house and a bridge providing access at roughly the midway point of the works. North of the wooded area is housing. Shanganagh Road Bridge is a protected structure (RPS No. 1772) and is a narrow two-lane stone arch bridge. Downstream of the bridge, Shanganagh Wood and Brookdene are both residential roads, with a footpath adjacent to the river along Shanganagh Wood, and a riparian strip and tree line on the left (north) bank at Brookdene.



Figure 2-8: Commons Road, River Lane and Brookdene Site Location

Bayview

Bayview (Figure 2-9) is a residential area bound to the east by the railway line and a green area through which the Shanganagh River flows. Bayview comprises semi-detached and detached houses with front and rear gardens. Downstream of this point, the river flows beneath the railway line and past Shanganagh Wastewater Treatment Plant to the south, before discharging into the sea at Killiney Bay.

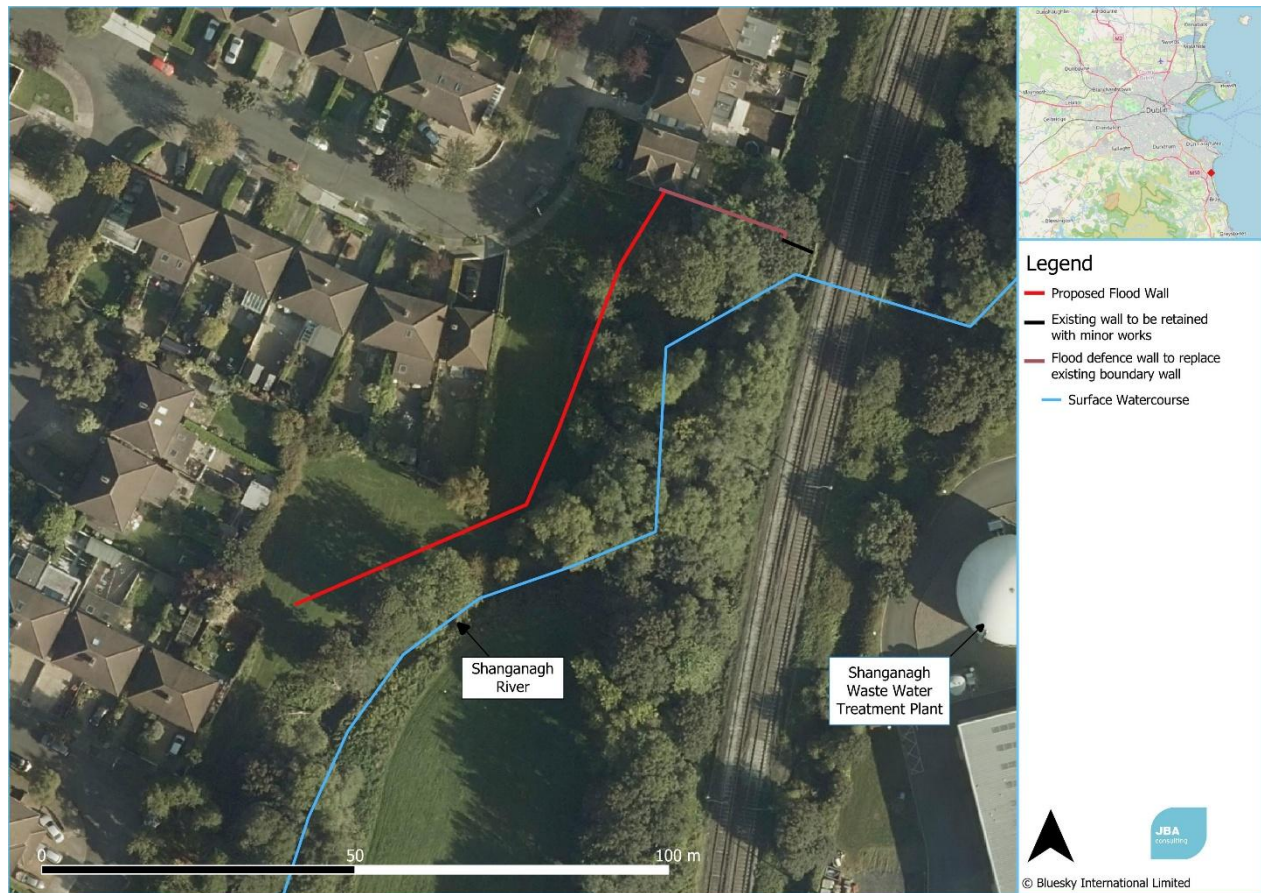


Figure 2-9: Bayview Site Location

2.2 Project Description

The characteristics of the proposed development are described in detail in this section.

Clon Brugh

- Construction of c. 113m of flood defence walls up to 1.35m high adjacent to the existing overland flow path from the Carysfort Maretime Stream.
- Demolition of c. 16m of existing masonry walls and realignment works to the existing footpath.

Belarmine Park

- Replacement of c. 100m of the Sandyford Hall boundary wall with a new concrete flood defence wall up to 2.6m high.
- Construction of c. 36m of new flood defence walls in Belarmine Park up to 1.65m high to tie into the existing culvert inlet.
- Minor upgrade works to the existing culvert inlet structure.

Kilgobbin Road

- Replacement of c.69m of existing stone boundary wall to a protected structure Kilgobbin House (RPS Ref: 1684) and construction of c.100m of stone finished flood defence walls up to c.1.7m upstream of Kilgobbin Bridge.
- Installation of c. 298m of culvert from a proposed flow control weir at Kilgobbin Bridge to a discharge point adjoining Meadowbrook downstream.

Glenamuck Road North

- Demolition and removal of c. 128m of existing masonry walls.
- Construction of c. 259m of stone finished flood defence walls up to 1.9m high, including flood gate, along Castle View/Ballyogan Grove and the upstream face of the bridge at Glenamuck Road roundabout.
- Construction of c. 90m of flood defence wall up to 1.5m high adjacent to the river immediately downstream of Glenamuck Road roundabout.
- Installation of a new in-channel debris screen immediately upstream of the existing bridge.

Cherrywood Road

- Construction of c. 178m of concrete flood defence wall ranging from 1.1m to 2.7m high, including demountable barriers and railings, on the bank of the Brides Glen River adjoining the existing properties and upstream of the Cherrywood Viaduct (RPS Ref. 1783).

Bray Road

- Construction of c. 133m of concrete flood defence wall ranging from 1.1m to 3.1m high, including flood gate, on the Carrickmines River to the rear of existing properties on Bray Road.
- Circa 75m of river channel realignment, replacement of the existing access bridge and strengthening works to the existing masonry arch.

Lower Brides Glen

- Construction of c. 129m of flood defence walls ranging from 1.2m to 2m in height. The walls are to be located along the north bank of Brides Glen River, within the curtilage of existing properties including a protected structure Waterfall Cottage (RPS Ref: 1770) and immediately upstream of the N11 culvert. Works include demountable barriers and decorative railings.

N11 Overflow Culvert

- Installation of c. 53m of new 2.4m diameter overflow pipe beneath the N11 dual carriageway including an inlet upstream of the N11 and an outlet structure in Loughlinstown Park.

Commons Road, River Lane and Brookdene

- Construction of c.209m of flood defence walls up to 2.4m high on Commons Road adjoining the river.
- Structural works to upgrade c. 324m of existing flood defence walls upstream of Shanganagh Road Bridge to an overall height of up to c.3.6m.
- Structural remedial works to the existing Protected Structure, Shanganagh Bridge (RPS Ref: 1773) including underpinning, scour protection and reinforcement of the masonry parapet.
- Upgrading of c.113m of existing flood defence wall on River Lane to a height of up to c.1.8m and construction of c.185m of flood defence wall to a height of up to c.1.2m in the Brookdene Estate.

Bayview

- Construction of c. 95m of stone finished flood defence walls up to 1.8m high in the green area adjacent to Bayview Grove/Lawns.
- Replacement of c. 17m of existing boundary wall at 20 Bayview Lawns with a new flood defence wall to match existing wall height and finishes and replacement of remaining c. 10m of wall tying into the culvert under the railway with a concrete flood defence wall.

2.3 Duration of Works

The construction phase is anticipated to last approximately 18-24 months. Operations of the site are expected to be permanent.

2.4 Excavation Requirements

Excavation depths and total area of land to be subjected to earthworks will be confirmed following detailed design.

2.5 Scheme Landscape Design

See the proposed scheme's update landscape design will be submitted alongside this conservation plan as part of the RFI response.

3 Methodology

This Otter Conservation Plan assesses the ecological features of value to the local Otter population that are present within the sub-catchments in relation to the proposed scheme works locations. This allows for identification of the potential impacts of the proposed development upon the ecological features associated with the local Otters. The assessment is based on a desktop study of existing data and site surveys, which provided information on the Otter population and associated habitats present within and adjacent to the proposed scheme works.

This Otter Conservation Plan will outline the findings of the desk-based assessment and the surveys and identify any potential impacts of the proposed scheme on ecological features associated with the local Otter population; and propose mitigation measures to avoid and/or reduce impacts and provide compensation measures where necessary.

3.1.1 Desktop Baseline Study

A desktop study was conducted of available published and unpublished data, along with a review of data available on the National Parks and Wildlife Service (NPWS), and National Biodiversity Data Centre (NBDC) web-based databases, in order to identify key habitats for the local Otter population, that may be present within ecologically relevant distances from the proposed scheme. The data sources below were consulted for the desktop study:

- NPWS, 2025a. The Status of EU Protected Habitats and Species in Ireland. Volume 1: Summary Overview. Unpublished NPWS report. Edited by: Domhnall Finch, Aoife Delaney, Fionnuala O'Neill and Deirdre Lynn. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin, Ireland;
- NPWS, 2025b. The Status of EU Protected Habitats and Species in Ireland. Volume 3: Species Assessment. Unpublished NPWS report. Edited by: Domhnall Finch, Aoife Delaney, Fionnuala O'Neill and Deirdre Lynn. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin, Ireland;
- Aerial photography available from www.osi.ie, Google Maps <http://maps.google.com/>;
- Online data available on Natura 2000 sites as held by the National Parks and Wildlife Service (NPWS) from www.npws.ie;
- Otter Survey of Ireland 2023-2024 – Irish Wildlife Manuals 161 (Reid et al. 2025)
- NBDC, 2026 – Species Distribution Maps; Available online at www.biodiversityireland.ie;
- All Ireland Red Data lists for vascular flora, mammals, butterflies, non-marine molluscs, dragonflies & damselflies, amphibians and fish; and
- DLRCC Planning Portal.

3.1.2 Field Surveys

Instream Otter surveys, with accompanying camera-trap monitoring, were carried out by JBA ecologists on the 9th of February; 25th March; 24th April; 8th and 21st of May, and the 8th and 18th of June 2026 to identify the presence of Otter resting sites (holts and couches) within the works areas of the proposed Carrickmines-Shanganagh FRS, and at least 200m upstream and downstream of these proposed works areas. The 200m extension ensures the inclusion of potential natal holts that could be potentially impacted by the works. The locations of all Otter field signs and potential resting sites were recorded, mapped and photographed where present, as well as notes taken on likelihood of recent use and general suitability for standard resting sites vs. maternal and natal resting sites.

The rivers and streams within the scheme's disturbance buffer were surveyed for field signs of Otter including:

- Holts
- Couches
- Latrines

- Spraint sites
- Individuals spraints, smears and anal jelly
- Feeding sites
- River / streambank trails
- Slides
- Footprints

Additionally, Otter spraints were collected during the field surveys for later analysis, in order gain insight into the dietary preferences of the local population. Analysis of spraint prey remains was conducted using Conry et al., 2005 - A guide to the identification of prey remains Otter spraint – 3rd Edition.

The ecological surveys recorded riparian habitats and signs of Otter habitation, following guidance outlined in the documents below:

- Best Practice Guidance for Habitat Survey and Mapping. The Heritage Council. (Smith et al., 2011);
- Guidelines for the Treatment of Otters Prior to the Construction of National Road Schemes – National Roads Authority (NRA, 2006); and
- The Otter Field Survey and Monitoring Handbook: A Practical Guide to Field and Camera-Trap Surveys (Findlay and White, 2026).

Habitats have been named and classified following A Guide to Habitats in Ireland by Fossitt (2000). Nomenclature for higher plants follows that given in The New Flora of the British Isles 4th Edition (Clive Stace, 2019). Identification of Irish plants generally follows Webb's- An Irish Flora (Parnell and Curtis, 2012).

Terminology for Otter-based field signs and resting areas will be following the update terms and labels outlined within Findlay and White (2026) field survey and monitoring handbook document.

3.1.3 Camera-trap Monitoring

Camera-trap set-up and monitoring during these surveys follow the methods outline within The Otter Field Survey and Monitoring Handbook: A Practical Guide to Field and Camera-Trap Surveys (Findlay and White, 2026), wherever methods practically fit within the limited timeframe given to conduct the monitoring study of potential Otter resting sites. Analysis of camera-trap footage was also undertaken utilising notes within the Findlay and White (2026) best-practice guidance document.

Camera-trap equipment included the below camera-trap models:

- IFP Sentinel 4K Trail Camera;
- Bushnell Prime Low Glow Trail Camera; and
- Browning Spec Ops Elite HP5 Lutra Trail Camera.

3.1.4 Consideration of Cumulative and In-combination Impacts

Potential sources of cumulative and in-combination impacts were identified based on the infrastructural design of other local development sites. Potential sources of cumulative and/or in-combination impacts of potential significance for the local otters were identified within the localities of the Carrickmines-Shanganagh FRS.

3.1.5 Residual Impacts

In respect to Otter, the proposed scheme has been assessed including mitigation by design measures. This was done where mitigation by design measures have proven to be effective and implemented effectively with a high certainty of functional operational success. Where notable negative residual impacts are still identified, further mitigation measures are proposed as part of the Otter Conservation Plan to avoid, reduce or minimise them.

3.2 NPWS Consultation

JBA ecologists held a meeting with the Divisional Ecologist from NPWS's Ecological Guidance and Advice Unit on the 23rd of July 2026, to discuss the results of the Otter field and monitoring surveys, as well as the mitigation measures proposed to alleviate potential negative impacts on the local Otter population, as a result of the construction and operations of the proposed FRS. The Divisional Ecologist stated that he was 'satisfied' with both the survey effort and resulting data, as well as the proposed pre-construction, construction and operational/post-construction monitoring mitigation measures to be put in place to safeguard the local Otter population.

3.3 Competent Persons

The assessment was prepared by William Mulville BSc (Hons) Zoology, MSc, MCIEEM. William is a Senior Ecologist with JBA Consulting, with over 9 years' experience in ecological research, endangered species conservation and ecological consultancy, who specialises in mustelid ecology.

The assessment was reviewed by Patricia Byrne - Patricia is a Principal Ecologist with JBA Consulting, with over 20 years' experience in environmental and ecological research, teaching and reporting; and with nine years in ecological consultancy. Patricia is a full Member of the Chartered Institute of Ecological and Environmental Management (CIEEM).

3.4 Limitations and Constraints

This Otter Conservation Plan is based on existing data from the above-mentioned sources. The conservation plan necessarily relies on some assumptions and is inevitably subject to some limitations as detailed below:

- The conservation plan cannot account for potential future developments within the locality that are not currently registered within DLRCC's planning systems.
- Data from biological record centres or online databases is historical information, and datasets may be incomplete, inaccurate, or missing. The absence of Otter records for an area may be due to the under recording in the area and not necessarily imply a lesser species density. These records are therefore to be treated as minimum information available for the area.
- Time and seasonal data limitations are present within this plan given the timing of the received RFI, as well as the relatively short return period for requested items within an ecological context, where the target species is an elusive, largely nocturnal, highly mobile apex predator (small numbers in any given location given its position within the food web) within a large study area. Photographic capture of Otter became increasingly difficult as vegetation growth increased in spring and early summer 2026.

4 Conservation Plan Objectives

4.1 Introduction

This section sets out the objectives of the Otter Conservation Plan, that will enable the local Otter population of within the Shanganagh River catchment to continue to inhabit the river and its tributaries with minimal impact on their activities.

4.2 Otter Conservation Objectives

The overarching objective is to maintain the existing local otter population. For this to be achieved the following factors will have to be assessed in order to maintain a stable population dynamic within the greater Carrickmines-Shanganagh area:

- Watercourse / Riparian Connectivity and Barrier Management;
- Protection of Territorial Range and Resources;
- Protection of Potential Resting Sites from Construction Disturbance; and
- Enhancement of Natural Riparian Zones.

4.2.1 Watercourse / Riparian Connectivity, Range Protection and Barrier Management

Watercourse / riparian connectivity controls the extent to which a riparian landscape facilitates the movements of Otters between the resources within their territorial range. The protection and enhancement of connectivity is required to offset the impacts of habitat loss and fragmentation from the proposed scheme. The loss of connectivity can reduce the size and quality of available habitat.

In order to preserve the riparian landscape connectivity for the local Otter population, the following strategies will be carried out:

- Ensure the appropriately landscaped commuting corridors for Otter navigation; and
- Ensure the presence of suitable temporary and permanent structures that allow for safe / undisturbed passage in artificial / urban habitats during the construction and/or operational phases of the proposed scheme.

4.2.2 Protection of Foraging Resources

The range of foraging resources available to Otter is determined by riparian habitat diversity and structure, river/stream physical parameter and instream / marginal features and water quality. Following guidelines on the protection of water quality and prescribed ecological mitigations within the proposed scheme's existing ecological/environmental reporting, as well as mitigations outlined within this Conservation Plan, will also ensure the availability of clean water, ensuring fish populations in the streams and river are not adversely affected, which in turn protects the core dietary components of the local Otter population's diet.

By ensuring that the riparian corridor is optimally maintained during construction and early post-construction phases, this will allow it to continue to provide Otters with non-fish prey items, such as waterfowl, amphibians and small non-volant mammals, which provide supplementary sustenance to their core fish-based diet. The proposed scheme outlines the retention of existing vegetation along most of the scheme, which will aid in maintaining the existing as waterfowl, amphibians and small non-volant mammals prey populations for Otter.

4.2.3 Protection and/or Provision of Resting Sites from Disturbance

Protection of potential existing Otter resting sites (holts and couches) is essential for ensuring the local population persists within the locality of the proposed scheme and is not driven out via construction- and operation-based disturbances.

In order to protect these potential existing Otter resting sites from enabling/pre-construction-, construction- and operation-based disturbances generated by the proposed scheme's works, the following strategies will be implemented:

- Re-examine the activity levels of potentially impacted resting sites within disturbance zone;
- Detail additional mitigation measures based on pre-enabling/pre-construction assessment of potentially active resting sites;
- Ensure strict site security and works area boundaries; and
- Ensure minimal visual, audible and vibration impacts within the area of potentially active holts and couches.

4.2.4 Enhancement of Natural Riparian Zones

The landscaping design plans and associated ecological mitigations for the proposed scheme will need to ensure that the long-term condition of the affected natural riparian zones, i.e., natural habitat types as opposed to flood walls etc., have a minimum functional ecological lag period following the commencement of the scheme works. Additionally, the scheme's landscaping will aim to restore and then enhance the overall quality of the riparian zones for the local Otter population, beyond that of their existing respective conditions.

5 Existing Environment

5.1 Baseline Conditions

The proposed scheme is set along multiple stretches of riparian habitat within the south Co. Dublin area; this includes the Shanganagh River and its tributaries, as well as the riparian habitats along their respective banks, which includes the mixed broadleaved and riparian woodlands of the Loughlinstown Woods proposed Natural Heritage Area (pNHA). While the majority of the riparian habitats are natural, artificial habitats (buildings, walls, roads, railway and pedestrian infrastructure) are present within or immediately adjacent to the riparian zone.

5.2 Core Riparian and Aquatic Habitats

The following sub-sections will detail the core riparian habitats and characteristics of the watercourses at each respective work site for the proposed scheme, including the habitats downstream of Bayview works site, i.e., habitats between Bayview and Killiney Beach.

5.2.1 Proposed Works Sites and Core Riparian Habitats

This sub-section outlines the core riparian habitats contained within and/or immediately adjacent to the proposed scheme's work areas; as well as the ecological functions they provide to the local Otter population.

Table 5-1: Core riparian habitats and their functionality for Otter within each works area and downstream

Work Areas	Core Riparian Habitats	Functionality for Otter
Belarmine Park	Mosaic: Mixed broadleaved woodland / Scrub	Sheltered terrestrial commuting Potential for holt or couch Provides cover to consume prey items
	Amenity grassland (improved)	Unsheltered commuting (low value)
	Mosaic: Other artificial lakes and ponds / Reed and large sedge swamps	Provides pond-based prey, i.e., fish, birds and amphibians Potential for couch Provides cover to consume prey items Partially sheltered commuting
Kilgobbin Road	Amenity grassland (improved)	Unsheltered commuting (low value)
	Improved agricultural grassland	Unsheltered commuting (low value)
	Hedgerows	Partially sheltered commuting
	Treelines (inner riparian zone)	Partially sheltered commuting
Glenamuck Road North	Scrub	Sheltered terrestrial commuting Potential for holt or couch Provides cover to consume prey items
	Treelines	Partially sheltered commuting
	Dry meadow and grass verges	Partially sheltered commuting Potential for couch Provides cover to consume prey items
Cherrywood Road	Earth bank	Partially sheltered commuting Potential for holt
	Amenity grassland (improved)	Unsheltered commuting (low value)

Work Areas	Core Riparian Habitats	Functionality for Otter
	Stone walls and other stonework	Sprainting site / territorial marking
	Mixed broadleaved woodland	Sheltered terrestrial commuting Potential for holt or couch Provides cover to consume prey items
Bray Road	Scrub	Sheltered terrestrial commuting Potential for holt or couch Provides cover to consume prey items
	Dry meadow and grass verges	Partially sheltered commuting Potential for couch Provides cover to consume prey items
	Mixed broadleaved woodland	Sheltered terrestrial commuting Potential for holt or couch Provides cover to consume prey items
Lower Brides Glen	Scrub	Sheltered terrestrial commuting Potential for holt or couch Provides cover to consume prey items
	Treelines	Partially sheltered commuting
	Dry meadow and grass verges	Partially sheltered commuting
	Mixed broadleaved woodland / Riparian woodland	Sheltered terrestrial commuting Potential for holt or couch Provides cover to consume prey items
Commons Road	Mixed broadleaved woodland	Sheltered terrestrial commuting Potential for holt or couch Provides cover to consume prey items
	Stone walls and other stonework	Sprainting site / territorial marking
Brookdene / River Lane	Mixed broadleaved woodland	Sheltered terrestrial commuting Potential for holt or couch Provides cover to consume prey items
	Stone walls and other stonework	Sprainting site / territorial marking
	Earth bank	Partially sheltered commuting
Bayview	Mosaic: Mixed broadleaved woodland / Scrub	Sheltered terrestrial commuting Potential for holt or couch Provides cover to consume prey items
	Treelines	Partially sheltered commuting
	Dry meadow and grass verges	Partially sheltered commuting
No Works Proposed (Downstream)		
Downstream of Bayview	Mosaic: Dry meadows and grassy verges / Scrub	Sheltered terrestrial commuting Potential for holt or couch Provides cover to consume prey items
	Mixed broadleaved woodland	Sheltered terrestrial commuting Potential for holt or couch Provides cover to consume prey items
	Mosaic: Mixed broadleaved woodland / Scrub	Sheltered terrestrial commuting Potential for holt or couch Provides cover to consume prey items

Work Areas	Core Riparian Habitats	Functionality for Otter
	Shingle and gravel shores	Partially sheltered commuting Sprainting site / territorial marking

5.3 Otter Field Signs

The below Otter field sign locations can be viewed in the maps displayed in Appendix A.

5.3.1 Signs of Frequent Habitation

Pawprints

During the 2026 instream surveys, multiple sets of Otter pawprints were recorded along the sand/muds of the left bank marginal sediments, immediately downstream of the Shanganagh Road Bridge. Pawprints have been recorded here on multiple occasions since 2023.

Slides

Slides frequently occurred alongside potential holts and couches recorded along the scheme's watercourses. Aside from these slides, only one other slide was noted within the Loughlinstown Woods pNHA, north of the Loughlinstown Pitch and Putt.

Spraints and Sprainting Sites

A total of 22 spraint samples were collected while conducting the instream and bankside surveying for Otter resting sites. These samples were taken from boulders; instream (dry) gravel depositional features; tree limbs crossing the watercourse; and rock armour installations near bridges. Multiple individual spraints and sprainting sites were recorded during the surveys, though none of sprainting sites qualified for status as a long-term Otter latrine, the size / quantity of which is notable larger than that of an average sprainting site. Well-used latrines are strong indicators for an Otter resting site within the immediate vicinity (Findlay and White, 2026). The details on the spraint / dietary analyse are expanded on in sub-section 5.5.

Sign Heap

A single sign heap, the term used to describe locations where Otter scrap up small piles of vegetation, silt/sand and spraint upon or adjacent to them, was recorded downstream of the Bayview works area. This sign heap was located in-channel on a sandy dispositional bar, with two spraints located immediately adjacent to the heap and claw scratchings in the sand.



Figure 5-1: Otter sign heap with spraints (centre left by seedling) downstream of Bayview works area

5.4 Otter Camera-trap Monitoring of Potential Resting Sites

5.4.1 Potential Holts

A total of eight potentially active Otter holts, including one historically active holt, were recorded within the 200m survey buffer zone (upstream and downstream) of the proposed scheme. None of the eight were deemed to be active in use by local Otter during the 2026 camera-trap survey period. The monitoring of the eight potentially active holts is detailed below.

Downstream of Bayview

A potential two-entrance Otter holt, with an accompanying slide into the river, was discovered along the right bank of the Shanganagh River downstream. This potential holt was in close proximity to the in-channel sign heap and spraints.

Monitoring of the potential holt revealed that it was currently being utilised by Red Fox (Figure 5-2).



Figure 5-2: Red Fox emerging from the potential two-entrance holt

Bayview Glen

A potential single entrance holt, with two accompanying slides, was recorded along the left bank of the Shanganagh River, within Bayview Glen residential area, which is situated between the Bayview and Brookdene work areas. A sprinting site was also recorded within 15m of this potential resting site.

Monitoring of this potential holt revealed that it was currently being utilised by Red Fox on a regular basis (Figure 5-3).



Figure 5-3: Red Fox emerging from potential holt entrance at Bayview Glen (left bank)

Brookdene

The previously identified potential Otter holt along the left bank of the Shanganagh River at Brookdene, was thoroughly examined from instream and top of bank (Figure 5-4). This potential holt has multiple entrances, seven in total, though entrance size varied notable, with only three entrances comfortably allowing entry for Otter, and one other entrance that would allow entrance, but mobility would be somewhat limited for an adult Otter. The remain three entrances were invasive European Rabbit *Oryctolagus cuniculus* -sized, though no other signs of their habitation (e.g. droppings) were present.

Monitoring of the potential holt revealed that it was occasionally being utilised by local Red Fox. This was also the case when this potential holt was monitored during the 2024 survey period.



Figure 5-4: The river-facing entrance of the potential holt at Brookdene along the left bank

Commons Road

Surveyors recorded a potential abandoned Otter holt along the left bank of the Shanganagh River, approximately 30m away from the nearest works area along the Commons Road. The notable debris and vegetation growth within the single entrance suggest that this potential holt has not been used for quite some time, likely over a year given the extent of the debris/detritus and vegetation growth currently in place (Figure 5-5). For these reasons, this abandoned potential holt was not camera-trap monitored. It was also in the same condition at the end of the 2026 survey period. However, it should be noted that this will be key potential to resurvey during the pre-construction phase, as its positioning within the bank, and the physical characteristics would make it very difficult for the likes of Red Fox or Badger to utilise this burrow so the likelihood of this resting site being an Otter holt is quite high.



Figure 5-5: Potential abandoned holt on the left bank along Commons Road

Loughlinstown Pitch and Putt 1 (outside survey and disturbance buffer)

A historically active Otter holt (several years ago) was located within Loughlinstown Wood pNHA and following a condition / utilisation assessment, it was determined to be abandoned given notable detritus and vegetation growth within and around the single entrance holt (Figure 5-6). The location of this now abandoned holt is outside of the legal disturbance buffers and the 200m survey buffer outlined within further information request. Based on this rationale, this abandoned potential holt was not camera-trap monitored during the 2026 survey period.



Figure 5-6: Abandoned holt (historically active) along the right bank adjacent to the local Pitch and Putt

Loughlinstown Pitch and Putt 2

A second potential Otter holt was discovered nearby the Loughlinstown Pitch and Putt, with recent signs of excavation, meaning that it had recently utilised. Subsequent camera-trap monitoring revealed that it was currently being utilised by a pregnant (camera-trap footage revealed clearly presenting teats) female Red Fox (Figure 5-7), that was undertaking additional excavations, likely to make the internal chamber more accommodating for the birthing of upcoming litter.



Figure 5-7: A female Red Fox emerging from the potential holt north of Loughlinstown Pitch and Putt

Lower Brides Glen / Stream Confluences

A potential holt was recorded near the Shanganagh River forming confluence of the Brides Glen Stream and Carrickmines Stream. The potential holt appeared inactive; however, as the single entrance holt was position so low on the bank, debris from the latest high flow had the ability to give a false impression of its activity status. A frequently used sprainting site was also located adjacent to this potential holt. Subsequent monitoring of this potential holt identified that an individual Otter was resting (dry coated Otter) somewhere within the locality, but not within the targeted holt (Figure 5-8). As it is possible for Otters to terrestrially navigate over the culvert outflows from the N11 into the confluence area where the camera-trap was deployed, this dry Otter could have resting within deep scrub /understorey cover on either bankside somewhere within the locality of this section of Loughlinstown Wood pNHA. Additional surveying was undertaken in May 2026, but vegetation growth of the woodland's understorey made it very difficult identify and potential densely covered couch within the locality.



Figure 5-8: A dry Otter (no reflection for moisture in coat and fuzzy outline) entering the water adjacent to the inactive holt at the confluence east of the N11

Upstream of Cherrywood Road (outside survey and disturbance buffers)

Surveying upstream of the Cherrywood Road works site, along the Brides Glen Stream, identified a potential holt along the right bank of the stream, along with two accompanying slides down from lower bank shelf containing the two-entrance resting site (Figure 5-9). The main entrance as displayed in the below photo, had shown signs of recent use, i.e., within the spring period. Camera-trap monitoring of the potential holt failed to capture its use by any of the local non-volant mammals.



Figure 5-9: Potential holt on the right bank of the Brides Glen Stream, upstream of Cherrywood Road

5.4.2 Potential Couches

Bayview Glen

Surveyors noted a depression in the earth under a pile of branches, i.e., potential couch, along the right bank of Shanganagh River near the Bayview Glen residential area (Figure 5-10). This potential Otter couch was then monitored, with the subsequent camera-trap data failing to capture any local mammals utilising this resting spot. Only Red Fox were noted commuting by this location.



Figure 5-10: Potential couch along the right bank of near Bayview Glen residential area

Loughlinstown Pitch and Putt

Surveyors identified a potential couch adjacent to the Loughlinstown Pitch and Putt, along the Shanganagh River (Figure 5-11). This potential couch had two slides and one sprainting site within close proximity to it, along the right bank. The camera-trap monitoring did not detect any mammals resting within the sandy oval patch amongst the vegetation (bottom right of the below photo). Local Otter were also no capture utilising the nearby sprainting site. It is important to note that monitoring at this particular potential resting site was compromised by active Giant Hogweed *Heracleum mantegazzianum* treatments taking place concurrently. A Giant Hogweed specimen adjacent to the potential couch was sprayed early within the monitoring period; with this act likely leaving behind intrusive and unattractive scents for Otter, which may have acted as a temporary deterrent to the utilisation of this potential couch.



Figure 5-11: Potential couch on right bank of the Shanganagh River adjacent to the Pitch and Putt

Upstream of Cherrywood Road

Upstream of the Cherrywood Road works site, along the Brides Glen Stream, surveyors identified a potential couch along the right bank of the stream, amongst the remains of fallen tree trunk base (

Figure 5-12). Absence of vegetation and detritus within an appropriately sized earth depression indicated that a small to medium sized mammal was resting within this space. Subsequent camera-trap monitoring of this potential couch revealed that it was currently being utilised by Red Fox.



Figure 5-12: Potential couch on the right bank of the Brides Glen Stream, upstream of Cherrywood Road

Upstream of Bray Road / Cherrywood Park (outside disturbance buffer)

A depression of vegetation along the right bank of the Carrickmines Stream (Figure 5-13) indicated that the spot was being utilised as a couch by local Otter, the likelihood of which was increased given the presence of a frequently utilised sprainting site 10m upstream of this location. Monitoring of this potential Otter couch revealed that it was currently being utilised as nesting material collection spot for local birds, as well as a resting spot for local domestic cats.



Figure 5-13: Potential couch on right bank of the Carrickmines Stream, upstream of Bray Road works

Approximately 10m further upstream, potential couch and confirmed sprainting site was also monitored, the raised bank under the pedestrian bridge displayed depression resembling resting depressions in the earth and designated sprainting points. During the monitoring of this potential resting site, only Otter spraint activity was observed (

Figure 5-14).



Figure 5-14: Potential couch (and confirmed active sprainting site) upstream of the Bray Road site

5.5 Dietary Analysis

Dietary analysis was conducted on a total of 22 spraint samples, five of which were from the Shanganagh River's lowest reaches (within 250m of downstream coastal waters) as it flows out through Killiney Beach and into the Irish Sea. The other 17 samples were collected along the watercourses between Bayview/Brookdene and Glenamuck Road North works areas.

The spraint samples collected downstream of the proposed works areas (within 250m of coastal waters) contained the vertebrae of 15-spined Stickleback *Spinachia spinachia*, European Eelpout *Zoarces viviparus*, Five-bearded Rockling *Ciliata mustela*, and juvenile Dublin Bay Prawn *Nephrops norvegicus*.

The spraints collected within and upstream of the proposed scheme's works contained the vertebrae and/or jaw remains of freshwater and/or anadromous fish species, such as salmonids (most likely Brown Trout and/or Sea Trout *Salmo trutta*), European Eel *Anguilla anguilla*, Three-spined Stickleback *Gasterosteus aculeatus*, Minnow *Phoxinus Phoxinus*, and an exclusively marine species, namely Ballan Wrasse *Labrus bergylta*; as well as a Mallard *Anas platyrhynchos* duckling (feathers and bill). The spraints containing the Ballan Wrasse remains (vertebrae, scales and pharyngeal teeth – similar in scale; as well as fragments of Blue Mussel, a regular component in Ballan Wrasse diet, whereas a very rare component within Otter diet) were collected from sprainting sites within the boundaries of the Lower Brides Glen work area and just upstream of the Bray Road works area. With the nearest suitable Ballan Wrasse habitat (rocky shore outcrops / islets) being located approximately 2km downstream and then a further 1.9km along the coast (either north or south), and the time range for passage of prey items through the gut of an Otter being between 1-4hrs (Heap et al. 2011), it is highly likely that an individual Otter switched from coastal to freshwater foraging within a single period of activity (single night). This high degree of mobility (approx. 3.9km minimum movement within 4hrs) within its territory and its capacity to engage in both coastal and freshwater foraging niches, highlights the adaptability of at least this one individual within the local population. Also, given the distance covered this individual is most likely a male with a larger territory size than that of the local females; with this high degree of mobility being essential to his continued control of his combined freshwater and marine territory.

Additionally, a concurrent 2026 riparian study, conducted by JBA Consulting for DLRCC, within the upper reaches of the neighbouring Kill O' the Grange Stream to the north also recorded the presence of marine fish species, namely Short-horned Sculpin *Myoxocephalus Scorpius* and 15-spined Stickleback, within the spraint samples collected from northern Clonkeen Park. These sample sites were located even further from suitable marine habitats, approximately 6.7km and 5.2km away from the nearest suitable habitat for Short-horned Sculpin and 15-spined Stickleback, respectively. This additional data suggests that the presence of Ballan Wrasse within the diet of the Shanganagh River Otter populations is not an isolated occurrence within the south Dublin Otter population. As to whether this could be the same individual, only follow-up DNA analysis of the spraints containing marine fish species within both Kill O' the Grange Stream and Shanganagh River would be able to discern this information. Theorised territorial ranges for the local Otter population will be discussed further in the following sub-section.

5.6 Theorised Existing Territorial Ranges

Prey diversity and abundance have the capacity to act as the main determining factor in the formation of territorial extents within apex predator species, such as the Eurasian Otter. Research across the Ireland and the UK has highlighted that Otter territories can reach extents of 20+km in upland areas where streams can only support a subset of prey species (when compared to large lowland rivers) and at lower abundances given the spatial limitations of upland streams. In coastal areas, some territories have been noted to be as small as 2km as both prey diversity (fish and multiple shellfish prey options) and abundance are naturally higher within these marine and estuarine habitats.

Furthermore, research in Portugal has shown that seasonal variation of prey distribution (i.e., seasonal droughts causing fish to seek out deeper bodies of the water within the catchment) can also lead to a reduction of an Otter's overall territory, as well as a higher tolerance of territorial overlap with same sex individuals (Quaglietta et al. 2104). It is also important to note that male Otter territories can be up to three times larger than those of the female Otters, with male a typically sharing its territory with two to three females (dependent on partial overlapping territories towards the edges of male's territory) at any given time.

Applying the above to the south Co. Dublin Otter population, and the known Otter data range, i.e., signs of habitation along the Shanganagh River and its tributaries, as well as the Killiney Beach and the neighbouring Kill O' The Grange Stream; there is likely a minimum of one male Otter and two to three female Otter within the Shanganagh River catchment / Killiney Beech. This assumption is based on the approximate 16.7km of main channel stream and river habitats present within the catchment and the potential 1.9 - 4km coastal territory of the Otter that consumed the Ballan Wrasse. The latter territorial parameter suggests that the abundances of fish within the Shanganagh River are not numerous enough to prevent Otter seeking additional sustenance within the coastal waters towards the northern and southern ends of Killiney Beach. Based on the above theorised minimum adult population, we can also assume that the two to three females will be accompanied by their offspring, with litter ranging between two and five cubs, which will be contained within their mother's territory for between 6-12 months; therefore, there can be between four and nineteen Otters (adult and cubs) within the Shanganagh River catchment / Killiney Beech territorial range at any given time. However, what is much more likely, with two to three cubs being the average litter size, a population of adult and cubs totalling between four and ten / thirteen.

The fragmented nature of the scheme work areas means that it is likely that territories of all the adult Otters will be potential impacted by the construction works for a period of time; with the territories of male and female east of the N11 being the most impacted. However, given that it is now known that at least one of the Otters within this territory can successfully forage for substantial prey items (Ballan Wrasse) within the coastal waters, disturbance impacts on their foraging range will likely be much less notable given their coastal foraging skills.

5.7 Existing Commuting and Foraging Barriers

5.7.1 Commuting Barriers

The most notable hard commuting barrier is the Carrickmines Stream's culverted section under the N11. The bend in the culvert, impacting lightening throughout its length, the anthropogenic disturbances (present within the left background of Figure 5-15), and lack of mammal ledge make this culverted section sub-optimal for Otter commuting activity. However, despite these sub-optimal conditions, Otter regularly frequent either end of this culverted section with a sprainting site adjacent to the eastern end of the culvert, and a sprainting site within sediment build-up at mouth of the culvert on the western inflow. Furthermore, the Otter that consume the Ballan Wrasse, deposited the spraints containing the marine fish, either side of this culverted section so it is evidently not a potential territorial boundary / barrier for the local Otter population.

The culverted section of the Brides Glen Stream is slightly more suitable with a straight path and daylight visible at either end when looking through the culvert. However, it still lacks a mammal pass /shelf for optimal commuting. Similar to the Carrickmines Stream culvert, a sprainting site was recorded at the eastern outflow of the Brides Glen culvert. This culvert section is also not considered a barrier to local Otters. It is clear that the local Otters have adapted to the sub-optimal conditions, which is expected given their noted high adaptability to urban environments across Ireland.



Figure 5-15: Carrickmines Stream N11 culvert displaying anthropogenic disturbance and sub-optimal Otter commuting

5.7.2 Foraging Barriers (Prey Availability)

Limitations on local prey availability can form soft foraging barriers for local Otter populations, as migratory fish species, including salmonids and European Eel are the preferred prey items of freshwater Otter populations within Ireland. If stretches of watercourses do not contain these species, or only contain a limited abundance of them, then these stretches will be sub-optimal for hunting and less likely to maintain a frequent Otter presence.

Two fish migration barriers (weirs) are present within and downstream of the proposed scheme's work areas. These weirs have been confirmed as fish migration barriers by Inland Fisheries Ireland following assessment. One of the weirs is located along Commons Road, just downstream of the Pitch and Putt course; while the other weir (Figure 5-16) is located within private land holdings along the Brides Glen Stream, between the Cherrywood Road and Lower Brides Glen work areas.



Figure 5-16: IFI-confirmed fish migration barrier along the Brides Glen Stream along Cherrywood Road

5.8 Other Non-volant Mammal Findings of Note

5.8.1 Pine Marten

Not previously recorded within Loughlinstown Woodland pNHA during past and recent JBA surveys, another mustelid species, Pine Marten *Martes martes*, was recorded on four occasions during the monitoring of the potential Otter holt east of the N11. The local Pine Martens appear to have an ample prey supply as the most frequently recorded mammal at this camera-trap location was the invasive Grey Squirrel *Sciurus carolinensis*. The removal of trees within this area will slightly impact the Pine Martens foraging activities in the short-term, with this area returning to fully functionality for the Pine Marten once the new trees reach a semi-mature state.



Figure 5-17: Pine Marten recorded multiple times within the Loughlinstown Wood riparian zone

5.8.2 Hedgehog

Also not previously recorded within the proposed scheme work areas, Hedgehog *Erinaceus europaeus*, was captured commuting by an Otter sprainting site and potential couch, upstream of the Bray Road works area. It should be noted that this location is outside the disturbance zone for non-volant mammals.



Figure 5-18: Hedgehog recorded commuting through Otter sprainting site and potential couch location

6 Potential Impacts

6.1 Construction Impact

The local Otter population will potentially be exposed to a range of construction-based emissions (surface water, groundwater and air to surface water-based pollutants), as well as riparian habitat loss which will occur to varying degrees within the scheme's work areas.

6.1.1 Physiological and Habitat Degradation via Pollutants

In the event that hydrocarbon pollutants are accidentally introduced into the local surface water and groundwater (surface water recharge) networks, local Otter may suffer from degraded furs notably impacting the furs' insulative qualities as result of a disruption to fur's natural water-proofing oils and its capacity to trap warm air close to the body, resulting in physiological stress for any affected Otters. In addition, these hydrocarbons can potentially be ingested by Otter as they groom their affected furs, leading to haemorrhagic gastroenteropathy, which will likely result in Otter mortalities (Baker et al., 1981). Moreover, surface water and groundwater-to-surface water-based pollution impacts have the potential to indirectly impact Otter via the deterioration of prey items in the food chain for Otter. This impact also has a knock-on effect as the consumption of prey items containing polluting elements may lead to bioaccumulation of toxic substances within the local Otter population. Accumulation of such toxic substances is known to result in pulmonary distress in the lungs of mammals, in addition to the general carcinogenic effects.

6.1.2 Disturbance

At present there are no active Otter holts or couches within the 200m disturbance buffer of the proposed scheme's work areas; however, one dry Otter individual was recorded east of N11, therefore, there is at least one utilised resting site within the locality of the Lower Brides Glen works area. As a result, the local Otter population will be subject to visual, vibrational and auditory disturbance impacts in the event that this works adjacent resting area is active during the construction phase. Such impacts have the potential to discourage the use of this resting site, potentially resulting in a temporary restriction in territory for local Otters which reside within this stretch of the Shanganagh River. Additionally, it cannot be predicted whether the local Otter will establish new holts or couches in the time prior to the commencement of the enabling works / construction phase along any of watercourses within, upstream or downstream of the scheme's work areas.

6.1.3 Habitat Loss and Fragmentation

All proposed works areas (with year-round waterbodies present) will undergo varying degrees of core riparian habitat loss. Temporary to short-term habitat fragmentation impact will also occur; and while the Shanganagh River and its tributaries will still be largely open for foraging and commuting, the banks will undergo a degree of vegetation removal, which in turn removes the safe commuting corridor for Otter along these streambanks / riverbanks.

6.1.4 Construction-related Fatalities

Additionally, work sites within the riparian corridors may lead to potential loss of life for individual Otters, (most likely inexperienced juveniles), in the case of accidents within the works areas (e.g. accidental trappings), after failure to exclude entry.

Therefore, in the absence of mitigation during the construction phase, it is predicted that there will be a temporary to short-term adverse impact of moderate significance for the local Otter population, given the timescales and nature of the above impacts.

6.2 Operational Impact

6.2.1 Partial Exclusion from Riparian Zone

The proposed works at Kilgobbin Road will result in an exclusion from the mid and outer riparian zone for Otter when instream, or a stream-entry barrier when commuting overland. However, the local Otter population will still be able to commute the Belarmine Park pond overland or instream via the culvert, though both these options are sub-optimal, and the overland also comes with linked increased collision risk as Otters may choose to cross Kilgobbin Road as part of this commute.

6.2.2 Disturbance

During the operational phase of the scheme there will be no disturbance impacts on the resting, foraging and commuting habitats of local Otters, given the operational nature of the scheme. Remedial landscaping will re-establish cover for commuting and foraging within areas where tree and ground-level vegetation was removed to carry out the construction works. Additionally, the heightening of flood walls will decrease the public's visual eye-lines of the streams and river, and in doing so shield local Otters from the visual disturbance of inquisitive passersby, as well as invasive street lighting that can interfere with their nocturnal hunting. Therefore, in relation to Otter disturbance impacts, the operational phase of the scheme will result in a slight positive impact for the local Otter population.

6.2.3 Habitat Loss and Fragmentation

The riparian corridor will largely remain intact for the local Otter population, with only thin strips of core riparian habitats, including amenity grassland (low value), dry meadow and scrub, being permanently lost as a result of the physical footprints of new floodwalls. Pockets of the newly landscaped habitats will contain young, lower density vegetation initially so functionally they will not provide as much shelter for Otter within the initial operational phase; however, these pockets will reach a level of maturity within a few years that will provide ample cover for Otter moving along the banks. Therefore, the effects of these minor fragmentations will be imperceptible several years after the completion of the works, when landscape has matured and restored the structure of the natural riparian zones.

6.2.4 Vehicle Collision Risk

As previously mentioned, the operational footprint of the proposed scheme will lead to a slight increase in vehicle collision risk, and potential injury and fatalities, at the Kilgobbin Road area. If an Otter is terrestrial commuting within downstream from Belarmine Park, it will find itself needing to cross the Kilgobbin Road to reach open, unwall channel downstream of the farm; or it will need to navigate north along the road until it can access the stream from the small accessible area by the bridge on the left bank. The navigating of the road in these two scenarios increases the likelihood of an accidental collision with a passing vehicle. However, this risk of such an event is very small given that signs of Otter habitation upstream of Kilgobbin Road have been very rare, with only historical data confirming presence within the park area, JBA has not recorded any Otter habitations signs in this area over the courses of several years. The most likely scenario for an Otter to navigate this far upstream would be to avail of readily available spawning Common Frogs and their spawn during the spring, limiting this already low collision risk probability to the height of the spawning season for Common Frog (February to April).

Conversely, new floodwalls and heightened floodwalls will decrease the likelihood of Otters venturing into roadways adjacent to the riparian zones, for example the floodwalls along Commons Road, Brookdene and Bayview work areas. Furthermore, the new outflow culvert / underpass beneath the N11 will provide safe dry or wet passage under the N11, further reducing potential vehicular collision risk.

Therefore, in absence of mitigation measures during the operational phase, the local Otter population are anticipated to be subjected to an overall long-term positive impact that is not significant.

7 Mitigation

7.1 Introduction

This section covers the mitigation by design elements within the proposed scheme that have been produced by JBA. These elements will help to ensure the achievement of the objectives set out in Section 4.

7.2 Mitigation by Design

7.2.1 Remedial Landscaping

The landscaping design plans and incorporated ecological mitigations for the proposed scheme will outline that wherever possible, existing vegetation will be retained, ensuring that the existing riparian zone is as optimally maintained as practically possible, whilst allowing the works to take place. However, where it is necessary to disturb and/or remove tree, scrub or understorey vegetation to accommodate the works, remedial tree planting, meadows and native hedging is to be planted as part of the landscaping. Additionally, invasive species present within the riparian corridor will be removed and replaced with native species. This will ensure the restoration and enhancement of any riparian corridor disturbance for the operational phase.

Planting of immature specimen trees to replace the trees lost are outlined within the landscape design plans, with appropriate species to contribute to the riparian corridor. In certain areas where it was deemed suitable, planting of whips and specimen trees (where appropriate), such as Grey Willow, Goat Willow, Alder, Silver Birch, Downy Birch and Pedunculate Oak will be carried out. The planting of whips will create a shrub layer for the riparian corridor that will mature and join with canopy of the planted specimen trees. This action will ensure the establishment of a fully mature riparian canopy and understorey within a medium to long-term period.

7.2.2 Proposed N11 Overflow Culvert

The newly proposed 2.4m diameter overflow culvert to be installed under the N11 at the Lower Brides Glen work area, will provide safe, spacious and dry passage for Otter and other non-volant mammals during low flow conditions within the Brides Glen Stream. This passage will become wetted as water levels raise and the stream flows over the new overflow weir along its left bank, which directs these flows towards the new culvert. Otter, other non-volant mammals, birds and amphibians will be able to navigate this spacious underpass in most frequent low level flood events; however, when extreme flood events occur, i.e., 1% AEP / 1–100-year flood event, only Otter will be able to navigate through this culvert underpass. It is also important to note that the vast majority of other vertebrate fauna will instinctually seek cover in elevated habitats, e.g., upper banks of Shanganagh River within the Loughlinstown Wood pNHA, rather than navigate core riparian zones in extreme storm / precipitation events.

7.3 Pre-enabling / Pre-Construction Mitigations

7.3.1 Pre-enabling / Pre-construction Otter Resting Site Activity Surveys

Prior to the commencement of any construction works, updated Otter resting site (camera-trap monitoring) surveys will be conducted in order to determine if any of the known holts or couches have become active, or new resting site established, in period between the last surveys and the year prior to the commencement of enabling / construction works. These surveys will be conducted by a suitably qualified ecologists / Ecological Clerk of Works (ECoW). In the event where the ECoW notes that one of the existing potential resting sites and/or a new resting site is active, the ECoW will need to apply on behalf of the scheme's client, for an Otter Derogation Licence from the NPWS. This derogation licence will update the mitigations within the scheme's CEMP accordingly, in order to safeguard the protected resting site(s) of local Otters.

7.3.2 Provision of Short-term Artificial Otter Holts

While the enabling and constructions work may not be present within the disturbance buffer zone of active Otter resting sites along the scheme, the removal of riparian vegetation and construction disturbances to immediate adjacent riparian habitats will likely prevent the establishment of any new Otter resting site within these affected riparian areas. In order to mitigate for this reduction in potential resting site establishment area, a total of six short-term natural material, above-ground holts will be installed at the following locations:

- Downstream of Bayview along the right bank adjacent to the local wastewater treatment plant;
- Within Loughlinstown Wood along the opposite bank to the Commons Roads works;
- Downstream of the Lower Brides Glen works area (particularly important at this location given the presence of the dry Otter at this location);
- Upstream of Bray Road works area, amongst the dense scrub vegetation;
- On the opposite bank to the Cherrywood Road works area, within the earth bank area (not currently utilised for private amenity); and
- Upstream of Glenamuck Road North works area, amongst the dense scrub vegetation in the riparian zone.

Installation of all these short-term artificial holts will be overseen by a suitably qualified ECoW.

A natural material, above-ground holt design is reasonably cheap and easier to build, with little impact on the surrounding flora and soil structure within the riparian zone. These artificial holts are being referred to as short-term resting sites as they only last several years before the woods rot and the structural integrity and thermal insulation capacity beings to fail, leading to the local Otters abandoning them for higher quality shelters. An example of this natural artificial holt design is shown below in Figure 7-1.



Figure 7-1: Natural materials artificial Otter holt design (©Oxford Preservation Trust)

7.4 Construction Phase Mitigations

7.4.1 Surface Water Control and Management Measures

As part of the proposed scheme submission, a dedicated surface water management plan that outlines mitigations to ensure that there is no detrimental impact on the quality of the surface water within the locality and downstream of the proposed scheme's work areas. The measures that are outlined in the surface water management plan include:

- Site Establishment (surface water interception)
- Welfare and Sanitary Facilities (correct discharge of wastewater)
- Fuel Storage
- Haul Road Mitigations
- Control of Sediment
- Use of Concrete

- Vehicles and Plants
- Monitoring and Verification of the Control Measures

These measures can be found within Section 3 and Section 4 of the Surface Water Management Plan in greater detail.

7.4.2 Dust Mitigation

As part of the Construction Environmental Management Plan (CEMP), there are mitigation measures that outline the control of dust within the work areas for the proposed scheme. These Dust Management Plan includes:

- Site Management
- Monitoring of Dust Levels
- Preparing and Maintaining the Site
- Operating Vehicles / Machinery and Sustainable Travel
- Operations
- Measures Specific to Demolition
- Measures Specific to Earthworks
- Measures Specific to Construction
- Measures Specific to Trackout

These measures can be found in Section 6.4 of the Preliminary CEMP that was submitted with the original planning submission in greater detail.

7.4.3 General Site Management & Exclusion

Standard site management measures will be adhered to, including the covering of all excavations to prevent accidental trapping or the use of mammal ramps in larger excavations to allow for escape as well as the use of exclusionary fencing where appropriate to prevent mammals, such as Otter, from entering any potentially dangerous areas.

7.4.4 Otter Toolbox Talk

There will also be a toolbox talk given to the site personnel by the appointed ECoW about the local Otters and where they are likely to potentially encounter them within works area (i.e. all work areas, bar Clon Brugh).

7.4.5 Light Spillage Monitoring

The ECoW will monitor construction site lighting along scheme's work areas (bar Clon Brugh), in order to ensure that there is no light spillage into the adjacent watercourses, which may disturb the commuting and foraging activities of Otter.

7.4.6 Artificial Holt Monitoring

The ECoW will be charged with ensuring that the artificial holts remain undisturbed during the proposed scheme's construction works, ensuring that any works carried out within the locality of the artificial holts do not stray into their proximity and potentially disturb any resting Otter(s).

7.4.7 Provision of Sheltered Commuting Screening

Given that bankside vegetation clearance that will take place along at a number of the work areas during the enabling phase, the provision of replacement commuting shelter will be required. In order to achieve this, non-diseased trees, due to be felled across the scheme work areas, will be cut to into segments and bundled, forming multiple floating log rafts, which will mirror the occurrence of deadwood building up behind a collapsed riparian tree. These will be secured to the opposite banks of active work areas along the scheme's length, where the works are visible from Otters within the watercourse or on the opposite bank.

The securing structure/mechanism will need to be able to adjust to rising and falling water levels, e.g. chain or heavy-duty rope with surplus length. These log rafts will cover a minimum length of works area, plus an additional length of 5m at either end to allow Otters cover before entering the works area. These log rafts will mainly provide cover for the Otters whilst in the water, allowing them to emerge from the water in gaps between bundled logs and between the rafts and the bank.

7.5 Operational Phase Mitigations

7.5.1 Remedial Landscaping

The remedial landscaping design implemented towards the end of construction and monitored by the ECoW into the initial operational phase, will ensure the long-term restoration of the core riparian habitats; details of the proposed landscaping are outlined previously in mitigation by design section.

7.5.2 Safeguarding and Monitoring of Artificial Otter Holts

The ECoW will continue to be tasked with ensuring that the artificial holts remain undisturbed during the proposed scheme's initial operational phase. The ECoW will monitor for signs of public interference; and should they be present, the ECoW will report to relevant stakeholders and suggest a means of securing them until the ecological lag of newly planted riparian landscapes has faded, and the Otters regain fully access to potential resting site establishment areas.

8 Overall Residual Impact on the Local Otter Population

It is predicted that, following the implementation of the pre-enabling / pre-construction, construction and operational phase mitigation measures, and a short-term ecological, there will be a long-term positive residual impact that is not significant for the local Otter population, given the matured remedial planting of the riparian zone, decrease in light spillage into the core riparian zone and watercourses, as well as no reduction in available resting site throughout the Shanganagh River catchment at any point from enabling works onwards.

9 Conclusion

With consideration for baseline desktop and survey data outline within this documents, it can be confidently stated that the strategies and accompanying mitigations outlined within this conservation plan, and associated mitigation reports, that will be strictly adhered to, will successfully safeguard the commuting, foraging and resting activities of the local Otter population that inhabits the Shanganagh River catchment and the coastal waters of Killiney Beach / Irish Sea.

Appendix A – Maps of Otter Field Signs and Potential Resting Sites

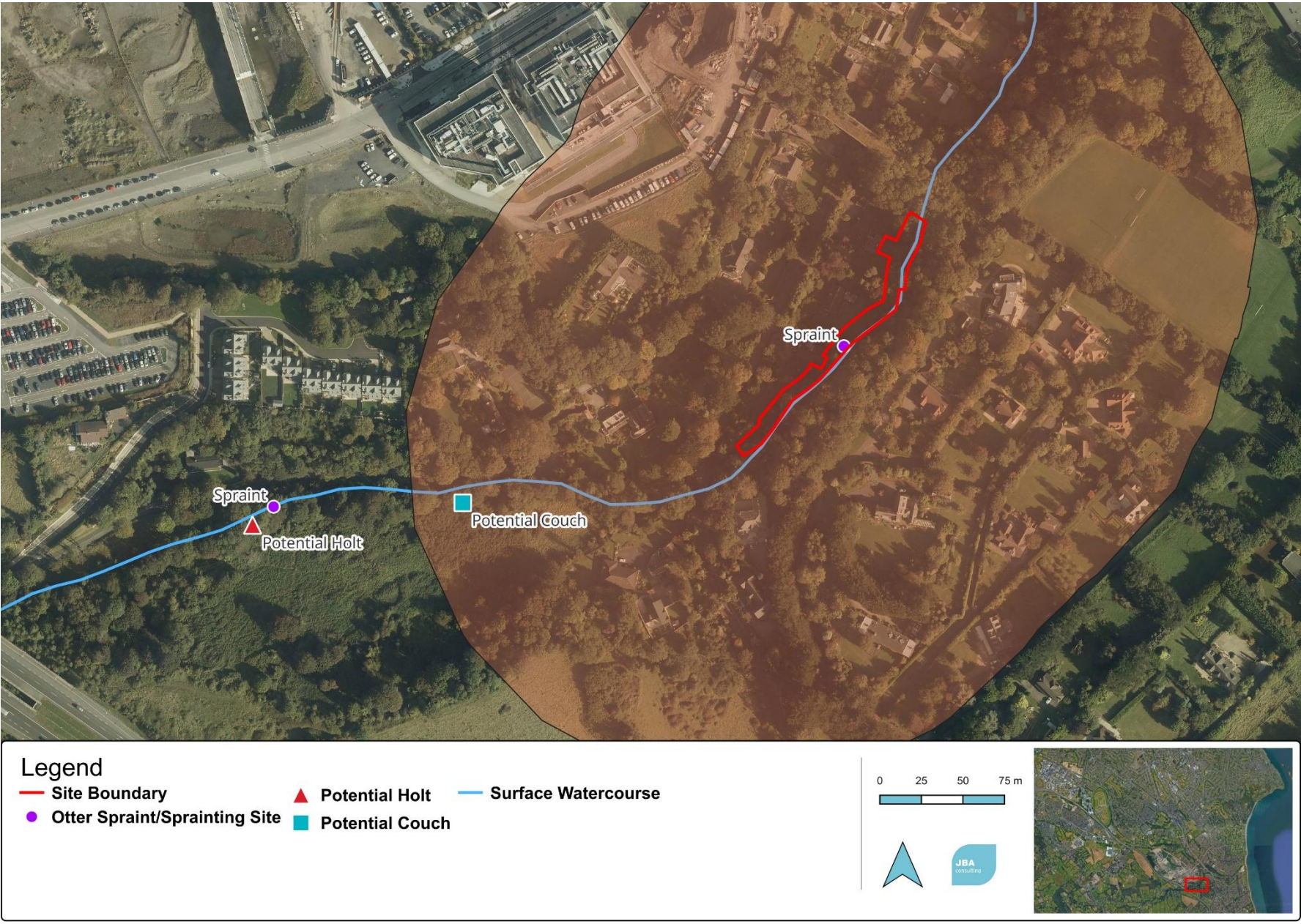
(N.B. Given the sensitive ecological information provided within, this Appendix is not to be shared publicly)

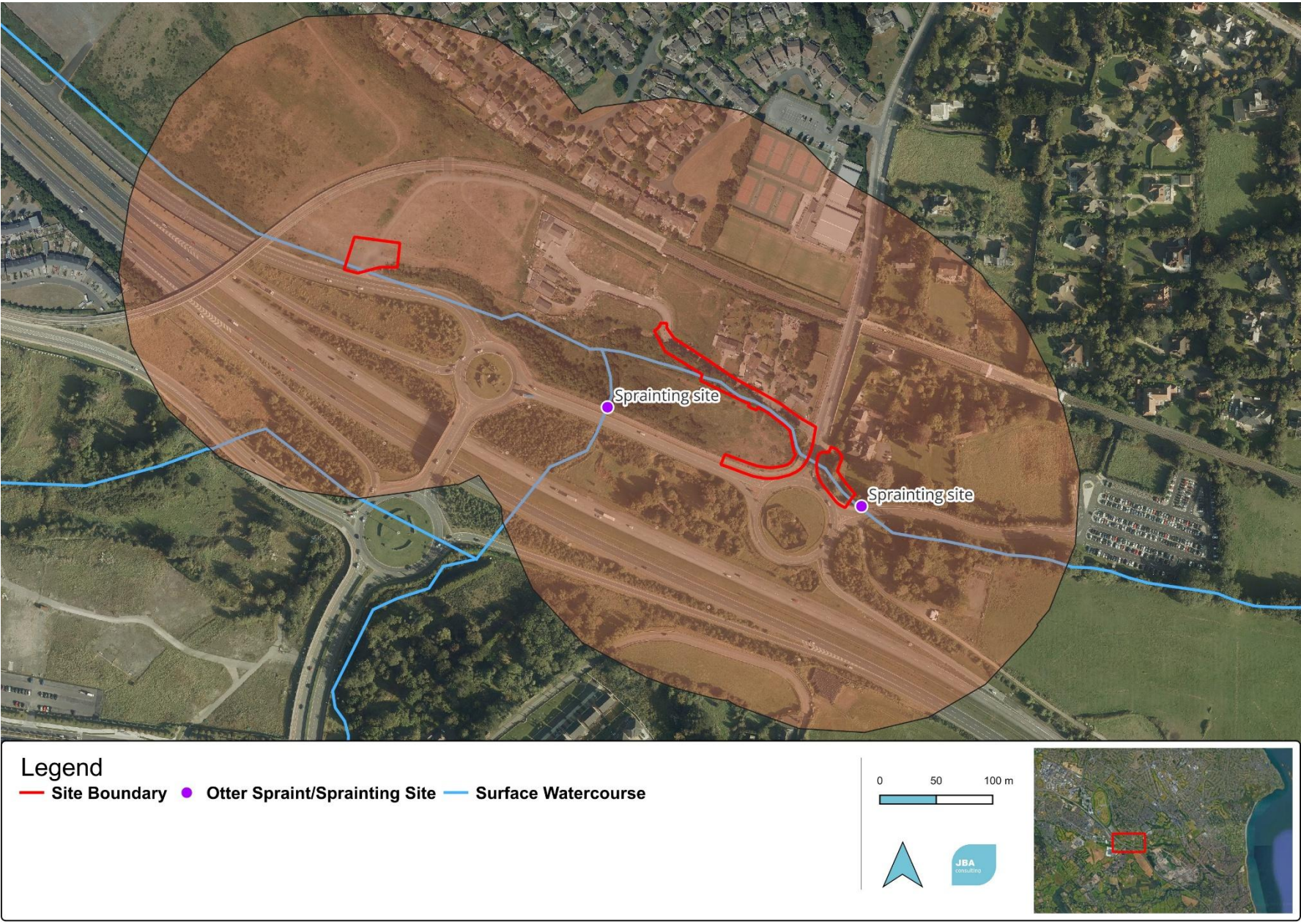
The following map figures proceed from the Killiney Beach area heading upstream.











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Offices at:

Dublin
Limerick
Cork
Castlebar

JBA Registered Office

24 Grove Island
Corbally, Limerick
Ireland
+353 61 345463
info@jbaconsulting.ie
www.jbaconsulting.ie

Egis Registered Office

Classon House
Dundrum Business Park
Dundrum, Dublin 14
Ireland
+353 1 485 1400
Info.ireland@egis-group.com
www.egis-group.com