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Dublin Country Council

River Dodder Flood Alleviation Scheme Phase 3

Environmental Constraints Report

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Terms and Abbreviations

°C	degrees Celsius
%	Percentage
µS/cm	Microsiemens per centimetre
µg/l	Microsiemens per litre
I	One
II	Two
III	Three
IV	Four
V	Five
AAS	Areas of Archaeological Sensitivity
ACA	Architectural Conservation Area
AQIH	Air quality index for health
BAP	Biodiversity Action Plan
BL	ByrneLooby
BoCCI	Birds of Conservation Concern in Ireland
BOD	Biological Oxygen Demand
By.	Barony
CEMP	Construction Environmental Management Plan
c.	Approximately
CFRAMS	Catchment Flood Risk Assessment and Management Study
Co.	County
COVID-19	Coronavirus disease 2019
DCC	Dublin City Council
DCDP	Dublin City Development Plan
DLRCC	Dun Laoghaire-Rathdown County Council
EC	Executive Council
EcIA	Ecological Impact Assessment
EIA	Environmental impact assessment
EIAR	Environmental impact assessment report
EIS	Environmental impact statement
EMD	Exploration and Mining Division (of the Department of Communications, Climate Action and Environment)

EPA	Environmental Protection Agency
EQSD	Directive on Environmental Quality Standards
ESB	Electricity Supply Board
EU	European Union
FCC	Fingal County Council
FAS	Flood Alleviation Scheme
FAQ	Frequently asked questions
FRMP	Flood Risk and Management Plan
FRS	Flood Relief Scheme
FSU	Flood Studies Update
GDSDS	Greater Dublin Strategic Drainage Study
GIS	Geographic Information Systems
GNI	Gas Networks Ireland
GSI	Geological Survey Ireland
GWB	Groundwater Bodies
HLC	Historic Landscape Characterisation
IFI	Inland Fisheries Ireland
IPC	Integrated Pollution Control
IPCC	Irish Peatland Conservation Council
km^2	Kilometres squared
km	Kilometres
kV	Kilovolts
LCA	Landscape Character Assessment
mg/l	Milligrams per litre
NHA/ pNHA	Natural Heritage Areas / proposed Natural Heritage Areas
N.I.	Northern Ireland
NIAH	National Inventory of Architectural Heritage
NMI	National Museum of Ireland
NPWS	National Parks and Wildlife Service
NRA	National Road Schemes
NSS	National Spatial Strategy
NTA	National Transport Authority
OPW	Office of Public Works
PAHs	Poly Aromatic Hydrocarbons

Pers. Comm.	Personal Communication
QI	Qualifying Interests
Q-value	Biological River Quality Classification System
RMP	Record of Monuments & Places
RPS	Record of Protected Structure
SAC	Special Areas of Conservation
SCI	Sites of Community Importance
SDCC	South Dublin County Council
SMR	Site and Monuments Record
SEA	Strategic Environmental Assessment
SI	Site Investigation
SI	Statutory Instrument
SPA	Special Protection Areas
TII	Transport Infrastructure Ireland
UNESCO	United Nations Educational, Scientific and Cultural Organization
WFD	Water Framework Directive
WHS	World Heritage Sites
WwTP	Wastewater Treatment Plant
ZAP	Zone of Archaeological Potential

Executive Summary

The overriding purpose of the project is to enhance the flood defences of the river Dodder from Clonskeagh Road Bridge to Orwell Road Bridge. The scope of works also includes flood defence works on the Little Dargle Stream at Braemor Road-Woodside Drive south-eastern junction. Work will be completed to the standards of the EU Directive on the Assessment and Management of Flood Risk (Floods Directive 2007/60/EC) transposed into Irish Law as SI 122 of 2010.

The proposed flood defences shall include an allowance for freeboard (300mm for walls, 500mm for embankments) as per the OPW guidelines and address Environmental, Social and Health and Safety concerns.

The Aim of the project at Preliminary Design Stage is to carry out a detailed evaluation of all viable flood alleviation measures, select the best measure or combination of measures and carry out a Preliminary Design.

A summary of the key constraints identified for each of the environmental disciplines considered as part of the baseline constraints identification exercise is described below. They include:

- Resources and Materials.
- Population and Human Health.
- Hydrology.
- Soils, Geology and Hydrogeology.
- Ecology and Biodiversity.
- Cultural Heritage and Archaeology.
- Landscape and Visual.
- Air Quality.
- Noise and Vibration.

Constraints have been further designated as follows:

- Programme constraints.
- Engineering/Design constraints.
- Legal constraints.

Resources and Materials
During planning, development, and construction, the utilities infrastructure must be fully considered to ensure that disruptions to the utilities infrastructure are avoided.
During the construction stage, measures may have to be taken in order to ensure the construction does not interfere with any of the underground or overground utilities services.
It will be necessary to contact ESB/GNI/Irish Water if there is a need for lines to be turned off for a period of time (e.g. for works or relocation of infrastructure) and to determine if the affected residences could be serviced from elsewhere.
Consideration of any design, construction or operations risks in areas where electricity lines and gas network pipes (and associated infrastructure) are located in close proximity to the proposed scheme.
Consideration of the designs effect on sewerage capacity in the event of hydrological changes or flooding.
Impacts on road and rail infrastructure and land ownership will need to be considered.
Impacts on public rights of way, footpaths and cycle paths will need to be considered. The proposed scheme design should ensure continuity of the public walkways within its footprint and future plans for same.
The scheme design and schedule will need to take into consideration the development of third party 'green' projects in the vicinity of the scheme area, where developments are anticipated to occur over a similar timescale.

Population and Human Health
The scheme design should take into account the value (both cultural and economic) of any buildings (residential, retail, etc.) close to the rivers' edges or likely to be adversely affected by the scheme within the scheme study area.
Impacts to hospitals and medical facilities in the scheme study area can have important social, equalities and human health impacts and must be given due consideration.
Flooding events can cause devastation to homes, businesses and local facilities, with social and human health impacts. Their specific protection through adequate flood defences should be considered in the design of the scheme. The local community's access to private property insurance should be considered a key constraint when progressing with the scheme.
Any design proposals should ensure that any bridges over watercourses are maintained where feasible so that temporary or permanent disruption of local transport links and access to homes and businesses in the study area are minimised.
Public and tourist amenities and facilities should also be considered key constraints. Impacts on public amenity areas adjacent to and requiring access to the rivers such as riverside walks, parks and playgrounds should be considered, with replacement mitigation proposed if necessary. Impacts on tourist facilities, recreation and amenity facilities in the area should be considered constraints, especially those requiring access to the watercourses in the area.

Hydrology
The surface water bodies in the study area recently failed the chemical status assessment due to the presence of priority and priority hazard substances[1]. Given the recent status of the waterbody, the development of the scheme should incorporate measures not to worsen its status and to improve it where reasonable. All possible risks of point source pollution or runoff during construction and operation should be assessed and prevented.
Works during the construction of the scheme could pose a threat to the water quality to water bodies within and downstream of the study area though various mechanism, chiefly: (1) Increasing suspended solids in the water bodies through release or run-off of significant amounts of suspended solids during enabling works and construction. (2) Unplanned events such as leaks/spills/runoff/accidental release or escape of fuels, oils and lubricants, bulk liquid cement, contaminated leachate, etc. Measures to protect surface water from leaks/spills, contamination, increased turbidity or input of suspended solid, etc, should be considered.
Consideration of any land contamination potentially present on site from historical land use. The CEMP for the scheme will include measures to avoid mobilising and/or creating pathways for any contaminants present on site to the surface where surface runoff can introduce contaminants to surface water during enabling and construction works.
Measures to protect EPA surface water monitoring station and avoid impacting their data collection process should be considered during design and construction phases.
There is limited publicly available surface water quality data for some of the waterbodies in the area (pond, lakes, and reservoirs). Baseline survey data (including ecological water quality data) should be collected for these water bodies if measures developed for the scheme could interact or impact upon these waterbodies.

Soils, Geology and Hydrogeology
Made ground and/or contaminated ground. Depending on the scheme design and type of works, for areas where made ground is uncompacted and/or highly variable it may require to excavate and place this material and replace it with suitable founding material. This material may also be a possible a source of contamination. As this material will be excavated during construction, it may require contamination testing to be undertaken during the detailed site investigation.
Soils and groundwater. Poor draining soils occurring within the scheme footprint are potentially soft and compressible and will likely require a detailed site investigation (SI) in order to design a suitable flood defence scheme. Appropriate environmental controls and management measures will be implemented for any advance SI works, this may include a requirement for AA screening, or an application/notification to NPWS for approval. A CEMP will be developed for construction activities. The CEMP will identify appropriate equipment and construction techniques that should be used in circumstances where there is a potential impact to the environment. Engineering design should minimise the impacts of the flood relief scheme on the sections of river within the study areas and the wide catchment.

[1] As part of the Water Framework Directive, a European 'priority list' of substances posing a threat to or via the aquatic environment was established, with the aim of reducing (or eliminating) pollution of surface water (rivers, lakes, estuaries and coastal waters) by the pollutants on the list. The Priority Substances Directive requires the progressive reduction or phasing out of these substances, referred to as 'priority substances', and those which are thought to pose the greatest threat are further identified as 'priority hazardous substances'.

Soils, Geology and Hydrogeology
Groundwater vulnerability to contamination. Depending on the design of the scheme, works may occur adjacent or within areas where groundwater is classified by the GSI as 'extremely vulnerable' to contamination. Appropriate environmental controls and management measures will be implemented for any advance SI works. A CEMP will be developed for construction activities.
Karst features. GSI data indicates that there are no recorded karst features in the study area. However, considering the underlying geology, it is prudent to consider that karst features such as caves, swallow holes, weathered rock and dolines can lead to ground instability and are a constraint to be considered in the engineering design of the scheme.
Geoheritage. Bedrock outcrop is relatively rare in Dublin and considered a valuable resource for geological data collection. It is good practice to inform the Geological Survey Ireland (GSI) (contact: Beatriz.Mozon@gsi.ie) where: • construction works temporarily or permanently uncover significant outcrop; • were reports detailing any site investigations can be made available to the GSI; • a digital photographic record of any significant new excavation can be produced and provided to the GSI.

Ecology and Biodiversity
Protected Sites There are two European sites within the ecological study area. There is the potential for these sites to be impacted by the proposed scheme. In-river works have the potential to re-suspend sediments which will then be transport downstream to enter the sea via the River Liffey. All such works must be designed to minimise this potential impact. Similarly, all work that is to be carried out on the river bank must be carried out in such a way as to minimise the potential for events such as diesel or concrete spillages, run off of water with suspended sediment loadings or any accidental spillages. If it considered necessary to re-build weirs or sluices, the same sort of construction approach should be designed in to minimise resuspension and loss of concrete to the river. Appropriate Assessment under Articles 6(3) and 6(4) of the EU Habitats Directive (Directive 92/43/EEC) will be required for the proposed scheme.
Protected/notable Species In ecological terms, the river corridor (including the river itself) supports a number of protected and/or notable species including three species of lamprey, salmon, eel, sea and brown trout, otter, bats, badger, hedgehog, pygmy shrew, common frog, kingfisher and sand martin, and little egret.
All works should be planned wherever possible to be carried out at times of the year that are ecologically least sensitive e.g. outside bird nesting (March – September) and fish migration periods (Spring/Summer, depending on species). Should works be undertaken during the nesting season, a survey should be undertaken prior to works to identify any active nests, including ground-nesting bird burrows (e.g. kingfisher, sand martin), in the vicinity of works.
Any in-river and bankside works have to be designed to minimise potential impacts on these (and all other) species.

Ecology and Biodiversity
Otter. The ecological study area contains suitable commuting, foraging, breeding and resting habitats for otter, although it should be noted that no holts or field signs of otter were recorded during the ecological walkover survey. As a European protected species, the otter is fully protected under the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended). Any scheme option that may have the potential to disturb otters must be assessed. A full otter survey will be completed once the scheme extents are known. If otters are found to be present and disturbance is likely then DCC must apply for a licence to allow proposed development works that might affect otters to proceed legally. The potential impacts on otter will be assessed and reported in the EIA. Otter mitigation works can potentially be conducted at any time of year but must avoid the breeding season (usually Spring but can be any time of year) if holts are present on site.
Badger. Although badgers have been recorded in the study area, no setts or field sign were recorded during the site visit. Should a badger sett be recorded within the scheme extents prior to construction works then appropriate mitigation and a licence for works will be required. Construction of new setts must be completed in Spring/Summer with blocking and destruction of existing setts completed in Autumn/early winter.
Bats. The scattered mature trees, bridges, architecture (churches, masonry) and areas of low water flow provide good foraging, roosting and commuting routes for bat species in the area. Options that require the removal of mature trees or works to bridges or other riverine structures with the potential to support roosting bats shall be assessed for bat potential. Bat surveys shall be conducted on any features with medium or high potential for roosting bats. The optimal time to conduct map surveys are May and August, when bats are most active. If bats are found, they should not be disturbed during hibernation period (October to March) or maternity period (June to August). If a bat roost requires removal then a licence would be required. Removal of roosts should be carried out during the summer months for hibernation roosts and during the winter months for maternity roosts.
Freshwater Fish. Fish present in the river include both brook and river lamprey (*Lampetra planeri* and *L. fluviatilis*) (River Dodder Habitats Management plan, 2008), brown trout (*Salmo trutta*), sea trout (*Salmo trutta morpha trutta*), stone loach (*Barbatula barbatula*), three-spined stickleback (*Gasterosteus aculeatus*) and eel (*Anguilla anguilla*). Salmon (*Salmo salar*) have been recorded in the river's lower course. Further surveys are currently being competed on site to establish the presence/absence/abundance of the fish species listed above. This may involve netting and electrofishing surveys. In terms of the construction programme, it should be noted that in salmonid catchments, in-stream works are not permitted between the months of January to April (migration) and October to December (spawning). This corresponds with guidance from Inland Fisheries Ireland. Lamprey (both species) spawning takes place in the spring and early summer period in often the same habitats where salmon and trout spawn. The spawning season for brown and sea trout is November to February. If spawning grounds are found to be present in the construction zone for the scheme then this period should be avoided. A full impact assessment and management plan for these fish species will be produced as part of the EIA report once full scheme details (including construction methods) are known.

Ecology and Biodiversity

Invasive Species. Japanese Knotweed, Himalayan balsam, and Gunnera are listed as invasive plants under the EC (Birds and Natural Habitats) Regulations 2011 (S.1. 477/2011). These regulations prohibit the introduction or dispersal of invasive species and appropriate measures should be undertaken in the proposed scheme development. Therefore, any works occurring in areas where invasive species are present must use appropriate measures. Mink, a legally designated invasive alien species found along the length of the Dodder. DCC Parks has previously initiated mink control programmes with NPWS, IFI and adjoining local authorities. South Dublin County Council are currently controlling mink in the upper catchment. Grey squirrel, another legally designated invasive alien species, is widespread in the Dodder catchment. An Invasive Alien Species Action Plan will be required for the proposed project.

Cultural Heritage and Archaeology

Any work carried out in close proximity to areas of archaeological, cultural heritage and built heritage importance must follow appropriate measures or guidelines to ensure the conservation and maintenance of the area. There are no World Heritage Sites, National Monuments or Sites with a Preservation Order within the archaeological study area. Sites to be considered as key constraints include:

- All sites listed in the Record of Monuments and Places (RMP) or the Sites and Monuments Record (SMR):
    - DU022-096002, Mill – unclassified, Rathmines South;
    - DU022-096001, Mill – unclassified, Rathmines South;
    - DU022-097, Bridge, Rathmines South;
    - DU022-004001, Bridge, Milltown (Uppercross By.);
    - DU022-004002, Water mill – unclassified, Milltown (Newcastle By.);
    - DU022-004003, Water mill – unclassified, Milltown (Newcastle By.);
    - DU022-004006, Mill – unclassified, Milltown (Newcastle By.);
    - DU022-098, Water mill – unclassified, Dublin South City;
    - DU022-092, House - 18th/19th century, Milltown (Uppercross By.);
    - DU022-093, Ford, Milltown (Uppercross By.);
    - DU022-090, Bridge, Clonskeagh (Dublin By.).
- Zones of archaeological potential (ZAP) for RMP sites with increased archaeological potential:
    - Area encompassing ZAP DU022-004001–006, extending from Milltown Bridge to Orwell Park, Milltown (Uppercross By.);
    - Area encompassing ZAP DU018-096, at Packhorse Bridge, Rathmines South.
- Areas of Archaeological Potential:
    - Five areas of archaeological sensitivity at Clonskeagh Bridge Park (AAS 1), Milltown Bridge Park (AAS 2), Dartry Park East (AAS 3), Dartry Park West (AAS 4) and Orwell Park (AAS 5) which are likely to reveal industrial heritage activity.
- All buildings or structures listed in the Record of Protected Structures:
    - Packhorse Bridge, Milltown Road;
    - Laundry stack, Milltown Road, Dublin 6;
    - Nine Arches bridge -Railway Viaduct, Milltown Road, Patrick Doyle Road, Dublin 6;
    - Former Dartry Dye Works, Dartry Road, Dublin 6;
    - Clonskeagh Castle, Whitebeam Road, Dundrum, Dublin 14;
    - Landore Hall, Churchtown, Dublin 14;

○ Beechmount, Orwell Road, Dublin 14. • All sites listed in the National Inventory of Architectural Heritage: ○ The Gate Lodge known as Ely's Arch (11211012).

Landscape and Visual
The study area contains several public parks, matures stand of trees and small woodlands and tree lined recreational pathways along both sides of the River Dodder. The retention and protection of trees and woodlands within Dublin is emphasised with the DCDP (2016-2022). The existing trees and planting within the study area provides both visual and recreational amenity for the residential areas within the study area and the wider district.
Landscape Character. The proposed development of the site will result in a change to the landscape character which will be most noticeable locally, such as from the adjacent residential areas e.g. Orwell Gardens, several public parks and public pathways (along the river banks and bridges). The potential magnitude of this change will be assessed when the details, scale and extent of the proposed interventions have been finalised. *Historical landscape character and cultural heritage within the study area:* Within the study area there are several designations (as defined by the DCDP (2106-2022) and Protected Structures of national interest that need to be considered such as: • Land use zoning objective Z9: To preserve, provide and improve recreational amenity and open space and green networks. • Conservation Area. • Zone of Archaeological Interest. • Sites of Archaeological Interest. A number of protected structures are also located within the study area (refer to section 'Cultural Heritage and Archaeology' above for more details). *Recreational amenity value:* There are several recreational amenities within the study area that need to be considered in relation to possible impacts on their accessibility, recreational and visual values: • Orwell Park (while located to the west of study area, impacts on this amenity would still need to be considered as park of this assessment). • Dodder Park. • Temple Park. • Milltown Golf Club (private). • Windy Arbour Playground. • Scully's Field (between Milltown and Clonskeagh). • Walking/ cycling pathways along much of the length of the river.
Views & Visual Amenity Value. Key viewpoints will be selected when the details, scale and extent of the proposed interventions have been defined, these shall include views into and out of the study area and those that demonstrate the visual amenity value within the locality. There is a need to protect: • Residential views towards the river; • Recreational views – towards to and from the river (e.g. public pathways and parks).
Construction Phase & Operational Phase. During the construction phase, the following elements of the proposed development have the potential to cause visual impacts, they will however be short to medium term in duration: • Temporary site works – hoarding, lighting, cranes, car parking, storage areas; • Construction traffic – dust and emissions;

Landscape and Visual
• Tree and vegetation clearance; • Groundworks – cut and fill excavations; • Laying of foundations. The principal elements which are likely to give rise to landscape and visual impact visual impact in the long term/operational phase are: • Removal of some existing trees; • Height of proposed structures/ interventions; • New structures/ interventions; • Change of character – dependent on proposed interventions type and scale; • Proposed tree and shrub planting. Appropriate design, siting and mitigation measures are required to integrate the proposed scheme within the landscape.

Air Quality
Impacts on air quality are expected to occur during the construction phase only. The key constraints in relation to air quality and climate are the sensitive receptors in proximity to the location of construction works. The scheme design should take into consideration any air/climate/noise/vibration sensitive receptors such as residences, schools, businesses, and medical facilities located in proximity to works associated with the flood relief scheme. The potential impacts of climate change will need to be considered in the design of the proposed scheme.

Noise and Vibration
Noise and vibration effects are expected to occur during the construction phase only and would be expected to include: • Construction traffic; • Earthmoving plant and equipment; • Sheet piling; • Power tools and generators.
Construction noise is temporary in nature, and therefore the normal way of minimising the impact is to limit the working hours. For larger infrastructure projects the Local Authority may place noise limits on the construction works.
Measures to avoid or minimise the potential impacts of noise on sensitive receptors during construction should be considered and implemented on site, as appropriate.
Ground-borne vibration attenuates rapidly with distance. People are very sensitive to vibration and can feel vibration long before it becomes an issue in terms of cosmetic damage or structural damage to buildings. Assessment of potential for damage due to vibration should be carried out where vulnerable structures are located in close proximity to works such as sheet piling.

The following tables provide a summary of the above constraints summarised according to programme, engineering/design and legal constraints.

Programme Constraints
Protected/notable Species. All works should be planned wherever possible to be carried out at times of the year that are ecologically least sensitive e.g. outside bird nesting (March – September) and fish migration periods (Spring/Summer, depending on species (see below).
Otter. If otters are found to be present and disturbance is likely then DCC must apply for a licence to allow proposed development works that might affect otters to proceed legally. The potential impacts on otter will be assessed and reported in the EIA. Otter mitigation works can potentially be conducted at any time of year but must avoid the breeding season (usually Spring but can be any time of year) if holts are present on site.
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Japanese Knotweed, Himalayan balsam, and Gunnera are listed as invasive plants under the EC (Birds and Natural Habitats) Regulations 2011 (S.I. 477/2011). These regulations prohibit the introduction or dispersal of invasive species and appropriate measures should be undertaken in the proposed scheme development. Therefore, any works occurring in areas where invasive species are present must use appropriate measures.
Any **in-river works** will need to ensure compliance with the WFD. Co-ordination of any in-river works with the IFI and adherence to any IFI requirements.
The presence of previously un-recorded **underwater archaeological artefacts** may significantly slow down the construction programme.
The application for derogation licences should be applied for in advance of any works which may disrupt any protected species.
Replies to requests for further information/clarification from An Bord Pleanála.

Engineering/Design Constraints
The design of the final scheme will be subject to a number of site investigations and may change depending on the findings of these investigations.
The made ground is uncompacted and highly variable may require excavation and replacement with suitable founding material.

Legal Constraints
A 3rd party challenge to the application to An Bord Pleanála and a request for an oral hearing.
All works must comply with all national and international laws and treaties as mentioned in the relevant sections of this report as well as the environmental reports.

1 Introduction

1.1 Overview

Dublin City Council (DCC) being the largest Local Authority in Ireland and in charge of administering the capital city, has through agreement with other local authorities in Dublin, taken the lead in procuring for flood alleviation and mitigation. Through agreement with South Dublin County Council (SDCC), Dun Laoghaire-Rathdown County Council (DLRCC), Fingal County Council (FCC) and the Office of Public Works (OPW), DCC has commissioned studies to address the high levels of existing flood risks in Dublin, under the EC Directive on the Assessment and Management of Flood Risks 2007 and the EU Floods Directive, as implemented in Ireland by SI 122 of 2010 EC Regulations 2010 and SI 495/2015. Flood risk in Ireland has historically been addressed through the use of structural or engineered solutions (arterial drainage schemes and/or flood relief schemes). In line with internationally changing perspectives, the government adopted a new policy in 2004 that shifted the emphasis in addressing flood risk towards:

- Catchment-based context for managing risk.
- More pro-active flood hazard and risk assessment and management, with a view to avoiding or minimising future increases in risk, such as that which might arise from development in floodplains.
- Increased use of non-structural and flood impact mitigation measures.

Notwithstanding this shift, engineered solutions to manage existing risks are likely to continue to form a key component of the overall national flood risk management programme and strategy. A further influence on the management of flood risk in Ireland is the 'Directive on the Assessment and Management of Flood Risks 2007/60/EC' of the European Parliament and of the Council (also known as the 'Floods Directive'). The aim of this Directive is to reduce the adverse consequences of flooding on human health, the environment, cultural heritage and economic activity.

Typical proposed flood alleviation works could involve raising the flood defence levels by constructing new flood defence walls incorporating flood gates and/or strengthening and raising existing ones, constructing new flood defence embankments and/or strengthening and raising existing ones, raising and repairing existing bridge parapets, work on weirs, work on channels and culverts, constructing storage ponds and/or strengthening and enlarging existing ones, installing new flap valves and repairing or replacing existing ones, installing new screens on culvert inlets and/or replacing existing ones, installing pressure manhole covers, and may include ancillary works such as pumping stations and/or storage tanks. In addition, an operation and maintenance strategy plan is required. The required flood defence levels have been established as an output of the Dodder Flood Risk and Management Plan (FRMP) as carried out by RPS Consulting Engineers on behalf of the OPW. The work is situated in an urbanised area and the working area and access is extremely limited.

DCC has commissioned ByrneLooby (BL) to develop and implement a flood alleviation scheme (FAS) for the 'River Dodder Flood Alleviation Scheme Phase 3' project. The overriding purpose and aim of the Dodder Flood Alleviation Scheme (hereafter referred to as 'the scheme' is discussed in following subsections.

The scheme area (see Figure W3394-ENVR001-FG001) in Appendix A) covers a section along the River Dodder which includes the following:

- Lengths of river channel/ watercourse that have hydraulic influence on the area intended to benefit from, and be protected by, any feasible scheme.
- Full hydrological catchment areas draining to the downstream end which is Clonskeagh Road Bridge.
- Places that have the potential to be environmentally impacted from any such scheme.

The focus of the scheme is between Orwell Road Bridge and Clonskeagh Road Bridge and surrounding environs which include Orwell Gardens, South Hill, Richmond Court, Shanagarry Apartments, Scully's Field, Milltown Grove, Milltown Hill, Ramleh Park and Dodder Park. The scope of works also includes flood defence works on the Little Dargle Stream at Braemor Road-Woodside Drive south-eastern junction.

1.2 Environmental Study Area

The environmental constraints study area consists of the River Dodder and environs in the vicinity of the river from Clonskeagh Road Bridge to Orwell Road Bridge, including flood defence works on the Little Dargle Stream at Braemor Road-Woodside Drive south-eastern junction in the DCC and DLRCC areas.

The study area boundary for each environmental discipline will vary according to the location of receptors and individual topic best practice, appropriate statutory and/or specialist guidance, and applicable legislation and regulations. The study area for each discipline topic is defined in each section, accompanied by a figure showing the extents of the study area for that topic.

The desktop study will consider the effects of the construction and operation of the scheme in the catchment area as a whole, where appropriate. Site surveys have been and will be undertaken to collect recent and site-specific baseline data to inform the scheme design, the scoping report and environmental impact assessment (EIA) for this scheme and data, where appropriate and available at the time of writing and, have been included in consideration of potential constraints.

1.3 Project Background and Need for the Scheme

The overriding purpose of the scheme is to enhance the flood defences of the River Dodder from Clonskeagh Road Bridge to Orwell Road Bridge including flood defence works on the Little Dargle Stream at Braemor Road-Woodside Drive south-eastern junction, to the standards of the

EU Directive on the Assessment and Management of Flood Risk (Floods Directive 2007/60/EC) transposed into Irish Law as SI 122 of 2010. The proposed flood defences are to include an allowance freeboard (300mm for walls, 500 mm for embankments) as per the OPW guidelines and to address Environmental, Social and Health and Safety concerns.

The aim of the project at Scheme Development and Preliminary Design Stage is to carry out a detailed evaluation of all viable flood alleviation measures, select the best measure or combination of measures and carry out a Preliminary Design.

1.4 History of flooding

The Dodder catchment is located within the eastern district study area, unit of management HA09. It stretches from the River Liffey Estuary at Ringsend in Dublin City, west as far as Tallaght and southwest as far as Kippure in the Dublin Mountains, covering three Dublin local authorities namely Dublin City Council (DCC), Dun Laoghaire-Rathdown County Council (DLRCC) and South Dublin County Council (SDCC), draining a catchment of approximately 120km^2 (ByrneLooby and McCloy Consulting, 2020)

There is historical evidence of a high level of flood risk within certain areas of the Dodder with significant fluvial and pluvial flooding events having occurred in the past. The river floods some surrounding areas from time to time, as it is too short and shallow to hold the volume of water which pours into it from its tributaries during heavy rain. The River Dodder "has a history of flooding and is known as a "flashy" river with a quick response to rainstorms" (RPS, 2014).

RPS (2014) state that recent, major flood events on the River Dodder Catchment have occurred on:

- 25 August 1986 (Hurricane Charlie), where over 300 properties were affected by the flooding. During this storm the reservoir dams in Bohernabreena were within millimetres of being overtopped. To secure these dams, new spillways have since been constructed at the Bohernabreena reservoirs to cater for the "Probable Maximum Flood" (which is 383 m^3/s at Bohernabreena);
- 1 February 2002, where over 600 properties were flooded on the lower Dodder downstream of Lansdowne Road Bridge during the event;
- 23–24 October 2011, where a severe flood event caused widespread flooding throughout the Dodder catchment.

1.5 Potential Flood Risk Management Measures

The proposed scheme is likely to comprise of a combination of flood defence walls and earth embankments, surface water drainage (in-land) and minor works as has previously been identified in the Dodder CFRAM Study. In the Dodder CFRAM study, four key areas were identified for proposed measures and subsequently are now being reconsidered for the present scheme under development. These areas are summarised below:

1. Corner Woodside Drive and Breamor Road (Little Dargle)
2. Darty Park, Darty Mill and Orwell Garden
3. Milltown Hill and Shanagarry Apartments
4. Clonskeagh Bridge, adjacent to Farmer's Brown Pub.

It is also noted flood events have occurred adjacent to the Dropping Well Pub on Milltown Road and this area will be considered for flood defence measures as the scheme progresses.

A figure showing the extent of these areas and their geographical context within the overall scheme area is provided in Appendix A in Figure W3394-ENVR001-FG002.

The scheme design is being primarily developed on the basis of the preferred option in the River Dodder CFRAM study. The proposed flood defence measures are subject to change as further information becomes available through project-level assessment.

1.5.1 Corner of Woodside Drive and Breamor Road (Little Dargle River)

Defence measures are also proposed at the corner of Woodside Drive and Braemor Road, shown in Figure 1-1.

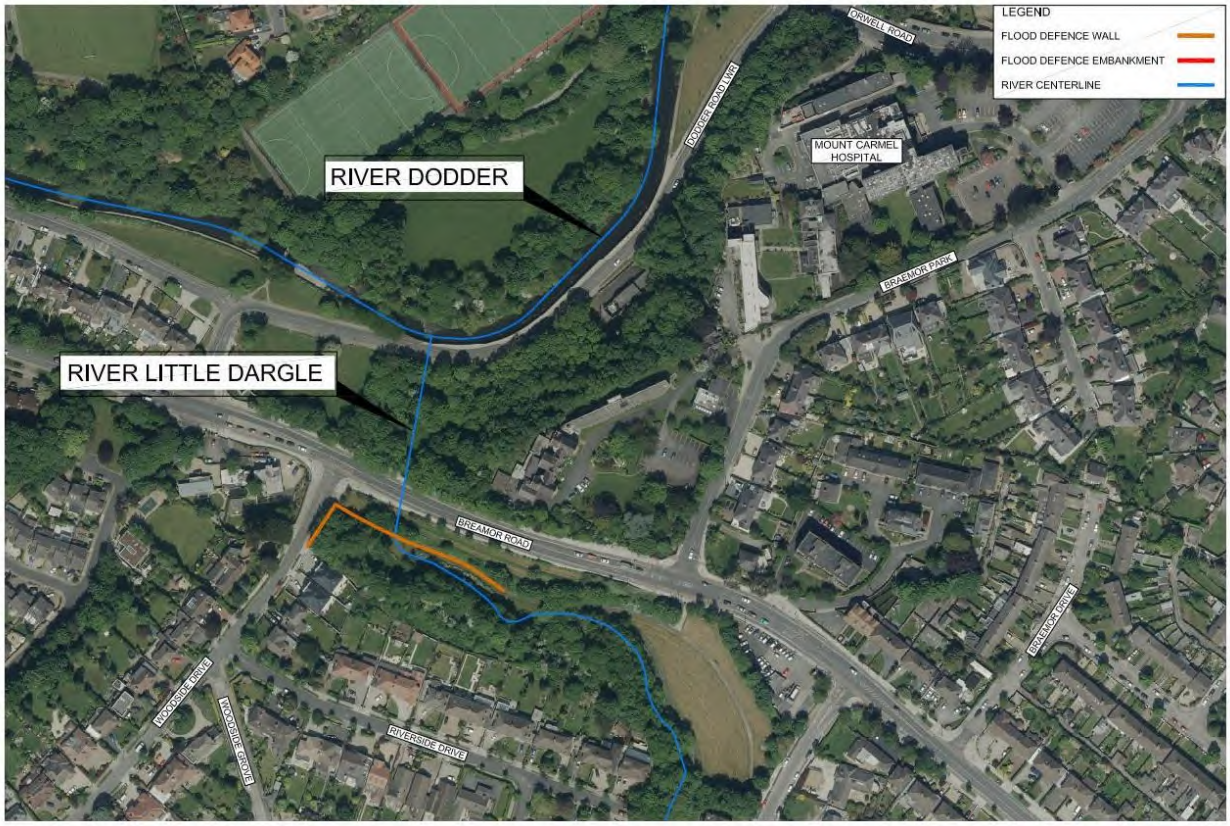

Figure 1-1 Proposed flood defence measures on the Little Dargle River under Dodder CFRAM study

1.5.2 Darty Mill, Darty Park and Orwell Gardens

Darty Mill, Darty Park and Orwell Gardens are residential areas situated north-east of Orwell Bridge and on a meander in the River Dodder. The Dodder CFRAM proposed measures are shown in Figure 1-2 and comprise:

- Development of flood defence wall downstream of Orwell Bridge on the right riverbank adjacent to Orwell Walk properties;
- Development of flood defence earth embankment on the right bank of the River Dodder from Dodder Park pedestrian bridge;
- Development of flood defence wall along the left bank of the River Dodder adjacent to Darty Mills factory and properties. This includes flood defence earth embankment on the north-eastern corner of Dodder Park.

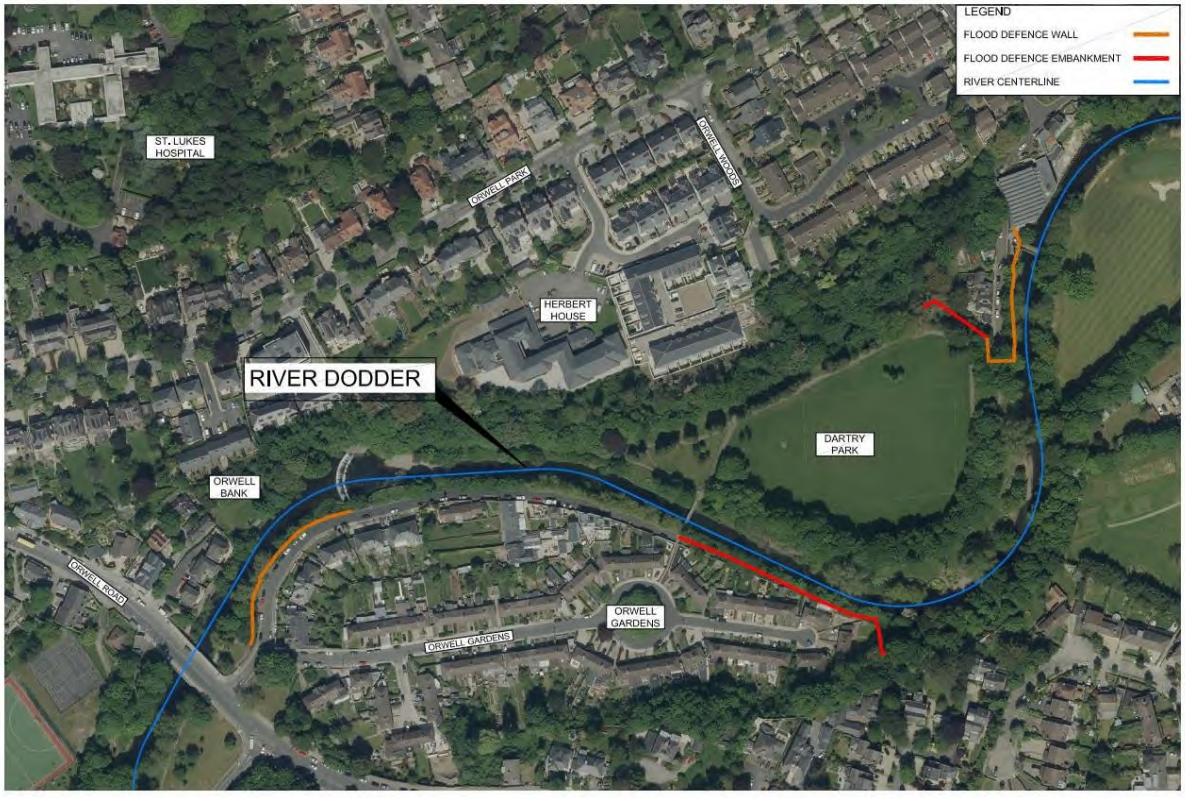

Figure 1-2 Proposed flood defence measures at Darty Park, Darty Mill and Orwell Gardens (River Dodder) under the Dodder CFRAM study

1.5.3 Milltown Hill and Shanagarry Apartments (River Dodder)

Milltown Hill area is comprised of residential and commercial properties situated adjacent to the River Dodder on the left bank, downstream of Dundrum Bridge. Proposed measures in the Dodder CFRAM study are shown in Figure 1-3 overleaf and include:

- Development of flood wall and earth embankment on the left bank of the River Dodder adjacent to Milltown road.

The Shanagarry Apartments area is comprised of residential and commercial properties situated adjacent to the River Dodder on the left bank and, in the south-eastern part of the scheme area, adjacent to the its confluence with the Dundrum Slang. Proposed measures are shown in Figure 1-3 overleaf and include:

- Development of section of flood wall on both left and right banks of the River Dodder;
- Development of flood earth embankment in two sections on both banks of the River Dodder.

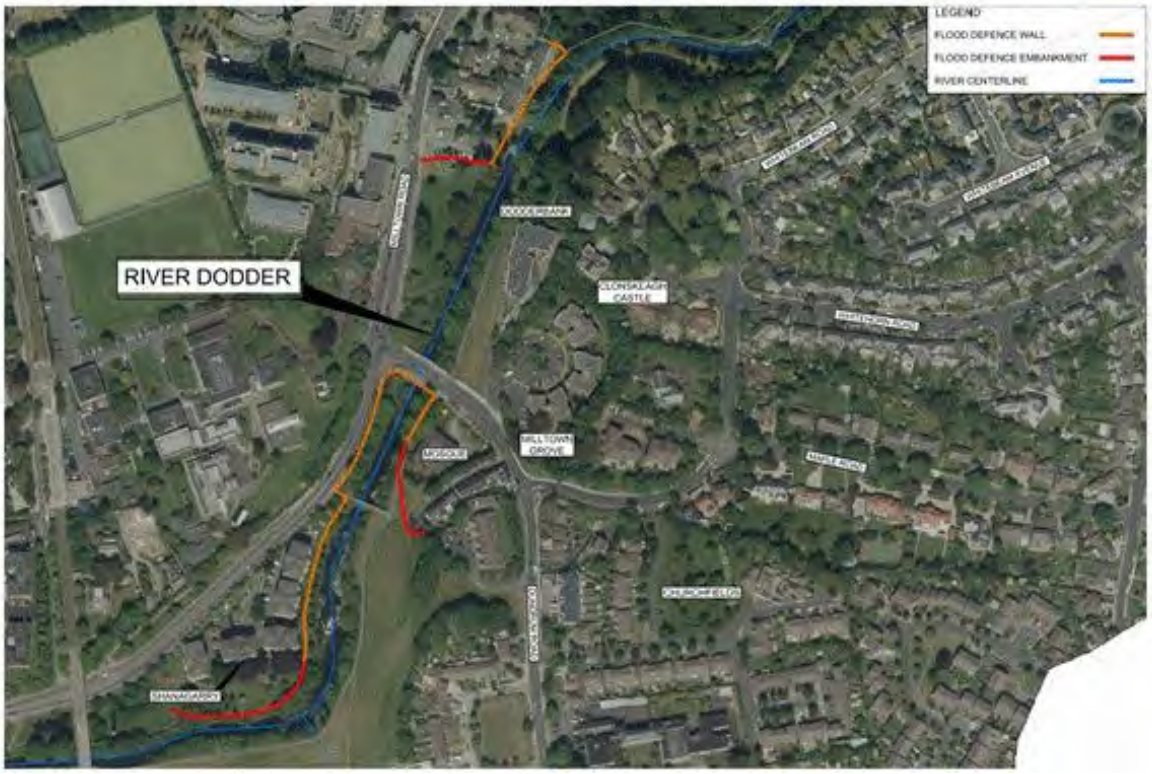

Figure 1-3 Proposed flood defence measures at Milltown Hill and Shanagarry Apartments (River Dodder) under the Dodder CFRAM study

1.5.4 Clonskeagh Bridge

Proposed defence measures in the Dodder CFRAM study are the development of a flood wall upstream of Clonskeagh Bridge on the left bank of River Dodder, shown in Figure 1-4.

Figure 1-4 Proposed flood defence measures at Clonskeagh Bridge (River Dodder) under the Dodder CFRAM study

2 Environmental Constraints

2.1 Stages of Work

Various stages of work are carried out in the completion of a flood relief scheme. There are five stages of work as outlined in Table 2-1 and the progression to each subsequent stage depends on the outcome of the previous stage.

Table 2-1 Flood Relief Scheme Stages

Stage	Environmental Assessment	Examples of the specific studies completed as the scheme progresses
I	Scheme Development	Data Gathering and review Ecology Surveys Archaeological Investigation Hydrology Study & Hydraulic Modelling Geotechnical Surveys Flow Velocity Surveys Topographic Surveys Site Investigations and site walkovers Conduct Flood Risk Assessments Prepare a number of Flood Risk Management Options Carry out a Cost Benefit Analysis Selection of a Preferred Option Flood Risk Management Plan Interference Notices Public Consultation
	Constraint Study	
	Screening for Appropriate Assessment	
	Initial Consultation with Stakeholders	
	Scoping for Environmental Impact Assessment	
II	Detailed Design	
	Public Consultation	
	Preparation of Environmental Assessment of Options Report	
	Public Consultation on Preferred Scheme	
	Preparation of Appropriate Assessment	
	Environmental Impact Statement for Preferred Option	
	Submission of a Part X Planning Application to An Bord Pleanála	
III	Detailed Design Confirmation	
	Tender	
IV	Construction Supervision	
V	Handover to Client	

ByrneLooby have been appointed to bring the scheme from preliminary design (Stage I), assessing various options available, through public consultation, detailed design and environmental procedures (Environmental Impact Assessment and Appropriate Assessment) to planning application to An Bord Pleanála (Stage II).

Subject to successfully satisfying An Bord Pleanála requirements, the scheme will then be tendered (Stage III), constructed (Stage IV) and delivered (completed) to the client (Stage V).

2.2 Scope of Environmental Constraints Study

The Environmental Constraints Study is the first step in the preparation of an environmental impact assessment report for the Dodder River Flood Relief Scheme. The purpose of the constraints study is to identify the key environmental aspects which may be impacted upon by possible flood alleviation measures and/or which may impose constraints on the viability and/or design of these measures.

The scope of the Constraints Study has followed the guidelines prepared by the Department of Housing, Planning and Local Government: Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (August 2018).

Guidance contained with the Environmental Protection Agency's Guidelines 'Advice Notes on the Current Practice in the Preparation of Environmental Impact Statements' (2015) has also been considered.

This environmental constraints study has been reported under the following sub-discipline/topic area headings:

- Resources and Materials
- Population and Human Health
- Hydrology
- Soils, Geology and Hydrogeology
- Ecology and Biodiversity
- Cultural Heritage and Archaeology
- Landscape and Visual
- Air Quality
- Noise

For this study, the human health, land use, traffic and population have been combined in the population and human health section. Similarly, other sections of the Constraints Study e.g. noise, air quality, etc. are also applicable to human beings. Air quality includes climate and noise includes vibration due to the nature and location of the scheme.

2.3 Methodology

ByrneLooby and its specialists have undertaken a series of desk studies and preliminary site visits as part of the constraints study. Further details on constraints are presented in the following sections of this report. Information has been gathered with due regard to the likely environmental impacts of the proposed scheme, and the statutory requirements for Environmental Impact

Assessment and Appropriate Assessment as set out in the EU Directives and associated Irish legislation.

The constraints study has had regard in general to the following guidance and information sources as mentioned below. Specific guidance and information sources are referenced in individual specialist sub- sections.

2.3.1 Guidance and Background Information

- Department of Housing, Planning and Local Government, August 2018. Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment.
- Environmental Protection Agency: Advice Notes on Current Practice in the Preparation of Environmental Impact Statements, (2003) and Draft Revised Notes, 2015.
- Department of Environment, Heritage and Local Government (2010) Appropriate Assessment of Plans and Projects in Ireland - Guidance for Planning Authorities.
- European Communities (2000) Managing Natura 2000 Sites: The Provision of Article 6 of the Habitats Directive 92/43/EEC.
- EC Environment Directorate-General (2000) Assessment of plans and projects significantly affecting Natura 2000 sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC.
- Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment.
- Department of Environment, Heritage and Local Government (2010) Circular NPW1/10 & PSSP 2/10 Appropriate Assessment of Plans and Projects in Ireland - Guidance for Planning Authorities.
- Dodder Catchment Flood Risk Assessment and Management Plan Strategic Environmental Assessment Statement 2014.
- Dodder Catchment Flood Risk Assessment and Management Plan 2011.
- Habitats Directive Article 6 Assessment for the Dodder Catchment 2010.
- Dodder Catchment Flood Risk Assessment and Management Strategic Environmental Assessment Environmental Report, 2010.
- Strategic Environmental Assessment Statement Environmental Report, 2010.
- Options Development Report with Multi Criteria Analysis Dodder CFRAMs 2009.
- Preliminary Options Screening Report Dodder CFRAMs, 2008.

- Hydraulic Analysis Report for Dodder CFRAMs 2008.
- Hydrology Analysis Report for Dodder CFRAMs, 2007.
- Project Inception Report Dodder, 2007.

Key guidance or references specific to specialist areas considered in this report are included in the discipline specific methodology sections, where appropriate.

2.4 Project Team

This environmental constraints report was drafted by ByrneLooby: Fiona Symes (peer review, EIA generalist inputs), Rhian Llewellyn (geology, soils, hydrogeology and hydrology and generalist inputs) and Paige Leresche (generalist inputs). Additional inputs were received from other internal ByrneLooby staff as necessary (for example the project management team and project engineers).

Specialist technical inputs were provided by the following subject matter experts retained by DCC: Siobhán Deery and Lisa Courtney (cultural heritage and archaeology specialists, Courtney Deery), Brendan O'Connor and Kevin Mc Caffrey (Ecologists, Aquafact), Rory Dalton and Louise Scally (bat specialists, MERC) Linda Maher and Dan Egan (landscape and visual amenity specialists, The Big Space), Nigel Jenkins (air quality and climate specialist, Phlorum), Benny Cryan (Acoustics and vibration specialist, Amplitude Acoustics).

2.5 Consultation

Consultation has been carried out with the public and various stakeholders, the purpose of which was to engage with them, to gather local knowledge on flooding and environmental constraints, and opportunities for addressing flood risk in the area.

Comprehensive communication and engagement plans have been developed and adopted by the team such as a project website, direct emails, local media, and public consultation among other approaches listed in Table 2-2 below. Consultation includes the establishment of a maintained project website and regular project newsletters.

At the time of writing consultation is ongoing. Where stakeholders have provided inputs that have implications on the project environmental constraints these have been considered.

A Scoping Report will be prepared for the EIA and Statutory Bodies, non-statutory bodies and interested stakeholders will be consulted with. Their views will be considered in the preparation of the EIA.

Table 2-2 Consultation methods

Communication Activity	Purpose / Correspondence
Project website	https://www.floodinfo.ie/frs/en/dodder-phase-3/home/ The website provides regular updates and information to stakeholders about the scheme. The website provides scheme information, scheme news and updates, a photo gallery, and resources section comprised of FAQ, glossary and contact subsections.
Direct Email	A dedicated project email address is the primary source of contact for all interested Parties (unless otherwise requested by party): dodderfasphase3@byrnelooby.com. On the 1st - 6th of July 2020, project information letters were sent to 87 relevant authorities and stakeholders. The responses to these letters have been logged and further information is provided in the Public Consultation Report (ByrneLooby, 2020).
Local authority / community publications such as parish newsletters	Stories in local authority / community group newsletters are likely to reach a wide range of citizens. A scheme newsletter is published regularly on the scheme website. This is drafted in non-technical language.
Social Media	Both DCC and DLRCC will publish updates on scheme progress via social media platforms as and when needed. These will be linked to the project website and other relevant feeds, as appropriate.
Public Consultation Days / workshop	Consultation exhibitions / events offer a more extensive and open form of engagement on a personal basis. They provide opportunities for members of the public to express views on the consultation subject area, ask questions, and receive feedback on the issues they raise. Public consultation day no. 1 (scheme introduction) was held on 14th January 2020. Due to the COVID-19 Pandemic, alternative consultation methods, such as the above, are being investigated.

The most common issues that arose during the first Public Consultation event held on 14th January 2020 included (ByrneLooby, 2020):

- Concerns that the proposed works would result in people being cut-off from the river;
- That the proposed works are planned in a way that minimised and prioritises the wildlife along the river;
- The inability of many to obtain flood insurance and a request that DCC bring this to the attention of OPW;
- Maintenance of the existing stormwater drainage and networks needs to be upheld;
- Some requests for meetings at local community level for specific flood areas.

At the time of writing, the following communications have been received in response to letter seeking the views of environmental stakeholders on the proposed scheme. These are summarised as follows:

- The Department of Communications, Climate Action and Environment (DCCAE) responded in a letter dated 13th August 2020. DCCAE state the importance of groundwater and as resource and provide information about publicly available data made through online portals for groundwater, natural resources (minerals/aggregates), geological mapping, and the geotechnical database. DCCAE request that that the Geological Survey Ireland (GSI) are either informed about any significant outcrop uncovered during works or that detailed photos of uncovered outcrop are provided to the GSI. They also request that the GSI are provided with copies of detailed site investigations, where available. (Reference: Response to consultation letter sent by ByrneLooby dated 1st July 2020, communications reference W3394-BL-ENV-L-014)).

- The Irish Peatland Conservation Council (IPCC) responded in a letter dated 17th August 2020. They bring attention to the blanket bog at the source of the River Dodder and the need to understand any effects to this area that may arise from the development of the scheme. They suggest using the Wetland Surveys Ireland mapping to identify locations of waterbodies and associated ecology that could potentially be affected by the scheme. They inform that their 2019 Hop To It! National Frog Survey received reports of six sighting of Ireland's only native species of frog (*Rana temporaria*) in the vicinity of the scheme, as identified by the general public. They also provide information about the Water Framework Directive and the National Biodiversity Data Centre datasets for the vicinity of the scheme area. The Irish Peatland Conservation Council are a registered charity and an environmental non-governmental organisation aiming to raise awareness and protect a representative sample of Irish Peatlands for present and future generations. (Reference: Report to consultation letter sent by ByrneLooby dated 1st July 2020, communications reference W3394-BL-ENV-L-036).

- An email from the Environmental Protection Agency (EPA), received 13th July 2020, noted the presence of EPA station 09010 at Waldron's Bridge and stated the importance that this station be protected throughout the flood scheme works and that the record at this site be maintained into the future as it is a long-term reference site of strategic national importance. (Reference: Report to consultation letter sent by ByrneLooby dated 1st July 2020, communications reference W3394-BL-ENV-L-036).

Where communications have been received that advise the inclusion of specific third parties in consultation these requests have been actioned.

3 Resources and Materials

3.1 Introduction

This section describes the constraints relating to material assets within the scheme study area and identifies possible issues which have the potential to constrain the flood relief scheme design.

For the purposes of this report, the study is defined as an area approximately 500m in radius from the centre point of the River Dodder where works are proposed. Features outside of this boundary (up to an outer extent of 2km) are discussed where relevant.

Figure 3-1 Constraints study area boundary for resources and materials

3.2 Methodology

The methodology included:

- Identification of possible material assets within the scheme study area.
- Identification of locations where there may be existing sensitive receptors.
- Identification of material assets constraints.

3.3 Baseline / Receiving Environment

Material assets within the study area include:

- Wastewater infrastructure.
- Waste management facilities.
- Utilities.
- Land ownership.
- Roads and Transportation network (including pedestrians and cyclists).

3.3.1 Wastewater infrastructure

3.3.1.1 Wastewater Treatment Plants

Wastewater infrastructure in the study area comprises sewerage networks and varied domestic treatment systems. EPA data indicates that there are no licenced Wastewater Treatment Plants (WwTP) located within the study area. The Ringsend Wastewater Treatment Plant (WwTP) is located downstream and outside of the study area, on the River Liffey, at a location ca. 2 km downstream of the confluence of the River Dodder and River Liffey. The Ringsend WwTP is currently undergoing upgrades to increase the capacity of municipal wastewater to 21,700 m^3 per day / 94,000 PE (60 g BOD) (Royal Haskoningdhv, 2020). However, due to the nature of the scheme and location of the WwTP at Ringsend, impacts arising from interactions between the scheme and this asset are considered unlikely.

3.3.1.2 Foul and storm water sewers

Data collated from Irish Water was used to identify existing sewerage infrastructure but was limited to pipe, manhole and outfall locations. These are a combination of combined foul and storm water sewers, foul and overflow mains. Irish Water aims at reducing the amount of water infiltration into foul network. It hopes to extend the network, as well as continue sewer maintenance in the city and repair, replenish, or update existing wastewater collection systems including the separation of foul and storm water. Appendix B (Drawing W3394-SK12) provides the existing foul and storm water sewers layout of the scheme area.

According to the Irish Water Sewer Services Layout provided by Irish Water:

- The Scheme area consists of a total of 4,340 foul and storm water sewer connections; where 1,621 are combined foul and storm water sewer, 2676 are foul and 41 are overflow. The pipe diameters vary from 100mm to 2,250mm in size.
- There are eleven outfalls which discharge within the scheme area (DCC, DLRCC and SDCC) comprised of:
    - seven storm water sewer overflows are located in DLRCC;
    - two outfalls for storm water are located in SDCC;
    - an outfall for the storm water sewer is located in SDCC, and;
    - an outfall for the storm water sewer is located in DCC.
- There are foul and storm water sewer pipelines which are located parallel to the River Dodder and a total of three river crossings.

Irish Water state that the aim of the, the Greater Dublin Strategic Drainage Study (GDSDS) is to focus on reduction of non-legitimate flows, manage risks of cross-contamination and strengthening current misconnection programme. No further information was available at the time of writing this report.

Irish Water had not provided a formal response to the consultation an information request letter dated 1st July 2020 (reference: W3394-BL-ENV-L-038) at the time of writing (see section 2.5).

3.3.2 Waste Management and licenced facilities

A review of the EPA database (EPA Geo Portal 'EPA Licensed Facilities', 2020) indicates that there are no EPA licences waste facilities, Industrial Emissions Licensing facilities (IEL), or Integrated Pollution Control (IPC) sites located in the vicinity of the proposed scheme. The former Smurfit Paper Mills located opposite the Clonskeagh Hospital and adjacent to the River Dodder at Clonskeagh surrendered its IEL licence and closed 2005

Bottle Banks are located at the Dropping Well Pub and Milltown Carpark bottle Bank. A bring centre is located at Herzog Park, Orwell Road (Dublin City Council Website, 2020).

3.3.3 Utilities

Utilities in the study area include water supply networks, digital infrastructure, electricity network infrastructure and gas network infrastructure.

3.3.3.1 Water utilities

Water is supplied in Dublin on a regional basis. The region includes all of Dublin City and County and parts of Wicklow and Kildare. The main source of water supply for the Dublin Region is Poulaphuca Lake on the Upper Liffey. Water is abstracted from Poulaphuca (Co Wicklow) and treated in Ballymore Eustace Water Treatment Plant (Co Kildare). Treated water is then transmitted from Ballymore Eustace to Dublin (approximately 40 km). A daily average of

540 million litres of water is collected from rivers, treated and made safe to drink at four main treatment plants. Three of these treatment plants are operated by Dublin City Council on behalf of Irish Water at Ballymore Eustace (Liffey), Roundwood (Vartry) and Ballyboden (Dodder). Fingal County Council operates the treatment plant at Leixlip (Liffey) on behalf of Irish Water (Dublin City Council, 2020).

The Bohernabreena reservoirs (two impounding reservoirs) at Glenasmole supply potable water to c. 35,000 households in the southern central part of Dublin city. These reservoirs are located in the River Dodder catchment and upriver of the scheme are discussed in further detail in section 5.3. Further information relating to the distribution network and associated facilities is not available at the time of writing this report.

Figure 3-2 Existing water mains in the study area

Data collated from Irish Water was used to identify existing water infrastructure but was limited to pipes, valve chambers, kiosks, pump station and junction boxes locations. The water distribution network in the scheme catchment area consists of distribution and trunk mains of

various pipe sizes and pipe material. Pipe size range from 25 mm to 750 mm and pipe materials include cast iron, PVC, asbestos cement and ductile iron.

Water services crossings have been identified at Orwell Bridge, Dundrum Bride and Clonskeagh Bridge, while most of the distribution network is situated along roads adjacent to private and public properties.

3.3.3.2 Electricity transmission

The ESB are responsible for the local network with EirGrid maintaining responsibility for the national transmission network. Figure 3-3 shows the ESB local network mapping. Further information relating to the distribution network and associated facilities is not available at the time of writing this report.

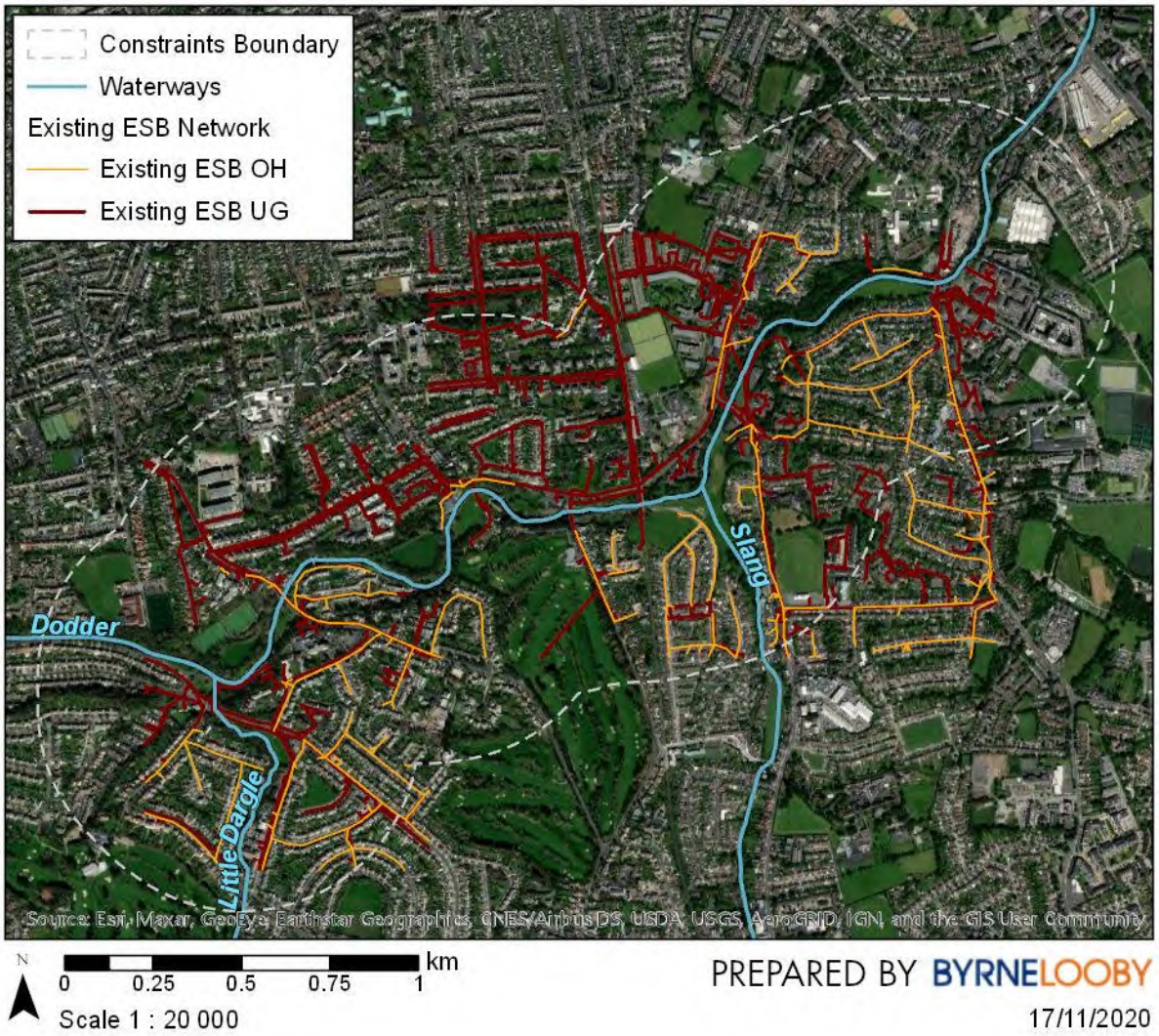

Figure 3-3 ESB distribution network in the study area

3.3.3.3 Gas infrastructure

Gas Networks Ireland (GNI) maintains a network of gas distribution infrastructure within the scheme study area. Underground gas mains are present throughout the area. Further information relating to the distribution network and associated facilities is not available at the time of writing this report.

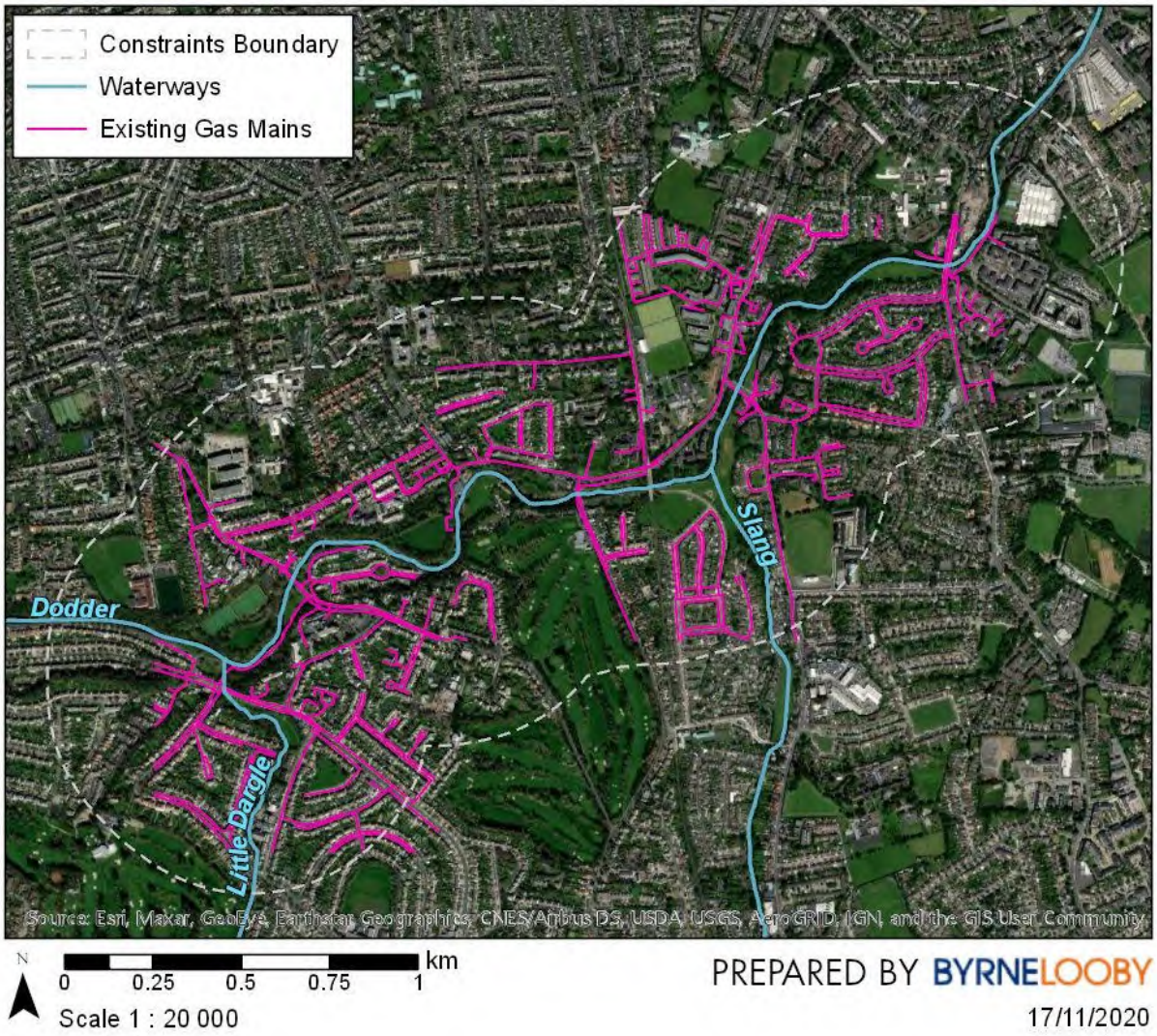

Figure 3-4 Gas distribution network

3.3.3.4 Digital infrastructure

High speed broadband and fibre-optic services are widely available in the study area through commercial operators. Landline phone connections and 4G and 4G+ mobile phone coverage is available from commercial operators in the study area (DCCAE national broadband plan website, October 2020; Commission for communications regulation, October 2020).

3.3.4 Land Ownership and Zoning

Land ownership and land use in the scheme study area are varied, including private, public, residential, commercial, and amenity areas. To avoid repetition within this report, land zoning is discussed in greater detail in section 9.

Access to privately owned lands may be required for construction and maintenance works, and land may also need to be acquired as a result of the scheme.

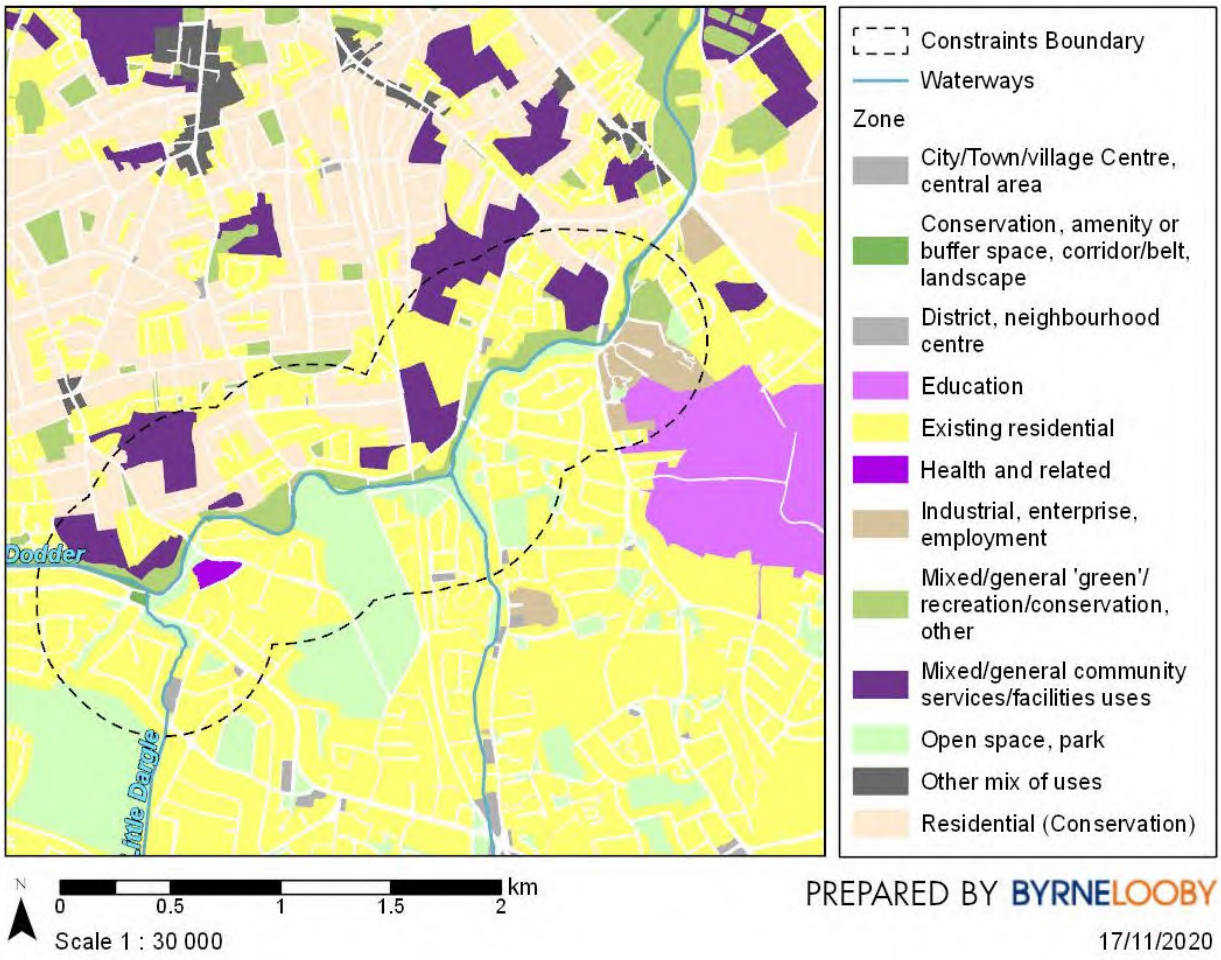

Figure 3-5 Land zoning within the scheme area
Data source: Department of Housing, Local Government and Heritage's Myplan.ie website (2020).

3.3.5 Roads and Transportation Network

The study area is served by the road network with national ('R') roads the greatest capacity roads present in the vicinity of the proposed scheme (R117, R820). Roads cross the River Dodder in the study area at Wardon's Bridge (also known as Orwell Bridge), Classon's Bridge, Milltown Bridge, Clonskeagh Bridge (Figure 3-6 and Table 5-2). All roads in the scheme study area are maintained by Dublin County Council, however any modifications to National Primary and Secondary roads may require consultation with Transport Infrastructure Ireland (TII). As of September 2020, there are no major roads projects on TII's Major Roads Project Active List proposed within the vicinity of the study area (TII 2020a).

The study area is served by the Greenline of Dublin's Luas light rail system with the 'Milltown' stop located within the vicinity of the study area to the north of the River Dodder and 'Windy Arbour' stop location south of the River Dodder. The Greenline crosses the study area over the Nine Arches Bridge and the route spans from Cabra (Broombridge, northside of Dublin) to Cherrywood/Loughlinstown, (Brides Glen, southern Dublin suburb) via central Dublin. Milltown is served by three bus regional routes: 142, 44, 61. Irish rail does not operate within the vicinity of the study area (TII 2020b).

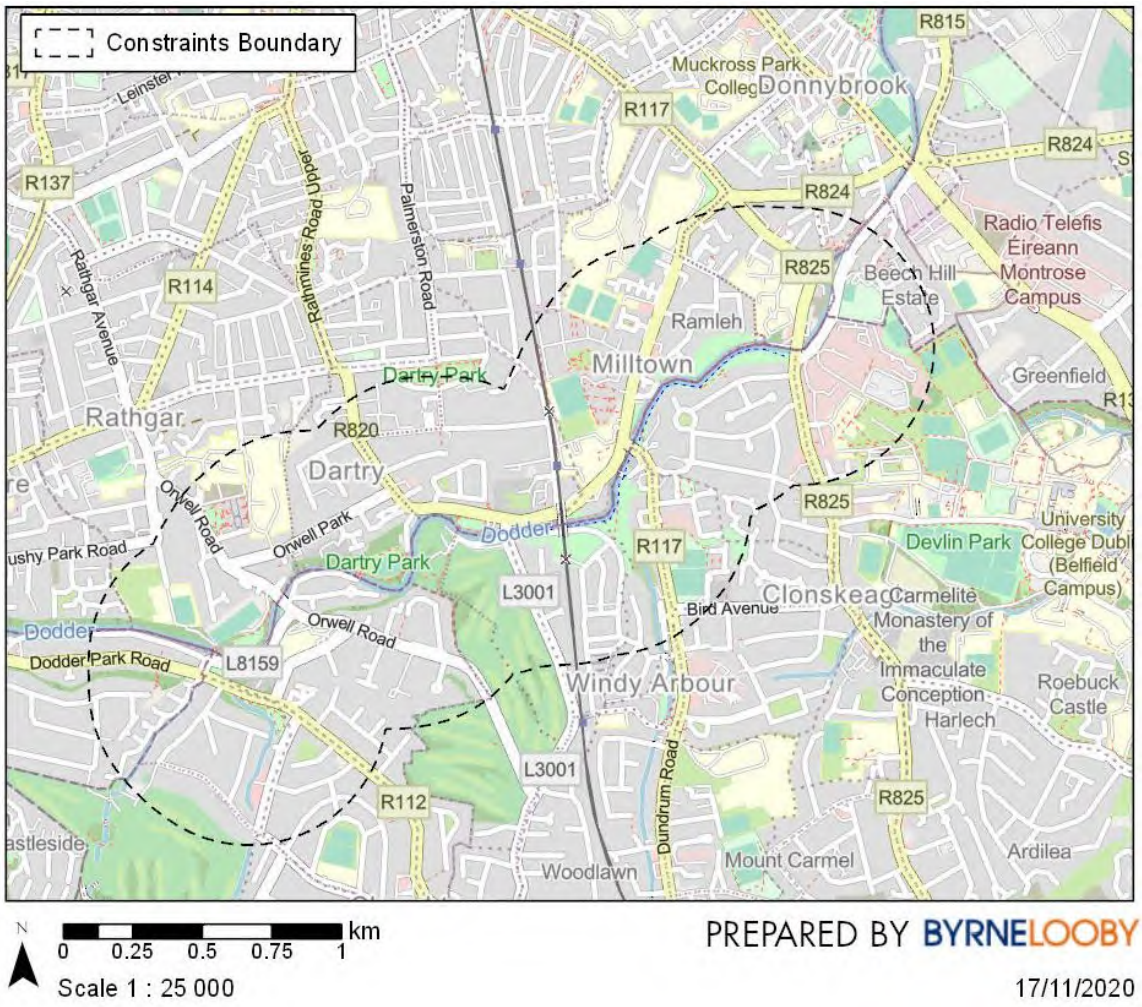

Figure 3-6 Roads and Transportation network in the scheme area

3.3.6 Pedestrian and Cycling Network

Various walking/cycling pathways are located along much of the length of the river and its immediate surrounds. Public amenity areas green areas in vicinity of the scheme are connected by public walkways, foot bridges and bridges.

There are two publicly accessible footbridges:

- pedestrian bridge linking at Dodder Park and the Orwell Gardens residential area; and
- Packhorse Bridge near the Bankside Cottages at Farranboley.

At the time of writing, no further information is available with regard to pedestrian and non-vehicular users of the study area (for example cyclists and equestrians). This data has been requested and will be considered as the scheme progresses. Anecdotal information suggests that the pathways along the river corridor are utilised for both recreational walking/cycling as well for commuting and are a valuable resource for the local residents.

The Dodder Greenway Route project is being developed by the NTA/South Dublin Country Council (SDCC) with the current route plan passing along the Dodder Valley corridor and the study area in the vicinity of the River Dodder. Although developed as a combination of off road and on road it utilises existing facilities within the Dodder Valley as much as possible to connect the linear parkland along the route. The Greenway route is approximately 14 km in length and passes along the Dodder Valley from Orwell / Terenure through the outer suburbs of Tallaght to rural and upland Dublin to the entrance to the Bohernabreena reservoirs at Glenasmole (SDCC 2020). The project website states that the overall scheme design will include:

- a shared 3-4 m wide bound surface on the off-road sections, tying into suitable bound surfacing for the on-road sections. It is proposed to utilise enhanced variations to reflect local context.
- Works will include widening and upgrade to existing paths, construction of new paths, the construction of several new bridges, upgrade of existing bridges and underpasses, junction upgrades, etc.
- The upgrade and creation of new entrances to the Greenway.
- Improved landscape treatment to provide a coherent and legible Greenway along the proposed Greenway.

Projected footfall data for the Dodder Greenway was not available at the time of writing.

3.4 Key Constraints

Impacts on services and utilities such as watermains, gas mains, underground powerlines etc. will all need to be considered during the design process. The possible interruption of these services and utilities should be minimised, where possible. Furthermore, impacts on road and rail infrastructure and land ownership will need to be considered.

Additional general and site-specific constraints will need to be considered as the scheme progresses, including:

- During planning, development, and construction, the utilities infrastructure must be fully considered to ensure that disruptions to the utilities infrastructure are avoided.
- During the construction stage, measures may have to be taken in order to ensure the construction does not interfere in any of the underground or overground utilities services.

- It will be necessary to contact ESB/GNI/Irish Water if there is a need for lines to be turned off for a period of time (e.g. for works or relocation of infrastructure) and to determine if the affected residences could be serviced from elsewhere.
- Consideration to any design, construction or operations risks in areas where electricity lines and gas network pipes (and associated infrastructure) are located in close proximity.
- Consideration of the designs effect on sewerage capacity in the event of hydrological changes or flooding.
- Impacts on road and rail infrastructure and land ownership will need to be considered.
- Impacts on public rights of way, footpaths and cyclepaths will need to be considered. The proposed scheme design should ensure continuity of the public walkways within its footprint and future plans for same.
- The scheme design and schedule will need to take into consideration the development of third party 'Green' projects in the vicinity of the scheme area, including potential impacts to utilities and infrastructure. This includes the section of Dodder Greenway Project likely to be located within the vicinity of the scheme. This project has not yet completed the options assessment process and a programme of works was not available at the time of writing. Third-party projects will be considered within the cumulative impact assessment section of the EIAR.

4 Population and Human Health

4.1 Introduction

This section sets out the principal constraints in relation to the population and human health setting of the study area. These include population, recreation/tourism, and public health matters characterising the study area that may impact on the selection of the flood alleviations measures for the proposed scheme, and which relate to the main settlement areas near which any flood relief measures are likely to be undertaken.

For the purposes of this report, the population and human health study area is defined as an area approximately 1 km in radius from the centre point of the River Dodder where works are proposed. Features outside of this boundary are discussed where relevant.

Figure 4-1 Constraints study area boundary for population and human health

4.2 Methodology

A desktop study was undertaken to identify the key population and human health constraints within the study area, specifically the areas surrounding the River Dodder from Clonskeagh Road Bridge to Orwell Road Bridge including flood defence works on the Little Dargle Stream at Braemor Road-Woodside Drive south-eastern junction in the DCC and DLRCC areas.

The following sources of information were used in the preparation of this section:

- Dublin City Development Plan 2016-2022.
- Dún Laoghaire-Rathdown County Development Plan 2016-2022.
- Censuses of Ireland 2016.

Sensitive receptors and potential constraints have been identified. Other datasets and environmental parameters will have interactions with population and human health, e.g. noise, vibration, air quality, climate, and material assets. These are dealt with in the other relevant sections of the report.

4.3 Baseline / Receiving Environment

The specific section of the river Dodder forms the border between Dublin City County and Dún Laoghaire-Rathdown County. Table 4-1 below presents the populations of the areas along the banks of this section of the river Dodder.

Table 4-1 Electoral Divisions along the River Dodder Study Area

Name	County	Population (2016)	Area (km2)	Density (persons /km2)
Churchtown-Orwell	Dún Laoghaire-Rathdown	1,943	0.96 km^2	2,032/km^2
Clonskeagh-Belfield	Dún Laoghaire-Rathdown	3,122	1.92 km^2	1,627/km^2
Clonskeagh-Farranboley	Dún Laoghaire-Rathdown	1,615	0.36 km^2	4,434/km^2
Clonskeagh-Milltown	Dún Laoghaire-Rathdown	2,049	0.52 km^2	3,931/km^2
Pembroke East D	Dublin City	5,263	1.85 km^2	2,845/km^2
Rathfarnham	Dublin City	4,683	1.23 km^2	3,797/km^2
Rathmines East B	Dublin City	6,058	1.26 km^2	4,816/km^2
Rathmines East C	Dublin City	3,351	0.74 km^2	4,542/km^2

Source: City Populations, 2020.

The total population of the areas along the banks of the River Dodder section is 28,084 over an area of 8.84 km^2. The areas surrounding this section of the River Dodder are mainly urban / suburban with medium density housing.

Directly along the banks of this section of the river, suburban housing and suburban related land uses are found such as Alexandra College and Clonskeagh Hospital and commercial properties such as the Reddy A+U Architecture office.

Various recreational facilities and features can also be found along the river such as the Dropping Well bar, Dartry Park, Dodder Park, Windy Arbour Playground, Temple Park and Waterfall Garden, Milltown Golf Course as well as various foot paths and foot bridges.

In the wider vicinity of the scheme area there are urban and suburban areas with locations of places of worship, medical facilities, shops and grocery stores, and educational facilities including the University College of Dublin. There are also commercial and administrative facilities including the Russian Embassy. There are various recreational facilities such as parks, guest houses, restaurants, and bars. Public amenity areas green areas in vicinity of the scheme are connected by public walkways, foot bridges and bridges. Further details are available in section 9.

During the first public consultation (see section 2.5) the inability of many to obtain flood insurance was bought forward with a request that DCC bring this to the attention of OPW. Insurance Ireland, the representative body for insurance companies in Ireland, and the OPW have a memorandum of understanding in place that sets out the principles of how they will work together to ensure that appropriate and relevant information on completed OPW flood defence schemes is provided to insurers to facilitate, to the greatest extent possible, the availability to the public of insurance against the risk of flooding.

4.4 Key Constraints

Constraints on population and human health will depend on the final nature and extent of the scheme, as well as the duration and nature of the construction phase.

In developing the scheme, the following must be considered:

- That areas of commercial or tourist potential maintain their aesthetic and public attractiveness both during construction and operation of the scheme.
- Development of the proposed scheme must take into consideration ways to complement and enhance public amenities including green spaces in the proposed scheme footprint. Measures to protect extant parks, recreational areas, and green public spaces should be developed within the proposed scheme. The proposed scheme design should ensure continuity of the public walkways within its footprint.
- National roads in the project are considered to be congested. Access to the River Dodder has access and movement limited by urban development in some areas. During construction of the scheme the traffic could pose problems for deliveries and site access and traffic management measures will be considered as part of the environmental impact assessment process.
- There is a potential for construction to make traffic more congested in the study area and vicinity. A traffic management plan will be required with the CEMP.
- Construction works will have to be mindful of maintaining access for both pedestrians and cyclists. A traffic management plan will be required during construction works.

- The traffic associated with construction works will need to be mindful of the tourist and retail trades.

- Sensitive receptors e.g. homes, schools and medical facilities should be considered key constraints in the design of the flood relief scheme. The scheme design should take into account the value (both cultural and economic) of any buildings (residential, retail, etc.) close to the rivers' edges or likely to be adversely affected by the scheme within the scheme study area. Hospitals and medical facilities in the scheme study area are sensitive receptors and must be given due consideration. Flooding events can cause devastation to homes, businesses and local facilities, with social and human health impacts. Their specific protection through adequate flood defences should be considered in the design of the scheme. The local community's access to private property insurance should be considered a key constraint when progressing with the scheme.

- Any design proposals should ensure that any bridges over watercourses are maintained where feasible so that temporary or permanent disruption of local transport links and access to homes and businesses in the study area are minimised.

- Public and tourist amenities and facilities should also be considered key constraints. Impacts on public amenity areas adjacent to and requiring access to the rivers such as riverside walks, parks and playgrounds should be considered, with replacement mitigation proposed if necessary. Impacts on tourist facilities, recreation and amenity facilities in the area should be considered constraints, especially those requiring access to the watercourses in the area.

- Other impacts to population that are also concerned with human health, including material assets such as water supply, wastewater treatment, and utilities should also be given due consideration.

5 Hydrology

5.1 Introduction

The principal surface water bodies within the study area are the River Dodder, the Little Dargle River and the Dundrum Slang (also known as the Dundrum River or River Slang). Lakes, transitional waters and coastal waters are not present in the study area. Figure 5-1 outlines the hydrological regime within the study area.

For the purposes of this report, the study is defined as an area approximately 1 km in radius from the centre line of the River Dodder where works are proposed. Features outside of this boundary (up to an outer extent of 5km) are discussed where relevant.

This constraint study area is located within the wider River Dodder catchment area (shown in Figure 5-2 overleaf), which is also considered in this section as appropriate.

Figure 5-1 Constraints study area boundary for the hydrological regime

5.2 Methodology

A desktop study was undertaken to describe the overall hydrological regime and water quality within the study area and to define hydrological constraints. The sources of publicly available information consulted in order to identify possible hydrological constraints within the study area include:

- EPA geoportal website including map viewer and water quality database.
- Geological data available through the GSI data portal and map viewer series.
- Data available through the EPA data portal and map viewer series.
- Water Framework Directive website www.wfd.ie
- The catchments.ie website.
- The watersandcommunities.ie website for the Local Authority Waters Programme.
- The OPW's floodinfo.ie portal website.
- Dublin City Development Plan 2016–2022.
- River Basin Management Plan for Ireland 2018 – 2021.
- Irish Water, Water Services Strategic Plan A Plan for the Future of Water Services 2015.

A number of other datasets are also relevant to hydrology due to their interactions, e.g. ecological sites and hydrogeological features. These have been dealt with in other relevant sections of this report.

Waterbodies within the constraints study are located within the River Dodder catchment.

The Catchments.ie website publishes water quality data for the sections of rivers within the constraints study area under the sub catchment unit classification 'Dodder_050' (WFD IE_EA_09D010900). This subcatchment comprises part of the larger Liffey River Catchment unit which is classified as 'Liffey and Dublin Bay Catchment Code 09'.

Constraints related to the ecology of the river are provided in Section 7 of this report.

5.3 Baseline / Receiving Environment

5.3.1 The River Dodder Catchment

The River Dodder is c. 27 km long and its total catchment area (estimates vary from ca 120 – ca 160 km^2) is presented in Figure 5-2.

The River Dodder rises in the Dublin/Wicklow Mountains on the northern slopes of Kippure Mountain. The upper portion of the catchment from the source to Old Bawn in Tallaght includes the Upper and Lower Bohernabreena Reservoirs, and their spillways, which supply water to

Dublin. This section is mainly rural while the lower catchment has lower gradients and is heavily developed with residential and industrial land. The River flows down through the suburban areas of Tallaght and Rathfarnham and through the city areas of Donnybrook and Ballsbridge before discharging into the Liffey Estuary at Ringsend. The lower section of the river is tidal up to Ballsbridge (RPS, 2011).

There are five main tributaries whose sub-catchments drain into the River Dodder; the Tallaght Stream, the Owendoher, the Whitechurch, the Little Dargle and the Dundrum Slang, all of which are heavily urbanised streams (RPS, 2011). Two of these tributaries occur with the study area.

The River Dodder has a history of flooding and is known as a "flashy" river with a quick response to rainstorms. This is due to its source being in the Dublin/Wicklow mountains which provides it with a steep gradient and periods of high rainfall (RPS 2010).

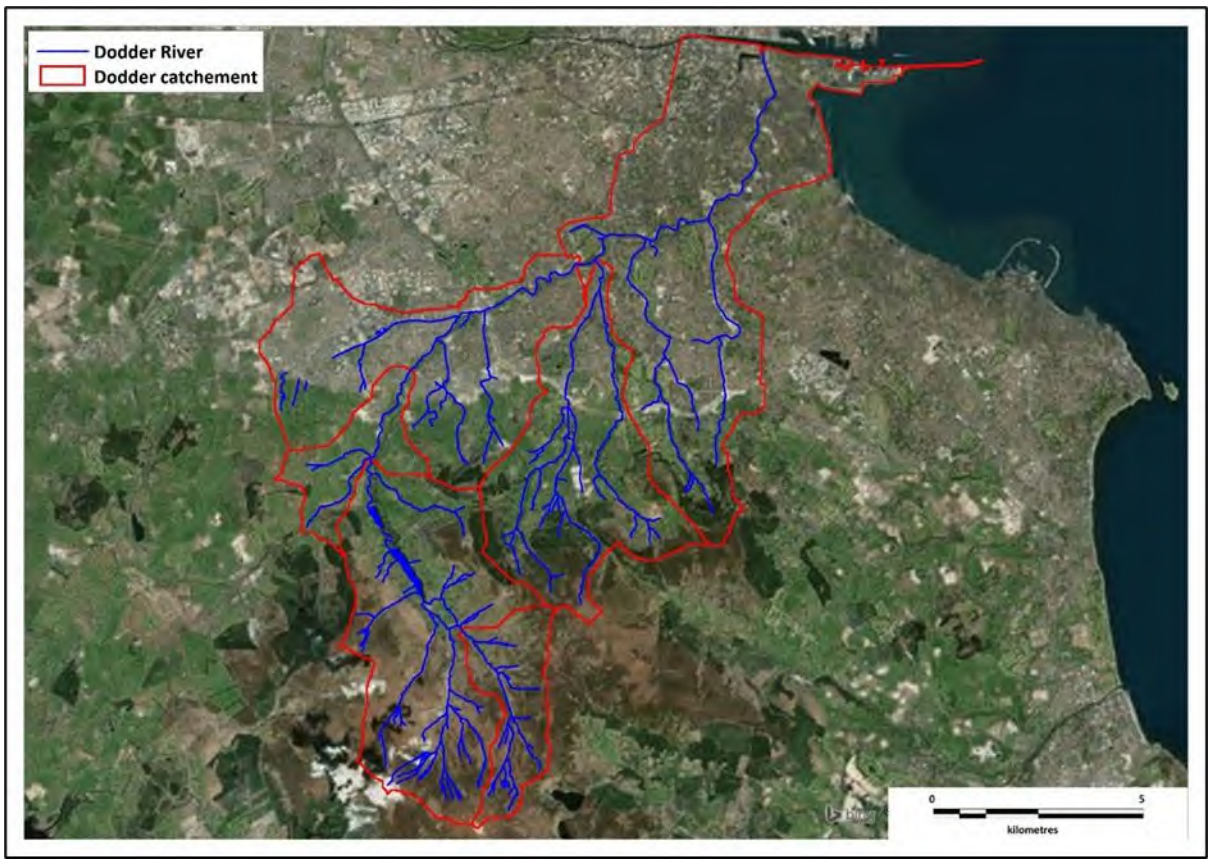

Figure 5-2 River Dodder Catchment (RPS 2011)

Within the hydrology study area, the pluvial catchment area is 4.45 km^2, comprising 4.07 km^2 urban, 0.30 km^2 sport and leisure facility and 0.08km^2 green urban area. The urban green area is Bushy Park providing an overland flow route at the upstream extent, whilst the sport and leisure facility is the Milltown Golf Club which provides an overland flow route to the Dodder upstream of the Dundrum Slang confluence and on the opposite side of the river to the proposed defence locations.

The overland flow routes contributing directly to the Dodder from the golf course and Bushy Park are most appropriately captured by distribution of the hydrology as inflows coinciding with flow

paths entering the watercourse. In urban areas, there are surface water collection and conveyance assets that discharge towards the Dodder.

No canals or other potentially impounded lake have been located that would have potential to cause a risk of flooding in the event of a breach or other failure or have an attenuating effect on fluvial flooding is identified.

5.3.2 Waterbodies within the River Dodder Catchment

5.3.2.1 Waterbodies in the wider vicinity of the scheme

The River Dodder has five main tributaries namely Owendoher, Whitechurch, Dundrum/ Slang, Little Dargle and Tallaght Stream. The River Basin Management Plan for Ireland lists 190 priority 'Areas for Action' where collaborative efforts between statutory bodies and relevant stakeholders will be focussed to improve water quality over the period 2018 – 2021. This plan recognises the Dodder as an area for action under the local authorities of Dublin City/Dún Laoghaire Rathdown/South Dublin and DCC routinely monitors water quality in the River Dodder and carries out monitoring under the Water Framework Directive (WFD).

5.3.2.2 Principal waterbodies in the constraints study area

Principal waterbodies in the constraints study area comprise rivers, a lake, a reservoir and a pond as shown in Figure 5-3. National waterbody monitoring stations and hydrometric gauges are present on rivers within the study area (Figure 5-3) and wider catchment with water monitoring taking place through national water monitoring plans, chiefly the EPA-led Water Framework Directive monitoring programme (Environmental Protection Agency, 2006). Through these programmes recent and location specific surface water quality data is available for rivers in the study area. Limited data is publicly available for the lake, reservoir, and pond shown in (Figure 5-3).

EPA records indicate that there are three active hydrometric stations in the study area and wider vicinity (Table 5-1). These are all recorder stations located on rivers. The significance of Waldron's Bridge Hydrometric Station was raised by EPA during consultation, see section 2.5).

Table 5-1 Active hydrometric stations in the study area and wider vicinity

Hydrometric station name	Waterbody	Station number	Location (Easting, Northing)	Catchment (km^2)	County Council Area
Within the constraints boundary					
Waldron's Bridge	River Dodder	09010	Easting 315574; northing 229739	94.3	Dublin City Council
Within vicinity of constraints boundary					
Willbrook Road	Owendoher River	09009	Easting 314246; northing 228508	20.5	South Dublin County Council
Frankfort	River Slang	09011	Easting 316908; northing 228850	5.5	Dún Laoghaire - Rathdown Council

Source: EPA Geo Portal 'Water Quality and Monitoring' (2020).

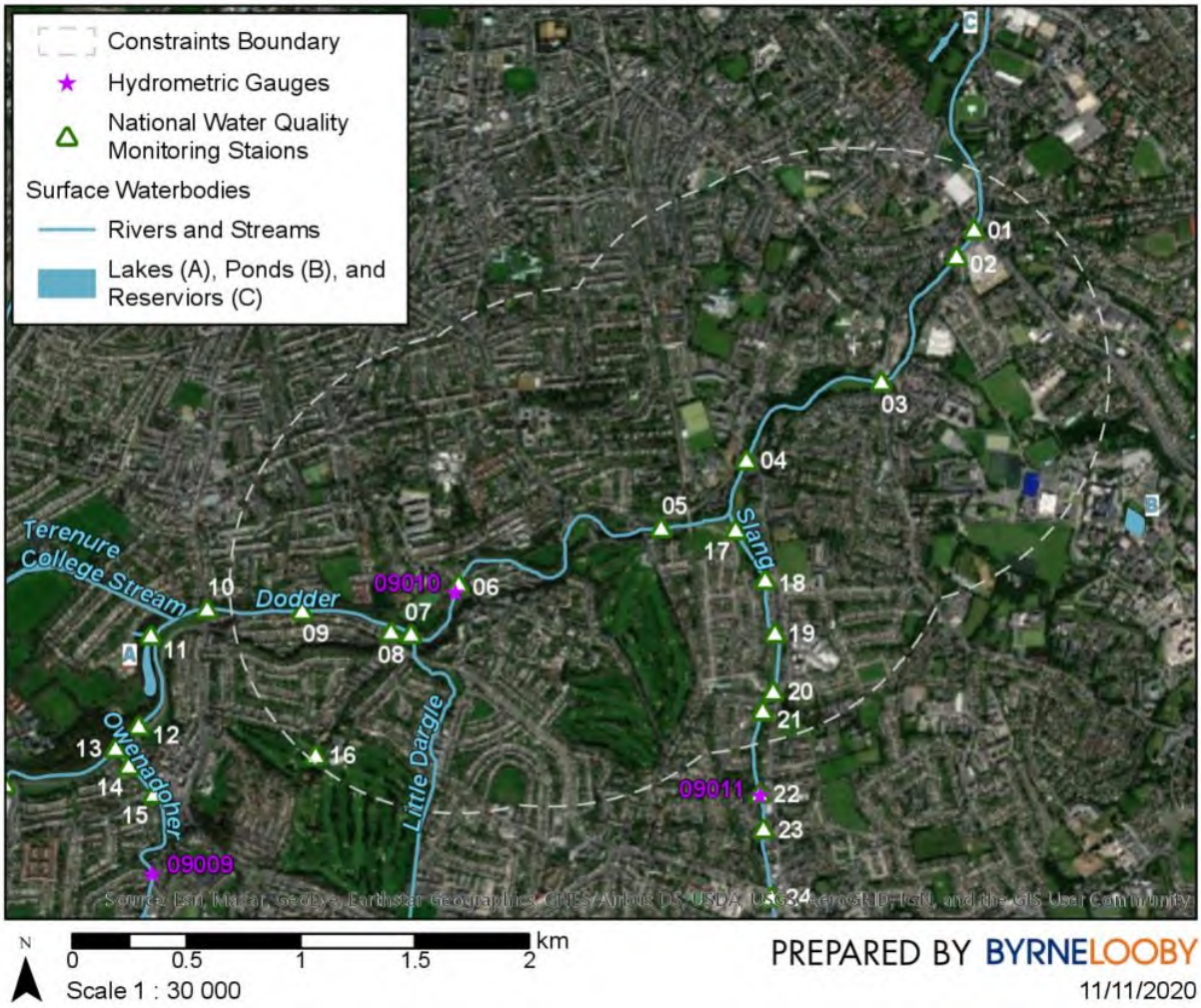

Figure 5-3 Principal waterbodies in the constraints study area with the locations of national waterbody monitoring stations and hydrometric gauges

Data source: EPA Geo Portal 'Water Quality and Monitoring' (2020).

EPA data indicates that Tidal and/or river tidal effects to rivers do not occur in the constraints study area (EPA Interactive Maps, 2020)).

EPA data indicates that there are no other waterbodies used for water supply for local authority or Group Water Schemes present in the hydrology environmental constraints study area (note the Upper and Lower Bohernabreena Reservoirs are located upriver) (EPA Interactive Maps, 2020.

River Dodder

The overall direction flow of the River Dodder within the study area is to the northeast. A confluence with the Little Dargle River occurs upstream of the bridge at Orwell road and a confluence with the Dundrum Slang occurs approximately adjacent to the Windy Arbour Playground downstream of the Nine Arches Bridge.

The bridges in the study area are described in Table 5-2.

Table 5-2 Bridges in the study area

Bridge name	Bridge location	Bridge description	Dublin City Industrial Heritage Record*
Waldron's Bridge/ Orwell Bridge	53°18'21.19"N, 6°16'0.65"W	Bridge at Orwell Road.	N/A not available
Classon's Bridge	53°18'27.70"N, 6°15'16.32"W	Bridge crossed by Churchtown Road Lower (L3001). Triple-arch masonry roadbridge, built c.1790, carrying road over River Dodder. Widened to both upstream and downstream sides in 1928.	22-03-014
Bridge and Nine Arch Viaduct	53°18'29.18"N, 6°15'4.97"W	Railway viaduct originally built for the Dublin and Wicklow Railway which opened in 1854. Luas Green Line crosses the bridge.	22-03-007 22-03-008 22-03-009
Foot Bridge (Orwell's)	53°18'23.49"N, 6°15'45.19"W	Original footbridge was replaced however it present operates as part of the Milltown LUAS stop	22-03-018
Packhorse Bridge	53°18'34.67"N, 6°14'54.08"W	Double-arch masonry former packhorse bridge, built c. 1650, as part of the commercial route between Dublin and Wicklow, now used as pedestrian bridge.	22-04-015
Milltown Bridge	53°18'37.57"N, 6°14'51.61"W	Bridge crossed by Dundrum Road (R117). Single-arch masonry road bridge, built c.1840, carrying Milltown Road over the River Dodder and replacing a previous ford. Bridge widened c.2000.	22-04-007
Clonskeagh Bridge	53°18'48.12"N, 6°14'19.17"W	Bridge crossed by Clonskeagh Road (R825). Single-arch masonry bridge, built c.1850, to carry road over the River Dodder, extended to west with west elevation rebuilt c.2000.	22-04-005
Beaver Row Bridge	53°19'5.82"N, 6°14'0.99"W	Pedestrians and cyclists now have access to the bridge which links Beaver Row and Brookvale Road.	N/A not available
Anglesea Bridge	53°19'9.53"N, 6°13'56.40"W	Bride crossed by R138.	N/A not available

* These structures are discussed in further detail in section 8

There are 9 weirs present along the section of the River between Waldron's Bridge and Clonskeagh Bridge as follows:

- Weir at Classon's Bridge - Just before a bend in the river there is a rubble stone weir where the river is retained by a stone wall on the southern side. Within the river there is a stepping stone ford running diagonally across the river, this is shown on the later OS maps of 1906.

- Laundry weir – downstream of Classon's Bridge - there is a large weir set perpendicularly across the river to west of side, previously with mill race running west from the site.
- Orwell curved weir – this curved weir was associated with a former Locke and Woods sawmill which includes a sluice gate and more modern metal bridge.
- Orwell Laundry weirs – there are two small single stage weirs 155 m and 300 m downstream of the Orwell curved weir.
- Milltown Laundry weirs – there are three single stage weir 60 m, 180 m and 280 m downstream of the Milltown Bridge.
- Shanagarry Weir – This is a multi-staged weir which is situated 230 m downstream of Nine Arches Bridge.

It is noted that the:

- WFD surface water monitoring programme 2013–2018 reported that in the study area (IE_EA_09D010900) Ecological Status or Potential was Moderate.
- WFD surface water monitoring programme 2013–2018 reported that in the study area (IE_EA_09D010900) Chemical Surface Water Status was classified as 'Failing to achieve good' with a Benzo(a)pyrene failure for Chemical Status. Benzo(a)pyrene is a polycyclic aromatic hydrocarbon classed as a priority hazardous substance and ubiquitous persistent, bioaccumulative and toxic compound under the Water Framework Directive and in the related Directive on Environmental Quality Standards (EQSD) (2008/105/EC amended by 2013/39/EU). It is listed in Annex III of the Persistent Organic Pollutants Regulation (EC 850/2004) and is listed as substance of very high concern under the REACH Regulation (EC/1907/2006). Sources include combustion of fuels, industry and manufacturing processes, and waste treatment processes. PAHs can either enter directly into water bodies via deposition from the air or surface run-off following rainfall, particularly from urban areas where high levels of PAHs may be present.

Further information relating to the water abstraction locations, river risk scores, and data from the 6 monitoring stations[2] in the scheme area were not available at the time of writing this report. The most recent published chemistry data is available from the Footbridge at Beaver Row (located c. 100m upriver of Anglesea Bridge at Donnybrook between Beech Hill Avenue and Brookvale Road; Station ID RS09D010900) and presented in Appendix C.

[2] Donnybrook Bridge (RS09D010910)
Footbridge at Beaver Row (RS09D010900)
Clonskeagh Rd Br (RS09D010850)
Milltown Bridge (Dundrum Rd Br)(RS09D010800)
Bridge on Churchtown Rd Lower (Classon's Bridge) (RS09D010770)
Orwell Rd (RS09D010750)

Little Dargle River

The Little Dargle is a small river that flows form its source in Ticknock (Dublin mountains), through Stackstown, Taylors Grange, Kingstown (tributary), Ballinteer, Harolds Grange, Dundrum, Churchtown Upper, White Hall and the Rathfarnham Village area. Substantial lengths of the river have been piped underground due to urban encroachment.

The Little Dargle River at the location where it enters a culvert prior to its discharge into theRiver Dodder is shown in Figure 5-4.

Figure 5-4 Little Dargle River at Braemor Road

Dundrum Slang

The Dundrum Slang is a tributary of the River Dodder. It flows from the foothills of Ticknock Mountain, under the M50 Motorway, through the suburbs of Ballinteer, Dundrum and Windy Arbour before discharging to the River Dodder at Milltown. The Dundrum Slang catchment is approximately 8.3km^2 (Flood Studies Update (FSU) Web Portal) and drains a predominately urban catchment (Nicholas O'Dwyer, 2019). The Dundrum Slang at its tributary with the River Dodder is shown in Figure 5-5.

Figure 5-5 The Dundrum Slang confluence with the River Dodder

5.4 Additional considerations

At the time of writing it is understood that two third-party Water Framework Directive projects are likely to occur within the vicinity of the scheme area, with one of these located in Milltown. Whilst limited information is available as to the precise location, nature and scale of the projects at this stage, it is understood the projects are likely to be relatively small and further details are expected to become available when the options assessment has been completed and prior to environmental impact assessment (EIA) stage for this project (*pers. comm.* Averil Gannon, DCC/WFD, 10th November 2020). These third-party projects will be considered within the cumulative impacts assessment of the environmental impact assessment (EIAR).

5.5 Key Constraints

The surface water bodies in the study area recently failed the chemical status assessment due to the presence of priority and priority hazard substances.

Under WFD requirements, the development of the scheme should incorporate measures *not to worsen* its status. All possible risks of point source pollution or runoff during construction and operation should be assessed and prevented. Works during the construction of the scheme could pose a threat to the water quality of water bodies within and downstream of the study area though various mechanism, chiefly:

(1) Increasing suspended solids in the water bodies through release or run-off of significant amounts of suspended solids during enabling works and construction; and

(2) Unplanned events such as leaks/spills/runoff/accidental release or escape of fuels, oils and lubricants, bulk liquid cement, contaminated leachate, etc.

Measures to protect surface water from leaks/spills, contamination, increased turbidity or input of suspended solid, etc, should be considered.

Contamination potentially present on site from historical land use must also be considered. The CEMP for the scheme will include measures to avoid mobilising and/or creating pathways for any contaminants present on site to the surface where surface runoff can introduce contaminants to surface water during enabling and construction works.

Measures to protect EPA surface water monitoring station and avoid impacting their data collection process should be considered during design and construction phases.

There is limited publicly available surface water quality data for some of the waterbodies in the area (pond, lakes, and reservoirs). Baseline survey data (including ecological water quality data) should be collected for these water bodies if measures developed for the scheme could interact or impact upon these waterbodies.

The scheme design and schedule will need to take into consideration the development of third party 'WFD' projects in the vicinity of the scheme area, including potential impacts to utilities and infrastructure.

6 Soils, Geology, Hydrogeology

6.1 Introduction

This section of the report outlines the environmental constraints associated with the soils, geology and hydrogeology of the study area.

For the purposes of this report, the study is defined as an area approximately 1 km in radius from the section of the River Dodder where works are proposed as shown in Figure 6-1 overleaf.

6.2 Methodology

In addition to the sources outlined in section 2.3.1, the following sources of publicly available information were consulted in order to identify potential constraints within the study area:

- Geological Survey Ireland (GSI) data and map viewer, including hydrogeology, geology, soils, geoheritage, and GeoUrban. GSI is a division of the Department of Communications, Climate Action and Environment. Specific attribution statement: "This report contains Irish Public Sector Data (Geological Survey) licensed under a Creative Commons Attribution 4.0 International (CC BY 4.0) licence".
- Exploration and Mining Division (EMD) data and map viewer. EMD is a division of the Department of Environment, Climate and Communications.
- Teagasc Irish Soil Information System.
- EPA map viewer.

6.3 Baseline / Receiving Environment

6.3.1 Bedrock geology

The upper reaches of the Dodder catchment and the area surrounding the Upper and Lower Bohernabreena Reservoirs consists of the Caledonian granites of the Northern and Upper Liffey Valley Plutons and Lower Palaeozoic marine sediments, mainly sandstones, greywacke, siltstones. The lower reaches of the catchment consist chiefly of the Carboniferous limestone of the Lucan Formation. The Lucan Formation underlies the entire study area is approximately equivalent to 'the Calp' of Marchant and Sevastopulo (1980). GSI data indicates that 19th century descriptions of outcrops in the study area (largely no longer available) report the lithologies to be interbedded limestone (sometimes cherty), dolomitic limestones (magnesium limestones), and shales. See Figure 6-1 Bedrock Geology in the study area (source: Geological Survey Ireland 50k digital mapping data).

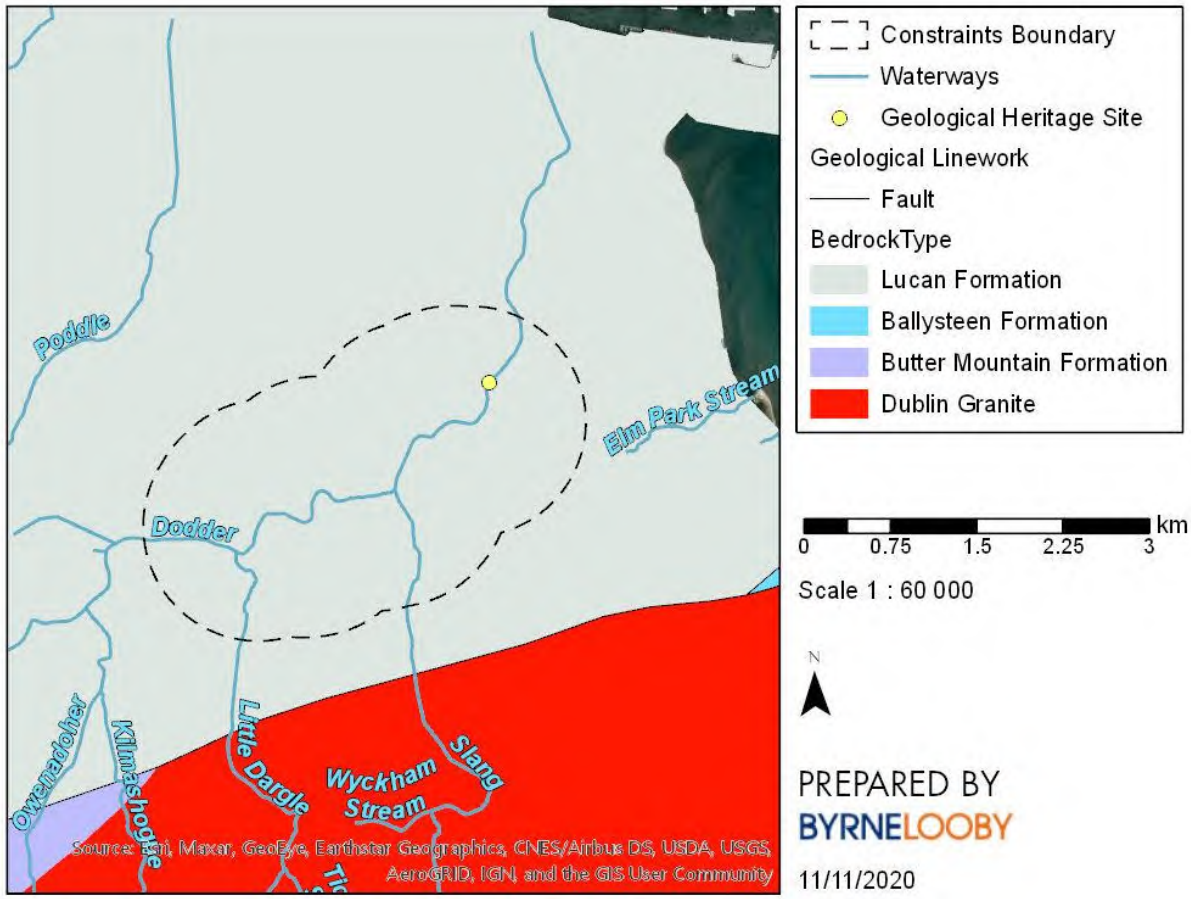

Figure 6-1 Bedrock Geology in the study area (source: Geological Survey Ireland 50k digital mapping data). The yellow circle marks the location of the outcrop of Carboniferous limestone beds discussed in section 6.3.5.

6.3.2 Quaternary geology

GSI data indicates that quaternary sediments in the lower reaches of the Dodder Catchment, and prevalent in the study the study area, are mainly comprised of alluvium and till derived from limestones with lesser areas of gravels derived from limestones. GSI data indicates that depth to bedrock within the study area ranges between 0–5 m.

6.3.3 Karst features

GSI data indicates that karstic features have not been recorded from the study area. However, the study and immediate environs are underlain by the limestone rocks of the Lucan Formation and this formation is reported to have karstic features elsewhere within Dublin (e.g. springs).

6.3.4 Soils

RPS (2014) states that 'the soils of the upper catchment consist of peaty podzols, acid brown earths and lithosols. The lower catchment is mainly manmade ground with some brown earths and surface water gleys along the river banks'.

GSI's Teagasc soils data indicates the predominant soils type in the constraints study area are urban soils with areas of mainly basic mineral soils that are poorly drained or deep, well drained, or acidic complexes that are shallow and rocky.

6.3.5 Geoheritage

An outcrop of Carboniferous limestone beds can be of observed outside of the study area in the river adjacent to Donnybrook Court where there is a weir built on natural exposures of thick limestone beds in the channel of the River Dodder (Coordinates (ITM) 717523.92, 731039.84) (see Figure 6-1). Although this occurs outside of the study area it is noted that the GSI report that natural exposures of Carboniferous limestone within Dublin City are quite rare and within the constraints of Dublin City's sparsely visible geology this outcrop is considered a valuable resource by the Geological Survey of Ireland (County Geology Site Report, River Dodder audited site, undated report).

6.3.6 Geohazards

GSI data indicates that landslide events are not recorded from the study area in publicly available records. Landslide susceptibility in the study area and immediate environs is general classified as low and classified as moderately low at the weir adjacent to Donnybrook Court, Clonskeagh Road bridge, the bridge at Churchtown Road Lower (Classon's Bridge), the weir adjacent to Temple Park, and an area at the bend in the river adjacent to Thorncliffe Park. Landslide susceptibility classification is classified as moderately high in the area of the viaduct at Patrick Doyle Road.

The study site has industrial heritage (see section 8.3) and an assessment of potential land contamination from historical land-use should be undertaken as the scheme progresses.

6.3.7 Economic geology

The Exploration and Mining Division (EMD) and GSI (both of the Department of Communications, Climate Action and Environment) and Ordnance Survey (OS) data indicate there are no recorded historic or active quarries or mines within the study area.

6.3.8 Hydrogeology

GSI data indicates that there are no group scheme and public supply source protection areas or groundwater scheme abstraction points located in the study area.

The GSI's groundwater data viewer indicates that the study area contains a locally important Aquifer (bedrock) which is moderately productive only in local zones. GSI data indicates that there are no groundwater wells and springs recorded in the study area. The locations of the closest recorded groundwater wells and springs are listed in Table 6-1.

Table 6-1 Location of nearest recorded groundwater wells and springs

GSI name	Type	Drill date	Depth of hole (metres)	Depth to rock (metres)	Location*	Source use	GSI yield class
2921NE W007	Borehole	May 1, 1989	60	4	Milltown Townland; Easting 316000, Northing 229500	Unknown	Good
2923SE W017	Borehole	July 31, 1987	83.8	15.2	Donnybrook Townland; Easting 318900, Northing 230700	Other	Moderate

*Location accuracy is to 200 m

The hydrological setting in the study area consists of made ground and low permeability subsoils.

At the time of writing, no further data was available with regard to local Ground Waterbodies such as name(s) and location(s), description, characterisation, hydraulic connectivity, confined/unconfined aquifer GWB elevations, recharge rates and recharge mechanism(s). This data has been requested and will be considered during the scheme development as it progresses.

The Ground Waterbody WFD Status 2013—2018 for the study area (IE_EA_G_008) is general classified as good, see Table 6-2.

Table 6-2 Ground Waterbody WFD Status 2013–2018 for the study area

Chemical	Overall Groundwater Status	Quantitative Groundwater Status
Good	Good	Good

The GSI groundwater vulnerability map indicates groundwater in the study area is classified from low vulnerability to extreme vulnerability. Discrete areas classified as extremely vulnerable are located within, or immediately adjacent to, the River Dodder and Little Dargle River.

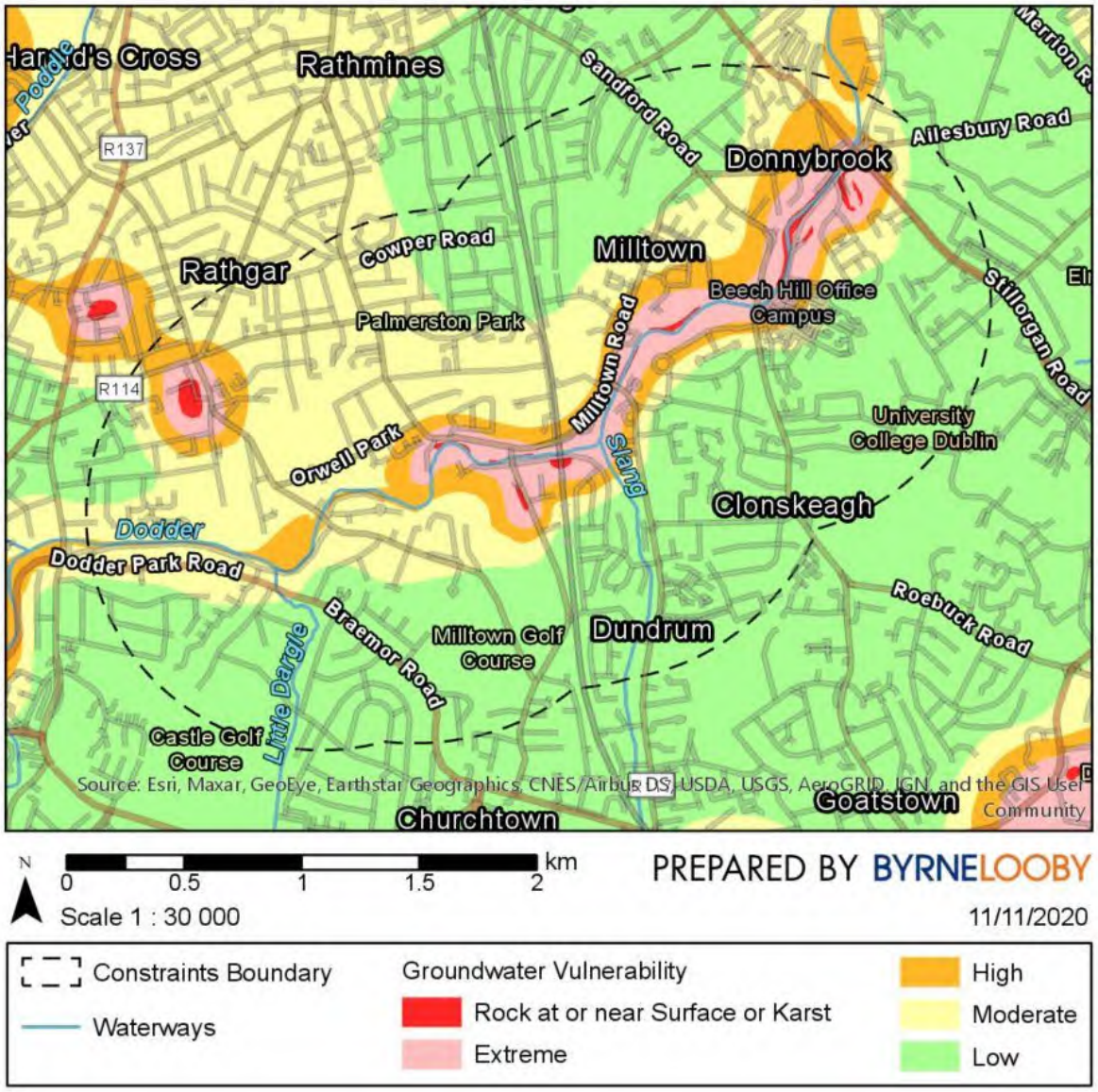

Figure 6-2 Groundwater vulnerability in the study area.
Data source: https://www.gsi.ie/en-ie/data-and-maps/Pages/Groundwater.aspx

6.4 Key Constraints

Key constraints associated with the soils, geology and hydrogeology of the study area include:

- Made ground and/or contaminated ground: Depending on the scheme design and type of works, for areas where made ground is uncompacted and/or highly variable it may require to excavate and place this material and replace with suitable founding material. This material may also be a possible a source of contamination. As this material will be excavated during construction, it may require contamination testing be undertaken during the detailed site investigation.
- Soils and groundwater. Poor draining soils occurring within the scheme footprint are potentially soft and compressible and will likely require a detailed site investigation (SI)

in order to design a suitable flood defence scheme. Appropriate environmental controls and management measures will be implemented for any advance SI works, this may include a requirement for AA screening, or an application/notification to NPWS for approval. A CEMP will be developed for construction activities. The CEMP will identify appropriate equipment and construction techniques that should be used in circumstances where there is a potential impact to the environment. Engineering design should minimise the impacts of the flood relief scheme on the sections of river within the study areas and the wide catchment.

- Groundwater vulnerability to contamination: Depending on the design of the scheme, works may occur adjacent or within areas where groundwater is classified by the GSI as 'extremely vulnerable' to contamination. Appropriate environmental controls and management measures will be implemented for any advance SI works. A CEMP will be developed for construction activities. A CEMP will be developed for all site investigation works, construction activities and traffic management.

- Karst features: GSI data indicated that there are no recorded karst features in the study area. However, considering the underlying geology it is prudent to consider that karst features such as caves, swallow holes, weathered rock and dolines can lead to ground instability and are a constraint to be considered in the engineering design of the scheme.

- Geoheritage: Bedrock outcrop is relatively rare in Dublin and considered a valuable resource for geological data collection. It is good practice to inform the Geological Survey Ireland (GSI) (contact: Beatriz.Mozon@gsi.ie) where:

    - construction works temporarily or permanently uncover significant outcrop;
    - were reports detailing any site investigations can be made available to the GSI;
    - a digital photographic record of any significant new excavation can be produced and provided to the GSI.

7 Ecology and Biodiversity

7.1 Introduction

This section assesses data on flora, fauna and habitats within the study area in order to identify receptors potentially sensitive to flood risk management options, or which may constrain the implementation of certain options.

For the purposes of this report, the constraints study area is defined as an area approximately 15km in radius from the section of the River Dodder where potential measures are proposed. This is shown in Figure 7-1.

7.2 Methodology

A desktop study approach was used to collate information from readily available sources that will be used to inform the later stages of the assessment of proposed flood defences. Information on the River Dodder catchment was sourced from websites of and publications from the following organisations: National Parks and Wildlife (https://www.npws.ie/maps-and-data/habitat-and-species-data (accessed September 2020)), the Environmental Research Unit, the Environmental Protection Agency and Inland Fisheries Ireland. In assessing the potential impacts on the prevailing biodiversity, due regard was given to relevant legislation and guidance including:

- EIA Directive (2014/52/EU);
- Planning and Development Acts 2000 – 2018 and Planning and Development Regulations 2001-2019;
- Wildlife Act 1976 and as amended;
- Flora (Protection) Order 2015;
- Inland Fisheries Act 1959 – 2010;
- EU Water Framework Directive 2000/60/EC;
- European Communities (Birds and Natural Habitats) Regulations 2011 (as amended);
- Guidelines for Ecological Impact Assessment in the UK and Ireland. Terrestrial, Freshwater, Coastal and Marine (Chartered Institute of Ecology and Environmental Management (CIEEM, 2018 (updated September 2019));
- Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment (European Union, 2013);
- Ireland's National strategy for Plant Conservation: progress towards 2020 (Smyth, N. Cole, E. Kelleher, C, Jebb, M & Lynn, D., 2019);

- Ireland's Marine Strategy Framework Directive Article 19 Report Initial Assessment, GES and Targets and Indicators (Marine Institute, October 2013);
- National Biodiversity Action Plan 2017-2021 (Department of Culture, Heritage and the Gaeltacht, 2011);
- Guidelines on Protection of Fisheries during Construction Works in and Adjacent to Waters (Inland Fisheries Ireland, 2016); and
- NRA Guidelines for assessment of ecological impacts of National Road Schemes (NRA 2009).

The walk over surveys involved examining and recording the habitats and flora and fauna that are present along the river bank and photographing representative elements of these. All identifications were made in the field and binoculars were used to identify birds. A number of other factors that are also relevant to ecology due to their interactions, e.g. hydrology, hydrogeology and population and human health, are detailed in the relevant sections of this report.

For the Bat survey report, see Appendix D.

7.3 Baseline / Receiving Environment

7.3.1 Protected Sites

7.3.1.1 Natura 2000 sites

Natura 2000 is an ecological network composed of sites designated under the Birds Directive (Special Protection Areas (SPA)) and the Habitats Directive (Sites of Community Importance (SCI), and Special Areas of Conservation (SAC)).

Best practice guidance (DoE, 2009) recommends that all Natura 2000 sites within 15km of a project be initially screened for impacts.

Within 15 km of the river section (Figure 7-1 and Table 7-1) there are 9 Special Protection Areas (SPA) and 7 Special Areas of Conservation (SAC).

Table 7-1: Natura 2000 Sites within 15 km of the River Dodder Study Section

Type	Site Code	Site Name	County
SAC	000199	Baldoyle Bay SAC	Dublin County
SAC	000202	Howth Head SAC	Dublin County
SAC	001209	Glenasmole Valley SAC	Dublin County
SAC	002122	Wicklow Mountains SAC	Dublin County, Wicklow County
SAC	000725	Knocksink Wood SAC	Dublin County, Wicklow County
SAC	000713	Ballyman Glen SAC	Dublin County, Wicklow County
SAC	003000	Rockabill to Dalkey Island SAC	Dublin County

Type	Site Code	Site Name	County
SAC	000206	North Dublin Bay SAC	Dublin County
SAC	000210	South Dublin Bay SAC	Dublin County
SPA	004006	North Bull Island SPA	Dublin County
SPA	004016	Baldoyle Bay SPA	Dublin County
SPA	004024	South Dublin Bay & River Tolka Estuary SPA	Dublin County
SPA	004040	Wicklow Mountains SPA	Dublin County, Wicklow County
SPA	004113	Howth Head Coast SPA	Dublin County
SPA	004117	Ireland's Eye SPA	Dublin County
SPA	004172	Dalkey Islands SPA	Dublin County

Source: National Parks & Wildlife Service (2019)

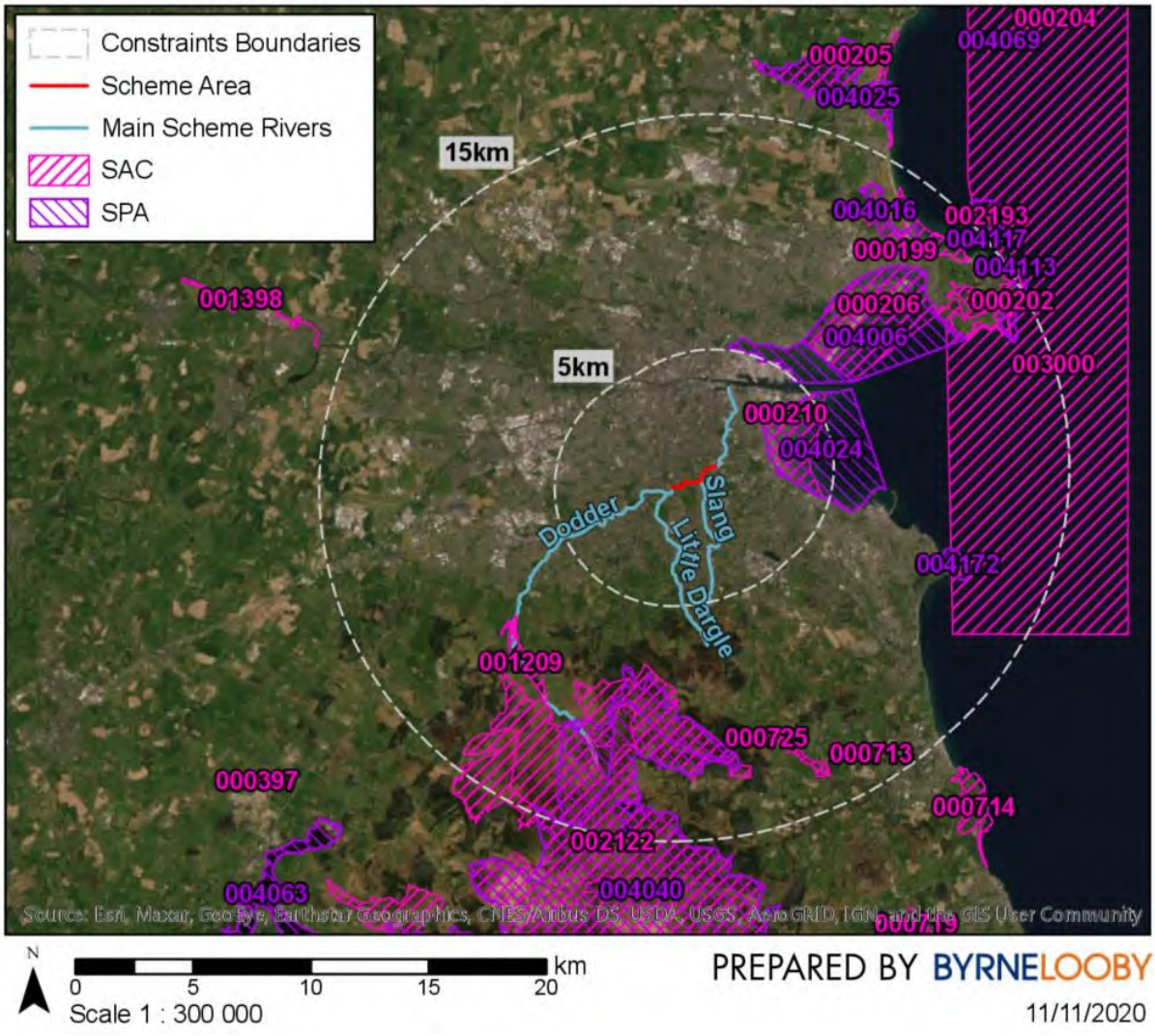

Figure 7-1 Natura 2000 Sites within 15 km of River Dodder Study Section

Stretches of the river lie within European sites and these are the Wicklow Mountain SAC (site code 002122) and the Glenasmole SAC (site code 001209).

The Qualifying Interests (QIs) for the Wicklow Mountain SAC are:

- Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*) [3110]
- Natural dystrophic lakes and ponds [3160]
- Northern Atlantic wet heaths with *Erica tetralix* [4010]
- European dry heaths [4030]
- Alpine and Boreal heaths [4060]
- Calaminarian grasslands of the *Violetalia calaminariae* [6130]
- Species-rich *Nardus* grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe) [6230]
- Blanket bogs (* if active bog) [7130]
- *Siliceous scree of the montane to snow levels (Androsacetalia alpinae* and *Galeopsietalia ladani*) [8110]
- Calcareous rocky slopes with chasmophytic vegetation [8210]
- Siliceous rocky slopes with chasmophytic vegetation [8220]
- Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles [91A0]
- *Lutra lutra* (Otter) [1355]

Of these, the only QI that occurs along the section of the River Dodder where works are proposed is the otter (see section 7.3.3.2.1 below for further information regarding the presence of otter).

The QIs for the Glenasmole SAC are:

- Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (*important orchid sites) [6210]
- *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [6410]
- Petrifying springs with tufa formation (*Cratoneurion*) [7220]

None of these occur along the section of the River Dodder where works are proposed.

There are two European sites at the location where the River Dodder empties into the Liffey and these are South Dublin Bay and River Tolka Estuary SPA (site code 004024) and South Dublin Bay SAC (site code 000210).

Species of Conservation Interest for the SPA are:

- Light-bellied Brent Goose (*Branta bernicla hrota*) [A046]
- Oystercatcher (*Haematopus ostralegus*) [A130]
- Ringed Plover (*Charadrius hiaticula*) [A137]
- Grey Plover (*Pluvialis squatarola*) [A141]
- Knot (*Calidris canutus*) [A143]
- Sanderling (*Calidris alba*) [A144]
- Dunlin (*Calidris alpina*) [A149]
- Bar-tailed Godwit (*Limosa lapponica*) [A157]
- Redshank (*Tringa totanus*) [A162]
- Black-headed Gull (*Chroicocephalus ridibundus*) [A179]
- Roseate Tern (*Sterna dougallii*) [A192]
- Common Tern (*Sterna hirundo*) [A193]
- Arctic Tern (*Sterna paradisaea*) [A194]
- Wetland and Waterbirds [A999]

The QIs for the South Dublin Bay SAC are:

- Mudflats and sandflats not covered by seawater at low tide [1140]
- Annual vegetation of drift lines [1210]
- *Salicornia* and other annuals colonising mud and sand [1310]
- Embryonic shifting dunes [2110]

7.3.2 Nationally Protected Sites

There are no Natural Heritage Areas (NHA) within 5 km of the site, however, there are 8 proposed Natural Heritage Areas (pNHA) listed below (Figure 7-2 and Table 7-2). Furthermore, stretches of the river lie within the River Dodder pNHA (site code 000991), however, the FAS works do not fall within this pNHA.

Site details and conservation objectives are not listed for these sites on the NPWS website.

Table 7-2: Proposed Natural Heritage Areas within 15 km of the River Dodder Study Area

Type	Site Code	Site Name	SAC/SPA within which the pNHA is located	County
pNHA	000201	Dolphins, Dublin Docks	Subsite of SPA 004024	Dublin County
pNHA	000206	North Dublin Bay	Subsite of SAC 000206 and SPA 004006	Dublin County
pNHA	000210	South Dublin Bay	Subsite of SAC 000210 and SPA 004024	Dublin County
pNHA	000991	Dodder Valley	None	Dublin County
pNHA	001205	Booterstown Marsh	Subsite of SPA 004024	Dublin County
pNHA	001753	Fitzsimon's Wood	None	Dublin County
pNHA	002103	Royal Canal	None	Dublin County
pNHA	002104	Grand Canal	None	Dublin County

Source: National Parks & Wildlife Service (2019)

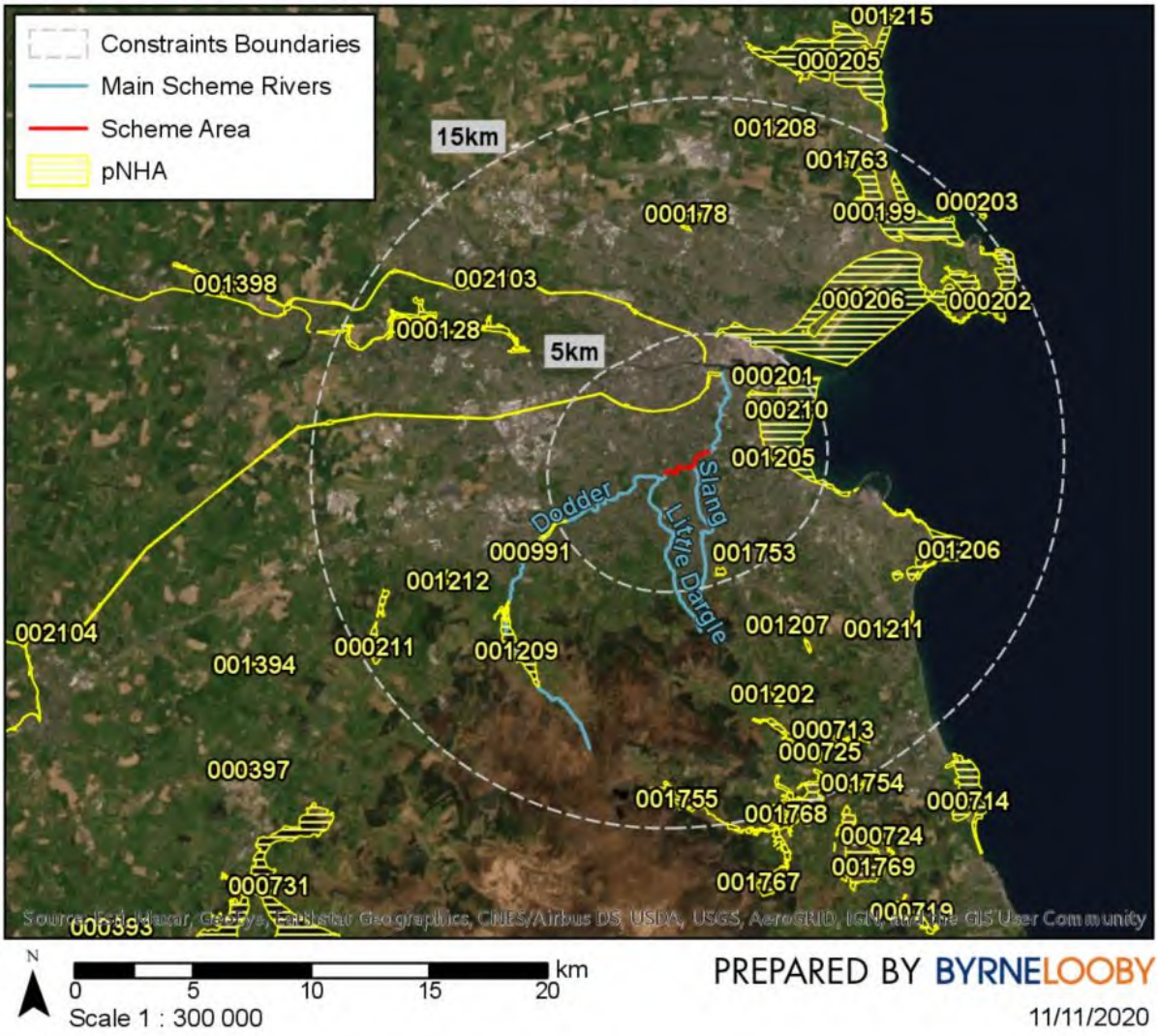

Figure 7-2 Proposed Natural Heritage Areas within 15 km of the River Dodder Study Section

7.3.3 Protected/Notable Species

Several species of flora and fauna are afforded protection under national, European and international law. At a national level, species are protected under, inter alia, the Wildlife Acts. At a European level, species are protected under, inter alia, the Birds Directive (Council Directive 79/409/EEC) and Habitats Directive (Council Directive 92/43/EEC), which are transposed into national law by various measures including the European Communities (Natural Habitats) Regulations, 1997–2005, and the European Communities (Conservation of Wild Birds) Regulations, 1985. The badger is not considered endangered in Ireland; however, badgers are protected under the Wildlife Acts (Wildlife Act, 1976; Wildlife Amendment Act, 2000), and in Northern Ireland under the Wildlife (N.I.) Order of 1985.

In many cases a derogation licence will be required to remove or disturb these legally protected species or their habitats.

7.3.3.1 Flora

Dublin City Biodiversity Action Plan 2008 – 2012 states that the rare plants shown in Table 7-3 have been recorded from the River Dodder. The data used in the report was provided by DNFC (unknown date, likely prior to 2008) and the report acknowledged that these records need to be re-surveyed to establish if plants were still at the locations. Further details on these species were not provided in the more recent Dublin City Biodiversity Action Plan (BAP) 2015-2020. It is not known if the plants were recorded from the scheme area and, at the time of writing, they have not been observed in ongoing ecological surveys.

Table 7-3 Flora reported from the River Dodder catchment in Dublin City BAP 2008 – 2012

Common name	Scientific name	Ireland Red List Status*
Dwarf Mallow	*Malva neglecta*	Near Threatened
Corncockle	*Agrostemma githago*	Waiting List
Marsh Yellow-cress	*Rorippa palustris*	Least concern
Stinking Tutsan	*Hypericum hircinum*	—
Monkeyflower	*Mimulus guttatus*	—
Keeled Garlic	*Allium carinatum*	—
Medium-flowered Winter-cress	*Barbarea intermedia*	—
*Wyse Jackson et al. (2016).		

7.3.3.2 Birds

The usual suite of both resident and winter/summer visitor land bird species is present along the river bank and these include gull, crow, thrush, tit, warbler and finch species, swallows and martins while water birds include mallard, heron, kingfisher, dipper, moorhen, grey wagtail, common sandpiper, cormorant (seen roosting on the Shanagarry (or Nine Arches) Chimney during the field survey) and mute swan. In recent years, a feral population of mandarin ducks has become established on the river. Little Egret (*Egretta garzetta*) has been recorded on all waterways in Dublin City (Dublin City Council, 2015).

7.3.3.2.1 Common Kingfisher

Common Kingfisher (*Alcedo atthis*) have been recorded on the River Dodder corridor. Kingfisher is listed on Annex I of the Birds Directive and is fully protected in the State by the Wildlife Act. Kingfisher is on the Birds of Conservation Concern in Ireland (BoCCI) 2014-2019 amber list of species, recognising the species as of medium conservation concern in Ireland (Colhoun & Cummins, 2013). This species is designated as of Least Concern in the IUCN Red List of Threatened Species 2019 (BirdLife International, 2016).

Ecological surveys are ongoing and at the time of writing and no field signs of Kingfisher were observed during the ecological site walkover.

The Dodder Greenway Updated Ecological Impact Assessment (EcIA) (Roughan and O'Donovan Consulting Engineers, 2020) stated that a kingfisher burrow was recorded in the left bank of the river upstream of the Orwell Road Bridge, however, this was not identified during that project's 2016 surveys (see Table 4.11.1, Nest 3 therein).

Kingfisher's breed beside still or slow flowing freshwater and prefer to excavate their nest burrow into the stone-free sandy soil of a low stream banks. If works are to be undertaken during the breeding season (February-October inclusive) a pre-construction survey should be undertaken to establish if active nests are present in the working area.

7.3.3.2.2 Sand Martin

Sand martin (*Riparia riparia*) have been recorded on the River Dodder corridor. This species is fully protected in the State by the Wildlife Act. Sand martin is on the Birds of BoCCI 2014-2019 amber list of species, recognising the species as of medium conservation concern in Ireland (Colhoun & Cummins, 2013). This species is designated as of Least Concern in the IUCN Red List of Threatened Species 2019 (BirdLife International, 2019).

Ecological surveys are ongoing and at the time of writing and no field signs of Sand Martin were observed during the ecological site walkover.

NBDC online records indicate that Sand martin has been observed in the scheme area (National Biodiversity Data Centre, 2021). This species has been found breeding in the Dublin City Council section of the River Dodder (*pers. comm.* Leslie Moore, City Parks Superintendent, 11th January 2021).

Sand martins breed in burrows dug into river banks or quarries. They are also opportunistic and have the ability to make use of suitable man-made structures for nesting (e.g. holes in wall structures).

7.3.3.3 Mammals (non volent)

The desk study data collection exercise confirmed records of otter, badger and fox (National Biodiversity Data Centre, 2021). The paragraphs below provide further information for otter and badger, given the level of protection that they are afforded under Irish and international law.

Ecological surveys are ongoing and at the time of writing and no field signs of any other species of mammal were observed during the ecological site walkover.

The study site contains suitable foraging, commuting, breeding and resting habitats for common mammal species in general and similar habitats are also present at a larger scale in the wider landscape. The mammal fauna recorded for the study site are terrestrial species listed of 'Least Concern' in the Irish Red Data Book of Mammals (Marnell et al., 2009). Overall, the proposed site is of low local importance for mammal (non-volant) species.

At the time of writing, DCC are conducting a city-wide survey of small mammals (badger, hedgehog and pygmy shrew) and it is anticipated that this will give a better understanding of sites in the locality (pers. comm. Leslie Moore, City Parks Superintendent, 11th January 2021).

7.3.3.3.1 Otter

Otter (*Lutra lutra*) have been recorded on the banks of the River Dodder. Otter is listed as Least Concern in the Irish Red Data Book and is fully protected in the State by the Wildlife Act. It is also listed in both Annex II and IV of the EU Habitats Directive and in Appendix II of the Berne Convention.

Ecological surveys are ongoing and no holts, resting places or field signs of otter were observed during the ecological site walkover.

The Dodder Greenway Updated EcIA (Roughan and O'Donovan Consulting Engineers, 2020) stated that Otter activity was recorded throughout that study area, which includes the Dodder FAS scheme area, in 2019. The precise locations of the features recorded are confidential but from the 2016 and 2019 survey descriptions therein a single couch and several potential holts were likely identified at locations within, or in close proximity to, the Dodder FAS scheme area (see Couch 2 and Potential Holts 8, 9, 14, 15, 17, 18, 19 in Table 4.8.1 therein).

Ecological surveys undertaken by DCC under the Dublin City BAP have found that accessibility for otter to the Little Dargle River from the River Dodder was poor and that where possible, connectivity should be improved. Otter signs were found in the Little Dargle River towards the city boundary, but downstream sections are culverted and prevent otter usage (*pers. comm.* Leslie Moore, City Parks Superintendent, 11th January 2021).

Recent surveys of the River Poddle indicate that otter from the River Dodder may move to the River Poddle, potentially making the River Dodder an important source for the maintenance of genetic diversity of the otter populations on the River Poddle (*pers. comm*. Leslie Moore, City Parks Superintendent, 11th January 2021).

7.3.3.3.2 Badger

Badger (*Meles meles*) have been recorded on the River Dodder corridor. The badger has been given legal protection under the Wildlife Act and is listed in Appendix III of the Bern convention as a species in need of protection.

Ecological surveys are ongoing and no setts or signs of Badger (e.g. setts, latrines, feeding signs etc) were recorded during were observed during the ecological site walkover. It is noted that adjacent parkland may provide some albeit limited foraging opportunities for Badger (e.g. earthworms and other invertebrates, see Byrne et al., 2012).

The Dodder Greenway Updated EcIA (Roughan and O'Donovan Consulting Engineers, 2020) stated that badger activity was observed between Donnybrook and Fort Bridge. Evidence recorded included active setts, latrines, prints, trails and snuffle holes. The precise locations of the features recorded are confidential but from the survey descriptions an active (observed in 2019) and an inactive outlier set were likely identified at locations within, or in close proximity to, the Dodder FAS scheme area.

7.3.3.3.3 Hedgehog

No field signs of hedgehog (*Erinaceus europaeus*) were observed during the ecological site walkover and ecological surveys are ongoing. However, it is noted that hedgehogs may be found in in various lowland habitats and are generally common in suburban gardens and parks, and in woodland/grassland mosaics and that such areas occur within, or in the vicinity of, the scheme. The Dodder is also likely to be an important local site for hedgehog as it contains some of the most extensive woodland habitats remaining in Dublin City (*pers. comm.* Leslie Moore, City Parks Superintendent, 11th January 2021).

Hedgehog is listed as Least Concern in the Irish Red Data Book and is fully protected in the State by the Wildlife Act.

Hedgehogs are primarily nocturnal and solitary, eat a range of ground-living invertebrates. They typically hibernate from late October to early April.

7.3.3.3.4 Pygmy shrew

No field signs of pygmy shrew (*Sorex minutus*) were observed during the ecological site walkover and ecological surveys are ongoing. This species is listed as Least Concern in the Irish Red Data Book and is protected in the State by the Wildlife Act.

Pygmy shrews are solitary and extremely territorial. They are found in a variety of habitats from dunes and farmland, to suburban areas and require vegetative cover and a good supply of invertebrates. It is noted that areas with potential suitable habitats may occur within, or in the vicinity of, the scheme. The Dodder is likely to be an important local site for pygmy shrew as it contains some of the most extensive woodland habitats remaining in Dublin City (*pers. comm.* Leslie Moore, City Parks Superintendent, 11th January 2021).

7.3.3.3.5 Pine Martin

No field signs of pine martin (*Martes martes*) were observed during the ecological site walkover and ecological surveys are ongoing. This species is listed as Least Concern in the Irish Red Data Book and is fully protected in the State by the Wildlife Act. It is also listed in Annex V of the EU Habitats Directive

Pine marten is found in the SDCC section of the River Dodder catchment and may be extending their range downstream (*pers. comm.* Leslie Moore, City Parks Superintendent, 11th January 2021). This species is listed as Least Concern in the Irish Red Data Book and is fully protected in the State by the Wildlife Act.

7.3.3.3.6 Red Squirrel

No field signs of red squirrel (*Sciurus vulgaris*) were observed during the ecological site walkover and ecological surveys are ongoing. This species is listed as Least Concern in the Irish Red Data Book. Red squirrel and their dreys are protected under the State by the Wildlife Act and they are also listed in in Appendix III of the Berne Convention.

Red squirrel is associated very closely with forests and general tree cover. Marnell *et al.* (2019) states that they tend lose out to grey squirrel populations in broadleaf and mixed wood habitat, due to competition and the impact of squirrel pox virus, which is carried by the grey squirrel

7.3.3.4 Bats

A bat survey undertaken by MERC on 15–16th August 2020 within the study area reports four bat species from the project area: Daubenton's (*Myotis daubentonii*), Pipistrelles (*Pipistrellus pipistrellus*), Soprano Pipistrelles (*Pipistrellus pygmaeus*) and Leisler's bat (*Nyctalus leisleri*). The results of the desk-top and site survey indicate that that the western section of the survey area, from Ely's Arch downstream to Temple Park was used more frequently by Daubenton's bat than any of the other species recorded. Pipistrelle species were more frequent in the area between Temple Park downstream to the area in the vicinity of David Lloyd Riverview (the eastern extremity of the site). However, within this area the section in the immediate vicinity of the pedestrian bridge between the Nine Arches viaduct and the bridge that carries the R117 equal activity of both Daubenton's bat and Pipistrelle species was recorded. Daubenton's bat were found over slower moving water (pools and slow glides) and were found in much lower numbers over fast flowing water (riffles and fast glides). Within the study area and wider vicinity there is good quality habitat for both foraging and roosting sites (MERC report dated 15th September 2020).

A species identified as likely to be Natterer's Bat (Myotis nattereri) has been recorded in the vicinity of Milltown Golf club (Roughan and O'Donovan Consulting Engineers, 2020).

All bat species are protected by law in the Republic of Ireland under the Wildlife Act 1976 and subsequent amendments.

7.3.3.5 Herpetofauna (reptiles and amphibians)

Ireland has only one native frog species, the Common frog, *Rana temporaria*. It is listed as an internationally important species and is protected under the Habitats Directive (92/43/EEC) and the Irish Wildlife Act (1976, amended 2000). The Irish Peatland Conservation Council's (IPCC) 2019 Hop To It! National Frog Survey received reports of six sightings (from a general public survey) of Ireland's only native species of frog (*R. temporaria*) in the vicinity of the scheme, as identified by the general public (*pers. comm.* IPCC letter dated 17th August 2020 (see section

2.5)). The riparian marginal vegetation along the River Dodder and drainage ditches may be important sites for frog spawning.

Smooth Newt has been found within ponds along the River Dodder catchment (*pers. comm.* Leslie Moore, City Parks Superintendent, 11th January 2021).

No field signs of any species of reptile or amphibian were observed during the ecological site walkover.

7.3.3.6 Freshwater Fish

Fish present in the river include both brook and river lamprey (*Lampetra planeri and L. fluviatilis*) (River Dodder Habitats Management plan, 2008), brown trout (*Salmo trutta*), sea trout (*Salmo trutta morpha trutta*), stone loach (*Barbatula barbatula*), three-spined stickleback (*Gasterosteus aculeatus*) and European eel (*Anguilla anguilla*). Salmon (*Salmo salar*) have been recorded in the River Dodder's lower course (Inland Fisheries Ireland, 2018). Sea lamprey (*Petromyzon marinus*) has been recorded from the River Dodder (Dublin City Council, 2015). Salmon is listed under Annex II and Annex V in the Habitats Directive [92/42/EEC] and Appendix III (in freshwater only) of the Bern Convention.

The Dodder is a popular river for fishing. The river has a reasonable stock of brown trout which is augmented by stocking by the local angling club. It also has a small stock of sea trout that is present in the lower tidal sections of the river. The best of the brown trout fishing is between Old Bawn in Tallaght and Ballsbridge. The best of the sea trout fishing is to be found downstream of Ballsbridge. The fishing season is open between 17th March and 30th September (Inland Fisheries Ireland, 2018).

Further surveys are required on site to establish the presence/absence / abundance of the fish species listed above. This will involve netting and electrofishing surveys.

7.3.3.6.1 Lamprey

Brook, River, and Sea lamprey have been reported from the River Dodder. All three Irish lamprey species are listed under Annex II of the European Union Habitats Directive (92/43/EEC),with the River Lamprey also listed on Annex V of the Habitats Directive, and are included in schedule 4 of the European Communities (Birds and Natural Habitats) Regulations (S.I. No. 477/2011). They are also listed on Appendix III of the Bern Convention.

DDC Parks state that experience has shown that "physical alterations to river channels associated with flood alleviation schemes can potentially reduce lamprey habitats" and the reasons for this have been reviewed and should be avoided in the design stage (Igoe et al 2004) (*pers. comm.* Leslie Moore, City Parks Superintendent, 11th January 2021).

7.3.3.6.2 European Eel

European eel have been reported from the River Dodder catchment. This species is listed as critically endangered in Annex II of the Convention on International Trade in Endangered Species (CITES). Eel are recognised as a potential food source for otter in Dublin City, based

on the DCC Otter Survey (*pers. comm.* Leslie Moore, City Parks Superintendent, 11th January 2021).

The IFI has noted in the national Eel Monitoring Report (IFI 2015) that "A programme to ease fish passage in the River Dodder is at the planning stage and should be implemented over the coming years in conjunction with Dublin City Councils as part of their flood relief scheme" as a means to restore ecosystems in Dublin for Eel. It is unclear how this is proposed to be achieved for the Dodder FAS, although the report notes several weirs (*pers. comm.* Leslie Moore, City Parks Superintendent, 11th January 2021).

7.3.3.7 Aquatic Invertebrates

The water quality of the River Dodder was assessed by carrying out an analysis of aquatic invertebrates and computing an evaluation of the quality based on the Q value. By taking a sample of the benthic invertebrates and identifying the biological material, it is possible to determine the likely quality of the water in terms of pollution. This is known as the Biological River Quality Classification System or Q value (Q-Scheme) and it has been in use in Ireland since 1971. It has undergone a number of modifications since then and has been included in the Local Government (Water Pollution) Act, 1977 (Water Quality Standards for Phosphorus) Regulations, 1998. It is routinely employed by the EPA. The Biotic Index is a quality measurement for freshwater bodies that range from Q1 – Q5 with Q1 being of poorest quality and Q5 being pristine/unpolluted as shown in Table 7-3 below.

Table 7-3: Biotic Index scoring system for the Q-Scheme (Lucey et al., 1999).

Biotic Index	Quality Status	Quality Class
Q5, 4-5, 4	Unpolluted	Class A
Q3-4,	Slightly Polluted	Class B
Q3, 2-3	Moderately Polluted	Class C
Q2, 1-2, 1	Seriously Polluted	Class D

Three locations were sampled (Figure 7-3). Q values ranged from 3 – 4 at Station to Q4 at the other two sampling sites i.e. on the North bank opposite Milltown Golf course and on the same bank in Dartry Park. The Q-value rating is assigned based on the relative percentage of sensitive and tolerant.

The recorded Q values indicate that water quality in the Dodder is slightly polluted at Station 1 and unpolluted at Stations 2 and 3 (EPA pollution status). Water quality (as Q values) at the Dundrum Road bridge have been relatively constant from 1971 – 2005 at between 2-3 and 3 with a slight increase in 2010 to 3 - 4 (EPA, 2020). A number of EPA monitoring points upstream of the study site have not been monitored since the early 90's. Two of these upstream stations were monitored in 2016 one at Springfield Avenue Bridge and the other in the Owenadoher River just upstream of its confluence with the dodder. The Springfield Avenue monitoring point received a Q3, while the Owenadoher received a Q4.

Figure 7-3 Location of the three Q value sampling sites

7.3.4 Aquatic and Terrestrial Site habitats

The site walkover survey focussed on the section of river between the R114 east as far as the bridge crossing at Churchtown Road Lower (Classon's Bridge) where it meets Milltown Road.

This area is very urbanised with many houses, apartment blocks, parklands, roads and associated bridge crossings, paths, 1 public house and a number of commercial premises.

Lower plant species (algae, mosses and ferns such as Pteridium and Blechnum) are common both in the river (algae) and on the banks (mosses and ferns). Higher plants recorded included Bind weed (*Convolvulus*), Herb-rober (*Geranium robertianum*), Briar (*Rubus spp*) (see Figure 7-4) and Nettle (*Urtica dioica*), Burdock (*Arctium minus*) (see Figure 7-5) as well as Cleavers (*Geum aparine*), Knapweed (*Centaurea nigra*), Rush (*Juncus effusus*), Ivy (*Hedera helix*) and Plantain (*Plantago lanceolata*).

Figure 7-4 Profuse growth of Briars

Figure 7-5 Burdock on the riverbank

Tree species included Sycamore (*Acer pseudoplantanus*), Ash (*Fraxinus excelsior*), Silver Birch (*Betula pendula*), Willow (*Salix spp*), Elder (*Sambucus nigra*), Alder (*Alnus glutinosa*) (see Figure 7-6) as well as Hawthorn (*Crategus monogyna*) and Blackthorn (*Prunus spinosa*).

Figure 7-6 Alder growing on the Dodder riverbank

Garden escapes that occur on the river bank include the Butterfly shrub (*Buddleia* spp), Leyland Cypress (*Chamaecypressus leylandii*), Silver Birch (*Betula pendula*) (probably planted as part of a landscape gardening scheme), Laurel (*Prunus* spp) and Gricelinia while invasive plant species include Japanese knotweed (*Reynoutria (Fallopia) japonica*), Crocosmia and Himalayan balsam (*Impatiens glandulifera*).

Habitats (Fossitt, 2000)) present along the section of the River Dodder in the scheme area include:

Table 7-3: Habitats types within and adjacent to the proposed scheme footprint

Habitat (Fossitt classification)	River Dodder
Scrub WS1	✓
Treelines WL2	✓
Riparian woodland WN5	✓
Buildings and artificial surfaces BL3	✓
Stone walls and other stonework BL1	✓
Spoil and bare ground ED2	✓
Scattered trees and parkland	✓
Amenity grassland (improved) GA2	✓

Habitat (Fossitt classification)	River Dodder
Ornamental non-native shrub WS3	✓
Flower beds and borders BC4	✓
Depositing lowland rivers FW2	✓
Drainage ditches FW4	✓

No botanical species protected under the Flora (Protection) Order 2015, listed in Annex II or IV of the EU Habitats Directive (92/43/EEC), or listed as species of conservation concern in Ireland were recorded for the study site. All species recorded during the botanical survey are considered common for similar habitats in the general area.

7.3.5 Invasive species

7.3.5.1 Flora

Currently, Regulations 49 and 50 of the European Communities (Birds and Natural Habitats) Regulations 2011 make it an offence to: Plant, disperse, allow dispersal or cause the spread of a number of non-native 'invasive species' including Japanese knotweed, Himalayan balsam and Gunnera.

A walkover survey to identify and record the occurrence of non-native invasive species was undertaken on the 8th September 2020. Japanese Knotweed, Himalayan balsam and Gunnera have been identified as present within the public realm areas in the study area. Wintering Heliotrope was also confirmed as present along stretches of the river within the ecological study area. Although this species is not listed within the aforementioned legislation, DCC requested the survey included this species.

7.3.5.2 Fauna

Mink, a legally designated invasive alien species found along the length of the Dodder. DCC Parks has previously initiated mink control programmes with NPWS, IFI and adjoining local authorities. South Dublin County Council are currently controlling mink in the upper catchment. Grey squirrel, another legally designated invasive alien species, is widespread in the Dodder catchment.

7.4 Key Constraints

7.4.1 Protected Sites

There are two European sites within the ecological study area. There is the potential for these sites to be impacted by the proposed scheme. In-river works have the potential to re-suspend sediments which will then be transport downstream to enter the sea *via* the River Liffey. All such works must be designed to minimise this potential impact. Similarly, all work that is to be carried out on the river bank must be carried out in such a way as to minimise the potential for events such as diesel or concrete spillages, run off of water with suspended sediment loadings or any accidental spillages. If it considered necessary to re-build weirs or sluices, the same sort of

construction approach should be designed in to minimise resuspension and loss of concrete to the river.

Appropriate Assessment under Articles 6(3) and 6(4) of the EU Habitats Directive (Directive 92/43/EEC) will be required for the proposed scheme.

7.4.2 Protected/notable Species

In ecological terms, the river corridor (including the river itself) supports a number of protected species including two species of lamprey, salmon, sea and brown trout, otter, bats, badger and common frog.

Any in-river and bankside works have to be designed to minimise potential impacts on these (and all other) species.

All works should be planned wherever possible to be carried out at times of the year that are ecologically least sensitive *e.g.* outside bird nesting (March–September) and fish migration periods (Spring/Summer, depending on species).

The site's potential to support protected mammals (i.e. pygmy shrew, pine martin, hedgehog and red squirrel) will be considered in the ecological assessment.

7.4.2.1 Otter

The ecological study area contains suitable commuting, foraging, breeding and resting habitats for otter, although it should be noted that no holts or field signs of otter were recorded during the ecological walkover survey. As a European protected species, the otter is fully protected under the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended). Any scheme option that may have the potential to disturb otters must be assessed. A full otter survey will be completed once the scheme extents are known. If otters are found to be present and disturbance is likely then DCC must apply for a licence to allow proposed development works that might affect otters to proceed legally. The potential impacts on otter will be assessed and reported in the EIA.

Otter mitigation works can potentially be conducted at any time of year but must avoid the breeding season (usually Spring but can be any time of year) if holts are present on site.

7.4.2.2 Badgers

Although badgers have been recorded in the study area, no setts or field sign were recorded during the site visit. Should a badger sett be recorded within the scheme extents prior to construction works then appropriate mitigation and a licence for works will be required. Construction of new setts must be completed in Spring/Summer with blocking and destruction of existing setts completed in Autumn/early winter.

7.4.2.3 Birds

All works should be planned wherever possible to be carried out at times of the year that are ecologically least sensitive e.g. outside bird nesting (March – September). Should works be undertaken during the nesting reason, a survey should be undertaken prior to works to identify any active nests, including ground-nesting bird burrows (e.g. kingfisher, sand martin), in the vicinity of works

7.4.2.4 Bats

The scattered mature trees, bridges, architecture (churches, masonry) and areas of low water flow provide good foraging, roosting and commuting routes for bat species in the area. The relatively dark, tree-line habitats are also beneficial for bats. Options that require the removal of mature trees or works to bridges or other riverine structures with the potential to support roosting bats shall be assessed for bat potential. Bat surveys shall be conducted on any features with medium or high potential for roosting bats. The optimal time to conduct map surveys are May and August, when bats are most active. If bats are found, they should not be disturbed during hibernation period (October to March) or maternity period (June to August). If a bat roost requires removal then a licence would be required. Removal of roosts should be carried out during the summer months for hibernation roosts and during the winter months for maternity roosts.

7.4.2.5 Freshwater Fish

Fish present in the river include both brook and river lamprey (*Lampetra planeri and L. fluviatilis*) (River Dodder Habitats Management plan, 2008), brown trout (*Salmo trutta*), sea trout (*Salmo trutta morpha trutta*), stone loach (*Barbatula barbatula*), three-spined stickleback (*Gasterosteus aculeatus*) and eel (*Anguilla anguilla*). Salmon (*Salmo salar*) have been recorded in the river's lower course. Further surveys are currently being competed on site to establish the presence/absence/abundance of the fish species listed above. This will involve netting and electrofishing surveys.

In terms of the construction programme, it should be noted that in salmonid catchments, in-stream works are not permitted between the months of January to April (migration) and October to December (spawning). This corresponds with guidance from Inland Fisheries Ireland (Murphy, 2016).

Lamprey (both species) spawning takes place in the spring and early summer period in often the same habitats where salmon and trout spawn (O'Connor, 2017). The spawning season for brown and sea trout is November to February. If spawning grounds are found to be present in the construction zone for the scheme then this period should be avoided.

A full impact assessment and management plan for these fish species will be produced as part of the EIA report once full scheme details (including construction methods) are known.