

# Opera Site

Limerick City and County Council

Appropriate Assessment (AA) Screening Report and  
Natura Impact Statement

**Prepared on behalf of:**

Limerick City and County Council

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## 1. Introduction

AECOM Ireland Limited (hereafter referred to as AECOM) was commissioned by Limerick City and County Council (LCCC) to produce this Appropriate Assessment (AA) Screening Report and Natura Impact Statement (NIS) to inform An Bord Pleanála's (ABP) AA of the 'Opera Site' in Limerick City.

Broadly, the development of the Opera Site (Figure 1; hereafter 'the proposed development'), comprises a new modern office-based campus supplemented by ancillary retail, cultural and licensed premises, and residential accommodation.

The European Communities (EC) Habitats Directive 92/43/EEC ('the Habitats Directive') provides, in Article 6 (3), the legal basis for Appropriate Assessment (AA) at European level. In the context of the proposed development, the requirement for AA Screening (and if required AA) under the Habitats Directive is transposed by the Planning and Development Act 2000, as amended ('The Planning Acts'), and the Planning and Development Regulations 2001 as amended ('The Planning Regulations').

### 1.1 Overview of Proposed Development Site

The proposed development site is a brownfield site including 17 Georgian buildings of historical and architectural significance along the western and southern boundaries, the famous 18th Century Granary building (a four/five-storey limestone former bonded warehouse) and associated structures in the northeast; and elsewhere by derelict contemporary warehousing and other vacant structures. The proposed development site is devoid of any semi-natural vegetation. Existing ground levels surrounding the proposed development range between 4.50m and 5.20 m Ordnance Survey (OS) Datum Malin.

### 1.2 Author Information

This AA Screening Report and NIS was originated by Robert Fennelly BSc, MSc, Dip CEcol MCIEEM. Robert is a Chartered Ecologist and Principal Ecologist at AECOM. Robert has 11 years' professional experience as an ecological consultant, and AA practitioner.

The AA Screening Report and NIS was checked (and in the case of reporting on bats also originated) by Dr. Emma Boston BSc (Hons), PhD MRSB MCIEEM. Emma is also Principal Ecologist at AECOM, and has over 14 years' experience in research and conservation, and 2.5 years' experience of AA.

The AA Screening Report and NIS was approved by Dr. Eleanor Ballard B.Sc. (Hons), DPhil. PgDip, CEnv MCIEEM, who is a Chartered Environmentalist with over a decade's experience of AA, and 20 years' providing biodiversity inputs to planning. All other suitably experienced AECOM ecologists who assisted with field surveys have third level qualifications in a discipline relevant to biodiversity.

### 1.3 Naming Conventions

Vascular plant nomenclature used in this AA Screening Report and NIS follows that of the Botanical Society of Britain and Ireland's Checklist of the Flora of Britain & Ireland<sup>1</sup> and as such, any name changes since 2007 (including Stace, 2010) are not included. Bryophyte nomenclature follows the 2009 Checklist of British and Irish bryophytes 2009 available online from the British Bryological Society<sup>2</sup>. Acronyms and abbreviations are spelled in full at first use. Mammal names follow those adopted in the Irish Red List (Marnell et al., 2009).

Throughout this AA Screening Report and NIS, references to web resources not associated with a published report (e.g. online databases) are referenced in footnotes. All published reports and policy documents, including the 'grey' literature (e.g. government and consultancy documents), and peer-reviewed literature are cited within the text following the Harvard format and listed in the References in Section 11.

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<sup>1</sup> Available online at <https://bsbi.org/resources> Accessed 10 October 2018.

<sup>2</sup> Available online at <http://www.britishbryologicalsociety.org.uk/> Accessed 10 October 2018.

## 2. Screening for AA

Under Section 177U (1) of the Planning Acts, a Screening for AA of the proposed development shall be carried out by the competent authority (in this case, ABP) to assess in view of best scientific knowledge, if that proposed development, individually or in combination with other plans or projects, is likely to have a significant effect(s) on any European sites. The term 'European site' is defined in Section 4.1.

Having regard for relevant European and national guidance on AA Screening (detailed in Section 6.2), AECOM concluded that the proposed development should be 'Screened in' to the requirement for AA. This conclusion was reached because, in the absence of mitigation measures, significant effects on the Lower River Shannon Special Area of Conservation (SAC; site code 2165) and the River Shannon and River Fergus Estuaries Special Protection Area (SPA; site code 4077), during construction and operation of the proposed development, could not be excluded on the basis of objective information, individually or in combination with other plans or projects.

Potential pollution risks to the Lower River Shannon SAC and the River Shannon and River Fergus Estuaries SPA during construction of the proposed development informed AECOM's conclusion that the proposed development should be 'Screened in' and the proposed development should be subject to the requirement for AA. Following National Parks and Wildlife Service (NPWS) technical advice<sup>3</sup> that AA Screening should 'Screen in' a project or plan, and not 'Screen in' particular European sites, this NIS considers potential effect pathways to all European sites which could be adversely affected.

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<sup>3</sup> Including but not limited to advice provided by the NPWS Head of Ecological Assessment, in a talk delivered at an 'Advanced Appropriate Assessment Workshop'; 17 April 2015, Dublin Port.

### 3. Appropriate Assessment

AA is the process provided for under Article 6 (3) of the Habitats Directive to determine whether a project or plan could 'adversely affect the integrity' of any European sites, either alone or in-combination with other plans or projects, in light of the conservation objectives of the European sites in question.

Under Section 177U (5) of the Planning Acts, the competent authority (in this case, ABP) shall determine that an AA of a proposed development is required if it *cannot be excluded* [emphasis added], on the basis of objective information, that the proposed development, individually or in combination with other plans or projects, will have a significant effect on a European site(s).

The statutory definition of an NIS is provided in Section 4.2. The methodology for completing the NIS is provided in Section 6.

## 4. Key Definitions

### 4.1 European sites

In the Republic of Ireland, European sites comprise:

- SACs designated for habitats, plants, and non-bird species;
- SPAs designated for bird species and their habitats; and,
- ‘Candidate’ sites including ‘cSACs’.

The process of designating cSACs as SACs is ongoing in Ireland. The term SAC is used throughout this report for both SACs and cSACs, given they are subject to equal protection.

The designation features of SACs are referred to as Qualifying Interests (QIs), and these comprise both species (excluding birds), and habitats.

The designation features of SPAs are referred to as Special Conservation Interests (SCIs), and these comprise bird species, as well as wetland bird habitats.

The designation features of European sites are identified in the Statutory Instruments for European sites where such sites have completed the designation process. In all cases, designation features are also identified in Conservation Objectives published by the NPWS. Any Conservation Objectives referred to in this NIS are referenced to identify the date of publication and version number.

### 4.2 Natura Impact Statement

Under Section 177T of the Planning Acts (177T), a NIS is defined as:

“A statement, for the purposes of Article 6 of the Habitats Directive, of the implications of a proposed development, on its own or in combination with other plans or projects, for one or more than one European site, in view of the conservation objectives of the site or sites”.

The NIS must “include a report of a scientific examination of evidence and data, carried out by competent persons to identify and classify any implications for one or more than one European site in view of the conservation objectives of the site or sites”.

### 4.3 Zone of Influence

Irish departmental guidance on AA Screening and AA (DoEHLG, 2010) requires European sites within the “*zone of impact*” of a plan or project to be identified (p. 32). In relation to the zone of impact, the guidance states:

*“For projects, the distance could be much less than 15 km, and in some cases less than 100m, but this must be evaluated on a case-by-case basis with reference to the nature, size and location of the project, and the sensitivities of the ecological receptors, and the potential for in combination effects”* (DoEHLG, 2010; p.32, para 1).

In this AA Screening Report and NIS, the term Zone of Influence (Zoi) is used in lieu of “zone of impact”. The detailed method used to identify the Zoi is outlined in Section 6.5.



## 5. Proposed Development

### 5.1 Location

The proposed development site (2.35 ha) is located in the heart of Limerick City Centre in the functional area of Limerick City and County Council (see Figure 1). The proposed development site is brownfield, and situated on the south side of the River Abbey at the confluence with the River Shannon, adjacent to the Hunt Museum and Arthur's Quay Shopping Centre. Largely in public ownership, the proposed development site occupies the majority of a city block bounded to the west by Patrick Street and Rutland Street, to the north by Bank Place, to the east by Michael Street and to the south by Ellen Street.

### 5.2 Summary of Main Features

The development comprises a mixed-use scheme of primarily office uses, supported by a range of retail / non-retail services, café/restaurant, licenced premises, apart-hotel, civic/cultural uses (including the City Library), residential use, open spaces, access routes and ancillary areas. The development also includes environmental improvement works to the adjacent public streets.

Demolition is proposed for :

- Existing industrial/warehouse/workspace buildings at Bogues Yard and Watch House Lane;
- The former Cahill May Roberts Building fronting Bank Place;
- Modern additions/extensions to the rear of the Granary Building (a Protected Structure) and to the rear of structures fronting onto Rutland Street, Patrick Street and Ellen Street;
- The existing Ellen Street surface car park;
- Nos. 6 & 7 Rutland Street, 6, 7/8 Patrick Street, and No. 3 Ellen Street; and,
- The structure adjoining to the south of the former Town Hall to facilitate widening of the existing east-west access route into the proposed development site.

The proposed development will provide:

- A new 6-storey office building on the corner of Michael Street and Ellen Street (Parcel 1) replacing the existing car park, the proposed new building ranges in height from 5-6 storeys with roof level plant and comprises office, retail and restaurant/café/bar uses at ground floor level and office use on upper levels, providing c. 12,111m<sup>2</sup> office use and c. 1,444m<sup>2</sup> non-office uses (excluding basement accommodation);
- An apart-hotel on the corner of Patrick Street and Ellen Street (Parcel 2A) replacing No. 6-8 Patrick Street and No. 3 Ellen Street) of 5 storeys with roof level plant and extending to the rear from ground floor level to 4th floor level including a café/bar/restaurant at ground floor. Nos. 4–6 Ellen Street are to be refurbished and modified as required, with retail at ground and basement floor levels of c. 1,014m<sup>2</sup>. Upper levels, will comprise apart-hotel units and will be linked by bridge access from the new apart-hotel building, providing a total floor area for the apart-hotel (including new build and refurbished areas) of c. 4,710 m<sup>2</sup>;
- Refurbishment and modification of No. 9 Ellen Street (Parcel 2B) for the provision of bar/restaurant/café uses at all floor levels, comprising 999m<sup>2</sup> excluding basement;
- A new City Library within the exiting Town Hall and adjoining structures (Parcel 3A4 cultural) comprising renovation and adaption of the Town Hall (a Protected Structure) and No. 8/9 Rutland Street, replacement of building extensions to the rear with a full height glazed atrium, and connection with new-build structures replacing 6 & 7 Rutland Street, extending and stepping-up to the rear over 4/5 no. floor levels with roof plant (providing a total floorspace of c. 4,148m<sup>2</sup> (excluding basement) including renovation and new-build areas). A café/restaurant is also proposed at the basement level of the library (c. 250m<sup>2</sup>). The new-build structure to the rear is split, providing for commercial office floor space over 4-5 storeys (Parcel 3A4 commercial providing c. 2,581m<sup>2</sup>);
- Refurbishment and adaptive re-use of 9 no. Georgian terraced houses (3no. NIAH) at Nos. 7-8 Ellen Street, Nos. 1-5 Patrick Street and Nos. 4-5 Rutland Street, respectively, to provide for retail use at ground and basement levels (comprising a total of 1,167.59m<sup>2</sup> retail floor space) and residential use on upper levels (c. 1,878.70m<sup>2</sup>). A total of 16 no. residential units are proposed; 3 no. 1 bed apartments, 9 no. 2 bed apartments, 1 no. 2 bed townhouses, 1no. three bed townhouse and 2 no. 4 bed townhouses. Private open space is proposed to be provided in new balconies to the rear or ground/podium level private gardens as appropriate.

- To the north of the site fronting Bank Place, is a proposed landmark building of 11–14 storeys, comprising 12,331m<sup>2</sup> office floorspace (Parcel 5);
- The existing 4-storey Granary Building (a Protected Structure) is proposed to be retained in office/restaurant/licenced premises use, with the addition of a circulation core to the rear in place of the former (modern) library structure (providing a total floorspace of c. 2,715m<sup>2</sup>).
- A significant new public square/plaza is proposed at the centre of the site (c. 4,013m<sup>2</sup>) linked by east-west connections to Michael Street/Patrick Street, to the south via the existing archway connecting to Ellen Street (under no. 7 Ellen Street), and to the north via a new north-south public space to the rear of the Granary Building ('the Granary Courtyard'), which links with an enhanced public space at Bank Place (c. 1,775m<sup>2</sup>).
- A basement car park, accessed from Michael Street, will be provided with parking for 155 no. cars and 311 no. secure bicycle spaces, together with shower and changing facilities and ancillary plant, attenuation, storage, refuse management and associated areas.
- The proposed development also includes environmental improvement works to the adjacent public streets, hard and soft landscaping changes, signage and flagpoles, lighting, change in level, substations, diversion of underground services, set-down areas, and all related site development and excavation works above and below ground.
- The Bruce House Doorway, Rutland Street (a protected Structure) will be relocated to the internal gable of No. 8 Rutland Street within the new library building atrium.

Vehicular access serving the development will be via a proposed entrance point on Michael's Street to an underground car park.

## 5.3 Surface Water Management

### 5.3.1 Existing

LCCC records show that there is no separate surface water drainage network within or around the proposed development site. There is an existing combined sewer network in the area surrounding the site. Surface water runoff generated within the site is currently collected by gullies and discharges to an existing 350mm diameter brickwork combined sewer that runs through the site. The existing road gullies on Michael Street, Ellen Street, Patrick Street, and Rutland Street are likely to discharge into the local combined sewer network. Existing gullies on Bank Place discharge directly to the Abbey River. The existing combined sewer running through the site ultimately discharges to an interceptor sewer in the River Shannon. The existing combined sewers in Bank Place discharge to an interceptor sewer in the Abbey River. These interceptor sewers convey flow to the Wastewater Treatment Plant (WwTP) at Bunlicky for treatment, prior to discharge of treated effluent into the River Shannon, c. 4 km downstream of the proposed development site.

### 5.3.2 Proposed

Within the site, a separate storm water drainage network will be provided to serve the proposed development. This network will collect, attenuate and treat runoff generated within the development. In addition to the new foul sewer in Michael Street it is proposed to provide a new storm water sewer and hydrocarbon interceptor, which includes a silt trap. Existing gullies which currently discharge to the combined sewer in Michael Street will be diverted to the proposed surface water sewer. Surface water run-off collected by this sewer will discharge to the Abbey River through the proposed outfall.

Surface water runoff generated within proposed development will be collected by a combination of linear drains (ACO Brickslot or equivalent) and gullies. It is proposed to provide a sewer network within the development which will convey runoff to an attenuation tank. The attenuation tank will have a flow control device restricting the discharge to the equivalent greenfield run-off rate (9.4 l/s). This network also includes a by-pass oil interceptor to remove hydrocarbons suspended in runoff. Due to level constraints within and surrounding the proposed development, a pump will be required to convey flow from the manhole downstream of the attenuation tank (MH S1-12) to a header manhole in Bank Place. From here surface water will be discharged to the Abbey River via the proposed outfall. Surface water run-off from the facade of the landmark building in Bank Place will discharge to an attenuation tank located in Bank Place prior to forward discharge to the Abbey River. The attenuation tank will have a flow control device restricting the discharge to the equivalent greenfield run-off rate (4 l/s).

It is proposed to provide a Rain Water Harvesting System (RWHS) within the development to facilitate re-use of roof run-off. The proposed surface water drainage network has been designed to allow for overflow from the areas served by the RWHS. The rainwater harvesting tanks capacity has been design in accordance with BS

8515: 2009 Rainwater harvesting systems: Code of practice. It proposed that tanks will be fitted with an overflow system that pumps overflow water to the adjacent surface water system.

Surface water run-off can impact on receiving watercourses in two ways:

- Discharge Rate: if the rate of discharge from the proposed development exceeds that of the existing catchment area then it is possible that existing watercourses could be overloaded, causing localised flooding or erosion of watercourse banks within the catchment.
- Quality of Run-Off: Run-off from trafficked areas can contain pollutants associated with traffic loading.

Therefore, the design of the proposed surface water drainage system includes:

- Consideration of pollution and flood risk requirements,
- Determination of the design storm used in the design of the drainage elements,
- Calculation of flows from the design storm within each drainage catchment,
- Determination of the location of outfall(s),
- The rainfall intensities used in the design have been increased by 20% to allow for the future effects of climate change.

#### 5.3.2.1 Hydraulic Capacity

The proposed surface water drainage network has been designed to convey run-off associated with a 1 in 5 year return period event without surcharge and a 1 in 100 year return period event without flooding.

#### 5.3.2.2 Attenuation of Run-off

In accordance with LCCC requirements, all surface water runoff generated by the proposed development will be attenuated and discharged at a restricted rate equal to the equivalent of the Greenfield runoff for a site of this area. The forward flow rate from the site will be restricted to 9.4 l/s downstream of the proposed attenuation tank. During rainfall events where the flow rate in to the attenuation tank exceeds the forward flow rate, the attenuation tank will store flows in excess of 9.4 l/s. Surface water run-off from the facade of the landmark building in Bank Place will discharge to an attenuation tank in Bank Place which will have a flow control device restricting the discharge to the equivalent greenfield run-off rate (4 l/s).

There has been no provision for green roof as it is proposed to utilise the roof space for plant and photovoltaic solar panels.

#### 5.3.2.3 Proposed Outfall

As there are no existing storm water only sewers in the area, it is proposed to discharge all storm water run-off generated on the development site to the Abbey River through a new outfall. A new surface water sewer will be provided between the site and the proposed outfall. The rate of discharge at this outfall is limited to the greenfield run off rate of 9.4 l/s.

The maximum discharge rate associated with the façade of the landmark building is limited to 4 l/s

#### 5.3.2.4 Treatment of Run-off

It is proposed to provide a Class I By-Pass hydrocarbon separator upstream of the main development attenuation tank to remove any hydrocarbons suspended in the site run-off. The separator also includes a silt trap to allow suspended solids to settle out prior to entering the attenuation tank and being discharged from the site. A Class I Bypass Hydrocarbon Separator has also been provided to treat surface water collected in the new gullies on Michael Street.

## 5.4 Foul Water

### 5.4.1 Existing

The existing site is currently served by an existing 350mm diameter brick work culvert combined sewer. This discharges to a 450mm diameter combined sewer in Patrick Street which in turn discharges to an 1800mm diameter interceptor sewer in the River Shannon. This ultimately flows to the wastewater treatment facility in Bunlicky.

### 5.4.2 Proposed

It is proposed to decommission the existing 350mm diameter culvert crossing the site. It is proposed to provide a new 450 mm diameter sewer in Michael Street which will intercept flow and allow the existing sewer within the site to be decommissioned. This new sewer will divert flows around the site and discharge to the existing combined sewer on Bank Place, which then discharges to an existing interceptor sewer in the Abbey River.

Within the proposed development, a separate foul water drainage network will be provided to serve all new buildings. A gravity network will discharge foul flows to the diverted sewer in Michael Street and to the existing 600mm diameter combined sewer on Bank Place. As the basement is at a lower level than the proposed gravity system, a pumped system will be required to convey wastewater from the basement to the gravity network at ground floor level. It is proposed to provide duty and stand-by pumps in order to ensure the system stays operational in the event of a pump failure. In addition, the pump sump has been designed to provide 24 hour storage to allow for emergency works in the event of a failure.

Due to the particular risk of contamination by detergents, runoff from the basement car park will also be discharged to the foul water network.

All food production areas that may generate grease, fats, oils will discharge through a grease trap to prevent maintenance issues during the operation phase of the development.

The wastewater loading estimate is based on the Environmental Protection Agency (EPA) Waste Water Manual “*Treatment Systems for Small Communities, Business, Leisure Centres and Hotels*” with specific guidance taken from Table 3 “Recommended Wastewater Loading Rates from Commercial Premises”. The occupancy loading factors are based on the guidelines set out in ‘Table 1.1 – Occupancy Load Factor’ in ‘Part B’ of ‘The Building Regulations’. The calculations are included in the Infrastructure Report.

## 5.5 Flood Risk

The Shannon Catchment Flood Risk Assessment and Management (CFRAM) Study indicates that the proposed development is at risk from a 1 in 1,000 year coastal flood event<sup>4</sup> (0.1% Annual Exceedance Probability).

The Office of Public Works and Department of Environment, Heritage, and Local Government (OPW and DoEHLG, 2009) have produced *Planning System and Flood Risk Management Guidelines* which recommend that minimum floor levels for a new development are set above the 1 in 100 year return period event water level for rivers or the 1 in 200 year return period event coastal water level, include an allowance for climate change, while also providing an appropriate freeboard.

Based on a 1 in 200 year return period coastal flood level of +4.72 m, a climate change allowance of 500 mm and an allowance of 100 mm for land movement, the appropriate Finished Floor Level for the proposed development is 5.32 m OD Malin. All essential infrastructure serving the proposed development (including primary transport and utility distribution, and electricity generating power sub-stations etc.) will be sited above the 0.1% AEP event coastal flood water level of 5.15 m OD Malin.

The design of the proposed development also incorporates super-elevated entrance/exits for the development as a measure to prevent any coastal flood waters from entering the main structure or the underground structure during operation.

## 5.6 Lighting

The existing Opera Site is in an urban area with significant existing lighting (e.g. from security lighting and adjacent roadways). Additional temporary lighting will be required for the duration of construction.

Operational lighting plans have been submitted with the planning application for the proposed development site. The presence of a common pipistrelle *Pipistrellus pipistrellus* bat roost within the proposed development site was confirmed in the course of bat surveys. This roost is not relevant to this NIS, because lesser horseshoe bat populations are (as the only Habitats Directive Annex II bat species in Ireland) the only bat of relevance to AA. The presence of the common pipistrelle bat roost has potential indirect relevance for the NIS, in that it has resulted in changes to the (lighting) design of the proposed development. Specifically, having regard for best available knowledge on lighting mitigation for bats (BCT and ILP, 2018):

- Uplighting has not been included on the façade of 4 and 5 Rutland Street; and,

<sup>4</sup> Available online at [shannoncfamstudy.ie/](http://shannoncfamstudy.ie/) Accessed December 2018; specifically, CFRAM Map S2526LIK\_EXCCD\_F1\_24 (dated June 2016).

- The lighting specification proposed at Bank Place on the northern boundary of the proposed development site where it borders the Abbey River has been amended to have a maximum Kelvin value of 3000, low-pressure sodium lights in preference to high pressure sodium lights or mercury lamps, and luminaires mounted on the horizontal with an upward light ratio of 0%.

For the avoidance of any doubt, potential impacts to, mitigation for, and licensing implications for this bat roost (which is not relevant to the AA process) have been addressed within Chapter 16 of the EIAR for the proposed development (AECOM. 2019).

## 5.7 Temporary Earthworks Support

The basement will be constructed to the rear of the retained structures, and to excavate the basement safely temporary earthworks support will be required. These temporary earthworks support will be required to resist loads from the existing buildings to maintain their stability, and ensure the basement excavation does not adversely affect the adjacent structures or services.

The method of earthworks support recommended is a secant piled wall about the perimeter of the basement. The site investigations indicate that rock is expected to be encountered at 3-4m below existing ground level. To install stable piles and reduce water ingress into the basement excavation, the piles would be bored into the rock for a minimum of 2.5m using a rotary boring piling rig. The piles will be installed with a 1.2m clearance to existing structures to facilitate piling rig access. Figure 3.24 depicts typical secant piles, in elevation and section.

The proposed locations for the secant piles wall around the basement would be at their closest point, c. 80 m from the River Shannon, and c. 35 m from the Abbey River.

## 5.8 Landscaping

Proposals for new trees and planting have been included in the proposed planting schedule of the open space design. Plantings are proposed in public spaces throughout the proposed development site. Whilst predominantly non-native, planning lists were reviewed by the NIS author who has verified no invasive or otherwise problematic plants for native biodiversity have been proposed. Raised planters proposed in the central plaza will include a mix of trees (to a mature height of c. 10-12 m), shrubs, grasses, and flowering plants. Bank plaza will include trees in hard paving, to include native alder *Alnus glutinosa* amongst non-native ornamentals. Shade tolerant non-native ferns in large pots are proposed at the Granary.

## 5.9 Construction Phasing

### 5.9.1 Overview

Subject to relevant approvals, the proposed development will be split into enabling works, followed by two development phases (Image 1). Subject to the grant of planning permission and other relevant approvals these phases are estimated to comprise:

- Enabling works (demolitions and site clearance): proposed to start Q3 2019 subject to planning permission;
- A northern site development phase proposed to be completed by Q2 2022; start ; and,
- A southern site development proposed to be completed by Q1 2024.



**Image 1: Phasing of New Build Structures above Podium Level**

### 5.9.2 Sequence of Construction Works

Subject to relevant approvals, the sequence of structural works would be as follows:

- Condition schedules and baseline monitoring surveys. Survey monitoring would be required at all stages through to project completion;
- Install temporary works to buildings to be retained;
- Carefully demolish structures to be removed;
- Commence the repair works to the retained structures;
- The proposed foul and storm water sewers in Michael Street will be laid and commissioned to allow the existing combined sewer crossing the site to be diverted;
- Install earthworks support to the basement perimeter;
- Excavate basement area;
- Construct new basement;
- Construct new buildings;
- Complete the development service connections; and
- Complete public realm and landscaping.

### 5.9.3 Phasing of Construction Works

The development will be broken into phases, given its size and demand for completion of plots at various stages in the programme. The phasing is discussed in the context of the enabling works elements and then the new build elements.

### 5.9.4 Enabling works

This phasing of enabling works is as follows:

- Condition schedules and baseline monitoring surveys;
- Install temporary works to buildings to be retained;
- Carefully demolish structures to be removed;
- Commence the repair works to the retained structures;
- Install earthworks support to the basement perimeter; and
- Excavate basement area.

Repair works to all existing retained structures will proceed as part of the enabling works while the interfaces of the new build to the existing structures will not be completed in this phase.

### 5.9.5 Basement Construction

The permanent basement would be constructed with a reinforced concrete basement slab, retaining walls and podium slab and suitable measures to resist water and gas ingress. A Grade 2 basement construction is anticipated with additional internal drained cavity construction in welfare and other areas which may be classed as habitable. A detailed contractor method statement would be required in advance of any works.

### 5.9.6 New Build Structures

The new build structures of the various parcels may be constructed for example in concrete frame, steel frame with slim floor construction, or castellated steel beam with composite concrete deck.

The structural frame of the new building which abuts the existing buildings would be independent of the existing structure to avoid significant load transfer onto the existing structures.

The construction of the new build structures would be broken into two distinct phases. The development of the Opera Site would proceed from the northern end at Bank Place with suitable basement access provided through Phase 2.

The completion of Phase 1 would conclude the works adjacent to the nearest residential neighbours on Rutland Street at the north-western corner of the site.

Phase 2 construction works would follow on from Phase 1, completing the development to the southern end of the site.

## 6. Methodology for NIS

### 6.1 Consultation

The Heritage Officer of Limerick City and County Council (LCCC) was contacted on 6 April 2017 to invite commentary on the scope of the ecological assessment. The Heritage Officer requested that bat and nesting bird surveys should be completed on the proposed development site, and that an AA Screening Report (and if necessary a Natura Impact Statement (NIS)) should be completed to inform the screening determination of LCCC as the competent authority. The Heritage Officer was consulted again by email on the 24 January 2019, and by phone on the 28 and 30 January 2019 to request data on any records of bird collisions with buildings in Limerick City; No records had been received at the time of writing..

The Senior Fisheries Environmental Officer of Inland Fisheries Ireland (IFI) was consulted in writing on various dates in January and February 2019. A meeting was subsequently held with the Senior Fisheries Environmental Officer on 12 February 2019, at which improvements to design of construction and operation-phase drainage were discussed and agreed between the design team and the Senior Fisheries Environmental Officer. The Senior Fisheries Environmental Officer also highlighted, as relevant to this NIS:

- IFI should be consulted in respect of the final mitigation measures and Construction Methodology and Phasing Management Plan proposed for the works. In particular IFI would be concerned about direct and indirect discharges to surface waters and the Abbey River in particular;
- The obligations laid down under the WFD concerning enhancement and prevention of deterioration (which apply to individual projects);
- The specific limits of surface water discharges should be provided;
- Proposed surface water treatment systems should address silt, hydrocarbons, waterborne debris, capacities (taking into account high precipitation conditions), retention times (to affect good settlement), and maintenance;
- The Abbey River is tidal, so any polluting discharge may be dispersed upstream and downstream of the point of discharge;
- The development of Rain Water Harvesting System (RWHS) is welcomed;

Birdwatch Ireland was consulted by email on the 29 January 2019 to request records of any bird collisions with buildings in Limerick City (or elsewhere on other tall buildings beside major rivers for context). AECOM was advised that the query had been passed to Birdwatch Ireland's scientific team on 30 January 2019. On 27 February 2019, Birdwatch responded that:

- *"Collision risk might be more related to building location rather than height";*
- *"There is historically a lack of hard data on this, while accounts and anecdotal information stems from light-related strikes from situations such as light houses whose inhabitants often had an interest in recording and rarities;*
- *"New technology in glass production is part of the solution"; (e.g. as described online at <https://news.nationalgeographic.com/news/2014/11/141113-bird-safe-glass-window-collision-animals-science/>)*

Bat Conservation Ireland (BCI) was contacted on 5 May 2017 to request bat roost records for a 5 km radius around a point centred on the proposed development site. A Data Sharing Agreement was returned to BCI on 18 May 2017; and results from the request were received on 22 May 2017. The BCI data did not confirm any records for lesser horseshoe bat within the Zol of the proposed development site.

Relevant desktop resources consulted, including those maintained by the NPWS and EPA are detailed later in Section 6.4.2.2.

## 6.2 Sources of Guidance

### 6.2.1 European Guidance and Case Law

The European Commission (EC) has recently published updated guidance on the provisions of Article 6 of the Habitats Directive, including AA Screening and AA (EC, 2018). This replaces the original EC guidance on Article 6 of the Habitats Directive (EC, 2000), but should be read with other EC guidance available online<sup>5</sup>.

As stated in EC (2018), the updated guidance *"incorporates the large body of rulings that have been issued by the CJEU over the years on Article 6"*<sup>6</sup>. This NIS also has regard for relevant updated case law since the publication of the EC guidance in November, 2018.

<sup>5</sup>Available from [http://ec.europa.eu/environment/nature/natura2000/management/guidance\\_en.htm](http://ec.europa.eu/environment/nature/natura2000/management/guidance_en.htm). Accessed December 2018.

<sup>6</sup>Including, but not limited to Case C-323/17 'People Over Wind', C-258/11 'Galway City Outer Bypass'; Peter Sweetman v Coillte Teoranta



## 6.2.2 National Guidance

There have been significant changes to AA practice since the last formally published Irish governmental guidance on AA (DoEHLG, 2010) arising from rulings in European, and Irish courts, and associated changes in statute.

The updated EC (2018) guidance is therefore followed in lieu of the 2010 DoEHLG guidance in this NIS, as supplemented by relevant unpublished (online) guidance from the NPWS<sup>7</sup> (updated to August 2018, at the time of writing).

## 6.2.3 Other Guidance

The methodology informing this NIS also draws on, and has evolved from guidance and recommendations from international AA practitioners (Levett-Therivel, 2009; Chvojková et al., 2013).

For instance, following Levett-Therivel (2009) *“the precautionary principle should be used with reasonableness, and should be commensurate with the level of risk and the level of uncertainty concerned. Time-consuming and costly ecological research should be required only in rare circumstances”*.

Other guidance relevant to field surveys and the assessment of technical effects includes the Draft Guidelines for Irish Planning Authorities on ‘Urban Development and Building Heights’ (Department of Housing, Planning and Local Government, 2018a), which state (p.9):

*“In development locations in proximity to sensitive bird and / or bat areas, proposed developments need to consider the potential interaction of the building location, building materials and artificial lighting to impact flight lines and / or collision”*.

## 6.3 Steps in Producing the NIS

The following steps for the NIS are compliant with the EC and DoEHLG guidance detailed above and are used as the basis for this NIS:

- Step 1 – Information Required (Section 8.1);
  - Informed by consultation responses (Section 6.1), and use of field and desktop studies (Section 6.4) to identify the relevant baseline environment relating to European sites (Section 7);
- Step 2 – Conservation Objectives (Section 8.2);
- Step 3 – Prediction of Effects (including Article 10 considerations; Section 8.3);
- Step 4 – Mitigation Measures (Section 9); and,
- Conclusion (Section 10).

## 6.4 Desktop and Field Study Methods

### 6.4.1 Desktop Study

This assessment was informed by a desktop study, which assessed the potential for all QIs, SCIs, and secondary features of European sites to occur within the ZOI, given their ecological requirements identified by Balmer *et al.* (2013) for SCIs (i.e. birds), and the NPWS for QIs (i.e. non-birds; NPWS, 2013a,b).

SCI birds and mobile QI species can travel many kilometres from their feeding or resting areas, so desktop surveys assessed the potential presence of such species beyond the European sites for which they are QIs/SCIs. Desktop studies had particular regard for the following sources:

- Information from the design team for the proposed development, including the Environmental Impact Assessment Report (EIAR) for the proposed development (AECOM, 2019), and including site-specific soil and groundwater data provided by the design team including the author of Chapter 7 of the EIAR for the proposed development (‘Land Soils, Geology and Groundwater’);
- Tabulated lists for all European sites in Ireland of SCIs and QIs, obtained through a data request to the NPWS;

<sup>7</sup> Available online at <https://www.npws.ie/development%20consultations>. Accessed November 2018.

- Information on ranges of mobile QI populations in Volume 1 of NPWS' Status of EU Protected Habitats and Species in Ireland (NPWS, 2013a), and associated digital shapefiles obtained from the NPWS Research Branch;
- Information on likely distribution of mobile SCIs bird populations from Bird Atlas 2007–11 (Balmer *et al.*, 2013), excluding birds of prey whose ranges were determined with reference to Hardey *et al.* (2013);
- Mapping of European site boundaries and Conservation Objectives for relevant sites in County Limerick and beyond, as relevant, available online from the NPWS;
- Distribution records for mobile populations of distant European sites held online by the National Biodiversity Data Centre (NBDC)<sup>8</sup>;
- Details of QIs/SCIs of European sites within the Limerick City Biodiversity Plan 2009-2014 (LCC, 2012), which had not been updated at the time of writing;
- Data including surface and ground water quality status, and river catchment boundaries available from the online database of the Environmental Protection Agency (EPA)<sup>9</sup>;
- National and regional surveys of semi-natural habitats, including grasslands (O'Neill *et al.*, 2013), saltmarsh (McCorry and Ryle, 2009; Devaney and Perrin, 2015), and woodland (Perrin *et al.*, 2008);
- Boundaries for catchments with confirmed or potential freshwater pearl mussel (FWPM) *Margaritifera margaritifera* populations in GIS format available online from the NPWS;
- Data obtained from Bat Conservation Ireland (BCI; see Section 6.1); and,
- Bird count data for European sites available online from Birdwatch Ireland's Wetland Bird Survey Programme<sup>10</sup>.

## 6.4.2 Field Study

### 6.4.2.1 Overview of Survey Objectives

The NIS was also informed by field surveys over a total of eleven dates in 2017, 2018, and 2019<sup>11</sup>, to determine within the Zol of the proposed development site, the location of European sites, and the known or potential distribution of any QI/SCI. The field surveys also considered the potential presence of any 'secondary' features of European sites, which may protect QIs or SCIs for instance including riparian habitats which may protect watercourses from pollution or human disturbance).

Informed by the desktop study (Section 6.4.1), project description (Section 5), and following the survey of habitats and invasive species (Section 6.4.2.2) which confirmed the absence of any significant semi-natural habitats in the urbanised habitats of the proposed development site<sup>12</sup>, field surveys included the following specific objectives:

- Determine if buildings or vegetation within the Zol of the proposed development could offer feeding or roosting habitat for lesser horseshoe bat *Rhinolophus hipposideros* which is the only bat species in Ireland for which European sites are designated and which (as will be detailed in Section 7.5.2.2) has been recorded within c.1 km of the proposed development site in the desktop study;
- Determine if any buildings or vegetation within the Zol of the proposed development could offer nesting or roosting habitat to SCI bird populations of SPAs which can nest in urban areas, such as gulls or peregrine falcon *Falco peregrinus*;
- Identify the potential presence of designation features for European sites within the Zol of the proposed surface water outfall into the Abbey River within the Lower River Shannon SAC (at Charlotte's Quay).
- Identify the potential presence in the River Shannon and/or Abbey Rivers, of features at risk of 'far-field' disturbance associated with piling during construction; and,
- Determine if invasive species scheduled to the European Communities (Bird and Natural Habitat) Regulations 2011 (S.I. No. 477) and 2015 (S.I. No. 355) (hereafter 'the Regulations') were present within the proposed development site and could pose a risk to European sites<sup>13</sup>.

<sup>8</sup> Available from <https://maps.biodiversityireland.ie/Map> Accessed June 2018

<sup>9</sup> Available from <https://gis.epa.ie/EPAMaps/> Accessed June 2018

<sup>10</sup> Available from <https://www.birdwatchireland.ie/?tabid=111> Accessed June 2018

<sup>11</sup> 10, 11 and 31 May 2017, 1 June 2017, 15 December 2017, 9 January 2018, 8 and 16 May 2018, 6 June 2018, 3 January 2019, and 12 February 2019.

<sup>12</sup> With the exception of the aquatic habitats at the proposed surface water outfall into the Abbey River within the Lower River Shannon SAC (at Charlotte's Quay).

### 6.4.2.2 Habitat and Invasive Species Surveys

Habitats and plants within the proposed development site and/or nearby areas of the River Shannon and Abbey River were surveyed on 10 and 31 May 2017, 6 June 2018, and 3 January 2019. The surveys included the identification of any invasive species present (which, if present, could pose a risk to European sites), and the identification of any habitats with the potential to host mobile populations of European sites. Finally, the surveys verified the results of desktop surveys, regarding the distribution of QI habitats of the Lower River Shannon SAC in the vicinity of the proposed development site (including the proposed outfall to the Abbey River).

### 6.4.2.3 Detailed Survey Methods for Lesser Horseshoe Bat

#### 6.4.2.3.1 Daytime Visual Inspections

A daytime visual inspection of buildings with potential suitability for roosting lesser horseshoe bats was conducted in daylight hours on 10 and 31 May 2017 to identify and photograph potential roost features and any potential bat entry/exit points.

The visual inspection included an internal and external building inspection of safely accessible buildings including 5 & 9 Ellen Street, 8 Rutland Street and 3 Patrick Street as well as various sheds in the courtyard in the centre of the site.

The results were used to grade structures as having Negligible, Low, Moderate, or High suitability for roosting bats having regard for the Bat Conservation Trust's (BCT) *Bat Surveys for Professional Ecologists: Good Practice Guidelines* (Collins, 2016).

#### 6.4.2.3.2 Bat Emergence and Re-Entry Surveys

Two surveyors carried out all surveys. Following the daytime visual inspections, emergence (pre-dusk) and re-entry (pre-dawn) surveys were carried out having regard for BCT guidance (Collins, 2016). Building features identified during the daytime inspections were prioritised during the emergence and re-entry surveys. Dusk emergence surveys started 30 minutes before sunset and ended two hours after sunset, while dawn re-entry surveys began two hours before sunrise and ended 30 minutes after sunrise. Initial surveys were carried out in May and June 2017, with update surveys in May and June 2018. All bat survey dates are tabulated in Section 6.4.2.1.5.

Buildings identified during the daytime visual inspections as being suitable for bat roosts were watched and if any bats emerged or entered, the surveyors attempted to pinpoint the roost entrance location, and identify and count the number of bats emerging/entering where light conditions allowed.

Bat detectors were used as a means of recording bat echolocation calls and identifying species present. Bat activity was also noted during emergence surveys, to provide an indication of the site's use by bats. Surveyors listened for bats using detectors and, on hearing a bat, they made an attempt to identify species, flight direction, height, and bat behaviour (e.g. feeding indicated by a feeding 'buzz', or social calls).

In 2017, surveyors used a combination of one Batbox Duet and one EM3 Echo Meter. In 2018, full spectrum Batlogger M detectors (Elekon AG) were used by both surveyors to record bat calls for ex-situ analysis. Weather details likely to influence bat activity including temperature, wind, and rain were also recorded during each survey.

All survey data were initially recorded onto survey maps in the field before being digitised and transferred into a Geographic Information System (GIS). Bat calls collected during surveys were stored digitally and subsequently identified to species level, where possible, using Kaleidoscope Pro (version 4.5.4) specialist software. These automated species identifications were additionally verified manually.

Once informed by the results of daytime visual inspection of buildings (and following recommendations in standard guidance (Collins, 2016) for survey effort of buildings with Moderate suitability for roosting bats), two emergence/re-entry surveys of 9 Rutland Street, 5 Ellen Street and 3 Patrick Street were carried out in May and June 2017 and a further two surveys were completed in May and June 2018 during suitable weather for bat survey (i.e. relatively calm and mild, with little or no rain). Surveyors were positioned with a view of the potential roost features on 9 Rutland Street, 5 Ellen Street and 3 Patrick Street, all of which faced into the central courtyard of the proposed development site.

<sup>13</sup> Under the Regulations (save in accordance with a licence) any person who "plants, disperses, allows or causes to disperse, spreads or otherwise causes to grow in any place" any species scheduled to the Regulations is guilty of an offence.

### 6.4.2.3.3 Hibernation Surveys

Bat hibernation surveys were carried out by suitably experienced AECOM ecologists under licence (Licence No: DER/BAT 2017-101) on 15 December 2017 and 09 January 2018. Safely accessible basements of buildings were entered on Rutland, Ellen and Patrick Street and inspected for suitability and direct signs of hibernating bats using a combination of a torch and digital 'endoscopic' camera to inspect deeper crevices. On 15 December 2017 five buildings were inspected: 4 Rutland Street, 6 Rutland Street, 8 Rutland Street, 5 Ellen Street, and 2 Patrick Street. Following this initial inspection, two buildings were considered to be suitable for hibernating bats: 5 Ellen Street and 8 Rutland Street. These were inspected for a second time on 09 January 2018.

### 6.4.2.3.4 Bat Activity Surveys

Two surveyors carried out all surveys. Following each emergence survey, bat activity surveys were conducted within the proposed development site. A pre-determined transect route around the proposed development site was walked a total of four times over two nights on 11 May and 10 June 2017, and a total of 3 times over two nights on 10 May and 31 May 2018.

As during the emergence/re-entry surveys, surveyors listened for bats using detectors with headphones and upon hearing a bat made an attempt to identify the direction and height of bat flight, and any notable bat behaviour (e.g. foraging or commuting). The equipment used for these surveys was as described for Bat Emergence and Re-entry surveys.

A 'static' (i.e. stationary automated) bat detector (Song Meter 2+ (SM2)) was additionally placed for a period of 8 consecutive nights from 8 May to 16 May 2018 to record bat activity within the proposed development site.

As for bat emergence and return surveys, bat recordings were analysed using Kaleidoscope Pro (version 4.5.4) and confirmed with manual assessment.

### 6.4.2.3.5 Summary of Bat Survey Dates

A summary table identifying all bat survey dates is presented in Table 1.

**Table 1: Dates and Timings of Bat Surveys of Proposed Development Site**

Date	Survey Type	Sunset Time	Start time of survey	End time of survey
10 May 2017	Preliminary ground level assessment of trees and structures followed by dusk emergence (followed by bat activity survey)	Sunset – 21:17 Dusk– 21:59	20:48	23:20
11 May 2017	Dawn re-entry	Sunrise – 05:45 Dawn– 05:03	03:51	06:00
31 May 2017	Dusk emergence survey (followed by bat activity survey)	Sunset – 21:46 Dusk–22:35	21:16	23:17
1 June 2017	Dawn re-entry	Sunrise – 05:16 Dawn – 04:28	03:00	05:31
8 May 2018	Dusk emergence survey (followed by bat activity survey)	Sunset – 21:14 Dusk – 21:55	20:45	22:48
8 May to 16 May 2018	'Static' (i.e. stationary automated) bat detector	Placed before dusk on 8 May. Removed before dusk on 16 May	N/A	N/A
6 June 2018	Dawn re-entry	Sunrise – 05:13 Dawn – 04:24	03:15	05:25

#### 6.4.2.4 Wintering (Wetland) Birds

The sources of wintering bird desktop data reviewed have been described in Section 6.4.1. A walkover survey to identify the potential distribution of wintering wetland bird habitats in the Abbey River and River Shannon within the potential Zol of noise and vibration disturbance from the proposed development was carried out in calm dry weather conditions on the morning of 12 February 2019. Wintering wetland bird surveys were not carried out (i.e. in the Abbey or Shannon Rivers upstream of the River Shannon and River Fergus Estuaries SPA), because:

- The proposed development site is located within an urban context, lacking significant wetland or vegetated habitats on or in which wetland birds would roost or feed; and,
- The Abbey River and River Shannon are not sufficiently tidal within the potential Zol of disturbance from the proposed development (i.e. within 500 m) for there to be exposed muds on which significant populations of wetland birds would feed.

#### 6.4.2.5 Nesting Birds

A nesting bird survey was carried out on the evenings of 10 and 31 May 2017, and mornings of 11 May and 1 June 2017 having regard for the methodology of the Common Bird Census (Marchant, 1983). This survey was repeated on the evening of 8 May 2018. The proposed development site was walked so that a surveyor came within 50 m of all potential nesting features. Birds were identified by sight and song and observations were plotted on a map. The focus of the survey was to identify the locations of individual nests in structures, to inform the potential requirement for seasonal building demolition/refurbishment. Breeding evidence was recorded in line with the British Trust of Ornithology (BTO) breeding status codes.

#### 6.4.2.6 Otter

During walkover surveys of the proposed development site and wider Zol along the Shannon and Abbey Rivers, searches were made for any potential breeding or resting sites for otter, and any feeding signs indicating otter presence (e.g. 'spraints' comprising food remains or territorial scent markings).

#### 6.4.2.7 Fish

The sources of desktop data for QI fish are included in Section 6.4.1. There were no fish surveys carried out because there are no instream works, and no bankside works proposed (with the exception of the localized works to an existing wall in Charlotte Quay to install the proposed surface water outfall to the Abbey River).

### 6.5 Criteria to Identify Relevant European Sites to the NIS

The 'source-pathway-receptor' model was applied to estimated Zols from the proposed development to identify a list of European sites and their QIs/SCIs potentially at risk of adverse effects to site integrity. These are termed 'relevant' European sites/QIs/SCIs throughout this NIS as relevant.

#### 6.5.1 The Source-Pathway-Receptor Model

The 'source-pathway-receptor' conceptual model is a standard tool in environmental assessment. In order for an effect to occur, all three elements of this mechanism must be in place. The absence or removal of one of the elements of the mechanism means there is no likelihood for the effect to occur. An example of this model is provided below:

- Source (s); e.g. piling works;
- Pathway (s); e.g. vibration and noise
- Receptor (s); e.g. roosting black-headed gulls *Chroicocephalus ridibundus* if present on quay walls on the nearby Abbey River or River Shannon;

The model is focused solely on relevant QIs/SCIs for which European sites are designated. Zones of Influence of Potential Effect Pathways

#### 6.5.2 Zones of Influence

The construction and operation of the proposed development has the potential to result in a number of effect pathways. The analysis of these effect pathways, using 'best available' scientific knowledge and professional judgement, leads to the identification of Zols.

The proximity of the proposed development to European sites, and more importantly their QIs/SCIs, can be of importance in identifying source-pathway-receptor models which could result in adverse effects.

For this NIS, a conservative approach has been used which minimises the risk of overlooking distant or obscure effect pathways, while also avoiding non-scientific and arbitrary buffer zones (e.g. 15 km), within which all European sites were considered. The starting point for this approach is to assess the complete list of all QIs/SCIs of European sites in Ireland (i.e. potential receptors), obtained in digital format from the NPWS, instead of listing European sites within arbitrary buffer zones.

Habitats and plants are not mobile, however, fauna species are and their predicted mobility outside European sites (i.e. range) will affect whether they occur within the Zol. The range of fauna species varies considerably, from a maximum of several metres (e.g. in the case of whorl snails *Vertigo* spp.), to hundreds of kilometres (in the case of migratory wetland birds). Whilst habitats and plants are not mobile, these features can still be adversely affected at considerable distances from an effect source; for instance where an instream habitat is located many kilometres downstream from a pollution source.

This difference in determining the Zol for (mobile) fauna versus (non-mobile) habitats has been illustrated in Image 2 and Image 3

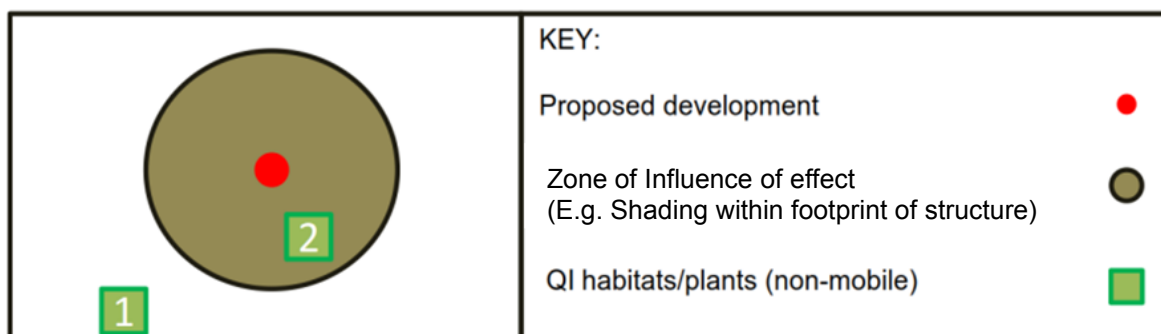


Image 2 Relationship between Zone of Influence and QI habitats and plants which are not mobile

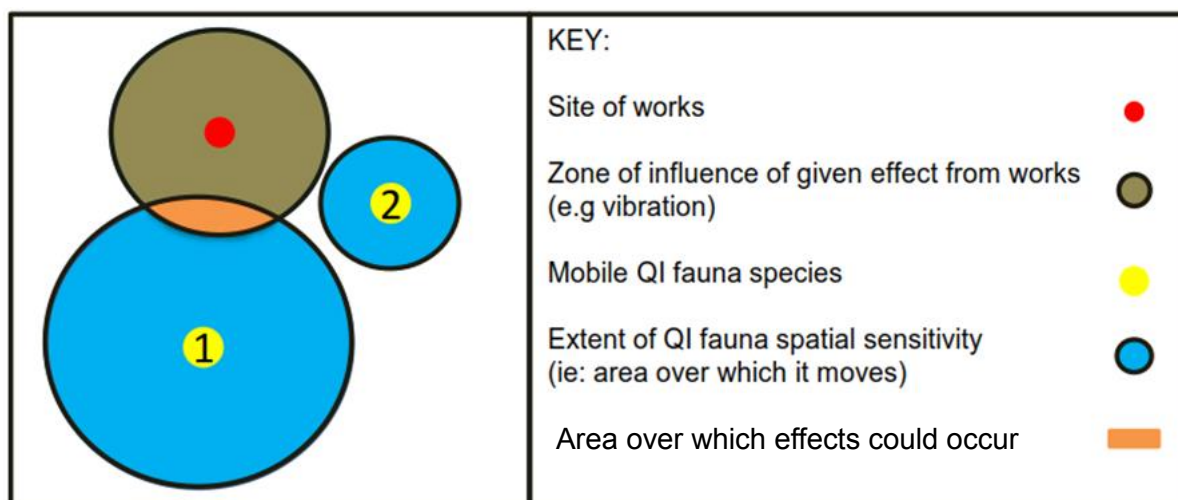


Image 3 Relationship between Zone of Influence and QI fauna species which are not mobile

In response to DoEHLG (2010) guidance, Zols were estimated for potentially relevant effects from the proposed development based on the “the nature size and location of the project”. These Zols are summarised in Table 2.

Table 2. Zones of Influence Estimated for Potential Effects from the Proposed Development

Phase	Source of Potential Effect	Description of Effect Pathway	Potential Zone of Influence of Effect (References Footnoted for Brevity)	Potential Relevance of Effect to AA Screening
Construction	Noise, vibration (including from piling), lighting and human presence during movements of vehicles and staff associated with construction activities.	During construction, noise or other construction-related disturbance could reduce the ability of populations of Qualifying Interest/ Special Conservation Interest species to forage, roost or breed (if Qualifying Interest/ Special Conservation Interest species are present within the estimated Zone of Influence).	Varies by species, and is difficult to define due to the variation in tolerances of different populations within the same species (e.g. rural vs urban), and the influence of local topography and ground conditions. Potentially assessed within 500 m of the proposed development footprint for wintering birds <sup>14</sup> , subject to the location and duration of the human disturbance (e.g. noise associated with human presence), and potential for local topography or other factors to mitigate the disturbance. However, distance could potentially be significantly lower (e.g. 150 m for potential disturbance impacts to otter underground sites from piling or blasting <sup>15</sup> , subject to local ground conditions.	Potential relevance to Special Conservation Interest fauna and Qualifying Interest habitats/species of European sites, if present.
	Surface water run-off carrying suspended silt or contaminants into the River Shannon and Abbey River (including following flooding)	<p>The proposed development requires the installation of a new outfall to the Abbey River (in Charlotte's Quay, adjacent the Lower River Shannon SAC) to service a new surface water sewer. During construction, there is potential for dust, silt, oils, fluids, paints, and/or concrete washings, etc. to enter the Abbey River and/or the River Shannon, either:</p> <ul style="list-style-type: none"> <li>• If contaminants within the proposed development site are washed into the proposed surface water sewer once installed, in the event where the treatment system is not installed and operational at the same time as the sewer is installed;</li> <li>• If precautions are not taken to prevent coastal flood waters from entering the proposed development site during construction (i.e. before super-elevated' entrance/exits are constructed)<sup>16</sup>; and/or,</li> <li>• Should concrete washings, grout, or silt be washed overland into the adjacent Abbey River (within the Lower River Shannon SAC) during installation of the new outfall in Charlotte's Quay.</li> </ul>	<p>The Zone of Influence of effects from contaminated surface water is difficult to accurately estimate as it will depend on numerous factors including the type and concentration of pollutants, assimilative capacity of receiving waters, and time of year (related to water levels).</p> <p>The proposed development site in Limerick City lies adjacent to the 'Shannon Estuary South' (freshwater) catchment in the Southwest region. However, both the River Shannon and Abbey Rivers are transitional downstream of the proposed development site.</p> <p>Applying the Precautionary Principle, it has been assumed that the proposed development has potential hydrological links to the 'Upper Shannon', 'Lower Shannon' and 'Mouth of Shannon' Hydrometric Areas (i.e. the entire estuarine catchment (s) downstream of proposed development).</p> <p>Local areas upstream of the discharge point to the Abbey River are also included in the Zone of Influence, given the Abbey River is tidal, and potential pollutants could be carried a distance upstream of the point of discharge.</p> <p>The open coastlines, where Coastal Waterbodies begin, are considered to fall outside the potential Zone of Influence of adverse effects.</p>	Potential relevance to Special Conservation Interest fauna and Qualifying Interest habitats/species of European sites, if present.

<sup>14</sup> Wintering birds collectively considered at risk of disturbance at up to 500 m based on compilation of data from Madsen (1985); Smit & Visser (1993) and Rees *et al.*, (2005).

<sup>15</sup> Having regard for guidance on road construction-related disturbance of underground sites from the National Roads Authority (NRA, 2006).

<sup>16</sup> The design team has reviewed the Shannon CFRAM Study which indicates that the proposed development is located in an area at risk during a 1 in 1,000 year return period (0.1% AEP) coastal flood event.

Phase	Source of Potential Effect	Description of Effect Pathway	Potential Zone of Influence of Effect (References Footnoted for Brevity)	Potential Relevance of Effect to AA Screening
	Disturbance of invasive species during the construction of the proposed development.	If invasive species are present, construction activities could lead to the dispersal of invasive species and/or material within and beyond the proposed development site; either via machinery, clothing or wild animals including birds, depending on the species concerned.	The Zone of Influence of effects for spread of terrestrial invasive species is difficult to accurately estimate, as plant fragments may be spread on tyre treads to distant unrelated sites. In relation to water-borne spread of vegetation, the Zone of Influence generally is restricted to the surface water Catchment Management Unit.	Potential relevance to Special Conservation Interest fauna and Qualifying Interest habitats/species of European sites, if present.
	Changes in groundwater quality, flow or yield associated with earthworks during construction.	Earthworks could interfere with groundwater potentially affecting the quality or distribution of habitats dependent on groundwater supply, if such habitats are present.	The Zone of Influence of potential effects to ground water quality, flow or yield are difficult to accurately estimate as it will depend on factors including the type and volumes of contaminations concerned, the depth and intrusion of excavations, and time of year (related to water levels). As a precautionary measure, a reasonable worst-case spatial Zone of Influence is considered to be the extent of the bedrock aquifer, as shown on the Geological Survey of Ireland (GSI) digital mapper, having regard for GSI Groundwater vulnerability mapping (reflecting type and thickness of soils, and presence of karst features), and potential interactions with surface water features.	Potential relevance to Qualifying Interest groundwater dependant habitats of European sites, if present.
	Noise, lighting and human presence during movements of vehicles and staff associated with operational activities.	During operation, noise or other disturbance from cyclists and pedestrians could reduce the ability of populations of Qualifying Interest/ Special Conservation species to forage, roost or breed (if Qualifying Interest/ Special Conservation species are present within the estimated Zone of Influence).	Varies by species as per first row in this table.	Potential relevance to Special Conservation Interest fauna and Qualifying Interest habitats/species of European sites, if present.
Operation	Surface water run-off during operation carrying suspended silt or contaminants into local watercourses (including following flooding).	The proposed treatment and attenuation system included in the design of the new surface water sewer will remove silt from roof and pedestrianised hardstanding run-off, as well removing hydrocarbons from run-off associated with vehicular use of the proposed Plaza, and adjacent roadways prior to entering the Abbey River within the Lower River Shannon SAC. Surface water from basement car parking areas which may be contaminated with detergents will be diverted into an existing combined sewer, which will carry this contaminated surface water to the existing licensed Bunlicky Waste Water Treatment Plant (WwTP) for treatment prior to discharge to the Lower River Shannon SAC.	No potential for adverse effects from this pathway, given: <ul style="list-style-type: none"> <li>The proposed treatment and attenuation system measures inherent in the new surface water sewer outfalling to the Abbey River (within the Lower River Shannon SAC), and,</li> <li>The diversion of run-off from car parking areas to Bunlicky Waste Water Treatment Plant (WwTP) for treatment prior to discharge to the Lower River Shannon SAC.</li> </ul>	Not relevant – pathway scoped out.



Phase	Source of Potential Effect	Description of Effect Pathway	Potential Zone of Influence of Effect (References Footnoted for Brevity)	Potential Relevance of Effect to AA Screening
Operation (cont.)	Proposed tall buildings posing a collision risk to birds	There is potential for the proposed 71.6 m high tower at Bank Place, to pose a collision risk to birds in flight.	<p>A major study of the characteristics of migratory bird populations across Western European flyways across multiple seasons and multiple years using high-precision weather radar indicates typical flight heights for birds on migration exceed 600 m above ground level (Dokter et al., 2010).</p> <p>As such, significant bird populations on migration (from distant SPAs) are unlikely to collide with the proposed tower. The bird populations potentially affected are most likely to be local populations using the Shannon and/or Abbey Rivers as visual cues along which to move between feeding and roosting sites, which could potentially strike the proposed tower, particularly at night and/or in conditions of poor visibility.</p>	Potential relevance to SCI birds of the River Shannon and River Fergus Estuaries SPA.

Phase	Source of Potential Effect	Description of Effect Pathway	Potential Zone of Influence of Effect (References Footnoted for Brevity)	Potential Relevance of Effect to AA Screening
Operation (cont.)	Foul water from the proposed development site	<p>The construction of the Bunlicky WwTP (and the associated construction of 45 km of large diameter sewers) has resulted in the elimination of some 50 sewer outfalls which had been discharging directly into the Shannon and Abbey Rivers<sup>17</sup>.</p> <p>In January 2019, the relevant Connections and Developer Services Manager of Irish Water responded to AECOM in writing that <i>“the water services authority have provided confirmation that the load generated by the proposed development can be catered for”</i>.</p> <p>The potential for pollution to result from the discharge of treated effluent in the River Shannon, following treatment at Bunlicky WwTP is therefore excluded, and this potential pathway is not considered further in this NIS.</p>	None – pathway scoped out.	Not relevant – scoped out

<sup>17</sup> Source: Punch Consulting Engineers. Available online from [http://punchconsulting.com/assets/files/downloads/Limerick\\_Main\\_Drainage\\_Scheme\\_Irish\\_Construction\\_Magazine.pdf](http://punchconsulting.com/assets/files/downloads/Limerick_Main_Drainage_Scheme_Irish_Construction_Magazine.pdf)

## 7. Baseline Description for NIS

This Section describes the desktop and field survey results, in order to describe the relevant baseline environment to the proposed development. The relevant baseline environment relates to anything that may be directly or indirectly related to the reasons for designation for, or protection of European sites.

### 7.1 European Sites within and adjacent the Proposed Development Site

A proposed surface water sewer and new outfall to the Abbey River (at Charlotte's Quay) means the proposed development site is 0 m from (i.e. adjoins but does not overlap the) the Lower River Shannon SAC. Excluding the proposed surface water drain and associated outfall to the Abbey River, the Lower River Shannon SAC (SAC; site code: 002165) is located c. 75 m from the rest of the proposed development site at its nearest point.

The River Shannon and River Fergus Estuaries SPA, whose boundary coincides with the upper (fully) tidal limit in the Shannon Estuary (site code 2165), is located c. 725 m downstream of the proposed development site. These European sites are shown in Figure 1 (Appendix A)

### 7.2 More Distant European Sites

There are no other European sites downstream of the proposed development site, or otherwise linked to the proposed development site. The next nearest European sites to the proposed development site are:

- The Glenomra Wood SAC (site code 1013) designated for QI old sessile oak woods (NPWS, 2018a), which is located c. 10 km to the north;
- The Tory Hill SAC (site code 439) which is designated for QI semi-natural dry grasslands, calcareous fens, and alkaline fens (NPWS, 2018b), and is located c. 13.5 km to the south; and,
- The Slievefelim to Silvermines Mountains SPA (site code 4165) which is designated for SCI breeding hen harrier (NPWS, 2018c), and is located c. 15.5 km to the east.

### 7.3 Terrestrial Habitats

The interior of the proposed development site, which includes areas of hardstanding, gravel, spoil heaps, and gullies within the inner courtyard contains a variety of common pioneer and weedy species such as rose-bay willow herb *Chamerion angustifolium*, common nettle *Urtica dioica*, ragwort *Senecio jacobaea*, dandelion *Taraxacum officinale* agg., ribwort plantain *Plantago lanceolata*, greater plantain *Plantago major*, daisy *Bellis perennis*, cleavers *Galium aparine*, white clover *Trifolium repens*, creeping buttercup *Ranunculus repens*, spear thistle *Cirsium vulgare*, common figwort *Scrophularia nodosa*, woody nightshade *Solanum dulcamara*, Yorkshire-fog *Holcus lanatus*, red valerian *Centranthus ruber*, as well as frequent patches of butterfly-bush *Buddleja davidii* across the site.

Buildings and stone walls hosted scattered plants of Atlantic ivy *Hedera hibernica*, ivy leaved toadflax *Cymbalaria muralis*, red valerian and butterfly-bush.

A total of 16 planted semi-mature trees are located around the boundary of the proposed development site. Non-native specimens dominated, typically comprising Norway maple *Acer platanoides*, small-leaved lime *Tilia cordata* and sycamore *Acer pseudoplatanoides*, although some native wych elm *Ulmus glabra* trees also occurred.

None of the terrestrial habitats overlapping or within the ZoI of the proposed development are QIs of European sites. All known locations for terrestrial QI habitats of the Lower Shannon SAC, including QI perennial vegetation of stony banks, QI vegetated sea cliffs, priority QI alluvial forests, and QI *Molinia* meadows are outside the ZoI of adverse effects from the proposed development, based on field surveys, and desktop data (NPWS, 2012a; NPWS, 2012b; Barron *et al.*, 2011; Perrin *et al.* 2008; Devaney *et al.*, 2013).

The proposed surface water outfall to the Abbey River (in Charlotte's Quay) will run entirely under existing built ground comprising a paved pedestrian plaza and the R445, before discharging surface water, following attenuation and treatment, to the Abbey River within the Lower River Shannon SAC through an existing limestone wall in Charlotte Quay, above the high water mark. Bryophytes (i.e. mosses and lichens) present on the wall in Charlotte Quay, which comprise QI 'watercourses of plain to montane levels' habitat of the Lower River Shannon SAC, are described in Section 7.4.1.2.

## 7.4 Aquatic Habitats, Water Quality, and Flood Risk)

### 7.4.1 Watercourses and Associated Habitats

There are no watercourses or wetland habitats within the proposed development site, however, aquatic QI habitats and species of the Lower River Shannon SAC, and SCI wetland birds and their habitats (from the River Shannon and River Fergus Estuaries SPA) are present downstream of the proposed development site within the Zol of the proposed development site.

#### 7.4.1.1 QI Estuarine and Mudflat Habitats

The various supporting documents (NPWS, 2012b-e) to the Conservation Objectives for the Lower River Shannon SAC were consulted. These documents indicate that marine community types associated with QI estuary habitats occur adjacent to the proposed outfall to the Abbey River (see Figure 2; Appendix A), and throughout the River Shannon downstream.

QI mudflat habitats of the Lower River Shannon SAC occur at least 0.7 km downstream, at which point the River Shannon Estuary is tidal, exposing mud substrates at low tide.

#### 7.4.1.2 QI Watercourses of Plain to montane Levels

QI watercourses of plain to montane levels habitat is a very broad habitat type, which can comprise one or more very common and widespread species found in most freshwater habitats (e.g. including water starworts *Callitriche* spp. and water mosses *Fontinalis* spp.), as well as a variety of rarer vascular (i.e. flowering) plant and bryophyte communities of restricted distribution (NPWS, 2013a). Site-specific Conservation Objectives for the Lower River Shannon SAC (NPWS, 2012a) have “*identified and concentrated upon three high-conservation value sub-types*”,

- Bryophyte-rich streams and rivers;
- Triangular club-rush *Schoenoplectus triquetus*; and,
- Opposite-leaved pondweed *Groenlandia densa*.

Bryophyte communities (i.e. mosses and lichens) associated with QI ‘watercourses of plain to montane levels’ habitat of the Lower River Shannon SAC were identified on the existing limestone wall of Charlotte Quay by the Abbey River, in the vicinity of the proposed surface water outfall (Figure 2). Having regard for the Site-specific Conservation Objectives for the Lower River Shannon SAC (NPWS, 2012a), these bryophytes correspond to the “*high-conservation value sub-type*” named “*Bryophyte-rich streams and rivers*”.

The bryophyte growth noted in the wall of Charlotte Quay (Photograph 1) conspicuously follows the horizontal line of frequent flooding of the Abbey River, approximately 1 m below the location of the existing outfall and in the vicinity of the location of the proposed outfall. It was not safe to collect a sample of the bryophytes to determine the species present given their location below the existing road level. Furthermore, having regard for European Commission guidance (EC, 2013), it is arguable that [any] “*aquatic mosses*” (p. 46) qualify as QI ‘watercourses of plain to montane levels’ habitat, regardless of which species are present. As such, applying the Precautionary Principle, these aquatic bryophytes were assumed to constitute QI habitat of the Lower River Shannon SAC of international importance.



**Photograph 1. View south of Charlotte's Quay. New outfall to be installed in the vicinity of existing outfall (blue dot), significantly above the typical flood level containing bryophytes, and indicated by a blue line.**

The interpretation that the bryophytes present constitute the bryophyte-rich sub-type of QI 'watercourses of plain to montane levels' habitat was further supported by the relevant Conservation Objectives supporting documentation (NPWS, 2012c) in which it is stated:

- *"The full distributions of this habitat and its sub-types in this site are currently unknown... Further investigation of all sub-types is required (p.3)"; and,*
- *"There are many bryophytes that grow on rocks in and by streams and rivers, where they keep moist from the constant humidity or water splashes (p. 4)".*

The nearest known location for QI triangular club-rush is located c. 845 m south east and downstream of the proposed development site in the River Shannon (NPWS, 2012e). Applying the Precautionary Principle, this QI population is within the Zol of adverse pollution effects from the proposed development site.

There are no QI opposite-leaved pondweed populations within the Zol of likely significant effects from the proposed development site. The nearest known location for QI opposite-leaved pondweed is c. 300 m north east and upstream of the proposed development site in the Abbey River.

#### **7.4.1.3 Other Relevant Aquatic Habitats**

There are no other QI aquatic habitats of the Lower River Shannon SAC within the Abbey River adjacent to the proposed outfall. There are no known instances of other QI aquatic habitats of the Lower River Shannon SAC within c. 9 km of the proposed development site.

All other QI estuarine habitats for which the Lower River Shannon SAC is designated to include saltmarsh, lagoon, reef and sandbank habitats do occur (albeit in excess of 9 km) 'downstream' of the proposed development site in the Shannon Estuary. In the absence of a scientific basis to exclude the effect pathway to these receptors based on distance, all these habitats are, despite their distance potentially within the Zol of adverse effects from the proposed development site.

There is SCI wetland bird habitat of the River Shannon and River Fergus Estuaries SPA present c. 0.7 km downstream of the proposed development site, within the potential Zol of adverse pollution effects.

#### 7.4.1.4 Summary of Distribution of QI/SCI Aquatic Habitats

The proximity to the proposed development site of known instances of QI aquatic habitats of the Lower River Shannon SAC are summarized in Table 3

**Table 3. Distance from the Proposed Development Site of QI/SCI habitats of the Lower River Shannon SAC and River Shannon and River Fergus Estuaries SPA**

Habitat (* = Priority) (All are SCI habitats of the Lower River Shannon SAC except for Wetland bird habitats)	Distance From Proposed Development
Water courses of plain to montane levels (code 3260)	Varies: -Bryophyte-rich communities are located in the wall of Charlotte Quay adjacent to new outfall into Abbey River (i.e. 0.0 km). -Triangular club-rush located c. 0.8 km south east and downstream (River Shannon) (NPWS, 2012e). -Opposite-leaved pondweed is located c. 0.3 km north east and upstream (Abbey River/Park Canal);
Estuaries (code 1130)	Adjacent new outfall into Abbey River (i.e. 0.0 km). NPWS, 2012c)
Wetland bird habitats (River Shannon and River Fergus Estuaries SPA)	c. 0.7 km downstream (NPWS, 2012c)
Mudflats (code 1140)	c. 0.7 km downstream (NPWS, 2012c)
Reefs (code 1170)	c. 9 km downstream (NPWS, 2012c)
Atlantic salt meadows (code 1330)	c. 11 km downstream (NPWS, 2012b)
<i>Salicornia</i> and other annuals colonising mud and sand (code1310)	c. 12.5 km downstream (NPWS, 2012b)
Coastal lagoons* (code 1150)	c. 23 km downstream (NPWS, 2012d)
Mediterranean salt meadows (code1410)	c. 30 km downstream (NPWS, 2012b)
Large shallow inlets and bays (Code1160)	c. 58 km downstream (NPWS, 2012c)
Sandbanks (code 1110)	c. 75 km downstream (NPWS, 2012c)

#### 7.4.2 Water Quality

Analysis of the EPA online mapper<sup>9</sup> identified two watercourses within the Zol of the proposed development, namely the transitional waters of the Abbey River and the River Shannon. These rivers are both hydrologically connected to the proposed development site as per the three pathways for surface water run-off during construction identified in Table 2.

The water quality of estuarine waters within the Zol of the proposed development (as well as the water quality of coastal waters further downstream in the mouth of the Shannon) is unpolluted according to the EPA<sup>18</sup>.

#### 7.4.3 Groundwater and Contaminated Land

##### 7.4.3.1 Groundwater

None of the SCIs of the Lower River Shannon SAC or River Shannon and River Fergus Estuaries SPA have relatively high groundwater dependency<sup>19</sup>. No groundwater-dependent SCIs of other European sites occur (in the (urban) environs of the proposed development site, where the intensely developed banks of the River Shannon are devoid of semi-natural vegetation.

Due to the potential for groundwater to be contaminated during construction work (including the potential for tidal interactions with groundwater), groundwater monitoring wells were surveyed and levels monitored for an extended period in May 2018, as part of the 'Land, Soils, Geology and Groundwater Chapter' of the EIAR for the proposed development (AECOM, 2019). This monitoring concluded that:

<sup>18</sup> Available from: <https://gis.epa.ie/EPAMaps/>. Accessed January 2019 Most recent results from 2010-2012.

<sup>19</sup> Identified with reference to discussion of ground-water related threat s and pressures of high importance by the NPWS (2013, a, b).

- *“The depth to groundwater during the monitoring period was between 1 m and 2 m below ground level ,*
- *The groundwater present responds only slightly to tidal fluctuations, [and] as such, there is no risk of tidal ingress during the construction or operation of the proposed development.*

During the 2017 site investigation, samples of shallow groundwater were collected and submitted for laboratory analysis of a broad spectrum suite of potential contaminants and general water quality parameters, including:

- Total petroleum hydrocarbons (TPHs), which are associated with hydrocarbon fuels;
- Polycyclic aromatic hydrocarbons (PAHs), which are associated with tars, fuels and ash;
- Metals;
- Volatile and semi-volatile organic compounds (VOC and SVOCs), which, in addition to the above, can also be associated with degreasing, dry cleaning and painting activities etc.
- Inorganics, major ions; and
- Chemical and biological oxygen demand.

Based on the analytical results, groundwater beneath the proposed development site was considered not to be a source of risk to waterbodies. While leaching of metals from made ground and subsoil was found to be a potential risk to groundwater at the site, the analytical results for groundwater indicated that it does not contain metals in excess of relevant standards for protective of controlled water and, therefore, the potential risk posed by metals in made ground and subsoil is not being realised.

#### 7.4.3.2 Contaminated Land

Everything in this Section is as stated in the Land, Soils, Geology and Groundwater Chapter' of the EIAR for the proposed development (AECOM, 2019).

In 2017 (and as stated in the Land, Soils, Geology and Groundwater Chapter' of the EIAR for the proposed development; AECOM, 2019) assessment for the presence of ionisable volatile organic compounds (VOCs) in made ground and subsoils within the proposed development site was undertaken in the field using a portable photo-ionisation detector (PID). PID results were generally very low (<5.0 parts per million (ppm)) with a maximum PID reading of 67.7 ppm recorded in a stratum with a slight hydrocarbon odour. The PID readings obtained did not identify a significant source of volatile organic contamination.

During the 2017 site investigation, samples of made ground and subsoil were collected and submitted for laboratory analysis. A broad spectrum suite of potential contaminants was analysed for, including:

- TPHs;
- PAHs;
- Metals;
- PCBs; and,
- VOC and SVOCs.

Leachate tests were run on samples of made ground and subsoil with the leachate generated also subject to laboratory analysis for a reduced suite of parameters.

The assessment concluded that concentrations of PAHs and lead in samples of made ground had the potential to impact future residents and commercial users of the site. The exceedances were identified in the following areas of the site:

- Phase 1: to the east of Parcel 5 (lead in made ground) and south of Parcel 4 (lead in made ground); and
- Phase 2: to the rear of Patrick St (lead in made ground), west of Bogue's Yard (lead in made ground) and south of Bogue's Yard (lead and PAHs in made ground).

With regard to metals in made ground and in leachate from made ground and subsoil, concentrations indicated that metals in made ground and subsoil had the potential to impact groundwater in the bedrock aquifer beneath the site.

In addition:

- No VOCs, SVOCs or PCBs were detected above laboratory detection limits in any of the soil samples analysed.
- Trace concentrations of hydrocarbons (<75 mg/kg) were detected in five of the 23 soil samples analysed, and did not exceed relevant standards.
- No asbestos containing material was identified by the laboratory in any of the soil samples analysed.

#### 7.4.3.3 Summary Remarks on Groundwater and Contaminated Land

Albeit at trace concentrations (<75 mg/kg), hydrocarbons were identified in six of 23 soil samples within the proposed development site. Metals were identified in made ground and subsoil with the potential to impact groundwater in the bedrock aquifer beneath the site, albeit analytical results for groundwater indicate that it does not contain metals in excess of relevant standards and the potential risk posed by metals in made ground and subsoil is not being realised.

#### 7.4.4 Flood Risk

As has already been detailed in Section 5.5 in the context of the Finished Floor Levels, the Shannon CFRAM Study indicates that the proposed development is at risk from a 1 in 1,000 year coastal flood event<sup>20</sup> (0.1% Annual Exceedance Probability).

While fluvial flooding (i.e. associated with rivers) has historically occurred in and around Limerick City in the past associated with the River Shannon and Abbey River, the Fluvial and Pluvial Maps for the Shannon Catchment Flood Risk Assessment and Management Study (CFRAM)<sup>21</sup> (note: pluvial is associated with rainfall) indicate that the proposed development site is not at significant risk of flooding from either fluvial or pluvial flooding. This is supported by the lack of recorded fluvial flood events in the vicinity of the proposed development<sup>22</sup>.

Similarly, no instances of pluvial flooding have been recorded for the proposed development site<sup>22</sup>

### 7.5 Mobile species

#### 7.5.1 Birds

##### 7.5.1.1 Breeding Birds

Herring gull *Larus argentatus* was recorded nesting within the proposed development site, where probable breeding evidence for a single pair of herring gull was recorded at buildings on Rutland Street in the summer of both 2017 and 2018. A single occupied nest of lesser black-backed gull *Larus fuscus* was recorded (2017 only) in a chimney pot on a roof top on Rutland Street. Roof-nesting and roosting gull populations of both these species are common in urban areas around the Irish coastline. Neither of these populations is associated with SCI populations of nearby or more distant SPAs. There are no SPAs designated for either gull species within 100 km of the proposed development site. Potential impacts to these species have been mitigated within the EIAR for the proposed development site, and these species are not discussed further.

There is no potential breeding habitat (i.e. riparian wooded areas) for SCI cormorant of the River Shannon and River Fergus Estuaries SPA within the nearby Abbey or Shannon Rivers or wider ZoI of noise and vibrational disturbance from the proposed development site.

The potential presence of peregrine falcon will be assessed prior to the commencement of demolition and construction by a suitably qualified ecologist, as they can nest on urban structures, and are the SCI of several SPAs in Ireland. There is no evidence, from desktop<sup>8</sup> or field surveys, of SCI peregrine falcon roosting or nesting within the proposed development site. Home ranges of peregrine falcon are unlikely to exceed 10 km based on published estimates (Hardey et al., 2013). The nearest SPA designated for this species is the Dingle Peninsula SPA (site code 4153) located more than 50 km from the proposed development site. As such, there is no potential for the proposed development site to offer SCI peregrine nesting or roosting habitat.

There is no potential for other SCI breeding birds to occur within the proposed development site.

<sup>20</sup> Available online at [shannoncfрамstudy.ie/](http://shannoncfрамstudy.ie/) Accessed December 2018; specifically, CFRAM Map S2526LIK\_EXCCD\_F1\_24 (dated June 2016).

<sup>21</sup> Available online at [www.shannoncfрамstudy.ie/](http://www.shannoncfрамstudy.ie/) Accessed December 2018.

<sup>22</sup> Available online from the Office of Public Works' (OPW) national flood hazard mapping [www.floodmaps.ie](http://www.floodmaps.ie) ;



### 7.5.1.2 Wintering Wetland Birds

#### *Feeding and Roosting Birds*

The urban habitats within the proposed development site do not offer potential feeding or roosting habitat to significant SCI wetland bird populations.

The River Shannon and River Fergus Estuaries SPA, located c. 0.7 km downstream, is designated for 21 bird species, and wetland bird (NPWS, 2012b). All but one of the species for which the SPA is designated are non-breeding populations. Cormorant *Phalacrocorax carbo* is designated for both breeding and non-breeding populations.

Observations on known and potential wintering wetland bird habitats were assessed in the course of the walkover survey of the Abbey River and River Shannon on the 12 February 2019, in conjunction with the digital version of the Site Specific Conservation Objectives (SSCO) for the River Shannon and River Fergus Estuaries SPA (NPWS, 2012g). Together, field observations and desktop data indicate that The nearest significant bird populations of the River Shannon and River Fergus Estuaries SPA to the proposed development site are SCI wintering and feeding flocks of several hundred black-headed gull<sup>23</sup>. The SCI black-headed gull populations roost (and in some locations feed on discarded food) on existing quay walls, pontoons, and railings on the eastern bank of the River Shannon, c. 120 m southwest of the proposed development site at their nearest point (pontoons by the Hunt Museum). These SCI black-headed gull feeding/roosting locations are physically screened from the proposed development site by existing buildings.

There are likely to be SCI feeding populations of several other species for which the River Shannon and River Fergus Estuaries SPA is designated (e.g. several duck species<sup>24</sup>, whooper swan *Cygnus cygnus*, and light-bellied Brent goose *Branta bernicla hrota*), in the River Shannon downstream of the proposed development site.

#### *Birds in Flight*

Black-headed gull individuals were observed overflying the proposed development site in winter 2018 and 2019. This would be expected due to the urban context for the proposed development site (as urban sites are favoured by many gull species) and due to the proximity of nearby black-headed gull roosts. There is also potential for other SCI bird species to overfly the proposed development site such as cormorant *Phalacrocorax carbo*, or light-bellied Brent goose *Branta bernicla hrota*, if commuting between downstream estuarine areas within the River Shannon and River Fergus Estuaries SPA, and upstream, undesignated (inland) feeding/roosting areas including playing pitches, or other wetlands/green spaces. Numbers and/or frequency of flights of these other SCI species are predicted to be significantly reduced relative to black-headed gull.

As such, whilst the wetland birds named in the preceding paragraph do not stop to feed or roost within the proposed development site, they may occasionally fly through or over it (and this is of relevance to the assessment of potential bird collision risk from proposed structures).

## 7.5.2 Mammals

### 7.5.2.1 Otter

Otter is a QI of the Lower River Shannon SAC. There are no potential locations for breeding or resting sites of otter in the nearby Abbey River or River Shannon or wider ZOI, and there is no sheltered riparian feeding habitat often favoured by otter (O'Sullivan, 1993) present locally. A search of NBDC records<sup>7</sup> returned a 2017 observation of an individual otter in the River Shannon, c. 400 m south west of the proposed development, within the ZOI of pollution effects.

In conclusion it has been assumed that foraging or commuting otter may occur occasionally in the Shannon and/or Abbey Rivers nearby the proposed development site, but as a minimum within the ZOI of adverse pollution effects.

### 7.5.2.2 Bats

As already highlighted in Section 6.4.2, lesser horseshoe bat is the only species for which SACs are designated in Ireland, and is also a QI of the Lower River Shannon SAC. As such, the lesser horseshoe bat is the only bat species assessed in this NIS.

<sup>23</sup> Smaller flocks of herring gull, common gull *Larus canus*, and lesser-black-backed gull *Larus fuscus* also occur, but these are not SCI features of the River Shannon and River Fergus Estuaries SPA.

<sup>24</sup> Shelduck *Tadorna tadorna*, Wigeon *Anas penelope*, Teal *Anas crecca*, and Shoveler *Anas clypeata* may all occur.

Although correspondence from BCI, dated 21 May 2017 returned no records of lesser horseshoe bat roosts, a search of NBDC records<sup>8</sup>, returned a 2015 field observation of an individual lesser horseshoe bat c. 1.1 km north east of the proposed development site. No lesser horseshoe bats were recorded within the Zol of the proposed development site in the course of two full seasons of bat emergence/return surveys and activity surveys in 2017 and 2018, completed by suitably experienced bat ecologists<sup>25</sup>, having regard for recommended survey effort for bats (Collins, 2016). The nearest European site with QI lesser horseshoe bat is the Tory Hill SAC, located c.13.7 km to the south of the proposed development site, which is significantly further from the proposed development site, than the maximum recorded foraging range (5.15 km) for lesser horseshoe bats from their roosting sites based on best available scientific knowledge in the form of radio-tracking data (Schofield, 1996; Bontadina et al., 2002; Rush and Billington, 2014).

There is no evidence of, or potential for lesser horseshoe to occur within the Zol of the proposed development site.

### Marine mammals

Bottlenose dolphin *Tursiops truncatus* is a QI of the Lower River Shannon SAC (NPWS, 2012c). Whilst bottle-nosed dolphin may occasionally occur within the middle reaches of the River Shannon Estuary in urban Limerick, the NPWS (2012c) identify the nearest 'suitable' bottlenose dolphin habitat as occurring c. 5.5 km downstream of the proposed development site. 'Critical habitat' (i.e. core habitat used preferentially within which the majority of dolphin occur) is located a minimum of c. 48 km downstream of the proposed development site. Pollution effects to fish in the Abbey River or River Shannon could reduce dolphin prey resources downstream. Despite their distance downstream, QI bottlenose dolphin is assumed to occur within the Zol of adverse pollution effects.

## 7.5.3 Fish

### 7.5.3.1 QI Atlantic Salmon and Lamprey

QI Atlantic salmon *Salmo salar* spawn upstream and outside the Zol of the proposed development. However the species does occur in the estuarine waters of the River Shannon on passage between upstream spawning and downstream estuarine/coastal waters, within the Zol of adverse pollution effects from the proposed development site.

There are three QI lamprey species of the Lower River Shannon SAC (brook lamprey *Lampetra planeri*, river lamprey *Lampetra fluviatilis*, and sea lamprey *Petromyzon marinus*). The brook lamprey is restricted to freshwater habitats and could not occur in the transitional waters within the Zol of adverse pollution effects from the proposed development site.

Sea lamprey is likely to spawn and feed in the estuarine habitats downstream of the proposed development site; while river lamprey (which spawns in freshwater upstream before migrating downstream) occurs in the downstream estuarine waters during its growth phase. Both sea and river lamprey occur downstream within the Zol of adverse pollution effects from the proposed development site.

## 7.5.4 Invertebrates

There are no suitable (freshwater) habitats for QI freshwater pearl mussel *Margaritifera margaritifera* within the Zol of the proposed development. The habitat of freshwater pearl mussel in Ireland is restricted to near natural, clean flowing fresh waters, often downstream of ultra-oligotrophic lakes (NS2, 2010). The nearest known population of freshwater pearl mussel to the proposed development is within the Cloon (Shannon Estuary) catchment (NS 2, 2010), which is not hydrologically connected to the proposed development site.

There is no suitable habitat for QI marsh fritillary butterfly *Euphydryas aurinia* within the Zol of the proposed development (i.e. semi-natural habitats containing the larval food plant devil's bit scabious *Succisa pratensis*). The nearest European site with QI marsh fritillary butterfly is Barrigone SAC (site code 1065), located c. 28 km south west of the proposed development, which is outside the potential dispersal range of the species (i.e. c. 10 km, according to Zimmerman *et al.*, 2011).

There is no potential habitat for other QI invertebrate species (e.g. whorl snails *Vertigo* spp., or Kerry slug *Geomaculus maculosus*) within the Zol of the proposed development site.

<sup>25</sup> Bat surveys were led by AECOM ecologists Dr Emma Boston (who holds a PhD in bat ecology, has over 14 years' experienced in bat survey and research, and has authored 17 no. peer-reviewed papers on bat ecology), Jenny Jones (five years' bat survey experience), and Caitriona Fenton (four years' bat survey experience). Hibernation surveys were led by Dr Emma Boston under licence No: DER/BAT 2017-101.

## 8. Appropriate Assessment

### 8.1 Step 1: Information Required

#### 8.1.1 Information on the Proposed Development

The proposed development has been described in Section 5.

#### 8.1.2 Information on European Sites

Having regard for the Zols in Table 2 on page 16, which were developed from the Project Description in Section 5, there are two European sites within the Zol of the proposed development: the Lower River Shannon SAC and the River Shannon and River Fergus Estuaries SPA.

No effect pathways have been identified between the proposed development and any more distant European sites.

This judgement has been informed by review of best available scientific knowledge on the known and potential distribution of European site designation features in Section 7.

#### 8.1.3 Source-Pathway-Receptor Links Identified

##### 8.1.3.1 Construction-Phase (Two Pathways identified)

###### 8.1.3.1.1 Pollution

A potential pollution effect pathway (arising during construction only) has been identified between the proposed development and both the Lower River Shannon SAC and the River Shannon and River Fergus Estuaries SPA. These are the only European sites downstream of the proposed development.

#### *Surface Water*

The proposed development requires the installation of a new outfall to the Abbey River (in Charlotte's Quay, adjacent the Lower River Shannon SAC) to service a new surface water sewer. During construction, there is potential for dust, silt, oils, fluids, paints, and/or concrete washings, etc. to enter the Abbey River and/or the River Shannon, either:

- If contaminants within the proposed development site are washed into the proposed surface water sewer once installed, in the event where the SUDS system is not installed and operational at the same time as the sewer is installed;
- If precautions are not taken to prevent coastal flood waters from entering the proposed development site during construction (i.e. in advance of construction of the operational phase super-elevated' entrance/exits), and/or
- Should concrete washings, grout, or silt be washed overland into the adjacent Abbey River (within the Lower River Shannon SAC) during installation of the new outfall in Charlotte's Quay.

#### *Groundwater*

Excavation and removal of made ground from across the site will reduce the potential risk posed by contaminants present in near surface soil and made ground. Groundwater at the proposed development site did not contain contaminants of concern at concentrations in excess of relevant standards. The presence of stiff clay beneath the site and cover of large areas of the site with buildings or hard standing during future development will restrict the potential vertical pathway for water moving beneath the site and limit rainfall percolation, consequently reducing further leachate generation. Excavation of made ground from across the site during the early stages of construction work will further reduce the risk posed by contaminants present in near surface soil and made ground.

Nevertheless, in addition to the above (surface water) pollution pathway, and although there is no significant tidal interaction with groundwaters the author of the 'Land, Soils, Geology and Groundwater' Chapter of the EIAR for the proposed development has identified potential pollution effects to groundwater and soils before mitigation measures. Specifically, a potential risk was identified through leaching of contaminants (principally metals) from soils at the site which groundwater results indicate are not being realised. However, applying the Precautionary Principle, such pollution could occur during enabling works and early stages of construction in each phase resulting in soil and/or groundwater contamination encountered during construction migrating into nearby

estuarine waters within the Lower River Shannon SAC, and/or River Fergus and River Shannon and Estuaries SPA.

As such, whether by surface and/or groundwater pathways, contaminants could enter, and affect the distribution of features of the Lower River Shannon SAC, and/or River Fergus and River Shannon and Estuaries SPA downstream, including Atlantic salmon, river lamprey, sea lamprey, and 21 species of wetland birds. The Abbey River is tidal, and as such so potential pollutants could also be carried upstream of the point of discharge.

#### 8.1.3.1.2 Habitat Loss

A second pathway (related to potential habitat loss of bryophytes during construction) has been identified between the proposed development and the Lower River Shannon SAC, which could arise in the course of installing the new Abbey River outfall.

There is no potential for installation of the new surface water sewer and outfall (in Charlotte's Quay, to the Abbey River) to result in habitat loss effects to QI Estuary habitats of the Lower River Shannon SAC, as no works will be instream.

However, as described in Section 7.4.1.2, the proposed outfall would be located c. 1 m above the typical river flood level, along which a line of mosses corresponding to QI bryophyte communities of the Lower River Shannon SAC are located. Although the invert level of the proposed outfall is above the line of QI bryophyte communities, in the absence of mitigation, and applying the precautionary principle, there is potential for installation of the new outfall in Charlotte's Quay to remove QI bryophyte communities (e.g. if care is not taken to core only the localized part of the quay wall into which the outfall must be inserted).

#### 8.1.3.2 Operation-Phase (Bird Collision Pathway Only)

In the absence of mitigation, there is potential for designated bird populations of the River Shannon and River Fergus Estuary SPA to collide with the proposed 14 storey (71.6 m) tower structure.

Collisions could occur in daylight hours when birds do not detect the reflective surface as a solid object (and as many birds look downwards in flight); however collisions are more likely to happen at night and/or in poor light conditions. The potential collision risk is considered to be significantly reduced by the location of the tower c.38.5 m from the Abbey River, and c.116.5 m from the River Shannon. The location of the proposed tower within an urban centre, which is well-lit at night further reduces the potential for frequent collisions with SCI species.

The bird populations potentially affected are most likely to be local populations using the Shannon and/or Abbey Rivers as visual cues along which to move between feeding and roosting sites. Given the River Shannon and River Fergus Estuaries SPA is designated for bird populations of estuarine habitats, and is located 0.7 km downstream of the proposed development, it is unlikely that significant populations would be at risk of collision. However, SCI black-headed gull is known to occur in the River Shannon within the vicinity of the proposed development site, and black-headed gull a species which may move inland to feed in areas such as playing pitches, or urban parks. Black-headed gull may commute through the proposed development site between downstream estuarine feeding/roosting areas, and upstream urban habitats. Whilst unlikely, the potential for other SCI species of the River Shannon and River Fergus Estuaries SPA (such as cormorant *Phalacrocorax carbo*, curlew *Numenius arquata*, light-bellied Brent goose *Branta bernicla hrota*, golden plover *Pluvialis apricaria*, lapwing *Vanellus vanellus* and/or whooper swan *Cygnus cygnus*) to move upstream to inland/freshwater feeding areas, and collide with the proposed tower (particularly at night or in poor visibility) cannot be excluded in the absence of evidence to the contrary.

Collisions could occur in daylight hours when birds do not detect the reflective surface as a solid object (and because some birds look downwards in flight), however collisions are more likely to happen at night and/or in poor light conditions. The potential collision risk is considered to be significantly reduced by the location of the tower c.38.5 m from the Abbey River, and c.116.5 m from the River Shannon. The location of the proposed tower within an urban centre, which is well-lit at night further reduces the potential for frequent collisions with SCI species. However in the absence of mitigation, and applying the precautionary principle, the potential for SCI birds of the River Shannon and River Fergus Estuaries SPA (including black-headed gull and cormorant) to collide with the proposed tower cannot be excluded.

#### 8.1.4 Source-Pathway-Receptor Links Scoped Out

Following review of the proposed development, and best available knowledge on relevant ecological features, the following pathways have been scoped out from the NIS, as no adverse effects to the integrity of any European

sites are predicted to arise via these pathways as a result of the proposed development alone or (as detailed later in Section 8.3.3), in-combination with other plans or projects:

- Construction: Noise and vibration generated during construction of the proposed development (including human presence, rotary core piling, demolition, access and egress of Heavy Goods Vehicles to/from proposed development site) has been scoped out, as no sensitive QI or SCI populations are predicted to occur within the proposed development site, or within the nearby Shannon River or Abbey River. The secant piling installation using rotary bored piling methods produces significantly lower levels of ground-borne vibration relative to other piling methods. Furthermore, these areas lack vegetation or other sheltered features and do not offer resting, breeding or feeding sites to significant populations of QI or SCI species on a regular basis.
  - SCI roosting black-headed gulls (known to be present in significant numbers c. 120 m from the proposed development site at their nearest point) are a 'generalist' feeder attracted to areas of human habitation (including busy city centres) where they scavenge human waste; the roosts of this species would not be significantly displaced by the additive noise from construction of the proposed development, given their tolerance for traffic and other forms of urban noise, and their likely habituation to the existing disturbance regime in nearby Limerick City.
  - If foraging or commuting otter are present in the River Shannon or Abbey Rivers, noise and human presence during piling or works to install the new surface water outfall to the Abbey River and/or within the proposed development site could temporarily displace foraging or commuting otter. However, given that otter are likely to only occur occasionally within the Zol of disturbance, because no otter breeding or resting sites are present within the Zol, and because otter are likely to be habituated to the existing urban lighting and noise disturbance regime, potential displacement impacts are considered non-significant.
- Construction: Noise and/ vibration from piling activities are not predicted to adversely affect QI Atlantic salmon, river lamprey, or sea lamprey populations (all of which are presumed to feed and/or migrate locally within the River Shannon and Abbey Rivers). There are no spawning populations of these species in the transitional waters within the nearby designated watercourses, who would be less able to displace in response to temporary disturbance. Importantly, there will be no instream piling, and as noted above, the proposed piling method also has relatively lower groundborne vibration relative to other piling techniques.
- Construction and Operation: Whilst the potential for coastal flooding could result in pollution during construction, the design team has concluded there is no risk associated with pluvial or fluvial flooding due to the lack of historical flooding events of this type, and due to the finished floor levels and ground levels in the vicinity.
- Construction and Operation: As has already been explained in Section 7.4.3, there is no risk of tidal ingress to the proposed development site during the construction or operation of the proposed development (which would introduce a new potential source of or pathway for pollution to enter the River Shannon).
- Construction and Operation: Lighting will be proposed as mitigation for bird collision on the proposed tower. Aside from the use of lighting as mitigation, lighting during construction and operation has been excluded as unlikely to result in significant effects because.
  - Façade lighting has been avoided on the proposed locations for artificial swift nesting provision;
  - No wintering bird feeding or roosting sites are located within the likely Zol of construction or operation-phase lighting;
  - No lesser horseshoe bats were recorded foraging or roosting within the proposed development site or wider Zol during two years of bat surveys completed having regard for relevant guidance.
  - No otter breeding or resting sites are present within the proposed development site or wider Zol, and any lighting of the construction site is unlikely to significantly increase existing light spill onto otter commuting or feeding habitats in the Abbey River and Shannon River.
- Operation: Diversion of 'surface' waters generated in basement car parking areas during operation (potentially contaminated with detergents) which will enter an existing combined sewer for treatment at the existing licensed Bunlicky WwTP for treatment, which Irish Water has determined can cater for the proposed development.

- Operation: Licensed treatment of foul water generated at the proposed development site at the existing licensed Bunlicky WwTP for treatment, which Irish Water has determined can cater for the proposed development.
- Operation: treatment and attenuation measures incorporated into the proposed surface water sewer which will outfall to the Abbey River within the Lower River Shannon SAC. Furthermore, the use of the Abbey River during operation, which will be subject to licensing by LCCC, will be subject to monitoring as a licence condition, which will ensure that, if required, appropriate maintenance of the surface water drain and outfall will be carried out by the licensee, to protect water quality in the receiving waters of the Lower River Shannon SAC, and the River Shannon and River Fergus Estuaries SPA downstream.

## 8.1.5 Identification of Relevant QIs and SCIs

### 8.1.5.1 Lower River Shannon SAC

The relevant QIs of the Lower River Shannon SAC for which source-pathway-receptor links were identified as a result of the construction of the proposed development are shown in Table 4. Table 4 should be read with the list of pathways already scoped out in Section 8.1.4.

**Table 4. Identification of Links (Grey Rows) with QIs of the Lower River Shannon SAC**

Qualifying Interest(s) (* = Priority Habitat)	Within Zone of Influence of Adverse Effects from Proposed Development?	Source-Pathway-Receptor Link(s) during Construction
Alluvial forests*	Priority QI alluvial woodland habitat is not present downstream, and is not within the Zone of Influence of adverse effects from the proposed development.	None
Atlantic salmon, river lamprey, and sea lamprey	No comprehensive mapping has been completed by the NPWS, ESB, or Inland Fisheries Ireland of spawning or nursery habitats for any of these species; but all are presumed present in the River Shannon estuary downstream within Zone of Influence of adverse effects from the proposed development. All three species spawn in freshwater habitats, but migrate downstream to feed and/or grow in estuarine and coastal areas.	QI Atlantic salmon, sea lamprey, and river lamprey are present downstream of the proposed development and could be affected by silt, oils, grit, or other potential contaminants generated during the construction of proposed development. As there will be no instream piling works, and no spawning habits are present, no displacement or injury of fish is predicted from piling activities.
Atlantic salt meadows	Atlantic salt meadow habitat has been mapped, and was identified c. 11 km downstream of the proposed development (NPWS, 2012b).	QI Atlantic salt meadow is present downstream of the proposed development, and could be affected by silt, oils, grit, or other potential contaminants generated during the construction of proposed development.
Bottlenose dolphin	Bottlenose dolphin has been identified within the Zone of Influence of adverse effects from the proposed development (NPWS, 2012c).	There is potential for bottlenose dolphin, downstream of the proposed development, to be affected by silt, oils, grit, or other potential contaminants generated during the construction of proposed development.
Brook lamprey	This species is restricted to freshwater habitats and could not occur within the downstream Zone of Influence of the proposed development site.	None
Coastal lagoons*	Priority QI coastal lagoon habitat has been mapped, and was identified c. 23 km downstream of the proposed development (NPWS, 2012d).	Priority QI coastal lagoons are present downstream of the proposed development, to be affected by silt, oils, grit, or other potential contaminants generated during the construction of proposed development.
Estuaries	Benthic communities associated with QI estuary habitat has been mapped by the NPWS (2012d), and is present adjacent the proposed Abbey River outfall.	QI estuary habitat in the Abbey River and River Shannon is present adjacent to and downstream of the proposed development and could be affected by silt, oils, grit, or other potential contaminants generated during the construction of proposed development.
Freshwater Pearl Mussel	QI freshwater pearl mussel is not present within the Zone of Influence of adverse effects from the proposed development.	None
Large shallow inlets and bays	QI large shallow inlet and bay habitat has been mapped, and was identified c. 58 km downstream of the proposed development (NPWS, 2012c).	QI large shallow inlets and bays is present downstream of the proposed development and could be affected by silt, oils, grit, or other potential contaminants generated during the construction of proposed development.

Qualifying Interest(s) (* = Priority Habitat)	Within Zone of Influence of Adverse Effects from Proposed Development?	Source-Pathway-Receptor Link(s) during Construction
Mediterranean salt meadows	QI Mediterranean salt meadow habitat has been mapped, and was identified c. 30 km downstream of the proposed development (NPWS, 2012b).	QI Mediterranean salt meadow is present downstream of the proposed development, and could be affected by silt, oils, grit, or other potential contaminants generated during the construction of proposed development.
Molinia meadows	QI Molinia meadow habitat is not present within the Zone of Influence of adverse effects from the proposed development.	None
Mudflats and sandflats	QI mudflat habitat has been mapped, and is present c. 780 m downstream of the proposed development (NPWS, 2012d).	QI mudflat is present downstream of the proposed development, and could be affected by silt, oils, grit, or other potential contaminants generated during the construction of proposed development.
Otter	No breeding or resting sites have been identified within the Zone of Influence of the proposed development (see Section 6.5.2). However, foraging and/or commuting otter are presumed to at least occasionally occur in the Abbey River and/or River Shannon within the Zone of Influence of the proposed development.	QI otter is presumed present downstream of the proposed development and could be affected by silt, oils, grit, or other potential contaminants generated during the construction of proposed development. Given that QI otter are likely to only occur occasionally within the Zone of Influence of noise and vibration disturbance from piling and the Abbey outfall construction, and because no breeding or resting sites are present, there is no pathway for adverse effects from displacement.
Perennial vegetation of stony banks	Perennial vegetation of stony bank habitat is not present downstream within the Zone of Influence of adverse effects from the proposed development.	None
Reefs	Reef habitat has been mapped, and was identified c. 9 km downstream of the proposed development (NPWS, 2012c).	QI reef habitat is present downstream of the proposed development, and could be affected by silt, oils, grit, or other potential contaminants generated during the construction of proposed development.
Salicornia and other annuals colonising mud and sand	QI Salicornia habitat has been mapped, and was identified c. 12.5 km downstream of the proposed development site (NPWS, 2012b).	QI Salicornia habitat is present downstream of the proposed development, and could be affected by silt, oils, grit, or other potential contaminants generated during the construction of proposed development.
Sandbanks	QI Sandbank habitat has been mapped, and was identified c. 75 km downstream of the proposed development (NPWS, 2012c).	QI sandbank habitat is present downstream of the proposed development, and could be affected by silt, oils, grit, or other potential contaminants generated during the construction of proposed development.
Vegetated sea cliffs of the Atlantic and Baltic coasts	Vegetated sea cliff habitat is not present downstream within the Zone of Influence of adverse effects from the proposed development.	None
Watercourses of plain to montane levels	QI Watercourse of plain to montane levels habitat ('bryophyte rich streams') have been mapped and identified adjacent the proposed Abbey outfall. QI Watercourse of plain to montane levels habitat (triangular club-rush sub-community) is present c. 0.8 km downstream further downstream of the proposed development (NPWS, 2012e)	QI Watercourse of plain to montane levels habitat ('bryophyte rich streams') is present adjacent to the proposed works to install the Abbey River outfall, and QI bryophytes could be removed during outfall construction. There are two sub-communities of QI Watercourses of plain to montane levels habitat present downstream of the proposed development, which could be affected by silt, oils, grit, or other potential contaminants generated during the construction of proposed development.

### 8.1.5.2 River Shannon and River Fergus Estuaries SPA

The specific SCIs of the River Shannon and River Fergus Estuaries SPA with which source-pathway-receptor links were identified with the proposed development are shown in Table 5 below. Table 5 should be read with the list of pathways already scoped out in Section 8.1.4.

**Table 5. Identification of Links (Grey Rows) with SCIs of the River Shannon and River Fergus Estuaries SPA**

SCI (s)	Distance to Proposed Development	Source-Pathway-Receptor Link(s)
Bar-tailed godwit <i>Limosa lapponica</i>	Feeding habitat has been identified downstream within the Zone of Influence	There is potential for contaminants generated during the proposed development to be carried into the drainage

SCI (s)	Distance to Proposed Development	Source-Pathway-Receptor Link(s)
	of adverse effects from the proposed development. This species does not roost or feed within the Zone of Influence of adverse disturbance effects (e.g. from piling, noise, lighting, or human presence).	network, and downstream into the Shannon Estuary, potentially reducing prey abundance or diversity for this species.
Black-headed gull <i>Chroicephalus ridibundus</i>	Same as entry for bar-tailed godwit in first row of this table.	-Same pollution pathway as for bar-tailed godwit in first row of this table. -There is additionally potential for birds to collide with the proposed tower.
Black-tailed godwit <i>Limosa limosa</i>	Same as entry for bar-tailed godwit in first row of this table.	Same pathway as for bar-tailed godwit in first row of this table.
Cormorant <i>Phalacrocorax carbo</i>	Same as entry for bar-tailed godwit in first row of this table.	Same pollution pathway as for bar-tailed godwit in first row of this table. -There is additionally potential for birds to collide with the proposed tower
Curlew <i>Numenius arquata</i>	Same as entry for bar-tailed godwit in first row of this table.	Same pollution pathway as for bar-tailed godwit in first row of this table. -There is additionally potential for birds to collide with the proposed tower
Dunlin <i>Calidris alpina alpina</i>	Same as entry for bar-tailed godwit in first row of this table.	Same pathway as for bar-tailed godwit in first row of this table.
Golden plover <i>Pluvialis apricaria</i>	Same as entry for bar-tailed godwit in first row of this table.	-Same pollution pathway as for bar-tailed godwit in first row of this table. -There is additionally potential for birds to collide with the proposed tower
Greenshank <i>Tringa nebularia</i>	Same as entry for bar-tailed godwit in first row of this table.	Same pathway as for bar-tailed godwit in first row of this table.
Grey plover <i>Pluvialis squatarola</i>	Same as entry for bar-tailed godwit in first row of this table.	Same pathway as for bar-tailed godwit in first row of this table.
Knot <i>Calidris canutus</i>	Same as entry for bar-tailed godwit in first row of this table.	Same pathway as for bar-tailed godwit in first row of this table.
Lapwing <i>Vanellus vanellus</i>	Same as entry for bar-tailed godwit in first row of this table.	-Same pollution pathway as for bar-tailed godwit in first row of this table. -There is additionally potential for birds to collide with the proposed tower
Light-bellied Brent goose <i>Branta bernicla hrota</i>	Same as entry for bar-tailed godwit in first row of this table.	Same pollution pathway as for bar-tailed godwit in first row of this table. -There is additionally potential for birds to collide with the proposed tower
Northern pintail <i>Anas acuta</i>	Same as entry for bar-tailed godwit in first row of this table.	Same pathway as for bar-tailed godwit in first row of this table.
Redshank <i>Tringa totanus</i>	Same as entry for bar-tailed godwit in first row of this table.	Same pathway as for bar-tailed godwit in first row of this table.
Ringed plover <i>Charadrius hiaticula</i>	Same as entry for bar-tailed godwit in first row of this table.	Same pathway as for bar-tailed godwit in first row of this table.
Scaup <i>Aythya marila</i>	Same as entry for bar-tailed godwit in first row of this table.	Same pathway as for bar-tailed godwit in first row of this table.
Shelduck <i>Tadorna tadorna</i>	Same as entry for bar-tailed godwit in first row of this table.	Same pathway as for bar-tailed godwit in first row of this table.
Shoveler <i>Anas clypeata</i>	Same as entry for bar-tailed godwit in first row of this table.	Same pathway as for bar-tailed godwit in first row of this table.
Teal <i>Anas crecca</i>	Same as entry for bar-tailed godwit in first row of this table.	Same pathway as for bar-tailed godwit in first row of this table.
Wetland bird habitats	There is SCI mudflat habitat present c. 0.7 km downstream of the proposed development	There is potential for contaminants generated during the proposed development to be carried into the drainage network, and downstream into the Shannon Estuary, potentially reducing wetland bird prey abundance or diversity in estuarine habitats.



SCI (s)	Distance to Proposed Development	Source-Pathway-Receptor Link(s)
Whooper swan <i>Cygnus cygnus</i>	Same as entry for bar-tailed godwit in first row of this table.	Same pollution pathway as for bar-tailed godwit in first row of this table. -There is additionally potential for birds to collide with the proposed tower
Wigeon <i>Anas penelope</i>	Same as entry for bar-tailed godwit in first row of this table.	Same pathway as for bar-tailed godwit in first row of this table.

### 8.1.5.3 Summary Descriptions of Relevant European Sites

The following extracts from the NPWS site synopsis for the Lower River Shannon SAC (NPWS, 2013c) summarizes the importance of the SAC as follows:

*“The estuaries of the River Shannon and River Fergus form the largest estuarine complex in Ireland. The site comprises the entire estuarine habitat from Limerick City westwards as far as Doonaha in Co. Clare and Dooneen Point in Co. Kerry.*

*“Both the Fergus and inner Shannon Estuaries feature vast expanses of intertidal mudflats, often fringed with saltmarsh vegetation.*

*“In the transition zone between mudflats and saltmarsh, specialised colonisers of mud predominate. Saltmarsh vegetation also occurs around a number of lagoons within the site.*

*“The site supports an excellent example of a large shallow inlet and bay.*

*“The intertidal reefs in the Shannon Estuary are exposed or moderately exposed to wave action and subject to moderate tidal streams.*

*“Freshwater rivers have been included in the site, most notably the Feale and Mulkear catchments, the Shannon from Killaloe to Limerick.*

*“Floating river vegetation characterised by species of water-crowfoot (*Ranunculus* spp.), pondweeds (*Potamogeton* spp.) and the moss *Fontinalis antipyretica* are present throughout the major river systems within the site. The rivers contain an interesting bryoflora with *Schistidium alpicola* var. *alpicola* recorded from in-stream boulders on the Bilboa, new to Co. Limerick. Alluvial woodland occurs on the banks of the Shannon and on islands in the vicinity of the University of Limerick.*

*“One grassland type of particular conservation significance, *Molinia* meadows, occurs in several parts of the site and the examples at Worldsend on the River Shannon are especially noteworthy.”*

The following extracts from the NPWS site synopsis for the River Shannon and River Fergus Estuaries SPA (NPWS, 2015) summarizes the importance of the SPA as follows:

*“The estuaries of the River Shannon and River Fergus form the largest estuarine complex in Ireland.”*

*“The site has vast expanses of intertidal flats which contain a diverse macroinvertebrate community, e.g. *Macoma-Scrobicularia-Nereis*, which provides a rich food resource for the wintering birds. Salt marsh vegetation frequently fringes the mudflats and this provides important high tide roost areas for the wintering birds. Elsewhere in the site the shoreline comprises stony or shingle beaches.*

*“The site is the most important coastal wetland site in the country and regularly supports in excess of 50,000 wintering waterfowl”*

## 8.1.6 Conservation Status of Relevant Features of European sites

### 8.1.6.1 Lower River Shannon SAC

The conservation status of QIs (at both national level, and within the Lower River Shannon SAC), and potential threats to relevant QIs of the Lower River Shannon SAC are presented in Table 6. QIs which have already been scoped out are not included.

**Table 6. Lower River Shannon SAC: Conservation Status and Threats to Relevant QIs**

Relevant QI (s) (*=Priority habitat)	Site-Level Status (NPWS, 2017a)	National Status (NPWS, 2013a and b)	Primary Site-level Threats from the Proposed Development (Professional Judgement Applied to NPWS, 2017a)	Other National Threats from NPWS (2013a) and Natura Standard Data Form (NPWS, 2017a)
Atlantic salmon	Excellent	Unfavourable (inadequate)	Discharges.	Cultivation (pesticides, fertilisation, grazing), grazing, trampling/overuse, erosion, afforestation, aquaculture, fishing, sand & gravel abstraction, quarries, peat extraction, mining, urbanisation, canalisation, barriers, invasive species, and introduction of diseases.
Atlantic salt meadows	Excellent	Unfavourable (inadequate)	Discharges.	Ecologically unsuitable grazing levels.
Bottlenose dolphin	Moderate	Favourable	Discharges.	Accidental entanglement in fishing gear, competition for prey resources, pollution, habitat degradation and disturbance due to human influence.
Coastal lagoons*	Moderate	Unfavourable (bad)	Discharges.	Water pollution in the form of excess nutrient enrichment, mostly from agricultural sources, but also due to domestic effluents from an increase in urbanisation and commercial and industrial activities.
Estuaries	Moderate	Unfavourable (inadequate)	Discharges.	Pollution and fishing/aquaculture related activities affect habitat quality in particular highly sensitive areas.
Large shallow inlets and bays	Excellent	Unfavourable (inadequate)	Discharges.	Fishing and aquaculture related activities are likely to affect habitat quality, particularly for some highly sensitive species such as Maerl and eel grass.
Mediterranean salt meadows	Excellent	Unfavourable (inadequate)	Discharges.	Ecologically unsuitable grazing levels.
Mudflats and sandflats	Moderate	Unfavourable (inadequate)	Discharges.	Pollution and fishing/aquaculture and diverse use of the foreshore are likely to affect habitat quality especially eelgrass beds.
Otter	Excellent	Favourable	Discharges.	Mortalities/Illegal killings, recreation/disturbances, hydroelectric schemes, aquaculture/fisheries, and American mink <i>Mustela vison</i> .
Reefs	Excellent	Unfavourable (bad)	Discharges.	Threats due to low recovery rate even with only small levels or pressure particularly fishing.
River lamprey	Moderate	Favourable	Discharges.	Eutrophication (natural), polderisation, reclamation of land from sea, estuary or marsh River channel maintenance, dredging, dumping, and depositing of dredged deposits.
Salicornia and other annuals colonising mud and sand	Poor	Unfavourable (inadequate)	Discharges.	Invasion of the on-going spread of common cordgrass <i>Spartina anglica</i> .
Sandbanks	Moderate	Unfavourable (inadequate)	Discharges.	None.
Sea Lamprey	Moderate	Unfavourable (bad)	Discharges.	Barriers such as weirs which may prevent migration and limit access to spawning bed. River channel maintenance, dredging, dumping, and depositing of dredged deposits.
Water courses	Poor	Unfavourable	Discharges.	Climate change.

Relevant QI (s) (*=Priority habitat)	Site-Level Status (NPWS, 2017a)	National Status (NPWS, 2013a and b)	Primary Site-level Threats from the Proposed Development (Professional Judgement Applied to NPWS, 2017a)	Other National Threats from NPWS (2013a) and Natura Standard Data Form (NPWS, 2017a)
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of plain to montane levels		(inadequate)		
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### 8.1.6.2 River Shannon and River Fergus Estuaries SPA

The conservation status of, and potential threats to, the River Shannon and River Fergus Estuaries SPA are presented in Table 7. Population trends are provided in Table 7, since there is no national conservation status assessment available for birds in Ireland, equivalent to the Favourable/Unfavourable data available from the NPWS for habitats and non-bird species. SCIs which have already been scoped out are not included in Table 5.

**Table 7. River Shannon and River Fergus Estuaries SPA: Conservation Status, Population Trends and Threats of (Single) Relevant SCI**

SCI	Site-Level Status (NPWS, 2017b)	'Short-Term' National Population trend (Table Footnote*)	'Long-Term' National Population trend (Table Footnote**)	Primary Site-level Threats from the Proposed Development (Professional Judgement Applied to NPWS, 2017b)	Other Threats from Birdlife International (2018), and Natura Standard Data Form (NPWS, 2017b)
Bar-tailed godwit	Undetermined	Stable	Decrease	Discharges.	Fertilisation, marine and freshwater aquaculture, , nautical sports, industrial or commercial areas, urbanised areas, human habitation, oil and gas exploration and associated infrastructure development, legal subsistence harvesting, reclamation activities and illegal hunting, and predation.
Black-headed gull	Undetermined	Insufficient data	Decrease	Discharges and collision risk.	Fertilisation, marine and freshwater aquaculture, discharges, nautical sports, industrial or commercial areas, urbanised areas, human habitation, avian influenza, avian botulism, coastal oil spills, egg collection chemical pollution.
Black-tailed godwit	Undetermined	Increase	Decrease	Discharges.	Fertilisation, marine and freshwater aquaculture, nautical sports, industrial or commercial areas, urbanised areas, human habitation, wetland drainage and agricultural intensification, habitat loss, climate change, predation, grazing, heavy traffic, pollution, human disturbance, habitat reclamation for tidal energy plants, aquaculture ponds, land conversion for agriculture, urban expansion and agricultural intensification at rice paddies.
Cormorant	Undetermined	Increase	Increase	Discharges and collision risk.	Fertilisation, marine and freshwater aquaculture, nautical sports, industrial or commercial areas, Urbanised areas, human habitation, by-catch.
Curlew	Undetermined	Decline	Decrease	Discharges and collision risk.	Fertilisation, marine and freshwater aquaculture, , nautical sports, industrial or commercial areas, urbanised areas, human habitation, afforestation of moorland, nest predation, habitat change, degradation of migratory staging areas owing to land reclamation, pollution, human disturbance and reduced river flows hunting and mechanised shellfish harvesting.
Dunlin	Undetermined	Stable	Decrease	Discharges.	Fertilisation, marine and freshwater aquaculture, , nautical sports, industrial or commercial areas, urbanised areas, human habitation, afforestation of moorland, nest predation, habitat change, invasion of alien plant species, intertidal mudflats from construction work, petroleum pollution, wetland drainage for irrigation, peat-extraction, reed bed mowing and burning, abandonment and changing land management practices, avian influenza
Golden plover	Undetermined	Decline	Decrease	Discharges and collision risk.	Fertilisation, marine and freshwater aquaculture, nautical sports, industrial or commercial areas, urbanised areas, human habitation, Severe weather conditions and hunting.

SCI	Site-Level Status (NPWS, 2017b)	'Short-Term' National Population trend (Table Footnote*)	'Long-Term' National Population trend (Table Footnote**)	Primary Site-level Threats from the Proposed Development (Professional Judgement Applied to NPWS, 2017b)	Other Threats from Birdlife International (2018), and Natura Standard Data Form (NPWS, 2017b)
Greenshank	Undetermined	Stable/Decline	Decrease	Discharges.	Fertilisation, marine and freshwater aquaculture, nautical sports, industrial or commercial areas, urbanised areas, human habitation, habitat loss, environmental pollution, reduced river flows and human disturbance.
Grey plover	Undetermined	Decline	Decrease	Discharges.	Fertilisation, marine and freshwater aquaculture, nautical sports, industrial or commercial areas, urbanised areas, human habitation, climate change, disturbance from recreational activities, intertidal oyster culture, urban and industrial development.
Knot	Undetermined	Decline	Decrease	Discharges.	Fertilisation, marine and freshwater aquaculture, nautical sports, industrial or commercial areas, urbanised areas, human habitation, land reclamation, urban, industrial and agricultural expansion, Damming of rivers, dredging, pollution, aquaculture operations, renewable energy developments, oil exploration, invasion of mudflats by <i>Spartina</i> grasses, tourism, flying aircraft, hunted, avian influenza, fishing nets.
Lapwing	Undetermined	Decline	Decrease	Discharges and collision risk.	Fertilisation, marine and freshwater aquaculture, nautical sports, industrial or commercial areas, urbanised areas, human habitation, land-use intensification, intensifying and changing agricultural practices, improvement of grasslands, by petroleum pollution, wetland drainage for irrigation, land abandonment and changing land management practices leading to scrub overgrowth, spring cultivation and predation.
Light-bellied Brent goose	Undetermined	Increase	Decrease	Discharges and collision risk.	Fertilisation, marine and freshwater aquaculture, nautical sports, industrial or commercial areas, urbanised areas, human habitation, hunting, disturbance from vehicles, future reduction in food supply and predation.
Northern pintail	Undetermined	Stable	Insufficient data	Discharges.	Fertilisation, marine and freshwater aquaculture, nautical sports, industrial or commercial areas, urbanised areas, human habitation, wetland habitat loss, reclamation of coastal areas for industrial development, pollution, wetland drainage, peat-extraction, changing wetland management practices, burning and mowing of reeds.
Redshank	Undetermined	Stable	Decrease	Discharges.	Fertilisation, marine and freshwater aquaculture, nautical sports, industrial or commercial areas, urbanised areas, human habitation, agricultural intensification, wetland drainage, flood control, afforestation, land reclamation, industrial development, encroachment of Cord-grass <i>Spartina</i> spp. on mudflats, improvement of marginal grasslands, disturbance on intertidal mudflats from construction work, predation and avian influenza.
Ringed plover	Undetermined	Decline	Decrease	Discharges.	Fertilisation, marine and freshwater aquaculture, nautical sports, industrial or commercial areas, urbanised areas, human habitation, petroleum pollution, wetland drainage for irrigation, land abandonment and changing land management practices leading to scrub overgrowth, avian botulism

SCI	Site-Level Status (NPWS, 2017b)	'Short-Term' National Population trend (Table Footnote*)	'Long-Term' National Population trend (Table Footnote**)	Primary Site-level Threats from the Proposed Development (Professional Judgement Applied to NPWS, 2017b)	Other Threats from Birdlife International (2018), and Natura Standard Data Form (NPWS, 2017b)
					and predation.
Scaup	Undetermined	Stable	Insufficient data	Discharges.	Fertilisation, marine and freshwater aquaculture, nautical sports, industrial or commercial areas, urbanised areas, human habitation, oil pollution, high levels of organochloride contaminants, coastal sewage outlets, entanglement in fishing nets, habitat loss, hunting, over-harvesting and avian influenza.
Shelduck	Undetermined	Stable	Decrease	Discharges.	Fertilisation, marine and freshwater aquaculture, nautical sports, industrial or commercial areas, urbanised areas, human habitation, habitat loss, predation from American mink, avian influenza, hunted for commercial and recreational purposes.
Shoveler	Undetermined	Stable	Insufficient data	Discharges.	Fertilisation, marine and freshwater aquaculture, nautical sports, industrial or commercial areas, urbanised areas, human habitation.
Teal	Undetermined	Increase	Decrease	Discharges.	Fertilisation, marine and freshwater aquaculture, nautical sports, industrial or commercial areas, urbanised areas, human habitation, lowland habitat loss and degradation, upland habitat loss due to afforestation and other land-use changes, lead shot ingestion, poisoning by white phosphorous ingestion, hunting, avian botulism and avian influenza.
Wetland bird habitats	Not assessed	Not assessed	Not assessed	Discharges.	Fertilisation, polderisation.
Whooper swan	Favourable	Increase	Decrease	Discharges and collision risk.	Fertilisation, marine and freshwater aquaculture, nautical sports, industrial or commercial areas, urbanised areas, human habitation, climate change & severe weather, Habitat shifting and alteration.
Wigeon	Highly unfavourable	Stable	Decrease	Discharges.	Fertilisation, marine and freshwater aquaculture, nautical sports, industrial or commercial areas urbanised areas, human habitation, disturbance from freshwater recreational activities, pollution, wetland drainage, peat-extraction, changing wetland management practices, burning and mowing of reeds and avian influenza virus.
<p>Table Footnotes</p> <p>* Source: EIONET (2015): All-Ireland trend calculated for period 1994/95 to 2008/09.</p> <p>** Source: EIONET (2015): In all cases the baseline period refers to 1995/99 – 1999/00 and the recent period to 2006/07 to 2010/11, the count for 2010/11 being the highest number recorded during either one of the aerial surveys.</p>					

## 8.2 Step 2: Conservation Objectives

### 8.2.1 Lower River Shannon SAC

Detailed Conservation Objectives for the Lower River Shannon SAC have been published by the NPWS (2012c). Table 8 identifies which Conservation Objective attributes could be adversely affected by the proposed development, for 'relevant' QIs scoped into the assessment.

**Table 8. Lower River Shannon SAC: Conservation Objective Attributes**

Relevant Qualifying Interest	Conservation Objective	Attributes Potentially Affected by the Proposed Development (NPWS, 2012a)	Attributes Not Potentially Affected by Proposed Development (NPWS, 2012a)
Atlantic salmon	To restore the favourable conservation condition	-Number of spawning adult fish -Atlantic salmon fry abundance -Out-migrating smolt abundance -Number and distribution of redds -Water quality	-Distribution: extent of anadromy
Atlantic salt meadows	To restore the favourable conservation condition	-Vegetation structure: zonation -Vegetation structure: vegetation cover -Vegetation composition: typical species and sub-communities	-Habitat area -Habitat distribution -Physical structure: sediment supply, creeks and pans, flooding regime -Vegetation structure: vegetation height -Vegetation structure: negative indicator species- <i>Spartina anglica</i>
Bottlenose dolphin	To maintain the favourable conservation condition	-Habitat use: critical areas	-Access to suitable habitat -Disturbance
Coastal lagoons*	To restore the favourable conservation condition	-Water quality: chlorophyll -Water quality: Molybdate Reactive Phosphorus (MRP) -Water quality: Dissolved Inorganic Nitrogen (DIN) -Depth of macrophyte colonisation -Typical plant species -Typical animal species -Negative indicator species	-Salinity regime -Habitat area -Habitat disturbance -Hydrological regime -Barrier: connectivity between lagoon and sea
Estuaries	To restore the favourable conservation condition	-Community distribution	-Habitat area
Large shallow inlets and bays	To maintain the favourable conservation condition	-Community distribution	-Habitat area
Mediterranean salt meadows	To restore the favourable conservation condition	Vegetation structure: zonation	-Habitat area -Habitat distribution -Physical structure: sediment supply -Physical structure: creeks and pans -Physical structure: flooding regime
Mudflats and sandflats	To restore the favourable conservation condition	-Community distribution	-Habitat area
Otter	To restore the favourable conservation condition	- Fish biomass available	-Couching sites and holts -Distribution -Extent of terrestrial habitat -Extent of marine habitat -Extent of freshwater (river) habitat -Extent of freshwater (lake/lagoon) habitat -Barriers to connectivity

Relevant Qualifying Interest	Conservation Objective	Attributes Potentially Affected by the Proposed Development (NPWS, 2012a)	Attributes Not Potentially Affected by Proposed Development (NPWS, 2012a)
Reefs	To maintain the favourable conservation condition	-Community distribution	-Habitat area -Habitat distribution -Habitat area
River lamprey	To restore the favourable conservation condition	-Population structure of juveniles -Juvenile density in fine sediment -Distribution	-Population structure of juveniles -Juvenile density in fine sediment -Extent and distribution of spawning habitat -Availability of juvenile habitat
Salicornia and other annuals colonising mud and sand	To maintain the favourable conservation condition	-Habitat distribution -Vegetation structure: zonation -Vegetation cover; typical species and sub-communities	-Habitat area - Physical structure: sediment supply; creeks and pans; flooding regime -Vegetation structure: vegetation height; -Negative indicator species- <i>Spartina anglica</i>
Sandbanks	To maintain the favourable conservation condition	-Community disturbance	-Habitat disturbance -Habitat area
Sea Lamprey	To restore the favourable conservation condition	-Juvenile density in fine sediment -Population structure of juveniles	-Availability of juvenile habitat -Distribution: extent of anadromy -Extent and distribution of spawning habitat
Water courses of plain to montane levels	To restore the favourable conservation condition	-Habitat area -Habitat distribution -Water quality: nutrients -Vegetation composition: typical species -Riparian habitat	-Hydrological regime -Substratum composition -Floodplain connectivity

### 8.2.2 River Shannon and River Fergus Estuaries SPA

Detailed Conservation Objectives for the River Shannon and River Fergus Estuaries SPA have been published by the NPWS (2012c). Table 9 identifies which Conservation Objective attributes could be adversely affected by the proposed development, for 'relevant' QIs scoped into the assessment.

**Table 9. River Shannon and River Fergus Estuaries SPA: Conservation Objective Attributes for SCI Birds**

Relevant Special Conservation Interest	Conservation Objective	Attributes Potentially Affected by Proposed development (NPWS, 2012f)	Attributes Not Potentially Affected by Proposed Development (NPWS, 2012f)
Bar-tailed godwit	To maintain the favourable conservation condition	-Population trend	-Distribution
Black-headed gull	To maintain the favourable conservation condition	-Population trend	-Distribution
Black-tailed godwit	To maintain the favourable conservation condition	-Population trend	-Distribution
Cormorant (breeding and no-breeding)	To maintain the favourable conservation condition	-Prey biomass available -Population trend	-Breeding population abundance: Apparently Occupied Nests (AONs) -Productivity rate -Distribution: breeding colonies -Barriers to connectivity -Disturbance at the breeding site -Distribution
Curllew	To maintain the favourable	-Population trend	-Distribution



Relevant Special Conservation Interest	Conservation Objective	Attributes Potentially Affected by Proposed development (NPWS, 2012f)	Attributes Not Potentially Affected by Proposed Development (NPWS, 2012f)
	conservation condition		
Dunlin	To maintain the favourable conservation condition	-Population trend	-Distribution
Golden plover	To maintain the favourable conservation condition	-Population trend	-Distribution
Greenshank	To maintain the favourable conservation condition	-Population trend	-Distribution
Grey plover	To maintain the favourable conservation condition	-Population trend	-Distribution
Knot	To maintain the favourable conservation condition	-Population trend	-Distribution
Lapwing	To maintain the favourable conservation condition	-Population trend	-Distribution
Light-bellied Brent goose	To maintain the favourable conservation condition	-Population trend	-Distribution
Northern pintail	To maintain the favourable conservation condition	-Population trend	-Distribution
Redshank	To maintain the favourable conservation condition	-Population trend	-Distribution
Ringed plover	To maintain the favourable conservation condition	-Population trend	-Distribution
Scaup	To maintain the favourable conservation condition	-Population trend	-Distribution
Shelduck	To maintain the favourable conservation condition	-Population trend	-Distribution
Shoveler	To maintain the favourable conservation condition	-Population trend	-Distribution
Teal	To maintain the favourable conservation condition	-Population trend	-Distribution
Wetland bird habitat	To maintain the favourable conservation condition	None	-Habitat area
Whooper swan	To maintain the favourable conservation condition	-Population trend	-Distribution
Wigeon	To maintain the favourable conservation condition	-Population trend	-Distribution

### 8.3 Step 3: Prediction of Effects

The prediction of potential effects from the proposed development (alone) to the integrity of European sites is presented in this Section. In-combination effects from the proposed development with other plans or projects are presented in Section 8.3.3.

#### 8.3.1 Lower River Shannon SAC

The prediction of effects from the proposed development to the integrity of the Lower River Shannon SAC is set out in Table 10.

**Table 10. Lower River Shannon SAC: Prediction of Effects on Site Integrity (QI)**

Relevant Qualifying Interest	Pathway and Effects Prediction to Trigger Adverse Effects (Grey Rows Indicate Pathways Triggering Adverse Effects)
Atlantic salmon, river lamprey, and sea lamprey	<p>Surface water pollution (including via groundwater)</p> <p>-Silt, grit, fuels, oils or other contaminants generated during construction could enter QI Atlantic salmon, river lamprey, and sea lamprey habitats downstream as a result of construction of the proposed development.</p> <p>-Conservation Objectives for Atlantic salmon potentially affected are: number of spawning adult fish, Atlantic salmon fry abundance, out-migrating smolt abundance, number and distribution of redds, water quality.</p> <p>-Conservation Objectives for river and sea lamprey potentially affected are: distribution, population structure of juveniles, and juvenile density in fine sediment.</p> <p>-Effects on QI river and sea lamprey could be further amplified by their 'Moderate' site-level status.</p> <p><b>-Adverse effects to site integrity are predicted from the proposed development alone in the absence of mitigation measures</b></p>
Atlantic salt meadows	<p>Surface water pollution (including via groundwater)</p> <p>-Silt, grit, fuels, oils or other contaminants generated during construction could affect this habitat downstream.</p> <p>-Conservation Objectives potentially affected are: Vegetation structure: zonation, vegetation structure: vegetation cover, vegetation composition: typical species and sub-communities.</p> <p><b>-Adverse effects to site integrity are predicted from the proposed development alone in the absence of mitigation measures</b></p>
Bottlenose dolphin	<p>Surface water pollution (including via groundwater)</p> <p>-Conservation Objectives potentially affected are: habitat use: critical areas</p> <p>-Effects potentially amplified by the 'Moderate' site-level status.</p> <p><b>-Adverse effects to site integrity are predicted from the proposed development alone in the absence of mitigation measures</b></p>
Coastal lagoons*	<p>Surface water pollution (including via groundwater)</p> <p>-Conservation Objectives potentially affected are: water quality: chlorophyll, water quality: Molybdate Reactive Phosphorus (MRP), water quality: Dissolved Inorganic Nitrogen (DIN), depth of macrophyte colonisation, typical plant species, typical animal species, negative indicator species.</p> <p>-Effects potentially amplified by the 'Moderate' site-level status.</p> <p><b>-Adverse effects to site integrity are predicted from the proposed development alone in the absence of mitigation measures</b></p>
Estuaries	<p>Surface water pollution (including via groundwater)</p> <p>-Conservation Objectives potentially affected are: community distribution.</p> <p>-Effects potentially amplified by the 'Moderate' site-level status.</p> <p><b>Adverse effects to site integrity are predicted from the proposed development alone in the absence of mitigation measures</b></p>
Large shallow inlets and bays	<p>Surface water pollution (including via groundwater)</p> <p>-Conservation Objectives potentially affected are: community distribution.</p> <p><b>-Adverse effects to site integrity are predicted from the proposed development alone in the absence of mitigation measures.</b></p>
Mediterranean salt meadows	<p>Surface water pollution (including via groundwater)</p> <p>-Conservation Objectives potentially affected are: vegetation structure: zonation.</p> <p><b>-Adverse effects to site integrity are predicted from the proposed development alone in the absence of mitigation measures.</b></p>
Mudflats and sandflats	<p>Surface water pollution (including via groundwater)</p> <p>-Conservation Objectives potentially affected are: Community distribution</p> <p>-Effects potentially amplified by the 'Moderate' site-level status</p> <p><b>-Adverse effects to site integrity are predicted from the proposed development alone in the absence of mitigation measures.</b></p>
Otter	<p>Surface water pollution (including via groundwater)</p> <p>-Conservation Objectives potentially affected are: fish biomass available.</p> <p><b>-Adverse effects to site integrity are predicted from the proposed development alone in the absence of mitigation measures.</b></p>

**Relevant Qualifying Interest**      **Pathway and Effects Prediction to Trigger Adverse Effects (Grey Rows Indicate Pathways Triggering Adverse Effects)**

Reefs	Surface water pollution (including via groundwater)	-Conservation Objectives potentially affected are: habitat distribution, community distribution. <b>-Adverse effects to site integrity are predicted from the proposed development alone in the absence of mitigation measures.</b>
Salicornia and other annuals colonising mud and sand	Surface water pollution (including via groundwater)	-Conservation Objectives potentially affected are: habitat distribution, vegetation structure: zonation; vegetation cover; typical species and sub-communities. -Effects potentially amplified by the 'Poor' site-level status. <b>-Adverse effects to site integrity are predicted from the proposed development alone in the absence of mitigation measures.</b>
Sandbanks	Surface water pollution (including via groundwater)	-Conservation Objectives potentially affected are: community disturbance-Effects potentially amplified by the 'Moderate' site-level status. <b>-Adverse effects to site integrity are predicted from the proposed development alone in the absence of mitigation measures.</b>
Water courses of plain to montane levels	Habitat loss AND Surface water pollution (including via groundwater)	-Conservation Objectives potentially affected are: water quality: nutrients, and vegetation composition: typical species, and riparian habitat. -Effects potentially amplified by the 'Poor' site-level status. <b>-Adverse effects to site integrity are predicted from the proposed development alone in the absence of mitigation measures.</b>

**8.3.2 River Fergus and River Shannon Estuaries SPA**

The prediction of effects from the proposed development to the integrity of the River Fergus and River Shannon Estuaries SPA is set out in Table 11.

**Table 11. River Fergus and River Shannon Estuaries SPA: Prediction of Effects on Site Integrity (SCI)**

**Relevant Special Conservation Interest**      **Pathway and Effects Prediction (Grey Rows Indicate Pathways Triggering Adverse Effects)**

Bar-tailed godwit	Surface water pollution (including via groundwater)	-Conservation Objectives potentially affected are: population trend <b>-Adverse effects to site integrity are predicted from the proposed development alone in the absence of mitigation measures.</b>
Black-headed gull	Surface water pollution (including via groundwater) Bird collision with the proposed tower (operation)	-Conservation Objectives potentially affected are: population trend -Effects potentially amplified by the 'Undetermined' site-level status <b>-Adverse effects to site integrity are predicted from the proposed development alone in the absence of mitigation measures.</b>
Black-tailed godwit	Surface water pollution (including via groundwater)	-Conservation Objectives potentially affected are: population trend. <b>-Adverse effects to site integrity are predicted from the proposed development alone in the absence of mitigation measures.</b>
Cormorant (breeding and non-breeding)	Surface water pollution (including via groundwater) Bird collision with the proposed tower (operation)	-Conservation Objectives potentially affected are population trend and prey biomass available <b>-Adverse effects to site integrity are predicted from the proposed development alone in the absence of mitigation measures.</b>
Curlew	Surface water pollution (including via groundwater) Bird collision with the proposed tower (operation)	-Conservation Objectives potentially affected are: population trend. <b>-Adverse effects to site integrity are predicted from the proposed development alone in the absence of mitigation measures.</b>
Dunlin	Surface water pollution (including via groundwater)	-Conservation Objectives potentially affected are: population trend. <b>-Adverse effects to site integrity are predicted from the proposed development alone in the absence of mitigation measures.</b>
Golden Plover	Surface water pollution (including	-Conservation Objectives potentially affected are: population trend. <b>-Adverse effects to site integrity are predicted from the proposed development</b>

**Relevant Special Conservation Interest**      **Pathway and Effects Prediction**  
**(Grey Rows Indicate Pathways Triggering Adverse Effects)**

	via groundwater) Bird collision with the proposed tower (operation)	<b>alone in the absence of mitigation measures.</b>
Greenshank	Surface water pollution (including via groundwater)	-Conservation Objectives potentially affected are: population trend. <b>-Adverse effects to site integrity are predicted from the proposed development alone in the absence of mitigation measures.</b>
Grey Plover	Surface water pollution (including via groundwater)	-Conservation Objectives potentially affected are: population trend. <b>-Adverse effects to site integrity are predicted from the proposed development alone in the absence of mitigation measures.</b>
Knot	Surface water pollution (including via groundwater)	-Conservation Objectives potentially affected are: population trend. <b>-Adverse effects to site integrity are predicted from the proposed development alone in the absence of mitigation measures.</b>
Lapwing	Surface water pollution (including via groundwater) Bird collision with the proposed tower (operation)	-Conservation Objectives potentially affected are: population trend. <b>-Adverse effects to site integrity are predicted from the proposed development alone in the absence of mitigation measures.</b>
Light-bellied Brent goose	Surface water pollution (including via groundwater) Bird collision with the proposed tower (operation)	-Conservation Objectives potentially affected are: population trend. <b>-Adverse effects to site integrity are predicted from the proposed development alone in the absence of mitigation measures.</b>
Northern pintail	Surface water pollution (including via groundwater)	-Conservation Objectives potentially affected are: population trend. <b>-Adverse effects to site integrity are predicted from the proposed development alone in the absence of mitigation measures.</b>
Redshank	Surface water pollution (including via groundwater)	-Conservation Objectives potentially affected are: population trend <b>-Adverse effects to site integrity are predicted from the proposed development alone in the absence of mitigation measures.</b>
Ringed plover	Surface water pollution (including via groundwater)	-Conservation Objectives potentially affected are: population trend. <b>-Adverse effects to site integrity are predicted from the proposed development alone in the absence of mitigation measures.</b>
Scaup	Surface water pollution (including via groundwater)	-Conservation Objectives potentially affected are: population trend. <b>-Adverse effects to site integrity are predicted from the proposed development alone in the absence of mitigation measures.</b>
Shelduck	Surface water pollution (including via groundwater)	-Conservation Objectives potentially affected are: population trend. <b>-Adverse effects to site integrity are predicted from the proposed development alone in the absence of mitigation measures.</b>
Shoveler	Surface water pollution (including via groundwater)	-Conservation Objectives potentially affected are: population trend. <b>-Adverse effects to site integrity are predicted from the proposed development alone in the absence of mitigation measures.</b>
Teal	Surface water pollution (including via groundwater)	-Conservation Objectives potentially affected are: population trend. <b>-Adverse effects to site integrity are predicted from the proposed development alone in the absence of mitigation measures.</b>
Wetland bird habitats	Surface water pollution (including via groundwater)	-No Conservation Objectives potentially affected <b>-No Adverse effects to site integrity are predicted as no Conservation Objectives are affected</b>
Whooper swan	Surface water pollution (including via groundwater) Bird collision with the proposed tower (operation)	-Conservation Objectives potentially affected are: population trend. <b>-Adverse effects to site integrity are predicted from the proposed development alone in the absence of mitigation measures.</b>
Wigeon	Surface water pollution (including	-Conservation Objectives potentially affected are: population trend. <b>-Adverse effects to site integrity are predicted from the proposed development</b>

**Relevant Special Conservation Interest**      **Pathway and Effects Prediction**  
**(Grey Rows Indicate Pathways Triggering Adverse Effects)**

via groundwater) (construction)	<b>alone in the absence of mitigation measures.</b>
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### 8.3.3 In-Combination Effects

#### 8.3.3.1 Introduction

This assessment has particular regard for developments potentially affecting the Lower River Shannon SAC and the River Shannon and River Fergus Estuary SPA, given their close proximity to the proposed development, and because – in the absence of mitigation – adverse effects from the proposed development site were predicted to affect these sites from the proposed development alone.

#### 8.3.3.2 Known Threats to Relevant Sites

The Natura Standard Data Form for the Lower River Shannon SAC (NPWS, 2017a) ranks the following activities as posing a threat of medium importance to the SAC, and identifies no threats as of high importance. The threats of medium importance are:

- Fertilisation;
- Urbanised areas;
- Air pollution;
- Discharges (unspecified)
- Waste discharge;
- Eutrophication;
- Grazing; and,
- Polderisation.

The Natura Standard Data Form for the River Shannon and River Fergus Estuary SPA (NPWS, 2017b) ranks four activities as posing a threat of high importance to the SPA. These are:

- Industry and commercial areas;
- Discharge of waste;
- Fertilisation; and,
- Urbanisation.

The Natura Standard Data Form for the River Shannon and River Fergus Estuary SPA also identifies three activities posing a threat of medium importance to the SPA:

- Nautical sports;
- Shipping lanes; and,
- Marine and freshwater aquaculture.

#### 8.3.3.3 Planning Application Search

A search was conducted of planning applications within the vicinity of the proposed development, using the National Planning Application Map Viewer hosted by the Department of Housing, Planning, Community and Local Government, and the Planning Enquiry system hosted by LCCC<sup>26</sup>.

Retention applications (i.e. typically local-scale residential or commercial developments where an impact has already occurred), and withdrawn and refused applications were excluded (see

<sup>26</sup> Available from <http://planningenquiry.limerick.ie/pes/LAResources/info.aspx> Accessed January 2019.

Table 12).

**Table 12. Summary Results of Planning Application Search**

Planning Application Reference Number	Location Name	Brief Development Description	Application Status/ Outcome	Approximate distance and direction from Proposed Development	Date Planning Application Granted
N/A	O'Connell Street - Limerick Urban Centre Revitalisation	Targeted infrastructure and citizen investment programme specifically designed for O'Connell Street (the area between the junctions of Denmark Street and Barrington Street, approximately 786 metres in length). The aims of the project are to -Improve the public realm; -Regenerate the urban fabric; -Reduce air pollution; and, -Promote noise reduction.  This project includes the remodelling of O'Connell Street for which an option appraisal has concluded that a single southbound lane is preferred.	Feasibility Concept Phase	c. 50 m south	N/A
14801	Sarsfield Lock	Construction of a pontoon and access gantry.	Conditional	c. 425 m south west	16/1/2015
16642	Dock Road , Bunlicky	The construction of a waste transfer station intended to handle 90,000 tonnes of waste material. This project has a ten year planning permission and will occur in two phases. (This development will be subject to a separate application for a Waste Licence to the Environmental Protection Agency. This application is accompanied by an Environmental Impact Statement (EIS).	Conditional	c. 2.7 km south west	23/03/2017
13300	Ballykeeffe , Dock Road	An increase in capacity of an existing waste transfer site to 130,000 tonnes. The development will require a revision of the Waste Licence granted by the EPA. This application is accompanied by an EIS.	Conditional	c. 2.7 km south west	16/4/2014
16345/ PL91 .248285	Castlemungret	An application to introduce the burning of alternative fuels, such as tires, solvents, shredded plastic and timber at a cement manufacturing plant.	Conditional, (appealed to An Bord Pleanála)	c. 4.8 km south west	11/04/2018
18168	Ellen Street/Carr Street/Punch's Row	Completion of the works comprising of a mixed development including new connections to the mains public water and sewer.	Conditional	c. 135 m south east	19/07/2018
171180/ PL91 .301154	O Connell St	The demolition of No. 40 and No. 41 O'Connell Street and construction of a new building consisting of a 7-storey block with 2-storey portico fronting O'Connell Street. Development will provide multi-media visitor experience, exhibition and education space for the "International Rugby Experience".	Conditional (appealed to An Bord Pleanála)	c. 0.5 km south	14/02/2018
13770172	The Curragower , Clancy Strand	Change of use of existing Mona & Ivy Lodges from existing residential to new use as part of the Curragower Bar and restaurant complex including the construction of single storey extension to rear of building to incorporate new commercial kitchen.	Conditional	c. 425 m north west	15/10/2014
1613	Presentation National School , Sexton Street	The removal of existing pre-fab building and the construction of 3 no. pre-school class rooms with entrance, toilets, kitchen, office, link to existing sports hall and associated site works.	Conditional	c. 560 m south	01/06/2016
16800	Bishop's Quay , Lower Cecil Street , & Henry Street	Demolition of the former Electricity Supply Board premises, demolition of rear annex, and change of use of No. 104 Henry Street from commercial use to residential use and construction of a commercial building.	Conditional	c. 620 m south west	19/06/2017
161010	Corner of Anne Street , and 42	Construction of a two storey mixed commercial unit including retail/restaurant with signage and all ancillary site works.	Conditional	c. 390 m south	21/04/2017

Planning Application Reference Number	Location Name	Brief Development Description	Application Status/ Outcome	Approximate distance and direction from Proposed Development	Date Planning Application Granted
Thomas Street					
Part 8 application 178001	Kilmurry Court , Garryowen , Limerick	Provision of 7 no. residential units, 2 no. two storey and 5 no. single storey units.	Pending	c. 900 m east	N/A
Part 8 application 178012	Clare Street & Lelia Place, Limerick.	Provision of 7 no. residential units (2 no. three-storey, 3 bedroom houses and 5 no. 2 bedroom apartments in two blocks and upgrading and re-routing of foul sewers and surface water drainage.	Pending	c. 470 m east	N/A
17949	58 Clare Street , Limerick	Construction of 4 no. three-storey terraced houses, car parking and ancillary site works to the rear.	Conditional	c. 830 m east	02/07/2018
18189	Strand Hotel Limerick, Ennis Road , Limerick.	The construction of a single storey extension of 687 sq. m (gross floor area) to the north wing of the existing hotel. The extension will include the provision of 20 additional hotel rooms; maintenance desk area; and repositioning of plant from existing roof to the roof of the new extension.	Conditional	c. 600 m west	31/05/2018
Part 8 application 188010	Lower Carey's Road , Limerick	Provision of 11 no. residential units, upgrading and re-routing of foul sewers and surface water drainage and (iv) all associated site works.	Pending	c. 1 km south	N/A

In the context of bird strike, a review was undertaken of other tall buildings in the vicinity of the proposed development site in Limerick City. There was no relevant information obtained on known or potential bird collisions with the existing 59 m high Riverpoint building at Bishop's Quay, either through consultation (Section 6.1), or through review of relevant planning files for Reference 04770206. There was similarly no information obtained on known or potential bird collisions with the existing 57 m high Clayton Hotel in Limerick City (Planning Reference P.97/409). There was no relevant information obtained on known or potential bird collisions with the proposed 15 storey structure, also at Bishops Quay (Planning Reference 16800). These buildings will collectively act in combination with the proposed development to increase the number of tall structures into which birds could collide. However these and all other buildings in Limerick City are situated in a brightly lit urban centre, below the height along which significant migratory bird movements occur. No significant in-combination bird collision effects are predicted.

The planning portal of An Bord Pleanála<sup>27</sup> and lists of Strategic Housing Developments (SHD)<sup>28</sup> were also consulted to identify any relevant applications in close proximity to the proposed development (see Table 13). There were at the time of writing no SHD applications in County Limerick.

**Table 13. Results of An Bord Pleanála Planning Search**

ABP Planning Reference Number	Brief Development Description	Application Status/ Outcome
PL13 .HC0006	Proposed Foynes to Limerick Road Improvement Scheme.	Pre-application consultations completed; application yet to be lodged.
PL91 .302168	Demolition of nos. 40 and 41 O'Connell Street, construction of building fronting O'Connell Street., providing multi-media visitor experience, exhibition, education space for the "International Rugby Experience".	Granted.

### 8.3.3.3.1 Discussion of Planning Applications

Numerous permissions were granted to extend or refurbish existing properties in the area surrounding the proposed development, due to the proposed developments location within Limerick City.

<sup>27</sup> Available online at <http://www.pleanala.ie> Accessed January 2019.

<sup>28</sup> Available online at <http://www.pleanala.ie/shd/applications/CurrentApplications/> Accessed January 2019.

With the exception of the consented (and existing) development (Reference 14801) of a pontoon and access gantry to the River Shannon at Sarsfield Lock (Harvey's Quay), within the Lower River Shannon SAC and River Shannon and River Fergus Estuary SPA, none of the permissions reviewed comprised infrastructure within European sites. Mitigation measures were proposed by the applicant to mitigate potential impacts from the construction of the pontoon and access gantry, and conditions additionally attached by LCCC to protect the River Shannon as part of the decision to grant planning reference 14801 including:

- Construction of all structures off-site;
- Production of a Construction and Environmental Management Plan in consultation with LCCC to include restriction of all fuel storage and any refuelling on-site; and,
- The presence of an ecologist to oversee implementation of mitigation measures;

Environmental Impact Assessments (EIA), accompanied by relevant mitigation were carried out by the applicants as part of the planning applications for several developments including references 13300, 16642 and 16345.

There are not determined to be significant in-combination collision effects on designated bird populations from the proposed development in –combination with other existing or proposed buildings in nearby urban Limerick, given that the scientific literature suggests significant migratory populations fly above urban building heights (i.e. 600 m as stated in Dokter et al., 2010).

No other potentially significant in-combination effects were identified with the existing and proposed developments in the planning application search results.

Potential for in-combination pollution effects are discussed further in Section 8.3.3.5.

#### 8.3.3.4 Plans

The Project Ireland 2040 National Planning Framework (Department of Housing Planning and Local Government, 2018b) is the overarching policy and planning framework for the social, economic and cultural development of Ireland. It includes a detailed capital investment plan for the period 2018 to 2027, the National Development Plan 2018-2027, and the 20-year National Planning Framework 2040. Project Ireland 2040 does not specifically identify any projects or policies in Limerick or elsewhere likely to result in significant in-combination effects. The draft Regional Spatial & Economic Strategy for the Southern Region (Southern Regional Assembly, 2019) sets out a 12-year strategic development framework for the Southern Region,. There are no potential in-combination effects from any policies in these plans, both of which have been subjected to AA's which concluded there would no adverse effects to European sites.

The Limerick City Development Plan 2010 – 2016 as varied (LCC, 2010) will remain in effect until an updated Development Plan has been adopted. The proposed development is specifically identified within the Limerick City Development Plan:

Policy CC.5 New Business Offer *"it is the policy of Limerick City and County Council to secure the development of the Opera Centre, the Hanging Gardens and the former Cleeves factory in support of the objectives set out in Limerick 2030"*.

The Opera Site is identified as having the potential to develop office based employment, cultural facilities with residential, retail and community uses.

There are specific mitigation policies in the LDP which will mitigate any potential for adverse effects from plan implementation. In particular there is a policy *"to protect the integrity of Natura 2000 sites during the identification of suitable sites for recreation, in particular in terms of their design and use"* (Policy LBR8).

Chapter 11 of the Limerick City Development Plan (Landscape, Biodiversity, and Recreation) includes environmental protection inherent in policies LBR.8 (use of Precautionary Principle), LBR.7 (implementation of Limerick City Biodiversity Plan), LBR.9 (protection of River Shannon and other waterways), and LBR.10 (protection of trees and wetlands).

The Limerick 2030 Economic and Spatial Plan (LCCC, 2015; hereafter 'the Limerick 2030 Plan) includes specific commentary on the proposed development:

- *"The development of the Opera Site provides the potential to have many hundreds of people working on this site over the next 10 years, thereby creating a vibrant City Centre employment cluster and a positive draw for other private sector investment."*



- The proposed development was also identified as: “A key driver for increased economic activity in the City Centre with potential to deliver significant employment opportunities and will act as a catalyst for other city centre developments and will act as a catalyst for other city centre developments”.

One of the key objectives of the Limerick 2030 Plan is to “establish a unique tourism offer that takes full advantage of the City Centre’s special heritage and environmental characteristics”. Further protections within the plan include the commitment to complete “improvements to the physical environment” (p.11). An AA Screening Statement produced by LCCC (LCCC, 2014) concluded that the Limerick 2030 Plan would not have likely significant effects on any European sites.

The Shannon (CFRAM) study implemented by the Office of Public Works (OPW) provides a strategy for the reduction and management of flood risk in Ireland. Limerick City, and therefore the proposed development site fall within a catchment unit named ‘Unit of Management (UoM) 25’. Each CFRAM Study is focused on areas known to have experienced fluvial (river) and/or coastal flooding in the past or which are considered to be at potentially significant risk. The OPW have proposed an extensive series of flood risk management options for UoM 25, including culvert upgrades, demountable defences, localised dredging and widening of the River Shannon, raising of road levels, and installation of various flood gates, and flapped outfalls. Following completion of an AA Screening Assessment, the OPW commissioned an NIS for UoM 25 (OPW, 2018), to assess the potential for the flood risk management options for UoM 25 to have adverse effects on European sites either alone or in-combination with other plans or projects. The NIS for UoM 25 concluded there would be no adverse effects on European sites, following implementation of detailed mitigation falling under five headings:

- requirement for project-level assessments;
- survey specifications informing project-level assessments;
- detailed design specifications at project-level;
- ecological assessment specifications at project-level (e.g. flood modelling); and,
- pollution mitigation specifications at project-level.

### 8.3.3.5 Pollution

The existing estuarine water quality downstream of the proposed development site offers a useful proxy metric for the pressure of existing projects and plans on the aquatic features within the Shannon Estuary, including the Lower River Shannon SAC and River Fergus and River Shannon Estuary SPA. As has already been detailed in Section 7.4.2, the water quality of estuarine waters within the Zol of the proposed development is “unpolluted” according to the EPA<sup>9</sup>. This suggests a relatively high assimilative capacity to absorb pollutants, relative to watercourses of polluted status. However the River Basin Management Plan (RBMP) (DoHGLP, 2018) states that “significant progress remains to be made regarding meeting the requirements for protected areas”. This is reflected in the fact that, based on data from 2007-2015, the EPA considers both the Upper and Lower Shannon Estuaries as “At Risk” of not meeting the WFD objective of “Good Status”<sup>29</sup>.

The Shannon International River Basin District (RBD) is one of eight RBDs established in Ireland. The implementation of the programme of measures developed as part of the RBMP is aimed at achieving improvements to the existing moderate status of the water body.

Following the construction of c.45 km of large diameter interceptor sewers and the associated WwTP, untreated Waste water discharges to the Shannon and Abbey Rivers from Limerick City have been eliminated.

There are binding obligations on all Irish local authorities including Limerick City and County Council to achieve good status of surface waters, under the terms of the EU Water Framework The following policies in the Limerick City Development Plan, will further mitigate the risk from future development pressures to protect water quality in the Shannon Estuary:

- Under Policy WS.6 Surface Water Drainage, it is the policy of Limerick City Council to provide a high quality Surface Water Collection and Disposal System. Specific objectives under this policy include:
  - Control discharges of surface water into drainage systems where the receiving drainage system is at or nearing full capacity;

<sup>29</sup> Available online from <https://gis.epa.ie/EPAMaps/> . Accessed January 2019

- To work in conjunction with other public bodies towards a sustainable programme of improvement for riverbanks, back drains, etc.
- Under Policy WS.5 Waste Water, “All new development proposals shall adhere to the following:
  - Have regard to the policy, national standards and guidelines, of not allowing the discharge of contaminants and greases to the City Council sewers;
  - Provide an adequate surface water system in order to minimise the risk of flooding.

Furthermore, Irish Water, who has national statutory remit for wastewater and drinking water services, has committed to a 25 year programme of improvements to wastewater impacts on surface waters in their Water Services Strategic Plan (WSSP).

Having regard for the inherent legal and policy requirements for good water quality above, no significant in-combination pollution effects are proposed.

#### **8.3.4 Concluding Statement: In-Combination Effects**

Following review of projects and plans, having regard for the existing unpolluted status of the Shannon Estuary, given the policy protections at national and county level, no significant in-combination effects are predicted to interact with the proposed development to adversely affect the Lower River Shannon SAC and/or the River Fergus and River Shannon Estuaries SPA.

## 9. Mitigation Measures

This section should be read with Figure 3 (Appendix A).

### 9.1 Construction Stage Mitigation

#### 9.1.1 Protection of QI Bryophytes of Lower River Shannon SAC

A Mobile Elevated Working Platform (MEWP), parked on Charlotte's Quay, will allow Contractors to access the limestone wall from the Abbey River side of the existing quay wall, whilst avoiding instream works. The Contractors will use a coring method (i.e. drilling from north to south), which will avoid any material entering the Abbey River. This will avoid any disturbance to QI bryophyte communities located c.1 m below the proposed outfall location. There will be no pouring of concrete for the installation of the proposed outfall, albeit Contractors will be permitted to locally grout the finished outfall.

The Ecologist will review and input to the method statement produced by the Contractor to ensure the method statement contains the specific measures above.

The Ecologist or other similarly experienced ecologist will then supervise the works to Charlotte Quay and direct or advise the Contractor as appropriate, to ensure the method statement is implemented, and bryophyte communities and water quality of the Lower River Shannon SAC are protected.

#### 9.1.2 Pollution: Lower River Shannon SAC and River Shannon and River Fergus Estuaries SPA

##### 9.1.2.1 Construction Methodology and Phasing Management Plan

The CMPP, which is included with this application, sets out the procedures, standards, work practices and management responsibilities of the appointed contractor to address potential negative environmental effects that may arise during construction of the proposed development. The primary aim of the CMPP is to reduce any potential negative effect from construction on the environment, as part of the implementation of the mitigation measures. The CMPP describes the approach that will be adopted to environmental management throughout project works at the site.

##### 9.1.2.2 Method Statements

The Contractor shall produce site-specific Method Statements for review and agreement with the Ecologist and Inland Fisheries Ireland, to demonstrate adherence to the specific, tried-and-tested pollution control measures set out below. These tried-and-tested pollution control measures leave no reasonable scientific doubt as to the protection of European sites from adverse effects.

##### 9.1.2.3 Main Pollution Control Measures

The Contractor will take the following mitigation measures:

- Prior to excavation of the basement, the proposed foul and storm water sewers in Michael Street will be laid and commissioned to allow the existing combined sewer to be diverted. During the construction of the new sewers, surface water arising from the development will continue to discharge to the combined sewer. Surface water collected will be treated by sedimentation prior to discharge to the existing combined sewer. Total Suspended Solids (TSS) and colour will be monitored daily by a hand held multi parameter sonde.
- Neither ground water nor surface water runoff from the working areas will be permitted to discharge directly to the Abbey River or Shannon River. Run off generated within the site during construction will be filtered and treated to remove hydrocarbons and sediment. Total Suspended Solids (TSS), pH/Electrical Conductivity and colour will be monitored daily by a hand held multi parameter sonde. In addition, the outlet from the sedimentation pond will incorporate a turbidity monitor with alarm at high level. In the event of surface water failing to meet the required standards, as set out in the discharge licence, water will be recirculated to the inlet of the sediment pond to provide further time for settlement. A penstock will be provided on the outlet from the sediment pond to control discharge from the site.
- In the event of surface water failing to meet the required standards, as set out in the discharge licence, water will be recirculated to the inlet of the sediment pond to provide further time for settlement. A penstock will be provided on the outlet from the sediment pond to control discharge from the site.
- No pouring of concrete will occur during the construction of the outfall, albeit localized grouting would be required as already stated in Section 9.1.1

- Maintain and monitor the performance of the surface water drainage network throughout the construction of the proposed development (as set out under Section 5.3.2), noting that the proposed storm sewer will include a permanent hydrocarbon separator which will treat runoff from Michael Street.
- Cover all temporary stockpiles generated during construction to minimise run-off;
- Locate spoil and temporary stockpiles in locations which are at least 15 m from drainage systems, the Abbey River and the River Shannon;
- Avoid direct or indirect discharges of untreated surface or ground water generated during the proposed development, to any surface water;
- Dewater all working areas at the end of each working day, if necessary using pumping and transport of water off-site in tankers (to appropriately licensed facilities) if volumes prevent effective attenuation and treatment prior to discharge;
- Where the Contractor utilises pumping to drain works areas, a back-up pump and generator shall be provided on site for use in the event of the primary pump failing;
- Use wheel washers and dust suppression on site roads (to be captured within the proposed treatment and attenuation system), and undertake daily plant maintenance checks and corrective actions where required;
- Establish contingency measures to cater for impacts to unknown services underlying the construction site (for example, old sewers, culverts);
- Identify whether shallow groundwater monitoring wells on site will be maintained and protected during construction works; decommissioned; or removed completely as part of excavation works, to prevent them from acting as direct pathways for contamination to enter the groundwater body beneath the site;
- Excavation:
  - All excavated materials will be inspected for signs of possible contamination, such as staining or strong odours;
  - Should any unusual staining or odour be noticed, this made ground / subsoil will be segregated and samples analysed for the presence of possible contaminants in order to determine an appropriate disposal outlet; and,
  - Excavated made ground and subsoil will be disposed to licensed / permitted waste management facilities, as appropriate for the waste classification of the material.
- Importation of fill:
  - The Contractor will vet the source of aggregate, fill material and topsoil imported to site in order to ensure that it is of a reputable origin and that it is “clean” (i.e. it will not contaminate the environment);
  - The Contractor and/or LCCC will implement procurement procedures to ensure that aggregate, fill material and topsoil are acquired from reputable sources with suitable environmental management systems as well as regulatory and legal compliance;
- Disposal of materials:
  - All material to be disposed of off-site will be disposed of to a facility licensed having regard for Irish Waste Management legislation. Where material is to be stockpiled on site prior to disposal, the contractor will control all run-off to prevent contamination of surrounding watercourses;
  - Contaminated soil will be assessed to determine its constituents and disposed of offsite having regard for Irish Waste Management legislation; and,
  - The Contractor will dispose of all alkaline wastewaters and contaminated storm water off-site having regard for Irish waste legislation.
- Control of concrete:
  - Ready-mixed concrete will be brought to the proposed development site by truck;
  - The pouring of concrete shall take place within a designated area to prevent concrete run-off into the soil / groundwater media;
  - During construction no pouring of concrete will occur during the construction of the outfall. Works to locally grout and otherwise repair Charlotte Quay, following installation of the proposed outfall will be

supervised by the Ecologist or other suitably experienced ecologist who will advise and direct the Contractor such that contaminated surface water does not enter the Abbey River;

- Washout of concrete transporting vehicles shall take place at an appropriate facility, offsite or where onsite wash out will be captured, for disposal off-site.
- Pollution Risk from Flooding
  - The Contractor will provide a ramp to the proposed development site as a mitigation measure to prevent any flood waters to enter the main structure or the underground structure during the Construction Stage.
  - As coastal flooding is somewhat predictable the Contractor shall take note of when coastal flooding warnings are issued for the Limerick City area (usually c. 24-36 hours in advance). In the event that a flood warning is issued, all plant and construction materials shall be moved and stored within areas only at risk from the 1 in 0.1% AEP coastal flood event (i.e. areas within 'Flood Zone C' as defined by OPW and DoEHLG (2009), which includes parts of Patrick Street, Ellen Street and Rutland Street). In this way, in the event of floodwaters inundating the site, no materials will be washed from the site into nearby watercourses.

#### 9.1.2.4 Spill Control Measures

No oils/fuels will be stored on the proposed development site for the purpose of refuelling on the site.

On-site plant will be refuelled by an external Contractor who will call to site as required. Road vehicles will not be refuelled at the site. Minor spills and leaks may occur from road vehicles and the onsite excavator. Any oils or fuels onsite will be removed by an experienced and authorised contractor.

Fixed plant shall be self-bunded; mobile plant must be in good working order, kept clean, fitted with drip trays where appropriate and subject to regular inspection.

Spill kits and oil absorbent material shall be carried with mobile plant and located at vulnerable locations around the site to reduce risk of spillages entering the sub-surface or groundwater environment; booms shall be held on-site for works near drains or dewatering points.

The Contractor will train all operatives in the proper handling of materials, the sensitive nature of the wider drainage system, and the consequences of accidental spillage.

The following steps provide the procedure to be followed by the Contractor(s) in the event of any significant spill or leak.

- Stop the source of the spill and raise the alarm to alert people working in the vicinity of any potential dangers;
- If applicable, eliminate any sources of ignition in the immediate vicinity of the incident;
- Contain the bulk of the spill immediately using a spill kit before placing the contaminated absorbent material and the contaminated soil in a stockpile outside the 1% Annual Exceedance Probability (AEP) floodplain (and at least 10 m from, and downslope of any drainage system or watercourses);
- Place all contaminated material on and cover with plastic to prevent leachate generation, until such time as it can be removed off-site by an appropriately licensed waste management company;
- If possible, cover or bund off any vulnerable areas where appropriate such as drains or watercourses;
- Notify a fully licensed waste Contractor immediately giving information on the location, type and extent of the spill so that they can take appropriate action to further investigate the incident to ensure it has been contained adequately, and so that the fully licensed waste Contractor can, subject to the appropriate permits, dispose of the contamination off-site having regard for relevant legislation; and,
- Notify LCCC and (if LCCC deem it appropriate) Inland Fisheries Ireland (IFI).

### 9.1.2.5 Emergency Response and Environmental Training

The Contractor shall produce an Emergency Response Plan (ERP) based on the Contractor's own Risk Assessment, which will be reviewed by the Employer's Representative Team, including the Ecologist. The ERP will include:

- The Contractor's proposed training of relevant staff, including cover staff, in the implementation of the ERP and the use of spill kits;
- Details of procedures to be undertaken by the Contractor in the event of the release of any sediment into a watercourse, or any spillage of chemicals, fuel or other hazardous wastes, non-compliance incidents with any permit or licence, or other such risks that could lead to a pollution incident, including flood risks;
- Confirmation of the number and specification of spill kits which shall be carried by the Contractor; and,
- Information on spill control procedures as specified in Section 9.1.2.4.

### 9.1.2.6 Monitoring During Construction

The Contractor will produce and commence a Water Quality Monitoring Programme (WQMP) at least one month in advance of the construction programme including any enabling works to establish a baseline dataset, and continue throughout construction. The regularity of, and specification for water quality monitoring in this section has been agreed following consultation with IFI during EIAR production.

The baseline water quality dataset will include sampling at low tide, sampling at high tide, and (where possible should such events overlap with the pre-construction monitoring period) periods of elevated rainfall.

The WQMP will sample surface water discharge upstream and downstream from the proposed outfall to the Abbey River, in similar habitat and flow conditions, to enable siltation and other contaminants from the proposed development to be detected and distinguished from 'background' levels (including natural and man-made activities).

The WQMP will include relevant parameters from the European Communities (Quality of Salmonid Waters) Regulations, 1988 S.I. No. 293 as amended including Suspended Solids, pH, Dissolved Oxygen, Biochemical Oxygen Demand, hydrocarbons, Nitrites, Nitrates and heavy metals.

Testing for pH, turbidity and/or Total Suspended Solids will be carried out daily in-situ using a calibrated multi-parameter sonde (to 0.1 NTU accuracy), and fortnightly for all other parameters.

The WQMP will inform the Contractor's adaptive management of the temporary construction-phase drainage works, having regard for any consents or planning conditions.

The Contractor will provide WQMP results to the Ecologist and LCCC at least fortnightly (but immediately after a known silt release or other pollution incident), along with a record of any corrective actions taken by the Contractor to improve or repair performance of silt fencing or other surface water protection measures.

### 9.1.3 Role of the Ecologist

Prior to commencement of construction, a suitably experienced and qualified Ecologist (the Ecologist), will be engaged as part of the Employer's Representative (ER) Team. The Ecologist will be a full member of a relevant professional institute such as the Chartered Institute of Ecology and Environmental Management (CIEEM), have relevant experience in the management of ecological constraints during construction, and hold or have held a protected species licence(s) in the Republic of Ireland. The Ecologist shall be appointed sufficiently in advance of the proposed development to arrange for any mitigation requirements to be incorporated into the Contractor's site-specific Method Statements and programme.

The Contractor will accommodate the Ecologist, whose role will be to:

- Communicate relevant matters to LCCC, and other stakeholders as relevant;
- Review Contractor Method Statements for compliance with the mitigation in this NIS ;
- Attend site meetings and input to Contractor toolbox talks prior to commencement of the proposed development; and,

- Supervise and direct construction of the proposed development as part of the Employer's Site Representative (ESR) Team<sup>30</sup>, including setting out.

#### 9.1.4 Licensing

At the time of writing this NIS, there were no protected species licences required in relation to QIs/SCIs, or invasive species. The presence of a common pipistrelle bat roost has been identified and is not relevant to the NIS. The presence of this roost will be mitigated during construction under licence as provided for in the EIAR for the proposed development.

The Ecologist will determine the potential requirement for licences outside the scope of this NIS (e.g. for protected species such as non-QI bat species and non-SCI bird species).

## 9.2 Operation Stage Mitigation

### 9.2.1 Pollution

The proposed storm water drainage system has been designed to ensure that there will be no increase in water levels or flow rates downstream of the proposed outfall. The system includes two attenuation tanks which will store run-off when the inflow rate exceeds 9.4l/s (the greenfield runoff rate). The system also includes a Class I ByPass Hydrocarbon Separator to remove hydrocarbons which may be suspended in runoff. To minimise sediment build up within the storm water drainage network, trapped inlets will be used at all points of entry and key manholes will have sumps to collect material. A regular maintenance regime, including monitoring, will be put in place to remove any excess build-up of material. A Class I ByPass Hydrocarbon Separator has also been provided to treat surface water collected in the new gullies on Michael Street.

Limerick Twenty Thirty shall on behalf of LCCC establish a maintenance company that will be responsible for the regular maintenance and monitoring of all infrastructure installed as part of the development. This includes the surface water drainage, gullies and petrol interceptor on Michael Street. Future third party Connection to the infrastructure in Michael Street will only be permitted if the same undertaking can be given with regards maintenance and monitoring. Limerick Twenty Thirty will be responsible for funding of the company and should units be sold (or resold) or leased (or subsequently lease), the sale shall incorporate a legal obligation on each unit owner to fund this management company on a pro rata basis.

### 9.2.2 Bird Collision (River Shannon and River Fergus Estuary SPA)

#### *Literature Review of Potential Mitigation Options*

Following a meta-review of historical studies of recorded bird collisions with lit communication towers, Longcore et al., (2012) recommended that solid red lights be replaced with flashing (not slow pulsing) red, red strobe, or white strobe lights to significantly reduce bird strike in the context of communication towers, in North America and Canada, across all bird species. The nature of the review by Longcore et al. meant that only existing tower-mounted light types were assessed (i.e. red and white, both strobe and solid), and the study therefore did not assess green light.

Poot et al (2008, not cited in Longcore et al., 2012) designed a field study to test if and how changing light colour influenced migrating birds under field conditions. This study was conducted at a single location in the North Sea, off the Dutch Coast, over the course of 41 nights during autumn migration in 2003 (September–November) under various weather conditions. Poot et al found that nocturnally migrating birds were disoriented and attracted by red and white light (containing visible long-wavelength radiation), whereas they were clearly less disoriented by blue and green light (containing less or no visible long-wavelength radiation). This finding was particularly evident on overcast nights.

Flashing lights (red and white lights) have been shown to repel birds, and produce significantly fewer collisions than do solid or slow-pulsing red lights to which birds may be attracted (Gehring et al., 2009; Longcore et al., 2012), particularly on foggy, misty nights. The NIS author is not aware of any available evidence on the relative merits of solid vs flashing green lights in reducing bird collisions.

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<sup>30</sup> The ESR Team is the site-based part of the ER team.

### *Proposed Mitigation*

In the absence of evidence to the contrary, in the light of best available scientific knowledge, *flashing green lights [emphasis added]* shall be installed on the proposed tower at Bank Place, and be maintained in good working order throughout building operation.

Prior to procurement of the proposed (flashing, green) lighting system, an ecologist with relevant credentials in the technical field of bird collision mitigation will review this measure, in the light of peer-reviewed scientific evidence published since the production of this NIS. In the event where new scientific evidence on lighting mitigation for bird collision conflicts with this measure, the ecologist will advise the relevant planning authority as appropriate, and advise on any changes in light colour or other parameters required to minimise the potential for strike risk.



## 10. Concluding Statement

Following implementation of mitigation measures which have been developed following Appropriate Assessment of the implications of the proposed development for European sites, and in view of relevant Conservation Objectives, the proposed development will have no adverse effects on the integrity of any European sites, either alone or in-combination with other plans or projects.

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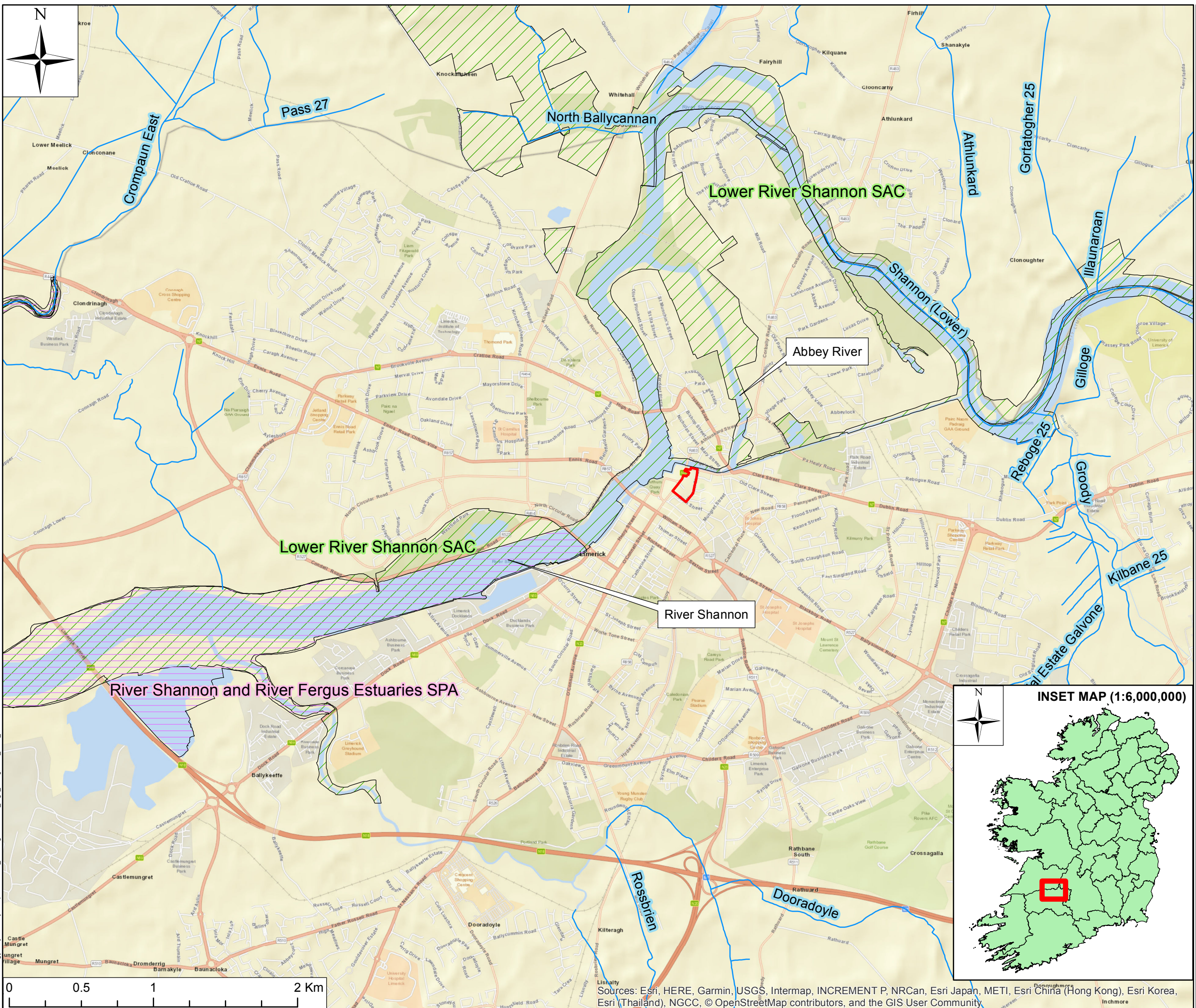
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## Appendix A Figures

**Figure: 1 Relevant European Sites**

**Figure: 2 Known Locations of Relevant Qualifying Interests**

**Figure: 3 Mitigation for European Sites**



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**Project Title:**  
 OPERA SITE

**Client:**  
 LIMERICK CITY AND  
 COUNTY COUNCIL

- LEGEND**
- Proposed Development Site
  - Watercourses
  - Special Protection Area (SPA)
  - Special Area of Conservation (SAC)

**Notes:**  
 There are no existing Natural Heritage Areas (NHAs) in the map extent

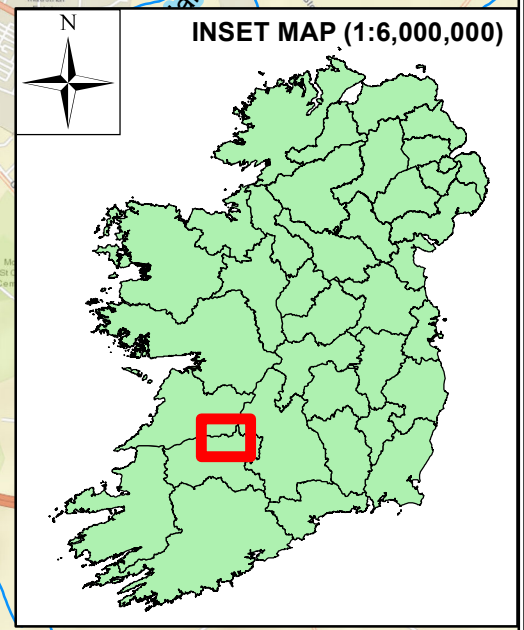
**AECOM Internal Project No:**  
 60568520

**Drawing Title:**  
 FIGURE 1. EUROPEAN SITES DISCUSSED IN NATURA IMPACT STATEMENT

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**Date:**  
 30/01/19

**Drawn: Chk'd: Ver'd App'd:**  
 SW KM XX XX

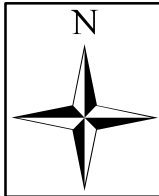


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Bryophytes on limestone wall assumed to correspond to Qualifying Interest (QI) Watercourses of Plain to Montane levels.

Abbey River

Outfall to Abbey River, fitted with flap valve.

Charlotte's Quay





Lower River Shannon SAC

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**Project Title:**  
OPERA SITE

**Client:**  
LIMERICK CITY AND  
COUNTY COUNCIL

- LEGEND**
-  Proposed Development Site
  -  Proposed Surface Water Drainage
  -  QI watercourses of plain to montane levels habitat (bryophytes) of Lower River Shannon SAC
  -  Special Area of Conservation (SAC) and extent of QI estuary habitat

**Notes:**

**AECOM Internal Project No:**  
60568520

**Drawing Title:**  
FIGURE. 2. LOCATIONS OF  
RELEVANT QUALIFYING  
INTEREST HABITATS.

**Scale at A3:** 1:1,250

**Date:**  
30/01/19

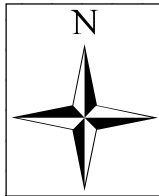
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Mitigation applicable to proposed surface water drainage and outfall:

- Drain and outfall, including SUDS to be constructed first;
- Outfall construction method to avoid pouring of concrete;
- Flap valve to be fitted;
- Proposed pipe installed by coring through wall;
- Method statement for works to be reviewed by suitably qualified ecologist; and;
- Works to be supervised by the suitably qualified ecologist to advise and direct Contractor on compliance with method statement.

**LEGEND**

- Proposed Development Site
- Proposed Surface Water Drainage
- Special Area of Conservation (SAC)
- Strobe light location

(Proposed Tower: Bank Place Place)

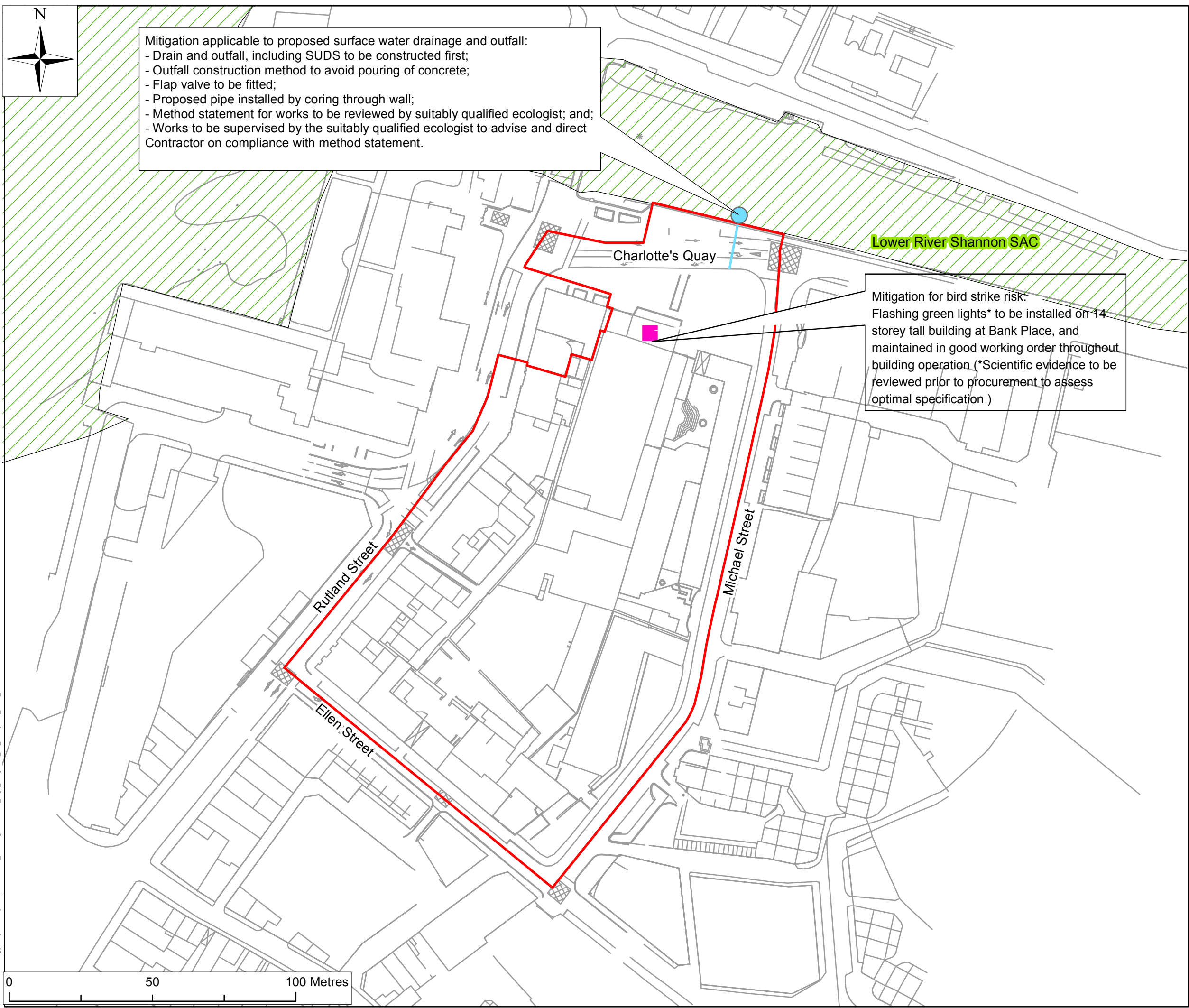
**Notes:**

- Refer to Chapter 16 for full suite of biodiversity mitigation.
- Other pollution mitigation during construction related to flood risk, phasing and drainage works is detailed in Chapter 9.4 of NIS.

**AECOM Internal Project No:**  
 60568520

**Drawing Title:**  
 FIGURE. 3. MITIGATION FOR EUROPEAN SITES.

**Scale at A3:** 1:1,250  
**Date:** 08/03/19  
**Drawn:** SW **Chk'd:** KM **Ver'd:** RF **App'd:** RF



Mitigation for bird strike risk:  
 Flashing green lights\* to be installed on 14 storey tall building at Bank Place, and maintained in good working order throughout building operation (\*Scientific evidence to be reviewed prior to procurement to assess optimal specification )

