MERC Consultants
environmental and conservation services

EU Habitats Directive: Annex IV Risk Assessment

Uisce Éireann - Rosie Hackett Bridge - Liffey Siphon Project

Proposed Maritime Site Investigations (SI)

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1	4/9/2026	Ronan Browne	Louise Scally
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Contents

1. Introduction 1
2. Legislation 3
3. Proposed site-investigation work 5
3.2 Survey/ support vessel and working platform 7
3.3 Site investigations 8
4. Receiving environment: Annex IV Species 10
4.1 Cetaceans 10
4.2 Otter 10
4.3 Bats 10
4.4 Reptiles (marine turtles) 11
5. Risk assessment 12
5.1 Sources on impact 12
5.1.1 Cetaceans 12
5.1.2 Otter 13
5.3 Bats 13
6. Risk Assessment Conclusion 13
8. Assessment of residual risk 14
9. Proposed mitigation 14
10. Bibliography 17

List of Figures

Figure 1. Overview of proposed site investigation location 2

List of Tables

Table 1. Project details and scope. 5
Table 2. Survey equipment and acoustic information. 6
Table 3. Example of a survey/working platform 8

1. Introduction

Uisce Éireann wishes to develop the Rosie Hackett Bridge - Liffey Siphon Project in Dublin City. The existing single-barrel inverted wastewater siphon beneath the River Liffey, constructed circa 1900, is a critical single point of failure in the wastewater network. The proposed permanent development would provide a new twin-barrel siphon between Eden Quay and Burgh Quay, together with shafts, connecting gravity pipelines, headworks and associated infrastructure.

The proposed maritime usage is in the tidal River Liffey in Dublin City, between Rosie Hackett Bridge and Butt Bridge, extending between Eden Quay on the northern bank and Burgh Quay on the southern bank. The proposed MUL area (Area A) is 1,831.81 m² (0.183 ha) and is shown in Figure 1 in relation to the Tailte Éireann High Water Mark.

The site investigations (SIs) are intended to determine physical, geotechnical, archaeological and environmental conditions required to design and assess the new siphon crossing. The current controlled scope comprises MBES bathymetry, sub-bottom profiling, marine refraction seismic, marine electrical resistivity tomography (ERT), two marine boreholes, benthic ecology sampling, archaeological inspection, and ancillary water/CTD observations.

This document presents an Annex IV risk assessment prepared to address the strict protection provisions for Annex IV species.

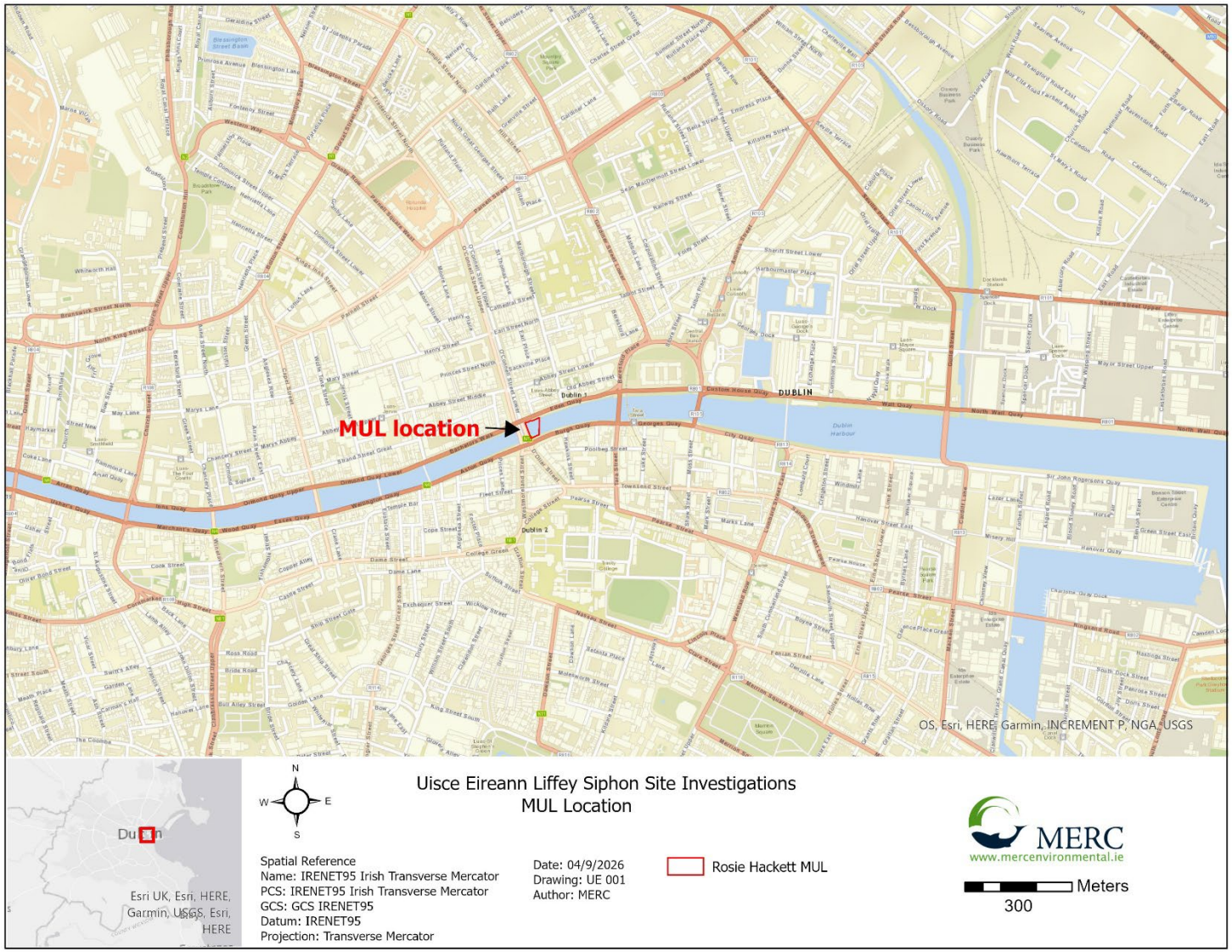


Figure 1. Overview of proposed site investigation location

2. Legislation

This assessment is prepared under Article 12 of Directive 92/43/EEC as transposed by the European Communities (Birds and Natural Habitats) Regulations 2011.

Article 12 of the EU Habitats Directive states:

Member States shall take the requisite measures to establish a system of strict protection for the animal species listed in Annex IV (a) in their natural range, prohibiting:
(a) all forms of deliberate capture or killing of specimens of these species in the wild;
(b) deliberate disturbance of these species, particularly during the period of breeding, rearing, hibernation and migration;
(c) deliberate destruction or taking of eggs from the wild;
(d) deterioration or destruction of breeding sites or resting places.

2. For these species, Member States shall prohibit the keeping, transport and sale or exchange, and offering for sale or exchange, of specimens taken from the wild, except for those taken legally before this Directive is implemented.

3.The prohibition referred to in paragraph 1(a) and (b) and paragraph 2 shall apply to all stages of life of the animals to which this Article applies.

4. Member States shall establish a system to monitor the incidental capture and killing of the animal species listed in Annex IV (a). In the light of the information gathered, Member States shall take further research or conservation measures as required to ensure that incidental capture and killing does not have a significant negative impact on the species concerned.

This Annex IV assessment examines whether the proposed works could give rise to: (i) deliberate killing; (ii) deliberate disturbance, particularly during breeding, rearing or migration; or (iii) deterioration or destruction of breeding or resting sites.

In accordance with Irish and CJEU law, 'deliberate disturbance' requires knowledge of the presence of the species and the intention to carry out the action giving rise to the disturbance.

To define the ZoI of a project, the potential for project related effects on sensitive receptors must first be established. For this purpose, a **Source-Path-Receptor (SPR)** model was applied. The SPR model is a well-established model frequently applied to the analysis of project related impacts on ecosystems and is the one which has been applied to the assessment of the proposed project.

Using this approach all elements of the proposed project were reviewed to assess potential pathways and receptors which might be affected so that a ZoI could be established. This process involved the following steps:

- The identification of sources of potential impacts and their pathways from the proposed project site to European Sites.

- Consideration of sensitive receptors and their dependent ecosystems within the aforementioned European sites.
- Identifying and characterising project related impacts and their likely effects, direct, indirect and cumulative on the identified sensitive receptors.

Once the ZoI was established, the following steps were taken to assess the potential for likely significant effects on sensitive receptors:

1. The scale and scope of the project was examined.
2. A desk review of the available literature describing the habitats and species known to occur at the proposed project sites and surrounding area was undertaken.
3. Any project related activities likely to affect migratory or highly mobile species was considered.
4. Any use of the proposed project sites by mobile species that make regular movements to, from, or across the site was assessed.
5. An assessment was carried out of the key ecological processes and species activity periods including seasonal variations in distribution, abundance and activity.

For this Annex IV assessment, the Source-Pathway-Receptor model is applied to Annex IV species and their breeding/resting sites throughout their natural range.

3. Proposed site-investigation work

The proposed project is limited to temporary site investigations. The assessment uses a defined maximum activity envelope for equipment, quantities, operating parameters, footprint and duration, as set out below.

The permanent Liffey siphon project is intended to provide network resilience by replacing the existing circa-1900 single-barrel siphon with a new twin-barrel siphon and associated infrastructure. Those permanent works are outside this Annex IV assessment. This assessment covers only the temporary site investigation programme.

Table 1. Project details and scope.

Parameter	Assessed project information
Project	Rosie Hackett Bridge - Liffey Siphon Project: maritime site investigations.
Location	Tidal River Liffey, Dublin City, between Rosie Hackett Bridge and Butt Bridge; Area A extends between Eden Quay and Burgh Quay.
Maritime setting	Modified urban tidal river bounded by engineered quays and bridge infrastructure, with downstream tidal connectivity to Dublin Port and Dublin Bay.
Water depth	Approximately 2-5 m depending on tide.
Investigation area	1,831.81 m² (0.183 ha), aligned with the Tailte Éireann High Water Mark, with two indicative marine borehole locations.
Assessed scope	MBES bathymetry; parametric and/or boomer sub-bottom profiling; marine refraction seismic; marine ERT; two geotechnical boreholes; benthic grab sampling/drop-down video; water/CTD observations; non-disturbance archaeological dive/quayside inspection, probe and metal-detector survey; testing of recovered material as required.
Programme	Proposed MUL duration: one year. SI works: approximately 14-21 days, currently programmed for Q1 2027; up to 12 hours/day, seven days/week and predominantly daylight. Jack-up mobilisation/demobilisation may occur at night over up to four nights. No 24-hour drilling is proposed.
Assessment envelope	The plant and methods described provide the acoustic source characteristics, physical footprint, line extent, duration, working hours, and discharge/containment envelope assessed.

Survey technologies proposed for the site are summarised in Table 2, which set out the survey equipment and acoustic information.

Table 2. Survey equipment and acoustic information.

Equipment	Model	Deployment	Supplier	Acoustic/operational information
Survey/support vessel	Small survey/support vessel	River surface	Appointed survey contractor	Broadband propulsion/mechanical noise. Small survey/support vessels approach Area A from downstream; no high-level active acoustic source assigned to vessel operation.
Bathymetric MBES	Teledyne SeaBat T20-P	Vessel-mounted / survey platform	Teledyne	190-420 kHz; proposed operation at 420 kHz. Source level estimated at 225 dB re 1 µPa at 1 m (peak)MUL inputs; indicative line spacing 5-20 m; up to one daylight day.
Parametric SBP	Innomar "standard" (indicative)	Towed	Innomar	Primary 85-115 kHz; secondary 2-22 kHz; up to 232 dB re 1 µPa @ 1 m, typically <200 dB; up to one daylight day.
Boomer SBP	Applied Acoustics AA301	Surface-towed catamaran	Applied Acoustics	0.5-5 kHz; 205-211 dB re 1 µPa @ 1 m; up to one daylight day.
Marine refraction seismic	Small airgun typical of similar marine SI projects as the reference source; final source selected by the specialist supplier based on site conditions. Weight-drop/impact source remains open for consideration.	Controlled source recorded using HYD-360/08 (50 m) fluid-filled 8-element streamer hydrophone array; 50 m tow leader; 4.5 m array tube; 360 mm element spacing; array sensitivity -169 dB re 1 V/µPa; frequency response 300 Hz-4 kHz (-3 dB). Passive receiver.	Appointed geophysical contractor	Assessed source envelope: peak frequencies 5-90 kHz; source levels 186-220 dB re 1 µPa @ 1 m; three 65 m lines (195 m total); up to one daylight day. Final source selection remains within this assessed envelope.

Equipment	Model	Deployment	Supplier	Acoustic/operational information
Marine ERT	MAPPEM S Geophysics	Towed/fixed electromagnetic/resistivity array	S Geophysics	Non-seismic; no significant underwater acoustic source identified. Revised survey extent up to approximately 300 m maximum total traverse length, aligned with the tunnelled marine extent and traverse direction, within one working day
Geotechnical drilling	Roto-sonic drilling with continuous casing	Four-legged modular jack-up barge	Appointed GI contractor	Two boreholes to a maximum depth of 20 m below bed. Roto-sonic drilling with continuous casing is specified to minimise disturbance and sediment mobilisation. Minor, localised suspension of fine sediments during penetration or tool insertion/removal is expected to be extremely limited in extent and duration.
Benthic / CTD / archaeological equipment	Day grab, drop-down video, small CTD, dive/probe/metal detector	Vessel/barge/quayside deployed	Appointed survey contractors	No material continuous acoustic source; intermittent mechanical contact or equipment-specific emissions only. Up to 30 benthic stations, maximum four 0.1 m² grabs per station.

3.2 Survey/ support vessel and working platform

The borehole works will be undertaken from a modular four-legged jack-up barge, approximately 12 m wide by 14 m long. The barge will be craned into and out of the River Liffey from Eden Quay or Burgh Quay and manoeuvred to the two borehole locations by a support vessel. Navigation between Rosie Hackett Bridge and Butt Bridge is currently very limited due to bridge-height restrictions. Uisce Éireann is arranging a meeting with Dublin Port to establish its requirements for the proposed works. The appointed Contractor will liaise with the Harbour Master throughout the works, and marine operators and the public will be informed in advance of potential disruptions where works affect the navigational channel. Table 4 summarises the working platform.

All vessels will be fit for purpose, certified and capable of safely undertaking all required survey work. Marine vessels will be governed by the provisions of the Sea Pollution Act 1991, as amended. In addition,

all vessels will adhere to published guidelines and best working practices such as the National Maritime Oil/HNS Spill Contingency Plan (NMOSCP), Marine Pollution Contingency Plan (MPCP), Chemicals Act 2008 (No. 13 of 2008), Chemicals (Amendment) Act 2010 (No. 32 of 2010) and associated regulations. Vessels shall have a Health, Safety and Environmental Management system which should conform to the requirements of the latest International Maritime Organisation (IMO), Safety of Life at Sea (SOLAS) and environmental requirements for their classification and with any national requirement of the territorial or continental / EEZ waters to be operated in.

Table 3. Example of a survey/working platform

Working platform	Modular four-legged jack-up barge, indicatively approximately 12 m wide x 14 m long.
Riverbed contact	Four legs; each leg typically <1 m^2 footprint. Therefore, eight leg placements across the two borehole positions.
Mobilisation	Craned into/out of the River Liffey from Eden Quay or Burgh Quay and manoeuvred by a support vessel; mobilisation/demobilisation may occur at night over up to four nights.
Drilling programme	Two boreholes to a maximum depth of 20 m below bed level; drilling up to 14 days within an overall 14–21-day SI programme; up to 12 hours/day, predominantly daylight.
Support vessel	Small survey/support vessels may access from downstream. Navigation between Rosie Hackett Bridge and Butt Bridge is currently very limited due to bridge-height restrictions. Dublin Port requirements will be established in advance; the appointed Contractor will liaise with the Harbour Master throughout the works and advance notice of potential navigational disruption will be provided to marine operators and the public as required.
Assessment status	Contractor-selected vessel/barge details shall remain within the assessed footprint, programme, acoustic and operating envelope. Survey contractors shall comply with the following as a minimum: Quality and Environmental Management Systems based on ISO9001:2015 and ISO14001 Provision of site and activity specific Method Statements for all the marine operations within their scope Provision of Quality Management Plans for all the marine operations.

3.3 Site investigations

The site investigation activities assessed are set out below.

Bathymetric survey

A Teledyne SeaBat T20-P MBES is proposed, operating within 190-420 kHz and intended to run at 420 kHz for high-resolution bathymetry. Indicative line spacing is 5-20 m. The activity is assessed for up to one day.

Sub-bottom profiling

The SBP is represented by an Innomar "standard" system with primary 85-115 kHz and secondary 2-22 kHz frequencies and source levels up to 232 dB re 1 µPa @ 1 m (typically <200 dB). A boomer option is the Applied Acoustics AA301, operating at 0.5-5 kHz and 205-211 dB re 1 µPa @ 1 m. SBP work is assessed for up to one day.

Marine electrical resistivity tomography (ERT)

A MAPPEM S Geophysics marine ERT/electromagnetic array is proposed. ERT is non-seismic and is not expected to generate significant underwater acoustic emissions. The revised ERT survey extent is up to approximately 300 m maximum total traverse length, aligned with the tunnelled marine extent and traverse direction, and undertaken within one working day.

Geotechnical boreholes

Two marine boreholes will be undertaken from the four-legged jack-up barge to a maximum depth of 20 m below bed level. Roto-sonic drilling with continuous casing is specified for the marine boreholes to minimise disturbance and sediment mobilisation and assist controlled recovery of drilled material. Minor, localised suspension of fine sediments may occur during penetration of soft riverbed material or tool insertion/removal but is expected to be extremely limited in extent and duration.

Benthic habitat sampling and video

Up to 30 benthic sampling locations are assessed within the proposed MUL, with up to four 0.1 m² Day-grab samples at each location. Drop-down video may precede sampling. The activity is small-scale and intermittent and is included in the bed-contact and water-quality pathways assessed in this report.

Ancillary water / CTD observations

Ancillary observations may include water sampling and temperature, conductivity/salinity and depth measurements using a small overboard CTD. These activities do not introduce a material continuous underwater acoustic source.

Archaeological surveys

The archaeological scope comprises non-disturbance dive inspection and quayside assessment, probe and metal-detector survey, and recording of bridge structures, culverts, masonry remains, riverbed topography and existing riverside conditions. No intrusive archaeological excavation is included in the maritime SI scope.

Vessel/platform presence, working hours and lighting

The overall SI programme is approximately 14-21 days. Works may operate up to 12 hours/day, seven days/week and predominantly in daylight. Jack-up mobilisation/demobilisation may occur at night over up to four nights; 24-hour drilling is not proposed. Small survey/support vessels approach from downstream. Night lighting will be restricted to the minimum safe task area and managed to avoid unnecessary illumination of the water, river margins, bridge soffits, quay-wall crevices and other potential bat-roost features.

Underwater and above-water noise

The principal underwater acoustic sources are MBES, parametric/boomer SBP and marine refraction seismic; drilling and vessel/platform operation provide lower-level or more local mechanical noise. Table 2 defines the maximum source characteristics and duty cycles. Above-water noise is mainly associated with drilling, generators, crane operations, and vessel/barge activity. These pathways are assessed for cetaceans, otter and bats below.

4. Receiving environment: Annex IV Species

The MUL footprint comprises tidal water/subtidal riverbed within a heavily modified urban river channel. The proposed MUL area is bounded by engineered quay walls and lies beside bridge infrastructure.

4.1 Cetaceans

A total of 26 cetacean species have been recorded in Ireland. A marine Mammal Database compiled and managed by the National Biodiversity Data Centre has collated data from numerous sources (e.g. Irish Whale and Dolphin Group, ObSERVE project) on the distribution of cetaceans off the coast of Ireland.

Harbour porpoise (*Phocoena phocoena*) occurs regularly in Dublin Bay, while common dolphin (*Delphinus delphis*), bottlenose dolphin (*Tursiops truncatus*) and minke whale (*Balaenoptera acutorostrata*) are also recorded in the wider coastal waters. Cetacean occurrence decreases substantially within the inner Liffey Estuary and is considered highly irregular in the canalised city-centre reach.

There is evidence that individual cetaceans can occasionally enter the River Liffey. A dolphin, identified as a common dolphin, was recorded near Custom House Quay in November 2018, downstream of Rosie Hackett Bridge. A further common dolphin was confirmed near Poolbeg in March 2022; the Irish Whale and Dolphin Group described this as only the second confirmed record of the species within the Liffey system. These observations demonstrate that cetacean access to the river is possible, but they represent unusual occurrences rather than evidence of regular use.

4.2 Otter

Dublin City Council identifies otter among protected fauna associated with city rivers, and the River Liffey corridor may be used for commuting and foraging. While records for otter use of the River Liffey within Dublin City Centre exist, no significant use of the area at or adjacent to the proposed project site exist. The nearest recorded signs of otter use are recorded as an inactive holt at North Wall quay in the 2019 (Macklin, 2019) and a sighting at Grand canal Street upper in 2020 and 2021 (Scott Cawley, 2023).

Macklin *et al*., 2019, stated that human related disturbance, as currently present in the area of the proposed project site, negatively correlates with otter distribution in this area. Furthermore, there is a lack of resting sites adjacent to the proposed project site. Therefore, it is considered unlikely that otter would be present at the proposed project site during work periods and in the unlikely event that they were present only minor temporary disturbance would occur.

4.3 Bats

The Liffey is treated as a potential commuting and foraging corridor for bats, and bridge soffits, masonry joints, quay-wall crevices and other built features in the vicinity are treated as capable of providing potential roost features. This precautionary approach addresses potential bat presence without assuming bats or roosts are absent.

The SIs do not include demolition, vegetation clearance, physical alteration of bridge or quay structures, or drilling/probing into potential roost features. Accordingly, there is no direct pathway for damage or

destruction of a bat breeding or resting place. The relevant pathway is temporary above-water activity and lighting, principally during jack-up mobilisation/demobilisation on up to four nights; drilling is predominantly during daylight.

Night lighting will be limited to the minimum safe task requirement, directed and shielded towards the work area and away from the water surface, bridge soffits, quay-wall crevices and other potential roost exits/features. No intentional illumination or physical obstruction of potential roost entrances is proposed. Short-duration vessel/crane activity in the established city-centre setting, with these controls, is not predicted to result in deliberate disturbance of bats.

4.4 Reptiles (marine turtles)

Sporadic occurrences of Leatherback, loggerhead, Kemp's ridley and hawksbill turtles are recorded for Ireland. Leatherback is considered a regular seasonal visitor and Irish waters form part of its natural foraging range; the remaining four species are considered rare or exceptional vagrants outside of their breeding range. The proposed project site is not considered suitable habitat for this species, and no project-specific pathway beyond the general aquatic corridor has been identified.

5. Risk assessment

5.1 Sources on impact

The proposed project has been assessed against the Regulation 51 prohibitions for Annex IV species. The SIs do not create a mechanism for deliberate capture or killing and do not physically interact with an identified or potential otter holt/couch or bat roost feature. The remaining credible pathway is temporary disturbance, principally underwater acoustic exposure for cetaceans and above-water activity/lighting for otter and bats.

The assessment is therefore framed around avoidance of prohibited acts through the defined project design and operating controls. A Regulation 54 derogation is required only where a prohibited act cannot be avoided.

5.1.1 Cetaceans

Underwater noise can lead to disturbance and/or injury to marine mammals, depending on the type and frequency of the noise and distance from the receptor.

Cetacean sensory systems are adapted to life in the water. They rely on sound to navigate, to communicate with one another and to sense and interpret their surroundings. Behavioural responses of marine mammals, including cetaceans, to a sound are known to be strongly influenced by the context of the event and individual factors such as the animal's experience, motivation, conditioning and activity (Southall *et al*, 2007). Such features and variability may also require consideration in the case-specific assessment of impact on marine mammals from introduced sound sources (NPWS 2014). Sound waves dissipate through the water with distance from the source. While local oceanographic conditions affect the path of the sound and its transmission.

Underwater noise from the combined geophysical survey equipment would be dominated by the impulsive airgun and boomer sources that could be detected by cetaceans. Noise could potentially propagate through the canalised River Liffey for up to approximately 3 km upstream and downstream of the survey area. However, cetaceans are unlikely to occur within the canalised inner Liffey. The potential for auditory injury (PTS) would principally be confined to within 100 metres of the operating source (considered a highly conservative assessment), while temporary disturbance, avoidance or displacement is considered most likely within approximately 1 km. While noise may be detectable up to 3 km distant, this would occur at progressively lower levels, and at this distance would have reduced to levels beyond which any likely significant effects on cetaceans would occur.

Underwater noise at levels capable of causing significant effects to cetaceans is unlikely to extend as far as Dublin Bay, where most cetacean records occur, and thereby create a mechanism for deliberate capture or killing or for damage/destruction of a cetacean breeding or resting place.

However, in the absence of site-specific acoustic modelling, the possibility of lower-level exposure and associated temporary disturbance cannot be entirely excluded. Therefore, mitigation to avoid the potential for impact on cetaceans is recommended.

5.1.2 Otter

While otter have the potential to commute or forage through the Liffey corridor, no significant use of the proposed project site or adjoining area has been identified. The nearest reported evidence comprises an inactive holt at North Wall Quay recorded during the 2019 Dublin City Otter Survey (Macklin *et al*., 2019) and sightings at Grand Canal Street Upper in 2020 and 2021 (Scott Cawley, 2023). As stated in section 4.2, Macklin *et al*., 2019, calculated that human related disturbance, as currently present in the area of the proposed project site, negatively correlates with otter distribution in this area.

The SIs are confined to the river surface/subtidal bed and do not alter banks. The proposed project site is within the canalised area of the River Liffey within the city centre. The quay walls are comprised of vertical rock/block walls unsuitable for the creation of holds and do not provide suitable platforms for resting. Therefore, there is no direct project pathway to damage or destroy a holt, couch or other breeding/resting place for otters. The jack-up barge occupies part of the channel temporarily and would not create any significant barriers to otter movement.

Otter hearing is not adapted for life underwater. Therefore, noise generated as a result of acoustic surveys would be highly unlikely to lead to disturbance to otters should they be present during acoustic survey operations.

Potential disturbance is limited to short-term vessel/barge presence, drilling activity and restricted night-time mobilisation lighting.

It is therefore concluded that likely significant effects on otter are not possible and no Regulation 51 prohibited act affecting otter is predicted.

5.2 Bats

This assessment treats bats as potentially using the River Liffey corridor and treats adjacent bridge/quay features as potentially suitable for roosting. No physical work to these structures or potential roost features is included. The only credible project interaction is temporary above-water activity and lighting, principally during jack-up mobilisation/demobilisation on up to four nights.

Lighting will be task-specific, kept to the minimum safe level, shielded and directed away from bridge soffits, quay-wall crevices, the water surface and other potential roost exits/features. With no physical roost intervention, deliberate disturbance, capture/killing or damage/destruction of a bat breeding/resting place is not predicted.

It is therefore concluded that likely significant effects on any bat species are not possible and no Regulation 51 prohibited act affecting bats is predicted.

6. Risk Assessment Conclusion

Having regard to the pathway-led ZoI, the defined maximum activity envelope and mitigation recommended in Section 9, the proposed SIs are not predicted to result in deliberate capture or killing of

an Annex IV animal, deliberate disturbance constituting a Regulation 51 prohibited act, or damage/destruction of a breeding or resting place. A derogation under Regulation 54 is therefore not required for the proposed project.

8. Assessment of residual risk

Residual cetacean risk is negligible due to the upstream distance of the proposed project and attenuation of noise emitting sources in the canalized sections of the river. Residual otter risk is negligible because there are no riverbank/resting-site works and passage, lighting and water-quality pathways are controlled. Residual bat risk is negligible because there is no physical intervention to potential roost features and night lighting is restricted and directed away from those features.

Overall residual Annex IV risk is assessed as negligible.

9. Proposed mitigation

NPWS (2014) provides guidance to manage the risk to marine mammals from man-made sound sources in Irish waters. This document provides guidance and mitigation measures to address key potential sources of anthropogenic sound that may impact negatively on marine mammals in Irish waters. The mitigation methods should follow the guidance prescribed by the National Parks and Wildlife Service. Specifically, in relation to Geophysical acoustic surveys, such as proposed in this project, the guidance set out in NPWS (2014), as stated below, should be fully implemented as detailed below.

1. A qualified and experienced marine mammal observer (MMO) shall be appointed to monitor for marine mammals and to log all relevant events using standardised data forms (Appendix 6, NPWS, 2014).
2. Unless information specific to the location and/or plan/project is otherwise available to inform the mitigation process (e.g., specific sound propagation and/or attenuation data) and a distance modification has been agreed with the Regulatory Authority, acoustic surveying using the above equipment shall not commence if marine mammals are detected within a 500m radial distance of the sound source intended for use, i.e., within the Monitored Zone.

Pre-Start Monitoring

3. Sound-producing activities shall only commence in daylight hours where effective visual monitoring, as performed and determined by the MMO, has been achieved. Where effective visual monitoring, as determined by the MMO, is not possible the sound-producing activities shall be postponed until effective visual monitoring is possible.
4. An agreed and clear on-site communication signal must be used between the MMO and the Works Superintendent as to whether the relevant activity may or may not proceed, or resume following a break (see below). It shall only proceed on positive confirmation with the MMO.
5. In waters up to 200m deep, the MMO shall conduct pre-start-up constant effort monitoring at least 30 minutes before the sound-producing activity is due to commence. Sound-producing

activity shall not commence until at least 30 minutes have elapsed with no marine mammals detected within the Monitored Zone by the MMO.

6. This prescribed Pre-Start Monitoring shall subsequently be followed by a Ramp-Up Procedure which should include continued monitoring by the MMO.

Ramp-up Procedure

7. In commencing an acoustic survey operation using the proposed acoustic equipment, the following Ramp-up Procedure (i.e., "soft-start") must be used, including during any testing of acoustic sources, where the output peak sound pressure level from any source exceeds 170 dB re: 1µPa @1m:

(a) Where it is possible according to the operational parameters of the equipment concerned, the device's acoustic energy output shall commence from a lower energy start-up (i.e., a peak sound pressure level not exceeding 170 dB re: 1µPa @1m) and thereafter be allowed to gradually build up to the necessary maximum output over a period of 20 minutes.

(b) This controlled build-up of acoustic energy output shall occur in consistent stages to provide a steady and gradual increase over the ramp-up period.

(c) Where the acoustic output measures outlined in steps (a) and (b) are not possible according to the operational parameters of any such equipment, the device shall be switched "on" and "off" in a consistent sequential manner over a period of 20 minutes prior to commencement of the full necessary output.

8. In all cases where a Ramp-Up Procedure is employed the delay between the end of ramp-up and the necessary full output must be minimised to prevent unnecessary high-level sound introduction into the environment.

9. Once the Ramp-Up Procedure commences, there is no requirement to halt or discontinue the procedure at night-time, nor if weather or visibility conditions deteriorate nor if marine mammals occur within a 500m radial distance of the sound source, i.e., within the Monitored Zone.

Line Changes

10. Where the duration of a survey line or station change will be greater than 40 minutes the activity shall, on completion of the line/station being surveyed, either

(a) shut down and undertake full Pre-Start Monitoring, followed by a Ramp-Up Procedure for recommencement, or

(b) undergo a major reduction in seismic energy output to a lower energy state[1] where the output peak sound pressure level from any operating source is 165-170 dB re: 1µPa @1m and then undertake a full Ramp-Up Procedure for recommencement.

11. Where the duration of a survey line or station change will be less than 40 minutes the activity may continue as normal (i.e., under full seismic output)

Breaks in sound output

[1] *It is important that this significant reduction in sound output is to a minimum point (i.e., minimum peak sound pressure level) that in theory remains audible above most ambient sound and shipping noise and yet is also consistent with the Ramp-up Procedure.*

12. If there is a break in sound output for a period greater than 30 minutes (e.g., due to equipment failure, shut-down, survey line or station change) then all Pre-Start Monitoring and a subsequent Ramp-up Procedure (where appropriate following Pre-Start Monitoring) must be undertaken.

13. For higher output survey operations which have the potential to produce injurious levels of underwater sound (see sections 2.4, 3.2) as informed by the associated risk assessment, there is likely to be a regulatory requirement to adopt a shorter 5–10-minute break limit after which period all Pre-Start Monitoring and a subsequent Ramp-up Procedure (where appropriate following Pre-Start Monitoring) shall recommence as for start-up.

Reporting

14. Full reporting on MMO operations and mitigation undertaken must be provided to the Regulatory Authority as outlined in Appendix 6 of NPWS (2014).

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Selected acronyms and abbreviations

Acronym	Meaning
AA	Appropriate Assessment
CIEEM	Chartered Institute of Ecology and Environmental Management
EIA	Environmental Impact Assessment
GIS	Geographic Information System
LSE	Likely Significant Effect
MARA	Maritime Area Regulatory Authority
MBES	Multibeam echosounder
MUL	Maritime Usage Licence
NPWS	National Parks and Wildlife Service
ERT	Electrical resistivity tomography
SBP	Sub-bottom profiler
SISAA	Supporting Information for Screening for Appropriate Assessment
MMO	Marine Mammal Observer
SI	Site investigation
WFD	Water Framework Directive
ZoI	Zone of Influence