
Chapter 27

Summary of Mitigation and Monitoring Measures

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27. Summary of Mitigation and Monitoring Measures

27.1. Introduction

The Transport (Railway Infrastructure) Act 2001 (as amended) provides for the making of a Railway Order application (also referred to herein as “the proposed Project”) by Córas Iompair Éireann (CIÉ) to An Bord Pleanála. The European Union (Railway Orders) (Environmental Impact Assessment) (Amendment) Regulations 2021 (S.I. No. 743 of 2021) gives further effect to the transposition of the EIA Directive (EU Directive 2011/92/EU as amended by Directive 2014/52/EU) on the assessment of the effects of certain public and private projects on the environment by amending the Transport (Railway Infrastructure) Act 2001 (‘the 2001 Act’).

An examination, analysis and evaluation is carried out by An Bord Pleanála in order to identify, describe and assess, in the light of each individual case, the direct and indirect significant effects of the proposed project (comprising inter alia railway works), including significant effects derived from the vulnerability of the activity to risks of major accidents and disasters relevant to it, on: population and human health; biodiversity, with particular attention to species and habitats protected under the Habitats and Birds Directives; land, soil, water, air and climate; material assets, cultural heritage and the landscape, and the interaction between the above factors.

The 2001 Act, including as amended by S.I. No. 743 of 2001, provides (at section 43) that a Railway Order shall include inter alia “any environmental conditions, including conditions regarding monitoring measures, parameters to be monitored and the duration of monitoring, to which the authorisation is subject...”.

An ‘environmental condition’, in relation to a railway order, means any condition, modification, restriction or requirement to which a railway order is subject that relates to (a) features of the railway works or measures envisaged to avoid, prevent, reduce or offset significant adverse effects on the environment, or (b) the monitoring of significant adverse effects on the environment (including conditions regarding monitoring measures, parameters to be monitored and the duration of monitoring).

In a similar vein, Annex IV(7) of the amended EIA Directive (2014/52/EU) requires: *A description of the measures envisaged to avoid, prevent, reduce or, if possible, offset any identified significant adverse effects on the environment and, where appropriate, of any proposed monitoring arrangements (for example the preparation of a post-project analysis). That description should explain the extent, to which significant adverse effects on the environment are avoided, prevented, reduced or offset, and should cover both the construction and operational phases.*

This chapter presents a summary of the mitigation and monitoring measures identified as a result of undertaking the environmental impact assessments carried out in the preceding chapters of this EIAR.

From the inception of the design and environmental assessment process of the proposed DART+ South West project (referred to hereafter as the ‘proposed development/proposed project’) the project team has strived to avoid, prevent and reduce adverse effects which are incorporated into the design drawings and specifications of the project that have been assessed as part of this EIAR.

Avoidance of impacts is most applicable at the earliest stages of a project, whilst prevention has taken place during the design and environmental assessments process between the design team and EIA team. Mitigation is a last resort and can include a remedy or offsetting adverse effects. For example, this can apply when projects cannot avoid significant effects due to their need to locate on a particular site, etc.

Where likely significant environmental effects have been identified during the environmental impact assessment process, measures have been proposed to mitigate these effects as much as reasonably possible, with any residual effects identified in the relevant chapters of this EIAR. The objective of this chapter is to provide a central location where all measures from the preceding chapters are presented together for both ease of reference and inclusion in the contract documents at a later stage of the project.

All of the mitigation and monitoring commitments detailed below are incorporated into the Construction Environmental Management Plan (CEMP) submitted as part of this Railway Order application; refer to Volume 4, Appendix 5.1.

27.1.1. Mitigation and Monitoring Measures

Mitigation and monitoring measures have been identified as environmental commitments and overarching requirements which shall avoid, reduce or offset potential impacts.

Mitigation and monitoring measures specified within the EIAR technical assessments are provided in Chapter 6 to Chapter 24 of this EIAR. The following tables in section 27.1.1.1 to 27.1.1.22 below summarise the construction and operational phase mitigation and monitoring measures outlined in the relevant EIAR technical assessments, plus the Natura Impact Statement, and should be read in conjunction with the mitigation outlined in the specific chapter and also with the Construction Environmental Management Plan (CEMP) in Volume 4, Appendix 5.1 of this EIAR.

27.1.1.1. Traffic and Transportation

The table below details the mitigation and monitoring measures identified in Chapter 6 Traffic and Transportation.

Table 27.1: Mitigation and Monitoring Measures for Traffic and Transportation

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Traffic and Transportation
Mitigation Measures	
Overarching Construction Phase Mitigation	
6.6	<p>The provision of temporary vulnerable user bridges has been proposed at all bridge reconstruction locations in order to mitigate the impact of bridge closures on vulnerable road users. In the case of the Kylemore Road Bridge (OBC5A) closure, a temporary northbound vehicular bridge is also to be provided in addition to the vulnerable user bridge to the east.</p> <p>A Construction & Environmental Management Plan (CEMP) as outlined in Volume 4, Appendix 5.1 will be updated by the successful Main Contractor. The CEMP will set out the Contractor's overall management and administration of the construction project. A Mobility Management Plan which will also include a Construction Traffic and Construction Worker Travel Plan will be provided by the Main Contractor outlining mitigation measures after having considered any potential cumulative impacts of works staging and other projects in the public space.</p>
Construction Phase Mitigation	
6.6.1.1	<p>General Mitigation</p> <ul style="list-style-type: none"> • Use of sufficient clear signage to ensure that construction vehicles use only designated routes and that the contracted hauliers are well briefed of the routes and restrictions; • Routing of HGVs on main roads away from sensitive areas such as schools, residential areas, and areas sensitive in terms of air quality; • Time slots for bulk deliveries to ensure that convoys of vehicles do not arrive simultaneously; • Provision of holding spaces to avoid congestion on the local road network by waiting vehicles; • Coordination of abnormal large loads; • Scheduling of deliveries/collections away from peak hours, either before the AM peak or during the inter-peak daytime period; • Encouraging construction hours to avoid the AM and PM peak traffic period for construction workers; • On-site recycling of materials to reduce export and import vehicle movements, including stockpiling topsoil for landscape works, or crushing existing hard standing material for engineering fill; • Keeping the access routes clear of debris associated with the construction; • Implementation of wheel washing facilities to prevent debris being deposited on the highway network; and • Implementation of appropriate traffic management (given the already constrained environment) to ensure that construction of the site access junctions does not give rise to undue disruption.

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Traffic and Transportation
6.6.1.2.1	<p>Defined Maximum Possession Periods</p> <p>Impacts to passenger rail services will be mitigated through reducing track possession time to outside of the peak travel, this will include temporary closures implemented at required locations overnight or over the weekends. Track possessions are a part of normal operating procedures on the railway line.</p> <p>In the case of the Phoenix Park Tunnel work impact; the proposed mitigation is to programme the implementation of as many of the other works required between the Heuston Station Yard and the Glasnevin connection (that would typically require peak period possessions) during the 6 month full track closure of the Phoenix Park Tunnel. This would include the construction of the proposed Heuston West Station.</p>
6.6.1.2.2	<p>Construction Staging to Limit Impact on Train Operations</p> <p>The construction staging has considered the principle of keeping 2 no. tracks in operation for the majority of the construction period where feasible. While this does prolong the construction contract, it also serves to limit the impact on passenger rail services.</p>
6.6.1.2.3	<p>Construction Works Sequencing Dependencies</p> <p>Limiting concurrent bridge closures, serves to reduce compounding the congestion already experienced on these limited crossing points over the railway corridor cutting.</p>
Operational Phase Mitigation	
6.6.2	<p>The mitigation proposed for the operational phase of the Project is embedded into the operational assessment.</p>
Monitoring	
6.7	<p>Traffic counts in advance of the works and periodically during the work period are recommended to validate the assessment in the future. This monitoring, as well as community engagement (meetings, surveys and correspondence) proposed throughout the bridge closures periods, will serve to alleviate concerns from local residents. The formalised audit processes for temporary traffic management schemes within DCC and TII will provide an additional tier to monitor the safety and efficacy of the temporary traffic management proposals during implementation.</p> <p>In addition, regular transport stakeholders' project co-ordination meetings are proposed. This will provide adequate multiparty input to aid any necessary adjustments in order to improve diversions in response to the actual impacts observed during the construction stage.</p> <p>An annual National Census of Rail patronage is carried out each year by Iarnród Éireann on behalf of the National Transport Authority. Boarding and alighting of passengers at every train station in the country are recorded on one day of the year. In the event that this annual census ceases to be undertaken, such data should continue to be gathered annually by Iarnród Éireann for the train stations within the study area.</p> <p>Ongoing monitoring of the car parking provided at the stations should be undertaken to ensure that demand does not exceed capacity. This will be done in consultation with the NTA to inform any strategic proposals around development of Park & Ride. Proposals to develop Park and Ride will be brought forward independently of the DART+ Programme.</p>

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Traffic and Transportation
	Ongoing monitoring of cycle parking will be undertaken by Iarnród Éireann to inform their existing Station Enhancement Programme to ensure adequate cycling facilities in terms of meeting existing demand and encouraging travel by alternative modes.

27.1.1.2. Population

The table below details the mitigation and monitoring measures identified in Chapter 7 Population.

Table 27.2: Mitigation and Monitoring Measures for Population

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Population
Mitigation Measures	
Construction Phase Mitigation	
7.6.1	<ul style="list-style-type: none"> Implementation of the Construction Strategy and all mitigation measures set out in Chapter 5 Construction Strategy of this EIAR and in the other chapters of this EIAR – particularly those directly impacting communities which include: Chapter 6 Traffic and Transportation, Chapter 9 Land and Soils, Chapter 10 Water, Chapter 12 Air Quality, Chapter 14 Noise and Vibration, Chapter 16 Material Assets: Agricultural Properties, Chapter 17 Material Assets: Non-agricultural Properties, Chapter 18 Material Assets: Utilities and Chapter 23 Human Health; A Construction Environmental Management Plan (CEMP) has been prepared as outlined in Volume 4, Appendix 5.1 and will be updated by the successful Main Contractor to address all environmental issues including noise emissions from both machinery and noise from the workforce, dust minimisation, lighting spill on neighbouring residential areas at night-time, etc.; Construction traffic management will be developed and implemented by the Contractor(s) via a construction traffic management plan to address all modes of transport during the construction stage and will be agreed with the respective local authorities prior to the commencement of the construction phase. Construction traffic management will be required to maximise the safety of the workforce and the public and to minimise traffic delays, disruption and maintain access to properties. It will also address temporary disruption to traffic signals, footpath access and the management of pedestrian crossing points, temporary disruption to rail traffic. It will also address the provision of appropriate temporary signage to direct road users to alternative car parking arrangements. The CTMP will be required to minimise disruption to economic amenities and residential properties and will ensure access is maintained along haulage routes and in vicinity of the construction site(s) for vehicles, pedestrians, cyclists, and economic operators at all times; A Mobility Management Plan (MMP) will be developed by the Contractor(s) as part of the CTMP and will address all modes of transport and travel required to deliver the project during the construction phase. This will include details regarding construction workers travelling to site, car-parking, haulage routes and construction compounds. Construction staff shall not be permitted to use the same station car parks for parking site vehicles where construction compounds are in situ;

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Population
	<ul style="list-style-type: none"> When railway services are planned to be disrupted for extended periods Iarnród Éireann will provide suitable bus transfer services to replace the services affected. Iarnród Éireann will be required to communicate disruption to rail passengers and the public in advance of all construction works that will impact service users and road-based users. The campaign will communicate alternative routes and appropriate signage including the proposed planned closure of station car parking spaces/ access; The Contractor will appoint a Community Liaison Officer and will be required to develop and implement a Community Liaison Plan (CLP) prior to the construction phase; Iarnród Éireann will appoint a Community Engagement Manager (CEM), or equivalent, who will be consulted in the preparation of the Plan as well as its maintenance and implementation. The CEM will provide the means of the stakeholder and members of the public to communicate with the project team, and for the project team to communicate relevant information of the proposed Project. Communication with the local community, with Dublin City Council, South Dublin City Council, Kildare County Council and other relevant stakeholders will be undertaken at an appropriate level and frequency throughout construction; Details of general construction process/phasing will be communicated to the relevant stakeholders prior to implementation to ensure local residents and businesses are fully informed of the nature and duration of construction; Condition Surveys will be carried out for properties which will include structural surveys prior to works with high levels of vibration e.g. piling, wall anchoring and soil nailing; and Lighting used during the construction period will minimise its luminosity and duration used to alleviate light pollution. Lighting will be positioned away and angled downwards from nearby properties so light interference is minimised.
Operational Phase Mitigation	
7.6.2	<ul style="list-style-type: none"> Design and maintain landscaping and public realm infrastructure to complement other environmental mitigation in this EIAR that promotes safety for all users; At detailed design stage the design team will continue to ensure safety is integrated into the design and maintenance of public spaces with a focus on promoting a sense of safety and comfort for all users particularly the young, old and people with disabilities; The public realm designs shall encourage passive security of public spaces and on transport infrastructure, e.g., through appropriate lighting, pleasant surroundings and design that discourages anti-social behaviour, graffiti, etc.; Planned works including maintenance of the railway infrastructure shall be communicated to neighbouring properties as part of the CIÉ notification procedures; Iarnród Éireann will continue to improve and enhance sustainable mobility measures to enable future capacity enhancements in a planned and co-ordinated manner; and All replacement and modifications to bridges and footbridges shall be designed to integrate with existing and future transport networks and promote sustainable mobility in line with government transport and climate policies.

EIA Reference	Description of Mitigation and Monitoring Measures for Population
Monitoring	
7.7	No project specific monitoring is proposed in relation to the Population effects.

27.1.1.3. Biodiversity

The table below details the mitigation and monitoring measures identified in Chapter 8 Biodiversity.

Table 27.3: Mitigation and Monitoring Measures for Biodiversity

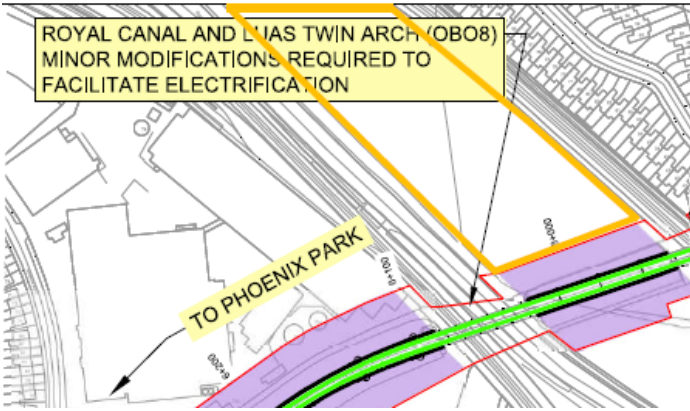
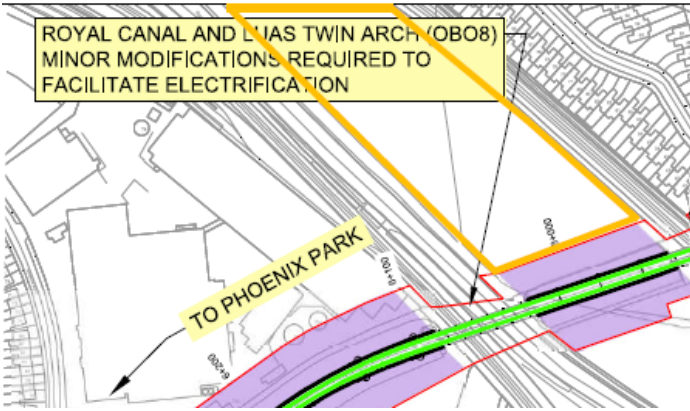
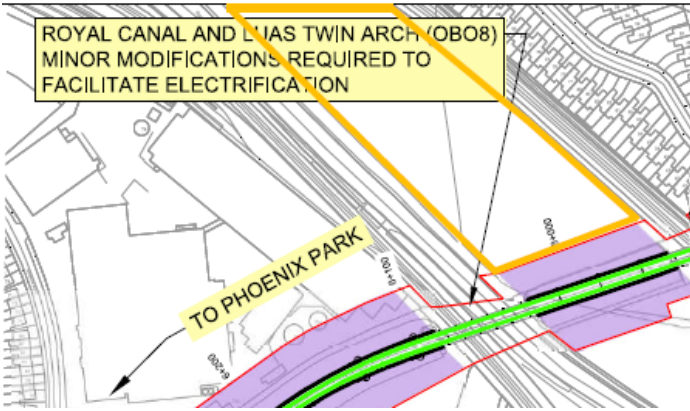
EIA Reference	Description of Mitigation and Monitoring Measures for Biodiversity
Mitigation Measures	
8.6.1.1	<p>Roles and responsibilities (Framework Measures)</p> <p>A Project Ecologist shall be appointed by Iarnród Éireann before the commencement of works. A suitably qualified and experienced ecologist (hereafter referred to as ‘the Project Ecologist’) shall be utilised in the implementation of the mitigation measures and survey requirements outlined here.</p> <p>The ecologist shall be a full member of a relevant institution, such as the Chartered Institute of Ecology and Environmental Management (CIEEM) or similar, have relevant experience in the management of mitigation measures and ecological constraints on construction sites/restoration projects, and hold or have previously held a protected species derogation licence in the Republic of Ireland. It shall be their responsibility to supervise and provide recommendations on the execution of any works which have the potential to give rise to negative or positive effects on biodiversity. The Project Ecologist shall be suitable qualified and experienced and have a minimum of five years’ experience completing similar tasks on linear infrastructure projects.</p> <p>The Contractor shall also appoint an Environmental Manager/Clerk of Works before the commencement of works. This person shall be responsible for carrying out environmental monitoring of the works and ensuring that the mitigation measures, proposed in this EIA and identified by the Project Ecologist, are adhered to. The Environmental Manager/Clerk of Works shall be suitable qualified and experienced and have a minimum of five years’ experience completing similar tasks on linear infrastructure projects.</p>
8.6.2.1.1	<p>Designated Sites for Nature Conservation - General Pollution Prevention Control Measures</p> <ul style="list-style-type: none"> • All works in, near (within 15 m of a watercourse feature) or liable to impact on a waterway must have prior agreement with IFI and NPWS; • Stockpiling of construction materials shall be strictly prohibited within 15 m of any ditch or watercourse; • Hazardous materials including diesel, fuel oils, solvents, paints and/or lubricants stored on temporary or permanent lands made available shall be stored on hardstand and within suitably designed bunded areas with a bund volume of 110% of the capacity of the largest tank/ container; • Re-fuelling of plant shall only take place on hardstand and not within 15 m of any watercourse or surface water feature (see Volume 3A of this EIA, Drawing DP-04-

EIA Section Reference	Description of Mitigation and Monitoring Measures for Biodiversity
	<p>23-DWG-EV-TTA-23750). Spill containment (i.e. drip trays) shall be used, and spill kits shall be kept available and used if necessary;</p> <ul style="list-style-type: none"> • Oils, fuel, chemicals, hydraulic fluids etc. will not be stored outside construction compounds. They will be stored in designated bunded areas at construction compounds in accordance with established guidelines. Refuelling of construction equipment and the addition of hydraulic oil or lubricants to vehicles/equipment will take place in these designated bunded areas only; • Waste oils and hydraulic fluids shall be collected in leak-proof containers and removed from the site for disposal or recycling at licensed facilities; • Waste materials shall be stored in designated areas that are isolated from surface water drains and watercourses. Waste materials will be carefully managed including covering stockpiles during rainfall. Skips shall be closed or covered to prevent materials being blown or washed away; • All machinery will be routinely checked to ensure no leakage of oils or lubricants occurs during the construction phase. Any spillages will be immediately contained, and the contaminated soil removed from the site and disposed of properly; • Wash down water from exposed aggregate surfaces, cast-in-place concrete and from concrete trucks will be trapped on-site to allow sediment to settle out before clarified water is released to a drain system; • No waste will be buried, burnt, or dumped on-site or in land adjacent to the site; • Only emergency breakdown maintenance shall be carried out on site. Emergency procedures and spill kits will be readily available at strategic and/or sensitive site locations and all relevant personnel will be familiar with emergency procedures; • An appropriate emergency response will be in place for any spillage of fuels, lubricants of hydraulic oils to ensure they are immediately contained; and • Any contaminated soil shall be removed from the site and disposed of in a licensed facility. <p>For the protection of watercourses associated with surface water run-off, the following measures shall be employed:</p> <ul style="list-style-type: none"> • No in-stream works will be permitted; • Where works are required within 15 m of a watercourse feature, the ecologist shall assess and verify that appropriate demarcation and signage is in place before works commence. Demarcation shall be physically marked out using post and rail/post and rope/bunting, or equivalent, and be signposted to identify an ecological sensitivity; • Silt fencing shall be installed for all work within 15 m of the River Liffey. Silt fencing shall consist of a maintainable geotextile membrane (equivalent to Terrastop™ Premium; 250 micron; 45 l/m²/sec). Installation, maintenance, and removal shall follow the manufacturers' specifications. The geotextile membrane will be inspected at least once a week and following any period of heavy rainfall (i.e. Met Éireann Orange and Red rain warning); • The Contractor will monitor weather forecasts for heavy rain and where required, certain works and in particular excavations/earthworks will cease in order to minimise exposed soil entering surface water run-off; and

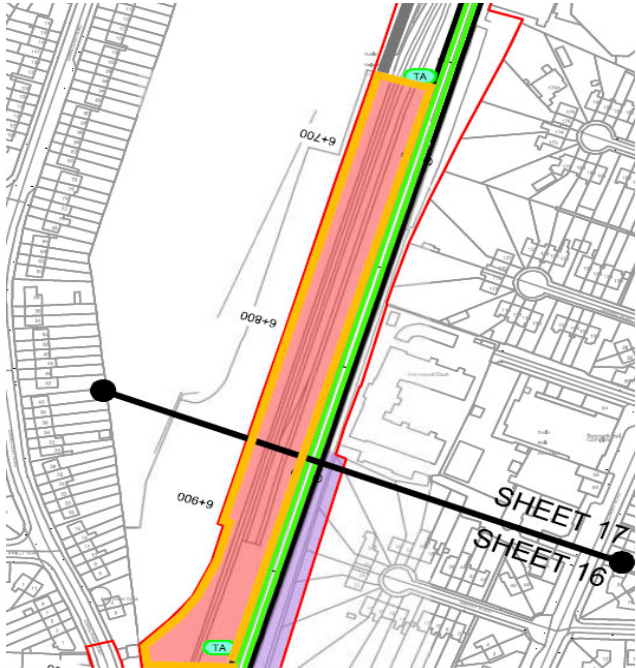
EIA Section Reference	Description of Mitigation and Monitoring Measures for Biodiversity
	<ul style="list-style-type: none"> • Soil excavation will not be completed during periods of prolonged or heavy rain (i.e. Met Éireann Orange and Red rain warning). <p>For the protection of watercourses associated with the use of concrete, the following measures shall be employed:</p> <ul style="list-style-type: none"> • All ready-mixed concrete shall be brought to site by truck. A suitable risk assessment for wet concreting shall be completed prior to works being carried out which will include measures to prevent discharge of alkaline waste waters to the underlying subsoil. Wash down and washout of concrete transporting vehicles shall take place at an appropriate facility offsite; • Concrete shall be contained and managed appropriately to prevent pollution of watercourses. Concrete pouring will be prevented during periods of heavy rainfall, and quick setting mixes shall be used; and • Waste materials shall be stored in designated areas that are isolated from surface water drains. Skips shall be closed or covered to prevent materials being blown or washed away. <p>In the case of environmental incidents or accidents occurring during the construction phase of the Project, the following measures will be applied:</p> <ul style="list-style-type: none"> • The Contractor will be required to have available on-site spill kits and hydrocarbon absorbent materials to deal with any accidental spillages; • An Environmental Incident and Emergency Response Plan will be established by the Contractor to deal with incidents or accidents during construction that may give rise to pollution in watercourses proximal to the works. This will include means of containment in the event of accidental spillage of hydrocarbons or other pollutants (e.g. oil booms, soakage pads); • Throughout all stages of the construction phase the Contractor will ensure that all site personnel are made aware of the importance of the freshwater environments and the requirement to avoid pollution of all types; • All hazardous materials on site will be stored within secondary containment designed to retain at least 110% of the total storage contents; • Temporary bunds for oil/diesel storage tanks will be used off-site during the construction phase of the proposed Project as appropriate; • Safe handling of all potentially hazardous materials will be emphasised to all construction personnel employed during this phase of the Project; and • Any spillage of fuels, lubricants or hydraulic oils will be immediately contained, and the contaminated soil removed from the site and properly disposed of at a suitable licensed facility.
8.6.2.1.2	<p>Invasive Alien Species Management</p> <ul style="list-style-type: none"> • Before construction begins, an Invasive Alien Species Avoidance and Management Plan shall be prepared by an ecologist/invasive species specialist pre-construction. This plan shall build on the baseline data presented in this chapter and include the following information and management protocols for dealing with occurrences of scheduled invasive species:

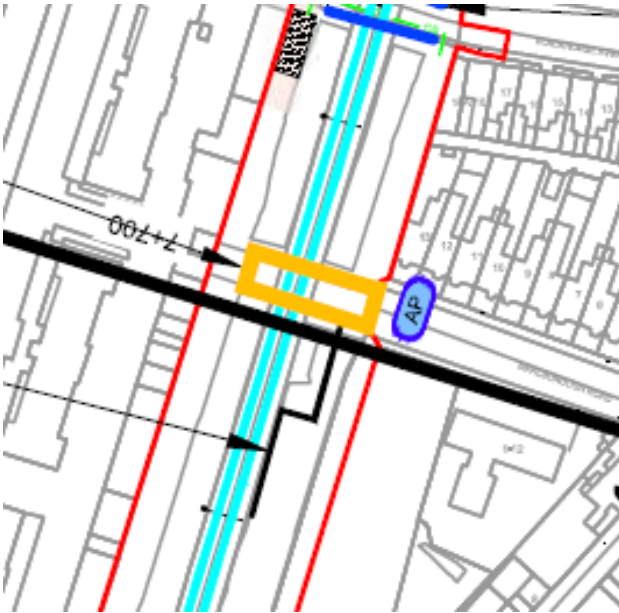
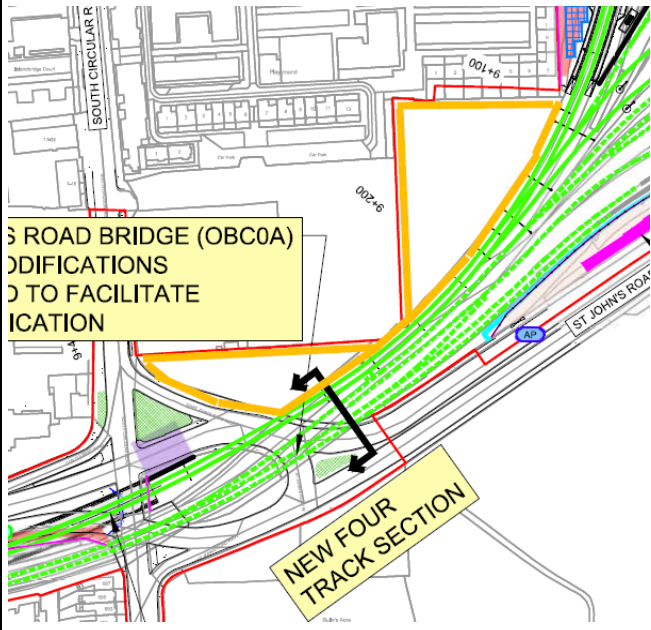
EIA Section Reference	Description of Mitigation and Monitoring Measures for Biodiversity
	<ul style="list-style-type: none"> ○ Confirmation of locations of invasive alien plant species (IAPS) identified in the baseline section of this chapter and identification of new or expanded locations of invasive alien plant species; and ○ A buffer zone of 10 m shall be put in place around all know location of IAPS. The buffer zone shall be physically demarked using post and rail/post and rope/bunting, or equivalent, and be signposted to identify an ecological sensitivity. The Ecologist shall assess and verify the demarcation and signage before works commence. <ul style="list-style-type: none"> ● Prior to works commencing within the vicinity of any IAPS, all site personnel shall be given a Toolbox talk where operatives will be briefed on the presence of the IAPS and the legal provisions relating to introduction and spread under the Wildlife Acts as amended and the Habitats Regulations; ● All excavated material within 7 m of the known IAPS locations shall be considered to be contaminated with IAPS (roots, stem fragments, or seeds) suitable to cause the spread of IAPS and shall be disposed of at an appropriately licensed waste facility; ● No works shall proceed in the 10 m buffer zone without prior approval from the Project Ecologist; and ● Materials introduced to the site during construction, such as soils, sands and gravels, shall be free from scheduled IAPS, with certification of such by the Environmental Clerk of Works. <p>Air Pollution</p> <p>The contractor shall monitor weather forecasts for strong wind (i.e. Met Éireann- Orange and Red wind warning) and works including excavations and earthworks shall cease in order to minimise dust emissions.</p> <p>Loss of habitats during construction</p> <p>Before construction begins, a Biodiversity Management Plan (or Landscape and Biodiversity Management Plan) shall be prepared by an ecologist and landscape specialist incorporating the measure outlined here.</p> <p>Retained areas</p> <p>Retained vegetation shall be improved through hedgerow planting, wildflower seeding, and tree planting which incorporates the safety requirements in relation to OHLE clearance specified in Iarnród Éireann CEE-TMS-381 Control and Management of Vegetation Standard. Measures shall include:</p> <ul style="list-style-type: none"> ● Where hedgerows contain gaps and connectivity can be improved, native trees and shrubs shall be planted under the direction of the Project Ecologist in consultation with the appointed landscape specialist. Species planted shall increase the variety of hedgerow types in terms of height, width, shape and species mix (diversity). Planted tree and scrubs shall be of Irish provenance (i.e. stock grown within the island of Ireland) and include mixes of at least five of the following species: blackthorn (<i>Prunus spinose</i>), hawthorn (<i>Crataegus monogyna</i>), hazel (<i>Corylus avellana</i>), crab apple (<i>Malus sylvestris</i>), pedunculate oak (<i>Quercus robur</i>), birch (<i>Betula pendula</i> and/or <i>B. pubescens</i>), rowan (<i>Sorbus aucuparia</i>), cherry (<i>Prunus avium</i> and/or <i>P. padus</i>), whitebeam (<i>Sorbus aria</i> and/or <i>S. hibernica</i>), wych elm (<i>Ulmus glabra</i>), guelder rose (<i>Viburnum opulus</i>), and spindle (<i>Euonymus europaeus</i>): <ul style="list-style-type: none"> ○ Hedgerows identified for improvement include the following locations: Zone B (areas between Park West/Cherry Orchard Station and Cherry Orchard

EIA Section Reference	Description of Mitigation and Monitoring Measures for Biodiversity
	<p>Footbridge, chainage 14+600 to 13+350); and Zone D (North entrance to Phoenix park Tunnel to the Glasnevin cemetery road bridge, chainage 8+150 to 5+650). Also see landscape mitigation, Drawing No. DP-04-23-DWG-RO-TTA-18801.</p> <p>Reinstated areas</p> <ul style="list-style-type: none"> • Hedgerow planting shall use a suitable native species mix (see above): <ul style="list-style-type: none"> ○ New hedgerows identified for improvement include the following locations: Zone B (adjacent to Park West substation, chainage 14+500; along Le Fanu Rd, chainage 12+600; adjacent to proposed Inchicore substation, chainage 11+750). See landscape mitigation, Drawing No. DP-04-23-DWG-RO-TTA-18801; ○ Management of new hedgerows shall include: <ul style="list-style-type: none"> ▪ New planting at each location will be dominated by native species identified for those locations. Where ash was the dominant hedgerow species removed, hawthorn or blackthorn shall be planted as dominant; ▪ The dominant tree species in the planting shall be feathered whips, while sub-dominant species shall be greater than 40 cm in height; ▪ All new hedgerow planting shall contain, at a minimum, five native tree/shrub species (see species list above); ▪ Planting shall follow a double-row format of zig-zag pattern, with row spacing at 50 cm and tree spacing at 40-45 cm; and ▪ All new hedgerows shall be maintained for eight years, with seasonal checks by a suitably qualified arboriculturist/ecologist for the first two years and yearly checks for the subsequent six years. A rate of 90% living individuals after 4 years and 80% living individuals after 6 years shall be retained, with replacement planting completed when required. Any gaps greater than 1 m shall be replanted with native tree/shrub species of similar size to those adjacent. • Replanting of reinstated soil cover areas shall use a wildflower seeding mix. Seeding mix shall include Irish native species with a 80:20 ratio of forbs to grasses in order to prevent grass dominance and reduce maintenance requirements. The native species seed mix shall be of Irish provenance (i.e. stock grown within the island of Ireland) and shall be species rich mixes which are appropriate for the soil type and locations. The Project Ecologist shall determine the suitable species mixes at the following locations: <ul style="list-style-type: none"> ○ All reinstated soil areas in Zone B, Zone C, and Zone D (including areas cleared for soil nailing); ○ Proposed attenuation tank at proposed Heuston West Station, chainage 9+000; ○ Proposed Compound, west of station road, chainage 15+500; and ○ Proposed substation at Hazelhatch, chainage 24+200. In addition to wildflower seeding, planting of species rich native trees and shrubs along boundary of land parcel, planting of pockets of mixed broadleaf woodland habitat, creation of pond habitat (preferably clustered design), installation of 6no. 1B Schwegler Nest Box (or equivalent) with varying entrance hole sizes (All boxes shall be made from long-lasting materials (e.g. woodcrete/woodstone)) shall be completed. • Green walls shall be developed on retaining walls/boundary treatments. Options of green walls include vertical planting 'living wall' and/or wall planter boxes. The living wall shall be

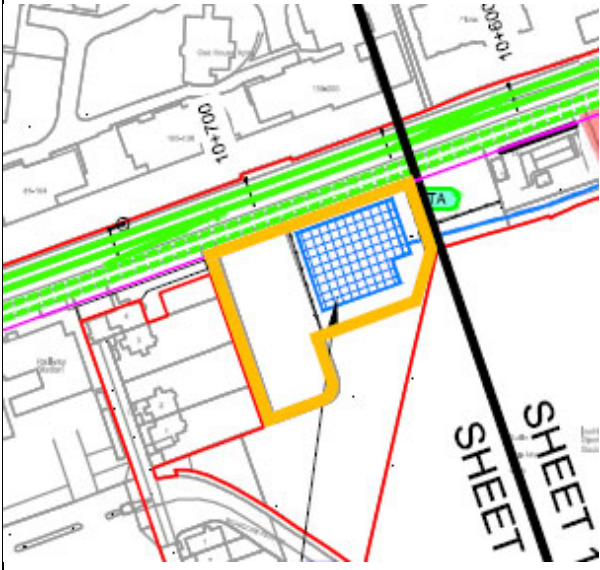
EIA Section Reference	Description of Mitigation and Monitoring Measures for Biodiversity				
	<p>achieved through the use of rows of planter boxes attached to the inside face of the retaining wall. The planter boxes shall be located, and firmly attached, on the top and/or inside base of the retaining walls. The green wall shall be installed on the retaining wall running parallel to Con Colbert Road to South circular road bridge, Chainage 10+370 to 9+675:</p> <ul style="list-style-type: none"> The green wall species mix shall be of Irish provenance (i.e. stock grown within the island of Ireland) and shall be appropriate for the soil type and locations. The species mix shall include plug plants of native heather (<i>Calluna vulgaris</i>), heath (<i>Erica cinerea</i> and <i>E. tetralix</i>), ivy (<i>Hedera helix</i>), and honeysuckle (<i>Lonicera periclymenum</i>). Climbers will trail down the rail side (i.e. on the southern aspect) of the wall. A minimum of 50% of coverage will be native Irish species. The Project Ecologist will determine the suitable species mixes, which will meet the health and safety requirements relating to the Project. <p>Creation of biodiversity ‘stepping stones’</p> <p>The following measures are to mitigate the loss of linear habitat removal through the enhancement of existing lands adjoining the proposed Project. The locations and enhancement measures are provided in Table 8.7 and enhancement areas are indicated by the orange line. Through consultation with the detailed design team, the Project Ecologist will determine the final specifications and locations of these enhancement measures.</p> <p>Table 8.7: Location and Enhancement of Existing Adjoining Lands</p> <table border="1"> <thead> <tr> <th data-bbox="309 1032 1034 1099">Location</th> <th data-bbox="1034 1032 1410 1099">Measures to be incorporated</th> </tr> </thead> <tbody> <tr> <td data-bbox="309 1099 1034 1906"> <p>Attenuation/soakaway at the Royal Canal</p>  </td> <td data-bbox="1034 1099 1410 1906"> <p>The following measures shall be instated:¹</p> <ul style="list-style-type: none"> Creation of 6 no. habitat piles through the use of deadwood. These are to be located throughout the site utilising woody vegetation proposed for clearance from the rail line; and Creation of pond habitat (preferably clustered design) consisting of at least 3 ponds. New ponds shall include features such as extensive shallows on at least one side, islands, and be a maximum depth of 50 cm. See pond creation toolkit information available </td> </tr> </tbody> </table>	Location	Measures to be incorporated	<p>Attenuation/soakaway at the Royal Canal</p> 	<p>The following measures shall be instated:¹</p> <ul style="list-style-type: none"> Creation of 6 no. habitat piles through the use of deadwood. These are to be located throughout the site utilising woody vegetation proposed for clearance from the rail line; and Creation of pond habitat (preferably clustered design) consisting of at least 3 ponds. New ponds shall include features such as extensive shallows on at least one side, islands, and be a maximum depth of 50 cm. See pond creation toolkit information available
Location	Measures to be incorporated				
<p>Attenuation/soakaway at the Royal Canal</p> 	<p>The following measures shall be instated:¹</p> <ul style="list-style-type: none"> Creation of 6 no. habitat piles through the use of deadwood. These are to be located throughout the site utilising woody vegetation proposed for clearance from the rail line; and Creation of pond habitat (preferably clustered design) consisting of at least 3 ponds. New ponds shall include features such as extensive shallows on at least one side, islands, and be a maximum depth of 50 cm. See pond creation toolkit information available 				

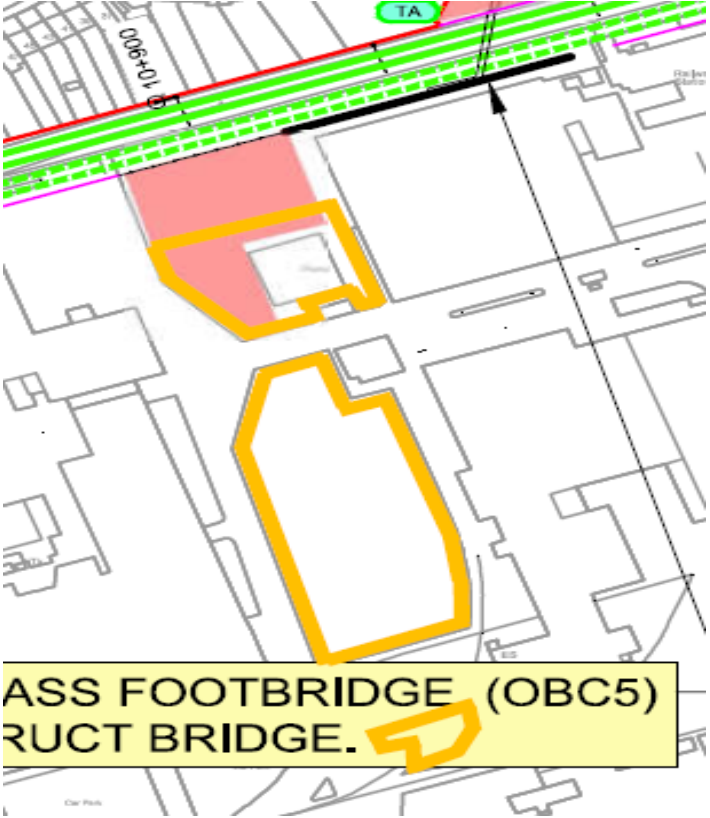
¹ Available online at: <https://freshwaterhabitats.org.uk/projects/million-ponds/pond-creation-toolkit/>. Accessed 29/12/2022.

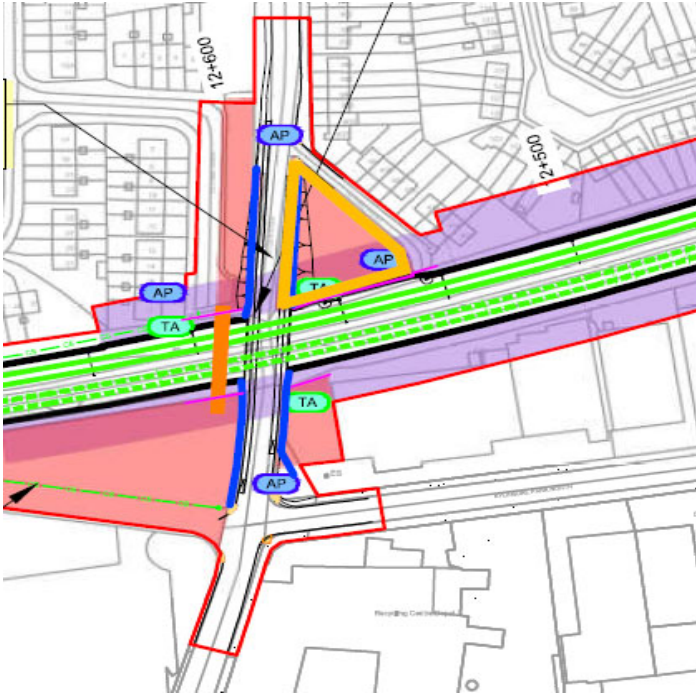
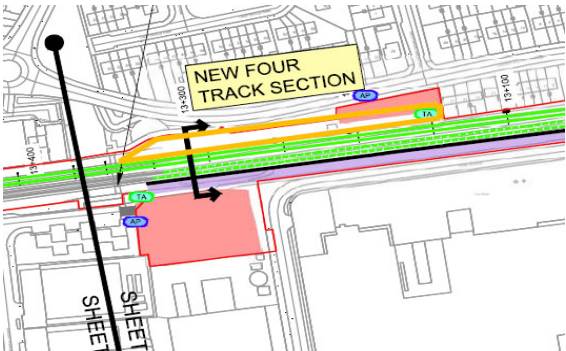
EIA Section Reference	Description of Mitigation and Monitoring Measures for Biodiversity	
		<p>from the Freshwater Habitat Trust in the UK:</p> <ul style="list-style-type: none"> ○ One pond may be used as a working pond to receive pumped water from the rail line, before it reaches the existing soakaway; and ○ Through consultation with the detailed design team, the Project Ecologist will determine the final specifications of the ponds.
	<p>Proposed construction compound at Cabra</p> 	<p>The following measures shall be instated:</p> <ul style="list-style-type: none"> • Embankment creation with slopes no greater than 80 degrees; • Planting of species rich native trees and shrubs along boundary of properties; and • Sowing Irish native wildflower seed mix (80:20 forbs to grass) in order to establish grassland and meadow habitat.


EIA Section Reference	Description of Mitigation and Monitoring Measures for Biodiversity	
	<p>McKee Barracks Bridge (OBO3), chainage 7+700</p> 	<p>The following measures shall be instated:</p> <ul style="list-style-type: none"> Retention of existing vegetation on the McKee barracks bridge.
	<p>South of proposed Heuston West Station at Platform 10, chainage 9+100 to 9+350</p>  <p>ROAD BRIDGE (OBC0A) MODIFICATIONS TO FACILITATE VEGETATION</p> <p>NEW FOUR TRACK SECTION</p>	<p>On adjacent land to Heuston Station the following measures shall be instated:</p> <ul style="list-style-type: none"> Removal of invasive alien plant species, including Japanese knotweed; Planting of species rich native trees and shrubs along boundary of the fence line; and Installation of bat boxes: 2 no. Schwegler 1FF bat box (or equivalent) and 2 no. 2F Schwegler Bat Box (or equivalent). All boxes shall be made from long-lasting materials (e.g. woodcrete/ Woodstone).

EIA Section Reference	Description of Mitigation and Monitoring Measures for Biodiversity	
	<p>West of South Circular Bridge (OBC1A) on 'Cut and cover tunnel', Chainage 9+500</p>	<p>The following measures shall be instated:</p> <ul style="list-style-type: none"> Green roof on top of the cut and cover tunnel to consist of vegetated fabric mats with broad mix of sedum and native wildflower species.
	<p>Proposed construction compounds north and south of Sarsfield Road Under-Bridge (UBC4), chainage 10+500.</p>	<p>For both areas, the following measures shall be instated:</p> <ul style="list-style-type: none"> Over-sowing of existing grassland with Irish native wildflower seed mix (80:20 forbs to grass); Planting of Irish native trees and shrubs along boundaries; Installation of bat boxes: 2no. Schwegler 1FF bat box (or equivalent) and 2no. 2F Schwegler Bat Box (or equivalent). All boxes shall be made from long-lasting materials (e.g. woodcrete/woodstone); and Installation of bird boxes: 4 no. 1B Schwegler Nest Box

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Biodiversity	
	<p>Proposed attenuation tank and amenity grassland in Inchicore Works, chainage 10+700.</p> 	<p>(or equivalent) with varying entrance hole sizes. All boxes shall be made from long-lasting materials (e.g. woodcrete/woodstone).</p> <p>The following measures shall be instated:</p> <ul style="list-style-type: none"> • Sowing Irish native wildflower seed mix (80:20 forbs to grass) to grassland and meadow habitat. Habitats to be managed with spring and autumn cut and removal; and • Within existing grassland habitat to the west of the proposed attenuation tanks, planting of Irish native trees and shrubs along boundary of the fence line to increase connectivity where gaps are present.

EIA Section Reference	Description of Mitigation and Monitoring Measures for Biodiversity	
	<p>Proposed construction compound and existing amenity grassland and water feature in Inchicore Works, chainage 10+900.</p> 	<p>The following measures shall be instated:</p> <ul style="list-style-type: none"> • Enhance existing amenity grassland through over-sowing of existing grassland with Irish native wildflower seed mixes (100% forbs, no grass); • Enhance existing tree and shrub through planting of Irish native species; • Installation of bat boxes: 2 no. Schwegler 1FF bat box (or equivalent) and 2 no. 2F Schwegler Bat Box (or equivalent). All boxes shall be made from long-lasting materials (e.g. woodcrete/ Woodstone); • Installation of bird boxes: 4 no. 1B Schwegler Nest Box (or equivalent) with varying entrance hole sizes. All boxes shall be made from long-lasting materials (e.g. woodcrete/ Woodstone; and • Enhancement of existing pond features such as extensive shallows on at least one side, islands, and be a maximum depth of 50cm. See pond creation toolkit information available from the Freshwater Habitat Trust in the UK.

EIA Section Reference	Description of Mitigation and Monitoring Measures for Biodiversity	
	<p>Existing Park/ proposed construction compound on Le Fanu Road, chainage 12+590.</p> 	<p>The following measures shall be instated:</p> <ul style="list-style-type: none"> • Restore existing amenity grassland through over-sowing of existing grassland with Irish native wildflower seed mix (100% forbs, no grass); • Enhance existing tree and shrubs through planting of Irish native species; • Installation of bat boxes: 2 no. Schwegler 1FF bat box (or equivalent) and 2no. 2F Schwegler Bat Box (or equivalent). All boxes shall be made from long-lasting materials (e.g. woodcrete/woodstone; and • Installation of bird boxes: 4 no. 1B Schwegler Nest Box (or equivalent) with varying entrance hole sizes. All boxes shall be made from long-lasting materials (e.g. woodcrete/ Woodstone).
	<p>Area east of Cherry Orchard Footbridge (OBC8B), chainage 13+350 to 13+150</p> 	<p>The following measures shall be instated:</p> <ul style="list-style-type: none"> • Enhance existing treeline by inter-planting Irish native tree species and shrubs.

EIA Section Reference	Description of Mitigation and Monitoring Measures for Biodiversity	
	<p>Area adjoining track on Cherry Orchard Ave, chainage 14+150 to 13+400</p> 	<p>The following measures shall be instated:</p> <ul style="list-style-type: none"> Enhance existing hedgerow by selective replacement planting using Irish native tree species and shrubs.
8.6.2.1.3	<p>Bat Roosting</p> <ul style="list-style-type: none"> Pre-construction bat roosting assessments will be completed, this assessment will visually assess all structures and tree proposed for removal/demolition. The visual assessment and any follow-on roost assessment methods shall follow the baseline methods outlined in this assessment; An alternative bat roosting structure, for use by multiple bat species, shall be installed adjoining the proposed Inchicore substation. The roost structure shall be suitable for maternity roosting or large colony roosting for Leisler's bat, Nathusius' pipistrelle, common pipistrelle, soprano pipistrelle and brown long-eared bat: <ul style="list-style-type: none"> Option 1: Consideration shall be given to repurposing the lookout tower (chainage 11+800), which is proposed for demolition. Repurposing shall include the 'blocking up' of the windows to exclude light, installation of bat suitable internal insulation (e.g. 50mm polyisocyanurate (PIR) board completely covered with Oriented Strand Board (OSB)), installation of wooded rafters at multiple heights for bats to roost on, and creation of one small opening on each aspect suitable for bats to enter/exit. A maintenance entrance shall also be installed for any future requirements. Final specification to be agreed with the Project Ecologist; and Option 2: Alternatively, pole mounted maternity/large colony bat boxes shall be provided. Four poles with two boxes per pole shall be installed i.e. a total of eight boxes. The boxes shall be constructed of long-lasting material and shall be 4-6 m above ground level with boxes orientated to different aspects. An alternative bat roosting structure, for use by multiple bat species, shall be installed adjoining the proposed Hazelhatch substation. The roost structure shall be suitable for maternity roosting or large colony roosting for Leisler's bat, Nathusius' pipistrelle, common pipistrelle, soprano pipistrelle and brown long-eared bat: <ul style="list-style-type: none"> Pole mounted maternity/large colony bat boxes shall be provided. Four poles with two boxes per pole shall be installed i.e. a total of eight boxes. The boxes shall be constructed of long-lasting material and shall be 4-6 m above ground level with boxes orientated to different aspects. <p>Bat Commuting and Foraging</p> <ul style="list-style-type: none"> The loss, fragmentation and alteration of suitable bat commuting and foraging habitat shall be mitigated through the measures detailed under section 8.6.2.1.2. Through these measures, habitat will be both enhanced where retained, reinstated and replanted where lost, and ecological stepping stones shall be created within adjoining habitat to provide connectivity within the wider landscape. <p>Bat Hibernation</p> <ul style="list-style-type: none"> Pre-construction bat roosting/hibernation assessments shall be completed. These shall include visual assessment of the Phoenix Park Tunnel and deployment of static bat detector in the appropriate season (late autumn and or early spring) before 	

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Biodiversity
	<p>construction begins. Methods shall follow the baseline methods outlined in this assessment;</p> <ul style="list-style-type: none"> • Pre-construction briefings and toolbox talks for all involved in the Project; • Bat hibernation boxes appropriate for brown long-eared bat to be placed in close proximity to northern Phoenix Park Tunnel entrance, e.g. on the top of the cutting, chainage 8+500. This location shall be agreed with the Project Ecologist. The bat hibernation box shall be of long-lasting material and be suitable for brown long eared bat shall be (e.g. the Vivara Pro Large Multi Chamber Wood Stone Bat Box for trees or the Schwegler 2FE wall-mounted bat shelter for structures only); • The timing of the construction works within the Phoenix Park Tunnel will avoid the winter hibernation periods (November-March, inclusive) (CIEEM, 2021); • In the event that construction works in Phoenix Park Tunnel cannot be completed outside the winter hibernation periods: <ul style="list-style-type: none"> ○ Construction works within Phoenix Park tunnel will only proceed under the supervision of the Project Ecologist. A derogation licence may be required to complete this work; and ○ Should any potential hibernation sites be identified during the construction phase by the Project Ecologist, works will immediately cease until the appropriate course of action is identified by the suitably qualified and licensed bat ecologist, which may include the requirement to seek a licence from the Wildlife Licensing Unit for the completion of the construction works. • Air pollution prevention measures for habitats, as set out in section 8.6.2.1.2 shall be employed.
8.6.2.1.4	<p>Badger Setts and Breeding</p> <p>At least one month in advance, but no greater than six months in advance, of commencing any enabling or advance works, a pre-construction survey for badger shall be undertaken by the Project Ecologist. The Project Ecologist shall report, in writing, any additional mitigation measures resultant from these surveys. Any additional mitigation measures shall be cognisant of the <i>Guidelines for the treatment of badgers prior to the construction of National Road Schemes</i> (NRA, 2005). The Project ecologist shall also advise on any additional relevant protective measures and/or licensing requirements resulting from the survey findings.</p> <p>Badger - Commuting and Foraging</p> <p>Habitat loss measures, as set out in section 8.6.2.1.2 shall be employed.</p>

EIA Section Reference	Description of Mitigation and Monitoring Measures for Biodiversity
8.6.2.1.5	<p>Birds – Breeding</p> <p>The removal of existing hedgerow and vegetation shall avoid the bird nesting season (March to August, inclusive);</p> <ul style="list-style-type: none"> • Construction lighting will avoid night time illumination of retained and adjoining vegetation during the bird nesting season (March to August, inclusive). All night time construction operatives will be informed of this requirement by the Project Ecologist or EcOW; and • Bird nesting boxes shall be installed at various locations. The specification for these boxes have been outlined in section 8.6.2.1.2. <p>Birds - Commuting and Foraging</p> <p>The following measures are required to lessen or avoid the identified or potential significant effects on commuting and foraging birds from biodiversity loss and disturbance from noise:</p> <ul style="list-style-type: none"> • The removal of existing hedgerows and vegetation shall avoid the bird nesting season (March to August, inclusive); and • Measures to retain, reinstate, and create ecological stepping-stone vegetation shall be put in place. These measures are set out in section 8.6.2.1.2.
8.6.2.2	Operational Phase Mitigation
8.6.2.2.1	<p>Bats - Hibernating</p> <p>The potential loss of the Phoenix Park Tunnel as a bat hibernation site during the operation of the proposed Project shall be mitigated through the installation of alternative bat hibernation boxes, detailed under section 8.6.2.1.3.</p>
Non-IEF Mitigation	
8.6.3.1	Construction Phase Mitigation
8.6.3.1.1	<p>Tree protection (Non-IEF Mitigation - Construction Phase)</p> <p>Prior to construction commencement, Root Protection Areas (RPAs) for retained trees shall be put in place. The purpose of protective barriers is to avoid any harmful construction activity that may damage the retained trees. Tree protection barriers shall be fit for the purposes of excluding construction activities and be durable to withstand an impact. The extent of the RPA shall be an area equivalent to a circle with a radius 12 times the stem diameter (stem diameter measured at 1.5 m above ground level) (NRA, 2006).</p>
8.6.3.1.2	<p>Pre-construction ecology surveys (Non-IEF Mitigation - Construction Phase)</p> <p>At least one month in advance, but no greater than six months in advance, of commencing any enabling or advance works, a pre-construction survey for protected and invasive alien species shall be undertaken (within a suitable season) within the proposed Project area, including areas which could not be accessed during the establishment of the baseline. The surveys shall be undertaken by a suitable qualified and experienced ecologist. The ecologist shall also advise, in writing, on any additional relevant protective measures and/or licensing requirements resulting from the pre-construction survey findings.</p> <p>The timing of vegetation removal for construction shall avoid the breeding bird season (e.g. no removal between 1st March and the 31st August, inclusive).</p>

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Biodiversity
8.6.3.1.3	<p>Bats (roosting and individuals) (Non-IEF Mitigation - Construction Phase)</p> <p>In the unlikely event that unknown roosting or stranded bats are encountered on the Project, works shall immediately cease in that area and the local NPWS Conservation Ranger shall be contacted. If present, bats shall only be removed under licence from the NPWS.</p>
8.6.3.1.4	<p>Badger (commuting and foraging) (Non-IEF Mitigation - Construction Phase)</p> <p>There is potential for badgers to be killed or injured during construction through accessing areas of construction, including excavations. The following measure shall be completed: protective fencing, covering excavations overnight and/or allowing temporary access ramps from excavations if too large or not possible to cover overnight.</p>
8.6.3.2	<p>Operational Phase Mitigation</p>
8.6.3.2.1	<p>Habitats (Non-IEF Mitigation - Operational Phase)</p> <ul style="list-style-type: none"> • Timing of works to avoid the breeding bird season (e.g. no removal between 1st March and the 31st August, inclusive); and • Operation activities to follow set guidelines for non-native invasive plant species and in accordance with the Invasive Species Management Plan for the proposed Project.
8.6.3.2.2	<p>Bats (Non-IEF Mitigation - Operational Phase)</p> <p>Measures to avoid artificial light spillage from operation with respect to structures and trees. Any proposed external lighting shall be directional and cowed to avoid the light spill (greater than 1 LUX above background levels) to all relevant ecological features.</p>
8.6.3.2.3	<p>Birds (Non-IEF Mitigation - Operational Phase)</p> <p>The feeder wire along both sides of Single Track Cantilever OHLE masts on the Liffey Bridge crossing (Zone D) will be fitted with a device to make lines more visible to commuting and foraging birds. Devices will not be required in any other location along the proposed Project:</p> <ul style="list-style-type: none"> • Devices should vary in colour (e.g. black and white), be as reflective as possible with glowing surfaces and be capable of a swinging or flapping motion making them more visible and effective (ESKOM Transmission, 2009) (see Figure 8-4). Devices shall not be restricted in their movement; • Devices should be placed 5 m apart and staggered on parallel lines. Based on various studies as reported by APLIC (2012) in the United States, data recommends spacing between 4.6 m and 30 m. As this is largely dependent on the extent of the overhead lines which requires mitigation through diversion devices, 5 m is considered appropriate for the Liffey Bridge crossing which only extends for c. 50m over the water; • Devices should be as large as possible for maximum visibility (i.e. diameter of at least 20cm and length of at least 10 to 20cm); and • Line markers shall require annual maintenance and replacement, ensuring that markers remain in position and functional throughout the lifetime of the proposed Project.

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Biodiversity
Monitoring	
8.7	<p>Monitoring is required for the following:</p> <ul style="list-style-type: none"> • Improving retained vegetation (section 8.6.2.1.2); • Replanting of reinstated areas (section 8.6.2.1.2); • Creation of 'stepping stones' for biodiversity (section 8.6.2.1.2); and • Bird diverters (section 8.6.3.2.3).

27.1.1.4. Land and Soils

The table below details the mitigation and monitoring measures identified in Chapter 9 Land and Soils.

Table 27.4: Mitigation and Monitoring Measures for Land and Soils

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Land and Soils
Mitigation Measures	
Construction Phase Mitigation	
9.67	<p>A Construction & Environmental Management Plan (CEMP) as outlined in Volume 4, Appendix 5.1 of this EIAR will be updated by the successful Main Contractor. The CEMP will set out the Contractor's overall management and administration of the construction project. It will be prepared by the Contractor during the pre-construction phase to ensure commitments included in the statutory approvals are adhered to and that it integrates the requirements of the CEMP including management of Construction & Demolition Waste. The mitigation measures will be implemented by the appointed Main Contractor(s). These include the best practice measures and the site-specific mitigation measures outlined below.</p>
9.6.1.1	<p>Excavation and Removal of Soils, Subsoils and Bedrock</p> <p>Mitigation by Design</p> <p>Construction works will be carried out with the smallest feasible footprint, reducing/limiting disturbance of soils, and minimising volumes of excavated material. It is a core strategy of the proposed Project to limit the volume of material that will be removed from the site, as detailed below and in Chapter 5, section 5.2.3. The hierarchy of preference in terms of dealing with excess material is:</p> <ol style="list-style-type: none"> 1) Retain on site and recycle within the works; 2) Use strategic excess areas of land to deposit material; 3) Use elsewhere on the Iarnród Éireann network or programme of works; 4) Enable contractor to use on another site; and 5) Dispose to appropriate off site facility. <p>The CEMP will address the Main Contractor's plans to manage excavation, stockpiling and movement of soils in accordance with the requirements of this EIAR. A preliminary geotechnical risk register has been prepared by TTA JV and will be developed during the detailed design phase to identify potential hazards (e.g., unforeseen soft ground, potential for settlement and induced vibration) and reduce via suitable mitigation (additional site investigation) significant risks (inadequate foundation design) posed by ground conditions.</p>

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Land and Soils
	<p>Mitigation During Active Works</p> <p>Once works have started in an area, the Main Contractor will be responsible for ensuring there is no excess removal of material beyond that deemed necessary to complete the works, in accordance with the approved design. Due to the limited space of many proposed work zones, and locations adjacent to other critical infrastructure (e.g. major roads, utilities) this is of primary concern. The layout of site work zones and compounds shall be optimised to reduce the need for subgrade works. Buried temporary works infrastructure will only be utilised where absolutely necessary. Designated material stockpile and sorting areas will be utilised to encourage on-site reuse.</p> <p>Old ballast will be removed to a dedicated site in the Inchicore Depot for re-use/recycling/disposal as appropriate. In areas where corridor widening is required the new tracks will be laid first and then old tracks will be removed and recycled/disposed of in line with the requirements of this EIAR including management of Construction and Demolition Waste.</p> <p>Should unknown contamination be encountered during construction, material will be considered as potentially hazardous and further testing will be required to confirm waste classification of suitability for re-use/retention on-site or disposal off site.</p> <p>Site water management is required at all earthworks sites to prevent waterlogging of freshly excavated soil, to prevent silty runoff from entering watercourses and drainage systems, and to alleviate rutting of haul routes. It requires ongoing design and management to reflect the changing operational sequences on the site. Measures will comprise slopes across haul routes and drainage channels leading to outfall positions. At outfall positions, measures will be required to de-silt the runoff using silt traps, settling ponds, pumping to settlement areas or other mechanical means.</p> <p>There is known flooding on the line within Zone D, between the Royal Canal and Luas Twin Arch Bridge (OBO8) and the Maynooth Line Twin Arch Bridge (OBO9). The infrastructure currently in place to overcome this is a pump station, pumping water to an adjacent filtration area. With track lowering required in this area it is proposed that the pump station will be enlarged to account for a higher volume of water.</p> <p>Where track lowering is required, as excavations are complete, a new drainage system is required to drain the lower foundation level of the railway.</p> <p>All plant, equipment, materials, temporary infrastructure and vehicles will be removed at the earliest opportunity and the surface of the ground restored as near as practicable to its original condition.</p>
9.6.1.2	<p>Erosion of Exposed Subsoils during Earthworks and Construction Activity.</p> <p>Mitigation during Active Works.</p> <p>Erosion control measures to be taken during the construction works will be outlined within a Sediment and Erosion Control Plan (SECP) which will be prepared by the successful Main Contractor. Mitigation contained within the SECP will be to current industry best practice and principles (e.g. CIRIA C648) and will typically include:</p> <ul style="list-style-type: none"> • Installation of drainage and runoff controls prior to start of site clearance/earthworks; • Sequence works in order to minimise areas of exposed ground; • Prevention of runoff from entering active works zones via interceptor drains, bunds etc.; • Dedicated areas for stockpiling and storage of excavated materials; • Covering of stockpiles to reduce wind/rain effects; • Monitoring and maintenance of erosion and sediment controls; and

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Land and Soils
	<ul style="list-style-type: none"> Establishment of vegetation/landscaping as soon as practicable following reinstatement.
9.6.1.3	<p>Accidental Emissions and Release of Potentially Hazardous Substances.</p> <p>Mitigation During Active Works.</p> <ul style="list-style-type: none"> The storage and handling of oils, fuel, chemicals and hydraulic fluids will be in secure areas within the site compounds and will not occur within a minimum of 50m from watercourses; Fuel and oil containers shall be stored within a secondary containment system e.g. bund to 110% of volume for static tanks or a drip tray for mobile stores. All ancillary equipment such as hoses, pipes are contained within the bund; Fuel and oil stores including tanks and drums shall be regularly inspected for leaks and signs of damage; Only designated trained operators are authorised to refuel plant on site; Storage of fuels, chemicals and lubricants at the Contractor’s compound must be fenced off and have a lockable gate to prevent unauthorised access or vandalism; Precautions will be installed on all fuel delivery pipes to ensure no leakages or spillages e.g. taps/valves fitted with a lock; Interceptor drip trays will be used during all refuelling operations and for stationary mobile plant; The principal control measures are as follows: <ul style="list-style-type: none"> A Fuel Management Protocol will be prepared by the Contractor; Protection measures will be put in place to ensure that all hydrocarbons used during the construction phase are appropriately handled, stored and disposed of in accordance with the TII/NRA document “Guidelines for the crossing of watercourses during the construction of National Road Schemes”. All chemical and fuel filling locations will be protected from potential spillages through the provision of appropriate protection measures including bunded areas and double skinned bowser units with spill kits; Storage tanks shall have secondary containment provided by means of an above ground bund to capture any oil leakage. Storage tanks and associated provision, including bunds, will conform to the current best practice for oil storage and will be undertaken in accordance with Best Practice Guide BPGCS005 – Oil Storage Guidelines (Enterprise Ireland); Where required, the pouring of concrete, sealing of joints, application of water-proofing paint or protective systems and curing agents will be completed in the dry and allowed to cure for 48 hours in order to avoid pollution of watercourses; The use and management of concrete in or close to watercourses will be carefully controlled to avoid spillage, and dedicated concrete washout areas/boxes will be utilized; An Emergency Response Plan will be prepared by the successful Main Contractor detailing the procedures to be undertaken in the event of a spillage of chemical, fuel or other hazardous wastes (e.g. concrete) to be in place prior to commencement of project. This will include identification of clean-up specialist emergency contractor. This Plan will contain at a minimum the following mitigation measures: <ul style="list-style-type: none"> Carry out an investigation to identify the nature, source and cause of the incident and any emission arising therefrom;

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Land and Soils
	<ul style="list-style-type: none"> ▪ Isolate the source of any such emission; ▪ Evaluate the environmental pollution, if any, caused by the incident; ▪ Identify and execute the measures to minimise the emissions/malfunction and the effects thereof; ▪ Identify the date, time and place of the incident; ▪ Notify the Agency and other relevant authorities; and ▪ The licensee shall provide a proposal to the Agency for its agreement within one month of the incident occurring or as otherwise agreed by the Agency to identify and put in place measures to avoid reoccurrence of the incident and identify and put in place any other appropriate remedial action. <ul style="list-style-type: none"> ○ Relevant staff, including cover staff shall be trained in the implementation of the Emergency Response Plan and the use of any spill kit/control equipment as necessary; and ○ Plant and equipment shall be maintained in place and in working order for the duration of the works. <ul style="list-style-type: none"> • Site compounds/storage facilities will be located at least 50m away from surface waters, where practicable. In addition, measures will be implemented to ensure that silt laden or contaminated surface water run-off from the compound does not discharge directly to surface waters. Appropriate mitigation measures should be adopted where compounds are constructed in lands at risk of flooding; • All soiled construction run-off water will be passed through settlement ponds/silt traps and/or bunds prior to outfall to the receiving surface water where appropriate; • Management of material deposition areas to prevent siltation of watercourse systems through run-off during rainstorms. It is recommended to construct collector ditches surrounding material stockpiles to contain run-off and direct it to the settlement ponds/silt traps before discharge to an adjacent watercourse; and • Wheel wash facilities to be appropriately located to ensure wash waters are intercepted, contained and directed to settlement ponds/silt traps prior to discharge to surface waters.
Operational Phase Mitigation	
9.6.2	No operational phase mitigation measures are proposed beyond those contained within the existing Iarnród Éireann Environmental Management Policies and Process document (CCE-IMS-008).

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Land and Soils
Monitoring	
9.7.1	<p>Construction Phase Monitoring</p> <p>Additional environmental testing of soils is not considered necessary unless further areas (currently unknown) of contamination are identified during the construction phase. The following procedures will form part of the CEMP/SECP to visually monitor all sources and pathways.</p> <p>It will be the responsibility of the Main Contractor to appoint a Project Ecologist (an Environmental Clerk of Works (ECoW)) to ensure that the mitigation measures outlined in this document (including any updates to this document following consent) are implemented in full and to supervise works in sensitive locations:</p> <ul style="list-style-type: none"> • An emergency response plan will be put in place in the event of an incident (i.e. a spill or leak); • Environmental audits; • Environmental awareness; and • Pollution/spill prevention measures. <p>Monitoring of dust generation will be part of the management of construction activities. Dust monitoring locations will be established on site. A baseline dust measurement will be made in advance of works and an ongoing system of monitoring will be implemented during the construction. Particular mitigation measures will be implemented when significant increases in deposition above baseline are measured.</p>
Operational Phase Monitoring	
9.7.2	<p>With the implementation of the proposed design, no additional mitigation measures for land and soils, are considered necessary for the operation of the Project.</p> <p>In the operational phase the proposed infrastructure will be maintained by Iarnród Éireann's Civil Engineering (CCE) and Signal, Electrical and Telecoms (SET) Departments and will be subject to their management procedures to ensure that the correct measures are taken in the event of any accidental spillages and this will reduce the potential for any impact.</p>

27.1.1.5. Water (Hydrology and Flood Risk)

The table below details the mitigation and monitoring measures identified in Chapter 10 Water (Hydrology & Flood Risk).

Table 27.5: Mitigation and Monitoring Measures for Water (Hydrology & Flood Risk)

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Water (Hydrology and Flood Risk)
Mitigation Measures	
Construction Phase Mitigation	
10.6.1	<ul style="list-style-type: none"> • Site works will be minimised and managed insofar as possible to prevent silty runoff from entering watercourses and drainage systems; • Surface water drainage on site will be controlled by construction of temporary berms and drainage channels;

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Water (Hydrology and Flood Risk)
	<ul style="list-style-type: none"> • Due to the proposed noise barriers causing a slight increase in flood level, an 83m long and 2m wide conveyance channel is proposed along the railway track along the north-eastern vicinity of the railway culvert crossing on the Shinkeen River; • There will be no direct discharge of surface water from any element of the works without suitable attenuation and treatment; • Settlement tanks/ponds, silt traps/bags and bunds will be used to control sediment loading to watercourses; • Where pumping of water or dewatering occurs, temporary sumps will be installed with filters at inlets and discharged through a sediment trap which would desilt water before discharging to an outfall; • The Contractor will ensure protection measures will be put in place to ensure that all hydrocarbons used are appropriately handled, stored and disposed of; the Contractor will prepare and adhere to a Fuel Management Protocol and communicate the contents to all staff (via induction/ toolbox talks); • Storage of fuel, oils and chemicals on an impermeable base, away from drains and watercourses. Fuel storage areas should be bunded to provide adequate retention capacity in the event of a leak or spillage occurring e.g. bund to 110% of volume of the largest container for static tanks or a drip tray for mobile stores. All ancillary equipment such as hoses, pipes are contained within the bund; • Foul drainage from all welfare facilities will be contained and disposed of in an appropriate manner, off site, to prevent pollution; • Hydrophilic grout and quick-setting mixes or rapid hardener additives shall be used to promote the early set of concrete surfaces exposed to water; • When working in or near the surface water and the application of in-situ materials cannot be avoided, the use of alternative materials such as biodegradable shutter oils shall be used; • Placing of concrete in or near watercourses will be carried out only under the supervision of the Project Ecologist (Ecological Clerk of Works (ECoW)); • The contractor will monitor weather forecasts for heavy rain and where required, certain works and in particular excavations or concrete pours will cease to minimise contaminants entering surface water run-off; • Wheel wash or similar washing facilities are installed, these will be located on an impermeable surface, and water will be passed through a silt buster or other appropriate surface water management mechanism prior to discharge; • Refuelling of plant and vehicles on impermeable surfaces, away from drains and watercourses; provision of spill kits at high risk and/or sensitive sites; and • The Contractor will provide method statements for weather and tide/ storm surge forecasting and continuous monitoring of water levels in all watercourses (in particular the Hazelhatch and Shinkeen streams which have the highest probability of flooding). The Contractor will also provide method statements for the removal of site materials, fuels, tools, vehicles, and persons from flood zones in order to minimise the risk to persons working on the site as well as potential input of sediment or construction materials into the river during flood events. <p>The Contractor is responsible for pollution prevention for the duration of the contract and until such time as permanent measures, such as permanent drainage and silt mitigation controls, are deemed to be adequate and appropriately constructed.</p> <p>Prior to works commencing on site, the Contractor will prepare a Pollution Prevention Plan (PPP) in line with the below requirements (as a minimum) and will communicate the contents</p>

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Water (Hydrology and Flood Risk)
	<p>to all staff (induction/toolbox talks). The PPP covers all potentially polluting activities, considering good practice standards. The Contractor is to provide the PPP to the Employer prior to start of works on site.</p> <p>The Contractor will also prepare an Environmental Incident and Emergency Response Plan which will detail the controls to be adopted to manage the risk of pollution incidents and procedures to be followed in the event of any pollution incidents based on mitigation from the EIAR and NIS and implementation of best practice.</p>
Operational Phase Mitigation	
10.6.2	<p>During the operational stage the drainage strategies and infrastructure as previously described in section 10.4.2.6 and Table 10.10 will limit the risk to watercourses and the hydrological environment from flooding and runoff contamination.</p> <p>Iarnród Éireann will also follow and implement its flood risk management operational procedures which assist in managing flood risk for rolling stock during inclement weather and flooding events, these include:</p> <ul style="list-style-type: none"> • CCE-TMS-311 - Irish Rail Weather Management Procedures (2017); • CCE-TEB-2014-05 - Guidance On Alerts And Service Restrictions During Adverse Weather Events; and • CME-TMS-001-008 - Operation Of IE RU Rolling Stock On Flooded Track (2016). <p>These procedures specify how Iarnród Éireann:</p> <ul style="list-style-type: none"> • Monitors and disseminates applicable weather warnings from Met Éireann; • Prepares and implements local weather management plans for predicted adverse weather events; • Set out recommended flood level limits for their rolling stock passing over flooded tracks; and • Set out actions to be undertaken by duty managers, drivers, signallers etc when high water alerts are issued. <p>Operational limits have been specified for the different rolling stock (i.e. types of trains) within their fleet, as shown in Figure 10-13. The limits have been set in order to avoid damage to critical onboard equipment and to mitigate against the risk of a train becoming disabled in a flooded area. The limits are also such to change depending on the track and weather conditions. It is important to note that no trains may operate over flooded track until permitted to do so by Iarnród Éireann Infrastructure Department. The EMU is the type of rolling stock of primary concern for this study. The maximum limit identified within the procedure for the EMU is the top of the railway track. A typical railway track is approximately 170mm deep from ground level.</p>

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Water (Hydrology and Flood Risk)					
		22000 	29000 	2600 2800 	LOCO 	EMU
	Top of rail+170mm	5mph (8kph)	5mph (8kph)			
	Top of rail+100mm	5mph (8kph)	5mph (8kph)	5mph (8kph)	5mph (8kph)	
	Top of rail	5mph (8kph)	5mph (8kph)	5mph (8kph)	5mph (8kph)	
	Bottom of rail head	5mph (8kph)	5mph (8kph)	5mph (8kph)	5mph (8kph)	5mph (8kph)
	Half rail height	Line Speed	Line Speed	Line Speed	Line Speed	5mph (8kph)
		Line Speed	Line Speed	Line Speed	Line Speed	Line Speed
						Approx. 170mm

Figure 10-13: Iarnród Éireann RU Rolling Stock Operating Procedure on flooded track condition

Monitoring	
10.7	<p>Water quality monitoring should be undertaken in the Royal Canal and all watercourses within the Study Area, with monthly samples being taken from at least 12 months prior to commencement of construction until at least 24 months post-completion. Additional sampling points if required can be determined by the Site Environmental Manager. The results of the water quality monitoring programme will be reviewed by the Site Environmental Manager and ECoW on an ongoing basis during construction. In the event of any non-compliance with regulatory limits for any of the water quality parameters monitored, an investigation will be undertaken to identify the source of this non-compliance and corrective action will be taken were the this is deemed to be associated with the proposed Project.</p> <p>It is expected that the OPW and EPA will continue to monitor water levels in the Hazelhatch Stream, Griffeen River and River Camac. The Marine Institute also has a tidal gauge at Dublin Port which can be monitored. Any unforeseen changes in extreme water levels or increased frequency can be risk assessed in the context of the scheme design.</p> <p>The drainage systems including new underground attenuation tanks serving the proposed Project must continue to function as designed. Maintenance of the new underground attenuation tanks and other drainage features will be in accordance with manufacturer recommendations.</p>

27.1.1.6. Hydrogeology

The table below details the mitigation and monitoring measures identified in Chapter 11 Hydrogeology.

Table 27.6: Mitigation and Monitoring Measures for Hydrogeology

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Hydrogeology
Mitigation Measures	
11.67	<p>A Construction & Environmental Management Plan (CEMP) has been prepared and is included in Volume 4, Appendix 5.1 of this EIAR. Should planning consent be received for the project, the appointed Main Contractor(s) will assume responsibility for the CEMP including all environmental commitments arising from the EIAR and NIS and any further commitments or conditions from the statutory planning process. It is intended that the CEMP will be a “live” document which will be reviewed prior to and updated during construction according to changing site-specific conditions on the project and to reflect current construction activities, manage environmental risks and mitigation.</p> <p>The Main Contractor(s) will update the CEMP over the duration of pre-construction and construction of the works. The CEMP will be updated by the successful Main Contractor. The CEMP will set out the Contractor’s overall management and administration of the construction project. It will be prepared by the Contractor during the pre-construction phase to ensure commitments included in the statutory approvals are adhered to and that it integrates the requirements of the CEMP including management of Construction & Demolition Waste. The mitigation measures will be implemented by the appointed Contractor(s). These include the best practice measures and the site-specific mitigation measures as they relate to hydrogeology are outlined below.</p>
Construction Phase Mitigation	
11.6.1.1	<p>Infiltration of Surface Water Runoff</p> <p>Excavated materials will be carefully managed in accordance with industry best practice during construction, to prevent any potential negative impact on the receiving environment:</p> <ul style="list-style-type: none"> • Excess material will be reused on-site or taken directly to an appropriately licenced facility avoiding contact with any open surface water drains; • Excavated material will not be left uncovered to avoid run-off of silty water and trial pits will be backfilled at the earliest convenience to avoid leaving stockpiles exposed; • Dust mitigation measures will be based upon the industry guidelines in the Building Research Establishment (BRE) document entitled ‘Control of Dust from Construction and Demolition Activities’; • Movement of material and trafficking will be minimised in order to reduce degradation of soil structure and generation of dust; • Site roads shall be regularly cleaned and maintained as appropriate. Hard surface roads shall be swept to remove mud and aggregate materials from their surface while any un-surfaced roads shall be restricted to essential site traffic only; • Any site roads with the potential to give rise to dust will be regularly watered, as appropriate, during dry and/or windy conditions (also applies to vehicles delivering material with dust potential); • All vehicles exiting the site shall make use of a wheel wash facility prior to entering onto public roads, to ensure mud, dust and other materials are not tracked onto public roads; • Wheel washes, in so far as is practicable, shall be self-contained systems that do not require discharge of the wastewater to water bodies; • Public roads outside the site shall be regularly inspected for cleanliness and cleaned as necessary; • Material handling systems and site stockpiling of materials shall be designed and laid out to minimise exposure to wind;

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Hydrogeology
	<ul style="list-style-type: none"> • Stockpiles will be fully managed through height restrictions, the following constraints will apply to temporary stockpiles: <ul style="list-style-type: none"> ○ Topsoil stockpiles will not exceed 2 metres in height and will have 1V:2H side slopes; and ○ Rock stockpiles will not exceed 5 metres in height and will have 1V:2H side slopes. • Water misting or sprays shall be used as required if particularly dusty activities are necessary during dry or windy periods; and • All vehicles which present a risk of spillage of materials, while either delivering or removing materials, will be loaded in such a way as to prevent spillage on to the public road. <p>Following erosion controls, sediment controls will be implemented to reduce whatever sediment has become suspended despite the erosion controls. The measures will include the use of settlement ponds, flocculation, check-dams or level spreaders, silt fencing and management of stockpiles as appropriate.</p> <p>The CEMP will develop a programme of visual inspections and audits to ensure the above mitigation is fully implemented.</p>
11.6.1.2	<p>Permanent Alteration to Groundwater Levels and Flows</p> <p>Additional consideration should be given to any areas of deep excavations or other works likely to extend below the water table during the construction phase. Pumping and removal of groundwater which could interfere with the existing groundwater flow regime should be considered only after ruling out feasibility of other options such as temporary cofferdams. A detailed method statement should be prepared in advance of works involving pumping of groundwater.</p> <p>Dewatering or pumping rates will be controllable by inline valves or similar in order to limit the volumes removed and the impacts upon receiving drainage network. Quality of pumped waters, particularly in relation to suspended solids will be monitored regularly and additional settlement tanks, silt bags, filters or similar incorporated as needed in order to meet Irish Water or other discharge requirements.</p> <p>No extracted or pumped groundwater will be discharged directly to surface waters in accordance with the Water Pollution Act 1977, as amended by the 1990 Act.</p>
11.6.1.3	<p>Accidental Emissions and Release of Potentially Hazardous Substances</p> <ul style="list-style-type: none"> • The storage and handling of oils, fuel, chemicals and hydraulic fluids will be in secure areas within the site compounds and will not occur within a minimum of 50m from watercourses; • Storage of fuels, chemicals and lubricants at the Contractor’s compound must be fenced off and have a lockable gate to prevent unauthorised access or vandalism; • The principal control measures are as follows: <ul style="list-style-type: none"> ○ Protection measures will be put in place to ensure that all hydrocarbons used during the construction phase are appropriately handled, stored and disposed of in accordance to the TII/NRA document “Guidelines for the crossing of watercourses during the construction of National Road Schemes”. All chemical and fuel filling locations will be protected from potential spillages through the provision of appropriate protection measures including bunded areas and double skinned bowser units with spill kits; ○ Storage tanks shall have secondary containment provided by means of an above ground bund to capture any oil leakage. Storage tanks and associated provision, including bunds, will conform to the current best practice for oil storage and will be undertaken in accordance with Best Practice Guide BPGCS005 – Oil Storage Guidelines (Enterprise Ireland);

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Hydrogeology
	<ul style="list-style-type: none"> ○ Where required, the pouring of concrete, sealing of joints, application of water-proofing paint or protective systems and curing agents will be completed in the dry and allowed to cure for 48 hours in order to avoid pollution of watercourses; ○ The use and management of concrete in or close to watercourses will be carefully controlled to avoid spillage; ○ An Emergency Response Plan detailing the procedures to be undertaken in the event of a spillage of chemical, fuel or other hazardous wastes (e.g. concrete) to be in place prior to commencement of project. This Plan will contain at a minimum the following mitigation measures: <ul style="list-style-type: none"> ▪ Carry out an investigation to identify the nature, source and cause of the incident and any emission arising therefrom; ▪ Isolate the source of any such emission; ▪ Evaluate the environmental pollution, if any, caused by the incident; ▪ Identify and execute the measures to minimise the emissions/malfunction and the effects thereof; ▪ Identify the date, time and place of the incident; ▪ Notify the Agency and other relevant authorities; and ▪ The licensee shall provide a proposal to the Agency for its agreement within one month of the incident occurring or as otherwise agreed by the Agency to identify and put in place measures to avoid reoccurrence of the incident and identify and put in place any other appropriate remedial action. ○ Relevant staff, including cover staff shall be trained in the implementation of the Emergency Response Plan and the use of any spill kit/control equipment as necessary; and ○ Plant and equipment shall be maintained in place and in working order for the duration of the works. ● Site compounds/storage facilities will be located at least 25 m away from surface waters. In addition, measures will be implemented to ensure that silt laden or contaminated surface water run-off from the compound does not discharge directly to the surface waters. Compounds shall not be constructed in lands at risk of flooding; ● All soiled construction run-off water will be passed through settlement ponds/silt traps and/or bunds prior to outfall to the receiving surface water where appropriate; ● Management of material deposition areas to prevent siltation of watercourse systems through run-off during rainstorms. It is recommended to construct collector ditches surrounding material stockpiles to contain run-off and direct it to the settlement ponds/silt traps before discharge to an adjacent watercourse; and ● Wheel wash facilities to be appropriately located to ensure wash waters are intercepted, contained and directed to settlement ponds/silt traps prior to discharge to surface waters.
Operational Phase Mitigation	
11.6.2	No operational phase mitigation measures are proposed beyond those contained within the existing Iarnród Éireann Environmental Management Policies and Process document (CCE-IMS-008).
Monitoring	
11.7	Based on the conclusions of the impact assessment and residual effects, additional monitoring of groundwater quality, although informative, is not considered necessary.

27.1.1.7. Air Quality

The table below details the mitigation and monitoring measures identified in Chapter 12 Air Quality.

Table 27.7: Mitigation and Monitoring Measures for Air Quality

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Air Quality
Mitigation Measures	
Construction Phase Mitigation	
12.6.1.1	<p>Dust</p> <p>Before commencing relevant works, an air quality management plan shall be prepared by the appointed main contractor and submitted for approval to the relevant planning authority. The plan must include all appropriate dust and emissions mitigation measures, applicable to the circumstances of the relevant site, based on the mitigation in this EIAR and local authority requirements and industry best practices. Dublin City Council (DCC) guidance document titled “Air Quality Monitoring and Noise Control Unit’s Good Practice Guide for Construction and Demolition” (2018) will be taken into consideration with respect to mitigation dust measures.</p> <p>The plan will be developed by the main contractor and for each worksite shall include:</p> <ul style="list-style-type: none"> • An inventory and timetable of activities which may give rise to emissions or dust; • Alert levels; • Alert system to be used (including notification process); • Details of control measures; • Details of dust monitoring arrangements, including the location of sensitive receptors, monitoring locations, and monitoring equipment to be used; and • Details of the air quality reporting requirements. <p>A pre-construction dilapidation survey of all buildings will be required prior to commencement of the construction phase. If asbestos potential is indicated in the pre-construction dilapidation survey, a fully intrusive asbestos-containing materials survey will be completed. Prior to commencement of the demolition works, all asbestos containing materials identified by the survey will be removed by a suitably trained and competent person. Asbestos-containing materials will only be removed from site by a suitably permitted/licensed waste contractor and will be brought to a suitably licensed facility. The Health and Safety Authority will be contacted where needed in relation to the handling of asbestos and material will be dealt with in accordance with the Safety, Health and Welfare at Work (Exposure to Asbestos) Regulations 2006, as amended and associated approved Codes of Practice.</p> <p>To reduce dust nuisance, a series of measures will be implemented including:</p> <ul style="list-style-type: none"> • Material handling systems and site stockpiling of materials will be designed and laid out to minimise exposure to wind. Water misting or sprays will be used as required if particularly dusty activities are necessary during dry or windy periods; • Liaison with local authorities and community groups; • Hoarding will be provided around the construction compounds; and • It is anticipated that methods of collecting rainwater and recycling for general site use, will be adopted where practical. <p>Strict dust prevention will be always in place, to minimise any potential emissions and these procedures will be strictly monitored and assessed. In the event of dust nuisance occurring outside the site boundary, movements of materials likely to raise dust will be curtailed and satisfactory procedures implemented to rectify the problem before the resumption of construction operations.</p> <p>Monitoring of construction dust deposition at nearby sensitive receptors that are identified based on potential risk of dust nuisance during the construction phase of the proposed Project is recommended to ensure mitigation measures are working satisfactorily. This can</p>

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Air Quality
	<p>be carried out using the Bergerhoff method in accordance with the requirements of the German Standard VDI 2119. The Bergerhoff Gauge consists of a collecting vessel and a stand with a protecting gauge. The collecting vessel is secured to the stand with the opening of the collecting vessel located approximately 2 m above ground level. The TA Luft limit value is 350 mg/m²/day (for non-hazardous dusts) during the monitoring period between 28 – 32 days.</p>
12.6.1.2	<p>Traffic</p> <p>The modelling of road traffic for impacts on human and ecological receptors has found no significant impacts that require mitigation measures with respect to the modelling of emissions. However, some mitigation measures can be put in place to minimise emissions:</p> <ul style="list-style-type: none"> • Implement a policy which prevents idling of vehicles both on and off-site including HGV holding sites; • Construction phase traffic shall be monitored to ensure construction vehicles are using the designated haul routes; • A construction Traffic Management Plan will be prepared by the contractor to give effect to the relevant mitigation measures presented in this EIAR and having considered any potential cumulative impacts of works staging and other projects in the public space; • The contractor must adhere to defined traffic routes as noted in the Traffic Management Plan; • Efficient scheduling of deliveries to minimise number of truck movements; and • Construction vehicles should conform to the current EU emissions standards and where reasonably practicable, their emissions should meet upcoming standards prior to the legal requirement date for the new standard. This will ensure emissions on haul routes are minimised. <p>Mitigation measures are required for the control of dust with respect to HGV movements onsite with the site and deliveries to/ from the site:</p> <ul style="list-style-type: none"> • HGV traffic leaving site will pass through a wheel wash; • Public roads outside the site will be regularly inspected for cleanliness and cleaned as necessary. If public roads are deemed to require additional cleaning where possible a suction device for road cleaning will be utilised to access spaces around cars and other street furniture more effectively; and • During movement of materials both on and off-site, trucks will be stringently covered with tarpaulin. Before entrance onto public roads, trucks will be adequately inspected to ensure no potential for dust emissions.
Operational Phase Mitigation	
12.6.2	<p>As all ambient air pollutants will remain in compliance with the ambient air quality standards and the proposed Project has negligible impacts at all modelled receptors no specific operation phase mitigation measures are required.</p>
Monitoring	
Construction Phase Monitoring	
12.7.1	<p>Monthly monitoring of dust deposition levels will be undertaken for the duration of construction for comparison with the guideline of 350 mg/m²/day (for non-hazardous dusts). This monitoring shall be carried out at a series of locations based on potential risk of dust nuisance during the construction phase of the proposed Project.</p> <p>This monitoring should be carried out at a minimum of three locations at construction compounds with a medium to high risk of dust nuisance and further monitoring locations at sensitive receptors around the proposed works.</p> <p>Where dust levels are measured to be above the guideline of 350 mg/m²/day, the mitigation measures in the area must be reviewed and improved to ensure that dust deposition is reduced to below 350 mg/m²/day. Should high dust levels continue to occur following these</p>

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Air Quality
	improvements, the contractor will provide alternative mitigation measures and/or will modify the construction works taking place.
Operational Phase Monitoring	
12.7.2	No monitoring measures are proposed for the operational phase.

27.1.1.8. Climate

The table below details the mitigation and monitoring measures identified in Chapter 13 Climate.

Table 27.8: Mitigation and Monitoring Measures for Climate

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Climate
Mitigation Measures	
Construction Phase Mitigation	
13.6.1.1	<p>Embodied Carbon</p> <ul style="list-style-type: none"> The design team and contractor shall maximise the use GGBS as a replacement for Portland cements to increase sustainability and the carbon footprint of civil and structural works. Only where GGBS is unsuitable for structural reasons can traditional Portland cements be employed on the project; Within the project design, the use of concrete will be minimised e.g. specify non-concrete assets where practicable such as gravel footpaths, grassed drains, etc.; Iarnród Éireann will pursue procurement of the highest recycled steel content that is available for the particular steel usage. This may vary depending on engineering constraints. The carbon emissions emitted during the production of virgin steel can be higher than some other structural materials on a tonne-by-tonne basis and recycled steel should be used where possible; All aggregates required shall be secondary aggregates and virgin aggregates may only be employed where secondary aggregates do not fulfil structural requirements and/or are unavailable; In so far as possible, the contractor will secure the above materials from local/regional sources or sources within the State to minimise material transport emissions; and Where possible materials will be re-used/recycled to reduce the need for procurement of new materials. In accordance with the IÉ Sustainability Strategy 2021 - 2030, 25% of raw material purchases will come from recycled sources.
13.6.1.2	<p>General</p> <ul style="list-style-type: none"> Iarnród Éireann will actively purchase materials and services with lower embodied/embedded emissions; The cut/fill balance will be further optimised to ensure that the minimal transport of material to and from the site is required thereby minimising transport emissions; There will be regular scheduled maintenance of construction plant machinery to maintain optimum operating efficiency; Transport distances (and associated carbon emissions from transport) of materials shall be minimised by securing or specifying local suppliers for materials, whenever feasible; For electricity generation at site compounds, hydrogen generators or electrified plant shall be used over traditional diesel generators; Precast over in-situ concrete for bridge construction, culverts, etc. will be specified where possible;

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Climate
	<ul style="list-style-type: none"> • The need for barriers or vehicle restraint systems (VRS) will be minimised through passive design to reduce the overall steel requirement on the proposed Project; • The use of sustainable timber post fencing in boundary treatments over steel will be stipulated unless required by health and safety standards; • Engines shall be switched off when machinery is not in use; and • A mobility strategy will be prepared to reduce the need for private vehicles to get to site (e.g., public transport and car sharing and maximising the amount of local labour).
Operational Phase Mitigation	
13.6.2.1	<p>Embodied Carbon</p> <p>The maintenance phase GHG emissions will primarily consist of the maintenance of materials which were used in construction. No specific mitigation is set out, however where possible, materials should be replaced in the most sustainable manner available. This may mean different materials used in replacement during the operational phase.</p>
13.6.2.2	<p>Rail</p> <ul style="list-style-type: none"> • Using timetable optimisation and driver training; • Fuel consumption telematics for older rolling stock; • Auto-Shut down for a significant portion of the fleet; • Matching train sizes to customer demand; • Elimination of Temporary Speed Restrictions (TSRs) arising from infrastructure renewals; and • Use of a Corporate Power Purchase Agreement (CPPA) to ensure an energy mix of 80% renewables in the operational phase electricity use. <p>In addition, a number of fuel efficiency programs are currently in progress/on-trial (Iarnród Éireann 2021). These include the trial replacement of ICR gearboxes, replacement of ICR diesel engines with hybrid drives, Envirox fuel additive to increase fuel efficiency and to keep diesel engine DP filters clean and replacement of diesel vans with electric road vehicles supported by charging points at depots and stations.</p>
13.6.2.3	<p>Demand</p> <ul style="list-style-type: none"> • Compliance with relevant ISO and national NSAI energy and environmental standards; • Contributing to transport sector decarbonisation including improving fleet and buildings fuel/energy performance, fleet hybridisation, phased network electrification and promoting and facilitating a shift to rail; • Recycling of 70% of all waste; • Near Zero Energy Building standard in all new buildings, and upgrades of 140 existing buildings to minimum BER B; • Reduction in overall carbon emissions by 51% between 2021 to 2030; • Improving operations, infrastructure and fleet climate change resilience including partnership approach to emergency responses and wide-ranging mitigation measures including coastal protection; • Reducing environmental impacts including LEAN management, waste and water management, green procurement in support of the circular economy and site decontamination; • Protecting habitats and promoting biodiversity in a partnership approach; and • The above actions and others within the Iarnród Éireann Sustainability strategy will be implemented as part of Iarnród Éireann's future mitigation and this includes the proposed Project mitigation.

EIA Section Reference	Description of Mitigation and Monitoring Measures for Climate
Monitoring	
13.7	No monitoring measures are proposed for the construction or operational phases.

27.1.1.9. Noise and Vibration

The table below details the mitigation and monitoring measures identified in Chapter 14 Noise and Vibration.

Table 27.9: Mitigation and Monitoring Measures for Noise and Vibration

EIA Section Reference	Description of Mitigation and Monitoring Measures for Noise and Vibration
Mitigation Measures	
Construction Phase Mitigation	
14.7.1	<p>Noise</p> <p>General Mitigation</p> <ul style="list-style-type: none"> • Construction shall be phased in accordance with the phasing of works outlined in Chapter 5 Construction Strategy of the EIA to minimise the duration of activities in each area. Due to the complex nature of the works detailed schedules, noise control measures and monitoring proposals shall, as a minimum, include the measures set out in this assessment and be documented in the CEMP; • Works will be carried out using Best Practicable Means (BPM) to minimise noise and vibration, such measures shall include: <ul style="list-style-type: none"> ○ Limiting the hours of construction and construction noise limits to those set out in Table 14.3, except in exceptional circumstances during night-time or weekend possessions as outlined in Chapters 4 and 5 of this EIA; ○ Work practices, equipment noise control and screening shall be in compliance with BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise, and BS 5228-2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part2: Vibration (together referred to as B.S. 5228). Typical work practices include: <ul style="list-style-type: none"> ▪ Scheduling of noisy works to the normal working hours; ▪ Adopting quiet working methods, using plant with lower noise emission levels; ▪ Adopting working methods that minimise vibration generation particularly with regard to demolition activities and piling; ▪ Plant such as pumps and generators used on or near sensitive locations will be contained within an acoustic enclosure and comply with the noise levels in Table 9 4 and Table 9 5 of BS 5228; ▪ Plant and machinery used on-site will comply with the EC (Construction Plant and Equipment) Permissible, Noise Levels Regulations, 1988 (S.I. No. 320 of 1988); ▪ All noise producing equipment will comply with S.I. No 632 of 2001 European Communities (Noise Emission by Equipment for Use Outdoors) Regulations 2001;

EIA Section Reference	Description of Mitigation and Monitoring Measures for Noise and Vibration
	<ul style="list-style-type: none"> ▪ Measures outlined in “Environmental Good Practice Site Guide” 2005 compiled by CIRIA and the UK Environmental Agency and the “London Good Practice Guide: Noise & Vibration Control for Demolition and Construction” 2016 These guidelines provide useful and practical information regarding the control of noise emissions at construction sites; ▪ Ensuring that all plant is properly maintained, (mechanisms properly lubricated, faulty silencers replaced, worn bearings replaced, cutting tools sharpened etc.); ▪ Closing acoustic covers to engines when in use or idling; ▪ Use of electrically powered equipment in preference to internal combustion powered equipment; ▪ Use of hydraulic equipment in preference to pneumatic equipment; ▪ Use of wheeled plant in preference to tracked plant; ▪ Locating plant as far away from noise and vibration sensitive receptors as practicable; ▪ Installation of site hoardings or perimeter noise barriers; ▪ Use of temporary acoustic enclosures or screens around specific noisy static plant; ▪ Use of large fully enclosed acoustic buildings to surround activities and/or worksites; ▪ Avoiding the unnecessary revving of engines and switch off equipment when not in use; ▪ Starting-up plant and vehicles sequentially rather than at the same time; ▪ Keeping internal haul routes well maintained to minimise impulsive noise and vibration from vehicles running over discontinuities in the running surfaces; ▪ Fitting rubber linings to chutes, hoppers and dumper vehicles to reduce impact noise from material transfer; ▪ Minimising drop heights of materials; ▪ Carrying out regular inspections of mitigation measures (BPM audits) to ensure compliance with noise and vibration commitments; ▪ Providing regular briefings for all site-based personnel so that noise and vibration issues (including the requirement to employ BPM at all locations at all times) are understood and that generic and site-specific mitigation measures are explained and adhered to; ▪ Ensuring that unloading is carried out within the worksite rather than on adjacent roads or laybys; ▪ Phasing of materials deliveries to be controlled on a ‘just in time’ basis to minimise noise and congestion on roads around the site; ▪ A formal stakeholder engagement process shall be put in place for the duration of the construction phase, including the provision of information to local residents about noise and vibration monitoring results, works likely to cause significant noise or vibration and/or works planned to take place outside of core working hours;

EIA Section Reference	Description of Mitigation and Monitoring Measures for Noise and Vibration
	<ul style="list-style-type: none"> ▪ Channels of communication between the Contractor, and relevant County Council Planning Sections (Planning Authority) and residents will be established at project commencement; and ▪ Records of any noise complaints relating to the construction operations will be investigated as soon as possible and reported to the Planning Authority. <ul style="list-style-type: none"> • Where the use of noise barriers is specified to reduce the noise level from construction works, their use will be temporary and they will be removed following the completion of the works; • Where works need to be completed outside normal working hours or where proposed works indicate that the noise or vibration levels set out in section 14.3.3.2 (Construction Noise Criteria) or section 14.3.3.4 (Construction Vibration Criteria) may be exceeded, permission for these works must be sought from the Planning Authority in advance of any works taking place. The application for such works will require a detailed noise control plan and follow up report to be prepared. This plan will include (i) a justification for the works being carried out in the manner proposed, (ii) an assessment indicating what alternatives have been considered, (iii) a statement of the noise control measures from B.S. 5228 to be adopted and how Best Practicable Means will be used to control noise, (iv) an activity specific noise monitoring programme including contact details for persons with the authority to cease working if required by the Planning Authority. Each follow up report will include details of any complaints received and the action taken to address such complaints; • A noise and vibration monitoring programme will be implemented for the duration of the construction phase. Monitoring will assess compliance of the construction works with the noise limits set out in Table 14.3 and Table 14.6; and • Full details of the Contractor's provision for noise and vibration monitoring and procedures including provisions for publication of monitoring results will be submitted to and approved by the Planning Authority prior to commencement of work. The Planning Authority shall have discretion to vary the monitoring requirements and publication of results during the course of construction. <p>Site Clearance</p> <p>The site clearance works will be the first activity to be undertaken and the installation of noise barriers along boundaries to mitigate the noise impact is likely to be premature as areas where the noise barriers are proposed are likely to require vegetation clearance before noise barriers are installed. To mitigate the noise impact, it is recommended to minimise the plant items operating simultaneously when clearance activities are within 33 m of a noise sensitive location. The plant items with the potential for greatest impact are the chainsaw, mulcher and stump grinder and it is recommended that these activities do not occur simultaneously within 33 m of noise sensitive locations. Where these activities are occurring for an extended duration within 20m of a receptor and there is direct line of sight, temporary barriers or enclosures should be considered where practicable.</p> <p>Ground Investigation</p> <p>Ground Investigation works are proposed on-track and off-track. Off-track works are not expected to exceed 70 dB L_{Aeq}. Where ground investigation works are on-track, this is undertaken at night-time when trains are not operating and the use of a vacuum excavator is required. The use of a vacuum excavator results in an increase in noise levels with exceedances in a noise limit of 70 dB L_{Aeq} at distances up to 42 m away from the activity where there is direct line of sight with the noise sensitive location. To mitigate the noise from the vacuum excavator the following mitigation measures are proposed:</p> <ul style="list-style-type: none"> • Fit a muffler to the upper air vent, the point at which the air flow exits the vacuum extractor vehicle to the atmosphere;

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Noise and Vibration
	<ul style="list-style-type: none"> Where practicable, use a plastic intake hose/nozzle. The selection of the nozzle is dependent on ground conditions and depth of excavation required. Where ground conditions are suitable a plastic nozzle should be used; Investigate the feasibility of installing a vertical screen fitted to the side of the vehicle to reduce the propagation of noise from the fans via the louvered fan vents. The feasibility of this design needs to consider the safe operation of the vacuum excavator, ventilation requirements for air flow and vertical and horizontal clearances for safe access along the railway line particularly through bridges and tunnels; and The relevant local authorities will also be informed and notified of night-time GI works. The local authority will be kept informed of the progression of the night-time GI works and of any concerns or complaints raised by the local community. <p>Site Compounds</p> <p>At this stage of the project installation of noise barriers along site compound boundary to mitigate the noise impact is likely to be premature as areas where the noise barriers are proposed are likely to require site clearance before noise barriers are installed. Noise barriers should be installed as soon as practicably possible. To mitigate the noise impact, it is recommended to minimise the plant operating simultaneously especially when activities are within 14 m of a noise sensitive location.</p> <p>Crushing and Screening</p> <p>It is proposed that noise barriers are installed adjacent to the crushing and screening plant where practicable. The location of the plant within the site compound should be such, that it maximises the distance to noise sensitive locations.</p> <p>Demolitions</p> <p>The predicted construction noise level from demolition activities is expected to be below 70 dB LAeq at the nearest noise sensitive locations when hydraulic breaker is not operating. The predicted noise levels are of the order of 10 dB higher when the hydraulic breaker is not operating. However, the hydraulic breaker will be required for brief periods. To mitigate the noise impact from the rock breaker, the following measures should be considered:</p> <ul style="list-style-type: none"> Fit suitably designed muffler or sound reduction equipment to reduce noise without impairing machine efficiency; and Use dampened bit to eliminate ringing. <p>Where works are occurring over an extended period, the use of temporary noise barriers/screens or enclosure should be implemented where practicable.</p> <p>Earthworks</p> <p>There is potential for significant impacts or greater at receptors within 18m and 30m of the proposed works when there is line of sight and partial line of sight respectively. Noise barriers are proposed along the boundary adjacent to nearby noise sensitive locations. Where line of sight is blocked, it is expected that construction noise impact will not be significant. Where line of sight between the construction plant and noise sensitive locations cannot be blocked, it is recommended that simultaneous use of plant in close proximity to the noise sensitive location be limited.</p> <p>Bridges</p> <p>There is potential for significant impacts at locations within 25m of the proposed works. The majority of plant items will result in predicted noise levels below the noise limit. However, use of rock breaking results in increased noise level although this activity will occur sporadically. To mitigate the noise impact from the rock breaker, the following measures should be considered:</p>

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Noise and Vibration
	<ul style="list-style-type: none"> • Fit suitably designed muffler or sound reduction equipment to reduce noise without impairing machine efficiency; and • Use dampened bit to eliminate ringing. <p>Where works are occurring over an extended period, the use of temporary noise barriers/ screens or enclosure should be implemented where practicable.</p> <p>Retaining Walls</p> <p>Where activities occur within 10m of the noise sensitive receptors, predicted noise levels can reach up to 80 dB and higher for secant piling, trench wall works and soil nailing/ wall anchoring. The noise levels at the nearest receptors are likely to have a profound impact.</p> <p>Installation of noise barriers along the boundary provided they block direct line of sight as well as minimising the simultaneous use of plant will reduce the noise impact. However, in some instances plant will be so close that an individual item plant could result in a very significant or profound significance of effect and/ or it may not be practical to install a noise barrier as the boundary wall is being replaced with a piled wall. Where possible the driving system should be enclosed in an acoustic shroud. However, given the proximity to some noise sensitive locations, the measures proposed may not be sufficient to fully mitigate the noise impact. Where this occurs, and where all reasonable measure have been taken to reduce noise levels through source and pathway control, the thresholds and criteria for temporary accommodation or the reasonable costs thereof, will be assessed and implemented as appropriate where eligibility has been established and in consultation with eligible owners/occupiers.</p> <p>It is recommended that in densely populated areas or where mitigation measures are limited for apartment blocks, consideration be given to the use of multiple piling rigs per location as the additional noise impact is minor, however, the works will be completed more quickly, thus reducing the overall impact.</p> <p>Track Lowering and Alignment</p> <p>The predicted noise levels show that for some activities the there is potential for exceedances when activities are within 25m of noise sensitive locations. The plant items with the greatest potential are the tamping machine with rail cutting and loading of ballast to a lesser extent. The tamping machine is constantly moving so the impact will be brief. Similarly, rail cutting occurs intermittently and the duration of the impact will be brief.</p> <p>In locations where track widening works are proposed, noise barriers are proposed along the boundary with nearby residents. This will help mitigate the noise from all activities including the track lowering and alignment works. Loading of ballast material has also been identified as one of the activities with potential to cause high noise levels and this will occur over a longer duration compared to tamping and rail cutting. To mitigate the noise impact from the loading of ballast material, it is recommended to minimise the drop height when loading the ballast material and to line the dump with a resilient material.</p> <p>Attenuation Tanks</p> <p>For noise sensitive locations in proximity to two proposed attenuation tanks at Inchicore, predicted noise levels are below the noise limits and no specific mitigation measures are proposed. However, site wide general measures will be applied to reduce the noise impact to its lowest. For noise sensitive locations in proximity to the proposed attenuation tank at Heuston West Station, there is potential for noise limits to be exceeded when activity occurs within 10m. Works are occurring adjacent to residential dwellings and apartment blocks. It is proposed to install noise barriers adjacent to the residential dwellings and/ or the site boundary where applicable. The use of noise barriers will have limited impact for the higher floors of adjacent apartment blocks and it is recommended that noise barriers are installed to protect the lower level floors in combination with reducing the simultaneous use of heavy plant when closer than 10 m from noise sensitive locations. These mitigation measures will reduce the overall noise impact as well as the number of noise sensitive locations where noise levels in</p>

EIA Section Reference	Description of Mitigation and Monitoring Measures for Noise and Vibration
	<p>excess of 70 dB L_{Aeq} are predicted. However, there will be some noise sensitive locations where there will be brief periods where noise levels are above the noise limits.</p> <p>OHLE Foundations</p> <p>Where more extensive works are occurring, for example where two tracks are becoming four tracks, noise barriers proposed along the boundary for other construction activities will be in place. When line of sight is obscured, there will be a reduction in the noise emissions.</p> <p>At locations where electrification is the primary construction activity, for example Zone A, mitigation measures are limited for these works due to the nature of the sites being temporary worksites and the plant involved is difficult to mitigate.</p> <p>It is recommended that in densely populated areas or where mitigation measures are limited for apartment blocks, consideration be given to the use of multiple piling rigs per location as the additional noise impact is minor, however, the works will be completed more quickly, thus reducing the overall impact.</p> <p>Installation of Gantries</p> <p>The installation of the gantries is proposed at locations where noise barriers are proposed along the boundary for other construction activities. Where the line of sight to nearby sensitive receptors is obscured the noise impact will be reduced. In addition to the noise barriers general construction mitigation measures will be implemented where possible.</p> <p>Roads</p> <p>During these works, there will be no passing traffic and the noise impact is not expected to be over and above the existing noise levels experienced at these locations. Nonetheless the character of the noise will be different and best practice measures outlined above should be implemented.</p> <p>Heuston West Station</p> <p>Where possible, the driving system (for piling) should be enclosed in an acoustic shroud. It is proposed to install noise barriers adjacent to the dwelling houses and/ or the site boundary where applicable. The use of noise barriers will have limited impact for the higher floors of adjacent apartment blocks and it is recommended that noise barriers are installed to protect the lower level floors in combination with reducing the simultaneous use of heavy plant when closer than 10m from noise sensitive locations.</p> <p>Night-time Works</p> <p>Where works need to be completed outside normal working hours permission for these works must be sought from the Planning Authority in advance of any works taking place. The application for such works will require a detailed noise control plan and follow up report to be prepared. This plan will include (i) a justification for the works being carried out in the manner proposed, (ii) an assessment indicating what alternatives have been considered, (iii) a statement of the noise control measures from B.S. 5228 to be adopted and how Best Practicable Means will be used to control noise, (iv) an activity specific noise monitoring programme including contact details for persons with the authority to cease working if required by the Planning Authority. Each follow up report will include details of any complaints received and the action taken to address such complaints.</p> <p>Where possible works will be undertaken in safe zones during daytime periods. In certain circumstances full possession of the railway (i.e no trains running) will be required and these will take place during weekend and night-time possessions. Where night-time works are proposed the following mitigation measures are proposed:</p> <ul style="list-style-type: none"> • Inform local residents about works planned to take place outside of core working hours; • Carry out as much preparatory work in daylight as possible;

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Noise and Vibration
	<ul style="list-style-type: none"> • Inspect the work site in daylight if possible and look for the best location to position generators; • Adopting quiet working methods, using plant with lower noise emission levels; • Locate plant as far away from noise and vibration sensitive receptors as practicable; • Plant such as pumps and generators used on or near sensitive locations will be contained within an acoustic enclosure; • Consider using additional supply cables (if safe) so that the generators can be positioned as far away from sensitive locations; • Use of electrically powered equipment in preference to internal combustion powered equipment; • Use of temporary acoustic enclosures or screens around specific noisy static plant; • Use of large fully enclosed acoustic buildings to surround activities and/or worksites; • Avoiding the unnecessary revving of engines and switch off equipment when not in use; • Starting-up plant and vehicles sequentially rather than at the same time; • Do not leave equipment or vehicle running/ idling unnecessarily; • Providing regular briefings for all site-based personnel so that noise and vibration issues are understood and that generic and site-specific mitigation measures are explained and adhered to; • Do not shout work instructions when working in residential areas at night unless absolutely necessary; • Phasing of materials deliveries to be controlled on a 'just in time' basis to minimise noise and congestion on roads around the site; • Take advantage of natural barriers such as vegetation, walls or embankments that can offer noise screening to adjacent neighbours; • For piling activity, where possible, the driving system should be enclosed in an acoustic shroud; and • For anchoring works at the Phoenix Park Tunnel, a temporary noise curtain/barrier should be installed at the tunnel entrance to reduce noise break out. <p>Eligibility of Temporary Rehousing</p> <p>Temporary rehousing will be offered to eligible owners/occupiers where the construction of the proposed Project causes, or is expected to cause, a measured or predicted airborne construction noise level that exceeds either of the following at property lawfully occupied as a permanent dwelling:</p> <ul style="list-style-type: none"> • A noise level 10 dB above any of the trigger noise levels presented in Table 14.12 (in section 14.3.4.3) the corresponding times of day; • A noise level 10 dB or more above the existing pre-construction ambient noise level for the corresponding times of day; and • Whichever level is the higher; and for a period of 10 or more days of working in any 15 consecutive days or for a total number of days exceeding 40 in any 6 consecutive months.

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Noise and Vibration																				
14.7.2	<p>Vibration</p> <p>The worst-case vibration levels at Le Fanu Drive are 1.85 mm/s for caisson piling and 1.04 mm/s for ground anchoring. Typical values for properties in the Le Fanu/ Kylemore area are 1.00 mm/s for piling and 0.38 mm/s for anchoring. BS 5228-2 indicates that these levels will cause complaints in residential environments but can be tolerated if prior warning and explanation is given to residents.</p> <p>A formal stakeholder engagement process will be put in place for the duration of the construction phase, including the provision of information to local residents regarding works likely to cause significant noise or vibration and/or works planned to take place outside of core working hours and also establish a process for handling all enquires including complaints.</p>																				
Operational Phase Mitigation																					
14.7.3	<p>Noise</p> <p>There is no specific statutory Irish guidance for rail noise mitigation. In order to provide a robust and consistent methodology, reference has been made to the mitigation criteria in the Transport Infrastructure Ireland (TII) Guidelines for the Treatment of Noise and Vibration in National Road Schemes, Revision 1 (2004) as the TII guidelines provide guidance on a structured approach to ameliorate as far as practicable transportation noise. Details on the operational noise mitigation criteria are presented in section 14.3.3.5.</p> <p>Several areas along the proposed Project were identified as meeting the criteria for mitigation presented in section 14.6.2.1. Table 14.69 presents the details of the noise barriers proposed to mitigate the operational noise impact. Although the term 'noise barriers' is used; this may take the form of walls, earthen berms and other landscaping features providing the required acoustic screening and meeting all other technical specifications. The locations of noise mitigation measures are shown in Volume 3A of this EIAR.</p> <p>Barriers will be specified to achieve a noise reduction class B3 when tested in accordance with EN 16272-2: 2012 Railway Applications - Track - Noise Barriers and Related Devices Acting on Airborne Sound Propagation - Test Method for Determining the Acoustic Performance - Part 2: Intrinsic Characteristics - Airborne Sound Insulation in the Laboratory Under Diffuse Sound Field Conditions. Where absorptive noise barriers are proposed, barriers will be specified to achieve an absorption performance of class A4 in accordance with EN 16272-1:2012 Railway applications - Track - Noise barriers and related devices acting on airborne sound propagation - Test method for determining the acoustic performance - Part 1: Intrinsic characteristics - Sound absorption in the laboratory under diffuse sound field conditions.</p> <p>Table 14.69: Details of proposed Operational Noise Mitigation Measures</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #ADD8E6;"> <th>Barrier ID</th> <th>Chainage</th> <th>Description</th> <th>Length (m)</th> <th>Height (m)</th> </tr> </thead> <tbody> <tr> <td>NB 1</td> <td>Ch 24+507 – 24+856</td> <td>Absorptive</td> <td>349</td> <td>2.0</td> </tr> <tr> <td>NB 2</td> <td>Ch 24+314 – 24+473</td> <td>Absorptive</td> <td>164</td> <td>2.0</td> </tr> <tr> <td>NB 3</td> <td>Ch 24+298 – 24+300</td> <td>Absorptive</td> <td>3</td> <td>2.5</td> </tr> </tbody> </table>	Barrier ID	Chainage	Description	Length (m)	Height (m)	NB 1	Ch 24+507 – 24+856	Absorptive	349	2.0	NB 2	Ch 24+314 – 24+473	Absorptive	164	2.0	NB 3	Ch 24+298 – 24+300	Absorptive	3	2.5
Barrier ID	Chainage	Description	Length (m)	Height (m)																	
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EIAR Section Reference	Description of Mitigation and Monitoring Measures for Noise and Vibration				
NB 4	Ch 24+124 – 24+292	Absorptive	168	2.5	
NB 5	Ch 24+057 – 24+116	Combination Absorptive/Reflective	57	4.0	
NB 6	Ch 23+863 – 24+057	Absorptive	211	2.5	
NB 7	Ch 24+118 – 24+118	Absorptive	27	3.5	
NB 8	Ch 24+020 – 24+118	Absorptive	96	3.5	
NB 9	Ch 23+759 – 23+902	Reflective	146	2.5	
NB 10	Ch 22+506 – 22+591	Reflective	86	3.5	
NB 11	Ch 22+245 – 22+340	Reflective	97	2.4	
NB 12	Ch 17+900 – 18+105	Absorptive	205	2.0	
NB 13	Ch 17+299 – 17+482	Reflective	182	2.5	
NB 14	Ch 15+741 – 15+868	Reflective	128	3.2	
NB 15	Ch 15+340 – 15+647	Reflective	316	2.5	
NB 16	Ch 13+960 – 14+160	Reflective	201	3.5	
NB 17	Ch 13+750 – 14+183	Absorptive	438	3.5	
NB 18	Ch 13+555 – 13+960	Absorptive	417	2.25	

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Noise and Vibration				
NB 19	Ch 13+440 – 13+481	Reflective	40	2.4	
NB 20	Ch 13+140 – 13+305	Reflective	168	1.5	
NB 21	Ch 13+060 – 13+140	Reflective	81	3.5	
NB 21a	Ch 13+060 – 13+060	Reflective	1	Varied	
NB 22	Ch 12+660 – 13+060	Reflective	405	3.5	
NB 23	Ch 12+612 – 12+660	Reflective	48	2.0	
NB 24	Ch 12+158 – 12+595	Reflective	437	1.1	
NB 25	Ch 11+700 – 12+125	Reflective	425	2.5	
NB 26	Ch 11+320 – 11+700	Reflective	379	3.5	
NB 27	Ch 11+293 – 11+320	Reflective	27	2.0	
NB 28	Ch 11+272 – 11+293	Reflective	21	3.5	
NB 29	Ch 10+810 – 11+272	Reflective	463	3.5	
NB 30	Ch 9+255 – 9+323	Reflective	68	3.0	
NB 30a	Ch 9+090 – 9+237	Reflective	143	3.0	
<p>There are several locations (R17, R17a, R20 and R20a) where the installation of noise barriers along the Project boundary is not effective as the properties are high rise buildings and even with noise barriers in place there would be direct line of sight between the noise sensitive locations and passing trains. Resilient rails were considered for these properties. Given that the rails are mounted on concrete sleepers in ballast, the effectiveness of resilient rails as a mitigation measure is limited. Therefore, the significance of effect at locations R17 and R20a</p>					

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Noise and Vibration																																																																													
	<p>was assessed to be long term negative moderate effect with a long term negative significant effect at location R20.</p> <p>Further investigation at noise sensitive location represented by location R20 and R20a identified that four of the noise sensitive locations (facades overlooking the railway at Seven Oaks Apartment Complex and Floraville from the 2nd to 4th floor) were identified as having a significant effect with a slight or moderate effect at other floors.</p> <p>For locations where a significant effect is identified, and in absence of an engineering solution to mitigate the noise impact within the Project boundary, noise insulation, or the reasonable costs thereof, will be offered to eligible owners at properties lawfully occupied as a permanent dwelling.</p> <p>Table 14-70 presents the predicted noise levels at the noise sensitive locations following the implementation of mitigation measures. The significance of effect is also presented.</p> <p>Table 14-70: Predicted Noise Levels with Mitigation</p> <table border="1"> <thead> <tr> <th rowspan="2">Receptor ID</th> <th rowspan="2">Description</th> <th colspan="2">Do Something with Mitigation</th> <th rowspan="2">Significance Rating</th> </tr> <tr> <th>Daytime L_{Aeq,16hr}</th> <th>Night-time L_{Aeq,8hr}</th> </tr> </thead> <tbody> <tr> <td>R1</td> <td>Claremont Lawns</td> <td>45.9</td> <td>40.4</td> <td>Slight (Positive)</td> </tr> <tr> <td>R2</td> <td>Claremont Crescent</td> <td>56.9</td> <td>51.3</td> <td>Not Significant</td> </tr> <tr> <td>R3</td> <td>Royal Canal Way</td> <td>58.9</td> <td>53.3</td> <td>Not Significant</td> </tr> <tr> <td>R4</td> <td>St Attracta Road</td> <td>34.8</td> <td>29.4</td> <td>Slight (Positive)</td> </tr> <tr> <td>R5</td> <td>Faussagh Ave and Barrow Road</td> <td>52.4</td> <td>47.1</td> <td>Moderate (Positive)</td> </tr> <tr> <td>R6</td> <td>Hamilton Gardens</td> <td>51.6</td> <td>46.2</td> <td>Slight (Positive)</td> </tr> <tr> <td>R7</td> <td>Homestead Court</td> <td>56.9</td> <td>51.5</td> <td>Slight (Positive)</td> </tr> <tr> <td>R8</td> <td>Marlborough Road</td> <td>52.5</td> <td>47.1</td> <td>Slight (Positive)</td> </tr> <tr> <td>R9</td> <td>McKee Barracks</td> <td>51.4</td> <td>46</td> <td>Slight (Positive)</td> </tr> <tr> <td>R10</td> <td>Park Lodge Apartments</td> <td>50.6</td> <td>45.2</td> <td>Moderate (Positive)</td> </tr> <tr> <td>R11</td> <td>Bridgewater Quay</td> <td>56.7</td> <td>51.3</td> <td>Slight (Positive)</td> </tr> <tr> <td>R12</td> <td>Riverpark Apartments</td> <td>54.7</td> <td>49.3</td> <td>Slight (Positive)</td> </tr> <tr> <td>R13</td> <td>Cavalry House</td> <td>52.9</td> <td>47.7</td> <td>Not Significant</td> </tr> <tr> <td>R14</td> <td>Clancy Quay (Brewery - 2 storey)</td> <td>56.6</td> <td>51.5</td> <td>Not Significant</td> </tr> </tbody> </table>	Receptor ID	Description	Do Something with Mitigation		Significance Rating	Daytime L _{Aeq,16hr}	Night-time L _{Aeq,8hr}	R1	Claremont Lawns	45.9	40.4	Slight (Positive)	R2	Claremont Crescent	56.9	51.3	Not Significant	R3	Royal Canal Way	58.9	53.3	Not Significant	R4	St Attracta Road	34.8	29.4	Slight (Positive)	R5	Faussagh Ave and Barrow Road	52.4	47.1	Moderate (Positive)	R6	Hamilton Gardens	51.6	46.2	Slight (Positive)	R7	Homestead Court	56.9	51.5	Slight (Positive)	R8	Marlborough Road	52.5	47.1	Slight (Positive)	R9	McKee Barracks	51.4	46	Slight (Positive)	R10	Park Lodge Apartments	50.6	45.2	Moderate (Positive)	R11	Bridgewater Quay	56.7	51.3	Slight (Positive)	R12	Riverpark Apartments	54.7	49.3	Slight (Positive)	R13	Cavalry House	52.9	47.7	Not Significant	R14	Clancy Quay (Brewery - 2 storey)	56.6	51.5	Not Significant
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EIAR Section Reference	Description of Mitigation and Monitoring Measures for Noise and Vibration				
	R15	Clancy Quay (Cooke Hall)	60.3	55.1	Slight
	R15a	Clancy Quay (Cooke Hall)	50.2	45	Moderate (Positive)
	R16	St John of God School, Islandbridge	37.8	32.7	Not Significant
	R17	Kilmainham Square (3rd floor)	65.4	60.3	Moderate
	R17a	Kilmainham Square (9th floor)	62.3	57.2	Not Significant
	R18	Dwellings along Inchicore Road	61.7	56.7	Not Significant
	R19	Dwellings of Sarsfield Road	62	57	Slight
	R20	Seven Oaks Apartments (4th Floor)	63.7	58.6	Significant
	R20a	Seven Oaks Apartments (6th Floor)	63.2	58.1	Moderate
	R21	16 - 72 Landen Road	54.9	49.8	Moderate (Positive)
	R22	139 – 179 Landen Road	57.2	52.1	Moderate (Positive)
	R23	183 – 315 Landen Road	61.9	56.8	Slight (Positive)
	R24	317 – 453 Landen Road	52.4	47.3	Slight (Positive)
	R25	317 – 453 Landen Road	53.6	48.5	Slight (Positive)
	R26	317 – 453 Landen Road	59	53.9	Slight (Positive)
	R27	317 – 453 Landen Road	57.5	52.4	Not Significant
	R28	Kylemore Drive	54.4	49.3	Moderate (Positive)
	R29	Le Fanu Drive	62.6	57.4	Moderate (Positive)
	R30	33 - 123 Cloverhill Road	56.9	51.8	Moderate (Positive)
	R31	1 – 27 Cherry Orchard Ave	58.2	53.1	Slight (Positive)
	R32	1 – 27 Cherry Orchard Ave	64.3	59.1	Moderate

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Noise and Vibration				
	R33	28 - 60 Cherry Orchard Ave	58.3	53.2	Slight (Positive)
	R34	44-47 Cherry Orchard Parade	56.6	51.5	Significant (Positive)
	R35	45-51 Cherry Orchard Crescent	56	50.8	Not Significant
	R36	New Development - Park West Road/Avenue	53.9	49	Significant (Positive)
	R36a	New Development - Park West Road/Avenue	66.4	61.4	Slight
	R36b	New Development - Park West Road/Avenue	55.7	50.8	Significant (Positive)
	R36c	New Development - Park West Road/Avenue	65.2	60.3	Slight (Positive)
	R37	Cherry Orchard Court	66.9	61.8	Slight (Positive)
	R38	45-48 Barnville Park	59.7	54.6	Slight (Positive)
	R39	Park West Ave (Hotel)	48.8	43.5	Moderate (Positive)
	R40	Park West Ave	51.6	46.5	Slight
	R41	Cooleven Close	62.5	57.4	Moderate (Positive)
	R42	Cappagh Ln (East)	52.4	47.2	Moderate (Positive)
	R43	Cappagh Ln (West)	54.6	49.5	Slight (Positive)
	R44	Lynch's Park 15-20	61	55.9	Not Significant
	R45	Kishoge Road	51.7	46.7	Significant (Positive)
	R46	55 - 75 Tullyhall Drive	65.7	60.7	Not Significant
	R47	Hansted Place	66.8	61.7	Not Significant
	R48	Adamstown Community College	67.6	62.6	Not Significant
	R49	Adamstown Ave/Adamstown Park	56.5	51.3	Slight

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Noise and Vibration																							
R50	Tubber Lane Road (North of Hillcrest Bridge)	47.9	42.8	Significant (Positive)																				
R51	Tubber Lane Road (South of Hillcrest Bridge)	55.3	50.2	Slight (Positive)																				
R51a	Tubber Lane Road (South of Hillcrest Bridge)	51.6	46.6	Significant (Positive)																				
R52	Loughlinstown Road	50.7	45.6	Significant (Positive)																				
R53	Intersection of Railway Cottages and Hazelhatch Road	65.3	60.3	Significant (Positive)																				
R54	Old Station Road	55.5	50.5	Moderate (Positive)																				
R55	27 - 30 Railway Cottages	63.5	58.5	Significant (Positive)																				
R56	27 - 30 Railway Cottages	62.6	57.6	Significant (Positive)																				
R57	Railway Cottages (Opposite Hazelhatch Car Park)	56.5	51.5	Not Significant																				
R58	Off Hazelhatch Road	51.4	46.6	Significant (Positive)																				
R59	Lord's Road	51.2	46	Significant (Positive)																				
<p>With the application of a structured approach to mitigation measures, the overall impact with respect to operational rail noise criteria during daytime periods is positive with the number of noise sensitive locations with predicted noise levels greater than the 55 dB $L_{Aeq,16hr}$ daytime criterion reducing. However, there is an increase in the overall number of noise sensitive locations with predicted noise level greater than the 45 dB $L_{Aeq,16hr}$ night-time criterion. Overall, the proposed Project with mitigation (Do Something with mitigation) results in a decrease in the median noise level of 0.4 dB during the daytime and 1.1 dB during night-time.</p> <p>Table 14-71: Predicted Noise Levels with Mitigation Measures – Noise Levels Greater than 55 dB $L_{Aeq,16hr}$ Daytime and 45 $L_{Aeq,8hr}$ Night-time</p> <table border="1"> <thead> <tr> <th rowspan="2">Receptor Description</th> <th colspan="3">$L_{Aeq,16hr}$ Daytime</th> <th colspan="3">$L_{Aeq,8hr}$ Night-time</th> </tr> <tr> <th>Do Minimum</th> <th>Do Something with Mitigation</th> <th>Change</th> <th>Do Minimum</th> <th>Do Something with Mitigation</th> <th>Change</th> </tr> </thead> <tbody> <tr> <td>All Receptor Types</td> <td>729</td> <td>648</td> <td>-81</td> <td>1332</td> <td>1416</td> <td>84</td> </tr> </tbody> </table>					Receptor Description	$L_{Aeq,16hr}$ Daytime			$L_{Aeq,8hr}$ Night-time			Do Minimum	Do Something with Mitigation	Change	Do Minimum	Do Something with Mitigation	Change	All Receptor Types	729	648	-81	1332	1416	84
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All Receptor Types	729	648	-81	1332	1416	84																		

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Noise and Vibration						
	Residential	675	592	-83	1252	1335	83
	Educational and Childcare Facilities	3	3	0	4	4	0
	Hotels and Accommodation	0	0	0	1	0	-1
	Healthcare	0	0	0	0	0	0
	Activities of Religious Organisations	0	0	0	0	0	0
	Other	51	53	2	75	77	2
	<p>The number of noise sensitive locations with predicted operational rail noise greater than the operational rail noise criteria must also be considered in the context of the existing baseline noise which is comprised of multiple noise sources. Of the 18 noise monitoring locations, four locations had noise levels less than 55 dB $L_{Aeq,16hr}$ during the daytime and these are located adjacent to the Phoenix Park Tunnel Branch Line section and at Hazelhatch. During night-time periods, one location had noise levels less than 45 dB $L_{Aeq,8hr}$ and this was located adjacent the Phoenix Park Tunnel Branch Line section. Although the predicted noise levels are above the operational noise criteria, the baseline measurements indicated that the pre-existing noise levels are general higher than the operational noise criteria and hence, rail noise may not be the dominant noise source at noise sensitive locations.</p> <p>PA Systems</p> <p>Iarnród Éireann have a standard procedure for the design of station services which include the design requirements for the PA systems. Section 5 of Iarnród Éireann Standard I-TEL-3930 Station Services – Design, Install and Commission requires that the normal output volume is an average of 10dB(A) above recorded background levels in the station. The design will ensure that PA announcements do not result in extraneous noise outside the station boundary.</p> <p>Maintenance Activities</p> <p>During the course of ongoing maintenance, the procedures outlined in Iarnród Éireann operation procedure CCE-QMS-008-002 Noise Management – CCE Activities will be implemented. This document outlines the following noise mitigation measures:</p> <ul style="list-style-type: none"> • The Community Liaison Officer (or other nominated person) will notify affected residents in advance of any planned works commencing with a letter drop in the relevant area; • Where planned work occurs over a 72hr weekend shutdown there will be a noise management plan submitted to the local authority; • All attempts to avoid, prevent or reduce the harmful effects of exposure to environmental noise arising from CCE work activities must be practical and appropriately risk assessed before implementation; • The following measures should be implemented where feasible during maintenance activities; • Carry out as much preparatory work in daylight as possible (sawing or drilling rails); 						


EIAR Section Reference	Description of Mitigation and Monitoring Measures for Noise and Vibration
	<ul style="list-style-type: none"> Inspect the worksite in daylight if possible and look for the best location to position generators; Position generators and lighting away from residential dwellings; Take advantage of natural barriers such as vegetation, walls or embankments that can offer noise screening to adjacent neighbours; Where necessary, use noise attenuation screens. The screens must be located as close to the receiver or source as possible; Consider using additional supply cables and structures so that the generators can be positioned as far away from housing as practicable; Where possible, use low-noise plant. Any unsuitable plant should be replaced by higher quality low noise plant, or contained by the use of mufflers/ silencers; Do not leave equipment or vehicles running/ idling unnecessarily; Do not shout work instructions when working in residential areas at night unless absolutely necessary; and Plan effectively to ensure timely deliveries of materials.
14.7.4	<p>Operation Phase Mitigation - Vibration</p> <p>There will be no significant vibration arising from the proposed Project in the operational phase and no mitigation measures are proposed.</p>
Monitoring	
14.8	<p>Due to the scale and nature of the activities arising from the proposed Project a comprehensive noise and vibration monitoring programme will be put in place.</p>
Construction Phase Monitoring	
14.8.1	<p>During the construction phase, a noise and vibration monitoring programme will be implemented by the appointed contractor to assess compliance of the construction works with the noise limits set out in section 14.3.3. The selection of monitoring locations (number and location) will be agreed with the relevant local authorities but will be based on the nearest representative noise sensitive locations to the working areas which will progress along the length of the proposed Project.</p> <p>Full details of the Contractor's provision for noise and vibration monitoring and procedures including provisions for publication of monitoring results will be submitted to and approved by the Planning Authority prior to commencement of work.</p> <p>The CEMP for the Project will detail channels of communication between the Contractor, Dublin County Council, South Dublin County Council and Kildare County Council/ IE and residents including a system for recording and investigating noise complaints relating to the construction operations.</p>
Operational Phase Monitoring	
14.8.2	<p>During the operations phase no specific noise monitoring is proposed but measures in future Noise Action Plans adopted by the Dublin County Council, South Dublin County Council and Kildare County Council are expected to include rail traffic noise monitoring.</p>

27.1.1.10. Landscape and Visual

The table below details the mitigation and monitoring measures identified in Chapter 15 Landscape and Visual.

Table 27.10: Mitigation and Monitoring Measures for Landscape and Visual

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Landscape and Visual
Mitigation Measures	
Construction Phase Mitigation	
15.6.2	<p>Measures in regard to existing trees and woody vegetation are set out for the purpose of minimising vegetation losses as follows:</p> <ul style="list-style-type: none"> All trees and woody vegetation to be retained within and adjoining the works area will be protected in accordance with the British Standard Institution (BSI) British Standard (BS) 5837:2012 'Trees in relation to in relation to design, demolition and construction - Recommendations' (BSI 2012). Works required within the root protection area (RPA) of existing trees to be retained will follow a project specific method statement for such works, which will be prepared by a professional qualified arborist; Wherever possible, trees and vegetation will be retained within the proposed Project. Trees and vegetation identified for removal will be removed in accordance with 'BS 3998:2010 Tree Work – Recommendations' (BSI 2010) and best arboricultural practices as detailed and monitored by a professional qualified arborist; and An arboricultural survey, impact assessment and tree constraints plan will be prepared and made available for the proposed Project in advance of construction. This will be fully updated at the end of the construction phase, with any recommendations for on-going monitoring of retained trees during the operational phase. <p>Where properties are subject to permanent and/or temporary acquisition (as listed in Chapter 17 Material Assets: Non-Agricultural Properties of this EIAR), an inventory of boundary details and accesses, planting, paving, and other features that may be disturbed or removed will be prepared prior to commencement of construction in order that these can be protected or replaced. Appropriate measures will be put in place to provide for protection of features, trees and vegetation to be retained, for continued access during construction, for adequate security and screening of construction works. All temporary acquisition areas will be fully decommissioned and reinstated at the end of the construction phase.</p> <p>In addition to the above measures, construction works will be managed by the preparation of a Construction Environmental Management Plan (CEMP) - refer to Volume 4, Appendix 5.1 of this EIAR. This provides the environmental management framework to be adhered during construction of the proposed Project.</p>
Operational Phase Mitigation	
15.6.3	<p>Operation Phase Mitigation</p> <p>Mitigation measures are proposed to avoid, reduce or remediate adverse landscape and visual effects of the operation phase of the proposed Project. These include measures which are an integral part of the proposed engineering design associated with DART+ South West along with proposed planting. The mitigation measures are listed below. Mitigation measures in the form of proposed planting is illustrated in drawings DP-04-23-DWG-EV-TTA-23838 through to DP-04-23-DWG-EV-TTA-23855 presented in Volume 4, Appendix 15.1 of this EIAR. These drawings also show the estimated wooded vegetation losses:</p> <ul style="list-style-type: none"> GRP Parapet extensions to existing bridge parapets will match that existing in terms of colour, materials and finish;

<p>EIAR Section Reference</p>	<p>Description of Mitigation and Monitoring Measures for Landscape and Visual</p>
	<ul style="list-style-type: none"> • Modifications to station structures, including parapets, will use materials similar to that existing in order to minimise visual change; • The railing and IP2X panel, introduced on top of existing retained masonry bridge parapets on the Phoenix Park Tunnel Branch Line will use parapet example 6² of the IP2X options illustrated below.  <p>Plate 15-1 Parapet Example 6</p> <ul style="list-style-type: none"> • Replacement bridge structures will be aesthetically finished to a high standard which will be informed by a Conservation Architect, particularly at sensitive locations including but not limited to Memorial Road Bridge and Glasnevin Cemetery Road Bridge. The structures will have regard for and be sympathetic to the existing landscape and visual amenity. The photomontage of Memorial Road Bridge from viewpoint 14 is indicative in this regard. Stone from the existing bridges will be reused where possible. At Memorial Road, the standard tree, removed at construction will be replaced; • Existing wooded vegetation at the boundaries of the electrical substations will be retained, where possible, to provide visual screening of these facilities. The grid connection to facilitate these substations will be routed to avoid wooded vegetation losses. Existing retained wooded vegetation will be protected as outlined above for construction; • A standard tree will be planted on either side of the northern approach to the Glasnevin Cemetery Road Bridge (OBO10). Climbers will be planted to screen the proposed boundary wall at the car park; • Replacement masonry walls will be finished using materials of a high design standard that will be sympathetic to the surrounding landscape and often featuring a stone finish. Where stone masonry walls need to be demolished, every effort will be made to reclaim the stone for repurposing elsewhere on the Project (i.e. stone masonry walls replaced with original stone);

² Parapet Example 6 presented in TTAJV Prelim Design Report – Parapets (Reference: DP-04-23-REP-ST-TTA-26904-v01-S3.PDR Parapets)

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Landscape and Visual
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- Areas in use as site compounds during construction will be restored and where feasible, the restoration will facilitate biodiversity measures;
- Existing wooded vegetation will be retained as far as is feasible. Proposed planting will be introduced to mitigate adverse landscape and visual effects where feasible and having regard for engineering and safety requirements. These measures are presented in DP-04-23-DWG-EV-TTA-23838 - DP-04-23-DWG-EV-TTA-23855 in Volume 4, Appendix 15.1 of this EIAR;
- Proposed planting will feature native species in order to match that existing in the landscape or alternatively match species lost, for example, street tree planting in urban areas;
- Proposals for the treatment of the public realm within the streetscape affected by the proposed Project will have regard to the existing character of the street or location, to emerging policies, objectives and proposals for the public realm and to opportunities for enhancement of the public realm and the streetscape. Proposals will have regard to historic details and features, to the quality of existing and proposed materials, to the reduction of clutter, ease of legibility, and management and maintenance requirements;
- The two public open spaces on the northern side of Le Fanu Road Bridge (OBC7), formerly in use as construction compounds, will be restored. Planting will be introduced to screen project components. The larger open space on the north east side may be the subject of a redesign. Concept plans indicating the possible approach to the redesign of these open spaces is presented below and incorporates the necessary mitigation.

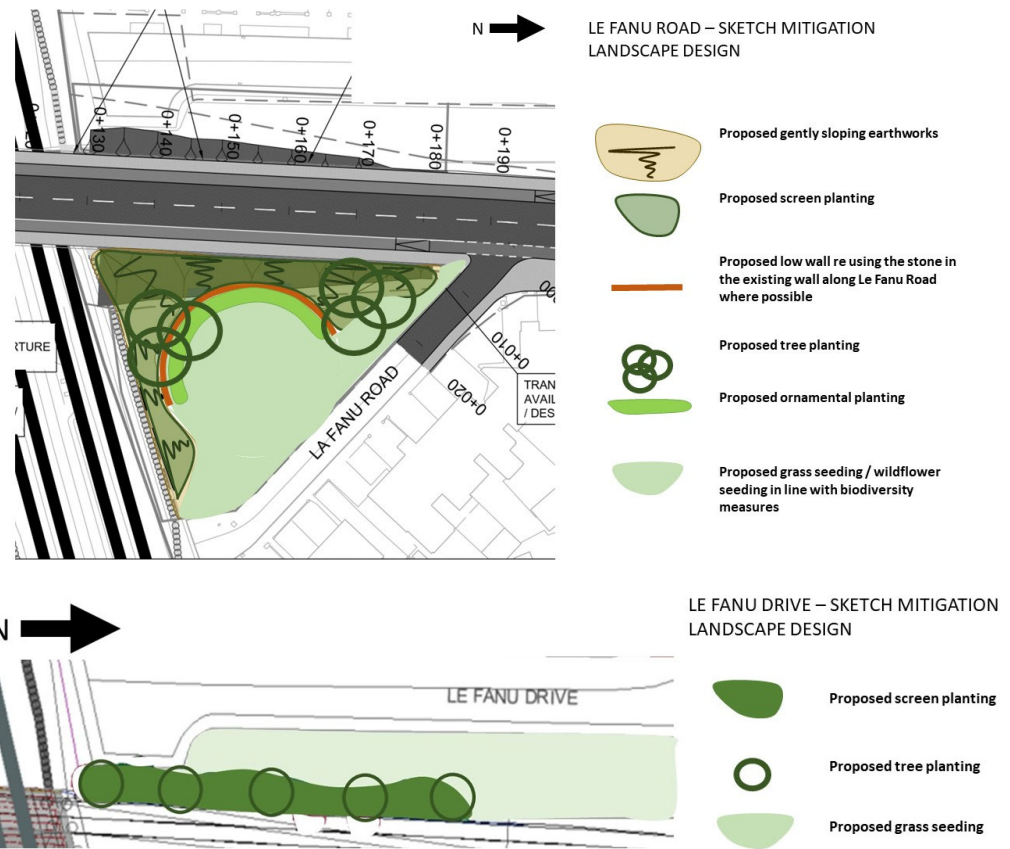


Figure 15-11 Le Fanu Drive Mitigation Landscape Design.

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Landscape and Visual
	<ul style="list-style-type: none"> Restoration of footpath and public open space at Kylemore Road Bridge (OBC5A) including replacement planting will be implemented; The pedestrian access to the Khyber Pass Footbridge (OBC5) will be refurbished; The boundary wall along the Chapelizod Bypass and Con Colbert Road will be faced in stone in order to present one uniform stone façade. The wall will have containerised planting featuring climbers which, over time, will grow down along the wall on the railway side and upwards along the boundary fence on top of the wall. The streetscape will be refurbished following use as site compound during construction; A green roof will be installed on the proposed cut and cover structure at South Circular Road Bridge (OBC1A); The entry and exit gates to the Islandbridge/ Heuston Substation on St John's Road will be designed to a high standard aesthetically in order to fit with the surrounding area; The supporting posts for the OHLE will be located at either end of Liffey Bridge (UBO1) near the bank of the River Liffey to minimise intrusion upon river views from the surrounding area; Effort will be made to retain existing wooded vegetation at and along noise barrier locations. The selection of final materials and finishes for proposed noise barriers will be carried out at detailed design stage. Where possible, noise barriers in rural areas will have a timber finish; and Landscape mitigation will have regard to the recommendations of Chapter 8 Biodiversity.
Monitoring	
15.7	Monitoring of implemented specific landscape mitigation measures shall be carried out and informed by good practice guidance. The monitoring is required to ensure that the proposed mitigation measures become well established and aid the integration of new elements associated with the proposed Project into the surrounding landscape and mitigate visual effects at residential properties.

27.1.1.11. Material Assets - Agricultural

The table below details the mitigation and monitoring measures identified in Chapter 16 Material Assets - Agricultural Properties.

Table 27.11: Mitigation and Monitoring Measures for Material Assets - Agricultural Properties

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Material Assets- Agricultural
Mitigation Measures	
Construction Phase Mitigation	
16.6.1.1	<p>Temporary land-take</p> <ul style="list-style-type: none"> A landowner liaison officer will be identified by the appointed contractor in the Construction Environmental Management Plan (CEMP). This liaison officer will coordinate landowner engagement to ensure matters are agreed and addressed in a timely manner and any landuse conflicts can be resolved;

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Material Assets- Agricultural
	<ul style="list-style-type: none"> • Prior to works commencing each landowner will be met by a member of the project team to inform of the expected start date on their lands, duration of works and to agree on specific issues of access, presence of livestock etc. pertaining to the proposed Project; • Following the completion of relevant construction works, lands temporarily acquired will be reinstated to existing agricultural condition. All materials and waste will be removed and disposed of appropriately.
16.6.1.2	<p>Construction Noise</p> <p>The appointed Landowner Liaison Officer will maintain an open channel for communication between the appointed contractor and adjacent landowners during the construction phase, especially when excessively loud activities are programmed, in order to prevent undue disturbance to farm animals due to noise. It will also facilitate farm enterprises so that livestock can be moved away from the construction work during critical times.</p>
16.6.1.3	<p>Dust</p> <p>Measures to control the production of dust will be put in place by the contractor (refer to Chapter 12 Air Quality) which presents a series of measures to control dust. Good communication between the contractor and the farmers in the proximity of construction activities will facilitate on-going farm enterprises so that livestock may be kept as far as possible from the construction work during critical times.</p>
16.6.1.4	<p>Restricted Access to Land</p> <p>Access will be restored, as soon as possible, to lands where it is removed or restricted for the construction of the proposed Project. Temporary or replacement access will be at a suitable location and, where possible, with the agreement of the landowner. An open channel for communication between individual farmers and the contractor will minimise difficulties caused by the restriction of access to land. Temporary fencing will be erected as required to delineate the site boundary and to minimise disturbance to adjacent lands. Temporary access gates may be required until such time as permanent access arrangements are in place.</p>
16.6.1.5	<p>Disturbance of Field Drainage</p> <p>In cases where drainage is impeded during construction and causes obvious difficulty to a particular landowner, temporary measures will be considered on a site-specific basis. This may include allowing waters to drain to less critical areas, so as to minimise the impact.</p>
16.6.1.6	<p>Disturbance of Services</p> <p>Where required, an alternative source of water/electricity will be provided to ensure that disruption to farming is minimised during the construction phase.</p>
16.6.1.7	<p>Disease or Pest Mitigation</p> <ul style="list-style-type: none"> • All machinery coming from outside of the State will be cleaned and disinfected on entry to the country; • All machines will be sprayed with appropriate disinfectant prior to arrival on site. The Contractor will verify to the Project Liaison Officer (PLO) that this has been done; • The PLO will liaise with the local District Veterinary Office (DVO) to establish the location of any restricted herds along the route of the proposed Project. The liaison will continue on a regular basis throughout the construction and reinstatement

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Material Assets- Agricultural
	<p>periods. Where any landholder becomes aware that his/her herd has become infected, it is his/her responsibility to inform the PLO as a matter of urgency;</p> <ul style="list-style-type: none"> Where the PLO has been informed of a restricted herd along the route, it will require the Contractor to disinfect machinery and personnel before leaving the land concerned. The number of accesses across the working strip will be reduced to one in the case of lands having restricted herd status. The Contractor will arrange for disinfectant mats/baths to be replenished with disinfectants, as required; and In the event of an outbreak of a Notifiable Disease, the proposed project will be subject to such operational restrictions as are imposed by Department of Agriculture Food and the Marine (DAFM).
Operational Phase Mitigation	
16.6.2	There are no likely significance effects on agricultural properties or practices as a result of the proposed Project and therefore no operational mitigation measures are required.
Monitoring	
16.7	No monitoring measures are proposed.

27.1.1.12. Material Assets - Non-Agricultural Properties

The table below details the mitigation and monitoring measures identified in Chapter 17 Material Assets – Non-Agricultural Properties.

Table 27.12: Mitigation and Monitoring Measures for Material Assets - Non-Agricultural Properties

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Material Assets - Non-Agricultural Properties
Mitigation Measures	
Construction Phase Mitigation	
17.7.1.1	<p>Temporary Land-take</p> <p>Following the completion of relevant construction works, lands temporarily acquired will be reinstated and returned to the owner.</p>
17.7.1.2	<p>Access to Property</p> <p>Access will be maintained to all affected property as much as possible and if interruption is necessary, it will be pre-notified to the property owner/ occupant and it will be restored without unreasonable delay. Traffic management measures will be put in place during construction where temporary or minor diversions are required. These measures are detailed within Volume 2, Chapter 6 Traffic and Transportation of this EIAR.</p>

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Material Assets - Non-Agricultural Properties
17.7.1.3	<p>Noise and Vibration</p> <p>Timing of works and noise and vibration limit values are amongst the main measures to mitigate noise impacts on sensitive receptors. These measures are detailed within Volume 2, Chapter 14 Noise and Vibration of this EIAR.</p> <p>Prior to construction and subject to written agreement with the relevant property owners, property condition surveys will be undertaken in relation to all buildings/structures located within 50m of the extents of the land-take boundary. Effectively and timely communication between the contractor and property owners during the construction phase will reduce undue disturbance due to noise.</p>
17.7.1.4	<p>Dust</p> <p>Dust suppression measures to mitigate generation and spread of dust are detailed within in Volume 2, Chapter 12 Air Quality of this EIAR. Effectively and timely between the contractor and property owners during the construction phase will reduce undue disturbance due to dust.</p>
17.7.1.5	<p>Disturbance of Field Drainage</p> <p>In cases where drainage is impeded during construction and causes obvious difficulty to a particular property owner, temporary measures will be considered on a site-specific basis. This may include allowing waters to drain to less critical areas, so as to minimise the impact.</p>
17.7.1.6	<p>Disturbance of Utility Services</p> <p>Where required, an alternative source of water/ electricity will be provided to ensure that disruption is minimised during the construction phase. Further measures relating to utilities are detailed within Volume 2, Chapter 18 Utilities of this EIAR.</p>
17.7.1.7	<p>Soil Nailing</p> <ul style="list-style-type: none"> • A Property Protection Scheme will be established for the proposed Project. As part of the scheme a pre-construction structural and condition survey will be carried out on impacted properties prior to any construction works. A post condition survey will also be carried out after works are completed. This initial survey will be a benchmark against which any deterioration in a property can be measured; and • Where soil nailing/ anchors will extend below trees in residential properties, a tree survey will be carried out within those properties prior to construction works to establish the current condition and health of the trees to ensure that they can be preserved and will not be impacted by the works.
Operational Phase Mitigation	
17.7.2	<ul style="list-style-type: none"> • Where part of the curtilage of the property is to be permanently acquired, the acquiring authority will hold discussions with the property owner and generally agree to replace boundaries on a like-for-like basis where possible, subject to safety considerations. Permanent boundary treatment will consist of a boundary that is comprised of one of the following: <ul style="list-style-type: none"> ○ Replacement boundary on a like-for-like basis; ○ Concrete post and wire; ○ Timber post and wire; ○ 2.4 m Security Purpose (SP) palisade fencing; ○ Open mesh steel pane for general purposes; and

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Material Assets - Non-Agricultural Properties
	<ul style="list-style-type: none"> ○ Acoustic barriers. • Any utility services that are interfered with as a result of the proposed Project will be repaired/replaced without unreasonable delay; and • The new drainage system will be designed to ensure that there will be no increased risk of flooding as a consequence of the proposed Project.
17.7.2.1	<p>Soil Nailing</p> <p>Iarnród Éireann will prepare a guidance note for property owners regarding any future planning for proposed extensions or changes to a property with substratum works after any substratum soil anchors are installed to ensure any 3rd party construction does not adversely impact on the soil anchors or the retaining wall they support and to ensure clear and timely communication between the parties can be achieved.</p>
Monitoring	
17.8	No specific monitoring is required.

27.1.1.13. Material Assets: Utilities

The table below details the mitigation and monitoring measures identified in Chapter 18 Material Assets: Utilities.

Table 27.13: Mitigation and Monitoring Measures for Material Assets: Utilities

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Material Assets: Utilities
Mitigation Measures	
Construction Phase Mitigation	
18.6.1	<p>A Construction & Environmental Management Plan (CEMP) has been prepared and is included in Volume 4, Appendix 5.1 of this EIAR. The CEMP will be updated by the successful Main Contractor. The CEMP will set out the Contractor’s overall management and administration of the construction project. It will be prepared by the Contractor during the pre-construction phase. The mitigation measures will be implemented by the appointed Main Contractor(s). These include the best practice measures as outlined below:</p> <ul style="list-style-type: none"> • Agreements have been put in place with various utility providers in order to maintain connections, or at least minimise downtimes, to public and private entities during the construction of the Project. These agreements include the provision of temporary diversions which will enable providers to reroute their service during non-peak periods to maintain connections to customers; • All existing services will be located by the appointed contractor and confirmed with relevant utility providers using service records, GPR surveys and slit trenches to ensure that their position is accurately identified before excavation works commence; • Where works are required in and around known utility infrastructure, precautions will be implemented by the appointed contractor to protect the infrastructure from damage, in accordance with best practice methodologies in line with the requirements of the utility companies whose assets are present in the area, where practicable; • Where diversions, or modifications, are required to utility infrastructure, service interruptions and disturbance to the surrounding residential, commercial and/or community property may be unavoidable. Where this is the case, it will be planned in advance by the appointed contractor. Required service interruptions will generally not be continuous for full days at a time. Prior to works commencing, advance notification will be given to all impacted properties (including vulnerable customers). This notification will include information on when interruptions and works are scheduled to occur and the duration of such interruption. Any required works will be carefully planned by the appointed contractor to ensure that the duration of interruptions is minimised in so far as is practicable; • Safety procedures will be put in place to minimise the risk to utility provider personnel and the general public during works on services. Protection measures during construction will include warning signs and markings indicating the location of utility infrastructure, safe digging techniques in the vicinity of known utilities, and in certain circumstances where possible, isolation of the section of infrastructure during works in the immediate vicinity; • Traffic management plans will be implemented to minimise the effect of utility diversion works for commuters; and • Collaboration with each utility provider will ensure safe practice when working on services and will minimise the time required for such works.

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Material Assets: Utilities
Operational Phase Mitigation	
18.6.2	<ul style="list-style-type: none"> Substations providing power to the OHLE will need to be maintained to ensure the new DART line remains operational. The substations will be required to have unimpeded vehicular access 24 hours per day from the public road network for maintenance staff from both Iarnród Éireann and ESB Networks; The substation must be located at ground level in order to facilitate the installation or replacement of heavy electrical equipment; the immediate area around the substation should be level; Any major utility infrastructure implemented in the reconfiguration of utilities to enable the Project will require periodical maintenance, such as foul pumping stations; and Any overhead assets (such as electrical cables) relocated underground for the Project will require different procedures by the utility provider in order to be maintained. Collaboration with each utility provider will ensure their maintenance requirements have been considered and that the appropriate wayleaves have been put in place.
Monitoring	
18.7	Electrical substations' output will be monitored during operation of the Project.

27.1.1.14. Material Assets: Waste Management

The table below details the mitigation and monitoring measures identified in Chapter 19 Material Assets: Waste Management.

Table 27.14: Mitigation and Monitoring Measures for Material Assets: Waste Management

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Material Assets: Waste Management
Mitigation Measures	
Construction Phase Mitigation	
19.6.1.1	<p>Resource Use</p> <ul style="list-style-type: none"> The Principal Contractor(s) will be responsible for sourcing materials for the construction of the proposed Project. These materials must comply with specific quality requirements; Iarnród Éireann will pursue procurement of the highest recycled steel content that is available for the particular steel usage. This may vary depending on engineering constraints; All aggregates required shall be secondary aggregates and virgin aggregates shall only be employed where secondary aggregates do not fulfil structural requirements and/ or are unavailable; Iarnród Éireann will support the use of local suppliers and re-use of materials on site to minimise the environmental impact, cost of transport and support the local economy and local communities in line with the proximity principle; Where possible materials will be re-used/recycled to reduce the need for procurement of new materials. In accordance with the IÉ Sustainability Strategy 2021 - 2030, 25% of raw material purchases will come from recycled sources;

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Material Assets: Waste Management
	<ul style="list-style-type: none"> The above actions alongside those committed to in the IÉ Sustainability Strategy 2021 – 2030 shall be implemented as part of the proposed Project mitigation; and Throughout the design and construction of the proposed Project, solutions will be sought to minimise the consumption of materials and the generation of waste throughout the lifecycle of the proposed Project. The DMRB LA110 guidance (2019) will be implemented throughout the detailed design and construction of the proposed Project.
19.6.1.2	<p>Waste Management</p> <p>A Construction Environmental Management Plan (CEMP) has been prepared as part of the Railway Order application – see Volume 4, Appendix 5.1. This document includes the migration from the EIAR including the specific mitigation applying to resource and waste management. Once appointed, the Contractor will take responsibility for the CEMP and delivery of the mitigation and management measures on the ground. The CEMP has had regard to the Best Practice Guidelines for the Preparation of Resources & Waste Management Plans for Construction and Demolition Projects (EPA, 2021). The contractor will be obliged to implement and maintain the measures and actions contained within in the EIAR during the construction phase.</p> <p>General Overarching Measures</p> <ul style="list-style-type: none"> The Contractor will develop and implement a Construction Waste Management Plan (CWMP) and a Construction Demolition Waste Management Plan (CDWMP) to ensure that waste arising on-site during the construction and demolition phase of the DART+ South West Project will be managed and disposed of in a way that ensures the provisions of the Waste Management Acts, 1996-2011 and associated Regulations (1996-2011) are complied with, to ensure that optimum levels of reduction, re-use and recycling are achieved, and with a goal of achieving the waste hierarchy in accordance with the relevant statutory provisions. This waste hierarchy is echoed in the EPA’s best practice guidelines for RWMPs; A demolition plan must be prepared by the Contractor in advance for each building and structure to be demolished; Waste hierarchy principles, i.e., prevention, preparing for re-use, recycling, recovery, disposal, will be implemented at all stages of the Project. These principles are essential in creating a sustainable circular economy. The starting point for all activities will be to prevent the creation of a waste material. It is important to attempt to prevent a waste material being created before searching for an appropriate place to dispose of it. This is in keeping with the circular economy approach; A Waste Management Co-ordinator (WMC) will be nominated who will have overall responsibility for the implementation of all waste processes. In conjunction with this, a clear responsibility structure will be introduced in the Project team to ensure difficulties encountered are raised at an appropriate level and acted upon. This is essential in ensuring that all waste is properly dealt with and not looked over accidentally in the mindset that another member of staff will undertake the necessary procedure. Everyone must be aware of their personal role and implement it appropriately; Any waste arising from the construction, operation, maintenance, and decommissioning phases of the Project will be deposited at an appropriate facility (as listed in Table 19.10) in accordance with the current national waste policy. This is necessary so that all waste is disposed of to the best possible facility type to adhere to the circular economy and resource opportunity strategies; In order to establish the appropriate reuse, recovery and/or disposal route for the surplus soils and stones to be removed off-site, it will first need to be classified. The material will initially need to be classified as hazardous or non-hazardous in

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Material Assets: Waste Management
	<p>accordance with the EPA publication Waste Classification – List of Waste & Determining if Waste is Hazardous or Non-Hazardous. Environmental soil analysis will be carried out on a number of representative soil samples for a range of parameters to allow the soil to be accurately classified as hazardous or non-hazardous. In addition, soil analysis will also be carried out in accordance with the requirements for acceptance of waste at landfills (Council Decision 2003/33/EC Waste Acceptance Criteria). This legislation sets limit values for acceptance of waste at landfills based on properties of the waste including potential pollutant concentrations and leachability;</p> <ul style="list-style-type: none"> • If any unforeseen waste or hazardous material is encountered during the Project, the EPA will be notified, and the material will be deposited at an appropriate waste facility. There is a possibility that unforeseen or hazardous material is encountered during excavation works. It is important that if such a case arises, the material is managed appropriately; • Records will be kept on the quantity, nature/type and quality of all waste leaving the site. Record keeping is important for coherency, future planning and the justification and accountability of past actions; and • Attempts will be made to reuse soil and stone material arising from excavation works on site as noise bunds, visual screens, etc. Ballast will be reused where possible. Reusing excavated material on-site will reduce the quantity of material needing to be removed off-site. This will also reduce truck movements. It is intended that concrete waste will be dealt with using an Article 28 notification (End-of-Waste). These notifications will allow the concrete waste to be fully recovered. <p>Measures to be implemented on site</p> <ul style="list-style-type: none"> • Source segregation: Source separating wastes into dry mixed recyclables, biodegradable, and residual wastes. Clear labelling of waste bins, containers, skip containers and storage areas, including waste stream colour coding and photographs as appropriate; • Waste auditing: good record keeping systems will be implemented. A recording system will be put in place and maintained by the Contractor to record the waste arising's including quantities (tonnes) and type of waste and materials leaving the site, either for reuse on another site, recycling, or disposal. The name, address and authorisation details of all facilities and locations to which waste and materials are delivered will be recorded along with the quantity of waste in tonnes delivered to each facility. Records will show material, which is recovered, and which is disposed; • Appropriate storage: Waste fuels/oils will be generated from equipment used on-site during construction and will be classified as hazardous waste. Paints, sealants, and hazardous chemicals etc. will be stored in secure, bunded locations. All hazardous waste will be separately stored and labelled, in appropriate lockable containers, prior to removal from site by an appropriately permitted waste collection service provider; • Efficient removal: Waste generated on site will be removed as soon as practicable following generation for delivery to an authorised waste facility; • Further efforts will be made to re-use soil and stone material arising from excavation works on site to further reduce the quantity of material needing to be removed off-site; • Exported materials, particularly soils, will be carefully managed to restrict the spread of Invasive Alien Plant Species (IAPS) (see Chapter 8 Biodiversity for further information on the management of IAPS); • Concrete waste will be dealt with using an Article 28 notification. These notifications will allow the concrete waste to be fully recovered into new product; and • As noted under section 19.2.1, by-product notifications (under Article 27 of the European Communities (Waste Directive) Regulations 2011 (S.I. 126 of 2011))

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Material Assets: Waste Management
	<p>provide an opportunity for reuse of surplus clean soil & stone material arising from construction activity. At time of construction, options for Article 27 by-product status will be reviewed, subject to waste management and planning requirements being fully met. Such opportunities offer potential to further reduce indirect effects of waste management resulting from the transport of materials from site, notably traffic, noise, and air emissions from transport related haulage.</p>
Operational Phase Mitigation	
19.6.2.1	<p>Resources</p> <p>Iarnród Éireann will support the use of local suppliers and re-use of materials on site to minimise the environmental impact, cost of transport and support the local economy and local communities throughout the operational phase of the project in line with the proximity principle. This will include strategies for re-use and recycling to reduce the need for procurement of unnecessary new materials.</p>
19.6.2.2	<p>Waste Management</p> <ul style="list-style-type: none"> Waste hierarchy principles will be implemented to operational contracts and activities to ensure that the circular economy approach is fully supported. Prevention, preparing for re-use, recycling and recovery will be enforced with appropriate licensed waste management facilities chosen to accept waste which could not otherwise be diverted; and The contaminated sediment collected in the attenuation ponds will contain hazardous chemicals. Therefore, it must be disposed of accordingly. Sediment and plant waste is likely to require pre-treatment prior to disposal. This can take place either as the material is extracted or at the landfill site itself.
Monitoring	
Construction Phase Monitoring	
19.7.1	<ul style="list-style-type: none"> Records shall be kept of all truck movements relating to the removal of site clearance vegetation, topsoil, and construction soil. The records shall include quantity, nature/type and quality of the material, and the excavation and disposal locations; Records shall be kept on the quantity, nature/type and quality of all waste leaving the construction site including individual waste and typical construction site waste; and Segregation of construction site waste shall be carefully monitored with waste audits taking place at regular intervals. An audit schedule shall be included in the CWMP prepared by the appointed Contractor.
Operational Phase Monitoring	
19.7.2	No operational phase monitoring is proposed.

27.1.1.15. Archaeology and Cultural Heritage

The table below details the mitigation and monitoring measures identified in Chapter 20 Archaeology and Cultural Heritage.

Table 27.15: Mitigation and Monitoring Measures for Archaeology and Cultural Heritage

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Archaeology and Cultural Heritage
Mitigation Measures	
20.6.1.2	<p>Zone A: Hazelhatch & Celbridge Station to Park West & Cherry Orchard Station</p> <p>Full time archaeological monitoring under licence (as defined in section 20.6.1.6 below) will take place during the earthmoving works located with the seven areas of archaeological potential (AAP1–AAP8).</p>
20.6.1.3	<p>Zone B: Park West & Cherry Orchard Station to Heuston Station</p> <p>Full time licenced archaeological monitoring will take place during earthmoving works located in AAP9 and AAP10 where there is a general archaeological potential.</p> <p>At AAP11 full time archaeological monitoring will take place, at the preconstruction and early stages of construction, where any preparatory groundbreaking or ground reduction works are required from the westernmost end of Islandbridge to Heuston Station (i.e., from War Memorial Park to Kilmainham which includes the area of the burial (DU018-302) on St Johns Road). The potential in this area relate to burials and stray finds, advanced test excavation within an existing rail corridor track or through the embankment could easily miss archaeological remains such as individual burials and stray finds at depth. Accordingly, site preparation and preliminary construction-related excavation works will be archaeologically monitored to establish if any archaeological remains exist at the site. This will include the monitoring of all removal of topsoil, together with ground reduction of the embankment of made ground to the level of natural soil, the topsoil should be moved using a toothless grading bucket to enable the archaeologist to identify if any human remains are present. The archaeologist will have provision to inspect all excavation to natural soil level, to temporarily halt the excavation work, if and as necessary, and to be given provision to ensure the temporary protection of any features of archaeological importance identified. Once identified the archaeologist will be afforded sufficient time to record and remove any such features identified and if necessary, under advice from an osteoarchaeologist.</p>
20.6.1.4	<p>Zone C: Heuston Yard & Station (incorporating New Heuston West Station)</p> <p>In a similar manner to AAP11, full time licenced archaeological monitoring of all earthmoving works (track lowering, drainage, roadworks etc.) will be carried out in AAP12 at Heuston Yard and Station.</p>
20.6.1.5	<p>Zone D: Liffey Bridge to Glasnevin Junction (Phoenix Park Tunnel Branch Line)</p> <p>Intermittent archaeological monitoring of earthmoving works within the tunnel (AAP13 and AAP14) is suggested to establish the nature and depth of the original construction works to provide a record of the past.</p>
20.6.1.6	<p>Archaeological Monitoring requirements</p> <p>During the construction phase all mitigation measures will be undertaken in compliance with national policy guidelines and statutory provisions for the protection of the archaeological heritage. All methodologies will have to be agreed in advance with the National Monuments Section of the Department of Housing, Local Government and Heritage (DHLGH).</p> <p>Archaeological mitigation measures can avoid, prevent, reduce or offset negative effects and these are achieved by preservation in-situ, by design and/ or by record.</p>

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Archaeology and Cultural Heritage
	<p>Archaeological monitoring will be undertaken in order to establish the presence or absence, as well as the nature and extent, of any archaeological deposits, features or sites that may be present within the land-take of the Project. If archaeological features are identified, provision (time and funding) should be made for the full recording and, if necessary, excavation of the archaeological material in compliance with any measures that the DHLGH and the relevant local authority deem appropriate.</p> <p>All construction work such as the clearance of land, new drainage track storage, the widening of culverts, the placement of maintenance tracks and topsoil stripping within the permanent and temporary land-take should be monitored. All other activities such as drainage, landscaping, access and maintenance roads and the provision of services and placement of compounds associated with the improvement of the railway will also have to be monitored by a licensed archaeologist.</p> <p>Monitoring includes all groundwork associated with the development including the placement of construction compounds, access and maintenance roads, landscaping, drainage and topsoil stripping within the permanent and temporary land-take to ensure that no features are damaged or removed without proper recording.</p> <p>Archaeological monitoring -will be carried out under licence to the Department of Housing, Local Government and Heritage (DHLGH) and the NMI, and will ensure the full recognition of, and the proper excavation and recording of, all archaeological soils, features, finds and deposits which may be disturbed below the ground surface.</p> <p>The licensed archaeologist will have provision to inspect all excavation to the formation level for the proposed works and to temporarily halt the excavation work, if and as necessary. They will be given provision to ensure the temporary protection of any features of archaeological importance identified. The archaeologist will be afforded sufficient time and resources to record and remove any such features identified.</p> <p>Archaeological excavation ensures that the removal of any archaeological soils, features, finds and deposits is systematically and accurately recorded, drawn and photographed, providing a paper and digital archive and adding to the archaeological knowledge of a specified area (i.e. preservation by record). As archaeological excavation involves the removal of the archaeological soils, features, finds and deposits, following this mitigation measure there is no further impact on the archaeological heritage.</p> <p>Iarnród Éireann will make provision to allow for, and to fund, the necessary archaeological monitoring, inspection and excavation works that will be needed on-site during and prior to construction, either directly or indirectly via the appointed contractor.</p>
Monitoring	
20.7	A suitably qualified archaeologist will monitor in the areas outlined above to ensure that all archaeological heritage remains are identified and recorded.

27.1.1.16. Architectural Heritage

The table below details the mitigation and monitoring measures identified in Chapter 21 Architectural Heritage.

Table 27.16: Mitigation and Monitoring Measures for Architectural Heritage

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Architectural Heritage								
Mitigation Measures									
Construction Phase Mitigation									
21.6.1	<p>Considering the geographical extent of the proposed works and the nature of work that is proposed the predicted impact on architectural heritage is relatively small. In many cases there is little or no scope for mitigation. The principal impacts are the erection of the OHLE, the raising of the parapets on historic bridges and the demolition of the masonry-arched bridge at Le Fanu Road and the dismantling, storing and reconstruction of the signal box at the Inchicore works in an alternative location.</p> <p>The requirements for OHLE are not flexible and there is no practical way of mitigating the impact; different arrangements of OHLE were considered at design stage as part of the optioneering process and the system now proposed was the arrangement adopted. Similarly, the raising of parapets is a safety requirement by providing suitable protection for the general public to prevent accidental contact with the OHLE, including with the aid of a stick or other long object. While demolition of masonry arch bridges can sometimes be avoided by actions such as lowering the track, in the case of Le Fanu Road Bridge (OBC7) the demolition and reconstruction is required in order to provide for four-tracking and the space available has insufficient horizontal clearance to accommodate 2 No. additional tracks within the corridor while using the existing arch. Similarly, the necessary additional width to add a new line of track at Inchicore can only be obtained by demolishing the signal box. As a result of design development, a track alignment solution was identified which enables the Turret structure to be retained on the opposite side of the track.</p> <p>In some cases a certain amount of mitigation can be achieved through design, such as the selection of an appropriate means of raising bridge parapets, while the recording of structures that are to be demolished, while not preserving the structures, can ensure that knowledge of their existence and character is preserved for the future.</p> <p>As per Chapter 5 Construction Strategy, a Conservation Architect will be appointed for the proposed Project to oversee and advise on works in proximity to heritage assets.</p> <p>Condition Surveys will be carried out for engineering, property and conservation purposes; these will include structural surveys prior to works with high levels of vibration and/or in proximity to features of conservation.</p>								
21.6.1.1	<p>Zone A</p> <p>The proposed mitigation and impact assessment (following implementation of mitigation) is outlined in Table 21.24.</p> <p>Table 21.24: Mitigation and Impact (following Mitigation) in Zone A</p> <table border="1" data-bbox="363 1693 1382 1886"> <thead> <tr> <th data-bbox="363 1693 488 1805">BH-no.</th> <th data-bbox="488 1693 657 1805">Location</th> <th data-bbox="657 1693 979 1805">Mitigation</th> <th data-bbox="979 1693 1382 1805">Impact (following Mitigation)</th> </tr> </thead> <tbody> <tr> <td data-bbox="363 1805 488 1886">BH-1</td> <td data-bbox="488 1805 657 1886">GSRW railway</td> <td data-bbox="657 1805 979 1886">No potential for mitigation</td> <td data-bbox="979 1805 1382 1886">The impact following mitigation will be moderate</td> </tr> </tbody> </table>	BH-no.	Location	Mitigation	Impact (following Mitigation)	BH-1	GSRW railway	No potential for mitigation	The impact following mitigation will be moderate
BH-no.	Location	Mitigation	Impact (following Mitigation)						
BH-1	GSRW railway	No potential for mitigation	The impact following mitigation will be moderate						

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Architectural Heritage																							
21.6.1.2	<p>Zone B</p> <p>The proposed mitigation and impact assessment (following implementation of mitigation) is outlined in Table 21.25.</p> <p>Table 21.25: Mitigation and Impact (following Mitigation) in Zone B</p> <table border="1" data-bbox="363 445 1442 1906"> <thead> <tr> <th data-bbox="363 445 541 510">BH-no.</th> <th data-bbox="541 445 722 510">Location</th> <th data-bbox="722 445 1031 510">Mitigation</th> <th data-bbox="1031 445 1442 510">Impact (following mitigation)</th> </tr> </thead> <tbody> <tr> <td data-bbox="363 510 541 775">BH-18</td> <td data-bbox="541 510 722 775">Le Fanu Road Bridge (OBC7)</td> <td data-bbox="722 510 1031 775">The bridge should be recorded by means of photographs, written description and measured drawings to English Heritage Level 3.</td> <td data-bbox="1031 510 1442 775">The impact following mitigation will be very significant.</td> </tr> <tr> <td data-bbox="363 775 541 1229">BH-33</td> <td data-bbox="541 775 722 1229">Signal box at Inchicore Works</td> <td data-bbox="722 775 1031 1229">The potential for reconstruction of the signal box on an alternative site as a museum piece should be explored and the signal box should be recorded by means of photographs, written description and measured drawings to English Heritage Level 3.</td> <td data-bbox="1031 775 1442 1229">The impact following mitigation will be profound.</td> </tr> <tr> <td data-bbox="363 1229 541 1458">BH-36</td> <td data-bbox="541 1229 722 1458">Extension to maintenance shed and shunting hut, Inchicore works</td> <td data-bbox="722 1229 1031 1458">The structures should be recorded by means of photographs and written description prior to their removal.</td> <td data-bbox="1031 1229 1442 1458">The impact following mitigation will not be significant.</td> </tr> <tr> <td data-bbox="363 1458 541 1906">BH-37</td> <td data-bbox="541 1458 722 1906">Wall at Inchicore works</td> <td data-bbox="722 1458 1031 1906">The section of the wall that is to be removed is to be recorded by means of photographs and written description prior to removal and the resulting new end of the wall is to be repaired in accordance with a method statement to be prepared by a qualified conservation specialist</td> <td data-bbox="1031 1458 1442 1906">The impact following mitigation will be significant.</td> </tr> </tbody> </table>				BH-no.	Location	Mitigation	Impact (following mitigation)	BH-18	Le Fanu Road Bridge (OBC7)	The bridge should be recorded by means of photographs, written description and measured drawings to English Heritage Level 3.	The impact following mitigation will be very significant.	BH-33	Signal box at Inchicore Works	The potential for reconstruction of the signal box on an alternative site as a museum piece should be explored and the signal box should be recorded by means of photographs, written description and measured drawings to English Heritage Level 3.	The impact following mitigation will be profound.	BH-36	Extension to maintenance shed and shunting hut, Inchicore works	The structures should be recorded by means of photographs and written description prior to their removal.	The impact following mitigation will not be significant.	BH-37	Wall at Inchicore works	The section of the wall that is to be removed is to be recorded by means of photographs and written description prior to removal and the resulting new end of the wall is to be repaired in accordance with a method statement to be prepared by a qualified conservation specialist	The impact following mitigation will be significant.
BH-no.	Location	Mitigation	Impact (following mitigation)																					
BH-18	Le Fanu Road Bridge (OBC7)	The bridge should be recorded by means of photographs, written description and measured drawings to English Heritage Level 3.	The impact following mitigation will be very significant.																					
BH-33	Signal box at Inchicore Works	The potential for reconstruction of the signal box on an alternative site as a museum piece should be explored and the signal box should be recorded by means of photographs, written description and measured drawings to English Heritage Level 3.	The impact following mitigation will be profound.																					
BH-36	Extension to maintenance shed and shunting hut, Inchicore works	The structures should be recorded by means of photographs and written description prior to their removal.	The impact following mitigation will not be significant.																					
BH-37	Wall at Inchicore works	The section of the wall that is to be removed is to be recorded by means of photographs and written description prior to removal and the resulting new end of the wall is to be repaired in accordance with a method statement to be prepared by a qualified conservation specialist	The impact following mitigation will be significant.																					

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Architectural Heritage															
	BH-42	Retaining walls east of Inchicore	The existing retaining walls are to be recorded by means of photographs and written description prior to removal.	The impact following mitigation will not be significant.												
	BH-43	Sarsfield Road Under-Bridge (UBC4)	The existing bridge is to be recorded by means of photographs and written description prior to the alterations.	The impact following mitigation will be moderate.												
	BH-45	Memorial Road Bridge (OBC3)	The parapets of the replacement bridge will replicate the masonry of the existing parapets.	The impact following mitigation will be moderate.												
21.6.1.3	<p>Zone C</p> <p>The proposed mitigation and impact assessment (following implementation of mitigation) is outlined in Table 21.26.</p> <p>Table 21.26: Mitigation and Impact (following Mitigation) in Zone C</p> <table border="1" data-bbox="363 1061 1406 1442"> <thead> <tr> <th data-bbox="363 1061 523 1111">BH-no.</th> <th data-bbox="523 1061 715 1111">Location</th> <th data-bbox="715 1061 1015 1111">Mitigation</th> <th data-bbox="1015 1061 1406 1111">Impact following mitigation</th> </tr> </thead> <tbody> <tr> <td data-bbox="363 1111 523 1245">BH-79</td> <td data-bbox="523 1111 715 1245">GSRW North Wall Extension</td> <td data-bbox="715 1111 1015 1245">No potential for mitigation.</td> <td data-bbox="1015 1111 1406 1245">The impact following mitigation will be moderate.</td> </tr> <tr> <td data-bbox="363 1245 523 1442">Error! Reference source not found.</td> <td data-bbox="523 1245 715 1442">Memorial Road Bridge (OBC3)</td> <td data-bbox="715 1245 1015 1442">No requirement for mitigation.</td> <td data-bbox="1015 1245 1406 1442">The impact following mitigation will be moderate.</td> </tr> </tbody> </table>				BH-no.	Location	Mitigation	Impact following mitigation	BH-79	GSRW North Wall Extension	No potential for mitigation.	The impact following mitigation will be moderate.	Error! Reference source not found.	Memorial Road Bridge (OBC3)	No requirement for mitigation.	The impact following mitigation will be moderate.
BH-no.	Location	Mitigation	Impact following mitigation													
BH-79	GSRW North Wall Extension	No potential for mitigation.	The impact following mitigation will be moderate.													
Error! Reference source not found.	Memorial Road Bridge (OBC3)	No requirement for mitigation.	The impact following mitigation will be moderate.													
21.6.1.4	<p>Zone D</p> <p>The proposed mitigation and impact assessment (following implementation of mitigation) is outlined in Table 21.27.</p> <p>Table 21.27: Mitigation and Impact (following Mitigation) in Zone D</p> <table border="1" data-bbox="363 1621 1410 1962"> <thead> <tr> <th data-bbox="363 1621 485 1697">BH-no.</th> <th data-bbox="485 1621 772 1697">Location</th> <th data-bbox="772 1621 1129 1697">Significance of effect</th> <th data-bbox="1129 1621 1410 1697">Impact assessment prior to mitigation</th> </tr> </thead> <tbody> <tr> <td data-bbox="363 1697 485 1823">BH-79</td> <td data-bbox="485 1697 772 1823">GSRW North Wall Extension</td> <td data-bbox="772 1697 1129 1823">No potential for mitigation.</td> <td data-bbox="1129 1697 1410 1823">The impact following mitigation will be moderate.</td> </tr> <tr> <td data-bbox="363 1823 485 1962">BH-110</td> <td data-bbox="485 1823 772 1962">Cabra Road Bridge (OBO6)</td> <td data-bbox="772 1823 1129 1962">The impact of the raising of the parapet is to be mitigated by design, while there is no potential for</td> <td data-bbox="1129 1823 1410 1962">The impact following mitigation will be moderate.</td> </tr> </tbody> </table>				BH-no.	Location	Significance of effect	Impact assessment prior to mitigation	BH-79	GSRW North Wall Extension	No potential for mitigation.	The impact following mitigation will be moderate.	BH-110	Cabra Road Bridge (OBO6)	The impact of the raising of the parapet is to be mitigated by design, while there is no potential for	The impact following mitigation will be moderate.
BH-no.	Location	Significance of effect	Impact assessment prior to mitigation													
BH-79	GSRW North Wall Extension	No potential for mitigation.	The impact following mitigation will be moderate.													
BH-110	Cabra Road Bridge (OBO6)	The impact of the raising of the parapet is to be mitigated by design, while there is no potential for	The impact following mitigation will be moderate.													

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Architectural Heritage			
			mitigating the impact of fixing the OHLE.	
	BH-111	Faussagh Road Bridge (OBO7)	The impact of the raising of the parapet is to be mitigated by design.	The impact following mitigation will not be significant.
	BH-112	Royal Canal and Luas Twin Arch (OBO8)	No potential for mitigation.	The impact following mitigation will be slight.
	BH-113	MGWR railway	No potential for mitigation.	The impact following mitigation will be moderate.
	BH-115	Maynooth Line Twin Arch (OBO9)	No potential for mitigation.	The impact following mitigation will be moderate.
	BH-116	Glasnevin Cemetery Road Bridge (OBO10)	The impact is to be mitigated by design.	The impact following mitigation will not be significant.
Operational Phase Mitigation				
21.6.2	There is no scope for mitigating the indirect effects of the project on architectural heritage, as the effects all arise from the ongoing presence of the OHLE and its impact on the character or setting of each structure of architectural heritage significance.			
Monitoring				
21.7	There is no requirement for monitoring in relation to the effects on architectural heritage either at construction stage or operational stage.			

27.1.1.17. EMF and Stray Current

The table below details the mitigation and monitoring measures identified in Chapter 22 Electromagnetic Compatibility and Stray Current.

Table 27.17: Mitigation and Monitoring Measures for Electromagnetic Compatibility and Stray Current

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Electromagnetic Compatibility and Stray Current
Mitigation Measures	
22.6	<p>The effects caused by EMI and EMF will be eliminated or reduced to acceptable levels during the ongoing design development and construction phases of the Project by the application of relevant legislation, standards and industry best practices.</p> <p>In addition to this, third parties with potentially sensitive equipment will be engaged as specified in section 22.3.6 to ensure that any risks of EMI are identified. It is expected that in the majority of cases that there are no specified receptors that are particularly sensitive to EMI and/ or conclude that the risk to any receptors from the new electrified railway is sufficiently low so that no additional mitigation measures are required. In the event that a</p>

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Electromagnetic Compatibility and Stray Current										
	<p>receptor of concern is identified then further assessment will be carried out at the detailed design stage to determine suitable and appropriate mitigation measures.</p> <p>As outlined in section 22.3, a combined EMC and Earthing and Bonding (E&B) route-wide desktop survey³ has also been conducted as part of the design of the Project. A number of assets were identified that require consideration regarding the risk posed to them by DC stray current. A full register of third-party assets was identified by the Project Design Team. Table 22.12 provides a summary of the asset types identified and the general approach to mitigating stray current corrosion. These should be reviewed, amended (if necessary) and incorporated into the detailed designs to ensure that the level of DC stray current on receptors is minimised.</p> <p>Table 22.12: Summary of Asset Types and Stray Current Mitigations</p> <table border="1" data-bbox="379 645 1441 1621"> <thead> <tr> <th data-bbox="379 645 715 741">Asset Type</th> <th data-bbox="715 645 1441 741">Stray Current Considerations and Possible Mitigation(s)</th> </tr> </thead> <tbody> <tr> <td data-bbox="379 741 715 1016">Overline Structures (e.g. Bridges, Signal Gantries)</td> <td data-bbox="715 741 1441 1016"> Bonding of overline structure to traction return system via a Voltage Limiting Device (VLD) and/ or use of traction bonded flashover plates may be necessary dependent on the following factors: <ul style="list-style-type: none"> • Structure material (e.g. stone, brick, steel etc); and • Proposed clearance between bridge soffit and contact wire. </td> </tr> <tr> <td data-bbox="379 1016 715 1205">Radio Transmitters</td> <td data-bbox="715 1016 1441 1205">N/A – earth mats for standalone transmitters will not have a direct galvanic connection to the traction return system and so any stray current flow through them will be incidental. Risk to these assets considered to be sufficiently low.</td> </tr> <tr> <td data-bbox="379 1205 715 1294">Buried Services (Electrical Cables)</td> <td data-bbox="715 1205 1441 1294">N/A - No significant risk of increased stray current flow since buried electrical cables are typically insulated.</td> </tr> <tr> <td data-bbox="379 1294 715 1621">Buried Services (Gas/Water/Sewage Mains)</td> <td data-bbox="715 1294 1441 1621"> Underground metallic services may encourage additional stray current flow from the DC traction return system resulting in corrosion/damage to railway and third-party assets. Possible mitigations include the following: <ul style="list-style-type: none"> • Renewing pads between tracks and sleepers to increase rail-to-earth resistance; and • Use of collection mats and/or sacrificial anodes. </td> </tr> </tbody> </table>	Asset Type	Stray Current Considerations and Possible Mitigation(s)	Overline Structures (e.g. Bridges, Signal Gantries)	Bonding of overline structure to traction return system via a Voltage Limiting Device (VLD) and/ or use of traction bonded flashover plates may be necessary dependent on the following factors: <ul style="list-style-type: none"> • Structure material (e.g. stone, brick, steel etc); and • Proposed clearance between bridge soffit and contact wire. 	Radio Transmitters	N/A – earth mats for standalone transmitters will not have a direct galvanic connection to the traction return system and so any stray current flow through them will be incidental. Risk to these assets considered to be sufficiently low.	Buried Services (Electrical Cables)	N/A - No significant risk of increased stray current flow since buried electrical cables are typically insulated.	Buried Services (Gas/Water/Sewage Mains)	Underground metallic services may encourage additional stray current flow from the DC traction return system resulting in corrosion/damage to railway and third-party assets. Possible mitigations include the following: <ul style="list-style-type: none"> • Renewing pads between tracks and sleepers to increase rail-to-earth resistance; and • Use of collection mats and/or sacrificial anodes.
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Monitoring											
22.7	<p>DART+ South West shall be provided with a stray current monitoring system at each traction substation. This will allow for a continuous monitoring of the rail to earth potential. The rail potential is monitored at dedicated locations along the line, typically at the substations. This will be used to demonstrate that:</p> <ul style="list-style-type: none"> • The electrification system does not introduce intolerable levels of stray current; and 										

³ DP-04-23-REP-EL-TTA-09433-V01-S03, “DART Expansion Project – Kildare Line, EMC/E&B Routewide Asset Survey Report.

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Electromagnetic Compatibility and Stray Current
	<ul style="list-style-type: none"> Ensure that the mitigations adopted by the design and construction delivery team have been correctly implemented and compliance with EN 50122-2 [5] has been achieved. <p>The DART+ South West stray current monitoring system is expected to use a centralised data acquisition system to allow it to be transferred to Iarnród Éireann SET Department.</p>

27.1.1.18. Human Health

The table below details the mitigation and monitoring measures identified in Chapter 23 Human Health.

Table 27.18: Mitigation and Monitoring Measures for Human Health

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Human Health
Mitigation Measures	
Construction Phase Mitigation	
27.7.1	<p>Communication with the local community, with Dublin City Council, South Dublin City Council, Kildare County Council and other relevant stakeholders will be undertaken at an appropriate level and frequency throughout construction. A Community Engagement Manager and Community Liaison Officer will be appointed prior to construction. A Community Liaison Plan will be prepared prior to construction and will be updated regularly.</p>
23.7.1.1	<p>Transport</p> <ul style="list-style-type: none"> Early notice to affected general practice surgeries, hospitals and emergency services of the diversions and bridge closures. Including ongoing updates to support their travel advice to service users and their own vehicle route planning; Sarsfield Road Bridge closure is for 5-7 days. This is considered a length of time where it would be feasible and appropriate, given the Chapter 6 findings on safety, to provide a safety steward to direct pedestrians, cyclists and mobility impaired; The Khyber Pass Footbridge closure should be accompanied by early and ongoing diversion advice that encourages cycling. This may include information boards that show the route in cycling travel times and measures to support a safe and accessible cycle route, e.g. dropped kerbs and where feasible separation from road traffic; and There is a public health opportunity to more broadly encourage active travel given that, not only do the road diversions have significant car journey time implications, but the proposed Project is also providing temporary pedestrian, cyclist and mobility impaired crossings in many instances. The duration of most bridge works would be sufficiently long to support lasting behavioural change that increased physical activity levels and supported mental health. The intervention would primarily relate to early and ongoing information at both the crossing points and at other community locations, e.g. educational facilities. The information boards could provide: the relative journey time differences for different transport modes; the benefits of active travel to health and the environment; public transport links, supporting multi-modal transport for longer journeys; and links to wider local authority, voluntary sector or public health schemes that support walking and cycling uptake. This would support general population health as well as reducing travel time delays for essential journeys, such as healthcare-related journeys.
23.7.1.2	<p>Air Quality No further mitigation is proposed beyond that already set out in Chapter 12.</p>

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Human Health
23.7.1.3	<p>Noise No further mitigation is proposed beyond that already set out in Chapter 14. Mitigation that avoids a risk to both individual and population health (such as temporary rehousing of eligible residents) is supported.</p>
23.7.1.4	<p>Socio-economic Status</p> <ul style="list-style-type: none"> As far as reasonably practicable (e.g. subject to standards and security checks) provide preferential access to construction apprenticeships and training schemes for young people in the local (Dublin City, South Dublin and Kildare) area who are Not in Education, Employment, or Training (NEET). Young people who are NEET are at a critical intervention point for public health. Targeted support at this stage can have a substantial effect on the health of this group and their future dependants. This is a low-cost measure with a high societal return; and Engage and support Dublin City, South Dublin and Kildare, where practicable, to provide local adult learning linked to construction related job opportunities relevant to disadvantaged adults facing skills barriers to construction opportunities.
Operational Phase Mitigation	
23.7.2.1	<p>Transport No further mitigation is proposed beyond that already set out in Chapter 6.</p>
23.7.2.2	<p>Air Quality No further mitigation is proposed.</p>
23.7.2.3	<p>Noise No further mitigation is proposed beyond that already set out in Chapter 14.</p>
23.7.2.4	<p>Socio-economic Status</p> <ul style="list-style-type: none"> As far as reasonably practicable (e.g. subject to standards and security checks) provide an ongoing scheme of preferential access to operational rail training schemes for young people in the local (Dublin City, South Dublin and Kildare) area who are Not in Education, Employment, or Training (NEET); and Engage and support Dublin City, South Dublin and Kildare, where practicable, to provide local adult learning linked to operation related job opportunities relevant to disadvantaged adults facing skills barriers to construction opportunities.
23.7.2.5	<p>EMF</p> <ul style="list-style-type: none"> The sharing with site-specific communities within Zones A to D of non-technical summary information about EMF regulatory standards, the actual negligible EMF risks of the proposed Project and the results of monitoring proposed in Chapter 22. This information sharing to reduce uncertainty and support a shared understanding could be via a website and/or posted leaflets.
Monitoring	
Construction Phase Monitoring	
23.8.1.1	<p>Transport No monitoring by the project is proposed. The mitigation provided in the form of information sharing with healthcare providers would support their own monitoring and further action if appropriate. Communication would be maintained with these services.</p>

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Human Health
23.8.2	Air Quality No monitoring is proposed.
23.8.3	Noise No monitoring is proposed.
23.8.4	Socio-Economic Status Monitoring of uptake of the NEET and adult learning interventions by the project can identify if there are barriers, and address these. Monitoring can also identify the successes and this information can be shared.
23.8.5	EMF No health-related monitoring of EMF is proposed.
Operational Phase Monitoring	
23.8.1.2	Transport No monitoring is proposed.

27.1.1.19. Major Accidents and Disasters

The table below details the mitigation and monitoring measures identified in Chapter 24 Major Accidents and Disasters.

Table 27.19: Mitigation and Monitoring Measures for Major Accidents and Disasters

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Major Accidents and Disasters
Mitigation Measures	
Construction Phase Mitigation	
24.4.3 (Table 24.9)	<p>Major Road Traffic Accidents</p> <ul style="list-style-type: none"> A Construction Traffic Management Plan (CTMP) will be prepared and implemented during the construction phase to be agreed with Iarnród Éireann and the respective local authority prior to the commencement of the construction phase; A Mobility Management Plan will be developed as part of the CTMP and will address all modes of transport and travel required to deliver the project during the construction phase. This will include details regarding construction workers travelling to site, car-parking, haulage routes and construction compounds to reduce potential effects (incl. traffic accidents) caused due to construction traffic and residential neighbourhoods; All accesses to the worksite and the compounds will be signposted, and anyone outside the work will be prohibited, installing the necessary perimeter fences and the necessary warning signs;

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Major Accidents and Disasters
	<ul style="list-style-type: none"> The necessary traffic signs will be placed outside the work to warn pedestrian and vehicle traffic of the risks involved in the work. Similarly, the necessary protections and notices will be placed, in specific cases in which the circulation through the annexed streets is affected; and All HGV drivers will be provided with appropriate safety awareness training.
24.4.3 (Table 24.9)	<p>Collapse/Damage to Structures</p> <ul style="list-style-type: none"> Stakeholder consultations will be carried out with owners of sensitive structures/buildings; Monitoring of existing historic/sensitive structures will be undertaken during construction to ensure their stability and durability; Where appropriate, sensitive structures at risk from construction works will be protected; A CEMP and an Incident Response Plan (IRP) will be prepared to manage the risk of collapse/ damage to structures; and Mitigation measures in relation to vibration identified in EIAR Chapter 14 Noise and Vibration will be adhered to.
24.4.3 (Table 24.9)	<p>Ground Collapse</p> <ul style="list-style-type: none"> A CEMP and an Incident Response Plan (IRP) will be prepared to manage the risk of collapse/damage to structures.
24.4.3 (Table 24.9)	<p>Fire/explosion</p> <ul style="list-style-type: none"> The risk will be managed through the CEMP and IRP; Hot Work Permit procedures will be followed; All construction compounds and construction sites will have 24/7 security; Explosive materials will not be stored on construction site/compounds overnight; and Transportation of explosives will be subject to prior agreement. When transportation of these materials is required, appropriate security measures will be implemented such as escort by An Garda Síochána.
24.4.3 (Table 24.9)	<p>Industrial Accidents (works near Seveso site)</p> <ul style="list-style-type: none"> The proposed Project cannot provide offsite mitigation measures however, TII's protocols for the management of major accidents will be followed in an event there is an incident at a nearby Seveso sites; and In the event of an accident, the Seveso site will have an emergency response plan registered with the HSA which will be activated and implemented.
24.4.3 (Table 24.9)	<p>Extreme Weather (Flooding) Events</p>

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Major Accidents and Disasters
	<ul style="list-style-type: none"> As is normal practice with infrastructure projects a Construction Environmental Management Plan (CEMP) will be prepared for the proposed Project; Monitoring of weather forecasts to ensure that necessary actions will be implemented in time at construction sites prior to prolonged/extreme weather events; and An emergency response plan may be drawn up including appropriate response measures for such Extreme Weather (Flooding) situations.
24.4.3 (Table 24.9)	<p>Spillage or long-term seepage of pollutants into a watercourse</p> <ul style="list-style-type: none"> As is normal practice with infrastructure projects, a CEMP will be prepared for the proposed Project. An Incident Response Plan will be prepared as part of the CEMP detailing the procedures to be undertaken in the event of spillage of chemical, fuel or other hazardous wastes, non-compliance with any permit or license, or other such risks that could lead to a pollution incident, including flood risks; The Environmental Manager will prepare Method Statements for construction works as detailed in the CEMP to be undertaken on, over or near water in consultation with Inland Fisheries Ireland (IFI) and other relevant authorities; Implementation of mitigation measures identified in Chapter 8 Biodiversity, 10 Hydrology, and Chapter 11 Hydrogeology in EIAR Volume 2; During construction, cognisance will have to be taken of the following guidance documents for construction work on, over or near water: <ul style="list-style-type: none"> <i>Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites</i> (Eastern Regional Fisheries Board); <i>Central Fisheries Board Channels and Challenges – The enhancement of Salmonid Rivers</i>; <i>CIRIA C532 Control of Water Pollution from Construction Sites Guidance for Consultants and Contractors</i>; <i>CIRIA C648 Control of Water Pollution from Constructional Sites</i>; and <i>Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes</i> (TII, 2006).
24.4.3 (Table 24.9)	<p>Human Disease</p> <ul style="list-style-type: none"> The contractor will provide site operatives with appropriate first aid material. All site operatives will be advised to wear steel toe cap boots with trousers to be tucked inside along with appropriate PPE such as gloves and headwear. All site operatives should be advised of the importance of washing hands before eating to avoid the risk of contracting Weil’s disease and other water borne diseases; and Government and HSE health and safety guidelines will be adhered to in relation to Covid-19 in workplaces to reduce the spread of the virus amongst the construction workers.
Operational Phase Mitigation	

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Major Accidents and Disasters
24.4.3 (Table 24.10)	<p>Train Derailment</p> <ul style="list-style-type: none"> • Appropriate training will be provided to all relevant staff members for operation of the electrified train fleet; • Operation and maintenance manuals will be made available to staff as early as possible; • A dedicated Major Incident Response Plan has been developed by Iarnród Éireann for the DART+ South West Project to identify the appropriate emergency response plans in event of an incident; • Appropriate back up procedures will be prepared and implemented in an event of an incident; • Periodic inspections and maintenance (as required) of the railway line in accordance with Iarnród Éireann (IÉ) Standards which include, but not limited to, the following: <ul style="list-style-type: none"> ○ IÉ CCE-TMS-363 Requirements for the Rail Testing Vehicle; ○ IÉ CCE-TMS-360 Track and Structures Inspection Requirements; ○ IÉ CCE-TMS-320 Track Quality Standard; and ○ International Union of Railways (UIC) Code 712 R Rail Defects. • As the design of the project has progressed Applications for Safety Approvals (ASA), Acceptance of Safety Cases and Authorisation for Placing in Service (APIS) are being developed. Design measures for the DART+ South West project have been accepted by the Commission for Railway Regulation (CRR) in order for licence to be granted.
24.4.3 (Table 24.10)	<p>Building Failure/Fire</p> <ul style="list-style-type: none"> • A Fire Safety Certificate will be submitted in advance of operation of the station (post approval of the railway order). It will be agreed and approved the Dublin Fire Brigade.
24.4.3 (Table 24.10)	<p>Extreme weather (flood) events</p> <ul style="list-style-type: none"> • Ongoing consultation and cooperation with local authorities and the Office of Public Works (OPW); • Inspections and maintenance (as applicable) of the drainage system and the proposed attenuation tanks; and • A dedicated Major Incident Response Plan has been developed by Iarnród Éireann for the DART+ South West project to identify the appropriate emergency response plans in event of flooding.
24.4.3 (Table 24.10)	<p>Industrial Accidents – Seveso sites</p>

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Major Accidents and Disasters
	<ul style="list-style-type: none"> The proposed Project cannot provide offsite mitigation measures however, TII's protocols for the management of major accidents will be followed in an event there is an incident at a nearby Seveso sites; and In the event of an accident, the Seveso site will have an emergency response plan registered with the HSA which will be activated and implemented.

27.1.1.20. Interactions

Mitigation measures are addressed within individual chapters as outlined in the preceding sections. No further mitigation proposed.

27.1.1.21. Cumulative Effects

The table below details the mitigation and monitoring measures identified in Chapter 26 Cumulative Effects.

Table 27.20: Mitigation and Monitoring Measures for Cumulative Effects

EIAR Section Reference	Description of Mitigation and Monitoring Measures for Cumulative Effects
Mitigation Measures – Tier 1	
	<ul style="list-style-type: none"> None required
Mitigation Measures – Tier 2	
Table 26.3	<ul style="list-style-type: none"> ESB networks and any agents will continue to collaborate constructively with the DART+ South West project team during the construction stages. A Construction Environmental Management Plan (CEMP) has been developed in respect of the DART+ South West Project and will be updated post planning and throughout construction.
Mitigation Measures – Tier 3	
Tables 26.5 - 26.7	<ul style="list-style-type: none"> The mitigation measures proposed as part of the DART+ South West Project EIA alongside those proposed as part of the relevant Tier 3 projects will be implemented. This will address the potential for cumulative effects. The Construction Environmental Management Plan (CEMP) prepared for the DART+ South West Project, alongside the implementation of the CEMP for the other relevant Tier 3 projects will address the potential cumulative impacts.
Mitigation Measures – Tier 4	
Tables 26.8-26.9	<ul style="list-style-type: none"> None required

27.1.1.22. Natura Impact Statement

In addition to the mitigation in the EIAR, the mitigation in the following table is included in the NIS.


Table 27.21: Mitigation and Monitoring Measures from the Natura Impact Statement

NIS Section Reference	Description of Mitigation and Monitoring Measures from the NIS												
Mitigation Measures													
7.1	<p>Appointment of Environmental Team</p> <ul style="list-style-type: none"> • Environmental Clerk of Works (ECoW) to ensure that the mitigation measures outlined in this NIS (including any updates to this document following consent) are implemented in full and to supervise works in sensitive locations. The Contractor shall appoint the ECoW before the commencement of works. The ECoW shall be suitably qualified and experienced and have a minimum of five years' experience completing similar tasks on linear infrastructure projects; and • Project Ecologist to supervise all implementation and overseeing of ecological mitigation measures and ensuring that activities on site are conducted in accordance with the planning permission as they pertain to ecological matters and specifically any works that could have an effect on the SCIs of South Dublin Bay and River Tolka Estuary SPA, North Bull Island SPA, Baldoyle Bay SPA and Ireland's Eye SPA. CIÉ shall appoint the Project Ecologist before the commencement of works. The Project Ecologist shall be a full member of a relevant institution, such as the Chartered Institute of Ecology and Environmental Management (CIEEM) or similar, have relevant experience in the management of mitigation measures and ecological constraints on construction sites/restoration projects, and hold or have previously held a protected species derogation licence in the Republic of Ireland. 												
Construction Phase Mitigation													
7.2.1	Control of Water Pollution												
7.1.2.1.1	<p>General Pollution Control</p> <ul style="list-style-type: none"> • All method statements for works in, near (within 15m of a watercourse feature) or liable to impact on a waterway must have prior agreement with IFI and NPWS; and • Stockpiling of construction materials shall be strictly prohibited within 15 m of watercourses and water-laden channels, such as the locations identified in Table 7.1 (see also section 7.2.1.2 for further information on the control of water pollution at Liffey Bridge). <p>Table 7.1 Watercourses which intersect the proposed Project</p> <table border="1" data-bbox="403 1771 1442 1989"> <thead> <tr> <th data-bbox="403 1771 767 1850">EPA Waterbody Name</th> <th data-bbox="767 1771 1114 1850">EPA Code</th> <th data-bbox="1114 1771 1442 1850">Location watercourse intersects the Project</th> </tr> </thead> <tbody> <tr> <td data-bbox="403 1850 767 1899">Liffey</td> <td data-bbox="767 1850 1114 1899">IE_EA_090_0400</td> <td data-bbox="1114 1850 1442 1899">53.347480, -6.304021</td> </tr> <tr> <td data-bbox="403 1899 767 1948">Camac</td> <td data-bbox="767 1899 1114 1948">IE_EA_09C020500</td> <td data-bbox="1114 1899 1442 1948">53.345995, -6.304627</td> </tr> <tr> <td data-bbox="403 1948 767 1989">Griffeen</td> <td data-bbox="767 1948 1114 1989">IE_EA_09L012100</td> <td data-bbox="1114 1948 1442 1989">53.335041, -6.447633</td> </tr> </tbody> </table>	EPA Waterbody Name	EPA Code	Location watercourse intersects the Project	Liffey	IE_EA_090_0400	53.347480, -6.304021	Camac	IE_EA_09C020500	53.345995, -6.304627	Griffeen	IE_EA_09L012100	53.335041, -6.447633
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NIS Section Reference	Description of Mitigation and Monitoring Measures from the NIS		
	n/a- tributary of the Griffeen	n/a	53.334922, -6.444964
	Coneyburrow_09	IE_EA_09L011900	53.335352, -6.493755
	Castletown_09	IE_EA_09C500830	53.325423, -6.518929
	<ul style="list-style-type: none"> • Stockpiling of loose materials shall be covered with an impermeable material (e.g. tarpaulin); • Hazardous materials including diesel, fuel oils, solvents, paints and/or lubricants stored on temporary or permanent lands made available shall be stored on hardstand and within suitably designed bunded areas with a bund volume of 110% of the capacity of the largest tank/container; • Re-fuelling of plant and construction equipment and the addition of hydraulic oil or lubricants to vehicles/equipment shall only take place on hardstand, within designated bunded areas only and not within 15 m of any watercourse or surface water feature (see Volume 3A of this EIAR, Drawing DP-04-23-DWG-EV-TTA-23750). Spill containment (i.e. drip trays) shall be used, and spill kits shall be kept available and used if necessary; • Oils, fuel, chemicals, hydraulic fluids etc. will not be stored outside construction compounds. They will be stored in designated bunded areas at construction compounds; • Waste oils and hydraulic fluids shall be collected in leak-proof containers and removed from the site for disposal or recycling at licensed facilities; • Waste materials shall be stored in designated areas that are isolated from surface water drains and watercourses. Waste materials will be carefully managed including covering stockpiles during rainfall. Skips shall be closed or covered to prevent materials being blown or washed away; • All machinery will be routinely checked to ensure no leakage of oils or lubricants occurs during the construction phase. Any spillages will be immediately contained, and the contaminated soil removed from the site and disposed of properly; • Wash down water from exposed aggregate surfaces, cast-in-place concrete and from concrete trucks will be trapped on-site to allow sediment to settle out before clarified water is released to a drain system; • No waste will be buried, burnt, or dumped on-site or in land adjacent to the site; • Only emergency breakdown maintenance shall be carried out on site. Emergency procedures and spill kits will be readily available at strategic and/or sensitive site locations and all relevant personnel will be familiar with emergency procedures; • An appropriate emergency response will be in place for any spillage of fuels, lubricants of hydraulic oils to ensure they are immediately contained; and • Any contaminated soil shall be removed from the site and disposed of in a licensed facility. <p>For the protection of watercourses associated with surface water run-off, the following measures shall be employed:</p> <ul style="list-style-type: none"> • No in-stream works will be permitted; • Where works are required within 15 m of a watercourse feature, ecologist shall assess and verify that appropriate demarcation and signage is in place before 		

NIS Section Reference	Description of Mitigation and Monitoring Measures from the NIS
	<p>works commence. Demarcation shall be physically marked out using post and rail/post and rope/bunting, or equivalent, and be signposted to identify an ecological sensitivity;</p> <ul style="list-style-type: none"> • Silt fencing shall be installed for all work within 15 m of the River Liffey. Silt fencing shall consist of a maintainable geotextile membrane (equivalent to Terrastop™ Premium; 250µ; 45l/m²/sec). Installation, maintenance, and removal shall follow the manufacturers' specifications. The geotextile membrane will be inspected at least once a week and following any period of heavy rainfall (i.e. Orange and Red rain warning); • The Contractor will monitor weather forecasts for heavy rain and where required, certain works and in particular excavations/earthworks will cease in order to minimise exposed soil entering surface water run-off; and • Soil excavation will not be completed during periods of prolonged or heavy rain (i.e. Orange and Redrain warning). <p>Controls over Use of Concrete</p> <ul style="list-style-type: none"> • All ready-mixed concrete shall be brought to site by truck. A suitable risk assessment for wet concreting shall be completed prior to works being carried out which will include measures to prevent discharge of alkaline waste waters to the underlying subsoil. Wash down and washout of concrete transporting vehicles shall take place at an appropriate facility offsite. Where this is not possible, wash down and washout shall take place within a washout berm for later disposal after drying; • Concrete shall be contained and managed appropriately to prevent pollution of watercourses. Concrete pouring will be prevented during periods of heavy rainfall, and appropriately designed mixes shall be used; and • Waste materials shall be stored in designated areas that are isolated from surface water drains. Skips shall be closed or covered to prevent materials being blown or washed away. <p>Control and Response to Environmental Incidents and Accidents</p> <ul style="list-style-type: none"> • The Contractor will be required to have available on site spill kits and hydrocarbon absorbent materials to deal with any accidental spillages; • An Environmental Incident and Emergency Response Plan will be established by the Contractor to deal with incidents or accidents during construction that may give rise to pollution in watercourses proximal to the works. This will include means of containment in the event of accidental spillage of hydrocarbons or other pollutants (e.g. oil booms, soakage pads); • All employees and subcontractors involved on site will be given a comprehensive induction prior to commencement of the works. The environmental training and awareness procedure will ensure that staff are familiar with the principles of the CEMP, the environmental aspects and impacts associated with their activities, the procedures in place to control these impacts and the consequences of departure from these procedures;

NIS Section Reference	Description of Mitigation and Monitoring Measures from the NIS
	<ul style="list-style-type: none"> Throughout all stages of the construction phase the Contractor will ensure that all site personnel are made aware of the importance of the freshwater environments and the requirement to avoid pollution of all types; All hazardous materials on site will be stored within secondary containment designed to retain at least 110% of the total storage contents; Temporary bunds for oil/diesel storage tanks will be used off- site during the construction phase of the proposed Project as appropriate; Safe handling of all potentially hazardous materials will be emphasised to all construction personnel employed during this phase of the proposed Project; and Any spillage of fuels, lubricants or hydraulic oils will be immediately contained, and the contaminated soil removed from the site and properly disposed of at a suitable licensed facility.
7.2.1.2	<p>Control of Water Pollution at Liffey Bridge</p> <ul style="list-style-type: none"> Attenuation tanks will greatly reduce the risk of untreated or uncontrolled discharges entering the Liffey Estuary, however mitigation in the form of hard engineering structures such as vortex grit chambers and silt barriers will be required to prevent an adverse effect on water quality and prey available to breeding populations of cormorant and herring gull; Discharge into watercourses will only be carried out with the consent of the ECoW to ensure all available measures have been applied to prevent siltation/pollution of the Liffey Estuary Upper; Clearly defined working areas, delineated by temporary protective fencing will be required, and are essential to ensure there is a sufficiently large buffer zone between working areas and the Liffey Estuary Upper and to avoid accidental incursion by personnel, materials or equipment; Stockpiling of construction materials (i.e. loose materials or any material that may give rise to run-off) will be located greater than 15 m from the bankside of the Liffey Estuary Upper (see also section 7.1.2.1) and will be covered with an impermeable material (e.g. tarpaulin); and Silt fences will be installed and maintained along the southern boundary of Liffey Bridge and will comply with the requirements of ASTM D6462 – 19 Standard Practice for Silt Fence Installation and Maintenance (June 2019) (ASTM, 2019) and adhere to IFI (2016) Guidelines. As a minimum: <ul style="list-style-type: none"> Silt fences will comprise of a supported geotextile fabric or similar with posts at 4 m distance as a minimum; Silt fences will comprise a double geotextile layer; Material geotextile should be adequately buried at an ‘L’ shape to its marker line (minimum 150mm) and the trench backfilled and compacted; and Silt fences will be inspected daily and after heavy rainfall.
Operational Phase Mitigation	
7.1.3	<p>Control of Water Pollution</p> <ul style="list-style-type: none"> The design of the proposed Project allows for all surface water run-off from the proposed Project to be treated prior to discharge to the River Liffey through either

NIS Section Reference	Description of Mitigation and Monitoring Measures from the NIS
	<p>through the existing drainage networks or through proposed drainage networks, which include: ‘filter drains’, and ‘attenuation tanks’;</p> <ul style="list-style-type: none"> • The release of discharge to the River Liffey after attenuation, shall not exceed the existing greenfield runoff rate and an A Class 1 bypass separator will be installed on the inlet pipe to the attenuation tank in order to treat surface water and remove any potential contamination prior to entering the tank and ultimately prior to discharge to the River Liffey; and • A Class 1 bypass separator will be installed on the inlet pipe to the attenuation tank in order to treat surface water and remove any potential contamination prior to entering the tank and ultimately prior to discharge to the River Liffey.
7.3.2	<p>Bird collision risk</p> <p>The feeder wire along both sides of Single Track Cantilever OHLE masts on the Liffey Bridge crossing (Zone D) will be fitted with a device to make lines more visible to commuting, foraging and migrating SCI light-bellied brent goose and SCI black-headed gull. Devices will not be required in any other location along the proposed Project. Although the information surrounding the efficacy of bird diverters with a species-specific focus is limited, a wide range of wire marking devices can be used, generally falling into three basic designs; aerial marker spheres, spirals, and suspended devices (swinging, flapping, and fixed) (APLIC, 2012).</p> <p>The hanging device is proposed here (Figure 7.1) as it is universal, cost-effective, allows easy installation, remains in position in severe weather conditions and fits a range of conductors/wires. Like other diverters (because there are few comparative studies), there is extensive field studies (Prinsen et al., 2011) showing that when installed properly they can significantly decrease bird strike. Hanging devices (e.g. Raptor Clamp Diverter, Fire Fly) are suspended from the wire with fixed or swinging plates or flappers and are designed to increase the visibility of overhead lines and reduce the incidence of bird collisions with overhead cables.</p>  <p>Examples of hanging tags (APLIC, 2012)</p> <p>Specifications requirements include (derived from SNH Guidance, 2016):</p> <ul style="list-style-type: none"> • Devices should vary in colour (e.g. black and white), be as reflective as possible with glowing surfaces and be capable of a swinging or flapping motion making them more visible and effective (ESKOM Transmission, 2009) (see Image A). Devices shall not be restricted in their movement; • Devices should be placed 5 m apart and staggered on parallel lines. Based on various studies as reported by APLIC (2012) in the United States, data recommends spacing between 4.6 m and 30 m. As this is largely dependent on the extent of the overhead lines which requires mitigation through diversion

NIS Section Reference	Description of Mitigation and Monitoring Measures from the NIS
	<p>devices, 5 m - is considered appropriate for the Liffey Bridge crossing which only extends for c. 50m over the water column;</p> <ul style="list-style-type: none"> • Devices should be as large as possible for maximum visibility (i.e., diameter of by at least 20 cm (8 in) and length of at least 10 to 20cm (4 to 8in). A study completed by Jenkins et al., (2010) concluded that by line marking with devices that increase visibility of the line are likely to lower general collision rates by 50% to 80%. Other studies have also shown a reduction of collision rates by 50% to 94% (Prinsen et al., 2011); and • Line markers shall require annual maintenance and replacement, ensuring that markers remain in position and functional throughout the lifetime of the proposed Project.
Monitoring	
N/A	No construction or operational monitoring measures are proposed.