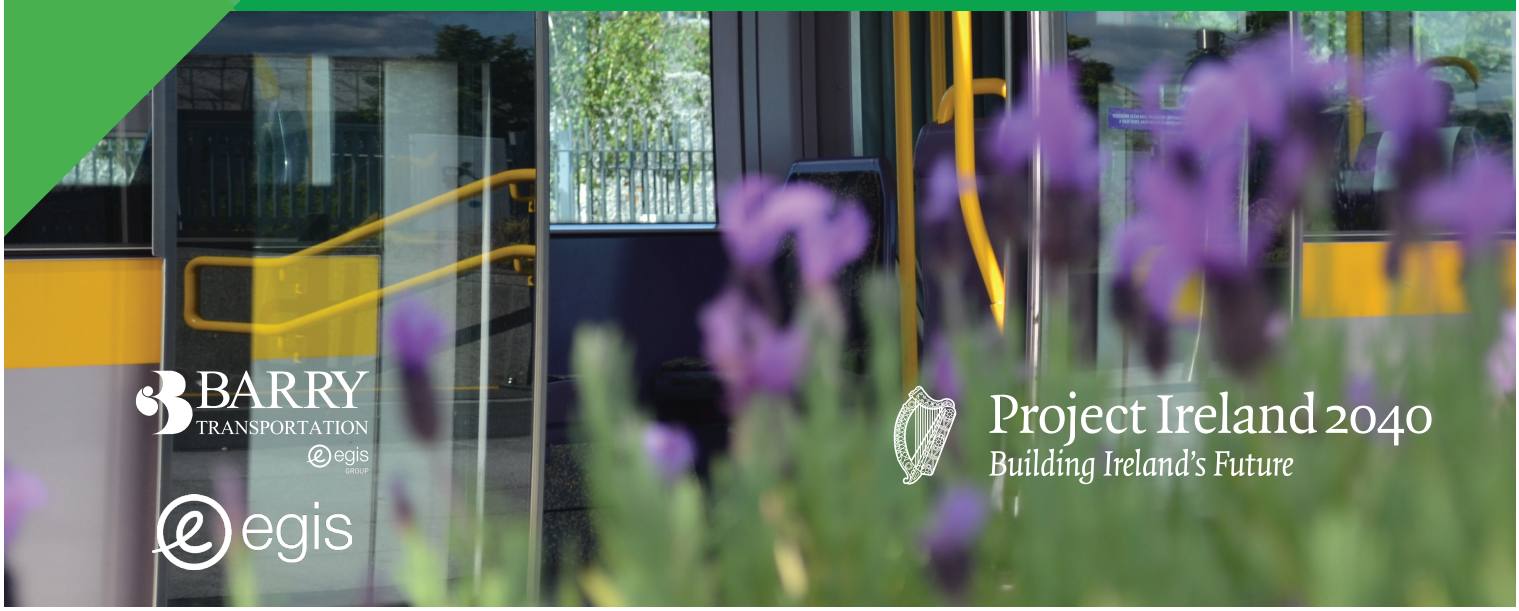
Bonneagar Iompair Éireann
Transport Infrastructure Ireland

NTA
Údarás Náisiúnta Iompair
National Transport Authority

Luas Finglas

Environmental Impact Assessment Report 2024

Appendix A14.1: Carbon Tool Memorandum



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Project Ireland 2040
Building Ireland's Future

Table of Contents

SECTION 1: EXECUTUVE SUMMARY 1
SECTION 2: BACKGROUND 2
SECTION 3: BASELINE SETTING 3
SECTION 4: TARGET SETTING 4
SECTION 5: QUANTIFICATION OF GHG EMISSIONS 5
SECTION 6: CARBON REDUCING MEASURES 6
SECTION 7: MONITORING & REPORTING 7
SECTION 8: CONTINUAL IMPROVEMENT 8
SECTION 9: CONCLUSION 9

Appendices

APPENDIX 1: TII CARBON TOOL EXCERPTS 1

List of Tables

Table 1: TII REM Model 3
Table 2: Emissions Breakdown 5
Table 3: Carbon Reducing Measures 6

SECTION 1: EXECUTUVE SUMMARY

The TII Carbon Tool has been used to evaluate the lifecycle carbon impacts of various design options for the proposed Scheme. The tool and associated carbon figures have been continuously updated to reflect the evolving design, incorporating measures to reduce carbon footprints and greenhouse gas (GHG) emissions.

One of the overarching objectives for Luas Finglas is to contribute to the Climate Action Plan targets for the decarbonisation of transport. In 2035, Luas Finglas is projected to facilitate an additional 1.3 million low-carbon public transport trips annually, increasing to an additional 1.8 million trips in 2050. A 350-space Park & Ride facility near the St Margaret's Road Luas stop will further support the decarbonisation of transport.

The tool quantified carbon emissions across various project stages, from pre-construction to end-of-life, totaling 62,350.1 tCO2e. Notably, embodied carbon accounted for 53,673.7 tCO2e of the total emissions.

Several measures have been integrated into the design to reduce carbon emissions, including:

- Maintaining existing tree corridors to minimise tree clearance;
- Enhancing habitats to increase carbon storage;
- Using concrete with ground granulated blast furnace slag (GGBS) to reduce the carbon footprint;
- Reusing site-won materials to minimise waste transportation; and
- Implementing solar arrays and nature-based SuDS solutions.

The TII Carbon Tool has been updated periodically, demonstrating continuous improvement in reducing carbon emissions. For example, from January 2023 to July 2024, emissions were reduced from 71,499.01 tCO2e to 62,350.1 tCO2e, reflecting ongoing refinements to the project.

The Luas Finglas project, supported by the TII Carbon Tool, is on track to significantly reduce carbon emissions through strategic design choices and continuous monitoring. This project aligns with broader climate action goals, contributing to a sustainable future for public transport.

SECTION 2: BACKGROUND

The TII Carbon Tool is designed to help organisations assess and manage their carbon emissions. It provides a platform for tracking and analysing carbon data, aiding in the development of strategies to reduce carbon footprints and promote sustainability initiatives.

The TII Carbon Tool has been developed for Luas Finglas to allow the design team to compare and evaluate the lifecycle carbon impacts of design options at each stage of the project. Details of carbon calculations are populated and continuously updated in the TII 'Carbon Assessment and Reduction Tool' in coordination with the evolution of the design. A number of measures have been incorporated into the scheme design to reduce carbon footprint and GHG emissions.

In the opening year 2035, Luas Finglas will deliver an increase of 1.3 million low carbon public transport trips per annum. This increases to 1.8million additional public transport trips in the design year 2050 due to underlying development growth and modal shift from car. The provision of a 350-space Park & Ride beside the St Margaret's Road Luas stop will also support the removal of vehicular traffic from the road network, thus contributing to the decarbonisation of travel.

A number of further carbon reducing measures are proposed within the Scheme, with all significant measures detailed within this report.

SECTION 3: BASELINE SETTING

The following baseline parameters were inputted to the TII Carbon Tool:

Scheme Type: Completely New Infrastructure

Existing Land Use: Combination of used and untouched land

24 – hour Annual Average Daily Traffic (AADT) for Do Minimum Scenario: 130893

A summary of the TII REM model for the project lifetime is presented in Table 1 below. The Do-Minimum Scenario and the Do-Something scenario have been modelled for the Opening Year 2035 and the Design Year 2050, demonstrating a reduction in road use emissions.

Table 1: TII REM Model

	2035 – Do Minimum	2035 – Do Something	2050 - Do Minimum	2050– Do Something
Road Use Emissions (tCO2e) Tonnes/year	4554.89	4371.38	4711.53	4531.3
Difference		-183.51		-180.23

SECTION 4: TARGET SETTING

As outlined in the Preliminary Business Case, one of the overarching objectives for Luas Finglas includes:

- Contribution to the Climate Action Plan targets for the decarbonisation of transport.

The overarching objectives were devised to be SMART: specific, measurable, attributable, realistic and time bound. In terms of decarbonisation, the objectives are set out as follows:

- Measurable:
  - Reduction in carbon emissions from transport related to travel in the Finglas corridor.
  - Carbon emissions related to Luas Finglas.
- Attributable:
  - Pre-Operation:
    - Transport modelling during construction.
    - Emission reductions defined by the Project Sustainability Plan.
  - During Operation:
    - Energy efficiency for Luas vehicles and facilities.
    - Procurement.
    - Mode share by sustainable transport.
- Realistic:
  - The need to increase public transport use to reduce carbon emissions is set out in the Climate Action Plan 2023.
  - Potential to set CO2 level targets in contract documents.
- Time Bound:
  - Contract performance timelines for Luas operation.
  - Transport modelling has been undertaken for two future years: Opening Year (2035) and Design Year (2050).

SECTION 5: QUANTIFICATION OF GHG EMISSIONS

The TII Carbon tool has been designed to include a lifecycle modular approach for carbon reporting, with the quantification of GHG emissions aligned to PAS 2080 requirements. An assessment of key materials has been undertaken to focus carbon calculations. The emissions breakdown is presented below:

Table 2: Emissions Breakdown

Project Stage	tCO2e
Pre-Construction	49.8
Embodied Carbon	53,673.7
Construction Activities	418.1
Construction Waste	288.6
Operational Use	7984.1
User Emissions	-180.2
Maintenance	59.7
End of Life	56.4
Total	62,350.1

Excerpts from the TII Carbon tool inputs which informed Table 2 are included at the end of this report.

SECTION 6: CARBON REDUCING MEASURES

The design includes a number of intrinsic considerations that will assist in the reduction of carbon (e.g. optimised gradients to reduce operational energy demand and reducing stop / go movements by combining road junctions in close proximity and increasing fully segregated sections to allow trams longer coasting at low energy consumption).

Alongside these design considerations, the proposed scheme includes a number of specific measures that include a quantifiable reduction in carbon, as outlined below.

Table 3: Carbon Reducing Measures

Mitigation Measure	Rationale	Reduction (tCO2e)
Maintaining existing tree corridors, where possible to minimise tree clearance.	Carbon storage associated with existing trees.	483.42
Habitat retention creation and enhancement. Carbon storage associated with habitats and gains in vegetated land.	1.27ha of Transitional Woodland Scrub has a Carbon Sink of 34.5tCO2e 1.62ha of Mixed Forest has a Carbon sink of 160.38tCO2e	194.9
Incorporation of concrete with 25% or 50% ground granulated blast furnace slag (GGBS) to reduce the carbon footprint.	Use of GGBS results in a reduction of 1025.95tCO2e across bridges and trackform. It also results in a reduction of 6621.52tCO2e for the Park and Ride (assuming 60% of concrete associated with the Park and Ride is GGBS).	7647.47
Proposed Vignole grass-track indicates >50% reduction in structural concrete.	The design is based on the use of a grass track to reduces concrete requirements.	729.42
Proposal to reuse approximately 4,000m3 of site won material to reinstate an existing void at the stabling site.	Sending 4,000m3 of soil to landfill would involve 4.96tCO2e associated with waste processing and 0.02tCO2e associated with transportation.	4.98
Larger construction site areas to facilitate optimised construction phases and reduce the transportation of waste.	Considered to represent a 5% reduction in the transport of waste.	0.005
Provision of satellite compounds to reduce travel distances to reduce the overall fuel consumption associated with the construction phase.	Considered to represent a 5% reduction in fuel consumption during construction.	3.553
Inclusion of a solar array on the roof of the Park and Ride.	Solar array is acknowledged as an energy source within Carbon Tool (319,500kWh generating 0tCO2e), if this was electricity from the grid it would equate to 96.16tCO2e.	96.16
Implementation of nature-based SuDS solutions.	Nature-based SuDS solutions saved 9,484m of 1.2m diameter concrete culverting.	4861.88

SECTION 7: MONITORING & REPORTING

The TII Carbon tool has been subject to a number of updates as the project progressed, as outlined below. The GHG emissions and mitigation measures reported related to the July 2024 issue of the TII Carbon tool.

- Preliminary Design Stage (January 2023)
- Reference Design Stage (June 2023)
- Reference Design Stage (January 2024)
- Reference Design Stage (March 2024)
- Reference Design Stage (July 2024)

SECTION 8: CONTINUAL IMPROVEMENT

Outputs from TII Carbon tool have demonstrated continuous improvement, with refinements to the scheme in March 2024 reducing carbon emissions to 62,524 tCO2e from 71,499.01tCO2e (based on Reference Design Stage (January 2024)). Further refinements between March 2024 and July 2024 reduced carbon emissions to 62,350.1tCO2e

SECTION 9: CONCLUSION

The implementation of the TII Carbon Tool has demonstrated a robust approach to managing and reducing carbon emissions throughout the project's lifecycle. By leveraging this tool, the design team has been able to continuously refine and optimise the project, resulting in substantial reductions in carbon emissions. The project is set to deliver significant environmental benefits, including a marked increase in low-carbon public transport trips and a reduction in road use emissions.

The integration of various carbon-reducing measures, along with strategic planning and monitoring facilitated by the TII Carbon Tool, ensures that the project aligns with the Climate Action Plan 2023 and contributes to the decarbonisation of transport.

Overall, the Luas Finglas project serves as a model for sustainable infrastructure development, showcasing how meticulous planning, innovative design solutions, and continuous improvement can lead to substantial environmental benefits.

Appendix 1: TII Carbon Tool Excerpts

Pre-Construction

Clearance and Demolition Activities | Land Use Change and Vegetation Loss | Water Use During Clearance and Demolition Activities | Carbon Saving Opportunities

Clearance and Demolition Activities Emissions (tCO2e): 10.86

Select rows to add to table:

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Clearance Category	Subcategory	Activity	Quantity	Unit	Activity Emissions tCO2e	Comments
Demolition and Site Clearance	General Clearance	General clearance - general site clearance	24.72	ha	10.86	MG

Clearance and Demolition Activities | Land Use Change and Vegetation Loss | Water Use During Clearance and Demolition Activities | Carbon Saving Opportunities

Land Use Change and Vegetation Loss Emissions (tCO2e): 38.93

Select rows to add to table:

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Vegetation Type	Quantity	Unit	Carbon Sink tCO2e (removed)	Comments
Natural Grassland	0.31	ha	7.73	Modified grassland - PB
Natural Grassland	0.99	ha	24.68	Other neutral grassland - PB
Transitional woodland scrub	0.02	ha	0.54	Wet woodland - PB
Transitional woodland scrub	0.20	ha	5.43	Wood-pasture and parkland - PB
Transitional woodland scrub	0.02	ha	0.54	Introduced shrub - PB

Clearance and Demolition Activities | Land Use Change and Vegetation Loss | Water Use During Clearance and Demolition Activities | Carbon Saving Opportunities

Water Use Emissions (tCO2e): 0.01

Select rows to add to table:

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Activity Type	Water Use	Quantity	Unit	Activity tCO2e	Comments
Demolition and Site Clearance	Water Use - UK Average	84,537.45	litres	0.01	148m3 water per £million contractors output at constant price. https://www.constructionleadershipcouncil.co.uk/wp-content/uploads/2021/02/SCTG09-WaterActionPlanFinalCopy.pdf
Construction	Water Use - UK Average	0.00	litres	0.00	
Construction	Water Use - UK Average	0.00	litres	0.00	
Construction	Water Use - UK Average	0.00	litres	0.00	
Construction	Water Use - UK Average	0.00	litres	0.00	

Clearance and Demolition Activities | Land Use Change and Vegetation Loss | Water Use During Clearance and Demolition Activities | Carbon Saving Opportunities

Carbon Savings Identified and Implemented

Description of options and how they will lead to carbon savings	Rationale for implementation
Maintaining existing tree corridors where possible to minimise tree clearance.	Carbon storage associated with retention of existing trees = 483.42tCO2e.
Landscape Design Strategy implemented.	To address carbon and climate adaptation.
Habitat retention, creation and enhancement addressed in Biodiversity Net Gain Report.	Carbon storage associated with gains in vegetation.

Embodied Carbon

Raw Materials Embodied Carbon | Transport | Carbon Saving Opportunities | + Add New Material

Raw Materials Embodied Carbon Emissions (tCO2e): 53,671.51

Scheme design life (years): 1

Select rows to add to table:

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Category	Sub Category	Material	Quantity	Unit	Default Maintenance Percentage	Embodied tCO2e	Maintenance tCO2e	Comments
Series 1700 - Structural Concrete	Concrete-Construction General	Concrete - design mix (average)	800.00	m3	0.00%	210.44	0.00	Piling (Broombridge Ref. Design - Updated) MB
Series 1700 - Structural Concrete	Concrete-Construction General	Concrete - design mix (average)	770.00	m3	0.00%	202.55	0.00	Frame - Piers, Abutements, Ramps (Broombridge Ref. Design - Updated) MB
Series 1800 - Structural Steelwork	General	Portal frames	620.00	tonne	0.00%	908.10	0.00	Frame - Steel Box Deck (Broombridge Ref. Design - Updated) MB
Series 1700 - Structural Concrete	Concrete-Construction General	Concrete - design mix (average)	605.00	m3	0.00%	159.14	0.00	Upper Floors/Slabs - Steel Box Concrete Slab (Broombridge Ref. Design - Updated) MB
Series 1700 - Structural Concrete	Concrete-Construction General	Concrete - design mix (average)	473.55	m3	0.00%	124.57	0.00	Upper Floors/Slabs - Concrete Bridge Deck (Broombridge Ref. Design - Updated) MB
Series 1700 - Structural Concrete	Concrete-Construction General	Concrete - design mix (average)	348.00	m3	0.00%	91.54	0.00	Piling - (Tolka Bridge Ref Design) MB
Series 1700 - Structural Concrete	Concrete-Construction General	Concrete - design mix (average)	132.00	m3	0.00%	34.72	0.00	Foundations (incl. Pile Caps) - (Tolka Bridge Ref Design) MB
Series 1700 - Structural Concrete	Concrete-Construction General	Concrete - design mix (average)	113.85	m3	0.00%	29.95	0.00	Basement Retaining Walls - Abutements & Wingwalls (Tolka Bridge Ref Design) MB

Series 1700 - Structural Concrete	Concrete-Construction General	Concrete - design mix (average)	336.60	m3	0.00%	88.54	0.00	Upper Floors/Slabs - Deck - (Tolka Bridge Ref Design) MB
Series 1800 - Structural Steelwork	General	Beam	130.00	tonne	0.00%	181.87	0.00	Upper Floors/Slabs - Central Deck Section - (Tolka Bridge Ref Design) MB
Railtrack	Track foundation	Bottom ballast - limestone or granite	2900.00	m3	0.62%	53.62	0.34	Grass Track - JD
Railtrack	Track foundation	Waterproof and membranes	19402.00	m2	0.62%	10.09	0.06	Grass Track - JD
Series 1700 - Structural Concrete	Concrete-Construction General	Concrete - prescribed mix (average)	1471.25	m3	0.00%	401.18	0.00	Grass Track - JD
Railtrack	Track	Flat bottom rails	555.00	tonne	0.62%	616.01	3.85	Grass Track - JD
Railtrack	Track foundation	Bottom ballast - limestone or granite	593.00	m3	0.62%	10.96	0.07	Embedded Track - JD
Series 1700 - Structural Concrete	Concrete-Construction General	Concrete - prescribed mix (average)	443.85	m3	0.00%	121.03	0.00	Embedded Track - JD
Railtrack	Track	Sleepers - Concrete	2.80	Nr	0.62%	0.00	0.00	Embedded Track - JD
Railtrack	Track	Flat bottom rails	138.00	tonne	0.62%	153.17	0.96	Embedded Track - JD
Series 1700 - Structural Concrete	Concrete-Construction General	Concrete - design mix (average)	83906.00	m3	0.00%	22071.15	0.00	Detailed breakdown of P&R not available until final option selected. False quantity of concrete generated to reflect overall embodied carbon - YM
Series 1700 - Structural Concrete	Concrete-Construction General	Concrete - prescribed mix (average)	97135.00	m3	0.00%	26486.87	0.00	Detailed breakdown of P&R not available until final option selected. False quantity of concrete generated to reflect overall embodied carbon - YM
Series 1800 - Structural Steelwork	General	Portal frames	1168.00	tonne	0.00%	1710.74	0.00	Steel Frame P & R - YM

Raw Materials Embodied Carbon | Transport | Carbon Saving Opportunities | + Add New Material

Transport of Raw Materials Emissions (tCO2e): 2.22

Select rows to add to table:

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Transport Type	Distance	Unit	Transport tCO2e	Comments
HGV - All - Average	20.00	km	0.00	Earthworks Distances - MB
HGV - All - Average	15.00	km	0.02	Concrete Distances - MB
HGV - All - Average	50.00	km	0.05	Structural Steel - MB
HGV - All - Average	2000.00	km	2.15	Additional Structural Steel to come from factory in Spain, likely via sea shipping - MB
HGV - All - Average	0.00	km	0.00	

Raw Materials Embodied Carbon | Transport | Carbon Saving Opportunities | + Add New Material

Carbon Savings Identified but not Implemented

Description of options and how they will lead to carbon savings	Rationale for why the option has not been taken forward for implementation
Use of recycled cold pressed rubber for the rail encasement beam to reduce concrete requirements.	Designed not proved and never implemented on another network. Nor is it locally sourced.

Carbon Savings Identified and Implemented

Description of options and how they will lead to carbon savings	Rationale for implementation
Incorporation of concrete with 25% or 50% Ground Granulated Blastfurnace Slag (GGBS) to reduce the carbon footprint.	Lower carbon footprint than other cements produced in Ireland, the use of both 25% and 50% GGBS concrete reduced carbon emissions by 7647.5tCO2e.
Design is based on the use of a grass track.	50% lower concrete requirements associated with proposed vignole grass track proposed, reducing carbon by 729.42tCO2e.
Implementation of nature based SuDS solutions to provide attenuation.	Nature based SuDS solutions saved 9,484m of 1.2m diameter concrete culverting.

Construction

Excavation Activities | Construction Activities | Water Use During Construction Activities | Construction Worker Travel To Site | Construction Waste | Carbon Saving Opportunities

Excavation Activities Emissions (tCO2e): 32.89

Select rows to add to table:

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Excavation Category	Excavation Sub Category	Activity	Quantity	Unit	Activity tCO2e	Comments
Earthworks - Excavation	General Excavation	General Excavation - Other	7310.00	m3	7.5982	Excavated material for Drainage Pipework - JS
Earthworks - Excavation	General Excavation	General Excavation - Other	7188.00	m3	7.4714	Excavated Material for Bioretention Areas and Ponds (Note - potential pond at Tolka Valley not included - to be sized during detailed design stage) - JS
Earthworks - Excavation	Excavations for Cuttings	Excavation for Cuttings - Topsoil	9000.00	m3	3.969	MC
Earthworks - Excavation	Excavations for Cuttings	Excavation for Cuttings - Other	24000.00	m3	10.584	Small increase in cuttings (other) to account for the englargement of the ICW and excavation for P&R - MC
Earthworks - Excavation	Excavations for Foundations	Excavation for Foundation - Other	2000.00	m3	3.2666	MC

Excavation Activities | Construction Activities | Water Use During Construction Activities | Construction Worker Travel To Site | Construction Waste | Carbon Saving Opportunities

Construction Activities Emissions (tCO2e): 127.52

Total Fuel Use

Select rows to add to table:

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Activity Category	Energy Type	Total Fuel Use	Unit	Activity tCO2e	Comments
Construction - Electricity Use	Grid Electricity - Ireland	187586.00	kWh (Net CV)	56.4555	GD
Construction - Plant Use	Gasoil / Diesel	26640.00	Litre	71.06	GD

Excavation Activities | Construction Activities | Water Use During Construction Activities | Construction Worker Travel To Site | Construction Waste | Carbon Saving Opportunities

Construction Water Use Emissions (tCO2e): 0.01

Select rows to add to table:

5 Add rows

Activity Type	Water Use	Quantity	Unit	Activity tCO2e
Construction	Water Use - UK Average	42895.00	Litre	0.0064

Excavation Activities | Construction Activities | Water Use During Construction Activities | Construction Worker Travel To Site | Construction Waste | Carbon Saving Opportunities

Construction Worker Travel Emissions (tCO2e): 257.64

Select rows to add to table:

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Mode of Transport	Total distance travelled by workers during construction (km)	Transport tCO2e	Comments/ notes/ assumptions
Car - Average	864000.00	187.1078	GD
Bus - Average local	432000.00	54.9547	GD
Train - Light rail and tram	432000.00	15.5779	GD

Excavation Activities | Construction Activities | Water Use During Construction Activities | Construction Worker Travel To Site | Construction Waste | Carbon Saving Opportunities

Construction Waste Emissions (tCO2e): 288.58

☐ If detailed information on Construction Waste is **not** available check this box. **Warning!** This action will **clear all data** from the detailed table below.

Select rows to add to table:

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Waste Type	Waste Route	Quantity	Unit	Transport Mode	Distance	Distance Unit	Waste Processing Carbon tCO2e	Transport tCO2e	Comments
Aggregate and Soil Exported Off-Site	Landfill	30000.00	tonnes	HGV - All - Average	17.00	km	37.17	0.02	This could potentially be reused if an Article 27 is pursued - MC
Hazardous Waste	Landfill	2700.00	tonnes	HGV - All - Average	33.00	km	247.13	0.04	Includes non-hazardous waste which will need to go to landfill - MC
Concrete, Brick, Tiles and Ceramics	Recycled	4236.00	tonnes	HGV - All - Average	33.00	km	4.19	0.04	MC

Excavation Activities | Construction Activities | Water Use During Construction Activities | Construction Worker Travel To Site | Construction Waste | Carbon Saving Opportunities

Carbon Savings Identified but not Implemented

Description of options and how they will lead to carbon savings	Rationale for why the option has not been taken forward for implementation
Further use of public transport by workers.	To ensure a conservative estimation of transport tCO2e associated with construction worker travel
Increased use of electric vehicles	To ensure a conservative estimation of transport tCO2e associated with construction worker travel

Carbon Savings Identified and Implemented

Description of options and how they will lead to carbon savings	Rationale for implementation
Soil Re-use Checklist was implemented.	To explore the potential for soil reuse within the scheme.
Proposing to re-use approx. 4,000 m³ of site won material to reinstate an existing void at the Stabling Site.	Sending 4,000m3 of soil to landfill would involve 4.96tCO2e associated with waste processing and 0.02tCO2e associated with transportation.
Proposing to re-use all Topsoil excavated (9,000m³).	Reusing excavated soil can be an effective way to reduce the environmental impact of construction activities while also saving money and improving soil quality.
Larger construction sites, reducing number of construction phases to reduce waste	To facilitate optimised construction phases and cycles, reducing waste transport by 5% (0.005tCO2e).
Provision of satellite compounds to reduce travel distances	Reduce fuel consumption during the construction phase by 5% (3.553tCO2e).

Operational Energy Use

Operational Energy Use | Operational Water Use | Operational Waste | Landscaping and Vegetation | Carbon Saving Opportunities

Operational Energy Use Emissions (tCO2e): 8,177.09

Scheme design life (years): 1

Select rows to add to table:

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Energy Use Category	Energy Type	Annual Consumption	Unit	Annual Emissions tCO2e	Comments/notes/assumptions
Lighting	Grid Electricity - Ireland	45650.00	kWh (Net CV)	13.74	Annual consumption is 11kW x 4,150 hours. Assuming all lighting in run at full power from dusk to dawn - in reality some lighting will be dimmed after midnight, tram stop lighting may be switched off at midnight and park lighting may be switched by PIR detection, reducing consumption by 20% or more - KC
Other	Grid Electricity - Ireland	3440000.00	kWh (Net CV)	1035.30	2 traction substations - YB
Other	Grid Electricity - Ireland	460523.00	kWh (Net CV)	138.60	Stops - YB
Other	Grid Electricity - Ireland	23224020.00	kWh (Net CV)	6989.46	Park and Ride Facility - YB
Other	Renewable - Solar	319500.00	kWh (Net CV)	0.00	Solar array on P&R - CB

Operational Energy Use | Operational Water Use | Operational Waste | Landscaping and Vegetation | Carbon Saving Opportunities

Operational Water Use Emissions (tCO2e): 0.06

Scheme design life (years): 1

Select rows to add to table:

5 Add rows

Water Use	Annual Water Consumption	Unit	Annual Emissions tCO2e	Comments/notes/assumptions
Water Use - UK Average	401376.00	litres	0.06	GD

Operational Energy Use | Operational Water Use | Operational Waste | Landscaping and Vegetation | Carbon Saving Opportunities

Operational Waste Emissions (tCO2e): 1.79

Scheme design life (years): 1

Select rows to add to table:

5 Add rows

Waste Type	Waste Route	Annual Quantity	Unit	Transport Mode	Annual Distance	Distance Unit	Waste Processing Carbon tCO2e	Transport tCO2e
General Office Waste	Landfill	3.44	tonnes	HGV - All - Average	50.00	km	1.61	0.05
General Office Waste	Recycled	3.44	tonnes	HGV - All - Average	50.00	km	0.07	0.05

Operational Energy Use | Operational Water Use | Operational Waste | Landscaping and Vegetation | Carbon Saving Opportunities

Landscaping and Vegetation Emissions (tCO2e): -194.84

Select rows to add to table:

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Vegetation Type	Quantity	Unit	Carbon Sink tCO2e (added)	Comments/ notes/ assumptions
Transitional woodland scrub	1.27	Ha	34.4593	Mixed scrub - PB
Mixed Forest	1.62	Ha	160.38	Urban tree - PB

Operational Energy Use | Operational Water Use | Operational Waste | Landscaping and Vegetation | Carbon Saving Opportunities

Carbon Savings Identified and Implemented

Description of options and how they will lead to carbon savings	Rationale for implementation
Promote active transport by provision of bicycle and walking tracks along route and dedicated bicycle storage provisions.	Low carbon transport.
Reduce energy needs/requirements for substations by providing an array of PV panels.	Reduce reliance on fossil fuels powering substations. Lowering carbon by 96.16tCO2e.
Reference Design Report - Sustainable Energy Design Plan (LDD101-BEV-PS-ROUT-XX-RP-PS-00004) considers a wide operating temperature range for all electrical MV, Traction and LV equipment.	To prevent the need for specific air conditioning, ventilation, or heating equipment/systems.
Park lighting may be switched by PIR detection.	To limit energy requirements as necessary.
Some lighting will be dimmed or switched off after certain times.	In line with DCC Policy of not lighting parks at night-time.

Rail User Emissions

Road Use | Train Operation | Carbon Saving Opportunities

Road Use Emissions (tCO2e): -180.23

REM Outputs: Do Minimum Scenario (tCO2e)	REM Outputs: Do Something Scenario (tCO2e)	Difference DS-DM Scenarios (tCO2e)	Comments/notes/assumptions
4711.53	4531.30	-180.23	Based on the design year 2050 - MK

User Transport

Total Do-Something Emissions (tCO2e): 5,566.60

Difference DS-DM Scenario (tCO2e): 5,566.60

Road Use | Train Operation | Carbon Saving Opportunities

Train Operation Emissions (tCO2e): 1,035.30

Scheme design life (years): 1

Energy Use Category	Energy Type	Annual Consumption	Unit	Annual Emissions tCO2e	Total emissions from train operation for project lifetime
Train Operation	Grid Electricity - Ireland	3440000.00	kWh (Net CV)	1035.30	1035.30

User Transport

Total Do-Something Emissions (tCO2e): 5,566.60

Difference DS-DM Scenario (tCO2e): 5,566.60

Road Use | Train Operation | Carbon Saving Opportunities

Carbon Savings Identified and Implemented

Description of options and how they will lead to carbon savings	Rationale for implementation
The provision of a 350-space Park & Ride beside the St Margaret's Road Luas stop	It will support the removal of vehicular traffic from the road network, thus contributing to the decarbonisation of travel.

Maintenance

Maintenance Plant Fuel Use | Carbon Saving Opportunities

Maintenance Plant Fuel Use Emissions (tCO2e): 59.73

Scheme design life (years): 1

Select rows to add to table:

5 Add rows

Fuel Type	Annual Quantity	Unit	Annual Emissions tCO2e	Comments/notes/assumptions
Gasoline (Petrol)	24300.00	Litre	59.73	GD

Maintenance Plant Fuel Use | Carbon Saving Opportunities

Carbon Savings Identified but not Implemented

Description of options and how they will lead to carbon savings	Rationale for why the option has not been taken forward for implementation
Use of electric vehicles to be factored in.	Dependent on third party vehicle fleet.

End of Life

Deconstruction Activities | Decommissioning Waste | Carbon Saving Opportunities

Deconstruction Activities Emissions (tCO2e): 23.62

Select rows to add to table:

5 Add rows

Activity Category	Activity Type	Fuel Type	Fuel Use per hour	Unit	hours per day	total days	Activity tCO2e	Comments
Deconstruction	Plant Use	Gasoil / Diesel	3552.00	Litre	1.00	1.00	9.47	Based on total of 3,552l of diesel - GD
Deconstruction	Generator Use	Grid Electricity - Ireland	47000.00	kWh (Net CV)	1.00	1.00	14.15	Based on total of 47,000kWh - GD

Deconstruction Activities | Decommissioning Waste | Carbon Saving Opportunities

Decommissioning Waste Emissions (tCO2e): 32.76

Select rows to add to table:

5 Add rows

Waste Type	Waste Route	Quantity	Unit	Mode	Distance	Distance Unit	Waste Processing Carbon tCO2e	Transport tCO2e	Comments
Mixed Metals	Recycled	1463.00	tonnes	HGV - All - Average	33.00	km	31.15	0.04	Steelwork - GD
Concrete, Brick, Tiles and Ceramics	Landfill	1236.84	tonnes	HGV - All - Average	33.00	km	1.53	0.04	Concrete - GD

Deconstruction Activities | Decommissioning Waste | Carbon Saving Opportunities

Carbon Savings Identified but not Implemented

Description of options and how they will lead to carbon savings
Reduced decommissioning activities associated with limited decommissioning.

Carbon Savings Identified and Implemented

Description of options and how they will lead to carbon savings
Assumed high percentage of recoverable, recyclable or reuse in place relevant for project.

Light Rail Summary

Emissions Breakdown By Stage | Embodied Carbon Emissions Breakdown | Detailed Breakdown | Emissions Intensity | Carbon Savings Options | Pie Charts

Export All Tables

Show/Hide Graph

Export Table

Show 5 entries

Search:

Option	Name	Pre-Construction	Embodied Carbon	Construction Activities	Construction Waste	Operational Use	User Emissions	Maintenance	End of Life	Total
All	All	All	All	All	All	All	All	All	All	All
1		49.8	53,673.7	418.1	288.6	7,984.1	-180.2	59.7	56.4	62,350.1

Emissions Breakdown By Stage | Embodied Carbon Emissions Breakdown | Detailed Breakdown | Emissions Intensity | Carbon Savings Options | Pie Charts

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Option	Name	Series 300 - Fencing and Environmental Noise Barriers	Series 400 - Road Restraint System	Series 500 - Drainage and surface ducts	Series 600 - Earthworks	Series 1200 - Traffic Signs and Road Markings	Series 1500 - Traffic Control and Communications	Series 1600 - Piling and Embedded Retaining Walls	Series 1700 - Structural Concrete	Series 1800 - Structural Steelwork	Series 2400 - Brickwork, Blockwork and Stonework	Railtrack	Other-Street Furniture and Electrical Equipment	Other-Timber	Other-Tunnels
All	All	All	All	All	All	All	All	All	All	All	All	All	All	All	All
1		0.0	0.0	0.0	0.0	0.0	0.0	0.0	50,021.7	2,800.7	0.0	843.9	0.0	0.0	0.0

Emissions Breakdown By Stage | Embodied Carbon Emissions Breakdown | Detailed Breakdown | Emissions Intensity | Carbon Savings Options | Pie Charts | Export All Tables

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Show 5 entries | Search:

		Embodied Carbon		Construction Activities						Construction Waste		Light Rail Use					Maintenance	
Option	Name	Materials	Material Transport	Clearance and demolition	Land Use Change and Vegetation Loss	Clearance and Demolition Water Use	Excavation	Construction Water Use	Plant Use	Construction Worker Travel to Site	Construction Waste Disposal	Construction Waste Transport	Operational Energy	Operational Water	Operational Waste Disposal	Operational Waste Transport	Landscaping and Vegetation	Maintenance Material	Maintenance Plant
		All	All	All	All	All	All	All		All	All	All	All	All	All	All	All	All	All
1		53,666.2	2.2	10.9	38.9	0.0	32.9	0.0	127.5	257.6	288.5	0.1	8,177.1	0.1	1.7	0.1	-194.8	5.3	59.7

Emissions Breakdown By Stage | Embodied Carbon Emissions Breakdown | Detailed Breakdown | Emissions Intensity | Carbon Savings Options | Pie Charts | Export All Tables

Show/Hide Graph | Export Table

Show 5 entries | Search:

				Construction Waste		Light Rail Use					Maintenance		User Emissions		End of Life			
tion	Construction Water Use	Plant Use	Construction Worker Travel to Site	Construction Waste Disposal	Construction Waste Transport	Operational Energy	Operational Water	Operational Waste Disposal	Operational Waste Transport	Landscaping and Vegetation	Maintenance Material	Maintenance Plant	Customer Use (Road Vehicle Use)	Train Operation	Decommissioning Emissions	Decommissioning Waste Disposal	Decommissioning Waste Transport	Total
	All		All	All	All	All	All	All	All	All	All	All	All	All	All	All	All	
32.9	0.0	127.5	257.6	288.5	0.1	8,177.1	0.1	1.7	0.1	-194.8	5.3	59.7	-180.2	1,035.3	23.6	32.7	0.1	63,385.4

Emissions Breakdown By Stage | Embodied Carbon Emissions Breakdown | Detailed Breakdown | Emissions Intensity | Carbon Savings Options | Pie Charts | Export All Tables

Show/Hide Graph | Export Table

Show 5 entries | Search:

Option	Name	tCO2e per km of rail	tCO2e per Euro spent
All	All	All	All
1		0.00000	0.00025

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Údarás Náisiúnta Iompair
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