Tritax Symmetry (Hinckley) Limited

HINCKLEY NATIONAL
RAIL FREIGHT INTERCHANGE

The Hinckley National Rail Freight Interchange Development Consent Order

Project reference TR050007

Environmental Statement
Volume 2: Technical Appendices

Appendix 18.2: RIBA Stage 1 Embodied Carbon Report

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Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 Regulation 5(2)(a)

The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 Regulation 14

This document forms a part of the Environmental Statement for the Hinckley National Rail Freight Interchange project.

Tritax Symmetry (Hinckley) Limited (TSH) has applied to the Secretary of State for Transport for a Development Consent Order (DCO) for the Hinckley National Rail Freight Interchange (HNRFI).

To help inform the determination of the DCO application, TSH has undertaken an environmental impact assessment (EIA) of its proposals. EIA is a process that aims to improve the environmental design of a development proposal, and to provide the decision maker with sufficient information about the environmental effects of the project to make a decision.

The findings of an EIA are described in a written report known as an Environmental Statement (ES). An ES provides environmental information about the scheme, including a description of the development, its predicted environmental effects and the measures proposed to ameliorate any adverse effects.

Further details about the proposed Hinckley National Rail Freight Interchange are available on the project website:

[redacted]

The DCO application and documents relating to the examination of the proposed development can be viewed on the Planning Inspectorate's National Infrastructure Planning website:

https://infrastructure.planninginspectorate.gov.uk/projects /east- midlands/hinckley-national-rail-freight-interchange/

Appendix 18.2 ◆ RIBA Stage 1 Embodied Carbon Report

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Disclaimer - The LCA predictions of embodied impacts, by their very nature, cannot be exact. It is not possible to track all the impacts associated with a product or service back through history accurately. Generic cost and environmental impact coefficients do not necessarily correspond to those of individual brands of the same product or service due to differences within industries in the way these products and services are delivered. Additionally, the modelling is only as accurate as the information provided, where this is not robust enough assumptions have been made to ensure modelling can take place. Ridge & Partners LLP cannot make assurances regarding the accuracy of these reports for the above reasons.

Version	Date	Description	Created by	Reviewed by
1.0	19.08.22	Stage 1 Embodied Carbon Report	Wendy Broomhead	James Lomas-Holt
2.0	14.03.23	Update to include Highways Infrastructure	James Ball	Wendy Broomhead

EXECUTIVE SUMMARY

1.1. Ridge & Partners LLP have been appointed by Tritax Symmetry to undertake a RIBA Stage 1 Embodied Carbon Assessment for the proposed rail head, highways infrastructure and logistics park at Hinckley National Rail Freight Interchange (HNRFI). The modelling results are based on the outline planning information provided over the course of RIBA Stage 1.

1.2. The results for the warehouse units are based on comparisons with historic embodied carbon data generated and collated for other similar units on Tritax Symmetry logistic parks across the UK using Etool software and the Ecoinvent database. The results for the rail head terminus have been based on the outline plans modelled using RSSB Rail Carbon Tool by Atkins & Faithful & Gould which utilises the ICE database and assumptions in the construction of the track and freight storage and handling areas. The results for the highways infrastructure are based on design team information modelled using OneClick software and the Ecoinvent database.

1.3. The information will be further developed by the team during the upcoming detailed design and construction stages. The headline RIBA Stage 1 results are reported below:

	Logistic Units & Welfare	**Railport & Railhead Infrastructure**	**Highways Infrastructure**
Upfront Embodied Carbon (Modules A1- A5)	**287,821** tCO_2eq	**10,133** tCO_2eq	**13,744** tCO_2eq

INTRODUCTION

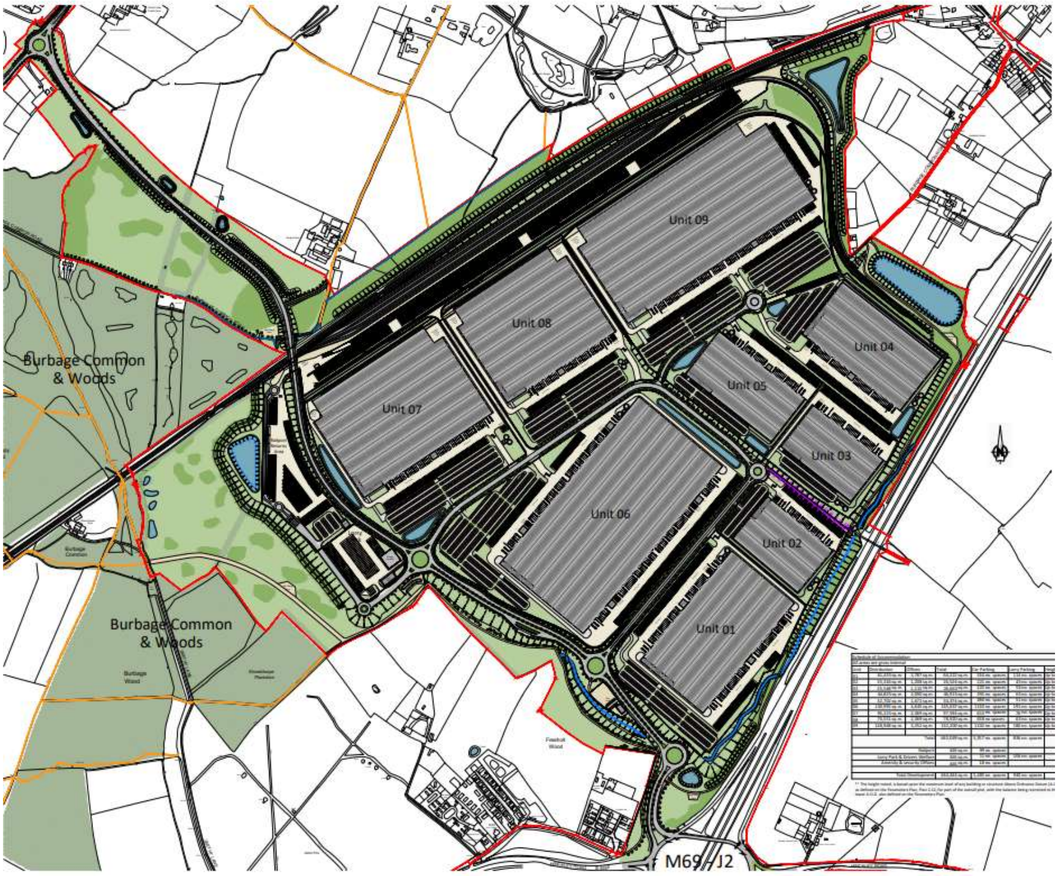
1.4. Ridge & Partners LLP have been appointed by Tritax Symmetry to undertake an embodied carbon assessment for the proposed rail head and rail port works, highways infrastructure and the logistic units at Symmetry Park Hinckley. The purpose of the assessment is to quantify the upfront embodied carbon associated with the proposed scheme to ascertain the impact on the Global Climate for reporting within the Environmental Statement.

1.5. Due to the similarity in the Tritax Symmetry Base Build product, this report and study builds on design and construction stage studies on other, similar projects. RIBA Stage1 information has been provided by the project team to allow an early stage estimate of the embodied carbon expected within the logistics park development. Further modelling will be carried out during future design development and construction phases to update the estimates above. Post-construction (RIBA Stage 6) phase, as-built verification of the embodied carbon for the logistic units will form the basis of the Tritax Symmetry Net Zero Carbon 'In Construction' declaration for each building.

PROJECT SCOPE

1.6. The development involves the construction of a new rail head and rail port alongside industrial units, incorporating warehousing, office space and welfare facilities plus service yards, car and cycle parking, bin stores and associated hard and soft landscaping, southern slip roads to M69 Junction 2, a new link road and other off site highway improvements.

Figure 1. Site Master Plan



1.7. The project information used included:

- Ridge & Partners Tritax Symmetry Master Development Sustainability Tracker (see extract in App A)
- WSP drawings for the Rail head and rail port (see drawing list in App A)
- AJA Architect Drawings for the logistics park (see drawing list in App A)

1.8. Additional information for typical rail head and rail port details were provided by papers published online as listed in Appendix A.

1.9. Additional information on the materials for the highways infrastructure provided by BWB Consulting.

BACKGROUND – NET ZERO CARBON & DESIGN GUIDANCE

1.10. Carbon Dioxide (CO_2) and other Greenhouse Gas emissions play a pivotal role in anthropogenic climate change. The release of these gases through human activity has been directly attributed to increases in global mean temperatures and more extreme fluctuation in climate across the planet. The built environment forms a substantial part of the UK's annual carbon emissions, so identifying and reducing the carbon emissions associated with this sector will form a key part of the UK's decarbonisation drive.

1.11. Emissions can be split into two different types: operational carbon and embodied carbon. Operational carbon, associated with the energy usage of buildings in use, has been the focus of legislation for a number of years as an attempt to quantify and reduce the impact (e.g., reduction in allowable emissions in the Approved Building Regulations Document Part L). Embodied carbon encompasses the emissions associated with the manufacture and transportation of materials and the construction of a development. It also covers the maintenance, replacement and end of life impacts over the development's lifetime. Upfront Embodied carbon refers to the impacts associated with the construction of the unit, up to practical completion.

1.12. Currently embodied carbon is a less defined area of impact and is not controlled by UK / EU legislation, but it is steadily becoming clear that reductions in embodied carbon will become increasingly important to reducing the carbon emissions of the UK.

Figure 2. Illustration of Embodied and Operational carbon sources, courtesy of Skanska [redacted]

NET ZERO CARBON (NZC)

1.13. Some industry bodies are looking beyond quantification and reduction of embodied carbon emissions and are pushing for proactive carbon offsetting to achieve a Net Zero emissions balance. The UK Green Building Council (UKGBC) have developed a framework definition for Net Zero Carbon buildings, which sets out the process for demonstrating that a development has achieved Net Zero Carbon status (ref: Net Zero Carbon Buildings: A Framework Definition, 2019). The UKGBC route applies the principles of the RICS methodology for whole life carbon (Ref: Whole life carbon assessment for the built environment 1st edition, November 2017). At this stage of the framework's development, the emphasis is on two different definitions for Net Zero Carbon buildings (see overleaf):

Figure 3. (Left) UKGBC, Net Zero Carbon Buildings: A Framework Definition (front cover). (Right) UKGBC buildings framework definitions and principles for approaches to Net Zero Carbon.

1.14. The UKGBC Framework instils principles that aim to improve transparency to create robust requirements and encourage action in the industry. The current guidance is intended as a steppingstone to a more robust Net Zero Carbon assessment process.

1.15. Tritax Symmetry are a Gold Leaf member of UKGBC and have committed to deliver all units to UKGBC's Net Zero Carbon 'In Construction' framework

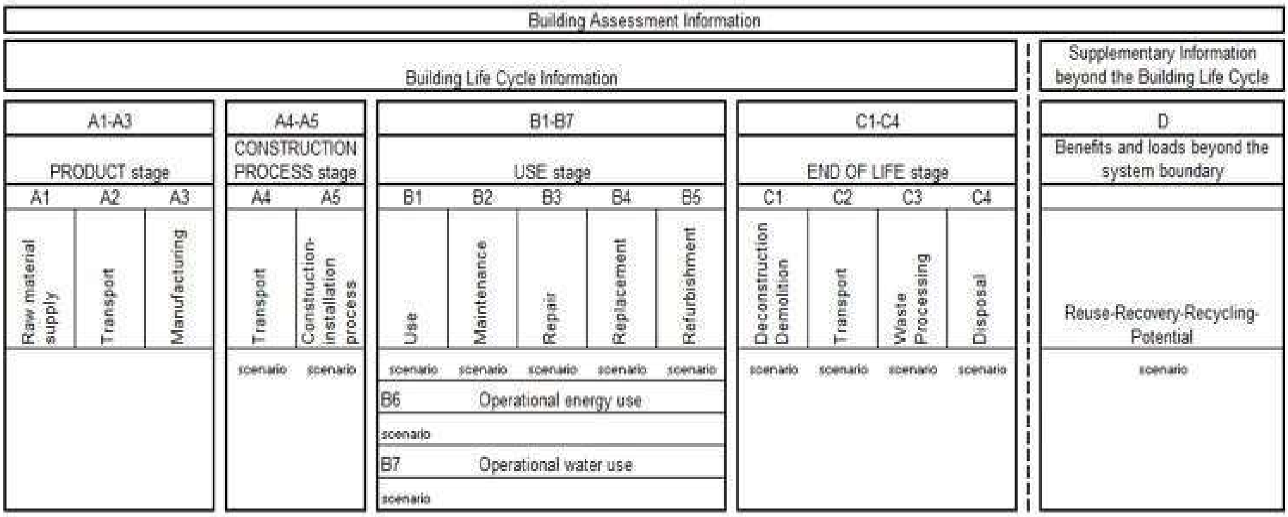
METHODOLOGY

1.16. The quantification of carbon dioxide emissions associated with this development has been achieved through the application of Life Cycle Assessment (LCA) principles. LCA covers a wide range of environmental indicators for materials, including principally, Global Warming Potential or GWP (kgCO_2eq). GWP provides the value of an elements embodied carbon emissions, which can then be scaled up to reflect the overall embodied carbon impact across an entire scheme.

1.17. Due to the limited design information available at Outline Application Stage, the embodied carbon associated with the warehouse units and the linking infrastructure, has been estimated based on data collected from historic Tritax Symmetry units where detailed LCA modelling has taken place. The upfront embodied carbon for the rail head has been estimated using RSSB Rail Carbon Tool by Atkins & Faithful & Gould which utilises the ICE database and generic industry standard construction details for the rail head and rail port. Information for the highways infrastructure was provided by BWB engineers based on the master plan slip road, link road and off site highway works layouts. This also includes the road and pedestrian bridges over the railway. Due to the early stage of design development and limited information available, these estimates will be approximate only and will vary based on the detailed design and with the construction methodology. It is considered that they do however represent a reasonable estimate of the impact of the development.

1.18. The scope of impacts under an LCA is often characterised across 'modules' (A to D) reflecting the timeline from production of materials through to their eventual disposal as set out in Figure 4 below.

Figure 4 Life cycle stages and modules as per EN 15804 [redacted]



1.19. To understand the immediate carbon impacts of the scheme, the study has focused on the upfront carbon emissions (EN 15978 modules A1-A5,)

1.20. The modelling approach has been based on the RICS Whole Life Carbon guidance.

1.21. For the Industrial units, the historic data used the software used was eTool LCA, an online software system allowing organisations to undertake detailed LCA studies. The datasets used were all derived from the eTool 'Default' software database, comprising of a mix of product specific EPDs and generic, ISO 14040 / 14044 compliant datasets (using Ecoinvent's globally recognised data as the upstream database).

1.22. For the rail head works and rail port carbon was modelled using the RSSB Rail Carbon Tool by Atkins & Faithful & Gould which utilises the ICE database.

1.23. For the highways works carbon was modelled using One Click LCA, using product specific Environmental Porduct Declarations (EPDs) and One Click's default ISO 14040 / 14044 compliant dataset.

SCOPING

1.24. According to the RICS guidance new build projects should be considered to commence on a cleared, flat site for consistency purposes. Therefore, works associated with site preparation such as cut and fill have been excluded, though general topsoil strip and excavation for individual elements (e.g., foundations) and specialist groundworks (e.g., stabilisation) are typically included.

1.25. The carbon associated with the rollingstock and cranes at the rail head has also at this time not been included because it is considered to be outside of the scope of the developer.

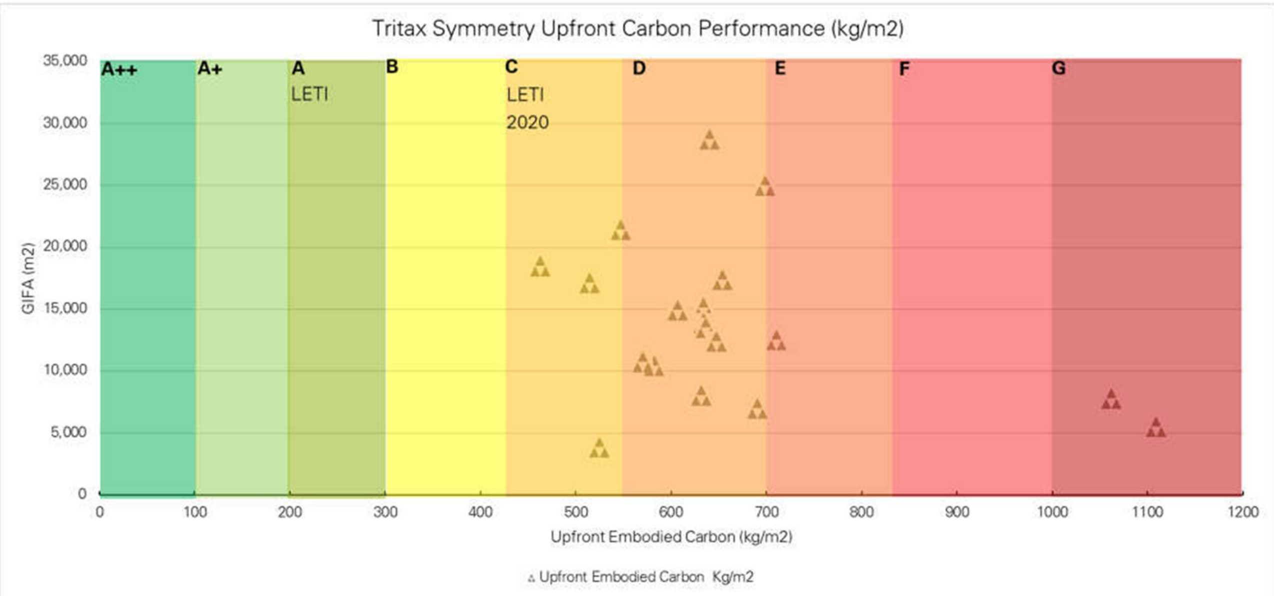
1.26. The RICS 'Whole Life Carbon' guidance requires that 95% of the cost of each major element (e.g., substructure, superstructure) is included in the modelling, allowing for some smaller items to be excluded. This approach is based on the correlation between high cost and high environmental impact for materials, generally. This rule was applied where possible throughout each of the key elements.

RESULTS AND DISCUSSION

Logistics Park

1.27. The figure below shows the range of historic data taken from other similar developments. The GIFA of each unit has been used to pick an assumed 'Upfront' embodied carbon impact based on similar sized units.

Figure 5. Historic Results of Upfront Carbon for Tritax Symmetry Units set against LETI 'Retail' benchmarks.



1.28. Based on the figures above it is possible to estimate the Upfront Carbon for the units proposed on the Hinckley site. The carbon intensity is reducing with time as contractors find ways of delivering lower carbon developments. Additionally, there will be a reduction in carbon density with the development as the site density increases as seen with the larger units.

Table 1. Estimated Upfront Carbon Emissions of the logistic units.

Unit	GIFA (sq,m)	Assumed Upfront Embodied Carbon density (*based on fig 1)* ($KgCO_2$eq.sq.m)*	Assumed Upfront Embodied Carbon (tCO_2eq.)*
01	64,222	550	37,045,
02	26,524	600	15,914
03	26,663	600	15,998
04	46,915	550	25,803
05	34,374	600	20,624
06	135,637	450	61,037
07	97,594	500	48,797
08	78,920	500	39,460
09	132,200	450	59,490
Welfare	465	750	349
Amenity/ security	465	750	349
Total	647,111		287,821

**The above totals include an allowance for local estate roads.*

RAIL HEAD AND RAIL PORT

2.1. Below sets out the results of the upfront carbon modelling from the rail head and rail port -

Table 2. Estimated Upfront Carbon Emissions of the rail head and rail port.

Element	Sub-element	Upfront Carbon Impact (tCO2eq)
Rail (22,000m)	CEN 60 rails	2,890
	RC Sleepers	236
	180mm subbase	66
	RC retaining wall	150
Container Storage Slab incl (47,000m2)	300mm RC slab	5,157
	150mm subbase	110
	250mm capping layer	135
Driver's Platform (9,185m)	RC slab	359
	150mm subbase	42
Acoustic Fencing (3,800m)	Timber acoustic fence	60
Construction Transport (A4)		461
Construction Site Equipment Impact (A5)		461
Upfront Construction Total		10,127

HIGHWAYS INFRASTRUCTURE

2.2. Below sets out the results of the upfront carbon modelling from the slip roads, link road, off site highway works road bridge and pedestrian bridge -

Table 3. Estimated Upfront Carbon Emissions of the highway works.

Element	Sub-element	Upfront Carbon Impact (tCO_2eq)
Main Highway Works (slip roads and A47 link road)	Bituminous Pavement	3,163
	Type 1	9
	CBGM Subbase	3,303
	6F Capping	74
	Gullies	15
	600mm Diameter Pipes	80
	100mm Plastic Ducts	14
	Lighting Columns	24
	Post & Rail Fence	68
	Concrete Retaining Walls	136
	Traffic Signal Poles	7
	Precast Concrete Kerbs	188
	Steel Barriers	101
	Manholes	27
Remote Junctions	Bituminous Pavement	267
	Type 1	1
	CBGM Subbase	58
	6F Capping	1
	Gullies	1
	100mm Plastic Ducts	9
	Lighting Columns	16
	Precast Concrete Kerbs	40
Railway Footbridge	Steel Structure	81
Concrete Road Bridge Structure	Structure and Piled Foundation	1,555
Construction Transport (A4)		1,560
Construction Site Equipment Impact (A5)		2,937
Upfront Construction Total		13,744

SUMMARY

2.3. The modelling results are based on the outline planning information with the warehouse units and their local road network based on comparisons with historic similar TSL units ; structural design of the highway works provided by BWB and the rail head terminus based on modelling using RSSB Rail Carbon Tool by Atkins & Faithful & Gould. The results are shown below.

	Logistic Units & Welfare	**Railport & Railhead Infrastructure**	**Highway Works**
Upfront Embodied Carbon (Modules A1- A5)	**287,821** tCO_2eq	**10,133** tCO_2eq	**13,744** tCO_2eq

2.4. Tritax Symmetry have committed to delivering the logistics units base build and the Rail port and rail head to the UKGBC Net Zero Carbon in Construction framework.

2.5. It is recommended that the modelling is further developed by the team during the upcoming detailed design and construction stages.

Appendix – Input Sources

2.6. Logistic Park Data – Based on historic modelling of other UK Tritax Symmetry units as listed below and unit layouts based on application masterplan:

Table 3. Estimated Upfront Carbon Emissions of other UK Tritax Symmetry Units.

Development Name	Unit	GIFA (m2)	Upfront Embodied Carbon CO_2eq Kg/m2
Biggleswade	Phase 2, unit 2	14,864	607
	Phase 2, unit 3	6,968	691
	Phase 2, unit 4	21,368	548
	Phase 2, unit 5	10,405	582
Bicester	Plot C, Unit C	24,969	699
Merseyside	Unit 1	15,041	634
Rugby	Unit 1	12,513	711
	Unit 2	17,304	655
Ma6nitude	Plot 1a, unit 11	13,843	634
	Plot 1a, unit 12	3,809	525
Banbury	Unit 6	18,464	463
	Unit 9	7,780	1062
	Unit 10	13,452	637
Aston Clinton	Unit 4	8,025	463
	Unit 5	17,094	515
	Unit 6	10,684	571
Doncaster / Blyth	Unit A	39,971	500
	Unit 3	12,333	648
Kettering	Unit 2	28,672	641

Rail Head Data –

Drawings and plans taken from WSP and AJA:

WSP -
70080518-WSP-DRG-ETR-00201-P01
70080518-WSP-DRG-ETR-00202-P01
70080518-WSP-DRG-ETR-00203-P01
70080518-WSP-DRG-ETR-000201-P01
70080518-WSP-DRG-ETR-000202-P01
70080518-WSP-DRG-ETR-000209-11-P01

AJA -
5905-249 Illustrative Masterplan

5905-260 Illustrative Sections Through Railport

Container Slab:
Typical slab specification extracted from the British Port Association for around 4no. stacked containers: (including 192kN load and 3% CBR)

- C32/40 300mm thick concrete slab incl a393 mesh
- 150mm type 1 subbase
- 250mm capping layer

Concrete Sleepers:
Typical concrete railway sleepers between 2500mm and 2600mm length including:

- 4pcs cast shoulders (steel)
- 4pcs clips (steel)
- 4pcs toe insulators and collars (nylon)
- 2pcs rail pads (natural rubber)
- 4pcs seal plates (polypropylene)

Source: ICE library 2. DESIGN CONSIDERATIONS | Concrete railway sleepers [redacted] and spacings between 450mm and 650mm (source The importance of sleepers spacing in railways - ScienceDirect

Ballast:
Typically 150mm on lightly trafficked lines, increased by 10% for concrete sleepers => assume 180mm thick

Source: 12. Railway track ballast | Geological Society, London, Engineering Geology Special Publications [redacted]

Tracks: assumed CEN 60