Karndean Designflooring

VERIFIED by SCS Global Services
ENVIRONMENTAL PRODUCT DECLARATION
BASED ON LCA

Declaration Owner

Karndean Designflooring
Crab Apple Way, Vale Park, Evesham
Worcestershire, WR11 1GP
United Kingdom
www.karndean.com

The EPD owner has the sole ownership, liability, and responsibility for the EPD

Product

Engineered Plastic Composite (WPC/EPC) Flooring:

- Korlok (May be called Capitol Rigid Core or Abode Vibe in Australia)
- Van Gogh Rigid Core (6.5mm)
- Korlok Select/Korlok Reserve Rigid Core
- Art Select Rigid Core

UNSPSC Class Code 30161707

EPD represents delivery of product to customers in North America, the United Kingdom and Australia.

Functional Unit

The functional unit is one square meter of flooring installed and maintained over a 1-year period

EPD Number and Period of Validity

SCS-EPD-10447
EPD Valid June 19, 2025 through June 18, 2030

Product Category Rule

Product Category Rule PCR 2019:14. Construction Products. International EPD® System. Version 1.3.4, VALID UNTIL: 2025-06-20. Complementary Product Category Rules (c-PCR) To PCR 2019:14. Resilient, Textile And Laminate Floor Coverings (EN 16810:2017). International EPD® System. VERSION: 2024-04-30, VALID UNTIL: 2025-06-20.
CEN standard EN 15804 serves as the core Product Category Rules (PCR)

Program Operator

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SCSglobal SERVICES

Declaration Owner:	Karndean Designflooring
Address:	Crab Apple Way, Vale Park, Evesham, Worcestershire, WR11 1GP, United Kingdom
Declaration Number:	SCS-EPD-10447
Declaration Validity Period:	June 19, 2025 through June 18, 2030
Program Operator:	SCS Global Services
Declaration URL Link:	https://www.scsglobalservices.com/certified-green-products-guide
LCA Practitioner:	Gerard Mansell, Ph.D., SCS Global Services
LCA Software and LCI database:	OpenLCA v2.4 software and the Ecoinvent v3.11 database
Product RSL:	1 year
Markets of Applicability:	North America; United Kingdom; Australia
EPD Type:	Product-Specific
EPD Scope:	Cradle-to-Grave and Module D
LCIA Method and Version:	EF3.1(EN15804)
Independent critical review of the LCA and data, according to ISO 14044 and ISO 14071	☐ internal ☒ external
LCA Reviewer:	Lindita Bushi Lindita Bushi, PhD, Athena Sustainable Materials Institute
Part A Product Category Rule:	Product Category Rule PCR 2019:14. Construction Products. International EPD® System. Version 1.3.4, VALID UNTIL: 2025-06-20.
Part A PCR Review conducted by:	The Technical Committee of the International EPD® System. Review chair: Claudia A. Peña, University of Concepción, Chile.
Part B Product Category Rule:	Complementary Product Category Rules (c-PCR) To PCR 2019:14. Resilient, Textile And Laminate Floor Coverings (EN 16810:2017). International EPD® System. VERSION: 2024-04-30, VALID UNTIL: 2025-06-20.
Part B PCR Review conducted by:	The Technical Committee of the International EPD® System.
Independent verification of the declaration and data, according to ISO 14025 and the PCR	☐ internal ☒ external
EPD Verifier:	Lindita Bushi Lindita Bushi, PhD, Athena Sustainable Materials Institute
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Disclaimers: *This EPD conforms to ISO 14025, 14040, 14044, and EN 15804.*

Scope of Results Reported: *The PCR requirements limit the scope of the LCA metrics such that the results exclude environmental and social performance benchmarks and thresholds, and exclude impacts from the depletion of natural resources, land use ecological impacts, ocean impacts related to greenhouse gas emissions, risks from hazardous wastes and impacts linked to hazardous chemical emissions.*

Accuracy of Results: *Due to PCR constraints, this EPD provides estimations of potential impacts that are inherently limited in terms of accuracy.*

Comparability: *EPDs within the same product category but registered in different EPD programmes, or not compliant with EN 15804, may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025.*

The owner of the declaration shall be liable for the underlying information and evidence; SCS shall not be liable with respect to manufacturer information, life cycle assessment data, and evidence supplied or made available to SCS.

1. Karndean Designflooring

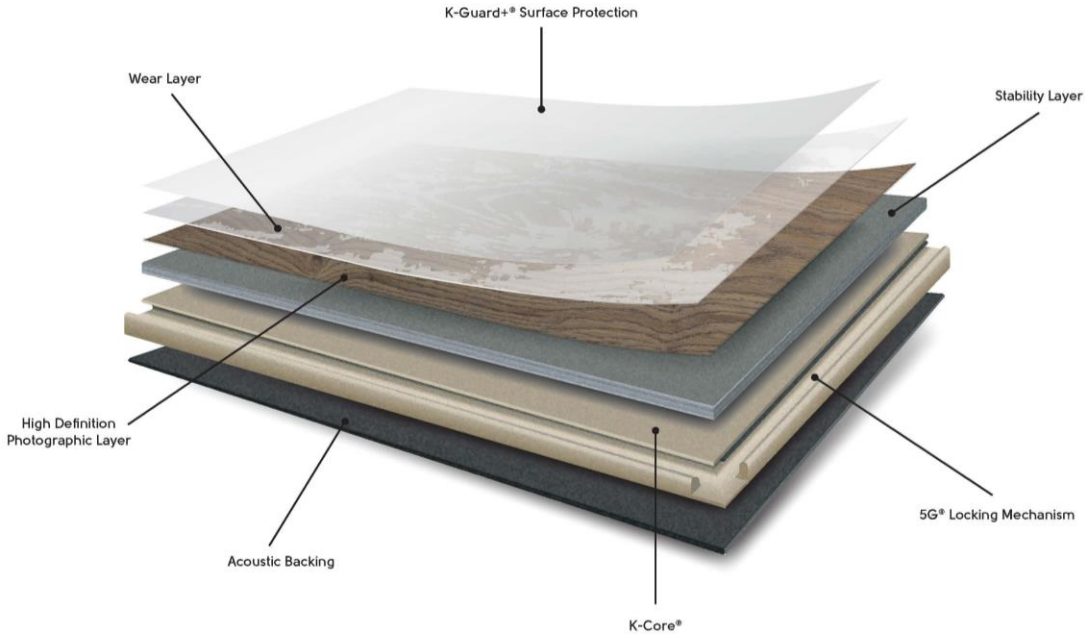
Karndean Designflooring is a global leader in flooring design with operations in the UK, North America, Australia and New Zealand. By offering a wide range of colours, textures and finishes, our products allow you to create looks that are unique to your home or business and are guaranteed to last. With a passion for creating floors which are both stylish and practical, we're here to help customers find the right floor for their space, needs and unique style.

At Karndean, we see flooring differently. From the ancient forests of Europe, to the remote Australian outback and beyond, we seek out expressive and intriguing forms in the natural world to influence our unique floor designs. By combining these original features with cutting edge design, we create simply beautiful floors that you'll love for a lifetime.

2. Product

2.1 PRODUCT DESCRIPTION

Karndean Designflooring's Rigid Core products are suitable for both commercial and residential interiors. The products covered in this environmental product declaration are available in a wide variety of designs, formats and sizes, including both tiles and planks. These products are structured into a number of layers, as shown in the diagram below, and comprise of a rigid core to assist in installation over uneven subfloors, and a pre-attached acoustic backing specifically engineered to give excellent acoustic properties, reducing noise transfer to rooms below. Regrind is included in the stability layers of the product.



2.2 PRODUCT FLOW DIAGRAM

A flow diagram illustrating the production processes and life cycle phases included in the scope of the EPD is provided below.

2.3 APPLICATION

The WPC/EPC products provide the primary function of flooring for interior applications. The flooring products are used in various residential and commercial applications including retail, healthcare, education, and hospitality.

2.4 DECLARATION OF METHODOLOGICAL FRAMEWORK

The scope of the EPD is cradle-to-grave and Module D, including raw material extraction and processing, transportation, product manufacture, product delivery, installation and use, and product disposal. The life cycle phases included in the product system boundary are shown below.

Cut-off and allocation procedures are described below and conform to the PCR and ISO standards.

Table 1. *Life cycle phases included in the product system boundary.*

	Product			Construction Process		Use							End-of-life				Benefits and loads beyond the system boundary
	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
	Raw material extraction and processing	Transport to manufacturer	Manufacturing	Transport	Construction - installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction demolition	Transport	Waste processing	Disposal	Reuse, recovery and/or recycling potential
Modules Declared	x	x	x	x	x	n/a	x	n/a	n/a	n/a	n/a	n/a	x	x	x	x	x
Geography	GLO	GLO	CN VN	GLO	NA GB RER AU	n/a	NA GB RER AU	n/a	n/a	n/a	n/a	n/a	NA GB RER AU	NA GB RER AU	NA GB RER AU	NA GB RER AU	NA GB RER AU
Share of specific data	>90%			>90%		-	-	-	-	-	-	-	-	-	-	-	-
Variation – products	-			-		-	-	-	-	-	-	-	-	-	-	-	-
Variation - sites	-			-		-	-	-	-	-	-	-	-	-	-	-	-

X = Included in system boundary

GLO = Global; NA = North America; CN = China; VN = Vietnam; GB = Great Britain; AU = Australia

2.5 TECHNICAL DATA

Technical specifications for the WPC/EPC flooring products are summarized in Table 2 through Table 5.

Table 2. *Product specifications for the Karndean Korlok and Van Gogh Rigid Core (6.5mm) WPC/EPC flooring product.*

Characteristic			Description			
Sustainable certifications			ISO 14001, CE			
VOC emissions test method			FloorScore®, Indoor Air Comfort Gold			
Characteristic			**Average Value**	**Unit**	**Max Value**	**Min Value**
Product thickness			6.50 (0.26)	mm (in)	7.00 (0.28)	6.00 (0.24)
Wear layer thickness (where applicable)			0.55 (0.022)	mm (in)	0.62 (0.024)	0.50 (0.020)
Product weight			7,480 (24.5)	g/m^2 (oz/ft^2)	8,452 (27.7)	6,732 (22.1)
Product Form	Planks	Width	177.0 (6.97)	mm (in)	177.1 (6.97)	176.9 (6.96)
		Length	708 (27.87)	mm (in)	709 (27.89)	708 (27.85)
Product Form	Planks	Width	180.0 (7.09)	mm (in)	180.1 (7.09)	179.9 (7.08)
		Length	1,220 (48.0)	mm (in)	1,221 (48.1)	1,220 (48.0)
Product Form	Planks	Width	225.0 (8.86)	mm (in)	225.1 (8.86)	224.9 (8.85)
		Length	1,420 (55.91)	mm (in)	1,421 (55.93)	1,420 (55.89)

Table 3. *Product characteristics for the Karndean Korlok Select WPC/EPC flooring product.*

Characteristic			Description			
Sustainable certifications			ISO 14001, CE			
VOC emissions test method			FloorScore®, Indoor Air Comfort Gold			
Characteristic			**Average Value**	**Unit**	**Max Value**	**Min Value**
Product thickness			6.50 (0.26)	mm (in)	6.7 (0.263)	6.3 (0.248)
Wear layer thickness (where applicable)			0.50 (0.020)	mm (in)	0.62 (0.024)	0.50 (0.020)
Product weight			7,480 (24.5)	g/m^2 (oz/ft^2)	8,452 (27.7)	6,732 (22.1)
Product Form	Planks	Width	225.0 (8.86)	mm (in)	225.4 (8.87)	224.6 (8.84)
		Length	1,420 (55.91)	mm (in)	1,422 (55.98)	1,418 (55.83)
Product Form	Planks	Width	149.0 (5.87)	mm (in)	149.4 (5.88)	148.6 (5.85)
		Length	596.0 (23.46)	mm (in)	596.5 (23.48)	595.5 (23.44)
Product Form	Tiles	Width	457.0 (17.99)	mm (in)	457.5 (18.01)	456.6 (17.97)
		Length	600.0 (23.62)	mm (in)	600.5 (23.64)	599.5 (23.60)

Table 4. *Product characteristics for the Karndean Korlok Reserve WPC/EPC flooring product.*

Characteristic			Description			
Sustainable certifications			ISO 14001, CE			
VOC emissions test method			FloorScore®, Indoor Air Comfort Gold			
Characteristic			**Average Value**	**Unit**	**Max Value**	**Min Value**
Product thickness			6.50 (0.26)	mm (in)	6.7 (0.263)	6.3 (0.248)
Wear layer thickness (where applicable)			0.50 (0.020)	mm (in)	0.62 (0.024)	0.50 (0.020)
Product weight			7,480 (24.5)	g/m^2 (oz/ft^2)	8,452 (27.7)	6,732 (22.1)
Product Form	Planks	Width	179.0 (7.05)	mm (in)	179.4 (7.06)	178.6 (7.03)
		Length	1,220 (48.03)	mm (in)	1,222 (48.11)	1,218 (47.95)

Table 5. *Product characteristics for the Karndean Art Select Rigid Core WPC/EPC flooring product.*

Characteristic			Description			
Sustainable certifications			ISO 14001, CE			
VOC emissions test method			FloorScore®, Indoor Air Comfort Gold			
Characteristic			**Average Value**	**Unit**	**Max Value**	**Min Value**
Product thickness			7.00 (0.28)	mm (in)	7.20 (0.28)	6.80 (0.27)
Wear layer thickness (where applicable)			0.70 (0.028)	mm (in)	0.79 (0.031)	0.63 (0.025)
Product weight			7,900 (25.9)	g/m^2 (oz/ft^2)	8,927 (29.3)	7,110 (23.3)
Product Form	Planks	Width	150.0 (5.91)	mm (in)	150.4 (5.92)	149.6 (5.9)
		Length	914.4 (36.0)	mm (in)	915.9 (36.1)	912.9 (35.9)
Product Form	Planks	Width	225.0 (8.86)	mm (in)	225.4 (8.87)	224.6 (8.84)
		Length	1,420 (55.9)	mm (in)	1,422 (56.0)	1,418 (55.8)
Product Form	Planks	Width	179.0 (7.05)	mm (in)	179.4 (7.06)	178.6 (7.0)
		Length	1,220 (48.03)	mm (in)	1,222 (48.11)	1,218 (47.95)
Product Form	Planks	Width	108.0 (4.25)	mm (in)	108.4 (4.27)	107.6 (4.23)
		Length	1,219 (48.0)	mm (in)	1,221 (48.1)	1,217 (47.9)
Product Form	Planks	Width	108.0 (4.25)	mm (in)	108.4 (4.27)	107.6 (4.23)
		Length	711 (28.0)	mm (in)	713 (28.1)	710 (27.9)
Product Form	Tiles	Width	457.2 (18.0)	mm (in)	457.7 (18.0)	456.8 (18.0)
		Length	457.2 (18.0)	mm (in)	457.7 (18.0)	456.8 (18.0)
Product Form	Tiles	Width	457.2 (18.0)	mm (in)	457.7 (18.0)	456.8 (18.0)
		Length	914.4 (36.0)	mm (in)	915.9 (36.1)	912.9 (35.9)
Product Form	Tiles	Width	457.0 (18.0)	mm (in)	457.5 (18.0)	456.6 (18.0)
		Length	600.0 (23.6)	mm (in)	600.5 (23.6)	599.5 (23.6)

2.6 MARKET PLACEMENT/APPLICATION RULES

Technical specifications of the flooring products are summarized below. Detailed product performance results can be found on the manufacturer's website www.karndean.com/

Table 6. *Technical classification and performance standards applicable to the WPC/EPC flooring products.*

Test Method	Korlok/Van Gogh Rigid Core (6.5mm)	Korlok Select	Art Select Rigid Core
EN 16511:2023 - Loose-laid panels - Semi-rigid multilayer modular floor covering (MMF) panels with wear resistant top layer	Class 33	Class 33	Class 33
EN 13501-1:2018 - Fire classification of construction products and building elements. Classification using test data from reaction to fire tests	Bfl-S1	Bfl-S1	Bfl-S1
ASTM F3261-20 — Standard Specification for Resilient Flooring in Modular Format with Rigid Polymeric Core (or European equivalent)	Class I	Class I	Class I

2.7 PROPERTIES OF DECLARED PRODUCT AS DELIVERED

The luxury vinyl flooring products are delivered for installation in the form of tiles and planks of various dimensions.

2.8 MATERIAL COMPOSITION

The primary materials include polyvinyl chloride (PVC), plasticizers, fillers and various stabilizers, pigments and coatings. While the products are available with various colors, the impact of different pigments on the estimated impact indicators is expected to be less than ±10%.

Table 7. *Material content for the flooring products in kg per square meter and percent of total mass. All values in the table have been rounded; masses to three significant figures, percentages to two significant figures.*

Component	Renewable	Recycled Content (%)	Korlok/Van Gogh Rigid Core (6.5mm)		Korlok Select/ Korlok Reserve		Art Select Rigid Core	
			kg/m²	% mass	kg/m²	% mass	kg/m²	% mass
PVC	No	0%	2.44	33%	2.33	31%	2.54	32%
Re-grind	No	100%	1.50	20%	2.40	32%	2.39	30%
Filler	No	0%	2.85	38%	2.34	31%	2.54	32%
Plasticizer	No	0%	0.218	2.9%	0.217	2.9%	0.236	3%
Stabilizer	No	0%	$9.58x10^{-2}$	1.3%	$7.98x10^{-2}$	1.1%	$8.68x10^{-2}$	1.1%
PE	No	0%	0.154	2.1%	$8.38x10^{-2}$	1.1%	$4.59x10^{-2}$	0.58%
Pigments/Coatings	No	0%	0.224	3%	$5.73x10^{-2}$	0.76%	$6.25x10^{-2}$	0.79%
Total Product	**No**	**0%**	**7.48**	**100%**	**7.50**	**100%**	**7.90**	**100%**

No substances required to be reported as hazardous are associated with the production of this products.

2.9 MANUFACTURING

Karndean Designflooring's WPC/EPC flooring is produced at their manufacturing facilities in China and Vietnam. The flooring is made primarily from polyvinyl chloride (PVC), calcium carbonate (mineral reinforcement), plasticizers and additives (i.e., pigments and stabilizers). The product is structured with multiple layers including a polyurethane (PU) protective layer, a clear embossed PVC wear layer, a backing layer, a high definition photographic layer, a core layer and a foamed backing layer.

The production of vinyl tile flooring involves the following general manufacturing processes: Polyvinyl chloride resins are mixed with calcium carbonate, plasticizers, and pigments in a large industrial mixer. The core is extruded to a dough-like consistency. The dough-like substance is then put through calendar rollers and squeezed into sheets. The LVT sheets are embossed, PU coated, adhered to the core and then cut into individual planks, profiled, a foamed backing layer adhered and then packaged for shipment..

2.10 PACKAGING

The products are packaged for shipment using cardboard cartons, plastic wrap and wooden pallets.

Table 8. *Material content for the flooring product packaging in kg per square meter. All values in the table have been rounded; masses to three significant figures, percentages to two significant figures.*

Component	Renewable	Recycled Content (%)	Korlok/Van Gogh Rigid Core (6.5mm)		Korlok Select/ Korlok Reserve		Art Select Rigid Core	
			kg/m²	% mass	kg/m²	% mass	kg/m²	% mass
Corrugate	Yes	0%	0.196	47%	1.40	80%	1.40	80%
Plastic	No	0%	$1.40x10^{-2}$	3.4%	0.140	8%	0.150	8.5%
Wood	Yes	0%	0.204	49%	0.204	12%	0.204	12%
Total Packaging			**0.414**	**100%**	**1.74**	**100%**	**1.75**	**100%**

2.11 PRODUCT INSTALLATION

Installation of the product is accomplished using hand tools with negligible impacts. Approximately 4% installation waste is assumed. The impacts associated with packaging disposal are included with the installation phase as per PCR requirements.

2.12 USE CONDITIONS

No special conditions of use are noted.

2.13 REFERENCE SERVICE LIFE

The Reference Service Life (RSL) of the flooring product is one year based on PCR requirements.

2.14 RE-USE PHASE

The flooring products are not reused at end-of-life.

2.15 DISPOSAL

At end-of-life, the products are disposed of in a landfill.

2.16 FURTHER INFORMATION

Further information on the product can be found on the manufacturer's website www.karndean.com.

3. LCA: Calculation Rules

3.1 FUNCTIONAL UNIT

The functional unit used in the study is defined as 1 m^2 of floor covering installed for use over a 1-year period. The corresponding reference flow for the product system is defined as the mass, in kg, of 1 m^2 of flooring product, excluding packaging and is presented in Table 9. For the present assessment, a reference service lifetime (RSL) is 1-year in conformance with the PCR.

Table 9. *Reference flows and RSL for the WPC/EPC flooring products.*

Product	Reference Flow (kg/m^2)	Reference Service Lifetime (yr)
Korlok/Van Gogh Rigid Core (6.5mm)	7.48	1
Korlok Select/Korlok Reserve	7.50	1
Art Select Rigid Core	7.90	1

3.2 SYSTEM BOUNDARY

The scope of the EPD is cradle-to-grave and Module D, including raw material extraction and processing, transportation, product manufacture, product delivery, installation and use, and product disposal. The following processes are excluded from the system boundary, consistent with the PCR:

- Construction activities, capital equipment, and infrastructure,
- Maintenance and operation of capital equipment,
- Personnel travel and resource use.

The life cycle phases included in the EPD scope are described in Table 10 and illustrated in Figure 1.

Table 10. *The modules and unit processes included in the scope for the flooring product system.*

Module	Module description from the PCR	Unit Processes Included in Scope
A1	Extraction and processing of raw materials; any reuse of products or materials from previous product systems; processing of secondary materials; generation of electricity from primary energy resources; energy, or other, recovery processes from secondary fuels	Extraction and processing of raw materials for the flooring components.
A2	Transport (to the manufacturer)	Transport of component materials to the manufacturing facilities.
A3	Manufacturing, including ancillary material production	Manufacturing of the flooring products and packaging (including upstream unit processes).
A4	Transport (to the building site)	Transport of product (including packaging) to the building site.
A5	Construction-installation process	Impacts from the installation of the product are assumed negligible. Impacts from the production, transport and disposal of waste material associated with installation are included in this phase in addition to impacts from packaging disposal.
B1	Product use	Not applicable
B2	Product maintenance	Maintenance of products over the product the 1-year RSL, including periodic cleaning.
B3	Product repair	Not applicable
B4	Product replacement	Not applicable
B5	Product refurbishment	Not applicable
B6	Operational energy use by technical building systems	Not applicable
B7	Operational water use by technical building systems	Not applicable
C1	Deconstruction, demolition	Demolition of the product is accomplished using hand tools with no associated emissions and negligible impacts.
C2	Transport (to waste processing)	Transport of the product to waste treatment at end-of-life
C3	Waste processing for reuse, recovery and/or recycling	The products are disposed of by landfilling which requires no waste processing
C4	Disposal	Disposal of the product via landfilling
D	Reuse-recovery-recycling potential	There are no significant impacts associated with Module D.

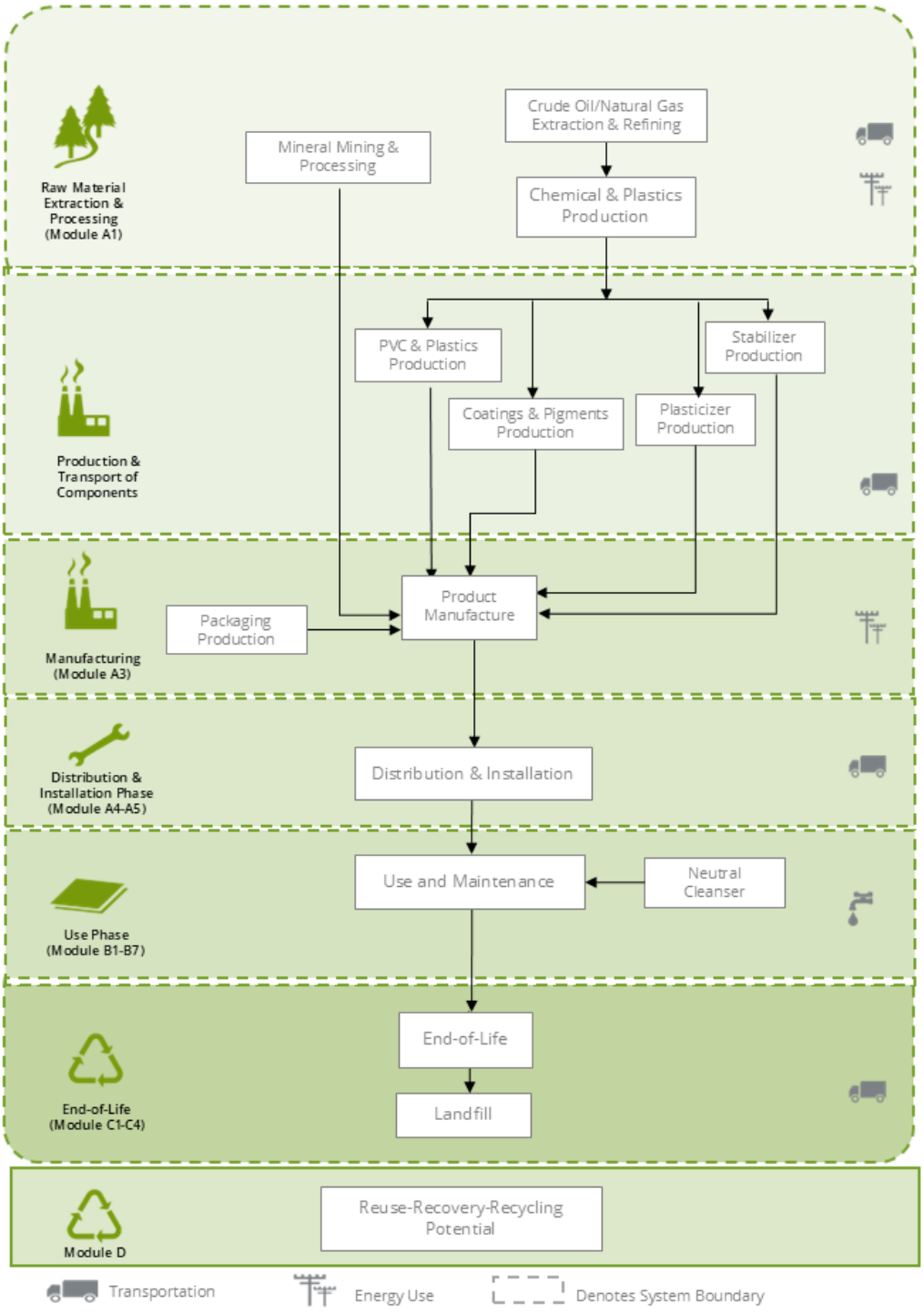


Figure 1. *Flow Diagram for the life cycle of the WPC/EPC flooring products.*

3.3 PRODUCT SPECIFIC CALCULATION FOR USE PHASE

The recommended cleaning regime is highly dependent on the use of the premises where the floor covering is installed. In high traffic areas more frequent cleaning will be needed compared to areas where there is low traffic. For the purposes of this EPD, average maintenance (moderate traffic levels) is presented based on typical installations.

3.4 UNITS

All data and results are presented using SI units.

3.5 ESTIMATES AND ASSUMPTIONS

- The Karndean Designflooring manufacturing facilities are located in Asia. Regional Ecoinvent inventory datasets for the appropriate energy grid mix were used to model resource use and emissions from electricity use at the manufacturing facilities.
- The Reference Service Life (RSL) of the products was modeled based on PCR requirements.
- Downstream transport was modeled based on information provided by the manufacturer representing distribution to consumer markets in Europe.
- The maintenance phase of the product life cycle was modeled based on information provided by the manufacturer including recommended installation and cleaning methods, as well as cleaning frequency.
- For the product end-of-life, disposal of product and product packaging is modeled based on the PCR guidance regarding recycling rates of product and packaging materials.
- For final disposal of the packaging material and flooring products at end-of-life, all materials are assumed to be transported 161 km by diesel truck to either a landfill or material reclamation facility (for recycling). Datasets representing disposal in a landfill and waste incineration are from Ecoinvent

The PCR requires the results for several inventory flows related to construction products to be reported including energy and resource use and waste and outflows. These are aggregated inventory flows, and do not characterize any potential impact; results should be interpreted taking into account this limitation.

3.6 CUT-OFF RULES

According to the PCR, processes contributing greater than 1% of the total environmental impact indicator for each impact are included in the inventory. No data gaps were allowed which were expected to significantly affect the outcome of the indicator results. No known flows are deliberately excluded from this EPD.

3.7 DATA SOURCES

Primary data were provided by Karndean Designflooring for their manufacturing facilities. The sources of secondary LCI data are the Ecoinvent database.

Table 11. *Data sources for the WPC/EPC flooring products.*

Component	Dataset	Data Source	Publication Date
PRODUCT			
PVC			
Polyvinyl Chloride	polyvinylchloride production, bulk polymerisation | polyvinylchloride, bulk polymerised | EN15804GD, S/RoW	EI v3.11	2024
Filler			
Calcium Carbonate	limestone production, crushed, washed | limestone, crushed, washed | EN15804GD, S/RoW	EI v3.11	2024
Plasticizer			
PVC Plasticizer	dioctyl terephthalate production | dioctyl terephthalate | EN15804GD, S/GLO	EI v3.11	2024
Stabilizer			
Stabilizer	Ca-Zn stabilizer;	EI v3.11	2024
	chemical production, organic | chemical, organic | EN15804GD, S/GLO	EI v3.11	2024
	chemical production, inorganic | chemical, inorganic | EN15804GD, S/GLO	EI v3.11	2024
	limestone production, crushed, washed | limestone, crushed, washed | EN15804GD, S/RoW	EI v3.11	2024
	zinc oxide production | zinc oxide | EN15804GD, S/RoW	EI v3.11	2024
Pigment			
Titanium dioxide	market for titanium dioxide | titanium dioxide | EN15804GD, S/RoW	EI v3.11	2024
Carbon black	carbon black production | carbon black | EN15804GD, S/GLO	EI v3.11	2024
Other			
Organic chemicals	chemical production, organic | chemical, organic | EN15804GD, S/GLO	EI v3.11	2024
Adhesive	polyurethane adhesive production | polyurethane adhesive | EN15804GD, S/GLO	EI v3.11	2024
Glue	methylene diphenyl diisocyanate production | methylene diphenyl diisocyanate | EN15804GD, S/RoW	EI v3.11	2024
PE	polyethylene production, low density, granulate | steam, in chemical industry | EN15804GD, S/RoW	EI v3.11	2024
PACKAGING			
Cardboard	containerboard production, linerboard, kraftliner | containerboard, linerboard | EN15804GD, S/RoW	EI v3.11	2024
Plastic	packaging film production, low density polyethylene | packaging film, low density polyethylene | EN15804GD, S/RoW; polyethylene production, low density, granulate | polyethylene, low density, granulate | EN15804GD, S/RoW	EI v3.11	2024
Wood	EUR-flat pallet production | EUR-flat pallet | EN15804GD, S/RoW	EI v3.11	2024
TRANSPORT			
Road transport	transport, freight, lorry 16-32 metric ton, EURO4 | transport, freight, lorry 16-32 metric ton, EURO4 | EN15804GD, S/RoW	EI v3.11	2024
Rail transport	transport, freight train, diesel | transport, freight train | EN15804GD, S/RoW	EI v3.11	2024
Ship transport	transport, freight, sea, container ship | transport, freight, sea, container ship | EN15804GD, S/GLO	EI v3.11	2024
MAINTENANCE			
Neutral cleaner	ethoxylated alcohol (AE7) production, petrochemical | ethoxylated alcohol (AE7) | EN15804GD, S/RoW; fatty acid production, from palm oil | fatty acid | EN15804GD, S/RoW; tap water production, conventional treatment | tap water | EN15804GD, S/RoW	EI v3.11	2024
Electricity	market for electricity, low voltage | electricity, low voltage | EN15804GD, S/US	EI v3.11	2024
	market for electricity, low voltage | electricity, low voltage | EN15804GD, S/GB	EI v3.11	2024
	market for electricity, low voltage | electricity, low voltage | EN15804GD, S/AU	EI v3.11	2024
Water	tap water production, conventional treatment | tap water | EN15804GD, S/RoW	EI v3.11	2024
WASTE DESPOSAL			
Landfill	treatment of municipal solid waste, sanitary landfill | municipal solid waste | EN15804GD, S/RoW	EI v3.11	2024
RESOURCES			
Grid electricity[1]	market for electricity, medium voltage | electricity, medium voltage | EN15804GD, S/VN	EI v3.11	2024
	market group for electricity, medium voltage | electricity, medium voltage | EN15804GD, S/CN	EI v3.11	2024
Heat – diesel	diesel, burned in building machine | diesel, burned in building machine | EN15804GD, S/GLO	EI v3.11	2024
Heat – biomass	heat production, wood chips from industry, at furnace 50kW | heat, central or small-scale, other than natural gas | EN15804GD, S/RoW	EI v3.11	2024

[1] The Chinese electricity resource mix consists of approximately 66% coal, 32% wind and hydropower, and 2% natural gas as represented in the ecoinvent v3.11 database. The Vietnamese electricity resource mix consists of approximately 49% coal, 30% hydropower, 18% natural gas and ~3% oil and imports. The GWP-GHG (AR6) impact of the Chinese grid electricity is ~0.9504 kg CO_2e/kWh; and ~0.6656 kg CO_2e/kWh for Vietnam.

3.8 DATA QUALITY

The data quality assessment addressed the following parameters: time-related coverage, geographical coverage, technological coverage, precision, completeness, representativeness, consistency, reproducibility, sources of data, and uncertainty.

Table 12. *Data quality assessment for the flooring product system.*

Data Quality Parameter	Data Quality Discussion
Time-Related Coverage: Age of data and the minimum length of time over which data is collected	The most recent available data are used, based on other considerations such as data quality and similarity to the actual operations. Typically, these data are less than 5 years old. All of the data used represented an average of at least one year's worth of data collection, and up to three years in some cases. Manufacturer-supplied data (primary data) are based on annual production for 2023.
Geographical Coverage: Geographical area from which data for unit processes is collected to satisfy the goal of the study	The data used in the analysis provide the best possible representation available with current data. Electricity use for product manufacture is modeled using representative data for Asia. Surrogate data used in the assessment are representative of global or European operations. Data representative of European operations are considered sufficiently similar to actual processes. Data representing product disposal are based on regional statistics.
Technology Coverage: Specific technology or technology mix	For the most part, data are representative of the actual technologies used for processing, transportation, and manufacturing operations. Representative fabrication datasets, specific to the type of material, are used to represent the actual processes, as appropriate.
Precision: Measure of the variability of the data values for each data expressed	Precision of results are not quantified due to a lack of data. Data collected for operations were typically averaged for one or more years and over multiple operations, which is expected to reduce the variability of results.
Completeness: Percentage of flow that is measured or estimated	The LCA model included all known mass and energy flows for production of the flooring products. In some instances, surrogate data used to represent upstream and downstream operations may be missing some data which is propagated in the model. No known processes or activities contributing to more than 1% of the total environmental impact for each indicator are excluded.
Representativeness: Qualitative assessment of the degree to which the data set reflects the true population of interest	Data used in the assessment represent typical or average processes as currently reported from multiple data sources and are therefore generally representative of the range of actual processes and technologies for production of these materials. Considerable deviation may exist among actual processes on a site-specific basis; however, such a determination would require detailed data collection throughout the supply chain back to resource extraction.
Consistency: Qualitative assessment of whether the study methodology is applied uniformly to the various components of the analysis	The consistency of the assessment is considered to be high. Data sources of similar quality and age are used; with a bias towards Ecoinvent v3.10 data where available. Different portions of the product life cycle are equally considered.
Reproducibility: Qualitative assessment of the extent to which information about the methodology and data values would allow an independent practitioner to reproduce the results reported in the study	Based on the description of data and assumptions used, this assessment would be reproducible by other practitioners. All assumptions, models, and data sources are documented.
Sources of the Data: Description of all primary and secondary data sources	Data representing energy use at Karndean's manufacturing facilities represents an annual average and are considered of high quality due to the length of time over which these data are collected, as compared to a snapshot that may not accurately reflect fluctuations in production. For secondary LCI data, Ecoinvent v3.10 LCI data are used.
Uncertainty of the Information: Uncertainty related to data, models, and assumptions	Uncertainty related to materials in the products and packaging is low. Actual supplier data for upstream operations were not available and the study relied upon the use of existing representative datasets. These datasets contained relatively recent data (<10 years) but lacked geographical representativeness. Uncertainty related to the impact assessment methods used in the study are high. The impact assessment method required by the PCR includes impact potentials, which lack characterization of providing and receiving environments or tipping points.

3.9 PERIOD UNDER REVIEW

The period of review is calendar year 2023.

3.10 ALLOCATION

Manufacturing resource use was allocated to the products based on area. Impacts from transportation were allocated based on the mass of material and distance transported.

3.11 COMPARABILITY

The PCR this EPD was based on was not written to support comparative assertions. EPDs based on different PCRs, or different calculation models, may not be comparable. When attempting to compare EPDs or life cycle impacts of products from different companies, the user should be aware of the uncertainty in the final results, due to and not limited to, the practitioner's assumptions, the source of the data used in the study, and the specifics of the product modeled.

4. LCA: Scenarios and Additional Technical Information

Delivery and Installation stage (A4 - A5)

Distribution of the flooring products to the point of installation is included in the assessment based on data from the manufacturer. Transport by diesel truck from the distribution centers to the point of installation is also included, based on information provided by the manufacturer. The transport parameters used to model the product systems are summarized in Table 13

Table 13. *Product distribution parameters, per 1 m^2.*

Parameter	Unit	Value		
Road transport				
Fuel type	-	Diesel		
Liters of fuel	L/100km	18.7		
Vehicle type	-	Diesel truck		
Capacity utilization	%	76		
Rail transport				
Fuel type	-	Diesel		
Liters of fuel	g/tkm	9.41		
Vehicle type	-	Diesel train		
Capacity utilization	%	75		
Ocean transport				
Fuel type	-	Fuel oil		
Liters of fuel	g/tkm	2.52		
Vehicle type	-	Ocean freighter		
Capacity utilization	%	70		
Product Name/Consumer Market	**Gross mass transported (kg)**	**Transport Distance (km)**		
		Road	**Rail**	**Ship**
Korlok Select /Korlok Reserve (distribution North America)	9.25	262	1,013	14,063
Art Select Rigid Core (distribution to North America)	9.65	262	1,013	14,063
Korlok (distribution to Australia)	7.89	135	-	10,800
Korlok/Van Gogh Rigid Core (6.5mm) (distribution to the United Kingdom)	7.89	274	-	21,694

Installation of the product is accomplished using hand tools with no associated emissions and negligible impacts. Four percent (4%) installation waste is assumed landfilled. Impacts associated with the production, transport, waste processing,

and disposal of installation wastage are included in this life cycle phase. The VOC emissions associated with the installation, use and maintenance of the products are negligible. The impacts associated with packaging disposal are included with the installation phase as per PCR requirements. The recycling rates used for the product packaging are based on national waste disposal statistics regarding recycling rates as specified in the PCR.

Table 14. *Installation parameters for the WPC/EPC flooring products, per 1 m^2.*

Parameter		Korlok/Van Gogh Rigid Core (6.5mm)	Korlok Select/ Korlok Reserve	Art Select Rigid Core
Ancillary materials (kg)		0.00	0.00	0.00
Net freshwater consumption (m^3)		0.00	0.00	0.00
Electricity consumption (kWh)		0.00	0.00	0.00
Product loss per functional unit (kg)		0.299	0.300	0.316
Waste materials generated by product installation (kg)		0.714	2.05	2.07
Output materials resulting from on-site waste processing (kg)		n/a	n/a	n/a
Mass of packaging waste (kg)	Plastic	0.140	0.150	0.150
	Corrugate	1.40	1.40	1.40
	Wood	0.204	0.204	0.204
Biogenic carbon contained in packaging (kg CO_2)[1]		0.734	2.94	2.94
Direct emissions (kg)		0.00	0.00	0.00

[1] Biogenic carbon contained in packaging calculated assuming the carbon content of corrugate and wood is 50% by weight

Maintenance stage (B2)

According to the manufacturer, typical maintenance involves regular sweeping and damp mopping, as well as periodic machine cleaning of the vinyl flooring. The present assessment is based on a recommended weekly cleaning schedule including sweeping and mopping with a neutral cleaner and monthly machine cleaning.

Table 15. *Maintenance parameters for the flooring products, per 1 m^2.*

Parameter	Unit	Korlok/Van Gogh Rigid Core (6.5mm)	Korlok Select/ Korlok Reserve	Art Select Rigid Core
Maintenance process	-	Damp mopping	Damp mopping	Damp mopping
Maintenance cycle	Cycles / RSL	52	52	52
Maintenance cycle	Cycles / ESL	52	52	52
Net freshwater consumption	$m^3/m^2/yr$	0.0058	0.0058	0.0058
Cleaning agent	$kg/m^2/yr$	0.119	0.119	0.119
Further assumptions	-	Moderate traffic; weekly maintenance	Moderate traffic; weekly maintenance	Moderate traffic; weekly maintenance
Maintenance process	-	Machine cleaning	Machine cleaning	Machine cleaning
Maintenance cycle	Cycles / RSL	12	12	12
Maintenance cycle	Cycles / ESL	12	12	12
Electricity	$kWh/m^2/yr$	0.022	0.022	0.022
Further assumptions	-	Moderate traffic; monthly maintenance	Moderate traffic; monthly maintenance	Moderate traffic; monthly maintenance

Disposal stage (C1 - C4)

The disposal stage includes demolition of the products (*C1*); transport of the flooring products to waste treatment facilities (*C2*); waste processing (*C3*); and associated emissions as the product degrades in a landfill (*C4*). For the luxury vinyl flooring products, no emissions are generated during demolition (*C1*) while no waste processing (*C3*) is required for landfill disposal.

Transportation of waste materials at end-of-life (*C2*) assumes a 161 km average distance to disposal, as per PCR guidance. No recycling of the product materials is assumed at end-of-life. The relevant disposal statistics used for the packaging are summarized in Table 16.

Table 16. *End-of-life disposal scenario parameters for the flooring products per m^2.*

Parameter	Korlok/Van Gogh Rigid Core (6.5mm)	Korlok Select/ Korlok Reserve	Art Select Rigid Core
Assumptions for scenario development	100% landfill	100% landfill	100% landfill
Collection process	-	-	-
Collected with mixed construction waste (kg)	7.48	7.50	7.90
Recovery	n/a	n/a	n/a
Disposal - Landfill (kg)	7.48	7.50	7.90
Removals of biogenic carbon (kg CO_2 eq)	n/a	n/a	n/a

5. LCA: Results

Results of the Life Cycle Assessment are presented below. It is noted that LCA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks. All LCA results are stated to three significant figures in agreement with the PCR for this flooring product and therefore the sum of the total values may not exactly equal 100%.

The impact indicators specified by the PCR include:

- Potential for Global Warming,
- Acidification Potential,
- Eutrophication Potential,
- Ozone Depletion Potential,
- Photochemical Ozone (smog) Creation Potential.
- Ecotoxicity,
- Human Toxicity, and
- Land Use/Land Occupation.

Impact category indicators for acidification, eutrophication, ozone depletion potential and photochemical ozone creation are estimated using the characterization factors[1], as prescribed by the PCR, including from CML-IA and ReCiPe methodologies as well as those defined by EN 15804 reference package based on EF 3.1. Impact indicators for Ecotoxicity and Human Toxicity are estimated using the USEtox 2.02 characterization method, while Land Occupation impacts are estimated using the ReCiPe 2016 version 1.1 methodology.

Environmental impact category indicators estimated using characterization factors based on the U.S. EPA's Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts – TRACI 2.1, are also reported.

These impact categories are globally deemed mature enough to be included in Type III environmental declarations. Other categories are being developed and defined and LCA should continue making advances in their development. However, the EPD users shall not use additional measures for comparative purposes.

The impact category indicators included in the assessment are summarized below. Modules B1, B3, B4, B5, B6, and B7 are not applicable and therefore set to zero. In addition, modules C1 and C3 are likewise not associated with any impact as the products are expected to be manually deconstructed. The flooring products do not contain bio-based materials. Impacts associated with Module D are negligible. In the interest of space and table readability, these modules are not included in the results presented below.

Note that the use of the results of modules A1-A3 without considering the results of module C is discouraged.

[1] https://www.environdec.com/resources/indicators

Table 18. *Key Life Cycle Impact Assessment results, per m^2, for the product over a 1-yr time horizon. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits.* (***Korlok Select/Korlok Reserve - Distribution to North America)***

Impact Category	Unit	A1-A3	A4	A5	B2	C2	C4
Core Indicators							
Global Warming Potential - total (GWP-total)	kg CO_2 eq.	9.45	4.02	1.95	$4.98x10^{-2}$	0.228	3.95
	%	48%	20%	9.9%	0.25%	1.2%	20%
Global Warming Potential - fossil fuels (GWP-fossil)	kg CO_2 eq.	11.2	4.02	1.13	$5.83x10^{-2}$	0.228	0.392
	%	66%	24%	6.6%	0.34%	1.3%	2.3%
Global Warming Potential - biogenic (GWP-biogenic)	kg CO_2 eq.	-1.77	$8.62x10^{-4}$	0.825	$-3.31x10^{-2}$	$1.58x10^{-4}$	3.56
	%	-69%	0.033%	32%	-1.3%	0.0061%	140%
Global Warming Potential - land use and land use change (GWP-luluc)	kg CO_2 eq.	$1.74x10^{-2}$	$1.80x10^{-3}$	$8.18x10^{-4}$	$2.47x10^{-2}$	$7.61x10^{-5}$	$6.21x10^{-5}$
	%	39%	4%	1.8%	55%	0.17%	0.14%
Global warming potential (GWP-GHG)	kg CO_2 eq.	11.4	4.02	1.65	$8.30x10^{-2}$	0.228	2.95
	%	56%	20%	8.1%	0.41%	1.1%	15%
Depletion potential of the stratospheric ozone layer (ODP)	kg CFC-11 eq.	$4.13x10^{-6}$	$7.03x10^{-8}$	$1.75x10^{-7}$	$9.19x10^{-10}$	$5.00x10^{-9}$	$2.18x10^{-9}$
	%	94%	1.6%	4%	0.021%	0.11%	0.05%
Acidification potential, Accumulated Exceedance (AP)	mol H+ eq.	$5.99x10^{-2}$	$7.38x10^{-2}$	$7.64x10^{-3}$	$3.40x10^{-4}$	$9.31x10^{-4}$	$8.58x10^{-4}$
	%	42%	51%	5.3%	0.24%	0.65%	0.6%
Eutrophication potential - freshwater (EP-freshwater)	kg P eq.	$4.01x10^{-3}$	$2.00x10^{-4}$	$2.00x10^{-4}$	$2.09x10^{-5}$	$1.57x10^{-5}$	$3.74x10^{-4}$
	%	83%	4.2%	4.2%	0.43%	0.33%	7.8%
Eutrophication potential - marine (EP-marine)	kg N eq.	$1.22x10^{-2}$	$1.93x10^{-2}$	$2.91x10^{-3}$	$2.09x10^{-4}$	$3.50x10^{-4}$	$5.59x10^{-3}$
	%	30%	48%	7.2%	0.51%	0.86%	14%
Eutrophication potential - terrestrial (EP-terrestrial)	mol N eq.	0.123	0.214	$2.42x10^{-2}$	$9.20x10^{-4}$	$3.81x10^{-3}$	$2.81x10^{-3}$
	%	33%	58%	6.6%	0.25%	1%	0.76%
Photochemical Ozone Creation Potential (POCP)	kg NMVOC eq.	$4.75x10^{-2}$	$6.06x10^{-2}$	$8.76x10^{-3}$	$3.15x10^{-4}$	$1.38x10^{-3}$	$1.94x10^{-3}$
	%	39%	50%	7.3%	0.26%	1.1%	1.6%
Depletion of abiotic resources - fossil fuels (ADPF)[1]	MJ	207	52.7	16.0	1.13	3.26	1.96
	%	73%	19%	5.7%	0.4%	1.2%	0.7%
Depletion of abiotic resources - minerals and metals (ADPE)[1]	kg Sb eq.	$7.54x10^{-5}$	$8.37x10^{-6}$	$3.67x10^{-6}$	$5.24x10^{-7}$	$7.93x10^{-7}$	$1.81x10^{-7}$
	%	85%	9.4%	4.1%	0.59%	0.89%	0.2%
Water use (WDP)[1]	m^3 World eq.	4.58	0.211	0.220	$4.49x10^{-2}$	$1.71x10^{-2}$	$8.61x10^{-2}$
	%	89%	4.1%	4.3%	0.87%	0.33%	1.7%

1) The results of this environmental impact indicator shall be used with care as uncertainties on these results are high or there is limited experience with the indicator.

Table 19. *Other Life Cycle Impact Assessment results, per m², for the product over a 1-yr time horizon. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits.* ***(Korlok Select/Korlok Reserve - Distribution to North America)***

Impact Category	Unit	A1-A3	A4	A5	B2	C2	C4
Additional Indicators							
Potential incidence of disease due to PM emissions (PM)	Disease Incidence	$4.79x10^{-7}$	$2.11x10^{-7}$	$8.24x10^{-8}$	$5.09x10^{-9}$	$1.88x10^{-8}$	$1.41x10^{-8}$
	%	59%	26%	10%	0.63%	2.3%	1.7%
Potential Human exposure efficiency relative to U235 (IRP)[2]	kBq U235 eq.	0.500	$4.18x10^{-2}$	$2.42x10^{-2}$	$5.75x10^{-3}$	$3.88x10^{-3}$	$2.83x10^{-3}$
	%	86%	7.2%	4.2%	0.99%	0.67%	0.49%
Potential Comparative Toxic Unit for ecosystems (ETP-fw)	CTUe	76.7	5.27	7.44	0.686	0.432	63.5
	%	50%	3.4%	4.8%	0.45%	0.28%	41%
Potential Comparative Toxic Unit for humans - cancer effects (HTP-c)[1]	CTUh	$9.44x10^{-9}$	$7.80x10^{-10}$	$4.55x10^{-10}$	$2.13x10^{-11}$	$3.92x10^{-11}$	$9.41x10^{-11}$
	%	87%	7.2%	4.2%	0.2%	0.36%	0.87%
Potential Comparative Toxic Unit for humans - non-cancer effects (HTP-nc)[1]	CTUh	$1.14x10^{-7}$	$2.23x10^{-8}$	$8.54x10^{-9}$	$6.07x10^{-10}$	$2.04x10^{-9}$	$1.45x10^{-8}$
	%	70%	14%	5.3%	0.37%	1.3%	9%
Potential Soil quality index (SQP)[1]	Dimensionless	250	16.8	11.8	1.22	1.93	4.34
	%	87%	5.9%	4.1%	0.43%	0.67%	1.5%

1) The results of this environmental impact indicator shall be used with care as uncertainties on these results are high or there is limited experience with the indicator.

2) This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

Table 20. *Resource use, per m², for the product over a 1-yr time horizon. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits.* ***(Korlok Select/Korlok Reserve - Distribution to North America)***

Parameter	Unit	A1-A3	A4	A5	B2	C2	C4
Resources							
Use of renewable primary energy resources used as energy carrier (PERE)	MJ	23.0	0.618	0.983	0.902	$5.30x10^{-2}$	$4.44x10^{-2}$
	%	90%	2.4%	3.8%	3.5%	0.21%	0.17%
Use of renewable primary energy resources used as raw materials (PERM)	MJ	27.7	0.00	1.11	0.00	0.00	0.00
	%	96%	0%	3.8%	0%	0%	0%
Total use of renewable primary energy resources (PERT)	MJ	50.7	0.618	2.09	0.902	$5.30x10^{-2}$	$4.44x10^{-2}$
	%	93%	1.1%	3.8%	1.7%	0.097%	0.082%
Use of non renewable primary energy resources used as energy carrier (PENRE)	MJ	159	52.4	15.6	1.14	3.23	1.94
	%	68%	22%	6.7%	0.49%	1.4%	0.83%
Use of non renewable primary energy resources used as raw materials (PENRM)	MJ	44.2	0.00	0.207	0.00	0.00	0.00
	%	100%	0%	0.47%	0%	0%	0%
Total use of non renewable primary energy resources (PENRT)	MJ	207	52.7	16.0	1.16	3.26	1.96
	%	73%	19%	5.7%	0.41%	1.2%	0.7%
Use of secondary materials (SM)	kg	0.00	0.00	0.00	0.00	0.00	0.00
	%	0%	0%	0%	0%	0%	0%
Use of renewable secondary fuels (RSF)	MJ	$6.31x10^{-2}$	$7.19x10^{-3}$	$3.03x10^{-3}$	$3.78x10^{-4}$	$7.38x10^{-4}$	$2.39x10^{-4}$
	%	84%	9.6%	4.1%	0.51%	0.99%	0.32%
Use of non renewable secondary fuels (NRSF)	MJ	0.00	0.00	0.00	0.00	0.00	0.00
	%	0%	0%	0%	0%	0%	0%
Use of net fresh water (FW)	m^3	0.135	$4.84x10^{-3}$	$2.52x10^{-3}$	$6.94x10^{-3}$	$3.94x10^{-4}$	$-2.99x10^{-2}$
	%	110%	4%	2.1%	5.8%	0.33%	-25%

Table 21. *Waste and outflows, per m², for the product over a 1-yr time horizon. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits.* ***(Korlok Select/Korlok Reserve - Distribution to North America)***

Parameter	Unit	A1-A3	A4	A5	B2	C2	C4
Wastes							
Hazardous waste disposed (HWD)	kg	0.461	$5.52x10^{-2}$	$2.50x10^{-2}$	$5.65x10^{-3}$	$3.31x10^{-3}$	$2.86x10^{-3}$
	%	83%	10%	4.5%	1%	0.6%	0.52%
Non hazardous waste disposed (NHWD)	kg	10.4	0.482	4.19	0.115	$3.54x10^{-2}$	27.2
	%	24%	1.1%	9.9%	0.27%	0.083%	64%
Radioactive waste disposed (RWD)	kg	$1.53x10^{-4}$	$1.03x10^{-5}$	$7.10x10^{-6}$	$1.38x10^{-6}$	$9.58x10^{-7}$	$6.74x10^{-7}$
	%	88%	5.9%	4.1%	0.8%	0.55%	0.39%
Components for re-use (CRU)	kg	0.00	0.00	0.00	0.00	0.00	0.00
	%	0%	0%	0%	0%	0%	0%
Materials for recycling (MFR)	kg	0.00	0.00	1.11	0.00	0.00	0.00
	%	0%	0%	100%	0%	0%	0%
Materials for energy recovery (MER)	kg	0.00	0.00	0.00	0.00	0.00	0.00
	%	0%	0%	0%	0%	0%	0%
Exported electrical energy (EEE)	MJ	$3.67x10^{-2}$	$6.07x10^{-3}$	$2.12x10^{-3}$	$4.25x10^{-4}$	$6.27x10^{-4}$	$4.12x10^{-4}$
	%	79%	13%	4.6%	0.92%	1.4%	0.89%
Exported thermal energy (EET)	MJ	$2.61x10^{-2}$	$6.61x10^{-3}$	$2.13x10^{-3}$	$5.81x10^{-4}$	$7.59x10^{-4}$	$3.47x10^{-3}$
	%	66%	17%	5.4%	1.5%	1.9%	8.7%

Table 22. *Key Life Cycle Impact Assessment results, per m^2, for the product over a 1-yr time horizon. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits.* ***(Art Select Rigid Core - Distribution to North America)***

Impact Category	Unit	A1-A3	A4	A5	B2	C2	C4
Core Indicators							
Global Warming Potential - total (GWP-total)	kg CO_2 eq.	10.1	4.20	2.01	$4.98x10^{-2}$	0.241	4.10
	%	49%	20%	9.7%	0.24%	1.2%	20%
Global Warming Potential - fossil fuels (GWP-fossil)	kg CO_2 eq.	11.9	4.20	1.17	$5.83x10^{-2}$	0.240	0.415
	%	66%	23%	6.5%	0.32%	1.3%	2.3%
Global Warming Potential - biogenic (GWP-biogenic)	kg CO_2 eq.	-1.77	$9.00x10^{-4}$	0.836	$-3.31x10^{-2}$	$1.66x10^{-4}$	3.69
	%	-65%	0.033%	31%	-1.2%	0.0061%	140%
Global Warming Potential - land use and land use change (GWP-luluc)	kg CO_2 eq.	$1.68x10^{-2}$	$1.88x10^{-3}$	$7.99x10^{-4}$	$2.47x10^{-2}$	$8.01x10^{-5}$	$6.47x10^{-5}$
	%	38%	4.3%	1.8%	56%	0.18%	0.15%
Global warming potential (GWP-GHG)	kg CO_2 eq.	12.0	4.20	1.70	$8.30x10^{-2}$	0.240	3.06
	%	56%	20%	8%	0.39%	1.1%	14%
Depletion potential of the stratospheric ozone layer (ODP)	kg CFC-11 eq.	$4.50x10^{-6}$	$7.35x10^{-8}$	$1.89x10^{-7}$	$9.19x10^{-10}$	$5.27x10^{-9}$	$2.30x10^{-9}$
	%	94%	1.5%	4%	0.019%	0.11%	0.048%
Acidification potential, Accumulated Exceedance (AP)	mol H+ eq.	$6.28x10^{-2}$	$7.71x10^{-2}$	$7.90x10^{-3}$	$3.40x10^{-4}$	$9.80x10^{-4}$	$8.98x10^{-4}$
	%	42%	51%	5.3%	0.23%	0.65%	0.6%
Eutrophication potential - freshwater (EP-freshwater)	kg P eq.	$4.19x10^{-3}$	$2.09x10^{-4}$	$2.09x10^{-4}$	$2.09x10^{-5}$	$1.65x10^{-5}$	$3.87x10^{-4}$
	%	83%	4.2%	4.2%	0.41%	0.33%	7.7%
Eutrophication potential - marine (EP-marine)	kg N eq.	$1.28x10^{-2}$	$2.01x10^{-2}$	$2.99x10^{-3}$	$2.09x10^{-4}$	$3.69x10^{-4}$	$5.84x10^{-3}$
	%	30%	48%	7.1%	0.49%	0.87%	14%
Eutrophication potential - terrestrial (EP-terrestrial)	mol N eq.	0.129	0.223	$2.49x10^{-2}$	$9.20x10^{-4}$	$4.02x10^{-3}$	$2.95x10^{-3}$
	%	33%	58%	6.5%	0.24%	1%	0.77%
Photochemical Ozone Creation Potential (POCP)	kg NMVOC eq.	$5.02x10^{-2}$	$6.33x10^{-2}$	$9.01x10^{-3}$	$3.15x10^{-4}$	$1.45x10^{-3}$	$2.02x10^{-3}$
	%	40%	50%	7.1%	0.25%	1.2%	1.6%
Depletion of abiotic resources - fossil fuels (ADPF)[1]	MJ	220	55.1	16.6	1.13	3.43	2.06
	%	74%	18%	5.6%	0.38%	1.2%	0.69%
Depletion of abiotic resources - minerals and metals (ADPE)[1]	kg Sb eq.	$8.16x10^{-5}$	$8.74x10^{-6}$	$3.93x10^{-6}$	$5.24x10^{-7}$	$8.35x10^{-7}$	$1.91x10^{-7}$
	%	85%	9.1%	4.1%	0.55%	0.87%	0.2%
Water use (WDP)[1]	m^3 World eq.	4.87	0.220	0.232	$4.49x10^{-2}$	$1.80x10^{-2}$	$9.06x10^{-2}$
	%	89%	4%	4.2%	0.82%	0.33%	1.7%

1) The results of this environmental impact indicator shall be used with care as uncertainties on these results are high or there is limited experience with the indicator.

Table 23. *Other Life Cycle Impact Assessment results, per m², for the product over a 1-yr time horizon. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits. (**Art Select Rigid Core - Distribution to North America**)*

Impact Category	Unit	A1-A3	A4	A5	B2	C2	C4
Additional Indicators							
Potential incidence of disease due to PM emissions (PM)	Disease Incidence	$5.06x10^{-7}$	$2.20x10^{-7}$	$8.43x10^{-8}$	$5.09x10^{-9}$	$1.98x10^{-8}$	$1.48x10^{-8}$
	%	60%	26%	9.9%	0.6%	2.3%	1.7%
Potential Human exposure efficiency relative to U235 (IRP)[2]	kBq U235 eq.	0.535	$4.36x10^{-2}$	$2.56x10^{-2}$	$5.75x10^{-3}$	$4.09x10^{-3}$	$2.98x10^{-3}$
	%	87%	7.1%	4.2%	0.93%	0.66%	0.48%
Potential Comparative Toxic Unit for ecosystems (ETP-fw)	CTUe	82.6	5.50	7.84	0.686	0.455	66.6
	%	50%	3.4%	4.8%	0.42%	0.28%	41%
Potential Comparative Toxic Unit for humans - cancer effects (HTP-c)[1]	CTUh	$1.02x10^{-8}$	$8.15x10^{-10}$	$4.86x10^{-10}$	$2.13x10^{-11}$	$4.13x10^{-11}$	$9.78x10^{-11}$
	%	87%	7%	4.2%	0.18%	0.35%	0.84%
Potential Comparative Toxic Unit for humans - non-cancer effects (HTP-nc)[1]	CTUh	$1.22x10^{-7}$	$2.33x10^{-8}$	$8.95x10^{-9}$	$6.07x10^{-10}$	$2.15x10^{-9}$	$1.51x10^{-8}$
	%	71%	14%	5.2%	0.35%	1.2%	8.8%
Potential Soil quality index (SQP)[1]	Dimensionless	252	17.5	11.9	1.22	2.03	4.57
	%	87%	6.1%	4.1%	0.42%	0.7%	1.6%

1) The results of this environmental impact indicator shall be used with care as uncertainties on these results are high or there is limited experience with the indicator.

2) This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

Table 24. *Resource use, per m², for the product over a 1-yr time horizon. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits. (**Art Select Rigid Core - Distribution to North America)***

Parameter	Unit	A1-A3	A4	A5	B2	C2	C4
Resources							
Use of renewable primary energy resources used as energy carrier (PERE)	MJ	23.5	0.645	1.00	0.902	$5.59x10^{-2}$	$4.68x10^{-2}$
	%	90%	2.5%	3.8%	3.4%	0.21%	0.18%
Use of renewable primary energy resources used as raw materials (PERM)	MJ	27.7	0.00	1.11	0.00	0.00	0.00
	%	96%	0%	3.8%	0%	0%	0%
Total use of renewable primary energy resources (PERT)	MJ	51.2	0.645	2.11	0.902	$5.59x10^{-2}$	$4.68x10^{-2}$
	%	93%	1.2%	3.8%	1.6%	0.1%	0.085%
Use of non renewable primary energy resources used as energy carrier (PENRE)	MJ	168	54.7	16.2	1.14	3.40	2.04
	%	68%	22%	6.6%	0.47%	1.4%	0.83%
Use of non renewable primary energy resources used as raw materials (PENRM)	MJ	48.3	0.00	0.222	0.00	0.00	0.00
	%	100%	0%	0.46%	0%	0%	0%
Total use of non renewable primary energy resources (PENRT)	MJ	220	55.1	16.6	1.16	3.43	2.06
	%	74%	18%	5.6%	0.39%	1.2%	0.69%
Use of secondary materials (SM)	kg	0.00	0.00	0.00	0.00	0.00	0.00
	%	0%	0%	0%	0%	0%	0%
Use of renewable secondary fuels (RSF)	MJ	$6.58x10^{-2}$	$7.51x10^{-3}$	$3.16x10^{-3}$	$3.78x10^{-4}$	$7.78x10^{-4}$	$2.51x10^{-4}$
	%	85%	9.6%	4%	0.49%	1%	0.32%
Use of non renewable secondary fuels (NRSF)	MJ	0.00	0.00	0.00	0.00	0.00	0.00
	%	0%	0%	0%	0%	0%	0%
Use of net fresh water (FW)	m^3	0.145	$5.06x10^{-3}$	$2.82x10^{-3}$	$6.94x10^{-3}$	$4.15x10^{-4}$	$-3.16x10^{-2}$
	%	110%	3.9%	2.2%	5.4%	0.32%	-25%

Table 25. *Waste and outflows, per m², for the product over a 1-yr time horizon. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits.* (***Art Select Rigid Core - Distribution to North America)***

Parameter	Unit	A1-A3	A4	A5	B2	C2	C4
Wastes							
Hazardous waste disposed (HWD)	kg	0.487	$5.77x10^{-2}$	$2.63x10^{-2}$	$5.65x10^{-3}$	$3.49x10^{-3}$	$3.00x10^{-3}$
	%	84%	9.9%	4.5%	0.97%	0.6%	0.51%
Non hazardous waste disposed (NHWD)	kg	11.1	0.503	4.29	0.115	$3.73x10^{-2}$	28.9
	%	25%	1.1%	9.5%	0.26%	0.083%	64%
Radioactive waste disposed (RWD)	kg	$1.63x10^{-4}$	$1.07x10^{-5}$	$7.53x10^{-6}$	$1.38x10^{-6}$	$1.01x10^{-6}$	$7.10x10^{-7}$
	%	88%	5.8%	4.1%	0.75%	0.55%	0.39%
Components for re-use (CRU)	kg	0.00	0.00	0.00	0.00	0.00	0.00
	%	0%	0%	0%	0%	0%	0%
Materials for recycling (MFR)	kg	0.00	0.00	1.12	0.00	0.00	0.00
	%	0%	0%	100%	0%	0%	0%
Materials for energy recovery (MER)	kg	0.00	0.00	0.00	0.00	0.00	0.00
	%	0%	0%	0%	0%	0%	0%
Exported electrical energy (EEE)	MJ	$3.94x10^{-2}$	$6.34x10^{-3}$	$2.24x10^{-3}$	$4.25x10^{-4}$	$6.60x10^{-4}$	$4.40x10^{-4}$
	%	80%	13%	4.5%	0.86%	1.3%	0.89%
Exported thermal energy (EET)	MJ	$2.81x10^{-2}$	$6.91x10^{-3}$	$2.22x10^{-3}$	$5.81x10^{-4}$	$7.99x10^{-4}$	$3.78x10^{-3}$
	%	66%	16%	5.2%	1.4%	1.9%	8.9%

Table 26. *Key Life Cycle Impact Assessment results, per m^2, for the product over a 1-yr time horizon. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits.* ***(Korlok/Van Gogh Rigid Core (6.5mm) - Distribution to the United Kingdom)***

Impact Category	Unit	A1-A3	A4	A5	B2	C2	C4
Core Indicators							
Global Warming Potential - total (GWP-total)	kg CO_2 eq.	12.8	3.43	1.13	$4.65x10^{-2}$	0.228	3.83
	%	60%	16%	5.2%	0.22%	1.1%	18%
Global Warming Potential - fossil fuels (GWP-fossil)	kg CO_2 eq.	12.8	3.43	0.774	$5.47x10^{-2}$	0.228	0.398
	%	72%	19%	4.4%	0.31%	1.3%	2.3%
Global Warming Potential - biogenic (GWP-biogenic)	kg CO_2 eq.	$5.53x10^{-2}$	$7.36x10^{-4}$	0.352	$-3.28x10^{-2}$	$1.57x10^{-4}$	3.43
	%	1.5%	0.019%	9.3%	-0.86%	0.0041%	90%
Global Warming Potential - land use and land use change (GWP-luluc)	kg CO_2 eq.	$1.58x10^{-2}$	$1.54x10^{-3}$	$7.07x10^{-4}$	$2.46x10^{-2}$	$7.59x10^{-5}$	$6.07x10^{-5}$
	%	37%	3.6%	1.7%	58%	0.18%	0.14%
Global warming potential (GWP-GHG)	kg CO_2 eq.	12.9	3.43	0.956	$7.94x10^{-2}$	0.228	2.86
	%	63%	17%	4.7%	0.39%	1.1%	14%
Depletion potential of the stratospheric ozone layer (ODP)	kg CFC-11 eq.	$4.05x10^{-6}$	$6.01x10^{-8}$	$1.66x10^{-7}$	$1.16x10^{-9}$	$4.99x10^{-9}$	$2.18x10^{-9}$
	%	95%	1.4%	3.9%	0.027%	0.12%	0.051%
Acidification potential, Accumulated Exceedance (AP)	mol H+ eq.	$6.24x10^{-2}$	$6.31x10^{-2}$	$5.59x10^{-3}$	$3.30x10^{-4}$	$9.28x10^{-4}$	$8.44x10^{-4}$
	%	47%	47%	4.2%	0.25%	0.7%	0.63%
Eutrophication potential - freshwater (EP-freshwater)	kg P eq.	$3.33x10^{-3}$	$1.71x10^{-4}$	$1.64x10^{-4}$	$1.37x10^{-5}$	$1.56x10^{-5}$	$3.60x10^{-4}$
	%	82%	4.2%	4.1%	0.34%	0.39%	8.9%
Eutrophication potential - marine (EP-marine)	kg N eq.	$1.59x10^{-2}$	$1.65x10^{-2}$	$1.84x10^{-3}$	$2.07x10^{-4}$	$3.49x10^{-4}$	$5.47x10^{-3}$
	%	40%	41%	4.6%	0.52%	0.87%	14%
Eutrophication potential - terrestrial (EP-terrestrial)	mol N eq.	0.166	0.182	$1.66x10^{-2}$	$9.23x10^{-4}$	$3.81x10^{-3}$	$2.78x10^{-3}$
	%	45%	49%	4.5%	0.25%	1%	0.75%
Photochemical Ozone Creation Potential (POCP)	kg NMVOC eq.	$6.20x10^{-2}$	$5.18x10^{-2}$	$5.66x10^{-3}$	$3.10x10^{-4}$	$1.38x10^{-3}$	$1.90x10^{-3}$
	%	50%	42%	4.6%	0.25%	1.1%	1.5%
Depletion of abiotic resources - fossil fuels (ADPF)[1]	MJ	229	45.0	12.4	1.11	3.25	1.95
	%	78%	15%	4.2%	0.38%	1.1%	0.67%
Depletion of abiotic resources - minerals and metals (ADPE)[1]	kg Sb eq.	$1.03x10^{-4}$	$7.15x10^{-6}$	$4.49x10^{-6}$	$5.33x10^{-7}$	$7.91x10^{-7}$	$1.80x10^{-7}$
	%	89%	6.1%	3.9%	0.46%	0.68%	0.16%
Water use (WDP)[1]	m^3 World eq.	5.07	0.180	0.220	$4.22x10^{-2}$	$1.70x10^{-2}$	$8.57x10^{-2}$
	%	90%	3.2%	3.9%	0.75%	0.3%	1.5%

1) The results of this environmental impact indicator shall be used with care as uncertainties on these results are high or there is limited experience with the indicator.

Table 27. *Other Life Cycle Impact Assessment results, per m², for the product over a 1-yr time horizon. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits.* ***(Korlok/Van Gogh Rigid Core (6.5mm) - Distribution to the United Kingdom)***

Impact Category	Unit	A1-A3	A4	A5	B2	C2	C4
Additional Indicators							
Potential incidence of disease due to PM emissions (PM)	Disease Incidence	$1.55x10^{-6}$	$1.80x10^{-7}$	$8.28x10^{-8}$	$5.03x10^{-9}$	$1.87x10^{-8}$	$1.40x10^{-8}$
	%	84%	9.7%	4.5%	0.27%	1%	0.76%
Potential Human exposure efficiency relative to U235 (IRP)[2]	kBq U235 eq.	0.599	$3.57x10^{-2}$	$2.60x10^{-2}$	$6.99x10^{-3}$	$3.87x10^{-3}$	$2.81x10^{-3}$
	%	89%	5.3%	3.8%	1%	0.57%	0.42%
Potential Comparative Toxic Unit for ecosystems (ETP-fw)	CTUe	93.5	4.50	6.91	0.674	0.431	62.4
	%	56%	2.7%	4.1%	0.4%	0.26%	37%
Potential Comparative Toxic Unit for humans - cancer effects (HTP-c)[1]	CTUh	$1.39x10^{-8}$	$6.66x10^{-10}$	$5.97x10^{-10}$	$2.10x10^{-11}$	$3.91x10^{-11}$	$9.14x10^{-11}$
	%	91%	4.4%	3.9%	0.14%	0.26%	0.6%
Potential Comparative Toxic Unit for humans - non-cancer effects (HTP-nc)[1]	CTUh	$1.22x10^{-7}$	$1.91x10^{-8}$	$6.92x10^{-9}$	$5.80x10^{-10}$	$2.03x10^{-9}$	$1.41x10^{-8}$
	%	74%	12%	4.2%	0.35%	1.2%	8.5%
Potential Soil quality index (SQP)[1]	Dimensionless	199	14.3	8.92	1.26	1.92	4.33
	%	87%	6.2%	3.9%	0.55%	0.83%	1.9%

1) The results of this environmental impact indicator shall be used with care as uncertainties on these results are high or there is limited experience with the indicator.

2) This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

Table 28. *Resource use, per m², for the product over a 1-yr time horizon. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits.* ***(Korlok/Van Gogh Rigid Core (6.5mm) - Distribution to the United Kingdom)***

Parameter	Unit	A1-A3	A4	A5	B2	C2	C4
Resources							
Use of renewable primary energy resources used as energy carrier (PERE)	MJ	29.3	0.528	1.20	0.912	$5.29x10^{-2}$	$4.42x10^{-2}$
	%	91%	1.6%	3.8%	2.8%	0.17%	0.14%
Use of renewable primary energy resources used as raw materials (PERM)	MJ	7.22	0.00	0.289	0.00	0.00	0.00
	%	96%	0%	3.8%	0%	0%	0%
Total use of renewable primary energy resources (PERT)	MJ	36.5	0.528	1.49	0.912	$5.29x10^{-2}$	$4.42x10^{-2}$
	%	92%	1.3%	3.8%	2.3%	0.13%	0.11%
Use of non renewable primary energy resources used as energy carrier (PENRE)	MJ	180	44.7	12.2	1.12	3.22	1.93
	%	74%	18%	5%	0.46%	1.3%	0.8%
Use of non renewable primary energy resources used as raw materials (PENRM)	MJ	46.4	0.00	$2.07x10^{-2}$	0.00	0.00	0.00
	%	100%	0%	0.045%	0%	0%	0%
Total use of non renewable primary energy resources (PENRT)	MJ	229	45.0	12.4	1.14	3.25	1.95
	%	78%	15%	4.2%	0.39%	1.1%	0.67%
Use of secondary materials (SM)	kg	0.00	0.00	0.00	0.00	0.00	0.00
	%	0%	0%	0%	0%	0%	0%
Use of renewable secondary fuels (RSF)	MJ	$6.18x10^{-2}$	$6.15x10^{-3}$	$2.78x10^{-3}$	$2.12x10^{-3}$	$7.36x10^{-4}$	$2.37x10^{-4}$
	%	84%	8.3%	3.8%	2.9%	1%	0.32%
Use of non renewable secondary fuels (NRSF)	MJ	0.00	0.00	0.00	0.00	0.00	0.00
	%	0%	0%	0%	0%	0%	0%
Use of net fresh water (FW)	m^3	0.172	$4.13x10^{-3}$	$5.62x10^{-3}$	$6.88x10^{-3}$	$3.93x10^{-4}$	$-3.00x10^{-2}$
	%	110%	2.6%	3.5%	4.3%	0.25%	-19%

Table 29. *Waste and outflows, per m², for the product over a 1-yr time horizon. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits.* ***(Korlok/Van Gogh Rigid Core (6.5mm) - Distribution to the United Kingdom)***

Parameter	Unit	A1-A3	A4	A5	B2	C2	C4
Wastes							
Hazardous waste disposed (HWD)	kg	0.644	$4.72x10^{-2}$	$2.90x10^{-2}$	$5.62x10^{-3}$	$3.30x10^{-3}$	$2.83x10^{-3}$
	%	88%	6.4%	4%	0.77%	0.45%	0.39%
Non hazardous waste disposed (NHWD)	kg	11.9	0.411	1.88	0.115	$3.53x10^{-2}$	27.5
	%	28%	0.98%	4.5%	0.27%	0.084%	66%
Radioactive waste disposed (RWD)	kg	$1.51x10^{-4}$	$8.76x10^{-6}$	$6.51x10^{-6}$	$1.58x10^{-6}$	$9.56x10^{-7}$	$6.70x10^{-7}$
	%	89%	5.2%	3.9%	0.93%	0.57%	0.4%
Components for re-use (CRU)	kg	0.00	0.00	0.00	0.00	0.00	0.00
	%	0%	0%	0%	0%	0%	0%
Materials for recycling (MFR)	kg	0.00	0.00	0.259	0.00	0.00	0.00
	%	0%	0%	100%	0%	0%	0%
Materials for energy recovery (MER)	kg	0.00	0.00	0.00	0.00	0.00	0.00
	%	0%	0%	0%	0%	0%	0%
Exported electrical energy (EEE)	MJ	$5.47x10^{-2}$	$5.18x10^{-3}$	$2.47x10^{-3}$	$2.31x10^{-3}$	$6.25x10^{-4}$	$4.18x10^{-4}$
	%	83%	7.9%	3.8%	3.5%	0.95%	0.64%
Exported thermal energy (EET)	MJ	$3.71x10^{-2}$	$5.65x10^{-3}$	$1.88x10^{-3}$	$5.81x10^{-4}$	$7.57x10^{-4}$	$3.63x10^{-3}$
	%	75%	11%	3.8%	1.2%	1.5%	7.3%

Table 30. *Key Life Cycle Impact Assessment results, per m^2, for the product over a 1-yr time horizon. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits.* ***(Korlok - Distribution to Australia)***

Impact Category	Unit	A1-A3	A4	A5	B2	C2	C4
Core Indicators							
Global Warming Potential - total (GWP-total)	kg CO_2 eq.	12.8	3.43	1.40	$5.73x10^{-2}$	0.228	3.83
	%	59%	16%	6.4%	0.26%	1%	18%
Global Warming Potential - fossil fuels (GWP-fossil)	kg CO_2 eq.	12.8	3.43	0.769	$6.59x10^{-2}$	0.228	0.398
	%	72%	19%	4.4%	0.37%	1.3%	2.3%
Global Warming Potential - biogenic (GWP-biogenic)	kg CO_2 eq.	$5.53x10^{-2}$	$7.36x10^{-4}$	0.626	$-3.32x10^{-2}$	$1.57x10^{-4}$	3.43
	%	1.4%	0.018%	15%	-0.81%	0.0039%	84%
Global Warming Potential - land use and land use change (GWP-luluc)	kg CO_2 eq.	$1.58x10^{-2}$	$1.54x10^{-3}$	$7.08x10^{-4}$	$2.46x10^{-2}$	$7.59x10^{-5}$	$6.07x10^{-5}$
	%	37%	3.6%	1.7%	58%	0.18%	0.14%
Global warming potential (GWP-GHG)	kg CO_2 eq.	12.9	3.43	1.14	$9.07x10^{-2}$	0.228	2.86
	%	63%	17%	5.5%	0.44%	1.1%	14%
Depletion potential of the stratospheric ozone layer (ODP)	kg CFC-11 eq.	$4.05x10^{-6}$	$6.01x10^{-8}$	$1.66x10^{-7}$	$1.01x10^{-9}$	$4.99x10^{-9}$	$2.18x10^{-9}$
	%	95%	1.4%	3.9%	0.024%	0.12%	0.051%
Acidification potential, Accumulated Exceedance (AP)	mol H+ eq.	$6.24x10^{-2}$	$6.31x10^{-2}$	$5.63x10^{-3}$	$3.94x10^{-4}$	$9.28x10^{-4}$	$8.44x10^{-4}$
	%	47%	47%	4.2%	0.3%	0.7%	0.63%
Eutrophication potential - freshwater (EP-freshwater)	kg P eq.	$3.33x10^{-3}$	$1.71x10^{-4}$	$1.65x10^{-4}$	$4.12x10^{-5}$	$1.56x10^{-5}$	$3.60x10^{-4}$
	%	82%	4.2%	4.1%	1%	0.38%	8.8%
Eutrophication potential - marine (EP-marine)	kg N eq.	$1.59x10^{-2}$	$1.65x10^{-2}$	$2.05x10^{-3}$	$2.22x10^{-4}$	$3.49x10^{-4}$	$5.47x10^{-3}$
	%	39%	41%	5.1%	0.55%	0.86%	14%
Eutrophication potential - terrestrial (EP-terrestrial)	mol N eq.	0.166	0.182	$1.67x10^{-2}$	$1.02x10^{-3}$	$3.81x10^{-3}$	$2.78x10^{-3}$
	%	45%	49%	4.5%	0.27%	1%	0.75%
Photochemical Ozone Creation Potential (POCP)	kg NMVOC eq.	$6.20x10^{-2}$	$5.18x10^{-2}$	$5.76x10^{-3}$	$3.36x10^{-4}$	$1.38x10^{-3}$	$1.90x10^{-3}$
	%	50%	42%	4.7%	0.27%	1.1%	1.5%
Depletion of abiotic resources - fossil fuels (ADPF)[1]	MJ	229	45.0	12.4	1.14	3.25	1.95
	%	78%	15%	4.2%	0.39%	1.1%	0.66%
Depletion of abiotic resources - minerals and metals (ADPE)[1]	kg Sb eq.	$1.03x10^{-4}$	$7.15x10^{-6}$	$4.50x10^{-6}$	$5.38x10^{-7}$	$7.91x10^{-7}$	$1.80x10^{-7}$
	%	89%	6.1%	3.9%	0.46%	0.68%	0.16%
Water use (WDP)[1]	m^3 World eq.	5.07	0.180	0.224	$4.24x10^{-2}$	$1.70x10^{-2}$	$8.57x10^{-2}$
	%	90%	3.2%	4%	0.75%	0.3%	1.5%

1) The results of this environmental impact indicator shall be used with care as uncertainties on these results are high or there is limited experience with the indicator.

Table 31. *Other Life Cycle Impact Assessment results, per m², for the product over a 1-yr time horizon. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits.* ***(Korlok - Distribution to Australia)***

Impact Category	Unit	A1-A3	A4	A5	B2	C2	C4
Additional Indicators							
Potential incidence of disease due to PM emissions (PM)	Disease Incidence	$1.55x10^{-6}$	$1.80x10^{-7}$	$8.32x10^{-8}$	$5.07x10^{-9}$	$1.87x10^{-8}$	$1.40x10^{-8}$
	%	84%	9.7%	4.5%	0.27%	1%	0.76%
Potential Human exposure efficiency relative to U235 (IRP)[2]	kBq U235 eq.	0.599	$3.57x10^{-2}$	$2.63x10^{-2}$	$1.94x10^{-3}$	$3.87x10^{-3}$	$2.81x10^{-3}$
	%	89%	5.3%	3.9%	0.29%	0.58%	0.42%
Potential Comparative Toxic Unit for ecosystems (ETP-fw)	CTUe	93.5	4.50	7.38	0.710	0.431	62.4
	%	55%	2.7%	4.4%	0.42%	0.26%	37%
Potential Comparative Toxic Unit for humans - cancer effects (HTP-c)[1]	CTUh	$1.39x10^{-8}$	$6.66x10^{-10}$	$6.00x10^{-10}$	$2.28x10^{-11}$	$3.91x10^{-11}$	$9.14x10^{-11}$
	%	91%	4.4%	3.9%	0.15%	0.26%	0.6%
Potential Comparative Toxic Unit for humans - non-cancer effects (HTP-nc)[1]	CTUh	$1.22x10^{-7}$	$1.91x10^{-8}$	$7.44x10^{-9}$	$6.99x10^{-10}$	$2.03x10^{-9}$	$1.41x10^{-8}$
	%	74%	12%	4.5%	0.42%	1.2%	8.5%
Potential Soil quality index (SQP)[1]	Dimensionless	199	14.3	9.06	1.22	1.92	4.33
	%	87%	6.2%	3.9%	0.53%	0.83%	1.9%

1) The results of this environmental impact indicator shall be used with care as uncertainties on these results are high or there is limited experience with the indicator.

2) This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

Table 32. *Resource use, per m^2, for the product over a 1-yr time horizon. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits.* ***(Korlok - Distribution to Australia)***

Parameter	Unit	A1-A3	A4	A5	B2	C2	C4
Resources							
Use of renewable primary energy resources used as energy carrier (PERE)	MJ	29.3	0.528	1.21	0.905	$5.29x10^{-2}$	$4.42x10^{-2}$
	%	91%	1.6%	3.8%	2.8%	0.17%	0.14%
Use of renewable primary energy resources used as raw materials (PERM)	MJ	7.22	0.00	0.289	0.00	0.00	0.00
	%	96%	0%	3.8%	0%	0%	0%
Total use of renewable primary energy resources (PERT)	MJ	36.5	0.528	1.49	0.905	$5.29x10^{-2}$	$4.42x10^{-2}$
	%	92%	1.3%	3.8%	2.3%	0.13%	0.11%
Use of non renewable primary energy resources used as energy carrier (PENRE)	MJ	180	44.7	12.2	1.15	3.22	1.93
	%	74%	18%	5%	0.47%	1.3%	0.8%
Use of non renewable primary energy resources used as raw materials (PENRM)	MJ	46.4	0.00	$2.07x10^{-2}$	0.00	0.00	0.00
	%	100%	0%	0.045%	0%	0%	0%
Total use of non renewable primary energy resources (PENRT)	MJ	229	45.0	12.4	1.17	3.25	1.95
	%	78%	15%	4.2%	0.4%	1.1%	0.66%
Use of secondary materials (SM)	kg	0.00	0.00	0.00	0.00	0.00	0.00
	%	0%	0%	0%	0%	0%	0%
Use of renewable secondary fuels (RSF)	MJ	$6.18x10^{-2}$	$6.15x10^{-3}$	$2.79x10^{-3}$	$2.37x10^{-4}$	$7.36x10^{-4}$	$2.37x10^{-4}$
	%	86%	8.5%	3.9%	0.33%	1%	0.33%
Use of non renewable secondary fuels (NRSF)	MJ	0.00	0.00	0.00	0.00	0.00	0.00
	%	0%	0%	0%	0%	0%	0%
Use of net fresh water (FW)	m^3	0.172	$4.13x10^{-3}$	$4.60x10^{-3}$	$6.88x10^{-3}$	$3.93x10^{-4}$	$-3.00x10^{-2}$
	%	110%	2.6%	2.9%	4.3%	0.25%	-19%

Table 33. *Waste and outflows, per m^2, for the product over a 1-yr time horizon. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits.* ***(Korlok - Distribution to Australia)***

Parameter	Unit	A1-A3	A4	A5	B2	C2	C4
Wastes							
Hazardous waste disposed (HWD)	kg	0.644	$4.72x10^{-2}$	$2.93x10^{-2}$	$6.03x10^{-3}$	$3.30x10^{-3}$	$2.83x10^{-3}$
	%	88%	6.4%	4%	0.82%	0.45%	0.39%
Non hazardous waste disposed (NHWD)	kg	11.9	0.411	3.23	0.115	$3.53x10^{-2}$	27.5
	%	28%	0.95%	7.5%	0.27%	0.082%	64%
Radioactive waste disposed (RWD)	kg	$1.51x10^{-4}$	$8.76x10^{-6}$	$6.60x10^{-6}$	$4.72x10^{-7}$	$9.56x10^{-7}$	$6.70x10^{-7}$
	%	90%	5.2%	3.9%	0.28%	0.57%	0.4%
Components for re-use (CRU)	kg	0.00	0.00	0.00	0.00	0.00	0.00
	%	0%	0%	0%	0%	0%	0%
Materials for recycling (MFR)	kg	0.00	0.00	$8.74x10^{-3}$	0.00	0.00	0.00
	%	0%	0%	100%	0%	0%	0%
Materials for energy recovery (MER)	kg	0.00	0.00	0.00	0.00	0.00	0.00
	%	0%	0%	0%	0%	0%	0%
Exported electrical energy (EEE)	MJ	$5.47x10^{-2}$	$5.18x10^{-3}$	$2.59x10^{-3}$	$2.02x10^{-4}$	$6.25x10^{-4}$	$4.18x10^{-4}$
	%	86%	8.1%	4.1%	0.32%	0.98%	0.66%
Exported thermal energy (EET)	MJ	$3.71x10^{-2}$	$5.65x10^{-3}$	$2.22x10^{-3}$	$5.83x10^{-4}$	$7.57x10^{-4}$	$3.63x10^{-3}$
	%	74%	11%	4.4%	1.2%	1.5%	7.3%

Table 34. *TRACI Life Cycle Impact Assessment results, per m^2, for the product over a 1-yr time horizon. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits.* ***(Korlok Select/Korlok Reserve - Distribution to North America)***

Parameter	Unit	A1-A3	A4	A5	B2	C2	C4
TRACI							
Global warming	kg CO_2 eq	11.2	3.97	1.60	$8.23x10^{-2}$	0.225	2.72
	%	57%	20%	8.1%	0.42%	1.1%	14%
Ozone depletion	kg CFC-11 eq	$4.86x10^{-6}$	$7.42x10^{-8}$	$2.04x10^{-7}$	$9.84x10^{-10}$	$5.28x10^{-9}$	$2.31x10^{-9}$
	%	94%	1.4%	4%	0.019%	0.1%	0.045%
Acidification	kg SO_2 eq	$5.22x10^{-2}$	$6.30x10^{-2}$	$6.72x10^{-3}$	$2.79x10^{-4}$	$8.35x10^{-4}$	$1.22x10^{-3}$
	%	42%	51%	5.4%	0.22%	0.67%	0.98%
Eutrophication	kg N eq	$7.13x10^{-2}$	$4.59x10^{-3}$	$2.54x10^{-2}$	$5.10x10^{-4}$	$2.24x10^{-4}$	0.179
	%	25%	1.6%	9%	0.18%	0.08%	64%
Smog	kg O_3 eq	0.762	1.25	0.149	$3.61x10^{-3}$	$2.36x10^{-2}$	$1.72x10^{-2}$
	%	34%	57%	6.7%	0.16%	1.1%	0.78%
Fossil fuel depletion	MJ surplus	24.1	7.59	2.09	0.131	0.460	0.269
	%	70%	22%	6%	0.38%	1.3%	0.78%

Table 35. *TRACI Life Cycle Impact Assessment results, per m², for the product over a 1-yr time horizon. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits.* ***(Art Select Rigid Core - Distribution to North America)***

Parameter	Unit	A1-A3	A4	A5	B2	C2	C4
TRACI							
Global warming	kg CO_2 eq	11.8	4.14	1.65	$8.23x10^{-2}$	0.237	2.82
	%	57%	20%	7.9%	0.4%	1.1%	14%
Ozone depletion	kg CFC-11 eq	$5.29x10^{-6}$	$7.75x10^{-8}$	$2.22x10^{-7}$	$9.84x10^{-10}$	$5.56x10^{-9}$	$2.43x10^{-9}$
	%	94%	1.4%	4%	0.018%	0.099%	0.043%
Acidification	kg SO_2 eq	$5.48x10^{-2}$	$6.58x10^{-2}$	$6.95x10^{-3}$	$2.79x10^{-4}$	$8.80x10^{-4}$	$1.29x10^{-3}$
	%	42%	51%	5.3%	0.21%	0.68%	0.99%
Eutrophication	kg N eq	$7.55x10^{-2}$	$4.79x10^{-3}$	$2.63x10^{-2}$	$5.10x10^{-4}$	$2.35x10^{-4}$	0.190
	%	25%	1.6%	8.9%	0.17%	0.079%	64%
Smog	kg O_3 eq	0.802	1.31	0.153	$3.61x10^{-3}$	$2.49x10^{-2}$	$1.81x10^{-2}$
	%	35%	57%	6.6%	0.16%	1.1%	0.78%
Fossil fuel depletion	MJ surplus	25.7	7.93	2.18	0.131	0.485	0.283
	%	70%	22%	5.9%	0.36%	1.3%	0.77%

Table 36. *TRACI Life Cycle Impact Assessment results, per m², for the product over a 1-yr time horizon. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits.* ***(Korlok/Van Gogh Rigid Core (6.5mm) - Distribution to the United Kingdom)***

Parameter	Unit	A1-A3	A4	A5	B2	C2	C4
TRACI							
Global warming	kg CO_2 eq	12.7	3.39	0.930	$7.87x10^{-2}$	0.224	2.64
	%	64%	17%	4.7%	0.39%	1.1%	13%
Ozone depletion	kg CFC-11 eq	$5.20x10^{-6}$	$6.34x10^{-8}$	$2.12x10^{-7}$	$1.24x10^{-9}$	$5.26x10^{-9}$	$2.31x10^{-9}$
	%	95%	1.2%	3.9%	0.023%	0.096%	0.042%
Acidification	kg SO_2 eq	$5.64x10^{-2}$	$5.38x10^{-2}$	$4.94x10^{-3}$	$2.71x10^{-4}$	$8.33x10^{-4}$	$1.22x10^{-3}$
	%	48%	46%	4.2%	0.23%	0.71%	1%
Eutrophication	kg N eq	$8.63x10^{-2}$	$3.92x10^{-3}$	$1.25x10^{-2}$	$4.56x10^{-4}$	$2.23x10^{-4}$	0.182
	%	30%	1.4%	4.4%	0.16%	0.078%	64%
Smog	kg O_3 eq	1.02	1.07	0.100	$3.60x10^{-3}$	$2.35x10^{-2}$	$1.71x10^{-2}$
	%	46%	48%	4.5%	0.16%	1.1%	0.76%
Fossil fuel depletion	MJ surplus	26.1	6.48	1.51	0.132	0.459	0.268
	%	75%	19%	4.3%	0.38%	1.3%	0.77%

Table 37. *TRACI Life Cycle Impact Assessment results, per m^2, for the product over a 1-yr time horizon. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits.* (***Korlok - Distribution to Australia)***

Parameter	Unit	A1-A3	A4	A5	B2	C2	C4
TRACI							
Global warming	kg CO_2 eq	12.7	3.39	1.10	$8.99x10^{-2}$	0.224	2.64
	%	63%	17%	5.4%	0.45%	1.1%	13%
Ozone depletion	kg CFC-11 eq	$5.20x10^{-6}$	$6.34x10^{-8}$	$2.12x10^{-7}$	$1.08x10^{-9}$	$5.26x10^{-9}$	$2.31x10^{-9}$
	%	95%	1.2%	3.9%	0.02%	0.096%	0.042%
Acidification	kg SO_2 eq	$5.64x10^{-2}$	$5.38x10^{-2}$	$4.98x10^{-3}$	$3.25x10^{-4}$	$8.33x10^{-4}$	$1.22x10^{-3}$
	%	48%	46%	4.2%	0.28%	0.71%	1%
Eutrophication	kg N eq	$8.63x10^{-2}$	$3.92x10^{-3}$	$1.80x10^{-2}$	$6.73x10^{-4}$	$2.23x10^{-4}$	0.182
	%	30%	1.3%	6.2%	0.23%	0.077%	62%
Smog	kg O_3 eq	1.02	1.07	0.101	$4.17x10^{-3}$	$2.35x10^{-2}$	$1.71x10^{-2}$
	%	45%	48%	4.5%	0.19%	1.1%	0.76%
Fossil fuel depletion	MJ surplus	26.1	6.48	1.51	0.126	0.459	0.268
	%	75%	19%	4.3%	0.36%	1.3%	0.77%

6. LCA: Interpretation

With few exceptions, the potential impacts over a single product life cycle are dominated by the production stage (A1-A3) followed by product distribution (A4) and disposal (C4). Other life cycle phase contributions are minimal.

7. Additional Environmental Information

7.1 ENVIRONMENT AND HEALTH DURING MANUFACTURING

The Karndean manufacturing facilities are certified to ISO 14001 – Environmental management systems.

7.2 ENVIRONMENT AND HEALTH DURING INSTALLATION

The Karndean luxury vinyl flooring products meet the requirements of the following:

- FloorScore®
- Indoor Air Comfort Gold

7.3 EXTRAORDINARY EFFECTS

Fire

The Karndean flooring products meet the following fire classification and performance standards:

- EN 13501-1:2018: Fire classification of construction products and building elements. Classification using test data from reaction to fire tests. All Karndean Designflooring's LVT ranges achieve a reaction to fire classification of B_{fl}-s1.
- ASTM E648: Standard Test Method for Critical Radiant Flux of Floor-Covering Systems using a Radiant Heat Energy

Source (also referenced as NFPA 253 and FTM Standard 372). All Karndean Designflooring's LVT ranges achieve Class 1.

- AS ISO 9239.1:2003: Reaction to fire tests for floor-coverings. Determination of the burning behavior using a radiant heat source.
- ASTM E662: Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials, also referenced as NFPA 258. All Karndean Designflooring's LVT ranges meet <450 requirement for smoke density.

7.4 ENVIRONMENTAL ACTIVITIES AND CERTIFICATIONS

The Karndean Designflooring products are REACH compliant. Accreditations and certifications include; FloorScore® and Indoor Air Comfort Gold.

For more information on Karndean Designflooring's certifications and environmental initiatives please view the Global Environmental Statement www.karndean.com/eco.

8. References

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