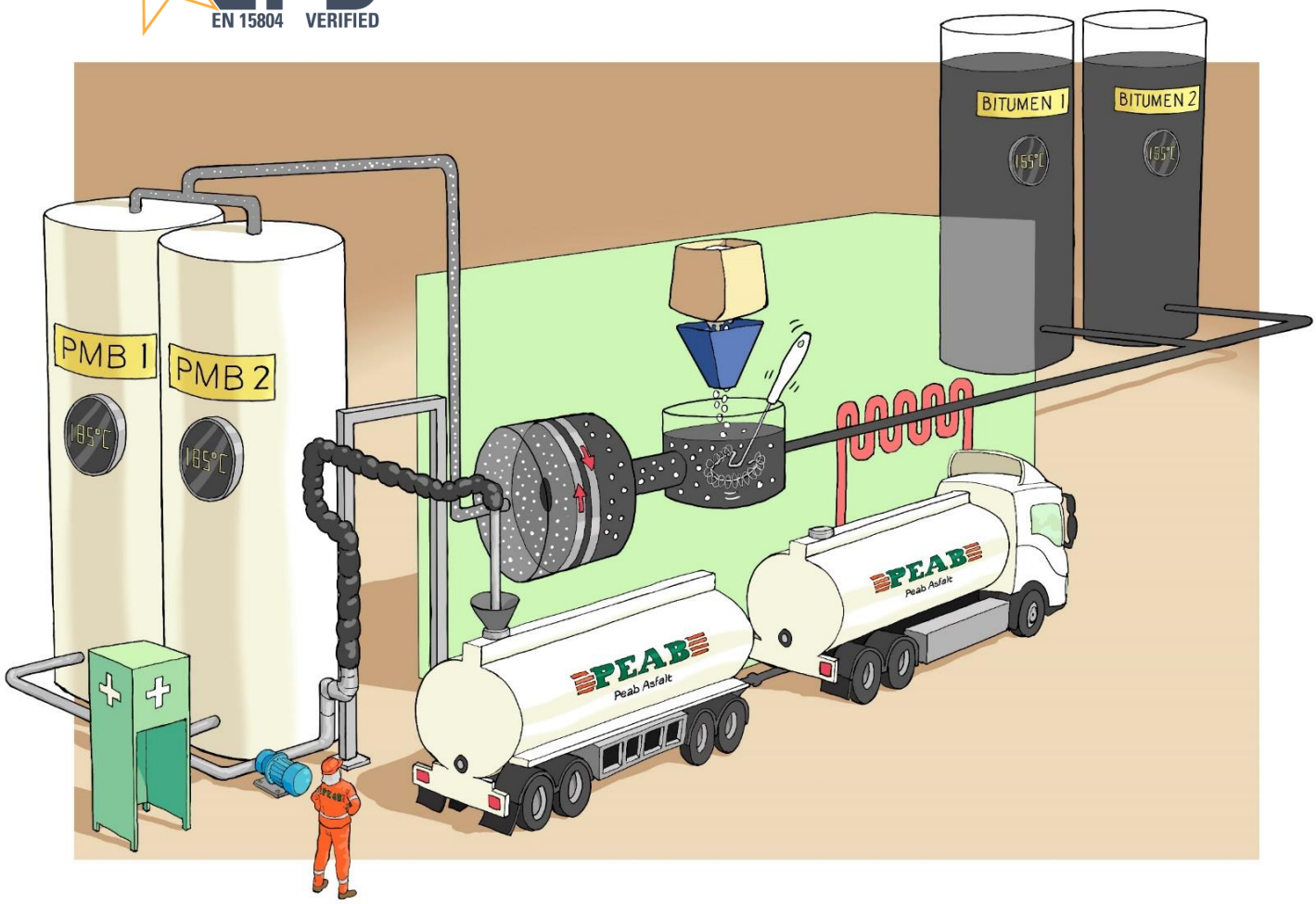

Environmental product declaration – EPD

Environmental product declaration according ISO 14025 and EN 15 804:2012+A2:2019

Polymer modified bitumen, PMB

Programme: The International EPD® System, www.environdec.com

Programme operator: EDP International AB

EPD registration number: S-P-03962

Publication date: 2021-12-06

Valid until: 2026-11-12

Peab Asfalt

Programme information

Programme:	The International EPD® System EPD International AB Box 210 60 SE-100 31 Stockholm Sweden www.environdec.com info@environdec.com

Product category rules (PCR): PCR 2019:14 Construction products version 1.1, UN CPC code: 153
PCR review was conducted by: Claudia A. Peña. The Technical Committee of the International EPD System, info@environdec.com
Independent third-party verification of the declaration and data, according to ISO 14025:2006: ☒ External ☐ Internal covering ☐ EPD process certification ☒ EPD verification
Third party verifier: Pär Lindman, Individual verifier approved by Environdec. *In case of recognised individual verifiers:* Approved by: The International EPD® System
Procedure for follow-up of data during EPD validity involves third party verifier: ☐ Yes ☒ No

The EPD owner has the sole ownership, liability, and responsibility for the EPD. EPDs within the same product category but from different programmes may not be comparable.

Company information

Owner of the EPD

Peab Asfalt AB, Box 1282, 262 24 Ängelholm, Sweden, tel. 0431-89 000

Description of Peab Asfalt AB

Peab Asfalt AB, a subsidiary of Peab AB, is one of Sweden's leading asphalt companies and the only one with a nationwide coverage, specializing in the production and deployment of hot, semi-hot, cold-mixed asphalt and sealcoating. The company has approximately 700 employees, operating all over in Sweden and has a subsidiary in Norway, Finland and Denmark.

Peab Asfalt's ambition is to take responsibility throughout the entire value chain for the environmental impact. The endeavour within the company is to reduce its climate impact, to ensure a highly material effective operation and work actively to phase out environmental and health hazardous materials.

Peab Asfalt AB is striving to reduce the waste of old asphalt in coating work by reusing as much as possible in the manufacture of new asphalt. Reuse of asphalt directly in place, contributes to reduced transportations to landfills, as well as the need for bitumen and rock materials.

Peab Asfalt AB is quality certified according to ISO 9001 and environmentally certified according to ISO 14001. All asphalt sites provide asphalt that is CE marked, in accordance with the requirements of SS-EN ISO 13108-1-8 and SS-EN ISO 13108-20-21.

More information at peabasfalt.se.

Production site

All products included in this declaration is produced on Peab production site in Västerås, Sweden.

Product information

Product description

The product polymer modified bitumen (PMB) is used as binder for different road application. PMB is mixed together with gravel to produce asphalt in an asphalt plant**.** The products presented in this declaration differs from each other in the production, in amount of each ingredients used. Asphalt get different characteristics through the variation of ingredients that are adopted to the area of use. It includes the bitumen types PaveBit PMB 40/100-75, PMB 45/80-55, PMB 75/130-65 and PG 76-34.

The PMB declared in this EPD fulfil the standard EN 14023 and the technical requirements from the Swedish Transport Administration according to TDOK 2013:0529. PMB is CE-marked with number 0402.

PMB is a black-brown liquid, which has the density 1 Mg/m^3 and a lifespan that is longer than 20 years. Road applications with PMB are reused in the same way as other coatings and contains non-hazardous subjects.

More information can be found in the safety data sheet (SDS) for each product.

Product identification

The production of PMB includes warm bitumen and polymer mixed together in a mill through a milling process. The polymer dissolves in the liquid and are then pushed to a storage tank to be stored. All production takes place after ordering, which means that the storage time is short for finished product.

The geographical coverage for all products in this declaration is Europe.

UN CPC code: 15330

LCA information

Declared unit

The declared unit is 1 tonne (1000 kg) of PMB at production plant gate.

Time representativeness

Collected data for this declaration is based on information from the year 2019.

Used databases and LCA software

The LCA software GaBi 9 Professional was used as well as databases provided by Thinkstep AG/Sphera (2019). Specific data from the supplier was used to model the SBS production process.

System boundaries

The LCA covers the cradle-to gate stages, i.e. extraction and transports of raw materials (upstream modules A1-A2) and manufacturing to passage of plant gate (core module A3). Transportation to construction site (module A4) has been excluded since an average transport length will be misleading because the transportation length can variate a lot. The end-of-life modules (C-D) are excluded, since the products need to be physically integrated with other raw materials (gravel and ballast) during installation (A5) so they can be applied to roads.

Table 1: Life cycle stages declared in this study. An "X" means that the stage is included and MND (Module Not Declared) means it is not. Since all product variants are presented separately and only one site is included, the variation not reported.

Life cycle stage	Included in this study (X)	Geography	Specific data used (% of GWP GHG)
A1) Raw material supply	X	Global	50% PMB 10%CE
A2) Transport	X	Global	100%
A3) Manufacturing	X	Sweden	100%
A4) Transport	MND	N.A.	N.A.
A5) Construction installation	MND	N.A.	N.A.
B1) Use	MND	N.A.	N.A.
B2) Maintenance	MND	N.A.	N.A.
B3) Repair	MND	N.A.	N.A.
B4) Replacement	MND	N.A.	N.A.
B5) Refurbishment	MND	N.A.	N.A.
B6) Operational energy use	MND	N.A.	N.A.
B7) Operational water use	MND	N.A.	N.A.
C1) Deconstruction, demolition	MND	N.A.	N.A.
C2) Transport	MND	N.A.	N.A.
C3) Waste processing	MND	N.A.	N.A.
C4) Disposal	MND	N.A.	N.A.
D) Reuse, recovery, recycling potential	MND	N.A.	N.A.

The upstream data concerning bitumen production contain several allocations made by the data providers. These include allocation in the following steps: crude oil extraction, refinery, and storage of bitumen. At the crude oil extraction step, burdens were allocated by oil-equivalents (energy allocation). At refinery allocation had been avoided by using an approach following up energy flows within the distillation column, using physical relationships, as proposed in ISO 14040 and ISO 14044.

Allocation for the storage stage of the life cycle was based upon a mass balance.

Close to 100% of all material and energy flows, have been included in the model calculations. The study applies a cut-off criterion of maximum 1%, which complies with the maximum cut-off criteria established by the PCR and EN 15804 standard.

System diagram

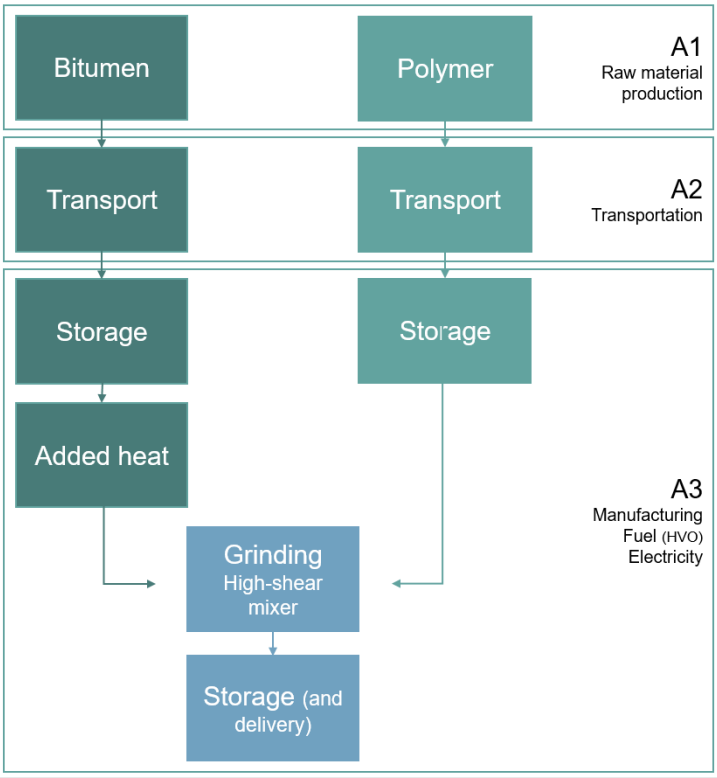

Figure 1: An overview of the studied product system for production of polymer modified bitumen (PMB).

Content declaration

PMB

Table 2: Information of the composition of declared bitumen types.

	PaveBit			
Materials	**PMB 40/100-75**	**PMB 45/80-55**	**PMB 75/130-65**	**PG 76-34**
Bitumen	>94%	>94%	>94%	>94%
SBS polymer	<6%	<6%	<6%	<6%

The values for each environmental parameter are presenting four PaveBit-products PMB 40/100-75, PMB 45/80-55, PMB 75/130-65 and PG 76-34 in the tables below (table 3 – table 6). An average for each parameter is presented in each table.

Environmental performance

Potential environmental impact

Table 3: Results of the LCA, modules A1-A3 – Potential environmental impact for 1 tonne (1000 kg) of specific bitumen types, PaveBit PMB 40/100-75, PMB 45/80-55, PMB 75/130-65 and PG 76-34.

			PaveBit				
PARAMETER		**UNIT**	**PMB 40/100-75**	**PMB 45/80-55**	**PMB 75/130-65**	**PG 76-34**	**PMB Average**
Indicator for climate impact, GWP - GHG		kg CO_2 eq.	3,00E+02	2,57E+02	2,74E+02	3,02E+02	2,83E+02
Global warming potential (GWP)	Fossil	kg CO_2 eq.	2,97E+02	2,53E+02	2,71E+02	3,00E+02	2,80E+02
	Biogenic	kg CO_2 eq.	3,25E+01	2,83E+01	3,00E+01	3,29E+02	3,09E+01
	Land use and transformation	kg CO_2 eq.	2,54E-01	2,17E-01	2,32E-01	2,56E-01	2,40E-01
	TOTAL	kg CO_2 eq.	3,29E+02	2,81E+02	3,01E+02	3,33E+02	3,11E+02
Depletion potential of the stratospheric ozone layer (ODP)		kg CFC 11 eq.	1,01E-05	1,03E-05	1,02E-05	1,01E-05	1,02E-05
Acidification potential (AP)		kg SO_2 eq.	1,98E+00	1,92E+00	1,95E+00	1,99E+00	1,96E+00
Eutrophication potential (EP)		kg PO_4^{3-} eq.	1,69E-02	1,27E-02	1,44E-02	1,72E-02	1,53E-02
Eutrophication aquatic freshwater		kg P eq.	5,51E-03	4,13E-03	4,70E-03	5,59E-03	4,98E-03
Eutrophication aquatic marine		kg N eq.	1,51E-01	1,17E-01	1,31E-01	1,52E-01	1,38E-01
Eutrophication terrestrial		mole N eq.	3,77E+00	3,50E+00	3,61E+00	3,79E+00	3,67E+00
Photochemical ozone formation		kg NMVOC eq.	1,54E+00	1,48E+00	1,51E+00	1,55E+00	1,52E+00
Depletion of abiotic resources – minerals and metals		kg Sb eq.	1,84E-05	1,35E-05	1,55E-05	1,87E-05	1,65E-05
Depletion of abiotic resources – fossil fuels		MJ, net calorific value	4,73E+04	4,66E+04	4,69E+04	4,73E+04	4,70E+04
Water scarcity		m^3 eq.	2,99E+01	2,26E+01	2,56E+01	3,04E+01	2,71E+01
Particulate matter emissions		Disease incidences	1,17E-05	1,10E-05	1,12E-05	1,16E05	1,14E-05
Ionizing radiation, human health		kBq U235 eq.	2,18E+01	1,51E+01	1,79E+01	2,22E+01	1,93E+01
Eco-toxicity (freshwater)		CTUe	2,32E+03	1,61E+03	1,90E+03	2,36E+03	2,04E+03
Human toxicity, cancer effects		CTUh	3,98E-06	3,96E-06	3,97E-06	3,97E-06	3,97E-06
Human toxicity, non-cancer effects		CTUh	5,01E06	4,68E-06	4,82E-06	5,03E-06	4,88E-06
Land use related impacts/soil quality		Pt	2,00E+00	-4,11E+01	-2,33E+01	4,84E+00	-1,44E+01

"E" is written as a substitute for the number of zero. For example 3,5E-02 means 0,035.

Use of resources

Table 4: Results of the LCA, modules A1-A3 – Use of resources for 1 tonne (1000 kg) of specific bitumen types, PaveBit PMB 40/100-75, PMB 45/80-55, PMB 75/130-65 and PG 76-34.

			PaveBit				
PARAMETER		**UNIT**	**PMB 40/100-75**	**PMB 45/80-55**	**PMB 75/130-65**	**PG 76-34**	**PMB Average**
Primary energy resources – Renewable	Use as energy carrier	MJ, net calorific value	2,16E+02	1,90E+02	2,01E+02	2,18E+02	2,06E+02
	Used as raw materials	MJ, net calorific value	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
	TOTAL	MJ, net calorific value	1,77E+02	1,49E+02	1,61E+02	1,79E+02	1,67E+02
Primary energy resources – Non-renewable	Use as energy carrier	MJ, net calorific value	9,38E+04	9,39E+04	9,39E+04	9,37E+04	9,38E+04
	Used as raw materials	MJ, net calorific value	3,40E+04	3,46E+04	3,44E+04	3,40E+04	3,43E+04
	TOTAL	MJ, net calorific value	8,33E+04	8,33E+04	8,33E+04	8,32E+04	8,33E+04
Secondary material		kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Renewable secondary fuels		MJ, net calorific value	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Non-renewable secondary fuels		MJ, net calorific value	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Net use of fresh water		m^3	8,28E-01	6,14E-01	7,02E-01	8,41E-01	7,46E-01

"E" is written as a substitute for the number of zero. For example 3,5E-02 means 0,035.

Waste production and output flows

Waste production

Table 5: Results of the LCA, modules A1-A3 – Waste production for 1 tonne (1000 kg) of specific bitumen types, PaveBit PMB 40/100-75, PMB 45/80-55, PMB 75/130-65 and PG 76-34.

		PaveBit				
PARAMETER	**UNIT**	**PMB 40/100-75**	**PMB 45/80-55**	**PMB 75/130-65**	**PG 76-34**	**PMB Average**
Hazardous waste disposed	kg	7,90E-06	5,33E-06	6,37E-06	8,00E-06	6,90E-06
Non-hazardous waste disposed	kg	1,02E+01	8,42E+00	9,15E+00	1,03E+01	9,50E+00
Radioactive waste disposed	kg	1,41E-01	1,10E-01	1,23E-01	1,41E-01	1,29E-01

"E" is written as a substitute for the number of zero. For example 3,5E-02 means 0,035.

Output flows

Table 6: Results of the LCA, modules A1-A3 – Output flows for 1 tonne (1000 kg) of specific bitumen types, PaveBit PMB 40/100-75, PMB 45/80-55, PMB 75/130-65 and PG 76-34.

		PaveBit				
PARAMETER	**UNIT**	**PMB 40/100-75**	**PMB 45/80-55**	**PMB 75/130-65**	**PG 76-34**	**PMB Average**
Components for reuse	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Material for recycling	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Materials for energy recovery	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy, electricity	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy, thermal	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

"E" is written as a substitute for the number of zero. For example 3,5E-02 means 0,035.

References

General Programme Instructions of the International EPD® System. Version 3.0.

EPD International (2019) PCR 2019:14 Construction products (EN 15804:A2). Version 1.11, date 2020-12-20

Eurobitume (2020). The Eurobitume life-cycle inventory for bitumen. Version 3.1. Available online at: https://www.eurobitume.eu/feature-lci-01/

LCA Report - Life Cycle Assessment for the Production of Styrene-Butadiene-Styrene (SBS) & Creation of a GaBi-Dataset, brands&values® for KRATON POLYMERS LLC, October 2018.

CEN European Committee for Standardisation (2019). EN 15804:2012+A2:2019, Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products.

Thinkstep AG / Sphera (2020). GaBi Software System and database for Life Cycle Engineering 1992-2018 version 9. Leinfelden-Echterdingen, Germany.

Willskytt. S., Peñaloza. D. and Hallberg. E. (2021) IVL Swedish Environmental Research Institute Ltd. LCA methodology report for bitumen product by Peab Asfalt - As basis for the publication of an EPD, 2021-06.

EPD®

www.environdec.com