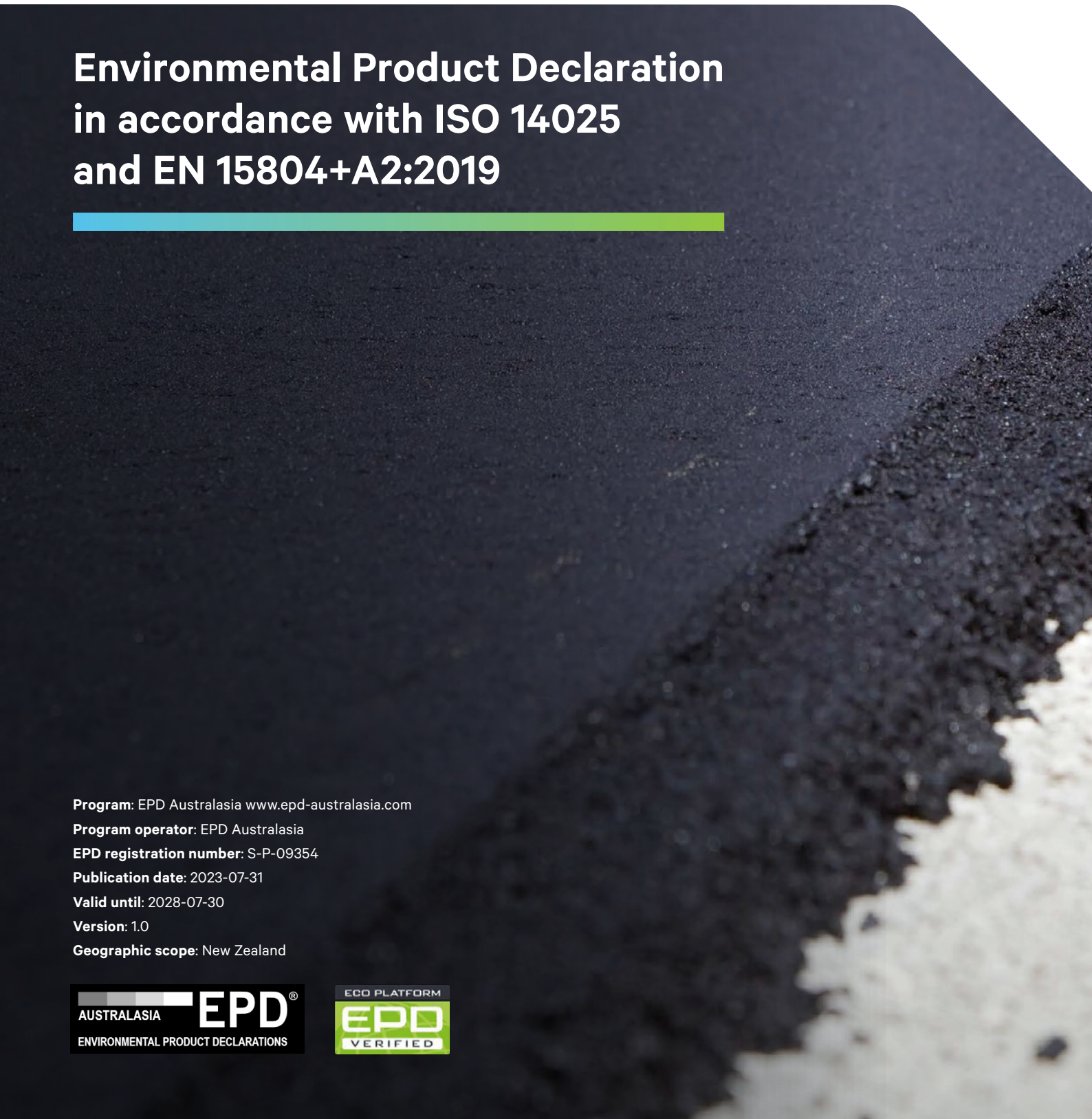
Downer
Relationships creating success

Asphalt

in New Zealand

Environmental Product Declaration in accordance with ISO 14025 and EN 15804+A2:2019



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AUSTRALASIA EPD® ENVIRONMENTAL PRODUCT DECLARATIONS

ECO PLATFORM EPD VERIFIED

Contents

Welcome

Sustainability is embedded into the way we work at Downer and means achieving good outcomes for our people, our communities, and the taiao (environment). We strive for excellence that will enable communities to thrive.

Our products and services impact millions of lives every day, and the sustainability of our operations is paramount – for our people, our partners, our shareholders, our customers, and their customers. We deliver these services while managing the impacts of our activities on the environment and communities in which we operate and working collaboratively with our supply chain. We understand that our ability to do this is fundamental both to Downer's success and the success of our communities.

Across Aotearoa New Zealand, our Asphalt Production teams are committed to increasing environmental sustainability through innovation. This includes supplying materials with high proportions of recycled materials, making the best use of locally available resources, reducing transport impacts, and preserving virgin materials. In addition to research and development, sustainability tracking, and target setting, we continue to invest in energy reduction initiatives including increasing our capabilities to produce future lower-impact products.

Alongside innovation, Downer believes third-party verification is critical to provide transparent, standardised, and comparable information. This Environmental Product Declaration (EPD) is a robust, evidence-based, independently-verified, and standardised tool to measure and communicate the sustainability of our asphalt products.

Together with our independently-verified Life Cycle Assessment calculator, this EPD enables you to quantify environmental outcomes for Downer's asphalt products and services. This supports informed purchasing decisions, transparent sustainability messaging, product quantification for green rating tools including the Infrastructure Sustainability Council's rating scheme, and promotes industry and environmental recognition. We hope that this transparent information will lift the industry as a whole.

Downer is committed to protecting our environment and supporting our communities by striving for increased environmental and sustainability outcomes, utilising innovation to adapt to the challenges we face. As a leading integrated services provider in Australia and New Zealand, we are empowered to contribute toward your sustainability goals and we look forward to continuing our efforts with you, now and in the future.

Ngā mihi nui,

Craig West
Executive General Manager, Transport & Infrastructure NZ
and New Zealand Country Lead

About Downer

At Downer, our customers are at the heart of everything we do.

Our **purpose** is to create and sustain the modern environment, and our **promise** is to work closely with our customers to help them succeed, using world-leading insights and solutions.

Downer designs, builds and sustains assets, infrastructure and facilities, and we are the leading provider of integrated services in Australia and New Zealand.

With a history dating back more than 150 years, Downer is listed on the Australian Securities Exchange and New Zealand Stock Exchange as Downer EDI Limited (DOW).

Downer Group employs approximately 33,000 people across more than 300 sites, primarily in Australia and New Zealand.

Downer's Road Services business builds, manages and maintains road networks across Australia and New Zealand, and manufactures and supplies products and services to create safe, efficient and reliable journeys.

A leading manufacturer and supplier of bitumen-based products, Downer is an innovator in the asphalt circular economy, using recycled products and environmentally sustainable methods to produce asphalt.

Our business is founded on four pillars which support **our purpose** and **our promise**:

Our commitment

Partnering with Downer means partnering with a contractor that has done, and continues to do, the lasting, transformational work across our business, with a focus on how that supports our customers' success.

Our core operating philosophy, 'Relationships creating success', encapsulates this theme.

We've been on this journey a long time, with decades of investment in research and development underpinning our ever-evolving business practices and industry-leading product and service offerings.

Downer delivers real, measurable, and recognised emissions reductions, and environmental benefits you can be proud to report to your stakeholders and the community.

A construction partner that leads with sustainability

Downer supports the science on climate change and is committed to taking action to decarbonise its emissions portfolio to help minimise global temperature rise.

Downer has set ambitious Scope 1 and 2 GHG emissions reductions targets in line with the SBTi Net Zero Standard (1.5°C pathway), as well as a Scope 3 emissions reduction target aligned to a well below 2°C trajectory. Downer has linked these targets to executive remuneration through the Short-Term Incentive (STI) plan to incentivise Business Units to decarbonise in line with Downer Group's overall ambition.

Our Scope 1 and 2 GHG emissions commitments are aligned with a 1.5°C pathway and support the transition to net zero emissions by 2050. Our targets, revised in FY22 for tracking in FY23 onwards are:

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See our sustainability strategies in action

For more information about Downer's commitment to sustainable performance that enhances the communities in which we operate while also helping our customers to meet their own sustainability goals, see our:

Downer Climate Change Report 2022

Sustainability Report 2022

Downer is a market leader in renewable energy generation, having delivered 18 wind farms and seven solar farms to date, which generate more than 3GW of power.

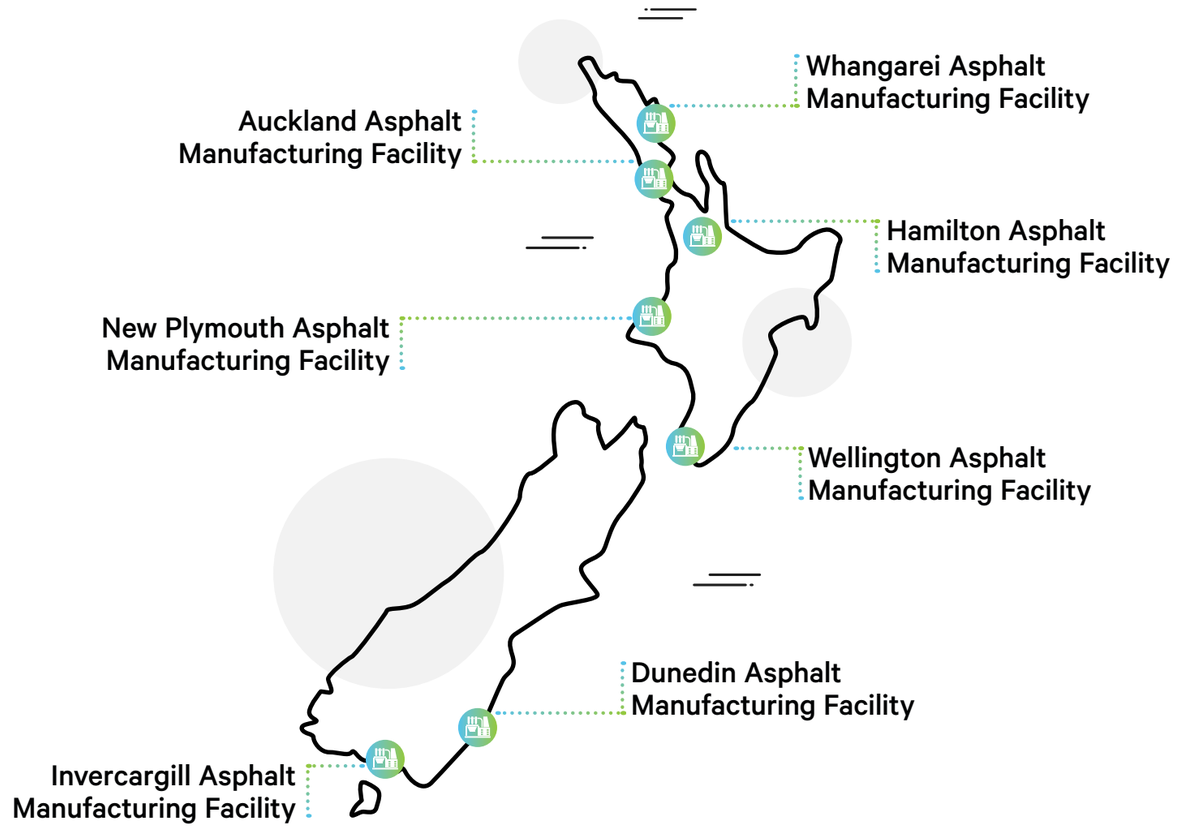
Queenstown Airport, Queenstown

Geographic reach

Downer's asphalt manufacturing plants provide asphalt to the entire New Zealand roading network. The services we deliver for our customers touch the lives of New Zealanders every day.

Our national footprint of 7 fixed asphalt manufacturing facilities allows Downer to support paved asset owners country-wide, from sub-divisions in Whangarei to airport surfacing in Invercargill.

We have relationships ranging from small landscaping contractors, to major infrastructure asset owners, Council Alliances, and Waka Kotahi.



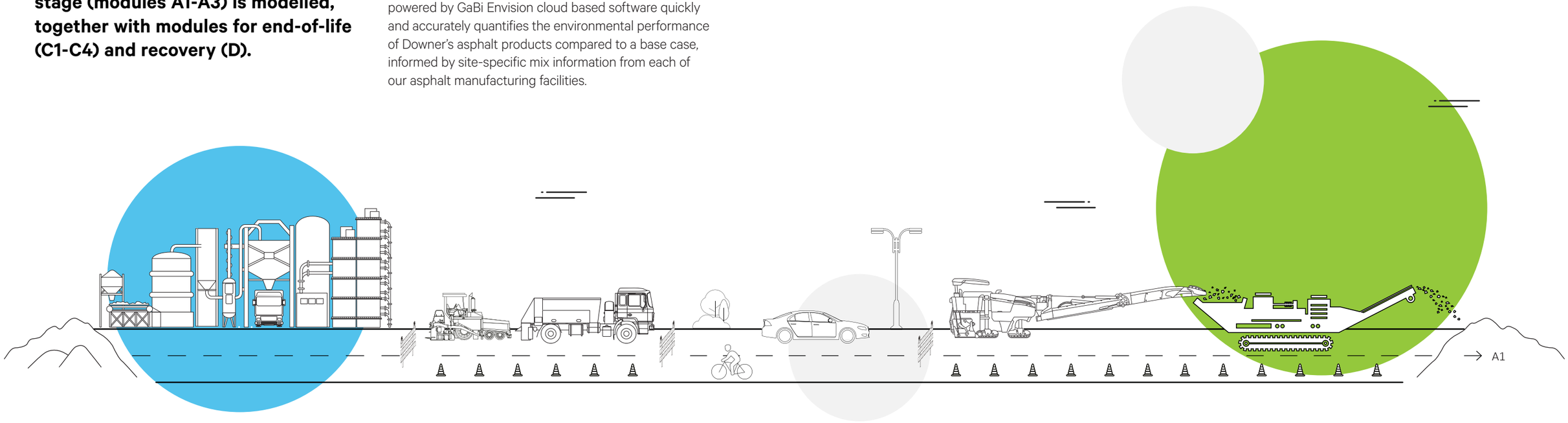
The product lifecycle

This is a *'cradle-to-gate with modules C1–C4 and module D'* style EPD, meaning the production stage (modules A1-A3) is modelled, together with modules for end-of-life (C1-C4) and recovery (D).

The construction process (modules A4-A5) and use stages (B1-B7) are not modelled within the EPD, as these are best determined for the individual project.

Downer's Life Cycle Assessment (LCA) calculator powered by GaBi Envision cloud based software quickly and accurately quantifies the environmental performance of Downer's asphalt products compared to a base case, informed by site-specific mix information from each of our asphalt manufacturing facilities.

Included in this EPD



Product | **Construction** | **Use** | **End-of-life** | **Recovery**

A1	A2	A3	A4	A5	B1 – B7	C1	C2	C3	C4	D
Raw material supply	Transport of raw materials	Manufacturing	Transport to customer	Construction/ installation	Use	De-construction/ demolition	Transport	Waste processing	Disposal	Re-use/ recovery/ recycling

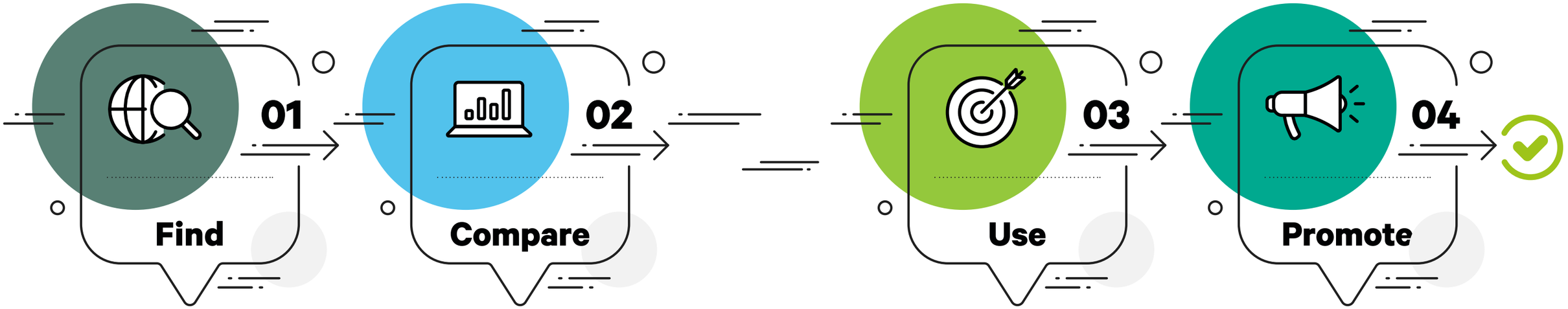
Cradle — **Gate**

How to use this EPD

This EPD provides independent, verified and transparent data to help our customers compare the environmental performance of Downer's asphalt products.

While the steps below provide a high-level guide to the application of this EPD, we are here to help.

For support in realising tangible benefits for your next project, contact our National Asphalt Production Manager, Jason Keen, at jason.keen@downer.co.nz.



The first step in using this EPD is finding the results for your chosen product/s.

Browse to the chapter for your asphalt plant, and then find the results for your local asphalt manufacturing facility.

This EPD includes carbon footprints calculated in different ways, to meet the requirements of three different standards/methods:

- EN15804:2012+A2:2019 (EN15804+A2)
- EN15804:2012+A1:2013 (EN15804+A1)
- IPCC AR5.

You should choose the carbon footprint indicator (left column of each table) that aligns with the way you need to use and/or compare the information.

Hint: Use the *Indicators guide* on the folowing page to understand the indicator names abbreviated in the results tables.

When comparing products, ask yourself the following questions:

- Can the results in the EPDs be compared? Are the EPDs produced to the same standard and EPD programme?
- Can I identify production-related impacts for the same indicators and the same declared unit for each material?
- Do the materials perform the same function?
- Do I expect the material to last for the same time in situ?
- How much of each material will I need? Is it the same, or is one of the asphalt products suitable for reduced thickness?
- How far will each material travel? How would this affect the cradle-to-site impacts for each material?

This EPD can be used to calculate and present the environmental impacts of construction projects.

Data-driven decision making is a crucial element of modern business strategy, providing confidence in, and maximising the positive impact of, pivotal decisions.

Comparisons between the data in this EPD, and comparable EPDs can be used to advocate for the use of Downer's asphalt products on your next project, verifying the associated carbon emission reduction and recycled content benefits.

If you are modelling the full life cycle of your project, you will also need to consider expected maintenance during the project life cycle, and the fate of the materials at end-of-life.

Enhance your brand in an industry moving towards a more sustainable future.

The third-party certified environmental performance benefits of Downer's asphalt products and services support our customer's in:

- Reducing their Scope 3 emissions
- Securing industry and environmental award recognition
- Qualifying projects for recognition by green rating tools including the Infrastructure Sustainability Council's (IS) rating scheme
- Communicating environmental sustainability achievements to their stakeholders and the public.

Environmental performance recognition can help enhance your organisation's credibility and reputation, creating invaluable opportunities for differentiation and investment as the world moves towards a more sustainable future.

Indicators guide

This page provides an introduction to the core environmental impact indicators.

The best-known effect of each indicator is listed in the descriptions and the abbreviations, in brackets, correspond to the labels in the following results tables.

Climate change (global warming potential)

GWP-total | GWP-fossil | GWP-biogenic | GWP-luluc

These environmental impact indicators provide a measure of greenhouse gas emissions, such as CO_2 and methane. These emissions are causing an increase in the absorption of radiation emitted by the earth, increasing the natural greenhouse effect. This may in turn have adverse impacts on ecosystem health, human health and material welfare.

The total Global Warming Potential (GWP-total) is split into three sub indicators: Fossil (GWP-fossil), Biogenic (GWP-biogenic), and land-use and land-use change (GWP-luluc).

Ozone depletion potential

ODP

Depletion of the ozone layer leads to higher levels of UVB ultraviolet rays reaching the earth's surface with detrimental effects on humans and plants.

The Ozone Depletion Potential is a measure of air emissions that contribute to the depletion of the stratospheric ozone layer.

Acidification potential

AP

Acidification Potential is a measure of emissions that cause acidifying effects to the environment.

A molecule's acidification potential indicates its capacity to increase the hydrogen ion (H^+) concentration in the presence of water, thus decreasing the pH value.

Potential effects include fish mortality, forest decline, and the deterioration of building materials.

Abiotic resource depletion

ADP-minerals&metals | ADP-fossil

The consumption of non-renewable resources decreases the availability of these resources and their associated functions in the future.

Depletion of mineral resources and non-renewable energy resources are reported separately.

Depletion of mineral resources is assessed based on an ultimate reserve model.

Water use

WDP

Water scarcity is a measure of the stress on a region due to water consumption.

Water scarcity is a relative concept. The amount of water that can be physically accessed varies as supply and demand changes. Water scarcity intensifies as demand increases and/or as water supply is affected by decreasing quantity or quality.

Eutrophication potential

EP-freshwater | EP-marine | EP-terrestrial

Eutrophication covers all potential impacts of excessively high levels of macronutrients, the most important of which are nitrogen and phosphorus. In aquatic ecosystems where this term is mostly applied, this typically describes a degradation in water quality.

Eutrophication can result in an undesirable change in the type of species that flourish and an increase the production of biomass.

As the decomposition of biomass consumes oxygen, eutrophication may decrease the available oxygen level in the water column and threaten fish in their ability to respire..

Photochemical ozone formation potential

POCP

Photochemical Ozone Formation Potential gives an indication of the emissions from precursors that contribute to ground level smog formation, mainly ozone (O_3).

Ground level ozone may be harmful to human health and ecosystems and may also damage crops. These emissions are produced by the reaction of volatile organic compounds (VOCs) and carbon monoxide in the presence of nitrogen oxides and UV light.

The environmental impact indicators included in this EPD are shown in the table below.

All the result tables from this point will contain the abbreviations only. All results reported in MJ are in net calorific value.

Core Environmental Impacts (EN15804+A2)

Indicator	Abbreviation	Unit
Climate change - total	GWP-total	kg CO_2-eq.
Climate change - fossil	GWP-fossil	kg CO_2-eq.
Climate change - biogenic	GWP-biogenic	kg CO_2-eq.
Climate change - land use and land use change	GWP-luluc	kg CO_2-eq.
Ozone Depletion	ODP	kg CFC11-eq.
Acidification	AP	Mole of H+ eq.
Eutrophication aquatic freshwater	EP-freshwater	kg P eq.
Eutrophication aquatic marine	EP-marine	kg N eq.
Eutrophication terrestrial	EP-terrestrial	Mole of N eq.
Photochemical ozone formation	POCP	kg NMVOC eq.
Depletion of abiotic resources - minerals and metals	ADP-minerals &metals	kg Sb-eq.
Depletion of abiotic resources - fossil fuels	ADP-fossil	MJ
Water use	WDP	m^3 world equiv.

Additional Environmental Impacts

Indicator	Abbreviation	Unit
IPCC AR5 GWP (excluding biogenic carbon)	GWP-GHG	kg CO_2-eq.
Respiratory inorganics	PM	Disease incidences
Ionizing radiation - human health	IRP	kBq U235 eq.
Ecotoxicity - freshwater	ETP-fw	CTUe
Human toxicity, cancer	HTPc	CTUh
Human toxicity, non-cancer	HTPnc	CTUh
Land use related impacts / soil quality	SQP	Pt

Biogenic carbon content

Indicator	Abbreviation	Unit
Biogenic carbon content - product	BCC-prod	kg
Biogenic carbon content - packaging	BCC-pack	kg

Resource use

Indicator	Abbreviation	Unit
Renewable primary energy as energy carrier	PERE	MJ
Renewable primary energy resources as material utilization	PERM	MJ
Total use of renewable primary energy resources	PERT	MJ
Non-renewable primary energy as energy carrier	PENRE	MJ
Non-renewable primary energy as material utilization	PENRM	MJ
Total use of non-renewable primary energy resources	PENRT	MJ
Use of secondary material	SM	kg
Use of renewable secondary fuels	RSF	MJ
Use of non-renewable secondary fuels	NRSF	MJ
Use of net fresh water	FW	m^3

Waste categories and output flows

Indicator	Abbreviation	Unit
Hazardous waste disposed	HWD	kg
Non-hazardous waste disposed	NHWD	kg
Radioactive waste disposed	RWD	kg
Components for re-use	CRU	kg
Materials for recycling	MFR	kg
Materials for energy recovery	MER	kg
Exported electrical energy	EEE	MJ
Exported thermal energy	EET	MJ

Environmental impact (EN15804+A1)

Indicator	Abbreviation	Unit
Global warming potential	GWP	kg CO_2-eq.
Depletion potential of the stratospheric ozone layer	ODP	kg CFC11-eq.
Acidification potential of land and water	AP	kg SO_2-eq.
Eutrophication potential	EP	kg PO_4^{3-}- eq.
Photochemical ozone creation potential	POCP	kg C_2H_4-eq.
Abiotic depletion potential – elements	ADPE	kg Sb-eq.
Abiotic depletion potential – fossil fuels	ADPF	MJ

Product information

Product(s) covered by this EPD

Downer produces asphalt at seven purpose-built fixed asphalt plants around New Zealand, in Whangarei, Auckland, Hamilton, New Plymouth, Wellington, Dunedin, and Invercargill.

This EPD covers the full current range of Downer's New Zealand asphalt products as summarised in Table 1. Each mix is specific to the named mix and plant. Products are not grouped.

About asphalt

Asphalt is a versatile, flexible paving material commonly used on roads, runways, hardstands, paths, car parks, and other projects in New Zealand. The simplest asphalts are a mixture of aggregate, sands and paving grade or 'straight-run' bitumen (i.e. as produced at the refinery). Asphalts can include various additives that, together with the grading of the aggregate, control the product's properties.

Asphalt inclusions

Downer's asphalts can include polymers, fibres, and ground limestone filler to modify the characteristics of the bitumen. Additionally, some asphalts produced at Downer's Auckland plant utilise recycled asphalt pavement (RAP) in place of some of the virgin aggregates and bitumen. Some asphalts in the northern plants also use melter aggregate, a secondary aggregate produced from slag from New Zealand Steel's melter, which has good skid resistance properties.

Asphalt production temperatures

Hot-mix asphalt is typically produced with output temperatures between 150-190 °C. The asphalt may be stored temporarily in the plant before being transported to site and laid using specialised paving equipment while still hot and workable. We note transport and paving activities are outside the scope of this study.

Downer also produces some lower-temperature asphalts using special additives to maintain workability. These lower-temperature asphalts are typically designed for repairs such as filling potholes, or for temporary works such as to allow the reopening of partially built or repaired roads.

The lower-temperature mixes produced in New Zealand are mixed at a raised temperature, although lower than 'hot mix', with the mixes in this study produced at temperatures between 80-125 °C. The mixes are then allowed to cool to ambient temperature before use, and may be stored for longer periods.

Industry classification

The industry classification for Downer's asphalt products is shown in Table 2.

Table 2: Industry classification

Classification	Code	Category
UN CPC Ver.2	3794	Bituminous mixtures based on natural and artificial stone materials and bitumen, natural asphalt or related substances as a binder
ANZSIC 2006	3101	Hot-mix bituminous paving manufacturing and/or laying

Table 1: Asphalt mixes produced by Downer in New Zealand, by asphalt manufacturing facility

Whangarei	Auckland	Hamilton	New Plymouth	Wellington	Dunedin	Invercargill
AC10 B60 OT	AC10R H PG64H SD	AC10 B60 WW	DG10 PG58V ZMR	AC14 HVY PG58V Bel	DG10 B60 RM	DG 7 B80 WB Medium
AC14 PG58H OT	AC10R Heavy PG64E SD	AC10 FPB WW	AC14 HVY PG58V ZMR	AC14 HF HVY PG58V Bel	DG10 FlexiPlus RM	DG10 B80 WB
AC14 FPB OT	AC14 R HF PG64H SD	AC14 B60 WW	AC14 HVY FPB ZMR	AC14 FPB Bel	DG7 B80 RM	DG14 B60 WB
AC14 High Fatigue B60 OT	AC14 R HF FPB SD	AC14 FPB WW	EME2 B15 ZMR	AC20 VH PG58V TeM	DG14 B60 RM	AC14 B80 WB
AC20 Heavy B60 OT	AC14R PG64E SD	AC14 H PG64H (B60) WW	THSRA 10 FMB ZMR	AC20 VH FPB TeM	AC20 FlexiPlus Heavy RM	AC20 PG52E Heavy WB
AC20 Heavy RS3HS OT	AC14R PG64H SD	AC20 B60 WW	PLANT MIX 6	DG7 FPB Bel	THSRA FlexiMax RM	AC14 FPB WB
Blinding Mix10	AC14R PG64V SD	AC20 FPB WW	QPR Coarse	DG7 PG58V Bel	AC14 B60 RM	Mix 10
DG7 B60 OT	AC20 R PG64H SD	Blinding Mix	QPR Fine	THSRA 14 HVY FMB TeM	AC14 FlexiPlus RM	
MIX 10 B60	AC20 R PG64E SD	DG10 B60 WW	DG10 FPB ZMR	PA10 FPB TeM	PA10 B60 HS HRM	
DG10 PG58H OT	DG10R PG64E SD	DG10 FPB WW	DG7 PG58V ZMR	AC10 PG58V Bel	PA10 FPB HS20 HRM	
	DG10R PG64S SD	DG7 B60 WW	DG7 FPB ZMR	AC10 FPB Bel	UTA FlexiPlus RM	
	DG7R PG64E SD	Fine Mix 10 WW	AC10 PG58V ZMR	DG10 PG58V Bel	AC20 B60 Heavy RM	
	DG7R PG64S SD	SMA10 B40 GM	AC10 FPB ZMR	DG10 FPB Bel	SMA10 FPB HRM	
	EME2 B15 SD	SMA10 FPB GM		Mix 6 PG58V Bel	SmartPave 7 RM	
	MIX 7 PG64S	SMA10 B40 WW		EME2 TeM	SmartPave 10 RM	
	SMA10 PG64E SD	SMA10 RS3HS WW				
	SMA11 Melter PG64E	EME2 B15 SD				
	SmartPave7 PG64S	SMA10 B40 SD				
	SmartPave7 PG64E	SMA10 FPB SD				

Technical specifications

The specifications that Downer's most common asphalt products must comply with are shown in Table 3. Some asphalt mixes are produced to regional or district council-specific requirements, which are not listed here.

Table 3: Technical specifications applying to the products in this background report

Mix type	Relevant Standards
DG	NZTA M10: 2020
AC	NZTA M10: 2020
SMA	NZTA M27: 2020
PA	NZTA P11: 2007
EPA	NZTA P11E: 2017 Draft
EME	NZTA M32: 2021

Dangerous substances

Hazardous properties for Hazardous Substances and New Organisms (HSNO classifications) and Globally Harmonized System (GHS) classifications are reproduced from vendor Safety Data Sheets or the Organisation for Economic Co-operation and Development's (OECD) global portal to information on chemical substances available at: https://www.echemportal.org/echemportal/.

Asphalt is not classified as hazardous and does not include hazardous substances requiring labelling. No substances in these asphalt mixes are listed as a Substance of Very High Concern (SVHC). SVHC list is available at: https://echa.europa.eu/candidate-list-table.

Declared Unit

The declared unit for this EPD is one metric tonne of asphalt mixture.

This aligns with the 'Technical Guidance (EN15804+A2) for Asphalt Mixtures' (Australian TGN) (EPD Australasia, 2022). The reference flow is the same as the declared unit.

The EPD results are specific to each plant and product, and no averaging is used.

Content Declaration

The composition of Downer's asphalt materials varies to suit each product's desired properties and performance. The content declaration provided in Table 4 covers the full range of declared asphalt products. Due to the confidential nature of the composition, upper and lower limits are given per ingredient.

Asphalt is sold in bulk, and packaging materials are irrelevant to the product.

Manufacturing Process

Downer manufactures hot-mix asphalt in continuous drum mix plants that control the mix design mix temperature to meet required performance specifications. The key raw materials are aggregates, which provide structure and may provide grip or skid resistance, and bitumen, which acts as a binder to hold the aggregate mixture together. In addition, other materials may be used to modify the properties of the asphalt and may be added at the asphalt plant or preblended into the bitumen.

Aggregates are normally sourced locally (from within 100 km) but may be imported further distances for special properties unavailable locally. Plants may also use a variety of secondary aggregate sources where these are locally available, such as slag aggregates.

Aggregates are fed into the drying and mixing drum at the required blend, then dried and heated to the desired temperature. For most asphalt mixes, aggregates must be fully dried, including driving out absorbed moisture, to allow bitumen to stick to the aggregate properly, creating a durable product.

Asphalt is also generally only workable while hot, so most mixes are heated well beyond the aggregates being dry. The drying process creates fine dust, called filler, which is captured and either fed back into the mix or carefully disposed of.

Lower temperature asphalts, where the aggregates may not be fully dried, require additives such as adhesion agents to prevent the moisture from 'stripping' the bitumen, in addition to additives such as diesel or QPR oil, to enable paving at lower temperatures.

Bitumen or polymer-modified binder (PMB) is stored hot in silos and pumped into the second part of the drum, along with filler, and any additives, such as fibre, adhesion agents, or workability agents. Where RAP is used, it is also added to this second part of the drum. The rotating drum mixes all the components together to create a consistent material.

The mixed asphalt is generally transferred into hot bins, ready for load out, or may be loaded directly onto waiting trucks. Asphalt may be stored for several hours in these insulated bins.

Table 4: Content declaration

Product components	Composition, weight-%	Post-consumer recycled material, weight-%	Biogenic material, weight-% and kg C/kg
Bitumen	3–8%	0	0
Polymer (SBS)	<2%	0	0
Primary Aggregates (coarse and fine)	19–97%	0	0
Secondary aggregates (coarse and fine)	<66%	0	0
RAP (chips and PAP)	<29%	100%	0
Limestone filler	<12%	0	0
Diesel (raw material)	<1.5%	0	0
Fibre	<0.5%	0	75%, ~0.5
QPR oil (rejuvenating agent)	<0.2%	0	0
Aggbind (adhesion agent)	<0.1%	0	0

System boundaries

A cradle-to-gate and end-of-life EPD

This EPD is 'Cradle to gate with modules C1–C4 and module D' type, as shown in Table 5. It includes the environmental impacts associated with raw material extraction and processing (A1), material transport to the manufacturer (A2), manufacturing processes (A3), end-of-life modules (C1–C4) and recovery stage (D).

These are the mandatory stages of the Australian TGN for this EPD type.

Other life cycle stages concerning transport to customer (A4), construction (A5), and the use stage (B1–B7) are not included in this EPD. These life cycle stages vary by end-use and are best considered according to application.

Production (Module A)

The production stage includes the environmental impacts associated with raw materials extraction and processing of inputs, transport to, between and within the manufacturing site, and manufacturing of product at the exit gate of the manufacturing site.

The raw materials are supplied by third parties and typically transported to site by truck. RAP, used at the Auckland asphalt manufacturing facility, is processed off-site and the processing impacts from end-of-waste state are included.

Process waste is given to third parties with no further processing.

End of Life (Module C)

This EPD aligns with the default scenarios provided by the Australian TGN for the end-of-life stages, as provided in Table 6. The Auckland asphalt manufacturing facility is considered to be in a metrolpolitan area, while all other facilities are considered to be in regional areas.

Module C1 – Deconstruction / demolition

Deconstruction of discarded asphalt pavement.

Module C2 – Transport

Transport of asphalt waste to waste processing.

Module C3 – Waste processing

Processing of asphalt waste into material to recycling as Recycled Asphalt Pavement (RAP) and to downcycling as granular subbase or backfill.

Module C4 – Disposal

It is assumed that all waste asphalt is sent to recycling or downcycling in alignment with the Australian TGN. Hence, landfilling or incineration is not assessed.

Recovery and Recycling potential (Module D)

Module D declares a potential credit or burden for the net scrap associated with Downer's asphalt products. Net scrap is the amount of scrap left after scrap from post-consumer needs is removed from scrap produced from the product. That is, secondary product used in product manufacture is subtracted from the overall amount of recycled product after the first life cycle.

If the net balance is positive, a credit is given. The credit is calculated by comparing the impacts associated with primary product produced.

Table 6: End of life scenarios for products

End of Life scenario	Unit	Metro areas	Regional areas
Recovery for recycling	%	90	75
Recovery for backfilling (downcycling)	%	10	25
Disposal to landfill	%	0	0

Table 5: Modules included in the scope of the EPD

	Product stage			Construction process stage		Use stage							End of life stage				Recovery stage
	Raw material supply	**Transport**	**Manufacturing**	**Transport**	**Construction Installation**	**Use**	**Maintenance**	**Repair**	**Replacement**	**Refurbishment**	**Operational energy use**	**Operational water use**	**Deconstruction /demolition**	**Transport**	**Waste processing**	**Disposal**	**Future reuse, recycling or energy recovery potential**
Module	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Modules declared	X	X	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X
Geography	GLO	NZ	NZ	-	-	-	-	-	-	-	-	-	NZ	NZ	NZ	NZ	NZ
Specific data		>90%		-	-	-	-	-	-	-	-	-					-
Variation – products		0%		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites		0%		-	-	-	-	-	-	-	-	-	-	-	-	-	-

X = included in the EPD; ND = Module not declared (such a declaration shall not be regarded as an indicator result of zero)

Life cycle inventory

Data and assumptions

Primary life cycle inventory data was used for all manufacturing operations up to the plant gate, including upstream data for inputs. Primary data for Downer's asphalt mixing operations was sourced from 2020-07-01 to 2021-06-30.

All data in the background system was from the Sphera Life Cycle Inventory Database 2022 (Sphera, 2022). Most datasets have a reference year between 2018 and 2021, and all fall within the 10-year limit allowable for generic data under EN 15804.

Upstream data

New Zealand-specific datasets have been used where available, including New Zealand electricity mix and natural gas. Other energy sources generally use Australian datasets, for example, diesel. Water inputs are modelled as tap water, regionalised for New Zealand.

The upstream production impacts for materials used in the asphalt mixes were calculated based on the quantities in the Bill of Materials, uplifted for any production waste, and using dataset-specific impacts extracted from Sphera databases.

Thermal Energy

Considering energy use, the Australian TGN provides two calculation methods (A and B). This EPD uses Method A: '*Determine the energy use for each mix design based on the composition, specific heat capacity of components, moisture content of raw materials and the plant's overall efficiency.*' So, thermal energy use for each mix relates to a specific mix composition and site efficiency.

Utilities

Utilities such as diesel, electricity, and water used in the manufacturing process are allocated to products based on mass of products. Measured data for electricity, water use, and diesel for mobile plants were obtained at site level, with exceptions noted below.

Average utility quantities (electricity, water, and waste) were calculated based on measured consumptions divided by the total volume of asphalt produced per site. Similarly, process and coated waste are calculated per plant based on annual production.

Water consumption is not measured in Auckland, Wellington, Whangarei, and Hamilton; the value is estimated as the average between the plants that measure this consumption. Similarly, lubricant usage is only measured in Wellington, Hamilton, Whangarei, and Invercargill; with the arithmetic average used for other plants.

Electricity

The composition of the electricity grid mix was modelled in GaBi. The New Zealand electricity grid consumption mix (2018) is made up of hydro (59.30%), geothermal (17.96%), natural gas (12.93%), wind (4.66%), hard coal (2.15%), coal gases (1.36%), biomass (0.70%), biogas (0.63%), photovoltaics (0.22%), lignite (0.05%), and fuel oil (0.03%) (Sphera, 2022).

The emission factor for the New Zealand national grid mix for the GWP-GHG indicator is 0.132 kg CO2-eq/kWh.

Waste

Process and coated waste are calculated per plant based on annual production. Wet scrubber waste is reported at Whangarei, New Plymouth, and Invercargill plants but not measured; Downer conservatively estimated the value as 2% (dry basis) of the asphalt production.

Wastewater is not measured in any plant and is estimated to equal water consumption. The wastewater assumption is considered a conservative approach as water is used for processing e.g. for wash down and dust suppression.

Recycling

RAP recycling is based on avoided burden approach. At the end of life (C1-C4), the asphalt is available for recycling as RAP. The RAP output is first used to satisfy open RAP inputs from the production stage (A1-A3). The difference between RAP input and output is called the 'net scrap output from the product life cycle'. A credit for this net scrap is given in Module D and based on the end of life scenarios (metro vs regional areas) and mix composition.

Transport

Transport data was collected from Downer for all input materials to all sites. The transport data included the transport modes and distances from suppliers. Transport distances were mapped against each line of BOM data and used to calculate upstream transport impacts using the calculated input volumes. Where transport data was not available, a standard value of 50 km was used.

Cut off criteria

Personnel is excluded as per section 4.3.1 in the PCR (EPD International, 2021). thinkstep-anz consistently excludes environmental impacts from infrastructure, construction, production equipment, and tools that are not directly consumed in the production process, ('capital goods') regardless of potential significance.

High-quality infrastructure-related data isn't always available, and there is no clear cut-off for what to include. For this reason, capital goods data are applied to LCA studies inconsistently. This is expected to lead to reduced consistency and comparability of EPDs. Capital goods were previously excluded from EPDs, thus including capital goods in current EPDs would further reduce their comparability.

For the processes within the system boundary, all available energy and material flow data have been included in the model. In cases where no matching life cycle inventories are available to represent a flow, proxy data have been applied based on conservative assumptions regarding environmental impacts.

Allocation

Where subdivision of processes was not possible, allocation rules listed in PCR chapter 6.7 have been applied.

Multi-output allocation generally follows the requirements of ISO 14044, section 4.3.4.2. Site level data for electricity, diesel for mobile plant (e.g. loaders), water, and lubricant usage are allocated by mass, based on the annual production of each plant.

Process Allocation (thermal energy) follows the Australian Guideline for Asphalt EPDs. The guide provides two allocation methods. Energy use in this EPD is allocated with Method A: "Determine the energy use for each mix design based on the composition, specific heat capacity of components, moisture content of raw materials and the plant's overall efficiency."

Allocation of background data (energy and materials) is according to Sphera LCI databases; documentation is available at https://sphera.com/product-sustainability-gabi-data-search/

Whangarei Asphalt Manufacturing Facility

Modules A1 – A3
Production Impacts per tonne of asphalt

Core Environmental Impacts (EN15804+A2)

Indicator	Unit	AC10 B60 OT	AC14 PG58H OT	AC14 FPB OT	AC14 High Fatigue B60 OT	AC20 Heavy B60 OT	AC20 Heavy RS3HS OT	Blinding Mix 10	DG7 B60 OT	Mix 10 B60	DG10 PG58H OT
GWP-total	kg CO_2-eq.	53.9	53.2	71.6	69.8	48.3	64.0	46.3	56.9	56.7	54.8
GWP-fossil	kg CO_2-eq.	53.6	52.9	70.0	69.5	48.0	62.6	46.0	56.6	56.4	54.5
GWP-biogenic	kg CO_2-eq.	0.257	0.257	1.51	0.292	0.251	1.31	0.242	0.262	0.262	0.259
GWP-luluc	kg CO_2-eq.	0.0306	0.0305	0.0321	0.0514	0.0287	0.0300	0.0268	0.0324	0.0324	0.0314
ODP	kg CFC11-eq.	5.53E-11	5.68E-11	1.33E-10	5.42E-11	5.67E-11	1.20E-10	5.20E-11	5.52E-11	5.52E-11	5.52E-11
AP	Mole of H+ eq.	0.222	0.221	0.238	0.285	0.194	0.208	0.165	0.246	0.246	0.232
EP-freshwater	kg P eq.	1.65E-04	1.65E-04	2.39E-04	1.86E-04	1.62E-04	2.24E-04	1.59E-04	1.67E-04	1.67E-04	1.66E-04
EP-marine	kg N eq.	0.0638	0.0632	0.0697	0.0815	0.0561	0.0617	0.0497	0.0698	0.0697	0.0662
EP-terrestrial	Mole of N eq.	0.702	0.695	0.761	0.898	0.617	0.674	0.547	0.768	0.767	0.728
POCP	kg NMVOC eq.	0.198	0.197	0.231	0.248	0.173	0.202	0.150	0.219	0.219	0.207
ADP-minerals &metals	kg Sb-eq.	1.03E-05	1.03E-05	1.28E-05	1.16E-05	8.95E-06	1.10E-05	7.08E-06	1.17E-05	1.17E-05	1.09E-05
ADP-fossil	MJ	3,010	3,000	3,310	3,290	2,570	2,830	2,050	3,420	3,410	3,190
WDP	m^3 world equiv.	5.10	5.24	5.54	6.05	5.23	5.48	4.81	5.10	5.10	5.10

Additional Environmental Impacts

Indicator	Unit	AC10 B60 OT	AC14 PG58H OT	AC14 FPB OT	AC14 High Fatigue B60 OT	AC20 Heavy B60 OT	AC20 Heavy RS3HS OT	Blinding Mix 10	DG7 B60 OT	Mix 10 B60	DG10 PG58H OT
GWP-GHG	kg CO_2-eq.	53.5	52.8	70.9	69.2	47.9	63.4	46.0	56.5	56.3	54.4
PM	Disease incidences	2.80E-06	2.79E-06	3.06E-06	3.38E-06	2.48E-06	2.70E-06	2.08E-06	3.10E-06	3.10E-06	2.93E-06
IRP	kBq U235 eq.	1.65	1.73	2.13	1.45	1.73	2.07	1.50	1.64	1.64	1.65
ETP-fw	CTUe	845	843	969	1,000	744	851	627	937	936	884
HTPc	CTUh	1.67E-08	1.66E-08	2.27E-08	2.19E-08	1.48E-08	1.99E-08	1.29E-08	1.84E-08	1.83E-08	1.74E-08
HTPnc	CTUh	5.55E-07	5.52E-07	9.82E-07	7.68E-07	4.94E-07	8.55E-07	4.30E-07	6.08E-07	6.08E-07	5.77E-07
SQP	Pt	112	113	137	133	111	131	107	114	114	113

Biogenic carbon content

Indicator	Unit	AC10 B60 OT	AC14 PG58H OT	AC14 FPB OT	AC14 High Fatigue B60 OT	AC20 Heavy B60 OT	AC20 Heavy RS3HS OT	Blinding Mix 10	DG7 B60 OT	Mix 10 B60	DG10 PG58H OT
BCC-prod	kg	0	0	0	0	0	0	0	0	0	0
BCC-pack	kg	0	0	0	0	0	0	0	0	0	0

Whangarei Asphalt Manufacturing Facility (continued)

Resource use

Indicator	Unit	AC10 B60 OT	AC14 PG58H OT	AC14 FPB OT	AC14 High Fatigue B60 OT	AC20 Heavy B60 OT	AC20 Heavy RS3HS OT	Blinding Mix 10	DG7 B60 OT	Mix 10 B60	DG10 PG58H OT
PERE	MJ	88.6	89.8	126	129	89.1	119	84.5	89.2	89.2	88.8
PERM	MJ	0	0	0	0	0	0	0	0	0	0
PERT	MJ	88.6	89.8	126	129	89.1	119	84.5	89.2	89.2	88.8
PENRE	MJ	864	855	1,160	1,060	769	1,030	713	924	922	884
PENRM	MJ	2,170	2,170	2,170	2,250	1,820	1,820	1,350	2,520	2,520	2,320
PENRT	MJ	3,030	3,020	3,330	3,310	2,590	2,850	2,070	3,440	3,440	3,210
SM	kg	0	0	0	194	0	0	0	0	0	0
RSF	MJ	0	0	0	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0	0	0	0
FW	m^3	0.264	0.267	0.310	0.369	0.266	0.302	0.253	0.265	0.265	0.264

Waste categories and output flows

Indicator	Unit	AC10 B60 OT	AC14 PG58H OT	AC14 FPB OT	AC14 High Fatigue B60 OT	AC20 Heavy B60 OT	AC20 Heavy RS3HS OT	Blinding Mix 10	DG7 B60 OT	Mix 10 B60	DG10 PG58H OT
HWD	kg	9.86E-09	1.01E-08	6.21E-08	1.54E-08	9.64E-09	5.33E-08	8.50E-09	1.02E-08	1.02E-08	1.00E-08
NHWD	kg	28.3	27.3	28.5	27.4	27.3	28.3	30.5	28.3	28.3	28.3
RWD	kg	0.0101	0.0106	0.0146	0.00923	0.0106	0.0139	0.00914	0.0102	0.0102	0.0101
CRU	kg	0	0	0	0	0	0	0	0	0	0
MFR	kg	1.82	1.82	1.82	1.82	1.82	1.82	1.82	1.82	1.82	1.82
MER	kg	0	0	0	0	0	0	0	0	0	0
EEE	MJ	0	0	0	0	0	0	0	0	0	0
EET	MJ	0	0	0	0	0	0	0	0	0	0

Environmental impact (EN15804+A1)

Indicator	Unit	AC10 B60 OT	AC14 PG58H OT	AC14 FPB OT	AC14 High Fatigue B60 OT	AC20 Heavy B60 OT	AC20 Heavy RS3HS OT	Blinding Mix 10	DG7 B60 OT	Mix 10 B60	DG10 PG58H OT
GWP	kg CO_2-eq.	50.1	49.4	67.2	65.5	45.0	60.2	43.7	52.6	52.4	50.7
ODP	kg CFC11-eq.	6.51E-11	6.68E-11	1.56E-10	6.39E-11	6.67E-11	1.42E-10	6.13E-11	6.50E-11	6.50E-11	6.50E-11
AP	kg SO_2-eq.	0.173	0.172	0.185	0.223	0.151	0.162	0.128	0.193	0.193	0.181
EP	kg PO_4^{3-}- eq.	0.0233	0.0231	0.0270	0.0295	0.0207	0.0240	0.0184	0.0254	0.0254	0.0241
POCP	kg C_2H_4-eq.	0.0219	0.0219	0.0261	0.0240	0.0189	0.0224	0.0148	0.0247	0.0247	0.0230
ADPE	kg Sb-eq.	1.04E-05	1.04E-05	1.29E-05	1.17E-05	9.02E-06	1.11E-05	7.14E-06	1.18E-05	1.18E-05	1.10E-05
ADPF	MJ	2,960	2,950	3,240	3,230	2,520	2,770	2,010	3,360	3,360	3,130

Modules C1 – C4
End of Life Impacts per tonne of asphalt

Core environmental impacts (EN15804+A2)

Indicator	Unit	C1	C2	C3	C4
GWP-total	kg CO_2-eq.	0.625	2.57	0	0
GWP-fossil	kg CO_2-eq.	0.625	2.58	0	0
GWP-biogenic	kg CO_2-eq.	6.18E-05	-0.0255	0	0
GWP-luluc	kg CO_2-eq.	4.53E-06	0.0176	0	0
ODP	kg CFC11-eq.	4.96E-14	2.56E-13	0	0
AP	Mole of H+ eq.	0.00297	0.0157	0	0
EP-freshwater	kg P eq.	1.10E-07	9.32E-06	0	0
EP-marine	kg N eq.	0.00143	0.00764	0	0
EP-terrestrial	Mole of N eq.	0.0157	0.0846	0	0
POCP	kg NMVOC eq.	0.00402	0.0147	0	0
ADP-minerals&metals	kg Sb-eq.	7.62E-09	2.63E-07	0	0
ADP-fossil	MJ	8.29	34.3	0	0
WDP	m^3 world equiv.	0.00464	0.0292	0	0

Additional Environmental Impacts

Indicator	Unit	C1	C2	C3	C4
GWP-GHG	kg CO_2-eq.	0.622	2.58	0	0
PM	Disease incidences	3.36E-08	5.88E-08	0	0
IRP	kBq U235 eq.	1.57E-05	0.00964	0	0
ETP-fw	CTUe	2.08	24.3	0	0
HTPc	CTUh	3.49E-11	5.01E-10	0	0
HTPnc	CTUh	2.18E-09	2.90E-08	0	0
SQP	Pt	0.0190	14.5	0	0

Resource use

Indicator	Unit	C1	C2	C3	C4
PERE	MJ	0.0271	2.37	0	0
PERM	MJ	0	0	0	0
PERT	MJ	0.0271	2.37	0	0
PENRE	MJ	8.29	34.4	0	0
PENRM	MJ	0	0	0	0
PENRT	MJ	8.29	34.4	0	0
SM	kg	0	0	0	0
RSF	MJ	0	0	0	0
NRSF	MJ	0	0	0	0
FW	m^3	6.98E-05	0.00274	0	0

Waste categories and output flows

Indicator	Unit	C1	C2	C3	C4
HWD	kg	8.99E-12	1.82E-10	0	0
NHWD	kg	1.18E-04	0.00560	0	0
RWD	kg	1.21E-07	6.39E-05	0	0
CRU	kg	0	0	0	0
MFR	kg	0	0	1,000	0
MER	kg	0	0	0	0
EEE	MJ	0	0	0	0
EET	MJ	0	0	0	0

Environmental impact (EN15804+A1)

Indicator	Unit	C1	C2	C3	C4
GWP	kg CO_2-eq.	0.615	2.51	0	0
ODP	kg CFC11-eq.	5.84E-14	3.02E-13	0	0
AP	kg SO_2-eq.	0.00206	0.0107	0	0
EP	kg PO_4^{3}-- eq.	4.80E-04	0.00268	0	0
POCP	kg C_2H_4-eq.	2.03E-04	-0.00402	0	0
ADPE	kg Sb-eq.	7.63E-09	2.63E-07	0	0
ADPF	MJ	8.29	33.9	0	0

Module D
Future reuse, recycling or energy recovery potential impacts and benefits per tonne of asphalt

Core Environmental Impacts (EN15804+A2)

Indicator	Unit	AC10 B60 OT	AC14 PG58H OT	AC14 FPB OT	AC14 High Fatigue B60 OT	AC20 Heavy B60 OT	AC20 Heavy RS3HS OT	Blinding Mix 10	DG7 B60 OT	Mix 10 B60	DG10 PG58H OT
GWP-total	kg CO_2-eq.	-15.4	-15.6	-15.6	-16.0	-13.5	-13.5	-9.79	-17.1	-17.4	-16.3
GWP-fossil	kg CO_2-eq.	-15.4	-15.6	-15.6	-16.0	-13.5	-13.5	-9.80	-17.1	-17.4	-16.3
GWP-biogenic	kg CO_2-eq.	0.00201	5.51E-04	5.51E-04	5.82E-04	0.00232	0.00232	0.0113	0.00199	2.90E-04	8.67E-04
GWP-luluc	kg CO_2-eq.	-0.00343	-0.00400	-0.00400	-0.00380	-0.00417	-0.00417	-0.00175	-0.00257	-0.00324	-0.00349
ODP	kg CFC11-eq.	-2.79E-11	-2.97E-11	-2.97E-11	-2.89E-11	-3.08E-11	-3.08E-11	-2.38E-11	-2.46E-11	-2.67E-11	-2.78E-11
AP	Mole of H+ eq.	-0.0373	-0.0378	-0.0378	-0.0392	-0.0312	-0.0312	-0.0197	-0.0433	-0.0440	-0.0404
EP-freshwater	kg P eq.	-1.35E-05	-1.42E-05	-1.42E-05	-1.42E-05	-1.35E-05	-1.35E-05	-9.49E-06	-1.35E-05	-1.42E-05	-1.40E-05
EP-marine	kg N eq.	-0.00360	-0.00376	-0.00376	-0.00400	-0.00246	-0.00246	-7.06E-06	-0.00471	-0.00489	-0.00421
EP-terrestrial	Mole of N eq.	-0.0411	-0.0430	-0.0430	-0.0456	-0.0288	-0.0288	-0.00123	-0.0529	-0.0551	-0.0478
POCP	kg NMVOC eq.	-0.0291	-0.0296	-0.0296	-0.0310	-0.0227	-0.0227	-0.0115	-0.0355	-0.0360	-0.0323
ADP-minerals &metals	kg Sb-eq.	6.56E-07	6.18E-07	6.18E-07	5.81E-07	8.34E-07	8.34E-07	1.30E-06	4.86E-07	4.42E-07	5.51E-07
ADP-fossil	MJ	-1,960	-1,970	-1,970	-2,030	-1,670	-1,670	-1,260	-2,250	-2,260	-2,090
WDP	m^3 world equiv.	-1.16	-1.33	-1.33	-1.26	-1.42	-1.42	-0.779	-0.875	-1.07	-1.17

Additional Environmental Impacts

Indicator	Unit	AC10 B60 OT	AC14 PG58H OT	AC14 FPB OT	AC14 High Fatigue B60 OT	AC20 Heavy B60 OT	AC20 Heavy RS3HS OT	Blinding Mix 10	DG7 B60 OT	Mix 10 B60	DG10 PG58H OT
GWP-GHG	kg CO_2-eq.	-15.2	-15.5	-15.5	-15.8	-13.4	-13.4	-9.72	-17.0	-17.2	-16.2
PM	Disease incidences	-2.40E-07	-2.46E-07	-2.46E-07	-2.53E-07	-2.08E-07	-2.08E-07	-1.26E-07	-2.70E-07	-2.78E-07	-2.58E-07
IRP	kBq U235 eq.	-0.886	-0.977	-0.977	-0.939	-1.03	-1.03	-0.686	-0.721	-0.828	-0.884
ETP-fw	CTUe	-286	-288	-288	-297	-245	-245	-179	-327	-329	-306
HTPc	CTUh	-6.15E-09	-6.18E-09	-6.18E-09	-6.36E-09	-5.32E-09	-5.32E-09	-4.04E-09	-6.97E-09	-7.01E-09	-6.54E-09
HTPnc	CTUh	-2.30E-07	-2.30E-07	-2.30E-07	-2.37E-07	-2.01E-07	-2.01E-07	-1.61E-07	-2.58E-07	-2.59E-07	-2.43E-07
SQP	Pt	-14.0	-15.3	-15.3	-14.8	-15.8	-15.8	-10.5	-11.9	-13.5	-14.1

Whangarei Asphalt Manufacturing Facility (continued)

Resource use

Indicator	Unit	AC10 B60 OT	AC14 PG58H OT	AC14 FPB OT	AC14 High Fatigue B60 OT	AC20 Heavy B60 OT	AC20 Heavy RS3HS OT	Blinding Mix 10	DG7 B60 OT	Mix 10 B60	DG10 PG58H OT
PERE	MJ	-20.7	-22.2	-22.2	-21.6	-22.8	-22.8	-16.6	-18.2	-20.0	-20.8
PERM	MJ	0	0	0	0	0	0	0	0	0	0
PERT	MJ	-20.7	-22.2	-22.2	-21.6	-22.8	-22.8	-16.6	-18.2	-20.0	-20.8
PENRE	MJ	-1,960	-1,970	-1,970	-2,030	-1,670	-1,670	-1,260	-2,250	-2,260	-2,090
PENRM	MJ	0	0	0	0	0	0	0	0	0	0
PENRT	MJ	-1,960	-1,970	-1,970	-2,030	-1,670	-1,670	-1,260	-2,250	-2,260	-2,090
SM	kg	0	0	0	0	0	0	0	0	0	0
RSF	MJ	0	0	0	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0	0	0	0
FW	m^3	-0.0397	-0.0444	-0.0444	-0.0426	-0.0461	-0.0461	-0.0275	-0.0324	-0.0378	-0.0401

Waste categories and output flows

Indicator	Unit	AC10 B60 OT	AC14 PG58H OT	AC14 FPB OT	AC14 High Fatigue B60 OT	AC20 Heavy B60 OT	AC20 Heavy RS3HS OT	Blinding Mix 10	DG7 B60 OT	Mix 10 B60	DG10 PG58H OT
HWD	kg	-4.64E-09	-4.90E-09	-4.90E-09	-4.84E-09	-4.81E-09	-4.81E-09	-3.49E-09	-4.41E-09	-4.72E-09	-4.74E-09
NHWD	kg	-9.19	-8.00	-8.00	-8.47	-7.43	-7.43	-12.1	-11.2	-9.79	-9.15
RWD	kg	-0.00526	-0.00578	-0.00578	-0.00556	-0.00609	-0.00609	-0.00413	-0.00433	-0.00494	-0.00525
CRU	kg	0	0	0	0	0	0	0	0	0	0
MFR	kg	0	0	0	0	0	0	0	0	0	0
MER	kg	0	0	0	0	0	0	0	0	0	0
EEE	MJ	0	0	0	0	0	0	0	0	0	0
EET	MJ	0	0	0	0	0	0	0	0	0	0

Environmental impact (EN15804+A1)

Indicator	Unit	AC10 B60 OT	AC14 PG58H OT	AC14 FPB OT	AC14 High Fatigue B60 OT	AC20 Heavy B60 OT	AC20 Heavy RS3HS OT	Blinding Mix 10	DG7 B60 OT	Mix 10 B60	DG10 PG58H OT
GWP	kg CO_2-eq.	-12.8	-13.1	-13.1	-13.4	-11.4	-11.4	-8.17	-14.2	-14.5	-13.6
ODP	kg CFC11-eq.	-3.28E-11	-3.50E-11	-3.50E-11	-3.41E-11	-3.62E-11	-3.62E-11	-2.80E-11	-2.90E-11	-3.15E-11	-3.28E-11
AP	kg SO_2-eq.	-0.0323	-0.0327	-0.0327	-0.0338	-0.0271	-0.0271	-0.0179	-0.0373	-0.0378	-0.0348
EP	kg PO_4^{3-}- eq.	-0.00171	-0.00178	-0.00178	-0.00186	-0.00131	-0.00131	-3.50E-04	-0.00209	-0.00217	-0.00193
POCP	kg C_2H_4-eq.	-0.0103	-0.0103	-0.0103	-0.0107	-0.00845	-0.00845	-0.00580	-0.0120	-0.0121	-0.0111
ADPE	kg Sb-eq.	6.20E-07	5.79E-07	5.79E-07	5.44E-07	7.93E-07	7.93E-07	1.27E-06	4.56E-07	4.08E-07	5.15E-07
ADPF	MJ	-1,950	-1,950	-1,950	-2,010	-1,660	-1,660	-1,250	-2,240	-2,240	-2,080

Auckland Asphalt Manufacturing Facility

Modules A1 – A3
Production Impacts per tonne of asphalt

Core Environmental Impacts (EN15804+A2)

Indicator	Unit	AC10R H PG64H SD	AC10R Heavy PG64E SD	AC14 R HF PG64H SD	AC14 R HF FPB SD	AC14R PG64E SD	AC14R PG64H SD	AC14R PG64V SD	AC20 R PG64H SD	AC20 R PG64E SD	DG10R PG64E SD	DG10R PG64S SD	DG7R PG64E SD	DG7R PG64S SD	EME2 B15 SD	MIX 7 PG64S	SMA10 PG64E SD	SMA11 Melter PG64E	SmartPave7 PG64S	SmartPave7 PG64E
GWP-total	kg CO_2-eq.	58.1	78.5	55.7	75.0	72.3	54.2	72.3	52.9	70.4	76.7	56.0	79.5	57.9	62.6	64.8	80.5	125	58.3	79.8
GWP-fossil	kg CO_2-eq.	57.7	76.9	55.4	73.4	70.8	53.9	70.8	52.6	69.0	75.1	55.7	77.8	57.6	62.3	64.4	83.6	128	58.0	78.2
GWP-biogenic	kg CO_2-eq.	0.282	1.64	0.280	1.54	1.45	0.278	1.45	0.277	1.40	1.59	0.282	1.66	0.284	0.294	0.290	-3.15	-3.15	0.284	1.66
GWP-luluc	kg CO_2-eq.	0.0330	0.0348	0.0321	0.0338	0.0332	0.0317	0.0332	0.0305	0.0320	0.0344	0.0327	0.0364	0.0346	0.0430	0.0393	0.0422	0.0544	0.0357	0.0375
ODP	kg CFC11-eq.	4.44E-11	1.26E-10	4.45E-11	1.21E-10	1.15E-10	4.45E-11	1.15E-10	4.23E-11	1.10E-10	1.24E-10	4.53E-11	1.32E-10	4.87E-11	5.51E-11	5.04E-11	1.90E-10	1.78E-10	4.91E-11	1.32E-10
AP	Mole of H+ eq.	0.251	0.271	0.238	0.257	0.246	0.227	0.246	0.221	0.239	0.264	0.242	0.274	0.252	0.274	0.280	0.335	0.483	0.253	0.275
EP-freshwater	kg P eq.	1.62E-04	2.42E-04	1.61E-04	2.35E-04	2.29E-04	1.60E-04	2.29E-04	1.59E-04	2.25E-04	2.39E-04	1.62E-04	2.45E-04	1.64E-04	1.71E-04	1.70E-04	3.57E-04	3.93E-04	1.65E-04	2.46E-04
EP-marine	kg N eq.	0.0807	0.0891	0.0772	0.0851	0.0821	0.0746	0.0821	0.0729	0.0803	0.0869	0.0780	0.0897	0.0804	0.0874	0.0877	0.105	0.138	0.0809	0.0901
EP-terrestrial	Mole of N eq.	0.886	0.973	0.848	0.930	0.897	0.819	0.897	0.801	0.877	0.950	0.857	0.980	0.884	0.961	0.965	1.14	1.51	0.889	0.984
POCP	kg NMVOC eq.	0.242	0.283	0.231	0.269	0.258	0.222	0.258	0.217	0.252	0.276	0.234	0.285	0.242	0.261	0.264	0.333	0.441	0.242	0.286
ADP-minerals &metals	kg Sb-eq.	1.16E-05	1.42E-05	1.10E-05	1.35E-05	1.27E-05	1.04E-05	1.27E-05	1.02E-05	1.24E-05	1.38E-05	1.13E-05	1.43E-05	1.16E-05	1.23E-05	1.22E-05	1.63E-05	1.83E-05	1.15E-05	1.42E-05
ADP-fossil	MJ	3,210	3,550	3,020	3,330	3,130	2,830	3,130	2,740	3,020	3,440	3,100	3,600	3,250	3,560	3,540	3,950	4,410	3,260	3,610
WDP	m^3 world equiv.	4.98	5.29	5.01	5.30	5.28	5.00	5.28	4.88	5.14	5.37	5.06	5.58	5.25	5.63	5.48	11.8	14.5	5.22	5.55

Additional Environmental Impacts

Indicator	Unit	AC10R H PG64H SD	AC10R Heavy PG64E SD	AC14 R HF PG64H SD	AC14 R HF FPB SD	AC14R PG64E SD	AC14R PG64H SD	AC14R PG64V SD	AC20 R PG64H SD	AC20 R PG64E SD	DG10R PG64E SD	DG10R PG64S SD	DG7R PG64E SD	DG7R PG64S SD	EME2 B15 SD	MIX 7 PG64S	SMA10 PG64E SD	SMA11 Melter PG64E	SmartPave7 PG64S	SmartPave7 PG64E
GWP-GHG	kg CO_2-eq.	57.6	77.8	55.3	74.3	71.6	53.8	71.6	52.5	69.8	76.0	55.5	78.7	57.4	62.2	64.2	84.7	129	57.9	79.1
PM	Disease incidences	2.98E-06	3.27E-06	2.83E-06	3.11E-06	2.95E-06	2.70E-06	2.95E-06	2.63E-06	2.87E-06	3.19E-06	2.90E-06	3.31E-06	3.01E-06	3.23E-06	3.31E-06	5.84E-06	7.34E-06	3.01E-06	3.31E-06
IRP	kBq U235 eq.	1.31	1.75	1.33	1.73	1.71	1.33	1.71	1.25	1.61	1.78	1.36	1.93	1.49	1.73	1.46	2.43	1.46	1.48	1.93
ETP-fw	CTUe	858	988	817	938	888	775	888	753	861	964	838	1,000	871	945	956	1,130	1,490	872	1,000
HTPc	CTUh	1.65E-08	2.30E-08	1.57E-08	2.18E-08	2.06E-08	1.49E-08	2.06E-08	1.45E-08	1.99E-08	2.24E-08	1.60E-08	2.34E-08	1.67E-08	1.82E-08	1.90E-08	2.70E-08	4.14E-08	1.67E-08	2.34E-08
HTPnc	CTUh	5.02E-07	9.62E-07	4.75E-07	9.05E-07	8.50E-07	4.51E-07	8.50E-07	4.36E-07	8.20E-07	9.34E-07	4.88E-07	9.80E-07	5.11E-07	5.65E-07	6.00E-07	1.20E-06	1.77E-06	5.15E-07	9.84E-07
SQP	Pt	87.8	114	87.0	111	109	86.6	109	84.7	106	113	87.9	117	90.9	100.0	96.2	2,080	2,100	91.8	118

Biogenic carbon content

Indicator	Unit	AC10R H PG64H SD	AC10R Heavy PG64E SD	AC14 R HF PG64H SD	AC14 R HF FPB SD	AC14R PG64E SD	AC14R PG64H SD	AC14R PG64V SD	AC20 R PG64H SD	AC20 R PG64E SD	DG10R PG64E SD	DG10R PG64S SD	DG7R PG64E SD	DG7R PG64S SD	EME2 B15 SD	MIX 7 PG64S	SMA10 PG64E SD	SMA11 Melter PG64E	SmartPave7 PG64S	SmartPave7 PG64E
BCC-prod	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BCC-pack	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Resource use

Indicator	Unit	AC10R H PG64H SD	AC10R Heavy PG64E SD	AC14 R HF PG64H SD	AC14 R HF FPB SD	AC14R PG64E SD	AC14R PG64H SD	AC14R PG64V SD	AC20 R PG64H SD	AC20 R PG64E SD	DG10R PG64E SD	DG10R PG64S SD	DG7R PG64E SD	DG7R PG64S SD	EME2 B15 SD	MIX 7 PG64S	SMA10 PG64E SD	SMA11 Melter PG64E	SmartPave7 PG64S	SmartPave7 PG64E
PERE	MJ	98.0	136	97.8	134	131	97.6	131	95.8	128	136	98.6	140	101	107	113	262	387	102	141
PERM	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	49.5	49.5	0	0
PERT	MJ	98.0	136	97.8	134	131	97.6	131	95.8	128	136	98.6	140	101	107	113	312	437	102	141
PENRE	MJ	911	1,240	871	1,180	1,130	841	1,130	819	1,100	1,210	880	1,260	913	990	1,010	1,370	1,900	917	1,270
PENRM	MJ	2,320	2,320	2,170	2,170	2,010	2,010	2,010	1,940	1,940	2,250	2,250	2,360	2,360	2,590	2,550	2,610	2,530	2,360	2,360
PENRT	MJ	3,230	3,570	3,040	3,350	3,150	2,850	3,150	2,750	3,040	3,460	3,130	3,620	3,270	3,580	3,560	3,980	4,430	3,280	3,630
SM	kg	224	224	244	244	245	245	245	295	295	224	224	146	146	0	51.7	0	659	97.0	97.0
RSF	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FW	m^3	0.291	0.336	0.291	0.333	0.330	0.290	0.330	0.286	0.324	0.337	0.293	0.345	0.299	0.311	0.327	0.398	0.732	0.298	0.345

Waste categories and output flows

Indicator	Unit	AC10R H PG64H SD	AC10R Heavy PG64E SD	AC14 R HF PG64H SD	AC14 R HF FPB SD	AC14R PG64E SD	AC14R PG64H SD	AC14R PG64V SD	AC20 R PG64H SD	AC20 R PG64E SD	DG10R PG64E SD	DG10R PG64S SD	DG7R PG64E SD	DG7R PG64S SD	EME2 B15 SD	MIX 7 PG64S	SMA10 PG64E SD	SMA11 Melter PG64E	SmartPave7 PG64S	SmartPave7 PG64E
HWD	kg	2.98E-08	8.79E-08	2.90E-08	8.34E-08	7.96E-08	2.89E-08	7.96E-08	2.83E-08	7.71E-08	8.57E-08	2.87E-08	8.93E-08	2.95E-08	3.14E-08	3.20E-08	9.93E-08	1.15E-07	2.98E-08	8.95E-08
NHWD	kg	1.04	2.27	0.425	1.58	1.49	0.422	1.49	0.418	1.45	1.62	0.426	1.69	0.433	0.447	3.03	2.01	2.11	1.57	2.82
RWD	kg	0.00818	0.0125	0.00824	0.0123	0.0120	0.00822	0.0120	0.00774	0.0113	0.0126	0.00844	0.0136	0.00920	0.0106	0.00913	0.0177	0.0128	0.00918	0.0136
CRU	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MFR	kg	34.1	34.1	34.1	34.1	34.1	34.1	34.1	34.1	34.1	34.1	34.1	34.1	34.1	34.1	34.1	34.1	34.1	34.1	34.1
MER	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EEE	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EET	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Auckland Asphalt Manufacturing Facility (continued)

Environmental impact (EN15804+A1)

Indicator	Unit	AC10R H PG64H SD	AC10R Heavy PG64E SD	AC14 R HF PG64H SD	AC14 R HF FPB SD	AC14R PG64E SD	AC14R PG64H SD	AC14R PG64V SD	AC20 R PG64H SD	AC20 R PG64E SD	DG10R PG64E SD	DG10R PG64S SD	DG7R PG64E SD	DG7R PG64S SD	EME2 B15 SD	MIX 7 PG64S	SMA10 PG64E SD	SMA11 Melter PG64E	SmartPave7 PG64S	SmartPave7 PG64E
GWP	kg CO_2-eq.	53.7	73.5	51.6	70.2	67.8	50.4	67.8	49.2	66.1	71.8	51.8	74.4	53.5	57.9	60.0	74.9	119	53.9	74.7
ODP	kg CFC11-eq.	5.23E-11	1.48E-10	5.24E-11	1.42E-10	1.36E-10	5.23E-11	1.36E-10	4.98E-11	1.30E-10	1.46E-10	5.34E-11	1.55E-10	5.74E-11	6.49E-11	5.93E-11	2.24E-10	2.10E-10	5.78E-11	1.56E-10
AP	kg SO_2-eq.	0.192	0.207	0.182	0.196	0.187	0.173	0.187	0.168	0.181	0.201	0.186	0.209	0.193	0.210	0.216	0.258	0.378	0.194	0.210
EP	kg PO_4^{3}-- eq.	0.0289	0.0336	0.0277	0.0321	0.0310	0.0268	0.0310	0.0262	0.0302	0.0328	0.0280	0.0339	0.0289	0.0314	0.0314	0.0401	0.0516	0.0290	0.0340
POCP	kg C_2H_4-eq.	0.0229	0.0274	0.0216	0.0259	0.0242	0.0202	0.0242	0.0197	0.0236	0.0266	0.0221	0.0276	0.0229	0.0233	0.0250	0.0326	0.0489	0.0225	0.0272
ADPE	kg Sb-eq.	1.16E-05	1.43E-05	1.10E-05	1.35E-05	1.28E-05	1.04E-05	1.28E-05	1.02E-05	1.25E-05	1.39E-05	1.13E-05	1.44E-05	1.16E-05	1.24E-05	1.23E-05	1.64E-05	1.84E-05	1.15E-05	1.43E-05
ADPF	MJ	3,160	3,480	2,970	3,270	3,070	2,790	3,070	2,690	2,970	3,380	3,050	3,540	3,200	3,500	3,480	3,870	4,340	3,200	3,540

Modules C1 – C4
End of Life Impacts per tonne of asphalt

Core environmental impacts (EN15804+A2)

Indicator	Unit	C1	C2	C3	C4
GWP-total	kg CO_2-eq.	0.625	2.57	0	0
GWP-fossil	kg CO_2-eq.	0.625	2.58	0	0
GWP-biogenic	kg CO_2-eq.	6.18E-05	-0.0255	0	0
GWP-luluc	kg CO_2-eq.	4.53E-06	0.0176	0	0
ODP	kg CFC11-eq.	4.96E-14	2.56E-13	0	0
AP	Mole of H+ eq.	0.00297	0.0157	0	0
EP-freshwater	kg P eq.	1.10E-07	9.32E-06	0	0
EP-marine	kg N eq.	0.00143	0.00764	0	0
EP-terrestrial	Mole of N eq.	0.0157	0.0846	0	0
POCP	kg NMVOC eq.	0.00402	0.0147	0	0
ADP-minerals&metals	kg Sb-eq.	7.62E-09	2.63E-07	0	0
ADP-fossil	MJ	8.29	34.3	0	0
WDP	m^3 world equiv.	0.00464	0.0292	0	0

Additional Environmental Impacts

Indicator	Unit	C1	C2	C3	C4
GWP-GHG	kg CO_2-eq.	0.622	2.58	0	0
PM	Disease incidences	3.36E-08	5.88E-08	0	0
IRP	kBq U235 eq.	1.57E-05	0.00964	0	0
ETP-fw	CTUe	2.08	24.3	0	0
HTPc	CTUh	3.49E-11	5.01E-10	0	0
HTPnc	CTUh	2.18E-09	2.90E-08	0	0
SQP	Pt	0.0190	14.5	0	0

Resource use

Indicator	Unit	C1	C2	C3	C4
PERE	MJ	0.0271	2.37	0	0
PERM	MJ	0	0	0	0
PERT	MJ	0.0271	2.37	0	0
PENRE	MJ	8.29	34.4	0	0
PENRM	MJ	0	0	0	0
PENRT	MJ	8.29	34.4	0	0
SM	kg	0	0	0	0
RSF	MJ	0	0	0	0
NRSF	MJ	0	0	0	0
FW	m^3	6.98E-05	0.00274	0	0

Waste categories and output flows

Indicator	Unit	C1	C2	C3	C4
HWD	kg	8.99E-12	1.82E-10	0	0
NHWD	kg	1.18E-04	0.00560	0	0
RWD	kg	1.21E-07	6.39E-05	0	0
CRU	kg	0	0	0	0
MFR	kg	0	0	1,000	0
MER	kg	0	0	0	0
EEE	MJ	0	0	0	0
EET	MJ	0	0	0	0

Environmental impact (EN15804+A1)

Indicator	Unit	C1	C2	C3	C4
GWP	kg CO_2-eq.	0.615	2.51	0	0
ODP	kg CFC11-eq.	5.84E-14	3.02E-13	0	0
AP	kg SO_2-eq.	0.00206	0.0107	0	0
EP	kg PO_4^{3}-- eq.	4.80E-04	0.00268	0	0
POCP	kg C_2H_4-eq.	2.03E-04	-0.00402	0	0
ADPE	kg Sb-eq.	7.63E-09	2.63E-07	0	0
ADPF	MJ	8.29	33.9	0	0

Module D
Future reuse, recycling or energy recovery potential impacts and benefits per tonne of asphalt

Core Environmental Impacts (EN15804+A2)

Indicator	Unit	AC10R H PG64H SD	AC10R Heavy PG64E SD	AC14 R HF PG64H SD	AC14 R HF FPB SD	AC14R PG64E SD	AC14R PG64H SD	AC14R PG64V SD	AC20 R PG64H SD	AC20 R PG64E SD	DG10R PG64E SD	DG10R PG64S SD	DG7R PG64E SD	DG7R PG64S SD	EME2 B15 SD	MIX 7 PG64S	SMA10 PG64E SD	SMA11 Melter PG64E	SmartPave7 PG64S	SmartPave7 PG64E
GWP-total	kg CO_2-eq.	-14.0	-14.0	-12.9	-12.9	-12.0	-12.0	-12.0	-10.8	-10.8	-13.4	-13.4	-15.5	-15.5	-20.5	-18.8	-21.4	-18.5	-16.0	-16.0
GWP-fossil	kg CO_2-eq.	-14.0	-14.0	-12.9	-12.9	-12.0	-12.0	-12.0	-10.8	-10.8	-13.4	-13.4	-15.5	-15.5	-20.5	-18.8	-21.4	-18.5	-16.0	-16.0
GWP-biogenic	kg CO_2-eq.	4.88E-05	4.88E-05	1.54E-04	1.54E-04	0.00114	0.00114	0.00114	0.00126	0.00126	0.00133	0.00133	0.00179	0.00179	-0.00303	0.00645	-0.00833	0.00680	0.00462	0.00462
GWP-luluc	kg CO_2-eq.	-0.00236	-0.00236	-0.00261	-0.00261	-0.00255	-0.00255	-0.00255	-0.00249	-0.00249	-0.00202	-0.00202	-0.00175	-0.00175	-0.00327	3.76E-04	-0.00538	4.00E-04	-7.24E-04	-7.24E-04
ODP	kg CFC11-eq.	-2.01E-11	-2.01E-11	-2.08E-11	-2.08E-11	-2.08E-11	-2.08E-11	-2.08E-11	-1.99E-11	-1.99E-11	-1.91E-11	-1.91E-11	-1.93E-11	-1.93E-11	-2.60E-11	-1.45E-11	-3.27E-11	-1.45E-11	-1.68E-11	-1.68E-11
AP	Mole of H+ eq.	-0.0358	-0.0358	-0.0324	-0.0324	-0.0296	-0.0296	-0.0296	-0.0263	-0.0263	-0.0341	-0.0341	-0.0399	-0.0399	-0.0542	-0.0498	-0.0562	-0.0489	-0.0414	-0.0414
EP-freshwater	kg P eq.	-1.11E-05	-1.11E-05	-1.08E-05	-1.08E-05	-1.04E-05	-1.04E-05	-1.04E-05	-9.61E-06	-9.61E-06	-1.05E-05	-1.05E-05	-1.14E-05	-1.14E-05	-1.56E-05	-1.13E-05	-1.80E-05	-1.12E-05	-1.08E-05	-1.08E-05
EP-marine	kg N eq.	-0.00411	-0.00411	-0.00354	-0.00354	-0.00300	-0.00300	-0.00300	-0.00253	-0.00253	-0.00375	-0.00375	-0.00454	-0.00454	-0.00690	-0.00572	-0.00747	-0.00554	-0.00455	-0.00455
EP-terrestrial	Mole of N eq.	-0.0462	-0.0462	-0.0400	-0.0400	-0.0341	-0.0341	-0.0341	-0.0290	-0.0290	-0.0421	-0.0421	-0.0507	-0.0507	-0.0771	-0.0631	-0.0841	-0.0610	-0.0506	-0.0506
POCP	kg NMVOC eq.	-0.0297	-0.0297	-0.0263	-0.0263	-0.0235	-0.0235	-0.0235	-0.0205	-0.0205	-0.0280	-0.0280	-0.0333	-0.0333	-0.0465	-0.0428	-0.0481	-0.0418	-0.0347	-0.0347
ADP-minerals &metals	kg Sb-eq.	2.93E-07	2.93E-07	3.57E-07	3.57E-07	4.49E-07	4.49E-07	4.49E-07	4.62E-07	4.62E-07	3.61E-07	3.61E-07	3.36E-07	3.36E-07	1.02E-07	3.73E-07	-3.69E-08	4.05E-07	4.20E-07	4.20E-07
ADP-fossil	MJ	-1,830	-1,830	-1,660	-1,660	-1,550	-1,550	-1,550	-1,380	-1,380	-1,770	-1,770	-2,060	-2,060	-2,700	-2,630	-2,710	-2,590	-2,190	-2,190
WDP	m^3 world equiv.	-0.773	-0.773	-0.860	-0.860	-0.859	-0.859	-0.859	-0.844	-0.844	-0.684	-0.684	-0.598	-0.598	-1.02	0.0324	-1.62	0.0337	-0.306	-0.306

Additional Environmental Impacts

Indicator	Unit	AC10R H PG64H SD	AC10R Heavy PG64E SD	AC14 R HF PG64H SD	AC14 R HF FPB SD	AC14R PG64E SD	AC14R PG64H SD	AC14R PG64V SD	AC20 R PG64H SD	AC20 R PG64E SD	DG10R PG64E SD	DG10R PG64S SD	DG7R PG64E SD	DG7R PG64S SD	EME2 B15 SD	MIX 7 PG64S	SMA10 PG64E SD	SMA11 Melter PG64E	SmartPave7 PG64S	SmartPave7 PG64E
GWP-GHG	kg CO_2-eq.	-13.9	-13.9	-12.8	-12.8	-11.9	-11.9	-11.9	-10.7	-10.7	-13.3	-13.3	-15.3	-15.3	-20.4	-18.7	-21.2	-18.4	-15.9	-15.9
PM	Disease incidences	-2.24E-07	-2.24E-07	-2.06E-07	-2.06E-07	-1.89E-07	-1.89E-07	-1.89E-07	-1.69E-07	-1.69E-07	-2.12E-07	-2.12E-07	-2.44E-07	-2.44E-07	-3.38E-07	-2.89E-07	-3.62E-07	-2.84E-07	-2.47E-07	-2.47E-07
IRP	kBq U235 eq.	-0.610	-0.610	-0.655	-0.655	-0.656	-0.656	-0.656	-0.637	-0.637	-0.562	-0.562	-0.531	-0.531	-0.791	-0.216	-1.12	-0.216	-0.383	-0.383
ETP-fw	CTUe	-267	-267	-243	-243	-225	-225	-225	-201	-201	-257	-257	-299	-299	-394	-376	-401	-370	-314	-314
HTPc	CTUh	-5.66E-09	-5.66E-09	-5.18E-09	-5.18E-09	-4.83E-09	-4.83E-09	-4.83E-09	-4.33E-09	-4.33E-09	-5.47E-09	-5.47E-09	-6.34E-09	-6.34E-09	-8.30E-09	-7.98E-09	-8.41E-09	-7.87E-09	-6.68E-09	-6.68E-09
HTPnc	CTUh	-2.09E-07	-2.09E-07	-1.91E-07	-1.91E-07	-1.80E-07	-1.80E-07	-1.80E-07	-1.62E-07	-1.62E-07	-2.02E-07	-2.02E-07	-2.34E-07	-2.34E-07	-3.02E-07	-2.96E-07	-3.03E-07	-2.92E-07	-2.48E-07	-2.48E-07
SQP	Pt	-10.1	-10.1	-10.5	-10.5	-10.5	-10.5	-10.5	-10.00	-10.00	-9.32	-9.32	-9.12	-9.12	-13.3	-5.11	-18.1	-5.08	-7.11	-7.11

Resource use

Indicator	Unit	AC10R H PG64H SD	AC10R Heavy PG64E SD	AC14 R HF PG64H SD	AC14 R HF FPB SD	AC14R PG64E SD	AC14R PG64H SD	AC14R PG64V SD	AC20 R PG64H SD	AC20 R PG64E SD	DG10R PG64E SD	DG10R PG64S SD	DG7R PG64E SD	DG7R PG64S SD	EME2 B15 SD	MIX 7 PG64S	SMA10 PG64E SD	SMA11 Melter PG64E	SmartPave7 PG64S	SmartPave7 PG64E
PERE	MJ	-15.1	-15.1	-15.6	-15.6	-15.5	-15.5	-15.5	-14.8	-14.8	-14.2	-14.2	-14.3	-14.3	-19.9	-10.1	-25.5	-10.1	-12.1	-12.1
PERM	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PERT	MJ	-15.1	-15.1	-15.6	-15.6	-15.5	-15.5	-15.5	-14.8	-14.8	-14.2	-14.2	-14.3	-14.3	-19.9	-10.1	-25.5	-10.1	-12.1	-12.1
PENRE	MJ	-1,830	-1,830	-1,660	-1,660	-1,550	-1,550	-1,550	-1,380	-1,380	-1,770	-1,770	-2,060	-2,060	-2,700	-2,630	-2,710	-2,590	-2,190	-2,190
PENRM	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PENRT	MJ	-1,830	-1,830	-1,660	-1,660	-1,550	-1,550	-1,550	-1,380	-1,380	-1,770	-1,770	-2,060	-2,060	-2,700	-2,630	-2,710	-2,590	-2,190	-2,190
SM	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RSF	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FW	m^3	-0.0279	-0.0279	-0.0299	-0.0299	-0.0296	-0.0296	-0.0296	-0.0286	-0.0286	-0.0253	-0.0253	-0.0239	-0.0239	-0.0373	-0.00822	-0.0541	-0.00810	-0.0162	-0.0162

Waste categories and output flows

Indicator	Unit	AC10R H PG64H SD	AC10R Heavy PG64E SD	AC14 R HF PG64H SD	AC14 R HF FPB SD	AC14R PG64E SD	AC14R PG64H SD	AC14R PG64V SD	AC20 R PG64H SD	AC20 R PG64E SD	DG10R PG64E SD	DG10R PG64S SD	DG7R PG64E SD	DG7R PG64S SD	EME2 B15 SD	MIX 7 PG64S	SMA10 PG64E SD	SMA11 Melter PG64E	SmartPave7 PG64S	SmartPave7 PG64E
HWD	kg	-3.64E-09	-3.64E-09	-3.61E-09	-3.61E-09	-3.52E-09	-3.52E-09	-3.52E-09	-3.30E-09	-3.30E-09	-3.45E-09	-3.45E-09	-3.65E-09	-3.65E-09	-4.98E-09	-3.31E-09	-5.93E-09	-3.27E-09	-3.36E-09	-3.36E-09
NHWD	kg	-7.99	-7.99	-7.05	-7.05	-7.07	-7.07	-7.07	-6.32	-6.32	-8.63	-8.63	-10.6	-10.6	-10.1	-17.5	-5.75	-17.6	-13.5	-13.5
RWD	kg	-0.00365	-0.00365	-0.00390	-0.00390	-0.00390	-0.00390	-0.00390	-0.00378	-0.00378	-0.00338	-0.00338	-0.00322	-0.00322	-0.00473	-0.00148	-0.00662	-0.00148	-0.00239	-0.00239
CRU	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MFR	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MER	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EEE	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EET	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Environmental impact (EN15804+A1)

Indicator	Unit	AC10R H PG64H SD	AC10R Heavy PG64E SD	AC14 R HF PG64H SD	AC14 R HF FPB SD	AC14R PG64E SD	AC14R PG64H SD	AC14R PG64V SD	AC20 R PG64H SD	AC20 R PG64E SD	DG10R PG64E SD	DG10R PG64S SD	DG7R PG64E SD	DG7R PG64S SD	EME2 B15 SD	MIX 7 PG64S	SMA10 PG64E SD	SMA11 Melter PG64E	SmartPave7 PG64S	SmartPave7 PG64E
GWP	kg CO_2-eq.	-11.7	-11.7	-10.8	-10.8	-10.1	-10.1	-10.1	-9.06	-9.06	-11.2	-11.2	-12.8	-12.8	-17.1	-15.5	-17.9	-15.2	-13.2	-13.2
ODP	kg CFC11-eq.	-2.37E-11	-2.37E-11	-2.45E-11	-2.45E-11	-2.45E-11	-2.45E-11	-2.45E-11	-2.34E-11	-2.34E-11	-2.25E-11	-2.25E-11	-2.28E-11	-2.28E-11	-3.06E-11	-1.71E-11	-3.85E-11	-1.70E-11	-1.98E-11	-1.98E-11
AP	kg SO_2-eq.	-0.0307	-0.0307	-0.0278	-0.0278	-0.0255	-0.0255	-0.0255	-0.0227	-0.0227	-0.0293	-0.0293	-0.0343	-0.0343	-0.0462	-0.0429	-0.0477	-0.0421	-0.0357	-0.0357
EP	kg PO_4^{3}-- eq.	-0.00180	-0.00180	-0.00159	-0.00159	-0.00139	-0.00139	-0.00139	-0.00120	-0.00120	-0.00166	-0.00166	-0.00196	-0.00196	-0.00291	-0.00239	-0.00317	-0.00232	-0.00196	-0.00196
POCP	kg C_2H_4-eq.	-0.00987	-0.00987	-0.00888	-0.00888	-0.00814	-0.00814	-0.00814	-0.00720	-0.00720	-0.00947	-0.00947	-0.0111	-0.0111	-0.0149	-0.0143	-0.0150	-0.0141	-0.0118	-0.0118
ADPE	kg Sb-eq.	2.68E-07	2.68E-07	3.31E-07	3.31E-07	4.22E-07	4.22E-07	4.22E-07	4.36E-07	4.36E-07	3.37E-07	3.37E-07	3.14E-07	3.14E-07	6.94E-08	3.61E-07	-8.13E-08	3.92E-07	4.02E-07	4.02E-07
ADPF	MJ	-1,820	-1,820	-1,650	-1,650	-1,530	-1,530	-1,530	-1,370	-1,370	-1,760	-1,760	-2,050	-2,050	-2,680	-2,630	-2,690	-2,590	-2,180	-2,180

Hamilton Asphalt Manufacturing Facility

Modules A1 – A3
Production Impacts per tonne of asphalt

Core Environmental Impacts (EN15804+A2)

Indicator	Unit	AC10 B60 WW	AC10 FPB WW	AC14 B60 WW	AC14 FPB WW	AC14 H PG64H (B60) WW	AC20 B60 WW	AC20 FPB WW	Blinding Mix	DG10 B60 WW	DG10 FPB WW	DG7 B60 WW	Fine Mix 10 WW	SMA10 B40 GM	SMA10 FPB GM	SMA10 B40 WW	SMA10 RS3HS WW	EME2 B15 SD	SMA10 B40 SD	SMA10 FPB SD
GWP-total	kg CO_2-eq.	57.2	77.2	53.0	70.0	53.8	52.3	69.3	45.6	57.2	77.2	58.2	60.7	105	123	58.4	77.1	64.4	62.0	81.9
GWP-fossil	kg CO_2-eq.	56.9	75.6	52.7	68.6	53.5	51.9	67.8	45.3	56.9	75.6	57.9	60.3	110	126	64.2	81.4	64.1	66.5	85.0
GWP-biogenic	kg CO_2-eq.	0.283	1.64	0.283	1.44	0.284	0.283	1.42	0.270	0.283	1.64	0.285	0.289	-4.53	-3.20	-5.80	-4.40	0.312	-4.57	-3.08
GWP-luluc	kg CO_2-eq.	0.0381	0.0399	0.0400	0.0414	0.0401	0.0405	0.0419	0.0375	0.0381	0.0399	0.0389	0.0397	0.0649	0.0666	0.0436	0.0454	0.0605	0.0560	0.0579
ODP	kg CFC11-eq.	5.27E-11	1.34E-10	5.62E-11	1.26E-10	5.62E-11	5.62E-11	1.24E-10	5.46E-11	5.27E-11	1.34E-10	5.36E-11	5.41E-11	9.05E-11	1.71E-10	1.11E-10	1.95E-10	5.64E-11	9.99E-11	1.90E-10
AP	Mole of H+ eq.	0.250	0.269	0.227	0.242	0.232	0.222	0.239	0.168	0.250	0.269	0.258	0.276	0.459	0.474	0.315	0.332	0.286	0.326	0.343
EP-freshwater	kg P eq.	1.70E-04	2.50E-04	1.70E-04	2.38E-04	1.71E-04	1.70E-04	2.37E-04	1.65E-04	1.70E-04	2.50E-04	1.71E-04	1.73E-04	3.15E-04	3.93E-04	2.95E-04	3.77E-04	1.83E-04	2.78E-04	3.65E-04
EP-marine	kg N eq.	0.0791	0.0870	0.0730	0.0795	0.0743	0.0719	0.0788	0.0593	0.0791	0.0870	0.0810	0.0854	0.131	0.137	0.0981	0.104	0.0931	0.103	0.109
EP-terrestrial	Mole of N eq.	0.873	0.955	0.807	0.873	0.821	0.794	0.866	0.656	0.873	0.955	0.894	0.941	1.45	1.51	1.08	1.14	1.03	1.13	1.20
POCP	kg NMVOC eq.	0.237	0.276	0.216	0.248	0.220	0.211	0.245	0.167	0.237	0.276	0.243	0.258	0.397	0.431	0.291	0.326	0.271	0.301	0.339
ADP-minerals &metals	kg Sb-eq.	1.13E-05	1.39E-05	1.02E-05	1.23E-05	1.05E-05	9.88E-06	1.21E-05	6.72E-06	1.13E-05	1.39E-05	1.18E-05	1.28E-05	1.49E-05	1.75E-05	1.31E-05	1.58E-05	1.26E-05	1.36E-05	1.65E-05
ADP-fossil	MJ	3,200	3,530	2,820	3,060	2,910	2,730	3,010	1,800	3,200	3,530	3,330	3,650	3,820	4,120	3,400	3,710	3,540	3,580	3,920
WDP	m^3 world equiv.	6.95	7.27	7.26	7.53	7.26	7.26	7.53	7.12	6.95	7.27	7.04	7.08	15.7	16.0	14.4	14.7	7.30	13.0	13.3

Additional Environmental Impacts

Indicator	Unit	AC10 B60 WW	AC10 FPB WW	AC14 B60 WW	AC14 FPB WW	AC14 H PG64H (B60) WW	AC20 B60 WW	AC20 FPB WW	Blinding Mix	DG10 B60 WW	DG10 FPB WW	DG7 B60 WW	Fine Mix 10 WW	SMA10 B40 GM	SMA10 FPB GM	SMA10 B40 WW	SMA10 RS3HS WW	EME2 B15 SD	SMA10 B40 SD	SMA10 FPB SD
GWP-GHG	kg CO_2-eq.	56.8	76.5	52.6	69.4	53.4	51.9	68.7	45.3	56.8	76.5	57.8	60.2	109	126	64.1	82.4	63.9	66.4	86.0
PM	Disease incidences	2.97E-06	3.26E-06	2.71E-06	2.92E-06	2.78E-06	2.64E-06	2.89E-06	1.94E-06	2.97E-06	3.26E-06	3.08E-06	3.31E-06	6.83E-06	7.10E-06	5.86E-06	6.14E-06	3.26E-06	5.48E-06	5.78E-06
IRP	kBq U235 eq.	1.54	1.97	1.71	2.08	1.71	1.71	2.08	1.65	1.54	1.97	1.58	1.60	0.969	1.40	1.98	2.43	1.71	1.93	2.41
ETP-fw	CTUe	991	1,120	915	1,020	935	895	1,000	678	991	1,120	1,020	1,100	1,440	1,560	1,070	1,200	1,080	1,120	1,260
HTPc	CTUh	1.71E-08	2.36E-08	1.56E-08	2.10E-08	1.60E-08	1.53E-08	2.07E-08	1.15E-08	1.71E-08	2.36E-08	1.77E-08	1.89E-08	3.43E-08	4.06E-08	2.00E-08	2.66E-08	1.90E-08	2.06E-08	2.76E-08
HTPnc	CTUh	5.16E-07	9.76E-07	4.70E-07	8.57E-07	4.82E-07	4.60E-07	8.45E-07	3.36E-07	5.16E-07	9.76E-07	5.34E-07	5.75E-07	1.26E-06	1.71E-06	6.95E-07	1.17E-06	5.87E-07	7.07E-07	1.21E-06
SQP	Pt	104	130	106	129	107	107	129	103	104	130	105	106	2,060	2,080	2,510	2,540	124	2,040	2,070

Biogenic carbon content

Indicator	Unit	AC10 B60 WW	AC10 FPB WW	AC14 B60 WW	AC14 FPB WW	AC14 H PG64H (B60) WW	AC20 B60 WW	AC20 FPB WW	Blinding Mix	DG10 B60 WW	DG10 FPB WW	DG7 B60 WW	Fine Mix 10 WW	SMA10 B40 GM	SMA10 FPB GM	SMA10 B40 WW	SMA10 RS3HS WW	EME2 B15 SD	SMA10 B40 SD	SMA10 FPB SD
BCC-prod	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BCC-pack	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Resource use

Indicator	Unit	AC10 B60 WW	AC10 FPB WW	AC14 B60 WW	AC14 FPB WW	AC14 H PG64H (B60) WW	AC20 B60 WW	AC20 FPB WW	Blinding Mix	DG10 B60 WW	DG10 FPB WW	DG7 B60 WW	Fine Mix 10 WW	SMA10 B40 GM	SMA10 FPB GM	SMA10 B40 WW	SMA10 RS3HS WW	EME2 B15 SD	SMA10 B40 SD	SMA10 FPB SD
PERE	MJ	157	195	159	192	159	159	191	157	157	195	157	158	398	436	297	337	163	272	314
PERM	MJ	0	0	0	0	0	0	0	0	0	0	0	0	49.5	49.5	61.9	61.9	0	49.5	49.5
PERT	MJ	157	195	159	192	159	159	191	157	157	195	157	158	448	486	359	399	163	321	363
PENRE	MJ	858	1,190	791	1,070	805	777	1,060	647	858	1,190	878	924	1,510	1,810	961	1,280	966	1,000	1,340
PENRM	MJ	2,360	2,360	2,050	2,010	2,130	1,970	1,970	1,160	2,360	2,360	2,480	2,750	2,340	2,340	2,460	2,460	2,590	2,610	2,610
PENRT	MJ	3,220	3,550	2,840	3,080	2,930	2,750	3,030	1,810	3,220	3,550	3,360	3,670	3,840	4,140	3,420	3,730	3,560	3,610	3,940
SM	kg	0	0	0	0	0	0	0	0	0	0	0	0	663	663	0	0	0	0	0
RSF	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FW	m^3	0.437	0.483	0.445	0.484	0.445	0.445	0.483	0.438	0.437	0.483	0.440	0.442	0.822	0.867	0.491	0.538	0.450	0.485	0.535

Waste categories and output flows

Indicator	Unit	AC10 B60 WW	AC10 FPB WW	AC14 B60 WW	AC14 FPB WW	AC14 H PG64H (B60) WW	AC20 B60 WW	AC20 FPB WW	Blinding Mix	DG10 B60 WW	DG10 FPB WW	DG7 B60 WW	Fine Mix 10 WW	SMA10 B40 GM	SMA10 FPB GM	SMA10 B40 WW	SMA10 RS3HS WW	EME2 B15 SD	SMA10 B40 SD	SMA10 FPB SD
HWD	kg	2.91E-08	8.69E-08	2.77E-08	7.72E-08	2.78E-08	2.76E-08	7.62E-08	2.80E-08	2.91E-08	8.69E-08	2.91E-08	2.92E-08	5.36E-08	1.09E-07	3.79E-08	9.58E-08	3.13E-08	3.67E-08	9.84E-08
NHWD	kg	2.62	3.86	0.433	1.49	0.435	0.432	1.47	1.48	2.62	3.86	2.03	1.72	0.775	1.99	0.686	1.96	0.457	0.645	2.00
RWD	kg	0.00951	0.0138	0.0104	0.0141	0.0105	0.0104	0.0141	0.00994	0.00951	0.0138	0.00977	0.00992	0.00791	0.0121	0.0132	0.0177	0.0105	0.0127	0.0175
CRU	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MFR	kg	17.9	17.9	17.9	17.9	17.9	17.9	17.9	17.9	17.9	17.9	17.9	17.9	17.9	17.9	17.9	17.9	17.9	17.9	17.9
MER	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EEE	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EET	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Environmental impact (EN15804+A1)

Indicator	Unit	AC10 B60 WW	AC10 FPB WW	AC14 B60 WW	AC14 FPB WW	AC14 H PG64H (B60) WW	AC20 B60 WW	AC20 FPB WW	Blinding Mix	DG10 B60 WW	DG10 FPB WW	DG7 B60 WW	Fine Mix 10 WW	SMA10 B40 GM	SMA10 FPB GM	SMA10 B40 WW	SMA10 RS3HS WW	EME2 B15 SD	SMA10 B40 SD	SMA10 FPB SD
GWP	kg CO_2-eq.	52.9	72.2	49.2	65.7	49.8	48.5	65.0	43.1	52.9	72.2	53.8	55.8	99.5	117	53.8	71.8	59.7	57.1	76.4
ODP	kg CFC11-eq.	6.21E-11	1.58E-10	6.61E-11	1.48E-10	6.61E-11	6.61E-11	1.47E-10	6.43E-11	6.21E-11	1.58E-10	6.32E-11	6.37E-11	1.07E-10	2.01E-10	1.30E-10	2.30E-10	6.64E-11	1.18E-10	2.23E-10
AP	kg SO_2-eq.	0.191	0.206	0.173	0.184	0.178	0.169	0.182	0.126	0.191	0.206	0.198	0.212	0.359	0.370	0.243	0.255	0.218	0.250	0.263
EP	kg PO_4^{3}-- eq.	0.0286	0.0332	0.0266	0.0303	0.0270	0.0262	0.0301	0.0218	0.0286	0.0332	0.0293	0.0308	0.0475	0.0513	0.0360	0.0400	0.0335	0.0375	0.0418
POCP	kg C_2H_4-eq.	0.0217	0.0262	0.0186	0.0221	0.0192	0.0177	0.0215	0.0108	0.0217	0.0262	0.0227	0.0251	0.0398	0.0440	0.0265	0.0309	0.0196	0.0244	0.0291
ADPE	kg Sb-eq.	1.14E-05	1.40E-05	1.02E-05	1.24E-05	1.05E-05	9.95E-06	1.22E-05	6.78E-06	1.14E-05	1.40E-05	1.18E-05	1.29E-05	1.50E-05	1.76E-05	1.32E-05	1.59E-05	1.27E-05	1.37E-05	1.66E-05
ADPF	MJ	3,140	3,460	2,770	3,000	2,860	2,680	2,950	1,760	3,140	3,460	3,280	3,590	3,760	4,050	3,330	3,630	3,470	3,520	3,840

Modules C1 – C4
End of Life Impacts per tonne of asphalt

Core environmental impacts (EN15804+A2)

Indicator	Unit	C1	C2	C3	C4
GWP-total	kg CO_2-eq.	0.625	2.57	0	0
GWP-fossil	kg CO_2-eq.	0.625	2.58	0	0
GWP-biogenic	kg CO_2-eq.	6.18E-05	-0.0255	0	0
GWP-luluc	kg CO_2-eq.	4.53E-06	0.0176	0	0
ODP	kg CFC11-eq.	4.96E-14	2.56E-13	0	0
AP	Mole of H+ eq.	0.00297	0.0157	0	0
EP-freshwater	kg P eq.	1.10E-07	9.32E-06	0	0
EP-marine	kg N eq.	0.00143	0.00764	0	0
EP-terrestrial	Mole of N eq.	0.0157	0.0846	0	0
POCP	kg NMVOC eq.	0.00402	0.0147	0	0
ADP-minerals&metals	kg Sb-eq.	7.62E-09	2.63E-07	0	0
ADP-fossil	MJ	8.29	34.3	0	0
WDP	m^3 world equiv.	0.00464	0.0292	0	0

Additional Environmental Impacts

Indicator	Unit	C1	C2	C3	C4
GWP-GHG	kg CO_2-eq.	0.622	2.58	0	0
PM	Disease incidences	3.36E-08	5.88E-08	0	0
IRP	kBq U235 eq.	1.57E-05	0.00964	0	0
ETP-fw	CTUe	2.08	24.3	0	0
HTPc	CTUh	3.49E-11	5.01E-10	0	0
HTPnc	CTUh	2.18E-09	2.90E-08	0	0
SQP	Pt	0.0190	14.5	0	0

Resource use

Indicator	Unit	C1	C2	C3	C4
PERE	MJ	0.0271	2.37	0	0
PERM	MJ	0	0	0	0
PERT	MJ	0.0271	2.37	0	0
PENRE	MJ	8.29	34.4	0	0
PENRM	MJ	0	0	0	0
PENRT	MJ	8.29	34.4	0	0
SM	kg	0	0	0	0
RSF	MJ	0	0	0	0
NRSF	MJ	0	0	0	0
FW	m^3	6.98E-05	0.00274	0	0

Waste categories and output flows

Indicator	Unit	C1	C2	C3	C4
HWD	kg	8.99E-12	1.82E-10	0	0
NHWD	kg	1.18E-04	0.00560	0	0
RWD	kg	1.21E-07	6.39E-05	0	0
CRU	kg	0	0	0	0
MFR	kg	0	0	1,000	0
MER	kg	0	0	0	0
EEE	MJ	0	0	0	0
EET	MJ	0	0	0	0

Environmental impact (EN15804+A1)

Indicator	Unit	C1	C2	C3	C4
GWP	kg CO_2-eq.	0.615	2.51	0	0
ODP	kg CFC11-eq.	5.84E-14	3.02E-13	0	0
AP	kg SO_2-eq.	0.00206	0.0107	0	0
EP	kg PO_4^{3}-- eq.	4.80E-04	0.00268	0	0
POCP	kg C_2H_4-eq.	2.03E-04	-0.00402	0	0
ADPE	kg Sb-eq.	7.63E-09	2.63E-07	0	0
ADPF	MJ	8.29	33.9	0	0

Module D
Future reuse, recycling or energy recovery potential impacts and benefits per tonne of asphalt

Core Environmental Impacts (EN15804+A2)

Indicator	Unit	AC10 B60 WW	AC10 FPB WW	AC14 B60 WW	AC14 FPB WW	AC14 H PG64H (B60) WW	AC20 B60 WW	AC20 FPB WW	Blinding Mix	DG10 B60 WW	DG10 FPB WW	DG7 B60 WW	Fine Mix 10 WW	SMA10 B40 GM	SMA10 FPB GM	SMA10 B40 WW	SMA10 RS3HS WW	EME2 B15 SD	SMA10 B40 SD	SMA10 FPB SD
GWP-total	kg CO_2-eq.	-16.4	-16.4	-14.8	-14.5	-15.3	-14.4	-14.4	-8.00	-16.4	-16.4	-16.7	-18.1	-15.3	-15.3	-17.8	-17.8	-18.1	-18.8	-18.8
GWP-fossil	kg CO_2-eq.	-16.4	-16.4	-14.8	-14.5	-15.3	-14.4	-14.4	-8.02	-16.4	-16.4	-16.7	-18.1	-15.3	-15.3	-17.8	-17.8	-18.1	-18.8	-18.8
GWP-biogenic	kg CO_2-eq.	0.00179	0.00179	0.00182	0.00228	0.00144	0.00172	0.00172	0.0165	0.00179	0.00179	0.00364	0.00321	0.00770	0.00770	-0.00486	-0.00486	-0.00198	-0.00638	-0.00638
GWP-luluc	kg CO_2-eq.	-0.00303	-0.00303	-0.00379	-0.00370	-0.00375	-0.00402	-0.00402	-1.83E-04	-0.00303	-0.00303	-0.00201	-0.00151	-7.83E-04	-7.83E-04	-0.00548	-0.00548	-0.00395	-0.00570	-0.00570
ODP	kg CFC11-eq.	-2.63E-11	-2.63E-11	-2.92E-11	-2.90E-11	-2.90E-11	-3.01E-11	-3.01E-11	-1.91E-11	-2.63E-11	-2.63E-11	-2.29E-11	-2.09E-11	-1.92E-11	-1.92E-11	-3.40E-11	-3.40E-11	-2.89E-11	-3.44E-11	-3.44E-11
AP	Mole of H+ eq.	-0.0407	-0.0407	-0.0354	-0.0345	-0.0368	-0.0341	-0.0341	-0.0144	-0.0407	-0.0407	-0.0420	-0.0469	-0.0378	-0.0378	-0.0446	-0.0446	-0.0462	-0.0478	-0.0478
EP-freshwater	kg P eq.	-1.36E-05	-1.36E-05	-1.36E-05	-1.34E-05	-1.38E-05	-1.37E-05	-1.37E-05	-7.21E-06	-1.36E-05	-1.36E-05	-1.27E-05	-1.29E-05	-1.09E-05	-1.09E-05	-1.66E-05	-1.66E-05	-1.52E-05	-1.72E-05	-1.72E-05
EP-marine	kg N eq.	-0.00424	-0.00424	-0.00325	-0.00308	-0.00354	-0.00301	-0.00301	0.00117	-0.00424	-0.00424	-0.00441	-0.00531	-0.00347	-0.00347	-0.00520	-0.00520	-0.00538	-0.00586	-0.00586
EP-terrestrial	Mole of N eq.	-0.0479	-0.0479	-0.0374	-0.0355	-0.0405	-0.0349	-0.0349	0.0121	-0.0479	-0.0479	-0.0494	-0.0592	-0.0388	-0.0388	-0.0593	-0.0593	-0.0608	-0.0666	-0.0666
POCP	kg NMVOC eq.	-0.0327	-0.0327	-0.0271	-0.0262	-0.0286	-0.0257	-0.0257	-0.00641	-0.0327	-0.0327	-0.0343	-0.0394	-0.0303	-0.0303	-0.0361	-0.0361	-0.0381	-0.0394	-0.0394
ADP-minerals &metals	kg Sb-eq.	5.56E-07	5.56E-07	7.08E-07	7.39E-07	6.60E-07	7.43E-07	7.43E-07	1.52E-06	5.56E-07	5.56E-07	5.48E-07	4.05E-07	7.30E-07	7.30E-07	3.44E-07	3.44E-07	3.45E-07	2.29E-07	2.29E-07
ADP-fossil	MJ	-2,120	-2,120	-1,870	-1,830	-1,930	-1,800	-1,800	-1,090	-2,120	-2,120	-2,220	-2,440	-2,080	-2,080	-2,210	-2,210	-2,330	-2,340	-2,340
WDP	m³ world equiv.	-1.03	-1.03	-1.28	-1.26	-1.26	-1.36	-1.36	-0.351	-1.03	-1.03	-0.718	-0.541	-0.383	-0.383	-1.73	-1.73	-1.26	-1.77	-1.77

Additional Environmental Impacts

Indicator	Unit	AC10 B60 WW	AC10 FPB WW	AC14 B60 WW	AC14 FPB WW	AC14 H PG64H (B60) WW	AC20 B60 WW	AC20 FPB WW	Blinding Mix	DG10 B60 WW	DG10 FPB WW	DG7 B60 WW	Fine Mix 10 WW	SMA10 B40 GM	SMA10 FPB GM	SMA10 B40 WW	SMA10 RS3HS WW	EME2 B15 SD	SMA10 B40 SD	SMA10 FPB SD
GWP-GHG	kg CO_2-eq.	-16.2	-16.2	-14.7	-14.4	-15.1	-14.3	-14.3	-7.95	-16.2	-16.2	-16.5	-18.0	-15.1	-15.1	-17.7	-17.7	-18.0	-18.7	-18.7
PM	Disease incidences	-2.57E-07	-2.57E-07	-2.30E-07	-2.25E-07	-2.39E-07	-2.24E-07	-2.24E-07	-8.54E-08	-2.57E-07	-2.57E-07	-2.59E-07	-2.84E-07	-2.26E-07	-2.26E-07	-2.95E-07	-2.95E-07	-2.95E-07	-3.15E-07	-3.15E-07
IRP	kBq U235 eq.	-0.807	-0.807	-0.952	-0.942	-0.940	-0.996	-0.996	-0.454	-0.807	-0.807	-0.636	-0.534	-0.454	-0.454	-1.19	-1.19	-0.934	-1.21	-1.21
ETP-fw	CTUe	-309	-309	-273	-268	-282	-264	-264	-149	-309	-309	-320	-352	-297	-297	-327	-327	-341	-347	-347
HTPc	CTUh	-6.61E-09	-6.61E-09	-5.88E-09	-5.78E-09	-6.07E-09	-5.70E-09	-5.70E-09	-3.47E-09	-6.61E-09	-6.61E-09	-6.84E-09	-7.49E-09	-6.39E-09	-6.39E-09	-6.94E-09	-6.94E-09	-7.24E-09	-7.33E-09	-7.33E-09
HTPnc	CTUh	-2.46E-07	-2.46E-07	-2.21E-07	-2.17E-07	-2.27E-07	-2.14E-07	-2.14E-07	-1.44E-07	-2.46E-07	-2.46E-07	-2.55E-07	-2.77E-07	-2.41E-07	-2.41E-07	-2.54E-07	-2.54E-07	-2.66E-07	-2.67E-07	-2.67E-07
SQP	Pt	-13.0	-13.0	-14.9	-14.7	-14.7	-15.4	-15.4	-7.08	-13.0	-13.0	-10.7	-9.45	-7.98	-7.98	-18.5	-18.5	-15.0	-19.0	-19.0

Resource use

Indicator	Unit	AC10 B60 WW	AC10 FPB WW	AC14 B60 WW	AC14 FPB WW	AC14 H PG64H (B60) WW	AC20 B60 WW	AC20 FPB WW	Blinding Mix	DG10 B60 WW	DG10 FPB WW	DG7 B60 WW	Fine Mix 10 WW	SMA10 B40 GM	SMA10 FPB GM	SMA10 B40 WW	SMA10 RS3HS WW	EME2 B15 SD	SMA10 B40 SD	SMA10 FPB SD
PERE	MJ	-19.5	-19.5	-21.7	-21.5	-21.6	-22.4	-22.4	-12.5	-19.5	-19.5	-16.8	-15.3	-13.5	-13.5	-26.1	-26.1	-21.9	-26.6	-26.6
PERM	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PERT	MJ	-19.5	-19.5	-21.7	-21.5	-21.6	-22.4	-22.4	-12.5	-19.5	-19.5	-16.8	-15.3	-13.5	-13.5	-26.1	-26.1	-21.9	-26.6	-26.6
PENRE	MJ	-2,120	-2,120	-1,870	-1,830	-1,930	-1,800	-1,800	-1,090	-2,120	-2,120	-2,220	-2,440	-2,080	-2,080	-2,210	-2,210	-2,330	-2,340	-2,340
PENRM	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PENRT	MJ	-2,120	-2,120	-1,870	-1,830	-1,930	-1,800	-1,800	-1,090	-2,120	-2,120	-2,220	-2,440	-2,080	-2,080	-2,210	-2,210	-2,330	-2,340	-2,340
SM	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RSF	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FW	m^3	-0.0363	-0.0363	-0.0428	-0.0422	-0.0424	-0.0448	-0.0448	-0.0152	-0.0363	-0.0363	-0.0280	-0.0236	-0.0184	-0.0184	-0.0558	-0.0558	-0.0433	-0.0573	-0.0573

Waste categories and output flows

Indicator	Unit	AC10 B60 WW	AC10 FPB WW	AC14 B60 WW	AC14 FPB WW	AC14 H PG64H (B60) WW	AC20 B60 WW	AC20 FPB WW	Blinding Mix	DG10 B60 WW	DG10 FPB WW	DG7 B60 WW	Fine Mix 10 WW	SMA10 B40 GM	SMA10 FPB GM	SMA10 B40 WW	SMA10 RS3HS WW	EME2 B15 SD	SMA10 B40 SD	SMA10 FPB SD
HWD	kg	-4.55E-09	-4.55E-09	-4.75E-09	-4.69E-09	-4.76E-09	-4.82E-09	-4.82E-09	-2.69E-09	-4.55E-09	-4.55E-09	-4.14E-09	-4.04E-09	-3.51E-09	-3.51E-09	-5.70E-09	-5.70E-09	-5.08E-09	-5.87E-09	-5.87E-09
NHWD	kg	-10.1	-10.1	-8.37	-8.51	-8.50	-7.83	-7.83	-15.2	-10.1	-10.1	-12.3	-13.5	-14.7	-14.7	-5.15	-5.15	-8.39	-4.80	-4.80
RWD	kg	-0.00482	-0.00482	-0.00564	-0.00558	-0.00557	-0.00589	-0.00589	-0.00282	-0.00482	-0.00482	-0.00385	-0.00328	-0.00282	-0.00282	-0.00698	-0.00698	-0.00554	-0.00711	-0.00711
CRU	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MFR	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MER	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EEE	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EET	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Environmental impact (EN15804+A1)

Indicator	Unit	AC10 B60 WW	AC10 FPB WW	AC14 B60 WW	AC14 FPB WW	AC14 H PG64H (B60) WW	AC20 B60 WW	AC20 FPB WW	Blinding Mix	DG10 B60 WW	DG10 FPB WW	DG7 B60 WW	Fine Mix 10 WW	SMA10 B40 GM	SMA10 FPB GM	SMA10 B40 WW	SMA10 RS3HS WW	EME2 B15 SD	SMA10 B40 SD	SMA10 FPB SD
GWP	kg CO_2-eq.	-13.6	-13.6	-12.4	-12.2	-12.8	-12.1	-12.1	-6.61	-13.6	-13.6	-13.8	-15.0	-12.6	-12.6	-15.0	-15.0	-15.2	-15.8	-15.8
ODP	kg CFC11-eq.	-3.10E-11	-3.10E-11	-3.44E-11	-3.41E-11	-3.41E-11	-3.54E-11	-3.54E-11	-2.25E-11	-3.10E-11	-3.10E-11	-2.69E-11	-2.46E-11	-2.26E-11	-2.26E-11	-4.00E-11	-4.00E-11	-3.40E-11	-4.06E-11	-4.06E-11
AP	kg SO_2-eq.	-0.0351	-0.0351	-0.0306	-0.0299	-0.0319	-0.0295	-0.0295	-0.0136	-0.0351	-0.0351	-0.0363	-0.0403	-0.0329	-0.0329	-0.0381	-0.0381	-0.0395	-0.0408	-0.0408
EP	kg PO_4^{3}-- eq.	-0.00193	-0.00193	-0.00159	-0.00152	-0.00169	-0.00151	-0.00151	1.17E-04	-0.00193	-0.00193	-0.00197	-0.00229	-0.00160	-0.00160	-0.00234	-0.00234	-0.00237	-0.00259	-0.00259
POCP	kg C_2H_4-eq.	-0.0113	-0.0113	-0.00966	-0.00945	-0.0101	-0.00927	-0.00927	-0.00465	-0.0113	-0.0113	-0.0118	-0.0132	-0.0109	-0.0109	-0.0119	-0.0119	-0.0126	-0.0127	-0.0127
ADPE	kg Sb-eq.	5.23E-07	5.23E-07	6.70E-07	7.01E-07	6.23E-07	7.03E-07	7.03E-07	1.50E-06	5.23E-07	5.23E-07	5.21E-07	3.81E-07	7.09E-07	7.09E-07	2.98E-07	2.98E-07	3.07E-07	1.82E-07	1.82E-07
ADPF	MJ	-2,110	-2,110	-1,850	-1,820	-1,920	-1,790	-1,790	-1,080	-2,110	-2,110	-2,200	-2,430	-2,070	-2,070	-2,190	-2,190	-2,310	-2,320	-2,320

New Plymouth Asphalt Manufacturing Facility

Modules A1 – A3
Production Impacts per tonne of asphalt

Core Environmental Impacts (EN15804+A2)

Indicator	Unit	DG10 PG58V ZMR	AC14 HVY PG58V ZMR	AC14 HVY FPB ZMR	EME2 B15 ZMR	THSRA 10 FMB ZMR	Plant Mix 6	QPR Coarse	QPR Fine	DG10 FPB ZMR	DG7 PG58V ZMR	DG7 FPB ZMR	AC10 PG58V ZMR	AC10 FPB ZMR
GWP-total	kg CO_2-eq.	67.8	64.2	83.9	70.4	91.7	67.2	58.7	64.4	91.1	68.7	92.4	66.2	88.1
GWP-fossil	kg CO_2-eq.	67.3	63.8	82.2	70.0	89.8	66.8	58.3	63.9	89.1	68.3	90.4	65.8	86.2
GWP-biogenic	kg CO_2-eq.	0.330	0.327	1.63	0.330	1.80	0.306	0.335	0.337	1.87	0.330	1.90	0.328	1.76
GWP-luluc	kg CO_2-eq.	0.115	0.116	0.118	0.115	0.117	0.115	0.116	0.116	0.117	0.115	0.117	0.116	0.117
ODP	kg CFC11-eq.	5.84E-11	5.85E-11	1.37E-10	5.84E-11	1.47E-10	6.29E-11	6.77E-11	6.83E-11	1.52E-10	5.84E-11	1.53E-10	5.85E-11	1.45E-10
AP	Mole of H+ eq.	0.310	0.288	0.306	0.319	0.351	0.314	0.285	0.302	0.333	0.314	0.337	0.300	0.322
EP-freshwater	kg P eq.	1.53E-04	1.52E-04	2.29E-04	1.53E-04	2.40E-04	1.59E-04	1.66E-04	1.67E-04	2.44E-04	1.53E-04	2.46E-04	1.53E-04	2.37E-04
EP-marine	kg N eq.	0.110	0.105	0.112	0.113	0.123	0.113	0.1000	0.106	0.119	0.111	0.121	0.107	0.116
EP-terrestrial	Mole of N eq.	1.22	1.16	1.24	1.25	1.35	1.25	1.11	1.18	1.32	1.23	1.33	1.19	1.28
POCP	kg NMVOC eq.	0.293	0.274	0.312	0.303	0.352	0.300	0.266	0.284	0.339	0.297	0.344	0.284	0.328
ADP-minerals &metals	kg Sb-eq.	1.21E-05	1.09E-05	1.33E-05	1.24E-05	1.62E-05	1.10E-05	1.23E-05	1.28E-05	1.51E-05	1.23E-05	1.54E-05	1.15E-05	1.43E-05
ADP-fossil	MJ	3,220	2,850	3,130	3,340	3,940	3,260	2,910	3,110	3,600	3,270	3,660	3,040	3,390
WDP	m^3 world equiv.	7.58	7.58	7.89	7.58	7.92	7.85	8.22	8.27	7.94	7.58	7.95	7.58	7.92

Additional Environmental Impacts

Indicator	Unit	DG10 PG58V ZMR	AC14 HVY PG58V ZMR	AC14 HVY FPB ZMR	EME2 B15 ZMR	THSRA 10 FMB ZMR	Plant Mix 6	QPR Coarse	QPR Fine	DG10 FPB ZMR	DG7 PG58V ZMR	DG7 FPB ZMR	AC10 PG58V ZMR	AC10 FPB ZMR
GWP-GHG	kg CO_2-eq.	67.2	63.7	83.1	69.8	90.8	66.7	58.2	63.8	90.2	68.2	91.5	65.6	87.2
PM	Disease incidences	3.14E-06	2.87E-06	3.12E-06	3.23E-06	3.72E-06	3.09E-06	2.90E-06	3.04E-06	3.48E-06	3.18E-06	3.52E-06	3.01E-06	3.32E-06
IRP	kBq U235 eq.	1.78	1.78	2.20	1.78	2.24	1.78	1.87	1.87	2.27	1.78	2.28	1.78	2.24
ETP-fw	CTUe	1,100	1,020	1,130	1,120	1,320	1,230	1,150	1,190	1,250	1,110	1,260	1,060	1,200
HTPc	CTUh	1.89E-08	1.74E-08	2.35E-08	1.94E-08	2.73E-08	2.08E-08	1.93E-08	2.03E-08	2.63E-08	1.91E-08	2.67E-08	1.81E-08	2.51E-08
HTPnc	CTUh	6.25E-07	5.79E-07	1.02E-06	6.38E-07	1.17E-06	6.86E-07	6.88E-07	7.15E-07	1.15E-06	6.31E-07	1.17E-06	6.02E-07	1.09E-06
SQP	Pt	255	255	280	255	283	256	258	258	284	255	285	255	283

Biogenic carbon content

Indicator	Unit	DG10 PG58V ZMR	AC14 HVY PG58V ZMR	AC14 HVY FPB ZMR	EME2 B15 ZMR	THSRA 10 FMB ZMR	Plant Mix 6	QPR Coarse	QPR Fine	DG10 FPB ZMR	DG7 PG58V ZMR	DG7 FPB ZMR	AC10 PG58V ZMR	AC10 FPB ZMR
BCC-prod	kg	0	0	0	0	0	0	0	0	0	0	0	0	0
BCC-pack	kg	0	0	0	0	0	0	0	0	0	0	0	0	0

Resource use

Indicator	Unit	DG10 PG58V ZMR	AC14 HVY PG58V ZMR	AC14 HVY FPB ZMR	EME2 B15 ZMR	THSRA 10 FMB ZMR	Plant Mix 6	QPR Coarse	QPR Fine	DG10 FPB ZMR	DG7 PG58V ZMR	DG7 FPB ZMR	AC10 PG58V ZMR	AC10 FPB ZMR
PERE	MJ	182	182	219	182	224	184	187	187	226	182	227	182	223
PERM	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0
PERT	MJ	182	182	219	182	224	184	187	187	226	182	227	182	223
PENRE	MJ	1,040	969	1,290	1,070	1,440	1,010	911	989	1,420	1,050	1,440	1,000	1,360
PENRM	MJ	2,210	1,900	1,860	2,280	2,520	2,260	2,020	2,140	2,210	2,250	2,250	2,050	2,050
PENRT	MJ	3,240	2,870	3,150	3,360	3,960	3,280	2,930	3,130	3,620	3,300	3,680	3,060	3,410
SM	kg	0	0	0	0	0	0	0	0	0	0	0	0	0
RSF	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0
FW	m^3	0.466	0.465	0.509	0.466	0.516	0.470	0.483	0.485	0.518	0.466	0.519	0.466	0.514

Waste categories and output flows

Indicator	Unit	DG10 PG58V ZMR	AC14 HVY PG58V ZMR	AC14 HVY FPB ZMR	EME2 B15 ZMR	THSRA 10 FMB ZMR	Plant Mix 6	QPR Coarse	QPR Fine	DG10 FPB ZMR	DG7 PG58V ZMR	DG7 FPB ZMR	AC10 PG58V ZMR	AC10 FPB ZMR
HWD	kg	2.97E-08	2.89E-08	8.50E-08	3.15E-08	9.20E-08	2.80E-08	2.60E-08	3.03E-08	9.60E-08	3.03E-08	9.77E-08	2.95E-08	9.13E-08
NHWD	kg	0.338	0.331	1.52	0.344	1.68	0.338	0.347	0.362	1.75	0.340	1.77	0.335	1.65
RWD	kg	0.0109	0.0109	0.0150	0.0109	0.0156	0.0109	0.0117	0.0118	0.0158	0.0109	0.0159	0.0109	0.0155
CRU	kg	0	0	0	0	0	0	0	0	0	0	0	0	0
MFR	kg	34.8	34.8	34.8	34.8	34.8	34.8	34.8	34.8	34.8	34.8	34.8	34.8	34.8
MER	kg	0	0	0	0	0	0	0	0	0	0	0	0	0
EEE	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0
EET	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0

Environmental impact (EN15804+A1)

Indicator	Unit	DG10 PG58V ZMR	AC14 HVY PG58V ZMR	AC14 HVY FPB ZMR	EME2 B15 ZMR	THSRA 10 FMB ZMR	Plant Mix 6	QPR Coarse	QPR Fine	DG10 FPB ZMR	DG7 PG58V ZMR	DG7 FPB ZMR	AC10 PG58V ZMR	AC10 FPB ZMR
GWP	kg CO_2-eq.	63.4	60.3	79.4	65.9	86.1	63.0	54.9	60.3	85.9	64.3	87.1	62.0	83.2
ODP	kg CFC11-eq.	6.88E-11	6.89E-11	1.61E-10	6.88E-11	1.73E-10	7.41E-11	7.97E-11	8.04E-11	1.78E-10	6.88E-11	1.80E-10	6.88E-11	1.71E-10
AP	kg SO_2-eq.	0.232	0.214	0.227	0.238	0.263	0.234	0.213	0.225	0.249	0.235	0.252	0.223	0.239
EP	kg PO_4^{3-}- eq.	0.0391	0.0373	0.0417	0.0402	0.0455	0.0401	0.0360	0.0381	0.0445	0.0395	0.0449	0.0383	0.0433
POCP	kg C_2H_4-eq.	0.00327	1.43E-04	0.00419	0.00427	0.0111	0.00233	6.13E-04	0.00236	0.00847	0.00373	0.00901	0.00173	0.00659
ADPE	kg Sb-eq.	1.22E-05	1.10E-05	1.34E-05	1.25E-05	1.63E-05	1.11E-05	1.23E-05	1.29E-05	1.52E-05	1.23E-05	1.55E-05	1.16E-05	1.44E-05
ADPF	MJ	3,160	2,790	3,060	3,280	3,860	3,210	2,820	3,010	3,530	3,220	3,590	2,980	3,330

Modules C1 – C4
End of Life Impacts per tonne of asphalt

Core environmental impacts (EN15804+A2)

Indicator	Unit	C1	C2	C3	C4
GWP-total	kg CO_2-eq.	0.625	2.57	0	0
GWP-fossil	kg CO_2-eq.	0.625	2.58	0	0
GWP-biogenic	kg CO_2-eq.	6.18E-05	-0.0255	0	0
GWP-luluc	kg CO_2-eq.	4.53E-06	0.0176	0	0
ODP	kg CFC11-eq.	4.96E-14	2.56E-13	0	0
AP	Mole of H+ eq.	0.00297	0.0157	0	0
EP-freshwater	kg P eq.	1.10E-07	9.32E-06	0	0
EP-marine	kg N eq.	0.00143	0.00764	0	0
EP-terrestrial	Mole of N eq.	0.0157	0.0846	0	0
POCP	kg NMVOC eq.	0.00402	0.0147	0	0
ADP-minerals&metals	kg Sb-eq.	7.62E-09	2.63E-07	0	0
ADP-fossil	MJ	8.29	34.3	0	0
WDP	m^3 world equiv.	0.00464	0.0292	0	0

Additional Environmental Impacts

Indicator	Unit	C1	C2	C3	C4
GWP-GHG	kg CO_2-eq.	0.622	2.58	0	0
PM	Disease incidences	3.36E-08	5.88E-08	0	0
IRP	kBq U235 eq.	1.57E-05	0.00964	0	0
ETP-fw	CTUe	2.08	24.3	0	0
HTPc	CTUh	3.49E-11	5.01E-10	0	0
HTPnc	CTUh	2.18E-09	2.90E-08	0	0
SQP	Pt	0.0190	14.5	0	0

Resource use

Indicator	Unit	C1	C2	C3	C4
PERE	MJ	0.0271	2.37	0	0
PERM	MJ	0	0	0	0
PERT	MJ	0.0271	2.37	0	0
PENRE	MJ	8.29	34.4	0	0
PENRM	MJ	0	0	0	0
PENRT	MJ	8.29	34.4	0	0
SM	kg	0	0	0	0
RSF	MJ	0	0	0	0
NRSF	MJ	0	0	0	0
FW	m^3	6.98E-05	0.00274	0	0

Waste categories and output flows

Indicator	Unit	C1	C2	C3	C4
HWD	kg	8.99E-12	1.82E-10	0	0
NHWD	kg	1.18E-04	0.00560	0	0
RWD	kg	1.21E-07	6.39E-05	0	0
CRU	kg	0	0	0	0
MFR	kg	0	0	1,000	0
MER	kg	0	0	0	0
EEE	MJ	0	0	0	0
EET	MJ	0	0	0	0

Environmental impact (EN15804+A1)

Indicator	Unit	C1	C2	C3	C4
GWP	kg CO_2-eq.	0.615	2.51	0	0
ODP	kg CFC11-eq.	5.84E-14	3.02E-13	0	0
AP	kg SO_2-eq.	0.00206	0.0107	0	0
EP	kg PO_4^{3}-- eq.	4.80E-04	0.00268	0	0
POCP	kg C_2H_4-eq.	2.03E-04	-0.00402	0	0
ADPE	kg Sb-eq.	7.63E-09	2.63E-07	0	0
ADPF	MJ	8.29	33.9	0	0

Module D
Future reuse, recycling or energy recovery potential impacts and benefits per tonne of asphalt

Core Environmental Impacts (EN15804+A2)

Indicator	Unit	DG10 PG58V ZMR	AC14 HVY PG58V ZMR	AC14 HVY FPB ZMR	EME2 B15 ZMR	THSRA 10 FMB ZMR	Plant Mix 6	QPR Coarse	QPR Fine	DG10 FPB ZMR	DG7 PG58V ZMR	DG7 FPB ZMR	AC10 PG58V ZMR	AC10 FPB ZMR
GWP-total	kg CO_2-eq.	-15.4	-13.8	-13.6	-16.2	-18.1	-11.4	-13.2	-12.5	-15.4	-15.2	-15.2	-14.6	-14.6
GWP-fossil	kg CO_2-eq.	-15.4	-13.8	-13.6	-16.2	-18.1	-11.4	-13.2	-12.5	-15.4	-15.2	-15.2	-14.6	-14.6
GWP-biogenic	kg CO_2-eq.	0.00309	0.00314	0.00341	6.33E-04	-0.00430	0.0124	-1.00E-03	0.00669	0.00309	0.00554	0.00554	0.00286	0.00286
GWP-luluc	kg CO_2-eq.	-0.00290	-0.00365	-0.00364	-0.00368	-0.00506	-4.61E-04	-0.00591	-0.00261	-0.00290	-0.00183	-0.00183	-0.00338	-0.00338
ODP	kg CFC11-eq.	-2.61E-11	-2.90E-11	-2.90E-11	-2.85E-11	-3.25E-11	-1.92E-11	-3.66E-11	-2.59E-11	-2.61E-11	-2.27E-11	-2.27E-11	-2.79E-11	-2.79E-11
AP	Mole of H+ eq.	-0.0376	-0.0322	-0.0314	-0.0398	-0.0457	-0.0253	-0.0295	-0.0282	-0.0376	-0.0373	-0.0373	-0.0350	-0.0350
EP-freshwater	kg P eq.	-1.30E-05	-1.31E-05	-1.30E-05	-1.41E-05	-1.63E-05	-8.93E-06	-1.50E-05	-1.15E-05	-1.30E-05	-1.19E-05	-1.19E-05	-1.32E-05	-1.32E-05
EP-marine	kg N eq.	-0.00360	-0.00261	-0.00246	-0.00412	-0.00539	-9.84E-04	-0.00228	-0.00175	-0.00360	-0.00346	-0.00346	-0.00314	-0.00314
EP-terrestrial	Mole of N eq.	-0.0410	-0.0304	-0.0287	-0.0468	-0.0612	-0.0115	-0.0274	-0.0206	-0.0410	-0.0390	-0.0390	-0.0360	-0.0360
POCP	kg NMVOC eq.	-0.0295	-0.0238	-0.0230	-0.0317	-0.0374	-0.0175	-0.0205	-0.0200	-0.0295	-0.0295	-0.0295	-0.0267	-0.0267
ADP-minerals &metals	kg Sb-eq.	6.66E-07	8.18E-07	8.44E-07	5.64E-07	3.21E-07	1.16E-06	8.30E-07	9.84E-07	6.66E-07	7.11E-07	7.11E-07	7.35E-07	7.35E-07
ADP-fossil	MJ	-1,990	-1,730	-1,700	-2,060	-2,270	-1,550	-1,540	-1,600	-1,990	-2,020	-2,020	-1,860	-1,860
WDP	m^3 world equiv.	-1.01	-1.26	-1.26	-1.23	-1.60	-0.366	-1.94	-0.981	-1.01	-0.695	-0.695	-1.16	-1.16

Additional Environmental Impacts

Indicator	Unit	DG10 PG58V ZMR	AC14 HVY PG58V ZMR	AC14 HVY FPB ZMR	EME2 B15 ZMR	THSRA 10 FMB ZMR	Plant Mix 6	QPR Coarse	QPR Fine	DG10 FPB ZMR	DG7 PG58V ZMR	DG7 FPB ZMR	AC10 PG58V ZMR	AC10 FPB ZMR
GWP-GHG	kg CO_2-eq.	-15.3	-13.7	-13.5	-16.0	-18.0	-11.3	-13.1	-12.4	-15.3	-15.1	-15.1	-14.5	-14.5
PM	Disease incidences	-2.38E-07	-2.11E-07	-2.06E-07	-2.56E-07	-2.99E-07	-1.51E-07	-2.09E-07	-1.81E-07	-2.38E-07	-2.30E-07	-2.30E-07	-2.26E-07	-2.26E-07
IRP	kBq U235 eq.	-0.799	-0.943	-0.944	-0.917	-1.12	-0.454	-1.32	-0.791	-0.799	-0.627	-0.627	-0.887	-0.887
ETP-fw	CTUe	-289	-253	-248	-301	-335	-217	-229	-230	-289	-290	-290	-271	-271
HTPc	CTUh	-6.22E-09	-5.49E-09	-5.39E-09	-6.45E-09	-7.10E-09	-4.82E-09	-5.00E-09	-5.06E-09	-6.22E-09	-6.26E-09	-6.26E-09	-5.86E-09	-5.86E-09
HTPnc	CTUh	-2.33E-07	-2.08E-07	-2.04E-07	-2.40E-07	-2.60E-07	-1.89E-07	-1.88E-07	-1.94E-07	-2.33E-07	-2.35E-07	-2.35E-07	-2.20E-07	-2.20E-07
SQP	Pt	-12.8	-14.6	-14.6	-14.5	-17.6	-7.50	-19.8	-12.3	-12.8	-10.4	-10.4	-13.9	-13.9

Resource use

Indicator	Unit	DG10 PG58V ZMR	AC14 HVY PG58V ZMR	AC14 HVY FPB ZMR	EME2 B15 ZMR	THSRA 10 FMB ZMR	Plant Mix 6	QPR Coarse	QPR Fine	DG10 FPB ZMR	DG7 PG58V ZMR	DG7 FPB ZMR	AC10 PG58V ZMR	AC10 FPB ZMR
PERE	MJ	-19.3	-21.4	-21.4	-21.3	-24.9	-13.0	-27.6	-18.7	-19.3	-16.4	-16.4	-20.6	-20.6
PERM	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0
PERT	MJ	-19.3	-21.4	-21.4	-21.3	-24.9	-13.0	-27.6	-18.7	-19.3	-16.4	-16.4	-20.6	-20.6
PENRE	MJ	-1,990	-1,730	-1,700	-2,060	-2,270	-1,550	-1,540	-1,600	-1,990	-2,020	-2,020	-1,860	-1,860
PENRM	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0
PENRT	MJ	-1,990	-1,730	-1,700	-2,060	-2,270	-1,550	-1,540	-1,600	-1,990	-2,020	-2,020	-1,860	-1,860
SM	kg	0	0	0	0	0	0	0	0	0	0	0	0	0
RSF	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0
FW	m^3	-0.0355	-0.0419	-0.0418	-0.0416	-0.0524	-0.0167	-0.0603	-0.0338	-0.0355	-0.0269	-0.0269	-0.0395	-0.0395

Waste categories and output flows

Indicator	Unit	DG10 PG58V ZMR	AC14 HVY PG58V ZMR	AC14 HVY FPB ZMR	EME2 B15 ZMR	THSRA 10 FMB ZMR	Plant Mix 6	QPR Coarse	QPR Fine	DG10 FPB ZMR	DG7 PG58V ZMR	DG7 FPB ZMR	AC10 PG58V ZMR	AC10 FPB ZMR
HWD	kg	-4.42E-09	-4.61E-09	-4.59E-09	-4.81E-09	-5.54E-09	-3.07E-09	-5.51E-09	-4.07E-09	-4.42E-09	-3.95E-09	-3.95E-09	-4.56E-09	-4.56E-09
NHWD	kg	-10.3	-8.55	-8.55	-8.73	-6.05	-15.0	-3.74	-10.6	-10.3	-12.5	-12.5	-9.21	-9.21
RWD	kg	-0.00477	-0.00559	-0.00559	-0.00544	-0.00657	-0.00282	-0.00773	-0.00473	-0.00477	-0.00380	-0.00380	-0.00527	-0.00527
CRU	kg	0	0	0	0	0	0	0	0	0	0	0	0	0
MFR	kg	0	0	0	0	0	0	0	0	0	0	0	0	0
MER	kg	0	0	0	0	0	0	0	0	0	0	0	0	0
EEE	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0
EET	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0

Environmental impact (EN15804+A1)

Indicator	Unit	DG10 PG58V ZMR	AC14 HVY PG58V ZMR	AC14 HVY FPB ZMR	EME2 B15 ZMR	THSRA 10 FMB ZMR	Plant Mix 6	QPR Coarse	QPR Fine	DG10 FPB ZMR	DG7 PG58V ZMR	DG7 FPB ZMR	AC10 PG58V ZMR	AC10 FPB ZMR
GWP	kg CO_2-eq.	-12.8	-11.6	-11.4	-13.5	-15.2	-9.38	-11.2	-10.4	-12.8	-12.6	-12.6	-12.2	-12.2
ODP	kg CFC11-eq.	-3.08E-11	-3.42E-11	-3.42E-11	-3.36E-11	-3.83E-11	-2.26E-11	-4.31E-11	-3.05E-11	-3.08E-11	-2.67E-11	-2.67E-11	-3.28E-11	-3.28E-11
AP	kg SO_2-eq.	-0.0325	-0.0280	-0.0274	-0.0343	-0.0391	-0.0226	-0.0256	-0.0248	-0.0325	-0.0324	-0.0324	-0.0303	-0.0303
EP	kg PO_4^{3-} eq.	-0.00169	-0.00135	-0.00129	-0.00190	-0.00240	-6.77E-04	-0.00128	-0.00101	-0.00169	-0.00162	-0.00162	-0.00154	-0.00154
POCP	kg C_2H_4-eq.	-0.0104	-0.00883	-0.00862	-0.0109	-0.0122	-0.00753	-0.00768	-0.00794	-0.0104	-0.0105	-0.0105	-0.00963	-0.00963
ADPE	kg Sb-eq.	6.33E-07	7.80E-07	8.06E-07	5.27E-07	2.77E-07	1.14E-06	7.79E-07	9.52E-07	6.33E-07	6.84E-07	6.84E-07	6.99E-07	6.99E-07
ADPF	MJ	-1,980	-1,720	-1,690	-2,050	-2,250	-1,540	-1,520	-1,590	-1,980	-2,010	-2,010	-1,850	-1,850

Wellington Asphalt Manufacturing Facility

Modules A1 – A3
Production Impacts per tonne of asphalt

Core Environmental Impacts (EN15804+A2)

Indicator	Unit	AC14 HVY PG58V Bel	AC14 HF HVY PG58V Bel	AC14 FPB Bel	AC20 VH PG58V TeM	AC20 VH FPB TeM	DG7 FPB Bel	DG7 PG58V Bel	THSRA 14 HVY FMB TeM	PA10 FPB TeM	AC10 PG58V Bel	AC10 FPB Bel	DG10 PG58V Bel	DG10 FPB Bel	Mix 6 PG58V Bel	EME2 TeM
GWP-total	kg CO_2-eq.	47.7	49.6	65.1	58.0	76.5	79.3	53.8	81.2	78.5	51.9	74.0	50.6	72.6	59.5	73.1
GWP-fossil	kg CO_2-eq.	47.4	49.4	63.8	57.6	74.9	77.4	53.6	79.5	76.6	51.6	72.2	50.3	70.9	59.2	72.7
GWP-biogenic	kg CO_2-eq.	0.237	0.241	1.29	0.311	1.50	1.93	0.241	1.57	1.83	0.240	1.69	0.237	1.69	0.245	0.327
GWP-luluc	kg CO_2-eq.	0.0314	0.0327	0.0328	0.0921	0.0937	0.0349	0.0325	0.0961	0.0964	0.0323	0.0342	0.0313	0.0332	0.0338	0.0971
ODP	kg CFC11-eq.	3.84E-11	3.85E-11	1.02E-10	5.47E-11	1.26E-10	1.32E-10	2.95E-11	1.30E-10	1.46E-10	3.54E-11	1.23E-10	3.24E-11	1.20E-10	2.38E-11	5.47E-11
AP	Mole of H+ eq.	0.201	0.214	0.219	0.247	0.266	0.269	0.242	0.298	0.289	0.223	0.245	0.220	0.242	0.277	0.326
EP-freshwater	kg P eq.	1.58E-04	1.59E-04	2.20E-04	1.93E-04	2.63E-04	2.59E-04	1.59E-04	2.70E-04	2.84E-04	1.59E-04	2.45E-04	1.58E-04	2.43E-04	1.61E-04	1.99E-04
EP-marine	kg N eq.	0.0653	0.0688	0.0731	0.0888	0.0966	0.0871	0.0765	0.104	0.0996	0.0718	0.0808	0.0706	0.0796	0.0861	0.111
EP-terrestrial	Mole of N eq.	0.717	0.755	0.799	0.979	1.06	0.949	0.839	1.14	1.09	0.788	0.881	0.774	0.868	0.943	1.23
POCP	kg NMVOC eq.	0.194	0.205	0.229	0.238	0.275	0.282	0.231	0.303	0.293	0.214	0.258	0.211	0.255	0.262	0.311
ADP-minerals &metals	kg Sb-eq.	8.80E-06	9.55E-06	1.09E-05	9.53E-06	1.19E-05	1.44E-05	1.09E-05	1.38E-05	1.42E-05	9.82E-06	1.27E-05	9.74E-06	1.26E-05	1.26E-05	1.34E-05
ADP-fossil	MJ	2,530	2,760	2,810	2,550	2,860	3,660	3,200	3,400	3,380	2,860	3,220	2,840	3,200	3,750	3,750
WDP	m³ world equiv.	4.21	4.21	4.46	5.71	5.99	3.81	3.40	6.00	6.05	3.94	4.29	3.67	4.01	2.89	5.72

Additional Environmental Impacts

Indicator	Unit	AC14 HVY PG58V Bel	AC14 HF HVY PG58V Bel	AC14 FPB Bel	AC20 VH PG58V TeM	AC20 VH FPB TeM	DG7 FPB Bel	DG7 PG58V Bel	THSRA 14 HVY FMB TeM	PA10 FPB TeM	AC10 PG58V Bel	AC10 FPB Bel	DG10 PG58V Bel	DG10 FPB Bel	Mix 6 PG58V Bel	EME2 TeM
GWP-GHG	kg CO_2-eq.	47.4	49.3	64.5	57.5	75.8	78.6	53.4	80.4	77.7	51.5	73.3	50.2	72.0	59.0	72.6
PM	Disease incidences	2.43E-06	2.59E-06	2.67E-06	2.57E-06	2.83E-06	3.30E-06	2.91E-06	3.24E-06	3.24E-06	2.67E-06	2.98E-06	2.65E-06	2.96E-06	3.31E-06	3.46E-06
IRP	kBq U235 eq.	0.930	0.930	1.27	1.73	2.12	1.02	0.477	2.13	2.21	0.778	1.25	0.626	1.09	0.187	1.72
ETP-fw	CTUe	712	764	814	776	890	1,030	859	1,020	1,040	782	922	779	918	978	1,030
HTPc	CTUh	1.37E-08	1.46E-08	1.89E-08	1.51E-08	2.08E-08	2.47E-08	1.64E-08	2.33E-08	2.41E-08	1.50E-08	2.20E-08	1.49E-08	2.19E-08	1.87E-08	2.01E-08
HTPnc	CTUh	4.27E-07	4.57E-07	7.87E-07	5.04E-07	9.10E-07	1.10E-06	5.18E-07	1.00E-06	1.08E-06	4.70E-07	9.65E-07	4.69E-07	9.64E-07	5.91E-07	6.59E-07
SQP	Pt	83.3	84.4	104	140	163	113	80.4	167	171	82.8	111	80.6	109	79.1	145

Biogenic carbon content

Indicator	Unit	AC14 HVY PG58V Bel	AC14 HF HVY PG58V Bel	AC14 FPB Bel	AC20 VH PG58V TeM	AC20 VH FPB TeM	DG7 FPB Bel	DG7 PG58V Bel	THSRA 14 HVY FMB TeM	PA10 FPB TeM	AC10 PG58V Bel	AC10 FPB Bel	DG10 PG58V Bel	DG10 FPB Bel	Mix 6 PG58V Bel	EME2 TeM
BCC-prod	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BCC-pack	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Resource use

Indicator	Unit	AC14 HVY PG58V Bel	AC14 HF HVY PG58V Bel	AC14 FPB Bel	AC20 VH PG58V TeM	AC20 VH FPB TeM	DG7 FPB Bel	DG7 PG58V Bel	THSRA 14 HVY FMB TeM	PA10 FPB TeM	AC10 PG58V Bel	AC10 FPB Bel	DG10 PG58V Bel	DG10 FPB Bel	Mix 6 PG58V Bel	EME2 TeM
PERE	MJ	93.8	94.2	124	114	148	136	87.5	151	158	91.8	133	89.3	131	83.6	116
PERM	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PERT	MJ	93.8	94.2	124	114	148	136	87.5	151	158	91.8	133	89.3	131	83.6	116
PENRE	MJ	690	724	968	829	1,130	1,210	789	1,210	1,200	753	1,110	735	1,090	878	1,060
PENRM	MJ	1,860	2,050	1,860	1,740	1,740	2,480	2,440	2,210	2,210	2,130	2,130	2,130	2,130	2,900	2,710
PENRT	MJ	2,550	2,780	2,830	2,570	2,870	3,680	3,230	3,420	3,400	2,880	3,240	2,860	3,220	3,780	3,770
SM	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RSF	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FW	m^3	0.272	0.273	0.308	0.320	0.360	0.310	0.252	0.364	0.372	0.266	0.315	0.258	0.308	0.240	0.324

Waste categories and output flows

Indicator	Unit	AC14 HVY PG58V Bel	AC14 HF HVY PG58V Bel	AC14 FPB Bel	AC20 VH PG58V TeM	AC20 VH FPB TeM	DG7 FPB Bel	DG7 PG58V Bel	THSRA 14 HVY FMB TeM	PA10 FPB TeM	AC10 PG58V Bel	AC10 FPB Bel	DG10 PG58V Bel	DG10 FPB Bel	Mix 6 PG58V Bel	EME2 TeM
HWD	kg	2.50E-08	2.52E-08	7.17E-08	2.88E-08	8.04E-08	9.77E-08	2.54E-08	8.27E-08	8.79E-08	2.64E-08	8.89E-08	2.51E-08	8.76E-08	2.63E-08	3.44E-08
NHWD	kg	10.4	10.4	11.4	0.440	1.53	17.7	16.2	1.59	1.81	12.3	13.7	14.3	15.6	19.9	0.471
RWD	kg	0.00598	0.00601	0.00935	0.0105	0.0143	0.00890	0.00350	0.0146	0.0154	0.00516	0.00979	0.00430	0.00893	0.00193	0.0106
CRU	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MFR	kg	9.78	9.78	9.78	9.78	9.78	9.78	9.78	9.78	9.78	9.78	9.78	9.78	9.78	9.78	9.78
MER	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EEE	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EET	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Environmental impact (EN15804+A1)

Indicator	Unit	AC14 HVY PG58V Bel	AC14 HF HVY PG58V Bel	AC14 FPB Bel	AC20 VH PG58V TeM	AC20 VH FPB TeM	DG7 FPB Bel	DG7 PG58V Bel	THSRA 14 HVY FMB TeM	PA10 FPB TeM	AC10 PG58V Bel	AC10 FPB Bel	DG10 PG58V Bel	DG10 FPB Bel	Mix 6 PG58V Bel	EME2 TeM
GWP	kg CO_2-eq.	44.3	45.9	61.1	54.4	72.3	74.1	49.5	76.3	73.7	48.0	69.3	46.7	68.0	54.4	68.0
ODP	kg CFC11-eq.	4.52E-11	4.53E-11	1.20E-10	6.44E-11	1.49E-10	1.55E-10	3.47E-11	1.54E-10	1.71E-10	4.17E-11	1.45E-10	3.81E-11	1.41E-10	2.80E-11	6.44E-11
AP	kg SO_2-eq.	0.153	0.164	0.167	0.184	0.198	0.206	0.186	0.224	0.218	0.170	0.187	0.168	0.185	0.214	0.246
EP	kg PO_4^{3}-- eq.	0.0236	0.0248	0.0277	0.0320	0.0363	0.0333	0.0274	0.0391	0.0378	0.0258	0.0308	0.0254	0.0304	0.0307	0.0398
POCP	kg C_2H_4-eq.	0.0174	0.0189	0.0212	0.00498	0.00905	0.0279	0.0219	0.0129	0.0130	0.0197	0.0246	0.0195	0.0244	0.0256	0.0135
ADPE	kg Sb-eq.	8.84E-06	9.59E-06	1.09E-05	9.60E-06	1.20E-05	1.44E-05	1.09E-05	1.39E-05	1.43E-05	9.85E-06	1.27E-05	9.77E-06	1.26E-05	1.26E-05	1.34E-05
ADPF	MJ	2,490	2,710	2,760	2,500	2,800	3,610	3,160	3,330	3,320	2,820	3,170	2,810	3,150	3,710	3,690

Modules C1 – C4
End of Life Impacts per tonne of asphalt

Core environmental impacts (EN15804+A2)

Indicator	Unit	C1	C2	C3	C4
GWP-total	kg CO_2-eq.	0.625	2.57	0	0
GWP-fossil	kg CO_2-eq.	0.625	2.58	0	0
GWP-biogenic	kg CO_2-eq.	6.18E-05	-0.0255	0	0
GWP-luluc	kg CO_2-eq.	4.53E-06	0.0176	0	0
ODP	kg CFC11-eq.	4.96E-14	2.56E-13	0	0
AP	Mole of H+ eq.	0.00297	0.0157	0	0
EP-freshwater	kg P eq.	1.10E-07	9.32E-06	0	0
EP-marine	kg N eq.	0.00143	0.00764	0	0
EP-terrestrial	Mole of N eq.	0.0157	0.0846	0	0
POCP	kg NMVOC eq.	0.00402	0.0147	0	0
ADP-minerals&metals	kg Sb-eq.	7.62E-09	2.63E-07	0	0
ADP-fossil	MJ	8.29	34.3	0	0
WDP	m^3 world equiv.	0.00464	0.0292	0	0

Additional Environmental Impacts

Indicator	Unit	C1	C2	C3	C4
GWP-GHG	kg CO_2-eq.	0.622	2.58	0	0
PM	Disease incidences	3.36E-08	5.88E-08	0	0
IRP	kBq U235 eq.	1.57E-05	0.00964	0	0
ETP-fw	CTUe	2.08	24.3	0	0
HTPc	CTUh	3.49E-11	5.01E-10	0	0
HTPnc	CTUh	2.18E-09	2.90E-08	0	0
SQP	Pt	0.0190	14.5	0	0

Resource use

Indicator	Unit	C1	C2	C3	C4
PERE	MJ	0.0271	2.37	0	0
PERM	MJ	0	0	0	0
PERT	MJ	0.0271	2.37	0	0
PENRE	MJ	8.29	34.4	0	0
PENRM	MJ	0	0	0	0
PENRT	MJ	8.29	34.4	0	0
SM	kg	0	0	0	0
RSF	MJ	0	0	0	0
NRSF	MJ	0	0	0	0
FW	m^3	6.98E-05	0.00274	0	0

Waste categories and output flows

Indicator	Unit	C1	C2	C3	C4
HWD	kg	8.99E-12	1.82E-10	0	0
NHWD	kg	1.18E-04	0.00560	0	0
RWD	kg	1.21E-07	6.39E-05	0	0
CRU	kg	0	0	0	0
MFR	kg	0	0	1,000	0
MER	kg	0	0	0	0
EEE	MJ	0	0	0	0
EET	MJ	0	0	0	0

Environmental impact (EN15804+A1)

Indicator	Unit	C1	C2	C3	C4
GWP	kg CO_2-eq.	0.615	2.51	0	0
ODP	kg CFC11-eq.	5.84E-14	3.02E-13	0	0
AP	kg SO_2-eq.	0.00206	0.0107	0	0
EP	kg PO_4^{3}-- eq.	4.80E-04	0.00268	0	0
POCP	kg C_2H_4-eq.	2.03E-04	-0.00402	0	0
ADPE	kg Sb-eq.	7.63E-09	2.63E-07	0	0
ADPF	MJ	8.29	33.9	0	0

Module D
Future reuse, recycling or energy recovery potential impacts and benefits per tonne of asphalt

Core Environmental Impacts (EN15804+A2)

Indicator	Unit	AC14 HVY PG58V Bel	AC14 HF HVY PG58V Bel	AC14 FPB Bel	AC20 VH PG58V TeM	AC20 VH FPB TeM	DG7 FPB Bel	DG7 PG58V Bel	THSRA 14 HVY FMB TeM	PA10 FPB TeM	AC10 PG58V Bel	AC10 FPB Bel	DG10 PG58V Bel	DG10 FPB Bel	Mix 6 PG58V Bel	EME2 TeM
GWP-total	kg CO_2-eq.	-13.7	-14.9	-13.7	-13.2	-13.2	-16.8	-16.5	-16.3	-16.6	-15.1	-15.1	-14.9	-14.9	-18.9	-18.1
GWP-fossil	kg CO_2-eq.	-13.7	-14.9	-13.7	-13.2	-13.2	-16.8	-16.5	-16.3	-16.6	-15.1	-15.1	-14.9	-14.9	-18.9	-18.1
GWP-biogenic	kg CO_2-eq.	0.00256	0.00115	0.00256	0.00186	0.00186	0.00313	0.00342	-0.00256	-0.00479	0.00229	0.00229	0.00400	0.00400	0.00331	0.00223
GWP-luluc	kg CO_2-eq.	-0.00397	-0.00405	-0.00397	-0.00454	-0.00454	-0.00221	-0.00219	-0.00514	-0.00603	-0.00341	-0.00341	-0.00273	-0.00273	-0.00108	-0.00199
ODP	kg CFC11-eq.	-3.01E-11	-3.01E-11	-3.01E-11	-3.21E-11	-3.21E-11	-2.35E-11	-2.35E-11	-3.33E-11	-3.61E-11	-2.79E-11	-2.79E-11	-2.57E-11	-2.57E-11	-1.93E-11	-2.25E-11
AP	Mole of H+ eq.	-0.0317	-0.0356	-0.0317	-0.0300	-0.0300	-0.0422	-0.0414	-0.0397	-0.0405	-0.0365	-0.0365	-0.0359	-0.0359	-0.0495	-0.0466
EP-freshwater	kg P eq.	-1.33E-05	-1.39E-05	-1.33E-05	-1.37E-05	-1.37E-05	-1.29E-05	-1.28E-05	-1.56E-05	-1.66E-05	-1.34E-05	-1.34E-05	-1.26E-05	-1.26E-05	-1.28E-05	-1.33E-05
EP-marine	kg N eq.	-0.00255	-0.00332	-0.00255	-0.00226	-0.00226	-0.00446	-0.00431	-0.00422	-0.00446	-0.00344	-0.00344	-0.00326	-0.00326	-0.00579	-0.00530
EP-terrestrial	Mole of N eq.	-0.0298	-0.0383	-0.0298	-0.0268	-0.0268	-0.0501	-0.0484	-0.0484	-0.0513	-0.0394	-0.0394	-0.0371	-0.0371	-0.0643	-0.0592
POCP	kg NMVOC eq.	-0.0233	-0.0273	-0.0233	-0.0214	-0.0214	-0.0344	-0.0336	-0.0312	-0.0319	-0.0283	-0.0283	-0.0278	-0.0278	-0.0422	-0.0390
ADP-minerals &metals	kg Sb-eq.	8.22E-07	6.90E-07	8.22E-07	8.60E-07	8.60E-07	5.35E-07	5.61E-07	5.18E-07	4.59E-07	6.83E-07	6.83E-07	7.27E-07	7.27E-07	3.32E-07	3.98E-07
ADP-fossil	MJ	-1,700	-1,870	-1,700	-1,610	-1,610	-2,220	-2,180	-2,010	-2,010	-1,930	-1,930	-1,930	-1,930	-2,570	-2,410
WDP	m^3 world equiv.	-1.36	-1.36	-1.36	-1.54	-1.54	-0.777	-0.776	-1.66	-1.91	-1.16	-1.16	-0.969	-0.969	-0.399	-0.685

Additional Environmental Impacts

Indicator	Unit	AC14 HVY PG58V Bel	AC14 HF HVY PG58V Bel	AC14 FPB Bel	AC20 VH PG58V TeM	AC20 VH FPB TeM	DG7 FPB Bel	DG7 PG58V Bel	THSRA 14 HVY FMB TeM	PA10 FPB TeM	AC10 PG58V Bel	AC10 FPB Bel	DG10 PG58V Bel	DG10 FPB Bel	Mix 6 PG58V Bel	EME2 TeM
GWP-GHG	kg CO_2-eq.	-13.6	-14.8	-13.6	-13.1	-13.1	-16.6	-16.4	-16.1	-16.5	-15.0	-15.0	-14.7	-14.7	-18.7	-17.9
PM	Disease incidences	-2.10E-07	-2.34E-07	-2.10E-07	-2.04E-07	-2.04E-07	-2.61E-07	-2.56E-07	-2.64E-07	-2.75E-07	-2.35E-07	-2.35E-07	-2.27E-07	-2.27E-07	-2.97E-07	-2.85E-07
IRP	kBq U235 eq.	-0.998	-0.995	-0.998	-1.10	-1.10	-0.668	-0.668	-1.15	-1.30	-0.886	-0.886	-0.779	-0.779	-0.454	-0.614
ETP-fw	CTUe	-249	-274	-249	-236	-236	-321	-316	-297	-300	-281	-281	-279	-279	-370	-349
HTPc	CTUh	-5.41E-09	-5.90E-09	-5.41E-09	-5.15E-09	-5.15E-09	-6.85E-09	-6.76E-09	-6.34E-09	-6.39E-09	-6.05E-09	-6.05E-09	-6.02E-09	-6.02E-09	-7.85E-09	-7.42E-09
HTPnc	CTUh	-2.05E-07	-2.21E-07	-2.05E-07	-1.95E-07	-1.95E-07	-2.55E-07	-2.52E-07	-2.34E-07	-2.35E-07	-2.27E-07	-2.27E-07	-2.26E-07	-2.26E-07	-2.90E-07	-2.74E-07
SQP	Pt	-15.4	-15.5	-15.4	-16.7	-16.7	-11.1	-11.1	-17.9	-19.9	-14.0	-14.0	-12.4	-12.4	-8.44	-10.6

Resource use

Indicator	Unit	AC14 HVY PG58V Bel	AC14 HF HVY PG58V Bel	AC14 FPB Bel	AC20 VH PG58V TeM	AC20 VH FPB TeM	DG7 FPB Bel	DG7 PG58V Bel	THSRA 14 HVY FMB TeM	PA10 FPB TeM	AC10 PG58V Bel	AC10 FPB Bel	DG10 PG58V Bel	DG10 FPB Bel	Mix 6 PG58V Bel	EME2 TeM
PERE	MJ	-22.3	-22.4	-22.3	-23.9	-23.9	-17.3	-17.3	-25.3	-27.6	-20.7	-20.7	-18.8	-18.8	-14.1	-16.6
PERM	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PERT	MJ	-22.3	-22.4	-22.3	-23.9	-23.9	-17.3	-17.3	-25.3	-27.6	-20.7	-20.7	-18.8	-18.8	-14.1	-16.6
PENRE	MJ	-1,700	-1,870	-1,700	-1,610	-1,610	-2,220	-2,180	-2,010	-2,010	-1,930	-1,930	-1,930	-1,930	-2,570	-2,410
PENRM	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PENRT	MJ	-1,700	-1,870	-1,700	-1,610	-1,610	-2,220	-2,180	-2,010	-2,010	-1,930	-1,930	-1,930	-1,930	-2,570	-2,410
SM	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RSF	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FW	m^3	-0.0446	-0.0449	-0.0446	-0.0493	-0.0493	-0.0296	-0.0295	-0.0534	-0.0605	-0.0397	-0.0397	-0.0342	-0.0342	-0.0200	-0.0275

Waste categories and output flows

Indicator	Unit	AC14 HVY PG58V Bel	AC14 HF HVY PG58V Bel	AC14 FPB Bel	AC20 VH PG58V TeM	AC20 VH FPB TeM	DG7 FPB Bel	DG7 PG58V Bel	THSRA 14 HVY FMB TeM	PA10 FPB TeM	AC10 PG58V Bel	AC10 FPB Bel	DG10 PG58V Bel	DG10 FPB Bel	Mix 6 PG58V Bel	EME2 TeM
HWD	kg	-4.74E-09	-4.87E-09	-4.74E-09	-4.94E-09	-4.94E-09	-4.23E-09	-4.21E-09	-5.43E-09	-5.83E-09	-4.61E-09	-4.61E-09	-4.30E-09	-4.30E-09	-3.93E-09	-4.25E-09
NHWD	kg	-7.85	-7.82	-7.85	-6.61	-6.61	-11.9	-11.9	-5.68	-3.86	-9.19	-9.19	-10.6	-10.6	-14.5	-12.5
RWD	kg	-0.00590	-0.00588	-0.00590	-0.00646	-0.00646	-0.00403	-0.00403	-0.00679	-0.00758	-0.00526	-0.00526	-0.00466	-0.00466	-0.00282	-0.00373
CRU	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MFR	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MER	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EEE	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EET	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Environmental impact (EN15804+A1)

Indicator	Unit	AC14 HVY PG58V Bel	AC14 HF HVY PG58V Bel	AC14 FPB Bel	AC20 VH PG58V TeM	AC20 VH FPB TeM	DG7 FPB Bel	DG7 PG58V Bel	THSRA 14 HVY FMB TeM	PA10 FPB TeM	AC10 PG58V Bel	AC10 FPB Bel	DG10 PG58V Bel	DG10 FPB Bel	Mix 6 PG58V Bel	EME2 TeM
GWP	kg CO_2-eq.	-11.5	-12.5	-11.5	-11.2	-11.2	-13.9	-13.7	-13.7	-14.0	-12.6	-12.6	-12.4	-12.4	-15.6	-15.0
ODP	kg CFC11-eq.	-3.54E-11	-3.54E-11	-3.54E-11	-3.78E-11	-3.78E-11	-2.77E-11	-2.77E-11	-3.92E-11	-4.25E-11	-3.28E-11	-3.28E-11	-3.03E-11	-3.03E-11	-2.27E-11	-2.64E-11
AP	kg SO_2-eq.	-0.0276	-0.0308	-0.0276	-0.0261	-0.0261	-0.0364	-0.0358	-0.0341	-0.0347	-0.0316	-0.0316	-0.0311	-0.0311	-0.0426	-0.0401
EP	kg PO_4^{3}-- eq.	-0.00134	-0.00162	-0.00134	-0.00124	-0.00124	-0.00199	-0.00193	-0.00197	-0.00208	-0.00165	-0.00165	-0.00156	-0.00156	-0.00245	-0.00229
POCP	kg C_2H_4-eq.	-0.00865	-0.00968	-0.00865	-0.00807	-0.00807	-0.0118	-0.0116	-0.0106	-0.0107	-0.01000	-0.01000	-0.00999	-0.00999	-0.0140	-0.0130
ADPE	kg Sb-eq.	7.82E-07	6.51E-07	7.82E-07	8.17E-07	8.17E-07	5.07E-07	5.33E-07	4.72E-07	4.09E-07	6.47E-07	6.47E-07	6.95E-07	6.95E-07	3.11E-07	3.72E-07
ADPF	MJ	-1,690	-1,850	-1,690	-1,590	-1,590	-2,200	-2,170	-1,990	-1,990	-1,910	-1,910	-1,910	-1,910	-2,560	-2,400

Dunedin Asphalt Manufacturing Facility

Modules A1 – A3
Production Impacts per tonne of asphalt

Core Environmental Impacts (EN15804+A2)

Indicator	Unit	DG10 B60 RM	DG10 FlexiPlus RM	DG7 B80 RM	DG14 B60 RM	AC20 FlexiPlus Heavy RM	THSRA FlexiMax RM	AC14 B60 RM	AC14 FlexiPlus RM	PA10 B60 HS HRM	PA10 FPB HS20 HRM	UTA FlexiPlus RM	AC20 B60 Heavy RM	SMA10 FPB HRM	SmartPave 7 RM	SmartPave 10 RM
GWP-total	kg CO_2-eq.	61.1	81.3	62.4	59.9	74.2	87.9	58.2	76.3	58.2	80.5	85.8	57.7	84.8	65.4	64.5
GWP-fossil	kg CO_2-eq.	60.9	79.8	62.1	59.6	73.0	86.0	57.8	74.9	57.9	78.8	88.8	57.4	86.8	65.1	64.2
GWP-biogenic	kg CO_2-eq.	0.221	1.43	0.230	0.227	1.21	1.76	0.0932	1.32	0.0672	1.57	-3.02	0.105	-2.08	0.227	0.223
GWP-luluc	kg CO_2-eq.	0.0701	0.0808	0.0738	0.0741	0.0831	0.0856	0.236	0.0839	0.272	0.0857	0.0835	0.220	0.0865	0.0709	0.0681
ODP	kg CFC11-eq.	5.59E-11	1.28E-10	5.82E-11	5.84E-11	1.18E-10	1.50E-10	2.94E-08	1.24E-10	3.60E-08	1.39E-10	1.80E-10	2.64E-08	1.72E-10	5.66E-11	5.47E-11
AP	Mole of H+ eq.	0.256	0.283	0.273	0.250	0.254	0.299	0.244	0.267	0.266	0.295	0.349	0.233	0.336	0.286	0.283
EP-freshwater	kg P eq.	1.11E-04	1.87E-04	1.14E-04	1.13E-04	1.74E-04	2.09E-04	1.19E-04	1.81E-04	1.21E-04	1.98E-04	2.92E-04	1.18E-04	2.72E-04	1.13E-04	1.12E-04
EP-marine	kg N eq.	0.0804	0.0912	0.0848	0.0796	0.0843	0.0965	0.0778	0.0875	0.0824	0.0943	0.109	0.0754	0.106	0.0878	0.0864
EP-terrestrial	Mole of N eq.	0.894	1.01	0.942	0.885	0.934	1.06	0.866	0.968	0.916	1.04	1.20	0.840	1.17	0.974	0.960
POCP	kg NMVOC eq.	0.230	0.272	0.244	0.225	0.245	0.291	0.219	0.257	0.237	0.284	0.330	0.210	0.319	0.255	0.253
ADP-minerals &metals	kg Sb-eq.	1.08E-05	1.33E-05	1.17E-05	1.04E-05	1.14E-05	1.44E-05	1.05E-05	1.24E-05	1.22E-05	1.44E-05	1.58E-05	9.76E-06	1.53E-05	1.24E-05	1.23E-05
ADP-fossil	MJ	3,000	3,320	3,260	2,860	2,820	3,550	2,750	3,050	3,200	3,560	3,790	2,550	3,680	3,500	3,480
WDP	m^3 world equiv.	7.04	7.36	7.21	7.22	7.48	7.62	7.38	7.50	7.38	7.53	12.8	7.38	11.8	7.09	6.96

Additional Environmental Impacts

Indicator	Unit	DG10 B60 RM	DG10 FlexiPlus RM	DG7 B80 RM	DG14 B60 RM	AC20 FlexiPlus Heavy RM	THSRA FlexiMax RM	AC14 B60 RM	AC14 FlexiPlus RM	PA10 B60 HS HRM	PA10 FPB HS20 HRM	UTA FlexiPlus RM	AC20 B60 Heavy RM	SMA10 FPB HRM	SmartPave 7 RM	SmartPave 10 RM
GWP-GHG	kg CO_2-eq.	60.7	80.6	61.9	59.5	73.6	87.1	57.7	75.6	57.7	79.8	89.7	57.3	87.7	65.0	64.1
PM	Disease incidences	2.88E-06	3.18E-06	3.09E-06	2.79E-06	2.80E-06	3.37E-06	2.77E-06	2.99E-06	3.13E-06	3.39E-06	5.61E-06	2.61E-06	5.10E-06	3.26E-06	3.25E-06
IRP	kBq U235 eq.	1.64	2.03	1.72	1.73	2.05	2.22	1.76	2.08	1.75	2.15	2.27	1.76	2.32	1.66	1.59
ETP-fw	CTUe	1,050	1,190	1,110	1,020	1,070	1,260	999	1,120	1,100	1,250	1,320	954	1,290	1,160	1,160
HTPc	CTUh	1.79E-08	2.41E-08	1.89E-08	1.73E-08	2.12E-08	2.63E-08	1.73E-08	2.25E-08	1.90E-08	2.53E-08	2.81E-08	1.65E-08	2.72E-08	1.99E-08	1.98E-08
HTPnc	CTUh	5.61E-07	9.88E-07	5.95E-07	5.45E-07	8.54E-07	1.12E-06	5.46E-07	9.19E-07	6.04E-07	1.06E-06	1.22E-06	5.19E-07	1.17E-06	6.25E-07	6.21E-07
SQP	Pt	176	207	181	181	206	218	189	209	191	215	2,040	188	1,660	177	174

Biogenic carbon content

Indicator	Unit	DG10 B60 RM	DG10 FlexiPlus RM	DG7 B80 RM	DG14 B60 RM	AC20 FlexiPlus Heavy RM	THSRA FlexiMax RM	AC14 B60 RM	AC14 FlexiPlus RM	PA10 B60 HS HRM	PA10 FPB HS20 HRM	UTA FlexiPlus RM	AC20 B60 Heavy RM	SMA10 FPB HRM	SmartPave 7 RM	SmartPave 10 RM
BCC-prod	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BCC-pack	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Dunedin Asphalt Manufacturing Facility (continued)

Resource use

Indicator	Unit	DG10 B60 RM	DG10 FlexiPlus RM	DG7 B80 RM	DG14 B60 RM	AC20 FlexiPlus Heavy RM	THSRA FlexiMax RM	AC14 B60 RM	AC14 FlexiPlus RM	PA10 B60 HS HRM	PA10 FPB HS20 HRM	UTA FlexiPlus RM	AC20 B60 Heavy RM	SMA10 FPB HRM	SmartPave 7 RM	SmartPave 10 RM
PERE	MJ	165	201	168	167	196	212	170	199	170	207	310	169	289	166	165
PERM	MJ	0	0	0	0	0	0	0	0	0	0	47.0	0	37.1	0	0
PERT	MJ	165	201	168	167	196	212	170	199	170	207	357	169	326	166	165
PENRE	MJ	928	1,250	956	906	1,130	1,360	878	1,170	898	1,260	1,400	863	1,370	1,010	992
PENRM	MJ	2,090	2,090	2,320	1,970	1,700	2,210	1,890	1,900	2,320	2,320	2,410	1,700	2,330	2,520	2,520
PENRT	MJ	3,020	3,340	3,280	2,880	2,830	3,570	2,770	3,070	3,220	3,580	3,810	2,560	3,700	3,520	3,510
SM	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RSF	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FW	m^3	0.422	0.465	0.428	0.427	0.461	0.481	0.431	0.465	0.433	0.475	0.504	0.430	0.502	0.425	0.421

Waste categories and output flows

Indicator	Unit	DG10 B60 RM	DG10 FlexiPlus RM	DG7 B80 RM	DG14 B60 RM	AC20 FlexiPlus Heavy RM	THSRA FlexiMax RM	AC14 B60 RM	AC14 FlexiPlus RM	PA10 B60 HS HRM	PA10 FPB HS20 HRM	UTA FlexiPlus RM	AC20 B60 Heavy RM	SMA10 FPB HRM	SmartPave 7 RM	SmartPave 10 RM
HWD	kg	1.08E-08	6.05E-08	1.13E-08	1.09E-08	5.12E-08	7.42E-08	1.98E-04	5.60E-08	2.43E-04	6.64E-08	7.41E-08	1.78E-04	7.13E-08	1.13E-08	1.11E-08
NHWD	kg	3.07	4.17	0.270	0.265	1.15	1.66	0.264	1.26	0.265	1.48	5.13	0.263	1.63	2.25	4.23
RWD	kg	0.01000	0.0139	0.0106	0.0105	0.0137	0.0154	0.0106	0.0140	0.0106	0.0148	0.0165	0.0106	0.0165	0.0102	0.00983
CRU	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MFR	kg	17.2	17.2	17.2	17.2	17.2	17.2	17.2	17.2	17.2	17.2	17.2	17.2	17.2	17.2	17.2
MER	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EEE	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EET	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Environmental impact (EN15804+A1)

Indicator	Unit	DG10 B60 RM	DG10 FlexiPlus RM	DG7 B80 RM	DG14 B60 RM	AC20 FlexiPlus Heavy RM	THSRA FlexiMax RM	AC14 B60 RM	AC14 FlexiPlus RM	PA10 B60 HS HRM	PA10 FPB HS20 HRM	UTA FlexiPlus RM	AC20 B60 Heavy RM	SMA10 FPB HRM	SmartPave 7 RM	SmartPave 10 RM
GWP	kg CO_2-eq.	57.3	76.9	58.3	56.2	70.5	83.0	54.5	72.2	53.9	75.7	80.7	54.3	79.8	61.0	60.1
ODP	kg CFC11-eq.	6.58E-11	1.51E-10	6.86E-11	6.87E-11	1.38E-10	1.77E-10	3.92E-08	1.46E-10	4.80E-08	1.63E-10	2.12E-10	3.52E-08	2.02E-10	6.66E-11	6.45E-11
AP	kg SO_2-eq.	0.196	0.215	0.209	0.191	0.192	0.228	0.186	0.203	0.204	0.226	0.268	0.177	0.258	0.220	0.218
EP	kg PO_4^{3}-- eq.	0.0288	0.0342	0.0303	0.0286	0.0315	0.0364	0.0282	0.0328	0.0298	0.0355	0.0413	0.0273	0.0401	0.0314	0.0309
POCP	kg C_2H_4-eq.	0.0127	0.0149	0.0140	0.0107	0.01000	0.0162	0.0102	0.0118	0.0138	0.0159	0.0214	0.00846	0.0192	0.0165	0.0170
ADPE	kg Sb-eq.	1.08E-05	1.33E-05	1.18E-05	1.05E-05	1.15E-05	1.45E-05	1.06E-05	1.25E-05	1.23E-05	1.45E-05	1.59E-05	9.83E-06	1.54E-05	1.25E-05	1.24E-05
ADPF	MJ	2,950	3,260	3,200	2,810	2,760	3,480	2,700	2,990	3,140	3,490	3,720	2,500	3,610	3,440	3,430

Modules C1 – C4
End of Life Impacts per tonne of asphalt

Core environmental impacts (EN15804+A2)

Indicator	Unit	C1	C2	C3	C4
GWP-total	kg CO_2-eq.	0.625	2.57	0	0
GWP-fossil	kg CO_2-eq.	0.625	2.58	0	0
GWP-biogenic	kg CO_2-eq.	6.18E-05	-0.0255	0	0
GWP-luluc	kg CO_2-eq.	4.53E-06	0.0176	0	0
ODP	kg CFC11-eq.	4.96E-14	2.56E-13	0	0
AP	Mole of H+ eq.	0.00297	0.0157	0	0
EP-freshwater	kg P eq.	1.10E-07	9.32E-06	0	0
EP-marine	kg N eq.	0.00143	0.00764	0	0
EP-terrestrial	Mole of N eq.	0.0157	0.0846	0	0
POCP	kg NMVOC eq.	0.00402	0.0147	0	0
ADP-minerals&metals	kg Sb-eq.	7.62E-09	2.63E-07	0	0
ADP-fossil	MJ	8.29	34.3	0	0
WDP	m^3 world equiv.	0.00464	0.0292	0	0

Additional Environmental Impacts

Indicator	Unit	C1	C2	C3	C4
GWP-GHG	kg CO_2-eq.	0.622	2.58	0	0
PM	Disease incidences	3.36E-08	5.88E-08	0	0
IRP	kBq U235 eq.	1.57E-05	0.00964	0	0
ETP-fw	CTUe	2.08	24.3	0	0
HTPc	CTUh	3.49E-11	5.01E-10	0	0
HTPnc	CTUh	2.18E-09	2.90E-08	0	0
SQP	Pt	0.0190	14.5	0	0

Resource use

Indicator	Unit	C1	C2	C3	C4
PERE	MJ	0.0271	2.37	0	0
PERM	MJ	0	0	0	0
PERT	MJ	0.0271	2.37	0	0
PENRE	MJ	8.29	34.4	0	0
PENRM	MJ	0	0	0	0
PENRT	MJ	8.29	34.4	0	0
SM	kg	0	0	0	0
RSF	MJ	0	0	0	0
NRSF	MJ	0	0	0	0
FW	m^3	6.98E-05	0.00274	0	0

Waste categories and output flows

Indicator	Unit	C1	C2	C3	C4
HWD	kg	8.99E-12	1.82E-10	0	0
NHWD	kg	1.18E-04	0.00560	0	0
RWD	kg	1.21E-07	6.39E-05	0	0
CRU	kg	0	0	0	0
MFR	kg	0	0	1,000	0
MER	kg	0	0	0	0
EEE	MJ	0	0	0	0
EET	MJ	0	0	0	0

Environmental impact (EN15804+A1)

Indicator	Unit	C1	C2	C3	C4
GWP	kg CO_2-eq.	0.615	2.51	0	0
ODP	kg CFC11-eq.	5.84E-14	3.02E-13	0	0
AP	kg SO_2-eq.	0.00206	0.0107	0	0
EP	kg PO_4^{3}-- eq.	4.80E-04	0.00268	0	0
POCP	kg C_2H_4-eq.	2.03E-04	-0.00402	0	0
ADPE	kg Sb-eq.	7.63E-09	2.63E-07	0	0
ADPF	MJ	8.29	33.9	0	0

Module D
Future reuse, recycling or energy recovery potential impacts and benefits per tonne of asphalt

Core Environmental Impacts (EN15804+A2)

Indicator	Unit	DG10 B60 RM	DG10 FlexiPlus RM	DG7 B80 RM	DG14 B60 RM	AC20 FlexiPlus Heavy RM	THSRA FlexiMax RM	AC14 B60 RM	AC14 FlexiPlus RM	PA10 B60 HS HRM	PA10 FPB HS20 HRM	UTA FlexiPlus RM	AC20 B60 Heavy RM	SMA10 FPB HRM	SmartPave 7 RM	SmartPave 10 RM
GWP-total	kg CO_2-eq.	-14.7	-14.7	-15.7	-14.2	-13.0	-16.3	-13.8	-13.8	-17.0	-17.1	-17.6	-13.0	-17.2	-17.0	-16.7
GWP-fossil	kg CO_2-eq.	-14.7	-14.7	-15.7	-14.2	-13.0	-16.3	-13.8	-13.8	-17.0	-17.1	-17.6	-13.0	-17.2	-17.0	-16.7
GWP-biogenic	kg CO_2-eq.	0.00378	0.00378	0.00513	0.00343	0.00196	-0.00273	0.00321	0.00314	-0.00383	-0.00391	-0.00498	0.00202	-0.00449	0.00284	0.00504
GWP-luluc	kg CO_2-eq.	-0.00291	-0.00291	-0.00180	-0.00334	-0.00460	-0.00521	-0.00364	-0.00365	-0.00539	-0.00539	-0.00562	-0.00459	-0.00562	-0.00223	-0.00136
ODP	kg CFC11-eq.	-2.64E-11	-2.64E-11	-2.25E-11	-2.79E-11	-3.23E-11	-3.35E-11	-2.90E-11	-2.90E-11	-3.39E-11	-3.39E-11	-3.45E-11	-3.23E-11	-3.46E-11	-2.35E-11	-2.07E-11
AP	Mole of H+ eq.	-0.0353	-0.0353	-0.0388	-0.0334	-0.0293	-0.0398	-0.0320	-0.0322	-0.0420	-0.0422	-0.0440	-0.0291	-0.0424	-0.0430	-0.0422
EP-freshwater	kg P eq.	-1.27E-05	-1.27E-05	-1.21E-05	-1.29E-05	-1.36E-05	-1.57E-05	-1.30E-05	-1.31E-05	-1.61E-05	-1.62E-05	-1.66E-05	-1.36E-05	-1.64E-05	-1.31E-05	-1.21E-05
EP-marine	kg N eq.	-0.00316	-0.00316	-0.00375	-0.00283	-0.00213	-0.00423	-0.00258	-0.00261	-0.00468	-0.00473	-0.00509	-0.00209	-0.00479	-0.00462	-0.00438
EP-terrestrial	Mole of N eq.	-0.0361	-0.0361	-0.0422	-0.0326	-0.0254	-0.0486	-0.0300	-0.0304	-0.0536	-0.0541	-0.0581	-0.0250	-0.0549	-0.0518	-0.0489
POCP	kg NMVOC eq.	-0.0272	-0.0272	-0.0310	-0.0252	-0.0207	-0.0312	-0.0236	-0.0238	-0.0335	-0.0337	-0.0355	-0.0205	-0.0339	-0.0352	-0.0346
ADP-minerals &metals	kg Sb-eq.	7.40E-07	7.40E-07	6.63E-07	7.88E-07	8.81E-07	5.13E-07	8.24E-07	8.18E-07	4.34E-07	4.26E-07	3.60E-07	8.87E-07	4.11E-07	5.08E-07	5.66E-07
ADP-fossil	MJ	-1,890	-1,890	-2,080	-1,800	-1,580	-2,010	-1,730	-1,730	-2,100	-2,110	-2,180	-1,570	-2,110	-2,250	-2,240
WDP	m^3 world equiv.	-1.03	-1.03	-0.677	-1.16	-1.56	-1.68	-1.26	-1.26	-1.71	-1.71	-1.77	-1.56	-1.78	-0.778	-0.525

Additional Environmental Impacts

Indicator	Unit	DG10 B60 RM	DG10 FlexiPlus RM	DG7 B80 RM	DG14 B60 RM	AC20 FlexiPlus Heavy RM	THSRA FlexiMax RM	AC14 B60 RM	AC14 FlexiPlus RM	PA10 B60 HS HRM	PA10 FPB HS20 HRM	UTA FlexiPlus RM	AC20 B60 Heavy RM	SMA10 FPB HRM	SmartPave 7 RM	SmartPave 10 RM
GWP-GHG	kg CO_2-eq.	-14.6	-14.6	-15.5	-14.0	-12.9	-16.2	-13.6	-13.7	-16.9	-16.9	-17.5	-12.9	-17.0	-16.8	-16.5
PM	Disease incidences	-2.25E-07	-2.25E-07	-2.38E-07	-2.16E-07	-2.00E-07	-2.65E-07	-2.10E-07	-2.11E-07	-2.79E-07	-2.80E-07	-2.92E-07	-1.99E-07	-2.83E-07	-2.66E-07	-2.55E-07
IRP	kBq U235 eq.	-0.811	-0.811	-0.615	-0.888	-1.11	-1.17	-0.943	-0.943	-1.18	-1.18	-1.22	-1.11	-1.22	-0.668	-0.529
ETP-fw	CTUe	-275	-275	-300	-261	-232	-297	-252	-253	-310	-312	-322	-231	-313	-326	-323
HTPc	CTUh	-5.93E-09	-5.93E-09	-6.45E-09	-5.66E-09	-5.06E-09	-6.34E-09	-5.46E-09	-5.49E-09	-6.61E-09	-6.64E-09	-6.85E-09	-5.04E-09	-6.65E-09	-6.95E-09	-6.90E-09
HTPnc	CTUh	-2.23E-07	-2.23E-07	-2.42E-07	-2.14E-07	-1.92E-07	-2.34E-07	-2.07E-07	-2.08E-07	-2.43E-07	-2.44E-07	-2.51E-07	-1.91E-07	-2.44E-07	-2.58E-07	-2.58E-07
SQP	Pt	-12.9	-12.9	-10.3	-13.9	-16.8	-18.0	-14.6	-14.6	-18.4	-18.4	-18.9	-16.8	-18.9	-11.2	-9.20

Resource use

Indicator	Unit	DG10 B60 RM	DG10 FlexiPlus RM	DG7 B80 RM	DG14 B60 RM	AC20 FlexiPlus Heavy RM	THSRA FlexiMax RM	AC14 B60 RM	AC14 FlexiPlus RM	PA10 B60 HS HRM	PA10 FPB HS20 HRM	UTA FlexiPlus RM	AC20 B60 Heavy RM	SMA10 FPB HRM	SmartPave 7 RM	SmartPave 10 RM
PERE	MJ	-19.4	-19.4	-16.3	-20.5	-24.0	-25.4	-21.4	-21.4	-25.9	-25.9	-26.5	-24.0	-26.5	-17.3	-15.0
PERM	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PERT	MJ	-19.4	-19.4	-16.3	-20.5	-24.0	-25.4	-21.4	-21.4	-25.9	-25.9	-26.5	-24.0	-26.5	-17.3	-15.0
PENRE	MJ	-1,890	-1,890	-2,080	-1,800	-1,580	-2,010	-1,730	-1,730	-2,100	-2,110	-2,180	-1,570	-2,110	-2,250	-2,240
PENRM	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PENRT	MJ	-1,890	-1,890	-2,080	-1,800	-1,580	-2,010	-1,730	-1,730	-2,100	-2,110	-2,180	-1,570	-2,110	-2,250	-2,240
SM	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RSF	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FW	m^3	-0.0358	-0.0358	-0.0265	-0.0393	-0.0498	-0.0539	-0.0419	-0.0419	-0.0552	-0.0552	-0.0570	-0.0497	-0.0571	-0.0297	-0.0227

Waste categories and output flows

Indicator	Unit	DG10 B60 RM	DG10 FlexiPlus RM	DG7 B80 RM	DG14 B60 RM	AC20 FlexiPlus Heavy RM	THSRA FlexiMax RM	AC14 B60 RM	AC14 FlexiPlus RM	PA10 B60 HS HRM	PA10 FPB HS20 HRM	UTA FlexiPlus RM	AC20 B60 Heavy RM	SMA10 FPB HRM	SmartPave 7 RM	SmartPave 10 RM
HWD	kg	-4.37E-09	-4.37E-09	-3.97E-09	-4.51E-09	-4.95E-09	-5.46E-09	-4.60E-09	-4.61E-09	-5.59E-09	-5.60E-09	-5.74E-09	-4.94E-09	-5.70E-09	-4.26E-09	-3.87E-09
NHWD	kg	-10.2	-10.2	-12.6	-9.23	-6.47	-5.55	-8.55	-8.55	-5.26	-5.25	-4.83	-6.47	-4.78	-11.9	-13.7
RWD	kg	-0.00484	-0.00484	-0.00373	-0.00527	-0.00653	-0.00685	-0.00559	-0.00559	-0.00696	-0.00696	-0.00713	-0.00653	-0.00716	-0.00403	-0.00325
CRU	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MFR	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MER	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EEE	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EET	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Environmental impact (EN15804+A1)

Indicator	Unit	DG10 B60 RM	DG10 FlexiPlus RM	DG7 B80 RM	DG14 B60 RM	AC20 FlexiPlus Heavy RM	THSRA FlexiMax RM	AC14 B60 RM	AC14 FlexiPlus RM	PA10 B60 HS HRM	PA10 FPB HS20 HRM	UTA FlexiPlus RM	AC20 B60 Heavy RM	SMA10 FPB HRM	SmartPave 7 RM	SmartPave 10 RM
GWP	kg CO_2-eq.	-12.3	-12.3	-13.0	-11.8	-11.0	-13.7	-11.5	-11.6	-14.3	-14.4	-14.8	-10.9	-14.5	-14.1	-13.8
ODP	kg CFC11-eq.	-3.10E-11	-3.10E-11	-2.64E-11	-3.28E-11	-3.81E-11	-3.94E-11	-3.41E-11	-3.41E-11	-3.99E-11	-3.99E-11	-4.06E-11	-3.81E-11	-4.08E-11	-2.77E-11	-2.44E-11
AP	kg SO_2-eq.	-0.0306	-0.0306	-0.0336	-0.0290	-0.0255	-0.0341	-0.0278	-0.0280	-0.0360	-0.0362	-0.0376	-0.0254	-0.0363	-0.0371	-0.0365
EP	kg PO_4^{3}-- eq.	-0.00153	-0.00153	-0.00172	-0.00142	-0.00120	-0.00198	-0.00134	-0.00135	-0.00215	-0.00217	-0.00231	-0.00118	-0.00220	-0.00205	-0.00194
POCP	kg C_2H_4-eq.	-0.00980	-0.00980	-0.0110	-0.00922	-0.00787	-0.0106	-0.00878	-0.00883	-0.0112	-0.0112	-0.0117	-0.00782	-0.0112	-0.0120	-0.0120
ADPE	kg Sb-eq.	7.07E-07	7.07E-07	6.36E-07	7.52E-07	8.38E-07	4.68E-07	7.87E-07	7.80E-07	3.87E-07	3.79E-07	3.13E-07	8.43E-07	3.63E-07	4.80E-07	5.43E-07
ADPF	MJ	-1,880	-1,880	-2,070	-1,780	-1,560	-1,990	-1,710	-1,720	-2,080	-2,090	-2,150	-1,550	-2,090	-2,240	-2,230

Invercargill Asphalt Manufacturing Facility

Modules A1 – A3
Production Impacts per tonne of asphalt

Core Environmental Impacts (EN15804+A2)

Indicator	Unit	DG 7 B80 WB Medium	DG10 B80 WB	DG14 B60 WB	AC14 B80 WB	AC20 PG52E Heavy WB	AC14 FPB WB	Mix 10
GWP-total	kg CO_2-eq.	60.3	57.0	56.7	58.3	57.2	77.4	59.7
GWP-fossil	kg CO_2-eq.	59.8	56.5	56.2	57.7	56.6	75.8	59.2
GWP-biogenic	kg CO_2-eq.	0.474	0.472	0.470	0.473	0.345	1.57	0.474
GWP-luluc	kg CO_2-eq.	0.0422	0.0423	0.0417	0.0465	0.202	0.0562	0.0404
ODP	kg CFC11-eq.	5.58E-11	5.80E-11	5.80E-11	5.33E-11	2.81E-08	1.19E-10	5.78E-11
AP	Mole of H+ eq.	0.252	0.229	0.222	0.228	0.216	0.254	0.256
EP-freshwater	kg P eq.	3.10E-04	3.09E-04	3.08E-04	3.10E-04	3.15E-04	3.79E-04	3.09E-04
EP-marine	kg N eq.	0.0753	0.0697	0.0681	0.0710	0.0684	0.0812	0.0755
EP-terrestrial	Mole of N eq.	0.821	0.761	0.743	0.775	0.747	0.884	0.824
POCP	kg NMVOC eq.	0.225	0.206	0.200	0.206	0.196	0.246	0.228
ADP-minerals &metals	kg Sb-eq.	1.10E-05	9.87E-06	9.42E-06	9.43E-06	9.00E-06	1.17E-05	1.15E-05
ADP-fossil	MJ	3,230	2,860	2,740	2,760	2,510	3,060	3,350
WDP	m^3 world equiv.	5.44	5.63	5.64	5.21	5.26	5.51	5.62

Additional Environmental Impacts

Indicator	Unit	DG 7 B80 WB Medium	DG10 B80 WB	DG14 B60 WB	AC14 B80 WB	AC20 PG52E Heavy WB	AC14 FPB WB	Mix 10
GWP-GHG	kg CO_2-eq.	59.8	56.5	56.2	57.8	56.7	76.7	59.2
PM	Disease incidences	3.04E-06	2.77E-06	2.67E-06	2.68E-06	2.55E-06	2.96E-06	3.13E-06
IRP	kBq U235 eq.	1.64	1.75	1.76	1.51	1.47	1.87	1.75
ETP-fw	CTUe	898	815	787	795	743	922	922
HTPc	CTUh	1.83E-08	1.68E-08	1.63E-08	1.66E-08	1.61E-08	2.23E-08	1.86E-08
HTPnc	CTUh	6.22E-07	5.74E-07	5.57E-07	5.69E-07	5.55E-07	9.57E-07	6.33E-07
SQP	Pt	516	517	517	519	527	546	516

Biogenic carbon content

Indicator	Unit	DG 7 B80 WB Medium	DG10 B80 WB	DG14 B60 WB	AC14 B80 WB	AC20 PG52E Heavy WB	AC14 FPB WB	Mix 10
BCC-prod	kg	0	0	0	0	0	0	0
BCC-pack	kg	0	0	0	0	0	0	0

Invercargill Asphalt Manufacturing Facility (continued)

Resource use

Indicator	Unit	DG 7 B80 WB Medium	DG10 B80 WB	DG14 B60 WB	AC14 B80 WB	AC20 PG52E Heavy WB	AC14 FPB WB	Mix 10
PERE	MJ	82.7	84.1	83.9	80.7	81.7	113	84.2
PERM	MJ	0	0	0	0	0	0	0
PERT	MJ	82.7	84.1	83.9	80.7	81.7	113	84.2
PENRE	MJ	972	909	898	916	886	1,220	973
PENRM	MJ	2,280	1,970	1,860	1,860	1,640	1,860	2,400
PENRT	MJ	3,260	2,880	2,760	2,770	2,530	3,080	3,370
SM	kg	0	0	0	0	0	0	0
RSF	MJ	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0
FW	m^3	0.301	0.305	0.305	0.293	0.293	0.332	0.306

Waste categories and output flows

Indicator	Unit	DG 7 B80 WB Medium	DG10 B80 WB	DG14 B60 WB	AC14 B80 WB	AC20 PG52E Heavy WB	AC14 FPB WB	Mix 10
HWD	kg	1.02E-08	1.02E-08	1.01E-08	9.47E-09	1.89E-04	5.45E-08	1.06E-08
NHWD	kg	36.8	35.3	35.3	38.5	39.5	39.5	35.4
RWD	kg	0.0101	0.0107	0.0107	0.00935	0.00901	0.0128	0.0107
CRU	kg	0	0	0	0	0	0	0
MFR	kg	0.171	0.171	0.171	0.171	0.171	0.171	0.171
MER	kg	0	0	0	0	0	0	0
EEE	MJ	0	0	0	0	0	0	0
EET	MJ	0	0	0	0	0	0	0

Environmental impact (EN15804+A1)

Indicator	Unit	DG 7 B80 WB Medium	DG10 B80 WB	DG14 B60 WB	AC14 B80 WB	AC20 PG52E Heavy WB	AC14 FPB WB	Mix 10
GWP	kg CO_2-eq.	56.2	53.3	53.2	54.7	53.8	73.3	55.4
ODP	kg CFC11-eq.	6.57E-11	6.82E-11	6.83E-11	6.27E-11	3.75E-08	1.40E-10	6.80E-11
AP	kg SO_2-eq.	0.195	0.178	0.172	0.176	0.166	0.194	0.199
EP	kg PO_4^{3-}-- eq.	0.0282	0.0263	0.0257	0.0267	0.0260	0.0317	0.0283
POCP	kg C_2H_4-eq.	0.0202	0.0174	0.0165	0.0152	0.0133	0.0173	0.0217
ADPE	kg Sb-eq.	1.11E-05	9.94E-06	9.49E-06	9.49E-06	9.06E-06	1.18E-05	1.16E-05
ADPF	MJ	3,180	2,810	2,690	2,710	2,470	3,010	3,290

Modules C1 – C4
End of Life Impacts per tonne of asphalt

Core environmental impacts (EN15804+A2)

Indicator	Unit	C1	C2	C3	C4
GWP-total	kg CO_2-eq.	0.625	2.57	0	0
GWP-fossil	kg CO_2-eq.	0.625	2.58	0	0
GWP-biogenic	kg CO_2-eq.	6.18E-05	-0.0255	0	0
GWP-luluc	kg CO_2-eq.	4.53E-06	0.0176	0	0
ODP	kg CFC11-eq.	4.96E-14	2.56E-13	0	0
AP	Mole of H+ eq.	0.00297	0.0157	0	0
EP-freshwater	kg P eq.	1.10E-07	9.32E-06	0	0
EP-marine	kg N eq.	0.00143	0.00764	0	0
EP-terrestrial	Mole of N eq.	0.0157	0.0846	0	0
POCP	kg NMVOC eq.	0.00402	0.0147	0	0
ADP-minerals&metals	kg Sb-eq.	7.62E-09	2.63E-07	0	0
ADP-fossil	MJ	8.29	34.3	0	0
WDP	m^3 world equiv.	0.00464	0.0292	0	0

Additional Environmental Impacts

Indicator	Unit	C1	C2	C3	C4
GWP-GHG	kg CO_2-eq.	0.622	2.58	0	0
PM	Disease incidences	3.36E-08	5.88E-08	0	0
IRP	kBq U235 eq.	1.57E-05	0.00964	0	0
ETP-fw	CTUe	2.08	24.3	0	0
HTPc	CTUh	3.49E-11	5.01E-10	0	0
HTPnc	CTUh	2.18E-09	2.90E-08	0	0
SQP	Pt	0.0190	14.5	0	0

Resource use

Indicator	Unit	C1	C2	C3	C4
PERE	MJ	0.0271	2.37	0	0
PERM	MJ	0	0	0	0
PERT	MJ	0.0271	2.37	0	0
PENRE	MJ	8.29	34.4	0	0
PENRM	MJ	0	0	0	0
PENRT	MJ	8.29	34.4	0	0
SM	kg	0	0	0	0
RSF	MJ	0	0	0	0
NRSF	MJ	0	0	0	0
FW	m^3	6.98E-05	0.00274	0	0

Waste categories and output flows

Indicator	Unit	C1	C2	C3	C4
HWD	kg	8.99E-12	1.82E-10	0	0
NHWD	kg	1.18E-04	0.00560	0	0
RWD	kg	1.21E-07	6.39E-05	0	0
CRU	kg	0	0	0	0
MFR	kg	0	0	1,000	0
MER	kg	0	0	0	0
EEE	MJ	0	0	0	0
EET	MJ	0	0	0	0

Environmental impact (EN15804+A1)

Indicator	Unit	C1	C2	C3	C4
GWP	kg CO_2-eq.	0.615	2.51	0	0
ODP	kg CFC11-eq.	5.84E-14	3.02E-13	0	0
AP	kg SO_2-eq.	0.00206	0.0107	0	0
EP	kg PO_4^{3}-- eq.	4.80E-04	0.00268	0	0
POCP	kg C_2H_4-eq.	2.03E-04	-0.00402	0	0
ADPE	kg Sb-eq.	7.63E-09	2.63E-07	0	0
ADPF	MJ	8.29	33.9	0	0

Module D
Future reuse, recycling or energy recovery potential impacts and benefits per tonne of asphalt

Core Environmental Impacts (EN15804+A2)

Indicator	Unit	DG 7 B80 WB Medium	DG10 B80 WB	DG14 B60 WB	AC14 B80 WB	AC20 PG52E Heavy WB	AC14 FPB WB	Mix 10
GWP-total	kg CO_2-eq.	-15.6	-14.2	-13.4	-13.8	-12.6	-13.8	-16.2
GWP-fossil	kg CO_2-eq.	-15.6	-14.2	-13.4	-13.8	-12.6	-13.8	-16.2
GWP-biogenic	kg CO_2-eq.	0.00406	0.00309	0.00429	0.00173	0.00245	0.00173	0.00421
GWP-luluc	kg CO_2-eq.	-0.00232	-0.00348	-0.00329	-0.00430	-0.00457	-0.00430	-0.00197
ODP	kg CFC11-eq.	-2.42E-11	-2.83E-11	-2.79E-11	-3.12E-11	-3.23E-11	-3.12E-11	-2.29E-11
AP	Mole of H+ eq.	-0.0385	-0.0335	-0.0311	-0.0320	-0.0279	-0.0320	-0.0405
EP-freshwater	kg P eq.	-1.26E-05	-1.31E-05	-1.26E-05	-1.37E-05	-1.34E-05	-1.37E-05	-1.25E-05
EP-marine	kg N eq.	-0.00375	-0.00287	-0.00237	-0.00264	-0.00186	-0.00264	-0.00410
EP-terrestrial	Mole of N eq.	-0.0423	-0.0331	-0.0276	-0.0309	-0.0225	-0.0309	-0.0460
POCP	kg NMVOC eq.	-0.0306	-0.0253	-0.0228	-0.0235	-0.0193	-0.0235	-0.0327
ADP-minerals &metals	kg Sb-eq.	6.53E-07	7.79E-07	8.67E-07	8.00E-07	9.27E-07	8.00E-07	6.01E-07
ADP-fossil	MJ	-2,050	-1,800	-1,700	-1,710	-1,520	-1,710	-2,150
WDP	m^3 world equiv.	-0.833	-1.20	-1.16	-1.46	-1.56	-1.46	-0.717

Additional Environmental Impacts

Indicator	Unit	DG 7 B80 WB Medium	DG10 B80 WB	DG14 B60 WB	AC14 B80 WB	AC20 PG52E Heavy WB	AC14 FPB WB	Mix 10
GWP-GHG	kg CO_2-eq.	-15.5	-14.1	-13.3	-13.7	-12.5	-13.7	-16.1
PM	Disease incidences	-2.40E-07	-2.18E-07	-2.02E-07	-2.14E-07	-1.92E-07	-2.14E-07	-2.49E-07
IRP	kBq U235 eq.	-0.701	-0.910	-0.889	-1.05	-1.11	-1.05	-0.636
ETP-fw	CTUe	-297	-262	-247	-250	-223	-250	-310
HTPc	CTUh	-6.38E-09	-5.67E-09	-5.37E-09	-5.43E-09	-4.89E-09	-5.43E-09	-6.65E-09
HTPnc	CTUh	-2.39E-07	-2.14E-07	-2.04E-07	-2.05E-07	-1.87E-07	-2.05E-07	-2.48E-07
SQP	Pt	-11.5	-14.2	-13.8	-16.1	-16.8	-16.1	-10.6

Resource use

Indicator	Unit	DG 7 B80 WB Medium	DG10 B80 WB	DG14 B60 WB	AC14 B80 WB	AC20 PG52E Heavy WB	AC14 FPB WB	Mix 10
PERE	MJ	-17.7	-20.9	-20.5	-23.2	-24.0	-23.2	-16.7
PERM	MJ	0	0	0	0	0	0	0
PERT	MJ	-17.7	-20.9	-20.5	-23.2	-24.0	-23.2	-16.7
PENRE	MJ	-2,050	-1,800	-1,700	-1,710	-1,520	-1,710	-2,150
PENRM	MJ	0	0	0	0	0	0	0
PENRT	MJ	-2,050	-1,800	-1,700	-1,710	-1,520	-1,710	-2,150
SM	kg	0	0	0	0	0	0	0
RSF	MJ	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0
FW	m^3	-0.0308	-0.0404	-0.0391	-0.0472	-0.0496	-0.0472	-0.0278

Waste categories and output flows

Indicator	Unit	DG 7 B80 WB Medium	DG10 B80 WB	DG14 B60 WB	AC14 B80 WB	AC20 PG52E Heavy WB	AC14 FPB WB	Mix 10
HWD	kg	-4.19E-09	-4.57E-09	-4.43E-09	-4.89E-09	-4.90E-09	-4.89E-09	-4.09E-09
NHWD	kg	-11.5	-8.95	-9.26	-7.17	-6.48	-7.17	-12.3
RWD	kg	-0.00422	-0.00540	-0.00528	-0.00619	-0.00653	-0.00619	-0.00385
CRU	kg	0	0	0	0	0	0	0
MFR	kg	0	0	0	0	0	0	0
MER	kg	0	0	0	0	0	0	0
EEE	MJ	0	0	0	0	0	0	0
EET	MJ	0	0	0	0	0	0	0

Environmental impact (EN15804+A1)

Indicator	Unit	DG 7 B80 WB Medium	DG10 B80 WB	DG14 B60 WB	AC14 B80 WB	AC20 PG52E Heavy WB	AC14 FPB WB	Mix 10
GWP	kg CO_2-eq.	-13.0	-11.9	-11.3	-11.6	-10.6	-11.6	-13.4
ODP	kg CFC11-eq.	-2.85E-11	-3.34E-11	-3.29E-11	-3.67E-11	-3.81E-11	-3.67E-11	-2.69E-11
AP	kg SO_2-eq.	-0.0334	-0.0291	-0.0271	-0.0278	-0.0244	-0.0278	-0.0350
EP	kg PO_4^{3-}- eq.	-0.00173	-0.00144	-0.00125	-0.00138	-0.00110	-0.00138	-0.00185
POCP	kg C_2H_4-eq.	-0.0108	-0.00923	-0.00859	-0.00867	-0.00751	-0.00867	-0.0114
ADPE	kg Sb-eq.	6.24E-07	7.42E-07	8.31E-07	7.58E-07	8.83E-07	7.58E-07	5.74E-07
ADPF	MJ	-2,040	-1,780	-1,680	-1,690	-1,500	-1,690	-2,140

Acronyms

ANZSIC	Australian and New Zealand Standard Industrial Classification
CO_2	Carbon Dioxide
EN	European Standard
EPD	Environmental Product Declaration
GPI	General Program Instructions
ISO	International Organisation of Standardisation
KG	Kilogram
LCA	Life Cycle Assessment
MND	Module not declared
PCR	Product Category Rules
RAP	Recycled Asphalt Pavement

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References

1. ANZSIC. Australian and New Zealand Standard Industrial Classification. (2006)
2. CEN. EN 15804:2012+A2:2019: Sustainability of construction works — Environmental product declarations — Core rules for the product category of construction products. Brussels: European Committee for Standardisation. (2019)
3. EPD Australasia. Instructions of the Australasian EPD programme v3.0 - A regional annex to the General Programme Instructions of the International EPD System. https://epd-australasia.com/wp-content/uploads/2018/09/Australasian-Annex-to-GPI_3.0-2018.pdf (2018)
4. EPD Australasia. Technical Guidance for Developing EPDs according to EN 15804+A2:2019 for Asphalt Mixtures – Australia. Version 2022-04-27. https://epd-australasia.com/wp-content/uploads/2022/04/EPDA-AfPA-Technical-Guidance-document-final-for-publication-20220427.pdf (2022)
5. International Organization for Standardization. ISO 14025:2006 Environmental labels and declarations — Type III environmental declarations — Principles and procedures (2006)
6. Sphera. GaBi Life Cycle Inventory Database 2021 Documentation. https://sphera.com/product-sustainability-gabi-data-search/ (2022).
7. The International EPD System. General Programme Instructions for The International EPD System v3.01. (2019)
8. The International EPD System. PCR 2019:14 Construction products Version 1.11. (2021)
9. UN. Central Product Classification (CPC) – Version 2.1. New York: United Nations. (2015).

Program information

EPD OWNER	Downer New Zealand Ltd roads@downergroup.com www.downergroup.com
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INDEPENDENT VERIFIFCATION	Independent third-party verification of the declaration and data, according to ISO 14025:2006: ☐ EPD process certification ☑ EPD verification
THIRD-PARTY VERIFIER	Rob Rouwette start2see Pty Ltd rob.rouwette@start2see.com.au
VERIFIER APPROVED BY	EPD Australasia
PROCEDURE FOR FOLLOW-UP	Procedure for follow-up of data during EPD validity involves third party verifier: ☐ Yes No ☑
VERSION HISTORY	V1.0 initial release
GENERAL INFORMATION	An Environmental Product Declaration, or EPD, is a standardised and verified way of quantifying the environmental impacts of a product based on a consistent set of rules known as a PCR (Product Category Rules). 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. EPDs of construction products may not be comparable if they do not comply with EN 15804. The results for EN15804+A1 compliant EPDs are not comparable with EN15804+A2 compliant studies as the methodologies are different. Results that are A1 compliant are given in an annex to this document to assist comparability across EPDs.

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