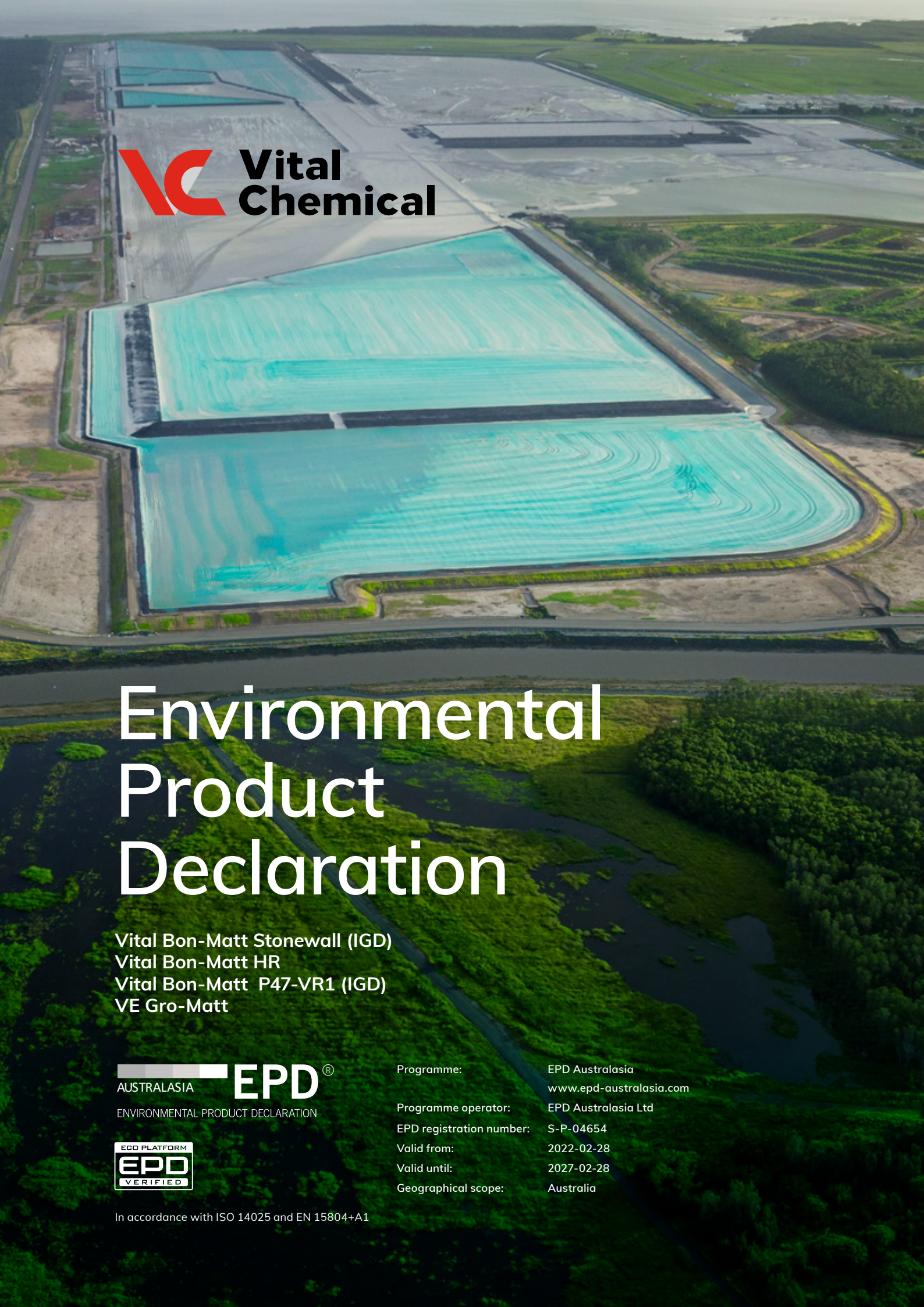


Vital Chemical

Environmental Product Declaration

Vital Bon-Matt Stonewall (IGD)
Vital Bon-Matt HR
Vital Bon-Matt P47-VR1 (IGD)
VE Gro-Matt

AUSTRALASIA EPD®
ENVIRONMENTAL PRODUCT DECLARATION

ECO PLATFORM EPD VERIFIED

In accordance with ISO 14025 and EN 15804+A1

Programme:	EPD Australasia www.epd-australasia.com
Programme operator:	EPD Australasia Ltd
EPD registration number:	S-P-04654
Valid from:	2022-02-28
Valid until:	2027-02-28
Geographical scope:	Australia

What is an

Environmental Product Declaration?

An Environmental Product Declaration (EPD) tells the environmental story of a product over its life cycle. It is science-based, independently verified, and globally recognised. It is a good way to demonstrate a company's commitment to environmental sustainability. Our EPD covers the environmental performance of four of our products: Vital Bon-Matt Stonewall (IGD), Vital Bon-Matt HR, Vital Bon-Matt P47-VR1 (IGD), and VE Gro-Matt.

Comparable to a nutritional label for food products — instead of nutritional information, an EPD transparently communicates the environmental impacts of a product. This EPD is based on a Life Cycle Assessment (LCA) covering cradle-to-gate plus distribution to customer. 'Cradle' refers to the raw material extraction and 'the gate' is the gate of Vital Chemical's South East Queensland manufacturing and distribution facility, as the product is ready to go out to customers.

The information included in an EPD is useful for a variety of applications, especially as environmental issues and viable solutions are often misunderstood by the market. Having an EPD enables sustainable decision-making that can be backed up by credible data.

An EPD can be used for any type of product or service to:

- describe its functional properties and material composition
- provide science-based information on the resources and energy used during manufacture and use
- illustrate the relevant environmental impacts, such as the carbon footprint
- give comparable information within the same product group.

Based on an open and transparent framework, an EPD discloses its registration number, the product category rules that it qualified under, and the third-party verifier. The validity of the EPD is also stated, which is normally three or five years.

Vital Chemical as the EPD owner has the sole ownership, liability, and responsibility for the EPD.

Content

About

Vital Chemical

For 45 years, Vital Chemical has helped solve industrial challenges by providing products and services to help clients with erosion and dust control, water treatment, concrete removal and corrosion inhibition.

Vital Chemical's focus is to develop and provide environmentally and sustainably sound products and associated services that offer efficacy and cost effectiveness and most importantly, products which are safe for humans, flora and fauna in the areas where they are used.

An Australian-owned and operated company, Vital Chemical is at the forefront of research, formulation, manufacturing and the application of a broad range of solutions to help clients across many industries deal with unique challenges and a vast array of geographic, climatic and built environment factors.

From remote mining operations, to urban construction, land rehabilitation projects, and port and rail applications, the Vital Chemical team has the experience and credentials to ensure clients receive the best possible solutions for their needs.

Vital Chemical delivers on our social responsibilities and is committed to the integration of sustainable practices throughout the organisation.

Civil Construction

Mining

Concrete

Land Rehabilitation

Agriculture

Residential Commercial Construction

Contaminated Land Rehabilitation

Our policies and commitments

Sustainability in Our Business

We integrate sustainable practises throughout the organisation incorporating environmental, social, and economic aspects. Our mission is to undertake all operations in a responsible and sustainable manner in order to achieve moral and community expectations whilst complying with all relevant legislation and regulations.

Our Sustainability policy

Australian Owned and Operated

As an Australian owned and operated manufacturer, we are extremely proud of our contribution to the local economy and to the positive environmental outcomes of the communities in which we operate.

Gender Equality

We support gender equality with a current proportion of 40% female employees and a 50/50 female to male Directorship. Respecting social and cultural diversity and promoting a culture of Equal Employment Opportunity, Vital Chemical strives to ensure that our operations support the long-term expectations and outcomes of our stakeholders.

Environment

Vital Chemical is committed to the preservation of the environment. Our goal is to undertake all operations in an environmentally responsible manner. We train our staff and nurture a culture of environmental responsibility. All our processes are continually monitored and refined to improve effectiveness.

Our Environmental Management policy

Safety

Safety remains our highest priority. People are our most valuable asset and we are all committed to the safety and welfare of everyone in the workplace - including our contractors, volunteers, clients, visitors and members of the public. We are AS/NZS 4801 Safety certified.

Occupational Health & Safety policy

Ethical Sourcing

Our mission to provide cost effective, sustainable solutions to support environmental outcomes and sustainability objectives is underpinned through the engagement of local, Australian organisations for the procurement of raw materials in line with our Ethical Sourcing Policy.

Quality

The quality of Vital Chemical's products and services is fundamental to our company ethos. Vital Chemical has established measurable objectives to continually improve our quality performance. Our Quality Management System is upheld in alignment with AS/NZS ISO 9001:2016.

Our Quality Management policy

Indigenous Engagement

Our vision is to build respectful and enduring relationships with Aboriginal and Torres Strait Islander peoples through our commitment to increasing educational, employment, training, and supply chain opportunities.

Cultural Diversity

Vital Chemical is committed to cultural and social diversity through the provision and support of an inclusive organisational culture in a diverse and non-discriminatory workplace.

Our
Production Location

The strategic geographical location of Vital Chemical's South East Queensland manufacturing and distribution facility, delivers efficient lead times from the placement of an order to the application of our products.

Vital Chemical is uniquely positioned to formulate, manufacture, store, and rapidly distribute large-scale volumes to supply major projects throughout Australasia.

Our team offers complementary on-site product training and educational initiatives across Australia. This customer focus assists our clients to achieve their environmental and economical outcomes throughout the delivery of their project.

ISO 14001 Environment Certified system
ISO 9001 Quality Certified system
AS/NZS 4801 Safety Certified system

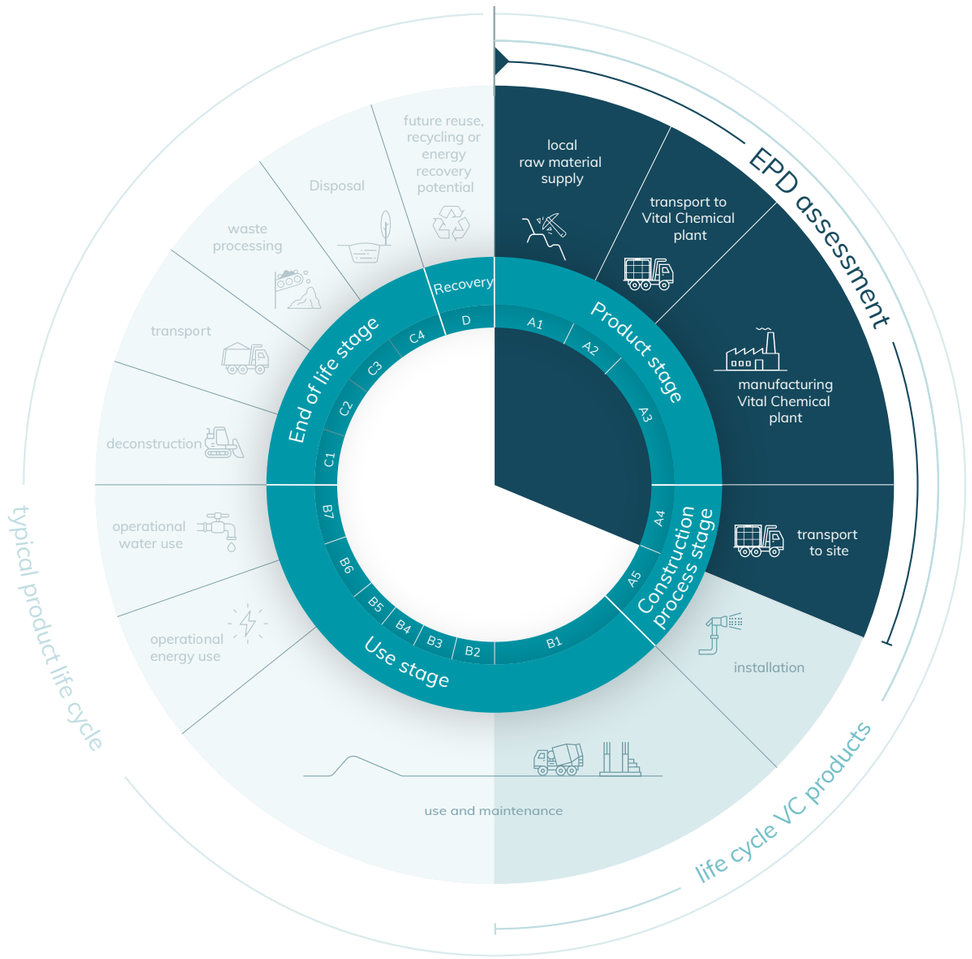
Vital Chemical HQ
Brisbane

A closer look at the
Product Life Cycle

The diagram below illustrates a typical product life cycle. The EPD assessment for the Vital Chemical products covers the product stage and part of the construction process stage.

The products in this EPD are expected to be released into the environment during the use stage and therefore would not complete a typical full life cycle.

Figure 1: Typical product life cycle



This EPD assessment considers the product stage (A1 - A3) and part of the construction process stage (A4).

Description

Vital Bon-Matt Stonewall (IGD)

A broad range dust and erosion control formulation effectively binding dust particles and fugitive particulate matter. Vital Bon-Matt Stonewall (IGD) has been independently tested to provide the highest levels in dust management and ground stabilisation.

Vital Chemical's renowned polymer technology provides instant stabilisation in a wide range of applications including but not limited to:

- Stockpiles and steep slopes and batters
- Exposed soil, sand or aggregate
- Broad acre areas
- Tailings Dams
- Unsealed Haul Roads
- Sub-base road stabilisation
- Berms, swales and drains
- Clearwater diversions, pond and dam lining
- Hazardous substance isolation – asbestos
- Train wagon veneering

Case Study

online version

Brisbane Airport New Parallel Runway

This project faced unique challenges from an erosion and sediment control perspective to stabilise 11 million cubic meters of sand in preparation for construction of the biggest aviation project in Australia (at the time of the project in 2015).

To prepare the land for construction, 11 million cubic metres of sand was pumped onto the 360 hectare site in preparation for construction of the airport runways and taxiways.

The challenge was to find a material that could stop the movement and the natural dispersive nature of the sand.

After rigorous environmental and performance analysis, Vital Bon-Matt Stonewall (IGD) was applied to the exposed surface of the dredged sand which was contained within bunds to allow for settlement.

The product provided a robust surface treatment. The application of Vital Bon-Matt Stonewall (IGD) facilitated effective management of on site erosion.

ENVIRONMENT | INNOVATION | WATER | SUSTAINABLE PROCUREMENT | LEGACY | SOCIAL

Description

Vital Bon-Matt HR

Formulated for efficient dust control and stabilisation, Vital Bon-Matt HR is a heavy duty, robust and concentrated product.

Designed for use on all unsealed roads, high traffic areas and other more challenging stabilisation scenarios.

Formulated to greatly reduce erodible surfaces by wind, water and traffic, Vital Bon-Matt HR is a highly effective solution where strong binding and durable surface conditions are required.

Curing in hours and not remobilising into the surrounding environments Vital Bon-Matt HR offers non-hazardous and durable long lasting stabilisation for:

- Haul roads
- Civil construction sites
- Unsealed roads
- Traffic areas
- Drains
- Areas of high velocity concentrated flow
- Long-term sealing

Case Study

online version

Sustainable Haul Road Management

Vital Bon-Matt HR was trialed throughout the Adelaide -Brighton Cement site on unconsolidated trafficked surfaces and loading areas. The Sustainable Haul Road Management Program consisted of twice weekly applications of Vital Bon-Matt HR.

The employment of Vital Bon-Matt HR facilitated the following key outcomes:

Road dust mitigation operations were drawing on approximately 200,000L of water per week at peak times in an attempt to manage dust generation from unsealed trafficked surfaces.

- A noticeable decrease in dust lift off from trafficked surfaces was reported by the client.
- An estimated 90% water savings for the purpose of dust suppression (the client reported that approximately 190,000L of potable water had been saved per week).
- Improved stabilisation and durability of the haul road surface, reducing servicing and maintenance costs.
- Significant reduction in watercart movement across the site was reported by the client in comparison to water only dust suppression.

SUSTAINABLE PROCUREMENT | ENERGY AND CARBON | ENVIRONMENTAL IMPACTS | WATER | ECOLOGY | WORKFORCE SUSTAINABILITY

Description

Vital Bon-Matt P47-VR1 (IGD)

Vital Bon-Matt P47-VR1 (IGD) is a multipurpose veneer designed for applications over surfaces where strength, durability and flexibility are required for shorter term stabilisation.

Vital Bon-Matt P47-VR1 (IGD) is ideal for the control of erosion and dust on non-trafficked areas to provide highly effective short to medium term stabilisation.

Curing within hours and will not remobilise into the surrounding environment whilst achieving the outcomes of high windspeed and heavy rainfall resistance.

Vital Bon-Matt P47-VR1 (IGD) offers cost effective, instant and sustainable surface stabilisation for:

- Non-trafficked areas
- Civil and mining broad acre
- Stockpile and residential developments

Case Study

online version

Masterplan Community Residential Development

A landmark residential development project in Southwest Queensland required an innovative soil stabilisation solution to deliver time and cost efficiencies during the multi-stage development. Surrounded by greenspaces and natural water bodies, it was important for the active and rapidly developing project to minimise environmental impact throughout the duration of its ongoing construction.

Vital Bon-Matt P47-VR1 (IGD) was applied to progressively stabilise individual lots to meet environmental compliance requirements prior to lots being sold. The employment of Vital Bon-Matt P47-VR1 supported significant time and cost savings for the development, whilst achieving regulatory compliance for erosion and sediment control.

The innovative use of Vital Bon-Matt P47-VR1 (IGD) during infrastructure development may improve sustainable development outcomes.

- Manufactured in Australia.
- Highly effective erosion control and surface stabilisation.
- Minimising rain impact erosion.
- Control of challenging dust and other erodible surface emissions for improved air quality.
- Reduced sediment discharges to receiving water.
- Reduced water cart movement across the site.
- Reduced water and energy use.
- Rapidly applied to large areas, providing effective stabilisation.

ENVIRONMENT | INNOVATION | ENERGY AND CARBON | WATER | LEGACY | SUSTAINABLE PROCUREMENT

Description

VE Gro-Matt

In combination with Vital Chemical's nutrient infused Vital Bon-Matt products as tackifiers, the VE Gro-Matt bonded fibre matrix (BFM) creates ideal growing conditions. The result is the delivery of a premium nutrient composition in combination with VE Gro-Matt's unique water holding capabilities.

VE Gro-Matt provides immediate and superior erosion control whilst establishing a sustainable growth medium.

The heat-treated wood fibres comprising VE Gro-Matt are sourced from Australian waste timbers.

VE Gro-Matt's moisture holding capacity enhances seed germination and has the added benefit of achieving project sustainability targets via the Infrastructure Sustainability Council's IS Rating tool.

VE Gro-Matt is a 100% Australian made and owned wood fibre matrix product specifically designed for projects that require:

- revegetation
- rehabilitation
- erosion control
- nutrient soil repair
- soil amelioration

Case Study

Sustainable Revegetation

online version

Following a robust selection process, VE Gro-Matt was chosen as the revegetation solution on the Caloundra Road to Sunshine Motorway (CR2SM) road upgrade project.

Manufactured in Queensland sourced from Australian waste timbers, VE Gro-Matt provided a revegetation solution with the ability to deliver on best value principles.

VE Gro-Matt may contribute to the following key outcomes:

- Manufactured locally in Queensland
- Diverting resources from waste for reuse
- Unique water holding capabilities improving soil moisture levels
- Providing ideal growing conditions resulting in the delivery of immediate stabilisation
- Establishing a sustainable growth medium
- Immediate stabilisation to reduce impacts to receiving water
- Minimising rain impact erosion
- Eliminating fugitive dust emissions

SUSTAINABLE PROCUREMENT | ENERGY AND CARBON | RESOURCE REUSE | GREEN INFRASTRUCTURE PLAN | ENVIRONMENTAL IMPACTS | WATER | ECOLOGY | WORKFORCE SUSTAINABILITY | LEGACY

Queensland's largest road infrastructure project with an intrinsic sustainability focus, there was stringent criteria around the erosion control works incorporating 1,000,000m²+ of a self-sustaining revegetation solution. The revegetation solution had clear requirements to support the establishment and sustainable growth of a specified blend of native seed species.

Additional Insights

1 Going beyond

Our commitment toward sustainability goes beyond mitigating negative environmental impacts. We have taken action to gear our manufacturing processes toward environmental efficacy whilst remaining at the forefront of research, formulation, development and manufacture of new and novel environmentally and sustainability-focused products.

2 Winner

For Excellence in Innovation, Contribution or Education (ICE) to the Erosion and Sediment Control Industry: VITAL CHEMICAL AND VITAL ENVIRONMENT

IECA Australasia would like to congratulate Vital Chemical and Vital Environment on winning the 2017 ICE Award. The judging panel made the following comments about Vital's contribution to the ESC industry.

"It is fantastic to see over a decade dedicated to providing new environmentally friendly products for the erosion and sediment control industry that really perform."

"Vital have driven a fundamental change in temporary erosion control in the construction industry."

3 Green Star and ISC compliance

The EPDs comply with the requirements for EPD under the Green Building Council of Australia's (GBCA's) Green Star rating system and the Infrastructure Sustainability (IS) rating scheme of the Infrastructure Sustainability Council (ISC).

As per EN 15804 | Independently verified | Cradle-to-gate with options (Distribution to customer, Module A4) scope | Product specific

We are proud members of:

How to use this EPD

Vital Chemical has developed this EPD to help to showcase the environmental credentials of four of our products: Vital Bon-Matt Stonewall (IGD), Vital Bon-Matt HR, Vital Bon-Matt P47-VR1 (IGD), and VE Gro-Matt.

The EPD provides life cycle data for calculating the impacts of the products at a building level. This data may be used by specifiers and developers to calculate and present the environmental impacts of particular construction projects.

This EPD can allow the represented products to qualify for points under green rating tools, such as the Green Building Council of Australia's (GBCA's) Green Star rating system.

Please note this EPD is based on a cradle-to-gate with options (Distribution to customer, Module A4) Life Cycle Assessment (LCA).

> ***"The importance of accurate data in today's climate cannot be understated. With a rising focus and drive on achieving net zero environmental product disclosures (EPDs) and other supply chain certification schemes are even more critical.***
>
> ***As an industry, a sector and a country we must be able to confidently identify and utilise products that can demonstrate their contribution to the broader outcomes being sought.***
>
> ***With the growing focus on carbon emissions reduction data accuracy to support reporting is absolutely core to success. The IS Rating Scheme utilises and rewards the use of EPDs as one of the mechanisms responding to the challenges faced."***
>
> **Patrick Hastings,**
> *Chief Delivery Officer,*
> *Infrastructure Sustainability Council (ISC)*

Product Information

This EPD applies to: Vital Bon-Matt Stonewall (IGD), Vital Bon-Matt HR, Vital Bon-Matt P47-VR1 (IGD), and VE Gro-Matt (Fibre). All products are manufactured for the building and construction industry by Vital Chemical at the facility in Goodna, Queensland.

Declared unit

EPDs that do not cover the full product life cycle from raw material extraction through to end-of-life use the term “declared unit”, rather than functional unit. “Declared unit” is used in this EPD as defined below:

For Vital Bon-Matt Stonewall (IGD), Vital Bon-Matt HR, and Vital Bon-Matt P47-VR1 (IGD):
Material and packaging required for 1 L of product

For Vital Gro-Matt:
Material and packaging required for 1 kg of product

Industry classification

The UN CPC and ANZSIC codes applicable to Vital Chemical products in this EPD are shown in Table 1.

Table 1: The UN CPC and ANZSIC codes applicable to Vital Chemical products.

Product	Classification	Code	Category
Vital Chemical	UN CPC Ver.2.1	83232	Landscape architectural services
	ANZSIC 2006	321	Land Development and Site Preparation Services

Application and product density

The Vital Bon-Matt range of products are primarily used for dust suppression and erosion control. The VE Gro-Matt product is also applied for erosion control and revegetation, though the revegetation application and impacts are not covered by this EPD.

Table 2: Vital Chemical products manufactured by Vital Chemical

Vital Chemical product list	Application	Density (kg/m3)
Vital Bon-Matt Stonewall (IGD)	Dust and erosion control for long term stabilsation	1040
Vital Bon-Matt HR	Heavy duty dust suppressant for challenging stabilsation scenarios	1040
Vital Bon-Matt P47-VR1 (IGD)	Dust and erosion control for shorter term stabilisation	1040
VE Gro-Matt	Ground stabilisation through erosion control and revegetation	420

Product composition and packaging per declared unit

Table 3: % composition of Vial Chemical products, including hazardous properties

Material		Hazardous properties (HSNO classifications)	Hazardous properties (GHS classifications)
Vital Bon-Matt Stonewall (IGD)	**%v/v**		
Acrylate copolymer	>60%	None	None
Green pigment	<3%	None	None
Non-hazardous ingredients	Remainder		
Vital Bon-Matt HR	**%v/v**		
Acrylate copolymer	>70%	None	None
Non-hazardous ingredients	Remainder	None	None
Vital Bon-Matt P47-VR1 (IGD)	**%v/v**		
Acrylate copolymer	<50%	None	None
Green pigment	<3%	None	None
Non-hazardous ingredients	<60%	None	None
VE Gro-Matt	**%m/m**		
Wood chip (wet hoop pine, radiata pine and eucalyptus wood chips)	>95%	None	None
Green Pigment*	<0.1%	None	None

*Not classified as hazardous according to Australian WHS Regulations

None of the materials identified in the European Chemicals Agency’s Candidate List of Substances of Very High Concern are present in the products at a concentration greater than 0.1% (ECHA, 2022).

Hazardous properties for Hazardous Substances and New Organisms (HSNO classifications) and Globally Harmonized System (GHS) classifications were searched for via supplier Safety Data Sheets (SDS) and OECD’s global portal to information on chemical substances available at: https://www.echemportal.org.

Vital Chemical products contain no hazardous substances requiring labelling. For Vital Chemical product SDS, please contact us.

Table 4: Packaging details for declared unit (i.e. 1 kg / 1 L of product)

Vital Chemical product list	Packaging type	Packaging proportion (kg) per declared unit
Vital Bon-Matt Stonewall (IGD)	1000L IBC	0.06
	20 L polydrum for sampling	0.000694
Vital Bon-Matt HR	1000L IBC	0.06
	20L poly drum for sampling	0.00323
Vital Bon-Matt P47-VR1 (IGD)	1000L IBC	0.06
	20L poly drum for sampling	0.000571
VE Gro-Matt	70L LLDPE bag	0.01

Please note: The poly drums are used for decanting products. Different quantities of poly drums were used per Vital Bon-Matt product over the study period.

This EPD has a cradle-to-gate

System Boundary

This EPD has a ‘cradle-to-gate with options’ scope 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) and distribution as an option (A4). Impacts and indicators related to waste are considered in the module in which the waste occurs in line with the “polluter pays principle” specified in EN 15804.

Table 5: Modules of the production life cycle included in the EPD (X = declared module; MND = module not declared)

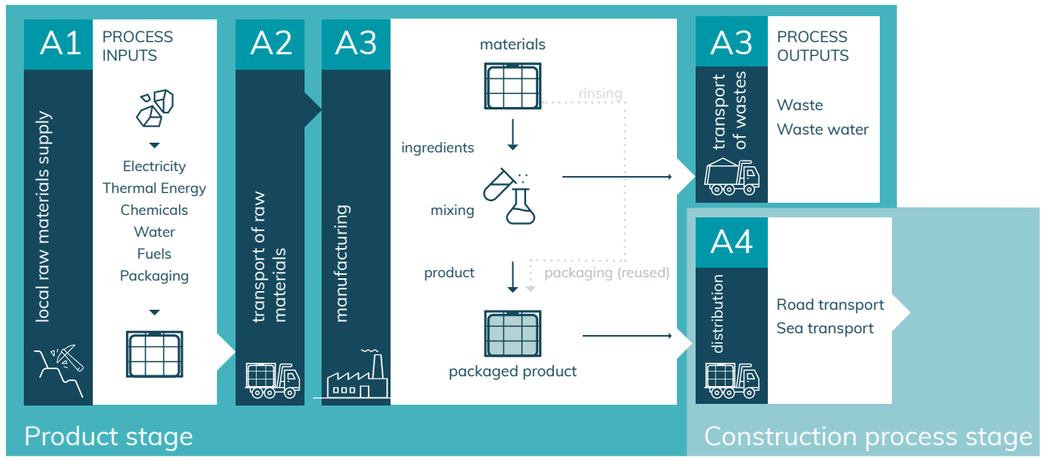
Product stage				Construction process stage	Use stage								End of life stage				Recovery
Raw material supply	Transport	Manufacturing	Transport	Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction / demolition	Transport	Waste processing	Disposal	Future reuse, recycling or energy recovery potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND
INCLUDED IN EPD																

Manufacturing process Vital Bon-Matt products

A simplified flow diagram reflecting production process for Vital Bon-Matt Stonewall (IGD), Vital Bon-Matt HR and Vital Bon-Matt P47-VR1 (IGD) is given below in figure 2.

The diagram includes the upstream, core, and downstream processes included within the declared modules.

Figure 2: Simplified flow diagram for Bon-Matt products (Modules A1-A4)



A1
Raw material supply

- Extraction and processing of raw materials.
- Generation of electricity from primary energy resources, also including their extraction, refining and transport. This includes energy needed for raw material supply and energy for manufacturing in core process.

A2
Transportation

- Transport of raw material to Vital Chemical facilities.

A3
Manufacturing

- Manufacturing process - mixing of ingredients
- Processing up to the end-of-waste state.
- Transport of wastes

A4
Transportation

- Distribution based on sales weighted average transport distances.

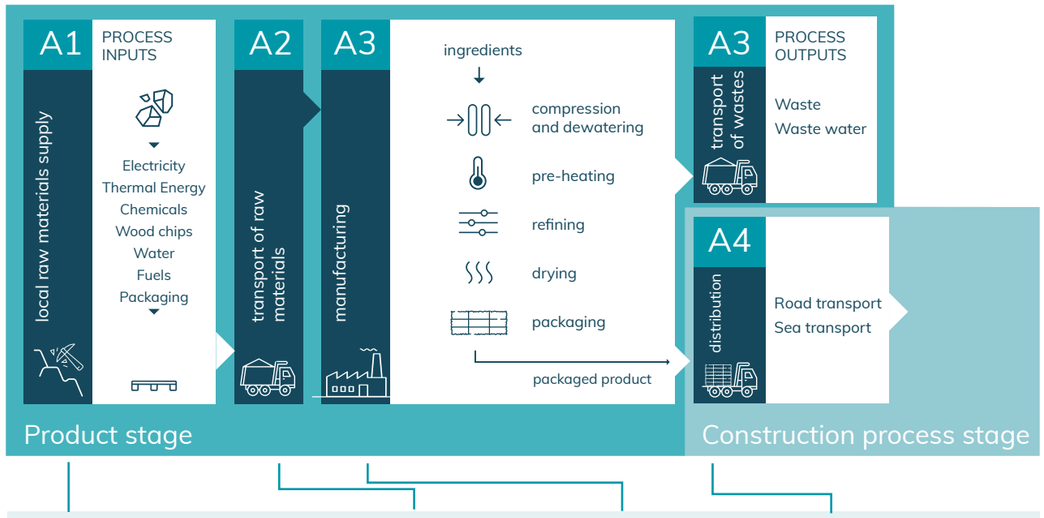
Upstream processes | **Core processes** | **Downstream processes**

Manufacturing process VE Gro-Matt

A simplified flow diagram reflecting production process for VE Gro Matt product is given below in figure 3.

The diagram includes the upstream, core, and downstream processes included within the declared modules.

Figure 3: Simplified flow diagram for VE Gro-Matt products (Modules A1-A4)



A1
Raw material supply

- Extraction and processing of raw materials.
- Generation of electricity from primary energy resources, also including their extraction, refining and transport. This includes energy needed for raw material supply and energy for manufacturing in core process.

Upstream processes

A2
Transportation

- Transport of raw material to Vital Chemical facilities.

A3
Manufacturing

- Manufacturing process - mixing of ingredients
- Processing up to the end-of-waste state.
- Transport of wastes

Core processes

A4
Transportation

- Distribution based on sales weighted average transport distances.

Downstream processes

Product Life Cycle Assessment

Life Cycle Inventory (LCI) Data and Assumptions

Processes within the system boundary are accounted for via primary data consisting of production for the 12 month period covering raw material inputs; raw material packaging; transport of raw materials, packaging and auxiliary inputs; energy and water inputs for production; internal transport; production outputs and overheads (e.g. water, lubricants, etc.).

Other relevant boundaries include:

Temporal boundary

Primary data were collected from Vital Chemical for the 12 month period between 1st Jan 2018 to 31st December 2018. No changes to production technology have occurred since the data collection period and hence the data continues to be representative of current practice.

Allocation

The ingredients, product packaging (IBCs and poly drums) and energy use for manufacturing the product were available at specific product level (per batch). Site level data included inputs and outputs related to oil, rags, overheads, packaging such as labels, cardboard packaging, timber pallets, paper, general waste, etc. The site level data was allocated to the individual products based on total production (mass) per year.

Background data

All data in the background system are from the GaBi Life Cycle Inventory Database 2021 (Sphera, 2021). Datasets have a reference year between 2017 and 2020, and are within the 10-year limit allowable for generic data under EN 15804 (CEN, 2013).

Geographical boundary

The foreground data for Vital Chemical products were collected from Vital Chemical's site in Queensland (Brisbane Terrace, Goodna Queensland), where Vital Bon-Matt products included in the EPD are manufactured.

Australian data was used where possible. For example, the background data associated with upstream operational materials or energy production (e.g. electricity) are taken from the GaBi Databases 2021 (including unit process emissions and emission factors, etc.).

For Vital Bon-Matt Stonewall (IGD), Vital Bon-Matt HR, and Vital Bon-Matt P47-VR1 (IGD) products, background data contribute to at least 84% of GWP impact. This reflects the impact of upstream production of raw material inputs which are modelled using European background datasets representing European conditions as geographically relevant datasets matching Australian conditions were not available.

Electricity

Electricity consumption was modelled using Queensland state specific electricity. The state specific electricity data was based on background data from the GaBi Life Cycle Inventory Database 2021 (Sphera 2021). The consumption mix, resulting in GWP of 1.05 kg CO_2 eq. per MJ, is composed of 87.1% hard coal, 9.3% natural gas, 2.2% coal seam gases, 1% hydro, 0.3% import from NSW, and the remainder from heavy fuel oil and photovoltaics.

Woodchips

A large proportion of VE Gro-Matt consists of woodchips. Biogenic carbon sequestered in the woodchips have been calculated based on EN 16449:2014. The manufacturing process results in a proportion of waste which is given away to a company that manufactures compost. For this waste, the respective biogenic carbon that was sequestered in the wood is released within the system. VE Gro-Matt is expected to be biogenic carbon neutral, where sequestered carbon (1.37 kg CO_2-eq./ kg of product) is released during the use phase as the product biodegrades.

Pigment

Conservative assumptions regarding the pigment have been used in modelling Vital Bon-Matt Stonewall (IGD), Vital Bon-Matt P47-VR1 (IGD) and VE Gro-Matt products. This likely has the effect of doubling ADPE impacts for these products.

Cut off criteria

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

For materials that are sent for recycling or reuse, a cut-off approach is applied after the material has been transported to a recycling/rehabilitation facility.

General municipal waste data is available at site level. While this waste is modelled as an output of general wastes to landfill, the input material accounting for the waste is modelled as burden free. This has negligible impact on results as the waste output per declared unit is minor and does not include raw material wastes.

Product Life Cycle Assessment

Life Cycle Inventory (LCI) Data and Assumptions - continued

Reuse and Recycling

Packaging such as intermediate bulk containers (IBCs) are designed for multiple use. The cleaning process to allow reuse of IBCs is modelled based on literature by Biganzoli et al (2018) while expected reuse cycles are obtained from a study by Deviatkin et al. (2019). 50 reuse cycles have been assumed.

Components for Reuse (CRU) and Material for Recycling (MFR) indicator results reflect reuse and recycling respectively. CRU results are due to packaging (IBCs and timber pallets) being reused, while MFR results reflect recycling of raw material packaging such as poly drums, cardboard and paper.

Transport

Primary transport data was used for transport of production inputs (A2), and for transport of products to the customer (A4). Any wastes from the production process (A3) are assumed to be transported over a 100 km distance to a treatment or disposal site. For distribution, sales weighted average distances were calculated. The distances modelled are given in Table 6.

Table 6: Distances modelled.
Truck (diesel), Euro 0 - 6 mix, 20 - 26t gross weight / 17.3t payload capacity.
Container ship (heavy fuel oil), 5,000 to 200,000 dwt payload capacity, ocean going.

Mode	Unit	Vital Bon-Matt Stonewall (IGD)	Vital Bon-Matt HR	Vital Bon-Matt P47-VR1 (IGD)	VE Gro-Matt
Sea freight distance	km	196	136	155	257
Truck freight distance	km	854	969	880	798

Introducing the

Life Cycle Impact Assessment (LCIA) Indicators

An introduction to each environmental impact indicator is provided below.
The abbreviation in brackets corresponds to the labels in the following tables.

Global Warming Potential (GWP-total, GWPf and GWPb)
| Climate change

Global Warming Potential quantifies the potential warming over 100 years from greenhouse gas emissions, such as carbon dioxide and methane. Emitting more of these gases is adding to the natural greenhouse effect — earth is absorbing more of the radiation than it emits. This may have widespread adverse impacts on ecosystem health, human health, and material welfare.

Abiotic Resource Depletion, non-fossil resources (ADPE) and fossil resources (ADPF)
| Resource consumption

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 total reserves.

Eutrophication Potential (EP)
| Algal blooms

Eutrophication covers all potential impacts of excessively high levels of macronutrients, the most important of which are nitrogen (N) and phosphorus (P). 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 Creation Potential (POCP)
| Smog

Photochemical Ozone Creation Potential gives an indication of the emissions from precursors that contribute to ground level smog formation, mainly ozone (O3). 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.

Acidification Potential (AP)
| Acid rain

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.

Ozone Depletion Potential (ODP)
| Ozone hole

Depletion of the ozone 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.

Life Cycle Impact

Assessment Results Vital Bon-Matt Products

This section provides EPD results for the environmental, resource use and waste categories and output flows for Module A1-A3 and A4 for the following products:

- Vital Bon-Matt Stonewall (IGD)
- Vital Bon-Matt HR
- Vital Bon-Matt P47-VR1 (IGD)

The values represent the declared unit: Material and packaging required for 1 L of product

Environmental impact Vital Bon-Matt products | Modules A1 - A3 + A4

Table 7: Environmental impact results Vital Bon-Matt products covering modules A1-A3 and A4

			Vital Bon-Matt Stonewall (IGD)		Vital Bon-Matt HR		Vital Bon-Matt P47-VR1 (IGD)	
Indicator	**abb.**	**Unit**	**A1-A3**	**A4**	**A1-A3**	**A4**	**A1-A3**	**A4**
Global warming potential (total)	**GWP-total**	**kg CO_2-eq.**	**0.703**	**0.0804**	**1.52**	**0.0906**	**0.579**	**0.0824**
Global warming potential (fossil)	GWPf	kg CO_2-eq.	0.702	0.0771	1.51	0.0869	0.579	0.0790
Global warming potential (biogenic)	GWPb	kg CO_2-eq.	2.78E-04	0.00328	0.00705	0.00373	-7.11E-04	0.00338
Global warming potential (land use and land use change)	GWP luluc	kg CO_2-eq.	3.04E-04	1.64E-06	5.06E-04	1.85E-06	2.64E-04	1.68E-06
Ozone depletion potential	ODP	kg CFC11-eq.	3.26E-13	1.59E-17	2.42E-14	1.80E-17	4.27E-13	1.63E-17
Acidification potential of land and water	AP	kg SO_2-eq.	9.24E-04	1.54E-04	0.00161	1.52E-04	7.95E-04	1.46E-04
Eutrophication potential	EP	kg PO_4^3-eq.	1.39E-04	2.59E-05	2.31E-04	2.70E-05	1.21E-04	2.53E-05
Photochemical ozone creation potential	POCP	kg C_2H_4-eq.	2.20E-04	-1.37E-05	4.85E-04	-1.68E-05	1.81E-04	-1.48E-05
Abiotic depletion potential – elements	ADPE	kg Sb-eq.	7.44E-06	1.29E-09	2.75E-07	1.44E-09	7.42E-06	1.31E-09
Abiotic depletion potential – fossil fuels	ADPF	MJ_{NCV}	18.9	1.08	41.6	1.22	15.5	1.10

← Global warming potential total is also known as Carbon footprint.

Resource use Vital Bon-Matt products | Modules A1 - A3 + A4

Table 8: Resource use results Vital Bon-Matt products covering modules A1-A3 and A4

			Vital Bon-Matt Stonewall (IGD)		Vital Bon-Matt HR		Vital Bon-Matt P47-VR1 (IGD)	
Indicator	**abb.**	**Unit**	**A1-A3**	**A4**	**A1-A3**	**A4**	**A1-A3**	**A4**
Renewable primary energy as energy carrier	PERE	MJ_{NCV}	0.794	0.00523	1.52	0.00592	0.677	0.00537
Renewable primary energy resources as material utilization	PERM	MJ_{NCV}	0	0	0	0	0	0
Total use of renewable primary energy resources	PERT	MJ_{NCV}	0.794	0.00523	1.52	0.00592	0.677	0.00537
Non-renewable primary energy as energy carrier	PENRE	MJ_{NCV}	13.2	1.08	28.6	1.22	10.8	1.11
Non-renewable primary energy as material utilization product	PENRM	MJ_{NCV}	5.18	0	12.7	0	4.14	0
Non-renewable primary energy as material utilization packaging*	PENRM	MJ_{NCV}	0.771	0	0.887	0	0.766	0
Total use of non-renewable primary energy resources	PENRT	MJ_{NCV}	19.2	1.08	42.3	1.22	15.7	1.11
Use of secondary material product	SM	kg	0	0	0	0	0	0
Use of secondary material packaging*	SM	kg	0.0225	0	0	0	0.0300	0
Use of renewable secondary fuels	RSF	MJ_{NCV}	0	0	0	0	0	0
Use of non-renewable secondary fuels	NRSF	MJ_{NCV}	0	0	0	0	0	0
Use of net fresh water	FW	m^3	0.00431	1.04E-05	0.00814	1.17E-05	0.00368	1.07E-05

Waste categories and output flows Vital Bon-Matt products | Modules A1 - A3 + A4

Table 9: Waste categories and output flows results Vital Bon-Matt products covering modules A1-A3 and A4

			Vital Bon-Matt Stonewall (IGD)		Vital Bon-Matt HR		Vital Bon-Matt P47-VR1 (IGD)	
Indicator	**abb.**	**Unit**	**A1-A3**	**A4**	**A1-A3**	**A4**	**A1-A3**	**A4**
Hazardous waste disposed	HWD	kg	4.13E-09	3.98E-12	4.34E-09	4.46E-12	4.40E-09	4.06E-12
Non-hazardous waste disposed	NHWD	kg	0.0131	2.74E-05	0.0159	3.03E-05	0.0121	2.78E-05
Radioactive waste disposed	RWD	kg	9.38E-05	1.69E-07	1.95E-04	1.82E-07	7.81E-05	1.69E-07
Components for re-use product*	CRU	kg	0	0	0	0	0	0
Components for re-use packaging*	CRU	kg	0.0395	0	0.0620	0	0.0320	0
Materials for recycling product*	MFR	kg	0	0	0	0	0	0
Materials for recycling packaging*	MFR	kg	0.00120	0	0.00119	0	0.00120	0
Materials for energy recovery	MER	kg	0	0	0	0	0	0
Exported electrical energy	EEE	MJ_{NCV}	0	0	0	0	0	0
Exported thermal energy	EET	MJ_{NCV}	0	0	0	0	0	0

*Results are separated for product and product packaging for Use of secondary materials (SM), Non-renewable primary energy as material utilization, Components for re-use and Materials for recycling indicators as per ACLCA (2019) guidance.

Life Cycle impact

Assessment Results VE Gro-Matt

This section provides EPD results for the environmental, resource use and waste categories and output flows for Module A1-A3 and A4 for:

» VE Gro-Matt

The values represent the declared unit:
Material and packaging required for 1 kg of product

Environmental impact VE Gro-Matt | Modules A1 - A3 + A4

Table 10: Environmental impact results VE Gro-Matt covering modules A1-A3 and A4

			VE Gro-Matt	
Indicator	**abb.**	**Unit**	**A1-A3**	**A4**
Global warming potential (total)	**GWP-total**	**kg CO_2-eq.**	**-1.25**	**0.0714**
Global warming potential (fossil)	GWPf	kg CO_2-eq.	0.128	0.0685
Global warming potential (biogenic)	GWPb	kg CO_2-eq.	-1.37	0.00289
Global warming potential (land use and land use change)	GWP luluc	kg CO_2-eq.	7.17E-05	1.46E-06
Ozone depletion potential	ODP	kg CFC11-eq.	1.45E-14	1.41E-17
Acidification potential of land and water	AP	kg SO_2-eq.	4.70E-04	1.54E-04
Eutrophication potential	EP	kg PO_4^3-eq.	6.17E-05	2.48E-05
Photochemical ozone creation potential	POCP	kg C_2H_4-eq.	2.35E-05	-1.11E-05
Abiotic depletion potential – elements	ADPE	kg Sb-eq.	1.23E-06	1.15E-09
Abiotic depletion potential – fossil fuels	ADPF	MJ_{NCV}	2.17	0.956

Resource use VE Gro-Matt | Modules A1 - A3 + A4

Table 11: Resource use results VE Gro-Matt covering modules A1-A3 and A4

			VE Gro-Matt	
Indicator	**abb.**	**Unit**	**A1-A3**	**A4**
Renewable primary energy as energy carrier	PERE	MJ_{NCV}	9.59	0.00463
Renewable primary energy resources as material utilization	PERM	MJ_{NCV}	9.03	0
Total use of renewable primary energy resources	PERT	MJ_{NCV}	18.6	0.00463
Non-renewable primary energy as energy carrier	PENRE	MJ_{NCV}	1.80	0.958
Non-renewable primary energy as material utilization product	PENRM	MJ_{NCV}	0	0
Non-renewable primary energy as material utilization packaging*	PENRM	MJ_{NCV}	0.446	0
Total use of non-renewable primary energy resources	PENRT	MJ_{NCV}	2.24	0.958
Use of secondary material product	SM	kg	0	0
Use of secondary material packaging*	SM	kg	0	0
Use of renewable secondary fuels	RSF	MJ_{NCV}	0	0
Use of non-renewable secondary fuels	NRSF	MJ_{NCV}	0	0
Use of net fresh water	FW	m^3	0.00228	9.17E-06

Waste categories and output flows VE Gro-Matt | Modules A1 - A3 + A4

Table 12: Waste categories and output flows results VE Gro-Matt covering modules A1-A3 and A4

			VE Gro-Matt	
Indicator	**abb.**	**Unit**	**A1-A3**	**A4**
Hazardous waste disposed	HWD	kg	4.02E-10	3.57E-12
Non-hazardous waste disposed	NHWD	kg	0.00629	2.49E-05
Radioactive waste disposed	RWD	kg	2.73E-05	1.58E-07
Components for re-use product*	CRU	kg	0	0
Components for re-use packaging*	CRU	kg	0.00171	0
Materials for recycling product*	MFR	kg	0	0
Materials for recycling packaging*	MFR	kg	0.00102	0
Materials for energy recovery	MER	kg	0	0
Exported electrical energy	EEE	MJ_{NCV}	0	0
Exported thermal energy	EET	MJ_{NCV}	0	0

*Results are separated for product and product packaging for Use of secondary materials (SM), Non-renewable primary energy as material utilization, Components for re-use and Materials for recycling indicators as per ACLCA (2019) guidance.

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Programme Related Information and Verification

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	Post:	Vital Chemical PO Box 51 Goodna QLD 4300, Australia
Geographical scope:		Australia
Reference year		1 Jan 2018 - 31 Dec 2018
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CEN standard EN 15804+A1 served as the core PCR		PCR 2012:01 Construction Products and Construction Services, Version 2.33, 2020-09-18
PCR review conducted by:		The Technical Committee of the International EPD® System Massimo Marino info@environdec.com
Independent verification of the declaration and data, according to ISO 14025:	☐	EPD process certification (Internal)
	☑	EPD verification (External)
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Approved by:		**EPD Australasia**
Procedure for follow-up of data during EPD validity involved third-party verifier	☐	yes
	☑	no
Version history:		1.0

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.

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