ENVIRONMENTAL PRODUCT DECLARATION

EPD of multiple products, based on a representative product. The products covered in the EPD are listed on page 20.

In accordance with ISO 14025 and EN 15804+A2:2019/AC:2021 for:

HYDRA STORM SN8 CORRUGATED rHDPE PIPES

BY HYDRA STORM

Programme: The International EPD System, www.environdec.com
Programme Operator: EPD International AB
Regional Programme: EPD Australasia www.epd-australasia.com
EPD Registration Number: EPD-IES-0014124
Valid from: 2024-09-05
Valid Until: 2029-09-05
Version: 1.0
Geographical location: Australia

An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at https://epd-australasia.com/

EPD® THE INTERNATIONAL EPD® SYSTEM

AUSTRALASIA EPD®
ENVIRONMENTAL PRODUCT DECLARATION

ECO PLATFORM EPD VERIFIED

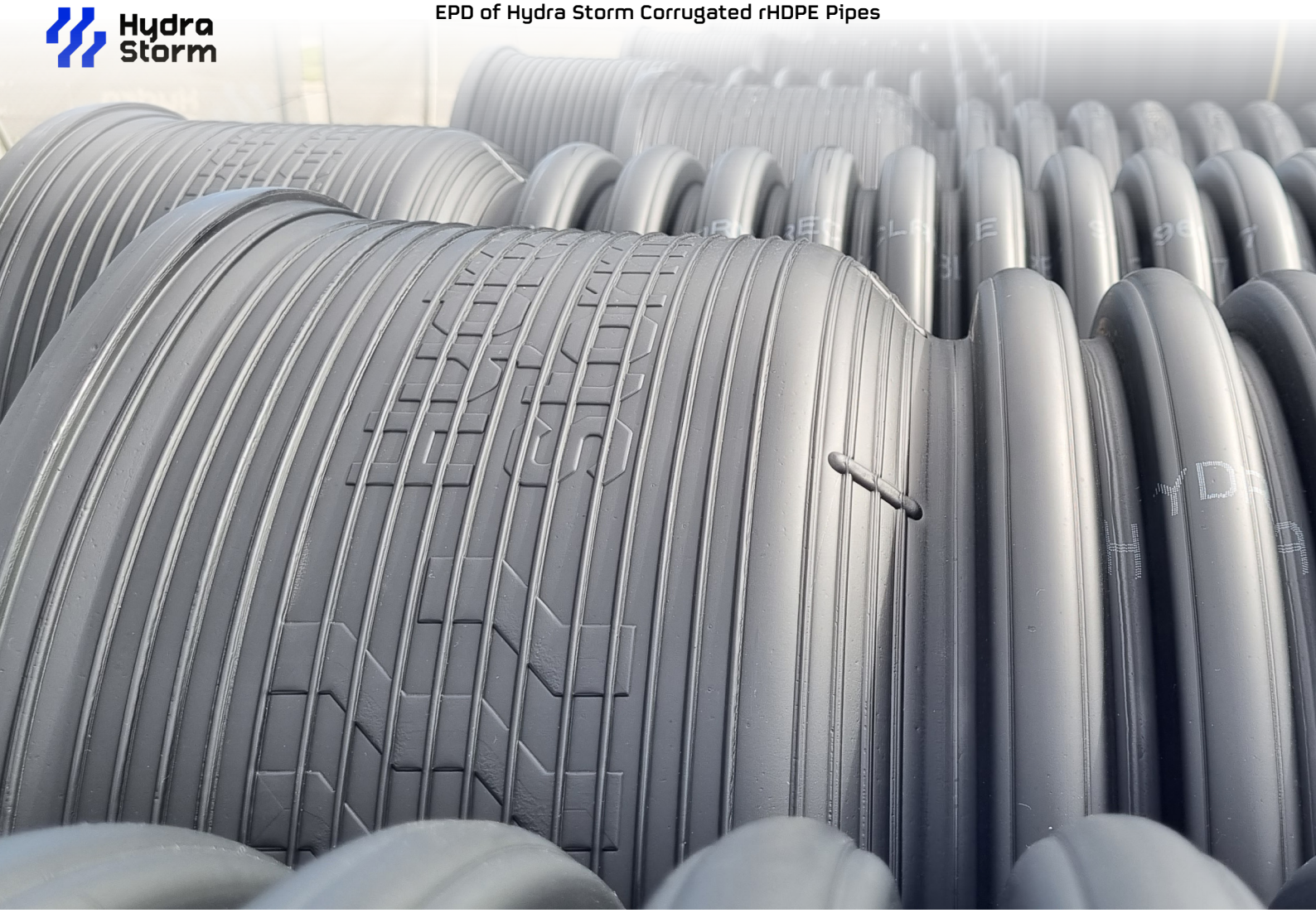
DISCLAIMER

This document offers insights into the environmental impacts associated with recycled high-density polyethylene pipes (rHDPE). Prior to purchasing goods, it is recommended to seek independent expert advice regarding their suitability for the intended purpose or application. Any safety information provided serves as a general guideline, and reliance upon or use of such information is undertaken at your own risk.

Except as outlined in Hydra Storm's terms and conditions of sale for these goods, and to the extent permitted by law, Hydra Storm disclaims liability for any direct or indirect loss, damage, or injury sustained by individuals relying on the information contained in this document.

Hydra Storm

CONTENTS



ENVIRONMENTAL PRODUCT DECLARATION

HYDRA STORM SN8 CORRUGATED rHDPE PIPES

1.0 ENVIRONMENTAL PRODUCT DECLARATION DETAILS

An Environmental Product Declaration (EPD) is a standardised and verified method of quantifying the environmental impacts of a product, based on consistent guidelines known as Product Category Rules (PCR). EPDs for products within the same category from different programs may not be directly comparable, as highlighted by ISO 14025. Additionally, adherence to standards such as EN 15804 ensures consistency in EPDs for construction products. This product specific EPD, aligned with principles from ISO 14040 and ISO 14044, provides detailed information on environmental impacts associated with the A5 module (installation module), focusing significantly on factors influenced by pipeline designers, infrastructure agencies, and installing contractors.

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

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

Declaration Owner:	**Hydra Storm** Web: www.hydrastorm.com.au Email: sales@hydrastorm.com.au Post: PO Box 517, Rockingham DC 6967
Geographical Scope:	Australia
Reference Year of Data:	2023-05-01 to 2024-04-30
EPD Programme Operator:	**EPD International AB** Web: https://www.environdec.com/ Email: info@environdec.com Post: Box 210 60, SE-100 31 Stockholm, Sweden
Regional Programme Operator:	**EPD Australasia Limited** Web: http://www.epd-australasia.com Email: info@epd-australasia.com Post: EPD Australasia Limited, 315a Hardy Street, Nelson 7010 New Zealand

PRODUCT CATEGORY RULES (PCR)

CEN Standard EN 15804 served as the core Product Category Rules (PCR)	
Product Category Rules (PCR):	PCR 2019:14 Construction Products, Version 1.3.2, 2023-12-08 (valid until 2024-12-20)
PCR review was conducted by:	The Technical Committee of the International EPD® System. See www.environdec.com for a list of members. The review panel may be contacted via info@environdec.com.
Review Chair:	No chair appointed

LIFE CYCLE ASSESSMENT (LCA)

LCA accountability:	**thinkstep Pty Ltd** Web: http://www.thinkstep-anz.com Email: anz@thinkstep-anz.com Post: 25 Jubilee Street, Perth, Western Australia 6151, Australia

THIRD-PARTY VERIFICATION

Independent verification of the declaration and data, according to ISO 14025:2006
X EPD verification by individual verifier

Third party verifier:	**Life Cycle Logic** Andrew D. Moore Web: www.lifecyclelogic.com.au Email: andrew@lifecyclelogic.com.au Phone +61 4 2432 0057
Verifier approved by:	EPD Australasia Ltd
Procedure for follow-up of data during EPD validity involved third-party verifier	Yes X No

2.0 PRODUCT SUSTAINABILITY

This EPD can be utilised to earn product sustainability credit points under the Green Building Council of Australia's (GBCA) Green Star rating tools and the Infrastructure Sustainability (IS) rating tools.

For IS ratings, EPDs are considered Type III environmental declarations that offer valuable data on environmental impacts for IS rewards.

Hydra Storm SN8 Corrugated rHDPE pipe EPD results can also be applied to represent rHDPE pipe products in Whole of Building Life Cycle Assessments under Green Star rating tools. Please refer to the product detail tables for converting the product results from kilograms of installed pipe to pipe length for individual products.

3.0 HYDRA STORM

Founded in 2002, Hydra Storm started as a precast concrete manufacturer producing stormwater and products for civil infrastructure, local governments and mining.

In 2021, Hydra Storm saw an opportunity to dive into the world of thermoplastics. This expansion into plastics by producing Corrugated HDPE pipes, allowed Hydra Storm to become a hybrid manufacturer of stormwater solutions in Australia.

Hydra Storm is a leading provider of innovative stormwater management solutions, dedicated to ensuring the efficient and sustainable management of stormwater. With a strong commitment to environmental stewardship, Hydra Storm offers a comprehensive range of products and services designed to mitigate the impact of stormwater on our ecosystems.

At Hydra Storm, we understand the challenges posed by stormwater runoff, including flooding, erosion, and water pollution. Our team of experts combines extensive knowledge and cutting-edge technology to develop effective stormwater management solutions that meet the unique needs of our clients.

We take pride in our commitment to quality, sustainability and environmental responsibility. Our stormwater management solutions are designed to not only effectively manage stormwater runoff but also promote the preservation and restoration of natural habitats. By implementing Hydra Storm's solutions, you can contribute to a healthier and more sustainable future for our communities.

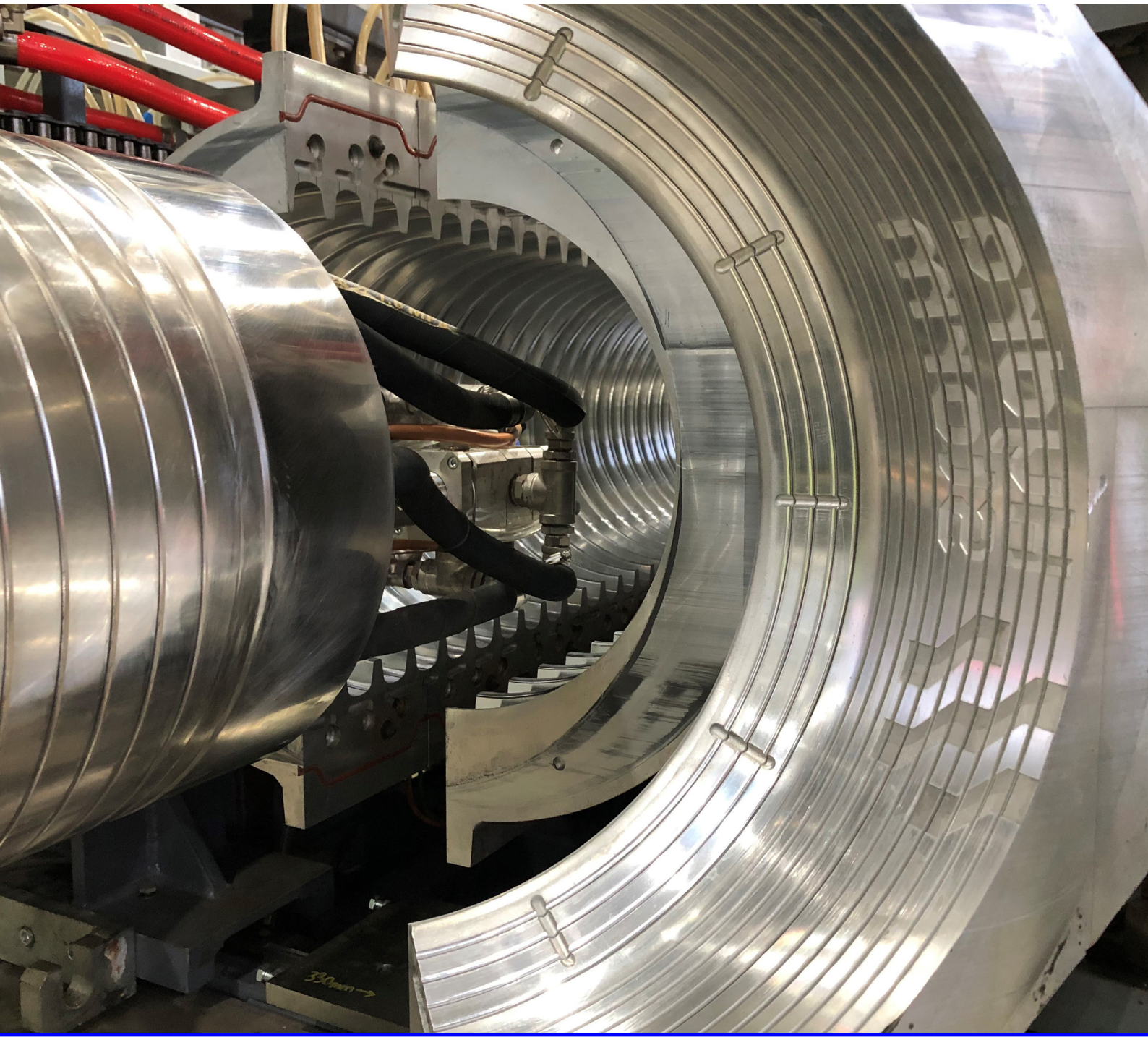
At Hydra Storm, we believe in the power of collaboration and partnership. We work closely with our clients to understand their unique challenges and goals, ensuring that our stormwater solutions are tailored to their specific needs. Our team of experienced professionals is dedicated to providing exceptional customer service and support throughout the entire project lifecycle.

Hydra Storm are tri-certified to ISO 9001, ISO 45001 and ISO 14001, ensuring Quality, OSH and Environmental Management Systems are adhered to in all products manufactured by Hydra Storm.

TECHNICAL CAPABILITY

Hydra Storm is dedicated to sustainability, producing pipes made entirely from recycled HDPE material (rHDPE). Our SN8 corrugated pipes adhere to the strict requirements of AS/NZS 5065, combining high performance with environmental responsibility. We operate in full compliance with ISO 9001 for quality management, ISO 45001 for occupational health and safety, and ISO 14001 for environmental management, reflecting our commitment to superior product standards and sustainable practices.

Our adherence to these international standards underscores our commitment to maintaining the highest levels of product quality, workplace safety, and environmental stewardship. To further support our customers, we provide a range of design tools to assist in product specification and design, enabling precise integration of our pipes into various applications. This comprehensive approach ensures that Hydra Storm remains at the forefront of industry innovation while continually advancing our sustainability objectives.



CONTENT DECLARATION

TABLE 1 - CONTENT DECLARATION

Product components	Weight (kg)	Post-consumer material, % mass	Biogenic material, weight-% and kg C per kg
rHDPE	>0.99	89	0 resp, 0
Additive	2.13E-05	0	0 resp, 0
Ink	2.18E-05	0	0 resp, 0
Total	1.00	89	0 resp, 0
Other component included			
Rubber ring	0.028	0	0 resp, 0
Packaging materials	**Weight, kg**	**Weight-% (versus the product)**	**Weight biogenic carbon, kg C/kg**
Timber	0.0128	1.28	0.00664
PET strapping	7.27E-04	0.07	0
Poly woven bags	4.73E-05	0.005	0
Sum	0.0136	1.36	0.00664

None of the products considered in this EPD contain materials identified in the European Chemical Agency's Candidate List of Substances of Very High Concern in the products at a concetration greater than 0.1% (ECHA, 2022).

INDSUTRY CLASSIFICATION

TABLE 2 - INDUSTRY CLASSIFICATION

Product	Classification	Code	Category
Product name/type	UN CPC Ver2.1	36320	Tubes, pipes and hoses, and fittings therefor, of plastics
	ANZSIC 2006	19120	Rigid and Semi-Rigid Polymer Product Manufacturing

DECLARED UNIT

ISO 14040 defines a functional unit as "quantified performance of a product system for use as a reference 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" instead.

The declared unit for the EPD is 1 kg of rHDPE corrugated pipe manufactured, packaged, and distributed to the customer with rubber ring seal.

The 1 kg product weight does not include the weight of rubber ring seal and packaging.

SCOPE

The scope of this LCA is cradle to gate with options, module C1-C4, module D and optional modules (A1-A3 + A4 + C + D). The following LCA stages have not been declared as they deemed not applicable/declared:Construction/ Installation (A5), Use (B1), Maintenance (B2), Repair (B3), Replacement (B4), Refurbishment (B5), Operational Energy Use (B6) and Operational Water use (B7).

The EPD complies with Product Category Rules – Construction Products (PCR 2019:14), EN 15804+A2 standard, ISO 14025, and General Programme Instructions (GPI). This EPD is aimed at businesses or customers using Hydra Storm's rHDPE pipes. It provides environmental impact data for Hydra Storm's rHDPE pipes. This EPD pertains to the Kwinana (WA) manufacturing site of Hydra Storm. As rHDPE pipes are produced at only this site, this EPD specifically covers rHDPE pipes from this production facility, and no weighted average calculation was performed for the manufacturing site.

HYDRA STORM SN8 CORRUGATED rHDPE PIPES

Hydra Storm Corrugated rHDPE pipes are manufactured exclusively from recycled PE Neutral material in Kwinana, Western Australia. PE Neutral material is manufactured in Australia from 100% Australian HDPE waste. Material is processed by D&M Waste Management in an integrated state of the art facility with Hydra Storm. Recycled PE Neutral material is blown into external silo's for storage and consumption by Hydra Storm. The primary section of the manufacturing line comprises of two extruders, each dedicated to a specific layer. These extruders utilise a combination of applied heat and internal friction to melt and propel the molten material through the extrusion die.

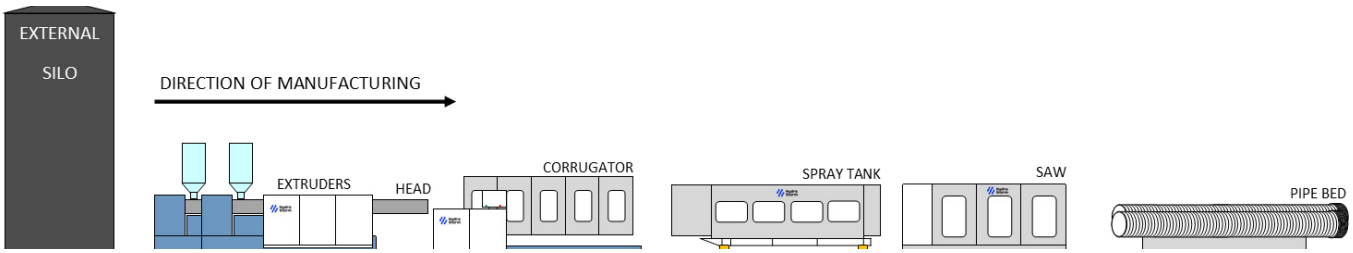
The extrusion die shapes the molten rHDPE into annular rings, forming the two layers. The inner layer is then drawn over a smooth cooling mandrel, while the outer layer is captured by a moving carousel of mold blocks with a corrugated profile.

Vacuum force is employed to pull the outer layer into the mold block cavity, while the controlled wall thickness and gap between the mold blocks and inner calibration mandrel press the two layers together, creating a bond at the trough of each corrugation. Chilled water is continuously circulated through the mold blocks and inner mandrel to solidify the material in the desired shape. At specific locations, specialised blocks are automatically inserted into the mold train to create a socket or "cuff." Only the outer layer is utilized in the formation of the cuff.

The pipes are cut by the cutter at the appropriate position relative to the cuff. Additionally, the smart trim removes a section of the inner layer from the cuff to create the correct socket profile for jointing. Afterward, the pipes are stacked and packaged for storage and transportation using timber and PET strapping materials - DN225, 300 375 and 450mm pipes are stacked and store loose. DN525 and 600mm are stored on timber and strapped with PET material.

Any internal waste, including off-cuts from the smart trim process, is granulated on-site and recycled into recycled PE Neutral material by D&M Waste Management.

MANUFACTURING DIAGRAM



SYSTEM BOUNDARIES

As shown in the table below, this EPD is of the type b) Cradle to gate with options, module C1- C4, module D and optional modules (A1-A3 + A4 + C + D). The production stage (Modules A1-A3) includes all aspects of rHDPE pipes (including rHDPE pellets production) from cradle-to-gate, utilising elementary and product flows.

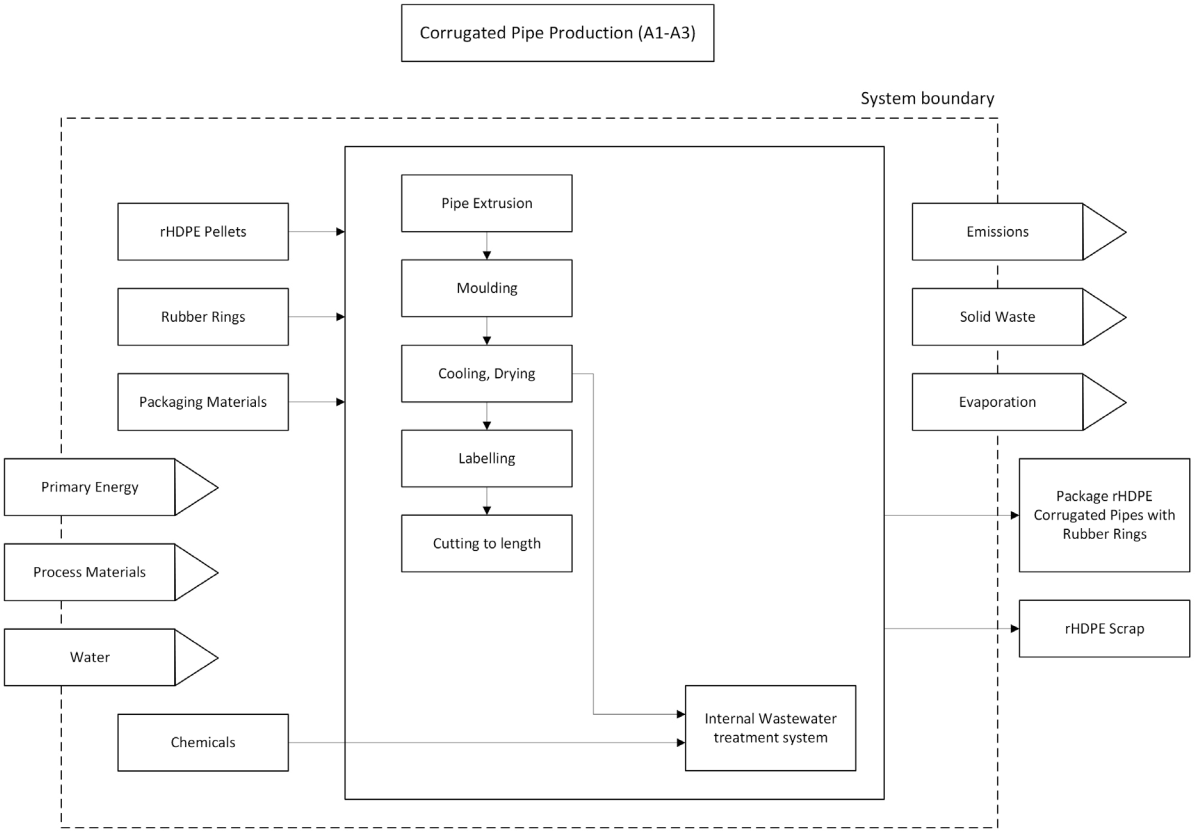
TABLE 3: MODULES OF PRODUCTION LIFE CYCLE INCLUDED IN THE EPD

	PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				RESOURCE RECOVERY STAGE
	RAW MATERIAL SUPPLY	TRANSPORT	MANUFACTURING	TRANSPORT	CONSTRUCTION INSTALLATION	USE	MAINTENANCE	REPAIR	REPLACEMENT	REFURBISHMENT	OPERATIONAL ENERGY USE	OPERATIONAL WATER USE	DE-CONSTRUCTION DEMOLITION	TRANSPORT	WASTE PROCESSING	DISPOSAL	FUTURE REUSE, RECYLING OR ENERGY RECOVERY POTETIAL
MODULE	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
MODULES DECLARED	X	X	X	X	ND	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X
GEOGRAPHY	GLO	GLO	AU	AU	-	-	-	-	-	-	-	-	AU	AU	AU	AU	AU
SPECIFIC DATA	93%***			-	-	-	-	-	-	-	-	-	-	-	-	-	-
VARIATION PRODUCTS **	<10%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
VARIATION SITES*	0%			-	-	-	-	-	-	-	-	-	-	-	-	-	-

X = included in the EPD
ND = Module not declared
* Only on site at 14 Butcher Street, Kwinana Beach WA
** The variation is only due to the rubber ring for which a worst-case assumption has been made. There is no variation between rHDPE pipe products as the declared unit is in kilograms of pipe.
***Includes all input data for upstream recycled HDPE pellet production, electricity, water use, diesel, lubricant and packaging materials on production site.

LIFE CYCLE DIAGRAM OF HYDRA STORM SN8 CORRUGATED RHDPE PIPE PRODUCTION

FIGURE 1: rHDPE CORRUGATED PIPE PRODUCTION PROCESS (MODULES A1-A3)



Since Module C is included in the EPD, the use of Module A1-A3 results without considering the results of Module C is discouraged.

DISTRIBUTION

Hydra Storm SN8 Corrugated rHDPE are distributed Australia wide. Distribution methods include Road (trucks) and rail. To calculate this distances were taken from manufacturing site to rail depot, rail depot to depot (interstate) and rail depot to distribution location in each capital city.

TABLE 4: TRANSPORT TO CUSTOMER (MODULE A4)

Scenario Information	Unit (expressed per functional unit or per declared unit)
vehicle type used for transport e.g. long distance truck, boat etc.	Truck: Euro 0 - 6 mix, 20 - 26t gross weight / 17,3t payload capacity Rail: Transport cargo - average, average train, gross tonne weight 1,000t / 726t payload capacity
Distance	43.3 km (Truck) 2750 km (Rail)
Capacity utilisation (including empty returns)	32% (Truck) 40% (Rail)
Bulk density of transported products	30.3 kg/m³
Volume capacity utilisation factor (factor: =1 or < 1 o r ≥ 1 for compressed or nested packaged products)	Not applicable

END OF LIFE (MODULE C) & RECOVERY AND RECYCLING POTENTIAL (MODULE D)

This study assumes that the most likely scenario is that the pipes will be abandoned. Hence although the pipe is 100% recyclable by itself, the pipe remains in the ground, and is not excavated at the end-of-life of the pipe that is over 100 years. This assumption is aligned with other EPDs.

4.0 CUT-OFF CRITERIA AND EXCLUDED PROCESSES

This section outlines the key aspects of the life cycle assessment study, including its assumptions and assessment methods. A summary of the parameters considered in the LCA is provided below.

DECLARED UNIT	The declared unit for the EPD is 1 kg of rHDPE corrugated pipe manufactured, packaged, and distributed to the customer with rubber ring seal.
GEOGRAPHICAL COVERAGE	Australia
LCA SCOPE	Cradle to gate with options, module C1- C4, module D and optional modules (A1-A3 + A4 + C + D).
DATA COLLECTION	Primary data were used for all manufacturing operations up to the plant gate, including upstream data for inputs. Primary data for Hydra Storm's operations were sourced for the calendar year 2023 (from 2023-05-01 to 2024-04-30). All secondary data come from MLC Database 2023.1 (Sphera, 2023) and are representative of the years 2019-2022. As the study intended to compare the production systems for the reference year 2022, all background data fall within the 10-year limit allowable for generic data under EN 15804.
DATABASE AND LCA SOFTWARE USED	The LCA model was created using the Life Cycle for Experts (LCA FE) v10.7.1.28 (formerly known as GaBi Software) for life cycle engineering, developed by Sphera Solutions, Inc. The Managed LCA Content (MLC) database v2023.1 (Sphera, 2023) (formerly known as GaBi LCI database) provides the life cycle inventory data for several of the raw and process materials obtained from the background system.

Life Cycle Assessment (LCA) involves assessing the inputs, outputs, and environmental impacts of a product system across its entire life cycle. It helps businesses analyze resource flows, waste generation, and environmental impacts like climate change associated with the production of goods and services. Adopting life cycle thinking is crucial in sustainable consumption and production, guiding policies and business practices to consider both upstream and downstream consequences. This approach helps prevent the transfer of environmental burdens between impact categories, regions, or stages within a product's life cycle, from its creation to its disposal.

In accordance with EN 15804, the Environmental Product Declarations (EPDs) of construction products may lack comparability if they do not adhere to this standard. Furthermore, EPDs may not be comparable, especially when different functional units are used in their assessment.

UPSTREAM DATA

The composition of the residual electricity grid mix of Western Australia is modelled in LCA FE based on published data for the financial year 1st July 2022 – 30st June 2023 (Electricity Gas Australia, 2024). The Western Australian residual electricity mix is made up of hard coal (40.6%), natural gas (59.4%), and heavy fuel oil (0.0339%).
Onsite consumption (0.302%), and the medium voltage (1kV-60kV) grid's transmission and distribution losses (1.88%) are calculated based on data from the Australian Energy Market Operator (Western Power, 2023).
The emission factor for the Western Australian residual grid mix for the GWP-GHG indicator is 0.847 kg CO2e/kWh based on EF3.1.

CUT-OFF CRITERIA AND EXCLUDED PROCESSES

Personnel is excluded as per section 4.3.2 of the PCR 2019:14 v1.3.2, published (EPD International, 2023). Environmental impacts from infrastructure, construction, production equipment and tolls that are not directly consumed in the production process ('capital goods') are excluded 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.

Infrastructure used in electricity generation is included as standard in the LCAFE datasets, as this is important for renewable generation .For the processes within the system boundary, minor inputs with negligible impacts over the life cycle such as raw material packaging are cut offs. However, all other 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.

All other reported data was incorporated and modelled using the best available life cycle inventory data, in compliance with EN15804 (section 6.3.6) and the PCR.

ALLOCATION

Where subdivision of processes was not possible, allocation rules listed in PCR chapter 4.5 have been applied.
This EPD uses economic allocation for co-products. Economic allocation is used when the impact of a certain input or output cannot be allocated using process allocation and is commonly used to allocate impacts to scrap. In this study, in accordance with the PCR v1.3.2, we have used economic allocation for pre-consumer HDPE waste input as well as the scrap co-product produced during pipe production. The product prices were based on FY23 data. Allocation for input materials that contain secondary material occurs in the upstream datasets. Multi-output allocation generally follows the requirements of ISO 14044, section 4.3.4.2. and the provision of PCR 2019:14 v1.3.2, section 4.5.1.

End-of-life allocation follows the requirements of EN 15804:2017+A2:2019 § 6.4.3.3 and generally follows the polluter pays principle. In this study, based on records for return of pipes and the life span of the corrugated pipes being over 100 years, it is assumed that they will remain in the ground forever. Although they are 100% recyclable at the end-of-life it is assumed that the pipes are neither excavated nor do not disintegrate in the 100-year span.

The "end-of-waste" state for the HDPE scrap produced during pipe production is at the point right before the scrap leaves the pipe production facility. This cut-off point is made because the HDPE scrap has economic value, and is bought by our sister company, D&M recycling from Hydra Storm. Module D for all HDPE scrap starts at the "end of waste", when the HDPE is no longer a product in its first life cycle and starts to be a potential input for its second life cycle. End of waste state for HDPE post-consumer waste is when it leaves the mine site. It begins with the transport of processed scrap from scrap dealers (paid by the scrap dealer) and includes the full recycling process (repelletisation) to produce rHDPE pellets. For offcuts that are landfilled, landfill is the end-of-waste point.

ASSESSMENT INDICATORS

The results tables describe the different environmental indicators for each product per declared unit, for each declared module. The EN 15804 reference package based on EF 3.1 is used.

The estimated impact results are only relative statements, which do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins and/or risks.

The use of primary energy is separated into energy used as raw material and energy used as energy carrier as per option C in Annex 3 in the PCR (EPD International, 2023).

Energy indicators (MJ) are always given as net calorific value.

TABLE 5: ABBREVIATIONS

EN15804+A2 CORE ENVIRONMENTAL IMPACT INDICATORS		
IMPACT CATEGORY	**ABBREVIATION**	**UNIT**
Climate change – total	GWP-total	kg CO2-eq.
Climate change – fossil	GWP-fossil	kg CO2-eq.
Climate change – biogenic	GWP-biogenic	kg CO2-eq.
Climate change – land use and land use change	GWP-luluc	kg CO2-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 [1]	ADP-m&m	kg Sb-eq.
Depletion of abiotic resources – fossil fuels [1]	ADP-fossil	MJ
Water use [1]	WDP	m³ world equiv.
LIFE CYCLE INVENTORY INDICATORS ON USE OF RESOURCES		
INDICATOR	**ABBREVIATION**	**UNIT**
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	PERE	MJ
Use of renewable primary energy resources used as raw materials	PERM	MJ
Total use of renewable primary energy resources	PERT	MJ
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	PENRE	MJ
Use of non-renewable primary energy resources used as raw materials	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
Total use of net fresh water	FW	m³

Continued on page 17

LIFE CYCLE INVENTORY INDICATORS ON WASTE CATEGORIES AND OUTPIT FLOWS		
INDICATOR	**ABBREVIATION**	**UNIT**
Hazardous waste disposed	HWD	kg
Non-hazardous waste disposed	NHWD	kg
Radioactive waste disposed	RWD	kg
Components for reuse	CRU	kg
Materials for energy recovery	MER	kg
Materials for recycling	MFR	kg
Exported electrical energy	EEE	MJ
Exported thermal energy	EET	MJ
EN15804+A2 ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS		
INDICATOR	**ABBREVIATION**	**UNIT**
Climate Change [2]	GWP-GHG	kg CO2-eq
Climate Change [3]	GWP-GHG (IPCC AR5)	kg CO2-eq
Particulate Matter emissions	PM	Disease incidences
Ionising Radiation – human health [4]	IRP	kBq U235 eq.
Eco-toxicity (freshwater) [1]	ETP-fw	CTUe
Human Toxicity, cancer [1]	HTP-c	CTUh
Human Toxicity, non-cancer [1]	HTP-nc	CTUh
LAND USE RELATED IMPACTS / SOIL QUALITY [1]	SQP	DIMENSIONLESS
BIOGENIC CARBON CONTENT INDICATOR		
INDICATOR	**ABBREVIATION**	**UNIT**
Biogenic carbon content - product	BCC-prod	kg C
Biogenic carbon content - packaging	BCC-pack	kg C
EN15804+A1 ENVIRONMENTAL IMPACT INDICATORS		
INDICATOR	**ABBREVIATION**	**UNIT**
Global warming potential	GWP (EN15804+A1)	kg CO2-eq.
Ozone depletion potential	ODP (EN15804+A1)	kg CFC11-eq.
Acidification potential	AP (EN15804+A1)	kg SO2-eq.
Eutrophication potential	EP (EN15804+A1)	kg PO43-eq.
Photochemical ozone creation potential	POCP (EN15804+A1)	kg C2H4-eq.
Abiotic depletion potential for non-fossil resources	ADPE (EN15804+A1)	kg Sb-eq.
Abiotic depletion potential for fossil resources	ADPF (EN15804+A1)	MJ

DISCLAIMERS

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

[2]This indicator is identical to GWP-total except that the CF for biogenic CO2 is set to zero. It has been included in the EPD following the PCR.

[3]GWP-GHG (IPCC AR5) is an additional GWP100 indicator that is aligned with the Intergovernmental Panel on Climate Change (IPCC) 2013 Fifth Assessment Report (AR5) (IPCC 2013), national greenhouse gas reporting frameworks in Australia and New Zealand and previous versions of the Construction Products PCR (PCR2019:14v1.11). It excludes biogenic carbon and indirect radiative forcing.

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

5.0 ENVIRONMENTAL PERFORMANCE OF HYDRA STORM SN8 CORRUGATED rHDPE PIPE

Results for 1 kg of recycled HDPE corrugated pipe manufactured, packaged, and distributed to the customer with rubber ring seal (0.028kg per kg of pipe). The 1 kg product weight does not include the weight of rubber ring seal and packaging.

ENVIRONMENTAL IMPACT RESULTS

TABLE 6: EN15804+A2 CORE ENVIRONMENTAL IMPACT INDICATORS

INDICATOR	UNIT	A1-A3	A4	C1	C2	C3	C4	D
GWP-total	kg CO2-eq.	1.39	0.0831	0	0	0	0	0
GWP-fossil	kg CO2-eq.	1.39	0.0826	0	0	0	0	0
GWP-biogenic	kg CO2-eq.	0.00473	5.13E-04	0	0	0	0	0
GWP-luluc	kg CO2-eq.	8.21E-05	1.52E-06	0	0	0	0	0
ODP	kg CFC11-eq.	1.98E-13	4.56E-13	0	0	0	0	0
AP	Mole of H+ eq.	0.00613	4.78E-04	0	0	0	0	0
EP-fw	kg P eq.	2.47E-07	3.81E-08	0	0	0	0	0
EP-fm	kg N eq.	0.00184	1.46E-04	0	0	0	0	0
EP-tr	Mole of N eq.	0.0201	0.00159	0	0	0	0	0
POCP	kg NMVOC eq.	0.00478	3.87E-04	0	0	0	0	0
ADP-mm	kg Sb-eq.	1.35E-06	2.12E-09	0	0	0	0	0
AFP-fossil	MJ	20.0	0.964	0	0	0	0	0
WDP	m³ world eq. deprived	0.299	0.0261	0	0	0	0	0

RESOURCE USE RESULTS

TABLE 7: USE OF RESOURCES

INDICATOR	UNIT	A1-A3	A4	C1	C2	C3	C4	D
PERE	MJ	0.193	0.196	0	0	0	0	0
PERM	MJ	0.211	0	0	0	0	0	0
PERT	MJ	0.404	0.196	0	0	0	0	0
PENRE	MJ	48.4	0.964	0	0	0	0	0
PENRM	MJ	48.8	0	0	0	0	0	0
PENRT	MJ	97.2	0.964	0	0	0	0	0
SM	kg	1.10	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	m³	0.00337	3.67E-04	0	0	0	0	0

WASTE CATEGORIES AND OUTPUT FLOW RESULTS

TABLE 8: WASTE PRODUCTION AND OUTPUT FLOWS

INDICATOR	UNIT	A1-A3	A4	C1	C2	C3	C4	D
HWD	kg	7.76E-10	1.46E-13	0				0
NHWD	kg	0.0185	2.29E-04	0				0
RWD	kg	2.54E-05	1.22E-07	0				0
CRU	kg	0	0	0				0
MFR	kg	0.123	0	0				0
MER	kg	0	0	0				0
EEE	MJ	0.00187	0	0				0
EET	MJ	0	0	0				0

ADDITIONAL INDICATORS

TABLE 9: EN15804+A2 ADDITIONAL ENVIRONMENTAL INDICATORS

INDICATOR	UNIT	A1-A3	A4	C1	C2	C3	C4	D
GWP-GHG	kg CO2-eq.	1.41	0.0827	0	0	0	0	0
GWP-GHG (IPCC AR5)	kg CO2-eq.	1.39	0.0827	0	0	0	0	0
PM	Disease incidence	4.75E-08	4.57E-09	0	0	0	0	0
IRP	kBq U235 eq.	0.00406	1.68E-05	0	0	0	0	0
ETP-fw	CTUh	4.91	0.226	0	0	0	0	0
HTPc	CTUh	2.11E-10	7.55E-12	0	0	0	0	0
HTPnc	CTUh	9.56E-09	1.65E-10	0	0	0	0	0
SQP	Dimensionless	2.43	0.0806	0	0	0	0	0

BIOGENIC CARBON CONTENT

TABLE 10: MODULE A1-A3 BIOGENIC CARBON CONTENT FOR 1KG OF rHDPE CORRUGATED PIPE.

INDICATOR	UNIT	A1-A3
BCC-prod	kg C / Declared unit	0
BCC-pack	kg C / Declared unit	0.00664

Note: 1kg of biogenic carbon is equivalent to 44/12 kg CO2

ADDITIONAL INDICATORS

TABLE 11: EN15804+A1 ENVIRONMENTAL IMPACT INDICATORS

INDICATOR	UNIT	A1-A3	A4	C1	C2	C3	C4	D
GWP (EN15804+A1)	kg CO2 Eq.	1.36	0.0827	0	0	0	0	0
ODP (EN15804+A1)	kg CFC-11 Eq.	2.33E-13	5.37E-13	0	0	0	0	0
AP (EN15804+A1)	kg SO2 Eq.	0.00477	3.71E-04	0	0	0	0	0
EP (EN15804+A1)	kg PO4 3- Eq.	6.24E-04	4.94E-05	0	0	0	0	0
POCP (EN15804+A1)	kg C2H4 Eq.	2.98E-05	7.74E-06	0	0	0	0	0
ADPE (EN15804+A1)	kg Sb Eq.	1.35E-06	2.12E-09	0	0	0	0	0
ADPF (EN15804+A1)	MJ	19.8	0.960	0	0	0	0	0

6.0 PRODUCT SPECIFICATIONS

Hydra Storm's HDPE pipes are available in sizes of nominal diameter (DN) 225 mm to 600 mm and 6-meter lengths. They are installed using a rubber ring jointing system which is provided by Hydra Storm as part of the product.

Rubber rings provided with the pipes vary based on the pipe diameter. However, they are not linearly proportional to the mass of the pipe. Hence using a conservative approach highest ring mass per kg of pipe of 0.0276, which is for pipe PE600C, has been used for all products.

TABLE 12: DETAILS OF rHDPE CORRUGATED PIPES AND RUBBER RINGS

PRODUCT CODE	DN [5]	STIFFNESS CLASS [5]	NOMINAL OVERALL LENGTH (mm) [5]	MEAN OUTSIDE DIAMETER [5]	MEAN INTERNAL DIAMETER [5]	WEIGHT (kg) [5]	CALCULATED RING MASS (kg) [6]	RING MASS/kg OF PIPE [7]
PE225C	225	SN8	6,446	252	218	20	0.552	0.0276
PE300C	300	SN8	6,408	344	294	34	0.938	0.0276
PE375C	375	SN8	6,366	423	363	53	1.463	0.0276
PE450C	450	SN8	6,351	504	435	79	2.180	0.0276
PE525C	525	SN8	6,311	601	519	105	2.898	0.0276
PE600C	600	SN8	6,245	688	589	134	3.698	0.0276

[5] Source: https://www.hydrastorm.com.au/hdpe-corrugated-pipe/
[6] Calculate based on the total pipe weight (kg) for each product multiplied by the ring mass of 0.0276kg per kg of pipe.
[7] Assumed highest ring mass of 0.0276 kg per kg of pipe based on pipe PE600C for all products (conservative approach).

7.0 REFERENCES

General Programme Instructions for the International EPD® System. Version 4.0, dated 2021-03-29. www.environdec.com.

PCR 2019:14 Construction Products, Version 1.3.2, 2023-12-08. EPD International.

EN 15804:2012+A1:2013; Sustainability of construction works — Environmental product declarations — Core rules for the product category of construction products . Brussels: European Committee for Standardization.

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 Standardization.

ISO 14040:2006; Environmental management – Life cycle assessment – Principles and framework. Geneva: International Organization for Standardization.

ISO 14044:2006; Environmental management – Life cycle assessment – Requirements and guidelines. Geneva: International Organization for Standardization.

ISO 14025:2006; Environmental labels and declarations — Type III environmental declarations — Principles and procedures. Geneva: International Organization for Standardization.

Sphera. (2023). Life Cycle Inventory Database 2023 Documentation. Retrieved from Sphera: https://sphera.com/product-sustainability-gabi-data-search/