PACIFIC STEEL
CERTAIN STRENGTH

Environmental Product Declaration

Reinforcing Bar, Coil and Wire

AUSTRALASIA EPD®
ENVIRONMENTAL PRODUCT DECLARATION

Programme: EPD Australasia,
www.epd-australasia.com

ECO PLATFORM EPD VERIFIED

Programme Operator:
EPD Australasia Limited

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 epd-australasia.com

IN ACCORDANCE WITH ISO 14025 AND EN 15804:2012+A2:2019/AC:2021

Publication Date: 2018-10-25
Version Date: 2024-02-29
Valid Until: 2029-02-28
EPD Registration Number: S-P-01002
Version 2.0
Geography: New Zealand

Pacific Steel Environmental Product Declaration

KEY INSIGHTS

Rating Tool EPD Compliance

- As per ISO 14025 and EN 15804:2012+A2:2019 (CEN, 2019)
- Independently verified
- Cradle-to-gate with modules C1-C4 and module D
- Product specific

Pacific Steel Overview

Version History:

- **Version 1.0**

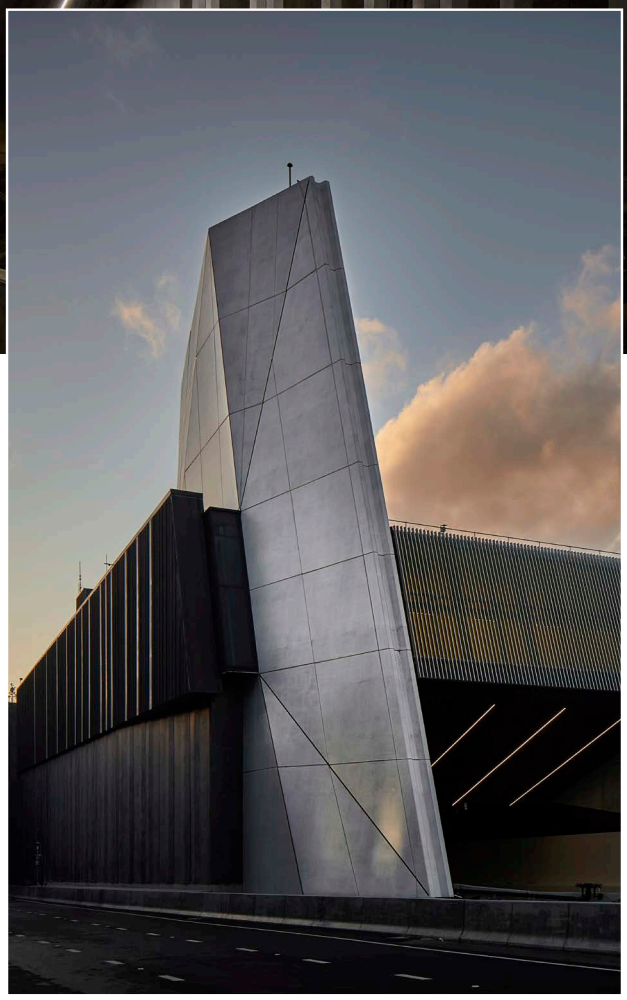
  Initial release (2018/10/25)

- **Version 2.0**

  Updated in line with 5-year validity, including updated data for all processes and results to EN15804+A2.

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 registered in different EPD programmes, or not compliant with EN 15804, may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025. The results for EN15804+A1 compliant EPDs are not comparable with EN15804+A2 compliant studies as the methodologies are different. Results that are EN15804+A1 compliant are given in this document to assist comparability across EPDs.



Case Study 1

Auckland Waterview Tunnel

Stretching between Pt Chevalier and Mt Roskill, the Waterview Tunnel project represents a critical piece of the Western Ring Route connecting Manukau, the city, West Auckland and the North Shore. During construction, engineers utilised an 87m-long custom-made Tunnel Boring Machine which excavated enough dirt to fill 320 Olympic-sized swimming pools, and installed more than 24,000 concrete segments to line the two tunnels. Pacific Steel's reinforcing bar was used for the reinforcing of the concrete, with the completed tunnels each measuring 2.4km in length, making them the longest road tunnels in New Zealand.

The History of Pacific Steel

NEW ZEALAND MADE FOR OVER 60 YEARS

Pacific Steel is New Zealand's only manufacturer of Wire Rod, Reinforcing Bar and Coil products, having produced high quality products for more than 60 years. Our Auckland based manufacturing facility has a capacity to produce 250,000 tonnes of manufactured steel per year, with much of this volume destined for foundations and structures around New Zealand.

We're also committed to providing our customers with outstanding service and exceptional products. Our Australasian Certification Authority for Reinforcing and Structural Steels, or 'ACRS' third party certification, is a reflection of the emphasis we place on quality. ACRS certification reduces the risk to our customers and end users by providing assurances that our products consistently meet the industry recognised highest standards and specifications.

We're also committed to working in the most efficient, environmentally-friendly manner possible, with our reinforcing products manufactured to Environmental Choice eco-label standards.

Case Study 2

Te Apiti Windfarm

Located 10km outside Palmerston North, the Te Apiti windfarm leverages the Manawatu Gorge's world-class wind resources to supply electricity to the national grid. A 400-tonne crawler crane was used to install the farm's 55 Vestas turbines, which have a combined capacity of more than 90 megawatts. Officially opened in December 2004 (just over a year after construction began) Te Apiti produces enough electricity every year to meet the electricity needs of approximately 30,000 average homes.

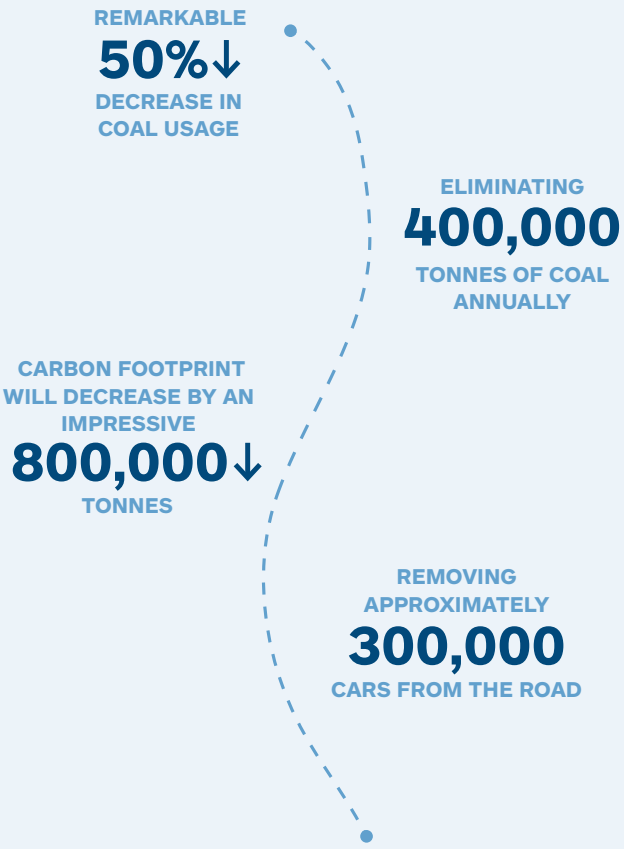
Reinforcing bar, locally manufactured by Pacific Steel in their Auckland based facility, was used for reinforcing the concrete.

Securing the future for lower emissions steel in New Zealand

Pacific Steel's sister business, New Zealand Steel, has recently announced plans to construct a state-of-the-art Electric Arc Furnace (EAF) at their Glenbrook steelworks.

Pacific Steel exclusively source their steel billets from New Zealand Steel and view the EAF as a crucial step towards harnessing renewable energy, recycling domestic scrap metal and reducing our country's carbon emissions.

The planned EAF will replace Glenbrook's existing oxygen steelmaking furnace and two coal-fuelled kilns, resulting in a significant reduction in coal consumption and carbon emissions. In fact, the adoption of EAF technology will lead to:



The EAF will enable New Zealand Steel to produce crude steel with an average embodied carbon per tonne below the global average of 1.9 tonnes CO_2/tonne steel.

This ground-breaking initiative signifies a pivotal milestone in securing the future of steelmaking in New Zealand while aligning with global decarbonization targets outlined in the Paris Agreement.

Furthermore, a strategic partnership with Contact Energy ensures a reliable supply of firmed renewable energy, which is vital for the success of this transformative initiative.

This ambitious project sets the stage for achieving New Zealand Steel's net-zero emissions goal by 2050. By leveraging renewable energy sources and recycling scrap steel domestically, New Zealand can significantly reduce its reliance on steel imports and exports. This circular economy model positions the nation as a global leader in low-emission steel production, while aligning with principles of sustainability.

In addition to reducing carbon emissions, the EAF offers production flexibility, allowing New Zealand Steel to scale down production during peak demand or supply shortages. Its ability to provide electricity back into the system during peak demand periods adds stability to the electricity grid. New Zealand Steel's investment in an Electric Arc Furnace marks a bold breakthrough in sustainable steel production.

Through innovative partnerships and a collaborative approach, New Zealand Steel sets an example for other industries to follow, demonstrating that sustainable practices can align with economic growth and environmental stewardship. Pacific Steel is delighted to be working with them to produce more sustainable steel billets.

Environmental Product Declaration – Pacific Steel

This EPD sets out information on Pacific Steel's reinforcing bar, coil and wire at the outbound gate of the manufacturing site. All products are manufactured by Pacific Steel at its facility in Otahuhu, Auckland. The declared unit presented is one kilogram of Pacific Steel product. This EPD is of the type "Cradle-to-gate with modules C1-C4 and module D". Other life cycle stages are dependent on how the product is used, and should be developed and included as part of holistic assessment of specific construction works.

> "Declared Unit — This EPD is valid for a declared unit of 1 kg of Pacific Steel reinforcing bar, coil and wire."

Products covered by EPD

This product specific EPD covers Pacific Steel's reinforcing steel products. Pacific Steel manufacture hot rolled bar and coil in 300E and 500E seismic grades which are typically used in the reinforcement of concrete structures. Pacific Steel also produce 500L and non-500L wire products, including non-structural drawn wire, non-structural rod feed and bending & cross welding wire. Pacific Steel's reinforcing products are manufactured to the requirements of AS/NZS 4671:2019 and certified by the Australasian Certification Authority for Reinforcing and Structural Steels (ACRS).

Pacific Steel Product Content

Table 1: Typical steel composition of product:

Element	Typical Content
Iron	>97%
Manganese	<1.5%
Silicon	<0.35%
Chromium	<0.1%
Carbon	<0.23%
Other	<0.1% each

Steel by Pacific Steel – Recycled Content
Pre-consumer recycled content: 5%

The above data complies with the ISO14021 definitions of recycled content.

Table 2: Content declaration for 1kg of Pacific Steel product

Substances	Weight (kg)	Post-consumer material, weight-%	Biogenic material, weight-% and kg C/kg
Carbon Steel	1	0%	0%

Table 3: Average packaging for 1 kg of Pacific Steel bar, coil and wire

Packaging materials	Pacific Steel Bar	Pacific Steel Coil	Pacific Steel Wire
Steel packaging mass (kg)	0.0016	0.0016	0.0015

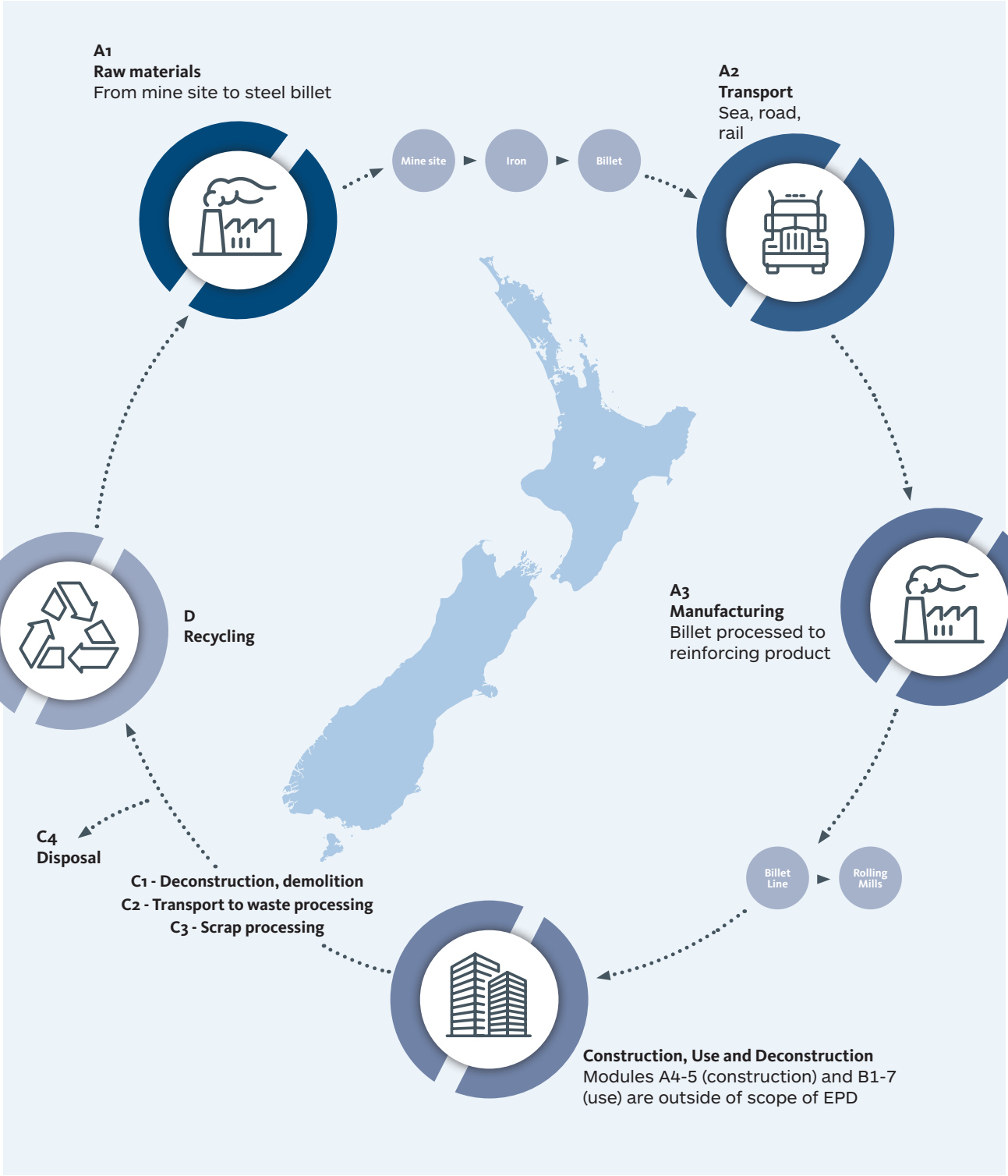
None of the materials in this EPD are on the Candidate List of substances of very high concern (SVHC), by the European REACH Regulation at a concentration greater than 0.1% by mass.

Pacific Steel Manufacturing Process

Pacific Steel manufactures its products using steel billets supplied by New Zealand Steel.

Those billets are reheated in a furnace at Pacific Steel, before being compressed and elongated through rolls to reduce thickness and increase strength.

The bar markings and diameters pressed into the bars determine which rolls are required, with the line rolls changing accordingly. The end product is then cooled and shipped out to customers around the country.



Scope of Declaration

The scope of this declaration is for 1 kilogram of Pacific Steel product (bar, coil and wire) from cradle to the mill gate, including end-of-life processing and recycling: Modules A1-A3, C1-C4 and D (according to EN 15804). Modules A4-A5 and B1-B7 have not been included due to the inability to predict how the material will be used following manufacture.

The system boundary applied in this study extends from mining of raw materials such as ironsand and coal; transport to and within the manufacturing site; iron and steel manufacture; ancillary service operations; rolling of steel billet to produce bar and coil; drawing to produce wire; and packaging for dispatch to customers at the exit gate of the manufacturing site.

The system boundary also includes: manufacture of other required input materials; transport between processing operations; the production of external services such as electricity, natural gas and water; and wastes and emissions to air, land and water. Co-products from the steelmaking process have been removed through the use of allocation.

As module C is included in the EPD, it is recommended to consider the results of module C in light of the results for modules A1-A3.

Table 4. Scope of Declaration in EPD

	Product Stage			Construction Process Stage		Use Stage							End of Life Stage				Recovery Stage
	Raw materials	Transport	Manufacturing	Transport	Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational Energy Use	Operational Water Use	De-construction 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	NZ	NZ	NZ	-	-	-	-	-	-	-	-	-	NZ	NZ	NZ	NZ	NZ
Specific Data	>90%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation Products	0%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation Sites	0%			-	-	-	-	-	-	-	-	-	-	-	-	-	-

X = Module Declared; ND = Not Declared (such a declaration shall not be regarded as an indicator of a zero result).

Environmental Performance

The environmental performance indicators included in this EPD are described in the following tables. All the result tables from this point will contain the abbreviations and units only. Please refer to this section for the indicator disclaimers. All results reported in MJ are in net calorific value.

Environmental indicators in accordance with EN 15804:2012+A1:2013 are provided to aid backward comparability.

Table 5. Core Environmental Impact Indicators in Accordance with EN 15804:2012+A2:2019

Indicator	Abbrev.	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-fw	kg P eq.
Eutrophication aquatic marine	EP-fm	kg N eq.
Eutrophication terrestrial	EP-tr	Mole of N eq.
Photochemical ozone formation	POCP	kg NMVOC eq.
Depletion of abiotic resources - minerals and metals[1]	ADP-mm	kg Sb-eq.
Depletion of abiotic resources - fossil fuels[1]	ADP-fossil	MJ
Water use[1]	WDP	m^3 world equiv.

Table 6. Life Cycle Inventory Indicators on Use of Resources

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

*PERM and PENRM are not relevant for the products declared in the EPD.

Table 7. Life Cycle Inventory Indicators on Waste Categories and Output Flows

Indicator	Abbrev.	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 Performance continued

Table 8. Biogenic Carbon Content Indicators

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

Note: 1 kg biogenic carbon is equivalent to 44/12 kg CO_2

Table 9. Additional Environmental Impact Indicators

Indicator	Abbrev.	Unit
GWP-GHG	GWP-GHG	kg CO_2-eq
Respiratory inorganics	PM	Disease incidences
Ionizing radiation - human health[2]	IRP	kBq U235 eq.
Eco-toxicity – freshwater[1]	ETP-fw	CTUe
Human toxicity, cancer[1]	HTPc	CTUh
Human toxicity, non-cancer.[1]	HTPnc	CTUh
Land use related impacts / soil quality[1]	SQP	Dimensionless

Table 10. Environmental Indicators in Accordance with EN 15804:2012+A1:2013

EN15804+A1	Abbrev.	Unit
Global warming potential (total)	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

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 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.

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.

Results of Assessment

Table 11. EPD Results for 1kg of Pacific Steel Products

Product		Bar	Coil	Wire	All				
		S-P-01002-1	S-P-01002-2	S-P-01002-3	S-P-01002-1, S-P-01002-2, S-P-01002-3				
Indicator	**Unit**	**A1-A3**	**A1-A3**	**A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
GWP	kg CO_2-eq.	3.95	3.82	4.09	6.34E-04	0.00502	0.00728	0.00325	-1.29
GWPf	kg CO_2-eq.	3.94	3.82	4.08	6.34E-04	0.00502	0.00723	0.00325	-1.29
GWPb	kg CO_2-eq.	0.00106	0.00125	0.00257	1.32E-07	9.93E-07	5.36E-05	0	9.08E-04
GWPluc	kg CO_2-eq.	4.03E-04	3.91E-04	4.19E-04	8.11E-09	6.55E-08	6.40E-07	1.19E-06	-2.73E-05
ODP	kg CFC11-eq.	6.87E-13	7.17E-13	1.11E-12	5.29E-17	4.27E-16	1.36E-14	7.33E-15	8.69E-15
AP	Mole of H+ eq.	0.0463	0.0446	0.0466	3.19E-06	9.25E-06	3.20E-05	1.94E-05	0.00288
EPfw	kg P eq.	8.92E-07	9.56E-07	1.45E-06	1.02E-10	8.21E-10	2.29E-08	5.74E-09	-2.27E-07
EPm	kg N eq.	0.00594	0.00574	0.00606	1.53E-06	3.99E-06	7.52E-06	6.60E-06	8.64E-04
EPt	Mole of N eq.	0.0660	0.0640	0.0683	1.67E-05	4.39E-05	1.20E-04	5.31E-05	0.0107
POFP	kg NMVOC eq.	0.0176	0.0171	0.0179	4.27E-06	9.17E-06	1.90E-05	1.47E-05	0.00179
ADPmm[1]	kg Sb-eq.	3.21E-07	3.13E-07	3.39E-07	2.27E-12	1.83E-11	8.69E-10	1.82E-10	-1.61E-07
ADPf[1]	MJ	47.8	46.3	49.6	0.00848	0.0684	0.0769	0.0493	-12.0
WDP[1]	m^3 world equiv.	0.402	0.439	0.665	2.50E-06	2.02E-05	0.0118	1.68E-04	-0.273

Table 12. Resource Use

Product		Bar	Coil	Wire	All				
		S-P-01002-1	S-P-01002-2	S-P-01002-3	S-P-01002-1, S-P-01002-2, S-P-01002-3				
Indicator	**Unit**	**A1-A3**	**A1-A3**	**A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
PERE	MJ	11.6	13.0	21.3	3.08E-05	2.48E-04	0.435	0.00588	0.861
PERM	MJ	0	0	0	0	0	0	0	0
PERT	MJ	11.6	13.0	21.3	3.08E-05	2.48E-04	0.435	0.00588	0.861
PENRE	MJ	47.9	46.3	49.6	0.00848	0.0685	0.0769	0.0502	-12.0
PENRM	MJ	0	0	0	0	0	0	0	0
PENRT	MJ	47.9	46.3	49.6	0.00848	0.0685	0.0769	0.0502	-12.0
SM	kg	0.0500	0.0500	0.0500	0	0	0	0	0
RSF	MJ	0	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0	0
FW	m^3	0.0210	0.0238	0.0392	4.96E-08	4.00E-07	8.04E-04	6.22E-06	-0.00617

Table 13. Waste Categories and Output Flows

Product		Bar	Coil	Wire	All				
		S-P-01002-1	S-P-01002-2	S-P-01002-3	S-P-01002-1, S-P-01002-2, S-P-01002-3				
Parameter	**Unit**	**A1-A3**	**A1-A3**	**A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
HWD	kg	1.61E-08	1.55E-08	1.58E-08	6.13E-15	4.95E-14	-1.05E-11	1.25E-12	-9.77E-11
NHWD	kg	0.349	0.336	0.347	1.83E-07	1.48E-06	4.95E-05	0.150	0.205
RWD	kg	5.81E-05	5.60E-05	6.49E-05	1.23E-09	9.96E-09	3.57E-08	5.56E-07	4.16E-06
CRU	kg	0	0	0	0	0	0	0	0
MFR	kg	0	0	0	0	0	0.850	0	0
MER	kg	0	0	0	0	0	0	0	0
EEE	MJ	0	0	0	0	0	0	0	0
EET	MJ	0	0	0	0	0	0	0	0

Results of Assessment continued

Table 14. Biogenic Carbon Content

Product		Bar	Coil	Wire	All				
		S-P-01002-1	S-P-01002-2	S-P-01002-3	S-P-01002-1, S-P-01002-2, S-P-01002-3				
Parameter	Unit	A1-A3	A1-A3	A1-A3	C1	C2	C3	C4	D
BCC-prod	kg	0	0	0	0	0	0	0	0
BCC-pack	kg	0	0	0	0	0	0	0	0

Table 15. Additional Environmental Impact Indicators

Product		Bar	Coil	Wire	All				
		S-P-01002-1	S-P-01002-2	S-P-01002-3	S-P-01002-1, S-P-01002-2, S-P-01002-3				
Indicator	Unit	A1-A3	A1-A3	A1-A3	C1	C2	C3	C4	D
GWP-GHG	kg CO_2-eq.	3.95	3.83	4.09	6.34E-04	0.00502	0.00729	0.00325	-1.29
PM	Disease incidences	2.85E-07	2.75E-07	2.88E-07	3.67E-11	1.18E-10	2.26E-10	2.18E-10	6.03E-08
IRP[2]	kBq U235 eq.	0.00654	0.00632	0.00729	1.54E-07	1.24E-06	4.89E-06	5.37E-05	0.0335
ETP-fw[1]	CTUe	40.2	44.4	71.7	0.00363	0.0293	1.38	0.0366	0.655
HTPc[1]	CTUh	4.34E-10	4.33E-10	5.17E-10	6.06E-14	4.89E-13	3.61E-12	3.88E-12	-5.74E-10
HTPnc[1]	CTUh	1.21E-08	1.17E-08	1.26E-08	2.98E-12	1.79E-11	9.51E-12	3.51E-10	-1.86E-08
LU[1]	Pt	9.70	9.49	10.5	1.56E-05	1.26E-04	0.0391	0.00420	0.170

Table 16. Environmental indicators in accordance with EN 15804:2012+A1:2013

Product		Bar	Coil	Wire	All				
		S-P-01002-1	S-P-01002-2	S-P-01002-3	S-P-01002-1, S-P-01002-2, S-P-01002-3				
Indicator	Unit	A1-A3	A1-A3	A1-A3	C1	C2	C3	C4	D
GWP	kg CO_2-eq.	3.88	3.76	4.01	6.25E-04	0.00496	0.00714	0.00314	-1.22
ODP	kg CFC11-eq.	8.23E-13	8.58E-13	1.32E-12	6.22E-17	5.02E-16	1.60E-14	8.63E-15	9.73E-15
AP	kg SO_2-eq.	0.0396	0.0382	0.0397	2.23E-06	6.60E-06	2.23E-05	1.55E-05	0.00219
EP	kg PO_4^{3-}-eq.	0.00203	0.00197	0.00210	5.13E-07	1.36E-06	3.92E-06	4.08E-06	2.89E-04
POCP	kg C_2H_4-eq.	0.00189	0.00182	0.00190	2.08E-07	-1.26E-06	1.16E-06	1.18E-06	-4.18E-04
ADPE	kg Sb-eq.	3.21E-07	3.13E-07	3.39E-07	2.27E-12	1.83E-11	8.65E-10	1.85E-10	-1.60E-07
ADPF	MJ	47.1	45.6	48.8	0.00846	0.0682	0.0764	0.0350	-11.7

Take Care When Comparing

This EPD complies with PCR 2019:14 Construction products v1.3.1.

Please note that:

- EPDs of construction products may not be comparable if they do not comply with EN 15804.
- EPDs within the same product category from different programmes may not be comparable.
- LCA provides high-level scientific guidance and differences in data should be substantial to be material.
- Understanding the detail is important in comparisons.
  Expert analysis is required to ensure data is truly comparable, to avoid unintended distortions.
- The best way to compare products and materiality of differences is to place them into the context of a structure across the whole life cycle.

Life Cycle Assessment (LCA) Methodology

This EPD has been produced in conformance with the requirements of the International EPD® System General Programme Instructions v4.0 (GPI) and PCR 2019:14 Construction products v1.3.1.

Primary Data
All data for primary iron and steel-making come from New Zealand Steel. New Zealand Steel's Life Cycle Inventory (LCI) for this update is based on data for the period from 1 July 2018 to June 30 June 2019. All Pacific Steel data is for the period 1 July 2018 to 30 June 2019.

Secondary Data
All data in the background system were from the GaBi Life Cycle Inventory Database (Sphera, 2023). Most datasets have a reference year between 2019 and 2022. The LCA software used is GaBi 10.7.128 from Sphera, using the CUP 2023.1 database.

Electricity
PCR2019:14 provides detail regarding the priority for LCI data for the generation of electricity used in module A1-A3. Electricity for primary iron and steel making was based on New Zealand Steel's cogeneration plants. The remainder constitutes purchased electricity. New Zealand Steel and Pacific Steel do not purchase specific electricity mixes that provide Guarantee of Origin. Furthermore, New Zealand electricity suppliers and market currently do not publish details of residual electricity mixes. Therefore, the electricity consumption mix on the market is used to model purchased electricity. The emission factor for the New Zealand national grid for the GWP-GHG indicator is 0.154 kg CO2e/kWh.

Allocation
Allocation follows EN 15804 section 6.4.3.2. Data for the production of bar, coil and wire were provided per process and thus allocation was not required. Since the difference in revenue (per mass) from the products and co-product (i.e., scrap) is high, allocation was performed based on economic values as per PCR2019:14 section 4.5.1.

The scrap entering the product system has a burden based on the economic allocation applied at the point of it leaving the system. Here, a scrap pool was created collating the scrap co-products of the the New Zealand and Pacific Steel system. GWP-GHG impact of scrap is 1.42 kg CO_2 eq. per kg of steel scrap.

Cut-off Criteria
The cut-off criteria applied allowed items constituting less than 1% by mass, energy and environmental relevance to be excluded from the study. However, data which fell within the cut-off criteria were included in the data set where available.

Personnel is excluded as per section 4.3.2 in the PCR (EPD International, 2023). 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.

Transport
Primary transport data was used for transport of production inputs (A2). Any wastes from the production process (A3) are assumed to be transported over a 100 km distance to a treatment or disposal site.

Transport modes:

- 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.

End of Life
Module C1 (deconstruction) was modelled based on the use of a 100 kW construction excavator. Module C2 (transport) assumed 50 km transport by truck to a waste processing facility or landfill.

The recycling scenario in this EPD was based on a steel recycling report by New Zealand Heavy Engineering Research Association (HERA), where it was estimated that 85% of steel scrap from the building and infrastructure sector is recovered (HERA, 2021). This is used for all products in this EPD and is considered conservative.

End of life allocation follows the requirements of EN15804:2012+A2:2019 section 6.4.3.3. At end-of-life, recovered scrap is available to produce a recycling credit within Module D.

A credit for net scrap is given in Module D based on the base metal used in the product and the worldsteel value of scrap.

Table 17. End of Life Scenarios for Products

Process	Unit (expressed per functional unit or per declared unit of components products or materials and by type of material)
Collection process specified by type	1 kg of reinforcing products collected with mixed construction waste
Recovery system specified by type	0.85 kg for recycling
	0.15 kg for landfill
Disposal specified by type	0.15 kg modelled as ferrous metals in landfill
Assumptions for scenario development	C1 - Demolishing with an Excavator (100kW)- Fuel consumption is calculated at 0.172g diesel input per kg of material. C2 - 50 km of transport by truck C3 - 0.2 MJ of electrical energy from the New Zealand grid needed to process 1 kg of scrap.

Recycling

All Pacific Steel products are recyclable into equivalent or higher quality products – no losses are necessary due to downgrading of recyclable material. Steel's magnetic properties mean that it can be easily separated for recycling. The intrinsic economic value of steel results in a high recovery rate of all steel waste.

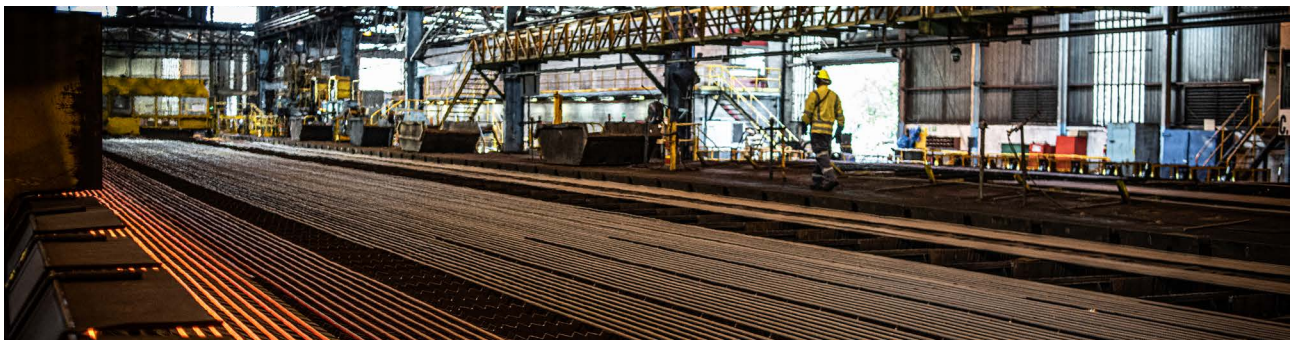
> "A focus on design to maximise recycling is important to minimise the whole of life impact of any construction project."

Our Safety Beliefs

At Pacific Steel we have embarked on a HSE journey, where building on our strong foundations, we have evolved our approach to how we manage Health, Safety and Environment to be more people-centred.

Our success comes from the presence of good things vs the absence of bad things - capacity in processes and effective controls (to be resilient to normal human error) vs the absence of incidents. We learn from our people who do the work, especially those who make and handle our product - people are creative problem solvers, not the problem. Context drives behaviour – we seek to learn and improve vs blame and punish.

- It's about listening to our people who know the work, especially those who make and handle our products every day. It's embedded into our foundational processes such as team meetings, toolbox discussions, audits, Take 2s, investigations or as a conversation starter in the workplace.
- It's about creating psychological safety so people feel safe to share how the work is really done "blue line vs black line" and contribute to stronger solutions.
- It's about facilitated conversations with our people who know the work to share the "blue line" - their insights, experiences and stories and work together in building stronger solutions.



References

CEN. (2013). 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

CEN. (2019). 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.

EPD Australasia. (2018). Instructions of the Australasian EPD Programme
Version 3.0, www.epd-australasia.com.

EPD International. (2023). PCR 2019:14
Version 1.3.1 Construction Products (2023-07-08). EPD International.

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

ISO. (2016). ISO 14021:2016
Environmental labels and declarations – Self-declared environmental claims
(Type II environmental labelling).

ISO. (2006). ISO 14025
Environmental labels and declarations - Type III environmental declarations - Principles and procedures. Geneva: International Organization for Standardization.

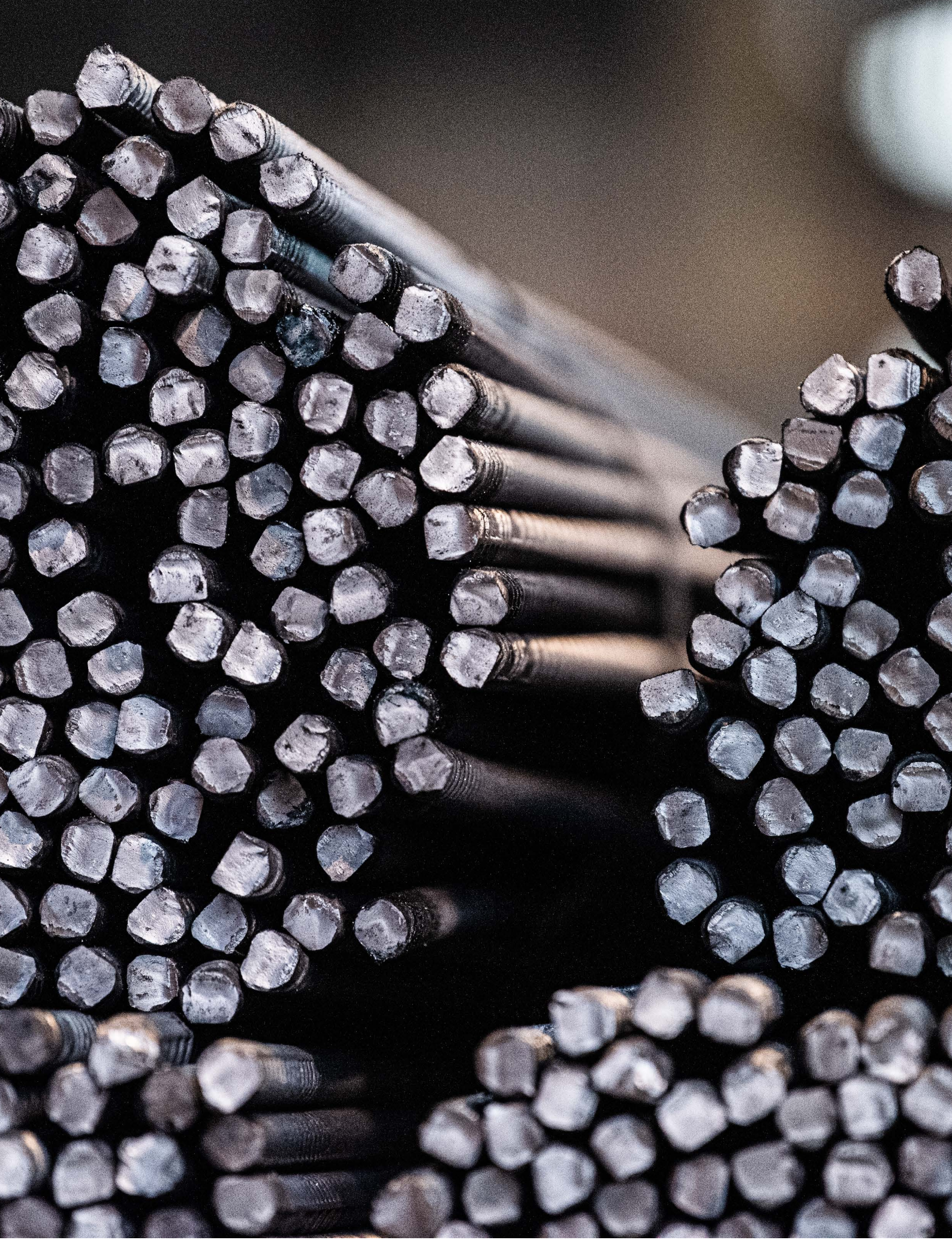
Sphera. (2023). GaBi Life Cycle Inventory Database 2023 Documentation.
Retrieved from Sphera: https://sphera.com/product-sustainability-gabi-data-search/

Recycling References

HERA. (2021). Steel Recycling Report.
HERA Report No R5-89: 2021v2 . Auckland: New Zealand Heavy Engineering Research Association (HERA).

EPD Registration Information

EPD information:	
EPD registration number:	S-P-01002
Approval date:	2018-10-25
Revision date:	2024-02-29
Valid until:	2029-02-28
Product group classification:	UN CPC 4124 – Bars and rods, hot-rolled, of iron or steel ANZSIC C2210 – Iron Smelting and Steel Manufacturing
Reference year for data:	Pacific Steel rolling and wire mills: 1 July 2018 to 30 June 2019 New Zealand Steel billet: 1 July 2018 to 30 June 2019
Geographical scope:	New Zealand
Contact information:	
EPD owner:	Pacific Steel (NZ) Limited Web: www.pacificsteel.co.nz Email: info@pacificsteel.co.nz Phone: 0800 7227 8335 Post: PO Box 22041, Otahuhu, Auckland 1640
EPD produced by:	thinkstep Limited Web: www.thinkstep-anz.com Email: anz@thinkstep.com
Programme operator:	EPD Australasia Web: www.epd-australasia.com Email: info@epd-australasia.com Phone: +64 9 889 2909
CEN standard EN 15804 served as the core PCR:	
PCR:	PCR 2019:14 Construction Products, Version 1.3.1, 2023-07-08
PCR review was conducted by:	The Technical Committee of the International EPD® System. Chair: No chair appointed Contact via info@environdec.com
Independent verification of the declaration and data, according to ISO 14025:	☐ EPD process certification (Internal) ☒ EPD verification (External)
Third party verifier, approved by EPD Australasia	Rob Rouwette, start2see Pty Ltd Web: www.start2see.com.au Email: Rob.Rouwette@start2see.com.au
Procedure for follow-up of data during EPD validity involved third-party verifier	☐ Yes ☒ No



For more information about
Pacific Steel products call
0800 7227 8335
or visit **pacificsteel.co.nz**

NOTE: Buyers and users of Pacific Steel products and services must make their own assessment of the products for their own conditions. All queries regarding product specification, purpose or application should be directed to Pacific Steel, phone 0800 7227 8335. Pacific Steel reserves the right to modify products, techniques, equipment and statements to reflect improvements in the manufacture and application of its products. The information contained in this brochure is supplied without prejudice to Pacific Steel's standard terms and conditions of sale. In the event of conflict between this information and the standard terms and conditions, the standard terms and conditions prevail.