AUSTRALASIA EPD®
ENVIRONMENTAL PRODUCT DECLARATION

ECO PLATFORM EPD VERIFIED

CHH PLY

APRIL 2023

Plywood

ENVIRONMENTAL PRODUCT DECLARATION

In accordance with ISO 14025 and EN15804+A2:2019

Programme:	The International EPD® System www.environdec.com
Programme operator:	EPD Australasia www.epd-australasia.com
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Geographical scope:	New Zealand

CONTENTS

WHAT IS AN EPD?

Carter Holt Harvey recognizes the importance of providing transparent and independently verified environmental impact information about its products. An Environmental Product Declaration (EPD) is a robust, science based, independently verified and standardized method for communicating the environmental impacts of products.

This EPD covers the environmental impacts of Carter Holt Harvey Plywood for application both within and outside the building envelope subject to treatment level. The products are manufactured within the Carter Holt Harvey Plywood mill located in Tokoroa, with treatment of some products completed at its Kinleith treatment facility, New Zealand.

This EPD is based on a cradle-to-gate Life Cycle Assessment (LCA), with end-of-life options included. 'Cradle' refers to the raw material extraction and 'the gate' is the gate of the Tokoroa Plywood mill as the product is ready to go out to customers.

Carter Holt Harvey, as the EPD owner has the sole ownership, liability, and responsibility for the EPD.

This EPD has been produced in accordance with a consistent set of rules known as product category rules (PCR). EPDs within the same product category from different programmes may not be comparable.

EPDs of construction products may not be comparable if they do not comply with EN15804+A2 or if they are produced using different product category rules.

ABOUT CARTER HOLT HARVEY

Carter Holt Harvey (CHH) is one of New Zealand's leading forest products companies, manufacturing and supplying timber, laminated veneer lumber (LVL), plywood and other building products to the New Zealand market.

Carter Holt Harvey together with its legacy companies has been a feature of the Australasian timber industry for more than 150 years.

Over the past decade, it has reconfigured its asset base through a combination of organic growth, capacity expansions at key sites and investment in technology.

CHH has consistently introduced new processes to improve productivity, and kept the business streamlined by closing smaller, inefficient facilities.

Today, Carter Holt Harvey is organised into four business units: Carter Holt Harvey Building Products (CHH Timber), Carter Holt Harvey Plywood (CHH Plywood), Carter Holt Harvey LVL (Futurebuild® LVL) and Carters Building Supplies.

CHH Plywood is one of the largest producers of plywood in New Zealand. Manufacturing from its central North Island site at Tokoroa, CHH Plywood produces brands Ecoply®, Shadowclad® and Handiply® for use in both structural and non-structural applications subject to proposed use.

SUSTAINABLE GROWTH

Carter Holt Harvey takes a sustainable approach to the way the company operates and grows its business. The company's commitment to the environment is fundamental to its business. From the use of plantation forests to promoting polices minimizing waste and emissions, CHH is proud of the sustainable base for its products. CHH continually strives to be an outstanding business in everything the company does, from manufacturing to service delivery with sustainable solutions at the core of this.

The CHH EPDs are a demonstration of the continual focus and commitment to sustainability, through a science driven, independently verifiable process with standard methodology across all products.

CarterHoltHarvey

BUSINESS UNITS

CHH Timber

CHH PLY

futurebuild LVL®

CARTERS
Your Building Partner

RESPONSIBLE OPERATIONS

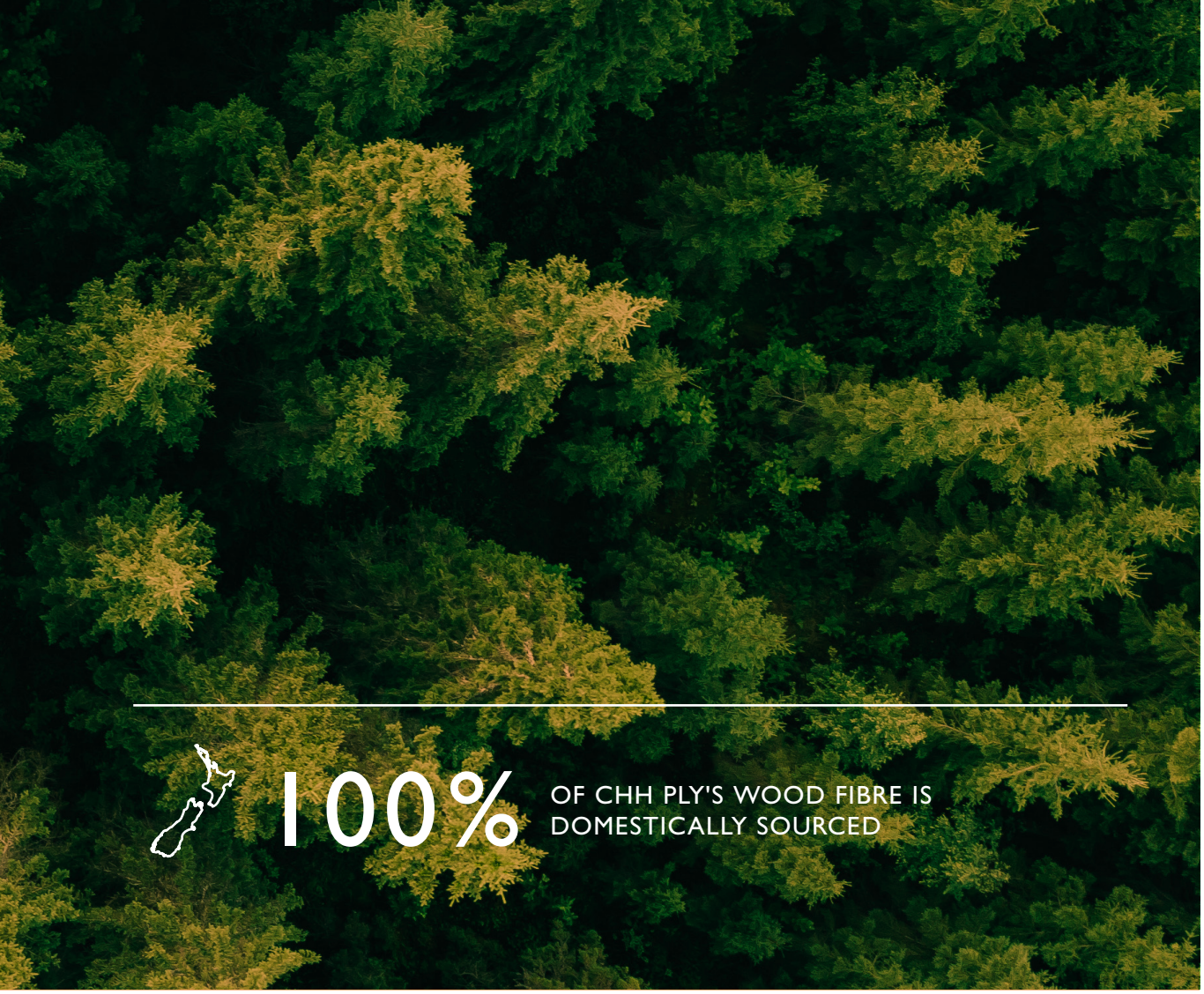
FSC AND SUSTAINABILITY ACCREDITATIONS

CHH Plywood has been assessed by the Forest Stewardship Council®, a globally recognised independent body, and granted FSC® Certification (FSC® C012019). This certification commonly known as FSC has assessed and confirmed CHH Plywood's operation is using responsibly sourced wood. The certification also covers a verification program and a risk assessment for the control of wood sourced from New Zealand pinus radiata plantations and CHH Plywood's internal process to manage this.

THIRD PARTY QUALITY ASSURANCE PROGRAM

CHH Plywood has strict quality assurance processes in place to monitor that Ecoply products are manufactured in a manner that meet both the structural and visual requirements of the specific product. Ecoply products are independently third party audited by the EWPAA (Engineered Wood Products Association of Australasia). The EWPAA certifies Ecoply manufactured by CHH Plywood at its Tokoroa plywood mill. Participation and compliance with the requirements of the EWPAA's process-based quality control scheme includes product testing and monitoring of properties. It provides the basis for the EWPAA's Product Certification of Ecoply as conforming to the requirements of AS/NZS 2269, Plywood – Structural. The EWPAA's product certification scheme is accredited under JAS-ANZ.

CHH Plywood also has quality assurance processes in place to monitor that Ecoply products satisfy the penetration and retention requirements for treatment



in accordance with AS/NZS 1604.3, Specification for preservative treatment - Part 3: Plywood, as required by NZS 3602, Timber and Wood-based Products for use in Building. Independent Verification Services (IVS) has been contracted to undertake independent, third-party auditing of CHH Ply's internal treatment processes at its treatment sites. Independent audit inspections are carried out bi-annually and include an audit of the treatment process and procedures. IVS also completes the verification of each treatment batch/charge for compliance with AS/NZS 1604.3.

CARTER HOLT HARVEY PLYWOOD AND THE ENVIRONMENT

CHH Plywood takes its environmental responsibility seriously by using waste handling procedures to optimise recovery and manage the creation of arisings. This starts with the use of only radiata pine sourced from sustainably managed renewable plantation and includes the application of optimisation algorithms for veneer peeling to enhance finished goods recovery. CHH Plywood has been actively involved in the development of markets for the use of downgraded arising product for use in industrial applications including packaging whilst peeler cores are often reprocessed for use as bearers. All waste product derived is assessed for downstream applications including bark for landscaping, boiler fuel and/or sold for use in wood fibre products.

The CHH Plywood range of untreated products have been issued Declare labels and determined to be Red List Free through the International Living Future Institute, and as such the untreated range can be used in Living Building Challenge

Formaldehyde Emissions for CHH Plywood products are measured as being less than 0.5 mg/L, classed as E0.

PRODUCTS COVERED IN THIS EPD

THIS EPD COVERS PLYWOOD

Carter Holt Harvey Plywood panels are manufactured from radiata pine wood veneers. The veneers are typically placed at right angles to each other for maximum strength and stability then bonded together with synthetic phenolic (PF) resin to form a strong and permanent Type A bond. Subject to application, the panels are then reprocessed and/or treated for use in market. The CHH Plywood range is made up of three distinct groups of products and is available in a range of treatments and finishes to suit both general and specific applications. The range includes:

ECOPLY® STRUCTURAL PLYWOOD

Ecoply® is New Zealand's leading brand of structural plywood and is manufactured from sustainably grown New Zealand plantation pine. The Ecoply brand includes a wide range of appearance and performance-rated plywood products providing durability, strength and design flexibility.

SHADOWCLAD® EXTERIOR PLYWOOD

Shadowclad® plywood panels provide a beautiful, natural wood exterior cladding that is well suited to most architectural styles. Manufactured from sustainably grown New Zealand plantation pine, Shadowclad can be used as a strong, yet lightweight exterior cladding and has been trusted in New Zealand construction for over 25 years.

HANDIPLY® PLYWOOD

Handiply® plywood is a range of plywood products comprising both structurally rated and non-structural plywood. Handiply non-structural plywood is a range of plywood products specifically produced for non-structural, non-load-bearing applications, or applications where compliance with NZ Building Code is not required. Non-structural plywood is not compliant with AS/NZS 2269.

PRODUCT APPLICATION

Plywood products are used in many applications where wood-based panels are advantageous. These applications include structural flooring, bracing, diaphragms, wall panels, cladding, rigid air barriers and internal linings. Various treatment levels are available to suit the target use and environment.

Product and Systems Development

CHH Plywood has developed a product range that goes beyond the supply of 'F' grade products to include cladding and pre-cladding solutions to enhance the built environment that are supported by technical expertise, Verification Method testing, flashing solutions and innovative coating solutions. Where noted, the CHH Plywood range is backed by BRANZ Appraisals, P21 testing as well as installation tools and Apps to support correct installation practices.

All these solutions are tied together with supporting literature and quality control procedures ensuring that solutions aid builders and designers in meeting the requirements of the New Zealand Building Code.

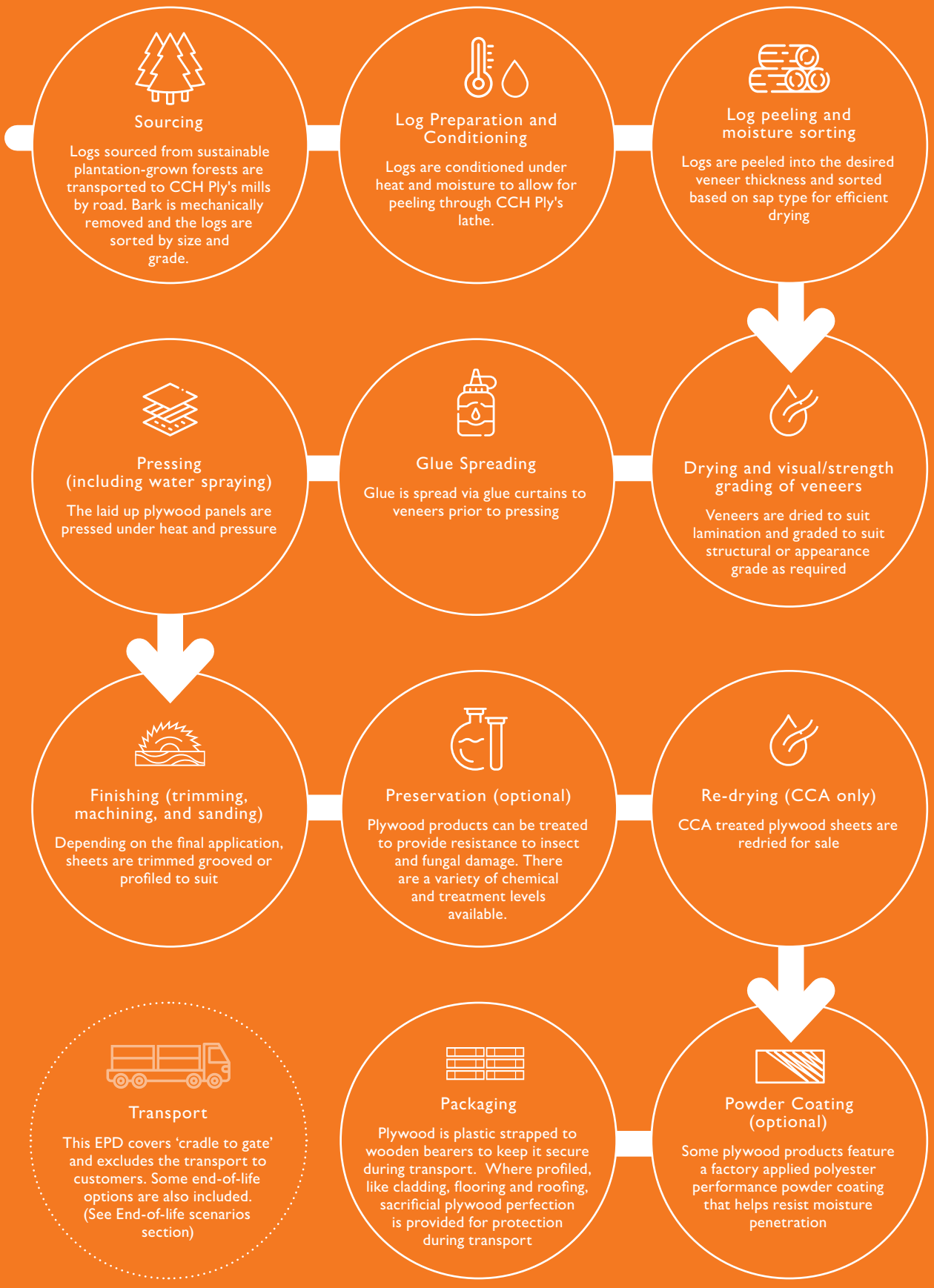
The Technical Expertise behind CHH Plywood

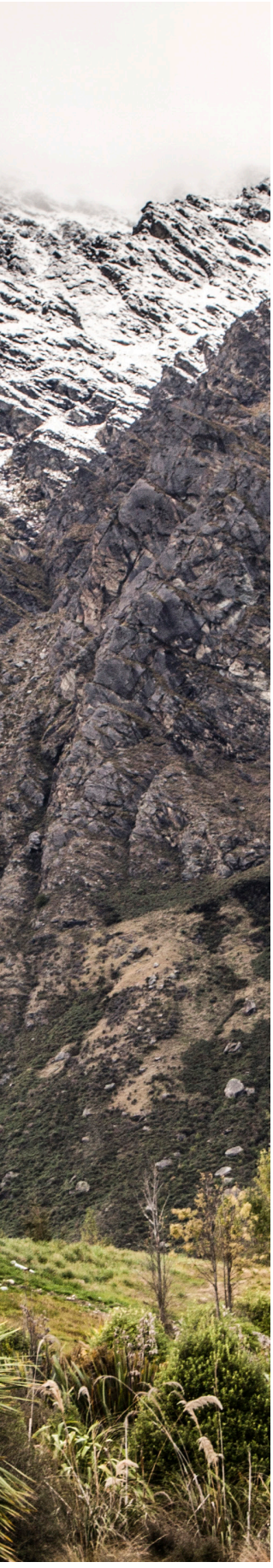
CHH Plywood is proud to manufacture and supply plywood products across Australasia and further afield.

All CHH Plywood products are developed by Engineers, Industry and Technical Experts – with design, and functionality at the centre of manufacturing, with the aim to ensure the products are made fit for purpose within the market.

An extensive library of Specification & Installation guides, Technical guides, CAD Files, 3D images is at www.chhply.co.nz.

Figure 1. Manufacturing process (abridged)





HOW TO USE THIS EPD

Carter Holt Harvey Plywood has developed this EPD to help to showcase the environmental credentials of their plywood products. The EPD also provides life cycle data for calculating the impacts of plywood 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 Star rating tool of the New Zealand Green Building Council (NZGBC).

New Zealand Green Building Council states:

> *"An EPD does not imply environmental superiority; it is solely a transparent declaration of the life-cycle environmental impact. The detailed, transparent environmental data that EPDs provide is an important step towards enabling whole-of-building life cycle assessment"*

The remainder of this EPD comprises 2 parts. Part one is the Technical Information for the method, assumptions, description of environmental indicators. Part two contains the results from modelling the life cycle assessment of the different products.

DECLARED UNIT

ONE CUBIC METRE OF PLYWOOD, AS SPECIFIED IN THE TABLE BELOW, PACKAGED AND READY FOR DISPATCH TO THE CONSUMER.

Table 1. Declared Unit

Product Group	Unit	Product
Plywood	1m³	Plywood (various thicknesses) 12% moisture content (dry basis), with a production weighted average density of 593 kg/m³

PRESERVATIVE TREATMENTS

Plywood products produced in New Zealand can be treated to help resist insect attack and/or fungal decay. Products to be used in outdoor applications are usually treated to the appropriate hazard class.

The plywood products listed in Table 1 may be supplied in an untreated or treated form. The treatment types shown in Table 2 are used by Carter Holt Harvey Plywood.

Table 2. Treatment class Treatment type Use

Treatment class	Treatment type	Use
Untreated	none	Interior dry situations protected from weather and dampness
H3	CCA	Outdoor products not in ground contact, structural
H3.1	Propiconazole + Tebuconazole (LOSP)	Outdoor products (paint coating required), not in ground contact, non-structural

POWDER COATED FINISH ON ECOPLY BARRIER AND SHADOWCLAD ULTRA

Powder coating is typically applied to two products (12mm Shadowclad Ultra and 7mm Ecoply Barrier). The powder coating results should be added to the untreated plywood results for these products. Shadowclad Ultra and Ecoply Barrier feature a factory applied polyester performance powder coating that helps resist moisture penetration, has a high 60-80 microns film build and is a low volatile organic compound (VOC) coating.

The powder coating is applied electrostatically to the face, edges and 150mm to the bottom of the back of each sheet of Ecoply Barrier and Shadowclad Ultra. The primer, factory applied on Shadowclad Ultra, can be exposed to the weather for up to 3 months prior to top coating, whilst when applied to Ecoply Barrier can be exposed for up to 180 days prior to installation of cladding.

CLASSIFICATION

Table 3 shows the classification codes and class descriptions of the products included within this EPD according to the UN CPC (Version 2.1) and ANZSIC 2006 classification systems.

Table 3. Plywood products included in this EPD

Product type	Classification	Code	Category
Plywood	UN CPC Ver.2.1	315	Veneer sheets; sheets for plywood; densified wood
	ANZSIC 2006	1493	Veneer and Plywood Manufacturing

PRODUCT COMPOSITION

Plywood products included in this EPD are composed of 91.4% kiln dried veneer and 8.6% resin. The kiln dried veneer is peeled from **Radiata Pine (Pinus radiata)**, grown within New Zealand in independent sustainably managed plantations and processed by Carter Holt Harvey.

The plywood product composition is a weighted average on dry mass basis.

UltTreated plywood products declared within this EPD include those treated with Propiconazole + Tebuconazole (H3.1 LOSP) and copper chrome arsenate (CCA).

No products declared within this EPD contain substances exceeding the limits for registration according to the European Chemicals Agency's "Candidate List of Substances of Very High Concern for authorisation".

SYSTEM BOUNDARIES

In Life Cycle Assessments (LCA), the system boundary is a line that divides the processes which are included from those which are excluded.

As shown in Table 4 this EPD is 'cradle-to-gate' with modules C1-C4 (end-of-life processing) and module D (recycling potential).

Other life cycle stages (Modules A4-A5 and B1-B7) are dependent on particular scenarios and best modelled at the building level, therefore these modules have not been declared.

Table 4. Modules included in the scope of the EPD (X = declared module | MND = module not declared)

	Product stage			Construction process stage		Use stage							End-of-life				Recovery
	Raw material supply	Transport	Manufacturing	Transport	Construction Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction / demolition	Transport	Waste processing	Disposal	Future reuse, recycling or energy recovery potential
Module	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Modules declared	X	X	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X
Geography	NZ	NZ	NZ	-	-	-	-	-	-	-	-	-	NZ	NZ	NZ	NZ	NZ
Specific data	>90%					-	-	-	-	-	-	-	-	-	-	-	-
Variation – products	<10%					-	-	-	-	-	-	-	-	-	-	-	-
Variation - sites	Not relevant					-	-	-	-	-	-	-	-	-	-	-	-

END OF LIFE

At the end of its useful life, a plywood product is removed from the building and may end up recycled, reused, combusted to produce energy, or landfilled. In New Zealand, the most common end-of-life method is landfill, especially for treated products, which have limitations for recycling and incinerating.

The landfill scenario and three other possible end of life scenarios are described below. Each scenario assumes that 100% of the wood is sent to that scenario. To create an end-of-life mix for a given region or end use, the reader should take a weighted sum of these scenarios. Where no specific data are available, the 'landfill' scenario should be used.

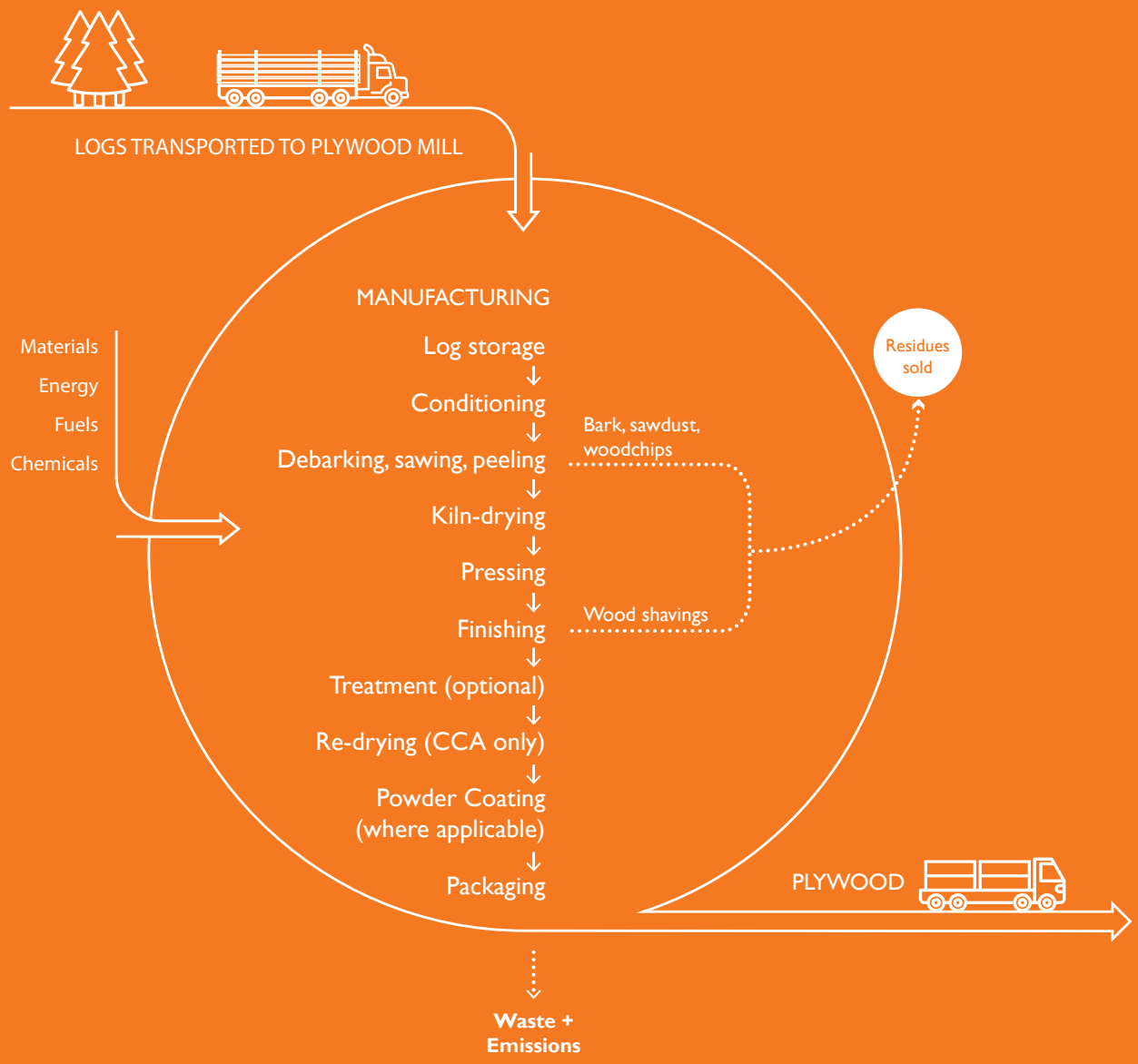
Under EN 15804+A2, the carbon sequestration of plywood has a net neutral impact over the whole life cycle because all sequestered carbon is released at the end-of-life stage. This means that assumptions of the decomposition of wood products and various end-of-life scenarios all have the same effect in terms of biogenic carbon.

PRODUCTION (MODULES A1-A3)

For all plywood products in this EPD, the production stage includes the forestry, sawmilling and kiln drying stages. It also includes treatment for the applicable products.

Figure 2 shows the basic manufacturing processes for the products included within this EPD.

Figure 2. Manufacturing (A1-A3) process flowchart



LANDFILL

Emissions from landfill are dependent on the Degradable Organic Carbon fraction (DOCf).

The DOCf = 0.1% for radiata pine. This is based on bioreactor laboratory research by Wang et al. (2011) for *Pinus radiata*. The impacts associated with the landfill are declared in module C4. All landfill gas that is combusted for energy recovery (module C4) is assumed to occur in a power plant with an electrical conversion efficiency of 36% (Australian Government 2014, p. 189) and the resulting electricity receives a credit for offsetting average electricity from the New Zealand grid (module D) in line with EN 16485:2014 (Section 6.3.4.5).

The landfill scenario assumes the following for carbon emissions:

- Of the carbon in the wood that breaks down in landfill, 50% is methane and 50% is carbon dioxide (Australian Government 2016, Table 43).
- All carbon dioxide is released directly to the atmosphere.
- 53% of the methane is captured, (MfE, 2019).
- Of the 53% captured, one quarter (13% of the total) is flared, and three quarters (40% of the total) is used for energy recovery (Carre, 2011).
- Of the 47% of methane that is not captured, 10% (5% of the total) is oxidised (released as carbon dioxide) (Australian Government, 2016a) and 90% (42% of the total) is released into the atmosphere as methane.
- In summary, for every kilogram of carbon converted to landfill gas, 80 % is released as carbon dioxide and 20% is released as methane.

In accordance with EN 15804+A2, any remaining biogenic carbon not degraded (99.9% of the carbon in the wood) is modelled as an emission of biogenic CO_2 to the air. Refer to the Additional Environmental Information section for information on permanent storage of biogenic carbon in radiata pine in landfill.

ENERGY RECOVERY

This scenario includes shredding (module C3) and combustion with the recovered thermal energy assumed to replace thermal energy from natural gas (module D) in line with EN 16485:2014 (Section 6.3.4.5). Note that other options may also be in use within New Zealand, including replacement of coal, replacement of electricity, and replacement of both electricity and thermal energy (via co-generation).

REUSE

The product is assumed to be removed from a building manually and reused with no further processing (i.e. direct reuse). Transport and wastage are excluded and only one reuse cycle is considered. The second life is assumed to be the same (or very similar) to the first, meaning that a credit is given for production of 1m³ of plywood in module D. The CO_2 sequestered, and energy content of the wood are assumed to leave the system boundary at module C3 so that future product systems can also claim these without double-counting in line with EN 16485:2014 (Section 6.3.4.2). Any further processing, waste or transport would need to be modelled and included separately.

RECYCLING

Plywood may be recycled in many different ways. This scenario considers shredding and effectively downcycling into wood chips. Wood waste is chipped (module C3) and assigned credits relative to the avoided production of virgin woodchips as a co-product from sawmilling (module D). In line with the reuse scenario, the CO_2 sequestered, and energy content of the wood are assumed to leave the system boundary at C3 so that future product systems can also claim these without double-counting (EN 16485:2014, Section 6.3.4.2).

LIFE CYCLE INVENTORY (LCI) AND ASSUMPTIONS

ENERGY

Thermal energy and transport fuels have been modelled using the Australian average as no New Zealand specific datasets are available (see Sphera, 2021 for documentation).

Electricity for plywood production (modules A1-A3) has been modelled with the New Zealand-specific grid mix. The New Zealand national electricity grid production mix (Sphera 2021, electricity reference year 2018) is made up of hydro (57.02%), geothermal (17.9%) natural gas (15.97%), wind (4.85%), hard coal gases (1.44%) hard coal (1.26%), biomass (0.74%), biogas (0.59%), and photovoltaics (0.17%), lignite (0.05%) and fuel oil (0.01%).The emission factor for the New Zealand national grid for the GWP-GHG indicator is 0.145 kg CO2e/kWh.

FORESTRY

Modelling of carbon flows in the forest has been performed in line with New Zealand's Greenhouse Gas Inventory (MfE, 2021).

Forestry is modelled as being in a steady-state, meaning that – on average – all harvested trees are

replanted and that soil carbon stocks remain constant over time at the national level (MfE, 2021).

Biodegradation of forest litter and forest residues are modelled as being aerobic (MfE, 2021) and therefore carbon neutral as carbon dioxide sequestered from the air during tree growth is later released back to the air as carbon dioxide.

ALLOCATION

Upstream data

For refinery products, allocation is applied by mass and net calorific value.

Co-products

These include bark, woodchips, sawdust and shavings. As the difference in economic value of the co-products is high (>25% as per EN 15804, Section 6.4.3.2), allocation by economic value has been applied.

CUT-OFF CRITERIA

Environmental impacts relating to personnel, infrastructure, and production equipment not directly consumed in the process are excluded from the system boundary as per the PCR (EPD International, 2019, Section 7.5.4). All other reported data were incorporated and modelled using the best available life cycle inventory data.

PRIMARY DATA

Primary data for forestry, peeling, drying, pressing, finishing, packaging and treatment was collected from the Carter Holt Harvey Plywood plant located in Tokoroa and the Kinleith treatment facility, New Zealand.

REPRESENTATIVENESS

Geographical

All primary and secondary data were collected specific to the countries or regions under study. Where country-specific or region-specific data were unavailable, proxy data were used. Geographical representativeness is considered to be high.

Temporal

Primary data for forestry, peeling, drying, pressing, finishing, packaging and treatment was collected for the 12 month period from 1st January 2020 to 31st December 2020. All secondary data come from the GaBi 2021 databases and are representative of the years 2015-2020.

Long-term emissions (>100 years) are not taken into consideration in the impact estimate. Waste to landfill is modelled assuming a 100-year time horizon.

Technological

All primary and secondary data were modelled to be specific to the technologies or technology mixes under study. Where technology-specific data were unavailable, proxy data were used. Technological representativeness is considered to be high.

OTHER ENVIRONMENTAL INFORMATION

When timber is landfilled any carbon not degraded can be expected to remain stored in the wood indefinitely under anaerobic conditions (Wang 2011 and Ximenes et al 2019). For CHH untreated plywood this would result in a reduction of the GWP (biogenic) and GWP (total) for module C4 for the "landfill (typical)" scenario of 951 kg CO_2 eq so that the module C4 total GWP (biogenic) is 19 kg CO_2 eq.

ENVIRONMENTAL IMPACT INDICATORS

An introduction the core environmental impact indicators is provided below. The best-known effect of each indicator is listed in the descriptions and the abbreviations, in brackets, correspond to the labels in the following results tables.

CLIMATE CHANGE (GLOBAL WARMING POTENTIAL)

(GWP-total, GWPf, GWPb, GWPluc)

A measure of greenhouse gas emissions, such as CO_2 and methane. These emissions are causing an increase in the absorption of radiation emitted by the earth, increasing the natural greenhouse effect. This may in turn have adverse impacts on ecosystem health, human health and material welfare. The Global Warming Potential (GWP) is split into three sub indicators: total (GWPt), fossil (GWPf), biogenic (GWPb), and land-use and land-use change (GWPluluc).

OZONE DEPLETION POTENTIAL (ODP)

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.

ACIDIFICATION POTENTIAL (AP)

Acidification Potential is a measure of emissions that cause acidifying effects to the environment. A molecule's acidification potential indicates its capacity to increase the hydrogen ion (H+) concentration in the presence of water, thus decreasing the pH value. Potential effects include fish mortality, forest decline, and the deterioration of building materials.

EUTROPHICATION POTENTIAL (EP-fw, EP-fm, EP-tr)

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

PHOTOCHEMICAL OZONE FORMATION POTENTIAL (POCP)

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

ABIOTIC RESOURCE DEPLETION (ADP-mm, ADPf)

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.

WATER USE (WDP)

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

RESULTS

The following tables show the results grouped in seven categories, each looking at different types of indicators. The headings below provide descriptions for each of these categories. Each column of numbers represents one declared unit: 1m^3 of plywood, packaged and ready for dispatch to the consumer.

The first row of the Environmental impact indicators, the Global Warming Potential (total) (GWPT) represents the total carbon footprint of the product. This is the sum of the biogenic carbon footprint (GWPB), mostly from the sequestration of carbon in wood, and the fossil carbon footprint (GWPF), which is mostly from the fossil fuels combusted during the production of the product. It should be noted that the GWPB is largely dependent on the density of the wood, which can vary by a large degree due to a range of factors.

For plywood products, the most common value used for the carbon footprint in ratings tools like Green Star and eTool is the GWPF.

To assess treated product, the indicators for the specific treatment type should be combined with those of the product in question.

ENVIRONMENTAL IMPACT EN15804+A2

The reported impact categories represent impact potentials, i.e., they are approximations of environmental impacts that could occur if the emissions would (a) follow the underlying impact pathway and (b) meet certain conditions in the receiving environment while doing so. The environmental impact results are therefore relative expressions only and do not predict actual impacts, the exceeding of thresholds, safety margins, or risks.

Long-term emissions (>100 years) are not taken into consideration in the impact estimate.

RESOURCE USE

The resource use indicators describe the use of renewable and non-renewable material resources, renewable and non-renewable primary energy and water.

Note: Water consumption: The FW indicator in the EPD results tables reports consumption (i.e. net use) of 'blue water' (which includes river water, lake water and ground water). This indicator deliberately excludes consumption of 'green water' (rain water), as net loss should be interpreted as any additional water loss beyond what would occur in the original, natural system. For plantation softwood forestry, the natural system might be a native forest or a grassland (Quinteiro et al. 2015).

WASTE AND OUTPUT FLOW

Waste indicators describe waste generated within the life cycle of the product. Waste is categorised by hazard class, end of life fate and exported energy content.

BIOGENIC CARBON INDICATORS

Biogenic carbon refers to the carbon stored in organic materials. This is sequestered during growth and released at end of life. EN15804+A2 requires the declaration of biogenic carbon content of the product and its packaging.

ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS

These indicators are voluntarily included to facilitate modularity where an EPD is used as input data for creating another EPD downstream in the value chain (EPD International, 2021).

ENVIRONMENTAL IMPACT EN15804+A1

EN 15804+A1 core environmental impact categories aid with historical comparison and are used within various rating tools.

GREEN STAR

These impact indicators comply with the Additional Life Cycle Impact Reporting requirement listed within the Green Star rating tools for Australia – Green Star Buildings v1, and Greenstar Design and As Built – as well as for New Zealand - Design and As Built Life Cycle Assessment Calculator NZv1.0. (Green Building Council of Australia, 2017; New Zealand Green Building Council, 2019).

RESULTS FOR 1m³ OF UNTREATED PLYWOOD

			A1-A3	C1	C2	C3	C3	C4	C3	D	D	D	D
INDICATOR		UNIT	Production	Decon-struction	Transport to EOL	Recycling	Energy recovery	Landfill (typical)	Reuse	Recycling	Energy recovery	Landfill (typical)	Reuse
Table 5. Environmental impact (EN15804+A2) covering modules A1-D													
GWP	Global warming potential	kg CO_2 eq	-737	0.381	1.94	977	977	1,030	971	-21.9	-674	0	-233
GWPf	Global warming potential (fossil)	kg CO_2 eq	215	0.382	1.86	6.14	6.14	56.4	0	-21.3	-676	0	-215
GWPb	Global warming potential (biogenic)	kg CO_2 eq	-952	-3.90E-04	0.0822	971	971	970	971	-0.579	1.96	0	-18.6
GWPluc	Global warming potential (land use change)	kg CO_2 eq	0.0577	7.69E-06	2.92E-05	1.79E-04	1.79E-04	0.0422	0	-0.00872	-0.00878	0	-0.0577
ODP	Depletion potential of the stratospheric ozone layer	kg CFC 11 eq	1.08E-10	5.62E-17	2.18E-16	8.89E-16	8.89E-16	1.39E-13	0	-6.95E-12	-1.48E-14	0	-1.08E-10
AP	Acidification potential - terrestrial and freshwater	Mol H+ eq	8.06	0.00192	0.00571	0.0542	0.0542	0.197	0	-0.313	-0.0926	0	-8.06
EPfw	Eutrophication potential - freshwater	kg P eq	3.24E-04	6.28E-08	3.40E-07	1.03E-06	1.03E-06	3.81E-05	0	-5.22E-05	-1.17E-05	0	-3.24E-04
EPm	Eutrophication potential - marine	kg N eq	3.53	9.09E-04	0.00274	0.0263	0.0263	0.0560	0	-0.124	-0.138	0	-3.53
EPt	Eutrophication potential - terrestrial	Mol N eq	38.7	0.00995	0.0302	0.289	0.289	0.613	0	-1.50	-1.52	0	-38.7
POFP	Photochemical ozone formation potential	kg NMVOC eq	10.6	0.00254	0.00530	0.0728	0.0728	0.160	0	-0.528	-0.192	0	-10.6
ADPmm*	Abiotic depletion potential – minerals & metals	kg Sb eq	1.06E-05	5.90E-09	3.15E-08	9.37E-08	9.37E-08	5.44E-06	0	-1.09E-06	-7.95E-05	0	-1.06E-05
ADPf*	Abiotic depletion potential – fossil fuels	MJ	984	5.07	25.7	80.0	80.0	807	0	-117	-11,600	0	-984
WDP*	Water scarcity	m³ world eq	54.9	0.00250	0.0150	0.0396	0.0396	-0.919	0	-11.9	-0.560	0	-54.9

*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.

INDICATOR		UNIT	A1-A3 Production	C1 Deconstruction	C2 Transport to EOL	C3 Recycling	C3 Energy recovery	C4 Landfill (typical)	C3 Reuse	D Recycling	D Energy recovery	D Landfill (typical)	D Reuse
Table 6. Resource use indicators results covering modules A1-D													
PERE	Renewable primary energy as energy carrier	MJ	4,100	0.0247	0.109	0.398	0.398	81.7	0	-2,400	-4.59	0	-4,100
PERM	Renewable primary energy resources as material utilization	MJ	10,000	0	0	-10,000	-10,000	0	-10,000	0	0	0	0
PERT	Total use of renewable primary energy resources	MJ	14,100	0.0247	0.109	-10,000	-10,000	81.7	-10,000	-2,400	-4.59	0	-4,100
PENRE	Non-renewable primary energy as energy carrier	MJ	985	5.07	25.7	80.0	80.0	807	0	-117	-11,600	0	-985
PENRM	Non-renewable primary energy as material utilization	MJ	0	0	0	0	0	0	0	0	0	0	0
PENRT	Total use of non-renewable primary energy resources	MJ	985	5.07	25.7	80.0	80.0	807	0	-117	-11,600	0	-985
SM	Use of secondary material	kg	0	0	0	0	0	0	0	593	0	0	593
RSF	Use of renewable secondary fuels	MJ	0	0	0	0	0	0	0	0	10,000	0	0
NRSF	Use of non-renewable secondary fuels	MJ	0	0	0	0	0	0	0	0	0	0	0
FW	Use of net fresh water	m³	2.94	4.91E-05	2.25E-04	7.83E-04	7.83E-04	0.0621	0	-0.657	-0.0170	0	-2.94
Table 7. Waste categories and output flow indicators covering modules A1-D													
HWD	Hazardous waste disposed	kg	1.48E-06	1.83E-11	7.73E-11	7.15E-08	7.15E-08	8.06E-08	0	-1.11E-07	-8.61E-07	0	-1.48E-06
NHWD	Non-hazardous waste disposed	kg	183	1.21E-04	4.07E-04	0.00192	0.00192	595	0	-5.74	27.6	0	-183
RWD	Radioactive waste disposed	kg	0.00224	6.98E-07	6.02E-07	1.11E-05	1.11E-05	0.00421	0	-7.36E-05	-8.14E-04	0	-0.00224
CRU	Components for re-use	kg	0	0	0	0	0	0	593	0	0	0	-593
MFR	Materials for recycling	kg	0	0	0	593	0	0	0	0	0	0	0
MER	Materials for energy recovery	kg	0	0	0	0	593	0	0	0	0	0	0
EEE	Exported electrical energy	MJ	0	0	0	0	0	0	0	0	0	0	0
EET	Exported thermal energy	MJ	0	0	0	0	0	0	0	0	0	0	0

RESULTS FOR 1m^3 OF UNTREATED PLYWOOD CONTINUED

Indicator		Unit	A1-A3 Production	C1 Decon-struction	C2 Transport to EOL	C3 Recycling	C3 Energy recovery	C4 Landfill (typical)	C3 Reuse	D Recycling	D Energy recovery	D Landfill (typical)	D Reuse
Table 8. Biogenic carbon content covering modules A1-D													
BCC-prod	Biogenic carbon content - product	kg	265	0	0	0	0	0	0	0	0	0	-265
BCC-pack	Biogenic carbon content - packaging	kg	2.25	0	0	0	0	0	0	0	0	0	-2.25
Table 9. Additional Indicators covering modules A1-D													
GWP-GHG	IPCC AR5 GWP (excluding biogenic carbon)	kg CO_2 eq	189	0.381	1.86	6.11	6.11	56.2	0	-18.7	-679	0	-189
PM	Respiratory inorganics	Disease incidence	1.65E-04	2.20E-08	2.98E-08	1.29E-06	1.29E-06	1.57E-06	0	-5.65E-06	2.12E-05	0	-1.65E-04
IR#	Ionizing radiation - human health	kBq U235 eq	0.270	8.19E-05	6.73E-05	0.00130	0.00130	0.391	0	-0.0131	-0.0993	0	-0.270
ETf*	Ecotoxicity freshwater	CTUe	2,990	1.94	6.87	30.6	30.6	407	0	-2,100	-4,320	0	-2,990
HTc*	Human toxicity, cancer	CTUh	6.22E-07	3.30E-11	1.16E-10	3.97E-09	3.97E-09	2.99E-08	0	-3.89E-08	-2.10E-08	0	-6.22E-07
HTnc*	Human toxicity, non-canc.	CTUh	4.53E-05	1.70E-09	6.46E-09	3.23E-08	3.23E-08	2.89E-06	0	-4.90E-06	3.83E-06	0	-4.53E-05
LU#	Land use	Dimensionless	4,280	0.0130	0.0534	0.243	0.243	46.3	0	-29.3	-8.09	0	-4,280
Table 10. Environmental impact (EN15804+A1) covering modules A1-D													
GWP	Global warming potential (total)	kg CO_2 eq	-786	0.376	1.92	977	977	52.6	971	-18.0	0	0	-663
ODP	Depletion potential of the stratospheric ozone layer	kg CFC-11 eq	1.48E-10	7.49E-17	2.90E-16	1.19E-15	1.19E-15	1.85E-13	0	-9.27E-12	0	0	-1.97E-14
AP	Acidification potential of land and water	kg SO_2 eq	5.76	0.00134	0.00394	0.0376	0.0376	0.155	0	-0.217	0	0	-0.0209
EP	Eutrophication potential	kg $(PO_4)^{3-}$ eq	1.19	3.05E-04	9.26E-04	0.00883	0.00883	0.0194	0	-0.0456	0	0	-0.0472
POCP	Photochemical ozone creation potential	kg Ethene eq	1.30	1.26E-04	-0.00152	0.00331	0.00331	0.00937	0	-0.187	0	0	0.107
ADPe*	Abiotic depletion potential – elements	kg Sb eq	1.06E-05	5.91E-09	3.15E-08	9.38E-08	9.38E-08	5.47E-06	0	-1.09E-06	0	0	-7.96E-05
ADPf*	Abiotic depletion potential – fossil fuels	MJ	977	5.06	25.7	79.9	79.9	796	0	-117	0	0	-11,600

*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.

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RESULTS FOR 1m^3 OF UNTREATED PLYWOOD CONTINUED

Indicator		Unit	A1-A3 Production	C1 Deconstruction	C2 Transport to EOL	C3 Recycling	C3 Energy recovery	C4 Landfill (typical)	C3 Reuse	D Recycling	D Energy recovery	D Landfill (typical)	D Reuse
Table 11. Green Star covering modules A1-D													
HT	Human Toxicity	CTUh	4.08E-06	1.31E-12	3.80E-12	3.47E-09	3.47E-09	2.5087E-09	0	-3.60E-06	0	0	6.5101E-09
LU	Land use	kg C deficit eq	168	8.83E-04	0.00458	0.0185	0.0185	0.606	0	-3.02	0	0	-0.492
GS-RDw	Resource depletion - water	m^3 water use	0.456	3.17E-05	1.45E-04	5.03E-04	5.03E-04	-0.0118	0	-0.0980	0	0	-0.00825
IR#	Ionising Radiation	kBq U-235 eq	0.270	8.19E-05	6.73E-05	0.00130	0.00130	0.391	0	-0.0131	0	0	-0.0993
PM	Particulate Matter	kg PM2.5 eq	0.734	9.78E-05	1.54E-04	0.00553	0.00553	0.00863	0	-0.0248	0	0	0.0936

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RESULTS FOR TREATMENT AND POWDER COATING APPLIED TO 1m³ OF KILN-DRIED PLYWOOD

			A1-A3		A1-A3
INDICATOR		UNIT	H3.1 LOSP	H3 CCA	POWDER COATING**
Table 12. Environmental impact results covering modules A1-D					
GWP	Global warming potential	kg CO_2 eq	37.4	17.8	77.9
GWPf	Global warming potential (fossil)	kg CO_2 eq	37.3	17.4	77.8
GWPb	Global warming potential (biogenic)	kg CO_2 eq	0.0840	0.414	0.0309
GWPluc	Global warming potential (land use change)	kg CO_2 eq	0.00831	0.00484	0.0500
ODP	Depletion potential of the stratospheric ozone layer	kg CFC 11 eq	5.89E-11	3.39E-10	1.23E-09
AP	Acidification potential - terrestrial and freshwater	Mol H+ eq	0.103	0.289	0.189
EPfw	Eutrophication potential - freshwater	kg P eq	5.42E-05	1.40E-04	3.35E-04
EPm	Eutrophication potential - marine	kg N eq	0.0228	0.0144	0.0417
EPt	Eutrophication potential - terrestrial	Mol N eq	0.241	0.169	0.449
POFP	Photochemical ozone formation potential	kg NMVOC eq	8.26	0.0523	0.142
ADPmm*	Abiotic depletion potential – minerals & metals	kg Sb eq	1.26E-04	0.00271	1.54E-04
ADPf*	Abiotic depletion potential – fossil fuels	MJ	1,410	213	2,190
WDP*	Water scarcity	m³ world eq	364	362	18.9
Table 13. Resource use indicators results covering modules A1-D					
PERE	Renewable primary energy as energy carrier	MJ	51.9	45.0	318
PERM	Renewable primary energy resources as material utilization	MJ	0	0	0
PERT	Total use of renewable primary energy resources	MJ	51.9	45.0	318
PENRE	Non-renewable primary energy as energy carrier	MJ	1,420	221	2,190
PENRM	Non-renewable primary energy as material utilization	MJ	0	0	0
PENRT	Total use of non-renewable primary energy resources	MJ	1,420	221	2,190
SM	Use of secondary material	kg	0	0	0
RSF	Use of renewable secondary fuels	MJ	0	0	0
NRSF	Use of non-renewable secondary fuels	MJ	0	0	0
FW	Use of net fresh water	m³	37.9	37.8	0.811

*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.

** For Shadowclad Ultra and Ecoply Barrier products that are powder coated these results should be added to Table 5-11 Results.

RESULTS FOR TREATMENT AND POWDER COATING APPLIED TO 1m³ OF KILN-DRIED PLYWOOD

INDICATOR		UNIT	A1-A3 H3.1 LOSP	A1-A3 H3 CCA	A1-A3 POWDER COATING
Table 14. Waste categories and output flow indicators covering modules A1-D					
HWD	Hazardous waste disposed	kg	2.39E-07	1.55E-07	1.57E-06
NHWD	Non-hazardous waste disposed	kg	0.289	1.38	7.46
RWD	Radioactive waste disposed	kg	0.00548	0.00302	0.0241
CRU	Components for re-use	kg	0	0	0
MFR	Materials for recycling	kg	0	0	0
MER	Materials for energy recovery	kg	0	0	0
EEE	Exported electrical energy	MJ	0	0	0
EET	Exported thermal energy	MJ	0	0	0
Table 15. Biogenic carbon content covering modules A1-D					
BCC-prod	Biogenic carbon content - product	kg	0	0	0
BCC-pack	Biogenic carbon content - packaging	kg	0	0	0
Table 16. Additional Indicators covering modules A1-D					
GWP-GHG	IPCC AR5 GWP (excluding biogenic carbon)	kg CO_2 eq	37.2	17.3	77.6
PM	Respiratory inorganics	Disease incidence	7.81E-07	2.74E-06	2.33E-06
IR#	Ionizing radiation - human health	kBq U235 eq	0.773	0.256	2.68
ETf*	Ecotoxicity freshwater	CTUe	827	560	1,250
HTc*	Human toxicity, cancer	CTUh	5.80E-06	1.51E-08	1.28E-07
HTnc*	Human toxicity, non-canc.	CTUh	3.79E-06	6.22E-07	1.40E-05
LU*	Land use	Dimensionless	20.3	11.4	65.7
Table 17. Environmental impact (EN15804+A1) covering modules A1-D					
GWP	Global warming potential (total)	kg CO_2 eq	35.5	17.5	74.3
ODP	Depletion potential of the stratospheric ozone layer	kg CFC-11 eq	1.09E-10	6.36E-10	2.29E-09
AP	Acidification potential of land and water	kg SO_2 eq	0.0839	0.256	0.154
EP	Eutrophication potential	kg $(PO_4)^{3-}$ eq	0.00836	0.00628	0.0170
POCP	Photochemical ozone creation potential	kg Ethene eq	4.85	0.0124	0.0205
ADPe*	Abiotic depletion potential – elements	kg Sb eq	1.26E-04	0.00271	1.54E-04
ADPf*	Abiotic depletion potential – fossil fuels	MJ	1,400	183	2,130
Table 18. Green Star covering modules A1-D					
HT	Human Toxicity	CTUh	7.27E-06	1.28E-09	4.84E-09
LU	Land use	kg C deficit eq	2.33	1.10	9.88
GS-RDw	Resource depletion - water	m3 water use	1.48	1.45	0.208
IR#	Ionising Radiation	kBq U-235 eq	0.773	0.256	2.68
PM	Particulate Matter	kg PM2.5 eq	0.00458	0.0169	0.0121

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PROGRAMME-RELATED INFORMATION AND VERIFICATION

Declaration owner	Carter Holt Harvey Plywood Limited www.chhply.co.nz Private Bag 92-102. Victoria Street West, Auckland 1142, New Zealand
EPD produced by	thinkstep-anz ltd thinkstep-anz.com | anz@thinkstep.com thinkstep-anz ltd, 11 Rawhiti Road, Pukerua Bay, 5026 Wellington, New Zealand
EPD programme operator	EPD Australasia Limited epd-australasia.com | info@epd-australasia.com EPD Australasia Limited, 315a Hardy Street, 7010 Nelson, New Zealand
CEN standard EN 15804+A2	PCR 2019:14, version 1.11 Construction Products. EPD International., 2021-02-05
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)
Third party verifier	Andrew D. Moore Life Cycle Logic Pty. Ltd lifecyclelogic.com.au | Andrew@lifecyclelogic.com.au PO Box 571, Fremantle WA 6959, Australia
Approved by	EPD Australasia
Procedure for follow-up of data during EPD validity involved third-party verifier	☐ yes ☑ no
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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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