



# Environmental Product Declaration for Barro Group Pre-mix Concrete E40PT22N3



In accordance with ISO 14025:2006 and EN 15804+A2:2019+A2:2019/AC:2021

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## Programme Information

EPDs within the same product category but registered in different EPD programmes may not be comparable. For two EPDs to be comparable, they shall be based on the same PCR (including the same version number up to the first two digits) 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.

Barro Group, as the EPD owner, has the sole ownership, liability, and responsibility for the EPD.

|                                                                                                         |                                                                                                                                                                                                  |                                                                                                                                                                                                                                             |
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| Product category rules (PCR)                                                                            | PCR 2019:14 Construction Products, Version 1.3.4 2024-04-30 (valid until 2025-06-20)<br>c-PCR-003: Product Category Rules (PCR) for Concrete and concrete elements (EN 16757) Version 2024-04-30 |                                                                                                                                                                                                                                             |
| PCR review conducted by                                                                                 | The Technical Committee of the International EPD® System.<br>Chair: Claudia A. Peña<br>Contact: <a href="mailto:info@environdec.com">info@environdec.com</a>                                     |                                                                                                                                                                                                                                             |
| Independent third-party verification of the declaration and data, according to ISO 14025:2006:          |                                                                                                                                                                                                  |                                                                                                                                                                                                                                             |
| <input type="checkbox"/> EPD process certification <input checked="" type="checkbox"/> EPD verification |                                                                                                                                                                                                  |                                                                                                                                                                                                                                             |
| Procedure for follow-up of data during EPD validity involves third party verifier:                      |                                                                                                                                                                                                  |                                                                                                                                                                                                                                             |
| <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No                                     |                                                                                                                                                                                                  |                                                                                                                                                                                                                                             |



## About Barro Group

**BARRO GROUP** is the leading independent supplier and distributor of high-quality construction materials.

Since commencing business in 1946, the family-owned Barro Group, operated by an experienced management team and skilled workforce, has established and secured an interest in a range of associated operations.

Barro Group is an integrated resources, manufacturing and distribution group, well-equipped to provide continued supplies of quality construction materials, genuine customer service and reliable delivery to any project - residential, commercial, civil, industrial.

Barro Group produces and delivers concrete in accordance with "Australian Standard 1379 - Specification and supply of concrete". The Barro Group Pty Ltd operates a Quality Management System which complies with the requirements of AS/NZS ISO 9001:2015 for the manufacture, sale and distribution of premixed concrete (Client Number 1035).

### Barro Group products

#### **PREMIXED CONCRETE**

standard mixes, and decorative and high-performance concrete mixes

#### **QUARRY MATERIALS**

aggregates, crushed rock, sands, gravels

#### **BUILDERS' SUPPLIES**

steel reinforcing and accessories, bagged cement products, building materials, oxides, tools of trade, landscape supplies

#### **CONCRETE PRECAST PANELS**

concrete precast panels

To support its core activities, Barro operates:

- ▶ well maintained delivery **fleet**;
- ▶ quality control **laboratories** for product testing and product development;
- ▶ fully equipped **workshops** for the servicing of plant and equipment;
- ▶ and supplies and services **tyres** for trucks and earthmoving equipment.

Barro Group is committed to continually improving performance to maintain high standards in occupational health and safety and environmental management, including its recycling and energy-saving strategies.

By maintaining high standards and competitive prices, Barro Group has been the selected supplier of construction materials to many landmark construction projects, and has a proven record of excellence in the supply of premixed concrete, quarry products and other construction materials. The depth and experience and competence of the management of Barro Group are evidenced by its growth and diversification over the years.

The Group is clearly well suited both technically and through its production facilities to successfully meet the needs of major construction projects.



## Product information

Concrete is a composite material that is made up of cement, water, and aggregates such as sand, gravel, or crushed rock. Other materials, such as fly ash or slag, may also be added to the mixture to enhance its properties and reduce cement use. When the cement and water are mixed, a chemical reaction occurs, creating a paste that binds the aggregates together. Once the mixture has hardened, it forms a strong and durable material that can be used in a variety of construction applications, including foundations, pavements, buildings, and decorative features. Concrete is prized for its strength, durability, and versatility, and it has become an essential material in modern construction.



Concrete is a versatile construction material that is used in a wide range of applications due to its strength, durability, and cost value. The technical purpose of concrete is to provide a strong and stable foundation or structure for buildings, roads, bridges, dams, and other projects.



Concrete is intended to be used as a construction material for a wide range of structures and infrastructure projects, including:

**Commercial, residential and industrial buildings:** Concrete is a popular choice for commercial, residential and industrial buildings due to its fire resistance, sound insulation, and ability to withstand harsh weather conditions.



**Building foundations:** Concrete is commonly used to create solid foundations for buildings, as it provides a strong and stable base that can support the weight of the structure.

**Roads and bridges:** Concrete is often used in the construction of roads and bridges due to its durability and ability to withstand heavy traffic loads.

**Dams and water reservoirs:** Concrete is a preferred material for building dams and water reservoirs, as it can withstand the weight of large bodies of water and resist erosion and other forms of damage.

**Sidewalks and curbs:** Concrete is commonly used to create sidewalks and curbs in urban areas, as it is durable, slip-resistant, and requires minimal maintenance.

**Retaining walls:** Concrete is often used to build retaining walls to hold back soil and prevent erosion, especially on steep slopes or hillsides.

Overall, concrete's intended use is to provide a strong, durable, and long-lasting construction material that can be used in a variety of applications.

## Industry classification

UN CPC 375 - Articles of concrete, cement and plaster

## Mix information

| Classification code | Strength (MPa) | Product name/description                   |
|---------------------|----------------|--------------------------------------------|
| E40PT22N3           | 40             | Post Tensioned S40MPa 22@3 - 700ms nominal |

## Production sites

This EPD covers concrete from 18 of Barro Group's batching plants in Victoria, Australia:

- |                  |                 |                    |
|------------------|-----------------|--------------------|
| ▶ Mount Evelyn   | ▶ Sunbury       | ▶ Point Wilson     |
| ▶ Ringwood       | ▶ Bacchus Marsh | ▶ Moolap           |
| ▶ Springvale     | ▶ Coburg        | ▶ Grovedale        |
| ▶ Dandenong      | ▶ Donnybrook    | ▶ Bannockburn      |
| ▶ Port Melbourne | ▶ Werribee      | ▶ Lincoln Causeway |
| ▶ Sunshine       | ▶ Laverton      | ▶ Wodonga          |





Figure 1 Victorian Barro Group batching plant locations



Figure 2 Melbourne and Geelong Barro Group batching plant locations



## LCA information

This EPD is for concrete mix E40PT22N3 produced at any of the Victorian batching plants. The mix results are declared as a production weighted average of all sites.

### Declared unit

One cubic metre (1 m<sup>3</sup>) of Barro Group mix E40PT22N3 concrete.

1m<sup>3</sup> of concrete is approximately 2 384 kg.

### Background data

Primary data for the LCA was collected and provided by Barro Group for the year 1 January 2023 – 31 December 2023.

SimaPro® LCA software v10.0.1.2 was used for the LCA modelling. All global background data are taken from Ecoinvent v3.10 allocation recycling cut-off model (Weidema, Bauer et al. 2023).

Background data for Australian material inputs, energy use, waste treatment and trucks are all sourced from the AusLCI EN15804 database v2.44 (Lifecycles 2024) which are then updated to Ecoinvent 3.10 for consistency with other data. Background data is less than 10 years old or have been updated within this timeframe.

### Cut-off criteria

The cut-off threshold for the LCA study was flows contributing less than 1% for any impact category included in the LCA. No flows were deliberately excluded due to this threshold, however particularly minor inputs expected to be well below this threshold were not considered. Packaging for chemical admixtures is expected to be well below this threshold and therefore not included in the study. Infrastructure, production equipment, and personnel related activities are non-attributable and excluded from the system boundary.

### Allocation

Fly ash – an input of some of the concrete mixes – is considered a by-product from coal-powered electricity generation, hence only the impacts from the transport of fly ash from the supplier to the batching plant were considered.



## Content declaration

The approximate mass composition of the concrete mixes produced at the batching plants are summarised in Table 1. The weight of one m<sup>3</sup> of the product varies depending on the mix.

**Table 1 Declared Barro Group concrete mix composition by mass**

| Component                                    | Quantity | Post-consumer recycled material (%) | Biogenic material (%) | Biogenic material (kg C/m <sup>3</sup> of product) |
|----------------------------------------------|----------|-------------------------------------|-----------------------|----------------------------------------------------|
| Coarse Aggregate                             | 32 - 49% | 0                                   | 0                     | 0                                                  |
| Sand                                         | 25 - 44% | 0                                   | 0                     | 0                                                  |
| Manufactured Sand                            | 0 - 13%  | 0                                   | 0                     | 0                                                  |
| Cement                                       | 6 - 27%  | 0                                   | 0                     | 0                                                  |
| Fly Ash                                      | 0 - 6%   | 0                                   | 0                     | 0                                                  |
| Ground Granulated Blast Furnace Slag (GGBFS) | 0 - 17%  | 0                                   | 0                     | 0                                                  |
| Chemical Admixtures                          | <0.5%    | 0                                   | 0                     | 0                                                  |
| Activator                                    | 0 - 0.5% | 0                                   | 0                     | 0                                                  |

As Barro Group premixed concrete is delivered in bulk there is no packaging for the products included in this EPD. There is no biogenic carbon or recycled material in the declared concrete mixes.

The mix included in this EPD does not contain substances in the Candidate List of Substances of Very High Concern in the European Chemicals Agency in concentrations >0.1% of the weight of the product. For further information, the safety data sheet for Barro Group concrete can be found [here](#).

## Mix information

| Classification code | Strength (MPa) | Product name/description                   |
|---------------------|----------------|--------------------------------------------|
| E40PT22N3           | 40             | Post Tensioned S40MPa 22@3 - 700ms nominal |



## System boundary

The system boundary describes the process steps included in the LCA. This LCA will cover the cradle-to-gate with options plus end-of-life life cycle stages (modules A1-A4, C1-C4, and D). Due to the multifunctional use of concrete, modules A5-B7 are not declared as these modules are best modelled at the construction/building project level. Please note that although informative, the use of the results of modules A1-A3 without considering the results of the entire module C are discouraged.

**Table 2 System boundary table according to EN 15804+A2 life cycle stages**

| 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 |   |   |   | Reuse-Recovery-Recycling-potential |  |                         |
| 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            | AU, JP              | AU | AU        | AU | -             | -  | -         | -  | -                         | -  | -   | -  | AU          | AU | AU     | AU |             |                            |               |   |                        |   |                       |   |                            |   |           |   |                  |                   |          |   |   |   | AU                                 |  |                         |
| Specific data used   | >85% <sup>1</sup>   |    |           | -  | -             | -  | -         | -  | -                         | -  | -   | -  | -           | -  | -      | -  | -           | -                          | -             | - | -                      | - | -                     | - | -                          | - | -         | - | -                | -                 | -        | - | - | - | -                                  |  |                         |
| Variation - products | 0%                  |    |           | -  | -             | -  | -         | -  | -                         | -  | -   | -  | -           | -  | -      | -  | -           | -                          | -             | - | -                      | - | -                     | - | -                          | - | -         | - | -                | -                 | -        | - | - | - | -                                  |  |                         |
| Variation - sites    | <10%                |    |           | -  | -             | -  | -         | -  | -                         | -  | -   | -  | -           | -  | -      | -  | -           | -                          | -             | - | -                      | - | -                     | - | -                          | - | -         | - | -                | -                 | -        | - | - | - | -                                  |  |                         |

X = module declared in this study. ND = module not declared in this study.

<sup>1</sup>Cement is a large majority of the impact (more than 80% for the GP cement mixes). The cement impact comes from the specific cement supplier EPD. Other major inputs including GGBFS and quarry materials are similarly sourced from the specific supplier EPD and data from self-owned quarries respectively.





**Figure 3 System boundary diagram for Barro Group concrete mixes**



### Product stage (A1-A3)

Barro Group concrete mixes involve coarse aggregates and sand from various self-owned quarries. Other raw materials are supplied from third parties. All raw materials are typically transported to the batching plant by truck. The electricity grid mix used in A1 and A3 is the residual market grid mix for Victoria, using the AusLCI residual market mix which is based on data published by the Australian Government, Department of Climate Change (2024) - GWP-GHG = 1.044 kg CO<sub>2</sub> eq./kWh.

### Transport to construction site (A4)

The concrete agitator truck was modelled using the customisable 28t truck from the AusLCI EN15804 database (Lifecycles 2024). A large concrete mixer truck was assumed, with capacity 7.4m<sup>3</sup> and loaded weight 28t. The average fuel use and load assumptions were obtained from the Survey of Motor Vehicle Use, Australia 2020 (Australian Bureau of Statistics 2020) using data from the articulated truck. The average cartage distance for Barro Group premix concrete from the batching plants to the construction site is 10km.

### End-of-Life (C1-C4, D)

For the calculation of end-of-life modules, it is assumed the mixes have been used to produce an unreinforced ground-bearing traditional concrete slab, with thickness 0.1m, for a residential family home. At the end-of-life of the concrete structure, the structure is demolished and either sent to recycling or landfill. Therefore, the downstream scenarios assume that there will be crushing and recycling of the concrete for the proportion that is not landfilled. Module D is based on the scenario "crushed concrete substitutes primary material without further processing" (e.g. in road construction). The R2 value used is 0.8, as per the masonry recycling rate from Pickin, Wardle et al. (2023). This is a scenario currently in use and representative of one of the most likely scenario alternatives for concrete products. Due to lack of data and for a more conservative assumption, there is assumed to be no carbonation (CO<sub>2</sub> absorption) of concrete material in any of these modules.

**Table 3 End-of-Life scenario parameters for modules C1-C4, D**

| Processes                                     | Quantity per m <sup>3</sup> of concrete | Unit      | Notes                                                                                                         |
|-----------------------------------------------|-----------------------------------------|-----------|---------------------------------------------------------------------------------------------------------------|
| <b>Collection</b>                             | 2 384                                   | kg        | Based on 25MPa with 30% GGBFS concrete from AusLCI database (ALCAS 2023).                                     |
| <b>Deconstruction demolition diesel usage</b> | 145                                     | MJ        | Assumption for a generic scenario.                                                                            |
| <b>Transport distance to recycling</b>        | 25                                      | km        | Distance from Melbourne CBD to concrete aggregate recycling centre.                                           |
| <b>Transport distance to landfill</b>         | 55                                      | km        | Distance from Melbourne CBD to landfill for concrete waste.                                                   |
| <b>Concrete recovered for recycling</b>       | 80                                      | % by mass | Based on masonry recycling rate from (Pickin, Wardle et al. 2023).                                            |
| <b>Concrete disposed to landfill</b>          | 20                                      | % by mass | Concrete not recycled is sent to landfill. Based on masonry recycling rate from (Pickin, Wardle et al. 2023). |



## Environmental impact indicators

The environmental indicators for the impact categories described in this EPD are summarised in the tables below. Environmental Footprint 3.1 (EF 3.1) was used. Abbreviations of each indicator will be used in the results tables for simplicity.

**Table 4 Mandatory potential environmental impact indicators according to EN 15804:2012+A2:2019**

| Indicator                                           | Abbreviation | Units                               |
|-----------------------------------------------------|--------------|-------------------------------------|
| Global warming potential - fossil                   | GWPF         | kg CO <sub>2</sub> eq.              |
| Global warming potential - biogenic                 | GWPB         | kg CO <sub>2</sub> eq.              |
| Global warming potential - land use/land use change | GWPL         | kg CO <sub>2</sub> eq.              |
| Global warming potential - total                    | GWPT         | kg CO <sub>2</sub> eq.              |
| Ozone depletion potential                           | ODP          | kg CFC 11 eq.                       |
| Acidification potential                             | AP           | mol H <sup>+</sup> eq.              |
| Eutrophication potential - freshwater               | EPF          | kg P eq.                            |
| Eutrophication potential - marine                   | EPM          | kg N eq.                            |
| Eutrophication potential - terrestrial              | EPT          | mol N eq.                           |
| Photochemical ozone creation potential              | POCP         | kg MNVOC eq.                        |
| Abiotic depletion potential - minerals & metals*    | ADPE         | kg Sb eq.                           |
| Abiotic depletion potential - fossil fuels*         | ADPF         | MJ                                  |
| Water deprivation potential*                        | WDP          | m <sup>3</sup> H <sub>2</sub> O eq. |

\* Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of the results are high and as there is limited experience with the indicator.



**Table 5 Additional potential environmental impact indicators according to EN 15804:2012+A2:2019**

| Indicator                                                                    | Abbreviation | Units             |
|------------------------------------------------------------------------------|--------------|-------------------|
| Particulate Matter emissions                                                 | PM           | Disease incidence |
| Ionising Radiation - human health**                                          | IRP          | kBq U-235-eq.     |
| Eco-toxicity - freshwater*                                                   | ETPF         | CTUe              |
| Human toxicity - cancer*                                                     | HTPC         | CTUh              |
| Human toxicity - non-cancer*                                                 | HTPNC        | CTUh              |
| Land use related impacts / soil quality*                                     | SQP          | Dimensionless     |
| Global warming potential - excluding biogenic uptake, emissions, and storage | GWP-GHG      | kg CO2 eq.        |

\* Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of the results are high and as there is limited experience with the indicator

\*\* Disclaimer: 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 from some construction materials is also not measured by this indicator.

**Table 6 Use of resources, waste production, and output flows**

| Indicator                                | Abbreviation          | Units                   |
|------------------------------------------|-----------------------|-------------------------|
| Primary energy resources - Renewable     | Use as energy carrier | PERE                    |
|                                          | Used as raw materials | PERM                    |
|                                          | Total                 | PERT                    |
| Primary energy resources - Non-renewable | Use as energy carrier | PENRE                   |
|                                          | Used as raw materials | PENRM                   |
|                                          | Total                 | PENRT                   |
| Use of secondary materials               | SM                    | kg                      |
| Use of renewable secondary fuels         | RSF                   | MJ, net calorific value |
| Use of non-renewable secondary fuels     | NRSF                  | MJ, net calorific value |
| Net use of fresh water                   | FW                    | m3                      |
| Hazardous waste disposed                 | HWD                   | kg                      |
| Non-hazardous waste disposed             | NHWD                  | kg                      |
| Radioactive waste disposed               | RWD                   | kg                      |
| Components for reuse                     | CRU                   | kg                      |
| Material for recycling                   | MFR                   | kg                      |
| Materials for energy recovery            | MER                   | kg                      |
| Exported energy - electrical             | EEE                   | MJ per energy carrier   |
| Exported energy - thermal                | EET                   | MJ per energy carrier   |



## Environmental performance indicator results

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

Results are declared per 1m<sup>3</sup> of concrete.

### Core indicators

| Indicator   | Unit                   | A1-A3    | A4       | C1       | C2       | C3       | C4       | D         |
|-------------|------------------------|----------|----------|----------|----------|----------|----------|-----------|
| <b>GWPF</b> | kg CO <sub>2</sub> eq. | 2.75E+02 | 2.68E+00 | 1.36E+01 | 5.11E+00 | 7.10E+00 | 2.46E+00 | -1.70E+01 |
| <b>GWPB</b> | kg CO <sub>2</sub> eq. | 2.44E-01 | 7.47E-04 | 7.57E-03 | 1.24E-03 | 1.98E-03 | 2.32E-03 | -1.11E-01 |
| <b>GWPL</b> | kg CO <sub>2</sub> eq. | 2.84E-01 | 6.78E-05 | 4.72E-04 | 2.28E-04 | 1.75E-04 | 2.32E-03 | -2.71E-01 |
| <b>GWPT</b> | kg CO <sub>2</sub> eq. | 2.76E+02 | 2.68E+00 | 1.36E+01 | 5.11E+00 | 7.11E+00 | 2.47E+00 | -1.73E+01 |
| <b>ODP</b>  | kg CFC11 eq.           | 1.70E-05 | 3.65E-08 | 2.14E-07 | 1.16E-06 | 1.60E-06 | 1.02E-06 | -1.59E-07 |
| <b>AP</b>   | mol H+ eq.             | 2.68E+00 | 7.06E-03 | 1.27E-01 | 3.22E-02 | 7.72E-02 | 2.36E-02 | -1.42E-01 |
| <b>EPF</b>  | kg P eq.               | 6.95E-03 | 1.58E-05 | 1.11E-04 | 5.21E-05 | 4.30E-05 | 2.30E-04 | -5.28E-04 |
| <b>EPM</b>  | kg N eq.               | 9.84E-01 | 2.63E-03 | 5.99E-02 | 7.89E-03 | 3.47E-02 | 8.21E-03 | -4.44E-02 |
| <b>EPT</b>  | mol N eq.              | 1.10E+01 | 2.88E-02 | 6.56E-01 | 8.82E-02 | 3.80E-01 | 8.99E-02 | -5.00E-01 |
| <b>POCP</b> | kg NMVOC eq.           | 2.87E+00 | 1.08E-02 | 1.95E-01 | 2.68E-02 | 1.04E-01 | 2.61E-02 | -1.45E-01 |
| <b>ADPE</b> | kg Sb eq.              | 4.57E-04 | 9.65E-08 | 5.70E-07 | 8.70E-07 | 3.70E-07 | 5.73E-06 | -4.28E-06 |
| <b>ADPF</b> | MJ                     | 3.17E+03 | 3.60E+01 | 1.79E+02 | 7.00E+01 | 9.91E+01 | 7.01E+01 | -1.47E+02 |
| <b>WDP</b>  | m <sup>3</sup> depriv. | 1.70E+03 | 1.99E-02 | 2.33E-01 | 1.05E-02 | 2.47E-02 | 3.15E+00 | -1.29E+01 |

### Additional indicators

| Indicator      | Unit                  | A1-A3    | A4       | C1       | C2       | C3       | C4       | D         |
|----------------|-----------------------|----------|----------|----------|----------|----------|----------|-----------|
| <b>GWP-GHG</b> | kg CO <sub>2</sub> eq | 2.69E+02 | 2.68E+00 | 1.36E+01 | 5.11E+00 | 7.10E+00 | 2.47E+00 | -1.73E+01 |
| <b>PM</b>      | disease inc.          | 1.42E-05 | 4.71E-08 | 3.65E-06 | 5.06E-07 | 1.63E-05 | 4.76E-07 | -3.03E-06 |
| <b>IRP</b>     | kBq U-235 eq.         | 3.50E-01 | 5.44E-03 | 3.81E-02 | 3.09E-01 | 4.37E-01 | 3.11E-01 | -5.96E-02 |
| <b>ETPF</b>    | CTUe                  | 1.77E+03 | 1.23E+00 | 6.20E+00 | 1.69E+01 | 2.30E+01 | 1.64E+01 | -1.57E+01 |
| <b>HTPC</b>    | CTUh                  | 9.52E-08 | 1.73E-10 | 9.56E-10 | 1.28E-10 | 2.90E-10 | 5.83E-10 | -1.30E-08 |
| <b>HTPNC</b>   | CTUh                  | 3.42E-06 | 3.37E-09 | 1.36E-08 | 6.49E-10 | 1.24E-09 | 1.01E-09 | -3.82E-08 |
| <b>SQP</b>     | Pt                    | 1.70E+03 | 5.08E-02 | 3.80E-01 | 8.83E+00 | 3.12E-01 | 1.47E+02 | -2.26E+03 |



## Resource use, waste flows, and output flows

| Indicator    | Unit           | A1-A3    | A4       | C1       | C2       | C3       | C4       | D         |
|--------------|----------------|----------|----------|----------|----------|----------|----------|-----------|
| Resource use |                |          |          |          |          |          |          |           |
| PERE         | MJ NCV         | 1.19E+02 | 5.65E-02 | 4.01E-01 | 2.37E-01 | 7.74E-01 | 1.21E+00 | -3.00E+01 |
| PERM         | MJ NCV         | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00  |
| PERT         | MJ NCV         | 1.19E+02 | 5.65E-02 | 4.01E-01 | 2.37E-01 | 7.74E-01 | 1.21E+00 | -3.00E+01 |
| PENRE        | MJ NCV         | 3.27E+03 | 3.60E+01 | 1.79E+02 | 4.68E+00 | 1.09E+02 | 7.28E+01 | -1.42E+02 |
| PENRM        | MJ NCV         | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00  |
| PENRT        | MJ NCV         | 3.27E+03 | 3.60E+01 | 1.79E+02 | 4.68E+00 | 1.09E+02 | 7.28E+01 | -1.42E+02 |
| SM           | kg             | 3.80E+01 | 1.50E-05 | 3.23E-04 | 1.96E-03 | 4.47E-02 | 1.75E-02 | -5.72E-03 |
| RSF          | MJ NCV         | 3.24E-03 | 1.88E-06 | 6.41E-05 | 2.52E-05 | 1.18E-04 | 3.76E-04 | -2.70E-03 |
| NRSF         | MJ NCV         | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00  |
| FW           | m <sup>3</sup> | 3.09E-01 | 0.00E+00 | 0.00E+00 | 6.31E-04 | 5.83E-03 | 7.52E-02 | 0.00E+00  |
| Waste flows  |                |          |          |          |          |          |          |           |
| HWD          | kg             | 5.43E-01 | 3.07E-03 | 1.94E-02 | 3.43E-03 | 5.02E-02 | 3.49E-02 | -2.89E-01 |
| NHWD         | kg             | 7.88E+03 | 9.95E-02 | 6.51E-01 | 1.10E-01 | 1.00E+00 | 1.04E+00 | -4.60E+00 |
| RWD          | kg             | 7.66E-05 | 1.29E-06 | 9.16E-06 | 1.01E-06 | 1.18E-05 | 1.07E-05 | -1.42E-05 |
| Output flows |                |          |          |          |          |          |          |           |
| CRU          | kg             | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00  |
| MFR          | kg             | 2.58E-03 | 8.00E-07 | 4.58E-06 | 3.65E-05 | 3.44E-04 | 3.26E-04 | -2.16E-03 |
| MER          | kg             | 9.61E-06 | 1.94E-08 | 2.54E-07 | 1.97E-07 | 1.35E-06 | 1.17E-06 | -5.85E-06 |
| EEE          | MJ             | 2.26E-02 | 2.96E-04 | 3.37E-03 | 3.66E-04 | 4.58E-03 | 3.99E-03 | -4.31E-03 |
| EET          | MJ             | 1.19E-02 | 3.81E-05 | 1.35E-03 | 4.67E-04 | 2.51E-03 | 2.49E-03 | -5.12E-03 |

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