

# Reach K-18566X

Reach semi-pedestal

Product Group

Vitreous Sanitary Ceramic Ware

|  |             |
|--|-------------|
| <b>Product Specifications</b>                |             |
| Packaged Product Weight (kg)                 | 14.8        |
| Product Recycled Content                     | 0%          |
| Product Recyclable Content                   | 5%          |
| Product Life time (years)                    | 50          |
| Product Application                          | Residential |
| <b>Use Phase Specifications</b>              |             |
| Flush Volume (gal/ flush)                    | N/A         |
| User Frequency (flushes/day/person)          | N/A         |
| Annual Cleaning Frequency (times)            | 52          |
| Cleaner                                      | N/A         |
| <b>Greenhouse Gas Emission (kg CO2- eq.)</b> |             |
| Material & Manufacturing                     | 22          |
| Use & Maintenance                            | 39          |
| <b>Water Intensity (m3)</b>                  |             |
| Material & Manufacturing                     | 0.66        |
| Use & Maintenance                            | -0.08       |
| <b>Manufacturing Locations</b>               |             |
| Saraburi, Thailand                           |             |



## Believing in Better

We believe in a better world. We are passionate about protecting the environment and enhancing the quality of life for current and future generations. And that means designing products that look beautiful and deliver exceptional performance, while being as sustainable as possible.



## Environmental Product Declaration

Vitreous Sanitary Ceramic Ware



|   |   |
|---|---|
| Program Operator Name, Address, Logo, and Website | UL Environment  |
| General Program Instructions and Version Number   | Program Operator Rules V2.3 February 2018   |
| Location of Explanatory Material                  | Saraburi, Thailand  |
| Declaration Holder and Address                    | Kohler Co.<br>444 Highland Drive, Kohler, WI  |
| Declaration Number                                | 4788111728.206.1  |
| Declared Product and Functional Unit              | Reach K-18566X, Single Pedestal/ Shroud   |
| Product Definition                                | Reach semi-pedestal   |
| Reference PCR and Version Number                  | PCR for Building-Related Products and Services. Adapted for UL Environment from the range of Environmental Product Declarations of Institute Construction and Environment e.V. (IBU). Part A (v.3): Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report. Part B (v.2): Sanitary Ceramic EPD Requirements |
| Markets of Applicability                          | Asia Pacific  |
| Date of Issue                                     | 01-Oct-20   |
| Period of Validity                                | 5 Years   |
| EPD Type  | Product Specific  |
| EPD Scope   | Cradle-to-grave   |
| Year of Reported Manufacturer Primary Data        | 2016  |
| LCA Software and Version Number                   | SimaPro v. 8.4.0.0  |
| LCIA Database(s) and Version Numbers              | Ecoinvent 3<br>DATASMART LCI Package (USEI 2.2)<br>TRACI 2.1 v1.04  |
| LCIA Methodology and Version Number               | CML-IA baseline v3.04<br>Cumulative Energy Demand (CED) v1.09   |
| Applicable Green Building Certifications Schema   | LEED v4/BD+C/Materials and Resources/Building Product Disclosure and Optimization-Environmental Product Declarations  |

# Environmental Product Declaration

Vitreous Sanitary Ceramic Ware



The PCR review was conducted by:

This declaration was independently verified in accordance with ISO 14025:2006. The UL Environment "Part A: calculation Rules for the Life Cycle Assessment Requirements on the Project Report" v3.0 (December 2017), based on CEN Norm EN 15804 (2012) and ISO 21930:2017, serves as the core PCR, with additional considerations from the USGBC/ UL Environment Part A Enhancement (2017).

☐ INTERNAL

☒ EXTERNAL

This life cycle assessment was conducted in accordance with ISO 14044 and reference PCR by:

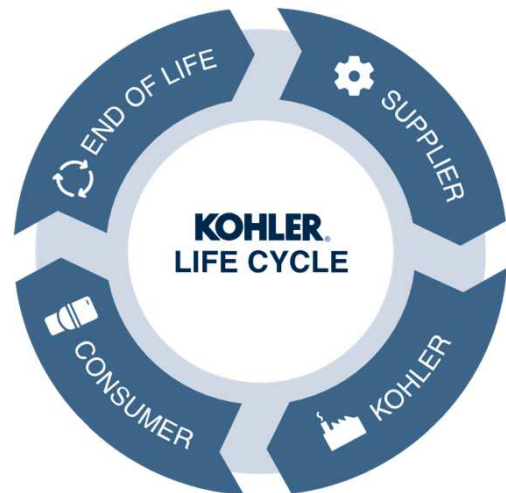
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:

Thomas Gloria, Life-Cycle Services, LLC

LIMITATIONS: 1) Environmental declarations from different programs (ISO 14025) may not be comparable; 2) Comparison of the environmental performance using EPD information shall be based on the product's use and impacts at the building level, and therefore EPDs may not be used for comparability purposes when not considering the building use phase as instructed under this PCR; 3) Full conformance with the PCR allows EPD comparability when all stages of a life cycle have been considered, when they comply with all referenced standards, use the same sub-category PCR, and use equivalent scenarios with respect to construction work. However, variations and deviations are possible. example of variations: Different LCA software and background LCI datasets may lead to differences results for upstream or downstream of the life cycle stages declared.

This document is an environmental product declaration (EPD) in accordance with ISO 21930. EPDs rely on Life Cycle Assessment (LCA) to provide information on a number of environmental impacts of products over their life cycles.

At Kohler Co., we believe in protecting the environment and enhancing the quality of life for current and future generations. When developing new products, we consider the environmental impact at each stage of a product's existence - from the activities of our suppliers through the end of the product's useful life. Designing for a better world means every choice counts.



## Product Description



Geometric straight lines in true minimalist fashion to match varied bathroom styles.

Additional data can be found at:

<https://www.kohlerasiapacific.com/productDetails/18566X?skuid=18566X-0>

## Applications and Uses

- Vitreous china
- Semi-pedestal lavatory
- Available in single-hole or 8" centers
- With overflow
- 572 x 454 x 410 mm

## Product Standards, Approvals and Certifications

Specified model meets or exceeds the following:

- ASME A112.19.2/CSA B45.1
- TIS 791-2544

## SUPPLIER OPERATIONS

### Base Material Content of the Product

| Material | Function                             | Quantity (% By Weight) |
|----------|--------------------------------------|------------------------|
| Clay     | Slip and Glaze Ingredient            | 45-55                  |
| Feldspar | Slip and Glaze Ingredient            | 25-35                  |
| Silica   | Slip and Glaze Ingredient            | 10-20                  |
| Balance  | Miscellaneous Hardware and Packaging | 5-10                   |

## KOHLER OPERATIONS

### Manufacturing Process Description

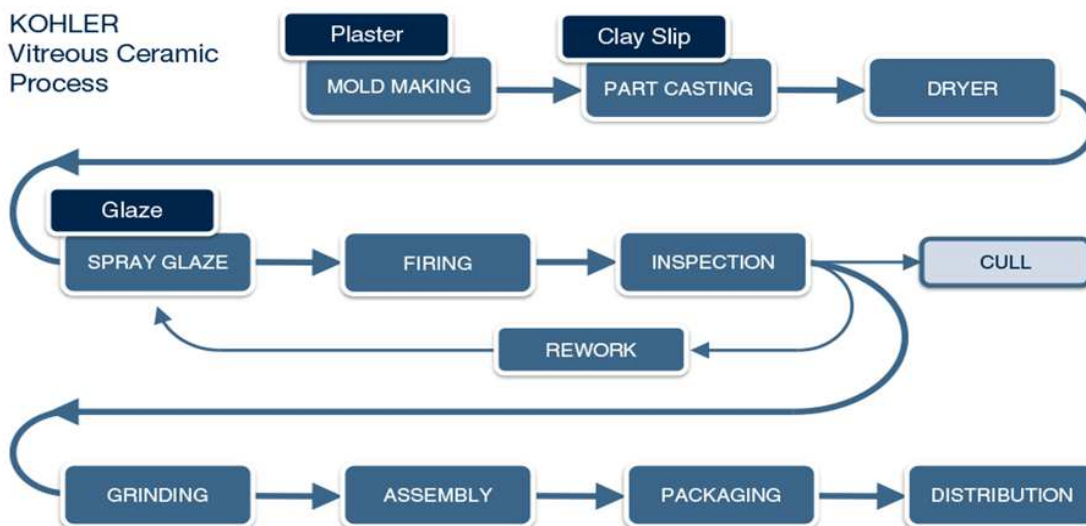
The body of vitreous ceramic sanitary ware is manufactured by casting slip - a mixture of water, clay, feldspar and silica - into a reusable mold. The cast body is partially dried, sprayed with an aqueous glaze mixture, and fired in a kiln to vitrify the product. An inspection process follows that ensures a singular high level of product quality. Finally, the ware is fitted with non-vitreous components, packaged and shipped.

### Manufacturing Locations



Not all products are produced in all plants. EPDs for specific models only include data from plants in which they are produced.

### Manufacturing Process



### Health, Safety and Environmental Aspects during Production

Kohler Co. has established program management guidelines for safety, accident prevention and environmental performance. These systems enable Kohler Co. operations to achieve world-class performance: Kohler Safety Management System (KSMS) and Kohler Environmental Management System (KEMS). The management systems are based on best management practices, and the application of these programs consistently delivers significant results.

### Packaging

Vitreous ware is packaged primarily with double-wall corrugated containerboard. When utilized, white exterior wrapping is manufactured with an Elemental Chlorine Free (ECF)/Totally Chlorine Free (TCF) bleaching process. Other packaging materials can include expanded polystyrene (EPS), low density polyethylene bags (LDPE) and honeycomb paperboard blocking. Corrugated containerboard and honeycomb blocking are 100% recyclable, and collection is available in most municipalities. Other materials are typically recyclable; however, this is dependent on local availability of collection programs.



## CONSUMER USE

### Conditions of Use

The majority of product use phase environmental impacts for vitreous ceramic sanitary ware are related to water throughput. It is important to note that water use impacts are assigned to the device that controls water flow rate. For example, a lavatory sink EPD will not include these impacts, as water consumption is controlled by the faucet that is paired with it. Similarly, a toilet bowl EPD will not include water use impacts, as the tank or flushometer it is paired with provides this function. However, a one-piece toilet with integrated tank and bowl will include water use impacts within its EPD.

### Reference Service Life

Residential pedestal/shrouds are assumed to remain in service for 50 years.

### Cleaning and Maintenance

Residential pedestal/shrouds are assumed to require 52 cleanings per year with N/A. These impacts are included within the product use stage of the LCA.



## END OF LIFE

### Recycle or Reuse

Collection and processing for vitreous product beneficial reuse and end-of-life are possible, but not widely available at present time

### Disposal

Upon PCR default assumptions, The KOHLER® LCA model assumes 100% of the vitreous portion of the product, accessories and packaging materials are landfilled.



## LIFE CYCLE ASSESSMENT

### Description of Declared or Functional Unit

The functional unit represented here refers to a single pedestal/shroud.

| Name                      | Value                    | Unit     |
|---------------------------|--------------------------|----------|
| Functional Unit           | 1 packaged product piece |          |
| Mass                      | 14.81                    | kg       |
| Conversion factor to 1 kg | 0.07                     |          |
| Flush rate                | 0                        | m3/flush |
| Flow rate                 | -                        | m3/sec   |

### Estimates and Assumptions

The LCI/ LCA assumptions are mentioned below:

- Product transport from DC to final customer and from customer to disposal site are modeled based on PCR specifications
- Product and packaging disposal scenarios are adopted from the PCR specifications
- Building estimated service life (ESL) is assumed to be 75 years
- Biogenic carbon content is estimated for three types of packaging materials: plywood, corrugate box and kraft paper
- Carbon calcination emission factors are sourced from FIRE database for caolin calcination

### Cut-off Criteria

This LCA is in compliance with the cutoff criteria specified in the PCR, as no known processes were excluded from this assessment outside of the specific items listed within the "System Boundary" section below.

### Allocation

Impacts are allocated to individual products with a unit process approach. Typically, product mass is used to build the impact allocation factors. Product-specific quality data is also employed to match impacts to products.

### Data Sources

Primary manufacturing data was collected directly from process experts for the eleven Kohler vitreous plants within North America, Thailand and China, for calendar year of 2016. Secondary data primarily references the DATASMART and ecoinvent 3 LCI databases. Both databases are widely distributed and are referenced within the LCA community. All ecoinvent datasets have been critically reviewed.

### Data Quality

Wherever secondary data is used, the study adopts critically reviewed data for consistency, precision and reproducibility to limit uncertainty. The data sources used are complete and representative of North America, Thailand and China in terms of the geographic and technological coverage and are a recent vintage (i.e., less than ten years old). Any deviations from these initial data quality requirements for secondary data are documented in the critically reviewed LCA report. When a product is produced at more than one plant, impacts are weighted by unit volume to produce a single result.

## LCA Modeling Scenarios

| Transport from gate to the building site (A4) |       |                   |
|---|-------|-------------------|
| Name  | Value | Unit              |
| Liters of fuel                                | 38    | l/100 km          |
| Transport distance                            | 821.9 | km                |
| Capacity utilization (including empty runs)   | 89    | %                 |
| Gross density of products transported         | -     | kg/m <sup>3</sup> |
| Capacity utilization volume factor            | 89    | -                 |

| Installation into the building (A5)                             |       |                |
|---|-------|----------------|
| Name  | Value | Unit           |
| Auxiliary material  | -     | kg             |
| Water consumption   | -     | m <sup>3</sup> |
| Other resources   | -     | km             |
| Electricity consumption   | -     | kWh            |
| Other energy carriers   | -     | MJ             |
| Product loss per functional unit                                | -     | kg             |
| Waste material at the construction site before waste processing | 1.569 | kg             |
| Output materials resulting from on-site waste processing        | -     | kg             |
| Direct emissions to ambient air, soil and water                 | -     | kg             |

| Reference service life       |       |       |
|------------------------------|-------|-------|
| Name                         | Value | Unit  |
| Reference service life (RSL) | 50    | years |

| Maintenance (B2)                                |       |                |
|---|-------|----------------|
| Name  | Value | Unit           |
| Maintenance process information                 | -     | -              |
| Maintenance cycle                               | 2600  | Number/RSL     |
| Maintenance cycle                               | 3900  | Number/ESL     |
| Water consumption                               | -     | m <sup>3</sup> |
| Auxiliary material (cleaning agent)             | N/A   | kg             |
| Other resources                                 | -     | kg             |
| Electricity consumption                         | -     | kWh            |
| Other energy carriers                           | -     | MJ             |
| Power output of equipment                       | -     | kW             |
| Material loss                                   | -     | kg             |
| Direct emissions to ambient air, soil and water | -     | kg             |

| Repair (B3)                             |       |                |
|---|-------|----------------|
| Name                                    | Value | Unit           |
| Repair process information              | -     | -              |
| Inspection process information          | -     | -              |
| Repair cycle                            | -     | Number/RSL     |
| Repair cycle                            | -     | Number/ESL     |
| Water consumption                       | -     | m <sup>3</sup> |
| Auxiliary                               | -     | kg             |
| Other resources                         | -     | kg             |
| Electricity consumption                 | -     | kWh            |
| Other energy carriers                   | -     | MJ             |
| Material loss                           | -     | kg             |
| Direct emissions to air, soil and water | -     | kg             |

| Replacement (B4)/Refurbishment (B5)     |       |                |
|---|-------|----------------|
| Name                                    | Value | Unit           |
| Replacement cycle                       | 1     | Number/RSL     |
| Replacement cycle                       | 0.5   | Number/ESL     |
| Electricity consumption                 | -     | kWh            |
| Liters of fuel                          | 19    | l/100 km       |
| Water consumption                       | -     | m <sup>3</sup> |
| Auxiliary material                      | -     | kg             |
| Replacement of worn parts               | -     | kg             |
| Direct emissions to air, soil and water | -     | kg             |

| Operational energy use (B6) and water use (B7) |       |                       |
|--|-------|-----------------------|
| Name   | Value | Unit                  |
| Water consumption                              | -     | m <sup>3</sup> /p/RSL |
| Electricity consumption                        | -     | kWh                   |
| Other energy carriers                          | -     | MJ                    |
| Equipment output                               | -     | kW                    |
| Direct emissions to air, soil and water        | -     | kg                    |

| End of life (C1-C4)                   |       |      |
|---------------------------------------|-------|------|
| Name                                  | Value | Unit |
| Collected separately                  | 0.712 | kg   |
| Collected as mixed construction waste | 14.09 | kg   |
| Reuse                                 | -     | kg   |
| Recycling                             | -     | kg   |
| Energy recovery                       | -     | kg   |
| Landfilling                           | 14.81 | kg   |



## System Boundaries

| Cradle to grave with options | Product Stage       |           |               | Construction Process Stage      |                   | Use Stage |             |        |             |               |                        |                       | End of Life Stage |           |                  |          | Benefits and Loads Beyond the System Boundaries | Reference Service Life |
|------------------------------|---------------------|-----------|---------------|---------------------------------|-------------------|-----------|-------------|--------|-------------|---------------|------------------------|-----------------------|-------------------|-----------|------------------|----------|---|------------------------|
|                              | Raw material supply | Transport | Manufacturing | Transport from gate to the site | Assembly/ Install | Use       | Maintenance | Repair | Replacement | Refurbishment | Operational energy use | Operational water use | Deconstruction    | Transport | Waste processing | Disposal | Reuse-Recovery-Recycling potential              |                        |
|                              | A1                  | A2        | A3            | A4                              | A5                | B1        | B2          | B3     | B4          | B5            | B6                     | B7                    | C1                | C2        | C3               | C4       | D   |                        |
|                              | X                   | X         | X             | X                               | X                 | X         | X           | X      | X           | X             | X                      | X                     | X                 | X         | X                | X        | MND   |                        |

Description of the System Boundary Stages Corresponding to the PCR

(X = Included; MND = Module Not Declared)

## Results of the Assessment

| TRACI 2.1 Impact Assessment |                          |                 |                            |            |                          |              |
|-----------------------------|--------------------------|-----------------|----------------------------|------------|--------------------------|--------------|
| Module                      | GWP                      | ODP             | AP                         | EP         | POCP                     | ADP          |
|                             | (kg CO <sub>2</sub> Eq.) | (kg CFC-11 Eq.) | (kg SO <sub>2</sub> - Eq.) | (kg N-Eq.) | (kg O <sub>3</sub> -Eq.) | (MJ surplus) |
| Total                       | 6.11E+01                 | 1.77E-05        | 2.86E-01                   | 2.13E-01   | 4.20E+00                 | 9.05E+01     |
| A1- A3                      | 2.17E+01                 | 2.34E-06        | 4.61E-02                   | 3.37E-02   | 7.31E-01                 | 4.63E+01     |
| A4                          | 2.08E+00                 | 1.80E-07        | 1.23E-02                   | 1.63E-03   | 3.49E-01                 | 4.14E+00     |
| A5                          | 3.73E-03                 | 1.80E-09        | 3.27E-05                   | 6.97E-06   | 7.77E-04                 | 1.68E-02     |
| B1                          | 0.00E+00                 | 0.00E+00        | 0.00E+00                   | 0.00E+00   | 0.00E+00                 | 0.00E+00     |
| B2                          | 3.70E+01                 | 1.52E-05        | 2.25E-01                   | 1.77E-01   | 3.06E+00                 | 3.92E+01     |
| B3                          | 0.00E+00                 | 0.00E+00        | 0.00E+00                   | 0.00E+00   | 0.00E+00                 | 0.00E+00     |
| B4                          | 0.00E+00                 | 0.00E+00        | 0.00E+00                   | 0.00E+00   | 0.00E+00                 | 0.00E+00     |
| B5                          | 0.00E+00                 | 0.00E+00        | 0.00E+00                   | 0.00E+00   | 0.00E+00                 | 0.00E+00     |
| B6                          | 0.00E+00                 | 0.00E+00        | 0.00E+00                   | 0.00E+00   | 0.00E+00                 | 0.00E+00     |
| B7                          | 0.00E+00                 | 0.00E+00        | 0.00E+00                   | 0.00E+00   | 0.00E+00                 | 0.00E+00     |
| C1                          | 0.00E+00                 | 0.00E+00        | 0.00E+00                   | 0.00E+00   | 0.00E+00                 | 0.00E+00     |
| C2                          | 2.56E-01                 | 4.50E-10        | 1.48E-03                   | 1.39E-04   | 4.29E-02                 | 4.80E-01     |
| C3                          | 0.00E+00                 | 0.00E+00        | 0.00E+00                   | 0.00E+00   | 0.00E+00                 | 0.00E+00     |
| C4                          | 7.40E-02                 | 3.57E-08        | 6.48E-04                   | 1.38E-04   | 1.54E-02                 | 3.32E-01     |

## CML 4.1 Impact Assessment

| Module | GWP                       | ODP             | AP Air                    | EP   | POCP                                   | ADP element | ADP fossil fuels |
|--------|---------------------------|-----------------|---------------------------|--|--|-------------|------------------|
|        | (kg CO <sub>2</sub> -Eq.) | (kg CFC-11 Eq.) | (kg SO <sub>2</sub> -Eq.) | (kg (PO <sub>4</sub> ) <sub>3</sub> - Eq.) | (kg C <sub>2</sub> H <sub>4</sub> Eq.) | (kg Sb-Eq.) | (MJ, LHV)        |
| Total  | 6.19E+01                  | 1.65E-05        | 2.84E-01                  | 1.06E-01                                   | 1.27E-02                               | 5.20E-04    | 8.03E+02         |
| A1- A3 | 2.20E+01                  | 1.83E-06        | 4.37E-02                  | 1.74E-02                                   | 2.58E-03                               | 1.90E-05    | 3.11E+02         |
| A4     | 2.09E+00                  | 1.35E-07        | 9.97E-03                  | 2.22E-03                                   | 3.94E-04                               | 2.22E-06    | 2.80E+01         |
| A5     | 3.76E-03                  | 1.36E-09        | 2.83E-05                  | 6.04E-06                                   | 1.39E-06                               | 4.24E-09    | 1.14E-01         |
| B1     | 0.00E+00                  | 0.00E+00        | 0.00E+00                  | 0.00E+00                                   | 0.00E+00                               | 0.00E+00    | 0.00E+00         |
| B2     | 3.75E+01                  | 1.45E-05        | 2.28E-01                  | 8.56E-02                                   | 9.61E-03                               | 4.99E-04    | 4.59E+02         |
| B3     | 0.00E+00                  | 0.00E+00        | 0.00E+00                  | 0.00E+00                                   | 0.00E+00                               | 0.00E+00    | 0.00E+00         |
| B4     | 0.00E+00                  | 0.00E+00        | 0.00E+00                  | 0.00E+00                                   | 0.00E+00                               | 0.00E+00    | 0.00E+00         |
| B5     | 0.00E+00                  | 0.00E+00        | 0.00E+00                  | 0.00E+00                                   | 0.00E+00                               | 0.00E+00    | 0.00E+00         |
| B6     | 0.00E+00                  | 0.00E+00        | 0.00E+00                  | 0.00E+00                                   | 0.00E+00                               | 0.00E+00    | 0.00E+00         |
| B7     | 0.00E+00                  | 0.00E+00        | 0.00E+00                  | 0.00E+00                                   | 0.00E+00                               | 0.00E+00    | 0.00E+00         |
| C1     | 0.00E+00                  | 0.00E+00        | 0.00E+00                  | 0.00E+00                                   | 0.00E+00                               | 0.00E+00    | 0.00E+00         |
| C2     | 2.58E-01                  | 2.82E-10        | 1.19E-03                  | 2.52E-04                                   | 4.90E-05                               | 1.16E-08    | 3.20E+00         |
| C3     | 0.00E+00                  | 0.00E+00        | 0.00E+00                  | 0.00E+00                                   | 0.00E+00                               | 0.00E+00    | 0.00E+00         |
| C4     | 7.45E-02                  | 2.69E-08        | 5.61E-04                  | 1.20E-04                                   | 2.76E-05                               | 8.39E-08    | 2.26E+00         |

## Rest of the World Impact Assessment

| Module | GWP                       | ODP             | AP                        | EP         | POCP                      |
|--------|---------------------------|-----------------|---------------------------|------------|---------------------------|
|        | (kg CO <sub>2</sub> -Eq.) | (kg CFC-11 Eq.) | (kg SO <sub>2</sub> -Eq.) | (kg N-Eq.) | (kg O <sub>3</sub> - Eq.) |
| Total  | 6.19E+01                  | 1.65E-05        | 2.84E-01                  | 1.05E-01   | 4.20E+00                  |
| A1- A3 | 2.20E+01                  | 1.83E-06        | 4.37E-02                  | 1.74E-02   | 7.31E-01                  |
| A4     | 2.09E+00                  | 1.35E-07        | 9.97E-03                  | 2.22E-03   | 3.49E-01                  |
| A5     | 3.76E-03                  | 1.36E-09        | 2.83E-05                  | 6.04E-06   | 7.77E-04                  |
| B1     | 0.00E+00                  | 0.00E+00        | 0.00E+00                  | 0.00E+00   | 0.00E+00                  |
| B2     | 3.75E+01                  | 1.45E-05        | 2.28E-01                  | 8.56E-02   | 3.06E+00                  |
| B3     | 0.00E+00                  | 0.00E+00        | 0.00E+00                  | 0.00E+00   | 0.00E+00                  |
| B4     | 0.00E+00                  | 0.00E+00        | 0.00E+00                  | 0.00E+00   | 0.00E+00                  |
| B5     | 0.00E+00                  | 0.00E+00        | 0.00E+00                  | 0.00E+00   | 0.00E+00                  |
| B6     | 0.00E+00                  | 0.00E+00        | 0.00E+00                  | 0.00E+00   | 0.00E+00                  |
| B7     | 0.00E+00                  | 0.00E+00        | 0.00E+00                  | 0.00E+00   | 0.00E+00                  |
| C1     | 0.00E+00                  | 0.00E+00        | 0.00E+00                  | 0.00E+00   | 0.00E+00                  |
| C2     | 2.58E-01                  | 2.82E-10        | 1.19E-03                  | 2.52E-04   | 4.29E-02                  |
| C3     | 0.00E+00                  | 0.00E+00        | 0.00E+00                  | 0.00E+00   | 0.00E+00                  |
| C4     | 7.45E-02                  | 2.69E-08        | 5.61E-04                  | 0.00E+00   | 1.54E-02                  |

| Resource Use |          |          |          |          |          |          |          |          |          |          |          |
|--------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| Module       | RPRRe    | PRPm     | RPRt     | NRPRRe   | NPRPm    | NRPRt    | SM       | RSF      | NRSF     | RE       | FW       |
|              | (MJ)     | (MJ)     | (MJ)     | (MJ)     | (MJ)     | (MJ)     | (kg)     | (MJ)     | (MJ)     | (MJ)     | (MJ)     |
| Total        | 5.75E+01 | 0.00E+00 | 5.75E+01 | #VALUE!  | 0.00E+00 | #VALUE!  | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 6.0E-01  |
| A1- A3       | 1.43E+01 | 0.00E+00 | 1.43E+01 | #VALUE!  | 0.00E+00 | #VALUE!  | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 6.6E-01  |
| A4           | 1.47E-01 | 0.00E+00 | 1.47E-01 | #VALUE!  | 0.00E+00 | #VALUE!  | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 9E-02    |
| A5           | 9.32E-04 | 0.00E+00 | 9.32E-04 | #VALUE!  | 0.00E+00 | #VALUE!  | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.3E-05  |
| B1           | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.0E+00  |
| B2           | 4.31E+01 | 0.00E+00 | 4.31E+01 | #VALUE!  | 0.00E+00 | #VALUE!  | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | -1.7E-01 |
| B3           | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.0E+00  |
| B4           | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.0E+00  |
| B5           | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.0E+00  |
| B6           | 0.00E+00 | 0.00E+00 | 0.00E+00 | #VALUE!  | 0.00E+00 | #VALUE!  | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.0E+00  |
| B7           | 0.00E+00 | 0.00E+00 | 0.00E+00 | #VALUE!  | 0.00E+00 | #VALUE!  | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.0E+00  |
| C1           | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.0E+00  |
| C2           | 7.32E-03 | 0.00E+00 | 7.32E-03 | #VALUE!  | 0.00E+00 | #VALUE!  | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.7E-02  |
| C3           | 0.00E+00 | 0.00E+00 | 0.00E+00 | #VALUE!  | 0.00E+00 | #VALUE!  | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.0E+00  |
| C4           | 1.85E-02 | 0.00E+00 | 1.85E-02 | #VALUE!  | 0.00E+00 | #VALUE!  | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.6E-04  |

| Output Flows and Waste Categories |          |          |          |          |          |          |          |          |
|-----------------------------------|----------|----------|----------|----------|----------|----------|----------|----------|
| Module                            | HWD      | NHWD     | HLRW     | ILLRW    | CRU      | MFR      | MER      | EE       |
|                                   | (kg)     | (kg)     | (kg)     | (kg)     | (kg)     | (kg)     | (kg)     | (MJ)     |
| Total                             | 0.00E+00 | 2.65E+01 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| A1- A3                            | 0.00E+00 | 5.25E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| A4                                | 0.00E+00 | 5.38E-01 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| A5                                | 0.00E+00 | 7.11E-01 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| B1                                | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| B2                                | 0.00E+00 | 5.87E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| B3                                | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| B4                                | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| B5                                | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| B6                                | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| B7                                | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| C1                                | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| C2                                | 0.00E+00 | 3.17E-03 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| C3                                | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| C4                                | 0.00E+00 | 1.42E+01 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |

| Greenhouse Gas Emissions and Removals |                        |                        |                        |                        |                        |                        |                        |                        |
|---------------------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| Module                                | BCRP                   | BCEP                   | BCRK                   | BCEK                   | BCEW                   | CCE                    | CCR                    | CWNR                   |
|                                       | (kg CO <sub>2</sub> e) | (kg CO <sub>2</sub> e) | (kg CO <sub>2</sub> e) | (kg CO <sub>2</sub> e) | (kg CO <sub>2</sub> e) | (kg CO <sub>2</sub> e) | (kg CO <sub>2</sub> e) | (kg CO <sub>2</sub> e) |
| Total                                 | 0.00E+00               | 0.00E+00               | 7.39E-01               | 7.39E-01               | 0.00E+00               | 7.32E+00               | 0.00E+00               | 0.00E+00               |
| A1- A3                                | 0.00E+00               | 0.00E+00               | 7.39E-01               | 0.00E+00               | 0.00E+00               | 7.32E+00               | 0.00E+00               | 0.00E+00               |
| A4                                    | 0.00E+00               | 0.00E+00               | 0.00E+00               | 0.00E+00               | 0.00E+00               | 0.00E+00               | 0.00E+00               | 0.00E+00               |
| A5                                    | 0.00E+00               | 0.00E+00               | 0.00E+00               | 7.39E-01               | 0.00E+00               | 0.00E+00               | 0.00E+00               | 0.00E+00               |
| B1                                    | 0.00E+00               | 0.00E+00               | 0.00E+00               | 0.00E+00               | 0.00E+00               | 0.00E+00               | 0.00E+00               | 0.00E+00               |
| B2                                    | 0.00E+00               | 0.00E+00               | 0.00E+00               | 0.00E+00               | 0.00E+00               | 0.00E+00               | 0.00E+00               | 0.00E+00               |
| B3                                    | 0.00E+00               | 0.00E+00               | 0.00E+00               | 0.00E+00               | 0.00E+00               | 0.00E+00               | 0.00E+00               | 0.00E+00               |
| B4                                    | 0.00E+00               | 0.00E+00               | 0.00E+00               | 0.00E+00               | 0.00E+00               | 0.00E+00               | 0.00E+00               | 0.00E+00               |
| B5                                    | 0.00E+00               | 0.00E+00               | 0.00E+00               | 0.00E+00               | 0.00E+00               | 0.00E+00               | 0.00E+00               | 0.00E+00               |
| B6                                    | 0.00E+00               | 0.00E+00               | 0.00E+00               | 0.00E+00               | 0.00E+00               | 0.00E+00               | 0.00E+00               | 0.00E+00               |
| B7                                    | 0.00E+00               | 0.00E+00               | 0.00E+00               | 0.00E+00               | 0.00E+00               | 0.00E+00               | 0.00E+00               | 0.00E+00               |
| C1                                    | 0.00E+00               | 0.00E+00               | 0.00E+00               | 0.00E+00               | 0.00E+00               | 0.00E+00               | 0.00E+00               | 0.00E+00               |
| C2                                    | 0.00E+00               | 0.00E+00               | 0.00E+00               | 0.00E+00               | 0.00E+00               | 0.00E+00               | 0.00E+00               | 0.00E+00               |
| C3                                    | 0.00E+00               | 0.00E+00               | 0.00E+00               | 0.00E+00               | 0.00E+00               | 0.00E+00               | 0.00E+00               | 0.00E+00               |
| C4                                    | 0.00E+00               | 0.00E+00               | 0.00E+00               | 0.00E+00               | 0.00E+00               | 0.00E+00               | 0.00E+00               | 0.00E+00               |

## Interpretation

Due to the high degree of value add within the vitreous product manufacturing process, the Kohler Operations life cycle stage drives most of the environmental impact categories for vitreous ceramic sanitary ware. Exceptions are products that control water flow rate, such as toilet tanks and one-piece toilets, which will see these consumer use phase impacts dominate the product life cycle.

Manufacturing impacts are primarily driven by energy (natural gas and electricity) use. Therefore, projects that improve energy efficiency have been and will continue to be a primary area of focus. Hardware accessories, especially those that contain metals such as brass and steel, also carry a greater contribution toward overall product environmental impact. Mass reduction and material substitution are areas of focus within the supplier operations portion of the product life cycle.

Where applicable, water use reduction efforts will see the greatest return on investment due primarily to the associated reduction in energy required to pump and treat this water. These efforts must be balanced against the product and product system's capacity to operate effectively when less water is available as a motive force.

## REFERENCES

- PCR Part A      UL Environment and Institut Bauen und Umwelt e.V., Königswinter (pub.): Product Category Rules for Construction Products from the range of Environmental Product Declarations of Institut Bauen und Umwelt (IBU), Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Background Report. December 2017, version 3
- PCR Part B      UL Environment and Institut Bauen und Umwelt e.V. (IBU). Product Category Rules Part B: Sanitary Ceramic EPD Requirement (V.2, January 2018)
- PCR Part B      UL Environment and Institut Bauen und Umwelt e.V. (IBU). Product Category Rules Part B: Plumbing Vessel EPD Requirements (V1, January 2018)
- ISO 14025      ISO 14025:2011-10, Environmental labels and declarations — Type III environmental declarations — Principles and procedures.
- ISO 14040      ISO 14040:2009-11, Environmental management — Life cycle assessment — Principles and framework
- ISO 14044      ISO 14044:2006-10, Environmental management — Life cycle assessment — Requirements and guidelines
- ISO 21930      Sustainability in buildings and civil engineering works — Core rules for environmental product declarations of construction products and services
- EN 15804      EN 15804:2012-04: Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction product
- WaterSense®      US EPA, Office of Wastewater Management <http://www.epa.gov/watersense>
- ULE 2013      UL Environment, General Program Instructions, 2013.
- OHSAS 18001      Occupational Health and Safety Management Systems - Requirements
- ISO 14001      Environmental Management Systems - Requirements with guidance for use
- ASME A112.19.2/CSA B45.1      Ceramic Plumbing Fixtures
- ADA      Americans with Disabilities Act - Standards for Accessible Design
- ICC/ANSI A117.1      International Code Council - Accessible and Usable Buildings and Facilities
- CSA B651      Accessible Design for Built Environment
- OBC      Ontario Building Code Section 3.8 - Barrier-Free Design
- ICES-003      Industry Canada, Interference Causing Equipment Standard 003 - Information Technology Equipment (ITE) - Limits and methods of measurement
- FCC part 15      Federal Communications Commission, Title 47, Part 15 - Radio Frequency Devices
- DOE-Energy Policy Act 1992      Department of Energy - Energy Policy Act 1992
- ASME A112.19.14      Six Liter Closets Equipped with a Dual Flushing Device
- ADA-Children's Environment      ADA Standards for Accessible Design - Clause 604.9
- ASME A112.19.19-06      Vitreous China Nonwater Urinals
- GREENGUARD      UL Environment, <http://greenguard.org/en/index.aspx>