Declaration Owner

Sloan Valve Company
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Product

Sloan Lavatories

Functional Unit

1 packaged, installed unit with a Reference Service Life of 20 years in a building with an Estimated Service Life of 75 years

EPD Number and Period of Validity

SCS-EPD-08752
EPD Valid March 10, 2023 through March 9, 2028

Product Category Rule

UL. PCR Guidance for Building-Related Products and Services Part A: Life Cycle Assessment Calculation Rules and Report Requirements. Version 3.2. December 2018.
UL PCR Guidance for Building-Related Products and Services Part B: Sanitary Ceramic EPD Requirements. Version 2.1. June 2018.

Program Operator

SCS Global Services
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Declaration owner:	Sloan Valve Company
Address:	10500 Seymour Avenue, Franklin Park, IL 60131
Declaration Number:	SCS-EPD-08752
Declaration Validity Period:	EPD Valid March 10, 2023 through March 9, 2028
Program Operator:	SCS Global Services
Declaration URL Link:	https://www.scsglobalservices.com/certified-green-products-guide
LCA Practitioner:	Beth Cassese, SCS Global Services
LCA Software and LCI database:	OpenLCA 1.10.3 software and the Ecoinvent v3.8 database
Product's Intended Application:	For use with plumbing systems to deliver and drain water.
Product RSL:	20 Years (ESL 75 Years)
Markets of Applicability:	North America
EPD Type:	Product-Specific
EPD Scope:	Cradle-to-Grave
LCIA Method and Version:	CML-IA Baseline and TRACI 2.1
Independent critical review of the LCA and data, according to ISO 14044 and ISO 14071	☐ internal ☒ external
LCA Reviewer:	Thomas Gloria, Ph.D., Industrial Ecology Consultants
Product Category Rule:	UL PCR Guidance for Building-Related Products and Services Part B: Sanitary Ceramics EPD Requirements. Version 2.1. June 2018.
PCR Review conducted by:	Tom Gloria, Christopher Marozzi, Kim Lewis
Independent verification of the declaration and data, according to ISO 14025 and the PCR	☐ internal ☒ external
EPD Verifier:	Thomas Gloria, Ph.D., Industrial Ecology Consultants
Declaration Contents:	

Disclaimers: *This EPD conforms to ISO 14025, 14040, 14044, and ISO 21930.*

Scope of Results Reported: *The PCR requirements limit the scope of the LCA metrics such that the results exclude environmental and social performance benchmarks and thresholds, and exclude impacts from the depletion of natural resources, land use ecological impacts, ocean impacts related to greenhouse gas emissions, risks from hazardous wastes and impacts linked to hazardous chemical emissions.*

Accuracy of Results: *Due to PCR constraints, this EPD provides estimations of potential impacts that are inherently limited in terms of accuracy.*

Comparability: *The PCR this EPD was based on was not written to support comparative assertions. EPDs based on different PCRs, or different calculation models, may not be comparable. When attempting to compare EPDs or life cycle impacts of products from different companies, the user should be aware of the uncertainty in the final results, due to and not limited to, the practitioner's assumptions, the source of the data used in the study, and the specifics of the product modeled.*

In accordance with ISO 21930:2017, EPDs are comparable only if they comply with the core PCR, use the same sub-category PCR where applicable, include all relevant information modules and are based on equivalent scenarios with respect to the context of construction works.

1. ABOUT Sloan

Sloan is the world's leading manufacturer of commercial plumbing systems and has been in operation since 1906. Headquartered in Franklin Park, Illinois, USA, the company is at the forefront of the green building movement and provides smart, sustainable restroom solutions by manufacturing water-efficient products such as flushometers, electronic faucets, sink systems, soap dispensing systems, and vitreous china fixtures for commercial, industrial, and institutional markets worldwide. The Sloan lavatories are manufactured at the William H. Marsh facility in Hangzhou, China.

2. PRODUCT

2.1 Product Description

Sloan lavatory products belong to the Commercial Plumbing Fixtures specification code, CSI code 22 42 16 and the UNSPSC code 30180000.

Sanitary ceramic plumbing fixtures are exchangeable devices that can be connected to a plumbing system to deliver and drain water, are designed to help conserve water and are installed in restrooms for commercial buildings, airports, stadiums, and the healthcare and hospitality sectors. The product system under study does not include a faucet, as these are included in a separate Product Category Rule (PCR).

Product Features:

- Dimensions can vary within the tolerances established in the governing ASME A112.19/CSA B45.1 Standard
- IAPMO certified to meet or exceed ASTE A112.19.2 Standards
- Meets ADA guidelines and ANSI A117.1 requirements
- White vitreous china
- Available for wall hung or countertop installation
- Includes an overflow
- Options including a backsplash, wheelchair access, and 4", 8", or single-hole centerset punching

2.2 Product Average

An average of the product line chosen as the representative product for this study. Results for each product model within the product line are grouped together by mass and presented in the Appendix.

Table 1. *Sloan Lavatories Represented in this EPD.*

Model	Mass (kg)	Model	Mass (kg)
SS3001	7	SS3065-STG	16
SS3001-STG	7	SS3102-STG	16
SS3002	7	SS3103	16
SS3002-STG	7	SS3103-STG	16
SS3102	7	SS3165	16
SS3802	7	SS3165-STG	16
SS3003	16	SS3803	16
SS3003-STG	16	SS3865	16
SS3065	16	SS3865-STG	16
		Average:	**13.0**

2.3 Flow Diagram

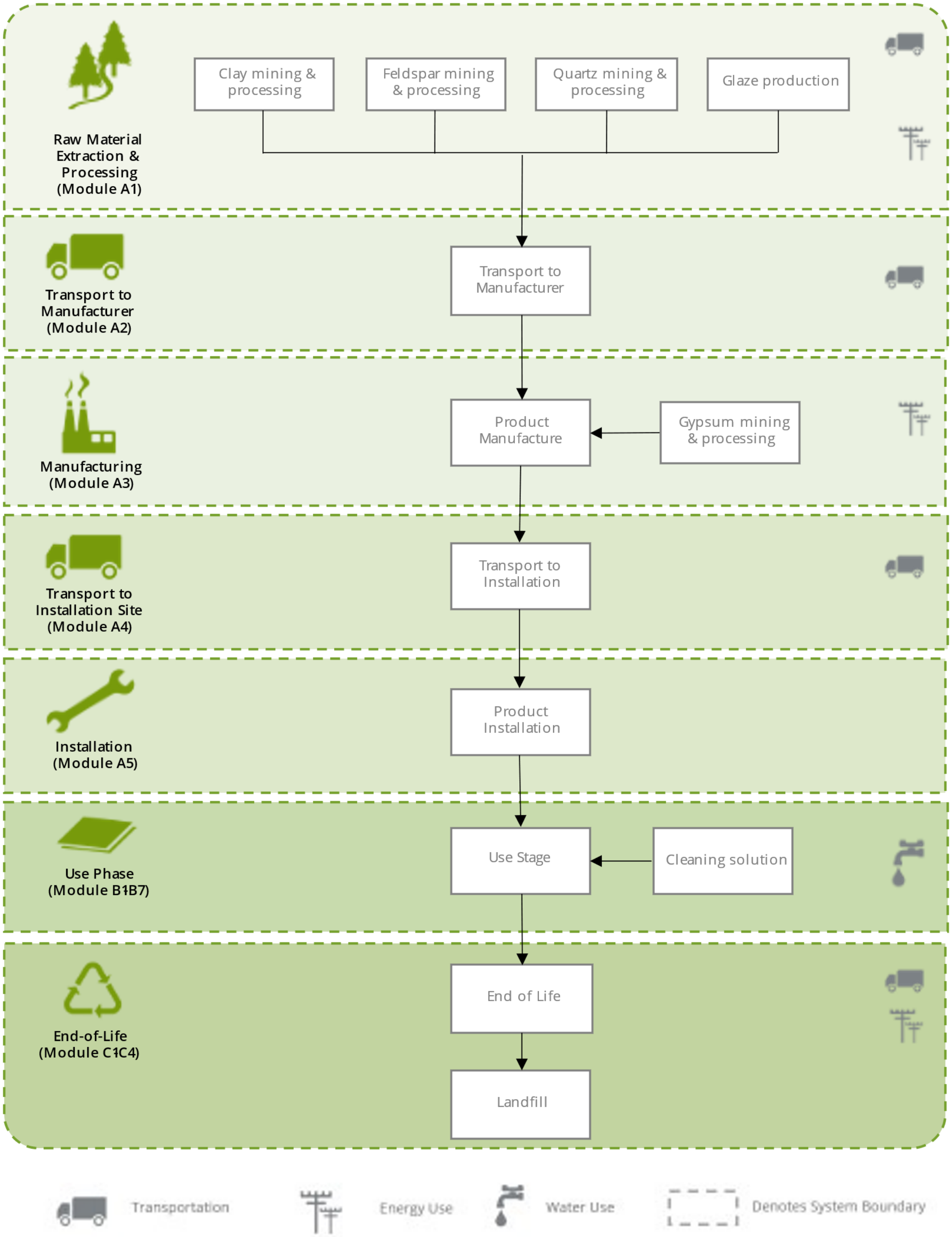


Figure 1. *Flow diagram for the Sloan Lavatories.*

2.4 Application

Sloan lavatories are designed for use with plumbing systems to deliver and drain water. The lavatories are installed in commercial, industrial, and institutional markets worldwide.

2.5 Declaration of Methodological Framework

The scope of the EPD is cradle-to-grave, including raw material extraction and processing; raw material transportation; product manufacture, including packaging; product distribution; installation; use; and end-of-life.

Manufacturing resource use was allocated to the products based on mass. Impacts from transportation were allocated based on the mass of material and distance transported.

According to the PCR, processes contributing greater than 1% of the total environmental impact indicator for each impact are included in the inventory. No known flows were deliberately excluded from this EPD.

2.6 Technical Requirements

Table 2. *Sloan Lavatory Technical Requirements.*

Property	Unit	Value
Width	mm	502
Length	mm	552
Height	mm	184
Minimum flow rate	GPM	25

2.7 Market Placement/Application Rules

The products declared in this document comply with the following codes or regulations:

- IAPMO certified to meet or exceed the ASME A112.19.2 standards – Ceramic Plumbing Fixtures
- ANSI A117.1 – Accessible and Usable Buildings and Facilities

2.8 Properties of Declared Product as Delivered

Sloan water closets are delivered by truck to the installation site. The total nominal weight of product with packaging delivered is 13.1 kg. The nominal dimensions of the representative product are: **Height** 7.25" (184 mm), **Width** 19.75" (502 mm), **Length** 21.75" (552 mm).

2.9 Material Composition

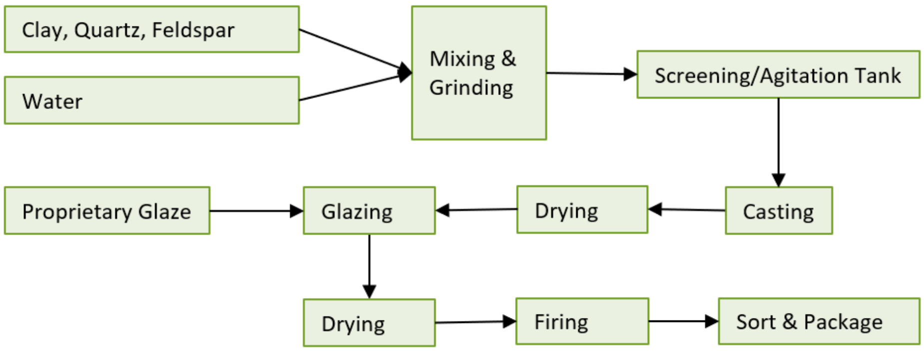
The main product materials for the average product are presented in Table 3. Product materials were reviewed for the presence of any toxic or hazardous chemicals. Based on a review of the product components provided by the manufacturer, no regulated chemicals were identified in the product or product components.

Table 3. *Sloan Lavatory Material Components.*

Material	Mass (kg)	Percentage of Total Mass
Clay	5.78	44.4%
Quartz	4.33	33.3%
Feldspar	2.89	22.2%
Glaze	0.0001	0.001%
Total	**13.0**	**100%**

2.10 Manufacturing

Sloan lavatories are manufactured in Hangzhou, China. Raw materials, including clay, quartz, and feldspar are mixed with water and ground thoroughly to form a uniform slip. The slip is screened and magnetically separated in an agitating tank. The ware are then cast in plaster molds and then dried before a glazing process. After glazing, the body is sent for drying and firing. The final products are then sorted and packaged for distribution.



2.11 Transportation

Transportation distance and mode from the manufacturing facility in China to the Sloan distribution center in Los Angeles, CA was provided by the manufacturer, as 10,570 km via ocean freighter. Transportation from the Los Angeles distribution center to sales locations were not available, so an average distance of 2725 km was assumed to represent locations across the United States. In addition, the Part B PCR requires 500 km of transport from the point of purchase to the building site.

2.12 Installation

Installation of the lavatories is completed using manual labor and does not require additional ancillary materials. Waste is generated from the disposal of the packaging material at the installation site.

2.13 Packaging

Table 4. *Sloan Lavatory Packaging Components.*

Material	Mass (kg)	Percentage of Total Mass
Fluting paper	2.06	87.5%
Steel	0.293	12.5%
Total	**2.35**	**100%**

2.14 Use Conditions

It is important to note that water use impacts are assigned to the device that controls water flow to avoid double counting (e.g., flushometer), which is outside the scope of the Environmental Product Declaration.

2.15 Product Reference Service Life and Building Estimated Service Life

The PCR establishes a Reference Service Life for water closets of 20 years. The PCR also establishes an Estimated Service Life of the building to be 75 years, for use in the use phase modelling to fulfill the required performance and functionality over the construction works.

2.16 Re-Use Phase

Reuse at end-of-life via collection and processing of water closets is possible but not widely available. It is assumed that no materials are recovered and processed for these purposes.

2.17 Disposal
It is assumed that lavatories at end-of-life are disposed of in a landfill. Transportation of lavatories assumes a 100 kilometer distance to disposal as specified in the PCR.

3. LCA Calculation Rules

3.1 Functional Unit

The functional unit used in the study is one (1) packaged, installed unit with a reference service life (RSL) of 20 years. The building estimated service life (ESL) is assumed to be 75-years.

Table 5. *Sloan Water Closet Functional Unit Properties.*

Property	Unit	Value
Functional Unit	One (1) packaged, installed product	
RSL	Years	20
ESL	Years	75
Mass	Kg	13.0
Conversion factor to 1 kg	kg	0.077
Flush rate	m^3/sec	N/A
Flow rate	m^3/sec	N/A

3.2 System Boundary

The scope of the EPD is cradle-to-grave, including raw material extraction and processing; raw material transportation; product manufacture, including packaging; product distribution; installation; use; and end-of-life.

Table 6. *Sloan Lavatory System Boundaries.*

Product			Construction Process		Use							End-of-life				Benefits and loads beyond the system boundary
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Raw material extraction and processing	Transport to manufacturer	Manufacturing	Transport	Construction - installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction demolition	Transport	Waste processing	Disposal	Reuse, recovery and/or recycling potential
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	MND

X = Included in system boundary
MND = Module not declared

3.3 Product Specific Calculations for Use Phase (Modules B1-B7)

Sloan lavatories are assumed to require daily cleaning with a 10 ml of 1% sodium lauryl sulfate solution.

3.4 Estimates and Assumptions

- Specific data were not available on the quartz in the product recipe. A secondary dataset for silica sand was used from Ecoinvent database.
- Product transport from point of purchase to the building site is assumed to be 500 km as required by the Part B PCR.
- Product transport from the Sloan distribution center in Los Angeles, CA to point of purchase was assumed to be 2725 km, representing an average of several major cities across the United States.
- Installation of the products is assumed to be manual, requiring no additional materials or energy use.
- Transport of the packaging waste at installation is assumed to be 100 km.
- Transport of the product at end-of-life to waste processing and disposal is assumed to be 100 km.
- The maintenance of the products is assumed to include daily cleaning with a 10 ml of 1% sodium lauryl sulfate cleaning solution as specified in the Part B PCR.
- The products are assumed to require no replacement during the 20-year RSL, but in accordance with the Part A PCR and Part B PCR, requires replacement 2.8 times over the 75-year ESL.
- The use phase modules B3 (Repair), B5 (Refurbishment), B6 (Operational Energy Use), and B7 (Operational Water Use) are assumed to have no impacts, as there is no resource or energy use associated with these modules.
- The use phase modules B2 (Maintenance) and B4 (Replacement) are modelled for the building/construction works ESL of 75 years.
- For the product end-of-life, disposal of product is assumed to be in a landfill.

3.5 Cut-off Rules

According to the PCR, processes contributing greater than 1% of the total environmental impact indicator for each impact are included in the inventory. No data gaps were allowed which were expected to significantly affect the outcome of the indicator results.

3.6 Data Sources

Primary data were provided by Sloan for the Hangzhou, China facility. The principal source of secondary LCI data is the Ecoinvent 3.8 database.

Table 7. *LCI datasets and associated databases used to model the Sloan Lavatory products.*

Component	Dataset	Data Source	Publication Date
Product			
Clay	market for clay | clay | Cutoff, U	Ecoinvent 3.8	2021
Feldspar	market for feldspar | feldspar | Cutoff, U	Ecoinvent 3.8	2021
Proprietary glaze	market for chemical, inorganic | chemical, inorganic | Cutoff, U	Ecoinvent 3.8	2021
Quartz	market for silica sand | silica sand | Cutoff, U	Ecoinvent 3.8	2021
Package			
Copper	market for scrap copper | scrap copper | Cutoff, U	Ecoinvent 3.8	2021
	market for metal working, average for copper product manufacturing | metal working, average for copper product manufacturing | Cutoff, U	Ecoinvent 3.8	2021
Steel	market for scrap steel | scrap steel | Cutoff, U	Ecoinvent 3.8	2021
	market for metal working, average for steel product manufacturing | metal working, average for steel product manufacturing | Cutoff, U	Ecoinvent 3.8	2021
Transport			
Truck	market for transport, freight, lorry 16-32 metric ton, EURO4 | transport, freight, lorry 16-32 metric ton, EURO4 | Cutoff, U	Ecoinvent 3.8	2021
Ship	market for transport, freight, sea, container ship | transport, freight, sea, container ship | Cutoff, U	Ecoinvent 3.8	2021
Manufacture			
Electricity	market for electricity, medium voltage | electricity, medium voltage | Cutoff, U	Ecoinvent 3.8	2021
Gypsum	market for gypsum, mineral | gypsum, mineral | Cutoff, U	Ecoinvent 3.8	2021
Natural Gas	market group for heat, central or small-scale, natural gas | heat, central or small-scale, natural gas | Cutoff, U	Ecoinvent 3.8	2021
Waste Gypsum	market for waste gypsum | waste gypsum | Cutoff, U	Ecoinvent 3.8	2021
Water	market for tap water | tap water | Cutoff, U	Ecoinvent 3.8	2021
Use			
Sodium lauryl sulfate solution	Market for soap | soap | Cutoff, U	Ecoinvent 3.8	2021
Waste			
Landfill	market for inert waste, for final disposal | inert waste, for final disposal | Cutoff, U	Ecoinvent 3.8	2021
Wastewater	market for wastewater from ceramic production | wastewater from ceramic production | Cutoff, U	Ecoinvent 3.8	2021

3.7 Data Quality

Table 8. *Data Quality Assessment.*

Data Quality Parameter	Data Quality Discussion
Time-Related Coverage: Age of data and the minimum length of time over which data is collected	The manufacturer provided primary data on product manufacturing for the William H. Marsh facility in Hangzhou, China on annual production for 2021. Representative datasets (secondary data) for upstream and background processes are generally less than 5 years old.
Geographical Coverage: Geographical area from which data for unit processes is collected to satisfy the goal of the study	The data used in the analysis provide the best possible representation available with current data. Electricity use for product manufacture is modeled using representative data modelled for the specific State Grid Corporation in China represented in this study. Surrogate data used in the assessment are representative of global or European operations and are considered sufficiently similar to actual processes.
Technology Coverage: Specific technology or technology mix	For the most part, data are representative of the actual technologies used for processing, transportation, and manufacturing operations. Representative component datasets, specific to the type of material, are used to represent the actual processes, as appropriate.
Precision: Measure of the variability of the data values for each data expressed	Precision of results are not quantified due to a lack of data. Data collected for operations were typically averaged for one more years and over multiple operations, which is expected to reduce the variability of results.
Completeness: Percentage of flow that is measured or estimated	The LCA model included all known mass and energy flows for production of the products. In some instances, surrogate data used to represent upstream and downstream operations may be missing some data which is propagated in the model. No known processes or activities contributing to more than 1% of the total environmental impact for each indicator are excluded.
Representativeness: Qualitative assessment of the degree to which the data set reflects the true population of interest	Data used in the assessment represent typical or average processes as currently reported from multiple data sources and are therefore generally representative of the range of actual processes and technologies for production of these materials. Considerable deviation may exist among actual processes on a site-specific basis; however, such a determination would require detailed data collection throughout the supply chain back to resource extraction.
Consistency: Qualitative assessment of whether the study methodology is applied uniformly to the various components of the analysis	The consistency of the assessment is considered to be high. Data sources of similar quality and age are used; with a bias towards Ecoinvent v3.8 data where available. Different portions of the product life cycle are equally considered.
Reproducibility: Qualitative assessment of the extent to which information about the methodology and data values would allow an independent practitioner to reproduce the results reported in the study	Based on the description of the data and assumptions used, this assessment would be reproducible by other practitioners. All assumptions, models, and data sources are documented.
Sources of the Data: Description of all primary and secondary data sources	Data representing energy use at the manufacturing facility represents a 12-month average and is considered of high quality due to the length of time over which these data are collected, as compared to a snapshot that may not accurately reflect fluctuations in production. For secondary LCI data, Ecoinvent v3.8 data are used.
Uncertainty of the Information: Uncertainty related to data, models, and assumptions	Uncertainty related to materials in the products and packaging is low. Actual supplier data for upstream operations was not available for all suppliers and the study relied upon the use of existing representative datasets. These datasets contained relatively recent data (<10 years) but lacked geographical representativeness. Uncertainty related to the impact assessment methods used in the study are high. The impact assessment methodology includes impact potentials, which lack characterization of providing and receiving environments or tipping points.

3.8 Period under review

The period of review is based on a 12-month period from January 2021 through December 2021.

3.9 Allocation

Manufacturing resource use was allocated to the products based on mass. Impacts from transportation were allocated based on the mass of material and distance transported.

3.10 Comparability

The PCR this EPD was based on was not written to support comparative assertions. EPDs based on different PCRs, or different calculation models, may not be comparable. When attempting to compare EPDs or life cycle impacts of products from different companies, the user should be aware of the uncertainty in the final results, due to and not limited to, the practitioner's assumptions, the source of the data used in the study, and the specifics of the product modeled.

4. LCA: TECHNICAL INFORMATION AND SCENARIOS

4.1 Transport to the Building Site (A4)

Table 9. *Sloan Lavatory Transportation Summary.*

Name	Unit	Value
Fuel type	-	Diesel
Liters of fuel	l/100 km	18.7
Vehicle Type	-	Freight Truck
Transport Distance	km	3,505
Capacity utilization	%	37
Vehicle Type	-	Ocean Freight
Transport Distance	km	10,570
Capacity utilization	%	70
Gross mass of products transported[1]	kg	15.4

[1] including packaging

4.2 Installation into the Building (A5)

Table 10. *Sloan Lavatory Installation Summary.*

Name	Unit	Value
Ancillary materials	kg	0
Net freshwater consumption specified by water source and fate	m^3	0
Other resources	kg	0
Electricity consumption	kwh	0
Other energy carriers	MJ	0
Product loss per functional unit	kg	0
Waste materials at the construction site before waste processing, generated by product installation	kg	0
Output materials resulting from on-site waste processing	kg	0
Mass of packaging waste specified by type	kg	2.35
Recycle	Kg	*1.71*
Landfill	kg	*0.511*
Incineration	kg	*0.129*
Biogenic carbon contained in packaging	kg CO_2	3.77
Direct emissions to ambient air, soil, and water	kg	0

4.3 Use

Maintenance (B2)

Table 11. *Sloan Lavatory Maintenance Summary.*

Maintenance	Unit	Value
Description of process	-	Daily cleaning with 10 ml 1% sodium lauryl sulfate solution
Maintenance cycle	Cycles/RSL	7300
Maintenance cycle	Cycles/ESL	27,375
Net freshwater consumption		
City water disposed to sewer	m^3	0.730
Ancillary materials		
Sodium lauryl sulfate solution	kg	0.073
Other resources	kg	0
Electricity consumption	kWh	0
Other energy carriers	kWh	0
Power output of equipment	kW	0
Material loss	kg	0
Direst emissions to ambient air, soil, and water	kg	0
Further assumptions for scenario development	-	-

Repair (B3)

No repair is required with the use of the product over the reference service lifetime.

Replacement (B4)

Table 12. *Sloan Lavatory Replacement Summary.*

Replacement	Unit	Value
Replacement cycle (RSL)	Number/RSL	0
Replacement cycle (ESL/RSL)-1	Number/ESL	2.8
Electricity consumption	kWh	0
Net freshwater consumption	m^3	0
Ancillary materials	kg	0
Replacement of worn parts	kg	0
Direct emissions to ambient air, soil, and water	kg	0
Further assumptions for scenario development	-	-

Refurbishment (B5)

No refurbishment is required with the use of the product over the reference service lifetime.

Operational Energy and Water Use (B6 – B7)

There is no operational energy or water use associated with the use of the product over the reference service lifetime.

4.4 End-of-Life

Table 13. *Sloan Lavatory End-of-Life Summary.*

End-of-life		Unit	Value
Assumptions for scenario development			Manual deconstruction, followed by 100 km truck transport to final disposal in landfill
Collection process	Collected separately	kg	0
	Collected with mixed construction waste	kg	13.0
Recovery	Reuse	kg	0
	Recycling	kg	0
	Energy recovery	kg	0
	Landfill	kg	13.0

5. LCA: Results

Results of the Life Cycle Assessment are presented below. It is noted that LCA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks. The following environmental impact category indicators are reported using characterization factors using the CML-IA impact assessment method and the TRACI 2.1 impact assessment method.

Table 14. *Mandatory Environmental Impact Assessment Categories*.

CMLI-A Impact Category	Unit	TRACI 2.1 Impact Category	Unit
GWP: Global Warming Potential	kg CO_2 eq.	**GWP:** Global Warming Potential	kg CO_2 eq.
ODP: Depletion potential of the stratospheric ozone layer	kg CFC 11 eq.	**ODP:** Depletion potential of the stratospheric ozone layer	kg CFC 11 eq.
AP: Acidification Potential of soil and water	kg SO_2 eq.	**AP:** Acidification Potential of soil and water	kg SO_2 eq.
EP: Eutrophication Potential	kg PO_4^{3-} eq.	**EP:** Eutrophication Potential	kg N eq.
POCP: Photochemical Oxidant Creation Potential	kg C_2H_4 eq.	**SFP:** Smog Formation Potential	kg O_3 eq.
ADPE: Abiotic Depletion Potential, elements	kg Sb eq	**FFD:** Fossil Fuel Depletion	MJ Surplus
ADPF: Abiotic Depletion Potential, fossil fuels	MJ		

These impact categories are globally deemed mature enough to be included in Type III environmental declarations. Other categories are being developed and defined and LCA should continue making advances in their development. However, the EPD users shall not use additional measures for comparative purposes. The following inventory parameters, specified by the PCR, are also reported.

Table 15. *Additional Transparency Categories*.

Resources	Unit	Waste and Outflows	Unit
RPR_E: Renewable primary resources used as energy carrier (fuel)	MJ, LHV	**HWD:** Hazardous waste disposed	kg
RPR_M: Renewable primary resources with energy content used as material	MJ, LHV	**NHWD:** Non-hazardous waste disposed	kg
$NRPR_E$: Non-renewable primary resources used as an energy carrier (fuel)	MJ, LHV	**RWD:** Radioactive waste, conditioned, to final repository	kg
$NRPR_M$: Non-renewable primary resources with energy content used as material	MJ, LHV	**CRU:** Components for re-use	kg
SM: Secondary materials	kg	**MR:** Materials for recycling	kg
RSF: Renewable secondary fuels	MJ, LHV	**MER:** Materials for energy recovery	kg
NRSF: Non-renewable secondary fuels	MJ, LHV	**EE:** Recovered energy exported from the product system	kg
RE: Recovered energy	MJ, LHV	**EE:** Recovered energy exported from the product system	MJ, LHV
FW: Use of new freshwater resources	m^3	-	-

All LCA results are stated to three significant figures in agreement with the PCR for this product and therefore the sum of the total values may not exactly equal 100%. Modules with zero (0) impacts: B1, B3, B5, B6, B7, C1, and C3 are omitted from the results tables to conserve space.

Table 16. *Impact indicator results for Sloan Lavatory products.*

CML Impact Method	GWP	ODP	AP	EP	POCP	ADPE	ADPF
	kg CO_2 eq	kg CFC-11 eq	kg SO_2 eq	kg PO_4^{3-} eq	kg C_2H_4 eq	kg Sb eq	MJ
A1	0.397	3.78×10^{-8}	0.002	5.40×10^{-4}	1.00×10^{-4}	4.02×10^{-6}	4.88
A2	1.05	1.82×10^{-7}	0.004	0.001	1.40×10^{-4}	3.63×10^{-6}	15.5
A3	19.5	1.96×10^{-6}	0.032	0.008	0.002	2.58×10^{-5}	276
A1-A3 Total:	**21.0**	**2.18×10^{-6}**	**0.039**	**0.009**	**0.003**	**3.35×10^{-5}**	**296**
A4	10.7	1.83×10^{-6}	0.075	0.013	0.002	3.39×10^{-5}	155
A5	0.361	4.20×10^{-8}	5.80×10^{-4}	3.80×10^{-4}	2.18×10^{-5}	8.05×10^{-7}	2.15
B2	15	9.07×10^{-7}	0.046	0.233	0.008	1.20×10^{-4}	56.5
B4	89.7	1.14×10^{-5}	0.319	0.063	0.014	1.90×10^{-4}	1270
C2	0.221	3.85×10^{-8}	8.50×10^{-4}	2.00×10^{-4}	2.90×10^{-5}	7.69×10^{-7}	3.28
C4	0.108	2.82×10^{-8}	6.70×10^{-4}	1.50×10^{-4}	2.67×10^{-5}	3.02×10^{-7}	2.48

TRACI Impact Method	GWP	ODP	AP	EP	SFP	FFD
	kg CO_2 eq	kg CFC-11 eq	kg SO_2 eq	kg N eq	kg O_3 eq	MJ Surplus
A1	0.395	4.97×10^{-8}	0.003	0.001	0.048	0.582
A2	1.05	2.43×10^{-7}	0.005	0.001	0.114	2.22
A3	19.3	2.37×10^{-6}	0.035	0.013	0.531	38.7
A1-A3 Total:	**20.7**	**2.66×10^{-6}**	**0.042**	**0.015**	**0.693**	**41.5**
A4	10.7	2.44×10^{-6}	0.083	0.012	1.78	22.3
A5	0.361	4.95×10^{-8}	6.30×10^{-4}	8.40×10^{-4}	0.011	0.287
B2	14.9	1.01×10^{-6}	0.052	0.537	0.616	5.65
B4	89.0	1.44×10^{-5}	0.353	0.079	6.94	179
C2	0.221	5.13×10^{-8}	0.001	2.40×10^{-4}	0.024	0.469
C4	0.107	3.76×10^{-8}	7.90×10^{-4}	1.70×10^{-4}	0.020	0.359

Table 17. *Additional Resource Use and Waste indicators for the Sloan Lavatory products.*
INA = Indicator not assessed, | Neg.= Negligible

Resource Use	RPR_E	RPR_M	$NRPR_E$	$NRPR_M$	SM	RSF	NRSF	RE	FW
	MJ	MJ	MJ	MJ	kg	MJ	MJ	MJ	m^3
A1	0.291	0.00	5.05	*INA*	0.00	*Neg.*	*Neg.*	*Neg.*	0.007
A2	0.181	0.00	15.7	*INA*	0.00	*Neg.*	*Neg.*	*Neg.*	0.002
A3	5.76	0.00	279	*INA*	0.00	*Neg.*	*Neg.*	*Neg.*	0.024
A1-A3 Total:	**6.24**	**0.00**	**300**	***INA***	**0.00**	***Neg.***	***Neg.***	***Neg.***	**0.033**
A4	1.72	0.00	157	*INA*	0.00	*Neg.*	*Neg.*	*Neg.*	0.017
A5	0.070	0.00	2.24	*INA*	0.00	*Neg.*	*Neg.*	*Neg.*	0.001
B2	254	0.00	73.1	*INA*	0.00	*Neg.*	*Neg.*	*Neg.*	0.921
B4	22.5	0.00	1290	*INA*	0.00	*Neg.*	*Neg.*	*Neg.*	0.143
C2	0.038	0.00	3.32	*INA*	0.00	*Neg.*	*Neg.*	*Neg.*	3.80×10^{-4}
C4	0.029	0.00	2.51	*INA*	0.00	*Neg.*	*Neg.*	*Neg.*	0.002

Waste & Output	HWD	NHWD	HLRW/ILLRW	CRU	MR	MER	EE
	kg	kg	kg	kg	kg	kg	MJ, LHV
A1	1.68×10^{-5}	0.601	2.29×10^{-5}	0.00	0.00	*Neg.*	*Neg.*
A2	4.15×10^{-5}	0.798	1.00×10^{-4}	0.00	0.00	*Neg.*	*Neg.*
A3	3.20×10^{-4}	0.646	9.82×10^{-5}	0.00	0.00	*Neg.*	*Neg.*
A1-A3 Total:	**3.78×10^{-4}**	**2.05**	**2.21×10^{-4}**	**0.00**	**0.00**	***Neg.***	***Neg.***
A4	3.80×10^{-4}	7.04	0.001	0.00	0.00	*Neg.*	*Neg.*
A5	7.27×10^{-6}	2.31	1.36×10^{-5}	0.00	0.00	*Neg.*	*Neg.*
B2	0.007	2.67	2.20×10^{-4}	0.00	0.00	*Neg.*	*Neg.*
B4	0.002	31.9	0.004	0.00	0.00	*Neg.*	*Neg.*
C2	8.78×10^{-6}	0.169	2.17×10^{-5}	0.00	0.00	*Neg.*	*Neg.*
C4	4.46×10^{-6}	13.03	1.64×10^{-5}	0.00	0.00	*Neg.*	*Neg.*

6. LCA: INTERPRETATION

The interpretation phase conforms to ISO 14044.The interpretation included the use of evaluation and sensitivity checks to steer the iterative process during the assessment, and a final evaluation including completeness, sensitivity, and consistency checks, at the end of the study.

The contributions to total impact indicator results are dominated by the use phase impacts from the replacement (B4) module. When examining the results without the use phase impacts, the results are dominated by the manufacture module (A3) with the product distribution module (A).

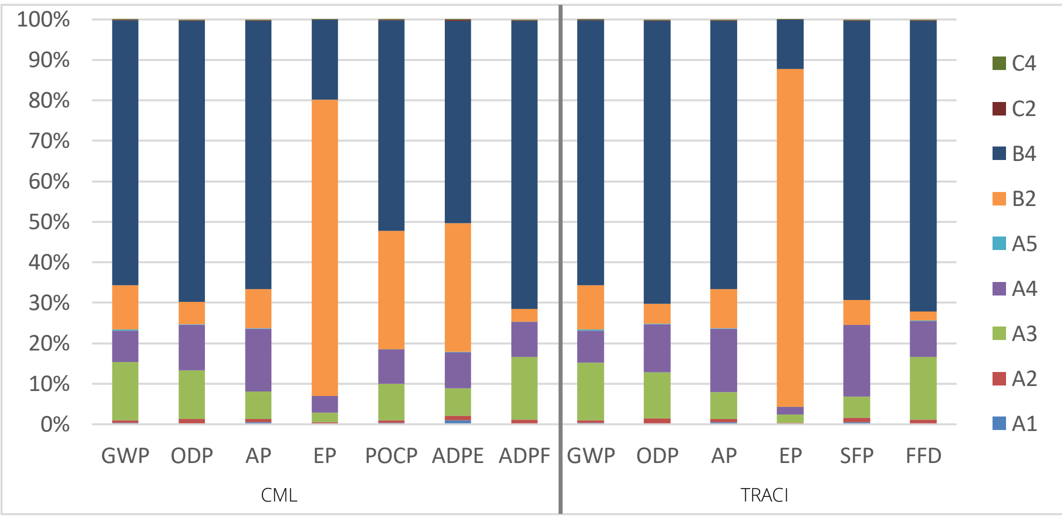


Figure 2. *Contribution analysis for the Sloan Lavatory Products.*

7. ADDITIONAL ENVIRONMENTAL INFORMATION

Over one billion gallons of water are wasted in the U.S. every year because of inefficient toilets, urinals, and faucets. Sloan's high efficiency fixtures and lavatories have been engineered for optimal performance with Sloan flushometers and faucets, and together, these systems conserve an enormous volume of water over the life of the products.

All of the fixtures in this EPD are manufactured in our state of the art Leadership in Energy and Environmental Design (LEED) Silver facility, in China. This facility was designed to capture rainwater and store it in underground storage tanks where it is then processed to drinking water quality. The water is then used to support the entire engineering center; from test benches and restrooms to showrooms and landscaping.

Sloan is a proud member of the United States Green Building Council (USGBC) and through the use of Leadership in Energy and Environmental Design (LEED) Green Building Rating System, Sloan recognizes and validates the importance of best-on-class building strategies and practices of high performing green buildings. Sloan's fixtures within this EPD can be used to help achieve USGBC LEED v4 points and complying with building codes.

No environmental or health impacts are expected due to extraordinary effects including fire and/or water damage and product destruction.

For more information on Sloan's certifications and environmental initiatives please visit the website at www.sloan.com.

8. REFERENCES

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- UL PCR Guidance for Building-Related Products and Services Part B: Sanitary Ceramics EPD Requirements. Version 1.0. June 2018.

APPENDIX: INDIVIDUAL MODEL RESULTS

Modules B1, B3, B5, B6, B7, C1, and C3 all have zero impacts and are omitted from the tables below in order to conserve space.

Table 18. *Lavatory models SS3001, SS3001-STG, SS3002, SS3002-STG, SS3102, SS3802 (mass = 7kg)*

Module		A1	A2	A3	Total A1-A3	A4	A5	B2	B4	C2	C4
CML-IA Environmental Impact Results											
GWP	kg CO_2 eq	0.213	0.564	10.8	11.6	6.51	0.361	15.0	51.8	0.119	0.058
ODP	kg CFC-11 eq	2.03x10^{-8}	9.80x10^{-8}	1.08x10^{-6}	1.20x10^{-6}	1.12x10^{-6}	4.20x10^{-8}	9.07x10^{-7}	6.60x10^{-6}	2.07x10^{-8}	1.52x10^{-8}
AP	kg SO_2 eq	0.001	0.002	0.018	0.021	0.046	0.001	0.046	0.189	4.60X10^{-4}	3.60X10^{-4}
EP	kg PO_4^{3-} eq	2.90X10^{-4}	0.001	0.005	0.006	0.008	3.80x10^{-4}	0.233	0.038	1.10x10^{-4}	8.16x10^{-5}
POCP	kg C_2H_4 eq	5.40x10^{-5}	7.38x10^{-5}	0.001	0.001	0.001	2.18x10^{-5}	0.008	0.008	1.56x10^{-5}	1.44x10^{-5}
ADPE	kg Sb eq	2.16x10^{-6}	1.96x10-^{6}	1.57X10^{-5}	1.98X10^{-5}	2.07x10^{-5}	8.05x10^{-7}	1.20X10^{-4}	1.20X10^{-4}	4.14x10^{-7}	1.63x10^{-7}
ADPF	MJ	2.63	8.35	152	1.63	94.6	2.15	56.5	728	1.77	1.33
TRACI Environmental Impact Results											
GWP	kg CO_2 eq	0.213	0.563	10.7	11.5	6.50	0.361	14.9	51.4	0.119	0.058
ODP	kg CFC-11 eq	2.67x10^{-8}	1.31x10^{-7}	1.31x10^{-6}	1.47x10^{-6}	1.49x10^{-6}	4.95x10^{-8}	1.01x10^{-6}	8.41x10^{-6}	2.76x10^{-8}	2.02x10^{-8}
AP	kg SO_2 eq	0.001	0.003	0.019	0.023	0.051	0.001	0.052	0.209	0.001	4.30x10^{-4}
EP	kg N eq	4.20X10^{-4}	0.001	0.008	0.009	0.007	0.001	0.537	0.049	1.30x10^{-4}	9.00x10^{-5}
SFP	kg O_3 eq	0.026	0.061	0.303	0.390	1.08	0.011	0.616	4.15	0.013	0.011
FFD	MJ Surplus	0.313	1.19	21.2	22.7	13.6	0.287	5.65	102	0.252	0.193
Resource Use Indicator Results											
RPR_E	MJ	0.157	0.097	3.44	3.69	1.05	0.070	254	13.4	0.021	0.016
RPR_M	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
$NRPR_E$	MJ	2.71	8.46	154	166	95.7	2.24	73.1	738	1.79	1.35
$NRPR_M$	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
SM	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RSF	MJ	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
NRSF	MJ	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
RE	MJ	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
FW	m^3	0.004	0.001	0.016	0.020	0.012	0.001	0.921	0.094	2.30x10^{-4}	0.001
Waste and Output Indicator Results											
HWD	kg	9.03x10^{-6}	2.24x10^{-5}	1.80x10^{-4}	2.11x10^{-4}	2.30x10^{-4}	7.27x10^{-6}	0.007	0.001	4.73x10^{-6}	2.40x10^{-6}
NHWD	kg	0.323	0.430	0.395	1.15	4.29	2.31	2.67	21.7	0.091	7.02
HLRW/ILLRW	kg	1.23x10^{-5}	5.53x10^{-5}	6.96x10^{-5}	1.37x10^{-4}	0.001	1.36x10^{-5}	2.20x0^{-4}	0.002	1.17x10^{-5}	8.81x10^{-6}
CRU	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MR	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MER	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EE	MJ, LHV	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 19. *Lavatory models SS3003, SS3003-STG, SS3065, SS3065-STG, SS3102-STG, SS3103, SS3103-STG, SS3165, SS3165-STG, SS3803, SS3865, SS3865-STG (mass = 16kg)*

Module		A1	A2	A3	Total A1-A3	A4	A5	B2	B4	C2	C4
CML-IA Environmental Impact Results											
GWP	kg CO_2 eq	0.488	1.29	23.9	25.7	12.8	0.361	15.0	109	0.273	0.133
ODP	kg CFC-11 eq	4.65×10^{-8}	2.24×10^{-7}	2.40×10^{-6}	2.67×10^{-6}	2.19×10^{-6}	4.20×10^{-8}	9.07×10^{-7}	1.37×10^{-5}	4.74×10^{-8}	3.47×10^{-8}
AP	kg SO_2 eq	0.003	0.005	0.040	0.047	0.090	0.001	0.046	0.384	0.001	0.001
EP	kg PO_4^{3-} eq	0.001	0.001	0.009	0.011	0.015	3.80×10^{-4}	0.233	0.075	2.50×10^{-4}	1.90×10^{-4}
POCP	kg C_2H_4 eq	1.20×10^{-4}	1.70×10^{-4}	0.003	0.003	0.003	2.18×10^{-5}	0.008	0.016	3.57×10^{-5}	3.29×10^{-5}
ADPE	kg Sb eq	4.94×10^{-6}	4.47×10^{-6}	3.09×10^{-5}	4.03×10^{-5}	4.05×10^{-5}	8.05×10^{-7}	1.20×10^{-4}	2.30×10^{-4}	9.46×10^{-7}	3.72×10^{-7}
ADPF	MJ	6.00	19.1	338	363	186	2.15	56.5	1540	4.04	3.05
TRACI Environmental Impact Results											
GWP	kg CO_2 eq	0.486	1.29	23.6	25.4	12.8	0.361	14.9	108	0.272	0.132
ODP	kg CFC-11 eq	6.10×10^{-8}	2.98×10^{-7}	2.90×10^{-6}	3.26×10^{-6}	2.92×10^{-6}	4.95×10^{-8}	1.01×10^{-6}	1.74×10^{-5}	6.31×10^{-8}	4.62×10^{-8}
AP	kg SO_2 eq	0.003	0.006	0.042	0.051	0.100	0.001	0.052	0.424	0.001	0.001
EP	kg N eq	0.001	0.001	0.016	0.018	0.015	0.001	0.537	0.093	3.00×10^{-4}	2.10×10^{-4}
SFP	kg O_3 eq	0.059	0.141	0.645	0.844	2.12	0.011	0.616	8.34	0.030	0.024
FFD	MJ Surplus	0.716	2.73	47.4	50.8	26.6	0.287	5.65	218	0.577	0.441
Resource Use Indicator Results											
RPR_E	MJ	0.358	0.223	6.93	7.51	2.05	0.070	254	27.0	0.047	0.036
RPR_M	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
$NRPR_E$	MJ	6.20	19.3	342	367	188	2.24	73.1	1560	4.09	3.09
$NRPR_M$	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
SM	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RSF	MJ	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
NRSF	MJ	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
RE	MJ	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
FW	m^3	0.009	0.003	0.029	0.040	0.023	0.001	0.921	0.182	0.001	0.003
Waste and Output Indicator Results											
HWD	kg	2.06×10^{-5}	5.11×10^{-5}	3.90×10^{-4}	4.62×10^{-4}	4.60×10^{-4}	7.27×10^{-6}	0.007	0.003	1.08×10^{-5}	5.49×10^{-6}
NHWD	kg	0.739	0.983	0.771	2.49	8.41	2.31	2.67	37.0	0.208	16.0
HLRW/ILLRW	kg	2.82×10^{-5}	1.30×10^{-4}	1.10×10^{-4}	2.68×10^{-4}	0.001	1.36×10^{-5}	2.20×10^{-4}	0.004	2.67×10^{-5}	2.01×10^{-5}
CRU	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MR	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MER	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EE	MJ, LHV	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

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