NETL Life Cycle Inventory Data
Process Documentation File

Process Name:	Powder River Basin Coal, Production and Transport
Reference Flow:	1 kg of Powder River Basin Coal
Brief Description:	This process includes all inputs for the raw material acquisition and raw material transportation for 1 kg of delivered Powder River Basin coal.

Section I: Meta Data

Geographical Coverage: US **Region:** N/A

Year Data Best Represents: 2008

Process Type: Extraction Process (EP)

Process Scope: Cradle-to-Gate Process (CG)

Allocation Applied: No

Completeness: Individual Relevant Flows Captured

Flows Aggregated in Data Set:

☒ Process ☒ Energy Use ☒ Energy P&D ☐ Material P&D

Relevant Output Flows Included in Data Set:

Releases to Air:	☒ Greenhouse Gases	☒ Criteria Air Pollutants	☒ Other
Releases to Water:	☒ Inorganic Emissions	☐ Organic Emissions	☐ Other
Water Usage:	☒ Water Consumption	☒ Water Demand (throughput)	
Releases to Soil:	☒ Inorganic Releases	☐ Organic Releases	☐ Other

Adjustable Process Parameters:

Train_dist	*The distance the train travels from the mine to the energy conversion facility*
Coal_bed_methane	*The amount of methane in the coal that is released during extraction and processing*

Tracked Input Flows:

PRB Commissioning	*The energy required for the commissioning and decommissioning of the mine*
PRB (NETL)	*The coal mine operations, including energy and water requirements*
Construction	*The construction of the surface coal mine*

Coal Unit Train Assembly, 100 Railcars, per kg Coal Transported

The construction of the locomotive and railcars for the transportation of the coal

Tracked Output Flows:

Powder River Basin Coal — *Delivered coal at the energy conversion facility*

Section II: Process Description

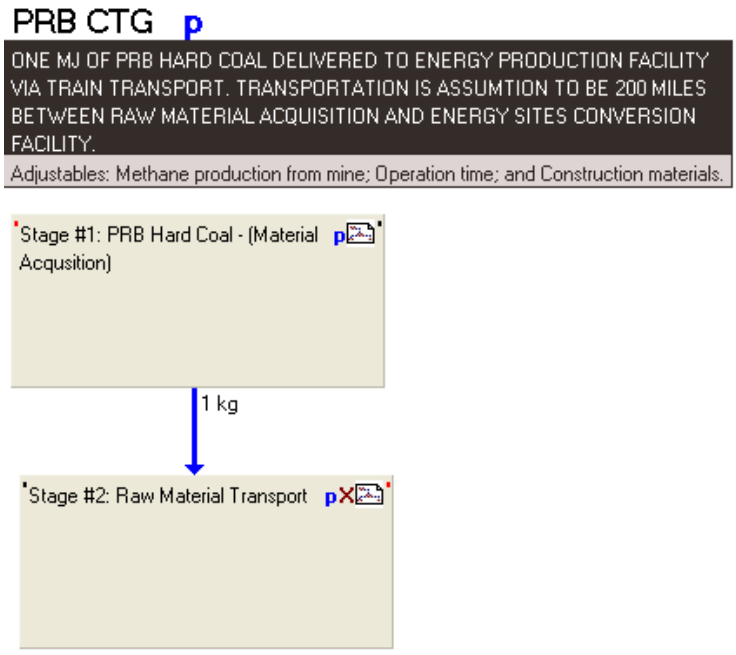
Associated Documentation

This unit process is composed of this document and the data sheet (DS) *DS_CTG_PowderRiverBasin_2011.01.xls*, which provides additional details regarding relevant calculations, data quality, and references.

Goal and Scope

The scope of this unit process covers all aspects of raw material acquisition (RMA) and raw material transportation (RMT) to the energy conversion facility as shown in **Figure 1**. At the downstream boundary for RMA and RMT, one kilogram of coal is delivered to the life cycle (LC) Stage #3 boundary. The RMA and RMT are discussed separately below.

Figure 1: Plan for RMA and RMT of Powder River Basin Coal



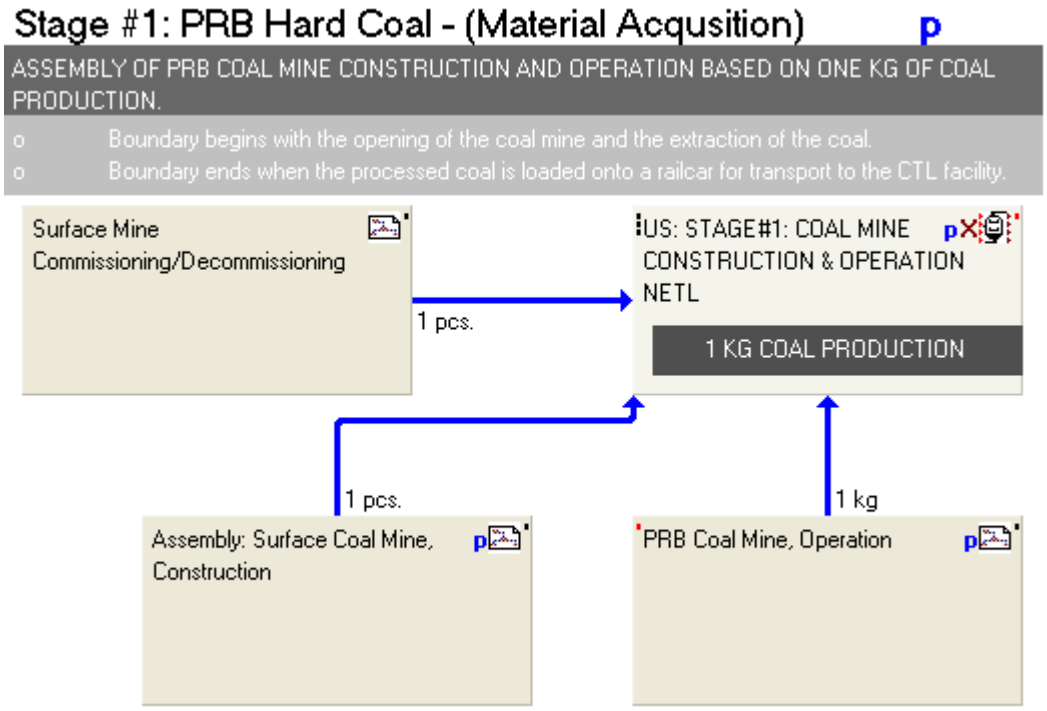
Boundary and Description

LC stage #1, RMA for subbituminous coal, includes the construction of an aboveground Powder River Basin (PRB) coal mine and required operation equipment, the operation of the coal mine, and the commissioning and decommissioning of the mine. The mine was modeled based on a compilation of surface mines in Wyoming and Montana, producing PRB Coal.

Each of the processes included in RMA for PRB coal includes upstream processes (for example, diesel fuel or steel). Coal mine construction and operation include individual construction unit processes for key equipment, which are then aggregated within the model as described below. The plan for RMA of PRB coal is provided in **Figure 2**.

Coal mine commissioning and decommissioning integrates diesel and gasoline use during commissioning and decommissioning of the PRB mine. Due to lack of available data, coal mine decommissioning was assumed to require 10 percent of the commissioning inputs. The coal mine operation includes energy from the power grid and diesel use for the operation of the mine and mine equipment. Coal mine methane emissions are included as an adjustable parameter in this process.

Figure 2: Plan for RMA of PRB Coal, Including Operations, Construction, and Commissioning/Decommissioning Profiles



The construction process contains key machinery needed for the initial clearing of the site and the extraction of the coal. The machinery includes:

- Blasthole Drill
  (DS/DF_Stage1_C_Blasthole_Drill_250000lb_2010.01.doc)
- Coal Loading Silo
  (DS/DF_Stage1_C_Coal_Loading_Silo_PRB_2010.01.doc)
- Conveyor System
  (DS/ DF_Stage1_C_Conveyor_System_48_Inch_2010.01.doc)
- Dragline
  (DS/ DF_Stage1_C_Dragline_8200ton_2010.01.doc)
- Coal Loader
  (DS/ DF_Stage1_C_Track_Loader_239_HP_2010.01.doc)
- Mining Truck
  (DS/ DF_Stage1_C_Mining_Truck_623690kg_2010.01.doc)
- Electric Shovel
  (DS/ DF_Stage1_C_Electric_Shovel_120_Tons_Payload_2010.01.doc)
- Coal Crusher
  (DS/ DF_Stage1_C_Coal_Crusher_254000lb_2010.01.doc)

Each piece of equipment is scaled to coal mine production, accounting for the lifetime of each piece of equipment, as relevant. The profiles and processes included in RMA are provided in **Table 1**. Those shown in bold face were developed by NETL.

Table 1: Profiles and Processes Included in RMA for Powder River Basin Coal

Stage #1: PRB Hard Coal - (Material Acqusition)
Assembly: Surface Coal Mine, Construction
Blasthole Drill, Construction
US: Blasthole Drill, Construction NETL
WOR: Steel Plate, BF, Manufacture NETL <u-so>
Coal Crusher, Construction
DE: Steel cold rolled PE
US: Coal Crusher, Construction NETL
Coal Loader, Construction
US: Track Loader, 239 Horsepower (HP), Construction NETL <u-so>
WOR: Steel Plate, BF, Manufacture NETL <u-so>
Coal Loading Silo, Construction
DE: Steel cold rolled PE
North American Average Electricity Mix, 2007 NETL
US: Coal Loading Silos, Construction NETL
US: Concrete, ready mixed, R-5-0 (100% Portland Cement) NETL <u-so>
Conveyor System, Construction
BF: Hot-dip Galvanized NETL
DE: Steel cold rolled PE

- DE: Styrene-butadiene rubber mix (SBR) PE
- US: Steel-Cord Conveyor System, 72", Construction NETL <u-so>
- Dragline, Construction
  - US: Dragline, 8,200 ton, Construction NETL <u-so>
  - WOR: Steel Plate, BF, Manufacture NETL <u-so>
- Electric Shovel, Construction
  - US: Electric Shovel, 120 tons payload, Construction NETL <u-so>
  - WOR: Steel Plate, BF, Manufacture NETL <u-so>
- Mining Truck, Construction
  - DE: Styrene-butadiene rubber mix (SBR) PE
  - US: Mining Truck for Surface Mine, 623,690 kg, Construction NETL <u-so>
  - WOR: Steel Plate, BF, Manufacture NETL <u-so>
- US: PRB Coal Surface Mine Assembly, Construction NETL <u-so>

PRB Coal Mine, Operation

- North American Average Electricity Mix, 2007 NETL
- RER: Ammonium nitrate PE
- US: DIESEL, NATIONAL AVERAGE, 2009 NETL <u-so>
- US: Fuel oil light at refinery PE
- US: Powder River Basin Surface Subbituminous Coal Mine, Operations NETL <u-so>

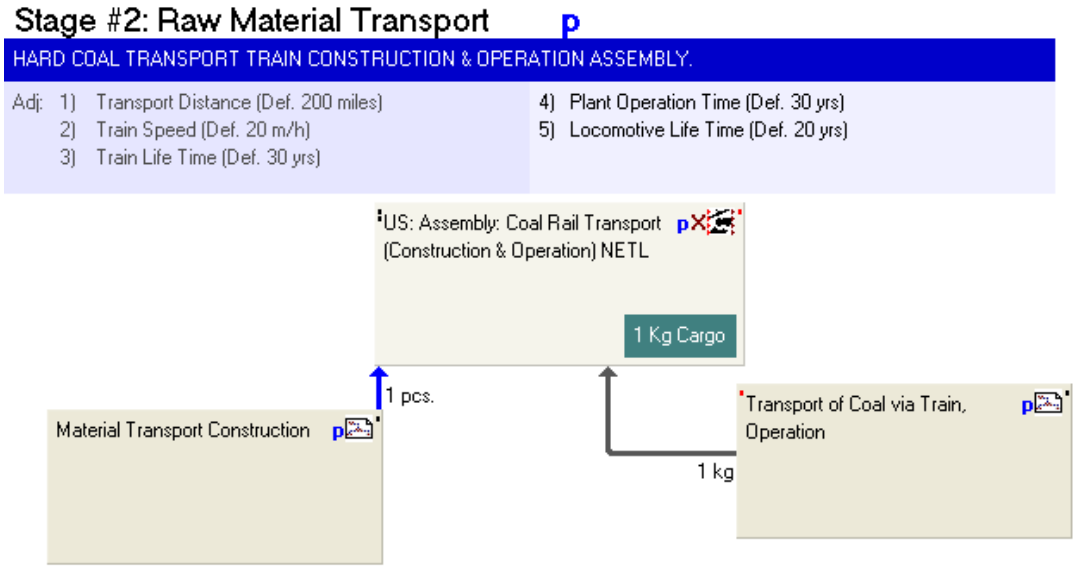
Surface Mine Commissioning/Decommissioning

- US: Commissioning and Decommissioning of Powder River Basin Coal Mine NETL <u-so>
- US: DIESEL, NATIONAL AVERAGE, 2009 NETL <u-so>

US: STAGE#1: COAL MINE CONSTRUCTION & OPERATION NETL

LC Stage #2 (RMT) includes the transport of the mined and processed PRB subbituminous coal from the aboveground coal mine site to the energy conversion facility (LC Stage #3). The construction of equipment used to transport mined coal and the operation of that equipment are considered within RMT. Coal transport takes place via a diesel-powered train/locomotive that is suitable for the transport of coal. The transport distance is an adjustable parameter for RMT, with a default value of 200 miles. The plan for RMT of coal is provided in **Figure 3**.

Figure 3: Plan for RMT of Powder River Basin Coal, Including Construction and Operation of Profiles for Transport



Construction of the train for RMT includes the materials required to construct the following piece of equipment for transport:

- Coal railcar
  (DS/DF_Stage2_C_Railcar_244000_lbs_Net_Capacity_2009.01)
- Diesel locomotive
  (4,400 horsepower) (DS/DF_Stage2_C_Locomotive_2009.01)
- Coal unit train (100 railcars and the required number of locomotives)
  (DS/DF_Stage2_C_Assembly_Coal_Unit_Train_100_Cars_2010.01)

The profiles and processes included in RMT are provided in **Table 2**. Those shown in bold face were developed by NETL.

Table 2: Profiles and Processes Included in RMT for Powder River Basin Coal

Stage #2: Raw Material Transport
- Material Transport Construction
  - RER: Aluminum sheet mix PE
  - US: Coal Railcar, 244000 lbs Net Capacity, Construction NETL <u-so>
  - US: Coal Unit Train Assembly, 100 Railcars, Construction NETL <u-so>
  - US: Diesel Locomotive, 4400 Horsepower, Construction NETL <u-so>
  - WOR: Steel Plate, BF, Manufacture NETL <u-so>
  - WOR: Steel, Stainless, 316 2B, 80% Recycled NETL <u-so>
- Transport of Coal via Train, Operation

US: Coal, Train Transport NETL <u-so>

US: DIESEL, NATIONAL AVERAGE, 2009 NETL <u-so>

US: Assembly: Coal Rail Transport (Construction & Operation) NETL

Parameters and Balances

The parameters for the highest level modeling plans for RMA and RMT of PRB subbituminous coal are shown in **Table 3**. These parameters may or may not include the adjustable parameters shown previously, depending on how the model was created. **Table 4** presents the input and output balances for resources and emissions of interest for the cradle-to-gate plan as well as each of the RMA and RMT plans.

Table 3: Adjustable Parameters for RMA and RMT of Powder River Basin Coal

Plan	Parameter	Value	Comment
LC Stage #1			
Stage #1: PRB Hard Coal	CH4_PRO	0.000149	[kg/kg coal] Amount of methane released from the mining and coal cleaning process
Stage #1: PRB Hard Coal	CONS_MAT	1	[pcs/kg] Number of pieces per kg of coal production
Stage #1: PRB Hard Coal	S1_OPER_TIME	30	[years] Length of study period, assumed to be the lifetime of the mine
LC Stage #2			
Stage #2: Raw Material Transport	CONS_MAT	1	[pcs/Kg] Pieces per kg of construction material.
Stage #2: Raw Material Transport	S2_OPER_TIME	30	[yrs] Adjustable. Assumed life of the power plant
Stage #2: Raw Material Transport	S2_TRAIN_DISNZ	200	[miles] User Defined parameter, default value is 200 miles one way
Stage #2: Raw Material Transport	S2_TRAIN_SPEED	20	[mph] Estimated average speed of coal unit trains for six railroads in US

Table 4: Inputs and Output Balances for Cradle-to-Gate, RMA, and RMT of Powder River Basin Coal (kg/kg delivered)

Process or Category	Cradle to Gate	Cradle to Gate (RMA)	Gate to Gate (RMT)
Inputs			
Flows	9.884E-02	9.065E-02	1.131E-02
Resources	9.884E-02	9.065E-02	1.131E-02
Energy resources	2.712E-03	1.904E-03	8.082E-04
Non renewable energy resources	2.712E-03	1.904E-03	8.082E-04
Crude oil (resource)	1.374E-03	8.122E-04	5.615E-04
Hard coal (resource)	4.385E-04	3.615E-04	7.703E-05
Lignite (resource)	1.502E-04	8.940E-05	6.077E-05
Natural gas (resource)	7.499E-04	6.411E-04	1.088E-04

Process or Category	Cradle to Gate	Cradle to Gate (RMA)	Gate to Gate (RMT)
Uranium (resource)	7.551E-09	4.148E-09	3.403E-09
Renewable energy resources	2.176E-08	8.865E-09	1.289E-08
Biomass	8.833E-10	3.859E-10	4.974E-10
Renewable fuels	5.493E-12	5.398E-12	9.596E-14
Wood	2.087E-08	8.473E-09	1.239E-08
Unspecified	0.000E+00	0.000E+00	0.000E+00
Land use	0.000E+00	0.000E+00	0.000E+00
Material resources	9.612E-02	8.875E-02	1.050E-02
Non renewable elements	4.713E-07	3.361E-07	1.353E-07
Aluminum	9.152E-12	8.591E-12	5.609E-13
Chromium	6.217E-14	2.496E-14	3.721E-14
Copper	1.344E-14	1.053E-14	2.910E-15
Iron	4.686E-07	3.342E-07	1.345E-07
Lead	3.792E-14	1.497E-14	2.295E-14
Magnesium	7.313E-17	2.918E-17	4.394E-17
Mercury	1.845E-14	7.510E-15	1.094E-14
Nickel	2.331E-16	9.533E-17	1.378E-16
Phosphorus	7.308E-12	2.916E-12	4.392E-12
Sulphur	6.774E-11	2.567E-11	4.207E-11
Zinc	2.608E-09	1.860E-09	7.485E-10
Non renewable resources	3.151E-03	1.721E-03	1.430E-03
Barium sulphate	2.155E-16	2.378E-17	1.917E-16
Basalt	2.898E-06	1.339E-07	2.764E-06
Bauxite	1.723E-04	4.134E-07	1.719E-04
Bentonite	5.622E-06	3.136E-06	2.485E-06
Calcium carbonate (CaCO3)	5.956E-08	5.591E-08	3.650E-09
Calcium chloride	2.206E-14	2.435E-15	1.963E-14
Chalk (Calciumcarbonate)	9.179E-41	5.100E-41	4.079E-41
Chromium ore (39%)	8.352E-09	3.595E-09	4.757E-09
Clay	6.181E-07	4.002E-07	2.179E-07
Colemanite ore	1.641E-09	5.623E-10	1.079E-09
Copper - Gold - Silver - ore (1,0% Cu; 0,4 g/t Au; 66 g/t Ag)	4.390E-08	2.941E-08	1.449E-08
Copper - Gold - Silver - ore (1,1% Cu; 0,01 g/t Au; 2,86 g/t Ag)	2.675E-08	1.792E-08	8.830E-09
Copper - Gold - Silver - ore (1,16% Cu; 0,002 g/t Au; 1,06 g/t Ag)	1.510E-08	1.011E-08	4.984E-09
Copper - Molybdenum - Gold - Silver - ore (1,13% Cu; 0,02% Mo; 0,01 g/t Au; 2,86 g/t Ag)	1.802E-08	5.879E-09	1.214E-08
Copper ore (0.14%)	1.350E-07	1.102E-07	2.478E-08
Copper ore (1.2%)	4.553E-09	3.050E-09	1.503E-09
Copper ore (4%)	3.775E-18	1.600E-18	2.174E-18

Process or Category	Cradle to Gate	Cradle to Gate (RMA)	Gate to Gate (RMT)
Copper ore (sulphidic, 1.1%)	4.084E-09	3.834E-09	2.503E-10
Dolomite	1.946E-07	1.439E-07	5.073E-08
Feldspar (aluminum silicates)	5.154E-12	2.057E-12	3.097E-12
Ferro manganese	1.131E-14	4.540E-15	6.773E-15
Fluorspar (calcium fluoride; fluorite)	1.295E-06	3.074E-09	1.291E-06
Granite	1.410E-21	5.708E-22	8.391E-22
Gravel	2.961E-07	2.961E-07	0.000E+00
Gypsum (natural gypsum)	2.590E-07	1.405E-07	1.185E-07
Heavy spar (BaSO4)	1.359E-05	7.584E-06	6.009E-06
Ilmenite (titanium ore)	5.491E-13	5.490E-13	6.898E-17
Inert rock	2.837E-03	1.628E-03	1.208E-03
Iron ore (56,86%)	4.794E-05	4.189E-05	6.049E-06
Iron ore (65%)	4.725E-09	6.828E-10	4.042E-09
Kaolin ore	2.944E-09	1.009E-09	1.936E-09
Lead - zinc ore (4.6%-0.6%)	1.136E-06	6.278E-07	5.084E-07
Limestone (calcium carbonate)	4.043E-05	2.297E-05	1.746E-05
Magnesit (Magnesium carbonate)	5.819E-12	2.879E-12	2.940E-12
Magnesium chloride leach (40%)	6.419E-07	4.295E-07	2.124E-07
Manganese ore	1.774E-09	7.007E-10	1.073E-09
Manganese ore (R.O.M.)	3.683E-07	3.296E-07	3.861E-08
Molybdenite (Mo 0,24%)	1.109E-08	3.599E-09	7.489E-09
Molybdenum ore (0.1%)	9.654E-10	3.859E-11	9.268E-10
Natural Aggregate	1.240E-05	6.243E-06	6.152E-06
Nickel ore (1,5%)	7.236E-10	6.601E-11	6.576E-10
Nickel ore (1.6%)	1.246E-06	1.161E-06	8.483E-08
Olivine	1.179E-13	4.732E-14	7.060E-14
Peat	4.375E-07	3.170E-07	1.205E-07
Phosphate ore	1.947E-11	1.578E-11	3.697E-12
Phosphorus minerals	4.434E-09	4.030E-09	4.040E-10
Phosphorus ore (29% P2O5)	1.024E-13	4.128E-14	6.109E-14
Potassium chloride	1.192E-10	6.189E-11	5.736E-11
Precious metal ore (R.O.M)	5.427E-10	1.715E-10	3.712E-10
Quartz sand (silica sand; silicon dioxide)	9.783E-07	8.596E-07	1.187E-07
Raw pumice	1.186E-10	9.757E-11	2.103E-11
Rutile (titanium ore)	2.105E-12	7.562E-13	1.349E-12
sand	1.739E-11	6.950E-12	1.044E-11
Slate	2.543E-13	1.002E-13	1.541E-13
Sodium chloride (rock salt)	6.720E-06	2.680E-06	4.041E-06

Process or Category	Cradle to Gate	Cradle to Gate (RMA)	Gate to Gate (RMT)
Sodium nitrate	5.188E-21	2.848E-21	2.340E-21
Sodium sulphate	1.550E-10	2.466E-11	1.304E-10
Soil	3.953E-06	1.938E-06	2.015E-06
Sulphur (bonded)	1.720E-13	1.070E-13	6.495E-14
Talc	2.280E-11	1.793E-11	4.871E-12
Tin ore	1.869E-17	2.062E-18	1.662E-17
Titanium ore	1.931E-08	1.030E-08	9.010E-09
Zinc - copper ore (4.07%-2.59%)	2.027E-07	1.164E-07	8.625E-08
Zinc - lead - copper ore (12%-3%-2%)	9.326E-08	5.313E-08	4.013E-08
Zinc - lead ore (4.21%-4.96%)	1.289E-18	5.465E-19	7.424E-19
Zinc ore (4%)	-8.712E-08	-6.036E-08	-2.676E-08
Zinc ore (sulphidic, 4%)	1.362E-17	9.298E-18	4.317E-18
Renewable resources	9.297E-02	8.703E-02	9.071E-03
Water	7.309E-02	6.933E-02	6.889E-03
Water	0.000E+00	0.000E+00	3.126E-03
Water (feed water)	1.062E-06	0.000E+00	1.447E-06
Water (ground water)	3.424E-02	3.362E-02	6.176E-04
Water (lake water)	2.708E-07	2.708E-07	0.000E+00
Water (municipal)	2.413E-07	2.413E-07	0.000E+00
Water (sea water)	2.848E-05	2.283E-05	5.648E-06
Water (surface water)	3.871E-02	3.557E-02	3.138E-03
Water (well water)	5.170E-08	2.067E-08	3.103E-08
Water (well-produced water)	1.197E-04	1.197E-04	0.000E+00
Water (with river silt)	3.128E-16	2.093E-16	1.035E-16
Air	1.987E-02	1.769E-02	2.178E-03
Carbon dioxide	7.635E-06	3.661E-06	3.974E-06
Nitrogen	9.589E-10	6.566E-10	3.023E-10
Oxygen	0.000E+00	0.000E+00	0.000E+00
Unspecified	2.626E-09	2.465E-09	1.609E-10
Unspecified minerals	5.975E-10	5.608E-10	3.662E-11
Unspecified resources	2.029E-09	1.904E-09	1.243E-10
Area of Production Land	0.000E+00	0.000E+00	0.000E+00
Output			
Flows	1.151E-01	1.030E-01	1.213E-02
Resources	3.798E-02	3.520E-02	2.778E-03
Energy resources	0.000E+00	0.000E+00	0.000E+00

Process or Category	Cradle to Gate	Cradle to Gate (RMA)	Gate to Gate (RMT)
Land use	0.000E+00	0.000E+00	0.000E+00
Material resources	3.798E-02	3.520E-02	2.778E-03
Renewable resources	3.798E-02	3.520E-02	2.778E-03
Water	3.797E-02	3.520E-02	2.776E-03
Water (feed water)	0.000E+00	3.851E-07	0.000E+00
Water (river water)	3.729E-02	3.454E-02	2.757E-03
Water (wastewater)	1.497E-04	1.305E-04	1.918E-05
Water (wastewater)	5.314E-04	5.314E-04	0.000E+00
Nitrogen	0.000E+00	0.000E+00	0.000E+00
Oxygen	4.439E-06	1.959E-06	2.480E-06
Ecoinvent	6.345E-07	6.345E-07	6.650E-15
Long-term emission	6.345E-07	6.345E-07	6.650E-15
Fresh water	6.345E-07	6.345E-07	6.650E-15
Chloride	6.345E-07	6.345E-07	0.000E+00
Dissolved organic carbon, DOC (Ecoinvent)	1.085E-13	1.019E-13	6.650E-15
Production residues in life cycle	7.502E-05	1.964E-05	5.538E-05
Hazardous waste for disposal	4.976E-05	1.166E-07	4.964E-05
Chromium containing slag	3.836E-12	3.836E-12	0.000E+00
Dross (Fines)	3.309E-07	7.732E-10	3.301E-07
Natrium oxide	5.624E-07	1.314E-09	5.611E-07
Red mud (dry)	4.887E-05	1.142E-07	4.875E-05
Soil and sand containing heavy metals	2.060E-10	1.934E-10	1.262E-11
Toxic chemicals (unspecified)	3.364E-10	1.341E-10	2.023E-10
Hazardous waste for recovery	3.033E-06	2.897E-06	1.363E-07
Used oil	8.898E-08	2.131E-10	8.876E-08
Waste water processing residue	2.944E-06	2.897E-06	4.755E-08
Waste for disposal	1.918E-05	1.392E-05	5.259E-06
Incineration good	1.841E-10	7.370E-11	1.104E-10
Sludge from water works (6% dry matter-content)	1.016E-11	3.805E-12	6.359E-12
Waste (solid)	7.486E-07	1.559E-07	5.928E-07
Waste for disposal (unspecified)	7.441E-08	7.441E-08	0.000E+00
Waste from steel works	1.836E-05	1.369E-05	4.666E-06
Waste for recovery	3.044E-06	2.700E-06	3.441E-07
Aluminum scrap	3.980E-15	1.445E-15	2.535E-15
Chemicals (unspecified)	1.005E-10	3.979E-11	6.066E-11
Cooling water	2.083E-06	1.895E-06	1.880E-07
Cryolite	1.543E-07	3.605E-10	1.539E-07
Dross	5.948E-10	2.159E-10	3.789E-10

Process or Category	Cradle to Gate	Cradle to Gate (RMA)	Gate to Gate (RMT)
Filter dust	6.089E-13	6.089E-13	0.000E+00
Furnace clinker	1.522E-13	1.522E-13	0.000E+00
Gypsum (contaminated)	2.428E-17	2.428E-17	0.000E+00
Gypsum (FDI)	4.851E-13	4.850E-13	5.865E-17
Plastic (unspecified)	1.900E-10	7.609E-11	1.140E-10
Production residues (unspecified)	1.459E-12	6.181E-13	8.405E-13
Rolling gravel	7.694E-08	7.694E-08	0.000E+00
Rolling tinder	8.524E-14	8.524E-14	1.031E-23
Slag	5.724E-07	5.707E-07	1.630E-09
Slag (containing precious metal)	5.631E-14	5.631E-14	0.000E+00
Slag (Iron plate production)	1.276E-09	1.276E-09	0.000E+00
Slag (Mn 6,5%)	1.556E-07	1.556E-07	0.000E+00
Waste paper	1.127E-13	9.599E-14	1.674E-14
Wood	1.890E-13	1.254E-13	6.358E-14
Wooden pallet (EURO)	5.623E-19	2.238E-19	3.384E-19
Mixed Waste (Hazardous or Radioactive)	3.044E-09	3.044E-09	0.000E+00
Neutralized residues	8.843E-14	8.842E-14	1.111E-17
Emissions to air	3.383E-02	2.456E-02	9.268E-03
Heavy metals to air	4.311E-09	2.239E-09	2.072E-09
Antimony	6.518E-12	2.564E-12	3.954E-12
Arsenic (+V)	8.092E-11	2.717E-11	5.375E-11
Arsenic trioxide	7.555E-16	4.215E-16	3.339E-16
Cadmium (+II)	7.686E-12	4.409E-12	3.277E-12
Chromium (+III)	2.012E-13	1.092E-13	9.199E-14
Chromium (+VI)	2.166E-15	8.659E-17	2.079E-15
Chromium (unspecified)	6.732E-11	4.141E-11	2.590E-11
Cobalt	1.611E-11	8.836E-12	7.272E-12
Copper (+II)	3.639E-11	2.209E-11	1.430E-11
Heavy metals to air (unspecified)	3.190E-13	2.681E-13	5.093E-14
Hydrogen arsenic (arsine)	6.271E-14	3.499E-14	2.772E-14
Iron	6.143E-11	5.154E-11	9.894E-12
Lanthanides	3.444E-15	9.649E-16	2.479E-15
Lead (+II)	2.931E-10	1.934E-10	9.972E-11
Manganese (+II)	9.979E-11	5.933E-11	4.046E-11
Mercury (+II)	3.680E-11	2.860E-11	8.199E-12
Molybdenum	4.923E-12	3.943E-12	9.804E-13
Nickel (+II)	4.233E-10	1.305E-10	2.928E-10
Palladium	6.106E-19	6.739E-20	5.432E-19

Process or Category	Cradle to Gate	Cradle to Gate (RMA)	Gate to Gate (RMT)
Rhodium	5.895E-19	6.505E-20	5.244E-19
Selenium	1.341E-10	5.583E-11	7.823E-11
Silver	1.639E-19	8.843E-20	7.546E-20
Tellurium	2.682E-14	1.456E-14	1.226E-14
Thallium	5.485E-13	4.527E-13	9.573E-14
Tin (+IV)	6.645E-11	1.911E-11	4.734E-11
Titanium	2.185E-13	6.161E-14	1.569E-13
Vanadium (+III)	2.201E-09	1.058E-09	1.143E-09
Zinc (+II)	7.737E-10	5.309E-10	2.428E-10
Inorganic emissions to air	1.825E-02	1.080E-02	7.442E-03
Ammonia	1.806E-06	1.583E-06	2.232E-07
Ammonium	1.874E-14	1.574E-14	2.999E-15
Ammonium nitrate	9.988E-16	6.275E-16	3.712E-16
Argon	1.631E-13	1.631E-13	0.000E+00
Barium	8.732E-09	4.838E-09	3.893E-09
Beryllium	1.706E-12	5.110E-13	1.195E-12
Boron compounds (unspecified)	1.504E-09	6.542E-10	8.501E-10
Bromine	4.792E-10	1.864E-10	2.928E-10
Carbon dioxide	1.386E-02	7.363E-03	6.499E-03
Carbon dioxide (biotic)	1.153E-11	1.153E-11	0.000E+00
Carbon dioxide (biotic)	1.161E-06	7.952E-07	3.656E-07
Carbon disulphide	1.303E-13	1.432E-14	1.160E-13
Carbon monoxide	5.834E-05	3.798E-05	2.036E-05
Carbon monoxide (biotic)	7.025E-14	7.025E-14	0.000E+00
Chloride (unspecified)	1.299E-09	8.828E-10	4.159E-10
Chlorine	1.490E-11	4.559E-12	1.034E-11
Cyanide (unspecified)	2.656E-11	2.368E-11	2.874E-12
Fluoride	2.496E-08	5.735E-10	2.438E-08
Fluorides	4.208E-12	1.512E-12	2.696E-12
Fluorine	4.408E-14	2.881E-14	1.527E-14
Helium	1.052E-11	5.742E-12	4.775E-12
Hydrogen	7.656E-09	2.439E-09	5.217E-09
Hydrogen bromine (hydrobromic acid)	2.051E-12	1.244E-12	8.075E-13
Hydrogen chloride	3.536E-08	1.303E-08	2.233E-08
Hydrogen cyanide (prussic acid)	4.421E-12	5.350E-13	3.886E-12
Hydrogen fluoride	2.572E-08	1.164E-09	2.456E-08
Hydrogen iodide	2.093E-15	1.274E-15	8.188E-16
Hydrogen phosphorous	8.112E-13	2.199E-15	8.090E-13

Process or Category	Cradle to Gate	Cradle to Gate (RMA)	Gate to Gate (RMT)
Hydrogen sulphide	4.285E-08	1.173E-08	3.112E-08
Lead dioxide	1.339E-13	1.251E-13	8.772E-15
Nitrogen (atmospheric nitrogen)	3.761E-07	2.866E-07	8.952E-08
Nitrogen (N-compounds)	3.189E-14	3.189E-14	0.000E+00
Nitrogen dioxide	2.502E-05	2.495E-05	6.321E-08
Nitrogen monoxide	2.564E-11	2.331E-11	2.339E-12
Nitrogen oxides	3.685E-05	2.087E-05	1.598E-05
Nitrous oxide (laughing gas)	7.283E-06	7.127E-06	1.561E-07
Oxygen	1.209E-06	7.488E-07	4.602E-07
Scandium	1.729E-15	4.577E-16	1.271E-15
Steam	4.240E-03	3.340E-03	9.006E-04
Strontium	6.539E-14	1.825E-14	4.715E-14
Sulphur dioxide	1.127E-05	6.398E-06	4.868E-06
Sulphur hexafluoride	2.042E-10	2.042E-10	4.357E-14
sulphur oxide	1.898E-09	1.898E-09	0.000E+00
Sulphuric acid	9.725E-12	2.496E-12	7.229E-12
Tin oxide	8.239E-17	2.813E-17	5.426E-17
Unspecified Particles	4.890E-09	4.590E-09	2.997E-10
Zinc oxide	1.648E-16	5.627E-17	1.085E-16
Zinc sulphate	1.578E-12	8.807E-13	6.978E-13
Organic emissions to air (group VOC)	1.687E-04	1.620E-04	6.693E-06
Group NMVOC to air	3.049E-06	1.759E-06	1.290E-06
Group PAH to air	2.422E-09	2.872E-10	2.135E-09
Anthracene	1.781E-13	9.040E-14	8.767E-14
Benzo{a}anthracene	8.960E-14	4.549E-14	4.411E-14
Benzo{a}pyrene	4.955E-11	1.273E-11	3.682E-11
Benzo{ghi}perylene	7.993E-14	4.058E-14	3.935E-14
Benzofluoranthene	1.599E-13	8.116E-14	7.872E-14
Chrysene	2.201E-13	1.117E-13	1.084E-13
Dibenz(a)anthracene	4.981E-14	2.529E-14	2.452E-14
Indeno[1,2,3-cd]pyrene	5.947E-14	3.019E-14	2.928E-14
Naphthalene	1.870E-11	9.494E-12	9.209E-12
Phenanthrene	5.875E-12	2.982E-12	2.893E-12
Polycyclic aromatic hydrocarbons (PAH)	2.347E-09	2.616E-10	2.086E-09
Halogenated organic emissions to air	6.171E-09	9.890E-11	6.072E-09
Dichloroethane (ethylene dichloride)	4.434E-15	4.422E-15	1.190E-17
Dichloromethane (methylene chloride)	8.291E-16	3.455E-16	4.836E-16
Dioxins (unspec.)	-6.905E-18	2.127E-17	-2.818E-17

Process or Category	Cradle to Gate	Cradle to Gate (RMA)	Gate to Gate (RMT)
Halogenated hydrocarbons (unspecified)	9.604E-14	3.914E-14	5.690E-14
Polychlorinated biphenyls (PCB unspecified)	1.378E-13	7.686E-14	6.093E-14
Polychlorinated dibenzo-p-dioxins (2,3,7,8 - TCDD)	4.813E-16	5.383E-17	4.274E-16
R 11 (trichlorofluoromethane)	5.513E-11	3.025E-11	2.488E-11
R 114 (dichlorotetrafluoroethane)	5.646E-11	3.098E-11	2.548E-11
R 116 (hexafluoroethane)	6.020E-10	1.407E-12	6.006E-10
R 12 (dichlorodifluoromethane)	1.185E-11	6.503E-12	5.350E-12
R 13 (chlorotrifluoromethane)	7.443E-12	4.084E-12	3.359E-12
R 22 (chlorodifluoromethane)	1.296E-11	7.108E-12	5.848E-12
Tetrafluoromethane	5.419E-09	1.296E-11	5.406E-09
Vinyl chloride (VCM; chloroethene)	6.778E-12	5.492E-12	1.285E-12
Acetaldehyde (Ethanal)	2.815E-09	2.609E-09	2.066E-10
Acetic acid	1.134E-08	1.049E-08	8.450E-10
Acetone (dimethylcetone)	2.803E-09	2.599E-09	2.042E-10
Acrolein	1.257E-12	6.379E-13	6.187E-13
Aldehyde (unspecified)	2.529E-11	1.264E-11	1.266E-11
Alkane (unspecified)	1.285E-08	1.096E-08	1.890E-09
Alkene (unspecified)	2.464E-09	1.299E-09	1.165E-09
Aromatic hydrocarbons (unspecified)	1.094E-09	1.017E-09	7.683E-11
Benzene	2.727E-09	2.254E-09	4.721E-10
Butadiene	1.624E-14	1.336E-14	2.880E-15
Butane	1.347E-07	8.555E-08	4.913E-08
Butane (n-butane)	3.251E-09	2.531E-09	7.197E-10
Caprolactam	5.066E-14	1.820E-14	3.246E-14
Cumene (isopropylbenzene)	5.404E-21	5.404E-21	0.000E+00
Cyclohexane (hexahydro benzene)	2.697E-12	2.126E-13	2.484E-12
Diethylamine	4.143E-19	3.394E-19	7.498E-20
Ethane	4.062E-07	2.703E-07	1.359E-07
Ethanol	5.503E-09	5.105E-09	3.983E-10
Ethene (ethylene)	2.324E-11	1.882E-11	4.417E-12
Ethyl benzene	1.931E-09	8.013E-10	1.129E-09
Fluoranthene	5.800E-13	2.944E-13	2.855E-13
Fluorene	1.841E-12	9.343E-13	9.062E-13
Formaldehyde (methanal)	1.155E-08	1.010E-08	1.451E-09
Heptane (isomers)	3.597E-09	1.991E-09	1.606E-09
Hexamethylene diamine (HMDA)	9.554E-16	7.860E-16	1.694E-16
Hexane (isomers)	5.610E-09	3.194E-09	2.416E-09
Mercaptan (unspecified)	8.938E-11	7.246E-11	1.691E-11

Process or Category	Cradle to Gate	Cradle to Gate (RMA)	Gate to Gate (RMT)
Methanethiol	1.243E-10	1.167E-10	7.620E-12
Methanol	5.468E-09	5.085E-09	3.822E-10
NMVOC (unspecified)	1.754E-06	9.337E-07	8.203E-07
Octane	1.979E-09	1.095E-09	8.836E-10
Pentane (n-pentane)	5.489E-08	3.641E-08	1.848E-08
Phenol (hydroxy benzene)	7.137E-14	8.855E-15	6.252E-14
Propane	6.061E-07	3.678E-07	2.383E-07
Propene (propylene)	1.743E-10	7.190E-11	1.024E-10
Propionic acid (propane acid)	2.106E-13	1.690E-13	4.163E-14
Styrene	3.199E-15	3.127E-16	2.886E-15
Toluene (methyl benzene)	9.387E-10	3.977E-10	5.410E-10
Trimethylbenzene	8.026E-16	2.740E-16	5.285E-16
Xylene (dimethyl benzene)	8.066E-09	3.335E-09	4.731E-09
Hydrocarbons (unspecified)	5.068E-10	4.534E-10	5.336E-11
Methane	1.636E-04	1.598E-04	3.729E-06
Methane (biotic)	1.228E-10	1.228E-10	0.000E+00
Organic chlorine compounds	1.193E-13	4.829E-14	7.102E-14
Unspecified Organic Compounds	3.399E-15	3.190E-15	2.083E-16
VOC (unspecified)	2.108E-06	4.335E-07	1.675E-06
Other emissions to air	1.530E-02	1.350E-02	1.798E-03
Aldehydes, unspecified	1.699E-15	1.595E-15	1.041E-16
Exhaust	9.487E-03	7.692E-03	1.796E-03
Particulate Matter, unspecified	3.051E-08	1.145E-08	1.906E-08
Sand (Silica) (SiO2)	3.240E-11	3.041E-11	1.986E-12
Used air	5.810E-03	5.808E-03	2.369E-06
Particles to air	1.158E-04	9.483E-05	2.095E-05
Dust (PM10)	4.626E-08	3.194E-08	1.433E-08
Dust (PM2,5 - PM10)	8.150E-14	8.150E-14	0.000E+00
Dust (PM2.5)	1.236E-07	5.760E-08	6.599E-08
Dust (Portland cement kiln)	7.611E-08	7.611E-08	0.000E+00
Dust (unspecified)	1.155E-04	9.467E-05	2.087E-05
Metals (unspecified)	1.890E-13	1.326E-13	5.636E-14
Unspecified Organic Chlorine Compounds	2.242E-14	2.105E-14	1.374E-15
Wood (dust)	3.041E-14	1.038E-14	2.003E-14
Radioactive emissions to air	6.463E-11	3.539E-11	2.924E-11
Uranium (total)	6.463E-11	3.539E-11	2.924E-11
Unspecified Heavy Metals	1.751E-18	1.644E-18	1.073E-19
Emissions to fresh water	4.316E-02	4.314E-02	2.295E-05

Process or Category	Cradle to Gate	Cradle to Gate (RMA)	Gate to Gate (RMT)
Analytical measures to fresh water	2.852E-02	2.852E-02	1.902E-07
Adsorbable organic halogen compounds (AOX)	8.844E-10	6.779E-10	2.065E-10
Biological oxygen demand (BOD)	3.446E-08	2.938E-08	5.084E-09
Chemical oxygen demand (COD)	4.021E-07	2.280E-07	1.741E-07
Nitrogenous Matter (unspecified, as N)	1.909E-09	1.416E-09	4.930E-10
Solids (dissolved)	2.852E-02	2.852E-02	4.338E-09
Total dissolved organic bounded carbon	8.585E-09	8.574E-09	1.100E-11
Total Dissolved Solids	7.940E-07	7.940E-07	0.000E+00
Total organic bounded carbon	1.950E-08	1.355E-08	5.957E-09
Heavy metals to fresh water	2.554E-05	2.119E-05	4.351E-06
Aluminium	1.203E-06	4.322E-07	7.709E-07
Antimony	1.066E-08	3.829E-09	6.830E-09
Arsenic (+V)	7.888E-08	5.698E-08	2.189E-08
Cadmium (+II)	3.432E-09	1.271E-09	2.161E-09
Chromium (+III)	1.922E-11	1.036E-11	8.856E-12
Chromium (+VI)	3.901E-13	2.277E-14	3.673E-13
Chromium (unspecified)	6.023E-08	2.241E-08	3.782E-08
Cobalt	1.216E-12	6.417E-13	5.748E-13
Copper (+II)	9.557E-08	6.374E-08	3.182E-08
Heavy metals to water (unspecified)	5.119E-11	4.986E-11	1.333E-12
Iron	1.700E-05	1.521E-05	1.793E-06
Lead (+II)	1.330E-07	5.904E-08	7.400E-08
Manganese (+II)	3.951E-06	3.950E-06	3.288E-10
Mercury (+II)	5.835E-10	2.110E-10	3.725E-10
Molybdenum	1.634E-10	9.261E-11	7.078E-11
Nickel (+II)	1.142E-06	5.559E-07	5.858E-07
Selenium	3.637E-08	3.636E-08	1.248E-11
Silver	1.041E-08	3.740E-09	6.669E-09
Strontium	4.924E-09	2.969E-09	1.955E-09
Thallium	2.659E-14	1.488E-14	1.171E-14
Tin (+IV)	3.977E-12	1.963E-12	2.014E-12
Titanium	1.750E-11	9.596E-12	7.903E-12
Unspecified Substance	1.515E-14	1.422E-14	9.283E-16
Uranium	2.038E-07	2.038E-07	0.000E+00
Vanadium (+III)	5.910E-11	3.561E-11	2.349E-11
Zinc (+II)	1.605E-06	5.881E-07	1.016E-06
Inorganic emissions to fresh water	1.376E-02	1.375E-02	1.447E-05
Acid (calculated as H+)	3.427E-08	1.171E-10	3.415E-08

Process or Category	Cradle to Gate	Cradle to Gate (RMA)	Gate to Gate (RMT)
Aluminum (+III)	8.133E-07	8.110E-07	2.296E-09
Ammonia	1.778E-09	1.268E-09	5.094E-10
Ammonia, as N	1.348E-11	1.348E-11	0.000E+00
Ammonium (total N)	1.302E-05	4.678E-06	8.344E-06
Ammonium / ammonia	1.248E-05	1.248E-05	2.430E-09
Barium	3.436E-08	3.391E-08	4.496E-10
Beryllium	1.943E-13	1.068E-13	8.751E-14
Boron	1.690E-09	1.072E-09	6.184E-10
Bromate	1.090E-15	4.575E-16	6.321E-16
Bromine	2.377E-13	1.860E-13	5.168E-14
Calcium (+II)	4.965E-07	2.747E-07	2.218E-07
Carbonate	3.026E-07	2.746E-07	2.801E-08
Chlorate	1.028E-12	4.226E-13	6.053E-13
Chloride	1.015E-05	6.456E-06	3.696E-06
Chlorine (dissolved)	1.055E-08	7.395E-09	3.152E-09
Copper ion (+II/+III)	1.025E-14	1.784E-15	8.469E-15
Cyanide	9.684E-08	3.479E-08	6.205E-08
Fluoride	6.459E-07	4.126E-07	2.333E-07
Fluorine	1.036E-11	5.699E-12	4.656E-12
Hydrogen chloride	2.101E-13	1.159E-13	9.425E-14
Hydrogen fluoride (hydrofluoric acid)	3.023E-13	2.479E-13	5.440E-14
Hydrogen Ions (H+)	3.382E-12	3.175E-12	2.073E-13
Hydroxide	1.056E-07	2.506E-10	1.053E-07
Inorganic salts and acids (unspecified)	3.326E-19	3.269E-19	5.709E-21
Iron ion (+II/+III)	4.495E-11	4.113E-11	3.825E-12
Magnesium (+III)	5.473E-08	3.517E-08	1.956E-08
Magnesium chloride	1.661E-13	1.833E-14	1.478E-13
Metal ions (unspecific)	3.176E-10	2.890E-10	2.866E-11
Neutral salts	7.463E-13	6.100E-13	1.363E-13
Nickel ion (+III)	2.519E-13	1.007E-14	2.418E-13
Nitrate	1.479E-06	1.470E-06	8.621E-09
Nitrate (as total N)	5.432E-14	5.099E-14	3.329E-15
Nitrogen	2.946E-05	2.946E-05	5.824E-11
Nitrogen (as total N)	6.275E-10	6.275E-10	0.000E+00
Nitrogen organic bounded	6.224E-09	5.546E-09	6.778E-10
Phosphate	2.188E-09	2.085E-09	1.030E-10
Phosphorus	1.441E-06	7.048E-07	7.363E-07
Potassium	1.420E-10	1.073E-10	3.471E-11

Process or Category	Cradle to Gate	Cradle to Gate (RMA)	Gate to Gate (RMT)
Silicate particles	3.856E-11	3.853E-11	2.843E-14
Sodium (+I)	1.480E-06	1.051E-06	4.290E-07
Sodium chloride (rock salt)	6.613E-07	6.613E-07	2.909E-13
Sodium hypochlorite	2.402E-12	1.354E-12	1.048E-12
Sulfates	4.962E-08	4.962E-08	0.000E+00
Sulphate	1.369E-02	1.369E-02	5.360E-07
Sulphide	1.250E-08	7.380E-09	5.117E-09
Sulphite	4.302E-10	2.749E-10	1.554E-10
Sulphur	1.124E-10	5.559E-11	5.679E-11
Sulphuric acid	2.709E-11	1.494E-11	1.215E-11
Unspecified Iron Oxides	3.879E-14	3.641E-14	2.377E-15
Unspecified Oil	1.374E-13	1.290E-13	8.422E-15
Unspecified Organic Chlorine compounds	3.114E-16	2.923E-16	1.909E-17
Unspecified Salt	1.246E-12	1.170E-12	7.636E-14
Unspecified Solids (Suspended)	4.837E-12	4.541E-12	2.965E-13
Organic emissions to fresh water	1.355E-06	1.345E-06	9.713E-09
Halogenated organic emissions to fresh water	6.082E-13	3.302E-13	2.780E-13
1,2-Dibromoethane	6.334E-16	4.993E-17	5.835E-16
Chlorinated hydrocarbons (unspecified)	1.709E-14	1.709E-14	1.402E-19
Chloromethane (methyl chloride)	5.888E-13	3.118E-13	2.770E-13
Dichloroethane (ethylene dichloride)	1.850E-16	1.850E-16	3.192E-20
Dichloropropane	7.669E-19	6.309E-19	1.360E-19
Polychlorinated dibenzo-p-dioxins (2,3,7,8 - TCDD)	6.045E-19	6.030E-19	1.523E-21
Vinyl chloride (VCM; chloroethene)	1.520E-15	1.084E-15	4.363E-16
Hydrocarbons to fresh water	1.337E-06	1.335E-06	2.151E-09
Acenaphthene	2.124E-13	1.274E-13	8.503E-14
Acenaphthylene	8.704E-14	5.167E-14	3.537E-14
Acetic acid	2.475E-10	2.307E-10	1.678E-11
Acrylonitrile	5.608E-14	4.614E-14	9.945E-15
Anthracene	3.154E-13	1.912E-13	1.242E-13
Aromatic hydrocarbons (unspecified)	1.493E-10	9.815E-11	5.118E-11
Benzene	4.232E-10	2.519E-10	1.713E-10
Benzo{a}anthracene	2.923E-14	1.716E-14	1.206E-14
Benzofluoranthene	1.522E-14	8.938E-15	6.282E-15
Chrysene	1.301E-13	7.624E-14	5.385E-14
Cresol (methyl phenol)	2.911E-12	1.440E-12	1.471E-12
Ethyl benzene	2.117E-11	1.252E-11	8.654E-12
Fluoranthene	4.008E-14	2.575E-14	1.433E-14

Process or Category	Cradle to Gate	Cradle to Gate (RMA)	Gate to Gate (RMT)
Hexane (isomers)	3.178E-13	1.572E-13	1.606E-13
Hydrocarbons (unspecified)	9.510E-10	9.136E-10	3.745E-11
Methanol	1.093E-06	1.093E-06	3.366E-10
Oil (unspecified)	2.412E-07	2.402E-07	1.044E-09
Phenol (hydroxy benzene)	4.548E-10	2.939E-10	1.609E-10
Polycyclic aromatic hydrocarbons (PAH, unspec.)	2.619E-10	9.058E-11	1.714E-10
Toluene (methyl benzene)	2.627E-10	1.530E-10	1.097E-10
Xylene (isomers; dimethyl benzene)	1.075E-10	6.644E-11	4.104E-11
Carbon, organically bound	1.707E-08	9.520E-09	7.545E-09
Naphthalene	1.291E-11	7.484E-12	5.431E-12
N-unspecified (N)	1.075E-13	1.010E-13	6.591E-15
Organic chlorine compounds (unspecified)	1.817E-14	7.339E-15	1.083E-14
Organic compounds (dissolved)	7.237E-12	2.666E-12	4.571E-12
Organic compounds (unspecified)	2.142E-12	8.635E-13	1.279E-12
Unspecified wastewater	8.132E-11	7.634E-11	4.984E-12
Other emissions to fresh water	0.000E+00	0.000E+00	0.000E+00
Particles to fresh water	8.469E-04	8.430E-04	3.929E-06
Metals (unspecified)	1.188E-12	7.852E-13	4.026E-13
Silicon dioxide (silica)	1.335E-11	5.338E-13	1.282E-11
Soil loss by erosion into water	5.249E-12	4.252E-12	9.968E-13
Solids (suspended)	8.469E-04	8.430E-04	3.928E-06
Suspended solids, unspecified	3.740E-09	2.892E-09	8.484E-10
Unspecified Oxides	3.225E-14	3.027E-14	1.976E-15
Radioactive emissions to fresh water	0.000E+00	0.000E+00	0.000E+00
Bromide	0.000E+00	0.000E+00	0.000E+00
Radionuclide	0.000E+00	0.000E+00	0.000E+00
Sulfite	0.000E+00	0.000E+00	0.000E+00
Unspecified Solids (Dissolved)	9.324E-12	8.752E-12	5.714E-13
Uranium (total)	1.893E-14	1.893E-14	0.000E+00
Emissions to sea water	3.551E-05	2.616E-05	9.346E-06
Analytical measures to sea water	8.944E-08	4.931E-08	4.013E-08
Adsorbable organic halogen compounds (AOX)	4.518E-15	1.981E-15	2.537E-15
Biological oxygen demand (BOD)	4.984E-09	2.185E-09	2.799E-09
Chemical oxygen demand (COD)	7.947E-08	4.494E-08	3.453E-08
Total organic bounded carbon	4.984E-09	2.185E-09	2.799E-09
Heavy metals to sea water	1.783E-08	9.353E-09	8.479E-09
Arsenic (+V)	2.175E-10	1.240E-10	9.349E-11
Cadmium (+II)	1.095E-10	6.219E-11	4.736E-11

Process or Category	Cradle to Gate	Cradle to Gate (RMA)	Gate to Gate (RMT)
Chromium (unspecified)	3.766E-10	2.234E-10	1.531E-10
Cobalt	1.199E-10	1.083E-10	1.166E-11
Copper (+II)	5.859E-10	2.981E-10	2.878E-10
Iron	2.075E-09	1.561E-09	5.141E-10
Lead (+II)	1.487E-10	7.196E-11	7.677E-11
Manganese (+II)	2.134E-10	1.619E-10	5.144E-11
Mercury (+II)	2.547E-12	1.480E-12	1.067E-12
Molybdenum	1.744E-11	1.456E-11	2.883E-12
Nickel (+II)	2.358E-10	1.407E-10	9.507E-11
Silver	1.388E-11	5.332E-12	8.553E-12
Strontium	1.123E-08	4.337E-09	6.897E-09
Tin (+IV)	1.663E-11	6.387E-12	1.024E-11
Titanium	1.694E-12	6.505E-13	1.043E-12
Vanadium (+III)	8.436E-11	7.506E-11	9.303E-12
Zinc (+II)	2.378E-09	2.160E-09	2.176E-10
Inorganic emissions to sea water	3.142E-05	2.435E-05	7.066E-06
Aluminum (+III)	5.453E-11	2.094E-11	3.359E-11
Ammonia	1.621E-09	6.223E-10	9.982E-10
Barium	6.137E-09	4.783E-09	1.354E-09
Beryllium	6.595E-12	6.088E-12	5.072E-13
Boron	8.818E-10	3.386E-10	5.432E-10
Calcium (+II)	9.630E-08	3.698E-08	5.932E-08
Carbonate	3.857E-07	3.005E-07	8.519E-08
Chloride	3.057E-05	2.377E-05	6.796E-06
Magnesium	2.411E-08	9.308E-09	1.481E-08
Nitrate	5.004E-10	3.900E-10	1.104E-10
Sodium (+I)	9.952E-08	4.363E-08	5.589E-08
Sulphate	1.639E-07	1.279E-07	3.599E-08
Sulphide	6.997E-08	5.447E-08	1.550E-08
Sulphur	4.718E-10	1.812E-10	2.906E-10
Organic emissions to sea water	1.865E-08	1.440E-08	4.252E-09
Hydrocarbons to sea water	1.846E-08	1.424E-08	4.226E-09
Acenaphthene	5.589E-12	4.955E-12	6.347E-13
Acenaphthylene	2.137E-12	1.889E-12	2.473E-13
Acetic acid	1.308E-11	1.233E-11	7.475E-13
Anthracene	1.720E-12	1.370E-12	3.504E-13
Aromatic hydrocarbons (unspecified)	4.984E-11	2.185E-11	2.799E-11
Benzene	1.612E-09	1.140E-09	4.712E-10

Process or Category	Cradle to Gate	Cradle to Gate (RMA)	Gate to Gate (RMT)
Benzo{a}anthracene	1.236E-12	1.106E-12	1.297E-13
Benzofluoranthene	1.354E-12	1.223E-12	1.311E-13
Chrysene	6.943E-12	6.237E-12	7.068E-13
Cresol (methyl phenol)	1.222E-11	4.693E-12	7.528E-12
Ethyl benzene	1.608E-10	1.340E-10	2.685E-11
Fluoranthene	1.443E-12	1.291E-12	1.514E-13
Hexane (isomers)	1.334E-12	5.124E-13	8.219E-13
Oil (unspecified)	1.236E-08	9.547E-09	2.810E-09
Phenol (hydroxy benzene)	2.534E-09	2.079E-09	4.546E-10
Toluene (methyl benzene)	9.886E-10	6.785E-10	3.101E-10
Xylene (isomers; dimethyl benzene)	7.141E-10	6.001E-10	1.140E-10
Naphthalene	1.885E-10	1.625E-10	2.598E-11
Particles to sea water	3.966E-06	1.739E-06	2.227E-06
Solids (suspended)	3.966E-06	1.739E-06	2.227E-06
Emissions to agricultural soil	0.000E+00	0.000E+00	0.000E+00
Emissions to industrial soil	6.588E-06	6.555E-06	3.271E-08
Heavy metals to industrial soil	6.465E-06	6.457E-06	8.068E-09
Antimony	7.457E-21	7.457E-21	0.000E+00
Arsenic (+V)	3.561E-09	3.561E-09	1.001E-14
Cadmium (+II)	6.554E-13	5.500E-13	1.054E-13
Chromium (+III)	3.697E-13	3.351E-13	3.461E-14
Chromium (+VI)	2.702E-20	2.702E-20	0.000E+00
Chromium (unspecified)	1.199E-10	9.670E-11	2.319E-11
Cobalt	2.113E-12	1.717E-12	3.961E-13
Copper (+II)	1.563E-12	1.309E-12	2.540E-13
Iron	6.372E-06	6.372E-06	3.222E-11
Lead (+II)	2.546E-08	2.546E-08	5.780E-14
Manganese (+II)	2.686E-11	2.080E-11	6.063E-12
Mercury (+II)	6.587E-11	6.587E-11	7.753E-16
Nickel (+II)	4.128E-11	3.015E-11	1.113E-11
Selenium	4.230E-10	4.230E-10	0.000E+00
Strontium	4.022E-08	3.223E-08	7.992E-09
Thallium	3.079E-09	3.079E-09	0.000E+00
Vanadium (+III)	1.944E-08	1.944E-08	0.000E+00
Zinc (+II)	1.483E-11	1.205E-11	2.778E-12
Inorganic emissions to industrial soil	1.222E-07	9.777E-08	2.442E-08
Aluminum (+III)	1.351E-10	1.085E-10	2.662E-11
Ammonia	6.324E-08	5.079E-08	1.245E-08

Process or Category	Cradle to Gate	Cradle to Gate (RMA)	Gate to Gate (RMT)
Bromide	1.811E-11	1.471E-11	3.395E-12
Calcium (+II)	9.741E-10	3.328E-10	6.413E-10
Chloride	2.118E-08	1.719E-08	3.998E-09
Chlorine	6.304E-18	6.304E-18	0.000E+00
Fluoride	6.036E-10	4.905E-10	1.132E-10
Magnesium (+III)	1.348E-10	4.615E-11	8.865E-11
Phosphorus	6.542E-09	5.242E-09	1.300E-09
Potassium (+I)	1.527E-08	1.235E-08	2.920E-09
Sodium (+I)	8.517E-11	2.908E-11	5.609E-11
Sulphate	2.000E-09	1.597E-09	4.033E-10
Sulphide	1.200E-08	9.583E-09	2.420E-09
Organic emissions to industrial soil	4.456E-10	2.197E-10	2.260E-10
Oil (unspecified)	4.456E-10	2.197E-10	2.260E-10
Radioactive emissions to industrial soil	0.000E+00	0.000E+00	0.000E+00
Calcium Fluoride	4.863E-10	4.863E-10	0.000E+00
Radionuclide	0.000E+00	0.000E+00	0.000E+00

Embedded Unit Processes

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Point of Contact: Timothy Skone (NETL), Timothy.Skone@NETL.DOE.GOV

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