NETL Life Cycle Inventory Data
Process Documentation File

Process Name: Natural Gas, Pipeline, Transport

Reference Flow: 1 kg of Natural Gas

Brief Description: This process includes all inputs for the raw material transportation for 1 kg of natural gas.

Section I: Meta Data

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

Year Data Best Represents: 2005

Process Type: Transport Process (TP)

Process Scope: Gate-to-Gate Process (GG)

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:

Distance	*The distance the natural gas travels*

Tracked Input Flows:

Natural Gas	*The natural gas required to have 1 kg delivered*

Tracked Output Flows:

Natural gas	*Natural gas delivered*

Section II: Process Description

Associated Documentation

This unit process is composed of this document and the data sheet (DS) *DS_RMT_NaturalGas_Pipeline_2011.01.xls*, which provides additional details regarding relevant calculations, data quality, and references.

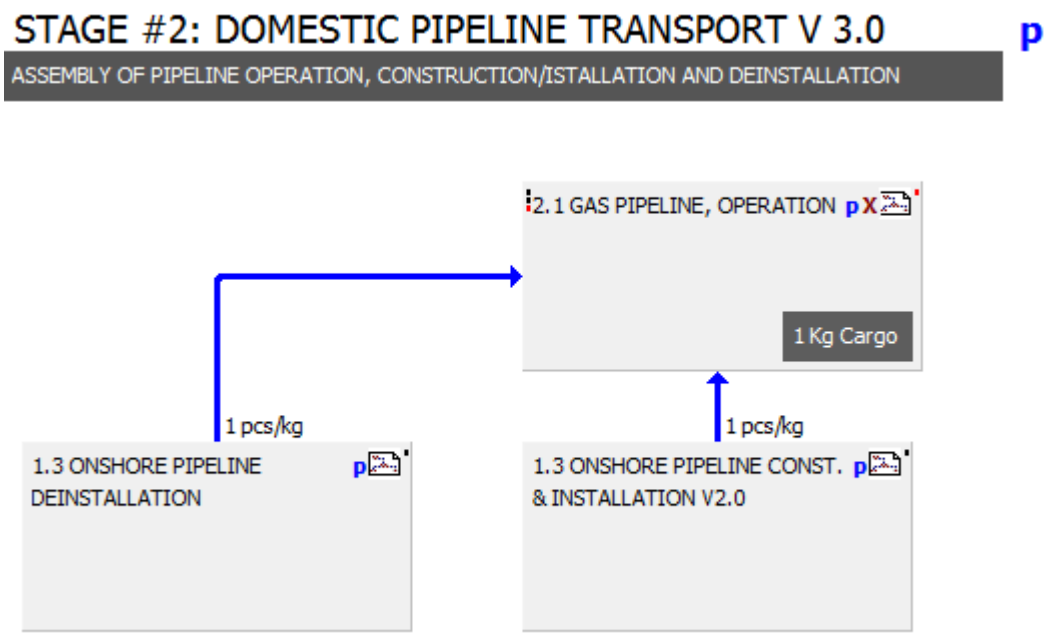
Goal and Scope

The scope of this unit process covers all aspects of raw material transportation (RMT) as seen in **Figure 1**. These processes were developed for the transportation of natural gas through an onshore pipeline. At the end, one kilogram of natural gas is delivered to the life cycle (LC) Stage #3 boundary.

Boundary and Description

This unit process includes the operation of onshore natural gas pipeline. The transport distance is an adjustable parameter for RMT. The plan for RMT is provided in **Figure 1**.

Figure 1: Plan for Pipeline Transportation, Including Operation of Profile



Construction and installation of the pipeline for RMT includes the materials required to construct the following piece of equipment for transport:

- Onshore pipeline

  (DS/DF_Stage1234_I_Onshore_Pipeline_Installation_Deinstallation_2010.01)

The profiles and processes included in RMT are provided in **Table 1**. Those shown in bold face were developed by NETL.

Table 1: Profiles and Processes Included in RMT for Natural Gas Pipeline Transportation

STAGE #2: DOMESTIC PIPELINE TRANSPORT V 3.0
1.3 ONSHORE PIPELINE CONST. & INSTALLATION V2.0
US: 1.3 ONSHORE PIPELINE, CONSTRUCTION & INSTALLATION V 2.0 NETL
US: DIESEL, NATIONAL AVERAGE, 2009 NETL <u-so>
WOR: Steel Pipe, Welded, BF, Manufacture NETL <u-so>
1.3 ONSHORE PIPELINE DEINSTALLATION
US: DIESEL, NATIONAL AVERAGE, 2009 NETL <u-so>
US: ONSHORE PIPELINE DEINSTALLATION V 2.0 NETL
2.1 GAS PIPELINE, OPERATION
US: North American Average Electricity Mix, 2007 080811 NETL
US: Pipeline NG Operation 072611 NETL <u-so>

Parameters and Balances

The parameters for the highest level modeling plan for natural gas pipeline transportation are shown in **Table 2**. These parameters may or may not include the adjustable parameters shown previously depending on how the model was created. **Table 3** presents the input and output balances for resources and emissions of interest for the RMT plan.

Table 2: Adjustable Parameters for RMT of Ocean Freighter Transportation

Plan	Parameter	Value	Comment
LC Stage #2			
Stage #2: Domestic Pipeline Transport	Distance	1450	[km] input pipeline length

Table 3: Inputs and Output Balances for RMT of Natural Gas Pipeline Transportation (kg/kg delivered)

Process or Category	Gate to Gate (RMT)
Inputs	
Flows	2.972E-02
Resources	2.972E-02
Energy resources	4.476E-04
Non renewable energy resources	4.476E-04
Crude oil (resource)	3.442E-05
Hard coal (resource)	3.004E-04
Lignite (resource)	2.253E-07
Natural gas (resource)	1.126E-04
Uranium (resource)	2.890E-11
Renewable energy resources	1.214E-09

Process or Category	Gate to Gate (RMT)
Biomass	9.164E-11
Renewable fuels	2.440E-15
Wood	1.123E-09
Unspecified	0.000E+00
Land use	0.000E+00
Material resources	2.927E-02
Non renewable elements	1.542E-04
Aluminum	6.031E-12
Chromium	4.013E-15
Copper	6.545E-15
Iron	1.534E-04
Lead	2.170E-15
Magnesium	4.525E-18
Mercury	1.303E-15
Nickel	1.698E-17
Phosphorus	4.522E-13
Sulphur	2.592E-12
Zinc	8.537E-07
Non renewable resources	4.556E-05
Barium sulphate	2.606E-19
Basalt	2.939E-09
Bauxite	7.192E-08
Bentonite	8.919E-08
Calcium carbonate (CaCO3)	3.925E-08
Calcium chloride	2.668E-17
Chalk (Calciumcarbonate)	2.158E-41
Chromium ore (39%)	1.522E-09
Clay	1.627E-08
Colemanite ore	2.312E-10
Copper - Gold - Silver - ore (1,0% Cu; 0,4 g/t Au; 66 g/t Ag)	1.996E-08
Copper - Gold - Silver - ore (1,1% Cu; 0,01 g/t Au; 2,86 g/t Ag)	1.216E-08
Copper - Gold - Silver - ore (1,16% Cu; 0,002 g/t Au; 1,06 g/t Ag)	6.863E-09
Copper - Molybdenum - Gold - Silver - ore (1,13% Cu; 0,02% Mo; 0,01 g/t Au; 2,86 g/t Ag)	3.088E-09
Copper ore (0.14%)	4.319E-08
Copper ore (1.2%)	2.070E-09
Copper ore (4%)	2.070E-19
Copper ore (sulphidic, 1.1%)	2.691E-09
Dolomite	8.268E-06
Feldspar (aluminum silicates)	3.189E-13

Process or Category	Gate to Gate (RMT)
Ferro manganese	7.287E-16
Fluorspar (calcium fluoride; fluorite)	5.401E-10
Granite	9.631E-23
Gravel	2.152E-07
Gypsum (natural gypsum)	1.016E-08
Heavy spar (BaSO4)	2.149E-07
Ilmenite (titanium ore)	3.990E-13
Inert rock	1.695E-05
Iron ore (56,86%)	1.190E-07
Iron ore (65%)	5.144E-11
Kaolin ore	4.149E-10
Lead - zinc ore (4.6%-0.6%)	1.853E-08
Limestone (calcium carbonate)	1.764E-05
Magnesit (Magnesium carbonate)	2.616E-13
Magnesium chloride leach (40%)	1.803E-09
Manganese ore	2.973E-10
Manganese ore (R.O.M.)	1.793E-09
Molybdenite (Mo 0,24%)	1.885E-09
Molybdenum ore (0.1%)	2.805E-11
Natural Aggregate	1.399E-06
Nickel ore (1,5%)	4.749E-11
Nickel ore (1.6%)	4.989E-09
Olivine	7.593E-15
Peat	1.986E-10
Phosphate ore	1.326E-13
Phosphorus minerals	1.245E-11
Phosphorus ore (29% P2O5)	3.163E-16
Potassium chloride	5.780E-12
Precious metal ore (R.O.M)	7.629E-11
Quartz sand (silica sand; silicon dioxide)	3.182E-08
Raw pumice	4.023E-11
Rutile (titanium ore)	3.748E-14
sand	1.089E-12
Slate	1.432E-14
Sodium chloride (rock salt)	9.398E-08
Sodium nitrate	1.182E-21
Sodium sulphate	6.657E-14
Soil	2.597E-07
Sulphur (bonded)	4.112E-15

Process or Category	Gate to Gate (RMT)
Talc	7.009E-12
Tin ore	2.260E-20
Titanium ore	8.856E-10
Zinc - copper ore (4.07%-2.59%)	9.835E-09
Zinc - lead - copper ore (12%-3%-2%)	6.207E-09
Zinc - lead ore (4.21%-4.96%)	7.067E-20
Zinc ore (4%)	-1.921E-10
Zinc ore (sulphidic, 4%)	9.408E-19
Renewable resources	2.907E-02
Water	2.896E-02
Water	8.453E-05
Water (ground water)	5.110E-03
Water (lake water)	1.968E-07
Water (municipal)	1.753E-07
Water (sea water)	1.792E-07
Water (surface water)	2.367E-02
Water (well water)	3.245E-09
Water (well-produced water)	8.703E-05
Water (with river silt)	1.418E-19
Air	1.188E-04
Carbon dioxide	2.928E-08
Nitrogen	8.945E-11
Unspecified	1.731E-09
Unspecified minerals	3.937E-10
Unspecified resources	1.337E-09
Output	
Flows	6.928E-02
Resources	2.290E-02
Energy resources	0.000E+00
Land use	0.000E+00
Material resources	2.290E-02
Renewable resources	2.290E-02
Water	2.290E-02
Water (feed water)	3.879E-07
Water (river water)	2.242E-02
Water (wastewater)	8.756E-05
Water (wastewater)	3.862E-04

Process or Category	Gate to Gate (RMT)
Oxygen	1.398E-09
Ecoinvent	4.611E-07
Long-term emission	4.611E-07
Fresh water	4.611E-07
Chloride	4.611E-07
Dissolved organic carbon, DOC (Ecoinvent)	7.150E-14
Emissions to air	4.636E-02
Heavy metals to air	6.834E-09
Antimony	6.489E-14
Arsenic (+V)	2.592E-12
Arsenic trioxide	1.216E-17
Cadmium (+II)	2.954E-11
Chromium (+III)	7.864E-15
Chromium (+VI)	6.293E-17
Chromium (unspecified)	1.745E-10
Cobalt	3.607E-13
Copper (+II)	7.332E-13
Heavy metals to air (unspecified)	9.122E-14
Hydrogen arsenic (arsine)	1.009E-15
Iron	6.829E-13
Lanthanides	2.738E-17
Lead (+II)	1.126E-09
Manganese (+II)	8.097E-13
Mercury (+II)	4.287E-11
Molybdenum	6.441E-14
Nickel (+II)	8.168E-12
Palladium	7.385E-22
Rhodium	7.129E-22
Selenium	1.834E-12
Silver	5.060E-20
Tellurium	1.048E-15
Thallium	6.406E-15
Tin (+IV)	6.766E-13
Titanium	1.738E-15
Vanadium (+III)	7.362E-11
Zinc (+II)	5.371E-09
Inorganic emissions to air	3.847E-02
Ammonia	2.036E-08
Ammonium	7.154E-15

Process or Category	Gate to Gate (RMT)
Ammonium nitrate	2.409E-17
Argon	1.185E-13
Barium	1.365E-10
Beryllium	6.077E-14
Boron compounds (unspecified)	1.296E-11
Bromine	5.391E-12
Carbon dioxide	3.841E-02
Carbon dioxide (biotic)	1.532E-08
Carbon dioxide (biotic)	8.378E-12
Carbon disulphide	8.569E-16
Carbon monoxide	5.035E-06
Carbon monoxide (biotic)	5.106E-14
Chloride (unspecified)	4.302E-12
Chlorine	1.964E-13
Cyanide (unspecified)	3.948E-13
Fluoride	1.109E-11
Fluorides	7.495E-14
Fluorine	5.926E-15
Helium	2.290E-13
Hydrogen	1.579E-11
Hydrogen bromine (hydrobromic acid)	4.227E-15
Hydrogen chloride	2.486E-08
Hydrogen cyanide (prussic acid)	6.485E-15
Hydrogen fluoride	2.379E-11
Hydrogen iodide	2.054E-18
Hydrogen phosphorous	4.610E-16
Hydrogen sulphide	1.212E-08
Lead dioxide	8.777E-14
Nitrogen (atmospheric nitrogen)	9.898E-09
Nitrogen (N-compounds)	2.318E-14
Nitrogen dioxide	1.462E-08
Nitrogen monoxide	7.229E-14
Nitrogen oxides	8.065E-06
Nitrous oxide (laughing gas)	4.392E-08
Oxygen	1.753E-08
Scandium	1.317E-17
Steam	4.773E-05
Strontium	5.196E-16
Sulphur dioxide	3.544E-06

Process or Category	Gate to Gate (RMT)
Sulphur hexafluoride	1.484E-10
sulphur oxide	2.922E-08
Sulphuric acid	7.873E-14
Tin oxide	1.346E-17
Unspecified Particles	3.222E-09
Zinc oxide	2.692E-17
Zinc sulphate	2.535E-14
Organic emissions to air (group VOC)	7.797E-03
Group NMVOC to air	2.303E-07
Group PAH to air	1.370E-11
Anthracene	2.829E-15
Benzo{a}anthracene	1.424E-15
Benzo{a}pyrene	8.659E-12
Benzo{ghi}perylene	1.270E-15
Benzofluoranthene	2.540E-15
Chrysene	3.497E-15
Dibenz(a)anthracene	7.913E-16
Indeno[1,2,3-cd]pyrene	9.448E-16
Naphthalene	2.971E-13
Phenanthrene	9.334E-14
Polycyclic aromatic hydrocarbons (PAH)	4.638E-12
Halogenated organic emissions to air	3.141E-12
Dichloroethane (ethylene dichloride)	3.210E-15
Dichloromethane (methylene chloride)	6.972E-17
Dioxins (unspec.)	-1.340E-15
Halogenated hydrocarbons (unspecified)	6.841E-15
Polychlorinated biphenyls (PCB unspecified)	2.210E-15
Polychlorinated dibenzo-p-dioxins (2,3,7,8 - TCDD)	3.849E-18
R 11 (trichlorofluoromethane)	2.086E-13
R 114 (dichlorotetrafluoroethane)	2.136E-13
R 116 (hexafluoroethane)	2.423E-13
R 12 (dichlorodifluoromethane)	4.484E-14
R 13 (chlorotrifluoromethane)	2.816E-14
R 22 (chlorodifluoromethane)	4.901E-14
Tetrafluoromethane	2.288E-12
Vinyl chloride (VCM; chloroethene)	5.583E-14
Acetaldehyde (Ethanal)	2.646E-11
Acetic acid	1.045E-10
Acetone (dimethylcetone)	2.640E-11

Process or Category	Gate to Gate (RMT)
Acrolein	1.996E-14
Aldehyde (unspecified)	8.792E-14
Alkane (unspecified)	1.319E-10
Alkene (unspecified)	3.300E-11
Aromatic hydrocarbons (unspecified)	1.045E-11
Benzene	1.374E-11
Butadiene	5.510E-15
Butane	1.590E-09
Butane (n-butane)	6.432E-12
Caprolactam	9.019E-16
Cumene (isopropylbenzene)	3.927E-21
Cyclohexane (hexahydro benzene)	1.700E-15
Diethylamine	1.396E-19
Ethane	4.329E-09
Ethanol	5.216E-11
Ethene (ethylene)	4.905E-13
Ethyl benzene	2.789E-11
Fluoranthene	9.214E-15
Fluorene	2.924E-14
Formaldehyde (methanal)	8.931E-11
Heptane (isomers)	5.324E-11
Hexamethylene diamine (HMDA)	3.241E-16
Hexane (isomers)	7.973E-11
Mercaptan (unspecified)	4.996E-13
Methanethiol	8.193E-11
Methanol	5.205E-11
NMVOC (unspecified)	2.150E-07
Octane	2.929E-11
Pentane (n-pentane)	5.643E-10
Phenol (hydroxy benzene)	7.732E-16
Propane	7.812E-09
Propene (propylene)	2.529E-12
Propionic acid (propane acid)	4.950E-16
Styrene	6.692E-18
Toluene (methyl benzene)	1.345E-11
Trimethylbenzene	1.311E-16
Xylene (dimethyl benzene)	1.169E-10
Hydrocarbons (unspecified)	3.093E-10
Methane	7.796E-03

Process or Category	Gate to Gate (RMT)
Methane (biotic)	3.321E-12
Organic chlorine compounds	7.989E-15
Unspecified Organic Compounds	2.240E-15
VOC (unspecified)	5.121E-07
Other emissions to air	9.672E-05
Aldehydes, unspecified	1.120E-15
Exhaust	9.483E-05
Particulate Matter, unspecified	1.231E-06
Sand (Silica) (SiO2)	2.135E-11
Used air	6.524E-07
Particles to air	4.622E-07
Dust (PM10)	4.254E-09
Dust (PM2,5 - PM10)	5.923E-14
Dust (PM2.5)	1.850E-09
Dust (Portland cement kiln)	2.059E-09
Dust (unspecified)	4.541E-07
Metals (unspecified)	7.456E-14
Unspecified Organic Chlorine Compounds	1.478E-14
Wood (dust)	4.967E-15
Radioactive emissions to air	2.767E-13
Uranium (total)	2.767E-13
Unspecified Heavy Metals	1.154E-18
Emissions to fresh water	7.217E-06
Analytical measures to fresh water	3.313E-06
Adsorbable organic halogen compounds (AOX)	1.261E-11
Biological oxygen demand (BOD)	1.034E-08
Chemical oxygen demand (COD)	1.089E-07
Nitrogenous Matter (unspecified, as N)	4.742E-09
Solids (dissolved)	2.606E-06
Total dissolved organic bounded carbon	6.227E-09
Total Dissolved Solids	5.771E-07
Total organic bounded carbon	2.187E-10
Heavy metals to fresh water	3.740E-07
Aluminium	2.143E-08
Antimony	1.898E-10
Arsenic (+V)	1.681E-09
Cadmium (+II)	7.136E-11
Chromium (+III)	1.375E-12
Chromium (+VI)	1.134E-14

Process or Category	Gate to Gate (RMT)
Chromium (unspecified)	1.835E-09
Cobalt	2.520E-14
Copper (+II)	2.158E-09
Heavy metals to water (unspecified)	3.582E-11
Iron	8.716E-08
Lead (+II)	2.187E-09
Manganese (+II)	1.615E-09
Mercury (+II)	1.038E-11
Molybdenum	8.919E-13
Nickel (+II)	6.576E-08
Selenium	3.622E-12
Silver	1.854E-10
Strontium	8.165E-11
Thallium	4.284E-16
Tin (+IV)	8.963E-14
Titanium	9.438E-14
Unspecified Substance	9.982E-15
Uranium	1.481E-07
Vanadium (+III)	4.347E-13
Zinc (+II)	4.149E-08
Inorganic emissions to fresh water	2.817E-06
Acid (calculated as H+)	2.591E-11
Aluminum (+III)	3.607E-10
Ammonia	2.512E-09
Ammonia, as N	2.714E-14
Ammonium (total N)	2.319E-07
Ammonium / ammonia	1.152E-07
Barium	2.420E-08
Beryllium	7.424E-16
Boron	7.145E-11
Bromate	9.248E-17
Bromine	1.516E-15
Calcium (+II)	2.709E-08
Carbonate	1.718E-07
Chlorate	7.734E-14
Chloride	2.981E-07
Chlorine (dissolved)	2.606E-09
Copper ion (+II/+III)	1.261E-15
Cyanide	1.724E-09

Process or Category	Gate to Gate (RMT)
Fluoride	1.007E-08
Fluorine	4.719E-13
Hydrogen chloride	1.031E-14
Hydrogen fluoride (hydrofluoric acid)	2.057E-15
Hydrogen Ions (H+)	2.228E-12
Hydroxide	4.322E-11
Inorganic salts and acids (unspecified)	1.483E-22
Iron ion (+II/+III)	1.641E-13
Magnesium (+III)	3.149E-09
Magnesium chloride	2.009E-16
Metal ions (unspecific)	8.553E-13
Neutral salts	3.254E-16
Nickel ion (+III)	7.319E-15
Nitrate	8.160E-10
Nitrate (as total N)	3.579E-14
Nitrogen	3.564E-09
Nitrogen (as total N)	4.560E-10
Nitrogen organic bounded	3.917E-11
Phosphate	4.472E-12
Phosphorus	2.076E-08
Potassium	9.547E-13
Silicate particles	2.782E-11
Sodium (+I)	9.101E-08
Sodium chloride (rock salt)	4.806E-07
Sodium hypochlorite	4.255E-15
Sulfates	3.606E-08
Sulphate	1.295E-06
Sulphide	1.593E-10
Sulphite	6.670E-12
Sulphur	2.533E-12
Sulphuric acid	1.329E-12
Unspecified Iron Oxides	2.556E-14
Unspecified Oil	9.056E-14
Unspecified Organic Chlorine compounds	2.052E-16
Unspecified Salt	8.211E-13
Unspecified Solids (Suspended)	3.188E-12
Organic emissions to fresh water	1.747E-07
Halogenated organic emissions to fresh water	2.120E-14
1,2-Dibromoethane	3.994E-19

Process or Category	Gate to Gate (RMT)
Chlorinated hydrocarbons (unspecified)	1.242E-14
Chloromethane (methyl chloride)	7.892E-15
Dichloroethane (ethylene dichloride)	1.344E-16
Dichloropropane	2.602E-19
Polychlorinated dibenzo-p-dioxins (2,3,7,8 - TCDD)	4.376E-19
Vinyl chloride (VCM; chloroethene)	7.453E-16
Hydrocarbons to fresh water	1.744E-07
Acenaphthene	2.784E-15
Acenaphthylene	1.151E-15
Acetic acid	1.561E-13
Acrylonitrile	1.903E-14
Anthracene	3.688E-15
Aromatic hydrocarbons (unspecified)	2.140E-12
Benzene	5.406E-12
Benzo{a}anthracene	4.223E-16
Benzofluoranthene	2.603E-16
Chrysene	1.968E-15
Cresol (methyl phenol)	6.562E-14
Ethyl benzene	2.641E-13
Fluoranthene	4.869E-16
Hexane (isomers)	7.173E-15
Hydrocarbons (unspecified)	6.285E-10
Methanol	1.401E-10
Oil (unspecified)	1.736E-07
Phenol (hydroxy benzene)	4.727E-12
Polycyclic aromatic hydrocarbons (PAH, unspec.)	4.220E-11
Toluene (methyl benzene)	3.535E-12
Xylene (isomers; dimethyl benzene)	1.297E-12
Carbon, organically bound	2.695E-10
Naphthalene	1.729E-13
N-unspecified (N)	7.087E-14
Organic chlorine compounds (unspecified)	1.087E-15
Organic compounds (dissolved)	2.023E-13
Organic compounds (unspecified)	1.421E-13
Unspecified wastewater	5.359E-11
Other emissions to fresh water	0.000E+00
Particles to fresh water	5.380E-07
Metals (unspecified)	4.066E-13
Silicon dioxide (silica)	3.879E-13

Process or Category	Gate to Gate (RMT)
Soil loss by erosion into water	3.615E-14
Solids (suspended)	5.379E-07
Suspended solids, unspecified	6.790E-12
Unspecified Oxides	2.125E-14
Radioactive emissions to fresh water	0.000E+00
Bromide	0.000E+00
Radionuclide	0.000E+00
Sulfite	0.000E+00
Unspecified Solids (Dissolved)	6.144E-12
Uranium (total)	1.376E-14
Emissions to sea water	2.896E-07
Analytical measures to sea water	1.229E-09
Adsorbable organic halogen compounds (AOX)	7.747E-17
Biological oxygen demand (BOD)	8.545E-11
Chemical oxygen demand (COD)	1.058E-09
Total organic bounded carbon	8.545E-11
Heavy metals to sea water	2.667E-10
Arsenic (+V)	3.012E-12
Cadmium (+II)	1.572E-12
Chromium (unspecified)	4.743E-12
Cobalt	3.411E-13
Copper (+II)	9.013E-12
Iron	1.543E-11
Lead (+II)	2.384E-12
Manganese (+II)	1.543E-12
Mercury (+II)	3.283E-14
Molybdenum	9.364E-12
Nickel (+II)	2.982E-12
Silver	2.593E-13
Strontium	2.091E-10
Tin (+IV)	3.106E-13
Titanium	3.164E-14
Vanadium (+III)	2.735E-13
Zinc (+II)	6.353E-12
Inorganic emissions to sea water	2.200E-07
Aluminum (+III)	1.018E-12
Ammonia	3.026E-11
Barium	4.219E-11
Beryllium	1.466E-14

Process or Category	Gate to Gate (RMT)
Boron	1.647E-11
Calcium (+II)	1.799E-09
Carbonate	2.654E-09
Chloride	2.117E-07
Magnesium	4.490E-10
Nitrate	3.440E-12
Sodium (+I)	1.707E-09
Sulphate	1.120E-09
Sulphide	4.832E-10
Sulphur	8.812E-12
Organic emissions to sea water	1.326E-10
Hydrocarbons to sea water	1.318E-10
Acenaphthene	1.900E-14
Acenaphthylene	7.423E-15
Acetic acid	6.911E-15
Anthracene	1.095E-14
Aromatic hydrocarbons (unspecified)	8.545E-13
Benzene	1.466E-11
Benzo{a}anthracene	3.854E-15
Benzofluoranthene	3.858E-15
Chrysene	2.093E-14
Cresol (methyl phenol)	2.282E-13
Ethyl benzene	7.862E-13
Fluoranthene	4.484E-15
Hexane (isomers)	2.492E-14
Oil (unspecified)	8.798E-11
Phenol (hydroxy benzene)	1.424E-11
Toluene (methyl benzene)	9.643E-12
Xylene (isomers; dimethyl benzene)	3.315E-12
Naphthalene	8.048E-13
Particles to sea water	6.801E-08
Solids (suspended)	6.801E-08
Emissions to industrial soil	4.671E-06
Heavy metals to industrial soil	4.669E-06
Antimony	5.419E-21
Arsenic (+V)	2.588E-09
Cadmium (+II)	5.627E-15
Chromium (+III)	1.138E-15
Chromium (+VI)	1.964E-20

Process or Category	Gate to Gate (RMT)
Chromium (unspecified)	8.621E-13
Cobalt	1.096E-14
Copper (+II)	7.535E-15
Iron	4.631E-06
Lead (+II)	1.851E-08
Manganese (+II)	4.842E-13
Mercury (+II)	4.787E-11
Nickel (+II)	1.388E-12
Selenium	3.074E-10
Strontium	2.279E-10
Thallium	2.238E-09
Vanadium (+III)	1.413E-08
Zinc (+II)	1.326E-13
Inorganic emissions to industrial soil	9.580E-10
Aluminum (+III)	1.258E-12
Ammonia	3.571E-10
Bromide	9.391E-14
Calcium (+II)	1.590E-10
Chloride	1.188E-10
Chlorine	4.582E-18
Fluoride	3.131E-12
Magnesium (+III)	2.198E-11
Phosphorus	3.715E-11
Potassium (+I)	1.210E-10
Sodium (+I)	1.391E-11
Sulphate	1.779E-11
Sulphide	1.068E-10
Organic emissions to industrial soil	1.480E-12
Oil (unspecified)	1.480E-12
Radioactive emissions to industrial soil	0.000E+00
Calcium Fluoride	3.534E-10
Radionuclide	0.000E+00

Embedded Unit Processes

NETL (2010). *NETL Life Cycle Inventory Data – Unit Process: Onshore Pipeline Installation and Deinstallation.* U.S. Department of Energy, National Energy Technology Laboratory. Last Updated: January 2010 (version 01). www.netl.doe.gov/energy-analyses (http://www.netl.doe.gov/energy-analyses)

References

None.

Section III: Document Control Information

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