NETL Life Cycle Inventory Data
Process Documentation File

Process Name: Open Pit Uranium Mine, Construction

Reference Flow: 1 piece of Underground Uranium Mine / kg U3O8

Brief Description: This process encompasses the materials required for the construction of a representative open pit uranium mine.

Section I: Meta Data

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

Year Data Best Represents: 1983

Process Type: Installation Process (IP)

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:

Tracked Input Flows:

Cast iron [Metals]	*Amount of cast iron required for construction of an open pit uranium mine*
Concrete, ready mix, R-5-0 [Concrete_Cement]	*Amount of ready mix concrete required for construction of an open pit uranium mine*
Copper [Non renewable elements]	*Amount of copper required for the construction of an open pit uranium mine*

Aluminum [Metals]	*Amount of aluminum required for the construction of an open pit uranium mine*
Steel cold rolled (St) [Metals]	*Amount of steel required for the construction of an open pit uranium mine*
Polyvinylchloride-tube (PVC) [Plastic parts]	*Amount of PVC required for the construction of an open pit uranium mine*
Rebar Wire Rod [Metals]	*Amount of rebar required for the construction of an open pit uranium mine*
Styrene-butadiene-rubber (SBR) [Plastics]	*Amount of rubber required for the construction of an open pit uranium mine*

Tracked Output Flows:

Open Pit Mine Construction [Construction]	*Construction of an open pit uranium mine*

Section II: Process Description

Associated Documentation

This unit process is composed of this document and the data sheet (DS) *DS_Stage1_C_Open_Pit_Uranium_Mine_2010.01.xls*, which provides additional details regarding relevant calculations, data quality, and references.

Goal and Scope

The scope of this unit process encompasses the materials necessary to construct an open pit uranium mine. The process is based on the reference flow of 1 piece of open pit uranium mine construction per kg of U_3O_8 as described below and shown in **Figure 1**. The open pit uranium mine is assumed to be constructed of aluminum, cast iron, concrete, copper, PVC, rebar, cold rolled steel, and styrene-butadiene-rubber. All other materials as considered negligible.

Boundary and Description

Construction of the open pit uranium mine is based on material list provided in the “Energy Technology Characterizations Handbook.” Installation of the mine is not included in this unit process.

Figure 1 provides an overview of the boundary of this unit process. The emissions produced while physically assembling the components (e.g., any dust particles which are released during the mixing of cement) for the open pit uranium mine are not included. The upstream emission from the production of the raw materials used for the construction of the open pit uranium mine (e.g., steel and concrete) are calculated outside the boundary of this unit process, based on proprietary profiles available within the GaBi model.

The weights for a selection of materials were available. The materials include: concrete, copper, aluminum, cast iron, and steel. While it is known that other materials would likely be used in construction of an open pit uranium mine, the completeness of thie data is considered sufficient for the low significance of this process in the lifecycle emissions of nuclear power (determined by life cycle screening of relative greenhouse gas emissions for all unit processes).

Table 1 provides a summary of modeled input and output flows per kg yellowcake output from the mine. Additional detail regarding input and output flows, including calculation methods, is contained in the associated DS sheet.

Figure 1. Unit Process Scope and Boundary

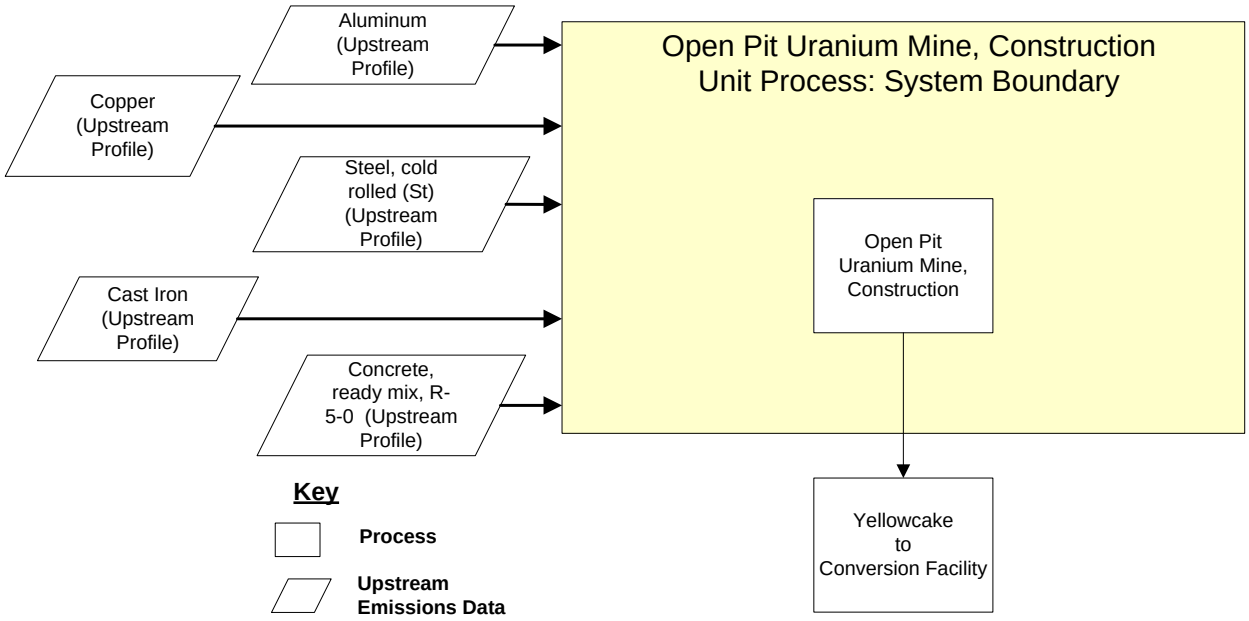

Table 1: Unit Process Input and Output Flows

Flow Name	Value	Units (Per Reference Flow)
Inputs		
Aluminum [Metals]	1.04E-03	kg/kg yellowcake
Cast iron [Metals]	7.34E-03	kg/kg yellowcake
Concrete, ready mix, R-5-0 [Concrete_Cement]	7.81E-04	kg/kg yellowcake
Copper [Non renewable elements]	2.19E-03	kg/kg yellowcake
Steel cold rolled (St) [Metals]	1.76E-01	kg/kg yellowcake
Outputs		
Open Pit Mine Construction [Construction]	1	piece/kg yellowcake

* **Bold face** clarifies that the value shown *does not* include upstream environmental flows. Upstream environmental flows were added during the modeling process using GaBi modeling software, as shown in Figure 1.

Embedded Unit Processes

None.

References

ETCH 1983 The Aerospace Corporation and Mueller Associates, Inc. 1983. *Energy Technology Characterizations Handbook*. Department of Energy. Washington, D.C.

Section III: Document Control Information

Date Created: November 8, 2010

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

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