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# Environmental Product Declaration



*CR Minerals*

## **Tephra OG**



ASTM INTERNATIONAL

According to  
ISO 21930  
ISO 14025

## 1. General Information

<b>Manufacturer Name:</b>	CR Minerals – 3345 Lime Rd. Pueblo, CO 81004
<b>Program Operator:</b>	ASTM International 100 Barr Harbor Drive West Conshohocken, PA 19428-2959, USA
<b>Declaration Number:</b>	EPD 465
<b>Reference PCR:</b>	ISO 21930: 2017
<b>Date of Issuance:</b>	May 26, 2023
<b>End of Validity:</b>	May 26, 2028
<b>Product Name:</b>	Tephra OG
<b>EPD Owner:</b>	CR Minerals
<b>Declared Unit:</b>	1 metric ton of Tephra OG
<b>EPD Scope:</b>	Cradle-to-gate (A1, A2, and A3)
<b>Verification:</b>	ISO 21930 serves as the core PCR. Independent verification of the declaration according to ISO 14025 and ISO 21930. <input type="checkbox"/> internal <input checked="" type="checkbox"/> external
<b>LCA Reviewer and EPD Verifier:</b>	Timothy S. Brooke ASTM International 

## 2. Product

### 2.1 Product and Company Description

CR Mineral is a producer of unique remediated fly ash Tephra OG in Pueblo CO. This specially formulated blend of fly ash and natural pozzolan is a very reactive and cost-effective pozzolan. This product is engineered to serve the oil and gas industries. It can be used in typical down-hole cement systems to enhance the early compressive strength of cement slurries. It will also reduce the permeability of the cement barrier thus ensuring a lasting seal between the annulus of the well bore and casing string.

## 3. LCA Calculation Rules

### 3.1 Declared Unit

The declared unit is 1 metric ton of Tephra OG produced at CR Minerals's manufacturing facility.

### 3.2 System Boundary

The system boundary for this study is limited to a cradle-to-gate focus. (see also Table 4):

- A1 Raw material supply:** Extraction, handling, and processing of input materials.
- A2 Transportation:** Transportation of all input materials from the suppliers to the gate of the manufacturing facility.
- A3 Manufacturing:** The preparation processes of CR Minerals' manufacturing facility. This phase also includes the operations of the manufacturing facility and all process emissions that occur at the production facility.

### 3.3 Estimates and Assumptions

All significant foreground data was gathered from the manufacturer based on measured values.

### 3.4 Cut-off Criteria

The cut-off criteria for all activity stage flows considered within the system boundary conform with ISO 21930: 2017 Section 7.1.8. Specifically, the cut-off criteria were applied as follows:

- All inputs and outputs for which data are available are included in the calculated effects and no collected core process data are excluded.
- A one percent cut-off is considered for renewable and non-renewable primary energy consumption and the total mass of inputs within a unit process. The sum of the total neglected flows does not exceed 5% of all energy consumption and mass of inputs.
- All flows known to contribute a significant impact or to uncertainty are included.
- The cut-off rules are not applied to hazardous and toxic material flows – all of which are included in the life cycle inventory.

No material or energy input or output was knowingly excluded from the system boundary.

### 3.5 Background Data and 3.6 Data Quality

Data was gathered for the primary material and energy inputs used in production for calendar year 2021. Table 1 describes each LCI data source for raw materials (A1), transportation (A2) and the core manufacture process (A3). Table 3 also includes a data quality assessment for on the basis of the technological, temporal, and geographical representativeness.

**Table 1: Secondary Data Sources and Data Quality Assessment**

#### A1: Raw Material Inputs

Inputs	LCI Data Source	Geography	Year	Data Quality Assessment
Natural Pozzolan	Primary Data: CR Minerals EPD for Tephra NP-Pueblo Pozzolan	US	2021	<b>Technology:</b> very good <b>Time:</b> very good <b>Geography:</b> very good
Fly Ash	No Burden	Global	2021	<b>Technology:</b> very good <b>Time:</b> very good Data is <5 years old <b>Geography:</b> very good

#### A2: Transportation

Inputs	LCI Data Source	Geography	Year	Data Quality Assessment
Trucking	USLCI: Transport, single unit truck, short-haul, diesel powered, Northwest/tkm/RNA	North America	2014	<b>Technology:</b> very good <b>Time:</b> good Data is <10 years old <b>Geography:</b> good

#### A3: Manufacturing

Energy	LCI Data Source	Geography	Year	Data Quality Assessment
Electricity	ecoinvent 3.7: Electricity, medium voltage, at grid, [WECC]	US	2018	<b>Technology:</b> very good <b>Time:</b> good Data is <5 years old <b>Geography:</b> very good

<b>Natural Gas</b>	USLCI: Natural gas, combusted in industrial boiler/US	US	2014	<b>Technology:</b> very good <b>Time:</b> good Data is <10 years old <b>Geography:</b> very good.
<b>Diesel (Fuel)</b>	USLCI: Diesel, combusted in industrial equipment/US	US	2014	<b>Technology:</b> very good <b>Time:</b> good Data is <10 years old <b>Geography:</b> very good.
<b>Oil</b>	USLCI: Residual fuel oil, combusted in industrial boiler/US	US	2014	<b>Technology:</b> very good <b>Time:</b> good Data is <10 years old <b>Geography:</b> very good.
<b>Freshwater Consumed</b>	Ecoinvent 3.7: Tap water {RoW}   market for   Cut-off	Global	2014	<b>Technology:</b> very good <b>Time:</b> good Data is <10 years old <b>Geography:</b> good

### 3.7 Period under Review

Data was gathered for the primary material and energy inputs used in the production for calendar year 2022.

### 3.8 Allocation

At CR Minerals several different products are produced. Since the primary data for manufacturing was only available on a facility level, the environmental load among the products produced is allocated according to its mass. For waste that is recycled, the 'recycled content approach' was chosen. The recycling of waste generated by the product system is cut off.

### 3.9 Comparability

This LCA was created using industry average data for upstream materials. Data variation can result from differences in supplier locations, manufacturing processes, manufacturing efficiency and fuel types used.

## 4. LCA Results

Life cycle impact assessment (LCIA) is the phase in which the set of results of the inventory analysis – the inventory flow table – is further processed and interpreted in terms of environmental impacts and resource use inventory metrics. Table 2 and 3 below summarize the LCA results for the cradle-to-gate (A1-A3) product system.

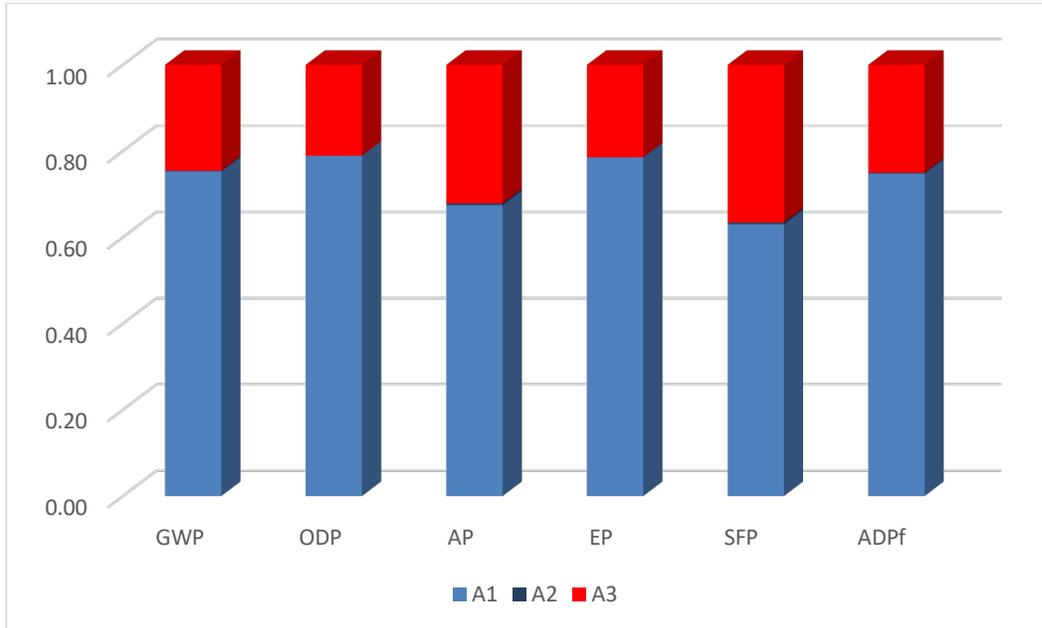
**Table 2: Description of the System Boundary (x: included in LCA; mnd: module not declared; mnr: module not reported)**

Product			Construction Installation		Use							End-of-life				Benefits Beyond the System Boundary		
Raw Material supply	Transport	Manufacturing	Transport	Construction / Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational Energy Use	Operational Water Use	De-Construction/ Demolition	Transport	Waste processing	Disposal	Reuse	Recovery	Recycling
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D	D	D
x	x	x	mnd	mnd	mnd	mnd	mnr	mnr	mnr	mnd	mnd	mnd	mnd	mnd	mnd	mnd	mnd	mnd

<b>Table 3. LCIA Results for 1 metric ton Tephra OG</b>						
<b>Environmental Indicator</b>	<b>Abbreviation</b>	<b>Units</b>	<b>Total</b>	<b>A1</b>	<b>A2</b>	<b>A3</b>
<b>Core Mandatory Impact Indicator</b>						
Global warming potential	<b>GWP</b>	kg CO <sub>2</sub> -eq	3.42E+01	2.57E+01	5.70E-02	8.38E+00
Depletion potential of the stratospheric	<b>ODP</b>	kg CFC-11-	2.10E-06	1.66E-06	2.38E-12	4.43E-07
Acidification potential of land and water	<b>AP</b>	kg SO <sub>2</sub> -eq	1.57E-01	1.06E-01	5.99E-04	5.03E-02
Eutrophication potential	<b>EP</b>	kg N-eq	2.22E-01	1.74E-01	3.55E-05	4.75E-02
Formation of tropospheric ozone	<b>SFP</b>	Kg O <sub>3</sub> -eq	3.67E+00	2.31E+00	1.50E-02	1.34E+00
Abiotic depletion potential for fossil	<b>ADPF</b>	MJ Surplus	4.15E+02	3.10E+02	8.08E-01	1.04E+02
Fossil Fuel Depletion	<b>FFD</b>	MJ Surplus	3.91E+01	2.83E+01	0.00E+00	1.08E+01
<b>Use of Primary Resources</b>						
Renewable primary energy carrier used as energy	<b>RPRE</b>	MJ	8.83E+01	6.98E+01	0.00E+00	1.85E+01
Renewable primary energy carrier used as material	<b>RPRM</b>	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-renewable primary energy used as energy	<b>NRPRE</b>	MJ	5.16E+02	3.90E+02	8.56E-01	1.26E+02
Non-renewable primary energy used as material	<b>NRPRM</b>	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00
<b>Secondary Material, Secondary Fuel and Recovered Energy</b>						
Use of secondary materials	<b>SM</b>	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of renewable secondary fuels	<b>RSF</b>	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of non-renewable secondary fuels	<b>NRSF</b>	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Recovered energy	<b>RE</b>	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00
<b>Mandatory Inventory Parameters</b>						
Use of freshwater resources	<b>FW</b>	m <sup>3</sup>	1.43E-01	9.61E-02	0.00E+00	4.71E-02
<b>Indicators Describing Waste</b>						
Disposed of hazardous waste	<b>HWD</b>	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Disposed of non-hazardous waste	<b>NHWD</b>	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Disposed of high-level radioactive waste	<b>HLRW</b>	m <sup>3</sup>	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Disposed of low-level radioactive waste	<b>LLRW</b>	m <sup>3</sup>	3.39E-08	2.68E-08	0.00E+00	7.10E-09
Components for reuse	<b>CRU</b>	kg	3.18E-07	2.51E-07	0.00E+00	6.67E-08
Materials for recycling	<b>MFR</b>	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for energy recovery	<b>MER</b>	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Recovered energy exported	<b>EE</b>	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00

## 5. Interpretation

Figure 1 shows the relative contribution to the cumulative impacts of the A1 through A3 phases of the cradle-to-gate life cycle. For all impact categories the biggest contribution comes from the A1 raw material phase.



**Figure 1.** Contribution analysis for Tephra OG

## 6. References

1. ASTM 2020 - ASTM Program Operator for Product Category Rules (PCR) and Environmental Product Declarations (EPDs) General Program Instructions v8, April 29<sup>th</sup>.
2. Athena Institute: 2021 - A Cradle-to-Gate Life Cycle Assessment of Tephra RFA-Pueblo Pozzolan, Tephra NP-Pueblo Pozzolan, and Tephra OG Manufactured by CR Minerals.
3. ISO 21930: 2017 Building construction – Sustainability in building construction – Environmental declaration of building products.
4. ISO 14025: 2006 Environmental labeling and declarations - Type III environmental declarations - Principles and procedures.
5. ISO 14044:2006/AMD 1:2017/ AMD 2:2020 - Environmental management - Life cycle assessment - Requirements and guidelines.
6. 14040:2006/AMD 1:2020 - Environmental management - Life cycle assessment - Principles and framework.