# ZTL ORGANICS

Verification of the avoided greenhouse gas emissions due to composting activities at ZTL Organics between April 2022 and March 2025 as required by the Credible Carbon® standard.

Authors: Matthew Burke and Bianca van Zyl

The Green House
Ubunye House
70 Rosmead Avenue
Kenilworth
7708
t: + 27 (0) 21 671 2161
f: + 27 (0) 86 638 3692
e: matt@tgh.co.za

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## Disclaimer

# EXECUTIVE SUMMARY

On behalf of the Credible Carbon standard, The Green House conducted an independent verification of the avoided greenhouse gas (GHG) emissions due to the composting activities at ZTL Organics.

**Reporting period:** 1 April 2022 until 31 March 2025

**Methodology:** GHG emissions avoided were estimated drawing from the assumptions in the **CDM's *AMS-III.F: Avoidance of methane emissions through composting* methodology**, while also taking in consideration the update recommendations from Verra on this methodology (*Clarifications to AMS-III.F: Avoidance of methane emissions through composting, 2025*).
Emissions savings were therefore calculated in drawing from CDM's *TOOL04, AMS-III.H and TOOL13* utilising the IPCC 2019 Refinements methodologies.
**Emission reductions achieved:** 5,496 tonnes $CO_2e$ (1 April 2022 until 31 March 2025)

| | Units | Value |
|---|---|---|
| **Baseline emissions (BE)** | **tonnes $CO_2e$** | **5,879** |
| Baseline solid waste emissions ($BE_{CH4,SWDS}$) | tonnes $CO_2e$ | 5,827 |
| Baseline wastewater emissions ($BE_{WW}$) | tonnes $CO_2e$ | 52 |
| **Project emissions (PE)** | **tonnes $CO_2e$** | **383** |
| Fossil fuel project emissions ($PE_{FC}$) | tonnes $CO_2e$ | 31.3 |
| Composting methane project emissions ($PE_{CH4}$) | tonnes $CO_2e$ | 180.8 |
| Composting nitrous oxide project emissions ($PE_{N2O}$) | tonnes $CO_2e$ | 171.1 |
| Emission reductions (ER) | tonnes $CO_2e$ | 5,496 |

**Approval under the Credible Carbon standard requires projects to be verified against the standards "four big questions":**

**Is the project real?**

The project is real and operational.

**Is the described technology in place and functioning in accordance with its design specification?**

The Green House witnessed that organic waste is collected and delivered to the Philippi site. Here it is sorted and composted, using their on-site front-end loader, to produce usable compost. The application of F.O.G trap waste to compost wells in the open windrows was also witnessed. The final product, post sieving was also witnessed, ready for sale to customers. These operations divert waste that would otherwise have ended up in landfill sites or, in the case of F.O.G trap waste, in wastewater treatment plants.

**Are the estimates of greenhouse gas emissions reduction reasonable in terms of accepted international standards and unbiased towards buyer or seller?**

The estimates presented in this report are based on a life cycle view consistent with the appropriate CDM standards and thus are a reasonable representation of the emissions avoided due to ZTL Organics operations. The estimates are conservative with respect to the avoided emissions achieved by the project.

### Is there a discernible impact on poverty?

The project provides numerous jobs and is an accessible income opportunity in an impoverished area. It therefore makes a discernible impact on poverty. The intention is also to distribute 50% of generated carbon credit revenue to ZTL Organics employees to helped with their family finances; this commitment will be verified in subsequent audit processes.

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# 1 INTRODUCTION

Zero to Landfill Organics (ZTL Organics) is a small privately run waste management business located in the Philippi Economic Development Initiative (off Stock Road, Philippi East), which specialises in organic waste composting. The business was started in 2009 by Melanie Ludwig and Llew Jones, with the focus on reducing the amount of organic waste sent to the City of Cape Town's landfill by recovering value through composting. Composting has multiple benefits, including reducing the volume of waste sent to landfill (i.e. landfill space saving), reducing landfill gas (methane) emissions and recovering valuable nutrients from the waste stream. In recent years, the project has also collected fat, oil and grease (F.O.G.) trap waste from restaurants and other commercial entities, preventing these materials from being disposed of in the City of Cape Town's over-loaded wastewater treatment plants (WWTPs).

Organic waste is currently collected from 27 waste generators throughout Cape Town. This waste is mixed with organic waste from six (6) waste management companies who deliver directly to the ZTL Organics' site. This organic waste includes food, garden and paper waste, as well as animal mortalities and F.O.G. trap waste. The Philippi site contains a large concreted area which allows for solid waste to be sorted (e.g. removal of plastic items) and then pushed into open windrows using ZTL's front-end loader. Wells are made in these open windrows to allow for liquid F.O.G. trap waste to be applied, in a process that ZTL Organics has refined over the years. These windrows are turned at regular times, using the front-end loader, to ensure effective thermophilic composting of the waste. Once the composting process is complete, compost is size graded onsite and prepared for sale to landscapers, farmers or community organisations participating in urban agriculture. All composting is undertaken on the concrete slap, with run-off collected in the onsite collection dam, ensuring no harmful impacts on the natural environment.

ZTL Organics currently has seven (7) employees who collect, process and sell the organic waste. Income is generated through both the collection and drop-off fees charged to clients, as well as downstream sale of compost but as with all waste handling enterprises prices are variable and the financial viability of the enterprise is precarious; while ZTL Organics exercises tight costs controls and has demonstrated resilience other enterprises in this sector have had to discontinue their operations.

The avoided GHG emissions have allowed the project to be registered under the Credible Carbon voluntary-market carbon standard. The project now seeks to issue credits into the Credible Carbon registry, which trades carbon credits from third-party verified African carbon projects that make a direct impact on poverty.

This report documents the verification process, conducted by The Green House, to confirm the avoided emissions and the eligibility of the project in terms of the Credible Carbon registration requirements. These requirements include answering the following "four big questions":

- Is the project real?
- Is the described technology in place and functioning in accordance with its design specification?
- Are the estimates of greenhouse gas emission reductions reasonable in terms of accepted international standards and unbiased towards buyer or seller?
- Is there a discernible impact on poverty?

The report covers the period from 1 April 2022 until 31 March 2025 for ZTL Organics. The methodology for the independent assessment is described in Section 2, followed by the assessment findings in Section 3.

# 2 VERIFICATION METHODOLOGY

Verification of ZTL Organics ongoing activities and avoided GHG emissions through composting activities was undertaken through a site visit, data collection from available records, confirmation of the data collection with physical records and calculations based on the data. These steps are described below.

## 2.1 Site visit

The Green House conducted a site visit on 31 October 2025 to meet Melanie Ludwig and witness the ZTL Organics team undertaking its daily work. The site, current operations and company assets were inspected, and hard copy data records were obtained.

## 2.2 Data collection and confirmation

The key data required to assess emission savings is the tonnage of organic waste collected and composted, disaggregated by material type. In order to determine project emissions (i.e. emissions from operations), data on fuel consumption for operations is also required.

The amount of waste collected and/or delivered to site is captured on invoice slips. These slips were used as the primary data source for the verification. The slips included the following data:

| Waste type | Data on slip |
|---|---|
| Food waste | Mass of food waste collected |
| Garden waste | Volume of garden waste collected, this is converted to mass using an average density of 300 kg/m3 for garden waste as supplied by ZTL |
| Animal mortality waste | Mass of animals collected |
| F.O.G. trap waste | Volume of liquid collected |

Melanie had already collected and collated this data prior to the site visit. However, the slips were utilised to confirm this collated data and ensure they accurately reflected actual operations.

For ZTL Organics' collection vehicles and front-end loader, fuel was directly purchased by ZTL organics. The original paper versions of all fuel purchases from 1 April 2022 until 31 March 2025 were used as the primary data source for the verification. process

Prior to ZTL Organics owning their own front-end loader, they rented a loader from a farmer. For this period fuel purchases data was not available; however, rental hour data was available. These hours were recorded in a book, with the records utilised as the primary data source for verification.

## 2.3 Calculation of GHG emissions avoided

Avoided GHG emissions from composting are estimated according to the CDM's *AMS-III.F: Avoidance of methane emissions through composting* methodology, while also taking in consideration the update recommendations from Verra on this methodology (*Clarifications to AMS-III.F: Avoidance of methane emissions through composting, 2025*).

All emissions are calculated using Fifth Assessment Report (AR5) global warming potentials, as required by the Verra standard.

### 2.3.1 Baseline scenario

The baseline scenario considers emissions that would have happened if composting operations did not occur. In ZTL's case, this means solid waste would have been landfilled in City of Cape Town (CCT) landfill sites, while F.O.G trap waste would have been treated in CCT wastewater treatment plants[1].

The emissions from landfilling of solid waste are estimated using the assumptions in the CDM's *TOOL04: Emissions from solid waste disposal sites* and therefore are calculated according to the IPCC's First Order Decay (FOD) method (*2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories - Volume 5, Chapter 2*). The values utilised for this method are summarised in Table 1.

Table 1: FOD method defaults and emission factors

| | Units | Food waste | Garden waste | Animal mortalities | Reference |
|---|---|---|---|---|---|
| Dry matter fraction | % | 40% | 40% | 40% | IPCC 2006 Guidelines[2] |
| Degradable organic carbon fraction (DOC) | % of dry mass | 38% | 49% | 62% | IPCC 2006 Guidelines |
| Degradable organic carbon fraction that decomposes ($DOC_f$) | % | 70% | 70% | 70% | IPCC 2019 Refinements |
| Methane correction factor (MCF) | % | 100% | 100% | 100% | IPCC 2019 Refinements |
| Half life (t1/2) | years | 12.0 | 14.0 | 14.0 | IPCC 2019 Refinements |
| Methane fraction of landfill gas (F) | % | 50% | 50% | 50% | IPCC 2019 Refinements |
| Oxidation factor (OX) | % | 0% | 0% | 0% | IPCC 2019 Refinements |
| **Mass of decomposable DOC deposited (DDOCm)** | **kg/kg waste** | **0.11** | **0.14** | **0.17** | **Calculated from above** |
| **Emissions** | **kg $CH_4$/kg waste** | **0.071** | **0.091** | **0.114** | **Calculated according to FOD method** |

As per CDM's *TOOL04*, the total emissions are corrected to account for uncertainty and ensure methane reductions are not overestimated. In ZTL's case, the correction factor is 81% (i.e. 19% of emissions are discounted due to uncertainty and to ensure that emission reductions are conservative).

The emissions from wastewater treatment of F.O.G trap waste liquid are estimated using the assumptions in the CDM's *AMS-III.H: Methane recovery in wastewater treatment* and therefore are calculated in accordance with *2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories - Volume 5, Chapter 6*. The values utilised for this method are summarised in Table 2.

[1] Liquid wastes, such as F.O.G. trap waste, is banned from landfill sites in Cape Town.
[2] Animal mortality value confirmed with https://www.in.gov/boah/files/Composting_Cattle_WSU_20151.pdf

Table 2: Wastewater treatment defaults and emission factors

| | Units | F.O.G. waste | Reference |
|---|---|---|---|
| Chemical oxygen demand (COD) | g/L | 138 | Conservative value based on Lopez et al. (2014) High-rate anaerobic digestion of wastewater separated from grease trap waste & Tang et al. (2024) Physicochemical characteristics of grease-trap wastewater with different potential mechanisms of FOG solid formation, separation, and accumulation inside grease traps |
| COD to sludge | % | 12% | CCT 2023 GHG inventory |
| COD removal efficiency | % | 85% | IPCC 2019 Refinements |
| Methane production potential (BO) | kg $CH_4$/kg COD | 0.25 | IPCC 2019 Refinements |
| Methane correction factor (MCF) - Wastewater treatment | % | 3% | IPCC 2019 Refinements |
| Methane correction factor (MCF) - Effluent | % | 11% | IPCC 2019 Refinements |
| **Methane emissions from treatment** | **kg $CH_4$/kg COD** | **0.011** | **Calculated according to IPCC method** |

As per CDM's *AMS-III.H*, the total emissions are corrected to account for uncertainty and ensure methane reductions are not overestimated. In ZTL's case, the correction factor is 89% (i.e. 11% of emissions are discounted due to uncertainty and to ensure that emission reductions are conservative).

### *2.3.2 Project scenario*

The project scenario considers emissions that happen due to project operations, which includes emissions from compositing and energy consumption for operations. These emissions are estimated using the assumptions in the CDM's *TOOL13 Project and leakage emissions from composting*.

The following emission factors are therefore applicable:

- Fuel
  - Off-road diesel 2.90 kg $CO_2$e/L (DFFE 2022 methodological guidelines)
  - On-road diesel 2.67 kg $CO_2$e/L (DFFE 2022 methodological guidelines)
  - On-road petrol 2.30 kg $CO_2$e/L (DFFE 2022 methodological guidelines)
- Composting
  - Methane 0.002 kg $CH_4$/kg composted (*TOOL13* value)
  - Nitrous oxide 0.0002 kg $N_2O$/kg composted (*TOOL13* value)

### *2.3.3 Avoided emissions*

Overall GHG emissions avoided are calculated as the difference between baseline scenario emissions and project scenario emissions.

## 2.4 Limitations

It is acknowledged that some of the organic waste may not have been landfilled if ZTL Organic's operations did not collect and compost the waste. However, in Cape Town default waste management is landfilling, with limited diversion options available to commercial entities. There is also currently no legal requirement for commercial entries to divert organic waste from landfill, with diversion being more expensive than disposal (landfilling). As such, it is assumed that the baseline scenario assumption of landfilling is applicable and any diversion that would have occurred is covered by the correction (discounting) factors.

It is also noted that the conversion of garden waste volumes to a mass estimate relied on an assumption of 'density value' that introduces some uncertainty. This value applied in these calculations is in line with South African DFFE default values[3] and international values for semi-compacted waste[4]. As such the value is deemed applicable and any uncertainty in this conversion is covered by the correction (discounting) factors.

# 3 FINDINGS

The following findings of the assessment are reported.

## 3.1 Site visit

The site visit undertaken by The Green House confirmed that the project is in existence and that ZTL Organic's operates as a collector, sorter, composter and seller of composted material. At the time of the site visit, the collection vehicles were out on collection runs and therefore were not witnessed. However, the sorting and composting area was full of organic waste in the process of being composted (Figure 1), which also showed how the F.O.G. trap waste was being applied to well made in the open windrows. Observations were made of the front-end loader used to process and turn the compost (Figure 2), as well as staff working to sort contaminants (plastic items, metal etc.) from the received organic waste (Figure 3).

Discussions with Melanie indicated that currently seven employees work at ZTL Organics. Alongside Melanie, two employees are responsible for collecting waste, three work on the composting operations and one is responsible for administration.

The site visit also confirmed the operation to be occurring in an impoverished area and as such it provides an accessible income opportunity to help alleviate poverty.

[3] http://iwmp.environment.gov.za/guideline/7
[4] https://www.epa.gov/sites/default/files/2016-04/documents/volume_to_weight_conversion_factors_memorandum_04192016_508fnl.pdf

Figure 1: Organic waste in process of being composted
Open windrows in evidence. The white liquid is F.O.G. trap waste that has been loaded into wells

Figure 2: Front-end loaded owned and operated by ZTL on the concreted area used for composting

Figure 3: ZTL employee on way pack from processing organic waste, also showing overall site layout and open windrows

## 3.2 Data collection

ZTL Organics' slips were compared with the collated data provided by ZTL (Melanie). This comparison revealed that certain slips were excluded from the collated data, with all of these slips either being small and/or uncertain material. As such and to be conservative[5], the collated data provided by ZTL was used directly. A summary of the data is presented in Table 3.

Table 3: Verified composting tonnages and volumes

| | Units | Food waste | Garden waste | Animal mortalities | Fat trap wastewater |
|---|---|---|---|---|---|
| Year 1 | $m^3$ | [redacted] | 1,233 | [redacted] | 305 |
| Year 2 | $m^3$ | [redacted] | 1,017 | [redacted] | 314 |
| Year 3 | $m^3$ | [redacted] | 1,100 | [redacted] | 802 |
| Year 1 | tonnes | 667 | 370* | 157 | [redacted] |
| Year 2 | tonnes | 697 | 305* | 19 | [redacted] |
| Year 3 | tonnes | 683 | 330* | 0 | [redacted] |

* - Calculated from volume based on density of 300 kg/$m^3$

Fuel data was collected directly from fuel receipts[6] and data supplied by ZTL[7]. This fuel covered the ZTL owned bakkies and front-end-loader. Historically, the front-end loader was rented from a farmer and for this period, only rental hours are known, which were converted to fuel consumption based on consumption of 2 L/hour. A summary of the data is presented in Table 4.

[5] In cases where material type was uncertain, inclusion in any category may overestimate results, especially if material was un-compostable (i.e. sent to waste).
[6] In certain cases, the receipt only showed fuel price and in these cases the fuel volume is calculated from average fuel prices for the period.
[7] In certain cases, ZTL reported fuel purchases which were from missing slips or slips which had faded (unreadable), in order to be conservative both the physical slips and missing slip fuel volumes were utilised.

Table 4: Verified fuel volumes

| | Units | Rented loader | Owned bakkie and loader | Petrol bakkie |
|---|---|---|---|---|
| Petrol | L | [redacted] | [redacted] | 3,380 |
| Diesel | L | 654* | 8,610 | [redacted] |

* - Calculated from loader hours (327 hours)

## 3.3 Calculation of GHG emissions avoided

The total estimated GHG emissions avoided through ZTL Organics composting activities for the period are **5,496 tonnes $CO_2e$**. A detailed breakdown is provided in Table 5, which shows the baseline and project emissions.

As noted in Section 2, baseline emissions are discounted using the CDM recommended correction factor to ensure all calculations are conservative.

Table 5: Verified avoided GHG emissions

| | Units | Value |
|---|---|---|
| **Baseline emissions (BE)** | **tonnes $CO_2e$** | **5,879** |
| Baseline solid waste emissions ($BE_{CH4,SWDS}$) | tonnes $CO_2e$ | 5,827 |
| Baseline wastewater emissions ($BE_{WW}$) | tonnes $CO_2e$ | 52 |
| **Project emissions (PE)** | **tonnes $CO_2e$** | **383** |
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| Composting nitrous oxide project emissions ($PE_{N2O}$) | tonnes $CO_2e$ | 171.1 |
| **Emission reductions (ER)** | **tonnes $CO_2e$** | **5,496** |

## 3.4 Response to the Credible Carbon Registry questions

In light of the above, The Green House provides the following responses to the Credible Carbon Registry assessment questions:

**Is the project real?**

The project is real and operational.

**Is the described technology in place and functioning in accordance with its design specification?**

The Green House witnessed that organic waste is collected and delivered to the Philippi site. Here it is sorted and composted, using their on-site front-end loader, to produce usable compost. The application of F.O.G trap waste to compost wells in the open windrows was also witnessed. The final product, post sieving was also witnessed, ready for sale to customers. These operations divert waste that would otherwise have ended up in landfill sites or, in the case of F.O.G trap waste, in wastewater treatment plants.

**Are the estimates of greenhouse gas emissions reduction reasonable in terms of accepted international standards and unbiased towards buyer or seller?**

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### Is there a discernible impact on poverty?

The project provides numerous jobs and is an accessible income opportunity in an impoverished area. It therefore makes a discernible impact on poverty. The intention is also to distribute 50% of generated carbon credit revenue to ZTL Organics employees to helped with their family finances.