Direct-Measurement of LFG Emissions

→ SWANA Northern Lights 2022

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About ✈ US

In extraordinary and challenging times, we are thankful for the things that make us strong.

The cornerstone of GHD’s business is our client service-led culture and connected global network.

We provide engineering, environmental, advisory and construction services to private and public sector clients.

Established in **1928** and privately owned by our people, GHD employees

+10k people across five continents and the Pacific region.

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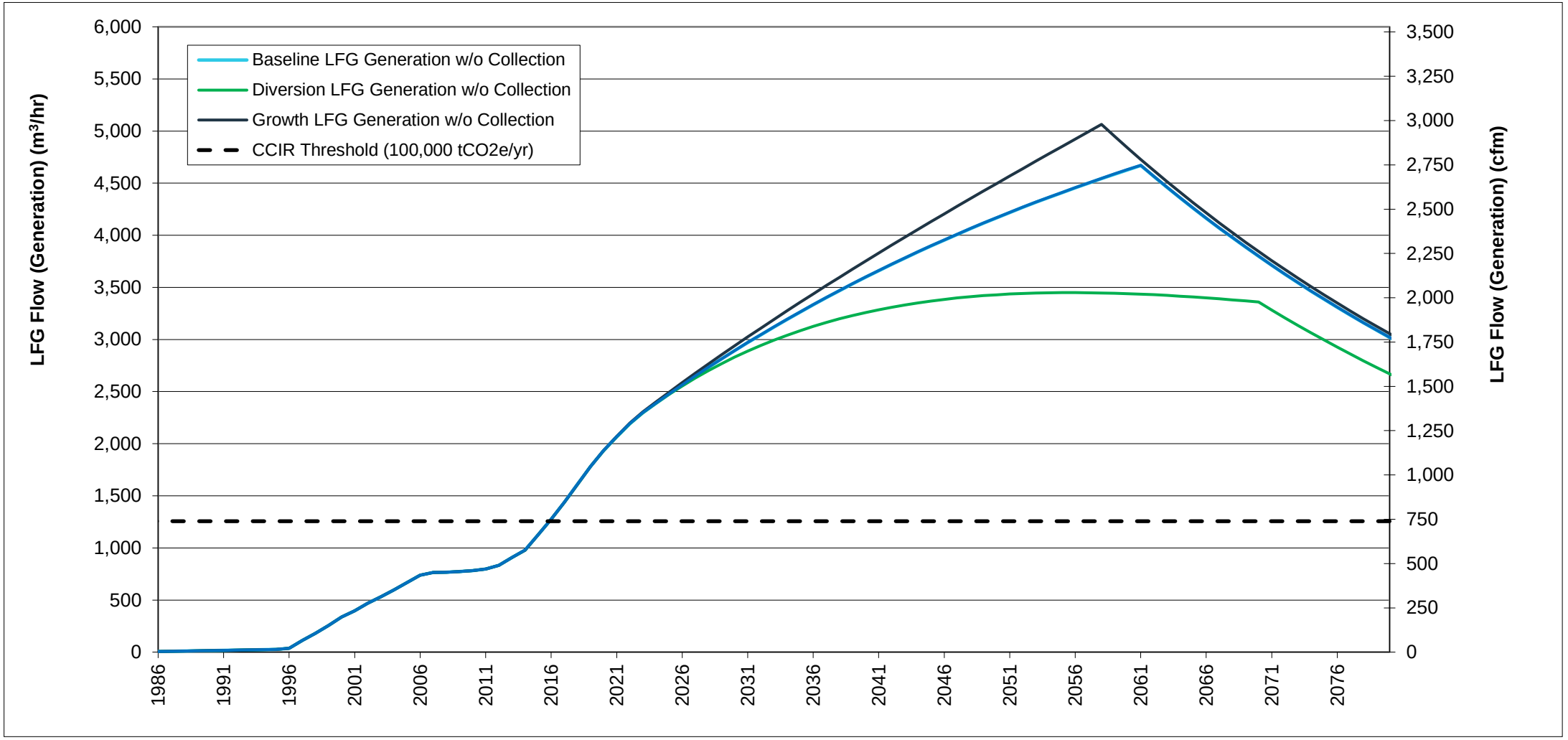
Problem Statement

- Claystone Waste in 2018 reported to TIER emissions from LFG in excess of 100,000 tonnes CO_2e for the previous year, based on desktop modeling.
- GHD evaluated LFG management options including collection and flaring, electricity generation, or RNG production.
- Following assessment and site visits, our team believed that the site's emissions were not as high as reported, due to unique site conditions:
  - Lack of odour
  - Lack of vegetative degradation
  - Significant comingling of MSW & soils
- GHD completed a field evaluation and found minimal levels of methane over the site.
- GHD and Claystone consulted with AEP and developed a methodology that was subsequently approved by AEP to quantify LFG emissions using a direct-measurement approach.

Desktop Modeling of Site LFG Generation

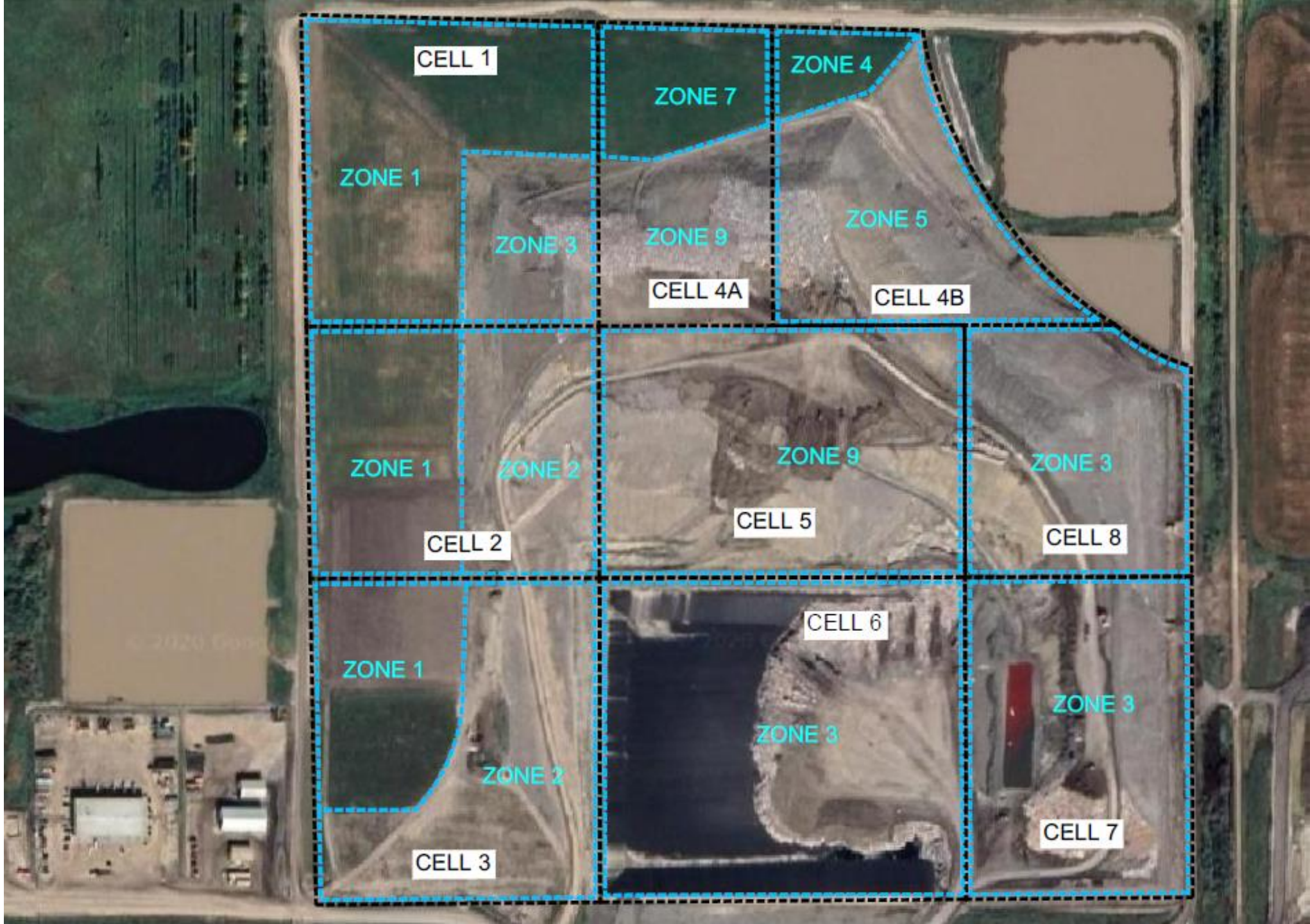


Direct-Measurement Methodology

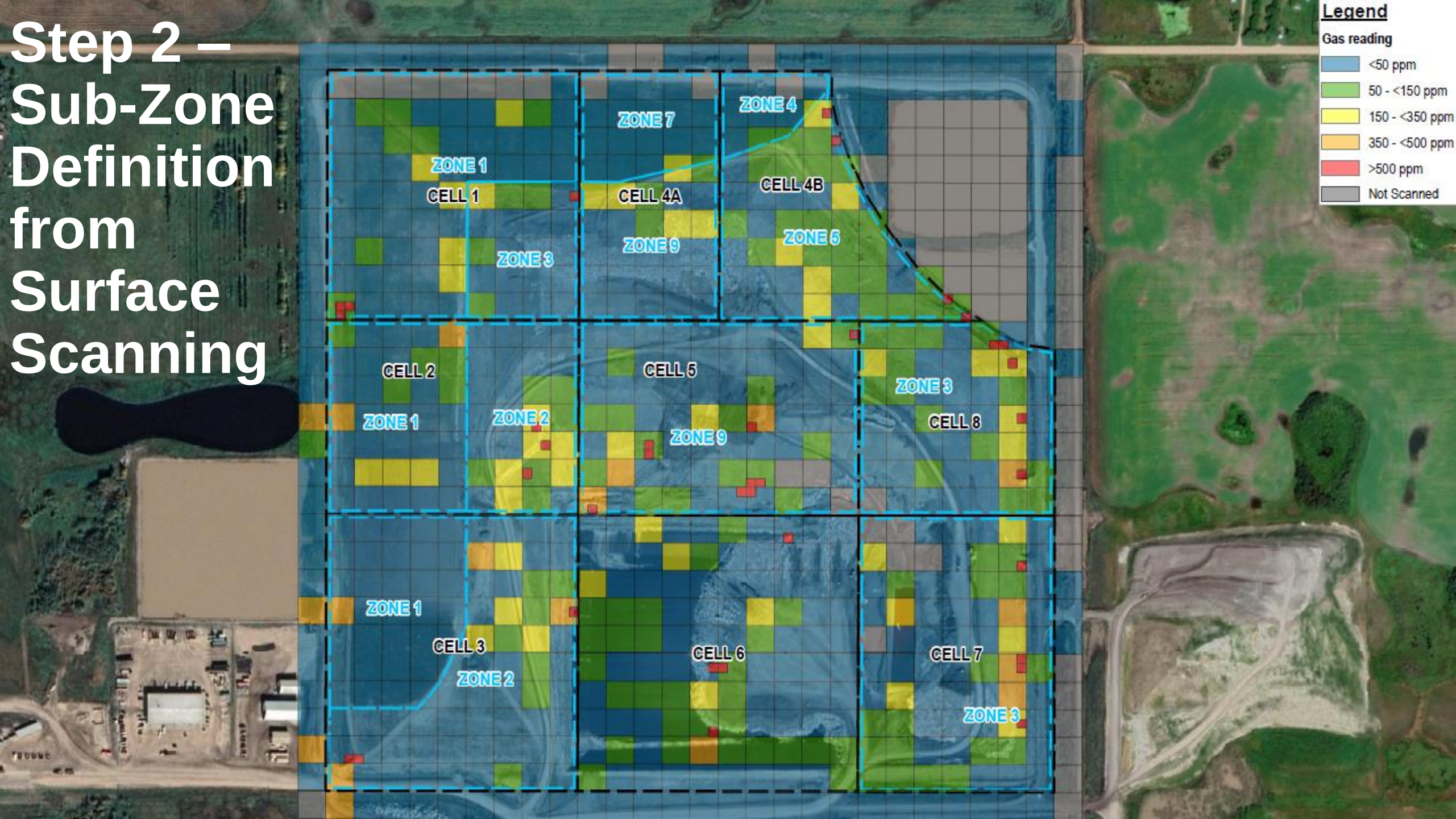
- The methodology was developed based on the AEP *Directive for Quantification of Area Fugitive Emissions at Oil Sands Mines*, Version 2.1, September 2019

- Methodology overview:
  - Step 1 – Base zone definition
  - Step 2 – Surface emissions scanning
  - Step 3 – Flux chamber measurements
  - Step 4 – Calculations & extrapolation

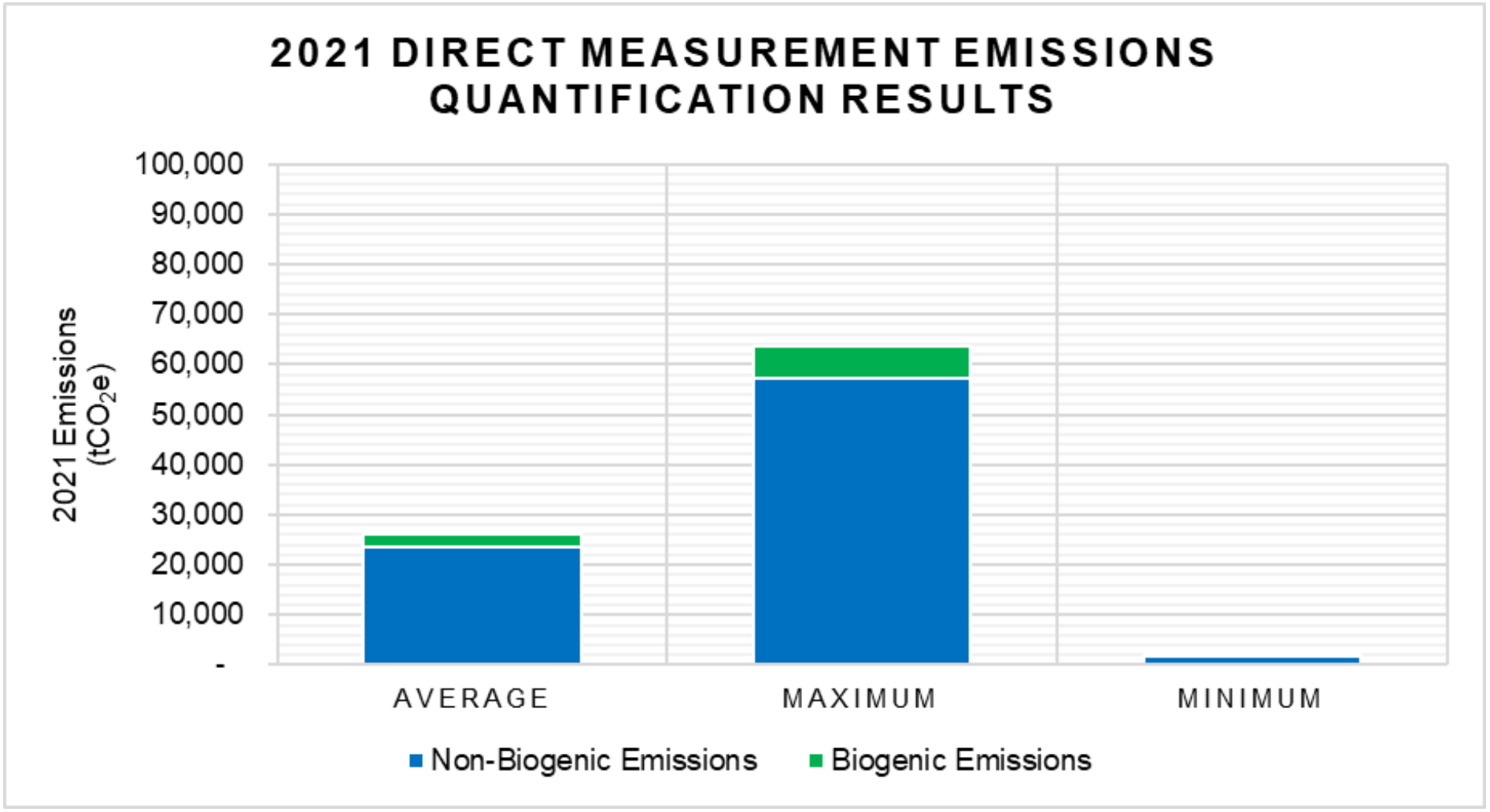
Step 1 – Zone Definition



Step 2 – Sub-Zone Definition from Surface Scanning



Steps 3 & 4 – Flux Chamber Measurements and Quantification



Outcomes

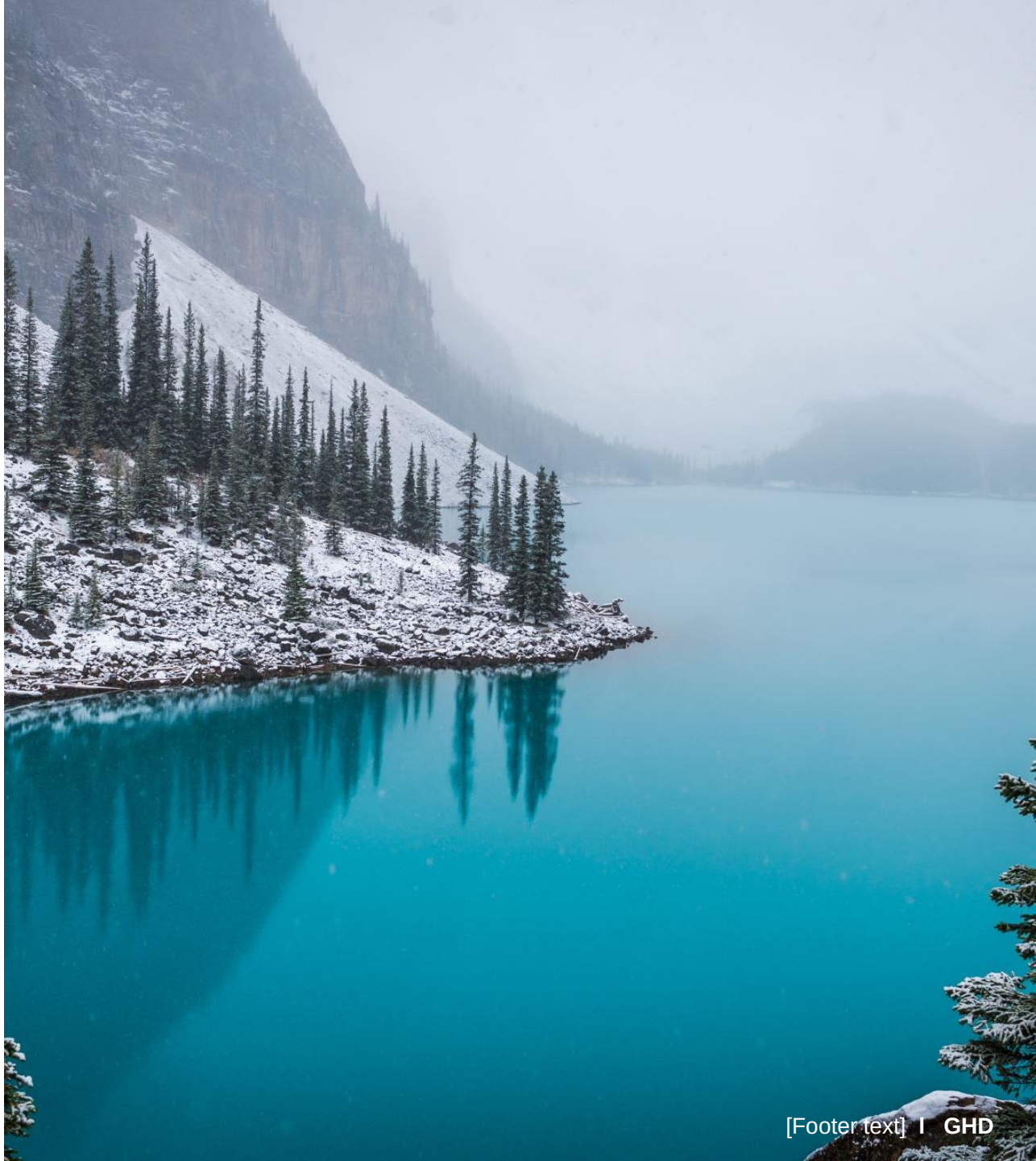
The direct-measurement program showed evidence that actual LFG emissions were not represented accurately by the desktop model, due to unique site conditions.

AEP accepted the direct-measurement results as proof that Claystone's Landfill was not emitting LFG in excess of the 100,000 tCO2e/year threshold for regulation and compliance under TIER.

Claystone Waste was removed from the list of regulated facilities under TIER, and continues to submit annual emissions quantifications using the direct-measurement approach to AEP.

Takeaways

- A model is a model is a model
  - Verification and comparison to actual data is critical
- Direct-measurement of LFG emissions is possible without a LFG collection system in place, using the methodology presented
- Collaboration with regulators to find better ways to collect and analyze data is needed
  - AEP was receptive to our proposed change in methodology and worked with us to refine the methods for direct-measurement of LFG emissions



Thank You

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