

Table S1. Estimated GHG emissions (on a kg CO₂ ha⁻¹ basis) required to revegetate of tailings at CD area at the Vale waste management facility near Sudbury, Canada. Required activities and amendments were derived from descriptions the literature [9–11]. GHG emissions associated with each action were also obtained from the literature [76–78].

Action Type	Description	Comments and Interpretations	GHG Emission Estimate, Units (Uncertainty) ³	Amount of Action Occurring, Units (Uncertainty)	GHG Emissions of Activity (Minimum, Maximum)
Amendment	Fertilizer production	Estimated emissions from fertilizer production [77] Some uncertainty about specific fertilizer applied, (1) 5-20-20 (5 percent nitrogen, 20 percent phosphate, 20 percent potash) [9,10] or (2) 8-24-24 [11] Used as minimum and maximum ranges.	(1) N: 857.54 kg CO ₂ Mg ⁻¹ (±10%) (2) P ₂ O ₅ : 165.09 kg CO ₂ Mg ⁻¹ (±10%) (3) K ₂ O: 120.28 kg CO ₂ Mg ⁻¹ (±10%)	750 kg ha ⁻¹ (±10%)	67.5 to 113.1 kg CO ₂ ha ⁻¹
	Agricultural Lime	(1) Production: Lime assumed of dolomitic origin [17] (2) Dissolution: IPCC default assumes all C is released to atmosphere following application to soils, some research suggests lower value [78].	(1) Production: 35.73 kg CO ₂ Mg ⁻¹ (±10%) (2) Dissolution: 0.064 Mg CO ₂ Mg ⁻¹ (minimum [78]) 0.13 Mg CO ₂ Mg ⁻¹ (maximum [78])	25 Mg ha ⁻¹ (±10%)	2163.5 to 4655.1 kg CO ₂ ha ⁻¹
	Seed production	(1) Grass seed: Mixture used [10,11] ¹ does not match precisely with species for which emissions estimates for production are available [78]. Therefore a range of values are used. (2) Legume seed: Various species ² at different points in time. Specific estimates for these species not available, therefore used same range as estimates for grass seed. (3) Fall rye seed: <i>Secale cereale</i> L., applied as a companion crop with grass.	(1) Grass seed: 0.54 kg CO ₂ kg ⁻¹ seed (minimum) 2.63 kg CO ₂ kg ⁻¹ seed (maximum) (2) Legume seed: Used same range of estimates as grass seed (3) Fall rye seed: 0.11 kg CO ₂ kg ⁻¹ seed (minimum) 0.13 kg CO ₂ kg ⁻¹ seed (maximum)	(1) Grass seed: 53–79 kg ha ⁻¹ (minimum and maximum application rates) (2) Legume seed: Application rate not available, assumed same rate as grass seed. (3) Fall rye seed: 60-94 kg ha ⁻¹ (minimum and maximum application rates)	(1) Grass seed: 28.6 to 207.8 kg CO ₂ ha ⁻¹ (2) Legume seed: 28.6 to 207.8 kg CO ₂ ha ⁻¹ (3) Fall rye seed: 6.6 to 12.2 kg CO ₂ ha ⁻¹
	Tree seedling production	Lowest GHG emission estimate in [76] is used because produced on site, therefore reducing energy use [10,11].	46.71 kg CO ₂ 1000 seedlings ⁻¹ (maximum, [76]) 23.36 kg CO ₂ 1000 seedlings ⁻¹ (minimum, assumption)	Assumed planting density of 750 stems ha ⁻¹ (±10%)	15.8 to 38.5 kg CO ₂ ha ⁻¹
Activity	Farm operations	Various operations have different emissions, and a varying number of these were required during the revegetation process, including discing, cultivation, and harvest [10,11].	8.72 kg CO ₂ ha ⁻¹ (minimum) 26.75 kg CO ₂ ha ⁻¹ (maximum)	A minimum of 3 farm operations occur in the first year [10,11]. Assume up to 5 are needed in subsequent years.	26.2 to 214 kg CO ₂ ha ⁻¹
	Amendment Application (Fertilizer, Lime, or Mulch)	At least 5 different amendments are applied in the first year, and then further applications of fertilizer and lime occur in subsequent years as needed [10,11].	12.35 kg CO ₂ ha ⁻¹	A minimum of 5 amendment applications occur. Assume up to 10 are needed in subsequent years [10,11].	61.8 to 185.3 kg CO ₂ ha ⁻¹
	Grass, legume, or fall rye seeding (Broadcast, seed drill, or Brillion seeder)	At least 3 seeding events occur in the first year, and 1 in the second year.	6.79 kg CO ₂ ha ⁻¹	A minimum of 4 seeding events occur. Assume up to 6 more occur in subsequent years [10,11].	27.16 to 67.9 kg CO ₂ ha ⁻¹
Total CO ₂ emissions (minimum, maximum)					2425.8 to 5701.7 kg CO ₂ ha ⁻¹

¹ Mixture used is *Poa compressa* L. (25%), *Agrostis gigantea* Roth. (25%), *Phleum pratense* L. (15%), *Poa pratensis* L. (15%), *Festuca arundinacea* Schreb. (10%), and *Festuca rubra* L. (10%) [10,11]. In addition *Bromus intermis* Leyss. may have been applied as a single species. ² Various clover (*Melilotus* spp.) used at different points in time, but the most common species used was Birds-foot trefoil (*Lotus corniculatus* L.). ³ Unless otherwise indicated, estimates of emissions are from [78].