

Appendix 3.3 Calculation of Construction Dust Emission Source

Construction Phase Year 2020 - 2026 and Year 2026 - 2030

Location	Source	Emission Rates	Parameters	Remarks		
YLEPP	Construction Activities	Heavy Construction Area Source (g/m <sup>2</sup> /s)	TSP	1.723E-05	Emission Rate = (Emission Factor*10 <sup>6</sup> /10000)/(30*No. of Operation hour*60*60)*(Percentage Active/100)*(1-Dust Suppression%)	
					2.69	TSP emission factor (Mg/hectare/month of activity)
					100	Percentage area actively operating (%)
					91.7	% of dust suppression
					12	no. of operation hour (hr)
				0.5	Emission height (m)	
				RSP	8.149E-06	RSP emission factor (Mg/hectare/month of activity)
					1.27237	% fraction of TSP
				FSP	1.240E-06	FSP emission factor (Mg/hectare/month of activity)
					0.19368	% fraction of TSP
			0.07	from USEPA AP-42, 5th ed. 11/06 ed. S13.2.4		
		Wind Erosion Area Source (g/m <sup>2</sup> /s)	TSP	2.695E-06	Emission Rate = Emission Factor*10 <sup>6</sup> /(10000*365*24*60*60)*(Percentage Active/100)	
				0.85	TSP emission factor (Mg/hectare/yr)	
				100	Percentage area actively operating (%)	
				0.5	Emission height (m)	
			RSP	1.275E-06	RSP emission factor (Mg/hectare/yr)	
				0.40205	% fraction of TSP	
			FSP	1.941E-07	FSP emission factor (Mg/hectare/yr)	
				0.0612	% fraction of TSP	
				0.07	from USEPA AP-42, 5th ed. 11/06 ed. S13.2.4	

**Appendix 3.3 Calculation of Construction Dust Emission Source**

Construction Phase Year 2020 - 2026

Phase 1-1

Source	Type	X1	Y1	X2	Y2	Height (m)	Width / Angle	Working Hour	TSP Emission Rate (g/m <sup>2</sup> -s)		RSP Emission Rate (g/m <sup>2</sup> -s)		FSP Emission Rate (g/m <sup>2</sup> -s)	
									Working hours	Non-working hours	Working hours	Non-working hours	Working hours	Non-working hours
P11_3	Area	820884.82	836654.10	297.70	84.49	0.5	98.4	07:00 - 19:00	1.723E-05	2.695E-06	8.149E-06	1.275E-06	1.240E-06	1.941E-07
P11_5	Area	820938.30	836654.00	7.71	31.57	0.5	98.4	07:00 - 19:00	1.723E-05	2.695E-06	8.149E-06	1.275E-06	1.240E-06	1.941E-07
P11_6	Area	820907.08	836655.60	4.79	31.12	0.5	98.4	07:00 - 19:00	1.723E-05	2.695E-06	8.149E-06	1.275E-06	1.240E-06	1.941E-07
P11_7	Area	820873.11	836596.94	37.19	3.24	0.5	98.4	07:00 - 19:00	1.723E-05	2.695E-06	8.149E-06	1.275E-06	1.240E-06	1.941E-07
P11_8	Area	820836.38	836584.69	6.58	22.71	0.5	138.91	07:00 - 19:00	1.723E-05	2.695E-06	8.149E-06	1.275E-06	1.240E-06	1.941E-07
P11_9	Area	820851.02	836569.24	6.56	17.80	0.5	98.41	07:00 - 19:00	1.723E-05	2.695E-06	8.149E-06	1.275E-06	1.240E-06	1.941E-07
P11_10	Area	820848.21	836566.53	68.52	4.56	0.5	98.41	07:00 - 19:00	1.723E-05	2.695E-06	8.149E-06	1.275E-06	1.240E-06	1.941E-07
P11_11	Area	820785.18	836506.56	7.42	69.73	0.5	98.41	07:00 - 19:00	1.723E-05	2.695E-06	8.149E-06	1.275E-06	1.240E-06	1.941E-07
P11_12	Area	820854.16	836496.37	81.64	7.36	0.5	98.41	07:00 - 19:00	1.723E-05	2.695E-06	8.149E-06	1.275E-06	1.240E-06	1.941E-07
P11_13	Area	820797.90	836636.09	211.63	6.41	0.5	98.41	07:00 - 19:00	1.723E-05	2.695E-06	8.149E-06	1.275E-06	1.240E-06	1.941E-07
P11_14	Area	820754.94	836593.51	5.95	36.27	0.5	98.41	07:00 - 19:00	1.723E-05	2.695E-06	8.149E-06	1.275E-06	1.240E-06	1.941E-07

Phase 1-2

Source	Type	X1	Y1	X2	Y2	Height (m)	Width / Angle	Working Hour	TSP Emission Rate (g/m <sup>2</sup> -s)		RSP Emission Rate (g/m <sup>2</sup> -s)		FSP Emission Rate (g/m <sup>2</sup> -s)	
									Working hours	Non-working hours	Working hours	Non-working hours	Working hours	Non-working hours
P12_1	Area	820757.49	836658.51	190.41	49.58	0.5	98.4	07:00 - 19:00	1.723E-05	2.695E-06	8.149E-06	1.275E-06	1.240E-06	1.941E-07
P12_2	Area	820790.38	836658.75	5.04	17.06	0.5	98.4	07:00 - 19:00	1.723E-05	2.695E-06	8.149E-06	1.275E-06	1.240E-06	1.941E-07
P12_3	Area	820750.12	836650.08	41.05	6.06	0.5	98.4	07:00 - 19:00	1.723E-05	2.695E-06	8.149E-06	1.275E-06	1.240E-06	1.941E-07
P12_4	Area	820739.39	836610.17	48.73	10.84	0.5	98.4	07:00 - 19:00	1.723E-05	2.695E-06	8.149E-06	1.275E-06	1.240E-06	1.941E-07
P12_5	Area	820725.54	836562.95	60.42	17.64	0.5	98.4	07:00 - 19:00	1.723E-05	2.695E-06	8.149E-06	1.275E-06	1.240E-06	1.941E-07
P12_6	Area	820771.08	836659.83	3.29	19.25	0.5	98.4	07:00 - 19:00	1.723E-05	2.695E-06	8.149E-06	1.275E-06	1.240E-06	1.941E-07
P12_7	Area	820711.38	836503.97	30.79	23.05	0.5	98.4	07:00 - 19:00	1.723E-05	2.695E-06	8.149E-06	1.275E-06	1.240E-06	1.941E-07

Phase 1-3

Source	Type	X1	Y1	X2	Y2	Height (m)	Width / Angle	Working Hour	TSP Emission Rate (g/m <sup>2</sup> -s)		RSP Emission Rate (g/m <sup>2</sup> -s)		FSP Emission Rate (g/m <sup>2</sup> -s)	
									Working hours	Non-working hours	Working hours	Non-working hours	Working hours	Non-working hours
P13_1	Area	820785.18	836506.56	81.64	76.99	0.5	98.39	07:00 - 19:00	1.723E-05	2.695E-06	8.149E-06	1.275E-06	1.240E-06	1.941E-07
P13_2	Area	820848.21	836566.53	68.53	23.47	0.5	98.4	07:00 - 19:00	1.723E-05	2.695E-06	8.149E-06	1.275E-06	1.240E-06	1.941E-07

Phase 1-4

Source	Type	X1	Y1	X2	Y2	Height (m)	Width / Angle	Working Hour	TSP Emission Rate (g/m <sup>2</sup> -s)		RSP Emission Rate (g/m <sup>2</sup> -s)		FSP Emission Rate (g/m <sup>2</sup> -s)	
									Working hours	Non-working hours	Working hours	Non-working hours	Working hours	Non-working hours
P14_1	Area	820773.24	836425.80	55.58	77.03	0.5	98.39	07:00 - 19:00	1.723E-05	2.695E-06	8.149E-06	1.275E-06	1.240E-06	1.941E-07
P14_2	Area	820967.46	836652.51	308.24	6.13	0.5	98.41	07:00 - 19:00	1.723E-05	2.695E-06	8.149E-06	1.275E-06	1.240E-06	1.941E-07
P14_3	Area	820872.17	836568.78	6.07	82.02	0.5	98.41	07:00 - 19:00	1.723E-05	2.695E-06	8.149E-06	1.275E-06	1.240E-06	1.941E-07
P14_4	Area	820870.67	836567.93	21.47	5.58	0.5	151.75	07:00 - 19:00	1.723E-05	2.695E-06	8.149E-06	1.275E-06	1.240E-06	1.941E-07
P14_5	Area	820851.10	836554.90	72.60	5.72	0.5	98.41	07:00 - 19:00	1.723E-05	2.695E-06	8.149E-06	1.275E-06	1.240E-06	1.941E-07
P14_6	Area	820783.01	836491.58	6.57	158.92	0.5	98.41	07:00 - 19:00	1.723E-05	2.695E-06	8.149E-06	1.275E-06	1.240E-06	1.941E-07
P14_7	Area	820776.67	836492.52	122.06	6.37	0.5	98.41	07:00 - 19:00	1.723E-05	2.695E-06	8.149E-06	1.275E-06	1.240E-06	1.941E-07

Phase 1-5

Source	Type	X1	Y1	X2	Y2	Height (m)	Width / Angle	Working Hour	TSP Emission Rate (g/m <sup>2</sup> -s)		RSP Emission Rate (g/m <sup>2</sup> -s)		FSP Emission Rate (g/m <sup>2</sup> -s)	
									Working hours	Non-working hours	Working hours	Non-working hours	Working hours	Non-working hours
P15_1	Area	820703.87	836473.96	93.06	75.65	0.5	98.4	07:00 - 19:00	1.723E-05	2.695E-06	8.149E-06	1.275E-06	1.240E-06	1.941E-07

**Appendix 3.3 Calculation of Construction Dust Emission Source**

Construction Phase Year 2026 - 2030

Source	Type	X1	Y1	X2	Y2	Height (m)	Width / Angle	Working Hour	TSP Emission Rate (g/m <sup>2</sup> -s)		RSP Emission Rate (g/m <sup>2</sup> -s)		FSP Emission Rate (g/m <sup>2</sup> -s)	
									Working hours	Non-working hours	Working hours	Non-working hours	Working hours	Non-working hours
									P2_1	Area	820872.35	836569.03	6.19	85.17
P2_2	Area	820709.64	836508.53	6.56	67.92	0.5	98.4	07:00 - 19:00	1.723E-05	2.695E-06	8.149E-06	1.275E-06	1.240E-06	1.941E-07
P2_3	Area	820780.84	836525.68	103.31	7.10	0.5	98.4	07:00 - 19:00	1.723E-05	2.695E-06	8.149E-06	1.275E-06	1.240E-06	1.941E-07
P2_4	Area	820749.53	836557.85	6.63	4.73	0.5	98.4	07:00 - 19:00	1.723E-05	2.695E-06	8.149E-06	1.275E-06	1.240E-06	1.941E-07
P2_5	Area	820780.64	836663.66	3.04	27.42	0.5	98.4	07:00 - 19:00	1.723E-05	2.695E-06	8.149E-06	1.275E-06	1.240E-06	1.941E-07
P2_6	Area	820769.74	836662.20	133.42	37.99	0.5	98.4	07:00 - 19:00	1.723E-05	2.695E-06	8.149E-06	1.275E-06	1.240E-06	1.941E-07
P2_7	Area	820808.19	836661.91	8.97	10.23	0.5	98.8	07:00 - 19:00	1.723E-05	2.695E-06	8.149E-06	1.275E-06	1.240E-06	1.941E-07
P2_8	Area	820885.15	836657.24	6.50	89.26	0.5	91.3	07:00 - 19:00	1.723E-05	2.695E-06	8.149E-06	1.275E-06	1.240E-06	1.941E-07
P2_9	Area	820795.10	836573.39	89.35	53.46	0.5	98.4	07:00 - 19:00	1.723E-05	2.695E-06	8.149E-06	1.275E-06	1.240E-06	1.941E-07
P2_10	Area	820806.77	836652.87	80.34	77.06	0.5	98.4	07:00 - 19:00	1.723E-05	2.695E-06	8.149E-06	1.275E-06	1.240E-06	1.941E-07
P2_11	Area	820866.58	836661.33	17.07	19.24	0.5	98.8	07:00 - 19:00	1.723E-05	2.695E-06	8.149E-06	1.275E-06	1.240E-06	1.941E-07
P2_12	Area	820854.23	836475.90	59.45	29.09	0.5	98.4	07:00 - 19:00	1.723E-05	2.695E-06	8.149E-06	1.275E-06	1.240E-06	1.941E-07
P2_13	Area	820818.67	836662.20	10.61	27.53	0.5	98.8	07:00 - 19:00	1.723E-05	2.695E-06	8.149E-06	1.275E-06	1.240E-06	1.941E-07
P2_14	Area	820846.36	836661.18	13.83	19.98	0.5	98.8	07:00 - 19:00	1.723E-05	2.695E-06	8.149E-06	1.275E-06	1.240E-06	1.941E-07

### Appendix 3.3 Calculation of Construction Dust Emission Source

#### Calculation of Dust Suppression Efficiency from Watering

Dust suppression efficiency is assumed to be 91.7%. Assumptions are stated as below.

With reference to the Equation (5-4) of USEPA's Control of Open Fugitive Dust Sources (EPA-450/3-98-008), dust suppression efficiency can be estimated by:

$$C = 100 - \frac{0.8 \cdot p \cdot d \cdot t}{i}$$

where

C = average control efficiency, in percent

p = potential average hourly daytime evaporation rate in mm/hour

d = average hourly daytime traffic rate in vehicles per hour

i = application intensity in L/m<sup>2</sup>

t = time between applications in hour (t = 1)

The following assumptions are made for assessment purpose:

#### Assumption 1:

Potential average hourly daytime evaporation rate p can be estimated by  $0.0049 \cdot e$ , where e is the mean annual average evaporation rate (inches). From past measurement data in Hong Kong's Observatory, evaporation recorded at King's Park between 1981 - 2010 is 1227.3 mm<sup>1</sup>. Therefore  $p = 0.0049 \cdot (1227.3 \text{ mm}) = 0.0049 \cdot (48.3188976 \text{ inches}) = 0.2368$ .

#### Assumption 2:

Estimate average hourly daytime traffic rate in vehicles per hour = 20. (d = 20)

#### Assumption 3:

Assume watering application intensity as 0.91 L/m<sup>2</sup>. (i = 0.91)

#### Assumption 4:

Assumes watering frequency as once every 2 hours. (t = 2)







With the above assumptions, dust suppression efficiency is calculated as below:

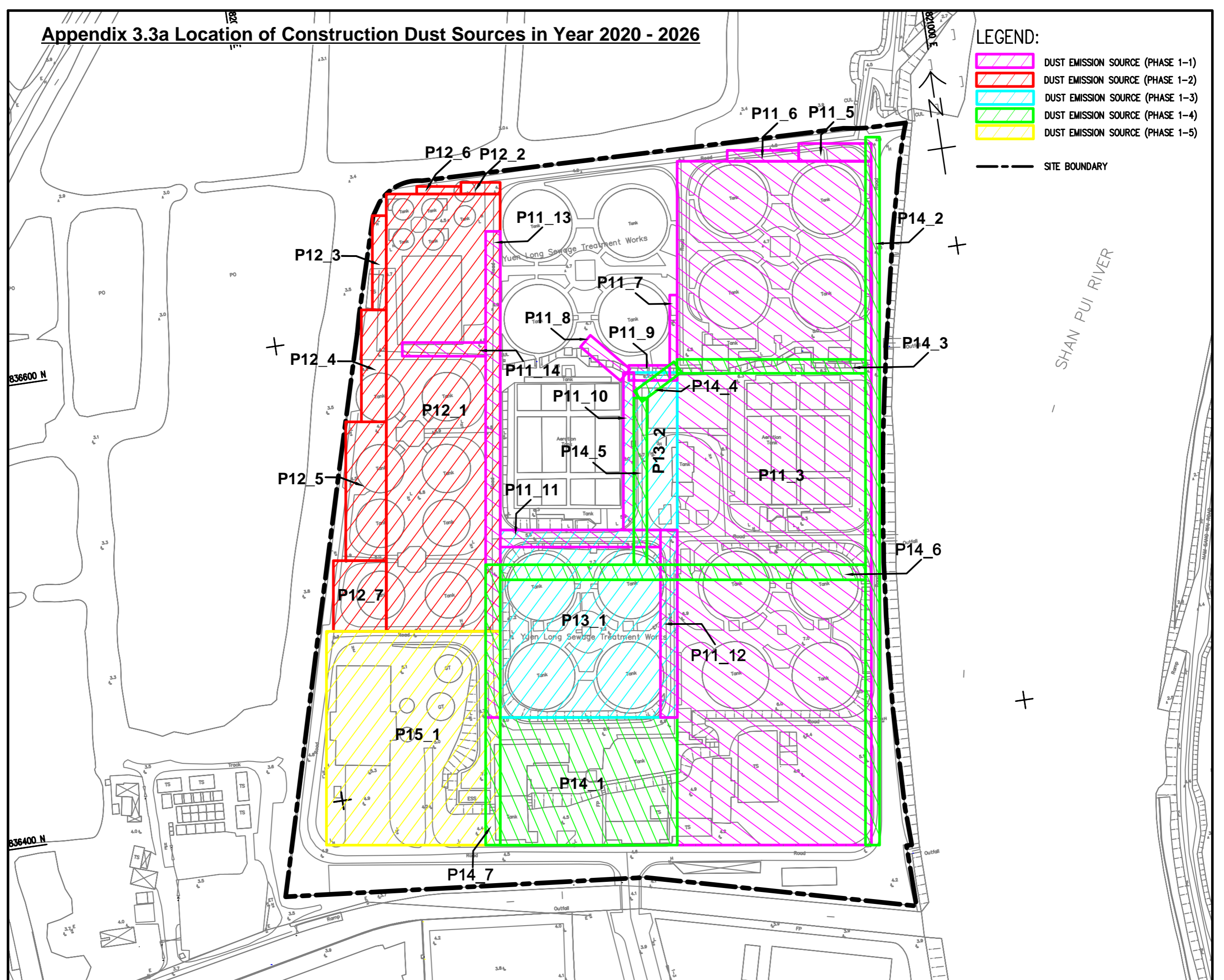
$$C = 100 - 0.8 \cdot (0.2368) \cdot (20) \cdot (2) / 0.91 = \underline{\underline{91.7\%}}$$

<sup>1</sup> The Hong Kong's Observatory evaporation recorded at King's Park between 1981 to 2010 is taken from [http://www.weather.gov.hk/cis/normal/1981\\_2010/normal\\_e.htm](http://www.weather.gov.hk/cis/normal/1981_2010/normal_e.htm)

# Appendix 3.3a Location of Construction Dust Sources in Year 2020 - 2026


## LEGEND:

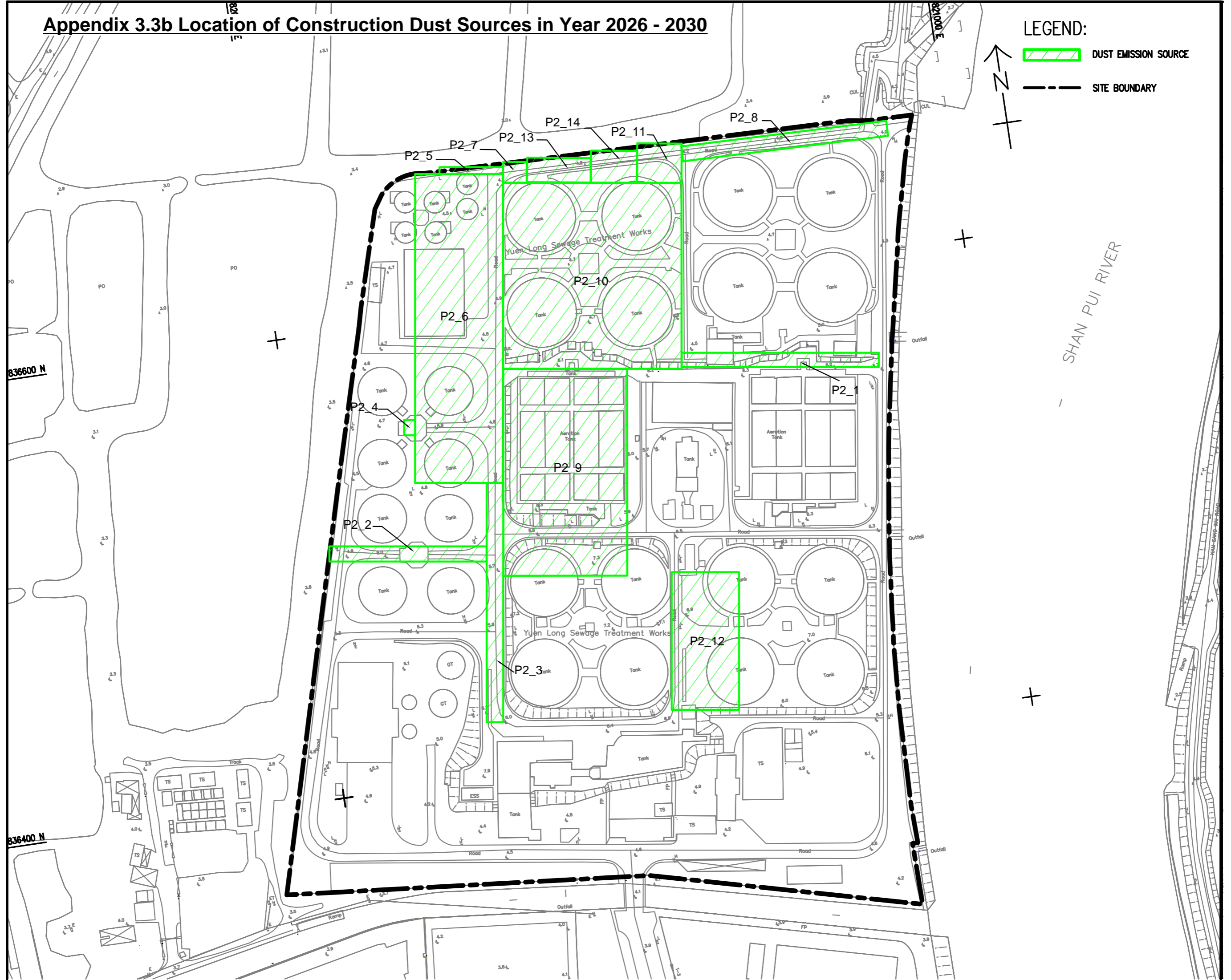
-  DUST EMISSION SOURCE (PHASE 1-1)
-  DUST EMISSION SOURCE (PHASE 1-2)
-  DUST EMISSION SOURCE (PHASE 1-3)
-  DUST EMISSION SOURCE (PHASE 1-4)
-  DUST EMISSION SOURCE (PHASE 1-5)
-  SITE BOUNDARY



# Appendix 3.3b Location of Construction Dust Sources in Year 2026 - 2030

**LEGEND:**

-  DUST EMISSION SOURCE
-  SITE BOUNDARY



SHAN PUI RIVER