Emission Inventory for Industrial Emissions

Industrial Source [2] [8]	Source ID	Type	X	Y	Base Elevation	Release Height	For Point Sources			For Area Sources				Pollutant Emission Rate						Operation Hours
							Exit Temperature	Exit Velocity	Internal Diameter	X-dim	Y-dim	Angle	Vertical Dim. (Sz)	RSP		FSP		NOx		
			(m)	(m)	(mPD)	(m)	(K)	(m/s)	(m)	(m)	(m)	(°)	(m)	(g/s)	($g/m^2/s$)	(g/s)	($g/m^2/s$)	(g/s)	($g/m^2/s$)	
Lam Tei Area																				
Polystyrene Foam Products Factory Limited [1] [2]	CH3	POINT	816602.0	831182.0	12.0	10.0	373	6.00	0.30					7.200E-03		5.533E-03		1.333E-01		0700 - 1900
Pillar Point Area																				
Hong Kong China Concrete Company Limited [3]	HKCC-EP1	AREA	812948.0	825405.0	5.8	5.0				5	5	137.0	0.00001		1.499E-03		2.248E-04		-	0700 - 1900
	HKCC-EP2	POINT	812917.0	825428.0	5.8	24.0	Ambient	15.56	0.20					1.240E-02		3.719E-03		-		0700 - 1900
	HKCC-EP3	POINT	812915.0	825431.0	5.8	26.0	Ambient	15.56	0.20					1.240E-02		3.719E-03		-		0700 - 1900
	HKCC-EP4	POINT	812913.0	825433.0	5.8	26.0	Ambient	15.56	0.20					1.240E-02		3.719E-03		-		0700 - 1900
	HKCC-EP5	POINT	812912.0	825430.0	5.8	16.0	Ambient	15.56	0.20					1.240E-02		3.719E-03		-		0700 - 1900
	HKCC-EP6_1	AREA	812897.0	825462.0	5.8	0.5				3	17	160.4	0.00001		5.254E-05		1.261E-05		-	0700 - 1900
	HKCC-EP6_2	AREA	812902.0	825446.0	5.8	0.5				3	17	160.4	0.00001		5.254E-05		1.261E-05		-	0700 - 1900
	HKCC-EP6_3	AREA	812897.0	825463.0	5.8	0.5				3	18	148.5	0.00001		1.051E-05		2.522E-06		-	0700 - 1900
	HKCC-EP6_4	AREA	812907.0	825447.0	5.8	0.5				3	18	148.5	0.00001		1.051E-05		2.522E-06		-	0700 - 1900
	HKCC-EP6_5	AREA	812898.0	825462.0	5.8	0.5				3	18	176.8	0.00001		1.051E-05		2.522E-06		-	0700 - 1900
	HKCC-EP6_6	AREA	812899.0	825444.0	5.8	0.5				3	18	176.8	0.00001		1.051E-05		2.522E-06		-	0700 - 1900
	HKCC-EP7	AREA	812954.0	825408.0	5.8	1.0				4	2	133.9	0.00001		3.904E-05		5.856E-06		-	0700 - 1900
	HKCC-EP8	AREA	812940.0	825416.0	5.8	6.0				15	12	136.9	0.00001		1.870E-06		2.805E-07		-	0700 - 1900
	HKCC-EP9	POINT	812914.0	825425.0	5.8	26.0	Ambient	15.56	0.20					1.240E-02		3.719E-03		-		0700 - 1900
Multi-Way Industries Limited [3]	MWI_EP1a	AREA	812943.1	825420.9	6.2	5.0				18	4.3	44	0.00001		4.496E-06		6.745E-07		-	0800 - 1800
	MWI_EP2a	AREA	812946.2	825425.0	6.2	5.0				18	10	44	0.00001		3.473E-06		5.210E-07		-	0800 - 1800
	MWI_EP3a	AREA	812956.3	825430.3	6.2	5.0				14	5	44	0.00001		9.262E-06		1.389E-06		-	0800 - 1800
	MWI_EP4a	AREA	812960.3	825436.3	6.2	5.0				14	5	44	0.00001		9.262E-06		1.389E-06		-	0800 - 1800
	MWI_EP5a	AREA	812963.5	825439.6	6.2	5.0				14	10	44	0.00001		7.236E-06		1.085E-06		-	0800 - 1800
	MWI_EP6b	AREA	812963.6	825452.3	6.2	0.5				3.75	3	44	0.00001		2.840E-04		4.261E-05		-	0800 - 1800
	MWI_EP7	POINT	812939.0	825479.0	6.2	22.0	Ambient	25.03	0.16					4.514E-04		1.354E-04		-		0800 - 1800
	MWI_EP8	POINT	812941.0	825477.0	6.2	22.0	Ambient	25.03	0.16					1.667E-04		5.000E-05		-		0800 - 1800
	MWI_EP9	POINT	812937.0	825475.0	6.2	16.0	Ambient	31.98	0.14					1.667E-04		5.000E-05		-		0800 - 1800
	MWI_EP10	POINT	812925.0	825460.0	6.2	22.0	Ambient	25.03	0.16					1.667E-04		5.000E-05		-		0800 - 1800
	MWI_EP11	POINT	812922.0	825463.0	6.2	22.0	Ambient	25.03	0.16					1.667E-04		5.000E-05		-		0800 - 1800
	MWI_EP12	POINT	812931.0	825469.0	6.2	8.0	Ambient	38.58	0.13					7.593E-05		2.278E-05		-		0800 - 1800
	MWI_EP131	AREA	812900.0	825468.0	6.2	0.5				28	4	5	0.00001		3.976E-06		9.543E-07		-	0800 - 1800
	MWI_EP132	AREA	812900.0	825468.0	6.2	0.5				28	4	10	0.00001		1.761E-06		4.226E-07		-	0800 - 1800
	MWI_EP133a	AREA	812900.0	825468.0	6.2	0.5				50	4	30	0.00001		1.249E-06		2.998E-07		-	0800 - 1800
	MWI_EP134b	AREA	812900.0	825468.0	6.2	0.5				60	4	44	0.00001		3.748E-06		8.994E-07		-	0800 - 1800
Pillar Point Valley Landfill Flare [4]	PPVL	POINT	812492.0	825646.0	14.5	19.5	353	15.00	1.45					7.680E-02		6.550E-02		4.499E-01		0000 - 2400
Butterfly Beach Laundry [5]	BBL1	POINT	812956.0	825600.0	6.3	38.0	482	7.50	0.79					1.221E-02		1.221E-02		1.058E-01		0730 - 2230
	BBL2	POINT	812956.0	825598.0	6.3	38.0	483	7.50	0.79					1.221E-02		1.221E-02		1.058E-01		0730 - 2230
	BBL3	POINT	812958.0	825599.0	6.3	38.0	472	7.50	0.79					1.221E-02		1.221E-02		1.058E-01		0730 - 2230
Castle Peak Power Station [6]	CPA	POINT	809780.3	826410.2	7.4	215.0	383	19.89	10.80					4.143E+00		4.143E+00		2.096E+02		0000 - 2400
	CPB	POINT	809975.8	826085.4	7.4	250.0	353	26.06	13.20					3.341E+00		3.341E+00		1.261E+02		0000 - 2400
Green Island Cement Company Limited [7]	GIC58	POINT	810254.7	825771.9	7.0	113	383	20.60	3.10					5.583E+00		5.583E+00		1.117E+02		0000 - 2400

Note:

[1] With reference to the approved EIA report of Hung Shui Kiu New Development Area (AEIAR-203/2016), some of its assessed chimneys (i.e. CH1, CH2, CH3 and CH16 in HSK EIA) fall within the 500m assessment area of the Project. Site visit was conducted in April 2022 and June 2023 and confirmed that only CH1 [please also refer to note 2 for CH1] and CH3 are still under operation, while CH2 and CH16 no longer exist, and no new stack was found. However, chimney information was not provided by the operators. Hence, the stack and emission information is made reference to the approved EIA report of Hung Shui Kiu New Development Area (AEIAR-203/2016). Nonetheless, based on site verification, location of the chimney has been updated.

[2] For chimney CH1 identified in the approved EIA report of Hung Shui Kiu New Development Area (AEIAR-203/2016), CEDD advised that construction of the proposed public housing developments at Nai Wai site will be carried out between 2026 and 2031. The industrial premise of chimney CH1 within the site boundary of the Nai Wai site therefore will be resumed before 2031 and before commissioning of TMB in 2033. Therefore, CH1 was not included.

[3] The stack information is made reference to their respective Air Pollution Control Plans (APCP).

[4] The stack information of Pillar Point Landfill Flare is made reference to the information provided by operator. Please see "Detailed Calculation of NOx and PM Emissions from Pillar Point Valley Landfill" for the detailed emission calculation. Where the emission rates for RSP are not available, it is considered reasonable to assume the same as that of TSP since most of the particulates contributed from these industrial chimneys after combustion would likely be less than or equal to 10μm in size. Where the emission rates for FSP are not available, it has been assumed the same as that of RSP for conservative assessment.

[5] The stack information and energy consumption data of Butterfly Beach Laundry are provided by the Hospital Authority. Please see "Detailed Calculation of NOx and PM Emission from Butterfly Beach Laundry" for the detailed emission calculation. Where the emission rates for RSP are not available, it is considered reasonable to assume the same as that of TSP since most of the particulates contributed from these industrial chimneys after combustion would likely be less than or equal to 10μm in size. Where the emission rates for FSP are not available, it has been assumed the same as that of RSP for conservative assessment.

[6] Exit velocity is calculated from flow rate from its SP licence. Stack height, exit temperature and stack diameter are referred to the APCP of Black Point Power Station (BPPS). The emission rates are made reference to the Ninth Technical Memorandum for Allocation of Emission Allowances in respect of Specified Licences. Emissions for CPA and CPB are based on the proportion in BPPS APCP. Temporal profiles from PATH 2.1 are applied. Where the emission rates for FSP are not available, it has been assumed the same as that of RSP for conservative assessment.

[7] The stack information is made reference to its SP Licence. Where the emission rates for RSP are not available, it is considered reasonable to assume the same as that of TSP since most of the particulates contributed from these industrial chimneys after combustion would likely be less than or equal to 10μm in size. Where the emission rates for FSP are not available, it has been assumed the same as that of RSP for conservative assessment.

[8] Site surveys have been conducted in April 2022 and June 2023 covering all accessible areas in the assessment area, no other chimneys were identified. Therefore, all chimneys within 500m has been included in the near-field model in the assessment.

Detailed Calculation of NOx and PM Emissions from Pillar Point Valley Landfill Flare

Emission from Landfill Gas Consumption [1]

Max. landfill gas consumption rate in Pillar Point Valley Landfill Flare	=	1700	m^3/hr [1]
Secondary NOx emission from flare system		650	kg/10^6 scm Methane [2]
Secondary PM emission from flare system		270	kg/10^6 scm Methane [2]
Standard Conditions (US standard)[3]:			
		60	F
	=	15.6	C
	=	288.6	K
Assume LFG at typical ambient temperature:			
		25	C
	=	298	K
	Therefore,		
		1	m^3 at 25°C
	=	0.96830723	scm
Landfill gas to be flared in Flare System		1700	m^3/hr [1]
	=	850	m^3/hr Methane, (50% Methane content in LFG)[1]
	=	823.0611	scm/hr
	=	0.2286281	scm/s
	NOx Emission =	**1.486E-01**	**g/s**
	PM (RSP/FSP) Emission [4] =	**6.173E-02**	**g/s**

Emission from Diesel Consumption [1]

Max. diesel consumption rate in Pillar Point Valley Landfill Flare	=	452	L/hr [1]
NOx emission factor	=	20	lb/1000 gal [5]
RSP emission factor	=	1	lb/1000 gal [5]
FSP emission factor	=	0.25	lb/1000 gal [5]

Summary of Emission Factors

Emission Factor (g/L)[6]		
NO_X	RSP	FSP
2.4	0.12	0.03

NOx Emission =	**3.013E-01**	**g/s**
RSP Emission =	**1.507E-02**	**g/s**
FSP Emission =	**3.767E-03**	**g/s**

Total Emission from Pillar Point Valley Landfill Flare

NOx Emission =	**4.499E-01**	**g/s**
RSP Emission =	**7.680E-02**	**g/s**
FSP Emission =	**6.550E-02**	**g/s**

Release Height of Chimney at Pillar Point Valley Landfill Flare	=	19.495	m [1]
Exit Temperature of Chimney at Pillar Point Valley Landfill Flare	=	353	K [1]
Internal Diameter of Chimney at Pillar Point Valley Landfill Flare	=	1.45	m [1]
Exit Velocity of Chimney at Pillar Point Valley Landfill Flare	=	15	m/s [1]

Note:
[1] Information provided by Pillar Point Valley Landfill operator. Landfill gas and diesel are consumed for the leachate treatment plant and landfill gas generator as provided by the operator.
[2] Information is made reference to Table2.4-4 of USEPA AP-42 Fifth Edition.
[3] Information is made reference to Appendix 3.5 of the approved EIA report of West New Territories (WENT) Landfill Extension (AEIAR-147/2009).
[4] According to Table2.4-4 of USEPA AP-42 Fifth Edition, the emission factor can be used for RSP and FSP.
[5] Information is made reference to Table 1.3-1 & Table 1.3-6 of USEPA AP-42 Fifth Edition.
[6] Conversion factor of 0.12 is adopted to convert from lb/1000 gal to g/L.

Detailed Calculation of NOx and PM Emissions from Butterfly Beach Laundry

Emission from Towngas Consumption

Towngas Consumption	8,697,840	MJ per month[1]	
Operating Hours Per Day	15	hours[1]	
Operating Days Per Month	31	days[1]	
	18,705	MJ per hour	
	1,083	m^3 per hour	(17.27 MJ = 1 m^3) [2]
Towngas Consumption	1,083,094	L per hour	
	38,249	scf per hour	(To convert from L to scf, multiply by 0.035)
Heat input	39,014,083	Btu per hour	(To convert from scf to Btu, multiply by 1,020)
	39	MMBtu per hou	(<100 MMBtu/hr, i.e. small boiler)
PM Emission Factor[3]	7.6	lb/10^6 scf	
	0.1217	g/m^3	(To convert from lb/scf to g/m^3, multiply by 16,018)
NOx Emission Factor[4]	0.22	g/kWh	
Towngas Consumption	5,196	kWh per hour	(1 MJ = 0.2778 kWh)

Emission Rate for Each Chimney[5]

NOx	PM	Unit
381.1	44.0	g/hr
0.1058	0.0122	g/s

Source [6]	Source ID	Type	X	Y	Release Height	Exit Temperature	Exit velocity	Internal diameter	Emission Rate (g/s)			Operation Hour
			(m)	(m)	(m)	(K)	(m/s)	(m)	NOx	RSP [7]	FSP [7]	
Butterfly Beach Laundry	BBL1	POINT	812956.0	825600.0	38	482	7.5	0.79	1.058E-01	1.221E-02	1.221E-02	0730 - 2230
	BBL2	POINT	812956.0	825598.0	38	483	7.5	0.79	1.058E-01	1.221E-02	1.221E-02	
	BBL3	POINT	812958.0	825599.0	38	472	7.5	0.79	1.058E-01	1.221E-02	1.221E-02	

Note:

[1] Data provided by the Hospital Authority. The highest consumption month, i.e. Mar-2022, within the period between Oct-2021 and Sep-2022 has been adopted for assessment. The operating hours in Mar-2022 were 15 hours per day from Monday to Sunday.

[2] 17.27 MJ = 1 m^3, reference from Electrical and Mechanical Services Department, https://www.emsd.gov.hk/en/gas_safety/gas_safety_tips_to_users/types_of_domestic_fuel_gases_and_their_properties/

[3] Information is made reference to Table 1.4-1 of USEPA AP-42 Fifth Edition.

[4] Information is made reference to the approved EIA report of Provision of a Poultry Slaughtering Centre in Sheung Shui (AEIAR-142/2009).

[5] There are 3 chimneys for Butterfly Beach Laundry and it is assumed that the emission is emitted evenly from the three chimneys (i.e. 1/3 for each chimney).

[6] Chimney height, exit temperature, exit velocity, diameter and operation period are provided by the Hospital Authority.

[7] Where the emission rates for RSP are not available, it is considered reasonable to assume the same as that of TSP since most of the particulates contributed from these industrial chimneys after combustion would likely be less than or equal to 10μm in size. Where the emission rates for FSP are not available, it has been assumed the same as that of RSP for conservative assessment.

Particle Size Distribution of Process for Hong Kong China Concrete Company Limited and Multi-Way Industries Limited

HKCC-EP2-5, HKCC-EP9, MWI-EP7-12

General Concrete Batching Process [1]		for RSP	for FSP
Particles Size Range	**Average Particles Size**	**Percentage**	**Percentage**
≤ 1.0	0.50	8%	27%
1.0 - 2.0	1.50	14%	47%
2.0 - 2.5	2.25	8%	27%
2.5 - 3.0	2.75	6%	-
3.0 - 4.0	3.50	14%	-
4.0 - 5.0	4.50	10%	-
5.0 - 6.0	5.50	8%	-
6.0 - 10	8.00	33%	-

HKCC-EP6_1-6_6, MWI-EP131-134b

Fugitive Emission from Paved Roads [2]		for RSP	for FSP
Particles Size Range	**Average Particles Size**	**Percentage**	**Percentage**
≤ 2.5	1.25	24%	100%
2.5 - 10.0	6.25	76%	-

HKCC-EP1, HKCC-EP7-8, MWI-EP1a-6b

Fugitive Emission from Material Handling [3]		for RSP	for FSP
Particles Size Range	**Average Particles Size**	**Percentage**	**Percentage**
≤ 2.5	1.25	15%	100%
2.5 - 5.0	3.75	42%	-
5.0 - 10.0	7.50	43%	-

Note:
1. Reference from Category 3 “Mechanically Generated Aggregate, Unprocessed Ores”, Page B.2 -13, Appendix B.2 Generalized Particle Size Distributions, AP-42, USEPA
2. Reference from Table 13.2.1-1, Section 13.2.1.3 , AP-42 Fifth Version, USEPA
3. Reference from Section 13.2.4 , AP-42 Fifth Version, USEPA
4. Percentages presented in table may not sum up to 100% due to rounding.

Sources in Polystyrene Foam Products Factory Limited

N

Fuk Hang Playground

Miu Fat Buddhist Monastery

CH3

The Sherwood

0 20 40 80 120 160 Meters

Note: Please refer to Figure 3.5 for location of sources.

Legend

- Chimneys
- 500m Assessment Area
- 4km Assessment Area
- TMB Proposed Alignment
- TMB Proposed Alignment (Tunnel)
- R11 Proposed Alignment
- R11 Proposed Alignment (Tunnel)

Sources in Hong Kong China Concrete Company Limited and Multi-Way Industries Limited

N

Ho Yeung Street

Ho Hoi Street

MWI_EP7
MWI_EP8
MWI_EP9
MWI_EP12
MWI_EP131
MWI_EP132
MWI_EP11
MWI_EP10
MWI_EP133a
MWI_EP134b
MWI_EP6b
MWI_EP5a
MWI_EP4a
MWI_EP3a
MWI_EP2a
MWI_EP1a
HKCC_EP6_1
HKCC_EP6_2
HKCC_EP6_3
HKCC_EP6_4
HKCC_EP6_5
HKCC_EP6_6
HKCC_EP4
HKCC_EP3
HKCC_EP5
HKCC_EP2
HKCC_EP9
HKCC_EP8
HKCC_EP7
HKCC_EP1

0 5 10 20 30 40 Meters

Note: Please refer to Figure 3.5 for location of sources.

Legend

- Point Source
- Area Source
- 500m Assessment Area
- 4km Assessment Area
- TMB Proposed Alignment
- TMB Proposed Alignment (Tunnel)

Sources in Pillar Point Valley Landfill Flare and Butterfly Beach Laundry

PPVL

Pillar Point Valley Landfill

BBL1 BBL3

BBL2

Butterfly Beach Laundry

N

0 15 30 60 90 120

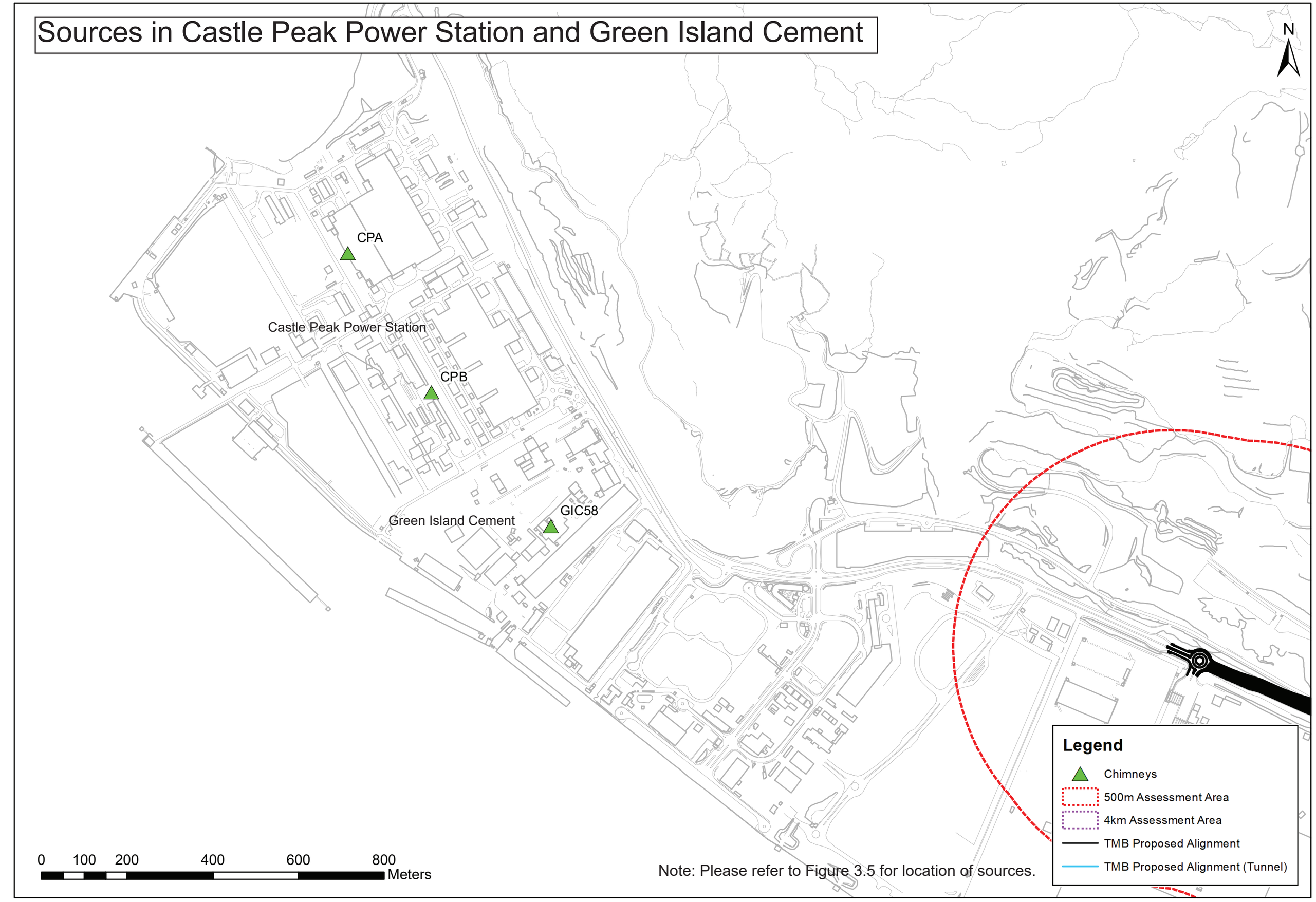
Meters

Note: Please refer to Figure 3.5 for location of sources.

Legend

- Chimneys
- 500m Assessment Area
- 4km Assessment Area
- TMB Proposed Alignment
- TMB Proposed Alignment (Tunnel)

Sources in Castle Peak Power Station and Green Island Cement



Note: Please refer to Figure 3.5 for location of sources.