

Criteria Pollutant Emission Inventory (OWTF)

Source	Source ID	Type	X (m)	Y (m)	Release Height (m)	Exit Temperature (K)	Exit velocity (m/s)	Internal diameter (m)	Emission Rate (g/s)		
									NOx	RSP	FSP [2]
OWTF [1]	OWTFCU	POINT	817820	819559	25	308	15	1.8	0.00E+00	2.03E-01	2.03E-01
	OWTFCO1	POINT	817897	819550	12	453	16.5	0.5	5.84E-01	2.92E-02	2.92E-02
	OWTFCO2	POINT	817897	819546	12	453	16.5	0.5	5.84E-01	2.92E-02	2.92E-02
	OWTFCO3	POINT	817902	819545	12	453	16.5	0.5	5.84E-01	2.92E-02	2.92E-02
	OWTFFGS	POINT	817903	819522	18	1173	13.3	2.2	2.35E+00	5.87E-02	5.87E-02
	OWTFASP	POINT	817902	819540	12	413	9.2	0.5	2.38E-01	5.96E-03	5.96E-03

Note:

[1] Emission rate and chimney information referenced from Environmental Review Report for "Organic Waste Treatment Facilities Phase 1: Proposed Design Change" (VEP488/2015)

[2] FSP emission rate is not given in Environmental Review Report for "Organic Waste Treatment Facilities Phase 1: Proposed Design Change" (VEP488/2015).

As a conservative assumption, FSP emission rates are assumed to be equal to RSP emission rates.

Emission Inventory (Vessels at NLRTS)

Source	Source Description	Source ID	Type	X (m)	Y (m)	Release Height (m)	Exit Temperature (K)	Exit velocity (m/s)	Internal diameter (m)	Emission Rate			Remarks
										Nox (g/s)	RSP (g/s)	FSP [2] (g/s)	
NLRTS-Main Engine	Cruising	MARa1	POINT	817684	820027	11	426	8	0.2	6.65E-03	3.63E-04	3.63E-04	Release height, exit temperature, exit velocity and emission rate referenced from "Report on Re-assessment of Environmental Implications, Organic Waste Treatment Facilities, Phase 1" (Application No. VEP-394/2013) For a conservative assessment, RSP emission rate is adopted as FSP emission rate
		MARa2	POINT	817650	819997	11	426	8	0.2	6.65E-03	3.63E-04	3.63E-04	
		MARa3	POINT	817615	819969	11	426	8	0.2	6.65E-03	3.63E-04	3.63E-04	
		MARa4	POINT	817581	819940	11	426	8	0.2	6.65E-03	3.63E-04	3.63E-04	
		MARa5	POINT	817545	819911	11	426	8	0.2	6.65E-03	3.63E-04	3.63E-04	
		MARa6	POINT	817510	819881	11	426	8	0.2	6.65E-03	3.63E-04	3.63E-04	
		MARa7	POINT	817476	819853	11	426	8	0.2	6.65E-03	3.63E-04	3.63E-04	
		MARa8	POINT	817440	819824	11	426	8	0.2	6.65E-03	3.63E-04	3.63E-04	
		MARa9	POINT	817407	819794	11	426	8	0.2	6.65E-03	3.63E-04	3.63E-04	
		MARa10	POINT	817373	819767	11	426	8	0.2	6.65E-03	3.63E-04	3.63E-04	
		MARa11	POINT	817338	819737	11	426	8	0.2	6.65E-03	3.63E-04	3.63E-04	
		MARa12	POINT	817303	819709	11	426	8	0.2	6.65E-03	3.63E-04	3.63E-04	
		MARa13	POINT	817269	819680	11	426	8	0.2	6.65E-03	3.63E-04	3.63E-04	
		MARa14	POINT	817234	819651	11	426	8	0.2	6.65E-03	3.63E-04	3.63E-04	
		MARa15	POINT	817199	819622	11	426	8	0.2	6.65E-03	3.63E-04	3.63E-04	
NLRTS-Auxiliary Engine	Maneuvering	MARI1	POINT	817677	820019	11	315	8	0.2	9.50E-01	3.80E-02	3.80E-02	
	Cruising	MARb1	POINT	817684	820027	11	315	8	0.2	2.12E-03	8.49E-05	8.49E-05	
		MARb2	POINT	817650	819997	11	315	8	0.2	2.12E-03	8.49E-05	8.49E-05	
		MARb3	POINT	817615	819969	11	315	8	0.2	2.12E-03	8.49E-05	8.49E-05	
		MARb4	POINT	817581	819940	11	315	8	0.2	2.12E-03	8.49E-05	8.49E-05	
		MARb5	POINT	817545	819911	11	315	8	0.2	2.12E-03	8.49E-05	8.49E-05	
		MARb6	POINT	817510	819881	11	315	8	0.2	2.12E-03	8.49E-05	8.49E-05	
		MARb7	POINT	817476	819853	11	315	8	0.2	2.12E-03	8.49E-05	8.49E-05	
		MARb8	POINT	817440	819824	11	315	8	0.2	2.12E-03	8.49E-05	8.49E-05	
		MARb9	POINT	817407	819794	11	315	8	0.2	2.12E-03	8.49E-05	8.49E-05	
		MARb10	POINT	817373	819767	11	315	8	0.2	2.12E-03	8.49E-05	8.49E-05	
		MARb11	POINT	817338	819737	11	315	8	0.2	2.12E-03	8.49E-05	8.49E-05	
		MARb12	POINT	817303	819709	11	315	8	0.2	2.12E-03	8.49E-05	8.49E-05	
		MARb13	POINT	817269	819680	11	315	8	0.2	2.12E-03	8.49E-05	8.49E-05	
		MARb14	POINT	817234	819651	11	315	8	0.2	2.12E-03	8.49E-05	8.49E-05	
MARb15	POINT	817199	819622	11	315	8	0.2	2.12E-03	8.49E-05	8.49E-05			

Note:

[1] Emission rate and chimney information referenced from Environmental Review Report for "Report on Re-assessment of Environmental Implications, Organic Waste Treatment Facilities, Phase 1" (Application No. VEP-394/2013)

[2] FSP emission rate is not given in Environmental Review Report for "Report on Re-assessment of Environmental Implications, Organic Waste Treatment Facilities, Phase 1" (Application No. VEP-394/2013). As a conservative assumption, FSP emission rates are assumed to be equal to RSP emission rates.

Daily Schedule of Marine Vessels at NLRTS

Hour of Day		Number of Activity per hour	
		Maneuvering	Cruising
0	1		
1	2		
2	3		
3	4		
4	5		
5	6		
6	7	1	
7	8		1
8	9		
9	10		
10	11		
11	12		1
12	13		
13	14	1	
14	15		1
15	16		
16	17		
17	18		
18	19		1
19	20		
20	21		
21	22		
22	23		
23	24		

Note: Referenced from Appendix 3.5 of Environmental Review Report for "Report on Re-assessment of Environmental Implications, Organic Waste Treatment Facilities, Phase 1" (Application No. VEP-394/2013).

Odour Emission Inventory (Siu Ho Wan)

Source	Source ID	Type	X	Y	Release Height	Exit Temperature	Exit velocity	Internal diameter	X-dim	Y-dim	Angle	Odour Emission Rate
			(m)	(m)	(m)	(K)	(m/s)	(m)	(m)	(m)	(o)	(OU/s) or (OU/m ² /s)
OWTF [1]	OWTFCU	POINT	817820	819559	25	308	15	1.8	---	---	---	7.44E+03
	OWTFASP	POINT	817902	819540	12	413	9.2	0.5	---	---	---	1.10E+01
SHW STW [2] [3] [4]	OD1	AREA	817576	819197	0	---	---	---	56	10	46.5	0.00E+00
	OD2	AREA	817554	819177	0	---	---	---	56	30	46.5	0.00E+00
	OD3	AREA	817583	819204	0	---	---	---	56	30	46.5	0.00E+00
	OD4	POINT	817685	819072	6	303	10	0.66	---	---	---	5.36E+02
	OD5	POINT	817679	819092	6	303	10	0.66	---	---	---	5.36E+02
	OD6	POINT	817789	819091	6	303	10	0.66	---	---	---	1.99E+02
	OD7	POINT	817513	819263	6	303	10	0.66	---	---	---	8.51E+02
	OD8	POINT	817664	819063	6	303	10	0.66	---	---	---	4.72E+01
	OD9	POINT	817598	819182	6	303	10	0.66	---	---	---	1.73E+03
NLRTS [5]	RTS1	POINT	817745	820050	15	303	1	1.6	---	---	---	4.80E+01
	RTS2	POINT	817740	820042	15	303	1	1.6	---	---	---	4.80E+01
	RTS3	POINT	817735	820033	15	303	1	1.6	---	---	---	4.80E+01
Proposed SPS [6] [7] [8]	SHWSPS	POINT	817081	819160	8.1	298	7	0.67	---	---	---	4.92E+01

Note:

- [1] Stack location, height and diameter, exit temperature and velocity, emission rate referenced from Appendix 3.1 of Environmental Review Report for "Organic Waste Treatment Facilities Phase 1: Proposed Design Change" (VEP488/2015)
- [2] Stack location, height and emission rate referenced from approved EIA for "Organic Waste Treatment Facilities Phase 1" (AEIAR-149/2010). No reference on stack diameter, exit temperature and velocity was available in the EIA. Thus stack diameter, exit temperature and velocity referenced from approved EIA for "Outlying Islands Sewerage Stage I Phase I" (EIA-124/BC), which is the best available information from the public domain.
- [3] According to information from DSD, the sedimentation tanks (OD1 - OD3) are covered and the deodourizing units for sedimentation tanks (OD9) are located in the vicinity of the tanks. Emission rate of OD9 calculated in "Calculation of Odour Emission at OD9 (Deodourizer Unit at SHWSTW Sedimentation Tank)" in this Appendix
- [4] Odour removal efficiency of OD4-OD9 assumed to be 95%. (Referenced from Environmental Permit for "Upgrading of Siu Ho Wan Sewerage Treatment Plant" (EP076/2000).
- [5] Emission rate calculated in "Calculation of Odour Emission at NLRTS" in this Appendix
- [6] Exit Temperature and velocity referenced from Appendix 3.1 of approved EIA for "Tuen Mun Area 54 Sewage Pumping Station" (AEIAR-122/2008)
- [7] Emission rate of proposed SPS calculated in "Calculation of Odour Emission from proposed Sewage Pumping Station" in this Appendix
- [8] Stack diameter of proposed SPS calculated in "Estimation of SPS Stack Diameter" in this Appendix

Calculation of Odour Emission at OD9 (Deodourizer Unit at SHWSTW Sedimentation Tank)

Source ID	X-dim	Y-dim	Unmitigated Odour Emission	Emission Rate
	(m)	(m)	(OU/m ² /s)	(OU/s)
OD1	56	10	7.44	4166.4
OD2	56	30	9.08	15254.4
OD3	56	30	9.08	15254.4
Unmitigated Emission Rate				34675.2
Odour Removal Efficiency [2]				95%
Mitigated Emission Rate				1733.8

Note:

[1] Source dimension and unmitigated emission rate referenced from Appendix 3.4 of Environmental Review Report for "Organic Waste Treatment Facilities Phase 1: Proposed Design Change" (VEP488/2015)

[2] Odour removal efficiency assumed to be 95%. (Referenced from Environmental Permit for "Upgrading of Siu Ho Wan Sewege Treatment Plant" (EP076/2000)).

Calculation of Odour Emission at NLRTS

Source ID	No.	X-dim	Y-dim	Unmitigated Odour Emission	Emission Rate
		(m)	(m)	(OU/m ² /s)	(OU/s)
Tipping Bay	1	6	36	3.68	794.88
Compacting Area	3	2.5	6	3.68	165.60
Unmitigated Emission Rate					960.48
Odour Removal Efficiency [3]					85%
Mitigated Emission Rate					144.07
Mitigated Emission Rate per Stack [4]					48.02

Note:

[1] Unmitigated emission rate referenced from Appendix A2 of Environmental Review Report for "Organic Waste Treatment Facilities Phase 1: Proposed Design Change" (VEP488/2015)

[2] Source dimensions are based on site observations

[3] Odour removal efficiency assumed to be 85%. With reference to the EIA for North Lantau Refuse Transfer Station (EIA-060/BC), a limit of maximum limit of 2 odour units at the site boundary is set to protect the public from nuisance and an odour control unit should be implemented in order to meet the odour standard at the site boundary. As also confirmed by EPD's Waste Transfer and Development Group, odour scrubbing units are installed at NLRTS to minimize the nuisance to the surrounding receivers, odour patrols are conducted regularly along the site boundary of NLRTS, and there were no odour complaints. Assumption of 85% removal efficiency in the current assessment is considered conservative.

[4] 3 stacks are located at NLRTS (with reference to Appendix A2 of Environmental Review Report for "Organic Waste Treatment Facilities Phase 1: Proposed Design Change" (VEP488/2015))

Calculation of Odour Emission from proposed Sewage Pumping Station

Source	No.	Length (m)	Width (m)	Area (m ²)
Wet well	3	2	5	30
Valve chamber	1	4	20	80
Emergency storage	2	1	1	2
Total Area (m ²)				112
Unmitigated Emission Rate (OU/s/m ²) [1]				8.79
Odour Removal Efficiency [2]				95%
Mitigated Emission Rate (OU/s)				49.22

Note:

[1] Unmitigated emission rate of inlet works at SHWSTW adopted as unmitigated emission rate of proposed SPS

[2] Odour removal efficiency referenced from Environmental Permit for "Queen's Hill Sewage Pumping Station" (EP-506/2016)

Estimation of SPS Stack Diameter

Parameter	Area (m ²)
Total Exposed Area (m ²) [1]	112
Ventilation Rate (/hr) [2]	10
Headroom Clearance (m) [3]	8
Volume of Air Released from SPS (m ³ /hr)	8960
Volume of Air Released from SPS (m ³ /s)	2.49
Exit Velocity (m/s) [4]	7
Chimney Diameter (m)	0.67

Note:

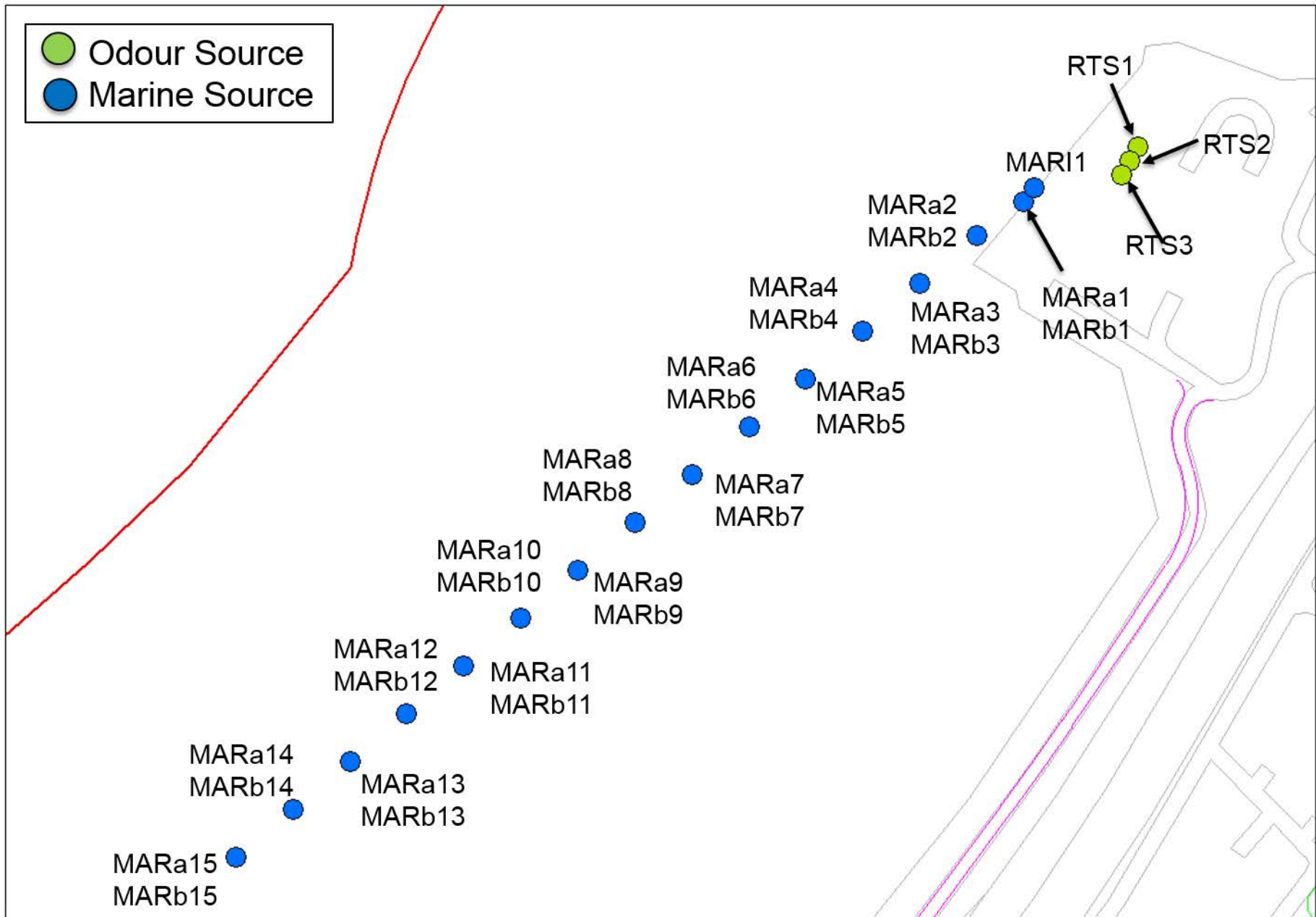
[1] Referenced from "Calculation of Odour Emission from proposed Sewage Pumping Station" in this Appendix

[2] With reference to DSD's "Sewerage Manual Part 2--Pumping Stations and Risng Mains", pump rooms and dry halls have a ventilation rate of 6-10. Ventilation rate is assumed to be 10 for a conservative assessment.

[3] Estimated by Engineer.

[4] Exit velocity referenced from Appendix 3.1 of approved EIA for "Tuen Mun Area 54 Sewage Pumping Station" (AEIAR-122/2008)

- Odour Source
- Marine Source



- Industrial Source
- Odour/Industrial Source

