## Appendix 3-1

## **Calculation of Odour Emission Rate**

lities No.	Source	Emission Factors		Parameters		
1	Odour Control Unit 1	Unmitigated	8.93973E+02	Total flow rate of each vent pipe (m <sup>3</sup> /s)	7.75	from Engineer
	(MIT)	OU/s		Emission Height, (m)		from Engineer
	(OD1 & OD2)	(one control unit)		Diameter of the stack, (m)		from Engineer
	Both OD1 & OD2 are designed for	(		Stack velocity, (m/s)		7 calculated
	all below facilities, thus each			Mitigation %	90	
	emission rate would be half of			Mildgadon /6	00	
	the total emission					
	the total emission					
	Enclosed Facilities:					
	Solids Handling Building	OU/s	3.4971E+03	Odour Emission Rate (OU/s)	E = DF x A x (V	 (2000) + Ot
	Solius Handling Building	00/s	3.4971E+03	Odour Emission Rate (OO/S)	E = DF X A X (V)	
				Dilution factor, DF (OU/m3)	0505	from HATS2A
				Air volume of the emission source, A (m3)		assumed (1*Surface Area)
				Total Exposed Area (m2)		from Engineer
				Ventilation rate, V (air changes per hour)		from Engineer
				Correction factor, Ct	1.31	Temperature correction factor
	Low Lift and Returns	OU/s	3.0586E+02	Odour Emission Rate (OU/s)	$E = DF \times A \times (V)$	/3600)
	Pumping Station					
				Dilution factor, DF (OU/m3)	1915	calculated, DF = 1.6 x (T/10) <sup>4.9</sup> x (ORP + 200) <sup>-0.59</sup>
				Temperature of sewage, T (F)	86	assumed
				Oxidation-reduction potential of sewage, ORP (mV)	150	assumed
				Air volume of the emission source, A (m3)	115	assumed (1*Surface Area)
				Total Exposed Area (m2)	115	from Engineer
				Ventilation rate, V (air changes per hour)		assumed 5 air changes per hour
				·····		
	Flash Mixing and	OU/s	3.3459E+03	Odour Emission Rate (OU/s)	$E = DF \times A \times (V)$	(3600)
	Flocculation Tanks	00/0	0.04002100			
				Dilution factor, DF (OU/m3)	1015	calculated, DF = 1.6 x (T/10) <sup>4.9</sup> x (ORP + 200) <sup>-0.59</sup>
						assumed
				Temperature of sewage, T (F)		assumed
				Oxidation-reduction potential of sewage, ORP (mV)		
				Air volume of the emission source, A (m3)		assumed (1*Surface Area)
				Total Exposed Area (m2)		from Engineer
				Ventilation rate, V (air changes per hour)	5	assumed 5 air changes per hour
	Sedimentation Tank (Weir Zone)	OU/s	3.6616E+03	Odour Emission Rate at weir (OU/s/m)	F 710 × 10 <sup>-4</sup> ×	
	. ,	00/s	3.0010E+03			x OP x F <sub>weir</sub> x h x K <sub>pH</sub>
	(PR01)			Odour potential, OP (OU/m3)		from Yang & Hobson
				Weir loading rate, Fweir (m3/m/h)		from Engineer
				Height of drops of liquid flow at weirs, h (m)		2 from Engineer
				pH correction coefficient, KpH	1.17	PH=7, from DSD,
				Surface Area of weir, m2)	225	from Engineer
				Weir width per each tank(m)		from Engineer
				Weir length per each tank (m)		) from Engineer
				Dry Weather Flow in Phase 2 (m3/d)		from DSD
				No. of Tanks	240000	
					9	
				Mitigation %	C	Odour reduction
		1	L			142
	Sedimentation Tank Effluent	OU/s	7.0946E+02	Odour Emission Rate (OU/s/m2)		0.0103V <sub>wind</sub> <sup>1.42</sup> + 2.93 V <sub>liquid</sub> ) x OP
	Channel			Odour potential, OP (OU/m3)	3305	from Yang & Hobson
				Velocity of liquid, V <sub>liquid</sub> (m/s)	8.1331E-02	2 from Engineer
				Wind Velocity, V <sub>wind</sub> (m/s)		2 from Engineer
				Odour Emission Reduction after UV process (%)		from Engineer
				Total Surface Area of Sedimentation Tank Effluent Channel, (m2)	225	from Engineer
						142
	Inlet Chamber of	OU/s	3.9039E+02	Odour Emission Rate (OU/s/m2)	Eton = $4 \times 10^{-3}$	0.0103V <sub>wind</sub> <sup>1.42</sup> + 2.93 V <sub>liguid</sub> ) x OP
	Outfall Pumping Station - A			Odour potential, OP (OU/m3)	3305	from Yang & Hobson
				Velocity of liquid, V <sub>liquid</sub> (m/s)		from Engineer
				Wind Velocity, V <sub>wind</sub> (m/s)		from Engineer
						•
				Odour Emission Reduction after UV process (%)		from Engineer
				Total Exposed Area of Outfall Pumping Station, (m2)	84	from Engineer
		1	1		1	

No. S	ource	Emission Factors		Parameters			
I	nlet Chamber of	OU/s	2.8602E+02	Odour Emission Rate (OU/s/m2)	Eton = 4 x 10 <sup>-3</sup> (0	0.0103V <sub>wind</sub> <sup>1.42</sup> + 2.93 V <sub>liquid</sub> ) x OP	
0	Outfall Pumping Station - B			Odour potential, OP (OU/m3)		from Yang & Hobson	
				Velocity of liquid, V <sub>liquid</sub> (m/s)	1.1997E-01	from Engineer	
				Wind Velocity, V <sub>wind</sub> (m/s)	2.5139E-02	from Engineer	
				Odour Emission Reduction after UV process (%)		from Engineer	
				Total Exposed Area of Outfall Pumping Station, (m2)		from Engineer	
ę	crew Pumps of	OU/s	9.3546E+02	Odour Emission Rate (OU/s/m2)	$Eton = 4 \times 10^{-3}$	 0.0103V <sub>wind</sub> <sup>1.42</sup> + 2.93 V <sub>liquid</sub> ) x OP	
	Outfall Pumping Station			Odour potential, OP (OU/m3)		from Yang & Hobson	
				Velocity of liquid, V <sub>liquid</sub> (m/s)		from Engineer	
				Wind Velocity, V <sub>wind</sub> (m/s)		from Engineer	
				Odour Emission Reduction after UV process (%)		from Engineer	
				Total Exposed Area of Outfall Pumping Station, (m2)		from Engineer	
	Vet Well of Outfall	OU/s	1.6593E+03	Odour Emission Rate (OU/s/m2)	$Eton = 4 \times 10^{-3}$	 0.0103V <sub>wind</sub> <sup>1.42</sup> + 2.93 V <sub>liquid</sub> ) × OP	
	Pumping Station	00,0		Odour potential, OP (OU/m3)		from Yang & Hobson	
. I.				Velocity of liquid, V <sub>liquid</sub> (m/s)		from Engineer	
				Wind Velocity, V <sub>wind</sub> (m/s)		from Engineer	
						from Engineer	
				Odour Emission Reduction after UV process (%) Total Exposed Area of Outfall Pumping Station, (m2)		from Engineer from Engineer	
				Total Exposed Area of Outial Fumping Station, (m2)	357	nom Engineer	
	nlet Chamber/Influent Channel, N01 - IN04)	OU/s	1.0105E+03	Odour Emission Rate (OU/s)	E = DF x A x (V/	3600) I	
	crew Pumps, Wet Wells of			Dilution factor, DF (OU/m3)	1915	calculated, DF = 1.6 x (T/10) <sup>4.9</sup> x (ORP + 200) <sup>-0.59</sup>	
	nlet Pumping Station			Temperature of sewage, T (F)	86	assumed	
	····			Oxidation-reduction potential of sewage, ORP (mV)	150	assumed	
				Air volume of the emission source, A (m3)	380	screw pump:(0.2 (the freeboard) * Surface Area); the other facilities assumed (1*Surface Area)	
				Total Exposed Area of Inlet Pumping Station (m2)	581	from Engineer	
				Ventilation rate, V (air changes per hour)	5	assumed 5 air changes per hour	
	Coarse Screens and Common Flow Channel	OU/s	5.7449E+02	Odour Emission Rate (OU/s)	E = DF x A x (V/		
(	SC01 - SC04)			Dilution factor, DF (OU/m3)	1915	calculated, DF = 1.6 x (T/10) <sup>4.9</sup> x (ORP + 200) <sup>-0.59</sup>	
`	,			Temperature of sewage, T (F)		assumed	
				Oxidation-reduction potential of sewage, ORP (mV)		assumed	
				Air volume of the emission source, A (m3)		assumed (1*Surface Area)	
				Total Exposed Area (m2)		from Engineer	
				Ventilation rate, V (air changes per hour)	5	assumed 5 air changes per hour	
	erated Grit Channel and common Flow Channel	OU/s	9.1626E+02	Odour Emission Rate (OU/s)	E = DF x A x (V/	3600) I	
(	GR01)			Dilution factor, DF (OU/m3)	1915	calculated, DF = 1.6 x (T/10) <sup>4.9</sup> x (ORP + 200) <sup>-0.59</sup>	
Ì	,			Temperature of sewage, T (F)	86	assumed	
				Oxidation-reduction potential of sewage, ORP (mV)		assumed	
				Air volume of the emission source, A (m3)		assumed (1*Surface Area)	
				Total Exposed Area (m2)		from Engineer	
				Ventilation rate, V (air changes per hour)	5	assumed 5 air changes per hour	
	ine Screen and Common Flow Channel after Fine Screens	OU/s	5.8713E+02	Odour Emission Rate (OU/s)	E = DF x A x (V/		
(	FSC01 - FSC06)			Dilution factor, DF (OU/m3)		calculated, DF = 1.6 x (T/10) <sup>4.9</sup> x (ORP + 200) <sup>-0.59</sup>	
				Temperature of sewage, T (F)	86	assumed	
				Oxidation-reduction potential of sewage, ORP (mV)		assumed	
				Air volume of the emission source, A (m3)		assumed (1*Surface Area)	
				Total Exposed Area (m2)	221		
		1		Ventilation rate, V (air changes per hour)	5	assumed 5 air changes per hour	

Facilities No.	Source	Emission Factors		Parameters	-	
2	Sedimentation Tanks	Unmitigated	2.0651E-02	Odour Emission Rate (OU/s/m2)		0.0103V <sub>wind</sub> <sup>1.42</sup> + 2.93 V <sub>liquid</sub> ) x OP
	(Quiescent Zone)	OU/s/m2		Odour potential, OP (OU/m3)		from Yang & Hobson
	(PR02)			Velocity of liquid, V <sub>liquid</sub> (m/s)	4.8611E-04	from Engineer
	· · · ·			Wind Velocity, V <sub>wind</sub> (m/s)		from Engineer
				wind vereery, wind (m/e)	4.70172.02	
		OLD	1.8990E-02			
		OLD	(max. rate)			
		OU/s/m2	(IIIax. Tale)	For surface roughness Zo = 1.0m		
		Equiescent zone- class A	1.8904E-02	Wind Speed at emission source, $V_{wind}$ (m/s)	$U_{-} = (U^{*} / k) \times [I_{-}]$	$I_{(Z_1 / Z_0)-\psi_M(Z_1/L)+(\psi_M(Z_0/L))}$ from Komari et al.,
		Equiescent zone - class B	1.8956E-02	Wind Speed at emission source, V <sub>wind</sub> (m/s)		calculated (for stability class A)
		Equiescent zone - class C	1.8990E-02	Wind Speed at emission source, V <sub>wind-B</sub> (m/s)		calculated (for stability class B)
		Equiescent zone - class D	1.8988E-02	Wind Speed at emission source, V <sub>wind-C</sub> (m/s)		calculated (for stability class C)
		Equiescent zone - class E	1.8922E-02	Wind Speed at emission source, V <sub>wind-D</sub> (m/s)		calculated (for stability class D)
		Equiescent zone - class F	1.8854E-02	Wind Speed at emission source, $V_{wind-E}$ (m/s)		calculated (for stability class E)
		Equiescent zone Class I	1.00342-02	Wind Speed at emission source, V <sub>wind-E</sub> (m/s)		calculated (for stability class E)
				Friction velocity, $U_{\Delta}^*$ (m/s)		calculated (for stability class A)
				Friction velocity, $U_{B}^{*}$ (m/s)		calculated, (for stability class A)
						calculated, (for stability class B)
				Friction velocity, U <sub>C</sub> * (m/s) Friction velocity, U <sub>D</sub> * (m/s)		calculated, (for stability class C) calculated, (for stability class D)
				, , ,		calculated, (for stability class D) calculated, (for stability class E)
				Friction velocity, U <sub>E</sub> * (m/s)		calculated, (for stability class E) calculated, (for stability class F)
				Friction velocity, $U_{F}^{*}$ (m/s)		
				Mean Obukov length, $L_A$ (m)		calculated, (for stability class A)
				Mean Obukov length, $L_B$ (m)		calculated, (for stability class B)
				Mean Obukov length, L <sub>C</sub> (m)		calculated, (for stability class C)
				Mean Obukov length, L <sub>D</sub> (m)		calculated, (for stability class D)
				Mean Obukov length, L <sub>E</sub> (m)		calculated, (for stability class E)
				Mean Obukov length, L <sub>F</sub> (m)		calculated, (for stability class F)
				Karman constant, k	0.41	
				Z <sub>1</sub> , (m)	1.01	
				Z <sub>0</sub> , (m)	1	
3	Odour Control Unit	Unmitigated	9.39526E+02	Total flow rate of each vent pipe (m <sup>3</sup> /s)	11.00	from Engineer
3		OU/s	9.39320E+02	Emission Height, (m)		from Engineer
	(OD3 & OD4)	(one control unit)		Diameter of the stack, (m)		from Engineer
	(003 & 004)	(one control unit)		Stack velocity, (m/s)		calculated
	Both OD3 & OD4 deodorized for			Mitigation %	90	
	below facilities, thus each			intigation /o		
	emission rate would be half of			Odour Emission Rate (OU/s)	$E = DF \times A \times (V/$	1900) × Ct
	the total emission			Dilution factor, DF (OU/m3)		measured max. odour concentration, oum <sup>-3</sup> of fresh dewatered sludge at Stonecutter Island STW
				Ventilation rate, V (air changes per hour)		for Raw Sludge Holding Tanks, Sludge Pumping Station, Return Liqour Pumping Station
				Ventilation rate, V (air changes per hour)		for Septic Waste Area, Sludge Dewatering Building
				Correction factor, Ct		Temperature correction factor
	Septic Waste Area	OU/s	6.0756E+02	Air volume of the emission source, A (m3)	15	assumed (1*Surface Area)
				Total Exposed Area of Septic Waste Area, (m2)		from Engineer
	Raw Sludge Holding Tanks	OU/s	1.0043E+04	Air volume of the emission source, A (m3)		assumed (1*Surface Area)
				Total Exposed Area of Raw Sludge Holding Tanks, (m2)	726	from Engineer
		1				
	Sludge Pumping Station	OU/s	4.9800E+02	Air volume of the emission source, A (m3)		assumed (1*Surface Area)
				Total Exposed Area of Sludge Pumping Station, (m2)	36	from Engineer
	Determ Linear Day in Const	011/-	4 4 5 9 9 5 9 9			
	Return Liqour Pumping Station	OU/s	4.1500E+02	Air volume of the emission source, A (m3)		assumed (1*Surface Area)
				Total Exposed Area of Return Liquor Pumping Station, (m2)	30	from Engineer
	Sludge Dowetoring Building		2 64525 .00	Air volume of the omission source $A(m0)$		annumad (1*Surface Area)
	Sludge Dewatering Building	OU/s	3.6453E+03	Air volume of the emission source, A (m3)		assumed (1*Surface Area) from Engineer
				Total Exposed Area of Sludge Dewatering Building, (m2)	88	from Engineer
	Contrifue		3.3200E+02	Air volume of the emission source $A(m^2)$	04	annumad (1*Surface Area)
	Centrifuge	OU/s	3.3200E+02	Air volume of the emission source, A (m3)		assumed (1*Surface Area) from Engineer
			1	Total Exposed Area of Centrifuge, (m2)	24	nom Engineer

Facilities No.	Source	Emission Factors		Parameters			
	Fine Screens Influent Channel	OU/s	1.0208E+02	Odour Emission Rate (OU/s/m2)	Eton = 4 x 10 <sup>-3</sup>	(0.0103V <sub>wind</sub> <sup>1.42</sup> + 2.93 V <sub>liquid</sub> ) x OP	
	(for disinfection facilities)			Odour potential, OP (OU/m3)	3305	5 from Yang & Hobson	
	(FIS01)			Velocity of liquid, V <sub>liquid</sub> (m/s)	8.1331E-02	2 from Engineer	
				Wind Velocity, V <sub>wind</sub> (m/s)	1.5000E-02	2 from Engineer	
				Odour Emission Reduction after UV process (%)		0 from Engineer	
				Exposed Area of Fine Screen Influent Channel (m2)	32.4	4 from Engineer	
	Fine Screens	OU/s	2.0164E+02	Odour Emission Rate (OU/s/m2)	$Eton = 4 \times 10^{-3}$	(0.0103V <sub>wind</sub> <sup>1.42</sup> + 2.93 V <sub>liquid</sub> ) x OP	
	(for disinfection facilities)			Odour potential, OP (OU/m3)		5 from Yang & Hobson	
	(FIS02-FIS03)			Velocity of liquid, V <sub>liquid</sub> (m/s)	8.1331E-02	2 from Engineer	
				Wind Velocity, V <sub>wind</sub> (m/s)	1.1111E-02	2 from Engineer	
				Odour Emission Reduction after UV process (%)		0 from Engineer	
				Exposed Area of Fine Screen (m2)	64	4 from Engineer	
	UV Tank Influent Channel	OU/s	6.4932E+01	Odour Emission Rate (OU/s/m2)	$Eton = 4 \times 10^{-3}$	(0.0103V <sub>wind</sub> <sup>1.42</sup> + 2.93 V <sub>liquid</sub> ) x OP	
	(UV01)			Odour potential, OP (OU/m3)		5 from Yang & Hobson	
				Velocity of liquid, V <sub>liquid</sub> (m/s)	7.6248E-03	3 from Engineer	
				Wind Velocity, V <sub>wind</sub> (m/s)	5.0556E-02	2 from Engineer	
				Odour Emission Reduction after UV process (%)		0 from Engineer	
				Total Exposed Area (m2)	218	8 from Engineer	
	UV Tank	OU/s	2.2555E+03	Odour Emission Rate (OU/s/m2)	$Eton = 4 \times 10^{-3}$	(0.0103V <sub>wind</sub> <sup>1.42</sup> + 2.93 V <sub>liquid</sub> ) x OP	
	(UV02-UV03)			Odour potential, OP (OU/m3)		5 from Yang & Hobson	
				Velocity of liquid, V <sub>liquid</sub> (m/s)		2 from Engineer	
				Wind Velocity, V <sub>wind</sub> (m/s)	3.4514E-02	2 from Engineer	
				Odour Emission Reduction after UV process (%)		0 from Engineer	
				Exposed Area of UV Tanks (m2)	795.2	2 from Engineer	
	UV Tank Effluent Channel	OU/s	6.2551E+02	Odour Emission Rate (OU/s/m2)		(0.0103V <sub>wind</sub> <sup>1.42</sup> + 2.93 V <sub>liquid</sub> ) x OP	
	(UV04-UV06)			Odour potential, OP (OU/m3)		5 from Yang & Hobson	
			1	Velocity of liquid, V <sub>liquid</sub> (m/s)		2 from Engineer	
			1	Wind Velocity, V <sub>wind</sub> (m/s)	1.0194E-0	1 from Engineer	
			1	Odour Emission Reduction after UV process (%)		0 from Engineer	
				Exposed Area of UV Effluent Channel (m2)	220.2	2 from Engineer	

Note:

The design wind velocity at the liquid surface of enclosed facilities including sedimentation tank effleunt channel; inlet chamber, screw pumps and wet wells of outfall pumping station; fine screens (for disinfection facilities); UV tank influent channel; UV tank & effluent channelwould not be greater than 0.00867m/s.

Facilities No.	Source	Emission Factors		Parameters		
1	Odour Control Unit 1	Mitigated	6.0026E+02	Total flow rate of each vent pipe (m <sup>3</sup> /s)	10.86	from Engineer
	(MIT)	OU/s		Emission Height, (m)		from Engineer
	(OD1, OD2 & OD5)	(one control unit)		Diameter of the stack, (m)		from Engineer
	Enclosed Facilities no. 2			Stack velocity, (m/s)		2 calculated
				Mitigation %	90	
	Both OD1, OD2 & OD5 are designed					
	for all below facilities, thus each			Odour Emission Rate (OU/s)	$E = DF \times A \times (V)$	//3600)
	emission rate would be one third of the total emission			Dilution factor, DF (OU/m3) Temperature of sewage, T (F)		calculated, DF = 1.6 x (T/10) <sup>4.9</sup> x (ORP + 200) <sup>-0.59</sup> assumed
				Oxidation-reduction potential of sewage, ORP (mV)		assumed
				Ventilation rate, V (air changes per hour)		assumed 5 air changes per hour
				Ventilation rate, V (air changes per hour)		for Solids Handling Building
	Enclosed Facilities:					
	Inlet Chamber/Influent Channel,	OU/s	1.0105E+03	Air volume of the emission source, A (m3)		screw pump:(0.2 (the freeboard) * Surface Area); the other facilities assumed (1*Surface Area)
	(IN01 - IN04)			Total Exposed Area of Inlet Pumping Station (m2)	581	from Engineer
	Screw Pumps and Wet Wells of					
	Inlet Pumping Station					
	Coarse Screens and	OU/s	5.7449E+02	Air volume of the emission source, A (m3)	216	assumed (1*Surface Area)
	Common Flow Channel			Total Exposed Area (m2)		from Engineer
	(SC01 - SC04)				-	
		OU/s	9.1626E+02	Air volume of the emission source, A (m3)		assumed (1*Surface Area)
	Common Flow Channel			Total Exposed Area (m2)	345	from Engineer
	(GR01)					
	Fine Screen and Common Flow	OU/s	5.8713E+02	Air volume of the emission source, A (m3)	221	assumed (1*Surface Area)
	Channel after Fine Screens	00/3	5.07132+02	Total Exposed Area (m2)		from Engineer
	(FSC01 - FSC06)			······		
	,					
	Solids Handling Building	OU/s	3.4971E+03	Odour Emission Rate (OU/s)	$E = DF \times A \times (V$	
				Dilution factor, DF (OU/m3)		from HATS2A measurement data (max odour concentration of screens)
				Air volume of the emission source, A (m3)		assumed (1*Surface Area)
				Total Exposed Area (m2) Temperature Correction factor, Ct		from Engineer Temperature correction factor
				remperature conection factor, of	1.51	
	Low Lift and Returns	OU/s	3.0586E+02	Air volume of the emission source, A (m3)	115	assumed (1*Surface Area)
	Pumping Station	0.010	0.00002102	Total Exposed Area (m2)		from Engineer
	1 0					
	Flash Mixing and	OU/s	3.3459E+03	Air volume of the emission source, A (m3)		3 assumed (1*Surface Area)
	Flocculation Tanks			Total Exposed Area (m2)	1258	3 from Engineer
					<b>-</b>	
	Sedimentation Tanks	OU/s	1.2824E+02	Odour Emission Rate (OU/s/m2)		(0.0103V <sub>wind</sub> <sup>1.42</sup> + 2.93 V <sub>liquid</sub> ) × OP
	(Quiescent Zone)		1.4719E+02	Odour potential, OP (OU/m3)		from Yang & Hobson
	(PR02)			Velocity of liquid, V <sub>liquid</sub> (m/s)		f from Engineer
				Wind Velocity, V <sub>wind</sub> (m/s)		2 from Engineer
				Covered Area, (m <sup>2</sup> )		covered all sedimentation tanks
				Mitigation %	C	Odour reduction
	Sedimentation Tank (Weir Zone)	F.	3.6616E+03	Odour Emission Rate at weir (OU/s/m)	$F = 7.16 \times 10^{-4}$	l x OP x F <sub>wair</sub> x h x K <sub>nH</sub>
	(PR01)	E <sub>weir</sub> OU/s	5.00T0L+03	Odour potential, OP (OU/m3)		from Yang & Hobson
	(FROT)	00/8		Weir loading rate, Fweir (m3/m/h)		from Engineer
				Height of drops of liquid flow at weirs, h (m)		from Engineer
				pH correction coefficient, KpH		pH=7, from DSD,
				Surface Area of weir, m2)		5 from Engineer
				Weir width per each tank(m)		from Engineer
				Weir length per each tank (m)		from Engineer
				Dry Weather Flow in Phase 2 (m3/d)		from DSD
				No. of Tanks	9	9
				Mitigation %	C	Odour reduction

Facilities No.	Source	Emission Factors	<u> </u>	Parameters	1	
	Sedimentation Tank Effluent	OU/s	7.0946E+02		Etere 4 x 10 <sup>-3</sup> /	$1.42 \cdot 0.00 \times 1.42$
		OU/s		Odour Emission Rate (OU/s/m2)		0.0103V <sub>wind</sub> <sup>1.42</sup> + 2.93 V <sub>liquid</sub> ) × OP
	Channel		7.1053E+02	Odour potential, OP (OU/m3)		from Yang & Hobson
				Velocity of liquid, V <sub>liquid</sub> (m/s)		from Engineer
				Wind Velocity, V <sub>wind</sub> (m/s)		from Engineer
				Odour Emission Reduction after UV process (%)		from Engineer
				Total Surface Area of Sedimentation Tank Effluent Channel, (m <sup>2</sup> )	225	from Engineer
				Mitigation %	0	
	Inlet Chamber of	OU/s	3.9039E+02	Odeur Emission Data (OLU/a/m0)	Eter 4 x 10 <sup>-3</sup> /	l 0.0103V <sub>wind</sub> <sup>1.42</sup> + 2.93 V <sub>liquid</sub> ) x OP
	Outfall Pumping Station - A	OU/s	3.9039E+02	Odour Emission Rate (OU/s/m2) Odour potential, OP (OU/m3)		from Yang & Hobson
	Outian Pumping Station - A			Velocity of liquid, V <sub>liquid</sub> (m/s)		from Engineer
						÷
				Wind Velocity, V <sub>wind</sub> (m/s)	1.9444E-02	from Engineer
				Odour Emission Reduction after UV process (%)	0	from Engineer
				Total Exposed Area of Outfall Pumping Station, (m2) Mitigation %	84	from Engineer
				Milgalion %	0	
	Inlet Chamber of	OU/s	2.8602E+02	Odour Emission Rate (OU/s/m2)	$Eton = 4 \times 10^{-3}$	l 0.0103V <sub>wind</sub> <sup>1.42</sup> + 2.93 V <sub>Ilauid</sub> ) × OP
	Outfall Pumping Station - B		2.00022702	Odour potential, OP (OU/m3)		from Yang & Hobson
	eactain amping station - D			Velocity of liquid, V <sub>liquid</sub> (m/s)		from Engineer
				Wind Velocity, V <sub>wind</sub> (m/s)		from Engineer
				Odour Emission Reduction after UV process (%)		from Engineer
				Total Exposed Area of Outfall Pumping Station, (m2)		from Engineer
				Mitigation %	02	nom Engineer
				Willigation 78	0	
	Screw Pumps of	OU/s	9.3546E+02	Odour Emission Rate (OU/s/m2)	$Eton = 4 \times 10^{-3}$	0.0103V <sub>wind</sub> <sup>1.42</sup> + 2.93 V <sub>liquid</sub> ) × OP
	Outfall Pumping Station	00/0	0.00402102	Odour potential, OP (OU/m3)	3305	from Yang & Hobson
	oution amping oution			Velocity of liquid, V <sub>liquid</sub> (m/s)		from Engineer
				Wind Velocity, V <sub>wind</sub> (m/s)		from Engineer
				Odour Emission Reduction after UV process (%)		from Engineer
				Total Exposed Area of Outfall Pumping Station, (m2)		from Engineer
				Mitigation %	0	
				Whage aon 70	Ŭ	
	Wet Well of Outfall	OU/s	1.6593E+03	Odour Emission Rate (OU/s/m2)	$Eton = 4 \times 10^{-3}$	0.0103V <sub>wind</sub> <sup>1.42</sup> + 2.93 V <sub>liquid</sub> ) x OP
	Pumping Station			Odour potential, OP (OU/m3)		from Yang & Hobson
	1 0			Velocity of liquid, V <sub>liquid</sub> (m/s)	1.1997E-01	from Engineer
				Wind Velocity, V <sub>wind</sub> (m/s)	2.9167E-02	from Engineer
				Odour Emission Reduction after UV process (%)		from Engineer
				Total Exposed Area of Outfall Pumping Station, (m2)		from Engineer
				Mitigation %	0	
				•		
	Odour Control Unit	Mitigated	9.39525E+02	Total flow rate of each vent pipe (m <sup>3</sup> /s)		from Engineer
	(mit)	OU/s		Emission Height, (m)		from Engineer
	(OD3 & OD4)	(one control unit)		Diameter of the stack, (m)	1.0	from Engineer
	Both OD3 & OD4 deodorized for			Stack velocity, (m/s)		calculated
	below facilities, thus each emission rate would be half of			Mitigation %	90	
	the total emission					
	Enclosed Facilities:					
	Fine Screens Influent Channel	OU/s	1.0208E+02	Odour Emission Rate (OU/s/m2)	$Eton = 4 \times 10^{-3}$	0.0103V <sub>wind</sub> <sup>1.42</sup> + 2.93 V <sub>liouid</sub> ) × OP
	(for disinfection facilities)			Odour potential, OP (OU/m3)		from Yang & Hobson
	(FIS01)			Velocity of liquid, V <sub>liquid</sub> (m/s)		from Engineer
	、 /			Wind Velocity, V <sub>wind</sub> (m/s)		from Engineer
				Odour Emission Reduction after UV process (%)		from Engineer
				Exposed Area of Fine Screen Influent Channel (m2)	32.4	
				Mitigation %	0	·····
				· · · · · · ·	Ĭ	

ties No. S	Source	Emission Factors		Parameters		
F	Fine Screens	OU/s	2.0164E+02	Odour Emission Rate (OU/s/m2)	Eton = 4 x 10 <sup>-3</sup>	(0.0103V <sub>wind</sub> <sup>1.42</sup> + 2.93 V <sub>liquid</sub> ) × OP
(	for disinfection facilities)			Odour potential, OP (OU/m3)	3305	from Yang & Hobson
(	FIS02-FIS03)			Velocity of liquid, V <sub>liquid</sub> (m/s)	8.1331E-02	from Engineer
				Wind Velocity, V <sub>wind</sub> (m/s)	1.1111E-02	from Engineer
				Odour Emission Reduction after UV process (%)	0	from Engineer
				Exposed Area of Fine Screen (m2)	64	from Engineer
				Mitigation %	0	
	UV Tank Influent Channel	OU/s	6.4932E+01	Odour Emission Rate (OU/s/m2)		(0.0103V <sub>wind</sub> <sup>1.42</sup> + 2.93 V <sub>liquid</sub> ) × OP
(	(UV01)			Odour potential, OP (OU/m3)		from Yang & Hobson
				Velocity of liquid, V <sub>liquid</sub> (m/s)		from Engineer
				Wind Velocity, V <sub>wind</sub> (m/s)		from Engineer
				Odour Emission Reduction after UV process (%)		from Engineer
				Total Exposed Area (m2)	218	from Engineer
				Mitigation %	0	
	N/ <b>T</b> 1-	011/-	0.05555 00	Orlean Engineering Bate (OLV/s/se0)	Elem 4 - 40 <sup>-3</sup>	 (0.0103V <sub>wind</sub> <sup>1.42</sup> + 2.93 V <sub>liquid</sub> ) x OP
	UV Tank	OU/s	2.2555E+03	Odour Emission Rate (OU/s/m2)		
(	(UV02-UV03)			Odour potential, OP (OU/m3)		from Yang & Hobson
				Velocity of liquid, V <sub>liquid</sub> (m/s)		rom Engineer
				Wind Velocity, V <sub>wind</sub> (m/s)		2 from Engineer
				Odour Emission Reduction after UV process (%)		from Engineer
				Exposed Area of UV Tanks (m2)	/95.2	from Engineer
				Mitigation %	0	
	JV Tank Effluent Channel	OU/s	6.2551E+02	Odour Emission Rate (OU/s/m2)	$Eton = 4 \times 10^{-3}$	(0.0103V <sub>wind</sub> <sup>1.42</sup> + 2.93 V <sub>liquid</sub> ) × OP
	(UV04-UV06)	0010	0.20012102	Odour potential, OP (OU/m3)		[from Yang & Hobson
( )				Velocity of liquid, V <sub>liquid</sub> (m/s)		from Engineer
				Wind Velocity, V <sub>wind</sub> (m/s)		from Engineer
				Odour Emission Reduction after UV process (%)		from Engineer
				Exposed Area of UV Effluent Channel (m2)		from Engineer
				Mitigation %	0	
5	Sludge Facilities			Odour Emission Rate (OU/s)	$E = DF \times A \times (V$	
				Dilution factor, DF (OU/m3)		measured max. odour concentration, oum <sup>-3</sup> of fresh dewatered sludge at Stonecutter Island STW
				Ventilation rate, V (air changes per hour)		for Raw Sludge Holding Tanks, Sludge Pumping Station, Return Liqour Pumping Station
				Ventilation rate, V (air changes per hour) Temperature Correction factor, Ct		for Septic Waste Area, Sludge Dewatering Building Temperature correction factor
				Temperature Correction factor, Gt	1.31	remperature conection factor
9	Septic Waste Area	OU/s	6.0756E+02	Air volume of the emission source, A (m3)	15	assumed (1*Surface Area)
				Total Exposed Area of Septic Waste Area, (m2)		from Engineer
F	Raw Sludge Holding Tanks	OU/s	1.0043E+04	Air volume of the emission source, A (m3)		assumed (1*Surface Area)
				Total Exposed Area of Raw Sludge Holding Tanks, (m2)	726	from Engineer
	Studeo Dumping Station	011/2	4.00005.00	Air values of the emission serves $A(m0)$	20	annumed (4*Curface Area)
	Sludge Pumping Station	OU/s	4.9800E+02	Air volume of the emission source, A (m3) Total Exposed Area of Sludge Pumping Station, (m2)		assumed (1*Surface Area) from Engineer
				Total Exposed Area of Sludge Fullping Station, (III2)	30	in om Engineer
F	Return Ligour Pumping Station	OU/s	4.1500E+02	Air volume of the emission source, A (m3)	30	assumed (1*Surface Area)
ľ				Total Exposed Area of Return Liquor Pumping Station, (m2)		from Engineer
5	Sludge Dewatering Building	OU/s	3.6453E+03	Air volume of the emission source, A (m3)		assumed (1*Surface Area)
				Total Exposed Area of Sludge Dewatering Building, (m2)	88	from Engineer
	Contrifuen	OU/s	2 2200E . 02	Air values of the omission source $A(m^2)$	04	accurred (1*Surface Area)
	Centrifuge	00/s	3.3200E+02	Air volume of the emission source, A (m3) Total Exposed Area of Centrifuge, (m2)		assumed (1*Surface Area) from Engineer

Note: The design wind velocity at the liquid surface of enclosed facilities including sedimentation tank effleunt channel; inlet chamber, screw pumps and wet wells of outfall pumping station; sedimentation tanks; fine screens (for disinfection facilities);

UV tank influent channel; UV tank & effluent channelwould not be greater than 0.00867m/s.