

Annex D5

Thermal Oxidizer, Landfill  
Gas Flare and Landfill Gas  
Generator Stack Emission  
Monitoring Results

**Table D5.1 Thermal Oxidiser Stack Emission Monitoring Results**

<b>Parameters</b>	<b>Monitoring Results (April 2022)</b>
NO <sub>2</sub>	0.63 gs <sup>-1</sup>
CO	<0.01 gs <sup>-1</sup>
SO <sub>2</sub>	<0.01 gs <sup>-1</sup>
Benzene	<6 x 10 <sup>-4</sup> gs <sup>-1</sup>
Vinyl chloride	<2 x 10 <sup>-5</sup> gs <sup>-1</sup>
Exhaust gas velocity	6.6 ms <sup>-1</sup>
<b>Parameters</b>	<b>Monitoring Results (May 2022)</b>
NO <sub>2</sub>	0.11 gs <sup>-1</sup>
CO	<0.02 gs <sup>-1</sup>
SO <sub>2</sub>	0.06 gs <sup>-1</sup>
Benzene	<3 x 10 <sup>-5</sup> gs <sup>-1</sup>
Vinyl chloride	<4 x 10 <sup>-5</sup> gs <sup>-1</sup>
Non-Methane Organic Carbons	0.0048 gs <sup>-1</sup>
Ammonia (NH <sub>3</sub> )	0.01 gs <sup>-1</sup>
Exhaust gas velocity	11 ms <sup>-1</sup>
<b>Parameters</b>	<b>Monitoring Results (June 2022)</b>
NO <sub>2</sub>	0.39 gs <sup>-1</sup>
CO	<0.01 gs <sup>-1</sup>
SO <sub>2</sub>	<0.01 gs <sup>-1</sup>
Benzene	<2 x 10 <sup>-5</sup> gs <sup>-1</sup>
Vinyl chloride	<2 x 10 <sup>-5</sup> gs <sup>-1</sup>
Exhaust gas velocity	9.0 ms <sup>-1</sup>

**Table D5.2 Thermal Oxidiser Stack Continuous Monitoring Results**

<b>Date</b>	<b>Gas Combustion Temperature (°C)</b>	<b>Exhaust temperature (K)</b>	<b>Exhaust gas velocity (ms<sup>-1</sup>) (a)</b>
1-Apr-22	980	1238	
2-Apr-22	964	1242	
3-Apr-22	955	1236	
4-Apr-22	973	1224	
5-Apr-22	956	1231	
6-Apr-22	980	1216	
7-Apr-22	955	1233	
8-Apr-22	956	1217	
9-Apr-22	972	1200	
10-Apr-22	950	1244	
11-Apr-22	974	1234	
12-Apr-22	949	1220	
13-Apr-22	Under Maintenance		
14-Apr-22	961	1232	
15-Apr-22	946	1242	
16-Apr-22	935	1225	6.6
17-Apr-22	942	1225	
18-Apr-22	965	1231	
19-Apr-22	928	1235	
20-Apr-22	920	1214	
21-Apr-22	958	1213	
22-Apr-22	978	1247	
23-Apr-22	929	1237	

Date	Gas Combustion Temperature (°C)	Exhaust temperature (K)	Exhaust gas velocity (ms <sup>-1</sup> ) (a)
24-Apr-22	928	1225	
25-Apr-22	970	1215	
26-Apr-22	972	1325	
27-Apr-22	944	1241	
28-Apr-22	Under Maintenance		
29-Apr-22	955	1215	
30-Apr-22	930	1234	
1-May-22	937	1201	
2-May-22	926	1193	
3-May-22	948	1215	
4-May-22	Under Maintenance	1221	
5-May-22	Under Maintenance	1232	
6-May-22	Under Maintenance	1227	
7-May-22	936	1205	
8-May-22	935	1205	
9-May-22	928	1197	
10-May-22	Under Maintenance	1228	
11-May-22	935	1201	
12-May-22	940	1205	
13-May-22	935	1194	11.0
14-May-22	943	1202	
15-May-22	949	1199	
16-May-22	927	1188	
17-May-22	930	1197	
18-May-22	935	1196	
19-May-22	Under Maintenance	1235	
20-May-22	912	1182	
21-May-22	933	1197	
22-May-22	944	1209	
23-May-22	921	1197	
24-May-22	928	1197	
25-May-22	933	1203	
26-May-22	931	1207	
27-May-22	943	1211	
28-May-22	901	1190	
29-May-22	946	1210	
30-May-22	944	1211	
31-May-22	948	1216	
1-Jun-22	930	1202	
2-Jun-22	924	1199	
3-Jun-22	929	1203	
4-Jun-22	936	1206	
5-Jun-22	927	1198	
6-Jun-22	926	1196	
7-Jun-22	929	1195	
8-Jun-22	927	1185	
9-Jun-22	927	1173	
10-Jun-22	924	1157	
11-Jun-22	924	1167	
12-Jun-22	931	1169	9.0
13-Jun-22	925	1165	
14-Jun-22	929	1164	
15-Jun-22	926	1167	
16-Jun-22	930	1169	
17-Jun-22	930	1171	
18-Jun-22	922	1165	
19-Jun-22	925	1168	
20-Jun-22	918	1166	

Date	Gas Combustion Temperature (°C)	Exhaust temperature (K)	Exhaust gas velocity (ms <sup>-1</sup> ) (a)
21-Jun-22	915	1162	
22-Jun-22	927	1168	
23-Jun-22	924	1170	
24-Jun-22	921	1167	
25-Jun-22	920	1170	
26-Jun-22	Under Maintenance	1236	
27-Jun-22	Under Maintenance	1223	
28-Jun-22	Under Maintenance	1234	
29-Jun-22	Under Maintenance		
30-Jun-22	923	1148	
<b>Average</b>	939	1204	8.9
<b>Min</b>	901	1148	6.6
<b>Max</b>	980	1325	11.0

**Notes:**

(a) The exhaust gas velocity was calculated based on the cross-section area of the stack and the gas flow and combustion temperature data measured during the stack emission monitoring.

**Table D5.3 Landfill Gas Flare Stack Emission Monitoring Results**

Parameters	Monitoring Results (April 2022)
	Flare 1 - F601
NO <sub>2</sub>	0.03 gs <sup>-1</sup>
CO	<0.005 gs <sup>-1</sup>
SO <sub>2</sub>	<0.005 gs <sup>-1</sup>
Benzene	<1.3 x 10 <sup>-5</sup> gs <sup>-1</sup>
Vinyl chloride	<1 x 10 <sup>-5</sup> gs <sup>-1</sup>
Exhaust gas velocity	4.5 ms <sup>-1</sup>
Parameters	Monitoring Results (May 2022)
	Flare 2 - F602
NO <sub>2</sub>	0.01 gs <sup>-1</sup>
CO	0.04 gs <sup>-1</sup>
SO <sub>2</sub>	0.06 gs <sup>-1</sup>
Benzene	<1.8 x 10 <sup>-5</sup> gs <sup>-1</sup>
Vinyl chloride	<1.5 x 10 <sup>-5</sup> gs <sup>-1</sup>
Non-Methane Organic Carbons	<0.0014 gs <sup>-1</sup>
Exhaust gas velocity	2.7 ms <sup>-1</sup>
Parameters	Monitoring Results (June 2022)
	Flare 1 - F601
NO <sub>2</sub>	0.03 gs <sup>-1</sup>
CO	0.098 gs <sup>-1</sup>
SO <sub>2</sub>	0.11 gs <sup>-1</sup>
Benzene	<3.6 x 10 <sup>-5</sup> gs <sup>-1</sup>
Vinyl chloride	<1.6 x 10 <sup>-5</sup> gs <sup>-1</sup>
Exhaust gas velocity	8.3 ms <sup>-1</sup>

**Table D5.4 Landfill Gas Flare Stack Continuous Monitoring Results**

Date	Gas Combustion Temperature (°C)	Exhaust temperature (K)	Exhaust gas velocity (ms <sup>-1</sup> ) (a)	Operation Status
<b>Flare 1 - F601</b>				
1 Apr 22	-	-		Standby
2-Apr-22	-	-		Standby
3-Apr-22	870	1113		In Operation
4-Apr-22	-	-		Standby
5-Apr-22	-	-		Standby
6-Apr-22	-	-		Standby
7-Apr-22	-	-		Standby
8-Apr-22	840	1093		In Operation
9-Apr-22	-	-		Standby
10-Apr-22	-	-		Standby
11-Apr-22	-	-		Standby
12-Apr-22	860	1103		In Operation
13-Apr-22	860	1103		In Operation
14-Apr-22	-	-		Standby
15-Apr-22	-	-		Standby
16-Apr-22	-	-	4.5	Standby
17-Apr-22	880	1123		In Operation
18-Apr-22	-	-		Standby
19-Apr-22	-	-		Standby
20-Apr-22	850	1113		In Operation
21-Apr-22	-	-		Standby
22-Apr-22	900	1093		In Operation
23-Apr-22	920	1123		In Operation
24-Apr-22	-	-		Standby
25-Apr-22	988	1203		In Operation
26-Apr-22	930	1103		In Operation
27-Apr-22	820	1078		In Operation
28-Apr-22	870	1093		In Operation
29-Apr-22	840	1083		In Operation
30-Apr-22	860	1033		In Operation
1-May-22	940	983		In Operation
2-May-22	860	953		In Operation
3-May-22	850	973		In Operation
4-May-22	850	953		In Operation
5-May-22	990	1053		In Operation
6-May-22	990	1063		In Operation
7-May-22	980	1023		In Operation
8-May-22	890	983		In Operation
9-May-22	940	983		In Operation
10-May-22	-	-		Standby
11-May-22	-	-		Standby
12-May-22	-	-		Standby
13-May-22	850	983		In Operation
14-May-22	-	-		Standby
15-May-22	-	-	2.7	Standby
16-May-22	930	983		In Operation
17-May-22	880	973		In Operation
18-May-22	847	1063		In Operation
19-May-22	830	1063		In Operation
20-May-22	-	-		Standby
21-May-22	880	1053		In Operation
22-May-22	820	943		In Operation
23-May-22	850	953		In Operation
24-May-22	870	983		In Operation

Date	Gas Combustion Temperature (°C)	Exhaust temperature (K)	Exhaust gas velocity (ms <sup>-1</sup> ) (a)	Operation Status
25-May-22	950	1003		In Operation
26-May-22	880	953		In Operation
27-May-22	860	1073		In Operation
28-May-22	830	953		In Operation
29-May-22	910	1033		In Operation
30-May-22	870	983		In Operation
31-May-22	900	1013		In Operation
1 Jun 22	867	993		In Operation
2 Jun 22	940	1083		In Operation
3 Jun 22	920	1083		In Operation
4 Jun 22	890	1023		In Operation
5 Jun 22	880	1033		In Operation
6 Jun 22	940	1033		In Operation
7 Jun 22	822	1013		In Operation
8 Jun 22	880	1053		In Operation
9 Jun 22	930	1123		In Operation
10 Jun 22	870	1053		In Operation
11 Jun 22	890	1143		In Operation
12 Jun 22	970	1033		In Operation
13 Jun 22	870	1013		In Operation
14 Jun 22	-	-		Standby
15 Jun 22	840	1043	8.3	In Operation
16 Jun 22	-	-		Standby
17 Jun 22	940	1083		In Operation
18 Jun 22	-	-		Standby
19 Jun 22	-	-		Standby
20 Jun 22	-	-		Standby
21 Jun 22	-	-		Standby
22 Jun 22	900	1013		In Operation
23 Jun 22	830	983		In Operation
24 Jun 22	900	1003		In Operation
25 Jun 22	860	1063		In Operation
26 Jun 22	842	1073		In Operation
27 Jun 22	850	1043		In Operation
28 Jun 22	900	1023		In Operation
29 Jun 22	886	1024		In Operation
30 Jun 22	878	993		In Operation
<b>Average</b>	886	1093	5.1	
<b>Min</b>	820	943	2.7	
<b>Max</b>	990	1203	8.3	
<b>Flare 2 - F602</b>				
1 Apr 22	873	1083		In Operation
2 Apr 22	876	1073		In Operation
3 Apr 22	870	1123		In Operation
4 Apr 22	880	1093		In Operation
5 Apr 22	950	1203		In Operation
6 Apr 22	844	1093		In Operation
7 Apr 22	-	-		Standby
8 Apr 22	-	-		Standby
9 Apr 22	-	-		Standby
10 Apr 22	880	1123		In Operation
11 Apr 22	850	1073		In Operation
12 Apr 22	870	1133		In Operation
13 Apr 22	850	1103		In Operation
14 Apr 22	860	1103		In Operation
15 Apr 22	890	1123		In Operation
16 Apr 22	880	1103	4.5	In Operation
17 Apr 22	870	1103		In Operation

Date	Gas Combustion Temperature (°C)	Exhaust temperature (K)	Exhaust gas velocity (ms <sup>-1</sup> ) (a)	Operation Status
18 Apr 22	850	1073		In Operation
19 Apr 22	840	1073		In Operation
20 Apr 22	870	1128		In Operation
21 Apr 22	875	1103		In Operation
22 Apr 22	-	-		Standby
23 Apr 22	850	1093		In Operation
24 Apr 22	-	-		Standby
25 Apr 22	880	1103		In Operation
26 Apr 22	840	1093		In Operation
27 Apr 22	850	1103		In Operation
28 Apr 22	870	1113		In Operation
29 Apr 22	910	1143		In Operation
30 Apr 22	875	1113		In Operation
1-May-22	875	1093		In Operation
2-May-22	860	1113		In Operation
3-May-22	870	1103		In Operation
4-May-22	860	1103		In Operation
5-May-22	870	1113		In Operation
6-May-22	880	1133		In Operation
7-May-22	840	1083		In Operation
8-May-22	840	1083		In Operation
9-May-22	860	1113		In Operation
10-May-22	850	1063		In Operation
11-May-22	850	1053		In Operation
12-May-22	870	1093		In Operation
13-May-22	880	1103		In Operation
14-May-22	870	1083		In Operation
15-May-22	860	1093		In Operation
16-May-22	880	1093	2.7	In Operation
17-May-22	840	1063		In Operation
18-May-22	870	1093		In Operation
19-May-22	860	1043		In Operation
20-May-22	880	1123		In Operation
21-May-22	880	1103		In Operation
22-May-22	870	1103		In Operation
23-May-22	890	1123		In Operation
24-May-22	840	1083		In Operation
25-May-22	830	1073		In Operation
26-May-22	850	1083		In Operation
27-May-22	870	1123		In Operation
28-May-22	870	1123		In Operation
29-May-22	850	1103		In Operation
30-May-22	840	1093		In Operation
31-May-22	820	1073		In Operation
1 Jun 22	860	1103		In Operation
2 Jun 22	830	1093		In Operation
3 Jun 22	850	1093		In Operation
4 Jun 22	880	1093		In Operation
5 Jun 22	880	1103		In Operation
6 Jun 22	870	1093		In Operation
7 Jun 22	830	1063		In Operation
8 Jun 22	840	1083		In Operation
9 Jun 22	880	1113		In Operation
10 Jun 22	840	1073	8.3	In Operation
11 Jun 22	880	1103		In Operation
12 Jun 22	840	1073		In Operation
13 Jun 22	880	1103		In Operation
14 Jun 22	880	1073		In Operation

Date	Gas Combustion Temperature (°C)	Exhaust temperature (K)	Exhaust gas velocity (ms <sup>-1</sup> ) (a)	Operation Status
15 Jun 22	870	1043		In Operation
16 Jun 22	870	1073		In Operation
17 Jun 22	870	1053		In Operation
18 Jun 22	870	1073		In Operation
19 Jun 22	860	1073		In Operation
20 Jun 22	880	1093		In Operation
21 Jun 22	880	1083		In Operation
22 Jun 22	860	1093		In Operation
23 Jun 22	880	1093		In Operation
24 Jun 22	880	1103		In Operation
25 Jun 22	840	1093		In Operation
26 Jun 22	860	1123		In Operation
27 Jun 22	870	1123		In Operation
28 Jun 22	930	1183		In Operation
29 Jun 22	877	1118		In Operation
30 Jun 22	860	1103		In Operation
<b>Average</b>	865	1098	5.1	
<b>Min</b>	820	1043	2.7	
<b>Max</b>	950	1203	8.3	

**Notes:**

(a) The exhaust gas velocity was calculated based on the cross-section area of the stack and the gas flow and combustion temperature data measured during the stack emission monitoring.



**Table D5.5 Landfill Gas Generator Stack Emission Monitoring Results**

Parameters	Monitoring Results (April 2022)
NO <sub>2</sub>	0.25 gs <sup>-1</sup>
CO	0.094 gs <sup>-1</sup>
SO <sub>2</sub>	<0.001 gs <sup>-1</sup>
Benzene	<3 x 10 <sup>-6</sup> gs <sup>-1</sup>
Vinyl chloride	<2.3 x 10 <sup>-6</sup> gs <sup>-1</sup>
Exhaust gas velocity	13.3 ms <sup>-1</sup>
Parameters	Monitoring Results (May 2022)
NO <sub>2</sub>	0.01 gs <sup>-1</sup>
CO	0.099 gs <sup>-1</sup>
SO <sub>2</sub>	0.004 gs <sup>-1</sup>
Benzene	<3 x 10 <sup>-6</sup> gs <sup>-1</sup>
Vinyl chloride	<2.4 x 10 <sup>-6</sup> gs <sup>-1</sup>
Non-Methane Organic Carbons	3 x 10 <sup>-4</sup> gs <sup>-1</sup>
Exhaust gas velocity	11.6 ms <sup>-1</sup>
Parameters	Monitoring Results (June 2022)
NO <sub>2</sub>	0.008 gs <sup>-1</sup>
CO	0.043 gs <sup>-1</sup>
SO <sub>2</sub>	<0.001 gs <sup>-1</sup>
Benzene	<4.0 x 10 <sup>-6</sup> gs <sup>-1</sup>
Vinyl chloride	<2.2 x 10 <sup>-6</sup> gs <sup>-1</sup>
Exhaust gas velocity	9.7 ms <sup>-1</sup>

**Table D5.6 Landfill Gas Generator Stack Continuous Monitoring Results**

Date	Exhaust temperature (K)	Exhaust gas velocity (ms <sup>-1</sup> ) (a)	Operation Status (Landfill Gas Generator in Operation)
01-Apr-22	843		In Operation (ENGB)
02-Apr-22	841		In Operation (ENGB)
03-Apr-22	844		In Operation (ENGB)
04-Apr-22	843		In Operation (ENGB)
05-Apr-22	842		In Operation (ENGB)
06-Apr-22	846		In Operation (ENGB)
07-Apr-22	843		In Operation (ENGB)
08-Apr-22	848		In Operation (ENGB)
09-Apr-22	847		In Operation (ENGB)
10-Apr-22	845		In Operation (ENGB)
11-Apr-22	847		In Operation (ENGB)
12-Apr-22	849		In Operation (ENGB)
13-Apr-22	848		In Operation (ENGB)
14-Apr-22	851		In Operation (ENGB)
15-Apr-22	850		In Operation (ENGB)
16-Apr-22	845	13.3	In Operation (ENGB)
17-Apr-22	846		In Operation (ENGB)
18-Apr-22	846		In Operation (ENGB)
19-Apr-22	846		In Operation (ENGB)
20-Apr-22	848		In Operation (ENGB)
21-Apr-22	851		In Operation (ENGB)
22-Apr-22	852		In Operation (ENGB)
23-Apr-22	853		In Operation (ENGB)
24-Apr-22	852		In Operation (ENGB)
25-Apr-22	854		In Operation (ENGB)

Date	Exhaust temperature (K)	Exhaust gas velocity (ms <sup>-1</sup> ) (a)	Operation Status (Landfill Gas Generator in Operation)
26-Apr-22	862		In Operation (ENGB)
27-Apr-22	855		In Operation (ENGB)
28-Apr-22	843		In Operation (ENGB)
29-Apr-22	870		In Operation (ENGB)
30-Apr-22	851		In Operation (ENGB)
1-May-22	848		In Operation (ENGB)
2-May-22	849		In Operation (ENGB)
3-May-22	848		In Operation (ENGB)
4-May-22	849		In Operation (ENGB)
5-May-22	850		In Operation (ENGB)
6-May-22	850		In Operation (ENGB)
7-May-22	850		In Operation (ENGB)
8-May-22	852		In Operation (ENGB)
9-May-22	851		In Operation (ENGB)
10-May-22	857		In Operation (ENGB)
11-May-22	855		In Operation (ENGB)
12-May-22	853		In Operation (ENGB)
13-May-22	854		In Operation (ENGB)
14-May-22	852		In Operation (ENGB)
15-May-22	849		In Operation (ENGB)
16-May-22	847		In Operation (ENGB)
17-May-22	847		In Operation (ENGB)
18-May-22	845	11.6	In Operation (ENGB)
19-May-22	852		In Operation (ENGB)
20-May-22	851		In Operation (ENGB)
21-May-22	851		In Operation (ENGB)
22-May-22	850		In Operation (ENGB)
23-May-22	851		In Operation (ENGB)
24-May-22	851		In Operation (ENGB)
25-May-22	852		In Operation (ENGB)
26-May-22	857		In Operation (ENGB)
27-May-22	-		Under Maintenance
28-May-22	855		In Operation (ENGB)
29-May-22	855		In Operation (ENGB)
30-May-22	854		In Operation (ENGB)
31-May-22	855		In Operation (ENGB)
01-Jun-22	848		In Operation (ENGB)
02-Jun-22	853		In Operation (ENGB)
03-Jun-22	858		In Operation (ENGB)
04-Jun-22	856		In Operation (ENGB)
05-Jun-22	856		In Operation (ENGB)
06-Jun-22	856		In Operation (ENGB)
07-Jun-22	859		In Operation (ENGB)
08-Jun-22	853		In Operation (ENGB)
09-Jun-22	850		In Operation (ENGB)
10-Jun-22	855		In Operation (ENGB)
11-Jun-22	856		In Operation (ENGB)
12-Jun-22	854		In Operation (ENGB)
13-Jun-22	856		In Operation (ENGB)
14-Jun-22	856		In Operation (ENGB)
15-Jun-22	850		In Operation (ENGB)
16-Jun-22	863		In Operation (ENGA)
17-Jun-22	857		In Operation (ENGA)
18-Jun-22	866	9.7	In Operation (ENGA)
19-Jun-22	866		In Operation (ENGA)
20-Jun-22	867		In Operation (ENGB)
21-Jun-22	868		In Operation (ENGB)
22-Jun-22	864		In Operation (ENGB)

Date	Exhaust temperature (K)	Exhaust gas velocity (ms <sup>-1</sup> ) (a)	Operation Status (Landfill Gas Generator in Operation)
23-Jun-22	874		In Operation (ENGB)
24-Jun-22	875		In Operation (ENGB)
25-Jun-22	865		In Operation (ENGB)
26-Jun-22	867		In Operation (ENGB)
27-Jun-22	868		In Operation (ENGA)
28-Jun-22	867		In Operation (ENGA)
29-Jun-22	879		In Operation (ENGA)
30-Jun-22	868		In Operation (ENGA)
<b>Average</b>	854	11.5	
<b>Min</b>	841	9.7	
<b>Max</b>	879	13.3	

**Notes:**

(a) The exhaust gas velocity was calculated based on the cross-section area of the stack and the gas flow and combustion temperature data measured during the stack emission monitoring.