BROMLEY ODOUR ASSESSMENT

August 2020 Odour Scout Monitoring Report

3 September 2020

Contents

1 Introduction

Environment Canterbury is currently working with the Christchurch City Council under an Adaptive Management Plan (**AMP**) to significantly reduce odours discharged from the Living Earth and EcoDrop facilities in Bromley Christchurch by September 2020. This came about after a pilot study completed in March 2020 showed that about 70% of the odour issues in Bromley come from these two sites.

Environment Canterbury has contracted NZ Air Limited (**NZ Air**) to undertake monthly independent odour assessments within the Christchurch suburb of Bromley. This report presents the results for the five day field odour scout monitoring program undertaken in the month of August 2020. To provide consistency with previous studies, the methodology for the odour scout program is based on that undertaken by Watercare Services in preceding months (as described in Watercare Report titled "*Bromley – Odour Scout Report*" – June 2020 AQ-2020-122). NZ Air has also reported and interpreted the data in a similar format to that undertaken by Watercare.

This independent odour scout monitoring program is part of a wider odour study which is being undertaken as a part of the AMP process agreed between the Christchurch City Council and Environment Canterbury. The Bromley odour study contains three primary data feeds:

1. Observations made by the general public through the "Smelt it" mobile phone application.
2. Environment Canterbury's enforcement team observations.
3. Monthly five day odour scout monitoring programs undertaken by an independent air quality consultancy.

Further information on the wider study can be found here:
https://www.youtube.com/watch?v=raVLXwhHGTo

2 Methodology

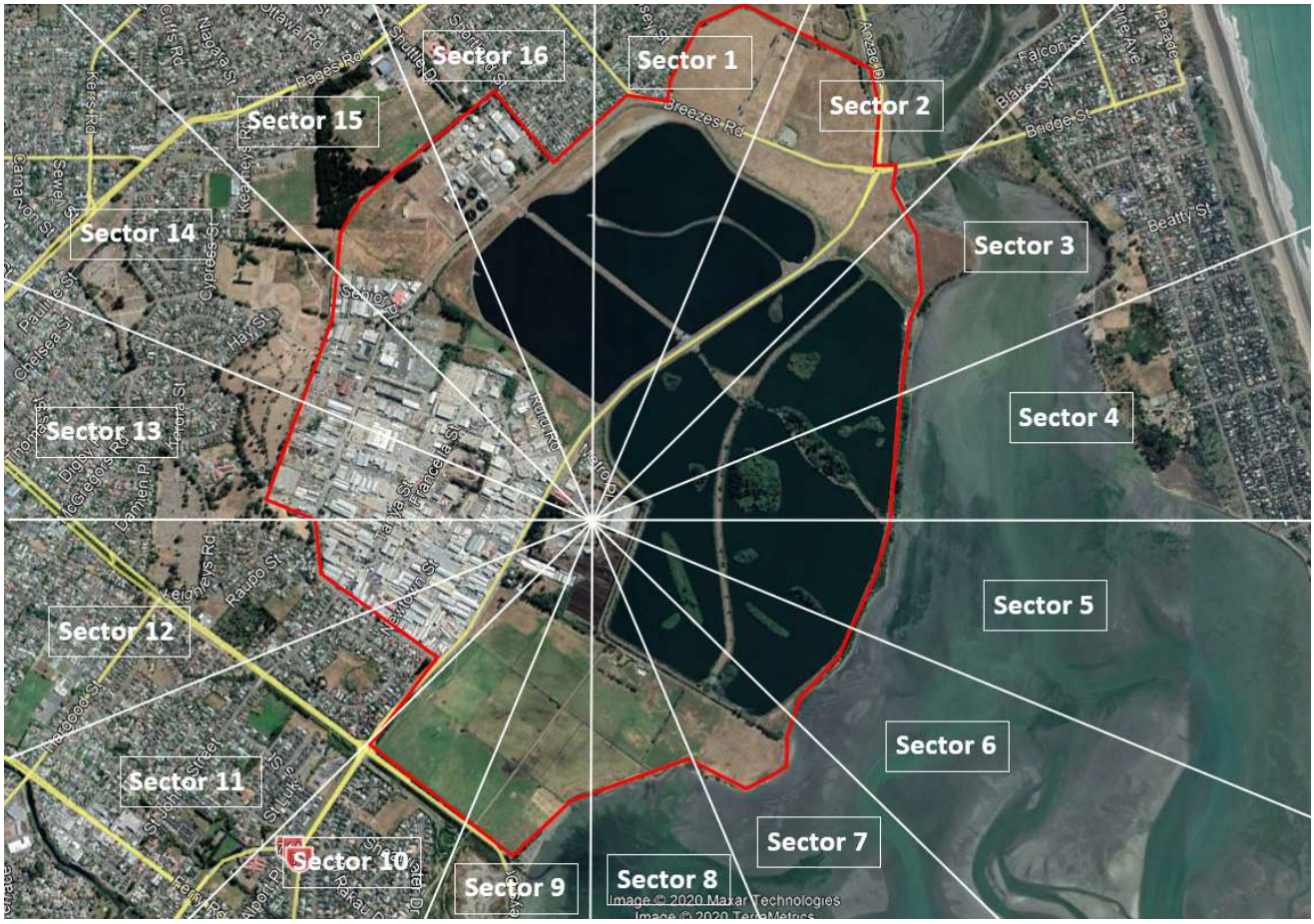
The NZ Air odour scout observations for August 2020 were made on the following dates:

- Monday 17th August
- Tuesday 18th August
- Wednesday 19th August
- Thursday 20th August
- Friday 21st August

The aera surrounding the EcoDrop and Living Earth facilities was divided into 16 sectors (note that the centre of the Sector wheel is slightly different to that in the Watercare study due to the fact that the odour observations are focused on emissions from the EcoDrop and Living Earth facilities). The study area and sectors are illustrated in **Figure 1**.

The red line in **Figure 1** (presented in the Watercare reports) is the approximate boundary of the Bromley suburb. There is no residential zoned land within the red line, therefore the most sensitive areas to nuisance odour are outside the red line.

FIGURE 1 STUDY AREA AND SECTORS



Aerial Imagery sourced from Google Earth July 2020

During each day an upwind odour observation was made, upwind of the EcoDrop and Living Earth facilities (located at the centre of the sector wheel), followed by a series of downwind observations, generally starting near the Bromley suburb boundary in the directly downwind sector. Observations are then made in a zig zag pattern moving towards the centre of the sector wheel. In this way the odour scout can determine the extent and intensity of any odour plume being emitted from the EcoDrop and/or Living Earth facilities. This methodology is based on the 'dynamic downwind surveillance' methodology described in the Draft Odour Surveillance Guidance produced by EPA Victoria[1].

Where odour consistent with that discharged from the EcoDrop and/or Living Earth facilities is observed at the Bromley suburb boundary, the odour scout moves to the furthest downwind extent of the plume for the first observation. Starting at the furthest extent of the plume ensures that the scout is not desensitised to the odour early in the monitoring run.

At the end of each monitoring run, odour observations are always made within the nearest downwind residential zoned land to ensure that there is no odour reaching this more sensitive location. On rare occasions sporadic odour has been observed beyond the extent of the immediate ground level downwind plume. This is likely to be a result of parts of the plume being elevated and descending at more distant locations, due to complex meteorological conditions or building downwash effects at these more distant locations.

[1] EPA Victoria "Odour Surveillance Method Draft" December 2019

In addition to the above methodology for selecting observation sites, the odour scout also receives email alerts from the Smelt It app. Where possible the odour scout undertakes the next odour observation at the location of the Smelt It app notification. These observations in response to the app notifications have been requested by Environment Canterbury to assist in validating observations by the public.

In addition to the above, if an odour is observed within the Bromley region whilst the odour scout is traveling between observations sites, an odour observation is made at that location. This provides a record of other odours that are present in the area.

Similar to the Watercare study, the methodology for making odour observations was based on the German reference method VDI 3940: 2006. The odour scout field observation methodology is also based on that described in Section 4 and Appendix 3 of the Ministry for the Environment Good Practice Guide for Assessing and Managing Odour (2016). At each odour observation location, the odour scout records the odour intensity (on a 0 – 6 scale) and character (from a list of 40 different odour descriptors) every 10 seconds for a period of 10 minutes. In addition to these observations, the following parameters are also recorded at each site:

- A unique sample site ID along with the GPS co-ordinates of the assessment location.
- The date and the time of the observation.
- The wind direction, as observed at ground level (in cardinal directions).
- The windspeed (in m/s as measured by a handheld anemometer).
- The cloud cover (in octas).
- The ground level ambient temperature (as recorded on a handheld digital thermometer).
- The overall hedonic tone (on a scale of -4 to +4).

The field sheets used to record the observations at each monitoring location are included as **Appendix A**. The list of odour character descriptors, intensity scale descriptors, and hedonic tone scale descriptors are also included in **Appendix A**.

Where applicable, the odour scout also records further information to provide context to the observation. For example, ”a number of diesel trucks were passing by which resulted in a sporadic ‘diesel fume’ type odour during the observation”, or “this observation was made directly downwind of a fish processing factory during business hours”. This information has been incorporated into the observation summaries in **Section 3** of this report.

For each monitoring month, two odour scouts made independent observations at each monitoring location on one out of the five days. As odour perception is very subjective, and differs from one individual to another, undertaking side by side independent observations by multiple persons provides an increased level of quality assurance for the monthly results.

Note, that both odour scouts have observed that it is difficult to accurately determine the difference between the ‘rubbish’ odour from the EcoDrop facility and the ‘compost’ odour from the Living Earth facility. Particularly when there is a chance of the odours mixing during downwind observations.

The odour scouts have done their best to determine the subtle difference between the two odours during downwind odour observations.

3 Results

To provide comparable results, NZ Air has calculated the “percentage odour character frequency” and “percentage odour intensity frequency” for each observation similar to that described in the Watercare report.

An odour intensity of ‘1 – very weak’ was categorised as when the odour scout could detect an odour, but the odour was not strong enough for a character to be assigned to the odour.

Each day’s data is also presented pictorially over an aerial figure. Within the Figures:

- the location ID is the number in the square;
- the colour of the square indicates the hedonic tone; and
- the wind direction during the observation is illustrated by the dark blue arrow adjacent to the location ID.

Where there is a red ‘R’ next to the ID number the observation is a response to a SmeIt It notification.

Where wind directions have been consistent and enough data has been collected withing the monitoring run, a description of the length and width of the plume observed has been provided.

3.1 Day 1 – 17th August 2020

On this date two odour scouts (DVK and HJ) were used to make independent duplicate observations at each monitoring location. The results for each scout are presented in **Tables 1 and 2** and **Figures 2 and 3**.

TABLE 1 DVK OBSERVATIONS – 17/8/2020

Location ID	1	2	3	4	5	6	7	8	9	10	11	12
Sector	11	2	3	4	5	13	6	12	11	13	11	11
Upwind/downwind	Upwind	Downwind	Downwind	Downwind	Downwind	Downwind	Upwind	Downwind	Downwind	Downwind	Downwind	Downwind
Date and time	17/08/2020 8:55	17/08/2020 9:20	17/08/2020 9:43	17/08/2020 10:15	17/08/2020 10:51	17/08/2020 11:22	17/08/2020 12:41	17/08/2020 13:28	17/08/2020 13:54	17/08/2020 14:13	17/08/2020 14:40	17/08/2020 14:55
Wind direction	W	SW	SW	WNW	E	E - S variable	NE	NE	NE	ENE	E	E
Wind speed (m/s)	0 - 0.1	0	0 - 0.5	0.3 - 0.5	0 - 0.4	0 - 0.3	0.5 - 1.2	0 - 0.4	0.2 - 2	0.6 - 0.9	0.5 - 2.2	0 - 0.5
Cloud cover (octa)	0	0	0	0	1	1	1	0	0	0	1	0
Temperature (Deg C)	5.9	12.8	9.2	5.3	12.8	12.2	12.9	12.8	14.8	15.6	13	10.8
Rain	none	none	none	none	none	none	none	none	none	none	none	none
Hedonic Tone	neutral	neutral	mildly unpleasant	neutral	neutral	neutral	neutral	neutral	mildly Unpleasant	very unpleasant	Unpleasant	neutral
Character Descriptor	Percentage of odour character detected											
No odour	100%	97%	100%	88%	100%	98%	63%	92%	53%	15%	22%	100%
Fragrant	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Sea/marine	0%	0%	0%	12%	0%	0%	23%	0%	0%	0%	0%	0%
Rubbish	0%	2%	0%	0%	0%	0%	0%	5%	3%	85%	0%	0%
Compost	0%	0%	0%	0%	0%	2%	0%	3%	23%	0%	78%	0%
Oily, fatty	0%	0%	0%	0%	0%	0%	0%	0%	20%	0%	0%	0%
Like gasoline, solvent	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Intensity Descriptor	Percentage of intensity detected											
No odour	100%	60%	42%	78%	100%	75%	23%	58%	7%	3%	5%	100%
Very weak	0%	37%	25%	10%	0%	23%	40%	33%	47%	12%	17%	0%
Weak	0%	3%	27%	12%	0%	2%	37%	8%	43%	30%	42%	0%
Distinct	0%	0%	7%	0%	0%	0%	0%	0%	3%	42%	33%	0%
Strong	0%	0%	0%	0%	0%	0%	0%	0%	0%	13%	3%	0%
Very strong	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Extremely strong	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

FIGURE 2 DVK OBSERVATIONS – 17/8/2020

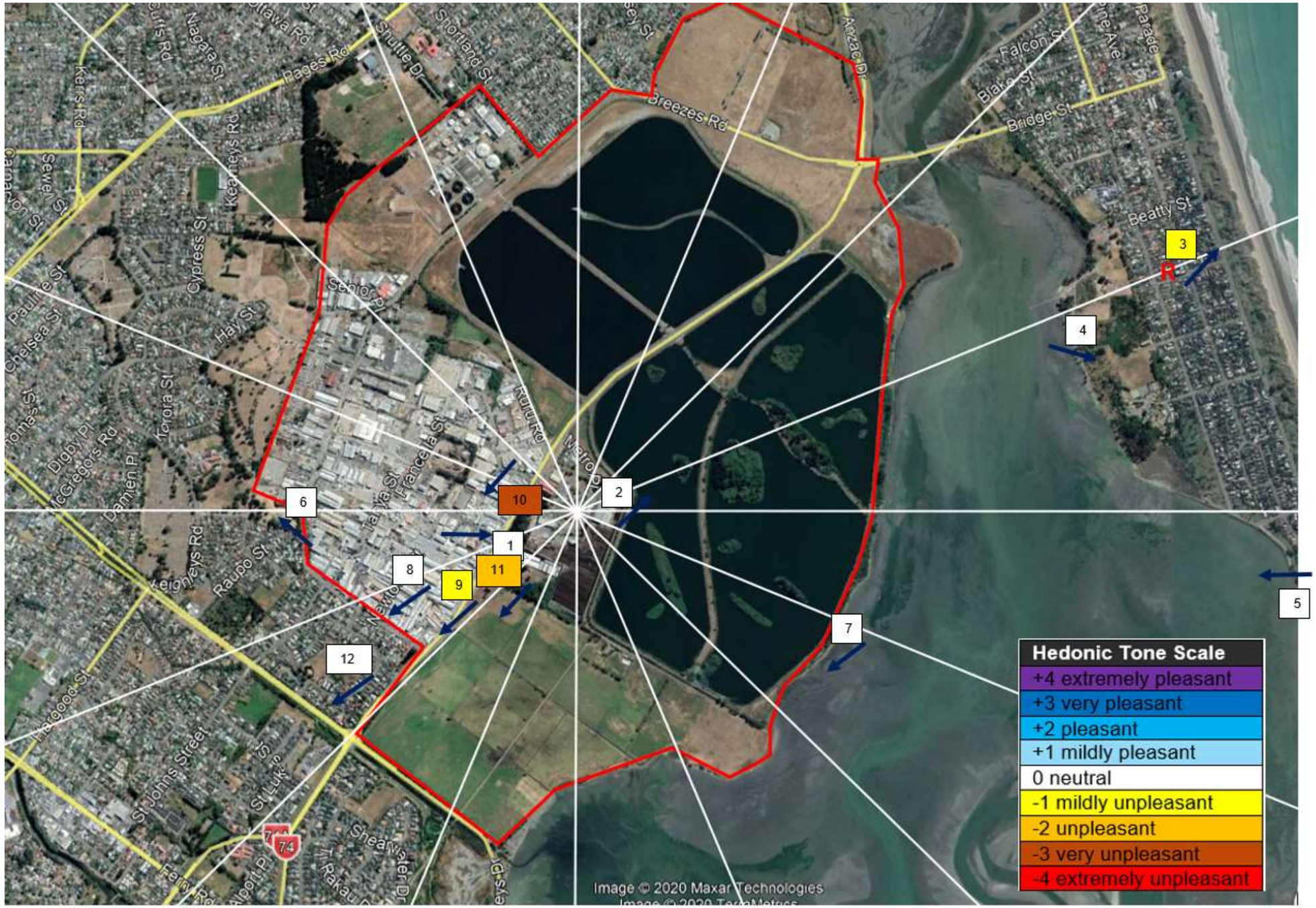
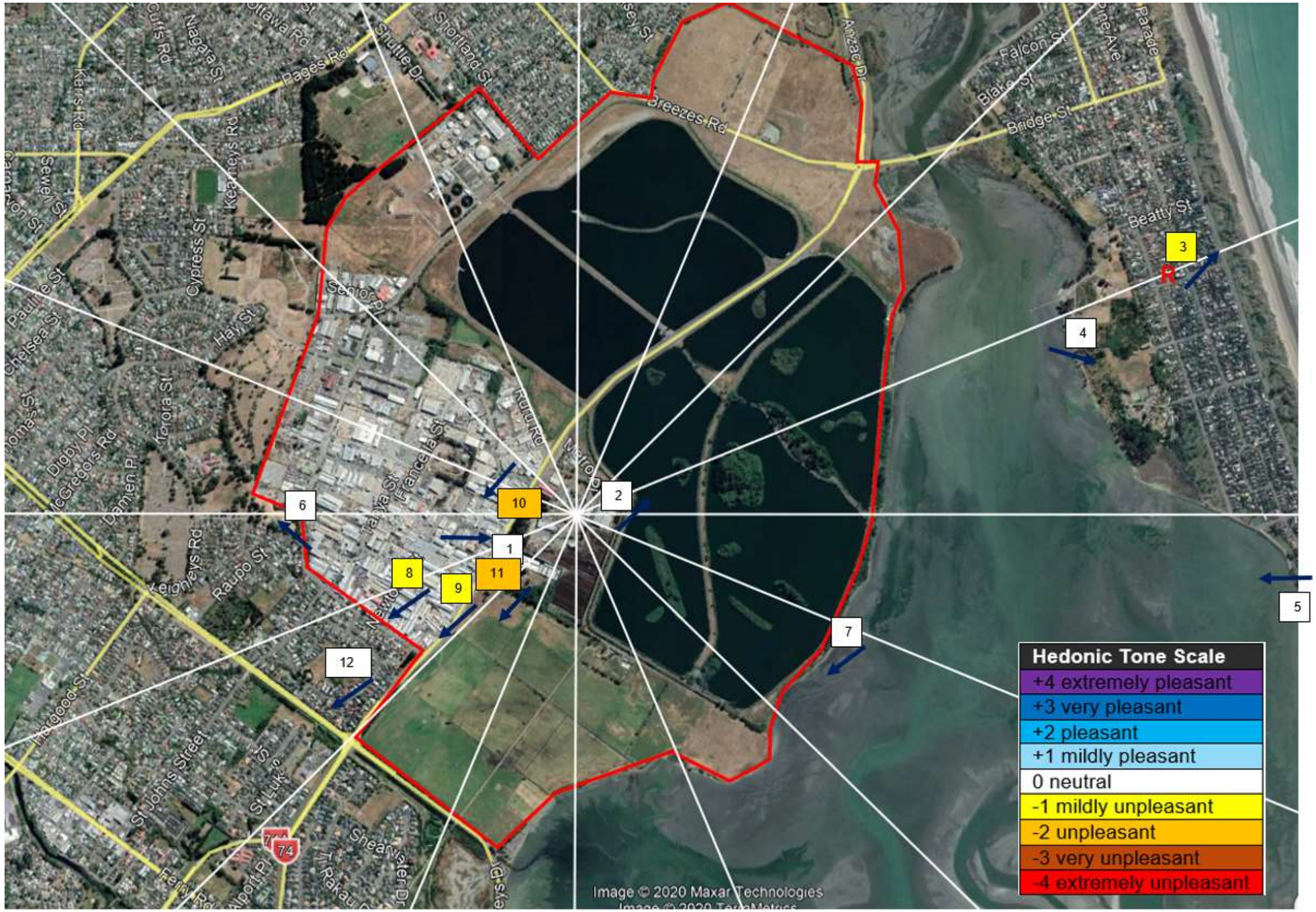


TABLE 2 HJ OBSERVATIONS – 17/8/2020

Location ID	1	2	3	4	5	6	7	8	9	10	11	12
Sector	11	2	3	4	5	13	6	12	11	13	11	11
Upwind/downwind	Upwind	Downwind	Downwind	Downwind	Downwind	Downwind	Upwind	Downwind	Downwind	Downwind	Downwind	Downwind
Date and time	17/08/2020 8:56	17/08/2020 9:20	17/08/2020 9:44	17/08/2020 10:15	17/08/2020 10:51	17/08/2020 11:20	17/08/2020 12:41	17/08/2020 13:28	17/08/2020 13:54	17/08/2020 14:14	17/08/2020 14:31	17/08/2020 14:55
Wind direction	W	SW	SW - S	WNW	E	E - S variable	NE	NE	NE	ENE	E	E
Wind speed (m/s)	0 - 0.1	0	0 - 0.5	0.3 - 0.5	0 - 0.4	0 - 0.3	0.5 - 1.2	0 - 0.4	0.2 - 2	0.6 - 0.9	0.5 - 2.2	0 - 0.5
Cloud cover (octa)	0	0	0	1	1	1	1	0	0	0	1	0
Temperature (Deg C)	5.9	12.8	9.2	5.3	12.8	12.2	12.9	12.8	14.8	15.6	13	10.8
Rain	none	none	none	none	none	none	none	none	none	none	none	none
Hedonic Tone	neutral	neutral	mildly unpleasant	neutral	neutral	neutral	neutral	mildly Unpleasant	mildly Unpleasant	Unpleasant	Unpleasant	neutral
Character Descriptor	Percentage of odour character detected											
No odour	100%	98%	92%	100%	100%	98%	97%	93%	68%	32%	20%	100%
Fragrant	0%	2%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Sea/marine	0%	0%	0%	0%	0%	0%	3%	0%	0%	0%	0%	0%
Rubbish	0%	0%	0%	0%	0%	0%	0%	0%	0%	68%	0%	0%
Compost	0%	0%	8%	0%	0%	0%	0%	7%	18%	0%	80%	0%
Oily, fatty	0%	0%	0%	0%	0%	0%	0%	0%	13%	0%	0%	0%
Like gasoline, solvent	0%	0%	0%	0%	0%	2%	0%	0%	0%	0%	0%	0%
Intensity Descriptor	Percentage of intensity detected											
No odour	100%	95%	68%	100%	100%	83%	88%	63%	28%	22%	5%	100%
Very weak	0%	3%	23%	0%	0%	15%	8%	30%	40%	10%	15%	0%
Weak	0%	2%	8%	0%	0%	2%	3%	7%	32%	47%	38%	0%
Distinct	0%	0%	0%	0%	0%	0%	0%	0%	0%	22%	42%	0%
Strong	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Very strong	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Extremely strong	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

FIGURE 3 HJ OBSERVATIONS – 17/8/2020



3.1.1 Day 1 Summary

At the start of Day 1 (Locations 1 and 2) there was very slight to calm wind conditions and therefore the wind direction was variable. It also started off cold, having been a frost that morning. There was no odour observed on the EcoDrop/Living Earth site boundary directly upwind (Location 1). At Location 2, directly downwind of the EcoDrop facility on Metro Place, there was a faint fragrant/fruity smell very briefly detected by both DVK and HJ, other than this there was essentially no odour at this location.

A Smelt It notification came through at 9:20 am from a location in South Brighton (Location 3) approximately 2.5 km from the Living Earth facility. Upon arriving at this location both odour scouts observed compost like odour. Intensities of 0 (no odour) – 3 (distinct) were detected at this location. Both odour scouts rated the hedonic tone as 'mildly unpleasant'.

Other observations were made in South Brighton as a part of a walkover of the South Brighton western shoreline, but as the wind direction changed/was variable, no further compost or rubbish like odour was detected in the area.

From Location 5 onwards, the wind directions were more consistently from the E – NE, but the wind speed remained low (generally less than 2 m/s). It was a sunny day and the temperature warmed up in the afternoon.

After an upwind observation at Location 7 (were only odours associated with the mudflats/sea were detected), a series of observations were made downwind from the EcoDrop/Living Earth facilities. Locations 8 – 11 were a part of a zig zag plume tracking assessment. Based on a walk along Newton Street, only a very faint infrequent rubbish and compost like odour could be detected on a very small portion of the street near Location 8 (approximately 400 m from the EcoDrop/Living Earth facility boundary).

Tracking the extent of the plume was limited in this area due to the fact that the only publicly accessible areas are the sidewalks on the roading network. Mildly unpleasant compost odour was observed at Location 9 (approximately 270 m downwind of Living Earth's boundary), however this was mixed with oily fatty odours from an adjacent lunch bar.

The odour scouts then traversed the eastern side of Dyers Road to try and find the centre of the EcoDrop odour plume, this was at Location 10. DVK observed frequent rubbish like odours ranging in intensity from 0 – 4 which he considered to have a hedonic tone of -3 'very unpleasant'. HJ made similar observations, but only reaching intensities of 3 and in his opinion the hedonic tone was -2 'unpleasant'.

Similar to the above, the centre of the Living Earth plume was determined to be Location 11. At this location both scouts observed compost like odours ranging in intensity from 0 – 4 and rated the overall hedonic tone as –2 'unpleasant'.

A final observation was made in the Bayswater Reserve which is within the downwind residential area, no odour was detected there.

In summary, there was an isolated observation of compost like odour in South Brighton for a short time approximately 2.5 km from Living Earth. When the wind shifted in late morning and in the early afternoon, the furthest extent of the odour plume from both facilities appears to have been at Newton Street (approximately 440 m from the Living Earth/EcoDrop boundary) and its width approximately 450 m along Dyers Road.

As with the July monitoring round, the duplicate odour observations between HJ and DVK were similar in intensity and character at all locations over the course of the day. There were slight differences at some locations which are within the expected range of variance between different individuals.

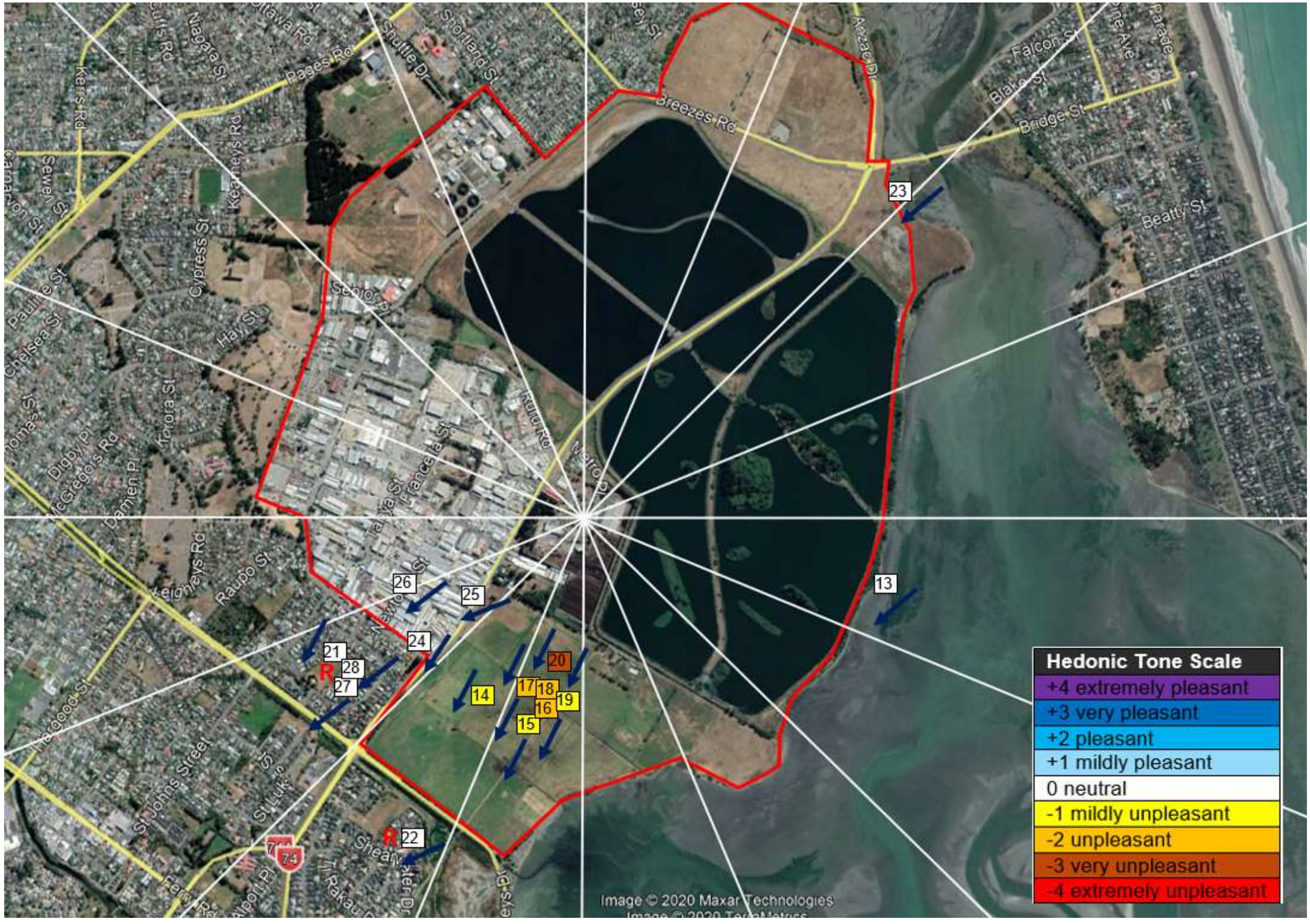
3.2 Day 2 – 18th August 2020

On this date one odour scout (HJ) was used to make observations throughout the day. The results for this day's observations are presented in **Table 3** and **Figure 4**.

TABLE 3 HJ OBSERVATIONS – 18/8/2020

Location ID	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Sector	6	10	9	9	9	9	9	9	11	10	3	10	10	11	11	11
Upwind/downwind	Upwind	Downwind	Downwind	Downwind	Downwind	Downwind	Downwind	Downwind	Downwind	Downwind	Upwind	Downwind	Downwind	Downwind	Downwind	Downwind
Date and time	18/08/2020 8:21	18/08/2020 9:05	18/08/2020 9:21	18/08/2020 9:39	18/08/2020 9:59	18/08/2020 10:16	18/08/2020 10:33	18/08/2020 10:48	18/08/2020 11:20	18/08/2020 12:02	18/08/2020 12:26	18/08/2020 12:49	18/08/2020 12:58	18/08/2020 13:24	18/08/2020 13:47	18/08/2020 14:02
Wind direction	NE	NNE	NNE	NNE	NNE - N	NNE	NNE	NNE - N	NNE	ENE	NE	NE - NNE	ENE	NE	NE	NE
Wind speed (m/s)	0.5 - 1	1.5 - 2.8	1 - 2.1	1.2 - 2	1.1 - 2.1	0.9 - 1.8	0.7 - 1.5	0.6 - 1.8	0 - 1.1	0.8 - 1.6	1.3 - 2.1	1.9 - 4.5	0.5 - 1.2	1.5 - 2.8	1.9 - 3.2	1.5 - 2.5
Cloud cover (octa)	8	8	8	8	8	8	8	7	7	8	8	4	3	3	3	3
Temperature (Deg C)	6.2	7.1	7.3	7.5	7.8	8	8.1	8.3	8.1	8.3	8.1	8.5	11.5	12.1	12.5	12.5
Rain	none	none	none	none	none	none	none	none	none	none	none	none	none	none	none	none
Hedonic Tone	neutral	mildly unpleasant	mildly unpleasant	unpleasant	unpleasant	unpleasant	mildly Unpleasant	very unpleasant	neutral	neutral	neutral	neutral	neutral	neutral	neutral	neutral
Character Descriptor	**Percentage of odour character detected**															
No odour	100%	72%	78%	12%	18%	0%	42%	0%	100%	100%	100%	92%	70%	100%	93%	100%
Compost	0%	28%	22%	88%	82%	100%	58%	100%	0%	0%	0%	8%	8%	0%	7%	0%
Oily, fatty	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	22%	0%	0%	0%
Intensity Descriptor	**Percentage of intensity detected**															
No odour	100%	22%	17%	0%	0%	0%	0%	0%	100%	100%	100%	73%	37%	100%	82%	100%
Very weak	0%	50%	62%	12%	18%	0%	42%	0%	0%	0%	0%	18%	33%	0%	12%	0%
Weak	0%	28%	22%	50%	48%	13%	42%	17%	0%	0%	0%	8%	30%	0%	7%	0%
Distinct	0%	0%	0%	38%	30%	50%	17%	42%	0%	0%	0%	0%	0%	0%	0%	0%
Strong	0%	0%	0%	0%	3%	37%	0%	37%	0%	0%	0%	0%	0%	0%	0%	0%
Very strong	0%	0%	0%	0%	0%	0%	0%	5%	0%	0%	0%	0%	0%	0%	0%	0%
Extremely strong	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

FIGURE 4 HJ OBSERVATIONS – 18/8/2020



3.2.1 Day 2 Summary

Day 2 was dominated by NNE – NE winds with variable speeds between calm and a steady breeze. Initially it was cool (~6 deg C) and overcast then later in the day the sun came out and the temperature warmed (~12 deg C).

There was no odour detected at either of the upwind observations (Locations 13 and 23).

The odour plume was well mapped within the paddocks to the south of Living Earth. It extended approximately 450 m from the site boundary and was approximately 400 m wide. Odours in the centre of the plume (approximately 150 m from the boundary) had intensities ranging from 2 (weak) to 5 (very strong). The overall hedonic tone in the centre of the plume was rated as -3 'very unpleasant'.

Some low intensity compost odour was detected briefly, later in the day, at Locations 24, 25 and 27. Location 27 is approximately 880 m from the nearest Living Earth/EcoDrop site boundary.

On two occasions HJ responded to Smelt It notifications (Location 21 and Location 22), on both these occasions no odour was detected at the Smelt It notification location. However, it is noted that compost like odour was detected very briefly at Location 27, a Smelt It notification was received a little after this observation (approximately 30 mins later). But the odour was not detected at the next location (Location 28), which was very nearby.

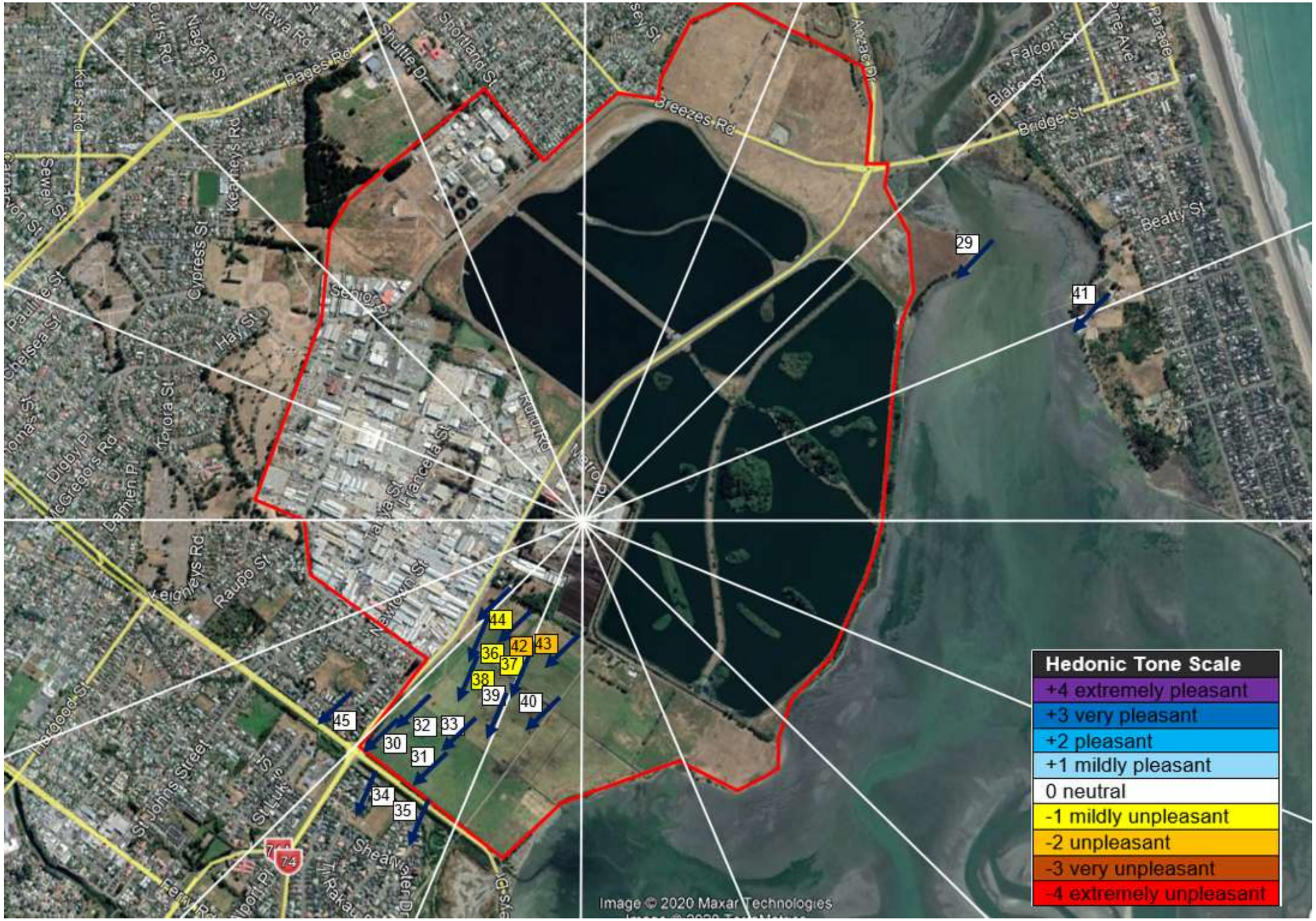
3.3 Day 3 – 19th August 2020

On this date only one odour scout (HJ) was used to make observations throughout the day. The results for this day's observations are presented in **Table 4** and **Figure 5**.

TABLE 4 HJ OBSERVATIONS – 19/8/2020

Location ID	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Sector	3	10	10	10	10	10	10	10	9	10	9	9	4	9	9	10	10
Upwind/downwind	Upwind	Downwind	Downwind	Downwind	Downwind	Downwind	Downwind	Downwind	Downwind	Downwind	Downwind	Downwind	Upwind	Downwind	Downwind	Downwind	Downwind
Date and time	19/08/2020 8:10	19/08/2020 8:32	19/08/2020 8:46	19/08/2020 9:03	19/08/2020 9:19	19/08/2020 9:45	19/08/2020 10:01	19/08/2020 10:27	19/08/2020 10:41	19/08/2020 10:56	19/08/2020 11:13	19/08/2020 11:28	19/08/2020 12:25	19/08/2020 12:51	19/08/2020 13:06	19/08/2020 13:22	19/08/2020 13:45
Wind direction	NE	NE	NE	NE	NE	NNE	NNE	NNE	NNE	NNE	NNE	NE	NE	NE	NE	NE	NE
Wind speed (m/s)	0.8 - 1.8	0.7 - 1.6	0.9 - 1.9	1.1 - 1.8	0.6 - 1.5	0.9 - 2.1	0.8 - 2.2	2.5 - 3.9	3.8 - 5.2	3.1 - 4.2	3.2 - 4.1	2.5 - 3.6	2.5 - 3.8	1.5 - 2.1	2.1 - 3.8	0.8 - 2.6	0.8 - 1.7
Cloud cover (octa)	7	7	7	7	7	7	7	7	7	7	7	7	7	6	6	6	7
Temperature (Deg C)	10.1	10.4	10.5	10.6	10.7	10.8	10.9	11.5	11.6	11.9	12.1	12	12.2	12	12.5	12.6	12.8
Rain	none	none	none	none	none	none	none	none	none	none	none	none	none	none	none	none	none
Hedonic Tone	neutral	neutral	neutral	neutral	neutral	neutral	neutral	mildly unpleasant	mildly unpleasant	mildly unpleasant	neutral	neutral	neutral	unpleasant	unpleasant	mildly unpleasant	neutral
Character Descriptor	Percentage of odour character detected																
No odour	100%	95%	93%	83%	100%	100%	100%	80%	52%	82%	97%	83%	100%	27%	8%	70%	100%
Rubbish	0%	0%	0%	0%	0%	0%	0%	20%	0%	0%	0%	0%	0%	0%	0%	30%	0%
Compost	0%	5%	7%	17%	0%	0%	0%	0%	48%	18%	3%	17%	0%	73%	92%	0%	0%
Intensity Descriptor	Percentage of intensity detected																
No odour	100%	72%	68%	35%	53%	100%	100%	37%	8%	45%	67%	28%	100%	0%	0%	30%	100%
Very weak	0%	23%	25%	48%	35%	0%	0%	43%	43%	37%	30%	55%	0%	27%	8%	40%	0%
Weak	0%	5%	7%	17%	12%	0%	0%	13%	35%	18%	3%	17%	0%	40%	57%	30%	0%
Distinct	0%	0%	0%	0%	0%	0%	0%	7%	13%	0%	0%	0%	0%	32%	27%	0%	0%
Strong	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	2%	8%	0%	0%
Very strong	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Extremely strong	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

FIGURE 5 HJ OBSERVATIONS – 19/8/2020



3.3.1 Day 3 Summary

During Day 3 the wind consistently blew from NNE - NE. There were light winds early in the day, but they picked up to a moderate breeze mid morning. It was an overcast, cool day (10 - 12 deg C).

There was no odour detected at either of the upwind observation locations, Locations 9 and 41. The furthest extent of the compost like odour plume was approximately 850 m downwind of the Living Earth boundary (Location 30), its width was approximately 200 m (between Locations 38 and 40). It had a hedonic tone of -1 (mildly unpleasant) at a distance of 350 m from the Living Earth boundary. At approximately 180 m from the boundary the hedonic tone was rated at -2 (unpleasant), with constant odour present at intensities ranging up to 4 (strong).

Rubbish like odour was detected at Locations 36 and 44, approximately 320 m and 220 m downwind from the nearest EcoDrop boundary. At both locations its hedonic tone was rated as -1 (mildly unpleasant).

At the three downwind observations within the residential zone (Locations 34, 35, and 45), no odour was detected.

There were no Smelt It notifications were received during this day's monitoring program.

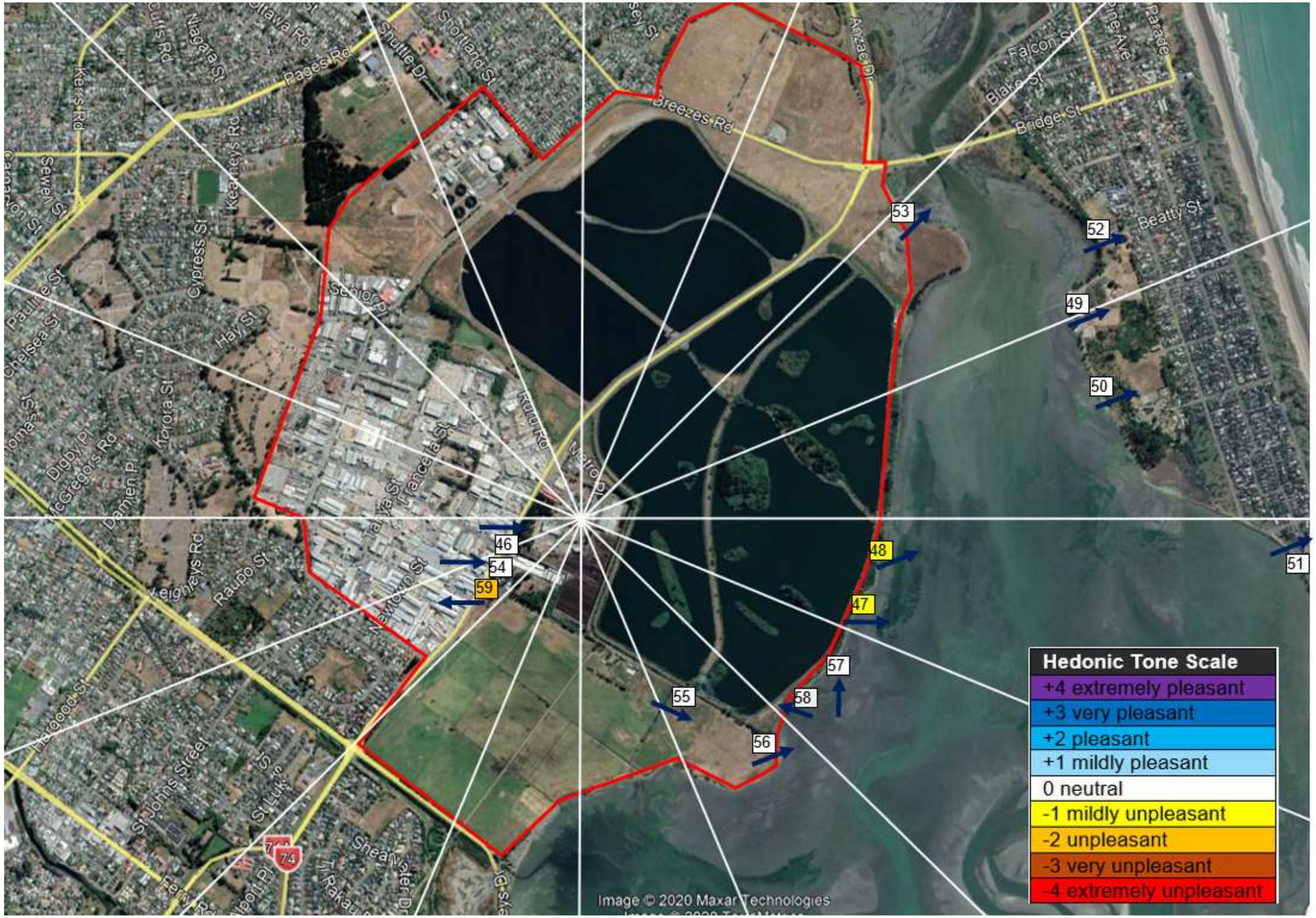
3.4 Day 4 – 20th August 2020

On this date one odour scout (HJ) was used to make observations throughout the day. The results for this day's observations are presented in **Table 5** and **Figure 6**.

TABLE 5 HJ OBSERVATIONS – 20/8 /2020

Location ID	46	47	48	49	50	51	52	53	54	55	56	57	58	59
Sector	10	6	6	4	4	5	4	3	10	8	7	6	7	10
Upwind/downwind	Upwind	Downwind	Downwind	Downwind	Downwind	Downwind	Downwind	Downwind	Upwind	Downwind	Downwind	Downwind	Upwind	Downwind
Date and time	20/08/2020 8:15	20/08/2020 8:52	20/08/2020 9:11	20/08/2020 9:51	20/08/2020 10:12	20/08/2020 10:31	20/08/2020 10:58	20/08/2020 11:34	20/08/2020 12:09	20/08/2020 12:50	20/08/2020 13:05	20/08/2020 13:27	20/08/2020 13:43	20/08/2020 14:16
Wind direction	W	W	WSW	WSW	WSW	WSW	WSW	SW	W	WNW	W - SW	SW - SE	SE - E	E
Wind speed (m/s)	0 - 0.2	0 - 0.3	0.1 - 0.3	1 - 1.4	0.8 - 1.3	0 - 0.3	0.8 - 1.9	0.8 - 1.5	0 - 0.3	0.2 - 0.6	0.1 - 0.5	0 - 2.2	2 - 2.5	1.5 - 2.2
Cloud cover (octa)	0	0	0	1	1	1	1	1	2	3	3	3	3	4
Temperature (Deg C)	6	7.1	7.2	8.2	11.2	11.9	12.5	12.3	15.1	16.3	16.5	17.2	17	16.8
Rain	none	none	none	none	none	none	none	none	none	none	none	none	none	none
Hedonic Tone	neutral	mildly unpleasant	mildly unpleasant	neutral	neutral	neutral	neutral	neutral	neutral	neutral	neutral	neutral	neutral	unpleasant
Character Descriptor	Percentage of odour character detected													
No odour	100%	88%	78%	100%	100%	100%	100%	100%	97%	92%	100%	100%	100%	3%
Compost	0%	0%	0%	0%	0%	0%	0%	0%	0%	8%	0%	0%	0%	97%
Like gasoline, solvent	0%	0%	0%	0%	0%	0%	0%	0%	3%	0%	0%	0%	0%	0%
Sewer odour	0%	12%	22%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Intensity Descriptor	Percentage of intensity detected													
No odour	100%	50%	22%	100%	100%	100%	100%	100%	92%	70%	100%	100%	100%	0%
Very weak	0%	38%	57%	0%	0%	0%	0%	0%	5%	22%	0%	0%	0%	3%
Weak	0%	12%	22%	0%	0%	0%	0%	0%	3%	7%	0%	0%	0%	42%
Distinct	0%	0%	0%	0%	0%	0%	0%	0%	0%	2%	0%	0%	0%	42%
Strong	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	13%
Very strong	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Extremely strong	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

FIGURE 6 HJ OBSERVATIONS – 20/8/2020



3.4.1 Day 4 Summary

Day 4 was a cold clear morning with calm wind conditions early in the day, but wind speeds picked up to a gentle breeze in the early afternoon. The ambient temperature warmed up to 17 deg C by early afternoon. The wind directions were W – SW for most of the day, but swung round to an easterly late in the monitoring run.

No odour was detected at either of the upwind locations (Locations 46 and 54).

Initially some mildly unpleasant sewer type odour was detected directly downwind of the wastewater treatment ponds (Locations 47 and 48).

All of the morning's downwind observations along the South Brighton shoreline detected no odour.

Some weak compost like odour was detected briefly at Location 55 (approximately 440 m downwind of the nearest Living Earth site boundary), but then the wind speed dropped off and the odour was lost.

At the end of the monitoring run constant compost like odour was detected at Location 59 which was considered to have an unpleasant hedonic tone (-2 on the hedonic tone scale). Odour intensities at this location ranged from 1 (very weak) to 4 (strong).

The extent of the odour plume was not able to be determined on this date due to no compost or rubbish like odour being observed at accessible downwind locations. However, as brief compost like odour was detected at Location 55 (approximately 440 m downwind of the nearest Living Earth site boundary), this may have been the edge/end of the Living Earth odour plume. The extent of the odour plume which occurred in the afternoon after the wind direction change could not be determined due to time restrictions.

There were no Smelt It notifications in the morning. After the wind change to easterly in the afternoon, there were a number of notifications beginning at 2 pm. Unfortunately, the odour scout was unable to respond to these at the end of the monitoring run.

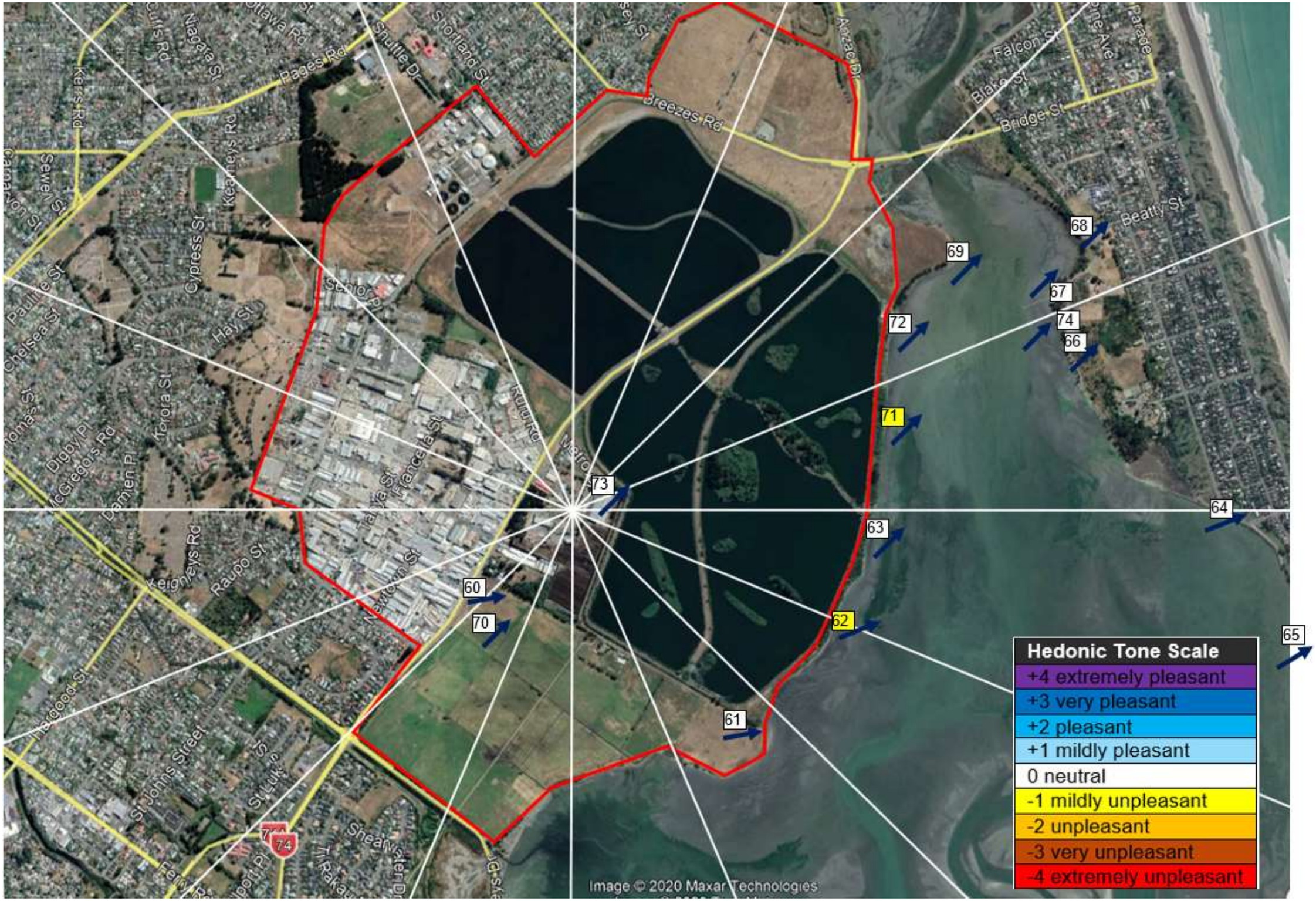
3.5 Day 5 – 21st August 2020

On this date one odour scout (HJ) was used to make observations throughout the day. The results for this day's observations are presented in **Table 6** and **Figure 7**.

TABLE 6 HJ OBSERVATIONS – 21/8/2020

Location ID	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74
Sector	10	7	6	5	5	5	4	4	4	3	10	5	4	8	4
Upwind/downwind	Upwind	Downwind	Downwind	Downwind	Downwind	Downwind	Downwind	Downwind	Downwind	Downwind	Upwind	Downwind	Downwind	Downwind	Downwind
Date and time	21/08/2020 7:43	21/08/2020 8:16	21/08/2020 8:28	21/08/2020 8:46	21/08/2020 9:29	21/08/2020 9:48	21/08/2020 10:13	21/08/2020 10:32	21/08/2020 10:53	21/08/2020 11:21	21/08/2020 11:51	21/08/2020 12:36	21/08/2020 12:51	21/08/2020 13:27	21/08/2020 13:44
Wind direction	WSW - W	WSW - W	WSW	SW	WSW	WSW - SW	SW	SW	SW	SW	SW	SW	SW	SW	SW
Wind speed (m/s)	0.8 - 1.3	0.4 - 1.1	0.2 - 0.8	0.2 - 0.6	0.2 - 0.4	0.6 - 1.2	1.2 - 2.4	1.1 - 2.0	0.8 - 1.5	1.2 - 2.6	1.2 - 2.1	0.8 - 1.6	0.6 - 1.3	0.4 - 1.5	1.1 - 2.8
Cloud cover (octa)	7	7	7	7	7	7	7	7	7	7	6	6	6	7	8
Temperature (Deg C)	6.5	6.9	7.1	7.4	8.1	8.3	8.5	8.3	8.5	8.6	9.2	9.6	9.7	11.2	11.5
Rain	none	none	none	none	none	none	none	none	none	none	none	none	none	Misty	none
Hedonic Tone	neutral	neutral	mildly unpleasant	neutral	neutral	neutral	neutral	neutral	neutral	neutral	neutral	mildly unpleasant	neutral	neutral	neutral
Character Descriptor	**Percentage of odour character detected**														
No odour	100%	100%	80%	95%	97%	100%	100%	100%	100%	100%	100%	75%	100%	93%	100%
Compost	0%	0%	0%	0%	3%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Musty, earthy, mouldy	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	7%	0%
Sewer odour	0%	0%	20%	5%	0%	0%	0%	0%	0%	0%	0%	25%	0%	0%	0%
Intensity Descriptor	**Percentage of intensity detected**														
No odour	100%	100%	50%	75%	82%	100%	100%	100%	100%	100%	100%	32%	68%	83%	100%
Very weak	0%	0%	30%	20%	15%	0%	0%	0%	0%	0%	0%	43%	27%	10%	0%
Weak	0%	0%	17%	5%	3%	0%	0%	0%	0%	0%	0%	20%	5%	7%	0%
Distinct	0%	0%	3%	0%	0%	0%	0%	0%	0%	0%	0%	5%	0%	0%	0%
Strong	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Very strong	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Extremely strong	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

FIGURE 7 HJ OBSERVATIONS – 21/8/2020



3.5.1 Day 5 Summary

Day 5 was cold (6 – 11 deg C), overcast, and was dominated by light south westerly winds.

No odour was detected at either of the upwind locations (Locations 60 and 70).

Some mildly unpleasant sewer type odour was detected directly downwind of the wastewater treatment ponds at Locations 62 and 71.

Weak compost like odour was detected briefly at Location 64 which was approximately 2.4 km west of the Living Earth facility.

Later in the day a weak musty/earthy odour was briefly detected at the end of Metro Place (Location 73), directly downwind of the Living Earth/EcoDrop facilities.

The extent of the odour plume was not able to be determined on this date due to limited compost or rubbish like odour being observed at accessible downwind locations. However, as brief compost like odour was detected at Location 64 (approximately 2.4 km downwind of the nearest Living Earth site boundary), this may have been the edge/end of the Living Earth odour plume.

Only one Smelt It notification was received on Day 5 during the monitoring period. It was received at 11:12 am from Taurus Place, Bromley and was described as a sewer type odour. This location is upwind of the Living Earth/EcoDrop facilities. The odour scout did not attend this notification.

4 Closing

This report presents the results of a five day odour scout monitoring program undertaken by NZ Air in August 2020 on behalf of Environment Canterbury.

A. Appendix A – Field sheets and parameter descriptors

Odour Diary Record Sheet

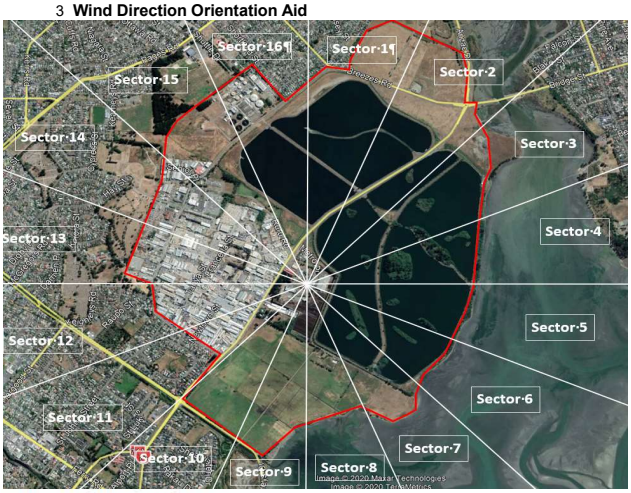
Name:	**Sample site:**	
Date (dd/mm/yy):	**Sample Start Time (hh:mm):**	**Rain (Circle one):** None / Misty / Drizzle / Steady / Torrential
Wind direction (coming from)[3]:	**Wind Strength[4]:**	
Hedonic Tone[5]:	**Cloud Cover:**	**Temperature:**
Approximate Plume Width[6]:	**Approximate Plume Length[6]:**	

Sample number	Odour Intensity Level (1-6)[2]	Odour descriptor (1-40)[1]	Sample number	Odour Intensity Level (1-6)[2]	Odour descriptor (1-40)[1]	Sample number	Odour Intensity Level (1-6)[2]	Odour descriptor (1-40)[1]
0:10			3:30			6:50		
0:20			3:40			7:00		
0:30			3:50			7:10		
0:40			4:00			7:20		
0:50			4:10			7:30		
1:00			4:20			7:40		
1:10			4:30			7:50		
1:20			4:40			8:00		
1:30			4:50			8:10		
1:40			5:00			8:20		
1:50			5:10			8:30		
2:00			5:20			8:40		
2:10			5:30			8:50		
2:20			5:40			9:00		
2:30			5:50			9:10		
2:40			6:00			9:20		
2:50			6:10			9:30		
3:00			6:20			9:40		
3:10			6:30			9:50		
3:20			6:40			10:00		

Odour samples every 10 seconds. The time between the 10 seconds is disregarded (interval method). Breath normally rather than sniffing.

If odour descriptor is 40 then please describe:

3 **Wind Direction Orientation Aid**



Measuring Cloud Cover

Okta No.	Description
0	Clear Sky
1	Sunny
2	Mostly sunny
3	
4	Half the sky is covered in cloud
5	
6	Mostly cloudy
7	Considerable cloudiness
8	Overcast
F	Fog / Mist

[1] Odour Character Discriptors

1	Fragrant	**21**	Like blood, raw meat
2	Perfumy	**22**	Rubbish
3	Sweet	**23**	Compost
4	Fruity	**24**	Silage
5	Bakery (fresh bread)	**25**	Sickening
6	Coffee-like	**26**	Musty, earthy, mouldy
7	Spicy	**27**	Sharp, pungent, acid
8	Meaty (cooked, good)	**28**	Metallic
9	Sea/marine	**29**	Tar-like
10	Herbal, green, cut grass	**30**	Oily, fatty
11	Bark-like, birch bark	**31**	Like gasoline, solvent
12	Woody, resinous	**32**	Fishy
13	Medicinal	**33**	Putrid, foul, decayed
14	Burnt, smoky	**34**	Paint-like
15	Soapy	**35**	Rancid
16	Garlic, onion	**36**	Sulphidic
17	Cooked vegetables	**37**	Dead animal
18	Chemical	**38**	Faecal (like manure)
19	Etherish, anaesthetic	**39**	Sewer odour
20	Sour, acrid, vinegar	**40**	Other(record description)

[4] Wind Strength Scale

Beaufort Force	Descriptor	Specification on land
0	Calm	Smoke rises vertically.
1	Very Light	Direction of wind shown by smoke drift but not by wind vanes.
2	Light breeze	Wind felt on face, leaves rustle, ordinary wind vane moved by wind.
3	Gentle breeze	Leaves and small twigs in constant motion, wind extends light flag.
4	Moderate breeze	Wind raises dust and loose paper, small branches move.
5	Fresh breeze	Small trees in leaf start to sway, crested wavelets on inland waters.
6	Strong breeze	Large branches in motion, whistling in telegraph wires, umbrellas used with
7	Near gale	Whole trees in motion, inconvenient to walk against wind.
8	Gale	Twigs break from trees, difficult to walk.
9	Strong gale	Slight structural damage occurs, chimney pots and slates removed.
10	Storm	Trees uprooted, considerable structural damage occurs.
11	Violent storm	Widespread damage.
12	Hurricane	Widespread damage.

[2] Odour Intensity Scale

Intensity Level	Odour intensity
1	Very Weak
2	Weak
3	Distinct
4	Strong
5	Very strong
6	Extremely Strong

[5] Hedonic Tone

Rating	Descriptor
-4	Extremely unpleasant
-3	Very unpleasant
-2	Unpleasant
-1	mildly unpleasant
0	Neutral
1	Mildly pleasant
2	Pleasant
3	Very Pleasant
4	Extremely Pleasant

Record hedonic tone at the end of the survey as an overall impression