

Introduction

This document has been compiled to comply with the document provided by BECA, *Appendix 12; Protocol for Monitoring Under Sheets*. Its purpose is to demonstrate Genera's capacity to recapture methyl bromide from the headspace of an enclosed log row post fumigation and prior to venting.

Methodology

Sampling from the log rows was carried out in accordance with the above mentioned BECA document and summarized as follows;

- A calibrated Gas Chromatograph (GC) was used to analyze gas samples collected from under a tarpaulin, using a syringe, from six sampling points per log row, as shown in Figure 1.
- Sampling points A and B were located at the front of the row and were adjacent to the inlet and outlet respectively of a recapture unit.
- A round of sampling was carried out every 20 minutes,
- Sampling was carried out for as long as possible which was ~approximately 4 hours
- Data relating to each log row monitored, meteorological conditions and subsequent venting were collated.

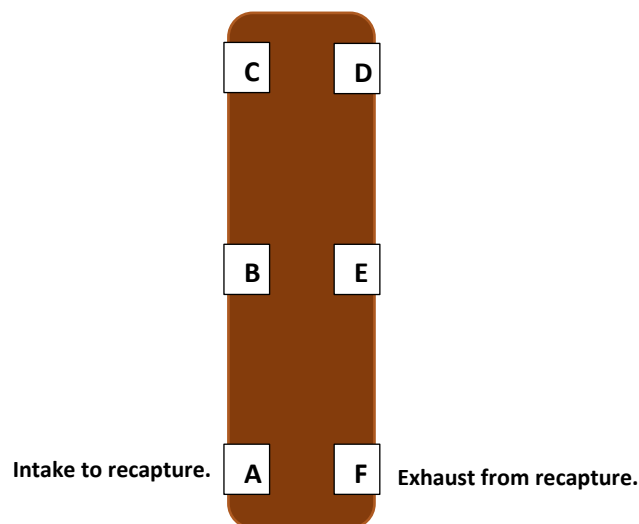


Figure 1 Sampling points around a log row.

Recapture Results

Monitoring of the Methyl Bromide concentration under the tarpaulins will be shown graphically and as a percentage of initial readings in this section with field results shown in the Appendix. The appendix will show each sample as a peak area reading given by the GC and the average per sampling round will be shown in g/m^3 . Each data point on the graphs represent the average of each sample round against the initial average.

Recapture 1

Figure 2 shows the reduction of Methyl Bromide over time; An average concentration reduction of 66.11% was achieved leaving 33.89% of the initial concentration after 280 minutes of recapture.

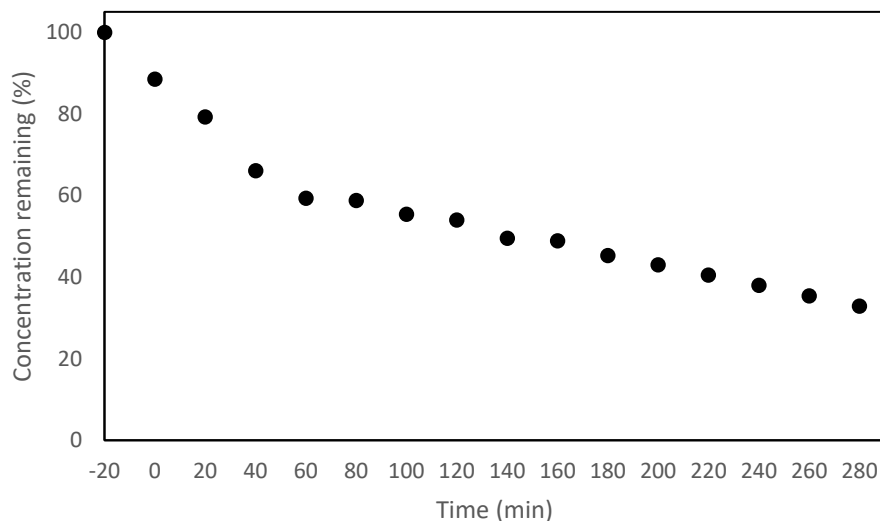


Figure 2 The reduction of Methyl Bromide over time during Recapture 1, based on percentage of initial Methyl Bromide concentration prior to recapture.

Table 1 shows the data relating to the log row and meteorological conditions at the time of recapture.

Table 1 Summary data of Recapture 1

Date	28/11/2019
Recapture start	7:35
Recapture finished	12:50
Log Row volume (m3)	1161.3
Initial Riken (g/m3)	204.2
Final Riken (g/m3)	108.5
Recapture unit	5
Solution Usage (Hours)	0
Wind Speed (km/h)	15
Wind Direction	NNW
Temperature (°C)	19.3
Relative Humidity (%)	76

Table 2 shows Environmental Monitoring Data for the Venting and WES

Table 2 Environmental Monitoring data from venting including monitored row.

General Venting Information								WES			
Date	Number of rows	Recaptured Rows	MB usage (Kg)	Capacity (m3)	Wind (Direction/Intensity) (knots)	Vent Start Time	Vent End Time	CUB ID	8 Hour Av. (ppm)		
28.11.12	7	7	1104	5309	NNW/7	13:05	14:50	RA1	1.4200		
Direct (TEL)			45 Degree Left (TEL)				45 Degree Right (TEL)				
CUB ID	1h Av. (ppm)	24h Av. (ppm)	Distance from closest Vent (m)	CUB ID	1h Av. (ppm)	24h Av. (ppm)	Distance from closest Vent (m)	CUB ID	1h Av. (ppm)	24h Av. (ppm)	Distance from closest Vent (m)
PB4	0.8317	0.0381	258	PB5	0.2592	0.0145	524	PB8	0.0247	0.0014	188

Recapture 2

Figure 3 shows the reduction of Methyl Bromide over time; An average concentration reduction of 38.91 was achieved leaving 61.09% of the initial concentration after 240 minutes of recapture.

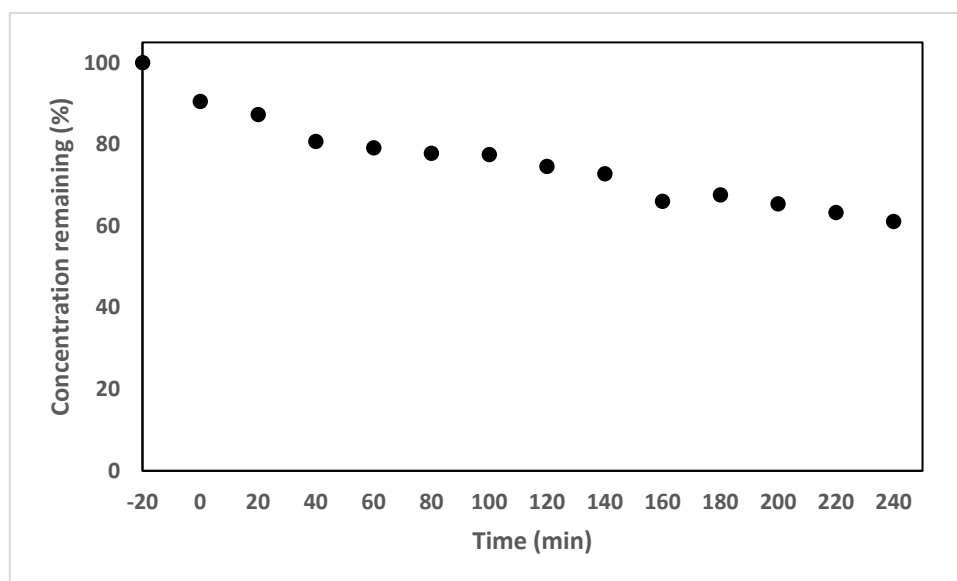


Figure 3 The reduction of Methyl Bromide over time during Recapture 2, based on percentage of initial Methyl Bromide concentration prior to recapture.

Table 3 shows the data relating to the log row and meteorological conditions at the time of recapture.

Table 3 Summary data of Recapture 2

Date	02/12/2019
Recapture start	8:50
Recapture finished	13:10
Log Row volume (m3)	1907.5
Initial Riken (g/m3)	205.9
Final Riken (g/m3)	108.7
Recapture unit	5
Solution Usage (Hours)	4.7
Wind Speed (km/h)	7
Wind Direction	N
Temperature (°C)	19.3
Relative Humidity (%)	84

Table 4 shows Environmental Monitoring Data for the Venting and WES

Table 4 Environmental Monitoring data from venting including monitored row.

Date	Number of rows	Recaptured Rows	MB usage (Kg)	Capacity (m3)	Wind (Direction/Intensity) (knots)	Vent Start Time	Vent End Time	CUB ID	8 Hour Av. (ppm)		
02.12.19	7	7	1049	5040	N/7	13:15	15:00	RA2	0.5252		
Direct (TEL)			45 Degree Left (TEL)				45 Degree Right (TEL)				
CUB ID	1h Av. (ppm)	24h Av. (ppm)	Distance from closest Vent (m)	CUB ID	1h Av. (ppm)	24h Av. (ppm)	Distance from closest Vent (m)	CUB ID	1h Av. (ppm)	24h Av. (ppm)	Distance from closest Vent (m)
PB3	0.0003	0.0000	1342	PB5	0.0003	0.0000	280	PB9	0.0078	0.0003	179

Recapture 3

Figure 4 shows the reduction of Methyl Bromide over time; An average concentration reduction of 80.5% was achieved leaving 19.5 % of the initial concentration after 160 minutes of recapture.

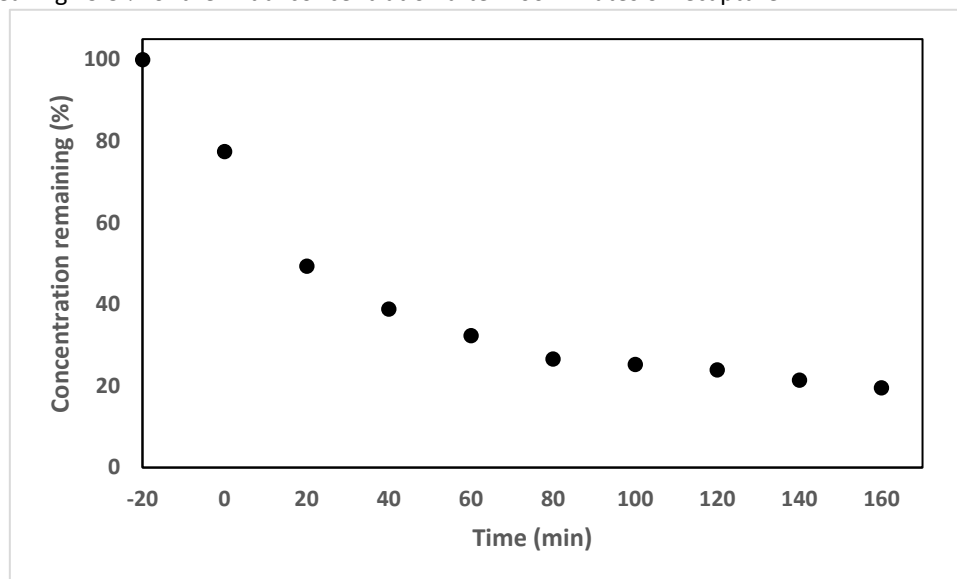


Figure 4 The reduction of Methyl Bromide over time during Recapture 3, based on percentage of initial Methyl Bromide concentration prior to recapture.

Table 5 shows the data relating to the log row and meteorological conditions at the time of recapture.

Table 5 Summary data of Recapture 3

Date	13/12/2019
Recapture start	13:30
Recapture finished	16:30
Log Row volume (m3)	184.4
Initial Riken (g/m3)	134.3
Final Riken (g/m3)	87.0
Recapture unit	5
Solution Usage (Hours)	8.7
Wind Speed (km/h)	18
Wind Direction	WNW
Temperature (°C)	22
Relative Humidity (%)	49

Table 6 shows Environmental Monitoring Data for the Venting and WES

Table 6 Environmental Monitoring data from venting including monitored row.

Date	Number of rows	Recaptured Rows	MB usage (Kg)	Capacity (m3)	Wind (Direction/Intensity) (knots)	Vent Start Time	Vent End Time	CUB ID	8 Hour Av. (ppm)		
13.12.19	1	1	14	184.8	WSW/WNW/3-5	8:35	8:53	RA2	0.0704		
Direct (TEL)			45 Degree Left (TEL)				45 Degree Right (TEL)				
CUB ID	1h Av. (ppm)	24h Av. (ppm)	Distance from closest Vent (m)	CUB ID	1h Av. (ppm)	24h Av. (ppm)	Distance from closest Vent (m)	CUB ID	1h Av. (ppm)	24h Av. (ppm)	Distance from closest Vent (m)
PB5	0.0021	0.0001	204	PB6	0.0000	0.0000	299	PB3	0.0000	0.0000	346

Recapture 4

Figure 5 shows the reduction of Methyl Bromide over time; An average concentration reduction of 36.2% was achieved leaving 63.8 % of the initial concentration after 280 minutes of recapture.

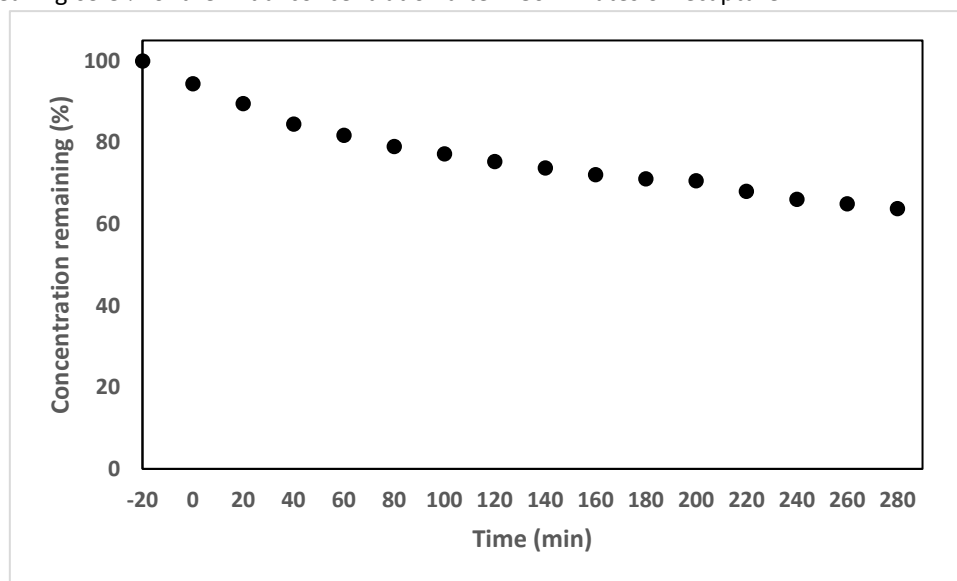


Figure 5 The reduction of Methyl Bromide over time during Recapture 4, based on percentage of initial Methyl Bromide concentration prior to recapture.

Table 7 shows the data relating to the log row and meteorological conditions at the time of recapture.

Table 7 Summary data of Recapture 4

Date	15/12/2019
Recapture start	7:50
Recapture finished	12:50
Log Row volume (m3)	826.8
Initial Riken (g/m3)	165.1
Final Riken (g/m3)	92.3
Recapture unit	5
Solution Usage (Hours)	11.3
Wind Speed (km/h)	20
Wind Direction	N
Temperature (°C)	19.9
Relative Humidity (%)	64

Table 8 shows Environmental Monitoring Data for the Venting and WES

Table 8 Environmental Monitoring data from venting including monitored row.

Date	Number of rows	Recaptured Rows	MB usage (Kg)	Capacity (m3)	Wind (Direction/Intensity) (knots)	Vent Start Time	Vent End Time	CUB ID	8 Hour Av. (ppm)		
15.12.19	1	1	67	826.8	NNW/7	13:10	14:10	RA2	0.0215		
Direct (TEL)			45 Degree Left (TEL)				45 Degree Right (TEL)				
CUB ID	1h Av. (ppm)	24h Av. (ppm)	Distance from closest Vent (m)	CUB ID	1h Av. (ppm)	24h Av. (ppm)	Distance from closest Vent (m)	CUB ID	1h Av. (ppm)	24h Av. (ppm)	Distance from closest Vent (m)
PB5	0.0089	0.0004	268	PB6	0.0225	0.0009	505	PB7	0.0000	0.0000	186

Recapture 5

Figure 6 shows the reduction of Methyl Bromide over time; An average concentration reduction of 28.5% was achieved leaving 71.5 % of the initial concentration after 240 minutes of recapture.

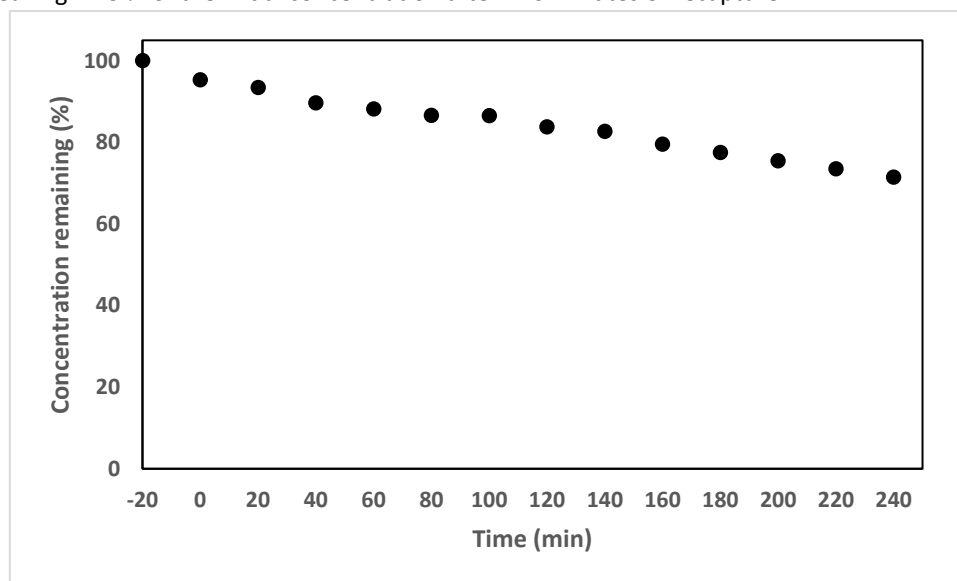


Figure 6 The reduction of Methyl Bromide over time during Recapture 5, based on percentage of initial Methyl Bromide concentration prior to recapture.

Table 9 shows the data relating to the log row and meteorological conditions at the time of recapture.

Table 9 Summary data of Recapture 5

Date	17/12/2019
Recapture start	8:40
Recapture finished	13:00
Log Row volume (m3)	1012
Initial Riken (g/m3)	200+
Final Riken (g/m3)	59.8
Recapture unit	5
Solution Usage (Hours)	16
Wind Speed (km/h)	24
Wind Direction	NE
Temperature (°C)	19.9
Relative Humidity (%)	90

Table 10 shows Environmental Monitoring Data for the Venting and WES

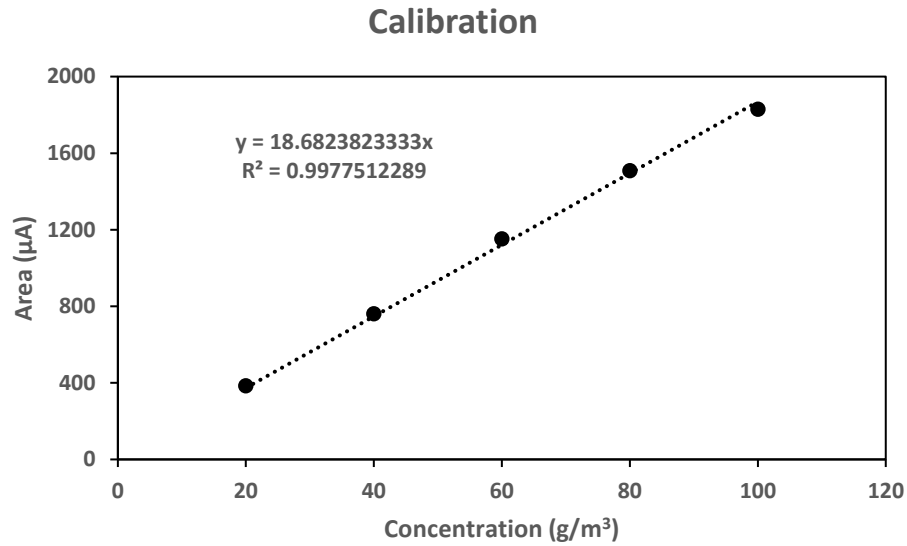
Table 10 Environmental Monitoring data from venting including monitored row.

Date	Number of rows	Recaptured Rows	MB usage (Kg)	Capacity (m3)	Wind (Direction/Intensity) (knots)	Vent Start Time	Vent End Time	CUB ID	8 Hour Av. (ppm)		
17.12.19	5	5	437	3110.764	NE/8	13:00	15:00	RA1	0.5342		
Direct (TEL)			45 Degree Left (TEL)				45 Degree Right (TEL)				
CUB ID	1h Av. (ppm)	24h Av. (ppm)	Distance from closest Vent (m)	CUB ID	1h Av. (ppm)	24h Av. (ppm)	Distance from closest Vent (m)	CUB ID	1h Av. (ppm)	24h Av. (ppm)	Distance from closest Vent (m)
PB6	0.0000	0.0000	876	PB3	0.0075	0.0003	169	Faulty Cub			

Appendix

Appendix 1: Gas Chromatograph Calibration Results

A 5-point (forced through 0) calibration using dilutions of pure MB in air was performed at the beginning of the monitoring event to give a linear regression with an R² of >0.992. Once successful standards were used on consecutive days to ensure the response from the GC was maintained. The use of the m and c figures from the $y=mx+c$ equation given was used to convert GC – measured data (peak area) into g/m^3 .



MB (g/m ³)	Std. 1	Std. 2	Std. 3	Average
20	386.39	382.74	383.97	384.37
40	755.64	763.28	764.01	760.97
60	1145.02	1149.66	1163.56	1152.75
80	1504.25	1515.22	1507.53	1509.00
100	1835.90	1827.84	1826.30	1830.01

Appendix 2: Field Data

Below is the raw data for each recapture event. Data for each sample point is given as g/m³ converted using the above formula from the peak area readings from the GC based on the calibration curve equation. The average converts each of the sample points into an average for each sampling round.

Recapture 1

Time	Duration (min)	A	B	C	D	E	F	Average (g/m3)
7:50	-20	81.13	117.85	109.71	96.48	116.58	92.80	102.43
8:10	0	85.73	92.48	93.34	92.93	87.37	92.14	90.66
8:30	20	67.84	74.77	83.26	89.36	82.74	89.31	81.21
8:50	40	57.21	63.20	78.39	82.08	66.57	58.65	67.69
9:10	60	44.94	53.13	74.22	75.74	64.26	52.30	60.76
9:30	80	37.34	50.26	80.22	82.61	60.74	49.91	60.18
9:50	100	39.86	48.11	69.44	76.52	60.81	45.90	56.77
10:10	120	33.87	44.57	74.98	82.54	50.49	45.30	55.29
10:30	140	34.98	49.45	67.24	64.19	47.67	41.07	50.77
10:50	160	33.26	51.97	64.60	66.37	48.68	35.74	50.10
11:10	180	37.89	38.01	57.43	65.17	44.55	35.25	46.38
11:30	200	34.60	42.58	56.42	59.30	40.14	31.40	44.07
11:50	220	34.15	41.29	52.98	55.41	36.70	28.31	41.47
12:10	240	33.69	40.01	49.54	51.53	33.27	25.23	38.88
12:30	260	33.24	38.73	46.09	47.64	29.83	22.14	36.28
12:50	280	32.78	37.45	42.65	43.76	26.40	19.06	33.68

Recapture 2

Time	Duration (min)	A	B	C	D	E	F	Average (g/m3)
8:50	-20	101.45	90.04	95.29	93.60	87.66	98.92	94.50
9:10	0	81.33	87.08	91.74	90.22	79.68	83.10	85.53
9:30	20	85.45	83.24	92.63	86.73	77.79	69.17	82.50
9:50	40	59.51	74.65	78.83	86.24	83.46	74.63	76.22
10:10	60	82.12	74.55	78.21	64.50	78.92	70.25	74.76
10:30	80	69.09	75.88	81.55	74.71	69.95	69.74	73.48
10:50	100	69.17	70.38	75.25	77.75	78.23	68.42	73.20
11:10	120	76.76	73.61	71.24	68.28	64.52	68.39	70.47
11:30	140	67.10	74.29	70.89	70.64	66.80	62.69	68.74
11:50	160	61.51	58.60	59.13	64.19	62.91	67.85	62.36
12:10	180	66.98	64.44	61.58	67.50	59.06	63.59	63.86
12:30	200	66.40	62.62	58.58	65.23	55.80	62.28	61.82
12:50	220	65.81	60.80	55.57	62.97	52.54	60.96	59.78
13:10	240	65.23	58.98	52.57	60.70	49.28	59.65	57.73

Recapture 3

Time	Duration (min)	A	B	C	D	E	F	Average (g/m3)
1:30	-20	68.60	104.14	87.68	87.40	106.34	67.64	86.97
1:50	0	16.81	74.09	88.50	87.81	97.83	38.97	67.33
2:10	20	7.96	42.81	73.13	82.74	43.08	7.68	42.90
2:30	40	12.76	27.58	58.59	66.41	25.93	11.53	33.80
2:50	60	13.03	18.93	52.69	55.02	16.88	12.21	28.13
3:10	80	10.98	13.72	43.77	45.96	14.13	10.43	23.17
3:30	100	10.31	13.10	41.90	42.87	13.46	10.31	21.99
3:50	120	10.15	12.76	39.79	40.06	12.49	9.60	20.81
4:10	140	8.78	12.90	36.63	36.91	7.82	8.78	18.64
4:30	160	8.10	9.33	33.62	33.34	9.74	7.96	17.01

Recapture 4

Time	Duration (min)	A	B	C	Average (g/m3)
7:50	-20	89.00	92.42	97.89	93.10
8:10	0	77.47	91.42	94.89	87.93
8:30	20	68.21	87.52	94.26	83.33
8:50	40	58.94	83.57	93.63	78.72
9:10	60	53.89	81.73	92.84	76.15
9:30	80	48.84	79.89	92.05	73.59
9:50	100	46.73	78.73	90.15	71.87
10:10	120	44.63	77.52	88.21	70.12
10:30	140	42.10	76.84	87.00	68.65
10:50	160	39.47	76.10	85.89	67.15
11:10	180	37.95	75.21	85.42	66.19
11:30	200	36.31	74.31	86.57	65.73
11:50	220	34.31	72.84	83.00	63.38
12:10	240	32.31	71.42	80.94	61.56
12:30	260	30.58	70.84	80.05	60.49
12:50	280	28.84	70.26	79.10	59.40

Recapture 5

Time	Duration (min)	A	B	C	D	E	F	Average (g/m3)
8:40	-20	49.35	53.14	47.77	54.36	54.56	47.72	51.15
9:00	0	47.24	48.85	50.67	50.67	47.84	47.24	48.75
0:00	20	46.42	47.99	49.50	49.07	47.24	46.46	47.78
9:40	40	45.42	45.62	47.04	47.04	45.22	44.82	45.86
10:00	60	44.31	44.61	46.53	46.33	44.61	44.11	45.08
10:20	80	43.40	44.01	45.62	46.03	43.60	43.20	44.31
10:40	100	43.23	43.91	45.55	45.80	43.81	43.15	44.24
11:00	120	43.00	43.00	43.81	44.41	40.98	41.99	42.86
11:20	140	41.59	42.19	43.20	42.59	42.59	41.59	42.29
11:40	160	40.53	40.00	42.62	41.25	39.20	40.43	40.67
12:00	180	39.66	38.81	41.81	40.03	37.91	39.62	39.64
12:20	200	38.79	37.62	41.01	38.81	36.63	38.81	38.61
12:40	220	37.92	36.44	40.21	37.58	35.35	38.01	37.58
13:00	240	37.05	35.25	39.41	36.36	34.07	37.20	36.56