

Marlborough District Council



METHYL BROMIDE MONITORING REPORT JANUARY 2011

Issue II

Amended March 2011

Marlborough District Council

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Executive Summary

Source Testing New Zealand Limited (STNZ) was commissioned by Marlborough District Council (MDC) to undertake methyl bromide monitoring at two locations in Picton. The purpose of the monitoring was to determine if methyl bromide emitted from the fumigation of export logs at the Port Marlborough NZ Ltd, Waimahara Wharf could be detected within the Picton community.

This report has been amended to account for the following:

- Table 1 Line 1 had the time incorrectly entered as 11:55. This has been corrected to 21:55.
- The time in Section 4.1 Paragraph 2 was initially reported as 21:05. This was corrected to 23:05.
- In Section 3.2: Fumigation Conditions, the mass of methyl bromide use for the ship holds and tarpaulins were transposed. Ship holds and tarpaulins were fumigated with 2,405 kg and 991.2 kg of methyl bromide respectively.
- At the request of the client, the reason for the shortage of GASTEC detector tubes was included in Page 9 Paragraph 2.

On 27 and 28 January 2011 logs for export were fumigated at Port Marlborough NZ Ltd Waimahara Wharf under gas tight tarpaulins and in ship holds using methyl bromide. The ambient concentration of methyl bromide just before, during, and after the release following the fumigation period was assessed at two sites in the Picton community (Waitohi Wharf and Picton Jetty) using MiniRAE PID analysers. The MiniRAE Photo Ionisation Detector analysers measure the concentration of total VOC's and do not specifically respond to methyl bromide.

In addition to the PID analysers, two approximately 4-hour samples were collected from each site in accordance with USEPA Method TO-17 "Determination of Volatile Organic Compounds in Ambient Air Using Active Sampling onto Sorbent Tubes". USEPA Method TO-17 results are reported as an average over the sampling period and therefore cannot be directly compared to 1-hour averaged data. However, it could be assumed that if all the methyl bromide was absorbed over a single hour then a worst case 1-hour averaged value could be calculated.

For the monitoring which commenced on 27 January 2011, the PID analyser located at Waitohi Wharf indicated the total VOC concentration increased from <0.1 to 0.6 ppmv over the duration of the monitoring period. Based on the odours detected at the monitoring site and the southerly wind direction, the observed VOCs were likely to have originated from the operation of the Inter Islander and Blue Bridge ferries.

The results of the USEPA Method TO-17 monitoring on 27 January indicated a methyl bromide concentration over the approximately 3 hours sampling period was 1.0 parts per billion by volume

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(ppbv). , If it was assumed that all the methyl bromide was absorbed over a single hour then a worst case 1-hour averaged value would calculate to 2.9 ppbv which is well below the California REL of 1 ppmv as a 1-hour average (0.29%).

For the monitoring which commenced on 27 January 2011, the PID analyser located at Picton Jetty indicated the VOC concentration was at or below detection limit of the analyser for the commencement of the monitoring until 00:35 on 28 January 2011, when the VOC concentration appeared to increase sharply to 2.0 ppmv by the end of the monitoring period. The southerly wind direction could have transported VOC emitted within the marina or central Picton to the monitoring site. However limited activity in these areas could also suggest the increase was due to instrumental drift.

The results of the USEPA Method TO-17 monitoring on 27 January indicated a methyl bromide concentration over the approximately 3 hours sampling period was <0.1 ppbv/. If it was assumed that all the methyl bromide was absorbed over a single hour then a worst case 1-hour averaged value would calculate to <0.3 ppbv which is well below the California REL of 1 ppmv as a 1-hour average (0.03%).

On 28 January 2011, the wind direction over the monitoring period was north north-west which could have acted for at least some of the time to directly transport emissions of methyl bromide from Shakespeare Bay to Waitohi Wharf and across the bay to the Picton Jetty monitoring station. The PID analysers located at both sites indicated the VOC concentration was <0.1 ppmv.

The results of the USEPA Method TO-17 on 28 January 2011 monitoring indicated the methyl bromide concentrations were 15 and 2.4 ppbv assuming a worst case 1-hour average at Waitohi Wharf and Picton Jetty respectively. Hence, despite the fumigation release under ideal wind direction to transport methyl bromide to Picton, the ambient concentration of methyl bromide was well below the California REL of 1 ppmv 1-hour average (1.5 %).

1. Introduction

Source Testing New Zealand Limited (STNZ) was commissioned by Marlborough District Council (MDC) to undertake methyl bromide monitoring at two locations in Picton. The purpose of the monitoring was to determine if methyl bromide emitted from the fumigation of export logs at the Port Marlborough NZ Ltd, Waimahara Wharf could be detected within the Picton community.

This report has been amended to account for the following:

- Table 1 Line 1 had the time incorrectly entered as 11:55. This has been corrected to 21:55.
- The time in Section 4.1 Paragraph 2 was initially reported as 21:05. This was corrected to 23:05.
- In Section 3.2: Fumigation Conditions, the mass of methyl bromide use for the ship holds and tarpaulins were transposed. Ship holds and tarpaulins were fumigated with 2,405 kg and 991.2 kg of methyl bromide respectively.
- At the request of the client, the reason for the shortage of GASTEC detector tubes was included in Page 9 Paragraph 2.

Port Marlborough NZ Ltd commissioned Sinclair Knight Merz Ltd (SKM) to assess methyl bromide concentrations at the site boundary during the fumigation of whole logs for export. This monitoring was undertaken in accordance with the SKM Methyl Bromide – Ambient Air Monitoring Protocol – Standard Protocol for Ambient Air Monitoring of Methyl Bromide at Fumigation Sites in New Zealand.

The SKM Methyl Bromide Ambient Air Monitoring Protocol outlines a number of methods for determining the ambient concentration of methyl bromide and recommends the use of Photo Ionization Detectors (PID) for the continuous determination of total volatile organic compounds (VOC's) with GASTEC methyl bromide specific gas detection tubes used to confirm the presence/absence of methyl bromide in the event more than minimal VOC's are detected. At the request of MDC this approach was applied by STNZ for the current monitoring in Picton.

In addition to the PID analysers, two approximately 4-hour samples were collected from each site in accordance with USEPA Method TO-17 "Determination of Volatile Organic Compounds in Ambient Air Using Active Sampling onto Sorbent Tubes".

For the duration of the monitoring meteorological conditions and field observations were also recorded on a routine basis.

Matthew Newby, Air Quality Scientist with STNZ performed the methyl bromide monitoring on 27 and 28 January 2011. Matthew has over 14 year's air quality monitoring experience and is designated as a Key Technical Person under STNZ's IANZ accreditation.

This report presents the results of the ambient air quality monitoring and a summary of meteorological conditions over the fumigation period.

2. Ambient Methyl Bromide Monitoring

2.1 Summary

The SKM Methyl Bromide Ambient Air Monitoring Protocol outlines a number of methods for determining the ambient concentration of methyl bromide and recommends the use of PIDs for the continuous determination of total VOC's with GASTEC gas detection tubes used to confirm the presence/absence of methyl bromide. Provided below is a brief summary of these two sampling methods. A brief summary of the approach employed for the current round of monitoring is presented below. For further details the reader is directed to the protocol which is available from MDC.

Samples were also collected as per USEPA Method TO-17 "Determination of Volatile Organic Compounds in Ambient Air Using Active Sampling onto Sorbent Tubes"

2.2 Photo-ionisation Detectors (PID)

Photo-ionisation Detectors (PID's) are used to measure the concentration of total volatile organic compounds (VOC's). The units use an ultra-violet lamp producing high energy photons to break down gas molecules into positively charged ions. The electrical current produced in the reaction becomes the signal output for the unit. Once set up, the detectors continually record total VOC concentration and are not specific to methyl bromide.

The MiniRAE 2000 and 3000 PID's used are currently the most readily available cost effective option for short term ambient air monitoring. The analysers were checked using zero and span gases (100 ppmv isobutanol) before and after the sampling event. Calibrations were carried out where required. Hydrocarbon-free air generated through the use of a carbon scrubber was employed to zero the analysers.

2.3 GASTEC Gas Detection Tubes

GASTEC gas detector tubes are thin glass tubes with concentration scales printed on them to enable direct reading of concentrations of the substance being measured. Each tube contains a particulate matrix (e.g. silica gel, alumina) which binds with carefully selected and highly stable detection reagents that are especially sensitive to the target substance in order to produce a distinct layer of colour change. The tubes are hermetically sealed at both ends. After snapping off the sealed ends, sample air is aspirated (drawn) into the detector tube manually by pulling the handle of a sampling 'pump' that the detector tube is attached to. The number of pump strokes required for various concentration ranges is stated on the tube box or instruction sheet.

When GASTEC tubes are used to confirm PID readings, only comparison with the PID recordings over the time taken to sample with GASTEC 'pump' are valid with an averaging period of approximately 30 seconds.

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The simplicity of this method makes it easy to use and does not require a highly trained operator. The easy-to-check readings reduce potential operator error and can give quick and reasonably accurate results. Detection ranges can be easily adjusted by selecting different tube types and by altering air volumes drawn through the tube, hence the flexible nature of the method. The tubes are pre-calibrated and do not require complicated calibration procedures required in other methods. Methyl bromide specific GASTEC tubes have an accuracy of 10% for measurements of 1 to 6 parts per million (ppm).

(Port Marlborough NZ Ltd was to arrange the supply of PID analysers and GASTEC detection tubes to STNZ for the monitoring. However, for the current round of monitoring only two GASTEC pumps were available. It was decided that the two technicians performing the monitoring at the port needed to react quickly to any possible methyl bromide emissions and took priority to the monitoring performed by STNZ as the USEPA Method TO-17 samples would determine the actual methyl bromide concentration. Hence, the shortage of GASTEC detector tubes during this assessment meant that no instantaneous methyl bromide-specific samples could be taken by this method.)

2.4 USEPA Method TO-17

USEPA Method TO-17 “Determination of Volatile Organic Compounds in Ambient Air Using Active Sampling onto Sorbent Tube” is designed for the monitoring of volatile organic compounds (VOCs) such as methyl bromide in ambient at concentrations as low as 0.5 to 25 ppbv. The method involves pulling a known volume of air through a packed sorbent tube to collect methyl bromide. Following sampling the methyl bromide was thermal desorbed with analysis by capillary Gas Chromatography Mass Spectrometry (GC/MS). STNZ are IANZ accredited for the collection of Method TO-17 samples. Analysis was performed by RJ Hill Laboratories, Hamilton who are IANZ accredited for the analysis.

Samples were collected for the duration of the fumigation release period which was approximately 3-hours on 27 January and 4-hours on 28 January 2011 respectively. USEPA Method TO-17 results are reported as an average over the sampling period and therefore cannot be directly compared to 1-hour averaged data. However, it could be assumed that if all the methyl bromide was absorbed over a single hour then a worst case 1-hour averaged value could be calculated.

2.5 Sampling Location

MDC selected two sampling locations within the Picton community. The first site was located at the seaward end of Waitohi Wharf with the second site located at the opening of the Picton Jetty (See Figure 1). Figure 1 depicts where the fumigation was being carried out at the time the MDC-commissioned monitoring was being performed. The Waitohi Wharf site was selected due to its relatively close location to Port Marlborough fumigation facility at Shakespeare Bay while the

Picton Jetty was selected to assess if methyl bromide could be transported to eastern Picton. Both sites were also secure so to avoid any tampering with the monitoring unit by the general public.

Figure 2 presents the Port Marlborough fumigation facility at Shakespeare Bay.



■ Figure 1: Picton MDC Methyl Bromide Monitoring Sites(North is at the top of the page)



■ Figure 2: Port Marlborough Fumigation Facility(the North direction is to the right of the page)

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3. Fumigation Practices

3.1 Methyl Bromide Fumigation at Shakespeare Bay

Fumigation using methyl bromide is generally carried out as follows:

- In shipping containers: fumigation of a variety of merchandise within closed shipping containers;
- Under tarpaulin enclosures: fumigation of logs and timber enclosed within gas tight tarpaulins or covers, sealed to the hard ground surface; and
- In ships holds: fumigation of products of any type including logs and timber within closed holds of ships.

These three types of fumigation differ from one another in size, in terms of mass of product and fumigant used. Total fumigant quantity per container is generally less than 10 kg, while within a tarpaulin enclosure it may exceed 100 kg, and a ship's hold may require a tonne. These quantities vary not only with the volume of the enclosure, but also with bio-security standards of the importing country, and the nature of the product being treated.

At the end of the fumigation period (generally around 24-hours after fumigation commences), the release of methyl bromide is staggered to reduce the likelihood of concentrations at the site boundary.

3.2 Fumigation Conditions

On 27 January 2011 ship holds containing whole logs for export were fumigated. On 28 January 2011 enclosed tarpaulins containing whole logs for export were fumigated. The fumigation was performed by South Fume Ltd who is approved by Ministry of Agriculture & Forestry (ISPM15 No. 260).

For the ship holds a total of 2,405 kg of methyl bromide was used with the release commencing at 21:05 hours on 27 January with the final hold opened at 00:30 hours on 28 January 2011.

A total of 5 log stacks were enclosed in tarpaulins and fumigated using 991.2 kg of methyl bromide. The release of the first tarpaulin occurred at approximately 19:00 hours with the final tarpaulin being removed at approximately 23:15 hours on 28 January 2011.

4. Methyl Bromide Monitoring Results

4.1 Field Observations

On 27 January 2011 the fumigation release was initially scheduled to commence at 20:00. The PID analysers were deployed approximately 30 minutes prior to the scheduled release to give some back ground data. A single analyser was deployed at each site.

USEPA Method TO-17 samplers commenced monitoring when the first hull was opened at 23:05 on 27 January 2011 and ran until the all clear was given by the port authority at approximately 02:15 on 28 January 2011.

On 28 January 2011 the fumigation release was initially scheduled to commence at 18:00. The PID analysers were deployed approximately 30 minutes prior to the scheduled release to give some back ground data. A single analyser was deployed at each site.

USEPA Method TO-17 samplers commenced monitoring when the first tarpaulin was removed at approximately 19:00 and ran until the all clear was given by the port authority at approximately 23:20.

Throughout the monitoring period the two sites were routinely checked and data recorded on the instrument readout, wind speed, wind direction, ambient temperature, along with the activity of any potential sources of VOC's additional to methyl bromide such as boats or vehicular traffic. The wind speed and temperature were measured using a Kestrel 2500 hand held anemometer.

4.1.1 Waitohi Wharf Field Observations

The Waitohi Wharf PID analyser was deployed at the seaward end of the wharf (See Figure 3). Waitohi Wharf serves as the ferry terminal and over the duration of the monitoring there were a number of arrivals and departures of the both the Inter-Islander and Blue Bridge ferries. Vehicle traffic on the wharf was limited to the field technician and ferry staff during the arrival and departure of the Inter-Islander. This traffic was at least 50 meters to the south of the analyser. Tables 1 and 2 present the field observations recorded for Waitohi Wharf for 27 and 28 January 2011 respectively.

On 27 January 2011 the wind direction was primarily southerly resulting in VOC from the ferries and the ferries vehicle staging areas being transported towards the samplers. Human sewage, cattle and other trucks, diesel fuel, and engine exhaust odours were all identified at the sampling site over the monitoring period.

On 28 January 2011 the wind direction was primarily north north-west which could for some of the time directly transport methyl bromide from Shakespeare Bay to Waitohi Wharf and across the bay to Picton Jetty.

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■ **Figure 3: Waitohi Wharf Methyl Bromide Monitoring Site**

■ **Table 1: Waitohi Wharf Field Observations, 27 January 2011**

Time (hours)	Comments	PID Conc. ¹ (ppmv)	PID Peak ² (ppmv)	Wind Speed (m/s)	Wind Direction (from)	Temp. (°C)
21:55	Commenced monitoring with PID A1.	0.0	0.0	4.1	180	17.6
22:15	Engine odour from Inter Islander ferry	0.1	0.1	2.1	180	17.0
22:30	Inter Islander departs	0.1	0.1	2.0	180	17.0
22:52	Instrument observation	0.1	0.1	1.9	180	16.9
23:20	Slight sewage odour. USEPA Method TO-17 sampling commenced	0.2	0.3	2.4	180	15.8
23:35	Oily sewage type odour. Inter Islander in port.	0.2	0.3	1.8	180	15.7
00:06	Sewage/cattle truck/diesel odours	0.3	0.3	0.3	180	15.2
00:35	Cattle Truck odour. Blue Bridge ferry docking	0.3	0.3	0.5	180	15.1
01:36	Inter Islander and Blue Bridge both in port.	0.5	0.7	0.2	180	14.8
02:16	Two people smoking next to monitors. PID and USEPA Method TO-17 sampling completed.	0.6	0.7	Calm	180	14.5

1. Actual PID concentration reading

2. Peak PID concentration reading over the logged period

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■ **Table 2: Waitohi Wharf Field Observations, 28 January 2011**

Time (hours)	Comments	PID Conc. ¹ (ppmv)	PID Peak² (ppmv)	Wind Speed (m/s)	Wind Direction (from)	Temp. (°C)
17:50	Deployed PID A1. Inter Islander and Blue Bridge in port	0.0	0.0	7.7	N	21.8
18:10	Inter Islander departed 18:00	0.0	0.0	4.3	340	21.6
18:26	Instrument observation	0.0	0.0	4.7	340	21.7
19:17	Blue Bridge departed 19:00. USEPA Method TO-17 sampling commenced	0.0	0.0	3.9	320	21.6
19:40	Instrument observation	0.0	0.0	3.0	330	21.6
20:13	Instrument observation	0.0	0.0	1.8	310	21.1
21:06	Inter Islander docking	0.0	0.0	2.7	300	20.0
22:00	Instrument observation	0.0	0.0	3.0	N	20.4
22:32	Instrument observation	0.0	0.0	2.4	300	19.6
22:40	Instrument observation	0.0	0.0	3.0	N	19.4
23:20	PID and USEPA Method TO-17 sampling completed.	0.0	0.0	2.6	330	18.9

1. Actual PID concentration reading

2. Peak PID concentration reading over the logged period

4.1.2 Picton Jetty Field Observations

The Picton Jetty PID was deployed at the opening to the Picton Marina (see Figure 4). Access to this portion of the marina was restricted to owners of the berthed vessels. Vessels at the entrance to the marina were a potential source of VOC's. A public car park was located on shore approximately 25 m to the east of the analyser. Tables 3 and 4 present the field observations recorded for Picton Jetty for 27 and 28 January 2011 respectively.

On 27 January 2011 the wind direction was primarily southerly which would have resulted in VOC from the marina and central Picton being transported towards the samplers.

On 28 January 2011 the wind direction was primarily north north-west which could act at least some of the time to transport methyl bromide from Shakespeare Bay to Waitohi Wharf and across the bay to Picton Jetty.



■ **Figure 4: Picton Jetty PID Monitoring Site**

■ **Table 3: Picton Jetty Field Observations, 27 January 2011**

Time (hours)	Comments	PID Conc. ¹ (ppmv)	PID Peak ² (ppmv)	Wind Speed	Wind Direction (from)	Temp. (°C)
21:34	Commenced monitoring with PID E3	0.0	0.0	3.0	180	17.4
23:05	USEPA Method TO-17 sampling commenced	0.0	0.0	2.5	180	16.2
23:45	Instrument observation	0.0	0.0	1.7	180	15.4
12:50	Inter Islander departing	0.8	1.3	Calm		15.2
01:26	Instrument observation	1.8	2.2	Calm		14.9
02:03	PID and USEPA Method TO-17 sampling completed.	3.9	5.1	Calm		14.7

1. Actual PID concentration reading

2. Peak PID concentration reading over the logged period

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■ **Table 4: Picton Jetty Field Observations, 28 January 2011**

Time (hours)	Comments	PID Conc. ¹ (ppmv)	PID Peak ² (ppmv)	Wind Speed	Wind Direction (from)	Temp. (°C)
17:35	Commenced monitoring with PID E3	0.0	0.0	2.7	320	21.1
18:36	Instrument observation	0.0	0.0	3.0	320	21.1
19:09	USEPA Method TO-17 sampling commenced	0.0	0.0	4.1	320	22.1
19:54	Instrument observation	0.0	2.7	2.2	320	20.7
21:17	Instrument observation	0.0	2.7	2.0	320	20.1
21:50	Instrument observation	0.0	2.7	0.9	320	20.4
22:40	Instrument observation	0.0	2.7	2.1	290	19.8
23:19	PID and USEPA Method TO-17 sampling completed.	0.0	2.7	1.9	300	19.4

1. Actual PID concentration reading

2. Peak PID concentration reading over the logged period

4.2 Meteorological Data

Meteorological conditions measured at Shakespeare Bay for the monitoring periods of the 27 and 28 January 2011 are presented in Tables 5 and 6 respectively.

■ **Table 5 Shakespeare Bay Meteorological Observations, 21:30 27/02/2011 to 02:15 28/02/2011**

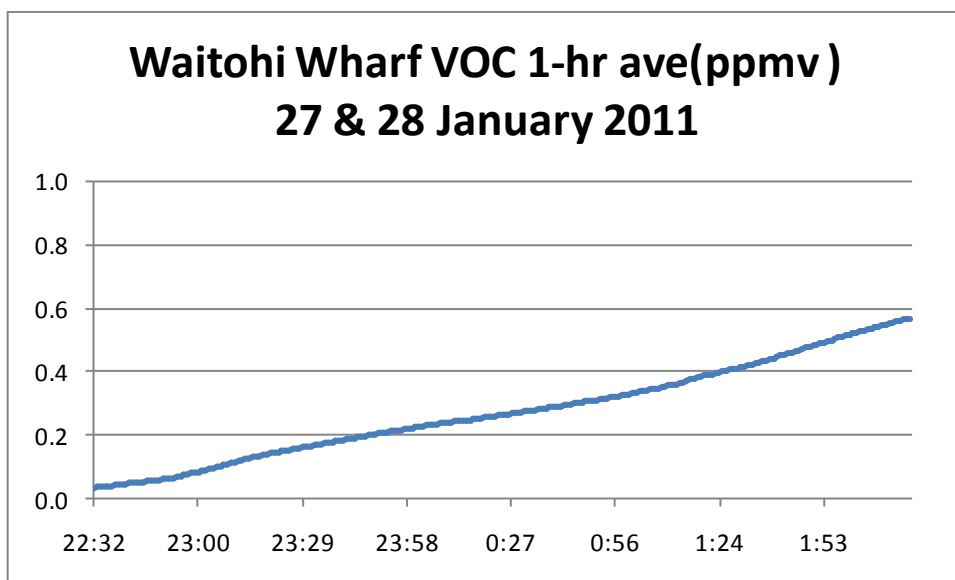
	Wind Direction (from)	Wind Speed (m/s)	Wind Speed Max. (m/s)	Rain (mm)	Temp. (°C)
Ave.	161	3.7	6.6	0	14.1
Max.	312	9.4	14.8	0	16.7
Min.	24	0.0	0.8	0	11.8

■ **Table 6 Shakespeare Bay Meteorological Observations, 17:35 to 23:20 28/02/2011**

	Wind Direction (from)	Wind Speed (m/s)	Wind Speed Max. (m/s)	Rain (mm)	Temp. (°C)
Ave.	118	6.4	13.8	0	19.7
Max.	360	14.2	22.8	0	22.8
Min.	0	1.5	4.3	0	18.6

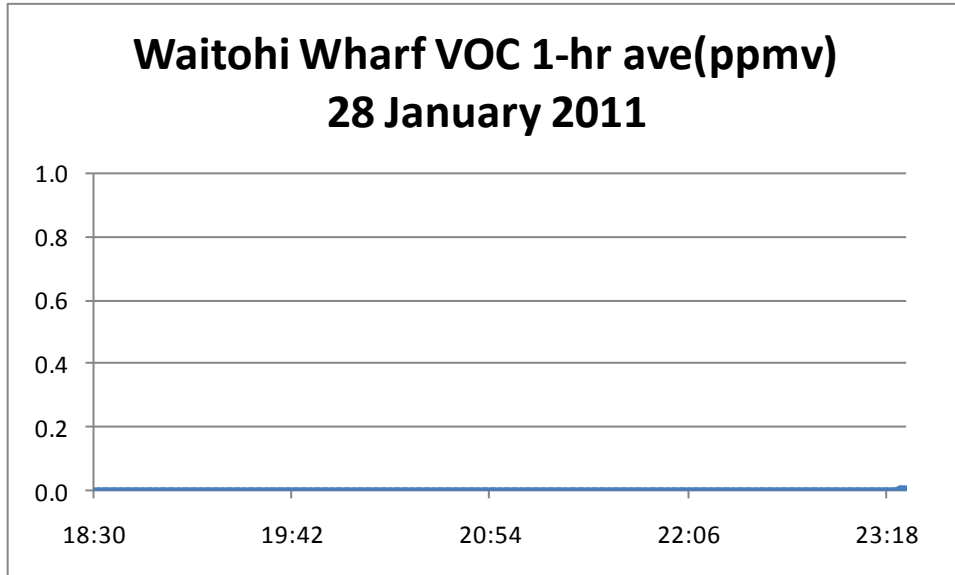
4.3 Photo-Ionisation Detectors Methyl Bromide Monitoring Results

The following section presents the results of the PID analyser ambient methyl bromide monitoring performed within the Picton community on 27 and 28 January 2011. Figures 5 and 6 present the 1-hour rolling average total VOC data from the PID analysers for Waitohi Wharf on 27 and 28 January 2011 respectively. Figures 7 and 8 present the 1-hour rolling average total VOC data from the PID analysers for Picton Jetty on 27 and 28 January 2011 respectively. Appendix A presents the Ambient Air Monitoring Site Evaluation Form for the current fumigation. Included in the form is the calibration zero and span data for each of the analysers deployed. Appendix B presents the raw data from each of the instruments. Appendix C contains the calibration certificates from the instrument suppliers.



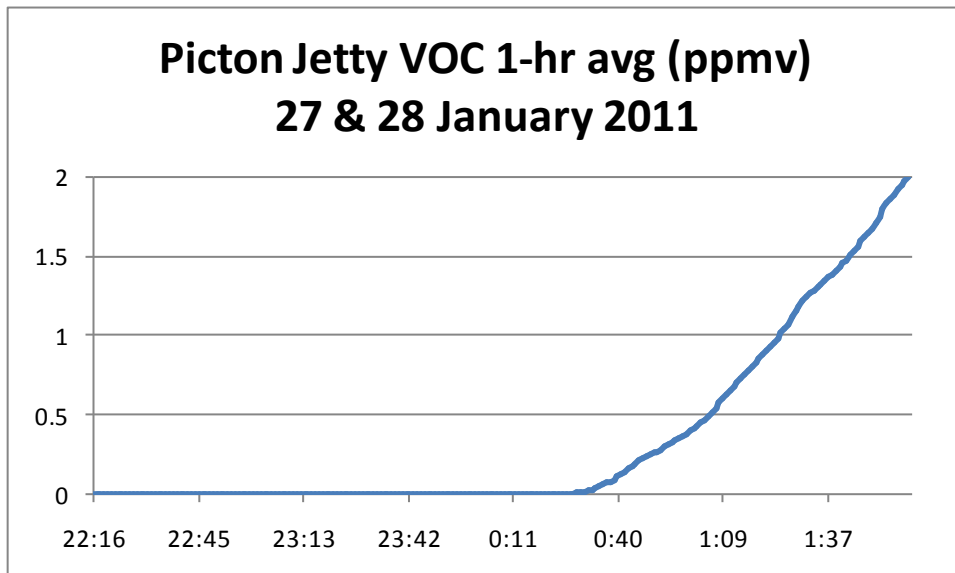
■ **Figure 5: Waitohi Wharf VOC Data, 27 & 28 January 2011**

The results of the ambient total VOC monitoring performed at the Waitohi Wharf on 27 and 28 January 2011 indicate that the concentration of VOCs increased gradually over the night from <0.1 ppmv to approximately 0.6 ppmv. A shortage of GASTEC gas detector tubes meant no methyl bromide-specific spot samples could be taken. However, the USEPA Method TO-17 sorbent tubes would determine if the VOCs detected were actually methyl bromide. Given the odours observed during the monitoring period (see Table 1) and the southerly wind direction, it was likely that the VOCs detected were from the operation of the Inter-Islander and Blue Bridge ferries.



■ **Figure 6: Waitohi Wharf VOC Data, Evening of 28 January 2011**

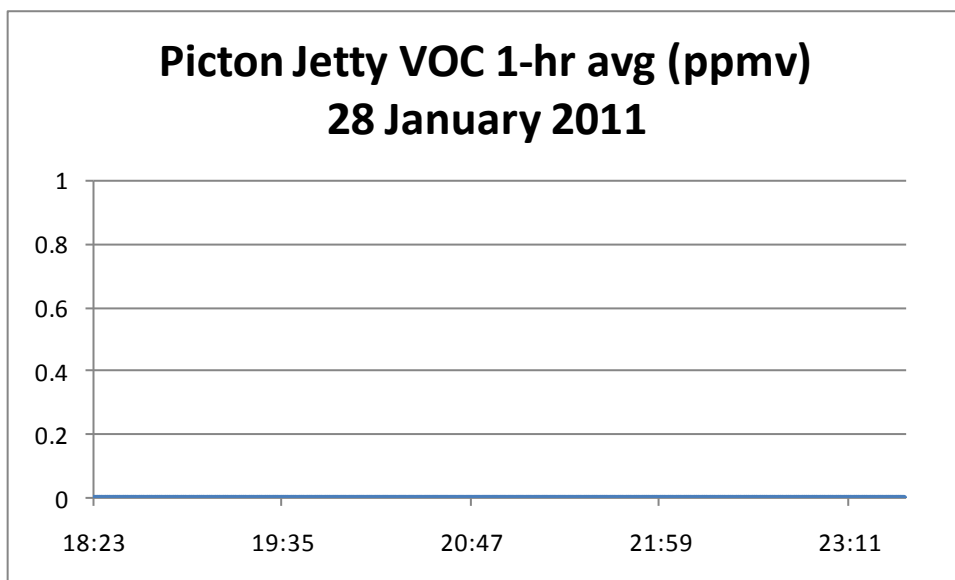
The results of the ambient total VOC monitoring performed at the Waitohi Wharf during the evening of 28 January 2011 indicate that the concentration of total VOCs was below detection limit of the analyser of 0.1 ppmv. This was despite the north north-westerly winds potentially transporting methyl bromide from Shakespeare Bay to Waitohi Wharf for at least some of the time.



■ **Figure 7: Picton Jetty VOC Data, 27 & 28 January 2011**

The results of the ambient VOC monitoring performed at the Picton Jetty on 27 and 28 January 2011 indicate that the VOC concentration was at or below detection limit of the analyser for the commencement of the monitoring until 00:35 on 28 January 2011. At this point the VOC concentration appeared to increase to 2.0 ppmv at 02:00 on January 2011.

As mentioned previously, a shortage of GASTEC gas detector tubes meant no methyl bromide specific spot samples could be taken. However, the Method TO-17 sampling would determine whether the VOCs detected were actually methyl bromide. Given the southerly wind direction, it was possible that the observed increase in the VOCs concentration was due to emissions from the marina and central Picton. However, it is equally likely that the increase was due to instrumental drift, as little activity was observed within the marina or at the northern end Picton.



■ **Figure 8: Picton Jetty VOC Data, Evening of 28 January 2011**

The results of the ambient total VOC monitoring performed at the Picton Jetty during the evening of 28 January 2011 indicate that the concentration of VOCs was below detection limit of the analyser of 0.1 ppmv. This was despite the north north-westerly winds acting to transport methyl bromide from Shakespeare Bay to Picton Jetty.

4.4 USEPA Method TO-17 Methyl Bromide Monitoring Results

Table 7 presents the results of the USEPA Method TO-17 ambient methyl bromide monitoring performed within the Picton community on 27 and 28 January 2011. Table 7 presents the methyl bromide concentrations averaged over the actual sampling period. Table 8 converts this data to reflect an assumed worst case 1-hour averaged concentration, i.e. assumes all the methyl bromide collected was absorbed over a 1-hour period. Appendix D presents the field sampling data along with the raw analytical results

■ Table 7 USEPA Method TO-17 Methyl Bromide Monitoring Results, 27 and 28 January 2011

Sample Description	Sampling Date	Sampling Period	Sample Volume (m ³) ¹	Mass (ng)	Conc. (µg/m ³) ¹	Conc. (ppbv) ²
Waitohi Wharf Run 1	27/01/2011	11:20 - 2:15	0.0130	55	4.2	1.0
Waitohi Wharf Run 2	28/01/2011	19:17 - 23:26	0.0168	260	16	3.7
Picton Jetty Run 1	27/01/2011	11:05 - 2:03	0.0122	<5	<0.4	<0.1
Picton Jetty Run 2	28/01/2011	19:09 - 23:19	0.0178	44	2.5	0.6

1. Corrected to 0 °C and 101.3kPa
2. Parts per billion (1,000 million) by volume

■ Table 8 USEPA Method TO-17 1-hour averaged Methyl Bromide Monitoring Results, 27 and 28 January 2011

Sample Description	Sampling Date	Sample Volume (m ³) ¹	Mass (ng)	Conc. (µg/m ³) ¹	Conc. (ppbv) ²
Waitohi Wharf Run 1	27/01/2011	0.0045	55	12	2.9
Waitohi Wharf Run 2	28/01/2011	0.0041	260	64	15
Picton Jetty Run 1	27/01/2011	0.0041	<5	<1.2	<0.3
Picton Jetty Run 2	28/01/2011	0.0044	44	10	2.4

1. Corrected to 0 °C and 101.3kPa
2. Parts per billion (1,000 million) by volume

The concentrations of methyl bromide detected at Waitohi Wharf using USEPA Method TO-17 were 1.0 and 3.7 ppbv for 27 and 28 January 2011 respectively. Converting these values to a worst case 1-hour average the concentration increased to 2.9 and 15 ppbv for 27 and 28 January 2011 respectively. 15 ppbv is 0.015 ppmv or 1.5% of the Californian REL of 1 ppmv averaged over 1 hour.

The concentrations of methyl bromide detected at Picton Jetty using USEPA Method TO-17 were <0.1 and 0.6 ppbv for 27 and 28 January 2011 respectively. Converting this to a worst case 1-hour average the concentration increased to <0.3 and 2.4 ppbv for 27 and 28 January 2011 respectively. 2.4 ppbv is 0.0024 ppmv or 0.24% of the Californian REL of 1 ppmv averaged over 1 hour.

SOURCE TESTING NZ

The Californian California Office of Environmental Health Hazard Assessment set an acute reference exposure limit (REL) of 1 ppmv 1-hour average. This is the concentration at or below which no adverse health effects are anticipated in the general human population. REL's are based on the most sensitive relevant adverse health effect reported in the medical and toxicological literature.

4.5 Discussion

On 27 and 28 January 2011 whole logs for export were fumigated under gas tight tarpaulins and within ship holds using methyl bromide at Port Marlborough NZ Ltd Waimahara Wharf. The ambient concentration of methyl bromide just before, during and after the release following the fumigation period was assessed at two sites in the Picton community (Waitohi Wharf and Picton Jetty) using MiniRAE PID analysers and USEPA Method TO-17 sorbent tubes.

The MiniRAE PID analysers measure the concentration of total VOC's and do not specifically measure methyl bromide. A shortage of GASTEC gas detector tubes meant no methyl bromide-specific spot samples could be taken. However, the USEPA Method TO-17 tubes would determine whether the VOCs detected were actually methyl bromide.

For the monitoring which commenced on 27 January 2011 and was completed early morning on 28 January, the PID analyser located at Waitohi Wharf indicated the total VOC concentration increased from <0.1 to 0.6 ppmv over the duration of the monitoring period. Based on the odours detected at the monitoring site and the southerly wind direction, the observed VOCs were likely to have originated from the operation of the ferries.

The results of the USEPA Method TO-17 monitoring at Waitohi Wharf during this period indicated a methyl bromide concentration of 2.9 ppbv as a worst case 1-hour average which is well below the California REL of 1 ppmv 1-hour average.

The PID analyser located at Picton Jetty during this 27 - 28 January monitoring programme indicated the VOC concentration was at or below detection limit of the analyser for the commencement of the monitoring until 00:35 28 January 2011 when it appeared to increase sharply to 2.0 ppmv by the end of the monitoring period. The southerly wind direction could have transported VOC emitted within the marina or central Picton areas to the monitoring site. However, it is equally likely that the increase was due to instrumental drift, as little activity was observed within the marina or in the northern end of Picton.

The results of the Method TO-17 monitoring at Picton Jetty during this 27 - 28 January monitoring programme indicated a methyl bromide concentration of <0.3 ppbv worst case 1-hour average which is well below the California REL of 1 ppmv 1-hour average.

SOURCE TESTING NZ

During the evening of 28 January 2011, the wind direction was north north-west which could have, at least for some of the time, transported emissions of methyl bromide from Shakespeare Bay to Waitohi Wharf and across the bay to the Picton Jetty monitoring station. The PID analysers located at both sites indicated the VOC concentrations were <0.1 ppmv.

The results of the USEPA Method TO-17 monitoring for the evening of 28 January indicated the methyl bromide concentrations were 15 and 2.4 ppbv worst case 1-hour average at Waitohi Wharf and Picton Jetty respectively. Hence, despite the fumigation release under ideal wind direction to transport methyl bromide into Picton, the ambient concentration of methyl bromide was well below the California REL of 1 ppmv 1-hour average.

Appendix A Ambient Air Monitoring Site Evaluation Form

This Appendix contains 7 pages including cover.

Ambient Air Monitoring: Site Evaluation Form

Site details (name, location etc)	PORT MARLBOROUGH SHAKESPEARE BAY
Exporter details (name, contact person etc)	ZINDIA
Fumigator details (name, contact person etc)	SOUTH FUME
Goods under fumigation (name, quantity etc) and location (stacks, holds, containers)	EASTERN SIDE - INDIA, HULLS ONLY
Fumigant used. Date and time fumigant introduced and quantity	METHYL BROMIDE
Data and time fumigant released (fill in retrospectively)	21:05 27-02-2011 → 02:15 28-02-2011
Relevant ambient air quality guidelines (legislative body, limits etc)	
Security or Property boundary monitoring	SECURITY
Closest sensitive receptor and distance from monitoring boundary and fumigated goods	
<i>Plan sketch/photograph/diagram of site including monitoring boundary</i>	

Ambient Air Monitoring: Sampling Methodology and Location

Ambient air monitoring equipment used and technique (active, passive etc)		PID + ATD						
Applicable method or standard of sampling (ISO, USEPA)		USEPA 70-17 For ATD						
Applicable method or standard of analysis (ISO, USEPA etc)		USEPA 70-17						
Estimated duration of sampling		5 Hours						
Number of sample locations		2						
Analyser section								
Analyser Information								
Make	Model	Equipment type	Equipment ID	Mode	Gas Selection	Correction Factor	Logging Interval	
T2	MiniRAE	2000	PID	PIDMINN24 10316	HYDRO	ISOBROME	1.7	60s
A1	MiniRAE	3000	PID	902425	HYDRO	ISOBROME	1.7	60s

CAL GAS Lot 102281 Exp MAR 11

Pre-sampling calibration								
Equipment type	Equipment ID	Span gas type and concentration (ppm)	Pre-cal Span reading (ppm)	Pre-cal Zero reading (ppm)	Calibration Span reading (ppm)	Calibration Zero reading (ppm)	Post-Monitoring Span reading (ppm)	Post-Monitoring Zero reading (ppm)
72	10316	100	198	0.0	169	0.0	179.8	0.0
A1	902225	100	178.6	0.0			179.6	0.6
Sample location information – mark each sample location on plan sketch with a X and associated sample number								
Sample Number	Location/Name	Equipment type and ID	Wind speed and direction at sample installation	Distance from fumigated goods	Start date and time	End date and time	Total sample time	

Ambient Air Monitoring: Site Evaluation Form

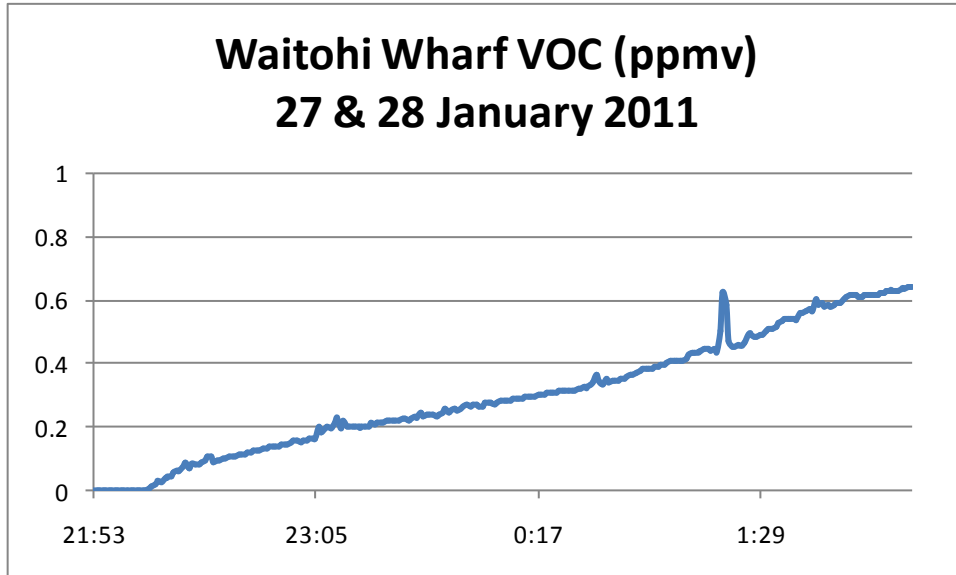
Site details (name, location etc)	APT MARLBOROUGH SHAKESPEAR BAY
Exporter details (name, contact person etc)	ZINDIA
Fumigator details (name, contact person etc)	SOUTH FUMIG
Goods under fumigation (name, quantity etc) and location (stacks, holds, containers)	LOGS UNDER TARPULINS
Fumigant used. Date and time fumigant introduced and quantity	METHYL BROMIDE
Data and time fumigant released (fill in retrospectively)	19:00 → 23:20 28.02.11
Relevant ambient air quality guidelines (legislative body, limits etc)	
Security or Property boundary monitoring	SECURITY
Closest sensitive receptor and distance from monitoring boundary and fumigated goods	
<i>Plan sketch/photograph/diagram of site including monitoring boundary</i>	

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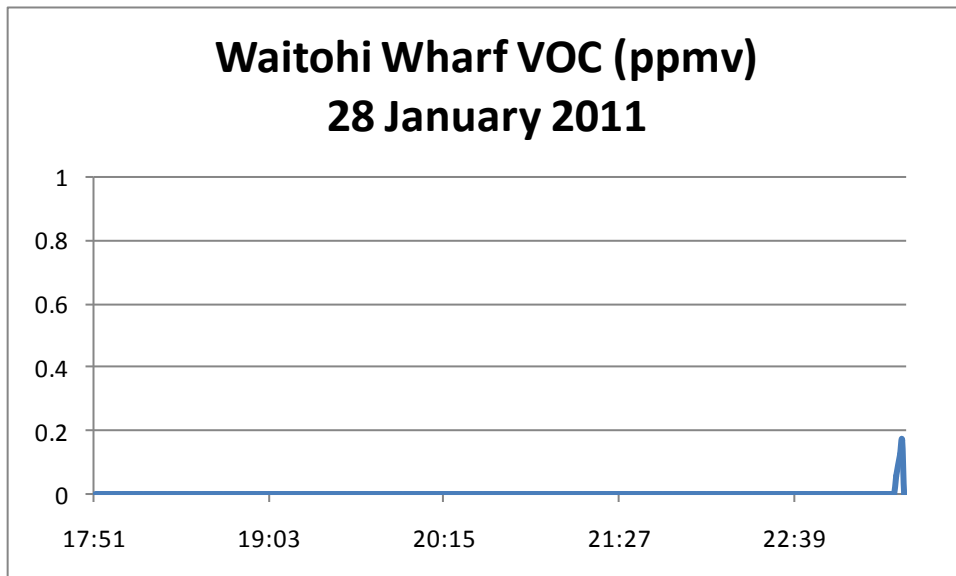
<i>Pre-sampling calibration</i>								
Equipment type	Equipment ID	Span gas type and concentration (ppm)	Pre-cal Span reading (ppm)	Pre-cal Zero reading (ppm)	Calibration Span reading (ppm)	Calibration Zero reading (ppm)	Post-Monitoring Span reading (ppm)	Post-Monitoring Zero reading (ppm)
PID	TZ	100	176.6	0.0			179.6	0.0
PID	A1	100	181.4	0.2	100.0	0.0	179.6	0.0
<i>Sample location information – mark each sample location on plan sketch with a X and associated sample number</i>								
Sample Number	Location/Name	Equipment type and ID	Wind speed and direction at sample installation	Distance from fumigated goods	Start date and time	End date and time	Total sample time	

Appendix B Raw PID VOC Data

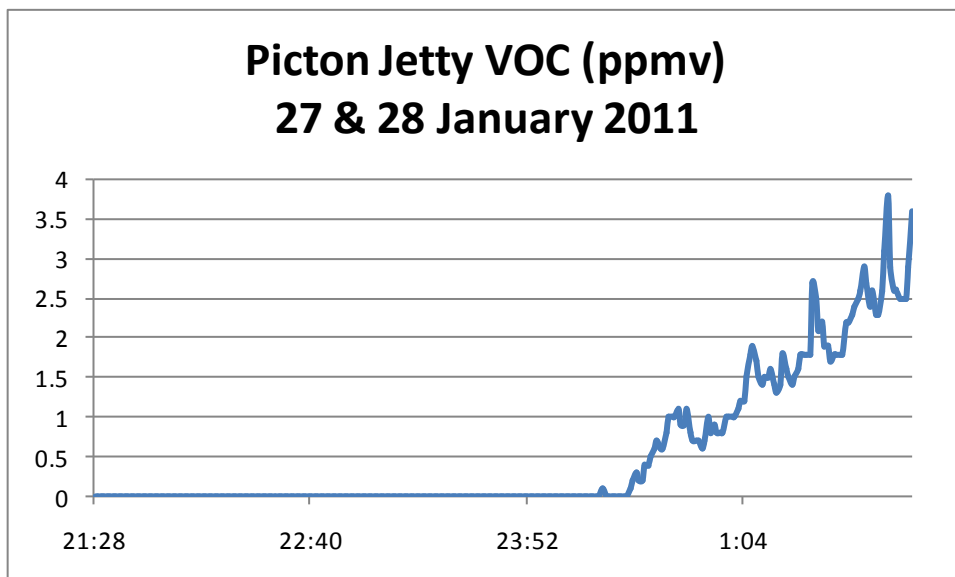
This Appendix contains 3 pages including cover.



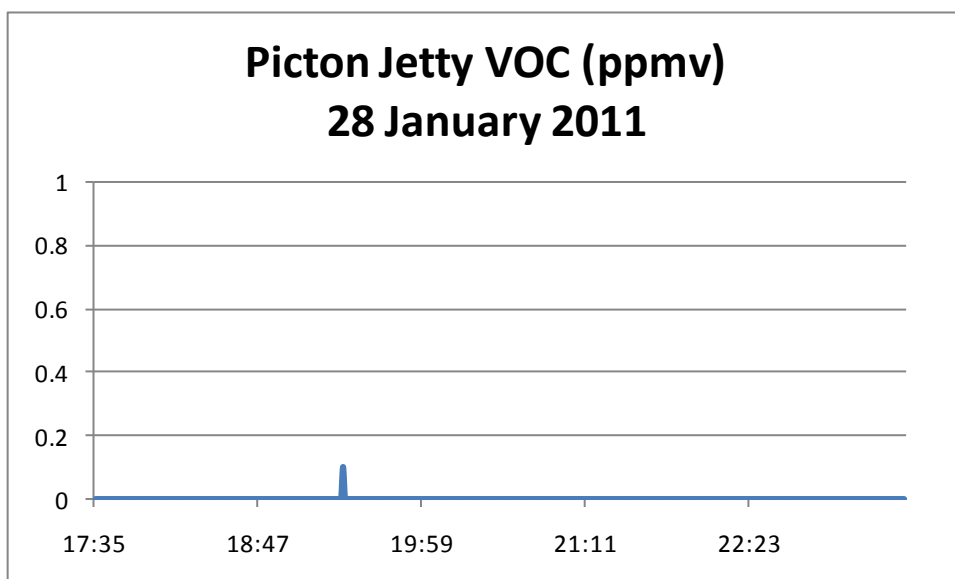
Waitohi Wharf Raw PID VOC Data, 27 & 28 January 2011



Waitohi Wharf Raw PID VOC Data, 28 January 2011



Picton Jetty Raw PID VOC Data, 27 & 28 January 2011



Picton Jetty Raw PID VOC Data, 28 January 2011

Appendix C Calibration Certificates

This Appendix contains 3 pages including cover.



apc services

equipment calibration, service & rental

A Trading Division of Wesfarmers Industrial and Safety NZ Limited

CERTIFICATE OF CALIBRATION AND COMPLIANCE

IMPORTANT DOCUMENT - DO NOT DESTROY

This document has been recorded in the records
of the Approved Workshop.

Customer:	Port Marlborough NZ Ltd	Certificate No:	150124
Branch/Dept:		Date:	24 January 2011
Contact:	Patrick Burdon	Instrument:	MiniRAE 3000 PGM73
Your O/N:		Config:	MB
Workshop Certificate No:	NZMDA 37/11(2)	Serial No:	592-902425
Certified Engineer:	Mr Jonathan Hicks	Battery Serial No:	

APC Ltd certifies that the above instrument has been calibrated in accordance with the manufacturers' instructions. This statement when signed by an authorised and registered person confirms that the item repaired as described above, complies with relevant requirements of AS2290.2-1989 and AS2275, AS2381.7 where applicable. The instrument has been tested and assessed to ensure compliance with the approval documents and the relevant standards to which it is approved.

Comments:

Signed: 

Calibrate Hire Instrument. Function Test ok. Correction Factor set at 1.7 for Methyl Bromide.

PLEASE NOTE: Damage to or loss of the equipment during the hire period will be charged to customers account.

Please return the instrument on or before the Due Date to avoid further charges.

<u>Channel</u>	<u>Alarm 1</u>	<u>Alarm 2</u>	<u>Calibration Gas</u>	<u>Certificate No.</u>
Isobuty	2 ppm	5 ppm	100ppm Iso + 20.8 O2 Bal N2	AO18068

New Parts

1 Hire

Next Calibration:

24 July 2011

Signed By



RENTALS

Equipment Report - MINIRAE 2000 PID

This PID has been performance checked / calibrated* as follows:

Calibration	Actual Value	Reading	Pass?	
Zero – fresh air	0.0 ppm	0.0 ppm	<input checked="" type="checkbox"/>	
Span – Isobutylene	100 ppm	104 ppm	<input checked="" type="checkbox"/>	
Set Alarm limits to	High	100 ppm	Low	50 ppm
Operations Check				
<input checked="" type="checkbox"/> Performance Check (pump, lamp, sensor & battery voltage check)				
<input checked="" type="checkbox"/> Battery Charged <input checked="" type="checkbox"/> Filters Check <input checked="" type="checkbox"/> Spare battery Voltage (5.5v minimum) V				
<input type="checkbox"/> Electrical Safety Tag attached (AS/NZS 3760)		Tag No:.....		Valid to:.....
<input type="checkbox"/> Bump test / Date:				

* Calibration gas traceability information is available upon request.

This PID has been performance checked / calibrated* as follows:

Date: 25/01/2011 Checked by: Daniel
Signed: DP

Please check that the following items are received and that all items are cleaned and decontaminated before return. A minimum \$20 cleaning / service / repair charge may be applied to any unclean or damaged items. Items not returned will be billed for at the full replacement cost.

Sent	Returned	Item
<input checked="" type="checkbox"/>	<input type="checkbox"/>	MiniRae 2000 PID / Operational Check, plus Battery Voltage @ ____ V
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Lamp Voltage @ ____ V Compound Set to: ____ C/factor: ____
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Protective yellow rubber boot
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Inlet probe (attached to PID)
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Spare water trap filter(s) Qty ____
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Charger 240V to 12V 500mA
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Instruction Manual behind foam on the lid of case "
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Quick Guide Sheet behind foam on the lid of case "
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Spare Alkaline Battery Compartment with batteries
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Inline Moisture trap Filter Guide Laminated
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Calibration regulator & tubing (optional)
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Carry Case
<input type="checkbox"/>	<input type="checkbox"/>	Check to confirm electrical safety (tag must be valid)

Processors Signature/ Initials DP

EE Quote Reference	Condition on return
Customer Ref	
Equipment ID	PID MINNZA
Equipment serial no.	
Return Date	/ /
Return Time	

"We do more than give you great equipment... We give you great solutions!"

Phone: (Free Call) 1300 735 295		Environmental Assessment Technologies		Fax: (Free Call) 1800 675 123	
Melbourne Branch 5 Caribbean Drive, Scoresby 3179 Email: RentalsEnviroVIC@thermofisher.com	Sydney Branch Level 1, 4 Talavera Road, North Ryde 2113 Email: RentalsEnviroNSW@thermofisher.com	Adelaide Branch 27 Sealah Road, Norwood, South Australia 5007 Email: RentalsEnviroSA@thermofisher.com	Brisbane Branch Unit 2/5 Ross St Newstead 4006 Email: RentalsEnviroQLD@thermofisher.com	Perth Branch 121 Seringara Ave Malaga WA 6090 Email: RentalsEnviroWA@thermofisher.com	

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G0553

Appendix D USEPA Method TO-17 Sampling Data and Raw Analytical Results

This Appendix contains 3 pages including cover.

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Raw Sampling Data

Sample Description	Sampling Date	Sampling Period	Sample Duration (m)	Initial Flow (mL/min)	Final Flow (mL/min)	Ave Flow (mL/min)	Sample Vol (m ³)	DGM Temp (°C)	Ambient Press. (kPa)	Sample Vol (m ³) ¹
Picton Jetty Run 1	27/01/2011	11:05 - 2:03	178	72.05	71.60	71.8	0.0128	15.6	101.8	0.0122
Picton Jetty Run 2	28/01/2011	19:09 - 23:19	243	78.61	79.71	79.2	0.0192	20.6	100.6	0.0178
Waitohi Wharf Run 1	27/01/2011	11:20 - 2:15	174	79.37	77.86	78.6	0.0137	15.8	101.8	0.0130
Waitohi Wharf Run 2	28/01/2011	19:17 - 23:26	246	73.31	74.43	73.9	0.0182	20.9	100.6	0.0168