TECHNICAL MEMORANDUM

DATE 29 March 2022 **Reference No.** 1667000-662-TM-Rev0

TO Barro Group Pty Ltd

FROM Golder Associates Pty Ltd **EMAIL** Laurent.campbell@wsp.com

BARRO SUNSHINE LANDFILL – VOLATILE ORGANIC COMPOUNDS (VOC) MONITORING RESULTS.

Barro Group Pty Ltd (Barro) engaged Golder Associates Pty Ltd. (Golder) to undertake boundary monitoring for volatile organic compounds (VOCs) at two locations along the Barro Sunshine Landfill (the site) boundary following the identification of a hotspot in Cell 5 North. The following technical memorandum presents the results from sampling conducted on 19 to 20 March 2022.

SAMPLING LOCATION

Monitoring for VOCs was undertaken at two locations using summa canisters, located near the western boundary ("West") and northern boundary ("North"). These locations were chosen to best represent ambient air quality conditions as close as practicable neighbouring residential properties. Details of the monitoring locations and corresponding siting assessment against criteria contained in AS3580.10.1 are presented in Table 1.

Table 1: Monitoring locations – VOCs by evacuated canister

Siting requirements (AS 3580.1.1)	Location ID	
	West	North
Co-ordinates (AMG)	308579, 5820432	3087310, 5820691
Clear sky angle 120°	✓	✓
Unrestricted air flow of 270° around sample inlet or 180° if inlet is on side of building	✓	✓
Height above ground to probe 2 m – 15 m	✓	✓
≥2 m from road	✓	✓
10 m from any object with a height exceeding 2 m below the height of sample inlet	✗*	✗*
No extraneous sources nearby	✓	✓

Note: * trees are located approximately 8 m from the monitoring locations and are situated on the far side of the monitor to the landfill

The location of the North and West summa canisters does not meet all the siting criteria contained in AS3580.10.1 due to trees located near the site boundary. The presence of nearby trees is a common non-compliance for ambient air quality monitoring sites; however, for the purpose of the monitoring it is considered satisfactory.

SAMPLING METHODOLOGY

The sampling for VOCs was in accordance with Golder Associates Test Method C9 "*Canister (Evacuated) Sampling for VOC and Reduced Sulphur compounds: In Ambient Air and Source Emissions*".

Sampling was undertaken by collecting whole air samples in 6-litre electro-polished (SUMMA) stainless steel canisters fitted with a flow restricting device set to sample over a 24-hour period. The canister is under negative pressure and when opened, slowly draws a whole air sample into the canister. The canister is closed at the end of the monitoring period, while still under a negative pressure.

Sample analysis was conducted by Gas Chromatography/Mass Spectrometry (GC/MS) in accordance with USEPA Method TO-15. The method uncertainty varies with the level of component detected and has been report between 25.5% and 47.4%.

Sampling was conducted by Golder (NATA Laboratory accreditation No. 1910). Sample analysis was conducted by SGS (NATA Laboratory Accreditation No. 2562).

ASSESSMENT CRITERIA

As part of the implementation of the *Environment Protection Act 2017* which came into effect on 1 July 2021, the Environment Protection Authority, Victoria (EPA Vic), published the draft Guideline for assessing and minimising air pollution in Victoria, Publication 1961, May 2021 (draft guideline). This draft air pollution guideline, when finalised, is intended to replace parts of the *State Environment Protection Policy (Air Quality Management)* (SEPP(AQM)). The *National Environmental Protection (Air Toxics) Measure*, (NEPM (Air Toxics)), describes air quality objectives and sampling methodologies at sites where significantly elevated concentrations of one or more air toxics are expected to occur.

Golder has used the SEPP (AQM) criteria for assessing the VOC results at the site since the beginning of the monitoring programme in 2019. Schedule B of the SEPP(AQM) specifies criteria as a 1-hour average and are therefore, not directly comparable to the monitored VOC concentrations collected over a 24-hour period. 24-hour criteria were derived using the EPA Victoria recommended method outlined in EPA Victoria Publication 1551.

Golder will compare the VOC results to the derived and applicable 24-hour criteria from each of the publications as follows:

- 24-hour criteria based on SEPP (AQM) Schedule B 1-hour average criteria derived using the recommended method outlined in EPA Victoria Publication 1551. This is intended to provide continuity from previous assessments.
- the NEPM (Air Toxics) 24-hour average criteria.
- Draft air pollution guideline 24-hour average criteria.

Where applicable criteria are presented as parts per million (ppm), these concentrations have been converted to micrograms per cubic meter (µg/m^3) to allow for direct comparison against the laboratory results.

RESULTS

Volatile organic compound results above the limit of reporting (LOR) for the sampling conducted on 19 to 20 March 2022 are presented in Table 2. A complete list of measured VOC concentrations is presented in Attachment A.

Table 2: Results: VOCs by evacuated canister

Site	West	North	(SEPP(AQM))	Draft Air Pollution Guideline (Vic)	NEPM (Air Toxics)
Sample No	22-505	22-506			
Sample start	19/03/2022	19/03/2022			
Sample end	20/03/2022	20/03/2022			
Compound	Concentration µg/m^3				
2-butanone	4.6	4.9			
Cyclohexane	<2	3.8			
Freon 12	2.4	2.1			
Hexane	<3	4.8			

Note: shaded cells indicate no available 24-hour criteria

The compound listed in Table 2 were detected above the limit of reporting (LOR) in both samples except for cyclohexane and hexane in sample 22-505.

There are currently no 24-hour Victorian or national ambient air quality objectives for 2-butanone, cyclohexane, freon-12 and hexane.

IMPORTANT INFORMATION RELATING TO THIS REPORT

Your attention is drawn to the document titled – "Important Information Relating to this Report," which is included in Attachment B of this report. The statements presented in that document are intended to inform a reader of the report about its proper use. There are important limitations as to who can use the report and how it can be used. It is important that a reader of the report understands and has realistic expectations about those matters. The Important Information document does not alter the obligations Golder has under the contract between it and its client.

GOLDER ASSOCIATES PTY LTD

Laurent Campbell
Environmental Scientist

Mark Tulau
Senior Air Quality Specialist

LC/MDT/lc

Attachments: A – Lab Reports
B – Important Information Relating to this Report

j:\civil\2016\1667000 - barro gita sunshine\correspondence out\1667000-662-m-summa voc results\1667000-662-tm-rev0.docx

ATTACHMENT A

Lab Reports

Appendix A - Volatile Organic compounds

Location	West	North
Sample No	**22-505**	**22-506**
Start date	**19-03-22**	**19-03-22**
End date	**20-03-22**	**20-03-22**
Compound	**Concentration (µg/m^3)**	
Acrolein	<3.4	<3.3
Acrylonitrile	<8.8	<8.5
tert-Amyl Methyl Ether	<2.9	<2.8
Benzene	<2.4	<2.4
Bromodichloromethane	<4.9	<4.7
Bromoform	<5.8	<5.7
Bromomethane	<4.4	<4.2
1,3-Butadiene	<1.5	<1.4
2-Butanone (Methyl Ethyl Ketone)	4.6	4.9
tert-Butyl Alcohol	<2.4	<2.4
n-Butylbenzene	<3.9	<3.8
sec-Butylbenzene	<3.9	<3.8
tert-Butylbenzene	<3.9	<3.8
Carbon Tetrachloride	<4.9	<4.7
Chlorobenzene	<2.9	<2.8
Chloroethane	<2.9	<2.8
Chloroform	<4.4	<4.2
Chloromethane	<3.4	<3.3
2-Chloroprene	<5.4	<5.2
3-Chloropropene	<3.4	<3.3
2-Chlorotoluene	<4.4	<4.2
alpha-Chlorotoluene	<3.4	<3.3
Cumene	<3.9	<3.8
Cyclohexane	<1.9	3.8
o-Cymene	<3.9	<3.8
Dibromochloromethane	<5.8	<5.7
1,2-Dibromoethane (EDB)	<5.8	<5.7
1,2-Dichlorobenzene	<6.3	<6.1
1,3-Dichlorobenzene	<6.3	<6.1
1,4-Dichlorobenzene	<6.3	<6.1
1,1-Dichloroethane	<3.4	<3.3
1,2-Dichloroethane	<4.9	<4.7
1,1-Dichloroethene	<2.9	<2.8
cis-1,2-Dichloroethene	<3.9	<3.8
trans-1,2-Dichloroethene	<2.9	<2.8
1,2-Dichloropropane	<8.8	<8.5
cis-1,3-Dichloropropene	<2.9	<2.8
trans-1,3-Dichloropropene	<3.4	<3.3
Diisopropyl Ether	<3.4	<3.3
1,4-Dioxane	<2.9	<2.8
Ethyl Acetate	<3.9	<3.8
Ethyl Benzene	<2.9	<2.8
Ethyl tert-Butyl Ether	<2.4	<2.4
4-Ethyltoluene	<2.9	<2.8

Appendix A - Volatile Organic compounds

Location	**West**	**North**
Sample No	**22-505**	**22-506**
Start date	**19-03-22**	**19-03-22**
End date	**20-03-22**	**20-03-22**
Compound	**Concentration (µg/m^3)**	
Freon 11	<1.5	<1.4
Freon 113	<4.9	<4.7
Freon 114	<1.5	<1.4
Freon 12	2.4	2.1
Heptane	<3.4	<3.3
Hexachlorobutadiene	<9.7	<9.4
Hexane	<2.9	4.8
2-Hexanone	<2.9	<2.8
m,p-Xylene	<6.3	<6.1
Methyl Methacrylate	<3.4	<3.3
Methyl tert-butyl ether	<2.9	<2.8
4-Methyl-2-pentanone	<2.9	<2.8
Naphthalene	<10	<9.9
2-Propanol	<49	<47
Propene	<4.9	<4.7
Propylbenzene	<3.4	<3.3
Styrene	<2.9	<2.8
1,1,1,2-Tetrachloroethane	<4.9	<4.7
1,1,2,2-Tetrachloroethane	<3.4	<3.3
Tetrachloroethene	<5.4	<5.2
Tetrahydrofuran	<1.9	<1.9
Toluene	<2.9	<2.8
1,2,4-Trichlorobenzene	<18	<17
1,1,1-Trichloroethane	<3.9	<3.8
1,1,2-Trichloroethane	<3.9	<3.8
Trichloroethene	<4.4	<4.2
1,2,4-Trimethylbenzene	<3.9	<3.8
1,3,5-Trimethylbenzene	<2.9	<2.8
2,2,4-Trimethylpentane	<4.4	<4.2
Vinyl Acetate	<3.4	<3.3
Vinyl Bromide	<3.9	<3.8
Vinyl Chloride	<1.9	<1.9
o-Xylene	<2.9	<2.8

Results expressed as micrograms per cubic metre of air at 0°C and 101.325 kPa
Analysis conducted by SGS (NATA Laboratory Accreditation Number 2562).
Analysis conducted on 24/03/2022, Report No ME325841A

The document ("Report") to which this page is attached and which this page forms a part of, has been issued by Golder Associates Pty Ltd ("Golder") subject to the important limitations and other qualifications set out below.

This Report constitutes or is part of services ("Services") provided by Golder to its client ("Client") under and subject to a contract between Golder and its Client ("Contract"). The contents of this page are not intended to and do not alter Golder's obligations (including any limits on those obligations) to its Client under the Contract.

This Report is provided for use solely by Golder's Client and persons acting on the Client's behalf, such as its professional advisers. Golder is responsible only to its Client for this Report. Golder has no responsibility to any other person who relies or makes decisions based upon this Report or who makes any other use of this Report. Golder accepts no responsibility for any loss or damage suffered by any person other than its Client as a result of any reliance upon any part of this Report, decisions made based upon this Report or any other use of it.

This Report has been prepared in the context of the circumstances and purposes referred to in, or derived from, the Contract and Golder accepts no responsibility for use of the Report, in whole or in part, in any other context or circumstance or for any other purpose.

The scope of Golder's Services and the period of time they relate to are determined by the Contract and are subject to restrictions and limitations set out in the Contract. If a service or other work is not expressly referred to in this Report, do not assume that it has been provided or performed. If a matter is not addressed in this Report, do not assume that any determination has been made by Golder in regards to it.

At any location relevant to the Services conditions may exist which were not detected by Golder, in particular due to the specific scope of the investigation Golder has been engaged to undertake. Conditions can only be verified at the exact location of any tests undertaken. Variations in conditions may occur between tested locations and there may be conditions which have not been revealed by the investigation and which have not therefore been taken into account in this Report.

Golder accepts no responsibility for and makes no representation as to the accuracy or completeness of the information provided to it by or on behalf of the Client or sourced from any third party. Golder has assumed that such information is correct unless otherwise stated and no responsibility is accepted by Golder for incomplete or inaccurate data supplied by its Client or any other person for whom Golder is not responsible. Golder has not taken account of matters that may have existed when the Report was prepared but which were only later disclosed to Golder.

Having regard to the matters referred to in the previous paragraphs on this page in particular, carrying out the Services has allowed Golder to form no more than an opinion as to the actual conditions at any relevant location. That opinion is necessarily constrained by the extent of the information collected by Golder or otherwise made available to Golder. Further, the passage of time may affect the accuracy, applicability or usefulness of the opinions, assessments or other information in this Report. This Report is based upon the information and other circumstances that existed and were known to Golder when the Services were performed and this Report was prepared. Golder has not considered the effect of any possible future developments including physical changes to any relevant location or changes to any laws or regulations relevant to such location.

Where permitted by the Contract, Golder may have retained subconsultants affiliated with Golder to provide some or all of the Services. However, it is Golder which remains solely responsible for the Services and there is no legal recourse against any of Golder's affiliated companies or the employees, officers or directors of any of them.

By date, or revision, the Report supersedes any prior report or other document issued by Golder dealing with any matter that is addressed in the Report.

Any uncertainty as to the extent to which this Report can be used or relied upon in any respect should be referred to Golder for clarification