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Our reference: **N90100**

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16 November 2012

Terminals Pty Ltd
PO Box 148
MATRAVILLE NSW 2036

Attention Mr Geoff Millard

PORT BOTANY PLANT

Emission Testing Report - NOVEMBER 2012

Tests were performed at the request of Terminals Pty Ltd to determine emissions to air as detailed below;

Test Summary		
Location	Test Date	Test Parameters*
EPA 7 – Bitumen Combustor	5 November 2012	Volatile organic compounds (VOC's), hydrogen sulfide, nitrogen oxides, carbon dioxide, oxygen

* Flow rate, velocity, temperature and moisture were determined unless otherwise stated.

Please refer to the following pages for results, plant operating conditions, test methods, quality assurance / quality control information and definitions.

Aaron Davis BSc LLB (Hons)
NSW Manager
jw doc:n90100.doc

Matthew Cook
Laboratory Manager



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RESULTS

Date	5/11/2012	Client	Terminals Pty Ltd
Report	90100	Stack ID	EPA 7 - Bitumen Combustor
Licence No.	1048	Location	Port Botany
EML Staff	HP	State	NSW
Process Conditions	Bitumen ship discharge operations		
Reason for testing:	Client requested testing to determine emissions to air		

Sampling Plane Details			
Sampling plane dimensions (mm) & area	980	0.754 m ²	
Sampling port size, number & depth	4" Flange (x2)		
Access & height of ports	Fixed ladder	20 m	
Duct orientation & shape	Vertical	Circular	
Downstream disturbance	Exit	6 D	
Upstream disturbance	Change in diameter	8 D	
No. traverses & points sampled	2	12	
Traverse method & compliance	AS4323.1	Ideal	

Comments
All results reported on a dry basis at NTP

Stack Parameters			
Moisture content, %v/v	8.9		
Gas molecular weight, g/g mole	28.2 (wet)	29.2 (dry)	
Gas density at NTP, kg/m ³	1.26 (wet)	1.30 (dry)	
% Oxygen correction & Factor	3 %	2.57	
Gas Flow Parameters			
Temperature, K	1114		
Velocity at sampling plane, m/s	9.3		
Volumetric flow rate, discharge, m ³ /s	7		
Volumetric flow rate (wet NTP), m ³ /s	1.7		
Volumetric flow rate (dry NTP), m ³ /s	1.6		
Mass flow rate (wet basis), kg/hour	7800		
Velocity difference, %	2		

Hydrogen Sulfide	Sampling time	Results		
		945-1045		
		Concentration mg/m ³	O2 corrected mg/m ³	Mass Rate mg/s
Hydrogen sulfide		<0.0019	<0.0048	<0.0029

Gases	Sampling time	Average			Minimum			Maximum			100 Percentile Concentration limit
		933-1043			933-1043			933-1043			
		Concentration mg/m ³	O2 corrected mg/m ³	Mass Rate mg/s	Concentration mg/m ³	O2 corrected mg/m ³	Mass Rate mg/s	Concentration mg/m ³	O2 corrected mg/m ³	Mass Rate mg/s	
Nitric oxide (as NO ₂)		52	130	82	47	120	74	62	160	96	
Nitrogen dioxide (as NO ₂)		<4.1	<11	<6.4	<4.1	<11	<6.4	<4.1	<11	<6.4	350
Nitrogen oxides (as NO ₂)		53	140	83	47	120	74	64	160	100	
Carbon dioxide		Concentration %			Concentration %			Concentration %			
		3.3			3.3			3.4			
Oxygen		13.9			13.7			14.1			

VOC's (as n-Propane)	Sampling time	Results			100 Percentile Concentration limit
		1002-1102			
		Concentration mg/m ³	O2 corrected mg/m ³	Mass Rate mg/s	
Total		<0.18	<0.45	<0.27	40

VOC's (speciated)	Sampling time	Results		
		1002-1102		
		Concentration mg/m ³	O2 corrected mg/m ³	Mass Rate mg/s
Detection limit ⁽¹⁾		<0.18	<0.47	<0.29

(1) Unless otherwise reported, the following target compounds were found to be below detection:
 Ethanol, Isopropanol, Isobutanol, Butanol, 1-Methoxy-2-propanol, Cyclohexanol, 2-Butoxyethanol
 Pentane, Hexane, Heptane, Octane, Nonane, Decane, Undecane, Dodecane, Tridecane, Tetradecane
 Cyclohexane, 2-Methylhexane, 2,3-Dimethylpentane, 3-Methylhexane, Isooctane, Methylcyclohexane, alpha-Pinene, beta-Pinene, d-Limonene, 3-Carene
 Acetone, Methyl ethyl ketone, Ethyl acetate, Isopropyl acetate, Propyl acetate, MIBK, 2-Hexanone, Butyl acetate, 1-Methoxy-2-propyl acetate, Cyclohexanone, Cellosolve acetate, 2-Butoxyethyl acetate, Ethylidiglycol acetate, Diacetone alcohol, Isophorone
 Benzene, Toluene, Ethylbenzene, m+p-Xylene, Styrene, o-Xylene, Isopropylbenzene, Propylbenzene, 1,3,5-Trimethylbenzene, alpha-Methylstyrene, tert-Butylbenzene, 1,2,4-Trimethylbenzene, 1,2,3-Trimethylbenzene, m-Diethylbenzene, o-Diethylbenzene, p-Diethylbenzene
 Dichloromethane, Chloroform, 1,1,1-Trichloroethane, 1,2-Dichloroethane, Carbon tetrachloride, 1,1-Dichloroethene, cis-1,2-Dichloroethene, trans-1,2-Dichloroethene, Trichloroethene, Tetrachloroethene, 1,1,2-Trichloroethane, 1,1,2,2-Tetrachloroethane, Chlorobenzene, Fluorobenzene



PLANT OPERATING CONDITIONS

Testing was performed during bitumen ship discharge operations to provide peak load rate between 0933 and 1102 on Monday, 5th November.

TEST METHODS

Unless otherwise stated, the following methods meet the requirements of the NSW Office of Environment and Heritage (as specified in the *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales, January 2007*). All sampling and analysis was performed by EML Air, NATA accreditation number 2732, unless otherwise specified. Specific details of the methods are available upon request.

Parameter	NSW Test Method	Reference Method	Uncertainty*	NATA Accredited	
				Sampling	Analysis
Sample Plane Criteria	TM-1	AS 4323.1	-	✓	NA
Flow rate, temperature and velocity	TM-2	USEPA 2	8%, 2%, 7%	✓	NA
Moisture content	TM-22	USEPA 4	8%	✓	✓
Volatile organic compounds	TM-34	USEPA 18	19%	✓	✓
Hydrogen sulfide	TM-5	USEPA 11	not specified	✓	✓
Nitrogen oxides (NO _x)	TM-11	USEPA 7E	12%	✓	✓
Carbon dioxide	TM-24	USEPA 3A	13%	✓	✓
Oxygen	TM-25	USEPA 3A	13%	✓	✓

* Uncertainty values cited in this table are calculated at the 95% confidence level (coverage factor = 2)

AS – Australian Standard
USEPA – United States Environmental Protection Agency
TM - Test Method

QUALITY ASSURANCE / QUALITY CONTROL INFORMATION

EML Air Pty Ltd is accredited by the National Association of Testing Authorities (NATA) for the sampling and analysis of air pollutants from industrial sources (Accreditation number 2732). Unless otherwise stated test methods used are accredited with the National Association of Testing Authorities. For full details, search for EML Air at NATA's website www.nata.asn.au.

EML Air is accredited to Australian Standard 17025 – General Requirements for the Competence of Testing and Calibration Laboratories. Australian Standard 17025 requires that a laboratory have a quality system similar to ISO 9002. More importantly it also requires that a laboratory have adequate equipment to perform the testing, as well as laboratory personnel with the competence to perform the testing. This quality assurance system is administered and maintained by the Quality Assurance Manager.

A formal Quality Control program is in place at EML Air to monitor analyses performed in the laboratory and sampling conducted in the field. The program is designed to check where appropriate; the sampling reproducibility, analytical method, accuracy, precision and the performance of the analyst. The Laboratory Manager is responsible for the administration and maintenance of this program.



DEFINITIONS

The following symbols and abbreviations may be used in this test report:

NTP	Normal temperature and pressure. Gas volumes and concentrations are expressed on a dry basis at 0°C, at discharge oxygen concentration and an absolute pressure of 101.325 kPa, unless otherwise specified.
Disturbance	A flow obstruction or instability in the direction of the flow which may impede accurate flow determination. This includes centrifugal fans, axial fans, partially closed or closed dampers, louvres, bends, connections, junctions, direction changes or changes in pipe diameter.
VOC	Any chemical compound based on carbon with a vapour pressure of at least 0.010 kPa at 25°C or having a corresponding volatility under the particular conditions of use. These compounds may contain oxygen, nitrogen and other elements, but specifically excluded are carbon monoxide, carbon dioxide, carbonic acid, metallic carbides and carbonate salts.
BSP	British standard pipe
NA	Not applicable
D	Duct diameter or equivalent duct diameter for rectangular ducts
<	Less than
>	Greater than
≥	Greater than or equal to
~	Approximately

