



AGL UPSTREAM INVESTMENTS PTY LTD
Newcastle Gas Storage Facility
Air Monitoring Report

Reporting Period: June – July 2017

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Foreword

| | |
|---------------------------|--|
| PREMISES | Newcastle Gas Storage Facility 5 Old Punt Road TOMAGO NSW 2322 |
| LICENCE DETAILS | <u>Environment Protection Licence 20130</u> |
| LICENCEE | AGL Upstream Investments Pty Limited |
| LICENCEE'S ADDRESS | Locked Bag 1837, St Leonards, NSW 2065 |
| MONITORING DATE | 15, 16, 27, 28 June 2017 |
| MONITORING BY | Ektimo |
| ANALYSIS BY | Ektimo (laboratory report number R003725) |
| OBTAINED DATA DATE | 16 August 2017 (Ektimo Report R003725) |
| REPORT DATE | 21 August 2017 |
| REPORT PREPARED BY | Aaron Clifton Environment Business Partner |

SUMMARY OF ACTIVITY

The Newcastle Gas Storage Facility (NGSF) is located in Tomago, New South Wales.

The NGSF includes:

- A processing plant that converts pipeline natural gas to liquefied natural gas (LNG) by cooling it to -162°C . It is capable of processing up to 66,500 tonnes of LNG per year.
- An insulated, non-pressurised LNG storage tank capable of containing 30,000 tonnes or $63,000\text{ m}^3$ of LNG, equivalent to 1.5 petajoules (PJ) of natural gas, and an associated containment area.
- A re-gasification unit to convert the LNG in the storage tank back into natural gas.
- A flare stack with a height of approximately 15m to combust hydrocarbons discharged from the process.

- A truck loading facility to allow the dispatch of up to 1,000 tankers of LNG per year.
- Infrastructure and utility connection and an emergency access road.

This Monitoring Report relates to those air monitoring activities specified in Part 5, Monitoring and Recording Conditions, of the Environment Protection Licence. The Licence conditions stipulate air monitoring is required to be carried out at the locations, at the frequency and using the test methods as set out in the tables below.

This report is prepared in accordance with the *Requirements for Publishing Pollution Monitoring Data* (EPA, October 2013) (**Publication Requirements**).

AIR MONITORING LOCATIONS

| Point | Location | Monitoring Frequency |
|-------|--|----------------------|
| 7 | Stack associated with the Gas Liquefaction System (H101) | Twice per year |
| 8 | Stack associated with the LNG Vaporiser (H501A) | Twice per year |
| 10 | Stack associated with the LNG Vaporiser (H501B) | Twice per year |
| 11 | Stack associated with the LNG Vaporiser (H501C) | Twice per year |

AIR MONITORING TEST METHODS

| Parameter | NSW EPA Test Method (Sampling Method) |
|---|---------------------------------------|
| Carbon dioxide | TM-24 |
| Carbon monoxide | TM-32 |
| Dry gas density | TM-23 |
| Moisture | TM-22 |
| Molecular weight of stack gases | TM-23 |
| Nitrogen Oxides | TM-11 |
| Oxygen (O ₂) | TM-25 |
| Solid Particles | TM-15 |
| Sulfuric acid mist and sulphur trioxide (as SO ₃) | TM-3 |
| Sulphur dioxide | TM-4 |
| Temperature | TM-2 |



| Parameter | NSW EPA Test Method (Sampling Method) |
|----------------------------|--|
| Velocity | TM-2 |
| Volatile organic compounds | OM-2 |
| Volumetric flowrate | TM-2 |

Air Monitoring Results

Monitoring Date: 16 June 2017

| Monitoring Point | Description | Pollutant | Units of measure | Oxygen correction | Sampling method | Monitoring frequency required by licence | Average Concentration | Concentration limit |
|---------------------|--|---|----------------------------|-------------------|-----------------|--|-------------------------|---------------------|
| 7 | Stack associated with Gas Liquefaction System (H101) | Carbon dioxide | Percent | | TM-24 | Twice per year | 8.3 | Not applicable |
| | | Carbon monoxide | Milligrams per cubic metre | 3% | TM-32 | Twice per year | <2 | 100 |
| | | Dry gas density | Kilograms per cubic metre | | TM-23 | Twice per year | 1.32 | Not applicable |
| | | Moisture | Percent | | TM-22 | Twice per year | 13 | Not applicable |
| | | Molecular weight of stack gases | Grams per gram mole | | TM-23 | Twice per year | 29.7 | Not applicable |
| | | Nitrogen Oxides (as NO ₂ equivalent) | Milligrams per cubic metre | | TM-11 | Twice per year | 75 | 250 |
| | | Oxygen (O ₂) | Percent | | TM-25 | Twice per year | 6 | Not applicable |
| | | Solid Particles | Milligrams per cubic metre | | TM-15 | Twice per year | <2 (mg/m ³) | 5 |
| | | Sulfuric acid mist and sulphur trioxide (as SO ₃) | Milligrams per cubic metre | | TM-3 | Twice per year | 0.074 | 60 |
| | | Sulphur dioxide | Milligrams per cubic metre | | TM-4 | Twice per year | <5 | Not applicable |
| | | Temperature | Kelvin | | TM-2 | Twice per year | 478 | Not applicable |
| | | Velocity | Metres per second | | TM-2 | Twice per year | 5.7 | Not applicable |
| | | Volatile organic compounds | Milligrams per cubic metre | 3% | OM-2 | Twice per year | 0.096 | 5 |
| Volumetric flowrate | Cubic metres per second | | TM-2 | Twice per year | 1.7 | Not applicable | | |

Monitoring Date: 28 June 2017

| Monitoring Point | Description | Pollutant | Units of measure | Oxygen correction | Sampling method | Monitoring frequency required by licence | Average Concentration | Concentration limit |
|---------------------|--|---|----------------------------|-------------------|-----------------|--|-------------------------|---------------------|
| 7 | Stack associated with Gas Liquefaction System (H101) | Carbon dioxide | Percent | | TM-24 | Twice per year | 8.5 | Not applicable |
| | | Carbon monoxide | Milligrams per cubic metre | 3% | TM-32 | Twice per year | <2 | 100 |
| | | Dry gas density | Kilograms per cubic metre | | TM-23 | Twice per year | 1.33 | Not applicable |
| | | Moisture | Percent | | TM-22 | Twice per year | 18 | Not applicable |
| | | Molecular weight of stack gases | Grams per gram mole | | TM-23 | Twice per year | 29.7 | Not applicable |
| | | Nitrogen Oxides (as NO ₂ equivalent) | Milligrams per cubic metre | | TM-11 | Twice per year | 82 | 250 |
| | | Oxygen (O ₂) | Percent | | TM-25 | Twice per year | 5.8 | Not applicable |
| | | Solid Particles | Milligrams per cubic metre | | TM-15 | Twice per year | <2 (mg/m ³) | 5 |
| | | Sulfuric acid mist and sulphur trioxide (as SO ₃) | Milligrams per cubic metre | | TM-3 | Twice per year | 0.1 | 60 |
| | | Sulphur dioxide | Milligrams per cubic metre | | TM-4 | Twice per year | <5 | Not applicable |
| | | Temperature | Kelvin | | TM-2 | Twice per year | 488 | Not applicable |
| | | Velocity | Metres per second | | TM-2 | Twice per year | 5.1 | Not applicable |
| | | Volatile organic compounds | Milligrams per cubic metre | 3% | OM-2 | Twice per year | <0.03 | 5 |
| Volumetric flowrate | Cubic metres per second | | TM-2 | Twice per year | 1.5 | Not applicable | | |

Monitoring Date: 15 June 2017

| Monitoring Point | Description | Pollutant | Units of measure | Oxygen correction | Sampling method | Monitoring frequency required by licence | Average Concentration | Concentration limit |
|---------------------|--|---|----------------------------|-------------------|-----------------|--|-------------------------|---------------------|
| 8 | Stack associated with LNG Vaporiser (H-501a) | Carbon dioxide | Percent | | TM-24 | Twice per year | 7.7 | Not applicable |
| | | Carbon monoxide | Milligrams per cubic metre | 3% | TM-32 | Twice per year | <3 | 125 |
| | | Dry gas density | Kilograms per cubic metre | | TM-23 | Twice per year | 1.32 | Not applicable |
| | | Moisture | Percent | | TM-22 | Twice per year | 16 | Not applicable |
| | | Molecular weight of stack gases | Grams per gram mole | | TM-23 | Twice per year | 29.6 | Not applicable |
| | | Nitrogen Oxides (as NO ₂ equivalent) | Milligrams per cubic metre | | TM-11 | Twice per year | 110 | 190 |
| | | Oxygen (O ₂) | Percent | | TM-25 | Twice per year | 7 | Not applicable |
| | | Solid Particles | Micrograms per cubic metre | | TM-15 | Twice per year | <1 (mg/m ³) | 40 |
| | | Sulfuric acid mist and sulphur trioxide (as SO ₃) | Milligrams per cubic metre | | TM-3 | Twice per year | 0.013 | 5 |
| | | Sulphur dioxide | Milligrams per cubic metre | | TM-4 | Twice per year | <5 | Not applicable |
| | | Temperature | Kelvin | | TM-2 | Twice per year | 359 | Not applicable |
| | | Velocity | Metres per second | | TM-2 | Twice per year | 5.2 | Not applicable |
| | | Volatile organic compounds | Milligrams per cubic metre | 3% | OM-2 | Twice per year | 0.12 | 20 |
| Volumetric flowrate | Cubic metres per second | | TM-2 | Twice per year | 3.1 | Not applicable | | |

Monitoring Date: 27 June 2017

| Monitoring Point | Description | Pollutant | Units of measure | Oxygen correction | Sampling method | Monitoring frequency required by licence | Average Concentration | Concentration limit |
|---------------------|--|---|----------------------------|-------------------|-----------------|--|-------------------------|---------------------|
| 8 | Stack associated with LNG Vaporiser (H-501a) | Carbon dioxide | Percent | | TM-24 | Twice per year | 8.4 | Not applicable |
| | | Carbon monoxide | Milligrams per cubic metre | 3% | TM-32 | Twice per year | <2 | 125 |
| | | Dry gas density | Kilograms per cubic metre | | TM-23 | Twice per year | 1.33 | Not applicable |
| | | Moisture | Percent | | TM-22 | Twice per year | 16 | Not applicable |
| | | Molecular weight of stack gases | Grams per gram mole | | TM-23 | Twice per year | 29.7 | Not applicable |
| | | Nitrogen Oxides (as NO ₂ equivalent) | Milligrams per cubic metre | | TM-11 | Twice per year | 130 | 190 |
| | | Oxygen (O ₂) | Percent | | TM-25 | Twice per year | 5.9 | Not applicable |
| | | Solid Particles | Micrograms per cubic metre | | TM-15 | Twice per year | <2 (mg/m ³) | 40 |
| | | Sulfuric acid mist and sulphur trioxide (as SO ₃) | Milligrams per cubic metre | | TM-3 | Twice per year | 0.051 | 5 |
| | | Sulphur dioxide | Milligrams per cubic metre | | TM-4 | Twice per year | <5 | Not applicable |
| | | Temperature | Kelvin | | TM-2 | Twice per year | 366 | Not applicable |
| | | Velocity | Metres per second | | TM-2 | Twice per year | 6.4 | Not applicable |
| | | Volatile organic compounds | Milligrams per cubic metre | 3% | OM-2 | Twice per year | 0.41 | 20 |
| Volumetric flowrate | Cubic metres per second | | TM-2 | Twice per year | 3.9 | Not applicable | | |

Monitoring Date: 15 June 2017

| Monitoring Point | Description | Pollutant | Units of measure | Oxygen correction | Sampling method | Monitoring frequency required by licence | Average Concentration | Concentration limit |
|---------------------|--|---|----------------------------|-------------------|-----------------|--|-------------------------|---------------------|
| 10 | Stack associated with LNG Vaporiser (H-501b) | Carbon dioxide | Percent | | TM-24 | Twice per year | 9.2 | Not applicable |
| | | Carbon monoxide | Milligrams per cubic metre | 3% | TM-32 | Twice per year | <2 | 125 |
| | | Dry gas density | Kilograms per cubic metre | | TM-23 | Twice per year | 1.33 | Not applicable |
| | | Moisture | Percent | | TM-22 | Twice per year | 18 | Not applicable |
| | | Molecular weight of stack gases | Grams per gram mole | | TM-23 | Twice per year | 29.8 | Not applicable |
| | | Nitrogen Oxides (as NO ₂ equivalent) | Milligrams per cubic metre | | TM-11 | Twice per year | 130 | 190 |
| | | Oxygen (O ₂) | Percent | | TM-25 | Twice per year | 4.4 | Not applicable |
| | | Solid Particles | Micrograms per cubic metre | | TM-15 | Twice per year | <1 (mg/m ³) | 40 |
| | | Sulfuric acid mist and sulphur trioxide (as SO ₃) | Milligrams per cubic metre | | TM-3 | Twice per year | 0.81 | 5 |
| | | Sulphur dioxide | Milligrams per cubic metre | | TM-4 | Twice per year | <5 | Not applicable |
| | | Temperature | Kelvin | | TM-2 | Twice per year | 358 | Not applicable |
| | | Velocity | Metres per second | | TM-2 | Twice per year | 5.1 | Not applicable |
| | | Volatile organic compounds | Milligrams per cubic metre | 3% | OM-2 | Twice per year | 0.052 | 20 |
| Volumetric flowrate | Cubic metres per second | | TM-2 | Twice per year | 3.1 | Not applicable | | |

Monitoring Date: 27 June 2017

| Monitoring Point | Description | Pollutant | Units of measure | Oxygen correction | Sampling method | Monitoring frequency required by licence | Average Concentration | Concentration limit |
|---------------------|--|---|----------------------------|-------------------|-----------------|--|-------------------------|---------------------|
| 10 | Stack associated with LNG Vaporiser (H-501b) | Carbon dioxide | Percent | | TM-24 | Twice per year | 9.5 | Not applicable |
| | | Carbon monoxide | Milligrams per cubic metre | 3% | TM-32 | Twice per year | <2 | 125 |
| | | Dry gas density | Kilograms per cubic metre | | TM-23 | Twice per year | 1.33 | Not applicable |
| | | Moisture | Percent | | TM-22 | Twice per year | 16 | Not applicable |
| | | Molecular weight of stack gases | Grams per gram mole | | TM-23 | Twice per year | 29.8 | Not applicable |
| | | Nitrogen Oxides (as NO ₂ equivalent) | Milligrams per cubic metre | | TM-11 | Twice per year | 150 | 190 |
| | | Oxygen (O ₂) | Percent | | TM-25 | Twice per year | 4 | Not applicable |
| | | Solid Particles | Micrograms per cubic metre | | TM-15 | Twice per year | <2 (mg/m ³) | 40 |
| | | Sulfuric acid mist and sulphur trioxide (as SO ₃) | Milligrams per cubic metre | | TM-3 | Twice per year | 0.038 | 5 |
| | | Sulphur dioxide | Milligrams per cubic metre | | TM-4 | Twice per year | <5 | Not applicable |
| | | Temperature | Kelvin | | TM-2 | Twice per year | 362 | Not applicable |
| | | Velocity | Metres per second | | TM-2 | Twice per year | 4.5 | Not applicable |
| | | Volatile organic compounds | Milligrams per cubic metre | 3% | OM-2 | Twice per year | 0.049 | 20 |
| Volumetric flowrate | Cubic metres per second | | TM-2 | Twice per year | 2.7 | Not applicable | | |

Monitoring Date: 15 June 2017

| Monitoring Point | Description | Pollutant | Units of measure | Oxygen correction | Sampling method | Monitoring frequency required by licence | Average Concentration | Concentration limit |
|---------------------|--|---|----------------------------|-------------------|-----------------|--|-------------------------|---------------------|
| 11 | Stack associated with LNG Vaporiser (H-501c) | Carbon dioxide | Percent | | TM-24 | Twice per year | 8.3 | Not applicable |
| | | Carbon monoxide | Milligrams per cubic metre | 3% | TM-32 | Twice per year | <2 | 125 |
| | | Dry gas density | Kilograms per cubic metre | | TM-23 | Twice per year | 1.32 | Not applicable |
| | | Moisture | Percent | | TM-22 | Twice per year | 19 | Not applicable |
| | | Molecular weight of stack gases | Grams per gram mole | | TM-23 | Twice per year | 29.7 | Not applicable |
| | | Nitrogen Oxides (as NO ₂ equivalent) | Milligrams per cubic metre | | TM-11 | Twice per year | 130 | 190 |
| | | Oxygen (O ₂) | Percent | | TM-25 | Twice per year | 6 | Not applicable |
| | | Solid Particles | Micrograms per cubic metre | | TM-15 | Twice per year | <2 (mg/m ³) | 40 |
| | | Sulfuric acid mist and sulphur trioxide (as SO ₃) | Milligrams per cubic metre | | TM-3 | Twice per year | 0.053 | 5 |
| | | Sulphur dioxide | Milligrams per cubic metre | | TM-4 | Twice per year | <5 | Not applicable |
| | | Temperature | Kelvin | | TM-2 | Twice per year | 359 | Not applicable |
| | | Velocity | Metres per second | | TM-2 | Twice per year | 5.1 | Not applicable |
| | | Volatile organic compounds | Milligrams per cubic metre | 3% | OM-2 | Twice per year | 0.023 | 20 |
| Volumetric flowrate | Cubic metres per second | | TM-2 | Twice per year | 3 | Not applicable | | |

Monitoring Date: 28 June 2017

| Monitoring Point | Description | Pollutant | Units of measure | Oxygen correction | Sampling method | Monitoring frequency required by licence | Average Concentration | Concentration limit |
|---------------------|--|---|----------------------------|-------------------|-----------------|--|-------------------------|---------------------|
| 11 | Stack associated with LNG Vaporiser (H-501c) | Carbon dioxide | Percent | | TM-24 | Twice per year | 8.2 | Not applicable |
| | | Carbon monoxide | Milligrams per cubic metre | 3% | TM-32 | Twice per year | <2 | 125 |
| | | Dry gas density | Kilograms per cubic metre | | TM-23 | Twice per year | 1.32 | Not applicable |
| | | Moisture | Percent | | TM-22 | Twice per year | 16 | Not applicable |
| | | Molecular weight of stack gases | Grams per gram mole | | TM-23 | Twice per year | 29.7 | Not applicable |
| | | Nitrogen Oxides (as NO ₂ equivalent) | Milligrams per cubic metre | | TM-11 | Twice per year | 130 | 190 |
| | | Oxygen (O ₂) | Percent | | TM-25 | Twice per year | 6.3 | Not applicable |
| | | Solid Particles | Micrograms per cubic metre | | TM-15 | Twice per year | <1 (mg/m ³) | 40 |
| | | Sulfuric acid mist and sulphur trioxide (as SO ₃) | Milligrams per cubic metre | | TM-3 | Twice per year | 0.032 | 5 |
| | | Sulphur dioxide | Milligrams per cubic metre | | TM-4 | Twice per year | <5 | Not applicable |
| | | Temperature | Kelvin | | TM-2 | Twice per year | 360 | Not applicable |
| | | Velocity | Metres per second | | TM-2 | Twice per year | 5.2 | Not applicable |
| | | Volatile organic compounds | Milligrams per cubic metre | 3% | OM-2 | Twice per year | 0.39 | 20 |
| Volumetric flowrate | Cubic metres per second | | TM-2 | Twice per year | 3.1 | Not applicable | | |