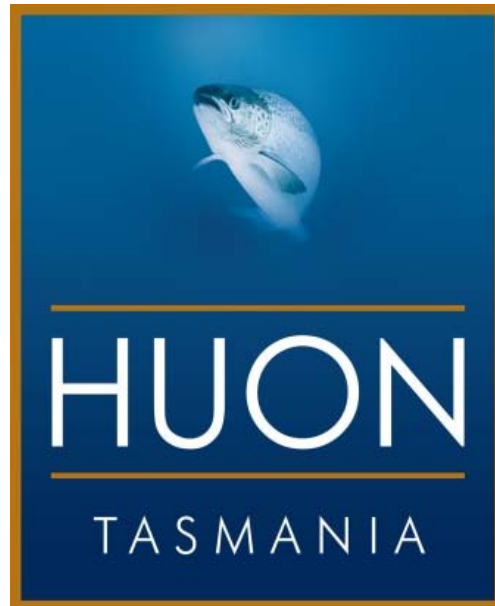


Huon Aquaculture Group Pty Ltd

Parramatta Creek Fish Processing Facility

APPENDIX C

MEASUREMENT OF PARTICULATE EMISSIONS





Report on Atmospheric Emissions No. 5 Boiler Stack

17 & 18 February 2016

**Huon Aquaculture
Parramatta Creek, Tasmania**

Report issued 29 April, 2016

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1. Executive Summary

1.1 Compliance

The total particulate emission from the three smokehouse stacks complied with the guidelines contained in the Environment Protection Policy (Air Quality) 2004.

Unfortunately there seems to have been a misunderstanding of the nature of the emission when Permit Conditions Environmental No. 7894 issued on 9 December 2009 was prepared. As discussed in detail in section 4.3 of this report, the permit conditions incorrectly require the particulate emission to be corrected to a reference condition of 12% CO₂. This reference condition is only applicable to boilers or incinerators of which the smokehouse is neither. Due to this requirement the smokehouses are unable to comply with the permit condition despite have very low particulate emission, as the carbon dioxide concentration was at all times lower than 1%.

1.2 Summary of Results

The average particulate emission, uncorrected for gas, was 6.9 mg/m³.

The average particulate emission calculated to 12% CO₂ was 493 mg/m³.

The average PM₁₀ particulate emission was 6.8 mg/m³.

All results are at 0°C, one atmosphere (101.325 kPa) dry.

2. Introduction

2.1 Purpose

The purpose of the investigation was to undertake commissioning tests of the particulate emissions from the stacks of the 3 smokehouses during normal operation. Sampling was conducted to comply with Permit Conditions Environmental No. 7894 issued on 9 December 2009.

2.2 Brief

The work was initially requested by Scott Nolan (General Manager Sales, Marketing & Processing) and finalised by Adam Chapman (Environmental Manager).

2.3 Site

The Huon Aquaculture Parramatta Creek Processing Facility is located at 7218 Bass Highway, East Sassafras Tasmania 7307. The brief was to carry out stack testing for particulate matter on the smokehouse stacks.

2.4 History

The emission of the smokehouses had not been tested since their installation.

2.5 Time

The tests were carried out between 13:00 and 22:10 hours on 17th February 2016, and between 07:45 and 11:50 hours on 18th February 2016.
All times in this report are in Australian Eastern Daylight Time (AEDT).

2.6 Location

Measurements were made from the sampling ports installed in the stacks above roof level.



2.7 Fuel

The three smoke generators burn approximately 90kg of Redgum wood chips between them in each 24 hour period.

2.8 Accreditation

LEC Environmental has been granted approval to undertake Stack Sampling and Testing for compliance with permit conditions under the *Environmental Management Pollution Control Act (1994)*. This approval was given by the Director of Environmental Management from the Department of Environment and Land Management. This approval included sampling and testing methods, and quality control.

3. Methods

3.1 Total Particulate Measurements

The flue velocities were determined and the equipment set up to sample isokinetically. The sampling equipment consists of either a stainless steel or an aluminium filter paper holder with an interchangeable tip, followed by a condenser, two de-entrainment chambers, suction pump and gas meter.

This method is based on Australian Standard AS4323.

Some tests were conducted using 70 mm filter papers and some using 125mm filter papers – the 125mm papers were held in a heated aluminium holder external to the stack.

As well as collecting the particulate matter, the filter papers also collect fish oil that is given off by the product during the smoking process. The fish oil was removed from the filter papers by washing with a solvent. The papers were then dried and reweighed to determine the particulate mass.

3.2 PM₁₀ - Particulates with an aerodynamic diameter <= 10 microns.

Sampling was carried out according to US EPA method 201A. This includes the determination of the molecular weight and viscosity of the gas from oxygen and carbon dioxide analysis. The gas is sampled isokinetically and passed through a stainless steel cyclone at a flow rate calculated to separate particles with an aerodynamic diameter of 10 microns or less from the larger fraction. The exit of the cyclone is connected to a filter paper holder containing a 70mm GFC filter paper. This is followed by a condenser, a suction pump, and gas meter.

As well as collecting the particulate matter, the filter papers also collect fish oil that is given off by the product during the smoking process. The fish oil was removed from the filter papers by washing with a solvent. The papers were then dried and reweighed to determine the particulate mass.

3.3 Moisture

The flue gas was drawn through a pre-weighed canister packed with Silica-Gel, followed by a gas meter and suction pump. The canister was weighed after the test to determine the mass of water collected. This method is based on Victorian EPA Method B3.

3.4 Carbon Dioxide, Carbon Monoxide and Oxygen

Carbon dioxide was determined by a non-dispersive infrared instrument. Carbon monoxide and oxygen were measured using a chemical cell. These are calibrated at twelve monthly intervals; the oxygen cell is also referenced to atmospheric oxygen.

4. Regulations

4.1 Extract from Permit 7894 issued 9 December 2009 Atmospheric

A1 Odorous gases

Odorous gases arising from the activity must be managed so that they do not cause environmental nuisance beyond the boundary of The Land.

A2 Atmospheric emission limits

- 1 In-stack concentrations at all nominated exhaust points of substances listed in Column 1 of the Table of Atmospheric Emission Limits below must not exceed the limits specified in Column 4 when measured in the units specified in Column 2 and adjusted to the reference gas value specified in Column 3

2 Table of Atmospheric Emission Limits

| Column 1 | Column 2 | Column 3 | Column 4 |
|--------------------|--|-------------------------------|----------------|
| Substance | Unit of Measurement | Reference Gas Value | Emission Limit |
| Particulate matter | mg/m ³ dry gas at 0°C and 101.325 kPa | 12% CO ₂ by volume | 100 |

A3 Smokehouse commissioning testing

- 1 Operation of smokehouses for the purpose of commissioning stack tests must not exceed 3 months.
- 2 During commissioning exceedences of emission limits specified in these conditions do not apply, provided all reasonable efforts to minimise such exceedences are implemented.
- 3 Operation of smokehouses must cease subsequent to commissioning unless it has been demonstrated to the satisfaction of the Director that the smokehouses can be operated in compliance with these conditions.

A4 Stack testing facilities

- 1 The following stack testing facilities must be maintained at all nominated exhaust points:
 - 1.1 sampling positions must be in accordance with Australian Standard AS 4323.1 (*Stationary source emissions - selection of sampling positions*), or as approved in writing by the Director;
 - 1.2 safe sampling platforms must be located to allow access to the sampling positions and safe access to these sampling platforms must be provided; and
 - 1.3 all necessary services required for the test method prescribed must be provided.

M3 Smokehouse exhaust stack monitoring reports

- 1 A Monitoring Report must be provided to the Director within 30 days of the receipt of results from each stack test.
- 2 The report must include:
 - 2.1 the results of the Stack test;
 - 2.2 the date on which the stack test was conducted;
 - 2.3 weather information at the time the stack test was conducted;
 - 2.4 relevant operating conditions including the fuel feed rate at the time the stack test was conducted;
 - 2.5 the stack test methods employed; and
 - 2.6 identification of breaches of limits specified in these conditions, an explanation of why each breach of specified limits occurred and details of actions taken in response to each identified breach of limits.

4.2 Environment Protection Policy (Air Quality) 2004

An excerpt from the guidelines for in stack concentrations is shown below.

Table 2 of this Schedule specifies in-stack concentrations that would normally be expected to be achievable using accepted modern technology referred to in clause 11 of this Policy.

The guidelines are intended to apply to new stationary sources and facility upgrades. Existing industry not able to currently meet the guidelines may need to progressively improve emissions performance according to a negotiated schedule (with due regard to environmental risk, economic cost and practicability) approved by the Director.

The in-stack concentrations contained in this schedule refer to routine operations of the activity. It is recognised that these values may not be achieved during commissioning, start-up or shutdown.

This Schedule does not apply to any boiler whose heating capacity (as determined by the apparatus by which it is heated) is less than 100 megajoules per hour.

The emission of a pollutant from a chimney or stack associated with a source specified in the second column of Schedule 1 should comply with the values of the third column in cases where accepted modern technology is used.

The concentration of a pollutant in the chimney or stack should be determined according to Australian Standard Methods or procedures approved by the Director. Moreover, the determination of pollutants should be conducted by personnel or laboratories approved by the Director.

For the purpose of this Schedule, a particular volume of a gas should be taken to be the amount of that gas which when dry would occupy that volume at a temperature of 0° Celsius and at an absolute pressure of 101.325 kilopascals. Moreover, the concentration of particles in an emission should be determined before its admixture with air, smoke, or other gases and be collected at a temperature as near to ambient as practicable.

For fuel burning equipment, the concentration of particles and oxides of nitrogen measured, should be adjusted to a reference gas value (oxygen or carbon dioxide) to compensate for variability due to the excess air rates in different combustion processes.

The reference gas values (by equipment and pollutant) are specified in Table 1.

Compilation of Tables 1 & 2 – Reference Conditions & In-stack concentrations

| | | |
|------------------------|---|---|
| Chlorine | Any trade, industry or process. | 200 mg/m ³ |
| Hydrogen Chloride | Any trade, industry or process. | 100 mg/m ³ |
| Hydrogen Sulphide | Any trade, industry or process. | 5 mg/m ³ |
| Fluorine and compounds | Any trade, industry or process other than a primary aluminium smelter manufacturing aluminium from alumina. | 50 mg/m ³ (HF or HF equivalent) |
| | Any primary aluminium smelter manufacturing aluminium from alumina. | 0.8 kg of total fluoride per tonne of aluminium produced |
| Metals | Any trade, industry, or process emitting antimony, arsenic, cadmium, lead, mercury, beryllium, chromium (hexavalent only), cobalt, manganese, nickel, selenium, tin, or vanadium or any compound thereof. | 5 mg/m ³ for total 1 mg/m ³ for cadmium 1 mg/m ³ for mercury |
| Oxides of Nitrogen | Any boiler operating on gas. | 350 mg/m ³ (as NO ₂) |
| | Any boiler operating on a fuel other than gas, other than a boiler used in connection with an electricity generator. | 500 mg/m ³ (as NO ₂) |
| | Any boiler operating on a fuel other than gas, being a boiler used in connection with an electricity generator with a capacity of less than 30 megawatts. | 500 mg/m ³ (as NO ₂) |
| | Any boiler operating on a fuel other than gas, being a boiler used in connection with an electricity generator with a capacity of 30 megawatts or more. | 800 mg/m ³ (as NO ₂) |
| | Any gas turbine operating on gas, being a turbine used in connection with an electricity generator with a capacity of less than 10 megawatts. | 90 mg/m ³ (as NO ₂) |
| | Any gas turbine operating on gas, being a turbine used in connection with an electricity generator with a capacity of 10 megawatts or more. | 70 mg/m ³ (as NO ₂) |
| | Any trade, industry or process other than for the manufacture of glass using sodium nitrate. | 2.0 g/m ³ (as NO ₂) |
| | Reference condition for fuel burning equipment other than gas turbines. | 7% O ₂ |

| | | |
|---|--|--|
| Particulate Matter | Any trade, industry or process and any fuel burning equipment or industrial plant. | 100 mg/m ³ |
| | Reference condition for boilers and incinerators. | 12% CO ₂ for wood-firing and 7% O ₂ for other fuels |
| Smoke | Any trade, industry or process and any fuel burning equipment or industrial plant. | A concentration no darker than Ringelmann 1, except that the concentration may be darker (but not so to exceed Ringelmann 3) for up to 10 minutes in any period of 8 hours for lighting a boiler or blowing soot, but only as long as all practicable means are employed to prevent or minimize the emission of air impurities. (This limit does not apply to emissions involving water vapour.) |
| Sulphur Dioxide | Any trade, industry or process manufacturing sulphuric acid from other than elemental sulphur. | 7.2 g/m ³ |
| | Any trade, industry or process manufacturing sulphuric acid from elemental sulphur. | 2.8 g/m ³ |
| Sulphuric acid mist or sulphur trioxide or both | Any trade, industry or process. | 100 mg/m ³ (as SO ₃ equivalent) |

4.3 Discussion of Regulations

It appears that at the time the conditions for Permit 7894 issued on 9 December 2009 were being prepared by the regulator; there may have been a misunderstanding of the nature of the smokehouses.

The permit has been written with a reference condition of 12% CO₂ being applied to the particulate concentration. However the reference conditions in the Environmental Protection Policy (Air Quality) 2004 specify that there should only be a reference condition for boilers and incinerators.

Boilers and incinerators are devices in which fuel is combusted in the presence of excess oxygen at high temperatures so that the fuel is consumed and heat is produced. The fuel is decomposed and most of the energy is produced by the combustion of the gases produced at temperatures above 800°C.

Smokehouses on the other hand have two components, the actual smoke generator which produces the smoke and the smokehouse itself where the smoke is exposed to the product. The smoke generator has a restricted oxygen supply and a much lower temperature so that the Redgum wood chips do not combust. The smoke is then released from the smoke generator into the smokehouse where it circulates around the product, fresh air is then used to displace the smoke.

Due to the way the smokehouse works the oxygen and carbon dioxide concentrations of the emission leaving the stack are very close to ambient air and are nowhere near the concentrations usually found in boilers and incinerators where a combustion process occurs.

As the smoke generator and smokehouse are not fuel burning equipment, and do not meet the definition of boilers and incinerators, it is not appropriate to have the particulate concentration corrected to a reference condition.

Furthermore the Environmental Protection Policy (Air Quality) 2004 states that:
"Moreover, the concentration of particles in an emission should be determined before its admixture with air, smoke, or other gases and be collected at a temperature as near to ambient as practicable."

The very design of the smokehouse means that the particulate matter produced by the smoker must be mixed with air prior to it being discharged to the emission point. This is another reason why it is not appropriate to have a reference condition to correct the particulate concentration from this emission.

It is our recommendation that the regulator re-issue the permit with the reference conditions removed as this was obviously a misunderstanding when the permit was originally issued.

5. Findings

5.1 Total Particulate Results with No Correction for Gas Concentration

| Particulates Test | Conc. mg/m ³ | Env. Reg. mg/m ³ | % Reg. Limit | Volume m ³ /s | M.E.R. mg/s |
|-------------------|-------------------------|-----------------------------|--------------|--------------------------|-------------|
| Test 1 Hot S1 | 1.6 | 100 | 2% | 0.741 | 0.1 |
| Test 2 Hot S1 | 6.6 | 100 | 7% | 0.735 | 4.9 |
| Test 3 Cold S2 | 10.3 | 100 | 10% | 0.767 | 7.9 |
| Test 4 Cold S3 | 11.3 | 100 | 11% | 0.793 | 8.9 |
| Test 5 Hot S1 | 3.2 | 100 | 3% | 0.661 | 2.1 |
| Test 6 Hot S1 Dry | 16.2 | 100 | 16% | 0.666 | 10.8 |
| Test 7 Hot S2 | 1.3 | 100 | 1% | 0.655 | 0.8 |
| Test 8 Hot S3 | 4.9 | 100 | 5% | 0.656 | 3.2 |
| Average | 6.9 | 100 | 7% | 0.709 | 4.8 |

Note: All results quoted at STP dry. M.E.R. = Mass Emission Rate.

Regulations quoted from Environment Protection Policy (Air Quality) 2004.

5.2 Total Particulate Results Calculated to 12% CO₂

| Particulates Test | Conc. mg/m ³ | Env. Reg. mg/m ³ | % Reg. Limit | Volume m ³ /s | M.E.R. mg/s |
|-------------------|-------------------------|-----------------------------|--------------|--------------------------|-------------|
| Test 1 Hot S1 | 76.1 | 100 | 76% | 0.741 | 0.1 |
| Test 2 Hot S1 | 409.2 | 100 | 409% | 0.735 | 4.9 |
| Test 3 Cold S2 | 308.3 | 100 | 308% | 0.767 | 7.9 |
| Test 4 Cold S3 | 289.0 | 100 | 289% | 0.793 | 8.9 |
| Test 5 Hot S1 | 101.5 | 100 | 101% | 0.661 | 2.1 |
| Test 6 Hot S1 Dry | 1701.4 | 100 | 1701% | 0.666 | 10.8 |
| Test 7 Hot S2 | 757.8 | 100 | 758% | 0.655 | 0.8 |
| Test 8 Hot S3 | 299.9 | 100 | 300% | 0.656 | 3.2 |
| Average | 492.9 | 100 | 493% | 0.709 | 4.8 |

Note: All results quoted at STP dry 12% CO₂. M.E.R. = Mass Emission Rate.

Regulations quoted from Permit 7894 issued 9 December 2009.

As discussed in section 4.3, it is not appropriate to correct the particulate emission from the smokehouses for CO₂. This table is presented in order to comply with the requirements of the current wording of Permit 7894. However due to the extremely low concentrations of CO₂ in the emission, the results presented above are not representative of the particulate emission.

It should be noted that for example in test 1 and test 7 the non-corrected particulate emission was of the same magnitude; however the results corrected for CO₂ differ by a magnitude of 10. The average CO₂ concentration during test 1 was 0.25%, and the average during test 7 was 0.02%. Thus a very small variation in CO₂ has caused a large variation in the corrected result.

5.3 PM₁₀ Particulate Results

| PM ₁₀ Particulates Test | Conc. mg/m ³ | Volume m ³ /s | M.E.R. mg/s |
|------------------------------------|----------------------------|-----------------------------|----------------|
| Test 9 Hot S3 | 3.0 | 0.653 | 0.5 |
| Test 10 Hot S3 | 10.5 | 0.653 | 1.9 |
| Average | 6.8 | 0.653 | 1.2 |

Note: All results quoted at STP dry. M.E.R. = Mass Emission Rate.

5.4 Moisture Results

| Moisture Test | Conc. g/m ³ | Conc. mm Hg |
|-------------------|---------------------------|----------------|
| Test 1 Hot S1 | 17.4 | 16.1 |
| Test 2 Hot S1 | 23.4 | 21.5 |
| Test 3 Cold S2 | 11.6 | 10.8 |
| Test 4 Cold S3 | 12.0 | 11.1 |
| Test 5 Hot S1 | 15.6 | 14.4 |
| Test 6 Hot S1 Dry | 9.9 | 9.3 |
| Test 7 Hot S2 | 23.4 | 21.5 |
| Test 8 Hot S3 | 22.9 | 21.0 |
| Test 9 Hot S3 | 26.3 | 24.0 |
| Test 10 Hot S3 | 26.6 | 24.3 |
| Average | 18.9 | 17.4 |

Note: All results quoted at STP.

5.5 Carbon Dioxide and Oxygen Concentration

During tests, carbon dioxide concentrations were all below 0.91%. Oxygen concentrations were all above 20.12%. Measurements are shown graphically in Annexure 7.25

5.6 Weather Conditions

The weather conditions at the Bureau of Meteorology station at Sheffield were:

| Date & Time | Temp. °C | Rain for day mm | Relative Humidity % | Wind Direction | Wind Speed Km/h | MSLP hPa |
|---------------|-------------|-----------------------|---------------------------|-------------------|-----------------------|-------------|
| 17/02/16 9 am | 15.0 | 0.2 | 57 | SW | 19 | 1008.8 |
| 17/02/16 3 pm | 20.7 | | 44 | SW | 11 | 1006.9 |
| 18/02/16 9 am | 17.0 | 0 | 62 | W | 6 | 1008.4 |
| 18/02/16 3 pm | 23.2 | | 50 | W | 11 | 1006.3 |

6. Conclusion

6.1 Compliance with Permit 7894

As discussed in section 4.3, the permit incorrectly requires the particulate emission to be corrected to a reference condition of 12% CO₂. The extremely low concentrations of CO₂ in the emission make it impossible for the emission to comply with the regulation in the EPN despite having extremely low particulate emissions.

Of the eight total particulates tests conducted, only one would have complied with the regulation corrected to CO₂, and one was of similar magnitude to the regulation. It is recommended that the reference condition of 12% CO₂ be removed from the permit as it is not consistent with the Environment Protection Policy (Air Quality) 2004.

6.2 Compliance with Environment Protection Policy (Air Quality) 2004

The total particulate emission complied with the guidelines as they do not require correction for gas concentration.



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Huon Aquaculture - Parramatta Creek**17 February, 2016****7.1 Velocity Measurements****Smoker 1 - Hot Smoke****Drying FA1 Stage****Stack Diameter: 345 mm****Pitot Tube Number: 12****Offset: 150 mm****Traverse 1**

| Distance (mm) | Pa | °C | K | Velocity (m/s) |
|----------------------|-----------|-------------|--------------|-----------------------|
| 15 | 39.2 | 39.4 | 312.6 | 6.74 |
| 51 | 55.3 | 38.8 | 312.0 | 7.99 |
| 101 | 62.0 | 38.5 | 311.7 | 8.46 |
| 244 | 73.4 | 32.4 | 305.6 | 9.11 |
| 294 | 100.1 | 38.8 | 312.0 | 10.75 |
| 330 | 105.0 | 38.7 | 311.9 | 11.01 |
| Average | | 37.8 | 310.9 | 9.01 |

**Traverse 2**

| Distance (mm) | Pa | °C | K | Velocity (m/s) |
|----------------------|-----------|-------------|--------------|-----------------------|
| 15 | 60.5 | 40.0 | 313.2 | 8.37 |
| 51 | 83.8 | 39.5 | 312.7 | 9.84 |
| 101 | 79.6 | 39.3 | 312.5 | 9.59 |
| 244 | 64.2 | 39.2 | 312.4 | 8.61 |
| 294 | 75.8 | 39.3 | 312.5 | 9.36 |
| 330 | 80.2 | 39.4 | 312.6 | 9.63 |
| Average | | 39.5 | 312.6 | 9.24 |

Average Stack Velocity: 9.1 m/s

Atmospheric Pressure: 1007 hPa
 Stack Relative Pressure: -0.8 Pa
 Static Pressure: 100.69 kPa
 Gas Specific Gravity Calculated As: 1

Volume: 0.847 m³/s at 38.6 °C, 101.325 kPa
 Volume: 0.742 m³/s at STP

Dry Volume based on moisture concentration during each test.

Test 1 Volume: 0.727 m³/s at STP dry
 Test 2 Volume: 0.721 m³/s at STP dry

Note: STP = Standard Temperature & Pressure, i.e. 0°C, 101.325 kPa (760 mmHg)

Huon Aquaculture - Parramatta Creek**17 February, 2016****7.2 Velocity Measurements****Smoker 1 - Hot Smoke****Intense Smoking Stage 16:40****Stack Diameter: 345 mm****Pitot Tube Number: 12****Offset: 0 mm****Traverse 1**

| Distance (mm) | Pa | °C | K | Velocity (m/s) |
|----------------------|-----------|-------------|--------------|-----------------------|
| 15 | 0.3 | 38.4 | 311.6 | 0.63 |
| 51 | 0.3 | 38.5 | 311.7 | 0.63 |
| 101 | 0.3 | 38.7 | 311.9 | 0.63 |
| 244 | 0.2 | 38.8 | 312.0 | 0.52 |
| 294 | 0.2 | 38.9 | 312.1 | 0.52 |
| 330 | 0.2 | 38.9 | 312.1 | 0.52 |
| Average | | 38.7 | 311.9 | 0.58 |

**Traverse 2**

| Distance (mm) | Pa | °C | K | Velocity (m/s) |
|----------------------|-----------|-------------|--------------|-----------------------|
| 15 | 0.2 | 40.3 | 313.5 | 0.53 |
| 51 | 0.1 | 40.3 | 313.5 | 0.39 |
| 101 | 0.1 | 40.3 | 313.5 | 0.39 |
| 244 | 0.1 | 40.2 | 313.4 | 0.39 |
| 294 | 0.1 | 40.2 | 313.4 | 0.39 |
| 330 | 0.1 | 40.2 | 313.4 | 0.39 |
| Average | | 40.3 | 313.4 | 0.41 |

Average Stack Velocity: 0.5 m/s**Atmospheric Pressure: 1007 hPa****Stack Relative Pressure: -0.9 Pa****Static Pressure: 100.69 kPa****Gas Specific Gravity Calculated As: 1****Volume: 0.046 m³/s at 39.5 °C, 101.325 kPa****Volume: 0.040 m³/s at STP****Dry Volume based on moisture concentration during each test.****Test 1 Volume: 0.039 m³/s at STP dry****Test 2 Volume: 0.039 m³/s at STP dry****Note: STP = Standard Temperature & Pressure, i.e. 0°C, 101.325 kPa (760 mmHg)**

Huon Aquaculture - Parramatta Creek**17 February, 2016****7.3 Velocity Measurements****Smoker 1 - Hot Smoke****Drying FA1 Stage****Stack Diameter: 345 mm****Pitot Tube Number: 12****Offset: 150 mm****Traverse 1**

| Distance (mm) | Pa | °C | K | Velocity (m/s) |
|----------------------|-----------|-----------|----------|-----------------------|
| 15 | 41.6 | 38.1 | 311.3 | 6.93 |
| 51 | 57.7 | 38.0 | 311.2 | 8.15 |
| 101 | 63.3 | 37.9 | 311.1 | 8.54 |
| 244 | 80.8 | 38.0 | 311.2 | 9.64 |
| 294 | 103.6 | 38.0 | 311.2 | 10.92 |
| 330 | 107.3 | 38.0 | 311.2 | 11.11 |
| Average | | 38.0 | 311.2 | 9.22 |

**Traverse 2**

| Distance (mm) | Pa | °C | K | Velocity (m/s) |
|----------------------|-----------|-----------|----------|-----------------------|
| 15 | 67.1 | 39.5 | 312.7 | 8.81 |
| 51 | 86.7 | 39.1 | 312.3 | 10.01 |
| 101 | 78.0 | 39.0 | 312.2 | 9.49 |
| 244 | 65.8 | 38.8 | 312.0 | 8.72 |
| 294 | 78.7 | 39.0 | 312.2 | 9.53 |
| 330 | 81.7 | 39.0 | 312.2 | 9.71 |
| Average | | 39.1 | 312.2 | 9.38 |

Average Stack Velocity: 9.3 m/s**Atmospheric Pressure: 1007 hPa****Stack Relative Pressure: -8 Pa****Static Pressure: 100.68 kPa****Gas Specific Gravity Calculated As: 1****Volume: 0.864 m³/s at 38.5 °C, 101.325 kPa****Volume: 0.757 m³/s at STP****Dry Volume based on moisture concentration during each test.****Test 1 Volume: 0.741 m³/s at STP dry****Test 2 Volume: 0.735 m³/s at STP dry****Note: STP = Standard Temperature & Pressure, i.e. 0°C, 101.325 kPa (760 mmHg)**

Huon Aquaculture - Parramatta Creek 17 February, 2016

7.4 Particulate Measurements

Smoker 1 - Hot Smoke

Test 1 - Traverse 2 - Intensive Smoke Cycle Only - Low Velocity

| Time | Meter Volume m ³ | Meter Temp °C | Condensate Temp °C | Flue Temp °C | CO ₂ % | O ₂ % |
|---|--------------------------------|------------------|-----------------------|-----------------|----------------------|---------------------|
| 14:30 | 51.071 | 27.0 | 26.5 | 38.9 | 0.02 | 20.91 |
| 14:35 | 51.277 | 28.0 | 27.0 | 39.5 | 0.02 | 21.02 |
| 14:40 | 51.501 | 28.5 | 27.5 | 36.9 | 0.07 | 20.99 |
| 14:45 | 51.702 | 29.0 | 27.5 | 36.3 | 0.33 | 20.72 |
| 14:51 | 51.857 | 29.0 | 28.0 | 35.6 | 0.51 | 20.48 |
| 14:55 | 51.912 | 28.5 | 28.0 | 35.1 | 0.61 | 20.32 |
| 14:57 | 51.927 | 28.5 | 28.5 | 33.5 | 0.17 | 20.88 |
| Missed Drying cycle with high velocity smoke emitted 14:59 to 15:02 | | | | | | |
| Average | | 28.4 | 27.6 | 36.5 | 0.25 | 20.76 |

Metered Volume: 0.856 m³

Calibration Factor: 1.032

Actual Volume: 0.883 m³

Vapour Pressure: 28 mm Hg

Atmospheric Pressure: 100.7 kPa



Corrected Volume: 0.766 m³ calculated to STP dry

Fish Oil & Particulate

Particulate Only

Filter paper number 20

Mass Recovered: 545.4 mg

1.2 mg

Fish Oil & Particulate Conc.: 712 mg/m³ calculated to STP dry

Fish Oil & Particulate Conc.: 34566 mg/m³ calculated to STP dry 12 % CO₂

Particulate Concentration: 1.6 mg/m³ calculated to STP dry

Particulate Concentration: 76 mg/m³ calculated to STP dry 12 % CO₂

Particulate Mass Flow Rate: 0.1 mg/s

Condensate: 0 ml

Condensate as Water Vapour: 0.000 m³

Meter Volume at Flue Temperature: 0.907 m³

Total Volume at Flue Temperature: 0.907 m³

Rate: 0.560 L/s

Probe Diameter: 10.0 mm

Cross Sectional Area: 0.785 cm²

Velocity At Tip: 7.1 m/s

Average Traverse Velocity: 0.4 m/s

Water Vapour Concentration: < 0.036 m³/m³ at Stack Temperature

Water Vapour Concentration: < 30.4 g/m³ at 0°C

Huon Aquaculture - Parramatta Creek 17 February, 2016

7.5 Particulate Measurements

Smoker 1 - Hot Smoke

Test 2 - Traverse 2 - Intensive Smoke, Smoke Reduction & Start of Drying Cycle

| Time | Meter Volume m ³ | Meter Temp °C | Condensate Temp °C | Flue Temp °C | CO ₂ % | O ₂ % |
|----------------|--------------------------------|------------------|-----------------------|-----------------|----------------------|---------------------|
| 15:43 | 51.976 | 28.5 | 28.5 | 41.8 | | |
| 15:48 | 52.098 | 28.5 | 29.0 | 40.6 | 0.21 | 20.79 |
| 15:53 | 52.189 | 29.0 | 29.0 | 39.8 | 0.35 | 20.62 |
| 15:58 | 52.302 | 29.0 | 29.0 | 39.7 | 0.34 | 20.61 |
| 16:03 | 52.378 | 29.0 | 29.0 | 38.3 | 0.05 | 20.81 |
| 16:08 | 52.451 | 28.5 | 29.0 | 43.1 | 0.02 | 21.13 |
| Average | | 28.8 | 28.9 | 40.6 | 0.19 | 20.79 |

Metered Volume: 0.475 m³

Calibration Factor: 1.032

Actual Volume: 0.490 m³

Vapour Pressure: 30 mm Hg
Atmospheric Pressure: 100.7 kPa

Corrected Volume: 0.423 m³ calculated to STP dry

Fish Oil & Particulate

Particulate Only

Filter paper number 21

Mass Recovered:

618.5 mg

2.8 mg

Fish Oil & Particulate Conc.: 1461 mg/m³ calculated to STP dry

Fish Oil & Particulate Conc.: 90397 mg/m³ calculated to STP dry 12 % CO₂

Particulate Concentration: 6.6 mg/m³ calculated to STP dry

Particulate Concentration: 409 mg/m³ calculated to STP dry 12 % CO₂

Particulate Mass Flow Rate: 4.9 mg/s

Condensate: 0 ml

Condensate as Water Vapour: 0.000 m³

Meter Volume at Flue Temperature: 0.509 m³

Total Volume at Flue Temperature: 0.509 m³

Rate: 0.339 L/s

Probe Diameter: 7.0 mm

Cross Sectional Area: 0.385 cm²

Velocity At Tip: 8.8 m/s

Average Traverse Velocity: 9.4 m/s

Water Vapour Concentration: < 0.039 m³/m³ at Stack Temperature

Water Vapour Concentration: < 33.1 g/m³ at 0°C



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7.6 Moisture Measurements

Smoker 1 - Hot Smoke

Test 1

| Time | Meter Volume m ³ | Meter Temp °C |
|----------------|--------------------------------|------------------|
| 14:30 | 15.7927 | 24.0 |
| 14:35 | 15.7974 | 24.5 |
| 14:40 | 15.8019 | 24.5 |
| 14:45 | 15.8066 | 24.5 |
| 14:50 | 15.8108 | 24.0 |
| 14:55 | 15.8152 | 24.5 |
| 14:57 | 15.8166 | 24.5 |
| Average | | 24.4 |

Metered Volume: 0.0239 m³

Actual Volume: 0.0233 m³

Calibration Factor: 0.973

Atmospheric Pressure: 100.7 kPa

Corrected Volume: 0.0212 m³ calculated to STP

Final Mass Chamber 20 114.4140 g

Initial Mass Chamber 20 114.0450 g

Mass Recovered: 0.3690 g

Moisture Concentration:

17.39 g/m³ calculated to STP

Equivalent vapour pressure:

16.1 mm Hg

Test 2

| Time | Meter Volume m ³ | Meter Temp °C |
|----------------|--------------------------------|------------------|
| 15:43 | 15.8167 | 24.5 |
| 15:48 | 15.8215 | 24.5 |
| 15:53 | 15.8263 | 24.5 |
| 15:58 | 15.8309 | 24.5 |
| 16:03 | 15.8353 | 24.5 |
| 16:08 | 15.8399 | 24.0 |
| Average | | 24.4 |

Metered Volume: 0.0232 m³

Actual Volume: 0.0226 m³

Calibration Factor: 0.973

Atmospheric Pressure: 100.7 kPa

Corrected Volume: 0.0206 m³ calculated to STP

Final Mass Chamber 21 113.5510 g

Initial Mass Chamber 21 113.0700 g

Mass Recovered: 0.4810 g

Moisture Concentration:

23.36 g/m³ calculated to STP

Equivalent vapour pressure:

21.5 mm Hg



Huon Aquaculture - Parramatta Creek**17 February, 2016****7.7 Velocity Measurements****Smoker 2 Cold Smoke**

Stack Diameter: 345 mm

Pitot Tube Number: 12

Offset: 150 mm

Traverse 1

| Distance (mm) | Pa | °C | K | Velocity (m/s) |
|----------------|------|------|-------|----------------|
| 15 | 60.8 | 24.4 | 297.6 | 8.18 |
| 51 | 78.6 | 24.5 | 297.7 | 9.30 |
| 101 | 66.9 | 24.4 | 297.6 | 8.58 |
| 244 | 76.2 | 23.9 | 297.1 | 9.15 |
| 294 | 85.3 | 23.7 | 296.9 | 9.68 |
| 330 | 83.1 | 23.5 | 296.7 | 9.55 |
| Average | | 24.1 | 297.2 | 9.08 |

**Traverse 2**

| Distance (mm) | Pa | °C | K | Velocity (m/s) |
|----------------|------|------|-------|----------------|
| 15 | 95.6 | 22.9 | 296.1 | 10.23 |
| 51 | 98.1 | 23.0 | 296.2 | 10.37 |
| 101 | 87.8 | 23.1 | 296.3 | 9.81 |
| 244 | 63.4 | 22.9 | 296.1 | 8.34 |
| 294 | 63.4 | 23.4 | 296.6 | 8.34 |
| 330 | 54.3 | 23.6 | 296.8 | 7.72 |
| Average | | 23.2 | 296.3 | 9.14 |

Average Stack Velocity: 9.1 m/s

Atmospheric Pressure: 1007 hPa

Stack Relative Pressure: -13.8 Pa

Static Pressure: 100.68 kPa

Gas Specific Gravity Calculated As: 1

Volume: 0.846 m³/s at 23.6 °C, 101.325 kPa

Volume: 0.778 m³/s at STP

Dry Volume based on moisture concentration during each test.

Test 3 Volume: 0.767 m³/s at STP dry

Note: STP = Standard Temperature & Pressure, i.e. 0°C, 101.325 kPa (760 mmHg)

Huon Aquaculture - Parramatta Creek 17 February, 2016

7.8 Particulate Measurements

Smoker 2 - Cold Smoke

Test 3 - Traverse 2 - Intense Smoke, Smoke Reduction, Start Drying Cycles

| Time | Meter Volume m ³ | Meter Temp °C | Condensate Temp °C | Flue Temp °C | CO ₂ % | O ₂ % |
|----------------|--------------------------------|------------------|-----------------------|-----------------|----------------------|---------------------|
| 20:59 | 52.795 | 15.0 | 18.0 | 21.6 | | |
| 21:04 | 52.911 | 15.0 | 18.0 | 21.2 | 0.59 | 20.54 |
| 21:09 | 53.003 | 16.0 | 17.5 | 22.0 | 0.72 | 20.34 |
| 21:14 | 53.044 | 16.0 | 17.5 | 20.7 | 0.47 | 20.59 |
| 21:19 | 53.082 | 16.0 | 17.5 | 22.6 | 0.11 | 20.97 |
| 21:24 | 53.172 | 16.0 | 17.5 | 22.1 | 0.12 | 20.98 |
| Average | | 15.7 | 17.7 | 21.7 | 0.40 | 20.68 |

Metered Volume: 0.377 m³

Calibration Factor: 1.032

Actual Volume: 0.389 m³

Vapour Pressure: 15 mm Hg
Atmospheric Pressure: 100.7 kPa

Corrected Volume: 0.358 m³ calculated to STP dry

Fish Oil & Particulate

Particulate Only

Filter paper number 22

Mass Recovered: 351.1 mg 3.7 mg

Fish Oil & Particulate Conc.: 980 mg/m³ calculated to STP dry

Fish Oil & Particulate Conc.: 29257 mg/m³ calculated to STP dry 12 % CO₂

Particulate Concentration: 10.3 mg/m³ calculated to STP dry

Particulate Concentration: 308 mg/m³ calculated to STP dry 12 % CO₂

Particulate Mass Flow Rate: 7.9 mg/s

Condensate: 0 ml

Condensate as Water Vapour: 0.000 m³

Meter Volume at Flue Temperature: 0.397 m³

Total Volume at Flue Temperature: 0.397 m³

Rate: 0.265 L/s

Probe Diameter: 7.0 mm

Cross Sectional Area: 0.385 cm²

Velocity At Tip: 6.9 m/s

Average Traverse Velocity: 9.1 m/s

Water Vapour Concentration: < 0.020 m³/m³ at Stack Temperature

Water Vapour Concentration: < 16.4 g/m³ at 0°C



Huon Aquaculture - Parramatta Creek

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7.9 Moisture Measurements

Smoker 2 Cold Smoke

Test 3

| Time | Meter Volume m ³ | Meter Temp °C |
|----------------|--------------------------------|------------------|
| 20:58 | 15.8400 | 12.0 |
| 21:03 | 15.8450 | 12.0 |
| 21:08 | 15.8495 | 13.0 |
| 21:13 | 15.8546 | 12.5 |
| 21:18 | 15.8593 | 12.5 |
| 21:23 | 15.8639 | 12.5 |
| Average | | 12.4 |



Metered Volume: 0.0239 m³
 Actual Volume: 0.0233 m³

Calibration Factor: 0.973
 Atmospheric Pressure: 100.7 kPa

Corrected Volume: 0.0221 m³ calculated to STP

Final Mass Chamber 22 117.8590 g
 Initial Mass Chamber 22 117.6030 g
 Mass Recovered: 0.2560 g

Moisture Concentration: 11.58 g/m³ calculated to STP
 Equivalent vapour pressure: 10.8 mm Hg

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7.10 Velocity Measurements

Smoker 3 Cold Smoke

Stack Diameter: 345 mm

Pitot Tube Number: 12

Offset: 150 mm

Traverse 1

| Distance (mm) | Pa | °C | K | Velocity (m/s) |
|----------------|-------|------|-------|----------------|
| 15 | 52.1 | 22.3 | 295.5 | 7.55 |
| 51 | 73.5 | 22.4 | 295.6 | 8.97 |
| 101 | 73.6 | 22.6 | 295.8 | 8.98 |
| 244 | 84.3 | 22.8 | 296.0 | 9.61 |
| 294 | 89.5 | 23.1 | 296.3 | 9.90 |
| 330 | 100.3 | 23.2 | 296.4 | 10.49 |
| Average | | 22.7 | 295.9 | 9.25 |



Traverse 2

| Distance (mm) | Pa | °C | K | Velocity (m/s) |
|----------------|------|------|-------|----------------|
| 15 | 97.0 | 22.9 | 296.1 | 10.31 |
| 51 | 99.1 | 22.8 | 296.0 | 10.42 |
| 101 | 89.3 | 22.6 | 295.8 | 9.88 |
| 244 | 68.0 | 22.4 | 295.6 | 8.62 |
| 294 | 73.6 | 22.2 | 295.4 | 8.97 |
| 330 | 72.3 | 22.1 | 295.3 | 8.89 |
| Average | | 22.5 | 295.7 | 9.52 |

Average Stack Velocity: 9.4 m/s

Atmospheric Pressure: 1007 hPa

Stack Relative Pressure: -14.1 Pa

Static Pressure: 100.68 kPa

Gas Specific Gravity Calculated As: 1

Volume: 0.871 m³/s at 22.6 °C, 101.325 kPa

Volume: 0.805 m³/s at STP

Dry Volume based on moisture concentration during each test.

Test 4 Volume: 0.793 m³/s at STP dry

Note: STP = Standard Temperature & Pressure, i.e. 0°C, 101.325 kPa (760 mmHg)

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7.11 Particulate Measurements

Smoker 3 - Cold Smoke

Test 4 - Traverse 2 - Intense Smoke, Smoke Reduction, Start Drying Cycles

| Time | Meter Volume m ³ | Meter Temp °C | Condensate Temp °C | Flue Temp °C | CO ₂ % | O ₂ % |
|----------------|--------------------------------|------------------|-----------------------|-----------------|----------------------|---------------------|
| 21:43 | 53.172 | 15.0 | 17.0 | 22.2 | 0.20 | 20.88 |
| 21:48 | 53.284 | 15.0 | 17.0 | 22.5 | 0.68 | 20.40 |
| 21:53 | 53.369 | 15.0 | 17.0 | 21.7 | 0.83 | 20.24 |
| 21:58 | 53.454 | 16.0 | 17.0 | 20.8 | 0.69 | 20.35 |
| 22:03 | 53.534 | 16.0 | 17.0 | 24.4 | 0.21 | 20.86 |
| 22:05 | 53.582 | 16.0 | 17.0 | 22.9 | 0.20 | 20.87 |
| Average | | 15.5 | 17.0 | 22.4 | 0.47 | 20.60 |

Metered Volume: 0.410 m³

Calibration Factor: 1.032

Actual Volume: 0.423 m³

Vapour Pressure: 15 mm Hg
Atmospheric Pressure: 100.7 kPa

Corrected Volume: 0.390 m³ calculated to STP dry

Fish Oil & Particulate

Particulate Only

Filter paper number 23

Mass Recovered: 406.1 mg

4.4 mg

Fish Oil & Particulate Conc.: 1041.0 mg/m³ calculated to STP dry

Fish Oil & Particulate Conc.: 26673.7 mg/m³ calculated to STP dry 12 % CO₂

Particulate Concentration: 11.3 mg/m³ calculated to STP dry

Particulate Concentration: 289 mg/m³ calculated to STP dry 12 % CO₂

Particulate Mass Flow Rate: 8.9 mg/s

Condensate: 0 ml

Condensate as Water Vapour: 0.000 m³

Meter Volume at Flue Temperature: 0.433 m³

Total Volume at Flue Temperature: 0.433 m³

Rate: 0.328 L/s

Probe Diameter: 7.0 mm

Cross Sectional Area: 0.385 cm²

Velocity At Tip: 8.5 m/s

Average Traverse Velocity: 9.5 m/s

Water Vapour Concentration: < 0.019 m³/m³ at Stack Temperature

Water Vapour Concentration: < 15.8 g/m³ at 0°C

Huon Aquaculture - Parramatta Creek 17 February, 2016

7.12 Moisture Measurements

Smoker 3 - Cold Smoke

Test 4

| Time | Meter Volume m ³ | Meter Temp °C |
|----------------|--------------------------------|------------------|
| 21:43 | 15.8639 | 12.0 |
| 21:48 | 15.8690 | 11.5 |
| 21:53 | 15.8739 | 12.0 |
| 21:58 | 15.8787 | 12.0 |
| 22:03 | 15.8835 | 12.0 |
| 22:05 | 15.8853 | 12.0 |
| Average | | 11.9 |



Metered Volume: 0.0214 m³
Actual Volume: 0.0208 m³

Calibration Factor: 0.973
Atmospheric Pressure: 100.7 kPa

Corrected Volume: 0.0198 m³ calculated to STP

Final Mass Chamber 23 115.1470 g
Initial Mass Chamber 23 114.9100 g
Mass Recovered: 0.2370 g

Moisture Concentration: 11.96 g/m³ calculated to STP
Equivalent vapour pressure: 11.1 mm Hg

Huon Aquaculture - Parramatta Creek**18 February, 2016****7.13 Velocity Measurements****Smoker 3 Hot Smoke**

Stack Diameter: 345 mm

Pitot Tube Number: 12

Offset: 150 mm

Traverse 1

| Distance (mm) | Pa | °C | K | Velocity (m/s) |
|----------------|------|------|-------|----------------|
| 15 | 44.1 | 42.1 | 315.3 | 7.17 |
| 51 | 52.9 | 42.9 | 316.1 | 7.86 |
| 101 | 52.7 | 43.4 | 316.6 | 7.85 |
| 244 | 64.7 | 43.6 | 316.8 | 8.70 |
| 294 | 77.2 | 43.8 | 317.0 | 9.51 |
| 330 | 76.4 | 43.9 | 317.1 | 9.46 |
| Average | | 43.3 | 316.4 | 8.43 |

11:48

**Traverse 2**

| Distance (mm) | Pa | °C | K | Velocity (m/s) |
|----------------|------|------|-------|----------------|
| 15 | 61.5 | 42.1 | 315.3 | 8.46 |
| 51 | 75.0 | 42.2 | 315.4 | 9.35 |
| 101 | 71.8 | 43.0 | 316.2 | 9.16 |
| 244 | 53.1 | 43.2 | 316.4 | 7.88 |
| 294 | 50.9 | 43.1 | 316.3 | 7.71 |
| 330 | 48.8 | 42.9 | 316.1 | 7.55 |
| Average | | 42.8 | 315.9 | 8.35 |

Average Stack Velocity: 8.4 m/s

Atmospheric Pressure: 1008 hPa

Stack Relative Pressure: -11.7 Pa

Static Pressure: 100.83 kPa

Gas Specific Gravity Calculated As: 1

Volume: 0.780 m³/s at 43.0 °C, 101.325 kPa

Volume: 0.674 m³/s at STP

Dry Volume based on moisture concentration during each test.

Test 5 Volume: 0.661 m³/s at STP dry

Test 6 Volume: 0.666 m³/s at STP dry

Test 7 Volume: 0.655 m³/s at STP dry

Test 8 Volume: 0.656 m³/s at STP dry

Test 9 Volume: 0.653 m³/s at STP dry

Test 10 Volume: 0.653 m³/s at STP dry

Note: STP = Standard Temperature & Pressure, i.e. 0°C, 101.325 kPa (760 mmHg)

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7.14 Particulate Measurements

Smoker 1 Hot Smoke

Test 5 - Traverse 2 - Intensive Smoke, Smoke Reduction & Start of Drying Cycle

| Time | Meter Volume m ³ | Meter Temp °C | Condensate Temp °C | Flue Temp °C | CO ₂ % | O ₂ % |
|----------------|--------------------------------|------------------|-----------------------|-----------------|----------------------|---------------------|
| 08:04 | 53.589 | 15.0 | 16.0 | 30.4 | 0.09 | 21.01 |
| 08:09 | 53.757 | 15.0 | 17.0 | 29.0 | 0.42 | 20.66 |
| 08:14 | 53.914 | 17.0 | 17.0 | 27.9 | 0.60 | 20.42 |
| 08:19 | 54.063 | 18.0 | 17.0 | 27.4 | 0.67 | 20.26 |
| 08:25 | 54.220 | 19.0 | 18.0 | 27.0 | 0.45 | 20.44 |
| 08:29 | 54.321 | 19.0 | 18.5 | 35.8 | 0.02 | 21.06 |
| Average | | 17.2 | 17.3 | 29.6 | 0.38 | 20.64 |

Metered Volume: 0.732 m³

Calibration Factor: 1.032

Actual Volume: 0.755 m³

Vapour Pressure: 15 mm Hg

Atmospheric Pressure: 100.8 kPa



Corrected Volume: 0.694 m³ calculated to STP dry

Fish Oil & Particulate

Particulate Only

Final Mass Paper 8N

Initial Mass Paper 8N

Mass Recovered: 843.1 mg

2.2 mg

Fish Oil & Particulate Conc.: **1215 mg/m³ calculated to STP dry**

Fish Oil & Particulate Conc.: 38891 mg/m³ calculated to STP dry 12 % CO₂

Particulate Concentration: 3.2 mg/m³ calculated to STP dry

Particulate Concentration: 101 mg/m³ calculated to STP dry 12 % CO₂

Particulate Mass Flow Rate: 2.1 mg/s

Condensate: 0 ml

Condensate as Water Vapour: 0.000 m³

Meter Volume at Flue Temperature: 0.788 m³

Total Volume at Flue Temperature: 0.788 m³

Rate: 0.525 L/s

Probe Diameter: 7.0 mm

Cross Sectional Area: 0.385 cm²

Velocity At Tip: 13.6 m/s

Average Traverse Velocity: 8.4 m/s

Water Vapour Concentration: <

0.019 m³/m³ at Stack Temperature

Water Vapour Concentration: <

15.9 g/m³ at 0°C

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7.15 Particulate Measurements

Smoker 1 Hot Smoke

Test 6 - Traverse 2 - Smoke Reduction & Start of Drying

| Time | Meter Volume m ³ | Meter Temp °C | Condensate Temp °C | Flue Temp °C | CO ₂ % | O ₂ % |
|----------------|--------------------------------|------------------|-----------------------|-----------------|----------------------|---------------------|
| 09:00 | 54.322 | 18.0 | 20.0 | 29.5 | 0.22 | 20.74 |
| 09:02 | 54.371 | 18.0 | 21.0 | 35.6 | 0.29 | 20.65 |
| 09:03 | 54.394 | 18.0 | 21.0 | 39.9 | 0.02 | 20.99 |
| 09:04 | 54.417 | 18.0 | 21.0 | 42.1 | 0.02 | 21.04 |
| 09:05 | 54.440 | 18.0 | 21.0 | 40.8 | 0.02 | 21.05 |
| Average | | 18.0 | 20.8 | 37.6 | 0.11 | 20.89 |

Metered Volume: 0.118 m³

Calibration Factor: 1.032

Actual Volume: 0.122 m³

Vapour Pressure: 18 mm Hg

Atmospheric Pressure: 100.8 kPa

Corrected Volume: 0.111 m³ calculated to STP dry

Filter paper number 24

Fish Oil & Particulate

Particulate Only

Mass Recovered: 39.4 mg 1.8 mg

Fish Oil & Particulate Conc.: 354 mg/m³ calculated to STP dry

Fish Oil & Particulate Conc.: 37242 mg/m³ calculated to STP dry 12 % CO₂

Particulate Concentration: 16.2 mg/m³ calculated to STP dry

Particulate Concentration: 1701 mg/m³ calculated to STP dry 12 % CO₂

Particulate Mass Flow Rate: 10.8 mg/s

Condensate: 0 ml

Condensate as Water Vapour: 0.000 m³

Meter Volume at Flue Temperature: 0.130 m³

Total Volume at Flue Temperature: 0.130 m³

Rate: 0.435 L/s

Probe Diameter: 7.0 mm

Cross Sectional Area: 0.385 cm²

Velocity At Tip: 11.3 m/s

Average Traverse Velocity: 8.4 m/s

Water Vapour Concentration: < 0.024 m³/m³ at Stack Temperature

Water Vapour Concentration: < 20.1 g/m³ at 0°C



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7.16 Moisture Measurements

Smoker 1 Hot Smoke

Test 5

| Time | Meter Volume m ³ | Meter Temp °C |
|----------------|--------------------------------|------------------|
| 08:04 | 15.8854 | 14.0 |
| 08:09 | 15.8905 | 15.5 |
| 08:14 | 15.8958 | 16.0 |
| 08:19 | 15.9008 | 16.5 |
| 08:24 | 15.9059 | 17.0 |
| 08:29 | 15.9108 | 16.5 |
| Average | | 15.9 |



Metered Volume: 0.0254 m³
 Actual Volume: 0.0247 m³

Calibration Factor: 0.973
 Atmospheric Pressure: 100.8 kPa

Corrected Volume: 0.0232 m³ calculated to STP

Final Mass Chamber 24 117.4390 g
 Initial Mass Chamber 24 117.0770 g
 Mass Recovered: 0.3620 g

Moisture Concentration: 15.58 g/m³ calculated to STP
 Equivalent vapour pressure: 14.4 mm Hg

Test 6

| Time | Meter Volume m ³ | Meter Temp °C |
|----------------|--------------------------------|------------------|
| 09:00 | 15.9108 | 15.5 |
| 09:01 | 15.9117 | 16.0 |
| 09:02 | 15.9126 | 16.0 |
| 09:03 | 15.9135 | 15.5 |
| 09:04 | 15.9144 | 15.5 |
| 09:05 | 15.9153 | 15.5 |
| Average | | 15.7 |

Metered Volume: 0.0045 m³
 Actual Volume: 0.0044 m³

Calibration Factor: 0.973
 Atmospheric Pressure: 100.8 kPa

Corrected Volume: 0.0041 m³ calculated to STP

Final Mass Chamber 25 146.8470 g
 Initial Mass Chamber 25 146.8060 g
 Mass Recovered: 0.0410 g

Moisture Concentration: 9.95 g/m³ calculated to STP
 Equivalent vapour pressure: 9.3 mm Hg

Huon Aquaculture - Parramatta Creek 18 February, 2016

7.17 Particulate Measurements

Smoker 2 Hot Smoke

Test 7 - Traverse 2 - Intensive Smoke, Smoke Reduction & Start of Drying Cycle

| Time | Meter Volume m ³ | Meter Temp °C | Condensate Temp °C | Flue Temp °C | CO ₂ % | O ₂ % |
|----------------|--------------------------------|------------------|-----------------------|-----------------|----------------------|---------------------|
| 09:17 | 54.440 | 19.0 | 21.0 | 35.4 | 0.02 | 21.08 |
| 09:22 | 54.617 | 21.0 | 21.5 | 33.7 | 0.02 | 21.06 |
| 09:27 | 54.780 | 22.5 | 21.5 | 33.2 | 0.02 | 21.03 |
| 09:32 | 54.946 | 24.5 | 22.0 | 33.0 | 0.02 | 21.01 |
| 09:37 | 55.109 | 26.0 | 22.0 | 29.7 | 0.02 | 21.00 |
| 09:42 | 55.299 | 27.0 | 22.0 | 43.1 | 0.02 | 21.06 |
| Average | | 23.3 | 21.7 | 34.7 | 0.02 | 21.04 |

Metered Volume: 0.859 m³

Calibration Factor: 1.032

Actual Volume: 0.886 m³

Vapour Pressure: 19 mm Hg

Atmospheric Pressure: 100.8 kPa



Corrected Volume: 0.792 m³ calculated to STP dry

Fish Oil & Particulate

Particulate Only

Filter paper number 80

Mass Recovered: 903.9 mg

1.0 mg

Fish Oil & Particulate Conc.: **1141.7 mg/m³ calculated to STP dry**

Fish Oil & Particulate Conc.: 684990.5 mg/m³ calculated to STP dry 12 % CO₂

Particulate Concentration: 1.3 mg/m³ calculated to STP dry

Particulate Concentration: 758 mg/m³ calculated to STP dry 12 % CO₂

Particulate Mass Flow Rate: 0.8 mg/s

Condensate: 0 ml

Condensate as Water Vapour: 0.000 m³

Meter Volume at Flue Temperature: 0.920 m³

Total Volume at Flue Temperature: 0.920 m³

Rate: 0.613 L/s

Probe Diameter: 9.0 mm

Cross Sectional Area: 0.636 cm²

Velocity At Tip: 9.6 m/s

Average Traverse Velocity: 8.4 m/s

Water Vapour Concentration: <

0.025 m³/m³ at Stack Temperature

Water Vapour Concentration: <

21.1 g/m³ at 0°C

Huon Aquaculture - Parramatta Creek

18 February, 2016

7.18 Moisture Measurements

Smoker 2 Hot Smoke

Test 7

| Time | Meter Volume m ³ | Meter Temp °C |
|----------------|--------------------------------|------------------|
| 09:17 | 15.9153 | 16.0 |
| 09:22 | 15.9199 | 15.5 |
| 09:27 | 15.9244 | 16.0 |
| 09:32 | 15.9289 | 16.5 |
| 09:37 | 15.9336 | 18.0 |
| 09:42 | 15.9379 | 20.5 |
| Average | | 17.1 |

Metered Volume: 0.0226 m³

Calibration Factor: 0.973

Actual Volume: 0.0220 m³

Atmospheric Pressure: 100.8 kPa

Corrected Volume: 0.0206 m³ calculated to STP

Final Mass Chamber 26 141.9610 g

Initial Mass Chamber 26 141.4800 g

Mass Recovered: 0.4810 g

Moisture Concentration: 23.36 g/m³ calculated to STP

Equivalent vapour pressure: 21.5 mm Hg

Huon Aquaculture - Parramatta Creek 18 February, 2016

7.19 Particulate Measurements

Smoker 3 Hot Smoke

Test 8 - Traverse 2 - Intensive Smoke, Smoke Reduction & Start of Drying Cycle

| Time | Meter Volume m ³ | Meter Temp °C | Condensate Temp °C | Flue Temp °C | CO ₂ % | O ₂ % |
|----------------|--------------------------------|------------------|-----------------------|-----------------|----------------------|---------------------|
| 10:03 | 55.299 | 27.0 | 23.0 | 37.8 | 0.02 | 21.05 |
| 10:08 | 55.471 | 27.0 | 23.5 | 35.4 | 0.02 | 21.08 |
| 10:13 | 55.651 | 27.0 | 23.5 | 34.3 | 0.33 | 20.57 |
| 10:18 | 55.824 | 27.0 | 23.5 | 34.1 | 0.45 | 20.35 |
| 10:23 | 55.996 | 28.0 | 24.0 | 34.1 | 0.50 | 20.26 |
| 10:28 | 56.196 | 28.0 | 24.0 | 47.7 | 0.02 | 21.00 |
| 10:30 | 56.277 | 28.0 | 24.0 | 49.8 | 0.02 | 21.04 |
| Average | | 27.4 | 23.6 | 39.0 | 0.19 | 20.76 |

Metered Volume: 0.977 m³

Calibration Factor: 1.032

Actual Volume: 1.008 m³

Vapour Pressure: 22 mm Hg

Atmospheric Pressure: 100.8 kPa



Corrected Volume: 0.886 m³ calculated to STP dry

Fish Oil & Particulate

Particulate Only

Filter paper number 8P

Mass Recovered: 882.0 mg

4.3 mg

Particulate Concentration: 996 mg/m³ calculated to STP dry

Particulate Concentration: 61507 mg/m³ calculated to STP dry 12 % CO₂

Particulate Concentration: 4.9 mg/m³ calculated to STP dry

Particulate Concentration: 300 mg/m³ calculated to STP dry 12 % CO₂

Particulate Mass Flow Rate: 3.2 mg/s

Condensate: 0 ml

Condensate as Water Vapour: 0.000 m³

Meter Volume at Flue Temperature: 1.047 m³

Total Volume at Flue Temperature: 1.047 m³

Rate: 0.646 L/s

Probe Diameter: 9.0 mm

Cross Sectional Area: 0.636 cm²

Velocity At Tip: 10.2 m/s

Average Traverse Velocity: 8.4 m/s

Water Vapour Concentration: <

0.029 m³/m³ at Stack Temperature

Water Vapour Concentration: <

23.9 g/m³ at 0°C

Huon Aquaculture - Parramatta Creek 18 February, 2016

7.20 Moisture Measurements

Smoker 3 Hot Smoke

Test 8

| Time | Meter Volume m ³ | Meter Temp °C |
|----------------|--------------------------------|------------------|
| 10:03 | 15.9379 | 23.5 |
| 10:08 | 15.9424 | 24.0 |
| 10:13 | 15.9468 | 23.5 |
| 10:18 | 15.9511 | 23.5 |
| 10:23 | 15.9554 | 24.0 |
| 10:28 | 15.9596 | 24.0 |
| 10:30 | 15.9612 | 24.0 |
| Average | | 23.8 |



Metered Volume: 0.0233 m³
 Actual Volume: 0.0227 m³

Calibration Factor: 0.973
 Atmospheric Pressure: 100.8 kPa

Corrected Volume: 0.0208 m³ calculated to STP

Final Mass Chamber 27 138.5370 g
 Initial Mass Chamber 27 138.0620 g
 Mass Recovered: 0.4750 g

Moisture Concentration: 22.89 g/m³ calculated to STP
 Equivalent vapour pressure: 21.0 mm Hg

Huon Aquaculture - Parramatta Creek 18 February, 2016

7.21 PM₁₀ Particulate Measurements

Smoker 3 Hot Smoke

Test 9 - Traverse 2 - Intensive Smoke, Smoke Reduction & Start of Drying Cycle

| Time | Meter Volume m ³ | Meter Temp °C | Condensate Temp °C | Flue Temp °C | CO ₂ % | O ₂ % |
|----------------|--------------------------------|------------------|-----------------------|-----------------|----------------------|---------------------|
| 10:44 | 56.277 | 27.0 | 25.0 | 40.2 | 0.02 | 21.14 |
| 10:49 | 56.325 | 27.0 | 25.0 | 38.0 | 0.02 | 21.14 |
| 10:54 | 56.384 | 27.0 | 26.0 | 38.5 | 0.39 | 20.42 |
| 10:59 | 56.443 | 28.0 | 26.5 | 37.4 | 0.47 | 20.30 |
| 11:04 | 56.506 | 28.0 | 26.5 | 43.6 | 0.02 | 20.95 |
| 11:06 | 56.532 | 28.0 | 26.5 | 44.4 | 0.02 | 21.05 |
| Average | | 27.5 | 25.9 | 40.4 | 0.16 | 20.83 |

Metered Volume: 0.255 m³

Calibration Factor: 1.032

Actual Volume: 0.263 m³
 Vapour Pressure: 25 mm Hg
 Atmospheric Pressure: 100.8 kPa
Corrected Volume: 0.230 m³ calculated to STP dryFlow Rate: 0.0112 m³/min calculated to 20°C dry, 101.325 kPa

Filter paper number 18

Fish Oil & Particulate

Particulate Only

Mass Recovered: 330.3 mg

0.7 mg

PM₁₀ Particulate & Fish Oil Conc.:1436.1 mg/m³ calculated to STP dryPM₁₀ Part. & Fish Oil Mass Flow Rate:

937.7 mg/s

PM₁₀ Particulate Concentration:3.0 mg/m³ calculated to STP dryPM₁₀ Particulate Mass Flow Rate:

0.5 mg/s

Condensate: 0 ml

Condensate as Water Vapour: 0.000 m³Meter Volume at Flue Temperature: 0.274 m³Total Volume at Flue Temperature: 0.274 m³

Rate: 0.208 L/s

Probe Diameter: 5.0 mm

Cross Sectional Area: 0.196 cm²

Velocity At Tip: 10.6 m/s

Average Traverse Velocity: 8.4 m/s

Water Vapour Concentration:

<

0.033 m³/m³ at Stack Temperature

Water Vapour Concentration:

<

27.5 g/m³ at 0°C

Huon Aquaculture - Parramatta Creek 18 February, 2016

7.21 PM₁₀ Particulate Measurements

Smoker 3 Hot Smoke

Test 9 - Traverse 2 - Intensive Smoke, Smoke Reduction & Start of Drying Cycle

Cut Point Calculation



| | |
|-----------------------------------|---|
| Oxygen | 20.8 % |
| Carbon Dioxide | 0.2 % |
| Moisture | 0.0316 m ³ /m ³ |
| Stack Temperature | 40.4 °C |
| Stack Temperature | 313.5 K |
| Stack Pressure | 756.3 mm Hg |
| Std. Cyclone Flow Rate | 0.0112 m ³ /min at 20°C |
| Gas Viscosity | 186.789 micropoise |
| Molecular Wt. Dry Gas | 28.8584 |
| Molecular Wt. Wet Gas | 28.5149 |
| Total Cyclone Flow Rate | 0.01244 m ³ /min at stack conditions |
| Cut Point D₅₀ = | 10.4898 microns |

Note: According to US 40CFR 51 Method 201A section 6.3.5
The test is acceptable if D₅₀ is between 9.0 and 11.0 microns.

7.22 PM₁₀ Particulate Measurements

Smoker 3 Hot Smoke



Test 10 - Traverse 2 - Intensive Smoke, Smoke Reduction & Start of Drying Cycle

| Time | Meter Volume m ³ | Meter Temp °C | Condensate Temp °C | Flue Temp °C | CO ₂ % | O ₂ % |
|----------------|--------------------------------|------------------|-----------------------|-----------------|----------------------|---------------------|
| 11:18 | 56.532 | 28.0 | 27.0 | 40.2 | 0.02 | 21.14 |
| 11:23 | 56.597 | 28.0 | 27.0 | 38.0 | 0.02 | 21.14 |
| 11:28 | 56.657 | 28.0 | 27.5 | 38.5 | 0.39 | 20.42 |
| 11:33 | 56.717 | 28.0 | 27.5 | 37.4 | 0.47 | 20.30 |
| 11:38 | 56.777 | 28.0 | 27.5 | 43.6 | 0.02 | 20.95 |
| 11:43 | 56.840 | 28.0 | 27.0 | 44.4 | 0.02 | 20.05 |
| Average | | 28.0 | 27.3 | 40.4 | 0.16 | 20.67 |

Metered Volume: 0.308 m³

Calibration Factor: 1.032

Actual Volume: 0.318 m³Vapour Pressure: 27 mm Hg
Atmospheric Pressure: 100.8 kPaCorrected Volume: 0.277 m³ calculated to STP dryFlow Rate: 0.0119 m³/min calculated to 20°C dry, 101.325 kPa

| | | |
|------------------------|------------------------|------------------|
| | Fish Oil & Particulate | Particulate Only |
| Filter paper number 19 | | |

| | | |
|-----------------|----------|--------|
| Mass Recovered: | 344.6 mg | 2.9 mg |
|-----------------|----------|--------|

| | |
|--|--|
| PM₁₀ Particulate & Fish Oil Conc.: | 1245.9 mg/m³ calculated to STP dry |
| PM ₁₀ Part. & Fish Oil Mass Flow Rate: | 813 mg/s |

| | |
|---|--|
| PM₁₀ Particulate Concentration: | 10.5 mg/m³ calculated to STP dry |
| PM ₁₀ Particulate Mass Flow Rate: | 2 mg/s |

| | |
|-----------------------------------|----------------------|
| Condensate: | 0 ml |
| Condensate as Water Vapour: | 0.000 m ³ |
| Meter Volume at Flue Temperature: | 0.331 m ³ |
| Total Volume at Flue Temperature: | 0.331 m ³ |
| Rate: | 0.220 L/s |

| | | | |
|------------------|----------|----------------------------|-----------------------|
| Probe Diameter: | 5.0 mm | Cross Sectional Area: | 0.196 cm ² |
| Velocity At Tip: | 11.2 m/s | Average Traverse Velocity: | 8.4 m/s |

| | | |
|-----------------------------|---|---|
| Water Vapour Concentration: | < | 0.036 m ³ /m ³ at Stack Temperature |
| Water Vapour Concentration: | < | 29.8 g/m ³ at 0°C |

Huon Aquaculture - Parramatta Creek 18 February, 2016

7.22 PM₁₀ Particulate Measurements

Smoker 3 Hot Smoke

Test 10 - Traverse 2 - Intensive Smoke, Smoke Reduction & Start of Drying Cycle

Cut Point Calculation

| | |
|------------------------|---------------------------------------|
| Oxygen | 20.7 % |
| Carbon Dioxide | 0.2 % |
| Moisture | 0.0320 m ³ /m ³ |
| Stack Temperature | 40.4 °C |
| Stack Temperature | 313.5 K |
| Stack Pressure | 756.3 mm Hg |
| Std. Cyclone Flow Rate | 0.0119 m ³ /min at 20°C |

| | |
|---------------|--------------------|
| Gas Viscosity | 186.674 micropoise |
|---------------|--------------------|

| | |
|-----------------------|---------|
| Molecular Wt. Dry Gas | 28.8517 |
| Molecular Wt. Wet Gas | 28.5046 |

| | |
|-------------------------|---|
| Total Cyclone Flow Rate | 0.01317 m ³ /min at stack conditions |
|-------------------------|---|

Cut Point D₅₀ = 10.0708 microns

Note: According to US 40CFR 51 Method 201A section 6.3.5

The test is acceptable if D₅₀ is between 9.0 and 11.0 microns.



Huon Aquaculture - Parramatta Creek 18 February, 2016

7.23 Moisture Measurements

Smoker Stack

Test 9

| Time | Meter Volume m ³ | Meter Temp °C |
|----------------|--------------------------------|------------------|
| 10:44 | 15.9612 | 26.0 |
| 10:49 | 15.9612 | 26.0 |
| 10:54 | 15.9647 | 27.0 |
| 10:59 | 15.9680 | 29.5 |
| 11:04 | 15.9712 | 29.5 |
| 11:06 | 15.9726 | 29.0 |
| Average | | 27.8 |



Metered Volume: 0.0114 m³
Actual Volume: 0.0111 m³

Calibration Factor: 0.973
Atmospheric Pressure: 100.8 kPa

Corrected Volume: 0.0100 m³ calculated to STP

Final Mass Chamber 28 131.4170 g
Initial Mass Chamber 28 131.1540 g
Mass Recovered: 0.2630 g

Moisture Concentration: 26.26 g/m³ calculated to STP
Equivalent vapour pressure: 24.0 mm Hg

Test 10

| Time | Meter Volume m ³ | Meter Temp °C |
|----------------|--------------------------------|------------------|
| 11:18 | 15.9726 | 28.0 |
| 11:23 | 15.9769 | 28.5 |
| 11:28 | 15.9812 | 28.5 |
| 11:33 | 15.9855 | 28.0 |
| 11:38 | 15.9896 | 28.0 |
| 11:43 | 15.9938 | 25.0 |
| Average | | 27.7 |

Metered Volume: 0.0212 m³
Actual Volume: 0.0206 m³

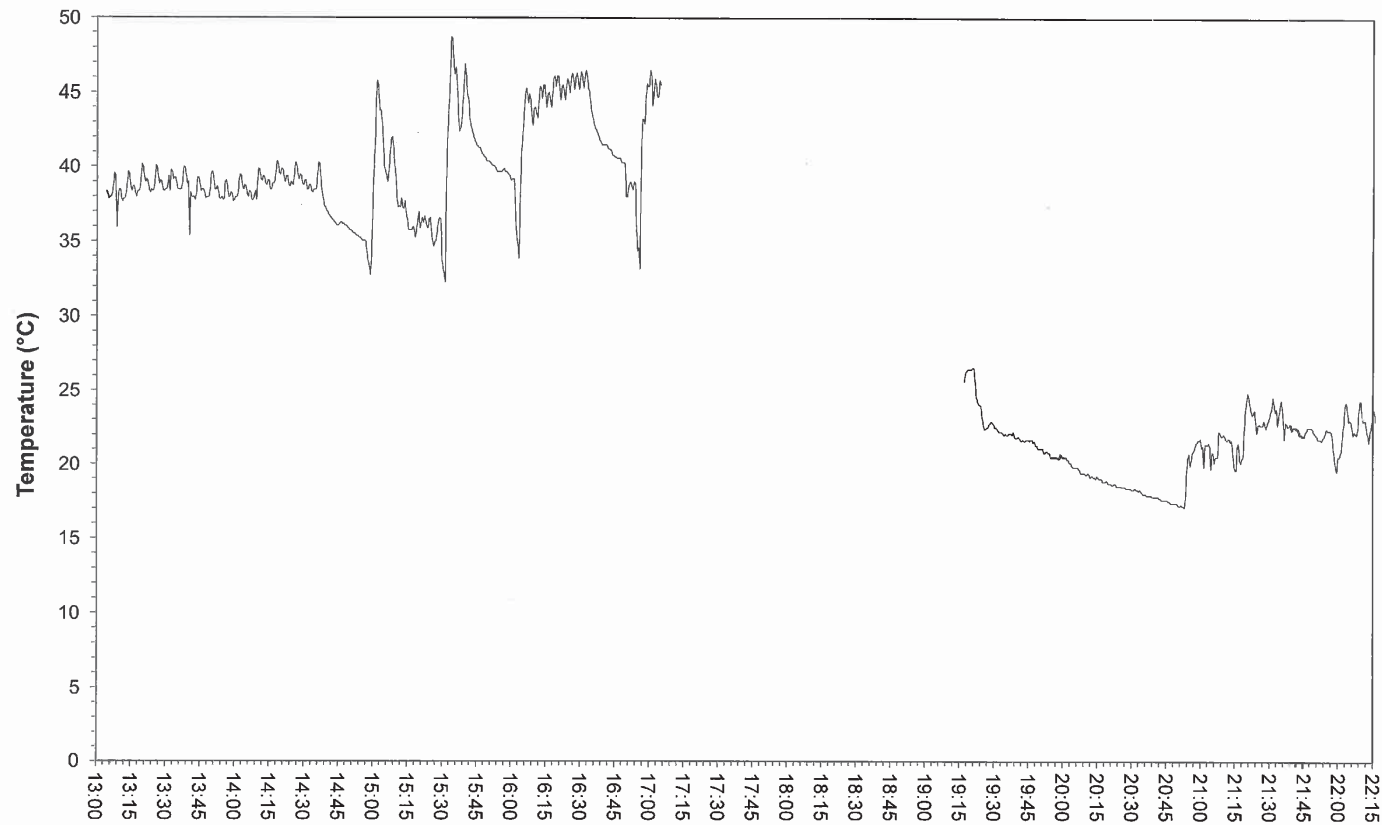
Calibration Factor: 0.973
Atmospheric Pressure: 100.8 kPa

Corrected Volume: 0.0186 m³ calculated to STP

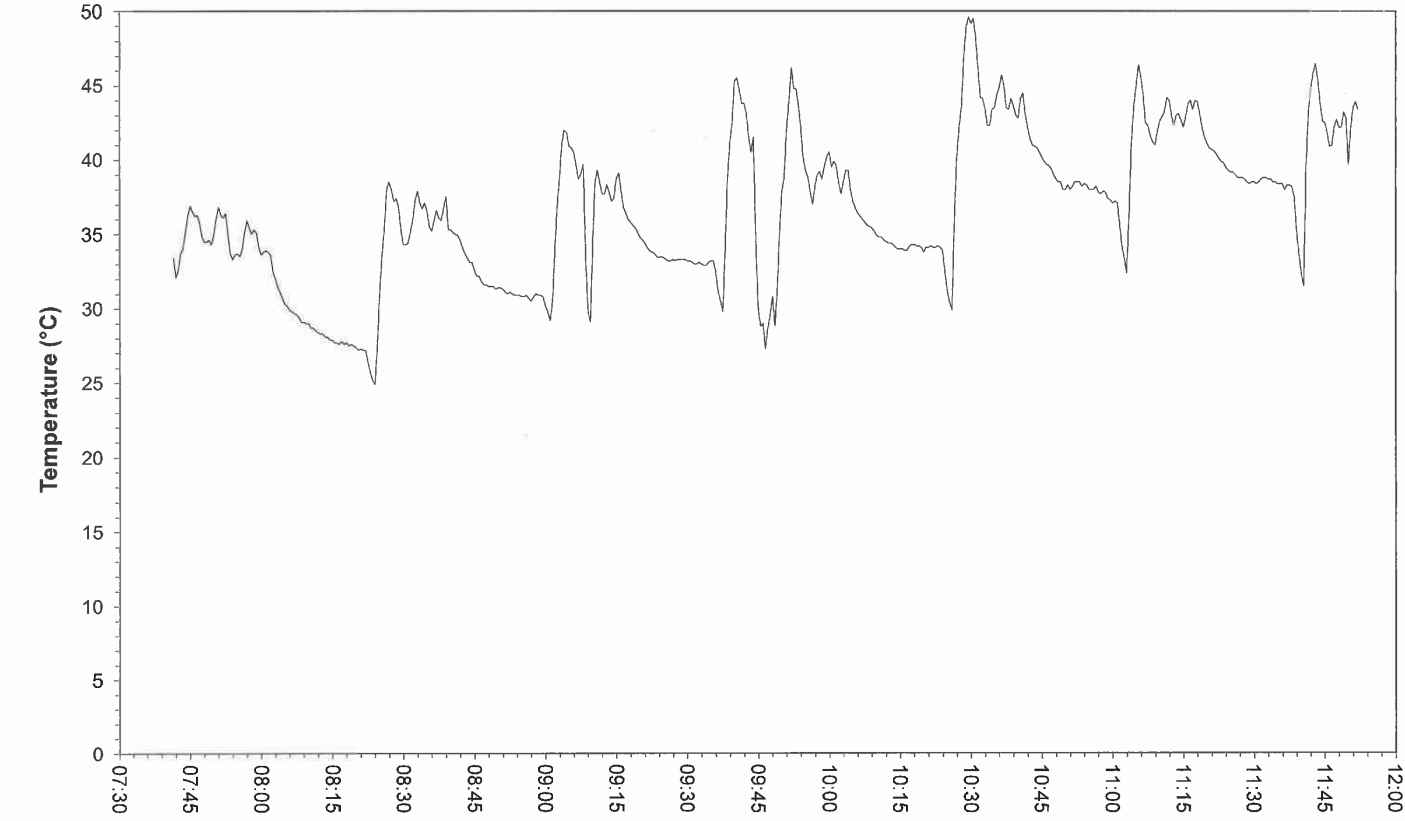
Final Mass Chamber 29 133.6500 g
Initial Mass Chamber 29 133.1550 g
Mass Recovered: 0.4950 g

Moisture Concentration: 26.56 g/m³ calculated to STP
Equivalent vapour pressure: 24.3 mm Hg

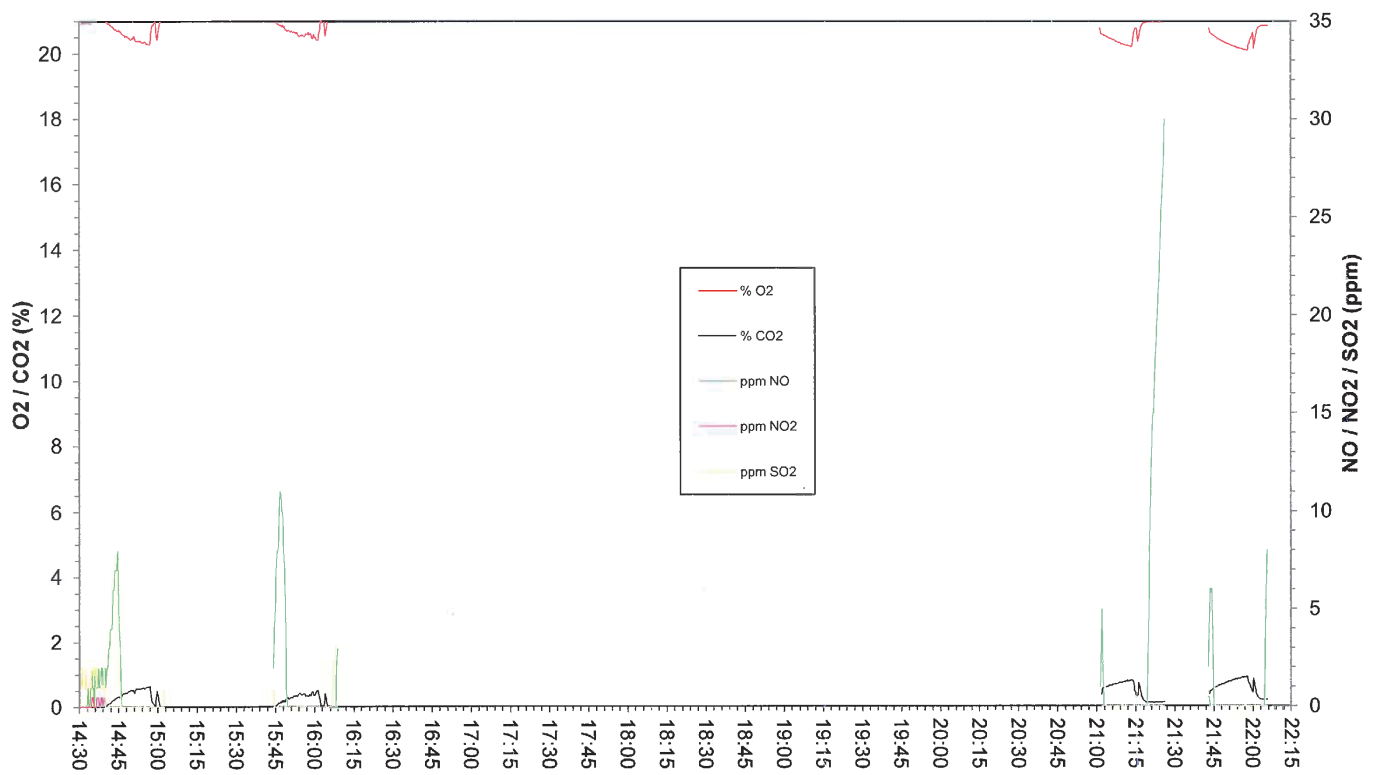
Huon Aquaculture Parramatta Creek - 17 February 2016
7.24 Stack Temperature



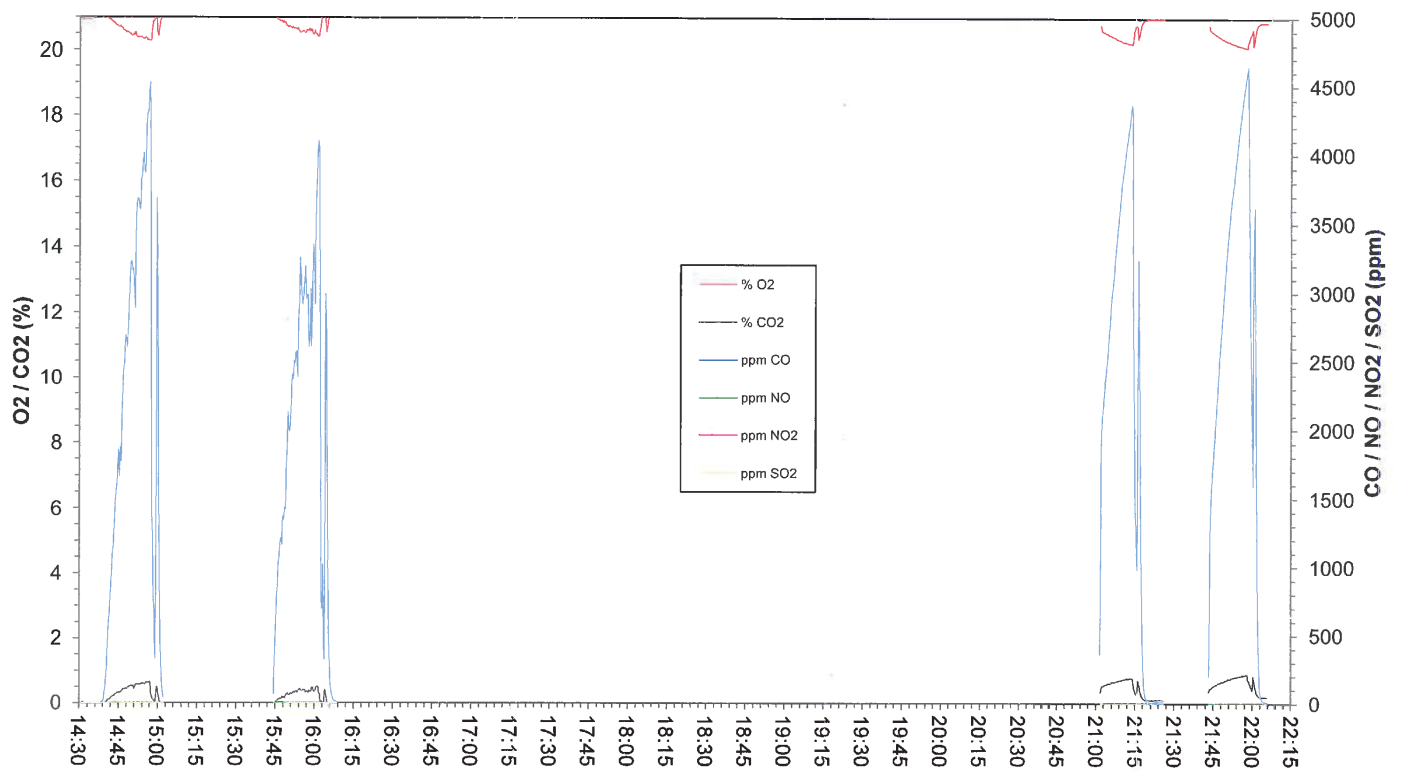
Huon Aquaculture Parramatta Creek - 18 February 2016
7.24 Stack Temperature



Huon Aquaculture Parramatta Creek - 17 February 2016
7.25 Gas Concentrations

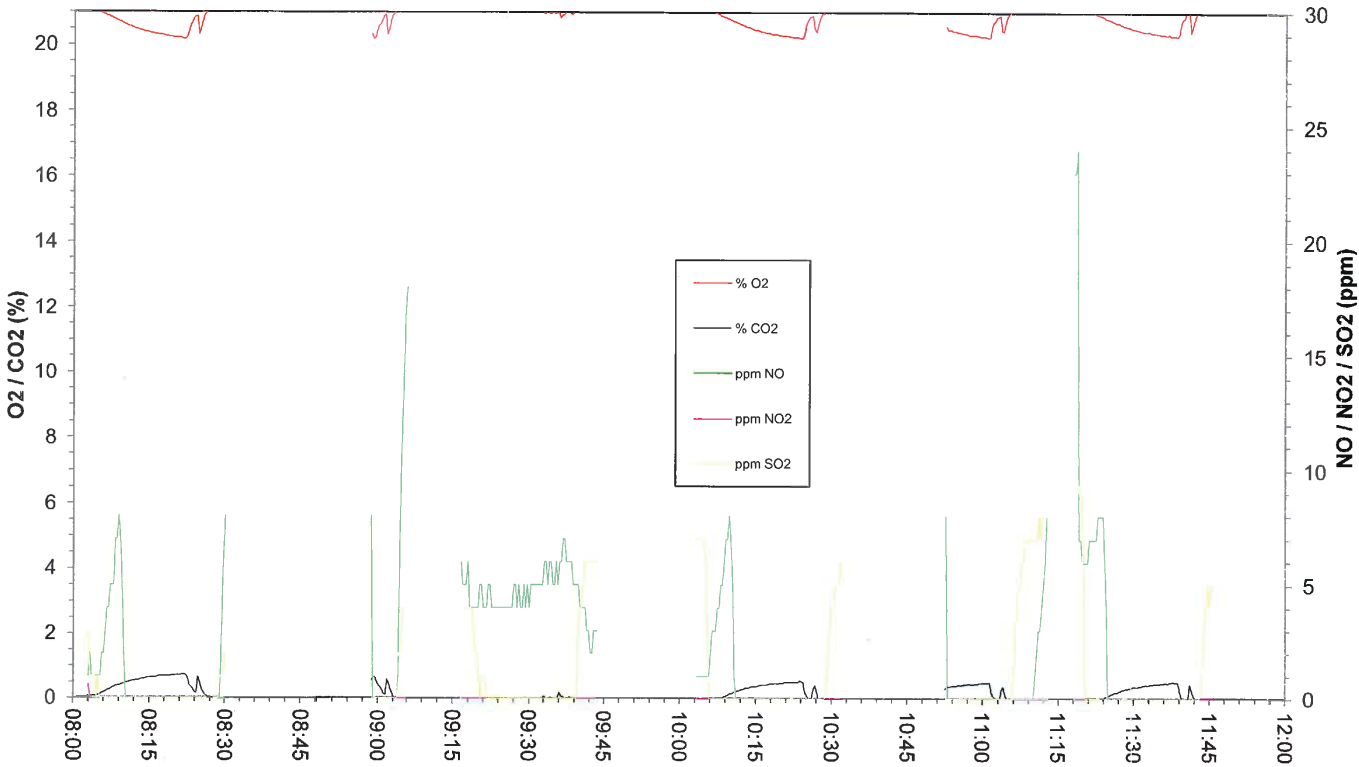


Huon Aquaculture Parramatta Creek - 17 February 2016
7.25 Gas Concentrations

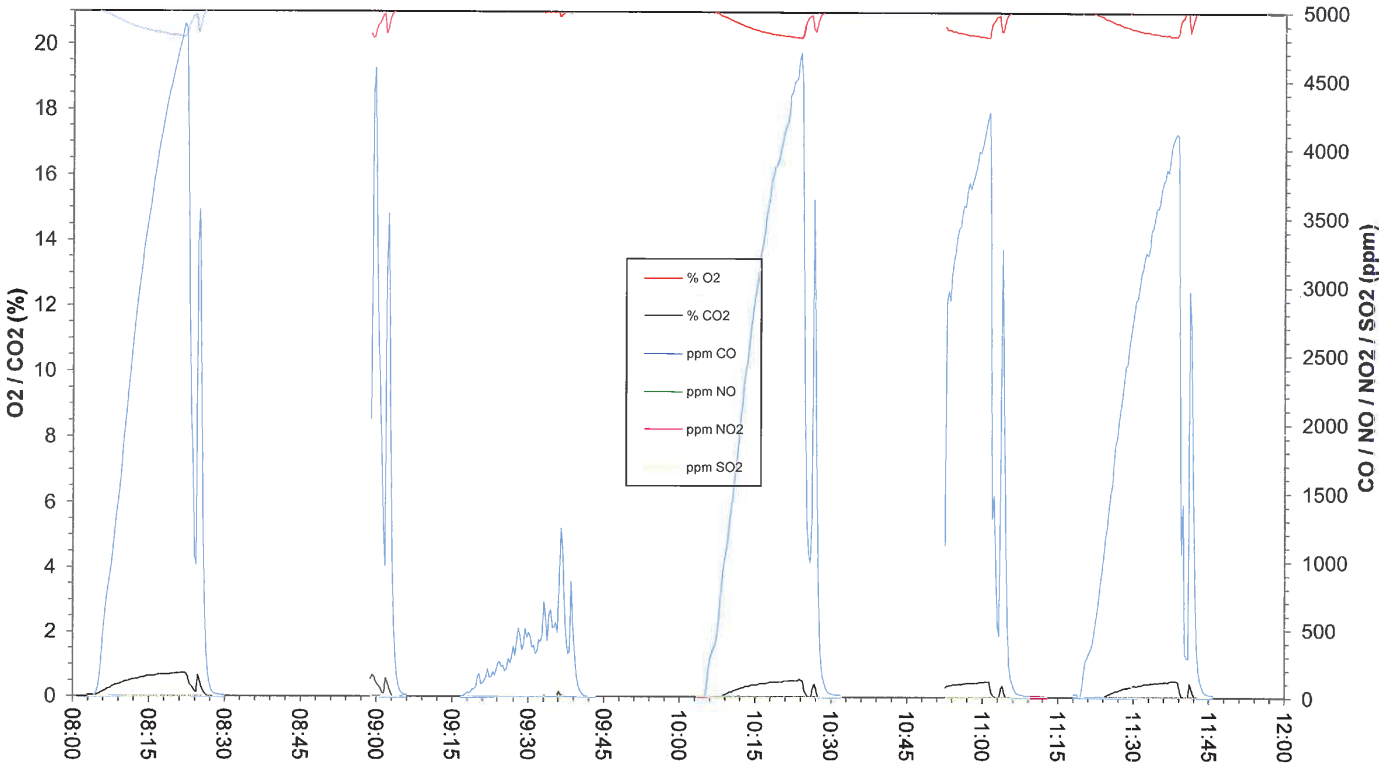


Huon Aquaculture Parramatta Creek - 18 February 2016

7.25 Gas Concentrations

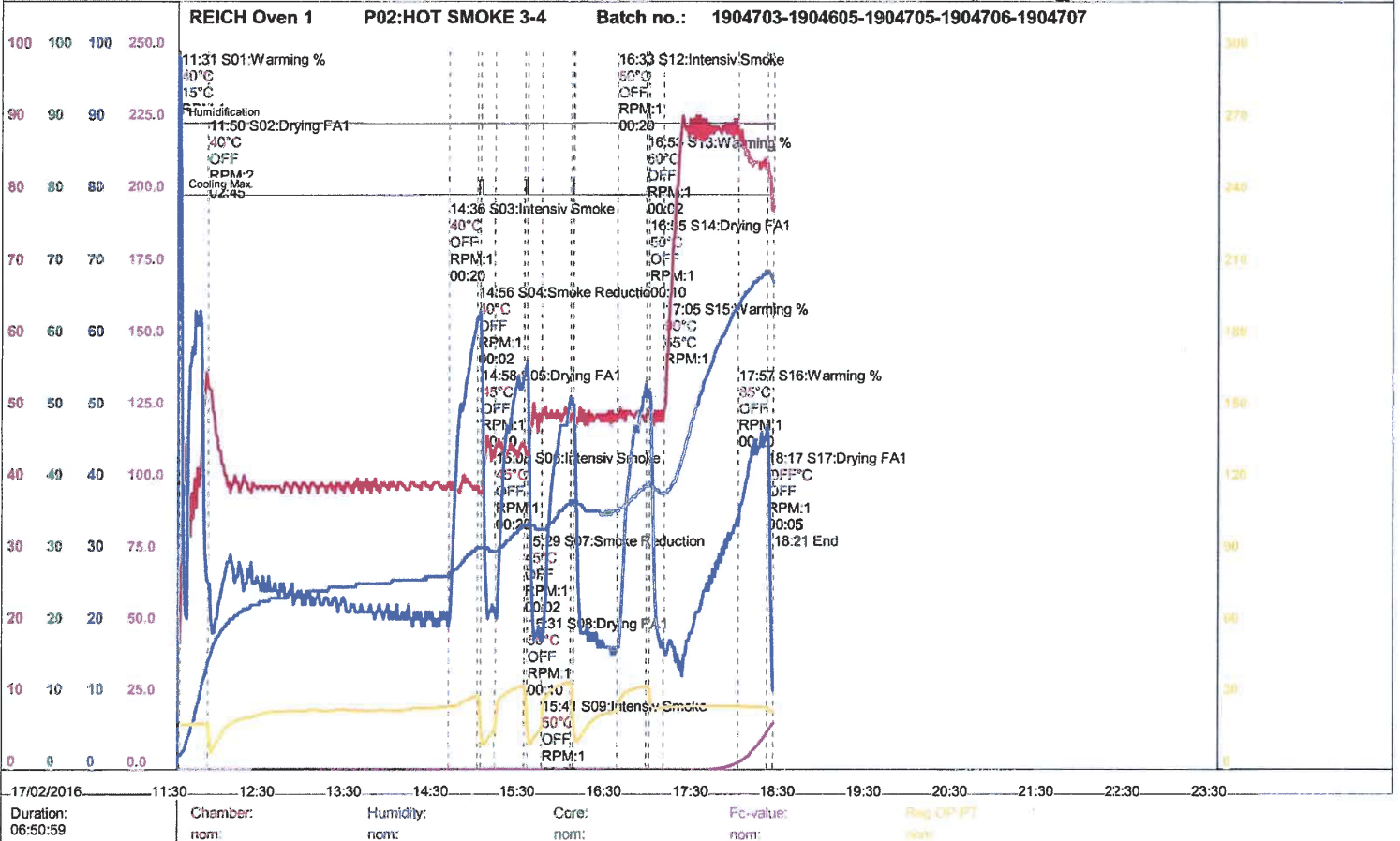


Huon Aquaculture Parramatta Creek - 18 February 2016
7.25 Gas Concentrations

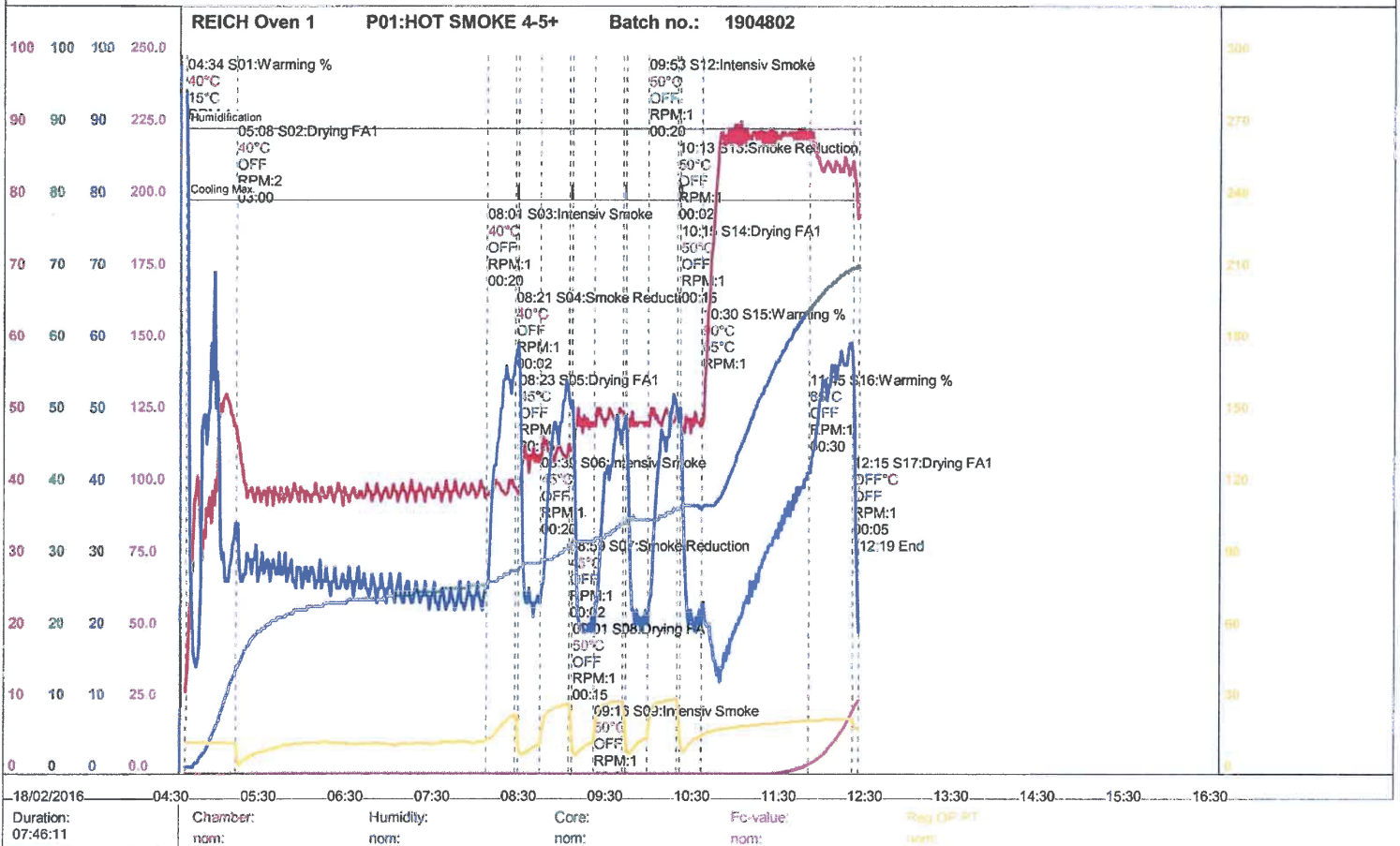


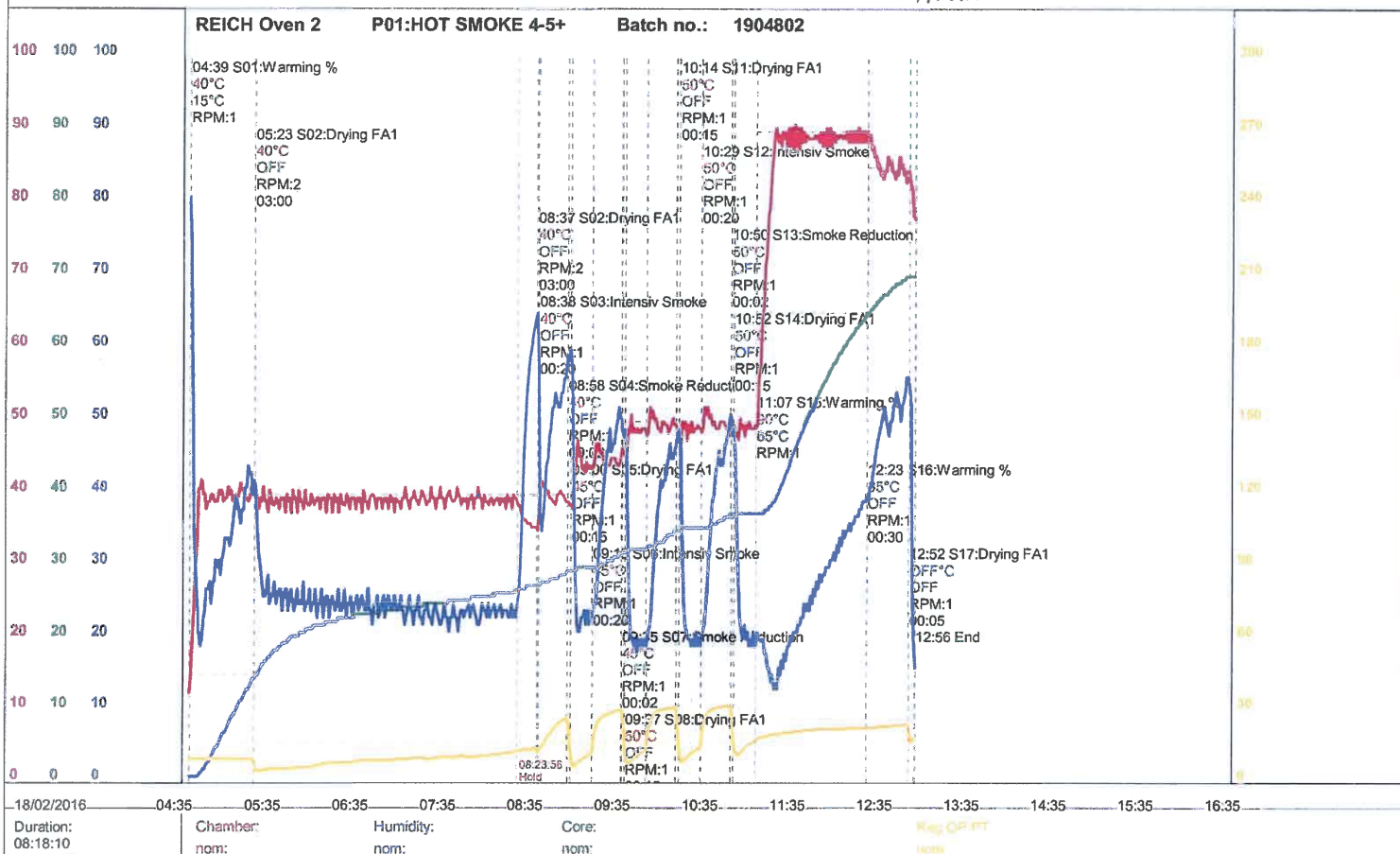
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WENS



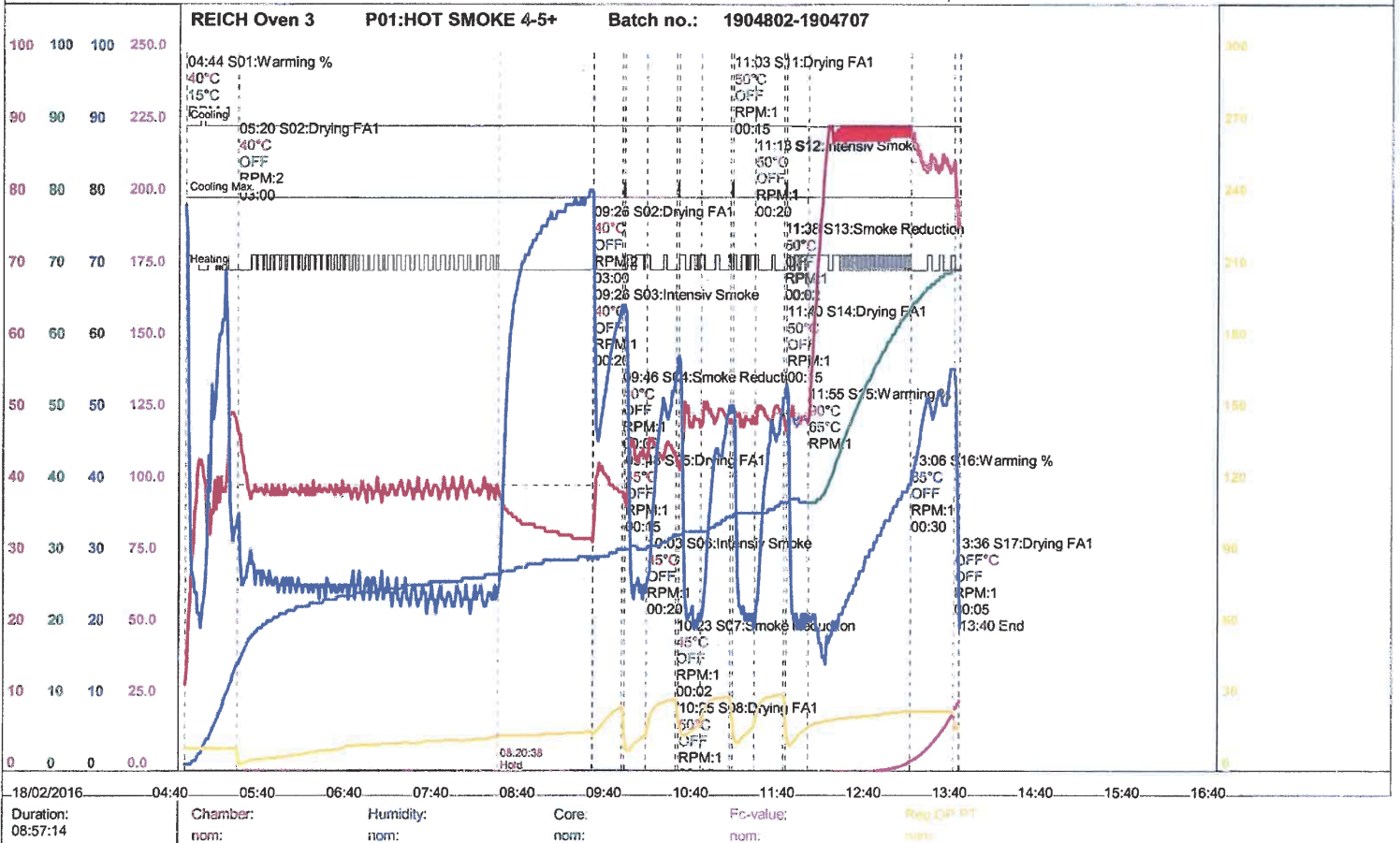
Curve / 18.02.2016 13:34:17





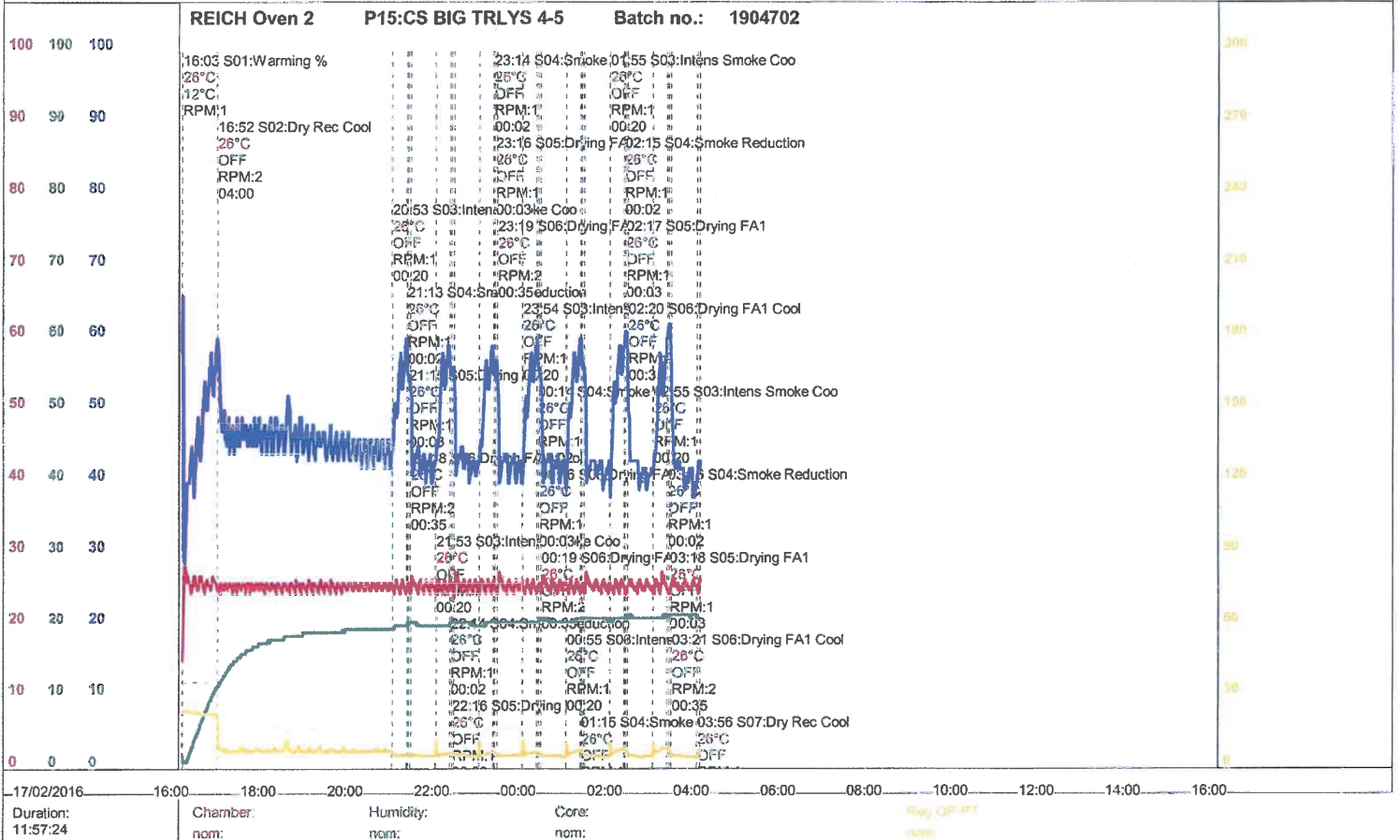
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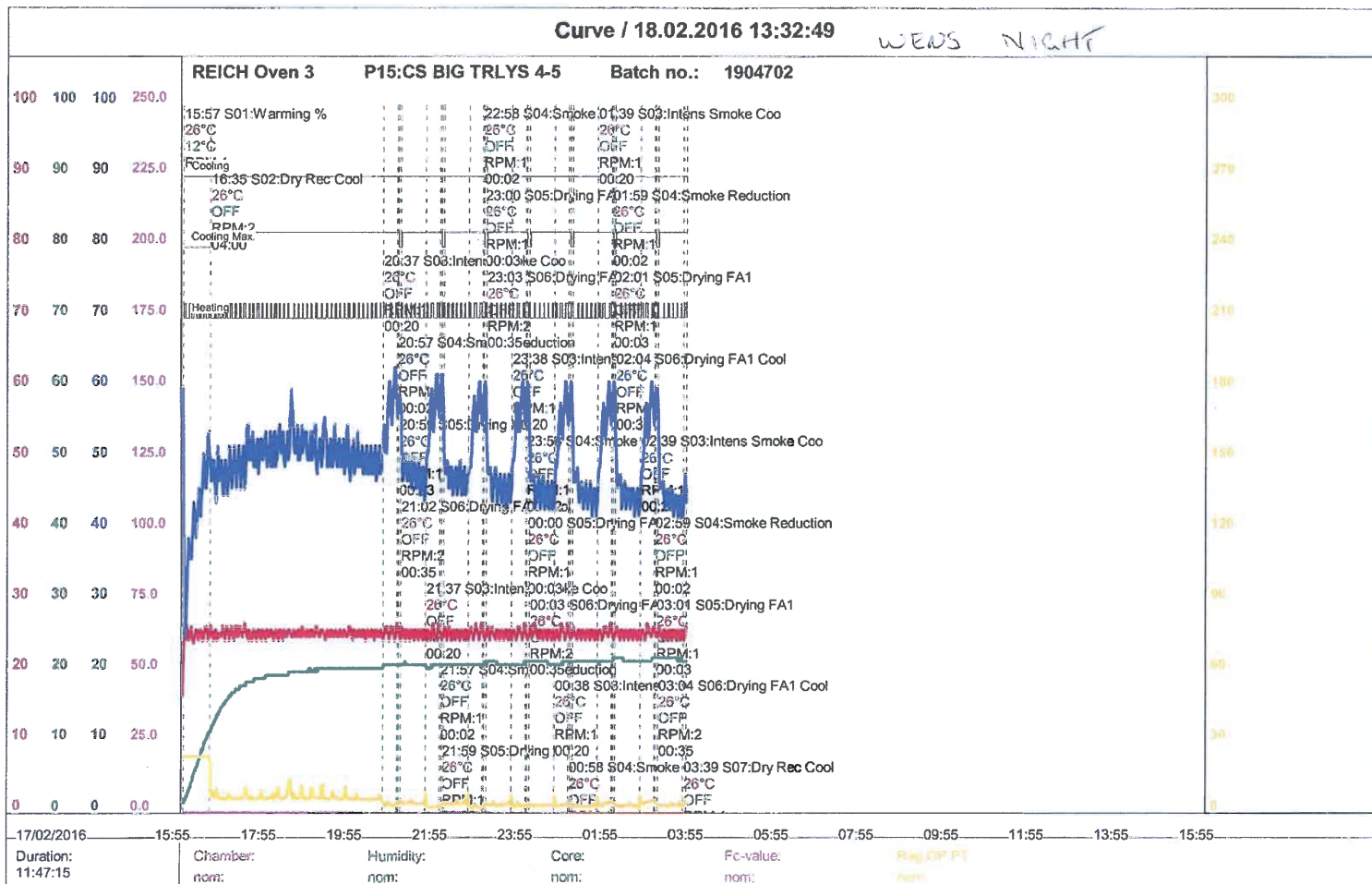
THUR



Curve / 18.02.2016 13:33:34

WENS NIGHT





Smokehouse Construction and Commissioning Plan

April 2016

Huon Aquaculture Parramatta Creek, Tasmania

Report issued 29 April, 2016

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1. Executive Summary

This document outlines the construction and commissioning plan for the smokehouses as required by clause CN1 of Permit Conditions Environmental No. 7894 issued on 9 December 2009. Unfortunately this condition was overlooked at the time of installation of the smokehouses which were commissioned in October 2014.

The commissioning tests on the smokehouses were conducted in February 2016, and showed that the total particulate and PM₁₀ particulate mass emission rates were lower than those used in section 4.1 and Appendix E of the October 2009 DPEMP.

It appears that at the time of preparation of Permit Conditions Environmental No. 7894 issued on 9 December 2009 there was a misunderstanding of the nature of the smokehouse emission. The permit condition requires correction of the particulate emission to a reference condition of 12% CO₂. This is not consistent with the Environment Protection Policy (Air Quality) 2004, and is discussed more fully in section 3.3 of this document. It is recommended that the permit be revised to remove this condition and to make it consistent with the EPP(AQ).

The waste material from the smokehouses is already being disposed of in an appropriate manner, with the ash being used in a composting program to produce potting mix.

It is recommended that a three year annual stack monitoring program be implemented to obtain a reasonable data set on the emissions, and following that a further review be conducted to recommend future testing.

2. Introduction

2.1 Purpose

The purpose of this document is to fulfil the requirements of Clause CN1 Smokehouse construction and commissioning plan in Permit Conditions Environmental No. 7894 issued on 9 December 2009.

2.2 Brief

The work was initially requested by Scott Nolan (General Manager Sales, Marketing & Processing) and finalised by Adam Chapman (Environmental Manager). The brief was to carry out stack testing on the smokehouse stacks and prepare documentation to satisfy requirement CN1 of Permit No. 7894, which had been previously overlooked.

2.3 Site

The Huon Aquaculture Parramatta Creek Processing Facility is located at 7218 Bass Highway, East Sassafras Tasmania 7307.

2.4 Document Preparation

This document has been prepared by Stephen Langlois of LEC Environmental (a division of LEC Consultants Pty Ltd) based on information provided by Huon Aquaculture staff including:

- Scott Nolan (General Manager Sales, Marketing & Processing)
- Adam Chapman (Environmental Manager)
- Simon Fraser (Factory Manager)
- Daniel Jenner (Operations Manager)
- Chris Newett (Engineering Manager)
- Allen Bennet (Master Smoker)

Tobias Layer of REICH Thermoprozesstechnik GmbH in Germany, manufacturer of the smoker units also provided information and clarification.

3. Regulations

3.1 Extract from Permit 7894 issued 9 December 2009

Atmospheric

A1 Odorous gases

Odorous gases arising from the activity must be managed so that they do not cause environmental nuisance beyond the boundary of The Land.

A2 Atmospheric emission limits

- 1 In-stack concentrations at all nominated exhaust points of substances listed in Column 1 of the Table of Atmospheric Emission Limits below must not exceed the limits specified in Column 4 when measured in the units specified in Column 2 and adjusted to the reference gas value specified in Column 3

2 Table of Atmospheric Emission Limits

| Column 1 | Column 2 | Column 3 | Column 4 |
|--------------------|--|-------------------------------|----------------|
| Substance | Unit of Measurement | Reference Gas Value | Emission Limit |
| Particulate matter | mg/m ³ dry gas at 0°C and 101.325 kPa | 12% CO ₂ by volume | 100 |

A3 Smokehouse commissioning testing

- 1 Operation of smokehouses for the purpose of commissioning stack tests must not exceed 3 months.
- 2 During commissioning exceedences of emission limits specified in these conditions do not apply, provided all reasonable efforts to minimise such exceedences are implemented.
- 3 Operation of smokehouses must cease subsequent to commissioning unless it has been demonstrated to the satisfaction of the Director that the smokehouses can be operated in compliance with these conditions.

A4 Stack testing facilities

- 1 The following stack testing facilities must be maintained at all nominated exhaust points:
 - 1.1 sampling positions must be in accordance with Australian Standard AS 4323.1 (*Stationary source emissions - selection of sampling positions*), or as approved in writing by the Director;
 - 1.2 safe sampling platforms must be located to allow access to the sampling positions and safe access to these sampling platforms must be provided; and
 - 1.3 all necessary services required for the test method prescribed must be provided.

M3 Smokehouse exhaust stack monitoring reports

- 1 A Monitoring Report must be provided to the Director within 30 days of the receipt of results from each stack test.
- 2 The report must include:
 - 2.1 the results of the Stack test;
 - 2.2 the date on which the stack test was conducted;
 - 2.3 weather information at the time the stack test was conducted;
 - 2.4 relevant operating conditions including the fuel feed rate at the time the stack test was conducted;
 - 2.5 the stack test methods employed; and
 - 2.6 identification of breaches of limits specified in these conditions, an explanation of why each breach of specified limits occurred and details of actions taken in response to each identified breach of limits.

Construction

CN1 Smokehouse construction and commissioning plan

- 1 At least 45 days prior to the commencement of construction of smokehouses, or by a date specified in writing by the Director, a Smokehouse Construction and Commissioning Plan must be submitted to the Director. This requirement will be deemed to be satisfied only when the Director indicates in writing that the submitted document adequately addresses the requirements of this condition to his or her satisfaction.
- 2 The plan must be consistent with Section 4.1 and Appendix E of the DPEMP.
- 3 The plan must be prepared in accordance with the *Environment Protection Policy (Air Quality)*.
- 4 Without limitation, the plan must include details of the following:
 - 4.1 a description of the smokehouses to be constructed including the design and performance specifications relevant to control of air emissions;
 - 4.2 a plan showing the location of each smokehouse, storage areas for wood and for waste, chimney stacks and the map coordinates for each stack exhaust point;
 - 4.3 smokehouse waste management measures;
 - 4.4 commissioning tests to be conducted;
 - 4.5 an ongoing stack testing program;
 - 4.6 a table containing all of the major commitments made in the plan;
 - 4.7 an implementation timetable for key aspects of the plan; and
 - 4.8 a reporting program to regularly advise the Director of the results of the plan.
- 5 The plan, as amended from time to time with the written agreement of the Director, must be implemented to the satisfaction of the Director.

3.2 Environment Protection Policy (Air Quality) 2004

An excerpt from the guidelines for in stack concentrations is shown below.

Table 2 of this Schedule specifies in-stack concentrations that would normally be expected to be achievable using accepted modern technology referred to in clause 11 of this Policy.

The guidelines are intended to apply to new stationary sources and facility upgrades. Existing industry not able to currently meet the guidelines may need to progressively improve emissions performance according to a negotiated schedule (with due regard to environmental risk, economic cost and practicability) approved by the Director.

The in-stack concentrations contained in this schedule refer to routine operations of the activity. It is recognised that these values may not be achieved during commissioning, start-up or shutdown.

This Schedule does not apply to any boiler whose heating capacity (as determined by the apparatus by which it is heated) is less than 100 megajoules per hour.

The emission of a pollutant from a chimney or stack associated with a source specified in the second column of Schedule 1 should comply with the values of the third column in cases where accepted modern technology is used.

The concentration of a pollutant in the chimney or stack should be determined according to Australian Standard Methods or procedures approved by the Director. Moreover, the determination of pollutants should be conducted by personnel or laboratories approved by the Director.

For the purpose of this Schedule, a particular volume of a gas should be taken to be the amount of that gas which when dry would occupy that volume at a temperature of 0° Celsius and at an absolute pressure of 101.325 kilopascals. Moreover, the concentration of particles in an emission should be determined before its admixture with air, smoke, or other gases and be collected at a temperature as near to ambient as practicable.

For fuel burning equipment, the concentration of particles and oxides of nitrogen measured, should be adjusted to a reference gas value (oxygen or carbon dioxide) to compensate for variability due to the excess air rates in different combustion processes.

The reference gas values (by equipment and pollutant) are specified in Table 1.

Compilation of Tables 1 & 2 – Reference Conditions & In-stack concentrations

| | | |
|------------------------|---|---|
| Chlorine | Any trade, industry or process. | 200 mg/m ³ |
| Hydrogen Chloride | Any trade, industry or process. | 100 mg/m ³ |
| Hydrogen Sulphide | Any trade, industry or process. | 5 mg/m ³ |
| Fluorine and compounds | Any trade, industry or process other than a primary aluminium smelter manufacturing aluminium from alumina. | 50 mg/m ³ (HF or HF equivalent) |
| | Any primary aluminium smelter manufacturing aluminium from alumina. | 0.8 kg of total fluoride per tonne of aluminium produced |
| Metals | Any trade, industry, or process emitting antimony, arsenic, cadmium, lead, mercury, beryllium, chromium (hexavalent only), cobalt, manganese, nickel, selenium, tin, or vanadium or any compound thereof. | 5 mg/m ³ for total 1 mg/m ³ for cadmium 1 mg/m ³ for mercury |
| Oxides of Nitrogen | Any boiler operating on gas. | 350 mg/m ³ (as NO ₂) |
| | Any boiler operating on a fuel other than gas, other than a boiler used in connection with an electricity generator. | 500 mg/m ³ (as NO ₂) |
| | Any boiler operating on a fuel other than gas, being a boiler used in connection with an electricity generator with a capacity of less than 30 megawatts. | 500 mg/m ³ (as NO ₂) |
| | Any boiler operating on a fuel other than gas, being a boiler used in connection with an electricity generator with a capacity of 30 megawatts or more. | 800 mg/m ³ (as NO ₂) |
| | Any gas turbine operating on gas, being a turbine used in connection with an electricity generator with a capacity of less than 10 megawatts. | 90 mg/m ³ (as NO ₂) |
| | Any gas turbine operating on gas, being a turbine used in connection with an electricity generator with a capacity of 10 megawatts or more. | 70 mg/m ³ (as NO ₂) |
| | Any trade, industry or process other than for the manufacture of glass using sodium nitrate. | 2.0 g/m ³ (as NO ₂) |
| | Reference condition for fuel burning equipment other than gas turbines. | 7% O ₂ |
| | Reference condition for gas turbines | 15% O ₂ |

| | | |
|---|--|--|
| Particulate Matter | Any trade, industry or process and any fuel burning equipment or industrial plant. | 100 mg/m ³ |
| | Reference condition for boilers and incinerators. | 12% CO ₂ for wood-firing and 7% O ₂ for other fuels |
| Smoke | Any trade, industry or process and any fuel burning equipment or industrial plant. | A concentration no darker than Ringelmann 1, except that the concentration may be darker (but not so to exceed Ringelmann 3) for up to 10 minutes in any period of 8 hours for lighting a boiler or blowing soot, but only as long as all practicable means are employed to prevent or minimize the emission of air impurities. (This limit does not apply to emissions involving water vapour.) |
| Sulphur Dioxide | Any trade, industry or process manufacturing sulphuric acid from other than elemental sulphur. | 7.2 g/m ³ |
| | Any trade, industry or process manufacturing sulphuric acid from elemental sulphur. | 2.8 g/m ³ |
| Sulphuric acid mist or sulphur trioxide or both | Any trade, industry or process. | 100 mg/m ³ (as SO ₃ equivalent) |

3.3 Discussion of Regulations

It appears that at the time the conditions for Permit 7894 issued on 9 December 2009 were being prepared by the regulator; there may have been a misunderstanding of the nature of the smokehouses.

The permit has been written with a reference condition of 12% CO₂ being applied to the particulate concentration. However the reference conditions in the Environmental Protection Policy (Air Quality) 2004 specify that there should only be a reference condition for boilers and incinerators.

Boilers and incinerators are devices in which fuel is combusted in the presence of excess oxygen at high temperatures so that the fuel is consumed and heat is produced. The fuel is decomposed and most of the energy is produced by the combustion of the gases produced at temperatures above 800°C.

Smokehouses on the other hand have two components, the actual smoke generator which produces the smoke and the smokehouse itself where the smoke is exposed to the product. The smoke generator has a restricted oxygen supply and operates at a temperature between 600°C and 800°C so that the Redgum wood chips do not combust. The smoke is then released from the smoke generator into the smokehouse (the temperature of the smoke is controlled to be between 30°C and 100°C) where it circulates around the product, fresh air is then used to displace the smoke.

Due to the way the smokehouse works the oxygen and carbon dioxide concentrations of the emission leaving the stack are very close to ambient air and are nowhere near the concentrations usually found in boilers and incinerators where a combustion process occurs. In fact the ratio between the transport air and smouldering air has to be kept at a ratio of 20:1 to ensure that explosive smoke densities are never reached – this is specified by German safety regulation BGR 138.

As the smoke generator and smokehouse are not fuel burning equipment, and do not meet the definition of boilers and incinerators, it is not appropriate to have the particulate concentration corrected to a reference condition.

Furthermore the Environmental Protection Policy (Air Quality) 2004 states that: *“Moreover, the concentration of particles in an emission should be determined before its admixture with air, smoke, or other gases and be collected at a temperature as near to ambient as practicable.”*

The very design of the smokehouse means that the particulate matter produced by the smoker must be mixed with air prior to it being discharged to the emission point. This is another reason why it is not appropriate to have a reference condition to correct the particulate concentration from this emission.

It is our recommendation that the regulator re-issue the permit with the reference conditions removed as this was obviously a misunderstanding when the permit was originally issued.

4. Plan

4.1 Description of Smokehouses

There are three identical smokehouses installed at the Huon Aquaculture Parramatta Creek Processing Facility. These are Reich Airmaster® UKQ 10000 BE G 505 H units. A detailed specification of the unit can be found in Annexure 5.1 Reich Airmaster® Project Description. The manufacturer's details on the emission of the units can be found in Annexure 5.2 Reich Emission Data Sheet. Photographs of the installation are included in Annexure 5.7.

There are two types of smoking processes in use at Huon Aquaculture, referred to as Hot Smoke and Cold Smoke. The cycles are different for each type.

The hot smoke cycle involves heating the core of the fish to 65°C for at least 10 minutes and heats the smokehouse chamber to up to 90°C using heaters mounted to the roof to achieve this. The hot smoke process usually runs for 6.5 to 7 hours and it has the following steps:

- Warming
- Drying
 - Intensive Smoke
 - Smoke Reduction
 - Drying
 - (this repeats a further 3 times)
- Warming
- Drying

The cold smoke cycle involves heating the core of the fish to 12 - 14 °C and achieves this using a chamber temperature of up to 26°C. The cold smoke process usually runs for approximately 11.5 hours and has the following steps:

- Warming
- Drying Cool
 - Intensive Smoke Cool
 - Smoke Reduction
 - Drying FA1
 - Drying FA1 Cool
 - (this repeats a further 6 times)
- Drying Cool

Charts showing some examples of the cycles are shown in Annexure 5.3 Hot Smoke Cycles and Annexure 5.4 Cold Smoke Cycles.

The smoke generator has a restricted oxygen supply and operates at a temperature between 600°C and 800°C so that the Redgum wood chips do not combust. The smoke is then released from the smoke generator into the smokehouse (the temperature of the smoke is controlled to be between 30°C and 100°C) where it circulates around the product, fresh air is then used to displace the smoke. As mentioned previously the ratio of transport air and smouldering air has to be kept at a ratio of 20:1 to ensure that explosive smoke densities are never reached (this is specified by German safety regulation BGR 138).

Smoke is only emitted from the smokehouses during certain steps during the cycles. During the Intensive Smoke (Hot Smoke) and Intensive Smoke Cool (Cold Smoke) steps, the majority of the smoke is being recirculated inside the smokers. However the ventilation system is arranged so that during this step there is a low velocity “overflow” of smoke that spills out of the stack. The manufacturer’s specification states that this air flow should be approximately 120 m³/h during this process. Due to the extremely low velocities this is difficult to measure precisely, however tests on 17 February 2016 gave a result of 143 m³/h which is in the same ballpark as the manufacturer’s specifications. This step of the process has a maximum duration of 20 minutes.

During the Smoke Reduction step, the external ventilation is closed off so as to settle the remaining smoke on to the product by recirculating the smoke. There is no exhaust air flow during this time, however occasionally there can be a small amount of smoke already in the stack that can be sucked out by the wind giving the appearance of an emission during this stage.

At the start of the Drying (Hot Smoke) and Drying FA1 (Cold Smoke) steps that follow an Intensive Smoke, the ventilation system opens and the air and smoke contained within the smoking chamber is emitted at higher velocity. The smoke is displaced quite quickly and has been displaced by clean air within about 3 minutes – this is consistent with observations and the manufacturer’s specifications.

4.2 Locations

Annexure 5.5 Engineering Drawings shows the location of the smokehouses and the design of the ventilation system. Annexure 5.6 includes plans and an aerial photograph showing the buildings and also the area used for wood chip storage – this is in the building labelled 04 which is the old potato shed.

The map coordinates (MGA55) for each stack exhaust point are as follows:

Smokehouse 1 Stack: 461682E, 5423111N

Smokehouse 2 Stack: 461683E, 5423113N

Smokehouse 3 Stack: 461683E, 5423115N

4.3 Smokehouse Waste Management

Please refer to the site waste management plan or the site waste water reuse plan presented in the 2016 DPEMP. The primary wastes from the smokehouse are packaging from the bags of Redbun wood chips and the ash from the smoke generators.

The plastic packaging is sent to landfill along with other plastic waste as described in the site waste management plan.

The waste ash (approximately 10 - 15kg per day) is removed from the smoke generators and placed within a designated 1 m³ ash bin. When this bin is full (approximately once per month) the bin is collected by Veolia Environmental Services and delivered to Dulverton Waste Management (145 Dawsons Siding Road, Latrobe – transport distance 37.4km). The waste is then used as compost to add valued carbon content to potting mix/compost. The resulting product is sold onto farmers and gardeners in the area.

Any moisture that occurs within the smokers (very little) – is sent to the site waste water treatment plant. There it passes through a trommel screen, saveall unit, clarifier and then two x 2.5 megalitre aerated anaerobic ponds before passing into a 5 megalitre facultative pond followed by a 5 megalitre naturally aerated anaerobic pond. Wastewater is then irrigated onsite within the 16.8 ha designated irrigation area. This process is covered by the waste water reuse plan, although there is no specific reference to the smokehouses in this document as the emission is a relatively minor one, and is considered part of the general facilities waste stream. The waste water treatment plant will be upgraded in 2016 to include an extended irrigation area, 4000 River Red gums under drippers and an additional 40 megalitre storage dam.

4.4 Commissioning Tests

Commissioning tests were conducted in February 2016 and results are presented in a separate report by LEC Environmental. The commissioning tests incorporated velocity, total particulate and moisture tests during both hot and cold smoke operations. PM₁₀ particulate tests were also conducted during hot smoke operations.

Results showed that while there was a considerable amount of fish oil in the emission, the actual particulate emission was very low. There does not appear to be significant variation between the particulate emission during the hot and cold smoke cycles.

The particulate emission was certainly lower than the data used to prepare the modelling in the October 2009 DPMP. That modelling used a PM₁₀ emission of 0.0233 g/s, based on an in-stack concentration of 100 mg/m³ and an exhaust flow rate of 0.233 m³/s. Whilst the modelling underestimated the flow rate, which averaged 0.653 m³/s; the average PM₁₀ particulate concentration was only 6.8 mg/m³, giving a PM₁₀ emission of 0.0012 g/s. Thus the modelling was quite conservative.

4.5 Stack Testing Program

It is recommended that an annual testing program be carried out for a period of three years starting in early 2017, with a review to be conducted after that time to determine further testing requirements. This will enable a reasonable amount of data to be collected on the emission.

The program should involve testing the emission of total particulate matter from each of the three smokehouse stacks. Duplicate tests should be conducted. The tests should encapsulate the start of the drying cycle as this is when the emission is the highest, both in concentration and mass emission. The tests should run for at least 20 minutes to capture an indication of the average emission. Filter papers used for collection should be washed with a suitable solvent to remove the fish oil that condenses on the papers, leaving the particulate matter behind.

The stack emission should be required to meet the in-stack concentration guidelines in the Environment Protection Policy (Air Quality) 2004 which is 100 mg /m³ of total particulate matter at a temperature of 0° Celsius and at an absolute pressure of 101.325 kilopascals. Note that this will require the removal of the reference condition of 12% CO₂ contained within the current Permit 7894 issued in December 2009.

The reports from the stack tests should be forwarded to the Director of the Environment Protection Authority within 30 days of the receipt of the report. Following the completion of three years of testing a review of the data should be conducted and recommendations for future testing prepared for submission to the Director of the Environment Protection Authority.

4.6 Plan Commitments & Implementation Timetable

| Commitment | Implementation Date |
|---|----------------------------|
| Wood chips to be stored in building 04 – old potato shed | Implemented & Ongoing |
| Plastic bags from wood chips to be disposed of according to site waste management plan | Implemented & Ongoing |
| Waste ash to be disposed of by placing in a dedicated skip bin and sent to Dulverton compost facility as per site waste management plan | Implemented & Ongoing |
| Liquid waste from smokehouses to be treated by site waste water treatment plant as per the site waste water reuse plan | Implemented & Ongoing |
| Smokehouse commissioning tests | Completed February 2016 |
| Smokehouse stack test round 1 | Early 2017 |
| Smokehouse stack test round 2 | Early 2018 |
| Smokehouse stack test round 3 | Early 2019 |
| Review of stack tests and preparation of recommendations for future testing for the EPA | June 2019 |



PROJECT DESCRIPTION

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CBS HUON SALMON

project no. 11003159

3x REICH AIRMASTER® UKQ 10000 BE G 505 H Transit RSC

drawing no. 350965e



POSITIONS for one unit!

- 1 REICH AIRMASTER® UKQ 10000 BE Transit RSC,
for 4 trolleys 100 x 100 x 200 cm
- 2 REICH MaxxSmoker G 505 H, woodchips smouldering smoke generator,
for beech wood chips size 4 - 12 mm
- 3 Control UNICONTROL 2000 TS,
controller box 400 x 600 x 250 mm,
placed on wall of the building.
- 4 Electrical main connection, in separate contactor box 1000 x 1400 x 300 mm,
Special voltage 254/440 V, 50 Hz, main switch and master fuse 3x 250 A by customer,
cable cross section at least 3x 120/70 mm², copper (Cu), by customer
 WARNING: For a safe operation of the system a stable power supply with a maximum fluctuation of +/- 5% of the nominal voltage is required!
 WARNING: We recommend to install an automatic power switch e.g. SCHNEIDER ELECTRIC NSX circuit breaker, which combines the demands main switch with emergency circuit breaker, explicit power monitoring and under- /overvoltage release!
 ATTENTION: Cable channels and cable trays by customer.
- 4.1 Separate ground connection, cable cross section 1x 70 mm², copper (Cu),
by customer
- 5 Compressed air connection R 1/2", 8 bar, central maintenance unit with filter, oiler, dehydration and hand stop valve, with additional connection R 1/4" for oil-free compressed air, by customer, max. consumption of compressed air approx. 300 l/min.
during cleaning (foaming) AND for the reverse air flap
- 5.1 Compressed air connection oiled, 8 bar, R 1/4" for cylinders and valves
- 5.2 Compressed air connection oil-free, 8 bar, R 1/4" for cleaning system
- 6 1x exhaust air connection for each unit, 1x DN 350, pressure tight to customers chimney, chimney must be pressure tight and drained with syphon, chimney diameter at least DN 350 mm.
Exhaust air volume max. 5500 m³/h, max. exhaust air temperature = max. process temperature, chimney and pipes to chimney by customer.
 WARNING: One separate chimney for each machine!
 WARNING: The approval procedure has to be initiated by customer before the installation of the machine and according to all local valid regulations!
- 7 Water connection, R 1", for the cleaning system, one cleaning station for up to 5x UKQ 10000.
Water flow pressure at least 4 bar, water filter and hand valve by customer,
consumption for cleaning and rinsing max. approx. 100 l/min,
 WARNING: Water must be clean and food safe!
 WARNING: Allowed maximum content of chlorides in water is 50 mg/l.
 If the values are higher, measures for reduction have to be taken!
- 7.1 Dosing pump station "DOSATRON" for all 5 UKQ 10000
- 7.2 Separate controller for cleaning system, contactor box 500 x 500 x 210 mm,
El. Connection 254V, 50 Hz, main switch and master fuse 1x 16 A,
cable cross section 3x 1,5 mm² (Cu), connection by customer.
- 7.3 Water connection R1" (DN25), water FLOW pressure at least 4 bar, water filter and hand valve by customer, for cleaning and rinsing, consumption for cleaning and rinsing max. approx. 100 l/min.

→ see following page





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- 7.4 Connection inlet cleaning / rinsing
NOTE: Connection pipework between central dosing pump station and the single connection point at each unit by customer, connection diameter DN25
- 7.5 Water connection R 1/2" (DN 15), water flow pressure at least 4 bar, water filter and hand valve by customer, for cooking and humidification
- 8 1x fresh air connection for each unit, 1x DN 350, filter by REICH, maximum fresh air consumption approx. 5500 m³/h, fresh air is being sucked into the machine out of the production room
WARNING: There's no under pressure allowed to occur in the production area at any time!
- 9.1 Drainage channel at entry and exit side of the smokehouses, by customer, width min. 200 mm, depth min. 150 mm
- 9.2 Drainage channel in front of the smoke generators, by customer
- 10 RecyclingSmoke Cooler (RSC)
- 11 Drainage connection RSC, outside diameter 42,4 mm, to be drained with syphon (water level 300 mm) by customer
- 12 Cooling connections RecyclingSmoke Cooler, cooling agent Ammonia (NH3), evaporation temperature -4°C, middle cooling capacity approx. 75 kW,
WARNING: Details to cooling circuit (by customer) please see separate scheme drawing and description no. 350965-8!
- 13 Support fan RecyclingSmoke Cooler.
- 14 2x drainage openings smokehouse, entry side.
- 15 Internet-PC by customer nearby, connected to the machine for process visualisation and recording software MasterControl and REICH-online-support via RemoteControl (password protected).



FURTHER TECHNICAL DATA for one unit!

Principal indications for preparation of installation

The supply of the working mediums can take place into the proximity of the connection points, supply and connection must be made by customer, after installation of the machine. The lines have to be laid out according to the connected loads. At the connections, the indicated pressures and volumes must be available. Before start up, all pipes must be clean, without any particles inside!

Place of installation

The floor within the installation area of the machine has to be **horizontal and evenly**, as well as close against humidity and water. A drainage channel has to be installed by customer, in front of the machine and the smoke generator. Sealing between chamber floor and buildings floor must be done by customer.

Electrical installation

The electrical installation has to be made by customer, from specialized craftsmen, according to the general and locally valid regulations. One separate main supply line is required for this machine. Main switch and master fuses must be installed by customer, into the main supply line.

REICH plants are corresponding to the VDE-regulations. The main supply line must be supplied, placed and connected by customer, to the contactor box of the plant. After connection, the prescribed and required electrical examinations must be done by customer.

WARNING: For a safe operation of the system a stable power supply with a maximum fluctuation of +/- 5% of the nominal voltage 254/440 V, 50 Hz is required!

WARNING: We recommend to install an automatic power switch e.g. SCHNEIDER ELECTRIC NSX circuit breaker, which combines the demands main switch with emergency circuit breaker, explicit power monitoring and under- /overvoltage release!

Attention: One separate switch for this unit.

NOTE: Cable trays and cable bridges by customer.

→ see following page





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Electrical consumers

Due to these data, the cross sections of the main supply line and the master fuses have to be examined and calculated, according to the local regulations:

| | | | |
|-----------------------------------|-------------------------------|----------|-----------|
| <u>UKQ 10000 BE G 505 H:</u> | Fan motors (4x 5,5 kW) | 22,0 kW | (~ 48 A) |
| | RSC support fan motor | 5,5 kW | (12,5 A) |
| | Electric heating (4x 29,4 kW) | 117,6 kW | (~ 155 A) |
| | Smoke generator G 505 H | 2,1 kW | (~ 8,5 A) |
| | Control | 0,5 kW | (~ 1 A) |
| ----- | | | |
| Σ 147,7 kW (approx. 225 A) | | | |

Ventilation of the installation area

The installation area of the smoke house must be pressure-free. During the process step 'drying', the maximum consumption of fresh air of each smoke house is approx. 5500 m³/h.

For 5 smoke houses, we assume that max. 3 smoke houses need fresh air at the same time $3 \times 5500 \text{ m}^3/\text{h} = 16500 \text{ m}^3/\text{h}$.

This volume of fresh air is sucked into the machine out of the room. A sufficient ventilation system of the installation area has to be designed and installed by customer. Other existing and future machines have to be taken in consideration!

WARNING: Underpressure is not allowed to occur in the production area at any time!

NOTICE: The fresh air should be as dry as possible to provide efficient drying and short process times.

Compressed air connection

A central air service unit with filter, oiler, dehydration and hand valve, main connection R 1/2", with an additional connection R 1/4" for oil-free compressed air, has to be installed by customer. Single connections R 1/4". The main connection line R 1/2" with an air pressure of 6-8 bar has to be installed by customer. Sufficient dimensions have to be minded! Max. required compressed air volume approx. 300 l/min.

Chimney

Inner diameter of the chimney must be at least DN 350 mm. One separate chimney is required for each smoke house. The chimney must be pressure tight and drained. The exhaust air pipe from the machine to the chimney has to be pressure tight. It has to be introduced into the chimney with an angle of 45°. The chimney and the pipe to the chimney have to be installed by customer.

WARNING: One separate exhaust air chimney is required for each smoke house!

WARNING: The approval procedure has to be initiated and carried out by customer, before the commissioning of the machine and according to the locally valid regulations!

Water connection

Water flow pressure must be at least 4 bar! A hand stop valve and a sufficient dimensioned water filter have to be installed by customer into the supply line. The main line has to be designed in consideration of the amount of existing and future machines.

Water quality

WARNING: The water must be clean and food safe!

WARNING: Allowed maximum content of chlorides in water is 50 mg/l. If the values are higher, measures for reduction have to be taken!

→ see following page





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Unloading and transport

Auxiliary personnel and transportation equipments for unloading and transport of the machines have to be provided by customer. If the machines will be installed to a later time, they have to be stored temporarily by customer, protected against influences of the weather.

Bricklayer-, lifting and insulation works

These are achievements by customer.



For additional important safety instructions and information regarding operation, cleaning and maintenance of the machines and its components, the corresponding documentations and operation instructions of REICH have to be considered!

Subject to technical modifications.

Please don't hesitate to get back, if you need further information.

02.10.2014

i. A. Roland Dibak
Engineering



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Unit

Description of machine: Universal smoke house with wood chip smouldering smoke generator working in partially open system.

Type: **REICH AIRMASTER® UKQ 10000 BE - G 505 H**

Description of smoking system: Partially open circulation system:

Only during the process 'Smoking', approx. 120 m³/h of fresh smoke are generated in the external smoke generator G 505 H and added to the airflow of the chamber. The smoke is being recirculated inside the chamber as part of the total air flow [total air circulation volume inside the chamber is approx. 20.000 / 40.000 m³/h (fan speed 1 / 2)]. According to the freshly generated smoke volume, there's an exhaust air flow of approx. 120 m³/h during the process 'Smoking'. See chapter 'Exhaust air' below. Maximum duration of a single smoking step is 20 minutes (limited by plant control). After this time, smoke generation is interrupted and the residual smoke is recirculated inside the chamber for some minutes whilst all flaps are closed. This is done to settle the remaining smoke onto the product ('Smoke Reduction'). Before the next smoking step can be started, the whole air volume inside the chamber is being exchanged by the process 'Drying'. The actual total smoking time is approx. 20-30 % of the total process time. A modern smoke house is not comparable with traditional smoking methods, where smoke is permanently produced and emitted (100 % smoking).

Smoke generator: REICH MaxxSmoker G 505 H,
fully automatic external smouldering smoke generator

Smoking agent: Beech wood chips, size 4 - 12 mm, dry

Control: UNICONTROL 2000 S/TS

Exhaust air (depending on processes)

Exhaust air volume flow 'Drying': Max. approx. 5500 m³/h during process 'Drying' in open system with fresh air flap and exhaust air flap open. No smoke emission (except for approx. 2-3 minutes directly after process 'Smoking' / Smoke Reduction').

Exhaust air volume flow 'Smoking': Max. approx. 120 m³/h during process 'Smoking' in partially open system with fresh air flap and exhaust air flap closed, but smoke bypass flap DN 125 mm partially open.

| | |
|----------------------------------|--|
| Exhaust air connection diameter: | DN 350 mm |
| Exhaust air speed @ DN 350: | Maximum approx. 16 m/s during process 'Drying' (open system, fresh flap and exhaust air flap open) and fast fan speed 2 |
| Exhaust air temperature: | approx. 24 – 90 °C (depending on processes eventually higher) |
| Chimney diameter: | To be designed and calculated by a chimney specialist assigned by customer, depending on the buildings characteristics, at least DN 350 mm |
| Smoke emission during 'Smoking': | C_{org} = organic combined carbon |



Smoke emission depends on smoking time, process, smoking material product and further parameters. The following values are without additional smoke destruction technology.

Max. mass concentration approx. 1000-2000 mg/m³ total amount of C_{org} during process 'Smoking'

Max. mass flow approx. 0,12-0,24 kg/h total amount of C_{org} during process 'Smoking', average value approx. 0,18 kg/h = 0,003 kg/min

Example:

... → 15 min 'Smoking' → 5 min 'Smoke Reduction' → 10 min 'Drying' ... (NOTE: The actual total smoking time is only approx. 20-30 % of the total process time. The remaining process time is used for warming, drying, equalizing, evacuation, smoke reduction, cooking etc.)

Smoking time 15 minutes → 15 min * 0,003 kg/min = 0,045 kg total amount of C_{org}

Half hour average value according to VDI 2595:
0,045 kg/(30 min) total amount of C_{org}

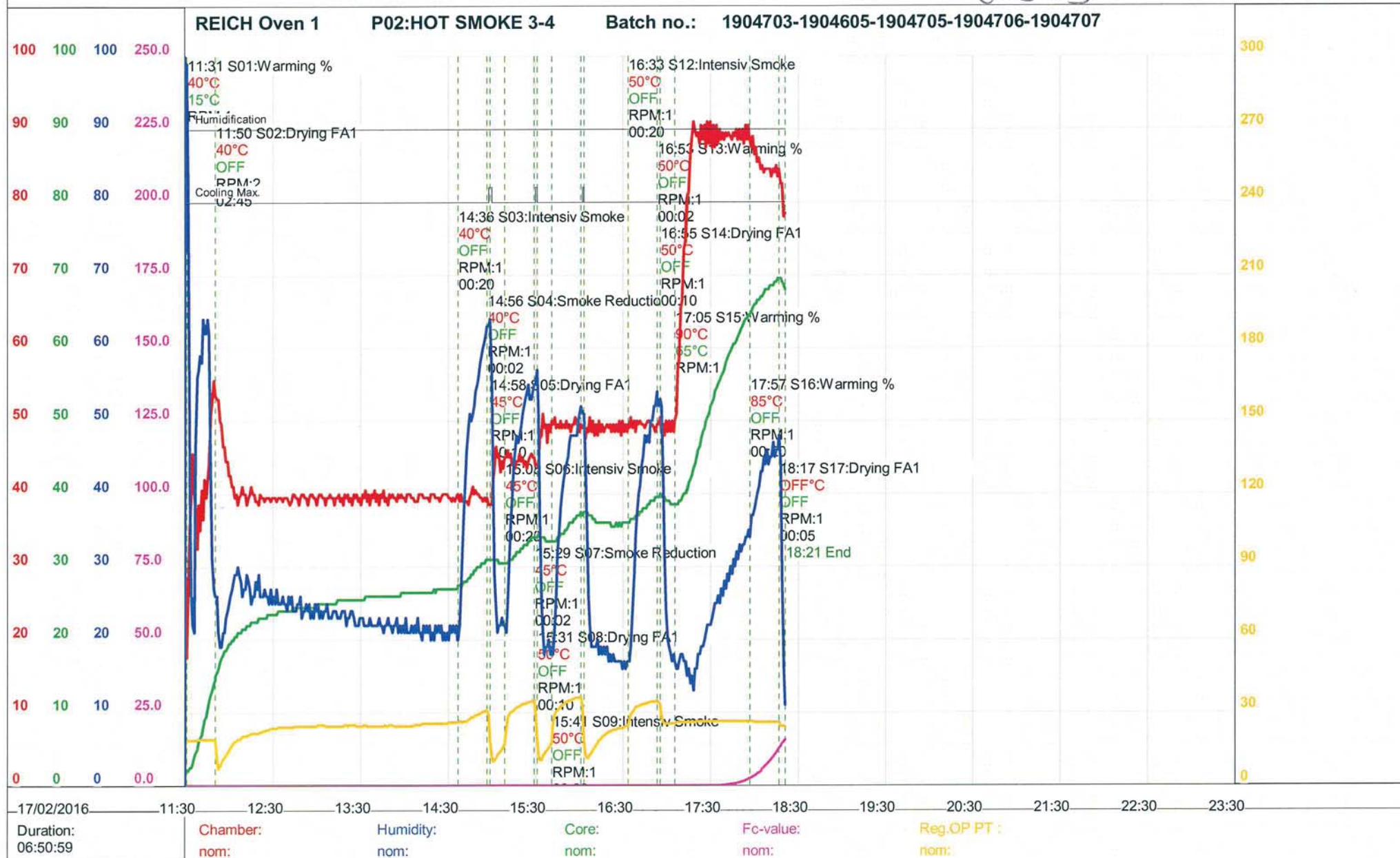
Values are only valid, when keeping the required prescribed maintenance measures.

Heating & Noise

| | |
|-------------|---|
| Heating: | Electricity, approx. 117,6 kW, no emissions |
| Noise level | < 65 dB (A) |

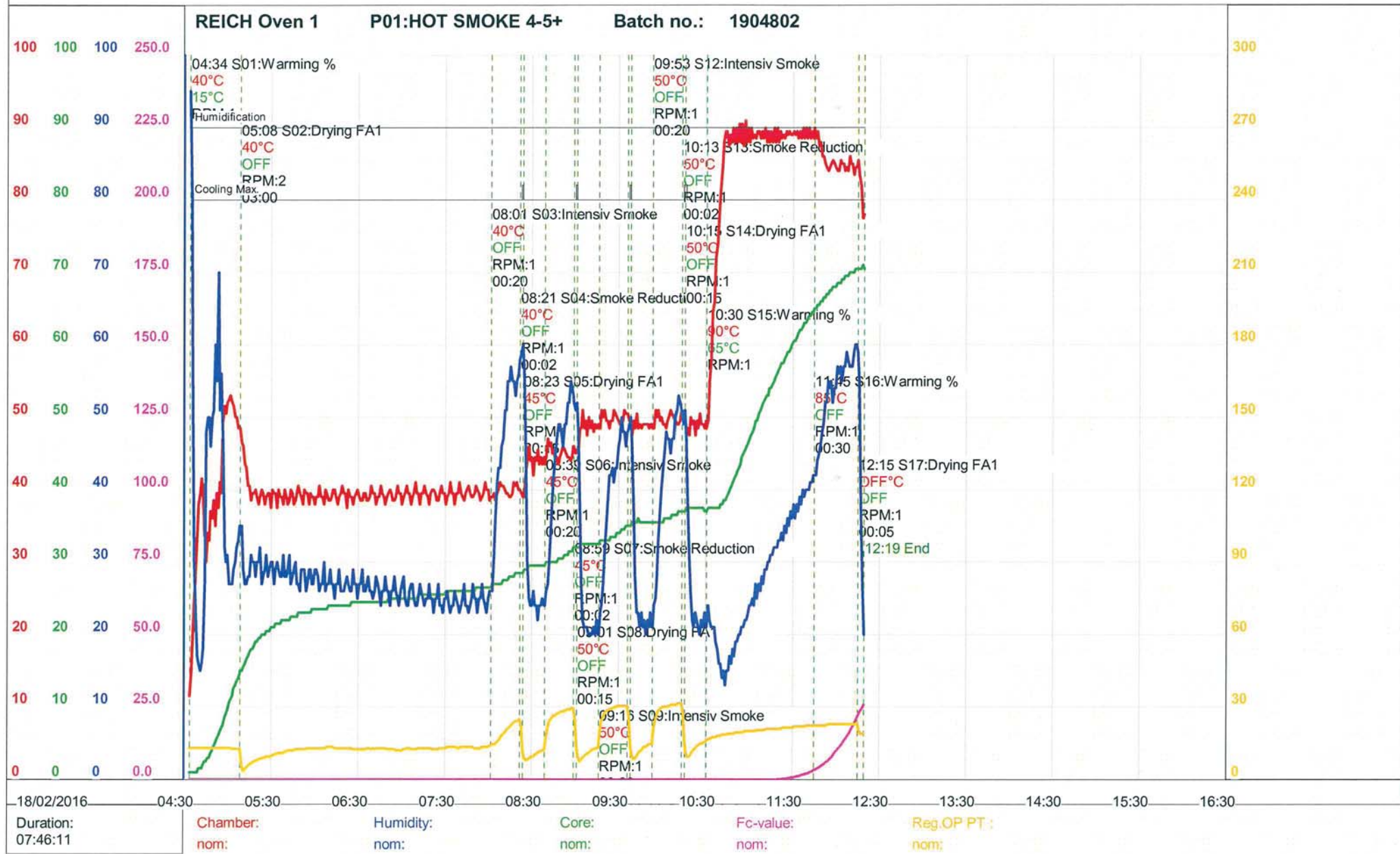
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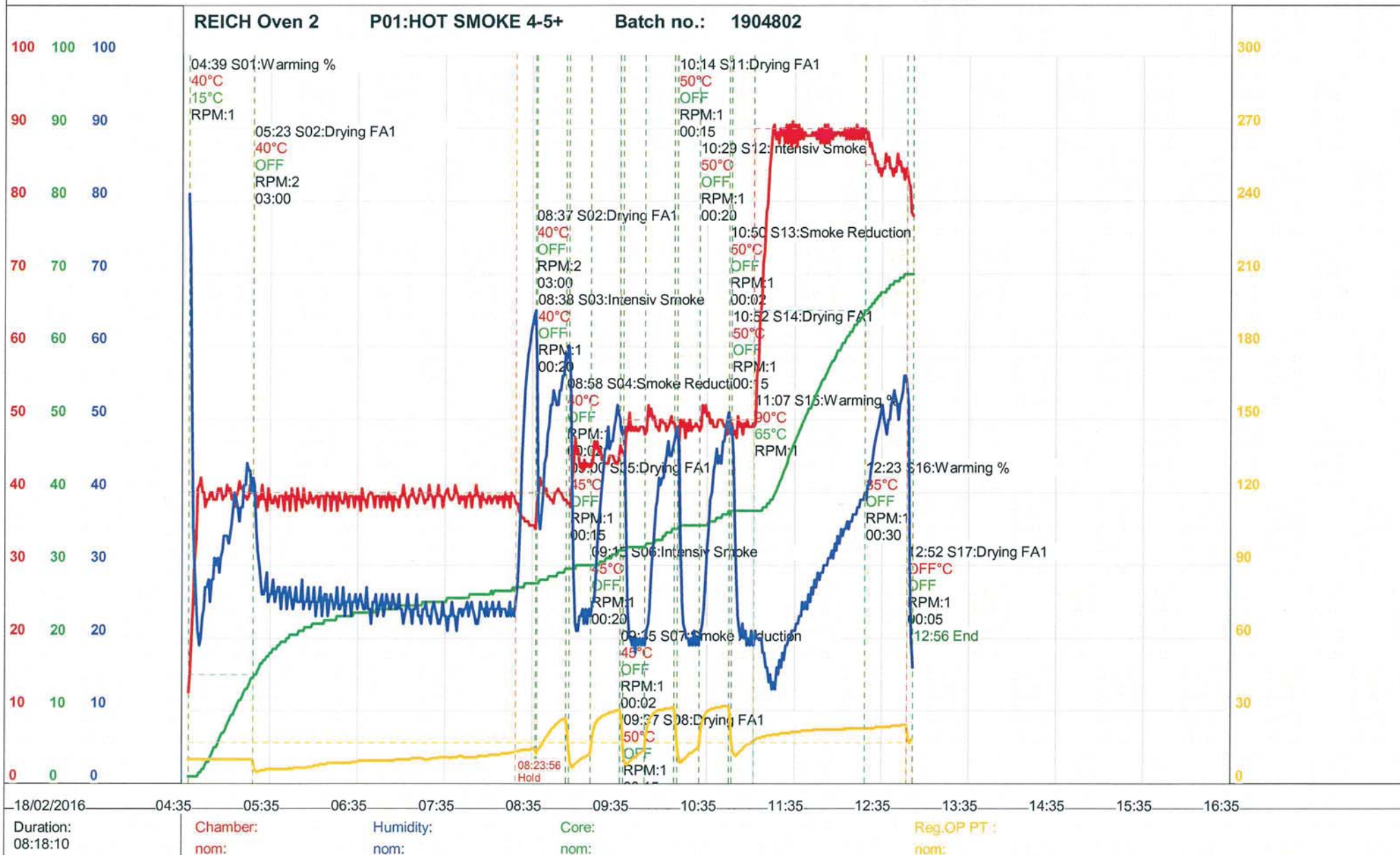
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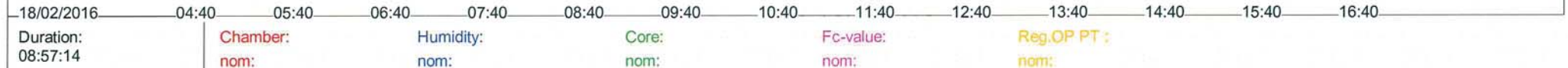
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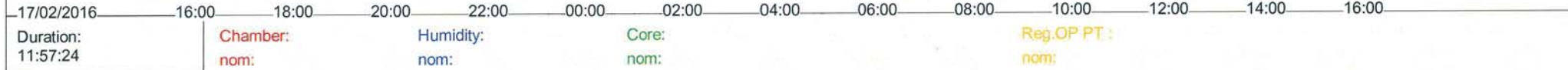


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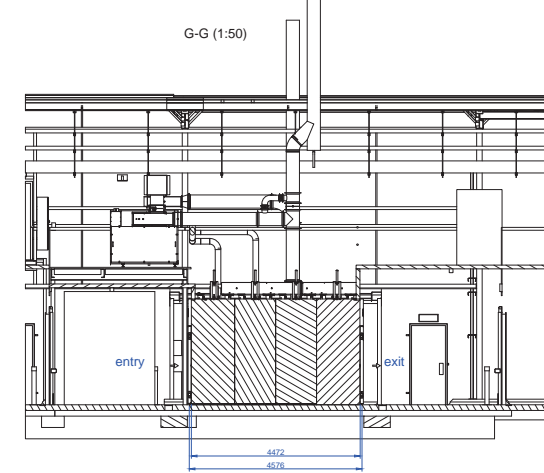
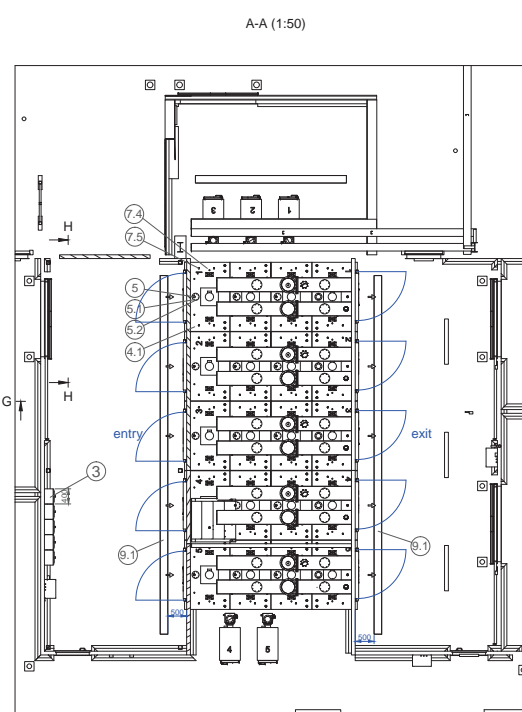
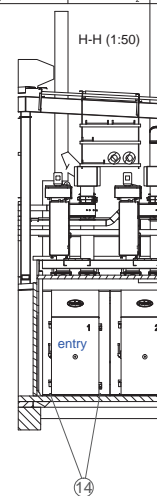
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| ZiK | Änderung | Datum | Name | Umgang | Stell. Z. |
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Latrobe Council
 Planning Exhibition Documents
 Planning Administration
 Date Advertised: 29-2-2020 Ref. Number: DA 238-2019
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04/04/2014 PD 1 INITIAL ISSUE KM
Date Issue Amendment Init App

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THIS DRAWING IS NOT FOR CONSTRUCTION


HUON AQUACULTURE
PARRAMATTA CREEK
TASMANIA

PROPOSED
VALUE ADD EXTENSION

Drawing Title
PLAN DETAILS SMOKE
HOUSE

| | |
|------------------------------|----------------------|
| Scales AS INDICATED ON SHEET | |
| Drawn K.M. | Date 04/04/14 |
| Project No. W12026 | |
| Bldg No. 02 | |
| Drawing No. 02A401 | Issue P0 1 |

ADVICE ♦ DESIGN ♦ ENGINEERING ♦ CONSTRUCTION

2 SITE KEY PLAN
A0 = 1 : 5000



Latrobe Council
Planning Exhibition Documents
Planning Administration

Date Advised: 29-2-2020

Ref Number: DA 238-2019

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- BUILDING NO. LEGEND**
- 00 - SITEWORKS
 - 01 - EXISTING SALMON PROCESSING FACILITY
 - 02 - PROPOSED NEW VALUE ADD FACILITY
 - 03 - PROPOSED SINGLE STOREY ADMIN & AMENITIES
 - 04 - EXISTING POTATO STORE BUILDING

- INTERNAL LEGEND**
- HOT SMOKE PROCESS
 - COLD SMOKE PROCESS
 - SHARED FACILITIES
 - DRY & BOX STORE
 - FILLING AND DRY SALT CURING (REFURBISHMENT WORKS)
 - OFFICE AND AMENITIES
 - EXISTING

- SITE SERVICES**
- EXISTING LUG ELEC
 - EXISTING LUG GAS
 - EXISTING LUG TELECOM
 - EXISTING LUG WATER
 - EXISTING LUG STORMWATER
 - EXISTING LUG WASTEWATER
 - EXISTING LUG SEWER
 - NEW FIRE HYDRANT MAIN

| Date | Issue | Amendment | Init | App |
|------------|-------|---------------------------|------|-----|
| 20/12/2019 | Rev 1 | CLIENT SUBMISSION | | |
| 20/12/2019 | Rev 2 | REVISED CONSULTANTS ISSUE | | |
| 17/02/2020 | Rev 1 | ISSUE TO CONSULTANTS | | |

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**HUON AQUACULTURE
PARRAMATTA CREEK
TASMANIA**

**PROPOSED
VALUE ADD EXTENSION**

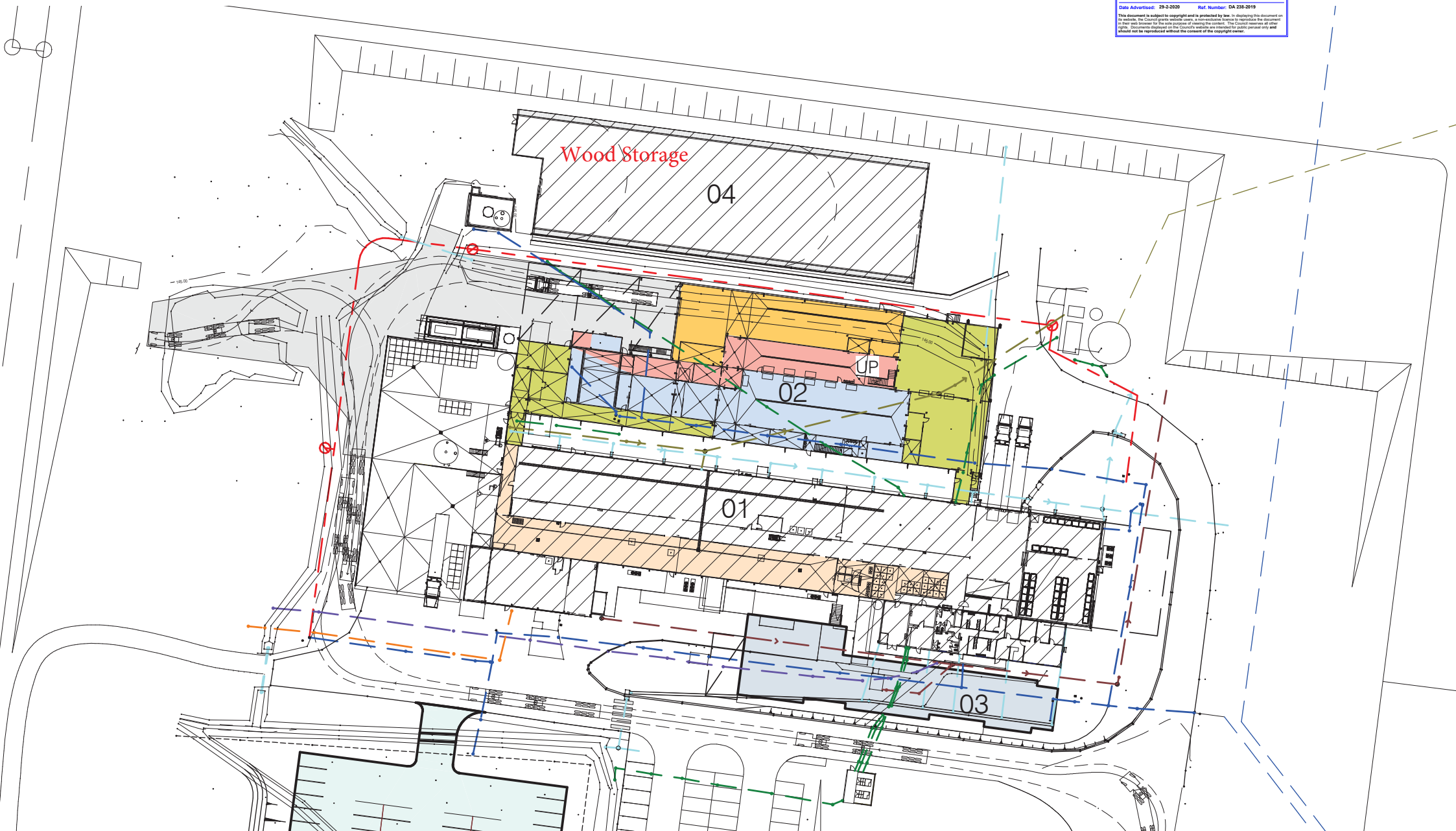
Drawing Title
OVERALL SITE PLAN

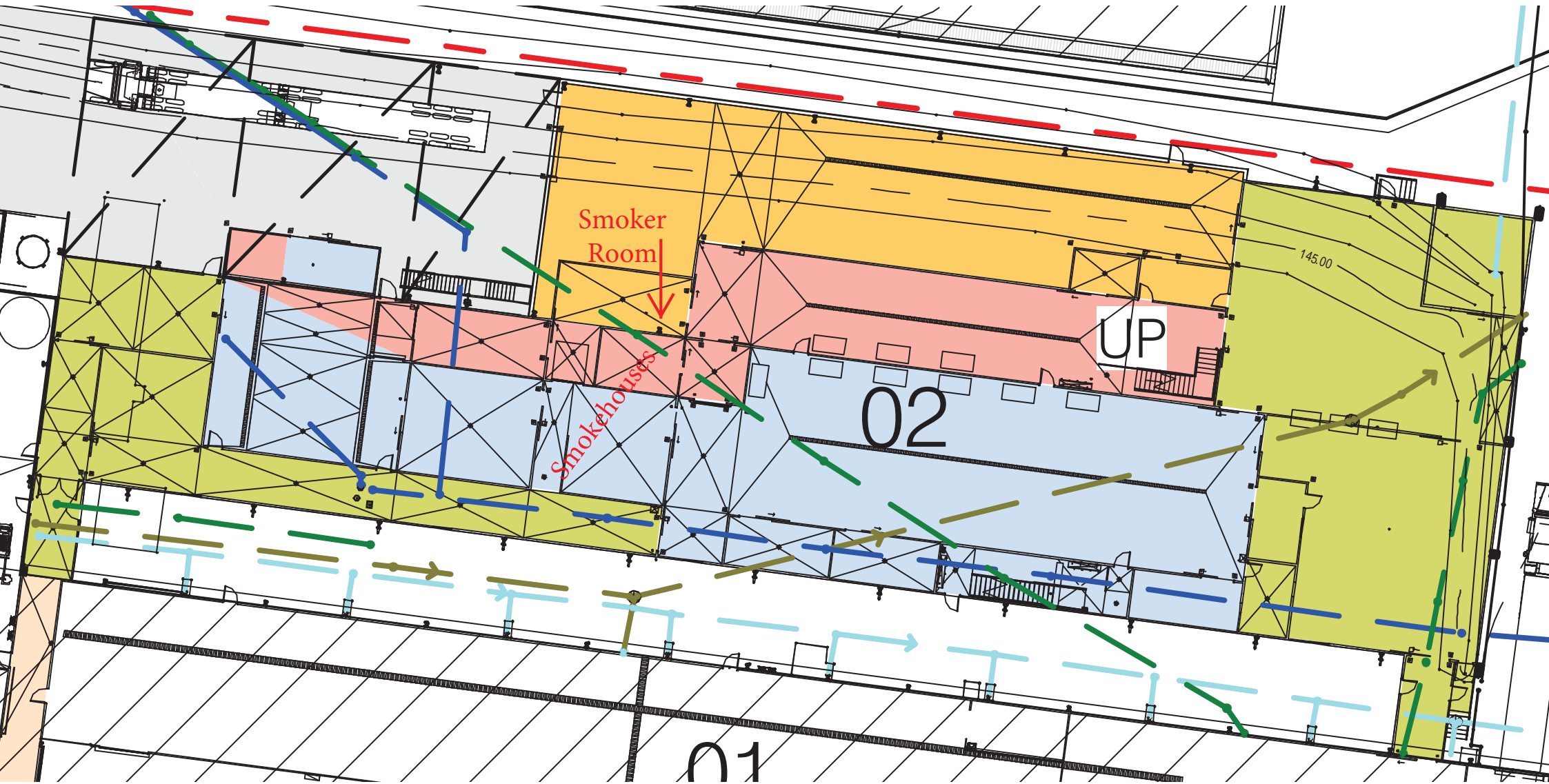
Scales: A0 = 1 : 1000 (A2 = 1 : 2000) 1" = 10m
Drawn: **K.M** Date: **08/02/13**

| | |
|------------------------------|------------------------|
| Project No. W12026 | Blkdy No. 00 |
| Drawing No. 00A001 | Issue P03 |



PRELIMINARY







5.7 Photographs of the Smokehouses



Smoke Generators



Smokehouse ventilation & recirculation system



Smokehouse ventilation & recirculation system



Exhaust stacks and sample ports