**Task 4.1 Calibration**

**Overview of the calibrating facility**

Contact Details

NAME/DESIGNATION (if any): Dr N Greenwood

MANAGING INSTITUTE/ORGANIZATION: Cefas

DEPARTMENT (if any):

ADDRESS: Pakefield Road, Lowestoft, Suffolk, NR33 0HT

COUNTRY: UK

TEL: +44 (0) 1502 562244

FAX:

Name of contact-person: Naomi Greenwood

E-mail: naomi.greenwood@cefas.co.uk

Part a: General Information

 1. Does your calibrating facility possess a well-defined organizational framework with

Dedicated staff? **No**

Clear hierarchy? **No**

Transparent chain of responsibility for management, technical/scientific

and operational decisions)? **Yes**

(If **No** to any of the above, pleaseprovide a brief description of how your facility is organized below)

The calibrations are carried out within different parts of the laboratory – there is not a single calibration facility which conducts all calibrations. Each sensor has defined calibration procedures with various responsible staff.

 2. Briefly describe the size and nature of the annual operating budget of your facility.

Is it funded by your Institute/Centre? **No**

 If **Yes,** is the funding constant? N/A

Is it funded by Projects? **Yes**

Is there separate funding for upgrading or acquiring new instrumentation, etc.? **Yes**

(Kindly provide an estimate of the annual operating budget and any additional information you think may be helpful below)

Funding for sensor calibrations comes from projects as required – there is no dedicated budget for this activity. Some of the infrastructure for calibrations is funded by the institute (eg. temperature bath, salinometer).

 3. Does your facility employ Quality Management Standards - ISO 9000:2000,

ISO 10012, Good Laboratory Practice (GLP), and the like - to its calibration

systems? **YES**

(If **Yes**, please specify below)

Some facilities are managed according to ISO 9001.

 4. Does your facility possess any kind of accreditation for the calibrations? **No**

(If **Yes**, please specify the parameter/s or measurand/s concerned, the kind

of accreditation and the issuing body below)

 5. Does your facility actively endorse a policy of continual training/education of

personnel actively involved in calibration activity? **Yes**

(If **Yes**, please provide a brief description of the kind of activities promoted below)

There is internal training provided at the institute and training records are maintained.

 6. Does your facility maintain a documented in-house Quality Assurance Programme? **Yes**

 7. Does your facility maintain a formal Quality Manual (containing, at the

very least, listings and descriptions of equipment and procedures,

maintenance/calibration records and certificates for instrumentation, and

safety precautions and regulations)? **Yes**

 8. Does your facility make use of control charts (Shewhart Charts, other) for

Quality Control purposes? **Yes**

(If **Yes,** please give details below)

Yes, for some parameters e.g. nutrients

 9. Can your facility assure an effective traceability chain to primary standards or,

in their absence, to conventionally accepted reference material (certified or

otherwise)? **Yes**

10. Does your facility furnish uncertainty estimations for its calibration systems? **No**

11. Does your facility maintain links of any kind with the National Metrology

Institute/s (NMI/s) of your country? **No**

(If **Yes**, please describe the nature of the relationship/s below)

12. In the list of sensors below, please indicate only the ones that you currently **never** calibrate yourselves; in each case, kindly report the calibration provider (manufacturer, other) and the typical calibration interval (trimonthly, half-yearly, yearly, other) you are presently employing.

*Physical sensors for*:

 Temperature, Conductivity (Salinity),

x Water Currents, \_ not calibrated X Pressure, not calibrated

*Optical sensors for*:

 Chlorophyll a, Turbidity,

 Photosynthetically Active Radiation (PAR), Dissolved oxygen,

*Chemical sensors for*:

 Phosphates, \_\_ N/A \_\_\_\_\_\_\_\_\_\_\_\_ Silicates, \_ N/A \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Nitrates, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Nitrites, \_\_ N/A \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Ammonia, \_N/A \_\_\_\_\_\_\_\_\_\_\_\_\_ Dissolved oxygen, N/A \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 pH, \_\_ N/A \_\_\_\_\_\_\_\_\_\_\_\_ Total alkalinity, \_ N/A \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Total carbon dioxide, \_\_ N/A \_\_\_\_\_\_\_\_\_\_\_ Dissolved organic carbon, N/A \_\_\_\_\_\_\_\_\_\_

 Total organic carbon, \_ N/A \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

***Please complete the questionnaire using the forms furnished in the following pages to provide details regarding your calibration practices for all the sensors in the above list that you do calibrate routinely*.**

**Task 4.1.1 Physical Sensors**

Part b: Calibration

Parameter/measurand\*: Temperature (Aanderaa and FSI)

Unit of measurement: degrees Celsius

Range: -2 to +35 deg celsius

Accuracy: 0.05 deg celsius

Precision:

Calibration uncertainty (if available):

1. How often do you calibrate the sensor/s or sensor system/s you are presently using for the specified parameter/measurand: please list the typical calibration interval/s you are employing; note that if you are calibrating irregularly, kindly specify why and when (e.g. before a deployment, following a malfunction, etc.).

12 months

 2. Please provide a brief description of the calibration setup, including a list of the principal equipment, reference material (certified and/or conventionally accepted) and instrumentation involved in a typical calibration operation.

Temperature controlled bath with calibrated PRTs used to give water temperature. Sensor is calibrated according to manufacturer SOP. PRT are sent to calibration facility every two years.

 3. Do you employ reference material which are mutable or unstable

(e.g. secondary standards, reagent solutions, gas mixtures,

pressure generators, etc.) to calibrate the sensor/s or sensor system/s

you are presently using for the specified parameter/measurand. **No**

(if **Yes**, please list the types of this kind of reference material you are employing; kindly specify also the measures you take to guarantee the reliability of the reference material in terms of batch-to-batch uniformity of characteristics)

 4. In your view, does your facility ensure an effective traceability chain for the

specified parameter/measurand? **Yes**

 5. Please provide a brief description of the procedures employed to ensure adherence of the performances of the principal equipment and reference instrumentation of the calibration setup to factory specifications (in-house monitoring of performance, in loco re-calibration, servicing by the manufacturer, etc.).

In-house SOP followed

 6. Does your facility maintain a Manual with a description of the calibration method

and the measuring procedures, together with details of sample treatment and

preparation when these steps are present? **Yes**

(If **Yes**, kindly attach a copy to the completed questionnaire, otherwise please provide a short, description below)

****

 7. In your view, is regular factory calibration/servicing necessary to obtain

optimal performances from your sensors/instrumentation for the

specified parameter/measurand in the field? **No**

(If **Yes**, please provide details of the sensors/instrumentation, indicating also the intervals you recommend for factory calibration/servicing, below)

Our in house calibration is sufficient

 8. Do you perform field calibrations for the specified parameter/measurand? **Yes**

(If **Yes**, please provide a brief description of the method and procedures)

Comparison made of all temperature data sources –deployment dependant.

 9. Does your facility perform:

* internal quality audits to monitor and assess its

 calibration system for the specified parameter? **No**

 - independent quality audits to monitor and assess its

 calibration system for the specified parameter? **No**

(If **Yes** to any of the above, please provide a brief description of the procedure/s applied, including a list of the principal equipment and instrumentation involved)

10. Does your facility actively maintain an archive containing issued calibration

reports/certificates for the specified parameter/measurand? **Yes**

(If **Yes**, please specify the document retention time/s)

Forever

11. Do you have any suggestions or ideas for improving the quality of your

calibrations for any particular sensor/sensor system you are presently using

for the specified parameter/measurand (e.g. innovative reference material,

modifications to existing methodologies or new methodologies

you have developed, etc.)? **No**

(if **Yes**, please provide a brief description of your ideas and/or suggestions, including the details of the sensor/s or sensor system/s)

12. Do you have any suggestions or ideas for improving the general quality

of the calibration of sensors or instruments for measuring the specified

parameter/measurand (e.g. testing and promoting the use of new

reference material, development of new methodologies, etc.)? **No**

(if **Yes**, please provide a brief description of your ideas and/or suggestions)

Submitted on: \_\_\_\_\_\_\_\_22/11/2011 (Date)

Compiled by: Naomi Greenwood and Dave Sivyer

**Task 4.1.1 Physical Sensors**

Part b: Calibration

Parameter/measurand\*: Salinity (Aanderaa and FSI)

Unit of measurement: none

Range:

Accuracy:

Precision:

Calibration uncertainty (if available):

 1. How often do you calibrate the sensor/s or sensor system/s you are presently using for the specified parameter/measurand: please list the typical calibration interval/s you are employing; note that if you are calibrating irregularly, kindly specify why and when (e.g. before a deployment, following a malfunction, etc.).

Sensors are checked for response before each deployment using a variable resistor. Sensors are calibrated at the start and end of each deployment using discrete water samples which are analysed for salinity using a reference instrument in the laboratory. The manufacturers conductivity coefficients are applied. This field calibration is considered sufficient for our applications.

 2. Please provide a brief description of the calibration setup, including a list of the principal equipment, reference material (certified and/or conventionally accepted) and instrumentation involved in a typical calibration operation.

Guildline portable salinometer used for analysis of discrete water samples. Instrument is standardised with IAPSO standard seawater.

 3. Do you employ reference material which are mutable or unstable

(e.g. secondary standards, reagent solutions, gas mixtures,

pressure generators, etc.) to calibrate the sensor/s or sensor system/s

you are presently using for the specified parameter/measurand. **No**

(if **Yes**, please list the types of this kind of reference material you are employing; kindly specify also the measures you take to guarantee the reliability of the reference material in terms of batch-to-batch uniformity of characteristics)

 4. In your view, does your facility ensure an effective traceability chain for the

specified parameter/measurand? **Yes**

 5. Please provide a brief description of the procedures employed to ensure adherence of the performances of the principal equipment and reference instrumentation of the calibration setup to factory specifications (in-house monitoring of performance, in loco re-calibration, servicing by the manufacturer, etc.).

Salinometer is serviced annually and standardised before each analytical run. QA checks are carried out on data from analytical run and must meet prescribed standards.

 6. Does your facility maintain a Manual with a description of the calibration method

and the measuring procedures, together with details of sample treatment and

preparation when these steps are present? **Yes**

(If **Yes**, kindly attach a copy to the completed questionnaire, otherwise please provide a short, description below)



 7. In your view, is regular factory calibration/servicing necessary to obtain

optimal performances from your sensors/instrumentation for the

specified parameter/measurand in the field? **No**

(If **Yes**, please provide details of the sensors/instrumentation, indicating also the intervals you recommend for factory calibration/servicing, below)

 8. Do you perform field calibrations for the specified parameter/measurand? **Yes**

(If **Yes**, please provide a brief description of the method and procedures)

Details given above. Offset is calculated from analysed samples and applied on database for each deployment.

 9. Does your facility perform:

* internal quality audits to monitor and assess its

 calibration system for the specified parameter? **No**

 - independent quality audits to monitor and assess its

 calibration system for the specified parameter? **Yes/No**

(If **Yes** to any of the above, please provide a brief description of the procedure/s applied, including a list of the principal equipment and instrumentation involved)

Analytical laboratory participates in performance testing (Quasimeme) for the determination of salinity

10. Does your facility actively maintain an archive containing issued calibration

reports/certificates for the specified parameter/measurand? **Yes**

(If **Yes**, please specify the document retention time/s)

forever

11. Do you have any suggestions or ideas for improving the quality of your

calibrations for any particular sensor/sensor system you are presently using

for the specified parameter/measurand (e.g. innovative reference material,

modifications to existing methodologies or new methodologies

you have developed, etc.)? **Yes**

(if **Yes**, please provide a brief description of your ideas and/or suggestions, including the details of the sensor/s or sensor system/s)

Make further use of the data collected during pre-deployment checking to identify sensor drift.

12. Do you have any suggestions or ideas for improving the general quality

of the calibration of sensors or instruments for measuring the specified

parameter/measurand (e.g. testing and promoting the use of new

reference material, development of new methodologies, etc.)? **No**

(if **Yes**, please provide a brief description of your ideas and/or suggestions)

Submitted on: \_\_22/11/2011 (Date)

Compiled by: \_N Greenwood and D Sivyer

**Task 4.1.2 Optical Sensors**

Part b: Calibration

Parameter/measurand\*: Chlorophyll (Seapoint SCF)

Unit of measurement: arbitrary flu unit

Range: (0 – 150 ug/l )

Accuracy: field calibration to 0.1ug/l

Precision: variable with gain setting

Calibration uncertainty (if available): deployment dependant but based on linear regression fit of fluorescence vs field values.

 1. How often do you calibrate the sensor/s or sensor system/s you are presently using for the specified parameter/measurand: please list the typical calibration interval/s you are employing; note that if you are calibrating irregularly, kindly specify why and when (e.g. before a deployment, following a malfunction, etc.).

Turner 10AU - 6 months

Seapoint SCF – every deployment

 2. Please provide a brief description of your calibration setup for the specified parameter/ measurand, including a list of the principal equipment, reference material (certified and/or conventionally accepted) and instrumentation involved in a typical calibration operation.

Turner 10AU calibration SOP 

 3. Do you employ reference material which are mutable or unstable

(e.g. biological cultures, optically-sensitive pigment extracts, etc.)

to calibrate the sensor/s or sensor system/s you are presently using for

the specified parameter/measurand. **Yes**

(if **Yes**, please list the types of this kind of reference material you are employing; kindly specify also the measures you take to guarantee the reliability of the reference material in terms of batch-to-batch uniformity of characteristics)

Chlorophyll standard purchased fresh before each calibration.

 4. In your view, does your facility ensure an effective traceability chain for the

specified parameter/measurand? **Yes**

 5. Please provide a brief description of the procedures employed to ensure adherence of the performances of the principal equipment and reference instrumentation of the calibration setup to factory specifications (in-house monitoring of performance, in loco re-calibration, servicing by the manufacturer, etc.).

See above SOP

 6. Does your facility maintain a Manual with a description of the calibration method

and the measuring procedures, together with details of sample treatment and

preparation when these steps are present? **Yes**

(If **Yes**, kindly attach a copy to the completed questionnaire, otherwise please provide a short, description below)

See above SOP and 

 7. In your view, is regular factory calibration/servicing necessary to obtain

optimal performances from your sensors/instrumentation for the

specified parameter/measurand in the field? **No**

(If **Yes**, please provide details of the sensors/instrumentation, indicating also the intervals you recommend for factory calibration/servicing, below)

 8. Do you perform field calibrations for the specified parameter/measurand? **Yes**

(If **Yes**, please provide a brief description of the method and procedures)

See first section

 9. Does your facility perform:

* internal quality audits to monitor and assess its

 calibration system for the specified parameter? **Yes**

 - independent quality audits to monitor and assess its

 calibration system for the specified parameter? **No**

(If **Yes** to any of the above, please provide a brief description of the procedure/s applied, including a list of the principal equipment and instrumentation involved)

The lab participates in a Quasimeme proficiency test for chlorophyll determination.

10. Does your facility actively maintain an archive containing issued calibration

reports/certificates for the specified parameter/measurand? **Yes**

(If **Yes**, please specify the document retention time/s)

Forever

11. Do you have any suggestions or ideas for improving the quality of your

calibrations for any particular sensor/sensor system you are presently using

for the specified parameter/measurand (e.g. innovative reference material,

modifications to existing methodologies or new methodologies

you have developed, etc.)? **Yes**

(if **Yes**, please provide a brief description of your ideas and/or suggestions, including the details of the sensor/s or sensor system/s)

Manufacturers supply a secondary solid standard to test one point response – which we don’t use very often as we find a highlighter pen does the job pretty well.

12. Do you have any suggestions or ideas for improving the general quality

of the calibration of sensors or instruments for measuring the specified

parameter/measurand (e.g. testing and promoting the use of new

reference material, development of new methodologies, etc.)? **Yes**

(if **Yes**, please provide a brief description of your ideas and/or suggestions)

Ideally we would collect more field samples for calibration as laboratory calibrations do not reflect the response of fluorometer to natural phytoplankton populations.

Submitted on: 22/11/2011 (Date)

Compiled by: \_N Greenwood and D Sivyer

**Task 4.1.2 Optical Sensors**

Part b: Calibration

Parameter/measurand\*: PAR (modified Licor 192SA)

Unit of measurement: uE.m-2s-1

Range: up to 10,000 µmol s-1 m-2

Accuracy: ± 5% in air traceable to NIST

Precision: 0.01uE.m-2s-1

Calibration uncertainty (if available):

 1. How often do you calibrate the sensor/s or sensor system/s you are presently using for the specified parameter/measurand: please list the typical calibration interval/s you are employing; note that if you are calibrating irregularly, kindly specify why and when (e.g. before a deployment, following a malfunction, etc.).

Annually

 2. Please provide a brief description of your calibration setup for the specified parameter/ measurand, including a list of the principal equipment, reference material (certified and/or conventionally accepted) and instrumentation involved in a typical calibration operation.

Calibration box using certified reference lamp. Output of sensor measured using calibrated digital volt meter and calibration coefficients calculated according to manufacturers SOP.

 3. Do you employ reference material which are mutable or unstable

(e.g. biological cultures, optically-sensitive pigment extracts, etc.)

to calibrate the sensor/s or sensor system/s you are presently using for

the specified parameter/measurand. **No**

(if **Yes**, please list the types of this kind of reference material you are employing; kindly specify also the measures you take to guarantee the reliability of the reference material in terms of batch-to-batch uniformity of characteristics)

 4. In your view, does your facility ensure an effective traceability chain for the

specified parameter/measurand? **Yes**

 5. Please provide a brief description of the procedures employed to ensure adherence of the performances of the principal equipment and reference instrumentation of the calibration setup to factory specifications (in-house monitoring of performance, in loco re-calibration, servicing by the manufacturer, etc.).

Output of reference lamp is checked before use to ensure it is within specified limits

 6. Does your facility maintain a Manual with a description of the calibration method

and the measuring procedures, together with details of sample treatment and

preparation when these steps are present? **Yes**

(If **Yes**, kindly attach a copy to the completed questionnaire, otherwise please provide a short, description below)



 7. In your view, is regular factory calibration/servicing necessary to obtain

optimal performances from your sensors/instrumentation for the

specified parameter/measurand in the field? **No**

In-house calibration is sufficient

 8. Do you perform field calibrations for the specified parameter/measurand?  **No**

(If **Yes**, please provide a brief description of the method and procedures)

 9. Does your facility perform:

* internal quality audits to monitor and assess its

 calibration system for the specified parameter?  **No**

 - independent quality audits to monitor and assess its

 calibration system for the specified parameter?  **No**

(If **Yes** to any of the above, please provide a brief description of the procedure/s applied, including a list of the principal equipment and instrumentation involved)

10. Does your facility actively maintain an archive containing issued calibration

reports/certificates for the specified parameter/measurand? **Yes**

(If **Yes**, please specify the document retention time/s)

forever

11. Do you have any suggestions or ideas for improving the quality of your

calibrations for any particular sensor/sensor system you are presently using

for the specified parameter/measurand (e.g. innovative reference material,

modifications to existing methodologies or new methodologies

you have developed, etc.)? **No**

(if **Yes**, please provide a brief description of your ideas and/or suggestions, including the details of the sensor/s or sensor system/s)

12. Do you have any suggestions or ideas for improving the general quality

of the calibration of sensors or instruments for measuring the specified

parameter/measurand (e.g. testing and promoting the use of new

reference material, development of new methodologies, etc.)? **No**

(if **Yes**, please provide a brief description of your ideas and/or suggestions)

Submitted on: \_24/11/2011\_\_\_

 (Date)

Compiled by: N Greenwood and D Sivyer

 (Name of respondent)

**Task 4.1.2 Optical Sensors**

(\* Please provide a separate sheet for each parameter)

Part b: Calibration

Parameter/measurand\*: Turbidity (Seapoint OBS)

Unit of measurement: FTU (converted to mg/l)

Range:

Accuracy: variable according to the gain setting

Precision:

Calibration uncertainty (if available):

 1. How often do you calibrate the sensor/s or sensor system/s you are presently using for the specified parameter/measurand: please list the typical calibration interval/s you are employing; note that if you are calibrating irregularly, kindly specify why and when (e.g. before a deployment, following a malfunction, etc.).

Every deployment

 2. Please provide a brief description of your calibration setup for the specified parameter/ measurand, including a list of the principal equipment, reference material (certified and/or conventionally accepted) and instrumentation involved in a typical calibration operation.

Linearity check of OBS sensor made with formazine standards.

Samples are collected in the filed using CTD and automated water sampler. Suspended particulate material is determined on the water samples and used to calibrate the OBS

 3. Do you employ reference material which are mutable or unstable

(e.g. biological cultures, optically-sensitive pigment extracts, etc.)

to calibrate the sensor/s or sensor system/s you are presently using for

the specified parameter/measurand. **No**

(if **Yes**, please list the types of this kind of reference material you are employing; kindly specify also the measures you take to guarantee the reliability of the reference material in terms of batch-to-batch uniformity of characteristics)

 4. In your view, does your facility ensure an effective traceability chain for the

specified parameter/measurand? **Yes**

 5. Please provide a brief description of the procedures employed to ensure adherence of the performances of the principal equipment and reference instrumentation of the calibration setup to factory specifications (in-house monitoring of performance, in loco re-calibration, servicing by the manufacturer, etc.).

Balances are serviced and calibrated annually

 6. Does your facility maintain a Manual with a description of the calibration method

and the measuring procedures, together with details of sample treatment and

preparation when these steps are present? **Yes**

(If **Yes**, kindly attach a copy to the completed questionnaire, otherwise please provide a short, description below)



 7. In your view, is regular factory calibration/servicing necessary to obtain

optimal performances from your sensors/instrumentation for the

specified parameter/measurand in the field? **No**

(If **Yes**, please provide details of the sensors/instrumentation, indicating also the intervals you recommend for factory calibration/servicing, below)

 8. Do you perform field calibrations for the specified parameter/measurand? **Yes**

(If **Yes**, please provide a brief description of the method and procedures)

 9. Does your facility perform:

* internal quality audits to monitor and assess its

 calibration system for the specified parameter? **No**

 - independent quality audits to monitor and assess its

 calibration system for the specified parameter? **No**

(If **Yes** to any of the above, please provide a brief description of the procedure/s applied, including a list of the principal equipment and instrumentation involved)

10. Does your facility actively maintain an archive containing issued calibration

reports/certificates for the specified parameter/measurand? **Yes**

(If **Yes**, please specify the document retention time/s)

forever

11. Do you have any suggestions or ideas for improving the quality of your

calibrations for any particular sensor/sensor system you are presently using

for the specified parameter/measurand (e.g. innovative reference material,

modifications to existing methodologies or new methodologies

you have developed, etc.)? **No**

(if **Yes**, please provide a brief description of your ideas and/or suggestions, including the details of the sensor/s or sensor system/s)

12. Do you have any suggestions or ideas for improving the general quality

of the calibration of sensors or instruments for measuring the specified

parameter/measurand (e.g. testing and promoting the use of new

reference material, development of new methodologies, etc.)? **No**

(if **Yes**, please provide a brief description of your ideas and/or suggestions)

Submitted on: \_24/11/2011\_

 (Date)

Compiled by: \_ N Greenwood and D Sivyer \_

 (Name of respondent)

**Task 4.1.2 Optical Sensors**

(\* Please provide a separate sheet for each parameter)

Part b: Calibration

Parameter/measurand\*: Oxygen (Aanderaa Optode)

Unit of measurement: mol l-1

Range: 0-500 mol l-1

Accuracy: <8μM or 5 % whichever is greater

Precision: <1μM

Calibration uncertainty (if available):

 1. How often do you calibrate the sensor/s or sensor system/s you are presently using for the specified parameter/measurand: please list the typical calibration interval/s you are employing; note that if you are calibrating irregularly, kindly specify why and when (e.g. before a deployment, following a malfunction, etc.).

Annually in the lab and field calibration applied each deployment

 2. Please provide a brief description of your calibration setup for the specified parameter/ measurand, including a list of the principal equipment, reference material (certified and/or conventionally accepted) and instrumentation involved in a typical calibration operation.

Lab calibration as per manufacturers manual using 0% and 100% solution

 3. Do you employ reference material which are mutable or unstable

(e.g. biological cultures, optically-sensitive pigment extracts, etc.)

to calibrate the sensor/s or sensor system/s you are presently using for

the specified parameter/measurand. **Yes**

(if **Yes**, please list the types of this kind of reference material you are employing; kindly specify also the measures you take to guarantee the reliability of the reference material in terms of batch-to-batch uniformity of characteristics)

100% oxygen solution

 4. In your view, does your facility ensure an effective traceability chain for the

specified parameter/measurand? **Yes**

 5. Please provide a brief description of the procedures employed to ensure adherence of the performances of the principal equipment and reference instrumentation of the calibration setup to factory specifications (in-house monitoring of performance, in loco re-calibration, servicing by the manufacturer, etc.).

 6. Does your facility maintain a Manual with a description of the calibration method

and the measuring procedures, together with details of sample treatment and

preparation when these steps are present? **Yes**

(If **Yes**, kindly attach a copy to the completed questionnaire, otherwise please provide a short, description below)



 7. In your view, is regular factory calibration/servicing necessary to obtain

optimal performances from your sensors/instrumentation for the

specified parameter/measurand in the field? **No**

(If **Yes**, please provide details of the sensors/instrumentation, indicating also the intervals you recommend for factory calibration/servicing, below)

 8. Do you perform field calibrations for the specified parameter/measurand? **Yes/No**

(If **Yes**, please provide a brief description of the method and procedures)

Yes, discrete samples are collected and analysed using Winkler titrations for each deployment. Results of these samples are used for field calibration of the sensor.

 9. Does your facility perform:

* internal quality audits to monitor and assess its

 calibration system for the specified parameter? **No**

 - independent quality audits to monitor and assess its

 calibration system for the specified parameter? **No**

(If **Yes** to any of the above, please provide a brief description of the procedure/s applied, including a list of the principal equipment and instrumentation involved)

10. Does your facility actively maintain an archive containing issued calibration

reports/certificates for the specified parameter/measurand? **Yes**

(If **Yes**, please specify the document retention time/s)

forever

11. Do you have any suggestions or ideas for improving the quality of your

calibrations for any particular sensor/sensor system you are presently using

for the specified parameter/measurand (e.g. innovative reference material,

modifications to existing methodologies or new methodologies

you have developed, etc.)? **Yes**

(if **Yes**, please provide a brief description of your ideas and/or suggestions, including the details of the sensor/s or sensor system/s)

Collecting more samples for field calibrations during deployments would be useful

12. Do you have any suggestions or ideas for improving the general quality

of the calibration of sensors or instruments for measuring the specified

parameter/measurand (e.g. testing and promoting the use of new

reference material, development of new methodologies, etc.)? **Yes**

(if **Yes**, please provide a brief description of your ideas and/or suggestions)

 Laboratory calibrations over a range of oxygen concentrations would be useful

Submitted on: 24/11/2011

 (Date)

Compiled by: N Greenwood and D Sivyer

 (Name of respondent)

**Task 4.1.3 Chemical Sensors**

(\* Please provide a separate sheet for each parameter)

Part b: Calibration

Parameter/measurand\*:\_Total oxidised nitrogen (NAS-3X)

Unit of measurement: \_mol l-1\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Range: \_0-60 mol l-1\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Accuracy: 10%\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Precision: 5%\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Calibration uncertainty (if available): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 1. How often do you calibrate the sensor/s or sensor system/s you are presently using for the specified parameter/measurand: please list the typical calibration interval/s you are employing; note that if you are calibrating irregularly, kindly specify why and when (e.g. before a deployment, following a malfunction, etc.).

Each deployment

 2. Please provide a brief description of the calibration setup, including a list of the principal equipment, reference material (certified and/or conventionally accepted) and instrumentation involved in a typical calibration operation.

It is a wet chemical sensor and employs a standard of known concentration which has been analysed in the lab. Before each deployment a linearity check is carried out to verify linearity and range of each instrument.

 3. Do you employ reference material which are mutable or unstable

(e.g. secondary standards, reagent & baseline solutions or blanks,

gas mixtures, etc.) to calibrate the sensor/s or sensor system/s

you are presently using for the specified parameter/measurand.  **No**

(if **Yes**, please list the types of this kind of reference material you are employing; kindly specify also the measures you take to guarantee the reliability of the reference material in terms of batch-to-batch uniformity of characteristics)

 4. In your view, does your facility ensure an effective traceability chain for the

specified parameter/measurand? **Yes**

 5. Please provide a brief description of the procedures employed to ensure adherence of the performances of the principal equipment and reference instrumentation of the calibration setup to factory specifications (in-house monitoring of performance, in loco re-calibration, servicing by the manufacturer, etc.).

SOP used for the determination of TOxN in standard and lab participates in Quasimeme

 6. Does your facility maintain a Manual with a description of the calibration method

and the measuring procedures, together with details of sample treatment and

preparation when these steps are present? **Yes**

(If **Yes**, kindly attach a copy to the completed questionnaire, otherwise please provide a short, description below)



 7. In your view, is regular factory calibration/servicing necessary to obtain

optimal performances from your sensors/instrumentation for the

specified parameter/measurand in the field? **No**

(If **Yes**, please provide details of the sensors/instrumentation, indicating also the intervals you recommend for factory calibration/servicing, below)

 8. Do you perform field calibrations for the specified parameter/measurand? **Yes**

(If **Yes**, please provide a brief description of the method and procedures)

Discrete samples are collected using a CTD and an automated water sampler. These samples are analysed in the lab for TOxN and results are compared with the sensor results.

 9. Does your facility perform:

* internal quality audits to monitor and assess its

 calibration system for the specified parameter? **No**

 - independent quality audits to monitor and assess its

 calibration system for the specified parameter? **No**

(If **Yes** to any of the above, please provide a brief description of the procedure/s applied, including a list of the principal equipment and instrumentation involved)

10. Does your facility actively maintain an archive containing issued calibration

reports/certificates for the specified parameter/measurand? **Yes**

(If **Yes**, please specify the document retention time/s)

forever

11. Do you have any suggestions or ideas for improving the quality of your

calibrations for any particular sensor/sensor system you are presently using

for the specified parameter/measurand (e.g. innovative reference material,

modifications to existing methodologies or new methodologies

you have developed, etc.)? **No**

(if **Yes**, please provide a brief description of your ideas and/or suggestions, including the details of the sensor/s or sensor system/s)

12. Do you have any suggestions or ideas for improving the general quality

of the calibration of sensors or instruments for measuring the specified

parameter/measurand (e.g. testing and promoting the use of new

reference material, development of new methodologies, etc.)? **No**

(if **Yes**, please provide a brief description of your ideas and/or suggestions)

Submitted on: \_24/11/2011

 (Date)

Compiled by: N Greenwood and D Sivyer

 (Name of respondent)