TECHNICAL SPECIFICATION

Contract for:

**CHEMICAL AND RADIOCHEMICAL ANALYSIS OF**

**PUBLIC DRINKING WATER SOURCES**

**Contract No. 23537**

September 2018

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Introduction

1. Routine monitoring of radioactivity in water sources used for public supplies has been carried out for many years. The programme forms part of the UK Government’s arrangements for meeting its obligations under Article 35 of the Euratom Treaty to monitor radioactivity in air, soil and water. The results are provided to the Department for Business, Energy and Industrial (BEIS) for periodic submission to the European Commission under Article 36 of the Euratom Treaty. The programme also provides information to the Radioactivity in Food and the Environment report [Ref 1], to the Water Companies on the activity concentrations of radionuclides in raw water sources and supplementary data to the Environment Agency on the exposure of the public to radiation. This contract is managed by the Environment Agency’s Reactor Assessment and Radiological Monitoring (RARM) team on behalf of (BEIS).

2. As this monitoring programme also includes sites in Wales representatives from Natural Resources Wales (NRW) will have joint management input to the programme. This is to ensure that the needs of the devolved Governments are represented. The Environment Agency will be responsible for the overall management of the contract, placing of orders and payment of invoices.

3. The present contract for Chemical and Radiochemical Analysis of Public Drinking Water Sources covers monitoring up to the end of the calendar year 2018. This document specifies the technical requirements for a new monitoring contract.

 4. In the present contract (ending March 2019) Water Company staff undertake the sampling and the contractor provides sample containers and transportation between the sampling locations and the Contractor’s analytical laboratory. However a trial has recently been undertaken on the benefits/drawbacks of different sampling options. This tender requires three sampling options to be costed as detailed in point 15 below.

**MONITORING OF PUBLIC DRINKING WATER SOURCES OBJECTIVES**

5. The objectives of the Chemical and Radiochemical Analysis of Public Drinking Water Sources programme are as follows:

* To support the provision of data to the EC under Article 35 of the Euratom Treaty;
* To contribute to statistics on the state of the environment;
* To provide background data for the Radiation Incident Monitoring Network (RIMNET);
* To support regulation under the Environmental Permitting Regulations 2016 (EPR 16).

Contract term and Work Programme Overview

6. The contract will be awarded for an initial 36 month period with options to extend for up to an additional 24 months based on the contract providers previous good performance and a continued business need.

7. It is important to BEIS and the Environment Agency that there is no break in the monitoring of public drinking water sources at the change-over of contracts. To enable the sampling and analytical programme to continue efficiently from the 1st April 2019, it is anticipated the contract will start in mid-February 2019 to allow for the various tasks and familiarisation processes, as detailed in the hand-over arrangements section, to be completed.

The sampling and analytical components of the contract are to cover the next three calendar years from 1st April 2019 to 31 March 2022 inclusive. Due to additional time required for reporting the Q1 2022 analysis, the reporting element of the contract will continue until December 2022.

Subject to satisfactory contractor performance and prevalent Environment Agency policy, the Environment Agency may wish to extend the contract in increments of 12 months for up to a further two years to cover monitoring up to the end of calendar year 2024, with reporting completed by the end of December 2025.

MAIN PROGRAMME ACTIVITIES

8. A number of different tasks are required in carrying out the Chemical and Radiochemical Analysis of Public Drinking Water Sources programme as follows (and detailed in later sections):

|  |  |
| --- | --- |
| **Task No.** | **Task** |
| 1 | Handover |
| 2 | Sampling |
| 3 | Laboratory analysis |
| 4 | Results reporting and interpretation |
| 5 | Provision of data to the EC and RIMNET |
| 6 | Site Visits |
| 7 | Emergency Response |
| 8 | Programme management and performance reporting |

Detailed Work Programme

9. In the present contract (ending December 2018) Water Company staff undertake the sampling and the contractor provides sample containers and transportation between the sampling locations and the Contractor’s analytical laboratory. However in this new contract a proposal should also be given for the contractor using their own (or subcontracted) staff to undertake the sampling in liaison with Water Companies.

10. Appendix 3 provides information on sampling and analytical requirements, including information on the Water Company sampling sites, samples to be obtained, determinands/analyses and detection limits required.

Task 1 Hand-over Arrangements

11. The contractor is to undertake a review of the sampling arrangements and agree them with the Environment Agency’s Programme Manager within four (4) weeks of contract award and prior to sampling programmes commencing. Issues to be considered include:

* Any changes to the provision of sample containers, requisite sample volumes and carrier/preservatives. A programme for the replacement of containers may also be required.
* Appropriate sampling instructions for issue to water companies with the first set of containers in early April 2019.
* Appropriate transport arrangements for delivery and collection of the sample containers to the receipt and dispatch sites listed in Appendix 2 and from the laboratory after sample analysis has been completed.
* Chain of custody arrangements to cover the delivery and collection of the sample containers.

12. Arrangements will need to be made by the contractor to facilitate the hand-over of a complete set of containers from the incumbent contractor. The contractor is then to ensure delivery of sample containers to the receipt and dispatch sites in early 2019.

13. At the end of the contract the sampling containers will remain the property of the Environment Agency and a complete and serviceable set are to be made available to the Environment Agency for use in any further sampling programmes. The contractor will be required to facilitate a satisfactory hand-over to the follow on contractor. Evidence shall be provided in the bid of experience of undertaking efficient contract handover (CM2).

Task 2 Sampling

14. Currently Water Company staff undertake the sampling and the contractor provides sample containers and transportation between the sampling locations and the Contractor’s analytical laboratory. As well as looking at options to continue working in that way this contract will also explore the contractor using their own (or sub-contracted) staff to take the samples (a grab sample) in liaison with Water Companies.

15. Currently composite samples are taken every quarter by Water Company staff which comprise of bulked weekly samples. However a trial has recently been conducted by the Environment Agency on the benefits of grab vs composite sampling. Depending on the findings of this study (still to be concluded) it may be decided that a grab sample is preferable. The three sampling approaches that should be provided in the tender are therefore

* Composite sample taken by Water Company staff (current method)
* Grab sample taken by Water Company staff
* Grab sample taken by Contractor (or subcontracted) staff

16. For the option of sampling by Water Company staff it is the responsibility of the contractor to ensure that containers are dispatched in time for the sampling to commence on the first day of each month/quarter and to ensure that samples are returned, in a safe and secure manner, to the laboratory to allow analysis to be completed in sufficient time to meet the reporting timelines set out in Appendix 1 The need to ensure a chain of custody is detailed later. The contractor will be required to store the sampling containers in a safe and secure manner between sampling programmes until they are re-issued to sites,

17. Appendix 2 (Table 3) contains details of the sampling locations and the form of the samples. Two different samples (series A and B) will be taken from each site and a third set of samples will be taken from the 11 river sites (series C) to allow for all analyses to be undertaken. Stabilisation solutions will need to be added to certain containers as shown in Tables 1 and 2 in Appendix 2. Tenderers should provide clear and concise sampling methodologies for the three sampling options and sample transport and stabilisation/carrier details in their tender submissions (TM3). The appointed contractor will be required to provide detailed sampling methodologies to the Water Companies.

18. Recently we have not received samples back from seven of the sampling sites. The Agency is working with the Water Companies to resolve this. Contractors are to provide pricing for the full programme in their tender return but there may be a point at which we accept that sampling at these sites is not feasible. Reductions to analytical costs to account for missing samples will be made. Any amendments to annual programme costs due to the removal or addition of sites will be agreed with the Programme Manager.

Task 3 Laboratory Analysis

19. Analysis shall be undertaken as detailed in the schedule - Appendix 2 (Tables 1 and 2).

20. Total alpha and total beta measurements are required for comparison with the World Health Organisation (WHO) guideline values of 0.5 and 1.0 Bq l-1 respectively [Ref 2]. In the event of a breach of the WHO guideline value of 0.5 Bq l-1, the total alpha result must be compared to the sum of the individual alpha-emitting nuclides reported. If these values are not consistent, taking the respective analytical uncertainties into account, a repeat total alpha measurement will be undertaken. Similarly any sample breaching the WHO guideline for total beta activity (1.0 Bq l-1) must be substantiated by examination of the reported gamma spectrometry, 90Sr and 40K measurements. If not substantiated a repeat total beta measurement will be carried out. These repeat measurements are to be undertaken promptly and reported immediately on completion of analysis.

21. The required reporting limits for each sample type are specified in Appendix 2, (Table 4) and a summary table is provided in Appendix B Table B.1, which shall be completed to indicate whether the specified limits can be met. If reporting limits cannot be met tenderers shall provide alternative method specific detection limits. Details for and a definition of detection limit used shall also be included, these shall be consistent with the ISO standard for the determination of detection limits [Ref 3] (TM4).

 22. Tender submissions shall clearly and concisely describe the analytical methods to be used for the various determinands (TM2), including a description of the original method validation procedures and how continued performance is assured (with evidence for an example method). These brief summaries shall also include details of all the major pieces of analytical equipment (QE1) which will be utilised on the contract – see further details in the “Equipment” sub-section of the “Quality Assurance “ section. The Environment Agency reserves the right to review the contractor’s procedures in detail prior to contract award.

23. After the contract has been awarded and prior to commencing work on the first quarter samples, the contractor shall submit detailed analytical procedures, within six (6) weeks of contract award, for approval by the Environment Agency’s Programme Manager. See further details below under “Quality Assurance”.

24. All determinands/analysis methods employed on the contract shall be accredited by the United Kingdom Accreditation Service (UKAS) or equivalent organisation. This is explained in greater detail below under “Quality Assurance”. It should also be noted that the Environment Agency has published an MCERTS performance standard for the radioanalytical testing of environmental and waste waters [Ref 4]. As the expected results from this programme will be at or close to method limits of detection, implementing this standard is not seen as a requirement for this contract, but would be advantageous. However, we would be happy to enter in to discussions over the costs, benefits and practicalities of implementing this standard.

25. The Environment Agency requires that all sources of uncertainty are included along with the reported results at the 95 % confidence level (ie 1.96σ). A clear statement on the sources of uncertainty considered and the way these are assessed and combined shall be included with the method summaries (TM2).

26. The contractor shall have processes in place to ensure that expertise of the contractor and any sub-contracted laboratory services is kept up to date and improvements are kept abreast of in relevant disciplines (SE3).

Task 4 Results Reporting and Interpretation

27. Requirements regarding administrative aspects and timelines for reporting are given in Appendix 1.

28. The contractor is to report **immediately** to the Agency Programme Manager any total alpha and/or total beta results in excess of the World Health Organisation (WHO) guideline values for alpha and beta activities of 0.5 and 1.0 Bq l-1 respectively, following completion of analysis.

29. The complete results are to be reported on a quarterly basis, an electronic version of the report is required to allow efficient onward reporting.

30. The contractor must supply monitoring data electronically to the Agency in a format to be specified by the Environment Agency Programme Manager this will need to be compatible with Microsoft Access or Excel.

**Task 5 Provision of Data to the EC and RIMNET**

31. The contractor is to supply the results to the European Community via their bespoke Radioactivity in the Environment Monitoring (REM) database. Currently only data for 3H, 90Sr and 137Cs are required. The software is downloadable from the JRC website and data entry is compatible with Microsoft Excel.

32. The contractor is also to supply the results as supplementary data to the RIMNET database of environmental monitoring results on a quarterly basis, within two months of the sample analysis being completed. This data entry is undertaken utilising a Microsoft Excel based Supplementary Data Entry (SDE) system and email process. Representatives from the RIMNET team will arrange the necessary requirements and provide help, if required.

Task 6 Site Visits

33. Site visits may be required as part of the sampling programme (depending on budget constraints). These visits would take the form of thorough investigations of the sampling procedures followed by Water Companies’ staff. If required an annual programme of site visits (up to 5 sites) would be agreed with the Environment Agency Programme Manager during the first quarter of each year. A procedure for carrying out the visits and a report format would be agreed with the Environment Agency’s Programme Managerbefore commencing any visits. Prices for visiting each site are required – see Appendix A Price Schedule Table1d and 1e.

Task 7 Emergency Response

34. In the event of an emergency, the contractor may be required to provide additional sample containers including transport to and from the sampling site, and carry out chemical and radiochemical analyses and provide reports (TM1).

35. For additional work, the contractor will be reimbursed on a case by case basis in line with the costs, rates and charges detailed in the Appendix A Price Schedule Table1d and 1e.

Task 8 Programme Management and Performance Reporting

36. The Contractor shall manage the work undertaken in accordance with this specification, including the general administrative functions specified in Appendix 1 – General Contract Arrangements. In particular the Contractor shall attend quarterly progress meetings and provide performance information.If separate project management costs are envisaged these must be included separately in the Appendix A Pricing Schedule.

37. For any sub contracted services where, for example, the fieldwork and analytical components are delivered by different companies it is essential that the partners work together to achieve an efficient and effective delivery of the results and services required.

Interfaces that need considering include:

* Sample scheduling to allow analysis to be completed to time.
* Sample hand-over to allow short lived radionuclides to be analysed before significant decay takes place and the batching of samples for efficient analysis.
* Agreement on the sample size required and use of appropriate preservatives / carriers that need adding to samples.
* Provision of appropriate paperwork and information regarding Health and Safety matters and to maintain a robust chain of custody, including notification of changes in sample locations or conditions at the time of sampling is required.
* Co-operation for investigations into unusual results.

38. The Contractor shall provide information on the systems they have in place to track complaints and commendations (both in relation to quality and timeliness of delivery) including the mechanisms for taking action and the key performance indicators (KPIs). Evidence shall be provided to the Project Manager as part of the quarterly progress meetings (QA3).

39. Supplier Performance Measures (SPMs)

The Environment Agency Programme Manager will measure the contractors’ performance throughout the framework term using a defined set of metrics that will be agreed with individual the contractor at framework award, appropriate to the services to be provided and developed during the framework term. It is expected that the SPMs will be based on the following headings (CM2):

* Service quality and delivery
* Framework and Programme Management
* Quality, Health, Safety and Environmental Performance
* Efficiency savings, innovation and value for money

The project manager will review the contractor’s performance against these measures in the quarterly progress meetings.

Persistent or serious failings by the contractor to meet the agreed SPMs may result in the contract being terminated due to poor performance. This information will also be recorded and may be used to inform future tender evaluations.

ANALYTICAL LABRATORIES

40. Regarding the access to analytical laboratories for services required on this contract, account will be taken of the practicalities of where analytical facilities are located. The Environment Agency has a number of considerations in this regard as follows:

* As the Environment Agency we need to apply one of our principle aims as set out in the Environment Act 1995, which is to discharge our functions towards the objective of achieving sustainable development. Our policies endeavour to minimise our carbon impacts and we would expect the same commitment from our supply chain. Evidence shall be presented to demonstrate your commitment to achieving an environmental outcome in line with this principle, to also include consideration of the potential impacts of long distance transport where relevant.
* The work is likely to lead to a number of small shipments of samples and we would need to be reassured that efficient and legally compliant trans-frontier shipments (where applicable) could be undertaken.
* Samples must be disposed of in accordance with current legislation.

Tender submissions shall indicate how these requirements will be met (HS5).

Quality Assurance

Company Quality Management System

41. After contract award the Contractor’s Quality Assurance manual for internal quality control, participation in external quality control schemes and information on accreditation under UKAS (or equivalent) shall be made available to the Environment Agency Programme Manager on request.

Quality Plan for Contract

42. Following contract award, the Contractor shall submit a Quality Plan for the Contract (including interfaces between consortium partners or subcontractors where appropriate), a draft shall be provided to the Environment Agency’s Programme Manager for approval within one month of the start of the contract. The main objective of the Quality Plan will be to demonstrate how the Contractor will meet the requirements of the work scope activities as stipulated in this Technical Specification. The Quality Plan shall include details of:

* The quality objectives to be attained.
* The contractor’s company/team structure (for relevant staff involved on the contract).
* Allocation of specific responsibilities to work scope activities and authority throughout the contract.
* List of relevant procedures, methods and working instructions etc.

43. The Quality Plan, once agreed by the Contractor and the Environment Agency, is expected to stand for the life of the contract, although amendments may be made by mutual agreement.

UKAS Accreditation

44. The Contractor and or any sub-contracted laboratory services shall hold and maintain UKAS accreditation (or equivalent) under the BS EN ISO/IEC 17025 : 2005. Laboratories will be expected to meet the upcoming 2017 standard ‘General requirements for the competence of testing and calibration laboratories’ standard for all the key determinands/analysis methods involved in the work programme, listed in Table C.1 in Appendix C, for the lifetime of the contract (Question AP1). It is expected that tenderers will already hold a range of the necessary accreditations at contract award and they will be scored accordingly. However, tenderers with no such accreditations will not necessarily be discounted so long as they have a commitment to achieving UKAS accreditation within 6 months of the date of contract award.

45. Tenderers shall return the list of the required UKAS accredited analyses (Table C.1 in Appendix C) with their submissions, indicating the methods for which they currently hold UKAS accreditation. In cases where UKAS accreditation is currently not held, tenderers shall offer a date by which such accreditation will be secured (such timescales must allow for UKAS’ own time for assessment activities) (AP1).

46. The list of UKAS accredited determinands/methods will be continuously reviewed during the lifetime of the contract. The Environment Agency may require the contractor, at their cost, to obtain/hold UKAS accreditation for additional determinands/methods should the need arise. Conversely, it is possible that the Environment Agency may agree to determinands/methods being deleted from the list of requirements in the event that they are no longer needed. All changes to UKAS accreditation requirements shall be agreed with the Environment Agency’s Programme Manager.

47. Failure to achieve the required key UKAS accreditations within the prescribed time period shall be deemed to be a breach of contract, unless circumstances outside the control of the contractor. The Environment Agency reserves the right to have samples analysed at a UKAS accredited laboratory at the Contractor’s expense if accreditation for the key analyses is not achieved in the required time period.

Documentation

48. Operating procedures will be required from the Contractor(s) to cover:

* Sampling
* Analysis (determinands listed in the Analytical Schedule (Appendix 2)).
* Health and Safety

49. The operating procedures are to specify the details of methods used and where appropriate detection limits and uncertainties. Also evidence of how the results will be representative and traceable. Sampling procedures, where appropriate, shall detail the optimum conditions under which samples are to be stored to eliminate or minimise loss of the principle constituents under investigation.

50. Detailed Health and safety risk assessments/instructions for sub-contractors and Water Companies regarding the use, transportation and analysis of the sample containers shall be provided to the Environment Agency Programme Manager by within four (4) weeks of contract award and reviewed with the Project Manager on a regular basis.

51. Detailed procedures shall be provided to the Environment Agency Programme Manager within four (4) weeks of contract award. Following approval of these procedures, the Contractor is required to issue the Environment Agency’s Programme Manager with controlled copies of the procedures. Updates for these procedures shall be required when substantial changes are made. The Environment Agency reserves the right to review the Contractors procedures in detail prior to Contract award.

52. Only members the Environment Agency’s Reactor Assessment and Radiological Monitoring Team will have access to the procedures. The procedures will be treated in confidence and information will not be divulged to third parties without express written permission from the Contractor. We envisage there would be occasions where Environment Agency Nuclear Regulators or Site Inspectorswould request details of a method, again permission would be sought before providing this information. The procedures will be returned at the end of the Contract.

Inter-comparisons

53. The Contractor’s laboratory or sub contractor’s laboratory used for this contract, is to participate in national/inter-national inter-laboratory comparisons (e.g. NPL, IAEA or equivalent) (a minimum of two per year) to assist in quality control checking. Where possible inter-comparisons should be chosen which relate not only to relevant determinands, but also relevant media. The results, along with their interpretation, identification of anomalies and recommendations for improvement are to be made available to the Environment Agency Programme Manager in a written report within 3 months of the inter-comparison exercise, these results will be treated in confidence. We would expect these to include gamma spectrometry and total alpha and beta determinations (Question QA2)

54. Evidence of performance (results and acceptability) in all the inter-comparison exercises, with determinands relevant to the requirements of this contract, in which you and any sub-contracted laboratory services, have participated shall be provided on an annual basis and will be considered as part of your performance management. We would expect these to include gamma spectrometry and total alpha and beta determinations (QA2).

55. The Contractor or their sub-contractor may also be required to take part in Environment Agency initiated inter-comparisons with other contract laboratories to assess compatibility between monitoring results and give baseline data. Arrangements would be agreed as necessary and payments will be made in accordance with analytical basket prices and time if applicable.

Personnel

56. The Contractor (including key sub-contractors) shall provide suitably experienced and qualified personnel to undertake this contract. Curriculum vitae and team structure are to be submitted with the tender returns. Information on the availability of key personnel to this contract and possible conflicting requirements on their time are also to be provided. The personnel and their commitment to the contract will be approved by the Environment Agency and once the contract is let. All proposed changes of personnel shall be notified to the Environment Agency Programme Manager and are subject to their approval (SE1/SE2).

Equipment

57. The Contractor, including sub-contractors, shall provide and maintain suitable analytical equipment to undertake this contract. Information on the amount and type of equipment for use on this contract will be provided to the Programme Manager at contract start-up. The Environment Agency reserves the right to examine relevant maintenance records at any time during the contract period. The suitability of the equipment proposed for the contract will be approved by the Environment Agency Programme Manager prior to the contract commencing or during the contract term if any changes occur. (QE1)

Calibration

58. All equipment and instruments used whether on-site or within a laboratory, are to be suitably and regularly calibrated, labelled with the due date and carry calibration records. Records of calibration shall be provided to the Environment Agency Programme Manager upon request.

Standards

59. Where they exist, British Standards or other internationally recognised standards should be used. Relevant Environment Agency technical guidance notes shall be referenced. During the course of the contract, the Contractor shall make the Environment Agency aware of any additional or new technologies or techniques which become available if they are considered to be superior to current methods or otherwise relevant to work on the contract.

Health, Safety and Environment

60. Health and safety is a prime concern for this contract and the successful contractor will need to demonstrate a clear commitment to maintaining a high standard on all health and safety matters, including any sub-contractors used. There will be a regular requirement to show how H&S training is being carried out, company reporting procedures are being maintained along with evidence of your continued commitment to the process.

61. The Contractor (and any sub-contractors) shall operate health, safety and environmental policies which are acceptable to the Environment Agency and consistent with the Environment Agency’s own policies, values and practices.

62. Linked to the Environment Agency Core Health and Safety values and SPMs, the contractor shall provide details of relevant Health and Safety information on how you plan to ensure your standards are maintained and monitored at the start of the contract. Information shall include day to day supervision, and the key Health and Safety risks, linked to the provision of this contract (for example include a table of top risks). In particular (HS1):

a) how you will mitigate any perceived risks/issues

b) how you will monitor, record and review those risks

c) how you will identify and manage new risk that are identified

d) how you might improve on your health and safety results annually.

63. The Contractor will be a representative of the Environment Agency and as such high standards of attitudes to safety, behaviour and professionalism are required. The Contractor and any sub-contractors used are required to provide adequately trained, safety conscious and experienced staff for execution of all work under the contract – both at the Contractor’s laboratory and when visiting sites for sample collection (HS3). All equipment used by the Contractor and any sub-contractors on the contract shall meet all necessary safety standards required.

64. The Contractor is to regularly monitor his/her own health and safety performance and that of any sub-contractors used, in respect of this contract and must be able to demonstrate this to the Environment Agency’s Programme Manager on request or as part of the quarterly SPM review.

65. Teams undertaking site visits should not normally work for more than 10 hours per day, including travel time. Under exceptional and infrequent circumstances this can be extended to 12 hours.

66. The contractor or their sub-contractor is to have satisfactory health and safety procedures and training in respect of staff driving vehicles to/from sampling/monitoring locations (HS3).

67. The contractor and any sub-contractors shall adhere to all rules and procedures applicable to that site when working on the water company sites.

68. The contractor is to provide a contact name and telephone number for emergency use outside of normal working hours.

Risk Assessments

Field-based

69. A risk assessment shall be undertaken for site visits and should take account of travelling/driving to and from sites and on site or environmental hazards (HS2).

70. The risk assessments shall be made available to the Environment Agency Programme Manager on request. If for any reason during a visit conditions are deemed unsafe, work must not be carried out and the Environment Agency Programme Manager shall be notified immediately.

Laboratory-based

71. All laboratory based work is to be undertaken following and in accordance with an appropriate COSHH assessment. Where appropriate, work shall also be undertaken in accordance with the Ionising Radiation Regulations 2017.

Training

72. The Contractor shall provide adequate training to staff and sub-contractors engaged in work on the contract with respect to all aspects of health, safety and environmental matters at any time during the contract period to the Environment Agency Programme Manager if requested (HS3).

**Reporting of Incidents**

73. The contractor shall have a procedure for reporting and recording Health and Safety or Environmental incidents relating to this contract (HS2/HS4). Safety accidents/incidents shall be reported to the Environment Agency Programme Manager as soon as possible after the event, but certainly on the same day. A copy of the Contractors incident report shall be emailed to the Programme Manager within one working day of the incident (HS4).

74. “Near-misses” (an unplanned event that did not result in injury, illness or damage, but had the potential to do so) shall also be reported to the Environment Agency’s Programme Manager within 3 working days.

Environment and Sustainability Performance

75. The Environment Agency places particular importance on maintaining good public relations with the individuals and communities with whom it works and expects all its suppliers to maintain the highest levels of environmental and sustainability performance. It is particularly important that suppliers know and fully understand the role of the Environment Agency as a regulator and champion in relation to the environment and we expect all of our suppliers to rigorously ensure that works for us do not give rise to pollution or other environmental incidents through high standards of environmental management.

76. The contractor shall take all reasonable steps to minimise the environmental impacts of undertaking this work and seek to improve their environmental and sustainability performance during the contract term, both on and off site. (HS5).

77. The contractor and any subcontracted laboratory service shall hold and maintain independent certification of their Environmental Management System under ISO 14001 or equivalent, for the lifetime of the contract. The contractor/sub-contractor shall achieve accreditation within 12 months of contract award. It is expected that most tenderers will already be accredited to this standard at contract award and they will be judged favourably. However, tenderers not currently accredited will not be discounted so long as they have a commitment to achieving this accreditation within a required timeframe (HS4).

78. It is expected that other key sub-contractors used for this contract shall have, as a minimum, a documented audited Environmental Management System that follows the principles of ISO14001 or other suitable accreditation if they do not hold a formal certified accreditation (HS4).

Audits

79. It is expected that the Contractor will periodically carry out both internal Quality Assurance Audits and Safety, Health and Environment Audits appropriate to the contract (or on the department or sub-contractor which carries out work on this contract). The Contractor shall provide details of such audits (in particular, non-compliances, observations and corrective actions) to the Environment Agency’s Programme Manager upon request.

80. The Environment Agency reserves the right to audit the contractor periodically. The main focus of Environment Agency audits is to ensure that the Contractor (and any sub-contractors) is fully compliant with the requirements of the contract as laid down in this technical specification. Environment Agency audits will pay particular attention to both Quality Assurance (QA) and Safety, Health and Environment (SHE) issues. The Environment Agency audits will be complimentary to UKAS surveillance audits and may cover aspects which are not subject to UKAS accreditation in order to provide additional reassurance to the quality of the work. To facilitate this, the Contractor shall make available any UKAS audit report findings relating to this contract to the Environment Agency Programme Manager upon request.

81. Audits will normally be carried out by Environment Agency staff, although the Environment Agency reserves the right to involve third party organisations in audits if it so wishes. Audits may cover work carried out in the field as well as work carried out at the Contractor’s laboratory. Audits may take place on an unannounced basis.

82. Environment Agency audits will be followed by audit reports which will be copied to the Contractor. As well as making general comments and recommendations the audit reports will specify any non-compliances and observations found. The Contractor is under obligation to rectify all non-compliances on a timescale to be agreed at the time with the Environment Agency Programme Manager.

Sub-contracting

83. Any intentions to use sub-contractors for key work scope activities, other than those already agreed at the time of contract award (if any), must have the prior approval of the Environment Agency Programme Manager. The Environment Agency reserves the right to refuse permission for such sub-contractors, however, permission shall not be unreasonably withheld.

84. Where sub-contractors for laboratory services are used, details of the sub-contractor’s staff, facilities, equipment, QA/QC, methods etc must be provided to the Environment Agency Programme Manager and should at least be of comparable quality to those of the main Contractor.

Conflicts of Interest

85. As part of its supplier selection and tender evaluation process, the Environment Agency will ensure that the contract is not awarded to any contractor that appears to have an unacceptable level of conflict of interest (OC1).

86. Throughout the period of the contract, the contractor shall continuously check for any emerging or apparent conflicts of interest with regard to the work they are being asked to undertake on the contract. This assessment shall include monitoring of drinking water around nuclear sites on behalf of nuclear operators. The Environment Agency Programme Manager must be notified immediately if a potential conflict of interest arises and the Environment Agency’s Programme Manager will assess whether the work presents an undue conflict of interest. However, the Environment Agency will only prevent the contractor from undertaking such work in extreme circumstances as this programme is designed as an ambient background programme not targeted on any particular site. Where the Environment Agency considers there presents an undue conflict of interest the Programme Manager will notify the contractor in writing that we do not wish them to undertake the work

Confidentiality

87. All results and all information obtained by the contractor through the execution of this contract will at all times remain the property of the relevant Environment Agencies of England and Wales (i.e. Environment Agency and Natural Resources Wales) and BEIS/Defra. The contractor is forbidden to either use for his/her own purposes or pass on to others information so gained. Any use or disclosure of such information will result in termination of the contract and possible prosecution.

References

1. Radioactivity in Food and the Environment (RIFE) report. See <https://www.gov.uk/government/publications/radioactivity-in-food-and-the-environment-rife-reports-2004-to-2016>
2. Guidelines for drinking-water quality, 3rd edition ©World Health Organization 2004 ISBN 92 4 154638 7
3. Determination of the detection limit and decision threshold for ionizing radiation measurement – Part 7 Fundamentals and general applications ISO 11929-7 (2005).
4. Performance Standard for Organisations Undertaking Radioanalytical Testing of Environmental and Waste Waters. (MCERTS) Environment Agency, May 2012.

APPENDIX 1

GENERAL CONTRACT ARRANGEMENTS

Designated Environment Agency Responsibilities

Programme Manager

1. The Environment Agency’s Programme Manager / Contract Supervisor is the single focus of contact between the Environment Agency and the Contractor. Contact with others including Environment Agency staff, must be reported to the Programme Manager without delay.

Contractor Liaison

2. In respect of the programme of work, its execution, scope and pricing, the Environment Agency’s Programme Manager or his/her authorised (in writing) representative(s) shall be the sole person(s) authorised to issue instructions to the Contractor on behalf of the Environment Agency.

Communications

3. It is expected that all normal communication methods will be employed between the Environment Agency and the Contractor *i.e.* telephone, email, faxes. Documents produced in electronic format must be produced using the Microsoft (MS) Office suite of software including MS Word (for documents), MS Excel (for spreadsheets) and MS Access (for databases). It would be advantageous if the Contractor also used MS Project (Gantt chart programmes) and MS Powerpoint (presentations).

Work Scope/ Change Control

Scope Changes

4. During the course of the contract it is possible that some changes to the work scope specified in the Technical Specification may be required.

5. Arrangements for change control on the routine sampling/analysis schedules are described below. These will be used for small-to-medium “routine” changes to the work scope. In the case of any major or non-routine changes to the work scope, these will be discussed with the contractor on a case-by-case basis if/when they arise.

Change control for routine sampling/analysis schedules

6. The individual prices for analyses, staff time, Travel & Subsistence etc. (Appendix A Tables 1d, 1e and 2) provided for the contract will be used for costing work to be added/deleted from the specification. In cases where the Environment Agency requires to add determinands which are not included in the individual prices, a price will be agreed with the Environment Agency’s Programme Manager prior to commencement of the work.

7. Change control will be notified to the Contractor formally in writing. Periodically (at the Programme Manager’s discretion), when there have been a significant number of changes to the routine sampling/analysis schedule (Appendix 2), an updated version of the schedule will be produced by the Programme Manager and copied to the contractor.

Contract Management and Progress Reporting

Meetings

8. The contractor shall attend meetings with the Environment Agency Programme Manager to discuss progress and other issues relating to the contract. These meetings will normally alternate between the Programme Manager’s office and the contractor’s office (the default being the Programme Manager’s office).

9. The contractor shall take the minutes of all meetings and provide a draft version to the Environment Agency Programme Manager for approval within 4 weeks of the meeting.

Start-up Meeting

10. Following the award of contract the Programme Manager will arrange a start-up meeting. Issues to be covered at this meeting include a detailed review of the technical specification to confirm mutual understanding and hand-over arrangements from the incumbent contractor, if applicable. Any technical issues will be discussed.

Progress Meetings

11. These meetings will usually be held at 6 monthly intervals. Issues to be discussed will include the current progress status and technical issues arising from this, health and safety, contractual, financial and quality assurance matters.

Close-out Meeting

12. At the end of the contract period, when the Programme Manager is satisfied that the contract deliverables have been satisfactorily delivered, a meeting will be held to review the work undertaken on the contract and any outstanding issues. A review of any technical, safety and QA/QC issues arising will be undertaken with the aim of learning from the contract.

Performance Reporting

13. To enable the Environment Agency to track the performance of the contract information on the sample returns from the sites and any analytical problems will be required on a quarterly basis.

ResultS Reporting

Report Production

14. Quarterly electronic reports are required. The contractor shall have the capability to produce a pdf version of the report. The reports shall include sample details, the results together with their uncertainties and a brief discussion of any significant/unusual results. All results shall be quality checked before issue including a check for internal consistency within the data.

Timescales

15. The contractor will ensure that quarterly reports are delivered to the Environment Agency Programme Manager as follows:

Approval version

16. Results are to be reported within one week of the end of the calendar quarter following receipt of the samples. For example, samples collected during Q1 April to June are to be analysed during Q3 July to Sept and results reported by 7th October.

Final version

17. Once the Environment Agency Programme Manager had notified the contractor that the report has been approved, the required electronic copy (amended if necessary) is to be sent within 5 working days.

Timeliness / Late Reporting

18. The reports of results are required within the specified time-scales to enable onward reporting to the European Commission. Time is therefore of the essence and the Agency reserves the right to reject reports on the basis of late delivery and adjust or with-hold payment accordingly.

Approval Process

19. An initial electronic copy of the report will be forwarded to the Environment Agency Programme Manager for comment and approval. A system for allowing sign-off of the report by both the contractor and Agency will need to be developed – ideally by using electronic signatures if their security can be guaranteed. The Programme Manager will complete the report sign-off when he/she is satisfied with the report and this is to be included with the issued report. Further approval may be sought from NRW if they require this.

Archiving

Sample Archiving

20. Samples not subject to loss/change on storage under ‘ideal’ conditions

The Environment Agency may wish to request repeat analysis at a later date on any samples taken where the principal constituents under investigation are not subject to loss or change during storage under ‘ideal’ or acceptable conditions. The sample residues are to be retained and archived for a period of 12 months from the date of reporting of the results.

Samples subject to loss/change on storage

Where it is known or envisaged that the principal constituents of a sample under investigation will be lost within a defined period of the sample being taken from the source, the contractor will institute, with prior agreement of the Environment Agency Programme Manager, the necessary procedures within the analysis regime to minimise or eliminate such loss. This will provide the Environment Agency, should repeat analysis of the sample be required, with analytical results which most accurately reflect all the conditions at source under which the sample was originally obtained.Where appropriate suitable carriers should be added to the samples.

Paperwork Archiving

21. All documents pertaining to the contract shall be kept for the duration of the contract and for a period of 12 months following the end of the contract after which they shall be securely destroyed.

Electronic Archiving

22. All electronic files pertaining to the contract should be kept for the duration of the contract and for a period of 12 months following the end of the contract after which they shall be permanently deleted.

Invoicing

Procedure for Invoicing

23. All invoices relating to this contract should be submitted to:

SSCL

Environment Agency

PO Box 797

Newport

NP10 8FZ

Supporting documentation (i.e. an Advice Note) giving a breakdown of the amount being claimed on each invoice should be submitted to the Environment Agency Programme Manager for authorisation prior to any invoice being submitted. In order to ensure prompt payment all invoices must quote the correct order number.

24. The advice notes are to be sent at quarterly intervals to the Environment Agency Programme Manager for each completed issue of reports. Advice notes should not be submitted until the work is completed i.e. results reports have been issued.

25. Advice notes involving a change to the Contract price shall be accompanied by the information necessary to support that change.

Price Adjustment

26. In the event that samples are not obtained from specific sites when required, and hence analyses are not undertaken, a price adjustment will be made to the quarterly invoice for analysis costs. The adjustment will be based on the individual prices given in the price schedule.

**Payment Terms**

27. The Environment Agency shall pay undisputed invoices within 30 days of receipt of Invoice as detailed in the Conditions of Contract.

Overpayment

28. In the event of overpayment for any reason, such over payment shall be recoverable by the Environment Agency from the Contractor. Credit notes of similar format to the invoices will be issued.

Legal Aspects of Work Programme

Chain of Custody and Audit Trail

29. An audit trail of all samples shall be maintained from the point of collection to final analysis. It should be possible to demonstrate that samples and the analytical process cannot be tampered with at any stage of the process.

30. A chain of custody record is required for all samples taken (QA1). The record must give the sampling date and time and the identity of the person taking the samples. The record will show the identity of the person taking responsibility for the custody of the samples. The record must be continuous and show the time and date when samples were passed from one person to the next. The samples must be sealed and kept under lock and key in such a way that the custodian is the only person with access. If there are any special storage requirements, there should be procedures to ensure that these are maintained.

31. In the event of a prosecution being brought by the Environment Agency, evidence of the operation of this system may be required by the Court. The Contractor may be called by the Court to give evidence.

Storage and transport

32. The samples will need to be transported to and stored in the laboratory in a secure manner under storage conditions that minimise or eliminate loss or change of the principal constituents under investigation. The methods employed for secure transport, storage and stabilisation must all be rigorous enough to withstand scrutiny in a court of law.

**Data protection**

33. Personal data held by the Contractor on behalf of the Environment Agency shall be held in compliance with the General Data Protection Regulation (GDPR) and the Data Protection Act, 2018.

Insurance

34. The Environment Agency requires the Contractor(s) to hold a specified level of insurance for professional indemnity and third party insurance for the duration of the contract. Details of these requirements are contained in the Environment Agency’s terms and Conditions (included elsewhere within the Invitation to Tender).

**APPENDIX 2**

**DETAILED SAMPLE/ANALYTICAL SCHEDULE**

Currently Water Company staff undertake the sampling and the contractor provides sample containers and transportation between the sampling locations and the Contractor’s analytical laboratory. As well as looking at options to continue working in this way this contract will also consider the contractor using their own (or sub-contracted) staff to take grab samples in liaison with Water Companies.

A trial has recently been conducted by the Environment Agency on the benefits of grab vs composite sampling. Depending on the findings of this study (still to be concluded) it may be decided that a grab sample is preferable. The three sampling options that should be costed are:

1. Composite sample taken by Water Company staff (current method)
2. Grab sample taken by Water Company staff
3. Grab sample taken by Contractor (or subcontracted) staff

A summary of the sampling and analytical requirements are shown in Table 1 for Option i) and Table 2 for Options ii) and iii). These Tables provide information on the three types of samples (A, B and C), associated containers and carriers to be used at the sites.

The appointed contractor will be expected to provide detailed sampling methodologies to the Water Companies.

**Table 1: Sampling and analytical requirements for Option i) - Composite Sample**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Sample Type | Sampling container | Sample Return | Site | Carriers | Quarterly analyses |
| Series ‘A’ | Three 25 l capacity polythene carboys per quarter. | Returned to lab on monthly basis and bulked per quarter | All sites | Acid solution with Cs and Sr carriers | 90Sr40K137Cs\*3H |
|  | Additionally for Site 3 only | None | 226Ra234U, 235U, 238U210Po |
| Series ‘B’ | One 25l capacity polythene jerrican per quarter | Returned to lab at quarterly intervals | All sites | Acid solution | Stable elements:K, Ca, SrTotal alpha (as 242Pu)Total beta (as 137Cs)Total beta (as 40K)Total dissolved solids |
| Series ‘C’ | One 25l capacity polythene jerrican per quarter | Returned to lab at quarterly intervals | Only sites 2, 4, 14, 19, 20, 21, 23, 25, 26, 28, and 29 | Alkaline solution of an iodide carrier and a small amount of sodium hydrogen sulphate to convert iodine to iodide. | 125I |

\* Plus any other radionuclides detected by gamma spectrometry at concentrations greater than 0.01Bq l-1.

**Table 2: Sampling and analytical requirements for Options ii) and iii) - Grab Samples**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Sampling container | Sample Return | Site | Carriers | Quarterly analyses |
| Series ‘A’ | One 25 l capacity polythene carboy per quarter. | Returned to lab on a quarterly basis | All sites | Cs and Sr carriers. No acid required | 90Sr40K137Cs\*3H |
|  | Additionally for Site 3 only | Not required | 226Ra234U, 235U, 238U210Po |
| Series ‘B’ | One 25l capacity polythene jerrican per quarter | Returned to lab at quarterly intervals. | All sites | Not required | Stable elements:K, Ca, SrTotal alpha (as 242Pu)Total beta (as 137Cs)Total beta (as 40K)Total dissolved solids |
| Series ‘C’ | One 25l capacity polythene jerrican per quarter | Returned to lab at quarterly intervals. | Sites:2, 4, 14, 19, 20, 21, 23, 25, 26, 28, and 29 | Alkaline solution of an iodide carrier and a small amount of sodium hydrogen sulphate to convert iodine to iodide. | 125I |

\* Plus any other radionuclides detected by gamma spectrometry at concentrations greater than 0.01Bq l-1.

The current sampling locations are given in Table 3 below.

Recently we have not received samples back from seven of the sampling sites. The Agency is working with the Water Companies to resolve this. Contractors are to provide pricing for the full programme in their tender return but there may be a point at which we accept that sampling at these sites is not feasible. Reductions to analytical costs to account for missing samples will be made. Any amendments to annual programme costs due to the removal or addition of sites will be agreed with the Programme Manager.

For the option of sampling by the Water Companies (i and ii), it is the responsibility of the contractor to ensure that containers are dispatched to and returned from the Water Company sites, in a safe and secure manner, in accordance with the agreed programme.

Carriers will be added to the sample containers as shown in Tables 1 and 2. No acid solution is required for the grab samples (options ii and iii).

For composite sampling (option i) the Series A samples will be returned on a monthly basis to be bulked into quarterly samples. Series B and C samples will be returned on a quarterly basis.

`The required reporting limits for the analyses are given in Table 4. A returnable table to be completed is provided in the Tender Return Document.

UKAS accreditation is required for all analyses. A returnable table to indicate accreditations held

is included in the Tender Return Document.

**Table 3. Sampling sites details.**

| **Site** | **Location** | **Contact Details** |
| --- | --- | --- |
| 1 | Elan Valley Reservoir, Rhayeder, Powys | Severn Trent Water LtdElan Valley Works Rhayader,Powys LD6 5HN |
| 2 | River Severn, Tewkesbury, Glous | Severn Trent Water LtdMythe Water Treatment WorksTewkesburyGloucestershireGL20 6AA |
| 3 | Groundwater, Holmesford, Matlock, Derbyshire | Severn Trent Water LtdOgston Water Treatment WorksStretton, Nr AlfretonDerbyshireDE55 6EL |
| 4 | River Tees, Broken Scar, Darlington, Co. Durham | Northumbrian Water LtdBroken Scar Water Treatment WorksConiscliffe RoadDarlingtonDL3 8TF |
| 5 | Kielder Reservoir, Northumberland | Northumbrian Water LtdOperation Centre -Yarrow moorFalstoneHexhamNE48 1BX |
| 7 | Haweswater Reservoir, Cumbria | United Utilities 11 Moss End Business VillageCrooklandsMilnthorpe, CumbriaLA7 7NU |
| 9 | Arnfield Water Treatment Plant, Glossop, Derbyshire | United Utilities Arnfield Treatment WorksManchester RoadGlossopDerbyshire.SK13 1NE |
| 10 | Ennerdale Lake, Cumbria | United Utilities 11 Moss End Business VillageCrooklandsMilnthorpe, CumbriaLA7 7NU  |
| 11 | Groundwater, Corn Close, Worsthorne, Lancashire | United UtilitiesRidgaling Water WorksPasture LaneBarrowfordNelsonLancashire BB9 6RA |
| 12 | Shallow groundwater, Denge, Folkstone, Kent | Affinity WaterStores Shearway RoadFolkestoneKent CT19 4AW |
| 13 | Deep groundwater, Chatham, Kent | Southern WaterSouthern HouseCapstone RoadChathamKentME5 7QA |
| 14 | River Dee, Huntingdon, Chester, Cheshire | United UtilitiesHuntingdon Water Treatment WorksHuntingdon ChesterCH3 6EA |
| 15 | Llwyn-on Reservoir, Cwmtaff, Cfn Coed, Merthyr Tydfil, Mid Glamorgan | Control RoomWelsh Water Llwyn-on Water Treatment WorksCwmtaff, Cefn-CoedMerthyr TydfilMid GlamorganCF48 2HS |
| 16 | Cwm Ystradllyn Treatment Works, Garn Dolbenmean, Gwynedd | Garn Dolbenmean Water Treatment WorksPorthmadoc RoadGarn DolbenmeanGwyneddLL51 9PJ |
| 17 | Ashford Reservoir, Cannington, Bridgewater, Somerset | Wessex Water plcAshford WTWCanningtonBridgwaterTA5 2NQ |
| 18 | Chew Valley Lake Reservoir, Bedminster, Bristol | Bristol WaterHead Office Bridgwater RoadBedminster DownBristol AvonBS13 7AT |
| 19 | River Avon, Christchurch, Hampshire | Bournemouth Water Stores Quadrant CentreFrancis AvenueBournemouthDorsetBH11 8NX |
| 20 | River Fowey, Lostwithiel, Cornwall | South West Water LtdRestormel Water Treatment WorksLostwithielCornwall PL22 0HN |
| 21 | River Exe, Upton Pyne, Exeter, Devon | South West Water LtdPynes Water Treatment WorksUpton PyneExeterDevonEX5 5EQ |
| 22 | Grafham Water, West Perry, Huntingdon, Cambridgeshire | Anglian Water Services LtdGrafham Treatment WorksWest PerryHuntingdonCambridgeshirePE18 0BW |
| 23 | River Drove, Stoke Ferry, Norfolk | Anglian Water Services LtdStoke Ferry Treatment WorksRiver DroveStoke Ferry NorfolkPE33 9QL |
| 24 | Groundwater, Littlecoates, Grimsby, S Humberside | Anglian Water Services LtdElsham WTWMiddlegate LaneElshamNorth LincolnshireDN20 0NU |
| 25 | River Thames, Oxford, Oxfordshire | Thames Water Utilities LtdFarmoor ReservoirCumnor RoadOxonOX2 9NS  |
| 26 | River Thames, Walton-on-Thames, Surrey | Thames Water Utilities LtdWalton Advanced Water Treatment WorksHurst RoadWalton on ThamesSurreyKT12 2EG |
| 27 | Groundwater, Bourne End, High Wycombe, Buckinghamshire | Thames WaterFobney Water Treatment WorksIsland RoadReadingBerkshireRG2 0SF |
| 28 | River Lee, Chingford, Waltham Forest, London | Thames Water Utilities LtdOperations – Water Quality902 Forest RoadWalthamstowLondonE17 4AE |
| 29 | River Thames, Chertsey, Surrey | Affinity Water LtdStaines Laboratory The CausewayStainesTW18 3BX |
| 30 | Eccup No. 1 (Washburn Valley Reservoirs), Leeds, Yorkshire | Yorkshire Water PlcEccup Water Treatment WorksHarrogate RoadLeedsLS17 7RJ |
| 31 | Chellow Heights, Bradford, Yorkshire | Yorkshire Water PlcTreatment Works Howarth RoadBradfordYorkshireuty OperatorShared ServiceBD9 6NX |
| 32 | Roadford Reservoir, Dowrglann, Cornwall | South West Water LtdRoadford Dam PumphouseBroadwoodwidgerLiftonDevonPL16 0SW |
| 33 | Honey Hill Water Treatment Works, Consett, Co. Durham | Honey Hill Water Treatment WorksNr Castleside, ConsettCo. Durham DH8 9DS |

Table 4. Required reporting limits.

|  |  |
| --- | --- |
| **Determinand** | **Reporting Limit** |
| Total alpha (as 242Pu) | 0.02 Bq l-1 |
| Total beta (as 137Cs) | 0.05 Bq l-1 |
| Total beta (as 40K) | 0.05 Bq l-1 |
| 3H | 4.0 Bq l-1 |
| 90Sr | 0.001 Bq l-1 |
| 125I | 0.002 Bq l-1 |
| 137Cs\* | 0.001 Bq l-1 |
| 210Po | 0.01 Bq l-1 |
| 226Ra | 0.01 Bq l-1 |
| 234U | 0.01 Bq l-1 |
| 235U | 0.01 Bq l-1 |
| 238U | 0.01 Bq l-1 |
| Stable K | 0.1 mg l-1 |
| Stable Ca | 0.1 mg l-1 |
| Stable Sr | 0.1 mg l-1 |
| Total Dissolved Solids (TDS) | na |

\*Plus any other radionuclides detected by gamma spectrometry at concentrations greater than 0.01Bq l-1.

End of specification