The Coal Authority

Resolving the impacts of mining

Framework Contract for Scientific Services

May 2019 – May 2023

SPECIFICATION

Version	Produced by	Reviewed by	Approved by	Date
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General Specification

1.0 Background

The Coal Authority operates over 70 mine water treatment schemes across the UK; these schemes primarily treat coal mine waters, but there is an increasing portfolio of metal mine water treatment schemes coming into operation.

A typical passive coal mine water treatment scheme comprises some or all of the following elements:

- Pumping borehole or gravity flow from an adit
- Aeration cascade
- Chemical dosing – e.g. lime, caustic soda, peroxide
- Transfer channels
- Settlement lagoons (typically 3m deep)
- Constructed wetlands (typically 0.5m deep and planted with *Phragmites*)
- Final discharge to nearby watercourse
- Sludge drying beds

Treatment for metal mine waters is more complex due to the wide range in metal mine water chemistry. Of the two current operational passive systems, one is removing iron from mine water originating from a former ironstone mine, which uses similar methods as those described above for coal mine water treatment. The second system removes metals from a former lead/zinc/barite mine, and uses sulphate reducing bacterial processes to remove metals in a compost-based bio-reactor.

The Coal Authority also oversees the operation of three active treatment schemes; two coal schemes (Dawdon and Ynysarwed) and one metal mine scheme (Wheal Jane). These schemes operate using standard metal hydroxide precipitation achieved by addition of lime or caustic soda, followed by settlement and clarification.

Flow rates through the mine water treatment schemes range from 5 to 300L/s.

2.0 Objective

The Contract is divided into four lots. LOT 1 covers field monitoring, the collection of samples and the provision of calibrated field measurement equipment; LOT 2 covers the laboratory chemical analysis of samples and includes the supporting services such as the supply and delivery of sampling materials, the collection of samples from various areas within the UK, the production of results certificates of analyses and the disposal of waste samples. It is envisaged that the monitoring and analysis of mine water will be the predominant element; however, analysis of gas, soils/ sludges/ sediments/ reed bed wastes may be required occasionally; LOT 3 covers the radiological monitoring of gas; and LOT 4 covers the radiological analysis of low level activity sludges as required.

2.1 Services Required

Services required under this contract are divided into four separate Lots and will include field monitoring and sample collection (LOT 1), analysis of samples, including analysis of samples obtained by the Authority, or on its behalf by a nominated Contractor or Consultant (LOT 2), and specialist radiological monitoring and analysis services (LOT 3). The nominated person will be deemed the Engineer.

Tenderers may wish to bid for one, two or all of the lots and should clearly indicate which lots they are bidding for. Each lot will be considered separately on a technical basis, however, where combining lots may offer cost savings, this should be clearly indicated in the tender and will be considered within the financial assessment.

Sub-contracting analysis is not the preferred option. However, if required, the Provider should provide full details of the contract laboratory (or other service provider) to be used, including all quality and accreditation information. Any future changes in sub-contracting arrangements would require the full agreement with the Coal Authority. All sub-contracted analysis will be required to meet the same timescales and quality standards as placed on the Provider.

LOT 1 Field Monitoring

The Provider shall be required to supply suitably experienced and qualified personnel for field monitoring and sampling services, to the satisfaction of the Coal Authority or the Engineer. Refer to Section 6.2 for further information.

The Provider will be required to undertake projects involving short to medium-term monitoring campaigns. The monitoring programme will be designed by the Coal Authority. The exact monitoring requirements for any given project will vary. Occasionally, the Provider may be requested to attend sites at short notice to undertake urgent / reactive sampling activities related to project or operational requirements.

A typical project will involve field monitoring, and the collection and laboratory analysis of samples (the latter is included in LOT 2). Monitoring will likely be required at multiple locations throughout any given sampling programme. Sites where monitoring and / or samples could be required include (but are not limited to) mine water treatment schemes; field scale pilot trials and catchment monitoring etc. Typically, it is estimated that there would be between 5 and 15 monitoring locations at any given site. A detailed sampling programme will be provided by Coal Authority and agreed with the supplier before any works commence.

Required sampling frequency will vary from project to project, from one-off monitoring rounds, to daily or weekly visits for up to 3 or more months, and in some cases 12 month sampling campaigns.

It will be the responsibility of the Provider to request and ensure that the correct sampling equipment (sample bottles, cool boxes, syringes and filters etc.) is provided by the Laboratory Services Provider (LOT 2) for all sampling campaigns undertaken by this contract.

The Provider will be expected to provide factual reporting from time to time of the onsite monitoring (including the instruments and calibration procedures used) in addition to a summary of all samples collected. This is in addition to routine reporting of on-site field

measurement results. Interpretative reporting is not envisaged to be required for LOT 1, however it may be requested as an optional item.

Flow monitoring of flow structures created to the appropriate, current BS or ISO standard will be required. Basic maintenance of such flow structures (such as removal of obstructions, cleaning of fouled surfaces etc.) is expected, where safe to do so. The condition of any flow structure monitored (including any remedial action taken and non-compliances with the standard) should be reported along with the flow monitoring results.

Although not a requirement, remote monitoring capabilities (such as drone surveys) may be valuable in providing additional information about a site. The Provider should include details of any capabilities they have to supply such remote monitoring services.

LOT 2 Laboratory Services

The Provider shall be required to provide suitably experienced and qualified personnel working in a high quality laboratory environment with accredited procedures (where possible) for all laboratory analyses, to the satisfaction of the Coal Authority or the Engineer. Refer to Section 7 for further information.

The Provider will be required to undertake projects involving short to medium-term monitoring campaigns. The monitoring programme will be designed by the Coal Authority and will typically use standard analytical suites that have been agreed with the Laboratory. On occasions, it may be necessary to devise a new analytical suite to fulfil the requirement of a project. Where this is the case, the Coal Authority will contact the Provider with a breakdown of the analysis to obtain a quote and a new suite code will be created for use. The exact monitoring requirements for any given project will vary.

A typical project will involve field monitoring (included in LOT 1) and the collection and laboratory analysis of samples. Monitoring will likely be required at multiple locations throughout any given sampling programme. Sites where samples could be required include (but are not limited to) mine water treatment schemes; field scale pilot trials and catchment monitoring etc. Typically, it is estimated that there would be between 5 and 15 sampling locations at a given site. A detailed sampling programme will be provided by Coal Authority and agreed with the supplier before any works commence.

Required sampling frequency will vary from project to project, from one-off monitoring rounds, to daily or weekly visits for up to 3 or more months, and in some cases 12 month sampling campaigns.

It will be the responsibility of the Provider to provide the correct sampling equipment (samples bottles, cool boxes, syringes and filters etc.) to the Field Monitoring Provider (LOT 1) for all sampling campaigns undertaken by this contract. This includes the delivery of sampling equipment to a designated address, in addition to the collection of samples for delivery to the laboratory.

The Provider will be expected to provide factual reporting of the laboratory analysis, collating all results for specified sites, in addition to routine reporting of results and the accreditation certificate for each sample report. Interpretative reporting is not envisaged to be required for LOT 2, but may be a requirement on occasion.

LOT 3 Radiological Monitoring of Gas

The Provider will be required to provide suitably trained and competent individuals to undertake radiological monitoring and analysis as required by the Engineer.

The Provider will be required to collect and analyse gas samples for Radon.

It will be the responsibility of the Provider to provide the correct sampling equipment and that all sampling is undertaken in compliance with relevant Health, Safety and Environmental Procedures and Public Health England guidance.

The Provider will be expected to provide factual reporting of all monitoring with appropriate accreditation certificates where appropriate. Interpretative reporting is not envisaged to be required for LOT 3, but may be requirement on occasion.

LOT 4 Radiological Analysis of Low Activity Sludges

The Provider will be required to provide suitably trained and competent individuals to undertake radiological monitoring and analysis as required by the Engineer.

The Provider will be required to analyse low activity sludges (including NORM) as per the Ionising Radiation Regulations 2017 (see Section 9 for further details).

It will be the responsibility of the Provider to provide the correct sampling equipment and that all sampling is undertaken in compliance with relevant Health, Safety and Environmental Procedures.

The Provider will be expected to provide factual reporting of all analysis with appropriate accreditation certificates where appropriate. Interpretative reporting is not envisaged to be required for LOT 4, but may be requirement on occasion.

2.2 Estimated Annual Requirement

Please refer to Table 3 and Table 4 in the Monitoring Suites for Laboratory Analysis within the Guidance for Monitoring Mine Water, provided as an attachment.

The current estimated annual number of field monitoring visits is as follows:

- 36 days per annum

The current estimated annual number of samples for analysis is as follows:

- CA1 Suite 100 samples per annum
- CA2 Suite 100 samples per annum
- CA3 Suite 100 samples per annum
- CA3+DOC Suite 25 samples per annum
- CA4 Suite 25 samples per annum
- MET_PR 50 samples per annum
- MET_STR 50 samples per annum
- MET_VFR 25 samples per annum
- CA01 15 samples per annum

- CA02 25 samples per annum
- CA_MET 25 samples per annum

Radiological monitoring and sample analysis is required from time to time on a project specific basis, particularly is some of the regional areas covered by this contract. Unfortunately, due to the project specific nature of this requirement an estimate of the potential amount of work required is not possible.

The information provided above should be used as indicative guidance only and is subject to change. The Coal Authority cannot guarantee the volume of samples which may be ordered. It is anticipated that the number of field monitoring visits and samples requiring analysis could increase significantly based on the current mine water remediation and research and development programmes that the Coal Authority are operating. Therefore, these numbers should only be used as an approximate guide. The majority of the work required under this contract will be ad-hoc in nature and the extent of the requirement will be project specific. However all details will be discussed and agreed with the field monitoring and laboratory suppliers, prior to the work commencing.

2.3 Location

The contract requires attendance at various locations throughout England, Scotland and Wales. Regions are as listed below:

- Scotland (predominantly the Southern Uplands, Central Belt and Fife)
- Northumberland and County Durham
- Cumbria
- Cheshire/Lancashire
- Yorkshire – North of Sheffield
- South Yorkshire/Nottinghamshire/Derbyshire/Leicestershire
- Staffordshire/Shropshire/Warwickshire/Herefordshire/Worcestershire
- Avon/Somerset
- Devon/Cornwall
- South Wales (including Pembrokeshire)
- North Wales (including Anglesey)
- Mid-Wales (Ceredigion and Montgomeryshire)

3.0 The Engineer and Consultants

The Coal Authority will notify the providers of the 'Engineer to Contract' for each instruction. Any restrictions on the Consultant or Contractor in performing the role of Engineer will be notified to the Providers.

The Providers will be required to co-operate fully with any Consultant or Contractor appointed by the Coal Authority whether or not the Consultant/Contractor is appointed as Engineer.

3.1 Instructions

The Services to be provided shall be specified as and when required by Engineer. The Provider will cooperate with the Coal Authority to put in place an agreed Service Instruction template to include all relevant information to allow the Services to be undertaken.

3.2 Confidentiality

The Providers shall instruct all personnel employed on this Contract that confidentiality must be rigorously enforced. Unless otherwise instructed by the Engineer, the Providers shall not communicate the results of any monitoring or testing or the fact that any monitoring or testing has been requested to any other party.

The Coal Authority may give permission in writing to the Provider to communicate with a specified Consultant/Contractor regarding specified sampling sites and results (in accordance with Section 3 above).

Any confidential material provided by the Provider (such as standard operating procedures, in-house methods or results of inter-laboratory proficiency testing) will be treated in strictest confidence by the Coal Authority. No such information will be distributed to third parties without the written consent of the Provider (subject to the proviso below).

The Coal Authority is a Non-Departmental Public Body and has obligations to disclose certain information under the Freedom of Information Act 2000 and to environmental regulators under their powers. Information provided to the Coal Authority should be made in full knowledge of that fact and all confidential information should be clearly marked as 'Confidential'.

4.0 Health, Safety and Environment

Nothing contained in this Specification shall be construed as overriding or limiting the rights of the Coal Authority or the obligations of the Providers under the Health and Safety at Work Act 1974, Control of Substances Hazardous to Health Regulations 2002, EH40-2005 Workplace Exposure Limits Guidance or any other statute, regulations, rule, order or bylaw.

The Provider's attention for LOT 1, LOT 2 and LOT 3 are drawn to the Coal Authority's SHE Policy Statement (attached). The requirements of this document will be strictly enforced and any costs associated with complying with the Policy must be included in your submission.

LOT 1 (and LOT 3)

In particular, the Providers of LOT 1 and LOT 3 will have special regard, when carrying out any field sampling or monitoring, to the attendant risks from old mine entries, shallow mine workings, toxic wastes, toxic and asphyxiant mine gases, old foundations, working in or near water courses, steep banks and gradients.

The Provider shall at all times co-operate, as far as is reasonably practicable, with all parties having Health and Safety responsibilities on or adjacent to any working locations, including the operators of our mine water treatment schemes, primarily Severn Trent Services.

The Provider will be required to comply with the Coal Authority's current SHE guidance for contractors (attached).

The Provider will be required to complete inductions with the Coal Authority's appointed Operational Contractor with responsibility for the particular sites or authorised Coal Authority personnel if attendance to one of the controlled sites (e.g. mine water treatment schemes) is required.

From time to time, the Provider may be required to work on site unsupervised by Coal Authority or Operational Contractor personnel. The sites are usually unmanned. The Provider may be required to liaise directly with the Operational Contractor's personnel to arrange access to locked sites.

Note most mine water treatment sites do not have any sanitation or potable water supply. The majority of sites do not have accessible electricity supply power points. Many sites are exposed and have limited shelter from the elements.

The Provider will be required to prepare a site- and task-specific method statement and risk assessment for each project.

Typical health, safety and environmental hazards when undertaking field monitoring include (but are not limited to):

- Working next to water
- Mine water
- Mine gases
- Hazardous chemicals used to aid mine water treatment
- Biological hazards of natural waters (such as *Legionella* and *Leptospirosis)*
- Flora and fauna
- Manual handling - it is not always possible to park immediately adjacent to every potential sampling point
- Uneven ground
- Underground workings
- Adverse weather - most of our mine water treatment sites have no buildings or shelter and are often located in exposed areas with limited shelter
- People - some parts of our mine water treatment schemes are accessible to the general public.

Mandatory PPE requirements include:

- Hi visibility jacket or vest
- Safety boots (steel toe cap & midsole) with ankle support
- Gloves (type as appropriate to task)
- Hard hat (if construction works are happening at site)

- Eye protection (type as appropriate to task)
- Life jacket (self-righting, to be worn if working within 2m of lagoon or watercourse)

Additional PPE/RPE may be required, depending on the nature of the tasks being undertaken.

5.0 Accreditation and Quality Control

The Coal Authority requires the Providers to work in accordance with accredited quality management systems (e.g. UKAS and MCERTS accreditation).

Staff involved in monitoring and analysis shall be suitably trained, competent and responsible for ensuring that the agreed quality control and quality management procedures are followed. The Provider should be able to issue a statement of qualifications if requested.

Parties primarily involved in sampling or laboratory analysis may wish to have an awareness of how the data (field or laboratory) might be assessed by the Coal Authority.

LOT 1

Additional quality control checks on data submitted by the field monitoring service Provider will be done by the Coal Authority, or its Consultants. Parties primarily involved in field measurements may wish to have an awareness of how on-site data might be assessed. The following points are considered.

- Once a dataset has been built up over a period of time then historical data give a good indication of what values to expect. Any significant differences from normal should be investigated.
- Conductivity can be reported in either µS/cm or mS/cm depending on the salinity of the mine water; results can be compared to the laboratory data to ensure that the correct units are being reported.
- The majority of mine waters in the UK are either net-alkaline or circum-neutral. The pH is therefore often reviewed to ensure that this is correct to reflect known conditions at site. Any significant change in pH on site will require further investigation.
- Certain parameters are reported in positive or negative numbers (e.g. redox potential / Eh). Based on the type of water being monitored, a review is made to make sure the reported values reflect site conditions.
- Field measurements may be compared to laboratory analyses. Due to degassing and precipitation reactions in the sample bottles, moderate changes in pH, alkalinity (and acidity) and conductivity may be observed between field and laboratory values.
- Flow monitoring structures will be used according to the appropriate, current BS or ISO standard. Flow measurements recorded may be compared to flow meter readings or readings calculated using the appropriate calculation of flow rate as specified in the standard.

Mine water is a highly variable and unstable media. Depending on the analytical suite required, a series of sample bottles will need to be filled at the sampling point. The bottles will differ in their collection, and preservation, and must be clearly labelled to reflect this.

For each determinand there is a preferred preservation method. For less stable determinands that are common in mine waters, it is critical that the correct preservation is applied. Table 1 links each determinand to the sample bottle type which represents an acceptable sampling method for that determinand.

Table 1. Preservation method acceptable for common determinands

Bottle size: Preservation:	1L No Preservative	100-500mL Nitric Acid	100-500mL Nitric Acid – Field Filtered	100-500mL Hydrochloric Acid
Non-Metals				
pH	✓			
Electrical conductivity	✓			
Total alkalinity	✓			
Chloride	✓			
Sulphate	✓			
Ammoniacal nitrogen*	✓			
Total suspended solids	✓			
Others	✓			
Total metals				
Iron, manganese, aluminium		✓	×	
Others		✓	×	
Dissolved metals (field filtered)				
Iron, manganese, aluminium	×	×	✓	
Others	×	×	✓	
Ferrous Iron				
Ferrous iron	×	×	×	✓

Notes:
*Ammoniacal nitrogen is sometimes preserved in sulphuric acid; however the Coal Authority does not require this method for most sites.

For bottles intended for metals analysis (i.e. total metals and dissolved metals), the Coal Authority requires the sample to be acidified with nitric acid in the field to prevent precipitation of metals, especially iron. If not preserved, there is a very high chance that any dissolved iron will drop out of solution in the bottle before it reaches the laboratory.

For a representative value of dissolved iron, field filtering of the sample is essential. Laboratory filtering is not an acceptable substitute as many mine waters, particularly from coal mines, contain significant amounts of iron, which will usually precipitate in the bottle.

Ferrous iron must be preserved with hydrochloric acid in the field. If it is not preserved it will in most cases readily oxidize and precipitate, and the sample will not be representative when it reaches the laboratory. The acidification process will dramatically slow down the rate of oxidation.

The laboratory may provide a sample submission form which should be completed and sent with the samples to the laboratory. It should be made clear to the laboratory which analysis suite is required for each sample location, such that they will expect the relevant

bottles. Reference to the suite codes is expected as the laboratory will then know which bottles to expect to make a complete analysis for each sampling location.

The Coal Authority will require the Provider to co-operate with the planning and implementation of a suitable sample quality assurance programme. As part of this assurance programme Coal Authority personnel may, from time to time, conduct audits of field monitoring and sample collection activities and will require access to appropriate certification/accreditation documentation, standard operating procedures, health and safety documentation and training records for staff involved in these activities (to demonstrate training and competence).

LOT 2

The Laboratory Service Provider will be required to provide details of their in-house QA/QC procedures (including details of the Laboratory Information Management System used) and also details of any relevant inter-laboratory proficiency testing studies.

Additional quality control checks on data submitted by the Laboratory Service Provider will be done by the Coal Authority, or its Consultants. Parties primarily involved in laboratory analysis may wish to have an awareness of how data might be assessed. The following points are considered.

- Once a dataset has been built up over a period of time then historical data give a good indication of what values to expect. Any significant differences from normal should be investigated.
- For coal mine waters in particular, abnormally high total iron values usually indicate that ochre / sediment may have been mistakenly included in the sample bottle. This may be accompanied by high suspended solids in addition to elevated concentrations of other metals such as aluminium and manganese, and in the case of metal mine sites, lead. In these instances, it is not possible to re-test the sample and a fresh replacement sample may need to be collected as soon as possible.
- Total metal concentrations should always be greater than dissolved metals, or at least very similar (i.e. within analytical error).
- In the majority of cases where pH is greater than ca. pH 5, it is generally assumed that any dissolved iron in the water will be present in the ferrous form. Thus, normally, the ferrous iron concentration should be similar in value to the dissolved iron concentration.
- A charge balance (Ion Balance Error - IBE) of the major dissolved cations (e.g. calcium, magnesium, sodium, potassium) and anions (alkalinity, chloride, sulphate) should usually be within 5%, although this may become more problematic for heavily ferruginous or saline waters. Any samples where IBE's >20% (by exception) are reported should be further investigated, as this could suggest that there is an error in the reported data.
- Field measurements may be compared to laboratory analyses. Due to degassing and precipitation reactions in the sample bottles, moderate changes in pH, alkalinity (and acidity) and conductivity may be observed between field and laboratory values.

The Coal Authority would expect that the laboratory would undertake standard quality checks on the results prior to release of the data. As a minimum this would be expected to

include a check of the IBE, total vs dissolved metal concentrations and a review of the historical trends to identify any atypical results.

Following a review of the data, if Coal Authority staff suspect there to be an error in the reported data, enquires will be made with the site operatives and / or the laboratory to investigate this further. This may result in a request for a re-test of the sample by the laboratory as a confirmation, at the cost of the Provider, which may result in further data reports being issued for the sample if the original result is not confirmed.

Coal Authority staff may from time to time wish to visit any laboratory providing an analytical services to satisfy that samples are being handled and analysed correctly, or to discuss analytical methods, which may be affected by interferences associated with the mine water sample matrix.

The Coal Authority would require a copy of each chain of custody record for all samples submitted for laboratory testing for auditing purposes.

The Coal Authority will require the Provider to co-operate with the planning and implementation of a suitable sample quality assurance programme. As part of this assurance programme Coal Authority personnel may, from time to time, conduct audits of sample preparation and analysis activities and will require access to appropriate certification/accreditation documentation, standard operating procedures (including in house methods), health and safety documentation and training records for staff involved in these activities (to demonstrate training and competence).

LOT 3

All monitoring should be undertaken in compliance with relevant standards and by staff who are trained and competent at radiological monitoring of gas. Details of relevant methodologies and QA/QC procedures should be made available to the Coal Authority upon request.

LOT 4

All analysis should be undertaken in compliance with relevant standards and by staff who are trained and competent at radiological analysis. Sludge analysis is required to be undertaken by a UKAS accredited laboratory. Details of relevant methodologies and QA/QC procedures should be made available to the Coal Authority upon request.

6.0 Particular Specification LOT 1 Field Sampling

6.1 General

When required, the Field Monitoring Provider shall be instructed by the Engineer to send suitably qualified and competent personnel to attend a field site and to conduct the sampling and field monitoring. The Coal Authority would consider suitable qualification and competence of field staff to include:

- Principles and good practices of environmental sampling
- Introductory knowledge of mine water treatment
- Experience in all aspects of sampling

- Supervised experience with appropriate laboratory techniques, if staff are expected to undertake on-site analysis (e.g. titrations) or operate field monitoring probes.
- Experience of flow monitoring, if staff are expected to take flow readings and remove or install data loggers.
- Full knowledge of the Coal Authority's Guidance for Non-Routine Monitoring of Mine Waters Including Sampling and Analysis (attached) and any relevant in-house sampling manuals followed by the Provider.

The Provider shall, as required by the Engineer, make arrangements with the Laboratory Services Provider (LOT 2) for delivery of sampling equipment to any UK address within two (2) working days of instruction, unless otherwise agreed with the Engineer.

The sample containers will be supplied with labels and sample submission forms. Blank labels will allow each sample aliquot to be uniquely identified following completion of the label at the time of sampling with the sampling details (i.e. site name, location description, sample aliquots filled, sampler identity, date and time). The sample submission form will be in a format to allow the Field Monitoring Provider to clearly and concisely specify the sampling details and analytical requirements (e.g. suite of determinands as specified by this Contract). Alternative methods of unambiguously communicating the sampling details and analytical requirements between Field Monitoring Provider and Laboratory Services Provider may be acceptable, but shall be agreed by the Engineer in advance.

Where preservation of samples in the field is required, the Laboratory Provider will advise the Field Monitoring Provider of the appropriate sampling method and supply the appropriate materials including sample containers – see below for more details. The containers will be labelled clearly to identify any pre-filled preservation fluids, and will be accompanied by documentation including relevant health and safety information.

At sites where water samples are routinely collected or long-term sampling programmes are being undertaken, the Field Monitoring Provider may request that sample bottles are pre-labelled with site name and sampling location as per the Coal Authority's current sampling programme. Additionally, the sample submission form will be pre-printed with sampling location details and required analytical suite, as per the sampling programme. At the time of sampling the Field Monitoring Provider will only have to complete the time and date and sampler identity.

The Laboratory Services Provider will provide the pre-labelled sample bottles sorted into sets as required for the pre-scheduled suite for each sampling location. By agreement the Laboratory Services Provider may provide one container per sampling site, containing all the bottles required for the sample suites for the sample locations at each site.

As part of the pre-labelling service, the Laboratory Services Provider will supply to the Field Monitoring Provider a reasonable number of spare un-labelled sample containers, in case of accidental damage to any of the pre-labelled containers.

Pre-labelling does not apply to ad hoc samples, which will occasionally be required.

Where samples are required to be kept cool for purposes of preservation, the Laboratory Services Provider shall supply sufficient "cool boxes" and ice packs as necessary to the Field Monitoring Provider.

It will be the responsibility of the Field Monitoring Provider to ensure that ice packs are frozen in suitable appliances (designated non-food) and kept cool before sampling

commences to ensure that samples are kept cool for as long as possible prior to delivery to the laboratory.

All “cool boxes” and ice packs that are the property of the Laboratory Service Provider must be returned to the Laboratory Service Provider in the condition in which they were received, notwithstanding reasonable wear and tear.

In hot weather conditions, additional ice packs may be required. Should the Field Monitoring Provider wish to have a separate supply of additional ice packs, they must agree with the Laboratory Service Provider how they will be differentiated from those owned by the Laboratory Service Provider, and must be returned to the Field Monitoring Provider in the condition in which they were received, notwithstanding reasonable wear and tear.

6.2 Field Monitoring and Site Visits.

When monitoring and/or site visit is required by the Field Monitoring Provider, the Engineer will liaise with the Field Monitoring Provider regarding methodology and to ensure that visits to the site can be completed in a safe manner. This may be done in consultation with, or with accompaniment from the Coal Authority’s Operational Contractor. The Operational Contractor will be aware of the inherent risks associated with each site and will communicate risk assessment data to the Field Monitoring Provider. The Field Monitoring Provider will be required to demonstrate their capability of utilizing the data to provide suitable risk assessments.

All sampling will be surface sampling i.e. no underground sampling from mines will be required. However, the provider’s personnel may on occasion be requested to wait at a mine entry to receive a sample collected by a third party from an underground source. Sampling from boats in lagoons/watercourses may occasionally be required and the Provider should indicate their capability to provide this.

Onsite XRF surveys of mine spoil tips may be required from time to time to identify sources of pollution and the capability to provide this service should be clearly indicated.

The current version of “The Coal Authority’s Guidance for Non-Routine Monitoring of Mine Waters, Including Sampling and Analysis” is attached at Appendix A. This provides a standard general framework for the field monitoring of mine waters which the Field Monitoring Provider will adhere to. The Field Monitoring Provider shall comply with this document unless otherwise agreed with the Coal Authority in writing.

No works are to commence on site until the Field Monitoring Providers Method Statement and Risk Assessments have been provided to the Engineer and are sufficiently developed to commence on site.

The Provider should detail their minimum mobilisation time following an urgent request to attend site for sampling and monitoring activities.

6.3 Additional Health and Safety Monitoring

There may be occasional requirements for monitoring activities and the collection of samples for the purposes of Health, Safety and Environmental assessment. This will include:

- The Field Monitoring Provider may be requested to attend site to collect water samples for *Legionella* and/or faecal coliform testing.
- The Field Monitoring Provider may be requested to attend site to monitor dust levels and conduct dust sampling.

Provision of these or similar services will be agreed with the Provider on an individual basis by the Engineer.

7.0 Particular Specification LOT 2 Laboratory Analysis

7.1 General

The Provider shall, as required by the Engineer, make arrangements for collection of samples from any UK address. The Laboratory Services Provider shall be liable for the security of samples from the time of collection, and in the event of breakage or loss, shall be liable for costs to the Coal Authority, of any re-sampling necessary.

Where reactive substances are involved, the Laboratory Services Provider will advise the Engineer of the acceptable maximum delay and make arrangements to commence the analysis accordingly.

Analysis shall commence within 48 hours of the Laboratory Services Provider being notified that the sample is available, or 24 hours of the issue of a test schedule, whichever is the later.

A test schedule may be requested by the Engineer to facilitate checking that the samples have been booked in for the requested suite of analysis.

The Laboratory Services Provider must be able to demonstrate the capability to analyse all of the major parameters required (refer to Appendix B, provided as an attachment), or shall identify any sub-contract laboratories who the Laboratory Services Provider proposes to employ, with agreement sought from the Coal Authority prior to any works commencing.

The Laboratory Services Provider should indicate measurement uncertainty for each analytical method used.

The Laboratory Services Provider must demonstrate compliance with the detection limit criteria in the attached Appendix B. The same detection limit is expected whether the determinands are analysed individually or as part of a suite. Where the Laboratory Services Provider's analytical method cannot meet the stated requirement, any proposed alternative method and associated detection limit and measurement uncertainty must be clearly stated for consideration by the Coal Authority in Schedule A to the Specification (and attach Schedule A where indicated as a response to the appropriate technical question).

As part of quality assurance of sample data, the Coal Authority will occasionally require the Laboratory Services Provider to perform cross-determinand checks on the analytical results at the cost of the Laboratory Services Provider. For example, checking that total iron is greater than dissolved iron or ferrous iron (within analytical error), or providing a calculated ion balance error where major ions have been analysed.

Results of the analyses shall, except in exceptional circumstances, be supplied to the Engineer within five (5) working days of any sample being available to the Laboratory Services Provider, whether obtained by the Engineer, the Laboratory Services Provider or another party.

In exceptional circumstances, the Provider may occasionally be required to provide results in less than the standard five (5) working days, if analytical methods allow. This will only be done on the specific request of the Engineer.

The Laboratory Services Provider will occasionally be required to provide interim results as they become available, and before a completed results certificate is issued. Electronic services, such as web portals, which allow external customers to track the progress of samples submitted for analysis and shows interim results would be of benefit to the Coal Authority, where offered by the Laboratory Services Provider.

A certificate showing the completed results shall be issued by the Laboratory Services Provider. The certificate will clearly indicate the sampling site name and Coal Authority's site reference number, description and identification number of each sample, date and time of sampling, the results for each determinand with reporting units and limits of detection, the name of the Engineer, the Laboratory Services Provider's name and address, laboratory identification numbers and appropriate details of the methods used and quality assurance / accreditation details.

Results shall be reported in the units listed with the Detection Limits in Appendix B.

The Coal Authority will require the following documents to be provided electronically:

- results certificate,
- test schedule,
- interim results

A suitable electronic format for these is one compatible with Adobe PDF or Microsoft Word or Microsoft Excel. Accredited (UKAS, MCERTS or equivalent) results certificates will be provided in a file which cannot be edited, e.g. Adobe PDF. Electronic documents should be given a file name which is reasonably descriptive so it is clear what the document contains, e.g. site name, sampling date, and laboratory reference number. The appointed Laboratory Services Provider will be notified of a specific email address to forward the specified electronic documents to, and it is imperative that they are received there.

The Coal Authority also requires the results in an electronic, tabular form, for example a spreadsheet format compatible with Microsoft Excel, including comma separated variable, "csv" text files. Other standards for electronic data transfer may be considered, if proposed by the Laboratory Services Provider, please provide any such details as an attachment as part of the response to the appropriate technical question.

For every batch of sample results, the tabular results must be emailed directly to the Coal Authority to the dedicated email address. In most cases the Engineer will also require a copy of the electronic results. This will aid archiving the analytical results into the Coal Authority's database.

When the Laboratory Services Provider emails the results certificates, or other documents, to the Engineer, it is essential that the Coal Authority is copied in to the same email via the dedicated address referred to above.

The Coal Authority requires that the Provider will collate all results from all sites and locations into a single spreadsheet on a monthly basis, and deliver this electronically as above. This will facilitate the Coal Authority transferring the data into its electronic database.

The disposal of all waste samples and containers shall be the responsibility of the Provider. Periods to retain samples for possible re-testing are specified below.

7.2 Water Analysis

Analysis of mine waters will form the bulk of the work the Laboratory Services Provider will be asked to provide. Some other environmental (generally non-potable) waters, including surface watercourses and groundwaters, will also be included.

The current version of "The Coal Authority's Guidance for Non-Routine Monitoring of Mine Waters, Including Sampling and Analysis" is attached at Appendix A. This provides a standard general framework which the Laboratory Services Provider, and others involved in monitoring mine waters, will adhere to. The Laboratory Services Provider shall comply with this document unless otherwise agreed with the Coal Authority in writing.

The Laboratory Services Provider shall provide all necessary sampling materials at the request of the Engineer or Field Monitoring Provider, these will include the following :–

- Inert non-leaching bottles (glass or plastic PET) for water samples
- Disposable syringe filters and 0.45µm filter units
- Preservative fluids (e.g. pre-measured volume of nitric acid or hydrochloric acid)

The above must be provided as applicable to the specified determinands and the laboratory's protocols.

The guidance document at Appendix A, and Table 1 in Section 5.0, provides details of which bottles and preservation method should be employed for each mine water suite, and the details which should be added to labels and the Laboratory Services Provider shall adhere to this guidance.

Containers shall be pre-labelled and ready for use, subject to the application of any preservatives which are unsuitable for prior addition. Hazard labels shall be displayed on any containers in which materials liable to cause harm are supplied. Health and safety information about the preservatives must be provided to sampling personnel.

Suitable crates or other containers shall be supplied for transport of the filled sample bottles back to the laboratory.

Where samples are required to be kept cool for purposes of preservation, the Laboratory Services Provider shall supply sufficient "cool boxes" and ice packs as necessary.

Water samples shall be retained by the Laboratory Services Provider for a period of two (2) calendar months from the date of commencement of analysis, unless otherwise agreed with the Engineer.

7.3 Sediment Analysis

The Laboratory Services Provider shall provide all necessary sample containers, at the request of the Engineer or Field Monitoring Provider, and recommend the minimum sample quantities required for analyses. These will include the following:–

- Sludge / Waste liquid samples should be collected in plastic HDPE with leak proof lid.
- Solid waste samples should ideally be collected in heat sealed plastic bags and, as a minimum, double bagged or collected in suitable HDPE containers.
- Any waste sampling emitting an odour when sealed must be placed in a secondary container e.g. heat sealed plastic bag.
- Solvent samples must be placed in a container that will not degrade on contact with the sample.

The comments made above for water analysis regarding labelling, preservation, and transportation will apply to all sediment (soil, ochre, stream sediments, mine tailings etc.) samples.

All samples shall be suitably labelled in the field. An assessment must be carried out to determine the most appropriate description of the sample and the following provided:-

- Site name
- Sampling Location
- Date
- Time
- Sampler
- Contact Telephone Number
- Sample Description – Solid/Liquid/Sludge
- Hazard Details (affix hazard label if required)

Waste Acceptance Criteria (WAC) testing according to the most current industry standards may be requested. Leaching tests may be requested followed by eluate (leachate) analysis, for example BS EN 12457 Parts 1 to 3, 2002 leachate tests for waste characterisation.

Sediment samples shall be retained for two (2) calendar months, unless otherwise agreed with the Engineer.

7.4 Gas Analysis

Gas analysis here refers to sampling and analysis of gas in the air phase (i.e. not dissolved gases in the water phase), typically the gas being emitted from mine workings. The Laboratory Services Provider shall provide sample containers for its own use as and when required to carry out gas sampling. In most instances, where gas samples are obtained by the Engineer, the Laboratory Services Provider will supply its own containers, typically Gresham tubes and/or Tedlar bags.

The sample containers used shall be inert to the gas mixture being sampled and free of contamination from any previous use. Should such contamination occur the Laboratory Services Provider shall be responsible for the cost of re-sampling and analysis.

7.5 Additional Health, Safety and Environmental Analysis

There may be occasional requirements for the analysis of samples for the purposes of Health, Safety and Environmental assessment. This will include:

- The Laboratory Services Provider may be requested to analyse water samples for *Legionella* and/or faecal coliform.
- The Laboratory Services Provider may be requested to analyse material samples for asbestos.
- The Laboratory Services Provider may be requested to analyse dust samples for the presence of hazardous substances.
- The Laboratory Services Provider may on occasion be requested to analyse water samples for the presence of algae in the instance of an algal bloom. This will aim to ascertain any potential adverse effect the algae may have on the wider environment (e.g. cyanobacteria).

Provision of these or similar services will be agreed with the Provider on an individual basis by the Engineer.

8.0 Particular Specification LOT 3 Radiological Monitoring of Gas

There may be an occasional requirement for the analysis of gas samples for concentration of Radon (Bq/m³) and calculated concentration of Radon progeny (J/m³). Samples are to be collected by the Provider in Gresham tubes and sent for analysis as soon as possible after collection. Alternatively, samples may be collected by Coal Authority personnel or appropriate third parties and sent to the Provider for analysis. The analysis must be completed by the Provider within four (4) days of the sample collection at the latest.

9.0 Particular Specification for LOT 4 Radiological Analysis of Low Activity Sludges

The Provider may be requested to attend a site to conduct radiological monitoring. This may require a competent technician to determine presence of radioactivity in the atmosphere and to confirm safe entry.

The following laboratory analysis may also be required:

- Low Specific Activity Sludge Contamination (including NORM): Determination of the presence of the most common gamma emitting radionuclides found in the ^{232}thorium, ^{238}uranium and ^{232}uranium series, in sludge, to assess whether the material is considered to be radioactive with regard to the Radioactive Substances Act 1993 or the Ionising Radiations Regulations 2017 (IRR17).

The purpose of this monitoring is to ensure safe working and entry to a site, as well as to confirm suitable routes for disposal of material.

Where a laboratory service provider for LOT 4 is unable to collect water or sediment samples directly, clear instructions for sampling requirements (i.e. details on containers/bottles, preservation methods, sample quantities, sample handing times etc.) must be provided to the Coal Authority and Field Monitoring Provider to ensure the correct procedure is followed so that the results are not compromised.

Please note, the Coal Authority would only request samples of mine water, ochre sludge or mine tailings to be collected to determine whether the sample media falls within scope of the current NORM regulations, and not for any other radiological monitoring.