Department
for Environment
Food & Rural Affairs

Appendix 2 – Call-Off Procedure:

for The Research, Development and Evidence Framework 1

Tender Reference:

Mole GWModel MF6 & Update

Project Ref: C-25863; Contract Ref: C-26372

Date: August 2024

1.0 Request for Proposal

1.1 The following document is to be used as a Call-Off template to be sent to all Contractors on a sub-lot by the Project Manager of the Contracting Authority for completion and return in accordance with the Call-Off procedures detailed in the Form of Agreement.

Research, Development and Evidence Framework **REQUEST FOR PROPOSAL**
To be completed by Contracting Authority Project Manager please remove all red

text before issuing			
Project title:	**Mole GWModel MF6 & Update**		
Call off Reference:	**RDE651**		
Atamis project ref (if applicable):	**C-25863**		
Cost Centre Code (for admin purposes only)	**10002926**		
Date:	**16/08/2024**		
Contracting Authority (Defra and its arms-length bodies etc)	**Environment Agency**		
Project Manager:	[redacted]	**Phone number:**	[redacted]
Authorized by:	[redacted]	**Email:**	[redacted]
Commercial Contact (if applicable):	[redacted]		

Project Start Date	**No later than 16th September 2024 , final date to be agreed with project manager**			
Project Completion Date	**Within 2 years from the start date**			
For any projects over the direct award threshold, full competition is required (i.e. all contractors on the Sub-Lot are invited to quote).	**Direct Award**	**N/A**	**Mini-comp**	**Yes**
Call off from Sub-Lot number	**5.2**			
Proposal return date:	**30/08/2024**			

Evaluation criteria:		
Contractors: Failure to meet any minimum score threshold stated will result in the bid being removed from the process with no further evaluation regardless of other quality or price scores.		
Quality	**Weighting**	**55%**
Social Value	**Weighting**	**10%**
Price	**Weighting**	**35%**
Quality Sub-Criteria Weightings: (Indicative only)		
E01 - Programme and Risk Management Max. 3 pages A4 Font Arial 12 + Gantt Chart + Risk Register	Please outline how you will ensure that this project will be delivered on time, within budget and to the required quality. In addressing this question your response should include: • What you perceive to be the main challenges and risks facing this requirement. Provide a comprehensive risk register as an attachment to this section, with mitigating actions, including pre and post mitigation scores. • Methodologies adopted by your organisation to mitigate such occurrences. • Outline programme in form of a Gantt chart, identifying key milestones and critical path activities, with justification to time estimates for tasks, to be included as an appendix. No other appendices shall be included in this section. • Description of the Quality Assurance procedures which will be used in this contract. • Details as to how the proposed management team will bring their skill and experience to deliver the project to time and budget. • Details of the proposed approach to management of the contract, to ensure it is delivered on time and to budget.	**30% of the 55% Quality weighting**

E02 - Understanding of MODFLOW6 code and regional groundwater modelling, and adequacy of technical staff resources Max. 6 pages A4 Font Arial 12 +CV's (additional 1 A4 page each not included in the count of 6 pages)	Please demonstrate how the project team will apply their knowledge, skill and experience to the delivery of this project. Your answers should include: • The project team's understanding of using MODFLOW6 code. • Understanding of regional-scale groundwater resources modelling in UK aquifers. • Details of any proposed sub-contractors and how they will be managed. • A summary of the number of hours contributed to each task by all individuals working on the project. • CVs for key personnel - brief summary of how those key personnel's experiences/skills will be applied to delivery of this project. CVs will not be scored but will be used as evidence to support the tenderer's response regarding the knowledge, skills and experience of the team and RDE T&Cs B11 will apply to the key personnel information provided in the CVs. • Demonstrate your resilience and how you will deal with unexpected changes in personnel or resource to ensure there will be minimal impact on the project delivery.	**50% of the 55% Quality weighting**
E03 - Proposed approach and methodology Max. 3 pages A4 Font Arial 12	Please provide your methodology for delivering the contract. Please include the areas listed below: • Understanding of project scope & requirements • A detailed methodology stating how you propose to deliver the required services outlined in the Specification How the proposed approach will deliver best value and efficiency for the project tasks	**20% of the 55% Quality weighting**
E04 - Sustainability/	Demonstrate how you will create	**10% of the total**

Social Value – creating fair opportunities/equality, diversity and inclusion Max. 3 pages A4 Font Arial 12	opportunities through the delivery of the contract to support and create fair opportunities, e.g. supporting SME's, ethnic minorities, championing equality, diversity and inclusion. Using a maximum of 3 pages describe the commitment your organisation will make to ensure that **additional opportunities specific to the contract** deliver the Award Criteria outlined. **Your response could include:** • your 'Method Statement', stating how you will achieve this and how your commitment meets the Award Criteria • a timed project plan and process, including how you will implement your commitment and by when • outline of how you will monitor, measure and report on your commitments/ the impact of your proposals • description of tools/ processes used to gather data • reporting provision feedback and improvement	**weighting**

Specification
1. Description of work required Project's full details will be available separately on the e-tendering system. This is a summary only:
Work scope summary The activities for the scope can be broadly split into thirteen task headings: Task 1: Digitise and collate springs data, incorporate them into the model and write a conceptual report chapter for them. Task 2: Examine specific areas: Greywell Fen, Royal Brook etc. and include a conceptual report chapter. Task 3: Verify the existing Mole model layer elevations using the spreadsheets, created in the 2023/24 WSP contract, and extend them in three model extension areas using the spreadsheets.

Task 4:	Split the existing Mole model single Chalk layer into two layers using flowing features and other data.
Task 5:	Parameterise the model area and layers.
Task 6:	Review water balance reporting areas and change from surface to groundwater catchments in Chalk and Greensand outcrop areas, using groundwater divides derived from piezometry mapping.
Task 7:	Convert the model from Modflow 96 to Modflow 6, maintaining the spatial discretisation (i.e. square-celled model of 200 x 200m cells), parameterising STREAM CELLS and layer KV where required. 4r will be retained as the recharge model.
Task 8:	Update the rainfall gridded 4r model input from CERF to HADUK and the potential evapotranspiration for MOSES to EAPET.
Task 9:	Extend time series of all other input data from the current model end date of March 2020 by four years to March 2024.
Task 10:	Extend the modflow groundwater model active extent in three separate areas: Southeast model (Lower Greensand only) Western extension Heathrow extension These three extensions, shown in Figure 2, are small areas, but require special attention as detailed in the next section. Review of model boundaries. Much of the west, north and east boundaries of the model are specified flow or related peripheral boundary conditions partly dependent on the neighbouring models. As these models have developed over the years, so the boundaries must be reviewed and updated where necessary.
Task 11:	Update the Modflow 6 model calibration
Task 12:	Produce three further standard model scenarios
Task 13:	Reporting

2. Required skills / experience from the contractor and staff. Include any essential qualifications or accreditations required to undertake the work.

The work must be carried out by a UK-based hydrogeologist.

3. Program of work and payment table (Detailing specific tasks, key milestones, deliverables & completion date where appropriate). Suppliers will provide their own timeline for Milestones, however the Milestones themselves and the payments linked to them are fixed.

Task no.	Task and deliverable	Completion date	Payment schedule
Milestone 1	Submit tasks 1&2: Conceptual update	**Est. 01/10/24**	**20%**
Milestone 2	Submit tasks 3-5 and 6-10: Update, conversion of model	**Est. 01/03/25**	**25%**
Milestone 3	Submit tasks 11&12: Recalibration of model and scenarios	**Est. 01/07/25**	**25%**
Milestone 4	Submit task 13: Final reporting	**Est. 01/01/26**	**30%**

4. Risk

Note: *This section is to be used to detail any risks or key elements relevant to the project i.e. Programme deliverable dates, workshops or external requirements, data, consultees, stakeholders etc. that could impact the success of the project if they are not managed.*

- **Should the project be delayed or not able to be delivered, there will be reputational risks involved with using an outdated model to make water resource decisions.**
- **Quality of the work is not at the required level and adds time and financial pressure.**
- **The Environment Agency are not happy with the timings and/or quality of the work produced by the supplier and there is a disagreement about payment.**
- **Delays in providing data to consultants resulting in delays to the project.**
- **Extent or complexity of required work underestimated/misunderstood and bid incorrectly priced.**

Note: The following information is managed at framework level and should not be repeated unless there are specific requirements that relate to your project. General requirements should be covered in Section 1 and be included in the Contractors reply to the Approach and Methodology section unless you are using the optional evaluation criteria. Delete sections if not required.

5. Health and Safety Requirements

***Note**: Only include if high risk activities being undertaken e.g. working at height, near or over water). Do not request RAMS or similar risk assessments are returned with submissions. These should only be requested at contract award.*

N/A

6. Further Sustainability Considerations

N/A

2.0 Proposal

2.1 The following document is to be used as a Call-Off template to be sent to all Contractors on a sub-lot for completion and return in accordance with the Call-Off procedures detailed in the Form of Agreement.

Research, Development and Evidence Framework 2 **PROPOSAL**
To be completed by the Contractor
Contractor's Name: WSP UK Ltd **Call off Reference:** RDE651 (C-25863) **Sub-Lot Number: 5.2** **Date:** 30 August 2024

1. E01 - Programme and Risk Management

Our approach to Project Management and Quality Assurance

Communication and scope clarity are the key to good project management, and we know that our approach to clarity and communications works: We actively seek customer feedback, with key metrics including 'establishing and matching requirements', 'ease of contact', 'responding to queries and comments', 'adopting a proactive approach', 'keeping customers informed of progress', and 'clarity of written communications'. These are consistently among our highest scoring attributes each year.

Our Project Management System is aligned with the Association of Project Manager's best practice and certified to ISO 9001 (Quality Management) and ISO 14001 (Environmental Management). A shared **Project Management Plan (PMP)** will be used to guide delivery and assurance of all aspects of the project. This is a live document owned by Harris Tarnanas (our proposed Project Manager), reacting to change, and designed to be used as a shared project management resource between our team and our client. The PMP contains information on project scope, engagement with the Environment Agency, planning, the schedule, milestones, delivery management, HSSE, risks and commercial aspects. The PMP will be updated to record all scope changes and additional requirements and will be kept under regular review. Review and update of the PMP provides a framework to aid the decision-making process through the project lifecycle and has been proven to help reduce the risk of project overruns.

[redacted] will hold a project review meeting with the Project Director, [redacted] monthly, to undertake the core quality assurance review and discuss any updates to the PMP. This review covers all aspects of the project from contracts, risks, quality, financial, programme and resourcing. This core assurance review can then be escalated to management or other teams to allow issues to be resolved, or solutions to be identified within the month end process.

[redacted] will keep in regular contact with the Environment Agency's Project Manager to deal with any issues or make key decisions as they arise. All actions will be tracked in the meeting minutes, or an action log, and any scope change or key technical decision will be communicated in writing in the Technical Issues/Agreement log. Short progress calls with the EA PM will be held, which will cover progress to date, issues, risks, and potential programme implications, for discussion and agreement of mitigation.

At the start of the project, we will develop a tailored **quality control plan** within the PMP. This will outline the procedures to be followed including calculation and data checking, data registers, use of data catalogues and GIS systems to store data, model files, model run logs, live risk registers, and Technical Issues and Benefits Logs. [redacted] and [redacted] will review all report deliverables before they are issued for review by the Environment Agency.

Specific Modelling Quality Assurance - WSP has developed a standard set of 'model hygiene and record keeping' procedures and tools which are essential to catch errors and keep a track on the data heavy synthesis, build, refinement, and predictive scenario work. These include input data plots, checks, and cleaning, record keeping focused around the model run logs for both 4R and MODFLOW components of the model, and internal peer review of a comprehensive set of map and spreadsheet outputs from the earliest runs. All the output needs to be regularly reviewed to minimise the risk of unpleasant surprises later.

Our approach to Project Delivery

Our proposed management team (as described further in E02) come with a solid record of managing groundwater modelling projects and are aware of the risks associated with model updates. [redacted] has 15 years of project management experience in the development of conceptual and numerical aquifer models, developed during his employment

with the Environment Agency and now here at WSP. He has also undertaken quality assurance of modelling results, an important aspect of building confidence in model predictions. [redacted] also has a 15-year record of project management, and more recently moving into project direction, with responsibility for undertaking regular project reviews (in terms of identifying risks to both programme and budget). [redacted], in his role of Technical Lead for our Sustainable Water Management team, also has responsibility for coordinating the internal auditing of our projects, and working with others to ensure that risks are minimised and mitigated. [redacted] will therefore work closely together to deliver the project in accordance with WSP's Project Management System.
[redacted] will co-ordinate the project, working closely with the Environment Agency and our team to meet time, budget, and quality objectives. At the start up meeting, WSP's project manager (PM), project director (PD) and technical reviewer [redacted]) will attend.
We also have allowed for thirteen (No. 13) technical calls with the EA, to discuss the review and sign of each technical task. Monthly progress reports will be issued documenting progress, plus the risk register and potential programme implications (e.g. Early Warnings and Compensation Events).
As requested, we have also accounted for four (No. 4) broader engagement meetings with Water Companies and other potential stakeholders (as required, as identified by the Environment Agency PM), to discuss project progress. These have been spread across the programme. We envisage the meeting will comprise

a) Meeting 1 - an early data request and conceptual focussed meeting initially, focussed on objectives and scope of the project, team and programme, communications and meetings plan, any outstanding data requirements, QA/QC requirements and version control
b) Meeting 2 - conceptual model (after completion of Tasks 1, 2, 3 and 4), preliminary results from recharge model '4R', after updated with rainfall and PE data, any remaining uncertainties proposals for MODFLOW groundwater model, groundwater model calibration acceptance criteria
c) Meeting 3 – presentation of interim results from the new model construction and initial calibration effort, to assess the initial challenges and approach to further calibration
d) Meeting 4 – presentation of the final version of the new model, with the aim of securing the agreement from stakeholders it represents the best available tool with which to undertake water resource and other impact assessments.

Finally, we will complete a project close out meeting with the EA to confirm that we have delivered the scope of work as agreed, and to run through the EA's check list for required deliverables (including all relevant model input and output files, as well as post-processed results).

Project Schedule

As requested, we provide a Gantt Chart in **Appendix EO1-2** with the main subtasks listed, as well as their dependencies. We have also provided a narrative as to the reasoning as to the proposed level of resource effort required to deliver each task.

Risk Management

Our project assurance is aimed at identifying and managing an emerging risk before it becomes a project issue. The preliminary **Risk Register** (**Appendix EO1-1**) identifies key risks which we know, from our previous experience, can affect groundwater model conversion and update projects. The risk register lists the main challenges, risks, and associated mitigations to keep the project on track and to time and includes suggestions for

mitigation and an analysis of the severity of the residual risks which might remain. (While this is a fixed price project, it is still important for us to identify risks which could lead to a variation in scope and cost.)
The risk register will be kept live and shared with the EA Project Manager at regular intervals, which allows us to discuss and identify measures to work around or mitigate issues and risks before or as they arise.

Health and Safety

WSP holds it culture of safety as a core value and safety is a prerequisite in everything we do. We have completed the project health and safety assessment as part of the proposal process, and this will be updated at project commencement. For this desk-based project, we have identified that stress and mental health is a key concern for us. As such, we will place our effort and focus on resourcing, regular review, and programme management, which we know can make a real difference to the health and wellbeing of our team, as well as delivering a successful project outcome.

Contract Management

WSP has submitted this tender response under the agreed terms and conditions of DEFRA's Research, Development and Evidence Framework 1. Our Project Director, [redacted] will consult regularly with our Framework Director, [redacted], to ensure that our work remains complaint with these agreed terms.
We note from the tender documents that **Clause B11** will apply to this project. This clause requires the Contractor to *acknowledge that the Key Personnel are essential to the proper provision of the Services, and that they shall not be released from supplying the Services without the agreement of the Authority*. WSP has therefore ensured that the team presented in E02 have sufficient time between project start and late 2025 to deliver the project and this time has already been allocated to their potential workload. Should a member of the team leave WSP for any reason we will reach back to our resourcing manager to acquire time from our wide pool of UK based hydrogeologists and groundwater modellers.
We also acknowledge that the work is let as a fixed price, and that there is a set of payment milestones (updated dates for which we provide in our cost proposal), based on groupings of individual sub-tasks, as described in the Call Off Form and Bidder Pack. WSP agrees to the payment milestones and the process for invoice submission, i.e. after agreement that the relevant sub-tasks have been completed in line with the terms of reference and our proposal.

2. E02 – Understanding of MODFLOW6 code and regional groundwater modelling and adequacy of technical staff resources

Our experience of regional scale groundwater resources modelling in the UK

WSP has a 25-year record in conceptual and numerical model development for the Environment Agency and Water Companies, focused on regional groundwater resource assessment and management. Relevant models have included the Chalk and Lower Greensand River Mole model itself, which WSP and its predecessors have refined and updated since its initial construction in 2009, the Chalk dominated Test and Itchen model (to the south west of the Mole core area - converted to MODFLOW-6) and the Kent Lower Greensand model (to the south east of the Mole). Slightly further afield WSP continues to develop the Wessex Basin model (also MODLFOW-6), and the Brighton and Worthing unstructured grid model. WSP constructed and maintains the North East Anglian Chalk (NEAC) model - the largest groundwater model developed in the UK – and many others, including rectilinear MODFLOW 6 conversions of the Newent, Wirral/West Cheshire, Yazor and Lower Mersey Basin models and the development of the Skerne model. All have been used to undertake a wide range of assessments from review of consents, resource availability including CAMS, WFD waterbody flow compliance, Source Protection Zones (SPZ) delineation and to support Water Company WINEP investigations. We have also recently explored the use of models to assess the impact of nitrate loading and Nature Based Solutions.

In addition to modelling, WSP has developed many of **tools to maximise the usefulness of groundwater model outputs for Environment Agency and water company staff** including the RUL package for scenario stream support and conjunctive use, FlowMaps flow duration curve statistic maps, Daily Flows synthesis re-combining combining 4R daily runoff with MODFLOW baseflow, modelled artificial influences mapping for quality assurance and model audit (AIUP), the Protected Water Features (PWF) database and flow compliance screening spreadsheets, and the Batched Abstraction Modelling (BAM) process which reduces the cost of individual source impact characterisation by about twenty times.

In response to the increased use of MODFLOW-6, WSP has also invested in enhancing its runoff and recharge code 4R, so that it is now capable of writing newly formatted input files for MODFLOW-6, for both structured and unstructured meshes.

Our understanding of MODFLOW 6

To date, WSP has constructed [redacted] groundwater models making use of the MODFLOW-6 modelling code, [redacted] of which have been constructed on a regular grid (i.e. DIS option). Many of these have required the development of a series of new pre- and post-processing codes. We note that there is no requirement to move away from the structured grid that has been defined already for the Mole model and, as such, the upfront effort for model conversion will be less than we have undertaken in other projects. However, we still expect to spend considerable effort in the generation of new geological layers, and the regeneration of a new SFR6 Stream File. With the potential for increased complexity, the new model will also benefit from using a more efficient solver, which will help to keep runs time down to acceptable levels.

Our experience suggests that MODFLOW 6 is particularly sensitive to consistency between boundary packages. So, for example, we understand that it is important to pay attention to the specification of SFR stream stage elevations and that layers may have to be adjusted compared with the geological structure model based on where they are above or below the water table.

As such, early checks of simulated groundwater levels running a Fully Licensed scenario will be carried out to ensure that maximum simulated drawdowns are credible, and that Fully Licensed abstraction can be satisfied where appropriate. It is also important to check

Naturalised scenario groundwater levels relative to the ground surface to ensure that areas of implied flooding (simulated heads above ground) are credibly minimised.
Keeping on top of model stability, mass balance errors and run times is vital. We have written code which maps the frequency with which model nodes are top of the list of convergence iterations to understand where instability is occurring. We regularly check time series of mass balance errors and seek to keep the model as simple and fast as it can credibly be without losing important parts of the conceptual process understanding.
WSP has invested in the development of new pre- and post-processing utilities (typically written in python and making use of the FloPy package), to streamline our modelling workflow. With our recent Test and Itchen work we now have all the pre- and post-processing tools we will need for the upgrade of the Mole model. A combination of spreadsheets, databases, QGIS, ArcGIS, Surfer and Python codes already exist for manipulating other input data time series (e.g. artificial influences) and model outputs including groundwater levels and stream flows for selected observed and gauged calibration cells and other boundaries (e.g. WELs, and boundary specified fluxes or making use GHBs). We also have time series and accretion profile extraction routines for the SFR6 package and have applied Zonebudget on MODFLOW 6.
In addition, having extracted time series heads or flows from standard predictive scenarios at key nodes in the model (e.g. WFD surface water body outflow points or CAMSLedger Assessment Points), we designed many of the well-established spreadsheet formats for hydro-ecological flow standard compliance screening on flow duration curves or time series which can be applied regardless of the code underpinning the model. We also confirm that the latest version of FlowMaps is compatible with MODFLOW 6, and the FlowMaps and AIUP layers will be included in final ModelMap GIS deliverable.
If required, we can make use of the ongoing upgrade of the DailyFlows synthesis tool to run with MODFLOW 6, which enables the synthesis of daily flow time series by combining daily runoff from 4R with MODFLOW baseflow accumulated from up-catchment stream cells. It has proved to be a helpful utility for hydro-ecological flow analysis on several models, and we can generate outputs for all WFD water bodies and CAMS APs.
The established tool kit described above can deliver the tasks and outcome set out in the specification. The same tools have been successfully handed over to Environment Agency and water company staff at the end of the Test and Itchen project, together with the 4R6 and MODFLOW 6 models.

Case Study 1 **– Wirral and West Cheshire Groundwater Model Conversion to MODLFOW 6 using regular model grid.**
WSP updated an existing Wirral and West Cheshire model, incorporating HadUK rainfall and EA PET inputs and converting to 4R (for the EA) and MODFLOW 6 (for UU). We adjusted Kc factors to deliver a good calibration of river flows and multiple scenario runs are being carried out in the mostly confined and sluggishly responding sandstone aquifer to indicate licence capping and aggregation options which avoid flow deterioration whilst retaining operational flexibility necessary for resilient public supplies.
Case Study 2 **– Newent Groundwater model built using MODFLOW 6 and regular grid.**
WSP recently updated the Newent Permo-Triassic sandstone groundwater and river flow model, incorporating the preferred HadUK and EA PET input climate data, and converting from MODFLOW96 to MODFLOW6 (DIS) without changing the 2D rectilinear grid or 3D layered structure. This model includes extensive lower permeability areas both upstream and downstream of the main aquifer which are built into the 4R whole catchment simulation but are not part of the smaller extent active MODFLOW model - we fixed option bugs in 4R to make this work with MF6, retaining backwards compatibility in the code. Perched streams

on the sandstones - which had previously been modelled by setting stream bed top and bottom to stream stage and directly specifying conductance (i.e. parameterising them as MF96 drains) - had to be given very thin but non-zero bed thickness in MF6 with back-calculated bed permeability to deliver equivalent conductance. Similarly, the direct specification of leakance between layers in MF96 which was locally set to prevent any vertical flow had to be re-parameterised with very low Kv, such that an exactly equivalent model was not possible. Like many other models recently switched to the EA's new PET data set, dominant land use Kc factors had to be reduced to retain a similar simulation of effective rainfall to maintain the calibration.

Case Study 3 **– Wessex Basin Groundwater Model (MODFLOW 6, Voronoi Grid)**

The team at WSP has worked on the development of the Wessex Basin Groundwater Model since 2005 and are currently finalising the update of the model both to the end of 2023 and to the newer MODFLOW6 code (from MODFLOW96). This has also included the update of the recharge model to utilise HadUK Rainfall and EA PET as well as the use of the HFR and AFR packages within MODFLOW6.

The new version of the modelling includes a Voronoi grid mesh that allows for more detailed representation of abstractions and key ecological receptors. Coupled with the increased layering in the model, it is now possible to better parameterise, where data exist, the specific hydraulic links between the radial drawdown at abstraction points and the near surface water levels that influence the ecology at the key receptor sites. The Wessex Basin has benefited from our learning on the Test & Itchen conversion.

The model has been used to support numerous WINEP Studies, CAMSLedger updates, Nitrate Trend Analysis, Drought Permit EARs, Climate Change studies and SPZ delineation. We also worked to develop a solution to the Army Basing Programme water and wastewater requirements on Salisbury Plain. This has allowed the protection of flows in the Hampshire Avon SAC (and associated SSSIs) through the relocation of discharge points and a revised distribution of abstraction between existing MoD boreholes and bulk supplies from Wessex Water.

Our Proposed Team

Our core technical team has been chosen based on both its project management and groundwater modelling skills, as well as prior knowledge of the current River Mole groundwater model. We have selected a compact team structure with a mix of staff at different grades to bring significant experience, quality, skills, and value to the work. We have intentionally integrated new members of staff into the Mole team, to build modelling capacity, ensure knowledge transfer and increase our delivery team resilience. In doing so, we are keen to ensure that sufficient hours are made available to experienced team members highly familiar with the history of the Mole model development. Considering feedback received from the EA after our first submission note that we have increased (between 20-40%) the hours allocated to [redacted] for specific technical guidance and task reviews, to ensure expert oversight and assure the quality of outputs. We present our chosen core team in in **Table 1**, highlighting our track record in both hydrogeology and our wider numerical modelling skills. An **organogram** of the team is presented below and CVs for each member of our team are provided in **Appendix EO2-1**.

Table 1 Summary of Key Personnel

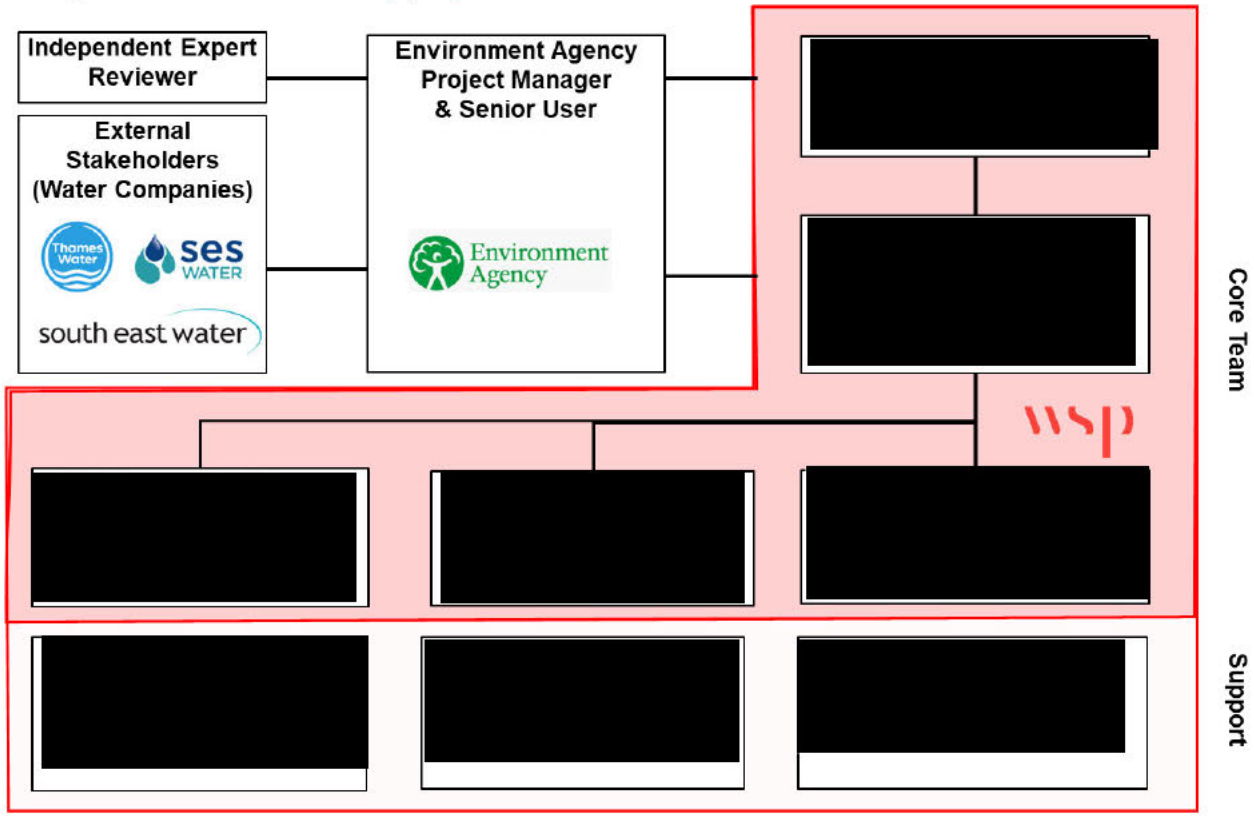
Name	Role	Experience
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted] Unstructured

[redacted]

[redacted]

Team Organogram with hours contribution

Project Team and Total Hours (2,009)



Resource allocation for each task

We provide a breakdown of the resource allocation by main task in **Table 2**. We have provided a narrative as to the reasoning for the level of effort we consider appropriate for each item in **Response E01**, as requested. Note that WSP does not require the use of subcontractors to deliver the scope of works as described in **Response E03**. All work will be completed in house, making use of the wider set of skills and experience in our UK team.

Table 2 Resource Allocation By Task

2009	Totals	[redacted]								
		Proj Man	Tech Review	Proj Dir	Data Analysis	Modeller	Data Proc	MF6 Advice	Geology	Geology
Task	Task Title	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours
1	[redacted]									

3. E03 - Proposed approach and methodology

Project Scope and Requirements

We are aware the Environment Agency relies heavily on the Mole groundwater model to undertake a wide range of groundwater related assessments, including Review of Consents, CAMS Assessments, WFD groundwater body investigations, Source Protection Zone delineation, to support Water Company WINEP investigations, assessing Water Company Water Resource Management Plans, undertaking drought studies and more recently to undertake the risk of groundwater flooding. Is it therefore essential that the Mole model is kept up to date, incorporating new field data and using a supported version of the MODFLOW code well into the future. We understand therefore that review of data and conversion of the existing model to the more recent MODFLOW-6 code is now due. From our previous experience of converting groundwater models from MODFLOW-96 to MODFLOW-6 we are aware of the technical challenges and the resulting pressure on delivering the project to time and budget. Examples have included the **Wessex Basin** and **Test and Itchen** groundwater models, where the introduction of more detailed stratigraphy has required extensive periods of re-calibration to achieve stringent acceptance criteria across the model domain. Combined with changes to input rainfall and PET, we also know that changes may be required to 4R parameterisation to ensure that the overall water balance remains credible. The technical risks that may affect the proposed programme for the conversion of the Mole model are less significant than these models, given that there is no requirement to convert the Mole from a regular to Voronoi (unstructured) mesh, or to re-design the surface routing network in 4R. However, we still envisage technical challenges along the way, which we must plan for and mitigate. To help with developing an efficient approach, we will bring our recent learning from the conversion of the Environment Agency's **Wirral and West Cheshire Permo-Triassic model** and **Newent groundwater model**, which are both MODFLOW-6 models constructed on a regular mesh and with distinct layering and faulting.

Detailed Methodology

We have set out our work programme in Response E01, starting the project during the week of **23 September 2024**, we can start drafting our team work instructions during October 2024 having brought the relevant data together. (Note that we have re-adjusted the tendered programme of the initial tasks slightly where we believe we can make delivery efficiencies by deploying both [redacted] and [redacted] together.)

Task 1 – Digitisation of Springs Data - We recognise that there are additional springs present on OS mapping, which could be incorporated into the definition of MODFLOW-6 stream cells across the model domain to facilitate additional surface water flows and to constrain simulated groundwater levels, particularly along the Chalk escarpment and where the Chalk becomes confined as it dips into the London Basin. We note that the EA has already produced a map of springs on the Lower Greensand which can be provided to us. The task will require the use of OS 10K mapping, plus the generation of a GIS shape file which we could undertake using either ArcMap or QGIS.

Task 2 – Examine specific areas which have undergone further investigation – We have allowed a month in the programme to review the new data specific to existing studies, on the assumption that the data is provided to WSP at the start of the project. We anticipate that the work will require a review of current model structure and properties and a comparison of observed data to propose reasonable model refinements, accepting that the model grid is not changing. Examples might include a revision to the active flowing thickness of the Chalk, the introduction or refinement of Horizontal Flow Barriers to represent key faulting, and reconsideration of aquifer properties such as horizontal and vertical hydraulic conductivity as

well as specific yield. We also note the requirement to consider leakage from the Basingstoke Canal Tunnel, which may require the introduction of additional Drain cells.

Task 3 – Verify Model elevations – WSP completed a comprehensive review of all borehole logs data in the study area in 2024, and we have allowed time in our proposal to discuss the production of the resulting dataset with [redacted] and [redacted] We envisage the task will include a comparison of the existing surface elevations (as extracted from the groundwater model) and point data where the stratigraphy has been noted in the borehole records. Should major disparities exist, we will undertake adjustments to the model surfaces to better reflect the historical data. We anticipate that uncertainties will remain, which we will highlight in our reporting. This task will also consider the thickness and distribution of the Sandgate Formation, which will be explicitly represented in the new groundwater model.

Task 4 – Split the Chalk into two layers – Related to Task 3, we note that the work undertaken by WSP in 2024 also recorded, where present, any details in the logs with respect to flowing horizons in the Chalk or additional comments related to water levels experienced at the time of construction. We will use these data as well as more routing monitoring data to estimate the upper "flowing" horizons in the Chalk.

Task 5 – Layer parametrisation – The revised Mole model will make use of existing parameters, albeit adjusted for MODFLOW-6. We will produce a grid of properties per layer revised, where required, considering Tasks 2, 3 and 4. The need for VKD parameterisation for the Chalk will be evaluated, but our working assumption is that splitting the Chalk into two layers, based on identifying the upper fractured zone, provides sufficient vertical resolution to simulate the differences in response between the shallow and deeper Chalk units.

Task 6 – Review water balance areas – We will use local piezometry to estimate groundwater catchments, noting however that there may be degree of uncertainty as to their full spatial extent in areas of low borehole density, and how such catchment divides may move seasonally. Our water balance will include a term to reflect this potential conceptual uncertainty and the presence of cross boundary groundwater flow between adjacent catchments.

Task 7 – Convert the model from MODFLOW-96 (VKD) to MODFLOW 6 – We have allowed four weeks within the programme to undertake the development of new MODFLOW-6 compatible files, whilst noting that the existing model grid will be retained. We will make use of our experience on the conversion of the **Wirral and West Cheshire** and **Newent** groundwater models to inform our strategy, to ensure that the files can be produced efficiently. We anticipate that it will be most onerous to undertake changes to the formation of the new Stream file (which must be developed with care to ensure that the boundary conditions are presented in the upper most active layer), and the Discretisation file (which will require the explicit representation of the Sandgate Formation, including areas where it may not be present). We have allowed time for [redacted] to offer the core team advice as to how to make the conversion as efficient as possible.

Task 8 – Update the rainfall and PET input data – As part of its suite of model pre-processing utilities, WSP has already developed Python scripts to produce grids of Rainfall and PET which are compatible with 4R. To extend the model to March 2024, we anticipate submitting a data request via Richard Davis at the EA for Daily Rainfall Tool output, to append to the HADUK rainfall dataset (which currently runs to end 2022).

Task 9 – Extend the time series of all other data - Our recent work for the Environment Agency updating the surface water abstractions and discharges and groundwater abstraction profiles was completed in early 2021. This work highlighted errors and omissions which were subsequently corrected in consultation with [redacted]. We are therefore confident that the dataset is in a good state and should only require a light touch update for existing abstractions and the incorporation of new time series in the new model domain. We

note that no new SWABS or SWDIS are to be included.

Task 10- Extend the groundwater model domain – This task will be intricate and is likely to require inputs from surrounding models such as the River Kennet, the London Basin and, if permission is granted, from the work undertake as part of the Heathrow Expansion Programme. We have broken the task down into the specific areas where the extensions are required and will work with the EA Project Manager to submit our data requests early during the design phase.

Task 11 – Model Calibration – We have broken down the time for the model calibration phase into 3 blocks of 3 weeks to allow for performance review meetings with the Environment Agency, assuming a week's turnaround for the review of model output. We also anticipate holding an external Engagement Meeting during the calibration phase, to check that our approach to parameterisation is in line with the Water Companies' (South East Water, Thames Water and Sutton and East Surrey Water) understanding of the aquifer responses at their abstraction boreholes. Our three phases will include sensitivity analysis of model parameters, including the requirement to assess the credibility of new external boundary conditions and to assess whether these play a significant role in the calibration within the core model area.

Task 12 – Develop standard EA scenarios (Naturalised, Recent Actual, Fully Licensed). As part of our work in 2021 we produced standard scenarios based on an averaging of abstraction returns data from the EA and checked by the Water Companies for their PWS sources. We will agree with the EA whether the assessment period should be updated to reflect the last five years' worth of abstraction data. If required, we would also be happy to quote for the development of additional scenarios (as developed in 2021) to cover off Future Predicted and Future Fully Licensed conditions – scenarios which are typically required to undertake No Deterioration studies.

Task 13 – Reporting – We have allowed a period of two months to produce a comprehensive model report (one draft and one final version to incorporate collated comments), which will describe the model update and model conversion process and the results from the historic and abstraction scenario runs. We expect this task to be substantial, given the extent of the work undertaken over 2024 and 2025. Associated with the delivery of the model report, we will transfer all relevant model files and outputs – making use of our "ModelMap GIS" approach to present all spatial datasets, and the supply of all associated time series outputs. We will commence our reporting in Q4 2025, leaving sufficient time in the programme for the EA to review the draft numerical construction chapter and figures to ensure delivery of the final report and model handover in February 2026.

(WSP Task 14) – Meetings –WSP has created a new task specifically to track the costs associated with three internal and four external stakeholder meetings. We will include costs for each meeting at the closest Milestone subsequent each meeting being held.

4. E04 – Sustainability/ Social Value – creating fair opportunities/equality, diversity and inclusion

At WSP we consciously create fair opportunities through the delivery of our work.
We champion equality, diversity and inclusion when encouraging future generations into our sector and supporting our existing colleagues. Our industry awards acknowledge our record (winner 2023 ED&I initiative of the year engineering construction industry training board (ECITB); runner-up 2023 company of the year award Association of Black and Minority Ethnic Engineers (AfBE-UK); winners of IChemE diversity and inclusion 2022).
To identify and address inequalities we collect, monitor, analyse and act on data from a range of sources. We review diversity and equality data monthly; this includes pay and promotion data and reporting on training (including I&D training). Actions include targeted recruitment from disadvantaged areas (minorities, disabilities, and women apprentices) and an updated parental leave policy. All pay reviews and promotions are considered from an I&D lens, challenging decision making and amending our approach accordingly. We conduct a quarterly staff survey and take informed positive action.
Example: we updated our holiday policy to allow colleagues to flex which days they take bank holidays. This progressive and inclusive policy allows all colleagues time off to celebrate their special and religious days without impacting their annual leave allowance.
Example: In 2022, informed by employment data and our desire to be more inclusive, we completed an overhaul of our recruitment lifecycle. We renewed our approach to job adverts, line manager guidance and interview guidance. We saw an immediate positive impact in the number of candidates from underrepresented backgrounds. This included: 13% increase in female applicants, 36% of offers being made to ethnic minority candidates; 25% increase in candidates identifying as disabled. Also 21% of our senior promotions were for colleagues from minority ethnic backgrounds. This year we are running specific campaigns for those from disadvantaged groups (including disability and women).
WSP also takes positive action to meet the UN's Sustainable Development Goals, including SDG 5 (Gender Equality) and SDG 8 (Decent Work and Economic Growth) – more information can be found in our 2023 ESG Report.

Contract Specific Alignment with Award Criteria

Creating fair opportunities through the delivery of the contract to support ethnic minorities and champion equality, diversity, and inclusion, aligns with the governments Social Value Model, model award criteria 6.1 (tackling inequality) and 6.2 (supporting in-work progression).
As well as our embedded social value (mentioned above) and in line with your request to provide project specific opportunities, we will build on our record in a proportional way to help develop the next generation workforce whilst promoting equality, diversity, and inclusion.
Specifically, as part of this contract we commit to:

1. Visiting a local school (ideally in Dorking or Leatherhead) to raise awareness of this project as well as careers in ground water resource management.
2. Providing a team member to support at least one of WSPs One Water school STEM webinars to talk about their work. These webinars target national events such as World River Week (Oct); National STEM Day (Jan); World Water Day (March); Women in Engineering Day (June).

3. Consciously seeking placement students or apprentices to help with the project's environmental data management. This will raise awareness of this area of work for future generation employees.
4. Present a lunch and learn sessions that involve employee resource groups (ERGs).

Promoting Opportunity and Inclusion

We are an equal opportunities employer, and we are proud to be a Disability Confident employer. Applications for employment by disabled persons are fully considered, bearing in mind the aptitudes of the applicant concerned. We are a signatory of the Armed Services Covenant since 2018 and support the employment of veterans by working with the Career Transition Partnership to promote our job opportunities.
We use our network with education and employment establishments to recruit, develop and retain people from diverse backgrounds. We have zero tolerance for modern slavery. We support in-work progression to help people, including those from disadvantaged or minority groups, move into higher paid work by developing new skills. We support colleagues on their career journey from initial work placements, through apprenticeships to chartered status and beyond with structured progression packages and informal mentoring. *Evidence: Anna Reed in our groundwater team is an excellent example of a technician being supported through her career, to the industry expert she now is*. Our inclusive work environment gives all colleagues the opportunity to fulfil their unique potential.

As demonstration of our investment in development, in 2023, we were awarded Gold membership by the 5% Club. This commits us having 5%+ of workforce in 'earn and learn' positions. We consistently exceed this target. In 2023 >10% of our UK workforce were in 'earn and learn' positions; 34% graduates and 23% apprentices were female and 38% graduates and 14% apprentices from ethnically diverse backgrounds. 'Earn and learn' provides a viable career route for those from socio-economically disadvantaged backgrounds, producing individuals with knowledge, experience and firsthand practical skills valued by employers.

Our working conditions promote an inclusive working environment. This aids retention and progression. To support colleagues, we put in place tailored work packages and have six employee resource groups (ERGs) – Gender; Menopause; CREED (ethnicity); VIBE (LGBTQI+); and our Neurodiverse Community. These groups support our inclusive polices by raising awareness and challenging our ways of working. These contribute to our thriving workplace whilst promoting visibility and providing safe spaces.

On this project we will focus our additional social value on:

1. engaging and inspiring the future workforce through STEM activities (including in deprived areas)
2. identifying opportunities for those new to our industry and/ or from minority groups to be involved on this project.

(We do not propose to use SMEs in this contract).

Other in-work skills development support includes our graduate scheme which includes structured development plans, 2-way mentoring; internal training programmes (water specific and generic such as social value and H&S training); external training courses; online and in person lunch and learn sessions.

Unique to WSP is WSP hour, which empowers all staff to adjust their work pattern by taking any hour off during the workday. This gives flexibility to do school runs, caring duties or keep fit during the working day.

Method Statement

We will discuss the projects social value aspiration with you at our inception meeting. We will then include social value milestones in our project programme. We propose the following:

1. Within the first month of award, we will identify named placement student/ apprentices to support our environmental data management tasks.
2. We will include social value as an agenda item on progress meetings to inspire ideas and make connections.
3. Will we arrange for one of the project team ([redacted] or [redacted] to present at our World Rivers Day online seminar in October 2024, and at an ERG session.
4. Engage with a school and provide a talk to school children (target dates March- Oct 2025, date TBC to fit in with school timetable).

We encourage clients to join us on our school engagements, as this gives sight of different organisations and career opportunities.

Monitoring & Reporting

We monitor our commitments on our WSP commitments tracker and will report progress to you at least quarterly, tying in with project reporting and key milestones. Our monitoring will also prompt us to plan to obtain the relevant points of contacts, especially with schools.
If you require specific reporting on the percentage of underrepresented groups/ apprentices employed / schools engaged with as a result of social value on this contract, we are happy to provide such information.

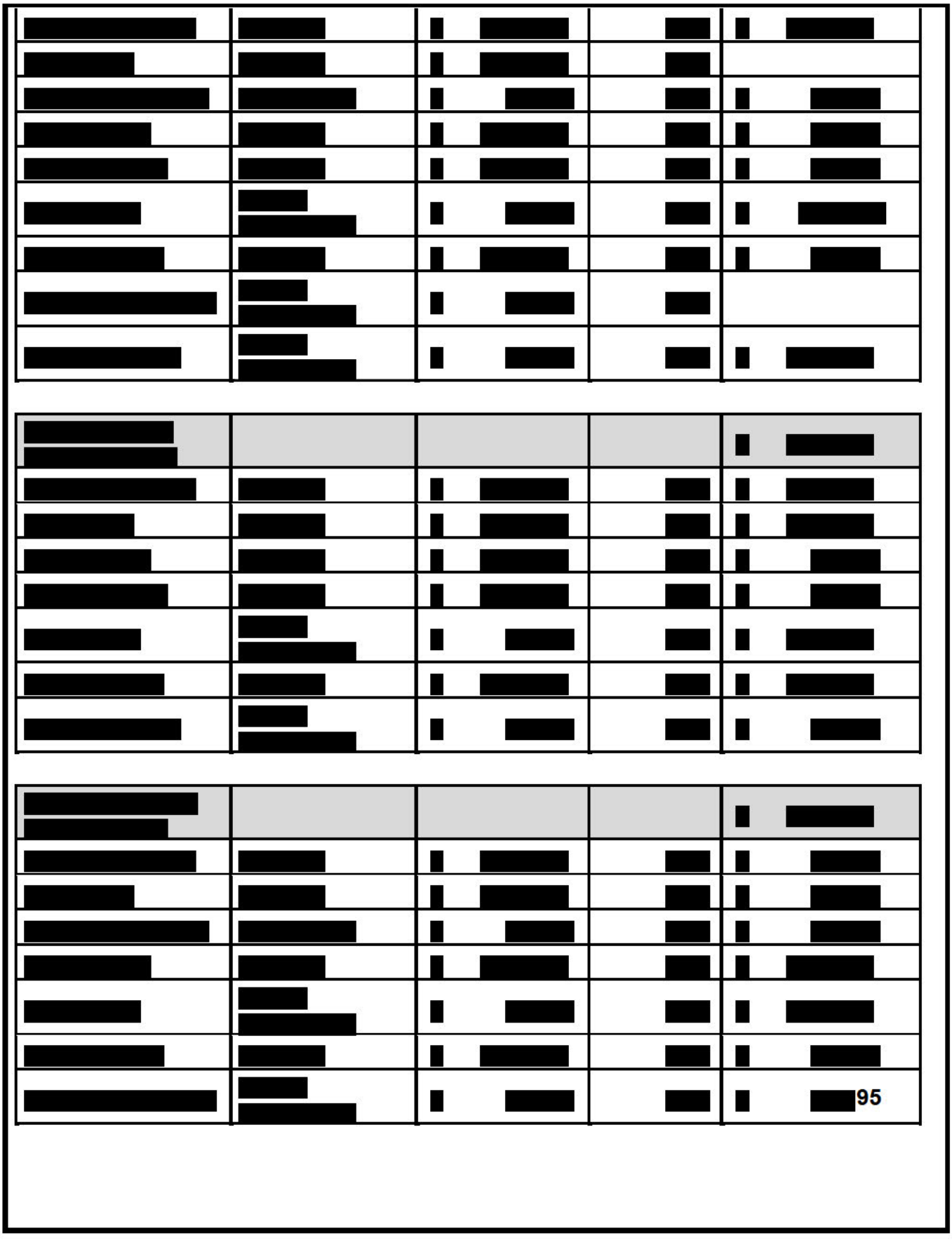
Continuous Improvement

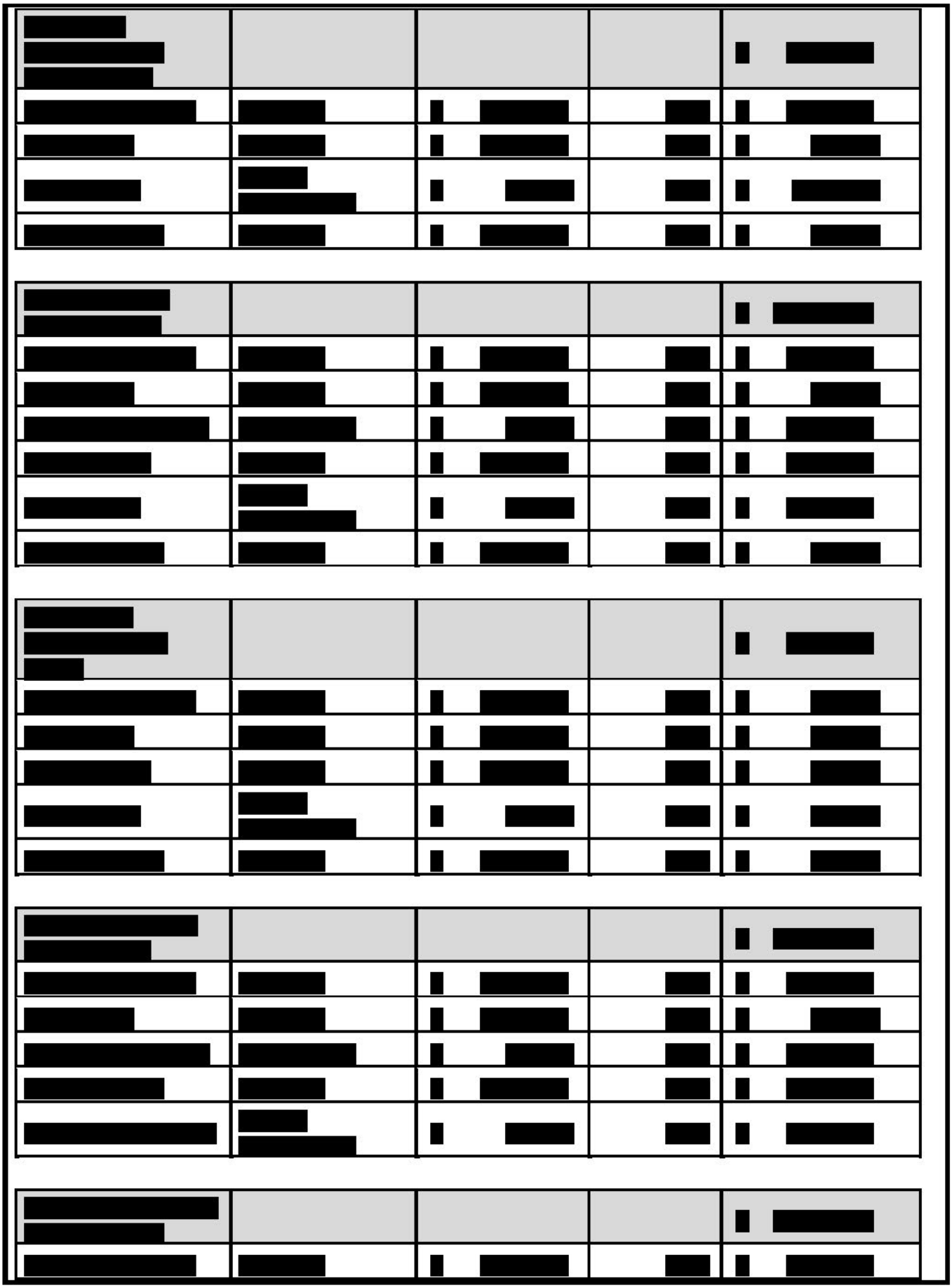
Through our progress meetings, we will identify areas for improvement and adapt accordingly. We will seek feedback from schools we interact with regarding how children have received the information. This can open opportunities for work experience, so building off the initial engagement. We will also seek feedback from yourselves. If appropriate we may promote this project and fair opportunities via a social media article to inform and inspire others.

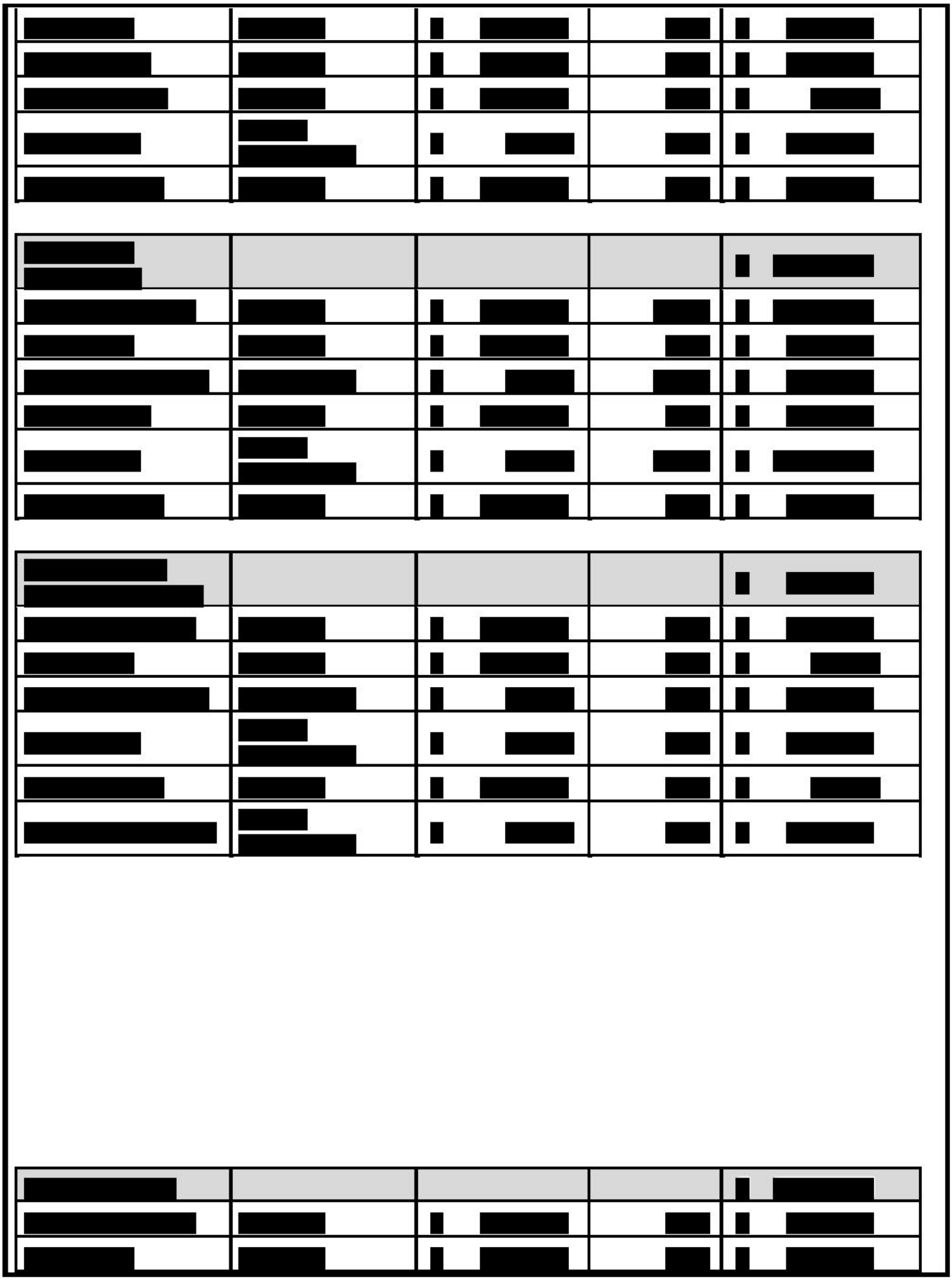
5. Cost Proposal

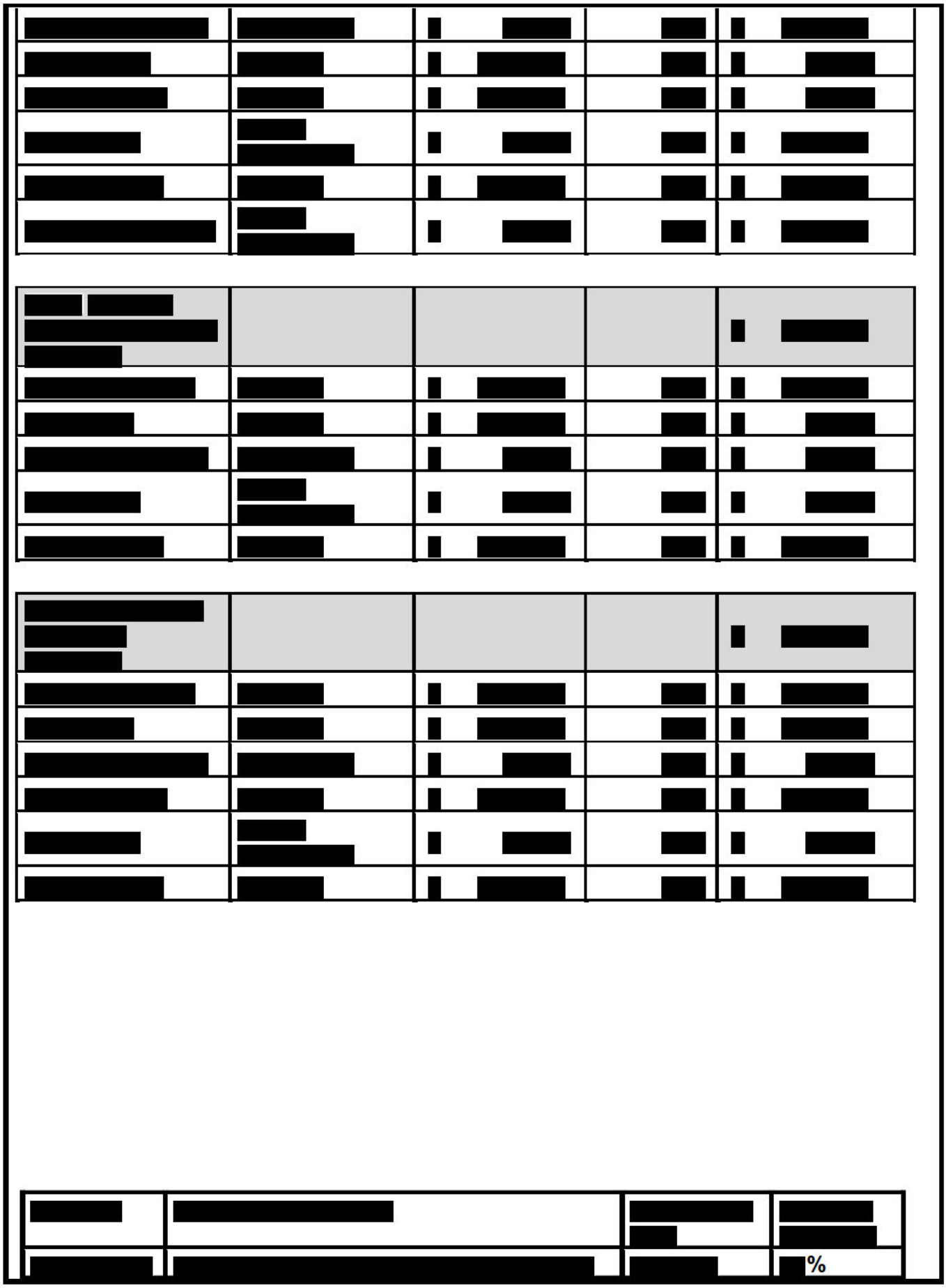
Please use day rates, including any applicable discounts, as agreed under the framework contract. We encourage a full cost schedule to be attached to support the costs summarised below.

Name	Framework grade	Day rate	No. of Days or part thereof	Cost
1 - [redacted]				
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	
[redacted]	[redacted]	[redacted]	[redacted]	
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]				[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	
[redacted]	[redacted]	[redacted]	[redacted]	
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]				[redacted]









	[redacted]		
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]

	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
	[redacted]	[redacted]

By signing this form ***WSP UK Ltd*** agree to provide the services stated above for the cost set out in your Cost Proposal and in accordance with the Research, Development & Evidence Framework 1Conditions of Contract.	
Contractor Project Manager:	[redacted]
Signature:	[redacted]
Date:	19 September 2024

3.0 Order Form

3.1 The following document is to be completed by the Contracting Authority and sent to the Contractor for counter signature to form a Call-Off contract.

Research, Development and Evidence Framework 2 ORDER FORM
To be completed by Contracting Authority Project Manager and sent to Contractor for countersignature. PLEASE INCLUDE ENTIRE DOCUMENT
Project title: Mole GWModel MF6 & Update **Call off Reference: RDE651** **Atamis project ref (if applicable): C-25863** **Atamis Contract ref: C-26372** **Date:20/09/2024**

THE Contracting Authority: The Department for Environment, Food and Rural Affairs, 2 Masham Street, London, SW1P 4DF

THE CONTRACTOR: WSP UK Limited, WSP House, 70 Chancery Lane, London, WC2A 1AF, United Kingdom

APPLICABLE FRAMEWORK CONTRACT

This Order Form is for the provision of the Call-Off Deliverables and dated [Insert date of issue]. It's issued under the Research Development & Evidence Framework Agreement reference 30210 for the provision of Mole GWModel MF6 Update project.

CALL-OFF SUB-LOT: 5.2

CALL-OFF INCORPORATED TERMS The following documents are incorporated into this Call-Off Contract. Where numbers are missing we are not using those schedules. If the documents conflict, the following order of precedence applies:

1. Defra Framework Terms and Conditions;
2. Request for Proposal;
3. Proposal;

No other Supplier terms are part of the Call-Off Contract. That includes any terms written on the back of, added to this Order Form, or presented at the time of delivery.

CALL-OFF CONTRACT START DATE: 23/09/2024

CALL-OFF CONTRACT EXPIRY DATE: 26/02/2026

CALL-OFF PERIOD: 5 Months 1 Year

Appendix EO1-1: Risk Register

T440: Project Risk Management Tool

Project No	2024UK282730	Project Name	**Mole Groundwater Model MODFLOW 6 & Update**

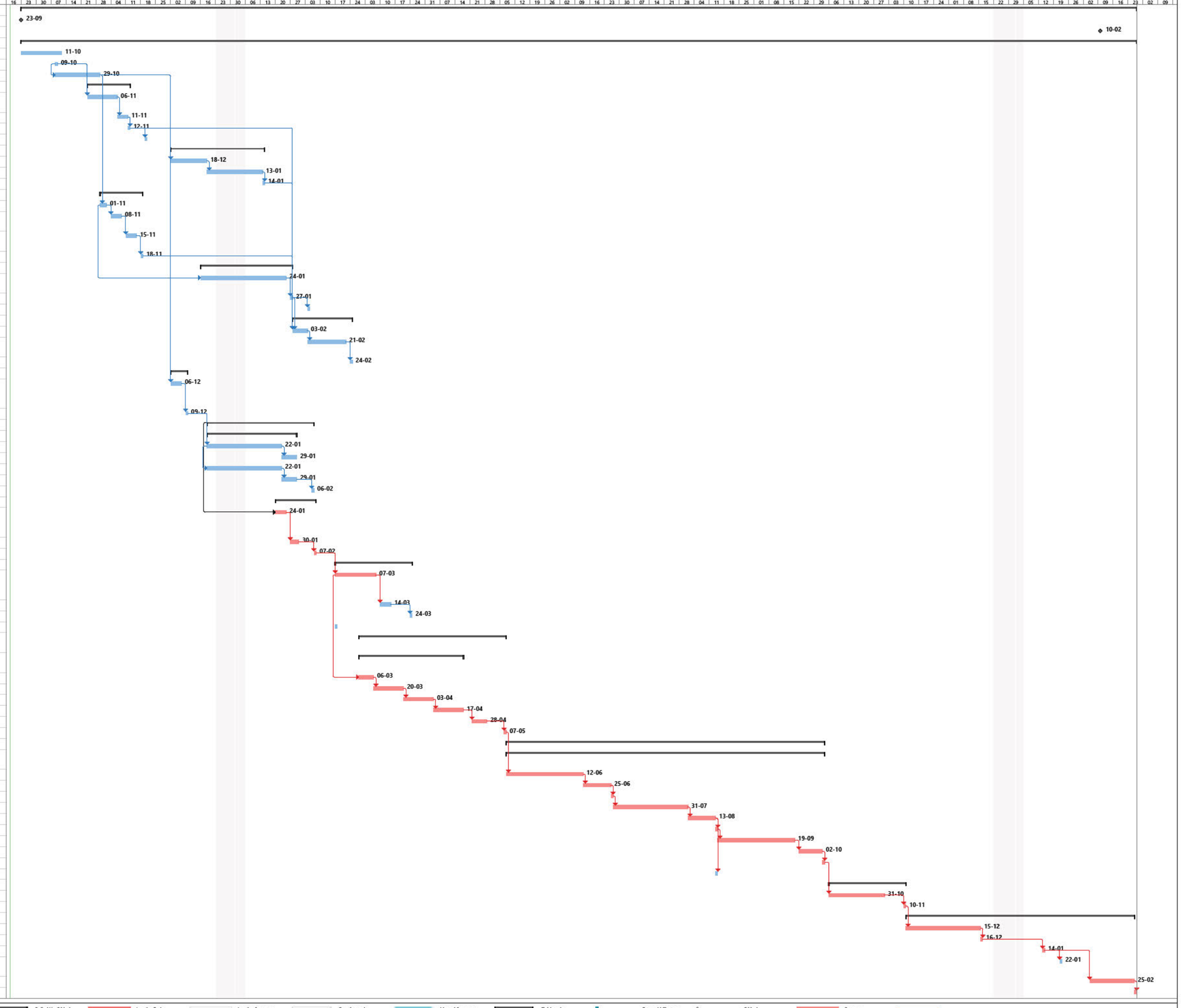
Risk ID	Date Identified	Identified By	Category	Risk or Opportunity?	Technical Discipline	Risk Description (Describe Cost, Programme & Quality Impacts)	Initial Impact	Initial Probability	Initial Rating	Response (Mitigation and/or Contingency)	Risk Owner	Review Date	Residual Impact	Residual Probability	Residual Rating	Status
1	30-Aug-24	WSP	Programme	Risk	All	Delays in data collation	Moderate	Possible	Medium	EA to provide all the data required in Task 1 at project start. WSP can be flexible with some other tasks	EA	01-Oct-24	Low	Possible	Low	Pending
2	30-Aug-24	WSP	Quality	Risk	All	Adequacy of existing data - extra data or surveys needed	Moderate	Possible	Medium	Review data requirements and agree with EA at start-up meeting.	EA	01-Oct-24	Moderate	Unlikely	Low	Pending
3	30-Aug-24	WSP	Technical	Risk	All	Use of the new input data (rainfall/PE) requires more extensive re-calibration than proposed	High	Possible	Medium	Early communication of issue and consequences with EA to discuss way forward. Stringent PM change management procedures throughout whole project from EA and WSP project managers.	WSP		Moderate	Possible	Medium	Pending
4	30-Aug-24	WSP	Programme	Risk	All	Water Companies do not respond with timely decisions or data	Moderate	Possible	Medium	Engage early with the Water Compnaies to ensure they are engaged with the approach. Documentation will be provided in advance to enable informed discussion during the allocated meetings times.	EA		Low	Possible	Low	Pending
5	30-Aug-24	WSP	Technical	Risk	All	Incorporation of revised geological layering requires extra effort than assumed	Moderate	Possible	Medium	Early review to assess degree of issue and to agree a way forward with the EA PM	WSP		Moderate	Unlikely	Low	Pending
6	30-Aug-24	WSP	Technical	Risk	All	There is a failure to achieve calibration of the new model that is the same or better than existing Historical Model	High	Possible	Medium	Early communication of issue and consequences with EA to discuss way forward. Stringent PM change management procedures throughout whole project from EA and WSP project managers.	WSP		Moderate	Possible	Medium	Pending
7	30-Aug-24	WSP	Programme	Risk	All	Final Report(s) delayed due to delay in receipt of EA review comments	Moderate	Possible	Medium	Two-week turnaround provided in the programme for EA comments on the two draft report. WSP to brief EA early on in start-up meeting what the anticipated delivery dates are.	EA		Low	Possible	Low	Pending
8	30-Aug-24	WSP	Commercial & Contracts	Risk	All	Key WSP Staff Leave and/or key staff illness or unforeseen unavailability (WSP)	Moderate	Possible	Medium	Keep QA throughout project up to date. Risk minimised by strength and depth of WSP Team - call on alternative experienced staff from large resource pool.	WSP		Low	Possible	Low	Pending
9	30-Aug-24	WSP	Staff/Resources	Risk	All	Key EA Staff Leave and/or key staff illness or unforeseen unavailability (EA)	Moderate	Possible	Medium	EA records and QA kept up to date, identify alternative points of contact - [redacted] to brief (e.g.) [redacted] of progress so that work can be picked up quickly	EA		Low	Possible	Low	Pending
10	30-Aug-24	WSP	Project Capital Cost	Risk	All	WSP underestimation of time required to complete scope	High	Possible	Medium	Our team's experience with Mole model reduces this risk. Our staff time inputs are realistic for the work required. Early EA discussion to flag and adapt.	WSP		Moderate	Unlikely	Low	Pending

Appendix EO1-2: Gantt Chart

EA- Mole Groundwater Model MF6 Update

Tender stage programme

ID	Task Mode	Name	Duration	Start	Finish	Predecessors
1		**Mole GWModel MF6 & Update**	**349 days**	**23-09-2024**	**26-02-2026**	
2		**Project start date**	**0 days**	**23-09-2024**	**23-09-2024**	
3		**Project completion date**	**0 days**	**10-02-2026**	**10-02-2026**	
4		**WSP Services**	**349 days**	**23-09-2024**	**26-02-2026**	
5		**Initiation and team mobilisation**	**15 days**	**23-09-2024**	**11-10-2024**	
6		**Project start up meeting**	**1 day**	**09-10-2024**	**09-10-2024**	
7		**Collection of data**	**15 days**	**09-10-2024**	**29-10-2024**	6SS
8		**Task 1- Digitise and collate springs data**	**14 days**	**24-10-2024**	**12-11-2024**	
9		**Digitise and collate springs data, incorporate them into the model.**	10 days	24-10-2024	06-11-2024	6FS+10 days
10		**Prepare a conceptual report chapter**	3 days	06-11-2024	11-11-2024	9
11		**Project Review meeting**	1 day	12-11-2024	12-11-2024	10
12		**Engagement meeting 1**	1 day	20-11-2024	20-11-2024	11FS+5 days
13		**Task 2- Examine specific areas**	**22 days**	**02-12-2024**	**14-01-2025**	
14		**Examine specific areas: Greywell Fen, Royal Brook etc.**	13 days	02-12-2024	18-12-2024	7FS+23 days
15		**Prepare a conceptual report chapter**	8 days	19-12-2024	13-01-2025	14
16		**Project review meeting**	1 day	14-01-2025	14-01-2025	15
17		**Task 3- Verify existing Mole model layers**	**14 days**	**30-10-2024**	**18-11-2024**	
18		**Verify the existing Mole model layer elevations**	3 days	30-10-2024	01-11-2024	7
19		**Using the spreadsheets from the 2023/24 WSP contract, check the existing Mole model surfaces**	5 days	04-11-2024	08-11-2024	18
20		**Extend the relevant surfaces in the three boundary extension areas using the spreadsheets**	5 days	11-11-2024	15-11-2024	19
21		**Project review meeting**	1 day	18-11-2024	18-11-2024	20
22		**Task 4- Split Chalk layer into two layers**	**21 days**	**16-12-2024**	**27-01-2025**	
23		**Split the Chalk layer into two layers using flowing features and other data**	20 days	16-12-2024	24-01-2025	18SS+33 days
24		**Project review meeting**	1 day	27-01-2025	27-01-2025	23
25		**Engagement meeting 2**	1 day	04-02-2025	04-02-2025	24FS+5 days
26		**Task 5- Parameterise the model area and layers**	**20 days**	**28-01-2025**	**24-02-2025**	
27		**Parameterise the model area and layers**	5 days	28-01-2025	03-02-2025	24,11,16,21
28		**Review specific areas whether the representation of aquifers should be improved in the regional model**	14 days	04-02-2025	21-02-2025	27
29		**Project review meeting**	1 day	24-02-2025	24-02-2025	28
30		**Task 6- Review Water Balance reporting areas**	**6 days**	**02-12-2024**	**09-12-2024**	
31		**Review Water Balance Reporting Areas and change from surface to groundwater catchments in Chalk and Greensand outcrop areas**	5 days	02-12-2024	06-12-2024	7FS+23 days
32		**Project review meeting**	1 day	09-12-2024	09-12-2024	31
33		**Task 7- Convert the model to Modflow 6**	**26 days**	**19-12-2024**	**06-02-2025**	
34		**Convert the model from Modflow 96 to Modflow 6**	**20 days**	**19-12-2024**	**29-01-2025**	
35		**Review stream cells parameterisation**	15 days	19-12-2024	22-01-2025	32FS+7 days
36		**Re-format model geometry input files**	5 days	23-01-2025	29-01-2025	35
37		**Re-format other model input files**	15 days	19-12-2024	22-01-2025	35SS
38		**Undertake test run and post-processing**	5 days	23-01-2025	29-01-2025	37
39		**Project review meeting**	1 day	06-02-2025	06-02-2025	38FS+5 days
40		**Task 8- Update rainfall gridded 4r model input**	**15 days**	**20-01-2025**	**07-02-2025**	
41		**Update the rainfall gridded 4r model input from CERF to HADUK and the potential evapotranspiration for MOSES to EAPET.**	5 days	20-01-2025	24-01-2025	33SS+12 days
42		**Undertake test run and post-processing**	4 days	27-01-2025	30-01-2025	41
43		**Project review meeting**	1 day	07-02-2025	07-02-2025	42FS+5 days
44		**Task 9- Extend time series of all input data by 4 years**	**26 days**	**17-02-2025**	**24-03-2025**	
45		**Extend time series of all other input data from the current model end date of March 2020 by four years to March 2024.**	15 days	17-02-2025	07-03-2025	43FS+5 days
46		**Undertake test run and post-processing**	5 days	10-03-2025	14-03-2025	45
47		**Project review meeting**	1 day	24-03-2025	24-03-2025	46FS+5 days
48		**Interim Project Review Meeting**	**1 day**	**17-02-2025**	**17-02-2025**	
49		**Task 10- Extend Modflow groundwater model in 3 separate areas**	**46 days**	**28-02-2025**	**07-05-2025**	
50		**Extend the Modflow groundwater model active extent in three separate areas:**	**35 days**	**28-02-2025**	**17-04-2025**	
51		**Confirm model boundary conditions**	5 days	28-02-2025	06-03-2025	45SS+9 days
52		**Implement Southeast extension**	10 days	07-03-2025	20-03-2025	51
53		**Implement Western extension**	10 days	21-03-2025	03-04-2025	52
54		**Implement Heathrow extension**	10 days	04-04-2025	17-04-2025	53
55		**Undertake test run and post-processing**	5 days	22-04-2025	28-04-2025	54
56		**Project review meeting**	1 day	07-05-2025	07-05-2025	55FS+5 days
57		**Task 11- Update Modflow 6 Mole model calibration**	**105 days**	**08-05-2025**	**03-10-2025**	
58		**Undertake 30 model re-calibration runs (Modflow)**	**105 days**	**08-05-2025**	**03-10-2025**	
59		**Phase 1 calibration**	25 days	08-05-2025	12-06-2025	56
60		**Review time for EA**	9 days	13-06-2025	25-06-2025	59
61		**1st interim call with EA**	1 day	26-06-2025	26-06-2025	60
62		**Phase 2 calibration**	25 days	27-06-2025	31-07-2025	61
63		**Review time for EA**	9 days	01-08-2025	13-08-2025	62
64		**2nd interim call with EA**	1 day	14-08-2025	14-08-2025	63
65		**Phase 3 calibration**	25 days	15-08-2025	19-09-2025	64
66		**Review time for EA**	9 days	22-09-2025	02-10-2025	65
67		**Final calibration call with EA**	1 day	03-10-2025	03-10-2025	66
68		**Engagement meeting 3**	1 day	14-08-2025	14-08-2025	63
69		**Task 12- Produce 3 standard model scenarios**	**26 days**	**06-10-2025**	**10-11-2025**	
70		**Produce 3 further standard model scenarios**	20 days	06-10-2025	31-10-2025	67
71		**Project review meeting**	1 day	10-11-2025	10-11-2025	70FS+5 days
72		**Task 13- Reporting**	**67 days**	**11-11-2025**	**25-02-2026**	
73		**Write draft report**	25 days	11-11-2025	15-12-2025	71
74		**Issue of draft report to EA**	1 day	16-12-2025	16-12-2025	73
75		**Collation of EA comments on draft report**	1 day	14-01-2026	14-01-2026	74FS+10 days
76		**Engagement meeting 4 - Presentation of project outcomes to Project Steering Group**	1 day	22-01-2026	22-01-2026	75FS+5 days
77		**Final comprehensive report on the model update**	15 days	05-02-2026	25-02-2026	75FS+15 days
78		**Project close out meeting**	1 day	26-02-2026	26-02-2026	77



Task, Milestone, Summary, Rolled Up Critical, Inactive Task, Inactive Summary, Duration-only, Manual Summary, Finish-only, External Milestone, Critical, Progress
Split, Slippage, Project Summary, Rolled Up Critical Split, Inactive Milestone, Manual Task, Manual Summary Rollup, Start-only, External Tasks, Deadline, Critical Split

Appendix EO2-1: Curriculum Vitae

CURRICULUM VITAE

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