

COLLABORATIVE RESEARCH AGREEMENT - RIO TINTO CENTRE FOR FUTURE MATERIALS
SCHEDULE 1 SECTION 3 – Funding

Work Package: WP00 Foundational Research: Building a First Nations Research Agenda to support the Rio Tinto Centre for Future Materials

Partner university: The Australian National University

Academic contact : [Redacted]

Year One	Year Two	Year Three	Total
[Redacted]	[Redacted]	[Redacted]	[Redacted]

All amounts in this Schedule exclude VAT which Imperial will pay at the rate from time to time prescribed by law.

Imperial's Finance Officer is: [Redacted], Department Operations Manager, Earth Science & Engineering

Academic Institutions 's Finance Officer is: [Redacted] Email: science.jaeger.rm@anu.edu.au

All payments of the Funding will be made by bank transfer to: [Redacted]
 Bank: [Redacted] s 47E - Public Interest Conditional Exemptions - Certain Operations of Agencies
 Branch: [Redacted]
 Account name: [Redacted]
 BSB: [Redacted]
 Account number: [Redacted]
 Swift code: [Redacted]

Funder Ref. or PO No. to be included on Invoice	[Redacted]
Invoice Address (Billing Address)	Accounts Payable, Imperial College London London, SW7 2AZ United Kingdom Tel: 020 7594 6000 Email: apinvoices@imperial.ac.uk
Contact Name*	Please confirm
Contact Tel*	Please confirm
Contact Email*	Please confirm
Funder VAT No. (if outside UK)**	Not needed
Additional Instructions (if any)	

* Required by Accounts Receivable for Invoicing

** EU Commercial Organizations without a VAT number will be charged UK V

AGREED by the Parties through their authorized signatories:

SIGNED for and on behalf of Imperial:

SIGNED for and on behalf of The Australian National University

Name [Redacted]

Name [Redacted]

Position Head of Contracts, Faculty of Engineering

Position Chief, Research and Information

Signature

[Redacted Signature]

Signature

[Redacted Signature]

RIO TINTO CENTRE FOR FUTURE MATERIALS

GRAND CHALLENGE:

DELIVERING FUTURE MATERIALS SYSTEMS FOR THE ENERGY TRANSITION WITH INTEGRITY: THE CU CHALLENGE

WORK PACKAGE DETAIL – RESEARCH

Please note: As outlined in the Centre contract between our universities, it is required that there are no third-party rights nor any other encumbrances that would prevent the use of Background IP under licence to Rio Tinto.

Section 1: Application Summary		
Work Package Title: WP00		
Phase 1 Foundational Research: building a First Nations research agenda to support the Rio Tinto Centre for Future Materials		
Work Package Coordinators (at least two people):		ANU ANU
<small>s.47F - Public Interest Conditional Exemptions - Personal Privacy</small>		
Work Package Team Member	Role	Department / University
<small>s.47F - Public Interest Conditional Exemptions - Personal Privacy</small>	Senior First Nations leadership and WP coordination	First Nations Portfolio / ANU
<small>s.47F - Public Interest Conditional Exemptions - Personal Privacy</small>	WP coordination, research and community engagement	School of Regulation and Global Governance / ANU
<small>s.47F - Public Interest Conditional Exemptions - Personal Privacy</small>	Community engagement and research	First Nations Portfolio / ANU
<small>s.47F - Public Interest Conditional Exemptions - Personal Privacy</small>	Community engagement and research	First Nations Portfolio / ANU
<small>s.47F - Public Interest Conditional Exemptions - Personal Privacy</small>	Community engagement and research	Australian National Centre for the Public Awareness of Science / ANU
<small>s.47F - Public Interest Conditional Exemptions - Personal Privacy</small>	Community engagement and research	Australian National Centre for the Public Awareness of Science / ANU
<small>s.47F - Public Interest Conditional Exemptions - Personal Privacy</small>	Community engagement and research, subject matter expert	Centre for Indigenous Policy Research / ANU

s.47F - Public Interest Conditional Exemptions - Part 1	Community engagement and research	Research School of Social Sciences / ANU
s.47F - Public Interest Conditional Exemptions - Part 1	International partner point of contact	UBC
s.47F - Public Interest Conditional Exemptions - Part 1	International partner point of contact	Witz
s.47F - Public Interest Conditional Exemptions - Part 1	International partner point of contact	Berkeley

Section 1.1: LAY SUMMARY (Maximum half a page)

This research contains two phases of work: **Phase 1** comprises this work package (**WP00**) which will build the foundations for genuinely collaborative research with First Nations communities affected by mining and energy transitions in Australia. It also contains preparatory activities for **Phase 2** which will engage with First Nations groups internationally through the Rio Tinto Centre for Future Materials partner universities. This proposal is for Phase 1 WP00 only.

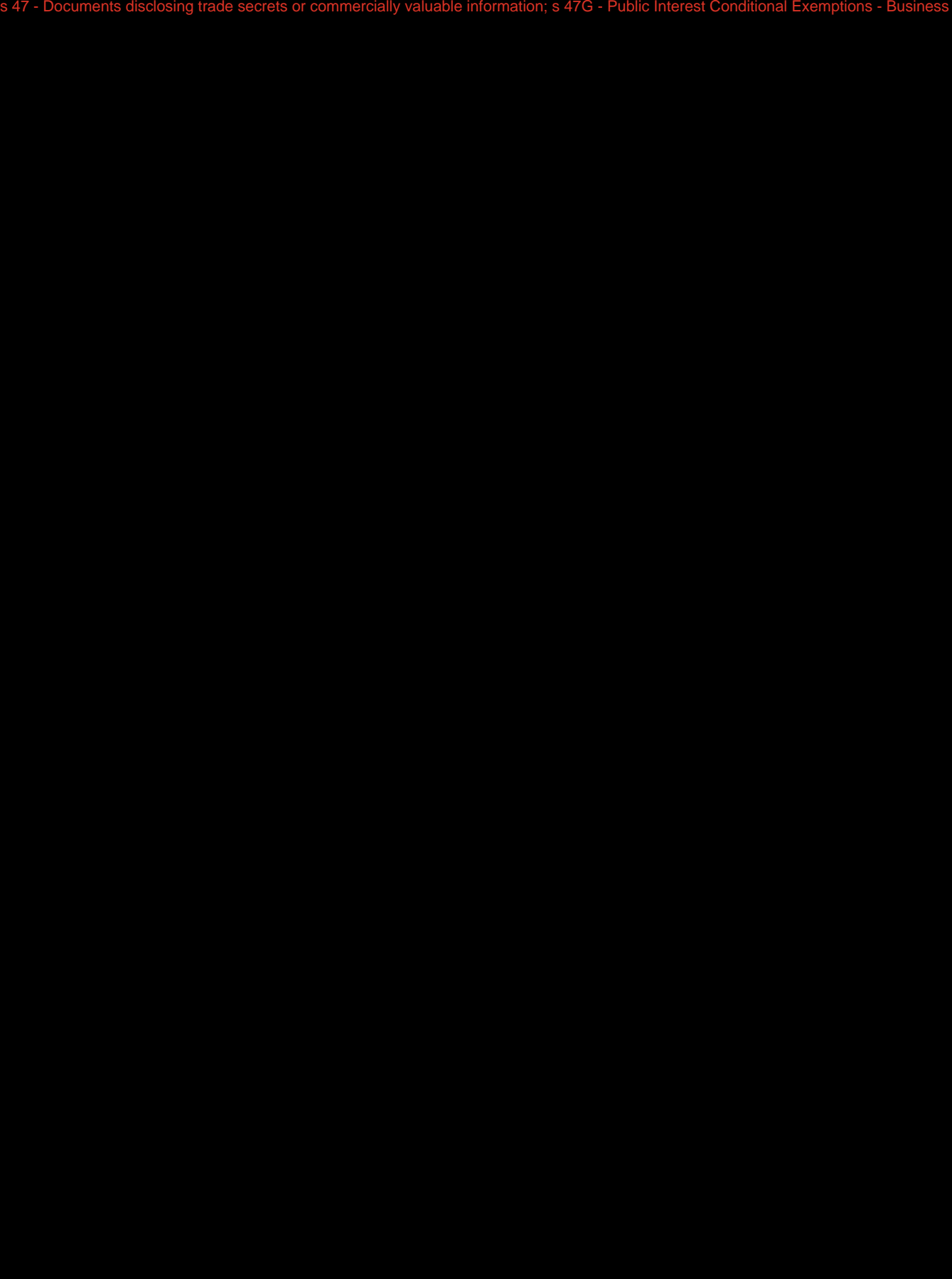
The aims of WP00 are to invest in collaborative research relationships with First Nations communities and build First Nations research capability so that we can then co-develop long-term research agendas and proposals that address the ‘Copper Challenge’ and other ‘Grand Challenges’ to be identified by the Centre. This ambitious collaborative work package will confer enduring benefits, ensuring that First Nations-led methods, insights, concepts and frameworks underpin and enhance the value of future research activities undertaken by the Centre.

To achieve these aims, several research-intensive units at the Australian National University will work with the ANU’s First Nations Portfolio (FNP) – an Indigenous-led branch of the university’s Executive that positions the ANU as a world leader in First Nations issues. We will build on the FNP’s connections to develop research relationships with First Nations groups in Australia. This will provide the basis to conduct collaborative workshops to elicit Indigenous views and priorities on topics spanning Indigenous sovereignty, rights and resilience in the context of mining and energy transitions. Through scholarships, mentoring and the appointment of First Nations research fellows at the ANU, we will also help to build the next generation of First Nations scholars that can take carriage of research within the Centre for the next decade and beyond. In parallel to this, we will lead a series of preparatory online workshops with collaborators at UBC, Witz and Berkeley to prepare a Phase 2 proposal that engages with First Nations groups internationally.

A primary outcome of WP00 will be enhanced capability to co-design future research agendas within the Centre that foreground First Nations’ rights and interests with respect to the production and supply of those essential materials, especially copper, that are needed for global energy transitions.

Section 2: WORK PACKAGE SCOPE (Maximum of two pages A4)

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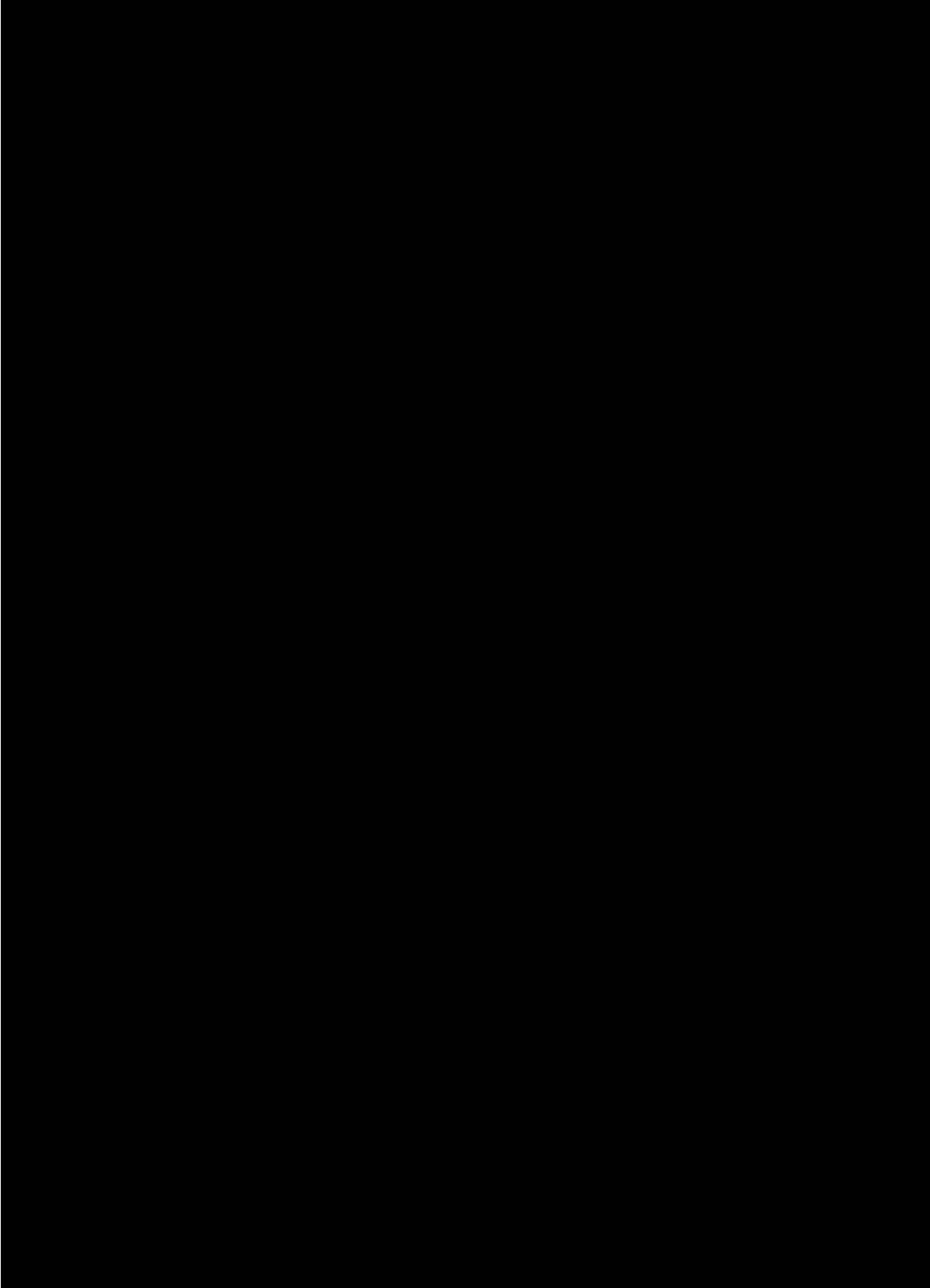


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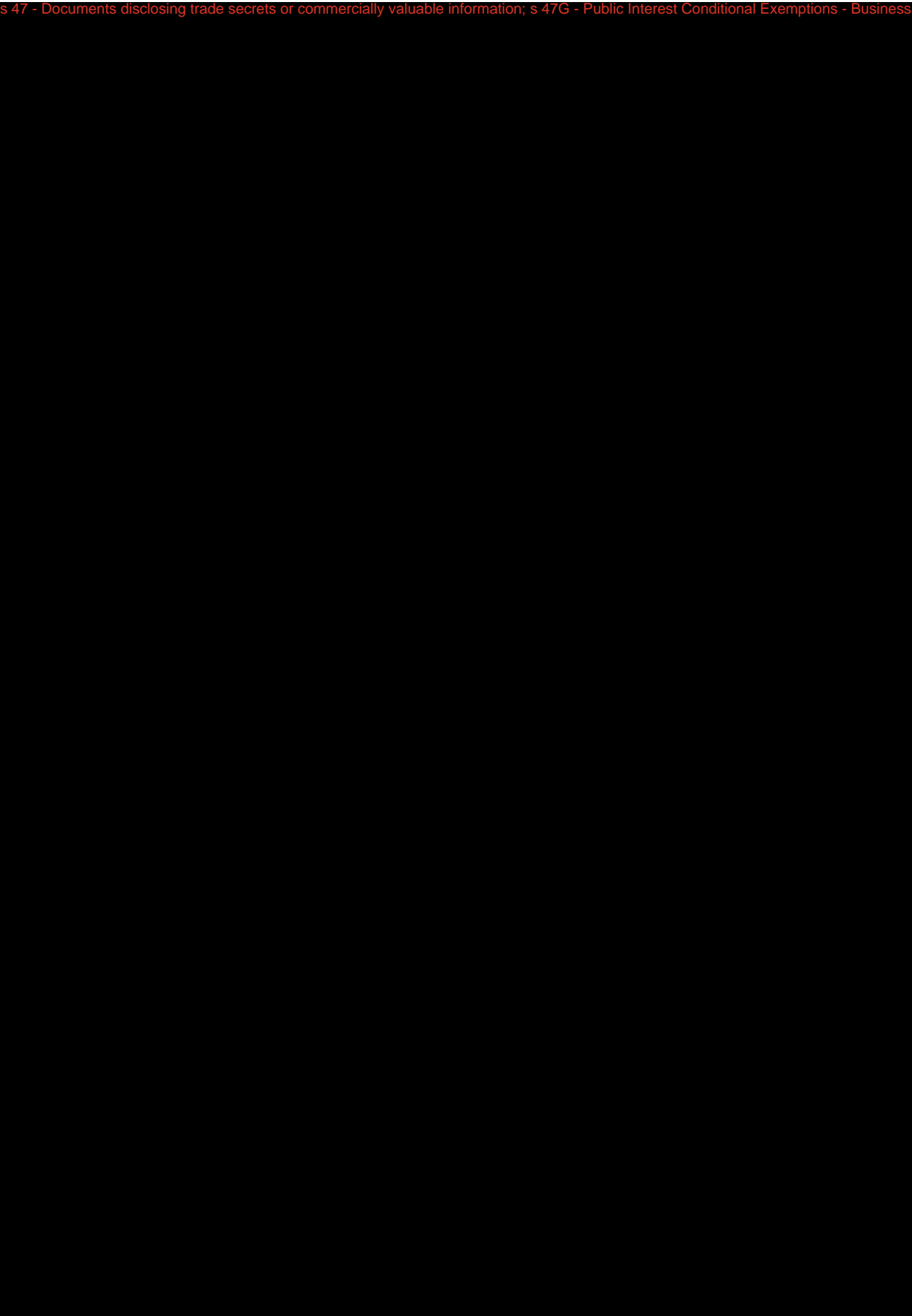


Section 3: WORK PACKAGE DETAIL (Maximum of three pages A4)

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Submit by 31 July to ccfm@imperial.ac.uk

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RIO TINTO CENTRE FOR FUTURE MATERIALS

GRAND CHALLENGE:

DELIVERING FUTURE MATERIALS SYSTEMS FOR THE ENERGY TRANSITION WITH INTEGRITY: THE CU CHALLENGE

WORK PACKAGE DETAIL – TEAM MEMBERS & RESOURCING

To be completed by the work package coordinators in conjunction with other team members.

This is to give an indication of the resources needed to deliver the work package – detailed costing will be requested once resources have been identified via the finance contacts provided.

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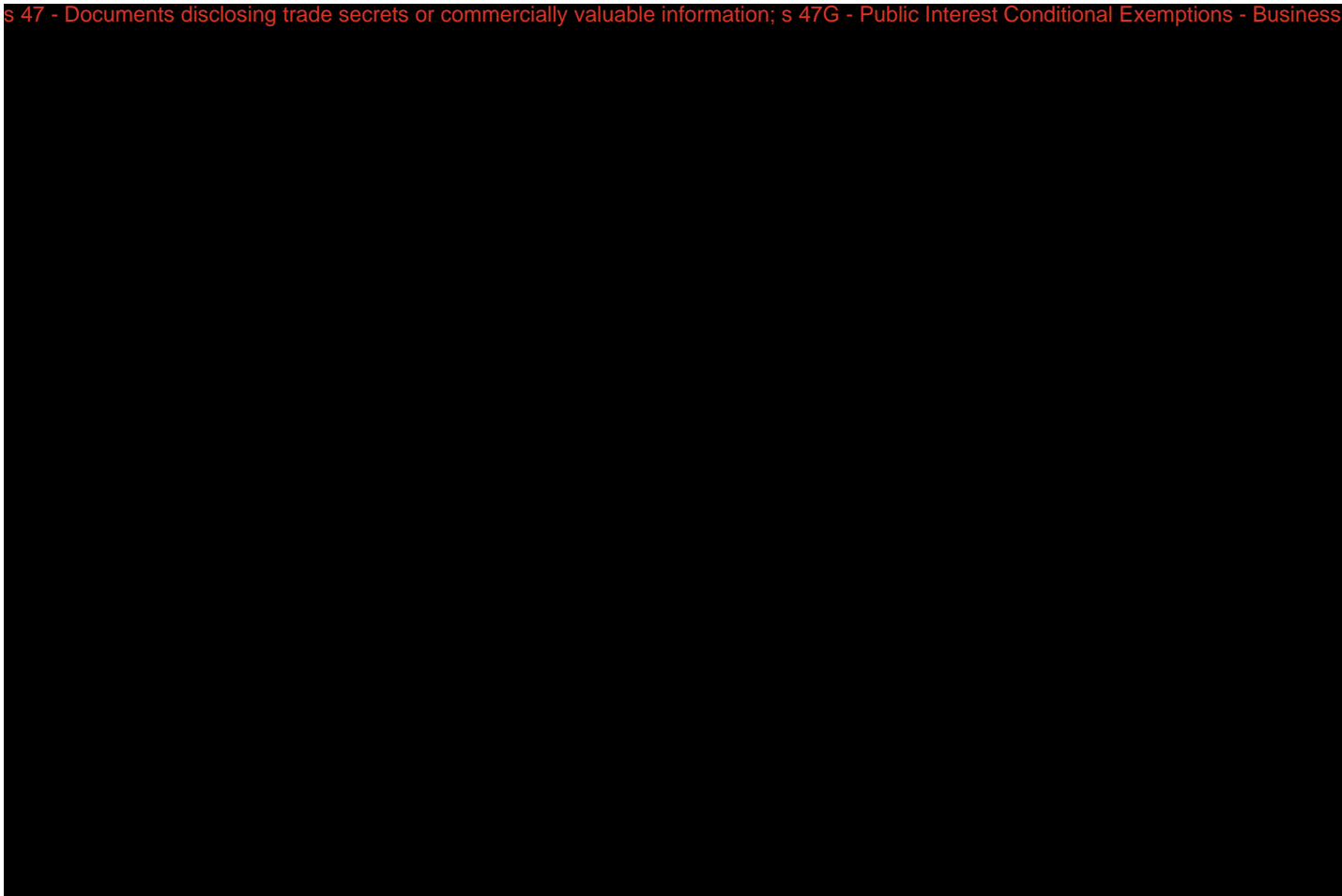
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Work Package Title: FOUNDATIONAL RESEARCH: BUILDING A FIRST NATIONS RESEARCH AGENDA TO SUPPORT THE CENTRE FOR FUTURE MATERIALS

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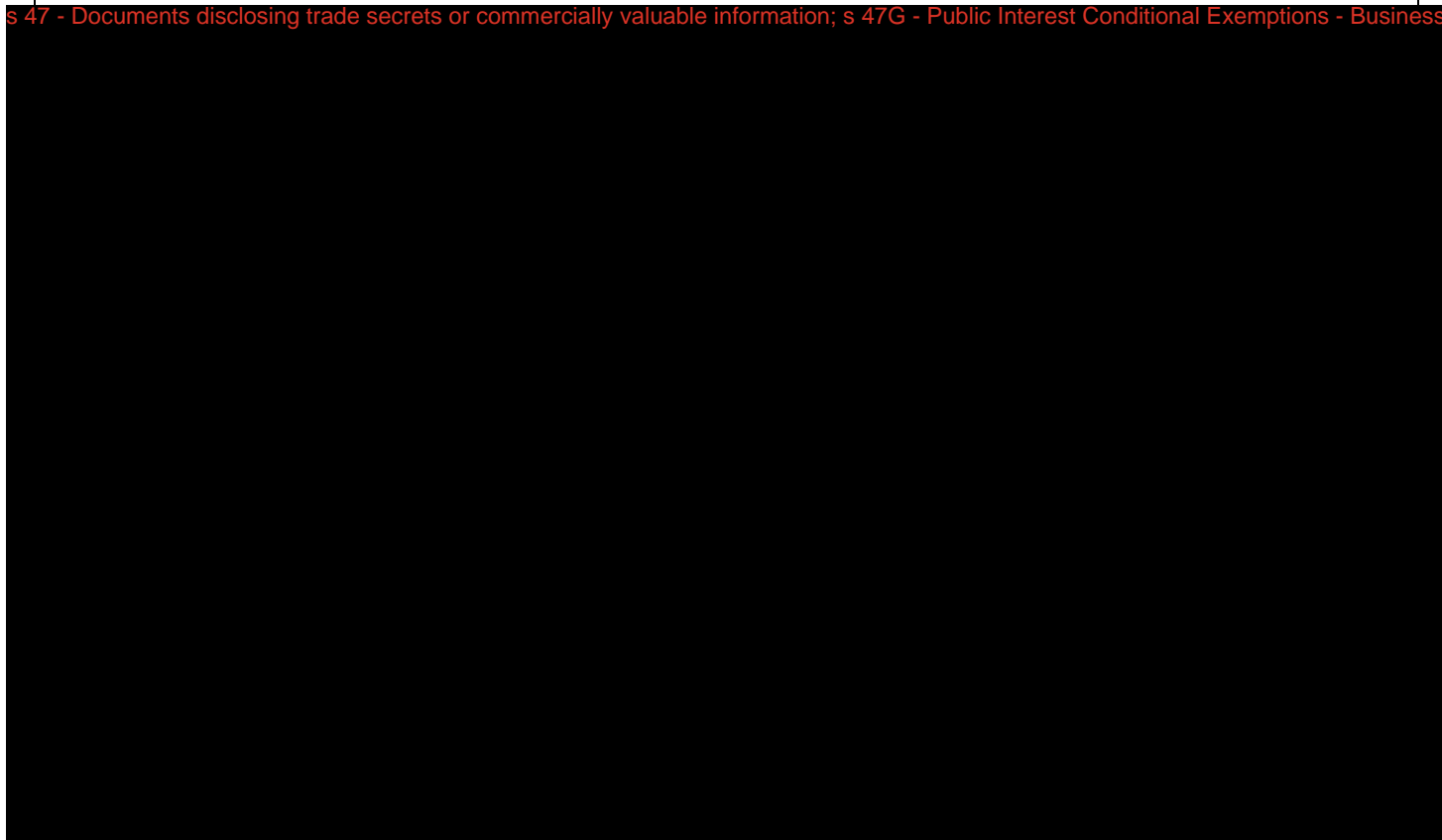
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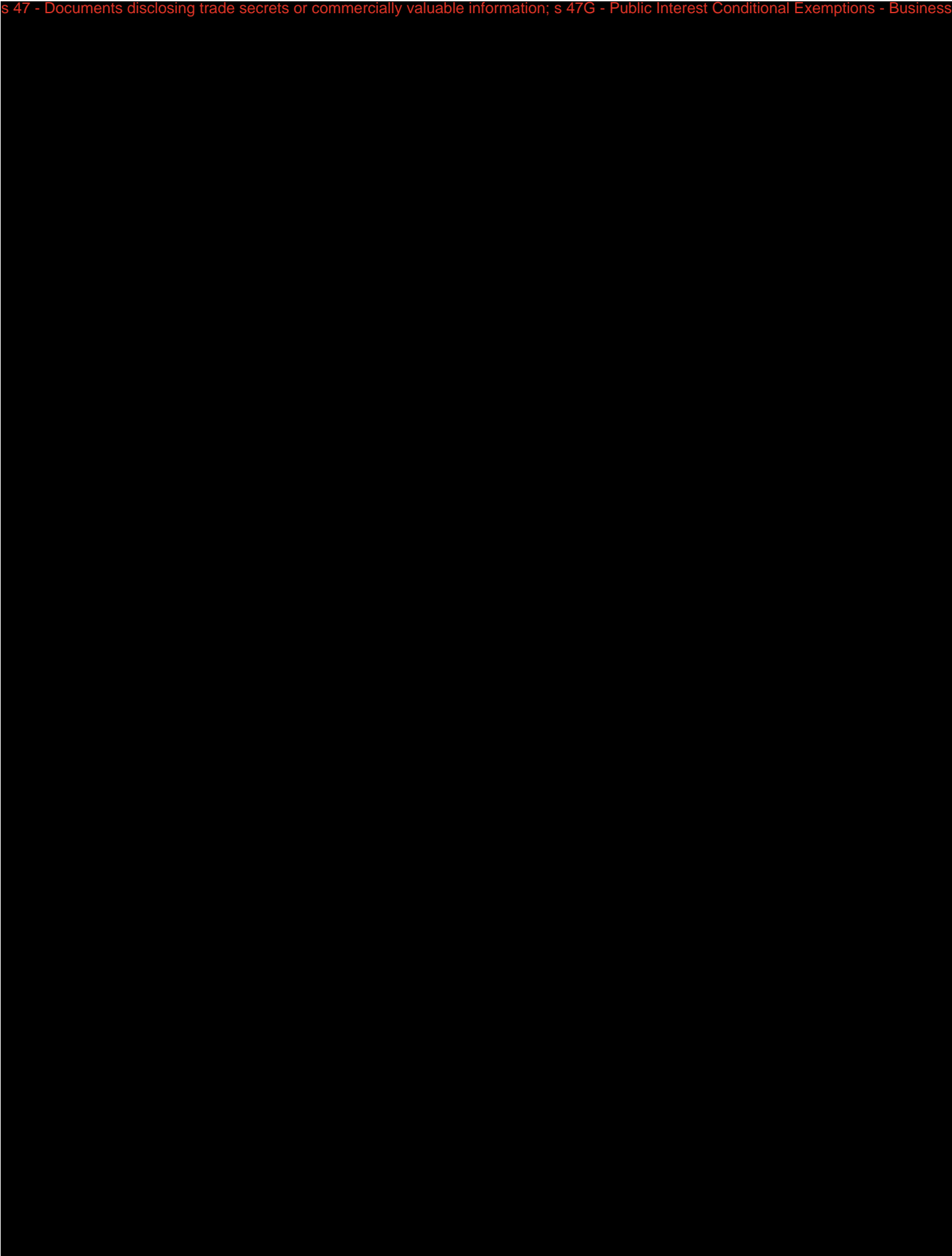
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Work Package Resourcing Request
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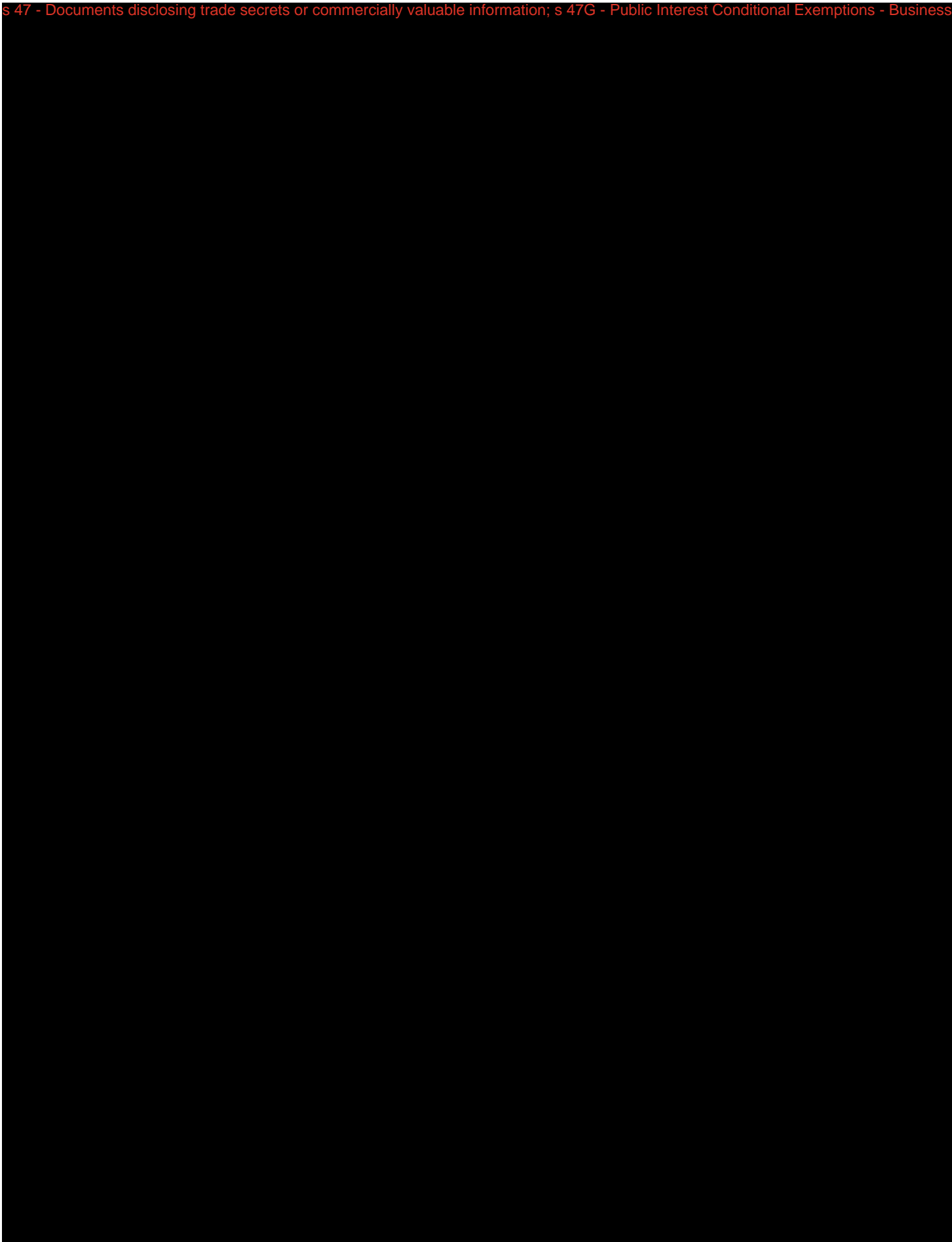


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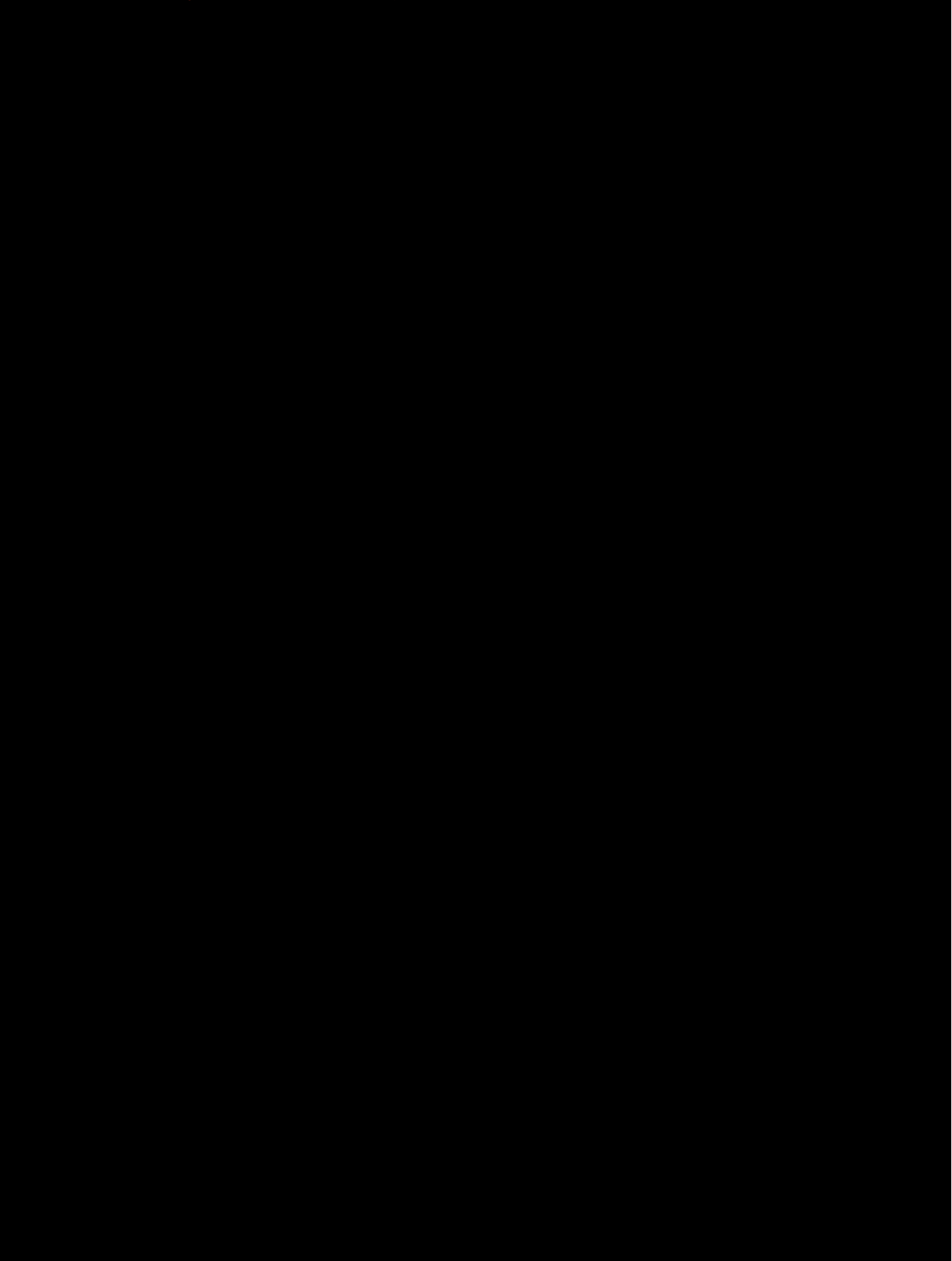
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COLLABORATIVE RESEARCH AGREEMENT - RIO TINTO CENTRE FOR FUTURE MATERIALS
SCHEDULE 1 SECTION 3 – Funding

Work Package: WP001 Foundational Research: Frameworks and Methods for Social-Technological Integration

Partner university: The Australian National University

Academic contact : [Redacted]

Year One	Year Two	Year Three	Total
[Redacted]			

All amounts in this Schedule exclude VAT which Imperial will pay at the rate from time to time prescribed by law.

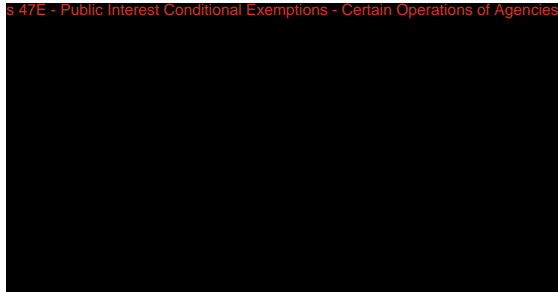
Imperial's Finance Officer is: [Redacted] Department Operations Manager, Earth Science & Engineering

Academic Institutions 's Finance Officer is: [Redacted], email: science.jaeger.rm@anu.edu.au.

All payments of the Funding will be made by bank transfer to:

Bank:
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Account Name:
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BSB:
Account Number:
Swift Code:



Email remittance to: bank.rec@anu.edu.au

Please include full details of ANU invoice number, name of sender, ANU purchase order number, ANU Uni ID, ANU charge code or details of receiving area as appropriate.

Funder Ref. or PO No. to be included on Invoice	[Redacted]
Invoice Address (Billing Address)	Accounts Payable, Imperial College London London, SW7 2AZ United Kingdom Tel: 020 7594 6000 Email: apinvoices@imperial.ac.uk
Contact Name*	Please confirm
Contact Tel*	Please confirm
Contact Email*	Please confirm
Funder VAT No. (if outside UK)**	Not needed
Additional Instructions (if any)	

* Required by Accounts Receivable for Invoicing

** EU Commercial Organizations without a VAT number will be charged UK V

AGREED by the Parties through their authorized signatories:

SIGNED for and on behalf of Imperial:

Name 

Position Head of Contracts, Faculty of Engineering

Signature 

SIGNED for and on behalf of The Australian National University

Name 

Position Director, Australian National Center for the P

Signature 

RIO TINTO CENTRE FOR FUTURE MATERIALS

GRAND CHALLENGE:

**DELIVERING FUTURE MATERIALS SYSTEMS FOR THE ENERGY
TRANSITION WITH INTEGRITY: THE CU CHALLENGE**

WORK PACKAGE DETAIL – RESEARCH

Please note: As outlined in the Centre contract between our universities, it is required that there are no third-party rights nor any other encumbrances that would prevent the use of Background IP under licence to Rio Tinto.

Section 1: Application Summary		
Work Package Title: WP001		
FOUNDATIONAL RESEARCH: FRAMEWORKS AND METHODS FOR SOCIAL-ENVIRONMENTAL-TECHNOLOGICAL INTEGRATION		
Work Package Coordinators (at least two people):		
<small>s.47F - Public Interest Conditional Exemptions - Personal Privacy</small> , Centre for the Public Awareness of Science (CPAS), ANU <small>s.47F - Public Interest Conditional Exemptions - Personal Privacy</small> , Centre for Environmental Policy, Imperial College		
Work Package Team Member	Role	Department / University
<small>s.47F - Public Interest Conditional Exemptions - Personal Privacy</small>	Lead coordinator, research, supervision, capacity-building	As above. Social science
<small>s.47F - Public Interest Conditional Exemptions - Personal Privacy</small>	Lead, research, supervision, capacity-building	As above. Social science
<small>s.47F - Public Interest Conditional Exemptions - Personal Privacy</small>	Contributor, co-supervision of Parcel 2	Earth Sciences & Engineering/ Imperial
<small>s.47F - Public Interest Conditional Exemptions - Personal Privacy</small>	Contributor Parcel 2, co-supervision, Parcel 1	Social science/CPAS/ANU
<small>s.47F - Public Interest Conditional Exemptions - Personal Privacy</small>	Contributor, Parcels 1, 2	Social science/Regulation & Global Governance/ANU
<small>s.47F - Public Interest Conditional Exemptions - Personal Privacy</small>	Collaborator (Advisory)	Material science/Berkeley
<small>s.47F - Public Interest Conditional Exemptions - Personal Privacy</small>	Collaborator (Advisory)	Biosciences/ANU
<small>s.47F - Public Interest Conditional Exemptions - Personal Privacy</small>	Collaborator (Advisory)	Mining sciences/UBC
<small>s.47F - Public Interest Conditional Exemptions - Personal Privacy</small>	Collaborator (Advisory)	Mining sciences/Wits
<small>s.47F - Public Interest Conditional Exemptions - Personal Privacy</small>	Collaborator (Advisory)	Mining sciences/UBC
<small>s.47F - Public Interest Conditional Exemptions - Personal Privacy</small>	Collaborator (Advisory)	Physical sciences/ANU
<small>s.47F - Public Interest Conditional Exemptions - Personal Privacy</small>	Collaborator (Advisory)	Earth sciences/ANU

Section 1.1: LAY SUMMARY (Maximum half a page)

Provide a summary of your work package and how it will address the Cu challenge. Avoid jargon (i.e. publishable on a website) and think about an audience that could be the public, school students, or policy makers.

The Rio Tinto Centre for Future Materials has the ambitious goal of developing the fundamental knowledge and know-how to transform how materials critical for the energy transition are produced, used and recycled. Since conventional methods of material extraction and processing have often adversely affected communities and ecosystems, the Centre seeks to foster an innovative research approach where inputs from the physical and biological sciences, social sciences and relevant communities are integrated to work out the technological and associated institutional interventions which have a better chance of jointly fulfilling socio-cultural, economic and environmental imperatives.

However, the bio-physical and social sciences lack much experience of collaborating to meet such transformative goals in this domain. In the Centre, social sciences will bring insights from anthropology, political economy, governance, socio-ecological systems, human-nature interactions and crucially, from deep engagement with Indigenous and non-Indigenous mining communities. The bio-physical sciences will bring deep expertise on how natural phenomena can be harnessed to create novel technological solutions. Experience shows that we are likely to find different ways of understanding and assessing key dimensions of future materials for energy transitions, both across these fields and between the project and wider experts and stakeholders. We therefore need systematic approaches to connect and interpret these inputs, make sense of potential differences and develop integrative ways forward which consider the system as a whole.

This Work package aims to build the foundations for integrative research capacity in the Rio Tinto Centre for the Cu challenge and beyond as we design further grand challenges. We will achieve this by co-designing: a.) a novel *framework* for knitting together different discipline-based inputs and b.) identifying and developing *assessment methods* suited to assessing the whole system. This will generate new knowledge not just of 'how' to collaborate (where much has been produced of a generic, process-based nature), but about the substance of key questions such as the following. How do we recognize and respond to unintended consequences of our technological solutions? How can we reconcile different specialist methods of environmental and social impact assessment? What exemplars of good practice do we find and can we invent so that work in this space contributes to wider social and environmental goals?

Section 2: WORK PACKAGE SCOPE (Maximum of two pages A4)

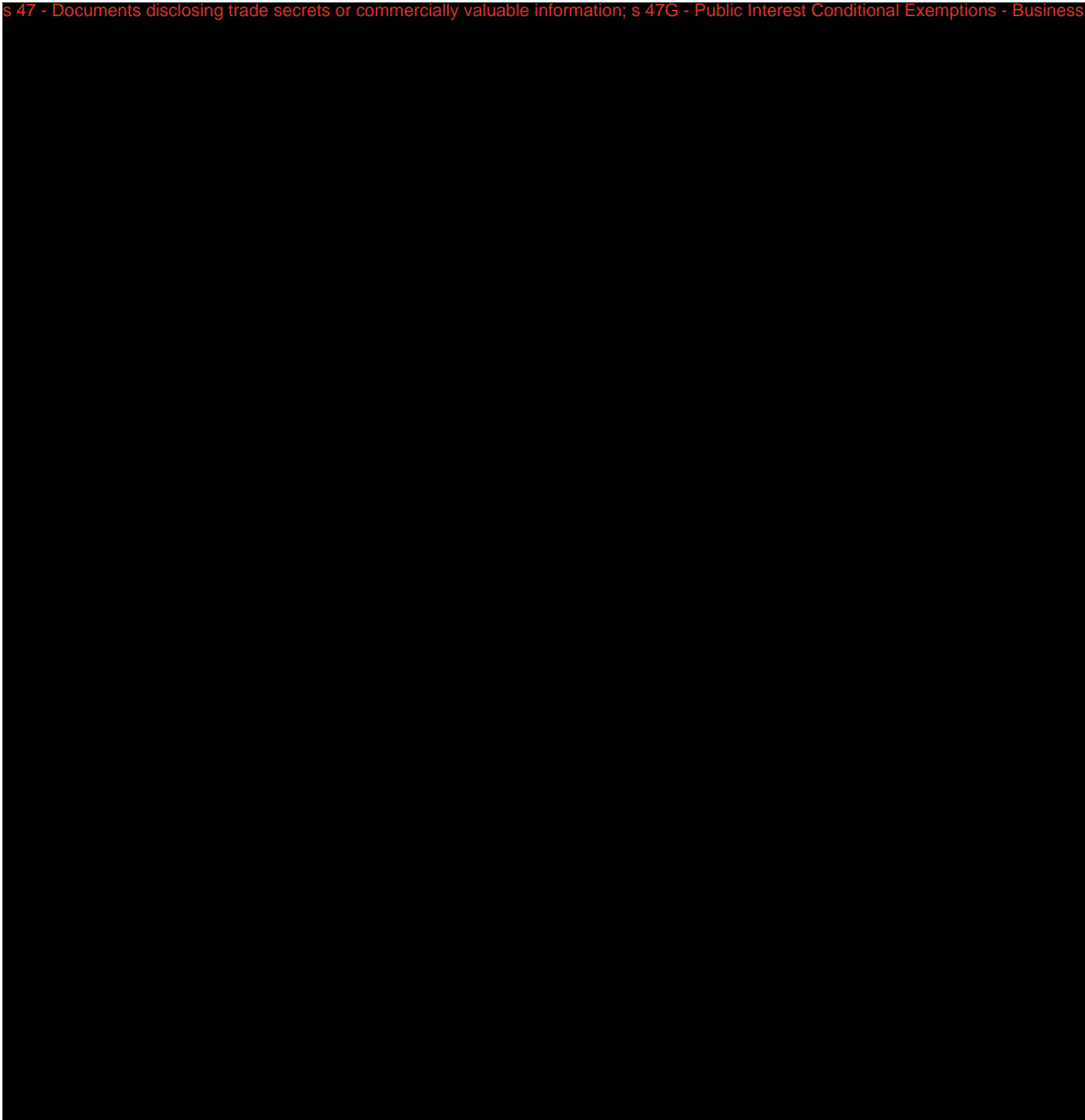
s 47 - Documents disclosing trade secrets or commercially valuable information; s 47G - Public Interest Conditional Exemptions - Business



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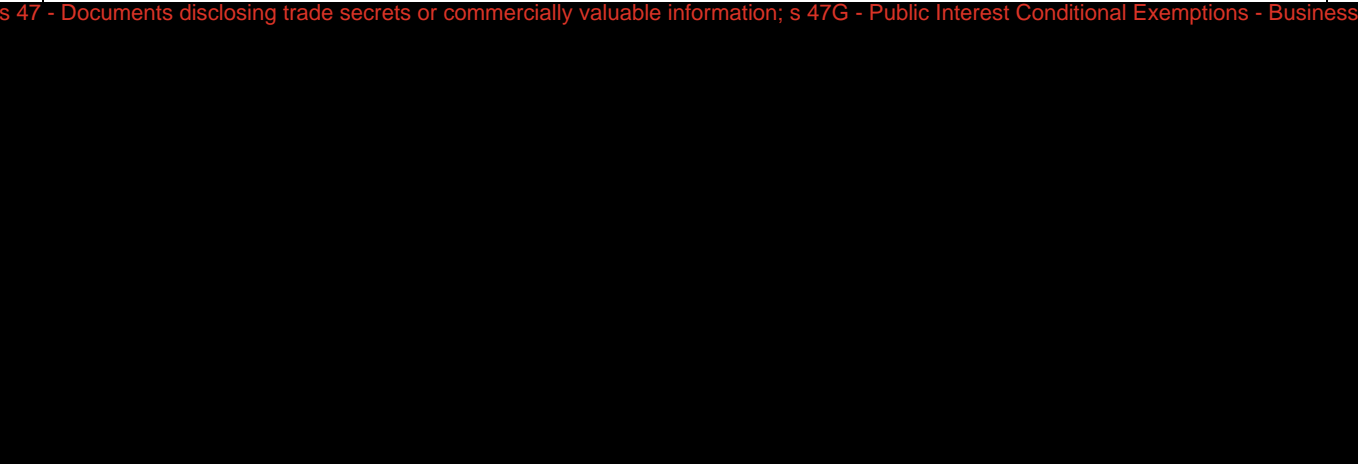


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Section 3: WORK PACKAGE DETAIL (Maximum of three pages A4)

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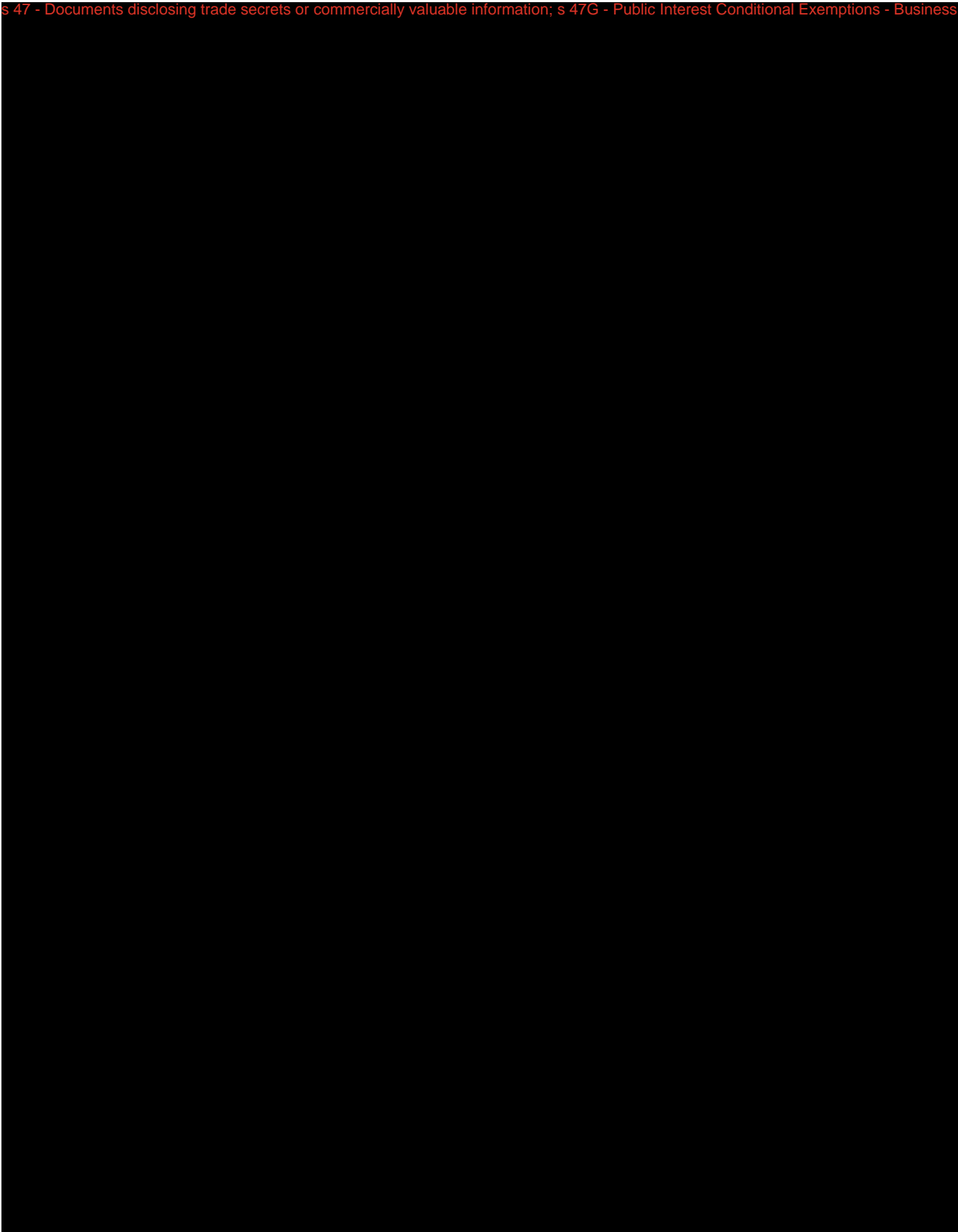


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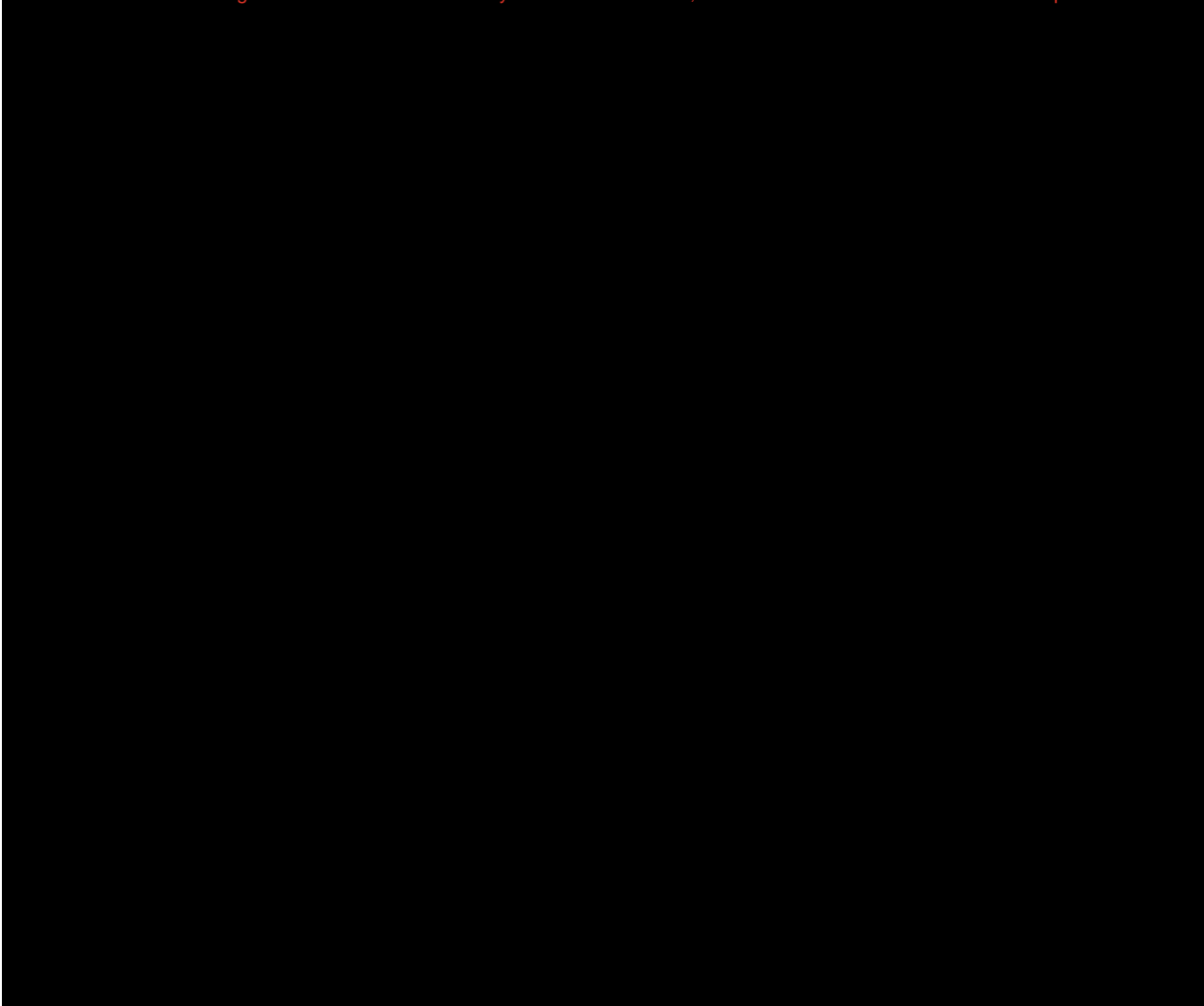
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RIO TINTO CENTRE FOR FUTURE MATERIALS

GRAND CHALLENGE:

DELIVERING FUTURE MATERIALS SYSTEMS FOR THE ENERGY TRANSITION WITH INTEGRITY: THE CU CHALLENGE

WORK PACKAGE DETAIL – TEAM MEMBERS & RESOURCING

To be completed by the work package coordinators in conjunction with other team members.

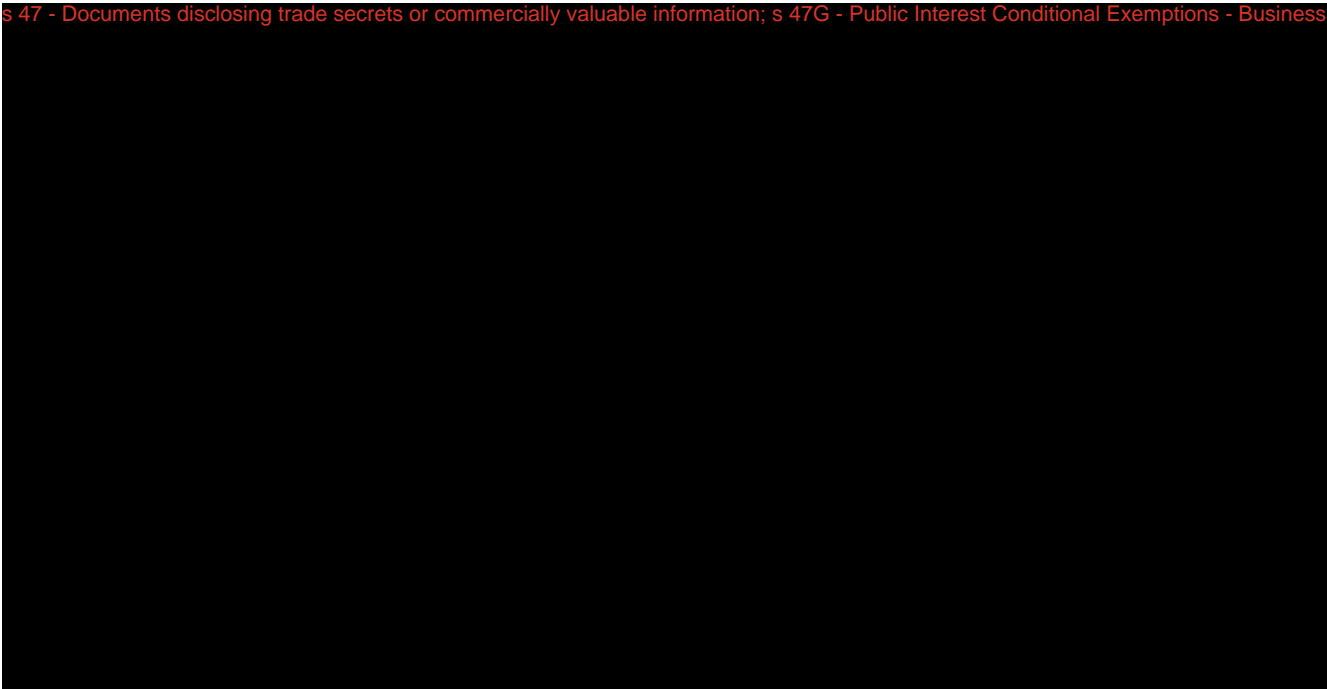
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**Work Package Title: FOUNDATIONAL RESEARCH: FRAMEWORKS AND METHODS FOR
SOCIAL-TECHNOLOGICAL INTEGRATION**

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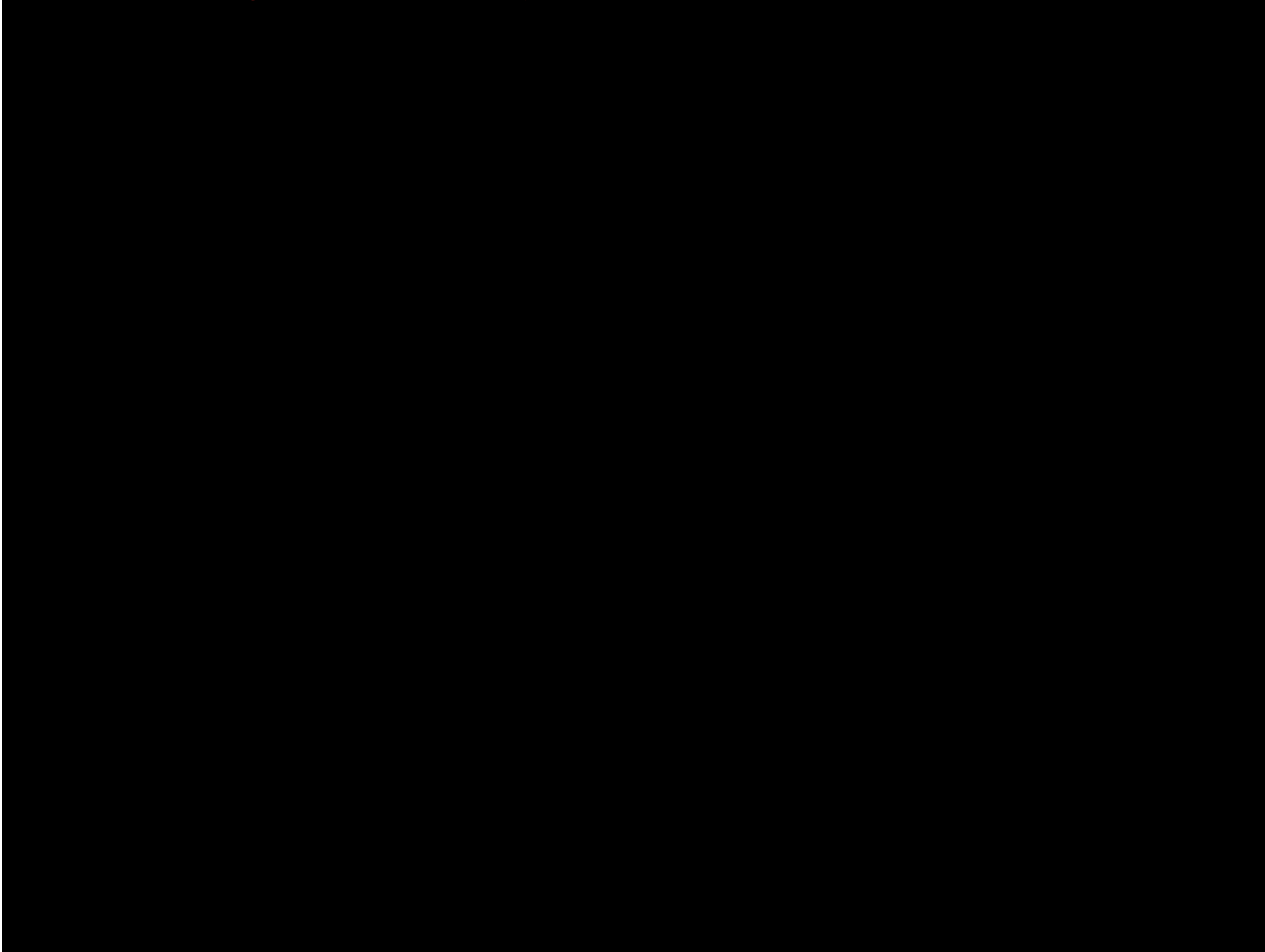
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Work Package Resourcing Request

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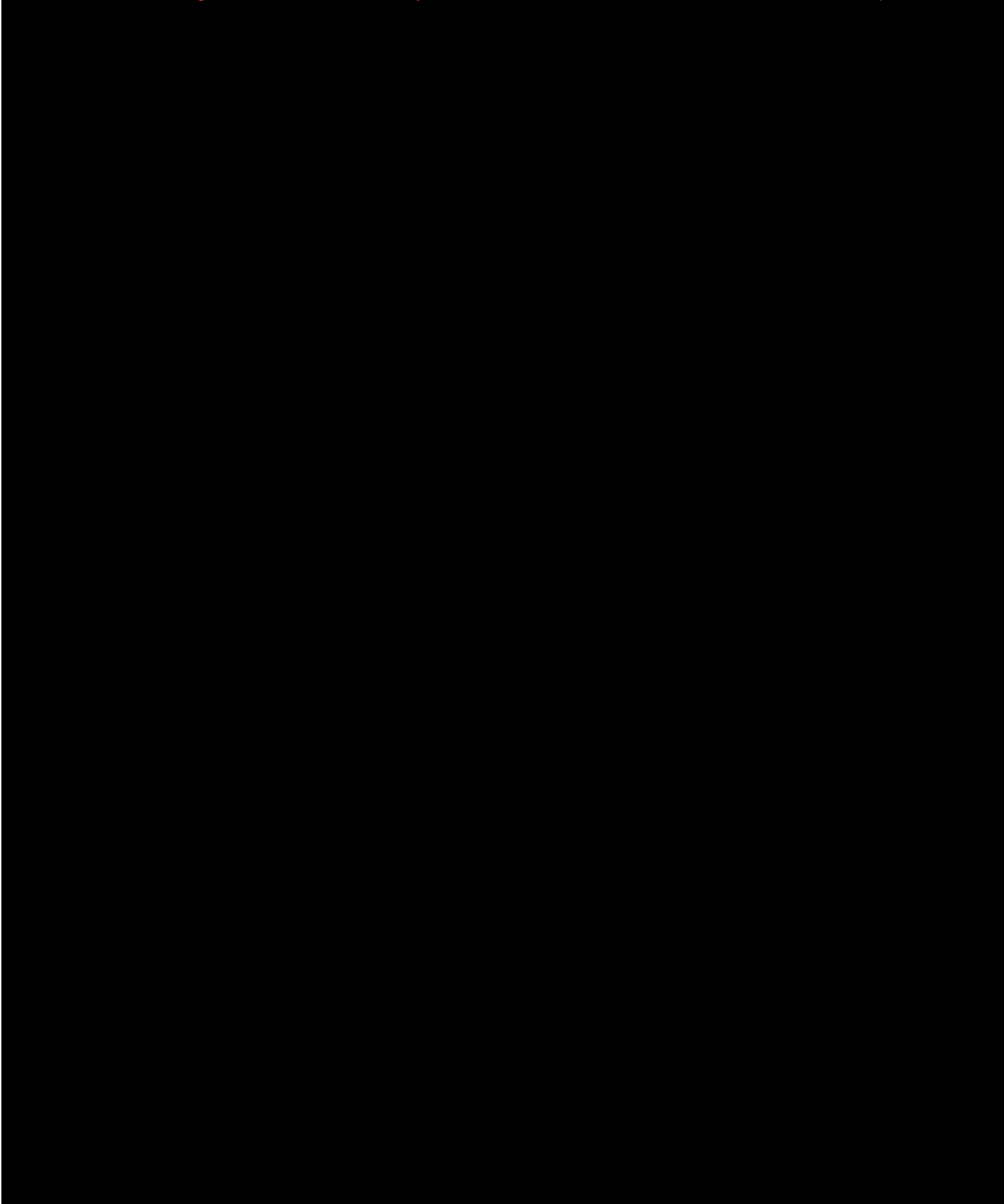


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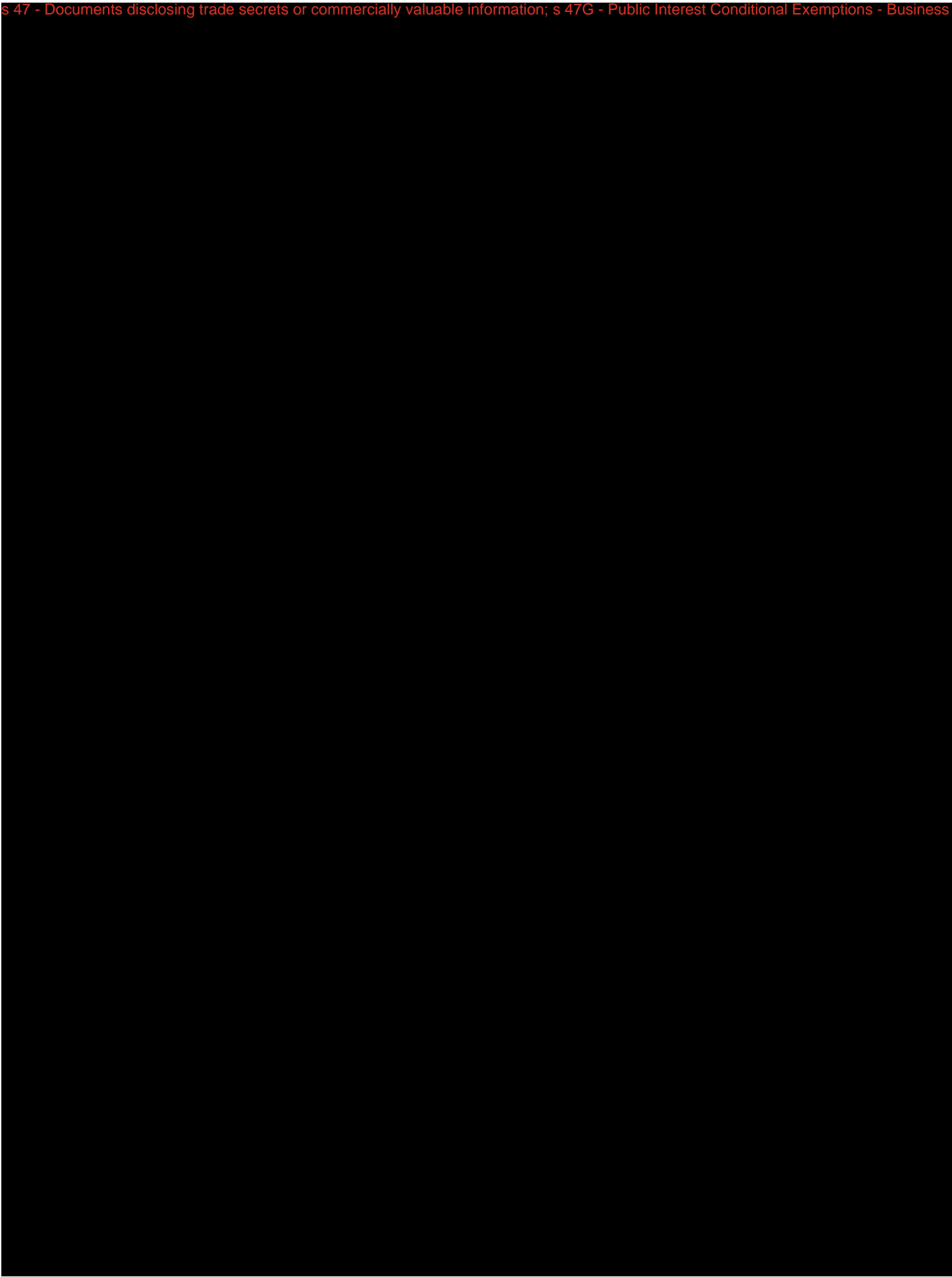
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COLLABORATIVE RESEARCH AGREEMENT - RIO TINTO CENTRE FOR FUTURE MATERIALS
SCHEDULE 1 SECTION 3 – Funding

Work Package: WP-1 Knowledge Review and Mapping

Partner university: The Australian National University

Academic contact: [Redacted]

Year One	Year Two	Year Three	Total
[Redacted]			

All amounts in this Schedule exclude VAT which Imperial will pay at the rate from time to time prescribed by law.

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Academic Institutions 's Finance Officer is: [Redacted]. Email: science.jaeger.rm@anu.edu.au

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Bank: [Redacted]
 Branch: [Redacted]
 Account name: [Redacted]
 BSB: [Redacted]
 Account number: [Redacted]
 Swift code: [Redacted]

Funder Ref. or PO No. to be included on Invoice	[Redacted]
Invoice Address (Billing Address)	Accounts Payable, Imperial College London London, SW7 2AZ United Kingdom Tel: 020 7594 6000 Email: apinvoices@imperial.ac.uk
Contact Name*	Please confirm
Contact Tel*	Please confirm
Contact Email*	Please confirm
Funder VAT No. (if outside UK)**	Not needed
Additional Instructions (if any)	

* Required by Accounts Receivable for Invoicing

** EU Commercial Organizations without a VAT number will be charged UK V

AGREED by the Parties through their authorized signatories:

SIGNED for and on behalf of Imperial:

Name [Redacted],

Position Head of Contracts, Faculty of Engineering

Signature [Redacted]

SIGNED for and on behalf of The Australian National University

Name [Redacted]

Position Director, School of Regulation and Global Governance

Signature [Redacted]

RIO TINTO CENTRE FOR FUTURE MATERIALS

GRAND CHALLENGE: DELIVERING FUTURE MATERIALS SYSTEMS FOR THE ENERGY TRANSITION WITH INTEGRITY: THE CU CHALLENGE

WORK PACKAGE DETAIL – RESEARCH

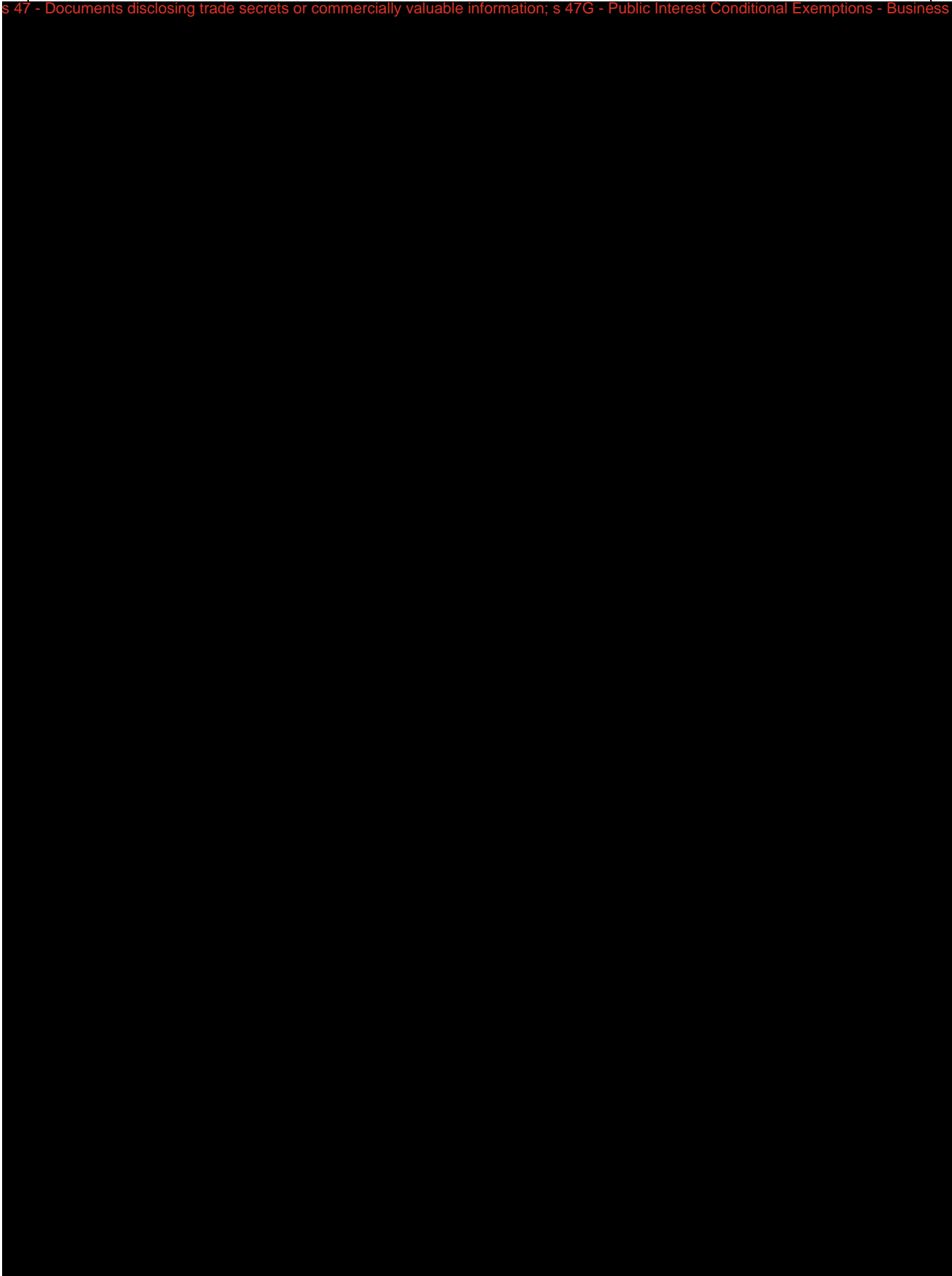
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Section 1: Application Summary		
Work Package Title: Knowledge Review and Mapping		
Work Package Coordinators (at least two people):		s.47F - Public Interest Conditional Exemptions - PIRs - U.C. Berkeley s.47F - Public Interest Conditional Exemptions - PIRs - Wits
Work Package Team Member	Role	Department / University
s.47F - Public Interest Conditional Exemptions - PIRs	Coordinator. Mining, processing, metallurgy extractive	Materials Science & Engineering, UC Berkeley
s.47F - Public Interest Conditional Exemptions - PIRs	Coordinator. Social sciences	Wits Inst for Social and Economic Research
s.47F - Public Interest Conditional Exemptions - PIRs	Contributor	School of Regulation and Global Governance, ANU
s.47F - Public Interest Conditional Exemptions - PIRs	Contributor	Centre for Environmental Policy, Imperial College London
s.47F - Public Interest Conditional Exemptions - PIRs	Contributor	Society Work and politics institute, the university of Witwatersrand
s.47F - Public Interest Conditional Exemptions - PIRs	Contributor	Wits Mining Institute / Wits School of Architecture and Planning
s.47F - Public Interest Conditional Exemptions - PIRs	Contributor	ANU Center for Public Awareness of Science
s.47F - Public Interest Conditional Exemptions - PIRs	Contributor	Department of Materials, Imperial College London
s.47F - Public Interest Conditional Exemptions - PIRs	Contributor	Materials Science & Engineering, UC Berkeley
s.47F - Public Interest Conditional Exemptions - PIRs	Contributor	Sauder School of Business, UBC
s.47F - Public Interest Conditional Exemptions - PIRs	Contributor	Earth Science and Engineering, Imperial College London
s.47F - Public Interest Conditional Exemptions - PIRs	Contributor	Earth Sciences and Engineering, Imperial College London
s.47F - Public Interest Conditional Exemptions - PIRs	Contributor	Geological Engineering, The University of British Columbia

CCF - Public Interest Contract	Contributor	Geological Science, The University of British Columbia
<p>Section 1.1: LAY SUMMARY (Maximum half a page) <i>Provide a summary of your work package and how it will address the Cu challenge. Avoid jargon (i.e. publishable on a website) and think about an audience that could be the public, school students, or policy makers.</i></p> <p>Before studying how to deliver copper for the energy transition globally, we need to study and compile the existing scholarly and commercial knowledge about copper deposits, extraction and processing, mine closure, the copper supply chain and its spatial and socio-ecological implications. Application-specific projections on future copper demand and the origins of this demand are also required. These data are needed as a foundation for some of the more technically focused projects, such as alternative materials, which will follow this initial phase of work. In addition, the data should be understood by examining copper in relation to various problems, such as geopolitics, historical institutions, resource governance and nationalism, as well as the spaces produced throughout the material life of copper and the meanings and value of copper for native/aboriginal/indigenous communities and societies in general. This work package will, therefore, acquire, assemble and review the historical and present knowledge, including the indigenous understanding of copper and its extraction. It will explore the quality and efficacies of the research methods applied, identifying knowledge gaps and alternative research methods. It will draw from transdisciplinary methods to assess how this knowledge has been shaped, map the discourse changes over time and how the generated knowledge can be drawn to accelerate the delivery of copper as one of the critical minerals in the shift to clean energy. The work generated in this package, in particular identifying the gaps in the existing research and copper knowledge systems, will be central to the development of all the work packages.</p>		

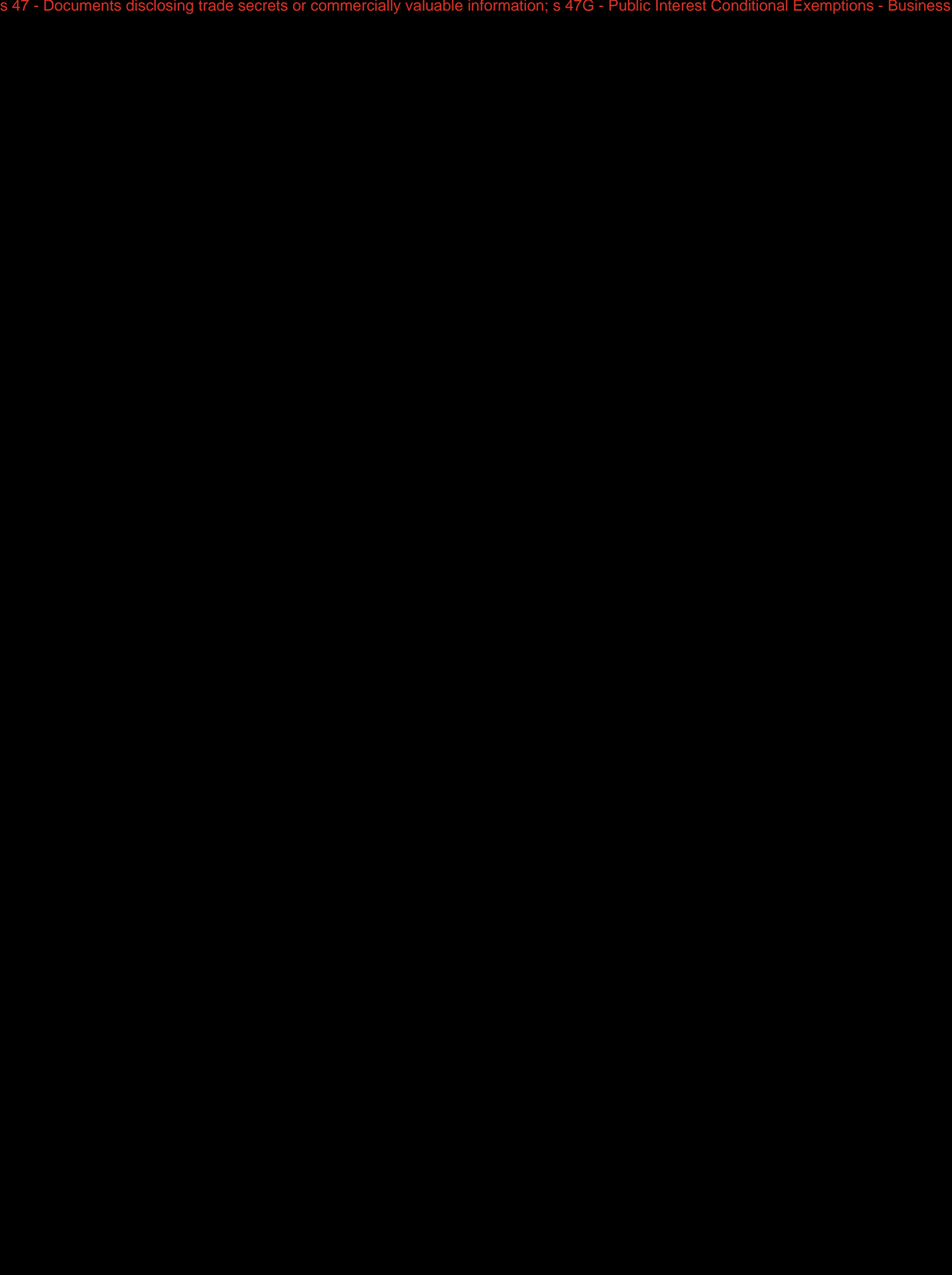
Section 2: WORK PACKAGE SCOPE (Maximum of two pages A4)

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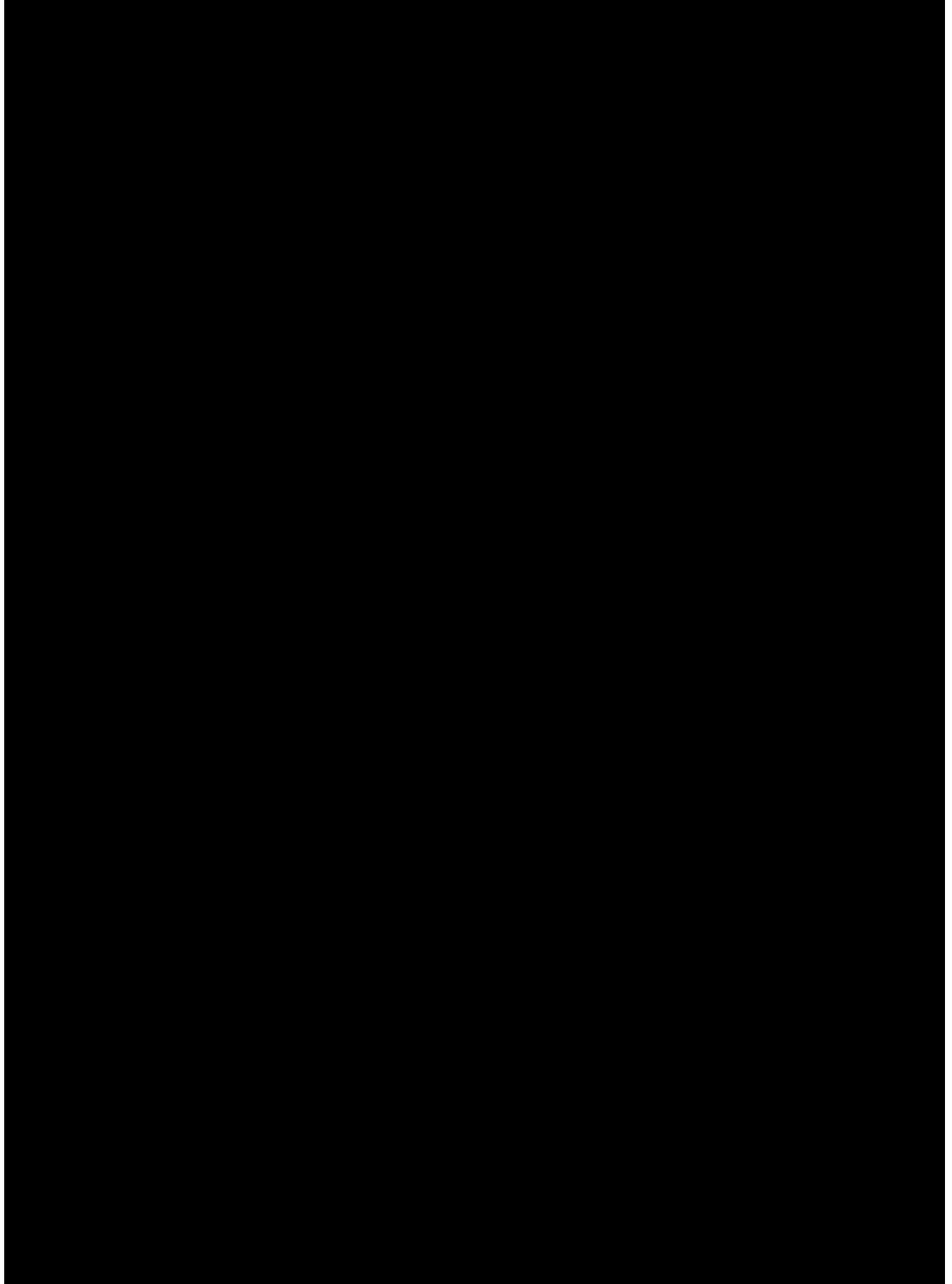
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Submit by 31 July to ccfm@imperial.ac.uk

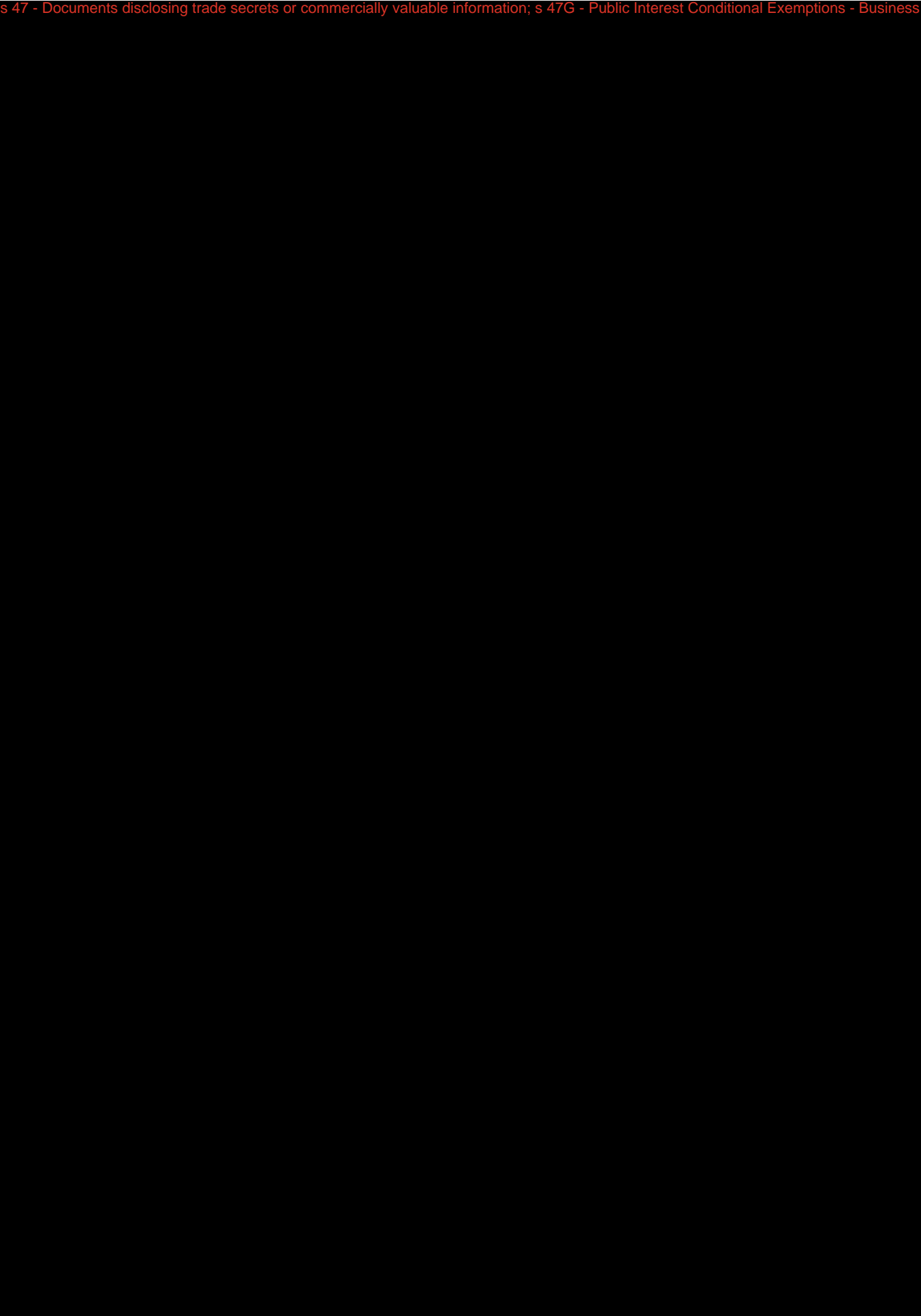
Section 3: WORK PACKAGE DETAIL (Maximum of three pages A4)

s 47 - Documents disclosing trade secrets or commercially valuable information; s 47G - Public Interest Conditional Exemptions - Business



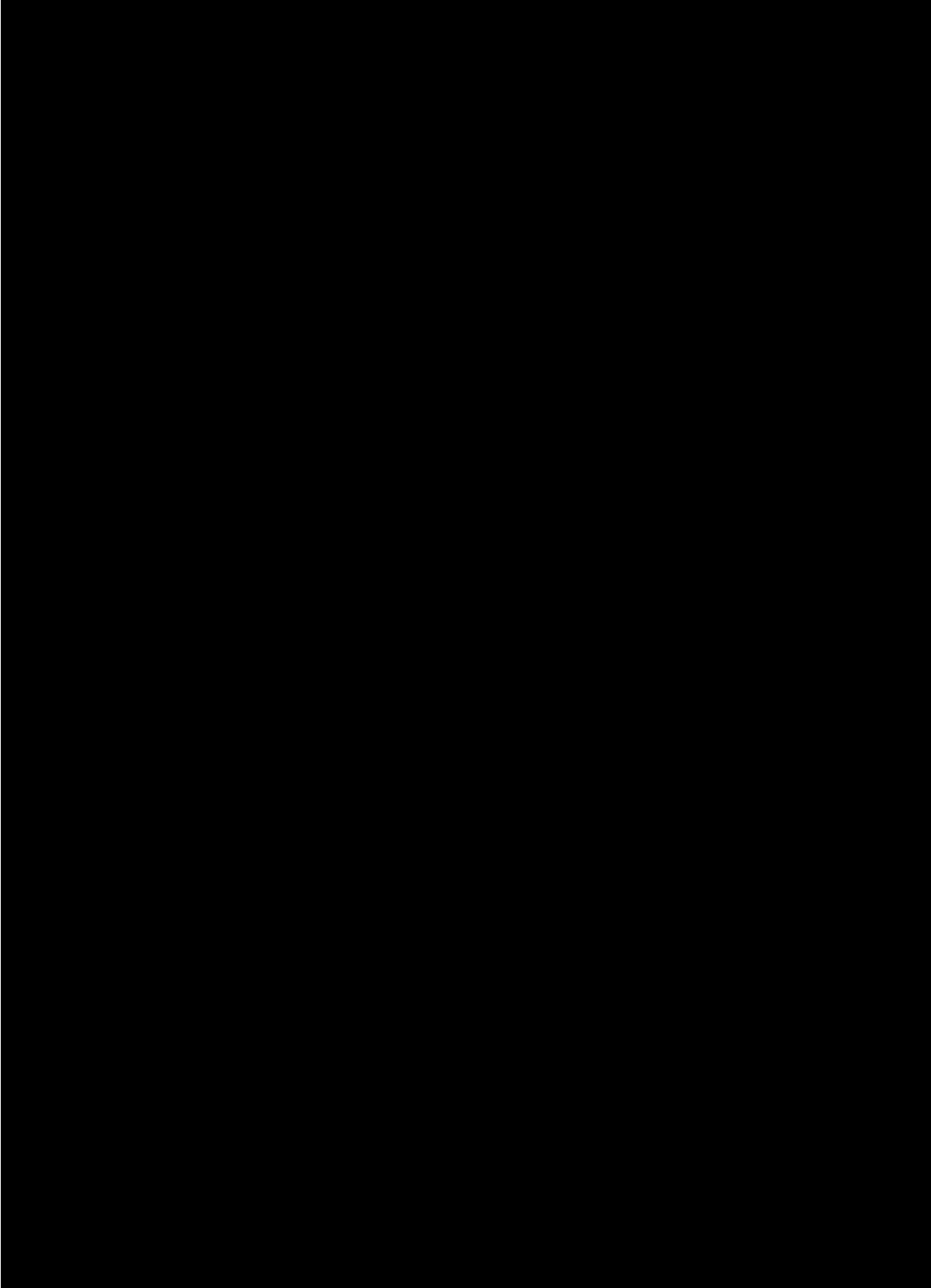
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RIO TINTO CENTRE FOR FUTURE MATERIALS

GRAND CHALLENGE: **DELIVERING FUTURE MATERIALS SYSTEMS FOR THE ENERGY TRANSITION WITH INTEGRITY: THE CU CHALLENGE**

WORK PACKAGE DETAIL – TEAM MEMBERS & RESOURCING

To be completed by the work package coordinators in conjunction with other team members.

This is to give an indication of the resources needed to deliver the work package – detailed costing will be requested once resources have been identified via the finance contacts provided.

s 47 - Documents disclosing trade secrets or commercially valuable information; s 47G - Public Interest Conditional Exemptions - Business

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[Redacted]

[Redacted]

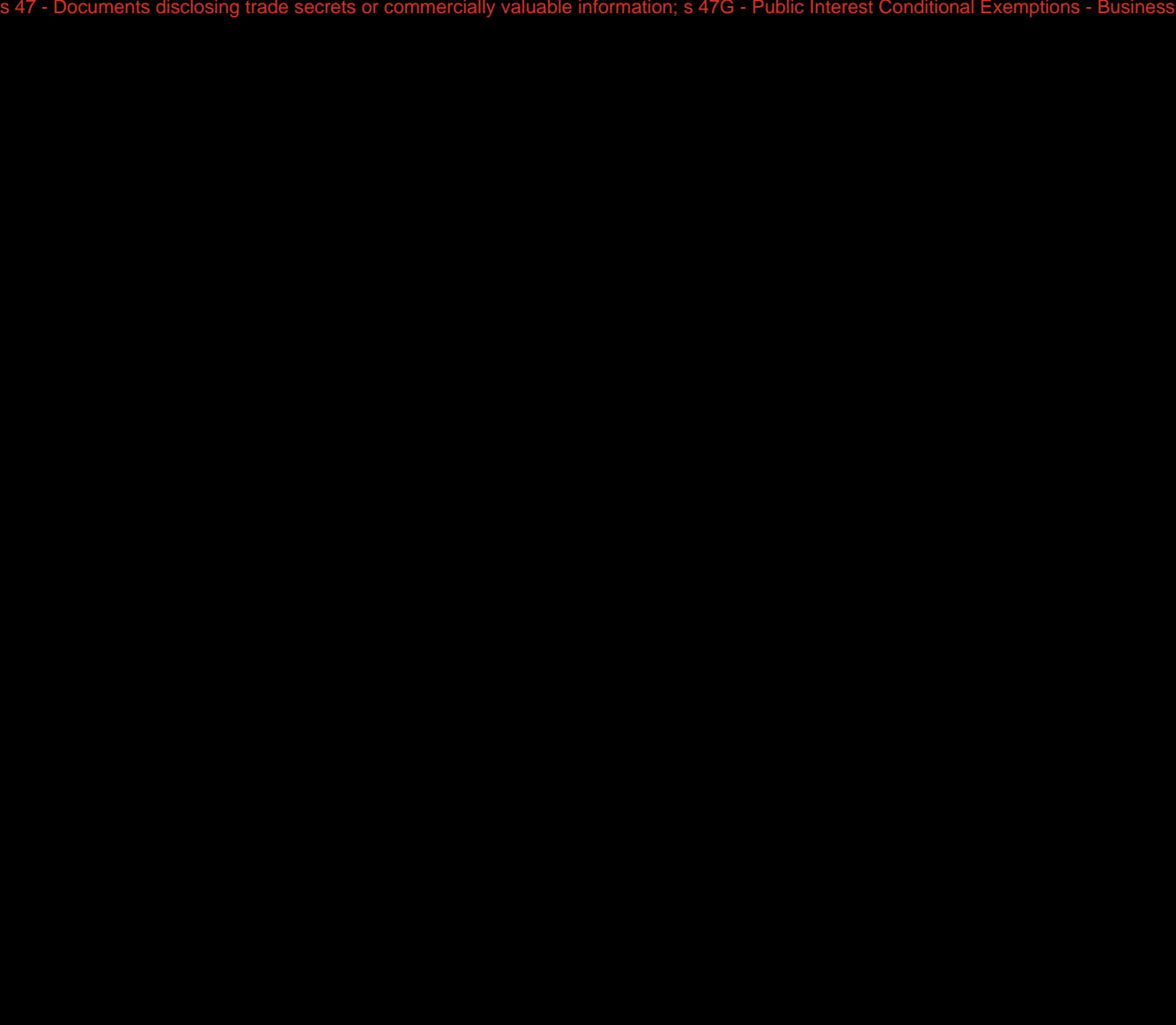
Work Package Title: Knowledge Mapping
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[Redacted]

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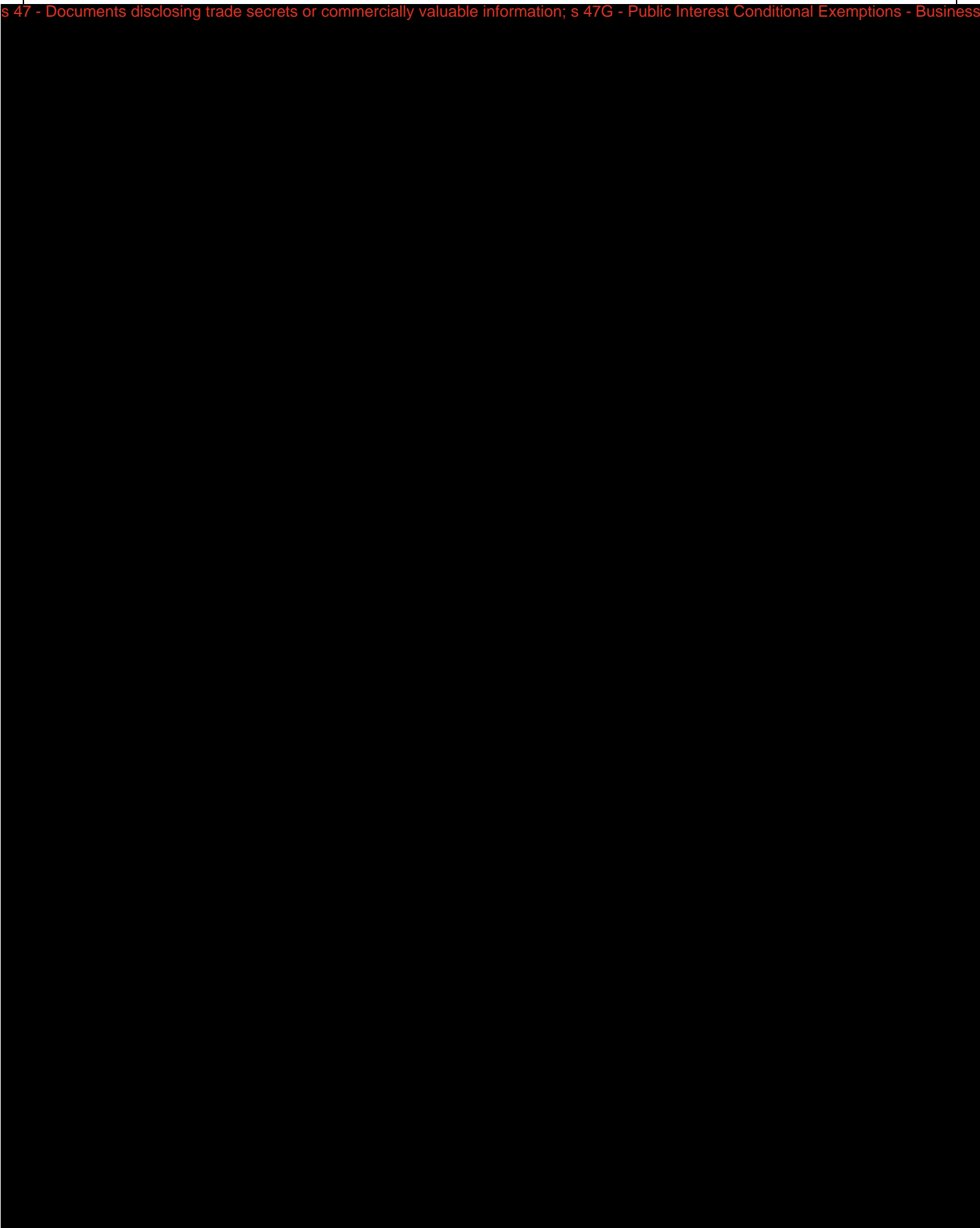


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Work Package Resourcing Request

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Submit by 31 July to ccfm@imperial.ac.uk

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COLLABORATIVE RESEARCH AGREEMENT - RIO TINTO CENTRE FOR FUTURE MATERIALS
SCHEDULE 1 SECTION 3 – Funding

Work Package: WP8 Post Waste

Partner university: The Australian National University

Academic contact: s 47F - Public Interest Conditional Exemptions

Year One	Year Two	Year Three	Total
s 47 - Documents disclosing trade secrets or commercially valuable information, s 47G - Public Interest Conditional Exemptions - Business			

All amounts in this Schedule exclude VAT which Imperial will pay at the rate from time to time prescribed by law.

Imperial's Finance Officer is: s 47F - Public Interest Conditional Exemptions, Department Operations Manager, Earth Science & Engineering

Academic Institutions 's Finance Officer is: s 47F - Public Interest Conditional Exemptions, email: science.jaeger.rm@anu.edu.au

All payments of the Funding will be made by bank transfer to:

Bank:
Branche:

Account Name:
ABN:
BSB:
Account Number:
Swift Code:

s 47E - Public Interest Conditional Exemptions - Certain Operations of Agencies

Email remittance to: bank.rec@anu.edu.au

Please include full details of ANU invoice number, name of sender, ANU purchase order number, ANU Uni ID, ANU charge code or details of receiving area as appropriate.

Funder Ref. or PO No. to be included on Invoice	s 47G - Public Interest Conditional Exemptions
Invoice Address (Billing Address)	Accounts Payable, Imperial College London London, SW7 2AZ United Kingdom Tel: 020 7594 6000 Email: apinvoices@imperial.ac.uk
Contact Name*	Please confirm
Contact Tel*	Please confirm
Contact Email*	Please confirm
Funder VAT No. (if outside UK)**	Not needed
Additional Instructions (if any)	

* Required by Accounts Receivable for Invoicing

** EU Commercial Organizations without a VAT number will be charged UK V

AGREED by the Parties through their authorized signatories:

SIGNED for and on behalf of Imperial:

SIGNED for and on behalf of The Australian National University

Name [Redacted]

Name [Redacted]

Position Head of Contracts, Faculty of Engineering

Position Interim Chief Research and Information Services

Signature [Redacted]

Signature [Redacted]

RIO TINTO CENTRE FOR FUTURE MATERIALS

GRAND CHALLENGE: DELIVERING FUTURE MATERIALS SYSTEMS FOR THE ENERGY TRANSITION WITH INTEGRITY: THE CU CHALLENGE

WORK PACKAGE DETAIL – RESEARCH

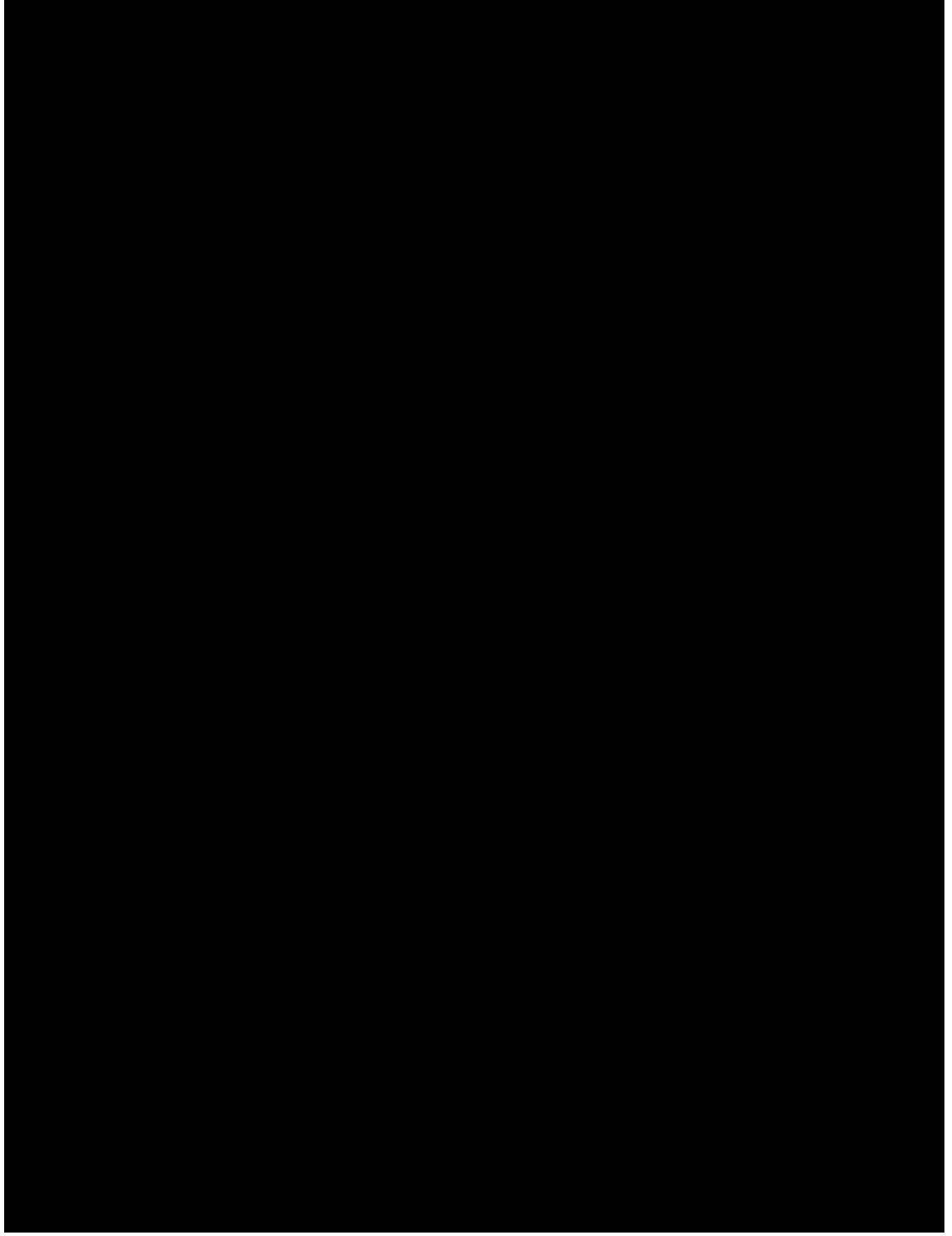
Please note: As outlined in the Centre contract between our universities, it is required that there are no third-party rights nor any other encumbrances that would prevent the use of Background IP under licence to Rio Tinto.

Section 1: Application Summary				
Work Package Title: Post Waste				
Work Package Coordinators (at least two people): <small>§ 47F - Public Interest Conditional Exemptions - Personal Data</small> from <i>Australian National University</i> <small>§ 47F - Public Interest Conditional Exemptions - Personal Data</small> from <i>Imperial College</i> <small>§ 47F - Public Interest Conditional Exemptions - Personal Data</small> from <i>University of British Columbia</i>				
Work Package Member	Team	Role	Department / University	
<small>§ 47F - Public Interest Conditional Exemptions - Personal Data</small>		Investigator	Australian National University	
<small>§ 47F - Public Interest Conditional Exemptions - Personal Data</small>		Investigator	Imperial College London	
<small>§ 47F - Public Interest Conditional Exemptions - Personal Data</small>		Investigator	University of British Columbia	
<small>§ 47F - Public Interest Conditional Exemptions - Personal Data</small>		Co-Investigator	University of California, Berkeley	
<small>§ 47F - Public Interest Conditional Exemptions - Personal Data</small>		Co-Investigator	University of British Columbia	
<small>§ 47F - Public Interest Conditional Exemptions - Personal Data</small>		Advisor	University of British Columbia	
<small>§ 47F - Public Interest Conditional Exemptions - Personal Data</small>		Advisor	Australian National University	
<small>§ 47F - Public Interest Conditional Exemptions - Personal Data</small>		Advisor	Imperial College London	
<small>§ 47F - Public Interest Conditional Exemptions - Personal Data</small>		Advisor	Rio Tinto	
<small>§ 47F - Public Interest Conditional Exemptions - Personal Data</small>		Advisor	Rio Tinto	
Section 1.1: LAY SUMMARY (Maximum half a page)				
<p>Hundreds of billions of tons of copper (Cu) sit idle in difficult to process mine waste sites. Novel solutions are needed to liberate this unrecovered Cu to meet the demand for manufacturing electronics and clean energy technologies, and so that mine sites can be remediated to protect the environment. Existing Cu extraction and processing methods were developed for ores as an input material. We are developing novel extraction and processing approaches that are optimised for generating Cu from mine site waste as an input. Extracting and processing Cu from mine site wastes is challenging because the concentration is lower than in starting ores and there are other contaminants present that limit the efficiency of conventional extraction processes. The proposed development of efficient and environmentally friendly Cu waste processing approaches will revolutionise how we source Cu and achieve our priorities such as environmental remediation and social good. We will draw on expertise from diverse fields of research such as sustainable system design, bioengineering, biochemistry and environmental engineering. We expect to deliver systems that enable water and energy recycling whilst generating copper, and systems that enable significant reductions in net carbon emissions and support regeneration of biodiverse ecosystems on degraded lands. This will involve developing platform technologies which incorporate new materials that interface biological systems with components of existing systems for processing Cu leachate from diverse sources. Development of on-site systems for sustainably converting mine site waste into usable copper resources is expected to lead to new business models that support rehabilitation of degraded land and deliver value to local communities and waste processors.</p>				

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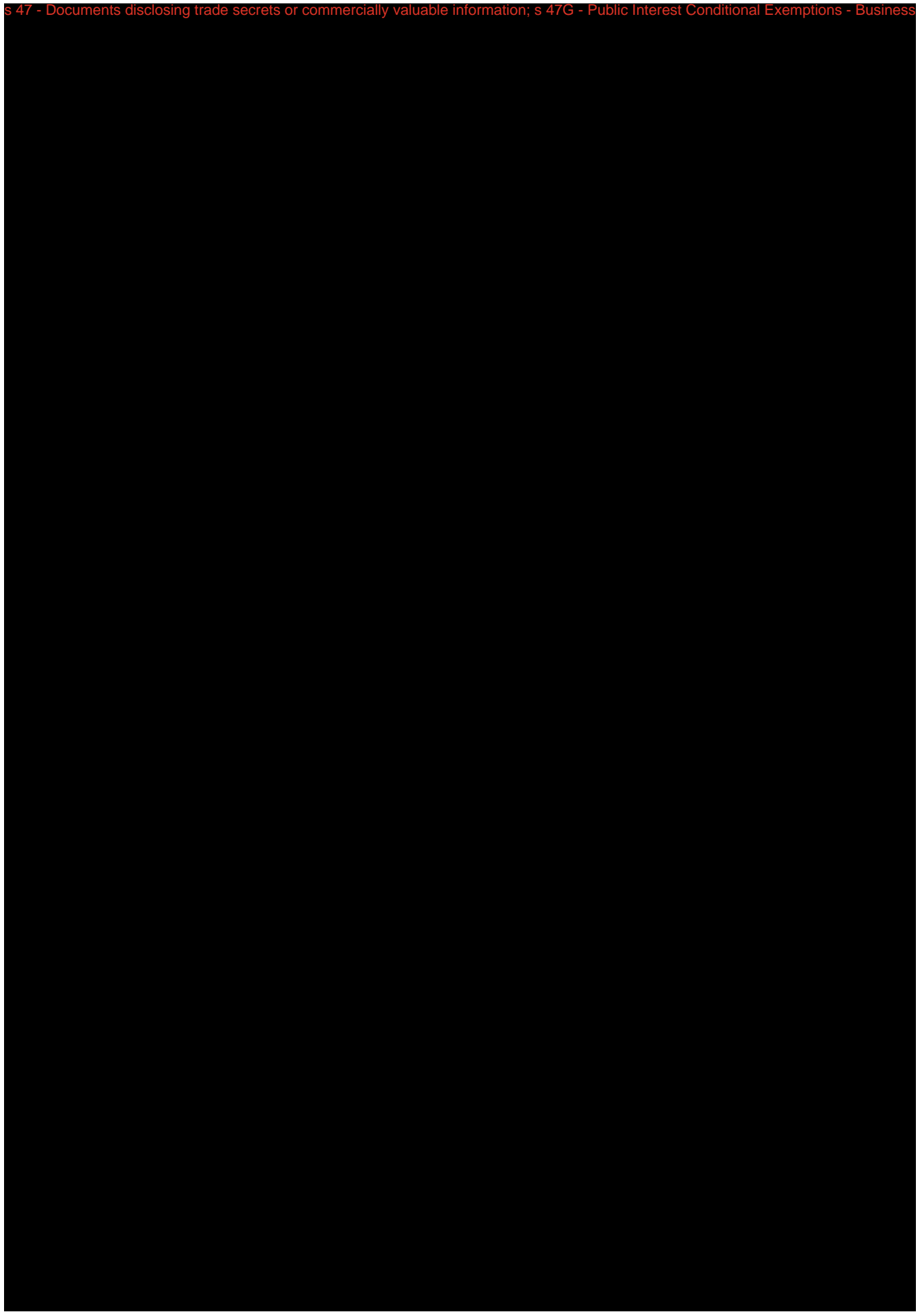
Section 2: WORK PACKAGE SCOPE (Maximum of two pages A4)

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Submit by 31 July to ccfm@imperial.ac.uk

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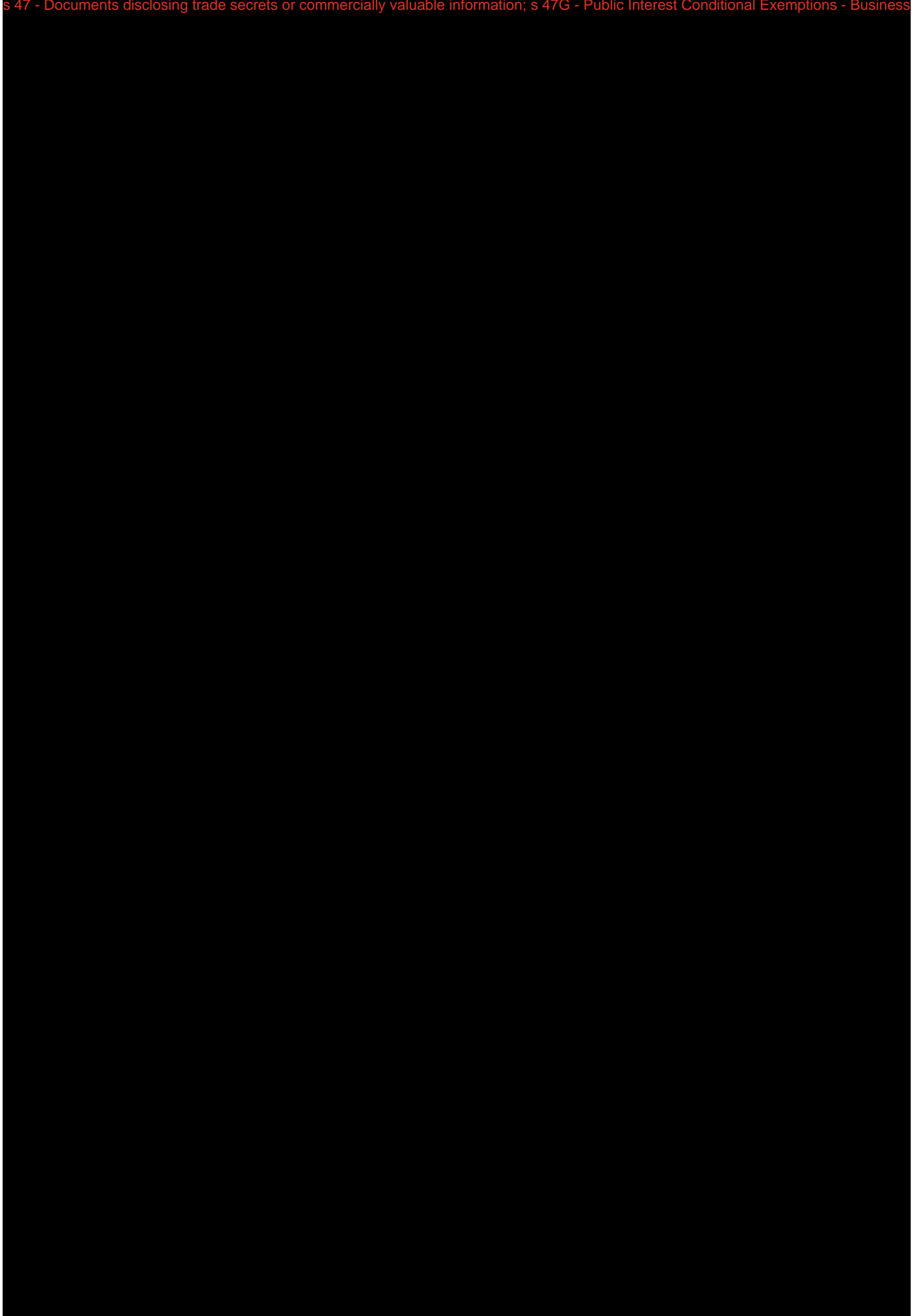


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Submit by 31 July to ccfm@imperial.ac.uk

Section 3: WORK PACKAGE DETAIL (Maximum of three pages A4)

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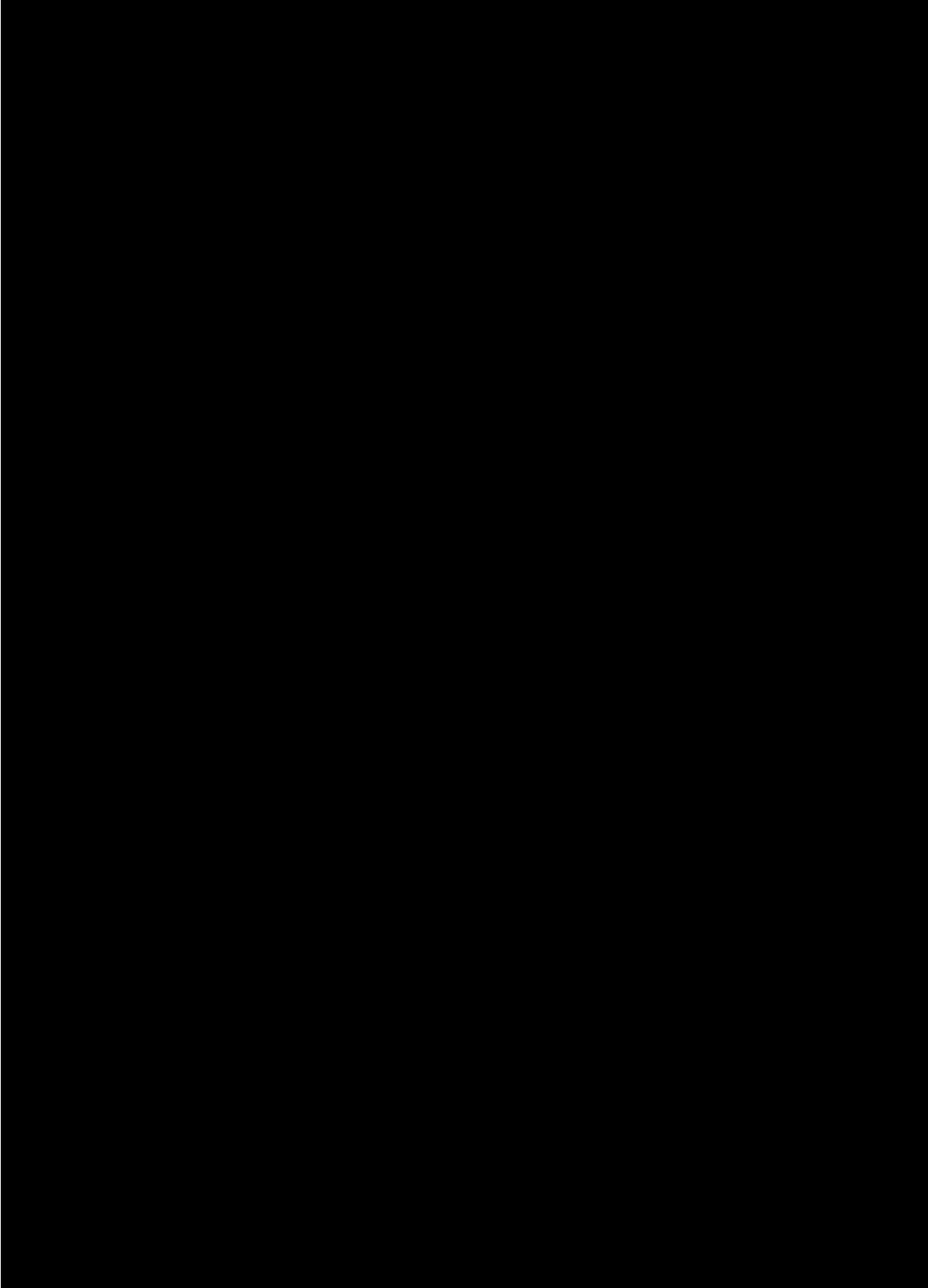
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RIO TINTO CENTRE FOR FUTURE MATERIALS

GRAND CHALLENGE: **DELIVERING FUTURE MATERIALS SYSTEMS FOR THE ENERGY TRANSITION WITH INTEGRITY: THE CU CHALLENGE**

WORK PACKAGE DETAIL – TEAM MEMBERS & RESOURCING

To be completed by the work package coordinators in conjunction with other team members.

This is to give *an indication* of the resources needed to deliver the work package – detailed costing will be requested once resources have been identified via the finance contacts provided.

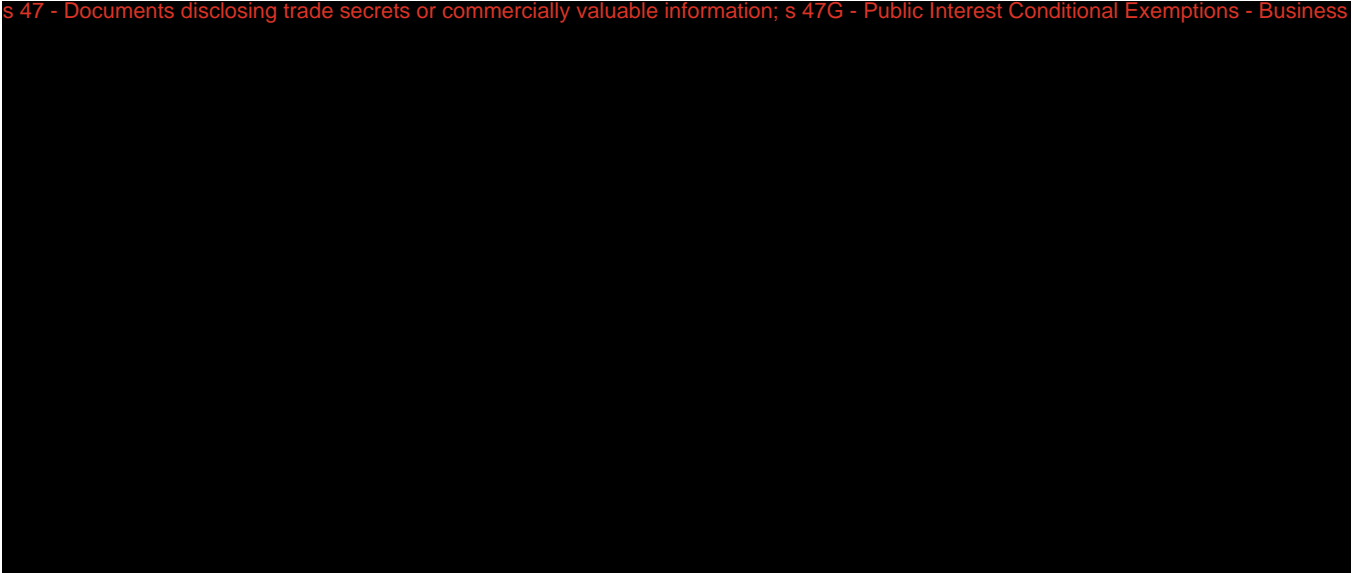
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Work Package Title:

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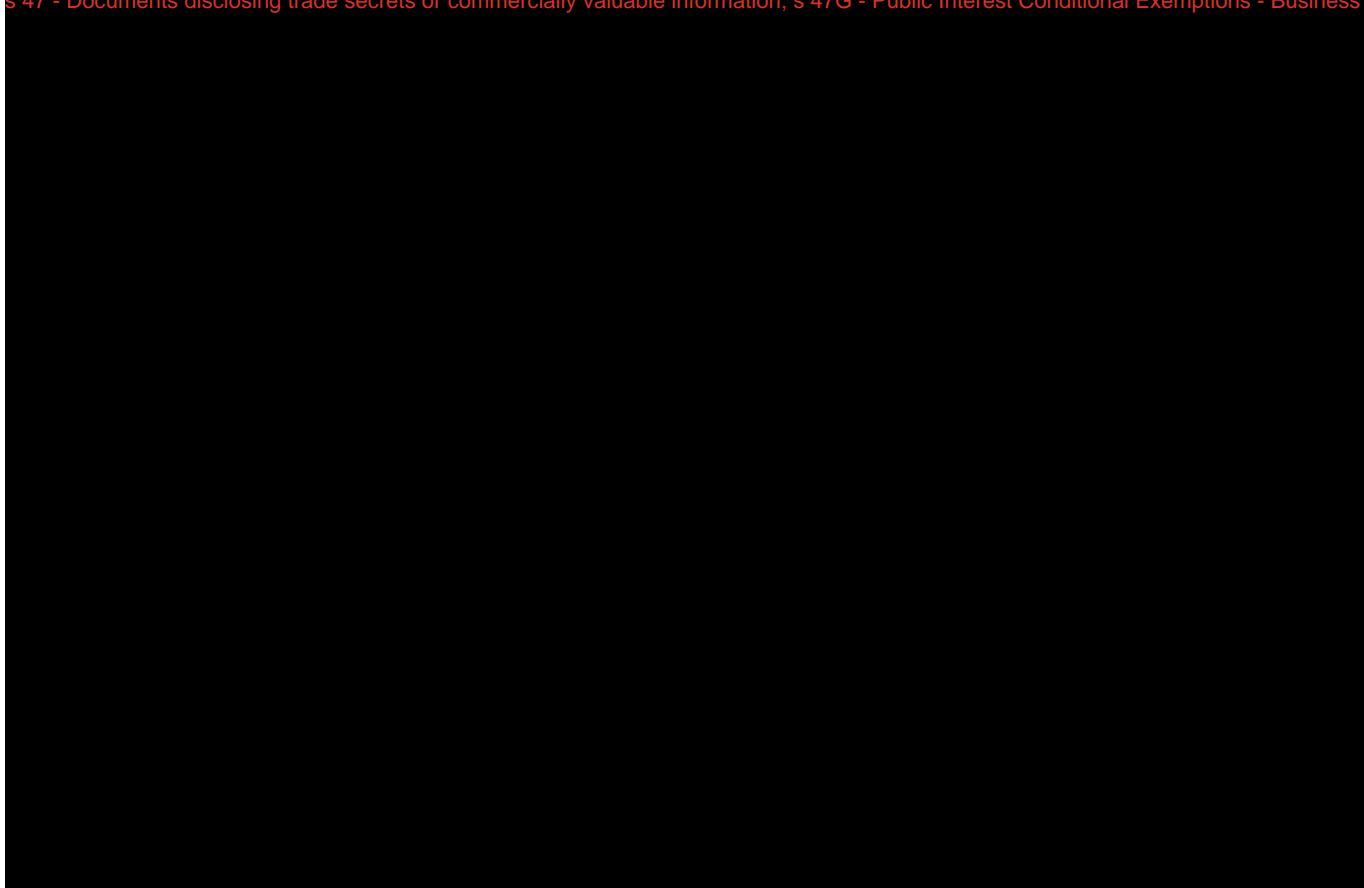
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Work Package Resourcing Request
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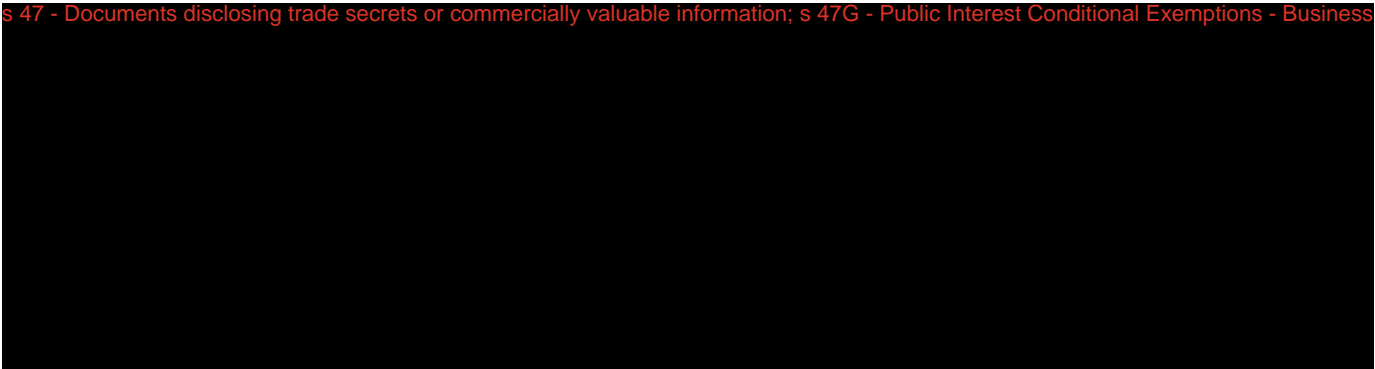
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COLLABORATIVE RESEARCH AGREEMENT - RIO TINTO CENTRE FOR FUTURE MATERIALS
SCHEDULE 1 SECTION 3 – Funding

Work Package: WP12 The copper mine of the future: Metal extraction from natural magmatic brines (CuBrine)

Partner university: The Australian National University

Academic contact: [Redacted]

Year One	Year Two	Year Three	Total
[Redacted]			

All amounts in this Schedule exclude VAT which Imperial will pay at the rate from time to time prescribed by law.

Imperial's Finance Officer is: [Redacted], Department Operations Manager, Earth Science & Engineering

Academic Institutions 's Finance Officer is: [Redacted] - science.jaeger.rm@anu.edu.au

All payments of the Funding will be made by bank transfer to:

Bank: [Redacted]
Branch: [Redacted]
Account Name: [Redacted]
ABN: [Redacted]
BSB: [Redacted]
Account Number: [Redacted]
Swift Code: [Redacted]

Email remittance to: bank.rec@anu.edu.au

Please include full details of ANU invoice number, name of sender, ANU purchase order number, ANU Uni ID, ANU charge code, or details of receiving area as appropriate.

Funder Ref. or PO No. to be included on Invoice	[Redacted]
Invoice Address (Billing Address)	Accounts Payable, Imperial College London London, SW7 2AZ United Kingdom Tel: 020 7594 6000 Email: apinvoices@imperial.ac.uk
Contact Name*	[Redacted]
Contact Tel*	N/a
Contact Email*	science.jaeger.rm@anu.edu.au
Funder VAT No. (if outside UK)**	Not needed
Additional Instructions (if any)	

* Required by Accounts Receivable for Invoicing

** EU Commercial Organizations without a VAT number will be charged UK V

AGREED by the Parties through their authorized signatories:

SIGNED for and on behalf of Imperial:

SIGNED for and on behalf of The Australian National University

Name s.47F - Public Interest Conditional Exemptions [Redacted]

Name s.47F - Public Interest Conditional Exemptions [Redacted]

Position Head of Contracts, Faculty of Engineering

Position Interim Chief, Research and Informat

Signature

s.47F - Public Interest Conditional Exemptions - Personal Privacy
[Redacted Signature]

Signature

s.47F - Public Interest Conditional Exemptions
[Redacted Signature]

RIO TINTO CENTRE FOR FUTURE MATERIALS

GRAND CHALLENGE: DELIVERING FUTURE MATERIALS SYSTEMS FOR THE ENERGY TRANSITION WITH INTEGRITY: THE CU CHALLENGE

WORK PACKAGE DETAIL – RESEARCH

Please note: As outlined in the Centre contract between our universities, it is required that there are no third-party rights nor any other encumbrances that would prevent the use of Background IP under licence to Rio Tinto.

Section 1: Application Summary		
Work Package Title: The copper mine of the future: Metal extraction from natural magmatic brines (CuBrine)		
Work Package Coordinators (at least two people):		<small>§ 47F - Public Interest Conditional Exemptions</small> , ICL <small>§ 47F - Public Interest Conditional Exemptions</small> , ANU <small>§ 47F - Public Interest Conditional Exemptions</small> , UBC
Work Package Team Member	Role	Department / University
<small>§ 47F - Public Interest Conditional Exemptions</small>	WPC	Department of Earth Science and Engineering /ICL
<small>§ 47F - Public Interest Conditional Exemptions</small>	WPC	School of Earth Sciences/ANU
<small>§ 47F - Public Interest Conditional Exemptions</small>	WPC	Department of Earth, Ocean and Atmospheric Sciences/UBC
<p>Section 1.1: LAY SUMMARY (Maximum half a page) Provide a summary of your work package and how it will address the Cu challenge. Avoid jargon (i.e. publishable on a website) and think about an audience that could be the public, school students, or policy makers.</p> <p>Mining for copper has traditionally required the use of explosives to blast rock, extensive crushing and milling of the rock to a fine powder, and separation of the valuable ore from the waste rock. The mining process requires large amounts of energy and water, and has significant negative environmental impacts on local populations. Yet demand for copper is predicted to increase significantly to supply the energy transition. New sources of copper, that can be mined with lower negative environmental impacts, are urgently required. We are investigating whether it may be possible to extract copper (and other critical metals) directly from copper-rich fluids in the Earth's crust, using extraction methods that offer considerably lower environmental impacts, and significantly reduced energy and water consumption, compared to conventional mining technologies.</p> <p>The metal resource we will target comprises very salty brines formed in the shallower parts of active volcanic and magmatic systems (depths of order a few km, similar to many oilfield developments). The brines will be produced via boreholes, the metals will be extracted at surface</p>		

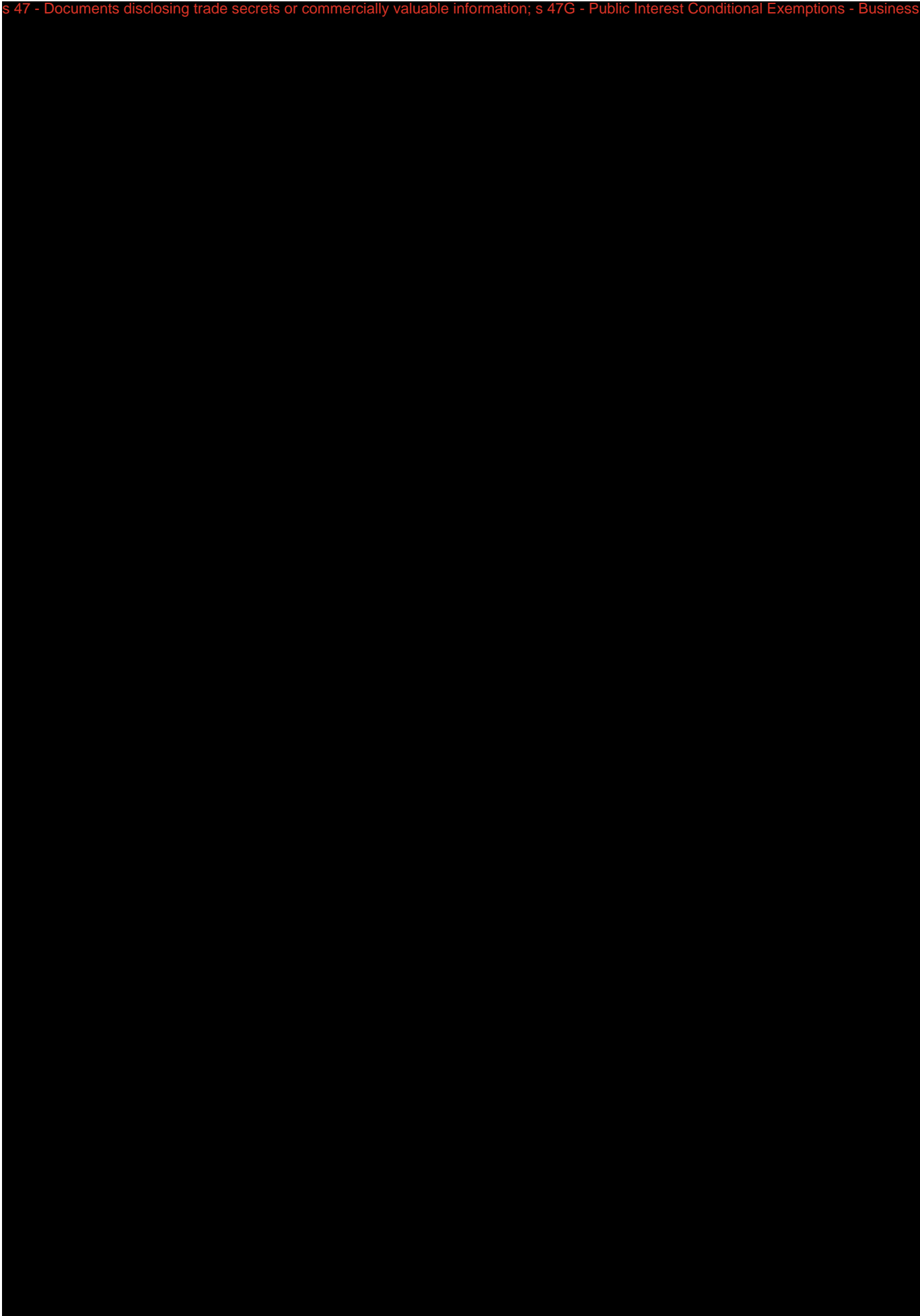
and the waste brine re-injected into the source reservoir. The hot brines could be used as a source of geothermal energy to power production operations, and any excess energy (electrical or heat) could be provided to local populations.

Our vision is for self-powered mines with a small surface footprint, comprising well heads on a small number of well sites, supplying a surface separation plant, with minimal negative impact on local populations and the potential to have a positive impact through (i) provision of surplus cheap or low cost electrical and heat energy, and (ii) the restoration or preservation of natural habitats that could include recreational use. Our inspiration is the Wytch Farm oilfield beneath the south coast of the UK, which has almost no visible footprint and is designed and operated to minimize negative environmental impacts to the local population.

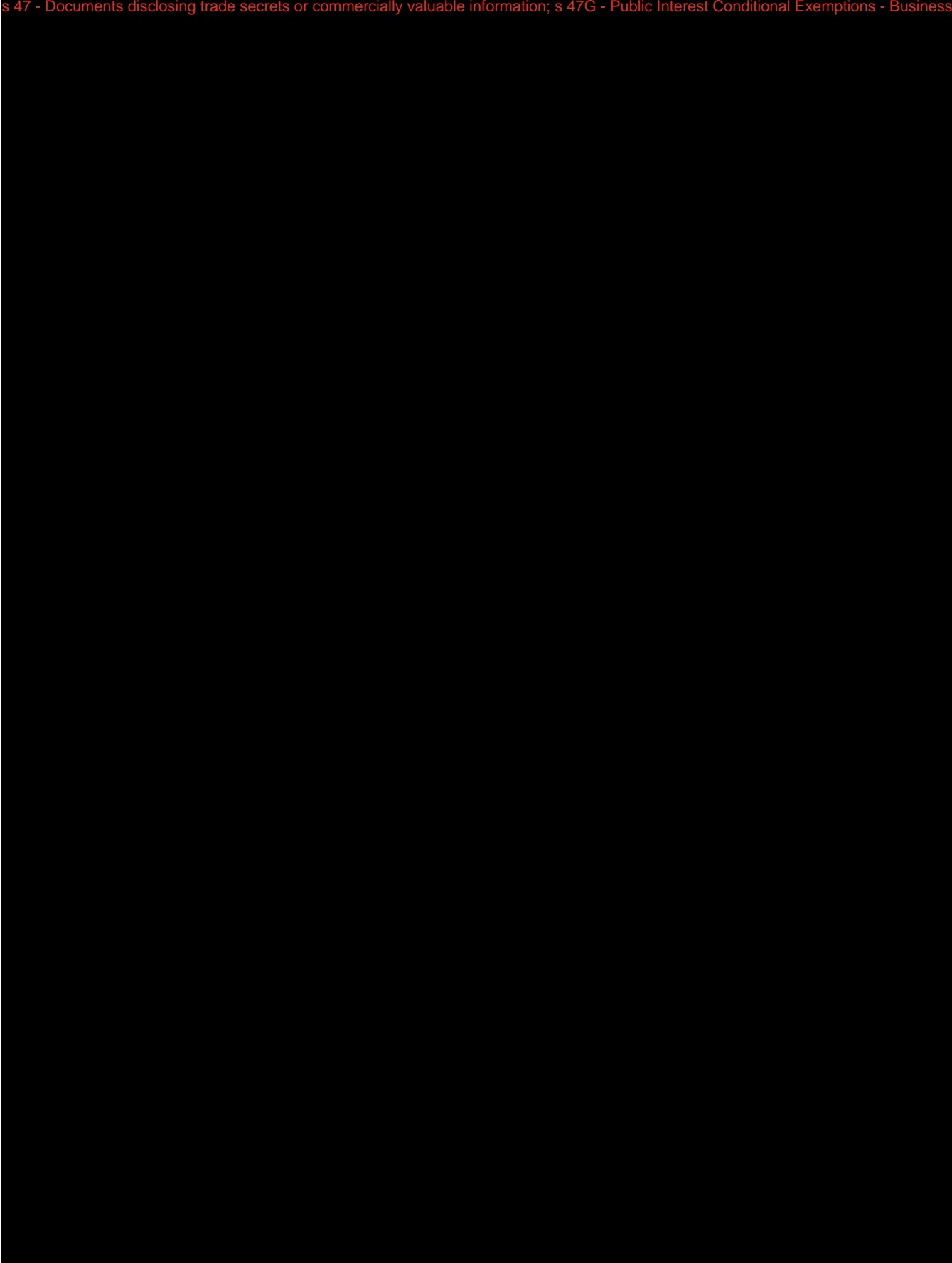
Section 2: WORK PACKAGE SCOPE (Maximum of two pages A4)

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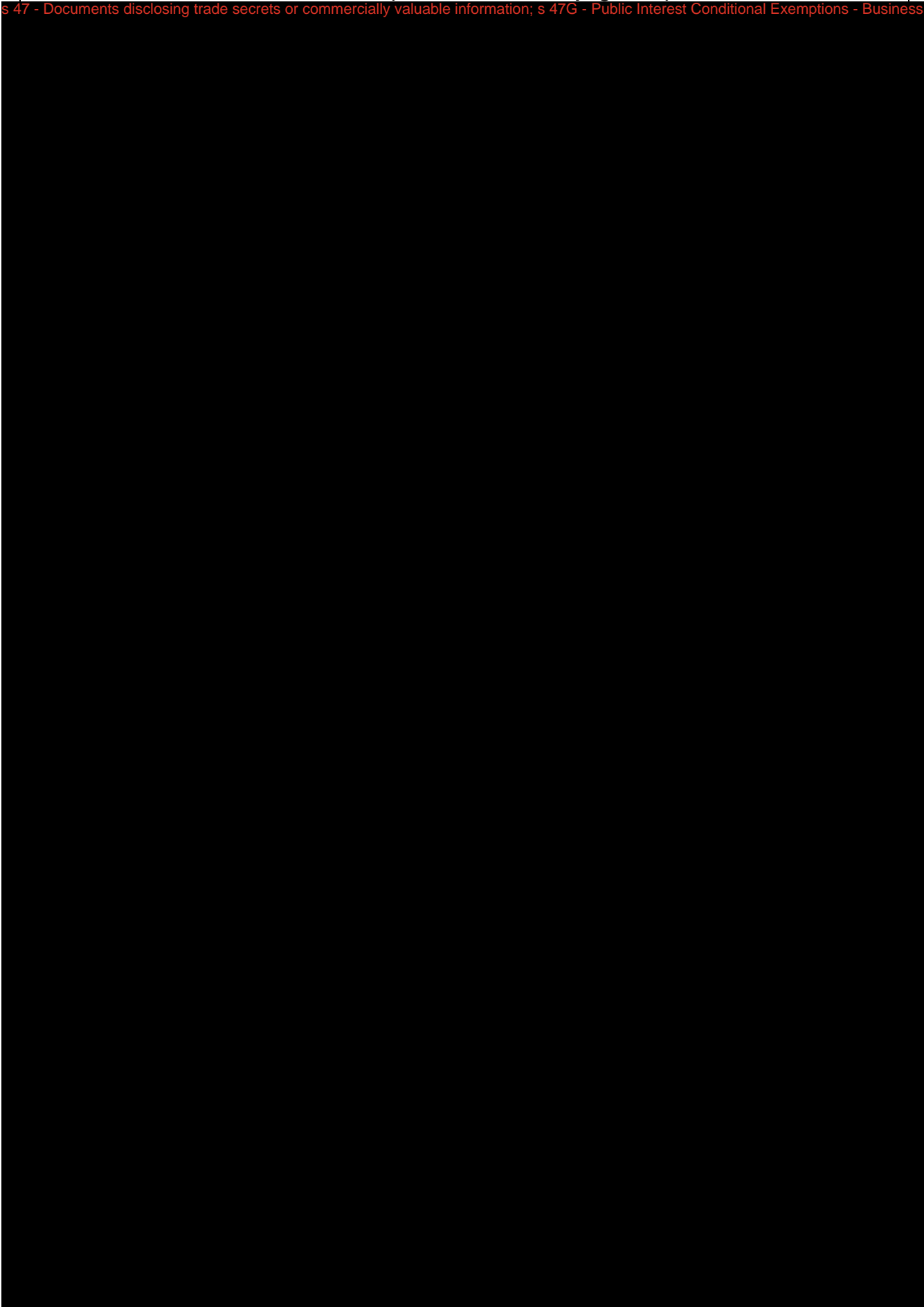


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Section 3: WORK PACKAGE DETAIL (Maximum of three pages A4)

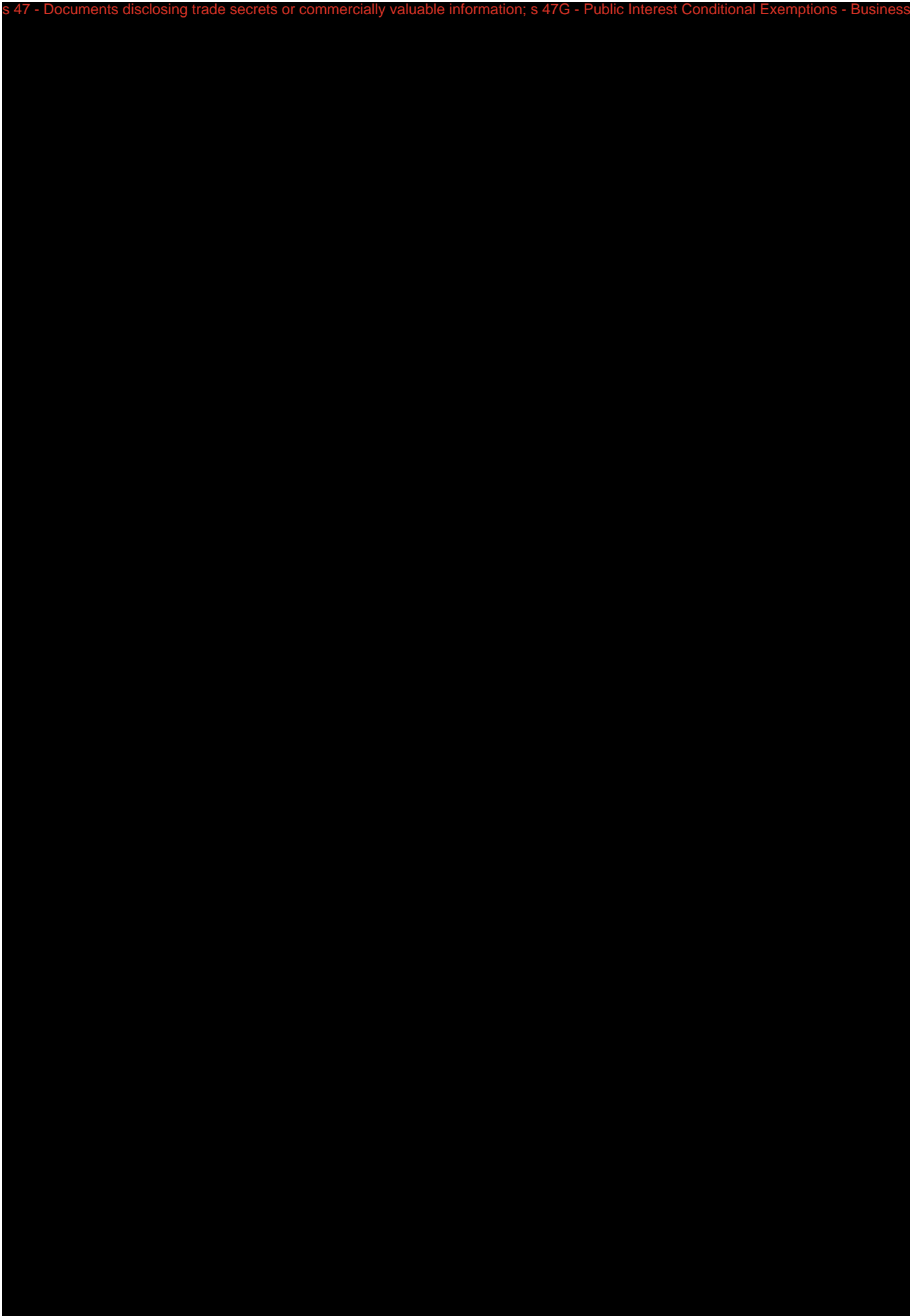
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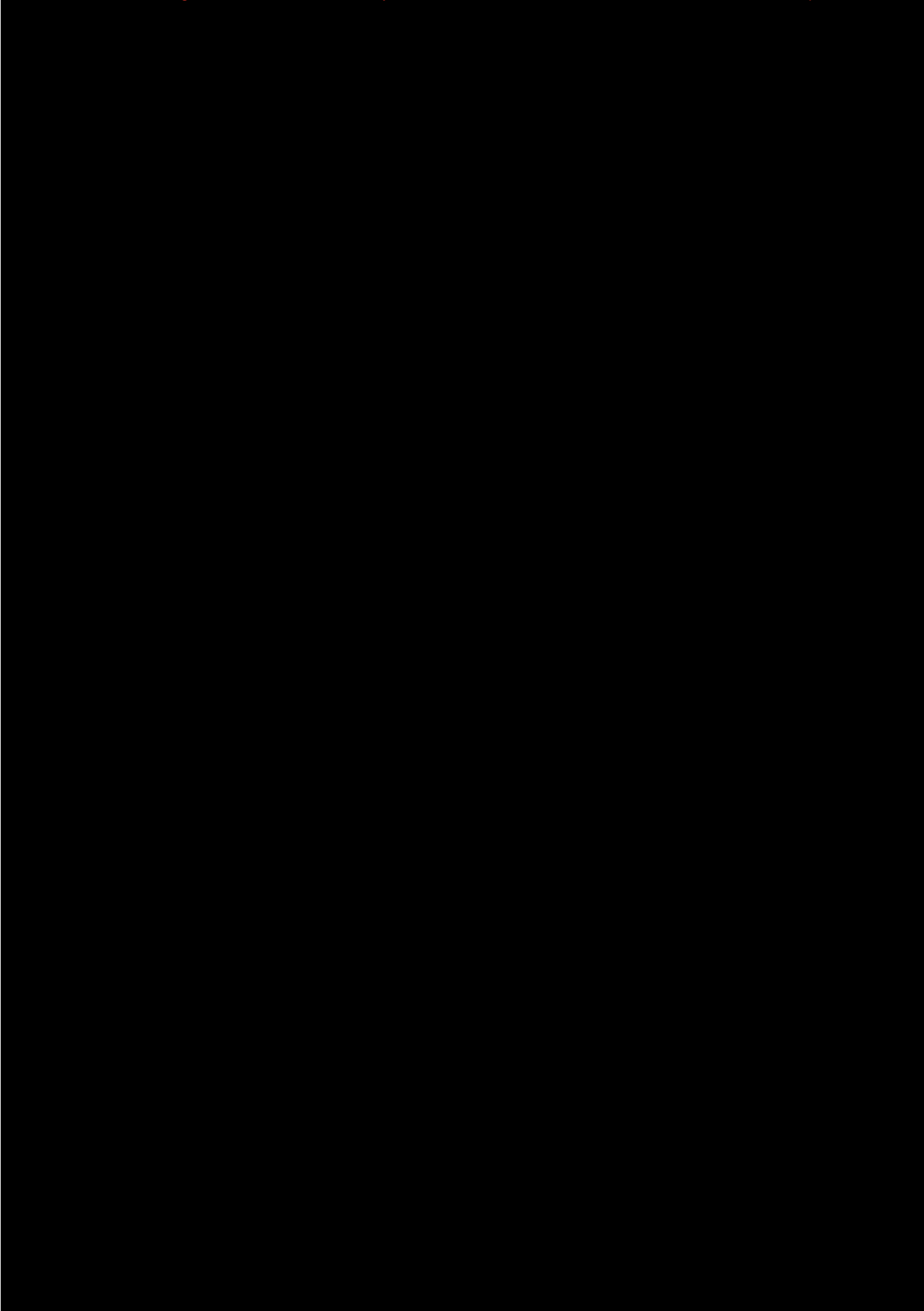
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RIO TINTO CENTRE FOR FUTURE MATERIALS

GRAND CHALLENGE: DELIVERING FUTURE MATERIALS SYSTEMS FOR THE ENERGY TRANSITION WITH INTEGRITY: THE CU CHALLENGE

WORK PACKAGE DETAIL – TEAM MEMBERS & RESOURCING

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s 47 - Documents disclosing trade secrets or commercially valuable information; s 47G - Public Interest Conditional Exemptions - Business

[Redacted]

Work Package Title: The copper mine of the future: Metal extraction from natural magmatic brines (CuBrine)

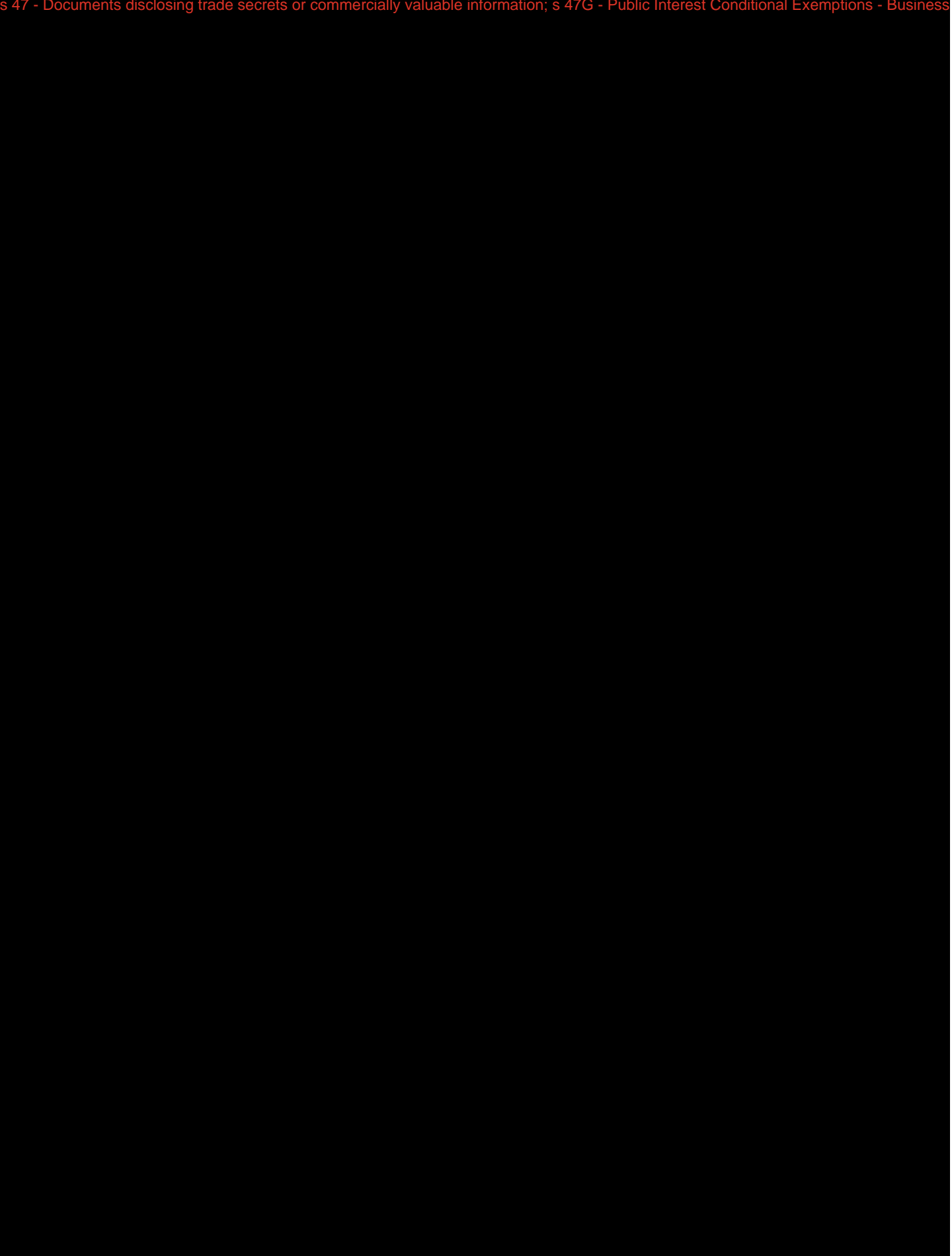
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[Redacted]

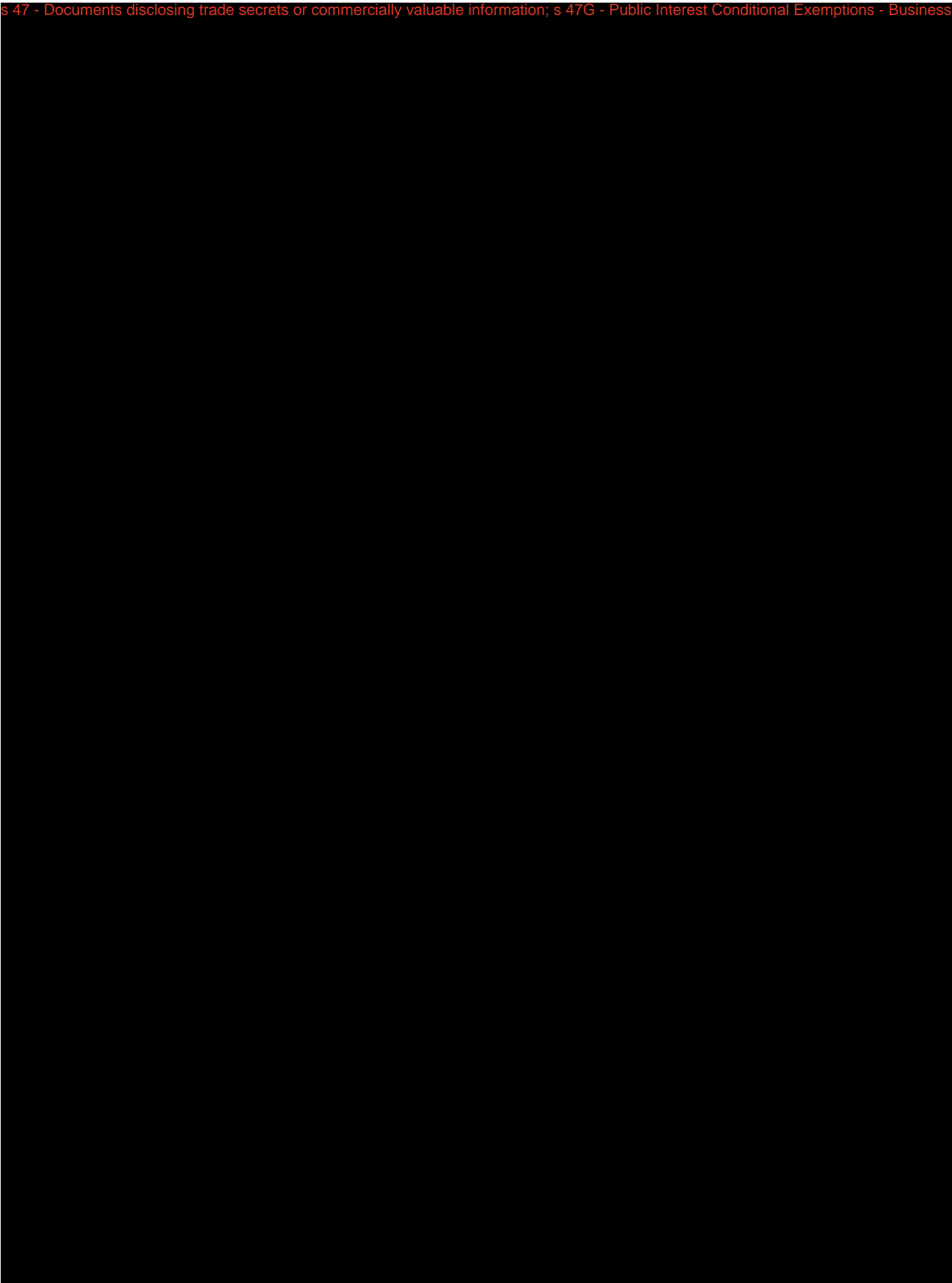
Create more rows as needed

Work Package Resourcing Request

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COLLABORATIVE RESEARCH AGREEMENT - RIO TINTO CENTRE FOR FUTURE MATERIALS
SCHEDULE 1 SECTION 3 – Funding

Work Package: WP13 Biomining - Biotechnology-based Solutions for Future Copper Mining

Partner university: The Australian National University

Academic contact : [Redacted]

Year One	Year Two	Year Three	Total
[Redacted]	[Redacted]	[Redacted]	[Redacted]

All amounts in this Schedule exclude VAT which Imperial will pay at the rate from time to time prescribed by law.

Imperial's Finance Officer is: [Redacted], Department Operations Manager, Earth Science & Engineering

Academic Institutions 's Finance Officer is: [Redacted], email: science.jaeger.rm@anu.edu.au

All payments of the Funding will be made by bank transfer to:

Bank: [Redacted]
Branche: [Redacted]

Account Name: [Redacted]
ABN: [Redacted]
BSB: [Redacted]
Account Number: [Redacted]
Swift Code: [Redacted]

Email remittance to: bank.rec@anu.edu.au

Please include full details of ANU invoice number, name of sender, ANU purchase order number, ANU Uni ID, ANU charge code or details of receiving area as appropriate.

Funder Ref. or PO No. to be included on Invoice	[Redacted]
Invoice Address (Billing Address)	Accounts Payable, Imperial College London London, SW7 2AZ United Kingdom Tel: 020 7594 6000 Email: apinvoices@imperial.ac.uk
Contact Name*	Please confirm
Contact Tel*	Please confirm
Contact Email*	Please confirm
Funder VAT No. (if outside UK)**	Not needed

Additional Instructions (if any)	
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*** Required by Accounts Receivable for Invoicing**

**** EU Commercial Organizations without a VAT number will be charged UK V**

AGREED by the Parties through their authorized signatories:

SIGNED for and on behalf of Imperial:

SIGNED for and on behalf of The Australian National University

Name § 47F - Public Interest Conditional Exemption

Name § 47F - Public Interest Conditional Exemption

Position Head of Contracts, Faculty of Engineering

Position Interim Chief
Research and Information Services

Signature § 47F - Public Interest Conditional Exemptions - Personal Privacy

Signature § 47F - Public Interest Conditional Exemptions - Personal Privacy

RIO TINTO CENTRE FOR FUTURE MATERIALS

GRAND CHALLENGE: DELIVERING FUTURE MATERIALS SYSTEMS FOR THE ENERGY TRANSITION WITH INTEGRITY: THE CU CHALLENGE

WORK PACKAGE DETAIL – RESEARCH

Section 1: Application Summary		
Work Package Title: Biomining - Biotechnology-based Solutions for Future Copper Mining		
Work Package Coordinators: <small>s.47F - Public Interest Conditional Exemptions - Personal P</small> University of California, Berkeley (UCB) <small>s.47F - Public Interest Conditional Exemptions - Personal P</small> from the <small>s.47F - Public Interest Conditional Exemptions - Personal P</small> , University of British Columbia (UBC)		
Work Package Team Member	Role	Department/University
<small>s.47F - Public Interest Conditional Exemptions - Personal P</small>	Co-Investigator	Australian National University (ANU)
<small>s.47F - Public Interest Conditional Exemptions - Personal P</small>	Co-Investigator	University of British Columbia (UBC)
<small>s.47F - Public Interest Conditional Exemptions - Personal P</small>	Co-Investigator	Imperial College (ICL)
<small>s.47F - Public Interest Conditional Exemptions - Personal P</small>	Advisor	University of the Witwatersrand, (Wits)
Section 1: LAY SUMMARY		
<p>Biomining is a process involving microorganisms to extract metals from mineral ores bodies and a method of collecting biological resources e.g., strains, genes, and gene products that can be harnessed for biotechnology innovation. Microorganisms including archaea, bacteria and fungi break down minerals in ores, binding or releasing metals like copper (Cu), gold, or uranium into more soluble forms. Such biohydrometallurgy is recognized for its cost-effectiveness and reduced environmental impacts. Biomining also enables extraction of metals from low-grade ores and treatment of waste streams including tailings and mining influenced waters (MIWs). However, Cu biomining presents specific challenges related to process efficiency, specificity, and stability. Effectiveness of individual microorganisms in leaching copper is influenced by factors such as mineral composition, temperature, pH, and the presence of inhibitory substances. Adapting microorganisms to site-specific mining conditions can be complex, requiring specialised traits or emergent metabolic processes. Moreover, different Cu ores demand distinct bioleaching methods with sulphide ores posing greater challenges compared to oxide ores. Thus, optimization for both growth and bioleaching potential are necessary to effectively recover Cu from different ores. Indeed, from a process development perspective identifying optimal conditions for biological activity is crucial. This involves controlling parameters like temperature, pH, oxygen, and nutrient availability. Deviations from optimal conditions can result in diminished recovery or process instability. Here we present a transformative approach to mining that integrates discovery of biological resources with invention of novel surface display (SD) platforms for Cu recovery. Key activities include: 1) building a biological resource discovery engine to identify Cu binding parts, and 2) development of biotechnology platforms for surface Cu binding and recovery including but not limited to cells, bacteriophage, membranes and lipid nanoparticles. These modular SD platforms will be iteratively refined under simulated real-world conditions using high-throughput automation systems and multifactorial experimental design to identify optimal performance parameters needed to 3) inform and expedite sustainable process development using hybrid living materials (HLMs) at relevant operating scales. Successful implementation of this work package can provide significant ESG benefits by creating new cost savings and revenue from waste, reducing environmental impacts of mining, and supporting bioeconomy development that improve the lives of local communities impacted by mining operations.</p>		

Section 2: WORK PACKAGE SCOPE

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Section 3: WORK PACKAGE DETAIL (Maximum of three pages A4)

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RIO TINTO CENTRE FOR FUTURE MATERIALS

GRAND CHALLENGE: **DELIVERING FUTURE MATERIALS SYSTEMS FOR THE ENERGY TRANSITION WITH INTEGRITY: THE CU CHALLENGE**

WORK PACKAGE DETAIL – TEAM MEMBERS & RESOURCING

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[Redacted]

[Redacted]

[Redacted]

Work Package Title: Biomining - Biotechnology-based Solutions for Future Copper Mining

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[Redacted]

s 47 - Documents disclosing trade secrets or commercially valuable information; s 47G - Public Interest Conditional Exemptions - Business

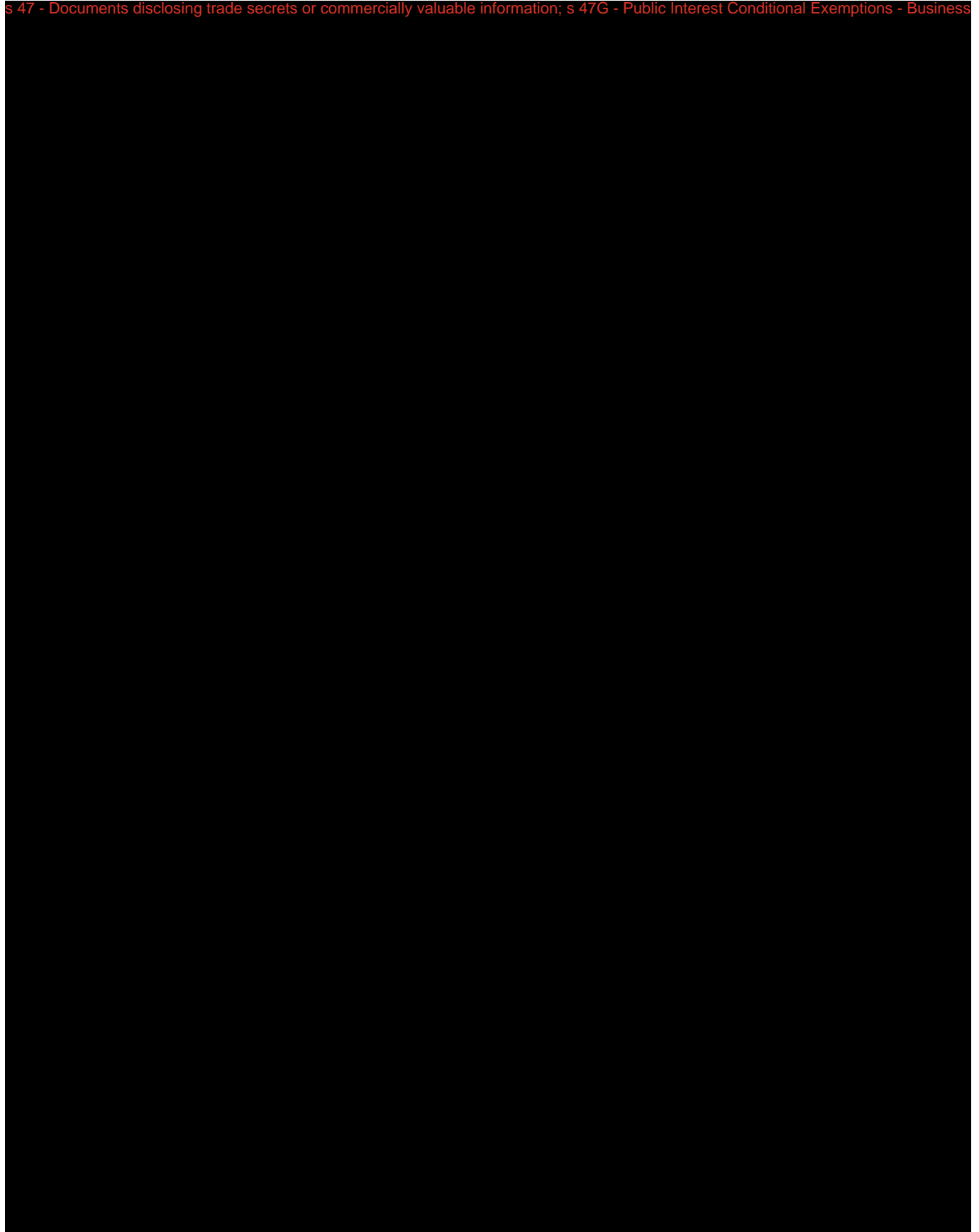


Create more rows as needed

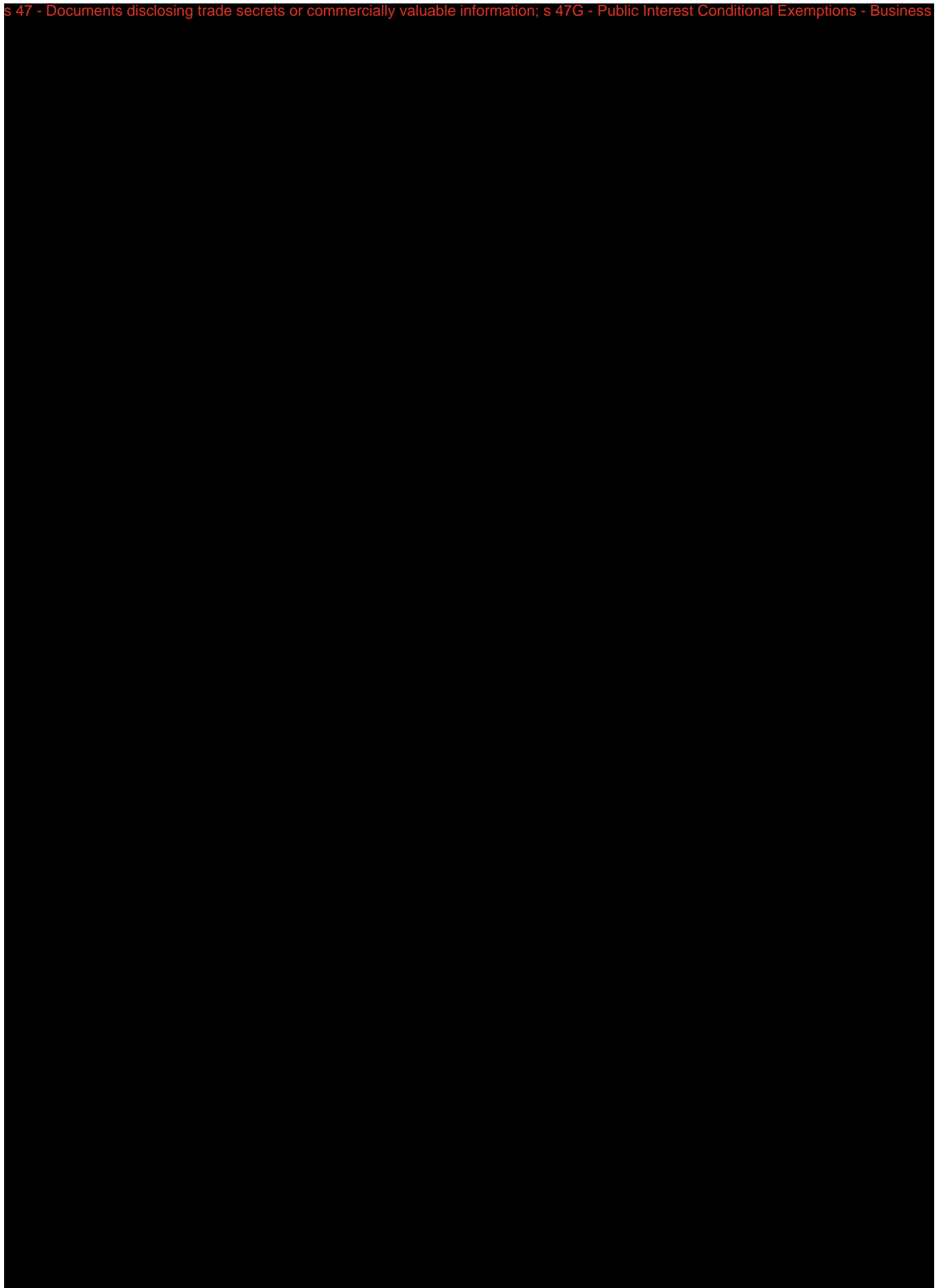
Work Package Resourcing Request
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Create more rows as needed

