

# Innovation Connections Project Contract

A completed and signed version of this document (which includes the terms stated in the **Standard Terms** section), together with each set of Project Details, forms an Agreement between the Research Provider and the Research Recipient.

## PROJECT DETAILS

Item	Name	Description
1	<b>Parties</b>	The Research Provider and the Research Recipient
2	<b>Research Provider</b>	<p>The University of Queensland ABN: 63 942 912 684</p> <p><b>Address for notices:</b> Director, Research Partnerships The University of Queensland, Brisbane QLD 4072 <a href="mailto:director.partnerships@research.uq.edu.au">director.partnerships@research.uq.edu.au</a></p>
3	<b>Research Recipient</b>	<p>Residue Solution Pty Ltd ABN: 61 093 883 991</p> <p><b>Address for notices:</b> 1/7 Clunies Ross Ct, Eight Mile Plains QLD 4113 <a href="mailto:david.frazer@phibion.com">david.frazer@phibion.com</a></p>
4	<b>Funding Recipient</b>	Research Provider
5	<b>Project Title</b>	Development of Dielectric Sensor System on Intelligent Amphirols for Mud Farming Tailings Facilities
6	<b>Project Activities</b>	<p>The aim of the project is to develop a method for quantifying in real time the density of soil waste and soft soil based on electromagnetic measurement results to improve TSF management and safety. In this one-year project, a specific designed RF architecture in the proof-of-concept level will be developed in the EM simulation and laboratory environment, in the same time, a minimum viable product (MVP) prototype will be built and tested in the real environment.</p> <p>As a future plan after this Innovation Connections program, the proposed contactless dielectric measurement system will be integrated on Phibion's Mud-master vehicle for the purpose of evaluating the density and water saturated condition of soil.</p> <p>The following research and development activities will be carried out in this one-year Innovation Connections:</p>

Item	Name	Description
		<p><b>WP 1: Project startup and definition of system capabilities</b></p> <p><b>Key Activities:</b></p> <ul style="list-style-type: none"> <li>• Site visit at Phibion (Eight Mile Plains, Queensland) and its remote factories to clarify the feature of the environment and Mud-master platform in which the system is to be developed and installed.</li> <li>• Familiar with the dielectric properties of the inspected soil of various types and the relation with its density (include water saturation).</li> <li>• Establish a three-dimensional (3D) numerical analysis program (based on electromagnetics propagation model) to determine the optimum range of working frequency and required RF power level.</li> <li>• Conduct a link budget analysis to determine the antenna aperture size of the dielectric sensor and its distance to inspected soil surface.</li> </ul> <p><b>Expected Outcomes:</b></p> <ul style="list-style-type: none"> <li>• Understanding the working environment of the Mud-master platform and determine the possible positions to be installed with dielectric sensors.</li> <li>• Acquiring the dielectric properties (permittivity and conductivity) of the inspected soil from database and imported those data into the numerical analysis model.</li> <li>• Quantitative understanding of the electromagnetics propagation characteristics in the soil as well as its response to the dielectric properties.</li> <li>• Specified the working frequency, RF power level and antenna type to be applied on the dielectric sensor.</li> </ul> <p>Start date: Commencement Date</p> <p>End date: 2 months from the Commencement Date</p> <p><b>WP 2: Contactless dielectric sensor designing and modelling in full-wave simulation environment</b></p> <p><b>Key Activities:</b></p> <ul style="list-style-type: none"> <li>• Implement the antenna design in terms of its working frequency and near-field characteristics.</li> <li>• Design the RF circuit of sensor in connect to the designed antenna structure.</li> <li>• Optimize the sensor geometry by computational EM simulator in order to achieve an acceptable impedance balance, near-field pattern, efficiency, and frequency-domain response</li> <li>• Evaluate the sensitivity and reliability of the dielectric sensor in terms of different soil properties.</li> </ul> <p><b>Outcomes:</b></p> <ul style="list-style-type: none"> <li>• Preliminary design and configuration of the sensor geometry and dimension are determined.</li> <li>• Specify the 3D topology and design parameters of the sensor, along with its feeding circuit.</li> <li>• Confirm the sensor performance in realistic full-wave simulation environment and the dynamic range of dielectric measurement.</li> </ul>

Item	Name	Description
		<p>Start date: 3 months from the Commencement Date  End date: 7 months from the Commencement Date</p> <p><b>WP 3: Build up the proof-of-concept MVP prototype</b></p> <p>Key Activities:</p> <ul style="list-style-type: none"> <li>• Build up the antenna designed from WP2 and measure its near- and far-field radiation performance.</li> <li>• Implement the RF feeding networks designed from WP2 and integrate it with the antenna body.</li> <li>• Connect the developed sensor to the vector network analyser and capture the data over the specified frequency (from WP1) in both free space and homogeneous medium for calibration purpose.</li> <li>• Install the MVP onto the mud-master platform and capture some raw RF signal from real application scenario.</li> <li>• Interpret the collected RF signal and map the data with soil properties.</li> </ul> <p>Outcomes:</p> <ul style="list-style-type: none"> <li>• Verification of the 3D simulation model to present the realistic laminates with high reliability.</li> <li>• Quantitative understanding of the system reliability and sensitivity of measuring the soil properties.</li> <li>• IP protected, and a next-stage development and commercialization plan is proposed.</li> </ul> <p>Start date: 8 months from the Commencement Date  End date: 12 months from the Commencement Date</p>
<b>7</b>	<b>Deliverables</b>	<p>3 months from the Commencement Date: Report outlining design parameters of the dielectric sensor</p> <p>7 months from the Commencement Date: Reporting outlining design of the dielectric sensor and validation of sensor performance using computational studies</p> <p>12 months from the Commencement Date: Report outlining system reliability and sensitivity of measuring soil properties</p>
<b>8</b>	<b>Commencement Date</b>	Date that is specified in the Commonwealth Funding Agreement
<b>9</b>	<b>End Date</b>	Date that is specified in the Commonwealth Funding Agreement
<b>10</b>	<b>Project Term</b>	<p>The Project will be for a term of 12 months, commencing on the Commencement Date and ending on the earlier of:</p> <p>(a) the End Date; and</p>

Item	Name	Description		
		(b) the effective date of termination, if the Agreement is terminated earlier in accordance with clause 7 of the <b>Standard Terms.</b>		
<b>11</b>	<b>Project Supervisor</b>	Dr Yifan Wang  Associate Professor Alexander Scheuermann  Professor Amin Abbosh		
<b>12</b>	<b>Researcher(s)</b>	To be recruited.  If the Researcher(s) becomes unavailable, the Research Provider must immediately notify the Research Recipient, and, subject to approval from the Research Recipient, replace with personnel with similar expertise and ability to those of the Researcher(s).		
<b>13</b>	<b>Project Location(s)</b>	The Research Project will be undertaken at The University of Queensland.		
<b>14</b>	<b>Research Provider Contribution</b>	Time for supervision from Project Supervisor valued at:  Dr Yifan Wang at 0.1FTE  Associate Professor Alexander Scheuermann at 0.1FTE  Professor Amin Abbosh at 0.1FTE  Provided to this Project as in-kind contribution.		
<b>15</b>	<b>Research Recipient Contribution</b>	N/A		
<b>16</b>	<b>Project Fees</b>	Research Recipient cash contribution: \$50,000  Research Provider contribution: N/A  Commonwealth funding: \$50,000  Total Project Value: \$100,000  The Parties acknowledge that the Commonwealth funding will be provided directly to the Research Provider.  Project Fees are exclusive of GST.		
<b>17</b>	<b>Payment Method</b>	The Research Recipient will pay the Project Fees (exc GST) to the Research Provider in accordance with the following schedule:		
		<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 5px; width: 50%;">Invoicing date</td> <td style="padding: 5px; width: 50%;">Payment amount (AUD ex GST)</td> </tr> </table>	Invoicing date	Payment amount (AUD ex GST)
Invoicing date	Payment amount (AUD ex GST)			

Item	Name	Description
18	<b>Intellectual Property</b>	Upon the execution of this agreement
		End Date

#### **18      Intellectual Property      Background Material**

The Research Provider has the following Background Material:

- i.     NA

The Research Recipient has the following Background Material:

- i.     Detailed information on MudMaster® operation in a range of commodities that provides fundamental information on how AMC can be optimised for any tailings/soft-soil. Data extracted the Research Recipient's MudMasters® while operating on client operations is subject to confidentiality between the Research Recipient and the Client. It is a pre-condition of access that the data is de-identified by the Research Provider to ensure the client remains anonymous. Data is to be identified by commodity only.

Access of any Background Material and Confidential Information provided by the Research Recipient is limited to the Project Supervisor (Item 11) and Researchers (Item 12), unless approved in writing by the Research Recipient.

Use of any Background Material, stated above, by the Research Recipient from the Research Provider for purposes other than the project will be subject to separate commercial arrangements between the Research Recipient and the Research Provider.

#### **Developed Material**

- i.     Intellectual Property in the Deliverables

Ownership of, and all Intellectual Property Rights in, the Developed Material will vest in the Research Provider and the Research Recipient as tenants in common in equal shares.

Subject to the Research Recipient not being in breach of any provision of this agreement, the Research Provider, to the extent of its ownership in the Developed Material, grants the Research

Item	Name	Description
		<p>Recipient an exclusive, perpetual, sub-licensable, royalty-free worldwide licence to use and commercialise the Developed Material in the fields of tailings management, dredge spoil management and soft soil recovery ("Phibion Exclusive Fields").</p>
		<p>The Research Recipient, to the extent of its ownership in the developed Material, grants the Research Provider:</p>
		<ul style="list-style-type: none"> <li>(a) a non-exclusive, perpetual, sub-licensable, royalty-free worldwide licence to use the Developed Material in any field for research and education purposes; and</li> <li>(b) an exclusive, perpetual, sub-licensable, royalty-free worldwide licence outside of Phibion Exclusive Fields.</li> </ul>
<b>19</b>	<b>Publication</b>	<p>Any subsequent intentions to publish are subject to clause 6.3.</p>
		<p>The Research Recipient acknowledges that the Research Provider may publish and otherwise disclose the results of the Project. The Research Recipient will have 30 days upon receipt from the Research Provider to review the manuscript and request removal of any Confidential Information from the manuscript.</p>
<b>20</b>	<b>Insurance</b>	<p>Public Liability: \$10,000,000 to be maintained for the Project Term.</p>
		<p>Professional Indemnity: \$10,000,000 to be maintained for the Project Term and a period of 1 years afterwards.</p>
		<p>The parties may agree to accept alternative forms of insurance which, whilst not precisely making reference to categories described in this clause, offer equivalent insurance cover.</p>
<b>21</b>	<b>Reports</b>	<p>Reports will provided on a regular basis by the Research Provider at regular intervals agreed between the Research Provider and Research Recipient.</p>
		<p>The Research Recipient shall submit to the Commonwealth:</p>
		<ul style="list-style-type: none"> <li>(a) a Progress Report at 6 months from the Commencement Date; and</li> </ul>
		<ul style="list-style-type: none"> <li>(b) a Final Report within 4 weeks of the End Date.</li> </ul>

## SIGNATURES

Executed as an agreement:

EXECUTED by RESIDUE SOLUTIONS PTY LTD by its duly authorised representative:



Signature of authorised  
representative



Signature of witness

04/04/2019

Date

DAVID FRAZER

Name of authorised  
representative (block letters)

DEAN BEAGLEY

Name of witness (block letters)

SIGNED for THE UNIVERSITY OF QUEENSLAND by its duly authorised representative:

.....  
Signature of authorised  
representative

.....  
Signature of witness

.....  
Date

.....  
Name of authorised  
representative (block letters)

.....  
Name of witness (block letters)