



Australia's National
Science Agency

GISERA | Gas Industry Social and Environmental Research Alliance

Progress report

Laboratory Based Evaluation of Cement Degradation Processes
in CSG Wells in Queensland



Australian Government
Department of Industry,
Science and Resources



Supported by
Government of
South Australia



NORTHERN
TERRITORY
GOVERNMENT



QGC

Santos

tamboran
RESOURCES



Progress against project milestones

Progress against milestones/tasks are approved by the GISERA Director, acting with authority in accordance with the [GISERA Alliance Agreement](#).

Progress against project milestones/tasks is indicated by two methods: [Traffic light reports](#) and descriptive [Project schedule reports](#).

1. Traffic light reports in the Project Schedule Table below show progress using a simple colour code:

- **Green:**

- Milestone fully met according to schedule.
- Project is expected to continue to deliver according to plan.
- Milestone payment is approved.

- **Amber:**

- Milestone largely met according to schedule.
- Project has experienced delays or difficulties that will be overcome by next milestone, enabling project to return to delivery according to plan by next milestone.
- Milestone payment is withheld.
- Milestone payment withheld for second of two successive amber lights; project review initiated and undertaken by GISERA Director.

- **Red:**

- Milestone not met according to schedule.
- Problems in meeting milestone are likely to impact subsequent project delivery, such that revisions to project timing, scope or budget must be considered.
- Milestone payment is withheld.
- Project review initiated by GISERA Director.

2. Progress Schedule Reports outline task objectives and outputs and describe, in the 'progress report' section, the means and extent to which progress towards tasks has been made.

Project schedule table

TASK NUMBER	TASK DESCRIPTION	SCHEDULED START	SCHEDULED FINISH	COMMENT
1	Literature review	1 May 2025	31 Aug 2025	
2	Cement samples and groundwater preparation	1 Jul 2025	30 Sep 2025	
3	Ageing/Accelerated experiments	1 Sep 2025	28 Feb 2026	
4	Cement Characterisation	1 Aug 2025	31 May 2026	
5	Geochemical modelling	1 Dec 2025	31 Mar 2026	
6	Final report compilation	1 Jan 2026	31 May 2026	
7	Communicate project objectives, progress and findings to stakeholders	1 May 2025	30 Jun 2026	

Project schedule report

TASK 1: Literature review

BACKGROUND

Typical reservoir conditions in the Surat Basin CSG fields are reviewed. This includes identifying the pressures, temperatures, and groundwater chemistry that wells are exposed to. Relevant data on common cement mixtures will be investigated following the previous studies such as Grigore et al (2024). Ageing and thermal accelerated ageing experiments on cement will be reviewed. The insights from this phase will inform the design of laboratory experiments. In this regards, a preliminary geochemical review will be conducted to ensure the experimental design meets the required conditions. The Technical Reference Group will be consulted to get their perspective on the validity of the cement composition(s) and experimental conditions.

TASK OBJECTIVES

- Selecting an appropriate cement for subsequent tests
- Designing the ageing experiments
- A preliminary geochemical review considering the reservoir condition and groundwater specifications

TASK OUTPUTS AND SPECIFIC DELIVERABLES

- This task will identify the cement composition, reservoir conditions (pressures, temperatures, and groundwater chemistry) and provides the design of ageing experiments.

PROGRESS REPORT

This task will be completed August 2025.

TASK 2: Cement samples and groundwater preparation

BACKGROUND

During this task, the project team will obtain representative cement ingredients, and representative gas and formation water mixtures for use in cement curing and the ageing experiments. Cement components and gas mixture composition will be based on reported data for the Surat Basin from Task 1. Formation water will be collected from the field where possible through liaison with operators, or an analogue will be produced based on literature in Task 1. Modification and commissioning of the equipment to be used for the ageing experiments will also take place, as well as manufacture of the required cement moulds. Cement samples will be cured under reservoir conditions for use in subsequent tasks.

TASK OBJECTIVES

- Obtain cement ingredients, reservoir gas, and formation water samples for use in curing and ageing experiments.
- Cure cement samples required for Task 3 under representative CSG reservoir conditions. Undertake necessary modification and commissioning of equipment for use in Task 3.

TASK OUTPUTS AND SPECIFIC DELIVERABLES

- This Task will deliver the modified and commissioned equipment as well as the materials, including cured cement samples, required for the ageing and accelerated ageing experiments in Task 3.

PROGRESS REPORT

This task will be completed September 2025.

TASK 3: Ageing/Accelerated experiments

BACKGROUND

To investigate the interaction between cement and formation water in CSG wells, ageing and thermally accelerated ageing experiments will be conducted over a period of three to six months. These experiments aim to simulate mid- to long-term environmental exposure by subjecting cement samples to controlled laboratory conditions that closely replicate field environments. By incorporating key reservoir factors such as pressure, temperature, groundwater chemistry, and the presence of reservoir gases, the study will provide insights into the degradation processes affecting cement integrity in CSG wells.

TASK OBJECTIVES

- Conducting ageing experiments aim to investigate the long-term degradation of cement in CSG wells by simulating ageing and thermally accelerated ageing under controlled laboratory conditions while replicating key reservoir conditions.

TASK OUTPUTS AND SPECIFIC DELIVERABLES

- This task will generate experimental data and information about cement degradation which is required for following characterisation (Task 4) and geochemical modelling (Task 5).

PROGRESS REPORT

This task will be completed February 2026.

TASK 4: Cement Characterisation

BACKGROUND

To precisely monitor and interpret any change of cement from mineralogical, petrophysical and internal structure aspects as a result of fluid-cement interactions during the aging experiments (Task 3), a comprehensive set of evaluations are necessary to be conducted on cement samples before and after the ageing experiments. The evaluations may include XRD, SEM, Micro-CT, TGA, and cement properties measurements.

TASK OBJECTIVES

- The integrated characterisation which will provide robust baseline data, facilitating accurate assessment of geochemical and structural changes resulting from cement-brine-gas interactions during the experimental ageing phase.

TASK OUTPUTS AND SPECIFIC DELIVERABLES

- The post-experimental characterisation will enable a direct comparison with baseline data, providing clear insights into the geochemical, structural, and petrophysical changes induced by cement-brine-gas interactions.

PROGRESS REPORT

This task will be completed May 2026.

TASK 5: Geochemical modelling

BACKGROUND

Post-experimental data (Task 3 and 4) will be integrated into comprehensive geochemical modelling to further interpret experimental results.

TASK OBJECTIVES

- To further understand the nature behind the experimental observations and extend the prediction from short-term aging experiments to longer timeframes.

TASK OUTPUTS AND SPECIFIC DELIVERABLES

Two types of modelling will be conducted:

- Thermodynamic modelling: This equilibrium-based approach will help identify the ultimate stable mineralogical phases and composition of the cement-brine-gas system, providing insights into long-term equilibrium conditions.

- Kinetic modelling: This time-dependent approach will extend experimental findings from the relatively short experimental duration (three to six months) to significantly longer timeframes (e.g., 30-50 years).

PROGRESS REPORT

This task will be completed March 2026.

TASK 6: Project Reporting

BACKGROUND

This project will investigate the cement degradation process in CSG wells in the Surat Basin in conditions (pressure, temperature, groundwater chemistry) typically encountered in this region. The project will be laboratory based, using ageing and accelerated ageing experiments to evaluate the extent of cement degradation. The project scope, methods, experimental results and analysis, and technical reports are provided in this task.

TASK OBJECTIVES

- Integrating the data and analysis from Task 1, 2, 3, 4 and 5 into a cohesive document as final project report

TASK OUTPUTS AND SPECIFIC DELIVERABLES

- Preparation of a final report outlining the scope, methodology, scenarios, assumptions, findings and any suggestions/options for future research;
- Following CSIRO ePublish review, the report will be submitted to the GISERA Director for final approval; and
- Provide 6 monthly progress updates to GISERA office.

PROGRESS REPORT

This task will be completed May 2026.

TASK 7: Communicate project objectives, progress and findings to stakeholders

BACKGROUND

Communication of GISERA's research is an important component of all research projects. The dissemination of project objectives, key findings and deliverables to relevant and diverse audiences allows discourse and decision making within and across multiple stakeholder groups.

TASK OBJECTIVES

- Communicate project objectives, progress and findings to stakeholders through meetings, Knowledge Transfer Session, fact sheets, project reports and journal article(s), in collaboration with GISERA Communication Team.

TASK OUTPUTS AND SPECIFIC DELIVERABLES

Communicate project objectives, progress and results to GISERA stakeholders according to standard GISERA project procedures which may include, but not limited to:

- Knowledge Transfer Session with relevant government/gas industry representatives.
- Preparation of an article for the GISERA newsletter and other media outlets as advised by GISERA's communication team.
- Two project fact sheets: one developed at the commencement of the project, and another that will include peer-reviewed results and implications at completion of the project. Both will be hosted on the GISERA website.
- Presentation of scientific results at conference.

PROGRESS REPORT

This task will be completed June 2026.

Variations to Project Order

Changes to research Project Orders are approved by the GISERA Director, acting with authority, in accordance with the [GISERA Alliance Agreement](#). Any variations above the GISERA Director's delegation require the approval of the relevant GISERA Research Advisory Committee.

The table below details variations to research Project Order.

Register of changes to Research Project Order

DATE	ISSUE	ACTION	AUTHORISATION

As Australia's national science agency and innovation catalyst, CSIRO is solving the greatest challenges through innovative science and technology.

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GISERA is a collaboration between CSIRO, Commonwealth and state governments and industry established to undertake publicly-reported independent research. The purpose of GISERA is to provide quality assured scientific research and information to communities living in gas development regions focusing on social and environmental topics including: groundwater and surface water, greenhouse gas emissions, biodiversity, land management, the marine environment, and socio-economic impacts. The governance structure for GISERA is designed to provide for and protect research independence and transparency of research.