
EIR request – criteria and external permissions for ARIA climate-cooling outdoor experiments

[REDACTED]
To: eir@aria.org.uk

21 February 2026 at 13:25

Dear FOI/EIR team,

Further to your responses of 20 January and 6 February 2026 regarding the “**Exploring Climate Cooling**” programme, please treat this as a request for **environmental information** under the Environmental Information Regulations 2004.

1. Criteria for identifying outdoor experiments

Please provide the current version of any internal ARIA document that sets out the **criteria** used to decide whether a climate-cooling-related project would involve **outdoor experiments or field trials**, as opposed to modelling, lab work or other contained research.

2. Required external permissions

Please provide any internal ARIA document (policy, procedures, guidance, or checklist) that describes the **external permissions or approvals** ARIA expects to be required before any climate-cooling outdoor experiment can proceed, for example from:

- the Civil Aviation Authority;
- environmental regulators;
- health and safety bodies;
- overseas regulators in the case of non-UK sites.

If no document exists for part 1 or part 2, please confirm this explicitly.

I would prefer the information in electronic form.

Yours faithfully,
[REDACTED]

21 April 2026

Dear [REDACTED],

Environmental Information Regulations 2004 (“EIR”) Request

We are writing in response to your recent request for information to the Advanced Research + Invention Agency (“**ARIA**”) dated 21 February 2026 in which you asked:

*“Further to your responses of 20 January and 6 February 2026 regarding the “**Exploring Climate Cooling**” programme, please treat this as a request for **environmental information** under the Environmental Information Regulations 2004.*

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- *environmental regulators;*
- *health and safety bodies;*
- *overseas regulators in the case of non-UK sites.*

If no document exists for part 1 or part 2, please confirm this explicitly.

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Response to EIR request

1. Criteria for identifying outdoor experiments

During the project selection process, applicants submitted proposals for projects, which included reasons for why such projects should involve outdoor experiments, modelling or other research. These applications were then reviewed in accordance with the criteria set out in the programme's solicitation documents, and the projects which would best align with the goals of the Exploring Climate Cooling programme were selected.

We have enclosed the Exploring Climate Cooling programme's call for proposals document at **Annex 1**, which includes the programme's evaluation criteria for applications. In addition, we enclose at **Annex 2** the Exploring Climate Cooling programme's thesis, which we have previously shared in our letter dated 2 April 2026. We draw your attention to the decision tree on page 7, which sets out the criteria for deciding whether a particular outdoor experiment might be supported by the programme. ARIA does not hold any further documents or information relevant to this element of your request.

2. Required external permissions

The specific permissions and approvals applicable to a given outdoor experiment depend on the nature and location of the project. It is a requirement of ARIA funding that the Exploring Climate Cooling outdoor experiments comply with local, national, and international regulations and, before any outdoor experiment takes place, that an independent environmental and legal assessment will be conducted and made publicly available. One such set of assessments has been completed in respect of the Re-thickening Arctic Sea Ice (RASI) project, which has been previously provided to you and is enclosed at **Annex 3** to **Annex 5**. As you will note, Willms & Shier Environmental Lawyers LLP (a Canadian legal firm) concluded that the project "*has all the permits and permissions required to proceed with the Project as planned for the 2026 season*" and "*has engaged with the local Inuit community*".

As described in our previous correspondence, the preparations for outdoor experiments in the UK are only in preliminary stages, and no outdoor experiments have been approved yet in the UK. As such, no documents describing the specific external permissions or approvals for these experiments are held yet.

Details of the community engagement process to which all outdoor experiments will be subject is available on ARIA's website: [Exploring Climate Cooling | Community Engagement](#). For your convenience, we have included the relevant extracts of this page at **Annex 6**. As you will see, Phase 1 includes the requirement that teams identify required permits and permissions, and Phase 2 requires that teams will obtain and publish all necessary permits and permissions.

Yours sincerely,

ARIA

You can ask us to review our response. If you want us to carry out a review, please let us know within 40 working days by emailing eir@aria.org.uk.

If you are still dissatisfied after our internal review, you may complain to the Information Commissioner's Office (ICO) for further investigation who can be contacted at: Information Commissioner's Office, Wycliffe House, Water Lane, Wilmslow, Cheshire, SK9 5AF.

Annex 1: Exploring Climate Cooling | Call for Proposals

Exploring Climate Cooling Call for proposals

Date: 13 September 2024

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SECTION 1: Programme Thesis and Overview.....	3
SECTION 2: Programme Objectives.....	4
SECTION 3: Technical Metrics.....	5
SECTION 4: What are we looking for/what are we not looking for.....	6
SECTION 5: Programme Duration and Project Management.....	12
Programme & Project Management.....	12
Project Milestones.....	14
Approach to Results and Intellectual Property.....	14
Community events.....	16
SECTION 6: Eligibility & Application process.....	16
Eligibility.....	16
Finding potential collaborators and teaming.....	16
Application Process.....	16
Stage 1 - Concept paper.....	17
Stage 2 - Full proposals.....	17
SECTION 7: Timelines.....	19
SECTION 8: Evaluation Criteria.....	20
Concept Paper and Proposal Evaluation Principles.....	20
Proposal evaluation process and criteria.....	20
SECTION 9: How to apply.....	22
SECTION 10: References.....	23

SECTION 1: Programme Thesis and Overview

This solicitation is derived from the programme thesis [Exploring Options for Actively Cooling the Earth](#), in turn derived from the ARIA Opportunity Space: [Future Proofing Our Climate and Weather](#).

Climate change, largely caused by anthropogenic greenhouse gas emissions, could cause the global temperature to increase by several degrees by the end of the century, precipitating climate tipping points with serious consequences [1,2]. The only sustainable solution to this problem is to cease the burning of fossil fuels and to eliminate excess greenhouse gases from the atmosphere. However, on account of the amount of carbon dioxide already in the atmosphere, a certain amount of continued global warming is almost certainly locked in [3,4]. In this context, there is a risk that the essential work of lowering atmospheric greenhouse gas levels – even under the most aggressive scenarios – does not happen fast enough to prevent the onset of temperature-induced tipping points.

Were such a temperature-induced climate tipping point to become apparent, our current level of understanding provides us with no options for how we might actively intervene to cool the relevant regions on the timescales required to avert or delay that tipping point. Approaches such as stratospheric aerosol injection [5], marine cloud brightening [6], increasing the reflectivity of the Earth's surface (e.g. by re-growing ice sheets), [7] and constructing space-based reflectors to shade the Earth from a proportion of incoming sunlight [8] have been proposed as potential methods by which to cool the Earth on a global or regional basis. However, an enormous amount of research is required on all these approaches: even basic questions as to whether they could work, what their immediate effects and side-effects might be, and whether they could ever be used safely and predictably remain unanswered. Informed debate as to the risks and impacts of such approaches requires resolution of these uncertainties.

Accordingly, following a 12-month discovery and engagement process, ARIA is now launching a programme aimed at answering fundamental questions as to the practicality, measurability, controllability and possible (side-)effects of approaches for actively cooling the Earth through indoor and (where necessary) small, controlled, outdoor experiments. In answering these questions, ARIA will fund not only the experiments themselves, but also the necessary modelling, simulation, observation and monitoring required to support the experiments, as well as research into the ethical, governance, law, and geopolitical dimensions of the approaches under investigation. Successful outcomes from this programme could include ruling particular options out from further study as technically infeasible, ruling them out as infeasible due to risks that cannot be adequately constrained, or highlighting which approaches show promise and would benefit from further research and development.

Acknowledging that this is a complex and ethically-challenging area of research, ARIA will be applying a particular set of governance and management principles in this programme, which are described in detail in the [programme thesis](#) and the [programme oversight and governance document](#).

SECTION 2: Programme Objectives

The programme aims to develop a scientific framework to underpin strong predict → test → monitor → validate loops for a range of approaches (Figure 1). The “predict”, “monitor” and “societal aspects” nodes in Figure 1 have received some (although arguably insufficient) interest in recent years. However, research into how approaches for cooling the Earth might work in practice, how their effects would be demonstrated with statistical confidence, and how any resulting technology might be scaled effectively has received much less attention. Therefore, whilst further research across all of the areas shown in Figure 1 is vital, we see that the “test” and “validate” nodes are particularly underserved.

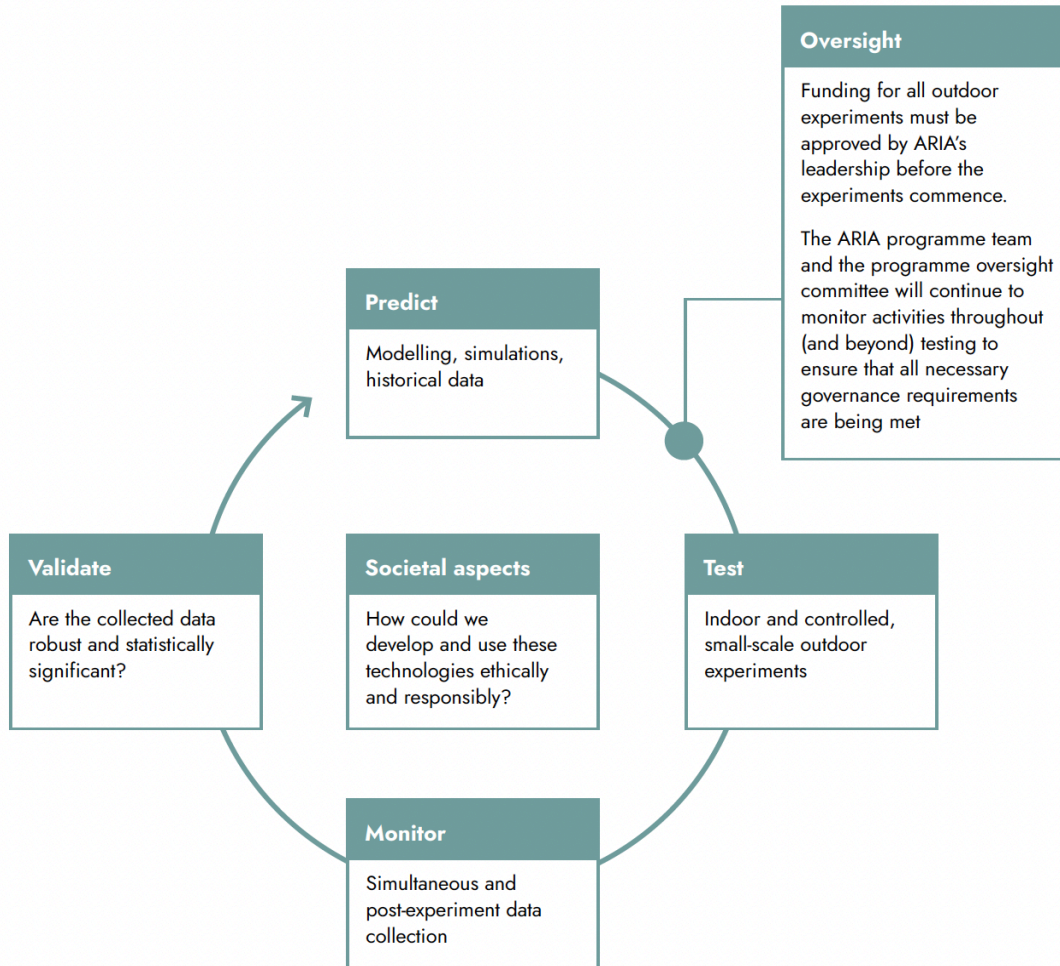


Figure 1: A technology research loop showing the “predict”, “test”, “monitor”, “validate” and “societal aspects” nodes. Details on the oversight mechanisms are described in the programme thesis and in the programme oversight and governance document.

Computer modelling and indoor testing are essential and necessary first steps in establishing the basic science behind how (or whether) a particular approach might work. However, modelling and indoor testing alone cannot provide all the data necessary to predict the effects of a given approach on the real world with a suitable level of confidence. Controlled outdoor experiments are therefore likely to be required to truly advance our understanding of the phenomena underlying potential approaches.

The overarching goal of this programme is to answer the most critical technical and fundamental questions on the practicality, measurability, controllability, and likely (side-)effects of approaches that might one day be used to actively cool the Earth. Projects will therefore need to demonstrate how they align with this goal.

SECTION 3: Technical Metrics

A very simplified estimate of the equilibrium temperature at the Earth's surface (T_{surf}) is provided by the equation below [9]:

$$T_{surf} = \sqrt[4]{\frac{S(1-\alpha)}{2\sigma(2-\varepsilon)}}$$

Where S is the solar constant (the power per unit area impinging on the Earth from solar irradiation), α is the planetary albedo (a measure of how much short-wave radiation is reflected from the Earth without being absorbed), σ is the Stefan-Boltzmann constant, and ε is the effective emissivity of the atmosphere (σ and ε together give a measure of how much long-wave radiation is emitted by the Earth back out to space).

In order to be in-scope for this programme, projects will need to demonstrate how the research they are proposing meets at least one of the following criteria:

1. The approaches being researched have the potential to alter T_{surf} (at any scale) by affecting at least one of the variables α , ε or S (see Table 1) in a manner that is statistically distinguishable from the background
2. The approaches being researched have the potential to alter parameters that map directly onto the variables α , ε or S (applicants will be required to justify explicitly how the parameters being perturbed map onto α , ε or S) in a manner that is statistically distinguishable from the background
3. The research proposed has direct bearing on the prediction, modelling, measurement, monitoring, validation, governance, education, public perception, ethics or other research questions related to approaches or experiments that could alter at least one of the variables α , ε or S (or parameters that map directly onto those variables)
4. The research proposed has direct bearing on open questions or uncertainties about the ecological or other environmental impacts, risks or side-effects related to approaches or experiments that could alter at least one of the variables α , ε or S (or parameters that map directly onto those variables).

ARIA encourages research plans that build in careful attention to measuring possible unintended side-effects and understanding possible risks. Where physical experiments are being proposed, applicants will need to consider testability and statistical significance in

their proposals (for example, can any parallels or lessons be drawn from some of the ways in which statistical methods have been employed to evaluate field trials of cloud seeding [10-12]?). **For physical experiments, project teams will need to convince the reviewers as to why the measurements/perturbations that they intend to make are the right things to measure/perturb, and how the results would substantially advance the validation or invalidation of the approach on the grounds of practicality, scalability, safety or impacts.**

ARIA will require publication of the results of the work that we fund (including negative results) in an accessible form, except if their publication would be likely to lead to public harm.

Table 1: Variables for study in this programme. The examples of approaches that could address these variables are not exhaustive, and neither should they be construed as use cases that ARIA considers to be more or less valuable than any others that can be imagined.

Variable	Examples of approaches that could address this variable (non-exhaustive)
Planetary albedo (a)	Marine cloud brightening [6]; ice sheet thickening [13]
Effective solar constant (S)	Space-based reflectors [8]
Effective emissivity of the atmosphere (ϵ)	Cirrus cloud thinning [14,15]

SECTION 4: What are we looking for/what are we not looking for

Funding across silos

We anticipate funding research into approaches for reducing global temperatures across the full range of science and engineering disciplines, in accordance with the framework presented in Figure 1.

Therefore, we expect to support projects across the social sciences that are of direct relevance to those approaches (including, but by no means limited to, consideration of public perception, potential legal, ethical, regulatory and governance frameworks, ethics, community engagement, and the economic impact of those approaches). ARIA is aware of previous and ongoing initiatives that have considered some of the ethical and societal issues around governance, stakeholder engagement and perceptions related to approaches for actively cooling the Earth over the last few years (see, for example: [16-19]). It will be

incumbent on proposers to demonstrate how any proposed research avoids duplication of effort with previous studies, be this in regards to technical or social research.

ARIA aims to provide as much flexibility as possible in terms of how the social sciences and humanities are represented in this programme. For example, ARIA may fund social scientists, ethicists, legal scholars, or humanities researchers to work specifically on certain technical research teams. In addition, ARIA may also fund a dedicated social science, law, and governance strand that works across the full range of approaches under investigation, in a manner that complements the efforts of social scientists that are embedded in specific research teams.

ARIA’s ultimate aim is to integrate aspects of all the nodes in Figure 1 (including relevant societal aspects) into each project, but we appreciate that different projects will have different requirements and that such integration may take time. Therefore, ARIA is open to receiving proposals for (and indeed funding) projects that focus solely on one node of Figure 1 in the first instance, with a view to encouraging greater cohesion between the different nodes as projects progress. Encouraging cohesion might also include suggesting that various teams combine their efforts at full proposal submission or award negotiation stage. If ARIA identifies areas that are especially poorly represented in submissions to the initial call, then we may issue a further call for relevant expertise in those areas.

Programme scope

Table 2 gives a breakdown of areas that are **out of scope** for this programme, along with the reasoning we have taken in coming to these decisions. **Approaches that are not explicitly listed as out of scope will be considered** (provided that their specific intent relates to the controlled perturbation of one of the variables given in Table 1, or altering parameters that map directly onto those variables).

Table 2: *Out of scope areas for this programme*

Topic or activity	Reasoning and comments
Removal, sequestration and/or utilisation of carbon dioxide	Multiple other public and private funders are already funding carbon dioxide removal and utilisation
General weather/climate simulation or monitoring activities that do not provide insights into the effects of altering one	Only simulation or monitoring activities that could be relevant to the temperature-reducing approaches being researched in this

<p>of the variables in Table 1 (or parameters that map directly onto those variables).</p>	<p>programme will be in scope. This programme is distinct from the work of the Natural Environment Research Council and their Research programme to model the impact of solar radiation management [20], and has been developed independently. ARIA will continue to engage with NERC as development of both programmes progresses.</p>
<p>Outdoor experiments where analysis via Figure 2 indicates that such experiments cannot be supported by this programme</p>	<p>Outdoor experiments that Figure 2 indicates cannot be supported will not be funded through this programme</p>
<p>Large-scale trials of climate engineering technologies continuously or over extended durations</p>	<p>This programme will only fund activities at research scale</p>

A framework for outdoor experiments

There is the potential for unintended negative consequences in any outdoor experiment. Therefore, it will be important to define a transparent set of principles from the outset that can guide the programme’s consideration of whether and how outdoor testing can proceed. ARIA has incorporated lessons from previous projects where outdoor experiments have been cancelled before commencing [21-24] and those where outdoor experiments have gone ahead [25,7] in developing these principles, with the aim of supporting the development of best practices for safe and transparent outdoor experiments.

Our guiding principle for outdoor experiments is that these should be conducted on the smallest possible length and timescales required to validate with statistical confidence that the approaches under test can affect the parameters under investigation. These scales will be approach-specific. A discussion on scale and duration of outdoor experiments is provided in the [programme thesis](#), and applicants are strongly encouraged to refer to this document when proposing outdoor experiments.

The magnitude of the intended perturbation should be limited so that it is within the bounds of known and benign natural phenomena (or anthropogenic phenomena that are considered harmless), so that there is precedent for the size of the effect that will be produced. The experiments should be designed so that as far as possible the effects either dissipate

through natural mechanisms within hours, or can be localised with very high certainty, or else that there should be an obvious and reliable mechanism for switching off the effect at any time, on demand. These features should minimise the risks of negative unintended consequences by confining the effects in space and/or time.

A combination of considerations on the size, duration and reversibility of outdoor experiments leads to the following suggested decision tree for assessing whether a particular outdoor experiment might be supported through this programme (Figure 2). Applicants proposing outdoor experiments are strongly advised to refer to this decision tree in their proposals, and to state explicitly how the experiments that they are proposing comply with the considerations listed.

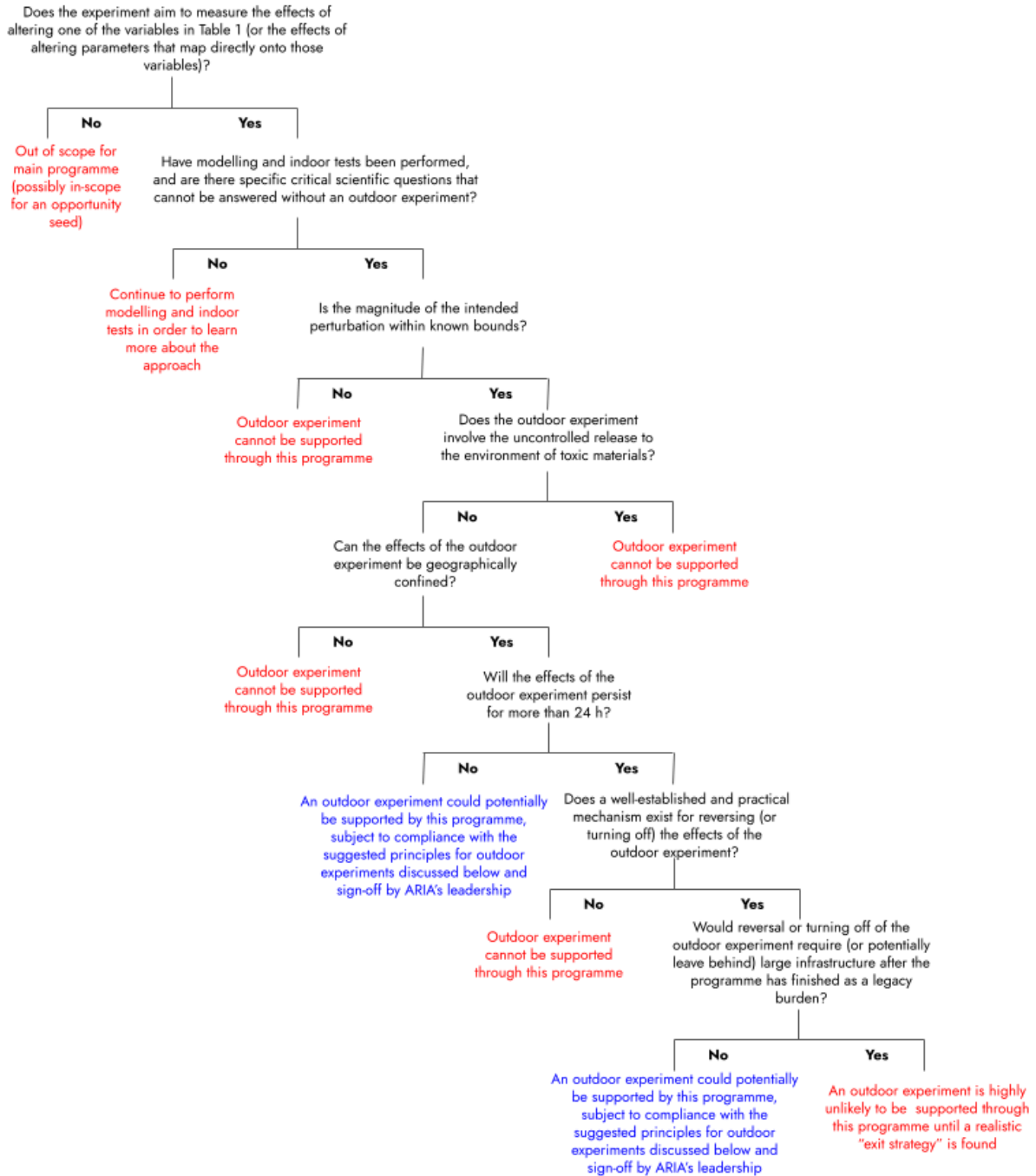


Figure 2: The outdoor experiment technical consideration decision tree for guiding applicants towards outdoor experiments that could be funded through this programme. Please refer to Table 1 for a description of the relevant variables.

In addition to this basic technical information, all outdoor experiments will need to comply with the following oversight and governance principles, which are given here so that project teams can see what will be required for any outdoor experiments:

1. **ARIA will not fund experiments where the activities proposed are prohibited by domestic or international law.** Project teams will be required to show how their tests comply with all applicable laws.
2. **A risk assessment will be performed and the findings made publicly available before any outdoor experiment.** This will be conducted by experts who are independent of the team performing the experiment, and will include relevant potential technological, environmental and socio-economic risks.
3. **Minimising risk by design.** Outdoor experiments should be designed at the minimum viable scale required for the generation of robust data, and where the magnitude of any perturbation has a natural analogue or commonly accepted anthropogenic precedent (and therefore where the effect of the perturbation is within the range of known and benign phenomena). Such considerations are summarised in Figure 2.
4. **Transparency, public participation and consultation.** Wherever possible, those conducting outdoor experiments will be required to notify and consult those who could reasonably be considered as likely to be affected by the experiments. ARIA sees consultation and engagement with the public as processes that will be sustained for the lifetime of projects. To facilitate informed decision making, detailed plans for the outdoor experiments, and the key decisions taken in developing these plans, will be consulted upon as transparently as possible well in advance of any experiment. The specific protocols for transparency will be developed in consultation with the Oversight Committee, and will include provisions for transparency regarding what the experiments involve, why the experiments are necessary, who is conducting the experiments, and who might be impacted by the experiments. The results of the experiments (including negative results) will also be made publicly available in an accessible form.
5. **Independent impact assessment.** Post-experiment, the environmental and any socio-economic impacts will be assessed by experts who are independent of the team performing the outdoor experiments, and the results of these assessments will be made publicly available. ARIA may also commission assessments of the broader implications of the experiments as appropriate.

6. **Limited scope.** Activities in this programme will be limited to research scale – ARIA will not fund deployment or any demonstration beyond the approved experiments.

ARIA intends to apply stage-gates to projects based around compliance with these principles, including undertaking sufficient engagement and experiment co-design with local communities and key stakeholders prior to funding being released for any outdoor experiment (or series of outdoor experiments). Details on the steps that project teams will be required to take for approval of funding for an outdoor experiment (or a series of linked outdoor experiments) is provided in the section 'A suggested framework for outdoor experiments' in the [programme thesis](#), and ARIA will provide specialist support to assist project teams with these steps. Information on ARIA's processes for approving funding for outdoor experiments can also be found in the programme thesis and the [programme oversight and governance document](#).

ARIA's leadership will be ultimately responsible for governance oversight and the release of funding for outdoor experiments, leveraging input from an independent programme oversight committee (see Figure 1 of the [programme oversight and governance document](#) for information on the role of this committee and its relationship to other actors in the programme). ARIA has also established a Committee of the Board for ethical and social responsibility, which will have visibility across all of ARIA's programmes.

A key aim is to earn and maintain trust in the research that is being undertaken. This will be underpinned by a culture of transparency. Our aim is to establish a culture of complete openness for outdoor experiments in terms of what activities are undertaken and their outcomes, similar to that which the International Civil Aviation Organization champions for the sharing of best practices in the aviation industry [26]. The principles above are designed to embed this mindset from the beginning of the projects supported by this programme.

SECTION 5: Programme Duration and Project Management

Programme & Project Management

We will fund early-stage and conceptual ideas through to more developed capabilities, across a portfolio of different approaches. Applications may therefore be initially highly speculative and may constitute one or more individuals or teams working together at the point of application. As projects develop, we would expect additional partners to join project teams to add their expertise; in some cases, ARIA may make the continuation of funding contingent on adding additional expertise to the project team. We also expect that some projects may fail to meet their agreed assessment criteria, which could result in a

managed phase-down of funding or a pivot in a new direction. Project teams will be able to bid for additional funding during the course of ongoing projects in order to bring in new members, explore new avenues, or undertake scale up or other activities which were not anticipated at application stage, but for which a strong case can be made. A schematic illustrating how this could work in practice is shown in Figure 3.

There will be a single call for proposals, with applicants able to request funding for durations ranging from a few weeks to five years. We aim to be as flexible as possible with our funding and to make additional funds available to successful projects. Projects opting to specify durations towards the longer end of the five-year maximum and requesting larger sums at initial application stage will be required to supply stronger justification for their requests. Conversely, more speculative projects may wish to request a shorter duration at application stage, with the possibility that ARIA will follow up with more substantial funding in the event that the project meets its objectives. The aim is to allow projects to “fail fast”, to reward success, and to help ARIA manage risk across the portfolio of funded projects. In cases where project teams ask for large awards of long duration at initial application stage, but ARIA considers the overall project to be too high risk, ARIA reserves the right to fund only the first stages of the proposed scheme of work, with the possibility of releasing further funding later on if progress de-risks the later stages of the project sufficiently.

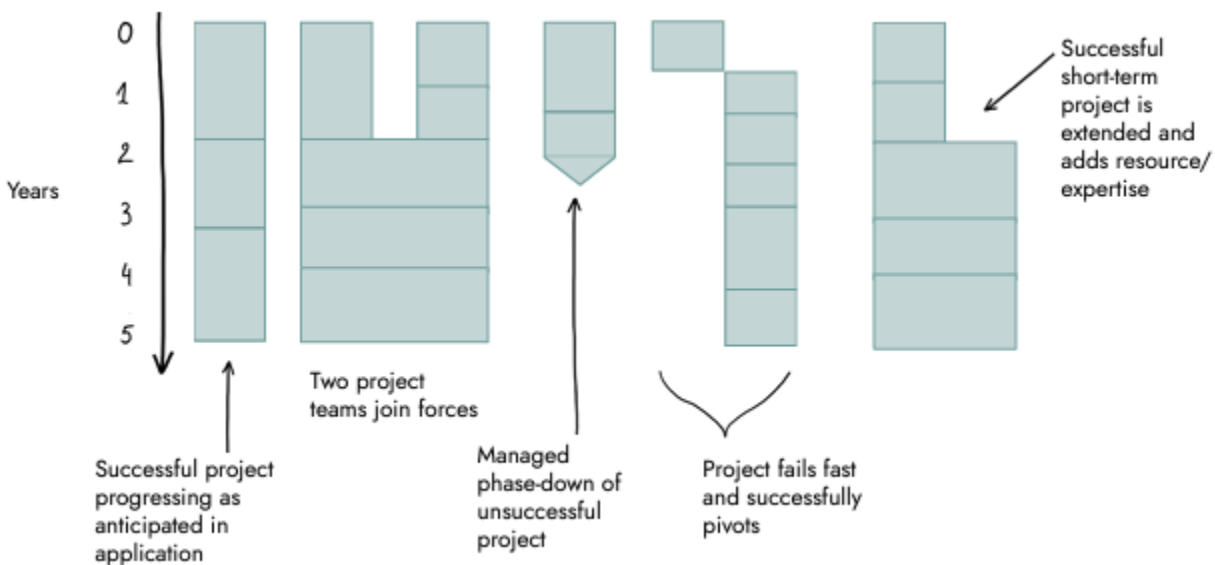


Figure 3: Illustration of the adaptive funding structure. Horizontal bars indicate project review points.

Project Milestones

ARIA will engage in negotiations with shortlisted applicants and will work together with those teams to develop their suggested success criteria into a rigorous set of staged performance metrics by which to gauge project progress. ARIA expects that each funded project will therefore have its own unique set of testable hypotheses, with a number of associated predefined and quantifiable key performance targets. For each project that is funded, ARIA will require the project teams to make public their hypotheses and key performance targets, together with a short discussion on how these are expected to lead to a step-change in understanding of the approach under consideration, as soon as realistically possible after project kick-off (most likely as part of the project's Q1 milestones). ARIA may then make use of third-party independent validation and verification at project review points in order to ensure rigour in the assessment of project performance.

Timelines for outdoor experiments and the steps that would need to be taken before these could take place will be discussed on a case-by-case basis during the project negotiation phase. For each outdoor experiment (or series of linked experiments), we will work with the project teams to provide a public statement on what the tests are attempting to achieve, and why those specific activities are critical, for publication during the outdoor experiment engagement/co-design phase. This document will then continue to be updated and iterated as a result of the engagement and co-design process.

There will be a programme-wide kick-off workshop for the projects selected for funding in the first half of 2025. Details will be provided to successful applicants.

Approach to Results and Intellectual Property

We are pursuing a very open approach to intellectual property (IP). Work under this programme should be undertaken with the intention of making project outcomes open-source and freely available. This means that the results from the work that we fund (including negative results) should be made available in a publicly available, open-access form, unless such publication would be likely to lead to public harm. As part of this, project teams will be required to give as much detail as possible on methodology and experimental data to ensure openness and transparency.

Intellectual property created by projects funded as part of this programme shall be published under creative commons or open source licences as appropriate. Our default position will be that project teams will not be permitted to file for patents in respect of inventions resulting from work that has been funded as part of this programme. We'll be asking all successful applicants and their team members to sign a public pledge not to seek patents on any work that is funded by this programme. This approach is designed to

enhance the public good by maximising the accessibility, usability, and collaborative potential of the funded projects, ensuring that the benefits extend to a wider community and fostering a culture of open innovation.

International partnerships

The impacts of climate tipping points (and the effects of actively cooling the Earth to delay or avoid the onset of these) are likely to be felt globally. Therefore, ARIA sees the need for a coordinated international effort led by public institutions to research approaches for actively cooling the Earth, what the effects and impacts of these approaches might be, and how their use might be governed.

To aid international collaboration and cooperation in this space, ARIA intends to:

1. Fund projects and researchers globally as part of this programme
2. Create opportunities for sharing best practice and learning with representatives of international and public benefit funding agencies, including annual workshops and invitations to observe the outdoor experiments that we fund.

For more detailed information on our approach to international partnerships with other funding organisations please see 'International partnerships with other funding organisations' in [the thesis](#). To further these aims, ARIA commits to being fully transparent across our programme design, management, and disclosure of the results of the research that is funded, by:

1. Requiring that the results from the work that we fund (including negative results) are available in a publicly available, open-access form, unless such publication would be likely to lead to public harm.
2. Making supporting documentation related to our outdoor experiments publicly available on the ARIA website (including pre-experiment risk assessments, post-experiment impact assessments, recommendations from our oversight committee, and results from our public engagement and co-design activities).
3. Continuing to update and iterate our (publicly available) governance and oversight procedures, calling out why any changes are being made and why we have made them.

Community events

In addition to programme workshops and in an effort to foster a collaborative research environment, ARIA will host regular community events to allow all programme teams to exchange updates, ideas, and feedback on the best paths forward. ARIA will also host annual in-person workshops where teams can showcase their work to a wider research community.

SECTION 6: Eligibility & Application process

Eligibility

We welcome applications from across the R&D ecosystem, including individuals, universities, research institutions, small, medium and large companies, charities and public sector research organisations.

ARIA can award funding to applicants who are based outside of the UK and/or whose projects will primarily take place outside of the UK for this Programme, provided these projects boost the net impact of the programme. Collaborations between UK and non-UK researchers are encouraged.

Finding potential collaborators and teaming

For those seeking specific expertise to support their proposal, we have created a teaming platform to facilitate finding potential team members who have registered their interest in this programme. By following the link to the [sign up form here](#) you will be able to register, submit your details, and gain access to a list of other individuals seeking to find/share their expertise. All requests are screened via ARIA's internal team prior to access, after which connections will be made by individual users based on aligned expertise.

Application Process

The application process consists of two stages:

Stage 1 - Concept paper

Concept Papers are designed to make the solicitation process as efficient as possible for applicants. By soliciting short concept papers (no more than three pages) ARIA reviewers are able to gauge the feasibility and relevance of the proposed project and give an initial indication of whether we think a full proposal would be competitive. Based on this feedback

you can then decide whether you want to submit a full proposal. If you miss the deadline for submission of concept papers you can still submit a full proposal. You can find out more about ARIA's review process [here](#).

To ensure the process is quick and open we do not require your organisation's consent prior to submission of a concept paper.

You can find guidance on what to include in a concept paper [here](#).

Following review of concept papers, applicants will either be encouraged or discouraged from submitting a full proposal. For more details on the evaluation criteria we'll use, click [here](#).

Stage 2 - Full proposals

This step requires you to submit a detailed proposal including:

- **Project & Technical information** to help us gain a detailed understanding of your proposal
- **Information about the team** to help us learn more about who will be doing the research, their expertise, and why you/the team are motivated to solve the problem
- **Administrative questions** to help ensure we are funding R&D responsibly. Questions relate to budgets, IP, potential conflicts of interest, etc.

You can find more detailed guidance on what to include in a full proposal [here](#). You can submit a full proposal even if you did not submit a concept paper.

More information on the evaluation criteria we will use to assess your answers can be found later in the document, or [here](#).

If you are a non-UK applicant we have provided some additional guidance in our [FAQs](#), including available visa options.

Use of Natural Environment Research Council (NERC) Facilities

We're working with the NERC to establish how their facilities may support the programme.

If your proposed research requires the support and use of a [NERC facility](#), you should do the following at each stage of the application process:

Stage 1 - Concept Papers

You should contact the [NERC facility](#), service and/or High Performance Computing (HPC) consortia lead to notify them of a potential dependency before submitting your concept paper. If applicable you should also notify Marine Planning via marineplanning@nerc.ukri.org directly if your proposal requires use of NERC's marine [facilities](#). For facilities relating to arctic services please contact arctic@bas.ac.uk

In submitting your concept paper, you must note potential use of the facility by detailing the relevant facility(ies) in the concept paper application portal. Details and facility costs do not have to be included at concept paper stage. You can find guidance on what to include in a concept paper [here](#).

Stage 2 - Full proposals

If encouraged to submit a full application, you should contact the NERC facility, service or HPC consortia lead as soon as possible to discuss your research proposal, and where applicable to complete any necessary HPC or facility form/application process as requested by the facility/marine planning, following the facility's normal access request procedures. As part of this process, NERC will provide a costed quotation for the services. The costing methods for this activity are currently being established with NERC and may not be finalised in time for the deadline for submission of proposals. As such, in submitting your full proposal, you should:

- Note the potential use of the NERC facilities in your proposal by completing the specific question included in the full proposal application portal. You can find guidance on what to include in a full proposal [here](#).
- For proposals that are assessed as compliant and in scope (in accordance with our project [review process](#)) you will be asked to submit a quotation from the HPC Consortia lead or facility, and evidence of prior agreement from the facility that your request is feasible and deliverable in the timeline indicated in your proposal. This should be submitted to ARIA no later than 16th January 2025. You will be notified by email that this information is required to be submitted via the application portal.

In any case you must ensure that you have discussed your proposal with the facility in good time prior to full application submission. Further discussion may be needed with any

successful projects in order to determine the most effective usage for delivery of the fieldwork aspects of the programme.

SECTION 7: Timelines

This call for project funding will be open for applications as follows (we may update timelines based on the volume of responses we receive):

Applications open	13 September
Concept paper submission deadline	07 October (12:00 Midday BST)
Concept paper review & notification of encouraged/not encouraged to submit full proposal sent	07 October - 08 November
<p>At this stage and based on your concept paper, you will either be encouraged/discouraged to submit a full proposal. If you receive feedback indicating that you are not encouraged to submit a full proposal you can still choose to submit a full proposal. You should note that this preliminary assessment/encouragement provides no guarantee of any full proposal being selected for award of funding.</p>	
Full proposal submission deadline	09 December (12:00 Midday GMT)
Full proposal review	09 December - 13 February
<p>If you are shortlisted following full proposal review, you will be invited to meet with the Programme Directors to discuss any critical questions/concerns prior to final selection. This discussion can happen virtually.</p>	
Successful/Unsuccessful applicants notified	13 February
<p>At this stage you will be notified if you have or have not been selected for an award subject to due diligence and negotiation. If you have been selected for an award (subject to negotiations) we expect a 1 hour initial call to take place between ARIA's programme director and your lead researcher within 10 working days of being notified.</p> <p>We expect contract/grant signature to be no later than 8 weeks from successful/</p>	

unsuccessful notifications. During this period the following activities will take place:

- Due diligence will be carried out
 - The programme director and the applicant will discuss, negotiate and agree the project activities, milestones and budget details
 - Agreement to the set Terms and Conditions of the Grant/Contract. You can find a copy of our funding agreements [here](#)
-

SECTION 8: Evaluation Criteria

Concept Paper and Proposal Evaluation Principles

To build a programme at ARIA, each Programme Director directs the review, selection, and funding of a portfolio of projects, whose collective aim is to unlock breakthroughs that could impact society. As such, we empower Programme Directors to make robust selection decisions in service of their programme's objectives ensuring they justify their selection recommendations internally for consistency of process and fairness prior to final selection.

We take a criteria-led approach to evaluation. As such, all proposals are evaluated against the criteria outlined below. We expect proposals to spike against our criteria and have different strengths and weaknesses. Expert technical reviewers (both internal and external to ARIA) evaluate proposals to provide independent views, stimulate discussion and inform decision-making. Final selection will be based on an assessment of the programme portfolio as a whole, its alignment with the overall programme goals and objectives and the diversity of applicants across the programme.

Further information on ARIA's proposal review process can be found [here](#).

Proposal evaluation process and criteria

Proposals will pass through an initial screening and compliance review to ensure proposals conform to the format guidance and they are within the scope of the solicitation. At this stage we will also carry out some checks to verify your identity, review any national security risks and check for any conflicts of interest. Prior to review of applications, Programme Directors and all other reviewers are required to recuse themselves from decision making related to any party that represents a real or perceived conflict of interest.

Where it is clear that a proposal is not compliant and/or outside the scope, these proposals will be rejected prior to a full review on the basis they are not compliant or non-eligible.

Proposals that pass through the initial screening and compliance review will then proceed to full review by the Programme Director and expert technical reviewers.

In conducting a full review of the proposal we'll consider the following criteria:

- 1) **Worth Shooting For** – The proposed project uniquely contributes to the overall portfolio of approaches needed to advance the programme goals and objectives. It has the potential to be transformative and/or address critical challenges within and/or meaningfully contribute to the programme thesis, metrics or measures.
- 2) **Differentiated** – The proposed approach is innovative and differentiated from commercial or emerging technologies being funded or developed elsewhere.
- 3) **Well defined** – The proposed project clearly identifies what R&D will be done to advance the programme thesis, metrics or measures, is feasible and supported by data and/or strong scientific rationale. The composition and planned coordination and management of the team is clearly defined and reasonable. Task descriptions and associated technical elements provided are complete and in a logical sequence with all proposed stage-gates and deliverables clearly defined.
- 4) **Responsible** – The proposal identifies major ethical, legal or regulatory risks and planned mitigation efforts are clearly defined and feasible.
- 5) **Intrinsic motivation** – The individual or team proposed demonstrates deep problem knowledge, have advanced skills in the proposed area and shows intrinsic motivation to work on the project. The proposal brings together disciplines from diverse backgrounds.

- 6) **Benefit to the UK and the wider world** – In order for this programme to succeed and provide benefit to the UK and globally it must be an international endeavour. Therefore, ARIA’s criteria around proposals from non-UK applicants being considered with regard to the next best alternative proposal from a UK organisation/individual have been adjusted for this call. Strong applications will therefore be those that benefit the UK and the wider world, and that will promote scientific innovation and invention with the ultimate aim of improving the quality of life in the UK and elsewhere.

ARIA may share a summary of the proposals encouraged to submit full proposals and information on proposals shortlisted following stage 2 full proposal review with NERC to prevent overlap with their [research programme to model impact of solar radiation management](#). Any information will be shared on a confidential basis.

SECTION 9: How to apply

Before submitting an application we strongly encourage you to read this call in full, as well as the [programme thesis](#) and [general ARIA funding FAQs](#).

If you have any questions relating to the call, please submit your question to clarifications@aria.org.uk.

Clarification questions should be submitted no later than 4 days prior to the relevant deadline date. Clarification questions received after this date will not be reviewed. Any questions or responses containing information relevant to all applicants will be provided to everyone that has started a submission within the application portal. We’ll also periodically publish questions and answers on our website: to keep up to date click [here](#).

Please read the portal instructions below and create your account before the application deadline. In case of any technical issues with the portal please contact clarifications@aria.org.uk.

Application [Portal instructions](#)

APPLY [HERE](#)

SECTION 10: References

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Annex 2: Exploring Options for Actively Cooling the Earth | Programme thesis

Exploring Options for Actively Cooling the Earth

Programme thesis

v2.0

Mark Symes, Programme Director

CONTEXT

This document presents the core thesis underpinning a programme that has now launched.

See the programme page [here](#), provide feedback on this programme thesis [here](#) or sign up for all updates about this opportunity space [here](#).

An ARIA programme seeks to unlock a scientific or technical capability that

+ changes the perception of what's possible or valuable

+ has the potential to catalyse massive social and economic returns

+ is unlikely to be achieved without ARIA's intervention

UPDATE: OUR THINKING, EVOLVED

A summary capturing the evolution of our thinking since first publication.

This programme thesis is derived from the ARIA opportunity space: [Future Proofing our Climate and Weather](#). The original version of the thesis was published in May 2024 and has been updated following community feedback. Read the original version of the thesis [here](#).

The main changes to the thesis are:

- + More detail has been provided on the governance of outdoor experiments, including an outdoor experiment funding approval decision tree. An outline of the roles and responsibilities of the independent programme oversight committee is also provided in a separate [programme oversight and governance document](#).
- + A section on why ARIA is leading this research effort has been added, together with some thoughts around how international collaboration and cooperation in this space could be catalysed.
- + Some of the language has been clarified to better reflect the intended purpose and scale of the research that ARIA will support.

PROGRAMME THESIS, SIMPLY STATED

This programme thesis is derived from the ARIA opportunity space: [Future Proofing Our Climate and Weather](#).

Climate change, largely caused by anthropogenic greenhouse gas emissions, could cause the global temperature to increase by several degrees by the end of the century, precipitating climate tipping points with serious consequences. The solution to this problem is to cease the burning of fossil fuels and to eliminate excess greenhouse gases from the atmosphere. However, lowering atmospheric greenhouse gas levels – even under the most aggressive scenarios – may not happen fast enough to prevent the onset of tipping points.

Such reasoning has led to proposals for methods to actively cool the Earth in order to “buy time” to decarbonise, and there has been considerable debate around the risks and benefits of these various methods. However, in the absence of substantial physical (as opposed to simulated) data on the mechanisms behind how these concepts might work (and what their effects might be), there is no prospect of being able to make proper judgements on what are or are not feasible, scalable, and controllable approaches for cooling the Earth.

This programme aims to answer fundamental questions as to the practicality, measurability, controllability and possible (side-)effects of such approaches through indoor and (where necessary) small, controlled, outdoor experiments. In answering these questions, we plan to fund not only the experiments themselves, but also the necessary modelling, simulation, observation and monitoring required to support the experiments, as well as research into the ethical, governance, law, and geopolitical dimensions of the approaches under investigation. Our objective is that the information gathered by this programme will allow for more definitive assessments on whether one or more of the approaches examined may one day be used responsibly and ethically to delay or avert the onset of temperature-induced climate tipping points.

PROGRAMME THESIS, EXPLAINED

A detailed description of the programme thesis, presented for constructive feedback.

Why this programme

Risk vs. risk

The Intergovernmental Panel on Climate Change (IPCC) has noted that global warming in excess of 1.5 °C above pre-industrial levels is now likely, even if increased action allows the world to achieve net zero emissions by 2040 ^[1]. Furthermore, it has stated that “the pace and scale of what has been done so far, and current plans, are insufficient to tackle climate change” ^[2]. In this context, there is increasing debate as to whether society should (and whether it can) buy time to decarbonise by manipulating certain variables to reduce global temperatures on a short-to-medium term basis.

This comes against a background of concern around the potential for climate tipping points (abrupt alterations in the Earth’s climate system), which may lead to essentially irreversible disruptive changes on a regional or global scale if the global temperature exceeds certain thresholds for any length of time ^[3,4]. Examples of such tipping points include the melting of the Arctic winter sea ice (leading to accelerated warming via ice-albedo feedback ^[5]), dieback of the Amazon rainforest and consequent ecosystem loss, and collapse of the major land-based ice sheets, leading to significant global sea level rises.

The thresholds for many such tipping points remain far from clear, but it seems likely that a certain amount of continued global warming is already locked in, even with rapid decarbonisation, on account of the amount of carbon dioxide already in the atmosphere ^[6,7]. The practical difficulties of rapid decarbonisation also imply that further warming will occur ^[8]. In this context, approaches such as stratospheric aerosol injection ^[9], marine cloud brightening ^[10], increasing the reflectivity of the Earth's surface (e.g. by re-growing ice sheets) ^[11], and constructing space-based reflectors to shade the Earth from a proportion of incoming sunlight ^[12] have been proposed as potential methods by which to cool the Earth whilst sufficient carbon dioxide is removed from the atmosphere to bring global temperatures down.

However, many poorly-constrained risks associated with the approaches above currently exist, especially regarding the scope and scale of their side-effects — which may affect different parts of the world unevenly ^[13]. Concerns also exist related to moral hazard ^[14], and the extent to which developing the capability to lower global temperatures without lowering atmospheric greenhouse gas levels (i.e. “treating the symptoms, but not the disease”) reduces the incentive to reach net zero and/or remove carbon dioxide from the atmosphere in a timely manner.

How (or whether) research into methods that could be used to reduce global temperatures should be conducted throws up a number of open questions ^[15-17]. For example, do the risks of unintended consequences and moral hazard associated with learning more about Earth-cooling approaches outweigh the risks of continued global warming without researching any intervention strategies? How should we weigh the risks associated with researching approaches for reducing global temperatures against the risk that the world discovers in 2040 or 2050 that efforts to achieve net zero and to remove carbon dioxide from the atmosphere have been insufficient to prevent very detrimental tipping points ^[18]? In such a scenario, what might be the risks of hurried deployment* of under-researched climate engineering approaches where we have little understanding of the consequences? And if these approaches were deployed, what might be the risks associated with a later, more sudden deployment relative to a slower ramp-up? Or the risks of termination shocks if deployment were suddenly stopped ^[19]?

Questions like these have fuelled a debate that has been ongoing for years ^[20], but which remains unresolvable with our current level of understanding. After considerable deliberation on the balance of risks, ARIA has come to the view that the risks of not being able to answer such questions are greater than the risks of researching approaches for actively cooling the Earth through a well-governed research programme. Others have come to similar conclusions regarding the need for research in this area to be undertaken transparently and in the public interest ^[21, 22]. It is in this context that ARIA has chosen to pursue a research programme into approaches for actively cooling the Earth.

* Following the example of the [European Commission's 2023 scoping paper on Solar Radiation Modification](#), we define “deployment” in this context to mean “a deliberate and large-scale intervention in the Earth's climatic system, with the aim of reducing global warming”.

Our discovery process has suggested to us that a key barrier to advancing our understanding of this field and being able to reach more definitive conclusions on particular approaches is a comparative dearth of real and relevant physical data from outdoor experiments ^[23-25].

Hence, we see a need for a programme that will accommodate small, controlled, geographically-confined outdoor experiments on approaches that may one day scale to help reduce global temperatures. These outdoor experiments are intended to answer critical scientific questions as to the practicality, measurability, controllability and likely (side-)effects of the proposed approaches that cannot be answered by other means. They may not be necessary or possible for all the projects we fund, and they are not meant to be stepping stones to deployment. To support the outdoor experiments, we plan to fund activities ranging from modelling and simulation, through to in-field observation and monitoring, and research on the legal, ethical, governance and geopolitical dimensions of the approaches under study.

The research conducted in this programme should allow us to provide critical (and currently missing) real-world data to scientists and society on what the options are for actively cooling the Earth, how such approaches might work, and what the consequences of their use might be, allowing better-informed assessments of their risks and benefits. Successful outcomes from this programme include ruling particular options out from further study as technically infeasible, ruling them out as infeasible due to risks that cannot be adequately constrained, or highlighting which approaches show promise and would benefit from further research and development.

Our approach

Our approach will be to develop a scientific framework to underpin strong predict → test → monitor → validate loops for a range of approaches (Figure 1). The “predict”, “monitor” and “societal aspects” nodes in Figure 1 have received some (although arguably insufficient) interest in recent years. However, research into how approaches for cooling the Earth might work in practice, how their effects would be demonstrated with statistical confidence, and how any resulting technology might be scaled effectively has received much less attention. Therefore, whilst further research across all of the areas shown in Figure 1 is vital, we see that the “test” and “validate” nodes are particularly underserved.

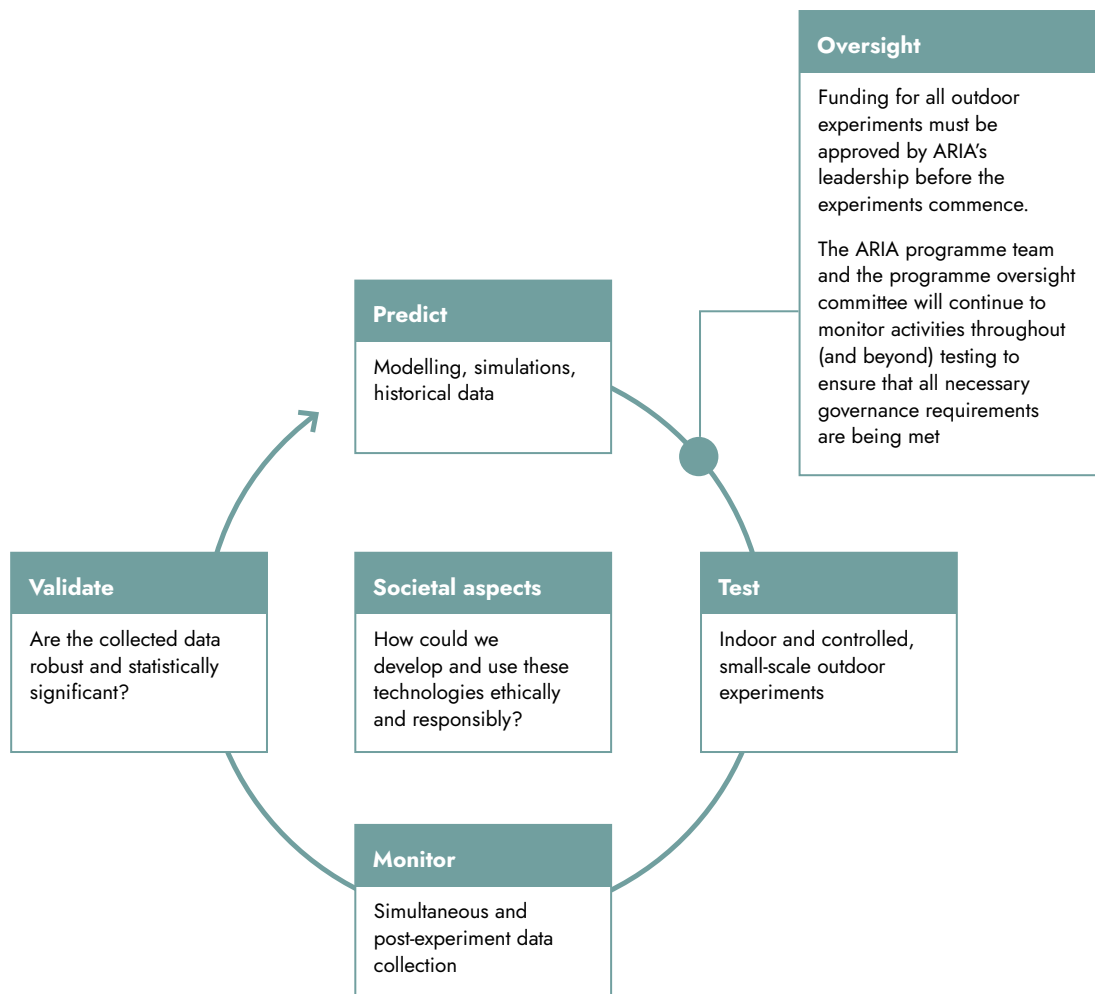


Figure 1: A technology research loop showing the "predict", "test", "monitor", "validate" and "societal aspects" nodes. Details on the oversight mechanisms are described herein and in the separate programme oversight and governance document.

Computer modelling and the indoor testing of approaches are essential and necessary first steps in establishing the basic science behind how (or whether) a particular approach might work. However, modelling and indoor testing alone cannot provide all the data necessary to predict the effects of a given approach in the real world with a suitable level of confidence. Controlled outdoor experiments are therefore likely to be required to truly advance our understanding of the phenomena underlying potential approaches. Initial thoughts on how outdoor experiments in this programme could be conducted openly and responsibly are presented throughout this thesis for constructive feedback, with the aim that these form the basis for decisions on whether any given outdoor test could proceed and how such experiments could be conducted responsibly.

A suggested framework for outdoor experiments

There is the potential for unintended negative consequences in any outdoor experiment. Therefore, it will be important to define transparently and at the outset a set of principles that can guide the programme's consideration of whether and how outdoor testing can proceed. ARIA has incorporated lessons from previous projects where outdoor experiments have been cancelled before commencing ^[26-29] and those where outdoor experiments have gone ahead ^[30,11] in developing these principles, with the aim of supporting the development of best practices for safe and transparent outdoor experiments.

Our guiding principle for outdoor experiments is that these should be conducted on the smallest possible length and timescales required to validate, with statistical confidence, that the approaches being tested can affect the parameters under investigation. These scales will be approach-specific; however, **Appendix A** posits what the upper bounds for the scale and duration of an outdoor experiment could be. In all cases, we expect initial outdoor tests to occur at much smaller scales than these upper bounds (for example, an appropriate scale for an initial outdoor cloud brightening experiment might be on the order of a few hundred metres).

The magnitude of the intended perturbation should be limited so that it is within the bounds of known and benign natural phenomena (or anthropogenic phenomena that are considered harmless), so that there is precedent for the size of the effect that will be produced. The experiments should be designed so that as far as possible the effects either dissipate through natural mechanisms within hours, or can be localised with very high certainty, or else that there should be an obvious and reliable mechanism for switching off the effect at any time, on demand. These features should minimise the risks of negative unintended consequences by confining the effects in space and/or time. A combination of considerations on the size, duration and reversibility of outdoor experiments leads to the following suggested decision tree for assessing whether a particular outdoor experiment might be supported through this programme (Figure 2).

Does the experiment aim to measure the effects of altering one of the variables in Table 1 (or the effects of altering parameters that map directly onto those variables)?



Out of scope for main programme (possibly in-scope for an opportunity seed)

Have modelling and indoor tests been performed, and are there specific critical scientific questions that cannot be answered without an outdoor experiment?



Continue to perform modelling and indoor tests in order to learn more about the approach

Is the magnitude of the intended perturbation within known bounds?



Outdoor experiment cannot be supported through this programme

Does the outdoor experiment involve the uncontrolled release to the environment of toxic materials?



Can the effects of the outdoor experiment be geographically confined?

Outdoor experiment cannot be supported through this programme



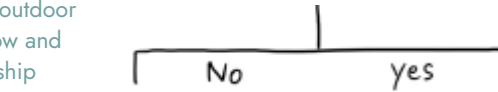
Outdoor experiment cannot be supported through this programme

Will the effects of the outdoor experiment persist for more than 24 h?



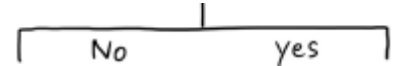
An outdoor experiment could potentially be supported by this programme, subject to compliance with the suggested principles for outdoor experiments discussed below and sign-off by ARIA's leadership

Does a well-established and practical mechanism exist for reversing (or turning off) the effects of the outdoor experiment?



Outdoor experiment cannot be supported through this programme

Would the reversal or turning off of the outdoor experiment require (or potentially leave behind) large infrastructure after the programme has finished as a legacy burden?



An outdoor experiment could potentially be supported by this programme, subject to compliance with the suggested principles for outdoor experiments discussed below and sign-off by ARIA's leadership

An outdoor experiment is highly unlikely to be supported through this programme until a realistic "exit strategy" is found

Figure 2: A suggested outdoor experiment technical consideration decision tree, to be used in conjunction with the principles for outdoor experiment oversight described in the main text.

Please refer to Table 1 under What will projects need to demonstrate? for a description of the relevant variables.

The suggestion is that applicants proposing outdoor experiments use this decision tree at the application stage in order to see if their intended experiment could in theory be supported by this programme or not.

In addition to this basic technical information, the following suggested principles for oversight of any subsequent outdoor experiments are presented here for feedback:

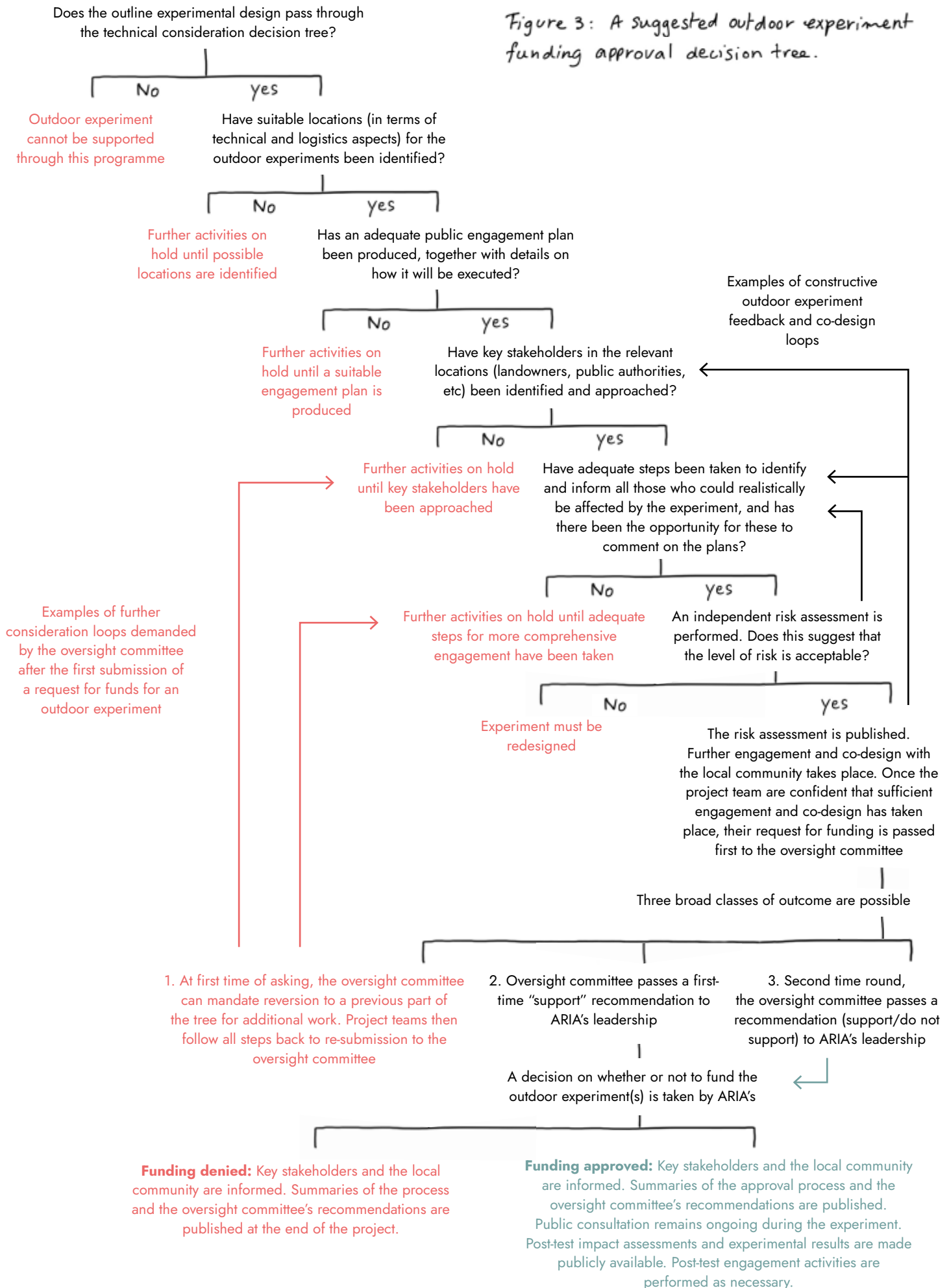
- 1. ARIA will not fund experiments where the activities proposed are prohibited by domestic or international law.** Project teams will be required to show how their tests comply with all applicable laws.
- 2. A risk assessment will be performed and the findings made publicly available before any outdoor experiment.** This will be conducted by experts who are independent of the team performing the experiment, and will include relevant potential technological, environmental and socio-economic risks.
- 3. Minimising risk by design.** Outdoor experiments should be designed at the minimum viable scale required for the generation of robust data, and where the magnitude of any perturbation has a natural analogue or commonly accepted anthropogenic precedent (and therefore where the effect of the perturbation is within the range of known and benign phenomena). Such considerations are summarised in Figure 2.
- 4. Transparency, public participation and consultation.** Wherever possible, those conducting outdoor experiments will be required to notify and consult those who could reasonably be considered as likely to be affected by the experiments. ARIA sees consultation and engagement with the public as processes that will be sustained for the lifetime of projects. To facilitate informed decision making, detailed plans for the outdoor experiments, and the key decisions taken in developing these plans, will be consulted upon as transparently as possible well in advance of any experiment. The specific protocols for transparency will be developed in consultation with the Oversight Committee, and will include provisions for transparency regarding what the experiments involve, why the experiments are necessary, who is conducting the experiments, and who might be impacted by the experiments. The results of the experiments (including negative results) will also be made publicly available in an accessible form.
- 5. Independent impact assessment.** Post-experiment, the environmental and any socio-economic impacts will be assessed by experts who are independent of the team performing the outdoor experiments, and the results of these assessments will be made publicly available. ARIA may also commission assessments of the broader implications of the experiments as appropriate.
- 6. Limited scope.** Activities in this programme will be limited to research scale – ARIA will not fund deployment or any demonstration beyond the approved experiments.

These principles then underpin the following outdoor experiment funding approval decision tree (Figure 3), which describes our current thinking on the steps that project teams will need to take in order for funding for a particular outdoor experiment (or series of linked experiments) to be approved. We expect that ARIA will provide specialist support to assist project teams in undertaking these activities.

ARIA's leadership will be ultimately responsible for governance, oversight and the release of funding for outdoor experiments, leveraging input from an independent programme oversight committee. ARIA also has a Committee of the Board for ethics and social responsibility, which has visibility across all of ARIA's programmes.

Find out more about the independent programme oversight committee and its relationship to other actors in the programme [here](#).

Figure 3: A suggested outdoor experiment funding approval decision tree.



A key aim is to earn and maintain trust in the research that is being undertaken. This will be underpinned by a culture of transparency. Our aim is to establish a culture of complete openness for outdoor experiments in terms of what activities are undertaken and their outcomes, similar to that which the International Civil Aviation Organization champions for the sharing of best practices in the aviation industry ^[31]. The principles above are designed to embed this mindset from the beginning of the R&D pathway for the approaches supported by this programme.

International partnerships with other funding organisations

The impacts of climate tipping points (and the effects of actively cooling the Earth to delay or avoid the onset of these) are likely to be felt globally. Therefore, we contend that it is vital that public institutions lead research into approaches for actively cooling the Earth, acting in a spirit of open international collaboration and cooperation, with full transparency, for the benefit of the global community ^[32].

By funding research into both the technical and non-technical aspects of approaches for actively cooling the Earth, this programme aims to drive forward both fundamental understanding of these approaches and their risks, and the development of structures for just and informed deliberation on their benefits and risks in lockstep.

Responsible and transparent research into actively cooling the Earth - including what the impacts of these approaches might be, and how their use might be governed - will require an international effort, led by public institutions. To aid international cooperation, ARIA intends to:

1. Fund projects and researchers globally as part of this programme
2. Bring an open mindset to co-funding projects with other government funding agencies
3. Make ourselves and our expert networks available to other government and (potentially other public benefit) funding agencies which are considering establishing their own research programmes in this space, including support with validation and verification of experiments
4. Create opportunities for sharing best practice and learning with representatives of international and public benefit funding agencies, including annual workshops and invitations to observe the outdoor experiments that we fund
5. Upon invitation, send expert teams from ARIA, or within its network, to observe and feed back on experiments being funded by other government funding agencies
6. Consider requests from other government funding agencies (both UK and non-UK) to observe the workings of the ARIA programme's oversight committee.

Through these routes for promoting international participation in the programme, sharing best practice, and building a culture of transparent cooperation for governing small-scale research experiments, we aim to start building up the expertise, ways of working, and critical mass and diversity of practitioners that a future international governance body would find immensely useful. To further these aims, ARIA commits to being fully transparent across our programme design, management, and disclosure of the results of the research that is funded, by:

1. Requiring that the results from the work that we fund (including negative results) are available in a publicly available, open-access form, unless such publication would be likely to lead to public harm.
2. Making supporting documentation related to our outdoor experiments publicly available on the ARIA website (including pre-experiment risk assessments, post-experiment impact assessments, recommendations from our oversight committee, and results from our public engagement and co-design activities)
3. Continuing to update and iterate our (publicly available) governance and oversight procedures, explaining why any changes are being made.

What we expect to fund

Funding across silos

We anticipate supporting research into approaches for reducing global temperatures across the entire range of science and engineering disciplines. We also expect to support projects across the social sciences, arts, humanities, and law/policy research that are of direct relevance to those approaches (including, but by no means limited to, consideration of public perception; design of potential legal, ethical, regulatory and governance frameworks; and the economic or broader social impacts of those approaches). We have also set aside funding to support project teams in working through specific aspects of ethics and community engagement, as well as documenting lessons that may be more broadly applicable for other research programmes.

ARIA is aware of previous and ongoing initiatives that have considered some of the ethical and societal issues around governance, stakeholder engagement and perceptions related to approaches for actively cooling the Earth over the last few years (see, for example: ^[33-36]). ARIA aims to provide as much flexibility as possible in terms of how the social sciences and humanities are represented in this programme. For example, ARIA may fund social scientists, ethicists, legal scholars, or humanities researchers to work specifically on certain technical research teams. In addition, ARIA may also fund a dedicated social science, law, and governance strand that works across the full range of approaches under investigation, in a manner that complements the efforts of social scientists that are embedded in specific research teams.

What will projects need to demonstrate?

The overarching goal of this programme is to answer fundamental questions on the practicality, measurability and controllability of technologies that might one day be used to actively cool the Earth. Projects will therefore need to demonstrate how they align with this goal.

A very simplified estimate of the equilibrium temperature at the Earth's surface (T_{surf}) is provided by the equation below ^[37]:

$$T_{surf} = \sqrt[4]{\frac{S(1-\alpha)}{2\sigma(2-\varepsilon)}}$$

Where S is the solar constant (the power per unit area impinging on the Earth from solar irradiation), α is the planetary albedo (a measure of how much short-wave radiation is reflected from the Earth without being absorbed), σ is the Stefan-Boltzmann constant, and ε is the effective emissivity of the atmosphere (σ and ε together give a measure of how much long-wave radiation is emitted by the Earth back out to space).

In order to be in-scope for this programme, projects will need to demonstrate how the research they are proposing meets at least one of the following criteria:

1. The approaches being researched have the potential to alter T_{surf} (at any scale) by affecting at least one of the variables α , ε or S (see Table 1) in a manner that is statistically distinguishable from the background
2. The approaches being researched have the potential to alter parameters that map directly onto the variables α , ε or S (applicants will be required to justify explicitly how the parameters being perturbed map onto α , ε or S) in a manner that is statistically distinguishable from the background
3. The research proposed has direct bearing on the prediction, modelling, measurement, monitoring, validation, governance, education, public perception, ethics or other research questions related to approaches or experiments that could alter at least one of the variables α , ε or S (or parameters that map directly onto those variables)
4. The research proposed has direct bearing on open questions or uncertainties about the ecological or other environmental impacts, risks or side-effects related to approaches or experiments that could alter at least one of the variables α , ε or S (or parameters that map directly onto those variables).

ARIA encourages research plans that build in careful attention to measuring possible unintended side-effects and understanding possible risks. Where physical experiments are being proposed, applicants will need to consider testability and statistical significance in their proposals (for example, can any parallels or lessons be drawn from some of the ways in which statistical methods have been employed to evaluate field trials of cloud seeding ^{[38-40]?}).

For physical experiments, project teams will need to convince the reviewers as to why the measurements/perturbations that they intend to make are the right things to measure/perturb, and how the results would substantially advance the validation or invalidation of the approach on the grounds of practicality, scalability, safety or impacts. ARIA will require publication of the results of the work that we fund (including negative results) in an accessible form, except if their publication would be likely to lead to public harm.

Table 1: Variables for study in this programme. The examples of activities that could address these variables are not exhaustive, and neither should they be construed as use cases that ARIA considers to be more or less valuable than any others that can be imagined.

Variable	Examples of activities that could address this variable (non exhaustive)
Planetary albedo (α)	Marine cloud brightening ^[10] ; ice sheet thickening ^[41]
Effective solar constant (S)	Space-based reflectors ^[12]
Effective emissivity of the atmosphere (ϵ)	Cirrus cloud thinning ^[42, 43]

Programme differentiation

To date, there have been very few actual (or even attempted) outdoor experiments into approaches whose ultimate goal would be to reduce global or regional temperatures on a short-to-medium term basis. We are not aware of any other programmes that have funded outdoor experiments with multiple different approaches in a coordinated way. Indeed, to date, all outdoor experiments that have been attempted or conducted in this space have been undertaken as individual stand-alone projects. This means that these projects have therefore also struggled to cover all of the nodes represented in Figure 1 comprehensively.

This programme has a strong emphasis on statistical significance and on understanding the physical principles that underlie the effects that the various approaches may produce. In this context, even if the only outcome of the programme is to prove that all the approaches that are investigated are either infeasible at scale or produce effects that are indistinguishable from natural background processes, then we will consider this a success. Such an outcome would directly support our objective to allow better-informed assessments as to whether any of the approaches examined might one day be used responsibly and ethically to reduce global temperatures on a short-to-medium term basis. This technology and outcome agnosticism strongly differentiates this programme.

Programme scope

Table 2 gives a breakdown of areas that we expect to be **out of scope** for this programme, along with the reasoning we have taken in coming to these decisions. Approaches that are not explicitly listed as out of scope will be considered (provided that their specific intent relates to the controlled perturbation of one of the variables given in Table 1, or altering parameters that map directly onto those variables). **Opportunity seed funding** may subsequently be available to support individuals or teams pursuing ambitious research that is out of scope for the programme, but which falls within the scope of the wider opportunity space **Future Proofing Our Climate and Weather**.

Table 2: Out of scope areas for this programme

Topic or activity	Reasoning and comments
Removal, sequestration and/or utilisation of carbon dioxide	Multiple other public and private funders are already funding carbon dioxide removal and utilisation
General weather/climate simulation or monitoring activities that do not provide insights into the effects of altering one of the variables in Table 1 (or parameters that map directly onto those variables)	Only simulation or monitoring activities that could be relevant to the temperature-reducing approaches being researched in this programme will be in scope. This programme is distinct from the work of the Natural Environment Research Council and their Research programme to model the impact of solar radiation management ^[44] , and has been developed independently. ARIA will continue to engage with NERC as development of both programmes progresses
Outdoor experiments where analysis via Figure 2 indicates that such experiments cannot be supported by this programme	Outdoor experiments that Figure 2 indicates cannot be supported will not be funded through this programme
Large-scale trials of climate engineering technologies continuously or over extended durations	This programme will only fund activities at research scale

Our approach to results and IP for this programme

We are pursuing a very open approach to intellectual property (IP). Work under this programme should be undertaken with the intention of making project outcomes open-source and freely available. This means that the results from the work that we fund (including negative results) should be made available in a publicly available, open-access form, unless such publication would be likely to lead to public harm. As part of this, project teams will be required to give as much detail as possible on methodology and experimental data to ensure openness and transparency.

Intellectual property created by projects funded as part of this programme shall be published under creative commons or open source licences as appropriate. Our default position will be that project teams will not be permitted to file for patents in respect of inventions resulting from work that has been funded as part of this programme. We'll be asking all successful applicants and their team members to sign a public pledge not to seek patents on any work that is funded by this programme. This approach is designed to enhance the public good by maximising the accessibility, usability, and collaborative potential of the funded projects, ensuring that the benefits extend to a wider community and fostering a culture of open innovation.

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APPENDIX A: Initial analysis on outdoor experiment scale

Rossby waves ^[45] caused by the Earth's rotation define characteristic length scales for weather systems in the UK that are on the order of 1000 km. Work examining the impact that perturbations in weather models have on the predictability of atmospheric conditions suggests that very large perturbations (by up to 100%) can be made on a length scale of 10 km without any significant effect on the behaviour of the overall system (at 1000 km scale) ^[46]. Therefore, a maximum outdoor experiment grid parameter on the order of 10 km should be small enough that any perturbation caused in that space for short periods (e.g. 24 hours or less) will subsequently be dwarfed by natural chaotic processes operating at larger scales once the experiment has ended. However, proposers will be required to start with outdoor experiments smaller than this (especially for initial tests) in order to demonstrate safety and controllability. Likewise, ARIA strongly prefers outdoor experiments in areas remote from population centres. Such scales place these outdoor experiments and their effects in the range of "microscale meteorology", as distinct from both the larger weather systems that we are familiar with from weather forecasts and the climate at large (see Figure 4).

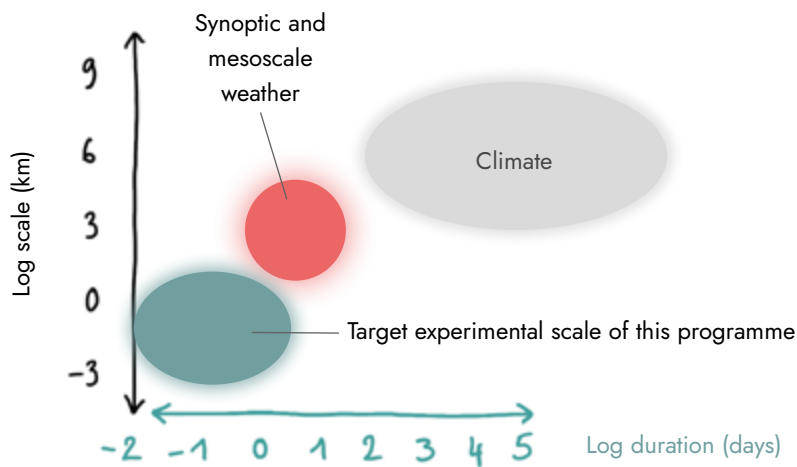


Figure 4: Context on the suggested scale and duration of outdoor experiments that could be accommodated in this programme.

These suggested length and timescale upper bounds are commensurate with (or indeed smaller than) those previously employed in anthropogenic climate perturbation experiments. Two examples are provided. Firstly, the marine cloud brightening project operating on the Great Barrier Reef ^[30] generates a plume behind the vessel that can grow in extent to 10-20 km, with effects that dissipate within hours. Secondly, as an example of an "unintentional" climate perturbation experiment, the "average" ship track (clouds that form after ships pass through an area due to nucleation of water droplets on emissions released from the ships' funnels) is on the order of 10 km wide and anything from a few km to several hundred km long ^[47]. Lifetimes for such artificially-generated clouds are generally a few hours, with formation starting around half an hour after emission of the exhaust ^[47]. The number of droplets in the track (corresponding to a peak brightness of the cloud) tends to peak roughly 3-5 hours after emission, with the track then fading such that the droplet count is indistinguishable from the background within 20 hours or so ^[48]. When the International Maritime Organization introduced tighter emissions limits for ships in an area off the coast of California in 2010, ships were obliged to navigate further from the coast. This in turn led to a dramatic shift (sustained over the timescale of years) in the location of ship tracks over an area of around 60,000 square kilometres ^[49].

Annex 3: Environmental Impact Assessment | Arctic Ice Thickening Field Test

Environmental Impact Assessment (EIA)

By Arctic Reflections B.V., October 2025

Arctic Ice Thickening Field Test

Field Test in February 2026, Qikiqtarjuaq, Nunavut
(formerly known as Broughton Island)





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We contribute to
Sustainable Development Goals

1. Introduction and Purpose

This Environmental Impact Assessment (EIA) evaluates the potential environmental effects associated with the Arctic Ice Thickening (AIT) field test to be conducted directly off the southeast coast of Qikiqtarjuaq (Nunavut) in February. The purpose of this field test is to evaluate the scientific and technical feasibility of using AIT to thicken sea ice in order to enhance its seasonal persistence, reflectivity, and potential cooling effect. The overall goal is to assess whether AIT can contribute to mitigating Arctic sea ice loss and related ecosystem impacts caused by global warming.

The main body of this document will provide a summarized overview of potential impact and relevant mitigation measures. Annex I will provide a detailed overview for each species used to compile the summarized overview. This EIA was informed by a broader Environmental Risk Assessment of the Arctic Reflections' sea ice thickening methodology in the Canadian Arctic (M. Teunis, 2023).

2. Project Overview

Three tailor-made skid barges equipped with pumps will be towed to the site by snowmobiles. The pumps, mounted on lifting frames, will extract seawater from below the ice and discharge it onto the surface to promote controlled ice thickening. Two alternating crews of five to eight people each will conduct the operations over approximately four weeks. The first crew will install scientific instruments, commission the pumps, and initiate ice thickening. After 2.5 weeks, the second crew will continue the process, complete the thickening phase, and carry out cleanup and storage of the equipment. Scientific instruments will remain in place to monitor melting throughout the spring and summer seasons, after which they will be recovered.

3. Site Description and Baseline Conditions

The field test will take place off the southeast coast of Qikiqtarjuaq, located on the east coast of Baffin Island in Nunavut. We identified 2 zones within which our field test could take place. Following an in-person joint meeting with the Hunters and Trappers Organization (HTO) and the Hamlet of Qikiqtarjuaq on September 10th, 2025, we jointly decided to designate a new Zone 3 (south-east of Qikiqtarjuaq) as the preferred location for our upcoming field test. Zone 3 has been selected because the likelihood of disturbing wildlife is lower compared to the previously indicated Zones 1 and 2. Zone 2 will not be considered anymore. Zone 1 will remain only as a fallback option, to be considered solely in extraordinary circumstances and only if the HTO determines just before the start of the field test that Zone 1 takes preference over Zone 3. Figure 1 shows these three zones. For reference, we have included a rectangle within each zone to illustrate the size of the final 1 km² site relative to the overall zone. The exact location within this zone will be chosen just before the start of the field test in collaboration with the HTO, to avoid areas where animals are known to gather while staying clear of community travel routes.

The Qikiqtarjuaq region is part of the Qikiqtaaluk (Baffin) region and falls within Inuit Nunangat. The area is characterized by landfast sea ice in winter, rugged fjord coastlines, and proximity to the Davis Strait. The local community of Qikiqtarjuaq has a population of approximately 600 people, with livelihoods closely tied to traditional harvesting and marine resources (Kanatami, 2023, pp. 5-6). The area supports species including ringed seals, bearded seals, polar bears, Arctic char, seabirds, and occasionally narwhals and bowhead whales during open-water seasons. The nearest sensitive habitat

features include polynyas and floe-edge ecosystems located farther east, outside the operational area (Copernicus Climate Change Service, 2021). (Qikiqtani Inuit Association, 2018, p. 33)



4.2 Biological Environment

The biological environment includes ice-dependent mammals (ringed and bearded seals, polar bears), Arctic cod, seabirds, and microorganisms inhabiting the sea ice. Operations are planned for February, prior to the ringed seal pupping season (March–April) and before the peak biological productivity period (April–June). Disturbance to wildlife is expected to be temporary and localized. Noise from pumps and snowmobiles may cause avoidance behavior in nearby seals or polar bears, though mitigation measures will minimize this risk. The impact of artificial light will be minimal, as operations occur primarily under natural daylight conditions. No significant effect on fish populations or plankton communities is anticipated. Arctic char typically winter and spawn in lakes (Fisheries and Oceans Canada, 2023, p. 18) and Arctic cod spawn in deeper ice-covered offshore areas and the site is distant from known spawning grounds (e.g., Franklin and Darney Bays). (Geoffroy, 2023, p. 7).

4.3 Socioeconomic and Cultural Environment

Qikiqtarjuaq is an Inuit community with active subsistence hunting and fishing, primarily targeting seals, Arctic char, occasionally polar bears and seasonally narwhals (Qikiqtani Inuit Association, 2018, p. 29). The field test area lies outside the main local harvesting routes, reducing potential overlap. Noise and human activity could temporarily disturb seals, potentially affecting harvest

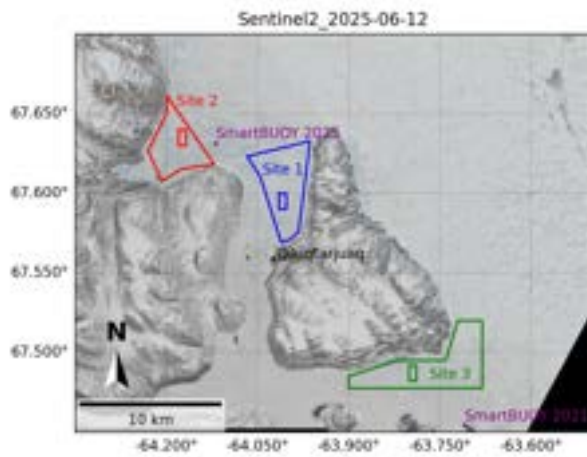


Figure 1: Potential field test sites zones, zone 3 being the preferred location

4. Analysis of Potential Environmental Impacts

4.1 Physical Environment

The physical disturbance from the AIT test will be minimal given its small (1 km²) footprint. Pumping seawater onto sea ice can be compared to constructing temporary ice roads in terms of physical impact. All activities are conducted during the winter season when the sea ice is stable and thick. No sediment disturbance is expected since pump inlets will be limited to a maximum depth of 50 cm below the ice surface, with local water depths easily exceeding 10 meters. No long-term alteration of the seafloor or hydrodynamic processes is anticipated. The thickened ice will eventually melt during summer, ensuring no lasting physical modification to the environment

Figure 2 Water depth (in meters) at the southern side of Qikiqtarjuaq, the location of our preferred field test zone 3.

opportunities, though this risk is minimal. The project will employ local wildlife monitors and engage community representatives to ensure culturally appropriate and environmentally sensitive operations, consistent with Inuit Tapiriit Kanatami's policy recommendations emphasizing Inuit participation in climate action initiatives (Inuit Tapiriit Kanatami (ITK), 2019, p. 4).

- Provide polar bear safety training for personnel.
- Prohibit any approaching or disturbance of wildlife by team members.
- Remove all non-essential equipment and waste after operations to avoid pollution.
- Always take the exact same route to and from the field test location to minimize disturbance caused by snowmobiles

5. Mitigation Measures

- Select field site with input from Inuit wildlife monitors to avoid seal concentrations, denning sites, or key travel routes.
- Use high-flow rate pumps to minimize operational duration and noise.
- Restrict artificial lighting; operate mainly in daylight.
- Cease all operations if polar bears or other wildlife are observed nearby.

6. Residual Impact Assessment

Due to the limited area and the timing of field test operations in February, no significant impact is expected. The most important mitigation is to minimize the disturbance of seals. Other than that, we think that the impact of our field test can best be compared with the impact of creating an ice road.

Biophysical resource	Potential impact	Proposed Mitigation	Residual impact	Predicted significance
Sea ice	Extended lifetime of sea ice	Limit to max 1 km ²	<ul style="list-style-type: none"> • low magnitude • localized geographic extent • frequent occurrence • short-term duration • fully reversible 	Not significant
Sea water	Disturbance of sediment while pumping	Use of pumps with short water inlet pipe (< 0.5m) while water depth > 10m	<ul style="list-style-type: none"> • low magnitude • localized geographic extent • frequent occurrence • short-term duration • fully reversible 	Not significant
Pinnipeds	Disturbance of ringed seals	<ul style="list-style-type: none"> • Exact field test area to be chosen based on topical information and advice from wildlife monitors, staying away from seal concentrations • Wildlife Monitors will continuously assess the proposed field test area and advise on any wildlife concerns • Avoid resting and foraging areas while travelling to and from field test area and always use the same route • Minimize use of artificial light / operate in February when there is daylight • Minimize use of artificial noise: use high flow rate pumps to reduce pumping time and limit vehicle movements • Operate in February before birthing period • Team will be instructed to stay away from wildlife and not feed, hunt, trap or disturb them 	<ul style="list-style-type: none"> • low magnitude • localized geographic extent • infrequent occurrence • short-term duration • fully reversible 	Not significant

Polar bear	Disturbance, negative human-bear encounters	<ul style="list-style-type: none"> Exact field test area to be chosen based on topical information and advice from wildlife monitors, staying far away from known dens Wildlife Monitors will continuously assess the proposed field test area and advise on any wildlife concerns Activities will cease if polar bear observed in proximity of the field test site and will only resume after the bear has left the area Team will receive polar bear training Minimize use of artificial light / operate in February when there is daylight Minimize use of artificial noise: use high flow rate pumps to reduce pumping time and limit vehicle movements Team will be instructed to stay away from wildlife and not feed, hunt, trap or disturb them 	<ul style="list-style-type: none"> low magnitude localized geographic extent infrequent occurrence short-term duration fully reversible 	Not significant
Fish	Disturbance of Arctic Cod	<ul style="list-style-type: none"> Avoid pumping near known spawning areas. Known spawning areas in Canadian Arctic are Franklin and Darney Bays Field test operations in February. By late spring (after operations) juvenile cod can be found in shallower waters 	<ul style="list-style-type: none"> low magnitude localized geographic extent infrequent occurrence short-term duration fully reversible 	Not significant
Whales	Disturbance of whales	<ul style="list-style-type: none"> Field test operations in February when whales are not present 	<ul style="list-style-type: none"> low magnitude localized geographic extent infrequent occurrence short-term duration fully reversible 	Not significant
Birds	Disturbance of birds	<ul style="list-style-type: none"> Field test operations in February when migratory birds are not present on the sea ice 	<ul style="list-style-type: none"> low magnitude localized geographic extent infrequent occurrence short-term duration fully reversible 	Not significant
Phytoplankton and Zooplankton	Disturbance of algae growth and disturbance of zooplankton	<ul style="list-style-type: none"> Operations in February avoid disrupting the critical bloom period Minimize artificial light Conduct measurements for future reference 	<ul style="list-style-type: none"> low magnitude localized geographic extent infrequent occurrence short-term duration fully reversible 	Not significant
Impact on harvesting	Disturbance of seals	<ul style="list-style-type: none"> See mitigation to prevent disturbance of seals in this table 	<ul style="list-style-type: none"> low magnitude localized geographic extent infrequent occurrence short-term duration fully reversible 	Not significant

7. Conclusion

The environmental impact of the proposed Arctic Ice Thickening (AIT) field test off the southeast coast of Qikiqtarjuaq is expected to be minimal. The activity is temporary, small in scale, and conducted during a period of low biological activity. With the mitigation measures in place, no significant adverse effects are anticipated on the physical, biological, or cultural environment. Continued collaboration with local Inuit organizations and wildlife monitors ensures that the project aligns with community values and respects Inuit rights under the Nunavut Agreement and UNDRIP.

8. References

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Annex I: Detailed overview per species

Potential Impacts on Pinnipeds around Qikiqtarjuaq (February – March)

Ringed Seals: Small pinnipeds (~1.5 m, 68 kg in winter) that depend on thick blubber layers for insulation and energy during the breeding season. They are key prey for polar bears and subsistence species for local communities. They primarily feed on arctic cod and crustaceans. Pupping starts at the end of March, but most born in April. To be found mainly to the Northwest of Qikiqtarjuaq year-round (Nunavut department of Environment, 2010, p. 52) (Qikiqtani Inuit Association, 2018, p. 70).

- **Bearded Seals:** Larger seals (~2.4 m, up to 340 kg in winter) that rely on benthic prey like crabs, shrimp, and clams. They birth pups on moving sea ice later in the year (April-May). Bearded seals can be found to the Northwest and to the South of Qikiqtarjuaq. The latter being the preferred location of our field test, but there they can only be found between August and November (Nunavut department of Environment, 2010, p. 26) (Qikiqtani Inuit Association, 2018, p. 70).

- **Harbour Seals:** not present in February-March (Qikiqtani Inuit Association, 2018, p. 71)

- **Harp Seals:** not present in February-March (Qikiqtani Inuit Association, 2018, p. 71)

- **Hooded Seal:** not present in February-March (Qikiqtani Inuit Association, 2018, p. 71)

- **Walrus:** not present in February-March (Qikiqtani Inuit Association, 2018, p. 71)

Potential Impacts of Operations:

- Disturbance from Noise and Human Activity:
 - Noise Stress:** Seals are highly sensitive to sound. This could cause seals to flee their resting or foraging areas, leading to increased energy expenditure.
 - Displacement:** Disturbance might force seals away from preferred habitats near Qikiqtarjuaq, affecting their access to prey and increasing competition in less suitable areas.
 - Artificial Light:**
 - Behavioral Disruption:** Artificial lighting during winter could disturb seals' natural behavior, such as resting or hunting. Light may also attract or repel prey species, indirectly affecting seals' foraging success.
 - Impact on Ice Habitat:**
 - Habitat Alteration:** Pumping water onto sea ice could change ice thickness and dynamics, potentially impacting seal breathing holes and access to sub-ice habitats.
 - Breeding Site Risk:** February is before the birthing period for bearded seals, but altering ice conditions later in winter could impact future habitat suitability for denning and pupping later in the year.

	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Qikiqtarjuaq												
bearded seal	X	X	X	X	X	X	X	X	X	X	X	X
harbour seal (rare)			X	X								
harp seal	X	X	X	X	X	X						X
hooded seal	X	X	X	X	X							X
ringed seal	X	X	X	X	X	X	X	X	X	X	X	X
walrus	X	X	X	X	X	X						

Figure 3: Observations of seals and walruses Qikiqtarjuaq [5] (Qikiqtani Inuit Association, 2018, p. 64)



Figure 4: Ringed Seal near Qikiqtarjuaq (arrow pointing at Qikiqtarjuaq) (Nunavut department of Environment, 2010, p. 52)

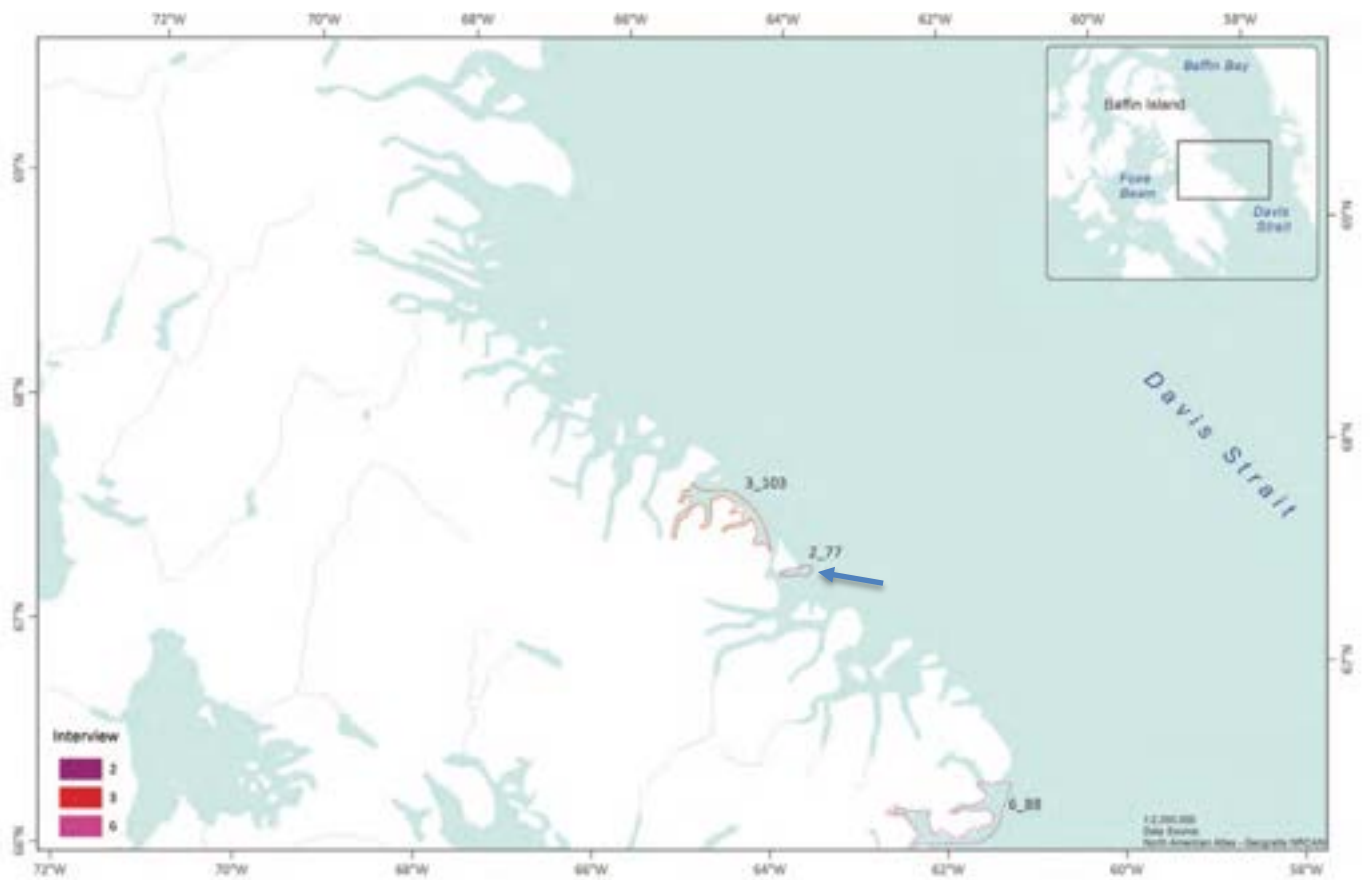


Figure 5: Bearded Seal near Qikiqtarjuaq (arrow pointing at Qikiqtarjuaq) (Nunavut department of Environment, 2010, p. 26)

Potential Impacts on Polar Bears around Qikiqtarjuaq (February–March)

Polar Bears (*Ursus maritimus*): Apex predators of the Arctic that rely on sea ice for hunting, mainly targeting ringed seals. Females den from November to late March/early April, with average litter sizes of 1-3 cubs, and typically breed in late April or early May. Polar bears can be found along the entire Baffin, Devon, and Ellesmere islands coastlines. They have their cubs in dens before ringed seals give birth. Polar bear hunt ringed seal pups in their dens, or out on the open ice (Qikiqtani Inuit Association, 2018, p. 76).

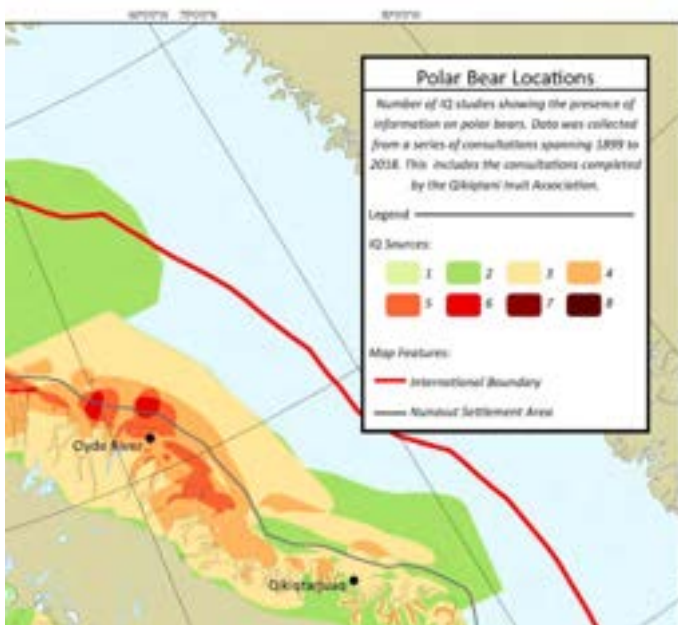


Figure 8 Location of polar bear based on Inuit hunting locations (Qikiqtani Inuit Association, 2018, p. 77)

Potential Impacts of Operations:

1. Disturbance from Noise and Human Activity:

- o Denning Females: Noise from pumping and associated activities near denning areas can disturb pregnant females or mothers with cubs, potentially causing den abandonment, which could lead to cub mortality.
- o Energetic Stress: Polar bears rely on conserving energy during winter. Human

activity that forces movement or alters behavior can increase energy expenditure, reducing survival chances.

2. Artificial Light:

- o Behavioral Disruption: Artificial light may disturb nocturnal hunting or resting patterns, potentially disorienting bears or altering their interaction with prey like ringed seals.
- o Impact on Hunting: Light may also affect the visibility of prey species, influencing hunting success.

3. Impact on Habitat and Prey Availability:

- o Prey Distribution: If ringed seals are displaced or their local populations are reduced due to operations, polar bears may struggle to find sufficient prey, increasing their travel distances and energy use.

4. Impact on Population and Reproduction:

- o Den Site Disruption: Operations in or near key denning areas may harm the reproductive success of females by causing abandonment or physical disturbance of dens.
- o Stress on Cubs: Disturbed females might fail to provide adequate care to cubs, affecting their survival.

Conclusion

Pumping operations, noise, and artificial light near Qikiqtarjuaq in February could impact polar bears, particularly denning females and hunting adults. The most critical concerns are disturbance to denning sites and disruption of hunting opportunities. Implementing mitigation measures will reduce these risks. The field test area will be selected based on current information and guidance from wildlife monitors, ensuring it remains distant from known dens. Wildlife monitors will continuously evaluate the site and provide advice on any concerns related to wildlife. If a polar bear is observed near the field test site, all activities will pause and only resume once the bear has left the vicinity. Additionally, the team will undergo polar bear safety training to ensure preparedness. We plan our

operations in February, so we can make use of daylight and minimize artificial light.

Potential Impacts on Fish Around Qikiqtarjuaq in February

In February, Arctic cod is the only fish species known to remain active under the sea ice near Qikiqtarjuaq. Arctic cod plays a critical role in the Arctic ecosystem, serving as a key prey species for marine mammals like seals and some seabirds. While Arctic char is a common species in the Arctic, they are not present directly in or under sea ice. They lack the necessary antifreeze proteins to survive the frigid saltwater temperatures and risk freezing. They therefore migrate to fresh water to overwinter or migrate to deep offshore areas. They spawn in September in lakes or rivers or streams connected to lakes.

Potential Impacts of Operations:

1. Direct Removal of Eggs or Larvae

- Risk: Arctic cod spawn during the winter, and their eggs and larvae may be present in the water column under the ice. Pumping seawater onto the ice risks unintentionally removing eggs or larvae from the local environment, which could reduce reproductive success in the immediate area. In general, it can be said that Arctic cod moves to deeper, ice-covered waters to release their eggs. The eggs and larvae then drift with the currents, eventually making their way into shallower coastal areas as they develop. By late spring and summer, juvenile cod can often be found in shallower waters

- Mitigation: Avoid pumping near known spawning areas or at depths where eggs and larvae are most concentrated. In the Canadian Arctic, spawning is suggested to occur near the Franklin and Darney Bays [(Geoffroy, 2023, p. 7).

2. Disturbance from Noise

- Risk: Arctic cod are sensitive to underwater noise, which can alter their behavior. Noise generated by pumping

equipment could cause cod to flee, leading to energy loss and potential displacement from optimal foraging grounds.

- Mitigation: limit operating time by using high flow rate pumps

3. Changes in Prey Availability

- Risk: Pumping operations might disturb zooplankton, a primary food source for Arctic cod. Any significant disruption to the local zooplankton population could impact cod feeding opportunities, particularly during the resource-scarce winter months.

- Mitigation: Maintain careful placement of pumping equipment / use short water inlet pipe to reduce the disturbance of zooplankton populations near the sea floor.

Broader Considerations

- Localized Impact: Arctic cod populations are highly adapted to dynamic and harsh conditions, so localized effects are unlikely to significantly impact the broader population.

- Ecosystem Dependency: Since Arctic cod are a cornerstone species, any significant disruption to their lifecycle could cascade through the food web, affecting higher predators like seals and seabirds.

Conclusion

By implementing precautionary measures, the potential risks to Arctic cod during February pumping operations can be minimized, ensuring minimal ecological disruption near Qikiqtarjuaq. Spawning occurs between September and April, and peaks between January and February, when our field test location is planned. We should thus stay away from the known spawning areas in the Canadian Arctic are Franklin and Darney Bays (Geoffroy, 2023, p. 7). By late spring (after our operations) juvenile cod can be found in shallower waters

Potential Impacts on Birds around Qikiqtarjuaq (February–March)

The majority of marine related birds arrive on Baffin Island during Upirngasaaq (mid-March – beginning of May) and depart towards the end of Aujaq (mid-September).

The exceptions are the Black guillemot and thick-billed murre. They remain in Baffin Bay and Davis Strait year-round, keeping to open

waters during the winter (Qikiqtani Inuit Association, 2018, p. 84).

Our operations in February and beginning of March (Ukiuq) will be on sea ice therefore no birds expected to be present.

	Upirngasaaq	Upirngaaq	Aujaq
Arctic Loon			
Arctic Tern		X	X
Black Guillemot*	X	X	X
Brant Goose		X	X
Canada Geese		X	X
Common Loon			
Red breasted Merganser		X	X
Dovekie		X	X
Eider duck*	X	X	X
Greater Snow Geese		X	X
Gulls		X	X
Harlequin duck		X	X
King Eider		X	X
Black-legged Kittiwake		X	X
Long-tailed Jaeger		X	X
Northern Fulmar		X	X
Long-tailed duck (Oldsquaw)		X	X
Red-necked Phalarope		X	X
Plovers		X	X
Razor Bill		X	X
Red knot		X	X
Ruddy Turnstone		X	X
Sandhill Crane		X	X
Sandpiper		X	X
Shorebirds		X	X
Thick-billed murre*	X	X	X
Tundra Swan		X	X
White-fronted goose		X	X
Yellow-billed Loon		X	X

*These birds remain year round wintering in open water areas

Figure 13 Common birds of Baffin Bay and Davis strait (Qikiqtani Inuit Association, 2018, p. 85)

Potential Impacts on Phytoplankton and Zooplankton

Sea ice is a crucial habitat for microorganisms such as phytoplankton and other microbes that form the base of the Arctic food chain. The spring and summer algae bloom, particularly from April to June, marks a vital period for Arctic marine life, with ice algae starting to bloom as early as April, followed by phytoplankton as the ice melts. These organisms support a wide range of species, from fish to marine mammals and birds. The timing of our operations in February and beginning of March avoids disrupting this critical bloom period, which starts when the sea ice starts thinning. Artificial light may disturb the natural cycle of zooplankton and krill and invertedly start their diel vertical migration (M. Teunis, 2023, p. 34). Minimizing artificial light will reduce this risk.

Potential Impacts on harvesting

As noted by the Nattivak Hunters & Trappers Organization, field test operations may mainly impact seal harvesting activities. Noise and human activity could potentially disturb seals, causing them to leave the area. To minimize these impacts, mitigation measures will be implemented, including noise level reduction, avoiding key habitats, and the utilization of low-impact lighting to limit disturbances to seal populations. To further mitigate risks, local wildlife monitors will be engaged during the flooding phase of the operations. The field test will avoid areas with known wildlife concentrations and key habitats, including seal dens. Additionally, the advice and expertise of wildlife monitors will guide the selection of the exact location for the Arctic Ice Thickening (AIT) field test.

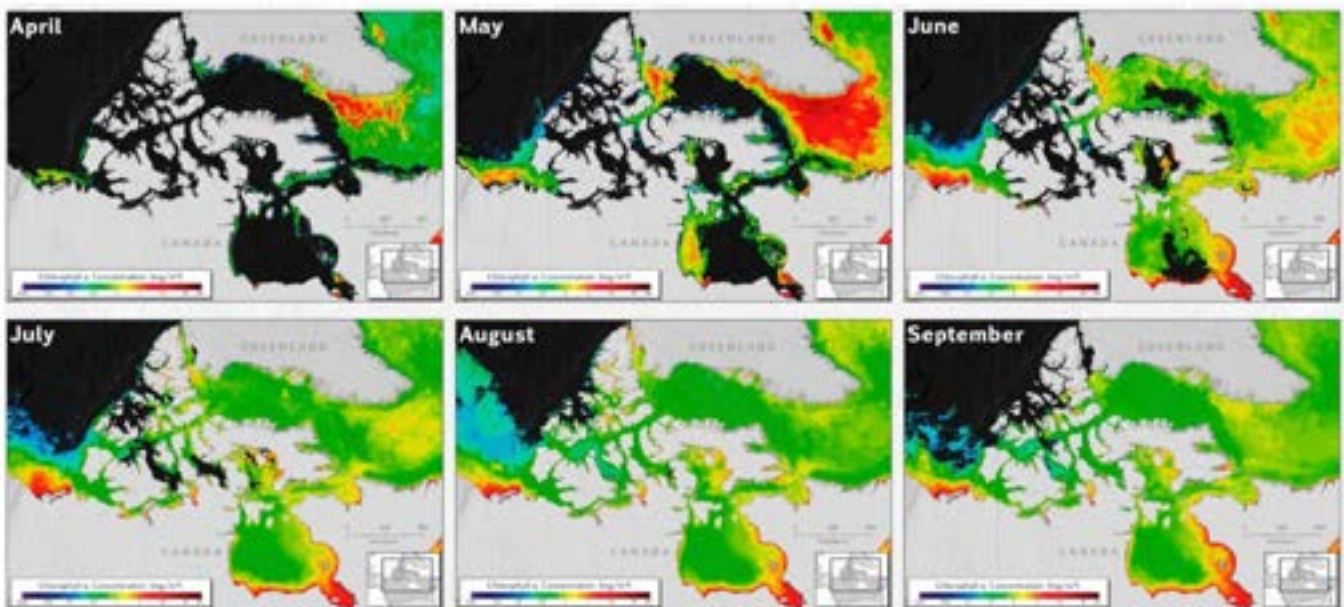


Figure 3.2 Monthly average chlorophyll-a concentration in the Canadian Arctic based on satellite imagery (pelagic phytoplankton). Chlorophyll is the green pigment in phytoplankton, so areas with high chlorophyll concentrations are places where phytoplankton are growing (Oceans North Conservation Society et al. 2018).

Annex 4: Real Ice | Independent Legal Assessment

As part of ARIA's commitment to responsible research, the Exploring Climate Cooling programme requires that all outdoor experiments be subject to an environmental and legal assessment, which is made publicly available.

Nunavut has an established permitting process for scientific research, coordinated by the Nunavut Research Institute (NRI). As part of this, the Nunavut Impact Review Board (NIRB) undertakes an assessment (a "screening report") of the proposed project's potential socio-economic, environmental, and ecosystem impacts. The screening report therefore fulfils ARIA's requirements for an independent pre-experiment environmental impact assessment in that it recommends the conditions under which the research project can take place, or if further assessment is required. The screening report is made available on NIRB's website for public comment, and various relevant bodies are contacted for input.

In the case of **Real Ice** — a sub-team conducting outdoor experiments within the wider Re-thickening Arctic Sea Ice (RASi) project — the screening report indicated that no further assessment was necessary and that the experiment could proceed with conditions that the Real Ice team were able to satisfy. This then led to the provisioning of the formal research permit for their experiment.

Following review of the RASi project by the independent Oversight Committee, ARIA's CEO mandated an independent assessment to confirm that the Real Ice sub-team's plans complied with all relevant laws, regulations, and permitting requirements, including those relevant to Indigenous rights as set out in the UN Declaration of the Rights of Indigenous Peoples.

The independent assessment, completed on December 23, 2025 by Willms & Shier Environmental Lawyers LLP, concluded that Real Ice has all the permits and permissions required to proceed with the project. Specifically, the review confirmed:

- There are no aquatic species at risk or critical habitats in the project area.
- The project location was chosen in collaboration with the Ekaluktutiak Hunters & Trappers Organization (EHTO).
- The project's deep engagement with the EHTO and the Nunavut Impact Review Board (NIRB) process is consistent with the interpretation and application of the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) in Canada.

In their assessment, Willms & Shier identified minor administrative steps for the project team to complete. ARIA's programme team worked directly with Real Ice to ensure these outstanding issues were resolved:

- **Permit typo:** The lawyers noted a typographical error on the Nunavut Research Institute (NRI) Scientific Research Licence (referencing NIRB file #25YN033 instead of the correct #23YN044) and noted it had not yet appeared on the NIRB public registry. The project team formally requested NRI to correct this typo on the public registry.
- **Transport Canada notification:** The legal review noted notice requirements for placing scientific equipment in navigable waters. In addition to following established local best practices — including clearly marking devices, logging coordinates, and directly informing the EHTO — the project team was instructed to utilise Transport Canada's "minor works" notification portal 48 hours prior to the placement of any relevant scientific equipment.

The full independent legal assessment provided by Willms & Shier Environmental Lawyers LLP is available below.

Memorandum

To: Mark Symes, Advanced Research and Invention Agency (“ARIA”)
From: Willms & Shier Environmental Lawyers LLP (“Willms & Shier”)
Date: December 23, 2025
File: 11265
Re: Review of Permitting Requirements for the Real Ice Development Company Limited
cc:

1 BACKGROUND

Real Ice Development Company Limited (“Real Ice”) is conducting an ice thickening field test near Cambridge Bay, Nunavut in winter and spring 2026 (the “Project”). ARIA is providing funding for the Project. ARIA has asked Willms & Shier to review Real Ice’s permits to ensure that Real Ice has all necessary permits to proceed with the Project as planned.

Real Ice intends to begin the Project in January 2026.

2 PROJECT INFORMATION

Since 2023, Real Ice has undertaken a series of small-scale sea ice thickening field studies. The first study took place in January 2023 in Nome, Alaska. 2024 and 2025 field studies took place near Cambridge Bay, Nunavut. The Project will be the third time the study is carried out around Cambridge Bay.

We understand from the materials provided by Real Ice that the ice thickening studies have been designed to advance understanding in several key areas: the enthusiasm, interest and engagement of local communities with the research, the logistical and operational challenges of conducting research on the ice, the engineering feasibility of thickening sea ice through water pumping from beneath the ice surface, the scientific dynamics associated with snow flooding in the winter and, more recently, melt pond drainage during the spring season.

The Project involves thickening a designated section of sea ice (approximately 0.25 km²) by pumping sea water into the snow on the ice. The Project site is a 1 km² area approximately 7 km from the Hamlet of Cambridge Bay and was chosen in collaboration with the Ekaluktutiak Hunters & Trappers Organization (“EHTO”).



Ice thickening operations are expected to be completed by March 2026, then monitoring and measuring will occur until the melt season (melt season is expected to be May to July 2026). During the melt season, Real Ice will also perform small scale operations to test the effectiveness of melt pond drainage.

During the January to March period, Real Ice will set up a camp on the ice near the Project site, consisting of an Arctic quality tent that can host up to 6 people, and is equipped with a heater, additional clothing, and first-aid kit.

Ice and snow thickness, temperatures and salinity measurements will be taken actively (drilling holes and collecting ice cores) and passively (through embedded ice thickness measurement devices) throughout the winter and melt season.

Equipment used includes snowmobiles, submersible battery-powered electric powered pumps (each capable of a water flow of around 800L per minute), drones for monitoring ice melt, semi-automated ice thickness measurement devices, an albedo-meter and ice augers.

Water pumping is expected to occur for around 50 days between January and March 2026. Every day the pumping equipment (pumps, batteries, and accessories) will be transported from the Canadian High Arctic Research Station (“CHARS”) to the Project site and back and pumping operations will run for a maximum of 7 hours during the daylight.

Semi-automated ice thickness measurement devices will be installed into the sea ice at the beginning of the winter. These devices are waterproof and equipped with GPS trackers and will be recovered after the melt season.

From the end of the winter and through all the melt season, an albedo-meter and an aerial drone will be used to measure surface albedo and broadband reflectivity of the test and control areas. This includes the final melt period when the sea ice is no longer safely accessible.

The Real Ice team will be hosted by CHARS in Cambridge Bay for the third winter in a row. CHARS will provide Real Ice with state-of-the-art facilities, storage, snowmobiles and living spaces. Real Ice will also work closely with EHTO, and EHTO members will be involved with the Project as local guides during day-to-day operations.

3 CONCLUSION

Based on our understanding of the Project, as set out above, and a review of relevant permitting requirements, Real Ice has all the permits and permissions required to proceed with the Project as planned for the 2026 season, subject to the outstanding issues and recommendations set out in Section 4, below.

Further, from our review of the documents provided, Real Ice has engaged with the local Inuit community through the EHTO. Real Ice has also worked through the Nunavut Impact Review Board process which provided opportunities for Inuit communities and individuals to participate in the decision-making process, consistent with the Nunavut Agreement and more generally with the interpretation and application of UNDRIP in Canada.

A full review of the permitting and engagement requirements is set out in Appendix A. Our review is based on the facts and assumptions set out in the documents provided. If you are aware of different facts or assumptions, please let us know immediately as this will impact our assessment.

4 OUTSTANDING ISSUES/ RECOMMENDATIONS

- 1 Real Ice's Scientific Research Licence for its 2026 field work states, "Licence holder is bound by the terms and conditions of the NIRB Screening Decision Report (File # **25YN033**) and the Department of Culture & Heritage archaeological sites terms and conditions".

It appears that #25YN033 is a typo and the Scientific Research Licence should refer to NIRB file #23YN044.

On the NIRB public registry, 25YN033 is a project on South Baffin Island by Nunavut Nukkiqsautiit Corporation (NNC). This is an issue as the terms and conditions in the screening report for NNC's project do not apply to Real Ice's project, yet Real Ice's licences ties Real Ice to those terms and conditions.

As a result, we recommend that Real Ice request that NRI re-issue the licence with the correct NIRB file number. Real Ice has confirmed they will request the updated Scientific Research Licence from NRI.

- 2 Real Ice's Scientific Research Licence for its 2026 field work is not posted on the NIRB public registry. We understand from Real Ice that NRI sent the Scientific Research Licence to NIRB.

We recommend that Real Ice confirm in January 2026 that the Scientific Research Licence for its 2026 field work is posted on the NIRB public registry. Real Ice has confirmed they will follow up with NRI about posting the Scientific Research Licence on the NIRB public registry.

- 3 While not a permit, there are notice requirements to Transport Canada for the use of monitoring and measurement devices in navigable waters. Real Ice should provide the required notification to Transport Canada and confirm to ARIA that this has been completed.

APPENDIX A: PERMITTING AND ENGAGEMENT REQUIREMENTS

ANALYSIS

Based on our understanding of the Project following a review of the provided documents, we identified the following organizations/entities that may have relevant regulatory/permitting requirements.

In the table below, we review each organization and determine whether it is relevant to the Project.

Jurisdiction	Organization	Potentially Applicable Legislation	Potentially Applicable Permit Requirement	Applicable or Not Applicable	Comments
Federal (Canada)	Transport Canada (TC)	<i>Canadian Navigable Waters Act</i> <i>Arctic Waters Pollution Prevention Act</i>	Prohibition on constructing, placing, altering, removing or decommissioning a work in, on, over, under through or across any navigable water ¹ without the appropriate approvals. Minor works are allowed in accordance with the Act. ² Prohibition of deposit of waste in arctic waters	Applicable. Notice requirements, no permit required. Minor works requirements may be applicable to the ice monitoring devices that Real Ice will be installing and leaving on the ice until the ice melts. This does not require a permit, but there are requirements in the Minor Works Order that need to be followed, including notification requirements	On October 17, 2023, Transport Canada submitted a comment during the 2023 NIRB screening process stating that, “Transport Canada has reviewed the project proposal and does not have any comments to submit, as none of the project components fall within Transport Canada’s mandate.”

¹ Navigable water includes the Arctic Ocean.

² Section 39(1) of the Minor Works Order designates scientific equipment as a minor works. Section 39(2) defines scientific equipment as monitoring and measurement devices, and any associated buoys, platforms or other similar structures, installed in, on, under, through or across navigable water.

				<p>under sections 4 and 8 of the Minor Works Order.³</p> <p>Based on our understanding of the Project, no obstructions or interference with navigation will occur at the Project site once ice melt occurs.</p>	
	<p>Environment and Climate Change Canada (ECCC)</p>	<p><i>Species at Risk Act</i> (administered by both ECCC and DFO)</p>	<p>Need approval to undertake activities which may affect species listed on Schedule 1 of the Act</p>	<p>Not applicable.</p> <p>Based on our understanding of the Project, the Project will not affect species at risk, no monitoring or assessment of species at risk will occur, and no habitat of species at risk will be impacted during the Project.</p>	<p>Based on the aquatic species at risk map published by DFO and the critical habitat for terrestrial species at risk map published by ECCC, there are no aquatic species at risk/critical habitat in the Project area.⁴</p> <p>It is our understanding that Real Ice worked with EHTO to select a project area that would not interfere with wildlife/where wildlife have not</p>

³ Canadian Navigable Waters Act, [Minor Works Order](#). Notification must be given prior to placing the scientific equipment and upon removal of the scientific equipment. Notification must be given in writing to a Canadian Coast Guard Marine Communications and Traffic Services Centre. Contact information for the Canadian Coast Guard Marine Communications and Traffic Services Centre in Iqaluit can be found [here](#).

⁴ [Aquatic Species at Risk Map](#); [Terrestrial Species at Risk Critical Habitat Map](#).

					been seen in recent years.
	Canadian Wildlife Service (CWS)	<i>Canada Wildlife Act</i> <i>Migratory Birds Convention Act</i>	Need a permit if engaging in certain activities in a National Wildlife Area (NWA) or Migratory Bird Sanctuary (MBS)	Not applicable. There are no NWAs or MBSs that cover the Project site.	The Ahiak Bird Sanctuary (a MBS) is located on the mainland, across from Cambridge Bay. ⁵
	Fisheries & Oceans Canada (DFO)	<i>Fisheries Act</i> <i>Oceans Act</i>	A licence is required to fish/collect fish, cetaceans, or marine mammals for scientific purposes Authorization is required to disturb marine mammals The <i>Oceans Act</i> establishes Marine Protected Areas	Not applicable. The Project does not include the study and/or collection of fish and/or marine mammals. It is also our understanding that the Project will not disturb marine mammals or fish. No Marine Protected Areas are near the Project site.	The only Marine Protected Area in Nunavut is the Tuvaijuittuq Marine Protected Area, located in the marine waters off the northwest coast of Ellesmere Island. ⁶
	Parks Canada (PC)	<i>Canada National Parks Act</i> <i>Canada National Marine Conservation</i>	A permit is required if engaging in certain activities in a National Park or Marine Conservation Area.	Not applicable.	There are no National Parks or Marine Conservation Areas near the Project site. ⁷

⁵ NWAs and MBSs can be viewed on this [map](#) and this [map](#).

⁶ List of [Marine Protected Areas](#).

⁷ Map of Canada's [National Parks](#); map of Canada's [Marine Conservation Areas](#).

		<i>Areas Act</i>			
	Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC)	<i>Territorial Lands Act, Territorial Land Use Regulations</i>	A land use permit is required for certain activities on Federal Crown Land, including fuel storage and the establishment of fieldwork campsites used for more than 100 days	Not applicable. The Project site, and corresponding field camp, is on sea ice, not Federal Crown Land.	CIRNAC submitted a comment during the 2023 NIRB screening process which provided the following recommendations: <ul style="list-style-type: none"> • Recommended standard terms and conditions regarding refueling of snowmobiles. • Recommended standard terms and conditions regarding consultation. • Recommended Proponent clarify potential impacts on water quality. • Recommended Proponent provide further information on hydrogen fuel used by the pump
Territorial (Nunavut)	Government of Nunavut	<i>Wildlife Act</i>	A licence is required for wildlife research and organized observation of wildlife	Not applicable. Based on our understanding of the Project, no research or organized observation of wildlife will be	

				conducted	
		<i>Nunavut Act, Archaeological and Palaeontological Sites Regulation</i>	A permit is required for the search or survey of archaeological and/or palaeontological sites and artifacts	Not applicable. Based on our understanding of the Project, no research will be conducted in relation to archaeological and/or palaeontological sites and artifacts	
		<i>Umbrella Inuit Impact and Benefit Agreement for Territorial Parks in the Nunavut Settlement Area</i>	A Territorial Parks Permit is required for any research activities taking place in a Territorial Park	Not applicable. There are no Territorial Parks within the Project Site.	Ovayok Territorial Park is the closest Territorial Park. ⁸
	Nunavut Planning Commission (NPC)	<i>Nunavut Agreement (Article 11)</i> <i>Nunavut Planning and Project Assessment Act</i>	NPC is the gatekeeper for all project proposals. All activities proposed in Nunavut must first be submitted to the NPC for review. Proponents of projects must submit a project proposal to the NPC to determine whether the project conforms to the	Applicable. The Project must be submitted to the NPC for review.	The Project was submitted to the NPC in 2025 (and previously in 2023 and 2024). On August 15, 2025 the NPC issued a letter stating that the Project is outside the area of an applicable regional land use plan and that “the project is exempt from

⁸ [Territorial Park Map.](#)

			requirements of any approved land use plans, and if so, whether the project type is exempt from the requirement for screening by NIRB.		screening by the NIRB because the NPC is of the understanding that the extension of the project duration and monitoring phase does not change the general scope of the original or previously amended project activities, and the exceptions noted in section 12.4.3(a) and (b) of the Nunavut Agreement do not apply”.
	Nunavut Impact Review Board (NIRB)	<i>Nunavut Agreement</i> (Article 12) <i>Nunavut Planning and Project Assessment Act</i>	NIRB only screens project proposals which have been referred to it by the NPC. NIRB has jurisdiction to conduct impact assessments on project proposals within the land and marine areas of the Nunavut Settlement Area. NIRB will conduct a screening of the proposed project to determine if a full environmental	Applicable. Screening of the Project by NIRB is required.	In 2023, the Project underwent a screening by NIRB. The NIRB Screening Decision Report, dated October 31, 2023, states that a review of the Project is not required as the Project is not likely to cause significant public concerns and it is unlikely to result in significant adverse environmental and social impacts. The Screening Decision

			<p>review is required.</p> <p>Upon conclusion of the screening process, NIRB provides its written report to the responsible Minister stating whether a full environmental review is required.</p> <p>If a review is not required, NIRB can recommend specific terms and conditions that apply in respect of the project.</p>		<p>Report contains 32 recommended project-specific terms and conditions.</p> <p>The NIRB recommendation requires approval from the responsible Minister. This can be provided formally by a letter from the Minister, or is assumed if the Minister does not provide a response within 15 days.</p> <p>It is our understanding a letter for the Minister was not received in relation to the project, as a result, the NIRB recommendation is deemed to be accepted.⁹</p>
	<p>Nunavut Research Institute (the science division of Nunavut Arctic College, “NRI”)</p>	<p><i>Scientists Act</i></p>	<p>A Scientific Research License is required for research in Nunavut in the health, social sciences, or natural/physical sciences</p>	<p>Applicable.</p> <p>Real Ice must obtain a Scientific Research License from NRI as Real Ice is conducting research within the</p>	<p>Real Ice obtained a Scientific Research Licence in August 2025 for the 2026 research season.</p> <p>The licence is valid from January 10, 2026 to August 1,</p>

⁹ Section 93(3) of the *Nunavut Planning and Project Assessment Act*.

			<p>disciplines.</p> <p>The licence applies to research regarding Nunavut’s air, land, water and people.</p> <p>NRI does not licence research on wildlife (plants, fish, birds and marine/terrestrial wildlife).</p>	natural/physical sciences discipline.	<p>2026.</p> <p>Real Ice also obtained Scientific Research Licences for their field work in 2024 and 2025.</p>
	Nunavut Water Board (NWB)	<p><i>Nunavut Agreement</i> (Article 13)</p> <p><i>Nunavut Waters and Nunavut Surface Rights Tribunal Act</i></p>	The NWB regulates the use of water and deposit of waste in freshwater in Nunavut (inland water). Permits and approvals are required.	<p>Not applicable.</p> <p>The Project is located offshore, in a marine area and involves the pumping of sea water, not freshwater.</p>	
	Nunavut Wildlife Management Board (NWMB)	<i>Nunavut Agreement</i> (Article 5)	The NWMB is responsible for the management of all wildlife in Nunavut. Wildlife is defined in the Nunavut Agreement as all wild terrestrial, aquatic, avian and amphibian flora and fauna.	<p>Not applicable.</p> <p>Based on our understanding of the Project, Real Ice will not have any interaction with marine mammals, birds, fish or plants as part of the Project and Real Ice is not conducting any research on wildlife.</p>	

	Nunavut Surface Rights Tribunal (NSRT)	<i>Nunavut Agreement (Article 21)</i> <i>Nunavut Waters and Nunavut Surface Rights Tribunal Act</i>	The NSRT was established for the purpose of providing an independent mechanism for the resolution of disputes arising from access to surface land in Nunavut and/or claims for compensation arising from loss or damage to wildlife, carving stone or other specified substances	Not applicable.	The mandate of the NSRT relates largely to the use/access of Inuit Owned Land for mineral exploration and other commercial purposes. Section 15.2.3 of the <i>Nunavut Agreement</i> states that Inuit Owned Land does not extend to marine areas
Regional (Kitikmeot Region, Cambridge Bay)	Kitikmeot Inuit Association (KIA)	<i>Nunavut Agreement – (Article 39 – NTI)</i>	A Inuit Owned Land Use Licence is required for certain activities on Inuit Owned Land. KIA manages 106,360 square kilometers of Inuit Owned Lands in the Kitikmeot Region ¹⁰	Not applicable. The Project takes place on sea ice.	Section 15.2.3 of the <i>Nunavut Agreement</i> states that Inuit Owned Land does not extend to marine areas.
	Kitikmeot Regional Wildlife Board (KRWB)	<i>Nunavut Agreement (Article 5)</i>	The KRWB manages harvesting of wildlife in the Kitikmeot Region	Not applicable. Based on our understanding of the Project, the Project does not involve hunting or	The Regional Wildlife Boards primarily regulate hunting and trapping activities in their respective areas.

¹⁰ [Map of Inuit Owned Land](#), published by CIRNAC.

				trapping.	
	Ekaluktutiak Hunters and Trappers Organization (EHTO)	<i>Nunavut Agreement</i> (Article 5)	<p>The EHTO is the Hunters and Trappers Association for the Cambridge Bay region.</p> <p>Regulates harvesting practices and techniques among its members, among other things.</p> <p>The EHTO is consulted on projects during co-management processes in the region.</p>	<p>Not applicable.</p> <p>While there are no permits required from EHTO to conduct the Project, EHTO’s support of the Project is integral to gaining other required approvals and to show adequate consultation and accommodation has occurred with potentially impacted parties.</p>	<p>EHTO has provided a letter of support, dated November 6, 2025, for the Project.</p> <p>It is our understanding that Real Ice is engaging frequently and deeply with EHTO.</p>

INUIT ENGAGEMENT AND UNDRIP

In 1993, the Nunavut Land Claims Agreement (the “Nunavut Agreement”) was signed as a modern treaty between Nunavut Inuit, represented by the Tungavik Federation of Nunavut, and the Government of Canada. It is the largest land claims settlement in Canadian history and led to the creation of Nunavut in 1999 and the Government of Nunavut.

The Nunavut Agreement established the Nunavut Settlement Area and various institutions of public government (i.e., co-management boards).

On June 21, 2021, the federal *United Nations Declaration on the Rights of Indigenous Peoples Act* (“UNDA”) received Royal Assent and immediately came into force. The purpose of UNDA is to affirm the United Nations Declaration on the Rights of Indigenous Peoples (“UNDRIP”) as an international

human rights instrument that can help interpret and apply Canadian law. UNDA also provides a framework to advance implementation of UNDRIP at the federal level.¹¹

UNDA requires that the Government of Canada, in consultation and cooperation with Indigenous peoples, “take all measures necessary to ensure the laws of Canada are consistent with the Declaration, prepare and implement an action plan to achieve the Declaration’s objectives, table an annual report on progress to align the laws of Canada and on the action plan”.¹²

The Government of Canada states in a backgrounder that UNDA:

- ♦ only imposes obligations on the federal government. It is intended to create a framework to support the Government of Canada to further implement the Declaration, and
- ♦ affirms that the Declaration is a universal international human rights instrument with application in Canadian law. This means that the Declaration is an important source to interpret provincial and federal law.¹³

As a result of UNDA, UNDRIP has application in Canadian law. The Federal Court has confirmed that UNDRIP is part of Canadian law and must be used to interpret Canadian law.¹⁴ A number of provinces and territories in Canada have also enacted their own UNDRIP legislation. Nunavut has not enacted its own UNDRIP legislation.

How UNDRIP is ultimately interpreted and applied in Canada is still subject to legal interpretation. The majority of court cases since the passage of UNDA have focused on the Crown’s duty to consult and accommodate.¹⁵

In Canada, federal and provincial decision bodies hold a constitutional duty to consult with Indigenous people. This duty to consult is enshrined in section 35 of the *Constitution Act, 1982*, and is heightened by UNDRIP. While the veto power under the ‘free, prior and informed consent’ provision of UNDRIP has not been interpreted to apply in Canada, UNDRIP does function to ensure that a robust process and

¹¹ Government of Canada, “Backgrounded: United Nations Declaration of the Rights of Indigenous Peoples Act”, last modified December 10, 2021, online: <https://www.justice.gc.ca/eng/declaration/about-afpropos.html>

¹² Government of Canada, “Backgrounded: United Nations Declaration of the Rights of Indigenous Peoples Act”, last modified December 10, 2021, online: <https://www.justice.gc.ca/eng/declaration/about-afpropos.html>

¹³ Government of Canada, “Backgrounder: United Nations Declaration of the Rights of Indigenous Peoples Act”, last modified December 10, 2021, online: <https://www.justice.gc.ca/eng/declaration/about-afpropos.html>

¹⁴ *Kebaowek First Nation v Canadian Nuclear Laboratories*, 2025 FC 319.

¹⁵ See for example, *Kebaowek First Nation v Canadian Nuclear Laboratories*, 2025 FC 319; *Eskasoni First Nation v Canada (Attorney General)*, 2024 FC 1856; *Trans Mountain Pipeline ULC, Re*, 2023 CarswellNat 4148; and *NorthRiver Midstream NEBC Connector GP Inc., Re*, 2023 CarswellNat 4057.

deep engagement between decision bodies and Indigenous people occurs, including good faith consultation and cooperation, and meaningful and effective participation in decision-making processes.¹⁶

Project proponents do not hold the constitutional duty to consult. However, consultation with potentially impacted Indigenous groups is often key to moving projects forward in a timely manner, and procedural aspects may be delegated to proponents or boards/tribunals.

In this case, it is our understanding that Real Ice has engaged deeply with EHTO and has worked closely with EHTO to develop the project, including selecting the Project location and refining equipment. In addition, the NIRB process also notifies potentially impacted Indigenous groups about the project, receives and considers comments, and makes its recommendation based on these comments and other considerations.

As a result, based on our understanding of the Project and the engagement that has occurred, we do not have concerns about violations of UNDRIP.

OTHER CONSIDERATIONS

USE OF DRONES

In Canada, drones weighing more than 250 grams are required to be registered and the operator must have a drone pilot certificate. The weight of the drone does not include the remote but does include anything attached to the body of the drone, such as a camera.¹⁷

Real Ice has confirmed that their drone(s) are registered (and registration will be renewed as applicable) and two members of the team have a basic operations certificate for flying a drone up to 25kg within line of sight.

VIDEO FOOTAGE

Video footage of wildlife and people must not be collected without first notifying the Nunavut Film Development Corporation.

Video documentation of wildlife may also require permission from the Government of Nunavut's Department of Environment.¹⁸

1396-0928-6682, v. 1

¹⁶ *Ibid* at paras 96-97, 119, 122, 128, and 131.

¹⁷ For more information about drone requirements, please see the following resources [here](#) and [here](#).

¹⁸ See page 13 of the NRI's [License Application Guidelines](#), dated May 2025.

Annex 5: Arctic Reflections | Independent Legal Assessment

As part of ARIA's commitment to responsible research, the Exploring Climate Cooling programme requires that all outdoor experiments be subject to an environmental and legal assessment, which is made publicly available.

Nunavut has an established permitting process for scientific research, coordinated by the Nunavut Research Institute (NRI). As part of this, the Nunavut Impact Review Board (NIRB) undertakes an assessment (a "screening report") of the proposed project's potential socio-economic, environmental, and ecosystem impacts. The screening report therefore fulfils ARIA's requirements for an independent pre-experiment environmental impact assessment in that it recommends the conditions under which the research project can take place, or if further assessment is required. The screening report is made available on NIRB's website for public comment, and various relevant bodies are contacted for input.

In the case of **Arctic Reflections** — a sub-team conducting outdoor experiments near Qikiqtarjuaq, Nunavut, within the wider Re-thickening Arctic Sea Ice (RASi) project — following the publication of the NIRB's Screening Decision Report recommending that the project be approved, the formal NRI scientific research licence (#01 008 26N-M) for their experiment was granted on January 15 2026.

Following review of the RASi project by the independent Oversight Committee, ARIA's CEO mandated an independent assessment to confirm that the Real Ice sub-team's plans complied with all relevant laws, regulations, and permitting requirements, including those relevant to Indigenous rights as set out in the UN Declaration of the Rights of Indigenous Peoples.

The independent assessment, completed on January 29, 2026 by Willms & Shier Environmental Lawyers LLP, concluded that Arctic Reflections obtained the required permits, licences, and approvals to proceed with the project commencing in February 2026. Specifically, the review confirmed:

- The project does not overlap with National Wildlife Areas or Migratory Bird Sanctuaries, nor will it significantly impact Species at Risk.
- Deep consultation with the local Qikiqtarjuaq Hunters and Trappers Association (QHTA) played a significant role in forming the scope of the project, including selecting the study area location and informing the timing of activities to minimise environmental impacts.

- The project's engagement with the QHTA and the NIRB process is consistent with the interpretation and application of the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) in Canada.

In their assessment, Willms & Shier identified several operational considerations for the project team. ARIA's programme team worked directly with Arctic Reflections to ensure these were fully resolved or integrated into their operational plans:

- **Equipment modification (Transport Canada):** The original project proposal included the use of flotation devices for summer monitoring. Following feedback submitted to NIRB by Transport Canada, Arctic Reflections altered the project scope to remove these flotation devices. All equipment will now be fully recovered prior to the summer ice melt, meaning no further Transport Canada permits or notices are required for navigable waters.
- **Land-based operations boundary:** The legal review confirmed that all land-based operations supporting the project (such as equipment maintenance and re-fueling) are strictly limited to the Hamlet of Qikiqtarjuaq. This ensures activities do not inadvertently encroach onto Inuit Owned Lands, which would trigger separate permitting requirements with the Qikiqtani Inuit Association (QIA).
- **Drone and video compliance:** The team has been made aware of, and must comply with, Transport Canada regulations regarding drone registration and pilot certification, as well as local requirements to notify the Nunavut Film Development Corporation before collecting any video footage of wildlife or people.
- **Licence validity:** The team's current NRI Scientific Research License is valid until December 31, 2026, and the team understands it must be formally renewed prior to any fieldwork in the 2027 research season.

The full independent legal assessment provided by Willms & Shier Environmental Lawyers LLP is available below.

Memorandum Privileged and Confidential

To: Mark Symes, Advanced Research Invention Agency (“ARIA”)
From: Willms & Shier Environmental Lawyers LLP (“Willms & Shier”)
Date: January 29, 2026
File: 11265
Re: Review of Permitting Requirements for Arctic Reflections

1 BACKGROUND

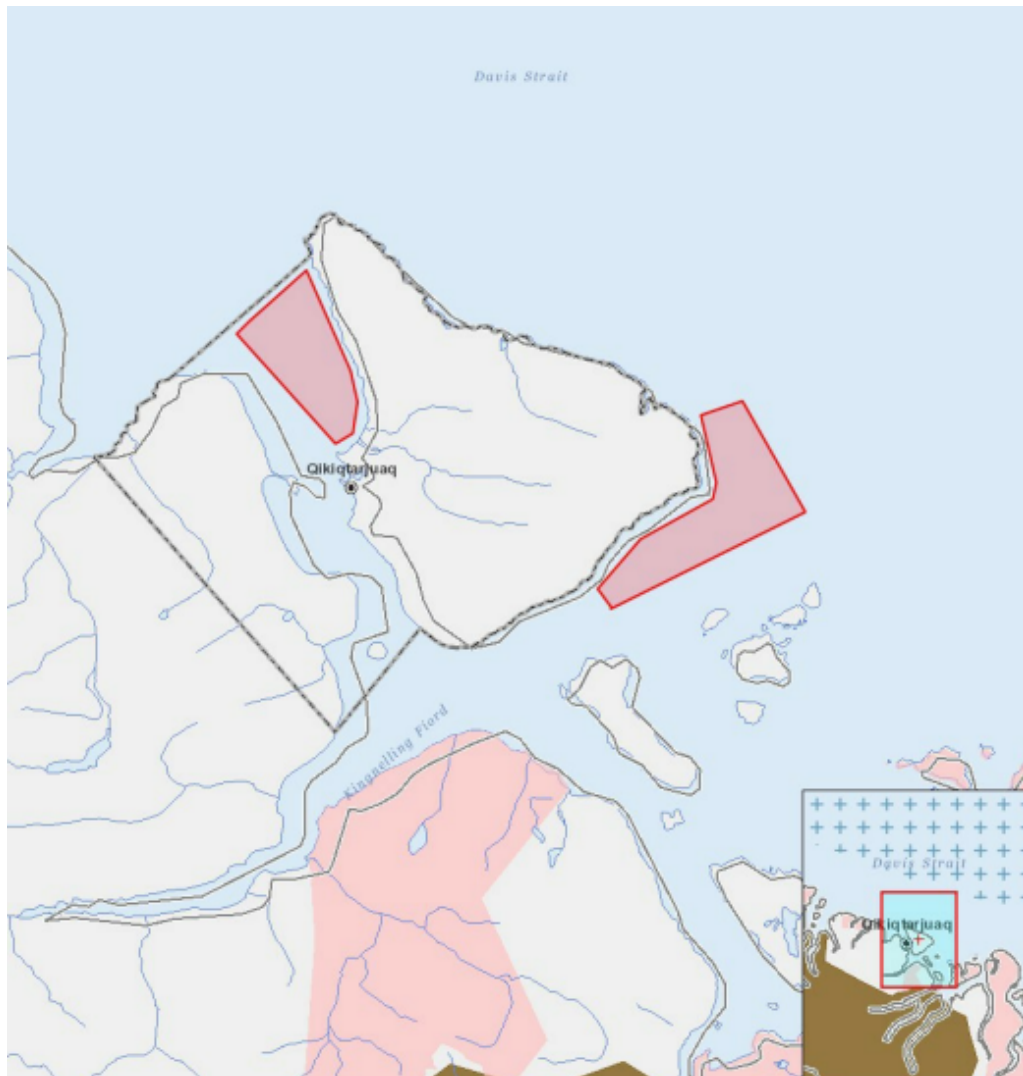
Arctic Reflections is conducting an ice thickening field test near Qikiqtarjuaq, Nunavut (the “Project”). ARIA has asked Willms & Shier to ensure that Arctic Reflections has the requisite permits to proceed with the Project as proposed.

Arctic Reflections intends to begin the Project in February 2026.

2 PROJECT INFORMATION

Arctic Reflections has undertaken prior small-scale studies in Svalbard, Norway, and subsequent larger scale studies in Newfoundland & Labrador Canada to evaluate ice thickening as a potential method for increasing Arctic sea ice resilience. These studies examined the impacts and effectiveness of ice thickening, a process in which seawater is pumped onto the ice surface during winter, where it refreezes and increases ice thickness and durability during the warmer summer months. The Project will be Arctic Reflections’ first study conducted in Nunavut.

Arctic Reflections has selected a study area outside the Hamlet of Qikiqtarjuaq, Nunavut on the frozen waters of the Davis Strait and immediately off the coast of Boughton Island (the “Study Area”).



Arctic Reflections plans to commence the operational phase of the Project in February 2026 including set up, pumping, and clean up over a 4–5 week period. Afterwards, all equipment will be recovered prior to the summer melt of sea ice. The same process is set to repeat in 2027.

The Project will be carried out by two crews of 5–8 researchers who will use snowmobiles and sleds to transport pumps and monitoring equipment to the Study Area. The researchers will then drill holes to pump sea water and install monitoring equipment to monitor ice thickness on both the pumped and non-pumped portions of the Study Area. Monitoring equipment consists of smart sensors and weather stations. Researchers will travel to and from the study area along the same path to minimize their environmental footprint and avoid disturbing wildlife. Refueling and maintenance of equipment is set to occur exclusively in the Hamlet of Qikiqtarjuaq and not on the sea ice.

Arctic Reflections have also hired local guides and wildlife monitors to assist with the day-to-day operations of the Project and have committed to partnering with the local community. We understand that consultation with the Qikiqtarjuaq Hunters and Trappers Organization (“QHTO”) has played a significant role in forming the scope of the Project and location of the Study Area.

Arctic Reflections will share the final research results and provide regular updates to the community including a series of engagement meetings at the outset and conclusion of the project.

3 CONCLUSIONS

Based on our understanding of the Project, as set out above, and review of relevant permitting requirements, Arctic Reflections has obtained the required permits, licences and approvals to proceed with the Project commencing on February 1, 2026. On January 12, 2026, Arctic Reflections received NIRB’s Screening Decision Report (the “NIRB Report”) which recommended to the Minister with decision-making authority that the project be approved.¹ On January 15, 2026, the Minister accepted NIRB’s recommendation to approve the Project, and the Nunavut Research Institute (“NRI”) issued scientific research licence number 01 008 26N-M to Arctic Reflections (the “NRI Scientific Research License”).² The NRI Scientific Research License represents the final stage of the permitting and approval process to commence scientific research in Nunavut.

From our review of the documents provided, Arctic Reflections has engaged with the local Inuit community including the Qikiqtarjuaq Hunters and Trappers Association (“QHTA”). Arctic Reflections has also completed the NIRB review process which provides opportunities for Inuit communities and individuals to participate in the decision-making process, consistent with the Nunavut Agreement and more generally with the interpretation of UNDRIP in Canada.

A full review of the permitting and engagement requirements is set out in **Appendix A** to this memorandum. Our review is based on the facts and assumptions set out in the documents provided, if you are aware of different facts or assumptions, please let us know immediately as this will impact our assessment.

¹ Letter from Albert Ehaloak, Chairperson of the NIRB, to the Honourable David Akeeagok, Minister Responsible for the Nunavut Arctic College, regarding Screening Decision for Arctic Reflections’ ‘Arctic Ice Thickening Field Test Qikiqtarjuaq’ Project Proposal, Qikiqtani Region, January 12, 2026. [the “NIRB Report”] Provided to our office January 13, 2026.

² Nunavut Research Institute Scientific Research License issued to Tom Meijeraan of Arctic Reflections by James Shirly of the Nunavut Research Institute, dated January 15, 2027.

4 RECOMMENDATIONS

- 1 During NIRB’s review of the Project, Transport Canada issued one comment prior to the conclusion of the comment period on December 1, 2025.

Transport Canada’s comment to NIRB stated that the use of flotation devices in the summer months “may require an approval under the *Canadian Navigable Waters Act* (“CWNA”)", and to review Transport Canada’s self assessment tool to determine if prior approval is required. The full comment submitted to NIRB by Transport Canada is attached as Appendix B to this memorandum.

While not a permit, there are notice requirements to Transport Canada for the use of the monitoring and measurement devices in navigable waters. If flotation devices are used, Arctic Reflections should provide the notification to Transport Canada and confirm to ARIA that this has been completed.

On January 5, 2026, Arctic Reflections confirmed that they responded to Transport Canada’s comment to NIRB with information that the Project will no longer proceed with the use of flotation devices to monitor ice melt. Instead, all equipment will be removed prior to ice melt.³ Arctic Reflections was verbally told by Transport Canada that Arctic Reflections will be contacted if further action is required. To our knowledge no further contact has been made by Transport Canada to date. Subject to further communications from Transport Canada, no further action regarding Transport Canada notices and/or permits are required at this time.

- 2 The Project has received a recommendation for approval from NIRB, subject to a series of terms, conditions, and recommendations set out in the NIRB Report.⁴ The NIRB terms and conditions have been incorporated by reference into the terms and conditions of the NRI Scientific Research License. Further, the NRI Scientific Research License also incorporates the Department of Culture & Heritage archeological sites terms and conditions by reference, however these terms and conditions are not relevant to the Project as it is currently described. We have reviewed the foregoing terms, conditions and recommendations and have not identified any areas of concern with respect to the Project’s current scope. Arctic Reflections should review and observe the NIRB Report to ensure ongoing compliance with all applicable terms, conditions and recommendations contained therein.

³ Email from Fonger Ypma (Arctic Reflections) to Mark Symes (ARIA) dated January 5, 2025.

⁴ The NIRB Report at p. 8-12.

- 3 Arctic Reflections has confirmed that all land-based operations necessary to support the Project will be limited to the Hamlet of Qikiqtarjuaq, Nunavut, and specifically at the Qik Research Centre, local hotels, and a community garage.⁵

We recommend that, should Arctic Reflections ever anticipate that land based operations extend onto Inuit owned lands, Arctic Reflections be aware of and prepare for the additional permitting requirements with the Qikiqtani Inuit Association (“QIA”).

- 4 The NRI Scientific Research License is valid from February 1, 2026, until December 31, 2026. Arctic Reflections must renew the NRI Scientific Research License prior to the 2027 research season.

⁵ Email from Fonger Ypma (Arctic Reflections) to Mark Symes (ARIA) dated January 16, 2025.

⁶ Section 2 of *CNWA* defines Navigable Water to include the Arctic Ocean.

APPENDIX A: PERMITTING AND ENGAGEMENT REQUIREMENTS

ANALYSIS

Based on our understanding of the Project following a review of the provided documents, we identified the following organizations/entities that may have relevant regulatory/permitting requirements.

In the table below, we review each organization and determine whether it is relevant to the Project.

Jurisdiction	Organization	Potentially Applicable Legislation	Potentially Required Permit	Applicable or Not Applicable	Comments
Federal (Canada)	Transport Canada (“TC”)	<i>Canadian Navigable Waters Act</i> <i>Arctic Waters Pollution Prevention Act</i>	Prohibition on constructing, placing, altering, removing or decommissioning a work in, on, over, under through or across any navigable water ⁶ without the appropriate approvals. Minor works are allowed in accordance with the Act. ⁷	Not applicable. Minor works requirements may be applicable to the ice monitoring devices that Arctic Reflections will be installing and leaving on the ice until the ice melts. This does not require a permit, but there are requirements in the Minor	On November 27, 2025, Transport Canada submitted a comment to NIRB stating that the use of flotation devices in the summer months “may require an approval under the CWNA”, and to review Transport Canada’s self assessment tool to determine if prior approval is required. The full comment submitted to NIRB by Transport Canada is attached as Appendix B to this memorandum. The Study Area is located on the Arctic Ocean and is defined as

⁶ Section 2 of *CNWA* defines Navigable Water to include the Arctic Ocean.

⁷ Section 39(1) of the Minor Works Order designates scientific equipment as a minor works. Section 39(2) defines scientific equipment as monitoring and measurement devices, and any associated buoys, platforms or other similar structures, installed in, on, under, through or across navigable water.

Jurisdiction	Organization	Potentially Applicable Legislation	Potentially Required Permit	Applicable or Not Applicable	Comments
				Works Order that need to be followed, including notification requirements under sections 4 and 8 of the Minor Works Order. ⁸ Arctic Reflections would also be obligated to submit a “No Interference with Navigation Notification of Work” with Transport Canada Based on our	navigable waters under the CWNA. ⁹ The use of flotation devices in navigable waters requires coordination with Transport Canada’s navigation Protection Program. The placement of scientific equipment in navigable waters does not necessitate a permit with Transport Canada, if the placement of scientific equipment is unlikely to interfere with navigation. If approval is not required, Arctic Reflections is obligated to submit a “No Interference with Navigation Notification of Work” with Transport Canada. ¹⁰

⁸ Canadian Navigable Waters Act, [Minor Works Order](#).

⁹ Navigable water means a body of water, including a canal or any other body of water created or altered as a result of the construction of any work, that is used or where there is a reasonable likelihood that it will be used by vessels, in full or in part, for any part of the year as a means of transport or travel for commercial or recreational purposes, or as a means of transport or travel for Indigenous peoples of Canada exercising rights recognized and affirmed by section 35 of the Constitution Act, 1982 (s. 2 *CNWA*).

¹⁰ Transport Canada’s notification requirements for owners of work in navigable waterways will include posting information in locations, such as, community centers, marinas, or local newspapers. These notifications will direct people to the registry for more information about the works and invite interested persons to provide written comments on the owner’s proposal within 30 days. Owners of works considered to have no interference with navigation will be required to post information as well but will not be required to entertain comments.

Jurisdiction	Organization	Potentially Applicable Legislation	Potentially Required Permit	Applicable or Not Applicable	Comments
				understanding of the Project, no obstructions or interference with navigation will occur at the Study Area once ice melt occurs.	Arctic Reflections has altered the scope of the Project to no longer utilize flotation devices in navigable waters. Subject to further communications from Transport Canada, no permits and/or notices are required at this time. ¹¹
	Environment and Climate Change Canada (“ECCC”)	<i>Species at Risk Act</i> – (administered both by ECCC and DFO)	Need approval to undertake activities which may affect species listed on Schedule 1 of the Act. <i>Species at Risk Act</i> Permits (“SARA Permit”) are required by those persons conducting activities that may affect species listed on Schedule 1 of the <i>Species at Risk Act</i> .	Not applicable. Based on our understanding of the Project. The Project will not affect significantly impact Schedule 1 species	ECCC did not submit comments during NIRB’s commenting period of the Project. Consultation with QHTA has informed the timing of the Project and location of the Study Area to minimize impacts on local wildlife. It is acknowledged that noise from the project may impact aquatic life in the area. Part of the Project’s mandate is to determine the extent, if any, ice thickening has on local wildlife.

¹¹ Email from Fonger Ypma (Arctic Reflections) to Mark Symes (ARIA) dated January 5, 2025.

Jurisdiction	Organization	Potentially Applicable Legislation	Potentially Required Permit	Applicable or Not Applicable	Comments
					<p>It is our understanding the Project’s impacts are nominal and do not require a SARA Permit.</p> <p>Arctic Reflections should continue monitoring potential impacts to schedule 1 species reassess whether a SARA permit is required in the future.</p>
	Canadian Wildlife Service (“CWS”)	<p><i>Canada Wildlife Act</i></p> <p><i>Migratory Birds Convention Act</i></p>	Need permit if engaging in certain activities in a National Wildlife Area (“NWA”) or Migratory Bird Sanctuary (“MBS”).	<p>Not applicable.</p> <p>Based on our understanding of the Project, there are no NWAs or MBSs that overlap with the Study Area.</p>	<p>Qaulluit National Wildlife Area is relatively close to Qikiqtarjuaq along the eastern coast of Baffin Island but is out of the main Study Area.¹²</p> <p>Arctic Reflections should ensure that that their operations and travel remain outside the boundaries of the Qaulluit National Wildlife Area.</p> <p>A map depicting the boundary of the Qaulluit National Wildlife Area is at <u>Appendix C</u> to this memorandum.</p>

¹² NWAs and MBSs can be viewed on this [map](#) and this [map](#).

Jurisdiction	Organization	Potentially Applicable Legislation	Potentially Required Permit	Applicable or Not Applicable	Comments
	Fisheries & Oceans Canada (“DFO”)	<i>Fisheries Act</i> <i>Oceans Act</i>	A licence is required to fish/collect fish, cetaceans, or marine mammals for scientific purposes. Authorization is required to disturb marine mammals. The <i>Oceans Act</i> establishes Marine Protected Areas.	Not applicable. The Project does not include the study and/or collection of fish and/or marine mammals. It is also our understanding that the Project will not disturb marine mammals or fish. No Marine Protected Areas are	The only Marine Protected Area in Nunavut is the Tuvaijuittuq Marine Protected Area, located in the marine waters off the northwest coast of Ellesmere Island. ¹³

¹³ List of [Marine Protected Areas](#).

Jurisdiction	Organization	Potentially Applicable Legislation	Potentially Required Permit	Applicable or Not Applicable	Comments
				within the Study Area.	
	Parks Canada (“PC”)	<p><i>Canada National Parks Act</i></p> <p><i>Canada National Marine Conservation Areas Act</i></p>	A permit is required if engaging in certain activities in a National Park and/or Marine Conservation Area.	<p>Not applicable.</p> <p>No National Parks or Marine Conservation Areas directly overlapping the Study Area.</p>	<p>Auyuittuq National Park is close to the Study Area, and directly inland from Qikiqtarjuaq.</p> <p>Arctic Reflections should be aware of the proximity of the Project and be aware that there are additional implications for conducting research in directly in Auyuittuq National Park.</p> <p>A map of Auyuittuq National Park in relation to the Study Area is included in Appendix D to this memorandum</p>
	Crown Indigenous Relations & Northern Affairs Canada (“CIRNAC”)	<i>Constitution Act, 1867 (Section 91(24))</i>	A land use permit is required for certain activities on Federal Crown Land, including fuel storage and the establishment of fieldwork campsites used for more than 100 days.	<p>Not applicable.</p> <p>The Study Area, is on sea ice, not Federal Crown Land.</p>	<p>CIRNAC regularly comments on projects before NIRB relating to a project’s impact on crown-indigenous relations.</p> <p>CIRNAC has not commented or expressed concern with the Project as of the</p>

Jurisdiction	Organization	Potentially Applicable Legislation	Potentially Required Permit	Applicable or Not Applicable	Comments
					date of this memorandum.
Territorial (Nunavut)	Government of Nunavut	<i>Wildlife Act s. 117 (Wildlife Research & Observation)</i>	Wildlife Research License. Wildlife Observation License. (Issued by the Department of Environment)	Not applicable. Based on our understanding of the Project, no research or organized observation of wildlife will be conducted.	Based on our understanding of the project, Arctic Reflections will not engage in activities that require a Wildlife Research License or a Wildlife Observation License.
		<i>Umbrella Inuit Impact and Benefit Agreement for Territorial Parks in Nunavut Settlement Area</i>	A Territorial Parks Permit is required for any research activities taking place in a Territorial Park.	Not applicable. There are no Territorial Parks within the Study Area.	
	Nunavut Planning Commission (“NPC”)	<i>Nunavut Agreement (Article 11)</i> <i>Nunavut Planning and Project Assessment</i>	The NPC is the gatekeeper for all project proposals. All activities proposed in Nunavut must first be submitted to the NPC for	Applicable. The Project must be submitted to the NPC.	Arctic Reflections submitted a project proposal to NPC on August 12, 2025 and is filed on the NPC public registry as File No. 150895. The study area was later amended at the

Jurisdiction	Organization	Potentially Applicable Legislation	Potentially Required Permit	Applicable or Not Applicable	Comments
		<i>Act</i>	<p>review.</p> <p>Proponents of projects must submit a project proposal to the NPC to determine whether the project conforms to the requirements of any approved land use plans, and if so, whether the project type is exempt from the requirement for screening by NIRB.</p>		<p>recommendation of the Qikiqtarjuaq Hunters and Trappers Association, resulting in a new proposal submission to the NPC on October 17, 2025. The most and is posted on the NPC Public Registry as file no. 150932.</p> <p>The NPC “has determined that this project proposal is outside the area of an applicable regional land use plan”</p> <p>This project has been reviewed by the NPC and does not require further NPC approval and has been forwarded to NIRB for screening.</p>
	Nunavut Impact Review Board (“NIRB”)	<p><i>Nunavut Agreement (Article 12)</i></p> <p><i>Nunavut Planning and Project Assessment Act</i></p>	<p>NIRB only screens project proposals which have been referred to it by the NPC.</p> <p>NIRB has jurisdiction to conduct impact assessments on project proposals</p>	<p>Applicable.</p> <p>Screening of the Project by NIRB is required.</p>	<p>On September 10, 2025, NIRB began screening application number 126230 from Arctic Reflections. Screening for this application was subsequently cancelled as a result of material changes to the application.</p>

Jurisdiction	Organization	Potentially Applicable Legislation	Potentially Required Permit	Applicable or Not Applicable	Comments
			<p>within the land and marine areas of the Nunavut Settlement Area.</p> <p>NIRB will conduct a screening of the proposed project to determine if a full environmental review is required.</p> <p>Upon conclusion of the screening process, NIRB provides its written report to the responsible Minister stating whether a full environmental review is required.</p> <p>If a review is not required, NIRB can recommend specific terms and conditions that apply in respect of the project.</p>		<p>On November 6, 2025, NIRB began screening Arctic Reflections updated application number 126244. The commenting period concluded on December 1, 2025. NIRB received one comment during the comment period from Transport Canada. A NIRB recommendation requires approval from the responsible Minister. This can be provided formally by a letter from the Minister, or is assumed if the Minister does not provide a response within 15 days.¹⁴</p> <p>On January 12, 2026, NIRB issued a recommendation to the Minister that the Project be approved.</p> <p>Arctic Reflections has successfully completed the NIRB review process and must</p>

¹⁴ Section 93(3) of the *Nunavut Planning and Project Assessment Act*.

Jurisdiction	Organization	Potentially Applicable Legislation	Potentially Required Permit	Applicable or Not Applicable	Comments
					comply with the terms, conditions and recommendations contained in the NIRB Report provided to the Minister.
	Nunavut Arctic College/Nunavut Research Institute (the science division of Nunavut Arctic College) (“NRI”)	<i>Scientists Act</i>	<p>NRI licences are required for all scientific research in Nunavut.</p> <p>The <i>Scientists Act</i> prohibits scientific research in Nunavut without first obtaining a licence from a Science Advisor.¹⁵</p> <p>A Scientific Research License is required for research in Nunavut in the health, social sciences, or natural/physical sciences disciplines.</p> <p>The licence applies to research</p>	<p>Applicable.</p> <p>Arctic Reflections must obtain a Scientific research License from NRI as Arctic Reflections is conducting research within the natural and physical sciences discipline.</p> <p>NRI only issues a research licence after a proponent obtains the requisite permits and approvals.</p>	<p>Arctic Reflections has successfully obtained a Scientific Research License Number 01 008 26N-M from the NRI on January 15, 2026. The terms and conditions contained in the NIRB Report have been incorporated by reference into the terms and conditions of the NRI Scientific Research License. Arctic Reflections must observe and comply with these terms and conditions to maintain the validity of the NRI Scientific Research License. The NRI Scientific Research License has also incorporated by reference the Department of Culture & Heritage archeological sites terms and conditions.</p>

¹⁵ *Scientists Act* at s. 3.1.

Jurisdiction	Organization	Potentially Applicable Legislation	Potentially Required Permit	Applicable or Not Applicable	Comments
			<p>regarding Nunavut’s air, land, water and people.</p> <p>NRI does not licence research on wildlife (plants, fish, birds and marine/terrestrial wildlife).</p>		<p>These terms are standard and do not conflict with Project as currently described.</p> <p>The NRI Scientific Research License is only valid until December 31, 2026, and must be renewed prior to continuing research in Nunavut for the 2027 season.</p>
	Nunavut Water Board (“NWB”)	<p><i>Nunavut Agreement</i> (Article 13)</p> <p><i>Nunavut Waters and Nunavut Surface Rights Tribunal Act</i></p>	The NWB regulates the use of water and deposit of waste in freshwater in Nunavut (inland water). Permits and approvals are required.	<p>Not applicable.</p> <p>The Project is located offshore, in a marine area not governed by the NWB.</p>	The stated mandate of the NWB “grants powers over the use, management and regulation of inland water in Nunavut.” ¹⁶
	Nunavut Wildlife Management Board (“NWMB”)	<i>Nunavut Agreement</i> (Article 5)	The NWMB is responsible for the management of all wildlife in Nunavut. Wildlife is defined in the Nunavut Agreement as all wild terrestrial, aquatic, avian and	<p>Not applicable.</p> <p>Based on our understanding of the Project, Arctic Reflections</p>	

¹⁶ <https://www.nwb-oen.ca/about/role-and-jurisdiction>.

Jurisdiction	Organization	Potentially Applicable Legislation	Potentially Required Permit	Applicable or Not Applicable	Comments
			amphibian flora and fauna.	will not require access to marine mammals, birds, fish or plants, and are not conducting any research on wildlife.	
	Nunavut Surface Rights Tribunal (“NSRT”)	<i>Nunavut Agreement (Article 10)</i> <i>Nunavut Waters and Nunavut Surface Rights Tribunal Act</i>	The NSRT was established for the purpose of providing an independent mechanism for the resolution of disputes arising from access to surface land in Nunavut and/or claims for compensation arising from loss or damage to wildlife, carving stone or other specified substances.	Not applicable.	The NSRT relates largely to the use and access of Inuit owned land for mineral exploration and other commercial purposes. Section 15.2.3 of the <i>Nunavut Agreement</i> states that Inuit owned land does not extend to marine areas. Our understanding is that the Project takes place exclusively on in marine areas.
Regional (Qikiqtaaluk/Qikiqta)	Nunavut Tunngavik Incorporated (“NTI”)	Article 39 of the <i>Nunavut Agreement</i> NTI	Not a permitting agency. NTI was created to ensures that	Not applicable.	NTI is the overarching organization that administers the <i>Nunavut Agreement</i> and is responsible for

Jurisdiction	Organization	Potentially Applicable Legislation	Potentially Required Permit	Applicable or Not Applicable	Comments
ni)			promises made under the Nunavut Agreement are carried out. NTI coordinates and manages Inuit responsibilities set out in the Nunavut Agreement and ensures that the federal and territorial governments fulfill their obligations.		<p>protecting the rights and interests of Inuit in Nunavut.</p> <p>NTI provides financial support to the three regional Inuit associations which carry out economic development in their respective regions. The three regional development agencies are as follows.</p> <p>Arctic Reflections' Project is located Qikiqtani region and under the purview of the Qikiqtani Inuit Association.</p>
	Qikiqtani Inuit Association ("QIA")	Article 39 of the <i>Nunavut Agreement</i>	<p>QIA serves as the development board under NTI for the Qikiqtani region.</p> <p>QIA requires a permit to be filed for access to Inuit owned lands when ever someone plans to conduct commercial, research,</p>	<p>Not applicable.</p> <p>The Project takes place on sea ice.</p> <p>The Project does not take place on Inuit owned lands.¹⁷</p>	We understand that the Project is confined to marine areas. Further, we understand that land-based activities will occur in the Hamlet of Qikiqtarjuaq. The Hamlet of Qikiqtarjuaq does not consist of Inuit Owned land and is not subject to a QIA land use permit.

¹⁷ [Map of Inuit Owned Land](#), published by CIRNAC.

Jurisdiction	Organization	Potentially Applicable Legislation	Potentially Required Permit	Applicable or Not Applicable	Comments
			tourism, or certain recreational activities on Inuit Owned Lands in the Qikiqtani region.		<p>QIA only has jurisdiction over Inuit owned lands in the Qikiqtani region. The study area is not on Inuit owned land.</p> <p>If Arctic Reflections ever determines that their land base activities extend outside the Hamlet of Qikiqtarjuaq and on to Inuit Owned Lands a permit may be required. Even minimal use of Inuit Owned Lands may require a submission of an Application for Access to Inuit Owned Land, along with payment of the requisite fee(s).</p> <p>In the documents provided to our firm, Arctic Reflections has stated that permitting and/or approvals from QIA are not required for this project.</p>
	Qikiqtaaluk Wildlife Board (“QWB”)	<i>Nunavut Agreement</i> (Article 5)	The QWB manages harvesting of wildlife in the Qikiqtaaluk	Not applicable. Based on our understandin	The regional Wildlife Boards primarily regulate hunting and trapping activities in their respective areas.

Jurisdiction	Organization	Potentially Applicable Legislation	Potentially Required Permit	Applicable or Not Applicable	Comments
			Region. The QWB consists of the chairpersons from each of the region's Hunter and Trapper Association member.	g of the Project, the Project does not involve hunting or trapping.	
	Qikiqtarjuaq Hunters and Trappers Association ("QHTA")	<i>Nunavut Agreement</i> (Article 5)	<p>QHTA is the Hunters and Trappers Association for Qikiqtarjuaq.</p> <p>QHTA regulates harvesting practices and techniques among its members, among other things.</p> <p>The QHTA is consulted on projects during co-management processes in the region.</p>	<p>Not applicable.</p> <p>While there are no permits required from QHTA to conduct the Project, QHTA's support of the project is integral to gaining other required approvals and to show adequate consultation and accommodation has occurred with potentially impacted</p>	<p>QHTA is identified as a potentially impacted group as it relates to the Project. QHTA's input and participation is important for NIRB review and process.</p> <p>It is our understanding that Arctic Reflections has engaged in thorough consultations with the QHTA to the design and implementation of the Project and Study Area.</p> <p>Arctic Reflections resubmitted their proposal with the NPC and subsequently initiated a new proposal with NIRB because of inputs from QHTA. Specifically, the Study Area was altered and refined based on input</p>

Jurisdiction	Organization	Potentially Applicable Legislation	Potentially Required Permit	Applicable or Not Applicable	Comments
				parties.	from the QHTA.

INUIT ENGAGEMENT AND UNDRIP

In 1993, the Nunavut Land Claims Agreement (the “Nunavut Agreement”) was signed as a modern treaty between Nunavut Inuit, represented by the Tungavik Federation of Nunavut, and the Government of Canada. It is the largest land claims settlement in Canadian history and led to the creation of Nunavut in 1999 and the Government of Nunavut.

The Nunavut Agreement established the Nunavut Settlement Area and various institutions of public government (i.e., co-management boards).

On June 21, 2021, the federal *United Nations Declaration on the Rights of Indigenous Peoples Act* (“UNDA”) received Royal Assent and immediately came into force. The purpose of UNDA is to affirm the United Nations Declaration on the Rights of Indigenous Peoples (“UNDRIP”) as an international human rights instrument that can help interpret and apply Canadian law. UNDA also provides a framework to advance implementation of UNDRIP at the federal level.¹⁸

UNDA requires that the Government of Canada, in consultation and cooperation with Indigenous peoples, “take all measures necessary to ensure the laws of Canada are consistent with the Declaration, prepare and implement an action plan to achieve the Declaration’s objectives, table an annual report on progress to align the laws of Canada and on the action plan”.¹⁹

¹⁸ Government of Canada, “Backgrounded: United Nations Declaration of the Rights of Indigenous Peoples Act”, last modified December 10, 2021, online: <https://www.justice.gc.ca/eng/declaration/about-afpropos.html>.

¹⁹ Government of Canada, “Backgrounded: United Nations Declaration of the Rights of Indigenous Peoples Act”, last modified December 10, 2021, online: <https://www.justice.gc.ca/eng/declaration/about-afpropos.html>.

The Government of Canada states in a backgrounder that UNDA:

- ♦ only imposes obligations on the federal government. It is intended to create a framework to support the Government of Canada to further implement the Declaration, and
- ♦ affirms that the Declaration is a universal international human rights instrument with application in Canadian law. This means that the Declaration is an important source to interpret provincial and federal law.²⁰

As a result of UNDA, UNDRIP has application in Canadian law. The Federal Court has confirmed that UNDRIP is part of Canadian law and must be used to interpret Canadian law.²¹ A number of provinces and territories in Canada have also enacted their own UNDRIP legislation. Nunavut has not enacted its own UNDRIP legislation.

How UNDRIP is ultimately interpreted and applied in Canada is still subject to legal interpretation. The majority of court cases since the passage of UNDA have focused on the Crown's duty to consult and accommodate.²²

In Canada, federal and provincial decision bodies hold a constitutional duty to consult with Indigenous people. This duty to consult is enshrined in section 35 of the *Constitution Act, 1982*, and is heightened by UNDRIP. While the veto power under the 'free, prior and informed consent' provision of UNDRIP has not been interpreted to apply in Canada, UNDRIP does function to ensure that a robust process and deep engagement between decision bodies and Indigenous people occurs, including good faith consultation and cooperation, and meaningful and effective participation in decision-making processes.²³

Project proponents do not hold the constitutional duty to consult. However, consultation with potentially impacted Indigenous groups is often key to moving projects forward in a timely manner, and procedural aspects may be delegated to proponents or boards/tribunals.

²⁰ Government of Canada, "Backgrounder: United Nations Declaration of the Rights of Indigenous Peoples Act", last modified December 10, 2021, online: <https://www.justice.gc.ca/eng/declaration/about-apropos.html>.

²¹ *Kebaowek First Nation v Canadian Nuclear Laboratories*, 2025 FC 319.

²² See for example, *Kebaowek First Nation v Canadian Nuclear Laboratories*, 2025 FC 319; *Eskasoni First Nation v Canada (Attorney General)*, 2024 FC 1856; *Trans Mountain Pipeline ULC, Re*, 2023 CarswellNat 4148; and *NorthRiver Midstream NEBC Connector GP Inc., Re*, 2023 CarswellNat 4057.

²³ *Ibid* at paras 96-97, 119, 122, 128, and 131.

In this case, it is our understanding that Arctic Reflections has engaged deeply with QHTO and has worked closely with QHTO to develop the project, including selecting the Study Area and informing the timing of drilling and pumping activities to best minimize impacts to the natural environment. In addition, NIRB process also notifies potentially impacted Indigenous groups about the project, receives and considers comments, and makes its recommendation based on these comments and other considerations. It is our understanding NIRB did not receive any comments from Indigenous Groups regarding the Project or about Arctic Reflections operations in Nunavut. The deadline for comments for the Project passed on December 1, 2025.

As a result, based on our understanding of the Project and the engagement that has occurred, we do not have concerns about violations of UNDRIP.

OTHER CONSIDERATIONS

4.1.2 USE OF DRONES

In Canada, drones weighing more than 250 grams are required to be registered and the operator must have a drone pilot certificate. The weight of the drone does not include the remote but does include anything attached to the body of the drone, such as a camera.

Microdrones (i.e., drones less than 250 grams) do not need to be registered and the operator does not need a drone pilot certificate; however, they must not be operated in a reckless or negligent manner.²⁴

4.1.3 VIDEO FOOTAGE

Video footage of wildlife and people must not be collected without first notifying the Nunavut Film Development Corporation.

Video documentation of wildlife may also require permission from the Government of Nunavut's Department of Environment.²⁵

²⁴ For more information about drone requirements, please see the following resources [here](#) and [here](#).

²⁵ See page 13 of the NRI's [License Application Guidelines](#), dated May 2025.

APPENDIX B: – TRANSPORT CANADA COMMENT TO NIRB

UNCLASSIFIED / NON CLASSIFIÉ

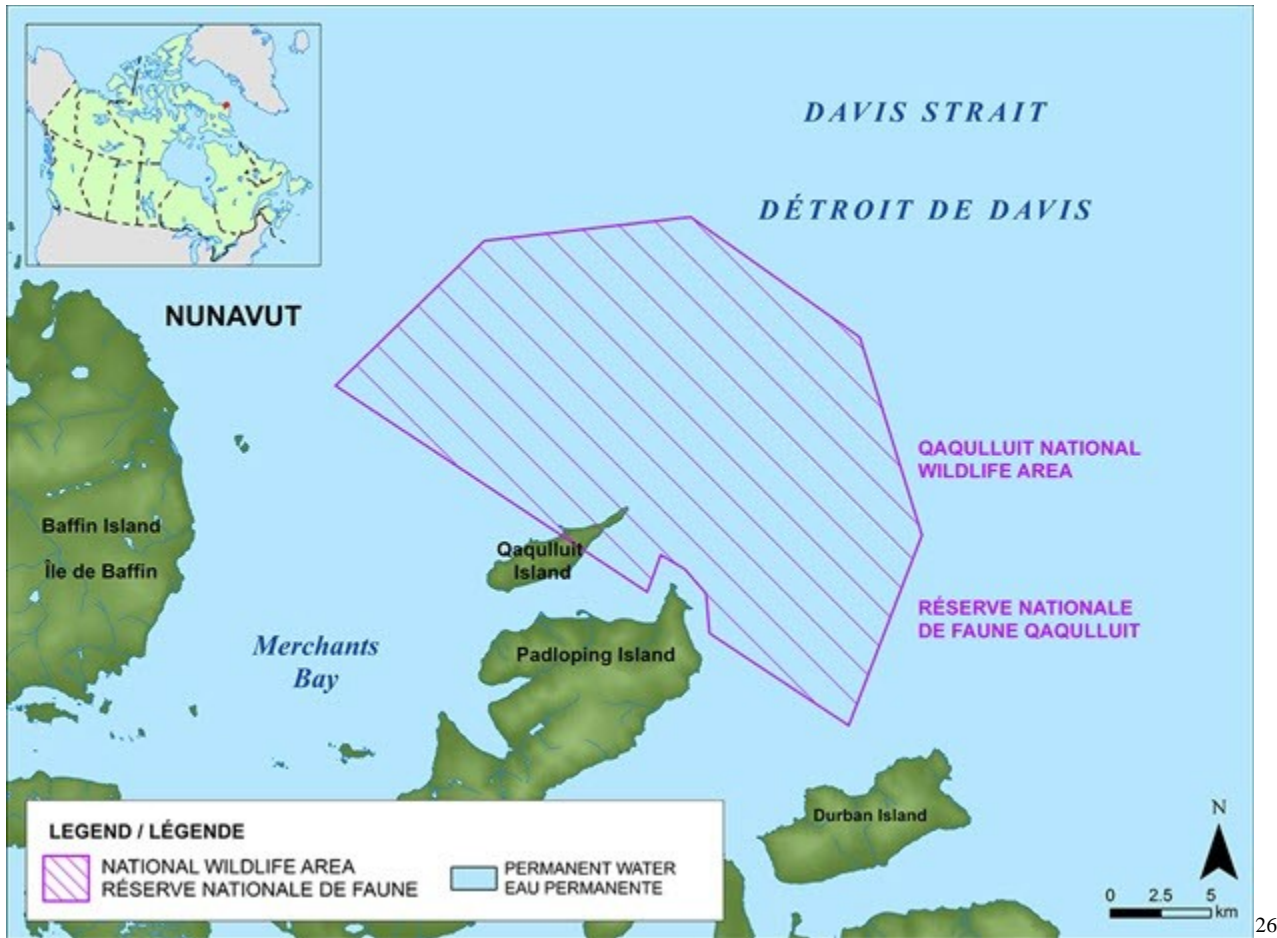


COMMENT FORM FOR NIRB SCREENINGS

The Nunavut Impact Review Board (NIRB) has a mandate to protect the integrity of the ecosystem for the existing and future residents of Nunavut. To assess the environmental and socio-economic impacts of the project proposal, NIRB would like to hear your concerns, comments and suggestions about the following project proposal application:

Project Proposal Title: <u>Arctic Ice Thickening Field Test Qikiqtarjuaq</u>	
Proponent: <u>Arctic Reflections'</u>	
Location: <u>Qikiqtani (South Baffin Region)</u>	
Comments Due By: <u>December 1, 2025</u>	NIRB #: <u>25YN078</u>
Indicate your concerns about the project proposal below:	
<input type="checkbox"/> no concerns	<input type="checkbox"/> traditional uses of land
<input type="checkbox"/> water quality	<input type="checkbox"/> Inuit harvesting activities
<input type="checkbox"/> terrain	<input type="checkbox"/> community involvement and consultation
<input type="checkbox"/> air quality	<input type="checkbox"/> local development in the area
<input type="checkbox"/> wildlife and their habitat	<input type="checkbox"/> tourism in the area
<input type="checkbox"/> marine mammals and their habitat	<input type="checkbox"/> human health issues
<input type="checkbox"/> birds and their habitat	<input type="checkbox"/> other: _____
<input type="checkbox"/> fish and their habitat	_____
<input type="checkbox"/> heritage resources in area	_____
Please describe the concerns indicated above:	
N/A	
Do you have any suggestions or recommendations for this application?	
<p>The project proposes to use two (2) floating platforms to keep scientific instruments floating when the ice starts to melt in summer. The Arctic Ocean is a navigable waterway and works in navigable waterways are subject to the <i>Canadian Navigable Waters Act</i> (CNWA) and in some cases may require an approval under the CNWA. The proponent should self-assess using the Transport Canada Navigation Protection Program (NPP)'s Project Review Tool (https://npp-submissions-demandes-pnp.tc.canada.ca/projectreview-outildexamenduprojet) to determine if the CNWA applies while the platforms are floating in open, navigable waters. The proponent should contact the NPP at NPPPNR-PPNRPN@tc.gc.ca directly for further advice.</p>	
Do you support the project proposal? Yes <input type="checkbox"/> No <input type="checkbox"/> Any additional comments?	
N/A	
Name of person commenting: <u>Holly Poklitar</u> of <u>N/A</u>	
Position: <u>Regional Env Advisor</u>	Organization: <u>Transport Canada</u>
Signature: <u>(Submitted via email)</u>	Date: <u>December 1, 2025</u>

APPENDIX C – MAP OF QAQULLUIT NATIONAL WILDLIFE AREA



²⁶ Government of Canada, *Qaqqulluit National Wildlife Area* retrieved from: <https://www.canada.ca/en/environment-climate-change/services/national-wildlife-areas/locations/qaqqulluit.html>.

APPENDIX D – MAP OF AUYUITTUQ NATIONAL PARK



Parks Canada map of Auyittuq National Park. Red highlights proximity to the Study Area.²⁷

1414-6709-8394, v. 4

²⁷ Parks Canada, Canadian Geographical Names Database (CGNDB), retrieved from: https://geonames.nrcan.gc.ca/search-placenames/unique?id=OAUQK&_gl=1*1pw8f6b*_ga*MTA1NTQyODg0MC4xNzYxMTYzMjcjz*_ga_C2N57Y7DX5*cze3NjYwNjMwMjIkbzmkZzAkdDE3NjYwNjMwMjIkaYwJGwwJGgw.

Annex 6: Exploring Climate Cooling | Community Engagement

Exploring Climate Cooling: Engagement flow

This is an outline for the engagement process. Teams will tailor their approach to the experiment, location and community.

Phase 1: Technical design + pre-site selection

Includes scoping technical details of the experiment and initial outreach to key stakeholders.

- Teams define all technical, scientific and logistical requirements for the experiment.
- They begin initial outreach with key stakeholders in potential sites, including land owners, local authorities and relevant public bodies.
- They identify any permits or permissions required.
- They begin to identify opportunities for co-design and collaboration, and develop materials describing the experiment ready for sharing.

As a result, teams will:

- Update their experiment design.
- Identify required permits or permissions.
- Identify potential experiment sites, but no decision is made yet.

Phase 2: Engagement + Impact Assessment

Includes community engagement + co-design, Environmental Impact Assessment conducted and published.

- Teams deliver in-person events and activities around potential site(s). These may take place in community, educational, civic and third spaces and will be (co-)designed around the needs of the community and with the support of key stakeholders. At these events, teams will:
 - Introduce themselves.
 - Share their plans and research aims.
 - Engage in active and inclusive listening and two-way dialogue.
 - Develop the experiment design collaboratively with the community.
 - Collect and consider public views.
- Teams will undertake an independent Environmental Impact Assessment (EIA) and legal assessment, and share findings with the community for feedback.

- The community will have an opportunity to co-design the experiment in response to previous engagement (including the EIA).
- Teams will apply for and receive all permits and approvals and share them publicly.

As a result teams will:

- Update experiment design to address feedback and developments from the community.
- Publish the EIA.

Phase 3: Dual scrutiny

Includes scrutiny from ARIA and the independent Oversight Committee.

- ARIA's leadership and Oversight Committee review experiment plans, and scrutinise level of community engagement (conducted and ongoing).
- Oversight Committee recommendation and ARIA leadership decision published.
- Teams address any additional requirements or assurances requested during the scrutiny process.
- Summary of community engagement and feedback published.

As a result teams will:

- Seek formal approval for the experiment and location.

Phase 4: Experiment begins

If approved, includes preparation of, conduction of, and communication about the experiment.

- Technical and logistical preparation of the experiment and ongoing community engagement activity is prepared.
- Full details explaining the experiment, research aims and project activity to date are shared with the wider public. These will be in a range of accessible formats, and where possible will invite further response and engagement.
- The experiment begins. The community and wider public have ongoing opportunities to view the experiment and stay informed and involved.
- Ongoing environmental monitoring during the experiment ensures it is halted if any unexpected impacts are observed.

As a result teams will:

- Conduct the experiment and share the process publicly.

Phase 5: Experiment concludes

Includes all findings and data being shared with the community and wider public.

- The team concludes engagement with the community through in-person activities to share findings and answer any further questions.
- Final experiment results and data published, alongside accessible summaries. Results shared in scientific journals, and publicly.

As a result teams will:

- Conclude the experiment, and share the process and results publicly.