APPLYING “ALL REASONABLE EFFORT” IN THE FALKLAND ISLANDS MINE CLEARANCE PROGRAMME: Encouraging Efficient, Confident, and Timely Evidence-Based Land Release Decision Making

By David Hewitson and Guy Marot [Fenix Insight Ltd.]

The Falkland Islands Mine Clearance Programme (FIMCP) ran from 2009 to 2020, through five operational phases, some lasting only a few months, some extending across several years. A core objective was to release land as efficiently as possible, only applying technical assets to those specific areas of land that justified such attention. This article describes the approach that was adopted to determine whether all reasonable effort (ARE) had been applied to each task in such a way that current (and future) stakeholders would have confidence in that decision so as to manage the fear of mines being missed.

Two organizations were contracted by the UK government to deliver the FIMCP: the land release contractor (LRC), most recently SafeLane Global; and the demining program office (DPO) provided by Fenix Insight Ltd.1 Additionally, a strategic adviser (Alistair Craib) provided advice, oversight, and contracting input. Around 20,000 anti-personnel (AP) and 5,000 anti-vehicle (AV) mines were declared as laid at the time of the 1982 conflict. In addition to explosive remnants of war (ERW) resulting from ground fighting, naval bombardment, and the abandonment of ammunition, a submunition threat was also present. Some military clearance took place in the immediate aftermath of the conflict but was stopped following a number of accidents to clearance personnel. From 2009 to the declaration of completion at the end of 2020, the FIMCP released over 23 million m² from 127 hazardous areas, clearing over 11,000 landmines within 2.3 million m² of cleared ground.

Contractual and Stakeholder Expectations

When the program started in 2009, there was both a contractual requirement to exceed the International Mine Action Standards (IMAS) and a high level of uncertainty among local stakeholders who feared that mines would be missed, deminers would die, and the environment would be unacceptably damaged by clearance operations. All three fears expressed by locals were addressed during the first phase of operations through a combination of thorough processes and procedures, a high level of transparency, engagement of local environmental stakeholders, and a program of public visits to working sites to demonstrate the quality and reliability of the work.

Every clearance program faces an identical fear: that mines might be missed. How this is addressed has huge implications for the cost, duration, and efficiency of program operations. The project efficiency risk is that the risk of missing mines will be addressed through the clearance of areas that don’t need it just in case. Such an approach imposes avoidable costs (often at significant levels) as well as delays, combined with stakeholder dissatisfaction, impatience, and implications for international treaty compliance. Professional, reputational, and contractual fears about missing mines are further compounded when there is additional uncertainty about legal liability. The FIMCP was contracted under English Law in a context in which criminal and civil liability, including corporate manslaughter cases, are established and often publicized.

The stated objective of the program was to release designated land by “applying all reasonable effort to ... remove all suspicion of mines/ERW ... and to reduce the remaining risk from explosive hazards to as low as reasonably practicable (ALARP).”2
ALARP and ARE are distinct but closely-related terms. They sit either side of the decision to release point in the land release process: the application of ARE to an area confirmed or suspected of containing explosive ordnance (EO) hazards should result in a residual risk that is ALARP. There are no recognized, defined criteria for what constitutes either ARE or ALARP, although guidance exists in a number of areas, including in IMAS and in UK Health and Safety Executive (HSE) publications.

The approach adopted in the Falkland Islands was based on a number of basic principles:

- The word reasonable in both ARE and ALARP indicates an expectation of logical, transparent reasoning based upon reliable evidence to support decision-making.
- The effort encapsulated in ARE is not just the physical effort of clearing land but includes enabling effort in training people, selecting and using appropriate equipment, establishing and implementing effective quality and information management systems, and using evidence to support decisions (Figure 1).
- The decision to declare that ARE has been applied and that no further activity is required before releasing the site only has value if other stakeholders agree.

The challenge, implicit within the concept of ARE, is to recognize that ARE has been applied at the earliest point in a land release task without undershooting the decision (i.e., releasing land before it is completely clear of EO hazards). The inevitable natural inclination is to overshoot—processing more land than is absolutely necessary, just to be on the safe side. In most real-world cases there is at least some uncertainty. That means that some overshoot will be unavoidable if all stakeholders are to agree with the decision. There were some sites in the Falkland Islands where large numbers of mines were present, regularly laid out, undisturbed, and fully recorded, taking the ARE decision as close to the theoretical earliest point as is realistically possible (with fewer than 10 m² cleared per mine found). Alternatively, there were others sites where there was no record, substantial changes had occurred since the conflict, and only one or two mines remained in large areas, making it much harder to assess ARE (resulting in over 15,000 m² per mine).

Figure 1. Conceptual illustration of the enabling and task level approach to all reasonable effort (ARE).

Developed by David Hewitson for the GICHD.
General Approach and Background

A lack of stakeholder confidence in released land often arises from uncertainty about why key land-release decisions were taken. Task documentation frequently consists of a disparate collection of paperwork that can be hard for an individual reader, especially one not familiar with the task, to understand holistically. Even an expert will often have significant questions when reviewing such documents about what happened and why. While everything may have made complete sense to managers on the ground at the time of the work, if the task documentation does not provide clear and accessible explanations, then later readers are left feeling unsure about what went on and why, and IMAS 07.14 defines risk as “the effect of uncertainty on objectives.” A future developer looking to use the land for a public project may determine that further technical activity is necessary just in case. Any such action diminishes, and in some cases wholly destroys the worth of the original work, with all its costs, use of resources, and physical risk.

In 2010, co-author David Hewitson worked with Bob Eaton of the Survey Action Centre to develop a process-driven approach to land release for the Tajikistan Mine Action Centre. The project included development of a core document that would tell the story of the site. The document aimed to explain:

- what EO to expect at the site (and why);
- how these expectations were reflected in the operational plan;
- what was actually found during operations; and
- what decisions were taken during operations in light of what was actually found.

Readers of the completed document should understand the task process from start to finish as a connected narrative that makes sense and leaves them confident in the decision to release the land as safe for use. Other associated documents, such as daily narrative logs, detailed mapping, quality management records, and certificates should also be available for reference where necessary. However, the site implementation plan (SIP) would be the heart of the documented explanation of what happened. The process (Figure 2) and associated documentation developed during that work was adopted in the FI MCP.

Stage 1: Tasking

In accordance with broader contractual requirements, a task order specifies the hazardous area to be processed but does not specify land release methods or any other technical details.

Stage 2: Information Collection

A fundamental part of the ARE process is identifying, accessing, and making use of all available information—not just information about the intended task site but also about the wider context of operations and contamination, including evidence from previously completed tasks. In the FI MCP, information was available from a number of sources:

- original Argentine records in Spanish created by the minelaying organizations and available for many (but not all) sites, including sketch maps, number and types of mines, among other details
- translated UK military records in English; essentially the same as the original records (although with occasional transcription errors), including additional, limited details from 1982 at those sites where UK military clearance took place, and information about clearance (usually of individual visible mines) that occurred over subsequent years
- information in published historical accounts
- information from interviews with veterans
- interviews with local people who were present before, during, and after the conflict

Further information became available as the clearance program progressed:

- comparison of what was actually found on the ground during previous clearance operations versus information in minefield records, allowing a general assessment of the reliability of records as well as results of detailed analysis (such as error brackets for distances and bearings recorded on maps)
- other lessons learned during operations
- real-world operational key performance indicators (KPIs)

Significant effort to identify and access potentially relevant information was applied by the LRC throughout the program, recognizing the importance of doing so to drive confident and credible decision-making.

Stage 3: Analysis and Planning

In addition to analysis of the expected threat type, detectability, and distribution, planning included geometric analysis of the expected arrangement of mines: in rows and panels, orientation, and separation. A key concept was that of the minimum survey target (MST): the smallest associated packet of mines defined in terms of numbers of mines, numbers of rows, separation of rows, and separation of panels. In some cases, planners might have confidence that they were looking for a combination of multiple rows of mines in several panels. In others there might be no record but evidence that, if mines were present, they would be in at least a certain quantity and arrangement (based on evidence that mines had never been laid in less than a given arrangement). On other occasions, particularly in areas that had been subject to partial historical clearance, the MST might be a single mine.

The analysis of the MST drove decisions about the width and separation of targeted technical survey (TS) lanes as well as those cases (where the MST was one or a very small number of mines) when targeted block clearance would be employed. Geometric analysis of the MST was applied to ensure confidence that any targeted TS could not go through a contaminated area without encountering at least one piece of evidence of mines present, nor could adjacent lanes go either side of a contaminated area (bracketing). In many areas the third dimension of depth was also important, reflecting the effects of peat or sand accumulation on top of the original mine contamination layer. Further analysis was conducted to identify the most appropriate areas to target during TS. Where present, records often used paces or
double paces as units of distance, bearings were taken using handheld compasses, and reference points had often disappeared or were hard to identify. Part of the ARE approach included analysis effort using reverse engineering on completion of site operations to compare the locations of actual finds, with distances and directions, against details in records. This allowed pool of error assessments during planning for subsequent tasks of where mines might be (if they were still in undisturbed rows) or had originally been (if identifying areas requiring block clearance). Moreover, the closing the loop effort was an important part of the overall approach to demonstrating the reasoning aspect of ARE decisions.

The resulting plan provided program managers, as well as those who would sign clearance certificates, with confidence that if no evidence of mines was found in an area, then it could reasonably be concluded that no mines were present. In doing so, the analysis laid the foundation for the decision-making that would take place during the operational phase to identify when ARE had been applied and when it was justified to stop operations and declare the area safe for release.

Stage 4: Initial Review

The draft plan, prepared by the LRC, was reviewed by the DPO. Any comments or questions were resolved before sign-off by both parties. The process was both transparent and represented clear liability risk sharing throughout.

Stage 5: Implementation

Implementation followed the agreed plan but with a constant review process considering the implications of new information, whether it was the discovery of mines where predicted or the absence of mines where expected. New information could reinforce confidence.
Figure 3. Example of key decisions in the field review and change log (Site SA 077). Note inclusion of environmental remediation in the effort applied at the site.

<table>
<thead>
<tr>
<th>Date of Review</th>
<th>Event/Reason for Review</th>
<th>Description/Required Changes</th>
<th>LRC Manager</th>
<th>FI DPO</th>
</tr>
</thead>
<tbody>
<tr>
<td>31 January 2018</td>
<td>Switching Decision</td>
<td>The LRC conducted a detailed review of the threat posed by mines using a combination of reconciliation against records or verification of the ground and has concluded that it is safe for deminers to switch activities from mine clearance to BAC.</td>
<td>[Signature]</td>
<td>[Signature]</td>
</tr>
<tr>
<td>3 February 2018</td>
<td>Clearance Complete</td>
<td>Having reviewed all available information the residual risk from Explosive Remnants of War including landmines is now assessed to be ALARP and that further technical survey/clearance action would not be justified.</td>
<td>[Signature]</td>
<td>[Signature]</td>
</tr>
<tr>
<td>20 February 2018</td>
<td>Remediation complete</td>
<td>All fences and posts (where appropriate) have been cleared, marking sticks and strings lifted, MMDs filled in and appropriate environmental remediation completed. No further practical activity is required.</td>
<td>[Signature]</td>
<td>[Signature]</td>
</tr>
</tbody>
</table>

in the planning assumptions or call them into question. Whenever the unfolding situation allowed refinement of the plan, or where it demanded a rethink, such considerations were documented in the Field Review and Change Log section of the SIP (Figures 3 and 4).

In each case the LRC would discuss their thinking with the DPO, and (once accepted) the decision log in the SIP would be signed by both parties. The relationship was one of cooperative independence. The DPO was prepared to ask for and review any evidence, and to question the reasoning behind decisions to ensure that whatever was captured in the record would make sense to future readers without prior knowledge of the task.

Through the logs, key decisions were captured about when it was appropriate to declare the site mine free, allowing a switch to battle area clearance (BAC) methods, as well as the point at which ARE had been applied in full. In every case, the countersignature by the DPO helped both the general credibility of the decisions and ensured that any perception of liability risk was shared between the DPO and the LRC, reducing the risk of conducting extended clearance just in case, while encouraging early and efficient completion of operations.

The LRC’s high-quality survey and mapping was a key component of the decision-making process, allowing LRC managers and DPO reviewers to see the evidence on site in a clear geographical context. Review and comparison of what was found against information in records, as well as evidence gained at previous sites, helped identify areas where missing mine drills (MMDs) were required. The SIP provided a collaborative approach to looking at what had been found, where definite or potential gaps might be present, why those gaps exist, and what the extent of any additional clearance would be to show that ARE had been applied.

Stage 6: Final Review

At the end of every task a post-completion analysis and management review were carried out and captured in the SIP. Their purpose was to close the loop between the experience gained on the specific task and the wider body of accumulated evidence-based knowledge that would feed into planning of future tasks.

The analysis and review addressed:
- results of quality assurance and quality control inspections
- results of any nonconformities, accidents, or complaints
- how reliably planning information related to what was actually found
- efficiency of switching between TS, mine clearance, and BAC activities
- identification of any new information that might call into question wider planning assumptions
- recommendations for improvement, including follow-up actions
- KPI results

**Figure 4.** Logging of a technical response to newly discovered information (SA 059).
Heavy machinery was required to work in extreme weather.

Conclusions

Some suggest that the FI MCP was easy because of the availability of records for which many other programs don't have comparable, available information sources. Although certainly true that records are helpful, for many sites in the Falkland Islands they were either unavailable or of limited use. Additionally, partial clearance immediately after the conflict left a situation of utter uncertainty. Even where records are reliable, there is still a responsibility on mine action operators to make best use of those records to drive efficiency, achieve safe release of land at the earliest possible opportunity, reduce the demands on public money, and make resources available for other work.

Throughout the FI MCP, both the LRC and DPO placed constant, rigorous emphasis on the collection and use of information to drive decision-making about when ARE had been applied in such a way that other stakeholders would understand and accept those decisions. The SIP helped program planners and monitors to focus on the task at hand. It helped them to think about what they were doing and why, and encouraged them to consider all relevant factors (enabling and on-site) that fell under the umbrella of ARE. The performance indicators captured at the end of every task provided a solid basis for the planning of both individual sites and projections for overall program progress.

Most importantly, the completed SIP provides a transparent, comprehensive record of the decisions taken and evidence associated, all the way through the task life cycle: from initial planning, to in-progress operational decision-making, to the final decision to declare

### Observations, conclusions, actions required

- **Results of quality-assurance and quality-control inspections.**
  There were no QA observations. Post clearance quality control sampling revealed no non-conformities.

- **Land release process performance (key performance indicators/ration).**
  - Average demining rate 11.12 m²/deminer/day (6hr)
  - Average efficiency 9.49²/mine
  - Average deminer day/mine 0.85 deminer days/mine
  - BAC rate 656.21 m²/deminer/day

- **Quality non-conformances, complaints, accidents.** Nil

- **Recommendations for improvement.** Nil

- **Follow-up actions arising from the review.** Nil

**Figure 5.** Extract from SIP for site SA 053, including standardized KPIs.
that ARE had been applied and the land was safe to release, to (equally
importantly) the feedback loop to support improved ARE decision-
making at later sites.

At every stage, and in every respect, the common thread in the way
that FI MCP program managers approached their task was through
reless, comprehensive, and careful collection and use of opera-
tional contextual and performance data, constantly reducing uncer-
tainty, and by extension risk, in every aspect of the program—from
technical procedures to prioritization and planning at both task and
strategic levels. The methods used, in particular the SIP, were founded
on original work carried out in Tajikistan and refined for the needs of
the FI MCP, but are applicable to any mine action program.

One experienced and knowledgeable mine action practitioner who
visited the Falkland Islands’ program said that, before they arrived,
they thought that the FI MCP’s approach to documenting land release
planning and decision-making would prove excessive. By the time they
left they were firmly of the opinion that the SIP approach should actu-
ally be the minimum applied in any mine action program.

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David Hewitson has been working in humani-
tarian mine action for over thirty years. He
conducted practical clearance of landmines
in Afghanistan, Angola, Cambodia, and
Mozambique and established and managed
field programs. In 1995, he founded a com-
mercial demining company and employed
more than 3,000 people in projects all over
the world. For the last ten years he has worked as co-founder and
director at Fenix Insight Ltd. He was the overseeing Director for the
Falkland Islands Demining Programme Office (FI DPO) contract
with the UK government. He has drafted a number of International
Mine Action Standards (IMAS) as well as other publications and was
instrumental in the conception and development of the standards
compliance tool at www.mineaction.net. He engages in technical
field operations as well as wider governmental and institutional
advisory work. Before joining the mine action sector, he served in
surface ships and submarines in the Royal Navy. He has a degree in
Aeronautical and Astronautical Engineering.

Guy Marot OBE
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Guy Marot OBE was the Programme
Manager for the Demining Programme
Office in the Falklands Islands responsible
for implementing the policies of the UK
National Mine Action Authority and, as
such, responsible for monitoring, inspec-
tion, and reporting of all activities of the
Land Release Contractor. Marot served for
twenty-six years in the British Army, within the Corps of Royal
Engineers in a variety of roles, the majority in explosive ordnance
disposal and IED search. He had operational tours in Northern
Ireland, Bosnia, and Iraq with other emergency deployments such
as commanding the Joint Service Explosive Ordnance Disposal
Detachment in the Falkland Islands in 1988. Since leaving the army,
he has undertaken numerous projects in the humanitarian, com-
nercial demining, and unexploded ordnance clearance industries.
He was the project manager for the clearance of part of the last
minefields left in Europe from WW2. In 2011, he was the local Head
of the Weapon Contamination Unit for the International Committee
of the Red Cross in Libya in 2011, the Republic of Congo in 2012,
and South Sudan in early 2014.
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1. Previous incarnations of the LRC, responsible for work in earlier phases of the programme included Bactec International Ltd and Dynasafe Bactec Ltd.
2. From Phase 5 project contractual documentation, Section 4 – Statement of Service Requirement.
3. IMAS 07.11 Land Release, Edition 1, Amendment 5, February 2019, includes broad guidance on the process elements influencing ARE. The recently released TNMA 07.11/03 All Reasonable Effort (ARE), Version 1.0, March 2021, provides more detailed advice on what constitutes ARE and how to demonstrate its application. Sources such as https://www.hse.gov.uk/managing/theory/alarpglance.htm explain the concept and practice of ALARP.
5. In some case over 40cm of peat had ‘grown’ over the 1982 mine layer surface level, and on beach areas 11m of sand had accumulated.
6. Suspected hazardous areas (SHAs) in the Falkland Islands were likely to contain other forms of ERW as well as mines. Mine clearance procedures were targeted only on those parts of the SHA where mines were expected until the LRC and DPO were confident that they had all been found and dealt with. At that point the remaining area within the fenced boundary of the SHA could be searched for non-landmine UXO (mortar rounds, grenades, etc.) using the much faster BAC techniques. At some SHAs less than 5 percent of the total SHA area was subject to mine clearance procedures, but the entire area needed to be checked for other UXO hazards.