SLNMAS 04.20

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Technical Survey

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Contents

Introduction

Experience in many mine action programmes as well as in Sri Lanka indicates that large areas of land that have been cleared were, in fact, hazard free. In many instances the targeting of clearance assets could have been improved if appropriate non technical and technical surveys had been conducted. The challenge is to attempt to better define the land that contains explosive hazards so that clearance activities can be limited to those areas.

A physical intrusive process into a hazardous area may provide enough information to allow an informed assessment of the clearance needs. This process is known as a technical survey and although it may be a separate activity, it is often integrated with clearance and can be undertaken before, during and even after clearance. In many cases however, it is only after technical survey and clearance are completed that the true nature and extent of mine/ERW contamination can be fully understood.

When sufficient information is available and a non-technical survey is carried out well, a technical survey may not be necessary before clearance. Where it is required, a technical survey may confirm the presence of mines or ERW leading to the location of one or more Defined Hazardous Areas (DHA). Alternatively, a technical survey may add to the confidence that there are no hazards leading to some, or all, of the land being released without the necessity for clearance.

A technical survey will not always be able to release land. In areas where randomly positioned hazards are expected, surveying a small percentage of these areas may not be appropriate. In such cases, while the survey may be able to demonstrate the presence of hazards and may give an indication of densities, it fails to provide sufficient confidence to justify the release of the land outside the sampled area.

Where the non-technical survey has indicated the presence of hazards in an unpredictable pattern, it may be appropriate to apply technical survey methods that provide full coverage over selected areas. If the outcome from such technical surveys is that no hazards are found, land release may be justified in some or all of the area when the combined data from non technical and technical surveys provide sufficient confidence that no hazards are present. Where survey finds evidence of hazards, however, subsequent clearance of the entire area may be required. Technical survey can be an important component of the land release process and can provide important information to improve planning of clearance tasks where hazards are identified. An output of a technical survey may also include perimeter marking.

Technical Survey

1 Scope

This standard establishes principles and provides guidance on the conduct of Technical Surveys as part of the Land Release process and details responsibilities and obligations of the mine action organisations involved.

2 Terms and definitions

A complete glossary of the terms and definitions used in the SLNMAS is given in SLNMAS 01.

The term **"Land Release"** describes the process of applying all reasonable effort to identify or better define CHA and remove all suspicion of mines/ERW through non technical survey, technical survey and/or clearance. The criteria for "all reasonable effort" shall be defined by the NMAA.

The term **"Suspect Hazardous Area" (SHA)** refers to an area suspected of having a mine/ERW hazard. A SHA can be identified by an impact survey, other form of national survey, or a claim of presence of explosive hazard.

The term **"Confirmed Hazardous Area" (CHA)** refers to an area identified by a non-technical survey in which the necessity for further intervention through either technical survey or clearance has been confirmed.

The term **"Defined Hazardous Area" (DHA)** refers to an area, generally within a CHA, that requires full clearance. A DHA is normally identified through thorough survey.

The term **"Non-technical Survey"** describes an important survey activity which involves collecting and analysing new and/or existing information about a hazardous area. Its purpose is to confirm whether there is evidence of a hazard or not, to identify the type and extent of hazards within any hazardous area and to define, as far as is possible, the perimeter of the actual hazardous areas *without* physical intervention. A non-technical survey does not normally involve the use of clearance or verification assets. Exceptions occur when assets are used for the sole purpose of providing access for non-technical survey teams. The results from a non-technical survey can replace any previous data relating to the survey of an area.

The term **"Technical Survey"** describes a detailed intervention with clearance or verification assets into a CHA, or part of a CHA. It should confirm the presence of mines/ERW leading to the definition of one or more DHA and may indicate the absence of mines/ERW which could allow land to be released when combined with other evidence.

The term **"Targeted Investigation"** refers to the investigation during technical survey of certain areas within a CHA that are more likely to be mined or contain ERW.

The term **"Systematic Investigation"** refers to a systematic process of applying technical survey in a CHA. It is typically used where there are no areas within the CHA that are more likely to be mined, or contain ERW, than others.

The term **"High Risk Area"** is defined as an identifiable area that is typically mined in a CHA, or an area that is described by a non-technical survey as being more likely to be mined, or contain ERW than others.

The term "**All Reasonable Effort**" describes what is considered a minimum acceptable level of effort to identify and document mined areas or to remove the presence or suspicion of mines/ERW. "All reasonable effort" has been applied when the commitment of additional resources is considered to be unreasonable in relation to the results expected.

3 Technical Survey – General Requirements

3.1 Principles of Technical Survey

A CHA is produced by a non technical survey that has identified a suspicion (or a claim) of mines or ERW. The degree of suspicion can vary and can be derived from various sources, including the local population, past or current military forces, the police, accidents, incidents, or other signs of mines and ERW. A CHA may require further investigation through the use of technical survey.

Technical survey serves the following main purposes:

- to confirm the presence of mines and ERW, (identify the type of hazards and the boundaries of hazardous areas) which will then require clearance and/or
- to increase confidence to help justify decisions on the release of land and/or
- to give the local people sufficient confidence to use land without resorting to full clearance techniques.

A technical survey differs from clearance, despite often using the same assets. The main purpose is to collect information about the presence and location of explosive hazards in a CHA. This information is then assessed and used to make decisions about the actual limits of the DHA where full clearance is required.

A technical survey typically complements a non-technical survey and can lead to the release of land or to more accurate DHA. Both non-technical and technical surveys aim to contribute to the decision making process to determine whether or not an area (or parts of it) contains explosive hazards. The main difference between them is that technical survey involves physical intervention into the suspect area.

A technical survey should result in confirmation of the existence of hazards and provide the planning requirements for the future clearance of land found to contain hazards. However, an absence of evidence does not automatically constitute evidence of absence. At times, even when no items are found, additional work may be required to satisfy the national authority and local land users that the ground is safe to use. The technical survey therefore needs to provide sufficient confidence in the absence of mines to release land.

Sampling methods, in particular, are unsuitable for technical survey into areas where a low density of hazards has been indicated by non-technical survey. There will often be situations however when the quality of local information and evidence of land use are sufficient for the non-technical survey alone to cancel parts of a suspect area or remove the suspicion of the existence of hazards without any requirement for technical survey.

Information gathering through the non-technical survey process does not stop when the technical survey starts. Additional non-technical survey information is often collected during technical survey. For example, new informants may provide additional information during technical survey, or, the assets used during technical survey may provide access to parts of the CHA that were previously inaccessible and so allow additional information to be gathered. Whenever mines/ERW are found after a survey has suggested that an area is safe, an appropriate area around the hazards should be reclassified as a CHA and additional resources deployed to address the problem.

3.2 Information to be collected during a Technical Survey

When conducted, a technical survey becomes a primary source of planning information for mine/ERW clearance operations. It involves gathering specific information through access into the CHA and recording, reporting, and mapping of any DHA as well as any parts of the suspect area that can be released.

When conducted independently of the clearance process, the information obtained from a technical survey should be summarised in a survey report which can then be used as the

technical specification for the planning and management of any subsequent clearance requirements and the release of land.

During a technical survey the following information shall be collected:

a. confirmation of the presence or likely density of mines/ERW;

b. confirmation of existing recorded information;

c. assessment of the ground in terms of the soil and metal contamination;

d. definition of the type, condition and extent of hazard;

e. the suggested depth of clearance for specific areas within the DHA. This should be clearly indicated in reports, sketches and maps; and

f. the resources recommended to carryout further activities, such as clearance, including assets to be used in specific areas of the DHA, and a work plan for these assets.

In addition to the information above, a detailed site plan (sketch, digital map of the area, aerial photograph, etc.) shall also be prepared. This will be provided, with the rest of the task dossier, to the organisation that will carry out any follow-on activity. The following information should be included in the site plan:

a. exploratory lanes (if used), area covered by technical survey assets, and safe access routes;

b. reference Point, Bench Marks, Turning Points and Intermediate Points as applicable;

c. distances and bearings from the bench mark and turning points;

d. location of visible mines/ERW and the pattern or mines (if known);

e. locations(s) of any mine, ERW or other devices found/destroyed earlier, or during, the technical survey;

f. prominent natural features such as high ground, water courses, trees, etc.; and

g. prominent man-made features within the CHA.

When the information has been collected and documented it should be returned to the DMAO Operations Section to be entered in to the IMSMA.

4 Output from a Technical Survey

4.1 General

The outputs from a technical survey are:

a. definition of any DHA within the initial CHA;

b. additional information for planning the initial clearance of any identified DHA;

c. the gathering of information (through all reasonable effort) which may be sufficient to determine and demonstrate, to the satisfaction of the land users, that an area is free of mines and ERW; and

d. additional information for the establishment of priorities for future action.

4.2 Releasing land by technical survey

A robust technical survey process will in many cases provide the ability to reduce the original suspect area. In order to do this the operator shall ensure that "all reasonable effort", as defined in SLNMAS 04 and in section 5.3 below, to determine that an area is free of mines/ERW contamination has been made. This involves gathering sufficient information through the use of demining assets such as manual resources, mine detection dogs and machines.

If a technical survey provides information about a part, or all, of a CHA to assess with confidence that the initial suspicion no longer exists (the claim of a hazard existing in that CHA, or part of the CHA, has been rejected) then the land can be released and the methods used shall be recorded.

4.3 All reasonable effort

The condition for releasing land by technical survey is that "all reasonable effort" of investigation has demonstrated with confidence that there is no evidence of hazards in the area.

5 Technical Survey Methods

5.1 General

Technical survey can be undertaken using the same assets as clearance but with a different methodology. Virtually any mine action asset can be used as long as it has been established that the asset can provide reliable and useful information, with a defined degree of confidence, in relation to the hazards that are expected to be found.

Assets should be used to complement each other in the conduct of a technical survey. Whichever method is used, when a technical survey confirms the presence of a mines/ERW, clearance is required. No technical survey method should put survey staff at greater risk than during clearance.

5.2 Technical Survey Assets

All assets used in technical survey shall be specifically accredited by the SLNMAC for this purpose. Assets used in technical survey shall be matched to the expected hazards to be found in the suspected areas and shall have demonstrated a capability to identify, remove, destroy or detonate the likely hazards with a degree of confidence defined by the SLNMAC.

The most common assets and methods used are:

a. Manual clearance. This is a reliable technical survey method providing a high degree of confidence in the ground that has been searched. Due consideration, however, should be given to the sample size when using manual clearance to determine the likely presence of mines.

b. Animal detection. Animal detection is also a reliable survey method. Dogs are the most common animal but other animals are also being trialled and used. The use of remote sensing technology (REST) may also be applicable for technical survey. REST however needs to be confirmed by another resource.

c. Flail machines. It is known through trials that flail machines can miss or move a percentage of targets/hazards. This is not necessarily a limitation in their use in technical survey as long as it can be reliably determined that the flail will detonate a reasonable percentage of hazards. A percentage of hazards that are not destroyed or detonated may also be thrown out leaving them visible on the ground to allow hazard identification. Recording detonations and conducting a visual search after flailing can enhance the value of flail machines as a technical

survey tool. Flailing may be considered adequate to restore confidence in land that is not being used on account of a suspicion of explosive hazards.

d. Tiller machines. Tiller machines normally crush or destroy hazards rather than detonate them. Because tillers detonate a much lower percentage of hazards than other machines they may have less value as a mechanical survey asset than flails.

e. Rollers. Rollers are known to detonate or crush a low percentage of hazards. The type of hazard, the ground conditions, and the weight and design of the roller will affect the percentage of mines and ERW that are detonated or crushed. Even if only 20 to 40% of mines are detonated rollers may still be a useful technical survey tool, for example, in areas where the non-technical survey has established the likelihood of many pressure sensitive mines. Rollers can also be used to gain access to areas of a CHA where visual inspection of the ground can occur or other assets such as low sensitivity metal detectors can then be used.

f. Low sensitivity metal detectors. (sometimes referred to as wide area detectors and may include magnetometers). These are detectors that are designed or configured to detect bulk amounts of metal (e.g. metal cased anti-vehicle mines and ERW) without signalling on small amounts. These detectors may prove to be useful in technical survey under some circumstances.

5.3 Confidence Classification of Survey Assets

The following confidence classification is allocated to technical survey assets. The confidence classification for technical survey assets used in the Sri Lankan MA programme shall be divided into low (1-4), medium (5-7) and high (8-10). The minimum confidence classification required for any land surveyed shall be as follows:

- No mines found: 3
- Mines found laid according to a pattern: 5
- Single mines found laid randomly: 9

The confidence rating for Technical Survey activities in Sri Lanka is allotted to resources as follows:

- Manual Mine Clearance - Metal Detectors: 9
- Manual Mine Clearance - Rake Excavation and Detection System (REDS): 9
- Manual Mine Clearance – Full excavation method: 9
- Mine Detection Dogs: 9
- Remote Sensing Technology: 5
- Mechanical roller with lose disks system: 5
- Machine with solid area roller: 2
- Mini flail: 5
- Mechanical Rake: 5
- Vegetation clearing/cutting machines: 0

The decision on what resources or combination of resources to be utilised shall depend on the mine threat, available resources, the terrain, the time available and the confidence classification required.

Taking all the information available in consideration the mine clearance agency in cooperation with the Operation Section of the applicable DMAO shall compile a technical survey plan and implement it accordingly.

A technical survey asset with a low or medium confidence rating may prove sufficient to use for land release provided that no mines were found during the technical survey and the previous non-technical survey generated a high level of confidence that the area is hazard free. Land released in this way shall not be recorded as “cleared”.

5.4 Targeted versus Systematic investigation

The objectives of a technical survey are to determine whether there are hazards present and to define the location of these hazards in the most economical manner. Targeted and systematic investigations are two processes that may be applied to achieve this. Targeted investigation will focus technical survey efforts on areas of the CHA that are thought to be more likely to contain hazards (these are sometimes called “high risk areas”). Systematic investigation is used where there are no obvious “high risk areas” to target. When there are no “high risk areas” the search for information should be spread uniformly over the area. Systematic investigation is less applicable or will require an increased survey requirement (ground coverage) in areas where the mines are not in a predictable pattern.

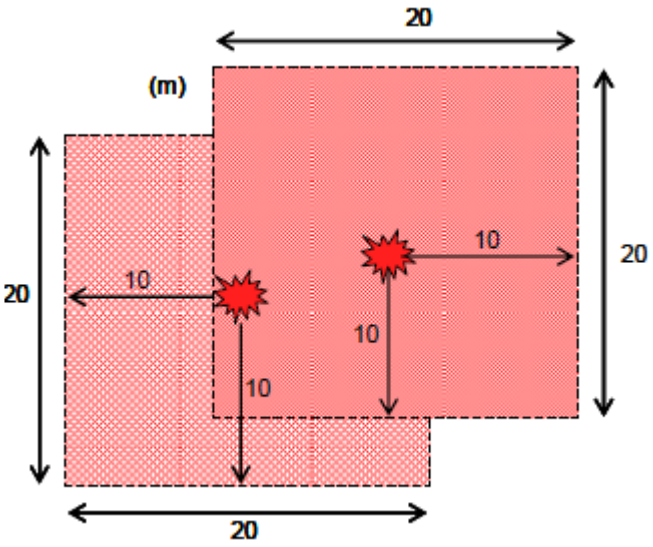
“High risk areas” are identifiable areas inside a CHA described by a non-technical survey as more likely to be mined than others, or areas that are more likely to be mined considering their geographical importance or tactical relevance etc. They are identified through an analysis of the military action that took place in the area or knowledge of the tactics used by the organisations who laid the mines/ERW. These areas should be targeted for search as a priority during technical survey because they will be more likely to provide vital information about whether the CHA, or parts of the CHA, contain a hazard and may, in fact, contain all of the hazard. If the identified “high risk areas” are found not to contain explosive hazards this may increase the confidence that other areas of the CHA will also not contain an explosive hazard.

5.5 The Buffer zone

Because “high risk areas” may not be well defined by features on the ground, an area around them shall also be searched. The area around the “high risk areas” is called the “buffer zone”. It is an area of ground that provides a safety margin around the suspected “high risk area”.

Buffer zones may also be used around identified hazards (e.g. a single mine) to determine whether the hazard is likely to be an isolated hazard.

It may not be appropriate to rely on buffer zones when a low density of hazards is anticipated in the area.



Example of a 10m buffer applied to 2 separately identified hazards

The table below provides a list of typical areas of high risk and the minimum buffer zones that shall be applied.

Type of 'High Risk Area/Identified Hazard	Buffer Zone Applied
Single mine	10 m
Stockpile of mines/ERW	10 m
Pathways	5 m each side of path
Large tree or copse of trees	6 m around tree
Water canals	3 m each side of canal
Potential cache areas	10 m
Fox hole/Fighting pit	10 m
Extended military position	50 m in front of position
Road	10 m each side of road
Military vehicle wreckage	15 m
Defence bund	50 m in front of bund
AP Mine line	5 m each side of mine line 10 m from last mine found
Human/Animal remains	10 m
Electrical pylons	5 m

5.6 Requirement for the degree of technical survey

The degree of technical survey required on a CHA will depend on the original level of suspicion and the quantity and quality of information collected by the non-technical survey efforts. Strong and reliable evidence from a non-technical survey that indicates the presence, size and location of the threat may negate the requirement for technical survey and the next step in the land release process should be the clearance of the CHA. Poor but reliable evidence from a non-technical survey that indicates the presence of the threat but the size and precise location are not clear should indicate the need to conduct a technical survey. A non-technical survey should, with a high degree of confidence, assist in determining the technical survey requirements if any.

The actions of technical survey may be sufficient to convince the local land users that previously suspect areas are in fact safe to use. The term "all reasonable effort" should be balanced with the remaining requirement for information after non-technical survey has been completed. An agreed definition of "all reasonable effort" will assist in determining the minimum requirements for technical survey on a CHA.

6 Technical Survey Process

Depending on the situation and the current conditions the following describes a broad outline of the sequence of work that should be followed.

a. Tasking. Receive tasking for the technical survey from the relevant authority.

b. Pre-planning. The non-technical survey report should be studied and assessed. Any sub-divisions of the CHA made during the non-technical survey should also be reviewed. All information about the CHA that was collected during the non-technical survey should be analysed in liaison with the non-technical survey staff when possible.

c. Plan asset requirements. Decide which of the available assets will be most suited to conduct the survey

d. Site visit. Conduct a site visit with the following:

   i. Non-technical survey team leader (when available);

   ii. Plans/operations representative from the DMAO;

   iii. Representative from the local area (e.g. landowner);

   iv. Representative from any other organizations that will be involved in the technical survey (e.g. MDD, mechanical assets)

e. Site preparations. Establishing administrative and other site features.

f. Conduct of the technical survey.

g. Planning assessment for any clearance requirements determined by the technical survey.

h. Marking and/or fencing of relevant parts of the task.

i. QA and completion report.

Mine risk education and community liaison should be conducted before, during, and after the technical survey.

See Annex A for an illustrative example of the non-technical and technical survey process.

7 Survey Team Requirements

When a technical survey is undertaken in the field, the following shall be considered.

a. Training. Technical survey shall *only* be undertaken by mine action personnel who are suitably trained, experienced and accredited to carry out the activity. Investment in the training of survey staff should have a positive impact on the accuracy of the survey. Survey teams should be sufficiently tested in conducting technical surveys before becoming operational. A good indicator is whether the survey concept is unambiguous and the teams are able to provide objective assessments.

b. Equipment. Demining assets used in technical survey shall be accredited for this task by the SLNMAC and matched to the expected hazards at each task site.

c. Staffing. The size of a survey team can vary depending on the local situation, which technical survey assets are being used and the complexity of the survey.

d. Communication. Communications for control and safety shall be tested before any survey work is conducted in any CHA.

e. Monitoring. Technical survey operations shall be subject to internal and external monitoring. The DMAO shall include Technical Survey teams in their weekly QA monitoring planning.

f. Liaison with local authorities. Technical survey teams shall coordinate with appropriate local or competent authorities to ensure that it is safe to conduct survey work in an area and to avoid disruptions in the work of the SLNMAC.

g. Medical backup and evacuation. All safety and CASEVAC procedures shall be as required during clearance and regularly assessed and tested.

8 Documentation

Information should be collected and recorded in a systematic manner. The Information Management System for Mine Action (IMSMA) shall be used.

Reports. Survey teams shall use the IMSMA data collection sheets as part of the technical survey process for the recording of information, so that it will be dispensed in a usable format for analysis and dissemination. The Technical Survey Report is attached as Annex B. Records must be kept in written, graphic, and digital formats so both digital and traditional paper mediums can transfer information to operators in the field and planners at the central level. All DHA's identified during the technical survey shall be recorded on a Defined hazardous area report as attached in Annex C. See also SLNMAS 13 for the reports and reporting formats.

Sketch maps. A sketch map of the area surveyed and the hazardous areas must include sufficient detail on the location and identification of the survey markers and the hazard marking system. Other relevant information that will assist future clearance activities should be included. Specific areas designated for manual clearance, mechanical clearance, reduction or demarcation should be clearly illustrated on the same site sketch.

Maps. Maps are the key element in providing geographical data on hazardous areas. The most detailed and accurate maps must be used as the standard for recording DHA. General location maps should be used to indicate the approximate size of any DHA, and in particular to mark reference points (or landmarks). Such information should be recorded electronically, and marked on a topographical map, a satellite image or on a trace. If topographical maps are not available, this information should be recorded on locally produced maps. A sketch map of each DHA shall include sufficient detail about the location and identification of the survey markers and the hazard marking system. Other relevant information which will assist future clearance activities should be included.

Map Datum/GPS Datum and Coordinates. For the purpose of recording mines/UXO in Sri Lanka the Kandawala Datum shall be used.

Measurement. The metric system shall be used for all measurements of distances, areas, altitude, etc. All bearings shall be in degrees using magnetic bearings.

Measuring Equipment. A variety of measuring equipment may be used to accurately record mined area data. These include compasses, protractors, GPS, DGPS, range finders, binoculars, cameras etc. In each case the equipment selected must provide the greatest degree of accuracy and reliability to the field operator and must ensure accuracy for its application. Personnel tasked to conduct surveys must have a good working knowledge of map reading and be able to operate and calibrate their own equipment.

The information recorded during the technical survey shall also form an important part of the documentation required for the hand over to the organisation conducting clearance, and later for the final hand over of the cleared land to the local authorities.

9 Marking

9.1 Hazard marking

The marking of mine and UXO hazards is undertaken to provide a clear and unambiguous warning of danger to the local population, and where possible to install a physical barrier to reduce the risk of unintentional entry into hazardous areas.

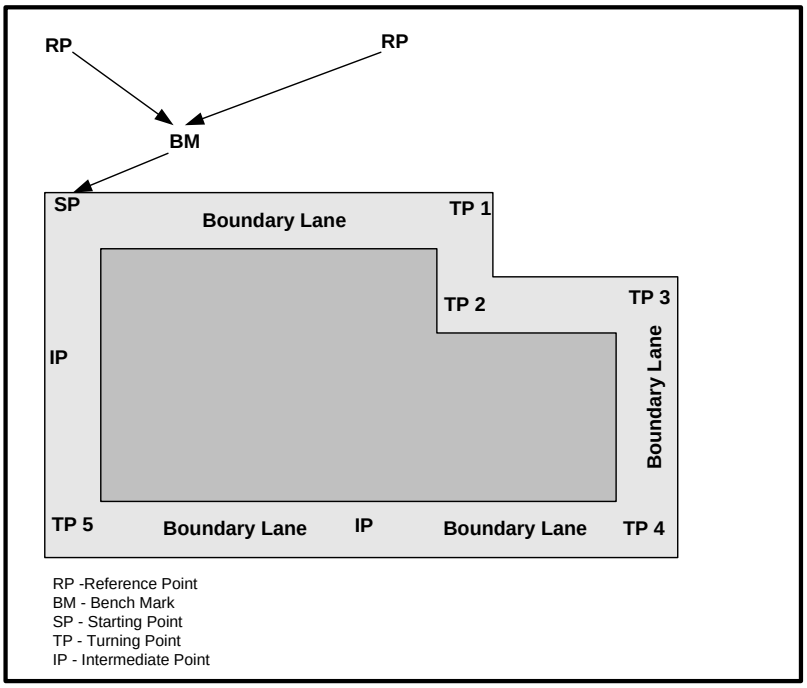
Permanent marking systems should be used to indicate the outer edge of DHAs which are not scheduled for immediate clearance. They should employ a combination of markers, signs and physical barriers. Temporary marking systems may be used to mark the perimeter of a DHA in preparation for immediate clearance operations.

The design of mine and UXO hazard marking systems should take account of local materials freely available in the contaminated region and the period for which the marking system will be in place. Guidance on permanent and temporary hazard marking systems is given in SLNMAS 06 – Marking of hazards)

9.2 Survey marking

A Technical Survey involves the use and recording of physical survey markers and indicators to assist subsequent clearance operations. The accurate marking of a DHA is one of the most important tasks of the survey team. Once the DHA boundaries have been identified during the Technical Survey, the perimeter of the DHA shall be marked on the ground. This type of marking is temporary and is undertaken to enable mine clearance teams, in the case of a high priority DHA, to identify the DHA boundaries prior to commencing clearance operations. In the case of a low priority DHA the perimeter markings will enable a marking team to erect permanent marking for future clearance. See Annex D for survey marking.

A series of visual markers are used to firstly identify the location of the DHA and, secondly, to mark the perimeter of the DHA. Figure 1 depicts the various markers to be used.



9.2.1 Reference point (Landmark)

A reference point (referred to in IMSMA as a 'landmark') is a fixed point of reference some distance outside the hazardous area. It should be an easily recognisable and permanent feature (such as a cross-roads or the abutment of a bridge) which can be used to assist in navigating to one or more benchmarks. The co-ordinates of a reference point should be surveyed by GPS or by resection.

9.2.2 Benchmark

A benchmark is a fixed point of reference that is used to locate a recorded hazard or hazardous area. It should normally be located a short distance outside the suspected hazardous area. A benchmark may not be necessary if the reference point is sufficiently close to the perimeter of the hazardous area. The co-ordinates of a reference point should be surveyed by GPS, or by resection.

9.2.3 Turning point

A turning point is a fixed point on the ground, which indicates a change in direction of the perimeter of the hazardous area. It shall be marked and recorded. Buried metal objects may be used to reinforce the marking of all turning points for permanent future reference.

9.2.4 Intermediate point

The distance between adjacent signs and markers on the perimeter of a hazardous area should not exceed 50m. Intermediate survey markers shall be used between turning points that are more than 50m apart. Intermediate survey markers shall be made of permanent or semi-permanent material, and should be buried or driven into the ground.

10 Responsibilities and obligations

10.1 SLNMAC

The SLNMAC shall:

a. develop a land release policy and national standard for Technical Survey;

b. accredit organisations as fit to undertake Technical Surveys;

c. prepare and publish standards and guidelines for quality assurance and quality control to be applied to Technical Survey contracts and agreements;

d. prepare and publish standards and guidelines on the documentation for Technical Survey;

e. utilize the information collected through the Technical Survey to prepare tasking orders and annual works programmes;

f. define liability issues relating to the clearance operator, the individuals undertaking the technical survey, and the local community, in accordance with national legislation and

g. monitor the effectiveness of land release outputs from technical survey.

10.2 Survey organisations

The organisation undertaking technical survey shall:

a. gain accreditation from the SLNMAC to conduct technical survey;

b. apply the SLNMAS for technical survey;

c. develop SOP for the implementation of technical survey;

d. collect the necessary information as required by the IMSMA data collection sheets;

e. where applicable, conduct a formal handover of the surveyed land to the organisation conducting clearance;

f. maintain and make available documentation as specified by the SLNMAC; and

g. consult closely with affected community about all decisions made during technical survey.

Annex A
Illustrated example of the Non-Technical & Technical Survey Process

Figure 1 – The picture illustrates a possible SHA generated during an impact survey or other claim of presence of hazard.

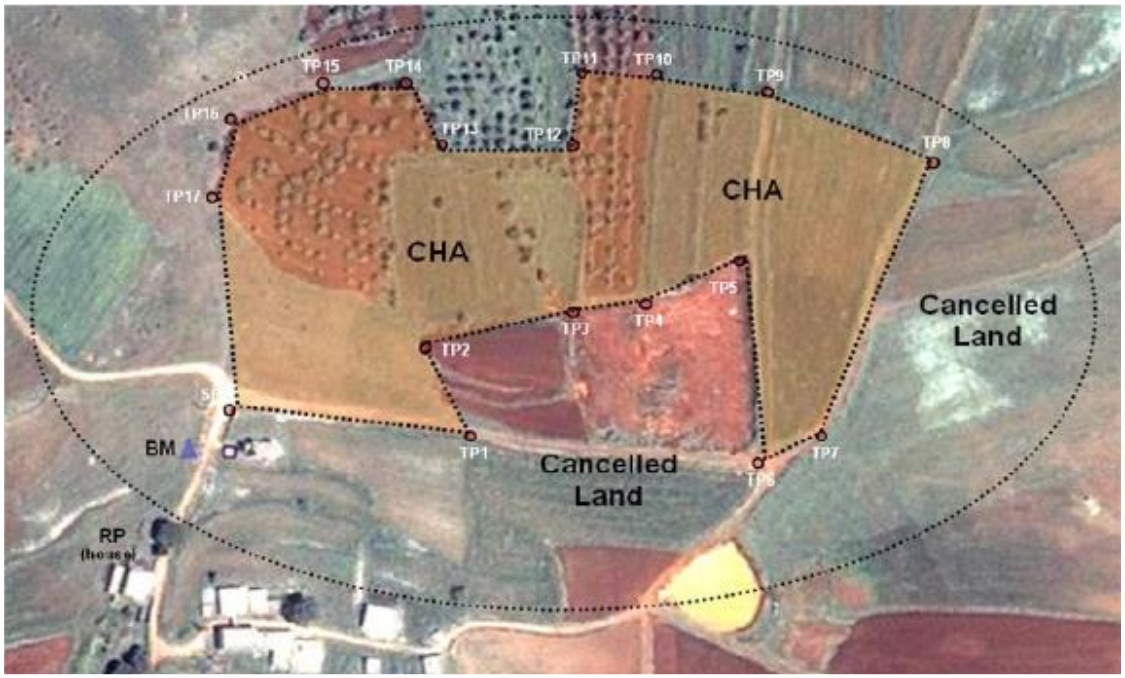


Figure 2 – This picture illustrates a possible conclusion of an initial non-technical survey. Based on further evidence the area outside the CHA has been cancelled and the CHA has been marked, for mapping purposes only and not physically on the ground, with a Reference Point (RP), Bench Mark (BM) and Turning Points (TP).

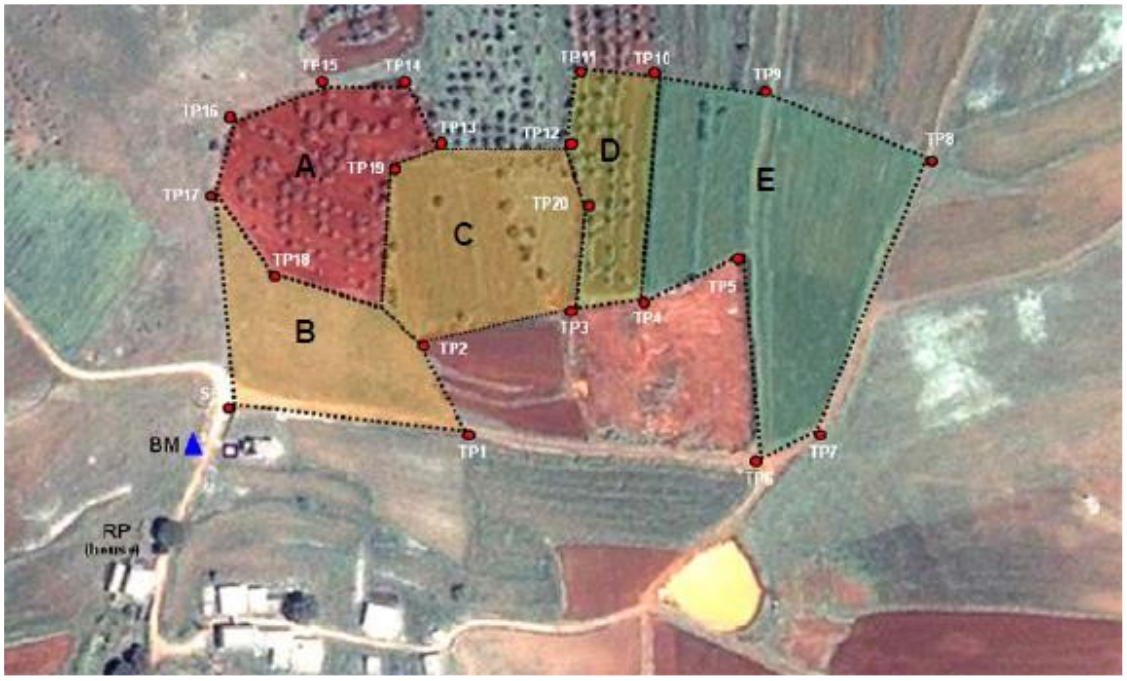


Figure 3 – This picture illustrates a possible situation after further information gathering and analysis. The CHA has now been sub-divided into sections based on differing evidence of hazards e.g. one section (A) may have shown hard evidence of mines on the surface and so obviously requires clearance. A first hand informant may have provided verbal information regarding a second (B) and a third (C) section stating that these areas are mined. The fourth and fifth (D and E) sections only have weak information regarding the presence of mines. The level and type of technical survey needed, therefore, may vary between sections.

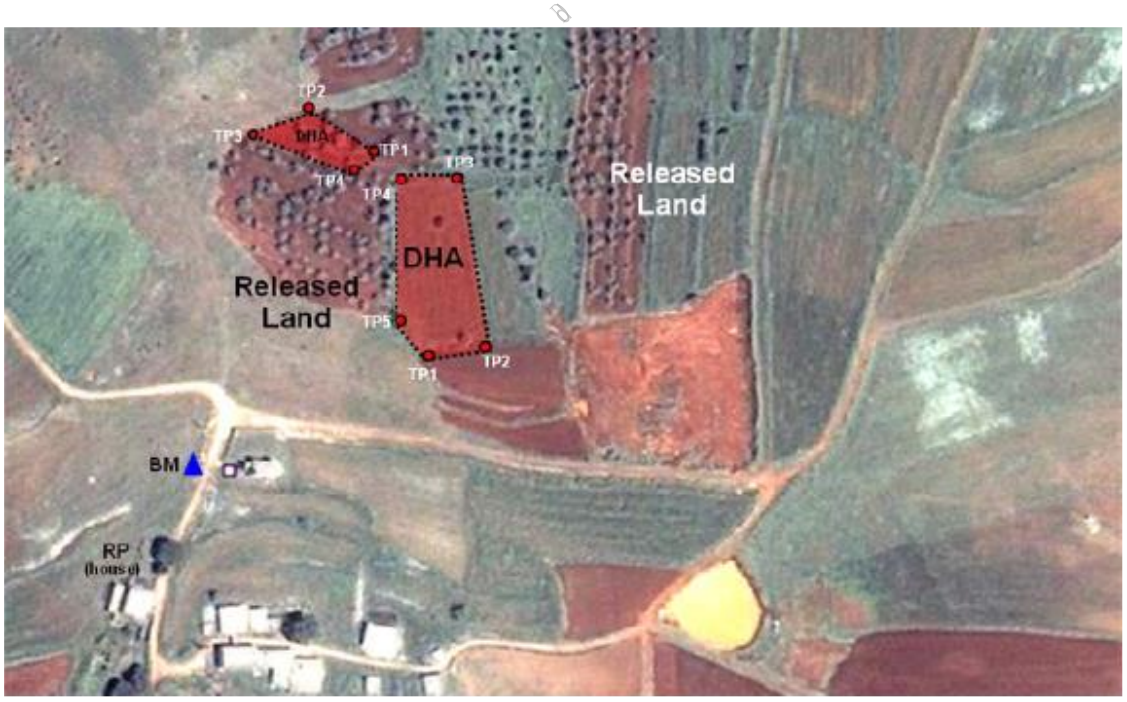


Figure 4 – This picture illustrates a possible situation following technical survey. The CHA has now been reduced to two discrete DHA. RP, BM and TP have now been put into the ground to mark the DHA for further clearance. TPs should also be placed to identify where technical survey has been conducted.

Note: Even at this stage, the whole, or part of the DHA may not require clearance because the clearance requirement will depend on the evidence that is found on the ground..

Annex B
Technical Survey Report

[1]General technical survey information

[1.1] ID:	[1.10] Data entry date:
[1.2] Owner MAC:	[1.11] Data entry by:
[1.3] Dossier No.:	[1.12] Data verified by:
[1.4] Task ID:	
[1.5] Reported by:	
[1.6] Position:	[1.13] Date of report
[1.7] Organisation:	[1.14] Status
[1.8] Task start date	[1.15] Task end date
[1.9] Tasked by	

[2]Coordinates of Survey (geographical reference)

[2.1]Province:	[2.6] Datum: Kandawala	[2.10]Map name:
[2.2]District:	[2.7]X/ Easting/ Long.:	[2.11]Map series:
[2.3]Divisional Secretariat:	[2.8]Y/ Northing/ Lat.:	[2.12]Map edition:
[2.4] GN Area:		[2.13]Map sheet:
[2.5] Village:	[2.09]Coord. fixed by: ☐ DGPS ☐ GPS or Map with accuracy ☐ <30m or ☐ >30m	[2.14]Map scale: **1 :**

[2.15]Description of geographical reference

[3] Survey Status History

[3.1] Technical Survey Method? ☐ Manual ☐ Mechanical ☐ MDD

[3.2] Number of DHA (Defined Hazardous Areas) found:_____

Perimeter of the Area cleared during Technical Survey

From point	No.	[7.1]To point	[7.2]Bear. [°]	[7.3]Dist. [m]	Kandawala Datum	
					[7.4]X/ East./ Long.	[7.5]Y/ North./ Lat.
Start Point	1	TP 1				

[3.3] Area cleared during the technical survey (sqm):_____

[3.4] Area released by Technical Survey (sqm):_____

[3.5] Depth of Clearance: _____cm

[3.6] May the whole tasked area be released by Technical Survey?[1]: ☐ Yes ☐ No

[4] Quantity and type of destroyed devices:

[4.1] Type of device (AP, AT, UXO etc.)	[4.2] Model	[4.3] Quantity	[4.4] Anti-lift fitted	[4.5] Booby trapped
			☐ Yes ☐ No	☐ Yes ☐ No
			☐ Yes ☐ No	☐ Yes ☐ No
			☐ Yes ☐ No	☐ Yes ☐ No
			☐ Yes ☐ No	☐ Yes ☐ No

[1] If the answer is yes, land shall be released by Technical Survey and no DHA report need to be attached.

[5] Quantity and type of marked devices:

[5.1] Type of device (AP, AT, UXO etc.)	[5.2] Model	[5.3] Quantity	[5.4] Anti-lift fitted	[5.5] Booby trapped
			☐ Yes ☐ No	☐ Yes ☐ No
			☐ Yes ☐ No	☐ Yes ☐ No
			☐ Yes ☐ No	☐ Yes ☐ No
			☐ Yes ☐ No	☐ Yes ☐ No

[6] Technical Survey Comments:

[7]Declaration:

<table>
<tr><th colspan="4">DECLARATIONS AND ACCEPTANCES</th></tr>
<tr><td colspan="2">HANDOVER AND DECLARATION ON BEHALF OF THE DEMINING ORGANISATION
Accreditation Certificate No: _____ / _____ 20__</td><td colspan="2">QUALITY ASSURANCE DECLARATION BY THE RMAO MINE ACTION OFFICER</td></tr>
<tr><td colspan="2">I CERTIFY THAT TO THE BEST OF MY KNOWLEDGE AND BELIEF THAT THE AREA AND DEPTH SPECIFIED IN THIS REPORT HAS BEEN CLEARED OF ALL MINES AND UXO HAZARDS AND THAT:[2]
• THE DEFINED HAZARDOUS AREA(S) IDENTIFIED IS/ ARE RECORDED AND PROPERLY MARKED BY SEMI-PERMANENT MARKING, OR
• THE TASKED AREA DOES NOT CONTAIN ANY MINES AND IS HEREBY RELEASED BY TECHNICAL SURVEY.</td><td colspan="2">I CERTIFY THAT THE AREA AND DEPTH SPECIFIED IN THIS HANDOVER AND FORMAL DECLARATION CERTIFICATE HAS BEEN INDEPENDENTLY ASSESSED TO BE CLEAR OF ALL MINES AND UXO HAZARDS AND THAT:[3]
• THE DEFINED HAZARDOUS AREAS REPORTED ARE ENTERED INTO IMSMA, OR
• IT IS HEREBY RECOMMENDED THAT THE TASKED AREA MAY BE RELEASED FOR USE.</td></tr>
<tr><td>NAME:</td><td></td><td>NAME:</td><td></td></tr>
<tr><td>POSITION:</td><td></td><td>POSITION:</td><td>Regional Mine Action Officer
Jaffna/Vavuniya/Batticaloa</td></tr>
<tr><td>DATE:</td><td></td><td>DATE:</td><td></td></tr>
<tr><td>SIGNATURE:</td><td></td><td>SIGNATURE:</td><td></td></tr>
<tr><td colspan="2">ACCEPTANCE BY THE GOVERNMENT AGENT / MINE ACTION FOCAL POINT OF THE DISTRICT</td><td colspan="2" rowspan="5"><u>Advisory:</u> As a general precaution, individuals or groups wishing to take up residence, work or cultivation activities in the subject area should be warned to immediately report any suspicious items to the SLA or direct to the Government Agent through their DS or GS to prevent any residual risks that may happen. Mine Risk Education will be arranged by the Mine Action Office upon request.

Attachments:

1. Final QC Report by the Quality assurance team.</td></tr>
<tr><td colspan="2">I ACCEPT RESPONSIBILITY OF THIS AREA ON BEHALF OF THE PEOPLE OF SRI LANKA. I UNDERSTAND THAT THE SPECIFIED AREA HAS BEEN CLEARED OF MINES AND UXO TO THE DEPTH SPECIFIED IN THIS HANDOVER AND FORMAL DECLARATION CERTIFICATE.</td></tr>
<tr><td>NAME:</td><td></td></tr>
<tr><td>POSITION:</td><td></td></tr>
<tr><td>DATE:</td><td></td></tr>
<tr><td>SIGNATURE:</td><td></td></tr>
</table>

Total number of pages: 5

Attachments:

Defined Hazardous Areas (DHA)

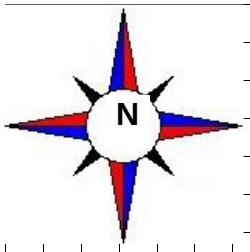
A DHA report for each DHA identified during the technical survey shall be attached to the Technical Survey Cover Sheet.

Attach the following sketch maps

1.) A sketchmap of the general area - indicating the Geographical Reference, position of each DHA with starting point, main road, towns, provincial and district boundaries, railways, School etc. (this can be an annoted A 4 size)

2.) Sketchmap of the area cleared during the Technical Survey

[2] Delete the one that is not applicable.
[3] Delete the one that is not applicable.

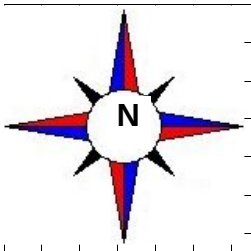


1 Square(5mm) = meters

Checklist

- Landmark
- Benchmark
- Datum point
- Turning points
- Start line
- Safe lanes
- Safe areas
- Cleared access roads
- Mine rows
- Location of booby traps
- Legend

Drawn by: Date: Checked by: Date:



1 Square(5mm) = meters

Checklist

- Landmark
- Benchmark
- Datum point
- Turning points
- Start line
- Safe lanes
- Safe areas
- Cleared access roads
- Mine rows
- Location of booby traps
- Legend

Drawn by: Date: Checked by: Date:

Annex C
Defined Hazardous Area Report

[1]General Mine Field Information

1.1 ID:	
1.2 Owner MAC	
1.3 Technical survey ID:	
1.4 Minefield name	1.11 Reported by:
1.5 Referenced TaskID(s):	1.12 Position:
1.6 Province:	1.13 Organisation:
1.7 District:	1.14 Report received
1.8 Divisional Secretariat:	1.15 Date of report
1.9 GN Area:	1.16 Status
1.10 Village:	1.17 Village Coordinate:

1.20 Distance from nearest village: _____km

1.21 Road possible for: ☐ Small 4x4 ☐ Big truck ☐ All

1.22 Best road to site from nearest village:

1.23 DHA description:

[2]Medical facilities:

	Name of location [specify details in “location sheet" for level 3,4, med.]	Travel time in hours & minutes
Level 1:	2.1	2.2
Level 2:	2.3	2.4
Level 3:	2.5	2.6
Level 4:	2.7	2.8
Medivac:	2.9	2.10

[3] DHA geographical reference and perimeters

[3.1] Datum: Kandawala	[3.2] Map edition:
[3.2] Map name:	[3.2] Map sheet:
[3.2] Map series:	[3.2] Map scale:1:
[5]Coordinates of the landmark:	**[6]Coordinates of the benchmark:**
[5.1] X/ Easting/ Long:	[6.1] X/Easting/Long:
[5.2] Y/ Northing/ Lat:	[6.2] Y/Northing/Lat:
[5.3] MGRS Coord.:	[6.3] MGRS Coord.:
[5.4] Coordinates fixed by: ☐ DGPS ☐ GPS Import. from GIS: ☐ <30m ☐ >30m	[6.4] Coordinates fixed by: ☐ DGPS ☐ GPS or Map with accuracy of: ☐ <30m or ☐ >30m
[5.5] Description of landmark:	[6.5] Description of benchmark:

[6]Description of the DHA perimeter points

From point	No.	[7.1]To point	[7.2]Bear. [°]	[7.3]Dist. [m]	Kandawala Datum		[7.6] MGRS Coord.
					[7.4]X/ East./ Long.	[7.5]Y/ North./ Lat.	
Benchmark	1	Datum point					
Datum point	2	TP 1					

[6.1]Size of DHA in square meters: _____ m²

[6.2]Marking: ☐ Local signs ☐ Official signs ☐ Fenced ☐ None

[7]Estimated Devices

Type of Device (AP, AT, UXO, etc.)	Model	Estimated Quantity

[7.1]Estimated devices: Total: _____

[7.2]Information Classification:

	Code	Evaluation	Information	Source
☐	M1	Mines or UXO physically verified	Confirmed	Reliable
☐	M2	Area reported with observed evidence of mines or UXO	Unconfirmed	Reliable
☐	M3	Area reported with observed evidence of mines or UXO	Unconfirmed	Unreliable
☐	M4	Area reported as mined with no evidence or indications of mines or UXO	Unconfirmed	Unreliable

[7.3]Condition of UXO: ☐ Unfused ☐ Safe ☐ Blind ☐ Unknown

[8]Demining (operational information)

[8.01]Vegetation: ☐ Grass ☐ Bushes ☐ Trees ☐ None

[8.02]Vegetation density: ☐ Low ☐ Light ☐ High

[8.03]Vegetation removable by: ☐ Manual ☐ Mechanical ☐ Chemical ☐ Burning

[8.04]Terrain category:
☐ A (open, week ground)
☐ B (hard ground mixed with rocks and light vegetation)
☐ C (very hard stony ground with heavy vegetation)
☐ D (wet/mud)

[8.05]Soil Type: ☐ Sand ☐ Chalk ☐ Ploughed ☐ Clay ☐ Rocky ☐ Swamp

[8.06]Contamination with: ☐ Metal ☐ Rubble tree stumps ☐ Other _____

[8.07]Level of contamination with metal: ☐ Low ☐ Medium ☐ High

[8.08]Level of soil metal content: ☐ Low ☐ Medium ☐ High

[8.09]Drainage features: ☐ Canals ☐ Rivers ☐ Drainage ☐ Lakes ☐ Other_____

[8.10]Ground profile: ☐ Flat ☐ Hillside ☐ Ridge ☐ Gully ☐ Embankment

[8.11]Slope: ☐ 0-5% ☐ 5-10% ☐ 10-15% ☐ 15-20% ☐ 20-25% ☐ 25-30% ☐ 30% +

[8.12]Is the terrain suitable to use dogs? ☐ Yes ☐ No ☐ Unknown

[8.13]Is the terrain suitable to use detectors? ☐ Yes ☐ No ☐ Unknown

[8.14]Is the terrain suitable to use prodding? ☐ Yes ☐ No ☐ Unknown

[8.15]Is mechanical demining possible? ☐ Yes ☐ No ☐ Unknown

[8.16]What type of mechanical device can be brought to the minefield: ☐ Light ☐ Medium ☐ Heavy

8.17 Special seasonal consideration:

9 Recommendation

9.1 Assessed degree of difficulty: ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

9.2 Recommended clearance priority: ☐ Low ☐ Medium ☐ High

9.3 Recommended no. of demining teams:

9.4 Type of operation recommended: ☐ Manual ☐ Mechanical ☐ Dogs ☐ Combined

9.5 Depth of clearance recommended: _____cm

9.6 Reason for clearance depth:

9.7 Estimated time for completion of clearance: _____days

9.8 Intended land use: ☐ Housing ☐ Development ☐ Industrial ☐ Agricultural ☐ Community
☐ Other:_____

9.9 Date of intended land use: _____ (month/year)

10 Agricultural fields blocked:

Select:
- ☐ Crop type: ⇒
  - ☐ Irrigated ⇒
    - ☐ Grain
    - ☐ Fruit
    - ☐ Vegetable
    - ☐ Other
    - ☐ Unknown
  - ☐ Rain fed ⇒ (same options)
- ☐ Pasture Type: ⇒
  - ☐ Fixed pasture ⇒
    - ☐ Cattle
    - ☐ Goats, Sheep
    - ☐ Other
    - ☐ Unknown
  - ☐ Migratory pasture ⇒ (same options)

11 Water access blocked:

Select:
- ☐ Irrigation
- ☐ Fishing
- ☐ Watering animals
- ☐ Bathing
- ☐ Laundry
- ☐ Other
- ☐ Drinking: ⇒
  - ☐ Lake or stream
  - ☐ Well or spring

[12]Non-agricultural areas blocked:

Select:
- ☐ Fuel
- ☐ Food
- ☐ Building materials
- ☐ Medicinal

[13]Infrastructure blocked:

- ☐ Housing area blocked

Roads blocked to:

- ☐ District center
- ☐ Provincial capital
- ☐ National capital
- ☐ Other: _____
- ☐ Alternative routes: _____

[14]Other infrastructure blocked:

- ☐ Bridge
- ☐ Dam or canal
- ☐ Railroad
- ☐ Airstrip
- ☐ Power line
- ☐ Power station
- ☐ Other vital points: What: _____
- ☐ Factory
- ☐ Oil field
- ☐ Medical facility
- ☐ Educational facility
- ☐ Market
- ☐ Cultural site

[15]Is a development project planed in the area: ☐ Yes ☐ No ☐ Unknown

[15.1]If yes, is the project funded: ☐ Yes ☐ No ☐ Unknown

[15.2]Contact info for project: _____

[16]Mine risk education given: (How trained/who trained)

[17]Additional information/comments

[18]Status History

Status	Valid from	Status user	Reason	Comment

[19]Data source information:

[19.1] Reported (Collected) by:	
Location:	
Date:	
Signature:	

[19.2] Verified by:	
Location:	
[19.1]Date:	
Signature:	

[19.3] IMSMA Data entry by:	
[19.4] Date entry date:	
Signature	

Total number of pages:_____

Attachments:

Attach a sketch map

To scale map of detailed area showing DHA perimeter, area to be cleared, adjacent areas and use, access roads, recommanded campsite and emergency landing zones, local landmarks etc. Include a north arrow, scale and legend. Also indicated areas within the DHA where specific mine clearance resources will be required.

Photo's

Please attached photo's of areas that would need specific attention during planning and clearance.

Annex D
Survey marking

1 General principles

A Technical Survey involves the use and recording of physical survey markers and indicators to assist subsequent clearance operations. As the survey and clearance may be conducted by different organisations it is essential that standard survey markings be used.

The SLNMAS marking scheme to be used is as follows:

There may be cases where signs made of combustible, useable or attractive material may be unlawfully removed by the local population. Signs will then have to be replaced by easily identifiable markings. Above all, such marks must be clear, and their locations documented as accurately as possible on hazard area maps. It also makes the physical handover of the ground from the technical survey to the demining organisation more important. Where such handovers cannot be made, it is the responsibility of the organisation that conducted the Technical Survey operating in conjunction with the local population, to plan an enduring marking system. in accordance with SLNMAS 06 Marking Mine and UXO Hazards

2 Reference points

A reference point (referred to in IMSMA as a 'landmark') is a fixed point of reference some distance outside the hazardous area. It should be an easily recognised feature (such as a cross-roads or the abutment of a bridge) which can be used to assist in navigating to one or more benchmarks. The co-ordinates of a reference point should be surveyed by resection or GPS. (Note: current commercial GPS accuracy is limited to +/-15m.)

Reference points shall be:

a) clearly visible from 30 m in normal daylight conditions from the normal direction of approach.

b) marked with a sign, which clearly distinguishes the sign from other marked area signs. The sign shall include a unique identification number, and show the distance and bearing to the benchmark. Details should be stamped, engraved, embossed, or marked in some other permanent way. The sign should be applied to a surface or attached to a post at approximately 1.25 m above ground level.

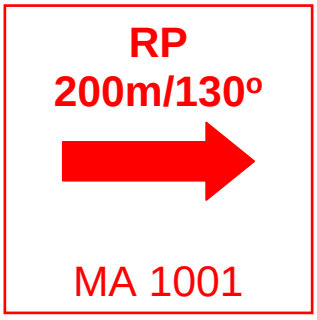


Figure 1: Example of a reference point marker

Note: Figure 1 shows an example of a sign indicating a reference point for DHA Number 1001. It indicates that the benchmark for DHA 1001 is located 200 m from this point on a magnetic compass bearing of 130º

3 Benchmarks

Benchmarks are fixed points of reference used to locate a marked and recorded hazard or hazardous area. A benchmark should normally be located a short distance outside the hazardous area.

Benchmarks shall be:

a) be surveyed by resection and GPS;

b) clearly visible from 30 m in normal daylight conditions from the normal direction of approach; and

c) marked with a sign, which clearly distinguishes the sign from other marked area signs. The sign shall include a unique identification number. Details should be stamped, engraved, embossed, or marked in some other permanent way. The sign should be applied to a surface or attached to a post at approximately 1.25 m above ground level.

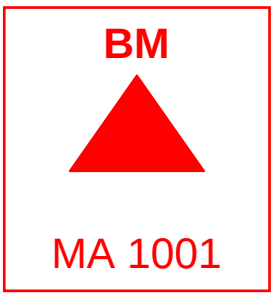


Figure 2: Example of a benchmark sign

Note: Figure 2 shows an example of a sign indicating a benchmark sign for DHA Number 1001.

4 Turning points

Turning points are fixed points on the ground which indicates a change in direction of the perimeter of the hazardous area.

Turning points shall be:

a) surveyed by resection (distance and bearings) and with the coordinates formally recorded;

b) marked by a survey marker driven into the ground so that the top is thirty centimetres below the surface. Additional buried metal objects should also be considered for use to mark all turning points for permanent future reference.

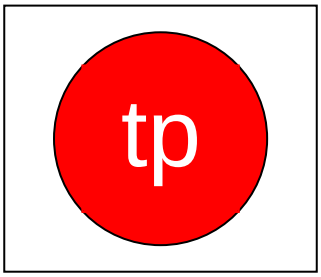


Figure 3: Example of a turning point sign

5 Intermediate points

The distance between adjacent signs and markers on the perimeter of a DHA should not exceed 50m. Intermediate survey markers shall be used between turning points that are more than 50m apart. Intermediate survey markers shall be made of permanent or semi-permanent material, and should be buried or driven into the ground. The general position of intermediate points should be formally recorded, but accurate coordinates are not required. Intermediate points need not be marked with a sign.