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Technical Survey

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Foreword

In July 1996, international standards for humanitarian mine clearance programmes were proposed by working groups at a conference in Denmark. Criteria were prescribed for all aspects of mine clearance, standards were recommended and a new universal definition of 'clearance' was agreed. In late 1996 the principles proposed in Denmark were developed by an UN-led working group into *International Standards for Humanitarian Mine Clearance Operations*. A first edition of these standards was issued by the UN Mine Action Service (UNMAS) in March 1997.

The scope of these standards has been expanded to include the other components of mine action, in particular those of mine risk education and victim assistance, and to reflect changes to operational procedures, practices and norms. The standards have now been renamed "International Mine Action Standards".

The United Nations has a general responsibility for enabling and encouraging the effective management of mine action programmes, including the development and maintenance of standards. UNMAS is the office within the United Nations Secretariat responsible for the development and maintenance of International Mine Action Standards (IMAS).

The work of preparing, reviewing and revising these standards is conducted by technical committees, with the support of international, governmental and non-governmental organisations. The latest version of each standard, together with information on the work of the technical committees, can be found at http://www.mineactionstandards.org/. IMAS will be reviewed at least every three years to reflect developing mine action norms and practices, and to incorporate changes to international regulations and requirements.

Introduction

The gathering of detailed technical and topographical information of known or suspected hazardous areas is conducted through a Technical Survey. Such areas will have been previously identified during the general mine action assessment. The primary aim of a Technical Survey is to collect sufficient information to enable the clearance requirement to be more accurately defined, including, interalia, the area(s) to be cleared, the depth of clearance, local soil conditions, and the vegetation characteristics.

The information obtained from a Technical Survey should be summarised in a survey report, which should be used as the technical specification for the planning and management of a subsequent clearance task. The output of a Technical Survey may also include perimeter marking, of the defined area, to reduce the risk of unintentional entry into the hazardous area, and it may produce data for any ongoing mine risk education programme. If clearance does not immediately follow a Technical Survey, then survey markers should be left securely in place. Such markers will enable the hazardous area to be located accurately and safely at a later date.

The term 'Technical Survey' is not applied universally. Indeed, some national mine action authorities and demining organisations consider the detailed examination of known or suspected hazardous areas, and the related documentation and marking as defined in this standard, to be merely the first stage of an integrated survey-clearance operation. However it is described, a Technical Survey is an important part of the clearance process, by providing the information needed for safe, effective and efficient clearance.

Technical Survey

1 Scope

This standard establishes principles and provides guidance on the requirements of Technical Surveys, and details responsibilities and obligations of the agencies and organisations involved.

2 Normative references

A list of normative references is given in Annex A. Normative references are important documents to which reference is made in this standard and which form part of the provisions of this standard.

3 Terms and definitions

A list of terms and definitions used in this standard is given in Annex B. A complete glossary of all the terms and definitions used in the IMAS series of standards is given in IMAS 04.10.

In the IMAS series of standards, the words 'shall', 'should' and 'may' are used to indicate the intended degree of compliance. This use is consistent with the language used in ISO standards and guidelines.

a) 'shall' is used to indicate requirements, methods or specifications that are to be applied in order to conform to the standard.

b) 'should' is used to indicate the preferred requirements, methods or specifications.

c) 'may' is used to indicate a possible method or course of action.

The term 'national mine action authority/authorities' refers to the government department(s), organisation(s) or institution(s) in each mine-affected country charged with the regulation, management and co-ordination of mine action. In most cases the national mine action centre (MAC) or its equivalent will act as, or on behalf of, the 'national mine action authority'. In certain situations and at certain times it may be necessary and appropriate for the UN, or some other recognised international body, to assume some or all of the responsibilities, and fulfil some or all of the functions, of a national mine action authority.

4 Technical Survey – purpose and scope

A Technical Survey is a specific operation related to a suspected hazardous area and is normally a contracted piece of work. A Technical Survey is conducted to gather the detailed technical and topographical information of known or suspected hazardous areas. Such areas will usually have been previously identified during the general mine action assessment (GMAA). The primary aim of a Technical Survey is to collect sufficient information to enable the clearance requirement to be more accurately defined, including the area(s) to be cleared, the depth of clearance, local soil conditions, and the vegetation characteristics. This will enable the preparation of a tasking order and allow subsequent clearance operations to be conducted in a safe, effective and efficient manner.

The Technical Survey is a critical step during the general mine action assessment process, and it should normally take place prior to actual demining activities after sites have been selected from a prioritised list. The information obtained from a Technical Survey should be summarised in a survey report, which shall be used as the technical specification for the planning and management of a subsequent demining task. Refer to IMAS 09.10 Clearance Requirement for more information. The concept is that, normally, when fully implemented, as a mine action programme matures and accumulates information, the Technical Survey teams would work ahead of the demining teams. This allows Mine Action Centres to define demining

requirements, plan future operations and prepare work programmes that would keep demining organisations occupied. It will also ensure that demining resources are utilised in the most productive, efficient manner and that the correct resources to deal with each problem are used. If feasible, Technical Surveys should be conducted one season ahead of demining activities.

There are two options for carrying out Technical Surveys. They can be categorized as a hasty and a more deliberate method.

a) sometimes, the Technical Survey will represent just the first step of a clearance project, and a detailed technical understanding of the mine and UXO threat will develop as clearance progresses. In this case the Technical Survey will take place just prior to the clearance activity and the aim would be to develop a site design for the one specific site; or

b) preferably, the Technical Survey will be carried out as a result of a broader planning process to ensure that the programme has the biggest impact on the mine problem as determined through an Emergency Survey or Landmine Impact Survey. In this process the Technical Survey contributes to the development of a works programme as well as a specific site design. The general mine action assessment is a continual process of information gathering and evaluation, while the Technical Survey is specific to collecting the information necessary to define the area to be cleared. This Technical Survey information is needed to prepare a tasking order before it is issued by the mine action authority. The tasking order indicates the area to be cleared, and the required clearance depth, as well as the requirements for monitoring and inspection. In addition, the Technical Survey will provide an opportunity to: (1) confirm existing data; (2) assess the type and quantity of resources best suited to a particular site; and (3) develop a demining plan for the site that covers area reduction, clearance and marking requirements in a manner that allows safe operation procedures to be applied and monitored as work progresses.

The scope and extent of each Technical Survey depends on many factors, including the accuracy and completeness of available information (such as information collected during the general mine action assessment), the local security situation, and the human and financial resources available for the survey. It will also depend on the form of the hazards and hazardous areas. For example, the Technical Survey of a classic minefield laid by an army using standard mine laying procedures would be quite different to the Technical Survey of a paddy field or water source around which anti-personnel mines and booby traps have been laid in an irregular fashion for the harassment of the local population.

A Technical Survey should also review, and if necessary revise, the general planning information collected during the general mine action assessment. This will include details, such as the local security situation, routes, terrain, infrastructure and the availability of suitable medical facilities. It will also be appropriate to review the local socio-economic impact of the hazardous area(s) in order to confirm the need and urgency of the follow-on clearance operation(s).

Demining organisations trained and accredited by national mine action authorities should carry out Technical Surveys. Suitable organisations shall be tasked by the mine action authority to ensure that the information collected and collated will enable the planning, development and/or refinement of annual works programmes.

5 Clearance requirements

IMAS 09.10 defines the requirements of mine and UXO 'clearance', and specifies the quality system (i.e. the organisation, procedures and responsibilities) necessary to determine that land has been cleared by a demining organisation in accordance with its contractual obligations.

The contractual arrangements shall specify the area to be cleared and the required depth of clearance. The clearance depth should be determined by a Technical Survey, or by reference to other reliable information which establishes the depth of the mine and UXO hazards, and an assessment of the intended land use.

An informed decision on the likely depth of mines and UXO will require an understanding of the mine laying tactics and weapon systems used, and an assessment of whether there has been any soil slippage or vertical movement of the mines within the soil. It may also involve the clearance of one or more sample areas.

The soil should be analysed to determine mineral and scrap metal contamination which will affect the choice of detectors. Tests of the soil's composition and mechanics should be made, to establish the potential use of mechanical equipment. Access routes and their suitability for vehicles should also be examined, especially where the use of heavy mechanical equipment is being considered.

6 Information to be collected during the Technical Survey

The Technical Survey is the primary source of planning information for mine and UXO operations and usually involves specific information gathering, entry into the contaminated area and mapping of the suspect area. In doing so, the survey process will:

a) provide essential information for regional and local planning;

b) provide planning information for subsequent area reduction, clearance and marking operations;

c) provide the basis for scheduling demining assets to limit down time; and

d) expedite demining activities through the provision of accurate and timely information on the particular site.

During the Technical Survey the following information should be collected:

a) confirmation of the presence of mines and UXO;

b) confirmation of data that was initially collected to support the general mine action assessment process;

c) assessment of the ground in terms of the soil, metal contamination, vegetation and slope;

d) a definition of the area in terms of its size, described through angles and bearings. Area measurements shall be more accurate than those calculated during the General Mine Action Assessment (GMAA) process and should be within +/-10% of the actual area;

e) the suggested depth per area to which clearance should be conducted. The actual clearance depth will be determined by the National Mine Action Authority after consideration of all relevant factors; and

f) the resources required to carry out demining activities per identified area and the estimated time for manual teams, mechanically assisted teams, mine detection dog teams and EOD teams as appropriate.[1]

In addition to the information mentioned above, a detailed site sketch must also be prepared as this will be provided to the demining organisation that will eventually carry out the task. The following information should be noted on the sketch of the area:

a) Exploratory lanes (if used), and safe access routes as applicable;

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/UXOs and the pattern of mines (if known);

[1] This will be based on the suggested clearance depth. The resource estimate will change if the National Mine Action Authority implement a different clearance depth.

e) Location(s) of any mine, UXOs or other devices destroyed during survey;

f) Natural prominent features such as hill contours, creeks, bushy areas, etc; and

g) Other prominent man-made features within the hazardous area (houses, tombs, fortifications, canals, roads, hills, rivers, etc).

In order to collect the required information, it will often be necessary to enter hazardous areas through breaching exploratory lanes into the suspect area. When the information has been collected and documented, it should be returned to the mine action authority to be included in the mine database. This will assist in the preparation of the annual works programme and the tasking orders that will be provided to demining organizations. These tasking orders will describe in detail what the demining requirements are (specific area and depth), what kind and quantity of resources are to be used and how long they are expected to work on the task to address the impact.

7 Marking

7.1 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 mine and UXO hazard areas 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 mine and UXO hazard area 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 IMAS 08.40.

7.2 Survey marking

A Technical Survey involves the use and recording of physical survey markers and indicators to assist subsequent clearance operations.

(Note: additional physical markers and indicators are used during clearance, such as datum points, datum/base lines, start lines and clearance lanes. The forms of marking used during clearance are not included in this standard.)

7.2.1 Reference point

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. Further guidance is given in Annex D. (Note: current commercial GPS accuracy is limited to +/- 15m.)

7.2.2 Benchmark

A benchmark is a fixed point of reference that is used to locate a marked and 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. Further guidance is given in Annex D

7.2.3 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 clearly marked and recorded. Buried metal objects may be used to reinforce the marking of all turning points for permanent future reference. Further guidance is given in Annex D

7.2.4 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. Further guidance is given in Annex D.

8 Documentation

Information should be collected and recorded in a systematic manner. Whenever possible use should be made of standard and proven information management systems and GIS, such as IMSMA. Guidance on the use of IMSMA data collection sheets as part of the Technical Survey is given in Annex E.

General location maps should be used to indicate the general area of the hazardous area, and in particular to mark the reference point (or landmark). Such information should be recorded electronically using GIS, or marked on a topographical map, a satellite image or on a trace. If GIS or topographical maps are not available, such information may be recorded on locally produced maps.

A sketch map of the hazardous area shall include sufficient detail on 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.

The information recorded during the Technical Survey forms an important part of the documentation required for the handover to the organisation conducting clearance, and later for the final handover of the cleared land to the national mine action authorities. (See IMAS 08.30)

9 International treaties

Two international treaties place special obligations on the Governments of mine-affected countries (who are States Party to the treaties) regarding the survey and marking of mined areas.

Amended Protocol II (AP II) to the UN Conventional Weaponry Convention requires that '… all reasonable precautions should be taken to protect civilians from the impact of mines, booby-traps and other devices.'

Article 5.2 of the *Convention on the Prohibition of the Use, Stockpiling, Production and Transfer of Anti-personnel Mines and on their Destruction* (commonly known as the Ottawa Convention or Mine Ban Treaty) requires each State Party to '… make every effort to identify all areas under its jurisdiction or control in which anti-personnel mines are known or suspected to be emplaced and (to) ensure as soon as possible that all anti-personnel mines in mined areas under its jurisdiction or control are perimeter-marked, monitored and protected by fencing or other means, to ensure the effective exclusion of civilians, until all anti-personnel mines contained therein have been destroyed.'

AP II and the Ottawa Treaty both imply an obligation on the Governments of mine-affected countries, who are also States Party to one or both of the agreements, to ensure that all mined areas under their jurisdiction and control are accurately surveyed, and then perimeter-marked by fencing or other means. Such marking and fencing will normally form part of a Technical Survey.

10 Responsibilities and obligations

10.1 National Mine Action Authority

The National Mine Action Authority shall:

a) accredit organisations as fit to undertake Technical Surveys;

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

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

d) prepare and publish standards for the design and construction of hazard marking systems to be used in national demining projects, and provide guidance to regional and local authorities on the retention and maintenance of minefield marking systems;

e) prepare and publish standards for survey marking;

f) prepare and publish standards for the documentation of Technical Surveys; and

g) maintain documentation, and make available documentation to authorities, organisations and the local population as required.

10.2 Survey organisation

The organisation undertaking the Technical Survey shall:

a) gain (from the National Mine Action Authority) accreditation and the licenses needed to conduct Technical Surveys;

b) apply the national standards for Technical Survey, including marking. In the absence of national standards, the survey organisation shall apply the IMAS standards, or such standards as are specified in their contract or agreement;

c) collect the necessary information as described in the appropriate Technical Survey form;

d) where applicable, conduct a formal handover of the surveyed land to the organisation conducting clearance; and

e) maintain and make available documentation as specified by the National Mine Action Authority.

In the absence of a National Mine Action Authority or authorities, the survey organisation should assume additional responsibilities. These include, but are not restricted to:

a) agree common marking standards with other survey organisations operating in the same general area; and

b) assist the host nation, during the establishment of a National Mine Action Authority, in framing national standards for Technical Surveys, including quality assurance and quality control.

Annex A
(Informative)
Normative references

The following normative documents contain provisions, which, through reference in this text, constitute provisions of this part of the standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of the standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid ISO or EN:

a) IMAS 08.10. General mine action assessment;

b) IMAS 08.30. Post-clearance documentation;

c) IMAS 08.40. Marking - mine and UXO hazards; and

d) IMAS 09.10. Clearance requirements.

The latest version/edition of these references should be used. GICHD hold copies of all references used in this standard. A register of the latest version/edition of the IMAS standards, guides and references is maintained by GICHD, and can be read on the IMAS website (http://www.mineactionstandards.org/). National mine action authorities, employers and other interested bodies and organisations should obtain copies before commencing mine action programmes.

Annex B
(Informative)
Terms and Definitions

B.1.1
area reduction
the process through which the initial area indicated as contaminated (during the general mine action assessment) is reduced to a smaller area.

Note: Area reduction may involve some limited clearance, such as the opening of access routes and the destruction of mines and UXO which represent an immediate and unacceptable risk. Such destruction will usually be to enable the collection of more reliable information on the extent of the hazardous area. Usually it will be appropriate to mark the remaining hazardous area(s) with permanent or temporary marking systems.

B.1.2
benchmark
a fixed point of reference used to locate a marked and recorded hazard or hazardous area. It should normally be located a short distance outside the hazardous area.

Note: A benchmark may not be necessary if the reference point is sufficiently close to the perimeter of the hazardous area.

B.1.3
hazard (ous) area
contaminated area
a generic term for an area not in productive use due to the perceived or actual presence of mines UXO or other explosive devices.

B.1.4
IMSMA
The Information Management System for Mine Action (IMSMA).

Note: This is the United Nation's preferred information system for the management of critical data in UN-supported field programmes and at the UN headquarters in New York. IMSMA consists, essentially, of two modules: the Field Module (FM) and Global Module (GM). The FM provides for data collection, information analysis and project management. It is used by the staffs of mine action centres at national and regional level, and by those implementing mine action projects - such as demining organisations. The GM refines and collates data from IMSMA FMs (and other field-based information systems) and provides the UN and others with accurate, aggregated information for the strategic management of mine action.

B.1.5
intermediate point
survey markers used between turning points that are more than 50m apart.

B.1.6
reference point
landmark
a fixed point of reference some distance outside the hazard(ous) area. It should be an easily recognised feature (such as a cross-roads or a bridge) which can be used to assist in navigating to one or more benchmarks.

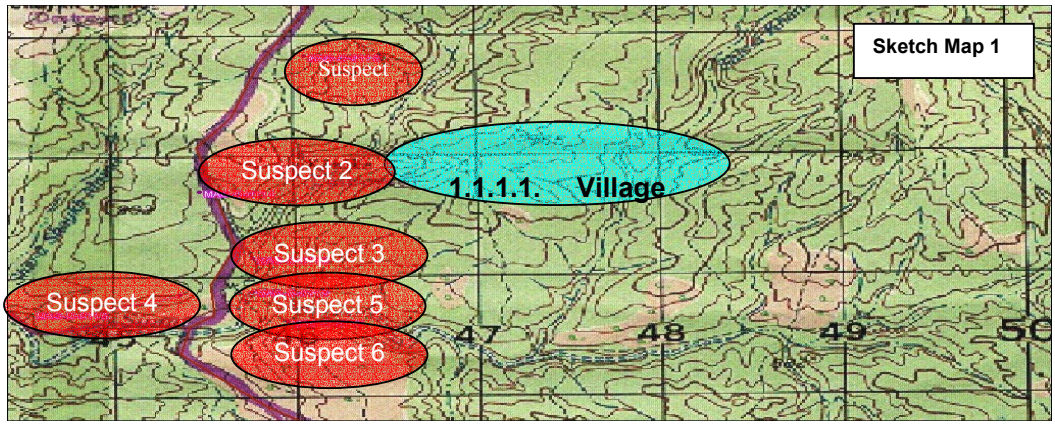
Note: Internationally these are often also referred to as Geodetic Points when the refer to a pre-surveyed location such as a trig point.

B.1.7
survey marker
a durable and long lasting marker used to assist in the management of marked and cleared land demining operations.

B.1.8
turning point
a fixed point on the ground which indicates a change in direction of the perimeter of the hazardous area.

Annex C
(Informative)
Illustrated example of carrying out a Technical Survey

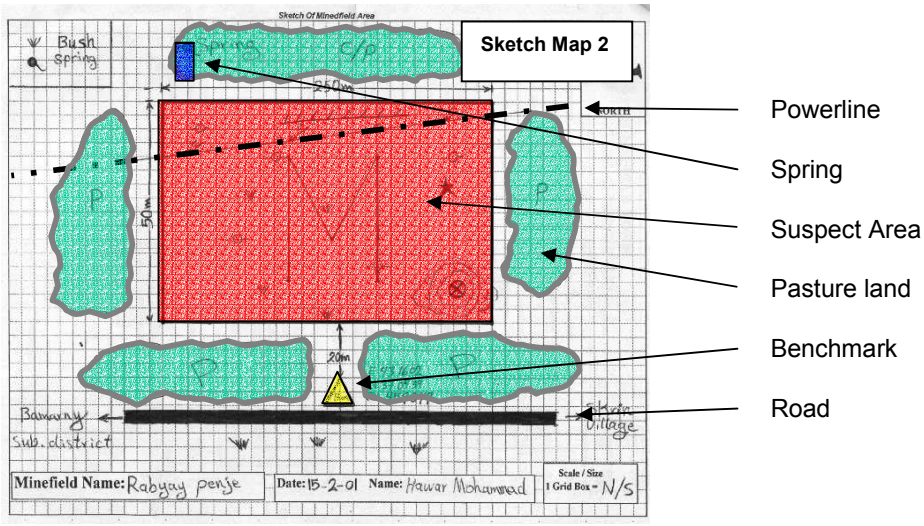
1. A Technical Survey should be carried out to collect sufficient information to enable the demining requirement to be more accurately defined. These demining activities include areas that need to be reduced, cleared and/or marked. Shown below in sketch map 1 is an example of a Village and six suspect mined areas within the village boundary. Interviewing the inhabitants of the village during either the Emergency Survey or Landmine Impact Survey identified these hazardous areas. The identified suspect areas prevent the villagers from living a normal live free from the dangers of mines and UXO.



2. During the Technical Survey pre-planning process one of the suspect areas, shown in sketch map 2, indicates constraints caused by the presence of mines.. The suspect area is blocking access to:

a. Pasture land for grazing. The identified suspect area is right in the middle of other agricultural land and at the moment an area of +/- 12 500 m^2 is unavailable for grazing.

b. Drinking water. The villagers have to walk around the hazardous area, instead of through it, to the spring that supplies the village with drinking water.



c. Powerline. The powerline has been damaged in the war and the area underneath the line would have to be cleared to reconstruct the line and pylons.

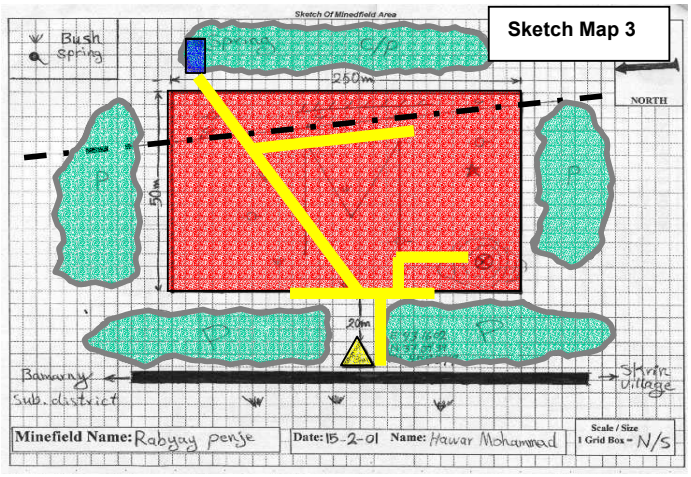
3 Using the road and the benchmark that was determined during the Emergency Survey or Landmine Impact Survey, as the starting point, one should analyse the constraints caused by the mines, and then propose solutions to address how these can be eliminated through marking, reducing and/or clearing the areas concerned. This pre-planning is done before carrying out the Technical Survey and it is done by analysing all available information and preparing an initial plan. The survey is then focussed at collecting the correct information that would allow such a final plan to be devised. Exploratory breaching lanes into the suspect area should also be planned. The purpose of these lanes is to allow safe access into the suspect area in order to collect specific information that can be used to develop a detailed plan for the site. The number and location of these lanes will depend on the information requirements. There could be a number of solutions to remove the impact in this particular case. One possibility would be to treat the areas as follows:

a. Pasture land. Depending on the terrain, vegetation and mine threat, it may be appropriate to consider the use mechanical assistance and mine detecting dogs in the area. The terrain feature in the bottom right hand corner of the suspect area could either be fenced off or it could be cleared manually.

b. Drinking water. As a first step, a safe lane could be made through the suspect area to provide villagers access to the spring.

c. Powerline. Due to the fact that the powerline is part of the area required for pastureland, one should clear the area around the powerline and pylons at the same time as the pastureland is being cleared. A different method might have to be applied due to the presence of scrap metal and power cables on the ground.

4 This Technical Survey pre-planning exercise will focus the Technical Survey team on the information they need to collect in order to confirm the initial plan. To support the identified planning requirements, lanes would have to be breached into the suspect area as shown in sketch map 3. The information collected through the survey will either confirm the preliminary plan or indicate that the plan needs to be amended.

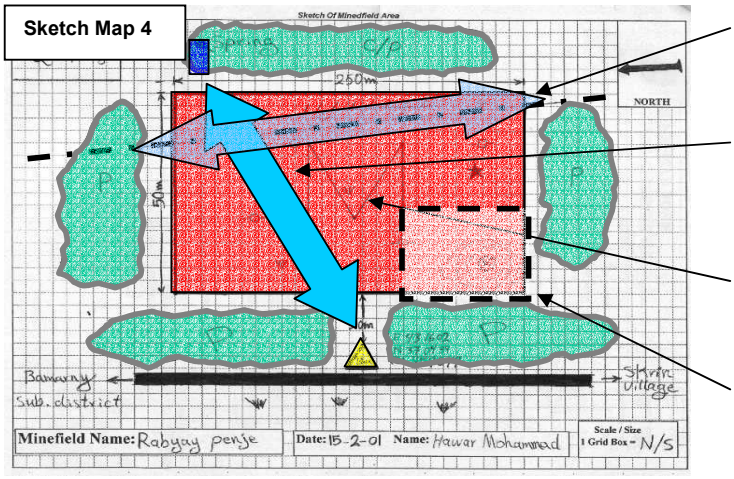


5 After the Technical Survey has been completed and the information has been entered into the mine information database a final plan should be developed for this particular site. The same process has to be carried out for each one of the six other identified suspect areas. These areas could eventually become one cluster and resources should be shared and moved between the six different sites to either prepare the ground, reduce the suspect area, clear and mark contaminated areas.

6 As a result of analysing the information collected though the Technical Survey a plan to deal with the mine problem is developed. The main focus of the plan is to address the

impact of the mines and unexploded ordnance on the community where it is found. Graphically one of many solutions is shown in sketch map 4. The plan should ensure that the whole area identified in the GMAA process is dealt with and as a result is accounted for.

Sketch Map 4



Demining along the destroyed powerline with manual deminers or MDD

Priority 1 to provide a safe lane through the hazardous area to the spring using MDD or Mechanical means

Demining the rest of the suspect area, possibly using mechanical assistance followed by MDD.

Fencing off the hilly area to be cleared at a later date

7 Pre-planning and the conduct of Technical Surveys will assist in the preparation of the annual works programme including demining, mine awareness and victim assistance plans and the tasking orders that will be provided to mine action organisations in particular demining organisations. These tasking orders will describe in detail what the demining requirements are (area and depth), which kind and how many resources are best to be used and how long they are expected to work on the task to address the impact that was defined during the GMAA process.

Annex D
(Informative)
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 marking is used in each country. National mine action authorities shall develop and publish such standards. This annex provides an example of the type and quality of marking required. In the absence of a national mine action authority or authorities, the survey organisation should adopt the following marking scheme.

Signs made of combustible, usable or attractive material may be removed by the local population, especially during conditions of emergency interventions, when the country will be starved of resources and materials. Signs will then have to be replaced by easily identifiable markings (such as painted cairns of stones or paint marks on walls or trees). 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 Technical Survey organisation, operating in conjunction with the local population, to ensure that an enduring marking system is devised.

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.

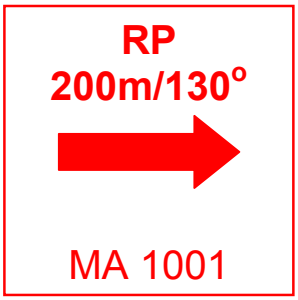


Figure 1: Reference point marker

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

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 or 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.

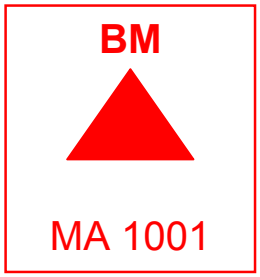


Figure 2: Benchmark sign

Note: Figure 2 shows a sign indicating a benchmark sign for Minefield 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) be surveyed by resection or GPS, and with the coordinates formally recorded;

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

c) marked by three survey markers: one at the change of direction, and one each side on the perimeter. The markers should be spaced 1.0m apart, clearly marked and recorded. Buried metal objects should also be used to mark all turning points for permanent future reference.

d) marked with a sign, which clearly distinguishes the sign from other marked area signs. 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 1.25m above ground level.

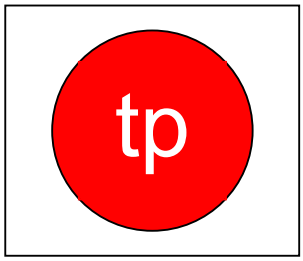


Figure 3: Example of a turning point sign

5 Intermediate points

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.

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.

Annex E
(Informative)
Guidance on the use of IMSMA for Technical Surveys

IMSMA. The Information Management System for Mine Action (IMSMA) is the United Nation's preferred information system for the management of critical data in UN-supported field programmes and at the UN headquarters in New York. IMSMA consists, essentially, of two modules: the Field Module (FM) and Global Module (GM). The FM provides for data collection, information analysis and project management. It is used by the staffs of mine action centres at national and regional level, and by the implementors of mine action projects - such as demining organisations. The GM refines and collates data from IMSMA FMs (and other field-based information systems) and provides the UN and others with accurate, aggregated information for the strategic management of mine action.

Technical Survey. A Technical Survey is the detailed technical and topographical investigation of known or suspected hazardous areas. IMSMA enables the User to enter, store and retrieve the information from such investigations using a Graphical User Interface (GUI) in a flexible manner. The relationship between data entry, storage and retrieval of technical survey information is shown in Figure 1.

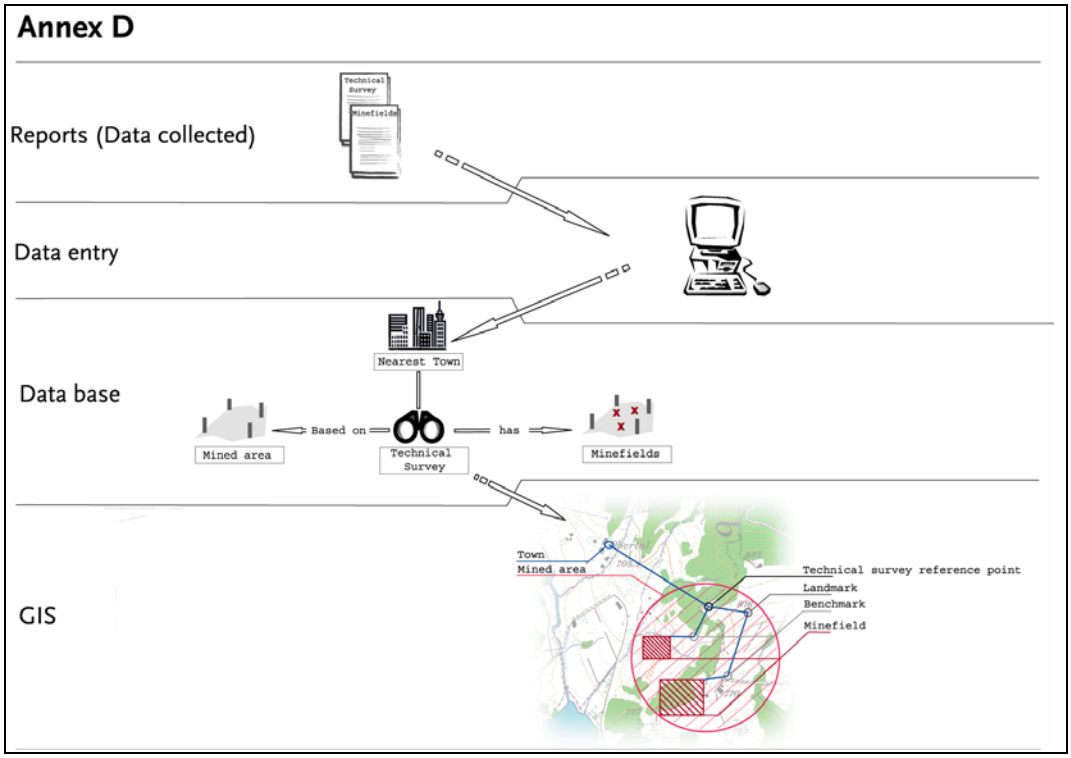


Figure 1: IMSMA FM - Technical Survey data entry, storage and retrieval

Data entry. The normal means of entering Technical Survey information is via two forms in the FM: the Minefield Report and the Technical Survey Report. The report formats defined in IMSMA may be used as provided, or they may be customised to meet local requirements.

a. A Minefield Report allows the User to enter data on the hazards (type, estimated quantity, depth of burial of mines/UXO and hazard marking systems emplaced), the location of physical survey markers (reference point and benchmarks), details on the mined areas perimeter (turning and intermediate points) and terrain information (soil type, ground profile, slope, drainage, vegetation cover and contamination/obstacles). The Report also allows other related information to be entered such as access, land use and the location of local medical facilities.

b. A Technical Survey Report allows the User to enter additional information when two or more mined areas are grouped closely together and are treated as a single task or project.

Technical Surveys may refer to areas previously recorded in IMSMA, perhaps as part of the general mine action assessment or included in a Dangerous Area Report or Mined Area Data Sheet. In such cases, it is important to use the same reference (i.e. mine area number). The Navigator and the IMSMA GIS functionality assist the user in identifying relevant and related reports and data sheets.

Data storage. Information is stored in Technical Survey tables within the IMSMA FM database. Additional relevant local information may be stored in other tables within the IMSMA FM database, for example in Contact, Location or Country Features tables.

Data retrieval. Data can be retrieved from the Technical Survey Report and associated Minefield Reports. Progress Reports can also be used to provide information on work done, and in progress, for each of the minefields referred to in the Technical Survey. This includes, for example, areas cleared (as part of an area/boundary reduction process), devices cleared or marked during survey, and other details of the survey process such as resources expended.

Reporting and Analysis Tools. IMSMA contains predefined reports useful for summarising data collected during the Technical Survey. IMSMA GIS functionality includes analysis tools that assist in developing mine clearance plans from the database.