Urban Survey

Technical Note

Contents

SECTION ONE - Introduction

1.1 Introduction

While the requirement to conduct ERW survey in urban environments is not entirely new, the scale and complexity presented by modern cities presents significant additional challenges. The density of buildings, modern construction methods, returning populations and non-ERW based hazards amongst others will require unique considerations when planning HMA operations. Programmes may use this note to inform the drafting of their own SOPs or directly embed it as an annex to their survey SOP. It is designed to provide operations staff with guidance on how to plan, conduct and manage urban survey operations, and how to use supporting survey forms. Survey in urban environments follows the same principles and many of the same procedures as conventional survey operations. However, in addition to general survey data there will be a requirement to gather additional technical information about the urban environment, from building types, detailed understanding of land ownership, to secondary environmental hazards. This is important to support clearance (understanding how many floors there are etc.), team safety (whether or not a building is safe to enter), and reconstruction (to identify buildings that are worth repairing etc.).

Additional guidance on threat assessment, survey in urban and IED environments can be found in:

- HALO Global IED SOP – Part 2 – Non-technical Survey
- IMAS 08.10 – Non-technical Survey (update due March 2019)
- IMAS 07.13 – Risk Management in Mine Action: Threat Assessment Annex (due March 2019)

Guidance for clearance operations in an urban environment can be found in:

- HALO Global IED SOP – Part 3 – Manual Clearance and TS: Annex E
- IMAS 09.13 – Building Clearance (due March 2019)
- HALO Libya SOP – Part 5 – Urban Clearance with Mechanical Assets

SECTION TWO – Non-Technical (Urban) Survey Procedures

2.1 Urban Survey Team Composition

Urban survey teams may conduct the following activities

- Rapid Assessment surveys of urban areas, in order to inform prioritization and planning of subsequent NTS operations
- NTS to identify, mark, map and report all SHA/CHA for entry into the national and HALO databases.
- Cancel previously reported hazardous areas that meet the necessary criteria
- Risk education or community liaison tasks.

Each urban survey team may include the following personnel:

TEAM MEMBER	QTY	QUALIFICATIONS
Team Leader	1	NTS course, urban survey training, HALO medic course
Assistant Team Leader	1	NTS course, urban survey training, HALO medic course, Risk Educator
Surveyor/driver	2	Survey training, driving license (HALO medic course if possible)
Structural assessor	*	Either a separate team member or one of the above, trained to make basic "safe to enter" assessments of buildings.

For rapid assessment operations it may be appropriate for the team to split into two sub-teams lead by the TL and ATL respectively. Operations Management personnel will need to consider vehicle, communication and support requirements carefully in this case. In general, it is recommended that the sub teams work at a maximum of 500m (or 15 minutes, whichever is the smaller) from a CASEVAC capable vehicle at all times.

2.2 Urban Survey Team Equipment

Each team should be equipped with[1]:

- CASEVAC capable vehicle (plus a support vehicle if required to split for Rapid Assessment tasks)
- Mapping equipment (GPS, compass, rangefinder, measuring tape)
- Reporting materials; smartphone/tablet with Fulcrum or similar. Paper copies of reports, notebook, stationary etc.
- Major Trauma Kit and stretcher
- Marking materials
- Sufficient food and water for 36 hours
- Communications equipment (Mobile phone, VHF radios, satellite phone if required)
- Personal protective equipment for secondary hazards if required (asbestos, falling debris etc.)
- Torches, binoculars, long range camera
- Uniform; robust work trousers, shirt, jacket etc.
- Digital or hard copies of: Relevant SOPs, UXO recognition guide, CASEVAC cards etc.
- Drones or other remotely delivered optics (if available, see guidance below)

2.3 Urban Survey Safety Considerations

The first priority for the team leader will always be guaranteeing the safety and security of his team. The team leader should not take any unnecessary risks entering potentially dangerous areas.

Survey in an urban environment presents significant additional hazards when compared to more conventional survey. Establishing which areas are contaminated/safe to move through,

[1] It is possible that there will sensitivities about certain items of equipment in many of the operating environments that IED clearance is conducted and/or teams may need to be managed remotely. As such the programme may wish to take a pragmatic approach to equipment carriage and make changes where required (e.g. use of smartphones for GPS, compass etc.)

identifying environmental hazards and a complex mix of ERW, mines and improvised explosive devices will require survey teams continually reassess their own safety. Programme SOPs and training should be structured with this in mind. Under no circumstances shall teams enter an area of active combat.

- While operating on foot the survey team and operations management staff will need to consider areas that are safe to transit through, and areas which are not. In particular, where ERW contamination is extensive and boundaries between buildings is unclear it may be difficult to ascertain which areas are contaminated with ERW and which areas may also have concealed victim operated devices which will present a greater immediate hazard to the survey team. If in doubt teams should remain on hard standing, use proven routes, or refer to the Operations Manager for further guidance.
- When travelling by road, the vehicle should keep to sealed surfaces and avoid driving on soft verges in known conflict areas. Teams should also consider that even sealed roads may be contaminated with ERW, either on the surface or concealed in small piles of debris etc. Where there is doubt, teams should dismount and move by foot; or cease operations, refer to the Operations Manager and re-plan the task. Travelling by armoured vehicle should not be used as a justification for driving onto potentially unsafe areas.
- In addition, survey teams should be aware of secondary hazards presented by an urban environment- particularly if working in an area very recently affected by conflict where. infrastructure/repair teams have not been able to do even basic safety repair work. Further detail is below, but hazards may include falling debris, toxic chemicals, asbestos, fuel or electrical hazards.
- Other safety procedures should remain the same as non-technical survey tasks in rural environments. Including route and CASEVAC planning, communications with HQ, activity logs etc.

2.4 Urban Survey Process

Exact processes for urban survey will vary considerably by programme, and will be heavily structured by factors like staff availability, size of the target area, access to area by international staff, availability of technical equipment etc. On the following page is an outline process that can be used as a guide and modified as required. It is designed to deliver useful, evidence-based information as soon as possible. It will likely require a specific mapping, reporting and IM system (using tools such as Fulcrum), and the GIS/desk assessment will need to be developed according to programme needs. Training should be designed around the operational methods that are to be used. There will be a greater reliance on GPS, reporting apps and satellite imagery than compass work and sketch maps. As such GPS accuracy should be as high as possible; using Bluetooth GPS adaptors for smartphones or standalone GPS systems. Further guidance is in the reporting chapter in Section 3, but there is greater emphasis on considering the ground/buildings in detail. As mentioned above this is to ensure team safety, help plan future clearance and target reconstruction efforts etc.

2.5 Environmental Safety & Non-explosive Hazards

Urban environments are full of toxic chemicals and materials which when controlled present little risk to individuals, however, following conflict these materials and chemicals may become exposed to the populations and HALO staff. Toxic industrial chemicals and materials may include;

- Radiological materials
- Asbestos used in building construction
- Chlorine used in swimming pools and water treatment plants
- Phosgene in plastics, medicines and fertilisers
- Hydrogen cyanide and ammonia used in the production of materials and medicines

Additionally, other hazards may be present, such as

- Confined spaces (creating an oxygen deficient environment)
- Unguarded heights
- Falling masonry
- Bio-hazards
- Gas leaks, and air hung powders which pose explosive and flammable risks

All of these can drastically affect the clearance plan and objectives and need to be identified early. In general, it is unlikely that urban survey teams will need to enter damaged buildings (particularly at the Rapid Assessment phase). However, there may be a requirement to enter a damaged building that is free from explosive hazards in order to gain better oversight of a hazardous area or meet informants. Prior to doing so a safety assessment must be carried out; not only to ensure that the area is free from ERW but also that it is safe from a structural and environmental safety point of view. Programmes should incorporate such requirements into training and operational planning.

2.6 Unmanned Aerial Vehicles (UAVs)

Physically surveying buildings presents its own challenges, satellite imagery and GIS may provide useful background information but cannot replace on-site survey. UAVs may be used to gather further evidence on site, without the need to physically enter a building. The ability to conduct a 360^{o} visual inspection of a building can facilitate the collection of additional information including, but not limited to;

- Potential additional access points
- Potential control point
- Identification of secondary hazards
- Indications of ordnance, ground sign, component parts or other direct/indirect evidence
- Evidence of current or recent occupation by civilians or combatants

Operations management staff should decide the extent to which it is appropriate for UAVs to enter structures or fly over hazardous areas. As this will present certain risks including, but not limited to:

- Potential loss of the drone in an area where it cannot be safety recovered
- Interacting with an item of ordnance and causing it to function (particularly improvised devices with sensitive switches)
- A collision that exposes a secondary hazard

Unless granted specific exemption by the Operations Manager UAVs should not enter buildings.

Unmanned ground vehicles (robots etc.) should not be used during non-technical survey. They should be used only as part of technical survey or clearance, as specified in a clearance plan.

SECTION THREE – Reporting Guidance

3.1 Report Formats

Examples of urban survey report formats are below. These can be modified or adapted for digital applications as required. Alternatively, they can be printed and completed by hand. The reports themselves should be used as follows:

1. **Urban Survey Rapid Assessment**: A simple form designed to be used with Fulcrum, requiring minimal training. The output will be "sectors" classified as “hazard present”, “hazard probable” or “no evidence of hazard” with some basic supporting information. It assumes no requirement to make structural assessments, or detailed polygon information. The GIS product should be standalone and not be entered onto national/IMSMA databases.
2. **Urban Non-Technical Survey**: An NTS form adapted for use in an urban environment- similar to standard NTS forms with some additional information until section 8. Section 9 onwards considers buildings in more detail. Allows the creation of multiple polygons on a single task, however programmes may find "one polygon one task" easier to manage Requires the use of form (2a) and potentially (2b)
    a. **Building Assessment**: A supplementary annex to form (2). One of these should be produced per building within the polygon. This form is intended to gather information to support clearance planning; establishing the layout of the building, specific ERW hazards, clearance considerations (such as rubble) and key non-explosive hazards that may pose a risk to clearance personnel
    b. **Basic Structural Safety Assessment** (pending): A supplementary annex to form (2). If required one of these could be produced per building within the polygon. This form is intended to make more in depth structural assessments focusing on extent of damage and likely reconstruction requirements. It does not require a structural engineer to complete it, but surveyors will require additional training to understand basic assessment principles.

Additionally, attached is a **Building Classification Guide**, this is an information only annex. It provides information on building types and likely/associated hazards to help inform the completion of forms (2a) and (2b). In the case of more complex or interlinked infrastructure a bespoke annex may be required, guidance from the Capability Group should be sought in this instance.

3.2 Threat Assessment

The reports include free text sections for history of areas, general descriptions and a task specific threat assessment. Guidance on threat assessment can be found in the NTS chapter of the Global IED SOPs. Completing a threat assessment in an urban environment contaminated by IEDs will be particularly important. It will formulate a most likely/best case/worse case assessment of devices, which will inform safety distances and search techniques used during clearance.

SECTION FOUR - Quality Control

Reports shall be submitted to the GIS Department, who shall conduct the initial quality check with one week of receiving the report to verify that:

- All form fields have been completed or marked not applicable
- All GPS coordinates and bearings fall in the correct position in accordance with the sketch map and satellite imagery
- The gathered information provided is correct.

If any errors are identified, the report shall be returned to the survey team leader for correction as soon as possible.

Once verified, all reports shall be checked and approved by the Operations Manager or designated survey manager. This shall include a review of direct and indirect evidence to ensure that the designation of the area as an SHA or CHA is justified by the evidence presented, and the perimeter is appropriately delineated. A member of staff with a relevant background in engineering should review structural assessments in detail.

Wherever possible all hazardous areas will be visited by the operations management to verify on-site the data, including the perimeter of the recorded hazardous areas.

Annexes (As separate excel file)**:**

Annex A – Rapid Assessment Report

Annex B – Urban Non-Technical Survey Report

Annex C – Building Assessment Form

Annex D – Basic Structural Safety Assessment Form (pending)

Annex E – Building Classification Guide

General task analysis

Establish size of target area, key stakeholders, relevant national standards/legislation, desired end-state etc. Of particular note programmes should seek to establish whether they can directly facilitate and support on-going reconstruction efforts. As this may guide the level of depth to which buildings are surveyed

GIS/desk assessment

Using open source data, maps, satellite imagery etc. Senior operations management and GIS staff should break down the target area into manageable "sectors" (either city blocks, building groups or individual buildings) to enable future survey. Reviewing conflict history should be enable programmes to understand the areas most likely to contain hazards and broadly what they might be. At this stage gathering information on key infrastructure would also be of benefit- in particular where there may be specific requirements for planning along more complex urban systems such as power lines, gas pipes, sub-surface systems or other distinct utilities

Rapid Assessment

Trained personnel operating (in pairs at a minimum) visit the target area and conduct rapid analysis of each tile as defined by the GIS/desk assessment. Each are should be graded as having a hazard present, probable, or "no evidence of hazard" using the Rapid Assessment form at annex A. Note these are not defined CHA/SHA at this stage. The output should be a GIS product/map showing areas where ERW contamination is densest and areas that are relatively free of contamination. It should also include key supporting data such as contact details for key informants etc.

ERW hazard present

Areas with visible evidence of ERW contamination, confirmed accidents etc. High priority for full NTS

ERW hazard probable

Areas where ERW can't be confirmed, but seems likely given reporting, history of area or visible damage. Not prioritised for NTS, unless confirmation of being free from hazards would enable access by other agencies (reconstruction etc.)

No evidence

No evidence of ERW contamination. Area not prioritised for NTS unless new evidence emerges, or all other areas have been completed.

No access

Teams cannot access areas due to secondary hazards, conflict activity, regional permissions etc. Area to be revisited once access has been gained

Urban Non Technical Survey

NTS takes place in accordance with SOPs and urban survey considerations, using the urban survey report format at annex B. Each NTS report will generate a single task (which may contain more than one polygon) and a separate building assessment report completed for each building within the task (annex C). Where possible a more in depth building assessment should be conducted with embedded personnel trained in basic structural safety assessment using the form at annex D; this will assist in making safe/not safe to enter decisions and guide future reconstruction efforts.

CHA

As with NTS elsewhere a CHA will be generated where there is direct evidence of ERW contamination using a modified urban NTS report, with associated building assessment annexes

SHA

As with NTS elsewhere an SHA will be generated where there is indirect evidence of ERW contamination using a modified urban NTS report, with associated building assessment annexes

No evidence

If, following NTS, no evidence of ERW contamination is found then this should be reported accordingly, and the map/database produced by the Rapid Assessment updated

Basic Structural Safety Assessment

Where possible a basic structural assessment should be conducted by a trained member of staff using the form at Annex D. This is not full structural survey, but a basic assessment that focuses on the structural damage to the building (rather than ERW hazards)