Challenges of MCM OPS in VSW and the „surf zone“

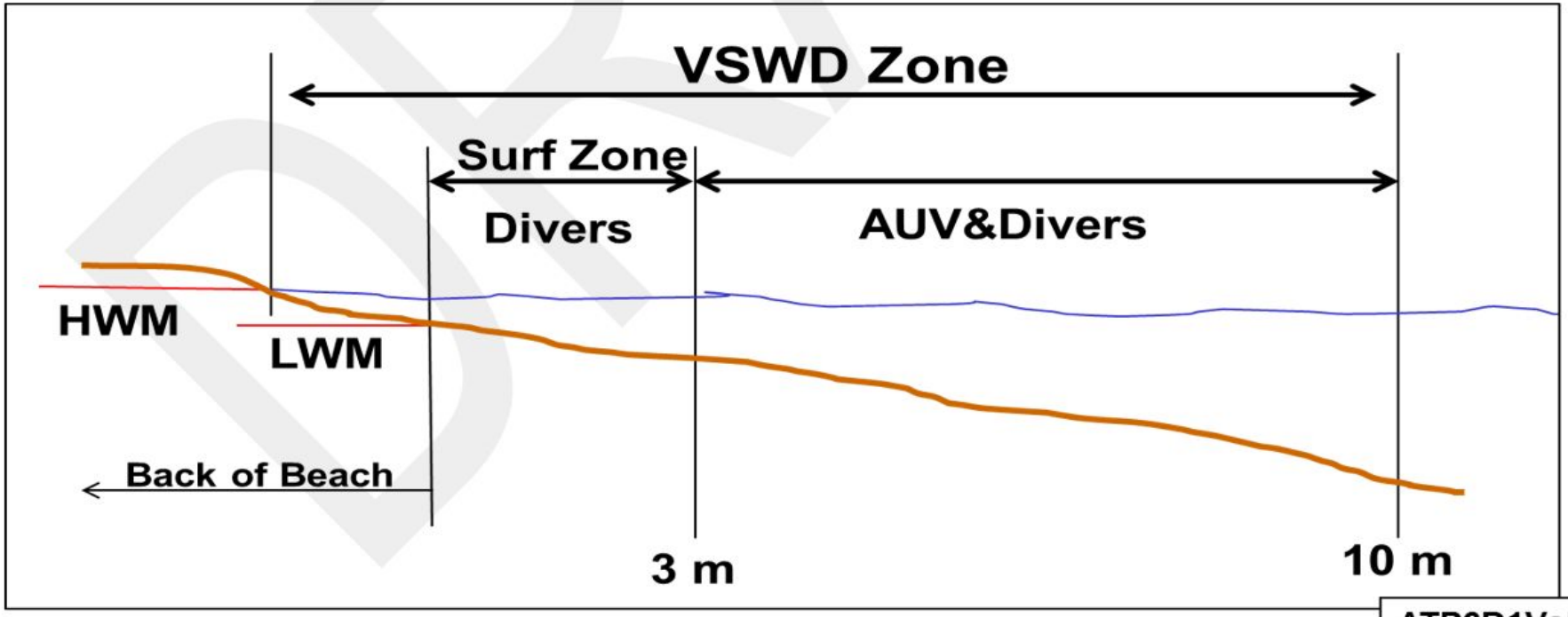
LCDR Miroslav Jug,
Slovenian Armed Forces
Helsinki, February 2025

Agenda - „Coast is clear!“

1. VSW zone - Operating in a minefield closest to the possible enemy
2. Manual or robotic approach - caps and limitations
3. Way ahead - How can industry fill in the gaps
4. Questions/debate.

1. Very Shallow Water zone – Operating in a minefield closest to the possible enemy

Definition of the very shallow water (VSW) zone



ATP6D1Vol II

1. Very Shallow Water zone – Operating in a minefield closest to the possible enemy

Very Shallow Water Diving (VSWD) is a concept for the **localization**, **identification**, and **clearance** of mines and other ordnance as well as underwater obstacles in the very shallow water (VSW) zone. The VSW environment encompasses the underwater areas from a water depth of 10 meters up to the surf zone, and the surface waters adjacent to the beach zone.

1. Very Shallow Water zone – Operating in a minefield closest to the possible enemy

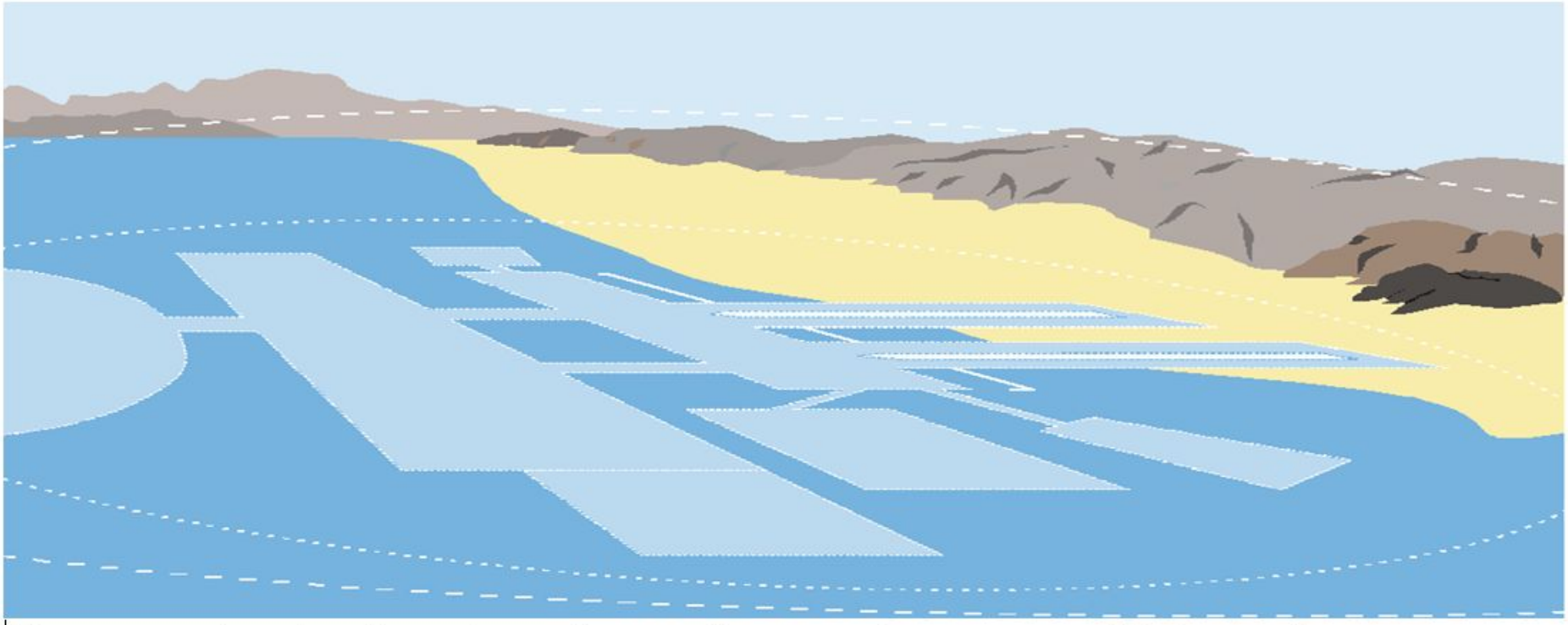
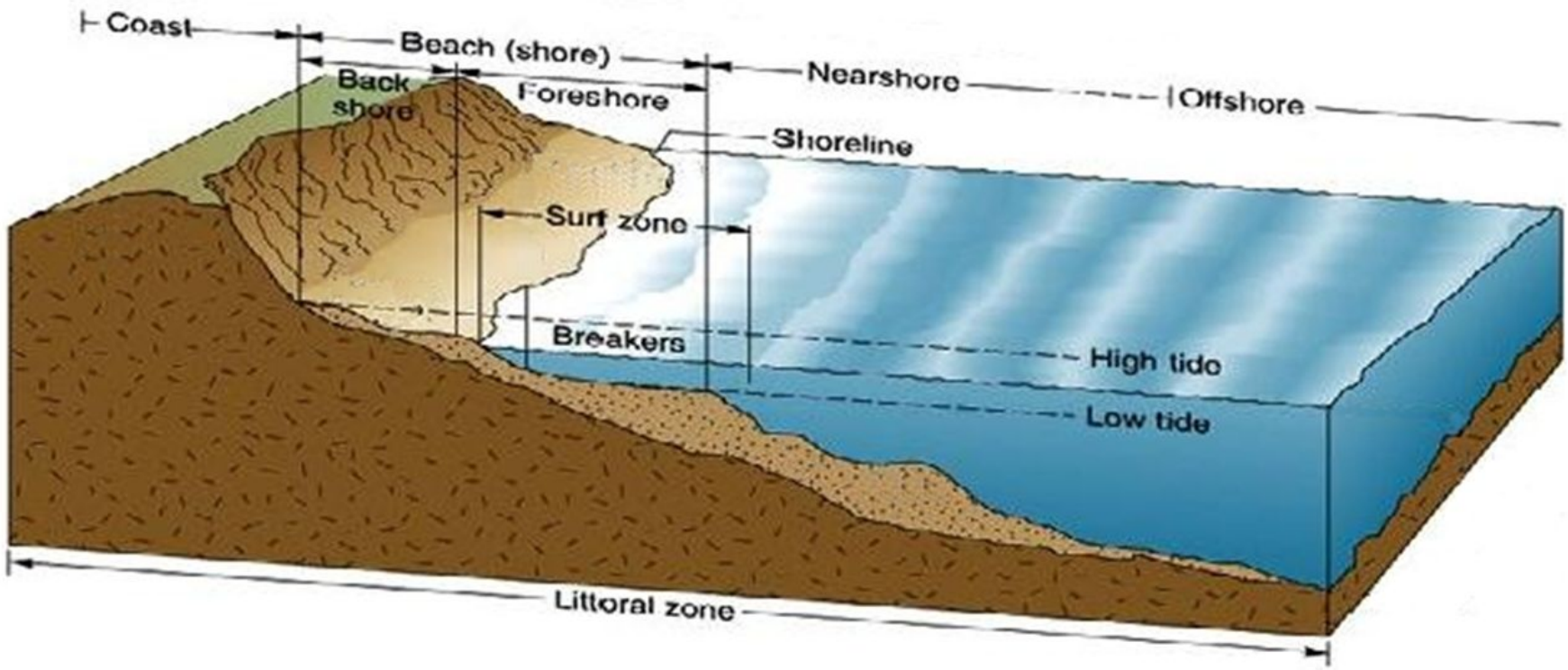


Diagram showing beach and nearshore waterspace, with lanes for access marked.

1. Very Shallow Water zone – Operating in a minefield closest to the possible enemy

The Very Shallow Water (VSW) zone and Surf Zone (SZ) are crucial and challenging areas within the coastal battlespace where maritime operations are concerned. Knowing your environment can be extremely beneficial, enabled by Intelligence Preparation of the Environment (IPoE) operations. Having a detailed awareness of the VSW/SZ area plays an important part in the planning and execution of beaching/amphibious operations (among others), determining go or no-go mission limits and setting time criteria for accomplishing objectives.

1. Very Shallow Water zone – Operating in a minefield closest to the possible enemy

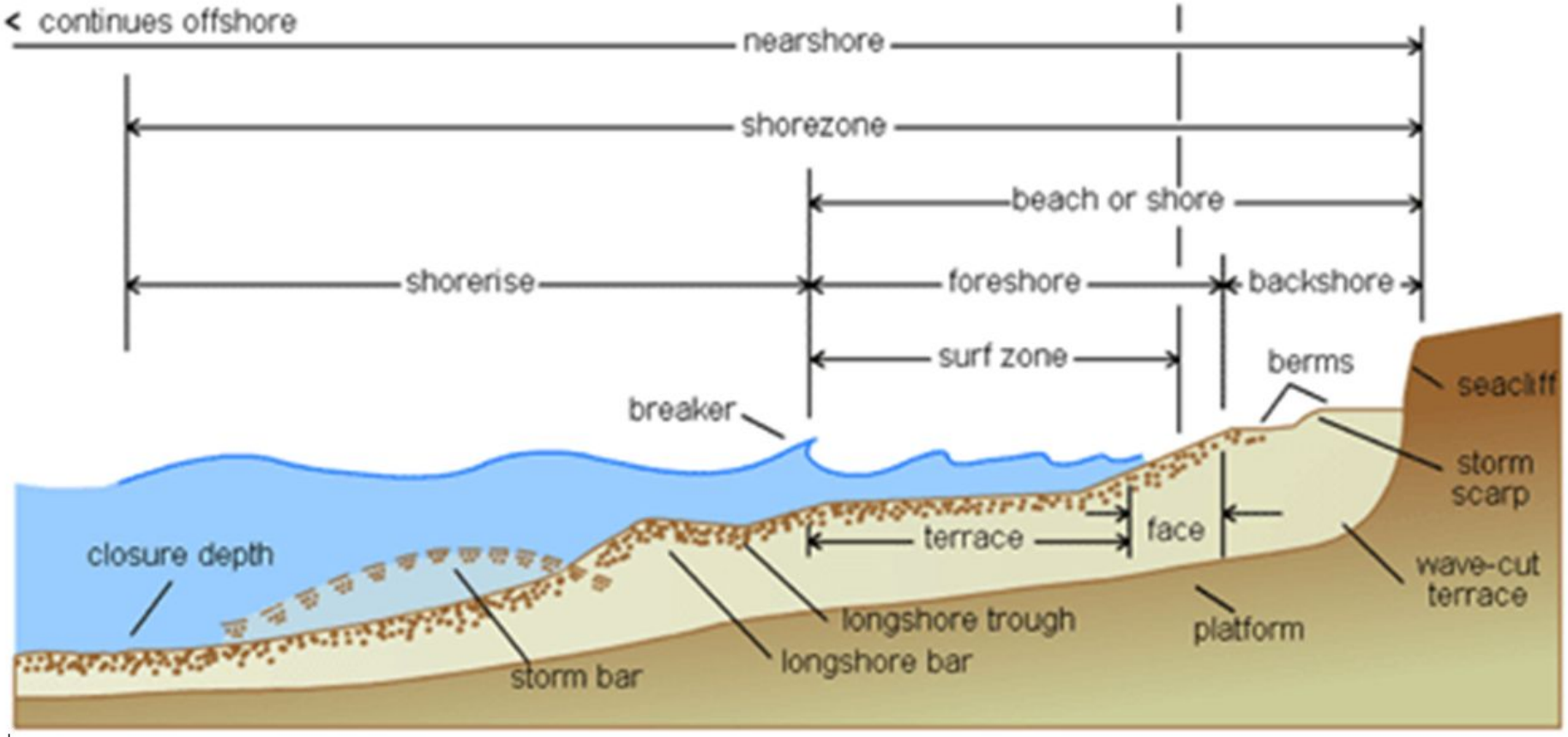


Terminology of zones across-shore on a beach shoreline.

1. Very Shallow Water zone – Operating in a minefield closest to the possible enemy

The dimensions of the VSW zone and SZ vary due to topography, bathymetry and oceanographic effects. In some cases, it may include the area of few meters from the beach or in others cases several kilometres. The bottom composition within the SZ can also vary wildly (i.e. kelp or flat sand), this requires multiple techniques and procedures to achieve success through the avoidance and/or removal of threats (e.g. mines, obstructions, UWIEDs, others).

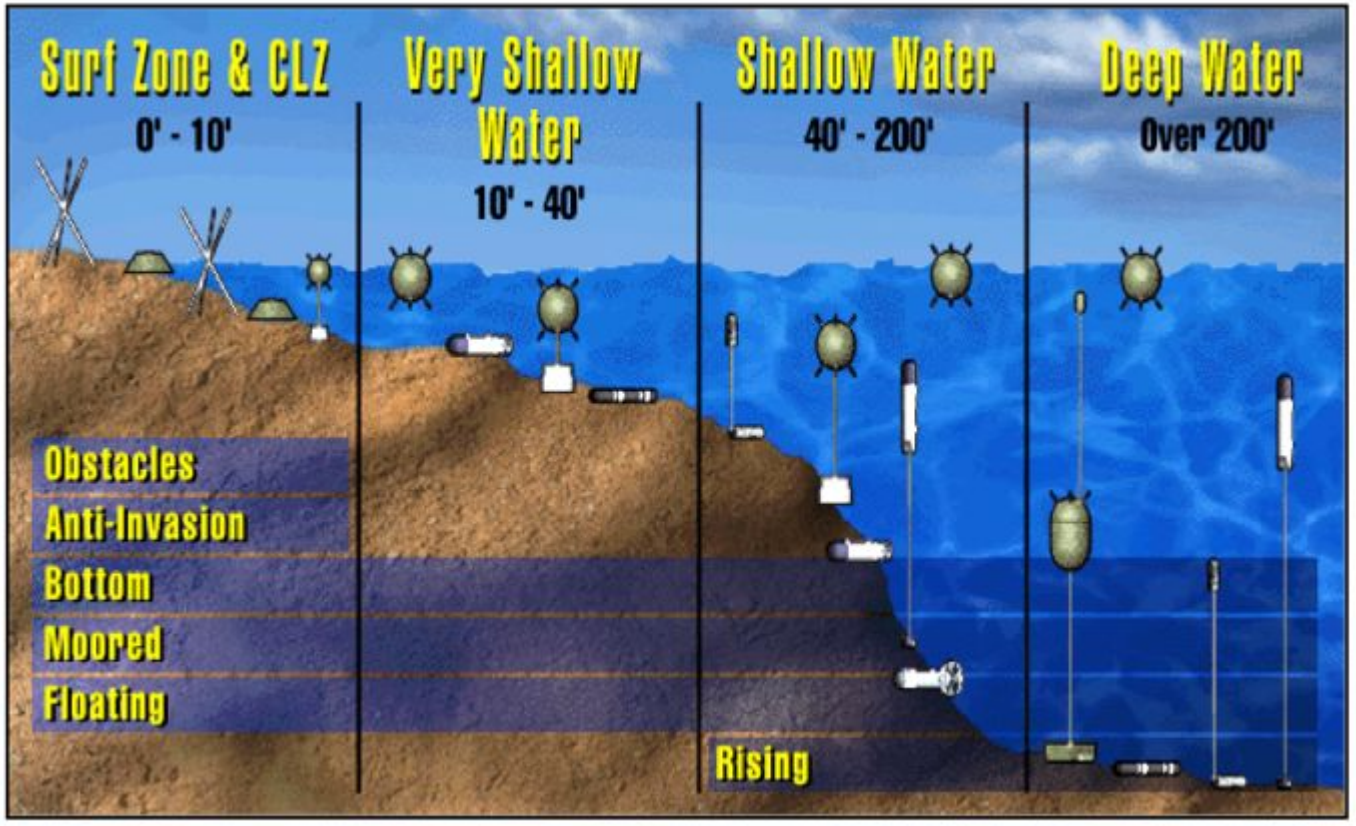
1. Very Shallow Water zone – Operating in a minefield closest to the possible enemy



1. Very Shallow Water zone – Operating in a minefield closest to the possible enemy

Threats can be defined as conventional ordnance, UWIEDs and obstructions (both man-made and natural) or a combination thereof, which may impede access to or from the shore or harbor.

1. Very Shallow Water zone – Operating in a minefield closest to the possible enemy



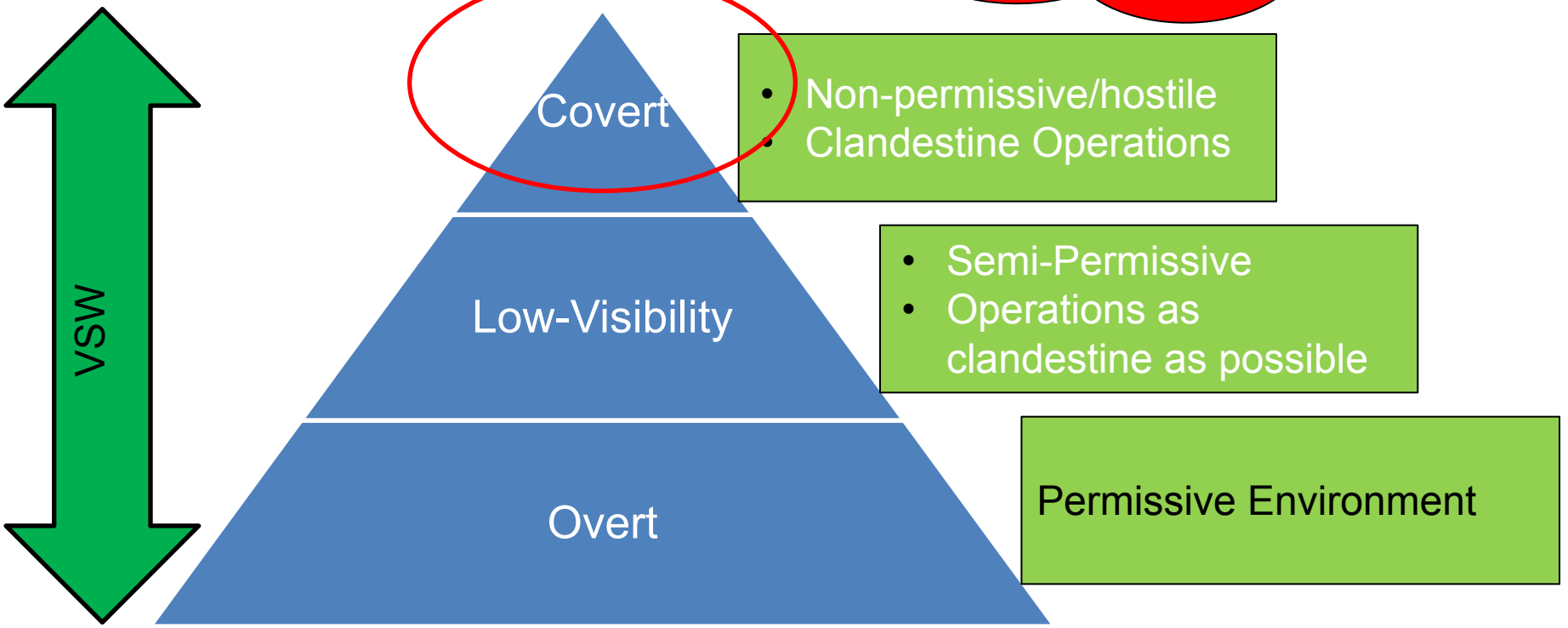
1. Very Shallow Water zone – Operating in a minefield closest to the possible enemy

Permissive vs. Non permissive

The key factor in determining whether the VSW/SZ is a permissive or non-permissive environment is whether the adjacent shoreline is defended or undefended. In a non-permissive environment it can be assumed that clandestine ops (covert or discrete) will be required by suitably trained units. When an EO threat exists in a non-permissive environment, it will necessitate a longer operating and logistical distance from the support vessel and will restrict operations to non daylight hours. In certain areas of the world in summer seasons this may leave only a small cycle of darkness. The quality of REA is likely to be lower and the level of risk is greater.

CHALLENGE

COMPLEX:
- Symmetric & Asymmetric threats
- Always Time Constraints



- Non-permissive/hostile
- Clandestine Operations

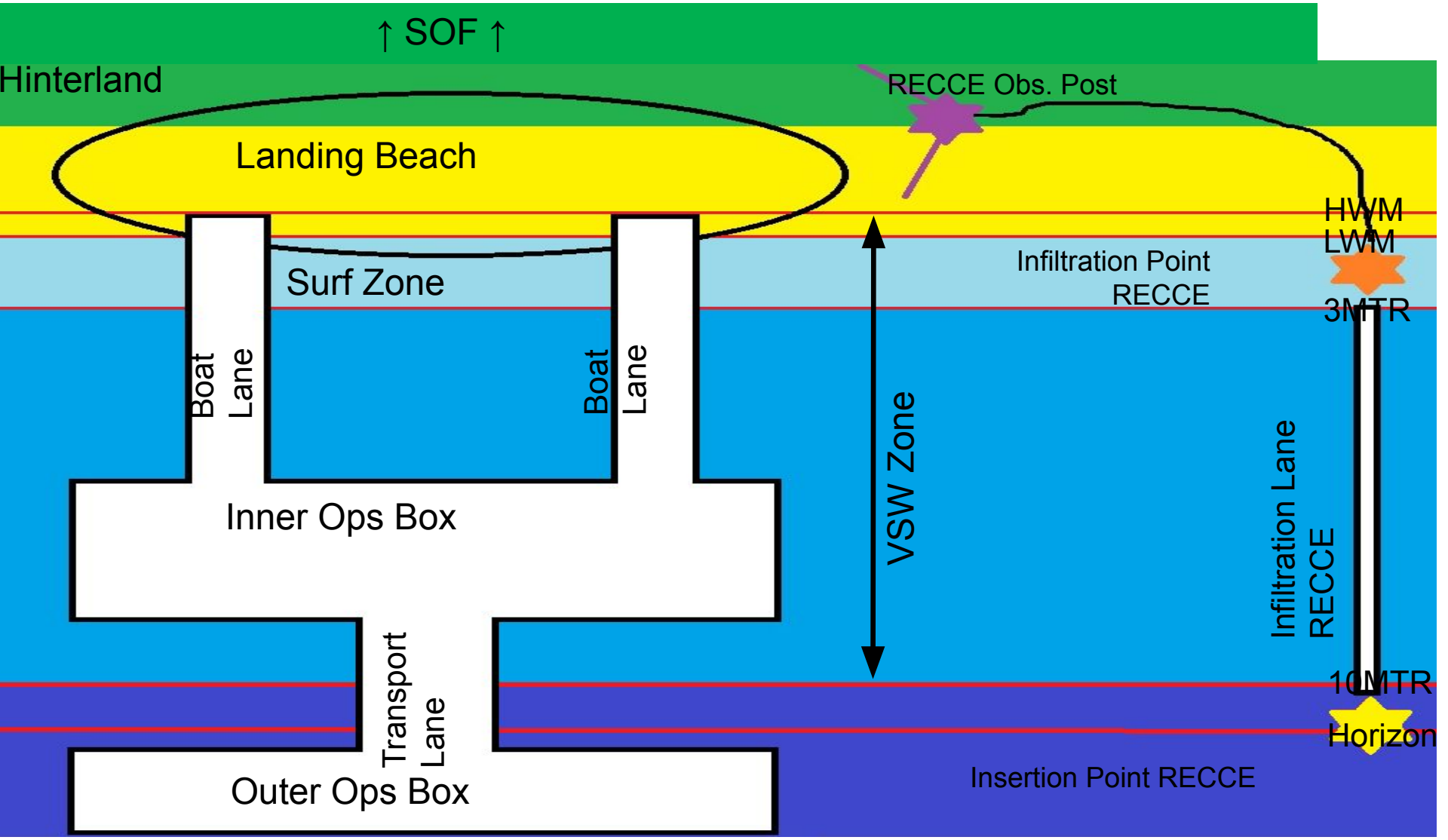
- Semi-Permissive
- Operations as clandestine as possible

Permissive Environment

1. Very Shallow Water zone – Operating in a minefield closest to the possible enemy

Whether conducting VSW operations in a conflict (semi-permissive or non-permissive environment) with a state or non-state actor, enemy detection systems must be assumed to be present. These can include infrared, night vision, radar, aerial surveillance, acoustic listening devices, spotters, etc. The range of these systems and associated weapon systems will influence friendly operations.

The land topography may give an advantage of oversight or present a kill zone for friendly forces working in the area.


↑ SOF ↑
Hinterland
RECCE Obs. Post
Landing Beach
HWM
LWM
Infiltration Point
RECCE
Surf Zone
3MTR
Boat
Lane
Boat
Lane
VSW Zone
Infiltration Lane
RECCE
Inner Ops Box
10MTR
Horizon
Transport
Lane
Outer Ops Box
Insertion Point RECCE

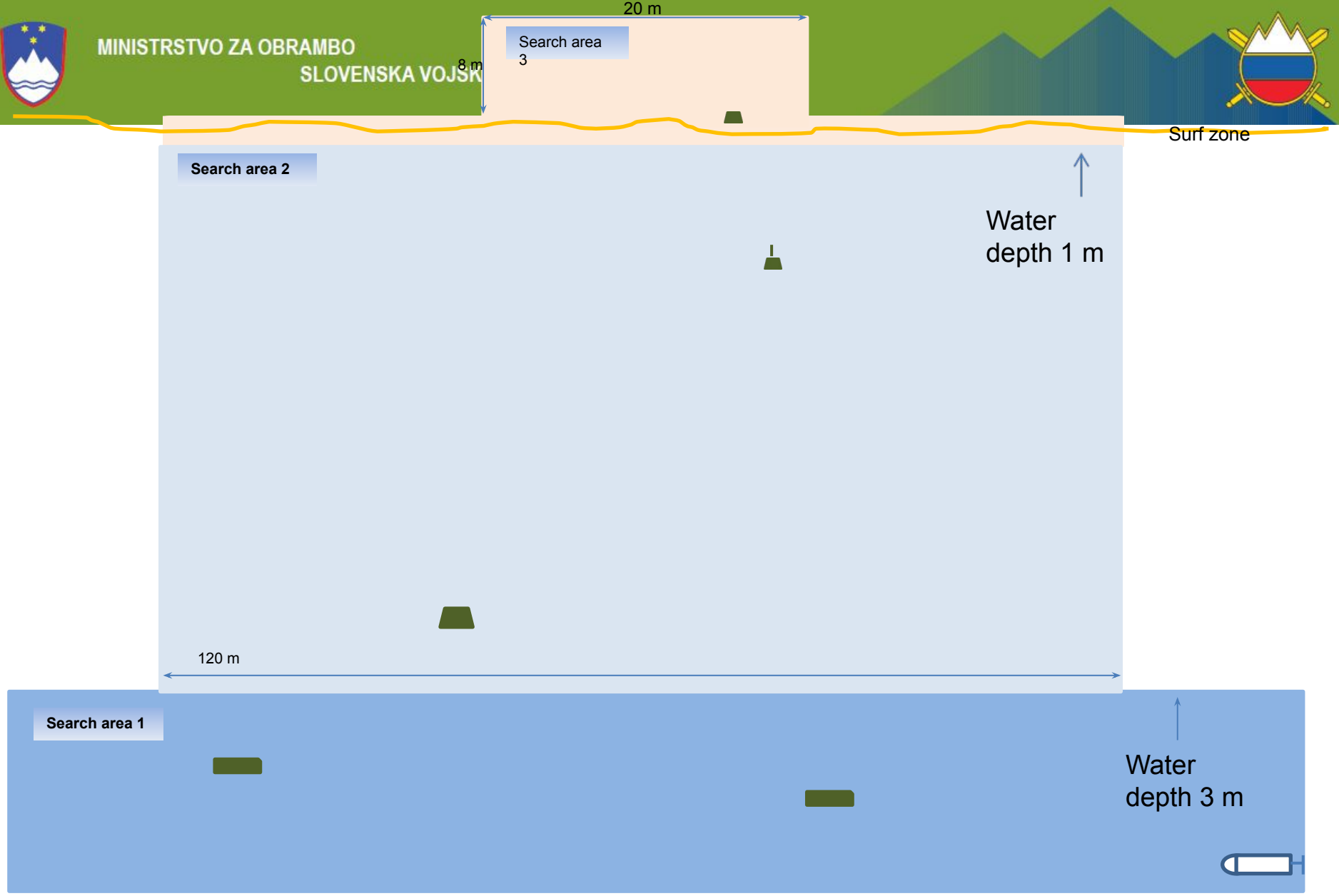
2. Manual or robotic approach - caps and limitations

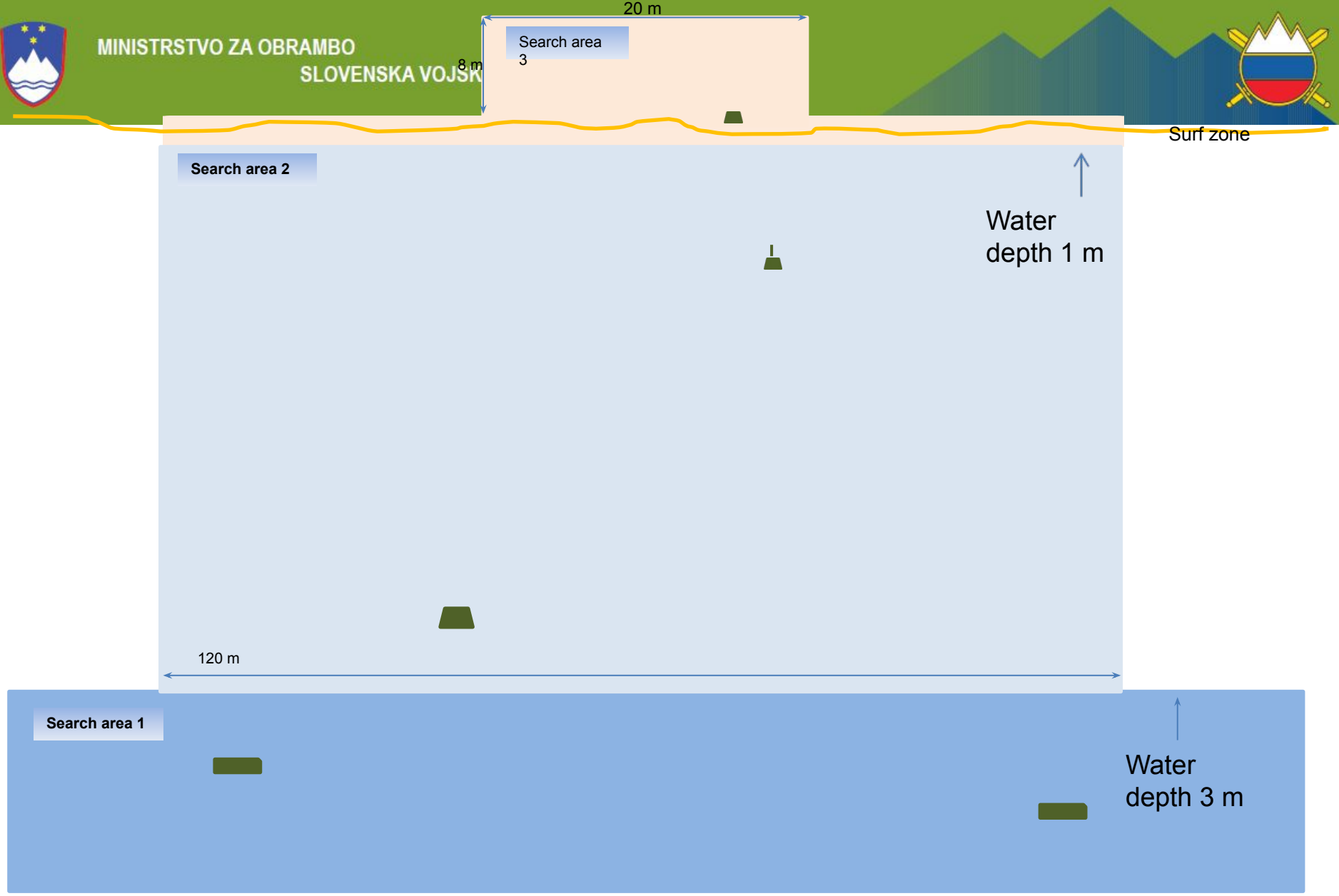
The nature of the operational environment and the assigned mission objectives has a fundamental impact on the kind of equipment required to conduct successful Explosive Ordnance Reconnaissance (EOR)/EOD operations in the VSW and the SZ. Favourable conditions may allow the use of basic techniques and traditional VSW NMCM equipment (jackstay lines etc. REF: AEODP 7, EOD Equipment and Requirements), while unfavourable conditions may require the use of advanced technological equipment and complex unstandardized methods. This diversity is a challenge with regard to the development of standard TTPs and suggests the need for a comprehensive toolbox to ensure the likelihood of mission success. Access to state-of-the-art equipment may increase efficiency, durability and precision in the areas where traditional tools have dominated. This bullet is intended to highlight relevant equipment and technologies used to counter operational factors associated with VSW and SZ operations.

2. Manual or robotic approach - caps and limitations

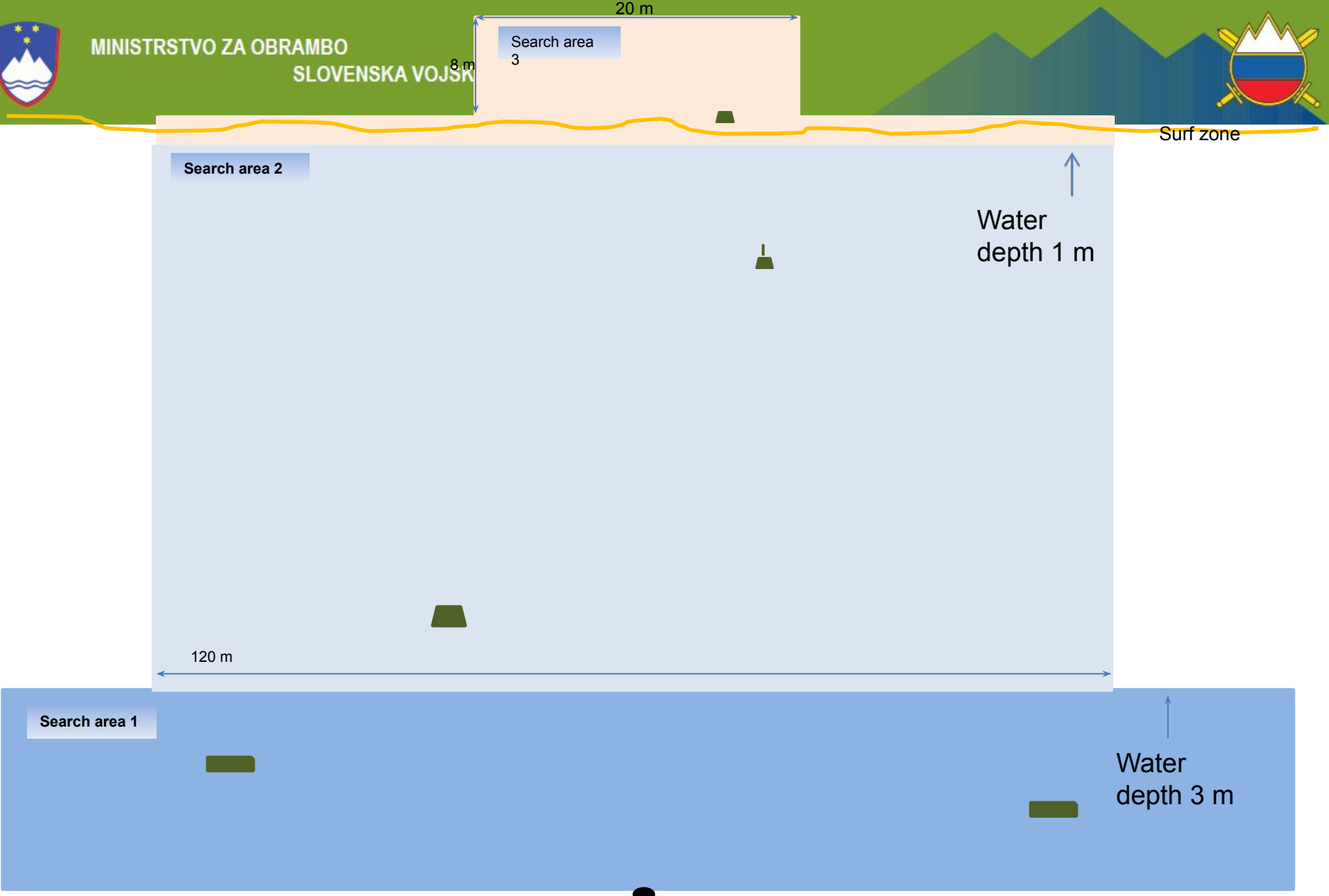
Equipment-overall

- Dive rigs
- PPE (Suits/clothing/heating sys/body armor/helmets)
- Search equipment (jackstay, navigational system, **hand held sonar**, NVG, optics, **UUVs, AUVs, ROVs** lights, lines)
- Tools (EOD/evasion and escape/cutting obstacles)
- Vessels (RHIBs, dinghy, kayak, diver propulsion/SDV included)
- Communications
- Weapons
- First Aid
- Rations
- Explosives (charge build up/trigger devices)/initiating systems

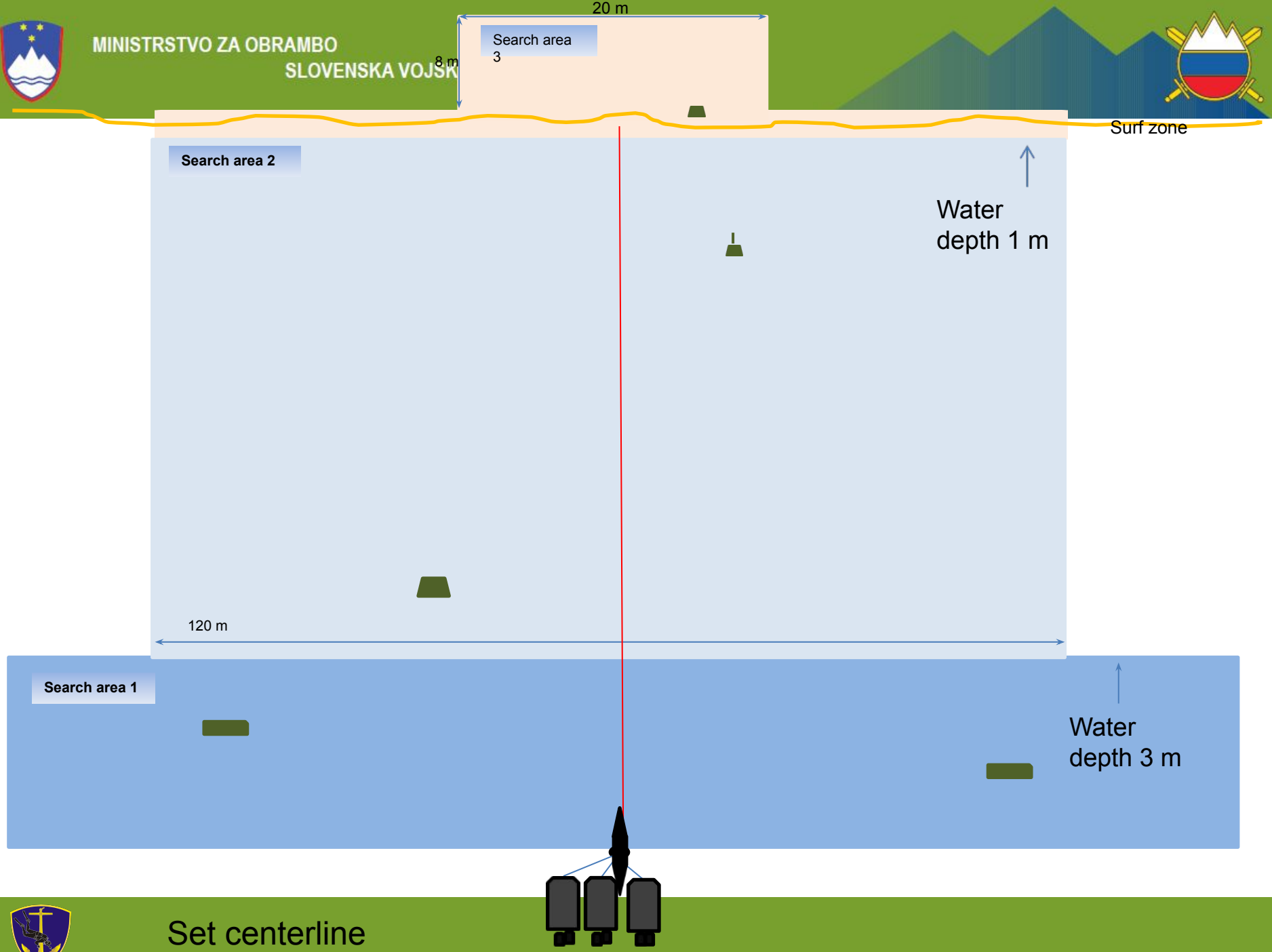

20 m
8 m
Search area 3
Surf zone
Search area 2
Water depth 1 m
120 m
Search area 1
Water depth 3 m



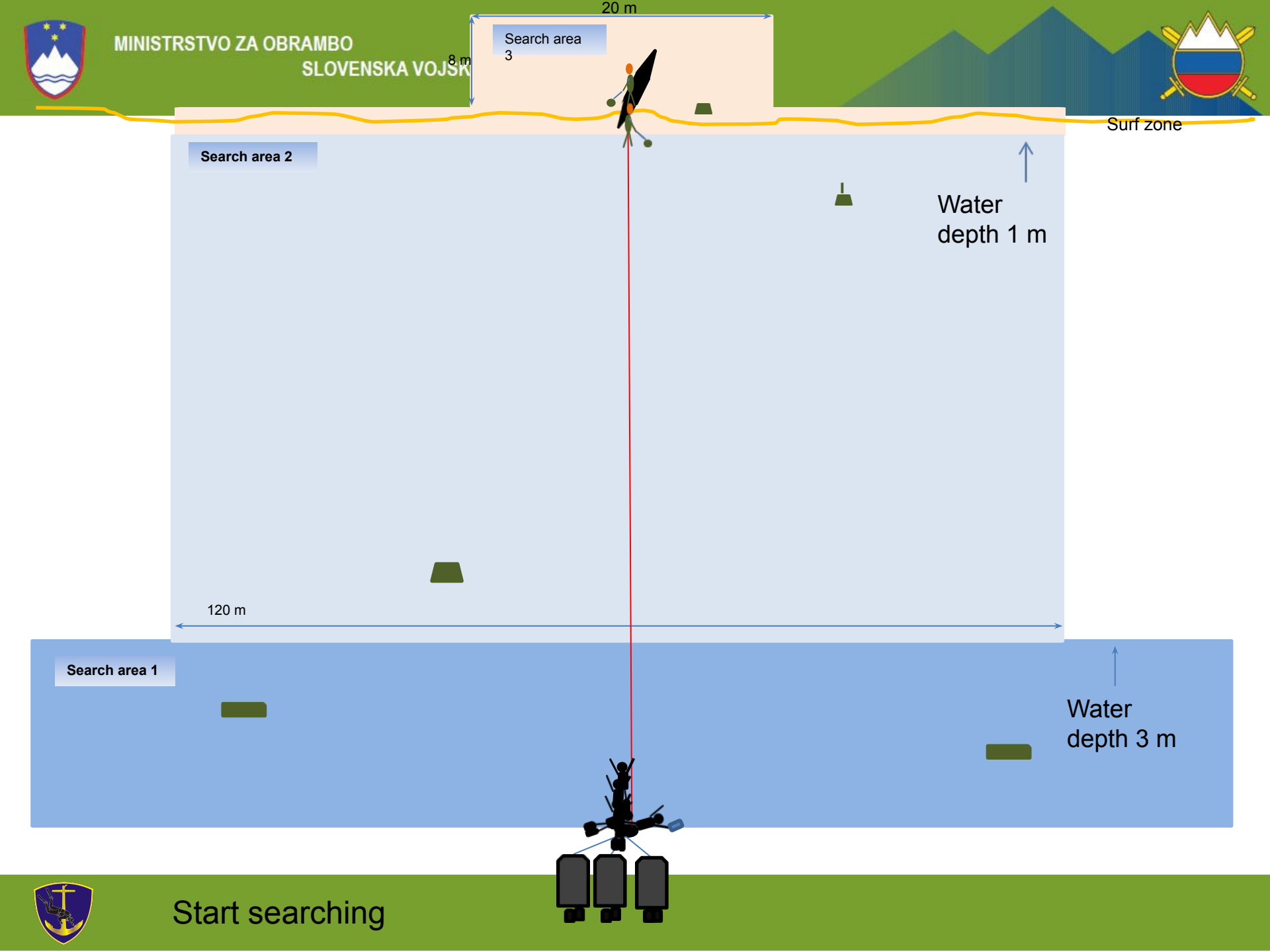
Analyze AUV data and programme positions to hand-held sonar



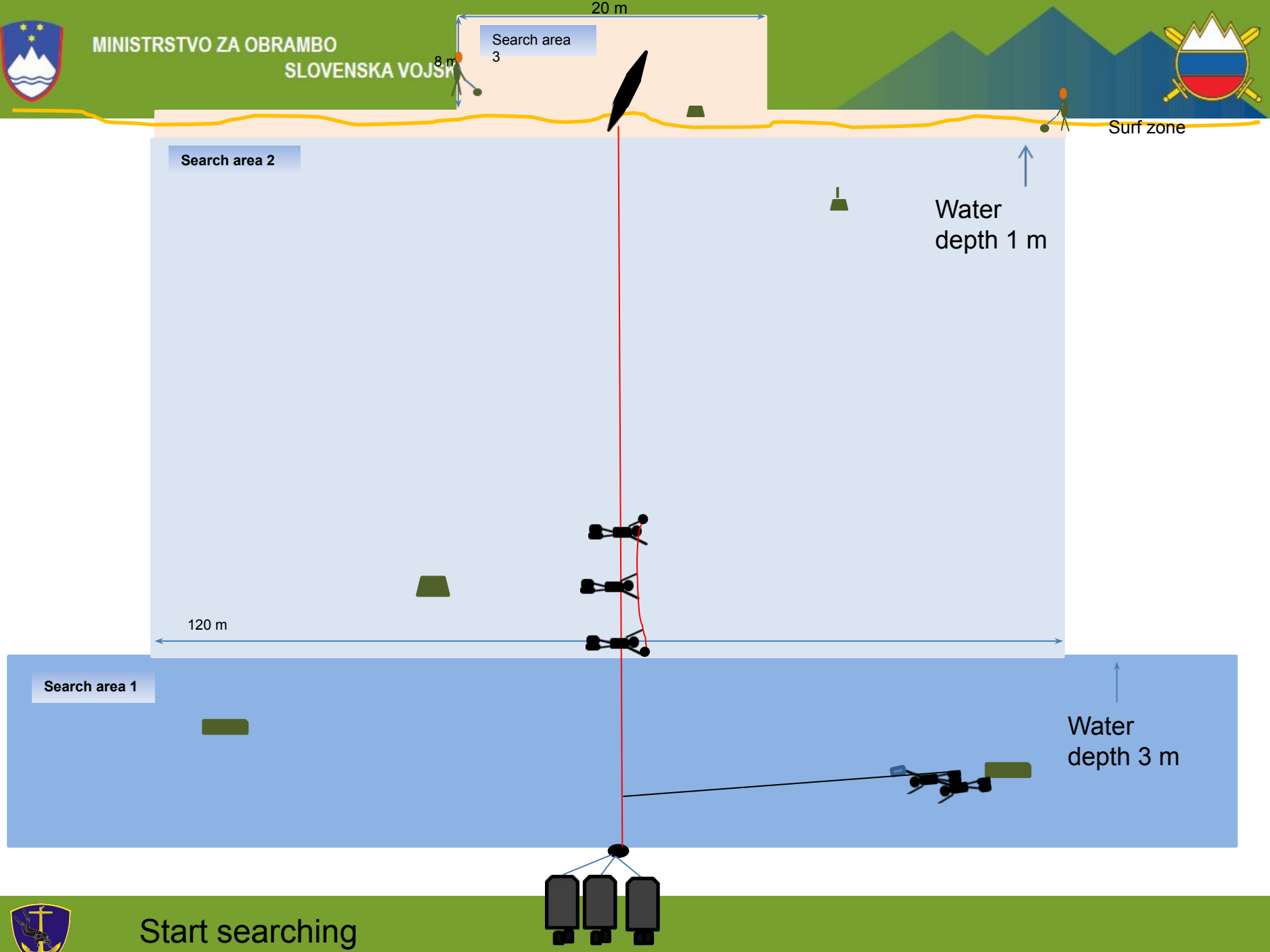
Mooring boats



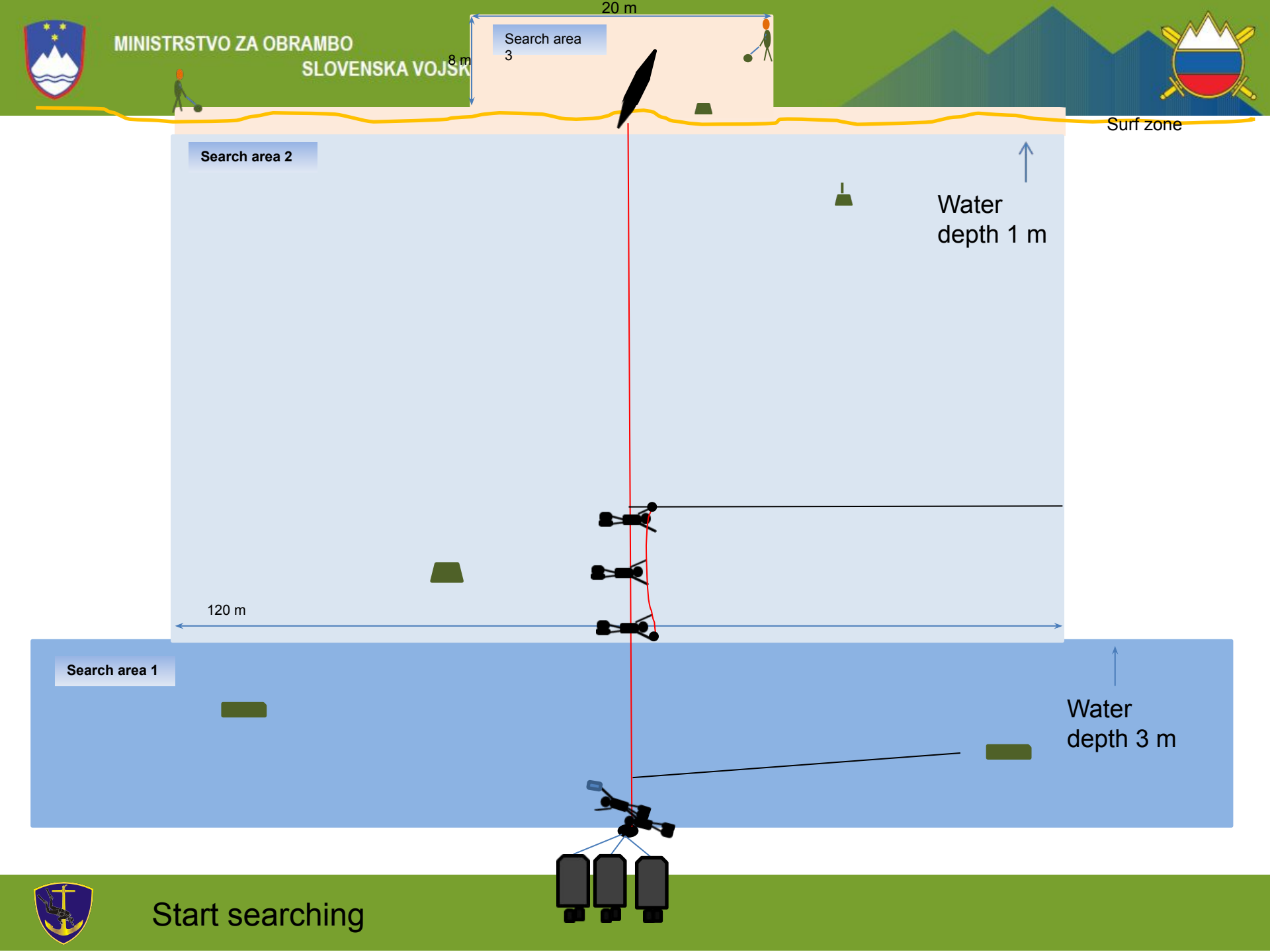
Set centerline



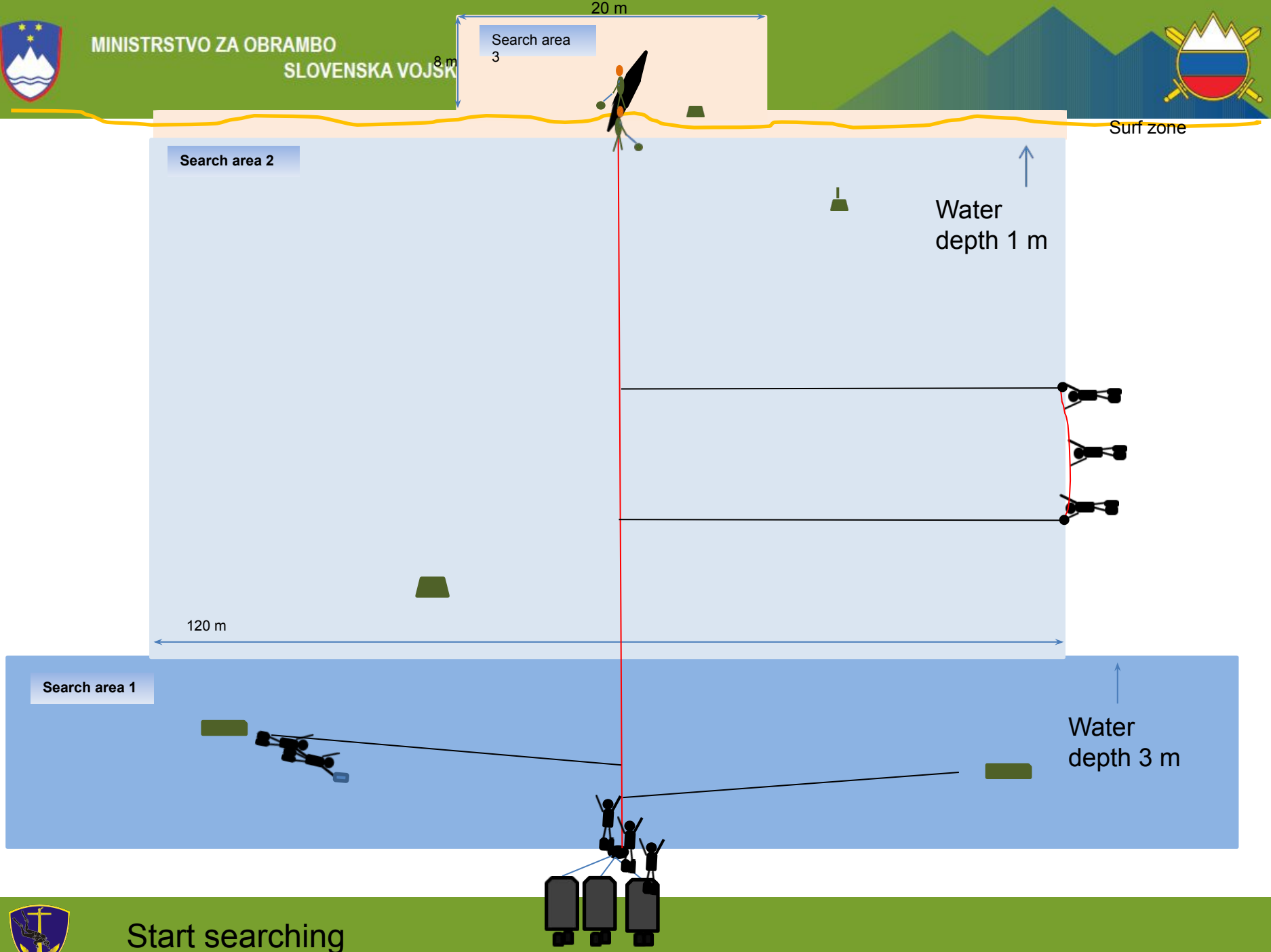
Start searching



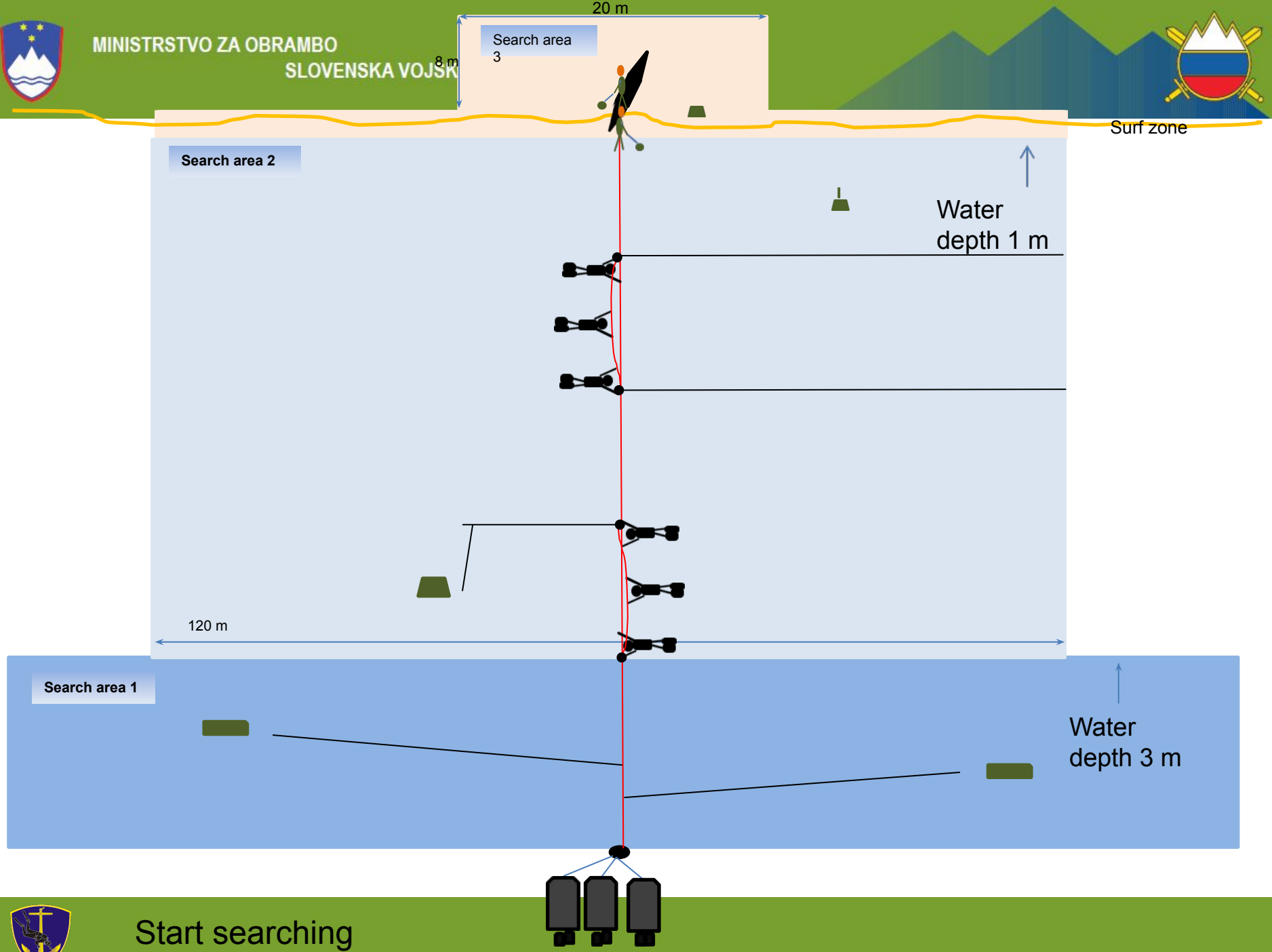
Start searching



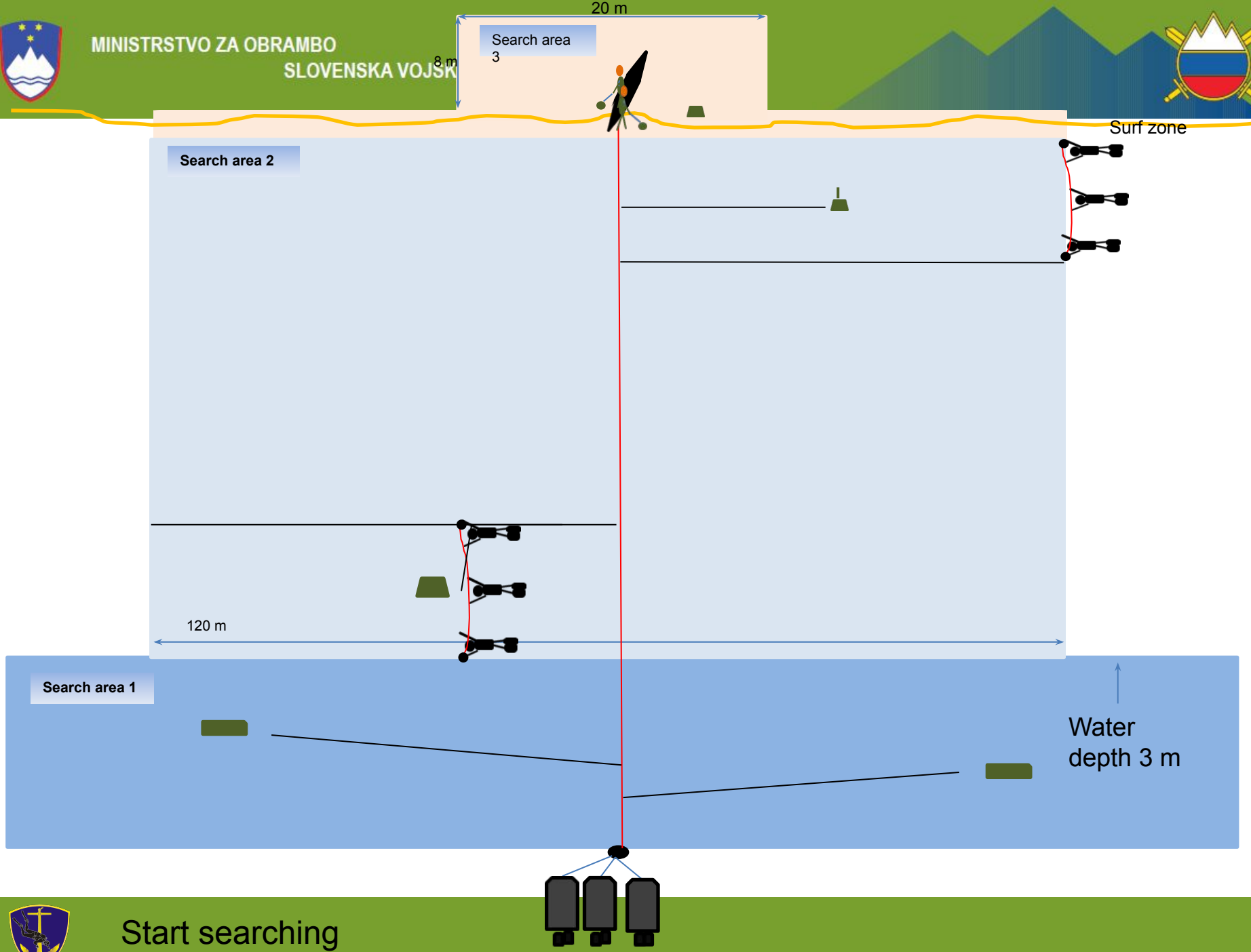
Start searching



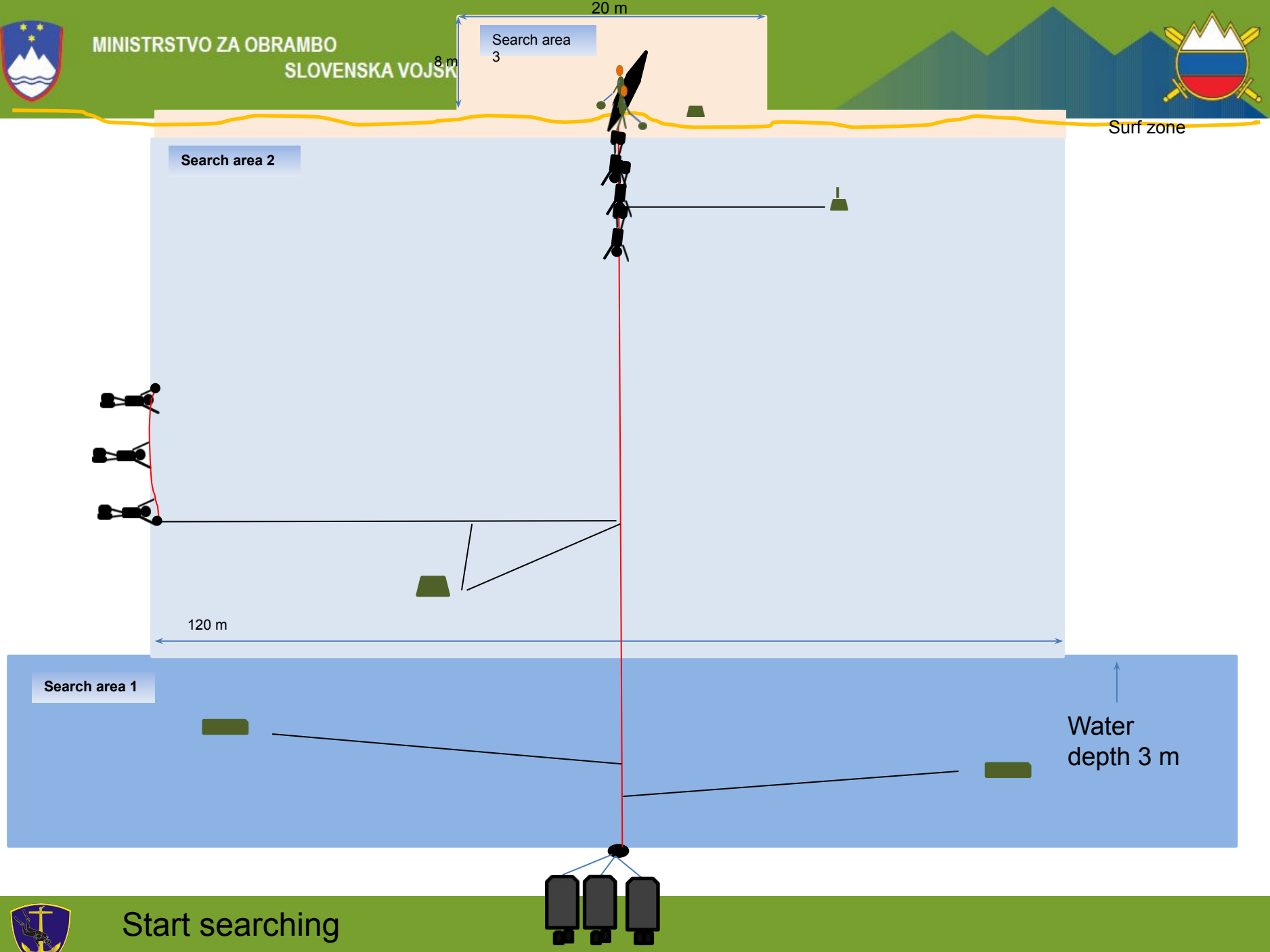
Start searching



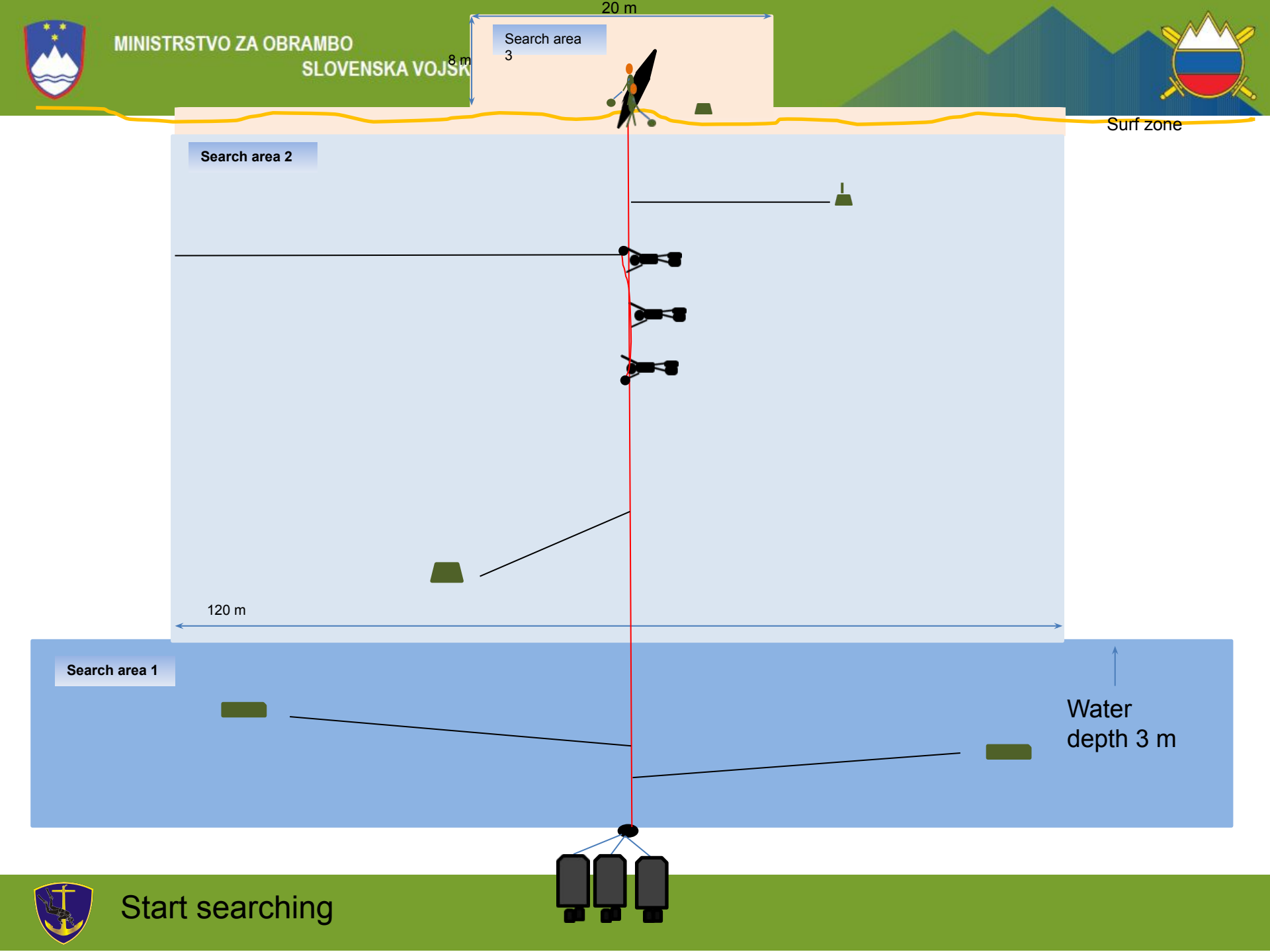
Start searching



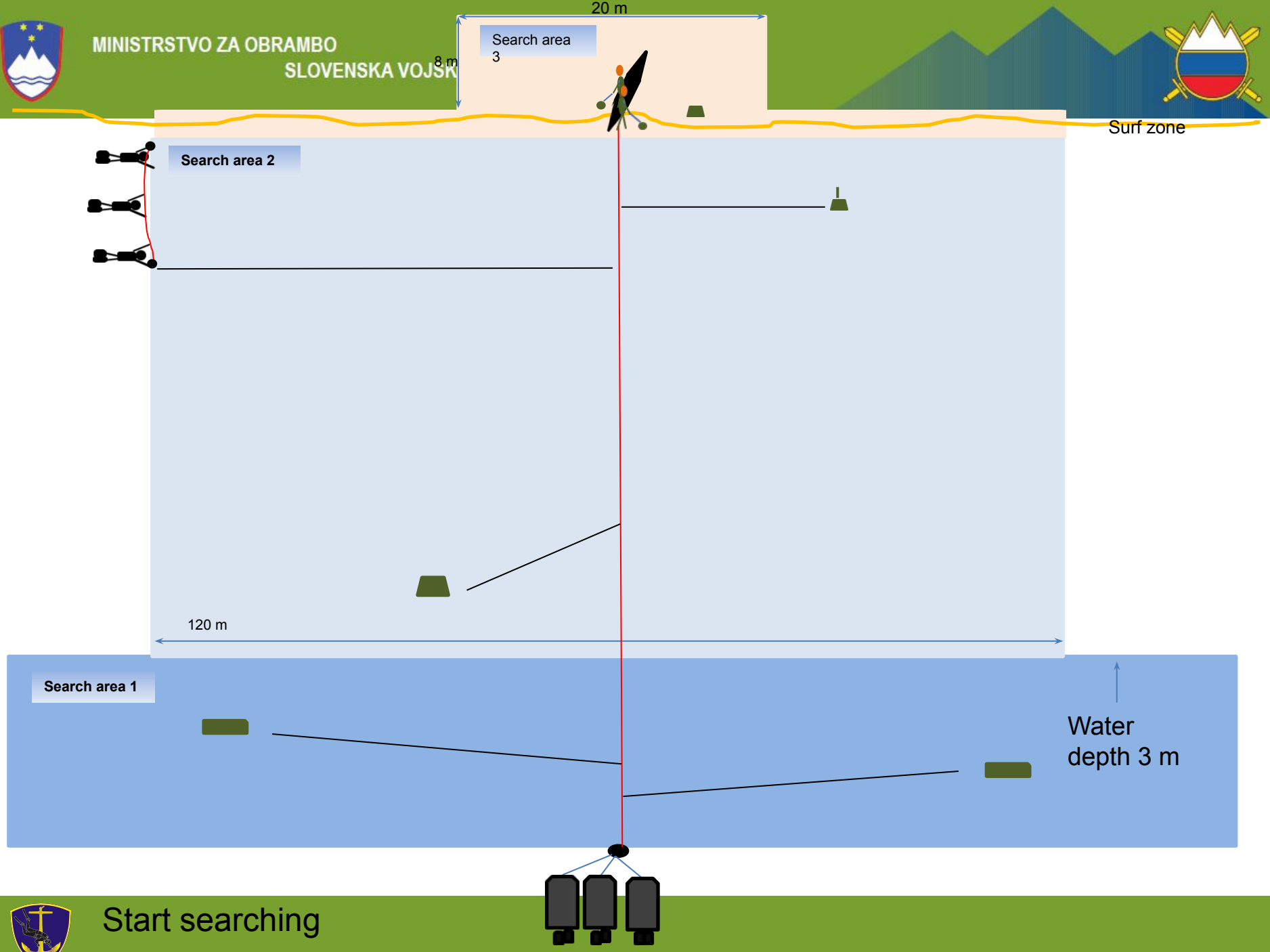
Start searching



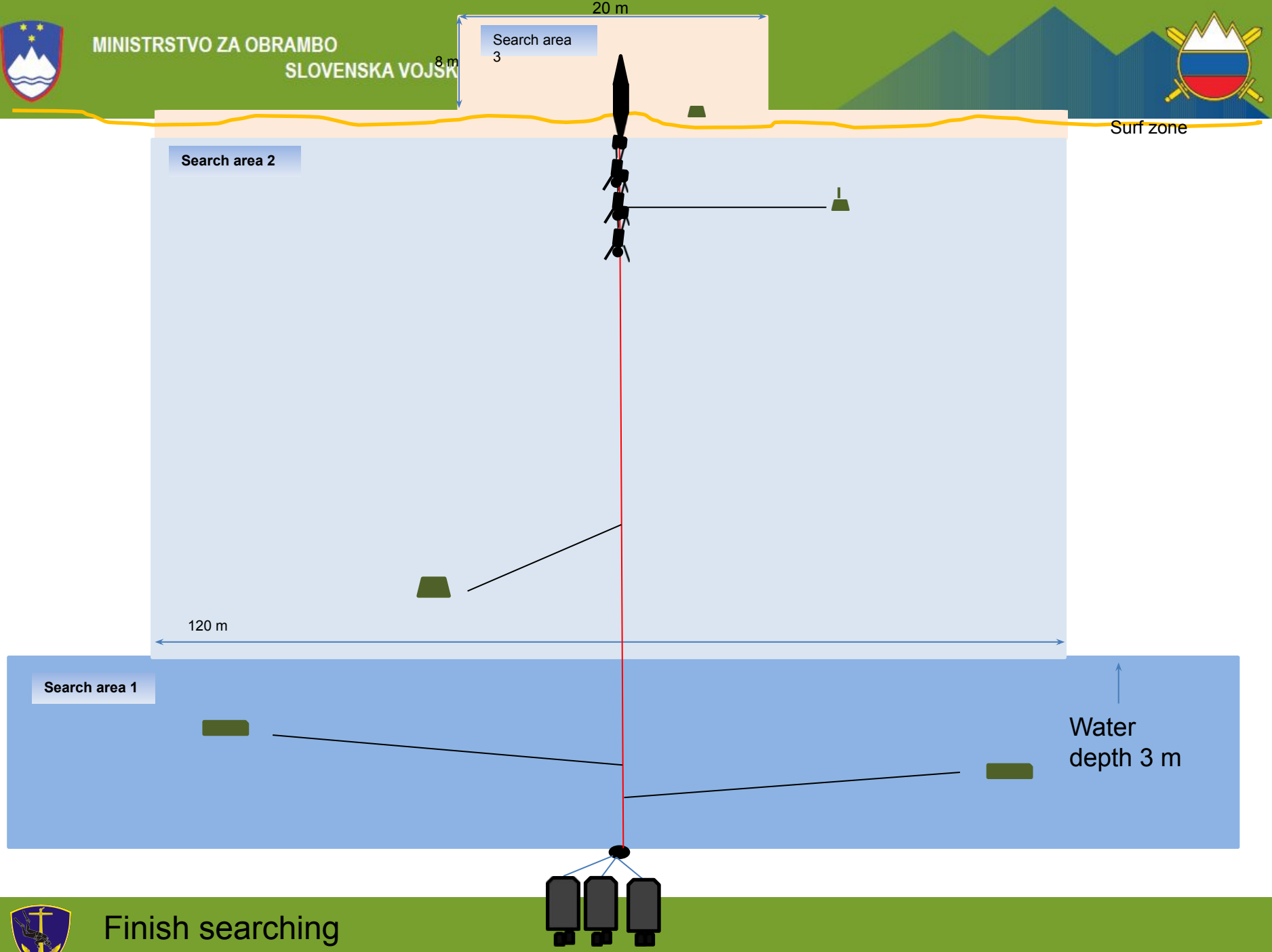
Start searching



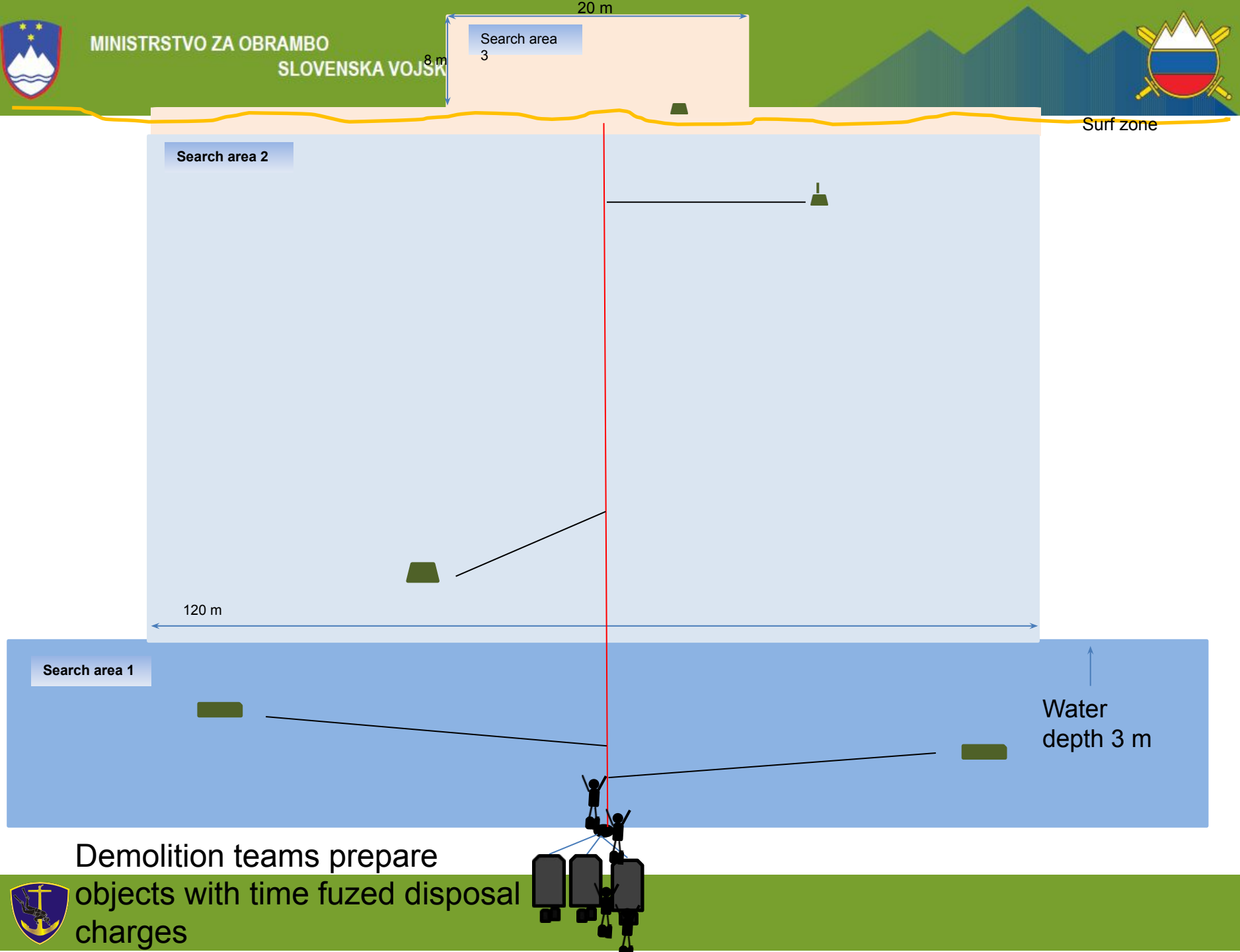
Start searching



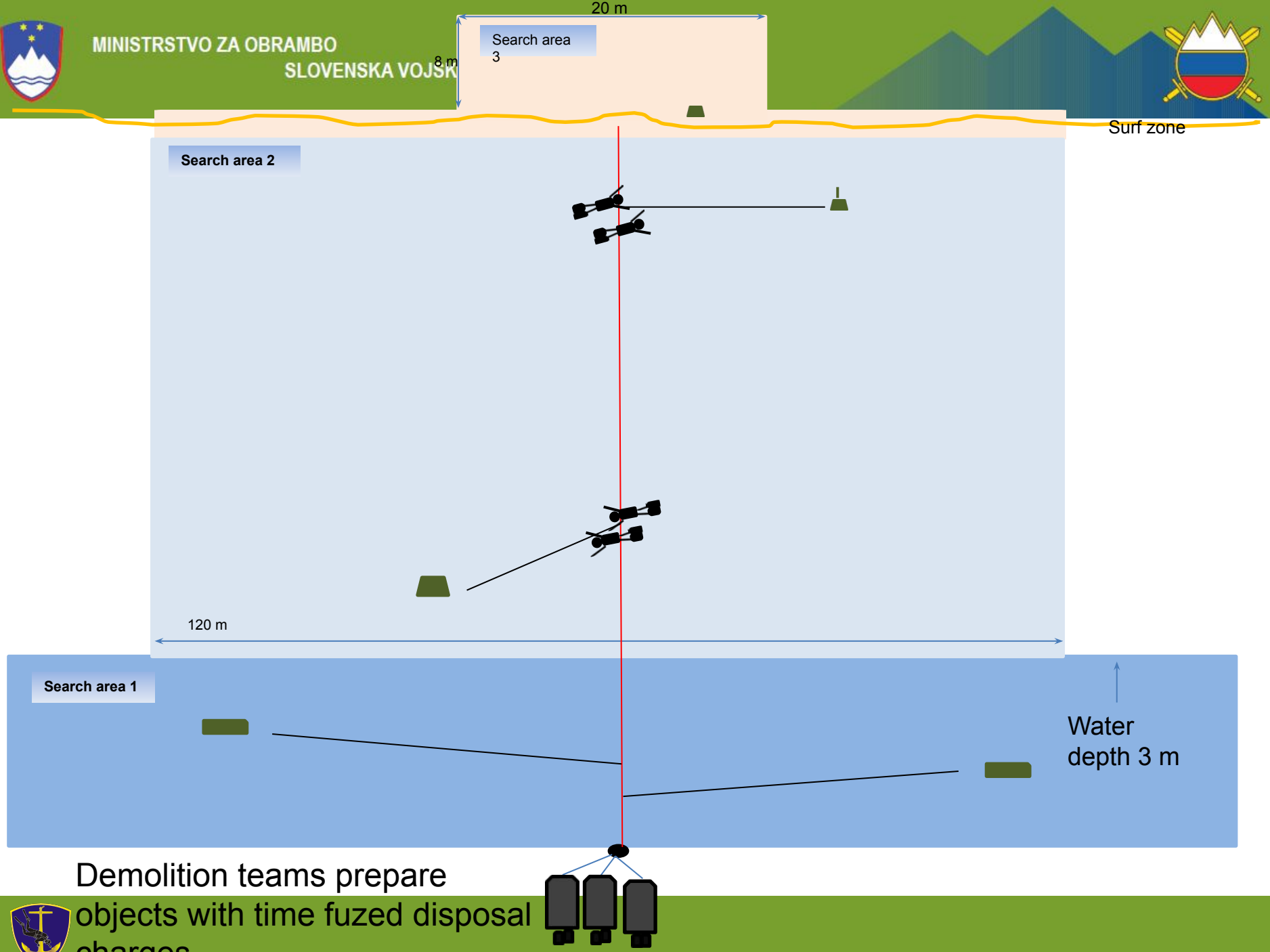
Start searching



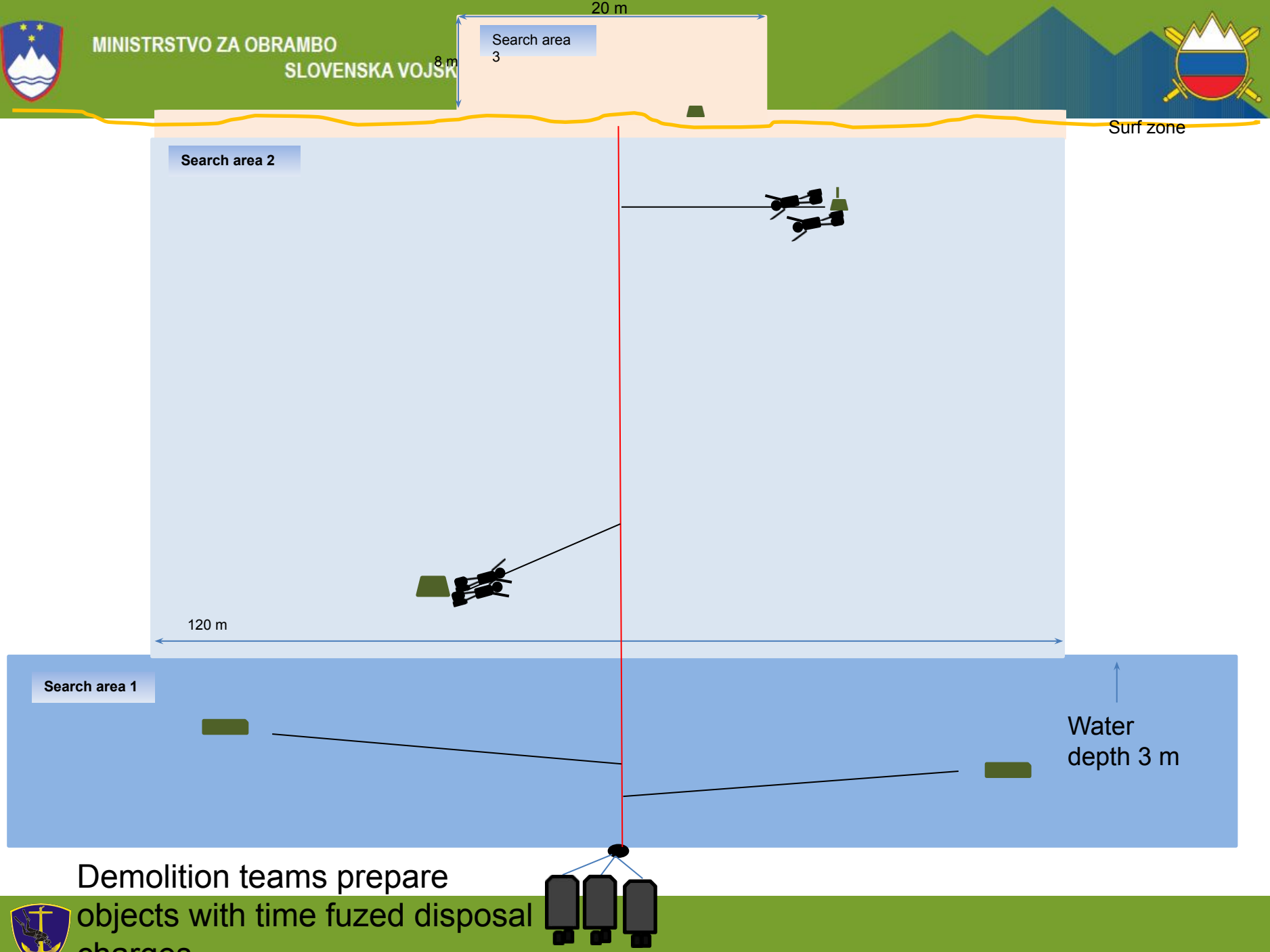
Finish searching



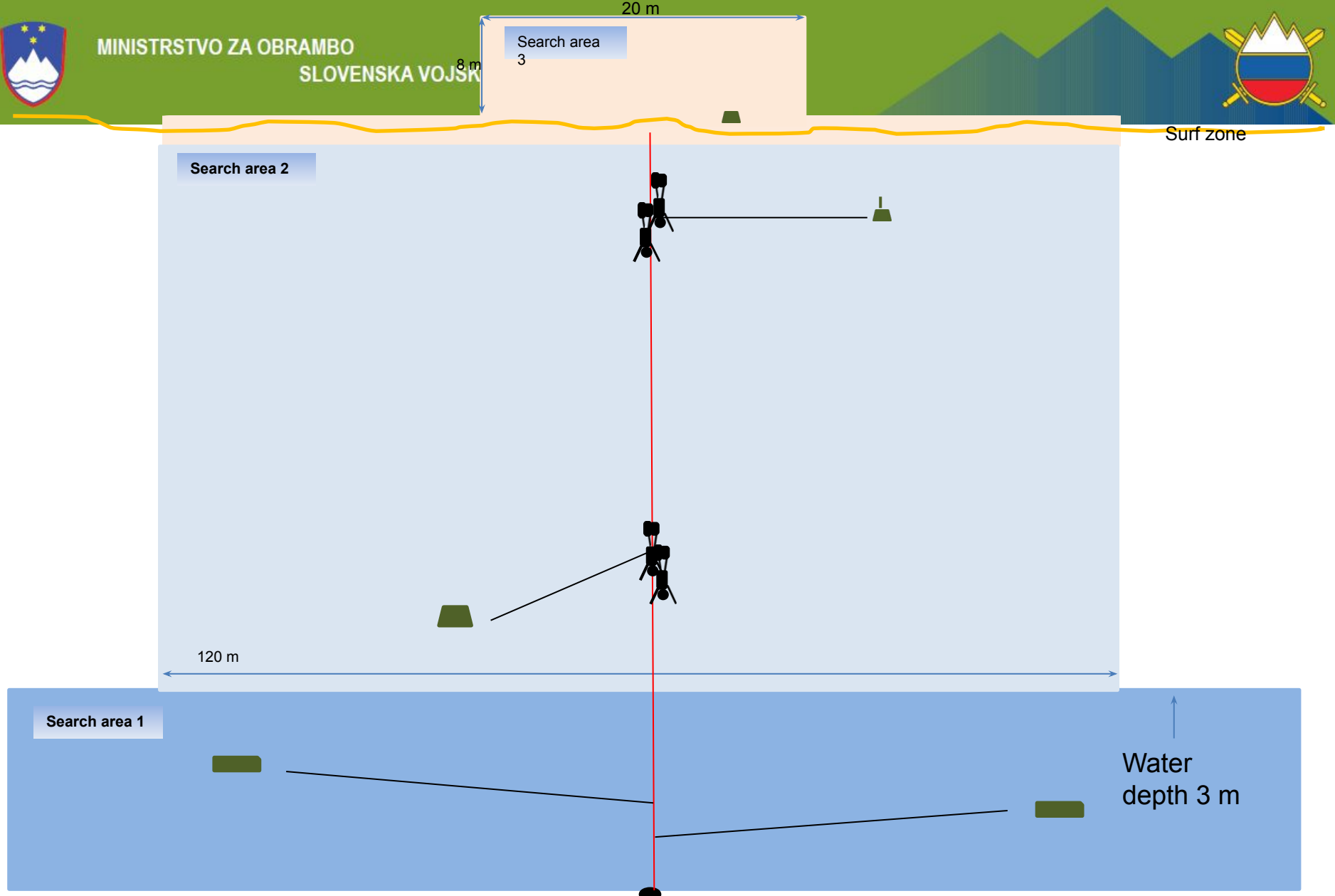
Demolition teams prepare objects with time fuzed disposal charges



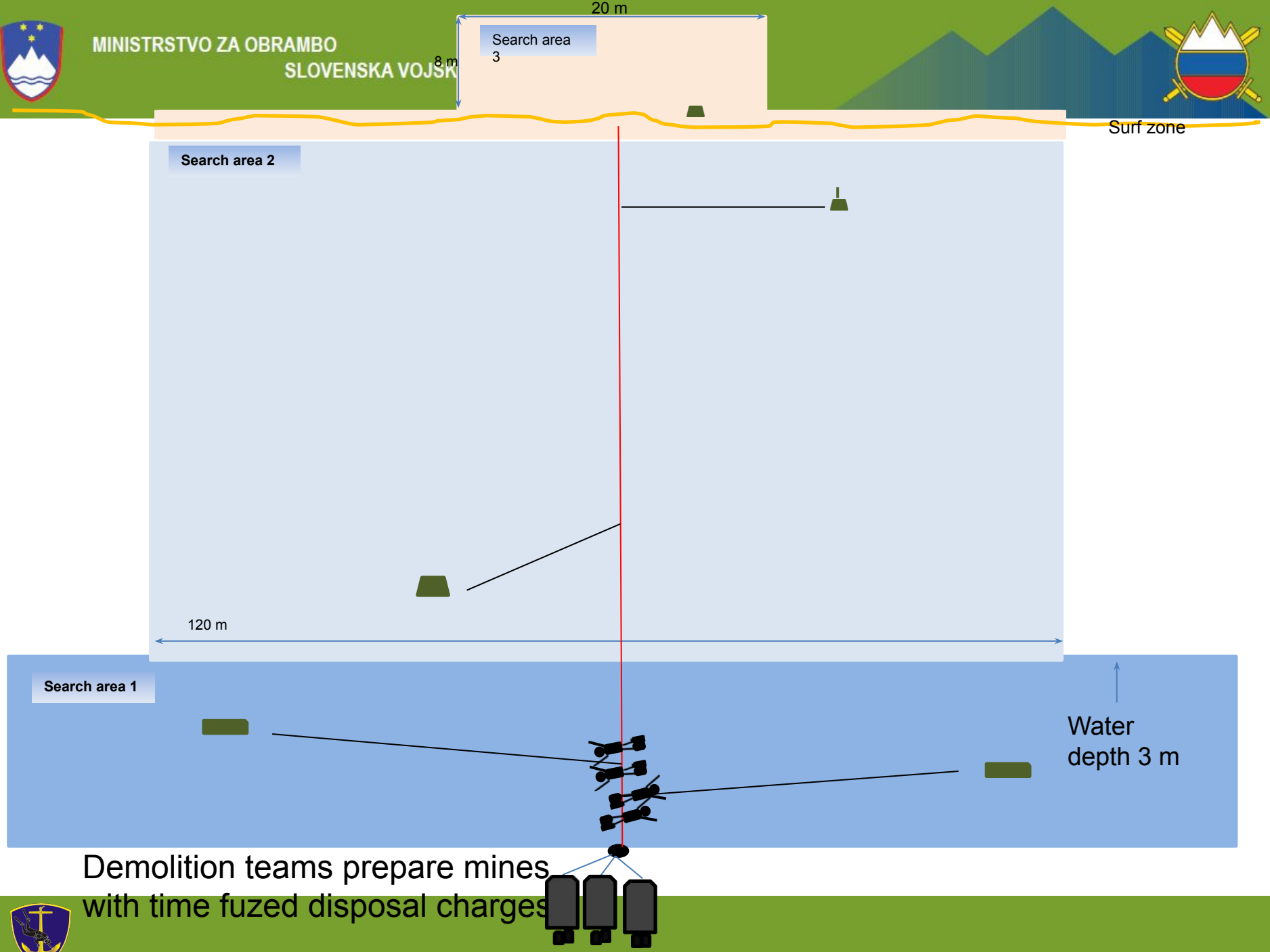
Demolition teams prepare objects with time fuzed disposal charges



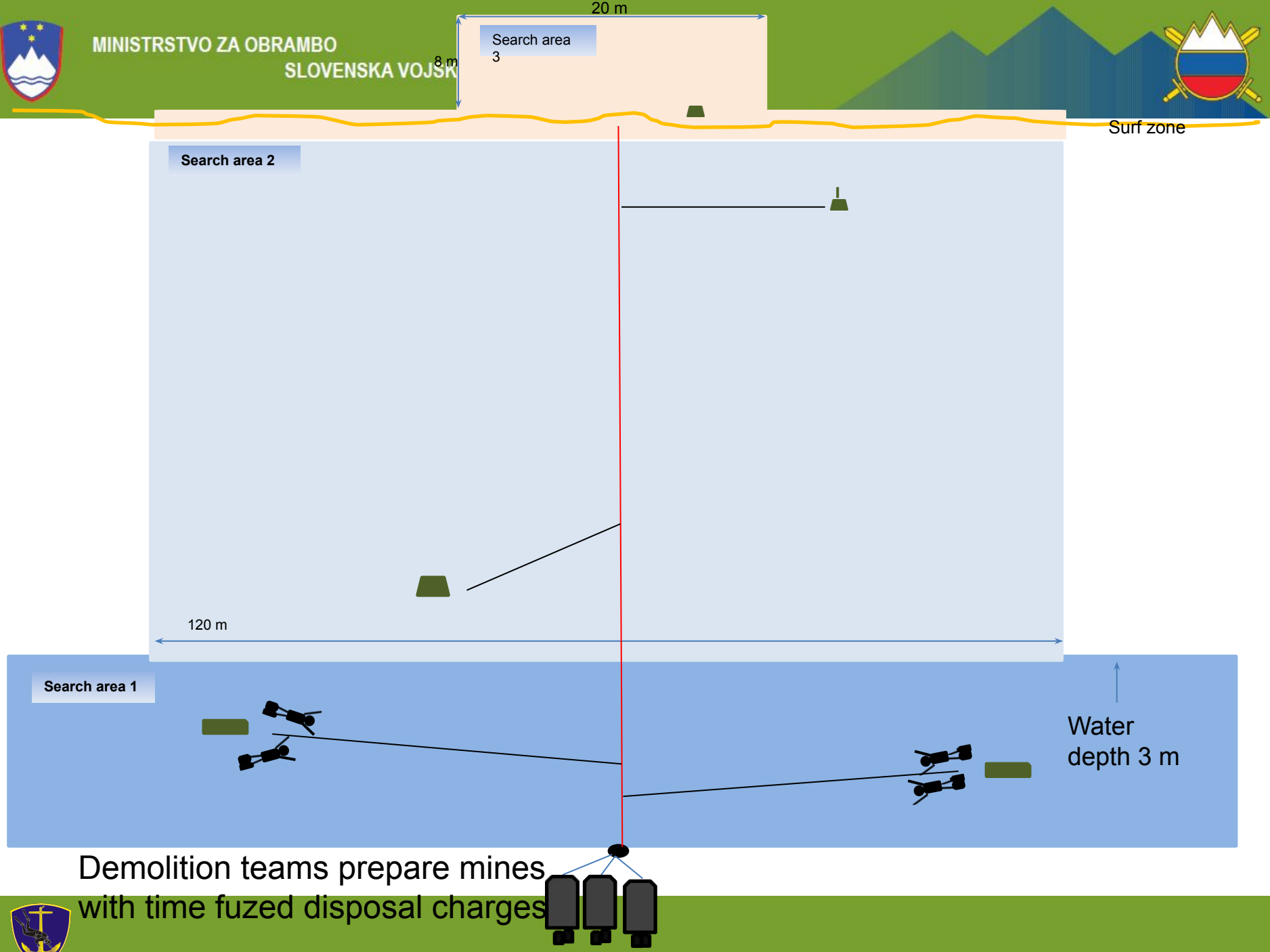
Demolition teams prepare objects with time fuzed disposal charges



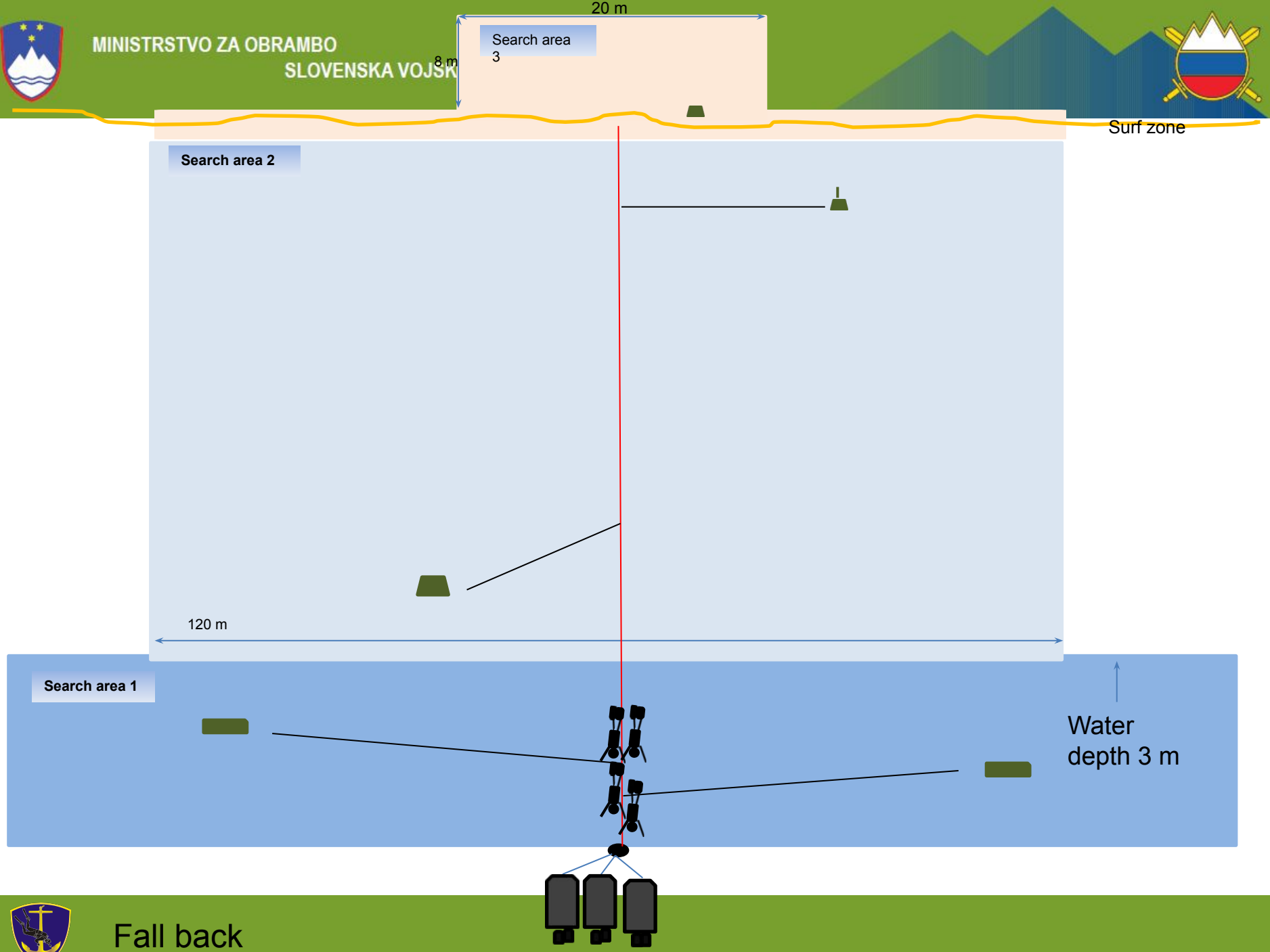
Demolition teams prepare objects with time fuzed disposal charges



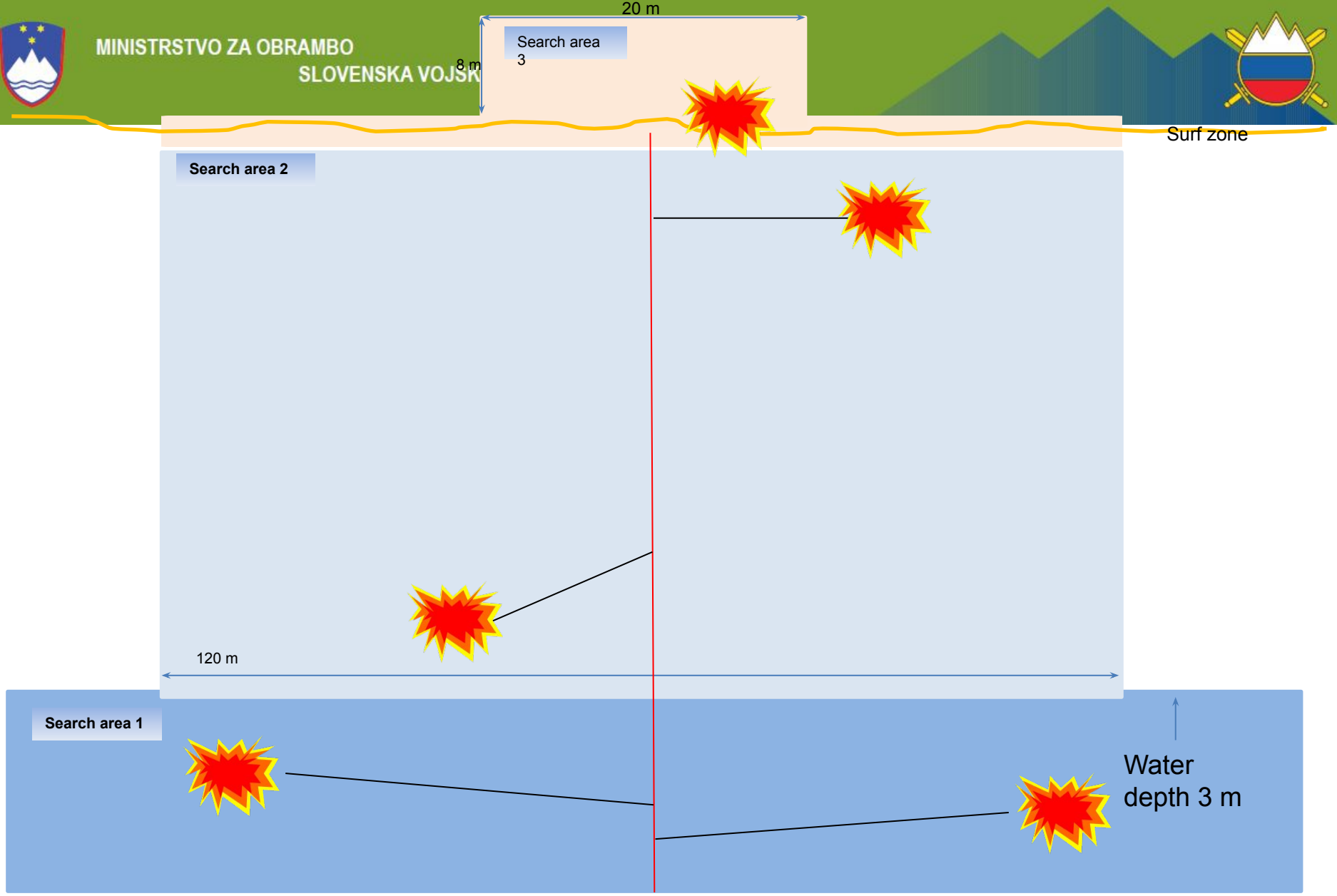
Demolition teams prepare mines with time fuzed disposal charges



Demolition teams prepare mines with time fuzed disposal charges


20 m
8 m
Search area 3
Surf zone
Search area 2
120 m
Search area 1
Water depth 3 m

Fall back


20 m
8 m
Search area 3
Surf zone
Search area 2
120 m
Search area 1
Water depth 3 m

2. Manual or robotic aproach - caps and limitations

Non-standard tools are systems that can be used based on availability and have an impact on mission success:

- Bottom penetrating radars
- Air based SONAR
- **Crawlers**
- UAV, USV
- Carpet bombing
- Towed magnetometer
- **LIDAR**
- Aerial Survey Change detection
- Precision munitions can be requested when targeting a specific boat lane (e.g. Joint Direct Attack Munition (JDAM)
- Mine Clearance Line Charges
- Bangalore Torpedo

3. Way ahead - How can industry fill in the gaps

DIGITALISATION AND ROBOTISATION IN VERY SHALLOW WATER BATTLESPACE

- Level of Artificial Intelligence(AI) in future systems (Grey areas in legal and ethic aspects for some nations/navies)

3. Way ahead - How can industry fill in the gaps

‚What if' questions/considerations:

- Difficult environmental conditions (posidonia seaweed f.e.)
- No wireless communication available (EMP bomb, etc.) and if no GPS signal, does AI take over?
- Level of AI- ethic and legal issues (depending on a user state and international law)
- Small navy issues (not every technical solution is available, limited in funding/personnel/equipment, etc.) VS. rich navies

3. Way ahead - How can industry fill in the gaps

„Million dollar“ sugestions about the future tools:

- **Multifunction small toolbox (less is more)**
- **Covers the whole range of tasks in VSW**
- **Tackles all environmental conditions**
- **Provides accurate and timely information for decision makers to use in follow-up ops (AMPHIB OPS, HA, DR) in VSW zone**

Having in mind that VSW-MCM is not about finding mines, but about finding routes!!

3. Way ahead - How can industry fill in the gaps

Currently available solutions

- Crawler robots (AUGV)
- LIDAR
- Carpet bombing
- „System of systems“- complete autonomy

3. Way ahead - How can industry fill in the gaps

LOOK AHEAD

- Today‘s armed conflict in Ukraine in many ways resembles WW I (despite the strong presence and help of modern technologies)
- Could future armed conflicts in the maritime domain resemble D-day on the beaches of Normandy?
- Are VSW MCM operations possible without military divers (C&E analyses) ?
- Who will declare that the „COAST IS CLEAR“?

Questions?