

FORMER SOVIET MILITARY TRAINING AREA WITTSTOCK

EXTENSION REQUEST OF THE FEDERAL REPUBLIC OF GERMANY IN THE CONTEXT OF ITS OBLIGATIONS UNDER ARTICLE 4 OF THE CONVENTION OF CLUSTER MUNITIONS

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EXECUTIVE SUMMARY AND EXTENSION REQUEST

LEGAL FRAMEWORK FOR THE EXTENSION REQUEST AND REQUESTED DURATION

The Federal Republic of Germany ratified the Convention on Cluster Munitions, which entered into force on 1 August 2010, on 8 July 2009.

According to Article 4 of the Convention, Germany has the obligation to clear cluster munition remnants on its territory ten years after the entry into force of the Convention. In 2011 the first indications for a contamination were discovered at the former military training area at Wittstock and immediately reported to the responsible coordinators and in the annual transparency report according to article 7.

Germany will not be able to comply with the contractual period of ten years after the entry into force of the Convention. Germany is therefore seeking an extension of its clearance obligation by five years, pursuant to article 4 (5).

EXTENT OF THE CONTAMINATION WITH CLUSTER MUNITIONS AND SPECIFICS OF THE SITE

The suspected area of contamination on the former Soviet training area near Wittstock, Brandenburg, is 1,100 hectares. The contamination was discovered by chance in 2011.

There are two factors that contributed to the need of an extension request:

Through the continuous use of the area for military training purposes from 1953 to 1993, the overall contamination with unexploded ordnance and remnants of war is particularly high, therefore making the clearance of cluster munition remnants particularly difficult.

After the end of active military use of the site, the area has become part of a natural reserve. The requirements of natural conservation have to be considered in the clearance of cluster munition remnants.

STATUS OF CLUSTER MUNITIONS CLEARANCE

Following the development of the concept for cluster munitions clearance, a road network was developed and cleared to make the site accessible. Additionally, much effort was required to establish a fire contain-

ment system for the site that was completed in 2016. This was required the burning of the area and make it accessible for cluster munitions clearance.

The actual clearance works on the site started in 2017. From March 2017 until October 2018, a total of 122 hectares were cleared from cluster munitions. During this clearance, 1,282 explosive submunitions were cleared and disposed of. About 75% of these were ShOAB-0.5. At the moment, 120 personnel are working on the clearance of the area. The average daily clearance per person is between 50 m² and 60 m².

FUNDING

The necessary funding for the German clearance efforts at Wittstock will be provided by the Institute for Federal Real Estate. Total clearance costs are currently estimated at 67 million EURO.

WORK PLAN FOR EXTENSION PERIOD AND RISKS FOR FURTHER DELAY

For the extension period the work will focus on the clearance of the remaining area suspected of contamination with cluster munition remnants. Based on current projections of a clearance of 150 – 200 hectares per year, completion of the clearance is likely for 2024. The documentation will be finalized in 2025.

Based on experience gathered in the clearance of cluster munitions at Wittstock so far, four main factors for further delay have been identified: (1) number of clearance personnel available on the market, (2) area made available by controlled burning (burning is restricted to few days per year), (3) degree of contamination with cluster munition remnants, other ordnance and clutter, as well as (4) metrological conditions, in particular extended periods of frost during the winter season. Possible adaptations (if possible) of the work plan are detailed in this extension request.

REQUEST FOR EXTENSION

For the reasons described above and in accordance with article 4 (5) of the Convention on Cluster Munitions, the Federal Republic of Germany hereby requests an extension of the deadline for completing the clearance and disposal of cluster munition remnants at the Former Soviet Training Area Wittstock. The new deadline, if granted, would be August 2025. The extension request takes into account the requirements of article 4 paragraph 6 of the Convention on Cluster Munitions.

REPORTING ON PROGRESS DURING EXTENSION PERIOD

Germany will keep States Parties regularly apprised of the situation at Wittstock through its Article 7 reports as well as by interventions at the Meeting of High Contracting Parties under relevant agenda items.

FURTHER READING

More and detailed information on the site, the contamination by cluster munitions, the status of clearance works and a work schedule for the duration of the extension period can be found in the "Report on the Clearance of Cluster Munitions for an Extension Request Pursuant to Article 4 of the Convention on Cluster Munitions" attached to this request.

FORMER SOVIET MILITARY TRAINING AREA WITTSTOCK

REPORT ON THE CLEARANCE OF CLUSTER MUNITIONS FOR AN EXTENSION REQUEST PURSUANT TO ARTICLE 4 OF THE CONVENTION ON CLUSTER MUNITIONS

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DEFINITIONS

The Convention on Cluster Munitions (CCM) defines „cluster munition remnants“, that were translated as „Streumunitionsrückstände“ in the German translation of the CCM. In this report, the general term “Streumunition” (“submunitions”) is used for cluster munition remnants that require clearance under the CCM.

The former military training area Wittstock was used by Soviet Forces in Eastern Germany (WGT – Westgruppe der Truppen). In this report, the site is referred to simply as “Wittstock”, „former Soviet military training area at Wittstock“, or by its recent name „Kyritz-Ruppiner Heide“ (Kyritz-Ruppiner Heath).

1. INTRODUCTION

At the former military training area Wittstock, 14 individual finds of ShOAB-0,5 explosive submunitions were recorded until the end of 2016. All find were restricted to the area of a mock airfield used for target practice by the Soviet Air Force until 1989 (figure 1).

With the ratification of the Convention on Cluster Munitions (CCM), the Federal Republic of Germany committed to the clearance of areas contaminated with cluster munitions and their remnants.

This report documents the project organization for the cluster munition remnants clearance at Wittstock, local conditions relevant with respect to cluster munitions clearance, the selected methodology for cluster munitions clearance, and results achieved in the reporting period.

This report shall inform the participants of the Meeting of States Parties to the Convention about the relevant local conditions, selected methodology and technologies and the status of cluster munitions clearance at Wittstock. It serves as the background for Germany's extension requests for its Article 4 obligations.

Participants of the Meeting of States Parties to the Convention are invited to contribute their methodological and technological experience to the project to further facilitate cluster munitions clearance at Wittstock.



Figure 1: A ShOAB-0.5 found on 10 July 2014.

2. THE WITTSTOCK SITE

2.1. LOCATION AND SIZE

The Wittstock former military training area has a size of circa 120 square kilometres. It is located in the state of Brandenburg circa 80 kilometres northwest of Berlin, 180 km southeast of Hamburg. The site is situated between Neuruppin (20 km to the North) and the town of Wittstock (15 km to the Southeast (figure 2).

Because of its peripheral location, access to the site by public roads is limited. The internal road network is limited and largely consists of sand and gravel tracks. The internal road network was improved to meet the requirements of the clearance project and forestry.

Vegetation cover varies and ranges from open landscapes dominated by heath and dry grass to closed (mainly) coniferous and deciduous forests and different states of natural succession in between. Dominating tree species is the common forest pine (*Pinus sylvestris*). The valuable ecological inventory, in particular large open landscapes of dry grass and European Dry Heath (habitat types 2310, 2330, 4030) resulted in the protection of large parts of the area in the trans-European Natura2000 (FFH, SPA) network of transnational important habitats.

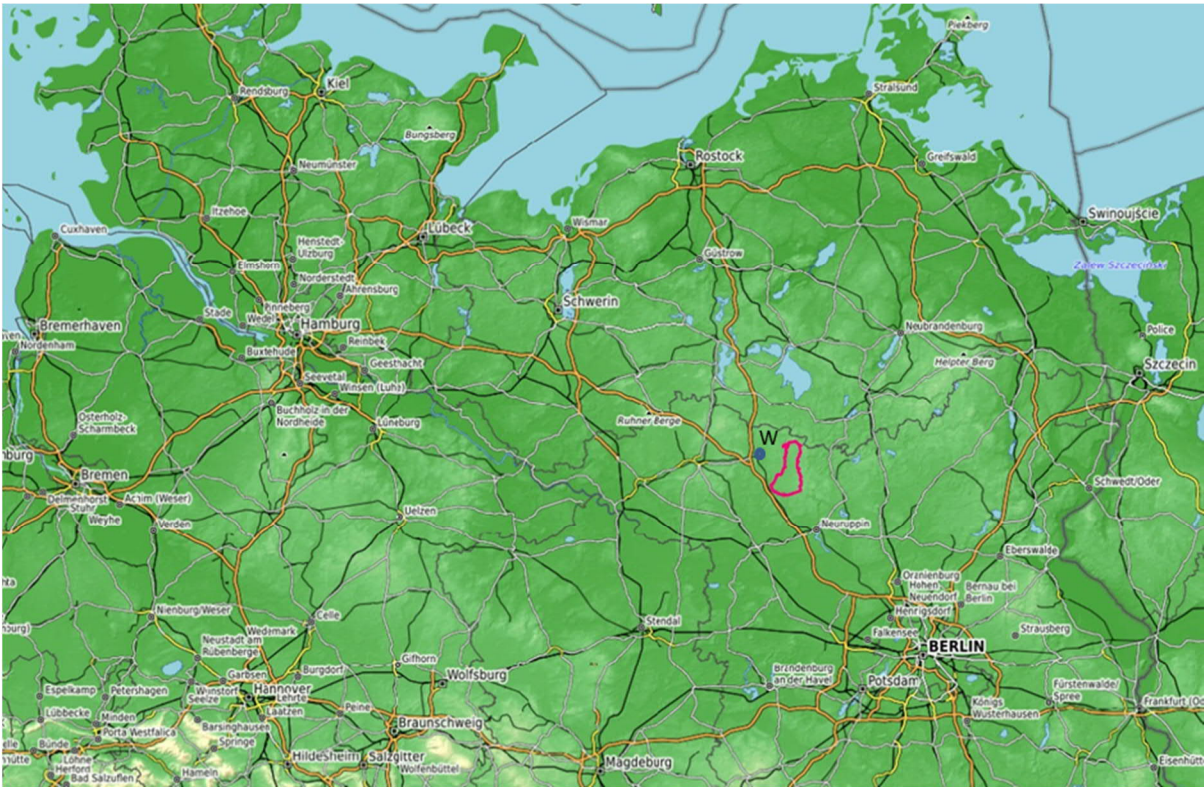


Figure 2: Location of the Wittstock site (red) in northeastern Germany between Berlin and Hamburg. The city of Wittstock is located west of the former military training area (blue circle marked with "W").

2.2. SITE HISTORY

Prior to its use for military training and exercises, the land was used for forestry purpose.

First military land use occurred from 1942/43 in the southern part of the site that later became a large Soviet military training area. German Wehrmacht units stationed in Neuruppin used part of the area for tank driving exercises and air defence exercises.

Intensive, permanent military use only began in the 1950ies when a Soviet military training area was established.

The military training area and bombing range was the northernmost of in total three Soviet military training areas on the area of the former German Democratic Republic. It was used by forces from all countries of the former Warsaw Pact for military exercises including live artillery, tank and air force bombing exercises. Ground forces trained at Wittstock with main battle tanks, infantry fighting vehicles and air defence tanks. Air forces used the site for training with bombers, fighter-bombers and helicopter gunships. In summary, the whole inventory of conventional military equipment, weapons and munitions of ground and air forces of the period 1949 until 1993 was utilized for exercises at Wittstock. However, firing ranges and non-firing ranges have to be regarded separately for the site (Figure 3).

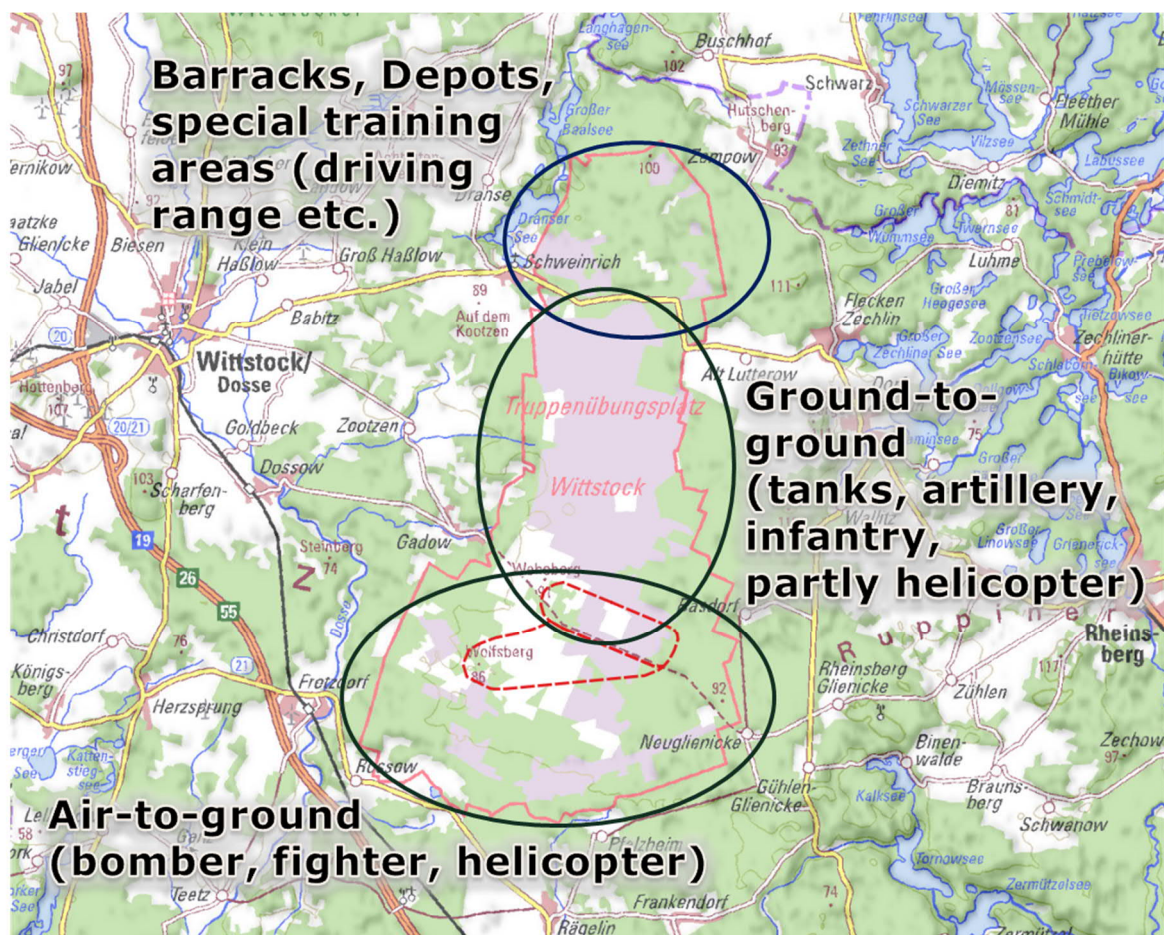


Figure 3: Large-scale military land use of Soviet troops at the Wittstock military training area.

Areas used for weapons training (firing ranges for air and ground forces) are limited to the southern and central parts of the former military training area south of the local road from Schweinrich to Flecken Zechlin.

The air force bombing range is located in the southern portion of the central part of the former military training area. The air force bombing range that was used for training attacks on ground targets that is partially contaminated with cluster munitions is located in this part.

Since the 1960ies, bombing exercises were carried out with both live and exercise (training) ordnance. In the 1970ies and 1980ies, elaborate mock ground targets were erected on the bombing range, including – among others – the replica of a NATO military airfield with air defence, artillery and missile emplacements (among others, „Nike“, „Hawk“, „Pershing“, „Patriot“ and „Lance“), tank and artillery columns. This target setup was used for both air force and artillery target practice.

Soviet military use ended with the withdrawal of Soviet troops from Germany in 1993. Initially, the German Air Force planned to establish a bombing range at Wittstock. These plans were abandoned in 2009. The site was handed over from the German armed forces (Bundeswehr) to the Institute for Federal Real Estate on 1 October 2011 and has since been administered by Bundesforstbetrieb Westbrandenburg.

2.3. CURRENT USE

Because of the large-scale, intensive contamination with unexploded ordnance, the Wittstock site remains closed to public access. A local by-law („Ordnungsbehördliche Verordnung zum Beschränken des Betretens“, „Sperrverordnung“) of the county bars the public from accessing the site. Signs in regular intervals of 50 m surrounding the Wittstock site, advise the public on possible risks (Figure 4). The entry ban is checked regularly. Violations are prosecuted. Dangers for the public are thus mitigated in accordance with German legislation.

The public risk prevention authorities and the general public of the surrounding communities are continuously informed in detail about the situation and the ongoing clearance work. This information exchange will continue through workshops, events, press releases and leaflets.

Because of the dangers posed by unexploded ordnance, land use at the Wittstock site is limited to forestry and natural conservation. Forestry personnel are trained with respect to the risks and dangers of unexploded ordnance. In the southern part of the area in the former safety area, a single sand track was cleared from unexploded ordnance and has since been opened for public access. The track that is clearly marked can be accessed by the public on foot, on bicycle, on horse or with horse-drawn coaches.

Depending on local conditions, some more distinctively marked tracks could be opened to the public in the future.

Due to the high degree of contamination, there are no intentions to release the whole area to the public.



Figure 4: Signs in regular intervals of 50 m surrounding the Wittstock site, advice the public on possible risks. (Danger of Life - Unexploded Ordnance - Access Prohibited)

3. FUNDAMENTAL CONSIDERATIONS

3.1. THE CONTAMINATED SITE

At the Wittstock site, ShOAB-0.5 explosive submunitions were encountered in the area of a mock airfield in the southern-central part of the site used for air force bombing practice. 14 individual finds of ShOAB-0,5 explosive submunitions were recorded until the end of 2016. Based on these finds and the results of historic research, an area suspected to be contaminated with cluster munition remnants was defined. It comprises the mock airfield and other, surrounding areas. The area suspected to be contaminated with cluster munition remnants comprises approximately 1,100 hectares (circa 11 million square meters) (Figure 5).

The vegetation cover the area and the special hazards posed by cluster munition remnants and other explosive ordnance did not allow for a technical investigation (e.g. through test grid investigations).

3.2. BASICS FOR THE PLANNING OF EXPLOSIVE ORDNANCE CLEARANCE

Insights into the historical use by the Soviet armed forces, most recently by the Western Group of Forces (WGT), are very limited. Respective requests for information from Russian government offices were inconclusive. Russian archives that could provide information are not accessible.

In this respect, in the planning and implementation of cluster munitions clearance, only general information on historical use can currently be used. The area suspected of cluster munition contaminations

- was used for intensive air force air-to-ground firing and bombing exercises with live and training ordnance,
- was used as a target area for artillery firing exercises with live and training ordnance, and
- was used for general military exercises with all types of live and training ordnance including all types of munitions

over a period of 35 – 40 years.

Therefore, the full spectrum of live and training ordnance of former Warsaw Pact states and a high contamination with fragments, live and inert ordnance as well as general metal scrap are to be expected.

With respect to the risk assessment are of particular importance:

- 1) Cluster munition remnants: the ShOAB-0,5 explosive submunitions is only known as live ordnance, a practice or training version is unknown. The ShOAB-0,5 has an all-ways-acting impact fuze (AW-281) and contains 85 grams of TG-30 high explosive (30% TNT / 70% Hexogen). The fuze is designed to initiate detonation on impact. Because of the fuze mechanism that does not allow to assess the state of unexploded ShOAB-0,5 and the fuze is all-ways acting, it cannot be transported and should only be handled under very special safety precautions and when necessary.

Considering the totality of Soviet and Warsaw Pact cluster munitions, the ShOAB-0,5 is also a benchmark as it is the smallest air-dropped explosive munition of the time and that with the least part of ferrous metal content.

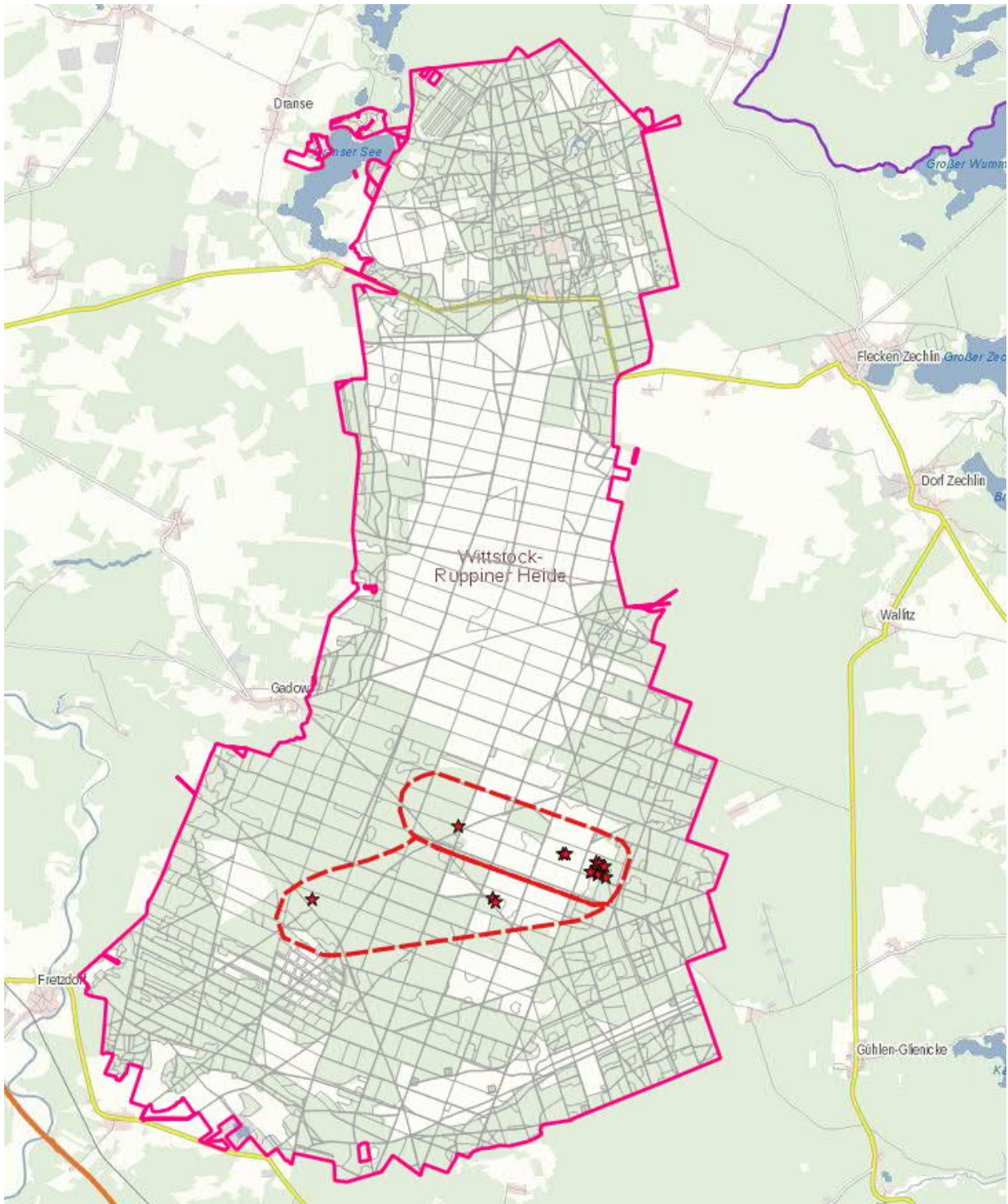


Figure 5: The area suspected to be contaminated with cluster munition remnants (red dashed polygons) with the finds of SHOAB-0.5 explosive submunitions until 2016 within the Wittstock former military training area (magenta polygon).

In total, 14 ShOAB-0,5 were found by chance prior to the start of the systematic cluster munitions clearance.

- 2) Vegetation: Furthermore, it has to be taken into account that the area suspected to be contaminated with cluster munition remnants is covered by dense vegetation (heath, pine, birch). The ground is typically not visible or only partially visible because of the dense vegetation cover. Also, the surface relief is highly uneven with numerous bomb craters, emplacements, ditches, ramparts, piles, etc (Figure 6).

The area suspected to be contaminated with cluster munition remnants is – as far is known today – circa 1,100 hectares (11 square kilometres) in size (Figure 5). The boundary of the area will be adapted based on information obtain in the ongoing cluster munitions clearance. The area cleared or investigated may extend beyond the boundaries of the contaminated area for organizational or safety reasons (e.g. because of the location of the forest firebreaks that were designed along natural features rather than the boundary of the suspected cluster munitions area only).



Figure 6: Heath vegetation and large-calibre dropped munitions inside the area suspected to be contaminated with cluster munition remnants.

3.3. RESPONSIBILITIES AND PARTIES OF UXO CLEARANCE

The clearance and disposal of unexploded ordnance as a security task is subject to police and administrative legislation and therefore the responsibility of the respective federal states of Germany. Almost all federal states have set up corresponding state agency for explosive ordnance disposal for these tasks. In Brandenburg this is the so called "Kampfmittelbeseitigungsdienst" (KMBD - "Brandenburg State Agency for Explosive Ordnance Disposal"), which is part of the police of the state of Brandenburg. Under German legislation, the federal government may not maintain an agency for explosive ordnance disposal.

In order to ensure a uniform approach to its properties, the Federal Government has set up the "Leitstelle des Bundes" for ordnance clearance at the Lower Saxony State Office for Construction and Property (NLBL), Hanover. The "Baufachlichen Richtlinien Kampfmittelräumung zur Erkundung, Planung und Räumung von Kampfmitteln auf Liegenschaften des Bundes" ("Guidelines for the Clearance of Unexploded Ordnance on Federal Properties") are the binding basis for the clearance of unexploded ordnance on federal government properties and thus apply for the Wittstock site.

To specify the procedures for the work to be carried out, site-specific work instructions were drafted. These were approved by the Brandenburg state agency for explosive ordnance disposal. They concern the aspects

- detection of unexploded ordnance (instruments and their use) (see also chapter 3.5)
- handling of cluster munition remnants and other remnants of war (on-site transport, storage, disposal)
- documentation

The state agencies for explosive ordnance disposal do not conduct site clearance projects. Their responsibilities are generally limited to the rendering safe, collection, transport and disposal of unexploded ordnance and other remnants of war. Site clearance (search, uncovering, identification, recovery, preparation for handover to state agencies) is generally conducted by commercial contractors that need to meet the requirements of the law on explosives (Gesetz über explosionsgefährliche Stoffe, - Sprengstoffgesetz (SprengG)). These contractors are mostly small enterprises with several dozen employees and the according equipment. These companies are mostly regionally active. Only a few companies have more than 100 employees. Of the specialist staff employed there, a large proportion is regularly tied up in long-term framework agreements with larger municipalities and federal states and are therefore not or only partially available for other tasks. Only about 1,500 people work in this small sector of commercial ordnance clearance in Germany. This comparably small number of employees in the sector in connection with the qualifications required by the federal law on explosives and a thriving construction industry limits the number of personnel available for clearance projects. It is also the reason why the planned personnel numbers for clearance at Wittstock (and in other projects) is not achieved.

Under a state regulation on explosive ordnance ("Kampfmittelverordnung"), the transport and disposal of explosive ordnance in the federal state of Brandenburg is the sole responsibility of the "State Agency for Explosive Ordnance Disposal" (Kampfmittelbeseitigungsdienst Brandenburg).

3.4. DISTRIBUTION AND DEPTH OF SHOAB 0,5

Until 2016, ShoAB-0,5 explosive munitions were only encountered exposed on the surface in areas with sparse vegetation. Because of their form and flight characteristics (high rpm rotation fuze arming mecha-

nism) it can be assumed that ShOAB-0,5 do not penetrate into the ground or only penetrate to shallow depths up to 10 - 20 cm. This assumption correlates with evidence and experience from cluster munitions clearance projects in South-East Asia where typical cluster munition depths implicate the following standard clearance depths defined by the relevant national authorities:

- Clearance depth in Cambodia: 20 cm
- Clearance depth in Laos: 25 cm
- Clearance depth in Vietnam: 30 cm

Because of the long time since the last use of cluster munitions in Wittstock 25 – 50 years ago it must be anticipated that cluster munitions that were exposed on the surface after impact have been covered by a thin layer of air-deposited sediments and vegetation (moss, heath, grass). Therefore, cluster munitions will typically not be visible on the surface today but the majority will be shallowly buried due to sand deposition and root layer build-up.

3.5. DETECTION OF SHOAB-0.5

The ShOAB-0,5 found by chance in July 2014 was investigated in-situ for detectability with hand-held sensors (magnetometers, metal detectors) that are commonly used for UXO detection Germany. Using a standard fluxgate vertical gradiometer (iron locator) with a sensor separation of 0.4 m, the magnetic amplitude detected at a distance of 0.1 m was circa 40 nT. At a distance of 0.3 m, this amplitude decreased to only 3 – 5 nT. Such anomalies are generally not discernible from background noise and cannot be reliably detected considering the overall contamination with ferrous metal objects (fragments, ordnance, and general scrap) on a former bombing range. Therefore, detection with iron locators that are most commonly used by commercial contractors for explosive ordnance disposal in Germany was ruled out for the detection of ShOAB-0,5.

Based on this result, a comparison of different metal detectors for the detection of UXO was conducted in October 2016. UXO detectors are based on standard metal detectors that are adapted (e.g., larger coils, use of later time gates) to suppress small metal objects (e.g., fragments, nails, bottle caps) while at the same time increasing the depth of detection for larger metal objects. Based on a market study, three instruments were selected for the test.

It was found that the depth of detection for the ShOAB-0,5 was comparable for the three instruments tested. However, differences were found in the ability of the instruments to suppress smaller targets (that do not have to be cleared) and selectively detect larger metal targets (benchmark half sphere ShOAB-0,5) in the highly cluttered environment of the former bombing range. The Instrument Minelab F3 UXO was found to be best suited for the task.

3.6. FOREST FIRE HAZARD

The Kyritz-Ruppiner Heide landscape in which the former military training area Wittstock is located is highly susceptible to forest fires because of the geological and meteorological conditions. Sandy soils with low nutrients contents, low water-storage capacity and an average annual precipitation of 560 mm in com-

ination with the prevalent vegetation consisting of heath (*Calluna vulgaris*), broom (*Genista* sp.) and various grasses result in a high forest fire risk over long periods of the year. Because of this, the Brandenburg law on forests prohibits – independent from the actual warning level for forest fires – fires and smoking closer than 50 meters to forests (LWaldG §23).

For the Wittstock former military training area, the local branch of Institute for Federal Real Estate responsible for the site (Bundesforstbetrieb Westbrandenburg) has developed various preventive measures against forest fires and taken precautions for forest fire fighting. For example, a firebreak system 50 m wide and 90 km long surrounding the site has been established. It consists of corridors free from trees and shrubs and strips of bare soil free from vegetation. The system is supplemented by internal, firebreaks. Furthermore, water reserves or wells were built on the periphery of the site near roads passable for fire trucks to provide water for firefighting in case of emergency.

Because of the contamination with unexploded ordnance and the local by-law prohibiting access to the site for the public, firefighting is limited to areas outside the area contaminated with unexploded ordnance. The fire brigade is not allowed to access the site in case of forest fires in areas contaminated with unexploded ordnance.

Because of this background, special safety precautions with respect to forest fires, special authorization for the use of fire by the responsible authorities are required to burn the vegetation prior to the commencement of clearance operations.

To enable the controlled burning of the area in section, it was necessary to create and maintain an internal system of firebreaks surrounding and subdividing the area suspected to be contaminated with cluster munition remnants (see also above / below) to prevent uncontrolled forest fires. This internal system of firebreaks was also a prerequisite to obtain the special authorizations for controlled burning from the competent authorities.

3.7. LOCATION IN AN FFH PROTECTED AREA

The area suspected to be contaminated with cluster munition remnants is located in an important natural reserve as the Wittstock site comprises the largest contiguous *Calluna* heathland in Germany. It has been registered with the European Commission as a Flora-Fauna-Habitat (FFH) natural reserve (FFH register number DE 2941-302). In accordance with Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (OJ L 206, 22.7.1992, p. 7), changed by Council Directive 2013/17/EEC of 13 May 2013 (OJ L 158, 10.6.2013, p. 193), natural habitat types of Community interest must be preserved. In the area suspected to be contaminated by cluster munition remnants, this affects the following habitat types:

- 4030 – European dry heaths
- 2310 – Dry sand heaths with *Calluna* and *Genista*
- 2330 – Inland dunes with open *Corynephorus* and *Agrostis* grasslands

Deterioration of these habitat types is prohibited. Consequently, the requirements of nature conservation law for the preservation of these habitat types must be taken into account in all measures on the site, including in the clearing of cluster munition remnants.

4. CONSIDERATIONS ON THE SUITABILITY OF CLEARANCE METHODS

The

- available information on the inventory of explosive remnants of war,
- detectability of ShOAB-0.5 explosive munitions,
- the dense vegetation cover,
- the necessary preventive measures against forest fires,
- the limited infrastructure,

had to be considered in the planning of the clearance. Careful consideration of these factors led to the conclusion that the investigation and clearance could not be conducted using standard methods of unexploded ordnance clearance. The reasoning for this is summarized as follows:

1. Manual Sub-Surface Clearance („full-area, selective recovery clearance“, German: „Vollflächige, punktuell bodeneingreifende Kampfmittelräumung“)

A manual sub-surface clearance using geophysical instruments according to the federal standard „Baufachliche Richtlinien Kampfmittelräumung“ („Guidelines for UXO Clearance“) termed „Vollflächige, punktuell bodeneingreifende Kampfmittelräumung“ „full-Area, selective recovery clearance“ is not possible because the dense vegetation cover does not allow for unhindered detection. Mechanical and manual removal of the vegetation cover are assessed as too dangerous because of the high density of unexploded ordnance in general and the abundance of UXO assessed as unsafe for handling in particular. Manual clearance comparable to land mine clearance is deemed unsuitable because of the dangers for the personnel involved and because of the low productivity and high costs.

Manual clearance similar to the clearance of landmines is not suitable because of the immense efforts required and the hazards posed to clearance personnel.

2. Mechanical Clearance („UXO Clearance by removal of soil and other materials (volume clearance / separation)“, „Kampfmittelräumung durch Abtrag von Boden und sonstigen Stoffen (Volumenräumung / Separation)“)

Mechanical clearance according to the federal standard „Baufachliche Richtlinien Kampfmittelräumung“ (Guidelines for UXO Clearance“) termed „Kampfmittelräumung durch Abtrag von Boden und sonstigen Stoffen (Volumenräumung / Separation)“ „UXO Clearance by removal of soil and other materials (volume clearance / separation)“ or mechanical clearance using tillers (Krohn tiller, Minewolf, Keiler or similar) would be possible considering cluster munition remnants alone but is impossible when considering large air-dropped munitions and shaped charge munitions because of the dangers for the surroundings, operators and equipment. Tilling would result in the initiation of all kinds of munitions, including large air-dropped bombs and shaped charge munitions. This would result in the destruction of the equipment and would require large safety areas for operating tillers. Also, areas can usually not be cleared completely using mechanical clearance systems. Areas with large obstacles (underground construction such as bunkers, large vehicle

or aircraft parts, etc.) and the ruggedness and varying micro topography cannot be cleared with mechanical systems. This would again require manual clearance as described in 1.) which is impracticable.

Furthermore, mechanical clearance would result in the release of explosives compounds into the environment (soil, groundwater) and thus result in additional environmental contamination that is not acceptable under German environmental legislation and considering the natural protection status of the site.

3. Prescribed Burning and Subsequent Clearance

Because standard manual and mechanical clearance have considerable disadvantages and are considered impossible to implement considering the local conditions at Wittstock, an alternative concept for the clearance of cluster munitions was developed. This concept comprises the prescribed burning of vegetation prior to sub-surface clearance or „full-area, selective recovery clearance“ (German: „vollflächige, punktuell bodeneingreifende Kampfmittelräumung“). Prescribed burning is a standard method in nature conservation and landscape management that has been established to maintain open space habitats such as European dry heathland. It has been used in Wittstock on a large scale for landscape management in the safety areas of the former military training area in the past. The application of prescribed burning yields synergies between cluster munitions clearance and landscape management. Considering the local conditions, prescribed burning followed by sub-surface clearance is the preferred method for the clearance of cluster munitions at the Wittstock site.

As described in the previous section, the clearance of cluster munitions at Wittstock is divided into the following steps:

- Preparation of the site: desk study and creation of an access and evacuation road network,
- preparation of the area suspected to be contaminated with cluster munitions for prescribed burning,
- prescribed burning of the vegetation, and finally
- sub-surface clearance of cluster munition remnants and other UXO

5. PREPARATION OF THE SITE – DESK STUDY AND ACCESS AND EVACUATION ROAD NETWORK

Following the handover of the then Wittstock military training area by the WGT to German Armed Forces (Bundeswehr) in 1993, German Armed Forces planned to continue its use as a bombing range. As part of the planning process, a comprehensive UXO desk study (German: „Historisch-genetische Rekonstruktion – HgR“) reconstructing the military use of the training area was conducted in 2001 – 2003. While the desk study yielded information on the beginning of the military used in the early 1950ies and the 199ies, little information was gained on the timeframe circa 1955 to circa 1990 due to a lack of sources. Intensified efforts by the Federal Forestry Agency as part of Institute for Federal Real Estate (Bundesanstalt für Immobilienaufgaben) following the take-over of the site from German Armed Forces did not yield relevant additional information. Only in 2017, satellite imagery yielding relevant information on the timeframe mentioned above could be obtained. Results of the analysis of this imagery are not available at the time of writing of this report.

Because of the known contamination of the site with unexploded ordnance, the site remained closed to the public after German Armed Forces handed over the site to the Institute for Federal Real Estate by means of a local by-law (“Ordnungsbehördliche Verordnung zum Beschränken des Betretens“, “Sperrverordnung“) that aims to prevent dangers for public safety. At the same time, a strategic concept („Strategisches Handlungskonzept“ – SHK) for the management and development of the site was developed. The SHK summarizes the knowledge with respect to UXO contamination of the site.

Based on the SHK, results of various UXO clearance campaigns initiated by German Armed Forces with respect to the planned, continued military use of the site and the UXO desk study, a concept for an evacuation and access road network, a fire control and containment plan and a general plan for emergency response were developed. The fire control and containment plan was necessary to be able to contain and fight potential wild-fires. The evacuation and access road network became – among others – necessary to enable safe access to the area contaminated with cluster munitions that became known at the time. This access road network is also necessary to enable the use of commercial contractors for cluster munitions clearance and prior preparation of the area suspected to be contaminated with cluster munitions for prescribed burning.

The evacuation and access road network and the existing fire-breaks (that were largely cleared by commercial EOD contractors for German Armed Forces between 1998 – 2006) were investigated by means of a magnetic survey in 2013 (full-area survey). This survey was followed in 2014 by the investigation and clearance of selected test grids.

The results were integrated in a concept for access by authorities and organizations responsible for public safety (“Zugangs- und Betretungskonzept für die Behörden und Organisationen mit Sicherheitsaufgaben“ – BOS-Konzept).

With these preparatory works, the prerequisites for the preparation of the site suspected to be contaminated with cluster munitions for prescribed burning were created.

6. PREPARATION OF THE SITE FOR PRESCRIBED BURNING - FIRE CONTAINMENT SYSTEM

Prescribed burning generally requires a preparation of the site to make sure the fire remains contained to the intended site. Considering the high risk for forest fires due to the prevailing heath and pine vegetation, a fire containment system must reliably prevent the spreading of ground and crown fires to neighbouring sites.

The local branch of the Federal Forestry Agency, Bundesforstbetrieb Westbrandenburg, has developed such a fire containment system consisting of a multi-layer system of fire-breaks for ground and crown fires:

- Outer Fire-Break (German „Sicherungsaußenring – SAR“)
- First Inner Fire-Break (German: „Erster Innenring – 1. IR“)
- Second Inner Fire-Break (German: „Zweiter Innenring – 2. IR“)
- Inner Roads (German: „Innenwege – IW“)
- Additional Fire-Breaks (German: „Sicherungslinien – SL“) that are created as required

The fire containment system consisting of these elements can be described as follows (compare Figure 7):

- The outer fire-break (Sicherungsaußenring - SAR) consists of a 5 m wide strip of bare soil free from vegetation. The SAR will be cleared completely from unexploded ordnance and will be maintained at minimum for the duration of the cluster munitions clearance. Shrubs and trees are removed in a 9 m wide buffer left and right of the SAR using armored harvesters.
- The first inner fire-break (Erster Innenring – 1. IR) consists of a 3 m wide strip of bare soil free from vegetation. The 1. IR will not be cleared from unexploded ordnance as it is only required to initially create a circa 140 m wide buffer to areas outside the area suspected to be contaminated with cluster munitions. Shrubs and trees were removed in a 9 m wide buffer left and right of the 1. IR using suitable armoured harvesters. Thus, a strip 18 m wide between the SAR and the 1. IR free of shrubs and trees is created.
- The second inner fire-break (Zweiter Innenring – 2. IR) consists of a 3 m wide strip of bare soil free from vegetation. The 2. IR will not be cleared from unexploded ordnance as it is only required to initially create a circa 140 m wide buffer to areas outside the area suspected to be contaminated with cluster munitions. Shrubs and trees were removed in the area between the 1. IR and the 2. IR as needed using armoured harvesters and clearance of work corridors.
- The inner roads (IW) were already existent. Shrubs and trees were removed in a 9 m wide buffer left and right of the IW using suitable, armoured harvesters. For continued use during the clearance campaign, the inner roads are cleared from unexploded ordnance.
- Additional fire-breaks were created as needed as so-called “Sicherungslinien – SL”. SL are usually located 18 m apart from existing roads (IW). Shrubs and trees were removed in a 9 m wide buffer left and right of the SL using suitable armoured harvesters, thus creating a circa 40 m wide area free of shrubs and trees along the corridors consisting of IW and SL.

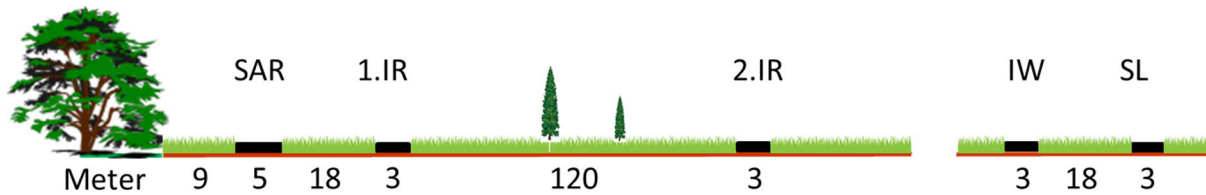


Figure 7: Principle of the fire containment system created around the area suspected to be contaminated with cluster munition remnants. Distances in meters, abbreviations see text.

Figure 8 shows the fire containment system created. The fire containment system largely comprises the area suspected to be contaminated with cluster munitions. Small parts on the eastern and western fringe remain outside because they are located in high forests that cannot be burned. However, sub-surface clearance using detectors is possible in these areas in the winter season.

The inner roads cross the area multiple times. The different firebreaks have a total length of 66,579 meters that are distributed as follows:

- Outer Fire-Break 18,496 m
- First Inner Fire-Break 18.846 m
- Second Inner Fire-Break 15.861 m
- Inner Roads 12.662 m
- Additional Fire-Breaks 714 m

Because of the contamination with large unexploded ordnance, the fire-breaks were created using an unmanned, remote-controlled caterpillar by an EOD contractor in 2016. In a first step, the intended routes were checked visually for obstacles and large unexploded bombs on the surface using imagery acquired by drones. For safety reasons, the minimum distance maintained between the operator and the caterpillar was 1,000 m. Furthermore, the project area was secured by camera-controlled barriers across the roads leading into the work area (Figure 9, Figure 10 and Figure 11).

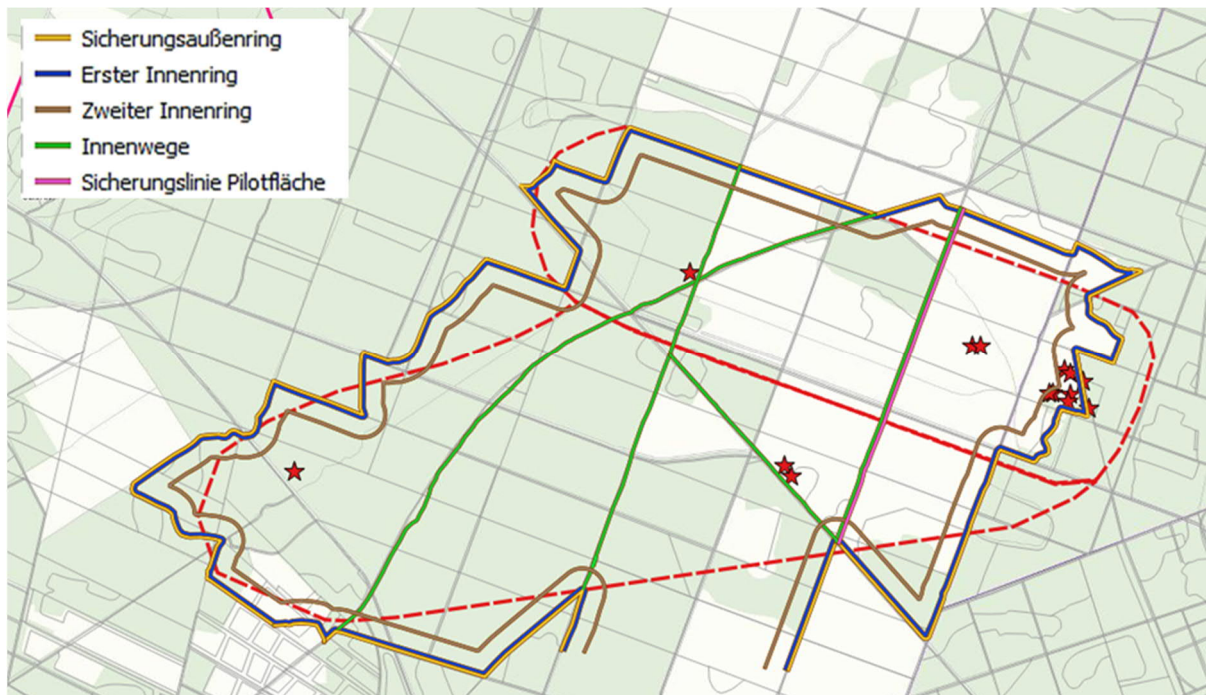


Figure 8: Fire containment system consisting of fire breaks according to the fire prevention concept of the Bundesforstbetrieb Westbrandenburg. Also shown are the area suspected to be contaminated with cluster munitions remnants and encounters of ShOAB-0,5 explosive munitions prior to commencement of the clearance campaign. For further explanations, see text.



Figure 9: Unmanned, remote-controlled caterpillar used to create the fire-breaks surrounding the area suspected to be contaminated with cluster munitions. For further explanations, see text.



Figure 10: Workplace of the operator of the remote-controlled caterpillar with wireless antennas, generator (on trailer). For further explanations, see text.



Figure 11: Fire-break as created by the remote-controlled caterpillar. For further explanations, see text.

7. PRESCRIBED BURNING

The prescribed burning of the first sectors inside the area suspected to be contaminated with cluster munitions started in 2017. It is planned to continue the burning on an annual basis as needed for the clearance. Per year, about 200 to 300 hectares can and should be burned when considering natural protection issues and planned clearance progress.

Prescribed burning requires special meteorological conditions to keep the fire under control. The required meteorological conditions are typically only met on few days each year, usually in the months February and March, and rarely in October / November.

For the prescribed burning, the area is cordoned off with a safety buffer of at minimum 1,000 m (usually 2,000 m and more) surrounding the area to be burned depending on local conditions. The fire is laid manually using fire-cans in areas previously checked for exposed unexploded ordnance and personnel then withdrawn. The area is not accessed for 24 hours after the start of the fire.

Following the establishment of the fire containment system of fire breaks surrounding the area suspected to be contaminated with cluster munition remnants in 2016, a total area of circa 406 hectares were burned (Figure 12 through Figure 14). Part of the burned areas are located outside the area suspected to be contaminated with cluster munition remnants. The burned areas comprise areas with little (no. I) and high (no. II and IV) contamination with unexploded ordnance (not necessarily cluster munitions remnants) and clutter. Area no. III has a varying contamination that is high in most parts but small in some parts.



Figure 12: Prescribed burning of heathland in Wittstock. For further explanations, see text.



Figure 13: An area after prescribed burning. For further explanations, see text.

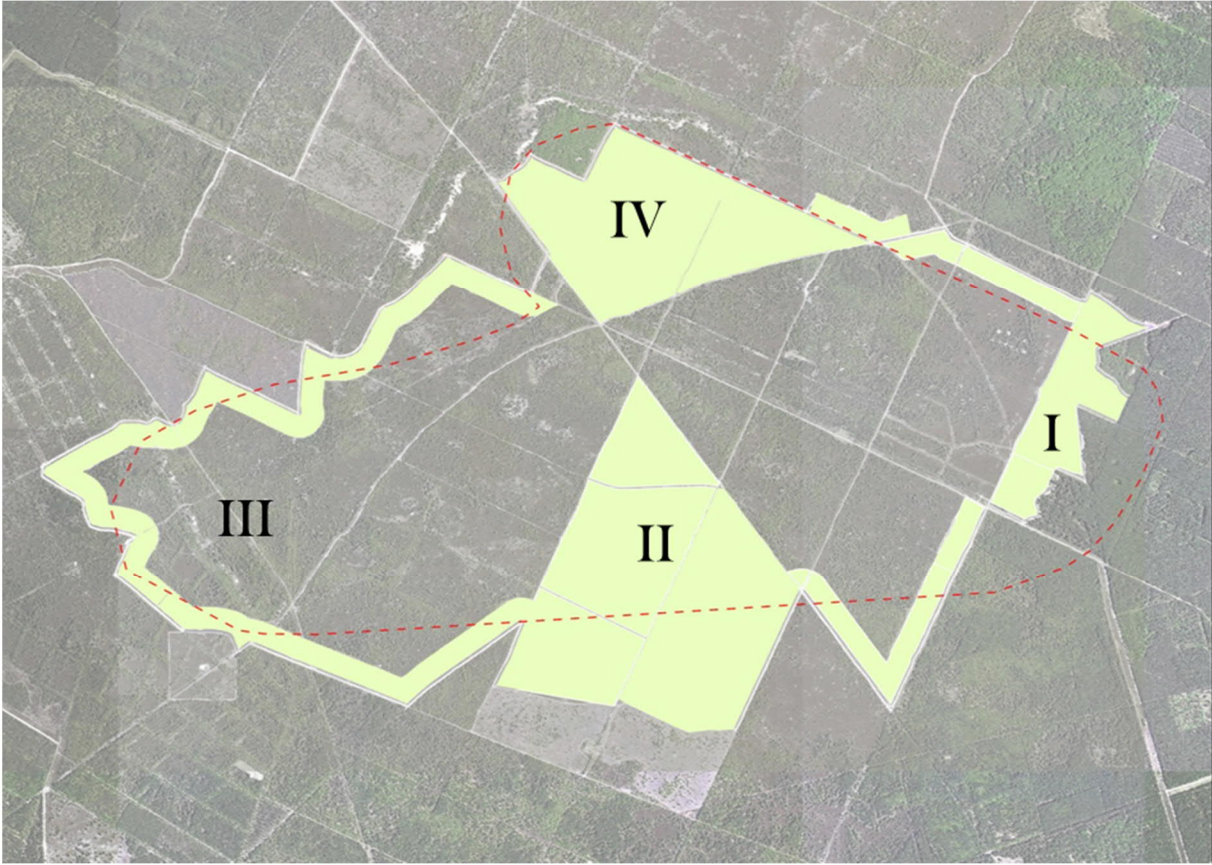


Figure 14: Areas subjected to prescribed burning in 2017 and 2018. For further explanations, see text.

8. ORDNANCE CLEARANCE – GENERAL PROCEDURE

8.1. METHOD

The area suspected to be contaminated with cluster munitions that require sub-surface clearance was divided in the sub-areas I through IV based on the prescribed burning conducted in late 2016 and early 2017 (Figure 14 and Figure 19).

The complete area suspected to be contaminated with cluster munitions was divided in parcels of 50 x 50 m (quadrants of the geodetic coordinate reference system ETRS89 UTM33N). Following the prescribed burning, each parcel inside the area suspected to be contaminated with cluster munitions is subjected to sub-surface clearance respectively „full-area, selective recovery clearance“ (German: „vollflächige, punktuell bodeneingreifende Kampfmittelräumung“). Based on on-site tests with different scenarios, the instrument selected for detection is the Minelab F-3 UXO (Figure 15). Centimetre-accuracy surveying and marking of all parcels with wooden stakes ensures the complete clearance of the parcels by the contractors which is checked with control survey by the on-site project management after completion. All finds of cluster munition remnants potentially containing explosive are surveyed in-situ with centimetre accuracy, numbered with a unique ID and documented photographically. All other unexploded ordnance is identified, recovered and documented per parcel (box).

Detected, larger anomalies that are too deep for manual recovery (usually > 0.5 m depth) are marked and later recovered with the assistance of a partially armoured excavator.



Figure 15: Clearance works. Upper row (left to right): marking of parcels, anomalies marked for excavation, find at the surface. Lower row: Detection with the “Minelab F-3 UXO”, recovery of anomalies.



Figure 16: Cluster munition remnants prepared for disposal by open detonation, here, here ZAB 2,5M (top) and open detonation of cluster munition remnants (bottom).

These works are only conducted on areas that were previously subjected to controlled burning. Small areas, where the vegetation could not be burned to the required degree, the method is adapted as needed.

The disposal of cluster munition remnants is conducted by the "Brandenburg State Agency for Explosive Ordnance Disposal" (Kampfmittelbeseitigungsdienst) by open detonation in situ (where required) or at an on-site, prepared blasting area (Figure 16).

8.2. DOCUMENTATION

All finds are documented in detail. The categories distinguished for documentation are:

- Scrap: Number of pieces and tonnage as well as generalized description per parcel
- Ordnance except cluster munition remnants: unique identification per find including the conditions of the find in the documentation sheet according to the guidelines on ordnance clearance on federal lands
- Cluster munition remnants: in addition to the information recorded for other ordnance, each find is documented from its identification to its disposal. For this, each cluster munition remnants find receives a unique number tag in one of three colours (red, green, blue). The colours are used to differentiate the finds of the various contractors. Readable markings (lot, production year, etc.) are recorded. The location of all finds is surveyed with an accuracy of +/- 0.1 m (Figure 17).

Fundkarte Räumung Streumunition Liegenschaft Wittstock Nr. **000746**

Funddatum, Uhrzeit	12.07.2018	12:20 Uhr
Typ	ShOAB-0.5	
Beschriftung	80-2-75 / TG-30 / 56-79	
Tiefe uGOK	0,10m	
Forstabt. / Teilfläche	Dünamünde	
R WGS84 UTM33N	347959,3	H WGS84 UTM33N 5885116,9
Detektiert mit	F3 UX0	
Dateiname Foto	Streumunition_0746.jpg	
Truppf. §20 SprengG	L. Fischer	
Unterschrift	Jan Fischer	
Bestätigung AG / öBÜ	B	




Figure 17: Documentation for find red no. 746, a ShOAB-0.5.

8.3. QUALITY CONTROL

The clearance conducted by commercial ordnance clearance contractors is subject to an intensive, independent quality control.

The objective of the clearance is the clearance of all ordnance and other metallic objects that are of the size of a ShOAB-0.5 or larger. This clearance objective is measured and checked by different criteria applied in quality control (Figure 18):

- The length of the edges of objects (X+Y+Z) found in quality control detections must not exceed 25 cm, the circumference of a ShOAB-0.5.
- Test objects with similar detection characteristics as the ShOAB-0.5 are hidden in selected parcels. These test objects must be relocated completely in the clearance conducted by the contractor.

Every parcel is first subjected to internal quality control by the contractor. In addition, each parcel is subjected to a quality control detection performed by an independent engineering company. This quality control detection comprises the detection of 10 – 20 % of each parcel. If one or more objects that exceed the 25 cm criterion are found, the clearance is not accepted. The parcel is then fully cleared again by the commercial clearance contractor. When this is complete, the parcel is subjected to a new quality control.

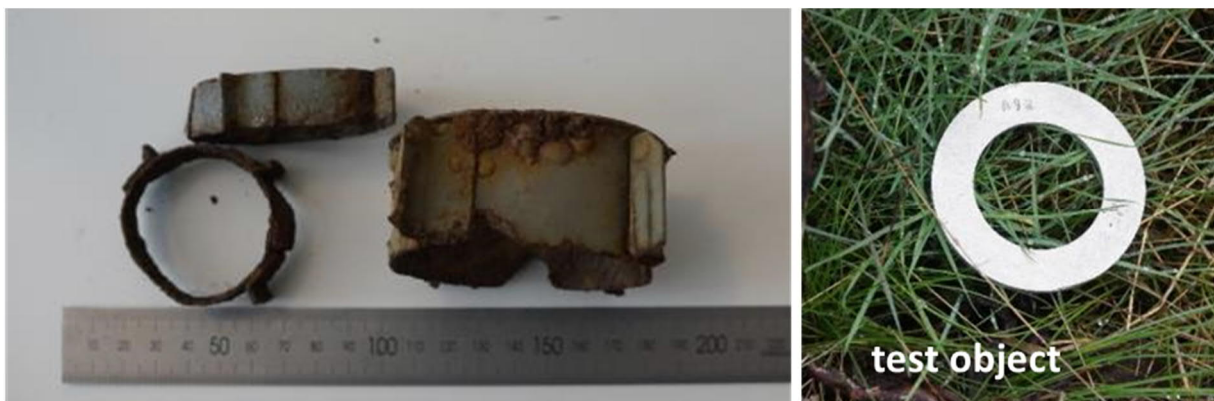


Figure 18: Objects of the minimum size to be detected (left) and test object applied to check the clearance (right).

9. CLEARANCE – STATUS AS OF OCTOBER 2018

After extensive preliminary work (see Chapters 5, 6 and 7), the actual clearing of the cluster munition remnants began in March 2017. An area in the eastern part of the suspected munitions suspected area was selected (sub-area I, Figure 14) for the start, assuming a representative site conditions (birch and pine growth, large heather, former positions, etc.) and a relatively low contamination with cluster munition remnants and other ordnance.

After partial completion of the work in sub-area I, the work was relocated at the beginning of July 2017 to area IV which is heavily contaminated with cluster munition remnants, other ordnance and clutter.

At the beginning of October 2017, work began in sub-areas II and III.

The intention of the clearance in different parts of the area suspected to be contaminated with cluster munitions is to gather experience about the clearance under different local conditions and intensities of contamination with clutter and unexploded ordnance. The knowledge gained will help to optimize the clearance campaigns in the following years with respect to technical and financial aspects.

Based on a public tender, three commercial contractors for explosive ordnance disposal were selected to conduct the clearance. For safety reasons, the contractors were assigned different clearance areas.

Until the end of October 2018, the following areas were cleared in sub-areas III and IV (Figure 19):

- Cleared area 2017: 47 hectares
- Cleared area January – October 2018 (with long winter break due to frozen ground): 74 hectares cluster munitions contaminated area plus large areas in the fire containment system / fire breaks

In total, 1,282 explosive submunitions were recovered, documented and disposed of by open detonation until the end of October 2018 (Figure 20):

- ShOAB-0,5: 965 Pcs. (ca. 75 %)
- AO-1 SCh: 47 Pcs. (ca. 4 %)
- AO-1 M:..... 2 Pcs.
- AO-2,5 RTM: 2 Pcs.
- AO-10 SCh: 2 Pcs.
- PTAB 1M: 1 Pcs.
- PTAB 2,5 M: 162 Pcs..... (ca. 13 %)
- PTAB 2,5 TG:..... 3 Pcs.
- PTAB 10-5: 6 Pcs.
- ZAB 1-E: 1 Pcs.
- ZAB 2,5:..... 1 Pcs.
- ZAB 2,5M: 90 Pcs. (ca. 7 %)

The depth below surface at which ShOAB-0.5 are found vary between 0 cm and 30 cm, with most found at depths up to 20 cm. The average depth of ShOAB-0.5 is circa 15 cm. These depths meet the expectations. PTAB-2.5M, AO-1 SCh and others are occasionally found at depths of up to 65 cm below surface. The de-

tectability of these cluster munition remnants was checked and confirmed by trials in the field. The concept described in chapter 4 is thus also suitable for these types of cluster munition remnants.

In addition to these cluster munitions remnants, all types of conventional ordnance from the former Warsaw Pact countries were encountered. The spectrum includes artillery and dropped munitions as well as missiles and rockets (Figure 22).

The clearance is conducted by the following personnel:

- 2017: started with 9 personnel in March 2017, soon increased to 20 and then 40 in summer 2017
- 2018: 100 personnel in April 2018, increased to 120 personnel by the end of June

The average clearance performance considering all involved personnel (senior EOD technician / project manager, EOD technicians, clearance workers, ordnance processing) is between 50m² and 60 m² per person and day.



Figure 19: Areas that were cleared and passed quality control until the end of October 2018. For further explanations, see text.



Figure 20:
Some cluster munition remnants found until the end
of October 2018. Upper left:: AO-1 Sch,
Upper right: AO-10 Sch, Center left:
PTAB 2,5 M, Center right: PTAB 10-5,
lower left: ZAB 2,5M

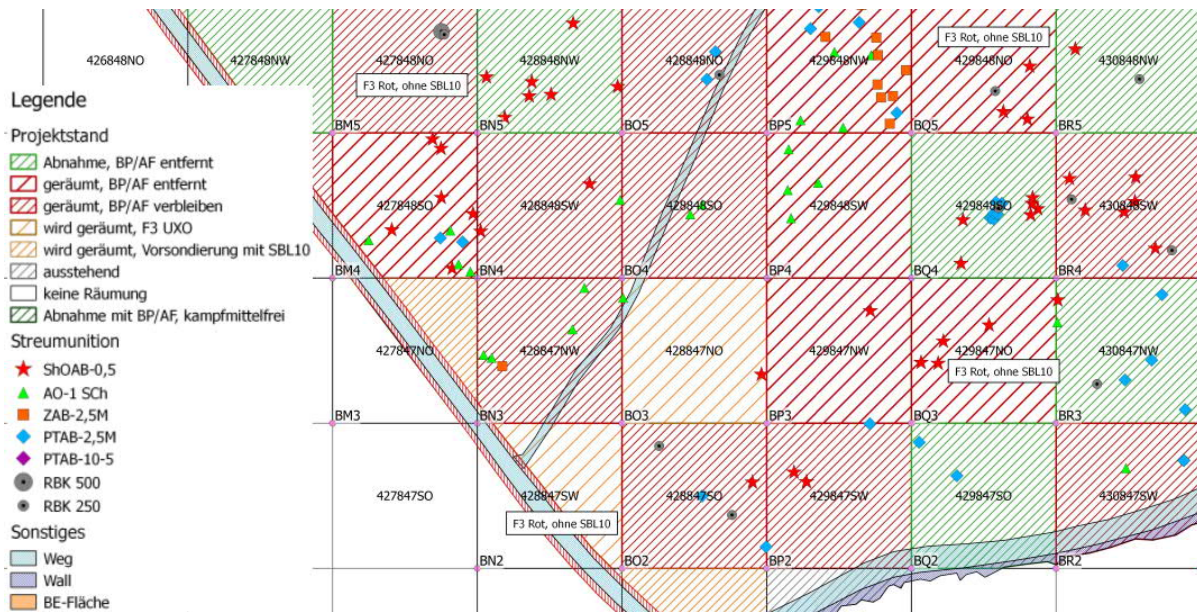


Figure 21: Finds of cluster munition remnants including cluster bomb containers (RBK) and their distribution pattern on sub-area IV. For further explanations, see text.



Figure 22: Other finds of explosive remnants of war, here artillery shells, missiles, fuzes, etc. For further explanations, see text.

10. CLEARANCE – PLANNING AND OUTLOOK

10.1. PROGNOSIS CLEARANCE DURATION

As described in chapter 9, the average clearance performance (involving senior EOD technician / project manager, EOD technicians, clearance workers, ordnance processing) is between 50 m² and 60 m² per person and day.

Starting in late 2018 clearance personnel will reach 150 (excluding client on-site and overall project management, site supervision). The effective permanent personnel for clearance works will be approximately 140 personnel. A further increase is not possible for reasons described in detail in chapter 10.3.

It is expected that a total of 125 hectares to 130 hectares will have been cleared from cluster munition remnants until the end of 2018. At this time, circa 970 hectares to 975 hectares will remain to be cleared. Based on the above numbers, the duration for the outstanding clearance can be estimated as follows:

Average daily clearance	50 m ² /Person/Day	60 m ² /Person/Day
Clearance personnel (effective)	140 Personnel	
Annual clearance duration	45 Weeks = 225 Workdays	
Annual personnel workdays	31.500 Personnel Workdays	
Annual clearance	157,5 Hectares	189 Hectares
Required duration in years for 980 hectares	ca. 6 Years	ca. 5 Years
Expected finalization of clearance	2024	2023
Expected end of project (accounting, documentation)	2025	2024

The cluster munitions convention requires the clearance to be completed by 31 July 2020. Within current parameters, the deadline cannot be met for the Wittstock site.

Local conditions, in particular the high contamination with clutter and difficulties in the acquisition of personnel for clearance put certain restrictions on clearance speed. In addition to that, numerous secondary requirements are necessary to ensure the safe and smooth clearance (qualification and regular instruction of clearance personnel on safety issues, maintenance of the road network, handover to and disposal of unexploded ordnance and ordnance remnants to public authorities, supply and maintenance of site installations and clearance equipment).

10.2. STRUCTURAL RISKS AND LIMITATIONS

The clearance works in Wittstock are subject to certain risks and restriction. With respect to clearance duration and costs these are in particular:

- Number of clearance personnel
- Areas available after controlled burning
- Degree of contamination with cluster munition remnants, other ordnance and clutter
- Meteorological conditions

These restrictions and the resulting risks for the clearance of cluster munitions are described in the subsequent sections.

10.3. NUMBER OF CLEARANCE PERSONNEL

Commercial contractors need to meet the requirements of the law on explosives (Gesetz über explosionsgefährliche Stoffe, - Sprengstoffgesetz (SprengG)). These contractors are mostly small enterprises with several dozen employees and the according equipment. These companies are mostly regionally active. Only a few companies have more than 100 employees. Of the specialist staff employed, a large proportion is regularly tied up in long-term framework agreements with larger municipalities and federal states and are therefore not or only partially available for other tasks. Only about 1,500 experts work in this small sector of commercial ordnance clearance in Germany. This comparably small number of employees in the sector with the qualifications required by the federal law on explosives and a thriving construction industry limits the number of personnel available for clearance projects.

The plan is to employ approximately 150 personnel for the clearance of cluster munition remnants in Wittstock, approximately 10% of the overall personnel available in Germany.

The full level of clearance personnel on-site should be reached by the first half of 2019.

A further increase of personnel is not visible for the following reasons:

- A maximum of 10 clearance workers must be continuously supervised by a qualified EOD technician with a license according to §20 SprengG (law on explosives) for commercial EOD works. This requirement results from federal legislation on explosives and occupational health and safety. A short-term increase of qualified EOD technicians is strictly limited because of the requirements of at least five years of experience in clearance works.
- Because of the thriving construction industry in Germany, delays in construction projects are now regularly experienced because of a lack of personnel for ordnance clearance. This also affects large-scale project. The shortage of personnel and fierce competition result in a lack of personnel.
- Contracting foreign companies for clearance works in Wittstock is not possible because of German legal restrictions.

In 2020, a renewed tendering of the clearance works in Wittstock will likely become necessary because of EU procurement requirements. In case other contractors than those already working in Wittstock will win this tender, this will result in a temporary decline and re-increase in the personnel working on the clearance in Wittstock.

The risk of a lack of personnel for clearance works is assessed as low at this time. However, the renewed tendering of the clearance works clearly increases the risk significantly with respect to the number of personnel available for the clearance of cluster munition remnants and the quality of the clearance because new personnel would have to be trained to achieve the standards of the personnel already working on sites. This could therefore have a significant effect on the continuation and completion of the clearance works.

10.4. AREAS AVAILABLE FOR CLEARANCE AFTER CONTROLLED BURNING

As described in chapter 4, the controlled burning of areas is a prerequisite for the clearance of areas from cluster munition remnants.

Despite the extensive system of firebreaks in the area suspected to be contaminated with cluster munition remnants and the external fire containment system, controlled burning is subject to many limitations (compare also chapter 7):

- Natural conservation requirements limit the controlled burning to a maximum of 200 – 300 hectares per year
- After regrowth of the vegetation, a renewed burning is only possible after several years. Therefore, controlled burning must only be applied to areas that will be cleared within the next one to two years.
- For safety reasons, controlled burning is limited to few days per year. In 2017, controlled burning was only possible on two separate days.

In addition to these requirements, additional factors have to be taken into account:

- Numerous forest fires in the summer of 2018 have brought public attention to forest fires. Controlled burning of heath and forest is now a matter of public discourse.

It is not possible to counter adverse weather conditions that do not allow for controlled burning. Continuous maintenance of the fire containment system and the internal firebreaks as well as continuous information of the competent authorities and the public is intended to support and maintain the acceptance of controlled burning.

As far as weather conditions allow, it is planned to subject circa 250 hectares per year to controlled burning in order to build up a reserve of burnt areas as only 190 hectares are expected to be cleared per year.

The risk of adverse weather conditions with respect to controlled burning and the resulting effects on the continuation and completion of cluster munition remnants clearance cannot be reliably assessed. However, through the building-up of a reserve the risks for a stand still are being mitigated.

10.5. DEGREE OF CONTAMINATION

For a large part of the area suspected to be contaminated with cluster munition remnants, no reliable information is available on the degree of contamination with cluster munition remnants, other ordnance and clutter.

The assessment and estimates with respect to clearance performance are based on current values. Whether these areas are representative for the total of the area is unclear.

A higher or lower degree of contamination could result in lower or higher performance during the clearance and hence a longer or shorter duration required for clearance.

At this time, the risk with respect to overall contamination and its effects on the continuation and completion of the cluster munition clearance cannot be reliably assessed.

10.6. METEOROLOGICAL CONDITIONS

The Wittstock region is significantly influenced by continental climate. Compared to the rest of northern Germany, this results in higher temperatures in the summer and lower temperatures during the winter.

In particular low temperatures over extended periods of time during the winter may result – apart from the effects on personnel and their performance – in frozen ground for several weeks. In this case, clearance is not possible for safety reasons and must be interrupted.

Some small, forested areas that cannot be subjected to controlled burning will be used to continue work in case of frozen ground. However, their size is limited and will not be sufficient to continue works over long periods of frost. In case of extended periods of frost, clearance works will have to be interrupted.

Additional countermeasures against weather extremes are not possible.

The risks emanating from adverse weather conditions and their effect on the continuation and completion of the cluster munition clearance cannot be reliably assessed.

10.7. PROJECT SCHEDULE

Based on the data and information available, the following project schedule is considered to be realistic (already completed works are included for better understanding) (see also Figure 23):

	Completed Work
2011	German Armed Forces hand over Wittstock former military training area to civilian authorities; military safety area revoked
2011	Closure of former military training area for public by local by-law
2011/2012	Additional historic research, development of the strategic concept for the management and development of the site
2013	Preparation of the evacuation and access road network to make the area suspected to be contaminated by cluster munitions accessible: geophysical investigation of road network
2014/2015	Preparation of the evacuation and access road network to make the area suspected to be contaminated by cluster munitions accessible: clearance of test grids on roads
2015	Development of the concept for cluster munitions clearance, trials, public tender for the development of the fire containment system surrounding the area suspected to be contaminated with cluster munitions

2016	Preparatory works, creation of the fire containment system; public tender for cluster munition clearance works of the area suspected to be contaminated with cluster munitions
2017	Investigation and clearance of a circa 47 hectares and trials for the adaptation of clearance methods to local site conditions
	Ongoing Work
2018	Clearance of the firebreaks to continuously maintain the fire containment system, clearance of circa 80 hectares from cluster munition remnants will be definitely completed
	Planned Work / Benchmarks
2019	Clearance of circa 150- 200 hectares from cluster munition remnants
2020	Clearance of circa 150- 200 hectares from cluster munition remnants
2021	Clearance of circa 150- 200 hectares from cluster munition remnants
2022	Clearance of circa 150- 200 hectares from cluster munition remnants
2023	Clearance of circa 150- 200 hectares from cluster munition remnants
2024	Clearance of circa 150- 200 hectares from cluster munition remnants
2025	Finalization, documentation, reporting of the project

A more detailed planning of sites and areas for clearance in the subsequent years is not possible. The areas to be cleared are defined by the areas subjected to controlled burning which in turn depend on the weather conditions and cannot be planned with respect to their location and size.

Regular monitoring of the speed of clearance will allow for a continuous optimization process.

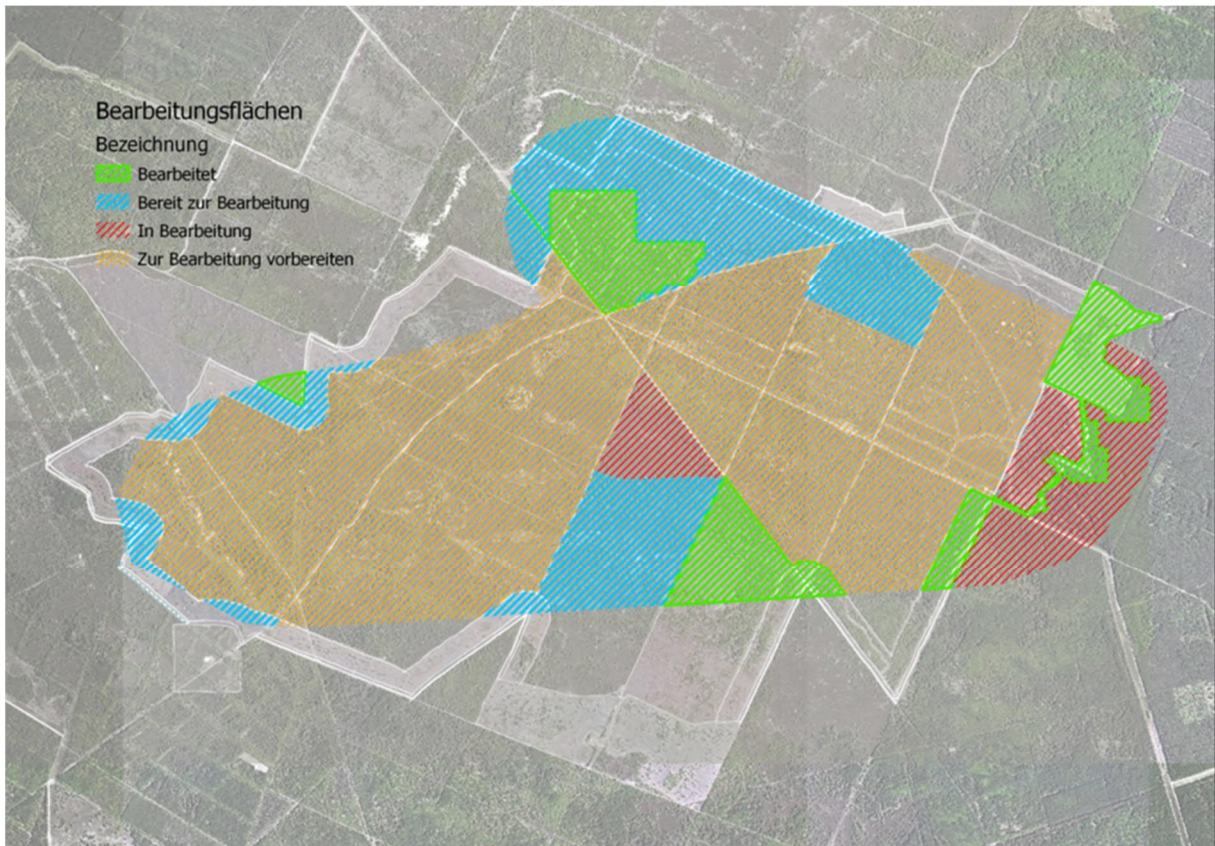


Figure 23: The clearance of cluster munition remnants in 2019 and 2020 will be focused on the red areas that are currently being cleared and the blue areas that have already been subjected to controlled burning. Which areas are subjected to controlled burning next largely depends on the weather conditions on the few days per year that are suitable for controlled burning (areas marked brown). Therefore, no specific areas can be planned for the years 2020 to 2024. For further explanations, see text.

11. COST ESTIMATE

The following costs are estimated for the clearance of the area of circa 1,100 hectares suspected to be contaminated with cluster munition remnants (as of October 2018, gross):

- Costs for clearance by commercial EOD contractors: ca. 60.000.000 €
- Costs for engineering: ca. 3.000.000 €
- Costs for disposal of ordnance (state EOD agency): ca. 4.300.000 €

These costs are estimated as follows:

Year	Costs for ... [in Euro]			
	clearance by commercial EOD contractors	engineering	disposal of ordnance	Total
2019	8.500.000	400.000	700.000	9.600.000
2020	8.500.000	440.000	700.000	9.640.000
2021	10.500.000	480.000	700.000	11.680.000
2022	10.500.000	480.000	700.000	11.680.000
2023	10.500.000	480.000	700.000	11.680.000
2024	10.500.000	480.000	700.000	11.680.000
2025	1.000.000	240.000	100.000	1.340.000
Total	60.000.000	3.000.000	4.300.000	67.300.000

The necessary funding for the German clearance efforts at Wittstock will be provided by the Institute for Federal Real Estate. Total clearance costs are currently estimated at 67 million EURO.

12. SUMMARY OF OUTLOOK

The previous chapters have given detailed information on the financial, technical, material and personnel needs to perform the clearance work up to 2025. This information will be summarized here:

	Clearance Area		Personell		Budget	
	estimate	actual	estimate	actual	estimate	actual
Year	[hectares]	[hectares]	[number]	[number]	[EURO]	[EURO]
2017	40 - 50	47	10 - 15	9 - 40	700.000	1.627.918
2018*	70 - 90	74	80 - 100	120	9.000.000	6.201.494
2019	150- 200		140 - 150		9.600.000	
2020	150- 200		140 - 150		9.640.000	
2021	150- 200		140 - 150		11.680.000	
2022	150- 200		140 - 150		11.680.000	
2023	150- 200		140 - 150		11.680.000	
2024	150- 200		140 - 150		11.680.000	
2025	-		50		1.340.000	

*) Data up to and including October 2018

The material needs (e.g. some few catapillars, site facilities for contractors) are negligible and were therefore not mentioned in the summary.

13. EFFECTS OF EXTENDED CLEARANCE DURATION

The extension of the duration for cluster munitions clearance at the Wittstock site will have the following effects:

- Socio-economic effects:
 - The Wittstock site is uninhabited; access for the public is prohibited. Apart from forestry and natural conservation, the area is not used.
 - The clearance of cluster munition remnants has created several dozen jobs in the communities surrounding the Wittstock site. This has positive effects in an area with a weak infrastructure. The extension of the clearance duration will maintain these jobs for a longer period of time, having a positive effect.
 - All available accommodation in the vicinity of the site is booked permanently for clearance personnel. Clearance personnel also purchase groceries and other goods needed locally. This has a positive effect on the otherwise economically weak region. This positive effect will be maintained by the extended continuation of clearance works.
 - Overall, the extension of the duration of cluster munition clearance at Wittstock will have predominantly positive effects. Negative effects are not anticipated at this time.
- Ecological effects
 - Ecologically, the extension of the duration of cluster munition clearance will have positive effects as smaller areas are cleared per year. This has fewer negative impacts on the ecosystem.

