REPORT ON THE ACCESS AND INVESTIGATION OF THE 'O' SECTOR DEEP DEFENSIVE MINING SYSTEM

CANADIAN NATIONAL VIMY MEMORIAL SITE MARCH 2000 – JULY 2003



Prepared by Lt Col M I Dolamore MBE
Deputy Chairman
The Durand Group

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Reference No:	Durand/103/03
Author:	Lt Col M I Dolamore MBE RLC
Contact Details:	Deputy Chairman, The Durand Group Tinkle Cottage The Green Oxfordshire OX17 3NG E-Mail: mike@dolamore.demon.co.uk
Photographs:	Lt Col M I Dolamore MBE RLC M Mace C Nubbert N Pryor Lt Col (Retd) PG P Robinson
Drawings:	Lt Col M I Dolamore MBE RLC Lt Col (Retd) PGP Robinson
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THIS REPORT IS DEDICATED TO THE MEMORY OF MIKE WATKINS

EXECUTIVE SUMMARY

1. O Sector was one of the British mining sectors on the Western Front during the 1914-18 war. The sector was located to the east of Neuville St Vaast at the southern end of Vimy Ridge in Artois, France. 182 Tunnelling Company Royal Engineers (RE) took over the existing French galleries in Apr 16 and developed a number of shallow offensive galleries before handing over to 175 Coy RE in May 16. The O Sector deep defensive mining system was constructed between mid 1916 and early 1917 by 175 Coy, and more latterly 172 Coy, to provide protection to the British front line.

2. Between 1998 and 2003 The Durand Group undertook a series of related projects to gain access to, and investigate, the O Sector deep defensive mining system. An initial attempt to gain access to the O64E incline gallery via the approach tunnel in 1998 failed and resulted in the death of a Group member. In 2000 the weather opened up the O64E winch chamber stairway which was excavated. The chamber and the winch incline were cleared in 2001. Access into the deep system was gained in late 2001 and the system explored and surveyed in 2002 and 2003.

3. The main lateral of the deep defensive system was found to be deliberately blocked half way along. It was clear that during construction of the A26 autoroute an interconnecting higher level offensive gallery had been breached allowing access into the deeper defensive system. That segment of the main lateral underlying the autoroute had subsequently been blocked and in filled with concrete. This denied access to the southern half of O Sector and therefore prevented exploration of the Lichfield Subway and the possible connected German workings.

4. The layout of the accessible northern half of the sector was found to correspond well to the available mapping and other documentation. The deep system was, however, found to be connected, by stairways, to two higher levels offensive systems. The general condition of the deep system tunnels is good but that of the higher level tunnels poor with one particular gallery in a dangerous condition. It would appear that the deep system had been partially cleared of all mining paraphernalia at some point, including tracks and sleepers.

5. No sitting mine charges were located in any of the deep level fighting tunnels although there was evidence to suggest that at least two chambers had contained ammonal explosive at some point. A store containing approximately 1500lbs of bagged ammonal explosive was located at the bottom of one of the incline galleries. There is a possibility that a mine charge remains in one of the higher level chambers, the access to which is blocked. Further investigation of this gallery is required to confirm or disprove this supposition.

6. Due to the obvious clearance of the deep system there were few artefacts of any note recovered from the tunnels. However, a number of significant artefacts relating to the winch system for the O64E incline gallery were recovered from the winch chamber and winch incline. These included the winch drum and handles as well as the bogies from the winch trolley. A fine example of a British trench brazier was recovered from the infill of the winch chamber stairway. An extensive array of graffiti was also discovered on the walls and ceilings of the system. Examples are included in this report but are detailed in a complementary volume.

ACCESS AND INVESTIGATION OF THE ‘O’ SECTOR DEEP DEFENSIVE MINING SYSTEM – CANADIAN NATIONAL VIMY MEMORIAL SITE

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ACCESS AND INVESTIGATION OF THE 'O' SECTOR DEEP DEFENSIVE MINING SYSTEM – CANADIAN NATIONAL VIMY MEMORIAL SITE

1 INTRODUCTION

1.1 Work is currently being undertaken to evaluate the general safety of the Canadian National Memorial Site at Vimy Ridge, France and improve interpretation of the site. The Durand Group has been assisting the Canadian authorities in evaluating the underground features located within the boundaries of the site. As part of this work the Durand Group undertook preliminary investigations of some of the access tunnels into the 'O' Sector deep defensive mine system in the south of the site between August 1998 and March 2000, but were unable to gain access into the deep level system.

1.2 In May 2000 the weather began to open up the entrance to the O.64.E winch chamber and a remote endoscopic examination revealed that the incline tunnel may be open. In September 2000 the staircase down into the winch chamber was excavated and in June 2001 the chamber itself was partially cleared and made safe. In September 2001 the blocked winch incline was cleared. In December 2001 final access into the deep system was made and a preliminary investigation carried out. Detailed survey expeditions have subsequently been undertaken in May 2002, September 2002 and July 2003.

1.3 This report provides a detailed record of all phases of the work carried out by the Durand Group to access the 'O' Sector deep defensive mining system between May 2000 to July 2003. This report does not detail the preliminary work carried out prior to that date which is documented in a previous Durand Group report[1]. This report is supplementary to, and should be read in conjunction with, this earlier work which provides the historical background to 'O' Sector and detailed mapping and archive reporting. Apart from some brief background and supplementary information this earlier work is not duplicated in this report.

2 OBJECTIVES

2.1 The overall objectives of the project were to:

- Gain access and assess the structural stability of the access tunnels, main lateral, fighting tunnels and listening posts that comprise 'O' Sector to determine what, if any, hazard it posed to the surface.
- Ascertain whether any explosive hazards remained within the system and if any mine charges were discovered to neutralise them.
- Note and make comment on any archaeological features that allowed a better understanding of the historical context of 'O' sector in relation to the Vimy battlefield.

[1] Dolamore MBE, Lt Col M I, 'Preliminary Investigation of the 'O' Sector Tunnel System at Vimy Ridge France August 1998 & March 2000, Durand/102/00, June 2000.

- Determine what, if any, link existed between 'O' Sector, the Lichfield Subway and the German mine workings.

- Make recommendations for further work.

3 BACKGROUND

3.1 The 'O' Sector deep defensive mining system is located under the First World War battlefield at Vimy Ridge, Artois in France. Construction of the system by 175 Tunnelling Company RE began in June 1916 and was continued by 172 Tunnelling Company RE when they assumed responsibility for the sector in September 1916. The system was largely completed by December 1916 although work on the Lichfield Subway[2], which it is believed connected with the deep system, continued in early 1917. The 'O' Sector deep defensive system was of standard design (see Figure 1).

3.2 The 'O' Sector deep defensive system was constructed to provide protection to the British front line in the area from the German mining threat. The main lateral of the system ran for some 3,600 ft along the front line at a depth of 60 – 80 ft. The main lateral[3] was accessed by a series of nine incline tunnels with access both from the support line and various communication trenches. The main lateral also provided access to a series of listening[4] and fighting tunnels[5] forward of the front line.

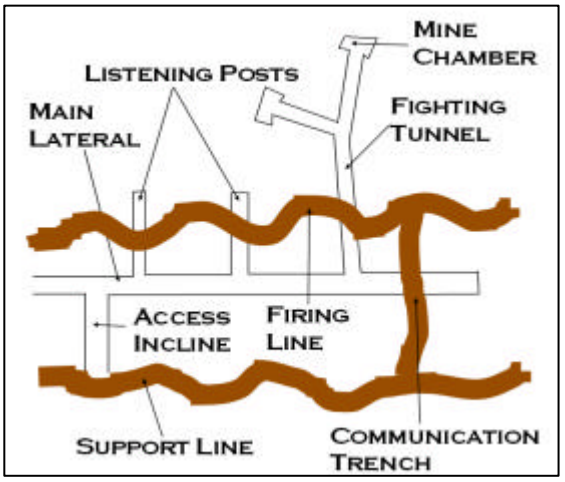


Figure 1.

Representation of part of a deep level defensive mine system

[2] Subways were shallow tunnels (normally 20 to 30 feet below the surface) intended to provide for safe and concealed movement between the forward and rear lines, though some also provided for movement along the line. Most included support facilities and HQ and accommodation dugouts, and many were linked to incline galleries into the deep fighting tunnels. The use of subways to provide protection to troops largely evolved following the devastating losses sustained on the first day of the Battle of the Somme amongst troops even before they had crossed their own front line.

[3] The 'main lateral' was the principal tunnel of the system running parallel to the front line and connecting the various access tunnels, listening posts and fighting tunnels together. In the Vimy Ridge area the main laterals (and hence the sectors) were normally of about 3,600 ft (~1000m) long.

[4] 'Listening posts' were short tunnels driven out from the main lateral under no-man's land at frequent intervals along the main lateral. They were used to listen for German mining activity in their vicinity. Once this had been detected a listening post was often converted into a fighting tunnel by the construction of a mine chamber and the placement of a mine charge.

[5] 'Fighting tunnels' were tunnels used to undertake offensive action against the enemy. They were often 'stand-alone' drives, perhaps with a number of 'arms' leading to mine chambers. In 'O' Sector two of the higher level fighting systems connected with the lower level deep system.

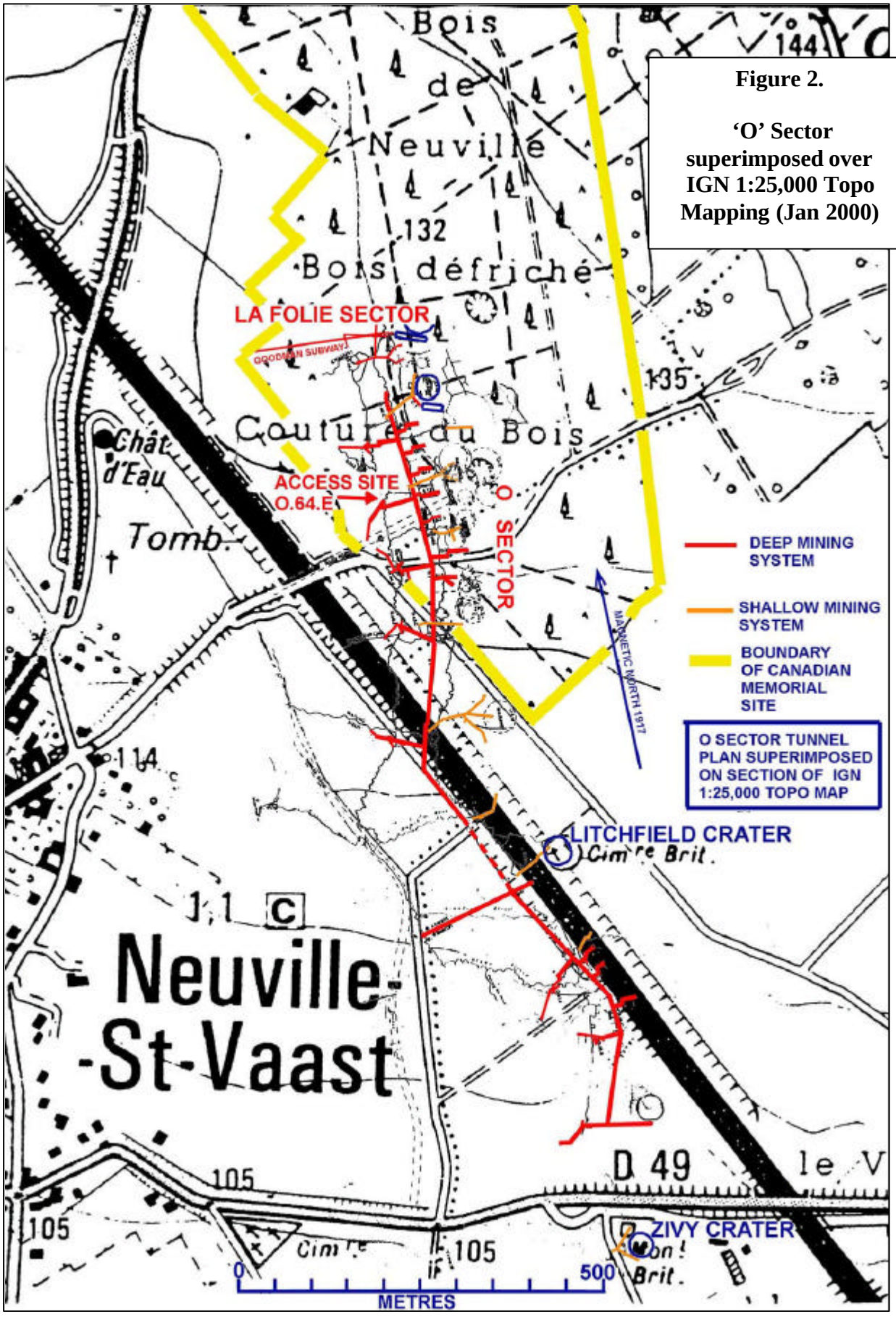


Figure 2.

'O' Sector superimposed over IGN 1:25,000 Topo Mapping (Jan 2000)

3.3 The system provided protection to that part of the British line in front of Neuville St Vaast (see Figure 2). 'O' Sector was at the southern end of Vimy Ridge and was one of the lesser active sectors in the area; the heavier subterranean fighting being further north in the La Folie and Berthonval sectors. Only the most northern third of the 'O' Sector system lies beneath the Canadian Memorial Site; the remainder lies under French farmland and is currently inaccessible. The modern A26, built in the late 1970s, crosses over 'O' Sector. Only three of the nine access inclines lie within the Canadian site.

4 MAPPING

4.1 A number of primary mapping sources were used in the preliminary assessments of 'O' Sector and the data within these were combined to provide a composite plan that was used as the preliminary tunnel plan for excavation and investigative purposes. However, these primary sources were not specifically detailed in the initial report and are therefore reproduced here for the sake of completeness, with appropriate comment.

4.2 The main mapping source used is a 175 Tunnelling Company RE tunnel plan of the sector, corrected up to 25 October 1916, and held by the National Archives. The plan is reproduced at Figure 3. This is a colour coded plan showing the sector at a fairly advanced stage of completion with both the northern and southern parts well advanced but not yet connected. This plan is also most useful as is shows the construction dates of the various access inclines and tunnel sections. Enlarged views of both the northern and southern parts of the system are reproduced at Figures 4 and 5.

4.3 Information about the early development of 'O' Sector is taken from two 175 Tunnelling Company RE plans showing the area of the Twins and B6 craters. These plans are reproduced at Figure 6, which is at the end of July 1916, and at Figure 7, which shows the work earlier that same month. These plans provide useful information about the development of the three access inclines - O.63.E, O.64.D and O.65.D – that lie within the Canadian site and which were the objects of the preliminary investigation work detailed previously.

4.4 Additional information about the later development of the system comes from another 175 Tunnelling Company RE map of the system held in the RE Museum at Chatham. This map is dated to late November 1916. A tracing of this has been taken and is reproduced at Figure 8. This map provides a wealth of finer detail about the construction of the various tunnel drives and of particular note are the various differences between this map and the earlier map in the National Archive.

4.5 One further major map source is available. This is a personal plan of 'O' Sector drawn by one of the 175 Tunnelling Company RE officers – Captain John Warnock MC RE and dated to the end of 1916, or perhaps the start of 1917. Whilst less accurate in scale and some detail, this plan provides additional information about the tunnel system not found on any of the other maps and plans, particularly at the southern of the sector. The Warnock plan is reproduced at Figure 9.

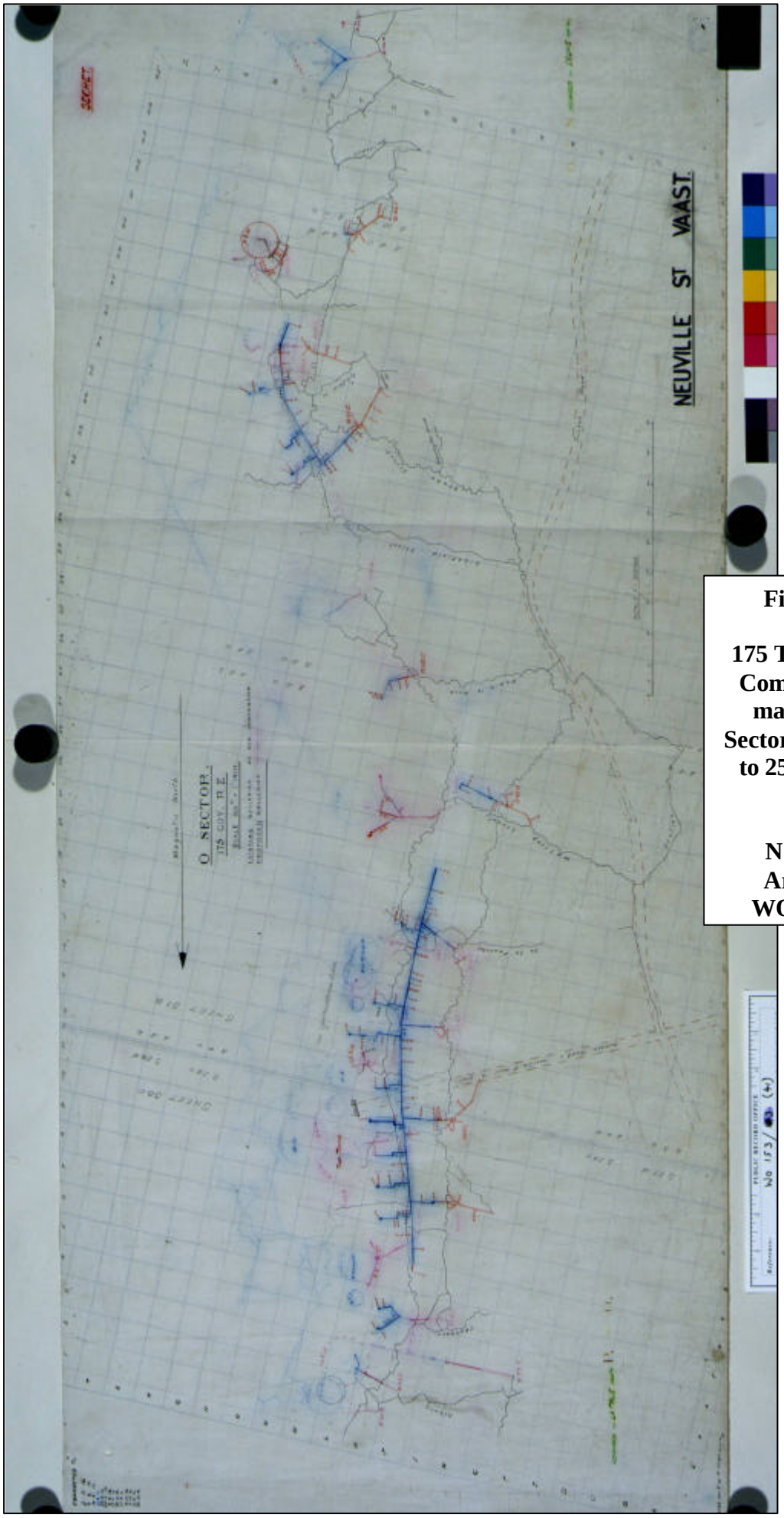


Figure 3.

175 Tunnelling Company RE map of 'O' Sector corrected to 25 October 1916

National Archives WO 153/41

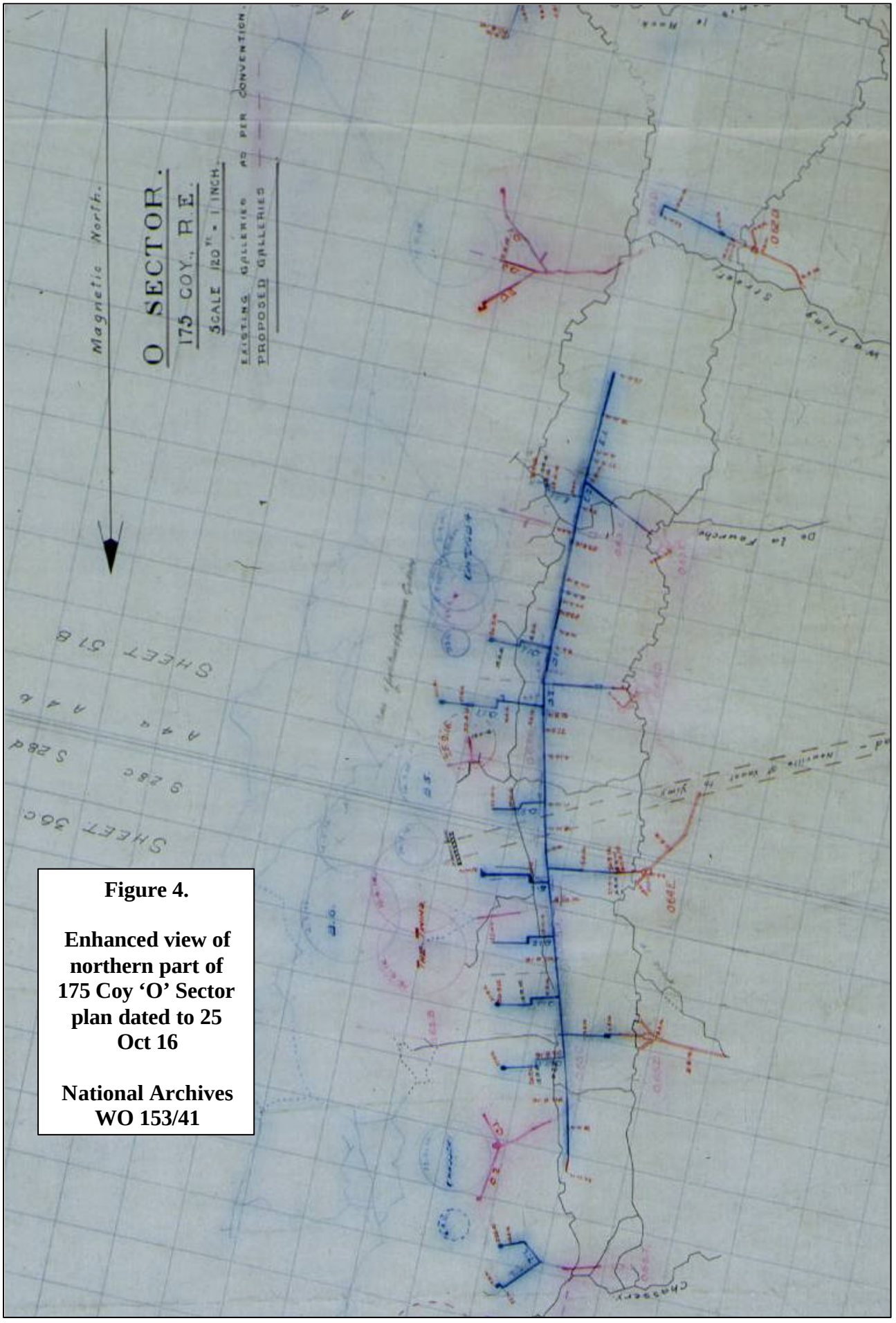


Figure 4.

Enhanced view of northern part of 175 Coy 'O' Sector plan dated to 25 Oct 16

National Archives WO 153/41

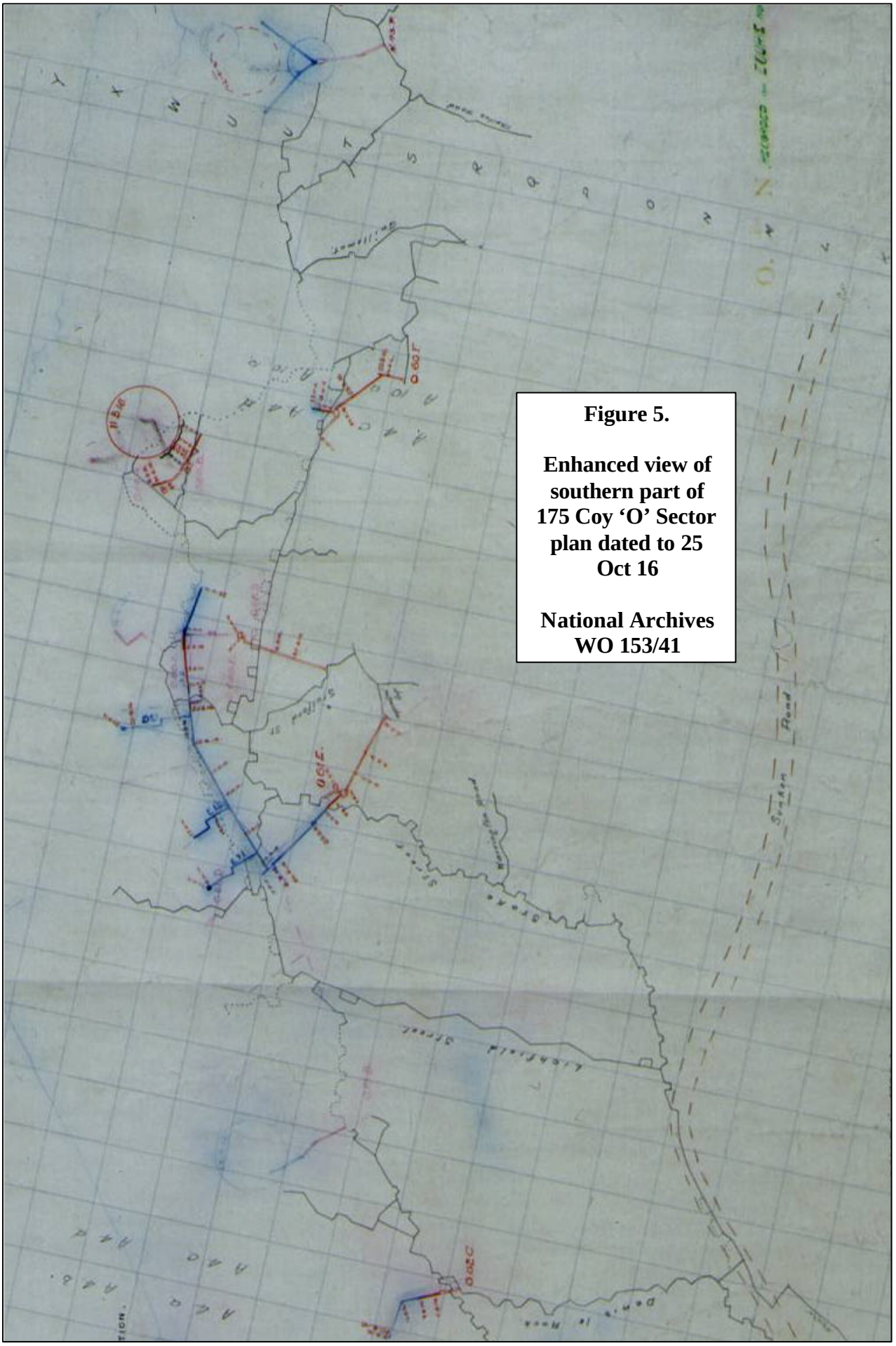


Figure 5.

Enhanced view of southern part of 175 Coy 'O' Sector plan dated to 25 Oct 16

National Archives WO 153/41

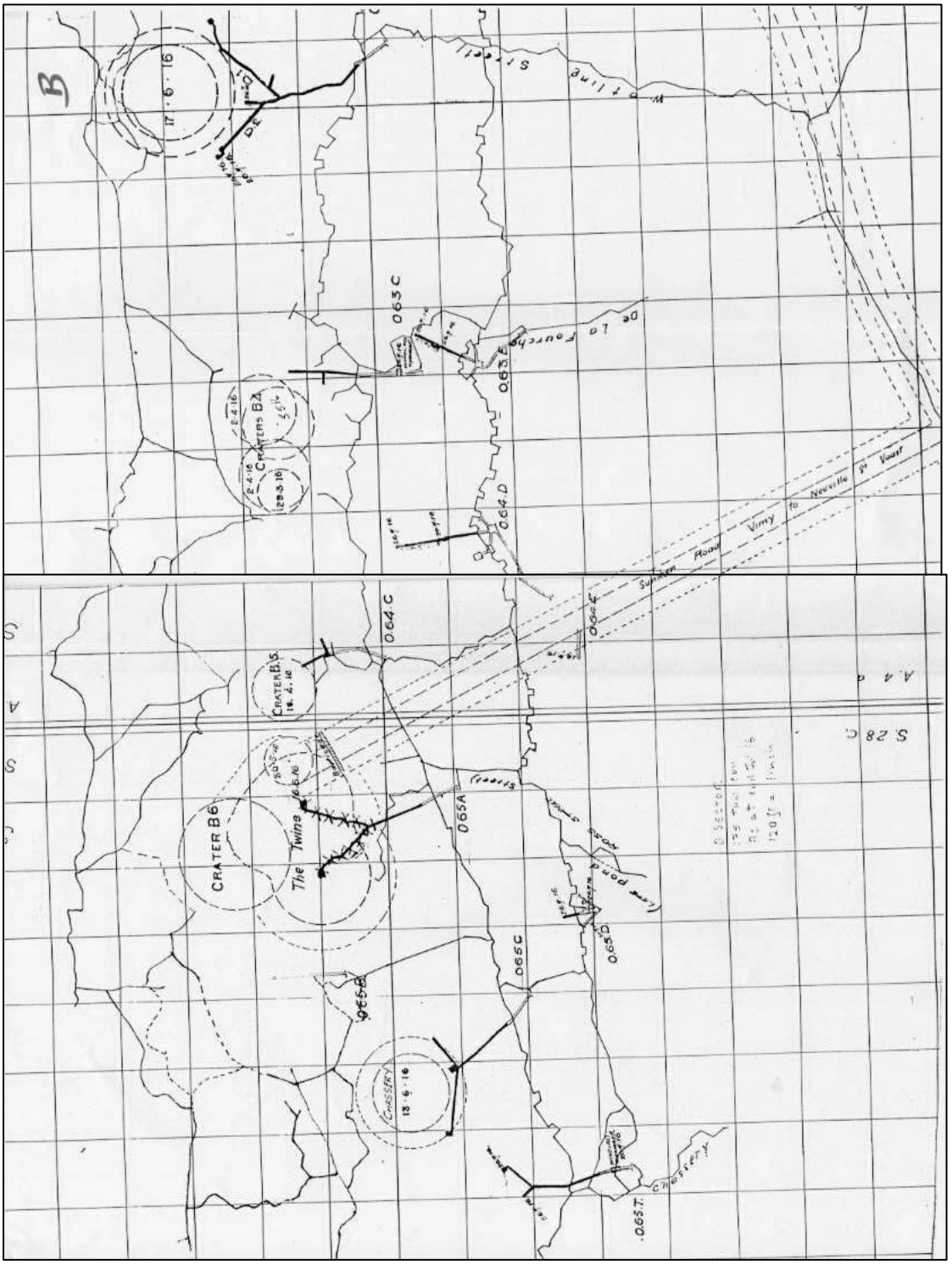


Figure 6. 175 Tunnelling Company RE map of O Sector dated to the end of July 1916

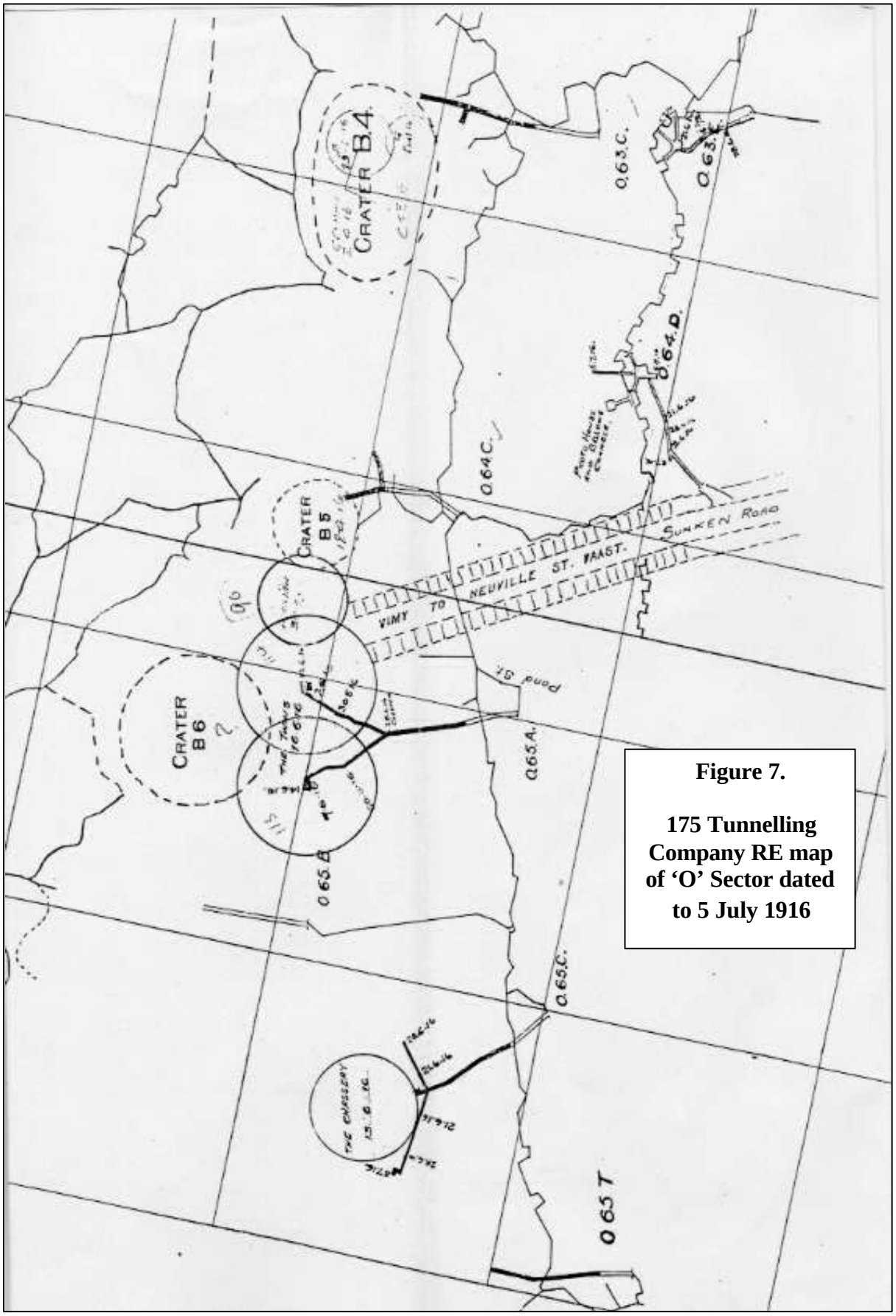


Figure 7.

175 Tunnelling Company RE map of 'O' Sector dated to 5 July 1916

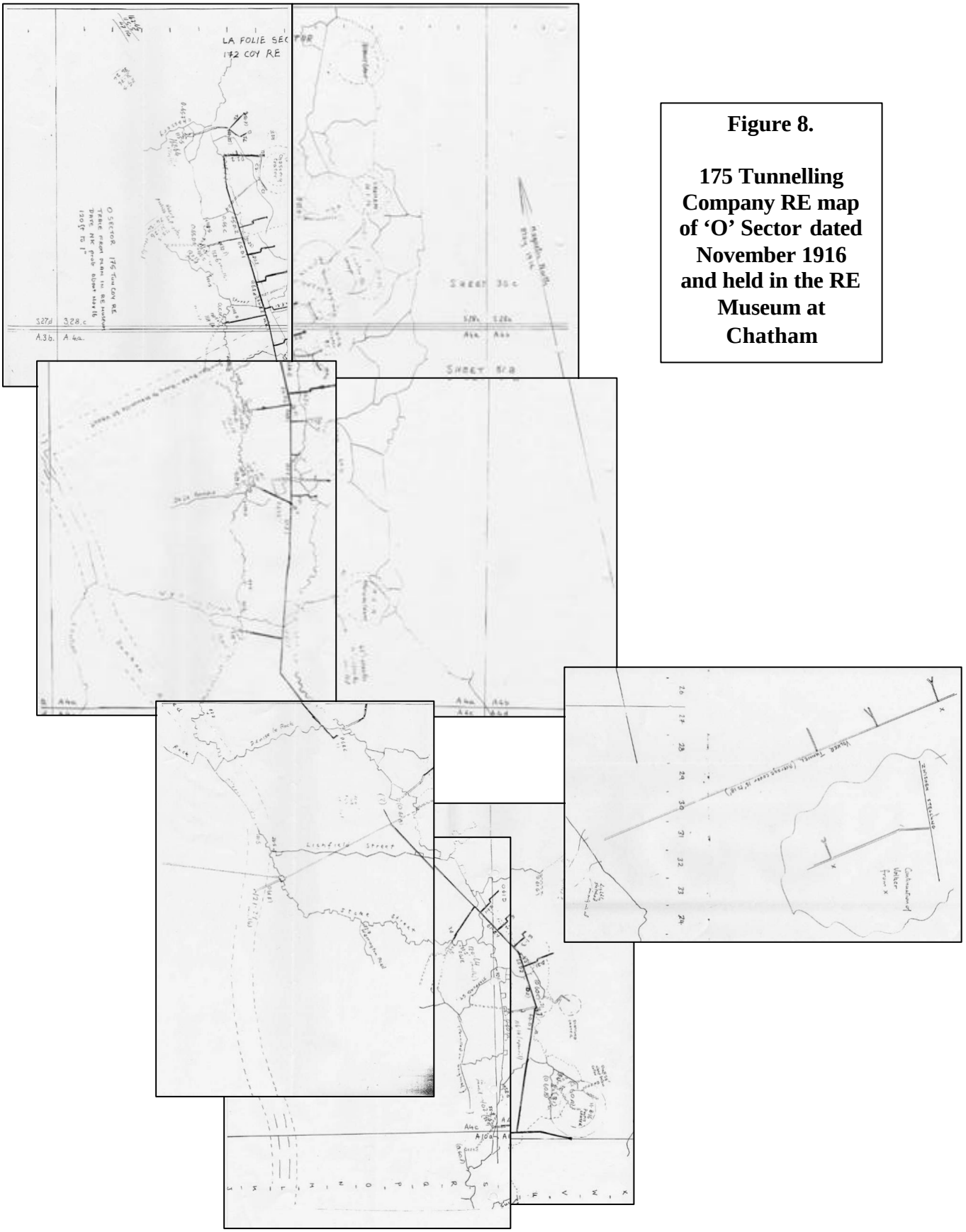


Figure 8.

175 Tunnelling Company RE map of 'O' Sector dated November 1916 and held in the RE Museum at Chatham

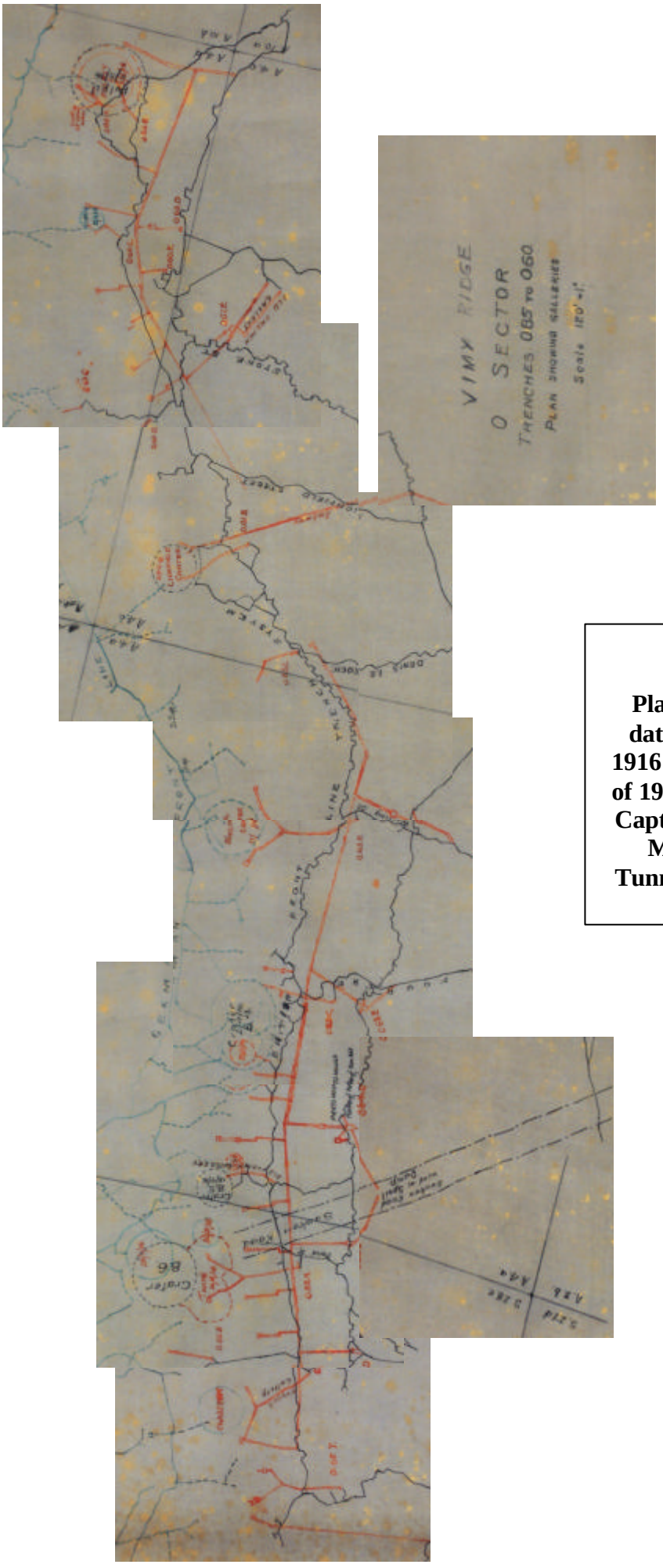


Figure 9.

Plan of 'O' Sector dated to the end of 1916 or the beginning of 1917 and drawn by Capt John Warnock, MC, RE of 175 Tunnelling Company RE

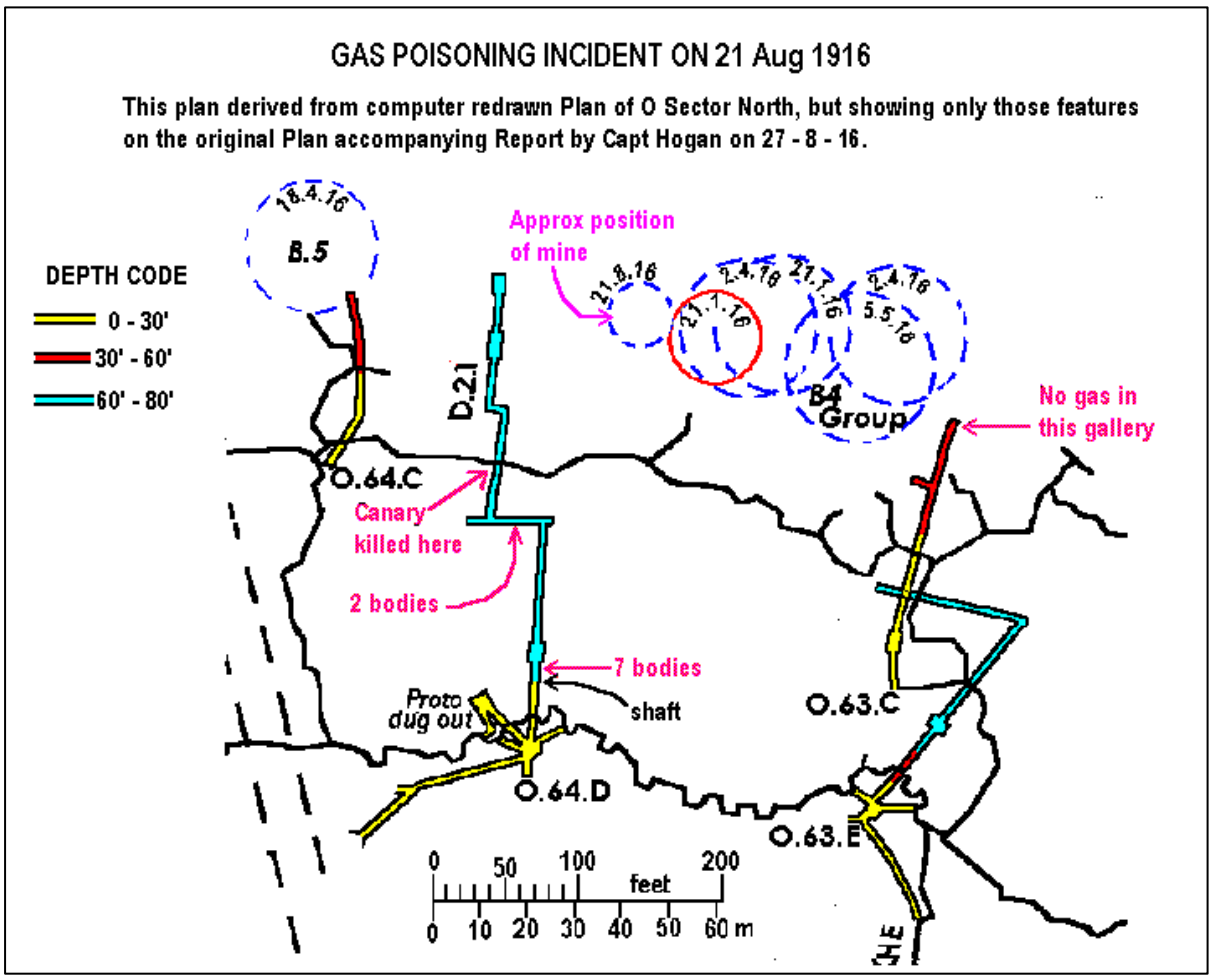


Figure 10. Hogan plan of the gas poisoning incident at O.64.D

4.6 One additional minor map source is also available. This shows the area of O.64.D in the middle of August 1916 and was included in a report into a gas poisoning incident there on the 21st of that month by Captain Dale Hogan RAMC. Full details about this incident are contained in the report, written for GHQ on 27 August 1916 and described in the preliminary report into the system[6]. A computer enhanced version of this plan is reproduced at Figure 10.

4.7 By combining all of the data contained within these various maps and plans it was possible, in 1998, to produce a composite plan of 'O' Sector, as at the end of 1916. This plan was reproduced in the preliminary report and used as the primary plan for initial excavation and exploratory work. The northern half of that plan has been reproduced in Figure 11 and is included as it provided the starting point for all subsequent activity on the sector.

4.8 Various British air photographs of the ground above 'O' Sector are also available. The clearest photograph of the area is dated the 21st of March 1917 and is reproduced at Photo 1. The sunken road, the Twins craters and the area around O.64.E are all clearly visible. Note that the desolate nature of the terrain contrasts vividly with the forested area found today.

6 pp 24-28.

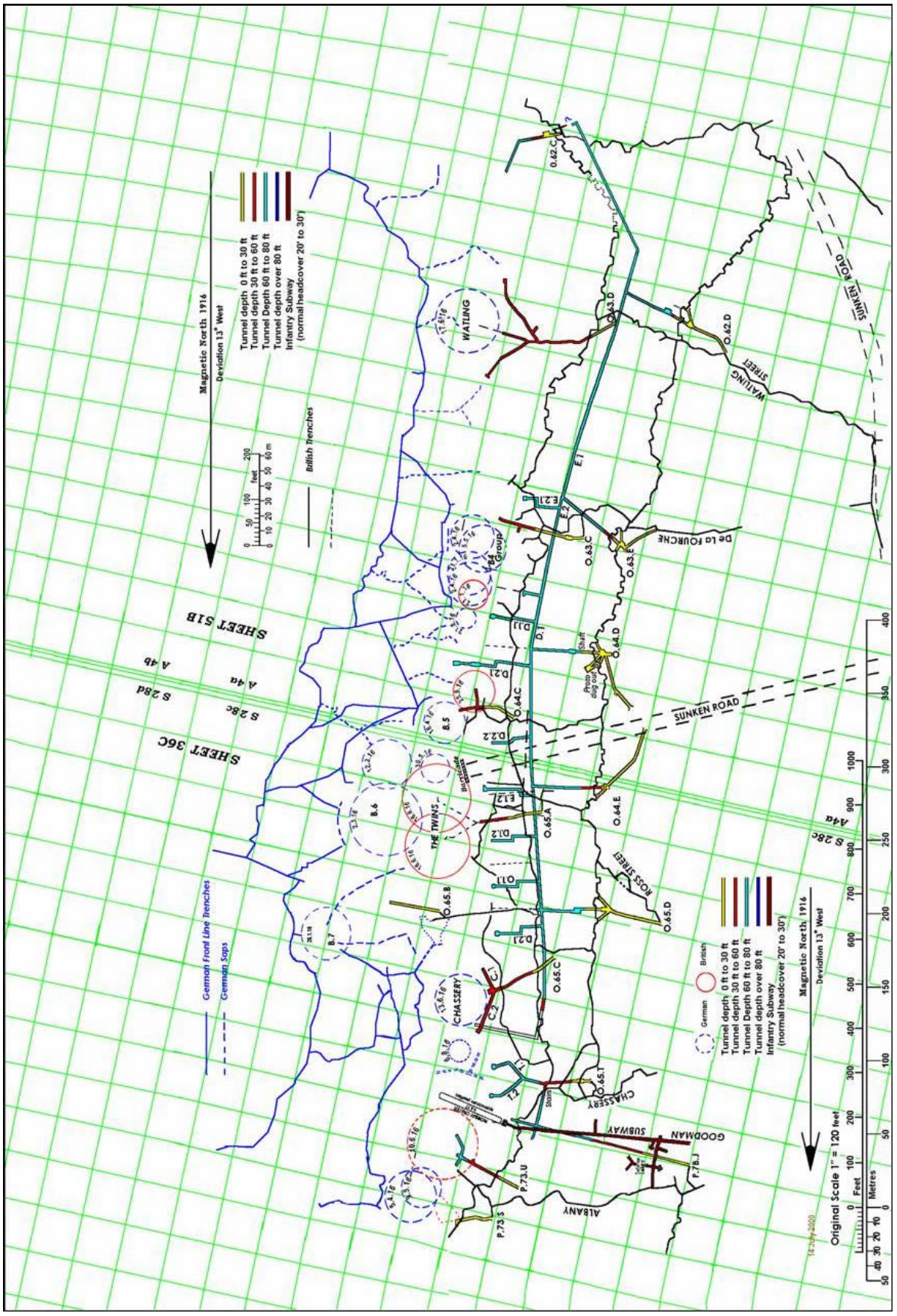


Figure 11. Composite plan of the northern part of 'O' Sector

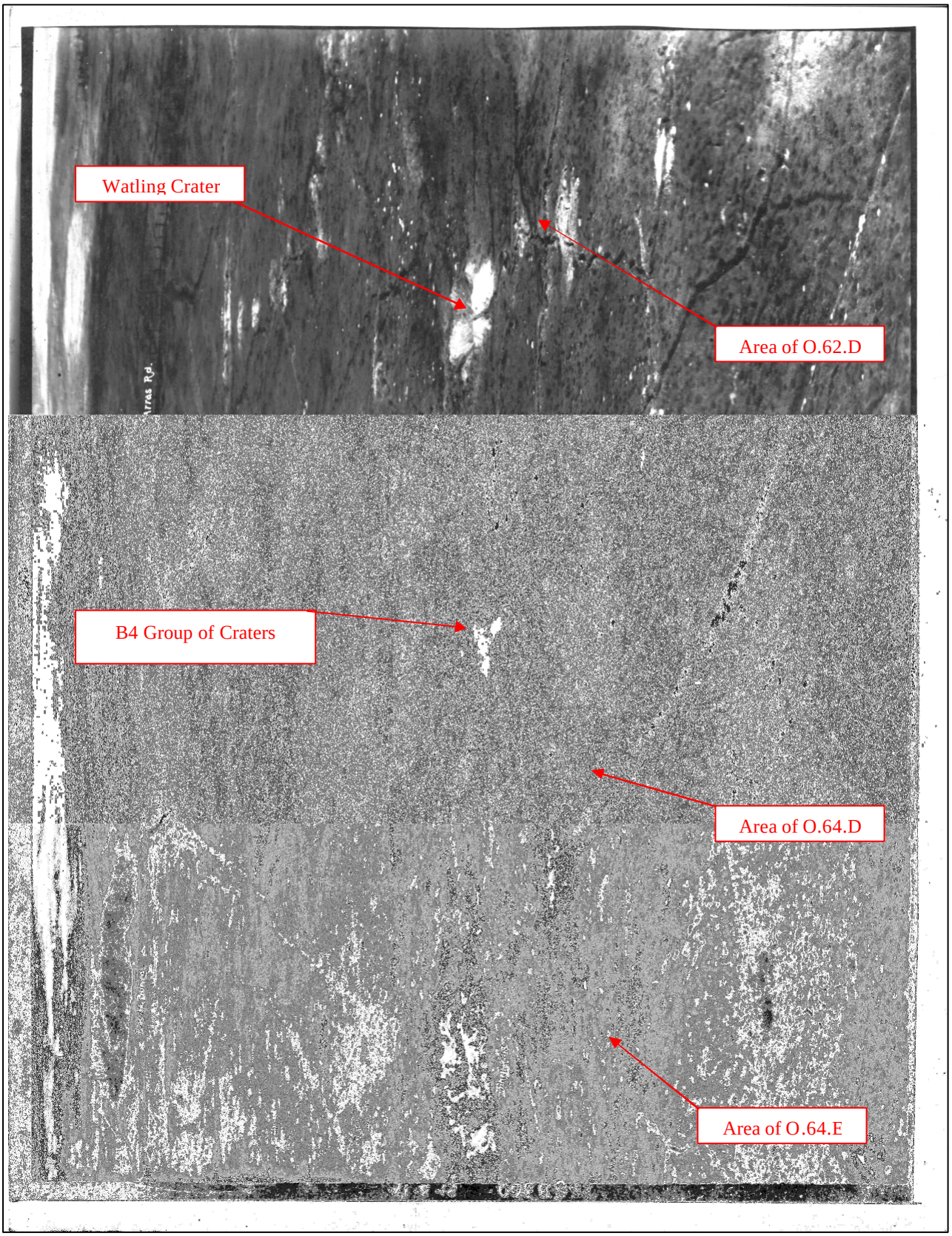


Photo 1. 21 March 1917 British Air Photograph of the area above 'O' Sector

5 TUNNEL TERMINOLOGY

5.1 Throughout the course of this report a number of different terms will be used to describe the 'O' Sector deep defensive tunnel system. These are shown below in Figure 12.

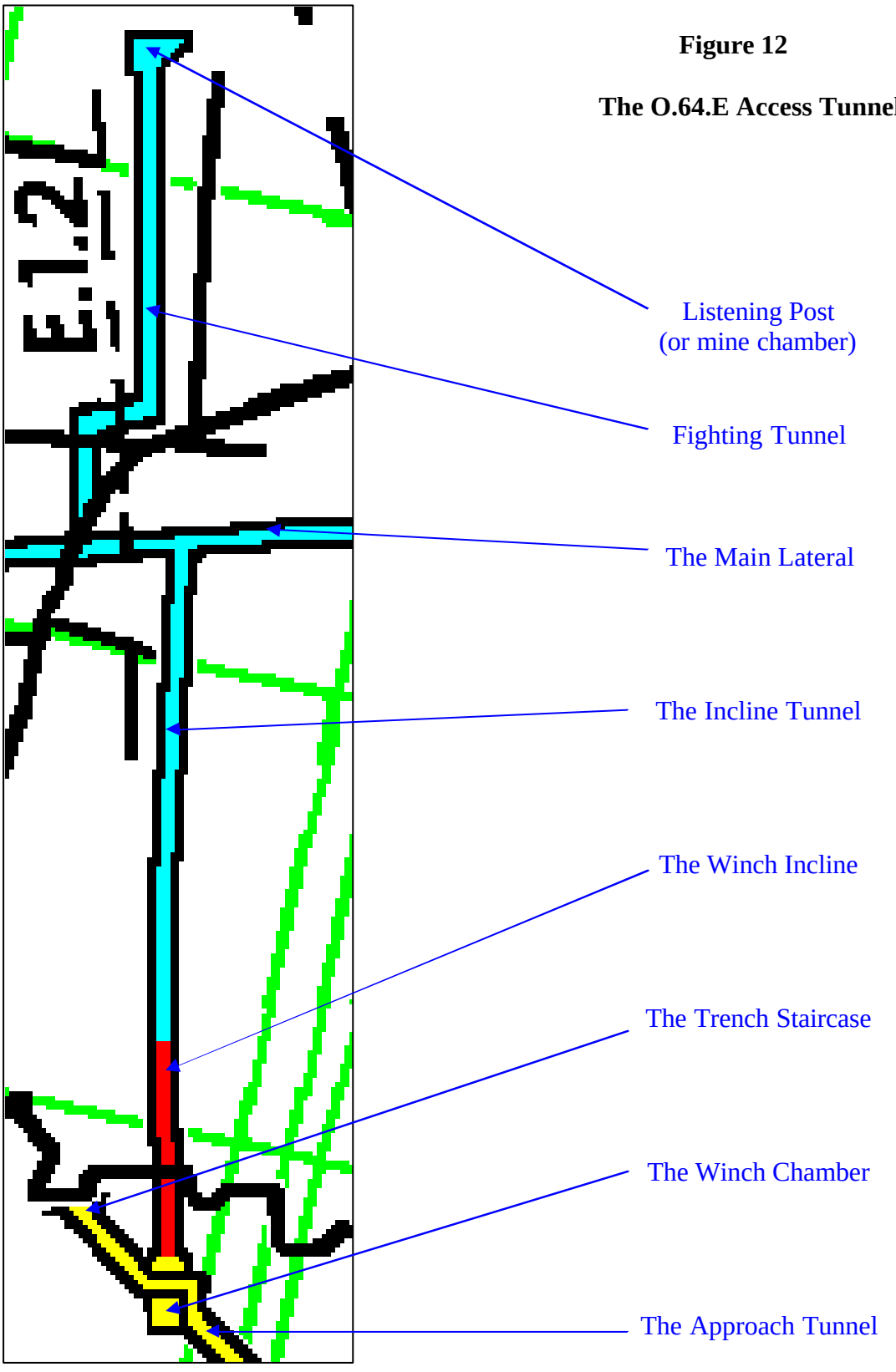


Figure 12

The O.64.E Access Tunnel

6 PREVIOUS EXCAVATION AND EXPLORATORY WORK

6.1 Investigation of O.65.D Approach Tunnel and Winch Incline

6.1.1 In May 1998 the O.65.D access tunnel was investigated and the results detailed in the preliminary report[7]. Three cuts across the line of the access tunnel were made in total (see Figure 13). The first cut was made across the approach tunnel leading from the original entrance to the winch chamber. In this area the tunnel could be seen to have collapsed at various points along its length and this was confirmed underground. This was unsurprising as the depth of the approach tunnel was only 4m below ground surface.

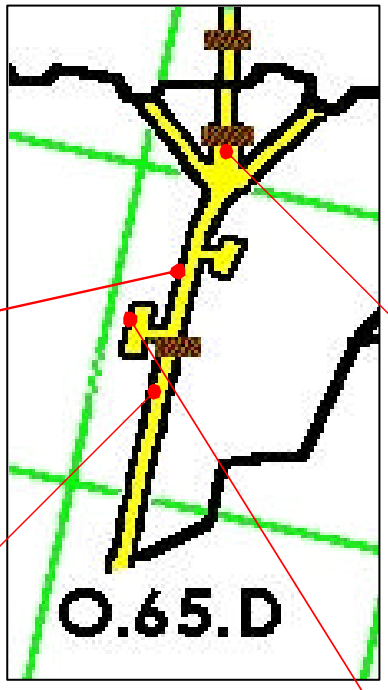
6.1.2 The second cut was made in front of the winch chamber over the area of the incline. Despite reaching a depth of 5.5m the incline was not reached. The third cut was made at the forward edge of the winch chamber, which was found to be partially collapsed. Access to the partially filled winch incline was gained at 18ft but it was found to be completely blocked some 60ft (+/- 3ft) down. It was, however, noted the incline was substantial, measuring some 6ft high by 5ft wide and descended at an angle of approximately 40° (See Photos 2-5).



Photo 2 – O.65.D Forward



Photo 3 – O.65.D Rearwards



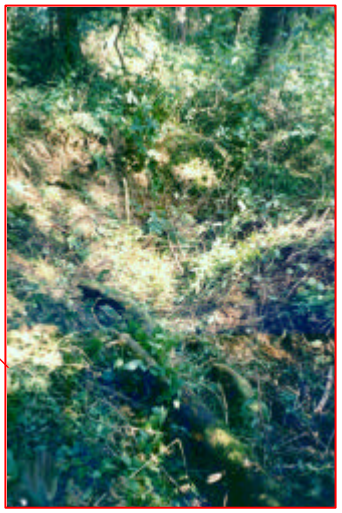


Photo 4 – Ground area above O.65.D winch chamber showing collapse

Photo 5 – Collapsed side chamber in O.65.D



Figure 13.

Investigation of the O.65.D approach tunnel and winch chamber

[7] Section 7, pp 56-60.

6.2 Investigation of O.64.E Approach Tunnel

6.2.1 The original entrance to O.64.E ran off from the sunken road running between Neuville St Vaast and Vimy. Although this had long since collapsed a small entrance into the approach tunnel was discovered and the subsequent investigation detailed in the preliminary report[8]. After clearance of some soil-wash at the break-in point the tunnel was found to be clear until the area of the winch chamber where a collapse blocked it completely (see Figure 14 and Photos 6-9).

6.2.2 The approach tunnel was found to be of standard construction with dimensions being approximately 5.5ft high and 3ft wide. The stability of the tunnel was found to be generally good throughout the run. There was some evidence of timbering running down the shallow incline from the original entrance to the level run of the tunnel and at a point where the tunnel widened out to form a small chamber. There was little evidence of timbering used elsewhere.

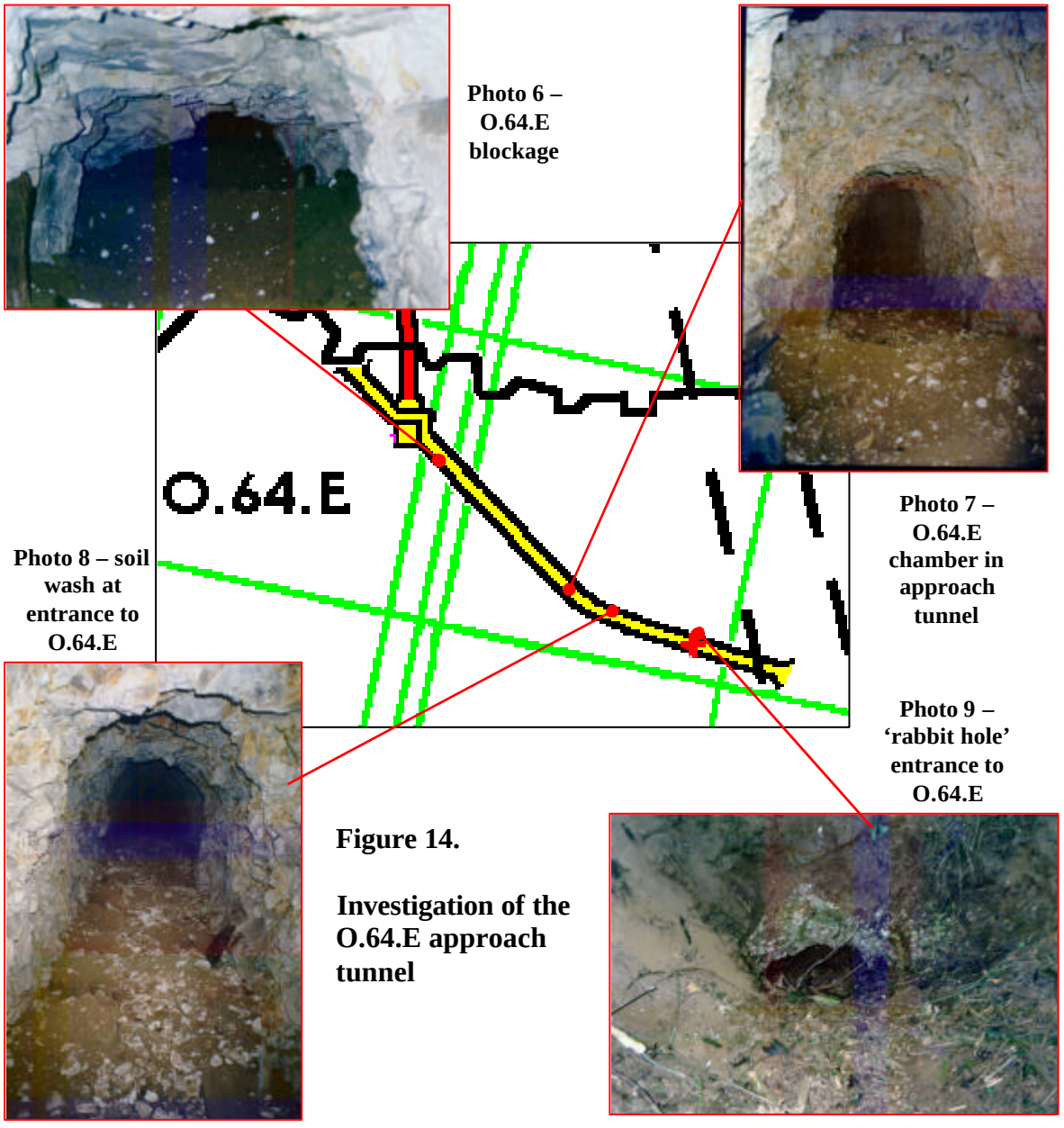


Figure 14.

Investigation of the O.64.E approach tunnel

[8] Chapter 8, pp 60-62.

6.3 Remote Endoscopic Examination of the O.64.E Winch Chamber & Incline

6.3.1 Inspection of the area of the trench stairway into the O.64.E winch chamber in March 2000 revealed that weathering had exposed the top of the stairway (see Figure 15 and Photo 10). Clearly the infill was slowly being washed down into the winch chamber and, presumably, the winch incline. The sides of the developing pit were therefore stabilised (Photo11) and the hole covered over to prevent further ingress of spoil.

6.3.2 Using a remote endoscope both winch chamber and incline were viewed. The winch chamber was found to be in generally good condition although partially filled to within 3-4ft of the roof with chalk debris and washed in soil. The endoscope probe penetrated some 10.5m down the winch incline before being stopped by debris. Although difficult to ascertain the exact nature of the blockage it was assessed that the incline was only partially blocked. It was therefore determined that the winch chamber and incline offered a potential way in to the deep system and was a feasible engineering project for the Group.

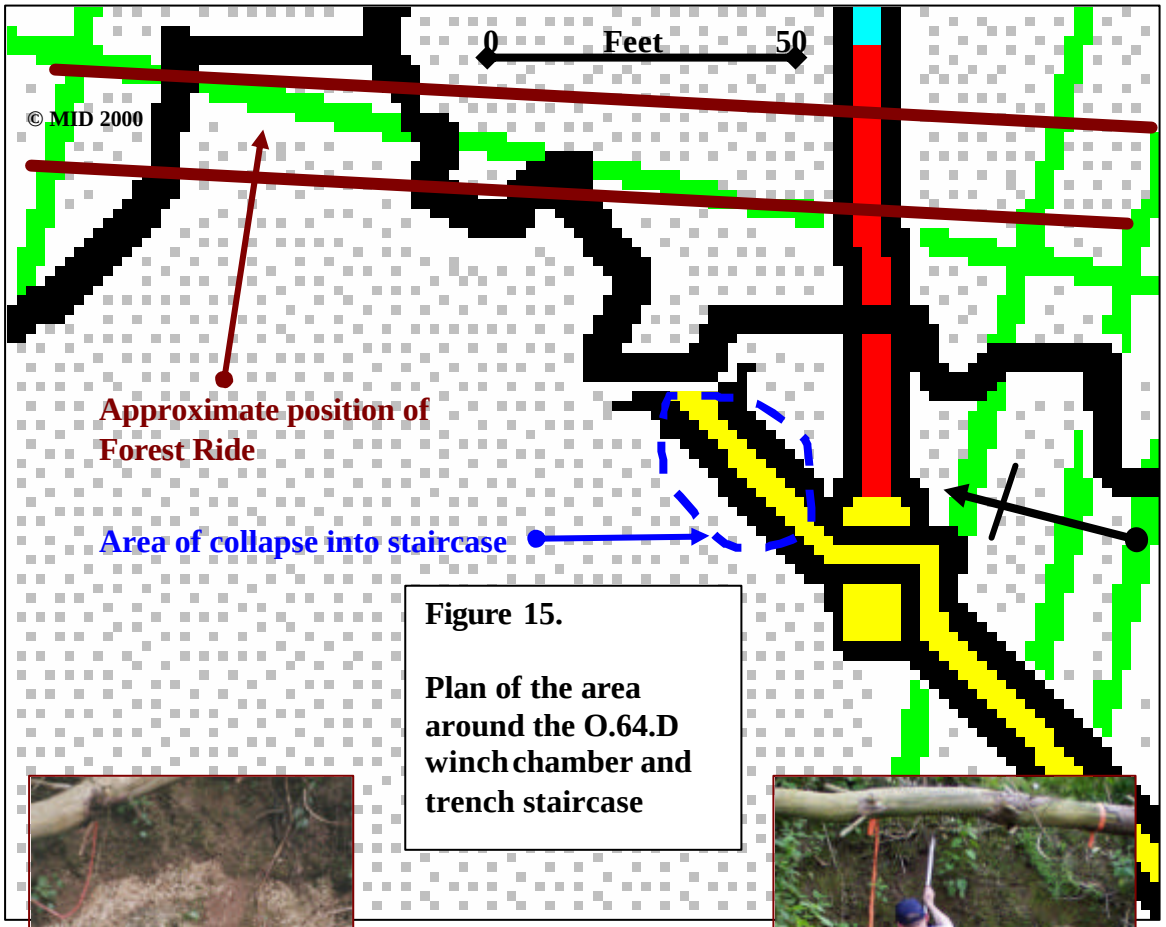


Figure 15.

Plan of the area around the O.64.D winch chamber and trench staircase



Photo 10 – The growing pit over the O.64.D trench staircase

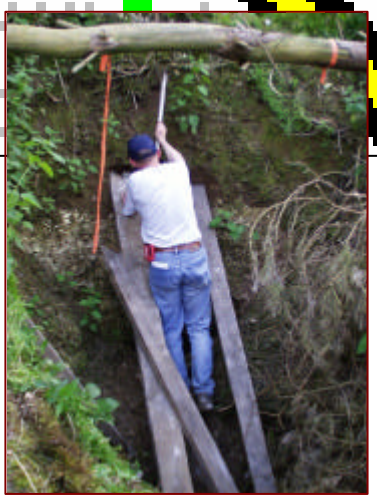


Photo 11 – Work underway to stabilise the sides of the O.64.D trench staircase pit

7 EXCAVATION OF THE O64E WINCH CHAMBER TRENCH STAIRWAY

7.1 In September 2000 a Durand Group project was undertaken to clear the trench stairway down into the O.64.E winch chamber. A detailed project plan[9] was produced including plans for the initial investigation of the deep defensive system, should access down the incline be gained. The area around the trench stairway was cordoned off and an area over an adjacent, collapsed dugout identified for the dumping of excavated spoil (see Figure 16). Specific areas were identified for work emergency equipment, other equipment and fabrication, as well as for an emergency vehicle.

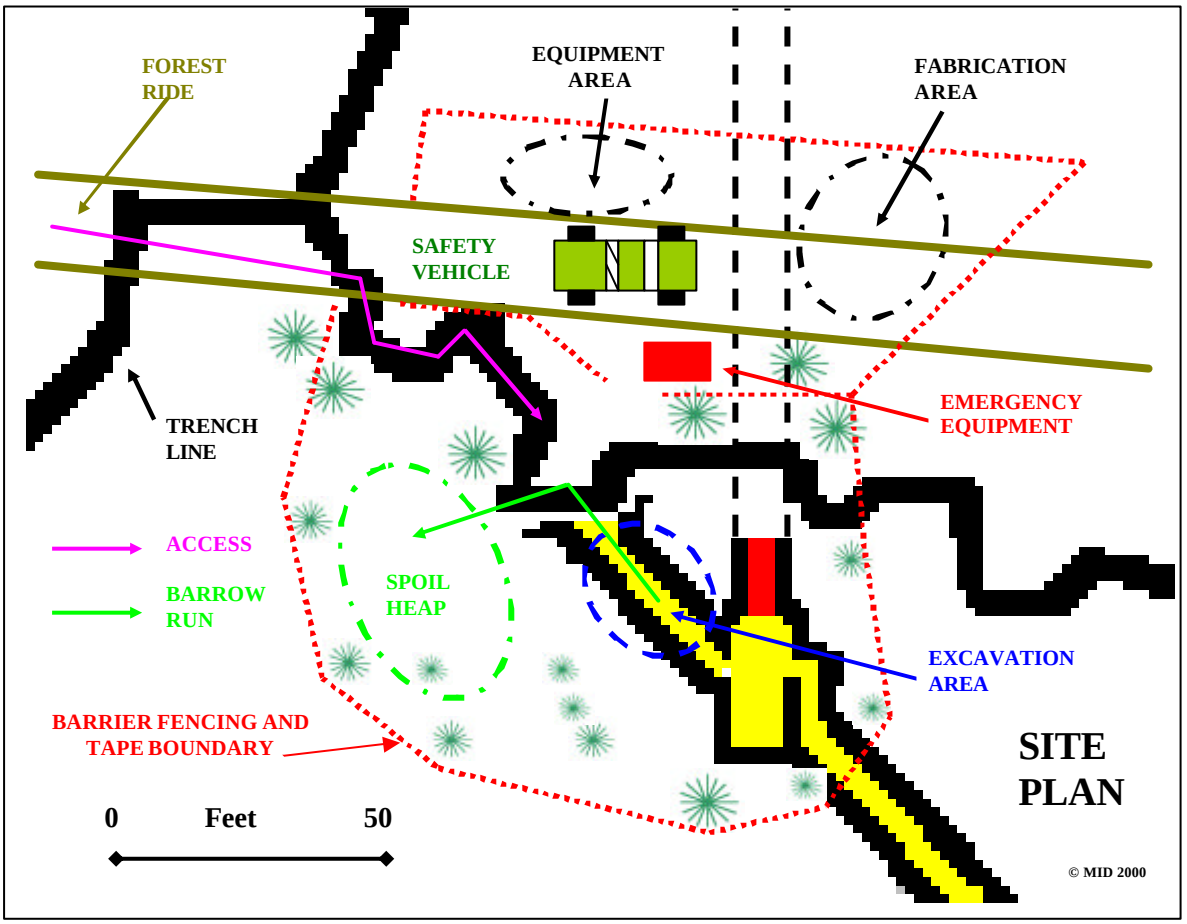


Figure 16. Site Plan

7.2 Before excavations could commence it was first necessary to clear the site of all vegetation. Photo 12 shows the general state of the site prior to vegetation clearance. Clearance was undertaken using a machete. Fortunately, there were few significant trees that required removal. Once this had been completed it was then necessary to check the working area for any unexploded ordnance. This was undertaken using a standard, in-service metal detector (see Photo 13). During the course of this clearance a number of rounds of British .303" and German 7.92mm Mauser SAA were recovered (See Photo 14).

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9 Dolamore MBE, Lt Col M I, 'Access and Preliminary Survey of 'O' Sector Vimy Ridge France 25 September – 2 October 2000 – Provisional Project Plan V1.3', 22 Aug 2000.



Photo 12. 2000 - The O.64.D trench staircase site prior to vegetation clearance



Photo 13. Checking the area for UXO prior to commencing excavations



Photo 14. Mixed SAA recovered from the site after initial metal detector clearance

7.3 Before any excavation work was undertaken a preliminary survey of the pit was made. It was possible to determine the original line of the collapsed trench staircase with the walls clearly visible and the associated infill material (Photo 15). This indicated that the original staircase was approximately 4ft in width. The infill material appeared to consist of medium grade chalk debris and fine soil. It was along the original line of the trench staircase that it was planned to excavate the infill and then stabilise the pit.

7.4 All excavation work in the area was undertaken by hand. The line of the original trench stairway was followed so that a ramp down into the pit was created (Photo 16). Some spoil was left over the original staircase to protect any surviving timber remains and other artefacts. The sides of the ramp were reinforced with fibreglass panels supported by timber props, to prevent any collapse. During the course of additional excavation of the ramp a number of significant finds were made.

7.5 At the top of the ramp the remains of some of the original pressed metal revetting supporting the trench line at the entrance was uncovered. Along the original line of the steps communication cable was found to run down into the chamber (Photo 17) whilst in the northern wall of the ramp a British trench brazier, in very good condition, was discovered. (Photo 18). In the staircase infill a British hobnail boot, along with a winch pulley winding bar and the remains of the original wooden steps and risers (Photo 19).



Photo 15 (left)

The original line of the trench stairway can be discerned with the chalk walls clearly visible

Photo 16 (below)

Hand excavation of the trench stairway







Photo 17. (above left)

Communication cabling running Along the line of the stairs

Photo 18. (above right)

British trench brazier in the side of the excavation

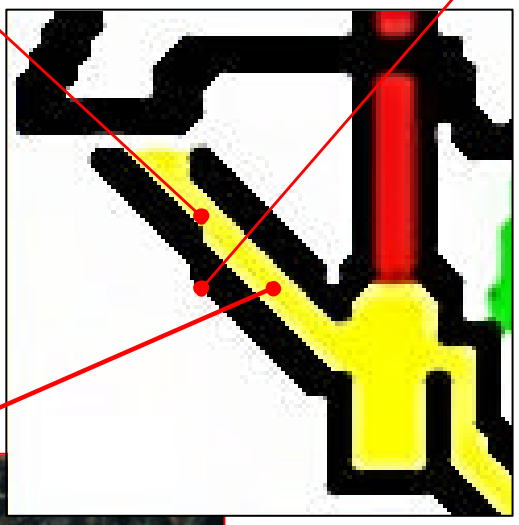




Photo 19.

British hobnail boot, winch bar and stair riser in the infill

7.5 Once the excavation approached head height the pit was enlarged and squared off. Timber supports, braced with acro-props, were then inserted into the pit (Photo 20) to provide a safe environment in which to continue excavating the stairway (Photo 21). Further excavation was then undertaken to reach the entrance to the winch chamber. Air hosing was inserted into the mouth of the chamber to pump fresh air into it prior to any entry by team members. It was assessed that the pump should be allowed to run for a minimum of 2 hours prior to entry (Photo 22).



Photo 20. (left)

Construction of safety cage in the pit



Photo 21. (right)

Safety cage complete less the weatherproof roof



Photo 22. (left)

Air hosing entering the winch chamber prior to final clearance of the entrance

7.6 As the excavation neared completion the chalk debris was taken down to the level of the original stairs, some of which were still in situ but were in poor condition (Photo 23). Unfortunately it was not possible to lift these. Measurements taken at the bottom of the staircase indicated that it had originally been approximately 5ft high and 4ft wide (Photo 24). This matched the standard RE dimensions known to be used at the time.



Photo 23. One of the original wooden steps in the trench staircase still in situ



Photo 24. The entrance to the winch chamber before final clearance

7.6 After clearance of the remaining soil and chalk debris at the entrance the surrounding chalk walls and roof were carefully examined to determine their stability. It was clear that there had been significant erosion of the supporting walls and that consequently there was an enhanced danger of collapse. Wooden supports were therefore inserted into the entrance to shore it up prior to entry (Photo 23). These supports were anchored into the chalk debris on the flooring which subsequently limited the degree of clearance of the winch chamber itself in order not to undermine them (Photo 24).



Photo 23. (left)

The cleared stairway showing the remains of the final steps and the shoring





Photo 24. (right)

Looking from the inside of the winch chamber at the shored entrance. Note the significant amount of chalk debris on the floor

7.7 A two man team made the initial reconnaissance of the winch chamber. The chamber itself was found to be only partially filled with chalk debris overlain by soil wash around the area of the entrance and down the winch incline. As would be expected this debris was deepest nearest the entrance and sloped down to both the west and south before levelling off (Photo 25). To the east the debris fell away sharply as it ran down the winch incline, which was found to be blocked some 30ft down the slope (Photo 26). The highest point of the chamber roof was calculated to be 3.8m (12'5") below ground surface.

7.8 The winch chamber was barrel shaped in construction (Photo 27) with the apex running in an east-west direction. From the western to the eastern face it measured 2.4m (8ft) long and from the northern to southern faces 1.8m (6ft). From the apex to the level of the chalk debris measured 2.2m, indicating that the original height of the chamber may well have exceeded 4m (12ft. In the centre, adjacent to the entrance, the roof had been carefully cut into a channel (Photo 28), presumably to accommodate the top of the winch equipment.

7.9 At the western end of the chamber the entrance to the original approach tunnel was visible (Photo 29). Examination of this tunnel revealed it to be blocked by a clay spill (Photo 30); this being the other side of the blockage that had been observed in the previous exploration of the approach tunnel from the original entrance. Adjacent to the approach tunnel entrance there was a small recess into the chalk face. The chalk face and roof in the vicinity of these features was observed to be badly broken with significant chalk slabbing visible.

7.10 Along the southern wall of the winch chamber the badly decayed remains of three wooden pillars were visible (Photo 31). It was assessed that these were the wooden supports for a winch platform that originally stood in the chamber. The corresponding three supports along the northern wall of the chamber were not visible and it was assessed that they remained buried under the chalk debris which filled the chamber and was deepest along the northern face. The remains of the winch cable were tangled about one of the pillars.

7.11 The length of the supporting pillars was not apparent at this time due to them being partially buried within the chalk debris. However, based on available documentary evidence and the position and height of the surviving remains it was assessed that they were probably at least 5ft tall and hence little of the height had actually been lost. This would mean that the original platform would have sat on the supports at the height shown, accounting for the need to have a barrel roof and the slot carved at the apex.

7.12 The incline shaft appeared to be 4.5ft in width and have a slope of approximately 45° (Photo 32). The front face of the chalk wall above the incline had broken off and there was extensive slabbing visible, rendering the face extremely unstable and dangerous. The barely legible remains of some graffiti were visible on the southern end of this face. The roof of the shaft sloped away in a stepped fashion indicating the method by which the incline was dug ie to achieve a 45° slope dig forward 2ft and then dig vertically down 2ft (see Figure 17).

7.13 The stepping on the roof of the incline appeared to act as a rubble stop (Photo 33) as several large chunks were visible at the blockage. It was therefore unclear whether the incline was completely filled with rubble or whether it was capped, perhaps with the remains of the winch platform and the chalk rubble. In the latter case this posed a potentially significant safety hazard as there could be a thin layer of relatively unstable material overlying a significant drop to the deep tunnel below.



Photo 25. (above)

The chalk debris overlying the winch chamber floor

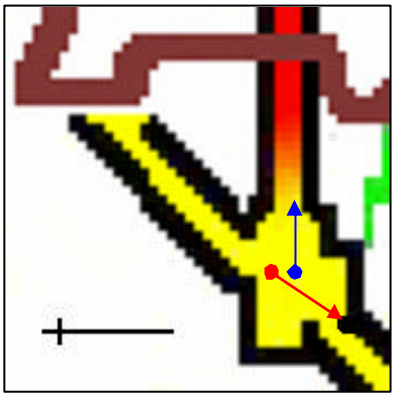


Photo 26. (below)

Looking down the blocked winch chamber incline





Photo 27. (left)

The junction of the southern and western faces of the winch chamber showing its barrel-shaped construction

Photo 28. (below)

Looking up at the winch chamber roof showing the channel cut into it to accommodate the winch assembly







Photo 29. (left)

The approach tunnel as seen from the winch chamber. Note the clay spill which completely blocks this tunnel

Photo 30. (below)

The rear (west) face of the winch chamber showing the approach tunnel (left) and the small recess (right). note the poor state of the roof in this area.







Photo 31. (above)

The remains of the wooden supports for the winch platform

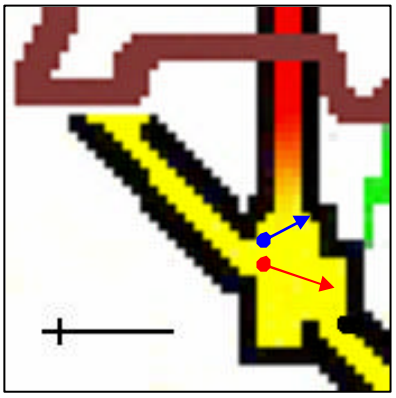


Photo 32. (below)

The winch cable tangled about one of the supports. Note the incline running away to the left



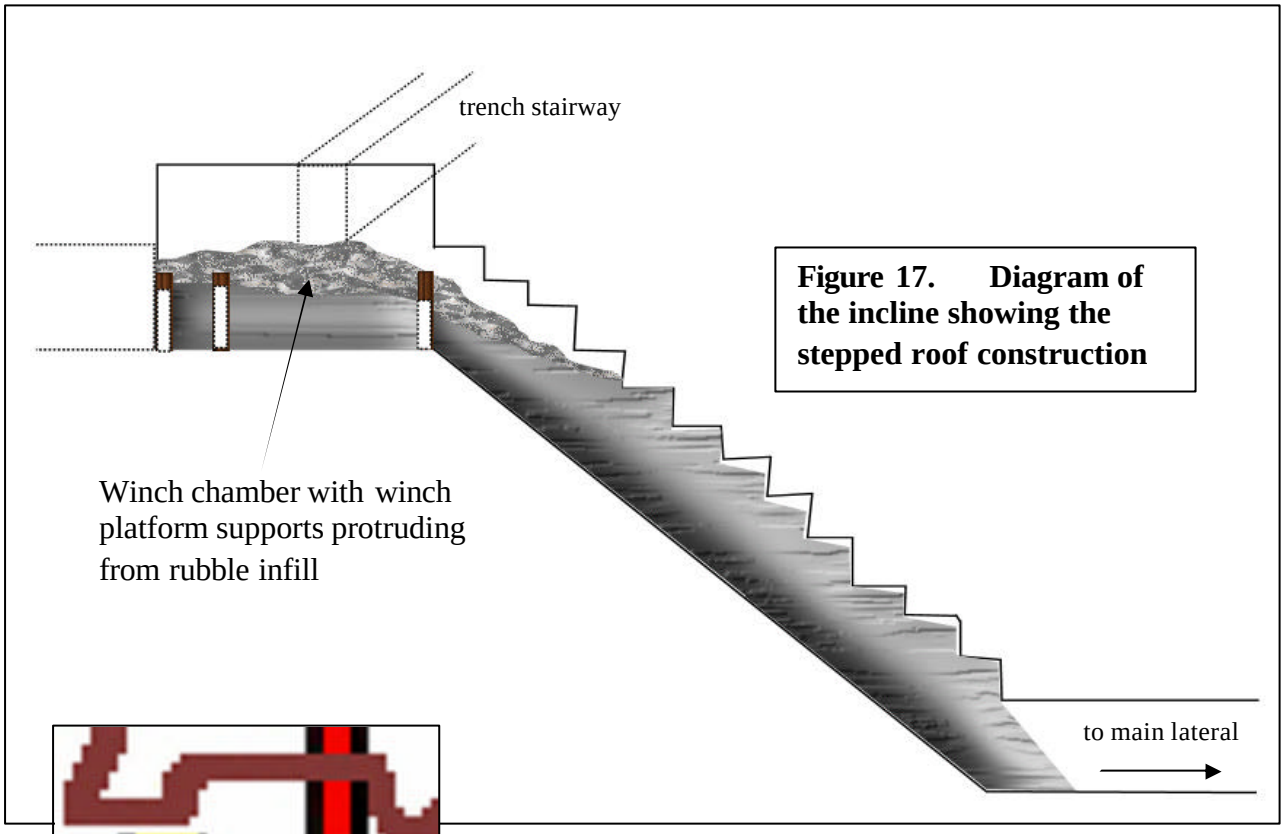


Figure 17. Diagram of the incline showing the stepped roof construction

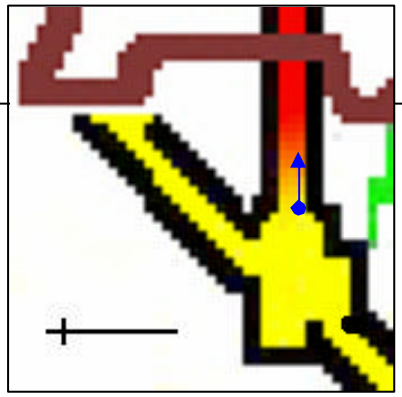


Photo 33.

At the blockage in the winch incline. Note the stepped nature of the roof



7.14 Some preliminary clearance of the rubble pile within the winch chamber was undertaken and three No.5 Mk I grenades recovered. The location of these suggested that they may have originally been left hanging in a bag on the winch platform. With time running out it was decided to leave clearance of the winch chamber and incline to another time. The supporting framework in the pit was therefore roofed and a secure entrance fitted to form what became known as 'The Hobbit House' (Photo 34). This secure structure prevented animals from accidentally falling into the deep excavation and sought to deter the casual battlefield scavenger. Figure 18 is a section plan of the excavation at the conclusion of this phase of the clearance project.



Photo 34. The Hobbit House

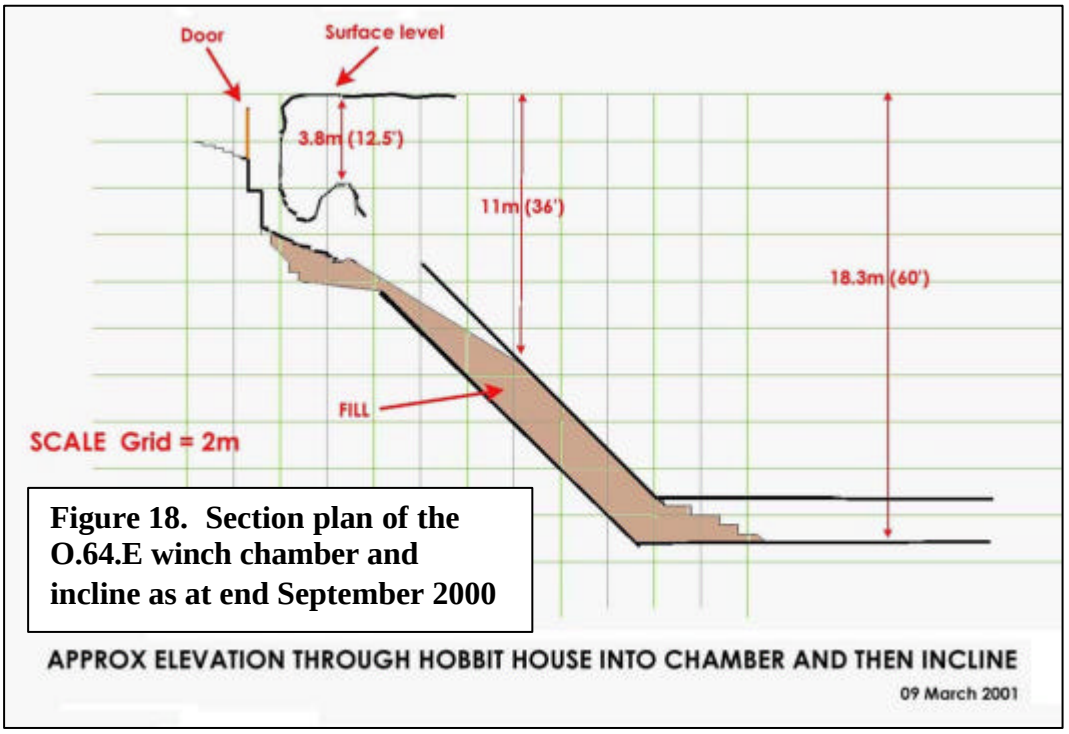


Figure 18. Section plan of the O.64.E winch chamber and incline as at end September 2000

8 PRELIMINARY CLEARANCE OF THE O64E WINCH CHAMBER

8.1 In June 2001 the Durand Group made a preliminary clearance of the winch chamber, prior to undertaking the clearance of the winch incline. The main aim of this preliminary clearance was to stabilise the debris pile and prevent further material from running down the incline. Another key aim was to remove any of the loose clay slabbing overhead and look at how the unstable west face of the chamber could be best stabilised. The opportunity was also to be taken to prepare for the insertion of a safety cage within the chamber to permit the incline clearance to proceed.

8.2 As soon as manual clearance of the chamber begun (Photo 35) it was clear that the size of the chamber and hence the depth of rubble within it was such that it would not prove practicable to clear the whole chamber. Complete clearance would undermine the supports placed at the entrance and potentially exacerbate the instability in other areas of the chalk walls. It was therefore decided to clear the chamber just sufficiently to allow a safe working environment for the subsequent clearance of the incline to be created.

8.3 The chalk debris was placed into sandbags and these were then used to create a retaining wall close to the west face of the chamber and around the trench entrance (Photo 36). The supporting walls were further braced by vertically driven wooden piles. The debris below this wall was then excavated and placed into the approach tunnel and the recess behind the wall. In this manner the debris was used to fill in the chamber beneath the unstable west wall (Photo 37). In this manner the trench entrance was enlarged significantly (Photo 38).

8.4 The chalk debris from the winch chamber was slowly removed and the retaining sandbag wall enlarged. As the depth of the excavation increased so a second retaining sandbag wall was constructed on a lower level around the head of the incline shaft. The remaining debris down to the level of the lip of the incline was then removed. At this point the immense scale of the winch chamber became fully apparent (Photo 39). From apex of the barrel roof to the floor measured approximately 4m.

8.5 During the course of the excavation of the lower debris levels in the chamber evidence of a wooden platform were uncovered (Photo 40). It was clear that this was the winch platform that had originally been supported by the wooden supports, but which had collapsed at some point. Not all of the entire platform was uncovered but it was unclear whether this was because parts of it were still buried beneath the retaining walls or whether part of the platform had slipped down the incline and now lay buried there.

8.6 As the platform remains were removed the winch drum was found to be lying underneath it. Upon further excavation the whole drum assembly, complete with turning handle attached and a length of winch cable wound around the drum, was recovered (Photo 41). Separated from it within the rubble was another turning handle. The drum was approximately 15” in length and with an internal diameter of 6”.

8.7 Although it is possible that the winch assembly was of a single drum variety, the need to lift heavy sandbags makes it likely that a differential double drum winch system was employed (Figure 19). The recovered winch drum is therefore likely to be the 6” drum with the 10” drum still to be recovered. The presence of an additional turning handle, and another turning bar in the staircase infill, suggest this to be the case. The height of the winch chamber itself also supports this hypothesis.

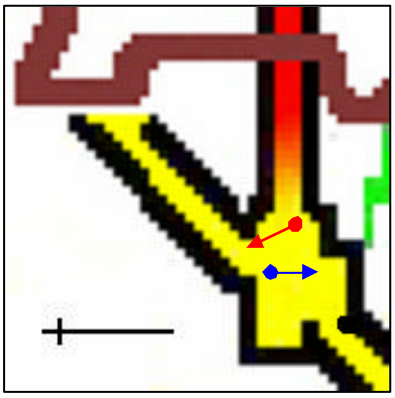


Photo 35 (left)

Hand excavation of the winch chamber. Note the essential safety harnesses worn

Photo 36 (below)

Wooden revetting held in place by wooden piles above the upper sandbag retaining wall



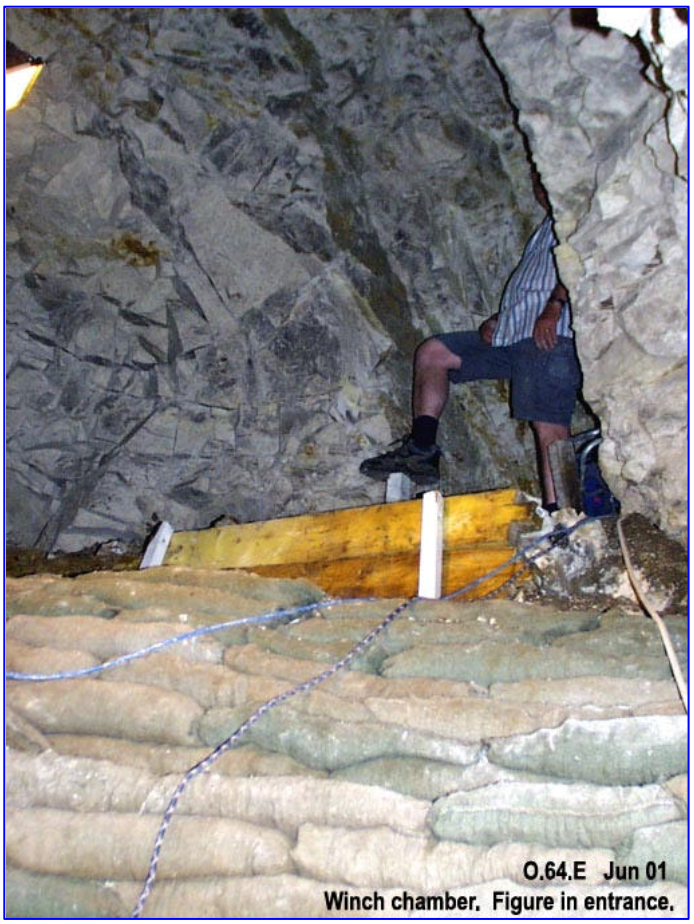




Photo 37 (above). Sandbag retaining wall with additional rubble behind infilling the approach tunnel and recess to support the unstable west wall





Photo 38 (left)

The cleared trench stairway entrance to the winch chamber. Compare with Photo 24.

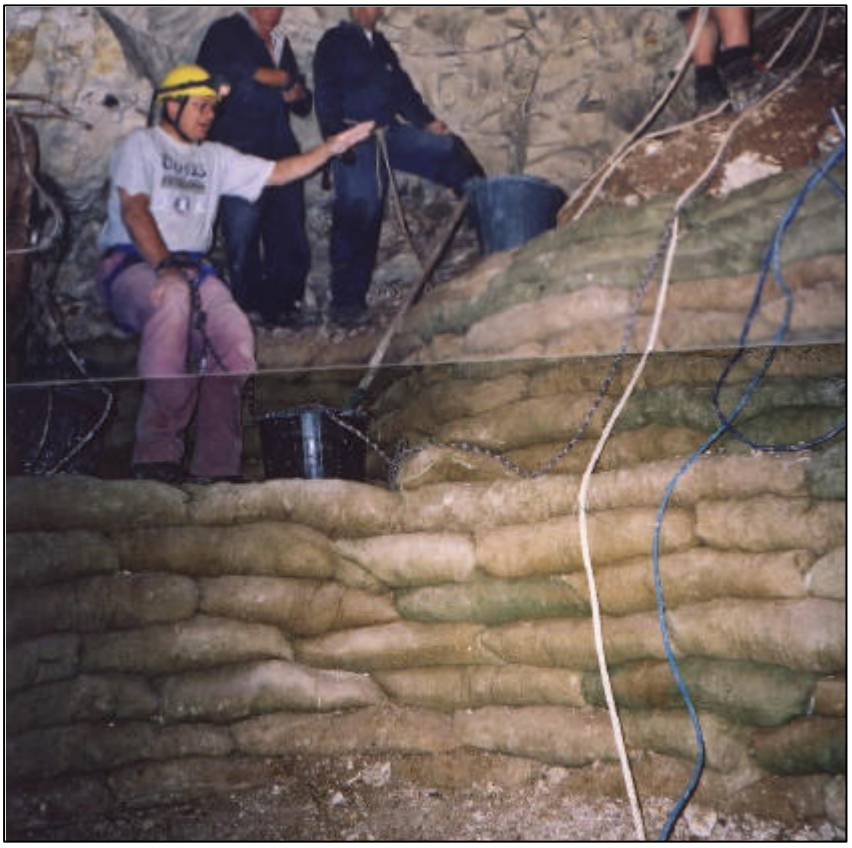
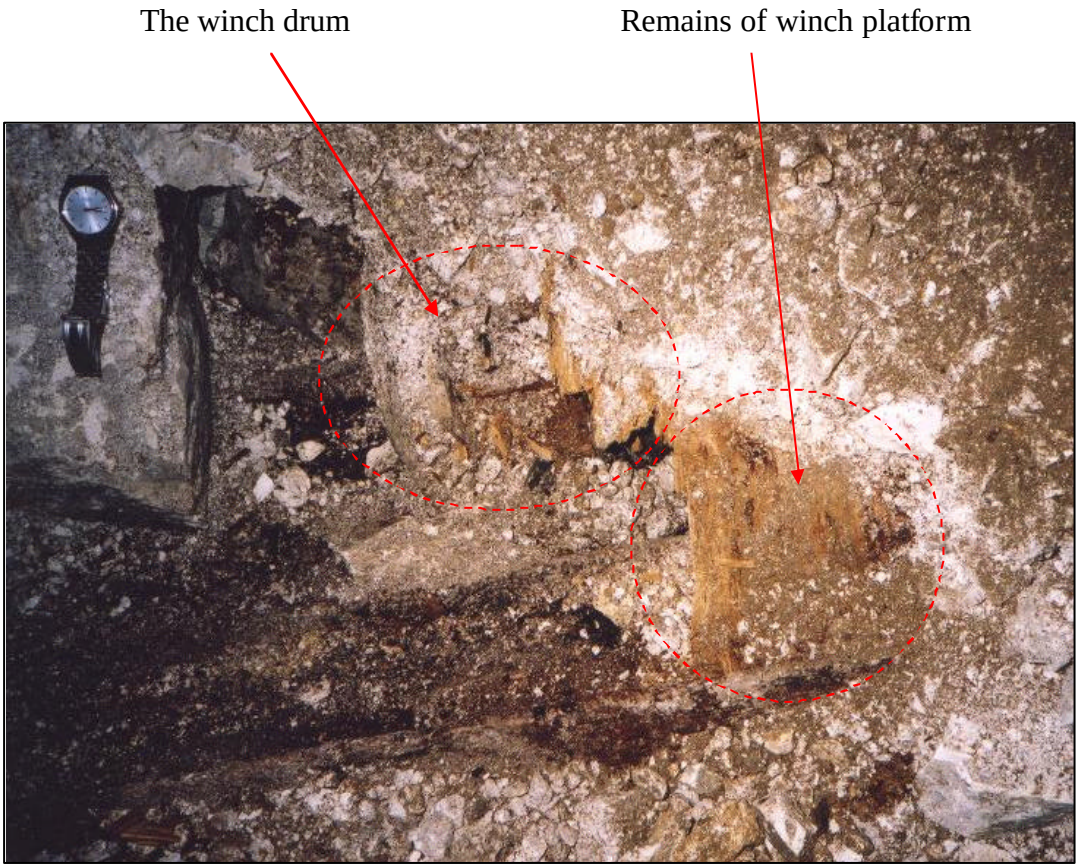


Photo 39 (left)

The partially cleared winch chamber with the two sandbag retaining walls

Photo 40 (below) The winch platform and winch drum in- situ



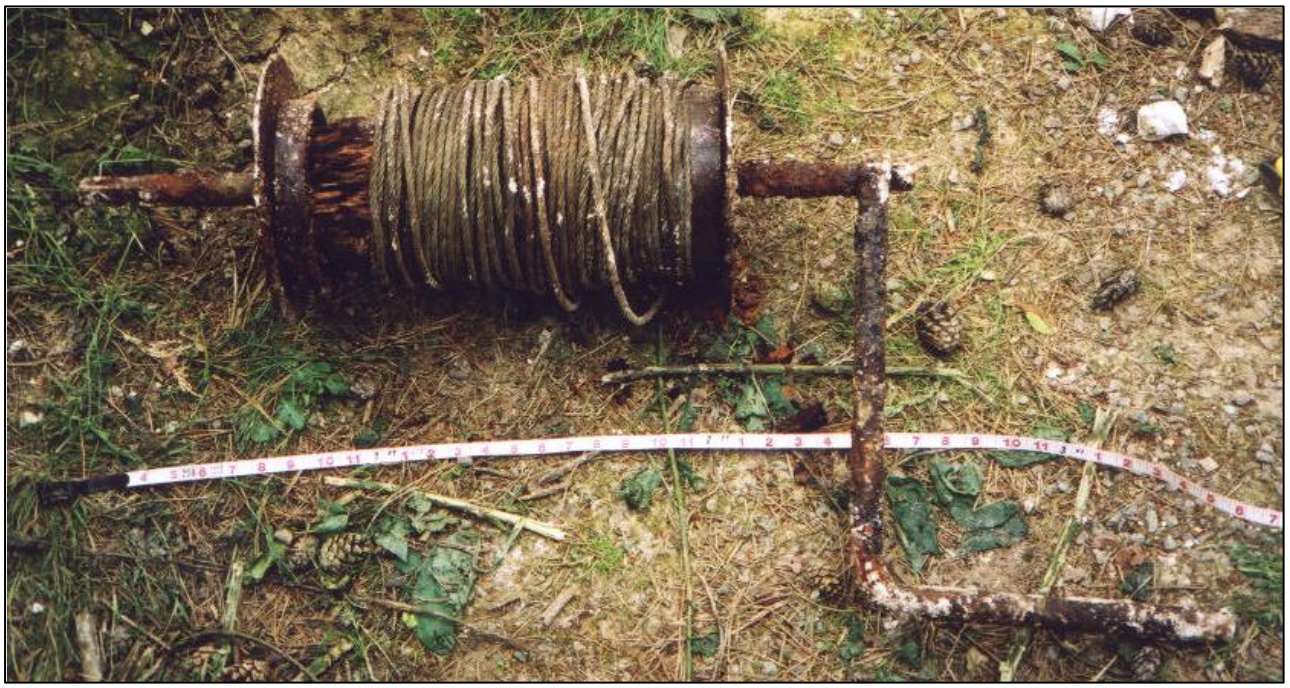


Photo 41.

OS04/01 - The recovered 6” winch drum with turning handle attached. Compare this with the diagram below

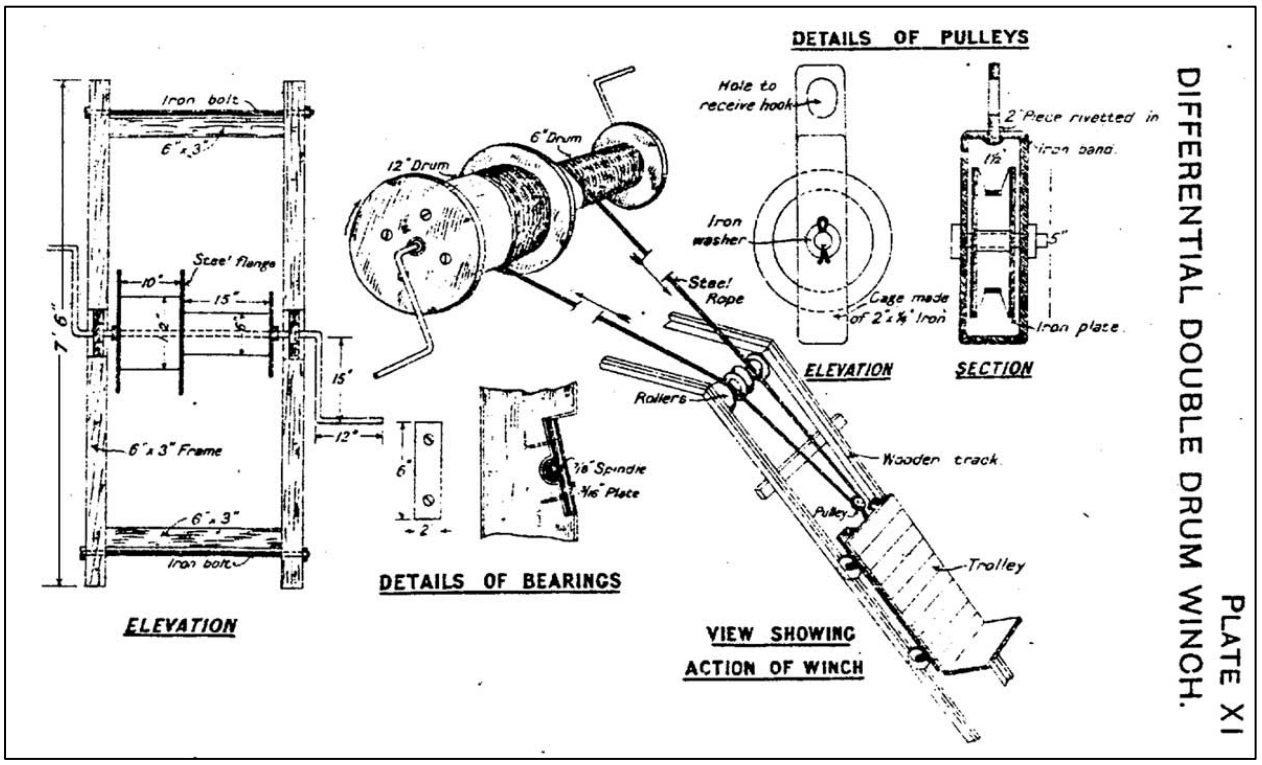
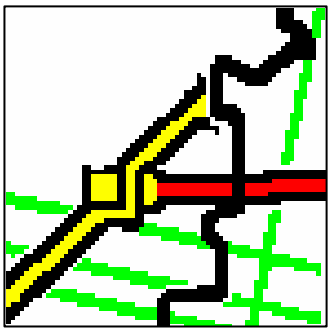


Figure 19. Plan of a differential double drum winch system from a 1918 British Engineering manual. Note the elevation height of the apparatus

8.8 At the end of the initial clearance of the winch chamber it was possible to make a reasoned assessment of the layout of the winch chamber. The physical evidence recorded made sense of the original 175 Tunnelling Company plan of O.64.E, which showed the approach tunnel from the sunken road apparently as a separate entity within the winch chamber. With the knowledge that the winch apparatus was probably located on top of a raised winch platform there may well have been access to the trench staircase from the approach tunnel via a route under the platform. A possible configuration is shown at Figure 20.



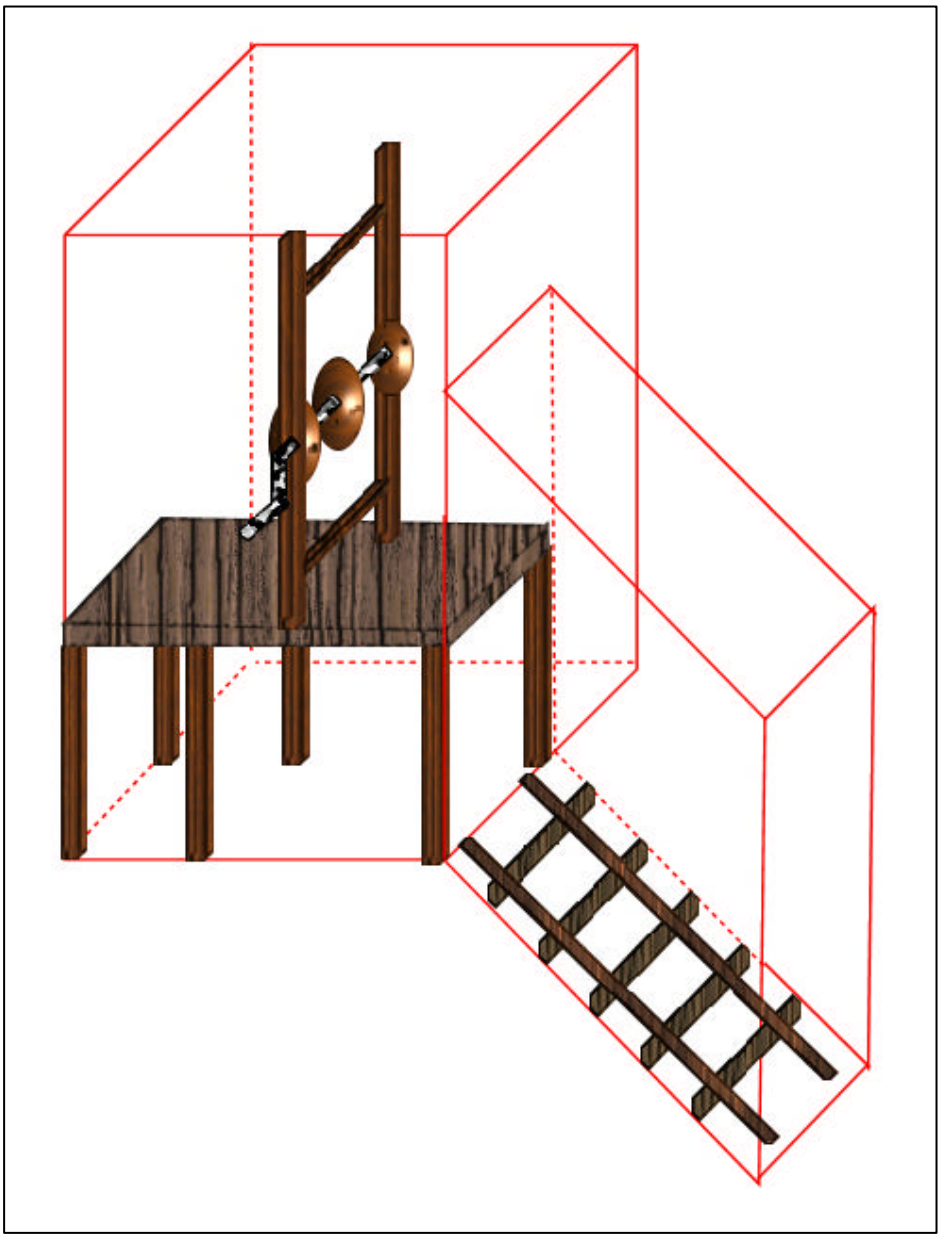


Figure 20.
Possible configuration of differential double drum winch assembly in the O.64.E winch chamber

8.9 It was also possible to make a guess as to the collapse and infilling sequence pertaining to O.64.E. From the different types of material in the infill and the position of the winch platform in the debris it is possible to draw some conclusions (Photo 42). The salient facts are:

- the winch platform lay on and was overlain by coarse chalk debris.
- in the area around the entrance and right down the left hand side of the incline the chalk was overlain by washed in soil.
- the deeper levels of the infill of the trench staircase was mixed, medium coarse chalk debris and soil containing WW1 artefacts.
- the shallow levels of the infill of the trench staircase were largely soil

8.10 It is likely that at the end of the war the trench staircase was in filled with coarse chalk debris which built up above and around the winch platform and also beneath it to a limited extent. At some point the winch platform partially collapsed (probably the north side) and the upper levels of the staircase infill began to slide down the incline. It is likely that a considerable quantity of additional chalk debris was then used to infill the incline and block up the winch chamber against the fallen platform. At some later point, after further decay of the platform and gradual movement of material down the incline, the staircase infill was undermined and the soil began to be washed down, creating the surface collapse.



Photo 42.
The blocked winch incline showing the soil wash (left)overlaying the medium coarse chalk debris (right)

9 CLEARANCE OF THE O64E WINCH INCLINE

9.1 In November 2001 a project was undertaken to clear the winch incline of all debris to allow access to the deep level system below. In view of the need to spend protracted periods of time working in the incline there was a need to protect against the possibility of chalk falls from the roof of the winch chamber. This was achieved by a metal scaffold being erected within the chamber that supported wooden boards stopped against the east wall of the chamber above the incline (Photo 43). Any chalk slabbing off the roof would therefore be stopped by the boards against the east wall and not fall down the incline onto those working below.

9.2 The considerable quantity of material blocking the incline dictated that a means other than manual excavation was needed to remove it. It was decided to use a system of minveyors[10] that would allow debris at the blockage to be mechanically moved up the incline and out of the winch chamber to the surface. The miniveyor system was installed although the steep nature of the incline meant that they were operating at the limit of their design. The material removed via the miniveyors was automatically deposited into a 'gator' tractor and removed off site (Photo 44). In this manner some 20 tonnes of chalk debris was removed from the incline.



Photo 43. Minveyors installed in the incline with the scaffold safety cage in place

[10] Kindly sponsored by Rako Products Ltd.



Photo 44. Miniveyors lifting the debris from the infill out of the winch chamber

9.3 It was not possible to position the miniveyors all the way down the incline and so as the excavation proceeded it was necessary to increasingly shovel and bucket the debris up the incline to the miniveyors. This inevitably slowed the excavation down and it was only at the very last moment during the period that a breakthrough was made. As debris was cleared away from a ridge on the roof of the incline a hole appeared through which a horizontal tunnel could be seen disappearing away into the distance (Photo 45).



Photo 45.

Breakthrough gap at the bottom of the O.64.E incline

9.4 At the end of the November 2001 project the majority of the winch incline had been cleared (Photo 46). In the course of the excavation some 19 cubic metres of chalk and soil had been excavated. It was estimated that this equated to approximately 28 tonnes of material. It was of particular note that with the exception of some SAA cartridge cases there were no artefact finds of any significance in the incline infill. The end state of the November project is as shown in Figure 21.





Photo 46 (above)

The cleared winch incline as at 2 Nov 01. Compare with the scene prior to the clearance. The red lines indicate the same profile and filled level

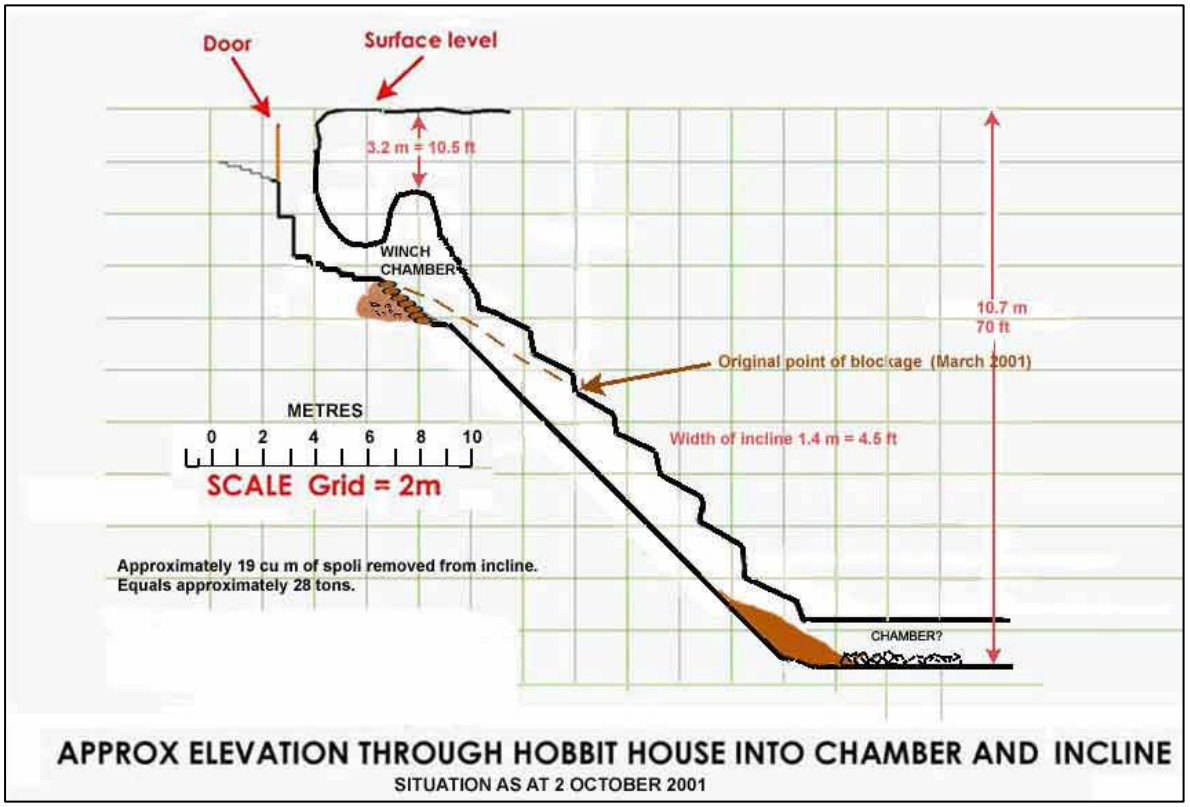


Figure 21. Situation at the end of the November 2001 project

9.5 During the course of the clearance of the winch incline it was noted that the surface of the chalk floor was 'notched' at approximately 6ft intervals. Although the scouring action of the debris in the incline and of the clearance operation itself had greatly smoothed off the surface it was still possible to determine that these were where the original winch track sleepers were positioned. These can be seen highlighted in Photo 46 and are shown on the representation in Figure 22. All trace of the wooden sleepers had, however, disappeared.

9.6 In December 2001 the Durand Group returned to O.64.E to complete the clearance of the winch incline. The gap at the bottom of the incline was enlarged by hand (Photo 47). Battery-powered lights were hung on the original candle nails in the incline to provide lighting at the working face whilst spotlights were used to provide lighting in the winch chamber. The confined nature of the incline meant that only 3 people could work at the blockage at any one time.

9.7 During the final breakthrough clearance work was also undertaken to stabilise the remaining debris. This was achieved through the insertion of retaining supports and sandbag traverses at regular intervals along the last 20ft of the incline (Photo 48). In view of the very steep nature of the incline a safety rope was laid down the incline in order to assist in descent and ascent (Photo 49).

9.8 It was decided that until a reconnaissance of the extent and condition of the deep defensive system was undertaken only the minimum clearance of the remaining debris would be made, commensurate with the requirements of access and the ability to manoeuvre an emergency stretcher. This meant that at the end of this stage of the work it was estimated that some 22 cubic meters of debris weighing 32 tonnes had been removed (Figure 22).



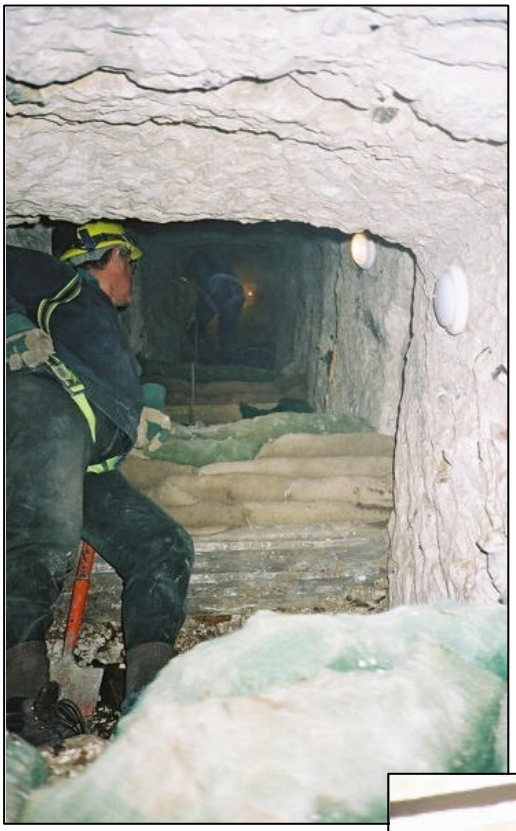


Photo 47 (above)

Work underway at the bottom of the winch incline to clear a passage. Note the use of lights.

Photo 48 (left)

Looking up the winch incline from the bottom. Note the use of sandbag and timber retaining walls.



Photo 49 (right)

Looking down the winch incline from the winch chamber

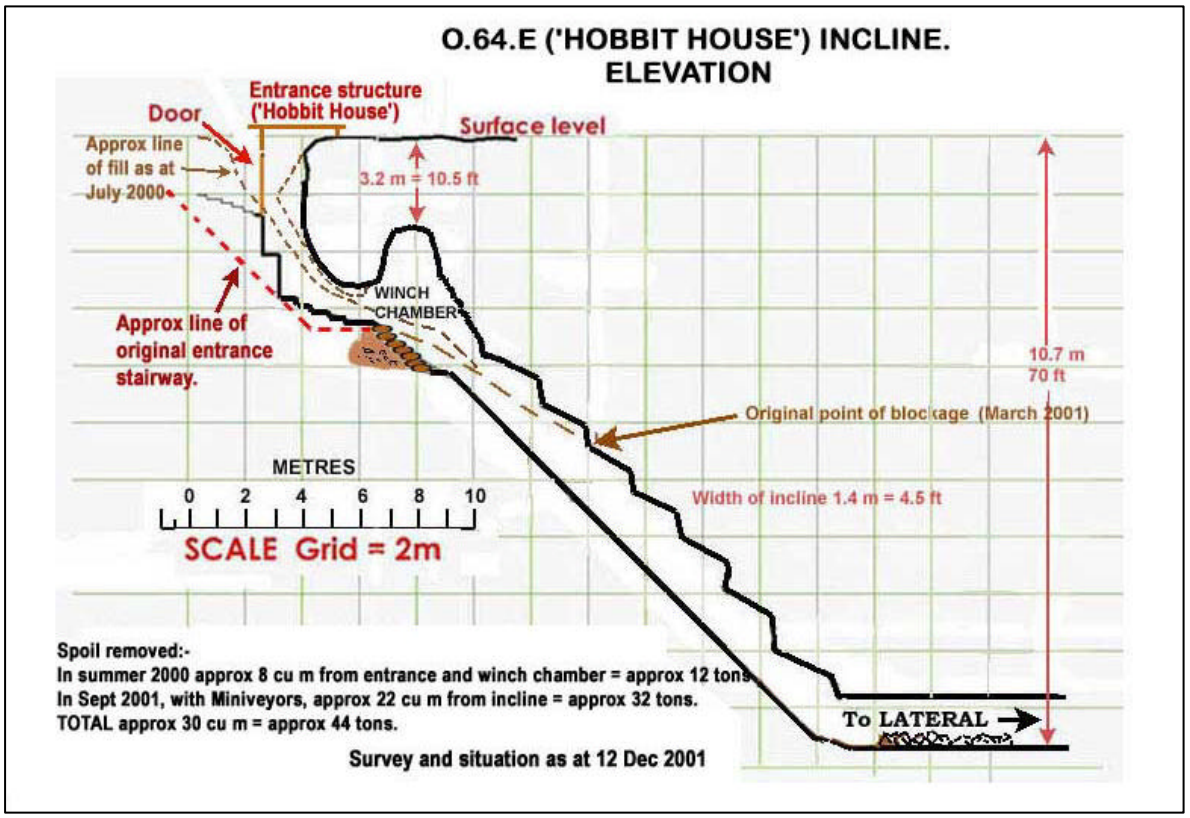


Figure 22. Situation at the end of the December 2001 project

10 ARTEFACT RECOVERY – THE WINCH TROLLEY

10.1 Prior to inserting the final retaining wall at the bottom of the incline it was decided to excavate the chalk down to the floor of the chamber for assessment purposes (Photo 50). As the chalk was removed a wheel from one of the winch trolley bogies appeared (Photo 51). Careful excavation revealed the complete bogie and part of the original wood that formed the trolley platform (Photo 52). Further excavation in the same area revealed the other bogie lying close to the first.

10.2 Both bogies were recovered to the surface (Photos 53 and 54) and were found to be in excellent condition. The metal work was not significantly rusted and the rubber wheels, although partially perished, were in a reasonable state. It is assessed that the original winch trolley would have looked much like that shown in Figure 27. This would have been used to haul filled sandbags to the surface from the workings below for subsequent disposal away from the entrances

10.3 Close examination of the area above where the winch trolley bogies were recovered revealed the badly decayed remains of additional timber, which bore similarities to that recovered from the winch chamber above and assessed to be from the winch platform. This is consistent with the collapse theory postulated in para 8.10. It was not possible to dig further into the debris in this area for fear of undermining the retaining wall. It is possible that additional artefacts remain to be uncovered in this area and full clearance of the incline should remain a future aspiration.



Photo 50 (left)

The bottom of the winch incline where the winch trolley bogies were recovered (incline running up at rear of photo)



Photo 51 (right)

First sight of one of the winch bogies (circled)



Photo 52 (right)

The first trolley bogie uncovered and before lifting. Remains of the trolley platform behind (circled)



Photo 53. The recovered winch trolley bogies



Photo 54. Closer detail of the recovered winch trolley bogies

11 INVESTIGATION OF 'O' SECTOR

11.1 A preliminary investigation of 'O' Sector revealed a deep level mine system that was in a very stable condition with very little evidence of slabbing or serious chalk falls. There was little evidence of any tunnel furniture with the exception of two collapsed and badly decayed gas doors along the main lateral. Although there was evidence of trackway along the lateral in many places in appeared to have been removed. Indeed, the lack of any substantial artefacts suggested that the system had been deliberately stripped of all usable materials, including wooden supports and sleepers.

11.2 The layout of the system appeared to correspond reasonably well with the mapping that was available with some minor exceptions. The tunnel extension at the far north of the system towards Chassery crater was found to have been completed with the beginnings of a further extension to the north towards 'P' Sector. Although unusual[11], this suggested that there had been some intent to continue 'O' Sector to the north, perhaps to connect up with 'P' Sector. Why this had been started but then abandoned is not known and no mention is made in any available record.

11.3 An additional stores area was located off of the main lateral opposite O.63.E. An unmapped explosives store, with bagged ammonal explosive still in situ, was also discovered at the bottom of the O.63.E incline. Additionally, a vertical shaft off the main lateral close to O.64.D was also discovered although it led nowhere and its exact use is unknown. It may have been the start of a deeper offensive drive that was never completed. O.63.C.2.1 was also found to have been extended further then was shown on the available mapping.

11.4 At two points in the system unmapped staircases were found connecting with higher level fighting tunnels. At the far north end a staircase connected the main lateral with a forward sap. On a landing half way up the stairs a hole in the ceiling gave access to the higher level O.65.C offensive gallery. A similar staircase connected the main lateral with O.63.D. Connections up to the surface trenches were also apparent but blocked.

11.5 The main lateral was found to be blocked by a modern breeze block wall just before the O.62.D access tunnel. It had also been noted that orange surveyors' marks had been nailed onto the chalk walls at all fighting tunnel entrances. It was apparent that the builders of the A26 had broken into O.63.D during construction, which had then given them access to the deeper system which they had surveyed. The section of the main lateral under the autoroute had then been blocked off and filled with concrete. This prevented access to the southern section of the system.

11.6 After the preliminary investigation a more detailed investigation of both the deep defensive system and the two higher level offensive tunnels was undertaken on a number of subsequent visits. All tunnels were systematically surveyed and photographed. There was also a considerable quantity of graffiti found in some of the listening posts and this was also systematically photographed and transcribed and is the subject of a separate, supplementary report. The amended plan of 'O' Sector is at Figure 23.

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[11] From a security viewpoint it was sensible not to join adjacent tunnel sectors in order not to jeopardise too much of the protection of the trenches above, should one particular sector be lost to the enemy. However, there is some suggestion that further north along the ridge the Berthonval Sector may have been connected to adjacent systems.

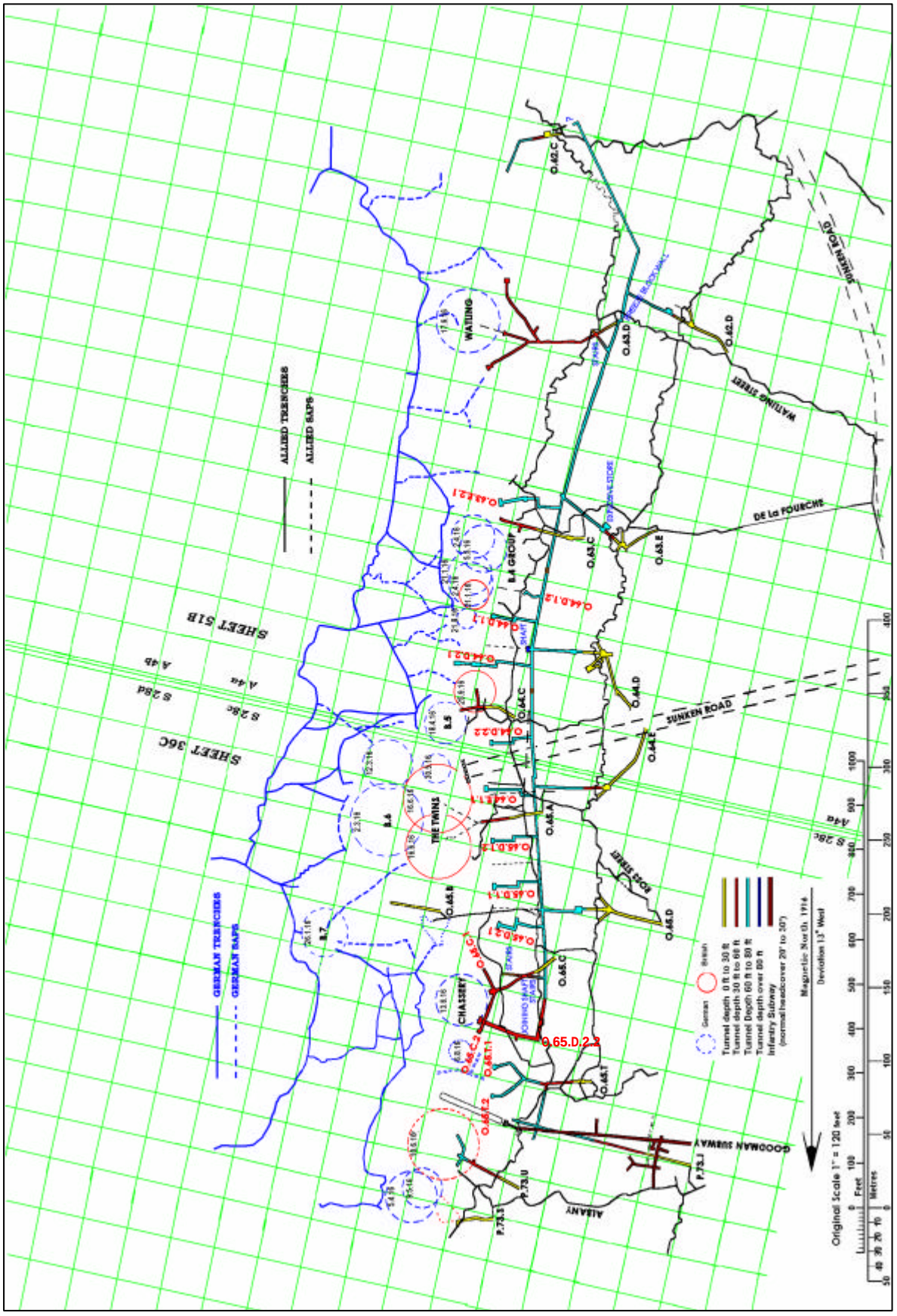


Figure 23. Updated plan of northern end of O Sector after preliminary investigation

12 THE O.64.E INCLINE GALLERY

12.1 The tunnel leading from the base of the incline to the main lateral was found to be 34m (110 ft) long. It was not quite straight as Photo 55 shows and the mapping indicates but deviates to the south by 5° after 5m and then back to the north by 5° after a further 5m; the net effect being to run back along the same line. The reason for this slight variation is unknown. The floor of the tunnel is level and measured to be at a depth of 80 ft. The tunnel itself was square cut and measured 5 ft high by 3 ft wide, typical mining dimensions. The roof was on very good condition with no evidence of slabbing.

12.2 Close to the bottom of the incline decayed wood was observed on the tunnel floor, probably the remains of tunnel props, the locations of which could still be clearly seen cut into the chalk walls. It may be that this was originally a gas door. Although any evidence of wooden trackway had been worn away at this end of the tunnel, there was some evidence for its existence closer to the main lateral. Soot markings along the walls of the tunnel indicated where candles, for light, had originally been placed.

12.3 As an expedient to clearing the bottom of the incline large blocks of chalk were stacked along the northern wall of the tunnel, rather than removed to the surface. These were subsequently used to bolster the retaining walls built at the bottom of the incline. No significant artefacts were recovered from the incline tunnel itself although a number of nails from the timber tunnel supports were discovered amongst the debris on the floor.



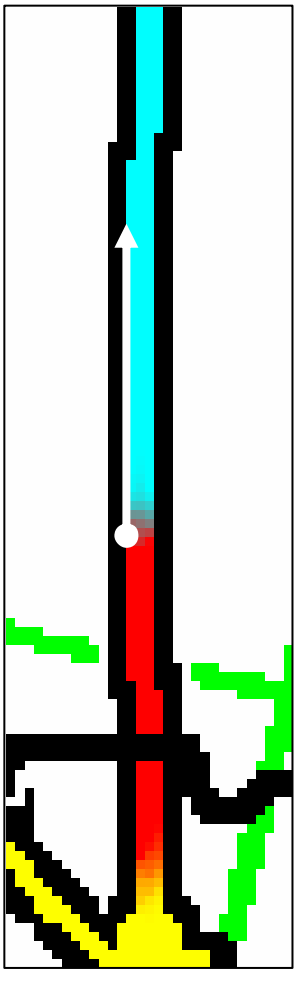


Photo 55.

The incline gallery from the bottom of the incline. Note chalk stacked on left by the Durand Group during clearance of the incline

13 THE MAIN LATERAL

14.1 An initial investigation of the main lateral revealed that the tunnel is blocked some 15m before its intersection with the O.62.D incline gallery. The blockage appears to be deliberate and takes the form of a breeze block wall cemented into place (Photo 56). The blockage is close to a dogleg in the tunnel (Photo 57) which was where the southern drive of O.63.E.1 met the northern drive of O.62.D.2. The use of breeze blocks indicates that the blocking wall is of modern construction.

13.2 Upon initially breaking through the blockage in the O.64.E incline an orange surveyor's mark had been noted nailed to a ledge. As progress was made along the main lateral other surveyor's marks were also noted. Close to the breeze block wall a set of stairs were noted leading to an upper level, later found to be the O.63.D fighting tunnel. It was clear that the builders of the A26 had broken into O.63.D during construction of the auto route and through the staircase, gained access to the deep defensive system.

13.3 In addition to surveying the deep system the construction company had obviously decided that it would be prudent to block the tunnel running under the road. They appeared to have constructed breeze block walls either side of the route of the road and then, presumably, filled the intervening tunnel space with concrete. The existence of concrete powder on the floor of the tunnel close to the wall supports this supposition. An overlay of the autoroute on the tunnel plan is at Figure 24.

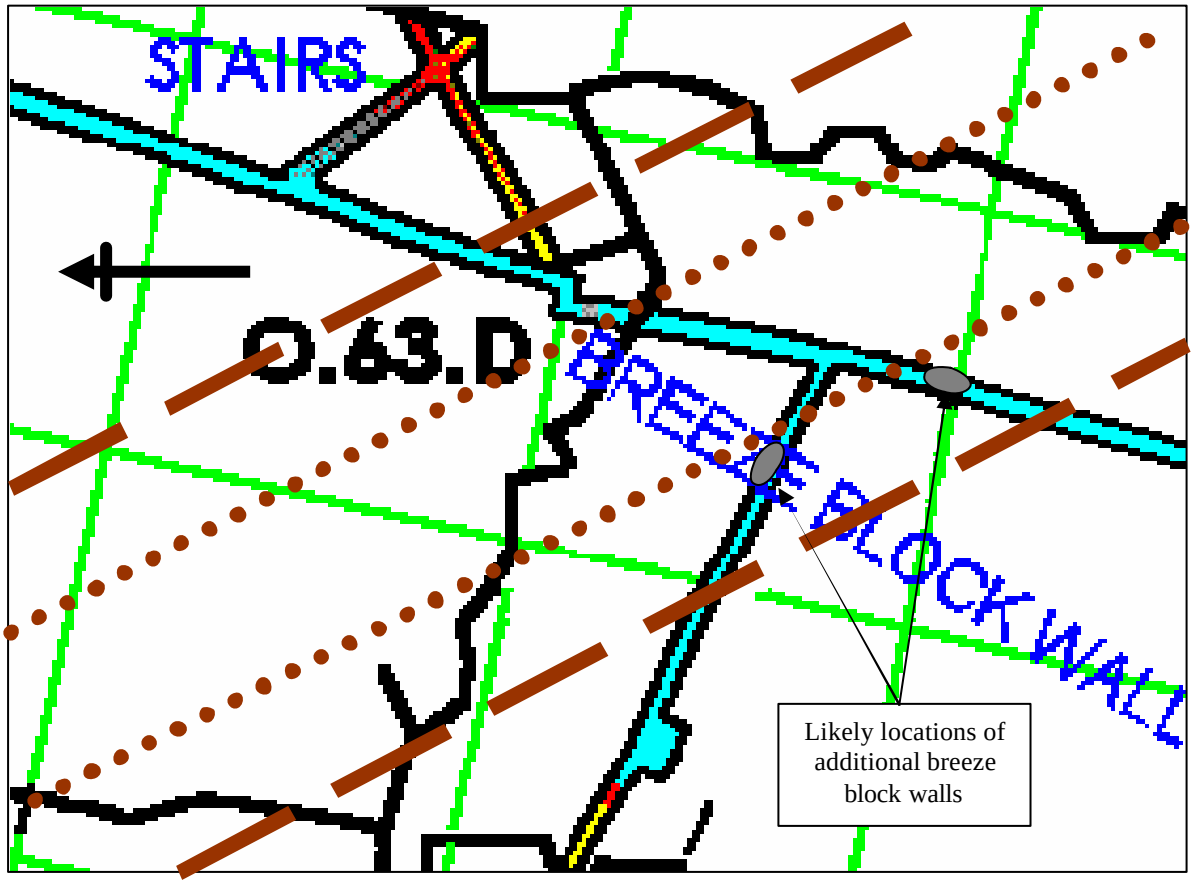


Figure 24. Outline of the autoroute cutting overlain on the tunnel plan

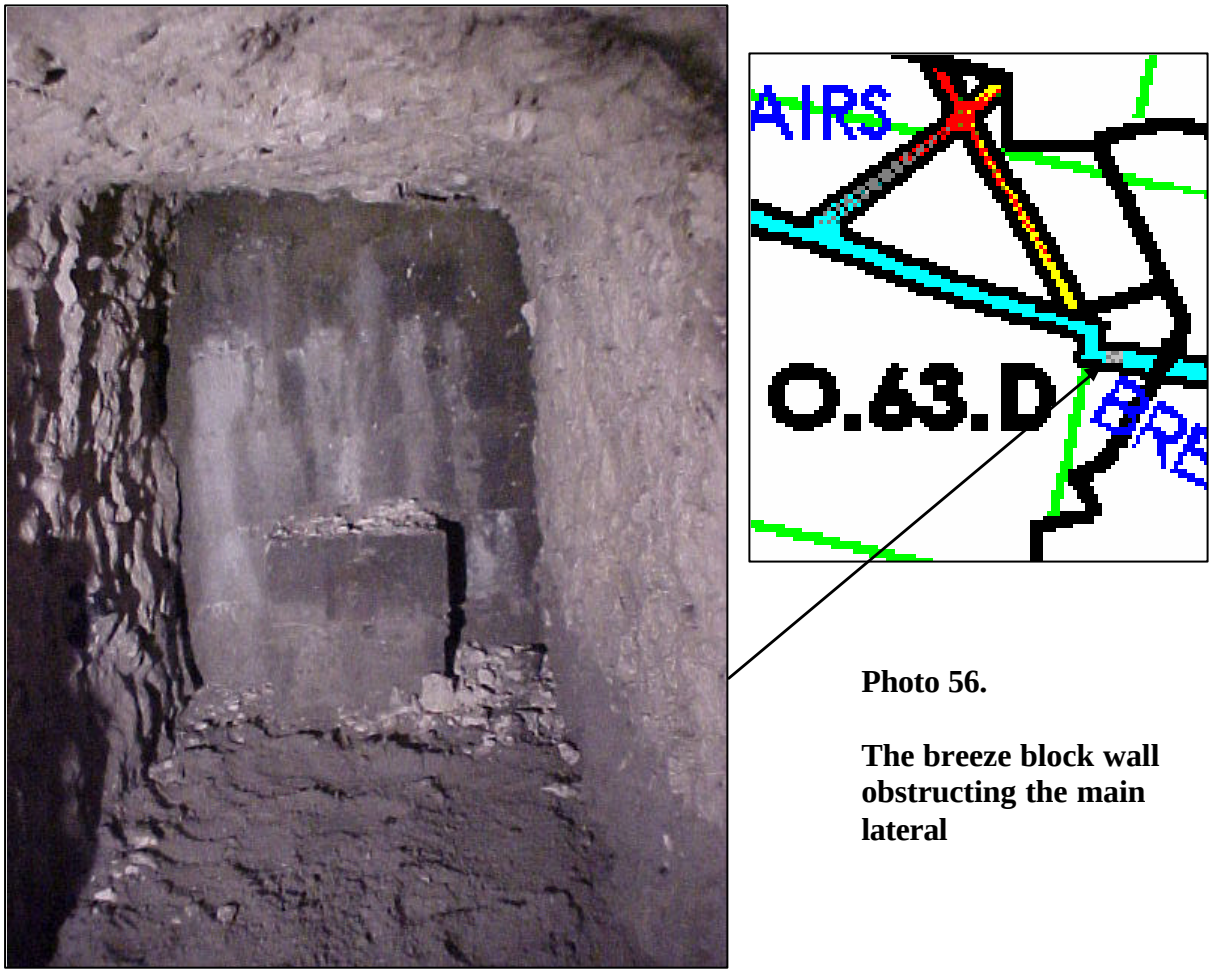


Photo 56.

The breeze block wall obstructing the main lateral

13.4 The overlay map shows that the blockage lies just to the north of the run of the autoroute pave, indicated by the dotted line. The plan also shows that the cutting in which the autoroute runs at this point, shown as a dashed line, cuts through the trench line access to the O.63.D fighting tunnel and was presumably the access point for the surveyors. A subsequent examination of this access tunnel would reveal the existence of another, confirmatory breeze block wall at this point.

13.5 It is likely that another breeze block wall was constructed in the tunnel on the southern side of the pave, as indicated. The run of the autoroute would also suggest that a third wall would need to have been constructed in the O.62.D tunnel, which it also bisects. A quick map analysis would suggest that the construction team would therefore have needed to pump approximately 50 cubic metres of concrete into the enclosed space.

13.6 The dogleg represents the point where the O.63.E.1 drive meets the O.62.D.2 drive. At the dogleg the O.62.D.2 drive has been taken past the intersection point by approximately 2m. The cavity formed at the end is full of chalk debris, possibly the remains of the intervening wall between the two drives which was broken down to connect the two tunnel sections (Photo 58). This is a good indication of the sensible use of redundant tunnel space to store debris dug from elsewhere rather than have to transport it to the surface for disposal.



Photo 57.

The dogleg in the tunnel close to the breeze block wall. Note the powdered concrete on the floor of the tunnel

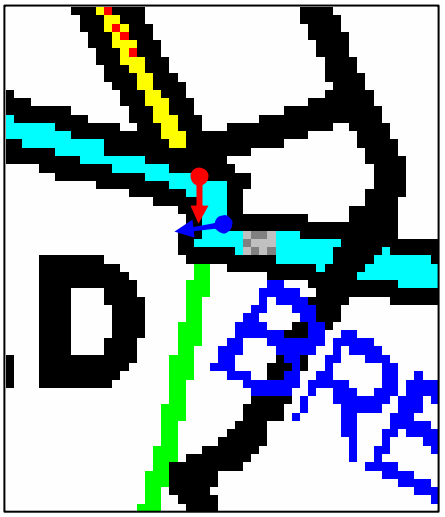




Photo 58.

The end of the O.62.D.2 drive filled with chalk debris

13.7 Photo 59 shows the view looking north from the dogleg The Durand Group member is squatting opposite the stepped incline up to the O.63.D offensive mine system. Photo 60 shows the E.1 section of the main lateral slightly further on. The floor remains like this for approximately 39m north from the dogleg. The very faint outline of the trolleyway sleepers and the tracks themselves can just about still be seen on the floor. Although there is also no evidence of any tracks being present around the corner by the breeze block wall the extensive wear of the floor at this point, arising perhaps from the building of the block, may have removed any evidence. It is likely that loads would originally have been cross-loaded at the dogleg between the two sections of track.

13.8 Photo 61 shows the E1 section of the main lateral further north as indicated on the plan. There is clear evidence of a trolley way having existed with the positions of the sleepers clearly visible but no decayed wood present as is evident in the La Folie system. This would suggest that the track way has been deliberately removed at some point. The spacing between the sleepers measured 90 cm (3 ft). The floor of the tunnel remains in this condition for the remaining 58m of the E.1 section of the main lateral. Along the whole of this section of the main lateral the tunnel measures 1.4m wide by 0.9m high.



Photo 59.

View north along the E1 section of the main lateral from the dogleg in the tunnel. Note the orange surveyor's mark on the ceiling opposite the stepped incline to the O.63.D system

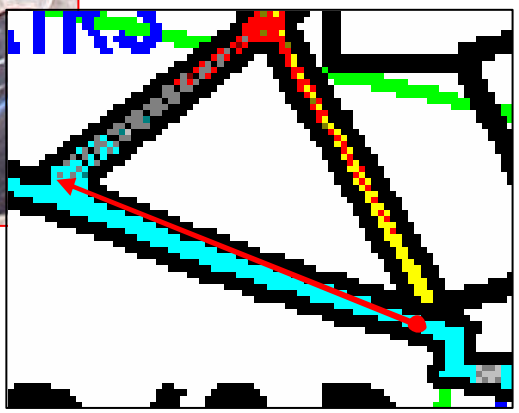
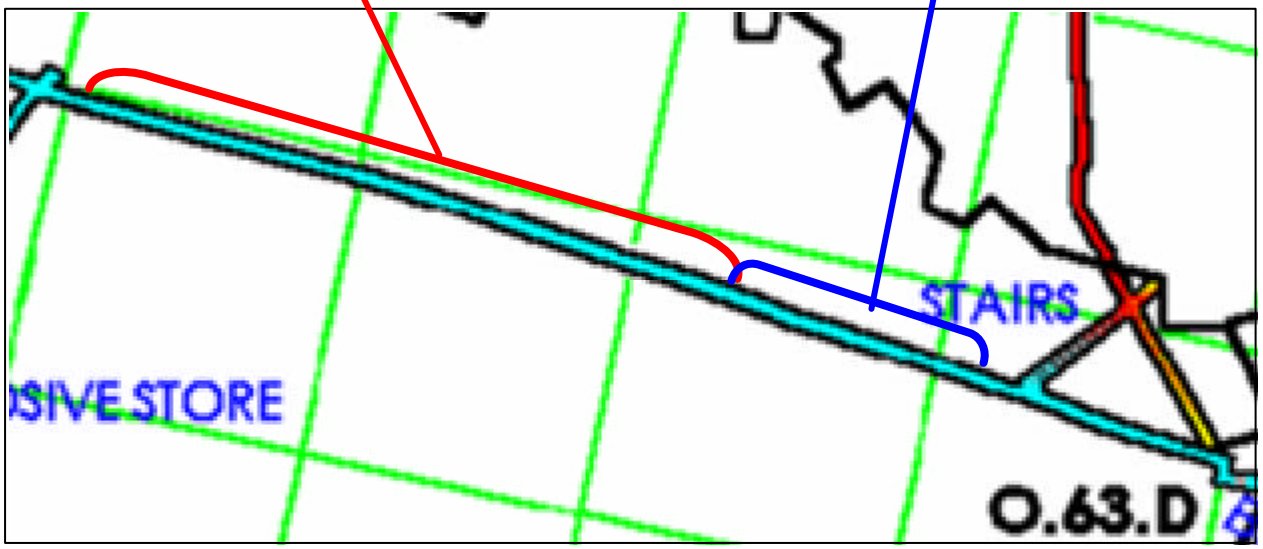




Photo 60 (left)
The E1 drive of the main lateral with the trackway position clearly visible but the wood apparently stripped out.

Photo 61 (below)
The E1 drive of the main lateral close to the dogleg. Note the faint outline of the original trolley tracks (arrowed)





13.9 Opposite the point where the O.63.E inclined gallery joins the main lateral there is a small cavity in the chalk wall some 2.3m deep and 1m wide (Photo 62). This may have been the beginnings of a fighting tunnel that was abandoned for some unknown reason although the proximity of the O.63.E.2.1 fighting tunnel and the absence of any indications of another drive at this point on the available plans tend to suggest otherwise. It is possible that it was deliberately dug as a stores area. The existence of a similar alcove in the main lateral of the La Foilie system, which is also used as a stores area, supports such a supposition. Within the cavity two empty petrol tins (presumably used for water) and a quantity of decayed timber struts were discovered.

13.10 Moving past the stores area north along the O.63.E.2 section of the main lateral the first 9m of the tunnel is relatively bear until the O.63.E.2.1 fighting tunnel is reached. Past this point the decaying remains of an extensive amount of timber is evident on the tunnel floor (Photo 63). This appears to be the remains of timber supports that originally ran along the walls at intervals as indentations in the walls are also evident. It is also likely that some of the timber represents the remains of the trolley tracks along this section although it is impossible to tell conclusively. Within this section there is evidence that there was once a gas door.



Photo 62

The stores area opposite the juncture of the O.63.E inclined gallery and the main lateral

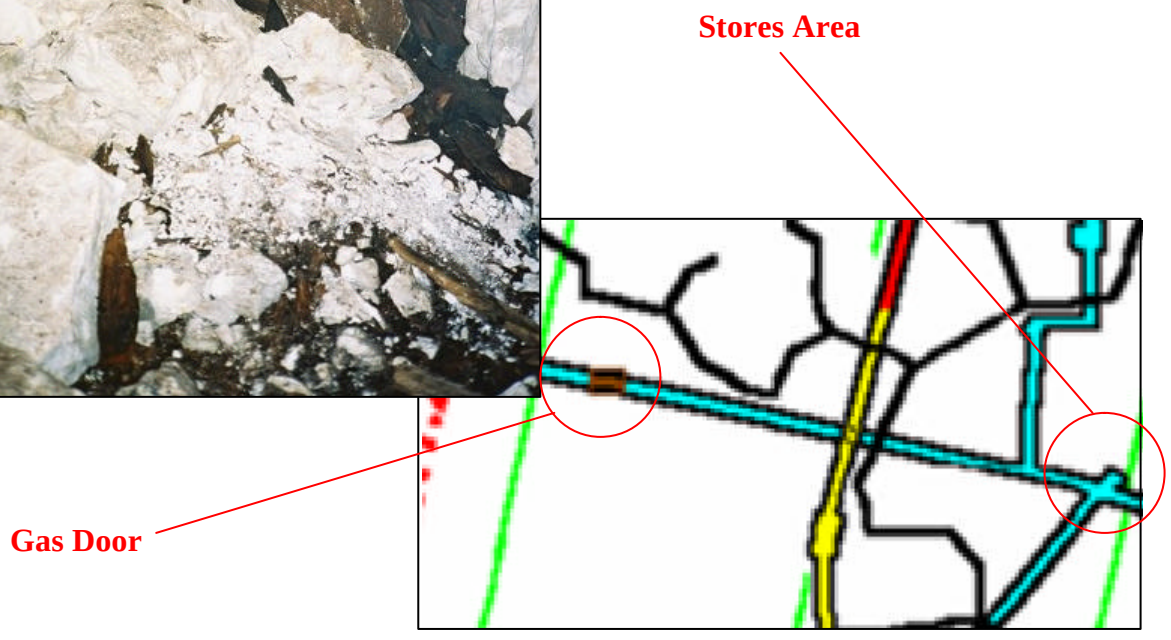




Photo 63

The O.63.E.2 section of the main lateral between the O.63.E.2.1 and O.63.E.2.2 fighting tunnels. Note the extensive quantity of decayed timber from the original tunnel supports and trackway

13.11 Opposite the juncture of the O.64.D incline gallery with the main lateral there is a vertical shaft dug into the eastern wall. The shaft is accessed through a small 0.8m wide by 0.8m deep entrance and the shaft itself is 1.7m wide by 1.5m deep and approximately 8m (24ft) deep. The tunnel at this point has been widened to permit work to be undertaken on the shaft whilst not blocking the main lateral. The shaft can be seen in Photo 64 and its location and surrounds on the plan at Figure 25.

13.12 Evidence of small rectangular cavities in both the floor of the entrance and at a corresponding height in the shaft wall opposite indicates that originally a wooden beam had been placed across the neck of the shaft. Presumably this would have been used as a support to raise and lower people and material up and down the shaft. The absence of any decayed wood either in the cavities or at the bottom of the shaft suggests that the beam had been deliberately removed rather than left to decay in situ.

13.13 There are no tunnels leading off from the bottom of the shaft or, indeed, any indications that any had been started. This raises the question of what the shaft was for. There are two possible options. It was either a subterranean well or was the intended access to a deeper level system that was never completed. The 175 Tunnelling Company plan of the system dated 25 October 1916 shows a proposed tunnel running forward into No-Man's land at this point and therefore the latter option is considered more likely. It is notable that there is a significant gap in the crater field at this point.



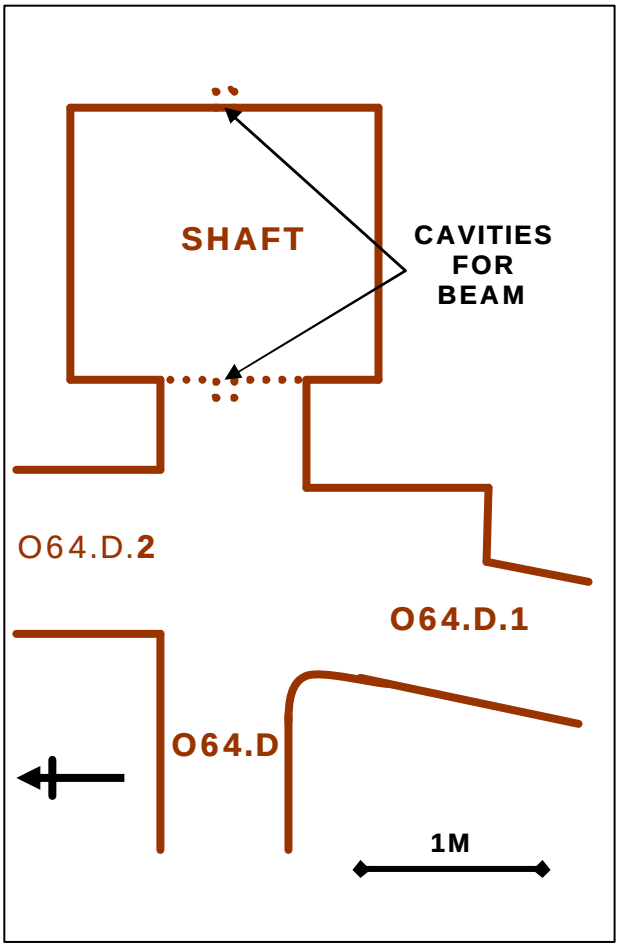
Photo 64

Shaft at the juncture of the O.64.D inclined gallery and the main lateral. Note the cavity in the far wall for the beam (circled)

Figure 25

General location map and plan of the shaft area on the main lateral at O.64.D





13.14 On the O.64.D.2 section of the main lateral the holes for the trolleyway sleepers are again clearly visible in the tunnel floor (Photo 65). The tunnel floor is, however, remarkably clean for most of this section again suggesting deliberate dismantling of tunnel furniture. Between the O.64.D.2.1 and O.64.D.2.2 fighting tunnels there is what appears to be another gas door (Photo 66). The evidence for this is again an extensive quantity of decayed wood (Photo 67).

13.15 The exact layout of the gas door is unknown. The layout of the remains is as shown in Figure 26. A central sump appears to have been dug into the tunnel floor measuring approximately 5ft long by 4ft wide. Four large 8" square timbers were originally set into recesses in the tunnel wall at each corner of the sump although only the badly decayed stumps now remain upright. There is extensive timber debris either side of the sump area. There is no evidence of any reinforced rubber material like that found used in the gas doors in the La Folie system.



Photo 65 (left)

The O.64.D.2 section of the main lateral



Photo 66 (right)

The remains of the gas door on the O.64.D.2 drive of the main lateral



Photo 67 (above)
The sump area of the gas door on the O.64.D.2 drive

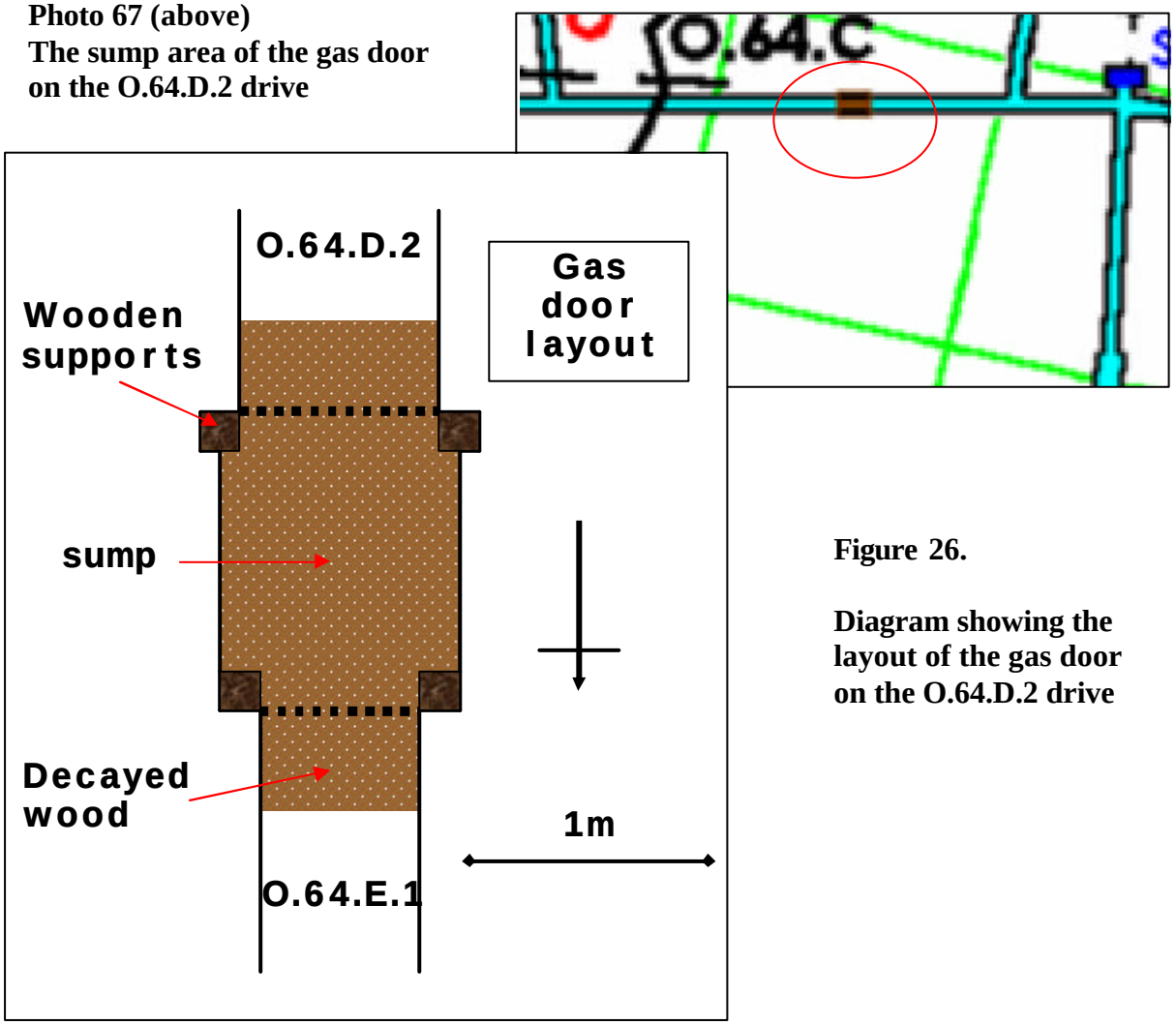


Figure 26.

Diagram showing the layout of the gas door on the O.64.D.2 drive

13.16 The O.64.E.1 / O.64.D.2 junction is another good example of where two drives meet underground. From the north (Photo 68) the junction appears to be nothing more than a slight curve in the main lateral. However, from the south (Photo 69) the junction between the two drives is very visible. The two drives appear to have been offset by 2m and as they approached each other the O.64.E.1 drive was then turned in to join the O.64.D.2 drive. The height of the main lateral tunnel changes from 1.5m (O.64.E.1 drive) to 1.4m (O.64.D.2 drive) at the junction.

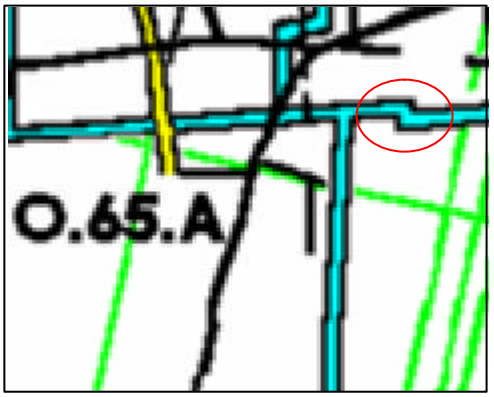


Photo 68 (left)

O.64.E.1 / O.64.D.2 juncture seen looking north to south

Photo 69 (below)

O.64.E.1 / O.64.D.2 juncture seen looking south to north





13.17 Along the O.65.D.2 drive of the main lateral faint remains of the trolley trackway are visible (Photo 70) although little wood debris is actually present. The trackway continues all along the rest of the main lateral (Photo 71) until the eastern perpendicular turn of the No.1 fighting tunnel at the far north of the sector. Towards the northern end of the drive more of the trackway remains in situ.



Photo 70 (left)

The main lateral looking north from O.65.D

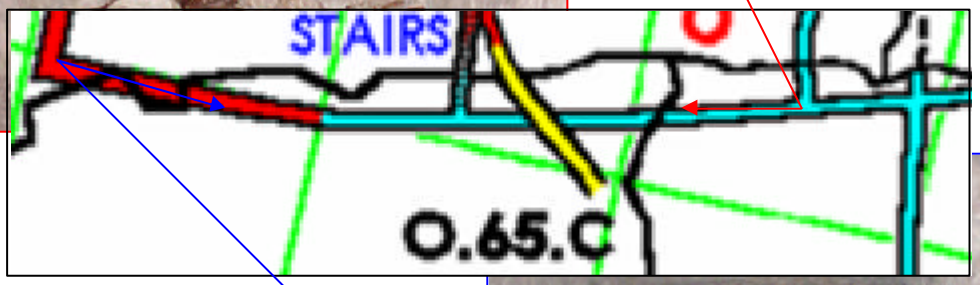




Photo 71 (right)

The main lateral looking south from No.1 fighting tunnel

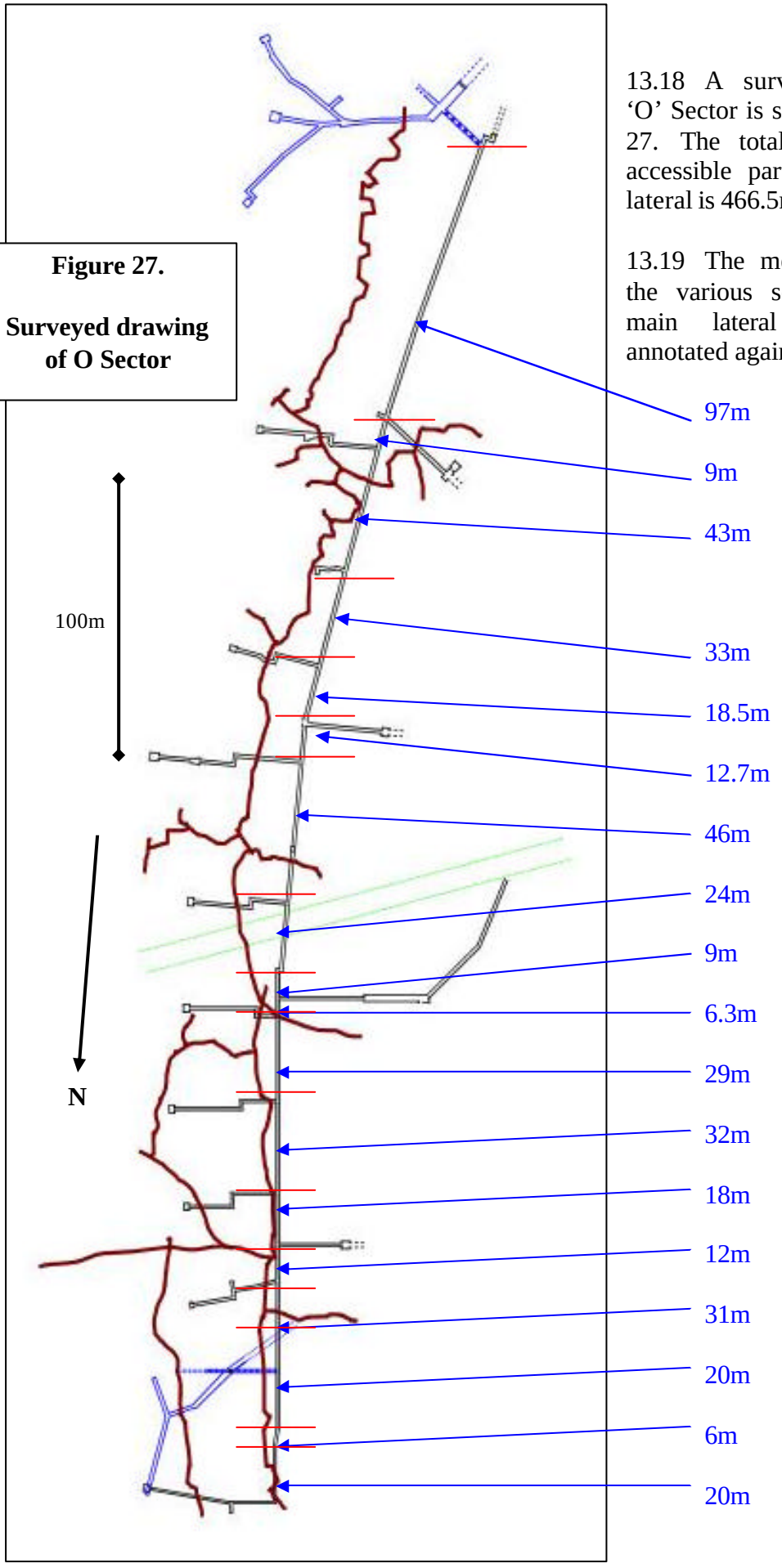


Figure 27.

Surveyed drawing of O Sector

13.18 A surveyed plan of 'O' Sector is shown at Figure 27. The total length of the accessible part of the main lateral is 466.5m (1530ft).

13.19 The measurements of the various sections of the main lateral are shown annotated against the plan.

14 THE O.65.D INCLINE GALLERY

14.1 The O.65.D incline gallery was investigated. A plan of the incline gallery is at Figure 28. The tunnel connecting the base of the incline to the main lateral was 22m long and measured 1.35m high and 0.9m wide. The cut-outs in the floor of the tunnel for wooden sleepers were visible along the length of the connecting tunnel (Photo 72). Closer to the incline there was considerably more evidence of decayed timber supports (Photo 73).

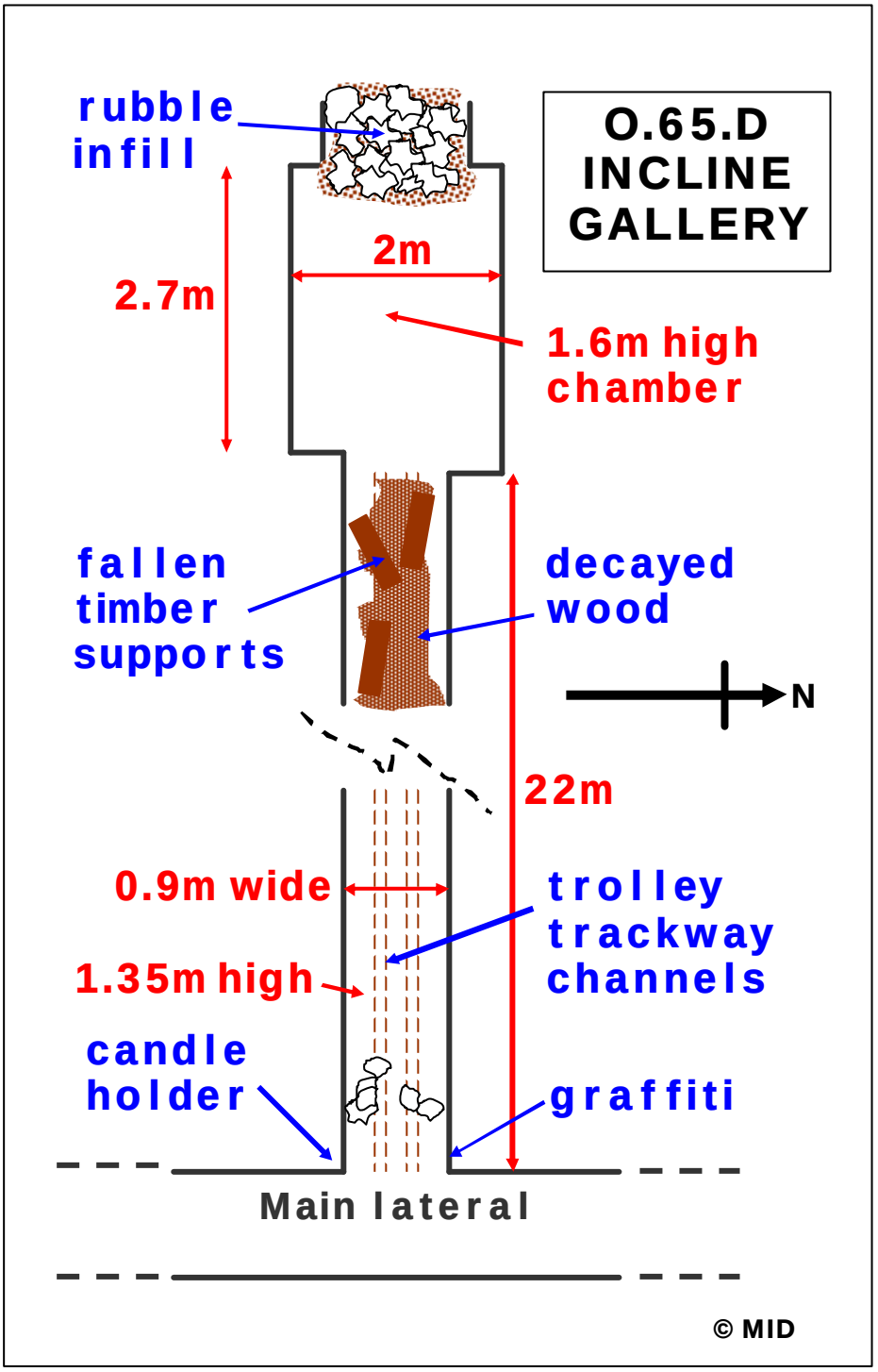


Figure 28. The O.65.D Incline Gallery



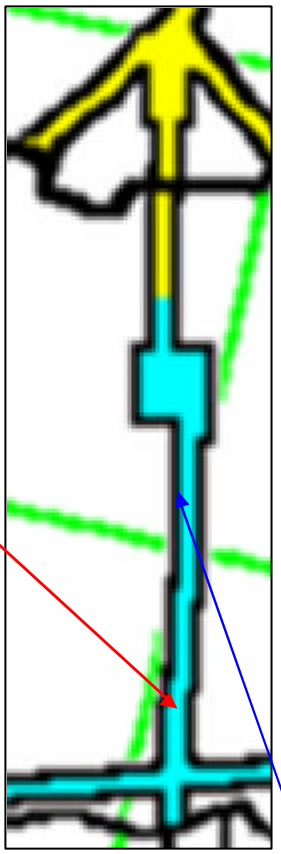




Photo 72 (above)

The O.65.D tunnel seen from the junction with the main lateral. The line of the trolley tracks is clearly visible in the chalk floor

Photo 73 (right)

The O.65.D tunnel nearer the incline. Note the decayed timber remains from supports on the floor

14.2 The tunnel from the main lateral ended in a small chamber at the base of the incline. The chamber measured 2.7m long by 1.6m high. The incline running west up from the chamber was blocked solid with large chalk blocks and the remains of the timber supports from the tunnel and an assumed winch platform (Photo 74). Within the chamber there was a solitary graffiti scrawl showing the name of 'Sapper A Kins' (Photo 75).



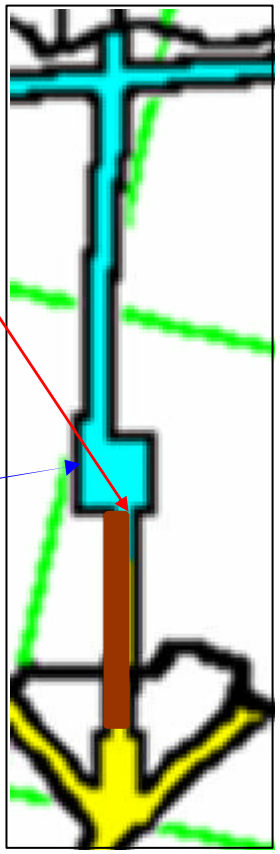
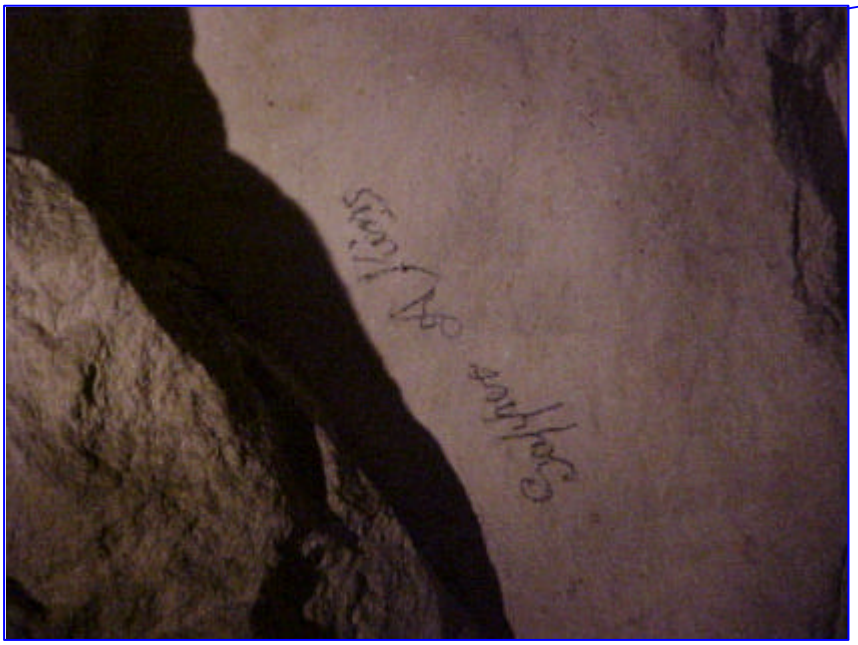


Photo 74. The blocked O.65.D incline gallery

Photo 75. Graffiti in the chamber – 'Sapper A Kins'



14.3 At the junction of the inclined gallery with the main lateral the tunnel is clearly marked on the northern corner of the wall and as shown in Photo 76. The inscription 'To O.65.D' and an arrow have been marked in purple ink. Below this another inscription had also been written in purple ink indicating that this tunnel was the 'O65D Downcast' (Photo 77). This suggests that O.65.D was used for the movement of men and materials down from the surface rather than up to the surface, easing potential congestion problems.

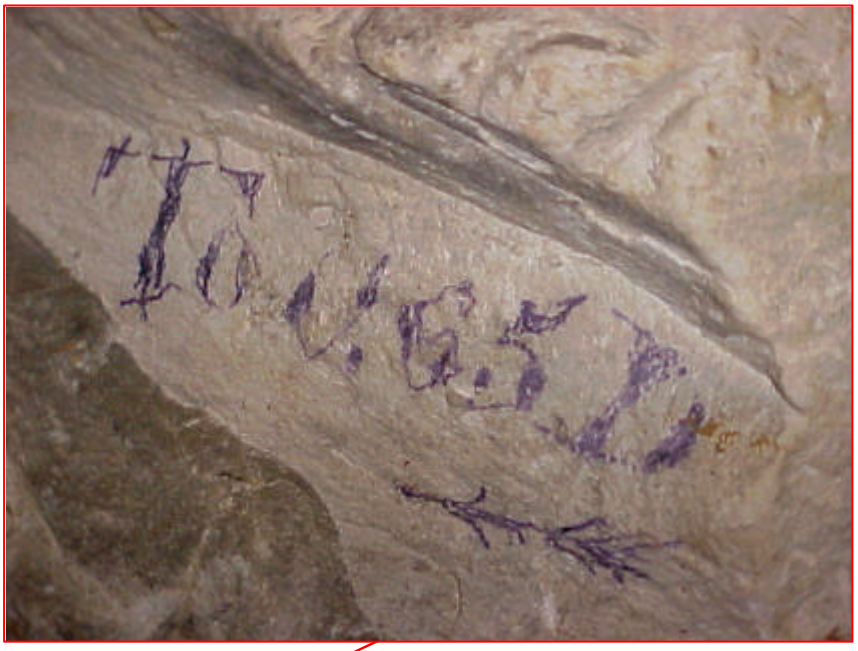
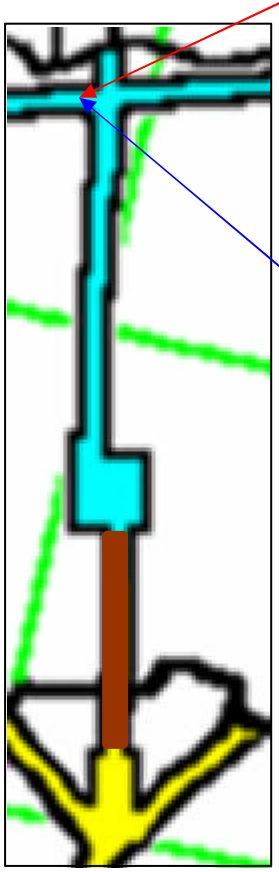


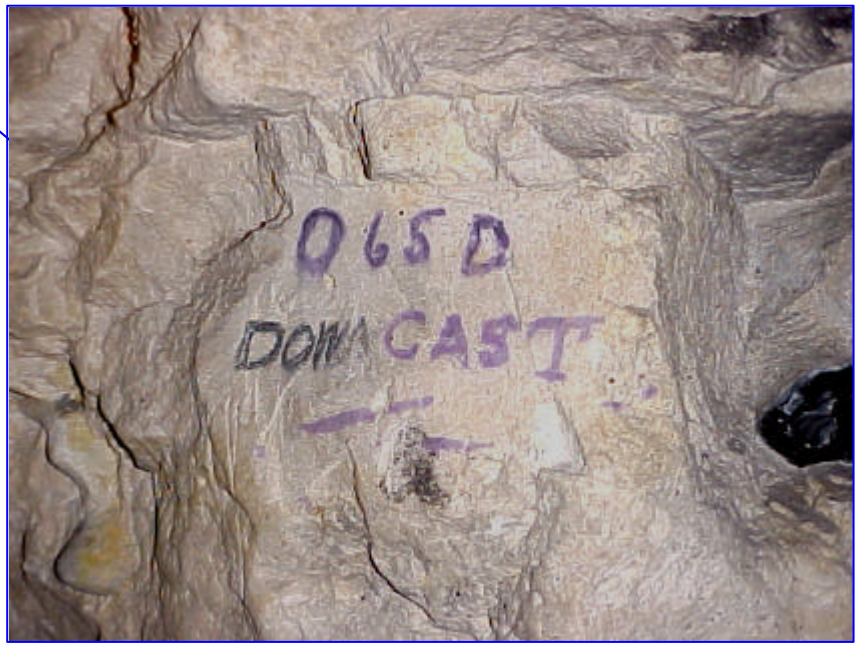
Photo 76 (left)

O.65.D ink marker on the chalk wall

Photo 77 (below)

'O65D Downcast' ink marker on the chalk wall





14.4 On the opposite corner of the tunnel from the graffiti a small niche had been dug into the chalk to hold a candle for lighting purposes. In the niche there was a small candle holder manufactured from the base of a food tin. The stub of a candle was found in the candle holder and there was evidence of soot stains on the chalk wall immediately above the holder (Photo 78).



Photo 78

Rusted remains of a candle holder with the stub of a candle in it and 'soot stains'

15 THE O.64.D INCLINE GALLERY

15.1 The O.64.D incline gallery was investigated. A plan of the gallery is at Figure 29. The tunnel connecting the base of the incline to the main lateral was 26.3m long and measured 1.35m high and 0.9m wide. Along the length of this tunnel the decaying stumps of wooden tunnel supports were visible and there were extensive patches of decaying wood on the tunnel floor. The channels in the chalk floor for the trolley tracks were clearly visible (Photo 79).

15.2 The chamber at the base of the incline measured 2.55m in length by 2m wide and was 2m high. The incline was completely blocked. The infill was largely clay with small chalk rubble (Photo 80) and differed from that in O.65.D which comprised mainly of large chalk blocks and little clay. The incline infill had spread out onto the floor of the chamber for a distance of a metre or so. There was no evidence of any winch cable and the chamber contained no graffiti.

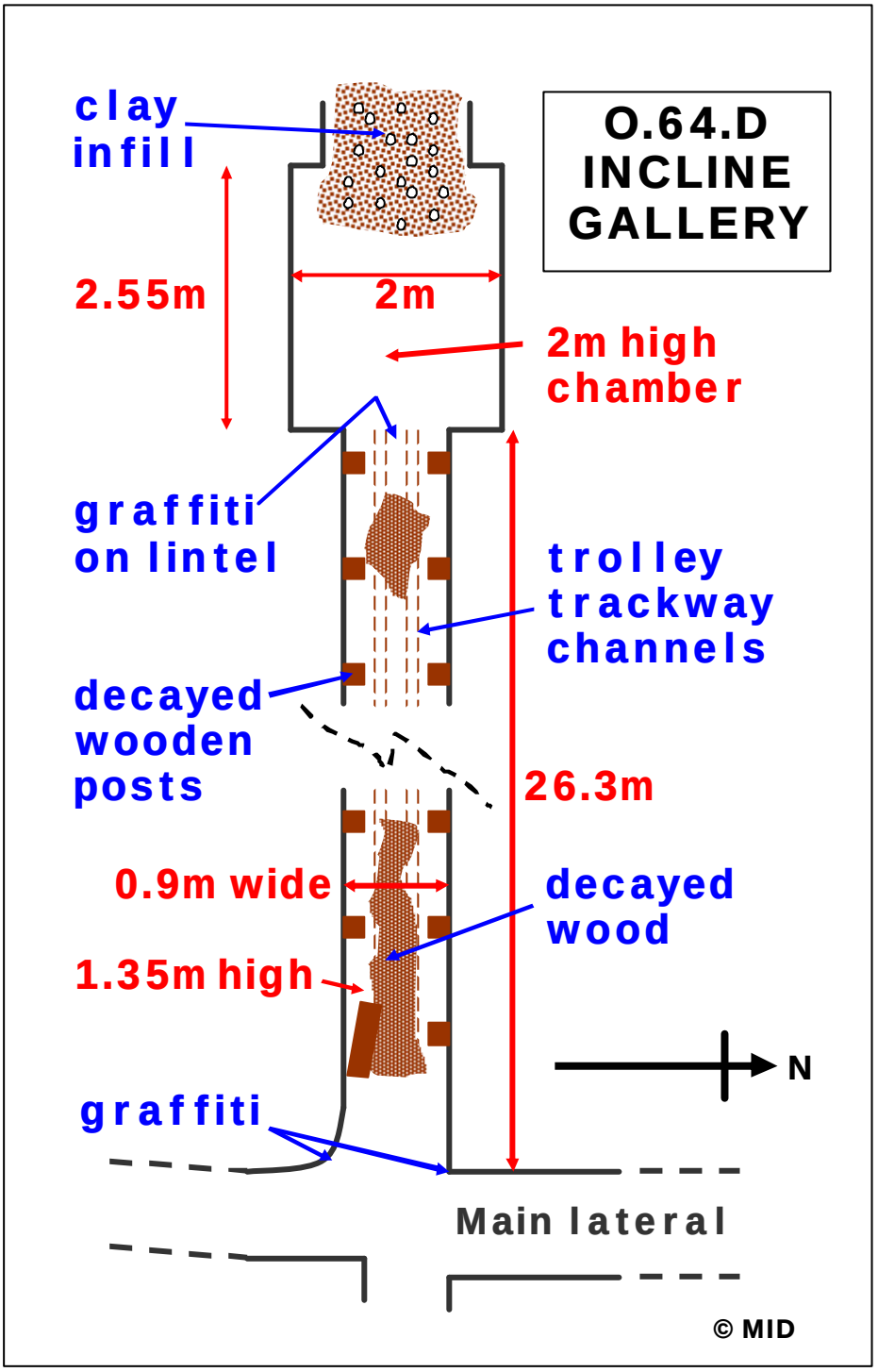


Figure 29. The O.64.D Incline Gallery

15.3 At the entrance to O.64.D on the main gallery there are several pieces of graffiti on the chalk walls. On the northern corner the tunnel is marked as the 'O64D Upcast' and the 'Proto House' rescue station is arrowed (Photo 81). A rusted nail has been hammered into the wall at this point. On the southern corner there are some indecipherable scribbles. One of these is possibly a carved inscription giving a name and number (Photo 82). The other (Photo 83) is a pencil inscription showing 'XV' and an unknown character, possibly 'C'.



Photo 79 (left)

The O.64.D tunnel leading to the incline. Note the fallen timbers on the floor

Photo 80 (below)

The blocked incline gallery Compare the infill with that of O.65.D in Photo 112





Photo 81 (left)

Graffiti at the entrance to the 'O.64.D Upcast' and 'Proto House'



Photo 82. Possible name and number carving on the chalk wall at the junction of O.64.D and the main lateral

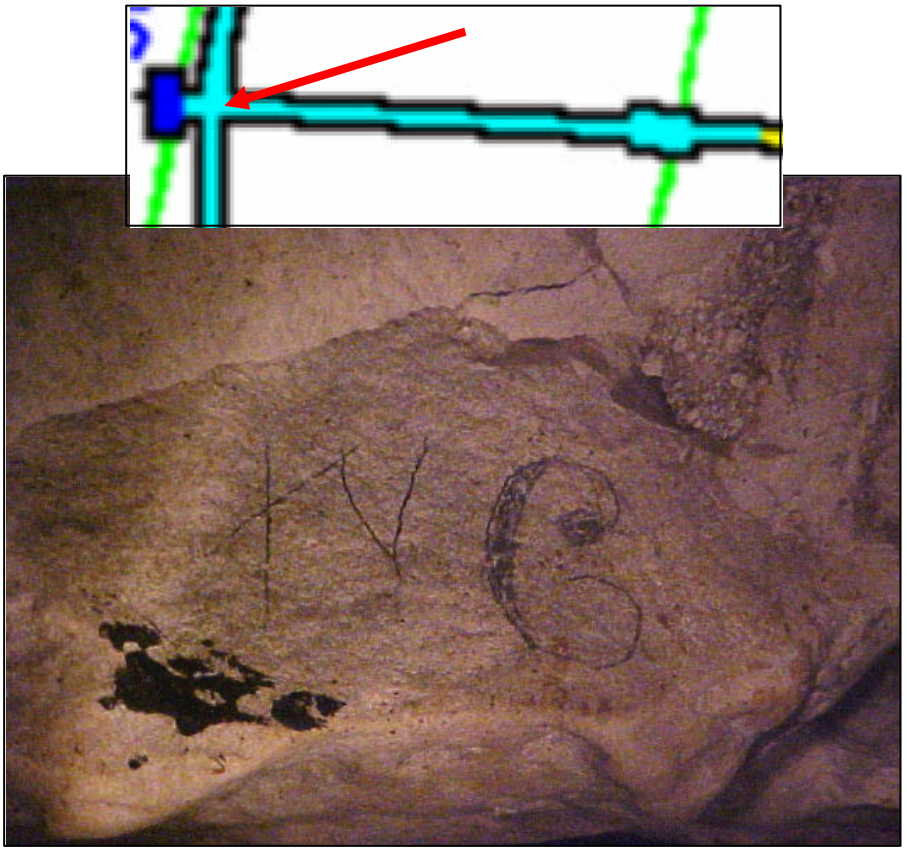


Photo 83. Pencil inscription on the chalk wall at the junction of O.64.D and the main lateral

16 THE O.63.E INCLINE GALLERY

16.1 The O.63.E incline gallery was investigated. A plan of the gallery is at Figure 30. The tunnel connecting the base of the incline to the main lateral was 27m long and measured 1.3m high and 0.9m wide. Unusually, there was no identifying graffiti at the intersection of the gallery with the main lateral (Photo 84). Along the length of this tunnel grooves for wooden sleepers in the floor were apparent (Photo 85). There are some patches of decaying wood on the tunnel floor and some loose chalk blocks although the tunnel is largely clear.

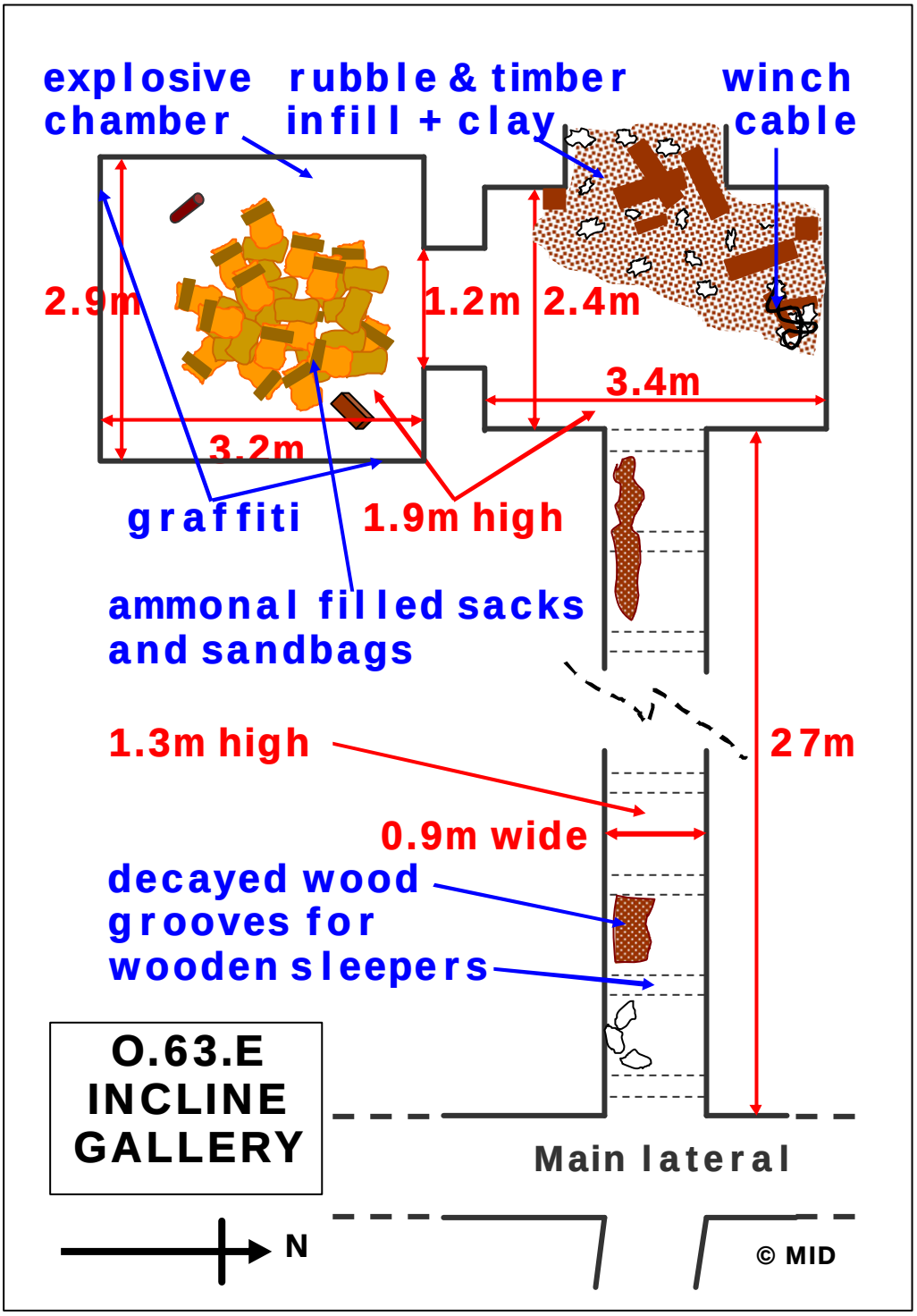


Figure 30. The O.63.E Incline Gallery

16.2 The chamber at the base of the incline measured 2.45m in length by 3.4m wide and was 1.9m high. The incline was completely blocked. The infill was largely clay with some small chalk rubble interspersed (Photo 86). The rubble also contained a number of substantial, decaying timbers that were probably washed down from the winch chamber above. The incline infill had spread out onto the floor of the chamber for a distance of 2 metres or so, especially on the northern side.

16.3 There were two upstanding timber supports still in position in the chamber either side of the incline itself. On the floor by the northern edge of the chamber a 5m length of the winch cable was discovered wrapped around a decaying timber support (Photo 87). One end of the cable disappeared into the clay spill and it is possible that this continued to run up the incline. No attempt was made to excavate this area and it is possible that a winch trolley remains in position. There was no evidence of graffiti in this chamber.

16.4 To the south of the chamber at the base of the incline there is an explosives store. This store measures 2.9m in length by 3.2m wide and 1.9m high. The entrance to the explosive store was 1.2m wide and 0.3m deep. Above the doorway of the explosive store there were a number of indecipherable graffiti markings created from the soot of a candle. Further similar examples were found on the roof of the explosive store. These were also similar to other markings elsewhere in the system.

16.5 Within the store there were approximately 50 ammonal sacks and ammonal filled sandbags. These were strewn around the store rather than stacked (Photo 88). Despite some dampness in the chamber the sandbags were in very good condition and retained their strength and durability. An empty ammonal box (Photo 89) was in the north east corner of the store. This box would have originally contained three tin cases each containing 84 x 4oz ammonal cartridges. A considerable quantity of loose ammonal was also strewn around.

16.6 A number of double sack ammonal bags were also noted in the chamber (Photo 90). With each bag filled with only 10-15lbs of explosive each these 'saddlebag' arrangements made transport along the tunnels easier by being suitable for carriage over the shoulder. Samples of the ammonal explosive from various sacks and sandbags were removed for later analysis. Although some leaching of the ammonium nitrate content has occurred the ammonal was found to still be a viable explosive composition.

16.7 In the south west corner of the explosive store the rusted remains of a heavy (30lb explosive) mobile charge were found beneath a number of ammonal bags. Measuring 24" long by 7" diameter the mobile charge was found in two parts and no explosive remained in the casing and no fuzing system was discovered (Photo 91). The remains of the canvas flap over the fuze system in the cap of the charge was still found in place although no evidence of the carrying strap or handle remained. A plan of the charge from the RE Experimental handbook is at Figure 31.

16.8 Within the explosive store a number of examples of graffiti were found on both the southern and eastern walls. One of these is an ink drawn picture of a woman wearing a hat (Photo 92). One is an engraved monograph (Photo 93) and another is the number '24' and a series of lines (Photo 94). The fourth example if a series of numbers (44 – 46 – 48 – 50 – 72) which may be a record of the number of ammonal bags contained in the explosive store (Photo 95).



Photo 84 (left)

Junction of O.63.E with the main lateral

Photo 85 (below)

The O.63.E gallery with sleeper grooves

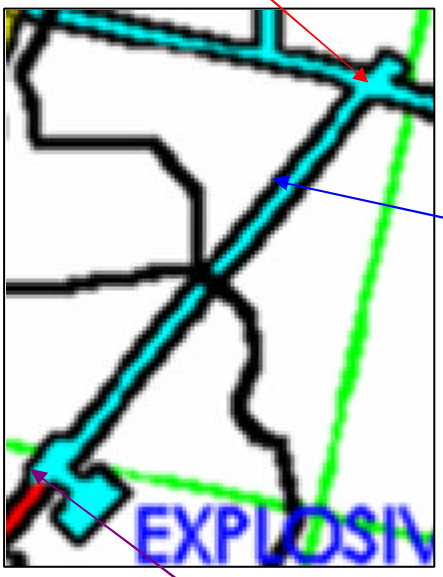






Photo 86 (left)

The infilled incline. Note the clay spill and the timbers



16.9 Within the store a legible copy of The Toronto Sunday World dated 11 March 1917 was also discovered. This has now been lodged by VAC with the National Archive in Ottawa.



Photo 87 (above)

Part of the winch cable in the chamber

Photo 88 (left)

The explosive store showing the disarrayed ammonal bags and sandbags

Photo 89 (below)

The ammonal box, ammonal bags and loose ammonal explosive





Photo 90 (left)

Saddlebag ammonal sack with single wooden batten

Photo 91 (below)

‘Heavy’ mobile charge – 30lbs of explosive



Figure 31 (below)

Plans taken from the RE Experimental Handbook showing mobile charges

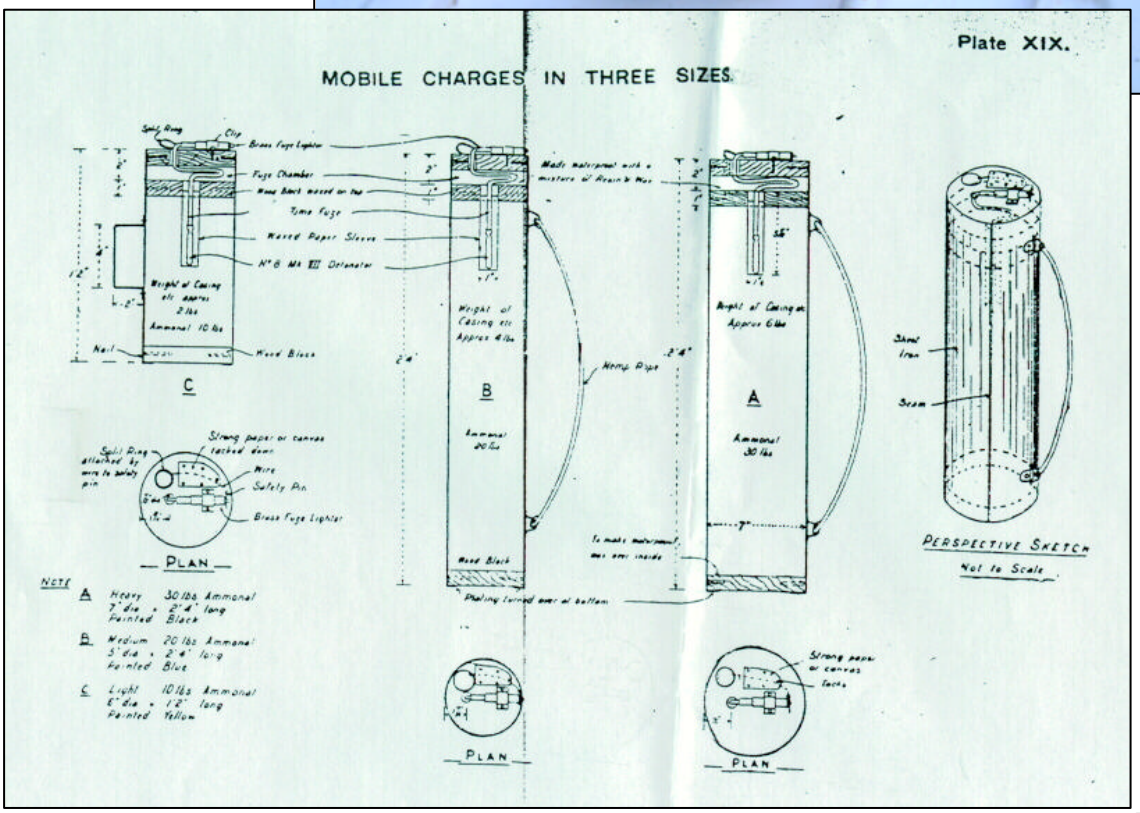




Photo 92 (left)

Ink drawing on chalk of a woman wearing a hat



Photo 93 (right)

Engraved monogram



Photo 94 (left)

Ink on chalk number and markings



Photo 95 (right)

Ink on chalk sequence of numbers – perhaps the number of explosive sacks in the store

17 NO. 1 FIGHTING TUNNEL – O.65.D.2.2

17.1 The No. 1 fighting tunnel was investigated. This is shown on the master plan as O.65.D.2.2. A plan of the tunnel is at Figure 32. This drive appears to have been dug to protect the northern flank of Chassery crater. Its location below the higher level offensive O.65.D.2 is interesting. It may have been intended to protect against any German mining efforts from Chassery crater itself. The total length of the No.1 drive is 43m and the tunnel is 0.9m wide and 1.7m high and has a 10° bend to the south in it at the 15m point.

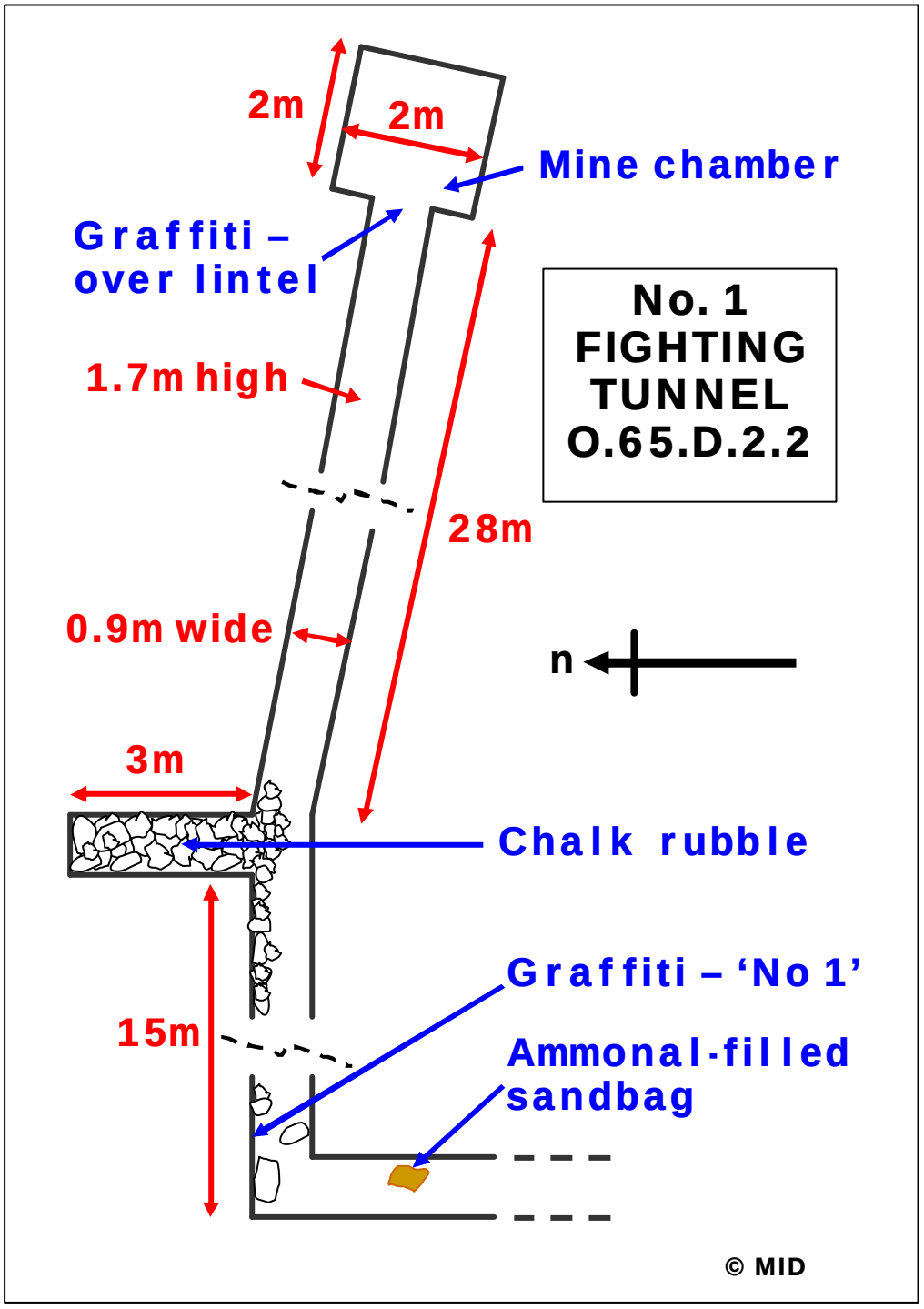


Figure 32. The No. 1 Fighting Tunnel (O.65.D.2.2)

17.2 At the northern extreme of the main lateral the tunnel takes a 90° turn to the east to form the No.1 fighting gallery. At the junction there is a large chalk block on the floor beneath an orange surveyors' mark bearing the number '38' (Photo 96). On the northern wall close to the block the number of the tunnel has been written in purple ink as 'Nº.1' (Photo 97). Along the left hand side of the drive from this point chalk blocks and debris, presumably from the mine chamber, has been stacked ready to be used as tamping if necessary (Photo 98).

17.3 At the bend in the tunnel another drive has been started at right angles to the north, towards 'P' Sector. Of similar dimensions to the main tunnel this drive is, however, only 3m deep and has been backfilled with chalk debris, again presumably from the mine chamber (Photo 99). The reason why this small tunnel was originally dug is not known. It could be that originally 'O' Sector was going to be extended further to the north. It is possible, although considered unlikely, that the intention may have been to join 'O' and 'P' sectors.

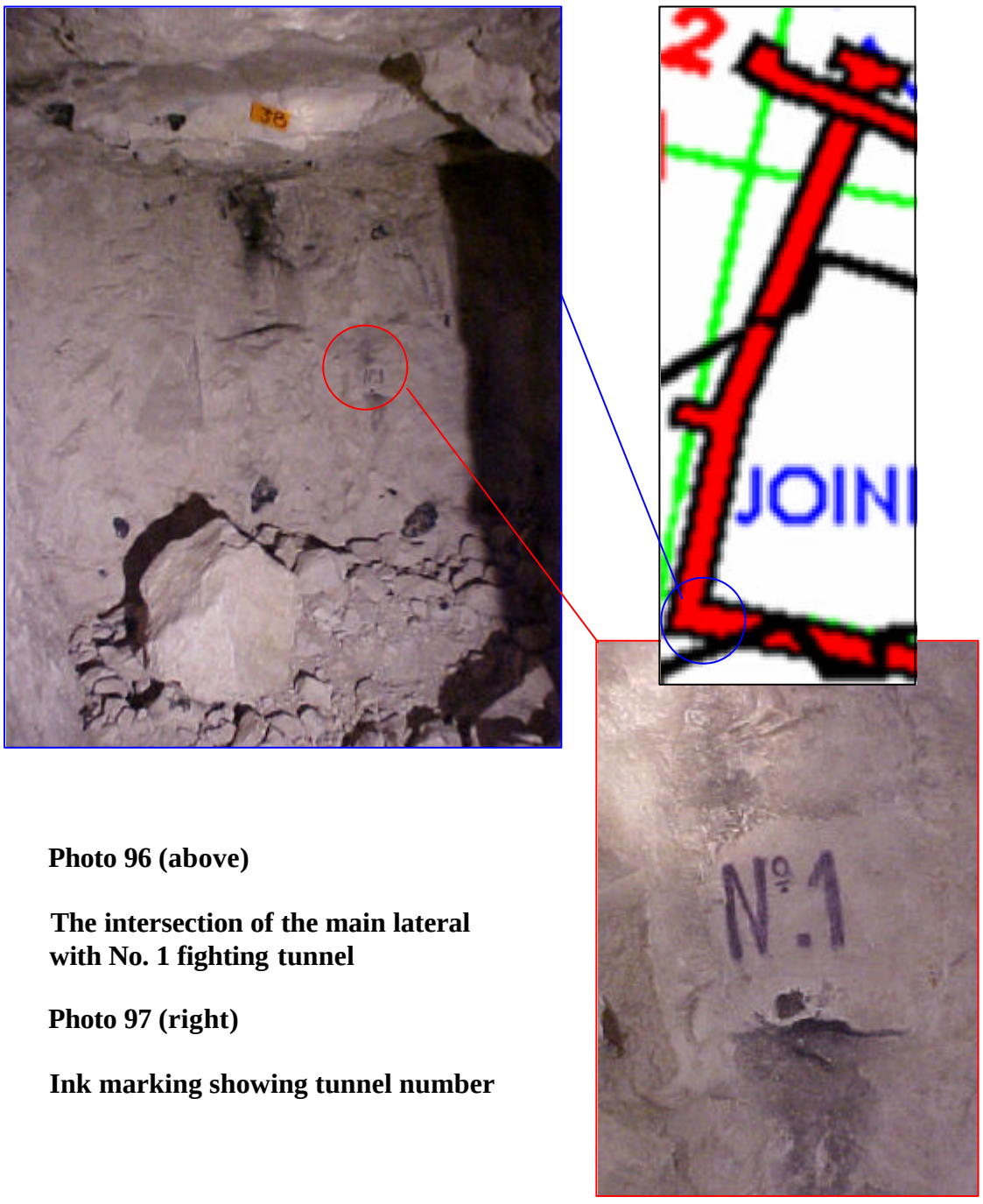


Photo 96 (above)

The intersection of the main lateral with No. 1 fighting tunnel

Photo 97 (right)

Ink marking showing tunnel number



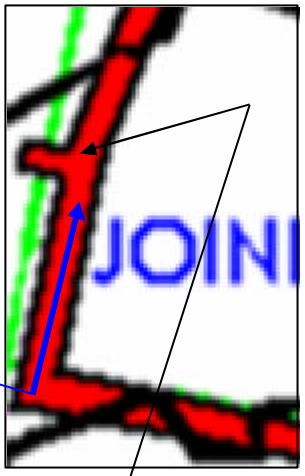




Photo 98 (above)

Looking east along the No. 1 drive with chalk debris for tamping stacked along the tunnel wall

Photo 99 (right)

The small northern drive off the No. 1 fighting tunnel backfilled with chalk debris

17.4 From the small side tunnel the rest of the No.1 gallery is largely clear of any debris on the floor (Photo 100). There is no indication of any trolley trackway having ever been in the tunnel. At the end of the drive the tunnel opens up into a mine chamber measuring 2m x 2m x 2m (Photo 101). The mine chamber is also largely clear of any chalk debris on the floor. There is only one example of graffiti in the chamber and this is located above the entrance lintel. This takes the form of a pencil drawn picture of a boxer with the wording 'the Lightweight Champion Pte Dann' (Photo 102).



Photo 100 (left)

Looking back along the No. 1 fighting tunnel from the entrance to the mine chamber



Photo 101 (right)

Andy Prada inside the No. 1 fighting tunnel mine chamber

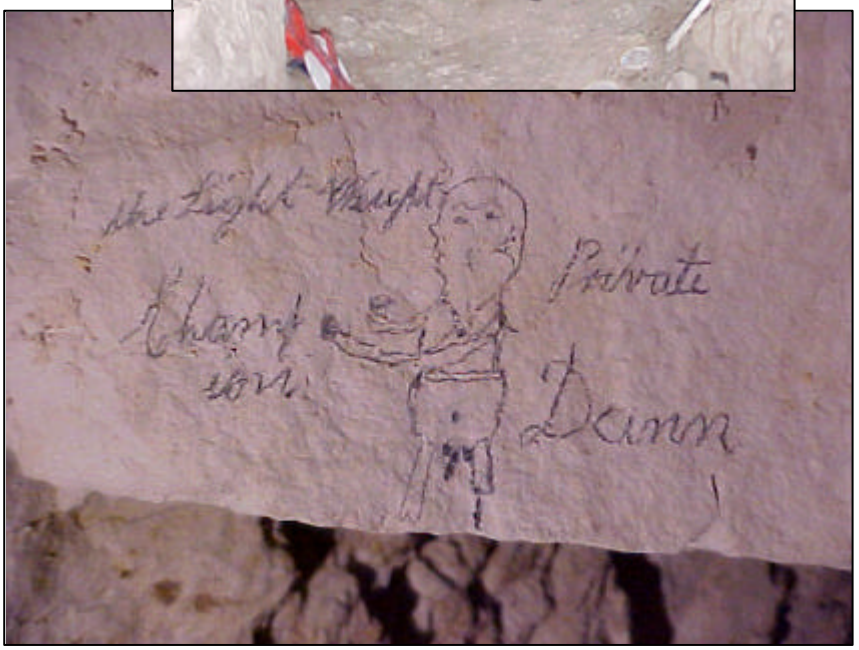


Photo 102 (right)

Pencil drawing of 'Pte Dann' - the lightweight boxing champion

17.5 It was noted that 5m along the main lateral from the No.1 fighting tunnel an ammonal filled sandbag had been dropped (Photo 103). Although the documentary record provides no evidence it is possible that the No.1 fighting tunnel mine chamber might have been charged at some point or made ready for charging with ammonal bags and sandbags placed on the main lateral ready for charging. Although there was no evidence of ammonal in the mine chamber closer examination of the area around the sandbag revealed traces of ammonal along the tunnel floor close to the east wall for a distance of several feet in each direction.



Photo 103. The dropped ammonal-filled sandbag in situ in the main lateral close to No. 1 fighting tunnel

18 NO. 2 FIGHTING TUNNEL – O.65.D.2.1

19.1 The No. 2 fighting tunnel was investigated. This is shown on the system plan as O.65.D.2.1. A plan of the gallery is at Figure 33. The tunnel was dug at 90° to the main lateral for 7.5m before changing direction 10° further to the south for a further 7.5m. At this point the tunnel splits left and right. The main drive is to the left for 3m before a 90° turn to the east where the tunnel is driven for a further 15.3m to a mine chamber. Chalk debris ready to be used as tamping is positioned along the northern side of the tunnel wall (Photo 104). The tunnel is 0.9m wide and 1.7m high.

18.2 The right hand drive at the 'T' junction is a dead-end running for only 3m and then a 90° turn east for less than half a metre. This tunnel has been backfilled with chalk blocks and debris, presumably taken from the left hand drive of the gallery (Photo 105). Impressions on chalk blocks in this debris indicate that the lower layers were originally contained in sandbags (Photo 106). Why this branch of the tunnel was abandoned is not known and there is no reference to it in the available records.

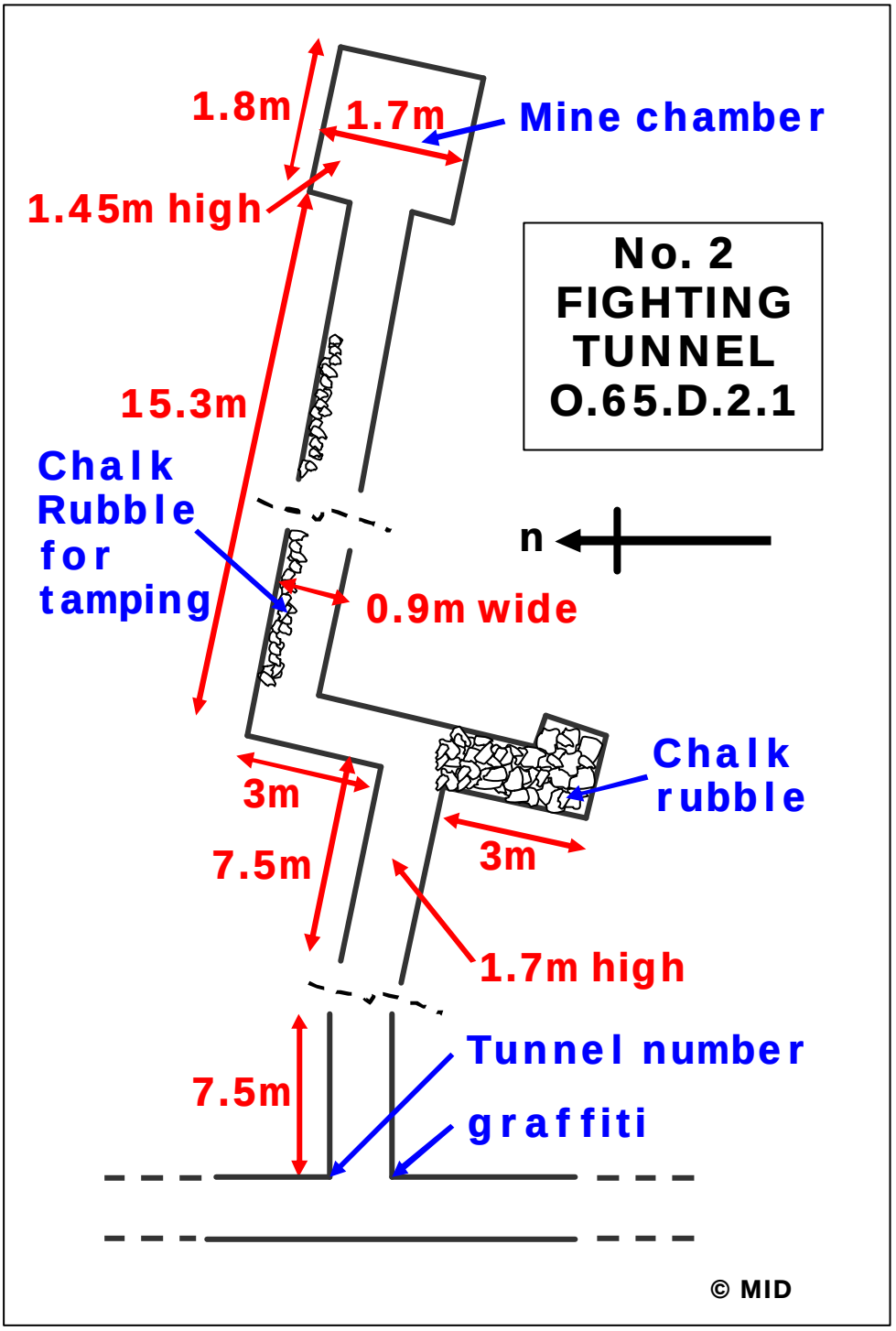


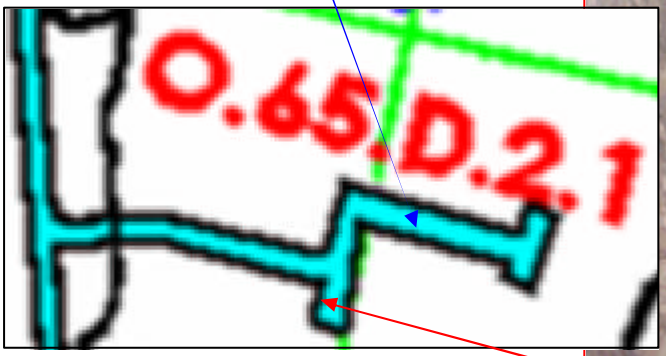
Figure 33. The No. 2 Fighting Tunnel (O.65.D.2.1)

18.3 The mine chamber measures 1.8m wide by 1.7m deep and is 1.45m high; the height gradually diminishing from 1.7m at the start of the gallery. The mine chamber itself is bare and contains no debris or graffiti. The only graffiti to be found in No.2 fighting tunnel is at the intersection of the tunnel with the main lateral. At this point the gallery number '2' is written in purple ink on the northern corner (Photo 107) whilst the initials 'DMP.' are written on the southern corner (Photo 108).



Photo 104 (left)

No.2 fighting tunnel looking towards the chamber. Note the chalk debris ready to be used as tamping material



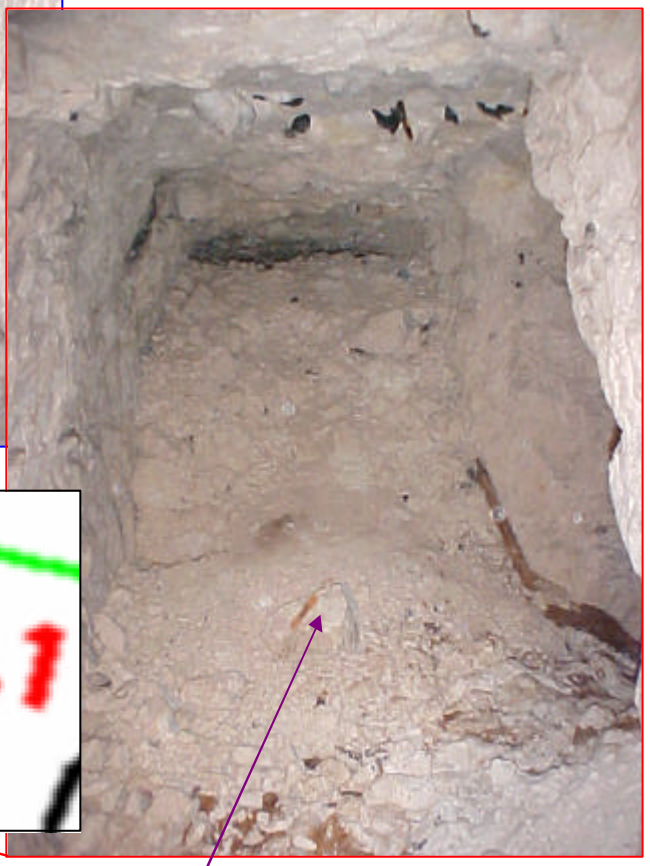


Photo 105 (above centre)

The blocked right hand drive of the tunnel.



Photo 106 (right)

Chalk debris showing material indentations from enclosure in a sandbag

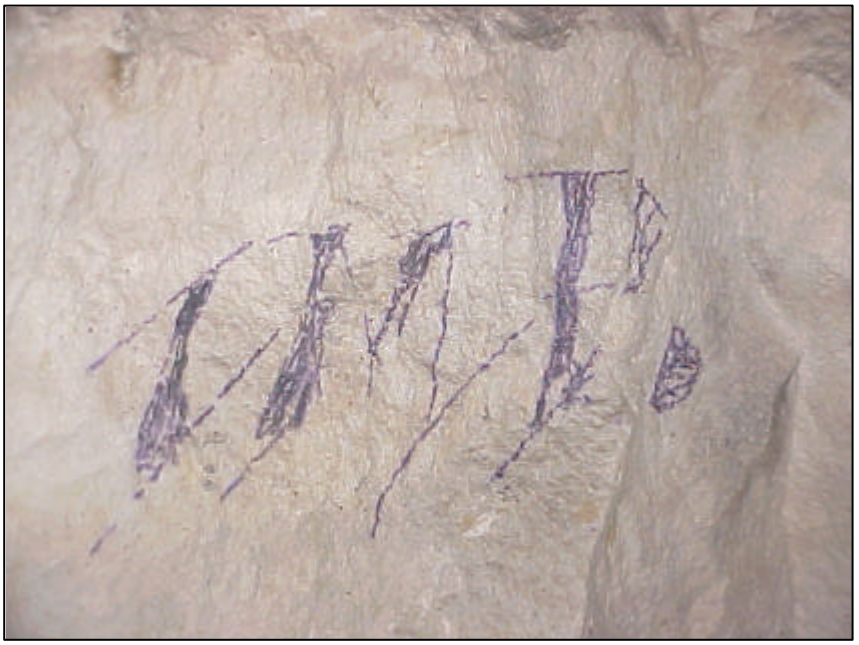


Photo 107 (left)

Ink drawn gallery number at the intersection of the tunnel with the main lateral

Photo 108 (right)

Ink drawn initials on the chalk wall at the intersection of the tunnel with the main lateral



19 NO. 3 FIGHTING TUNNEL – O.65.D.1.1

19.1 The No. 3 fighting tunnel was investigated. This is shown on the system plan as O.65.D.1.1. A plan of the tunnel is at Figure 34. This tunnel is one of the simplest of all in 'O' Sector. The gallery runs for 15m at 90° to the main lateral before making a dogleg to the north for 5m and then running another 15.3m to the mine chamber. The tunnel is 0.9m wide and 1.4m high; smaller than many of the other galleries. The tunnel is virtually completely clear of any debris (Photo 109) with only a small quantity of decaying timber from a tunnel support on the floor in one place.

19.2 At the junction of the tunnel with the main lateral the gallery number has been written onto the chalk wall in purple ink (Photo 110). On the roof of the mine chamber the soot from candles has been used to draw tunnel plans (Photo 111) and write various initials. In the mine chamber there are two ink drawings of women on the eastern wall (Photo 112). One drawing is of the head and shoulders of a woman wearing a hat. The other is of a female sailor dancing the sea shanty with a ship in the far distance.

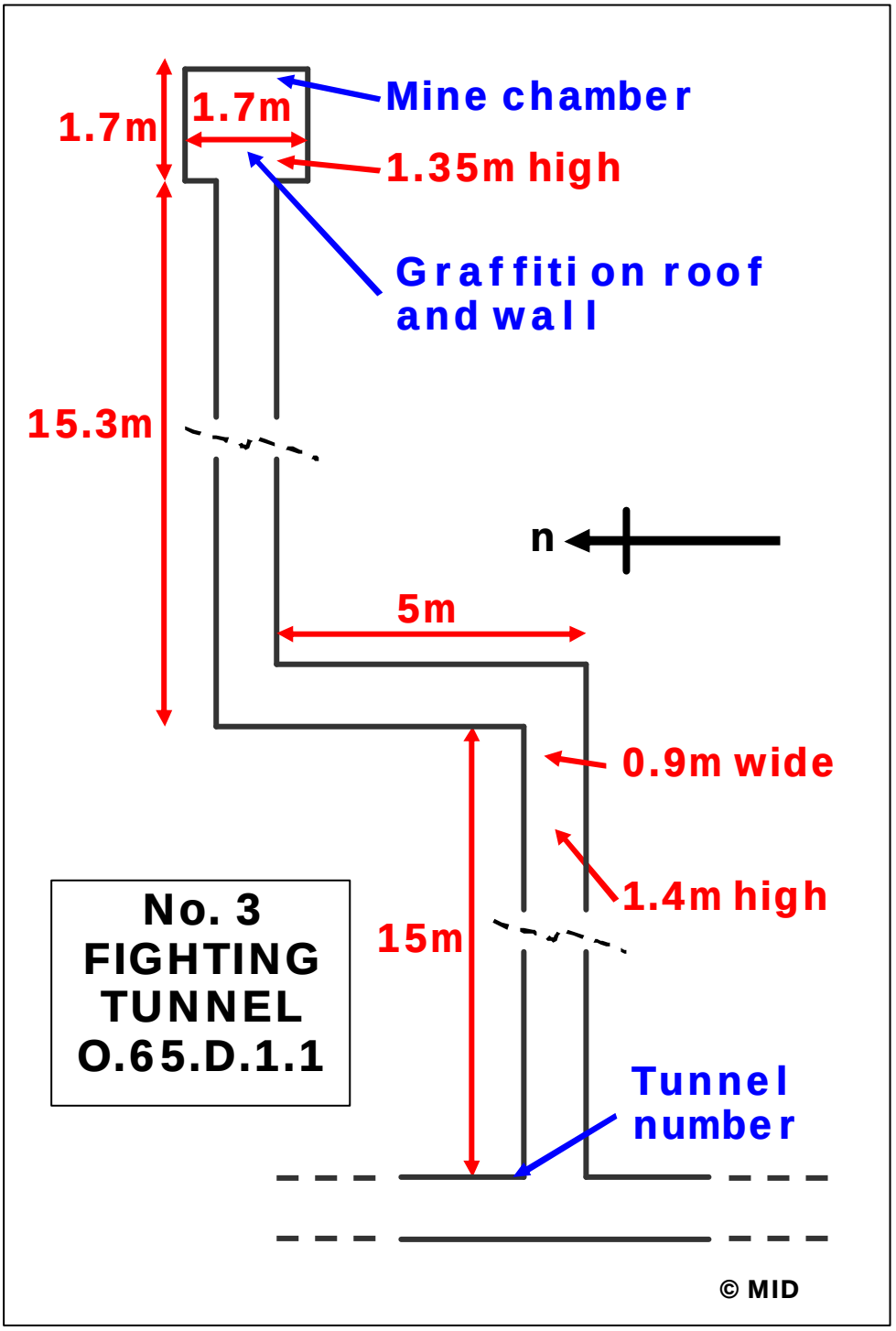


Figure 34. The No. 3 Fighting Tunnel (O.65.D.1.1)



Photo 109 (left)

View of No. 3 fighting tunnel from the intersection with the main lateral

Photo 110(below)

Tunnel number written in ink on the wall at the intersection with the main lateral







Photo 111 (left)

Plan of a tuunel system drawn in candle soot on the roof of the mine chamber



Photo 112. Graffiti in the O.65.D.1.1 Mine Chamber

20 NO. 4 FIGHTING TUNNEL – O.65.D.1.2

20.1 The No. 4 fighting tunnel was investigated. This is shown on the system plan as O.65.D.1.2. A plan of the tunnel is at Figure 35. The tunnel runs at 90° to the main lateral for 12m before taking a 3m long, left-hand dog-leg and then running for another 24m to the mine chamber. Throughout the drive the tunnel is 1.4m high and 0.9m wide (Photo 113). There are a number of small chalk blocks on the floor of the tunnel near to its connection to the main lateral. Apart from these the tunnel is relatively clear of debris. The tunnel is numbered at the entrance with an ink drawn '4' on the northern corner of the intersection with the main lateral (Photo 114).

20.2 The mine chamber measures 2m wide by 2m deep and is 1.35m high. The chamber is square cut and is clear of any debris on the floor. The tell-tale marks made by a mining pick are clearly visible in the walls and the roof of the chamber. There are a number of examples of graffiti within the chamber. On the roof of the chamber there are a number of indecipherable scrawls drawn by using the soot from a candle. Unlike those found in the chamber of No. 3 fighting tunnel these do not appear to be tunnel drawings, merely scrawled lines (Photo 115).

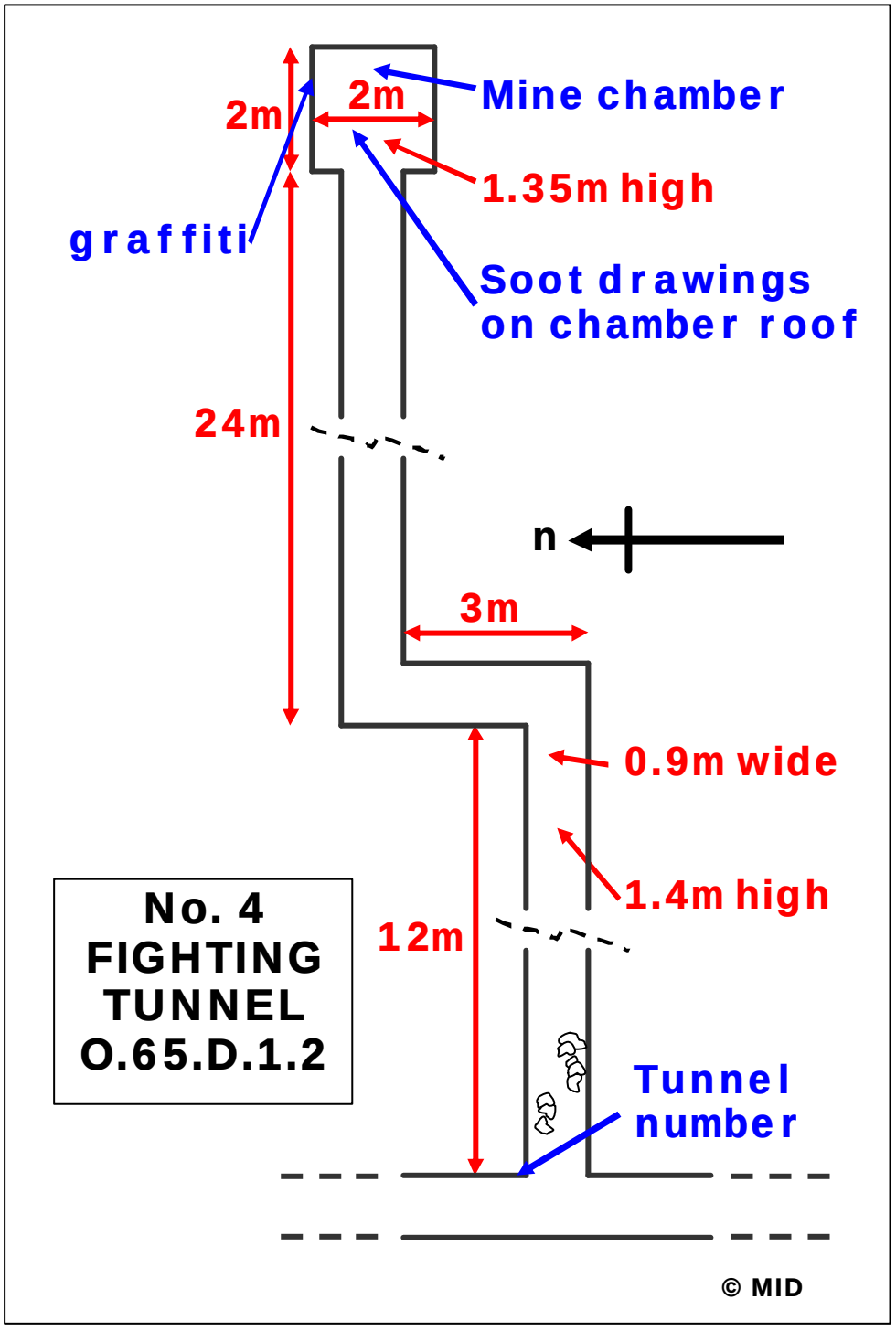


Figure 35. The No. 4 Fighting Tunnel (O.65.D.1.2)

20.3 The other most notable examples of graffiti found in the No.4 fighting tunnel mine chamber are located on the northern wall. Most noticeable are a picture of a partially sighted, one-legged soldier leading a military horse and cart (Photo 116) and uttering an obscenity and a pornographic picture of a naked woman and two flying phalluses (Photo 117). The only name found written within the chamber belongs to Pte Clayton (Photo 118) who scrawled his surname on the rear wall.



Photo 113 (left)

The main drive of the No. 4 fighting tunnel. Note that it is clear of any noticeable debris

Photo 114 (below)

Tunnel number written in ink on the chalk wall on the main lateral



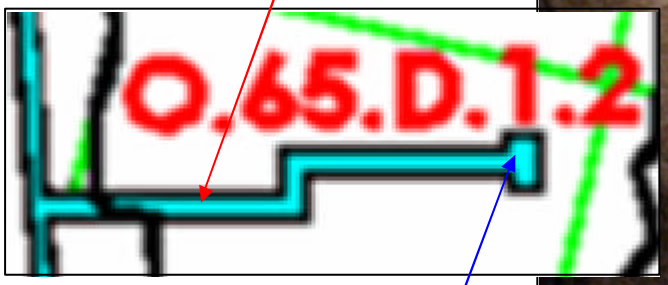




Photo 115 (left)

Scrawl on the roof of the chamber drawn using soot from a candle



Photo 116

Graffiti in the No. 4 mine chamber - swearing soldier



Photo 117

Graffiti in the No. 4 mine chamber - naked lady



Photo 118

Graffiti in the No. 4 mine chamber - 'W Clayton'

21 NO. 5 FIGHTING TUNNEL – O.64.E.1.1

21.1 The No. 5 fighting tunnel was investigated. This is shown on the system plan as O.64.E.1.1. A plan of the tunnel is at Figure 36. The tunnel runs at 90° to the main lateral for 8.5m before taking a 3m long, right-hand dog-leg and then running for another 23.3m to the mine chamber. Throughout the drive the tunnel is 1.4m high and 0.8m wide (Photo 119). Along the right hand side of the final drive chalk blocks have been stacked ready to be used as tamping. The tunnel is numbered at the entrance with an ink drawn '5' on the northern corner of the intersection with the main lateral (Photo 120).

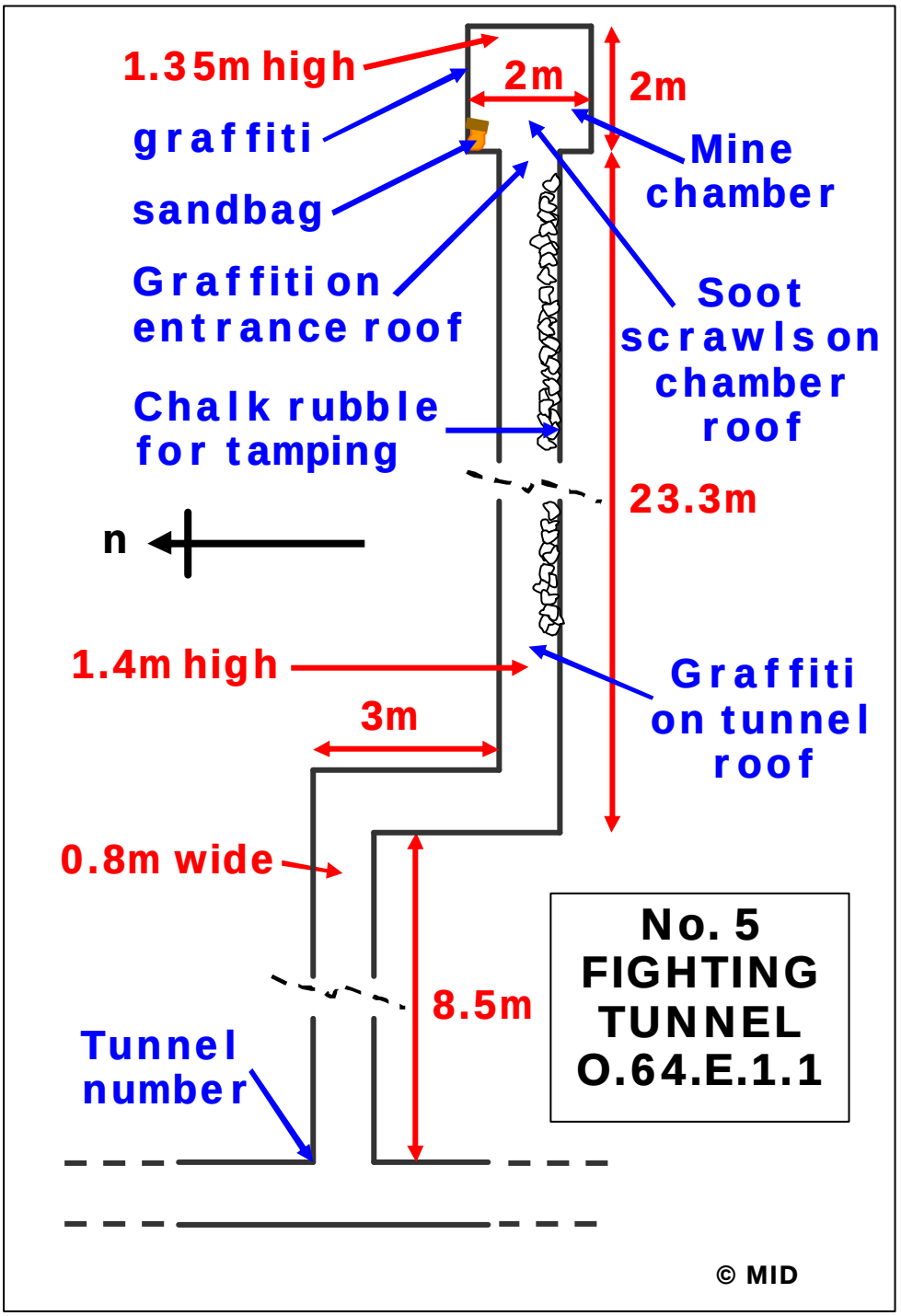


Figure 36. The No. 5 Fighting Tunnel (O.64.E.1.1)



Photo 119

The main drive of the No. 5 fighting tunnel as seen from the main lateral

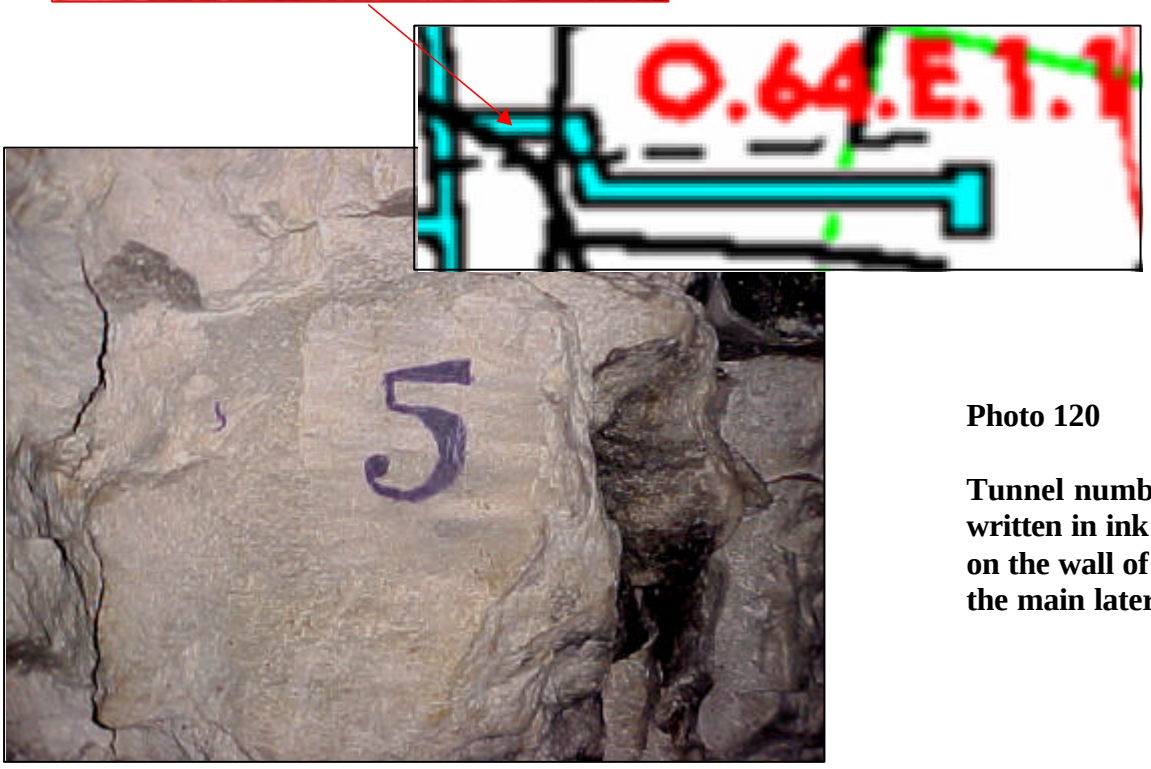


Photo 120

Tunnel number written in ink on the wall of the main lateral

21.2 Along the final drive of the tunnel there are also a number of examples of soot drawn scrawls on the tunnel roof. These are in two distinct areas. The first area is on the tunnel roof immediately prior to the entrance into the mine chamber (Photos 121 & 122). Both of the scrawls shown appear to be people's initials. The second area is on the tunnel roof approximately 2m past the dog-leg on the final drive (Photo 123). This area appears to comprise a jumbles assortment of letters and numbers.



Photo 121



Photo 122



Photos 121 & 122 (above & above left)

Examples of soot drawn graffiti from the entrance to the O.64.E.1.1 mine chamber

Photo 123 (left)

Soot drawn graffiti from the roof of the O.64.E.1.1 main tunnel drive

21.3 The mine chamber measures 2m wide by 2m deep and is 1.35m high. The chamber is square cut and is clear of any debris on the floor with the exception of a sandbag deposited in the north west corner. This is empty but may have originally contained ammonal explosive as traces were detected on the floor adjacent. There are a considerable number of examples of graffiti within the chamber. These take the form of pictures of objects (Photos 124 – 126), pictures of naked ladies (Photos 127 & 128) obscene drawings (Photos 129 & 130) and names. Notably Pte Clayton's name once again appears (Photo 131).

21.4 At the entrance to the mine chamber there are additional examples of graffiti. These are on the northern face of the tunnel adjacent to the entrance. These include the name 'Cpl Morris 25/2/17' (Photo 132) written in purple ink and a picture of a heart penetrated by an arrow with the words 'A FRANCE' and some additional words that have been smeared and are unreadable beneath the former written in black ink (Photo 133).

21.5 On the roof of the chamber there are a number of scrawls drawn by using the soot from a candle. One of these is clearly a tunnel plan (Photo 134) whilst a number of others are initials (Photos 135 – 138) and one appears to be an indecipherable jumble of letters and lines with no apparent meaning (Photo 139).

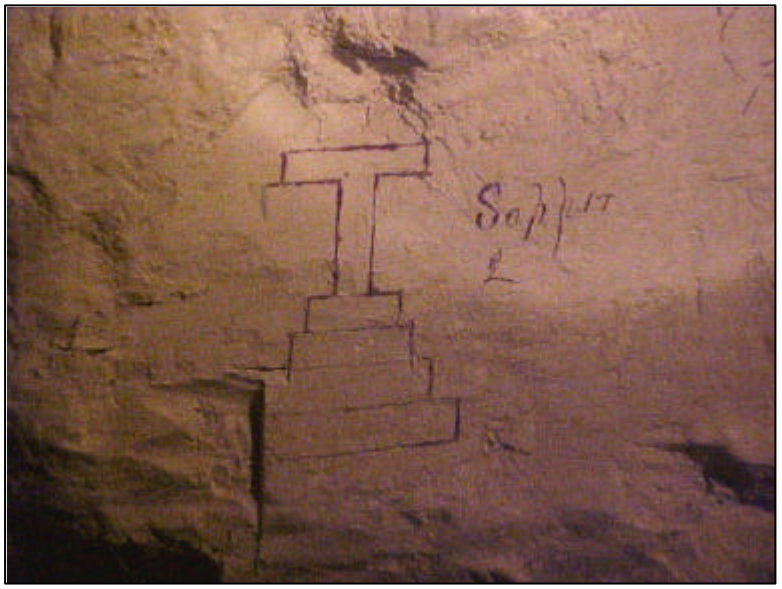


Photo 124

O.64.E.1.1 graffiti - Tunnellers emblem & ‘Sapper’ in purple ink



Photo 125

O.64.E.1.1 graffiti - Heraldic initials in purple ink



Photo 126

O.64.E.1.1 graffiti - Flower head in black ink



Photo 127 (left)

O.64.E.1.1 graffiti - reclining naked lady



Photo 128 (right)

O.64.E.1.1 graffiti - standing naked lady



Photo 129 (left)

O.64.E.1.1 graffiti - man and woman



Photo 130 (right)

O.64.E.1.1. graffiti - dog having sex with naked woman



Photo 131

O.64.E.1.1. graffiti - Pte Clayton strikes again!

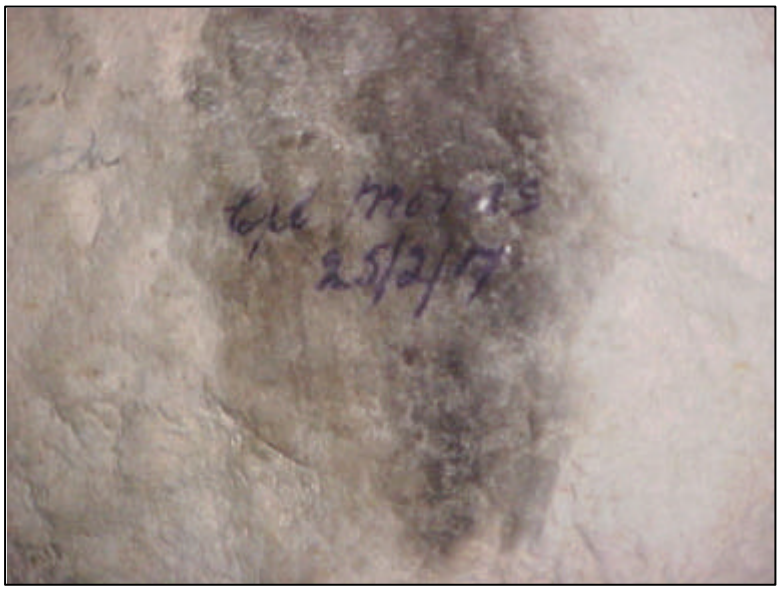


Photo 132

O.64.E.1.1 graffiti - 'Cpl Morris 25/2/17'

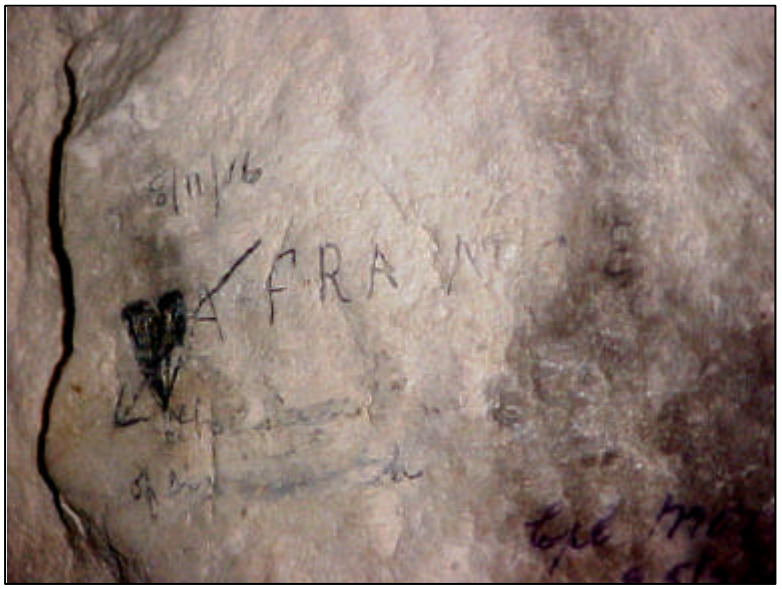


Photo 133

O.64.E.1.1 graffiti - pierced heart and accompanying words



Photo 134



Photo 135

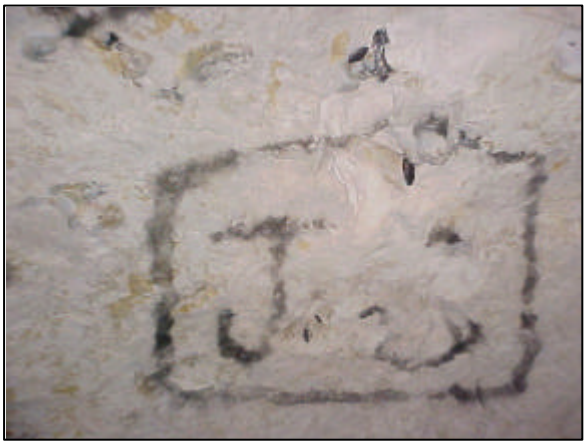


Photo 136



Photo 137



Photo 138



Photo 139

Photos 134 – 139. Examples of soot drawn graffiti in the No. 5 fighting tunnel

22 NO. 6 FIGHTING TUNNEL – O.64.D.2.2

22.1 The No. 6 fighting tunnel was investigated. This is shown on the system plan as O.64.D.2.2. A plan of the tunnel is at Figure 37. The tunnel runs at 90° to the main lateral for 11m before taking a 2.9m long, left-hand dog-leg and then running for another 20.4m to the mine chamber. Throughout the drive the tunnel is 1.2m high and 0.85m wide. Along the left hand side of the whole length of the tunnel there is chalk rubble piled ready to be used as tamping. Unlike the fighting tunnels there is no tunnel number on the main lateral.

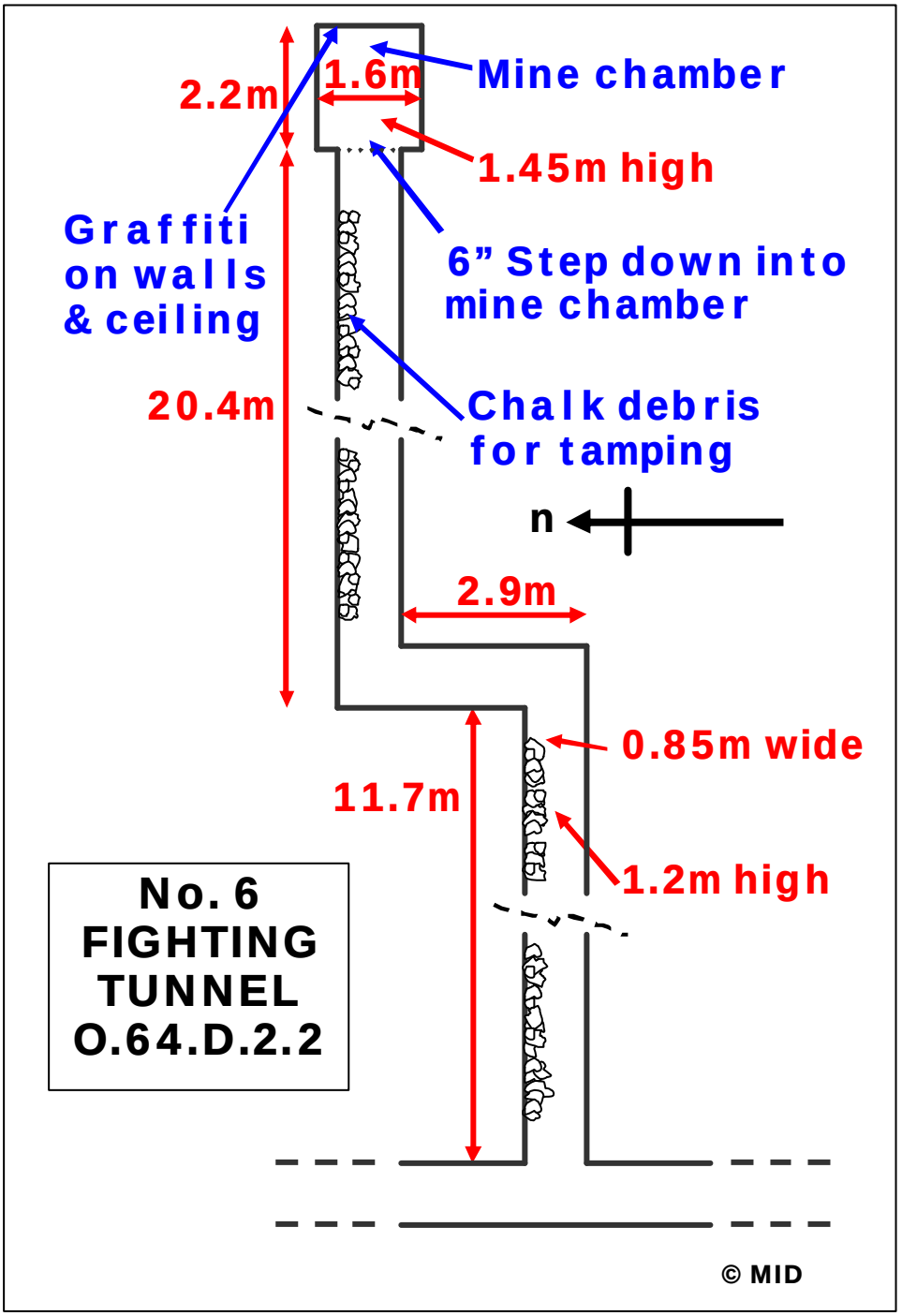


Figure 37. The No. 6 Fighting Tunnel (O.64.D.2.2)

22.2 Along the left hand side of the whole length of the tunnel there is chalk debris stacked along the left wall ready to be used as tamping. The mine chamber is 2.2m deep by 1.6m wide and is 1.45m high; there being a 6" step down into the chamber form the tunnel. There is some general graffiti on the walls of the chamber (Photos 140 – 142). Most notable of these is one that refers to 175 Tunnelling Company RE (Photo 143). There are also some lines of poetry within the chamber one of which is very difficult to read (Photos 144 & 145). There are also two examples of soot scribbles on the ceiling (Photos 146 & 147).



Photo 140

O.64.D.2.2 graffiti - 'Sapper L Davies'

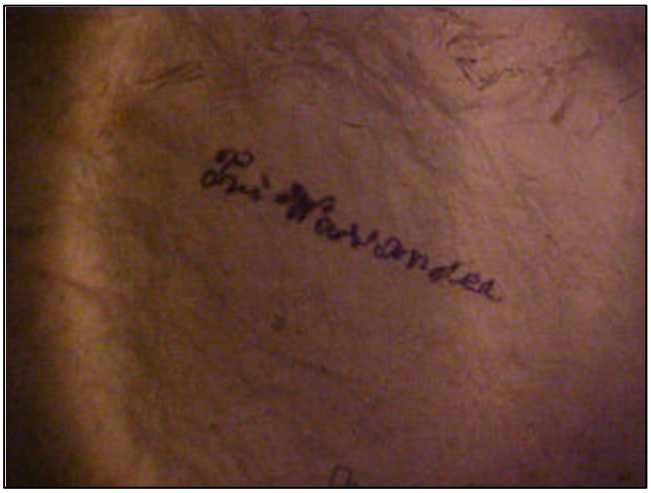


Photo 141

O.64.D.2.2 graffiti - 'Pri Waranden'



Photo 142

O.64.D.2.2 graffiti - 'A King 1st January 1917 The tired dream Of HOME'

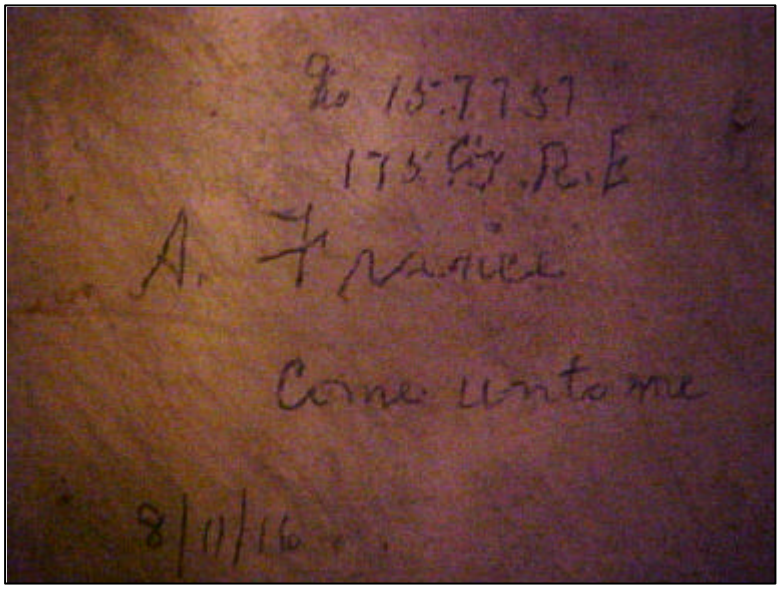


Photo 143

O.64.D.2.2. graffiti - 'No 157757 175 Coy RE A Francis Come unto me 8/11/16'

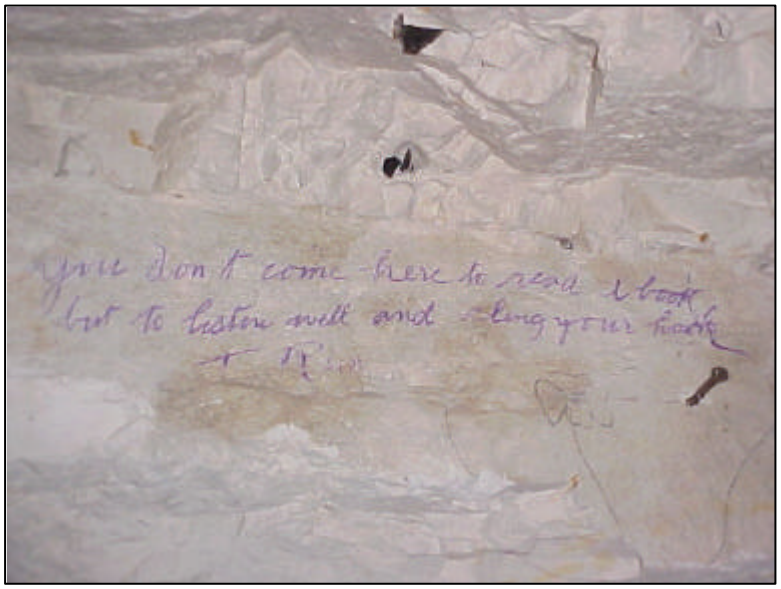


Photo 144

O.64.D.2.2 graffiti - 'You don't come here to read a book but to listen well and sling your hook'

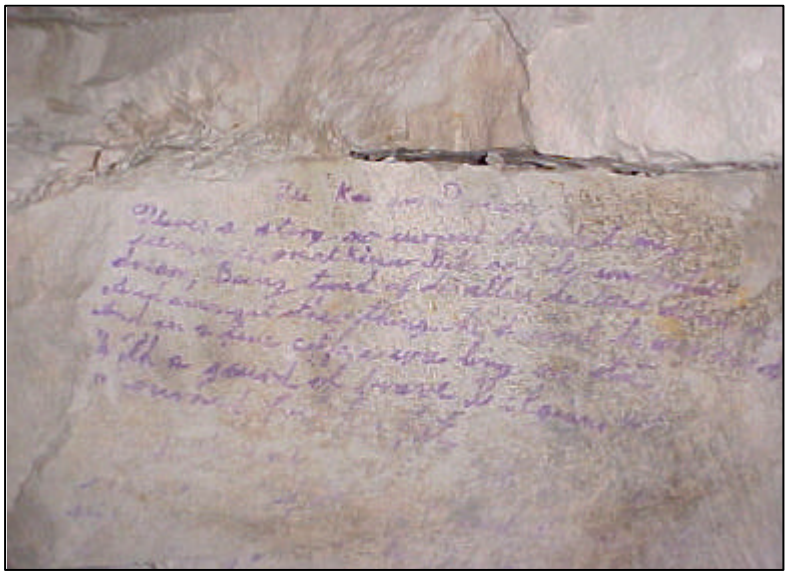


Photo 145

O.64.D.2.2 graffiti - Indecipherable poem written in purple ink





Photo 146 **Photo 147**

Photos 146 & 147. Soot daubs on the ceiling of the O.64.D.2.2 mine chamber

23 NO. 7 FIGHTING TUNNEL – O.64.D.2.1

23.1 The No. 7 fighting tunnel was investigated. This is shown on the system plan as O.64.D.2.1. A plan of the tunnel is at Figure 38. The tunnel is constructed at 90° to the main lateral and is 1.5m high and 0.85m wide throughout its length. The tunnel number is marked in ink on the northern corner of the tunnel's intersection with the main lateral (Photo 148). The tunnel runs for 22.5m before it takes a left-hand dog-leg for a further 3.4m. Along this first section of the tunnel upstanding, although decayed, tunnel timber supports remain in situ in a number of places. Chalk debris, ready to be used as tamping, is stacked along the southern wall of the tunnel.

23.2 After the dog-leg the tunnel runs for another 12.5m before opening up into a middle chamber. More chalk debris is stacked along the southern wall of the tunnel along this section of the tunnel and a number of decaying timber supports remain in situ. The mid-chamber is 3m in length and 2.2m wide at the western end but tapers back to 0.85m wide at the eastern end. A quantity of chalk blocks has been stacked alongside the northern wall of the chamber but has collapsed spilling chalk debris across the floor of the chamber (Photo 149). At the eastern end a collapsed, decaying timber support lies across the neck of the tunnel (Photo 150).

23.3 From the middle chamber the tunnel then runs for another 11.3m in to a mine chamber. This section of the tunnel is clear of both timbers and debris. The mine chamber is square-cut and measures 2.8m deep by 2.3m wide and is also 1.5m high. Along the base of the southern face of the chamber chalk debris has been stacked (Photo 151). Apart from this material the chamber is clear of any other debris. Within this chamber the chalk shows considerable flint intrusion and evidence of soot marks on the face of the walls, although these do not appear to marry up with any obvious candle niches. Indeed, the faces of the chamber are largely devoid of any significant distortion.

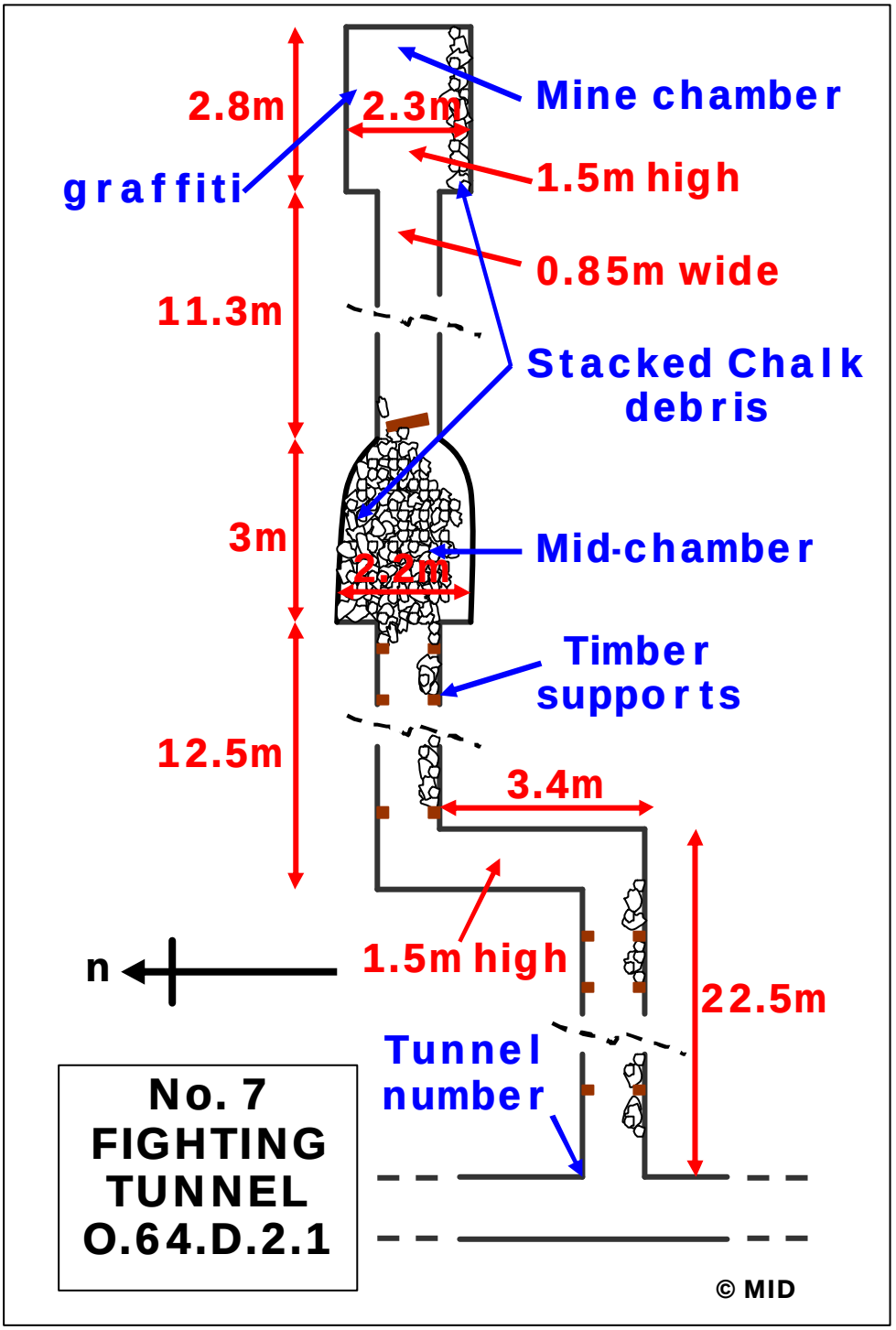


Figure 38. The No. 7 Fighting Tunnel (O.64.D.2.1)

23.4 Along the initial section of the tunnel there is an ink-drawn scribble on the northern wall which records the progress of the tunnellers driving this particular fighting tunnel. This is shown at Photo 152. The scribble indicates that a distance of 42' 8" had been driven by 30/9/16 (written in purple ink) and 53' 2" by 7am on 2/10/16 (written in black ink). In the mine chamber there is an extensive array of pencil and ink-drawn pictures. Subjects include women, soldiers and general portraits (Photos 153 – 158).

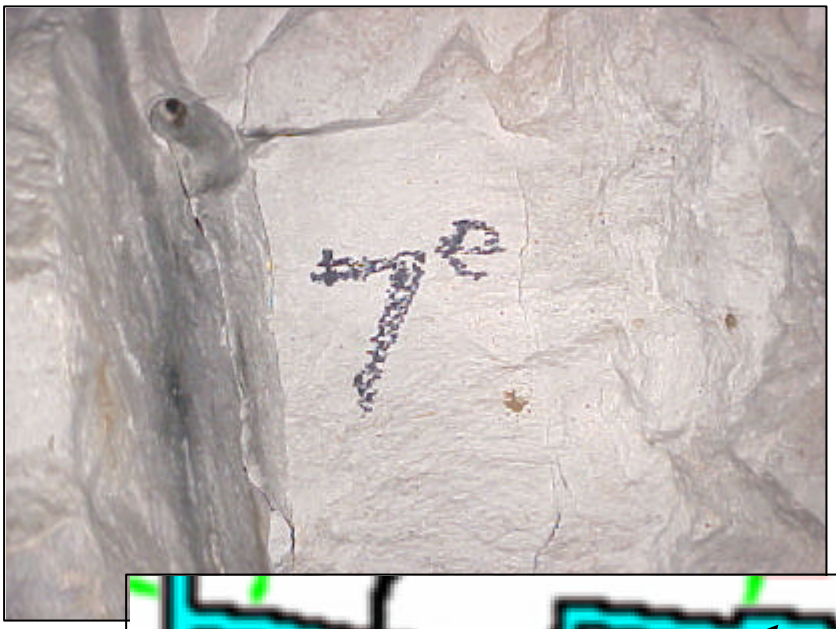
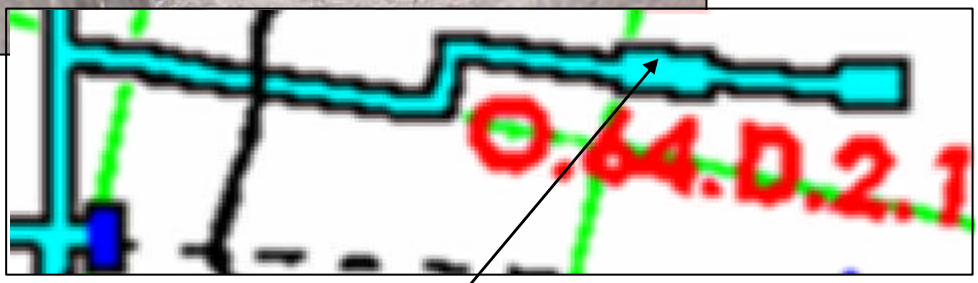


Photo 148

No. 7 tunnel marker in pencil



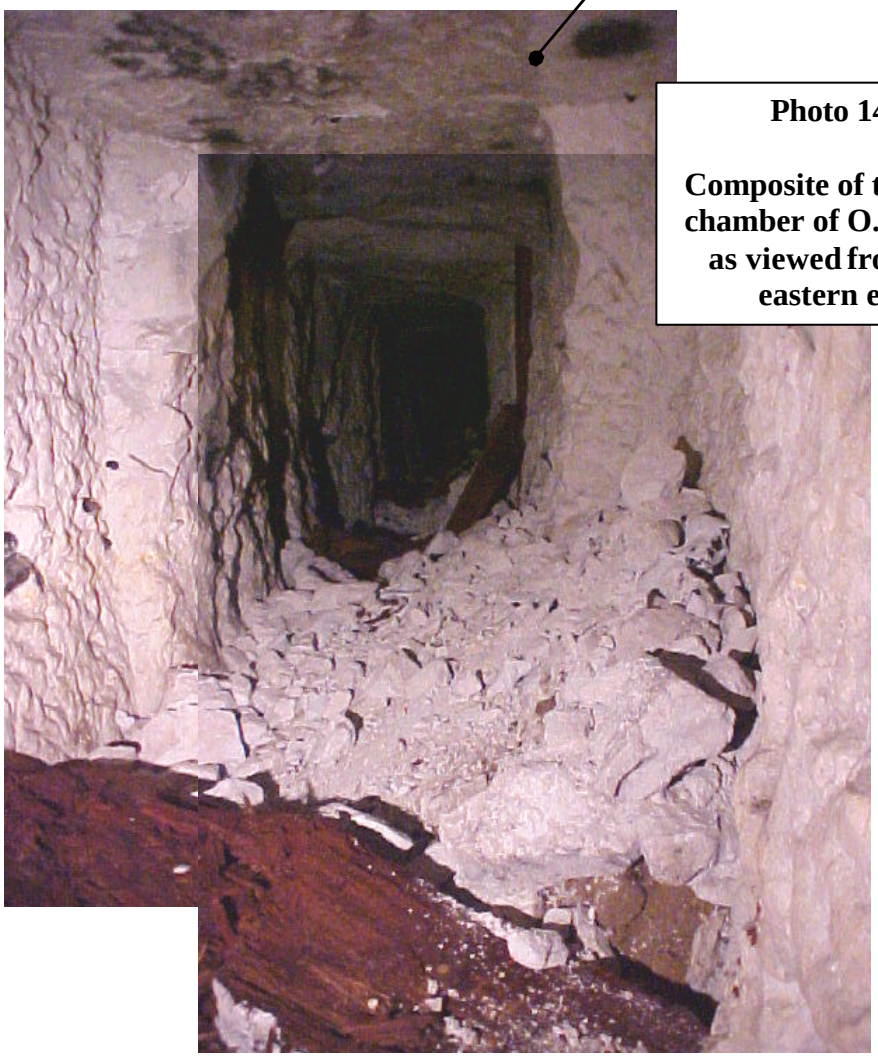


Photo 149

Composite of the mid-chamber of O.64.D.2.1 as viewed from the eastern end



Photo 150

Collapsed and decaying timber support in the No. 7 Fighting Tunnel



Photo 151

Andy Prada of the Durand Group in the O.64.D.2.1 mine chamber – note the chalk debris to the right

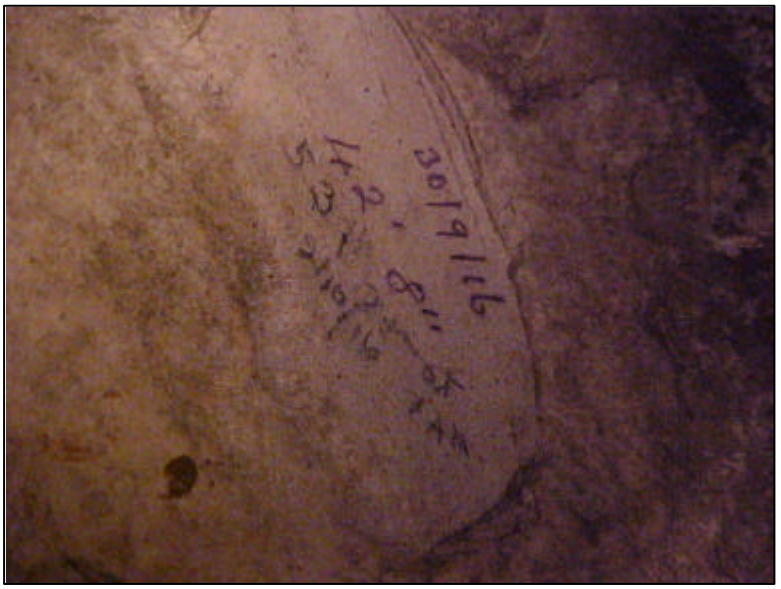


Photo 152

Ink-drawn scribble recording progress of the miners in digging the No. 7 fighting tunnel



Photo 153



Photo 154



Photo 155



Photo 156



Photo 157



Photo 158

Photos 153 – 158. Ink drawings in the O.64.D.2.1 Mine Chamber

24 NO. 8 FIGHTING TUNNEL – O.64.D.1.1

24.1 The No. 8 fighting tunnel was investigated. This is shown on the system plan as O.64.D.1.1. A plan of the tunnel is at Figure 39. The tunnel is constructed at 90° to the main lateral and is 1.5m high and 0.85m wide throughout its length. There is no tunnel number at the entrance. 2m into the tunnel there are a stack of sandbag-shaped clay blocks by the northern wall (Photo 159), along with some chalk debris on the floor. The tunnel runs for 14.3m before it takes a left-hand dog-leg for a further 3m.

24.2 The tunnel runs for another 14.1m to a mine chamber but is not straight. It makes a pronounced southern slant before turning north again and running straight. Along the northern wall of this stretch of the tunnel chalk debris has been stacked ready to be used as tamping (Photo 160). 2m before the mine chamber a pair of British military waders lie discarded (Photo 161). Although the upper areas of both boots have decayed away the lower section remain and are in a stable, but fragile condition.

24.3 The mine chamber is of square-cut construction and measures 2.4m deep by 1.6m wide and is 1.55m high (Photo 162). In the rear face of the chamber there is a small niche with very obvious sooting on the chalk face above it; this was clearly a niche for a candle. On the floor of the chamber there is a considerable amount of brown, decayed organic material. This covers most of the chamber floor. In the north west corner of the chamber there is a another decaying British military wader (Photo 163).



Photo 159

Clay blocks at the start of the No. 8 Fighting Tunnel

Photo 160

Looking back along the O.64.D.1.1 tunnel – note the stacked chalk

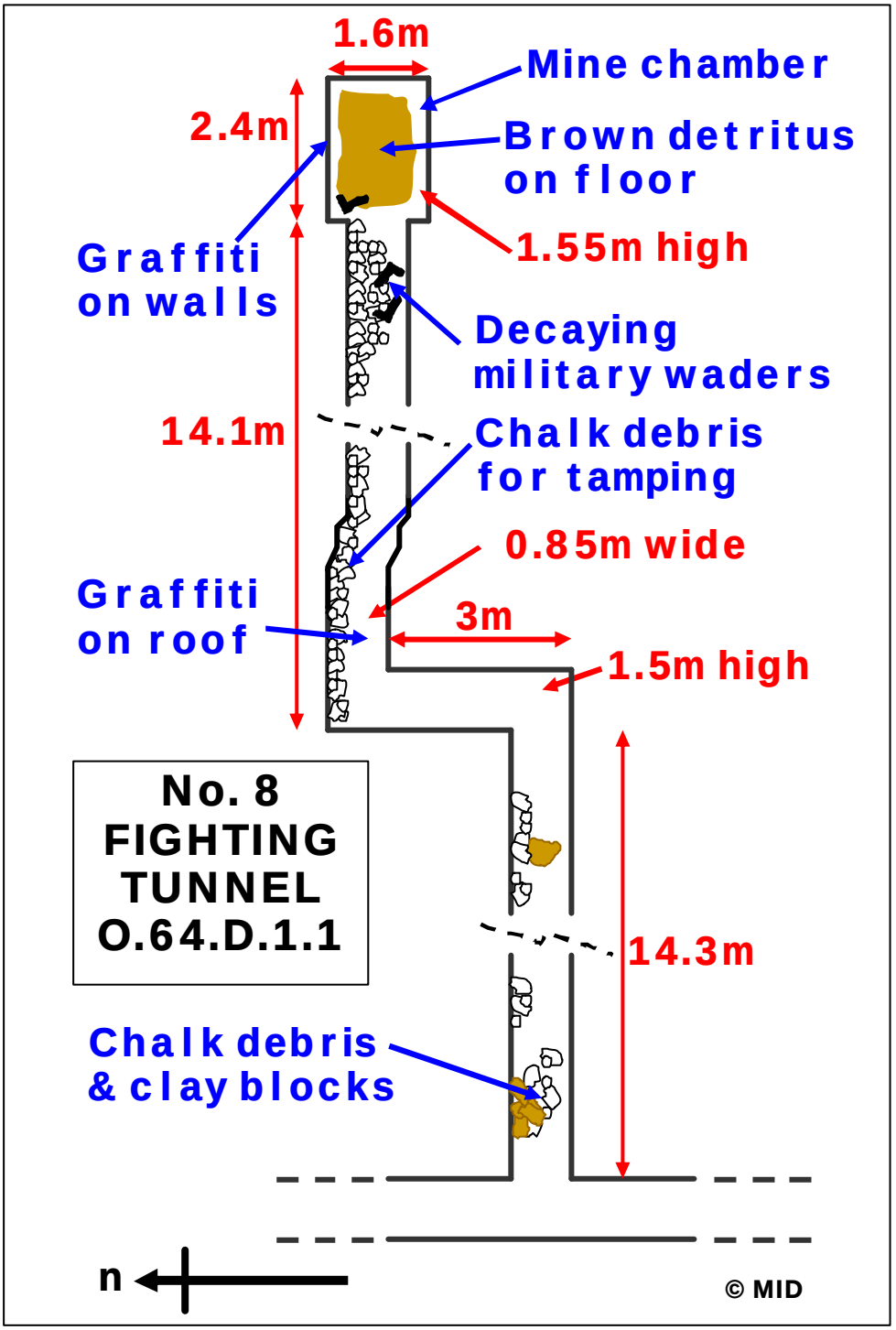


Figure 39. The No. 8 Fighting Tunnel (O.64.D.1.1)

24.4 Amongst the material on the chamber floor there were two British military tunic buttons (Photo 164) and very fragmented, and badly decayed, pieces of tunic material. Small fragments of sandbag Hessian were also located as well as a dispersed quantity of possible ammonal explosive. The leather strap from one of the waders was also located within the chamber (Photo 165) as was the lid from an unknown metal container (Photo 166). Other very badly broken and rusted fragments of thin metallic materials were also found on the chamber floor.



Photo 161 (left)

British military waders discarded in the fighting tunnel



Photo 162 (left)

The O.64.D.1.1 mine chamber. Note the brown decayed detritus on the chamber floor



Photo 163 (right)

British tunic buttons and tunic material



Photo 164 (left)

British military wader in the O.64.D.1.1 mine chamber

Photo 165 (right)

Leather strap from a British military wader





Photo 166 (left)

Lid from a metal tin found in the O.64.D.1.1 mine chamber

24.5 There is a small array of graffiti within the mine chamber. With one exception (an ink drawn name (Photo 167) all of the other examples are carved or scratched into the chalk (Photos 168 – 170). Just after the dog-leg in the tunnel there is also one example of soot drawn graffiti on the roof.

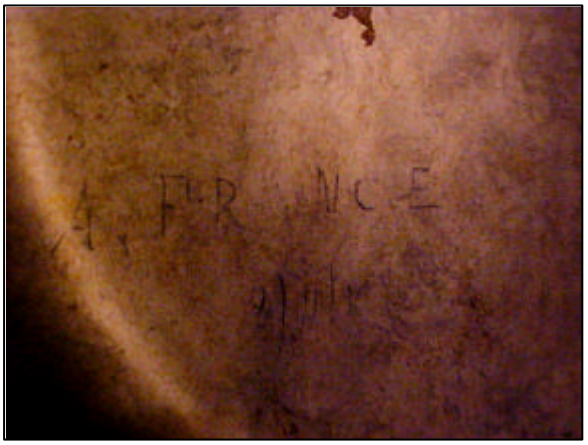


Photo 167



Photo 168



Photo 169



Photo 170

Photos 209 – 212. Examples of graffiti found in the O.64.D.1.1 mine chamber

25 NO. 9 FIGHTING TUNNEL – O.64.D.1.2

25.1 The No. 9 fighting tunnel was investigated. This is shown on the system plan as O.64.D.1.2. A plan of the tunnel is at Figure 40. This is an incomplete fighting tunnel that twists to both left and right (Photo 171). The tunnel number is written in ink on the wall of the main lateral (Photo 172). The overall length of the tunnel is only 8.9m and the tunnel ends in a dead-end just 1.9m after a left-hand dog-leg. The tunnel is 1.2m high and 0.9m wide and is clear of any debris. The north east corner of the final bend in the tunnel has not been completed or squared-off. The end face of the tunnel is rough and has also not been squared off; just as though it was originally intended to continue the tunnel (Photo 173).

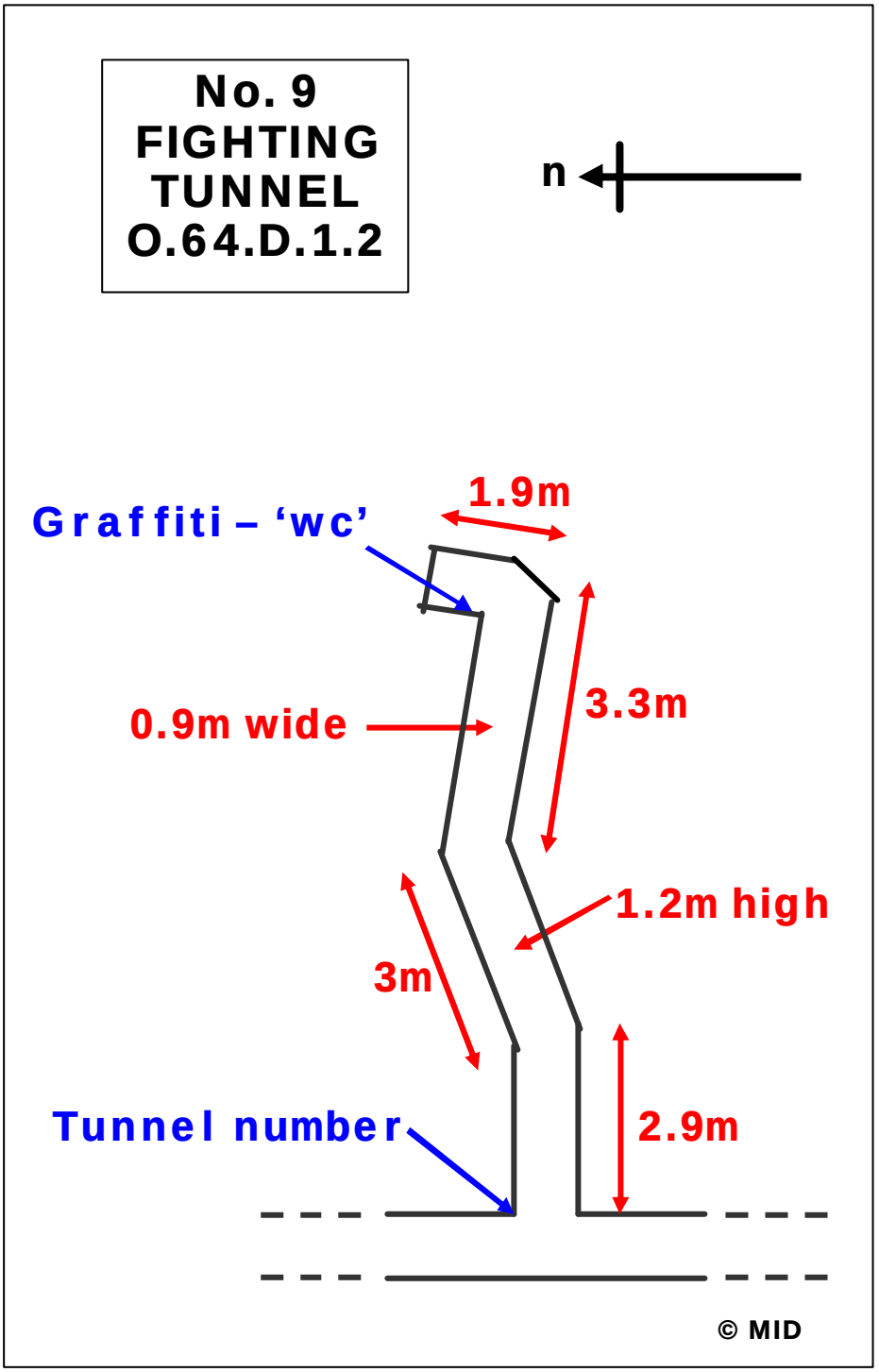


Figure 40. The No. 9 Fighting Tunnel (O.64.D.1.2)

25.2 There is not a great deal of graffiti within the No. 9 fighting tunnel. Pte Clayton has made his mark once more (Photo 174) and a pencil drawn 'WC' on the south face of the tunnel around the final bend (Photo 175) suggests that this drive might have been used as a lavatory by the tunnellers digging the rest of 'O' Sector.



Photo 171 (left)

The No.9 fighting tunnel showing the twist and turn of the drive



Photo 172 (right)

The tunnel number at the entrance with an associated ink drawing





Photo 173 (left)

The unfinished end face of the No. 9 drive



Photo 174 (left)

Pencil marking 'WC'
In the O.64.D.1.2 drive

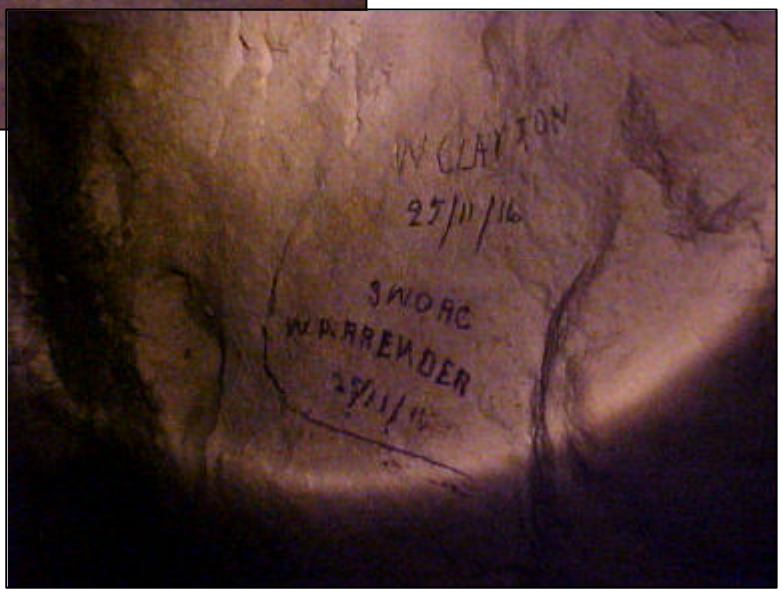


Photo 175 (right)

Graffiti at the end of the O.64.D.1.2 drive

26 NO. 10 FIGHTING TUNNEL – O.63.E.2.1

26.1 The No. 10 fighting tunnel was investigated. This is shown on the system plan as O.63.E.2.1. A plan of the tunnel is at Figure 41. There is no tunnel number on the main lateral. The tunnel is 1.2m high and 0.75m wide and is largely clear of any debris with the exception of some clay spill on the floor at the start (Photo 176). The tunnel is dug at 90° to the main lateral and runs for 15.8m before a right hand dog-leg which runs for a further 3.2m. The north east corner of the tunnel is enlarged, as though a northern branch was contemplated, and filled with chalk debris.

26.2 The tunnel then runs at 70° to the main lateral for another 4.7m before the tunnel widens out into a small chamber some 5.5m in length and 2m wide at the eastern extremity. The northern side of this chamber is filled with chalk debris. An empty sandbag, that clearly once contained ammonal explosive, lies discarded on the floor of the chamber. The tunnel then runs at 85° for another 14.5m before reaching a mine chamber which is entered via a 35cm step down. The mine chamber is 2 m square and 2.05m high.

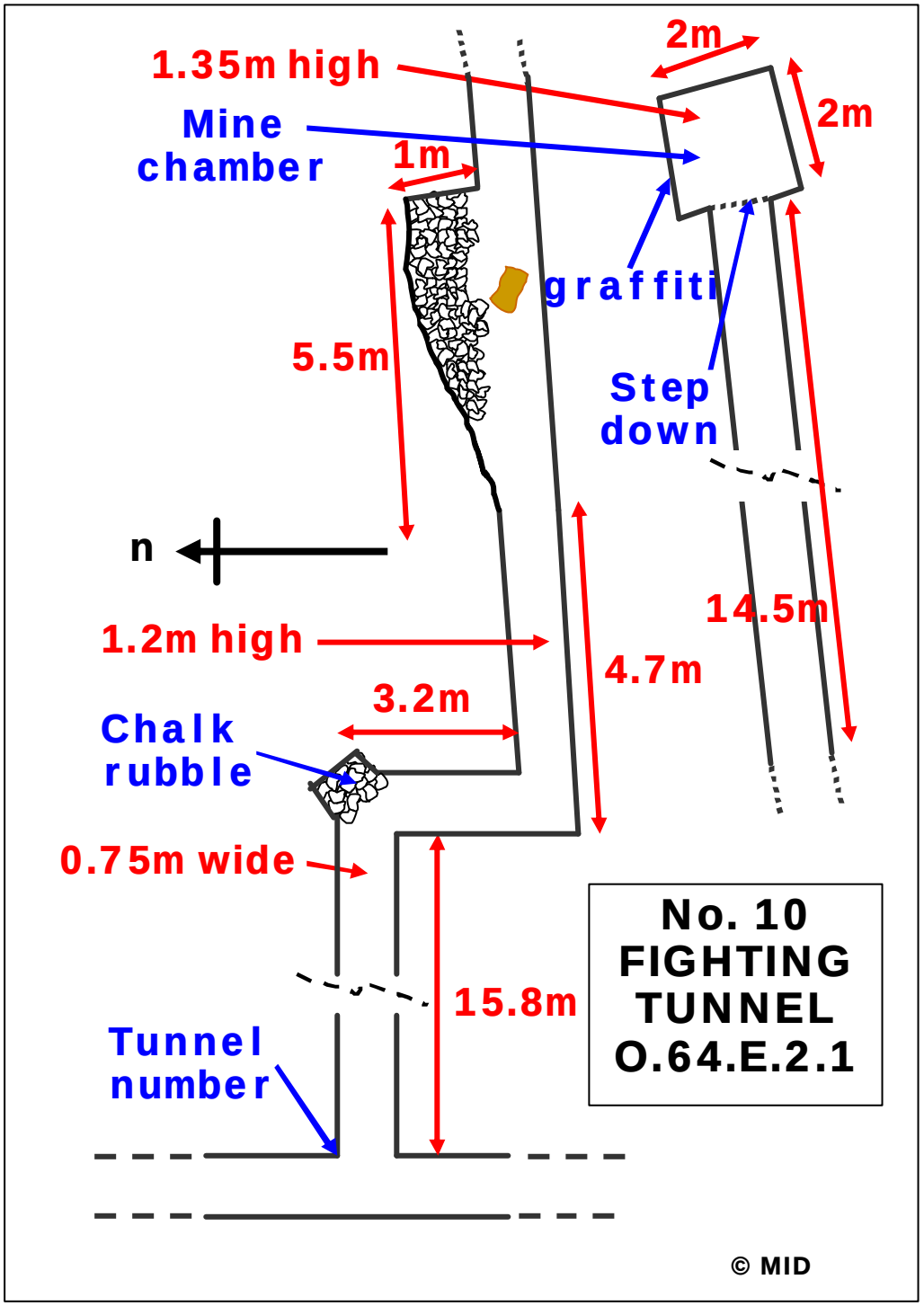


Figure 41. The No. 10 Fighting Tunnel (O.64.E.2.1)

26.3 The mine chamber contains a range of pornographic drawings and other graffiti. Of interest amongst the former is an artistic impression of a fisherman entitled 'The Skipper' (Photo 177), a picture of a naked woman being chased by a naked black man (Photo 178). The chamber has clearly been used as a listening chamber as the markings shown in Photos 179 and 180 indicate. Pte Clayton once again makes his mark showing that he belonged to the 8th South Lancashire Regiment (Photo 181) and was attached to 175 Tunnelling Company RE (Photo 182). Other graffiti includes 'RE' (Photo 183) and another scrawl from Pte France (Photo 184).



Photo 176 (left)

The No. 10 fighting tunnel as seen from the main lateral – note the minor clay and chalk debris on the floor of the tunnel

Photo 177 & 178 (below)

Ink drawing of 'The Skipper' and a naked woman being chased by a naked black man

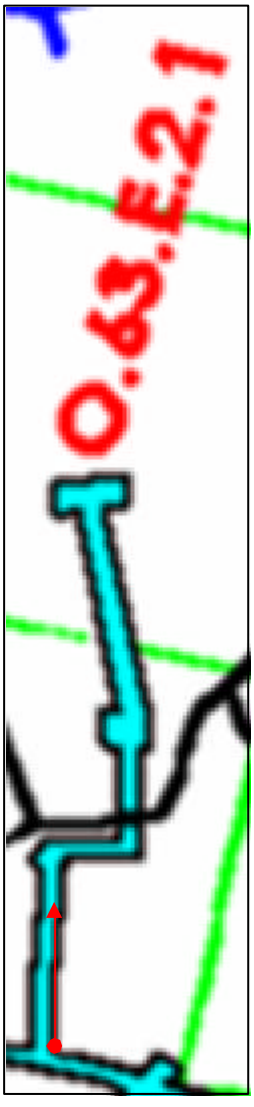










Photo 179 **Photo 180**

Photos 220 & 221. Evidence of listening activity in the O.64.E.2.1 mine chamber



Photo 181 (left)

Pte Clayton of The 8th Bn the South Lancs

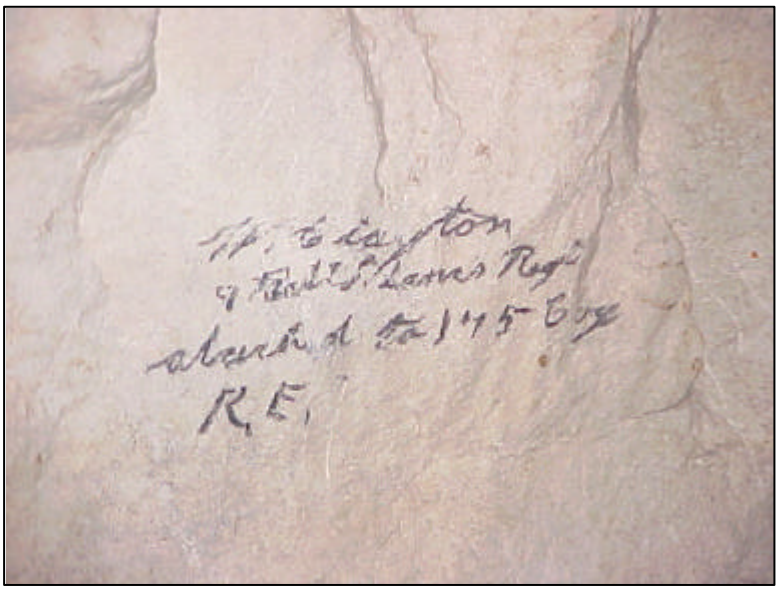


Photo 182 (left)

Pte Clayton attd. 175 Tunnelling Company RE

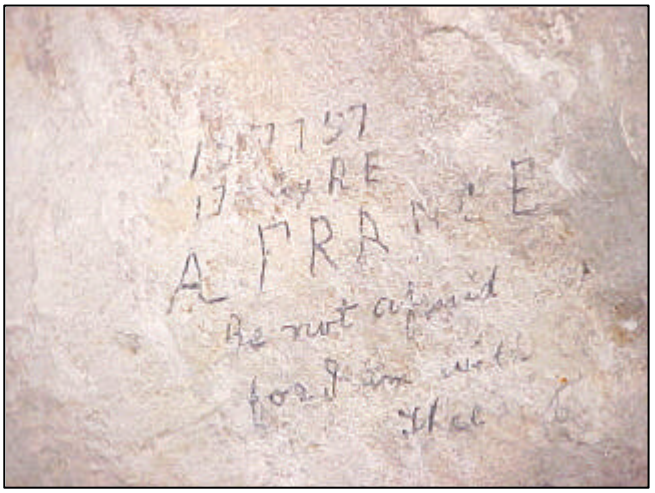


Photo 183 (left)

Royal Engineers monogram

Photo 184 (right)

127757 Pte A France
175 Coy RE
'Be not afraid for I am with thee'



27 THE O.65.C HIGHER LEVEL OFFENSIVE MINE GALLERIES

27.1 Investigation of the system revealed that 31m north of O.64.D.2.1 a stairway had been dug up from the main lateral to connect to the higher level O.65.C offensive gallery. As the 175 Tunnelling Company War Diary[12] reveals O65C was originally a French gallery dug by the M/6 French Engineer Company. 175 Coy took it over from the French at midnight on 5 May 16. How far the gallery had proceeded at this point is unknown.

27.2 At 4.20pm on 13 Jun 16 the Germans blew Chassery crater in front of O65C although no damage appears to have been done to the gallery. It is likely that the C1 and C2 galleries were thrown out on either side of the crater immediately after this time. Indeed the 175 Tunnelling Company plan on O Sector dated to 5 Jul 16 indicates that C1 was dug between 13 – 28 Jun 16 and C2 between 13 Jun and 5 Jul 16. Of note from that plan is the clear indication that the original O65C drive itself terminated in a mine chamber (Figure 42).

[12] 175 Tunnelling Company RE War Diary - PRO 95/404.

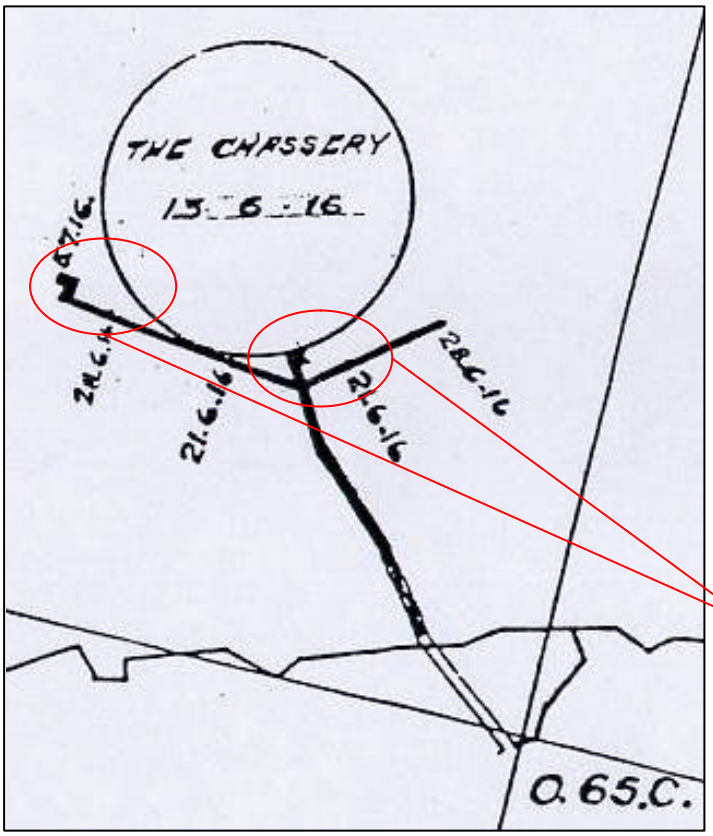


Figure 42.

Enlarged detail of the 175 Tun Coy RE plan of O Sector dated 5 July 1916 showing the O.65.C offensive mine gallery

Note the mine chambers

27.3 The chalk stairs from the main lateral ascend for 14m at a 45° slope. The stairway is 0.85m wide and 1.4m high. The steps have a rise of approximately 30cm and there is evidence of clay wash down the northern side of the stairway (Photo 185). The climb up is steep and treacherous and requires a safety rope (Photo 186). The stairs lead to a 3m long landing which is covered in decomposing wood debris (Photo 187). On the southern side of the landing there is a fallen timber support behind which there is a blind British 18pdr artillery shell (Photo 188) as well as an empty oil can.

27.4 On the eastern side of the landing the stairway continues upwards at a 45° angle (Photo 189). The stairway is covered in clay wash and small chalk debris but can be climbed for a distance of 15m before it is blocked with large chalk blocks and clay infill. The total distance of the stairway suggests that the original entrance was in the forward trench line to the west of Chassery crater (see Figure 43) although there is no evidence of this on the ground.

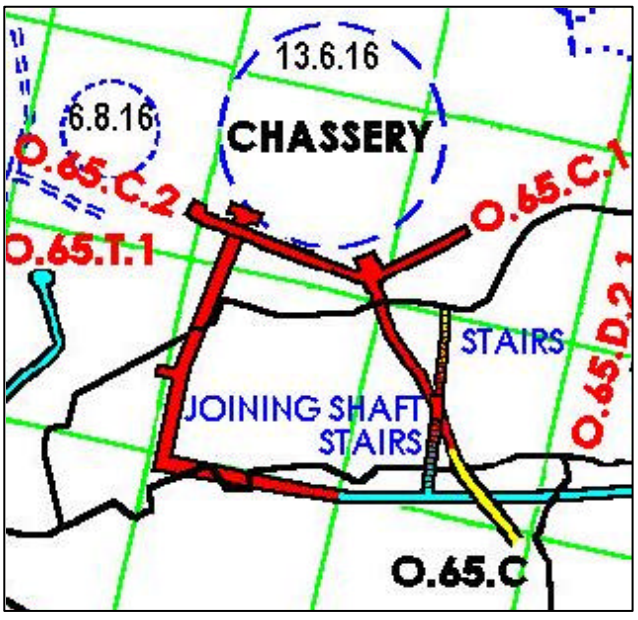


Figure 43 (right)

Stairway down to O Sector and joining to O.65.C

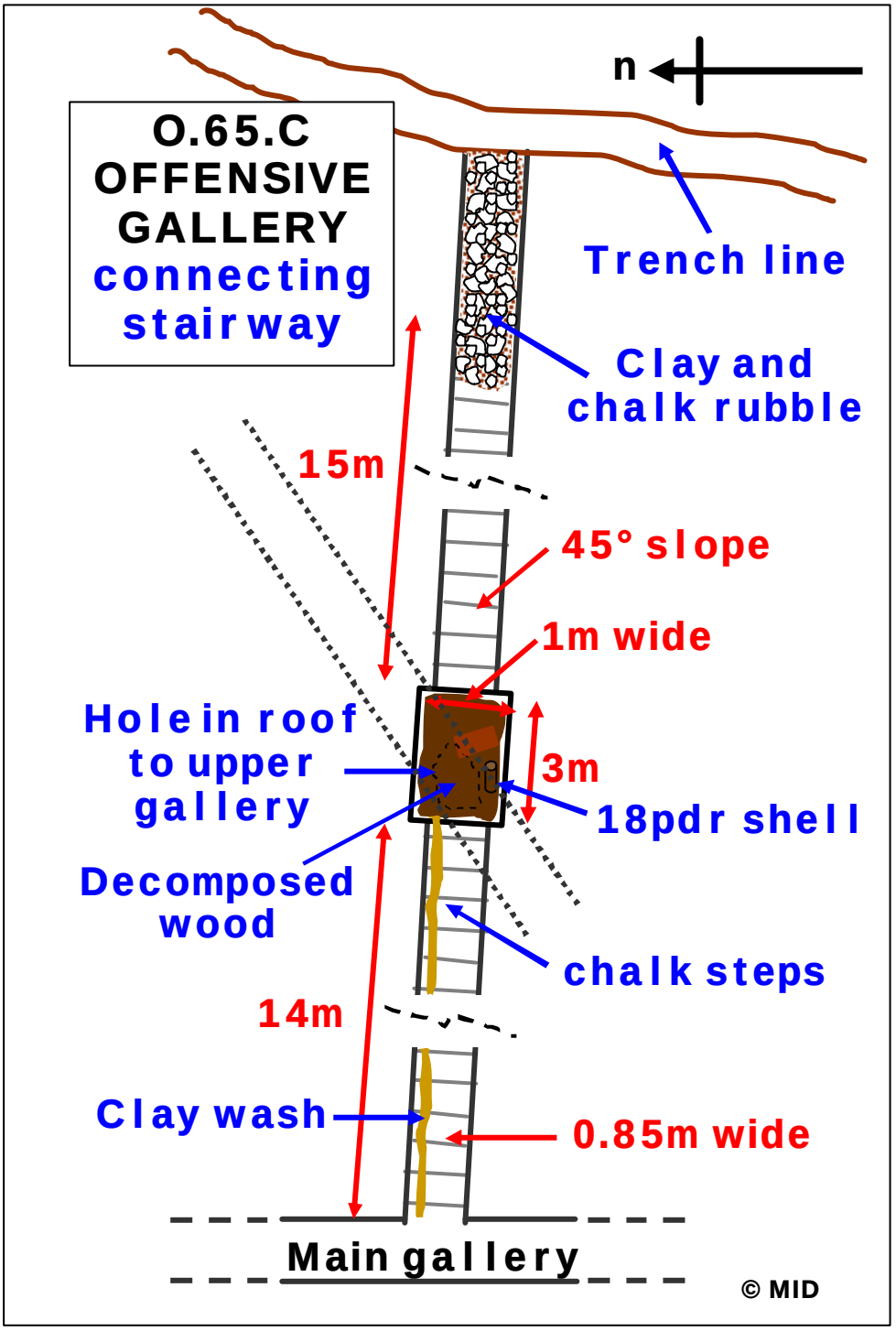


Figure 44. The O.65.C Offensive Gallery – Connecting Staircase

27.5 Above the landing a hole has been broken through into the higher level O65C gallery. Whether this was a deliberate connection or not is not known and is not recorded in any of the available written sources. The balance of probabilities is that it was deliberate and that access might originally been via a simple wooden ladder. However, the positioning of the stairway beneath the O65C gallery, the positioning of a landing beneath the hole and the use of a connecting stairway elsewhere in the system all suggests the opposite.



Photo 185

Looking up the O.65.C stairway from the main lateral



Photo 186

Looking down the O.65.C stairway from the landing



Photo 187

Durand Group member on the landing of the O.65.C stairway

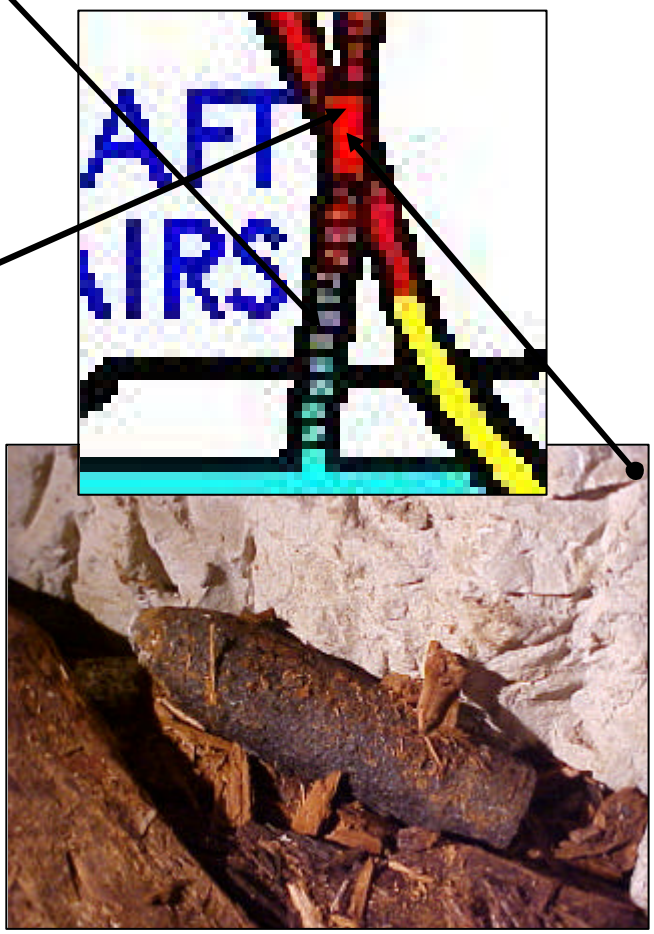


Photo 188

Blind 18 pdr HE shell



27.6 The 175 Tunnelling Company War Diary indicates that the Germans were particularly active in this area in Jun 16 with several mine and camouflet charges fired just to the south of Chassery crater. O65C next features in the record for 1 Jul 16 when it is noted that *'In SAP O.65C chamber being made for charging*'. It is assumed that this refers to the chamber shown at the end of the main drive.

27.7 On the 2nd of July the War Diary records that '950lb *of ammonal [is] being charged in O.65.C*' and that '*during this work [the] enemy heavily shelled the sap head and completely wrecked same'*. During this action one officer and two ORs were injured and 8 ORs killed. On the 5th of August the '*enemy blew [a] camouflet between O.65.T and O.65.C'* although *'no damage was done to our saps'*.

Photo 189. The O.65.C stairway as seen from the landing leading up to the trench

27.8 The connecting hole between the landing and the O65C gallery is approximately rectangular measuring1.5m long by 1m wide. The hole is 1.5m deep and the upper gallery can only be accessed by climbing the chalk walls. Upon climbing into the upper gallery it is noticeable that one is also on a fairly flat landing between two sections of stairway (Photo 190). A plan of the upper gallery is at Figure 45. It is possible that the original steps were flattened out to form the landing when the connection was made.

27.9 Although the hole occupies a significant proportion of the tunnel width there is a small passage to the western side. To the south west the tunnel continues to run up to the original entrance and is covered with loose chalk debris. After 10m the tunnel is completely blocked with mainly chalk debris (Photo 191) with evidence of supporting timbers having been washed down the slope. It is most noticeable that the tunnel along this section is larger than normal – some 1.5m wide and 1.5m tall. This is clearly part of the original French workings.



Photo 190

The connecting hole between the stairway and the O.65.C offensive mine gallery

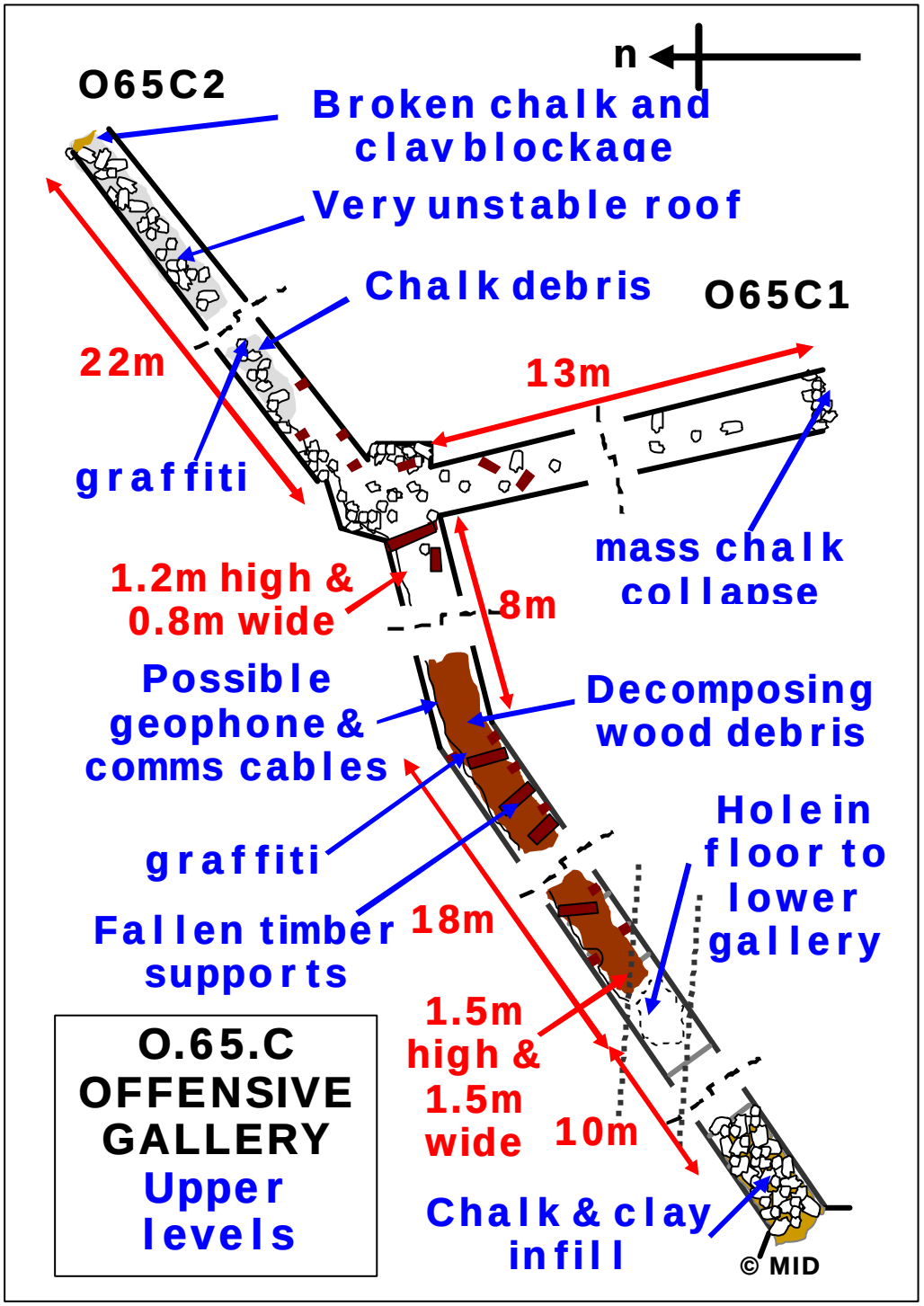


Figure 45. The O.65.C Offensive Gallery – Upper Levels

27.10 The O.65.C gallery continues to run down for 18m (Photo 192) until levelling off. The tunnel floor is thickly covered with decomposing wood from tunnel supports. Along the south eastern side some of the supports are still in situ although badly decayed. The tunnel is square cut with very little chalk debris on the floor. Along the north western side of the tunnel pair of communication cables run along the floor (Photo 193). There is also a thicker cable that may belong to a geophone, thought to still be in the C2 gallery but lying under the fallen chalk debris.



Photo 191

The blocked O.65.C entrance seen from the landing



Photo 192

The O.65.C gallery running down from the landing



Photo 193

The pair of communication cables and the possible geophone cable running along the wall of the O.65.C gallery

27.11 Along this section of the tunnel there is some graffiti written on the chalk walls. One of the most notable is shown at Photo 194. This is an ink drawn scrawl relating to '155095 Sapper Robert ****** 175 Coy RE 2nd Army France'. A bnger pencil drawn text (Photo 195) appears to have been deliberately smudged and an attempt made to wipe it out although the inscription 'RE' can be made out. The third notable example (Photo 196) is a simple inscription 'Wm McHugh'. These all appear to relate to personnel employed with 175 Tunnelling Company RE.

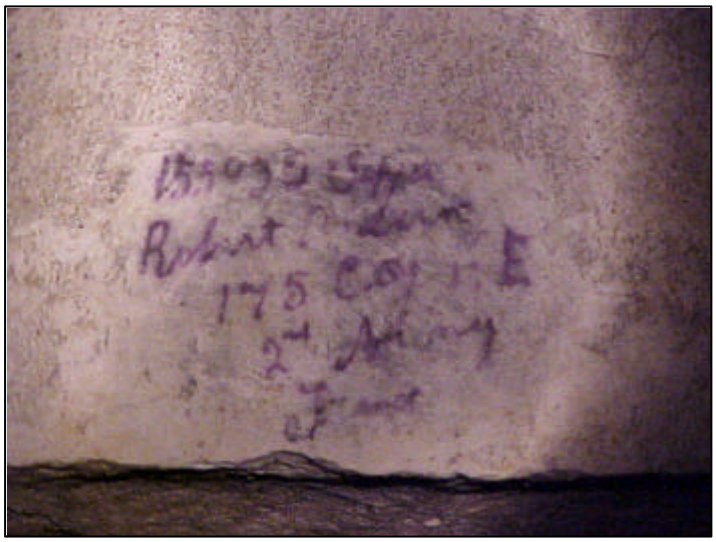


Photo 194

Ink drawn graffiti in the O.65.C gallery - '155095 Sapper Robert **** 175 Coy RE 2nd Army France'**

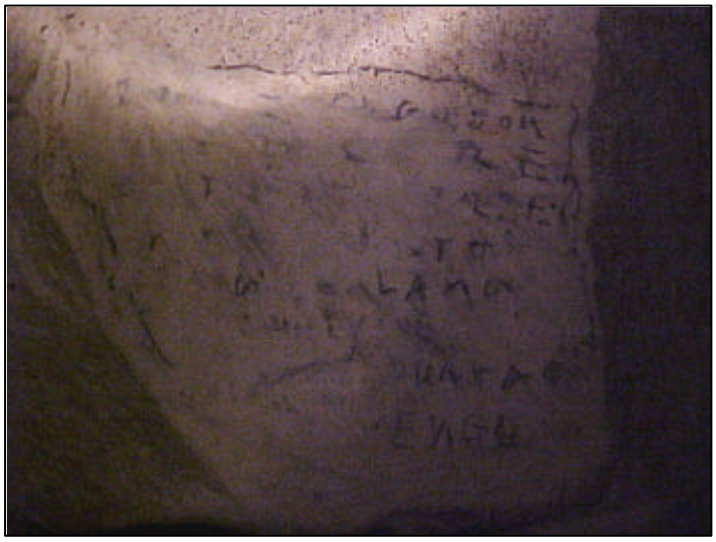


Photo 195

Pencil graffiti in the O.65.C gallery - an attempt has been made to deliberately wipe it out

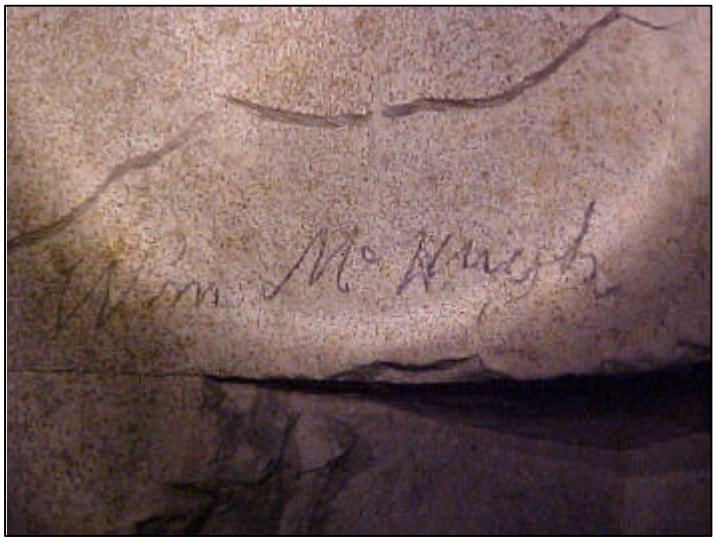


Photo 196

Pencil graffiti in the O.65.C gallery - 'Wm McHugh'

27.12 On the level the O.65.C gallery clears of decaying timber and reaches a T-junction. As this point is reached the tunnel narrows down to 0.8m wide and reduces in height to 1.2m. At this point a supporting timber brace remains in situ (Photo 197). Ahead the tunnel widens out slightly and the C1 and C2 drive branch off to right and left. There is no evidence of the tunnel continuing straight ahead at this point. In may be that this widened space is, infact, the mine chamber shown on the various tunnel plans. On the eastern wall in this area someone has written in black ink 'THE LORD IS MY SHEPHERD AND I SHALL NOT WANT' (Photo 198).



Photo 197

Looking at the possible O.65.C mine chamber with the C1 and C2 galleries running off right and left



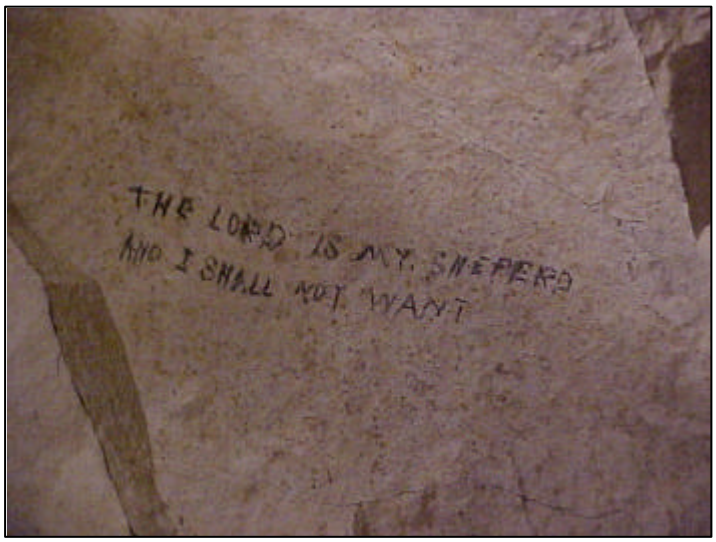


Photo 198

Graffiti in the O.65.D 'mine chamber' - 'The Lord is my Shepherd I shall not want'

27.13 The C1 gallery runs off to the right from the O.65.C drive (Photo 199). The gallery is straight and largely clear of any debris on the tunnel floor. The gallery runs for 13m before ending in a jumble of cracked and broken chalk. It looks as though the tunnel has collapsed at this point although the measurements mapped against the tunnel plan suggest that this is where the tunnel had been deliberately ended. The remainder of the tunnel is, however, in very good condition. There is nothing else of any interest in the C1 gallery.

27.14 It is interesting to note that the 3rd Army Mining Report for the week ending 15 Sep 16 records that 'a charge has been placed in O.65.C.1 in readiness for an enemy gallery which is approaching between B.4 and B.5 craters'. This is confusing since as has already been mentioned, there is no map or physical evidence of a mine chamber at the end of the C1 gallery and the B4 and B6 craters are located some 200m to the south of this area.



Photo 199 (right). The O65C1 gallery

27.15 The C2 gallery[13] runs off to the left from the O.65.C drive (Photo 200). This gallery is in very poor condition with cracked and hanging chalk on the tunnel roof and a considerable amount of fallen chalk covering the tunnel floor. In places the chalk is so thick that the unrestricted height is reduced to less that 18". Some decaying timbers remain in situ although the cross beams have all fallen. The tunnel runs for 22m before ending in a massive collapse and a very visible clay intrusion (Photo 201). The tunnel ends some 7m short of the mine chamber shown on the plans.

27.16 The very poor state of the C2 gallery matches the written record. In the 175 Tunnelling Company War Diary entry for 6 Aug 16 mention is made that '*enemy [is] heard working in O65C2, O65T1 & T2….nil damage….charge and leads in O65C2 not damaged….sap filled with gas….cracks have appeared in both saps and floor in O65T has heaved….O65T gas cleared within 48hrs….O65C – not yet cleared'*. This also indicates that an unspecified explosive charge had been laid in the C2 chamber by this time.

27.17 There is no further mention of O.65.C in the 175 Coy War Diary or any of the 3rd Army weekly mining reports. The next reference to the gallery is in the 172 Tunnelling Company RE[14] War Diary entry of 10 Jan 17 which states that at 7.15 pm the '*enemy blew a mine under CHASSERY crater damaging gallery No O65C*' but that there were '*no casualties'*. There are no other references to the O.65.C gallery in any of the available documentary sources and hence no record that either the C2 mine charge was fired or removed.

27.18 It is therefore possible that a mine charge still remains in situ at the end of the C2 gallery. There does not however appear to be any armoured firing cables running down the gallery although the considerable quantity of fallen chalk and other debris on the floor along the whole length of O.65.C makes it difficult to be certain that this is the case. It is possible that the visible cable previously postulated as belonging to a geophone may actually be related to the firing circuit of a mine charge instead.

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[13] It is almost certain that Mr Browaski and his sons exited the deep system from O.65.C through a then open collapse; perhaps at the end of the O.65.C.2 gallery. We know the collapse was subsequently filled in which might account for the mix of clay and chalk found at the collapsed end of the gallery.

[14] 172 Coy had taken over responsibility for O Sector on 9 Nov 16.



Photo 200

The very poor condition O.65.C2 gallery

Photo 201

The clay intrusion and collapsed end of the O.65.C2 gallery

27.19 There are a number of examples of graffiti in the C2 gallery although the great amount of chalk debris pile dup against the tunnel wall in places may conceal further examples. For the purposes of this report four notable examples are included. Photo 202 shows a black ink drawing of the Royal Engineers badge. Photo 203 shows a black ink drawing of a flower. Photo 204 shows a comic character and associated logo whilst Photo 205 shows a distance marker on the roof of the tunnel.



Photo 202 (left)

O.65.C2 - Royal Engineer badge



Photo 203 (right)

O.65.C2 - ink picture of a flower



Photo 204 (left)

O.65.C2 – comic character



Photo 205 (right)

O.65.C2 - distance marker on the Tunnel roof

28 THE O.63.D HIGHER LEVEL OFFENSIVE MINE GALLERIES

28.1 The 182 Tunnelling Company War Diary[15] indicates that work on O.63.D and O.62.A commenced during the week ending 10 Apr 16. O.63.D was therefore one of four British, higher level, offensive galleries designed to wrestle the initiative back from the German miners in the centre of O Sector. Along with the other galleries O.63.D was taken over by 175 Tunnelling Company RE at 7pm on 5 May 16. At this time German efforts appear to have been concentrated away from O.63.D as the 175 Coy War Diary entry for 29 May 16 records that *'the enemy has been heard blasting fairly regularly from all galleries to the north of O63D'*.

28.2 The situation changed in June as the 3rd Army Controller of Mines Weekly Mine Report for the week ending 23 Jun records that *'the en[emy] exploded a very large mine at 6pm on [the] 17th in front of O63d and about 50yds from our observation line, doing little damage to our gallery'*. The report goes onto say that *'the infantry hold the near lip which will shortly be protected by O63D'*. The 175 Coy War Diary entry for the 17th also says that *'the enemy [had] established himself on [the] rear lip of [the] crater..'*. This explosion created Watling Crater.

15 182 Tunnelling Company RE War Diary – PRO 95/488

28.3 The diary entries for the following two days indicate that all work along O Sector was halted whilst listening tests were carried out. Having established where the Germans were mining 175 Coy resumed work with a vengeance with 8 faces being advanced on 30 Jun 16 and some 259' of tunnels dug. Over the course of the next three weeks the protective tunnel system around Watling Crater was consolidated. D1 and D2 were thrown out to left and right with 175 Coy plans showing that the D2 and D3 chambers were completed on 26 Jul 16 (Figure 46).

28.4 Whilst the War Diaries or mining summaries contain no further references to O.63.D it is clear that further work connected to the system was undertaken. The O.62.D.2 drive was not constructed until Nov 16 and so the staircase connecting the main lateral to O.63.D cannot have been excavated until mid Nov 16 at earliest. The Warnock plan indicates that German galleries were approaching both O.63.D1 and O.63.D2.

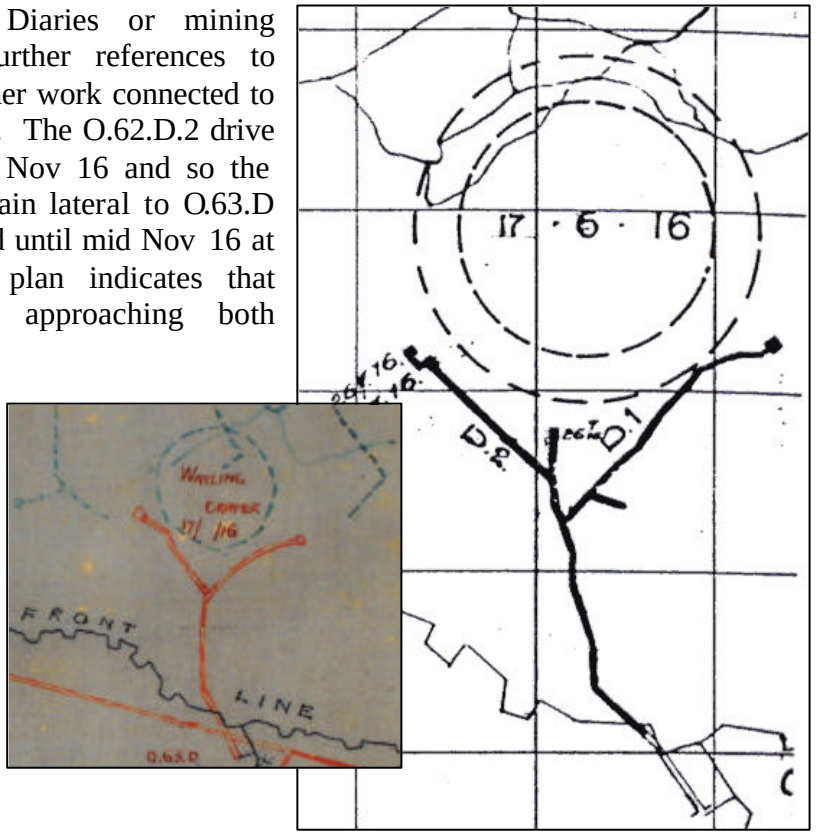


Figure 46

The O.63.D gallery showing both the construction dates and the approaching German galleries

28.5 The main lateral is connected to the higher level O.63.D offensive mine gallery by a stairway 17.5m in length and inclining at 45° (Photo 206). A plan of the connecting stairway is at Figure 47. The stairway entrance is located 3.3m from the dogleg in the main lateral just prior to the breeze block wall. The stairway is 0.9m wide and 1.1m high. There is some remaining evidence of steps but the chalk has been badly broken along the whole length of the stair incline and is fairly treacherous to ascend and descend. The stairway runs up at a 100° angle to the main lateral and opens up into a small chamber (Photo 207) covered in fine chalk debris and spilled clay.

28.6 On the eastern side of this chamber the stairway continues ahead at a 45° angle, presumably to the surface (Photo 208). An analysis of the mapping suggests that this stairway was originally entered from the forward trench line. This tunnel is, however, completely blocked with chalk debris and can only be accessed to a depth of 1.5m. To the south of the chamber a 1.3m wide tunnel ascends to the surface, exiting probably in the Watling Street communication trench (Photo 209). This tunnel is also 1.3m high and the floor is covered in loose chalk debris. The tunnel is blocked after 11.5m by a breeze block wall almost certainly placed their by the A26 engineers who also blocked the main lateral.

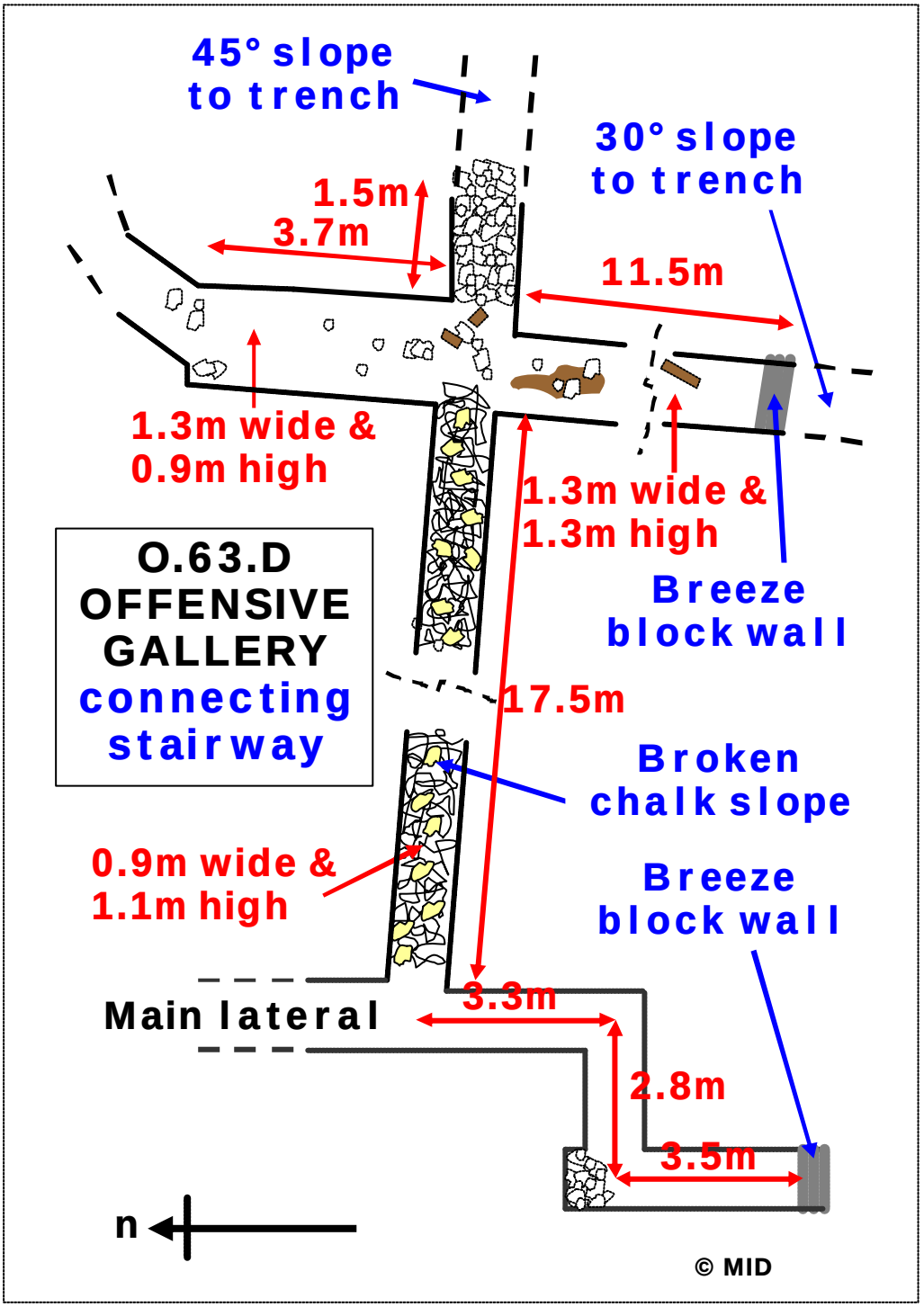


Figure 47. The O.63.D Offensive Gallery – Connecting Stairway

28.7 The northern end of the chamber[16] opens out into a 1.3m high by 0.9m high tunnel, some 3.7m in length that leads off to the various mine chambers (Photo 210). The floor of this is covered in loose chalk debris and clay. A number of fragments of timber tunnel supports also litter the floor throughout this area. The clay appears to have tumbled down into this space from the eastern tunnel up to the surface.

[16] It is through the blocked off southern entrance that Mr Browaski and his two sons gained access at the time the autoroute was being constructed



Photo 206 (left)

The chalk stairway connecting the main lateral with the higher level O.63.D offensive gallery

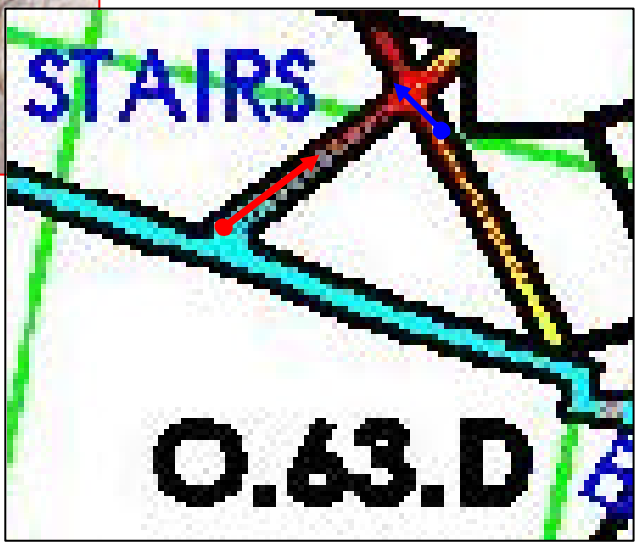


Photo 207 (below)

The small chamber at the top of the connecting stairway leading to O.63.D





Photo 208 (left)

Looking up the blocked stairway leading to the forward trench line

Photo 209 (below left)

Looking up the tunnel leading to Watling Street communication trench – breeze block wall at the end



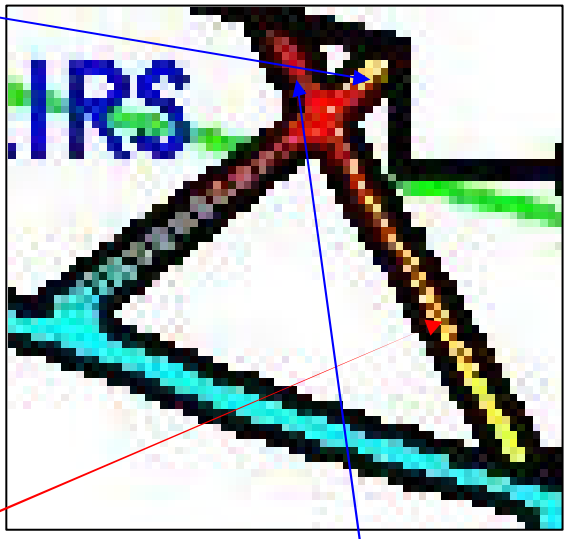




Photo 210 (right)

The start of the tunnel leading off to the O.63.D mine chambers

28.8 The main gallery leading from the small chamber at the top of the stairway from the main lateral is 29.2m long and only 1.1m wide by 1.2m high. This main gallery is not straight as is shown in the plan at Figure 48. At the start of the gallery the floor is covered in clay and tide marks on the walls indicate that occasionally the tunnel floods to a height of 3" or so. At the end of the gallery the tunnel widens out to 1.4m and increases in height to 1.4m. The northern corner of this opening is piled with chalk debris (Photo 211). The gallery branches at this point (Photo 212) with the south eastern tunnel leading off to O.63.D.1 and the eastern tunnel to O.63.D.2 and O.63.D.3.

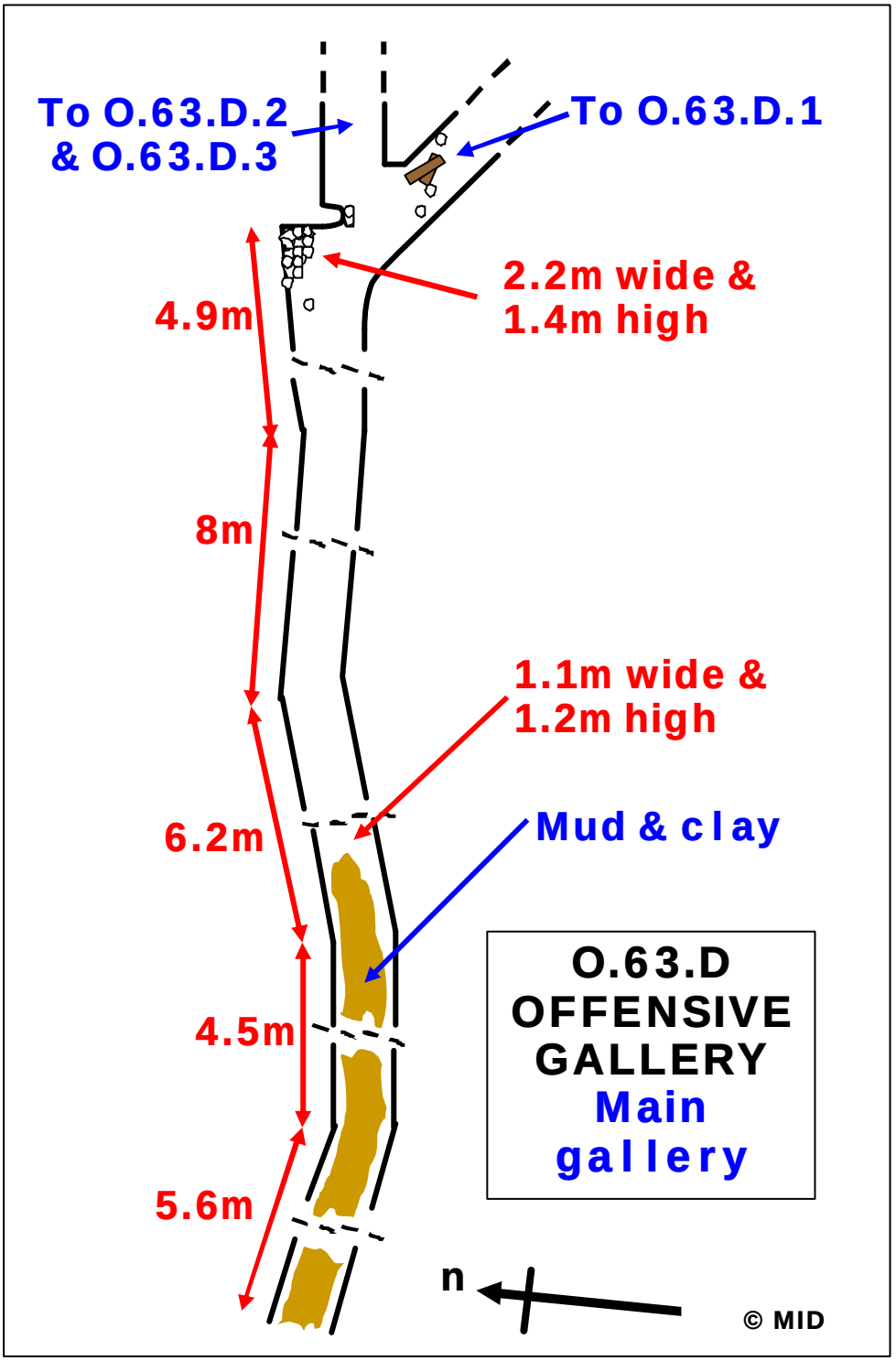


Figure 48. The O.63.D Offensive Gallery – Main Gallery



Photo 211

The chalk debris piled in the corner of the gallery leading to the branch





Photo 212

The branch in the gallery with O.63.D1 to the right and O.63.D2 & O.63.D3 to the left

28.9 The O.63.D.1 Fighting Gallery

28.9.1 A plan of the O.63.D.1 gallery is shown at Figure 49. The gallery tunnel is 1m wide and 1.25m high. The total length of the gallery is 48.4m and it arches around a 30° angle. A number of fallen timber supports lie across the start of the tunnel (Photo 213). A decayed roof timber remains in place as well although the uprights have decayed away. Chalk debris has been stacked along the southern wall of the tunnel and has fallen across the tunnel along most of its length.

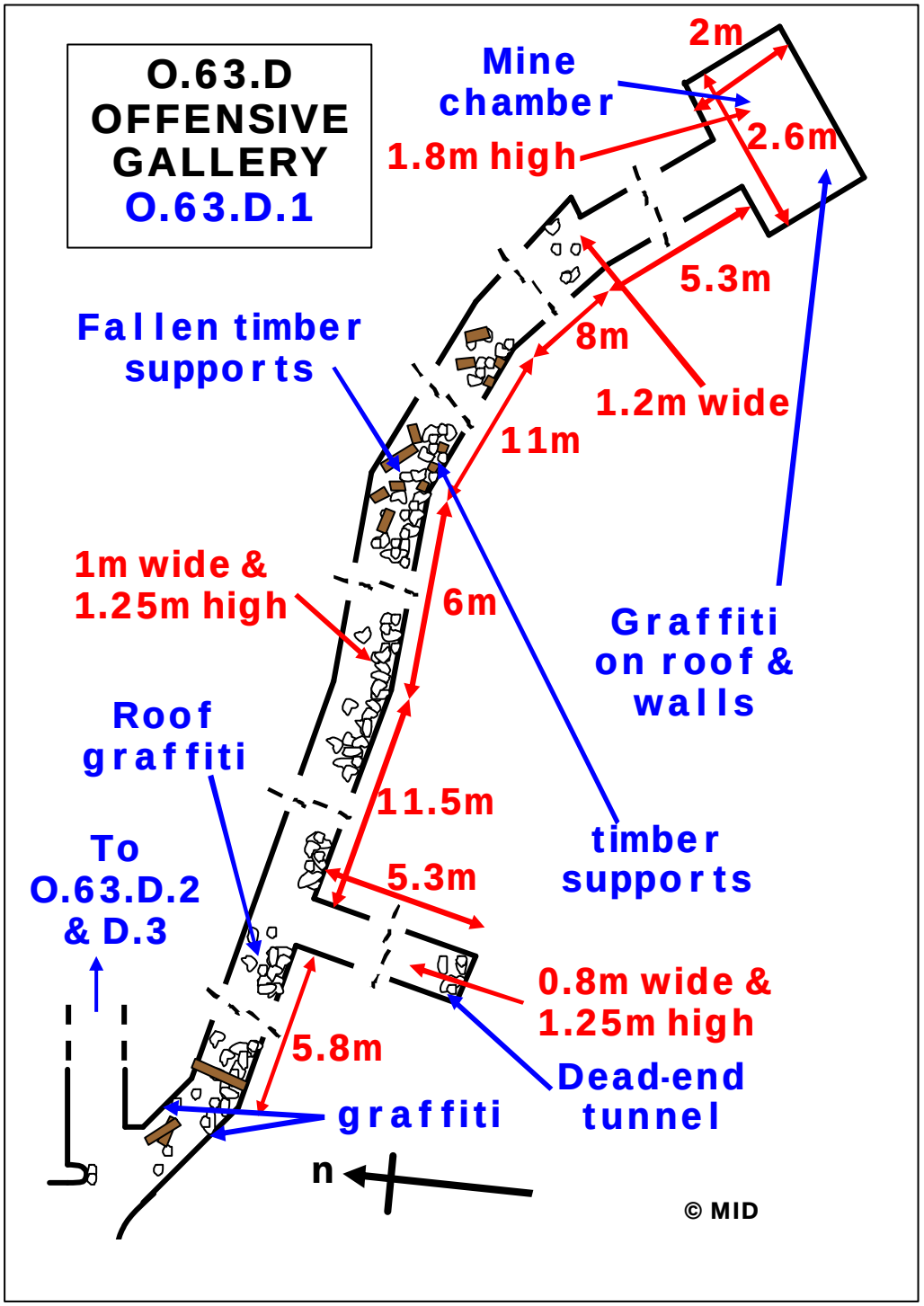


Figure 49. The O.63.D Offensive Gallery – O.63.D.1

28.9.2 On both walls of the tunnel at the start of the gallery there are a number of examples of graffiti. These take the form of rank, name and number inscriptions, drawings, scribbles and poetry. An example of one face containing a number of inscriptions is shown at Photo 214. The inscription on the facing wall that is a quotation from Shakespeare is shown in Photo 215. Along this initial length of the gallery there are also a number of examples of graffiti on the roof – these take the form of soot scrawls.



Photo 213 (right)

The start of O.63.D.1 – note the fallen timber supports.

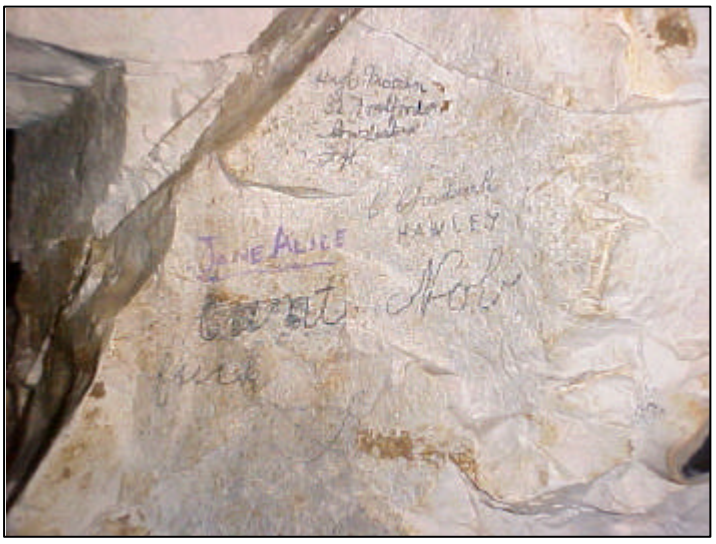


Photo 214 (left)

Panel of graffiti on the northern wall of the tunnel at the start of O.63.D.1

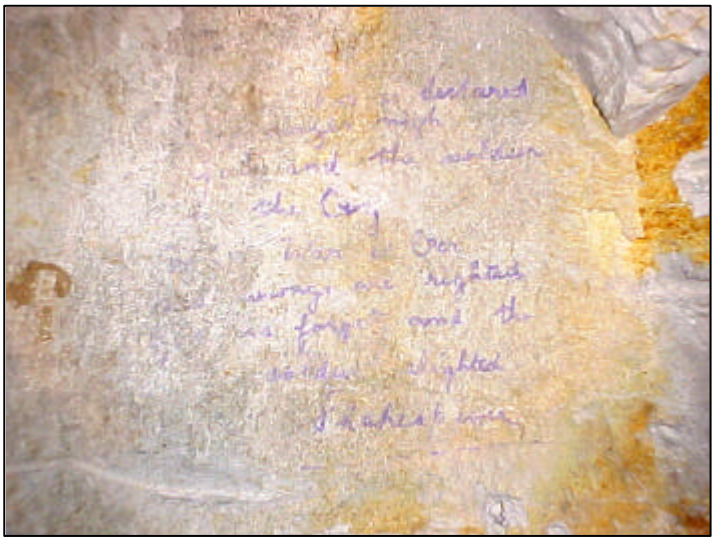


Photo 215 (right)

Quotation from Shakespeare on the southern wall of the tunnel at the start of O.63.D.1

28.9.3 5.8m into the gallery there is a small side tunnel leading off to the south (Photo 216). This side tunnel is 5.3m long, 0.8m wide and 1.25m high. There is a small quantity of chalk debris stacked up against the end wall. There are no other items of interest in this side tunnel. The tunnel continues to run straight for another 11.5m before turning 10° to the east and continuing for another 6m. Chalk debris is also stacked along the side of the tunnel (Photo 217)

Photo 216 (right)

The small side tunnel off of O.63.D.1





Photo 217 (left)

Chalk debris stacked along the tunnel wall in O.63.D.1

Photo 218 (below)

Fallen timbers in the O.63.D.1 gallery



28.9.4 The gallery makes a 25° turn to the south and runs for another 11m. Along this section of the tunnel a considerable quantity of decayed wood covers the tunnel floor and a number of timber supports also remain in situ (Photo 218). The chalk debris is stacked higher by the wall along this section of the tunnel. The gallery makes another 15° turn to the south and runs for another 8m before widening out to 1.2m. The tunnel then makes another 10° turn to the south and runs for 5.3m into a mine chamber.

28.9.5 The mine chamber is 2.6m wide and 2m deep. It is of square-cut construction and is 1.8m high (Photo 219). The floor of the chamber is covered is a thin layer of crushed chalk debris and decayed wood. Graffiti is on both the chamber walls and roof; the latter taking the form of soot scribbles. Amongst the more notable examples of graffiti are those shown in Photos 220 - 222. Photo 220 shows a pencil drawing of a soldier wearing a hat. Photo 221 shows 'One of the Gang M^{c}DIARMID 2/15 ^{Rg,} L.D'. Photo 222 shows 'Day Shift Gadsby F. Coates J. 5/12/16'.



Photo 219 (above)

The O.63.D.1 mine chamber



Photo 220 (above)

Graffiti in the O.63.D.1 mine chamber - pencil drawing of a soldier in hat

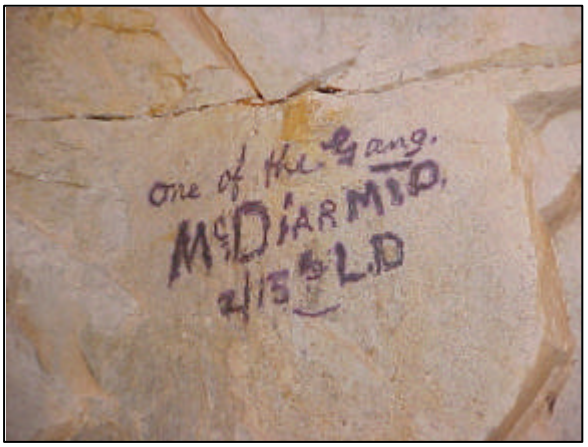


Photo 221

O.63.D.1 graffiti – 'One of the Gang'

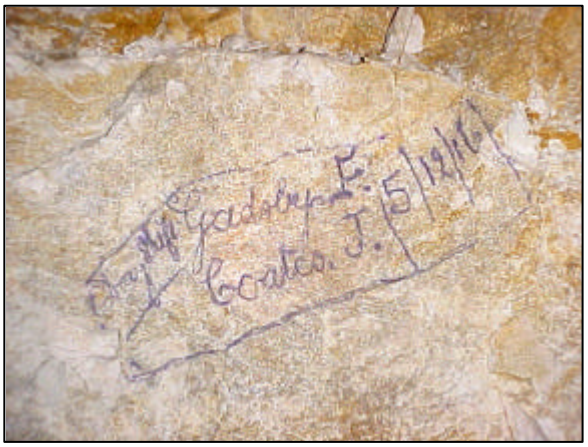


Photo 222

O.63.D.1 graffiti – 'Day Shift 5/12/16'

28.9.6 One of the main features of the graffiti in the O.63.D.1 mine chamber is the great number that record the names of men positioned there on listening duty during Dec 16 – Feb 17. A few examples of these are shown in Photos 223 – 226. Photo 223 shows that listening duty in this chamber appears to have been undertaken as a pair; in this case 'Cpl Dyke and G Hughes on 21.12.16'. Elsewhere in the chamber the pair of listeners record their names and all the days that they were on duty - 'J.R. Barnes and S. Ellway' in Photo 224 and 'Spr Robinson' in Photo 225. One of the main panels of graffiti dedicated to this practise is shown in Photo 226.

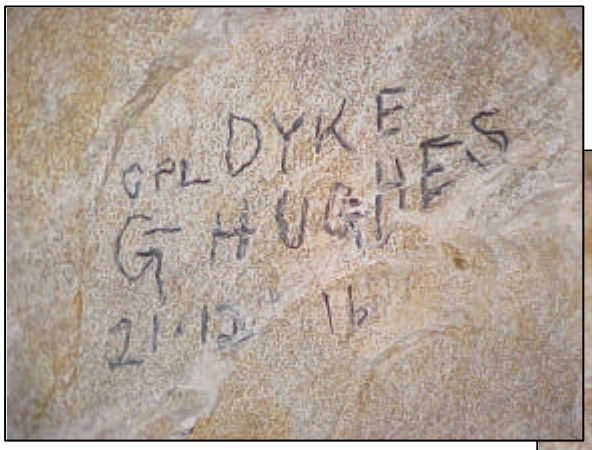


Photo 223 (above)

O.63.D.1 graffiti – 'Dyke & Hughes'

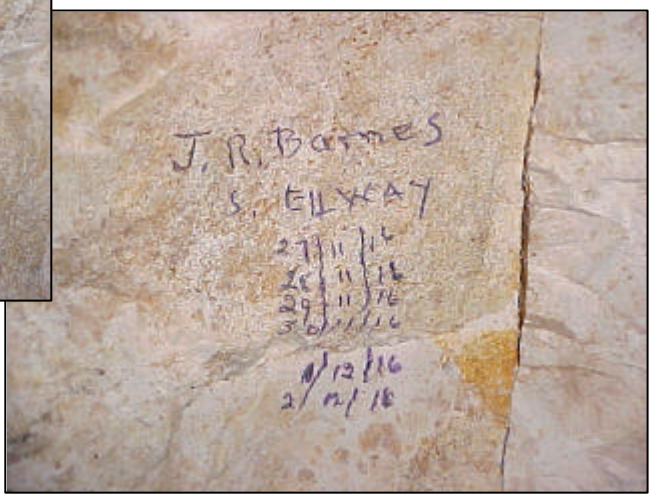


Photo 224 (above)

O.63.D.1 graffiti – 'Barnes & Ellway'

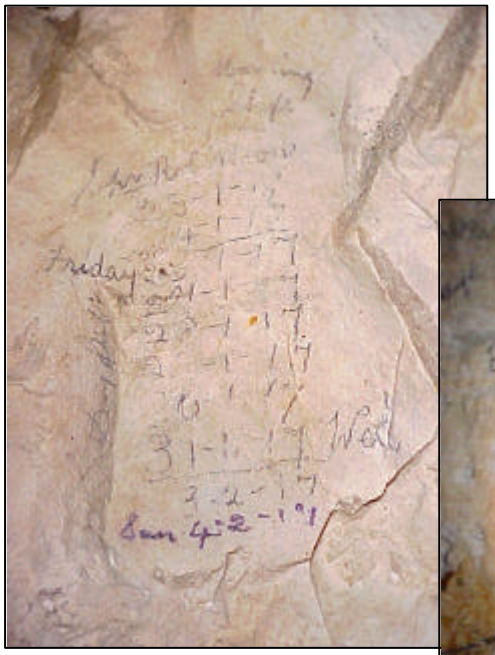


Photo 225 (above)

O.63.D.1 graffiti – 'Spr Robinson'



Photo 226 (above)

O.63.D.1 graffiti – main duty panel

28.10 The O.63.D.3 Fighting Gallery

28.10.1 A plan of the O.63.D.3 gallery is shown at Figure 50. At the junction with the O.63.D.1 gallery the left-hand fork runs for another 6.6m before reaching another fork. The tunnel is 1m wide and 1.3m high and there is chalk debris stacked along the northern wall and decaying timber spread across the floor (Photo 227). The left-hand fork runs off to the O.63.D.2 gallery. The right-hand fork runs off to the O.63.D.3 gallery and some fallen timber tunnel supports lie across the tunnel entrance (Photo 228).

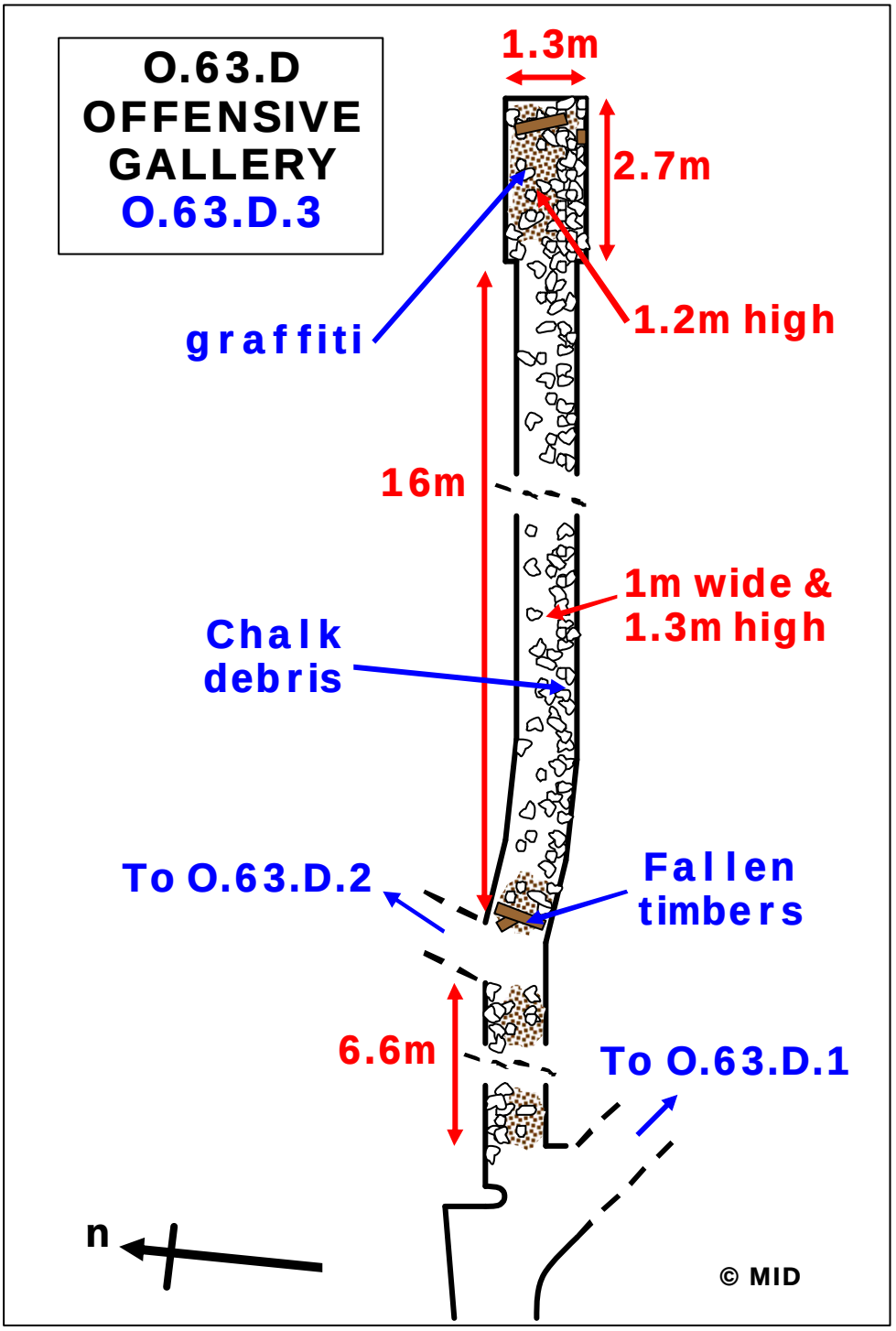


Figure 50. The O.63.D Offensive Gallery – O.63.D.3

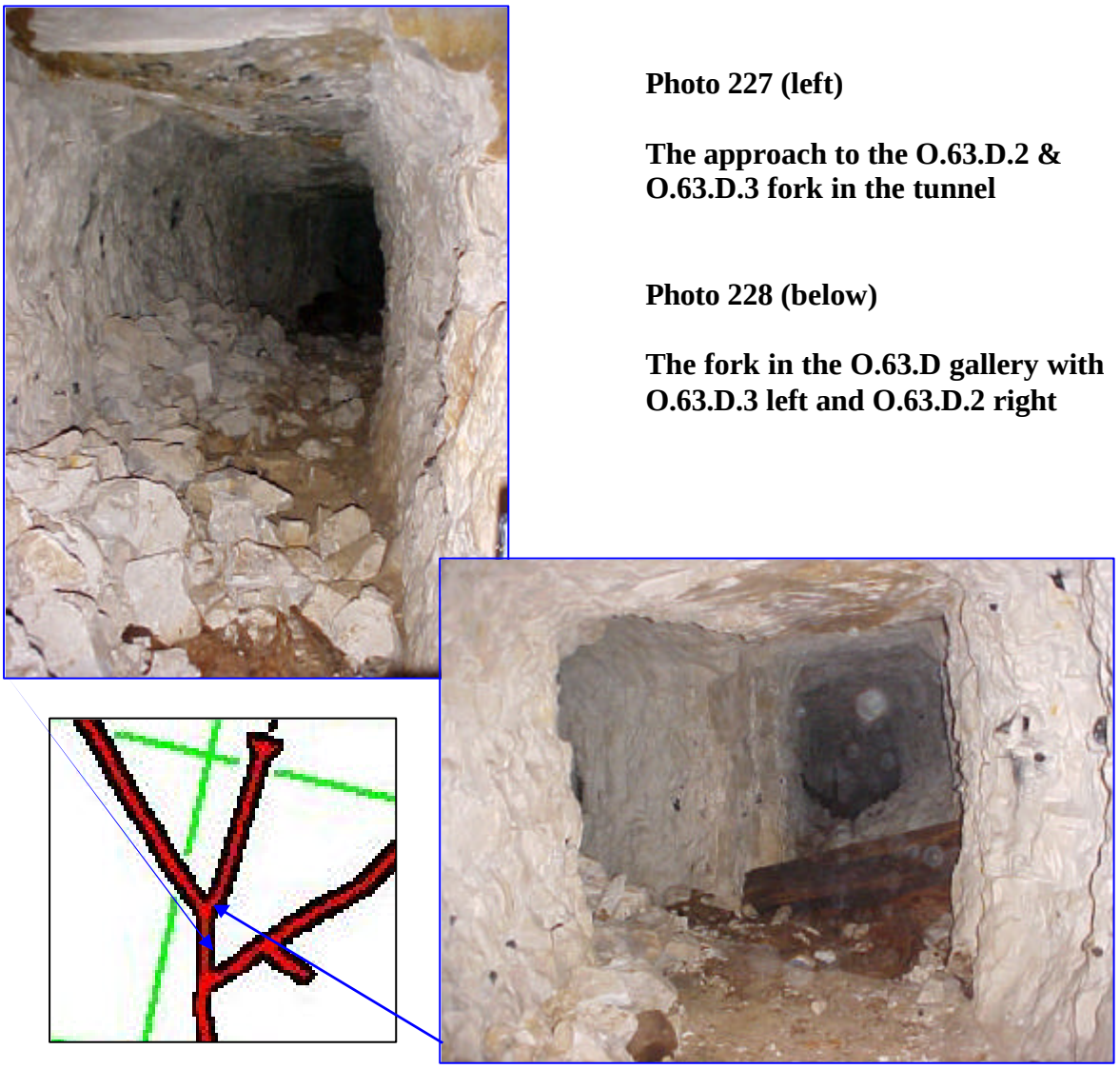


Photo 227 (left)

The approach to the O.63.D.2 & O.63.D.3 fork in the tunnel

Photo 228 (below)

The fork in the O.63.D gallery with O.63.D.3 left and O.63.D.2 right

28.10.2 The O.63.D.3 gallery is 1m wide and 1.3m high and 16m in total length. The last 10m of the tunnel descends slightly at an angle of 20°. Chalk debris is stacked against the eastern wall but has toppled over and spilled across the tunnel floor. The tunnel ends in 1 2.7m long by 1.3m wide chamber (Photo 229). An upright, decaying tunnel timber is located in the south-eastern corner and other fallen timbers lie in the chamber. Chalk debris covers the floor of the chamber to a depth of 30cm or so. The chamber is not as well defined as some of the others and the walls have not been 'smoothed' very well. Ledges appear to be covered with decayed organic material.

28.10.3 There is some graffiti in the chamber. Two of the more interesting examples are illustrated. Both clearly indicate that the chamber was used for listening. Photo 230 is an ink drawing showing where the listeners should listen. The arrow surrounded by the words 'listen here' suggests that the Germans may have been close to O.63.D.3 at some point and the occupants were indicating to their comrades the best place to listen for enemy activity. There is very definite evidence for enemy activity indicated by the graffiti shown in Photo 231. This example shows that 'Sapper James H Robinson heard them here'.



Photo 229

O.63.D.3 mine chamber showing the chalk infill and tunnel timbers

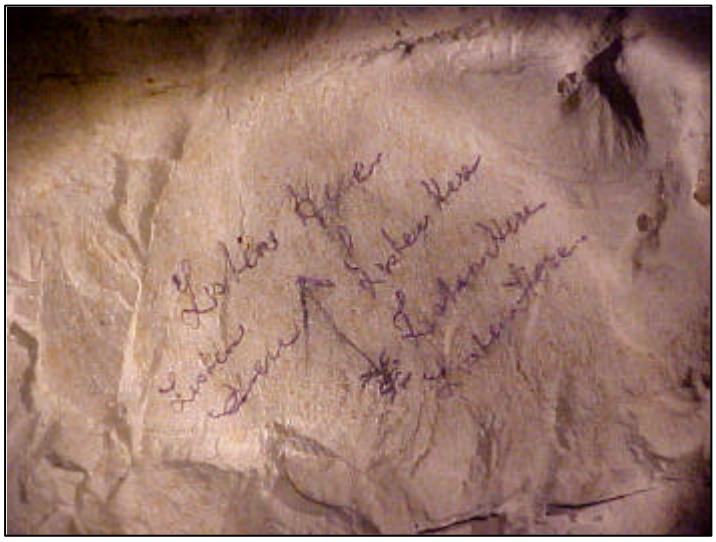


Photo 230

O.63.D.3 graffiti - ‘Listen here’

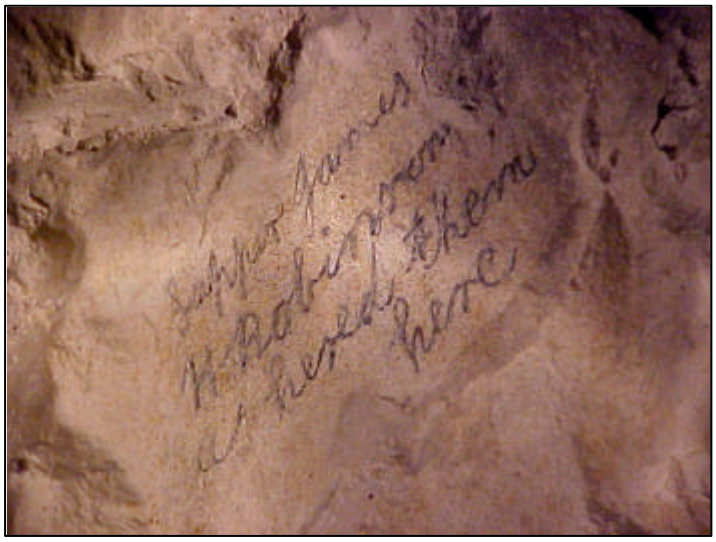


Photo 231

O.63.D.3 graffiti - ‘Sapper James H Robinson heard them here’.

28.11 The O.65.D.3 Fighting Gallery

28.11.1 A plan of the O.63.D.2 gallery is shown at Figure 51. The gallery is 1m wide and 1.3m high and runs for 29m before a dog-leg. Along this length of the gallery a number of standing timber supports remain in situ on the north western side of the tunnel. The timber supports along the south eastern side have all fallen across the tunnel. The chalk debris dug from the mine chamber and stacked along the western wall has collapsed across the floor of the tunnel (Photo 232).

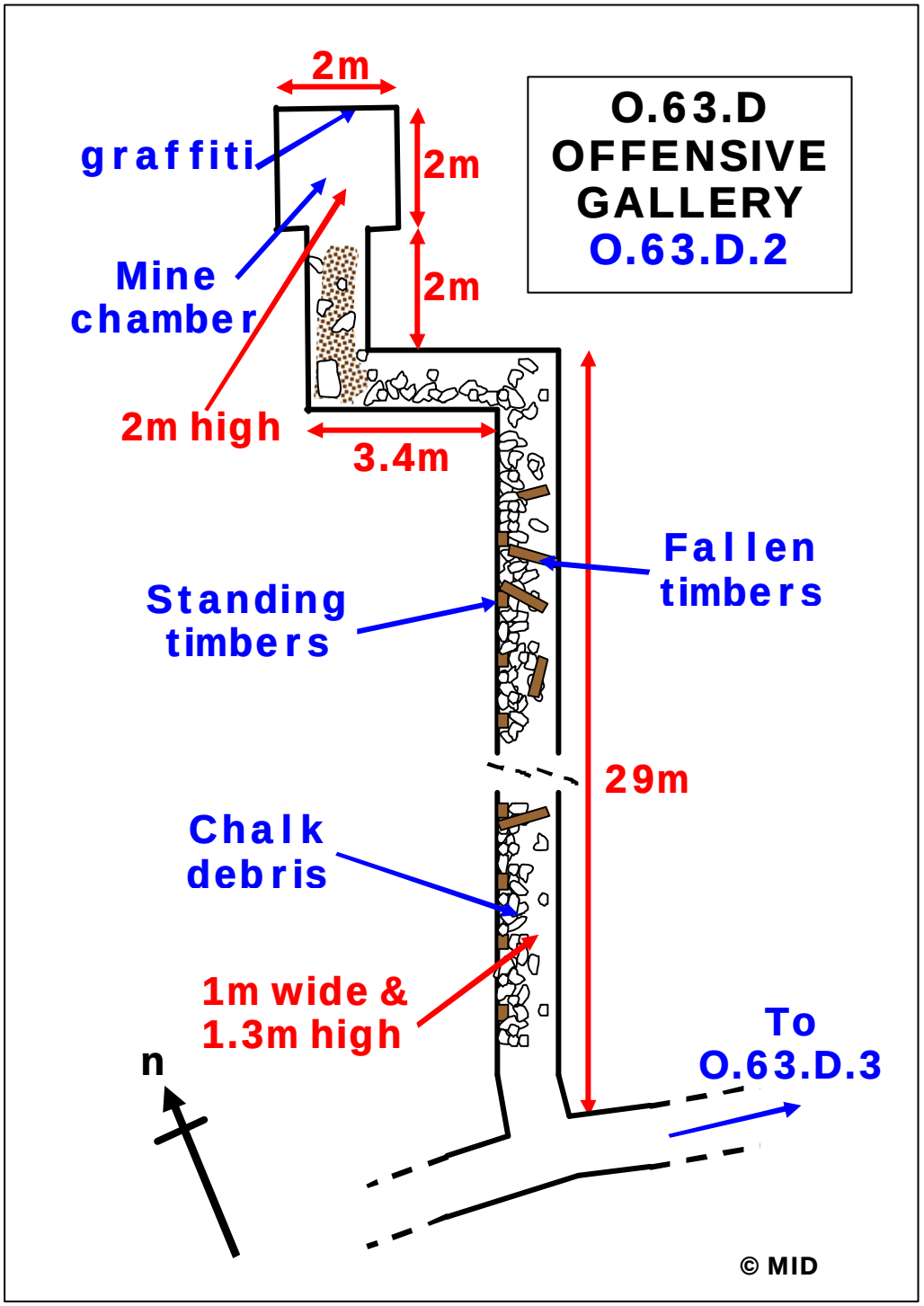


Figure 51. The O.63.D Offensive Gallery – O.63.D.2

28.11.2 The left hand dog-leg is 3.4m long. A large chalk block is located in the western corner of the tunnel at this point. This appears to have been deliberately placed here rather than fallen from the roof. A further 2m stretch of gallery runs forwards before ending in a mine chamber (Photo 233). Along this final stretch of tunnel there is a considerable quantity of decayed timber on the floor. The O.63.D.2 mine chamber is 2m long by 2m wide and is 2m high and is clear of any debris apart from a very light covering of fine chalk debris (Photo 234).



Photo 232 (left)

The O.63.D.2 gallery tunnel with the standing and fallen timber supports and the spilled chalk debris





Photo 233 (above)

The dog-leg in the O.63.D.2 gallery with the prominent chalk block on the floor

Photo 234 (left)

The O.63.D.2 mine chamber. Note the soot scrawls on the roof of the chamber

28.11.3 The O.63.D.2 mine chamber contains the greatest array of graffiti of any of the O Sector tunnels and chambers. Only a small selection is included in this report to illustrate the variety. At the entrance to the mine chamber there are two examples; one on either side of the tunnel wall. One (Photo 235) gives the names of two listeners who were present for the afternoon shift on 28 Jan 17. Another (Photo 236) provides comment on a mine explosion – 'up she goes with the best of luck'. There is also a good example of soot graffiti on the tunnel roof immediately before the chamber (Photo 237). This takes the form of a tunnellers 'T' with writing beneath.

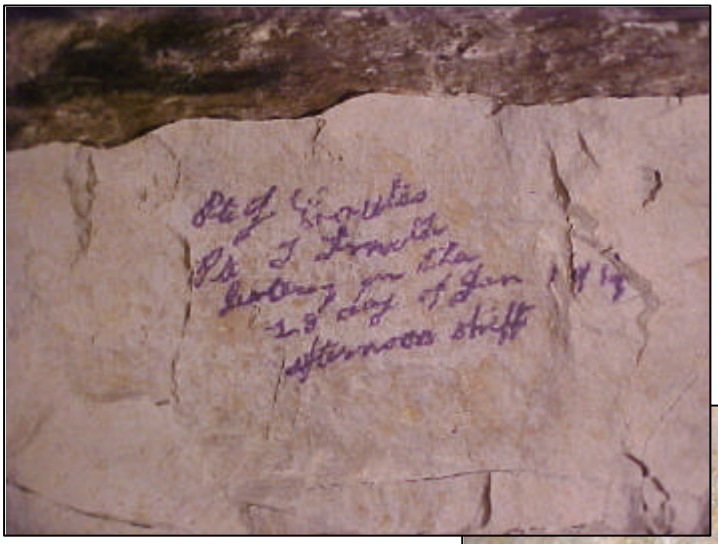


Photo 235 (left)

O.63.D.2 tunnel graffiti - afternoon shift names 28 Jan 17

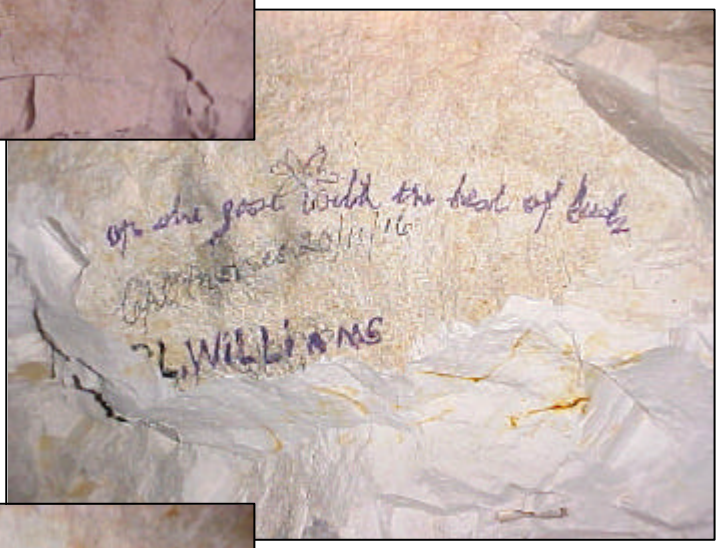


Photo 236 (right)

O.63.D.2 tunnel graffiti - 'up she goes'



Photo 237 (left)

O.63.D.2 tunnel graffiti - tunnellers' mark on the tunnel roof

28.11.4 The mine chamber contains a lot of graffiti giving the names of those soldiers who were involved in listening duties. There are several panels of such scribbling including that shown in Photo 238. These normally consist of the names of the listening pair, the date and the duty shift. The chamber also contains several references to 172 Tunnelling Company soldiers such as that shown in Photo 239. This particular example refers to 137617 Sapper D E Francis and 137615 Sapper J Morris who recorded their duty stint on 22 Nov 16.

28.11.5 Of greatest note in this chamber is the poetry shown in Photo 240. One soldier has written in purple ink:

'You don't come here to sleep and slum,
But to listen for the Hun,
With the geophone you'd hear
The Dirty Eyed German fucking near
A Old Soldier'

To this another hand appears to have responded in black pencil:

'Now don't come here as Listeners Poet
And you old soldier, ought to know it
So use your wits
And harken for Fritz
If you hear him, then we'll blow it.
Anon'



Photo 238 (right)

One of the O.63.D.2 mine chamber graffiti panels

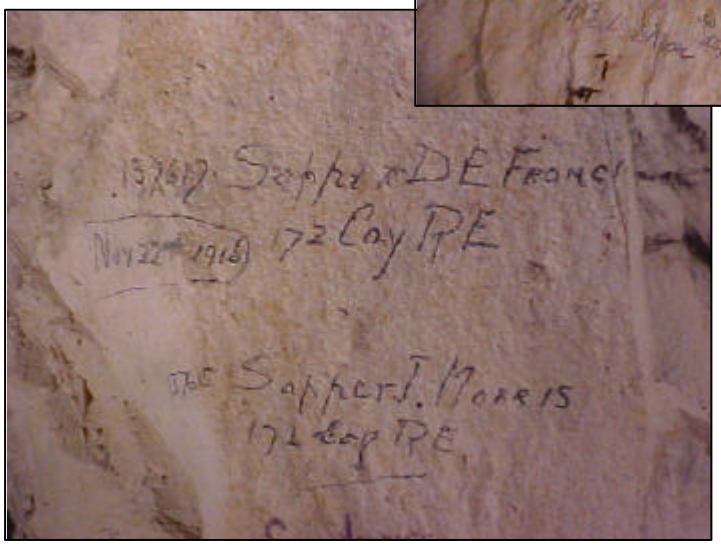


Photo 239 (left)

O.63.D.2 graffiti - Sapper Francis & Sapper Morris

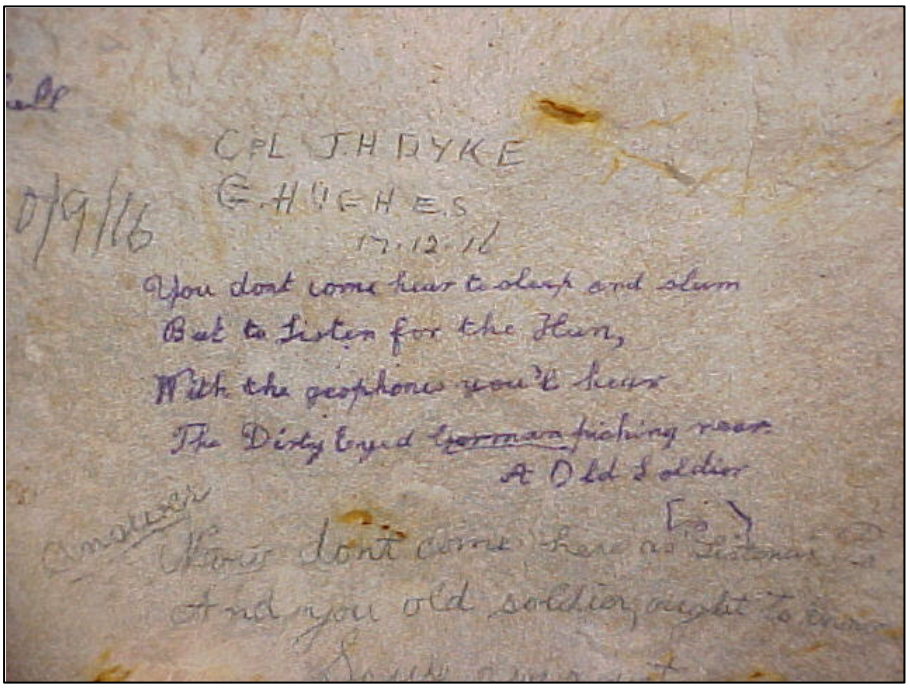


Photo 240

O.63.D.2
Some poignant poetry

28.11.6 In addition to the names of listeners there are also a number of pictures and other drawings on the chamber walls. A few examples are shown below. Photo 241 shows an anchor and heart whilst Photo 242 shows a crude figure associated with some initials. Photo 243 appears to be a picture of an officer. The chamber roof is completely covered with soot scribbles. One of these appears to be the outline of a tunnel system (Photo 244) surrounded by initials.



Photo 241

O.63.D.2 graffiti – anchor & heart

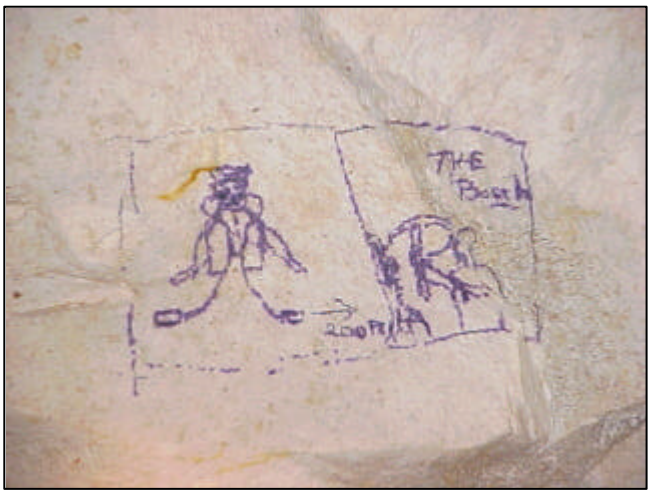


Photo 242

O.63.D.2 graffiti – crude figure & initials



Photo 243 (left)

O.63.D.2 graffiti - ink drawing of an officer



Photo 244 (right)

Soot graffiti on the roof of the O.63.D.2 chamber. Note the tunnel plan

29 CONCLUSIONS

29.1 Although gratifying to have accessed the O Sector it was disappointing to find that it had been deliberately blocked off close to O62D by the builders of the A26, the evidence for which are the modern, orange survey markers throughout the system. These suggest that the whole system was systematically explored and surveyed at that time. Unfortunately no record of this survey was deposited with the Director at Vimy, as far as is known. The southern half of the sector therefore remains unexplored.

29.2 The condition of the deep tunnels within the accessible northern half of the sector is generally very good. There is little evidence of any major roof falls or slabbing and the tunnels appear very stable with few areas having required timbering. Even where the remains of timber supports are encountered the tunnel structure remains sound. Where chalk falls have been encountered these appear to be from the tunnel walls rather than the roofs. The deep system poses no surface hazard.

29.3 The general condition of the two higher level offensive galleries (O.63.D & O.65.C) is, however, poor. In most of the galleries there is evidence of roof slabbing and there is considerable rubble covering the tunnel floors. O.63.D.2, in particular, is in a very dangerous condition with substantial roof falls and clay intrusions and evidence of frequent flooding. However, the likelihood of a sudden surface collapse is considered highly unlikely and therefore these do not pose any significant safety hazard.

29.4 There were no obvious sitting mine charges discovered within the accessible northern half of the sector although clearly ammonal explosive was positioned in at least two mine chambers at some point during the war. There is approximately 1500lbs of ammonal explosive located in the O.63.E explosive store although no associated demolition accessories. Testing of a small quantity of the ammonal indicated that it had significantly degraded and poses no surface hazard. It can be left to decay within the store.

29.5 It is possible that a mine charge remains in the collapsed mine chamber of O.65.C2. The available records clearly refer to a mine charge being in situ but there is no record of it having been removed. Although there are no obvious firing cables the covering rubble on the tunnel floor could be concealing them. The possible geophone cable may support the existence of a mine charge in O.65.C2 although this is not conclusive in its own right.

29.6 Further substantial clearance of the rubble in the O.65.C2 tunnel would be necessary in order to determine first whether firing cables are still in position. This would then give some idea as to whether a mine charge still existed. However, substantial engineering works would be required to first stabilise the O.65.C2 gallery to permit safe working and then to clear through the collapse to the mine chamber beyond. It is possible that the mine chamber itself has collapsed.

29.7 Although no comment can be made about sitting mine charges or other explosive hazards within the inaccessible southern portion of the system it is assessed that it is not likely to be any significantly different from the northern part. In any case the southern section lies outside the boundaries of the memorial site and so pose no safety hazard to the general public within the Canadian site.

29.8 It is apparent that 'O' Sector appears to have been partially cleared during, or at the end of the war. There is clear evidence of the deliberate removal of wooden rails and sleepers from some parts of the tunnel trackway although in other places both have been left to decay in situ. The lack of any significant mining artefacts in the tunnels also supports the supposition that clearance was a deliberate act, probably by the miners themselves. It is not possible to say what may have remained and subsequently been removed when the construction of the A26 rendered temporary access.

29.9 That portion of 'O' Sector now accessible contains a number of unique archaeological features. With the exception of P Sector no other British deep defensive mining systems are accessible anywhere on the Western Front. The cleared incline gallery down into O Sector is also believed to be unique at this time, all others being completely filled. The system also contains a very substantial quantity of unique military graffiti, which are the subject of a separate, supplementary report.

29.10 The general layout and design of 'O' Sector corresponds well to the various mining plans, mine reports, war diaries and other surviving documentation available to the Durand Group. Where there are differences these can generally be dated to the period for which no records survive and are after the date of the last available tunnel plan. It has not been possible to confirm that the southern half connects with the northern half but it is assessed that it does.

29.11 Due to the inability of the Durand Group to gain access to the southern half of the sector it was not possible to determine if any link existed between 'O' Sector, the Lichfield Subway and the German mine workings known to be close in the area. Gaining access to the southern sector through one of the three incline galleries that lay outside the site is possible but not considered practical at this time. It is possible that any survey report produced by the builders of the A26 may make reference to any such connections if they existed.

29.12 Despite the relatively small number of artefacts recovered some are significant. The recoveries of the winch assembly and the bogies from the winch trolley are significant as is the discovery of the mobile charge in the explosive chamber. It is possible that other artefacts associated with the winch equipment remain underneath the debris stacked to the rear of the winch chamber for stability purposes. All of the other artefacts are either associated with military equipment and uniform or trench furniture and are unlikely to be directly associated with the tunnels as they appear in the trench stairway infill.

30 RECOMMENDATIONS FOR FUTURE WORK

30.1 'O' Sector is unlikely to ever be sufficiently safe to allow the general public access and it is recommended that it is not considered for this purpose. However, the system is a very significant subterranean battlefield archaeological resource and it is considered that it should be retained for further research purposes.

30.2 The Hobbit House will provide adequate protection and security to the system for the short to medium term. Canadian Veteran Affairs do, however, need to make a decision about the long term future of 'O' Sector. If the system is to remain open, even for further research purposes, then a more substantial and permanent entrance will need to be constructed. This is necessary from both safety and security perspectives.

30.3 It is suggested that 'O' Sector be comprehensively surveyed and photographed to allow a 3-D graphic of the system to be constructed. It would then be possible to construct an audio-visual interactive tour of the system which could be accessed by visitors to the site in the visitor's centre i.e. if the visitors cannot go into the system then bring the system to the visitor.

30.4 There is a need to undertake additional clearance and consolidation work on the winch incline. The incline needs to be cleaned up and the sandbag revetment either replaced or the remaining rubble removed completely (the latter option is recommended). It is recommended that the winch chamber is cleared of all rubble and measures be taken to replace the temporary protective framing in the chamber with a more permanent structure.

30.5 Further research needs to be undertaken with the Arras municipal archaeologist to determine what, if any, survey reports were produced by the construction team who built the A26 and broke into and surveyed the system. It is possible that this might give some idea of whether a connection into the German workings was made and may influence decisions on any future work on the southern half of the system.

30.6 Further work needs to be undertaken to confirm whether a mine charge remains in the O.65.C2 mine chamber. Some clearance of the rubble at the beginning of the gallery should be undertaken to determine the existence, or otherwise, of any firing circuit. This would permit an informed decision to be made about what, if any, further work is necessary with regard to this chamber.

30.7 The mining artefacts recovered from 'O' Sector should be professionally preserved; particularly the winch trolley and winch mechanism. Consideration should be given to these being restored to their original condition and displayed in an appropriate venue at Vimy Ridge. They should not be displayed in the Grange Subway without appropriate environmental protection.

ANNEX A - ARTEFACTS RECOVERED FROM EXCAVATION CONTEXTS

A1.1 For the sake of simplicity only five context areas were used to record artefact finds during the initial clearance work to gain access to the winch chamber, the clearance of the winch incline and the investigation of the tunnel system. These were as follows:

- OS01 – The infill of the trench staircase
- OS02 – The trench line (incl parapet and parados) within the fenced site
- OS03 – The area surrounding the trench staircase within the fenced site
- OS04 – The winch chamber and winch incline down to the horizontal deep level
- OS05 – The deep level tunnels

A1.2 All artefacts recovered were numbered using the context number followed by a serial number starting at 001. Small artefacts were bagged and labelled and lodged with the Vimy Site Director for safekeeping. Some larger items were highlighted to the Arras Municipal Archaeologist for potential conservation and wider exhibition. Note that only the more significant artefacts from the tunnels (context OS05) were recovered.

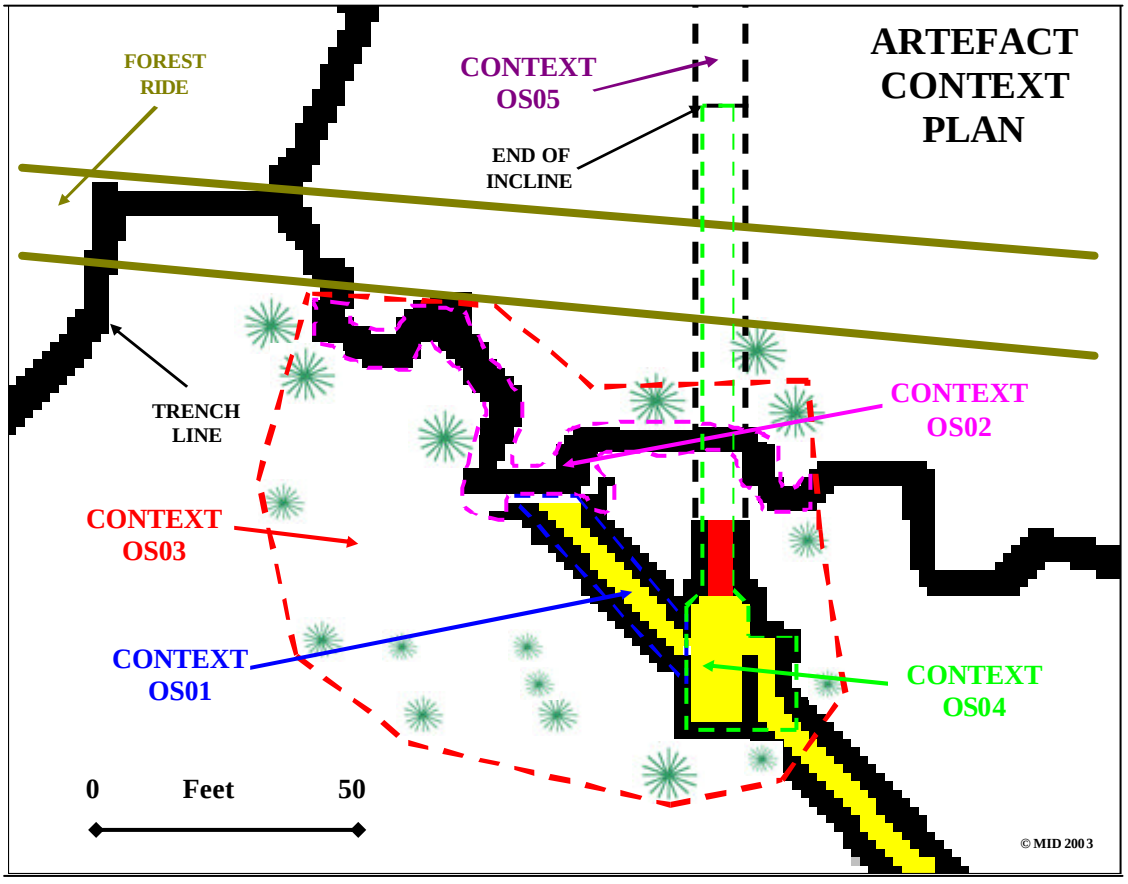
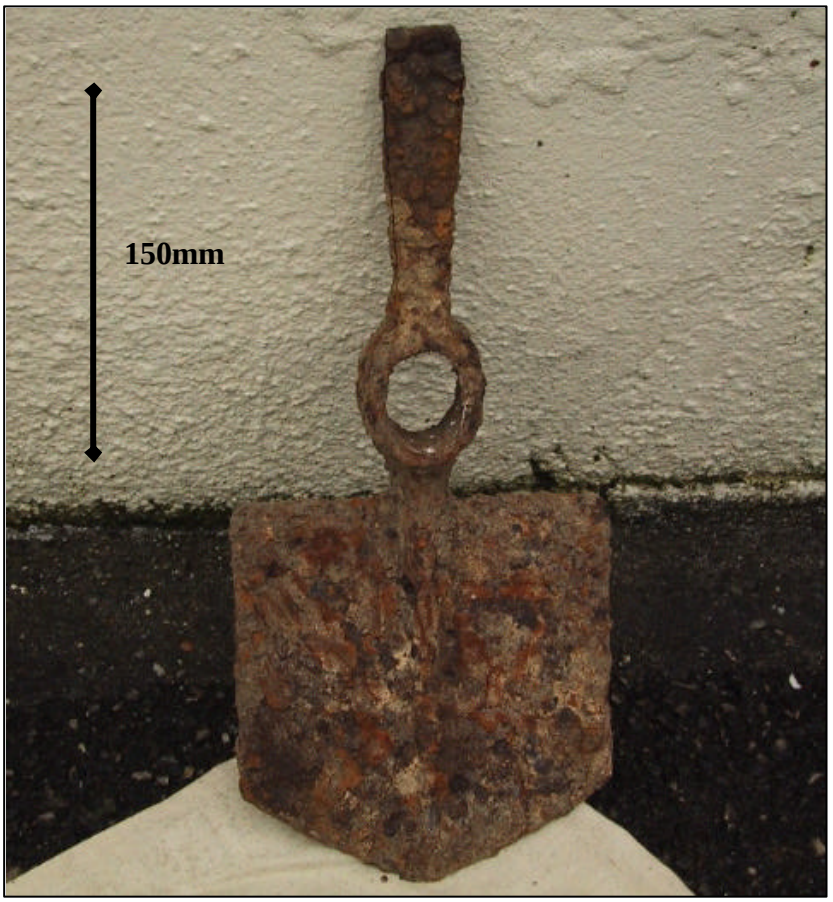


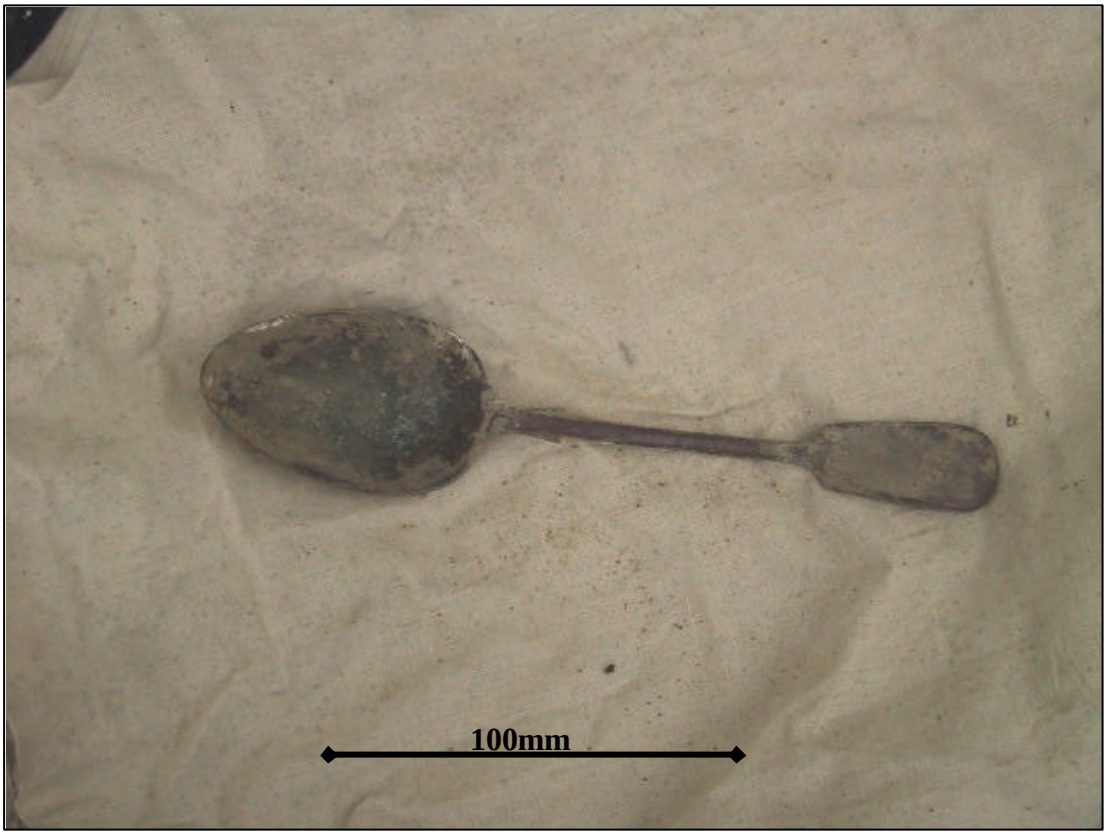
Figure A1. Artefact Context Plan



OS01/001 - British Entrenching Tool



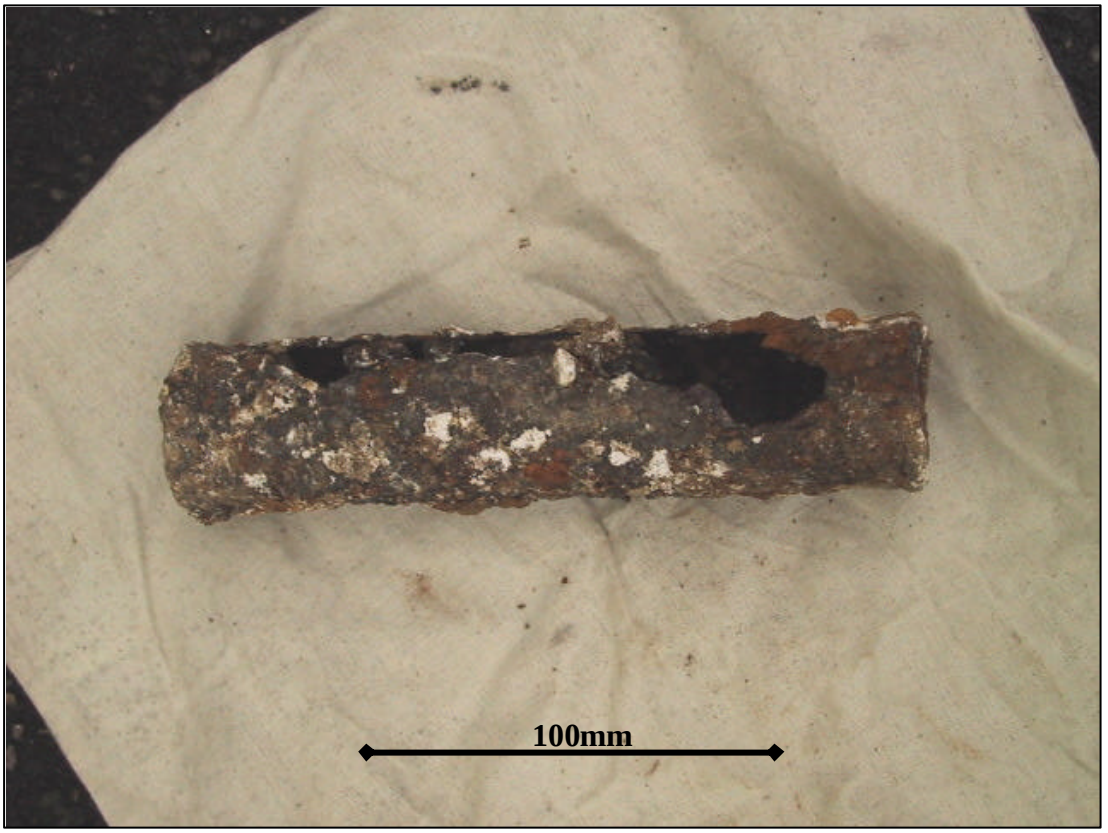
Digging in using the entrenching tool



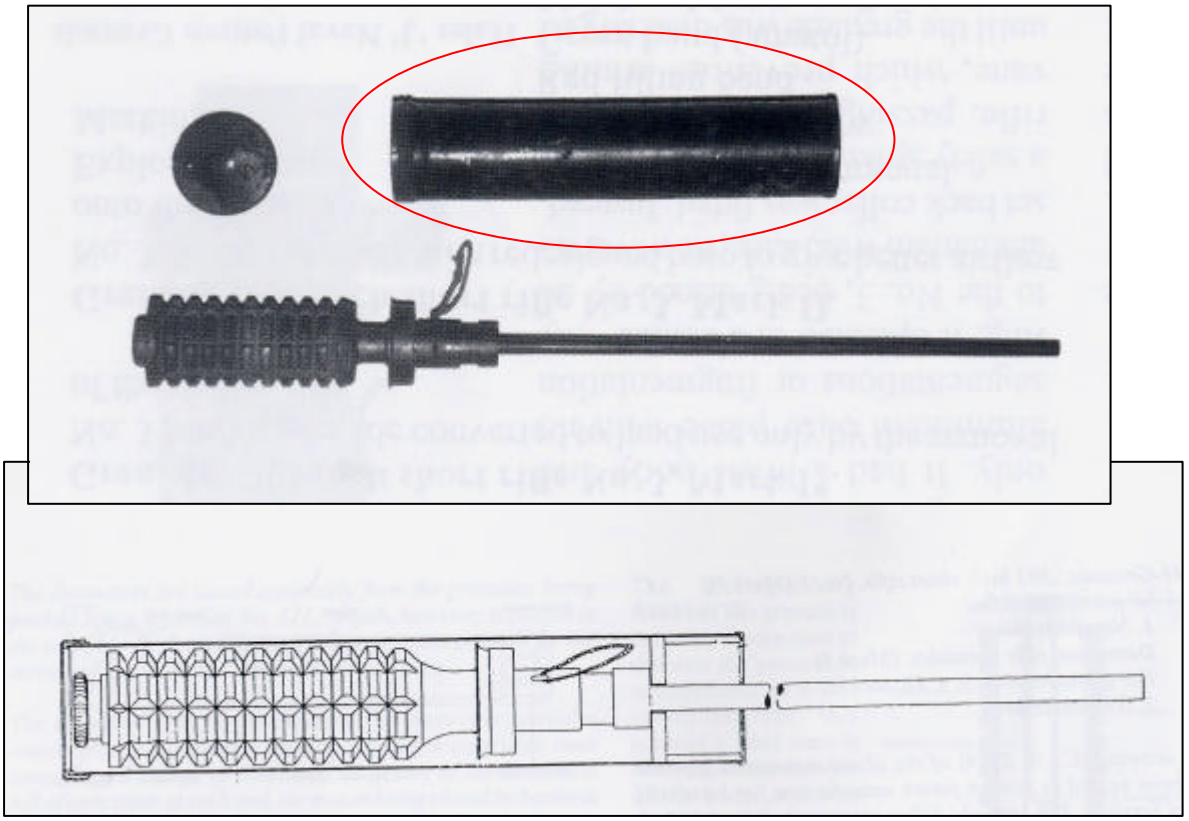
OS01/002 – Spoon



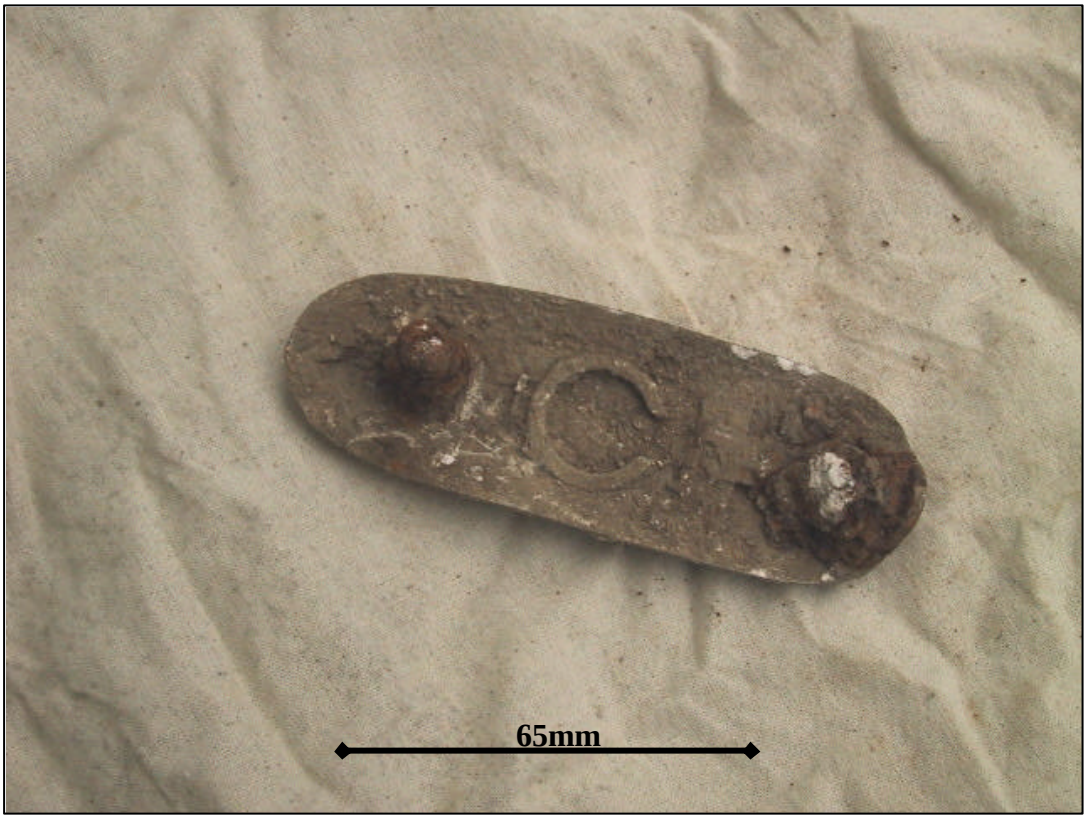
British troops eating with issue spoons



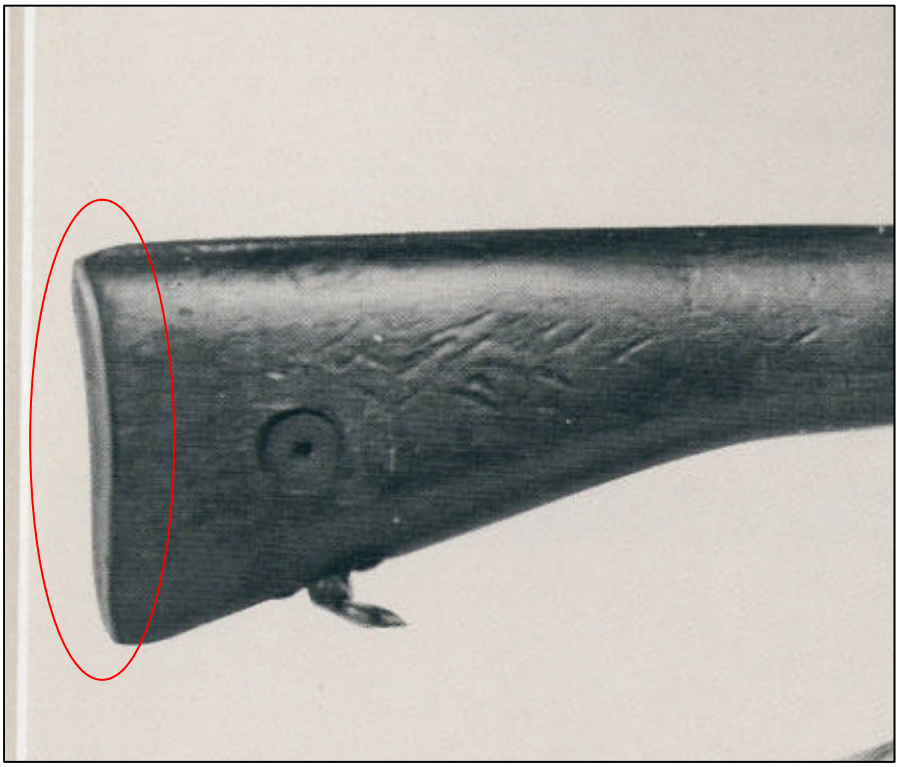
OS01/003 – Container for British Grenade, .303" Short Rifle, No.3 Mk 1



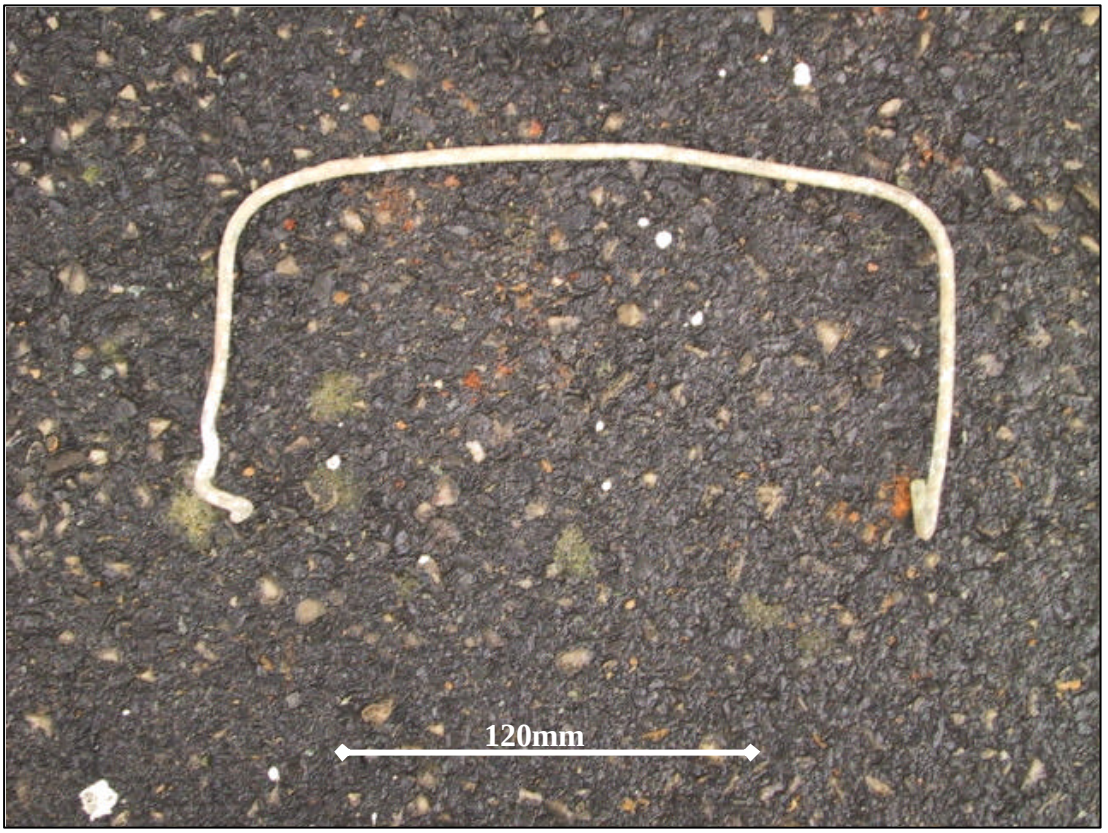
Original Photograph and Sketch of No. 3 Grenade



OS01/004 – Butt Plate from a British .303” Short Magazine Lee Enfield Rifle



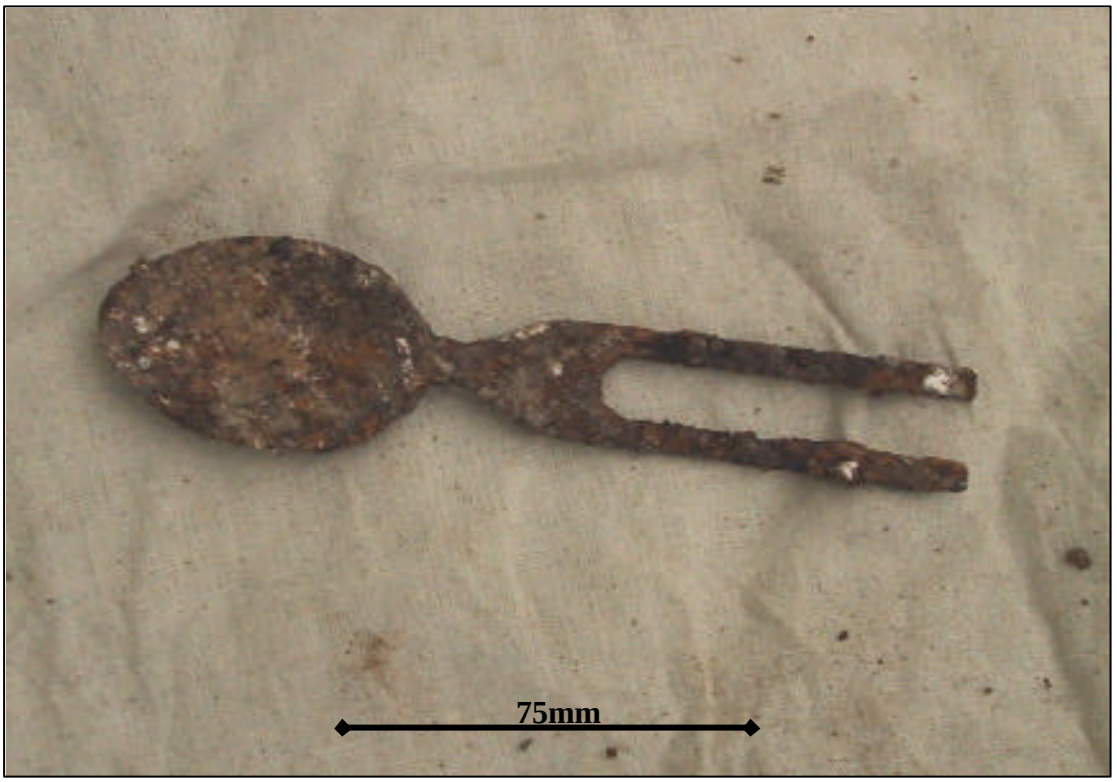
Butt of a .303” SMLE Rifle with Butt Plate Circled



OS01/005 – Handle from British Mess Tins



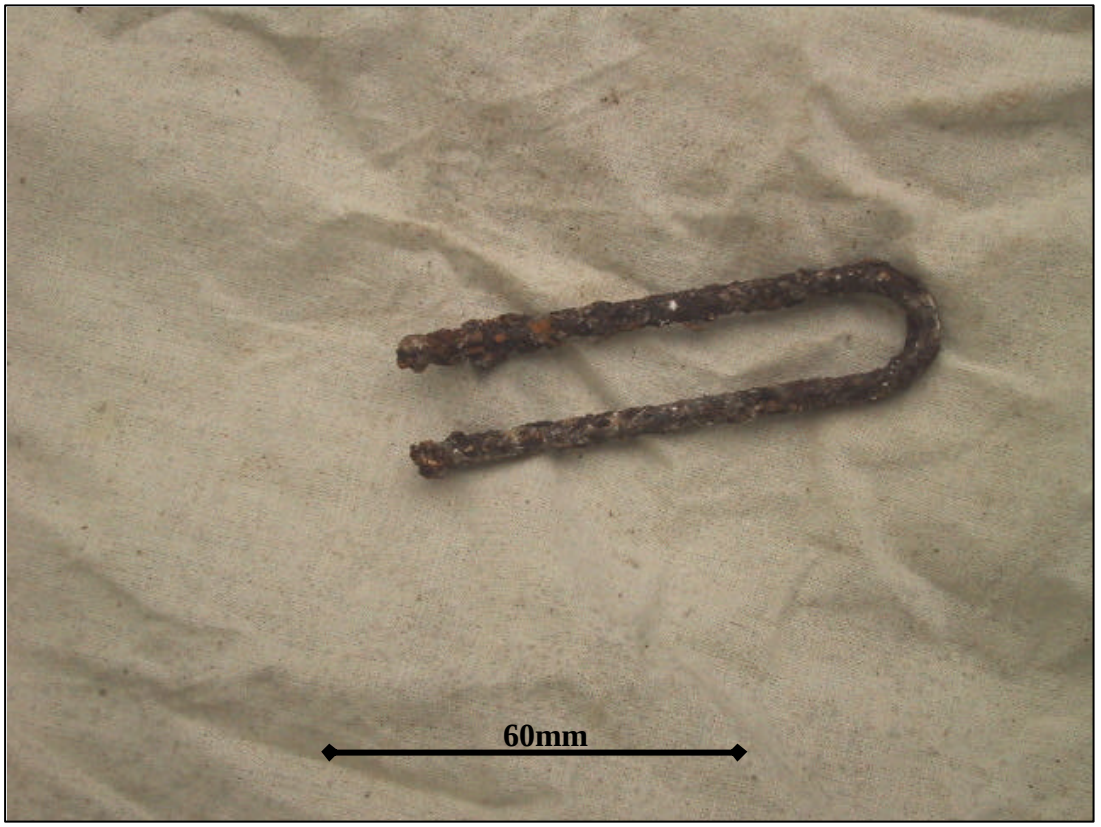
British Mess Tin in webbing Carrier showing metal handle



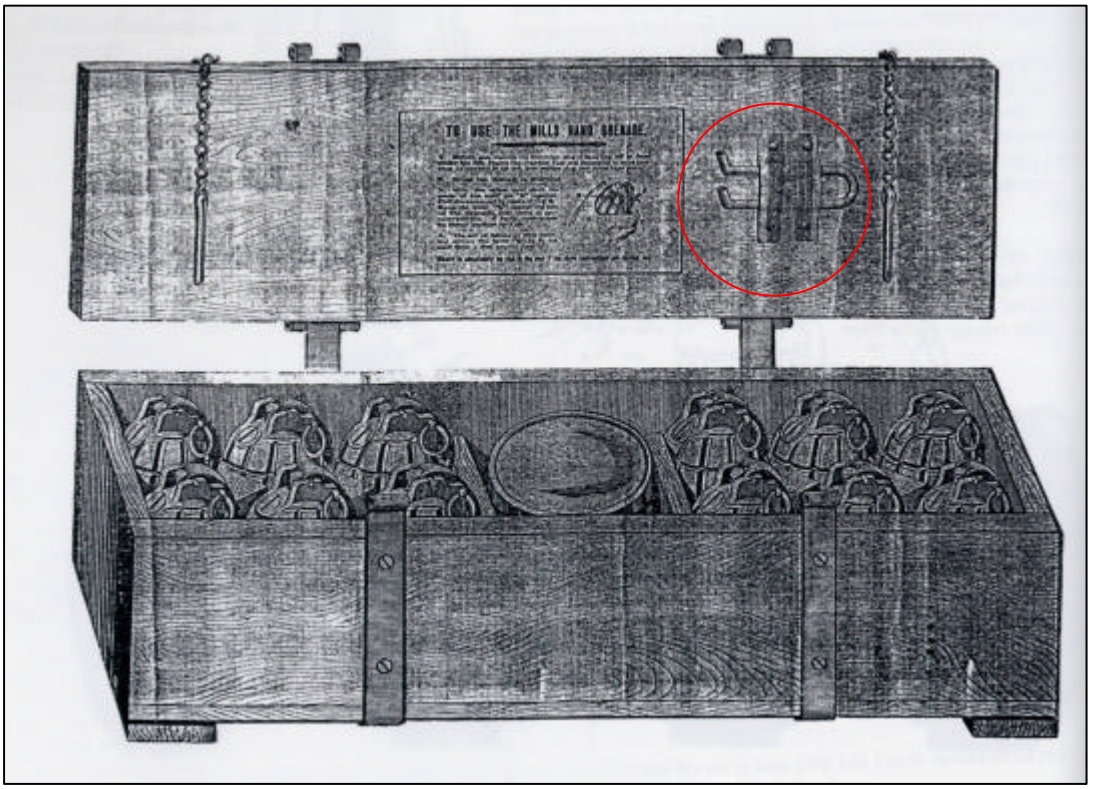
OS01/006 – Unknown Spoon less wooden handle



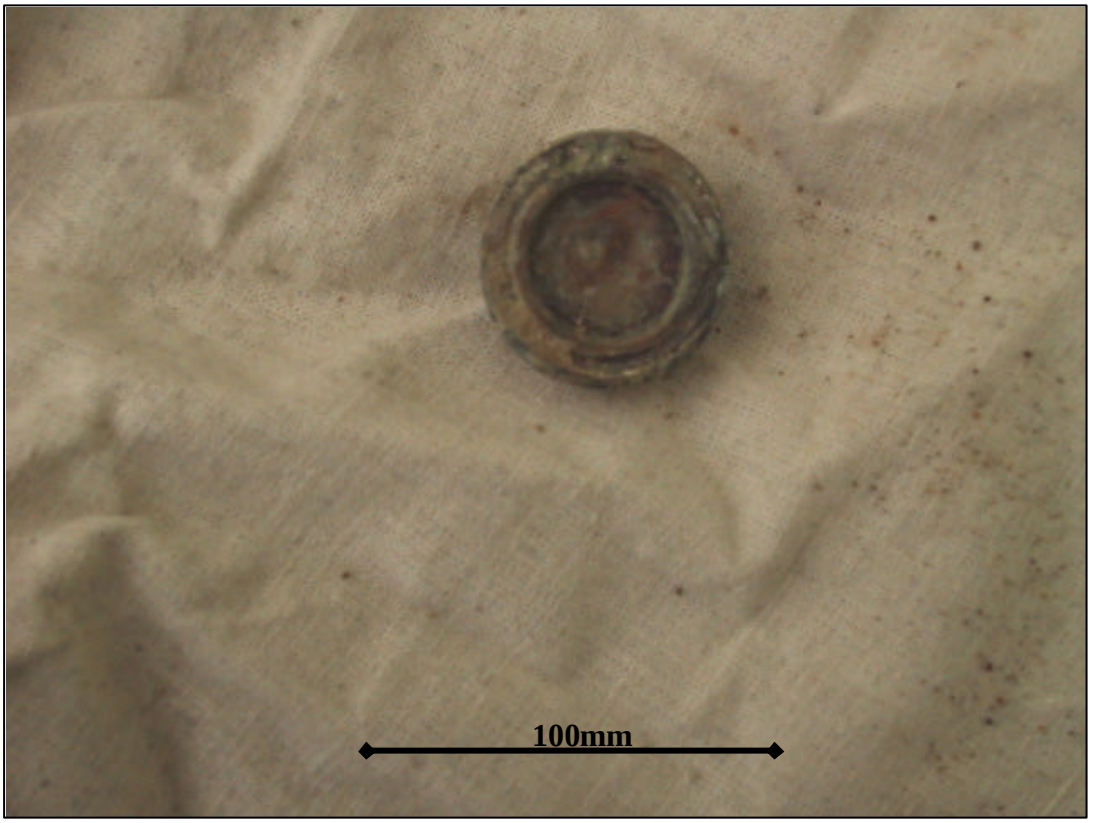
British soldier eating



OS01/007 – Base Plug Key for No. 5 Mills Grenades



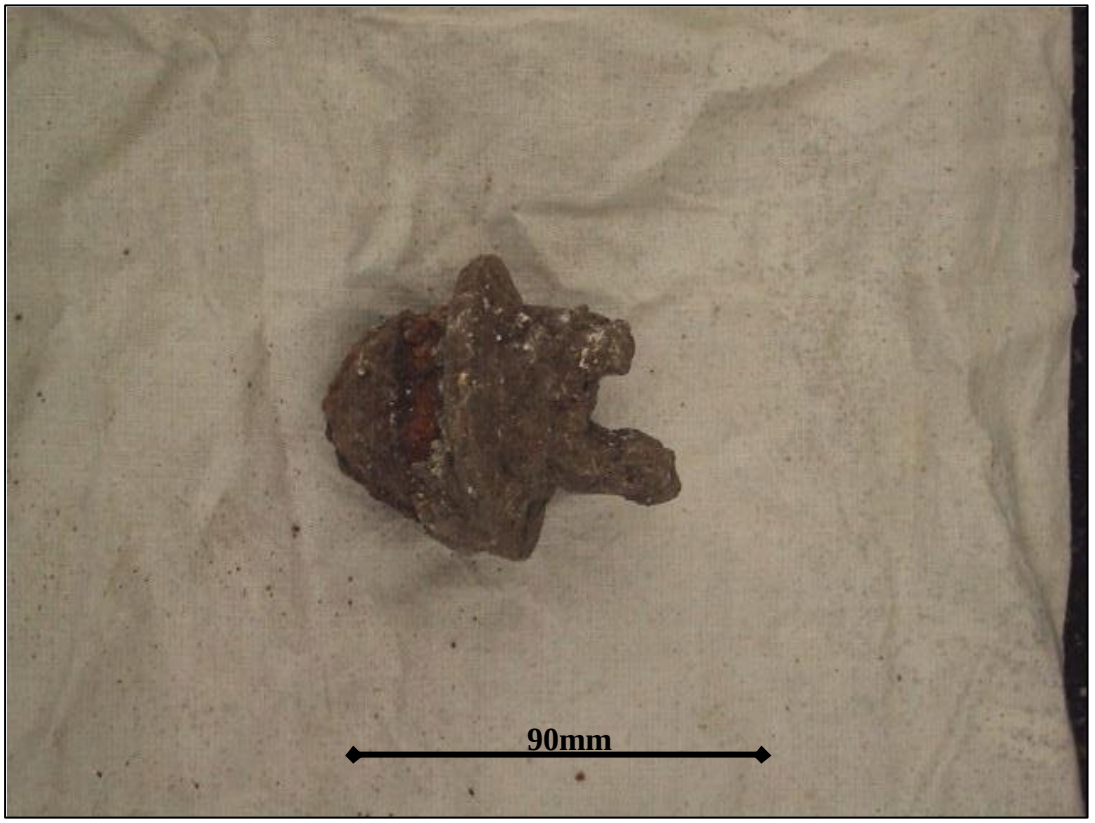
Drawing of Box of No. 5 Hand Grenades, with Base Plug Key Circled



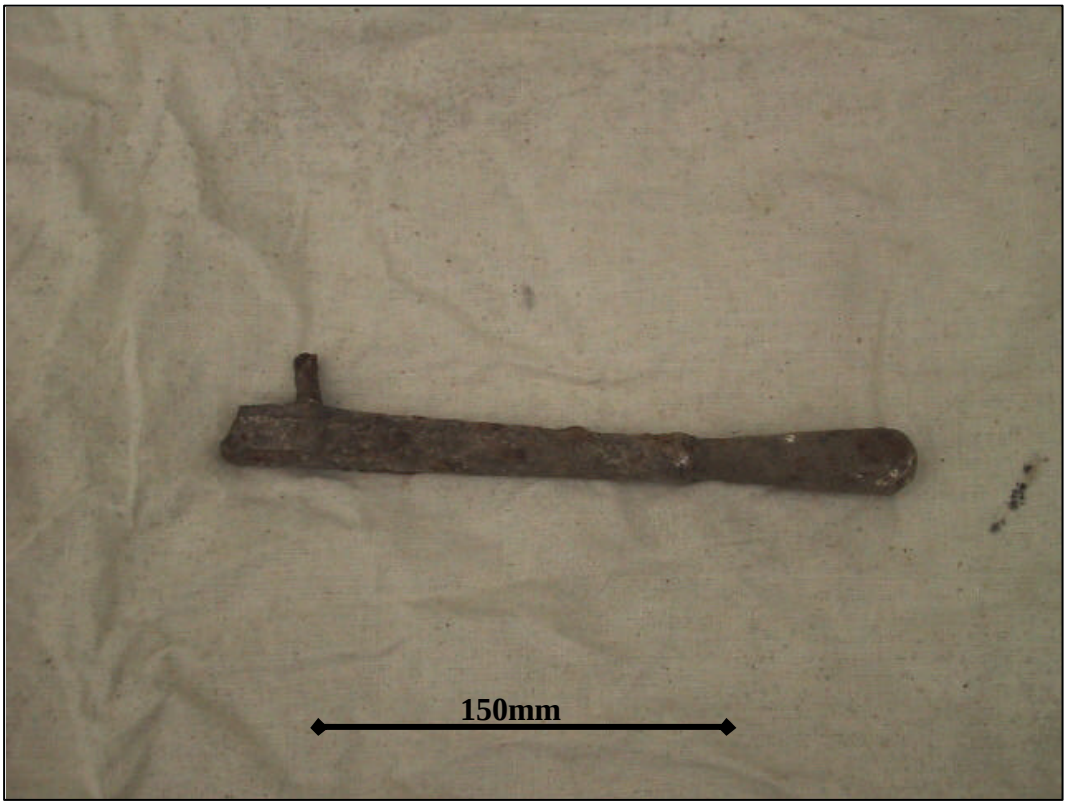
OS01/008 – Unidentified Time Ring from shell fuze



OS01/009 – Corroded Enamel Plate



OS01/010 – Unidentified Fuze



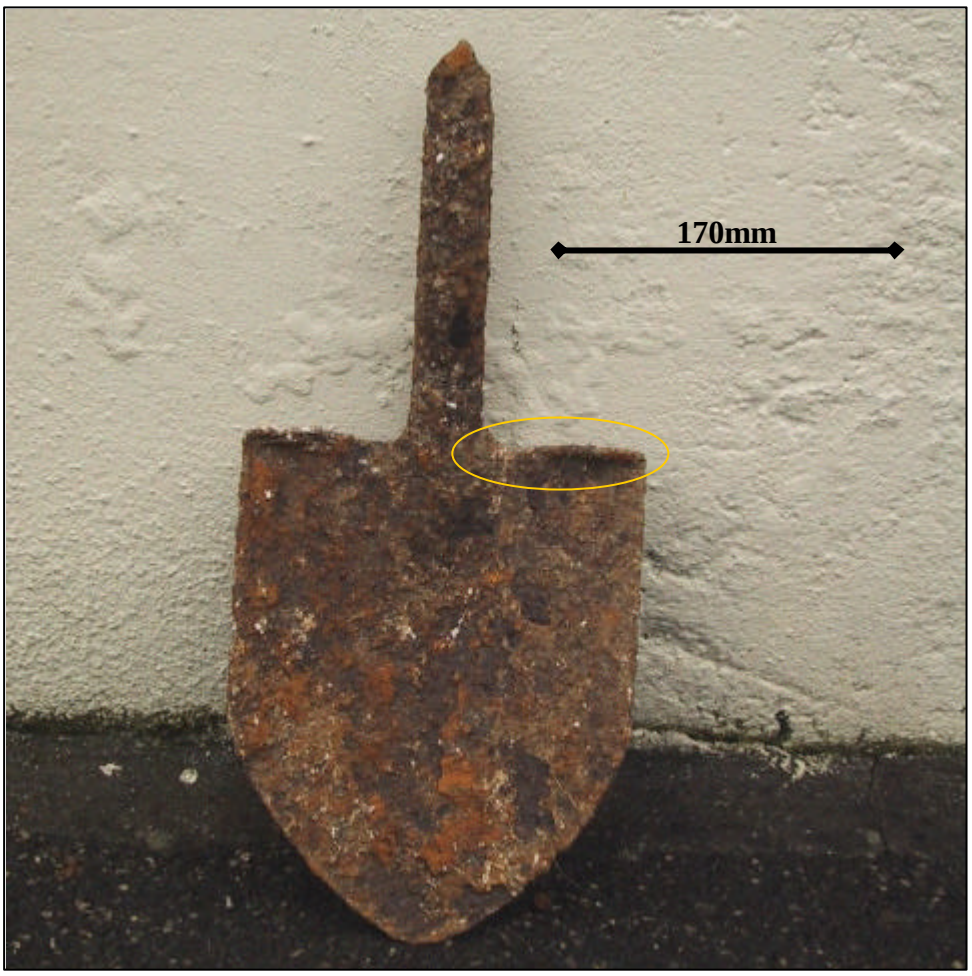
OS01/011 – Metal Door Furniture



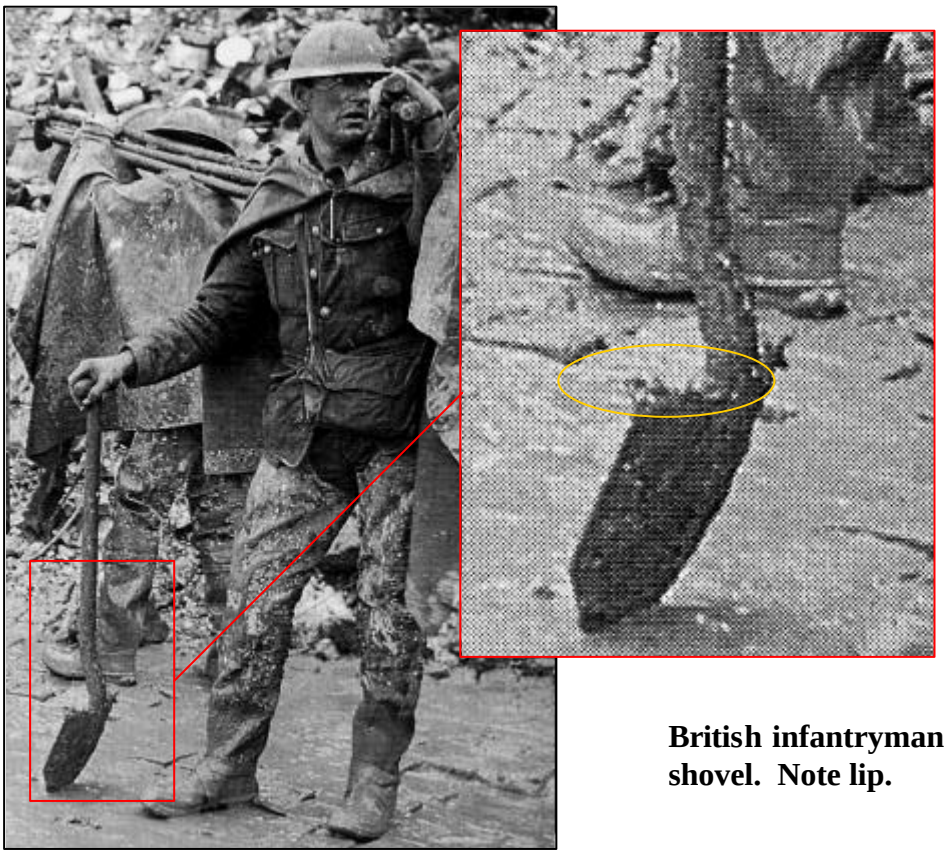
OS01/012 - British Trench Brazier



British Trench Brazier



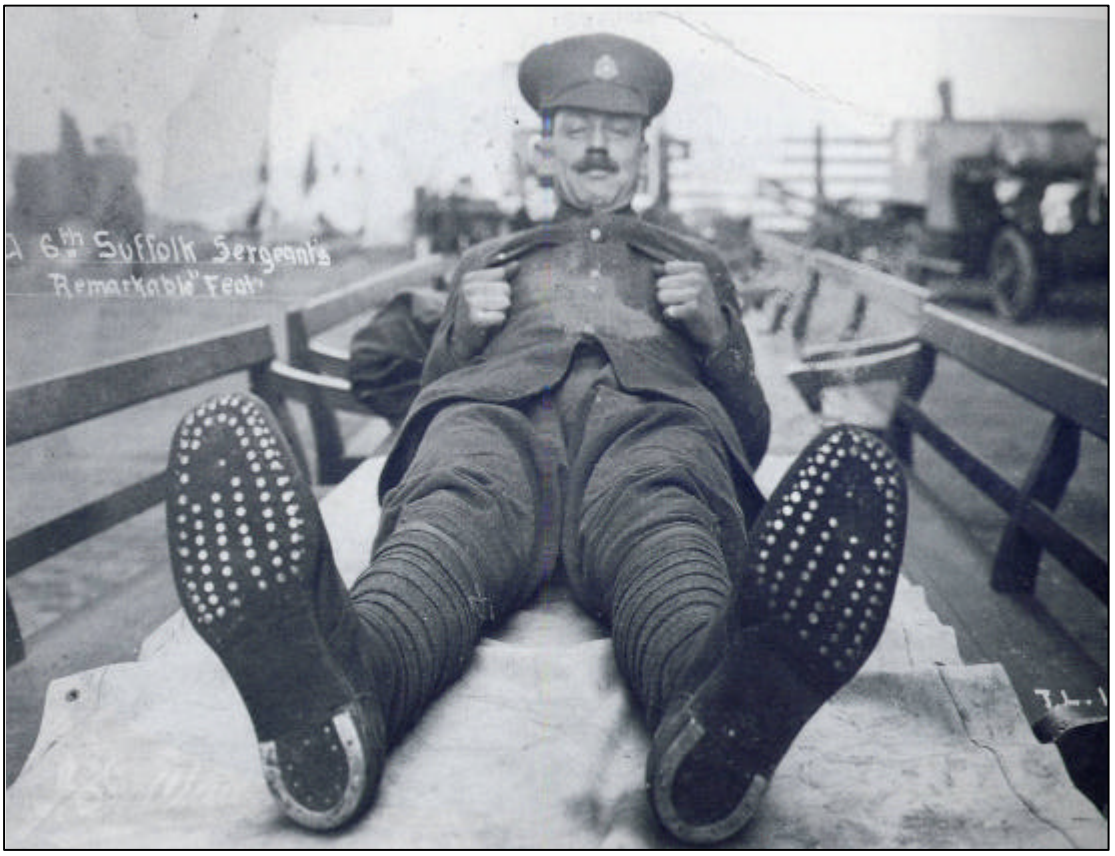
OS01/013 – British Pattern Shovel Head



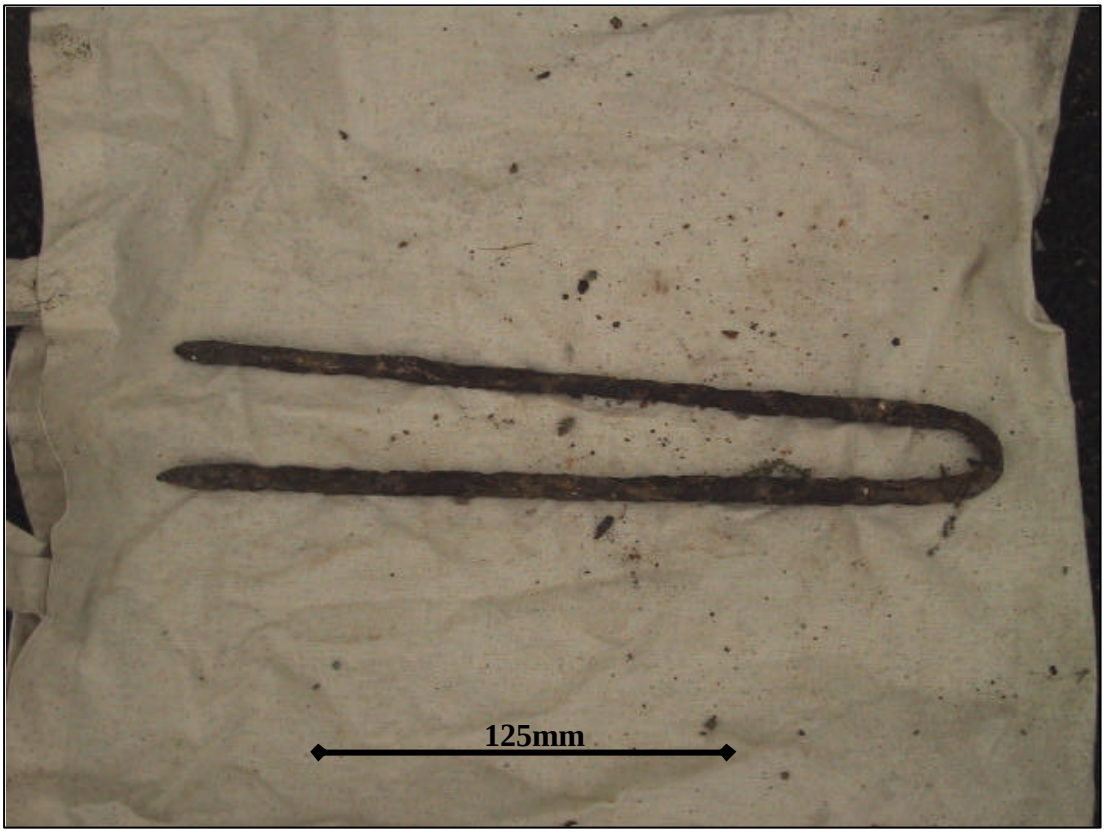
British infantryman with shovel. Note lip.



OS01/014 – British Hobnail Boot



British soldier showing off his boots



OS01/015 – Wiring Pin



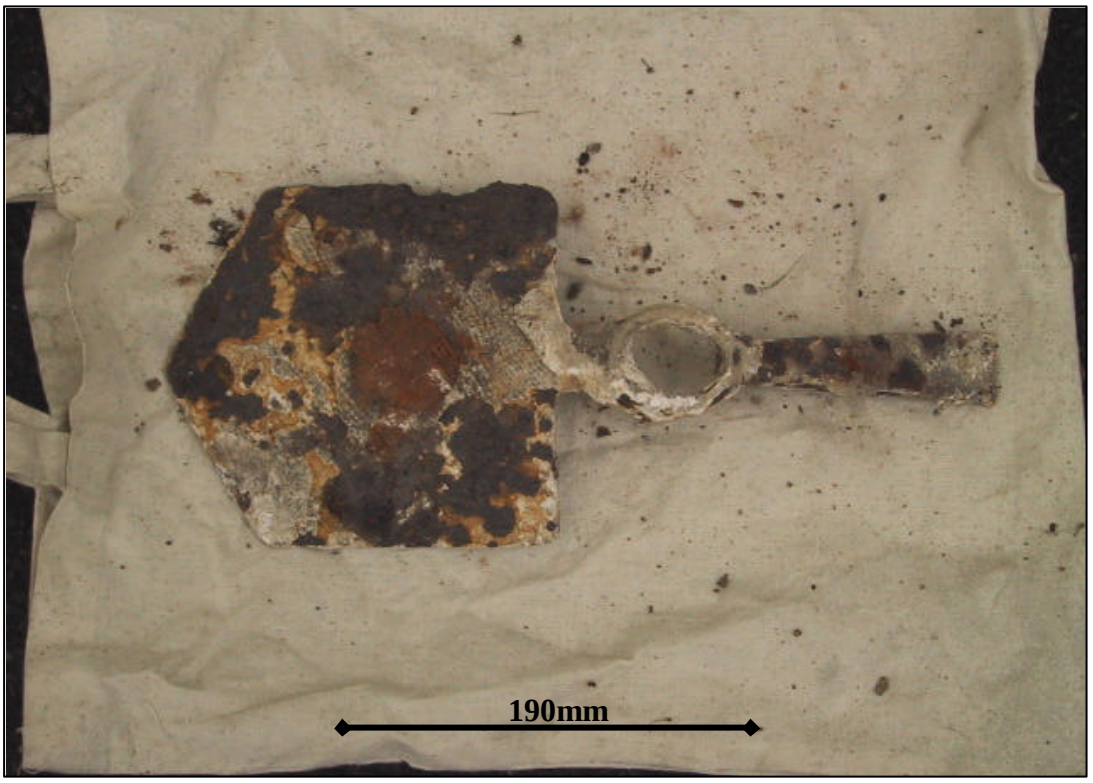
French trench with wiring pins circled



OS01/016 – Winding Bar



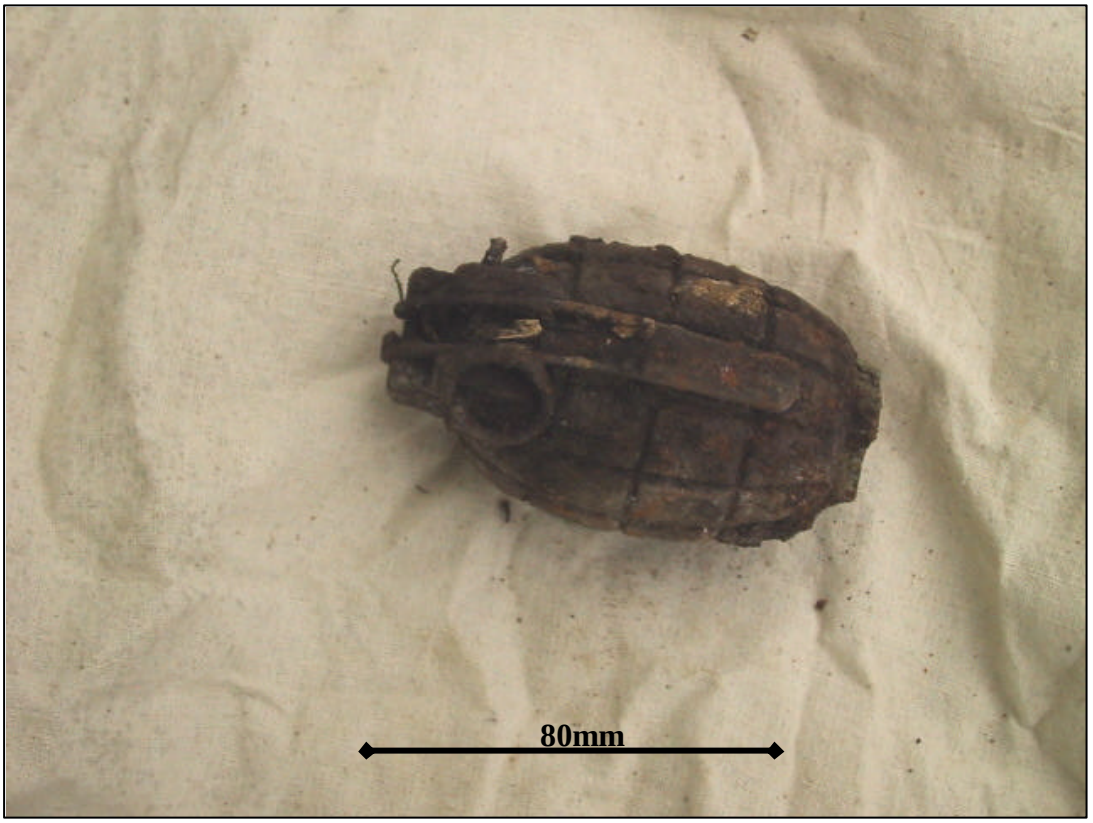
OS01/017 – Metal Coiling from Air Hosing



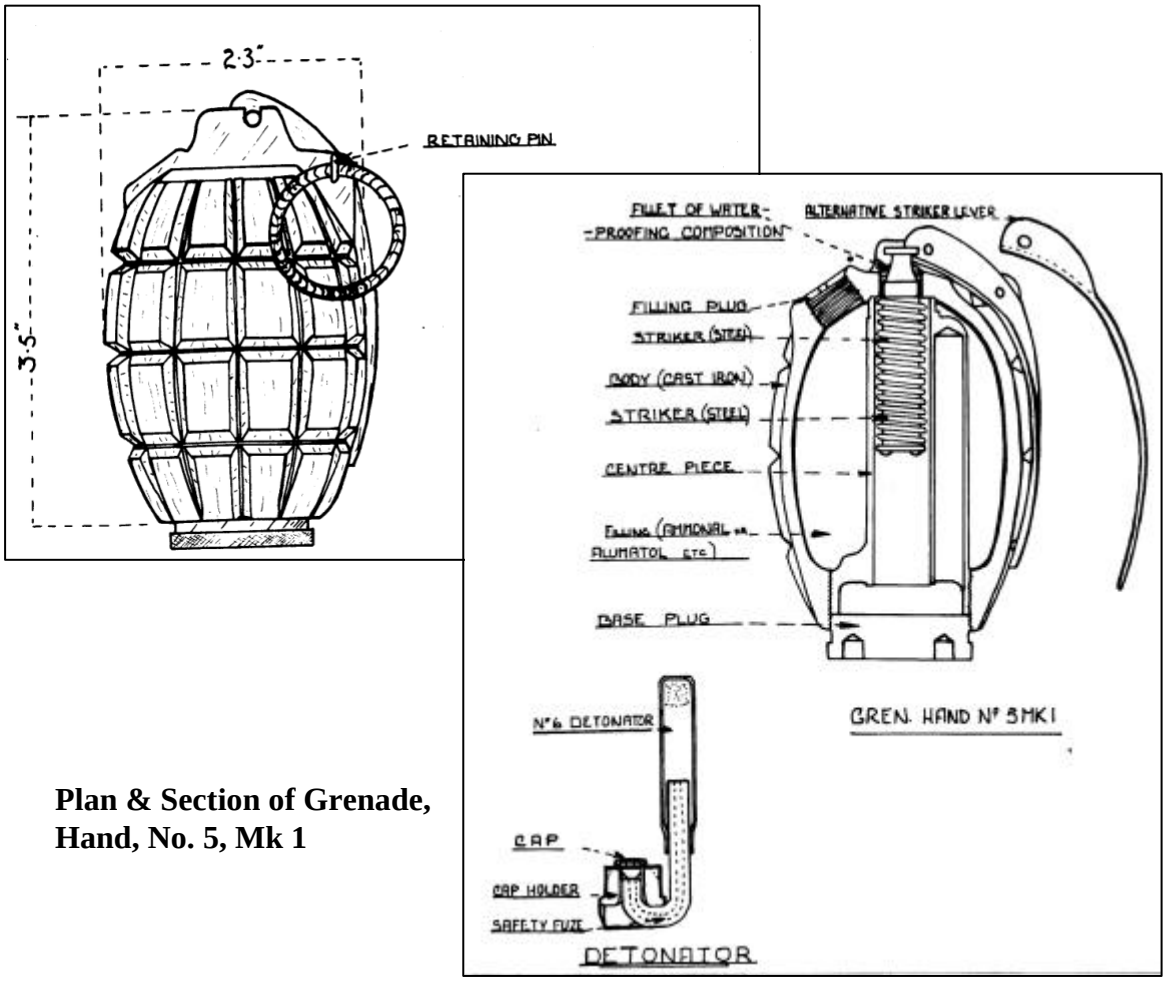
OS02/001 – British Entrenching Tool



OS02/002 – Roll of British Barbed Wire



OS02/003 – British Grenade, Hand, No. 5, Mark 1 (fuzed)



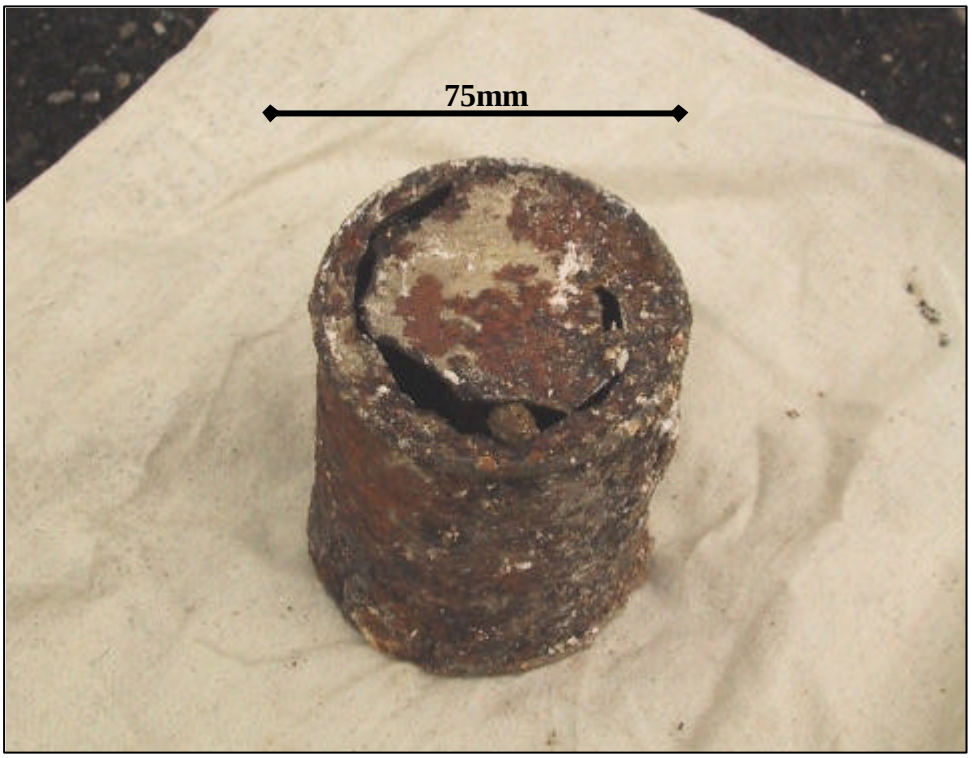
Plan & Section of Grenade, Hand, No. 5, Mk 1



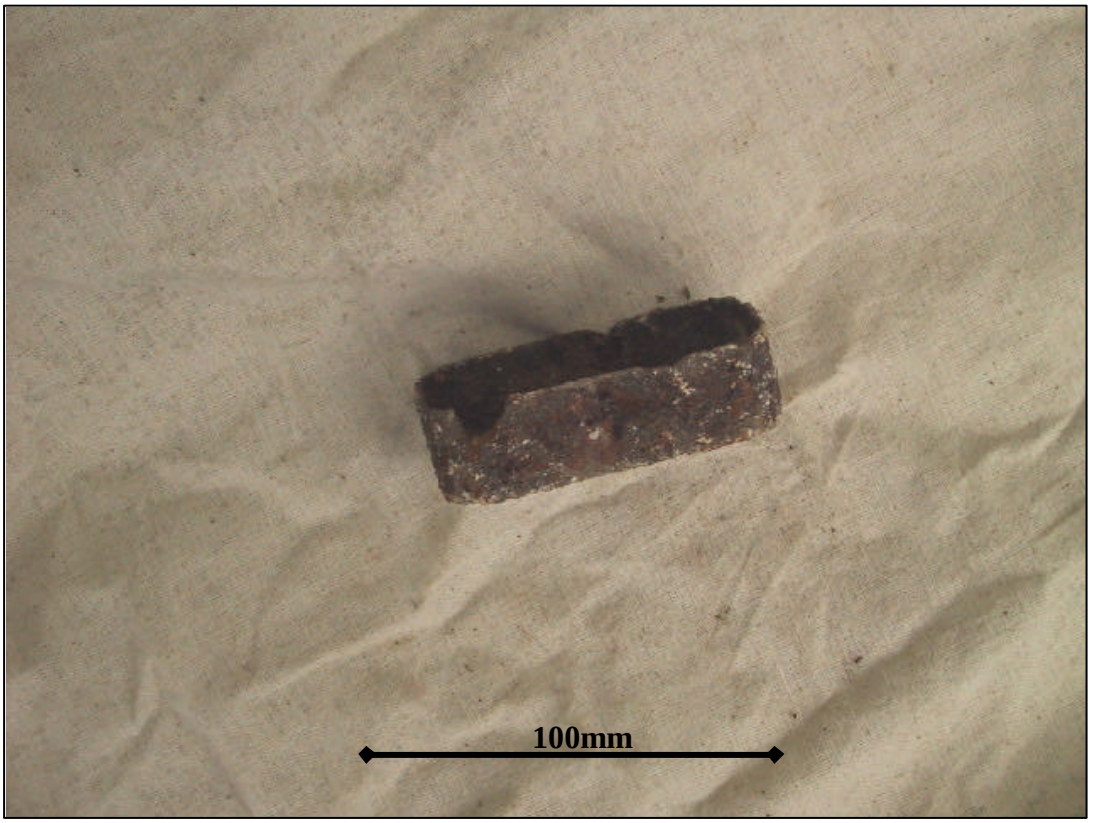
OS02/004 – British Cap Badge Backing Plate



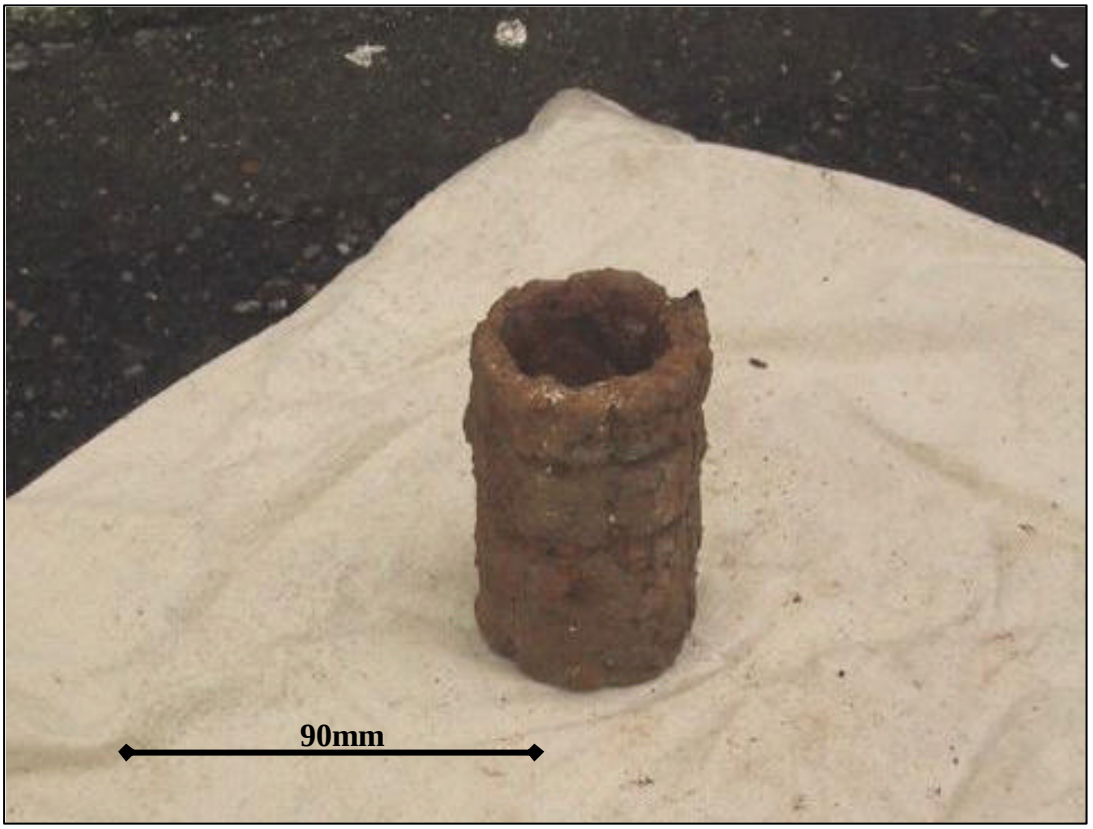
Medical Orderly



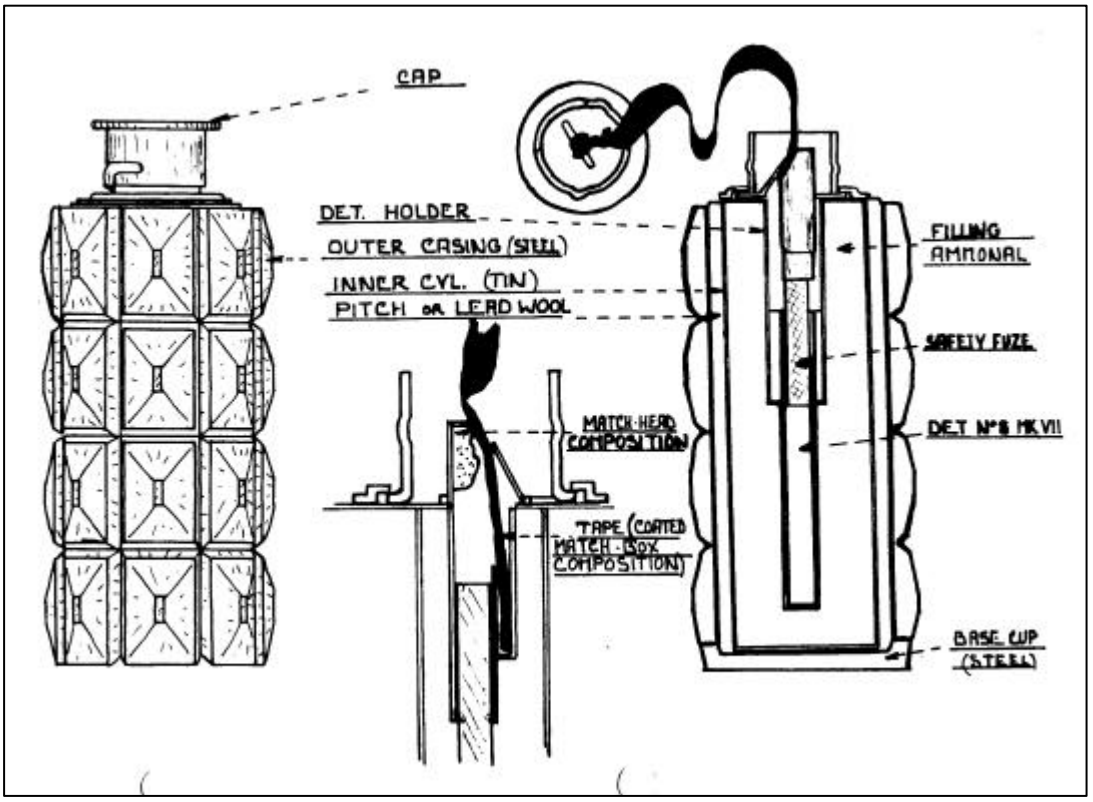
OS02/005 – British Jam Tin



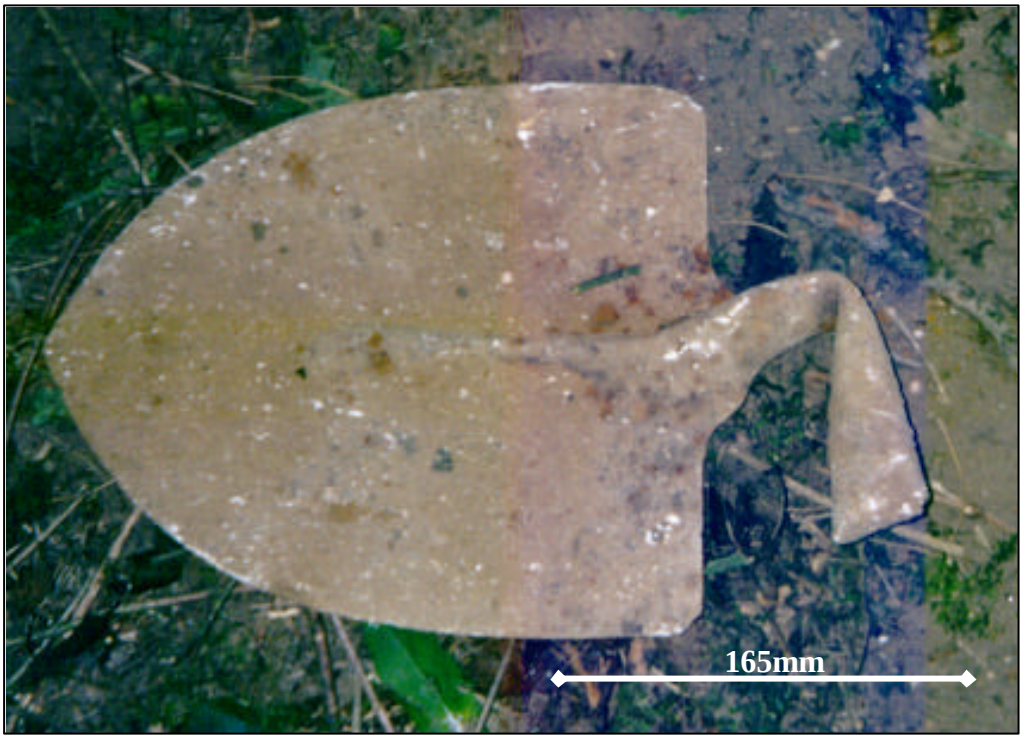
OS02/006 – Lid from Bully Beef Tin



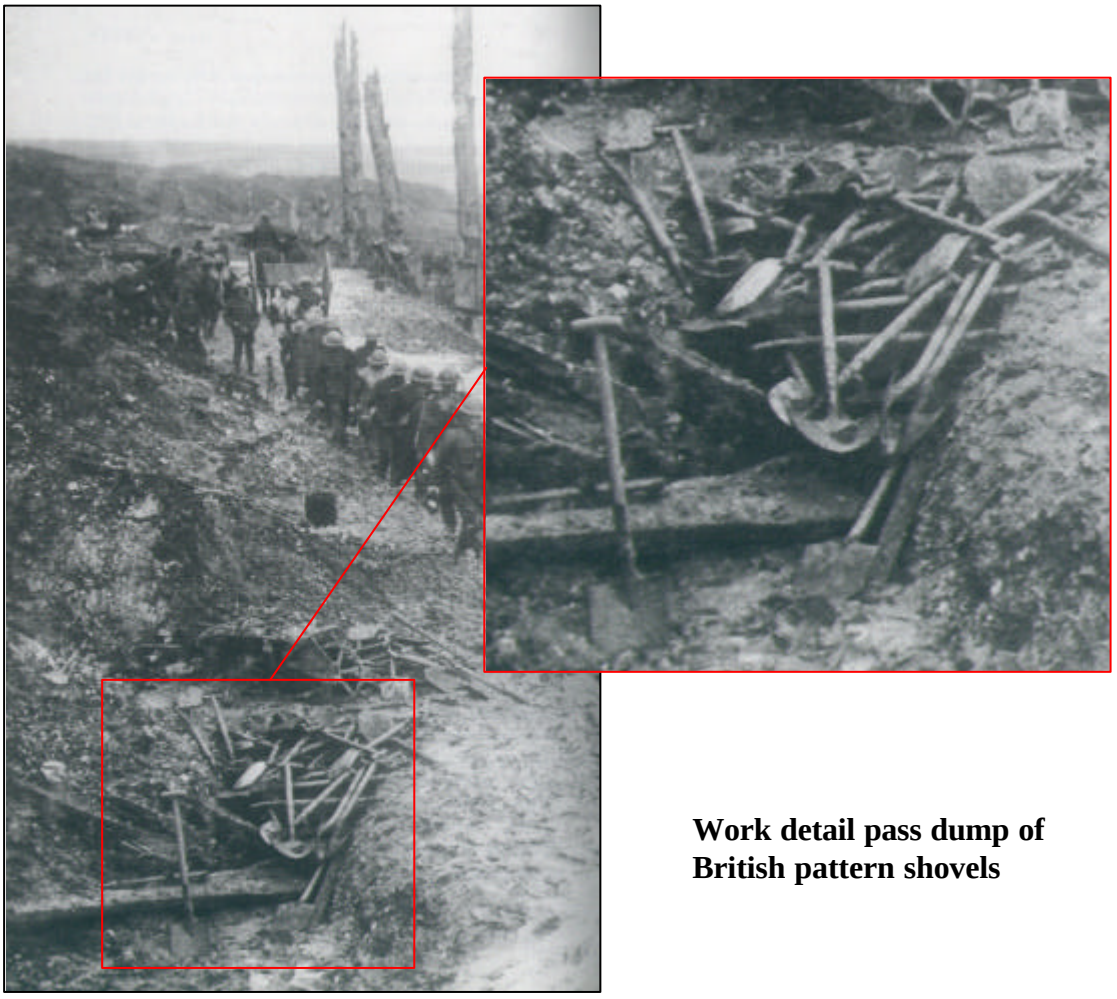
OS02/007 – Body of a Grenade, Hand, No. 14, Mk 1 (‘Heavy Pitcher’)



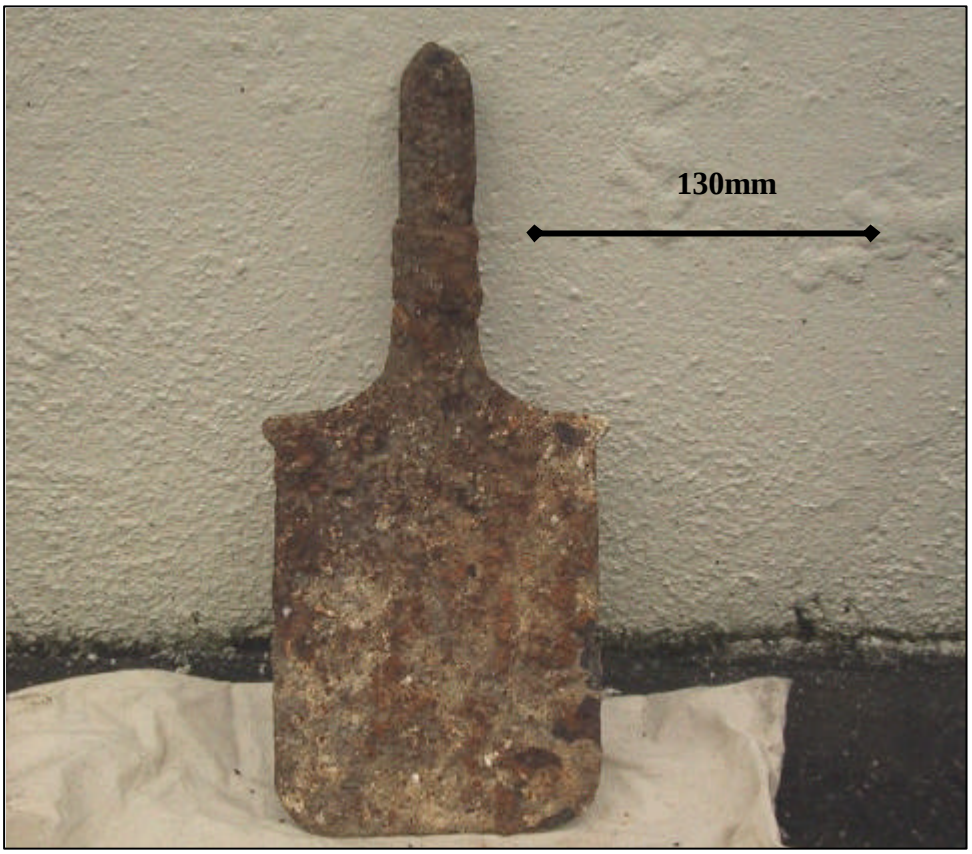
Elevation & Section of a Grenade, Hand, No. 14, Mk 1



OS03/01 – British Shovel Head



Work detail pass dump of British pattern shovels



OS03/02 – French Shovel Saw

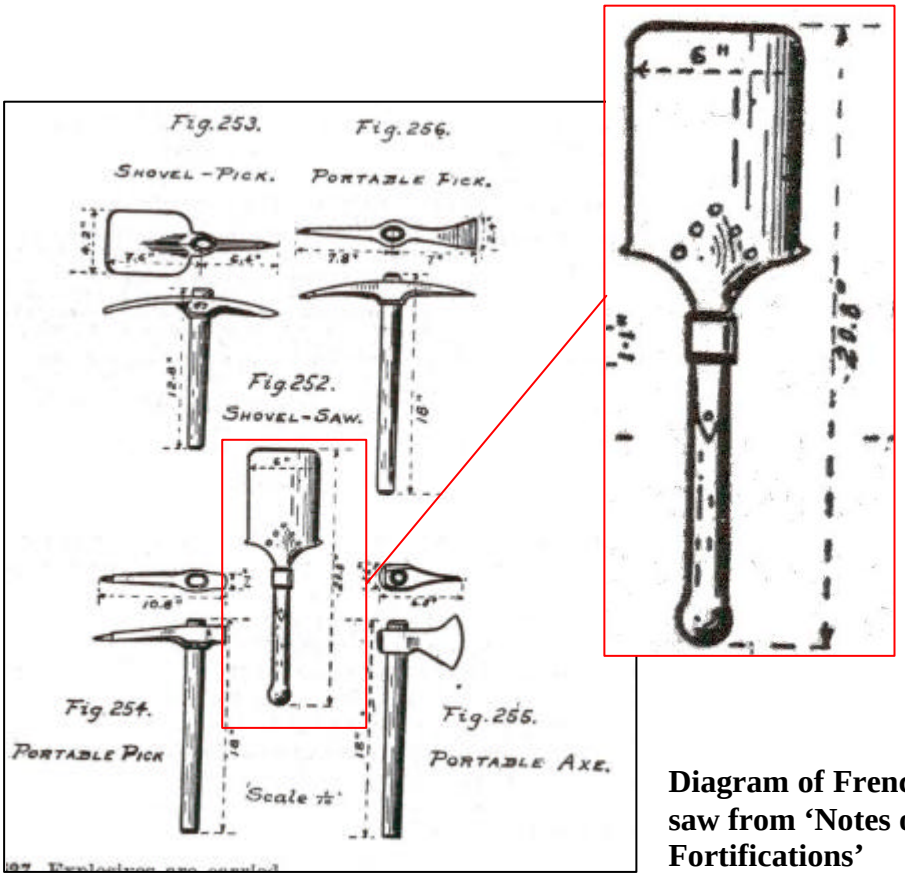
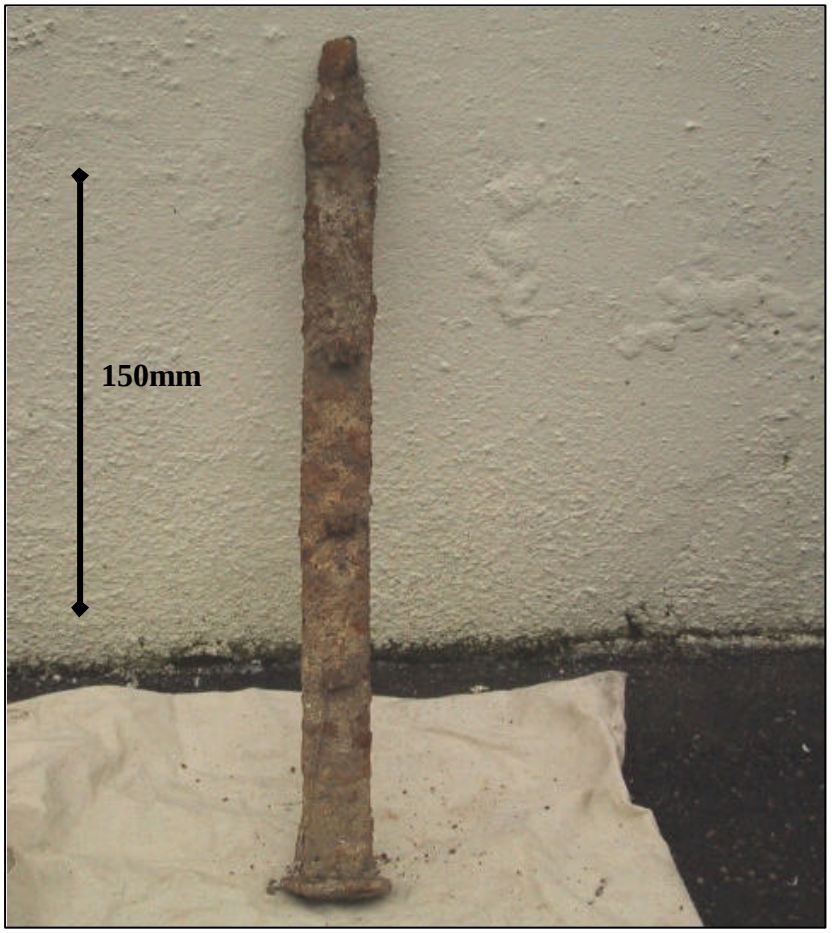
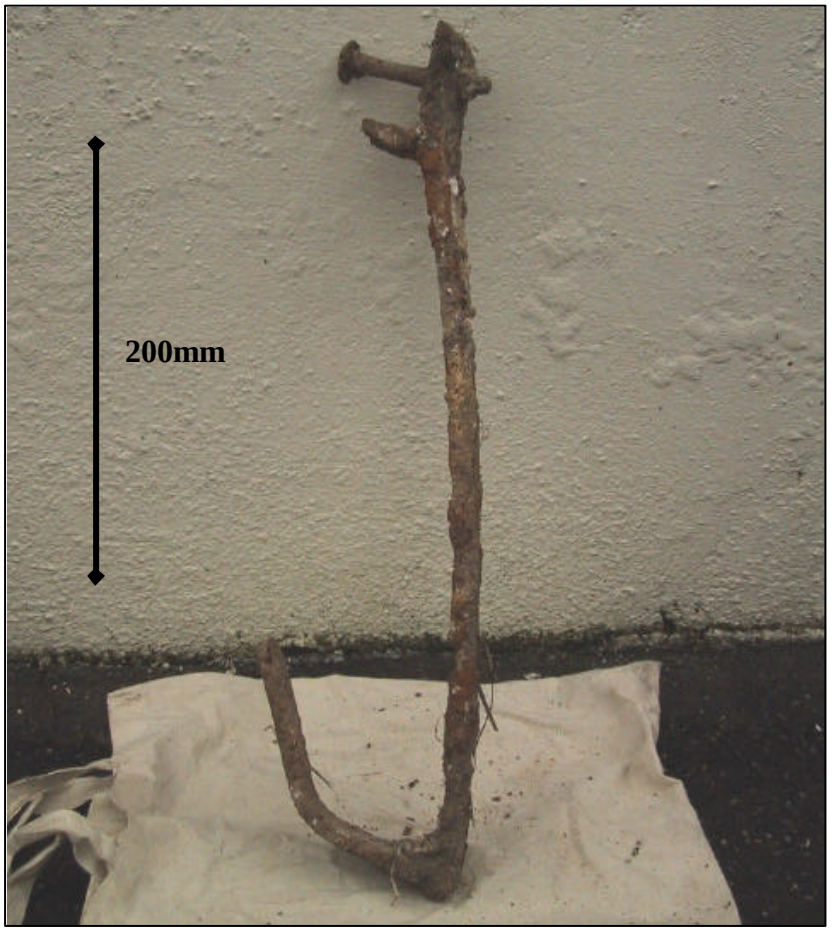


Diagram of French shovel saw from 'Notes on Field Fortifications'



OS03/04
Trench Furniture:
Reinforcing Bar



OS03/05
Trench Furniture:
Cable Support



OS03/05 – Trench Furniture: Chain Link and Securing Rivet



British trench with trench furniture



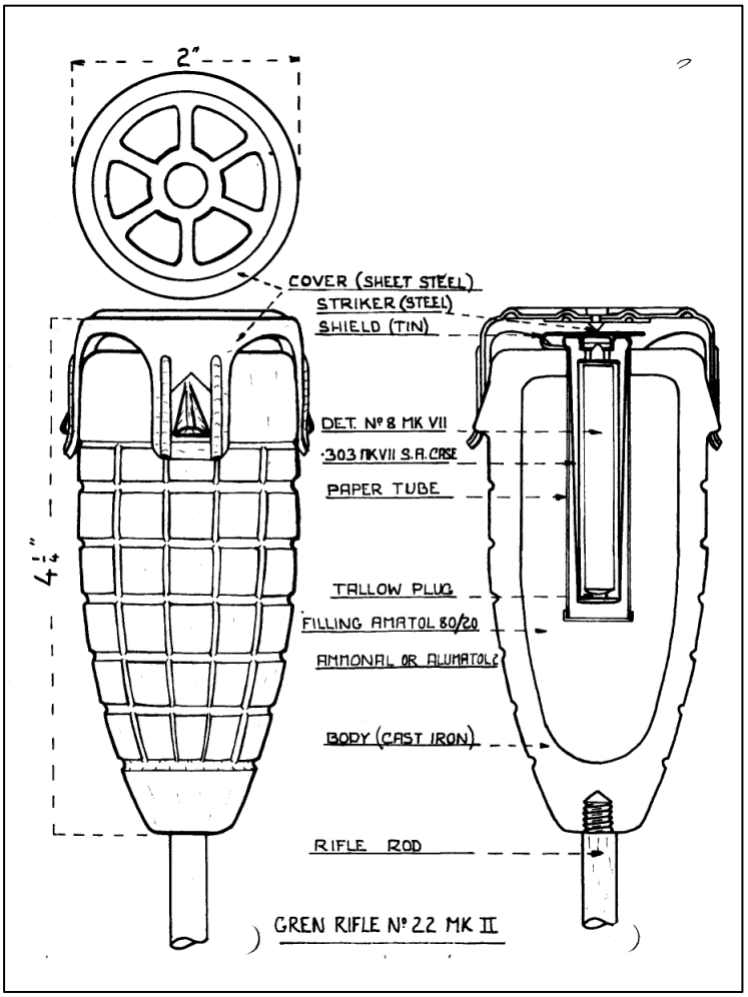
OS03/06 – German Water Bottle



German Mess Tins and Water Bottle with Cover



OS03/07 – Cache of Grenades, Rifle No. 22 Mk II (Newton Pippin)



Plan and Section of Grenade, Rifle No. 22 Mk II (Newton Pippin)



OS04/01 – Winch Drum with Handles and Cabling



OS04/02 – Bogies from British Winch Trolley



OS05/01 – Metal Door Furniture



OS05/02 – Metal Door Furniture



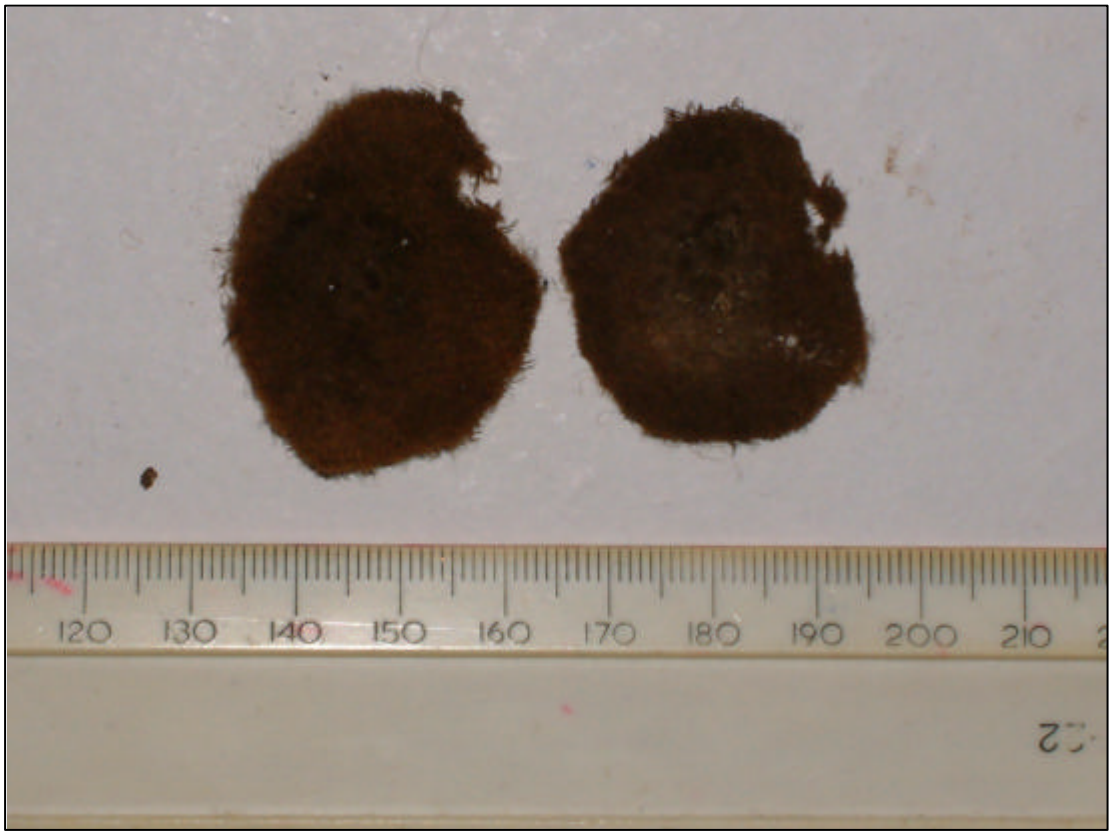
OS05/03 – British Heavy Mobile Charge



OS05/04 – Fragment of Ammonal Explosive Bag



OS05/05 – British Army Tunic Buttons



OS05/06 – Fragments of Serge Cloth from British Army Tunic

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