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From the Killing Ground: Digital Approaches to Conflict Archaeology - a Case Study from Waterloo

Stuart Eve and Tony Pollard

ABSTRACT

Since 2015, *Waterloo Uncovered* has been conducting archaeological fieldwork on the famous 1815 battlefield in Belgium. This paper will focus on two aspects of this work that demonstrate how digital technologies have been used both to interpret the archaeology and to facilitate reconstruction. At Hougoumont, the farm which served as a strong point on Wellington's right, metal detector survey has provided a visceral insight into the fighting, which has added much to what is already known from historical accounts. This interpretation has in part been facilitated through the use of a digital recording system known as ARK, which plots finds on a map of the site and allows artefacts to be viewed as groups and also as individual objects, which can be subject to detailed scrutiny. The archaeological results of the project have also been useful in informing a virtual reality reconstruction of Hougoumont, which although in an early stage of development will permit visitors to step back in time and experience the farm as it appeared in 1815.

INTRODUCTION

With a win against the Prussians at Ligny and a draw against the Anglo-Allies at Quatre Bras on 16 June 1815, Napoleon would face the final battle of his illustrious military career at

Waterloo on 18 June. The Duke of Wellington had withdrawn his army to a position around 10 miles south of Brussels, where a long ridge naturally lent itself to defence.

FIGURE 1 GENERAL LOCATION

There was dead ground enough behind the ridge to conceal an entire army, a sunken road running across the top of the slope, as perfectly placed as any field fortification, and on the forward slope, a series of high-walled farms providing[1] ready-made strong points to cover his right, centre and left. The battle lasted from morning to night, and if it was not for the arrival of what was left of the Prussian army might have gone Napoleon's way. It was, as Wellington said, 'the damn-nearest run thing you ever saw in your life.'

Hougoumont, was the farm on the right flank of Wellington's position and here fighting raged for the entire day, with the Allies at times having to reinforce the garrison by filtering in reinforcements from the ridge behind – an ability that contributed much to the French failure to take what was effectively a make-shift fort. Napoleon intended this assault to draw men from elsewhere on Wellington's line, and thus allow him to smash through the centre once he had pounded it with his massed artillery. It didn't work out like that though, and instead it soaked up thousands of French troops, while the line just about held against every infantry and cavalry attack thrown against it. By evening Napoleon's army had exhausted itself and with the arrival of the Prussians from the east was fighting on two fronts. The French army broke and fled the field, and after his surrender Napoleon spent the rest of his life in exile on the island of St Helena.

FIGURE 2 MAP OF BATTLE OF WATERLOO

In 2015, the two hundredth anniversary of the battle coincided with the official founding of *Waterloo Uncovered*. The idea for the project was conceived by two officers in the Coldstream Guards, one still serving and one retired due to PTSD.[1] The aim was to engage military veterans and serving military personnel with mental health issues, including PTSD, and/or suffering physical injury, in an archaeological project on one of the world's most famous battlefields. Archaeology had been proven to have therapeutic qualities and the precedent for involving veterans was set by Operation Nightingale. Essential to the project's viability, however, was a strong research agenda, and here conflict and battlefield archaeology had already proven their worth in making an important contribution to our historical understanding of past conflicts (Scott and McFeaters, 2011). It will become clear, later in this paper, that the veteran cohort has also fed ideas directly into the project's research, with their past experiences proving a valuable asset. Also vital was a partnership with the Service Public de Wallonie, now known as the Agence Wallonne du Patrimoine (AWaP), which is the Wallonian state organisation responsible for cultural heritage and archaeological intervention.[2] With the co-operation and support of AWaP, a field evaluation was carried out in April 2015, on the basis of a research design that took Hougoumont as the initial focus for investigation, not least because of the Coldstream Guard's association with this part of the battle (Pollard 2015a).

Importantly, Hougoumont represented a prime target for investigation as it was a location with defined boundaries which witnessed particularly heavy fighting throughout the battle,

in what could be described as a battle within a battle. Hougoumont has been much written about by Anglophone historians and Wellington himself credited the battle won thanks to the closing of its gates by the defenders. The victorious commander spoke here of an incident when French soldiers entered the complex via the North gate, only to become trapped inside when the gates were closed behind them. The Coldstream Guards are usually credited with this act, an association which obviously made the farm of special interest to the founders of the project. It was hoped however that archaeological investigations would provide fresh insight into these and other events in and around Hougoumont, allowing a more objective perspective, breaking away from the somewhat jingoistic historiography passed down over two centuries. In particular, it was hoped that archaeology would produce evidence for the French side of the story, shedding light on aspects of the battle that lack detail or have been shaped to fit the long accepted narrative.

First, it was essential to establish whether there was recoverable battle-related archaeology surviving at Hougoumont. In early 2015, Hougoumont was nearing the completion of a long programme of renovation carried out by Project Hougoumont, a British based charity which sought to turn what had been a dilapidated group of buildings and walls into an essential destination for visitors to the battlefield, with a visitor centre in the buildings ranged along the western side of the courtyard. In reality, Hougoumont had long been a must see attraction for visitors, particularly those from Britain, with the first visits by interested civilians taking place just weeks and even days after the battle was fought (Pollard forthcoming).

Previous archaeology had taken place on the site, most notably with the excavation of the buried remains of the chateau (the large house that divided the North courtyard from the South courtyard), which for the most part had been burned to the ground during the battle (Willems 2015). However, this work was limited in scale and had not included investigations of the wider landscape of Hougoumont or detailed metal detector surveys. The first work associated with *Waterloo Uncovered* was a geophysical survey of areas within and outside the farm complex, carried out by specialists from the University of Gent, which became an early partner in the project (De Smedt & Van Meirvenne 2014). This survey used state-of-the-art electromagnetic induction (EMI) technology to cover large areas, with numerous anomalies indicating the presence of subsurface features in various parts of the site. These were followed by a limited programme of excavation, which aimed to ground truth some of the anomalies, accompanied by metal detector prospection, which would establish the presence or absence of metal objects related to the battle.

PLATE 1: COURTYARD AT HOUGOUMONT FROM NORTH. CHATEAU STOOD IN FRONT OF THE CHAPEL (SITE IS PLATFORM WITH GAZEBO). FARMHOUSE AND SOUTH GATE IN DISTANCE.

This initial programme of work produced mixed results, with two of the strong magnetic anomalies proving to be brick kilns associated with the building of the farm and chateau, sometime in the early to mid 17th century (Logie 1984). Prior to excavation it had been speculated that these might represent pyres on which the dead of the battle had been cremated, and for which there is plentiful eyewitness evidence (Pollard, ibid). Instead, the clay-lined pits filled with charcoal and brick wasters represented the genesis of the farm,

and as such served to provide the archaeology of Hougoumont with an extended time-depth, which went well beyond the single day over which the battle was fought.

FIGURE 3 – AREAS OF HOUGOUMONT

As part of this evaluation, which took place in April 2015, metal detector survey was carried out in the area known as the Killing Ground – or Killing Zone[3] (Pollard 2015b). This is a long open space, around 30 metres wide, which runs along the outside of the south wall of the garden for around 200 metres. French troops had to cross this ground to reach the wall defended by Allied troops, who knocked loopholes for muskets into it. Given the amount of musketry in this area, delivered by attackers and defenders, it was expected that a considerable number of musket balls would be present below the ground surface. Alas, this expectation was confounded, with a metal detector sweep of the entire area resulting in the recovery of only two musket balls. At first it was suspected that this was the result of metal detectorists illegally removing material from the battlefield, a site which is protected by Belgian law. This assumption seemed to fit with the pattern of more musket balls being recovered from the open field that was covered by the wood at the time of the battle. The thinking being that detectorists could operate largely unseen close to the wall but would be more exposed, hence open to observation, in the field.

Despite the disappointing result in the Killing Ground it was clear that the battlefield did have archaeological potential and so a larger team returned to the site for two weeks in July

2015, and has done so every year since. For the purposes of this paper, the focus will remain on the Killing Ground, where archaeological fortunes improved.

ARCHAEOLOGY DOING THE WORK OF HISTORY

The story of the Battle for Waterloo has been told and retold many times, with Hougoumont representing an element of the wider conflict that has been selected for special treatment from the very beginning (with Wellington's mention of it in dispatches setting the ball rolling). All elements of the farm complex, including the courtyards to the west, the walled garden in the centre, and the orchard to the east, which was protected to the west and south by thick hedges and a ditch, were defended and attacked. The actions in these three areas were particular in character, with the courtyard defence reaching its climax with the incursion of around 40 French troops through the North gate, the walled garden being successfully defended by men shooting through loopholes and over the top of the high wall enclosing it on three sides, and the orchard, which changed hands several times during the day. The earliest action at Hougoumont was however fought outside the confines of these three areas, with Allied troops fighting in the wood to the south, and the more open ground, occupied in part by kitchen garden plots, to the west.

Today, the farm, though relatively well preserved, does not appear as it did in 1815. The first transformation came during the battle itself, when the chateau and various other buildings were destroyed or badly damaged by fire (probably after being hit by howitzer shells). Contemporary illustrations post-dating the battle show the walls of some of these, such as the large barn or stable block against the north wall, still standing. However, these

precarious wall remnants were demolished and in most cases the buildings, including the chateau, were not rebuilt (only its attendant chapel survived). It was not just buildings that became casualties of war, the woods to the south were cut down not long after the battle due to the trees being so badly damaged by shot and shell, this area now being large open arable fields. These trees would have provided a key defence for the farm, concealing the nature of the complex behind them while also shielding it from direct fire from French artillery.

Another key defensive feature was the wall around the garden to the east of the building complex. There is still a wall here, which is pierced in places by well-made loopholes, but subsequent archaeology has proven that this wall has been rebuilt since the battle, with the loopholes reconstructions for the benefit of tourists (Bosquet, Barton, Eve et.al. 2016: 5). Photographic evidence also backs this up, the with the wall in places looking higher in late 19th century images, while loopholes can be seen to disappear over time. What was a quite ornate garden, with flower beds, footpaths and covered walkways, has also long gone, with the area inside the walls today occupied by a paddock of grass. As with the wood, there is no sign of the fruit trees that occupied what is now an open field to the east of the garden, with the hedges framing the orchard gone and the ditches backfilled.

PLATE 2: THE KILLING GROUND TO SOUTH OF GARDEN WALL, VIEW FROM EAST. THE TREES ARE IN THE GARDEN. NOTE LOOP HOLES.

Archaeology is an effective way of reconstructing the former appearance of the farm, but it is not just the remains of walls no longer standing that can put back on the map (this work

will be detailed in a forthcoming paper by the authors). The metal objects left behind after the battle have the potential to be an incredibly informative body of evidence. The importance of this data is all the greater in the case of the Killing Ground, because unlike other areas, such as the courtyard and the orchard to the east there is a relative paucity of eyewitness testimony from combatants here. Some of those other accounts are incredibly detailed and vivid, with the descriptions of fighting outside the complex and inside the courtyard by Matthew Clay of the 3rd Foot Guards being among the most well-known (Glover 2006). Accounts from combatants in the orchard are referred to below, but only where they shed some light on the action in the Killing Ground.

As for testimony that specifically refers to the defence of the garden wall, the following appear to represent the bulk of what is available, and it is these which have shaped the generally accepted picture of the fight across the Killing Ground. Lieutenant Colonel Francis Home of the 3rd Foot Guards recorded the following in a letter:

> Not more than 1400 of the Guards in Hougoumont, about 300 of the Nassau troops employed as sharp shooters. No loop holes made in the garden wall until 10 o'clock in the morning. From these the men fired securely and the slaughter was immense. The Frenchmen repeatedly asked Colonel Home to order his men to fire upon them and put them out of their misery (Glover 2010a: 144).

The comment, almost a complaint, that loopholes were not made until 10 am, contrasts with the statement by Woodford that they were made the night before (Siborne 1993: 263),

which is the timing that most secondary accounts agree with. The quote that seems to be the source for the many descriptions of piles of dead bodies in the Killing Ground comes from the unpublished memoirs of Private Peter Leonhard from the Nassau regiment, mentioned by Home above.

> We had hardly taken up position at the loopholes when masses of French came out of the woods, apparently all set to capture the farm, but they were too late! A shower of balls loosed off on the French was so terrible that the grass in front was soon covered with French corpses. Their retiring and advancing thus went on alternatively, and we were attacked four times in our farm, but each time the French were again repelled (Glover 2010b: 158-9).

The foregoing is very specific, mentioning four attacks across the Killing Ground. Woodford backs this up, reporting that the French 'came on in force several times, but did not try a general escalade; there was constant firing from the wood against the garden' (Siborne 1993: 264). On the basis of these accounts Siborne interprets the situation thus:

> Whilst the central portion of the tirilleurs kept up an incessant fire from behind the hedge and trees facing the south buildings and the gardens, the remainder pressed on in crowds against the inclosures (sic) by which the post was flanked (1995: 313).[4]

French accounts have only relatively recently been seriously considered by British historians. Siborne did request testimonies from French officers to compliment the many he

received from their allied counter-parts, but alas none were forthcoming. Among the current *cadre* of British military historians providing the French perspective, the work of Andrew Field and Paul L. Dawson is notable. It would appear however, after searching for relevant material in translation, that there is a similar paucity of information of the fight in the Killing Ground from the French side. One of the few mentions comes from a letter by Major Beaux, of the 1st Regiment of Line Infantry, addressed to Marshal Soult from 16 April 1833. In it he states:

> It was deemed imprudent to risk all three battalions that made up my regiment in view of the resistance put up by the defenders in the last attack, and so I ordered the 2nd and 3rd Battalions to remain in reserve, and by a normal movement, forgetting my responsibilities I marched at the head of the 1st battalion to attack the farm and capture it, However, we were repulsed with heavy losses, most notably from among the officers (Dawson 2018: 46).[5]

He goes on to explain that a second attack was made by the 2nd Battalion, but despite 'superhuman efforts' this was also repulsed. The Major then split the remnants of his battalions into two groups of skirmishers and set them on the east and west flanks of the farm, from where they delivered aimed fire at the defenders (it is probably the men he places on the west flank who, from the higher ground there, deliver fire into the garden close to the gate in the wall between the south courtyard and the garden, as mentioned by Woodford in his letter to Siborne, which is referred to more fully below[6]).

It is then, to the archaeology that we must turn to in order to fill in historical detail at one of the key locations in the battle for Hougoumont. Of course, most of the large objects were removed from the field in the days and weeks after the battle, but smaller objects, such as musket balls and buttons, will generally escape battlefield clearance, and over time become incorporated into the topsoil. As previously noted a metal detector scan from the surface revealed very few musket balls in the Killing Ground during the evaluation. However, when a few centimetres of soil was removed by a mechanical excavator during the first two week season in 2015, more metal signals were obtained when this ground was again scanned with a metal detector. The problem was not that the musket shot had been removed by detectorists but that the detectors were not fully penetrating the ground. Accordingly, transects were cut across the area, from the base of the walls to the fence that now demarcates the southern boundary. Soil was removed every few centimetres and the freshly exposed surface detected. Each fresh spit revealed more artefacts, until the surface of the subsoil was reached, around 30 centimetres below the present ground surface.

PLATE 3 – METAL DETECTING IN THE KILLING GROUND (FROM THE SOUTH LOOKING TO GARDEN WALL WITH LOOP HOLES)

Since 2015, the entire area of the Killing Ground that retained surface integrity has been metal detected using the spit technique described above - the western third of the area has been subject to quarrying for sand and clay and so deposits with musket balls have not survived there (Bosquet, Eve, & Pollard 2015: 28). In order for these objects, which were recovered in their hundreds, to shed light on the events they represent, it is vital that their exact location is accurately recorded. Each find spot was therefore recorded using a GPS

system. It is here that the process began to take on a distinctly digital character, with the co-ordinates loaded into the Archaeological Recording Kit (ARK), along with details on the nature of each individual object.

DIGITAL RECORDING WITH ARK

ARK (https://ark.lparchaeology.com/) was developed by one of the *Waterloo Uncovered* project partners, L – P : Archaeology, to efficiently record and publish results from archaeological excavations. The system has been used on a large number of archaeological sites around the world, from the deep urban stratigraphy of London (Morgan & Eve 2012) to a collection of archaeological sites across the Classical world (http://www.fastionline.org/). ARK is an integrated system, combining spatial data (via a Geographic Information System - GIS), textual data (via an online blogging platform), contextual data (via an online database entry form) and physical objects (via the finds catalogue). All of this data is brought together within an open-access web-based platform, allowing the archaeologists and the general public to view and query the archaeological findings in real-time as they are excavated in the field.

For the purposes of this paper we will concentrate on the finds recording workflow. The fieldwork element of the WU project is limited to a two-week Summer period – the only time when all the project staff and experts are together and actively interpreting the archaeological results at the same time. The team often works in two or three locations across the battlefield, therefore it is vital that there is little or no lag between the time the

find is excavated and the time that it is uploaded onto ARK, and displayed on the virtual map. The general workflow for a metal detected find is as follows:

1. The metal detectorist uncovers the find, and makes a rough initial interpretation of it (e.g. a musket ball, or a buckle) and mark the find location with a flag.
2. The survey team (following the detectorists) assign the find a unique number, which is then used throughout the digital workflow. They also at this stage record the exact location of the find on the Belgian National Grid to within 10mm (using Differential GPS). Every piece of data within ARK referring to that find uses the unique number, allowing us to link all of the disparate pieces of data together.
3. The find is brought back from the field into the on-site finds laboratory. At this stage, due to the unique find number and the upload of the survey data, the basic information about the find (location, find type) is already accessible to view within the ARK interface.
4. The finds team lightly clean and analyse the find, adding further information such as weight, diameter, condition and, in the case of the musket balls, calibre size and whether it is a French or Allied ball. Fortunately for the archaeologist is it possible, at least for the most part, to distinguish between those shots fired by the Anglo-Allies and those fired by the French. This is simply because of a difference in size, with the French musket balls being slightly smaller than those fired by the Brown Bess musket favoured by their enemies.[7]
5. The cleaned find is then passed to the finds photography team, who take scale photographs, and where appropriate, photographs for 3D photogrammetry (see below).

At this point the find has a detailed record, with photographs and spatial location. This is fully accessible online for anyone to view and, critically, to search. The search function allows the finds to be grouped in any number of ways, including nationality of musket ball, condition and location – allowing the archaeologists to quickly ask questions of the data such as: “show me all of the French musket balls found in the Killing Ground” or “list all of the buttons found in the courtyard that are not Coldstream Guards” . The online record also has a section for public comments, enabling interested observers to add further information to the find. This has proved extremely useful in the identification of some finds (particularly coins), enabling crowd-sourced identification of finds outwith the expertise of the immediate team.

FIGURE 4 – DETAILED ARK RECORD, SHOWING MAPS, PHOTOGRAPHS AND PUBLIC COMMENTS

FROM THE KILLING GROUND

To return to the results, following the procedure above, the musket balls in the Killing Ground were displayed on a map of the site, in this case both Google Earth and historical maps produced both before and after the battle, were used, it was possible to view the objects in relation to structural features, such as the garden wall or the wood that once stood to the south.

ARK allows each object to be interrogated individually - with a click of the mouse bringing up the recorded data and a photograph of the object. The objects can also be viewed as a scatter, in its entirety or as sub groups. Thanks to the difference in the calibre of musket balls, it is possible, using ARK, to see at a glance the spatial relationship between incoming (French) and outgoing (Allied) shot. A detailed analysis of the meaning of this information will be the subject of a forthcoming paper by the present authors, but for present purposes, it will suffice to consider just one aspect of interpretation.

FIGURE 5 – MUSKET BALLS IN KILLING GROUND

The French fighting advance through the wood must surely have been halted by the hedge which then separated its northern edge from the narrow strip of open ground beyond it (White 2016: 13). Like the wood, this is no longer extant, though according to the historic maps the present wire fence runs along the same line. Archaeology has also provided buried evidence for this hedge line in the form of a ditch left behind following the grubbing out of the trees and bushes from which it was formed. It should be noted, however, that the presence of crops in the field once accommodating the wood has prevented excavation very far south from the fence-line, hence the presence or absence of a dug ditch running alongside the hedge, on its southern side, has not yet been established. Ditch or no ditch, however, the hedge is likely to have represented an effective boundary, as surviving hedges elsewhere on the battlefield indicate, and as some of the eyewitness accounts attest (there are descriptions of both a not very dense hedge and ditch, and of a dense hedge and shallow ditch (ibid: 13)).

The presence of musket balls in the Killing Ground, and more particularly their precise location, as visible on the ARK plots, indicates that however much of a barrier the hedge presented it was not an impermeable one, as French troops were able to deliver fire against the defended wall. Of course it might have been possible to fire a musket through the hedge, but this would be difficult and aimed shots would be all but impossible due to the high density of branches and foliage. Some idea of how thick the hedge might have been comes from Private Clay, who describes the orchard hedge, which on maps appears to be nothing more than an eastern extension of the same hedge that fronts the wall. It was thick enough to merit 'clearing away branches on our side, and making clear openings by which means, without exposing ourselves, we could take a more correct aim at the enemy (Glover 2006: 17). Clay is describing something akin to loopholes here. This might suggest it was equivalent to the wall in thickness and protective quality, but this must be tempered with an account from the commander-in-chief of the Netherlands Army, which states that that the French captured the hedge (temporarily) and destroyed it in several places (quoted in Field 2012). This damage probably relates to several gaps reported to have given the French ingress and which were barricaded once the attackers had been pushed back out by men under Sergeant Cristoph Brandt of the Kings German Legion (Glover 2013: 199).

This incident might shed some light on what was happening in front of the garden wall, where concentrations of French fire against the wall might suggest that this French soldiers gained access to the Killing Ground through gaps in the hedge, with fire delivered at that part of the wall sited directly opposite where the attackers debouched into the open ground (Pollard 2016: 11). Gaps in the hedge might also be indicated by Allied musket balls

recovered from the hedge line, with small concentrations possibly indicating fire delivered at these openings and the French soldiers passing through them.

If, as suggested above, there were gaps in the hedge, were they already there at the time of the French attack or did the French create them in order to break out of the wood? It is again a question that cannot be answered by the historical record, but the archaeology might provide a hint of an answer. There are French musket balls sitting along the hedge and these appear to correspond to the location of the small concentrations of Allied shot. This might point to French fire delivered against the gaps in the hedge as they advanced through the wood, as at that time these gaps might have been defended by Allied troops, who under increasing pressure from the attackers then sprinted back across the open ground and scrambled back over the wall (either using ladders or simply by being pulled up by comrades standing on the makeshift firing steps behind it). This scenario is however presented as a suggestion, as it has not yet been possible to detect in the field to the south of the hedge in this area, which means we have no idea if Allied shot delivered from the hedge line is there to be found.

FIGURE 6 – CRAAN MAP (1816) SHOWING OPENING THROUGH HEDGE WEST END OF KILLING GROUND (SHOWS AREA OF EXCAVATION IN CLOSE-UP)

There is a limited concentration discernible towards the eastern end of the metal detected stretch of the Killing Ground – close to the south-eastern corner of the wall. Further the west though the picture is different. Here, there is a much larger and denser scatter of French shot clustered against the wall, with smaller concentrations further again to the

west. The impression here is of a much larger body of attacking soldiers, not just a small number who have passed through a presumably narrow gap in the hedge. Locating the point of access for this larger number of troops is more straightforward than in the case of the smaller concentrations further west, as the historical mapping shows a feature in the hedge at a point close to the eastern limit of the wall.

Here, the hedge turns inward to form a shallow 'V' shape in plan, at around the same place close to the south eastern corner of the wall and the boundary with the orchard. Excavation of this area in 2016, uncovered uneven trenches in the subsoil which might indicate the line of the hedge in this area, and one of them had a distinct angle matching one of the edges of the 'V'. However, these were discontinuous and it seemed on the basis of these remains that a gate might have been present here. This accords with eye witness accounts from the battle, including a recollection by Ensign the Hon. Henry Montagu of the 3rd Foot Guards, who was fighting in the adjacent orchard, in a letter to William Siborne:

> I found it (the battalion) very well formed, occupying the strong fence above the hollow lane, keeping up a desultory fire, till suddenly, a shout arose on all sides, when we jumped out of the ditch and charged across the Orchard clearing the French before us, and pursued into the wood by the Gate at the corner of the Garden wall. The ditch had been very deep, & had been full of water, but when I reached it, was completely filled with killed and wounded so as to form a complete bridge (Glover, 2004: 176).

The account of Captain Douglas Mercer, also of the 3rd Foot Guards and fighting in the orchard, and again in a letter to William Siborne, is also specific about this location when referring to a map at precisely the point under discussion: 'At the corner of the orchard I

have marked *C* where there was a gate…'(Glover, ibid: 172). These first-hand accounts point to a gate in the hedge close to the corner of the garden wall, and the archaeology, although less clear, does not run counter to these observations. It is here that the musket ball scatter provides corroborating evidence. The heavy concentration of musket balls located along the base of the wall roughly opposite *to* and extending to the west *from* the proposed gate location suggests delivery by a substantial body of men. This number of troops is unlikely to have entered into the Killing Ground through narrow breaches in the hedge; only a wide opening such as that provided by a gate is likely to have facilitated passage on this scale. The gate then seems to have given access not only the Killing Ground, which extended to the west of this location, but also to the orchard, which opened out to the east. There is some suggestion of a barrier across this point on some maps (dividing the Killing Ground from the orchard), and indeed a discontinuous linear feature was uncovered in the excavation, but Siborne's map and others show no boundary, and so the gate would provide free access to both areas depending on whether a left or right turn is taken once through it.

This concentration of fire is likely to have put the defenders stationed along this eastern section of the wall under pressure, so much so that it might be here that French troops have managed to get over the wall and continued the fight in the garden beyond it. This proposition is backed up by the presence of French musket balls in the garden, which from the levels of distortion exhibited by some of them were fired at close range and therefore do not simply represent balls dropping at the end of their range after passing over the wall. Close quarter fighting in the south eastern corner of the garden is also suggested by the presence of musket balls fired by defenders inside the garden, presumably at French troops who have managed to negotiate the wall. Again, this is an event that has escaped the

historical record, particularly that written by the defenders and Anglophone historians, which only record incursions into the courtyards (north and south), as the only time that the French managed to breach the defences.[8] An example here is the account provided to Siborne in 1838, by Alexander Woodford, who in 1815 was a Major in the 2nd Regiment of Foot (Coldstream Guards). He wrote: "The French as I recollect never got into the garden. They were in the orchard but did not scale the walls. (Siborne, 2015: 265).

There is however at least one reference to just such an event in the French records. Jean-Baptiste Adolphe Charras in his *Histoire de la Campagne de 1815 Waterloo*, writes:

> The most daring, the most audacious, penetrated, by several openings in the hedges, into the orchard, and even further, helping each other they crossed the wall of the garden. But death was the price of their efforts. Never have such brave men been so vainly sacrificed (1869: 256).[9]

Again there is mention of openings in the orchard hedge, and this reference might indicate an escalade over the eastern wall rather than the southern wall as previously suggested. This would, however, still put them in roughly the right part of the garden to be involved in the firefight suggested by the musket balls inside it. This attack might have been made possible by the distraction caused by heavy fire delivered against the eastern portion of the south wall. However, finds of several pieces of grape shot, fired from a cannon, might provide further evidence for heavy fire keeping defender's heads down in the eastern portion of the garden, perhaps along both the eastern and southern walls.

ARK and its ability to digitally transpose archaeological finds onto either a historical map or a modern resource such as Google Earth has allowed for the musket balls in the Killing Ground and inside the walled garden to provide a detailed impression of the French assault on Hougoumont, and one which is scarcely represented in the written record. For the first time we can say that that small groups of French troops broke through narrow gaps in the hedge, but the heaviest assault came through a gate towards the eastern end of the south wall. It was the heavy fire delivered by these troops, with support from cannon, that allowed an escalade of the wall, either along the eastern or southern walls. This resulted in a fire-fight in the garden, which is likely to have resulted in the death or capture of any French troops who made it over the wall.

VISUALISING WATERLOO

The battlefield of Waterloo is remarkably well preserved, and bar two major road widening schemes, and the urban expansion of Braine D'Alleud, the field systems and woodlands have changed very little since 1815. However, as is the case with any landscape subject to modern agricultural practices, hedges and field boundaries have been removed and in the case of Hougoumont the entire southern wood was felled after the battle due to damage sustained during the fighting. After five years of fieldwork at Waterloo we have now given numerous site tours, explaining the ebb and flow of the battle around Hougoumont, but the most difficult part of this has always been explaining to visitors the effect that the crops, the woodland, the hedges, the ditches and the garden wall firing platforms and loopholes would have had on any frontal assault of the farm complex. According to contemporary accounts, the wheat and rye would have been up to a height of seven feet (Sergeant Cotton quoted in

Beardsley 2015), and the hedges were designed to be completely stock-proof, thick enough to stop roving cattle.

In an attempt to better understand the effect that these landscape features would have had on visibility and movement of troops, we have begun to experiment with virtual and augmented reconstructions of Hougoumont. Using the Unity gaming engine, it is possible to recreate the topography of the battlefield and virtually rebuild Hougoumont itself. We can then virtually plant wheat fields, orchards and woodland in the areas indicated on the historic maps and revealed by our archaeological excavations.

This work has much benefitted from having veterans on the project, some of whom have had combat experience. Hougoumont is made up from a number of enclosures, some of these defined by walls, and still visible, and some of them by hedges (e.g. the Great Orchard and one side of the Killing Ground), which no longer survive. Those veterans who saw service in Iraq and/or Afghanistan saw an immediate similarity between the surviving enclosures, which included the courtyard and the walled garden, and the compounds which they encountered in theatre, and indeed in and around which some of them had fought. While working within these areas, either excavating or metal detecting, veterans would at times offer their impressions of how they would have defended or attacked that location, and despite tactics changing since 1815, factors such as concealment, cover, and lines of sight, or fields of fire, are still important considerations.

Another area that prompted discussion was the wood to the south of the complex, which was the scene of fighting at various times throughout the day of the battle. Only the three

standing Chestnuts, close to the south gate, are left to remind us of this tree covered terrain, as the area was cleared in the years immediately following the battle. It is difficult today to envisage what it must have been like to be inside this enclosed environment in the thick of the battle. In order to give some idea of how soldiers would move and react in woodland a trip was made to a local forest, which was thought to bare some similarity to that at Hougoumont. Here, the veterans demonstrated how they would seek cover, shift position and observe, all the time aware that the enemy might be close by.

FIGURE 7 – HOUGOUMONT FROM THE VIRTUAL FOREST

With the veteran's insights in part informing the virtual reconstruction of Hougoumont, which is intended to be very much from the soldier's-eye view, it can be seen from FIGURE 6, that even these early reconstructions vastly alter the perspective that we have of the assault on Hougoumont. We can now view the approach to Hougoumont from the perspective of the French soldiers, picking their way through the woodland, to fight their way through the ditch and hedge, and from the perspective of the Allied soldiers manning the garden wall as the French emerge from the hedge and attempt to cross the open space of the Killing Ground. It is clear from these experiments that due to the hedges, woods and crops the French troops wouldn't have had any idea of the size and extent of Hougoumont's defences until the very last minute, and at that point they would already be through the hedge and caught in the Killing Ground.

The virtual model is still at a very early stage, but we have already used it successfully at the annual Chalke Valley History festival as the centrepiece of an interactive tour of the battlefield and our excavations.

CONCLUSION

The forgoing has demonstrated how digital recording of artefacts has provided insight into where and how the defences provided by hedges and walls were breached by French troops at Hougoumont. Historical accounts, particularly those written by British observers and historians, give the impression, made explicit in some cases, that the French never managed to get over the walls. Almost entirely forgotten, even in French texts, is an escalade over the walls and into the eastern end of the garden, either over the eastern wall itself, or the much longer southern wall, along which the Killing Ground ran.

This close grained analysis has also given us a much better idea of where the French assaulted the wall after breaking through the hedge at several locations, the most dramatic influx coming through the gate opposite the eastern end of the wall. Additionally, building an interactive virtual model of Hougoumont has allowed us to further explore the character of this assault, which emphasise the bravery and tenacity that the French exhibited, despite the difficult topographic features of the landscape and the extremely limited visibility.

One last point can be made regarding the gate, which is especially germane given that its role has now been clarified by the archaeology. The closing of the battle in the orchard, and therefore at Hougoumont itself, is on the basis of testimony provided to him, described thus by Siborne:

> The 3rd guards once more lined the front hedge (of the orchard), and also, in conjunction with the light troops of du Plat's brigade, and the remains of both of the Brunswick advanced-guard-battalion, and the 1st battalion of the 2nd regiment of the Nassau, forced the entrance into the wood near the south-east angle of the garden-wall, and firmly established themselves in that quarter (1990: 313).

From this it is clear just how important the gate was, as not only did it give access to considerable numbers of French troops - into the Killing Ground and the Orchard - but also ensured that when the final push by the defenders came, it was the gate that drained the French out of the enclosed area and facilitated their pursuit through the wood. The North gate at Hougoumont has garnered a lot of attention over the years, but the reality is that a more obscure gateway at the eastern end of the Killing Ground was perhaps a just as important piece of real estate.

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[1] Major Charles Foinette and Captain Mark Evans (Retired) studied archaeology together at University College London before joining the army. *Waterloo Uncovered* grew from a desire to engage veterans and still serving personnel in an archaeological project. Dr. Stu Eve and Professor Tony Pollard are Archaeological Field Directors of the *Waterloo Uncovered* project.

[2] Dominique Bosquet and Véronique Moulaert are also field directors of *Waterloo Uncovered*.

[3] The term 'Killing Ground' is used by modern historians and does not seem to appear in contemporary accounts of the battle. Examples can be found in Hamilton-Williams 1993: 278 and, Adkin 2001: 332. Likewise, 'Killing Zone' is a modern term, and one that was somewhat unconsciously adopted by *Waterloo Uncovered*.

[4] Leonhard's mention of grass, points away from the use of the area at the time of battle as a kitchen garden, as shown on Willem Benjamin Craan's map published in 1816, and a description mirrored in several secondary accounts including on a map in Hamilton-Williams (1993:284).

[5] Both Paul Dawson and Andrew Field refer to this report. Both provide their own slightly different translations – to the point of using different spellings of the author's name – Dawson refers to Major Beaux, and Field to Major LeBeau. Both present this as their only French account of the fighting in the Killing Ground.

[6] Alexander Woodford, a Major in the 2nd Foot Guards at the time of the battle, writes: 'A rising ground commanded the south-west angle of the farm. The corn was high and concealed the tiraillers, who kept a regular fire upon the doors of communication I have mentioned, and killed several men and wounded some Officers.' Siborne, 1993: 264.

[7] The British Brown Bess musket had a calibre of the 0.75", while the French Charville musket had a calibre of 0.69"

[8] The most famous of these is the break in through the North gate, but there were also incursions through the South gate and the small door in the western wall of the farm complex, both of which were into the south courtyard (Dawson 2018: 51-53).

[9] Charras was the son of a General in Napoleon's army and himself a French soldier, though a staunch Republican. He researched and wrote his anti-Bonapartist history of the 1815 campaign during exile in Belgium. Unfortunately, the source of this reference to the entry into the garden is not noted in the text.