Tank Training Site, Fritton Lake Somerleyton, Ashby & Herringfleet HER ref. SOL 029

Archaeological Survey Report

SCCAS Report No. 2013/052

Client: Suffolk County Council

Author: Mark Sommers

April 2013

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Author: Mark Sommers

Contributions By: Stuart Burgess

Report Date: April 2013

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Summary

Fritton Lake and the surrounding land was used by the 79th Armoured Division as a training and experimental site from 1943 through to 1947. It was used to secretly develop techniques and to instruct tank crews in the operation of amphibious tanks, known as Duplex Drive or DD Tanks, primarily for use in the allied invasion of France during World War 2. It originally consisted of an accommodation area, workshop and maintenance buildings, dummy landing craft slipways, specific training structures, a large tank park and numerous tracks and roadways linking the various components. Due to the secret nature of this establishment relatively little is known about its layout and operation. Following its decommissioning, the site was cleared and the majority of above ground structures demolished. Despite this, significant evidence is preserved at this site in the form of foundations, floor slabs, trackways, and areas of hardstanding as well as the structural remains of the landing craft slipways. There is also at least one extant building with significant portions of a second standing nearby. Many of these remains are relatively slight and are in danger of being destroyed or simply being lost. To mitigate against this and as an aid to further the understanding of this site, a survey of all the known extant remains was carried out. The main the aim of the survey was to produce a plan of the training establishment and to undertake a basic descriptive record of the remains. The results of the survey are presented along with an introduction into the site's historic background.

1. Introduction

The area around Fritton Lake, situated in the Suffolk parish of Somerleyton, Ashby and Herringfleet (formerly three separate parishes, now a single entity), was used by the 79th Armoured Division of the British Army, during the 1940s, for the development of amphibious tanks and as a training establishment for crews to familiarise themselves with their use. The main drive behind the training program was the proposed D-Day landings, which comprised a significant part of the Allied invasion of Europe leading to the end of World War Two. The amphibious tanks were known as DD Tanks, which stood for 'Duplex Drive' and was a reference to the tank's twin drive system needed to incorporate propellers for use when floating. The act of using the tank on water was known as 'swimming' and they were often confusingly referred to as 'swimming tanks'.

The site was in use until 1947 after which it was dismantled and the site returned to the original owners. Part of what had been an area of accommodation for men based at the site, including at least two extant buildings, was leased to the Scouting Organisation for use as a Scout Camp. The remainder of the land was restored and replanted as cover for game birds or returned to forestry.

The entire site then lay undisturbed and virtually forgotten until the early part of the 21st century when the then Country Park Manger of the Somerleyton Estate, Stuart Burgess, recognised that significant components of the camp survived within the woodland on the south side of the lake and undertook a program of personal research and investigation into the site's history with the ultimate aim of bringing recognition to the site's historical significance and to further understanding of the important role it played in World War Two.

Although numerous remains are present scattered across the area, no attempts to assess the extent of the site's survival had been undertaken. In order to rectify this, funding was obtained from the European Interreg IV A Project to undertake a basic survey of the extant remains. The results of the survey, carried out over three days in April 2013, are presented in this report.

A further aim of the project is to use the recorded data to provide evidence of survival and to further the known background of the site for a Heritage Lottery Fund application to enable further studies to undertaken at this site.

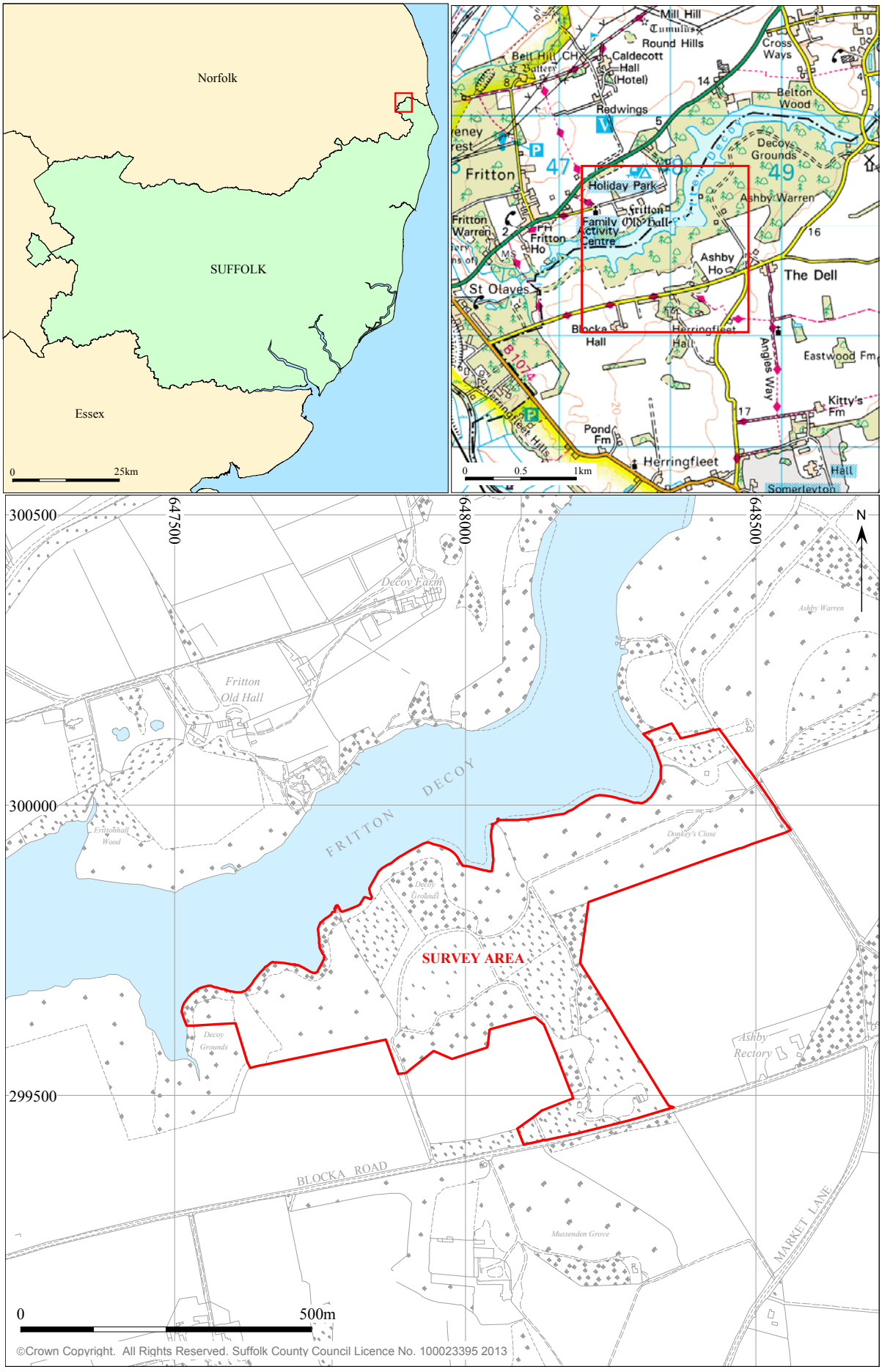


Figure 1. Location plan

2. Location

Fritton Lake, or Fritton Decoy as it is also known, and the surrounding land is part of the estate of Somerleyton Hall, which lies 2.5km to the south east. The lake itself is located on the border between the counties of Suffolk and Norfolk, to the east of the Norfolk village, St Olaves. It is a meandering, elongated stretch of water approximately 3500m in length and 270m in width giving it a total area of *c.* 60 hectares. The lake is between 3m to 5m deep and its existence is probably the result of medieval peat excavation. Numerous meandering and tapering inlets once surrounded the lake although few now remain. These were known as decoys and were used for trapping ducks and other lake birds.

The survey area comprises a 26 hectare parcel of land on the south bank of Fritton Lake lying between the lake and Blocka Road to the south. It is wholly within the county of Suffolk.

The National Grid Reference for the centre of the survey area is TM 4989 9957. See Figure 1 for a location.

3. Historic Background

A history of the site, including an introduction into the development of the amphibious tanks used on Fritton Lake, has been compiled by Stuart Burgess to act as a background to the survey. It has been reproduced in full as Appendix 1 of this report.

4. Methodology

The survey was undertaken using a Total Station Theodolite (TST) using survey stations that had been located using a GPS system with sub 5cm accuracy. It was initially intended to use the GPS equipment to undertake the entire survey but due the density of tree cover this was not possible.

In general, only the outlines of features were recorded, which in practice, due to the regular shapes involved, required only the corners to be plotted. All features recorded consisted of concrete or brick footings and wall lines, concrete floor slabs and pads, or areas of concrete hardstanding.

Many of the features were partially buried under thin deposits of topsoil or leaf mould and consequently it was necessary to use a steel probe to identify their full extent. Occasionally, small areas were cleared with a leaf-blower or a hand trowel to highlight wall lines etc.

5. Survey Results

The total area investigated comprises some 26 hectares. Within this area four specific zones were subjected to detailed surveys to record any extant remains related to the military occupation of the site. The four survey areas were related to known areas within the military complex which have been identified through the historic research undertaken by Stuart Burgess. The survey areas are marked in Figure 2 and are identified as follows:

1. Military Camp	An area of accommodation buildings and associated structures.
2. Tank Park and Workshops	A large area of concrete hardstanding on which tanks were parked when not in use, with evidence for adjacent workshops and other structures.
3. Training Facilities and other features	Site of the amphibious escape training building and the nearby immersion pool.
4. Landing Craft Ramps	Location of a group of four dummy landing craft ramps from which the tanks entered the lake.

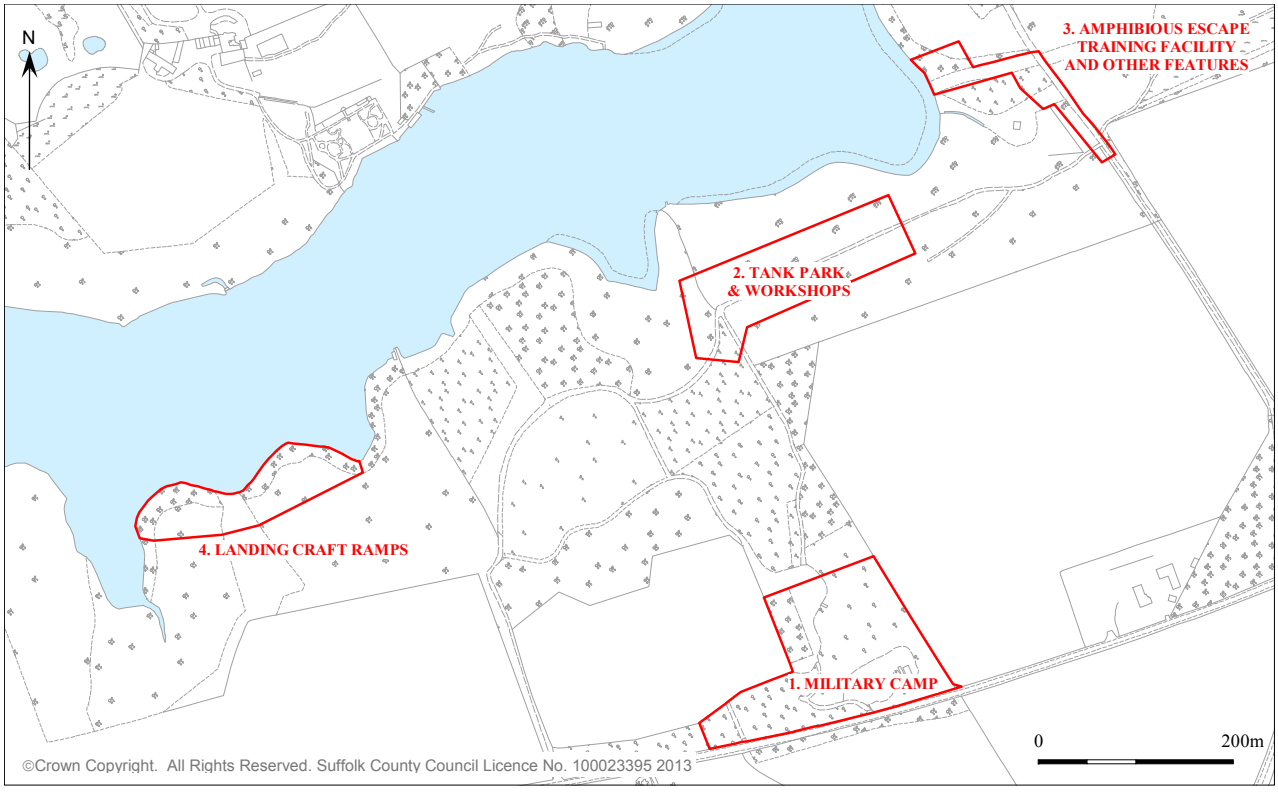


Figure 2. Detailed survey areas

1. Military camp

A total of twenty-nine features were recorded in the area of what was formerly the accommodation area for the instructors, sappers and ancillary staff attached to the training and development establishment. Of the twenty-four features, twenty-two were the sites of buildings, or have been interpreted as such. The remainder were features associated with the camp area, such as a fence post, a gateway and drainage features. They were numbered 1 to 29 and are briefly described in the table below; see Figure 3 for a plan of their locations.

Feature No.	Description
1	Site of a rectangular building. Only an outline of brickwork visible (plate 1)
2	Site of square shaped structure. Concrete slab floor with surrounding walls built of hollow concrete blocks, with a single wall running approx. north-south dividing the structure into two equal cells (plate 2)
3	Stub of angle-iron/steel rod. Possible the remains of the Dannert fence that originally ran around the entire training/development area (plate 3)
4	Line of brickwork, with corners at both ends. Probably marking the south side of a rectangular building (plate 4)
5	Short length of brick wall. Presumably relates to an unknown building to the north west of Building 4.
6	Coils of wire hawser. Presumably discarded during the dismantling of the camp. Thought to have been associated with anti-sea plane defences (plate 5).
7	Site of a roughly square building. Outline of brickwork enclosing a concrete slab (plate 6).
8	Site of a rectangular building. Only an outline of brickwork visible (plate 7).
9	Site of a rectangular building. Only an outline of brickwork visible (plate 8).
10	Site of a rectangular building. Only an outline of brickwork partially visible. Appears to be slightly more complex construction involving a second row of brickwork with mortar/concrete surface between. Remnants of a concrete floor slab also evident (plate 9).
11	Site of a roughly square structure. Remains comprise a strip of concrete forming a square shape although this has broken into separate, largish pieces but tree root growth (plate 10).
12	Probable site of a building. Comprises two concrete slabs lying adjacent to form a roughly square base.
13	Site of a rectangular building. Consists of an outline of brickwork enclosing a concrete slab (plate 11). A separate paving slab was noted outside the structure, adjacent to the south west corner (plate 12).
14	Concrete floor slab of a small sub-square building. Edges of the slab are corrugated suggesting corrugated iron shed. Evidence for a central doorway in the west wall (plate 13)
15	Rectangular structure with offset rectangular shaped block at southern end. Brick construction with internal concrete slabs (plate 14). Numerous internal divisions and evidence for open drains/gulley and toilets within. Interpreted as an ablutions block. Drainage pipe access point noted immediately to the east (plate 15)
16	Group of three drainage access points (manholes) consisted of vertical edged brick lined pits with salt-glazed ceramic pipes evident (plate 16).

Figure 3. Survey results: military camp area

17	An area of concrete slab detected using a probe. Possibly the site of a small building.
18	Site of a rectangular building. Consists of an outline of brickwork enclosing a concrete slab. Cobbles evident on the upper surface of the slab with areas of a smoother screed laid over. Also evidence for a central doorway in the west wall (plate 17).
19	Site of a rectangular building. Outline of brickwork enclosing a concrete slab (plate 18).
20	Site of a rectangular building. Consists of a partially visible concrete slab. Full extent of slab established using a probe.
21	Site of a rectangular building, believed to be of similar dimensions to Building 19. Consists of a partially visible concrete slab although full extent is not discernable.
22	Rectangular building consisting of a concrete slab with a number of pre-cast concrete uprights (plate 19). The walls appeared to have been constructed of lightweight hollow ceramic building blocks built in panels set between the uprights (plate 20). The upper section of the uprights along the east and west walls were angled to form part of the roof structure. The Corner uprights were of a different pattern, being slightly sturdier. Has been interpreted as a cookhouse. What is presumably a later building has been built within the central area using the existing uprights (plate 21). The walls and roof of this building are clad in corrugated iron sheets. The roof structure comprises a timber frame bolted to the concrete uprights and is possibly part of the original structure.
23	Site of a square building consisting of a brick wall, being the width of three bricks (noticeably thicker than all other structures) around a concrete floor slab (plate 22).
24	Site of a rectangular building. Consists of an outline of brickwork enclosing a concrete slab. Cobbles evident on the upper surface of the slab with areas of a smoother screed laid over. Also evidence for a central doorway in the east wall (plate 23).
25	Pair of curving walls flanking a gateway (plate 24). Constructed of hollow concrete blocks and covered with a thin skim of render into which lies have been drawn to give the appearance of ?stone blocks. The south west end of the western wall has an additional square block on the upper face which has a dished depression in the top (plate 25).
26	Area of concrete slab, possibly related to a structure but no obvious evidence for walls. Appears as a northwards continuation of the slab under building 28. Has been extended on the western edge but this appears to be later and is possibly related to post-military activities.
27	Concrete and brick lined pit. Possible a vehicle servicing pit. Used as a fire place by the scouts. No obvious indication of an associated structure (plate 26).
28	Existing scout hut. Similar dimensions to huts recorded elsewhere on site (i.e. buildings 10, 18 etc.) suggesting it may be built on the footprint of a former military camp building (plate 27).
29	Rectangular, brick built structure. Extant and in current use by the scout association. Believed to be a military camp building. Its brick construction and location away from the accommodation buildings suggests it nay have housed a generator (plate 28).

Buildings 30 to 37 were identified after completion of the survey. Buildings 30, 35, 36 and 37 were recorded during a later visit by Stuart Burgess whilst buildings 31 to 34 have been transcribed from an aerial photograph of the site, dated 26th March 1944 (RCHME ref. HLA/694/4112).

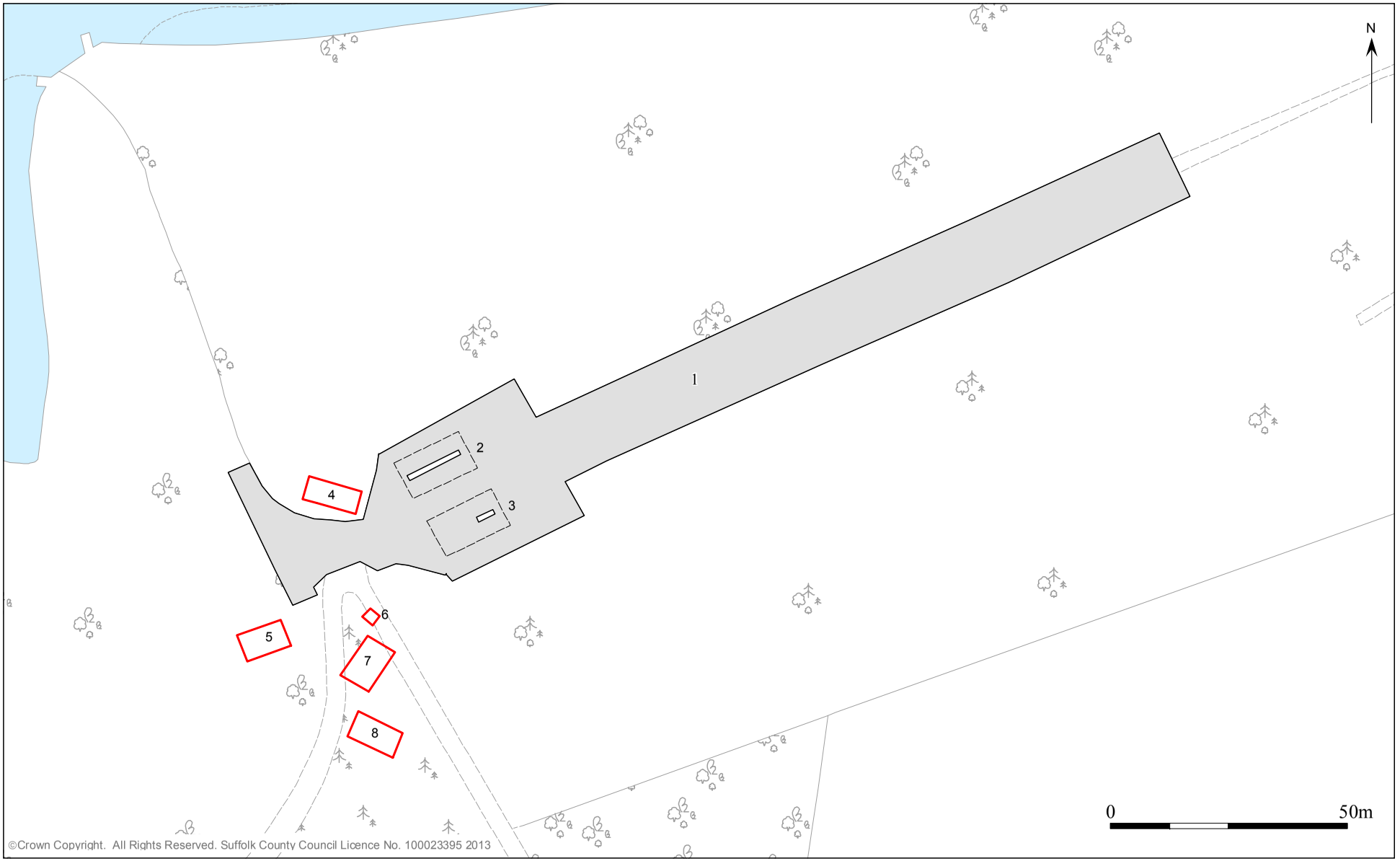


Figure 4. Survey results: tank park area

2. Tank park and workshops

See Figure 4 for the recorded locations of features within the area of the tank park.

The main component of the tank park was a large expanse of concrete hardstanding used for storing the tanks when they were not in use (feature 1, shaded grey, in Fig. 4). It measured just under 16m in width and had a length of 144m (plate 29). The land in this area slopes down to the north towards the lake and the tank park forms a level terrace. The northern edge is slightly raised and was easily traceable whilst the southern edge had been become partially obscured by material moving down slope and could only be traced with the probe.

At the south west end of the tank park the concrete hardstanding widened out around the site of two former buildings. In this area two elongated pits were present (features 2 and 3). Both had vertical edges formed of concrete cast *in-situ* with stepped ledges on the northern and southern sides into which timber baulks could be fitted to cover the pit. The northern of the two pits (2) measured 12.1m in length whilst the southern pit (3) was only 3.8m long. Both were 1.1m in width. The total depths could not be ascertained as they were obscured by vegetation and partially filled with water (plate 30). They have been interpreted as servicing pits associated with maintenance of the tanks. Both were originally located inside buildings that have since been demolished. The approximate outlines of the two buildings have been transcribed from the March 1944 aerial photograph (marked on Fig. 4 with dashed lines).

The concrete hardstanding continued to the south west to form a hammer head shaped area associated with trackways that led approximately north and south.

In the vicinity of the south west end of the tank park a number of other buildings were located (features/buildings 4 to 8). Building 4 was visible as an outline of brickwork enclosing a concrete slab (plate 31). Buildings 5 to 7 appeared as level platforms which revealed an underlying hard surface when probed. Building 8 was partially visible as an area of concrete slab.

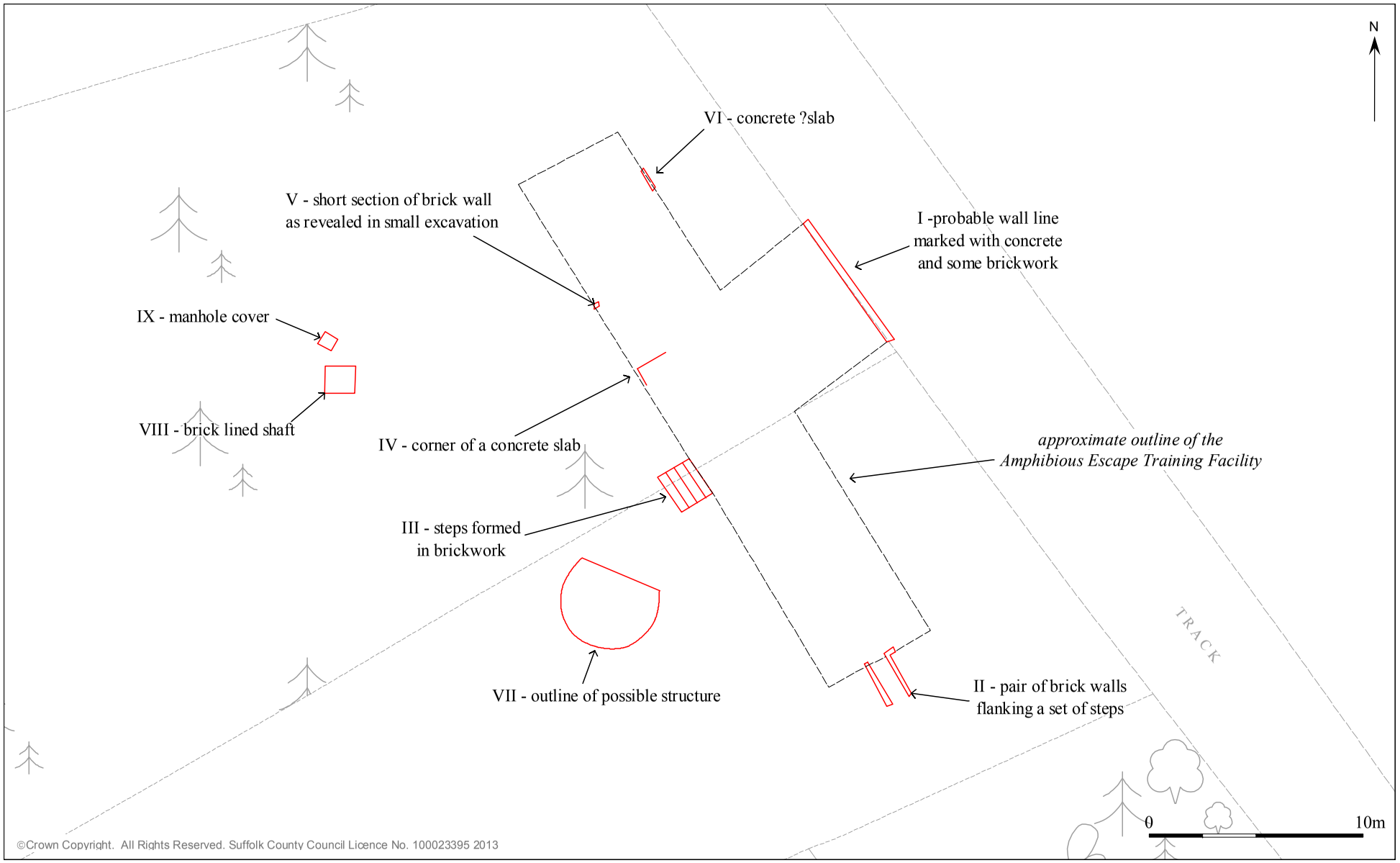


Figure 5. Survey results: the Amphibious Escape Training Facility

3. Amphibious escape training facility and other features

The amphibious escape training facility was located to the east of the tank park on a south west facing slope running down from a north west to south east track. It is thought that the building was originally cut onto this slope. Only scant remnants of this building were visible during the survey making their interpretation difficult. Figure 5 illustrates the remains recorded (marked in red). These are itemised below with possible interpretation. See Figures 12, 13 and 14 of Appendix 1 for possible layout and appearance of this structure.

I - A strip of concrete revealed through limited hand excavation. Smooth on the upper surface although edges appear a little irregular (plate 32). Some brickwork visible, particularly towards the north west end. Thought to be the north-east wall, i.e. the rear wall, of the water tower that stood on the north east side of the main building.

II - Pair of parallel brick walls. Probably flanking walls either side of a series of steps leading down from the building. They mark the site of door and the south east extent of the building.

III - A set of four steps formed from solid brickwork leading down from the building. They mark the site of a door and the south west extent of the building.

IV - The western corner of a level concrete slab, the full extent of which it was not possible to establish due to the sloping nature of the ground and vegetation. Thought to be part of the floor in the area of the escape chambers.

V - A short section of brick wall seen in at the base of a small excavation. Appeared to be aligned perpendicular to the main structure. Probably one of the retaining walls either side of the access passage to the subterranean pump and equipment room.

VI - Small area of concrete, probably marking the north east wall. Possible part of the raised floor over the subterranean pump and equipment room.

VII - Irregular shaped outline of a possible structure separate from the main building. Formed of concrete which has been cast against sheets of corrugated iron.

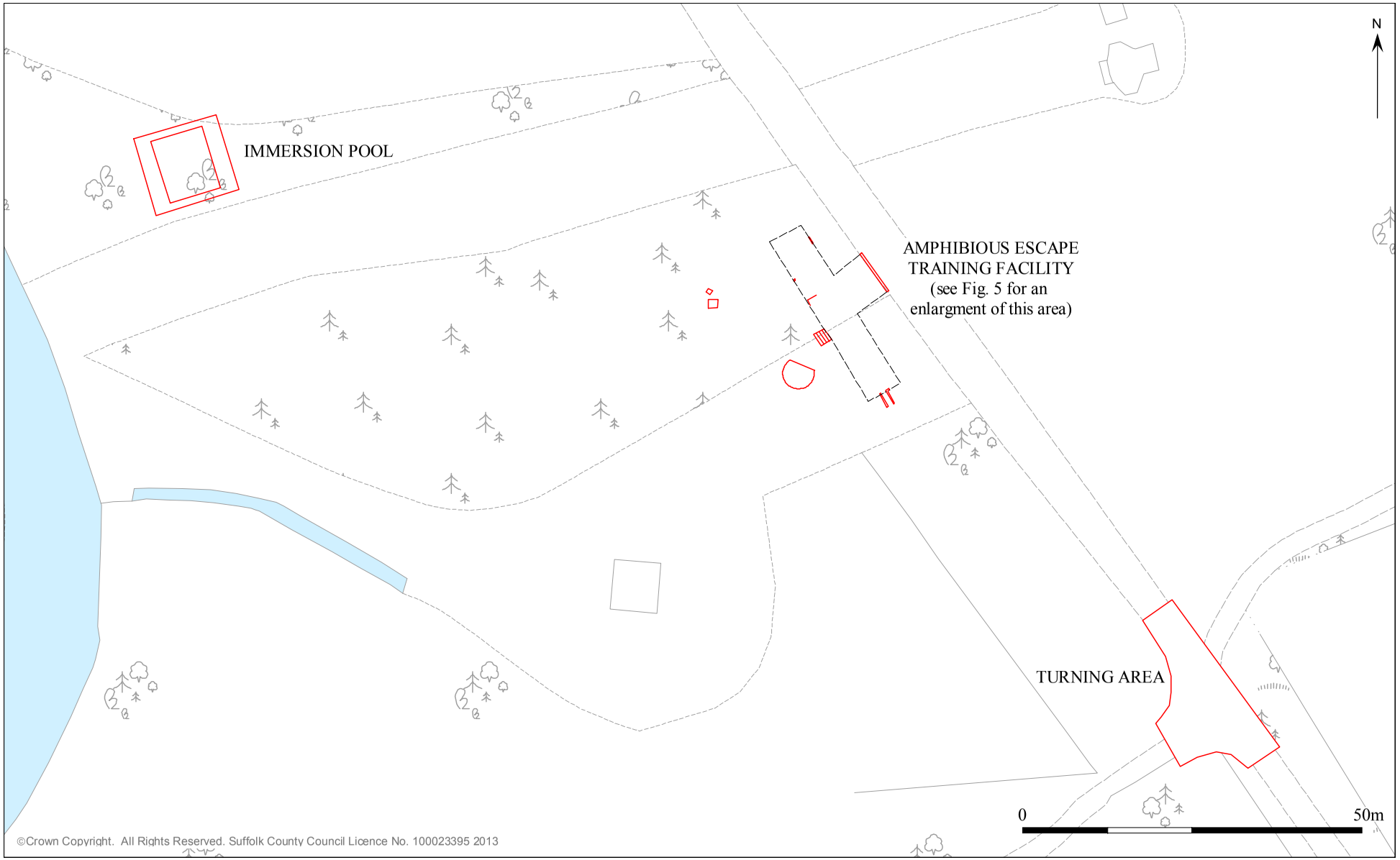


Figure 6. Survey results: area in the vicinity of the Amphibious Escape Training Facility

VIII - Vertical brick lined shaft. Rectangular in profile with iron steps set in one side (plate 33). A large diameter pipe visible in one corner at the base. The shaft extends above the present ground level by *c.* 1m (plate 34). Its purpose is unknown but it is believed to be associated with water management in the training chambers within the main building.

IX - Manhole cover at present ground level adjacent the brick shaft (VIII). Constructed of a cast iron with concrete (plate 35).

Other features in the area of the Amphibious Escape Training Facility (see Figure 6) were the immersion pool and an area of concrete hardstanding at a 'T' junction of tracks.

The immersion pool consisted of a roughly rectangular pool of water, measuring *c.* 9.5m by 7.75m, with sloping banks on all sides (plate 36). It was used to test the water-proofing of the tanks prior to swimming in the lake

The area of concrete hardstanding was placed at a junction the tracks at a point where tanks would have been cornering and therefore liable to cause heavy wear to the track surface. It is also thought to be a turning area for the low-loaders that delivered the tanks to the site.

4. Landing craft ramps

West of the tank park a series of four launching ramps for the tanks were present (marked in red in Figure 7). These consisted of short lengths of Bailey bridge ending with ramps into the water and were designed to simulate the launching of a tank from a landing craft. All of the Bailey bridge structures have been removed but a series of concrete slabs and beams remain *in-situ.* Each consisted of a single slab of concrete, measuring *c.* 10m by 6.3m with two further narrow slabs or beams, measuring 7.1m by 1.4m, set between the slab and the water (plate 37).

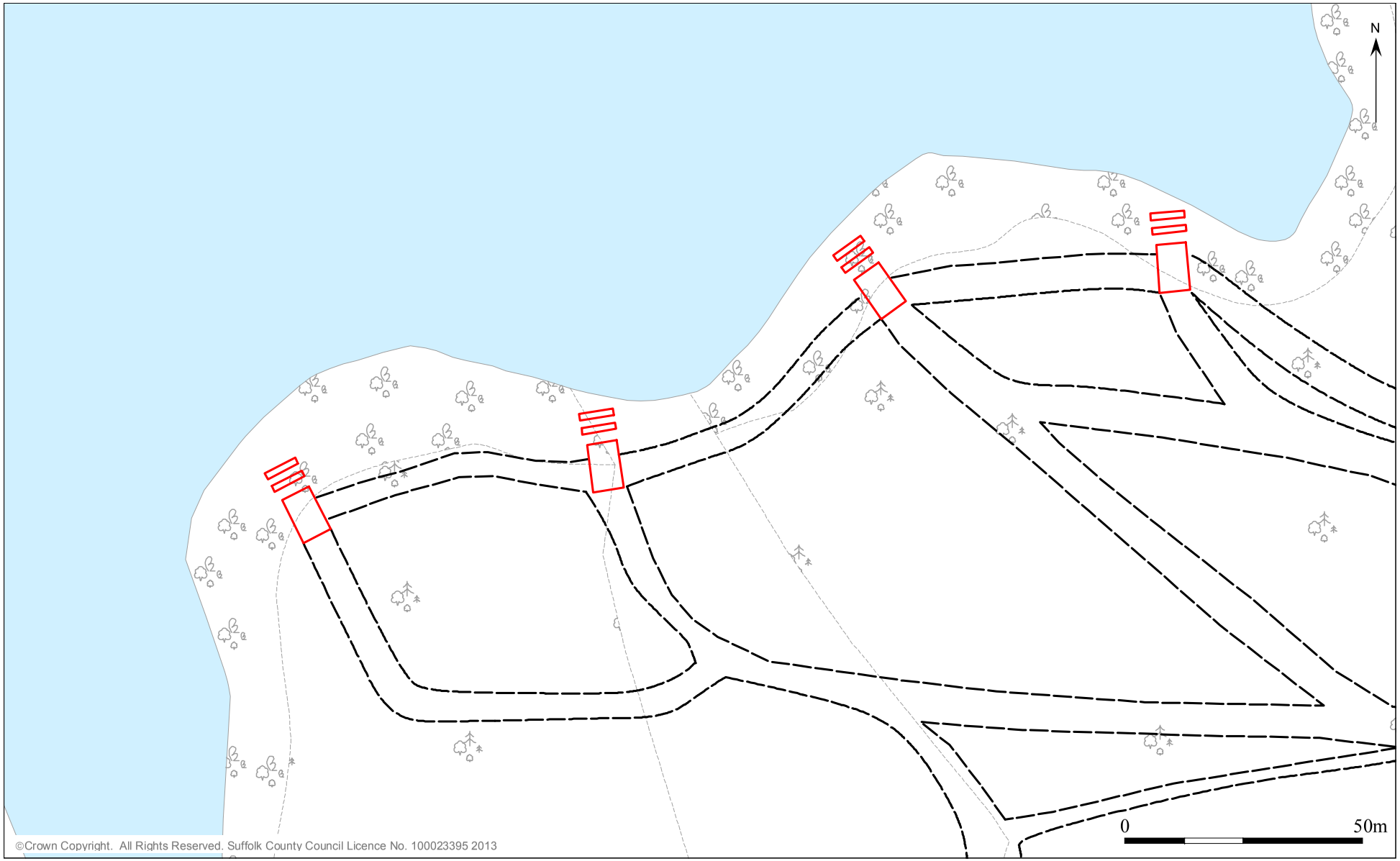


Figure 7. Survey results: dummy landing craft ramps (in red, access tracks in black dashed line)

The larger slabs supported part of the bridge and would have also assisted with the lining up of the tank before starting out onto the bridge, whilst the two smaller slabs are associated with supporting the bridge and access ramp up onto the bridge.

The launching ramps were connected to each other and the rest of the site by a series of tracks, some of which were visible as earthworks (plate 38). A complex of trackways is visible on 1944 aerial photographs and those in the launching area have been transcribed in Figure 7 (marked in black dashed lines). Many of these tracks converge on a junction to the south east of the launching area where a second concrete turning area was recorded (visible Figure 8).

6. Conclusions

The survey has revealed that substantial remains of the former tank development and training establishment survive in the area examined (see Figure 8 for an overall summary of the survey). Although only a small component is actually visible at ground level enough has been recorded to gain an understanding of the basic layout of the camp from which certain aspects of its operation can be deduced.

Use of the probe and the minimal amount of hand excavation that was undertaken has demonstrated that substantial remains of the establishment, particularly in the accommodation area, exist just beneath the surface of the topsoil or under deposits of leaf litter, which would indicate that the dismantling of the site in the late 1940s involved the clearance of above ground structures only.

This is highly interesting and unique site related to a specific event in the history of World War 2 as well as the subsequent development of other experimental projects. It affords numerous opportunities to undertake further research on many aspects of the site's operation and its effect on the local population.

A number of artefacts have been recovered across the site as casual finds ranging from everyday household items used by the men living on the site to tank parts, including a makers ID plate from one of the tanks that served here, which in itself has provided significant evidence about the manufacture of the Valentine DD (see Appendix 2), and remnants of the Bailey bridges used on site (plate 39). The artefacts that have been

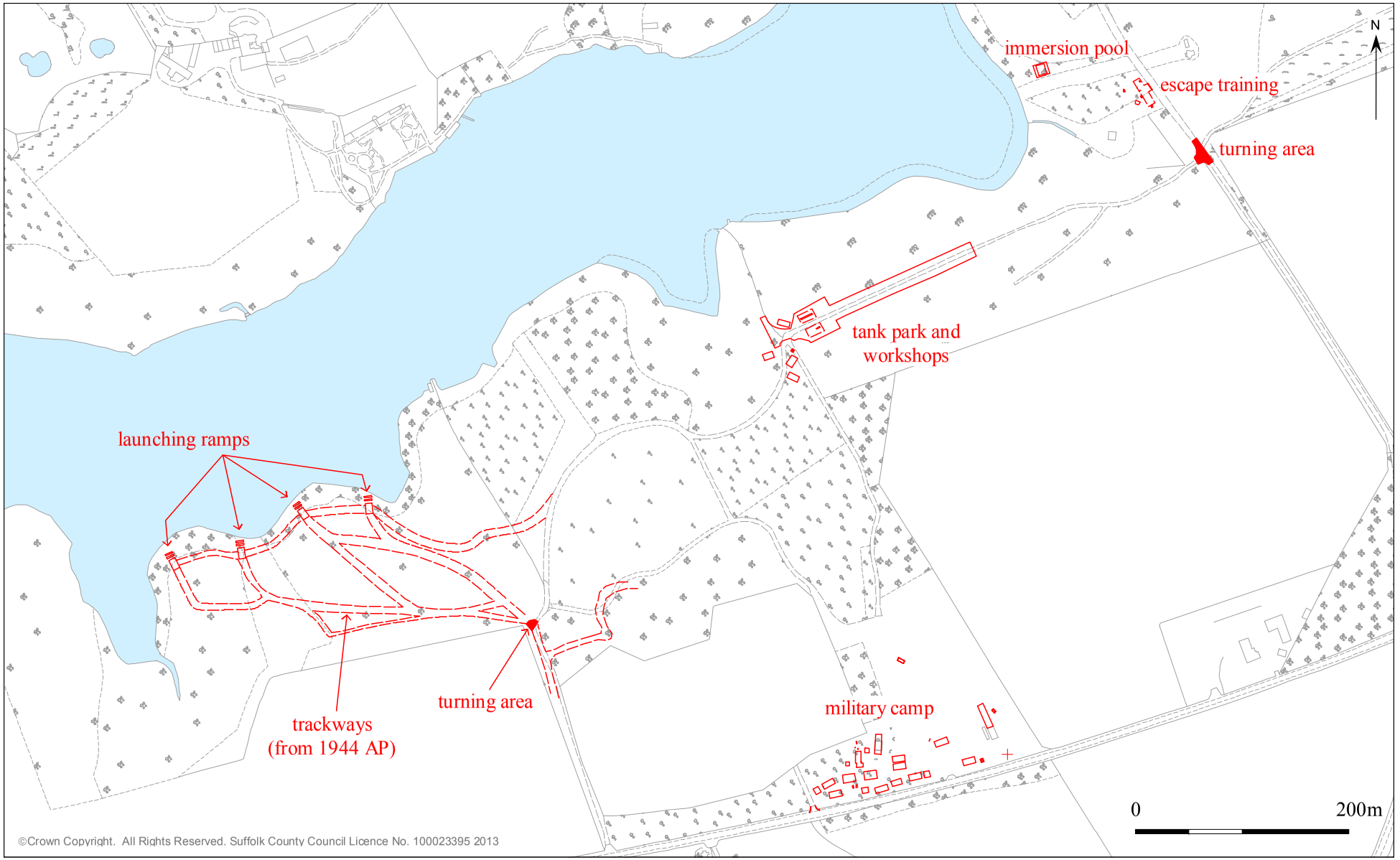


Figure 8. Survey results: overall summary

revealed form the basis of a collection that could be used for educational purposes and for display either on site or at local museums.

Further work could be in the form of open area excavation of individual buildings, which being relatively simply and straightforward, could be carried out as community projects involving local schools, volunteer groups and possibly the Scout Organisation, with the potential to reveal specific details and artefacts that would enable the purposes of each structure to be determined. Appendix 3 comprises an example of an educational visit that involved archaeological activity. The results of which has furthered the recording and interpretation of one of the camp buildings (Building 15).

7. Acknowledgements

The survey was undertaken by Simon Picard and Mark Sommers of the Suffolk County Council Archaeological Service Field Team with considerable help and guidance from Stuart Burgess. Thanks also go to Stuart and his team of volunteers who spent some time in advance of the survey clearing areas and identifying structures for recording.

The project was overseen by Dr Rhodri Gardner, Contracts Manager for the SCCAS Field Team, and the project was initiated and the funding secured by Sarah Poppy of the SCCAS Conservation Team.

Thanks also goes to Paul Howard, the Scout Master, for his help and support and for kindly making the scout camp facilities available during the survey and to Edward Knowles, the Estate Manager, for facilitating access.

Finally, thanks go to Lord Somerleyton for allowing access to the land and for his continuing interest in the project.

8. Plates

Plate 1. Building 1, north east corner

Plate 2. Building 2, camera facing west

Plate 3. Feature No. 3, possible Dannert fence post

Plate 4. Building 4, south east corner

Plate 5. Feature No. 6, abandoned coil of wire hawser

Plate 6. Building 7, camera facing south east

Plate 7. Building 8, south west corner

Plate 8. Building 9, south east corner

Plate 9. Building 10, northern wall, camera facing west

Plate 10. Building 11, camera facing south east

Plate 11. Building 13, northern wall line, camera facing north east

Plate 12. Building 13, south east corner showing floor slab and external paving slab

Plate 13. Building 14, western wall, camera facing north

Plate 14. Building 15, showing an internal division and channel in floor, camera facing west

Plate 15. Building 15, drain access point , adjacent to the eastern wall of Building 15

Plate 16. Feature 16, northern drainage access point, camera facing north

Plate 17. Building 18, western end of structure

Plate 18. Building 19, showing floor slab and wall lines

Plate 19. Building 22, showing uprights of former structure, camera facing north west

Plate 20. Building 22, upright in the north west corner showing remnants of the hollow ceramic blocks

Plate 21. Building 22, camera facing south

Plate 22. Building 23, north west corner

Plate 23. Building 24, doorway in eastern wall

Plate 24. Flanking walls either side of an entranceway (25), camera facing north

Plate 25. east end of eastern flanking wall (25)

Plate 26. Concrete and brick lined pit (27), camera facing north

Plate 27. existing scout building (Building 28), camera facing south

Plate 28. Building 29, camera facing east

Plate 29. North east end of tank park, camera facing north east

Plate 30. Tank park area - service pit in Building 2

Plate 31. Tank park area - Building 4, camera facing east

Plate 32. Amphibious Escape Training Facility - wall line (I)

Plate 33. Amphibious Escape Training Facility - view down brick lined shaft (VIII)

Plate 34. Amphibious Escape Training Facility - exterior of the brick lined shaft (VIII)

Plate 35. Amphibious Escape Training Facility - manhole cover (IX)

Plate 36. Immersion pool, camera facing north west

Plate 37. Landing craft ramp supports (L2), camera facing north west

Plate 38. trackway leading down to L1 visible as an earthwork, camera facing north west

Plate 39. Bailey bridge component reused as a fence post

Appendix 1. Historical Background

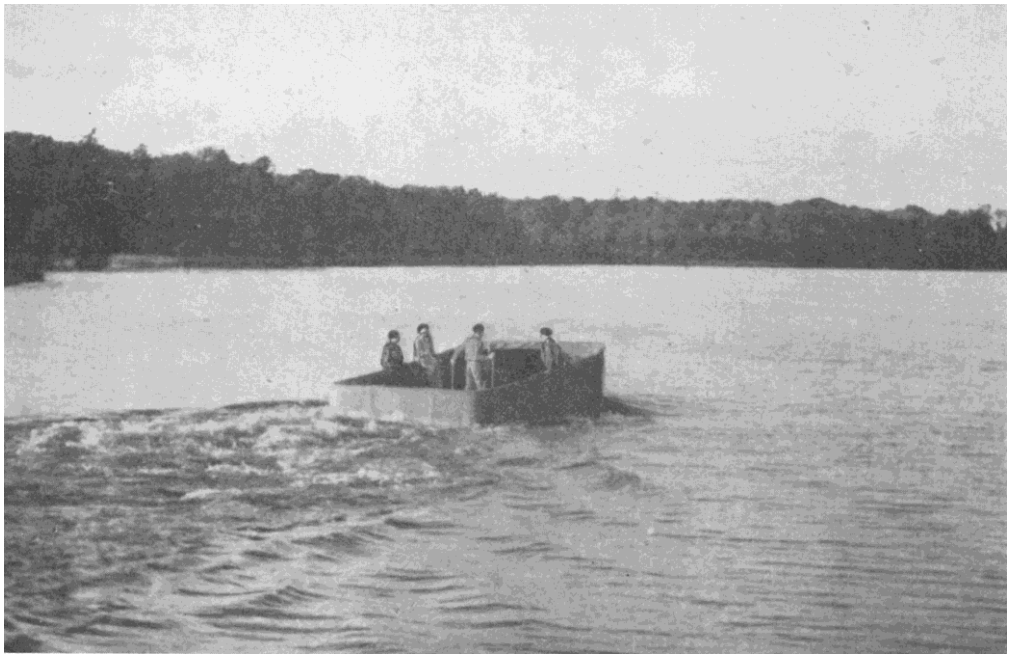
79th Armoured Division

Top Secret Duplex Drive Tank Training Wing:

Fritton Lake

Somerleyton Estate

Suffolk



Stuart Burgess

April 2013

Contents

79th Armoured Division: Freshwater Wing

Introduction

Within the grounds of Somerleyton Estate, on the Norfolk / Suffolk border, is a truly a unique site associated with World War Two. On the shores of Fritton Lake, the 79th Armoured Division established a Training and Experimental Wing to develop and perfect techniques using the Duplex Drive (DD) Tanks.

Valentine and Sherman Tanks were adapted to make them amphibious, so that they could "swim" to shore and provide close fire support to the first wave of troops landing on enemy beaches. These tanks were part of a series of tanks that had been modified to do something more than just fight in the regular way, and were collectively known as "funnies".

The Lake became a significant training facility in 1943 and went on to train in excess of 2000 men prior to D Day and a further 500 after D Day. The DD tanks and their crews proved themselves as key and effective weapons for the D Day Landings, and as such became versatile in subsequent European Operations associated with Estuary and River crossing.

The significance of the Freshwater Training Wing cannot be underestimated in relation to the development of the Duplex Drive Tanks[1]. Its archaeology concerns the Military Camp and functional infrastructure associated with the provision of elementary training, tactical development, amphibious tank escape as well as post war experimentation and trials. The 60 acre site is well preserved, with surviving features such as a tank park, contemporary Landing Craft slipways, subterranean structures and the footings of a large number of huts, stores and other buildings connected with the workshop and maintenance facility. The site was occupied between 1943 and 1947.

This report aims to outline the historical relevance of the site, and demonstrates its function, development and significance during and after World War Two.

[1] Further reports regarding the Duplex Drive Tank Story have been written by the same Author. Fritton Lake became known as "Water Assault Wing A". It was one of 8 wings set up during the War in the UK and Europe. Other Wings were established at Gosport Hampshire (B Wing Saltwater), and Burton upon Stather, Lincolnshire (River Crossing Wing), which were utilised to train men in other aspects of DD tank operation.

1 Evolution of Swimming Tanks

In November 1942 a specialised Armoured Division was established in response to failures in Europe associated with amphibious landings and tackling German Defences. The 79th Armoured Division – led by Major General Percy Hobart - was instructed to develop a range of tanks that would undertake a secondary role to overcome the problems Allied forces encountered at Dieppe earlier that year. Amongst these were the Duplex Drive (DD) swimming tanks.

They were successfully developed by Nicolas Straussler, and swam under their own power (by means of a propeller) to the beaches on D Day. The assault on 6th June 1944 witnessed 240 Sherman DD tanks involved in the landings, some swimming distances of over 5000yards. The provision of armoured support so early in an operation proved to be a critical and significant advantage to the Allies, enabling German machine gun positions to be destroyed, and facilitating advances on the beaches[2].

Fig 1 Valentine DD at Gosport 14th January 1944 with screens down. Note the turret is 180 degrees to the rear, so as not to foul the screens

Fig 2 Valentine IX DD with Screens inflated. This tank is the only surviving example of a Duplex Drive Valentine

Fig 3 Close up of rear propeller on a Valentine DD – power is taken direct of the gear box

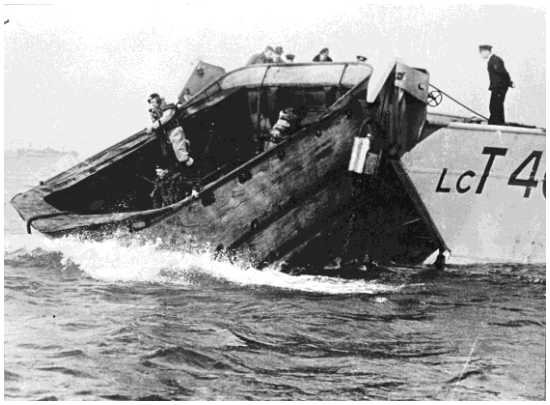


Fig 4 Sherman DD descending Landing Craft (Tank) during trials in the Solent.

[2] For a compete account of this please refer to S Burgess 2013 Development of Duplex Drive Swimming Tanks, and D Fletcher 2006 Swimming Shermans of World War Two

2 Establishment of the Freshwater Training Wing

In early 1943, following Top Secret trials in Scotland and Wales, the 79th Armoured Brigade set about locating a suitable inland lake to utilise for DD training, and undertake further trials, tactics and training with these completely new and novel machines.

By March 1943 the Lake at Narford Hall in West Norfolk had been requisitioned, and a small cadre from 79th Armoured Brigade began trials and training there. However, very quickly it was recognised that the 52 acre lake was only capable of training 5 tank crews at a time, and would be insufficient to train whole squadrons, so alternative sites were considered.

Several UK locations were evaluated, but Fritton Lake was considered most suitable, partly due to its proximity to other 79th Armoured Division Operational Areas[3]. Surveys undertaken by Capt. Morrison on 16th April 1943 assessed its suitability and security implications. Despite some resistance, consent was granted on 10th May 1943[4].

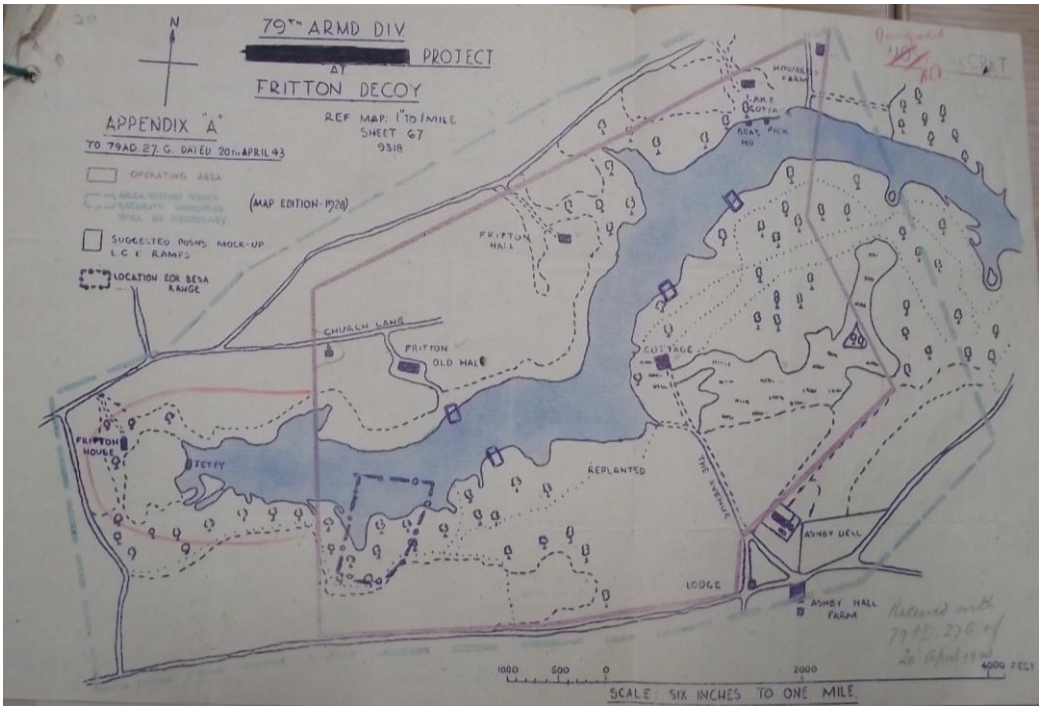


Fig 5 : Map drawn in April 1943 for the reconnaissance of the DD tank Training Project. A BESA range was proposed but late rejected. Likewise final locations of Launching Ramps and Camp were not committed to at this time. PRO WO 199/806 (Dscf 6494)

The 180 acre Lake was in a very rural area and virtually completely surrounded by trees. The shores of the lake were firm sand and gravel, and its depth ranged from 10-16ft deep. The training area was considered large enough to accommodate 2 squadrons (36 tanks) at a time but it would be necessary to construct a tank park and camp within the wooded parts of the

[3] The 79th Armoured Brigade were based at Eastern Command HQ, Saxmundham, and possessed training and experimental sites at Woodbridge, Orford and Ufford.

[4] Brigadier of General Staff (training) opposed the plan, citing that the east coast was frequently reconnoitred by the enemy; that the lake may be viewed from many locations along the Beccles to Great Yarmouth Road, and that several of the banks, especially within Belton Common Wood were too steep for the purpose for which training was required. Pro wo199/806 dscf 6498

Estate to assist secrecy and training. It was originally planned to evacuate local residents, however, civil security was managed by requiring residents to sign the Official Secrets Act and apply for permits to access certain parts of the site. In July 1943 those occupiers of cottages and land overlooking the lake were requested to attend a meeting in Fritton Village Hall. Here Percy Hobart explained to the residents and farm workers that the lake was being requisitioned for experimental work and training and issued of permits and byelaws.

Security fencing, consisting of a triple Dannert Fence, was erected around the perimeter of the site[5] and 5 access points would be controlled by CMPs. All exits were linked by telephone to the Permit Office in Fritton[6]. Posters were displayed, and Red Caps patrolled the fence line.

To reduce aerial observation by enemy planes, camouflage netting was erected over the tank park. In addition, local rumours were already spreading about the presence of the Army at Fritton Decoy. The official line was that it was a Bridging Camp and was to be used for constructing Bailey bridges, pontoons, invasion barges and other techniques associated with ferrying tanks and troops across rivers.

Construction work at Fritton commenced in May 1943, and by August had cost £16,000[7]. It was completed by December 1943 and the work was undertaken by a number of units, some being responsible for the maintenance of the corduroy road, LCT Ramps and other facilties.

3 Training Syllabus

Fritton Lake's role was to introduce men to the Duplex Drive tanks, and provide a safe environment on relatively calm inland waters for crews to learn to operate them. Training involved a 2 week course, covering DD tank preparation and waterproofing, screen maintenance and repair, tank escape, launching, swimming and navigation and finally transition on an assault beach. Units from British and Canadian Regiments were trained between June 1943 and January 1944, followed by three US Tank Battalions trained in the months before D Day (see Appendix 6). Following attending the School at Fritton, regiments would attend the Saltwater School at Gosport, before being issued their own DD Valentines for training at a number of UK Operational Areas (including Linney Head, Pembroke Wales).

The role of the instructors was to perfect the ability and skills of the crews, so that the tank could arrive at a beach and continue its natural role as a fighting tank. Drills were repeatedly practiced attending to waterproofing the tank, inflating the screen and preparing the tank for swimming. Communication skills between the commander and driver were perfected and the transition drill from "swimming tank" to "fighting tank" were rehearsed on the tank park. At least ten waterborne hours were required to train the crews, and swimming training would occur at day, night and under simulated assault conditions (eg at dawn using smoke grenades).

[5] In July 1943 a request was made for the erection of a Tripple Dannert Fence requiring the following supplies – 2300 coils of Dannert Wire, 7000 pickets, 250 coils barbed wire and Knife Rests (120' timber, 4" diameter) PRO WO 205/417 (dscf 6850). See Appendix 1 for Original Map and for the route of the wire fence. The knife rests were presumably for blocking tracks and agricultural access points

[6] The Permit Office was a Hut located opposite Angle Cottage, Beccles Road. PRO WO 205/417 (Dscf 6851)

[7] The original budget was £10,000 but the cost escalated due to heavy installations and changes associated with the likely use of the DD Sherman. PRO WO 205/417 (dscf 6833) 10th August 1943

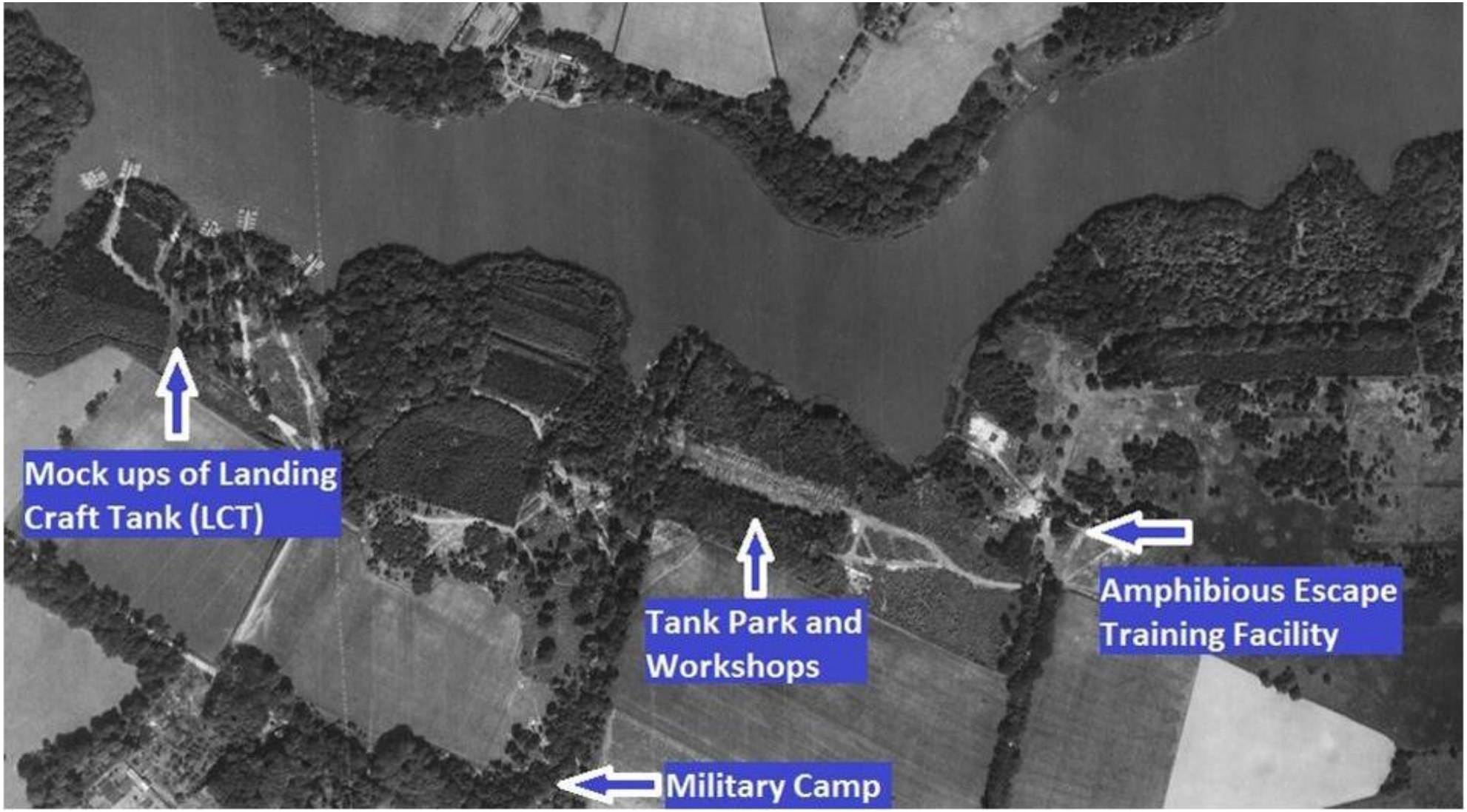


Fig 6 Map Showing Location of the 4 main features of 79th Armoured Division School at Fritton Lake.

26th March 1944 [RCHME HLA/694/4112]

4 OVERVIEW OF THE FACILITIES AT FRITTON

4.1 Military Camp

The main Camp was located adjacent to Blocka Road, Ashby. The ranking officers were billeted in Herringfleet Hall, Ashby, whilst the Instructors, Sappers and Ancillary Staff were accommodated in Nissen Huts in the wood opposite. Men would have been housed in WW1 Bell tents during the construction phase whilst huts were built.

There were 2 entrances to the camp from the Ashby Road. The Western entrance accessed the accommodation huts (containing 12 men per hut), whilst the Eastern entrance accessed stores, workshops, radio and registration huts. From a 1944 air photograph, an array of buildings can be discerned in the woods. The majority were timber sheds or Nissen huts. They were assembled upon hastily-built brick or concrete footings. Only a few buildings were of a more sturdy construction - namely the Cook House and the Generator Hut.

Fig 7 Remains of the Cook House. Some of the original supports have been re used to make the present day corrugated iron shed

Fig 8 Re-used Military Structure, used to formerly house a machine, assumed to be the site of the Generator

The Cook House occupies a central area on the camp, and is constructed of concrete pillars set in the ground, and a screed concrete floor on two levels within. The walls were built from light weight blocks, and rendered. Evidence of tiles, drainage gullies and a raised area suggest the presence of preparation areas and ovens for cooking. The mess hut was located at right angles to it, and was made of timber.

In addition there were several smaller structures: CMP (Red Caps) huts adjacent to either entrance, water tower, man holes, inspection pits as well as other satellite huts. A range of larger buildings can be seen to the east, and survey work intends to locate most of these, and map their location using GPS. The road ways were made of small tree trunks, wired together.

Those attending training at the Lake were housed in Hotel and Bed and Breakfast facilities in Great Yarmouth. They would have cooked meals at their Hotels, and be provided with sandwiches for lunch. Veteran instructor Jim Hawkin remembers that a number of the Huts contained chalk sketches and pictures made by fellow Instructor Sgt Poole-West.

Fig 9 remains of brick footings

Fig 10 View of contemporary camp (Probably Sudbourne) c 1946[8]

Fig 11 Aerial View of Camp showing temporary buildings. The central run of huts were used for accommodation, whist those to the east may relate to officers mess and support buildings. The Generator Hut can be seen near the top of the image. [RCHME HLA/694 / 4112 26th March 1944].

[8] From PRO DEFE 2/1220 (Dscf 697) The SADE Report refers to the Land Assault Wing, located at Sudbourne Hall, Near Orford, Suffolk. The operator is demonstrating a mine detector.

4.2 Amphibious Escape Training Facility (Amphibious Training Well – ATW)

The risk of drowning in an amphibious tank was very high, so training was instigated to equip crews with specialist rescue equipment and instruct them in surfacing drill. Initially, crews would learn basic techniques at Oulton Broad Swimming Pool, prior to training in corrugated chambers or cisterns. The equipment originally comprised of the Davis Submarine Escape Apparatus (DSEA), but was later improved to the more compact Amphibious Tank Escape Apparatus (ATEA). Captain Alexander Cross was responsible for this and later awarded a MBE.

Following this basic training, crews would then make an escape from a submerged DD tank. This was undertaken in a complex of buildings and structures that included a 20m long Nissan Hut and elevated Braithwaite Rectangular Water Tower.

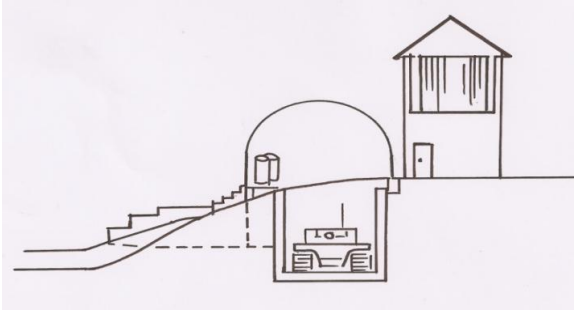


Fig 12 Side elevation of Amphibious Training Well. The site was on a hill side, making excavation of the tank chamber easier from an engineering point of view.

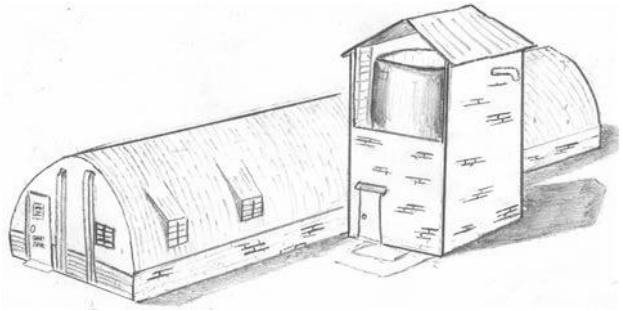


Fig 13 Artist Impression of how the building would have looked, based on surving brick work and aerial photographs

The cut down hull of a Valentine Tank, No T15961, was used and located in the bottom of a 20ft deep concrete lined chamber[9]. Crews would descend a ladder and take up their relative positions in the hull of the tank. Instructors would flood the chamber from the adjacent 2000 gallon water tank. During this time the crews would fit their apparatus, and upon a given signal, would float to the surface, breathing through their life saving devices. Later by December 1943, a second chamber was constructed with the cut down hull of a Sherman Tank[10]. This was donated by the Highland Light Infantry and given to the 13th /18th Hussars at Wickham Market. Apparently it was named 'Robert the Bruce'[11].

The building also housed a subterranean pump room, containing a Pelaphone diesel engine, water pipes, valves and pumping equipment, ATEA store, recharging area for the Oxygen Vessels, petrol driven air compressor for the ATEA sets as well as large water cylinders for storing and heating water.

[9] A request was submitted on 27th May 1943 by the 79th Armoured Division and T15961 was written off for use. PRO WO 32/10420 (Dscf 6764)

[10] Engineers report delays in construction of the "Sherman Pattern Bath".PRO WO 205/47 (Dscf 6731) – October 1943 . The addition of this chamber was because Shermans would be used for the D Day Landings. Crews such as the East Riding Yeomanry had to return to Fritton to practice an escape from the Sherman Hull (much to their frustration!)

[11] Pers comm ME Mawson, 13th /18th Hussars Tank Driver (letter 24/7/2003)

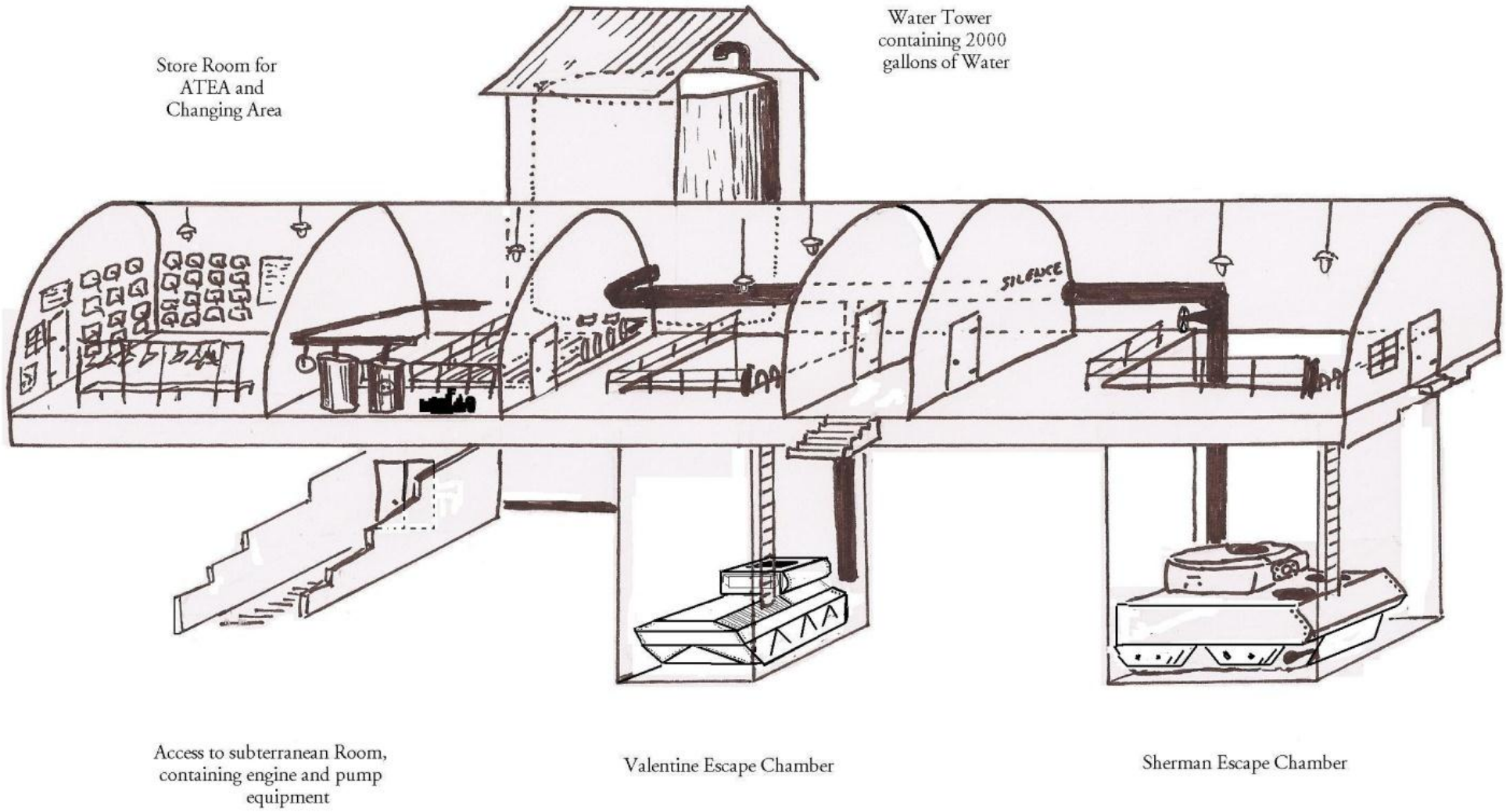


Fig 14 Diagram to illustrate the Amphibious Training Well – based upon Film Footage, Photographs and surviving archaeology

4.3 Tank Park and Service Area

Running parallel with the Lake was constructed a broad concrete hard standing, measuring approximately 150m long by 15m wide. It was capable of providing standings for 50 tanks. The tanks would park side by side lined up either side of the main through route, 25 tanks each side. This area was used by the crews to learn and perfect the drills associated with waterproofing, screen inflation, repairs and maintenance. The whole area was covered in a camouflage net, supported by scaffold towers and wires attached to trees. Remains of the wire, as well as scars in the trees can still be seen today.

The west end of the tank park splayed out in a 'Y' shape, facilitating access north directly to the lake, and westward enabling access to the Landing Craft mock ups. Also at this end was located a number of buildings, including 2 large "hanger style" Romney Huts with large sliding doors at either end. These were the mechanics workshops for servicing the tanks, and included a long inspection trench for accessing the belly of the tank. Arranged adjacent to these Huts were a series of other buildings, including First Aid Point, Electricians Workshop, Communications Hut and Stores. A building also housed about 100 sets of Amphibious Tank Escape Apparatus (ATEA), recharging equipment related to the Oxygen for the vessels, and air compressor for inflating the sets.

Near to the eastern end of the tank park was located the fuel depot. Petrol was stored in "flimsies", stockpiled under a simple canvas structure in the woods. Crews would have to collect up to 9 (18l / 4 gallon) containers to fill the fuel tanks on the Valentine[12].

Vehicular access to the tank park was via an entrance at Ashby Dell, adjacent to Ashby Hall Lodge. Here low-loaders could deliver DD tanks covered with a large tarpaulin. Residents were instructed to draw their curtains, and remain in the property. At the northern end of the track, the transporters were able to turn around on a concrete hard standing. Tanks would then drive westward to the tank park.

Fig 15 & 16 Views of Tank Park area and Workshops Feb 1945. The vertical scaffold can clearly be seen supporting the camouflage netting, and the design of the Romney Hut with sliding doors. The DD Sherman Mk 1 is demonstrating Topee – designed for protecting the DD screens during jungle warfare. [Picture Credits Left PRO DEFE 2/1220, Right –Bovington 0039/D1]

[12] The fuel tank capacity was 36 gallons, and the crew of 3 would be required to refill prior to swimming. Presumably those crews returning first to the tank park, would ensure they park closest to the fuel store!

Following swimming in the lake for 300 hrs, the DDs would require be transported back to the main workshops in Eastern Command. Replacement Valentine DDs (numbering 14) were available at Fritton, as spares for training, or when crews sunk any tanks. These were all recovered by specialist teams, who would deposit the unserviceable tank in a recovery area. Here the screens and propeller would be removed before the tanks were transported off site.

REME crews would also salvage spares and useable parts to repair operational vehicles. Evidence of this has been found including guide horns and track shoes (from a Sherman tank), air compression valves, pipes and systems, parts from drivers telescope, as well as radio equipment, battery cells, gaskets, unused rivets and other items pertaining to tank equipment and armour.

Fig 17 Aerial view of Tank Park. 36 DD Valentines can be seen parked. To their west are two Romney Huts, as well as a number of other sheds and structures. The camouflage netting appears to be ineffective in concealing the site at this time. [RCHME HLA/694 / 4112 26th March 1944]

4.4 Immersion Pool[13]

Prior to crews taking their tanks in the water, it was necessary to ensure they were waterproofed correctly. Crews would drive their tank into a shallow water filled pit, dug near to the lake, where the tank would be submerged up as far as the track guard. Inside the tank, crews could inspect for leakages, and set about remedial work prior to entering the Lake[14].

[13] The Pool is located away from the Tank Park, and shows signs of repeated use in 1944, however Instructor Jim Hawkin recalls the Crews dipped the tanks in the lake just north of the tank park.

[14] At Gosport and Narford, concrete pools were constructed, and called “birdbaths” Pers Comm Jim Hawkin

4.5 Mock-up Landing Craft Ramps

In order for tank crews to train on the lake, several areas were established to permit DD tank access to the lake. A simple hard core slipway was created just to the North of the main tank park to permit novice drivers, and experimental trials, to access into the lake. A second location was also established near to the immersion pool, however further to the west were constructed four mock-up Landing Craft (tank) ramps.

The LCT ramps were built by the 94th Field Company between 29th May and 14th July 1943[15]. The Unit assembled Bailey Bridges on floating pontoons, which extended in length to 15m, and were secured in place by tensioned bracing wires to prevent the structure moving. Four ramps from LC(T) Mk II and LC(T) Mk IV were fitted and secured with cables to a double double Bailey Bridge arrangement and elevated to an angle of 17.5 degrees. This angle was critical, because if the ramp was too steep, the DDs would ship water over the bow, and if too shallow, the DDs might fail to become buoyant before clearing the ramp, and rip the screen.

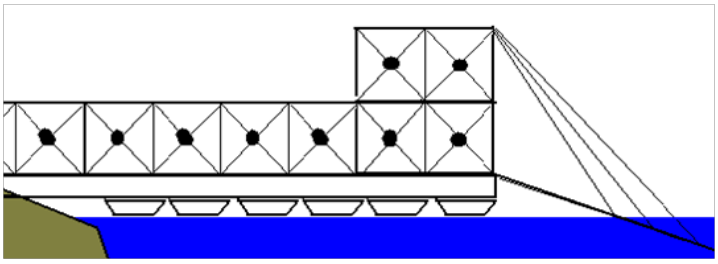


Fig 18 Illustration of the Mock up Landing Craft (tank). Their overall length was determined by the depth of water at the ramp. A Valentine DD required 8ft of water to float

Fig 19 Image of DD Valentine descending LC(T) Ramp 1943 Imperial War Museum Film WOY 530.

Where the DDs approached the LC(T) structure, a concrete surface was laid to facilitate the slewing of the tank. Sappers were employed to maintain the Bailey Bridge, make adjustments and bail the pontoons following submersion or more likely rain.

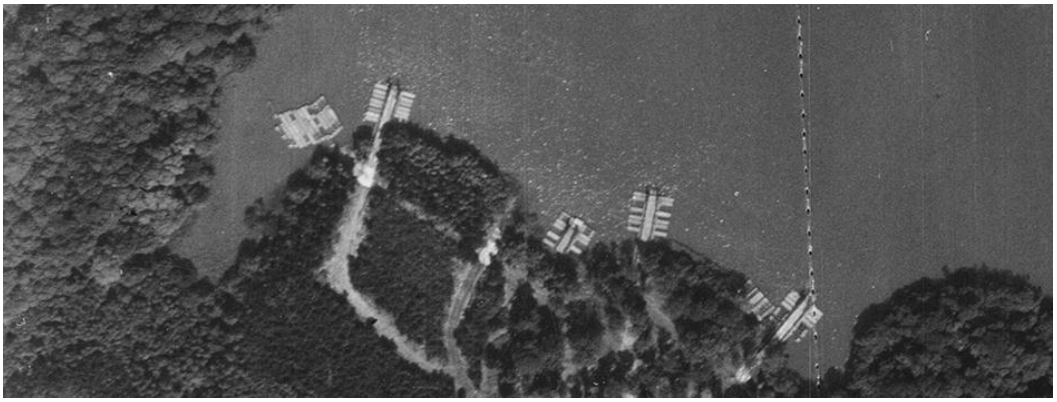


Fig 20 Aerial image of the 4 LC(T) ramps. Their varying length relates to the depth of water at the end of the ramp. The floating pontoon to the west was used by the recovery team to operate mud pumping equipment and provide air to divers . The mock up LCT ramping in the centre of the picture has been floated east of its orignal mooring. [RCHME HLA/694 / 4112 26th March 1944]

[15] PRO WO 166/12040 War Diary of 94th Field Company (Dscf 338). PRO WO 32/10420 (Dscf 6765). The first preliminary test was undertaken on 28th June. It's not known how this went, however the coincidental drowning of an East Riding Yeomanry Driver, Trooper Leslie Lloyd, on 22nd June may suggest that problems occurred.

4.6 Corduroy Road, Concrete slewing areas and Bailey Bridge

Extending from both ends of the Tank Park were temporary tracks made up of logs laid side by side, woven together with wire. These were known as Corduroy roads, and were maintained by Sappers. Many of the trees required to create the track, were felled from woodlands on the Somerleyton Estate[16]. The track from the tank park was corduroy, and marked on the edges with white painted stakes (see images in appendix).

They were secured at 8ft intervals by short metal stakes, about 2ft long, that were driven into the ground to hold down the wire. This prevented the woodland tracks from getting churned up, and reduced the wear to the tank's caterpillar tracks. Where it was necessary for the tanks to turn sharply, or where there was an intersection of paths, a concrete pad was constructed to accommodate the caterpillar tracks slewing round.

Remains of this track (metal stakes) can be found throughout the Woodland, and in some places the pairs of stakes can be discerned for up to 30 feet. No doubt many were removed, as they caused damage to tyres and hazards to horses.

4.7 Assault Beach ("North Beach")

The DDs would exit the lake at a prepared area on the north side of Fritton Lake, near to Lake Cottage. This site was chosen because it facilitated landing tanks side by side - simulating an assault on a defended beach. Two sets of 5 exits were established, reflecting the number of DDs able to be carried on LC(T)s. Key to the training here was the quick transition from swimming tank to fighting tank. Crews had to perfect the drill to drop the screens, rotate the turret and disengage propeller prior to ascending the shore.

Fig 21 Aerial image of Exit Beach. This area has since been planted with trees

Fig 22 Surviving concrete raft formerly supporting Bailey Bridge at Lound Run

For those tanks unable to swim back into the lake, a corduroy road extended from the beach round via the Lound Run then back to the Tank Park (a distance of some 2 km). To cross the boggy ground at Lound Run a Bailey Bridge was constructed, mounted on two concrete rafts[17].

[16] Pers com Jim Hawkin

[17] Pers com Jim Hawkin. Jim states that only those tanks unable to swim back due to damaged screens, engine trouble or recovered from the lake would return this way. Air photo evidence supports the presence of the Bailey Bridge in March 1944, but it is possible that there were only short lengths of corduroy road due to the reduced volume of traffic on the woodland tracks

5 Post D Day Utilisation of Fritton Lake

Fritton Lake's main role was associated with the D Day Landing preparations. However the success and effectiveness of the Duplex Drive Tanks on D Day resulted in the tanks being considered for River Crossing operations. Two further regiments – the 15th/ 19th Hussars and the Staffordshire Yeomanry undertook training at Fritton in preparation for their role in crossing European rivers with the DDs.

As it transpires only the Staffordshire Regiment eventually undertook River Crossing Training at a special wing at Burton upon Stather, before undertaking European Operations with their DD tanks.

During these operations it became evident that the heavy Sherman DDs encountered difficulties exiting the soft silty riverbanks, and to this end Fritton – as well as Burton upon Stather - assumed a secondary role – that of overcoming river obstacles.

Additionally at this time, the 79th Armoured Division were being replaced by the Assault Training and Development Centre (ATDC). Research and trails continued at Fritton for a further 18 months under ATDC, before they were replaced by SADE – Specialised Armour Development Establishment.

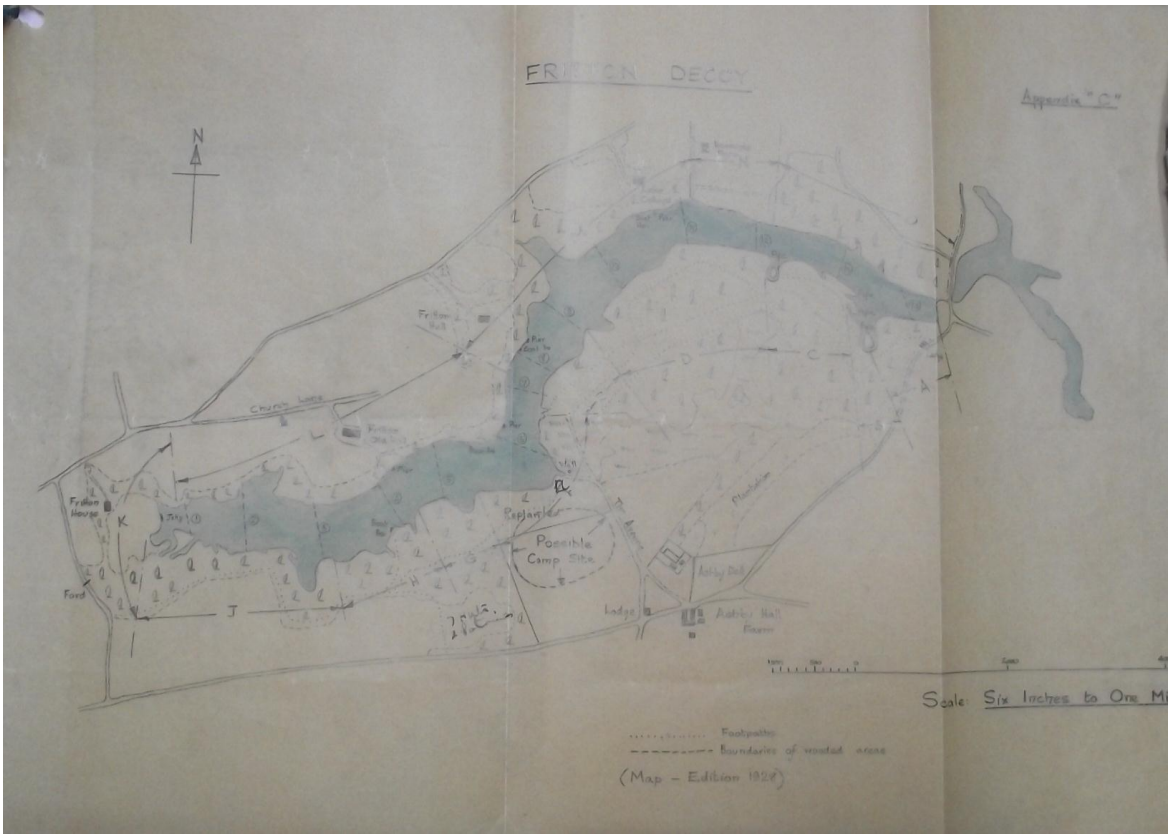
Fig 23 Trails associated with the Swimming Ark or Hopper in 1945, enabled other DDs to climb over it, out of steep sided canals. SEP 6680/31

Fig 24 "Ginandit Mk II" was a device used to push in front of the tank whilst swimming and deployed over soft mud. SEP 6681/04/09

Training continued at Fritton under SADE until 1947, where upon swimming tanks were becoming larger and more impractical to be launched at sea. A facility continued at Gosport for a number of years, and by 1951 that too was eventually closed. Infrastructure at Fritton was removed by 1950 and the woods and lake returned to the Estate. Part of the military camp was leased out to the Scouting Organisation, and the remainder of the land was replanted as cover for game birds and forestry.

Thus Duplex Drive Tank Development came to an end. Its role on D Day was a unique and significant. As a weapon hurriedly devised and tested during WW2 it proved its effectiveness as a dual purpose vehicle. Every credit should go to the men who developed, trained and ultimately operated these tanks, many of whom were present at Fritton Lake from 1943-1947.

Appendix 1 Historical Maps

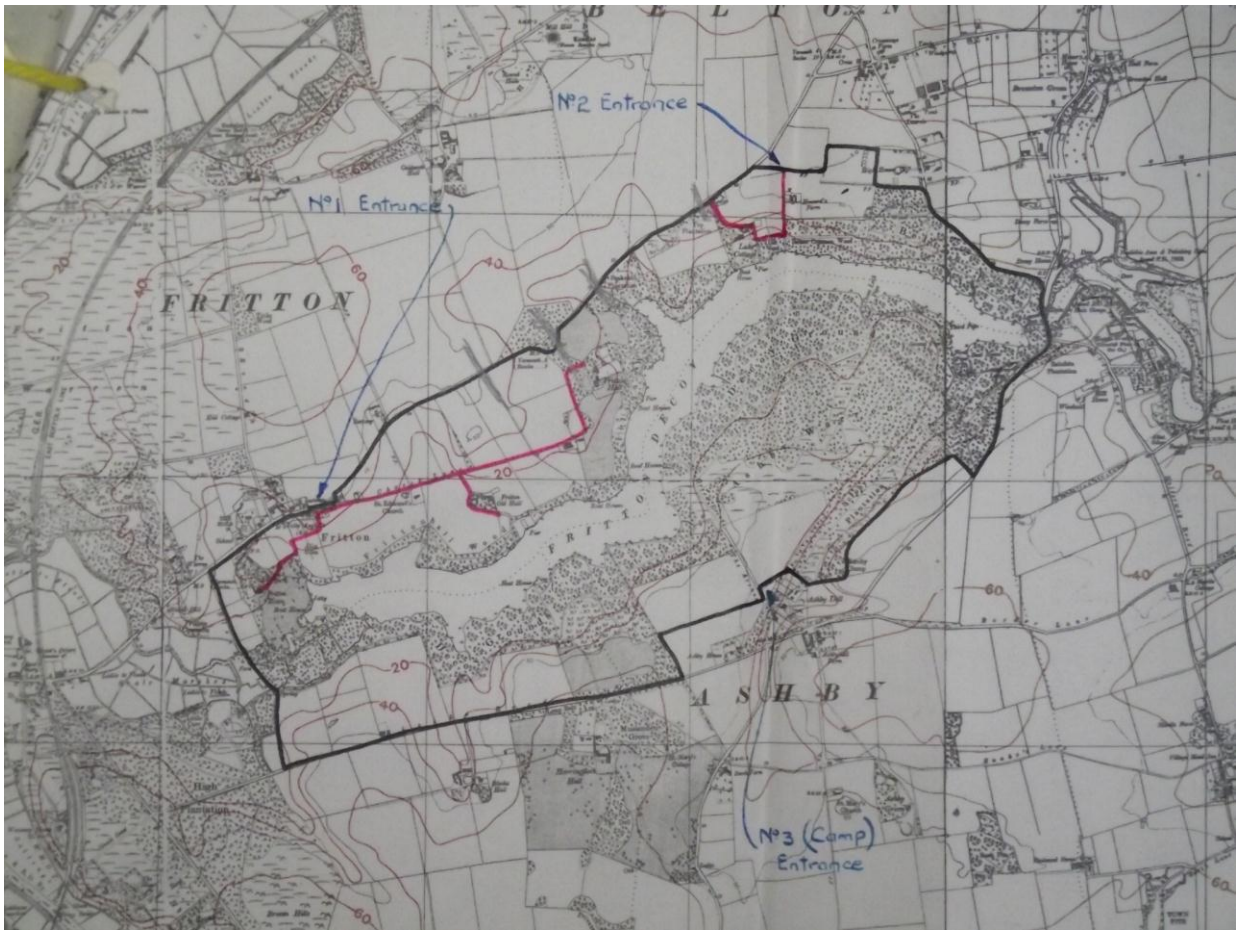


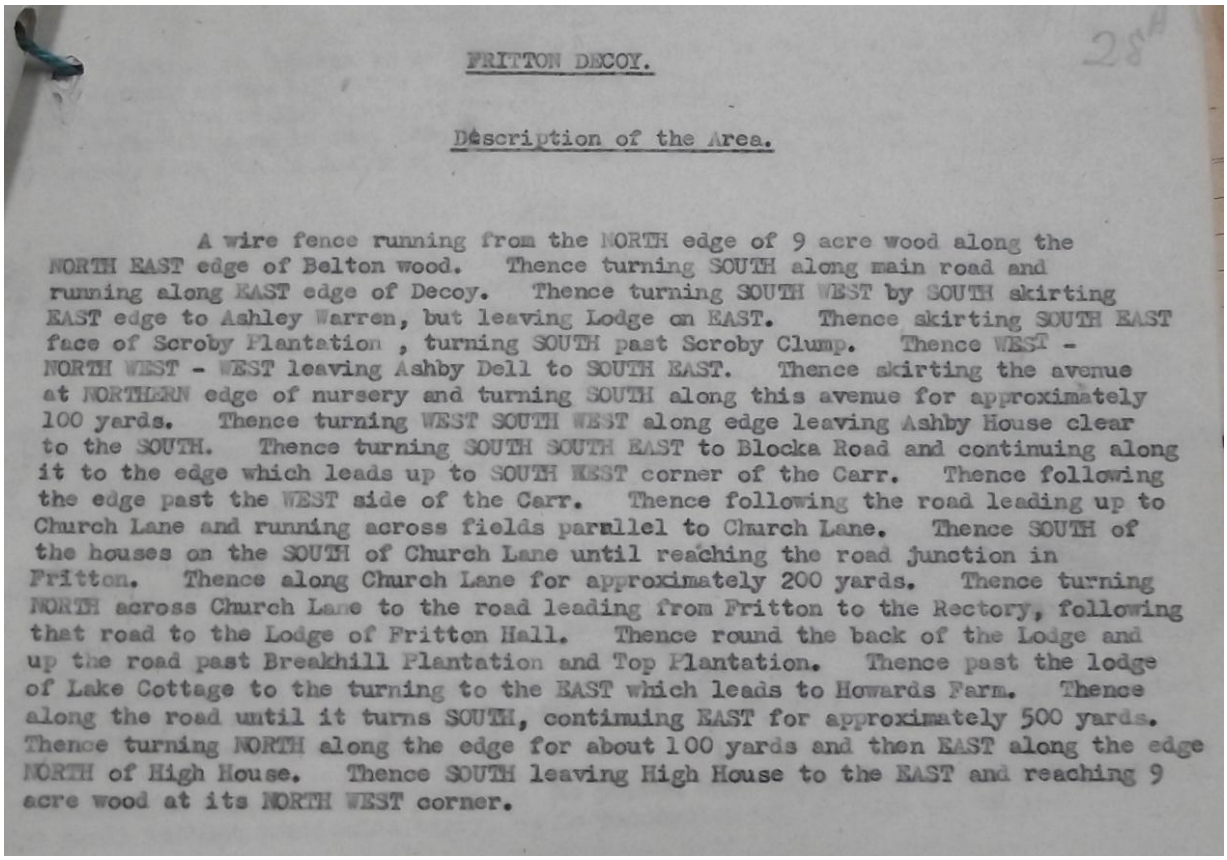
Appx 'B'

FRITTON DECOY

	Depths of Water						Section No. (see trace)							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
f South Bank	6"	1'6"	6"	1'	1'	1'8"	1/8 to 20'	6'	6"	1/10 to 40'	1/8 to 20'	1/7 to 20'	6"	5'
th at South Bank	1'	1'	1"	1"	9"	6"	2"	1'	6"	1'	6"	6"	2'	9"
" 10' out	3'	2'	4'	1'	2'	1'	6'	4'	2'	4'6"	2'	3'	-	3'
" 20' out	7'	10'	8'	3'	4'	2'	12'	6'	3'	6'6"	8'6"	9'	9'	6'
" 60' out	8'	5'	14'	11'	11'	10'	12'	13'	10'	9'	10'	10'	10'	6'
" Centre	9'	9'	10'	16'	7'	12'	12'6"	11'6"	12'	12'	11'	10'	9'	6'
" 60' out	8'	7'6"	9'	11'	10'	11'	7'	11'	8'6"	11'	12'	9'6"	9'	6'6"
" 20' out	4'6"	5'6"	8'6"	7'	4'	6'	2'	6'6"	4'	7'	7'6"	4'6"	5'	6'
" 10' out	2'6"	1'6"	3'6"	3'6"	2'	2'	1'	4'	3'	2'	5'	6'	3'	3'
" North Bank	6"	6"	1'	9"	6"	3"	6"	1'	1'	6"	1'	3"	3"	2'
lt of North Bank	1'	1'	1'	2"	2"	4'	2'	1'	6"	6"	6"	6"	9"	6"

Fig 25 & 26 Images showing reconnaissance details from April 1943. The surveyor assessed suitability of the lake environment for training and security. Here measurements and descriptions of bank areas were recorded. The chart records the bank heights and water depths.
PRO WO 199/806 (Dscf 6494)





FRITTON DECOY.

Description of the Area.

A wire fence running from the NORTH edge of 9 acre wood along the NORTH EAST edge of Belton wood. Thence turning SOUTH along main road and running along EAST edge of Decoy. Thence turning SOUTH WEST by SOUTH skirting EAST edge to Ashley Warren, but leaving Lodge on EAST. Thence skirting SOUTH EAST face of Scroby Plantation , turning SOUTH past Scroby Clump. Thence WEST - NORTH WEST - WEST leaving Ashby Dell to SOUTH EAST. Thence skirting the avenue at NORTHERN edge of nursery and turning SOUTH along this avenue for approximately 100 yards. Thence turning WEST SOUTH WEST along edge leaving Ashby House clear to the SOUTH. Thence turning SOUTH SOUTH EAST to Blocka Road and continuing along it to the edge which leads up to SOUTH WEST corner of the Carr. Thence following the edge past the WEST side of the Carr. Thence following the road leading up to Church Lane and running across fields parallel to Church Lane. Thence SOUTH of the houses on the SOUTH of Church Lane until reaching the road junction in Fritton. Thence along Church Lane for approximately 200 yards. Thence turning NORTH across Church Lane to the road leading from Fritton to the Rectory, following that road to the Lodge of Fritton Hall. Thence round the back of the Lodge and up the road past Breakhill Plantation and Top Plantation. Thence past the lodge of Lake Cottage to the turning to the EAST which leads to Howards Farm. Thence along the road until it turns SOUTH, continuing EAST for approximately 500 yards. Thence turning NORTH along the edge for about 100 yards and then EAST along the edge NORTH of High House. Thence SOUTH leaving High House to the EAST and reaching 9 acre wood at its NORTH WEST corner.

Fig 27 & 28 PRO WO 205/417 (Dscf 6854) WO 199/806 (Dscf 6469).

The text refers to the Boundary of the site, and the likely route taken by the Dannert Security Fence

Appendix 2 Full Time Staff at Fritton Lake

Fig 29 Collective of School Staff, Fritton Lake 1946

The men in the group photo at this time were either employed by SADE, or ATDC. There are men from a wide number of regiments, reflecting the original 79th Armoured Division's selection of suitable staff from a cross section of Regiments. The Wing at Fritton employed 127 men. There were 86 men employed by the Division including 5 Instructors (Captains) 16 Instructors (Sergeants), 24 driver mechanics, 6 fitters, as well as technical sergeants, store men, electricians and fabricators. In addition there were 41 REME staff attached to the Wing undertaking roles such as mechanics, fitters, welders, blacksmiths, and driver mechanics.

Lt Colonel Douglas Bain MBE was Chief Instructor. He was from the Hampshire Regiment, and resided in Beccles during his employment at Fritton. He is located in the middle of the second row from the front. To his right is Captain Alexander Cross OBE. He was responsible for the development of the ATEA from DSEA and was in charge of the Amphibious Training Well. Jim Horkin, originally from Leeds, was requisitioned to Fritton Bridging Camp in July 1943, and was trained as an Instructor. He was 19 at the time.

Fig 30 & 31 Full time Instructional Staff at Fritton Lake c1946

Craftsman Orrin CPL Pountney Craftsman Salloway

SGT Poole-west CPL Clark (inter SGT) TRP Ainscough TRP Mant CPL Jessup CPL Solari

SGT Quinnell BEM (RE) Lt Col D Bain OBE Capt AA Cross MBE (OC ATEA School) Capt Leiper SGT Lee (Canada)

Appendix 3 Contemporary views of Fritton Lake and training / trials

Fig 32 Valentine DD being tested for waterproofness in Fritton Immersion Pool [Bovington 2191-E1]

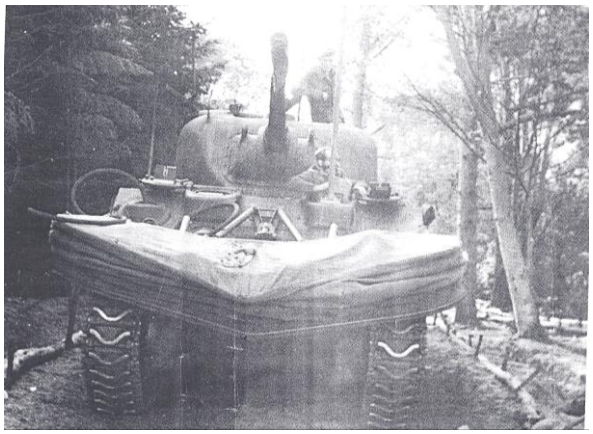


Fig 33 Sherman DD driving through woods. Note absence of corduroy road, but the sides are marked with trees held in place by stakes [Forty, G Tank Warfare in the Second World War]

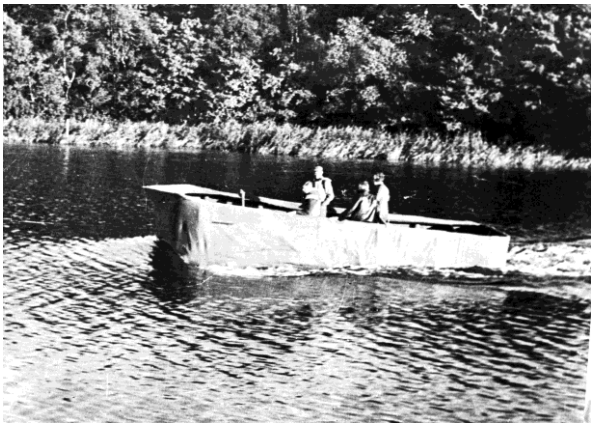


Fig 34 Trail of prototype DD Sherman at Fritton Lake [Bovington 2199-C5]

Fig 35 M12 Floatation Device – Trails at Fritton 1946
[SEPA 6681/04/09]

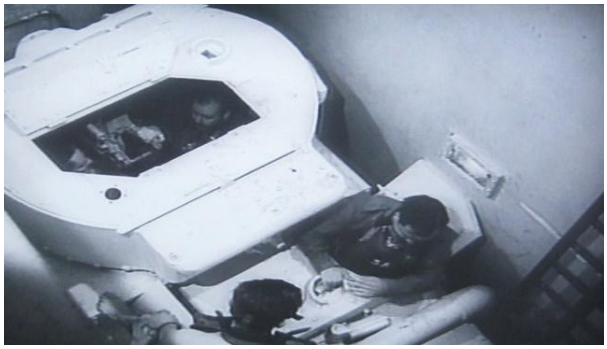
Fig 36 Crews from SADE fitting rudder to Swimming Ark [SEPA 6589/03/12]

Fig 37 View of slipway N of Tank Park
[SEPA 6690/25]

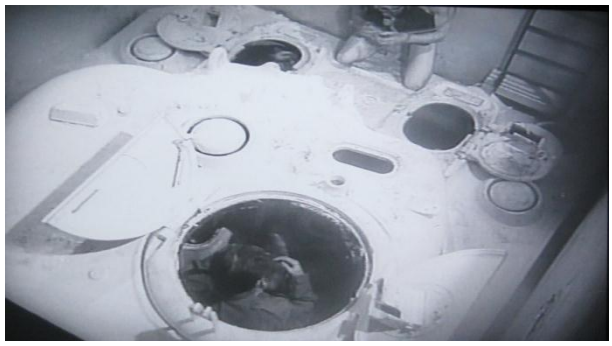
Appendix 4 Photographic Images of Amphibious Training Well

Sequence of Images showing the procedures undertaken in the Amphibious Training Well

1 Entering the Chamber
The crews would descend a ladder in to the chamber containing the cut down hull of a tank

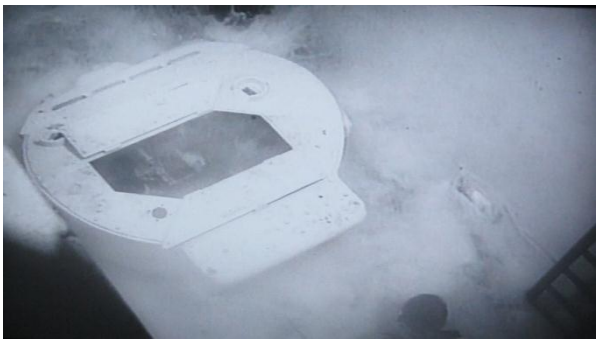


2 Taking up position in the Valentine Tank:,
The Commander and Gunner would occupy the turret, whilst the Driver would be located separately



3 Taking up position in the Sherman Tank:
Three crew (Commander, Gunner and Wireless Operator) would occupy the turret, whilst the driver and side gunner sat at the front of the hull

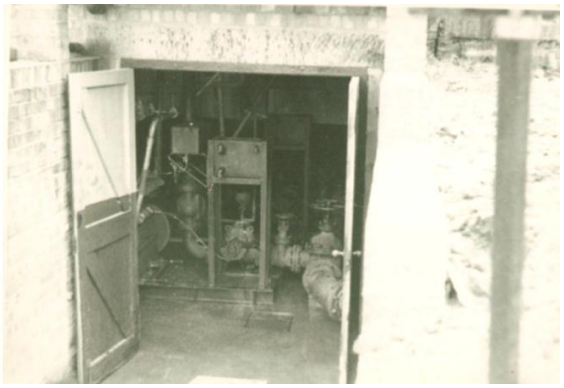
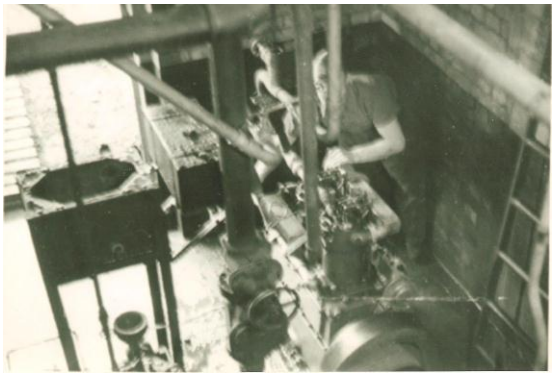
4 Turning on the main Valve.
The pipes were about 18 inch diameter, and would bring in water from the Braithwaite Water Tower. The water was kept at a moderate temperature



5 Flooding the Chamber.
The filling of the chamber would to take less than 3 minutes. During this time the men would put on their ATEA, and begin breathing into it

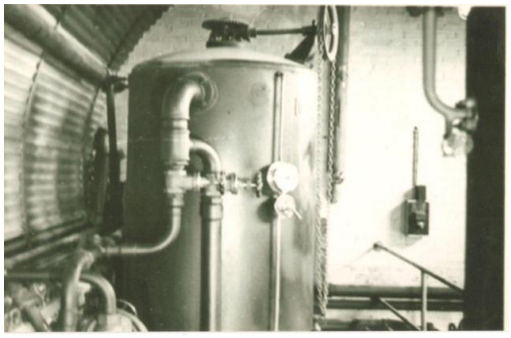
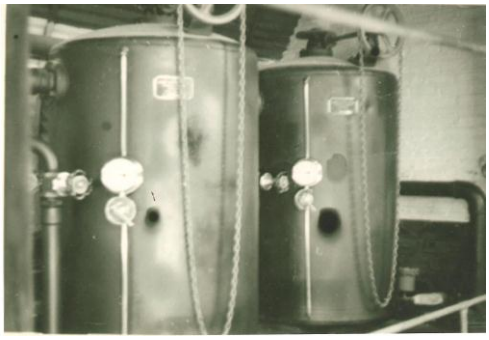
6 Exiting to the surface.
Crews would exit in a strict order, according to rank. This would prevent congestion of crews through the restrictive escape hatches

Images Courtesy of the Imperial War Museum [From SKC 351]

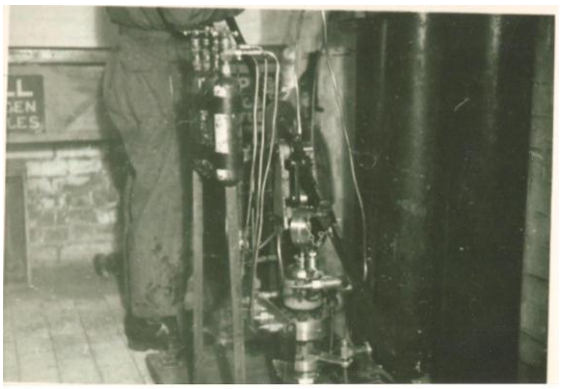
Views of Subterranean Pump Room of ATW

This area is located beneath the ground on the. It was accessed via a path on the west side of the Well, where the ground sloped naturally away towards the lake. The room contains the diesel Pelaphone engine and pumps that removed the water out of the chambers containing each Tank Hull, back up into the water tower. [SEPA 12 and SEPA 9]

View of inside Nissen Hut of ATW

This image shows a pressurised water tank. It is located up against a brick wall, suggesting this structure is located at one of the ends of the hut, unless of course there was an internal brick wall. The evidence of railings to one side suggests that there is a lower area, either accessing the subterranean pump room or possibly even the chamber containing the Valentine. [SEPA 15 & 13]

Refilling of the Oxygen Cylinders in the ATW

Empty Oxygen cylinders from the ATEA were refilled in the building. Each cylinder held enough Oxygen for 7 minutes. The obscured sign is likely to read “FULL OXYGEN VESSLES”. [SEPA 11 & 1]

It is assumed these 2 images are at the ATW, but may equally be the store near the Tank Park.

Appendix 5 Training Dates of Crews in Preparation for D Day

REGIMENT	FRESH WATER TRAINING	SALT WATER TRAINING
Royal Tank Regiment	10th April 1943 NARFORD LAKE	22nd July – 26th August LOCK STRIVEN, Scotland
East Riding Regiment	23rd June – 5th July 1943 FRITTON LAKE	28th August – 9th Sept 1943 LINNEY HEAD, Wales
4th / 7th Dragoons	31st July - 14th Aug 1943	29th Nov- 15th Dec 1943 STOKES BAY, Hampshire
13th / 18th Hussars	15th – 29th August 1943 3rd – 16th September 1943	15th Dec 1943 – 1st Jan 1944
6th Canadian Armoured Brigade (1st Hussars)	21st Nov – 5th Dec 1943 5th -20th Dec 1943	1st -16th Jan 1944
10th Canadian Armoured Brigade (Fort Garry Horse)	20th Dec 1943 -1st Jan 1944 1st -15th Jan 1944	16th Jan – 2nd Feb 1944
US 743rd Tank Battalion	17th – 31st Jan 1944	2nd -18th Feb 1944
US 741st Tank Battalion	31st Jan - 16th Feb 1944	18th Feb – 5th Mar 1944
Nottinghamshire Rangers	16th Feb – 4th Mar 1944	5th -21st Mar 1944
US 70th Tank Battalion	4th – 20th Mar 1944	21st Mar – 4th Apr 1944
Shermanisation Courses for all Valentine DD Crews	4th -23rd Apr 1944 (6 Regiments)	

Post D Day Training

REGIMENT	FRESH WATER TRAINING	SALT WATER TRAINING
15th / 19th Hussars	12th July – 1st August 1944[18]	Lee on sands, Brightlingsea, Essex
Staffordshire Yeomanry	July 1944. Modified training Schedule. No LC(T) ramp training but focus on precision landing at day and night	11th – 21st August 1944 River crossing Wing Burton-on-Stather
ATDC instructors	Refresher training in ATEA	22nd – 31st August Burton-on-Stather

ATEA training (1944)

391 men trained July	346 Men trained in August	Refresher training for all personnel Sept and Oct
45 men from 142 BDS (LAW) trained in November 1944 (plus 5 trained in Salvus Diving Suit)		
15 men trained in ATEA and 1 in Salvus trained in December 1944		
A fire at ATW in early January 1945 suspended training. Repairs undertaken[19]		

[18] PRO DEFE 2 /1220 [Dscf 594]
[19] PRO DEFE 2 /1220 [Dscf 657]

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Final Report of the Specialist Armour Development Establishment (SADE) 1951

1939 Military Training Pamphlet Nos 21A and 21B Dannert Wire:

http://wartimecanada.ca/sites/default/files/documents/Dannert%20Concertina%20Wire%2021B.pdf

http://wartimecanada.ca/sites/default/files/documents/Dannert%20Concertina%20Wire%2021A.pdf

Documentary Records (locations)

Suffolk Record Office, Bury St Edmunds

Public Record Office, Kew

English Heritage (Royal Commission for Historic Monuments, Kimble Drive, Swindon)

Archives of the Staffordshire Yeomanry, US Tank Battalions, 15th / 19th Hussars

Bovington Tank Museum, Dorset

Royal Engineers Museum, Gillingham, Kent

Acknowledgements

The Author would like to thank Lord Somerleyton, Hugh Crossley for permitting access to the private areas of the Somerleyton Estate, as well as Edward Knowles Estate Manager and Arthur Wymark, Gamekeeper for their knowledge and assistance.

Appendix 2. History of a Valentine

A manufacturer's identification plate, originally fitted to one of the Fritton training tanks, was recovered from the undergrowth at the site. The following brief report details the known history of this individual tank, T67595

Known history of Valentine Mk V DD, T67595

T69595 was one of a batch of Valentine tanks ordered from Metropolitan Cammel on order number T2454. The War Department numbers allocated ran from T67221 to T67865, made up by:

T67221 to T67260: 40x Valentine Mk II
T67261 to T67320: 60x Valentine Mk II hulls to be converted into bridgelayers
T67321 to T67865: 545x Valentine Mk V.
Also 25x Valentine II turrets complete and 35x Mk II turrets in parts.

A later variation to the order included giving 85x of the MkV's 'Special hulls'. This was primarily thinner side plates (43mm instead of 50mm) but also holes in the rear plates for the drive shaft and some exterior bolt holes drilled in different locations. These hulls were the ones to be made into the Duplex Drive variants and T67595 was one of these.

The order was split between Metro's Old Park factory in Wednesbury, Staffs and the Midland factory in Washwood Heath, Birmingham. T67595 was built at the Midland Works; the 790th large item built there(including carriages, bridges etc built pre-war as well as tanks), this being shown by the M790 marking on the plate. (Products from the other factory are numbered OPxxx instead of Mxxx)

The order was split approximately T67221 to T67630, Midland Works and T67631 to T67865, Old Park but the WD numbers and chassis numbers do not exactly correspond by about a dozen so more research is required. Records indicate that the vehicles were produced between 20 Nov 1941 and 11 March 1942 but that is clearly wrong as that is a production rate of more than 200 per month and the date on the plate shows T67595 to have been completed in 1943. Perhaps the records should show 11/3/43?

The basic vehicles were built at there respective factories and the ones destined to become DD's were then taken to 'B' Shop at Midland Works for the DD conversion equipment to be fitted. The first 41 were made of mild steel, marked with a yellow triangle (Caution unarmoured, not to be used on

operations), they had a weak propeller drive system based on a Chevrolet truck front axle steering unit and had a canvas screen with 4 hinges in the top rail so the centre section stayed flat and the front and rear parts rose at an angle. (Later versions had two hinges only and the front and rear halves rose at an angle to each other with no flat centre section). T67595 had all of these early production features.

T67595 was issued to 79 Armoured Division for training use at Fritton early in 1943 and its use must have been intensive as Kew Public Records have documents stating it had done in excess of 300hrs of use by early August 1943. As water speed was 4 knots, this means it did over 1,200 miles (which was maybe 150 to 200 practice launches?) Disposal instructions were sought mid August 1943 for some 20 machines in a similar state.

Due to the secrecy of the DD, it was planned that all of the DD equipment would be removed in situ at Fritton and either scrapped or used for spare parts, the bare hull being returned for smelting.

On 25 August 1943, 14 vehicles, including T67595 were listed to be used as targets to determine how much damage they could sustain and still stay afloat and some were subsequently sunk off the South Wales coast by machine gun and artillery fire but in September 1943 it was decided that T67595 would not be sunk but retained by 79 Armoured Division at Fritton for unspecified 'experiments'.

There are no further records of the vehicle and one assumes that once the experiments were concluded, it was stripped of DD parts at Fritton and the hull dispatched for smelting, the brass plate was presumably accidentally lost when the screen platform/trackguards were removed. (In theory, there could easily be parts around from another few dozen tanks)

You may be interested to know that two of this batch of Valentines survive worldwide but this plate is the only, concrete proof of which of the Mk V's were DD's as well as confirming that they were built at Midland Works.

The other survivors are T67275, Mk II bridgelayer which is at the Overloon Museum in Holland and T67286, again a Mk II bridgelayer which is preserved in Rome. This latter one has the chassis number M503.

A number of this batch (no DD's though) went to New Zealand where several Valentine II's and V's survive but I am not aware of any that have been positively identified as coming from this batch. So far as I know, there are no surviving Mk VDD's anywhere in the world, either on land or under the sea and this plate is the largest known surviving piece of one. There is one surviving Valentine IXDD, T82527DD, M1022 built 1943 (mine) and I know of the cut down lower hull plates of a Mk XI which has not been positively identified but may be T120881DD, M1144 built 1944 if these lower hull plates and a found ID plate from another location are in fact related.

John Pearson 21/4/2010

5 4 3 2 1 0 | 5 4 3 2 1 0 | 5 4 3 2 1 0 | 5 4 3 2 1 0
THOUSANDS | HUNDREDS | TENS | UNITS

CONTRACT NO. T. 2454 DATE 26 · 6 · 41 FOR 645 *

TANKS TO DETAILS BELOW —

GUARANTEE YEARS DESCRIPTION
545. VALENTINE V (3-man turret)
40. VALENTINE II (2-man turret)
60. HULLS FOR SCISSORS BRIDGES
35. Turrets 2-man type complete
25. " " " in parts, together with turret rings, gun mountings, rotary platforms, traverse gear, No. 19 W/T sets and turret stowage.

DELIVERY OR COLLECTION DUE

W.D. NOS. ALLOTTED T 67221 — TO T 67865.
SEPERATE WD NOS SEE REVERSE

BODY BY G.M.C. Diesel Engine CT. NO. & DATE

11/3/42 66/1 VAL II 67/1 VAL II 69/1 VAL II 69/3 VAL II 70/3 VAL II 72/1 VAL II 73/1 VAL II 74/1 II

DATES RECEIVED

MET. - CAMM. CARR. & WAGON CO.

COMPLETE

PAT. NOS. 225069. 297992 C. C. 76385 H

"A" VEHICLES
TRUCKS
M/C'S
CARS
LORRIES
VANS
TRAILERS
TRACTORS
B
Firm written 20/11/41.
T
V
DDS.
COMPLETED

P. 16/3/42

MAKERS INITIALS
B C D E F G H I J K L M N O P Q R S T U V W X Y Z

VALENTINE V T67321 TO T67865 = 545
(85 with special Hull)
VALENTINE II T67221 TO T67260 = 40
HULLS FOR SCISSORS T67261 TO T67326 = 60

645

B/F.D. VAL II
12
75 - 1
76 · 2
76 1
SHECKED
WD BK
24/3/42
16
77 1
77 2
78 · 1
80 · 1
81 1
82 1
83 · 1
83 4
84 2
86 1
88 2
92 4
94. 4.

VAL V SCISSORS BRIDGE 25.3.42
79 6
85 3
85 1
89 1
89 2
92 4
83. 4
86 1
99 8
99 1
100 2
101 3
101 1
110 1
127 3
160 - 4
164 - 3

VAL II B/FD. 41
S95 - 2
105 · 6 (S.B)
107 4 S.BR
107 · 2
107 · 4 · S.B
113 2
113 4 S.B
114 1
114 2
114 2.S.B
115 1
114 2.SB
79 5 SB
85 3 SB

VAL V 11/5/42
120 · 1
120 2
121 2
122 1
123 2
124 1
125 · 1.
126 · 2
130 · 5
132 4
133 4
135 3
137 2
138 2
138 2
139 · 1
140 · 2
141 · 2
142 - 1
143 - 1
143 - 1
144 · 2
144 · 3

V B/FD 47
145 = 2
146 = 2
147 - 1
148 - 1
149 - 1
152 - 3
152 - 3
153 - 1
153 - 1
157 -
158 - 4
158 - 2
159 - 3
159 - 2
162 · 1
163 - 1
165 - 2.
166 - 2
166 - 3
167 - 3

V B/FD 85
168 - 1
169 - 2
170 - 4
171 - 1
172 - 2
174 - 1
175 - 2
176 - 4
177 - 2
178 - 2
179 - 4
182 - 2
184 - 4
185 - 8
186 - 3
187 - 1
189 - 1
192 - 1

Appendix 3. Education Visit and Archaeological Activity

Duplex Drive Tank Project

Educational Visit and Archaeological Activity

Stuart Burgess

May 2013

Introduction

Facilities on The Somerleyton Estate create sufficient opportunities to enable vocational learning to schools and other educational establishments. Both Fritton Lake Country Park, as well as the privately managed Scout Association Camp Site provides suitable buildings and space which can be utilised as outdoor classrooms and facilitate wider learning.

As part of on-going WW2 research at Fritton Lake, and further the recent SCC Survey, a trial educational workshop was undertaken on 8th May 2013.

The aim of the day was to carry out and assess how practical such days would be, and receive feedback from those participating.

Format

Stuart Burgess invited a small group of 8 children to attend. The students were aged between 8 and 18, and were all educated at home. The day was split in two, with the morning session looking at displacement and buoyancy activities, keeping a tight theme to the 79th Armoured Division and the Duplex Drive Tanks.

In the afternoon session the students were shown the site, and were able to participate in the uncovering of the footings and walls of one of the buildings within the Training Camp.

A temporary classroom was created at Herringfleet by utilising the Scout Associations' Crew Hut. Benches, tables and chairs were available to use for the day. Its limited size would restricted future group size to about 20, but hand washing, toilet and electric points made it a most suitable venue.

Classroom session

Stuart Burgess led the session and began by introducing the background to the Estate, project and the plan for the day. He used a power point presentation to enable the students to learn from visual aids, and also had practical resources to facilitate demonstrations and permit the students to experiment with various problems. The students were issued workbooks to assist them.

Following an introduction to the events surrounding the early developments during Second World War – including the Raid on Dieppe, Stuart used a pictorial diagram (figs 1 and 2) of a typical beach defences to open discussion and enable students to discuss and identify the different challenges that would be encountered on the Normandy Beaches. They were asked to identify each and to discuss ways these might be overcome. Through classroom discussion, the students were able to complete the worksheet below by referring to the series of images shown on the screen. (See Fig xx for correct answers)

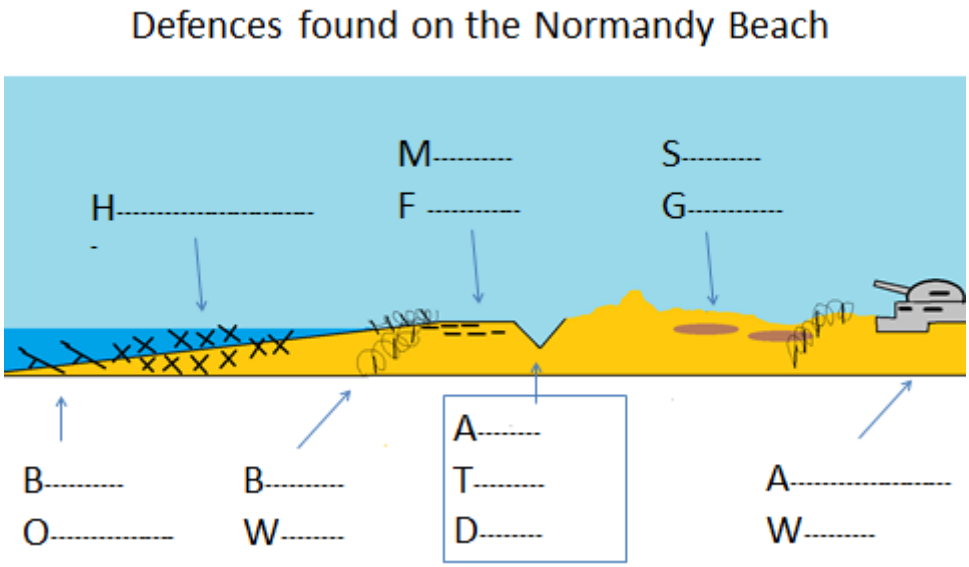


Fig 1 Hand out used to enable students to discuss beach defences

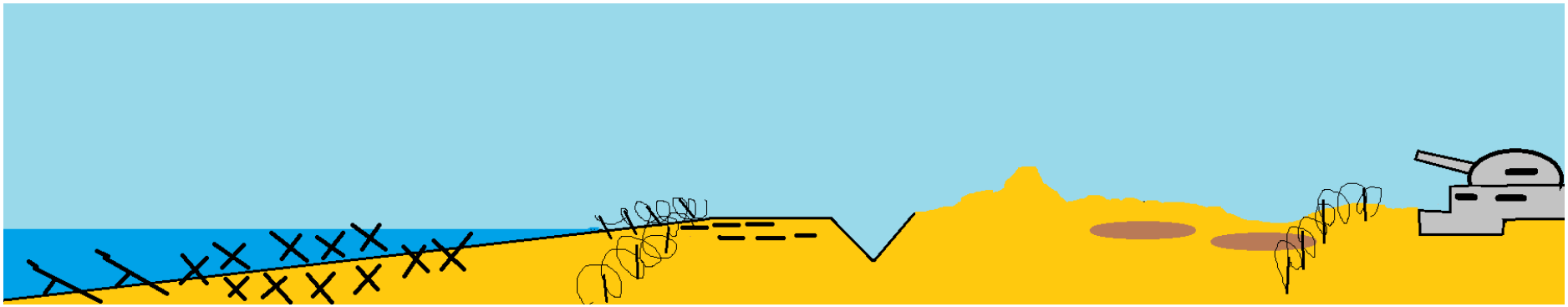
Following this exercise, the students then discussed the range of ways these problems could be overcome. The results of this were produced in Table 1 below.

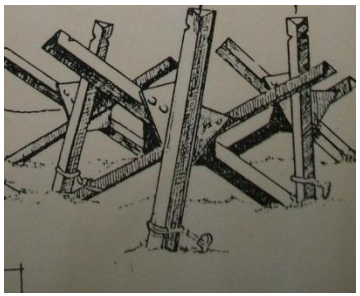
Fig 2 Diagram to Show the various problems to be encountered by Allied Forces on Normandy Beach

Beach Obstacles

Minefield

Boggy Ground





Hedgehogs

Barbed Wire

Anti-Tank Ditch

Atlantic Wall

British Solutions to German Defences

PROBLEM	EXISTING MILITARY SOLUTION	79th Armoured Division Solution
Beach Obstacles	Engineers dismantle by hand	AVRE protects Engineers
Barbed Wire	Engineers cut wire by hand	Flail tank
Minefield	Man with metal detector	Flail tank
Anti Tank Ditch	Fill in with soil using bulldozer	Armoured Ramp Carrier
Soft Ground	Avoid	Tank Laying Mats
Atlantic Wall	RAF and Naval bombardment	Tanks on beach during early assault. Flame thrower tanks Mortar Launching tanks
Supporting Infantry	Rapid build up of ships and troops	Tanks on beach during early assault

Table 1 Completed table following discussion of Beach Defence Problems

The students were then able to look at images and film of some of the other "Funnies" that Percy Hobart and the 79th Armoured Division pioneered, to enable the full process to be realised. They understood that the vehicles really existed and were simply conventional tanks modified by engineers to undertake a secondary role.

Following on from this, the notion of bringing armoured tanks during the early assault was discussed, with the students suggesting that tanks could drive on the sea bed, or arrive on small ships, or even float to shore.

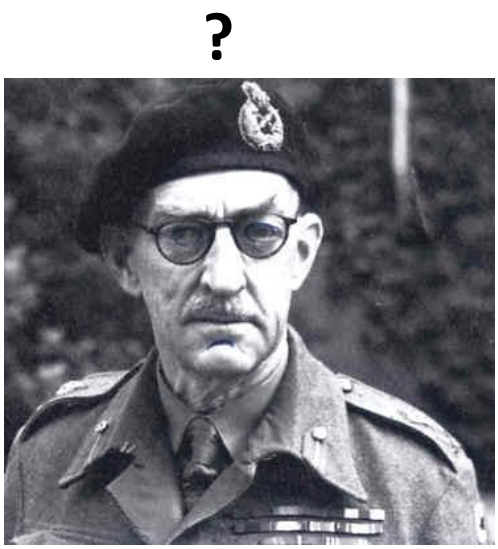


Fig 3 Image of Percy Hobart and speech bubble used as part of audio visual aids during lesson.

In order to fully answer this, Stuart introduced the concept of Archimedes Principal, and carried out some visual practicals with the students.

Displacement and Buoyancy Experiments

In the first instance the students were asked to consider why objects floated, followed by looking at what happens when objects are put onto water. Students learnt two key facts:

1 1cm3 of water weighs 1g,

2 The amount of water displaced is equal to the weight of the object.

Following on from this point, as a group they were able to look at heavier or denser items, and understand why a can of diet soft drink floats, but a more sugary drink sunk.

Fig 4 Demonstration showing that the can containing more sugar is denser that diet or zero sugar drinks. In this case, the drink on the left contained 46g of sugar, compared to 2g in the right hand can.

Lastly the students were presented with a small mathematical problem, to help reinforce the principal of displacement. The question showed that a barge 200cm by 300cm was put into water A horse climbed onto the barge, and the barge sunk by a further 12cm The students were asked to calculate the weight of the horse, using the figures provided.

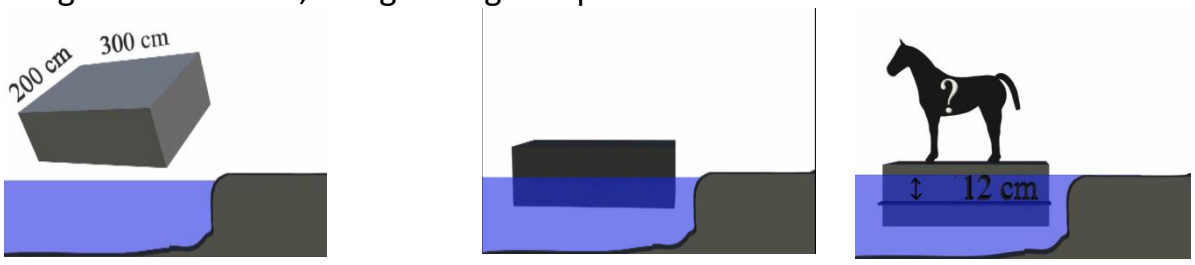


Fig 5 Class exercise was to reinforce the principal of displacement

A number of students had grasped the notion that objects will displace their own weight, but for some of the younger (under 10) students this exercise required assistance.

Class Experiments

Three stations were set up for the students to experiment and learn from their own actions theories and ideas about displacement. These were as follows:

1 Assessing which items would float or sink

2 Making heavy items float

3 Making tin foil boats and investigating how much load it could hold.

Fig 6 In the first exercise, students were required to identify an object, guess if it floated or might sink, and comment on any interesting findings. Amongst the items was a heavy metal tin and a breeze block – which both floated. The lesson learnt here was that the denser the item, the less likely it was to float, irrespective of its weight.

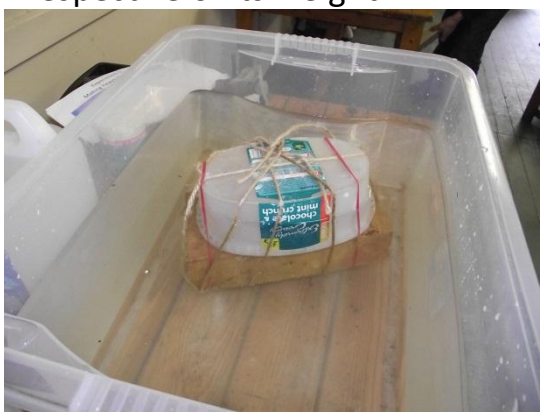


Fig 7 During the second experiment students were presented with bricks and other heavy objects. They had access to plastic bottle, tubs, bubble wrap and plastic tubes as well as string and elastic bands. The students had find out what force (volume of bottle) was required in order to make these objects positively buoyant.

Fig 8 & 9 Making tin foil boats from 30cm2 sheets enabled the students to build a range of boats shapes to see which was capable of holding the most weight.

Archaeological Exercise

Students were shown around the training site, to enable them to understand the context of the project. The group was then showed how best to explore and uncover the footprint of a building, and the need to proceed carefully to avoid removing or damaging any insitu features.

The area chosen was Building 15, whose outline was very different when compared to many of the other regular structures found on site. Building 15, comprised of an irregular outline with internal walls – very different to the more rectangular building footings and archaeology typical of the site.

Fig 10 Students and Adult helpers during the excavation.

The area of Building 15 was covered in dead branches, leaf litter and nettles, with the roots of the latter growing in the soil on top of the concrete. In several places sycamore trees had become established on the walls, and their roots were often found traversing the side gulleys and drainage features discovered. These roots and other woody structures were left in place, so as not to cause damage to archaeological features.

Fig 11 and 12. Views NE (March 2013) and N (May 2013) showing the site before and after clearing the overburden. The exterior walls were identified first, and care was taken uncovering internal areas, due to the irregular numbers of walls and other features.

Fig 13 View of some of the Students and Adults who participated in the Day's Activities.

Fig 14 View of Northern section, showing section of vertical support, and internal wall lines. A small vertical pin was discovered (arrowed)

Fig 15 View of Foundations for Water tank (far side – circular) and 78cm square base for an additional structure.

Conclusions

The exercise proved that there is a great amount of potential for future educational visits. The capacity for outdoors learning, the opportunity to experience and understand a WW2 site, and the ability for students to become involved in genuine exploration of the site are very much present at Fritton.

Feedback from the group was extremely positive, with both pupils and parents providing good praise, interest and understanding. They enjoyed the first lesson, and simple practical's, and thoroughly enjoyed the experiments before lunch. "The challenges were fun and the children were really enthused by Stuart's teaching and knowledge" said one parent. "I found the day very interesting and I learnt a great deal….I wish we could spend another day exploring the site and finding buildings" said one of the pupils.

In summary, the day went extremely well, with the students benefiting immensely from such a varied of topics including maths, science and history. The pupils came away from the day with further knowledge, a wider understanding of WW2, and some applied mathematics too. "All in all it was a very successful occasion, and is testimony to Stuart's commitment and passion."

Long Term Suggestion

It would be hoped that in the long term such a visit could be undertaken more regularly. Up to 40 students could be accommodated, with 20 based in the class room for half the day, and then swapping with those busy excavating, as part of a round robin. Alternatively a similar lesson and experiments can be delivered directly to schools or held within the confines of existing facilities at Fritton Lake Country Park.

Possible routes could be through the English Heritage "Local History for Local Schools" Initiative, as well as through funding from the Heritage Lottery Fund.

Appendix 1 Investigation into Archaeology of Building 15

The SCC survey discovered in excess of 30 buildings and structures associated with the Full Time Instructional Camp at Fritton Lake. Out of all the buildings discovered during the SCC Survey, Building 15 appeared to be less regular than many of the others. Due to the proximity of drains and subterranean pipe work it was assumed to be associated with the toilet block. However, during work to examine the full extent of the building, a number of internal walls and additional structures were determined, and posed a number of questions about the purpose and extent of the structure. Stuart Burgess applied for consent from the Somerleyton Estate, and with the assistance of an organised school learning day, was able to uncover the remainder of the building.

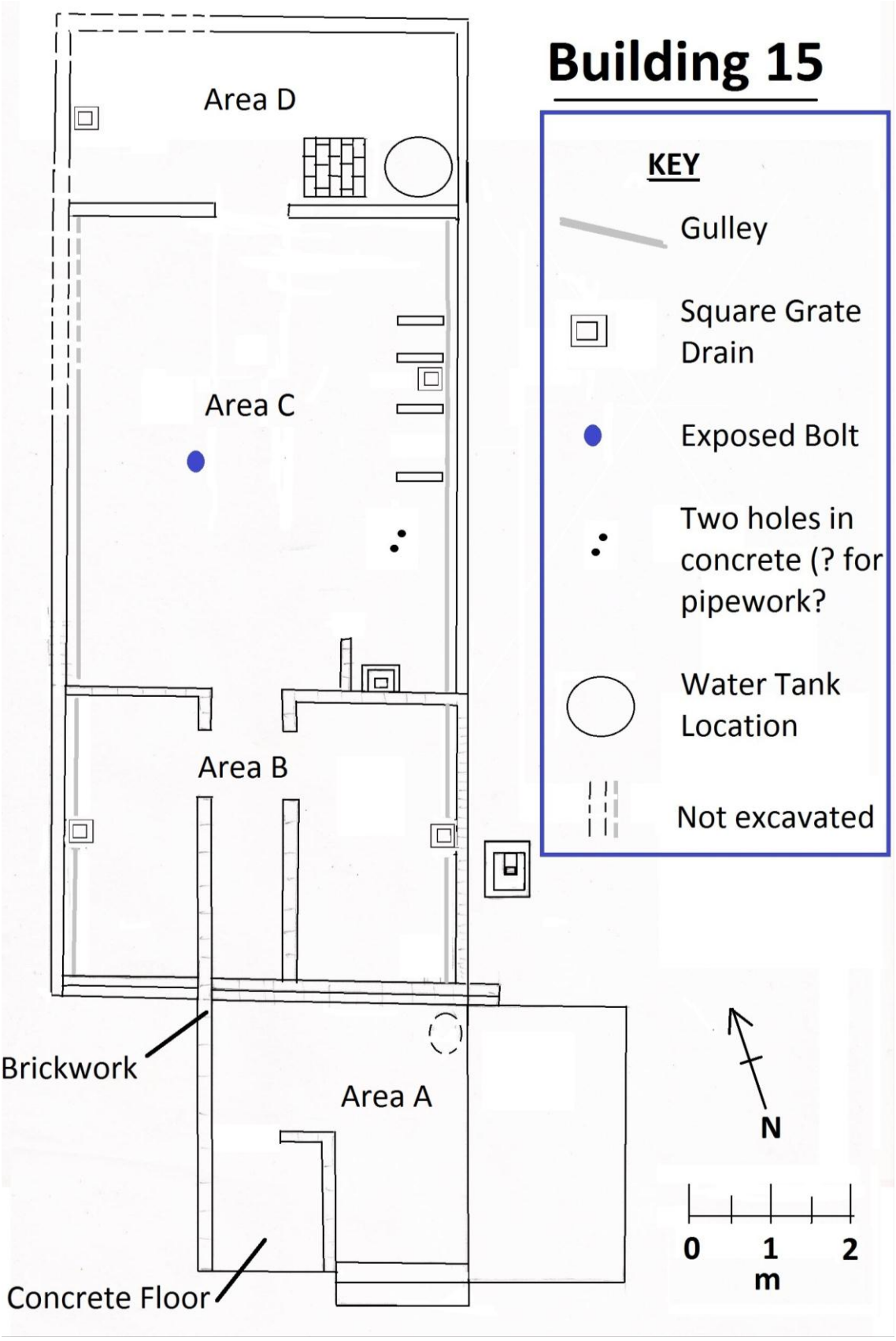
On 8th May a small group of students and parents assisted with the excavation of one of the buildings that formed part of the World War Two Camp associated with the 79th Armoured Brigade.

Using hand tools (small trowels) and brushes, it was quickly possible to ascertain the overall outline of the building, whose footprint occupied an area of 14m x 7m. (This outline was initially plotted in as part of the SCC survey). Following instruction, the group were able to uncover the clear footprint of the floors and supporting walls / footings of the structure. During this part of the process, leaves, nettled and branches were removed by hand, and soil shovelled off into wheelbarrows. Care was taken to note the presence of internal walls, and features as the “dig” progressed, and any finds were kept separate.

The plan overleaf shows the overall layout of the building, and some of the key features are annotated, and the building can be divided into 4 separate areas.

AREA 1 To the southern end of Building 15 was located a concrete floor that had been laid in two section, measuring 3.2m x 2.8m, and 3.2m x 2.0m. Brick work was only discovered on its western side, which enclosed a small internal room of dimensions 1.6 x 1.3, with a doorway located to the north. Centrally on the south of the structure was a series of 1.5m long concrete slabs, that

Fig 1 Annotated plan of Building 15 following excavation and surveying.



suggest an entrance way. It is unclear if these relate to an entrance to the whole building, or just this southern portion, due to the presence of the thick brick wall adjacent to floor to the north. In the northeast corner of the floor was a man made depression, which appeared to have been formed as the concrete was laid. The second concrete floor to the west of this entrance is offset to the main range of the building, but no reason could be ascertained why this was so.

Area 2 Moving north into the next section was two internal rooms, measuring 3.5m x 1.7m, divided by a corridor. Doorways into the "side rooms" were very clear, and both rooms contained gulleys running parallel with the exterior walls.

These were associated with a slightly sloping floor (towards the exterior walls), and the rooms have been interpreted as shower facilities. Within both rooms were located a small square drain, formerly containing a grate, to take the water away from the gulleys, into 4 inch diameter glazed pipe.

Area 3 The central corridor continues into the next section, northward, and enters a floored area of approximate size 5.6m long x 4.8m wide. Again there were side gulleys along both external walls, with a drain part way along the eastern gulley. However no drain was discernible on the western side, due to a sycamore tree stump, suggestion that there might be a corresponding drain there. The floor contained several features, including a larger drain to the southeast of the room, four parallel lengths of brickwork protruding 0.5m from the east wall (suggesting they were supporting a structure), a prominent steel pin, and two noticeable holes (30mm diameter) in the concrete floor.

The brick supports may have been associated with supporting sinks, or a trough, whilst the two holes may have had water pipes originally. The pin may be associated with an internal structure, and except for some slight discolouration of the floor, and signs of erosion (leaking ceiling rather than from foot fall) no further evidence could be deduced to support a structure or central unit.

Area 4 The central corridor extends into the northern portion of the building, into a curious room containing a square drain to the west, and infrastructure

remains to the east. The overall room size is 4.8m wide x 1.6m deep. At the location of the doorway was observed two small rectangular holes that would have received the timber for the door frames. Their presence suggests that the floor was poured after the external structure was built. The brick and concrete remains in the eastern portion clearly relate to a cylindrical object (with a base diameter of 0.58m) having being installed and fixed to the ground by means of a cement fill. Some of this was insitu, whilst another piece was found loose. This is assumed to be related to a water tank, perhaps hot water, as cold water would have been piped in. The tank could have been a large as 80cm diameter, and may have contained a volume of 200gallons. The adjacent 0.8m square brick footing is likely to have supported further brickwork, and perhaps equipment related to the heating or pumping of this water.

The rear (north side) wall was double width, and no entrance was seen. Limited excavation occurred in the northwest corner due to tree stumps and roots. Brick fragments found in association with the building contained traces of paint on one side, suggesting that some of the internal walls were turquoise in colour.

Fig 2: Fragments of turquoise coloured brickwork from the Areas C and D

Conclusion

The building is certainly related to ablution activities on the Camp. Shower facilities and the presence of numerous gulleys and drains support this. Further washing room structures may have been present, but evidence for this has mostly been removed.

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