

THE MILITARY PONTOON BRIDGE BETWEEN GRAVESEND AND TILBURY DURING THE GREAT WAR

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As part of the anti-invasion preparations for the South-East in 1914 a major cross-Thames pontoon bridge was established between Gravesend and Tilbury. In the event of an enemy landing in Kent or in Essex, this was to provide a means for troops to pass over the river in either direction according to strategic need. It came under the control of the general commanding the Central Force, a reserve which was held ready both to reinforce defence lines and to strike an invader trying to advance inland. The bridge, with a section open for river traffic for most of the time, remained in place until almost the end of the war.

Precursors

There has been a ferry between Gravesend and Tilbury, where the Thames narrows upstream after the estuary, since the medieval period if not before,¹ linked on either side of the river by trackways or roads leading inland. In 1539-40, and for reasons relating more to selecting the most suitable sites for defending the lower Thames approaches to London, the river anchorages and shoreline naval assets, the inner line of new land-based artillery defences were placed close to this crossing. Such a juxtaposition increased the importance of this section of the river, especially as it was the lowest viable ferry crossing in the Thames, one or two others further downstream being of less utility. It has been suggested that this place was chosen during the Spanish invasion scare of 1588 for the siting of a pontoon bridge to facilitate the possible transfer of the reserve of troops in camp at Tilbury to meet a landing if it occurred in Kent. If this bridge was started, it appears not to have been completed. If need be boats could, of course, have been used. A boom defence between Gravesend and Tilbury to impede the progress of an enemy naval squadron upstream was established.² During the Dutch Raid of 1667 a line of warships and block ships was defensively moored across the Thames at Gravesend, again an obstacle rather than a bridge.³ In 1778, however, during a war with France, then in alliance with the revolutionary American colonies, a military ferry called 'The Communication' was established between Gravesend and Tilbury.⁴ This was for the routine transfer of troops across the river from one part of the country to another, necessary during a period of war, and as a preparation for such transit in the event of invasion. It consisted of six troop barges with drop-

down ends. These were connected from three pairs of jetties on either side of the river by a hawser which was used to warp the barges back and forth. 'The Communication' was reactivated during the French Revolutionary War in 1793. However, this arrangement, so unpopular with the masters of shipping, whose vessels occasionally and inadvertently rammed the barges, was soon discontinued, its hawsers and buoys being withdrawn. Still called The Communication, it was replaced by barges towed across the river by sailing vessels or, in calm weather, by rowing boats. In 1798 the Crown hoped that with completion of a proposed Gravesend-Tilbury tunnel, the Communication and its associated expense could be terminated and, instead, a fee paid to the tunnel company for soldiers with their arms and equipment to march through. The tunnel scheme failed and the Communication continued.⁶ Subsequently there were arrangements for the War Office to use contracted private boats and the commercial ferry, upon payment of an agreed fee.⁷

The origins of the Great War pontoon bridge

By the late 19th century it was generally accepted that to confront any invasion threat to the Thames estuary region a semi-fixed link across the river would be required for maximum flexibility in deploying large numbers of troops in Kent and Essex. With this in mind, in 1875 during a period of heightened tension with France, a contingency plan for a pontoon bridge was made by the Royal Engineers.⁸ This was to consist of a line of barges overtopped by a timber roadway, to connect the western part of Gravesend's riverside with that somewhat to the west of Tilbury Fort. It was incorporated in planning for the new London Defence Scheme which was evolved from the mid-1880s. This was to create, in the event of an apprehended invasion, a giant and well-manned outlying entrenched camp to cover the land approaches to the capital from the south and the east. The bridge would have been especially important for the reciprocal transit of troops to reinforce the intended Wrotham Position in Kent and the Brentwood Position in Essex, as well as for the crossing of forces to fight further afield. The Wrotham Position also secured an important road which passed north through Meopham to Gravesend and the bridge. The London Defence Scheme was described in detail in a handbook of 1903.⁹

As part of the preparations for the bridge, by 1901, some 7,000 fathoms (42,000ft) of metal chain as well as an assortment of anchors and shackles were placed at Tilbury Fort where an array of new mobilisation stores had been added. The services of barges to be made available on immediate demand to carry the roadway were reserved from Messrs Cory and Son, on payment of an annual fee. However, no funds appear to have been set aside for the purchase of the necessary timber to make the spanning roadways, the materials for these apparently having to be found at the time of construction.¹⁰

Yet the idea of a bridge drew criticism from various quarters, both on grounds of its cost and because despite provision for an opening section, some considered that it would be an impediment to ship movements to and from the Port of London in the event of war. Most vehement were the remarks of an incoming new General Officer commanding the Thames District who, in 1903, declared the contingency

scheme to be impracticable, at the same time citing the existence of ferries upstream at Woolwich and tunnels at Blackwall as being, in his view, entirely adequate for the transit across the river of a military formation of up to a Corps in size. This drew a counter-attack from another general who asserted that the bridge was indeed feasible and entailed a significantly shorter marching distance between the Wrotham and Brentwood Positions, depending upon whether the main enemy landing was south or north of the Thames.¹¹ As it happened, following an assurance in this same year by the Royal Navy that it could prevent an invasion, by 1906 the London Defence Scheme in general was discontinued and with it, by 1907, the plans for the pontoon bridge. The stores for the latter were removed from Tilbury Fort and arrangements for reservation of barges discontinued.¹²

Revival and establishment of the bridge during the Great War

Confidence in the Royal Navy's assurance proved short-lived, lasting little more than five years, it then being accepted that in the event of war, now most likely with Germany, there would need to be defence plans against the possibility of an invasion of up to 70,000 men.¹³ Indeed, soon after the outbreak of war in August 1914 the London Defence Scheme was revived and physically implemented with the digging of trenches in advanced lines south and east of London, with a connection from Westerham via the position at Wrotham to the Medway at Halling. Also included in the arrangements was the actual establishment of the pontoon bridge, based upon the earlier plans.¹⁴ Following an advance warning from the War Office to the Port of London Authority (P.L.A.), the latter were advised on 7 October 1914 that it had been decided 'to forthwith construct a pontoon bridge at Gravesend for military purposes'.¹⁵ Since the original bridge scheme of 1875, the intended Tilbury end of the bridge had become occupied by the developing Tilbury Docks, so a more easterly route for the bridge had to be adopted. It was now to run from the lawn of the *Clarendon Royal Hotel* at Gravesend to the river bank at the western extremity of Tilbury Fort (**Figs 1 and 2**). A 'Notice to Mariners' was issued during this same month.¹⁶ Formation of the bridge had meant finding and assembling a sufficient number of dumb (unengined) barges, a large amount of planking, rope, anchors and chain, as well as other plant necessary for carrying out the task. In cooperation with the War Office implementation was carried forward by the Engineering Department of the P.L.A., work being started to adapt barges and carry out other preparations on the 17th or 18th of October at London's Surrey Docks and at Tilbury. By 14 November, if not a day or two before, the pontoon bridge had been completed, a gap being 'left for navigation'.¹⁷ Within days, an invoice for the payment of £30,000 was submitted to the War Office by the P.L.A. which was also to maintain the bridge and to carry out its operations. River traffic was to be under the control of the Harbour Master at Gravesend.¹⁸ The gap for shipping was to be quickly closed for the transit of troops and/or vehicles upon the instruction of the War Office.

Judging from measurements taken from the official plan, the bridge was 833 yards long, consisting of 67 barges, spanned beam to beam by two timber planked and kerbed 8ft. wide carriageways, having safety fencing along the outside edging, and planking covering the space between the inner kerbs to protect men and horses from dropping through. Some 14 miles of timber were used in construction.²⁰

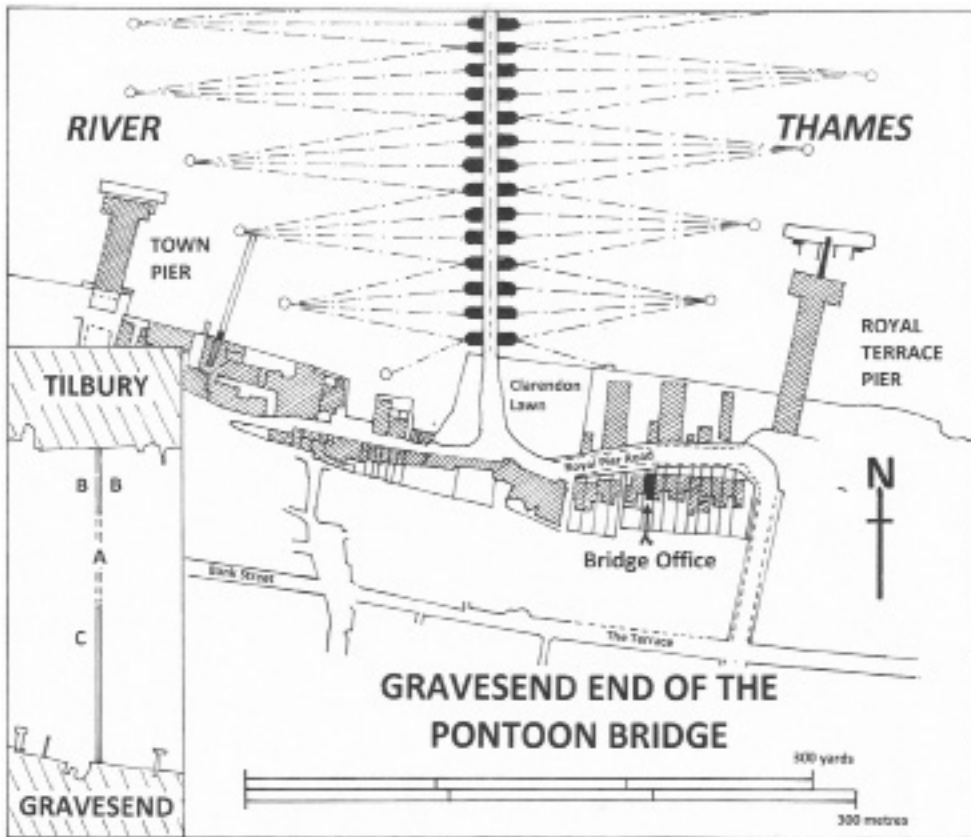


Fig. 1 Plan of the end of the pontoon bridge at Gravesend, showing the barges connected by chain to the mooring screws. The inset shows the whole of the bridge, with (A) the gap for navigation (B) the positions of barges moored for closure and (C) spare barges. Based on an original plan in R.J.N. Willcox, *op. cit.* (see note 20). (Victor Smith.)

Twenty-four barges, including a lifting roadway section, were normally detached to provide the opening for navigation, being held ready at moorings on either side of the north end of the bridge for reconnection when demanded. Six spare barges were moored on the west side of the south end of the bridge as replacements in the event of damage to the bridge caused by the collision of shipping. On the north side a link from the bridge led both on to Fort Road, running north across the marshes to the road infrastructure of the hinterland and, by a side turn west, to the nearby railway station in rear of the Tilbury ferry landing stage. The connection with the road system on the south side at Gravesend involved a turn into Royal Pier Road from a temporary roadway across the lawn of the *Clarendon Royal Hotel*. There were two railway stations just 550 yards (508m) away. The bridge could accept the marching feet of large columns of troops as well as the weight of field artillery, wagons and motor vehicles.²¹ To keep the bridge in place its barges were connected by chain to cast-iron mooring screws in the river bank along either side



Fig. 2 The pontoon bridge at Gravesend, with part of the lawn of the Clarendon Royal Hotel in the foreground, at an unknown date during the Great War.
(Victor Smith)

of its length, resilient to the strong ebb and flow of the river as well as to the rise and fall of the tide, on average a difference of 20ft (6.2m). The bridge was fitted with navigation lights, a signalman's box either side of the opening section and telephones. Tugs, motorised lighters and launches were on constant standby.²²

Contemporary photographs are thought to show the bridge guarded by regular soldiers but there was a proposal in 1916 for these to be replaced by members of the Volunteer Training Corps, to release the former for other duties.²³ It was in a dinghy slipping between the barges at the Gravesend end of the bridge that in June 1915 the escaping German prisoner of war, Sub. Lt Gunther Pluschow, had ignored the challenges of the sentries and made his get-away from the Thames by stowing away on a Dutch ferry, becoming the only German prisoner of war to escape from Britain in either world war.²⁴

Operation of the bridge

The organisational chart for activating the completion of the bridge for military transit and for its re-gapping for shipping to pass through appears complex but this was necessary because of the large number of affected organisations responsible for, and using, the river.²⁵ As a result there were over 20 points of sequential telephone



Fig. 3 The house in Royal Pier Road, Gravesend, used as the Bridge Office throughout the Great War. (Photograph Victor Smith, 2018.)

contact, and cascading lines of communications beyond that, originating with an instruction bearing the name ‘Centraforce’ from either the War Office in Whitehall or the Section Command Office (Thames) to the Bridge Office at Gravesend (**Fig. 3**) as well as to the Chief Engineer in London. The Bridge Office would then (a) contact the Engineer in Charge at Gravesend who would immediately confirm to the War Office receipt of their instruction and advise the start of necessary action and (b) alert the Foreman of the bridge to begin his. At the same time, a panoply of communications was to be sent to the various offices for river management up and down the river. Crucially this included the harbourmasters and the London docks, to forewarn them of the impending cessation (and, when decided upon,) resumption of river traffic.

The Bridge Office was at the still-existing 5 Royal Pier Road, Gravesend, where there was a clerk 24-hours per day to notify the Engineer in Charge of messages received. Under engineer supervision, the staff required for operating the bridge consisted of 2 clerks, a Foreman, Assistant Foreman and a force of hands, signalmen and winchmen, divided into two 12-hour shifts. Added to these there were the crews of the tugs, lighters and launches. On receipt of an instruction at the Bridge Office to close the bridge the operating team on stand-by would be mobilised by two 15-second bursts of a foghorn as well as the sounding of the whistle of the attending tug. Launches would then be sent to warn-off approaching shipping. The masters of shipping preparing to leave from the London docks were to be held back by the dock masters concerned. The bridge would be closed by tugs towing the necessary 24 barges and roadways into position to fill the gap, where they would be reconnected by the hands. The procedure was reversed to re-open the river for shipping. Four hours were allocated for a reconnection but in tests this reportedly took 3 hrs 19 minutes and 2 hrs 8 minutes for re-opening. Heavy 3-ton lorries, each with 1½ tons of freight, were driven over the bridge in double-column without any problem.²⁶ Originally the gap for navigation appears to have been 716ft (Fig. 1, *inset*) but a collision with the bridge in 1915 resulted in that distance being increased to 800ft.²⁷ By May 1915 a detachment of the Royal Engineers based at the nearby New Tavern Fort had laid a cross-Thames telephone cable on the riverbed next to the bridge.²⁸

Because there was no invasion, the bridge was never used for its intended home defence purpose, but it was, from time to time, crossed by troops and equipment (**Fig. 4**). A diary of closures and crossings was probably kept by the P.L.A. but this does not appear to have survived. Because of security considerations, troop movements across the bridge were not mentioned in local newspapers. To maintain



Fig. 4 Mounted troops arriving at Gravesend over the pontoon bridge from Tilbury, perhaps the Yeomanry referred to in the text. This is at an unknown date during the Great War but thought to be in 1915. (Peter Torode, *Consilium Dare* collection.)

the vital flow of the Thames river traffic, reconnections of the bridge were kept to a minimum. A Gravesend journalist, apparently present as a witness for the duration of the war, remarked in his retrospective at the end of 1918 that ‘... save for one or two occasions when yeomanry passed from one shore to the other, it was never brought much into use...’ adding that the bridge ‘was the scene of many accidents to shipping...’.²⁹ Not least of the collisions was one early in December 1914 when two London sludge hoppers struck each other and the bridge. More seriously on the 18th of the same month an Orient steamer fouled it, carrying away 20 barges in the process.³⁰ By 23 December it had been necessary to obtain an estimate for alternative means of transit from the manager of the railway ferries which crossed reciprocally between Gravesend and Tilbury. He confirmed that these could transport 2,500 troops per hour and could also carry wagons, horses and field guns.³¹ Another collision involved the Norwegian vessel *Frederiksberg* which, during a gale in January 1917, (32) dragged her anchors and bumped into two of the barges.³² The War Office were far from enthusiastic about meeting the costs arising from collisions and even for payments to the P.L.A. for their routine maintenance and which, on several occasions, it sought to reduce by special pleading but with only limited success.³³

The end of the bridge

With Germany on the back-foot after the failure of its Ludendorff Offensive in the summer of 1918, followed by sustained and winning allied offensives, there seemed sufficient confidence about the future of the war to result in a decision taken in September to discontinue the bridge. It was dismantled in the following month, October. The barges and timber were taken back into Surrey Docks where the bridge project had begun almost exactly four years before.³⁴ The materials were bought by the P.L.A., its valuable timber of various kinds being reserved for such purposes as piling and rafting. The barges were brought to a condition for resale.

There was a postscript: in August 1941 during the latter part of a period of concern about the threat of invasion during the Second World War, the drawings and papers for the pontoon bridge scheme were again looked at by the War Office with a view to forming a similar construction at Gravesend. But on grounds of scarce resources and the time it would have taken to complete the project this was not proceeded with.³⁵

Discussion

Pontoon bridges have a long history of use in Europe and Asia, usually as a temporary means for military forces to cross an unbridged waterway. During the Great War they were used on the Continental Western Front, and also to supplement existing bridges whose capacity was insufficient. In Britain itself there was a lesser use but as well as the one at Gravesend there was another across the Swale from the mainland to the Isle of Sheppey, forming a reciprocal communication for troops.³⁶ The pontoon bridge at Gravesend was, as has been noted, a vital crossing for the London defences and for the movement of strike forces to attack an invader

beyond them but the full extent of any improvement to road networks consequent upon the pontoon bridge is not clear. It is however known that on the Essex side some existing roads leading from it were re-surfaced and widened.³⁷ Although the bridge is sometimes also suggested as having been a boom defence or an anti-submarine obstacle,³⁸ there were no mentions of such roles in contemporary official documents. Land-based anti-warship artillery and riverine mines were provided downstream.

In the event of an invasion the bridge would have become vulnerable to attack from the air to disrupt the strategic movements of Central Force and its successor, the Southern Army. Anti-aircraft guns had been provided at Tilbury Fort and Tilbury Docks. No doubt these would have been brought into action under such circumstances as well as the aircraft of the home defence air force. The earlier-mentioned estimate of December 1914 for use of the ferries showed that there was an alternative method for getting troops across in case of need, their adoption as a standing means of crossing during a period of war not having been approved by the War Office. When bombing raids took place locally in 1915 (by a Zeppelin) and in 1917 (by an aeroplane), no attempt was made on the bridge.³⁹ From continuing crossing of the Thames by air raiders throughout the war the bridge must have been well known to the Germans. In the event of the Germans landing and approaching that part of the Thames containing the bridge, the latter would probably have been destroyed at the last moment upon the order of the commander of home forces, in order to deny its use to the enemy and, at the same time, the ferries would have been withdrawn upstream or disabled.

The rise, fall and revival of a scheme for the pontoon bridge arose from the degree of governmental confidence in the ability of the Royal Navy to prevent invasion. Even during the Great War, when the navy was at its most powerful, in a 'belt and braces' approach to defence there was massive investment in anti-invasion preparation of which the pontoon bridge had a crucial intended part. Its existence, remarkable speed of construction, the planning and engineering behind it and its strategic significance deserve to be better-known.

ACKNOWLEDGEMENTS

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ENDNOTES

¹ Described and discussed in numerous entries in R.P. Cruden, 1843, *The History of the Town of Gravesend and of the Port of London*, Gravesend.

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² Shown in a map by Robert Adams in *Thamesis Descriptio*, Anno 1588, B.M. K6.17. See also the contemporary documents reproduced in R.P. Cruden, *op. cit.* (see note 1), 234-255 and Garrett Mattingly, 1959, *The Defeat of the Spanish Armada*, London, 291.

³ Diary of Samuel Pepys, 1667, 10th June, and C. Abernethy, 1958, *Mr. Pepys of Seething Lane*, London, 297, 303.

⁴ R.P. Cruden, *op. cit.* (see note 1), 440. Drawn to the attention of the writer by Peter Kendall is an item from the *Kentish Gazette* (22 July 1780) which refers to the presence of a pontoon bridge between Gravesend and Tilbury during the same month, used for the purpose of troop transit during a large exercise. This contemporary report is inconsistent with other evidence for the use of the troop-carrying barges including a detailed contemporary engraving of the same exercise held in the collection of Gravesend Library.

⁵ Numerous references are to be found in the *Royal Engineers Letter Books (Gravesend)* held at the Royal Engineers Library and Museum.

⁶ R.P. Cruden, *op. cit.* (see note 1), 456-65; Victor Smith and Eric R. Green, 2000, *The Gravesend Blockhouse*, Gravesend, 15-16.

⁷ Peter Kay, 2017, *The London, Tilbury and Southend Railway – the Gravesend Ferry*, Wivenhoe, 436-7 *et. seq.*

⁸ TNA WO78/645/1-7.

⁹ TNA WO106/6188, 'Handbook for the London Defence Positions (Provisional)', War Office, 1903.

¹⁰ TNA WO32/10062, 10063, 10064 and 10065.

¹¹ TNA WO32/1065.

¹² TNA CAB3/2/1/44a and TNA WO32/9966.

¹³ TNA CAB3/2/1/44a.

¹⁴ Described in Victor Smith, 2016, 'If the Kaiser should come: Defending Kent during the Great War', *Archaeologia Cantiana*, CXXXVII, 85.

¹⁵ Museum of London Docklands, PLA/NMM, Box 36 and PLA River Committee Book, No. 4.

¹⁶ TNA WO32/9967.

¹⁷ *Ibid.*

¹⁸ TNA WO32/9968.

¹⁹ Museum of London Docklands, PLA/NMM, Box 36.

²⁰ TNA WO32/9968; R.J.N. Willcox, March 1929, 'Thames War-Time Bridge of Boats', *PLA Monthly*, 153-156; H.J. Deane, 1939, 'The Military Bridge over the Thames at Gravesend', *Royal Engineers Journal*, LIII, 345-357. The latter two articles contain numerous illustrations of the pontoon bridge.

²¹ See sources quoted in note 20.

²² *Ditto.*

²³ *Gravesend Reporter*, 1916, 4 March, 6.

²⁴ Victor Smith, 2016, 'The One who Got Away – a Wartime escape from Gravesend', *Historic Gravesham*, 62, 3-9.

²⁵ TNA WO32/9968.

²⁶ *Ibid.*

²⁷ Museum of London Docklands, PLA River Committee Book, No. 4.

²⁸ *Ibid.*

²⁹ Anon., 1918, 'How Gravesend, Northfleet and District played their parts in the Great War', *Kent Messenger*.

³⁰ Museum of London Docklands, PLA River Committee Book, No. 4.

³¹ TNA WO32/9968.

³² *Gravesend Reporter*, 1917, 21 April, 5.

³³ Museum of London Docklands, PLA River Committee Book, No. 5.

³⁴ Museum of London Docklands, PLA/NMM Box 36.

³⁵ TNA WO32/10067.

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³⁶ Victor Smith, *op. cit.* (see note 14), 78.

³⁷ R.J.N. Willcox, *op. cit.* and H.J. Deane, *op. cit.* (see note 20).

³⁸ *Anon.*, 2017, Gravesend – First World War Walking Trails, Screen South, 4 and 8.

³⁹ F.A. Mansfield, 1922, *History of Gravesend in the County of Kent*, 154-160.