Fig.1: aerial view of the Tower of London from the north-east (1992), showing the three landward arms of the late 13th-century moat, drained and filled in in 1843-5. Crown copyright: Historic Royal Palaces.

Getting rid of shallow water

Edward Impey

The filling of the Tower Moat, 1843-5

ISSUE vol. 7, no. 15 of this journal carried an article by Dr Geoffrey Parnell on the history of the Tower of London's moat[1], prompted by the proposals to reflood it which were then being examined by the Historic Royal Palaces Agency (HRPA)[2]. The article clearly demonstrated the great interest of the moat's history and that its present state is of importance in itself, rightly emphasising that 'any alterations to it deserve and require close scrutiny'[3]. By that date, however, HRPA was already in the early stages of a research programme devised to inform such scrutiny, which by the end of 1997 had seen a thorough examination of the documentary material, a major archaeological evaluation exercise, and a long list of important discoveries. Some aspects of what has been learnt from the exercise have already been covered in print[4] and a substantial (unpublished) report prepared[5], while a monograph is planned for 2001: this article gives a brief account, drawn from the same research exercise, of what may or may not remain the last great event in the Tower's structural history -- the draining and backfilling of the moat in the 1840s.

1. G. Parnell 'Getting into deep water?' *London Archaeol* 7 no. 15 (1995) 387-90.
2. The Historic Royal Palaces Agency changed to Trust status on 1 April 1998, and is now known as Historic Royal Palaces. It is responsible for the Tower of London, Hampton Court Palace, the State Apartments at Kensington, the Banqueting House at Whitehall and the Dutch House and Queen Charlotte's Cottage at Kew.
3. *Op cit* fn 1, 390.
4. E. Impey 'The western entrance to the Tower of London, 1240-1241' *Trans London Middlesex Archaeol Soc* 48 (1997) 59-75.
5. E. Impey and G. Keevill, The Tower of London Moat 1997 (65 A3 pages).

The existing moat, successor to a series of others, was created by Edward I during his expansion of the castle in 1275-80. Between then and the mid-19th century it had been altered by the building of the wharf (*c*1360 - *c*1400), the revetment of its outer bank in 1670-1683[6], and the filling of the barbican (or Lion Tower) moat in the 18th century. However, the problems which led to the final solution of 1843-5 had been apparent from the very beginning: 'from time immemorial', explained a Royal Engineers' report of 1832,

> the drainage of the Tower [ditch] has existed on the present principle, viz that it has been conveyed through small drains into the Tower ditch, whence such portions as were in a state of fluidity have passed at ebb tide into the Thames, and particles of a denser nature have been deposited in the ditch[7].

Indeed, as early as 1293 and 1306 vast efforts had been necessary to dredge the moat, and, structural interventions apart, the rest of its history is a woeful tale of attempts to prevent pollution by the inhabitants of the Tower and its surroundings and to keep it free of mud. Particularly drastic measures were taken in the late 18th century, including the cutting of a canal through the wharf[8] but were followed by more than two decades of relative inactivity: it was probably this, in addition to the realisation that the stagnant moat was to blame for the garrison's ill-health, which provoked the crises and drastic actions of the 1840s.

The first new initiatives, in 1826-7, probably encouraged by the newly appointed Constable the Duke of Wellington, were intended, as before, to clean the moat but keep it water-filled; apart from its defensive value and its function as a drain, it acted as a tidal reservoir for the Royal Mint (supplied after 1810 via a tunnel to its new site) and to run the water-wheels in St Thomas's Tower which pumped water round the castle. How much was actually done is unknown, but it was only a few years later, in September 1830, that, under Wellington's direction, the last great attempt was made to restore the wet moat. Archival information is abundant, but perhaps less telling than the following account from *The Standard* of 15 October 1830:

> The Duke of Wellington .. having issued his orders for cleansing and deepening of the Tower moat workmen are now busily employed in the process. The moat is to be deepened four feet all round the Tower. The water in the moat was allowed to run off; pieces of wood were laid across the bed at short distances, in the form of ratlins; upon this a railway in miniature is constructed; the mud, a thick, rich compost, invaluable as manure, is collected into square boxes on wheels; these are pushed along the railway by labourers with very little trouble. The contents of the box are dropped into a barge, moored in front of 'Traitor's Gate', the soil thus collected is taken up the river for the use of the rearers of Battersea plants and other agriculturalists.

In the event, however, the operation was not a great success. A plan made after work had stopped in December 1830 noted that only a 'portion of the accumulated sediment' had been removed[9] and that a further 4,500 cubic yards of fill were to be removed in the following year[10]. Nevertheless, renewed attention was successfully focused on the moat's perimeter, taking up the precedent set by the 1797 *Act for...improving and Keeping in Repair Tower Hill*[11]. The slope above the revetment wall (the counterscarp), enclosed by iron railings in 1828-9[12] was put down to ornamental gardens in 1837[13], and the promenade around the moat's edge created -- more or less in its existing form -- to afford views of the castle and its wet moat: the result was an early and interesting attempt to improve the Tower's environs for reasons beyond those of security and practicality, although a stern reminder of its more sinister purposes is found in the Board's condition that 'no trees are to be planted, nor enclosure made that can afford cover'[14].

A new departure was, however, made in 1832, prompted by the horrific smell of the stagnant sewage-laden mud, churned up during removal and the process of raking it into a central channel in the hopes that the tide would sweep it out[15]: the Secretary of the newly-founded St Katharine Docks Company, Sir John Hall, suggested that at least drains should be built to carry the Tower's sewage directly into the river[16]. This would have allowed the moat to remain as it was, but have greatly reduced, if not the rate of silting, at the least the moat's offensive smell, but Wellington's reaction was dismissive: in his view the sewerage proposals were prohibitively expensive, 'and could not be calculated upon as likely to produce any benefit for years'[17], while the smell would just have to be tolerated[18]: he remained persuaded that tidal action,

6. *Op cit* fn 1, 388.
7. Wellington papers, University of Southampton: WP2/200/54.
8. Work 14/1/2 and 31/1256.
9. WO 94/72/8.
10. WO 44/131.
11. Tower Hill Improvement Act, 37 George III, cap. 87.
12. WO 44/30, 302; *op cit* fn 1, 388.
13. WP 2/203/60-6
14. WP 2/203/60-1
15. WP 2/200/54

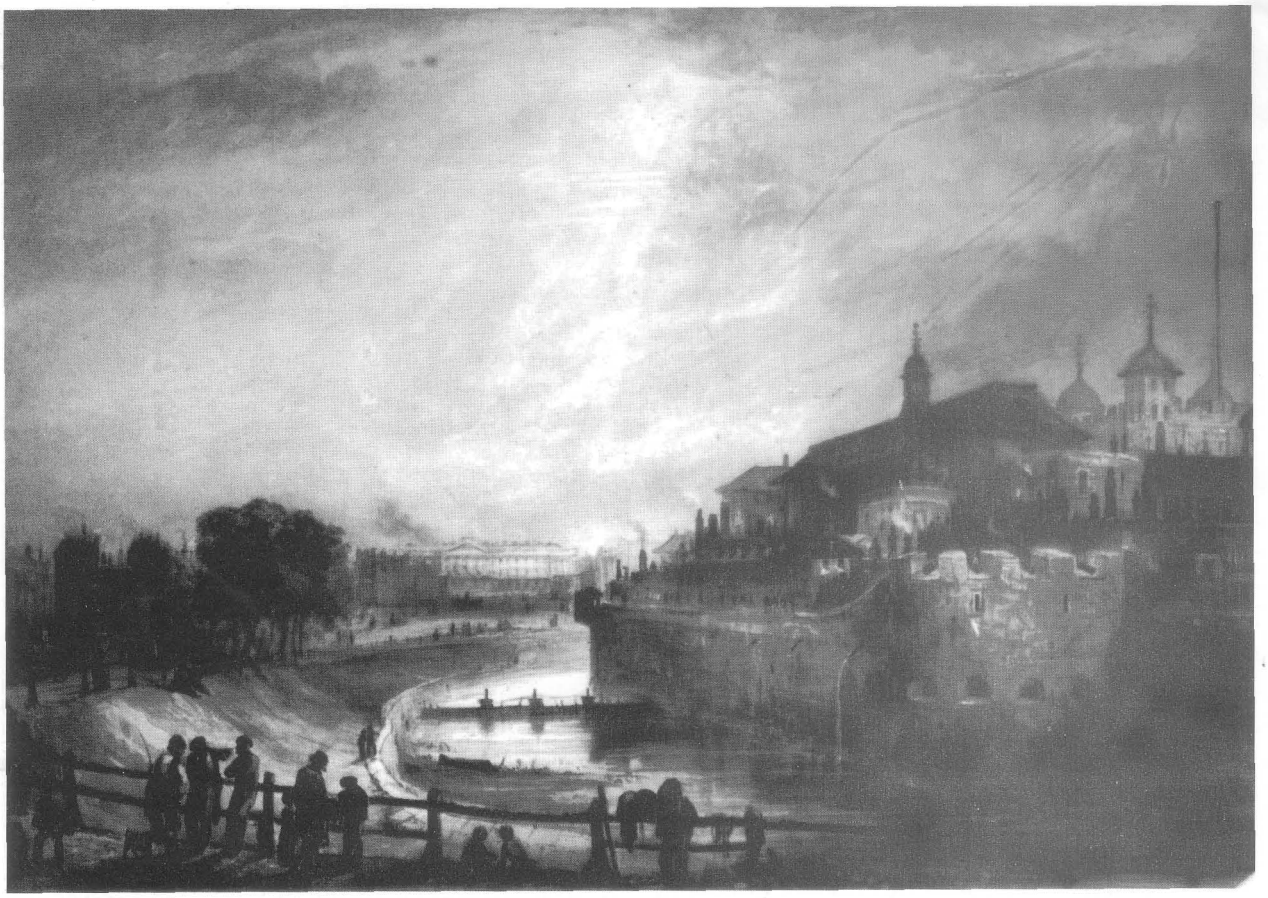

Fig.2: view over the Tower from the north west in about 1840, showing the wet moat in its last years (George Bryant Campion, 1796-1870). Note the mud banks in the water, the late 18th-century weir and the drains discharging directly into the moat. In the backround is the 17th-century Grand Storehouse, burnt in 1841, some debris of which was used to fill in the moat in 1843-5. Reproduced by kind permission of the Guildhall Library, Corporation of London.

properly managed, could be relied on to scour the moat and assured the Privy Council to this effect[19]. The Constable's opposition to any other action remained firm until 1840-1, when a series of reports blamed the stagnant moat for the poor health of the Tower's inhabitants, the catalyst being an epidemic among the 1st Battalion of the Grenadier Guards reported in *The Times* of 14 May 1841[20]. Four days later Wellington acknowledged that 'The state of the health of the inhabitants can be attributed to the ditch, and the want of more frequent cleaning by the admission of the tide' and charged the Major of the Tower, John Elrington to 'ascertain the inconvenience, labour and cost ... of the more frequent admission of the tide' and to report back to him[21]. The extent of the problem was underlined a fortnight later by the Surgeon General in a letter to Elrington, explaining that:

> the bank of filthy mud which is exposed whenever the tide begins to ebb, impregnated with putrid animal and excrementitious matter, surrounded by rank vegetation ... and emitting a most obnoxioux smell .. cannot fail to have a most prejudicial effect[22]

The health hazard had, of course, long been recognised -- the inhabitants of Trinity Square and Tower Hill had complained in 1832 that 'a disease called cholera prevails to an alarming extent in the neighbourhood' and blamed it on the moat[23]. But this time it was the Tower garrison which had suffered, and a link with the moat, whether rightly or wrongly, firmly established. Wellington was forced to take notice.

16. WP 2/200/37.
17. WP2/200/61.
18. WP 2/200/56.
19. WP 2/200/61.
20. *The Times*, 14 May 1841.
21. WP2/206/121.
22. WO 44/614.
23. WP 2/200/35 *Memorial of the undersigned inhabitants...to the Commissioners of the Central Board of Health*, 17 July 1832.

Precisely what had to be done was debated during the early part of 1841. Wellington and others clearly assumed that the answer lay in better maintenance, but in June of the same year the Surgeon Major, John Hunter, suggested to Elrington[24] the alternative eventually adopted -- that the moat be converted 'into a dry fosse'[25]. The final decision followed Wellington's receipt, in the same month, of a note from the Royal Engineers' Office with estimates for scouring the moat and instituting a new management system, at £4,630 and 'To convert the moat into a dry ditch and to build sewers therein to receive the soil and surface drainage' at £4,775[26]. Ever conscious of the need for security, Wellington may initially have been reassured by the assumption that the back-filled moat could still be flooded through sluices at Traitors' Gate, but his decision was swiftly made: within a few days he had written to the Master General of the Ordnance, reasoning that although scouring was an option, 'it must be observed however that the mass of mud would be very soon re-formed in the ditch and would cost the same sum of money to remove it'[27]. His conclusion was to accept that the wet moat 'should be a dry ditch with a sewer and other works to carry off the water'.

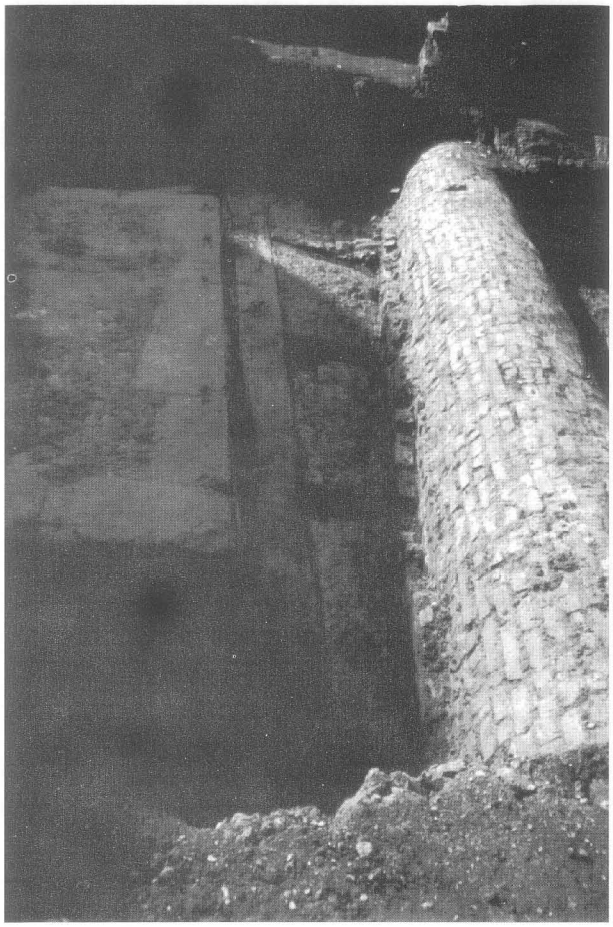

Fig. 3: view of the brick culvert laid down as the moat was being being backfilled in 1843-4, shown at the point where it cuts the remnants of Henry III's ill-fated western gatehouse (excavated 1995-7). It was intended to carry surface drainage from within the Tower, previously discharged directly into the moat – a function it still serves. (Photo: Oxford Archaeological Unit)

Acting on the decision was more difficult. Although Wellington's authority was unquestioned, it was the Board of Ordnance which had to provide the money, and at its meeting of 15 July 1841 the Inspector General reiterated that 'the Duke of Wellington's observations respecting the health of the Garrison and inhabitants are of so paramount a character that it is incumbent to forego the defence of a wet ditch', but it was noted that no funds were to be forthcoming even in the following year, it not being 'intended to take any steps at present, in the contemplated work of draining the Tower moat'[28]. Exacerbated by divisions of authority, opposition to expenditure on the moat whilst no funds had yet been set aside to repair or replace the recently burnt Grand Storehouse and the objections of the Mint (who feared the loss of their reservoir), work did not begin on site until March or April 1843. But from then on, encouraged by correspondence in the press and the Duke's insistence, it proceeded apace: a meeting of the Board on 10 March finalised arrangements with an external contractor for the work and it was agreed that a 10-horsepower engine, intended to replace the water-wheels and 4-horsepower engine in St Thomas's Tower, should be ordered immediately[29]. On 21 April *The Times* reported that drainage works had already begun in the south moat and that 'the moat...is now in process of being filled up, with a view to being converted into grounds for healthful recreation'. In July it told its readers that

> upwards of a hundred men are daily employed at the Tower in making preparations for filling up the moat. Extensive cuttings are being made in the soil for the pupose of effectually draining the swamp, and carrying off the numerous drainings which flow from the interior of the Citadel

24. WP 2/206/126.
25. PRO WO 44/614.
26. WO 44/614.
27. WO 44/614.
28. WO 44/614 Letter from the Commanding Engineer to the Inspector General of Fortifications (1 July 1841) and memorandum on the above dated 15 July 1841.
29. WO 47/1962.

Exactly how the work was done, or in what order, is not yet clear, but the first task was certainly to drain the moat and remove the more unstable silts. The next almost certainly saw the building of the massive brick culvert running round three sides of the castle, as although this was placed within a trench dug down into earlier fills, excavation has shown that it was not, as has been implied elsewhere, inserted through the 1840s backfill[30]. The ordering of cast-iron rainwater heads and downpipes in 1843 (presumably linked to the culvert from the outset) and their fixing to the Tower's outer curtain walls in the following year[31], suggests that this became operational very early on. Sewers were also laid within the castle, although the work was not completed, and even then inadequately, until the 1850s[32].

At the same time, or immediately afterwards, the massive task of actually filling in the moat began. Material included 'rubbish from the ruins of the Grand Storehouse'[33] -- all useful materials having been sold off[34] -- and, as it became available, debris from the foundation trenches of Waterloo Barracks which replaced it[35]. Excavation has shown, however, that the bulk of the fill was composed of clay-rich deposits brought in from other riverine sites -- possibly from dock excavations in the East End. Needless to say the resulting 'reversed' stratigraphy, the volume of re-deposited finds, and the similarity between the imported fills and the silts of before 1843 made for some complicated archaeology. Great care seems to have been taken to compact the fill, the upper levels containing carefully laid spreads of fine rubble and clinker, and the surface very skilfully graded, the ground rising as much as 1.5m from north to south, following the fall of the culvert. In spite of unforeseen difficulties encountered in 1844, which the contractor was granted an additional £50 to overcome, the main operation seems to have been complete by the end of 1845.

No sooner, of course, had the work been completed, than it was regretted: in the face of the Chartist scare, at its height in the late 1840s, the absence of the wet moat increased the need to reinforce the Tower's built defences, and led, among many other alterations, to the building of the short-lived North Bastion in 1845[36]. The moat could now, however, be put to a number of other uses. The original intention, as described by the *The Times*, was that 'when work is completed it is intended to lay out a considerable portion of the ground in ornamental gardens', but although proposal drawings exist, no work was done. Equally unsuccessful was the petition of a few years later by Harrison, the works contractor, for a three-year lease of the newly reclaimed ground for growing mangel-wurzel -- no doubt for sale to the London dairies, ubiquitous until the advent of the milk-train. By mid-1846, however, a decision had been taken to put the whole area down to grass[37], since when, part gravelled and part grassed, it has been used for drill[38], as grazing for cows and sheep[39], as a vegetable garden and a venue for theatrical events; today, although closed to the public for security reasons, it is is used for various forms of recreation by the Tower's inhabitants, canine and otherwise.

What of the future? Although the philosophical debate as to the merits of reflooding will remain an issue as long as the project is discussed, feasibility studies and archaeological evaluation revealed that there are at least no insurmountable conservation or engineering reasons against it: a system of monitoring environmental conditions within the *in-situ* fill and excavation backfill[40], due to run for another two years, is now indicating that reflooding would not endanger deposits retained beneath the water. Thus, although there are no current proposals to do so, the removal of the 19th-century backfill may yet add another chapter to the continuum of Tower history.

Acknowledgements

This article is largely based on the work of other people. They include Dr Todd Longstaffe-Gowan, Ruth Guilding and Stephen Priestley (working for Elizabeth Banks Associates), Graham Keevill (Oxford Archaeological Unit; in charge of fieldwork) and members of HRP staff. In addition, I am particularly grateful to Dr Geoffrey Parnell for much information and for commenting on this paper in draft.

30. *Op cit* fn 5, 57.
31. WO 49/168. The suppliers were Messrs G. Thompson and Sons.
32. WP 2/211/25.
33. *The Times*, 14 December 1845.
34. Tenders were invited for the materials in four lots (WO 47/1944 and WO 47/1946).
35. *The Times*, 15 May 1845.
36. G. Parnell *The Tower of London* (1993) 91; *op cit* fn 30.
37. *The Times*, 3 April 1846.
38. WP 2/211/212, 213.
39. WO 94/58/14.
40. Devised by David Howell of the Hampton Court Textile Conservation Studio, in collaboration with English Heritage and Royal Holloway College.