
Article:
Clarke, BG orcid.org/0000-0001-9493-9200, Barrett, B, Hudson, E et al. (1 more author) (2017) Engineering the landscape – Capability Brown's role. Proceedings of the Institution of Civil Engineers (London) Engineering History and Heritage, 170 (1). pp. 19-30. ISSN 1757-9430

https://doi.org/10.1680/jenhh.16.00017

August 2016

Engineering the landscape – Capability Brown's role

Barry Goldsmith CLARKE CEng, FGS, FICE

Benedict BARRETT MEng

Eleanor HUDSON MEng

James Whibberley BSc MSc FGS

Corresponding author

B G Clarke

University of Leeds

Leeds LS29JT

01133439454

b.g.clarke@leeds.ac.uk

4856 words, 4 Tables, 6 Figures

Keywords - Earth Dams, Excavation, Geology, History

Engineering the landscape – Capability Brown's role

Clarke, B. G., Barrett, B., Hudson, E. and Whibberley, J.

Abstract

Celebrating the 300th anniversary of birth of Capability Brown is an opportunity to recognise the significant contribution the 18th Century landscape architect made to civil engineering leaving a sustainable legacy. As a gardener, architect and engineer, he was responsible for over 250 gardens transforming the landscape by extensive earthworks, drainage schemes, earth dams, roads and planting using only the power of people and animals. Brown and his contemporaries such as Grundy Jr, Brindley, Ince and Smeaton, were responsible for innovative engineering that survives today because of continuing investment and maintenance.

1 Introduction

2016 marked the 300th anniversary of the birth of one of the most iconic UK landscape architects, Lancelot 'Capability' Brown who, together with John and William Aislabie, William Kent and Charles Bridgman, was responsible for developing the Augustan and Serpentine styles of the English garden (Turner, 2005) that portrayed a natural and wild landscape enhancing the houses of the wealthy, increasing their value and producing self-sustaining properties. Brown created gardens across England and Wales (Figure 1), the largest of which are noted for a serpentine body of water and open expanses of turf with irregularly scattered individual and clumps of trees (Gregory et al, 2013). These gardens required a mix of landscape design, architectural design, engineering and horticulture but overall an inspirational vision. At that time (1740-1783) it was not unusual to find people practicing one or more of these disciplines. Brown specialised in horticulture and land and water management, which included major engineering works to create earthworks, drainage schemes, roads, bridges and buildings using techniques that were known since Roman times (Morgan, 1914).

Gregory et al (2013) undertook a review of research into Brown's work on behalf of English Heritage as part of the 300 year celebrations to identify a number of issues to be addressed including the reputation of Brown, development of an archive of a portfolio of landscapes and the social and economic value of Brown's work. There is no reference to Brown as an engineer yet, at the time, he was variously described as an improver, an architect and an engineer. There are very few records of Brown's work though some letters, bank accounts, maps, plans and contracts (Gregory et al 2013) do exist. The 2016 ICOMOS-UK conference celebrating Capability Brown concluded that there is little known of Brown's working practice. Authors have relied on secondary literature to develop an understanding of Brown's skills as a landscape designer, architect and horticulturalist. There are very few references to the engineering aspects of the gardens yet they were, possibly, the most significant of the time given that they predate the Industrial Revolution and the canal age (1763-1790). This paper reviews the construction of these gardens to demonstrate that, at that time, these were immense engineering achievements and, through planned maintenance, many still exist today.

2. Lancelot 'Capability' Brown (1716-1783)

Lancelot Brown, the fifth of six children, the youngest of three boys, was baptised on 30 August 1716 in Kirkharle, Northumberland, to William and Ursula Brown. He started working in 1732 as a gardener at Kirkharle Hall for Sir William Loraine. He left in 1739 and, in 1740, was engaged as head gardener by Lord Cobham of Stowe. Shields (2006) suggests he was appointed because of his knowledge of hydraulic engineering, which he developed at Kirkharle Hall, constructing artificial streams, ponds and fountains and observing the mine pumping systems in Northumberland. She also suggests that he spent the time between leaving Kirkharle and starting at Stowe working in Lincolnshire on drainage and water management schemes possibly for Grundy Sr (1696-1748). While there is much speculation as to his whereabouts in 1739-40, it is clear he gained the confidence of Lord Cobham who initially employed him to repair a breached dam caused by freezing weather. There is also evidence that Brown may have worked at Grimesthorpe prior to Grundy Jr (1719-83) works on the 'proposed additions to the Great Water'.

In 1750, Brown left Stowe to setup his own architectural practice in London. It is apparent that Brown had developed a network of influential contacts, initially through Lord Cobham, because of the support he received in his appointment as Master Gardener at Hampton Court in 1765. It also appears that he built up a professional network of architects, landscape architects, architect engineers and engineers (Table 1) through his practice.

It is estimated that there are 267 sites (Figure 1) in England and Wales which Brown helped design, though there is some question as to the actual number. According to Gregory et al (2013), the number of sites attributed to Brown varies from 214 (Stroud, 1957), 169 (Turner, 2005) to 216 (Park and Gardens, 2015). It is clear that it was impossible for Brown to personally supervise all these sites which supports Brown's (2011) view that Capability Brown ran a business making use of his contacts and reputation to gain commissions and using sub-contractors and associates to carry out the work. There is also evidence that he remained in contact with the clients through correspondence and site visits.

3. The 18th century

There were three significant developments that took place in the 17th and 18th centuries that supported Brown's work: - political stability and monetary policy encouraging a significant investment in manufacturing; improvements in transport to facilitate movement of people and goods; and improvements in land management to enhance agricultural production. The improvement in trade was driven by political stability during the Georgian era leading to the growth of cities and decline of rural communities which was facilitated by the Agricultural Revolution. It was the time of global expansion, which was triggered by the government's monetary policy following the creation of the Bank of England which, in turn, supported the government's economic policies (Dugan and Dugan, 2000). This was the start of the Industrial Revolution when investment and trade in textiles, iron and porcelain proved possible because of significant improvements in the transport system due to the River Navigation Acts (1651-1850), the Turnpike Acts (1663-1836) and the canal era (1763-1790). The 18th Century also saw a shift in the structure of society encouraging social and professional

networks. For example, the Smeatonian Society, formed in 1771 at the peak of Brown's activity, included eminent civil engineers who were known to, indeed worked with, Brown.

Modern civil engineering began in the 18th century with the development of canals to support the Industrial Revolution but the improvements in road construction, river navigation and land management were already underway using construction techniques to move /lift materials powered by people and animals; unchanged since Roman times (Figure 2). While the observational technique was practiced, the emergence of the mathematical and theoretical principles that facilitated the design and construction of civil engineering works, i.e. the works covered by Tredgold's definition, allowed more ambitious projects to be completed. Engineers such as John Grundy (Jr), John Smeaton, Henry Ince and James Brindley were among the first to distinguish themselves by specialising as civil engineers. This was the time of the Agricultural Revolution leading to a significant increase in food production driven by changes in the marketing system, transport to move produce and improvements in agricultural processes. One aspect of the Revolution and of direct relevant to Brown's work was the art of land drainage. Thought to have been developed in the Netherlands as a way to better manage the low lying flat lands, the Dutch became pioneers in canal building, and with that, soil restoration and maintenance, soil drainage and land reclamation technology. They established two types of drainage systems, surface and sub-surface, both using gravity to serve the same purpose, to control the flow of water and to manage the level of the water table. The reduction in the volume of water in the soil would also consolidate the foundation soils, making embankments more stable, thus reducing the number of failures during construction. Therefore, the experience of land management, the transport network, the social and business networks enabled Brown to produce a large portfolio of work.

4. Capability Brown's roles

Brown, at the time, was known as a gardener, a gardener designer, an 'improver', an architect and an engineer (e.g. Public Advertiser, 1770) at a time when the terms civil engineer and landscape architect had not been introduced. He is now celebrated as a landscape architect. Brown (2011) suggests, based on a review of Capability Brown's bank accounts and estate archives, that he was associated with a project for a number of years but only visited the site occasionally to monitor progress and suggest further improvements. It was his associates who dealt with the day to day supervision of specialist subcontractors, estate workers and local contractors. Hence, Brown created a vision which he sold to the client leaving others to undertake the technical interpretation and implementation. This technique was used by civil engineers of the time e.g. James Brindley (1716-1772) would set out the alignment of a canal leaving the construction to his associates (Rolt, 1969).

This process also extended to his architectural works which included new houses (e.g. Claremont, Surrey; Redgrave, Suffolk; Croome Court, Worcestershire), refurbishment (e.g. Broadlands, Hampshire; Corsham, Wiltshire; Warwick Castle and Newham Paddock, Warwickshire; Burghley House, Northamptonshire), estate buildings (Milton Abbas, Dorset; Combe Abbey, Warwickshire) and garden structures.

His skills as a landscape architect are well known; his skills as an architect less so; and his skills as an engineer are almost unknown even though he was employed as an engineer on drainage schemes before moving to Stowe and as an engineer in Boston following the 1755 earthquake. Brown's engineering work included drainage schemes, canals, river diversion, dams, weirs, earthworks, bridge, roads and buildings with earthworks and water engineering being the most significant.

5. Major Engineering Works

Gregory et al (2013) suggested that draining the land around the house and creating a serpentine lake in the middle distance defined Brown's style. John and William Aislabie were the first to create this style (began in 1718) at Studley Royal, North Yorkshire; an English landscape of the Augustan Style. Stowe, where Brown moved to in 1740, was also an Augustan Style garden designed by Charles Bridgman (1690 -1738) and completed by William Kent (1685- 1748) and James Gibbs (1682-1754), leading landscape architects of the time. Thus, Capability Brown started his career working with the leading garden designers of the time before developing his own style, the Serpentine Style, which is a more abstract style with fewer formal structures compared to those used in the Augustan Style gardens. The other feature of this style of garden was that it was less about a public display of wealth and more about productivity (Turner, 2005). The Serpentine Style garden included a lake shaped in accordance with Hogarth's line of beauty (an S-shaped curved line) (Hogarth, 1753), a perimeter carriage drive, an encircling tree belt, clumps and individual trees and a turfed area below the house sweeping down to the lake. The engineering challenge was to create a landscape which did not necessarily conform to the existing topography yet appeared natural.

5.1 Earthworks

The scale of earthmoving in creating an English landscape was substantial and possibly exceeded civil engineering works of the time. The canal era was about to begin and major fortifications were no longer being built. The majority of Brown's sites were underlain by soft sedimentary rocks of the Cenozoic and Mesozoic periods (Figure 1) which were more easily excavated than the harder rocks of the Palaeozoic era to the north and west of the Tees-Exe line. Creating the English landscape required a significant labour force and time because of the quantity of material that could be excavated, moved and placed as shown in Table 2; typical volumes of soil that could be dug in a day and transported by barrow or animal drawn carts. For example, the Grecian garden at Stowe, which involved moving 18000m^3 of earth, took a year (Hinde, 1986) requiring 9400 man-days or 30 people working six days a week to excavate the soil with 225k barrow movements.

5.2 Water Engineering

Engineering aspects of the water features included earthworks to form canals, embankments, dams and lakes; drainage schemes to supply water and manage the ground water level to drain naturally boggy land; and sealing of lakes and dams. A key difference between the waterways Brown developed and those created for the early canals, was Brown created the landscape; canal engineers followed the landscape.

The use of weirs to control rivers, dams to retain water and systems to drain land and move water were well known but the scale of Brown's work far exceeded those for civil engineering structures of the time. Binnie (1987) suggested that Brown was responsible for at least forty earth dams though there is little written evidence of their design and construction. Skempton (2002) suggests that Brown was responsible for more dams at that time than anyone else. Polodak et al (2013) studied 53 water features attributed to Brown to show that 37 still exist today.

Binnie (1987) described the development of water retaining structures in the UK from the Roman period which places the work of Brown in context. The Romans built clay core dams with stone facings to retain water and aqueducts lined with puddled clay to transport water. Prior to the canal era, dams and weirs were used to provide power for grinding corn, fulling wool and driving bellows for iron work, to aid river navigation, and to catch and retain fish. In 1600, John Taverner described the construction of dams (Binnie, 1987) to use wetted earth to reduce permeability, allow for settlement of the crest before filling, remove turf before construction and use rock fill to protect the upstream slope from wave action. There was no reference to compaction even though compaction by ramming was used to create road subbases. Dams were built of earth, rock fill with clay cores and rock fill and brushwood depending on the local geology using the techniques described in Table 3a.

While there are few records of Brown's work it is known that he built earth dams (e.g. Wakefield Lodge), rock fill dams with a clay blanket covered by a layer of rock fill on the upstream face (e.g. Lince Dam, Blenheim), rock fill with a clay core (e.g. Grand Cascade, Blenheim) and rock fill dams with a clay core and clay cut off (e.g. Burton Constable) similar to the examples shown in Figure 3.

The type of dam depended on the availability of clay. An abundance of clay led to an earth dam with stone protection on the upstream face; limited clay led to rock fill dams with clay cores and/or clay blankets. The superficial deposits also influenced the construction of the lake in order to prevent water loss. Table 3b describes the process of creating clay liners attributed to Grundy Jr. Hinde (1986) suggested that Brown was using clay to seal dams and lakes in 1750 before the concept was introduced by Brindley in 1762 to the House of Commons.

Brown created the lakes by damming an existing river or by lowering the level of the land and filling it with water from nearby springs supplemented by drainage systems used to drain the land, especially around the house, to maintain the ground water level.

Brown's first major project was the design of the 700 acre gardens at Petworth House, West Sussex (1753) where the upper part of the lake is underlain by the Atherfield Clay, a generally massive sandy mudstone which weathers to clay, and the lower part of the lake and dam are founded on Hythe Beds, fine to medium sands, sandstones and silts (Figure 4). This 165m long, 7m high dam with an 11m crest earthfill dam has a clay core with masonry protection on the upstream face. The artificial lake at Petworth required some 60000 tonnes of soil to be excavated and moved (Attar, 2010). The south end of the lake is lined, possibly using excavated clay from the north end. The excavated soil was used to build the earth dam (approx. 15000 tonnes) leaving the remainder to modify the topography of the estate thus creating the artificial landscape. It would have taken twenty people two years to excavate the soil involving 416k barrow movements (Table 2).

Failures of his water retaining structures were not unknown. For example, Brown in 1756 wrote to the Petworth steward stating that 'I am doubtful the springs have abated. If that should be the case the sinking is the less to be wondered at, however if there are faults they shall be mended' suggesting the water level was falling which was either due to a reduction in supply from the springs that fed the lake or a leak from the base/sides of the lake. Brown suggested that it was a leak which meant a failure of the clay liner. His commitment to repair the leak is a characteristic of his work; he would charge for the work he did and repair if necessary.

Artificial lakes were also created by lowering the ground such as that at Burton Constable (1759), where Brown created a 1 to 1.5m deep lake in glacial till underlain by the Flamborough Chalk Formation to lower the water table avoiding boggy areas in the vicinity. The excavated material was used to create islands, another feature of Brown's designs. Hall (1995) uncovered minutes of meetings between Brown and his client, William Constable (of Burton Constable, East Yorkshire), which provides an insight into the development of Brown's thinking through a series of plans and notes. Most of the notes refer to planting but there are references to drainage, the lake and the Bridge. In particular, Brown required a clay wall to be constructed in a 0.5m wide trench excavated down to the natural clay and backfilled with strong clay creating an impermeable barrier, evidence of a clay cut off trench.

In 1751, Brown was engaged by Lord Coventry of Croome Court not only to develop the gardens but also refurbish the house, his first major architectural commission. The house was located in a swamp which required a system of culverts to drain the land into a pond and a 2000m lake (Stroud, 1975) (Figure 5), the level of which, was maintained by nearby springs. Brown spent some twelve years at Croome Court which is underlain by river terrace gravels and the Branscombe Mudstone Formation, a silty mudstone/clay. The lake had to be lined with clay possibly quarried from the nearby Westbury Formation. The 1.5mi long lake was created by damming a stream running though the estate using a weir formed of rockfill with an external clay wall (as opposed to a clay core).

Earth dams were used where there were significant deposits of clay such as the glacial till deposits found at Harewood House (1772) (Figure 6). Skempton (2002) suggests the 115 m long, 7. 6m high dam was constructed of glacial till; Binnie (1987) reported that the dam leaked as they filled the lake for the first time. It proved to be leakage along the side of the sluice which was permanently sealed possibly with clay. Brown also introduced siltation ponds at Harewood possibly because he became more aware of sedimentation in lakes later in his career.

The gardens at Blenheim Palace (1763-1773) are considered the most impressive works of Brown and, as it is a World Heritage Site, the most important. Brown was engaged by the 4th Duke of Marlborough to create the 150 acre Great Lake which included the Grand Cascade Dam, a 134m long by 8.8m high limestone rubble dam with a clay core and the Lince Dam, a 4m high limestone rubble dam with a clay blanket on the upstream face. He also rerouted the River Glyme through a canal cut into the side of the valley. The underlying rock is limestone overlain by alluvium in places. It was necessary to line the lake possibly using clay loam topsoil because of the lack of locally available clay.

Table 4 provides further details of gardens constructed over a thirty year period highlighting the relationship between the underlying geology and method of constructing the dams and lining the lakes. It appears that Brown and his associates developed their knowledge of water engineering through experience and working with other eminent professionals of the time.

6. Discussion

6.1 Engineering the landscape in the 18th Century

Gregory et al (2013) suggest that Brown was responsible for less than 5% of the gardens developed between 1740 and 1783; i.e. landscape architecture in the 18th century had a significant social and economic impact. The terms landscape architect and civil engineer were introduced by Humphrey Repton (1752 – 1818) in 1804 and John Smeaton (1774 – 1792) in 1771. Prior to that, architects were responsible for buildings and gardens and surveyors for roads. It was clear that the professionals developed their reputation across a number of disciplines. Shields (2006) suggested that Brown worked on Deeping Fen, a forty seven square mile low lying area in Lincolnshire, under the direction of Grundy Sr (1696 – 1748) prior to moving to Stowe. This project included a reservoir, embankments, dredging and sluices. Grundy Jr (1719 – 1783) worked with his father from 1739 but also undertook estates work at Grimesthorpe for the Duke of Ancaster including the construction of a dam and reshaping the land in front of the castle though the design of the estate is attributed to Brown.

The fact that Brown worked with Grundy Jr suggests that many of the techniques he used were adopted from Grundy Jr's designs. This ability to develop his skills and knowledge by observing other's work is a feature of Brown's career. He worked with Robert Adam (1728 – 1793) the architect at Lutton Hoo, Harewood House and Compton Verney; yet ran his own architectural practice from 1750.

Most of Brown's major designs adapted existing parkland to create the Serpentine Style garden; that is he had a master plan which could be adapted to suit the local topography. Brown had a reputation of being able to ride around an estate and develop a plan that led to a commission which would last several years. During that time he would visit the estate on several occasions, review work in hand and give further instructions. The pace of construction together with the improvements in transport meant that this was entirely feasible.

Thus Brown, by working with other professionals, developing partnerships, creating teams and maintaining contact with the clients was able to develop a successful business at a time when there was sufficient wealth and labour to transform country estates.

Brown did undertake engineering works and was employed as an engineer on at least one occasion but most of his engineering works were part of the overall design to create a style of landscape garden. His ability to appreciate the image that his design would create, which included the landscape, the aspect from the house and horticultural features, was very important because of the time it took to create the landscape and for the trees to grow meant that clients had to have faith in his vision.

Brown's work included remodelling of complete estates, design of new and refurbished buildings and amendments to existing estates. He did not supervise the work on a day to day basis but employed surveyors, foremen, architects and others to undertake the work. In turn, they employed a local labour force. Thus, it was his ability to delegate the construction to his associates and maintain the confidence of his clients over a sustained period of time that contributed to his success.

6.2 Conserving the 18th Century landscape in the 21st Century

There have been a number of eras of civil engineering that created a legacy that still function today (e.g. drainage schemes (17th century), canals (18th century), railways (19th century) and motorways (20th century)). The 18th century English landscape gardens, even though they are not national infrastructure, can be added to this list because of the scale of the engineering works and the fact that many still function today because of planned maintenance. They can be publicly or privately owned or owned by organizations such as the National Trust and English Heritage; collectively they help protect the UK's heritage and opens spaces.

The 18th century landscape gardens were designed to be sustainable and they continue to be through management of the land, water features, drainage schemes, roadways and buildings. For example, in 2009 a new dam was constructed at Blenheim Palace to replace one which had been subject to leaks since the 1840s. The dam retains 6000 thousand cubic metres of water and, to comply with the 1975 Reservoirs Act, has to withstand a 1 in 1,000-year flood and over-topping in a 1 in 10,000-year flood event (BBC News, 2009). The original dam with a clay and rubble core was repaired by installing a bentonite filled trench to prevent leaks and reinforced with 6000m^2 of concrete blocks to resist overtopping replacing the earth covered stone walls used by Brown.

Firth (1980) describes the case for identification, preservation and adaptation of the landscape at Harewood, Yorkshire, representative of the problems facing many other English 18th century landscapes; that is sustainable management of the estate. Much of the 18th century masonry and structural work remains intact because of the original over engineering. The drainage system and the bridges are still operational. The lake was drained and dredged around 1900 because of siltation and the weir forming the major trout pond was washed out in 1950 and repaired in 1963.

Podolak et al (2015) undertook a review of the 53 water features on 23 estates produced by Brown and noted that 70% still exist today due to periodic maintenance. This includes dredging to remove sediment, removing vegetation and repair of water retaining structures. Most of the gardens lie to the south of the Tees Exe line in an area underlain by the 'softer' rocks of limestones, sandstones, chalk and clays. These were easier to work by hand allowing significant volumes of soil and rock to be excavated and moved by cart. The sediment yield for lakes formed from existing streams is significant leading to ongoing maintenance or partial or total loss of a lake (Polodak et al, 2015) though silt ponds were introduced by Brown towards the end of his career. Geological knowledge at the time was limited so the observational technique was used and it is clear that historical and contemporary knowledge was developed because of the advances in construction techniques shown in Table 4. For example, excavations for lakes that encountered sand and gravels would require a puddled clay liner; water retaining structures had clay blankets or clay cores in areas where sources of clay were limited.

These gardens are part of the UK's heritage which was recognized in the 1975 Finance Act as exempt from capital transfer tax ensuring land was not sold off to pay for death duties. Some of the water retaining structures are subject to the 1975 Reservoir Legislation Act. These have helped create a sustainable future for the immense civil engineering works of the 18th century.

5. Conclusions

Celebrating Capability Brown's' reputation as a landscape architect 300 years after his birth was an opportunity to review engineering aspects of his works. Brown was operating at a time when substantial modifications to country estates were underway. The social, political and economic conditions facilitated their development, which helped transform the English countryside leaving a legacy that is still in use today. The modifications collectively were probably the most significant civil engineering works of the time though by the end of the 18th century modern civil engineering had begun with the canal era leading into the Industrial Revolution. The steam engine had been invented and was in use to dewater mines but the power Brown needed came from people and animals. Therefore, the scale of his work was all the more impressive given that it relied on a large workforce distributed throughout the country during the thirty three years he ran his architectural practice.

Brown is known as a landscape architect but at that time he would have been known as a gardener or architect given that architects designed buildings and gardens. There are references to Brown as an engineer and it is clear that many of his commissions included substantial engineering works. However, it does appear from the secondary literature that he left the detail to associates, which included architects (e.g. Henry Holland), surveyors (e.g. Samuel Lapidge) and contractors (e.g. Milliken). Given that the detail of the engineering works was within the construction team there was little engineering design. It was based on existing knowledge, experience, learning from others and the observational technique creating a legacy that exists today. Brown's aim was to produce a sustainable landscape which has been demonstrated through continued maintenance of the planting and engineering structures.

Much of Brown's work has survived. This is partly due to over engineering and partly due to planned maintenance. The main issues have been the silting of lakes and ponds and loss of water from lakes due to leakage through the liner or earth dams. Many of the water retaining structures are subject of the 1975 Reservoir Act, which, together with increased public access, has ensured the remaining gardens continue to be engineered.

References

Attar, R. 2010. The English Landscape garden. History Extra. 16 August.

BBC News (2009) http://news.bbc.co.uk/local/oxford/low/people_and_places/history/newsid_8327000/8327366.stm (accessed 01/11/2016)

Binnie, G. M. 1987. Early dam builders in Britain. London: Institution of Civil Engineers, Thomas Telford Ltd.

Brown, J. (2011) Lancelot 'Capability' Brown, 1716-1783: The Omnipotent Magician. London: Chatto & Windus

Dugan, S. and Dugan, D. (2000) The Day the World Took Off - the Roots of the Industrial Revolution: Channel 4, London

Firth, I.J.W. (1980) Landscape management: the conservation of a Capability Brown landscape – Harewood, Yorkshire: Landscape Planning, 7, pp.121-149, Elsevier Scientific Publishing Company, Amsterdam

Gregory, J. et al. 2013. A Research Impact Review Prepared For English Heritage By The Landscape Group, University of East Anglia, English Heritage

Hall, E. (1995) 'Mr Brown's Directions': Capability Brown's Landscaping at Burton Constable (1767-82). Garden History. 23(2), pp.145-174.

Hinde, T. (1986) Capability Brown – The Story of a Master Gardener. London: Century Hutchinson Ltd.

Hogarth, W (1753) The Analysis of Beauty

Hyams, E. (1971) Capability Brown & Humphry Repton. London: J. M. Dent & Sons Ltd

ICOMOS- UK (2016) Capability Brown: Perception and Response in a Global Context, University of Bath, UK

Morgan, M H (1914) Vitruvius: The Ten Books on Architecture, Harvard University Press

Podolak, K., Mathias Kondolf, G.M., Mozingo, L. A., Bowhill, K. and Lovell, M. (2013) Designing with Nature?: The persistence of Capability Brown's 18th century water features; Landscape Journal: design, planning, and management of the land; Volume 32, Number 1, pp. 51-64

Public Administrator (1770) 6th September 1770

Roberts, J. (2001) 'Well Temper'd Clay': Constructing Water Features in the Landscape Park. Garden History. 29(1), pp.12-28.

Rolt, L. T. C. (1969) Navigable Waterways. London: Longmans, Green and Co Ltd

Shields, S. (2006) Mr Brown Engineer. Garden History, 34(2). pp. 174-191

Skempton, A. W. (2002) A Biographical Dictionary of Civil Engineers in Great Britain and Ireland 1500-1830. London: Thomas Telford.

Stroud, D. (1957) Capability Brown. London: Country Life.

Turner, R. (1985) Capability Brown and the eighteenth-century English landscape. London: Weidenfeld and Nicolson.

Turner, T, (2005) Garden History Philosophy and Design 2000 BC to 2000 AD, Spon Press

UK Legislation: 1975 Finance Act: http://www.legislation.gov.uk/ukpga/1975/7/contents (accessed 01/11/2016)

UK Legislation: 1975 Reservoirs Act: http://www.legislation.gov.uk/ukpga/1975/23/contents (accessed 01/11/2016)

List of Tables

List of Figures