

**HYDROLOGY RESTORATION: ARCHAEOLOGICAL SURVEY
WREST PARK GARDENS
SILSOE
BEDFORDSHIRE**

OLD PARK WEIR

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Preface

Every effort has been made in the preparation of this document to provide as complete a summary as possible within the terms of the method statement. All statements and opinions in this document are offered in good faith. Albion Archaeology cannot accept responsibility for errors of fact or opinion resulting from data supplied by a third party, or for any loss or other consequence arising from decisions or actions made upon the basis of facts or opinions expressed in this document.

This report has been prepared by Hester Cooper-Reade, with contributions from Jane Blanchflower (documentary) and Mercedes Planas (survey). Documentary Research was undertaken by Jane Blanchflower and the measured survey was undertaken by Souterrain Ltd (Mercedes Planas and Martin Wilson). The project was managed by Hester Cooper-Reade, assisted by Gary Edmondson.

Albion Archaeology is grateful to Edmund Hobday of BEA Landscape Design Ltd, who commissioned the work as part of the hydrological restoration scheme on behalf of English Heritage. Albion Archaeology would also like to acknowledge the assistance and cooperation of the following:

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The staff of BLARS, particularly James Colett-White

Mike Turner, formerly Head of Estate Services

*Albion Archaeology
St Mary's Church
St Mary's Street
Bedford, MK42 OAS
☎: 01234 294006
Fax: 01234 294008
e-mail: office@albion-arch.com*

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Structure of the Report

After the introductory Section 1, there is a summary of the methodology in Section 2, followed by the results of the documentary and cartographic study (Section 3) and field survey (section 4). A short assessment of the results is included in each of the relevant sections. Section 5 summarises the main conclusions. Section 5 is a bibliography. The subsequent appendices contain further details of the documentary and cartographic results, including a chronological table and notes on the current water management systems at Wrest Park. Figures and plates (photographs) are bound at the back of the report.



Key Terms

Throughout this report the following terms or abbreviations are used:

<i>Albion</i>	Albion Archaeology
<i>BCAS</i>	Bedfordshire County Archaeological Service
<i>BCC</i>	Bedfordshire County Council
<i>BLARS</i>	Bedfordshire and Luton Archives and Records Service
<i>Client</i>	English Heritage
<i>HER</i>	Historic Environment Record
<i>IFA</i>	Institute of Field Archaeologists
<i>Procedures Manual</i>	<i>Procedures Manual Volume 1 Fieldwork, 2nd Edition 2001.</i> Bedfordshire County Council



Non-Technical Summary

During April 2007 Albion Archaeology undertook an archaeological survey of the Old Park Weir on behalf of English Heritage. The work was commissioned on behalf of English Heritage by BEA Landscape Design Ltd as part of the hydrology restoration project. This results described here represent an initial stage of work comprising desk-based study and a survey of the Old Park Weir.

Wrest Park is located on the southern margins of the greensand ridge at the eastern edge of the village of Silsoe and approximately 15 kilometres south of Bedford. Old Park Weir links Old Park Water with Serpentine Water and lies on the western edge of the current park. It is one of a number of weirs forming part of a complex water management system linking the various waters, canals and lakes, most of which were laid out in the 18th century.

The 40 hectare designed landscape at Wrest Park dates from the 1650s onwards, although the encircling canals including Old Park Water and the Serpentine achieved their present form during the landscaping works carried out by Brown 1758-1760. For the most part, however, Brown's designs were created by modifications in shape to earlier water bodies constructed from the period 1702 - 1720. Although the precise date at which the weir was built is unclear, it is known that Old Park Water and the Serpentine were completed around 1760 and that the great variation in levels necessitated at least the need for a bank (BLARS: crt 190/45). It is quite possible that Old Park Weir was created at this point, or soon afterwards, as the requirements for managing the water systems became more apparent.

Old Park Weir is a stone-built, broad-crested weir and spillway, which controls the flow of water between Old Park Water to the north and the Serpentine to the south. The weir and associated structures comprise the weir itself, a spillway with manhole for manual release of water and retaining wall around the northern end of Old Park Water. Trees, now removed, have split the wall in various places and the western bank wall is showing signs of slumping. The concrete capping repaired and replaced in 1971 is loose and in places fragmentary. Dredging of Old Park Water and the Serpentine was large-scale and took place on a number of occasions. Both draglines and excavators were used for this work and it is likely that beyond the protection of the associated structures the silt build ups would have been formed relatively recently

It is possible to make some tentative suggestions as to the possible developmental sequence of Old Park Weir. However, without further investigative work, and in the absence of specific documentary evidence, this remains largely conjectural.



1 INTRODUCTION

1.1 Background to Project

In April 2007 Albion Archaeology was commissioned by Bea Landscape Design Ltd, on behalf of English Heritage to undertake an archaeological desk-based study and survey of the Old Park Weir prior to restoration work. The work was undertaken in accordance with a design brief and method statement agreed with English Heritage (Bea Landscape Design Ltd, 2006).

Project requirements meant that this current phase of works was limited to a survey of the Old Park Weir, although it is anticipated that this report will be integrated into a wider archaeological report once further works have been agreed. This report will be submitted to Bea Landscape Design Ltd for inclusion in their documentation relating to the hydrological restoration scheme. As commissioning agents Bea Landscape Design Ltd are overseeing the work and liaising directly with English Heritage.

1.2 Site Location (Fig. 1)

Wrest Park is located on the southern margins of the greensand ridge on a gentle south-facing slope, at the eastern edge of the village of Silsoe and approximately 15 kilometres south of Bedford. It is centred at TL 09100/35100. The soil is a calcareous gley type of the Wicken association over gault clay.

Old Park Weir links Old Park Water with Serpentine Water and lies on the western edge of the current park. It is one of a number of weirs forming part of a complex water management system linking the various waters, canals and lakes, most of which were laid out in the 18th century.

1.3 General Background (Fig. 2)

Wrest Park is Listed Grade 1 on the English Heritage Register of Parks and Gardens. In addition the house and garden areas are within a Scheduled Ancient Monument. The park and surrounding land has been designated as a conservation area by Mid Bedfordshire Council.

The 40 hectare designed landscape at Wrest Park dates from the 1650s onwards, when Amabel (second wife of Henry Grey, 10th Earl of Kent), her son Anthony and his wife Mary began constructing a 'new' garden using Amabel's personnel wealth and, from 1871, that inherited by Mary after the death of her father. Although much of the visible form of the gardens dates from 1758-60 when the park was landscaped under the direction of Lancelot Brown, significant elements of the pre-existing formal garden survive, making Wrest Park one of the best remaining examples of pre-landscape formal gardening in England. The encircling canals including Old Park Water and the Serpentine achieved their present form during the landscaping works carried out by Brown, although, for the most part, these were created by modifications in shape to earlier water bodies constructed from the period 1702 - 1720.

The system of canals at Wrest Park is man-made and relies on a series of built structures to control and retain water. The present pumped system was adapted in



1972 and relies on a circulating pump since the original spring in the Bath Ground no longer flows. The banks of the water bodies are formed in natural clay and prone to erosion, particularly if there is regular fluctuation in the water levels (LUC, 1993). Ongoing repairs of the banks and weirs still involve puddling of the clay to prevent leakage (Slatcher pers. com.). The farm ditch entering at the north-west corner has significant catchment and also carries storm water run-off from the A6 Silsoe bypass. It appears to have some silt load which has caused deposits at slack points in the system such as the heat of Old Park Water and its overflow (LUC, 1993). The canals accumulate leaves and general vegetational debris, but the west side is less affected than the central or eastern areas because of prevailing wind direction and lack of parkland trees.

Various works to repair and restore elements of the water management system have been undertaken since the late 1940s. However, this work has been of varied success and in some cases has contributed to the current drainage and erosion problems which exist around the park. In 1983, The Department for Ancient Monuments and Historic Buildings commissioned an historical survey of Wrest Park and began to develop a management strategy for the continuing restoration of the gardens (LUC 1983, 1993). These reports on the historical background and development of the gardens were drawn up by Land Use Consultants and contain useful summaries of the chronological development of the park, copies of many of the relevant maps and plans and documentary references, many of which refer to the Estate Records held in the Lucas Archive at BLARS. As part of this current phase of restoration of the gardens, English Heritage is planning to reinstate and repair the water courses and has adopted a policy of informing the restoration process through archaeological investigation and research.

Previous archaeological investigations within the Wrest Park Gardens include a survey of garden features and archaeology (Albion Archaeology 2002) and several excavations and geophysical surveys carried out by BCAS/Albion Archaeology (Dawson, 2001) and the Amptill & District Archaeological and Local History Society (BLARS 120 SIL acc, 12056) during the late 1980s and 1990s. Although the basic chronology relating to the development of the water courses can be surmised, precise references to the various water structures, lakes and canals are generally sparse and the location referred to is often obscure.

The management plans (LUC, 1983, 1993) provides a chronological framework for the main periods of garden development, outlining seven key phases

- Williamite Landscape 1671-1702
- Great Garden First Phase 1702-1720
- Great Garden Second Phase 1720 – 1730
- Great Garden Third Phase 1730 – 1740
- The Romantic Landscape 1740-1800
- Earl de Grey, The French Landscape 1797 – c.1859
- Victorian Landscape 1859 – 1916



2 METHODOLOGY AND LIMITS OF THE SURVEY

2.1 General Methodology

The current investigation comprised desk-based study, measured survey, field study and photography and was limited to the Old Park Weir and adjacent areas. The desk-based study was likewise limited to documents relevant to the development of the water courses and associated structures and, although this was undertaken within a wider remit, this report concentrates on those elements of the study that relate to the Old Park Weir.

The work was carried out in accordance with the archaeological brief issued by Bea Landscape Design Ltd (limited to the Old Park Weir by subsequent correspondence) and relevant IFA Standards and Guidelines.

2.2 Methodology: Desk-based Study

The desk-based study involved visits to BLARS and Wrest Park itself. The Head Gardener, Chris Slatcher, was interviewed as part of the study and documents and photographsheld in the gardeners' archive were examined. Summaries of the documentary evidence are included in the appendices attached to this report.

2.3 Methodology: Survey

A dual frequency GPS system, a Leica SR530 was used to establish four control points to the OS co-ordinate system on open ground in the vicinity of the weir.

A Leica Total Station TCR 705 was then set up at one of the control points and the outline of the structure was surveyed. This included all visible tops and bottoms of the weir and associated structural features.

The elevations of the three walls of the weir were then surveyed using the reflectorless mode of the instrument, recording all visible coursework and cracks within the structure.

The survey was complemented by digitally rectified photography (where it was possible to do so safely) to record the detail of the stonework. This method comprised the use of survey targets, which were arranged to include at least four of each on every photograph. The targets were then surveyed. Photographs were taken by a 5.0 mega-pixel resolution digital camera. Each photograph was then computer-rectified and the details of features digitised in AutoCAD.

Survey Illustrations

The weir is presented in four figures (11-14). The first (Fig. 11) is a location plan and detailed plan of the weir. The other illustrations (Figs. 12-14), each show a separate elevation of the wall of the weir, a location plan and a perspective view.

Details of the survey:

Date:	20th, 23rd and 24th April 2007
Surveyor:	Mercedes Planas MIFA
Survey Assistant:	Martin Wilson MIFA



Equipment: Leica Total Station TCR 705
Leica GPS Dual Frequency S530
Software: Leica Geo- Office
AutoDesk Map

2.4 The Photographic Survey

The Photographic archive will comprise both digital and print film using digital SLR-type format and 35mm and 120mm print film.

2.5 Limitations of the survey

Although Old Park Water had been drained prior to the survey, the depth of wet silt at the base of the lake, to the north of the weir, and the depth of water, to the south of the weir, in the Serpentine, meant that close access to the main faces of the weir was limited. No examination of the weir was possible below the water line to the south or the level of the silt to the north. Whilst some vegetation was trimmed to allow better examination of the stonework, detailed cleaning of the weir faces was not undertaken. A detailed examination of the weir was however made from the areas that were accessible. All measured survey work was undertaken electronically and by GPS.



3 DOCUMENTARY AND CARTOGRAPHIC STUDY

3.1 Introduction

The results of the current study are summarised below, 3.2. Whilst this section is largely concerned with the development of the water courses, specifically the Old Park Weir and its associated waters, brief general historical background relating to the development of the park has been included for clarity of understanding. A detailed summary of the documentary evidence, a chronology of the waterways and a summary of the current water management systems at Wrest Park (largely Chris Slatcher pers. com.) are included as appendices.

3.2 Brief History of the Development of the Water Courses

3.2.1 Williamite Landscape 1671-1702

In 1658 the garden constructed by Amabel (1606-1698), second wife of Henry Grey, 10th Earl of Kent, and her son and his wife, was described as ‘new’ (BLARS: 228/12). This ‘new’ garden had been constructed in the grounds of a large moated tudor manor which stood to the north of the current house at Wrest Park. During this period the Long Canal was built c.1686-88 by constructing a dam across a shallow valley (BLARS L31/288). This is largely the garden shown in Kyp’s engraving of 1705 (Fig. 3; BLARS X254/88/22/a), although it is not clear whether the original moat (?with the exception of the western remnant from which a diagonal canal had been constructed) had been infilled during this period or during the early years of the subsequent phase.

Kyp’s engraving of the park clearly shows the line of the ha-ha running from what is now the location of Old Park Weir, north westwards towards the edge of the park. The engraving appears to show a bridge or ?structure crossing the stream where it meets the ha-ha.

3.2.2 The Great Garden Phase 1: 1702-1720

Henry Grey, (1671-1740), 1st Duke of Kent and grandson of Amabel, inherited Wrest Park in 1702 after a Grand Tour of the Netherlands, Germany and Italy. He expanded the gardens focussing particularly on canals and avenues of trees which reflect his experience of the Netherlands and England (Halpern, 1995)

Between 1702 and Kyp’s engraving of 1705 works on the garden continued. These included the laying of pipes from the canal in the chapel garden (east of the old house) to the millpond and, in 1704, the ‘filling up’ of the moat (BLARS L33/289/79; L31/289/156, 157, 162). The canal referred to is probably one of the diagonal ones shown on Kyp’s engraving. The alignment of the northernmost of the diagonal canals indicates that it was likely fashioned from part of the original moat, although further alterations to the southernmost diagonal canal, and the addition of canals at right angles to and either side of the northern end of the Long Canal are described in 1707 as ‘skilful use of the old moat and nearby stream’ (BLARS: L31/289/220). The reference to the skilful use of the stream may refer to alterations to the brook to the south east of the mill pond although this was not fully canalised until 1718 (LUC, 1993). Between 1707 and 1709 further additions to the water courses were made, and by 1711 the Archer



Pavillion had been built at the southern end of the Great Canal. This was followed, in 1713, by the enlargement of the brook to the south of the Great Canal (Collet-White, 1983). The reference to the ‘filling up of Mr Acker’s canal’ in 1716 (BLARS: L30/8/33/22) probably refers to the filling in of the northernmost diagonal canal to the east of the old house, which, on Laurence’s 1719 plan, has been replaced by a terrace.

Laurence’s plan (Fig. 4; BLARS: L30/8/87; L33/286 f.33) shows the extent of the works that took place in this period, although the brook running along the western edge of the gardens is little altered. On this plan too, the subsequent location of the Old Park Weir can clearly be seen at the point where the ha-ha/ride (west) and newly created garden ride (east) meet.

3.2.3 The Great Garden Phase 2 1720-30

Although the exact locations are uncertain, the accounts give a picture of the 1720s as a major period in the development of the waterways at Wrest Park. In 1723 work took place around the Great Canal and the canal ‘next Old Park’ (BLARS: L31/292/331-340). Work also took place on the new octagonal basin south of the Archer Pavillion (BLARS: L31/198). Tilemans sketches 1728-29 (BLARS: L31/199) show a formal southern canal with octagon-shaped lake and a linear canal in the south-west corner running from the southern canal up to meet the other western linear canal. This had disappeared in the first Roque plan of 1735 (Fig. 5; BLARS: x95/230), being replaced by the Serpentine Lake and the Bastion at its northern end.

3.2.4 The Great Garden: Phase 3 1730-1740

During this phase the gardens were established in a form that has largely endured to the present day. The designs are recorded by Rocque in two engravings of 1735 and 1737. By 1735 the Serpentine Lake had been constructed and the ‘spade’ end of the Great Canal re-shaped. On the first Roque Plan (1735) wings are shown at the northern end of the Great canal, although by the second Roque plan of 1737 these had been infilled.

3.2.5 The Romantic Landscape 1740 – 1800

After the death of Henry Grey, 1st Duke of Kent, in 1740, the estate passed to his granddaughter, Jemima Yorke, later the 2nd Marchioness Grey. Jemima, who controlled the estate until her death in 1797, had a considerable influence on the development of the garden and limited the dominance of the Romantic landscape (Godber, 1963). Apart from the joining together of the outer canals, removal of formal gardens near the Archer Pavilion and the planting of more trees, the lower gardens remained virtually unaltered. However, visits by Lancelot Brown in 1758-60 and again in 1778-9 resulted in alterations to the grounds, including the softening of the lines of the water courses (Godber, 1963). From the later 1770s to the end of the Napoleonic Wars the gardens at Wrest were maintained but not significantly altered.

The joining of the Serpentine with Old Park Water appears to have taken place in around 1760 when the documents record that the waters behind the Bowling Green were joined, and one end turned through the ‘little additional grove’ into the ditch which comes from the mineral spring, the other carried to meet the Serpentine where from the difference in levels, ‘more than could be overcome by



digging', there must be a bank of earth which planting and shrubs must conceal (BLARS: crt 190/45).

3.2.6 Earl de Grey, The French Landscape 1797 – c. 1859

On Jemima's death in 1797 the estate passed into the hands of Thomas, Earl de Grey who, in 1834, pulled down the old house (Collett-White 1991 a & b) and built a new French-style mansion further to the north. Parterres were created around the new house and, in 1835, an orangery was constructed (Dawson, 2001).

3.2.7 Victorian Landscape 1859 – 1916

During the remainder of the 19th century into the early 20th, minor changes and additions took place, although the gardens were well maintained as evidenced by a series of photographs by Country Life Magazine in 1904.

3.2.8 Later Developments 1916 – present

In 1916 Wrest Park became a military hospital and in 1917 was sold following the death of Lord Lucas. Many of the trees were subsequently felled and sold as timber and, in 1934, statues from the garden was disposed of and the estate purchased by the Essex Timber Company. In 1946 The Ministry of Public Buildings and Works bought the Park and, in 1947, leased it to the National Institute of Agricultural Engineering. At this time the gardens were neglected and in a poor condition. Most of the lakes were silted up and overgrown with reeds. A photograph seen as part of the documentary study (un-catalogued gardener's archive) shows crops growing on the site of the Long Canal after the draining of water from the lakes during WWII.

From 1947 a series of ad hoc works took place until, in 1983, the Department for Ancient Monuments and Historic Buildings commissioned the historical survey undertaken by Land Use Consultants (1983, 1993).

The works undertaken from 1947 include a number of episodes of dredging. An oblique aerial shot dating to 1952 appears to show the entire Broad Water drained for excavation of silts (LUC, 1993). The condition of Old Park Water and Serpentine River indicates that these may have already been cleared. Various undated photographs show dragline excavation of the silts, including those that had been allowed to build up in Old Park Water and the Serpentine. Further dragline excavation of the silts took place around 1965, and again in 1970, although the extent and location of this work is unknown (LUC, 1993). Dredging at various locations, including Old Park Water and the Serpentine, took place in 1973 and again in 1988, the latter involved de-silting of the Leg O' Mutton Lake and was carried out under archaeological observation (Dawson, 2001).

Between 1970 and 1973 various works were carried out on the weirs and banks of the water bodies, including repairs and maintenance of the Old Park Weir. A specification dated October 1971 includes cutting down of trees and clearing of weed growth from the masonry, removal of loose stonework and replacement in cement mortar. In addition the concrete sill was to be packed out where cracked or hollow, and re-constructed with re-inforcing mesh in 4:2:1 concrete. Works in 1973 included repairs to the wing walls by the manhole at Old Park Water and a diversion for manual emptying of Old Park Water (un-catalogued gardeners' archive).



3.3 Summary of evidence relating to Old Park Weir

Although the precise date at which the weir was built is unclear, it is known that Old Park Water and the Serpentine were completed around 1760 and that the great variation in levels necessitated at least the need for a bank (BLARS: crt 190/45). It is quite possible that Old Park Weir was created at this point, or soon afterwards, as the requirements for managing the water systems became more apparent. The earlier plans (e.g., Rocque) and (?)Jeffrey's County Plan of 1765, apparently show a bridge at this point linking one of the rides within the garden to the Old Park. Mike Turner suggests Twin Waters (River Hit) Weir was constructed soon after the formal pattern had been established following flooding problems with the southern lakes (1991). Although both Old Park and River Hit Weir have undergone episodes of repair and re-building, it would be logical to assume that they were built around the same time.

The demarcation between the Old Park Water and the Serpentine is clearly shown on Earl de Grey's plans of 1834 (see Dawson, 2001, plate 4:86) but there is insufficient detail to show the presence of a weir, although the bridge shown in the previous plans does not appear. It is not until the 1st edition OS map of 1880 (fig. 6) that the weir (or waterfall) is clearly marked. The current weir has a curved spillway to the west which is only evident on the 1924 OS map (fig. 8).

A 1:2500 plan dating to 1971 (un-catalogued gardeners' archive) contains diagrams of weirs and sluices with annotations detailing necessary repairs. An accompanying specification details repairs to the Old Park Weir, including repairs to the concrete sill (Un-catalogued Gardeners' Archive). The 1971 plan also shows the spillway with its wooden sluice gates, prior to the insertion of the concrete drain and manhole. A comparison between this drawing and the current survey (fig. 11), suggests that the angle of the spillway was tightened as a result of these works and that the stonework along the opposing bank may have been extended, to prevent erosion opposite the spillway exit. The undated plan gives the OD height of weir spillover level as 170.16 (53.0733m), slightly lower than the current level of around 53.22mOD, and also indicates that sections of weir and retaining wall around the southern edge of Old Park Water are leaking and require repair.

A bill of works dated to November 1973 includes a dredging contract for Old Park Water and the Serpentine, in addition to repairs to the wing walls by the manhole at Old Park Water and the diversion for manual emptying of the Old Park Lake (un-catalogued gardeners' archive).

3.4 Assessment of Results: Documentary Study

The documentary and cartographic study has allowed a better understanding of the development of the water courses at Wrest Park, although many of the references are somewhat oblique and difficult to place geographically within the park. Similarly many of the plans do not show sufficient detail of the weirs and other water structures to allow a detailed chronology of every development, particularly minor changes and alterations. However, the study has enabled the drawing together and summarising of a large body of knowledge, particularly the personal recollections of the current head gardener, Chris Slatcher (1979 to present), and the previous Head of Estate Services, Mike Turner (appointed to



post 1984). The un-catalogued gardeners' archive (see appendix 2) provides important information on the state of the waterways, including various repairs and restorations from the early 1970s to the present.

Although much of the information is already known, the disparate nature of both the secondary and the primary sources has meant that , with the exception of Mike Turner's chronology (1991, BLARS 130 SIL Acc 11145), there are few studies detailing the complex chronology and workings of the water systems at Wrest.



4 FIELD SURVEY

4.1 Description of Weir and Evidence for Restoration and Repair

The results of the measured survey, including height data are illustrated as Figs. 11-14.

Old Park Weir is a stone-built, broad-crested weir and spillway, which controls the flow of water between Old Park Water to the north and the Serpentine to the south. The weir and associated structures comprise the weir itself, a spillway with manhole for manual release of water and retaining wall around the northern end of Old Park Water. Trees, now removed, have split the wall in various places and the western bank wall is showing signs of slumping. The concrete capping repaired and replaced in 1971 is loose and in places fragmentary (un-catalogued gardeners' archive).

The weir is built from random blocks of the typically iron-rich greensand seen in many local buildings. Similar size blocks have, however, been selected for each of the courses to ensure that each was built level. The weir has been entirely re-pointed using cement and capped with a concrete sill. In general, particularly within the bank walls, larger blocks are used towards the base of the structure.

It is possible that the retaining wall continues as one build, along the back of the main weir wall (Plate 21). The stonework of this part of the weir is visible where the silt deposits are slightly lower to the south-east corner of the weir and the build is certainly similar to that seen in the more visible parts of the retaining wall where they exist around the western and eastern edges of Old Park Water. Slightly different levels and a crack in the current concrete capping mark the edge of the main weir wall and the narrower wall along its southern edge. However, without excavation of the silt and removal of the concrete capping, it is difficult to ascertain whether the retaining wall and the southern most section of the weir wall are indeed the same build

Structurally, the bank walls of the weir are not tied into the main weir wall, but butt up to and over that wall (Plates 19 and 20). Examination of the eastern bank wall shows this clearly, but the cement pointing on the western bank wall makes this harder to discern. However, it appears that both bank walls are of a similar construction, using similar lifts of stone with the larger blocks to the base. The main weir wall contains more random stonework throughout.

The spillway which first appears on the 1924 OS Map (fig. 8) (date of construction unknown, although it doesn't appear on the 1901 OS Map (fig. 7), has been substantially rebuilt, probably as a result of the works specified in 1971 (Plates 11 and 12). Comparison with the plan specifying the works to this weir in 1971 (fig. 10) and the current plan (fig. 11) show that wooden sluice gates were replaced with a concrete drain and that the spillway curve was tightened, particularly on its western edge. The western edge of the spillway and the eastern edge up to the point where it butts the western bank wall are built of machine-cut bricks and the concrete capping is integral to this build. Part of this re-build included the insertion of a large concrete drain as a replacement to the wooden sluice gates shown on the 1971 drawing (fig. 10).



4.2 Structural History of the Weir

It is possible to make some tentative suggestions as to the possible developmental sequence of Old Park Weir. However, without further investigative work, and in the absence of specific documentary evidence, this remains largely conjectural.

1. Retaining wall around southern edge of Old Park Water; bank behind to cope with change in levels mentioned in the documentary evidence. The documentary evidence suggests a difference in levels, 'more than could be overcome by digging', which necessitated a bank of earth 'which planting and shrubs must conceal'
2. Flooding in the south of the park (see Turner, 1991) and possible associated problems with the area between Old Park Water and Serpentine necessitate the building of Twin Waters Weir and Old Park Weir. In the case of the Twin Waters Weir, Turner (1991) suggests that this would have occurred shortly after completion of the 1760 works when problems such as flooding would have become apparent. The main weir wall is all that survives of this phase. There is no sluice. The construction of the bank walls may have mirrored the current layout although this is uncertain.
3. Sometime between 1901 and 1924, but probably prior to the Great War, a sluice was added to improve the management of water between Old Park Water and the Serpentine. Prior to the war, the park was well-maintained, although little substantive works took place. Improvements or repairs, including an element of structural re-building would be entirely consistent with the general maintenance of the park. At the same time or possibly later (at least prior to the restoration works in 1971) the bank walls were replaced, possibly re-using original stone. These walls are not tied into the main weir wall. The weir was capped with concrete at this point or some time later.
4. The 1971 works replace the wooden sluice gates with a concrete drain and tighten the angle of the sluice itself. The new build is clearly discernible by the use of machine-cut blocks; the outline of the old curve can be seen where the sluice edge on the serpentine side joins that canal. The 1971 plan appears to show the eastern bank wall as shorter than the present one. Yet, despite slumping and cracking, the eastern bank wall is clearly of one build. An alternative scenario is that the bank walls were re-built after, rather than before, the re-alignment of the sluice, possibly as a result of erosion caused by the faster flow of water towards the eastern bank opposite the outfall of the sluice.

4.3 Assessment of Results

The field survey did not involve intrusive work and as such was limited by the visible and accessible parts of the structure. However the results, when taken with the documentary evidence, suggest that the history of the weir was complex and that the existing structure may include a number of different episodes of repair and rebuild. Lack of precise documentary evidence means that at present the suggested structural development of the weir is only conjectural. Further exposure of details of the structural elements including removal of the concrete capping, some removal of the surrounding silt in order to further investigate the edge of Old Park Weir and a detailed investigation of the change in level between Old Park Water and the Serpentine would be required in order to further elucidate the history of the weir. However, it should be noted that the dredging works that are known to have taken place on a number of occasions were essentially destructive and the location of original banks and surfaces beyond the protection of the structures is unlikely.



4. CONCLUSIONS

- Although the documentary evidence gives a good overview of the development of the landscape and formation of the main water bodies, specific detail is often lacking or unclear. Later records that may give hints as to the repairs and renovations that have taken place since the 1940s are patchy and often missing. Understanding the later modifications is often crucial to establishing whether earlier structural elements survive and although some useful records exist in the un-catalogued gardener's archive, there were clearly a number of unrecorded interventions throughout the park. Copies of currently un-catalogued records should be accessioned to BLARS.
- The tentative structural history of the weir is largely conjectural but further information may be forthcoming as a result of limited intrusive work before or during restoration.
- Dredging of Old Park Water and the Serpentine was large-scale and took place on a number of occasions. Both draglines and excavators were used for this work and it is likely that beyond the protection of the associated structures the silt build ups would have been formed relatively recently.



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6 APPENDIX 1 – WATER MANAGEMENT SYSTEMS AT WREST PARK

The Historical Significance of the Waterways at Wrest Park

Wrest Park contains one of the five best remaining examples of pre-landscape formal gardening in England, the others being Westbury Court in Gloucestershire, Powis Castle, Bramham Park in West Yorkshire and Melbourne Hall in Derbyshire. Towards the end of the 17th century and at the beginning of the 18th century there were many of these formal French-style gardens in England but the majority were swept away by the English landscaping schools of Brown, Repton and others. The grand formal views with their geometrical plans were replaced by informal sylvan scenic views with grazing animals close to the house but contained by the sunken walled ditch (ha-ha).

It was Jemima, Marchioness de Grey (1722-1797), who kept the influence of the English landscape school to a minimum at Wrest. She controlled the estate from 1740 to 1797 and, apart from the joining together of the outer canals, removal of the formal gardens near the Archer Pavilion and the planting of more trees, the lower gardens are virtually unaltered since the 1730s. Detailed estate accounts survive from c.1685 onwards, enabling an understanding of the development of the waterways which are a major feature of the estate.

Current Water Management at Wrest Park

The following account has been compiled following a conversation on 27th April 2007 with Chris Slatcher, English Heritage's Head Gardener at Wrest Park. Chris has worked at Wrest Park since 1979.

All waterways are formed from natural clay, a calcareous gley type of the Wicken association over gault clay. The numbers in the text relate to an EH plan of the garden.

Old Park Water is fed by a stream from the NW (1), above the Bath House Pond (2) which is also known as the Lily Pond. There is a stepped sluice (3) and when the Bath House Pond water is high it flows into Old Park Water. If Old Park Water is high, the water backs into the Bath House Pond causing flooding and damage to plants in the shrubbery.

The sluice at Old Park Weir (4) can be opened manually to keep the level of Old Park Water artificially low so this raises the question of why there is a problem with flooding around the Bath House? The answer is that Old Park Weir was raised by 6-10 inches by the addition of concrete capping c.1971 to hold more water in Old Park Water for the Silsoe Institute's irrigation requirements. During the past few years there has been high rainfall and the excess water has resulted in flooding to the S and W (5) of the Orangery, between it and the Bath House.

The Orangery downpipes and manhole were checked and found to be in good working order. Originally rainwater from the roof of the Orangery was held in tanks in the undercroft but the roof water now runs into an area SW of the Orangery into a set of shallow ditches near the roadway. No culverts were visible but a pipe under the road to the Bath House Pond was blocked. The pipes were 6 inch diameter clay landpipes, filled with silt. These were dug out by hand and removed in May 2003. (Ref. Memo to John Ette (EH) on Bath House Flooding 7.4.2003). RH Partnerships (Cambridge) were involved and SMC 6 was required.

When the Bath House was built, it was supplied by a spring 10-15m NW (6) of the Bath House but this no longer exists apart from evidence of a high water table. Tree roots growing through South Park Weir beneath the concrete capping had raised its height further which had contributed to the Bath House Pond flooding. The water in the Bath House Pond is brown in colour, indicating iron chelates and laboratory tests indicated that water from the Orangery was high in iron. Near the Chinese Bridge, on the E side of the gardens, is a



sewage works (7). A pump on the edge of N Broad Water re-circulates the water to the Bath House cascade and this water contains a high level of nitrates from the sewage.

In April 2003 the Environment Agency obtained ground water data from boreholes in three different areas of the gardens. The data showed a vast increase in water levels. The pipes which were dug out near the Bath House and Orangery were replaced to drain the area but the manual outlet beside Old Park Weir has been used to assist the process.

The ha-ha (8) to the W of Old Park Weir runs W through the former parkland from the weir to a bridleway where it stops. This marks the edge of the former De Grey estate. Field drains feed into the ha-ha ditch from the fields to the N and S and the ha-ha ditch in turn feeds into the Serpentine Water S of Old Park Weir. There is approximately a 4-5 feet fall at the Serpentine Weir (9) in the Twin Waters area at the SW corner of Wrest Park garden.

Old Park Water was drained in 2007 for silt removal and to reduce the pressure on the weir wall which was leaking. Contractors removed the fish and EH are awaiting an archaeological survey of the weir wall prior to silt removal from Old Park Water. The weir may be dismantled and re-built using existing materials. It is constructed from irregular sandstone/ironstone blocks, probably quarried locally, and held together with mortar. Behind the weir wall, on the N side, is a one-metre wide and full-depth gravel infill.

The natural kink (10) in the W bank of Old Park Water N of the Bowling Green House (visible on the 25 inch OS maps) indicates the position of an old oak tree which was removed c.1980s. Just N of the kink the inlet which once supplied the ram pump is marked by some swamp cypress trees. A pipe network runs E, about 20 yards N of the Bowling Green N hedge into the spinney to the W of the present croquet lawn. In the spinney is the brick chamber (11) which once housed the hydraulic ram pump. The ram pump was removed in the 1980s and is now in the undercroft of the Orangery. Details of the ram are held in the Head Gardener's archive. There were two outlets from the ram, one to the N which supplied the roof tanks of the mansion and one to the E which acted as an overflow.

The amphitheatre (12) on the S side of the Leg O'Mutton Lake was filled in with clay and backfilled with chalk c.1988. There is an underground drain connecting Old Park Water and the Leg O'Mutton Lake (13). The plastic drainpipe can be raised or lowered to control water flow into the Leg O'Mutton Lake. The Leg O'Mutton Lake has two water exits on its E side (14). Both transport excess water into the Long Canal and one retains its wooden sluice. The same principle applies to excess water from the Long Canal which runs through a plastic pipe (15) into the Ladies Lake to the east. There is a slight W to E fall in ground level. The clay land drains running N/S (16) into the N side of the Leg O'Mutton Lake have been damaged by vehicle wheel rutting and work is needed to improve the drainage of the path on the N side.

At the NE end of the Ladies Lake (17) is an outflow chamber which takes excess water into the N Broad Water at a point approximately 10 yards W of the Chinese Bridge.

In the NW corner of the Leg O'Mutton Lake (18) is a brick culvert which probably carries the run-off from the roof of the Bowling Green House or toilets at the S end of the Bowling Green House. The gravel path immediately to the W of the Bowling Green House, running down the E side of the Old Park Water, runs beneath the bastion-shaped planting (19) shown on the Rocque Plan (1737).

The Serpentine Water was drained in the 1980s and the silt was mechanically removed using a 360 excavator. The silt was spread on the field to the W (20) and the W edge of the bank was repaired. The Serpentine Weir used to leak around the SE edge but it is puddled every 5 years by garden staff to re-seal it. The stonework indicates a similar age to that of the Old Park Weir. The water runs through the weir by natural flow and there is a sluice key to manually empty the lake. The Serpentine Weir wall was repaired in the 1980s.

From the SW, the River Hit flows into the South Broad Water and this can be controlled by a stop cock sluice situated beneath an earth bank (21) which may have originally been a bridge or a clear channel. Ditches from the SW woodland exit into the Broad Water.



In the SE corner of the Long Canal is a wooden sluice gate set between brick walls with stone capping (22). An underground pipe takes the water south to a manhole E of the Archer Pavilion and then E to a woodland ditch which runs just S of East Half House. At the edge of the woodland the pipe turns due N to a large brick culvert (5 feet square & 6 feet deep) on the edge of East Broad Water. The water can also run S to Broad Water where there used to be a pivoting flap controlled by water pressure (23), but this is not operational at present.

Ditch water from the NE woodland panels drains into the culvert and flows out underneath Broad Water via manholes on the E side, within the grounds of Whitehall Lodge (24). Once through Whitehall it joins the River Hit which runs SE to Gravenhurst.

There used to be a natural sluice out of Broad Water S of Whitehall Lodge, discharging into the River Hit, but this was dammed after the Second World War. To prevent flooding in the Whitehall Lodge area, a circular metal penstock and approx. 18 inch diameter pipe was installed running due SE under Twin Waters woodland ride into the River Hit.

The rope ferry which is mentioned in Philip, Earl de Grey's early 19th century description of the garden features, probably crossed the South Broad Water opposite the S end of Lady Duchess's Walk (25). On the S bank there are Scots pines, roses and honeysuckle which may be the remnants of the arbour which was built at the ferry landing place. It is possible that there may be wooden stumps remaining in the water.

The Wrest Park sewage works is situated just SE of the Chinese Bridge. The works has a clinker filtration bed for liquids and underground tanks for solids. The liquids pass into East Broad Water SE of the Chinese Bridge. Due N of the sewage works is the E ha-ha (26), some 30m of which has collapsed. The ha-ha runs N, becoming a field boundary ditch. Modern sewage pipes run due S from the former Silsoe Institute buildings, under Broadwalk to the sewer bed. A second pipe runs S from the mansion to Butcher's Row (lime avenue) and continues due S under the ornamental lawns to a large culvert 25m SE of the fountain (27), under Broadwalk to the sewer bed. This is a combination of historic culverts and clay pipes. There is a third run from the walled garden toilets (28) (S wall), 5 yards S into Butcher's Row, then E to join the second sewer. There is CCTV footage of all the sewer pipes, some of which are in poor condition.



7 APPENDIX 2 – DOCUMENTARY EVIDENCE

Documentary Evidence

Land Use Consultants Master Plan of Wrest Park: BLARS Z 821 acc.7419

These Master Plans by Land Use Consultants of 43 Chalton Street, London NW1 1SB were made on behalf of Directorate of Ancient Monuments and Historical Buildings (later English Heritage). The purpose of the Plans was to examine the historical background of the development of the gardens and to determine how they could be restored. Copies of maps at various stages of their history and comment based on study of documents held at BLARS, particularly the Lucas Archive, are included.

A Summary Report was produced in 1983 (Z 821/1) but the key document is:-

Wrest Park Masterplan (2) for Restoration & Management September 1993: Z 821/2

Section C: Encircling Canals (p.96)

The encircling canals (Old Park Water, Serpentine River, Broad Water) achieved their present form under the direction of Lancelot Brown in 1758-60 although, for the most part, these were modifications in shape of earlier water bodies mainly from the period 1706-20.

Since 1947 when the MPBW took over the grounds of Wrest, there have apparently been several contracts concerned with clearance of silted water bodies. The following are known:-

1947 (June) - Vertical aerial photographs show widespread weed – little surface water (water bodies had been drained off during WWII).

1952 – Oblique aerial photo appears to show entire Broad Water drained for excavation of silts. Some silts deposited near pavilion; others to east side of Broad Water. Condition of Old Park Water and serpentine River indicates that they may have been cleared out already.

c.1965 - further work apparently carried out with dragline (exact extent and location unknown).

c.1988 – Dredging and lake edge restoration work carried out by external contract.

The report states that the shape of the water bodies is particular and historically significant. The banks are formed in natural clay and are prone to erosion, particularly if there is regular fluctuation in the water levels. It advises that the levels should be maintained at their highest level to minimise erosion.

The farm ditch entering at the NW corner has significant catchment and also carries storm water run-off from the Silsoe by-pass. It appears to have some silt load which has caused deposits at slack points of the system (head of Old Park Water, overflow of OPW).

The canals accumulate leaves and general vegetational debris but the west side (OPW and Serpentine Water) is less affected than the central or eastern areas because of prevailing wind direction and lack of parkland trees.

The system of canals is manmade and relies on a series of built structures to control and retain water. The present pumped system was adapted by HBMC engineers in 1972 and relies on a circulating pump since the original spring in the Bath ground no longer flows.

The 1993 Masterplan includes a chronology with documentary references, many of which refer to the Estate Records held in the Lucas Archive at BLARS. There are references to waterworks but it is difficult to ascertain their precise location in the absence of plans. However Mike Turner, formerly Head of Estate Services at Wrest Park, has summarised the



chronology of the waterways on a map in his article on the development of the waterways at Wrest Park:-

BLARS 130 SIL acc. 11145: *Development of the Waterways at Wrest Park*: M J B Turner, Feb 1991

This article includes a chronology from c.1084 to 1991 and there is also a copy at the Head Gardener's Office, Wrest Park.

BLARS LUC 227/01/43: *Survey of Lakes* (referred to on p.96 of the LUC Masterplan 1993) but not examined.

Bedfordshire Archaeology Vol. 24 2001: *A brief introduction to the archaeology of Wrest Park*: M Dawson

Restoration of the main water bodies, paths and rides in Wrest Park was assisted between 1988 and 1991 by archaeological excavations and geophysical survey. The work enabled much of the garden's underlying drainage to be mapped and confirmed the orientation and layout of several lost features. The present garden was also shown to result largely from the 19th century landscaping which obscures the formality of the Great Garden created in the early 1700s with its regular subdivisions marked by yellow sand paths, wrought iron fencing and low brick walls.

In 1988 the pattern of drainage and features relating to the 'Williamite' (1705) garden and the amphitheatre on the south bank of the Leg O' Mutton lake were investigated (BCAS 1988). In the late summer of 1988 the lack of rain resulted in the appearance of parch marks on the parterre south of the fountain and on the lawns south of the Archer pavilion. This provided an opportunity to map the foundations of the old house and some of the gardens' drainage.

BCAS 1988: *Archaeological Investigation of the Leg O'Mutton Lake, Wrest Park*, BCAS Report

BCAS 1989: *Archaeology at Wrest Park*, BCAS Report

BCAS 1990: *Garden Archaeology at Wrest Park Bedfordshire 1989-1990, An Interim Report*, BCAS Report

BCAS 1991: *Archaeology at Wrest Park 1990-1991*, BCAS Report

BLARS 120 SIL acc. 12056: *An archaeological evaluation of a collapsed culvert in the gardens of Wrest Park, Silsoe, March 1997* K Fadden & M J B Turner, Ampthill & District Archaeological & Local History Society

Evaluation carried out following appearance of a small hole in the lawn near the Atlas Pond TL 092353. Revealed a previously unsuspected early 18th century culvert and the site of a bridge which pre-dated the culvert. There was probably a substantial spring in the area of the Atlas Pond but this is now dry and the present water running in the east ha-ha originates from a spring to the NE of the estate.

BLARS 130 SIL acc.13688: *Wrest Park 1686-1730s: Exploring Dutch Influence*: Linda Cabe Halpern, *Garden History* 30:2

Henry Grey, 12th Earl, inherited the estate in 1702 after a Grand Tour to the Netherlands, Germany & Italy. He expanded the gardens focusing particularly on canals and avenues of trees which reflect his experience of Dutch gardens. Wrest Park combines aspects of the gardening traditions of the Netherlands and England, interweaving them in a personal statement of the Duke's taste and political aspirations.

BLARS 130 SIL acc.11760: *The Duke of Kent's Garden at Wrest Park*: Linda Cabe Halpern, *Garden History* c.1994

BLARS X254/88/22/a: *Wrest Park from Britannia Illustrata or Views of Several of the Queen's Palaces also of the Principal Seats of the Nobility & Gentry (London 1707)* by Leonard Knyff & Johannes Kip, plate 18. 1705-6.



There are two engravings, one a distant view showing the garden encircled by a moat which was later formalised into distinct sections – Old Park Water, Broad Water, Octagon etc. The other depicts the Old House and its formal gardens.

BLARS 33/127-145: Tillemans sketches and prints (coloured)

Pieter Tillemans was born in the Netherlands and came to England in 1708. He died in 1734. Tillemans was employed to paint views of countryseats with figures and buildings or landscapes with sporting subjects. He could have been employed at Wrest Park to give impressions of proposals for the finished gardens with monuments and canals, which in fact were never executed as drawn. These drawings do not show Old Park Water but the Long Canal (33/127) and the Bowling Green Canal (33/145) are depicted. The drawings do not provide any substantial evidence for the hydrological restoration archaeology of Old Park Weir although they are important in terms of the stylistic history of the gardens.

BLARS L33/125-126: Design & Reference list for Canal Pleasure Boat 1765

The boathouse is shown on OS maps as being at the NW edge of North Broad Water. No structure remains but the site of the slipway is discernable. The boat was probably used only on North & South Broad Water and the Octagon because the weirs would have prevented access to the Serpentine and Old Park Water.

BLARS L30/21/2/3c: Letter dated 29th July 1766 from Amabel, afterwards Countess de Grey, to Catherine Talbot, describing the launching of the Pleasure Boat.

The boat, which had a swan at one end and a tiger at the other, was launched at 6pm on 28th July 1766:-

'Accordingly, at six o'clock in the evening the whole parish being apprized of it crowded down to the shore, and covered it to the very farthest point. Every individual in the family assembled about the boat, ship, I beg its pardon, and the haymakers sat at a distance in two rows. As soon as we had placed ourselves on the opposite bank she was let down into the water, colours and streamers flying, music playing. Indeed we had no cannons fired, no cheers given, nor bottle of wine flung at her head....she was brought along shore, we embarked under the shade of the Acacias, and had a most prosperous voyage.'

BLARS CRT 190/45/38 acc.11823: Wedgwood, Wimpole & Wrest, The Landscape Drawings of Lady Amabel Polwarth, David Adshead, Apollo Magazine April 1996

In 1773-4 a 944-piece dinner & dessert service was made by J Wedgwood & T Bentley for Catherine the Great. The Empress's service included 1,222 views of ruins in Great Britain, country seats of nobility, gardens, landscapes and other embellishments. Lady Amabel (1751-1833) provided 11 or possibly 13 drawings of views of gardens and landscapes including Wrest Park. One was a pen and ink drawing of the Canal at Wrest.

BLARS CRT 190/45/28: Essays on Jonson & the Sons of Ben; Carew's Secular Masque: M P Parker, University of Pittsburgh Press 1982

This examines Thomas Carew's (c.1595-1639) poem 'To my friend G N from Wrest' part of which describes the moat surrounding Wrest Park. Carew writes of 'flowing streames in deepe and spacious channels, where they slowly creepe in snake windings, as the shelving ground leads them in circles, till they twice surround this island mansion, which i' th' center plac'd, is with a double Crystall heaven embrac'd, in which our watery constellations floate, our Fishes, Swans, out Water-man and Boate'.

The poem suggests that there was a double moat encircling Wrest Park in the early 17th century but Turner (Development of Waterways at Wrest 1991 p.3) states that he has not found any sign of a filled-in moat from aerial photos.

BLARS CRT 130 SIL acc.3144 Earl de Grey's (1781-1859) illustrations and notes on history of buildings at Wrest Park (illustrations recorded on slides and notes in bound volume)

The following are descriptions of buildings associated with the waterways:-

The Bath House 'was built by the Earl of Hardwicke but the precise date is not known. It was supplied by pipes from a spring in the neighbourhood which was supplied (now believed erroneously) to have some chalybeate quality.'

The Ferry 'The building and the water, was moved to its present position in the year 1823 in order to form an object in looking down the long grass walk from My Lady's Canal.'



The Old Bridge 'The present Bridge was erected upon the same spot, and upon the same model as one originally placed there, when the Canal was lengthened by Lancelot Brown for Lord Hardwicke and March about 1760.'

The Chinese Bridge 'A Bridge was built upon the same site as this, when the alterations in the gardens by Lancelot Brown took place about 1758, but it fell down, and was replaced by the present bridge about 20 years after. This is now so much decayed (1831) that it must be taken down. [Pencil note: 'became unsafe and has been replaced by one of a more simple design.'

Head Gardener's Archive, Wrest Park Gardens Office

Box 1: Wrest Park Waterways Restoration, 1970 onwards:-

1987 July: Survey of Lakes, drawing 227/10/05 scale 1:100

Sections & profiles, bank edge details not shown.

1987 Sept: Site clearance location & sections

Long Canal (spade end & SW corner), Leg O'Mutton Lake & Ladies Lake

1987 Sept: Campshedding to Ladies Lake & Leg O'Mutton Lake, drawing 227/10/13, LUC Consultants

Edge section scale 1:5, Plan 1:10, overview

1970: Survey of area NW of Long Water

Includes invert levels Old Park Water at inflow to Leg O' Mutton Lake

1971: Report on Conditions of Lakes & Weirs in Ornamental Gardens

Low water levels problem where Serpentine meets Broad Water – suggests construction of earth bank at Twin Rivers gate.

1971 Feb: Plan of Levels of water in lakes, scale: 1:1250

Old Park Water 51.39m above mean sea level, invert level 51.10m at inflow just south of Bowling Green House

1971 Feb: Layout & Sketch Diagrams of Weirs & Sluices on Ornamental Lake System, scale 1:2,500

1971 Sept: Plan of Wrest Park weir details (Area 1) Serpentine to S end of River Hit & Old Park Weir details

1971 Sept: Plan of Wrest Park weir details (Area 2) Broad Water to River Hit

1971 Oct: Bill of Quantities and Specification for alterations to Lakes at Wrest Park

Includes Old Park Weir – cut down trees, clear weed growth from masonry, remove loose stonework and replace in cement mortar. Pack out concrete sill where cracked or hollow beneath. Re-construct sill with re-inforcing mesh in 4:2:1 concrete.

1971 Sept: Specification & Bill of Quantities for Installation of Well Point and Pump to Bath House Lake

1972 July: Renovation of Waterways, handwritten notes

1972 May: Plan of re-circulating pump

Includes site plan with pump at NW corner of Broad Water

1973: Dredging works and general waterworks, lakes contract, Hawes of Aldeburgh

1973 Nov: Bill of Works for Waterworks Renovations

Includes dredging contract for Old Park Water, Serpentine, Broad Water, Chinese Bridge area.



Repairs to wing walls by manhole at Old Park Water and diversion for manual emptying of Old Park Lake.

Hydraulic Ram: undated notes & diagram

This was originally located in a chamber between the Leg O'Mutton Lake and Long Canal. It worked by a system of valves; gravity and air pressure moving water along a series of pipes and through the ram which supplied two 500 gallon lead tanks in the roof of the mansion. This, in turn, supplied the house, stable and gardens, the overflow feeding the marble and Atlas fountains. The ram pump was removed around the early 1980s and is now in the Orangery undercroft.

1994: *The Fountain, Wrest Park, History of Art & Heritage Management Group Project*

1995 Sept: *Report on the Broad Water for Wrest Park Angling Club, C Vaughan for CB Fisheries*

This report was commissioned to assess costs for cleaning the lakes, particularly Broad Water, and includes sediment depths, sites & distances, min & max water depths.

2000 Nov: *Plan of water from culvert to Twin Waters stream at Whitehall Lodge*

2003 April: *Bath House Flooding, Memo to John Ette (EH) from Chris Slatcher (Head Gardener)*

Flooding problems in the Bath House/Orangery area. Digging requiring Scheduled Monument Consent 6.

Miscellaneous undated photographs

These include:-

Amphitheatre at the Leg O'Mutton Lake before infill

Atlas Pond dredging and infilling

Ladies Lake campshedding erosion underneath

Waterways after drainage during WWII, including crops growing on site of Long Canal

Dragline excavation of lakes using tracked excavator

Maps

BLARS L33/286 f.33: 1719 Survey Plan by E Laurence

This shows a narrow, relatively straight moat or canal running down the west side of the formal gardens. To the west of the canal (now part of Old Park Water) is the Old Park with avenues of trees marking the lines of rides which continue in the formal garden. A ride crosses the canal approximately where Old Park Weir is now sited, but a bridge is not shown. The fundamental plan of the garden had been laid out by this time but further land was purchased from Trinity College, Cambridge (1711-20) allowing the expansion of 'The Great Garden', including the construction of the Octagon canal in 1725-6), south of the Great Canal. This expansion is not shown on the Laurence Plan.

BLARS X95/230: Plan of Wrest Park by John Rocque 1735 & 1737 (two versions)

The second plan (1737) shows a number of changes including: the addition of Batty Langley's Green House, some additional winding paths, the filling in of the cruciform at the head of the Long Canal, the adaptation of the Bowling Green House, the extension of the gardens to the west including the creation of the Serpentine Canal. A bridge is shown roughly where Old Park Weir is situated, carrying one of the diagonal rides from the Old Park to the Archer Pavilion. Immediately to the south of the ride, next to the north end of Serpentine Canal, is a bastion-shaped plantation.

BLARS Jeffreys County Plan 1765

This shows a bridge across Old Park Water or Serpentine Canal just to the south of the ride shown on the Rocque Plan, but this may be a cartographic inaccuracy because the Plan lacks the detail of the Rocque Plan. The Leg O'Mutton Lake (with amphitheatre), Ladies Lake and Long Canal (with spade end), South and North Broad Water are shown.



BLARS Map of Bedfordshire by Bryant 1826

This map shows the encircling canals and the Long Canal but it lacks detail and definition.

BLARS OS 25" to 1 mile: 1st edition 1880, 2nd edition 1901, 3rd edition 1924

The overflow sluice adjacent (on W side) of the main Old Park Weir is shown on the 1924 OS map but not on the earlier maps.

OS 1:2500 1977

Shows the Old Park sluice and weir. Scanned and names of weirs and canals superimposed.

English Heritage Plan of Gardens, undated

BEA Landscape Design: Hydrology Restoration Map, October 2006, Scale 1:2500

Aerial Photographs

c. 1946-1952 (single photo) held in Head Gardener's Archive at Wrest Park

Verticals 1:10,000 1946-47, 1968, 1976, 1981, 1986, 1991. 1996, 2002 held by Bedfordshire County Council Heritage & Environment Section



8 APPENDIX 3 – CHRONOLOGY OF WATERWAYS

CHRONOLOGY OF WATERWAYS AT WREST PARK

Date	Evidence	Reference
c.1084	Watermill at Wrest (3 possible sources of water:- Stream in SW corner [River Hit]; spring & stream in NW corner; stream to NE). Old millpond situated to NW of present Chinese Bridge.	VCH Vol II p.331
1573	Inventory of Reginald de Grey refers to a moated Tudor building	J Collett-White, exhibition 1983
1651	Large moated Tudor manor probably on site of Medieval house, formal garden to S. Moat may have encircled house or had been reduced to small portion to W of house, shown in later Kip engravings	Joyce Godber 'Wrest Park & the Dukes of Kent' p.1
c.1686-88	Long Canal built by constructing a dam across a shallow valley	BLARS L31/288
1687	Estate accounts: taking carp, tench & perch out of best pond and putting them 'in the moat above the bridge next to the court wall'. Best pond probably Long Canal.	BLARS L31/195
1690-99	Accounts: cisterns made for two fountains in present croquet lawn area. Likely that these were situated high up in the house to collect rainwater from the roof.	BLARS L31/288
1701-4	'Making a place to lay the pipes from canal in Chapel garden to millpond'. Chapel garden to E of Old House and canal is probably diagonal one shown in Kyp engravings.	BLARS L33/289/79
1704 Jan/Feb	'Filling up moat and spring; work in spring' – Kip engravings show possible remnants of moat system to W of Old House and this entry may refer to the filling in of the other part of the moat or the filling in of the W remnant.	BLARS L31/289/156,157,162
1704 Mar	Reference to work at the spring – 'cleaning, laying pipes to it – two millwrights laid a great pipe to it, rammed it down and stopped up the water'. Probably to provide a more controllable source of drinking water for the house.	BLARS L31/289/172
1704 May	'making vaults in the canal' – probably brick-vaulted conduits	L31/289/220
1705	Kynff drawings showing Great Canal, old millpond, diagonal eastern canal and remnants of moat running to W of Old House.	
1707	Henry de Grey 'by skilful use of the old moat and a nearby stream he made a great canal. Two smaller straight stretches of water were contrived to right angle at either side'. It appears that Henry slimmed down the Great Canal to about two-thirds of its original width and possibly widened the 'spade' end as shown in Laurence's Map of 1719.	L31/290/12,16,19
1707-09	Accounts mention 'making canals for ducks' and to Will. Bishop for 'making the great drain in Lime Walk'. To Tho. Bishop for 'making and laying troughs from the spring to the little horse pond and from the bridge to the millpond and the Great Canal'. Will. Bishop's bill 'for the brick wall by the little canal' and 'cutting through the wall of the spring to lay in the troughs and making up again.'	L31/290/149
1709-11		
1713		J Collet-White op.cit p.6



1716	The troughs are probably underground pipes of hardwood or brick. Archer Pavilion built at S end of Great Canal 'Enlargement of the brook to the S of the Great Canal'	Joyce Godber op.cit. p.6 L30/8/33/22
1719	'Filling up of Mr Ackers canal and making a handsome terrace in the room of it answering to that on the other side which leads to Hill House....This may refer to the filling up of a canal with soil near the present W terrace, or the filling in of the diagonal E canal. It could refer to the filling of the canals with water – on the 1719 plan there is a new hemispherical basin to the S of the Pavilion, two new canals at right-angles to the Great Canal and the octagonal basin at the end of the W terrace. (one of these could have been Mr Ackers Canal)	L30/8/87
1720	Edward Laurence's Plan of Gardens. A terrace on E and W sides of S front of Old House, the W end terminating in an octagonal basin. The wings have been added to the N end of the Great Canal and there are two short, linear canals to the E and W of the wings.	L31/292/149/153
1720	'To John Dewell on account of the canals and basin next the Old Park'	L31/292/161,171,174 175
1722-3	Accounts record various works on the waterways including 'finishing the canals from the penstock by the Figure, the basin and cut next the Meadow' ; 'canal near Ion brook [this is to the SE of the park] to the gate into Feilden Mead'; 'the Great or Long Canal towards Feilden Mead'	L31/292/337,339,340 L31/292/336-340 L31/198
1723		
1725		
1726-27		L31/294/111
1727-28	Although the exact locations are uncertain, the accounts give a picture of the 1720s as a major period in the development of the waterways at Wrest. Great Canal – sanding – 50 men involved Work 'around Great Canal and canal next Old Park' Purchase of boat for new Octagon (octagonal basin S of Archer Pavilion)	L31/199
1735	Much work on the Octagon, including carrying sand from sand-hill to fill up the Octagon Tillemans sketches show formal S canal with Octagon and a linear canal in the SW corner running from the southern canal up to meet the other western linear canal. This had disappeared in the Rocque Plan of 1735, being replaced by the Serpentine Lake and the Bastion at its N end.	X95/230
1737	First Rocque Plan – wings shown at N end of Great Canal and 'spade' end re-shaped. SW linear canal replaced by Serpentine Canal. A five-sided bastion (to the SE of South Park Weir) has replaced the circular pond and column at the N end of this area.	X95
1748	Second Rocque Plan – wings at N end of Great Canal have been filled in, but remainder of waterways remain unaltered.	Joyce Godber 'Marchioness Grey of Wrest Park' p.45 CRT 190/45
1750	Jemima, Marchioness de Grey, begins to alter the course of one of the canals to a more curving line to lessen the formality of the garden.	
1758	'But the common fall of water which all the canals have at their sluice runs out into a very large conch shell' probably refers to Chinese Bridge area where shell is still situated.	Joyce Godber ibid. CRT 190/45 Letter 2 vol.19
1760	Lancelot Brown employed to 'lay the waters together	CRT 190/45



	around the garden'. 'The canals already joined are the circular canal, John Dewells canal and the millpond: and the stream which they make is to be lost'. The millpond was still being worked on and when finished it was proposed to work on 'the piece of water at the bottom of the garden' and join it to the 'circular and the brook' so that 'the whole, when finished, will appear one stream running in where the brook now comes into the garden, and winding until it is lost among bushes'. 'The design for laying the waters together round the garden is finished. The waters behind the Bowling Green have been joined this year, and one end turned through the little additional grove into the ditch which comes from the mineral spring, the other carried to meet the Serpentine where from the difference of levels, more than could be overcome by digging, there must be a bank of earth which planting and shrubs must conceal.	Joyce Godber <i>ibid.</i> p.62
1760	'The Serpentine in the same manner joins the brook at the lower end of the garden, and from that brook is now really a fine piece of water, one undivided stream made out of the different canals on the Cain Hill side as far as the upper end of the old millpond.'	Mike Turner 'The Development of the Waterways at Wrest Park' Feb 1991
1766	This was the last major alteration to the waterways at	CRT 190/45
1770	Wrest apart from the replacement of the U-shaped pond by the Atlas Pond after the new house was built	L30/21/2/3c BLARS misc.123
1778	and the digging out of the amphitheatre semicircle to	CRT 130 SIL4
1828	form the Leg O'Mutton Canal.	<i>Ibid.</i>
1831	It is not known when the Twin Waters weir was built	<i>Ibid.</i>
1876	and the overflow stream dug. Mike Turner suggests	Mike Turner <i>op.cit.</i>
1939-45	that they may have been constructed following flooding problems with the S lakes soon after the formal pattern was established.	Photos in Head Gardener's Archive
1946-7	Cold Bath built.	
1948	Launching of the pleasure boat Replacement bridge and classical cold bath designed by Edward Stevens	Mike Turner <i>op.cit.</i> LUC
1952-69	New timber bridge replaced original Chinese Bridge Ferry moved to end of My Lady Duchess Walk New timber Chinese Bridge replaced the one built in 1778 New Chinese Bridge built from stone. Gardens allowed to become overgrown to obscure pattern from the air and lakes drained. NIAE moved to Wrest Park and restoration commenced within a few years.	Mike Turner <i>op.cit.</i>
1952-69	Silt clearance from lakes (light railway used). Bath House spring still running but gradually diminished as a result of borehole extraction and eventually became dry. Atlas Pond also dried, only filling occasionally in Winter.	Mike Turner <i>op.cit.</i>
1987-8	Electric re-circulating pump installed to bring water from N end of Broad Water to site of mineral spring.	Mike Turner <i>op.cit.</i>
c.1970	This pump also feeds water to the lion's head over the conch shell near the Chinese Bridge. Lake levelling systems renovated using simple adjustable overflows. The inlet for a boathouse in the S corner of N Broad Water was filled up with soil. A new automatic weir replaced a hand-operated sluice in this area. The pipe run from a defunct hydraulic ram supplying the roof tanks of the mansion was re-used to run mains water	BLARS LUC Report 1993 p.56 – NB this may refer to the above works
1987 July		LUC Report 1993



	back down into the gardens for watering and to supply the fountain.	p.58
1988	The weir at Twin waters was restored during this time. Silt clearance from Ladies Lake, Leg O'Mutton Lake and Spade end of Long Canal. New conduit fitted between Long Canal and Ladies Lake. Beds CC archaeologists on site.	Mike Turner op.cit.
1989	All lakes apart from Long Canal were drained and dredged with dragline and dumper. 1971 Plan 673DK1/3 records layout and sketch diagrams of weirs and sluices on ornamental lake system. This may have been prepared with a view to a series of works but no other records have been seen.	Mike Turner op.cit.
1990	LUC survey of all lakes – profiles and silt depths recorded. LUC proposed that lake edge stabilisation, replacement of amphitheatre stage and lakes weed clearance would be best undertaken as an external contract	Mike Turner op.cit.
1991	Ampitheatre restored - semicircle filled in with soil and clay restoring the Leg O'Mutton Lake to its 1737 size and shape.	
2007	Ladies Lake and Leg O'Mutton Lake campshedded (revetted) to original size and shape. Flap valve refurbished on Broad Water south of Archer Pavilion. Serpentine Weir leaking again Serpentine Weir re-built by Dawsons (Shefford) Ltd. Atlas Pond restored by IER & Paul Davis Ltd. No sign of spring found by archaeologists. Pond puddled with clay and filled with water from a tanker. Old Park Water drained for silt removal	Chris Slatcher, EH

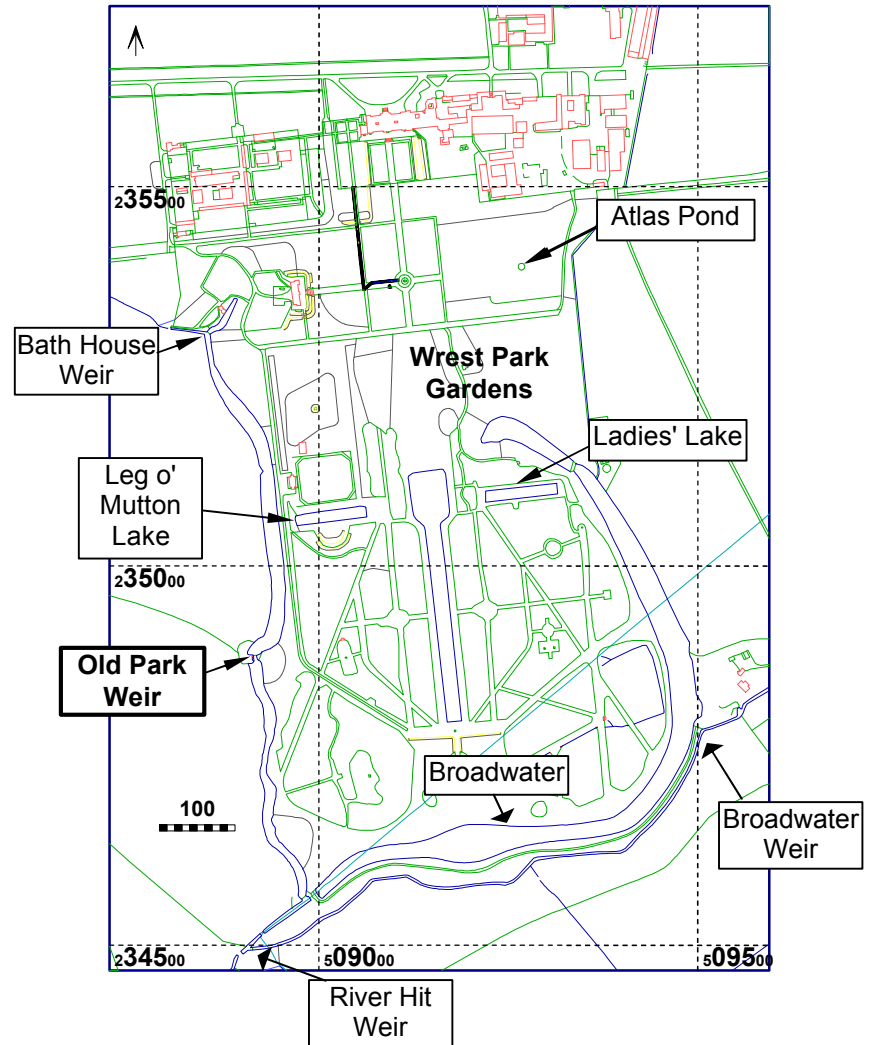
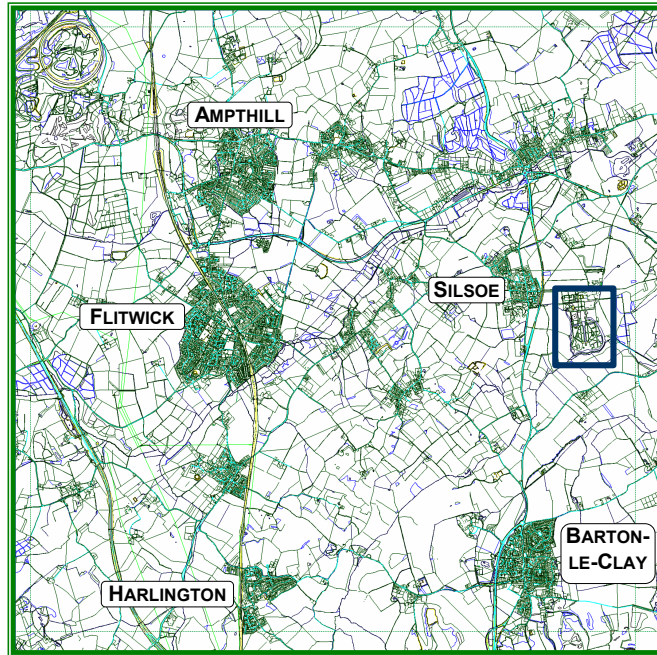
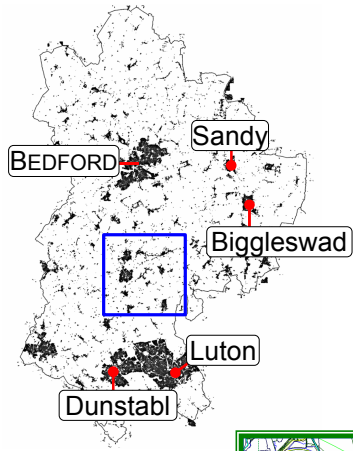


Figure 1: Site location map

Base map reproduced from the Ordnance Survey Land-line Map (2004), with the permission of the Controller of Her Majesty's Stationery Office, by Bedfordshire County Council, County Hall, Bedford. OS Licence No. 100017358(LA). © Crown Copyright.

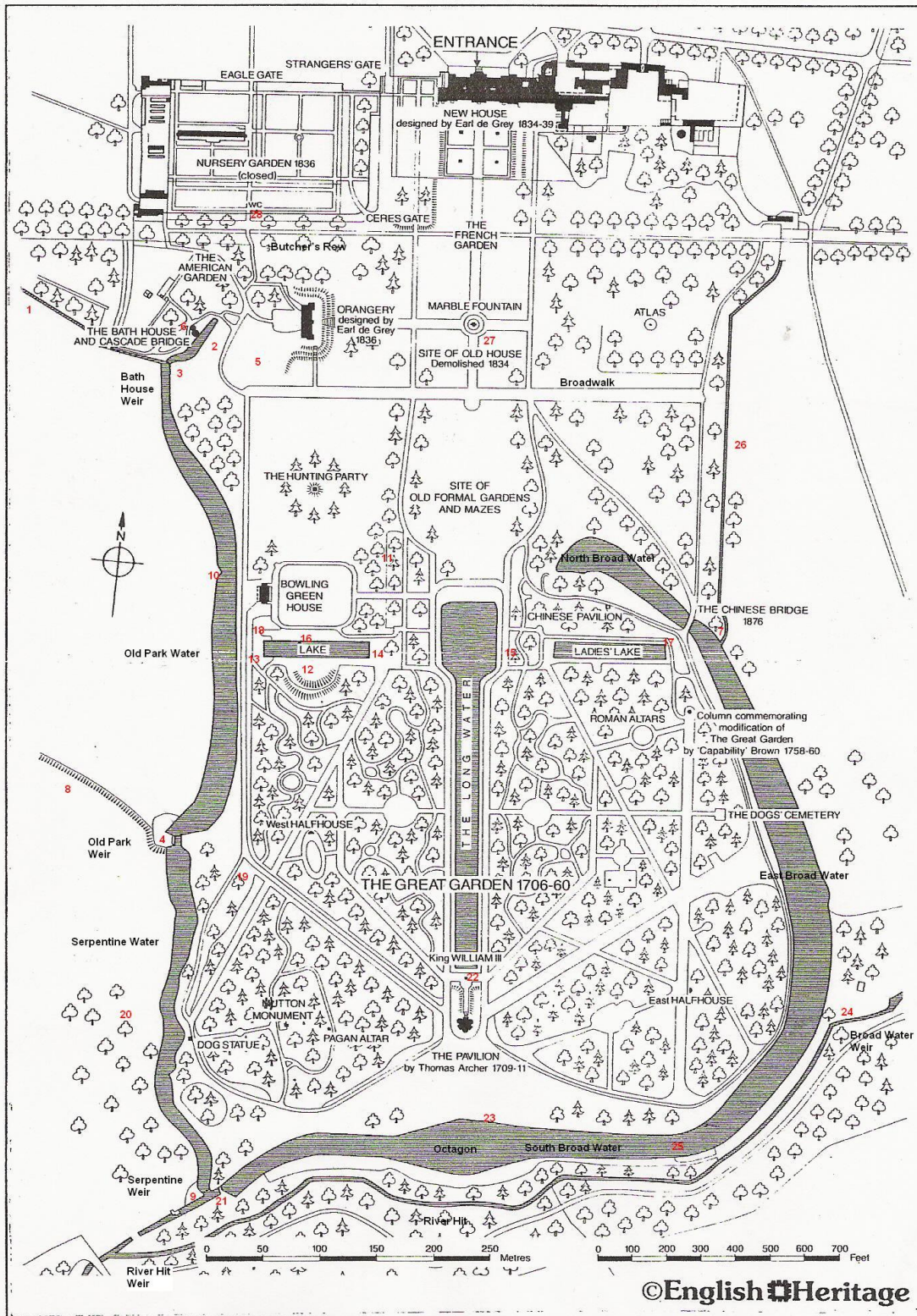


Figure 2: English Heritage Water Management System Plan Annotated (See Appendix 2 for reference numbers)

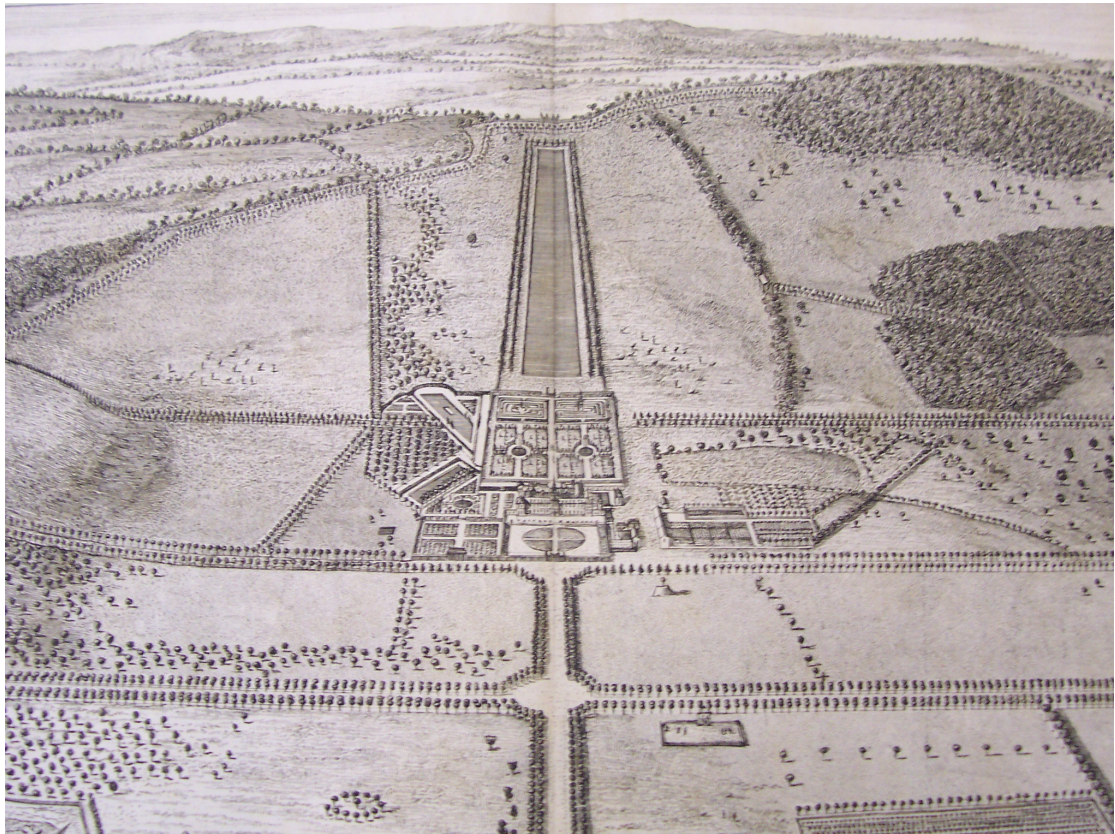


Figure 3: Kyp's Engraving, 1705

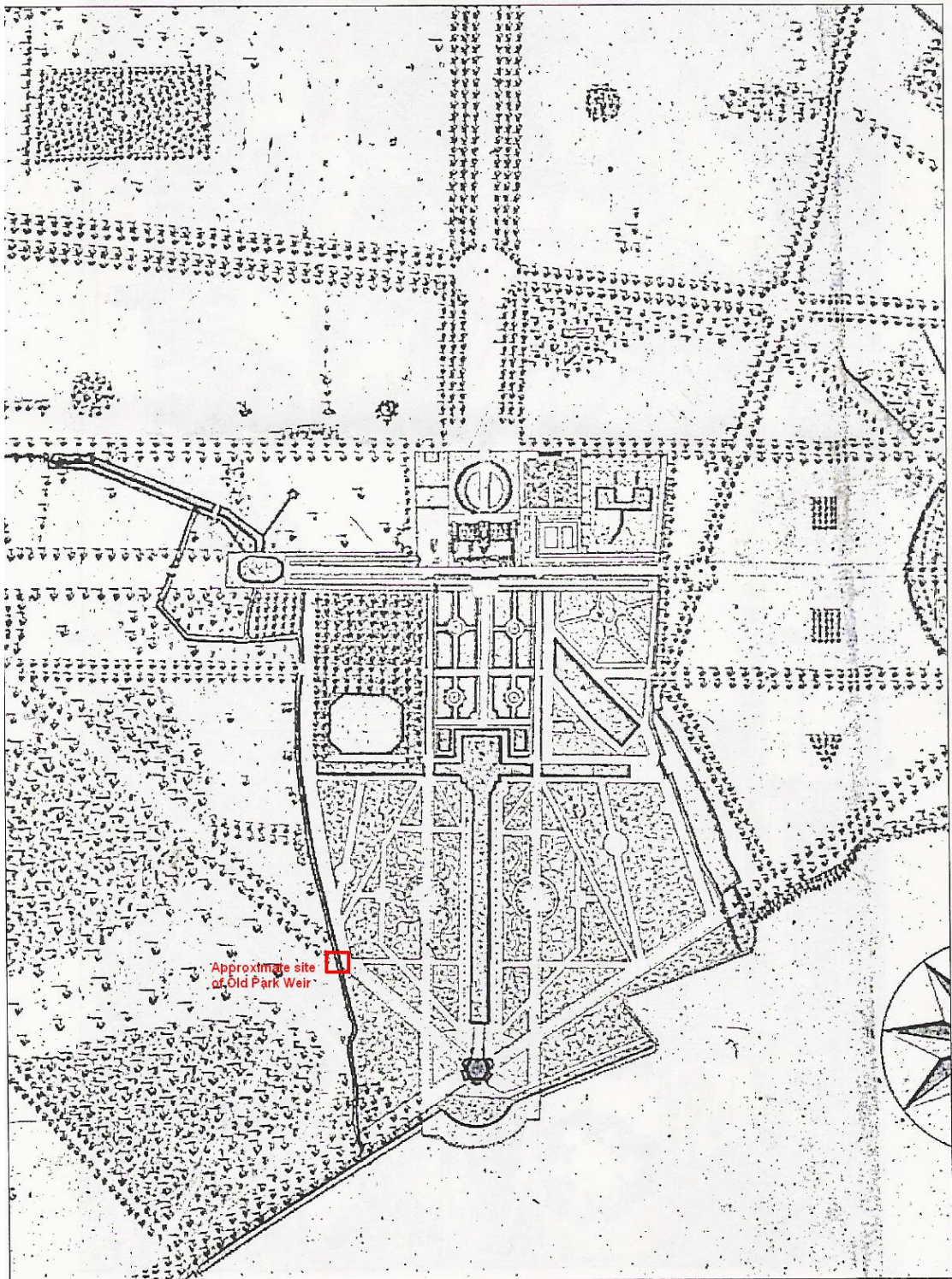


Figure 4: Survey Plan by E. Laurence, 1719

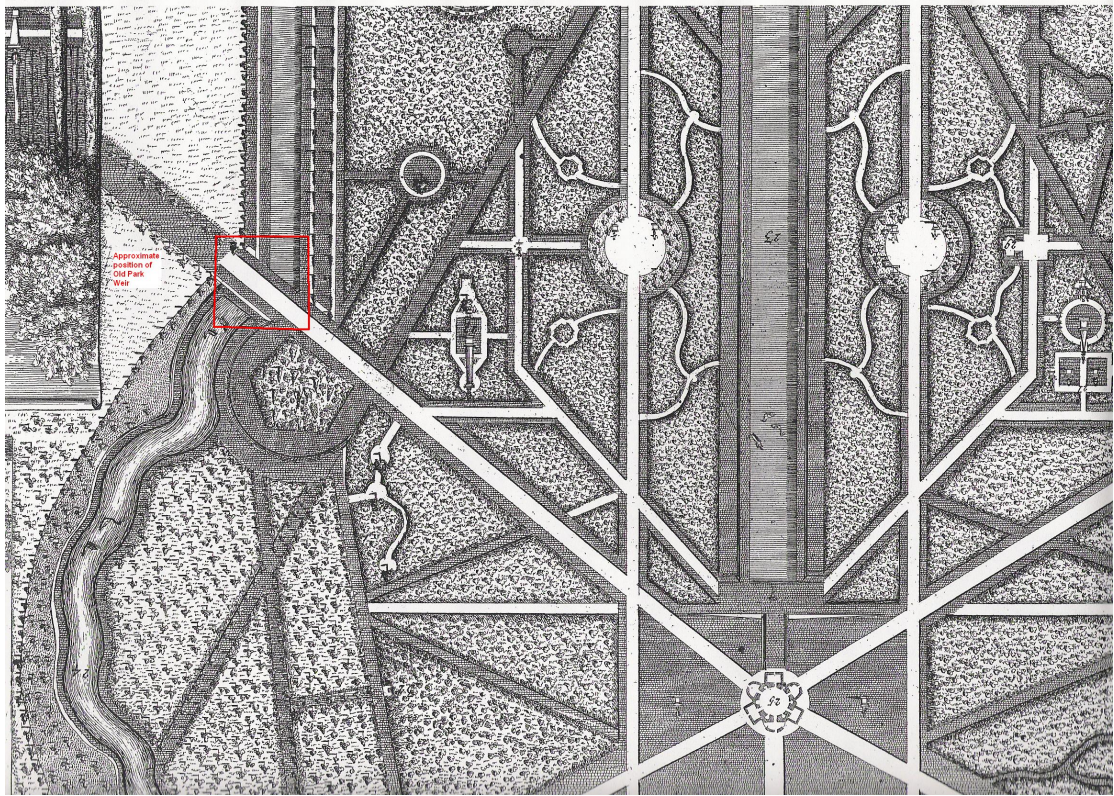


Figure 5: Plan by John Rocque, 1735

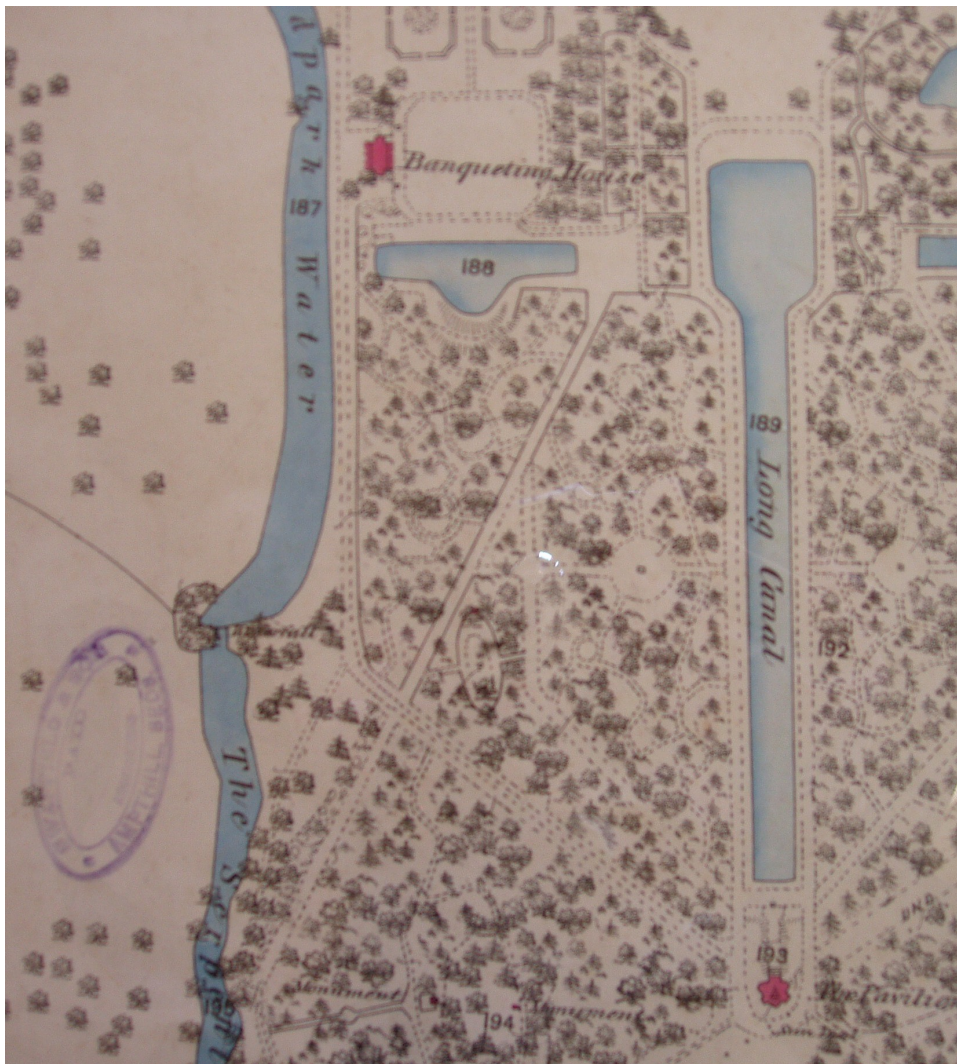
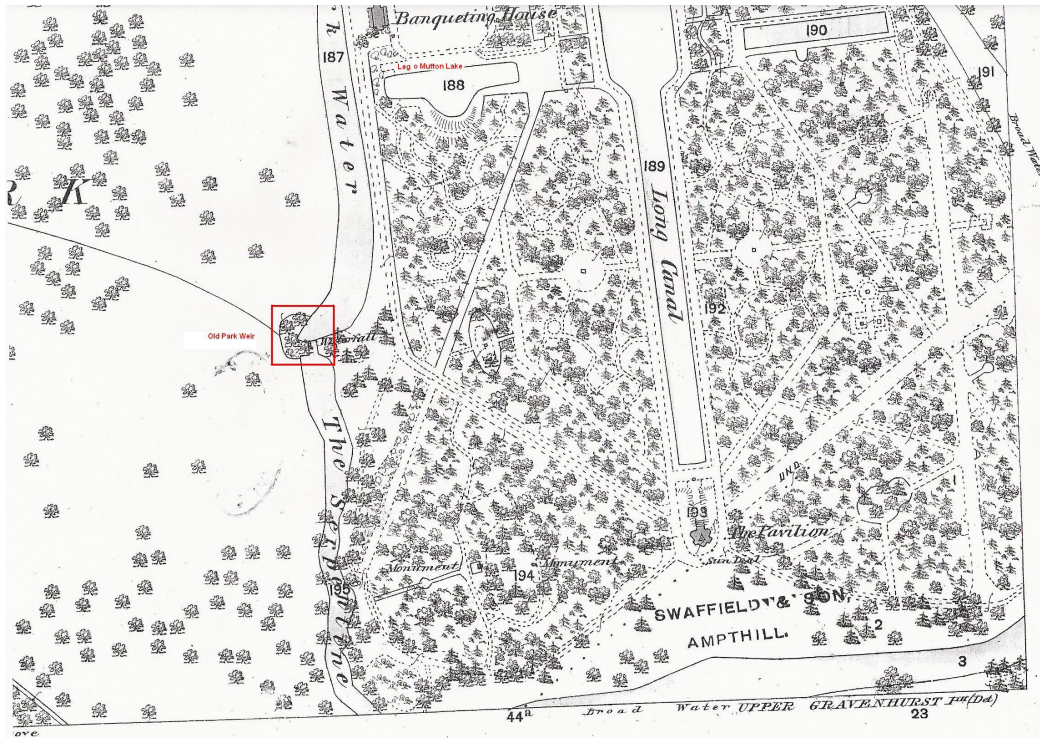


Figure 6: First Edition OS Maps 1881 & 1882

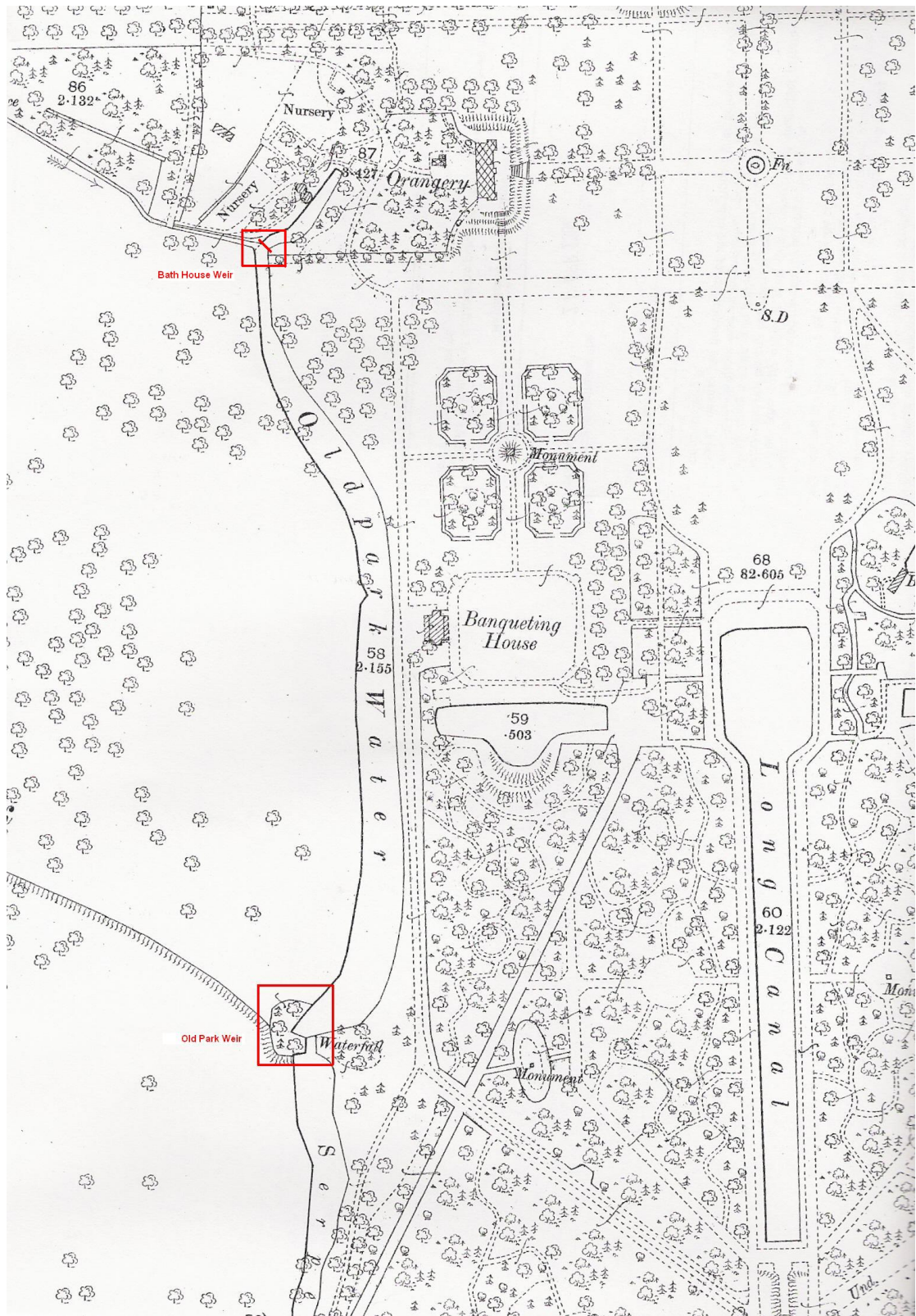


Figure 7: 1901 OS Map

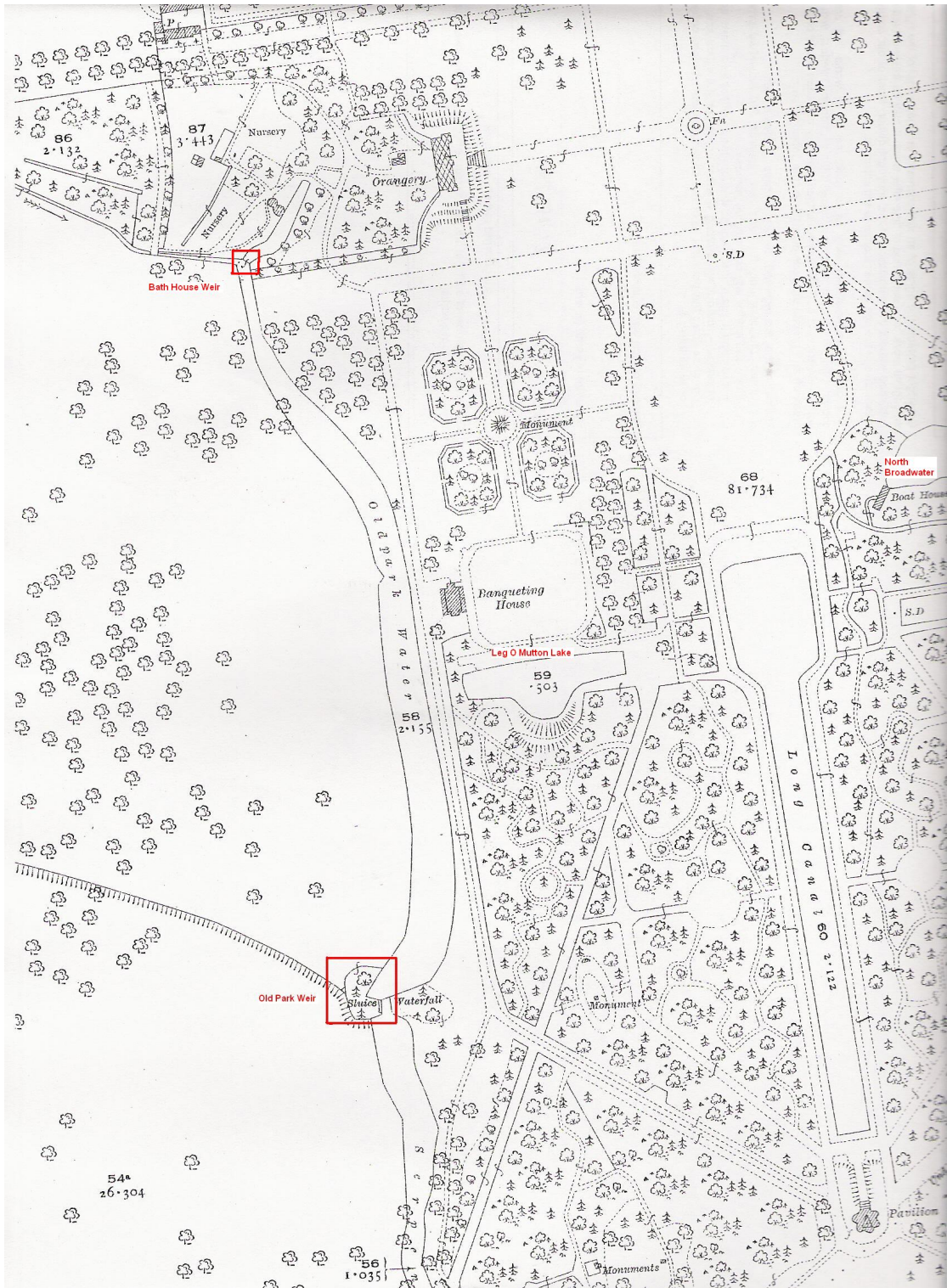


Figure 8: 1924 OS Map



Figure 9: 1977 OS Map

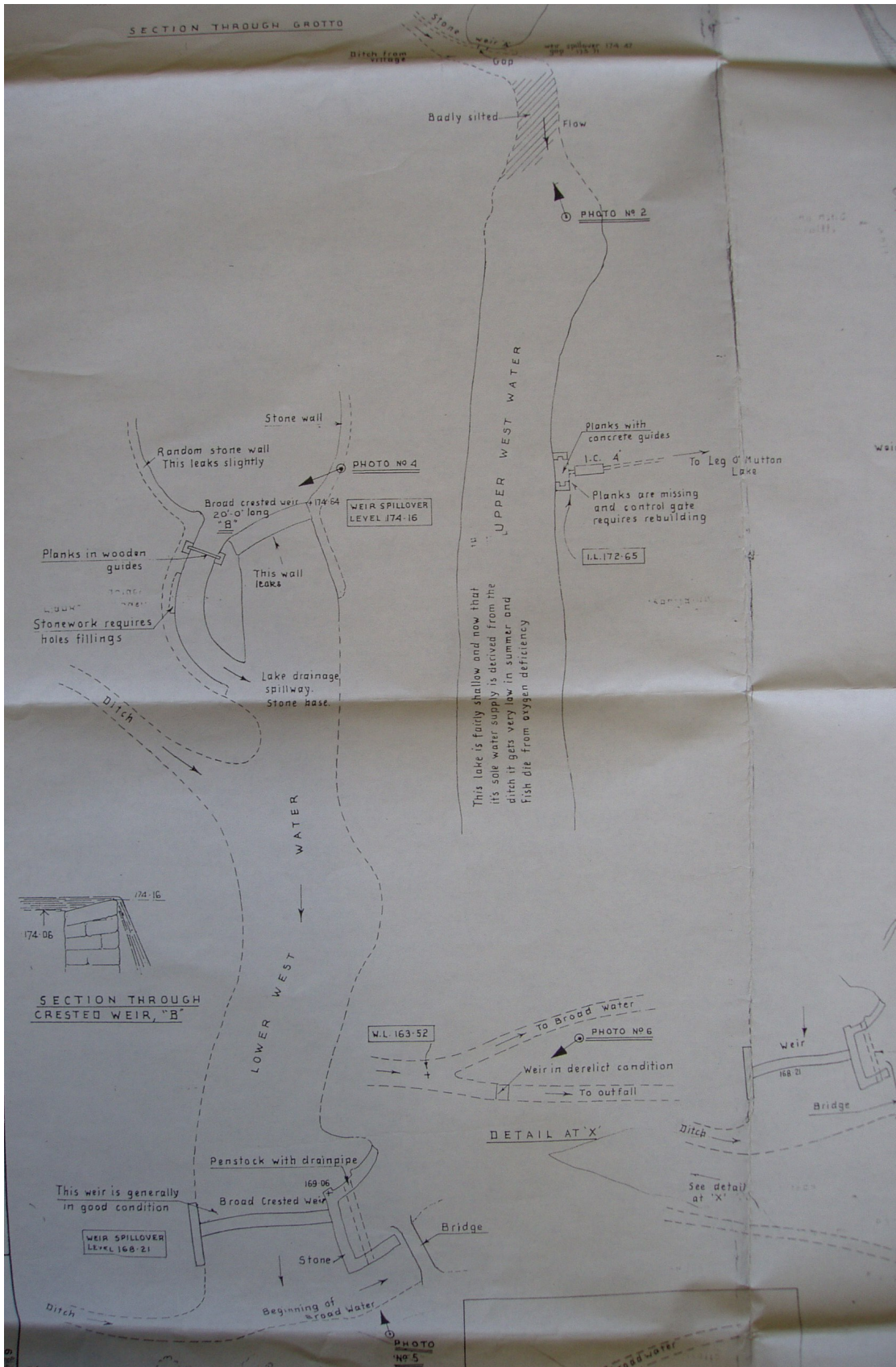


Figure 10: Plan Showing Old Park Weir, annotated with details of repairs