



# Bedford Gas Works

## Historic Building Investigation and Recording

January 2018

**Client: Montagu Evans**

Issue No: 1

OA Reference No:

NGR: TL04140 49195

oxfordarchaeology



southsouthsouth



Client Name: Montagu Evans

Document Title: Bedford Gasworks

Document Type: Historic Building Investigation and Recording

Grid Reference: TL04140 49195

Planning Reference: -

Site Code: BEGAS17

Invoice Code: BEGASBS

OA Document File Location:

OA Graphics File Location:

Issue No: 2

Date: January 2018

Prepared by: Jon Gill, Project Manager, Historic Buildings

Checked by: Julian Munby, (Head of Buildings Archaeology)

Edited by:

Approved for Issue by: Julian Munby (Head of Buildings Archaeology)

Signature:

.....

**Disclaimer:**

*This document has been prepared for the titled project or named part thereof and should not be relied upon or used for any other project without an independent check being carried out as to its suitability and prior written authority of Oxford Archaeology being obtained. Oxford Archaeology accepts no responsibility or liability for the consequences of this document being used for a purpose other than the purposes for which it was commissioned. Any person/party using or relying on the document for such other purposes agrees and will by such use or reliance be taken to confirm their agreement to indemnify Oxford Archaeology for all loss or damage resulting therefrom. Oxford Archaeology accepts no responsibility or liability for this document to any party other than the person/party by whom it was commissioned.*

**OA South**  
Janus House  
Osney Mead  
Oxford  
OX2 0ES  
  
t. +44 (0)1865 263 800

**OA East**  
15 Trafalgar Way  
Bar Hill  
Cambridge  
CB23 8SG  
  
t. +44 (0)1223 850 500

**OA North**  
Mill 3  
Moor Lane Mills  
Moor Lane  
Lancaster  
LA1 1QD  
t. +44 (0)1524 880 250

e. [info@oxfordarch.co.uk](mailto:info@oxfordarch.co.uk)  
w. [oxfordarchaeology.com](http://oxfordarchaeology.com)

Oxford Archaeology is a registered Charity: No. 285627



## Bedford Gasworks

### *Historic Building Investigation and Recording*

#### Contents

Summary .....	vii
<b>1 INTRODUCTION .....</b>	<b>9</b>
1.1 Project Background .....	9
1.2 Methodology .....	9
<b>2 BACKGROUND HISTORY .....</b>	<b>9</b>
2.1 General Development of the Gas Industry in the 19 <sup>th</sup> century .....	9
2.2 The Gasworks in Ford End Road, Bedford .....	11
<b>3 DESCRIPTION OF SITE.....</b>	<b>13</b>
3.1 Introduction .....	13
3.2 Gasholder No. 69.....	13
3.3 Gasholder No. 70.....	15
3.4 Gasholder No.71 .....	16
3.5 Other structures at the site .....	17
<b>4 SUMMARY AND CONCLUSIONS.....</b>	<b>19</b>
<b>APPENDIX A BIBLIOGRAPHY .....</b>	<b>20</b>

## List of Figures

Figure 1: Site location

Figure 2: First edition 25 inch Ordnance Survey map (1884)

Figure 3: Second edition 6 inch Ordnance Survey map (1902)

Figure 4: 1924 Ordnance Survey map

Figure 5: Plans of gasworks in 1920 and 1928, taken from *The Gas Journal*, May 23, 1928

Figure 6 1932 Aerial photograph showing Holders No. 69 (with original structural frame) and No. 70

© Historic England (EPWO37466)

Figure 7: Plan of gasworks in 1933

Figure 8: 1950 Ordnance Survey map

Figure 9: 1971 Plan of site showing areas proposed for demolition

Figure 10: Current site plan with location of photographs in report

## List of Plates

Plate 1: Holders 69 and 70 from north-west

Plate 2: Holders 69 and 70 from south-east

Plate 3: Holder 69 from south

Plate 4: Holder 69 from west

Plate 5: Holder 69 from south

Plate 6: Holder 69 from south-east

Plate 7: Detail of the cylinder of Holder 69

Plate 8: Opening created in Holder 69

Plate 9: Detail of frame of 69

Plate 10: Detail of guide rail rollers

Plate 11: Detail of Holder 69

Plate 12: Ladder against Holder 69

Plate 13: Detail of Holder 69

Plate 14: Detail of Holder 69

Plate 15: Typical standard in Holder 69

Plate 16: Detail to north of Holder 69

Plate 17: Plant building to west of Holder 69

Plate 18: Plant building to west of Holder 69

Plate 19: Interior of building to west of Holder 69

Plate 20: Interior of Holder 69

Plate 21: Interior of Holder 69

Plate 22: Interior of Holder 69

Plate 23: General view of Holder 70

Plate 24: General view of Holder 70

Plate 25: North side of Holder 70

Plate 26: Holders 69 and 70

Plate 27: Makers plate on Holder 70

Plate 28: Feature to north of Holder 70

Plate 29: Ladder to side of Holder 70

Plate 30: Detail of standard to Holder 70

Plate 31: Trench around Holder 70

- Plate 32: Plant buildings to NW of Holder 70
- Plate 33: Plant buildings to NW of Holder 70
- Plate 34: Interior of Holder 70
- Plate 35: Interior of Holder 70
- Plate 36: Interior of Holder 70
- Plate 37: Interior of Holder 70
- Plate 38: Interior of Holder 70
- Plate 39: Detail of side of Holder 70
- Plate 40: Detail of side of Holder 70
- Plate 41: General view of Holder 71 during demolition
- Plate 42: General view of Holder 71 during demolition
- Plate 43: General view of Holder 71 during demolition
- Plate 44: General view of Holder 71 during demolition
- Plate 45: General view of Holder 71 during demolition
- Plate 46: General view of Holder 71 during demolition
- Plate 47: Surviving rear side of Holder 71
- Plate 48: Makers plate to side of Holder 71
- Plate 49: Feature to north side of Holder 71
- Plate 50: Section detail through cylinders of Holder 71
- Plate 51: Ex-situ detail of rollers in Holder 71
- Plate 52: Detail of plant by Holder 71
- Plate 53: North side of Holder 71
- Plate 54: Section through side of Holder 71
- Plate 55: Trench around Holder 71
- Plate 56: Side of Holder 71
- Plate 57: North side of Holder 71
- Plate 58: Plant to north side of Holder 71
- Plate 59: Junction plate to side of Holder 71
- Plate 60: Plant to north-east of gasworks
- Plate 61: Plant to north-east of gasworks
- Plate 62: Plant to north-east of gasworks
- Plate 63: Plant to north of Holder 70
- Plate 64: Plant to north of Holder 70
- Plate 65: Typical section of wall to west side of site

## Summary

The gasworks in Bedford has been a feature of the town's landscape since the 1830s; initially on a site off Priory Street and from 1864 on a nearby site off Ford End Road. The large gasholders would have formed prominent features illustrating the 19<sup>th</sup> and 20<sup>th</sup>-century industrial development of this part of the town, also shown by the Eagle Brewery to the west of the works, the Britannia Iron Works to the south-east and by the railway passing to the east.

The gasworks gradually expanded during the first half of the 20<sup>th</sup> century but then in the 1970s much of the site was cleared after British Gas decided to phase out the production of gas from burning coal in retorts to the use of natural gas.

Three large gasholders remained in use after this switch to natural gas but they are now redundant and the site is being fully cleared. This forms part of a wider national programme to clear redundant gasholders and due to the fact that they are often of some heritage interest (although rarely listed) National Grid is undertaking a programme of historic building recording prior to their loss. Their interest is often as they form prominent elements of many urban landscapes.

The three holders at the Bedford works which have been recorded are all 20<sup>th</sup>-century in date and the part of the overall site where they are located is also part of the 20<sup>th</sup>-century expansion to the works. Two of the holders are spirally guided and name plates firmly date them to 1926 and 1938. The other holder has a telescopic design and it was originally constructed in the early 20<sup>th</sup> century (probably Edwardian period). However, it underwent a substantial reconstruction in the mid 20<sup>th</sup> century (probably between 1945 and 1960) when the external supporting frame was replaced.

The gasholders are of limited intrinsic heritage significance but they will have some local interest in relation to this part of Bedford and the current recording has documented this.

The site also includes various other small elements of plant but none of these are of any age or heritage significance.





## 1 INTRODUCTION

### 1.1 Project Background

- 1.1.1 Oxford Archaeology (OA) was commissioned by Montagu Evans LLP, on behalf of The National Grid, to undertake historic building recording at a former Gasworks in Ford End Road in Bedford. This was undertaken in relation to the demolition of three gasholders at the site prior to the remediation and redevelopment of the area.
- 1.1.2 The work forms part of a wider national project agreed between Historic England and National Grid to record gasholders (and Gasworks) prior to their loss even when these are not listed or of only local interest.
- 1.1.3 A brief for the work was produced by Edward Youngson of Montagu Evans which specified that a basic Level 2 survey on this site should be undertaken.

### 1.2 Methodology

- 1.2.1 The recording was undertaken during the demolition of the gasholders and clearance of the site. One of the gasholders had already been half demolished by the time the recording was undertaken and work had also started on the other two holders. No access inside the gasholders was possible for safety reasons although photographs of the interior could be taken from openings recently created in the structures in preparation for their demolition.
- 1.2.2 As specified in the brief a 'basic Level 2 survey' was undertaken which was largely photographic and descriptive in nature. The levels of recording undertaken in the wider project to record gasworks have previously been agreed with Historic England on a portfolio basis.
- 1.2.3 The recording utilised the existing overall site plan but no new metric survey was undertaken.

## 2 BACKGROUND HISTORY

### 2.1 General Development of the Gas Industry in the 19<sup>th</sup> century

#### 2.1.1 General history

- 2.1.2 The account below on the general development of the gas industry, as well as the discussion on different types of gas holders, is based largely on several articles available on line by Dr Russell Thomas, particularly *The History and Operation of Gasworks (Manufactured Gas Plants)*.
- 2.1.3 The origins of the use of gas for artificial lighting lie in the 1790s when William Murdoch first used coal gas to illuminate his house in Redruth, Cornwall. Murdoch produced the gas by burning coal in a small retort in his back yard. In the following years he continued to experiment with gas lighting by improving the technology and in the first decade of the 19<sup>th</sup> century his methods were used to illuminate various mills and industrial works.
- 2.1.4 Other important individuals were also helping to develop the industry in this period including Samuel Clegg an engineer who's work led to several technical advances and Frederick Winsor who established the Gas Light and Coke Company in 1812. Winsor's vision, which was for an industry where gas was supplied to many customers from a single large gasworks, differed from Murdoch's which was for individual smaller plants supplying single sites.
- 2.1.5 By 1850 there were 13 gas companies in London and many provincial towns were also lit by gas. In 1869 work began on the Gas Light and Coke Company's Beckton gasworks.

- 2.1.6 The industry developed in the later 19<sup>th</sup> century with various innovations such as the vertical retort plant, which allowed continuous operation and used gravity to create a process flow, the gas mantle light and the greater use of by products from the gas production process.
- 2.1.7 The Second World War had a major impact on the industry, particularly through bomb damage and loss of workers to the war effort and in an attempt to rebuild the industry after the war the Labour Government passed the Gas Act of 1948 which nationalised the industry with 12 gas boards.
- 2.1.8 In the later 1960s it was decided that the UK would phase out gas produced from coal and would instead move to an industry based on natural gas, some imported and some obtained from North Sea gas fields. This led to extensive works during the 1970s to clear redundant facilities from gasworks and adapt or convert other plant which was to be reused. By the mid 1970s there were very few surviving sites where town gas was still being produced; these were mainly in remote parts of Scotland and the last site closed in 1981.

### **2.1.9 Elements of a gasworks**

- 2.1.10 A typical gasworks where coal gas was produced comprised many different elements of plant, although some of these may only have been at the larger sites. Among the elements would be:
- The retort (a sealed container where coal would be heated externally to produce gas (and various other byproducts);
  - Condensers which cooled the gas;
  - Various washers/scrubbers/purifiers which would remove ammonia/tar/hydrogen sulphide/hydrogen cyanide;
  - Gasholders where the gas would be stored in order to cope with peaks and troughs in demand and to ensure that there was always a ready supply (discussed further below)
- 2.1.11 The flow of gas around the site would be maintained by plant called 'exhausters' which were found on all but the smallest gasworks.
- 2.1.12 **Gasholders:**
- 2.1.13 From the early 19<sup>th</sup> century the gas produced in retorts was stored in large holders and in the early phase of the industry these tended to be housed within separate buildings due to fears of explosion. In truth however the dangers of leaking gas becoming trapped and then exploding was considerably greater when the gasholder was enclosed by a separate building and this gradually led to the external cylindrical gasholder which became the most recognisable feature of any gasworks.
- 2.1.14 In 1824 the telescopic gasholder was invented whereby separate, circular, close fitting vessels would be located within one another so that each inner vessel would rise when the outer one reached its capacity. This allowed increased storage on the same footprint. Initially the upper lifts of the early types of telescopic holders were raised vertically, either guided by wire cables or by columns, and then in the late 1880s the spirally-guided gasholder was invented comprising a series of vessels which would rotate and spiral up or down with each chamber guided by the one below. Each vessel would have diagonal guide rails fixed to its side which would engage with roller carriages fixed to the top of the vessel beneath. Two of the gasholders at Bedford are of this common design.
- 2.1.15 In almost all types of gas holder the cylinders were essentially floating on a large seal of water at the base and the gas would generally be stored here for 24 to 36 hours.

## 2.2 The Gasworks in Ford End Road, Bedford

- 2.2.1 The origins of Bedford's gas industry lie in the formation in 1833 of *The Gas Light Company* by a number of local businessmen and the establishment of a gasworks on the west side of the town adjacent to Priory Street. The site was initially supplied with water-borne coal from Newcastle, using the River Great Ouse, prior to the extension of the railway to the town (*A Hundred Years of Bedford and its Gas Supply*).
- 2.2.2 The gasworks was originally on the edge of Bedford but due to the expansion of Bedford, the area surrounding the works became more developed and difficulties emerged over the works polluting neighbouring water supplies. In 1864 the Bedford Gas Act was passed and work began on the company's new gasworks off Ford End Road further from the centre of the town. The new works were close to the new railway.
- 2.2.3 The earliest Ordnance Survey (OS) map for this area is that from 1884 (Fig 2) and this shows the gasworks located on the south-east side of Ford End Road. This complex, included four circular structures (not necessarily all gasholders) but it did not extend south-east as far as the site in the current project. The map shows the rail network passing to the east of the gasworks and the large Britannia Ironworks to the south-east.
- 2.2.4 The next OS map is the edition of 1902 (surveyed in 1900) and this shows that by this date the gasworks had extended slightly south-eastwards but still not as far as the site in the current project (Fig 3). A large gasholder had been constructed in this enlargement of the site and the various ranges along the north-eastern side of the gasworks had also been extended south-eastwards.
- 2.2.5 During the 1920s considerable investment was made at the Bedford Gasworks to improve efficiencies and storage capacity and these are detailed in an article contained in the *Gas Journal* May 23, 1928. The article includes a plan of the works from 1920 and this shows that by this date a large new gasholder had been constructed subsequent to the OS map from 1902 on a new piece of land which formed a south-eastwards extension to the works (Fig 5). The plan labels this as 'No.3 Two Lift Gasholder, 865,000 cubic feet' and it is on the site of Gasholder 69 which has been recorded in the current project. It is unlikely that this gasholder would have been constructed during the First World War or immediately after it so it is probable that it dates from the Edwardian period. The structure later underwent some reconstruction in the mid 20<sup>th</sup> century (detailed further below).
- 2.2.6 The article confirms that the retort houses of the gasworks were along the eastern edge of the site, closest to the railway line, together with the coal store, while the Head Office and Engineer's Residence were adjacent to Ford End Road. The site incorporated a set of railway tracks and various other buildings including purifiers, oxide shed, boiler house and circular tar/liquor tank. Among the improvements undertaken in the 1920s was the construction of a Tully Plant.
- 2.2.7 The OS map of 1924 (Fig 4) shows a broadly similar layout of structures to that in 1920 although it is likely that new facilities at the works were under construction at the time of the survey. The map confirms that the gasworks had not yet expanded to its full size; the area immediately to the west which includes most of the site in the current project was still shown as allotments on the 1924 map.
- 2.2.8 An excellent set of aerial photographs survive dated 1932 and available on the *Britain From Above* website showing the site in some detail. One of these is included here as Figure 6. These photographs confirm that by this date a large spiral-guided gasholder had been constructed to the west of the one shown in 1924 and it is clear that this was one of the gasholders recorded in the current project (No. 70). However, the works had still not reached its full extent because the photographs show a very long boundary wall, a short distance to the west of

Holder No.70 and beyond this there still appear to have been allotments in the area where Holder No.71 now stands.

- 2.2.9 With regard to the current project a key feature shown by the photographs is the fact that the guide frame of Holder 69 was quite different in 1933 to that today and it has clearly been reconstructed. The structure in 1932 had 18 sets of tapering stanchions (same number as today) but they were each formed from simple cross/lattice girders distinctly different to the castellated girders present today. The horizontal members of the structure were also constructed from similar lattice members and unlike today each of the stanchions was topped by a ball finial. The castellated steelwork which forms the current frame is normally associated with reconstructions between 1945 and 1960 (as noted in the project brief).
- 2.2.10 The 1932 photographs provide much detail on the many buildings of the gasworks standing at this date but because they no longer survive and have not been recorded in the current work a detailed description of them from the photo is unnecessary here.
- 2.2.11 The pamphlet produced in 1933 (*A Hundred Years of Bedford and its Gas Supply*) provides further evidence on the layout of the wider works complex in this year and states that at this time the largest gasholder had a capacity of 1.5 million cubic feet. This would have been Gasholder 70 recorded in the current project.
- 2.2.12 The OS map of 1938 suggests that by this date the gasworks had extended westwards into the area that was formerly allotments; the wall dividing the areas which was shown on the 1932 photos is no longer present on the map but it is interesting to note that Gasholder 71 is also not yet shown. Today the holder has a name plate dated 1938 so it may even have been under construction when the map was being surveyed.
- 2.2.13 An OS map from 1950 confirms that Holder No.71 had been erected and this shows the works at their maximum extent (Fig 8). As referred to above towards the end of the 1960s it was decided to move towards natural gas and to phase out the production of coal gas. A demolition works plan from May 1971 (included in the project brief) shows that much of the gasworks site was to be cleared, other than the three main gasholders and various other pieces of surviving plant.
- 2.2.14 The OS map of 1980 confirms that by the end of the decade the main historic part of the gasworks had been cleared.

## 3 DESCRIPTION OF SITE

### 3.1 Introduction

- 3.1.1 As outlined above the site which forms the focus of the current project comprises an area of 20<sup>th</sup>-century expansion to the south-east of the 1860s gasworks in Bedford. The site of the original works was cleared in the later 20<sup>th</sup> century and today it remains as an area of scrubland. The Britannia Iron Works to the south-east no longer survives but there is still evidence of the industrial nature of this part of the town in the form of the railway line to the east and the Eagle Brewery to the west.
- 3.1.2 The current site is dominated by three large gasholders arranged in a line broadly south-west to north-east although there also survives various other minor pieces of plant or infrastructure (see section 3.5).

### 3.2 Gasholder No. 69

- 3.2.1 **Numbering:** The easternmost of the three gasholders recorded in the current project is generally marked on historic plans as being Gasholder No. 3 but there is a No '69' painted on its side today (Plate 16) and therefore this numbering has been used in the current study.
- 3.2.2 **Historical summary:** As outlined above there was originally a gasholder constructed on this site at some point between the Ordnance Survey map of 1902 and a plan dated 1920 which was included in an article from the *Gas Journal*. It is very unlikely that a new holder would have been constructed during the First World War or immediately after it so it is safe to assume that this holder pre-dates 1914 and is probably Edwardian in date. However, we also know that the supporting structural frame was entirely reconstructed in the mid 20<sup>th</sup> century (probably sometime between 1945 and 1960), possibly together with the entire gasholder (discussed further below).
- 3.2.3 **General description:** This is a three-lift, frame-guided, above ground gasholder. The structure comprises two main elements: 1) the outer structural frame and 2) the telescopic cylindrical holder with three separate close-fitting cylinders which would have fitted immediately inside one another. The outer cylinder or tank is fixed in place, bolted to the outer frame, and the other two cylinders would have risen or lowered vertically (as opposed to spirally) depending on the amount of gas being held at any time. Their movement would have been guided by the outer structural frame.
- 3.2.4 The structure is c.45 m in diameter and its full height is c.26 m above ground although it is set within a c.2 m tall concrete-lined pit (Plate 14). This pit has a guard rail extending around it with a simple, relatively crude design with L-section uprights. Both this and the character of the concrete lining to the pit immediately beneath are suggestive of a mid 20<sup>th</sup> century date rather than an Edwardian one, so these elements are believed to date from the reconstruction between c.1945 and c.1960.
- 3.2.5 **Drum:** The outer cylindrical tank or drum is constructed from large sheets of steel, arranged in seven horizontal rows, riveted together with a single line of rivets at each horizontal joint and rows of two rivets at each vertical joint. The main drum is painted a dark chocolate brown but the lower two sheets are a lighter brown.
- 3.2.6 At the top of the fixed outer drum there is a narrow walkway, overhanging beyond the line of the drum and supported from beneath by simple brackets (2 between each stanchion) bolted to the cylinder (Pl.9-10). The guardrail around this walkway has a simple design with L-section uprights that match those around the trench which surrounding the base of the gasholder and therefore this rail is also believed to date from the mid 20<sup>th</sup> century reconstruction. It is

- interesting to note however that there is also another guardrail around the top of the drums with an older design apparently with circular posts and rounded joints where they adjoin the rails (Pl. 10, 15). Although it was not possible to examine these guard rails closely they appear to have been fixed to the innermost drum and their design strongly suggests that they were from the original (Edwardian) gasholder. This suggests that the main cylindrical gas holder was retained in the mid 20<sup>th</sup>-century remodelling rather than being entirely replaced.
- 3.2.7 When the recording was undertaken two large openings had previously been made through the side of the cylinders to allow demolition machines to enter and here it was possible to see the two inner drums, also in section (Pl. 8, 14-15). These drums were also formed from riveted sheet steel although the steel was thinner than that in the outer drum and the rivets were also smaller.
- 3.2.8 At the point where the opening has been made it is just possible to see the curved brackets which hold a free wheel at their end which engages with guide slots in each vertical stanchion (Plate 10). These would have helped stabilise the overall holder and allowed it to rise or fall smoothly.
- 3.2.9 **Interior of drum:** The interior of the gasholder could be partially seen during the current project through the two large openings although it was not safe to actually enter the drum (Pl.20-22). The walls of the inner cylindrical drum are braced by a series of 36 vertical posts or ribs and towards the north there are two full height pipes (inlet and outlet?) extending from the base which is obscured by water up through the top of the roof.
- 3.2.10 The crown is supported at its centre by a structural post which comprises two distinct elements: the lower part, which extends down into the water is a lattice type girder which is presumably fixed while the upper part is a cylindrical column and it may be that this element would rise telescopically as the gas holder expanded. At the top and bottom of the cylindrical column there is a steel ring which secures the inner end of a series of 18 ties and trusses supporting the roof covering.
- 3.2.11 Each of the 18 light-weight trusses is formed from steel and has a cigar-shaped profile which tapers towards each end (ie towards the apex and towards the point where the domed roof meets the vertical wall). Each truss has a series of circular-section tie rods forming the long lower member and a T-profile length of rolled steel forming the upper member which directly supports the roof covering. Between the upper and lower members there are five evenly spaced ties bolted at top and bottom.
- 3.2.12 The overall roof structure is also supported by 18 long tie-rods connecting the 'eaves' (ie where the roof meets the vertical walls) to the top of the central lattice-work stanchion. The sheets of steel which form the roof covering are supported by concentric rings of rolled steel resting on the trusses.
- 3.2.13 The base inside the cylinder is obscured by water of unknown depth and this obscured whether there was a dumping to this structure.
- 3.2.14 **External structural frame:** The structural frame which supports the holder is formed from 18 castellated steel, I-section standards (90 x 20 cm at base) which taper as they rise toward the top of the frame and the frame is braced by two ring-girders which extend around the entire structure. These rings, which are each formed by 18 separate castellated steel beams, are located at the very top of the structure and at a point approximately two thirds the overall height of the structure. These upper two tiers also incorporate tension-rods in a simple cross shape, within every panel between each stanchion.

- 3.2.15 The lower third of the frame is also braced by the fixed outer section of the main tank which is bolted to each of the 18 stanchions. The mid 20<sup>th</sup>-century walkway around the top of the drum incorporates a small projection around each standard.
- 3.2.16 The inner face of each standard has a simple vertical slot or guide rail to engage with the free-wheel referred to above that allowed the cylinders to lift.
- 3.2.17 **Other structures:** On the west side of the structure there is a small, mid or later 20<sup>th</sup> century building (booster house?) constructed from pre-fabricated concrete panels with two pipes extending from here into the upper part of the drum (Plates 17-19). This structure, which has a flat concrete roof and timber doors, was probably added in the early 1970s when the site was converted to the storage of natural gas.
- 3.2.18 On the north side of the gas holder there is an earlier, concrete lined pit which is now redundant and which has been covered over by concrete 'sleepers'. Two small pipes extend up from below, just above the top of the sleepers and clearly there would formerly have been a substantial piece of plant here against the side of the gasholder.
- 3.2.19 **Discussion of phasing:** It is known that the original gasholder in this location was constructed in the early 20<sup>th</sup> century (probably Edwardian period) but that the current supporting structural frame dates from the mid 20<sup>th</sup> century. In terms of the history and phasing of Gasholder No.69 the main question is whether the cylindrical gasholders themselves were also rebuilt in the mid 20<sup>th</sup> century or whether the frame was rebuilt around the surviving holders. The current analysis suggests that the mid-20<sup>th</sup>-century works did not comprise a complete rebuild and that the cylinders themselves survive from the earlier phase. The nature of the steelwork to the outer drum appears older than the mid 20<sup>th</sup>-century frame and this interpretation is particularly supported by the fact that there are two types of guard rail at the top of the drums. The outer rail is clearly later and dates from the mid 20<sup>th</sup> century works but the inner rail has an older design and must survive from the Edwardian phase.
- 3.2.20 The nature of the roof structure, with a combination of tie-rods in tension and rolled steel in compression is also suggestive of an earlier date (eg Edwardian) than the 1950s and also earlier than the other two gasholders at this site.

### 3.3 Gasholder No. 70

- 3.3.1 **Numbering:** Holder No.70 is the central of the three gasholders and historic plans tend to label it as No.4.
- 3.3.2 **Historical summary:** Historic maps show that the land which includes Holder No.70 was incorporated into the expanding gasworks during the 1920s and we know from a name plate on the north side of the structure that it was built in 1926 (Pl. 27).
- 3.3.3 **General description:** Holder No.70 is an above-ground, 3-lift spiral-guided, structure and the full diameter of the holder is c.45 m. There is a shallow, concrete-lined trench immediately surrounding the full circumference of the tank and a guard rail extends around this (Pl. 31). A name plate on the northern side of the structure shows that it was built in 1926 by Contractors *C&W Walker Ltd* from Donnington, Shropshire and by the Engineer *JB Hansford*.
- 3.3.4 **Drum and structural frame:** The skin of the fixed outer tank is formed from six horizontal courses of riveted plates braced by 20 rolled steel standards against the face of the drum. Each standard is c.89 cm wide and with their centres set c.8 m apart from the adjacent one. The upper four courses of plates are painted brown while the lower two are black. The rivets are arranged in something of a pattern whereby there are fewer rivets at the higher junctions:
- 3.3.5 Inside the fixed outer tank there are a further three close-fitting cylinders and these have been partly exposed in the current project by the creation of a large opening through the holder in

preparation for demolition plant to enter the structure (Pl. 36-37). The inner three cylindrical 'lifts' are all formed from slightly thinner sheets of steel and they are fixed with a lighter-duty structure braced with L-section steels.

- 3.3.6 **Interior of drum:** The internal face of the drum is braced by 35 full-height, vertical I-section steels with additional diagonal bracing every second bay.
- 3.3.7 At the centre of the tank is a structural post, similar to that in Holder 69, with a fixed, hollow lattice-box girder to the lower part and a cylindrical column above this.
- 3.3.8 The shallow domed roof of the crown is supported by c.35 trusses, each one extending between the central column and the outer drum. The basic structural principles found in the roof of this gasholder are similar to those in No.69 but the construction is less elegant with a large number of flat steel plates, L-profile rolled steel and a small number of tie-rods. The main structure is a 'cigar' shaped truss from the apex to the 'eaves', with six transverse struts across the truss and with additional bracing provided by cross members. In addition to the cigar-shaped truss the structure is also strengthened by pairs of flat-section steel connecting the top of the central lattice box girder with the 'eaves' where the vertical walls meet the roof. Due to the curve of the under edge of the cigar-shaped truss and the straight tie there is a point in each example where the two structural elements overlap and the lower (straight) member straddles either side of the upper (curved) member.
- 3.3.9 The upper edge of each cigar-truss supports a series of concentric rings which themselves support the roof covering itself.
- 3.3.10 The floor of the holder is almost entirely obscured by a shallow pool of water but in places it is possible to see what appear to have been sheets of steel plate forming the floor. The floor appears to be flat and there does not appear to be a dumping at the base.

### 3.3.11 **Other structures:**

- 3.3.12 To the west of Holder 70 there is a small, white concrete framed structure with a flat roof and similarly to the structure by Holder 69 there are two pipes exiting it which connect with the main gasholder (Pl.25). The doorway to this structure has been infilled with concrete block. Also similarly to Holder 69 there is a pit on the north side lined with concrete blocks which is covered over with concrete 'sleepers' (Pl.28). Two small pipes extend up from plant below. This pit extends across the trench which encircles the gasholder.

## 3.4 **Gasholder No.71**

- 3.4.1 **Numbering:** Holder No.71 is the westernmost of the three gasholders and historic plans tend to label it as No.5.
- 3.4.2 **Historical summary:** The pamphlet *A Hundred Years of Bedford and its Gas Supply* shows that in 1933 the site of Gasholder 71 was in an area which had not yet been acquired by the expanding Gasworks and a name plate on the northern side of the structure shows that it was built in 1938.

### 3.4.3 **General description:**

- 3.4.4 Gasholder No.71 has a similar 3-lift, spiral-guided, above-ground design to No.70 but it is larger (c.49 m diameter) and it has a slightly larger (wider and deeper) trench around its edge. A name plate on the northern side of the structure shows that the gasholder was built in 1938 by Contractors *C&W Walker Ltd* from Donnington, Shropshire and by the Engineer *JB Hansford* (Pl.49).



- 3.4.5 **Tank/Drum:** The outer cylindrical tank is formed from six horizontal courses of steel plate and these are connected with separate steel plates riveted to the side of the main structure. The connecting plates in the lowest two courses are large and octagonal while those in the two courses above this are thinner rectangular strips. The arrangement of the upper two courses is different and here the plates are connected by much larger plates which also incorporate pairs of tall tapering brackets which also support the walkway around the upper rim of the holder. Unlike Holder 70 there are no full height standards around the edge of the tank.
- 3.4.6 On the north side of the holder there is a staircase fixed to the external drum which would have allowed access to the walkway around the fixed tank. Access would also have been possible up to the higher levels when the holder was raised and the simple structural frame from two free-standing flights of stairs survive above the lower tank.
- 3.4.7 **Interior of drum:** the current recording has been undertaken during the demolition of this holder; the entire roof structure has been removed and almost half of the walls. The construction of the fixed tank and three separate cylindrical lifts inside can be seen in section. The external skin (fixed tank) is formed from thick sheet steel with large rivets while the inner lifts are formed from thinner sheet steel with smaller rivets. There are vertical I-section ribs within the gasholder, strengthening the inner lift and the imprint is visible of diagonal lines of rivets spiralling around the holder. These rivets fix diagonal guide rails on the outer face of the inner lift which would engage with rollers at the top of the adjacent lift to help raise the vessel.
- 3.4.8 To the northern side of the structure there are two large vertical pipes extending up from the base to the roof. The pipes terminate just below the roof but there are two holes directly above and clearly there would have been further pipes or flues which continued out of the structure.
- 3.4.9 **Other structures:** On the north-east side of holder 71, outside the perimeter trench, there is a small piece of plant (booster/pump or value house?) within a box c.1 m tall x 1.5 m long x 75 cm wide. Two pipes with valves enter the structure and connect with the main gas holder. It is assumed that this was added in the 1970s works when the site was converted to natural gas and that it had the same function as the larger structures adjacent to the other two gasholders.
- 3.4.10 Similarly to the other two gasholders on the north side there is a pit with concrete sleepers over the top with pipes extending up from plant held below. This pit is set against the side of the main cylindrical tank and it interrupts the trench around the perimeter of the tank. The guard rails also respect this feature and return around the point where the trench meets it.

### 3.5 Other structures at the site

- 3.5.1 Although the site is dominated by the three gasholders there are various other features or surviving pieces of plant. Some of these have been described above as they clearly directly relate to a particular gasholder but others comprise distinct groups in themselves. In addition there are also other sections of pipework at the surface crossing the site and it has not been attempted to plot or record all of these.
- 3.5.2 Other than the gasholders the largest other group of plant is at the western corner of the site (to NW of gasholder 71). There was no access to this area during the recording but it is only surrounded by a chain-link fence so some photographs could be taken (Plates 60-62). The pamphlet *A Hundred Years of Bedford and its Gas Supply* shows that this installation is within an area which was not part of the gasworks in 1933 but we know that Gasholder 71 was erected in 1938 so it was part of the gasworks in this date. The 1:1250 OS map from 1968 does not show anything in this area so we can be confident that it had not been built by then but a plan of the site from 1971 does show a set of structures whose outline appear to closely match

the current features. The 1971 plan labels these structures *Booster and Governor Installation* and it appears to show pipes connecting with each of the three gasholders.

- 3.5.3 The Booster and Governor Installation comprises a simple open-sided, steel-framed structure with a corrugated panel roof. This provides a simple structure covering over sets of pipes at the surface and extending below-ground towards the north and south.
- 3.5.4 There is another smaller installation to the north of Holder 70 with a simple metal framed roof providing rudimentary shelter (Plates 63-64). This structure is clearly later 20<sup>th</sup>-century in date and it is not shown on any of the plans. The latest of the plans are from 1990 so the structure may post date this although the 1990 plan does not appear to show every structure at the site.
- 3.5.5 This plant was constructed by Donkin and comprises various pipes with 'flow of gas' marked in several places as well as a fan on a concrete base and what appears to be a small sump. Some pipes are also labelled live gas and some 'purged'.
- 3.5.6 To the north-east of Holder 70 is a pair of small single storied brick structures with a covered cable extending to the north and clearly they were part of the electrical infrastructure at the site. A plan from 1974 shows a building here with a different orientation but presumably with a similar function and the plan suggests that this included a substation, switchgear, meter room and transformer.
- 3.5.7 A stone wall survives around much of the southern, western and eastern boundaries of the site but the northern side, which divides the surviving part of the gasworks from the earlier parts demolished in the 1970s, comprises a chain-link fence. The stone wall is c.1.2 m tall and formed from courses of neatly dressed stone blocks.
- 3.5.8 The south-east corner of the site is a large area of overgrown scrubland and this is the location of the former gasworks purifier house which OS maps show was demolished in the 1970s.

## 4 SUMMARY AND CONCLUSIONS

- 4.1.1 The gasworks at Bedford, and particularly the large cylindrical gasholders, have formed a prominent feature on the local townscape since the early 1830s, before Queen Victoria came to the throne. The gasworks moved site in the 1860s and it grew in several phases in the first half of the 20<sup>th</sup> century but it was largely cleared in the 1970s due to the policy to move from town gas created by burning coal to natural gas. Three large gasholders continued in use and survived into the 21<sup>st</sup> century but they are also now redundant and are being removed.
- 4.1.3 None of the three gasholders are of particular historical significance but they are local landmarks and they do illustrate something of the development of gasholders in the 20<sup>th</sup> century. The earliest holder is frame guided and was originally constructed in the early 20<sup>th</sup> century (probably Edwardian period) but the surrounding external structural frame was reconstructed in the mid 20<sup>th</sup> century. The other two are both spiral guided and from the second quarter of the 20<sup>th</sup> century (1926 and 1938).
- 4.1.4 The earliest spiral guided gasholders were constructed in the late 19<sup>th</sup> century (the first being in Northwich in 1890) and those constructed between 1920 and 1930 formed part of the proliferation of spiral guided gasholders from 1920 through to 1950, when they became the prevalent type of gasholder. Whilst the reconstruction of the frame guided gasholder at Bedford is interesting because it wasn't replaced with a spiral guided gasholder (which would have had a larger capacity), it is essentially a modern construction that is of limited historic architectural or engineering significance.
- 4.1.5 Due to the general prominence and ubiquity of gasholders during the 20<sup>th</sup> century in urban areas they are a building type that has developed a heritage interest and a wide programme of recording has been undertaken to document these structures. The recording of the three holders at Bedford has formed part of this programme.

## APPENDIX A      BIBLIOGRAPHY

### ***Bibliography***

Thomas Russell Dr *The History and Operation of Gasworks (Manufactured Gas Plants)* (unpublished report, 2014)

A Hundred Years of Bedford and its gas supply, 1833-1933. (Published by the Bedford District Gas Co).

### ***Maps***

1884 Ordnance Survey map (25 inch)

1902 Ordnance Survey map (25 inch)

1926 Ordnance Survey map (25 inch:1 mile)

1927 Ordnance Survey map (1:10,000)

1938 Ordnance Survey map (1:10,000)

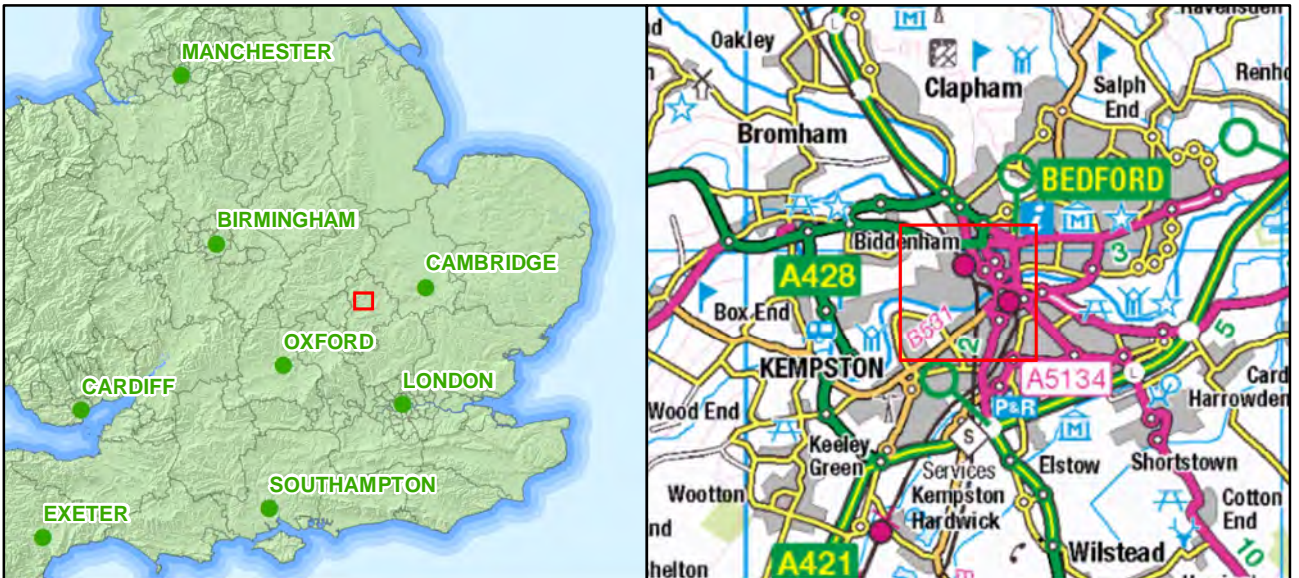
1972 Ordnance Survey map (1:10,000)

1980 Ordnance Survey map (1:10,000)

1987-89 Ordnance Survey map (1:10,000)

### ***Websites***

[www.britainfromabove.org.uk](http://www.britainfromabove.org.uk)



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User

Figure 1: Site location

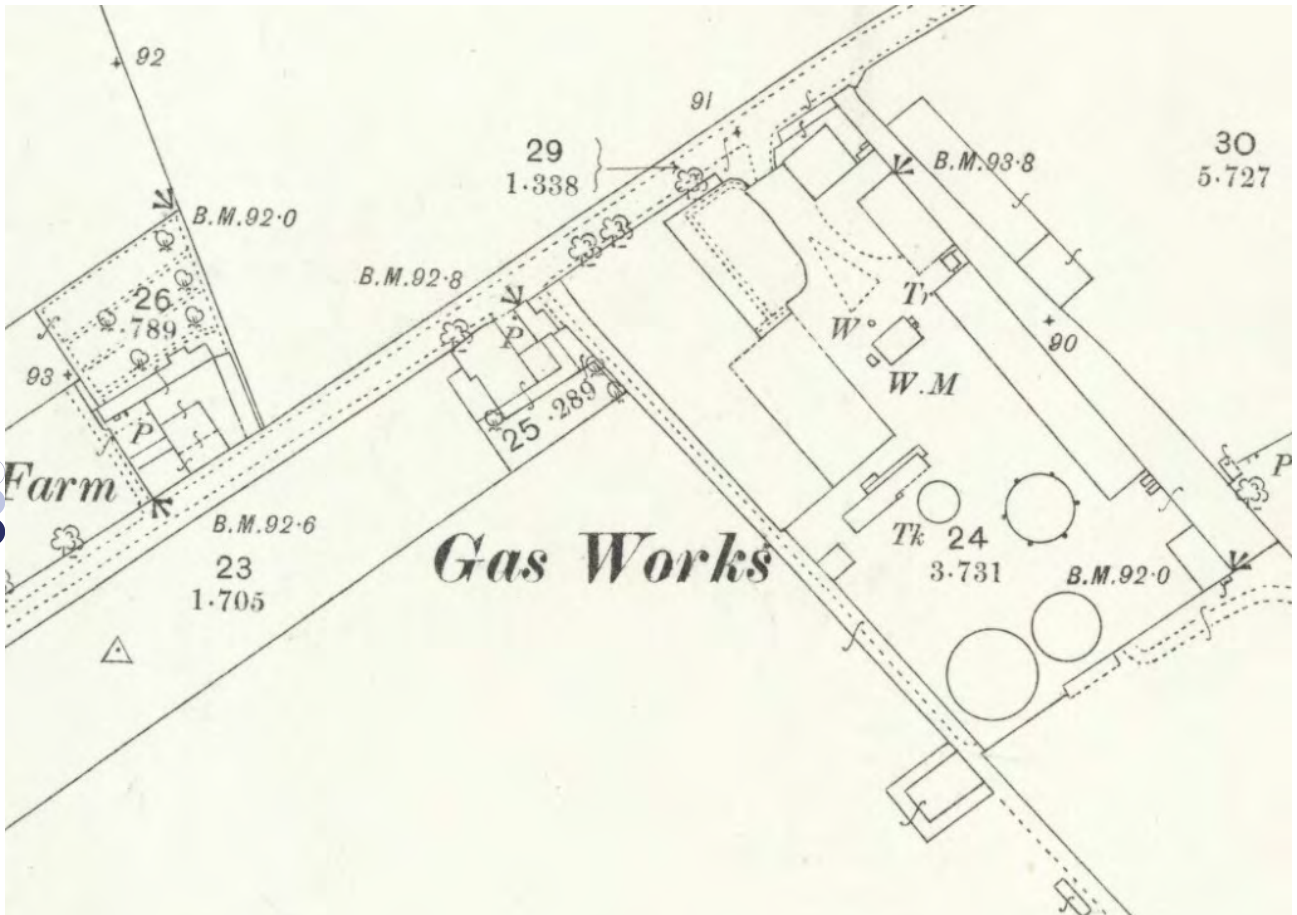


Figure 2: First edition 25 inch Ordnance Survey map

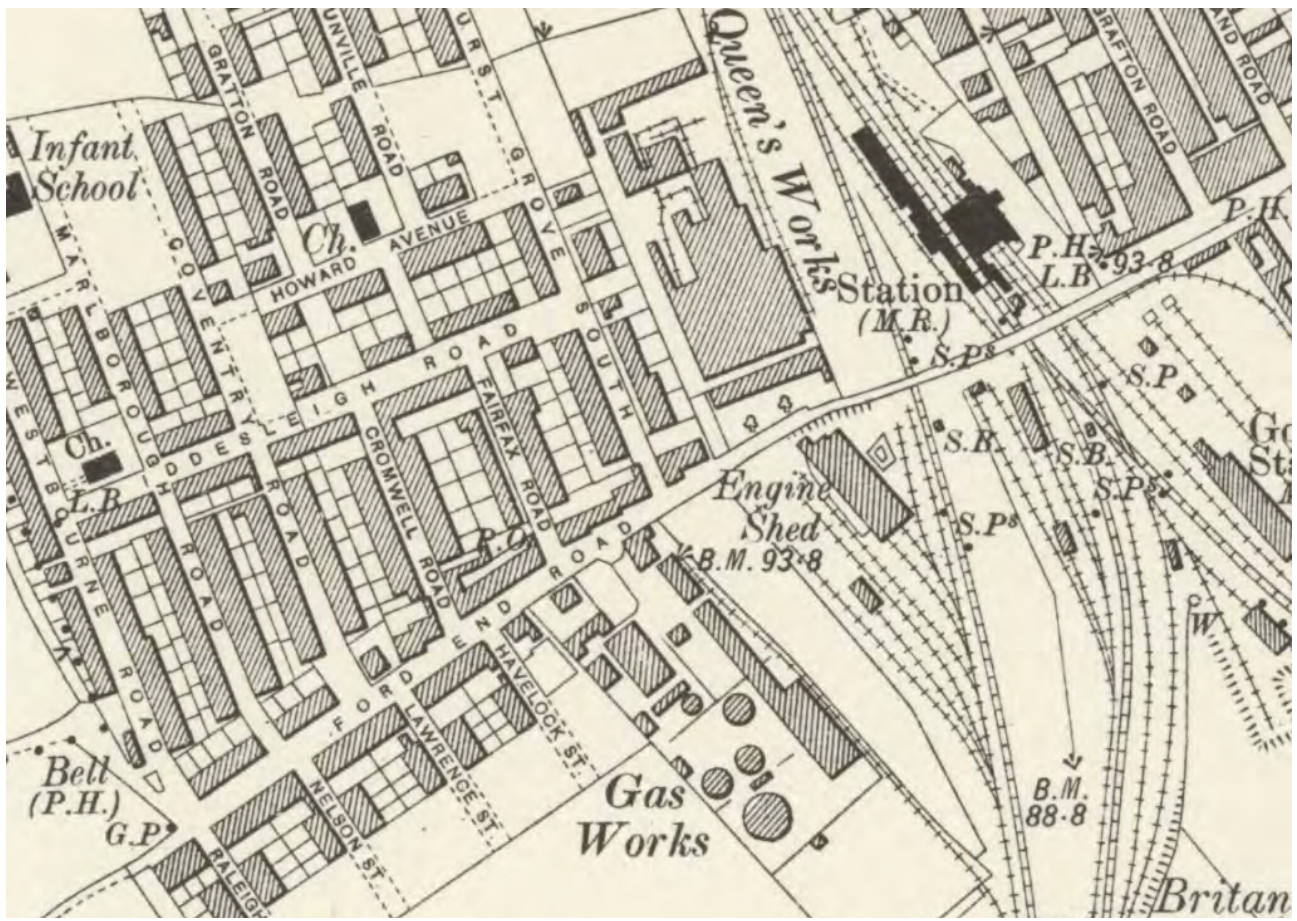


Figure 3: Second edition 6 inch Ordnance Survey map

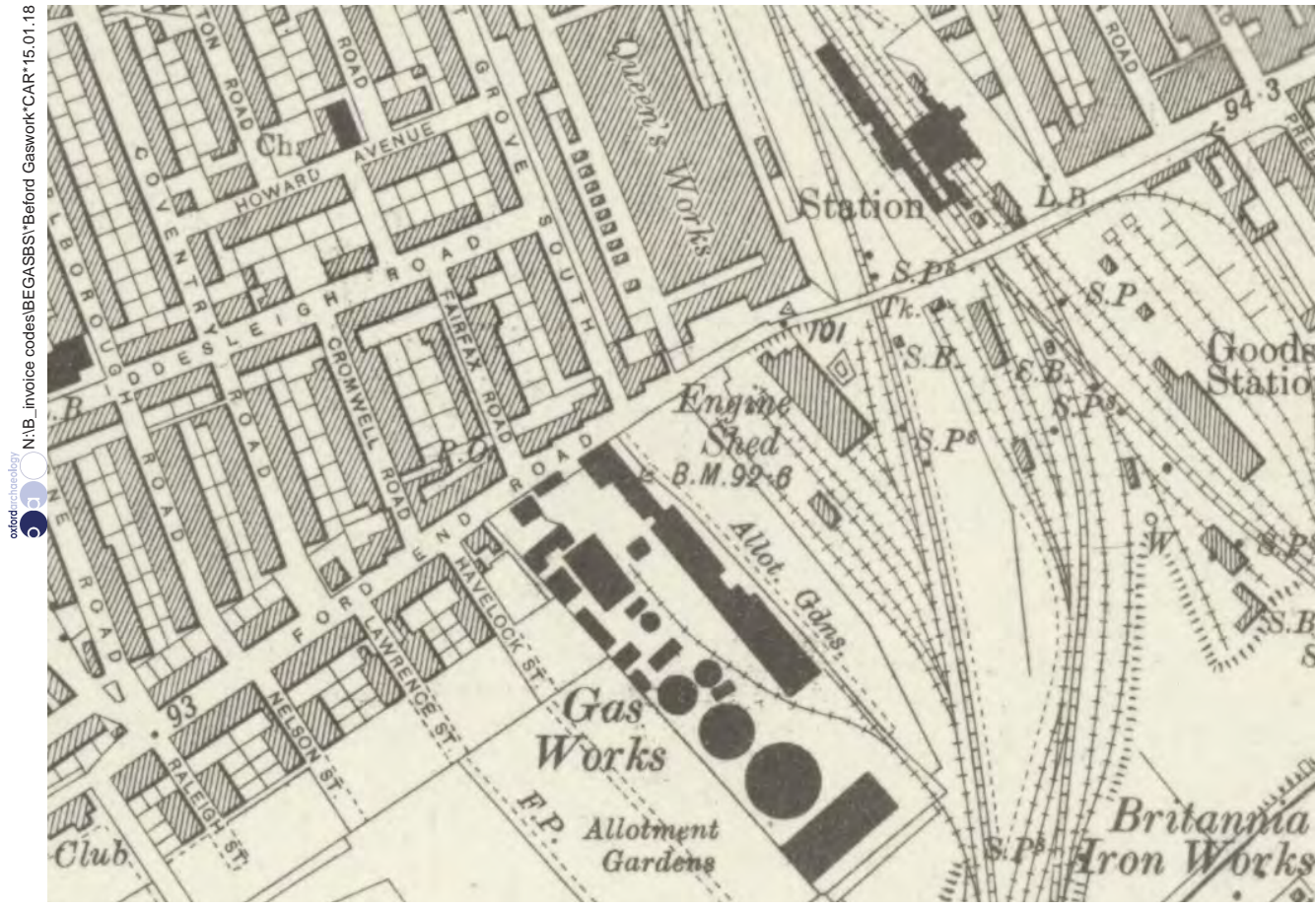


Figure 2: 1924 Ordnance Survey map

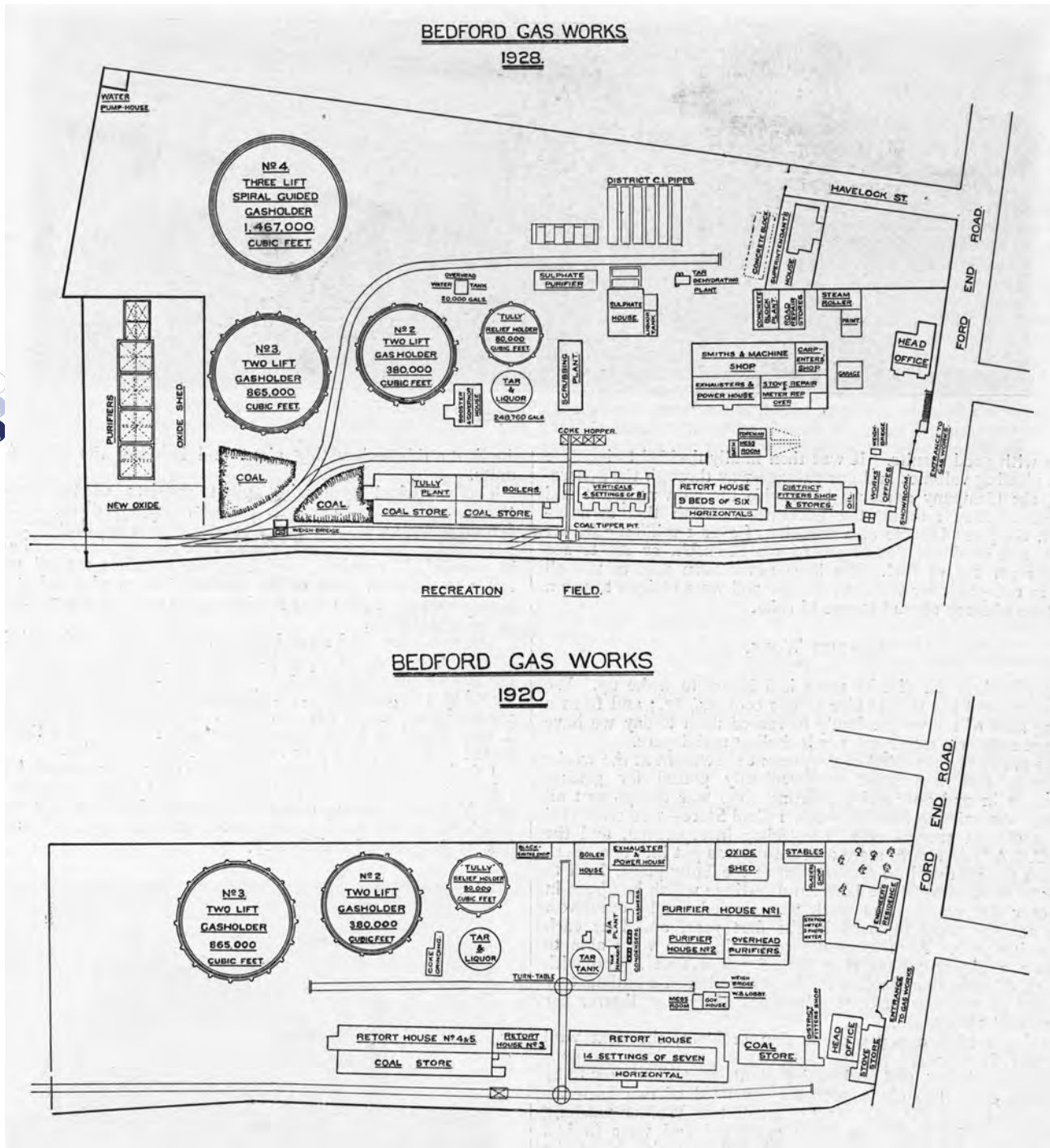


Figure 5: Plans of gaswork in 1920 and 1928, taken from *The Gas Journal*, May 23, 1928





Figure 6: 1932 aerial photograph showing holders No.69 (with original structural frame) and No.70.  
©Historic England (EPWO37466)

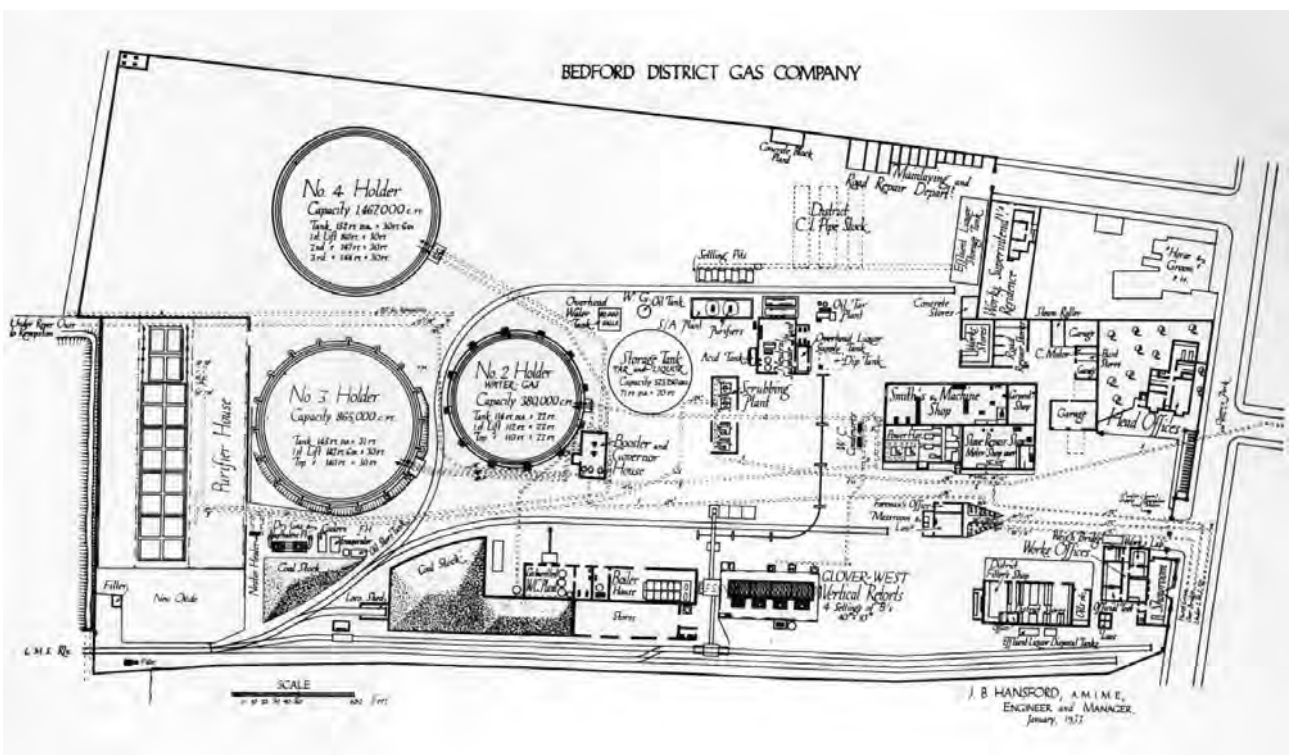
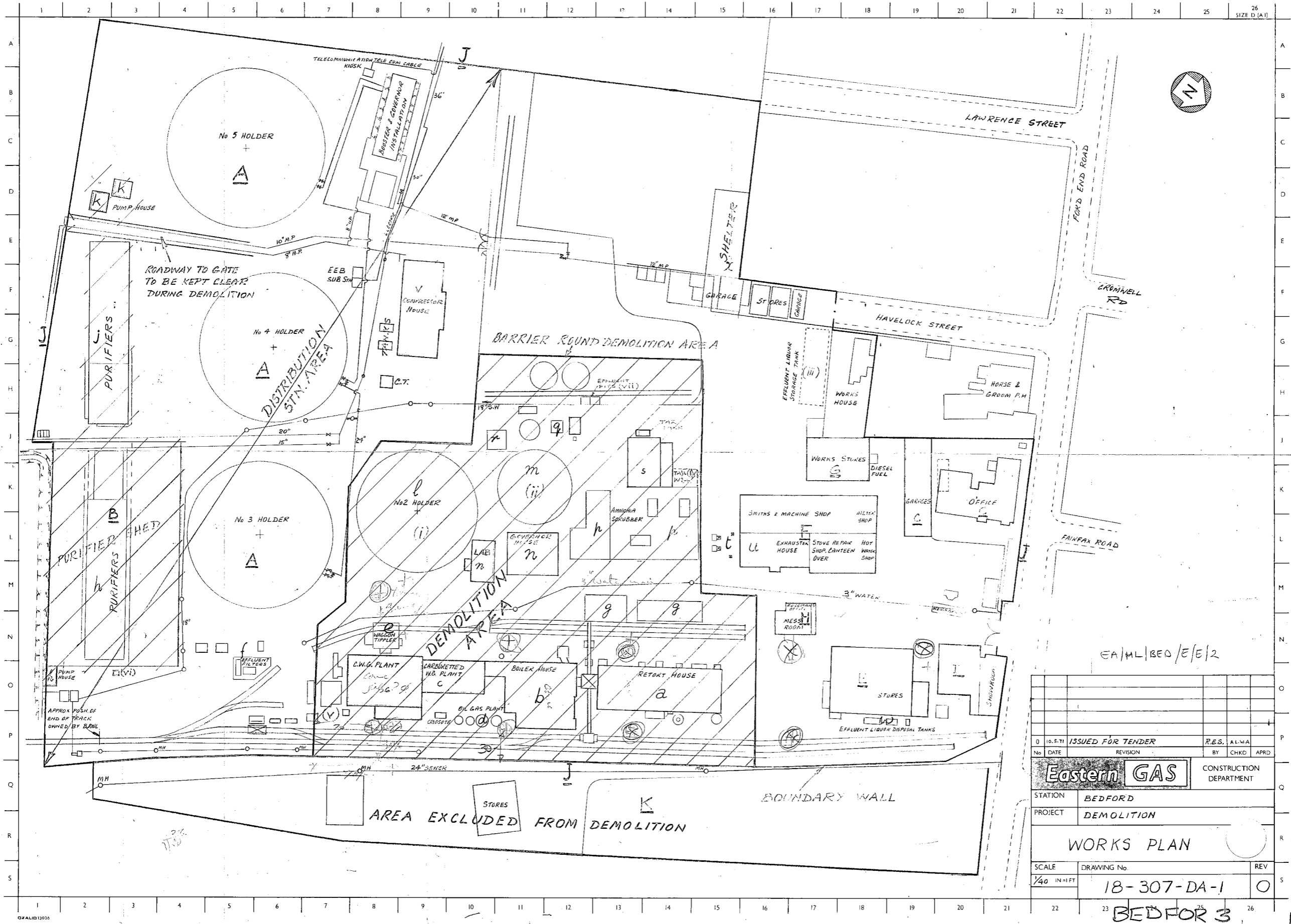


Figure 7: Plan of gaswork in 1933



Figure 8: 1950 Ordnance Survey map



ISSUED FOR TENDER		RES. ALWA	
No.	DATE	REVISION	BY
			CHKD APRD
<b>Eastern GAS</b>		CONSTRUCTION DEPARTMENT	
STATION	BEDFORD		
PROJECT	DEMOLITION		
<b>WORKS PLAN</b>			
SCALE	DRAWING No.	REV	
1/40 IN. = 1 FT.	18-307-DA-1	O	

BEDFOR 3

Figure 9: 1971 plan of site showing areas proposed for demolition

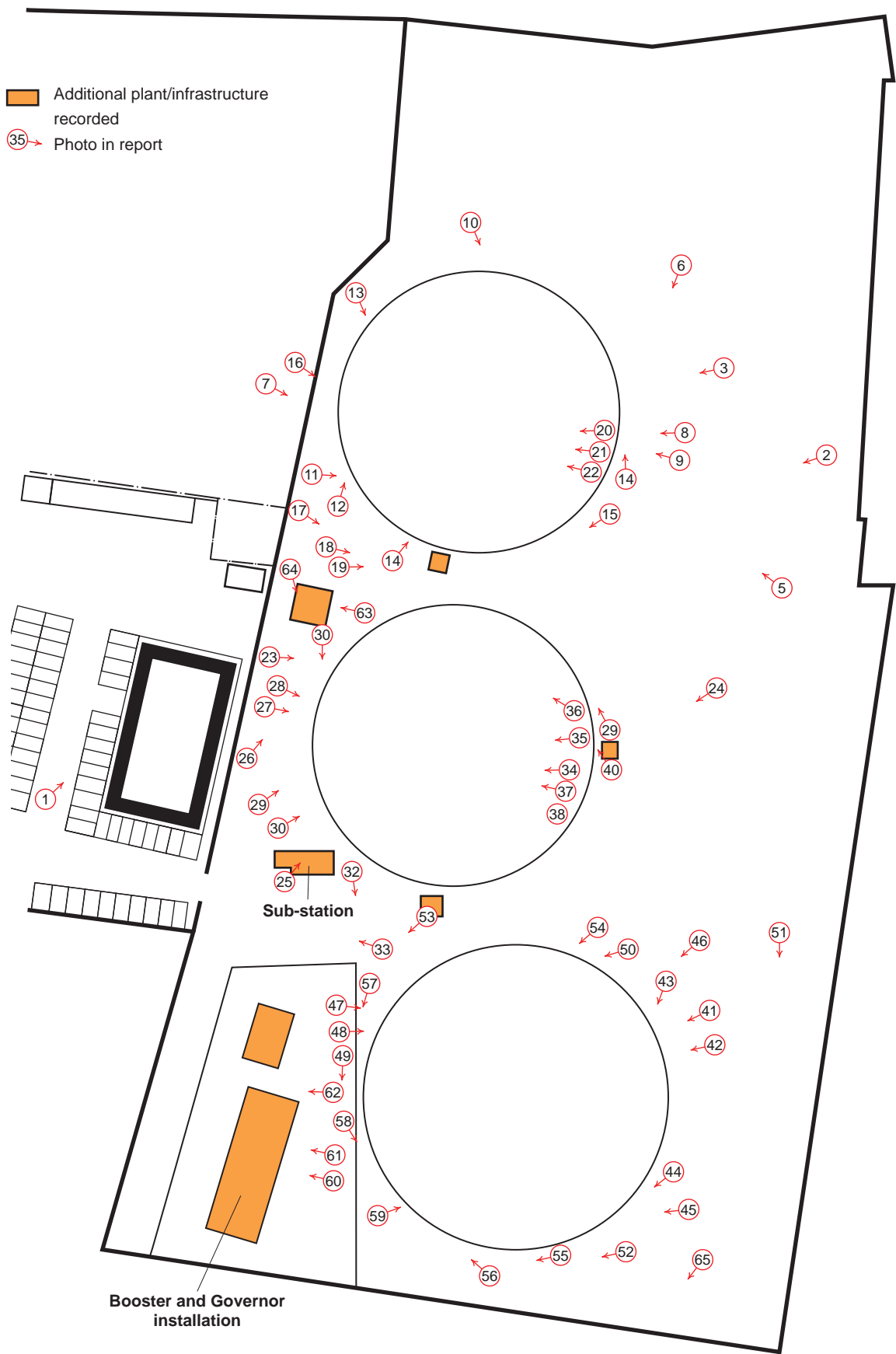


Figure 10: Current site plan with location of photographs in report



Plate 1: Holders 69 and 70 from north-west



Plate 2: Holders 69 and 70 from south-east



Plate 3: Holder 69 from south



Plate 4: Holder 69 from west



Plate 5: Holder 69 from south



Plate 6: Holder 69 from south-east



Plate 7: Detail of the cylinder of Holder 69



Plate 8: Opening created in Holder 69





Plate 9: Detail of frame of 69



Plate 10: Detail of guide rail rollers



Plate 11: Detail of Holder 69



Plate 12: Ladder against Holder 69



Plate 13: Detail of Holder 69

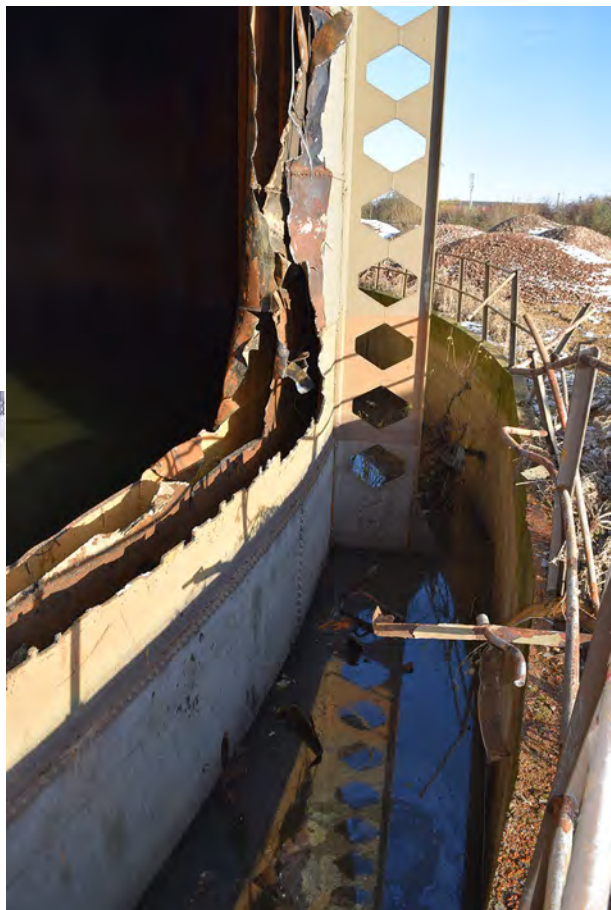


Plate 14: Detail of Holder 69



Plate 15: Typical stanchion in Holder 69



Plate 16: Detail to north of Holder 69



Plate 17: Plant building to west of Holder 69



Plate 18: Plant building to west of Holder 69



Plate 19: Interior of building to west of Holder 69



Plate 20: Interior of Holder 69



Plate 21: Interior of Holder 69



Plate 22: Interior of Holder 69



Plate 23: General view of Holder 70



Plate 24: General view of Holder 70



Plate 25: North side of Holder 70



Plate 26: Holders 69 and 70





Plate 27: Makers plate on Holder 70



Plate 28: Feature to north of Holder 70



Plate 29: Ladder to side of Holder 70



Plate 30: Detail of stanchion to Holder 70



Plate 31: Trench around Holder 70



Plate 32: Plant buildings to NW of Holder 70



Plate 33: Plant buildings to NW of Holder 70



Plate 34: Interior of Holder 70



Plate 35: Interior of Holder 70



Plate 36: Interior of Holder 70



Plate 37: Interior of Holder 70



Plate 38: Interior of Holder 70



Plate 39: Detail of side of Holder 70



Plate 40: Detail of side of Holder 70



Plate 41: General view of Holder 71 during demolition



Plate 42: General view of Holder 71 during demolition



Plate 43: General view of Holder 71 during demolition



Plate 44: General view of Holder 71 during demolition





Plate 45: General view of Holder 71 during demolition



Plate 46: General view of Holder 71 during demolition



Plate 47: Surviving rear side of Holder 71



Plate 48: Makers plate to side of Holder 71



Plate 49: Feature to north side of Holder 71



Plate 50: Section detail through cylinders of Holder 71



Plate 51: Ex-situ detail of rollers in Holder 71



Plate 52: Detail of plant by Holder 71



Plate 53: North side of Holder 71

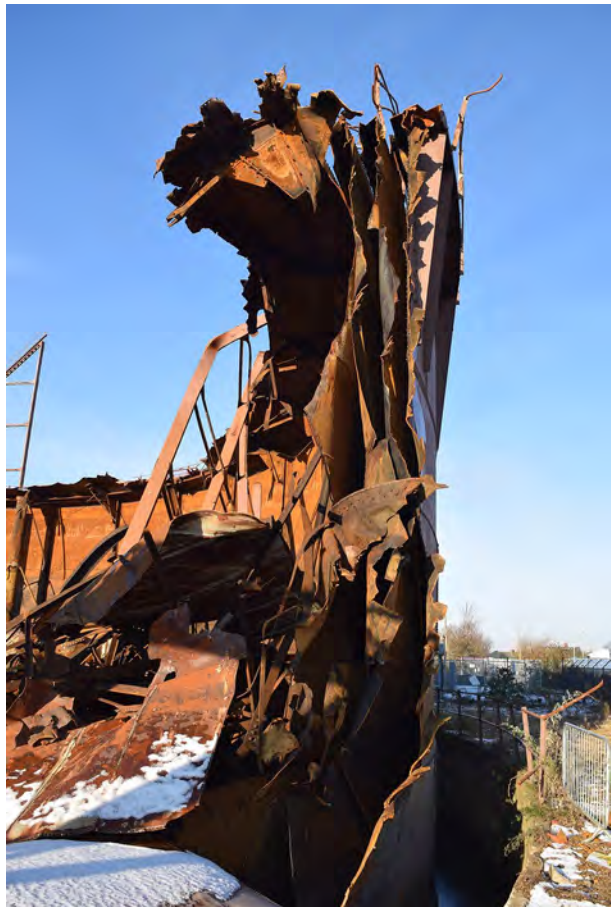


Plate 54: Section through side of Holder 71



Plate 55: Trench around Holder 71



Plate 56: Side of Holder 71



Plate 57: North side of Holder 71



Plate 58: Plant to north side of Holder 71



Plate 59: Junction plate to side of Holder 71



Plate 60: Plant to north-east of gasworks



Plate 61: Plant to north-east of gasworks



Plate 62: Plant to north-east of gasworks



Plate 63: Plant to north of Holder 70





Plate 64: Plant to north of Holder 70



Plate 65: Typical section of wall to west side of site





**Head Office/Registered Office/  
OA South**

Janus House  
Osney Mead  
Oxford OX2 0ES

t: +44 (0) 1865 263 800  
f: +44 (0) 1865 793 496  
e: [info@oxfordarchaeology.com](mailto:info@oxfordarchaeology.com)  
w: <http://oxfordarchaeology.com>

**OA North**

Mill 3  
Moor Lane  
Lancaster LA1 1QD

t: +44 (0) 1524 541 000  
f: +44 (0) 1524 848 606  
e: [oanorth@oxfordarchaeology.com](mailto: oanorth@oxfordarchaeology.com)  
w: <http://oxfordarchaeology.com>

**OA East**

15 Trafalgar Way  
Bar Hill  
Cambridgeshire  
CB23 8SQ

t: +44 (0) 1223 850500  
e: [oaeast@oxfordarchaeology.com](mailto: oaeast@oxfordarchaeology.com)  
w: <http://oxfordarchaeology.com>



**Director:** Gill Hey, BA PhD FSA MCifA  
*Oxford Archaeology Ltd is a  
Private Limited Company, N<sup>o</sup>: 1618597  
and a Registered Charity, N<sup>o</sup>: 285627*