



Former Gasworks at Crow Lane Romford

Historic Building Investigation and Recording

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Contents

Summary	vii
1 INTRODUCTION	1
1.1 Project Background	1
1.2 Aims and Objectives	1
1.3 Methodology	1
2 HISTORICAL BACKGROUND.....	3
2.1 General Development of the Gas Industry in the 19 th and 20 th centuries	3
2.2 Elements of a gasworks.....	3
2.3 Historic development of Romford.....	4
2.4 Romford's Gasworks.....	5
3 DESCRIPTION OF THE SITE.....	7
3.1 Introduction.....	7
3.2 Gasholder Number 4	7
3.3 Gasholder Number 5	9
3.4 Gasholder Number 7	9
3.5 Gasholder Number 9	11
3.6 Other structures or features.....	13
4 CONCLUSION.....	15
APPENDIX A BIBLIOGRAPHY	16

List of Figures

- Figure 1: Site location
- Figure 2: Site plan showing location of plates in this report
- Figure 3: 1895 Ordnance Survey plan (6 inch)
- Figure 4: 1915 Ordnance Survey plan (25 inch)
- Figure 5: 1939 Ordnance Survey plan (25 inch)
- Figure 6: 1949 Aerial photograph
- Figure 7: 1954 plan of Romford gasworks
- Figure 8: Undated (1950s?) plan of Romford gasworks
- Figure 9: 1965 plan of Romford gasworks
- Figure 10: 1971 plan of Romford gasworks
- Figure 11: 1976 plan of Romford gasworks
- Figure 12: 1991 aerial photograph

List of Plates

- Plate 1: Gasholder 4 looking south-east
- Plate 2: Gasholder 4 looking north
- Plate 3: Detail of bracket to gasholder 4
- Plate 4: Detail of truncated bracket to gasholder 4
- Plate 5: General view of gasholder 4
- Plate 6: Gasholder 4 detail of lifts after creation of opening in holder
- Plate 7: Gasholder 4 detail of underside of top of holder.
- Plate 8: Detail of lifts within tank of No 4 after cutting through
- Plate 9: Infilled opening from former pipe in gasholder 4
- Plate 10: Ex-situ section of gasholder lift
- Plate 11: View between lifts of gasholder 4
- Plate 12: Plant to east of gasholder 4
- Plate 13: Plant adjacent to gasholder 4
- Plate 14: Base of holder 4 after demolition of tank
- Plate 15: Roof structure within gasholder 4
- Plate 16: Roof structure within gasholder 4
- Plate 17: Roof structure within gasholder 4
- Plate 18: Roof structure within gasholder 4
- Plate 19: Roof structure within gasholder 4
- Plate 20: General view within gasholder 4
- Plate 21: Detail of structure within gasholder 4
- Plate 22: Detail of structure within gasholder 4
- Plate 23: Inner face of gasholder 4
- Plate 24: Detail within gasholder 4
- Plate 25: Remains of gasholder 5 after its demolition
- Plate 26: Remains of gasholder 5 after its demolition
- Plate 27: General view of gasholder 7 looking east
- Plate 28: Gasholder 7 looking east during demolition
- Plate 29: Gasholder 7 looking south
- Plate 30: Staircase on north side of gasholder 7
- Plate 31: Makers plate on gasholder 7
- Plate 32: Opening created in gasholder 7
- Plate 33: Plant on north side of gasholder 7
- Plate 34: Gasholder 7 after removal of section of outer tank
- Plate 35: Detail of lifts after opening cut through holder

- Plate 36: Staircase of gasholder 7
Plate 37: Steps on gasholder 7 to allow access to upper lifts
Plate 38: General view of gasholder 7
Plate 39: Detail of outer tank during demolition
Plate 40: View during demolition
Plate 41: General view into gasholder 7
Plate 42: General view into gasholder 7
Plate 43: No 7 general view of interior
Plate 44: General view of interior of gasholder 7
Plate 45: Gasholder 7 roof detail
Plate 46: Gasholder 7 roof detail
Plate 47: Gasholder 7 roof detail
Plate 48: Gasholder 7 roof detail
Plate 49: Detail of lifts of holder 7 after creation of opening
Plate 50: General view of gasholder 9, southern side
Plate 51: South side of gasholder 9
Plate 52: East side of gasholder 9
Plate 53: Depression around gasholder 9
Plate 54: General view of gasholder 9 during demolition
Plate 55: Plant around gasholder 9
Plate 56: Gasholder 9 during demolition
Plate 57: Staircase to gasholder 9
Plate 58: Side of gasholder 9
Plate 59: Bracket of gasholder 9
Plate 60: Space between tank and lift of gasholder 9
Plate 61: Steps on top of gasholder 9
Plate 62: Pipes adjacent to gasholder 9
Plate 63: Roof structure within gasholder 9
Plate 64: Roof structure within gasholder 9
Plate 65: Roof structure within gasholder 9
Plate 66: Roof structure within gasholder 9
Plate 67: Roof structure within gasholder 9
Plate 68: Roof structure within gasholder 9
Plate 69: Roof structure within gasholder 9
Plate 70: Base of inner lift within gasholder 9
Plate 71: View within gasholder 9
Plate 72: View within gasholder 9
Plate 73: View within gasholder 9
Plate 74: Stanchion at centre of gasholder 9
Plate 75: View of inner lift within gasholder 9
Plate 76: Pipe within gasholder 9
Plate 77: Side of gasholder 9 after creation of opening
Plate 78: Steel plate floor in gasholder 9
Plate 79: Boiler house, north side
Plate 80: East side of boiler house
Plate 81: South side of boiler house
Plate 82: Interior of boiler house
Plate 83: Interior of boiler house
Plate 84: Telemetry and switchroom, south side
Plate 85: East side of telemetry room
Plate 86: North-east corner of telemetry room.

Summary

Oxford Archaeology was commissioned by Montagu Evans LLP on behalf of National Grid to create an Historic Building Record of the former gasworks at Crow Lane, Romford, London Borough of Havering. The site had been developed from the early 1880s as a new site to allow the expansion of the Romford Gas and Coke Company and there was further expansion during the 20th century through the acquisition of adjacent parcels of land. In common with other gasworks across the country the site was overhauled in the later 20th century after the decision to phase out producing coal gas in favour of natural gas but four gasholders survived into the 20th century.

These holders subsequently became redundant and have recently been dismantled. An archive record was created prior to (and during) the dismantling of the last three holders as part of a national programme of recording these distinctive structures which have formed familiar landmarks in towns and cities throughout much of the 19th and 20th centuries.

The three gasholders recorded are each 20th-century structures and typical for this period of gasholder design. They are each above ground, spiral-guided holders without standards. Holder No.4 was constructed in c.1925 while holders 7 and 9 were constructed in c.1960-61. There were some differences in the construction of all the holders, particularly in the trussed structures that support the shallow-domed crowns.

The work has provided for posterity an archive record of these distinctive structures and it will allow comparison with other sites.

1 INTRODUCTION

1.1 Project Background

- 1.1.1 Oxford Archaeology (OA) was commissioned by Montagu Evans LLP, on behalf of National Grid, to undertake historic building recording of the decommissioned gasworks at Crow Lane, Romford, Greater London.
- 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 dismantling, including those which are not listed or of only local interest.
- 1.1.3 The former gasworks, hereafter referred to as 'the site', is situated to the south-west of Romford Town Centre, approximately 800m or half a mile south-west of Romford Railway Station (Figure 1).

1.2 Aims and Objectives

- 1.2.1 The principal aim of this project is to document the history and development of the site and to record and interpret the structures on this site prior to their demolition. The information is being presented in the form of a written, illustrated report and archive.

1.3 Methodology

- 1.3.1 This report has been produced in accordance with a brief produced by Montagu Evans LLP on behalf of National Grid and is based upon on-site investigation and documentary research. As specified in the brief, a 'Basic Level 2 survey' was undertaken which was largely photographic and descriptive in nature. The level of recording undertaken in the wider project to record gasworks have previously been agreed with Historic England on a portfolio basis.
- 1.3.2 The 'Basic Level 2' record is adapted from the Historic England guidelines in *Understanding Historic Buildings: A Guide to Good Recording Practice* which states that a Level 2 is: '*... a descriptive record, made in similar circumstances to Level 1 but when more information is needed. It may be made of a building which is judged not to require a more detailed record, or it may serve to gather data for a wider project. Both the exterior and interior of the building will be seen, described and photographed. The examination of the building will produce an analysis of its development and use and the record will include the conclusions reached, but it will not discuss in detail the evidence on which this analysis is based. A plan and sometimes other drawings may be made but the drawn record will normally not be comprehensive and may be tailored to the scope of a wider project.*'¹
- 1.3.3 The work comprises three principal elements: a photographic, a drawn and a written record.
- 1.3.4 The *photographic record* is intended to act as a general record of the building prior to alteration and includes photographs of the exterior and interior, and architectural detail and fixtures. Digital photographs, in jpeg format, were taken using a camera with up to 24-megapixel capability.

For the *drawn record*, the engineering site plans were made available to OA by the National Gas Archive. These drawings were used as a basis for the archaeological recording; locations of features being verified, the addition of further annotations for interpretation, and recording additional information.

The *written record* consists of field notes and annotations that complement the photographic and drawn records and add further analytical and descriptive detail.

- 1.3.5 This site is not included in Historic England's Monument Protection Plan (MPP) Step 3 report for the gas industry.
- 1.3.6 The initial site visit to record the structures was carried out on 22 February 2018 and further visits were made on 10 April and 23 May 2018.

2 HISTORICAL BACKGROUND

2.1 General Development of the Gas Industry in the 19th and 20th centuries

2.1.1 Introduction

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)* as well as the Monuments Protection Programme Step 1 report (1997) and the London Gasholders Survey by Malcolm Tucker (2000).

2.1.3 General history

2.1.4 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 19th century his methods were used to illuminate various mills and industrial works.

2.1.5 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.

2.1.6 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 huge Beckton gasworks.

2.1.7 The industry developed in the later 19th 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. Between 1875 and 1920 gas consumption trebled (MPP, 1997), partly due to the expansion of non-lighting uses and from competition with electricity.

2.1.8 The inter-war period saw a rationalisation of the previously fragmented industry with more regulation, consolidation of companies and standardisation. 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.

2.1.9 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. In 1986 the industry was re-privatised.

2.2 Elements of a gasworks

2.2.1 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).
- 2.2.2 The flow of gas around the site would be maintained by plant called 'exhausters' which were found on all but the smallest gasworks.
- 2.2.3 **Gasholders:**
- 2.2.4 From the early 19th 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 familiar and easily recognisable type of structure at almost all gasworks. As indicated above their main function was to cope with peaks and troughs in demand but they also provided the mains pressure.
- 2.2.5 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, thus allowing increased storage on the same footprint. Until the second half of the century most of these holders had a single lift rather than multiple lifts and whereas the earlier ones operated with a chain lift mechanism the later ones used a form of guide framing. The first guide frames had a central column but these quickly gave way to a series of columns or girders around the circumference of the holder with bracing between to form a type of exoskeleton. The first three-lift holder was constructed in 1861 (Blackfriars) and the first four-lift was constructed in 1886 (East Greenwich). A 'cup and grip' seal between the lifts was formed through a U-shaped rim at the base of each lift filling with water and engaging with a similar inverted rim at the top of the adjacent lift.
- 2.2.6 This type of guided-frame gasholder was constructed at numerous sites at ever greater scales through much of the rest of the 19th century although in the late 1880s a distinctly different form of gasholder was invented. This was the spirally-guided holder 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 carriage rollers fixed to the top of the vessel beneath. The gasholders at Romford are of this common design.
- 2.2.7 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.

2.3 Historic development of Romford

- 2.3.1 The history of the town of Romford in the London Borough of Havering is well detailed by the Victoria County History in their *A History of the County of Essex: Volume 7* and is summarised here:
- 2.3.2 During the middle ages, a small market town grew along the main London-Colchester road and the river Rom. It remained subject to Hornchurch for church purposes until the 19th century, but for civil purposes was virtually independent by the 16th century. A local board,

later an urban district council, was formed in 1851. The district became a municipal borough in 1937. In 1965, the London Borough of Havering was formed.

- 2.3.3 Romford's population in 1801 was 3,179, occupying 522 houses. Romford was first connected to the expanding railway network in 1839 and continued to grow throughout the 19th century; in 1841 the population was at 5,317 (census data). To the east of the gasworks site, the Romford Union Workhouse was established in 1838, now the site of Queen's Hospital.
- 2.3.4 The site, as does a large area surrounding the site, lies upon the sedimentary bedrock of the London Clay Formation with superficial sand and gravel deposits of the Hackney Gravel Member recorded.
- 2.3.5 The site is not within a Conservation Area and is neither associated with or intervisible with the Romford Conservation Area which is set along Market Place and High Street to the northern end of the town centre. The closest listed buildings are the 19th-century church and chapel 430m to the north-east and are not associated with or intervisible with the gasworks. There are several locally listed buildings in the vicinity: an early 20th-century school and three 19th- and 20th-century public houses along London Road to the north of the railway line and two late 19th-century buildings associated with the former hospital along Oldchurch Road to the east of the site. Those along London Road are not associated or intervisible with the site. The former hospital buildings are partially intervisible with the site, however, they are not associated with the site, and they themselves are no longer in their original context as they are now part of a residential development on the site of the former hospital.
- 2.3.6 A map regression of the Ordnance Survey (OS) maps of 1875 onwards (Figs 1-12) shows the site and much of the surrounding area in agricultural use prior to the construction of the gasworks, with the gradual development of housing estates to the north, east and south in the remainder of the 19th century and first decades of the 20th century. By the Second World War, housing had started to be built to the west of the site.
- 2.3.7 Although the cemetery, hospital and the stadium are discussed, and the former gas showrooms in the town centre are disparaged, there is no mention of the gasworks in Pevsner's (and later editors) *The Buildings of England London 5: East London* volume.

2.4 Romford's Gasworks

- 2.4.1 The Romford Gas Company's commemorative centenary publication details how a small private gasworks operating on South Street, immediately north of the railway station, was purchased by a newly established company, The Romford Gas and Coke Company, in early 1847. By the early 1880s, the existing site was fully utilised and a larger site was required and so three acres of agricultural land were purchased along Nursery Walk, to the south-west of the town centre, and once the new works were installed, the site at South Street was closed.
- 2.4.2 The Romford Gas Company, as it was known after 1929, gradually purchased further parcels of the adjacent agricultural land and by 1947 the gasworks occupied 25 acres and were supplying approximately 42,000 consumers and supplied an area of 43.29 square miles. The plant and distribution systems were also being extended, for example, a vertical retort had been constructed in 1920, but had been extended out of necessity five times by 1943.
- 2.4.3 The gasworks were bombed during the Second World War, although, according to the centenary publication, without the loss of supply to consumers. Following the war, the plans for new housing and industrial developments in the area necessitated plans for new plant to meet the expected new capacity of four times the existing which would be required. By the publication of the centenary book in October 1947, the Government had announced their

intention to privatise all of the gas companies and in 1949 the North Thames Gas Board was established which itself was dissolved with the formation of British Gas in 1973.

- 2.4.4 In the 1950s, the cost of coal forced the North Thames Gas Board to explore other sources which resulted in Romford being selected to receive gas from the oil refineries at Shell Haven and Coryton in the east of the Gas Board's area. This required specific plant and instrumentation to be installed at the gasworks to 'reform' i.e. convert the refinery gas to town gas. The installation of the plant began in 1956 and on the 5th May 1958, the Romford Gas Reforming Plant became operational and a paper was presented at the AGM of The Institution of Gas Engineers in May 1959.
- 2.4.5 Various documents held at the Gas Archives show that in 1965-7 there was further investment at the Romford site into new plant for producing gas but this was shortly before there was a national shift in policy from producing coal gas to the cleaner natural gas. This necessitated the decommissioning of retorts and other plant at gasworks throughout the country although many gasholders were retained for storage. Gasholders 4, 5, 7 and 9 were evidently retained for storage, but had been decommissioned and isolated from the network for some time prior to this survey.

2.4.6 *Map evidence relating to Romford gasworks*

- 2.4.7 The gasworks first appears on the OS map of 1898 (Fig 3), revised three years earlier, and shows two gasholders and several associated buildings to the north-eastern part of the current site, none of which survive; it also shows the rail track coming into the site from the main railway line. None of the current gasholders are within the footprint of that the gasworks had at this time. The 25 inch map of 1915 (Fig 4) shows that the site had expanded to the west and additional buildings and a further gasholder have been constructed. However, this expanded complex still did not include the site of the gasholders in the current project.
- 2.4.8 The following edition was revised prior to the Second World War and published in 1946 (Fig 5) and shows the expansion of the site into the current plot with three further gasholders, two of which are gasholders 4 and 5. By the edition of 1976, the site is occupied to its full extent with the four extant gasholders in place with one smaller gasholder and numerous smaller circular tanks and associated buildings; it is also notable that the surrounding area is heavily developed and the adjacent workhouse is now in use as a hospital.
- 2.4.9 Photographs and engineering plans have been made available by the National Gas Archive (Figs 6-12 provide a sample from these).

3 DESCRIPTION OF THE SITE

3.1 Introduction

- 3.1.1 As outlined above the former gasworks site is located to the south-west of Romford town centre. The site is bounded to the north by the Great Eastern Mainline and to the east by Nursery Walk, both with housing estates beyond; to the south is Crow Lane with Romford Cemetery beyond. The north-west of the site is an area tenanted by a gas engineering company and to the west of the site is the Royal Mail sorting office with waste ground beyond.
- 3.1.2 When the recording was undertaken the site contained three gasholders (No's 4, 7 & 9), two extant brick buildings and numerous pieces of associate equipment. A fourth gasholder (No. 5) was demolished shortly prior to the start of the recording. The three gasholders were located in the southern half of the overall former complex, within areas which were developed in the 20th century as the gasworks expanded. The OS map which was surveyed in 1915 (published in 1921) shows that at this date the land on which the gasholders now stand was not yet part of the gasworks; most of this land was still part of a set of fields although a smaller area were allotments (see Fig 4).

3.2 Gasholder Number 4

- 3.2.1 **General description:** Gasholder Number 4 was the oldest and the smallest of the structures recorded in the current project. It was also the northernmost, being located on land that was shown as allotments on the OS map which was published in 1921 (previous survey revised in 1915). A demolition plan provided in the current project states that it was constructed in 1925. When the first recording visit was made to Romford the holder had been largely dewatered and the interior could be seen through a large opening created in the side of the tank although some water remained which prevented any access into the holder.
- 3.2.2 It was a telescopic, spiral-guided, cylindrical holder with three separate lifts which would have fitted immediately inside one another. These three lifts were set within an outer drum or tank fixed in place at ground level and without any sunken pit or depression around it. The demolition plan referred to above states that the holder was 44.9m in diameter by 10.1m in height.
- 3.2.3 **Tank:** The fixed outer tank was formed from six horizontal rows or courses of riveted steel plates without any tall structural standards (Pl. 5). The uppermost row of plates was approximately half the height of the other five rows and while the lowest row was painted a grey colour the others were painted a chocolate brown colour. Each of the sheets in the lowest two courses were jointed by rectangular, riveted connecting plates while in the upper courses the sheets were connected by being riveted at the points where the sheets overlap. The upper connections also had fewer rivets. There were also horizontal lines of rivets at the points where each row overlapped the one above or below. These sheets were staggered as they climbed rather than each one stepping in and the rivets were each c.5 cm in diameter and with a flattened profile rather than domed.
- 3.2.4 At the curb or top of the tank there was a projecting solid steel walk-way deck which was supported by regular pairs of triangular-shaped brackets. Between each of these pairs of brackets there were also four further simple brackets formed from lengths of L-section steel which supported a handrail around the projecting walkway. At their base these were riveted to the outer shell and they had a kinked alignment with the outer edge of the walkway adjoining at the kink. Above this point the brackets were vertical and they supported two horizontal rails. There appeared to be three further walkways, one at the top of each of the inner lifts but these could not be seen closely from the ground.

- 3.2.5 On the north side of the tank there was a blocked circular hole (c.70 cm diameter and c.70 cm above the ground) which clearly shows the location of a former adjoining pipe (Pl. 9). This was blocked with a welded plate and its outline was also visible within the gasholder. Several small concrete pads were noted within the ground immediately to the north-east of the gasholder as well as truncated steel stubs against the side of the tank, towards its mid height (Pl. 4-5). These may survive from a former staircase.
- 3.2.6 After the demolition of the steel tank the sunken cylindrical base in which the tank sat could be seen. This was sunken c.1.5 m below ground level and it was formed from reinforced concrete, c.12 cm thick with the imprint from the former cast-iron sheets which lined it clearly visible (Pl. 14).
- 3.2.7 To the south-eastern edge of the holder there was a quarter turn staircase with a mid-point landing and steel stanchions set on concrete pads. The lower half of this was within a mesh enclosure (Pl. 2).
- 3.2.8 **Lifts:** A large opening was created through the side of the holder prior to the start of the recording, in preparation for demolition plant to enter the structure, and this allowed the inner face of the inner lift to be seen. The cut through the holder also provided a sectional view through the three cylindrical lifts and tank (Pl. 6-8) which confirmed that while the rigid steel plate which formed the outer tank was 2 cm thick the plates which form the inner lifts was much thinner (0.5 cm thick). The inner lifts are also constructed with much smaller rivets.
- 3.2.9 The outer face of each lift had diagonally set I-section rails (Pl. 10-11) which would have engaged with carriage rollers fixed to the top of the adjacent lift and the top of the tank. These would have guided the lifts to rise and fall and to rotate telescopically as the holder filled with gas. The outline of these could be seen within the gasholder through diagonal lines of rivets that secure the rails on the outer side of the innermost lift. As this is an above-ground holder all the carriage rollers were at the top of the structure and almost no visual access to these was possible. These could only be seen from below in the area where the opening was created in the side of the holder (Pl. 7). The base of each of the lifts comprised a U-shaped tray which would have been filled with water when the holder was in operation and it would have formed a seal with the top of the adjacent lift (cup and grip seal).
- 3.2.10 The internal face within the gasholder (ie the innermost lift) was braced by 40 full-height, I-section steel stanchions, each of which was 28 cm wide in section and supported the end of a truss.
- 3.2.11 As referred to above a small amount of water (30-40 cm) remained in the tank at the time of the recording and this obscured the bases of the stanchions although it could be seen that the base of the tank was constructed from riveted steel plates. There were two large free-standing vertical pipes inside the gasholder (inlet and outlet pipes), on the eastern side, which extend from the floor to the crown and supported by simple sloped braces.
- 3.2.12 There would formerly have been fixed staircases constructed on the top of the tank and the outer two lifts to provide access to the upper walkways when the holder was in a raised position but these had been removed prior to the current recording.
- 3.2.13 **Crown structure:** the roof or crown of the gasholder was a shallow dome formed from riveted steel plates supported by concentric rings of purlins, set on 40 rafter ribs which radiated like spokes from the centre of the dome. The outer ends of these ribs sat on the stanchions which lined the inner face of the holder but there was some variety at their inner ends. Here the ribs alternated so that there were 20 full length members which were connected to a ring at the very centre and 20 shorter ribs which terminated at a much wider ring at a point approximately one third of the distance from the centre.

- 3.2.14 The full length ribs formed part of 20 light-weight metal trusses with a relatively conventional form for the first half of the 20th century. The lowest member was a flat section tie which sloped slightly upwards towards the centre and between this and the curved upper rib there were a series of struts (five vertical and five raking). These struts were formed by a combination of flat section and L-section steel members and they were jointed with riveted connecting plates. There were two further concentric rings around the holder immediately beneath these trusses.
- 3.2.15 Beneath each of the 20 shorter ribs there was further trussed bracing, simpler and shallower than that in the main trusses, comprising 3 vertical struts, 2 raking struts and a tie to the underside.
- 3.2.16 The structural form of this crown was distinctly different to those of the other two holders recorded at Romford, particularly because there was no cylindrical shaft (or axle) at the centre and there was no central prop fixed to the ground to provide support when the holder is in the lowered position. There was a relatively short vertical box girder at the centre, raised up and held aloft by the trusses, but this is much higher than the axle type shafts in the other two gasholders.
- 3.2.17 **Other associated plant:** To the north-east of the holder there were various pieces of plant (Pl. 12-13) including one labelled an artesian well.

3.3 Gasholder Number 5

- 3.3.1 Gasholder Number 5 was the westernmost gasholder at the site but unfortunately by the time OA had been commissioned to undertake the current work the demolition contractors were already on site and this holder had been taken down. A plan produced by Atkins and provided to OA shows that this was an above-ground, four-lift, spiral-guided gasholder, constructed in riveted steel and set in a steel tank. It was constructed in 1938 and was 50.3m in diameter by 10.1m in height.
- 3.3.2 The floor or base of the holder was being removed when the first recording was undertaken and it could be seen that it was formed from large riveted steel plates. The tank was set in a slight depression but not a clear pit (Pl. 25-26).

3.4 Gasholder Number 7

- 3.4.1 Gasholder No 7, which is close to Crow Lane in the southern part of the site, was an above-ground spiral-guided gasholder with a steel tank and four lifts. A demolition plan relating to the current project states that this gasholder dated from 1960 but documents held at the Science Museum Library and Archive suggest that the construction of the holder may have started some years earlier. These include a contract for the construction of this holder from November 1954 and another contract for the construction of the foundations from April 1955. The foundations contract was based on a tender from WC French Ltd. It is also worth noting that it is shown on a plan of the site from 1954 whereas on the same plan No.9 is merely labelled as a 'future' gasholder. The demolition plan states that the holder is 58.5m in diameter and 10m in height.
- 3.4.2 **Tank:** The tank was set in a slight earth-bank depression, without a perimeter trench, and it was constructed from seven horizontal rows of riveted steel plates (Pl. 30). The lower four rows were jointed with large diagonal plates but the row above this was jointed with slender vertical connecting plates and the two uppermost rows were simply connected through riveting at the point where the plates overlap (and there were fewer rivets on the very top row). There were also horizontal rows of rivets between each course of steel plates. The

lowest row was painted a light grey colour but the other six rows are painted brown, similarly to the other holders at Romford.

- 3.4.3 There were no full-height standards to the outer face of the tank but there were a series of steel brackets (c.48) fixed to the upper half of the side of the tank with two vertical flanges (Pl. 37). These brackets were taller than on the other tanks, rising from the mid point of the tank, and the two flanges were braced by three horizontal struts. These supported a walkway which extended around the upper edge of the tank but the brackets must also have provided structural support for the trusses within the gasholder. The simple walkway was also supported by a series of smaller intermediate brackets.
- 3.4.4 During the dismantling works an opening was created through the tank and this showed that it was constructed from relatively thick section steel plates with the lower plates being thicker (c.3 cm thick) than the upper ones (Pl. 39, 49). It could also be seen during the dismantling works that the inner face of the tank was braced at its top by brackets which coincide with the tall brackets on the outer face of the tank.
- 3.4.5 A makers plate on the side of the tank showed that the holder was 'made and erected by C & W Walker Ltd, Donnington, Shropshire' although the plate did not have a date.
- 3.4.6 To the north of the tank there was a steel, dog-leg staircase providing access to the upper curb and the lower half of this was within a steel mesh enclosure (Pl. 30).
- 3.4.7 Close to the staircase on the northern side of the tank there was a concrete lined pit (valve pit?) with metal grille at the surface and a penstock-type wheel connected to a rod descending into the pit to operate the mechanism (Pl. 33). Immediately to the west of this pit there was a pipe (c.15 cm diameter) fixed to the side of the tank and extending up its full height. At its base this pipe curved to a horizontal alignment but at this point it has been truncated and capped. This clearly formerly connected to a further pipe or plant.
- 3.4.8 On the south-western side of the tank there was another similar pipe (c.15 cm diameter) connected to the side of the tank but now truncated at its base. A large triangular shaped staircase was fixed to the top of the tank, projecting above it and this would have provided access to the upper parts of the holder when it was in a raised position. This staircase comprised four steel verticals and three horizontals jointed by connecting plates (Pl. 37).
- 3.4.9 **Lifts and interior of bell:** Within the fixed tank the gasholder contained a 'bell' comprising four separate cylindrical lifts fitting within each other which would have risen and fallen in stages as the holder filled with gas. Similarly to the other gasholders at Romford the bell would have rotated and the four lifts would have risen spirally through I-section rails fixed diagonally to the outer face of each lift engaging with carriage rollers fixed to the top of the adjacent lift or outer tank. There were staircases fixed to the top of three of the lifts, matching that mentioned above fixed to the top of the tank, so that when each lift was in a raised position access was possible to the upper walkways.
- 3.4.10 During the dismantling works a large section of the tank was removed to expose the outer face of the adjacent lift, constructed from c.12 rows of relatively thin (0.5 cm thick) sheets of steel and the diagonally set rails (Pl. 34).
- 3.4.11 Also during the dismantling works it could be seen that the four lifts were all set on rolled steel joists (30 cm tall x 12 cm wide) on the floor and radiating away from the central point of the holder (Pl. 41). The base of each lift had a perimeter U-shaped 'tray', c.40 cm tall welded to it (Pl. 35) which would have engaged with a lip at the top of the adjacent lift and which would have been filled with water to seal the gas when the bell was raised ('cup and grip').

- 3.4.12 The inner lift was supported by 48 I-section steel posts, visible within the holder (Pl. 42), and these also supported the ends of the crown trusses. There were two tall pipes within the bell chamber (inlet and outlet pipes?) towards the east and north. Each of these was free-standing and extended from the base to the crown.
- 3.4.13 Crown structure:** The shallow domed crown of the gasholder was formed from riveted steel plates and this was supported by concentric rings of purlins set on 48 T-section rafter ribs which met at a ring at the top of the crown. This ring was at the top of a large, central vertical shaft which also had a similar holding ring at its base. The rafter ribs were supported from beneath by two rings of 'principal' purlins as well as by radiating trusses extending between the cylindrical shaft at the central point of the holder to the stanchions at the perimeter. When the gasholder was in use the crown structure would have risen with the innermost lift and it would have been supported by the pressure within the tank but when the tank was empty (as at the time of the current work) the cylinder at the centre of the crown structure would rest on a box girder fixed to the ground (Pl. 48).
- 3.4.14 There were 24 main trusses and between these were 24 intermediate trusses, supported on brackets at the head of the 48 stanchions around the inner face of the chamber (Pl. 46-47).
- 3.4.15 Each of the main trusses included an almost horizontal tie formed from a pair of flat-section steels extending from a ring at the centre of the holder (at the base of the shaft) to the outer edge of the truss. This tie would help counter the outward thrust away from the centre. Each main truss also included a large cigar shaped lattice extending from the ring at the top of the shaft to the stanchions at the outer edge. The top of each lattice was formed from the long rafter ribs, while the base was formed from a curved flat section steel, and between these there were a series of L-section members arranged in a 'Warren' lattice pattern. At its lowest point the lattice curved down just beneath the horizontal ties and at this point the two members which form the tie wrap to either side of the lattice.
- 3.4.16 The horizontal tie was essentially structurally separate from the lattice although towards the centre of the holder there are some slender rods which hang down from the lattice to provide some support.
- 3.4.17 The intermediate 'trusses' were much simpler and added bracing to counter the weight of the crown. They comprised two triangles beneath the rafter ribs, each one with raking flat section steels in tension and an L-section post at the centre to counter compression.
- 3.4.18 The crown structure was entirely constructed from steel and it is interesting to note that the members in the upper half of each truss were clean and relatively rust free while those in the lower half had an extensive orange coating (corrosion) in common with the all the steelwork within the chamber below this point. This distinction is clearly due to the fact that the holder would have been filled with water up to this line.

3.5 Gasholder Number 9

- 3.5.1 **Introduction and general description:** The easternmost gasholder at Romford (No 9) was also an above-ground spiral-guided holder in a steel tank with four lifts. It had a very similar form, but not identical, to holder No.7.
- 3.5.2 The site of the holder is labelled on a plan from 1954 as 'future No 9 gasholder' and the archives of the Science Museum holds a contract for its construction, signed by RJ Dempster and dated May 1956. The museum archive also has a contract dated April 1957 and signed by W&C French Ltd for the construction of the raft foundations for holder No. 7. A demolition plan produced for the current project states that it was constructed in 1961 and that it was 58.5m in diameter by 10m in height.

- 3.5.3 **Tank:** The tank was set in a slight earth-bank depression (Pl. 53), but without any perimeter trench, and it was formed from eight courses of steel plate. Similarly to Holder No. 7 the lower six rows were jointed by large diagonal riveted plates but the upper two rows had thin rectangular connecting plates (Pl. 51-52). The rivets were similar to those on gasholder 7 but noticeably more rounded than those used on the earlier gasholder (No.4).
- 3.5.4 There was a walkway around the upper perimeter curb of the tank supported by a series of brackets formed from two triangular shaped vertical flanges braced by two horizontal struts (Pl. 59). These large brackets are smaller than the similar ones on Holder 7.
- 3.5.5 On the west side of the tank there was a steel dog-leg staircase providing access to the walkway at the top of the tank, with the lower half of the stairs within a mesh security enclosure (Pl. 57).
- 3.5.6 There was a makers plate on the side of the tank showing that it was constructed by R&J Dempster, Manchester in 1960.
- 3.5.7 On the north side of the holder there was a concrete lined valve pit with a steel grille over the top and a penstock-type wheel to operate the mechanism within the pit (Pl. 55). Immediately above this pit there was a relatively slender pipe (c.15 cm diameter) fixed to the side of the gasholder which was capped at its base, and just to the north of the pit there was a larger cast-iron pipe (c.60 cm diameter) protruding vertically from the ground. This had also been capped and it may be that this was a gas inlet/outlet pipe which became redundant when the plant was modified in the 1970s for natural gas.
- 3.5.8 On the south side of the gas holder there was a concrete base with another c.15 cm diameter, full height pipe fixed to the side of the holder and at its bottom this capped pipe curved suggesting it formerly connected to a piece of plant set on this concrete base.
- 3.5.9 **Lifts and interior of bell:** As with the other holders the lifts were retracted into the tank at the time of the survey as the holder had been emptied of gas so very little of these, or the crown, could be seen prior to the start of the demolition phase.
- 3.5.10 Four staircases were visible from the ground rising up above the tank and lifts and these would have provided access to the walkways around each lift when the holder was in a raised position. Each of these comprised three Warren type lattice posts and two horizontals providing a structural frame for the simple set of steps.
- 3.5.11 When the opening was created in the side of the holder it could be seen that the lifts were constructed from thinner plates of steel than the tank and that the lifts had similar 'cup and grip' troughs at their base as in Holder No. 7. The full 'sandwich' of the outer tank and four lifts was 2.3 m in width.
- 3.5.12 Unlike the other two gasholders at Romford full access was possible into the bell chamber during the demolition phase because it had been fully emptied of water and this allowed a much closer inspection of the internal structure. The floor was clad in steel plates, c.1.5 m wide and riveted together (Pl. 78).
- 3.5.13 The sides of the bell (ie the inner face of the innermost lift) were constructed from 15 rows of the relatively thin steel and the base of this was 36 cm above the steel plate floor. Similarly to Holder No.7 the lifts rest on a series of radiating steel joists set on the floor (Pl. 70).
- 3.5.14 The walls were braced with 48 full height, I-section stanchions, each one c.3.5 m apart and measuring 36 cm long with a 15 cm flange (Pl. 75).

- 3.5.15 There were two large vertical pipes (inlet and outlet), roughly at the north and south ends of the holder, extending up to a hole in the crown from the base (Pl. 76-77). These pipes were roughly 1 m in diameter.
- 3.5.16 **Crown structure:** the shallow-domed crown of the gasholder was clad in steel plates and the structure which supports it was similar (but not identical) to that in Holder No.7. At the centre of the structure was a cylindrical shaft (similar to the axle on a bicycle wheel) and at the top and bottom of this there are rings which hold the inner ends of the radiating 'spokes' of the trusses (Pl. 63-66). The outer ends of the trusses rested on brackets at the top of each of the stanchions around the edge of the bell.
- 3.5.17 There were 48 trusses although these divided into 2 different types which alternated with each other (24 of each type). There was a main type of full length truss, which extended right into the ring at the centre, and an intermediate truss which terminated at a ring beam (or 'principal purlin') approximately one third of the way from the centre. This ring beam was formed from two I-section steel joists and it supported 24 vertical I-section struts which hand down and support the main trusses.
- 3.5.18 The main trusses comprised a curved upper rib (or rafter) from the outer stanchion to the ring at the top of the 'axle' shaft as well as a flat-section steel tie, sloping gently down from the outer stanchion to the ring at the base of the shaft. Beneath the rafter ribs there were three I-section vertical members to counter downward forces and the base of each of these was connected by a flat section member. There were also two further diagonal flat section members between them to add bracing.
- 3.5.19 The simpler intermediate trusses extended between the outer stanchion and the ring beam and they comprised a St Andrews type cross formed from flat section steels to the diagonals and horizontal as well as I-sections to the two vertical members. There were further flat sections either side of this to the outer stanchion and ring beam.
- 3.5.20 There was a fixed stanchion at the centre of the holder which provided support for the crown structure when the holder was in the lowered position and there was no support from the pressure of the gas within the holder (Pl. 73). This stanchion was c. 4.3 m tall up to the structural ring at the base of the shaft and its width tapered so that while its base was c.1.2 m² at the top it was c.90 cm². The diameter of the lower ring was c.1.7 m.

3.6 Other structures or features

3.6.1 Boiler House

- 3.6.2 Towards the centre of the four gasholders was a single storey structure which formed the boiler house (Pl. 79-83). Various site plans held at the National Grid Archives suggest that this structure was constructed in the mid 1970s. It is not shown on a plan from 1972 but is shown on one from 1976. It is labelled on several plans as the 'anti-freeze boiler house'.
- 3.6.3 The building had a rectangular plan and it was a relatively tall, single-storey structure. It was constructed from a light brown coloured brick laid in English bond although the upper third of each elevation was slightly darker than the lower two-thirds. The building presumably had a flat roof although this is hidden behind parapets to each wall.
- 3.6.4 The north elevation contained a pair of tall double doors, constructed from timber boards and incorporating slat vents towards the top of each door. These vents appeared inserted but there was also a lower slat vent in one door which was primary and the words 'ANTIFREEZE BOILER HOUSE' was painted immediately above this.

- 3.6.5 The only feature in the west elevation was a large horizontal-slat vent in the upper third of the wall, beneath a concrete lintel which was much wider than the vent. The width of the lintel is surprising and although there is no evidence of there ever having been a larger opening beneath it may be that it was used to allow for the possibility of such an opening being required at some point in the future (for example to allow for the insertion of new plant inside).
- 3.6.6 The east elevation also had a high-level, horizontal-slat vent beneath a wide concrete lintel, similar to that in the west elevation, as well as another large slat vent towards the lower northern corner. This elevation had several horizontal flues from the boiler and other plant inside the building.
- 3.6.7 The south elevation included a single small doorway for pedestrian access, a small lean-to with three plain doors and a large metal flue, standing slightly away from the wall which would have carried the main exhaust gases from the boiler.
- 3.6.8 The interior had bare brick walls and a concrete-slab ceiling supported by two east-to-west steel joists. The main plant within the building was almost certainly modern replacements for the original plant.

3.6.9 Telemetry Room

- 3.6.10 To the north of gasholder No.5 and the west of holder 4 was another small, single-storey brick structure which incorporated a telemetry room and a slightly later electrical switch room on the west side (Pl. 84-86). This building does not appear to be shown on an aerial photograph from 1984, (NT/NTG/E/F/3/33) but it is clearly shown on one from 1991 (NT/NTG/E/F/1/36). No access was possible inside the building.
- 3.6.11 The building had a flat roof, a concrete plinth and the walls were formed from a buff coloured brick laid in stretcher-bond. There were vertical joints in the north and south walls between the telemetry room and the small switch room extension and in addition there was a step in the roof between the two areas.
- 3.6.12 The south wall had a single, plain-board doorway with sign saying 'Telemetry Room', as well as a tall aerial and four vents towards the corners of the elevation. The east wall also had a tall aerial projecting above the roofline but the main feature of the elevation was a large set of electrical cables extending through six holes towards the roofline and continuing vertically down to a sunken duct in the ground. The north elevation also had a number of cables extending down it vertically and entering the building through two circular holes close to the roof line. This wall also had four vents towards the corners of the telemetry room.
- 3.6.13 The west wall comprised two pairs of double doors formed from vertical timber boards painted light blue and with a simple sign saying 'electrical switchroom'.
- 3.6.14 There were numerous sunken electrical cables in the area immediately around the building and extending away from it.
- 3.6.15 Access to the building was via a set of concrete paths laid within the shingle which forms the main ground surface around the gasworks.

3.6.16 Boundary wall

- 3.6.17 The former gasworks site had a modern fence around all sides and there appeared to be no sections of surviving historic walls or fences.

4 CONCLUSION

- 4.1.1 The former gasworks at Crow Lane Romford is one of many similar sites across the country which have been decommissioned due to changes in the gas industry and the redundant gasholders are currently being dismantled. The above-ground holders at Romford have been very prominent local landmarks for much of the 20th century and as part of the redevelopment of the site National Grid have commissioned Oxford Archaeology to document the holders through of programme of historic building recording. The recording, which has been undertaken both before and during the demolition, forms part of a wider thematic study to document other redundant gasworks and it will allow comparison between sites.
- 4.1.2 The site at Crow Lane, Romford was originally developed from the early 1880s, to allow the expansions of the operations of the local gas company, and it then continued to grow in the 20th century. Three gas holders have formed the main focus of the current recording: two of these were constructed in c.1960-61 and the other was constructed in c.1925. Each of the three holders were of the same basic spiral-guided type, typical for the middle decades of the 20th century, although there were subtle differences in the construction of each particularly in the form of the structure which supports the crown.
- 4.1.3 The crown of the earliest gasholder (No. 4) comprised a single large span and the trusses in this were similar to those that would be found in a conventional building of this period. The trusses in the other two however had a central prop to provide additional support (at least when the holder was in the lowered position) and the much deeper form of these trusses perhaps represents a design more specifically for a gasholder.

APPENDIX A BIBLIOGRAPHY

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February 2018

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 Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA,

Figure 1: Site location



Figure 2: Site plan showing location of plates in this report



Figure 3: 1895 Ordnance Survey plan (6 inch)

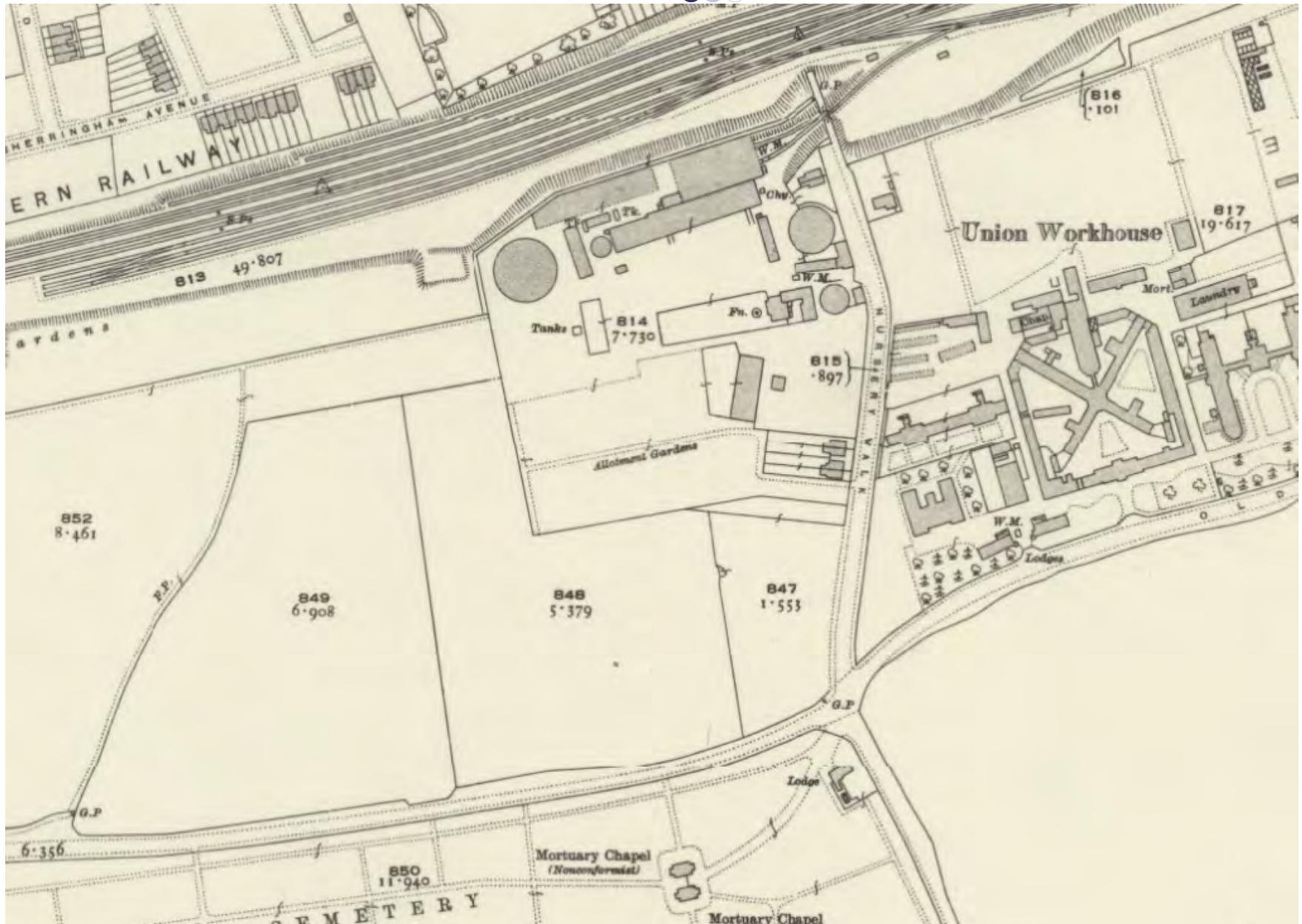


Figure 4: 1915 Ordnance Survey plan (25 inch)

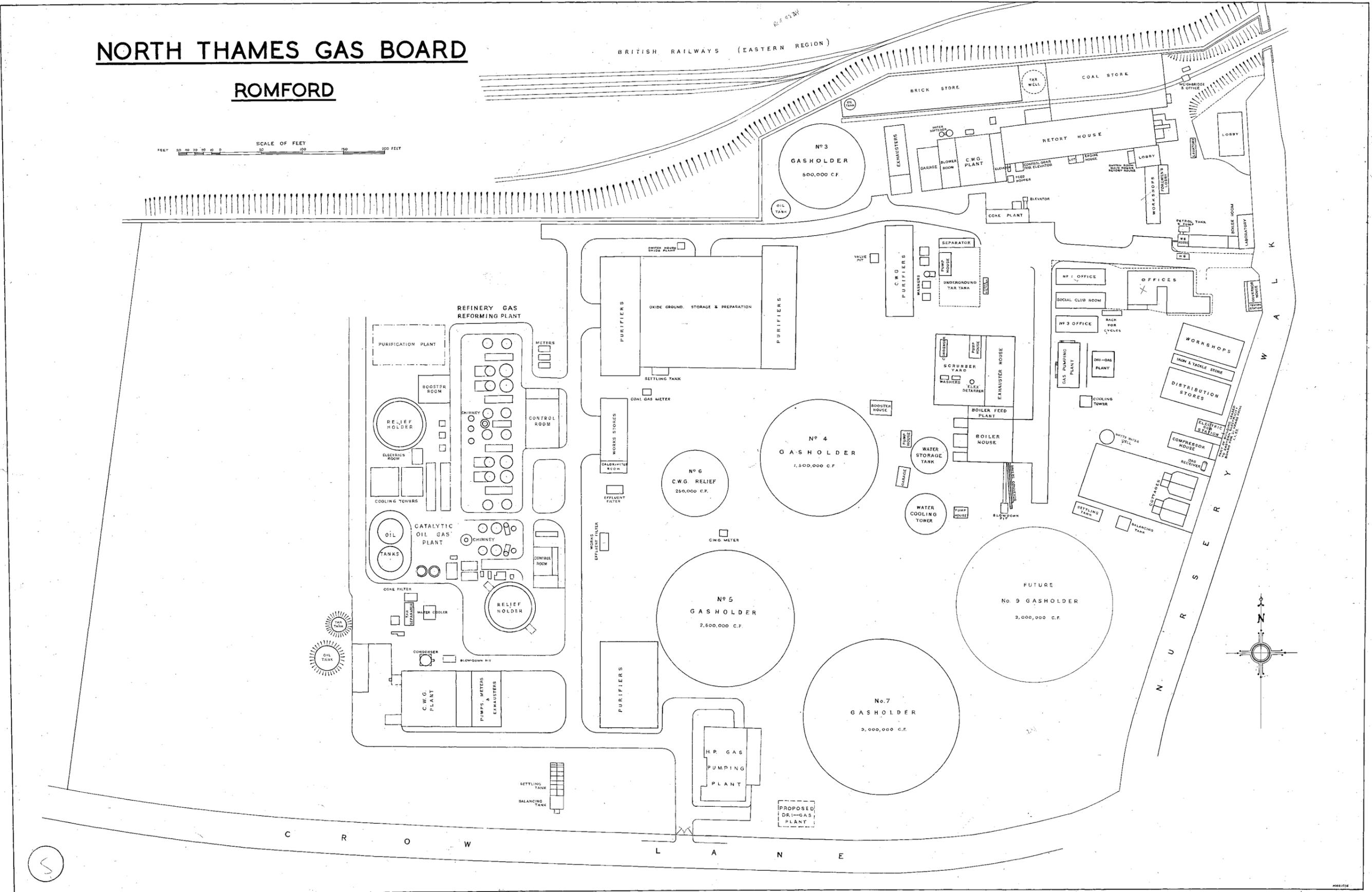


Figure 6: 1949 Aerial photograph

NORTH THAMES GAS BOARD ROMFORD

BRITISH RAILWAYS (EASTERN REGION)

SCALE OF FEET
0 50 100 150 200



NT/ex/Rom/e/e/1

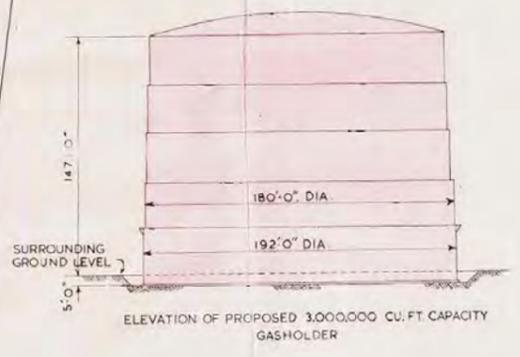
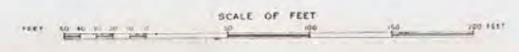
Figure 7: 1954 plan of Romford gasworks

oxford-archaeology 110.0.10.86 invoice codes r thru z IR_codes/IRGAS/IRGAS18/RGASBS/Romford Gasworks LG'01.08.18

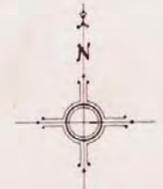
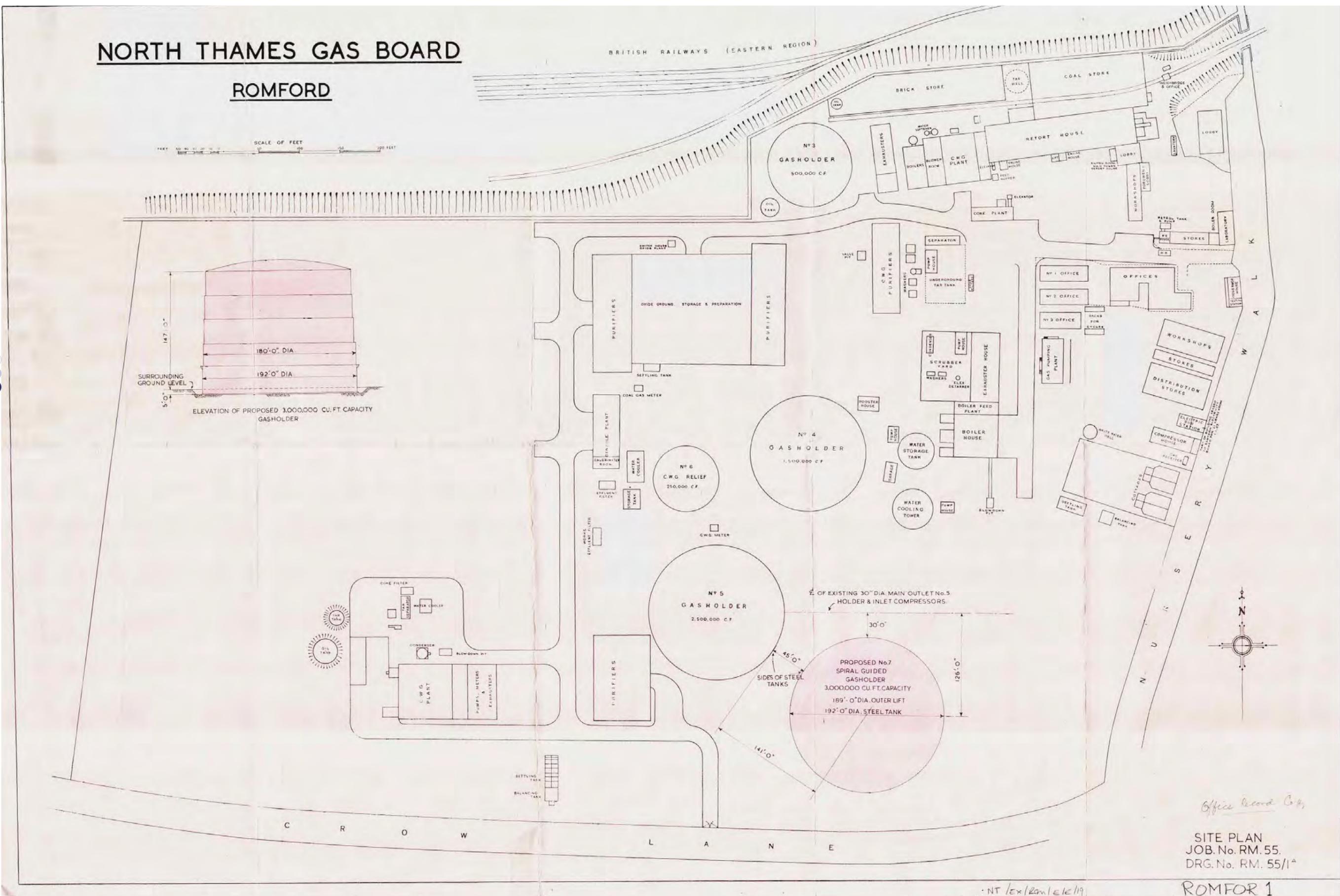
NORTH THAMES GAS BOARD

ROMFORD

BRITISH RAILWAYS (EASTERN REGION)



ELEVATION OF PROPOSED 3,000,000 CU. FT. CAPACITY GASHOLDER



Office Record C/4

SITE PLAN
JOB. No. RM. 55.
DRG. No. RM. 55/1^a

ROMFORD 1

NT/Ex/Rom/1/1/19

Figure 8: Undated (1950s?) plan of Romford gasworks

oxfordancestry | 110.0.10.86 | invoice codes r thru z | R_codes | RGABS | RGAS | B | RGASBS | Romford Gasworks | LG 01.08.18

41

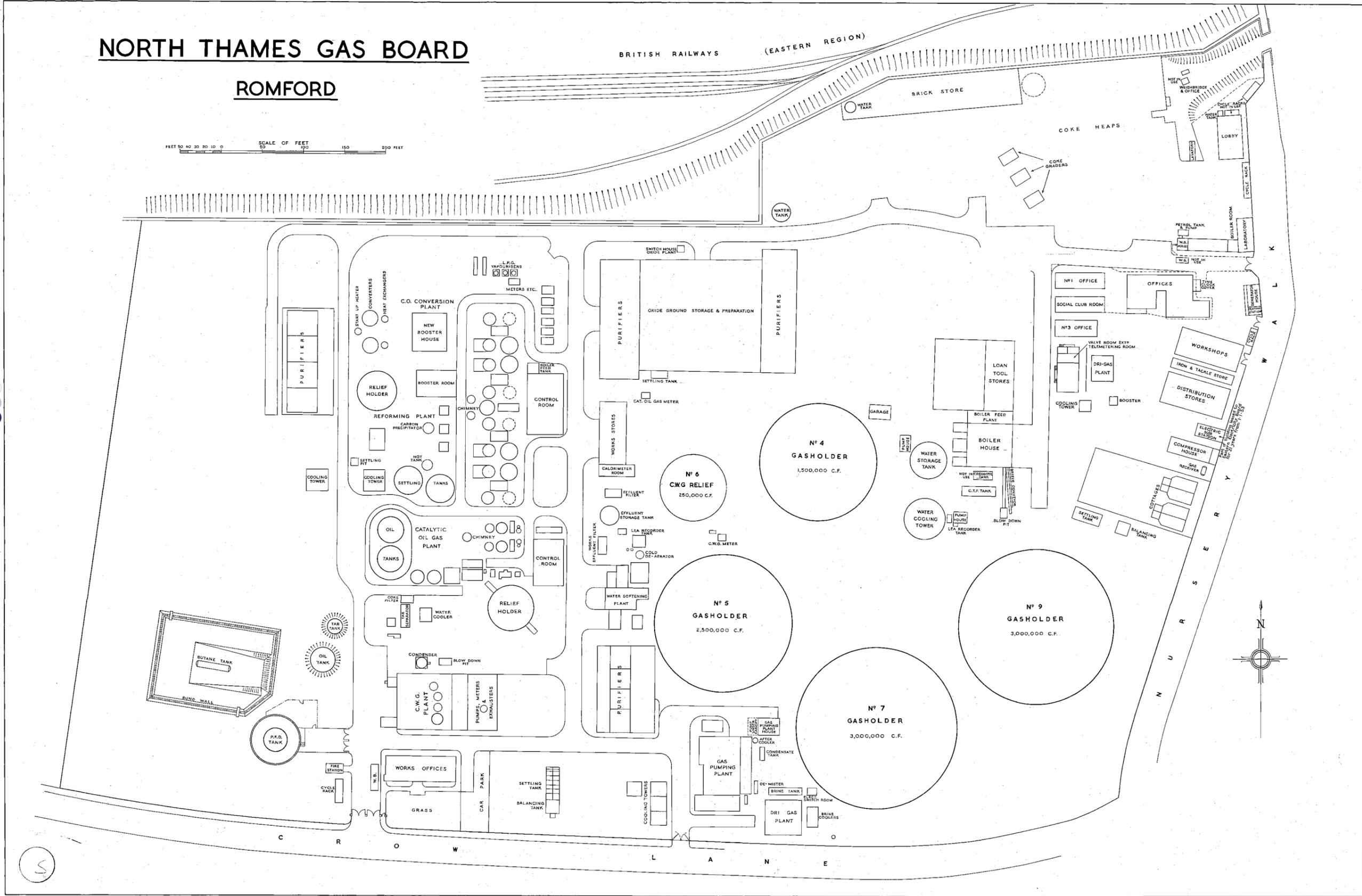
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NORTH THAMES GAS BOARD

ROMFORD

BRITISH RAILWAYS (EASTERN REGION)

SCALE OF FEET
0 50 100 150 200 FEET



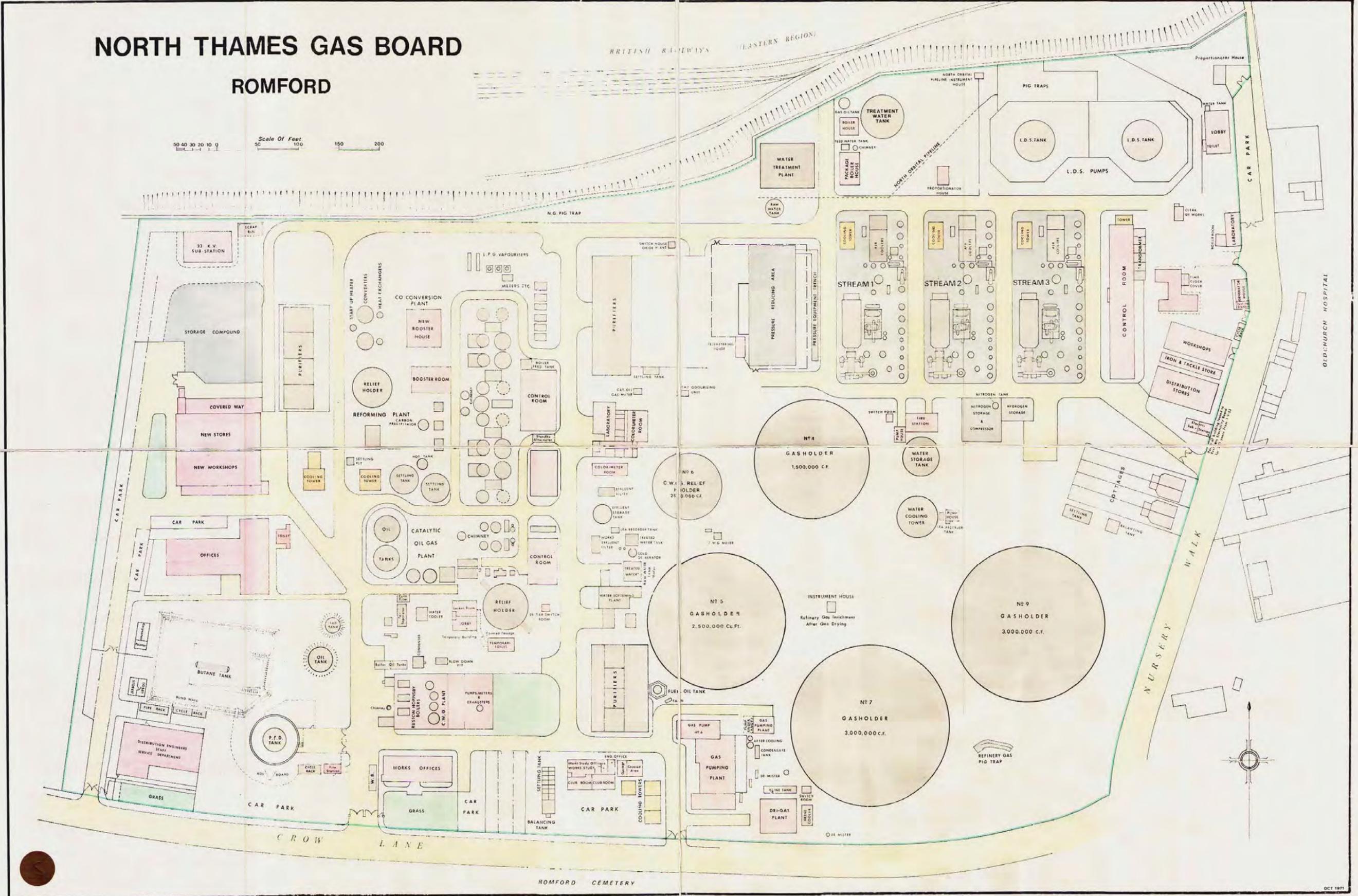
NT/Ex/Rom/2/1/3

14

Figure 9: 1965 plan of Romford gasworks

NORTH THAMES GAS BOARD ROMFORD

Scale Of Feet
0 10 20 30 40 50 100 150 200



NT/ex/Rom/19

Figure 10: 1971 plan of Romford gasworks

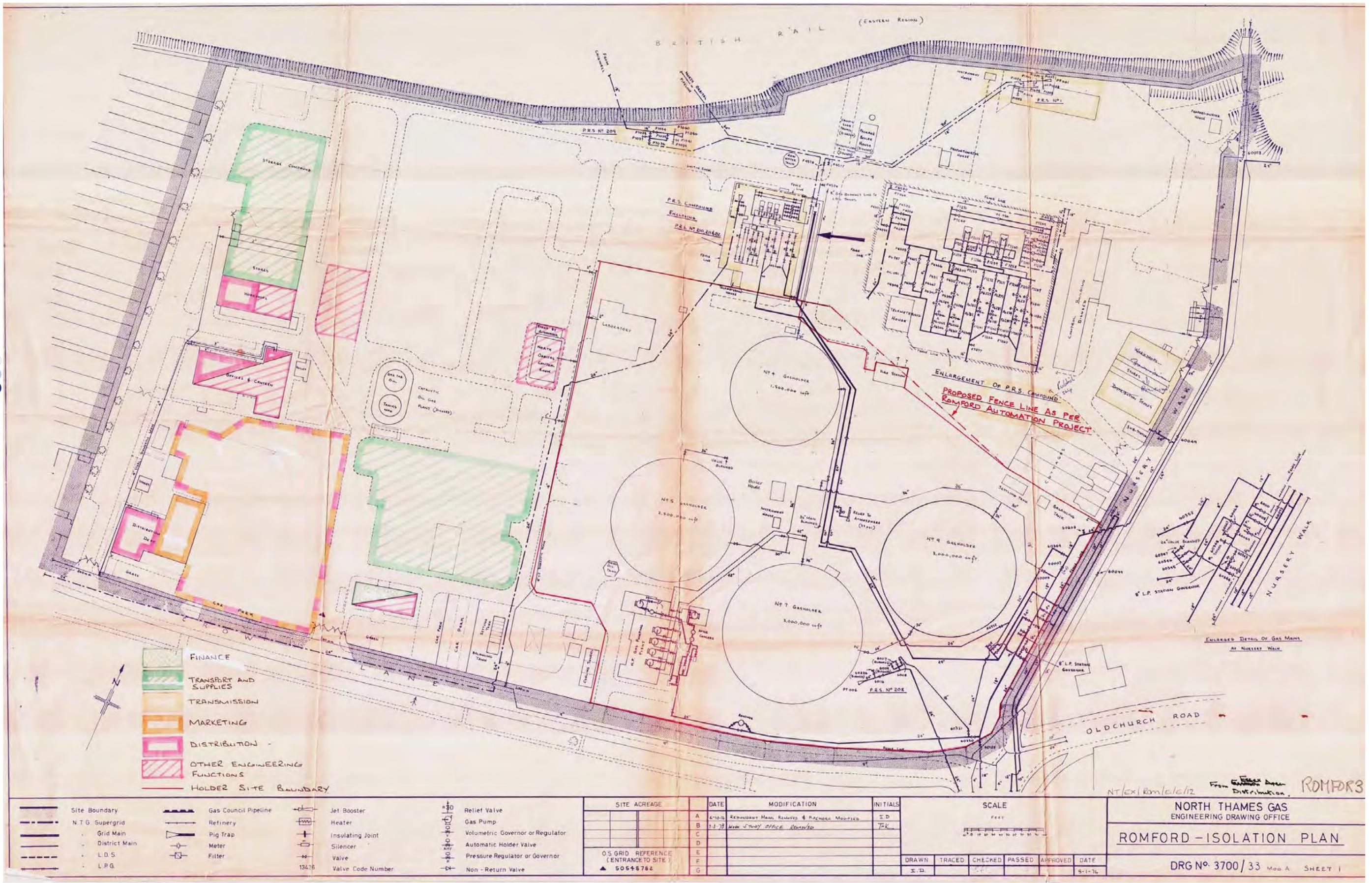


Figure 11: 1976 plan of Romford gasworks



Figure 12: 1991 aerial photograph



Plate 1: Gasholder 4 looking south-east



Plate 2: Gasholder 4 looking north



Plate 3: Detail of bracket to gasholder 4



Plate 4: Detail of truncated bracket to gasholder 4



Plate 5: General view of gasholder 4



Plate 6: Gasholder 4 detail of lifts after creation of opening in holder

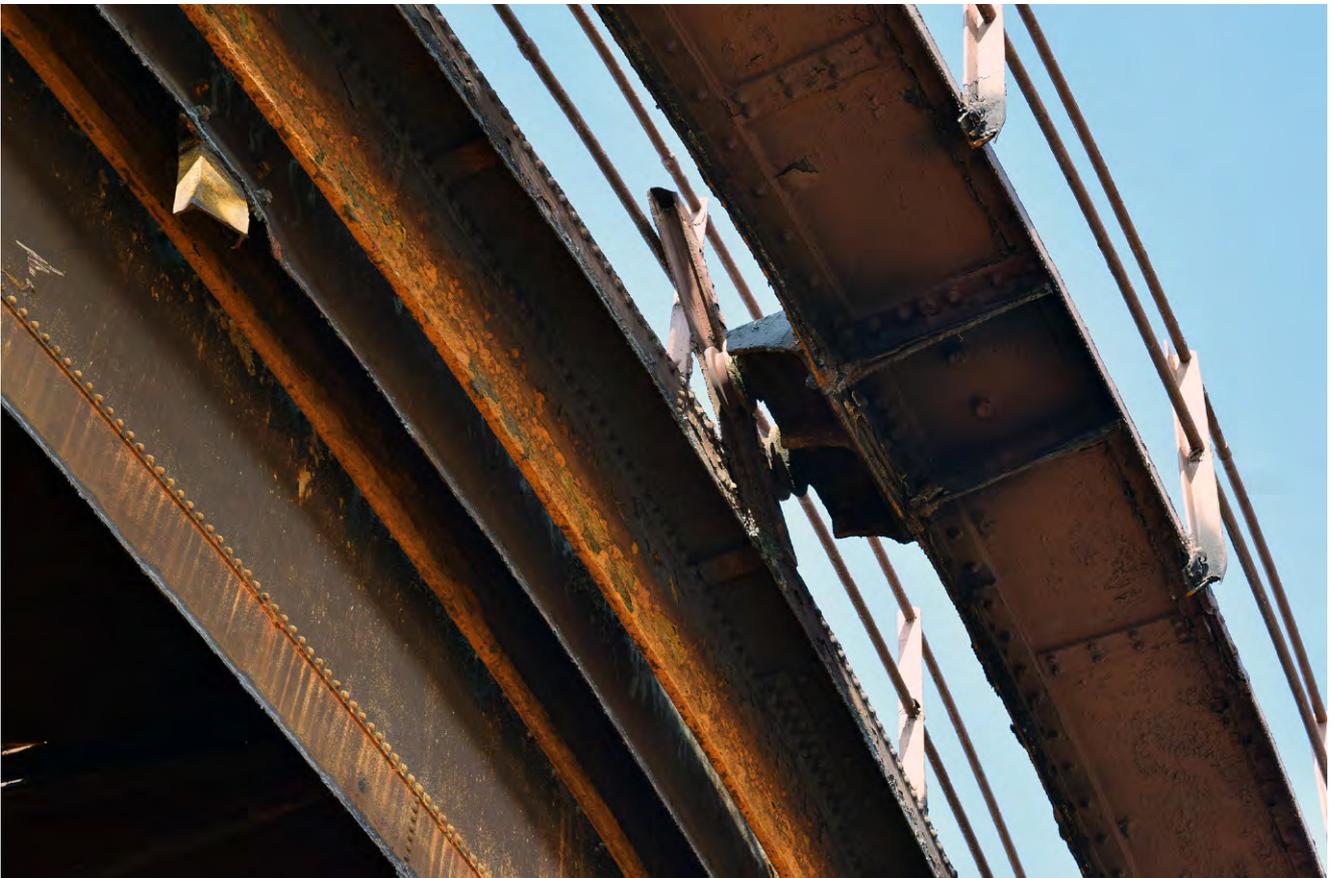


Plate 7: Gasholder 4 detail of underside of top of holder



Plate 8: Detail of lifts within tank of No 4 after cutting through



Plate 9: Infilled opening from former pipe in gasholder 4



Plate 10: Ex-situ section of gasholder lift



Plate 11: View between lifts of gasholder 4



Plate 12: Plant to east of gasholder 4



Plate 13: Plant adjacent to gasholder 4



Plate 14: Base of holder 4 after demolition of tank



Plate 15: Roof structure within gasholder 4

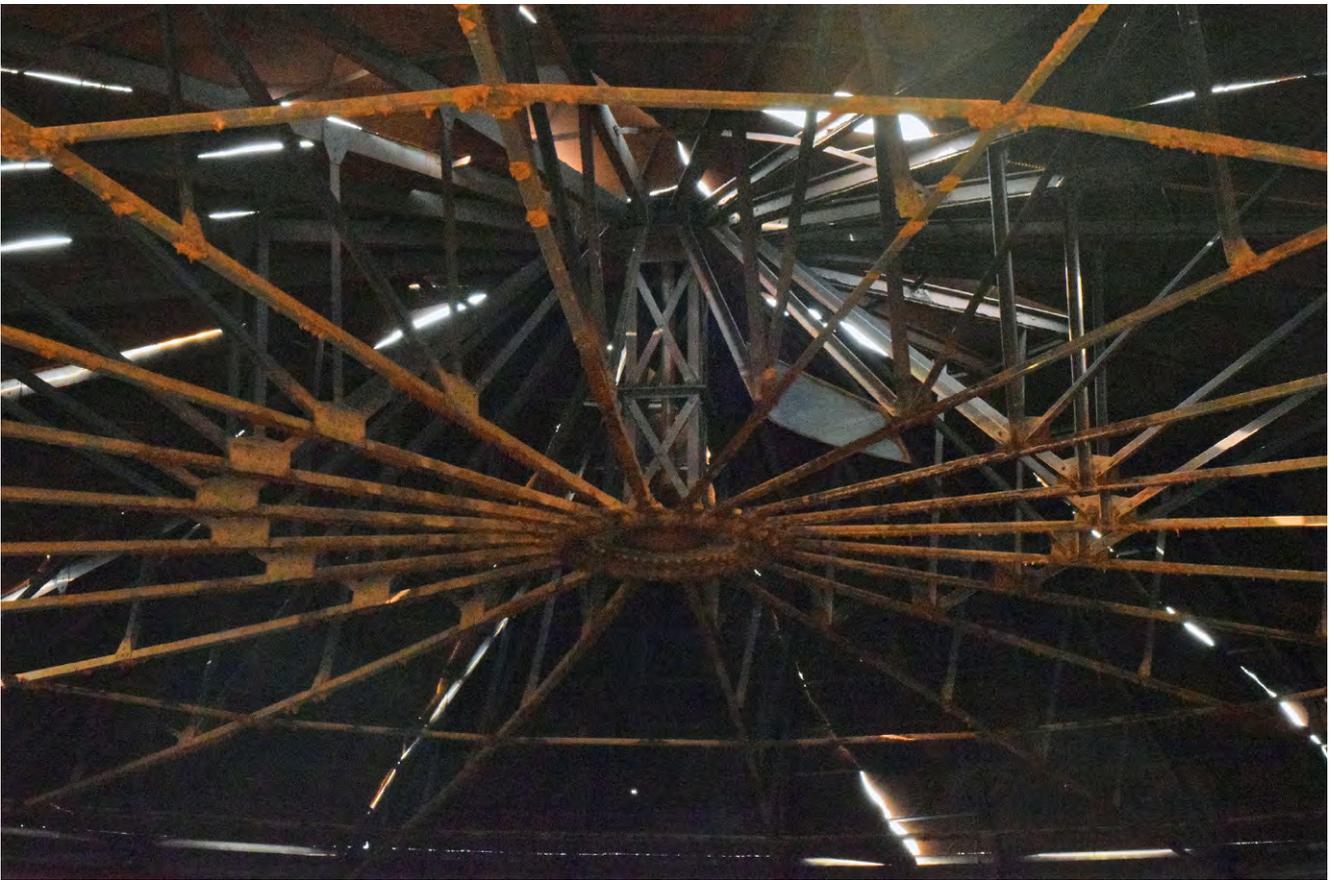


Plate 16: Roof structure within gasholder 4



Plate 21: Detail of structure within gasholder 4



Plate 22: Detail of structure within gasholder 4



Plate 23: Inner face of gasholder 4

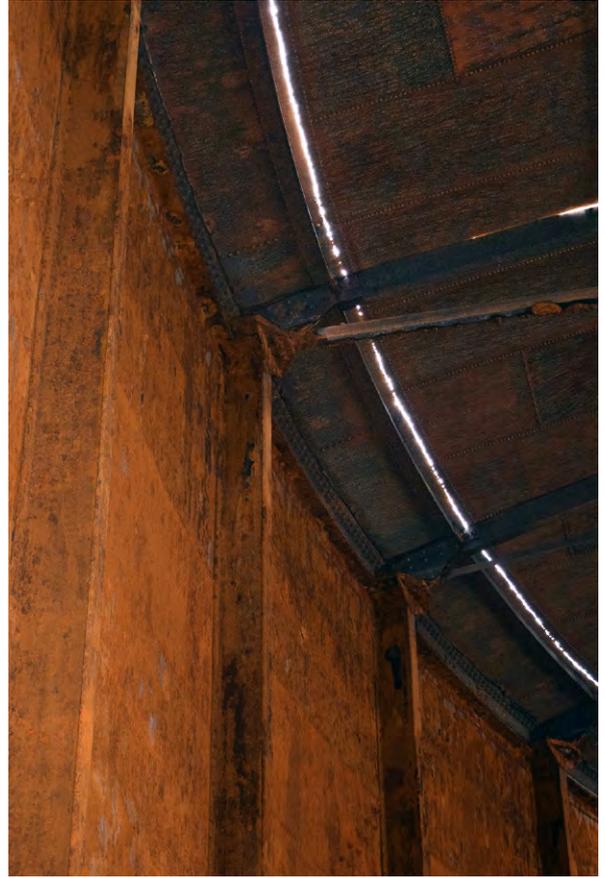


Plate 24: Detail within gasholder 4



Plate 25: Remains of gasholder 5 after its demolition



Plate 26: Remains of gasholder 5 after its demolition



Plate 27: General view of gasholder 7 looking east



Plate 28: Gasholder 7 looking east during demolition



Plate 29: Gasholder 7 looking south



Plate 30: Staircase on north side of gasholder 7



Plate 31: Makers plate on gasholder 7



Plate 32: Opening created in gasholder 7



Plate 33: Plant on north side of gasholder 7



Plate 34: Gasholder 7 after removal of section of outer tank

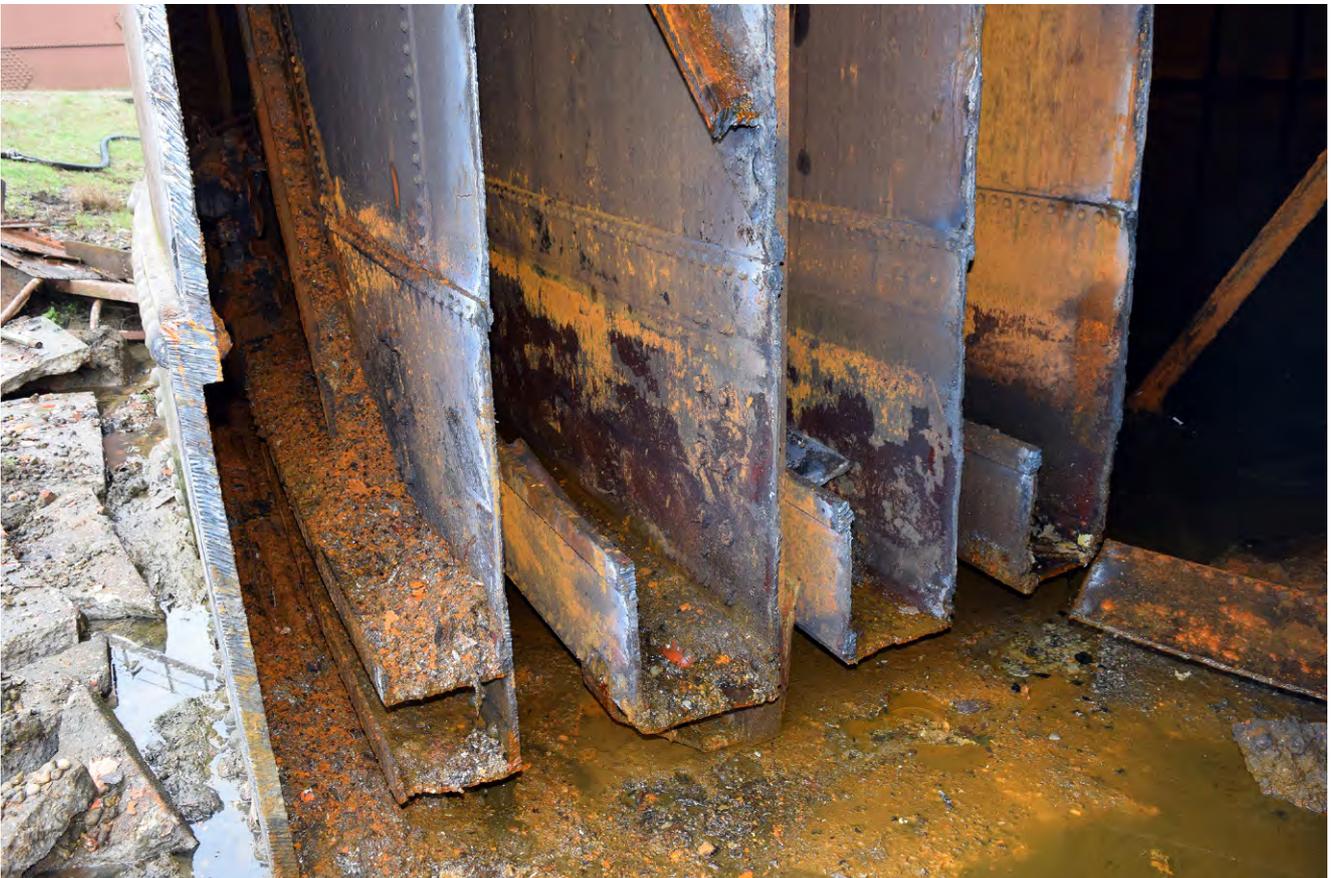


Plate 35: Detail of lifts after opening cut through holder



Plate 36: Staircase of gasholder 7

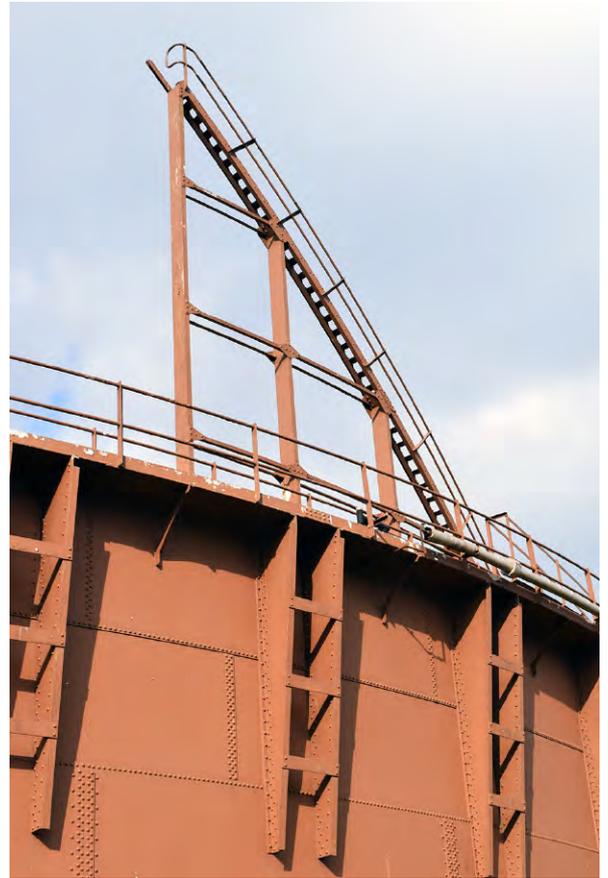


Plate 37: Steps on gasholder 7 to allow access to upper lifts



Plate 38: General view of gasholder 7



Plate 39: Detail of outer tank during demolition



Plate 42: General view into gasholder 7

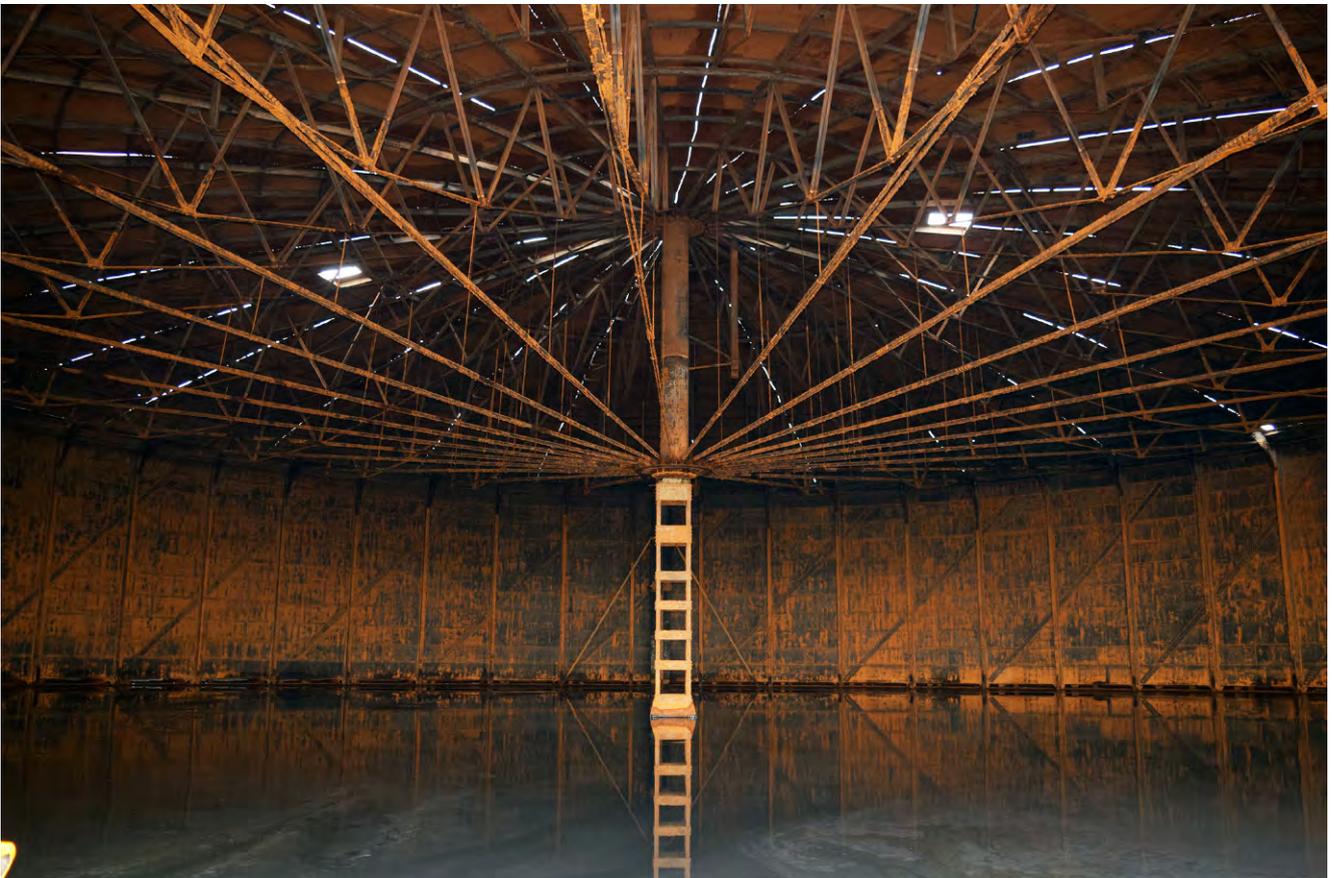


Plate 43: No 7 general view of interior



Plate 44: General view of interior of gasholder 7



Plate 45: Gasholder 7 roof detail



Plate 46: Gasholder 7 roof detail



Plate 47: Gasholder 7 roof detail



Plate 48: Gasholder 7 roof detail

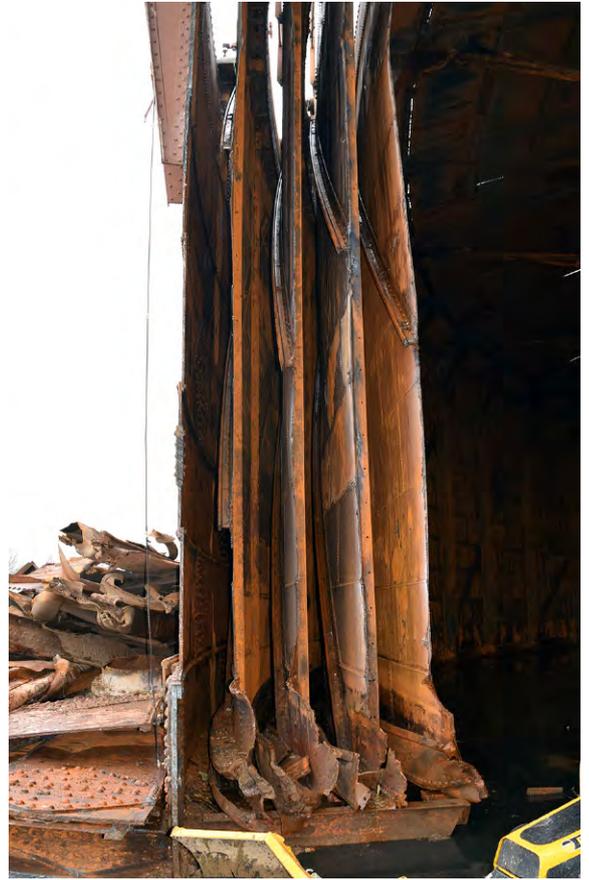


Plate 49: Detail of lifts of holder 7 after creation of opening



Plate 50: General view of gasholder 9, southern side



Plate 53: Depression around gasholder 9



Plate 54: General view of gasholder 9 during demolition



Plate 55: Plant around gasholder 9



Plate 56: Gasholder 9 during demolition



Plate 57: Staircase to gasholder 9

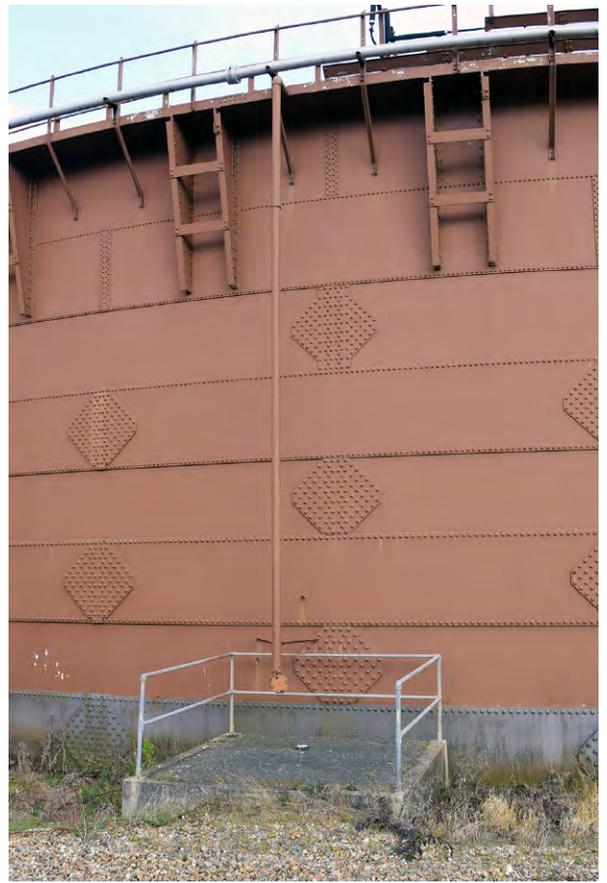


Plate 58: Side of gasholder 9



Plate 59: Bracket of gasholder 9

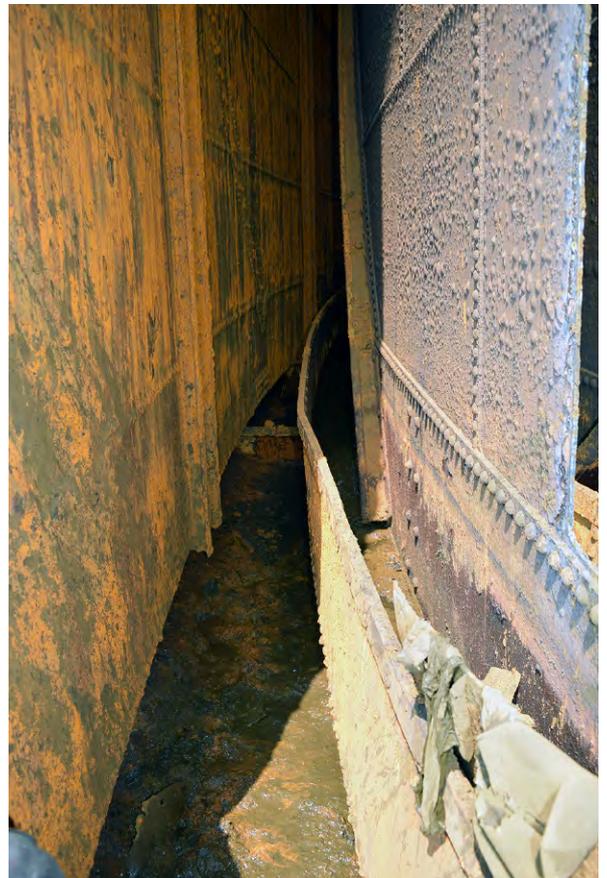


Plate 60: Space between tank and lift of gasholder 9



Plate 61: Steps on top of gasholder 9



Plate 62: Pipes adjacent to gasholder 9



Plate 63: Roof structure within gasholder 9



Plate 64: Roof structure within gasholder 9



Plate 65: Roof structure within gasholder 9



Plate 66: Roof structure within gasholder 9



Plate 67: Roof structure within gasholder 9

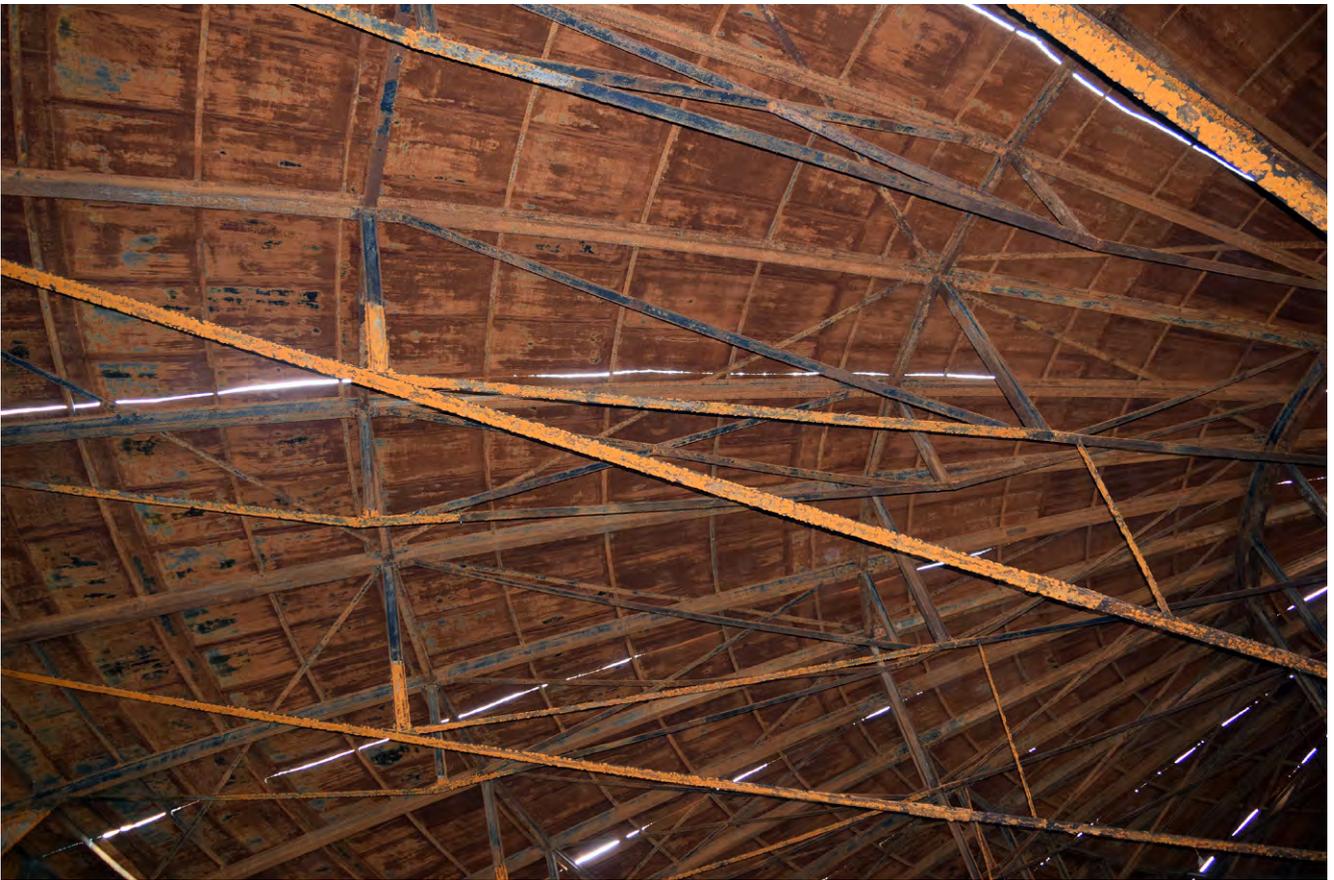


Plate 68: Roof structure within gasholder 9



Plate 69: Roof structure within gasholder 9



Plate 70: Base of inner lift within gasholder 9



Plate 73: View within gasholder 9

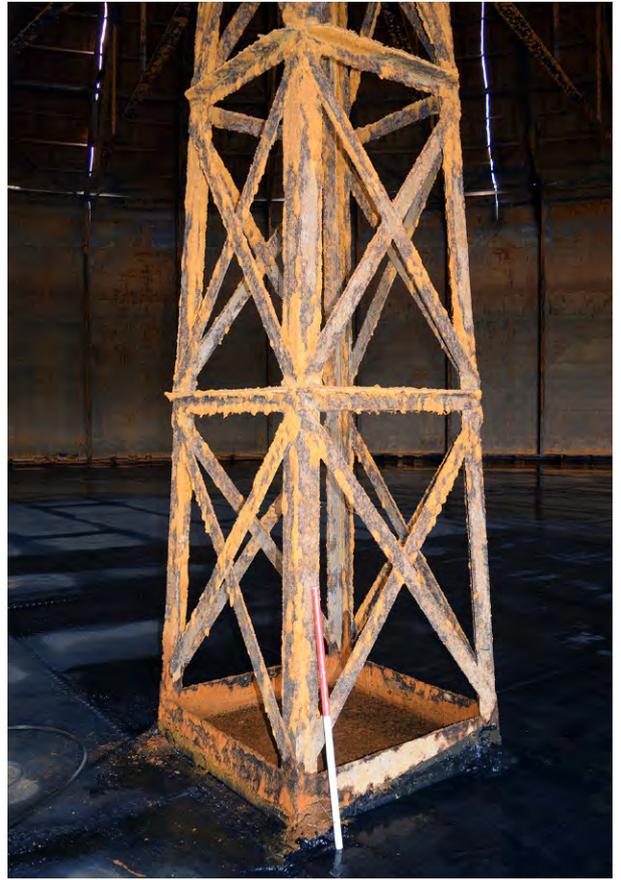


Plate 74: Stanchion at centre of gasholder 9



Plate 75: View of inner lift within gasholder 9

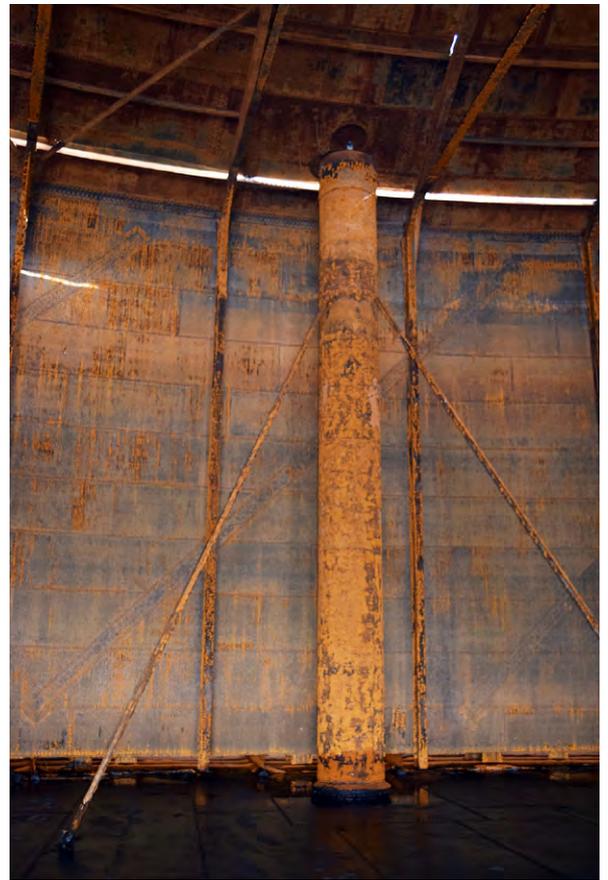


Plate 76: Pipe within gasholder 9

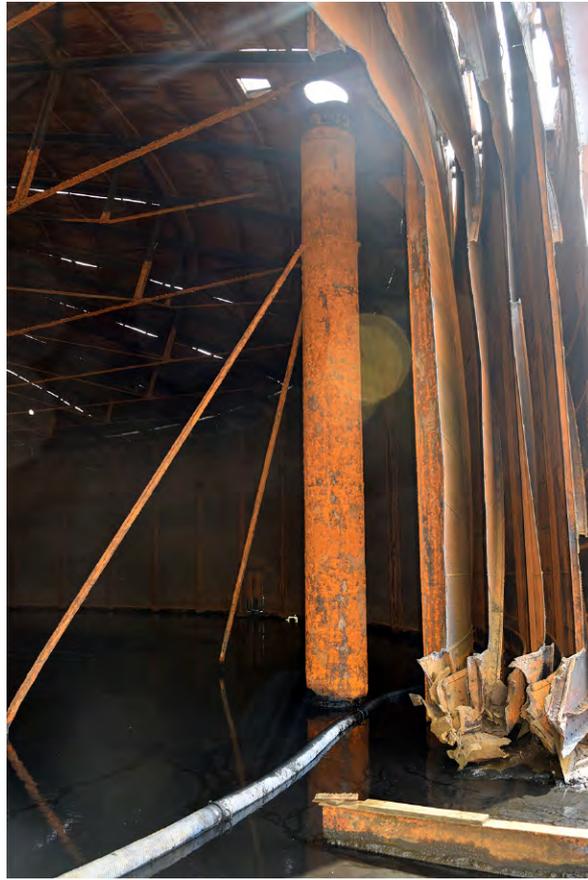


Plate 77: Side of gasholder 9 after creation of opening

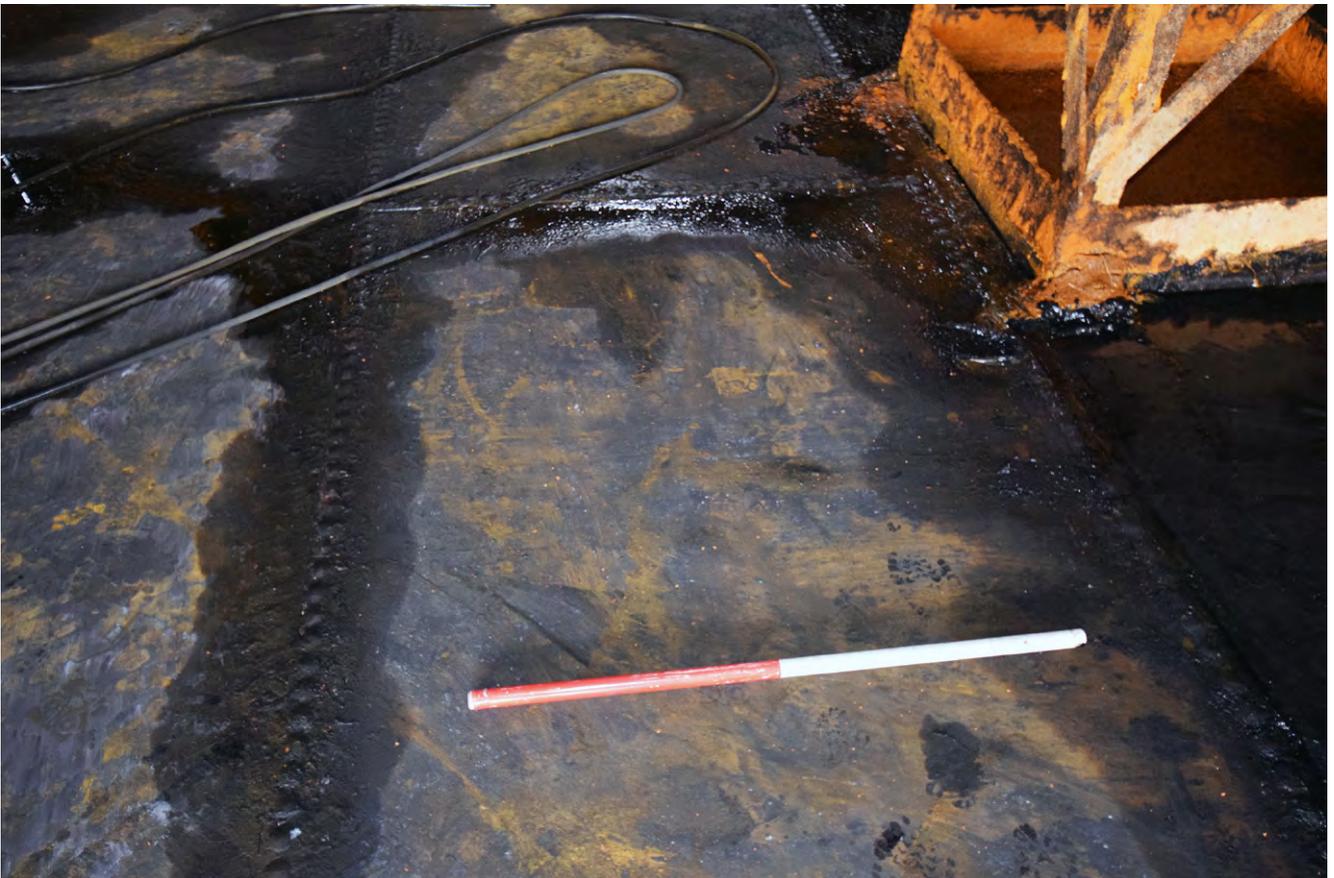


Plate 78: Steel plate floor in gasholder 9



Plate 79: Boiler house, north side



Plate 80: East side of boiler house



Plate 81: South side of boiler house

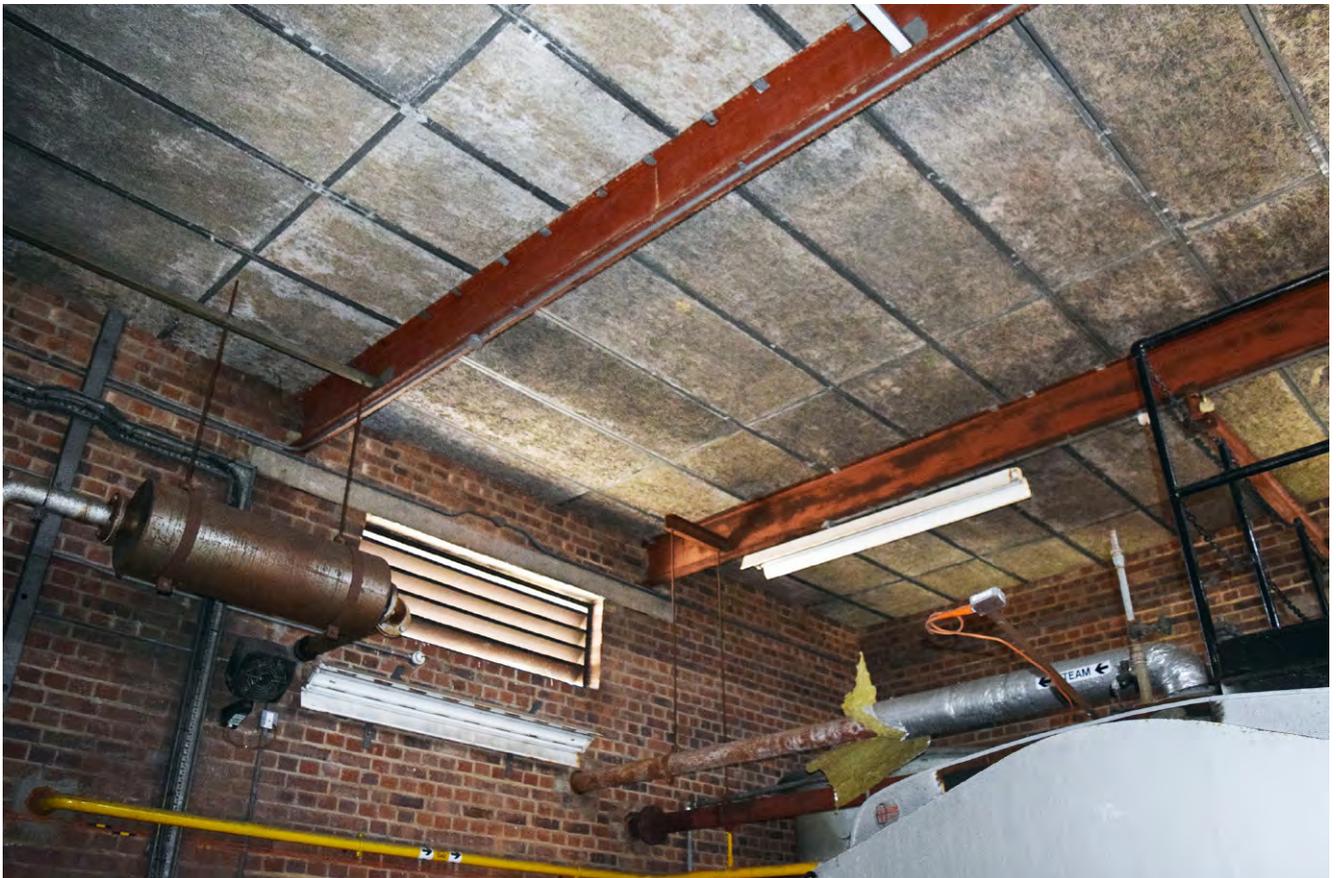


Plate 82: Interior of boiler house



Plate 83: Interior of boiler house



Plate 84: Telemetry and switchroom, south side



Plate 85: East side of telemetry room



Plate 86: North-east corner of telemetry room



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