

**Site Details:**

FRONT STREET, GROSMONT,  
WHITBY, YO22 5QE

**Client Ref:** PO16155-D9255-TK  
**Report Ref:** GS-5723237  
**Grid Ref:** 482664, 505418

**Map Name:** National Grid

**Map date:** 1974-1976

**Scale:** 1:10,000

**Printed at:** 1:10,000



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Revised 1974  
Edition N/A  
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Surveyed 1975  
Revised 1976  
Edition N/A  
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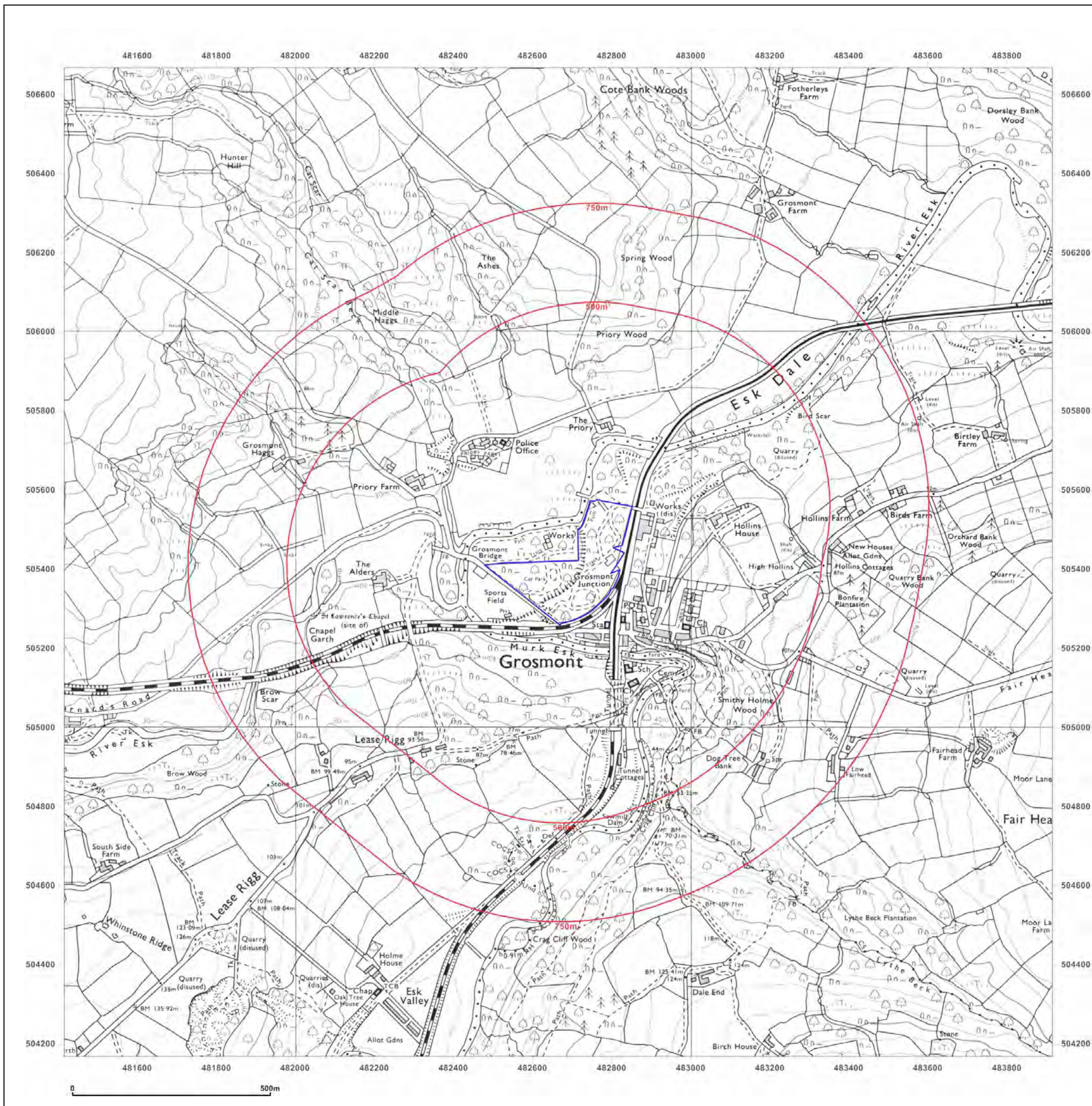
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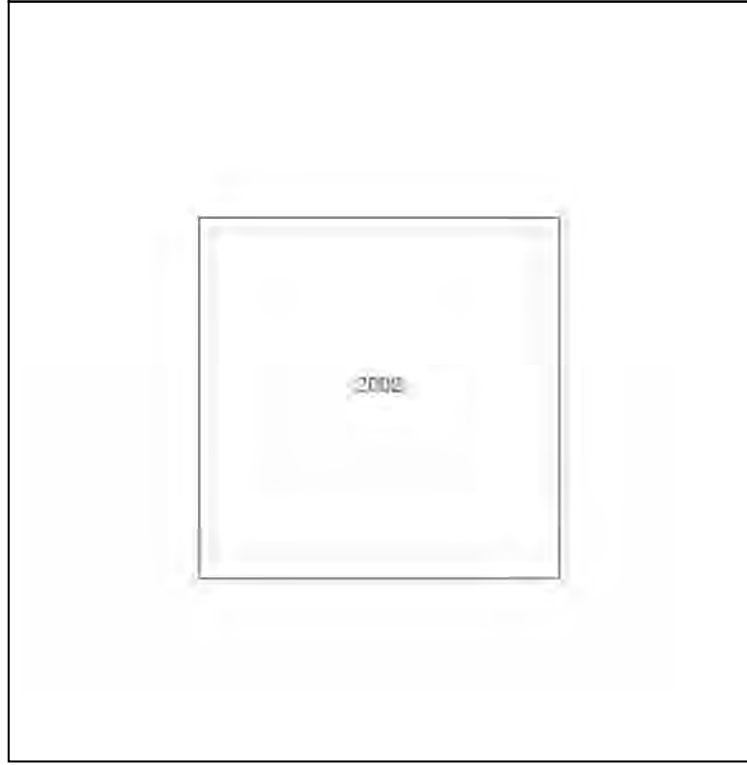
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**Map Name:** 1:10,000 Raster

**Map date:** 2002

**Scale:** 1:10,000

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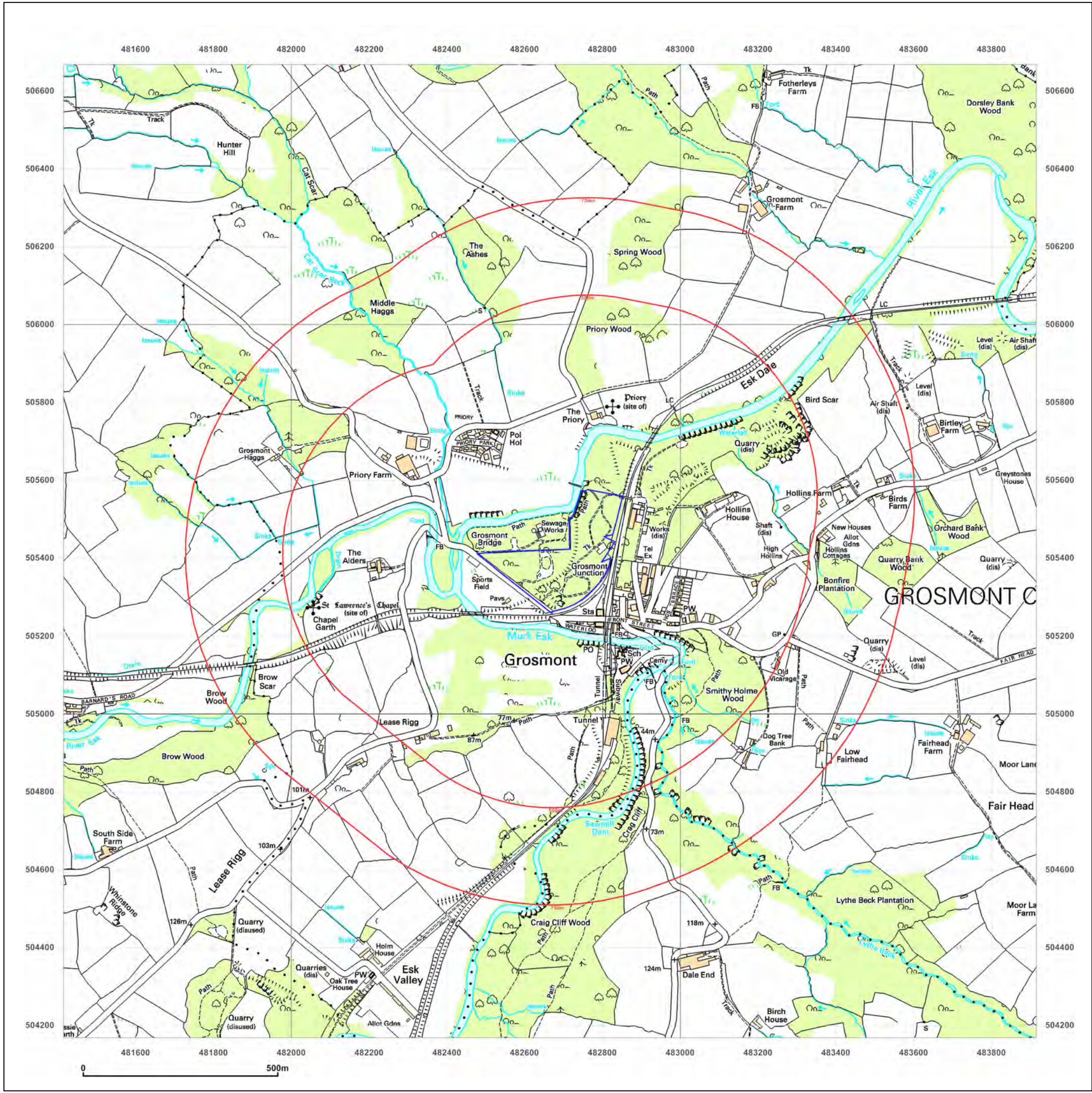
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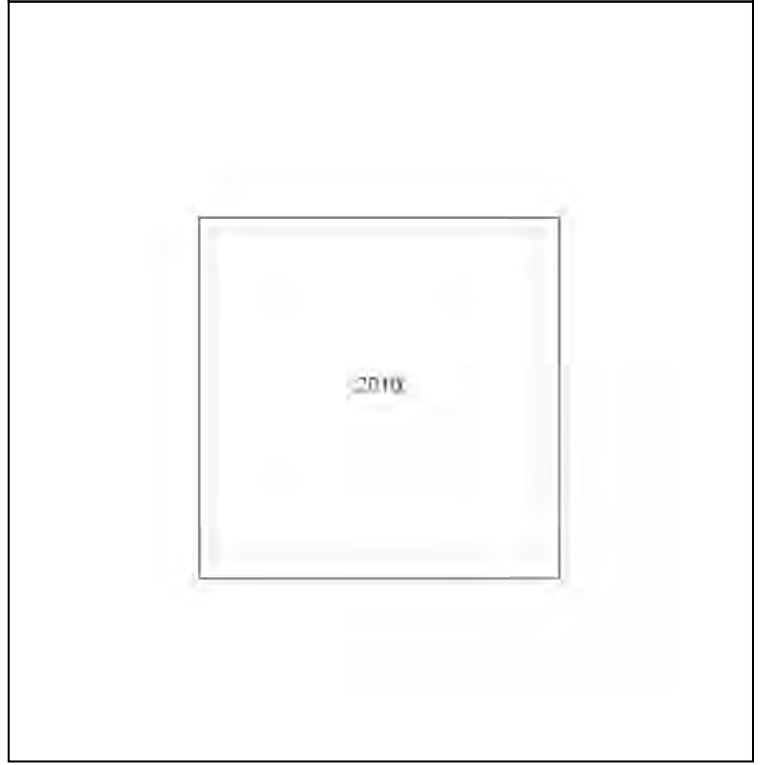
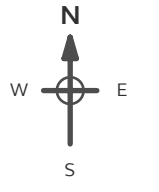
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**Client Ref:** PO16155-D9255-TK  
**Report Ref:** GS-5723237  
**Grid Ref:** 482664, 505418

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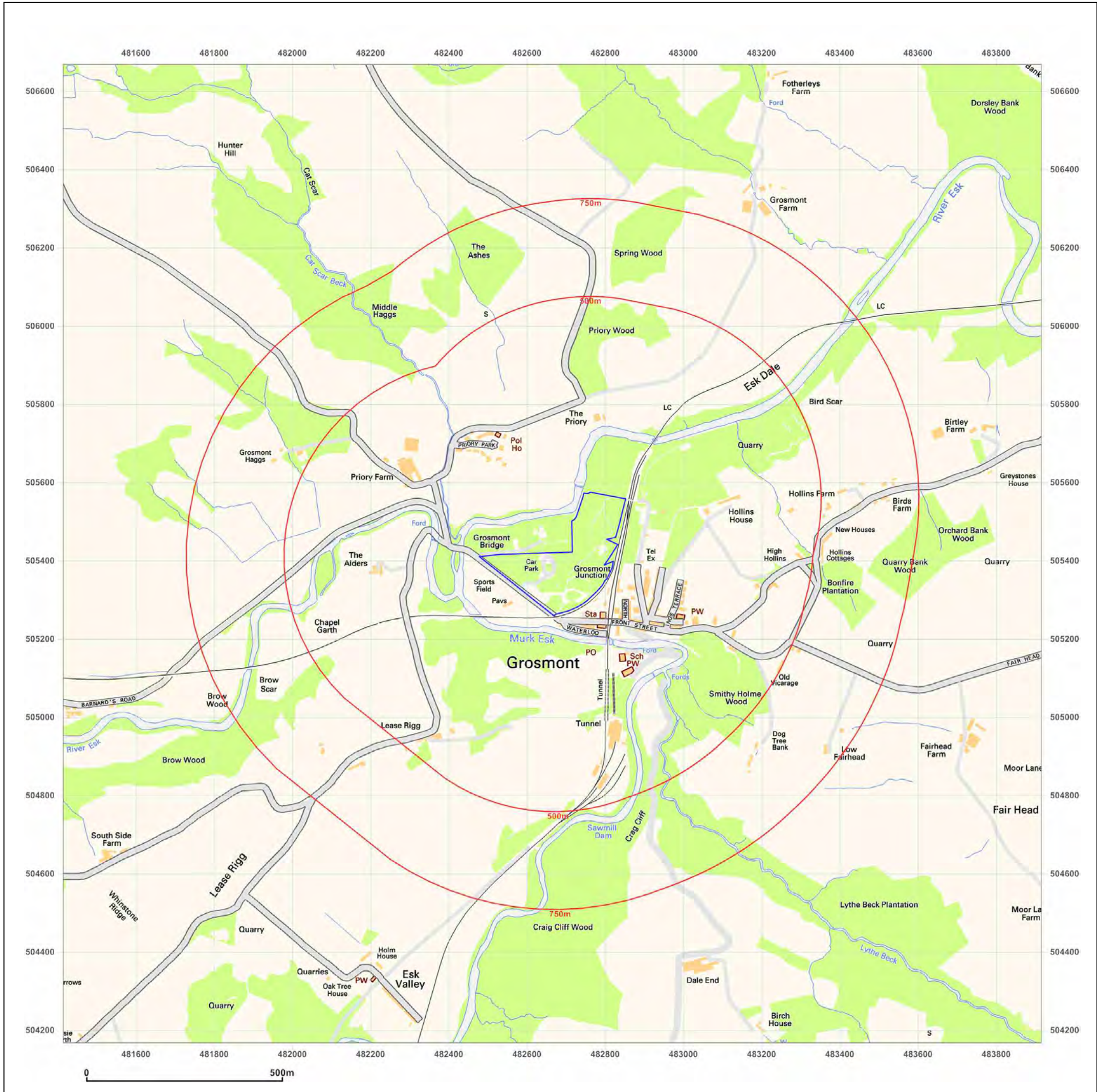


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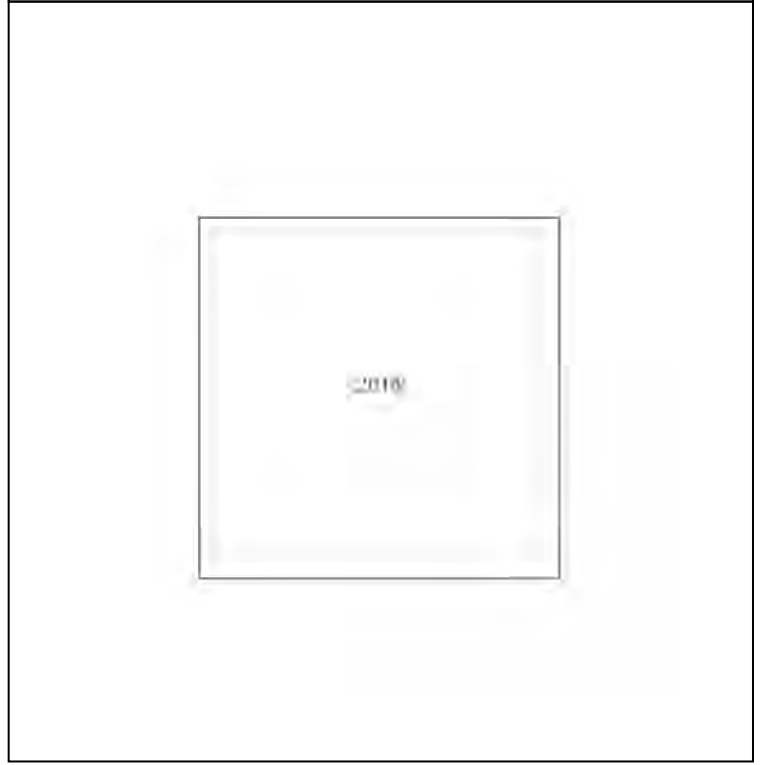
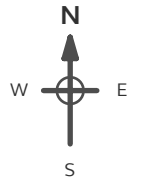
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**Client Ref:** PO16155-D9255-TK  
**Report Ref:** GS-5723237  
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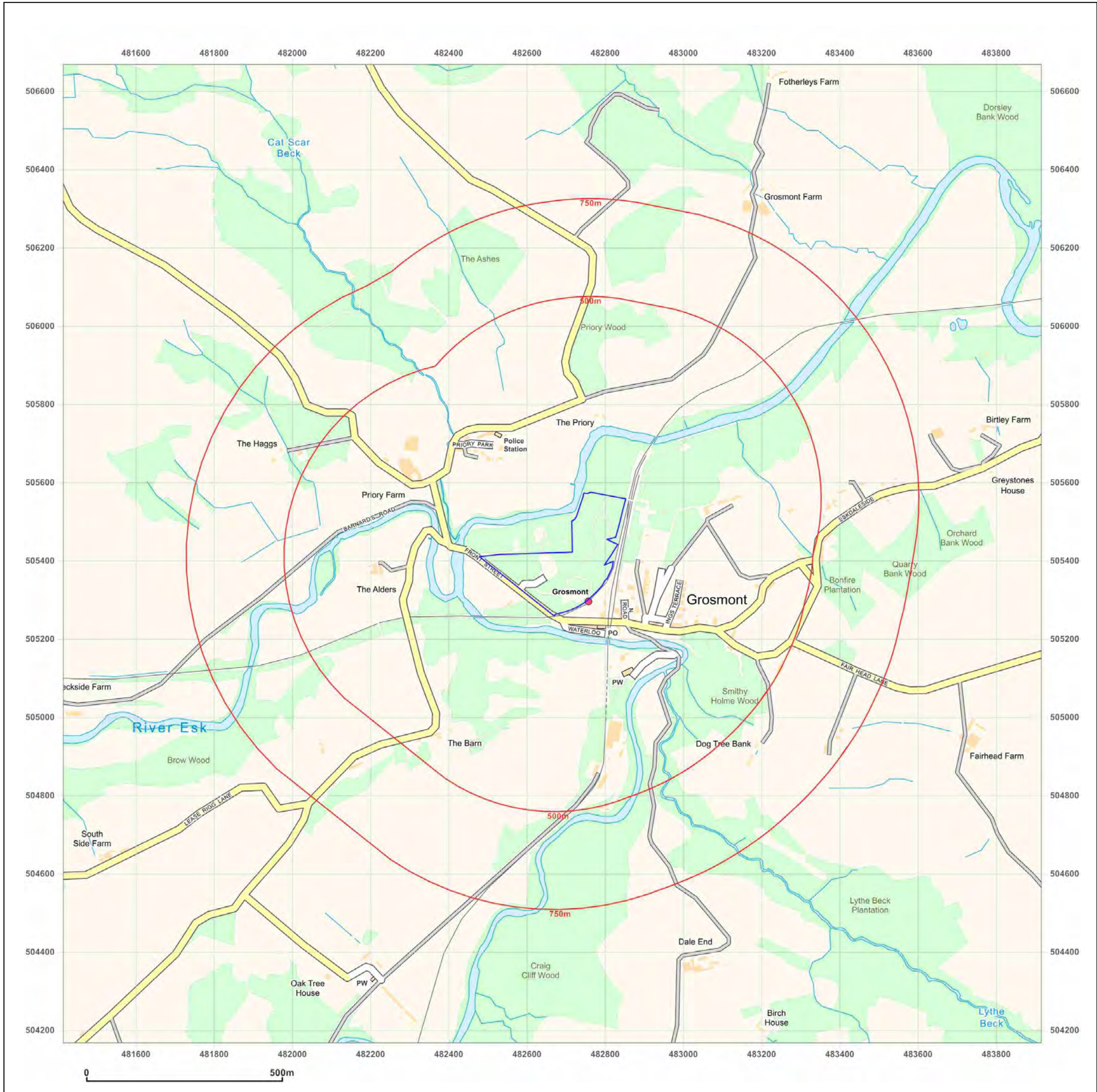


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FORMER GROSMONT IRONWORKS,  
GROSMONT, NORTH YORKSHIRE  
PHASE 1 ARCHAEOLOGICAL SURVEY

Ed Dennison Archaeological Services Ltd  
18 Springdale Way  
Beverley  
East Yorkshire  
HU17 8NU

FORMER GROSMONT IRONWORKS,  
GROSMONT, NORTH YORKSHIRE

PHASE 1 ARCHAEOLOGICAL SURVEY

Report no: 2007/303.R01  
Version: Final  
Date: July 2007  
Author: Shaun Richardson & Ed Dennison

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On behalf of

North York Moors National Park Authority  
The Old Vicarage  
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Helmsley  
York YO62 5BP

**PHASE 1 ARCHAEOLOGICAL SURVEY,  
FORMER GROSMONT IRONWORKS, GROSMONT, NORTH YORKSHIRE**

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## EXECUTIVE SUMMARY

In February 2007, Ed Dennison Archaeological Services Ltd (EDAS) were commissioned by Mr Graham Lee, Senior Conservation Archaeologist of the North York Moors National Park Authority (NYMNP), to undertake a programme of Phase 1 archaeological survey and recording at the former Grosmont Ironworks, Grosmont, North Yorkshire (NGR NZ8271505342 centred). The survey was required to provide information to assist with the formulation of management and interpretation proposals for the site.

The Grosmont ironworks were established in 1862 by Charles and Thomas Bagnall, members of a well-established family of ironworkers and colliery owners. They also controlled the neighbouring iron mines, and made use of the recently constructed railways to bring in raw materials and move out the processed ore. An account written in 1863 describes the complex as comprising two blast furnaces, hot blast stoves, an engine house and boiler house with chimney, a bank of calcining kilns, and a steam lift, with a number of railway sidings and associated infrastructure. The works achieved their highest output between c.1865 and 1875, with 40,000 tons of pig iron being produced each year and about 500 people employed directly or indirectly. A third blast furnace was added in c.1875. However, a decline in the price of pig iron, coupled with industrial unrest, led to the works closing in 1891 and most of the plant was demolished. The site experienced a second phase of activity at the turn of the 20th century, when the extensive slag dumps were reworked and re-processed to produce road stone. New railway lines and structures were built to facilitate this reworking, which ceased around the time of the Second World War.

Almost nothing remains above ground of the Grosmont ironworks today, partly due to the reworking of the area in the 20th century. The main visible elements are the chimney base and the lower part of the third and latest blast furnace in the upper NYMNP car-park, and a tramway bridge to the north which brought iron ore over the river Esk from the adjacent mines. Several other railway bridge abutments survive, as well as a wharf structure on the river. However, it is likely that the remains of all three of the blast furnace bases survive below the upper car-park; the 1863 description of the works describes their substantial nature and depth, together with associated flues and pipes. It is possible that the largest surviving structure on the site, two 4.4m high ruined brick pillars on the north side of the upper car-park, represents a remnant of the ironworks railway gantry which took material to the calcining kilns or perhaps is part of the steam lift engine house itself. However, it is clear that the structure was extensively modified after c.1900 to be used as part of the slag re-processing operations. Further research into the scale and scope of the re-processing work might shed further light on this phase of activity.



# 1 INTRODUCTION

## Reasons and Circumstances of the Project

- 1.1 In February 2007, Ed Dennison Archaeological Services Ltd (EDAS) were commissioned by Mr Graham Lee, Senior Conservation Archaeologist of the North York Moors National Park Authority (NYMNP), to undertake a programme of Phase 1 archaeological survey and recording at the former Grosmont Ironworks, Grosmont, North Yorkshire (NGR NZ8271505342 centred).
- 1.2 The scope of the work was defined by discussions between EDAS and the Senior Conservation Archaeologist of the NYMNP; no formal brief or specification was prepared. In summary, the project comprised a detailed archaeological survey of the core of the remains, supplemented by a walkover survey of a wider area. The resulting descriptive report would provide sufficient information to assist with the formulation of management and interpretation proposals for the site.

## Site Location and Description

- 1.3 The former Grosmont ironworks and its associated remains are located within the village of Grosmont in the valley of the river Murk Esk in North Yorkshire (see figure 1). The ironworks occupied a site on the western edge of the village, adjacent to the former Castleton to Grosmont railway line (now partly formed by the North Yorkshire Moors Railway), at an elevation of c.33m AOD. The site lies within the North York Moors National Park but currently has no statutory protection.
- 1.4 The site complex is accessed via a rough metalled trackway leaving the north side of Front Street, the main route out of Grosmont to the west. At the time of the survey, the detailed survey area was an unofficial car-park and was partly overgrown with saplings and scrub. The area is separated from the adjacent railway line by a curving 1.6m high boundary wall, c.0.5m wide at the base and built of neatly coursed squared sandstone set in a lime mortar surmounted with semi-circular coping.
- 1.5 The detailed survey area was sub-rectangular in plan and measured c.150m long (north-east/south-west) by c.76m wide (north-west/south-east) (see figure 2); the area corresponded to the National Park Authority's upper car-park adjacent to the railway station. Following the initial site survey work, it was agreed that a walkover survey would be carried out over an expanded area to the north and north-east, as far as the river Esk and a former bridge crossing the main Whitby to Pickering line. This enlarged area, which included the National Park Authority's lower car-park, covered most of the former ironwork's slag tips as well as a number of other features apparently associated with other industrial enterprises, such as the brickworks formerly located to the east of the railway line.

## Objectives of the Project

- 1.6 The aims and objectives of the project can be summarised as follows:
  - to gather sufficient information to establish the extent, nature, character, condition, quality and date of any surviving archaeological and historical features within the survey area;

- to establish the functional relationships between the archaeological and historical features;
- to provide a basis for the preparation of detailed management proposals by the National Park's Senior Conservation Archaeologist;
- to provide a detailed, pre-intervention record of the site;
- to provide information for display and interpretation purposes.

### **Survey Methodology**

- 1.7 As noted above, the scope of the archaeological survey work was defined through discussion between EDAS and the Senior Conservation Archaeologist of the NYMNP. Three main elements were involved:

#### *Documentary research*

- 1.8 No detailed primary documentary research was required to be undertaken as part of the project. The basic history of the ironworks has already been established by Counsell as part of a wider history of Grosmont (Counsell 1981) while Chapman has produced an excellent booklet on Grosmont ironstone mines and ironworks, reproducing much valuable primary documentation (Chapman 2002). Other readily available material, including historic maps and secondary sources have also been consulted. A full list of the sources consulted, together with their references, is given in the bibliography below.

#### *Detailed site survey*

- 1.9 A detailed topographic survey of the whole of the survey area was carried out to record the position and form of all features considered to be of archaeological and/or historic interest.
- 1.10 The survey was undertaken at a scale of 1:250 by Benchmark Surveys of Leeds using EDM total station equipment. Sufficient information was gathered to allow the survey area to be readily located through the use of surviving walls, wall junctions and other topographical features. The survey recorded the position at ground level of all structures, wall remnants and revetments, earthworks, spoil and waste tips and any other features considered to be of archaeological or historic interest. The survey also recorded any differences in the exposed surface detritus, such as concentrations of stone or brick rubble, as well as differences in coarse vegetation, as these features may aid the functional differentiation and interpretation of the site.
- 1.11 The site survey was integrated into the Ordnance Survey national grid by resection to points of known co-ordinates. Heights AOD were obtained by reference to Ordnance Survey benchmarks in the field wall to the west of the site. A temporary bench mark was established and left on site using a ground marker approved by the National Park Authority. Control points were observed through trigonometric intersection from survey stations on a traverse around and through the site. The maximum error in the closure of the traverse would be less than +/- 25mm. The locations, descriptions and values of the Bench Marks and control points are stated in the final survey data. The EDM survey was undertaken on 21st-22nd March 2007.

- 1.12 On completion of the EDM survey, the field data was plotted at a scale of 1:250 and re-checked on site as a separate operation, on 13th March 2007. Detailed amendments and additions were made using hand-measurement techniques, and the results digitised back into the electronic survey data. Brief descriptive records incorporating location, dimensions, plan, form, function, possible date, and sequence of development of the identified sites were made, and this information is contained in the gazetteer of sites which appears as Appendix 1.

*Walkover survey*

- 1.13 Modern Ordnance Survey map bases at scales of 1:1250 and 1:2500 were supplied by the NYMNPA for the enlarged survey area. This area was then subject to a detailed walkover survey, locating the remains of features marked on the historic maps, and also those which were not. Their locations were sketched onto the Ordnance Survey bases as accurately as was possible, although the dense late winter/early spring vegetation, and the poor preservation of some of the remains, meant that they could only be located approximately.
- 1.14 Brief descriptive records incorporating location, dimensions, plan, form, function, possible date, and sequence of development of the identified sites were made, and this information is contained in the gazetteer of sites which appears as Appendix 1. The walkover survey was carried out on 21st May 2007.

*Photographic record*

- 1.15 A general photographic record of the site and its significant parts, together with close-up photography of significant details, was undertaken. The photographic guidelines produced by the RCHME were followed and each photograph was provided with a scale and an identifier where appropriate. Photographs were taken using digital and 35mm colour print film; due to the nature of the remains on site, only a limited number of photographs were taken. A selection of the site photographs have been reproduced for illustrative purposes to accompany this report.
- 1.16 All photographs have been clearly numbered and labelled with the subject, orientation, date taken and photographer's name, and are cross referenced to film and negative numbers. All photographic film was exposed and processed to ensure high quality definition, and was processed to archival standards according to manufacturer's specifications.

**Report and Archive Production**

- 1.17 This report forms a detailed written record of the site complex, prepared from the readily available documentary sources and the data gathered on site, and analyses its form, function, history, and sequence of development, as far as is possible given the limitations of the survey methodologies. The site is also placed within its historical, social and industrial context, where possible. Two copies of the survey report have been provided to the NYMNPA, including an electronic version. Copyright of all survey material and the report had passed to the NYMNPA.
- 1.18 A properly ordered and indexed project archive (paper, magnetic and plastic media) was deposited with the NYMNPA at the end of the project, in accordance with the standard set by the National Archaeological Record. The archive contains field and final ink drawings, written accounts, structured catalogues and indices,

and project management records. Drawn records have been presented as wet ink plots on standard "A" size matt surface stable polyester film sheets.

## 2 HISTORICAL BACKGROUND

### Introduction

- 2.1 As noted above, no new documentary research was required as part of the archaeological survey work, and so the following chapter is drawn almost entirely from the historic map coverage and readily-available secondary publications.

### Early Transport Links and Ironstone Mining

#### *The railway network*

- 2.2 The genesis of the Grosmont ironworks lay in two events, the improvement of the railway network in the immediate area and the start of commercial ironstone mining in the Murk Esk/Esk river valley. A horse railway connecting Whitby with Pickering had first been proposed in 1826 but it was only in the early 1830s that the project began to gather momentum. A report by Thomas Storey in 1833 concluded that the commercial possibilities of the line were favourable, including the extraction of ironstone along the route, and another pamphlet by William Thompson in the same year made the same case (Chapman 2002, 6 & 15). However, it is probable that far more weight was attached to the positive assessment given by George Stephenson, after which sufficient funds were raised and an Act of Parliament obtained, on 6th May 1833 (Hoyle 1978, 66). Detailed surveying of the proposed route started soon after and construction began at the Whitby end in September 1833 (Joy 1969, 10-12).
- 2.3 The single track line, initially horse-drawn throughout, ran up the valley of the river Esk from Whitby, through the vale of Goathland and reaching the village itself via a water-powered inclined plane. From Goathland, it crossed Newtondale and then onto Pickering. At Grosmont, the route included a tunnel beneath Lease Rigg, linking the Esk valley to the vale of Goathland, and a wooden bridge over the Murk Esk. The Tunnel Inn was built adjacent to the bridge on the north side of the Murk Esk to allow horses to be changed and to provide refreshments for travellers. A settlement then grew up around the inn, which was locally known for some time as "Tunnel" rather than "Grosmont" (Chapman 2002, 6-7); it is so named on the Ordnance Survey 1853 6" map (see figure 3).
- 2.4 By May 1835 the section from Whitby to Grosmont (including the 120 yard long Grosmont tunnel) was complete, and in June of the same year regular services between Whitby and the Tunnel Inn at Grosmont began. The line carried both passengers and also industrial traffic, with 10,000 tons of stone being conveyed from the Whitby Stone Company's Lease Rigg sandstone and whinstone quarries near Grosmont in the first year. The whole line was completed in 1836, being formally opened on May 26th (Joy 1969, 10-15; Chapman 2006, 6).
- 2.5 Initially, the Whitby and Pickering (hereafter W&P) Railway was not a commercial success, the losses being attributed to the continued use of horse-haulage into the 1840s, although it did stimulate some local industrial development; for example, a battery of four large limekilns was erected at Grosmont before 1840 by the Whitby Lime Company and the railway was used to bring limestone in from Pickering (Joy 1969, 21 & 25). The W&P was then purchased by George Hudson in 1844 and amalgamated with the York and North Midland Railway. Soon after, between 1845 and 1847, the whole length of the former line was converted to double-track locomotive haulage, including the provision of a new station at Grosmont, as well

as a tunnel and stone bridge across the Murk Esk (Chapman 2002, 15; Joy 1969, 24). The final piece of the local network fell into place in October 1865, when the North Yorkshire and Cleveland (NYC) Railway opened, creating a junction at Grosmont (Chapman 2002, 28); the NYC had actually been absorbed by the North East Railway in 1858, who had completed the majority of the line, although it retained the title of the NYC (Rounthwaite 1997, 31).

### *Ironstone mining*

- 2.6 As mentioned above, the commercial viability of ironstone deposits along the length of the W&P had been highlighted by its promoters as early as 1833. Chapman notes that, although it is commonly stated that ironstone deposits were first discovered at Grosmont during the driving of the original tunnel, there is an account given by geologist Joseph Bewick stating that they were in fact first seen in the bed of a stream in the *vicinity* of the tunnel works by a Mr Wilson, one of the partners of the Tyne Iron Company (Chapman 2002, 7). Ironstone mining at Grosmont may have been commenced by the Whitby Stone Company, and in May 1836, very soon after the railway had opened, the firm sent a trial cargo of 55 tons of ironstone to the Birtley Iron Company and another to the Tyne Iron Company. Although the first assessments were not favourable, due to shale impurities, later samples were of better quality. This led to a contract between the Whitby Stone Company and the Birtley Iron Company, for the former to supply the latter with ironstone (Counsell 1981, 24-25; Chapman 2002, 7-8).
- 2.7 The two main ironstone seams worked at Grosmont were the Avicula and the Pecten beds, although limited attempts were also made to work the Top or Dogger ironstones. Following their contract with the Birtley Iron Company, the Whitby Stone Company leased land in 1839 from Thomas Hay, a prominent local landowner, and started mining there, on the east side of the railway line and south of the Esk. In 1840, the Birtley Iron Company then leased land further to the north-east at Carr House Farm to mine their own ironstone; the farm was consequently re-named Birtley Farm. Between the two aforementioned mines, further mining took place on land owned by Mrs Mary Clarke (Counsell 1981, 24-25; Chapman 2002, 8-12).
- 2.8 Despite a drop in trade in 1842 due to the improved availability of Scottish ironstones, combined with the invention of the hot blast process at blast furnaces, matters improved again between 1843 and 1846 as a result of the erection of new blast furnaces in Cleveland. However, trade was again affected by the discovery of the Cleveland Main Seam of ironstone at Eston in 1850, which was more easily accessible and therefore cheaper to extract than the Grosmont deposits. The solution to this problem, or so it seemed to those concerned, was to build blast furnaces closer to the site of the Grosmont mines, which still had a combined annual output of 70,000 tons in 1859; this total was made up from the Whitby Stone Company mines (30,000 tons), Mrs Clarke's Hollins House Mine (30,000 tons) and the Birkley Iron Company's mine at Eskdale (10,000 tons) (Shill & Minter 1994, 289). Although several schemes were proposed or reported upon in local newspapers, only two came to fruition; the ill-fated blast furnaces at nearby Beck Hole and the far more successful ironworks at Grosmont itself (Chapman 2002, 15-20).

## The Grosmont Ironworks

### *Construction and opening*

2.9 The future site of the Grosmont ironworks, to the north of the aforementioned battery of limekilns and on the west side of the railway line, is shown as enclosed agricultural land on the Ordnance Survey 1853 6" map (see figure 3). The land on which the ironworks was built was bought by Thomas and Charles Bagnall in 1861. The Bagnalls were a well-established family of ironworkers and colliery owners, having erected ironworks in Shropshire during the early 19th century and then moved to Staffordshire (Shill & Minter 1994, 288-289). In order to secure a future supply of ironstone, Charles and Thomas had also purchased the Hay estate at Grosmont, which included the mines operated by the Whitby Stone Company, and started building back-to-back workers' cottages in the village in May 1862 (Counsell 1981, 28; Chapman 2002, 18-21).

2.10 The contactors for the construction were Thomas Perry and Sons, and the foundation stone for the first blast furnace was laid on the 14th June 1862, reported on as follows in the *Whitby Gazette*:

*The foundation stone of the first blast furnace for the Grosmont Iron Co was laid on Wednesday last (14th June) and was the occasion of great rejoicing. Flags were flying in all directions and formed a beautiful contrast with the green trees ... T Bagnall Esq, one of the proprietors being over to inspect the nature of the foundations for 2 furnaces, it was resolved ... to lay the first stone. Under the stone was placed a parchment roll. This roll named various officials as: Charles and Thomas Bagnall; Thomas Perry Manager; W Henry Talbot, Cashier; Thomas Perry and Son, Contractors for the Iron Works; Coulthard and Son, contractors for the engine; William Wilde, Builder.'* (Chapman 2002, 21-23).

2.11 The first cargo of firebricks and blocks for the furnaces arrived at Whitby from Newcastle soon after, and the works appear to have been completed in 1863, when they were the subject of an article published in the *Proceedings of the Institution of Mechanical Engineers* (Coulthard 1863; see Appendix 2). This article provides a valuable and detailed description of the ironworks as they were when first built, given by Mr Hiram Coulthard of Blackburn, who had designed the engines and boilers on the site, and who had also been responsible, with the works manager Mr Barnes, for the general working arrangements of the site. The layout of the site is shown on a plan accompanying the article. Coulthard noted that the ironworks were served by a siding from the main W&P line. Coke was brought in from the Newcastle and Durham coalfields and, at the height of its operation, two coke trains a day arrived at Grosmont to feed the furnaces. The limestone used as a flux was derived from Pickering, whilst the ironstone was mined locally (Counsell 1981, 28).

2.12 The two blast furnaces that were initially erected were described as being constructed on "a very efficient and economical plan" and, allowing for Sunday stoppages, each could produce 250 tons of pig iron a week. Each furnace measured 18 feet in diameter at the boshes, and rose to a height of 63 feet from ground level to the charging floor; when fully charged, each weighed c.1200 tons. The stone and concrete foundations of each furnace supported the firebrick hearth, whilst the superstructure above was carried on ten cast-iron pillars; the pillars incorporated integral brackets to support the pipes conveying the blast and water to the five tuyeres of each furnace (Coulthard 1863, 225-227).

- 2.13 The throat of each blast furnace was equipped with a wrought-iron tube to collect the waste gases, which were then conveyed via a large gas main to the boilers of the engine house, located to the south-west of the furnaces. The engine house was built of red brick with mouldings of white brick with a large water tank on the roof supplying water to the tuyeres and the pig-beds; the water was taken from the river Esk by two lift pumps. The engine house contained three direct-acting high pressure engines, the third being provided in case of the failure of one of the other two - these type of engines were preferred to a single large beam engine due to the much higher cost of the foundations and frame for the latter. The engine house was also provided with a travelling crane to cater for the examination of the engines or replacement of parts. The five boilers were each 73 feet long and of plain egg-ended form, and exhaust gases were taken into an adjacent 180 feet high chimney (Couthard 1863, 227-229).
- 2.14 The high pressure engines provided the blast for the furnaces. The blast was conveyed via the large diameter blast main to hot-blast stoves located on the north-west side of the furnaces. Each furnace was equipped with three hot-blast stoves, built of common brick (described as being “made on the estate”) lined with refractory firebrick. The stoves raised the temperature of the blast to between 600 to 700 degrees Fahrenheit, and from here it passed to the tuyeres at the base of each furnace. Although the works were finished by the end of 1863, the blast furnaces were not “blown in” until the beginning of 1864, the Whitby Gazette of the 9th January reporting that the first tapping “was highly satisfactory, the metal being of a very superior quality” (Chapman 2002, 28-29).
- 2.15 In the area to the north-west of the hot-blast stoves, there was also a bank of calcining kilns, for calcining the iron ore delivered to the site. The railway siding leading into the site passed beneath an unidentified structure and then through the calcining kilns, terminating at a steam lift to their south-west, which was used to raise the iron ore from the railway to the level of the kilns (Coulthard 1863, 227-229). A 19th century photograph, reproduced by Chapman (2002, 23), shows the base of three of the brick-built calcining kilns, each equipped with a tall semi-circular draw arch within which probable cast-iron lintels over the draw eye/eyes can be seen. In front of the kilns, equipped with two wheeled hand-carts, are the workmen who drew out the calcined ore standing by several furnace fillers.
- 2.16 Although the plan accompanying the 1863 article (see Appendix 2) clearly shows that there was a desire to increase the capacity of the site from two to four furnaces, and that provision had been made for such an eventuality from the start, the extra furnaces were not added immediately. The amended 1853 Ordnance Survey 6” map (probably dating to c.1860) shows only the original two furnaces to be present, as does the plan of 1864 (see figure 4a and plate 3). The 1853 OS plan shows a siding leaving the W&P, curving around to the south-west to join the NYC, and there are two other sidings further to the north, curving round from the W&P and running south-west and west across the site; one branch runs around the north side of the calcining kilns to the steam lift while the other leads to a building adjacent to the Grosmont Bridge road. Only some of these lines are shown on the 1864 plan. To the east, a smaller length of railway siding runs north, running to a “tramway” shown on the 1864 map which then crosses the river Esk.
- 2.17 The two 1860s maps also show a walled or enclosed space to the south of two furnaces, with the large engine and boiler house clearly visible to the south-west. On the OS plan, a single railway track loops around in a broad curve from the furnaces to run north-west, crossing over the line to the calcining kilns and the



siding leading to the building close to the Grosmont Bridge road. A small rectangular structure stands to the north-east of the eastern furnace, with further roofed buildings to the east; only the latter buildings are shown on the 1864 plan. The hot-blast stoves (five on the OS map, six on the 1864 map) described in 1863 are indicated to the north of the furnaces, with two buildings beyond, one of which represents the calcining kilns; a long rectangular structure on the north-east side of these might be another unidentified building.

- 2.18 It is believed that four standard gauge locomotives were employed on and around the ironworks site, including one or two Black Hawthorns, and an engine with a vertical-boiler which pulled the slag trucks; some of these might also have been narrow gauge engines. They were assisted by a NER saddletank, built in 1866, and whose final duty on the site was to assist in the demolition of one of the furnaces (see below) (Joy 1969, 24-25; Rounthwaite 1997, 32).

#### *Operation and Expansion*

- 2.19 In the period immediately following the opening of the ironworks, Charles and Thomas Bagnall continued to acquire ironstone mines in the Grosmont area. They bought the former estates of Mary Clark to the east of the W&P line in 1864 for £40,000, taking over the mines operating there and probably constructing a girder bridge which formerly led over the main line and into the ironworks site. They also purchased land to the north of the river Esk around Priory Farm, where a further mine was developed (Chapman 2002, 28-30). According to the *Whitby Gazette*, the ironworks were operating successfully:

*... one of the furnaces turned out last week 280 tons of iron. The quality and cost is such that the proprietors are enabled to ship it to the iron district of South Wales, a vessel having taken in a cargo for Cardiff ...* (Chapman 2002, 30).

- 2.20 In 1865, the *Whitby Gazette* also reported on plans to erect additional plant at the ironworks, to extract petroleum from the Grosmont shales, although the proposed scale of the operation appears to have been much exaggerated by the paper, with little being done beyond small scale experiments (Chapman 2002, 30).

- 2.21 The ironworks were at their peak of production between c.1865 and 1875, with 40,000 tons of pig iron being produced per annum, and about 500 people being employing directly or indirectly (Bulmer & Co 1890, 930-933); it has been suggested that they, along with the mines, turned in an annual profit of some £20,000 for the Bagnalls during this period (Whitworth 2006, 69). In 1864, the Grosmont mines produced almost 80,000 tons of ironstone, of which 45,000 tons was used at the ironworks (Counsell 1981, 28). Other industries were also founded locally in the same period, such as a brickworks in 1870 (Counsell 1981, 28-29).

- 2.22 This industrialisation, and in particular the presence of the ironworks, had a profound impact on the social and physical structure of the village, the population of which peaked at c.1,600 in 1880; this was five times the population in 1981. As well as erecting workers' housing, the Bagnalls provided a working men's institute in 1871. In conjunction with Mrs Mary Clark, they also enlarged St Matthew's Church - between 1875 and 1884, the church was rebuilt in the Early English style, although the tower still remained incomplete in 1937; the reredos was erected as a memorial to Charles Bagnall (Kelly & Co 1937, 104). Other institutions typical of industrial settlements arose during the same period, for example the Grosmont Co-

operative Society was founded in 1867 and the Grosmont Methodist Church the following year. At a later date, the ironworks had its own brass band, whilst local mines also fielded cricket teams (Chapman 2002, 49-50).

2.23 In 1871, the *Journal of the Iron and Steel Institute* was able to report that:

*Mr Charles Bagnall said that there were two furnaces at Grosmont which were open topped, the gas was used for all requirements, the coke rate was as much as 23 ½ cwts per ton of pig iron, this large amount he attributed to the poor quality of the coke. The ironstone used was lean and did not average 27½ percent in its raw state. The average when calcined was not known because they used a little Rosedale and 25 percent of raw stone (Chapman 2002, 36).*

2.24 The Grosmont ironworks were relatively unaffected by the widespread industrial unrest which affected the Cleveland area in 1874, and indeed the early 1870s had been a prosperous time generally for the British iron trade, partly as a result of the Franco-Prussian War. In anticipation of continued good business, the Bagnalls had expanded the scale of their mines at Grosmont and in c.1875 began construction of a third and taller blast furnace at the ironworks, which was “blown in” on the 3rd July 1876; the earlier pair of furnaces was subsequently raised in height to match it (Chapman 2002, 40-43). However, a lithograph of Grosmont, made in c.1874 (Chapman 2002, 42; see plate 2), appears to show the third furnace under construction (its site marked by a cluster of upright features, probably scaffolding), with the west of the original pair already raised in height. Comparison with a later photograph of c.1880 (see below) suggests that the east furnace was still being charged by the original 1863 incline, described as comprising:

*... two longitudinal wrought-iron girders 4 feet and 3 feet deep respectively, the larger one prepared to receive the wrought iron beams that form the roadway of the incline up which the materials for smelting are drawn by means of a pair of fixed horizontal engines (Coulthard 1863, 227).*

2.25 On the lithograph, the western furnace appears to be already served by a vertical lift, raising raw materials to the heightened charging floor from the original incline. A 19th century engraving, perhaps based in part on the lithograph but showing all three furnaces, also shows the west furnace as being taller than the east, although the depiction is rather crude and nowhere near as detailed as the lithograph (Whitworth 2006, 72). The arrangement of the ironworks after the completion of the third furnace is most clearly shown on a photograph of c.1880 (Counsell 1981, 25; Joy 1969, 34; Chapman 2006, 45); Whitworth (2006, facing page 61) captions this photograph as 1911, which is clearly wrong as the furnaces were demolished by 1892.

2.26 The c.1880 photograph (see plate 4) is taken from the area to the immediate south of Grosmont station, looking north, with the three blast furnaces rising from the centre. The rings of cast-iron columns supporting the superstructure of each furnace are clearly visible, as is the girder structure described in 1863 linking the original furnaces, with the incline rising to it from the rear. Above the girders, the framework of the vertical lift shown on the lithograph rises to the charging floor, which links the top of all three furnaces. Unfortunately, little else can be made out of the associated structures; the blast main is just visible to the rear of the furnaces, whilst the engine house chimney rises above the smoke to their left.

However, the photograph does give an excellent impression of the extent to which the ironworks dominated the skyline of the village.

#### *Decline, Closure and Demolition*

- 2.27 Almost immediately after the third furnace was “blown in”, the price of pig-iron began to fall markedly again, decreasing by 75% between 1873 and 1879. In December 1878, the *Whitby Gazette* reported that one of the furnaces at Grosmont was to be shut down owing to the “dullness of trade in the iron market”. Matters worsened in 1879, when the entire staff of the works were apparently under notice of discharge due to a long strike in the Durham coalfield. The works and mines at Grosmont were struck by industrial unrest over union membership in 1880, which was eventually settled in court at Whitby (Counsell 1981, 29-30; Chapman 2002, 46). In addition, although output generally remained high, several of the local ironstone mines began to close from the late 1880s onwards.
- 2.28 The ironworks finally closed, rather suddenly, in July 1891, although as Chapman notes, given the quality of the local ironstone, the higher transport charges for raw materials and pig iron, and competition from elsewhere in Cleveland, it is perhaps remarkable that they lasted as long as they did (Chapman 2002, 51). The works, and also the mines owned by the Bagnalls, were put up for sale at the end of 1891; the auction notice in the *Whitby Gazette* noted that the fixtures and fittings, including engines, cranes, pumps and other items, were to be divided into 930 lots, perhaps indicating that there was no serious attempt to sell the works as a going concern (Counsell 1981, 29-30). Chapman (2002, 51-52) reproduces the sale notice for the ironworks which, as it contains much useful information regarding the site, is given in Appendix 2.
- 2.29 The works were not sold in 1891 and were offered for auction again in January 1892, but could only attract a top bid of £5,800. They were finally sold privately about week later, for the sum of £7,000, to Arthur Gladstone, of the firm Gladstone and Cornforth in West Hartlepool (Rounthwaite 1997, 31; Shill & Minter 1994, 293). The estate was then sub-divided into three lots, which Gladstone offered for sale in August 1892. Land to the north-west of the Esk was bought by Mary Chapman, the slag banks between the railway and the Esk were bought by William Oliphant, and the land to the east of the W&P line was bought by John and James Dunwell of the brickworks (Chapman 2002, 53). Just as the opening of the ironworks had had a profound effect upon the village, so did its closure, with the population falling by a half to 872 by 1901 (Counsell 1981, 29-30).
- 2.30 Although Rounthwaite (1997, 31) states that “several years were necessary to clear the equipment and strip the furnaces”, the dismantling and demolition of the works appears to have started quickly, and by December 1892 the *Iron and Coal Trades Review* was able to report that the three furnaces had been “raised to the ground” (Chapman 2002, 53). One of the furnaces was demolished using a railway engine, the No 2262 saddletank formerly employed on the site (Rounthwaite 1997, 33). Writing many years later, Jack Cook recalled that:
- One of the three furnaces was pulled down by an Engine with a long rope and when it fell there was a cloud of dust for quite a long time.* (Chapman 2002, 53).
- 2.31 The scale of the demolition is amply demonstrated by the Ordnance Survey 1893 25” map (see figure 4b). The map marks the site as “Grosmont Iron Works (Disused)” and no furnaces are shown. It appears that the boiler house and

engine house had also been completely demolished, with only the chimney stack still remaining. An L-shaped range of buildings to the north-west of the chimney may have formed part of the ironworks, as it appears on a late 19th century engraving of the site (Whitworth 2006, 72) as a central two storey structure flanked by single storey buildings to either end, perhaps representing the “fitting shop, bolt store and iron store” of the 1891 sale description. A long rectangular structure to the north of the former blast furnaces may represent either the calcining kilns or the hot blast ovens marked in 1863, or a new structure. Most of the railway sidings formerly serving the furnaces had been taken up, apart from a single line on a north-east/south-west alignment crossing the site to their north. A large area to the north and north-west of the railway line was formed by waste tips, with a further very large tip on the north side of the Esk. The earliest tip shown on the amended 1853 6” map had by now been superseded by others, with earthworks suggestive of former tram lines crossing over its path. The site is similarly depicted on the Ordnance Survey 1895 6” map.

#### *Post-closure slag re-processing*

- 2.32 The closure of the ironworks did not mark the end of industry on the site; in fact, it heralded an era of industrial activity that was to have as great an effect on the landscape as the preceding 27 years of ironworking. In March 1902, the area of slag heaps bought by William Oliphant was leased to William Schofield, who commenced extraction of the slag, crushing and grading it for use as road stone; similar reprocessing of the slag heap on the north side of the Esk began in about 1906. Rounthwaite estimated the combined volume of the two areas of slag tipping to be over one million tons and, in order to aid extraction, two new standard gauge lines were laid down across the site (Rounthwaite 1997, 31). In the surrounding area, attempts were made by Arthur Gladstone to re-open some of the old ironstone mines which had been closed for more than ten years, and between 1906 and 1915 some production resumed. The brickworks on the east side of the railway were expanded in the early 20th century, including the addition of a new 120 feet tall chimney in 1902. At a later date, in 1923, a large annular Hoffman kiln was built, and the works did not finally cease production until 1957 (Chapman 2002, 54-58).
- 2.33 As well as having interest in ironstone mining, Arthur Gladstone must also have undertaken slag re-processing himself, as in 1913 both Gladstone and Company and Wm Schofield and Son are listed as slag merchants at Grosmont (Kelly & Co 1913, 108). As well as being crushed for roadstone, some of the slag was later used to manufacture slag wool as a fire-proof packing for boilers (Counsell 1981, 31). The 1913 Ordnance Survey 25” map (see figure 5a) shows significant changes to have taken place since 1893, particularly in the area of former slag tipping to the north of the ironworks. Virtually the only remnant of the ironworks surviving at this date was the boiler house chimney (marked as “Chy”). Although three “Old Shafts” are shown, these are in the wrong place to be the blast furnace bases, and so may perhaps relate to the former calcining kilns. The L-shaped range shown to the north-west of the chimney had been reduced in size slightly since 1893, but several new buildings had been erected to its north, adjacent to the north-east/south-west railway siding crossing the site. A siding leading from these new buildings into the area of slag tips to the north had been re-established, and the pattern of the tips themselves had changed since 1893 as a result of the extraction of slag for processing. The site is similarly depicted on the Ordnance Survey 1916 6” map.

- 2.34 In c.1928, Gladstone and Company appear to have been replaced by George Hodsman and Sons, merchants for tarred slag (Kelly & Co 1933, 106; Joy 1969, 57-58). Although Chapman states that Schofield's slag reprocessing operation closed in 1932, both Hodsman and Schofield still appear as slag merchants at Grosmont in 1937 (Kelly & Co 1937, 104).
- 2.35 Extraction of slag probably finally ceased some time around the Second World War, almost certainly because all economically viable supplies had been exhausted. The 1952 Ordnance Survey 6" map shows many of the structures on the former ironworks site to be unchanged since 1913 but, apart from a very small remainder, all slag heaps between the works and the river Esk had disappeared, as had the very large tip on the north side. Almost the last relic of the ironworks to be removed was the very tall boiler house chimney, which was not demolished until 1957, and by 1969, Joy was able to describe the former ironworks site as a "grass grown area" (Joy 1969, 57-58).
- 2.36 The site was leased (for 42 years) by the National Park Authority in 1976 from Scarborough Borough Council for use as a car-park. Cars are visible on an aerial photograph using the lower part of the car-park in September 1973. The upper area, containing the main ironworks complex, is shown as more overgrown, with fewer tracks (although the chimney base is clearly visible), and its access is completely different from the present arrangements.

### 3 SITE DESCRIPTION

#### Introduction

- 3.1 A summarised description of the features identified within the site complex is given below, based on the more detailed information contained within the gazetteer of numbered components which appears as Appendix 1. A more detailed discussion of the features in relation to the development of the site is given in Chapter 4 below.
- 3.2 A total of 24 archaeological sites and features was identified in the survey area, as follows. These sites are depicted on figures 6 and 8. It should be noted that the identified sites are based on the surviving earthworks, rather than the “sites of” structures as depicted on the historic maps.

Site No	Site Name
1	Chimney base, south edge of detailed survey area
2	Hoist/lift base, south-west part of detailed survey area
3	Earthworks, south part of detailed survey area
4	Site of engine house/boiler house, south part of detailed survey area
5	Earthworks, central part of detailed survey area
6	Blast furnace base, central part of detailed survey area
7	Blast furnace base, central part of detailed survey area
8	Blast furnace base, central part of detailed survey area
9	Railway cutting, north-east and central part of detailed survey area
10	Earthworks, north-east part of detailed survey area
11	Former railway track, north part of detailed survey area
12	Possible ruined structure, north edge of detailed survey area
13	Possible ruined structure, north edge of detailed survey area
14	Hollow/disturbance, south-west corner of walkover survey area
15	Railway line and bridge, south-west corner of walkover survey area
16	Possible ruined structure, east side of walkover survey area
17	Linear depressions, east side of walkover survey area
18	Ruined buildings, north-east corner of walkover survey area
19	Bridge abutments, embankment and bridge pier, north end of walkover survey area
20	Tramway and bridge, north part of walkover survey area
21	Ruined structure, north part of walkover survey area
22	Wharf structure, east bank of river Esk
23	Area of spoil tipping, north of track leading to sewerage treatment plant
24	Area of spoil tipping, south of track leading to sewerage treatment plant

#### Site Description

##### *The former ironworks complex*

- 3.3 Very little survives above ground of the ironworks complex. Of the three furnace bases, the best preserved is that of the easternmost (and latest) base, namely the third furnace (**Site 8**) built in 1875 and “blown in” in July 1876. The remains comprise a section of the base of the shaft, standing to a maximum height of

1.60m, and stepping inwards from the base to the upper part (see plate 6). The surviving part of the base is not perfectly circular in plan but is slightly flattened, measuring a maximum of c.6m north-south by c.5.2m east-west. It is built of segmental refractory bricks (average dimensions 360mm by 160mm by (160mm?)); no remains of either tuyere openings or the tapping hole were visible at the time of the survey. In section, the walls of the shaft appear to be at least four bricks deep, suggesting that they were slightly thicker than those of the original furnaces. The original pair of furnaces (**Sites 6 and 7**) (now the central and western of those on the site) are now marked by little more than slag scatters and poorly defined earthworks (see plate 5). At the site of the central furnace (**Site 7**), refractory bricks are visible eroding out of the north side of one of the earthworks, suggesting that at least part of the outer curve of the base survives. Close by, a 1.40m long straight edge, apparently structural, can be seen. The apparent length of the edge corresponds closely with that shown for the tuyere openings in 1863, and this is most probably what the edge represents; if so, it suggests that there are further remains of the furnaces's substantial base surviving below ground, perhaps including the tapping hole and hearth. The mound forming the furnace base is being ridden over by mountain bikes, and quite a bit of erosion and rutting is occurring.

- 3.4 Almost all other buildings and structures associated with the ironworks have completely disappeared, the only exceptions being the large brick hoist/lift base located on the north side of the detailed survey area, and the chimney base to its south; the first appears to largely post-date iron production on the site, and so is described as part of the remains relating to slag reprocessing (see Site 2 below).
- 3.5 The chimney (**Site 1**) formerly served the boilers in the boiler house adjacent to the engine house, and was originally 180 feet (54.8m) high. The chimney remained intact long after the rest of the ironworks had been demolished; the upper 50 feet (15.2m) were taken down in March 1935 for safety reasons, but it was only finally completely demolished on the 13th March 1957. The base was heavily overgrown at the time of the survey. It is c.7.40m long (north-west/south-east) by 6.60m (north-east/south-west) wide, comprising a 1.20m high mound, with large coursed squared stone blocks partly visible along the west and south sides; no traces of the circular chimney shaft could be seen in the surface of the mound. Some c.16m to the west of the chimney base, the remains of a concrete foundation, c.4m long and 1m high, are visible, with a lower concrete footing curving around its west side; this presumably forms the only surviving remnant of an L-shaped range of buildings once standing to the west of the engine/boiler house complex.
- 3.6 Elsewhere, there are minor earthworks possibly representing the remains of the engine/boiler house complex itself (**Site 4**), an associated building (**Site 5**) and a further smaller, possibly short-lived, structure (**Site 3**) closer to the railway line. In the north corner of the detailed survey area, discrete earthworks and brick scatters may represent isolated buildings shown on late 19th century maps (**Sites 12 and 13**), while there is another ruined structure (**Site 16**) within a sub-rectangular earthwork just to the east.

#### *Transport connections*

- 3.7 As has been stated in Chapter 2 above, the Bagnalls purchased several local ironstone mines in order to secure a reliable supply of source material for their ironworks. Ironstone from the mines to the east of the W&P line was brought into the ironworks complex via a girder bridge (**Site 19**) which crossed the main line.

This bridge is believed to have been in use between c.1870 and 1890, and it is shown on the c.1874 lithograph (see plate 2); the bridge was also used to transport shale waste from the mines to be dumped in the area to the north. The bridge structure has been demolished since 2002, but the coursed squared sandstone abutments still survive.

- 3.8 To the west, in c.1864, new ironstone mines were sunk in the vicinity of Priory Farm on the north side of the Esk. Ironstone was carried from these mines south-east down an inclined tramway on an embankment, crossing the Esk on a bridge and then rising again in a southern curve to reach the ironworks. The bridge (**Site 20**) still survives and is supported on stone abutments and two stone piers (see plate 9). The piers stand c.5m tall and are built of rock-faced ashlar. They rise from substantial cut-waters surmounted by chamfered stonework; the chamfers act as plinths for the upper parts of the pier, which taper inwards as they rise. The upper c.0.50m of each pier is raised in machine-made red brick. Rolled steel I-section girders run between the piers and the abutments, supporting the sleepers forming the track bed, but all rails have been taken up. It is possible that an earlier bridge crossed the river to the south, perhaps also bringing stone from the mine, as suggested by the 1864 plan of the works, although nothing now remains of this structure.
- 3.9 Apart from these bridges, very little survives of the transport network in the immediate area of the ironworks, the last piece of surviving trackway having been taken up in 1954. To the north and west of the blast furnaces, there is a railway cutting (**Site 9**), represented as a linear depression c.12m wide at the base. This cutting may be on the line of a railway track shown on the amended 1853 6" map, or on the line of the long linear structure shown in 1864 to the north-west of the calcining kilns, it was almost certainly re-cut in the early 20th century to facilitate slag reprocessing (see below). The south side of the cutting is formed by a 0.50m high scarp, which has been somewhat disturbed by modern metalling of the former track bed to make it suitable for use by vehicles. This has had the effect of raising the base of the cutting; the actual former ground surface may be represented by a steep-sided gully, up to 1.2m deep, running along the bottom of the north side. As it runs south-west, the cutting becomes better defined; the south side stands up to 1.60m in height, whilst the north side is slightly higher at 1.80m. Both sides are steeply sloping and appear to contain a high proportion of stone rubble/slag.
- 3.10 Approximately mid-way along the cutting, there are earthworks (**Site 11**) probably representing another railway track which might be the one shown on the amended 1853 6" map although it is difficult to be certain. These tracks originally continued south-west, crossing the Grosmont Bridge road and joining the NYC line. They were carried across the road on a substantial bridge (**Site 15**), although only the west abutment still survives. It is 6m wide, stands a maximum of 2.15m high and is built of coursed squared large sandstone blocks with prominent herringbone tooling. A partly collapsed brick and stone roadside wall runs south-east from the abutment, whilst the former track line follows the top of a substantial north-facing scarp above the pavilion of Grosmont Cricket Club. Elsewhere, at the north-east end of the detailed survey area, another line (**Site 10**) survives as a steep east-facing scarp, up 1.60m high and perhaps representing part of a cutting for the railway track shown here on the historic maps.
- 3.11 It is clear from the map evidence that the tipping of the slag from the ironworks had started in the area to the south of the river by the time that the amended 1853 6" map was published. By the time the ironworks closed in 1891, a huge slag bank,



in the form of flat-topped spoil heaps, had built up between the works and the Esk (**Sites 23 and 24**); these spoil heaps covered buildings previously depicted adjacent to the Grosmont Bridge road in the 1860s. There was a further huge slag bank on the north side of the Esk, beyond the area of the current survey. This appears to have overlain and disrupted the incline leading from the Priory Farm mines across the bridge (Site 20) described above. It is assumed that this bridge either became disused or was latterly used itself for tipping slag. However, the majority of the slag bank on the north side of the Esk appears to have been tipped from a second bridge (**Site 19**) a short distance to the north, also shown in 1893. This bridge had gone by 1913 but might perhaps have been re-instated to allow re-working of the slag bank (see below), as the surviving remains appear too modern to be the structure shown in 1893. They comprise, to the east bank of the river, the remains of a stone and concrete abutment, some 4m high, whilst in the centre of the river, there is a c.10m tall concrete bridge pier (see plate 8). The pier is approximately hexagonal in plan, with sides tapering gently inwards towards the top; wrought-iron or steel strapwork survives around the upper part.

### *Slag reprocessing*

- 3.12 The reprocessing of the slag banks in the first half of the 20th century brought about massive changes to the survey area's topography but, as with the ironworks, traces of associated structures are few and far between.
- 3.13 Slag was extracted via two main points. The first was via railway lines laid into the area of the slag banks between the former ironworks and the river Esk. These lines diverged either side of a ruined structure (**Site 2**) on the north-west side of the detailed survey area, which now represents the largest surviving structure within this part of the survey area. A more detailed discussion of the possible function of this structure is given in Chapter 4 below, but it appears to be in the same general location as the "Steam Lift" marked in 1863, which was used to raise ironstone from the line of the railway to the top of the calcining kilns. However, the structural evidence indicates that the structure remained in use long after the ironworks had been demolished, and that it was altered as late as 1927.
- 3.14 The ruined structure comprises two substantial brick pillars, rising to a maximum height of 4.40m (see plate 7 and figure 7). Both are rectangular in plan, the east pillar being slightly smaller than the west, but both have battered north and south faces and both are built of handmade reddish-brown and yellow bricks, incorporating bands of large refractory bricks. The east pillar has been subject to more alteration than the west, including a large irregularly-shaped area of repair or alteration, crudely carried out in re-used refractory bricks to the east face. To one side of the repair, a sub-oval "shaft" has been cut down through the body of the pillar. The shaft is c.0.60m deep and open to the east side, sloping downwards at a slight angle from north to south. There also appear to be the remains of a circular shaft in the east face. It is difficult to determine exactly how the shaft was cut into the brickwork; it has the appearance of being worn away in several stages by rubbing or friction, but this is not clear. The gap between the two pillars was once crossed by several beams or girders, the uppermost of which was a later insertion, and which bears the date "1927" above its former east end. The ground falls away very sharply to the north of the pillars, with the gap between the two now forming a footpath. A number of features are visible in plan only in the immediate area of the pillars, including concrete bases/beds and ruined structures of machine-made brick.

- 3.15 The second point of extraction was from the large slag bank on the north side of the Esk. Map evidence demonstrates that by 1913, a tramway had been reinstated across the bridge (**Site 20**) formerly taking ironstone from the Priory Farm mines to the furnaces, and this led to two conjoined buildings adjacent to the W&P line. The former tramway cutting becomes visible a short distance to the east of the bridge, and can be traced south-east for c.40m, sloping gently upwards from west to east. It survives as a linear depression, 2.5m wide at the top, with a 1.60m wide flat base and near vertical sides rising to 1.80m in height. At the west end, the sides are revetted with drystone walls incorporating river cobbles, but to the east, they comprise slag blocks laid to a slightly battered profile. Beyond the cutting, it may be possible to trace the former line of the tramway shown in 1913 as a very low north-east facing scarp containing a high proportion of slag.
- 3.16 To the south of the bridge, there are the remains of a wharf (**Site 22**). This appears to have been built by 1913, and was therefore presumably associated with the slag reprocessing operations, although it has not been possible to recover any documentary information supporting this proposal. The wharf is accessed via a flight of concrete steps leading down from a footpath above at the north end. The wharf structure itself is built of concrete throughout, and is c.50m long, 2.0m wide and 1.2m high; it was in use by a private fishing club at the time of the survey (see plate 10). At the north end, a second flight of steps leads down to a narrow landing platform. Approximately half way along the wharf, the shaley rock outcrop above has been revetted with concrete, and has a crude angle-iron canopy over a low concrete bench. To the south of the canopy, a crude recess c.2m deep has been cut into the shaley rock; it may have a small alcove hollowed into the rear (east) face. The opening into the recess is covered by a crude but substantial concrete and brick frame once fitted with a door. To the south of the wharf, the river bank angles sharply to the south-west and is revetted with sandbanks.
- 3.17 Above the wharf, on the top of the shaley outcrop, there are the remains of a ruined structure (**Site 21**) which does not appear on any of the historic maps consulted for the survey work. At its north end, there is a short section of collapsed angle-iron and railing fence. Where the fence returns to the south, its former line is marked by a 0.30m high slag block revetment wall, which can be followed south from the return for a distance of c.10m-12m. To the west of the wall, between it and the rock outcrop, there are a series of small ruined structures, or perhaps more likely a single structure with internal divisions. There appears to have been a set of steps leading up from an adjacent footpath at the north end, with the entrance to the building presumably located at this end. The remnants of box hedging survive along one edge of the steps, whilst there are conifers to the west and a line of hawthorns to the east.
- 3.18 There were also other ruined structures noted within the survey area which, although they appear on the 1893 25" map, appear from their surviving remains to belong to the slag reprocessing period rather than the ironworks. The concrete bridge pier in the centre of the river Esk (Site 19) has already been described.
- 3.19 In addition, at the north-east corner of the walkover survey area are the remains of a pair of buildings (**Site 18**), also shown in 1913 and surviving as late as 1952. Of the two, slightly more survives of the east building than the west, although both have largely been dismantled above ground. The east building is associated with an isolated and substantial mass concrete base which remains within the undergrowth. This base is 3.13m long (north-south) by 2.12m wide (east-west) and stands 2.20m high; it is built of roughly cast concrete with a high percentage of

crushed slag and has shuttering marks to all four sides. The base is overgrown with ivy and the upper surface could not be examined. Some 10m to the north, there is another concrete base of a similar form and composition but covering a slightly larger area. This has the remains of a ruined brick wall on its north side, perhaps formerly enclosing a yard. There is a pit, reminiscent of a vehicle inspection pit, to the east of the former yard area. This pit is 2.92m long (north-south) by 0.90m wide (east-west) and is c.1m deep, although the base is partly backfilled. The sides of the pit are built of machine-made red bricks (average dimensions 240mm by 110mm by 80mm) with a shallow frog to the upper surface and set with a cement mortar. To the west of the former yard area, a low south-facing scarp with a high slag content is visible running westwards for some distance into the woods. The above ground remains of the west building comprise a single concrete base, measuring 2.95m long (east-west) by 2.50m wide (north-south) and standing 1.20m high. It is set on a bed of machine made bricks, and, like the other bases described above, is built of concrete containing a very high proportion of crushed slag. There are original central openings in both short walls. That to the west is wider, and leads into the interior of the base; a pair of substantial iron bolts are set into the sides of the interior a short distance in from the opening. The interior walls then curve inwards, so that the opening in the east end is quite narrow to the exterior.

- 3.20 The extent of re-working was such that by 1952 the site had attained its existing topography. Although there are a number of areas where earthworks perhaps associated with the re-working survive (for example, **Site 17**), they may just as easily be more recent. Large-scale disturbance clearly continued even after re-working had ceased, as shown by the large hollow (**Site 14**) adjacent to the Grosmont Bridge road, which was excavated after 1952.

## 4 DISCUSSION AND CONCLUSIONS

- 4.1 The Phase 1 archaeological survey uncovered no evidence for the pre-ironworks landscape at Grosmont, but this is hardly surprising, given the changes that took place between 1862 and c.1940. The ground level of the area between the ironworks and the river Esk rose by some c.5m to c.6m between 1862 and 1891 as a result of the tipping of slag, and then this entire landscape of industrial waste (including that to the north of the Esk) was recycled between c.1900 and 1940. Indeed, the level of demolition and re-working that was undertaken on the site has removed almost all above ground traces of the ironworks themselves.
- 4.2 As has been stated above, the two main factors behind the founding of the ironworks at Grosmont were the presence of the railway and the local availability of ironstone. Indeed, Grosmont owes its existing form as a settlement largely to the location of the tunnel and bridge on the Whitby and Pickering Railway, so much so that it was known locally, and named, as "Tunnel" for many years. The foundation of the ironworks had a similarly profound effect on the size, layout and social organisation of the settlement.
- 4.3 It is assumed that it was the railway and the ironstone, combined with knowledge previously acquired through their operation of ironworks in Shropshire and Staffordshire, that attracted Charles and Thomas Bagnall to Grosmont in the first instance. As Chapman has shown, theirs was only one of several schemes that were proposed for ironworks in the district, but it was eventually only one of two which were built and, following the failure of the works at Beckhole, the only one to attain any degree of lasting success. Slightly further afield, the Glaisdale ironworks, which came into blast in 1866, were of similar size to Grosmont, with three blast furnaces from the start, although again they were relatively short lived, lasting only until 1876 (Rounthwaite 1997, 36).
- 4.4 A detailed comparison of Grosmont with other ironworks within the Cleveland iron district would require further research beyond the scope of this survey but nevertheless, a few points regarding contemporary technology and techniques can be made. Grosmont formed part of the phenomenal growth in pig iron manufacture that took place in Cleveland during the mid 19th century; the 38 furnaces erected in 1850 had increased to 108 furnaces in 1863, and 130 by 1875 (Rounthwaite 1997, 21 & 52). The works underwent several important changes in the same period, typical of improvements to blast furnace operation practiced in the district. Between 1850 and 1875, there was a general trend towards an increase in the height of furnaces from around 50 feet to 80 feet or more, and also an increase in the blast temperature from 600 degrees to 1400 degrees Fahrenheit; these measures were found to greatly reduce the fuel requirements for producing pig iron (Allen 1983, 3). The original pair of furnaces built at Grosmont were 63 feet in height, comparable with furnaces built elsewhere in the Cleveland district during the late 1850s and early 1860s but shorter than the tallest furnaces being built by the mid 1860s (Allen 1983, 5). As noted in Chapter 2, although it is sometimes stated that the original pair of furnaces were raised in height in 1875-76 when the third, taller, furnace was built, a lithograph of Grosmont, made in c.1874 (Chapman 2002, 42) appears to show the third furnace under construction with the western of the original pair already having been increased in height. Whatever the exact sequence of construction, the 1891 sale notice demonstrates that all three furnaces had reached 80 feet in height. The listed greater capacity of the third furnace in 1891 as compared to the original pair suggests that the Bagnalls were also aware of the developments at the Ormesby Ironworks in the late 1860s, where

the owner, Mr C Cochrane, believed that fuel consumption declined with capacity rather than height, and so built accordingly (Allen 1983, 4-5).

- 4.5 The 1863 description of the works describes the hot-blast stoves in some detail; there were three to each furnace, and they were of cast-iron pipe-stove form, raising the temperature of the blast to between 600 to 700 degrees Fahrenheit. As such, they appear to have been operating at a lower temperature than was normal in Cleveland, with the average works being blown at 750 to 800 degrees Fahrenheit by 1860 and some as high as 1000 degrees Fahrenheit (Allen 1983, 6). It may be that the three pipe-stoves per furnace were not sufficient to raise the temperature high enough, and this was remedied by the addition of a fourth pipe-stove to each of the original furnaces, as evidenced by the 1891 sale notice. The same sale notice also states that the third furnace was served by four “Whitwell Stoves”. Mr T Whitwell was the owner of the Thornaby Ironworks, and in 1865 he patented a regenerative firebrick stove, capable of raising blast temperatures to 1400 degrees Fahrenheit, following developments made at Ormesby Ironworks in the early 1860s (Allen 1983, 6). This suggests that the third furnace at Grosmont may have operated at a higher temperature than the earlier pair.
- 4.6 As has been previously noted, almost nothing remains above ground of the Grosmont ironworks. The main visible elements are the remnants of the lower part of the third and latest furnace (**Site 8**) and the tramway bridge to the north (**Site 20**) which brought iron ore from the mines located near Priory Farm. However, it is likely that the remains of all three of the blast furnace bases survive below the present NYMNP car-park; the 1863 description of the works describes their substantial nature and depth, together with associated flues and pipes.
- 4.7 It is possible that the largest surviving structure on the site (**Site 2**) may not be associated with the ironworks at all. The evidence as to whether it is contemporary with the works or not can be summarised as follows:

*Contemporary.* Although located in approximately the same position as the “Steam Lift” described in 1863 and used to raise trucks containing iron ore from the railway to a gantry feeding the calcining kilns, it bears little resemblance to the lift as depicted on the accompanying plan. On this plan, the lift is shown as a square structure with small circles at each corner and a larger circle in the centre, a form reminiscent of some late 19th century hydraulically-operated railway wagon lifts in West Yorkshire (e.g. Dennison 1997). The undated engraving reproduced by Whitworth also shows a tall structure, apparently with a pyramidal roof, in this general location, with another structure of a similar height to the south, and the gantry running north from the pair; the form of the gantry, namely a pair of angled legs supporting the line, closely resembles examples illustrated at the Cleveland Iron and Steel Works in the early 20th century (Dorman Long & Co Ltd 1924, 351 & 363). Surveys of other calcining kilns in the Cleveland district unfortunately provide little comparative information, as by the time these were undertaken, the accompanying gantries/tramway lines had long since been demolished (e.g. Owen 1998, 65-74). The surviving structure at Grosmont does have scarring to the east face of the east pillar that could have been made by an abutting gantry being removed, and perhaps it once housed/supported either the engine powering the steam lift or the brake mechanism and drum.

*Not contemporary.* All the major structures on the ironworks site appear to have been comprehensively demolished soon after it was sold early in 1892, so why should this element have been left? It also incorporates refractory material into its

structure, suggesting that it was built from material re-used from elsewhere on site, although only the refractory bricks incorporated into the alteration to the east pillar bear definite signs of having come from one of the furnaces. The structure remained in use whilst slag reprocessing was undertaken on site, and was modified as late as 1927.

- 4.8 On the basis of current evidence, it is considered most likely that the structure is a remnant of the ironworks gantry, with the concrete footings to the north representing further pillars, as shown on the 1864 plan of the works. However, the surviving structure was extensively modified after c.1900 to be used as part of the slag re-processing on site. Perhaps there was still a need to raise slag into hoppers prior to reprocessing, or alternatively some may have been shipped out in its raw state via the adjacent railway siding, again necessitating the use of a lift/hoist to load into wagons.
- 4.9 The reworking of the former areas of slag tipping had as profound an effect on the immediate landscape as the ironworks had had in their time. By its very nature, the process of reworking the tips removed almost all of the surface evidence for how it was done. The larger operation appears to have been carried out by William Schofield and Sons, who may have been re-working the tips between the ironworks and the Esk, using former ironworks buildings to the south-west of the engine/boiler house location which presumably housed crushers for making roadstone. It is tempting to see the tramway re-installed across the former ironstone mine bridge (**Site 20**), and used to extract slag from the tip on the north side of the Esk, as forming a separate operation, perhaps those of Gladstone and Company who were listed in 1913. It is assumed that slag reprocessing on this scale took place on the majority of former ironworks sites, such as, for example, at Glaisdale between 1918 and 1947 (Rounthwaite 1997, 36), although it is difficult to find published secondary sources detailing comparative operations.
- 4.10 The major structural remnants of the slag reprocessing on the site, apart from the much altered topography, are the bridge pier (**Site 19**), the nearby wharf (**Site 22**) and the brick pillars (**Site 2**) discussed above. Of the former two sites, the construction of the pier makes it unlikely that it formed part of the bridge shown here in 1893, and therefore, based on the map evidence, it seems to post-date 1913 but had clearly become disused again by 1952. Similarly, the wharf appears to have been present at least in part by 1913, although the surviving structure has been modified and altered since – might it have served some military purpose during the Second World War? Other ruined structures within the site (such as **Site 21**) may also be associated with the slag reprocessing, but also post-date 1913, although further research would be needed to confirm this. Some structures could be much later, given that, although the slag tips had probably been exhausted by c.1945, large scale disturbance continued even after re-working had ceased, as shown by the large hollow (**Site 14**) adjacent to the Grosmont Bridge road, which dates to after 1952.

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1913 Ordnance Survey 25" to 1 mile map sheet 45/4  
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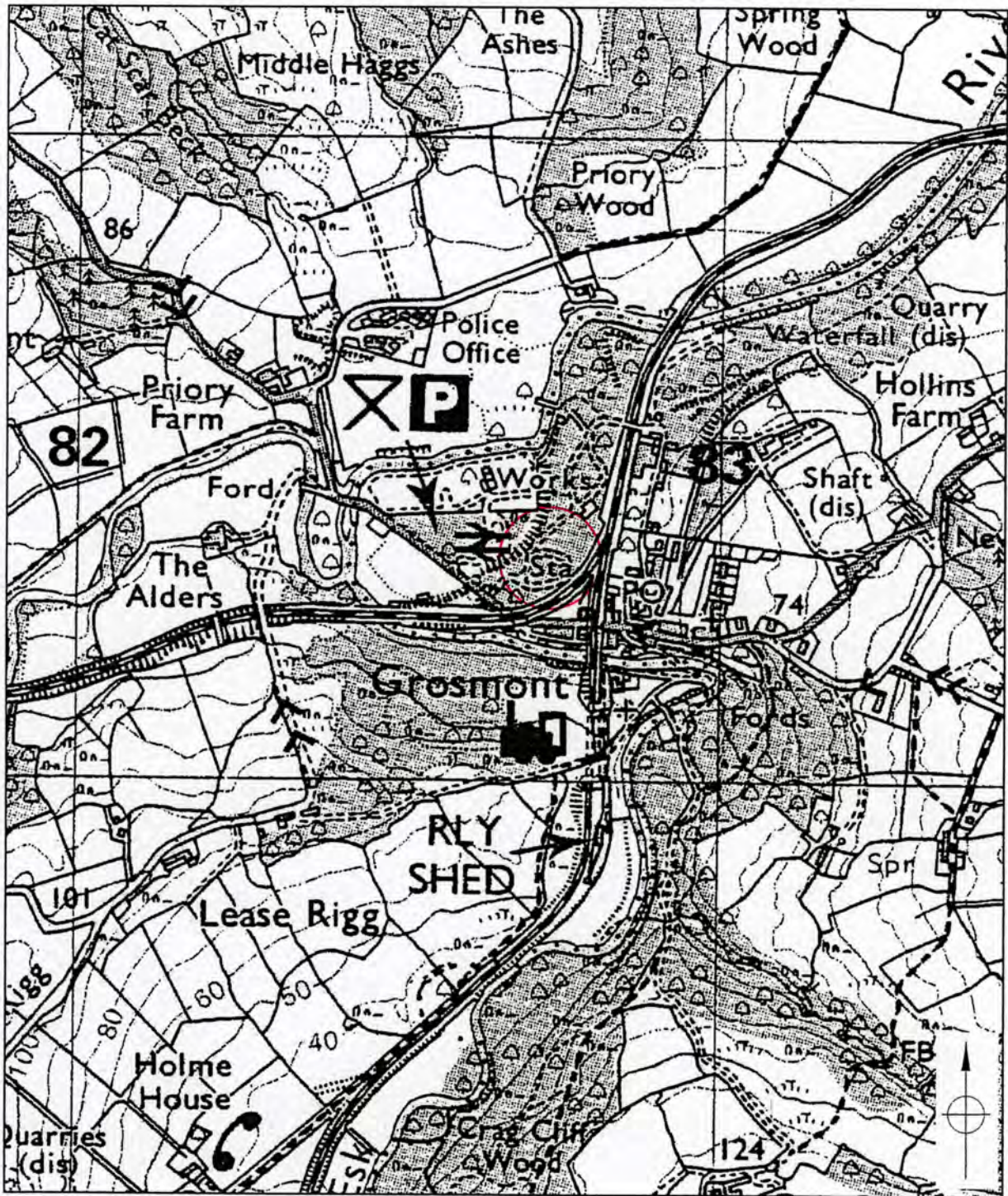
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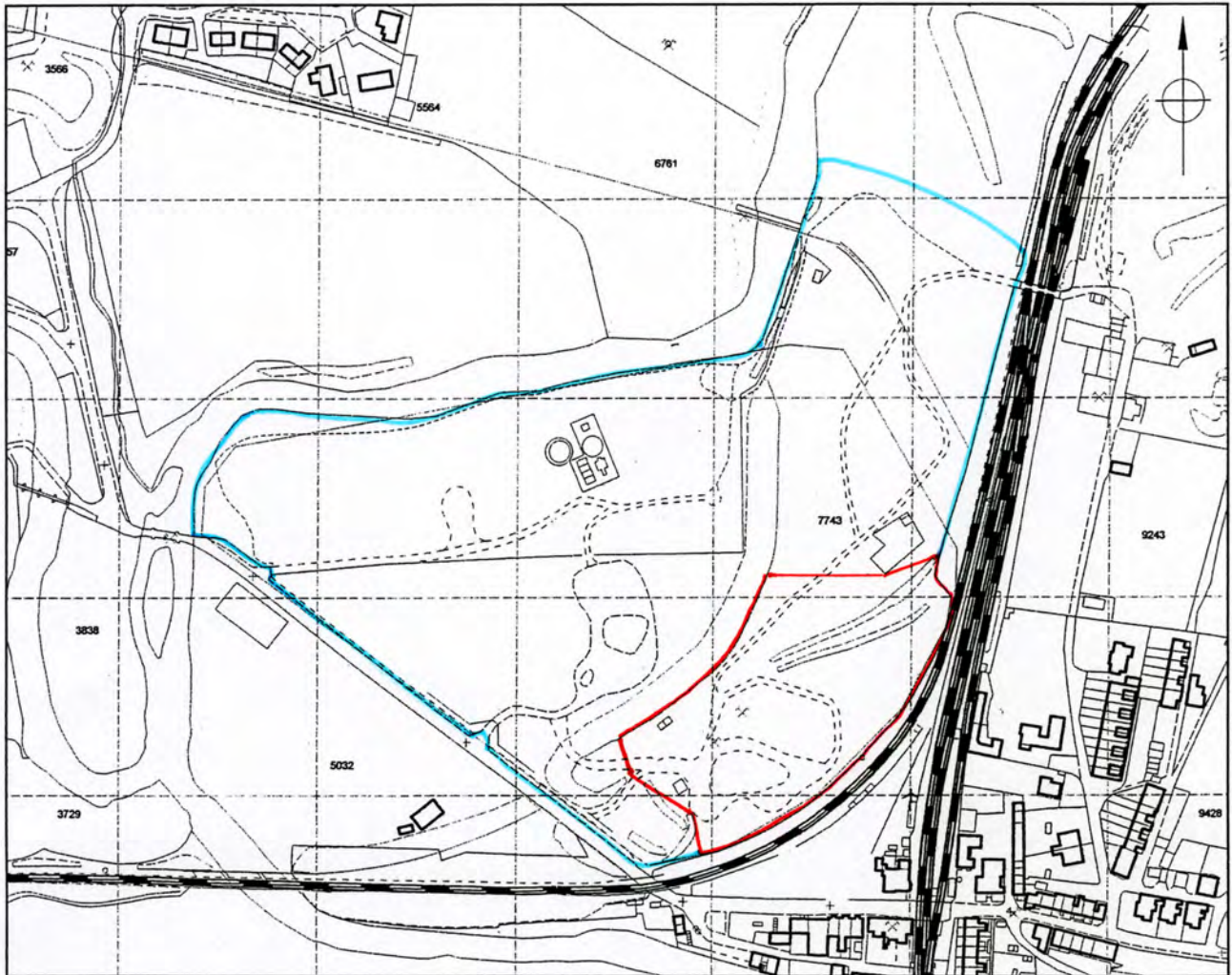
## **6 ACKNOWLEDGEMENTS**

- 6.1 The Phase 1 archaeological survey was commissioned by the North York Moors National Park Authority, through their Senior Conservation Archaeologist, Mr Graham Lee. Graham Lee also provided maps and information from the NYMNPAs SMR. EDAS would like to thank all concerned for their co-operation whilst carrying out the work.
  
- 6.2 The EDM survey was undertaken by Benchmark Surveys of Leeds, with additional site support from Ed Dennison and Philip Woolley. The enhancement of this survey was done by Shaun Richardson who, with Richard Lamb, also carried out the walkover survey of the expanded area. Shaun Richardson undertook the documentary research and produced the fieldwork records and a draft report. Graham Lee kindly provided comments on the draft report. The final report was produced by Ed Dennison, with whom the responsibility for any errors remains.



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TITLE		GENERAL LOCATION	
SCALE	DATE	NTS	JUL 2007
EDAS		FIGURE	1

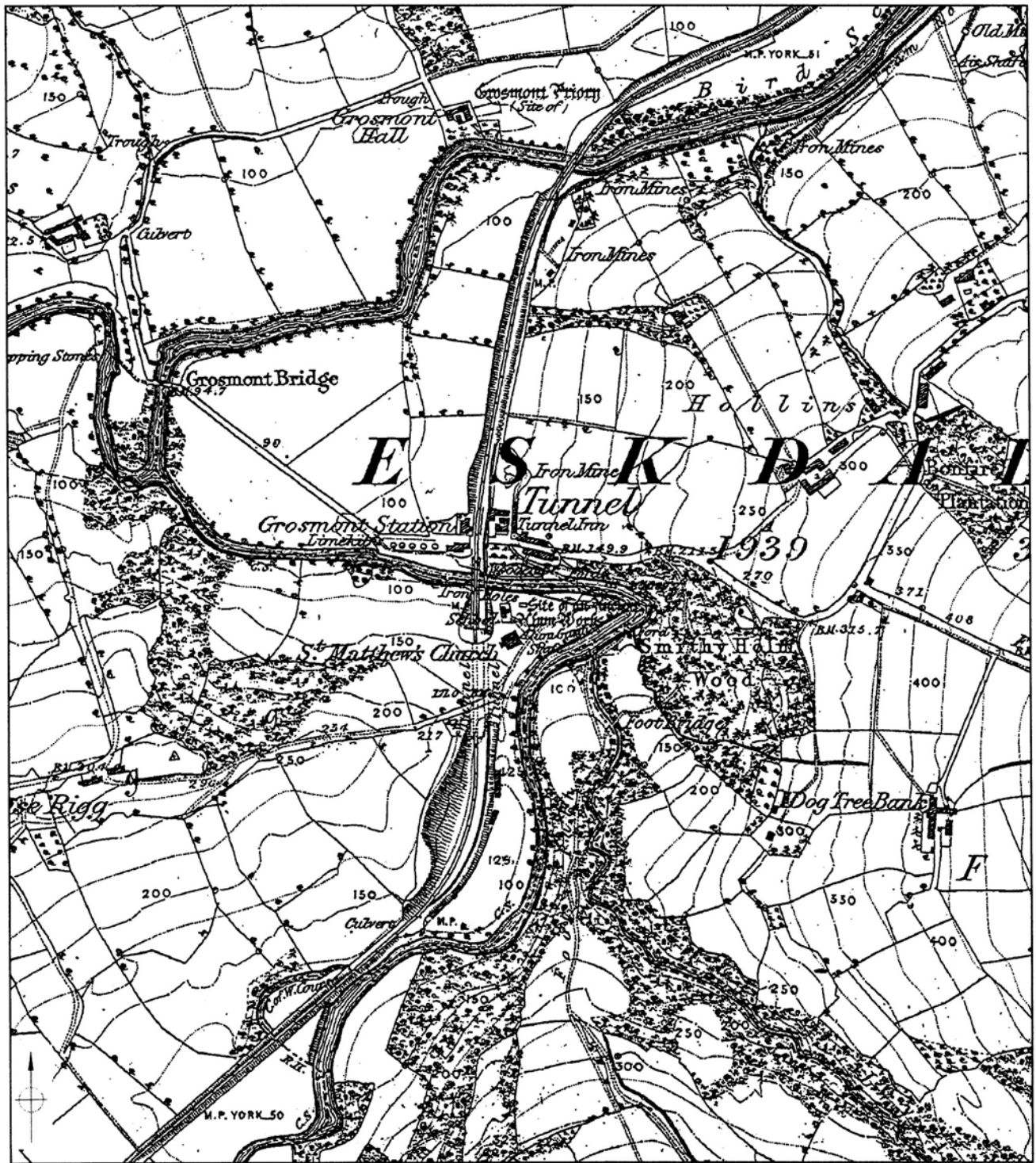


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- Detailed survey area
- Walkover survey area

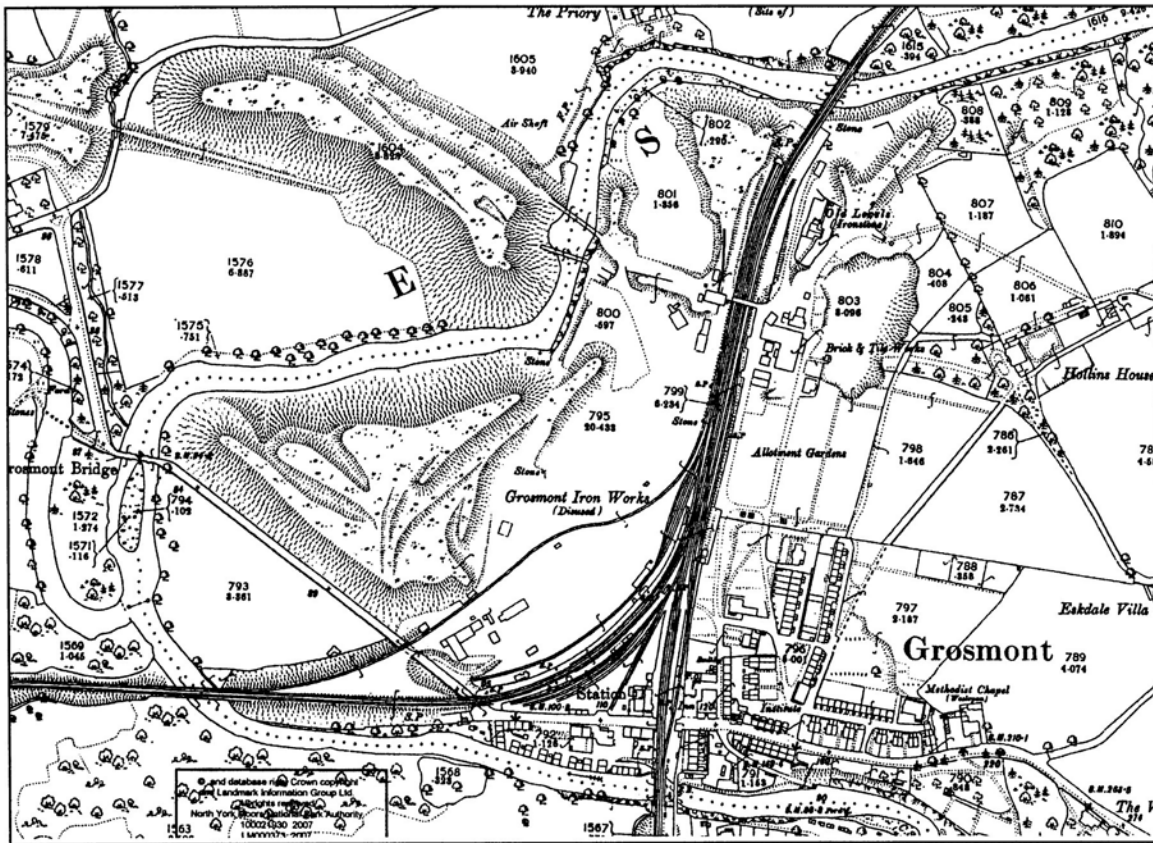
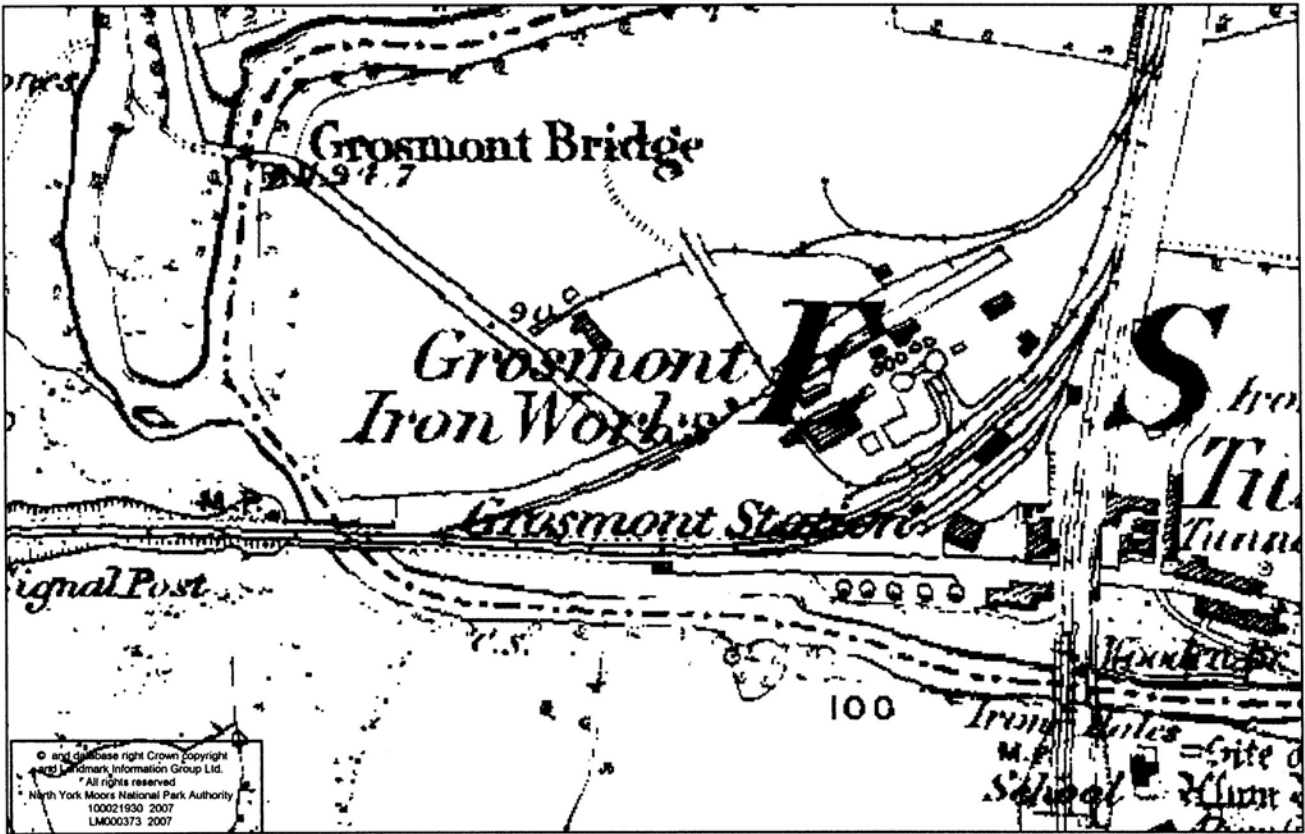
Base plan provided by NYMNPA

PROJECT		GROSMONT IRONWORKS	
TITLE		SURVEY AREAS	
SCALE	AS SHOWN	DATE	JUL 2007
	EDAS	FIGURE	2



Source:  
 a) OS 1853 6" map sheet 45

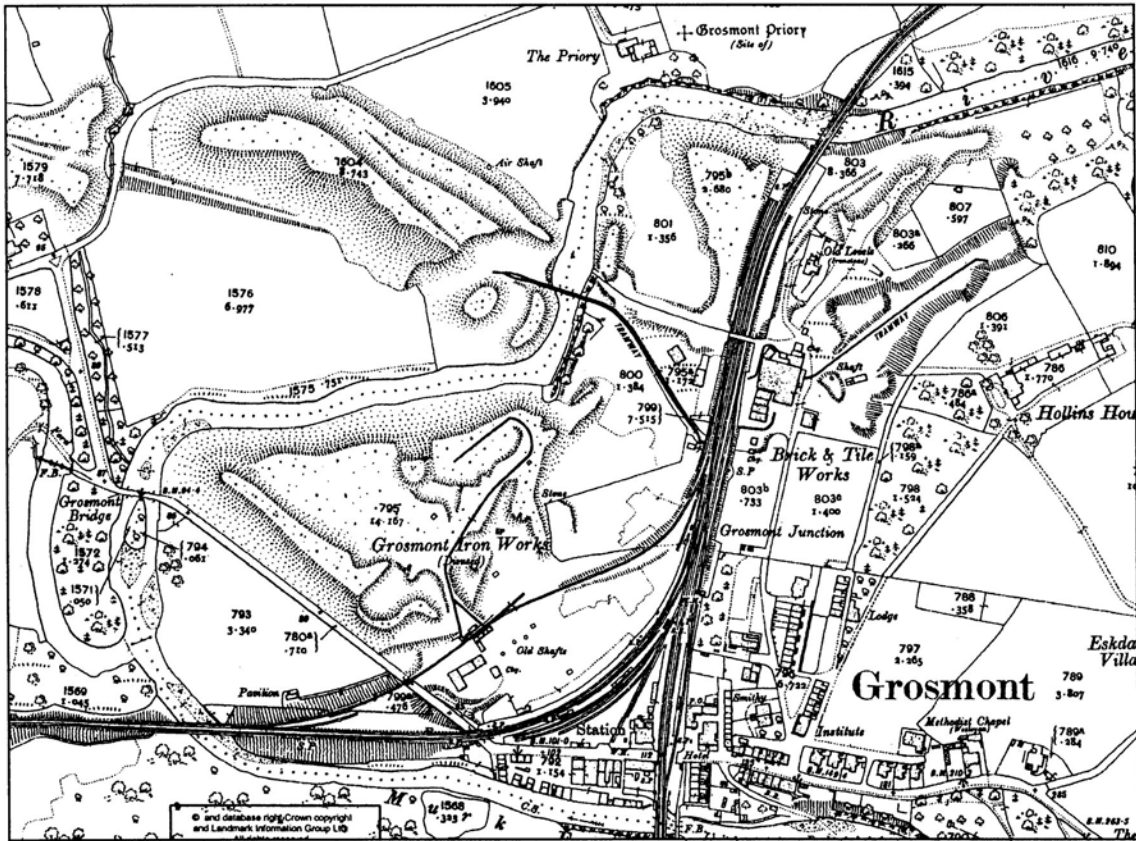
PROJECT		GROSMONT IRONWORKS	
TITLE		1853 ORDNANCE SURVEY MAP	
SCALE	NTS	DATE	JUL 2007
EDAS		FIGURE	3



Sources:

- a) OS 1853 6" map sheet 45 (amended after c.1860)
- b) OS 1893 25" map sheet 45/4

PROJECT		GROSMONT IRONWORKS	
TITLE		HISTORIC ORDNANCE SURVEY MAPS	
SCALE	NTS	DATE	JUL 2007
EDAS		FIGURE	4

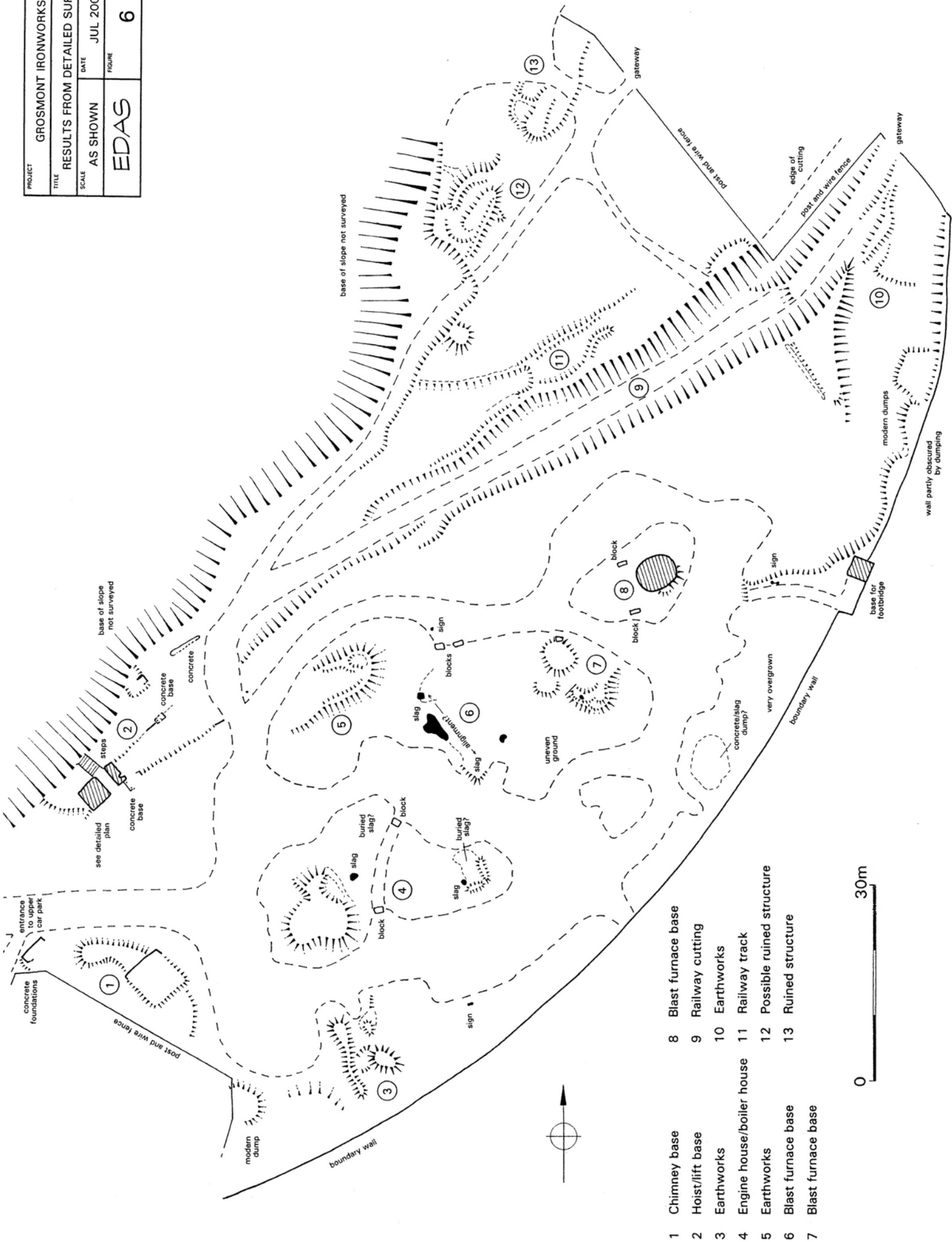


Sources:

- a) OS 1913 25" map sheet 45/4
- b) OS 1952 6" map sheet 45NE

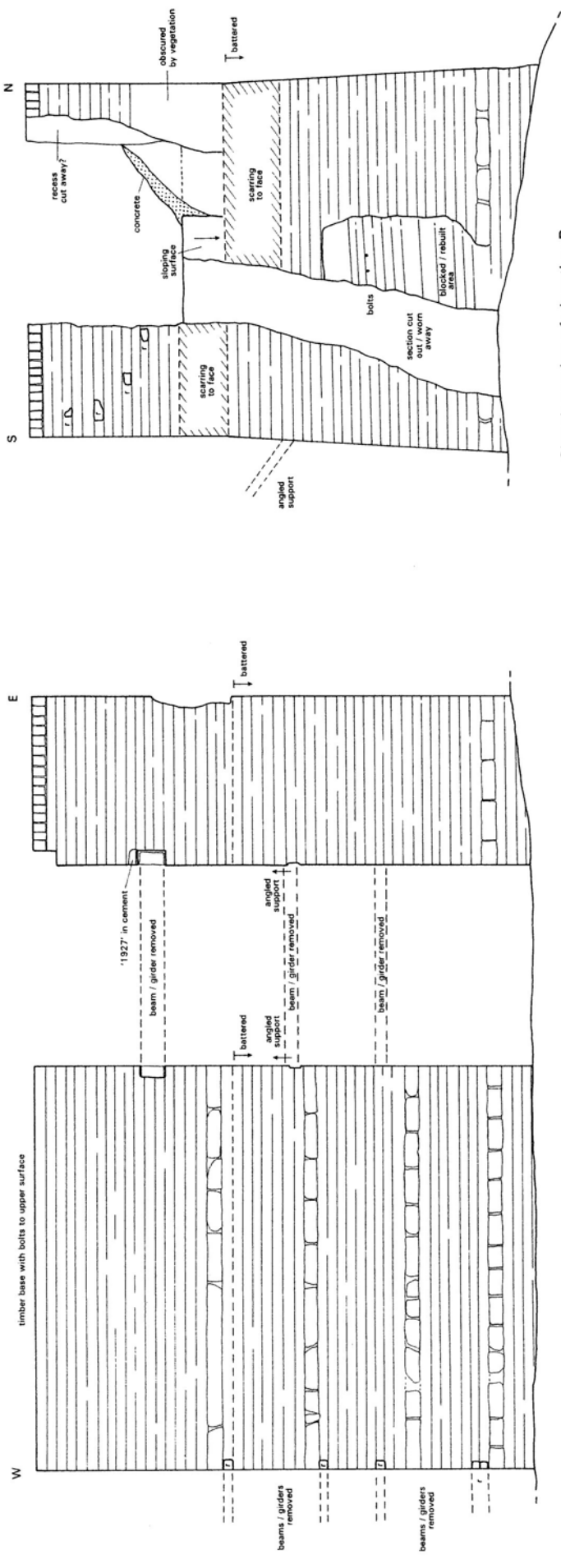
PROJECT		GROSMONT IRONWORKS	
TITLE			
HISTORIC ORDNANCE SURVEY MAPS			
SCALE	NTS	DATE	JUL 2007
EDAS		FIGURE	5

PROJECT	GROSMONT IRONWORKS		
TITLE	RESULTS FROM DETAILED SURVEY		
SCALE	AS SHOWN	DATE	JUL 2007
	EDAS	FIGURE	6



- 1 Chimney base
- 2 Hoist/lift base
- 3 Earthworks
- 4 Engine house/boiler house
- 5 Earthworks
- 6 Blast furnace base
- 7 Blast furnace base
- 8 Blast furnace base
- 9 Railway cutting
- 10 Earthworks
- 11 Railway track
- 12 Possible ruined structure
- 13 Ruined structure

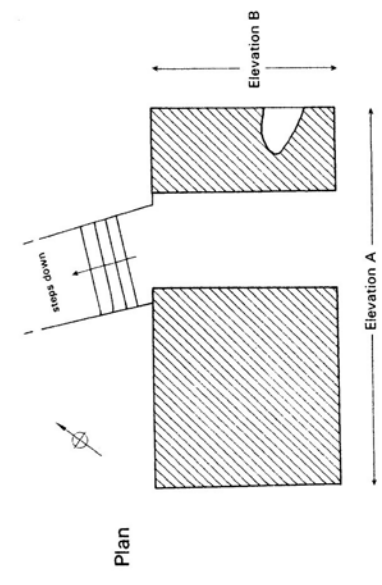




Sketch section of elevation A

Sketch section of elevation B

r = recess

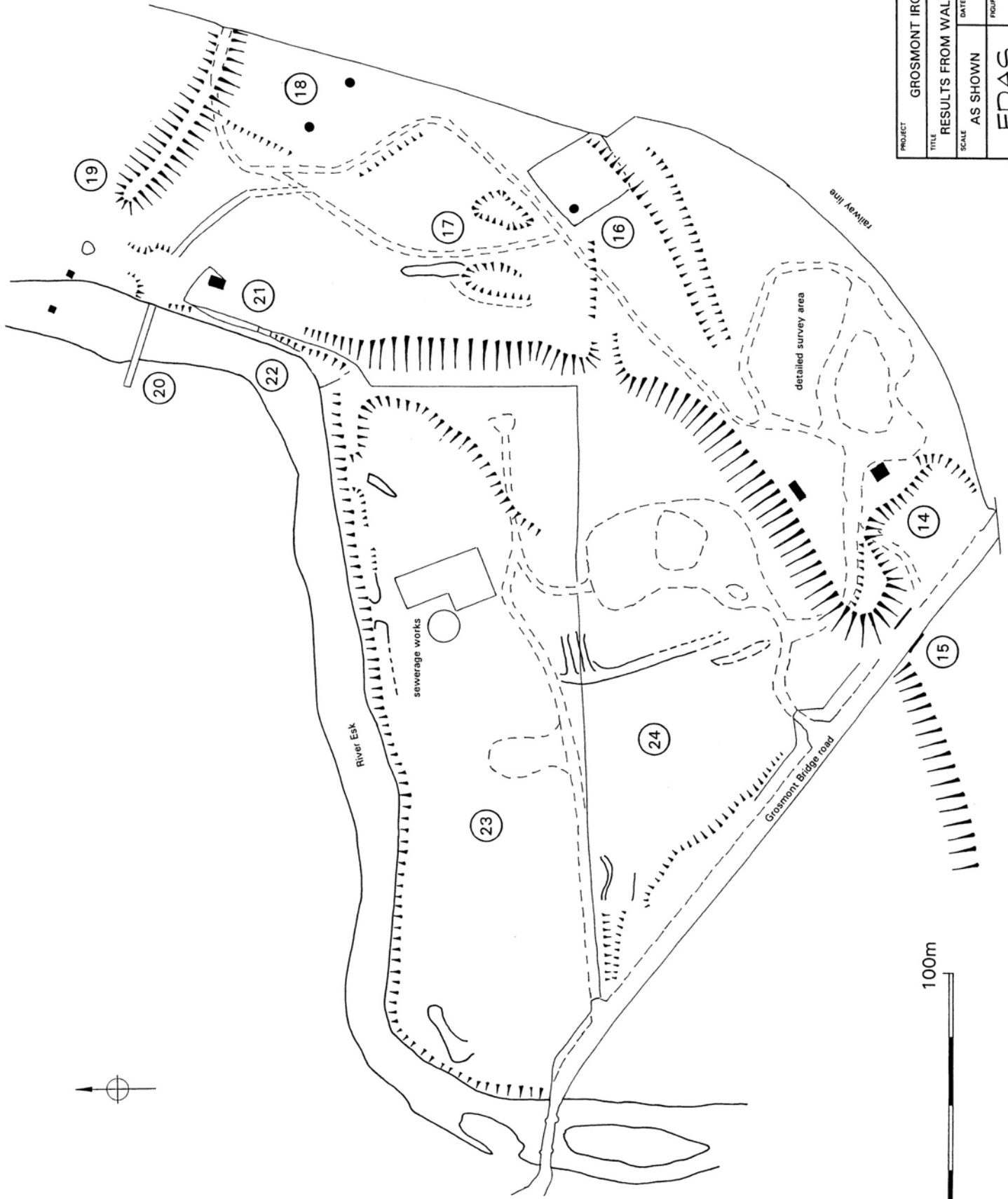


Plan

PROJECT	GROSMONT IRONWORKS		
TITLE	SKETCH SURVEY OF HOIST BASE		
SCALE	AS SHOWN	DATE	JUL 2007
	EDAS	FIGURE	7



PROJECT	GROSMONT IRONWORKS		
TITLE	RESULTS FROM WALKOVER SURVEY		
SCALE	AS SHOWN	DATE	JUL 2007
	EDAS		FIGURE 8



0 100m

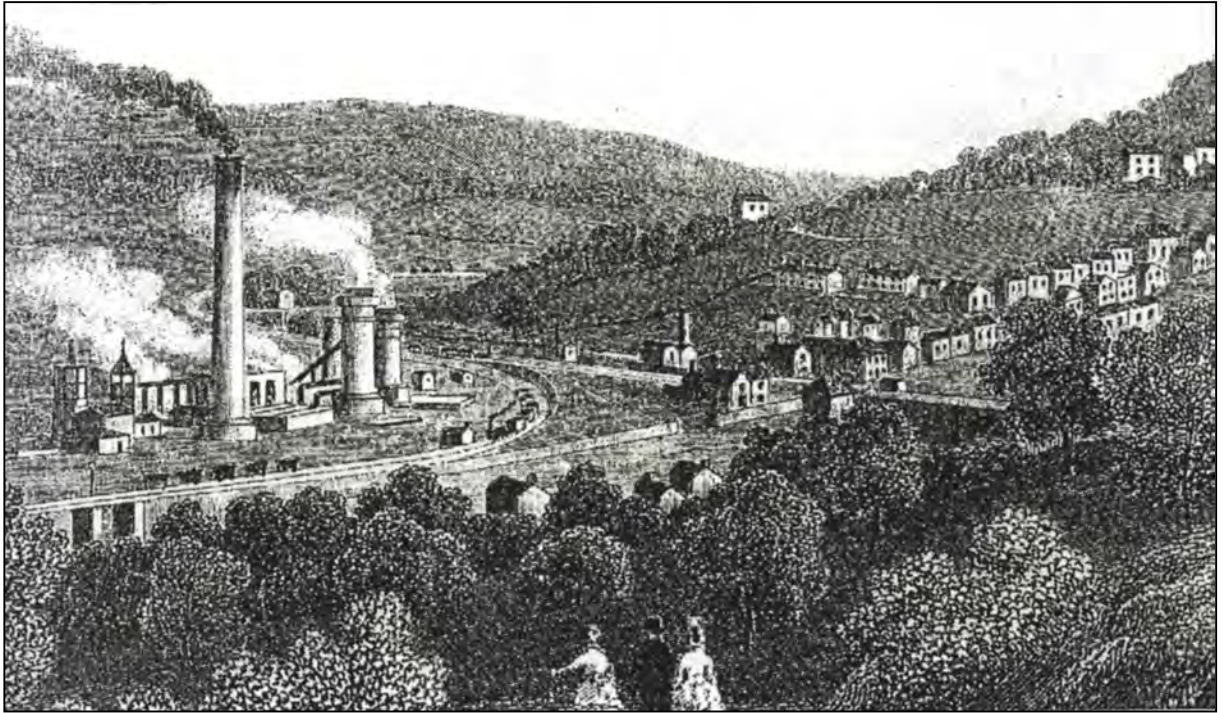


Plate 1: Engraving showing Grosmont in the 19th century with the ironworks complex (from Whitworth 2006, 72).

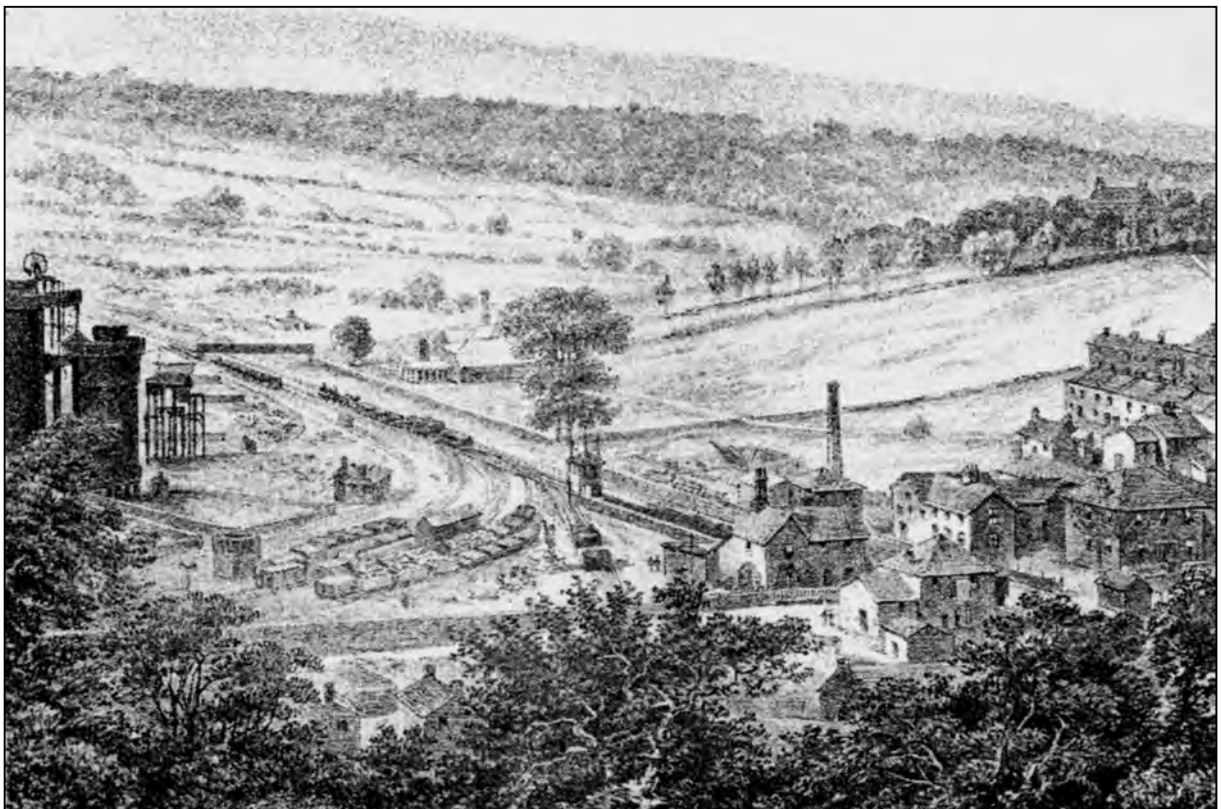


Plate 2: Lithograph showing Grosmont in c.1874 with the third blast furnace under construction (from Chapman 2002, 42).

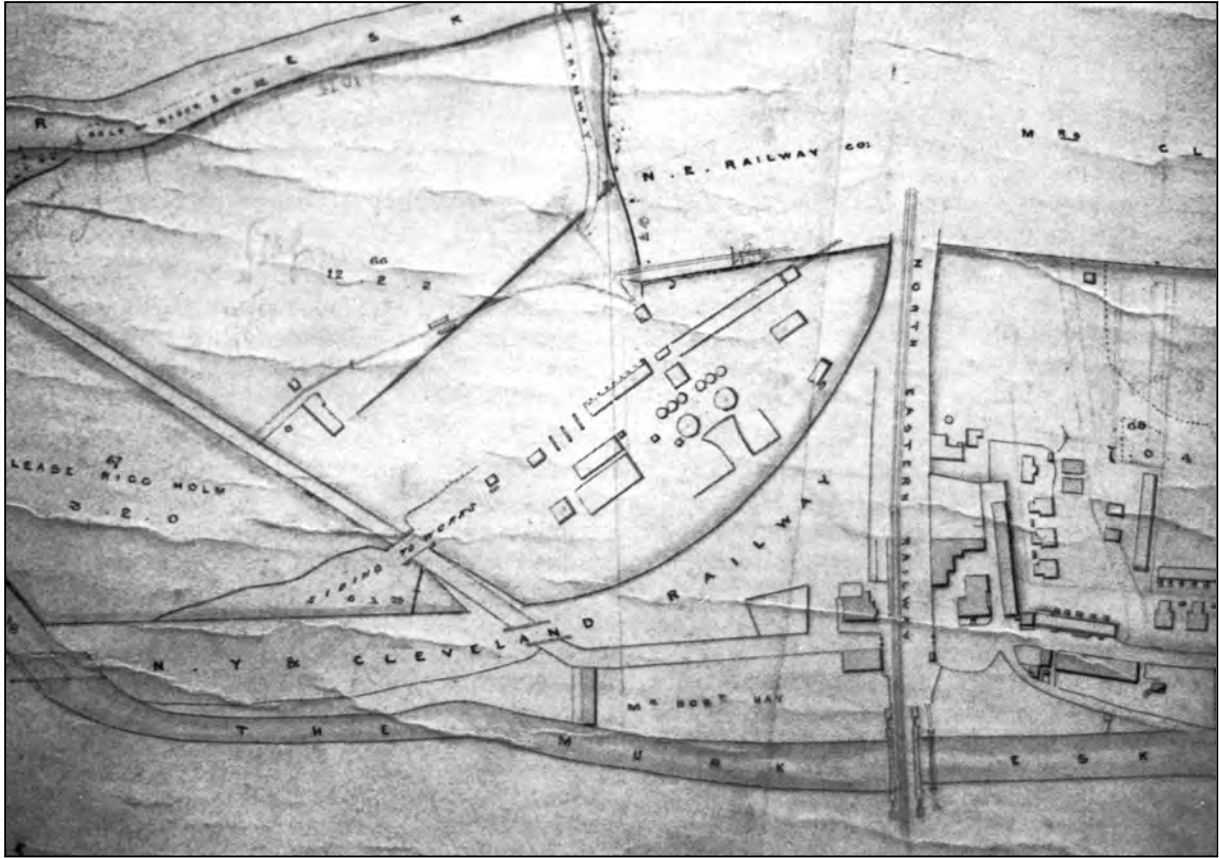


Plate 3: Plan of Grosmont ironworks in 1864 (from Shill & Minter 1994, 290).

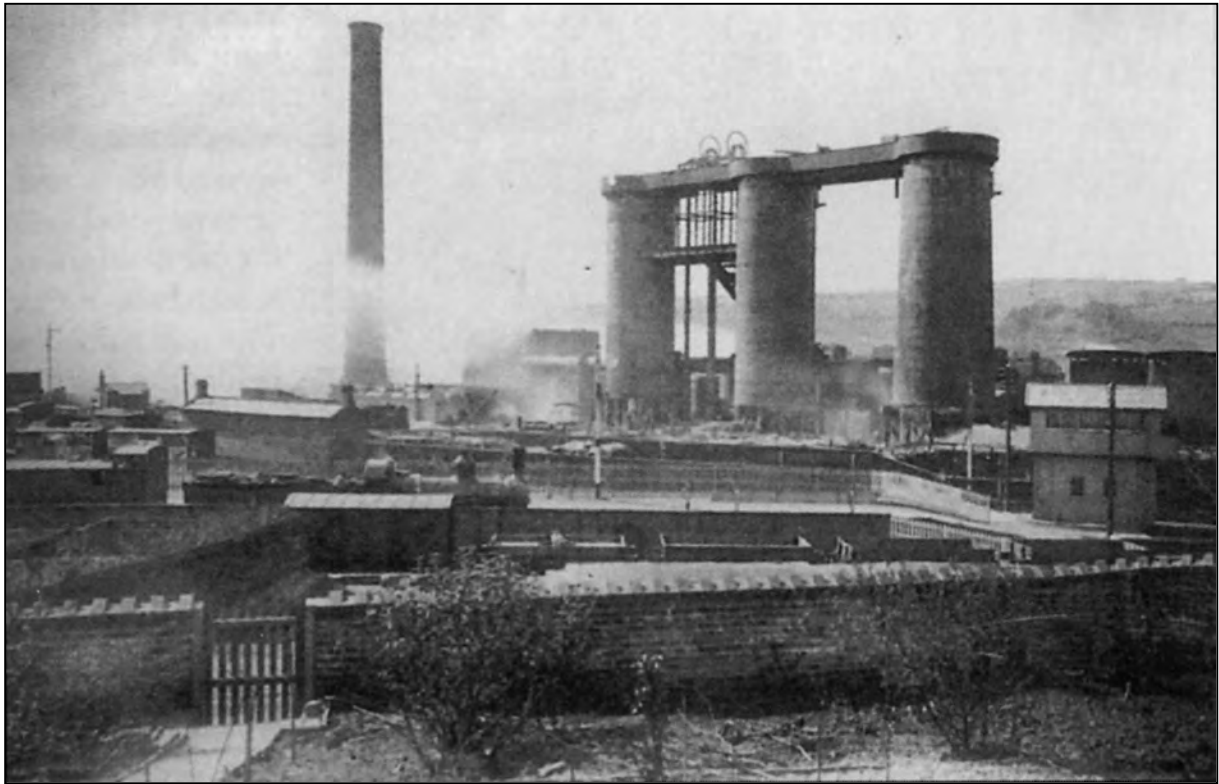


Plate 4: Grosmont ironworks in c.1880 (from Whitworth 2006, facing page 61).



Plate 5: Furnace base (Site 7), looking NW.



Plate 6: Furnace base (Site 8), looking NE.



Plate 7: Remains of hoist / lift (Site 2), looking NW.



Plate 8: Bridge pier (part of Site 19), looking N.



Plate 9: Tramway bridge (part of Site 20), looking N.



Plate 10: Wharf and related structures (Site 22), looking NE.

## **APPENDIX 1**

## APPENDIX 1: GAZETTEER OF SITE COMPONENTS

Site number: 001	Site name: Chimney base, south edge of detailed survey area	NYMNPASMR: 7843
<p>Historical development:</p> <p>A detached chimney is shown to the south-west of the engine and boiler house in 1863. The chimney has a square base with a circular section stack, and rose to a height of 180 feet; it features prominently on an undated engraving made after c.1875 [1]. By the time the amended 1853 6" map was published, a north-south railway line passed between the chimney and the engine/boiler house, tipping slag from the blast furnaces into the area to the north [2]. This line is not shown on the 1864 map of the works [3]. The railway is also not shown on the 1893 map, and the engine/boiler house complex had been removed, with only the chimney and an L-shaped range of buildings to the north-west remaining [4]. The L-shaped range had itself been slightly reduced in size by 1913, although the chimney is still present, marked as "Chy" [5]. The chimney in fact remained intact long after the rest of the ironworks had disappeared; the upper 50 feet were taken down in March 1935 for safety reasons, but it still appears on the 1952 6" map [6]. The surviving portion was finally demolished on the 13th March 1957, an operation undertaken by Theaker &amp; Company of Staithes [7].</p>		
<p>Site description:</p> <p>The chimney base lies on the south edge of the survey area and was heavily overgrown at the time of the survey. It is c.7.40m long (north-west/south-east) by 6.60m wide (north-east/south-west), comprising a 1.20m high mound, with large coursed squared stone blocks partly visible along the west and south sides; no traces of the circular chimney shaft could be seen in the surface of the mound. To the east, there is a slight curvilinear west-facing scarp and to the west, a spread curvilinear mound of stone, brick and concrete rubble c.0.70m high. Some c.16m to the west of the chimney base, the remains of a concrete foundation, c.4m long and c.1m high, are visible, with a lower concrete footing curving around its south side; this presumably forms part of the L-shaped range shown here in 1893 and 1913 [8].</p>		
<p>References:</p> <p>[1] Coulthard, H 1863 "Description of the New Iron Works at Grosmont". <i>Proceedings of the Institution of Mechanical Engineers</i>, 228; Whitworth, A 2006 <i>Grosmont: A Brief History</i>, 72          [2] OS amended 1853 6" to 1 mile map sheet 45          [3] 1864 plan of the Grosmont ironworks          [4] OS 1893 25" to 1 mile map sheet 45/4          [5] OS 1913 25" to 1 mile map sheet 45/4          [6] OS 1952 6" to 1 mile map sheet 45NE          [7] Chapman, S 2002 <i>Grosmont and its Mines: a Short History of Ironstone Mining around Grosmont</i>, 53          [8] Shaun Richardson EDAS site visit</p>		



Site number: 002	Site name: Hoist/lift base, south-west part of detailed survey area	NYMNP SRM: 7843
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Historical development:

A "Steam Lift" is shown in this general location in 1863, as a square structure with small circles at each corner and a larger circle in the centre; it was described as being for "the purpose of raising the minerals from the line of the railway to the top of the calcining kilns" [1]. Unfortunately, it cannot be seen on the amended 1853 6" map due to the placement of lettering, but a slightly more rectangular structure is shown on the 1864 plan [2] [3]. An undated engraving, made after c.1875, shows a tall structure, apparently with a pyramidal roof, in this general location, with another structure of similar height to the south [4]. The steam lift appears in the 1891 sale description as "Steam Lift for Gantry, 32" cylinder with feeding Donkey Engine, 2½ " ram. Brake drop with drum", serving a gantry 380 feet long to the calcining kilns [5]. Virtually all of this structure had been demolished by 1893, although a small rectangular structure remained in this general location on the north side of a railway line [6]. By 1913, this structure was once again surrounded by railway lines, laid to facilitate removal of slag from the area to the north, although it may be significant that none of the lines appear to link up to the structure itself; a line of conjoined sub-square structures to the south may have been storage hoppers [7]. Both the structure and the storage hoppers were still present in 1952, although all the railway lines had been taken up by this date [8]. Writing in 2002, Chapman described the structure as "a couple of brick structures which probably formed part of the structure supporting the calcining kilns where the ironstone was roasted before being fed into the furnaces" [9].

Site description:

The hoist/lift base lies in the south-western part of the survey area and was partly overgrown with ivy at the time of the survey. It comprises two substantial brick pillars, rising to a maximum height of 4.40m. The eastern pillar is the smaller of the two, being 3.50m long (north-south) by 1.50m wide (east-west), the north and south faces having a battered profile for approximately two-thirds of their lower height. The pillar has been subject to much repair and patching, but the majority is built of handmade reddish-brown and yellow bricks (average dimensions 230mm by 110mm by 70mm) laid in no particular bonding pattern and set with a lime mortar. There is a single course of large refractory bricks running around the base and the pillar is topped by a course of headers set on edge. The east face preserves much evidence for repair and alteration. Towards the centre of the lower part, there is a large irregularly-shaped area of repair or alteration, crudely carried out in re-used refractory bricks and incorporating two iron bolts which project slightly from the face. On the south side of the repair, a sub-oval "shaft" has been cut down through the body of the pillar. This shaft is c.0.60m deep and open to the east side, sloping downwards at a slight angle from north to south. There appears also to be the remains of a circular shaft in the east face. It is difficult to determine exactly how the shaft was cut into the brickwork; it has the appearance of being worn away in several stages by rubbing or friction, but this is not certain. On both sides of the shaft, there are horizontal bands of shallow scarring to the face of the pillar, four to five courses deep and set at different heights. Above these, there is a wide gap in the centre of the east face, forming a step or recessed area running across the full width of the pillar. This could not be accessed at the time of the current survey but it appears to contain evidence for several phases of brick concrete alteration, as do the parts of the east face which rise above it to either side.

The larger western pillar is c.3.50m square, and built of similar bricks to the eastern pillar, although it incorporates four courses of the much larger refractory bricks (up to 470mm by 19mm by 11mm) and occasionally the brickwork forms a rough header bond. Like the eastern pillar, the pillar has battered north and south faces, although overall it has been subject to less alteration than the eastern pillar. There are four shallow recesses at the south-west corner, spaced at roughly regular centres to c.2m above ground level; these formerly housed metal beams or girders which extended south. The central area of the upper part is slightly recessed and, although it could not be inspected in detail, it appears to retain a substantial base of some kind comprising two parallel timbers pierced by tall bolts.

An examination of the gap between the two pillars shows that it was once crossed by several beams or girders. The two lower beams were set back slightly from the south faces of the pillars; at the same level as the upper of these two beams, angled timbers/girders once sloped upwards from the gap between the pillars. The third and uppermost beam/girder was set flush with the south faces of the pillars. It was the most substantial of the three members once crossing the gap and it appears

to be a later insertion; the cement above its former east end has the date "1927" written into it.

The ground falls away very sharply to the north of the pillars, with the gap between the two forming a footpath at the time of the survey, leading to a flight of steps. A number of features are visible in plan only in the immediate area of the pillars. There is some very decayed concrete at the base of the south-west corner of the western pillar, whilst at the base of the south-east corner of the eastern pillar, there is a rectangular concrete base or bed with a bolt at three of the four corners. A slight north-facing scarp runs c.14m east from the bed, terminating in a 0.30m high concrete edge. A similar scarp runs east from the north-east corner of the eastern pillar for c.11m, terminating in another rectangular concrete base or bed, again with bolts to the corners and remnants to concrete edging to either side.

Some c.13m to the north-east of the eastern pillar, the remains of another structure are set into the top of the steep north-facing slope. The structure is rectangular in plan, c.2.5m long, 0.60m wide and set parallel to the line of the top of the slope. It is built of orange machine-made bricks (average dimensions 235mm by 110mm by 70mm) set with a cement mortar; decaying concrete is visible eroding out of the slope to either side, with further linear concrete footings to the north-east [10].

References:

- [1] Coulthard, H 1863 "Description of the New Iron Works at Grosmont". *Proceedings of the Institution of Mechanical Engineers*, 229
- [2] OS amended 1853 6" to 1 mile map sheet 45
- [3] 1864 plan of the Grosmont ironworks
- [4] Whitworth, A 2006 *Grosmont: A Brief History*, 72
- [5] Chapman, S 2002 *Grosmont and its Mines: a Short History of Ironstone Mining around Grosmont*, 51-52
- [6] OS 1893 25" to 1 mile map sheet 45/4
- [7] OS 1913 25" to 1 mile map sheet 45/4
- [8] OS 1952 6" to 1 mile map sheet 45NE
- [9] Chapman, S 2002 *Grosmont and its Mines: a Short History of Ironstone Mining around Grosmont*, 61
- [10] Shaun Richardson EDAS site visit, 13/3/07

Site number: 003	Site name: Earthworks, south part of detailed survey area	NYMNPAsMR: 7843
<p>Historical development:</p> <p>A railway line runs through this approximate area on the amended 1853 6" map but no structures are shown [1]. A small single storey structure with a hipped roof and an end ridge stack, and a smaller adjoining building on the west side, may be shown here on a lithograph of c.1874 [2]. A small structure with an irregular plan form may be shown here in 1893 [3] but by 1913 it appears to have been replaced or reduced in size, and to have a small enclosure attached to the west side [4]. It is similarly depicted in 1952 [5].</p>		
<p>Site description:</p> <p>The earthworks lie in the south part of the survey area, adjacent to the curving wall forming the south-eastern boundary to the site, and were heavily overgrown at the time of the survey. The wall stands 1.60m high and is c.0.50m wide at the base. It is built of neatly coursed and squared sandstone set with a lime mortar and is surmounted by semi-circular coping. The main earthwork is a north-south aligned bank, some c.12m long, standing up to 1m high with a bulbous north end. There is a 1.2m high sub-circular mound on its east side, with a smaller similar feature to its north. To the west, there is a very slight north-facing scarp and beyond this a modern dump [6].</p>		
<p>References:</p> <p>[1] OS amended 1853 6" to 1 mile map sheet 45          [2] Chapman, S 2002 <i>Grosmont and its Mines: a Short History of Ironstone Mining around Grosmont</i>, 42          [3] OS 1893 25" to 1 mile map sheet 45/4          [4] OS 1913 25" to 1 mile map sheet 45/4          [5] OS 1952 6" to 1 mile map sheet 45NE          [6] Shaun Richardson EDAS site visit, 13/3/07</p>		

Site number: 004	Site name: Site of engine house/boiler house, south part of detailed survey area	NYMNPASMR: 7843
<p>Historical development:</p> <p>In 1863, the engine house was described as being built of red brick with mouldings of white brick with a large water tank on the roof supplying water to the tuyeres and the pig-beds; the water was taken from the River Esk by two lift pumps. The engine house contained three direct-acting high pressure engines, the third being provided in case of the failure of one of the other two; these type of engines were preferred to a single large beam engine due to the much higher cost of the foundations and frame for the latter. The engine house was also provided with a travelling crane to allow examination of the engines or replacement of parts. The five boilers were each 73 feet long and of plain egg-ended form, and exhaust gases were taken into an adjacent 180 feet high chimney (see Site 1). There were evidently plans to expand the capacity of the works, as on the accompanying plan, two further engines and two further boilers are indicated by dashed lines [1]. The boiler house is depicted on the amended 1853 6" map, with a detached narrow rectangular building running parallel to the north side which probably represents the engine house [2]. The buildings are similarly shown on the 1864 plan, although the boiler house seems slightly smaller and there is not such a large gap between this and the engine house [3]. An undated engraving, made after c.1875, shows the engine house as a tall building, probably equipped with two storey windows in the long elevations, with the lower parallel structures of the boiler house to the south [4]. Despite the sentiments expressed in 1863, a large vertical blowing engine was eventually installed in the engine house along with the three direct-acting engines, and appears in the 1891 sale notice, as do the pumping engines and boilers [5]. By 1893, apart from the chimney (Site 1), the boiler and engine house had been demolished, although the parallel structure shown to the north on the amended 1853 6" map may have still survived; a small rectangular building had also appeared further to the south [6]. By 1913, the latter had both also gone, the first replaced by three circular features labelled as "Old Shafts"; although it is tempting to see these as the remains of the blast furnaces, they are in the wrong place and they may feasibly represent some of the calcining kilns shown in 1863 [7]. They are still shown in 1952 [8].</p>		
<p>Site description:</p> <p>The site of the engine house/boiler house is located in the south part of the survey area, although little remains visible above ground. The principal feature is a spread, irregularly sub-circular mound, c.10m in diameter and up to 1m high. It has been disturbed relatively recently at the north-east corner, whilst there is a large lump of slag and an area of mossed ground surface to the east, the last perhaps indicative of a rubble spread beneath. Along the east side of the mossed area, an informal footpath has been blocked by placing a very large dressed sandstone block at either end. Some c.24m to the east of the main mound, there is a short right-angled earthwork bank, again with some associated slag and mossed ground surface. This may represent the remains of the small building shown in this approximate location in 1893 [9].</p>		
<p>References:</p> <p>[1] Coulthard, H 1863 "Description of the New Iron Works at Grosmont". <i>Proceedings of the Institution of Mechanical Engineers</i>, 227-229</p> <p>[2] OS amended 1853 6" to 1 mile map sheet 45</p> <p>[3] 1864 plan of the Grosmont ironworks</p> <p>[4] Whitworth, A 2006 <i>Grosmont: A Brief History</i>, 72</p> <p>[5] Chapman, S 2002 <i>Grosmont and its Mines: a Short History of Ironstone Mining around Grosmont</i>, 51-52</p> <p>[6] OS 1893 25" to 1 mile map sheet 45/4</p> <p>[7] OS 1913 25" to 1 mile map sheet 45/4</p> <p>[8] OS 1952 6" to 1 mile map sheet 45NE</p> <p>[9] Shaun Richardson EDAS site visit, 13/3/07</p>		

Site number: <b>005</b>	Site name: <b>Earthworks, central part of detailed survey area</b>	NYMNPASMR: <b>7843</b>
<p>Historical development:</p> <p>A detached narrow rectangular building is shown in approximately this position on the amended 1853 6" map, to the north of the engine/boiler house (see Site 4); it is unclear whether this represents the engine house or another structure [1]. Also depicted on the 1864 plan [2]. There is a detached building shown in this general area in 1893 but had been demolished by 1913 [3] [4].</p>		
<p>Site description:</p> <p>An earthwork lies in the central part of the survey area, formed by a linear mound, aligned approximately east-west and c.18m in length. It rises to a maximum height of 1.0m but the sloping sides generally have an uneven profile. There are further slight earthworks in the surface of the mound but it is unclear if it represents a demolished structure, as indicated by the 1913 map, or simply material which has been dumped here [5].</p>		
<p>References:</p> <p>[1] OS amended 1853 6" to 1 mile map sheet 45          [2] 1864 plan of the Grosmont ironworks          [3] OS 1893 25" to 1 mile map sheet 45/4          [4] OS 1913 25" to 1 mile map sheet 45/4          [5] Shaun Richardson EDAS site visit, 13/3/07</p>		

Site number: <b>006</b>	Site name: <b>Blast furnace base, central part of detailed survey area</b>	NYMNPAsMR: <b>7843.01</b>
<p>Historical development:</p> <p>By scaling off the 1863 plan of the works, using the chimney base (Site 1) as a reference point, this furnace matches the western of the original pair shown on the plan. At their base, the furnaces consisted of a hearth, upon which there was a shaft lined with refractory bricks; the shaft had internal and external diameters of c.2.2m and 5.5m respectively at this point. There was a straight-sided tapping hole on one side of the shaft, above which were five equally spaced tuyere openings. Above the tuyere openings, the sides of the shaft splayed out to form the superstructure of the furnace, which was supported on a ring of 10 cast-iron columns [1]. The furnace is shown on the amended OS 6" map and the 1864 plan of the works [2] [3]. This furnace, along with the other two on the site, was demolished between January and December 1892 [4].</p>		
<p>Site description:</p> <p>At the time of the survey, all above ground parts of the furnace base had completely disappeared, leaving only a linear scatter of large lumps of slag, covering an area c.16m long (north-west/south-east). However, it is possible that extensive below-ground remains may still be present, given the substantial nature of the blast furnace foundations [5].</p>		
<p>References:</p> <p>[1] Coulthard, H 1863 "Description of the New Iron Works at Grosmont". <i>Proceedings of the Institution of Mechanical Engineers</i>, 226-227</p> <p>[2] OS amended 1853 6" to 1 mile map sheet 45</p> <p>[3] 1864 plan of the Grosmont ironworks</p> <p>[4] Chapman, S 2002 <i>Grosmont and its Mines: a Short History of Ironstone Mining around Grosmont</i>, 53</p> <p>[5] Shaun Richardson EDAS site visit, 13/3/07</p>		

Site number: 007	Site name: Blast furnace base, central part of the detailed survey area	NYMNPAsMR: 7843.01
<p>Historical development:</p> <p>By scaling off the 1863 plan of the works, using the chimney base (Site 1) as a reference point, this furnace matches the eastern of the original pair shown on the plan. At their base, the furnaces consisted of a hearth, upon which there was a shaft lined with refractory bricks; the shaft had internal and external diameters of c.2.2m and 5.5m respectively at this point. There was a straight-sided tapping hole on one side of the shaft, above which were five equally spaced tuyere openings. Above the tuyere openings, the sides of the shaft splayed out to form the superstructure of the furnace, which was supported on a ring of 10 cast-iron columns [1]. The furnace is shown on the amended OS 6" map and the 1864 plan of the works [2] [3]. This furnace, along with the other two on the site, was demolished between January and December 1892 [4].</p>		
<p>Site description:</p> <p>At the time of the survey, only fragmentary remains of the furnace base could be seen above ground. They comprise an area of uneven ground c.12m across, formed principally by two sub-oval mounds, each rising to a maximum of 1.2m in height. Refractory bricks are visible eroding out of the north side of the north mound, suggesting that at least part of the outer curve of the furnace base survives. The south mound has a 1.40m long straight edge, apparently structural, on its west side. The apparent length of this edge corresponds closely with that shown for the tuyere openings in 1863, and this is most probably what the edge represents; if so, it suggests that there are further remains of the substantial furnace base surviving below ground, perhaps including the tapping hole and hearth. The site is being ridden over by mountain bikes and is suffered quite a bit of erosion and rutting [5].</p>		
<p>References:</p> <p>[1] Coulthard, H 1863 "Description of the New Iron Works at Grosmont". <i>Proceedings of the Institution of Mechanical Engineers</i>, 226-227</p> <p>[2] OS amended 1853 6" to 1 mile map sheet 45</p> <p>[3] 1864 plan of the Grosmont ironworks</p> <p>[4] Chapman, S 2002 <i>Grosmont and its Mines: a Short History of Ironstone Mining around Grosmont</i>, 53</p> <p>[5] Shaun Richardson EDAS site visit, 13/3/07</p>		

Site number: <b>008</b>	Site name: <b>Blast furnace base, central part of detailed survey area</b>	NYMNPASMR: <b>7843.01</b>
<p>Historical development:          This is the remains of the third furnace, built in 1875 and blown in in July 1876. The furnace, along with the other two on the site, was demolished between January and December 1892 [1].</p>		
<p>Site description:          The remains of the furnace comprise a section of the base of the shaft, standing to a maximum height of 1.60m, and stepping inwards from the base to the upper part. The surviving part of the base is not perfectly circular but is slightly flattened in plan, measuring a maximum of c.5.6m north-south by c.6.0m east-west. It is built of segmental refractory bricks (average dimensions 360mm by 160mm by (160mm?)); no remains of either tuyere openings or the tapping hole were visible. In section, the walls of the shaft appear to be at least four bricks deep, suggesting that they were slightly thicker than those of the original furnaces. This furnace is the only one of the three (see Sites 6 and 7) to retain any substantial remains above ground, and it is therefore likely that further remains of the base survive just beneath the ground surface [2].</p>		
<p>References:          [1] Chapman, S 2002 <i>Grosmont and its Mines: a Short History of Ironstone Mining around Grosmont</i>, 53          [2] Shaun Richardson EDAS site visit, 13/3/07</p>		



Site number: <b>009</b>	Site name: <b>Railway cutting, north-east and central part of detailed survey area</b>	NYMNPAs SMR: <b>7843</b>
<p>Historical development:</p> <p>A railway line is shown on this general alignment on the amended 1853 OS 6" map. At the point where it left the main W&amp;P line, it was formed by two parallel tracks. These both curved around south-west for a short distance, before the north track turned directly west (see Site 11). It had a number of sub-branches, eventually passing beneath another line and terminating at a long rectangular building near the east side of the complex. The south track continued to the south-west, apparently to the site of the steam lift (Site 2), before crossing the road to Grosmont Bridge and eventually joining the NYC line [1]. By 1893 the north track had been taken up, and only the south track remained, apparently following a similar route to that shown on the earlier map [2]. The south track was still present in 1913, although it appears to have been slightly re-aligned and recut since 1893; it ran along the north edge of an earthwork cutting, the first time such a feature is shown [3]. By 1952, only the northern section of the south track, situated within the cutting, remained [4]. It was finally taken up in 1954 [5].</p>		
<p>Site description:</p> <p>The cutting survives as an earthwork in the north-east and central part of the survey area. At its north-east end, where it leaves the restored W&amp;P line, the cutting is represented by a linear depression, c.12m wide at the base. The south side comprises a 0.50m high scarp, which has been somewhat disturbed by modern metalling of the former track bed to make it suitable for use by vehicles. This has had the effect of raising the base of the cutting; the actual former ground surface may be represented by a steep-sided gully, up to 1.2m deep, running along the bottom of the north side beyond a post and wire fence. As the cutting runs south-west, it becomes better defined; the south side stands up to 1.60m in height, whilst the north side is slightly higher at 1.80m, and the base of cutting is c.5m wide. Both sides are steeply sloping and appear to contain a high proportion of stone rubble/slag. Approximately mid-way along the cutting, earthworks probably representing the former north track shown on the amended 1853 map are visible (see Site 11). The fact that these are set substantially higher than the base of the cutting, combined with the cutting first being shown in 1913, suggests that it does not represent the parallel tracks on the early map but that it was re-cut in the early 20th century as part of the slag processing on site. The sides of the cutting become less prominent towards its south-west end, eventually fading out altogether and disturbed by a track, although part of the alignment of the south branch may be visible near to the former hoist (Site 2) [6].</p>		
<p>References:</p> <p>[1] OS amended 1853 6" to 1 mile map sheet 45          [2] OS 1893 25" to 1 mile map sheet 45/4          [3] OS 1913 25" to 1 mile map sheet 45/4          [4] OS 1952 6" to 1 mile map sheet 45NE          [5] Rounthwaite, T E 1997 <i>The Ironstone Mines and Railways of Cleveland and Rosedale</i>, 31          [6] Shaun Richardson EDAS site visit, 13/3/07</p>		

Site number: <b>010</b>	Site name: <b>Earthworks, north-east part of detailed survey area</b>	NYMNPASMR: <b>7843</b>
<p>Historical development:</p> <p>A railway track is shown leaving the main W&amp;P line in this general position on the amended 1853 OS 6" map, curving south-west to join another track and then following the line of the southern boundary wall of the ironworks site, eventually terminating south of the boiler house complex [1]. No track is shown on the 1864 plan [2]. By 1893 the alignment of the track appears to have changed slightly [3]. By 1913 it had largely been taken up, only a short section of the north end remaining. Its former course is partly indicated by a dashed line adjacent to the ironworks' boundary wall, whilst a further sub-rectangular area is indicated by dashed lines to the north, although it is not clear what these represent [4].</p>		
<p>Site description:</p> <p>The most-prominent earthwork within this area is a steep east-facing scarp, up 1.60m high and perhaps representing part of a cutting for the railway track shown here on historic maps. Between the scarp and the main cutting (Site 9) running through the site, there is a linear bank, only 0.70m wide and 0.30m high, containing a high proportion of stone rubble. The bank has a shallow linear depression running parallel to the north side. The feature may represent a former boundary line, perhaps a collapsed field wall, or it may be associated with the dashed lines marked in this approximate area in 1913. The curving stone wall forming the eastern boundary of the ironworks site is partly obscured by dumping from the adjacent railway line in this area [5].</p>		
<p>References:</p> <p>[1] OS amended 1853 6" to 1 mile map sheet 45          [2] 1864 plan of the Grosmont ironworks          [3] OS 1893 25" to 1 mile map sheet 45/4          [4] OS 1913 25" to 1 mile map sheet 45/4          [5] Shaun Richardson EDAS site visit, 13/3/07</p>		

Site number: 011	Site name: Former railway track, north part of detailed survey area	NYMNPAs SMR: 7843
<p>Historical development:</p> <p>A railway line is shown on this general alignment on the amended 1853 OS 6" map. At the point where it left the main W&amp;P line, it was formed by two parallel tracks. These both curved around south-west for a short distance, before the north track turned westward (see Site 11). It had a number of sub-branches, eventually passing beneath another line and terminating at a long rectangular building on the west side of the site. The south track continued south-west, apparently to the site of the steam hoist (see Site 9). By 1893 the north track had been taken up, and appears not to have been subsequently re-instated [2].</p>		
<p>Site description:</p> <p>The remains of the railway track lie on the north side of the cutting (Site 9) crossing the north part of the survey area. They first become visible to the south of a footpath, where a relatively well-defined curvilinear south-facing scarp, standing 0.50m high, can be traced running to the east. It eventually merges with a spread bank positioned along the east side of a sub-rectangular area, partly enclosed by banks of similar form [3].</p>		
<p>References:</p> <p>[1] OS amended 1853 6" to 1 mile map sheet 45          [2] OS 1893 25" to 1 mile map sheet 45/4          [3] Shaun Richardson EDAS site visit, 13/3/07</p>		

Site number: <b>012</b>	Site name: <b>Possible ruined structure, north edge of detailed survey area</b>	NYMNPA SMR: <b>7843</b>
Historical development: A small isolated structure is shown in this approximate area in 1893 [1] but it had gone by 1913 [2].		
Site description: The possible ruined structure is represented by a spread of low earthworks (up to 0.80m in height) covering a sub-rectangular area measuring some 14m long (north-south) by 8m wide (east-west); the bank forming the east side of the spread is relatively sharply defined. The south end of the earthworks has been truncated by a steep south-west facing scarp, standing up to 1.20m in height. This scarp runs south across a footpath and then angles sharply to the south-west, passing a c.1m high sub-circular mound before fading from view. It is difficult to see whether these earthworks represent the remain of a building – more likely earthworks lie just to the north (see Site 13) [3].		
References: [1] OS 1893 25" to 1 mile map sheet 45/4 [2] OS 1913 25" to 1 mile map sheet 45/4 [3] Shaun Richardson EDAS site visit, 13/3/07		

Site number: <b>013</b>	Site name: <b>Possible ruined structure, north edge of detailed survey area</b>	NYMNPA SMR: <b>7843</b>
Historical development: A small isolated structure is shown in this approximate area in 1893 [1] but it had gone by 1913 [2].		
Site description: The possible ruined structure is represented by a spread of low earthworks (up to 0.50m in height) covering a sub-oval area c.9m across; all contain a high proportion of brick rubble. Within the general spread, there are several better defined earthworks that might represent former wall lines or returns. The presence of the brick rubble suggests that these earthworks are more likely to be the site of the building shown in 1893 rather than others (Site 12) slightly further to the south-west [3].		
References: [1] OS 1893 25" to 1 mile map sheet 45/4 [2] OS 1913 25" to 1 mile map sheet 45/4 [3] Shaun Richardson EDAS site visit, 13/3/07		

Site number: 014	Site name: Hollow/disturbance, south-west corner of walkover area	NYMNPA SMR:
<p>Historical development:</p> <p>Nothing is shown in this area on the amended 1853 OS 6" map or the 1864 plan [1] [2]. By 1893, it was partly occupied by an L-shaped range of buildings, built to the north of the former boiler/engine house complex (see Site 3) and apparently shown on an undated engraving made after c.1875 [3]. The west end of the range projected south, towards a scarp with a trackway running along the base, giving access to the Grosmont bridge road; a railway line also terminated in this approximate area (see Site 10) [4]. The railway line had been taken up by 1913, but otherwise the area remained much the same as shown in 1893 [5]. By 1952, the building forming the west end of the L-shaped range had been demolished [6].</p>		
<p>Site description:</p> <p>This part of the complex is now formed by a large sub-rectangular depression adjacent to the Grosmont Bridge road, with near vertical scarps to two sides. A tarmaced footpath still leaves the main road in the approximate position of the trackway shown in 1893 but the scarp beneath which the latter ran has been massively enlarged since 1913, covering an area some 50m long (east-west) by 25m wide (north-south). The scarp on the northern side is near vertical and stands c.2m high. There is much brick (including some refractory material) and stone debris eroding out of the scarp, with the remains of timber posts in one place, driven into the ground to retain the scarp behind. The scarp on the south-east side is also near vertical, and formed of blast furnace slag tipped from north-west to south-east, some of it whilst apparently still quite hot; it may have been either tipped from the railway shown here in 1893, or perhaps tipped to form its base. The only trace of the L-shaped range to survive appears to be a small concrete and brick base adjacent to the former boiler/engine house chimney (see Site 1) [7].</p>		
<p>References:</p> <p>[1] OS amended 1853 6" to 1 mile map sheet 45          [2] 1864 plan of the Grosmont ironworks          [3] Whitworth, A 2006 <i>Grosmont: A Brief History</i>, 72          [4] OS 1893 25" to 1 mile map sheet 45/4          [5] OS 1913 25" to 1 mile map sheet 45/4          [6] OS 1952 6" to 1 mile map sheet 45NE          [7] Shaun Richardson EDAS site visit, 21/5/07</p>		

Site number: 015	Site name: Railway line and bridge, south-west corner of walkover area	NYMNPASMR:
<p>Historical development:</p> <p>A railway line is shown on the amended 1853 OS 6" map, leaving the W&amp;P line and curving around to the south-west, north of the ironworks (see Site 6). To the west of a steam lift (see Site 2), a number of tracks appear to merge into a single line, and continue south-west, crossing over the road to Grosmont Bridge and then joining the NYC line [1]. The lines are not shown on the 1864 plan, although "siding to works" is depicted [2]. By 1893, the system described above had been reduced to a single line and a small building had appeared close to the east side of the road bridge [3]. The road bridge may have been reduced in width by 1913, whilst the building previously shown in 1893 had been demolished [4]. The bridge remained in situ in 1961-62 and was equipped with NER rails [5].</p>		
<p>Site description:</p> <p>The former route of the track can be seen as a flattened area running along the top of the steep north-facing scarp adjacent to the steam hoist (Site 2). It is then disturbed by the modern vehicular access in the upper car park but recommences as a similar feature to the south-west, running through a wooded area. No trace of any associated structures survives above ground, although a 0.30m deep covering of tarmac is eroding out of the south side of this area into a steep-sided hollow (Site 14). Little remains of the former bridge over the Grosmont Bridge road. The east abutment has disappeared completely, although part of the west abutment still survives. It is 6m wide, stands a maximum of 2.15m high and is built of coursed squared large sandstone blocks with prominent herringbone tooling; a partly collapsed brick and stone roadside wall runs south-east from the abutment, whilst the former track line follows the top of a substantial north-facing scarp above the pavilion of Grosmont Cricket Club [6].</p>		
<p>References:</p> <p>[1] OS amended 1853 6" to 1 mile map sheet 45          [2] 1864 plan of the Grosmont ironworks          [3] OS 1893 25" to 1 mile map sheet 45/4          [4] OS 1913 25" to 1 mile map sheet 45/4          [5] Rounthwaite, T E 1997 <i>The Ironstone Mines and Railways of Cleveland and Rosedale</i>, 31          [6] Shaun Richardson EDAS site visit, 21/5/07</p>		

Site number: <b>016</b>	Site name: <b>Possible ruined structure, east side of walkover area</b>	NYMNPA SMR:
<p>Historical development:</p> <p>A structure may be shown in this approximate position on the amended 1853 6" map but this is not clear [1]; a similar situation occurs on the 1893 25" map [2]. By 1913, the site fell within an irregularly shaped area denoted by a dashed line, itself set within an enclosed area with a stone marked at the north-west corner [3].</p>		
<p>Site description:</p> <p>The site is represented by a sub-rectangular earthwork, located close to the north-west corner of a fenced allotment area. The earthwork is formed by low spread banks, standing up to c.1m high and apparently containing a high proportion of red handmade brick rubble, perhaps the remains of a structure some 4m long (north-south) by 3m wide (east-west). The earthwork stands on a north-facing scarp and there is further disturbed ground to the north. A low north-facing scarp, c.1m high, runs west from the earthwork; it appears to have either a high slag content or to be built from slag blocks. It may be aligned on a gap in the major north-west facing scarp which separates the lower and upper car park areas [4].</p>		
<p>References:</p> <p>[1] OS amended 1853 6" to 1 mile map sheet 45          [2] OS 1893 25" to 1 mile map sheet 45/4          [3] OS 1913 25" to 1 mile map sheet 45/4          [4] Shaun Richardson EDAS site visit, 21/5/07</p>		



Site number: <b>017</b>	Site name: Linear depressions, east part of walkover area	NYMNPAs SMR:
<p>Historical development:</p> <p>Nothing is shown in this area on the amended 1853 6" map and it seems to lie just east of the main area of slag tipping in 1895 [1] [2]. A dashed line curves through this area, following an irregular course, in 1913 [3].</p>		
<p>Site description:</p> <p>The feature is represented by two conjoined linear depressions, each up to c.5m wide and c.1.20m deep, situated to the immediate west of a footpath; both have much slag in their steeply sloping sides. The southern depression has a spread bank containing a high proportion of ash running parallel to its east side. To the east of the footpath, there is large sub-circular depression, with an uneven base and poorly defined banks and mounds incorporated into its edge. Together, these features cover an area at least c.50m square [4].</p>		
<p>References:</p> <p>[1] OS amended 1853 6" to 1 mile map sheet 45          [2] OS 1893 25" to 1 mile map sheet 45/4          [3] OS 1913 25" to 1 mile map sheet 45/4          [4] Shaun Richardson EDAS site visit, 21/5/07</p>		

Site number: 018	Site name: Ruined buildings, north-east corner of walkover area	NYMNPASMR:
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Historical development:

No buildings appear to be present here on the amended 1853 6" map [1]. Chapman notes that after Messrs Bagnall of Grosmont Ironworks had purchased Mrs Mary Clark's land east of the railway in 1863, they must have erected the "prominent girder bridge" here; mining tubs filled with ironstone from the adjacent mine appear to have tipped into railway wagons in a siding, which then took the ironstone into the ironworks. Waste shale from the mine was taken across the bridge and tipped in the area to the north; the bridge is thought to have been in use between c.1870 and 1890 [2]. A lithograph of c.1874 clearly shows the bridge and also what is described as the "east" building below; this appears to have a hipped roof, with a number of smaller structures attached to the east side [3].

By 1893, the ironstone mines on the east side of the W&P line were disused, and there was no longer a railway crossing the bridge over the main line. To the west of the bridge, there was a wide embankment running westward towards two bridges over the river Esk (Sites 19 and 20). A rectangular building stood on the top of the east end of the embankment, with a short section of railway leaving the north side and running onto the large mine waste spoil heap. To the south of the embankment, there were two further buildings. Of these, the rectangular west building is slightly the larger and has a number of smaller structures attached to the north end. The east building is also rectangular, and has a smaller building or yard attached to the north end [4].

Some 20 years later, in 1913, the railway bridge over the W&P line was still present, as was the adjacent embankment, but the building shown at the last's east end in 1893 had gone. A wall or boundary ran across the top of the embankment as far as the river, suggesting that the area to the north where mine waste had been tipped was now under separate ownership. The two buildings to the south of the embankment remained and, with minor alterations, were much as shown in 1893 [5]. There were still present in 1952, the eastern building having been widened [6].

Site description:

Of the two buildings shown to the south of the embankment in 1893, 1913 and 1952, slightly more remains of the east than the west, although both have largely disappeared above ground. The first comprises an isolated and substantial mass concrete base surviving within the undergrowth. The base is 3.13m long (north-south) by 2.12m wide (east-west) and stands 2.20m in height; it is built of roughly cast concrete with a high percentage of crushed slag and has shuttering marks to all four sides. The base is overgrown with ivy and the upper surface could not be examined. Some 10m to the north, there is another concrete base of a similar form and composition but covering a slightly larger area. This has the remains of a ruined brick wall on its north side, presumably that formerly enclosing the yard area shown here in 1893 and 1913. There is a pit, reminiscent of a vehicle inspection pit, to the east of the former yard area. The pit is 2.92m long (north-south) by 0.90m wide (east-west) and is c.1m deep, although the base is partly backfilled. The sides of the pit are built of machine-made red bricks (average dimensions 240mm by 110mm by 80mm) with a shallow frog to the upper surface and set with a cement mortar. To the west of the former yard area, a low south-facing scarp with a high slag content is visible running westwards for some distance into the woods.

The above ground remains of the west building comprise a single concrete base; it is difficult, on current evidence, to determine whether the base fell within the main building or the small associated structure shown at its north end in 1893. The base is 2.95m long (east-west) by 2.50m wide (north-south), and stands 1.20m in height. It is set on a bed of machine made bricks, and, like the other bases described above, is built of concrete containing a very high proportion of crushed slag. There are original central openings in both short walls. That to the west is wider, and leads into the interior of the base; a pair of substantial iron bolts are set into the sides of the interior a short distance in from the opening. The interior walls then curve inwards, so that the opening in the east end is quite narrow to the exterior [7].

References:

[1] OS amended 1853 6" to 1 mile map sheet 45

[2] Chapman, S 2002 *Grosmont and its Mines: a Short History of Ironstone Mining around Grosmont*, 28, 42 & 61

- [3] Chapman, S 2002 *Grosmont and its Mines: a Short History of Ironstone Mining around Grosmont*, 61
- [4] OS 1893 25" to 1 mile map sheet 45/4
- [5] OS 1913 25" to 1 mile map sheet 45/4
- [6] OS 1952 6" to 1 mile map sheet 45NE
- [7] Shaun Richardson EDAS site visit, 21/5/07

Site number: 019	Site name: Bridge abutments, embankment and bridge pier, north end of walkover area	NYMNPAs SMR:
<p>Historical development:</p> <p>A field boundary is shown on this approximate line on the amended 1853 6" map [1]. Chapman notes that after Messrs Bagnall of Grosmont Ironworks had purchased Mrs Mary Clark's land east of the railway in 1863, they must have erected the "prominent girder bridge" (hereafter referred to as the W&amp;P bridge) here over the W&amp;P line; mining tubs filled with ironstone from the adjacent mine appear to have tipped at staiths on the west side of the W&amp;P line, running down wooden chutes into standard gauge railway wagons in a siding which then took the ironstone into the ironworks. Waste shale from the mine was taken across the bridge and tipped in the area to the north; the bridge is believed to have been in use between c.1870 and 1890, and is clearly visible on a lithograph of c.1874 [2]. Rounthwaite, writing in 1961-62, produced a plan titled "Grosmont in 1880" which shows two bridges crossing the river Esk at a point west of the W&amp;P bridge, with "industrial lines" leading to an area of slag tipping on the west side of the river [3].</p> <p>By 1893, the ironstone mines on the east side of the W&amp;P line were disused, and there was no longer a railway crossing the bridge over the main line, although the bridge itself remained. To the west of the W&amp;P bridge, there was a wide embankment running westward towards two bridges over the river Esk (see also Site 20). A rectangular building stood on the top of the east end of the embankment, with a short section of railway leaving the north side and running onto the large mine waste spoil heap. To the south of the embankment, there were two further buildings (see Site 18). At the west end of the embankment, the northern of the two bridges over the Esk crossed the river at an angle, although it carried neither a railway nor a tramway by this date. The bridge lead to the north part of the large area of slag tipping on the north side of the Esk; the position of revetment walls at the west end of the embankment suggest that a railway line ran out from the ironworks, curved around to the north-west, ascended a slope between the revetments and then crossed the bridge to tip slag over the river [4]. The Esk bridge had gone by 1913, and the slag banks to the north of the Esk were being re-worked using the southern bridge. However the embankment and W&amp;P bridge remained, although a wall line had been built along the top for its entire length, suggesting the land to the north was now in separate ownership [5]. The site is similarly depicted in 1952 [6]. There were plans to re-use the W&amp;P bridge over the main railway line when ironstone mining re-commenced in the area between c.1906 and 1905, although this does not appear to have happened. It was described as being due for demolition in 2002 [7] and this has subsequently taken place. The concrete pier surviving today on the site of the Esk bridge (see below) was described by Chapman in 2002 as "another remnant apparently of the slag removal days" [8].</p>		
<p>Site description:</p> <p>The features are described from east to west. The bridge shown crossing the W&amp;P line from the brick and tile works in 1893 and 1913 was demolished after 2002 ; however, the coursed squared sandstone abutments still survive. Similarly, the building depicted at the east end of the embankment (i.e. at the west end of the bridge) in 1893 has also left little trace, although the embankment itself survives as a prominent if densely overgrown earthwork. It is curvilinear in plan, c.80m long (east-west) and stands up to 3m in height. Towards the west end, the flat top is only c.1m wide, whilst the sides slope very steeply downwards, especially to the north, and contain a high proportion of shaley waste; the overall form of the embankment is similar to that of a spoil heap. A short distance to the north-west of the west end of the embankment, there is a large sub-circular steep-sided hollow, c.3m deep in the centre, with a bank of spoil or upcast above the eastern side. It is possible that the hollow was created by the grubbing out or demolition of a large stone or concrete pier, similar to those which survive within the adjacent river. The east bank of the river retains the remains of a stone and concrete abutment, some 4m high, whilst in the centre of the river, there is a c.10m tall concrete bridge pier. The pier is approximately hexagonal in plan, with sides tapering gently inwards towards the top; wrought-iron or steel strapwork survives around the upper part. The height of the pier suggests that it may once have carried a tramway/railway line leading the west end of the embankment and being carried across the river on a number of similar structures, of which this is the sole survivor [9].</p>		
<p>References:</p> <p>[1] OS amended 1853 6" to 1 mile map sheet 45</p>		

- [2] Chapman, S 2002 *Grosmont and its Mines: a Short History of Ironstone Mining around Grosmont*, 28, 42 & 61
- [3] Rounthwaite, T E 1997 *The Ironstone Mines and Railways of Cleveland and Rosedale*, 31
- [4] OS 1893 25" to 1 mile map sheet 45/4
- [5] OS 1913 25" to 1 mile map sheet 45/4
- [6] OS 1952 6" to 1 mile map sheet 45NE
- [7] Chapman, S 2002 *Grosmont and its Mines: a Short History of Ironstone Mining around Grosmont*, 59, 61
- [8] Chapman, S 2002 *Grosmont and its Mines: a Short History of Ironstone Mining around Grosmont*, 61
- [9] Shaun Richardson EDAS site visit, 21/5/07

Site number: 020	Site name: Tramway and bridge, north part of walkover area	NYMNPA SMR:
<p>Historical development:</p> <p>Nothing is shown here on the amended 1853 6" map [1]. In c.1864, Messrs Bagnall of Grosmont Ironworks acquired land from a Mr Wilkinson on the north side of the river Esk, sinking three new ironstone mines (Grosmont Hags or New Mine) in the vicinity of Priory Farm. Ironstone was carried from the mines south-eastwards down an inclined tramway on an embankment, crossing the Esk on a bridge and then rising again in a southern curve to reach the ironworks [2]. Rounthwaite, originally writing in 1961-62, produced a plan titled "Grosmont in 1880" which shows two bridges crossing the river Esk here, with "industrial lines" leading to an area of slag tipping on the west side of the river [3]. In 1893, two bridges are also marked crossing the river here (see also Site 19). The inclined tramway formerly leading to the south bridge can be seen to the north of the Esk, running down from the mines at Priory Farm. However, it appears to have been largely covered over by later slag tipping from the ironworks and so presumably the bridge was also disused at this date; there is no indication on the map that the two were linked by a tunnel. East of the bridge, two parallel walls project from beneath revetment walls almost certainly formerly supporting a railway leading to the north Esk bridge (Site 19), although again, there is no indication of a tunnel here [4]. In the early 1900s, Rounthwaite suggests that a standard gauge track was laid down across the bridge to allow extraction of slag from the waste tip on the west side of the river [5]. By 1913, a double tramway line is marked crossing the south bridge from the west bank, where it was indeed being used to mine the slag tipping and then running south-eastward towards a two small conjoined buildings adjacent to the railway line [6]. By 1952, the bridge is marked as a footbridge and although "Tramway" is shown, it appears to have been taken up [7].</p>		
<p>Site description:</p> <p>The bridge across the Esk is supported on stone abutments and two stone piers. The piers stand c.5m tall and are built of rock-faced ashlar. They rise from substantial cut-waters surmounted by chamfered stonework; the chamfers act as plinths for the upper parts of the pier, which taper inwards as they rise. The upper c.0.50m of each pier is raised in machine-made red brick. Rolled steel I-section girders run between the piers and the abutments, supporting the sleepers forming the trackbed; all the rails have been taken up.</p> <p>All traces of the spoil heaps shown on historic maps on the north and west bank of the river have been removed. However, the former tramway cutting becomes visible a short distance to the east of the bridge, and can be traced south-east for c.40m, sloping gently upwards from west to east. It survives as a linear depression, 2.5m wide at the top, with a 1.60m wide flat base and near vertical sides rising to 1.80m in height. At the west end, the sides are revetted with drystone walls incorporating river cobbles, but to the east, they comprise slag blocks laid to a slightly battered profile. Beyond the cutting, it may be possible to trace former line of the tramway shown in 1913 as a very low north-east facing scarp containing a high proportion of slag [8].</p>		
<p>References:</p> <p>[1] OS amended 1853 6" to 1 mile map sheet 45          [2] Chapman, S 2002 Grosmont and its Mines: a Short History of Ironstone Mining around Grosmont, 29          [3] Rounthwaite, T E 1997 <i>The Ironstone Mines and Railways of Cleveland and Rosedale</i>, 46          [4] OS 1893 25" to 1 mile map sheet 45/4          [5] Rounthwaite, T E 1997 <i>The Ironstone Mines and Railways of Cleveland and Rosedale</i>, 31          [6] OS 1913 25" to 1 mile map sheet 45/4          [7] OS 1952 6" to 1 mile map sheet 45NE          [8] Shaun Richardson EDAS site visit, 21/5/07</p>		

Site number: 021	Site name: Ruined structure, north part of walkover area	NYMNPASMR:
<p>Historical development:</p> <p>In 1895, a rock outcrop forming the east bank of the river Esk is marked in this location, although no structures appear to be shown [1]. By 1913, a boundary had been built around the south end of the outcrop, whilst a structure appears to have been built at its base on the river bank (see Site 22); an angled boundary is shown to the east of the outcrop, above its northern end [2]. It is similarly shown in 1952 [3].</p>		
<p>Site description:</p> <p>The angled boundary shown in 1913 appears to survive as a largely collapsed angle-iron and railing fence. Where the fence returns to the south, its former line is marked by a 0.30m high slag block revetment wall, which can be followed southwards from the return for c.10m to 12m. To the west of the wall, between it and the rock outcrop, there are a series of small ruined structures, or perhaps more likely a single structure with internal divisions. There appears to have been a set of steps leading up from an adjacent footpath at the north end, with the entrance to the building presumably located at this end; the internal walls are built from a mixture of slag blocks and red handmade bricks set with a lime mortar, surviving up to 1m in height. The remnants of box hedging survives along one edge of the steps, whilst there are conifers to the west of the ruined structure and a line of hawthorns to the east. Some distance to the south, the curving boundary marked around the south end of the rock outcrop in 1913 also survives as a ruined angle-iron and railing fence; a cast-iron post with a ball finial adjacent to the river suggest that the railing fence may be a later replacement of an earlier boundary [4].</p>		
<p>References:</p> <p>[1] OS 1895 6" to 1 mile map sheet 45          [2] OS 1913 25" to 1 mile map sheet 45/4          [3] OS 1952 6" to 1 mile map sheet 45NE          [4] Shaun Richardson EDAS site visit, 21/5/07</p>		

Site number: <b>022</b>	Site name: <b>Wharf structure, east bank of river Esk</b>	NYMNPA SMR:
<p>Historical development:</p> <p>A structure is marked here in 1913, below a rock outcrop [1]. The wharf location has the name Salmon's Leap and is apparently a favoured spot for private fishing [2].</p>		
<p>Site description:</p> <p>The wharf is accessed via a flight of concrete steps leading down from a footpath above at the north end. The wharf structure itself is built of concrete throughout, and is c.50m long, 2m wide and 1.2m in height; it was in use by a private fishing club at the time of the survey. At the northern end, a second flight of steps leads down to a narrow landing platform. Approximately half way along the wharf, the shaley rock outcrop above has been revetted with concrete, and has a crude angle-iron canopy over a low concrete bench. To the south of the canopy, a crude recess c.2m deep has been cut into the shaley rock; it may have a small alcove hollowed into the rear (east) face. The opening into the recess is covered by a crude but substantial concrete and brick frame once fitted with a door. To the south of the wharf, the river bank angles sharply to the south-west and is revetted with sandbanks [3].</p>		
<p>References:</p> <p>[1] OS 1913 25" to 1 mile map sheet 45/4          [2] Chapman, S 2002 <i>Grosmont and its Mines: a Short History of Ironstone Mining around Grosmont</i>, 5          [3] Shaun Richardson EDAS site visit, 21/5/07</p>		



Site number: <b>023</b>	Site name: <b>Area of spoil tipping, north of trackway leading to sewage treatment plant</b>	NYMNPASMR:
<p>Historical development:</p> <p>Spoil tipping from the ironworks had commenced in this area by the time that the amended 1853 6" map was published, with a single tip served by a railway line being marked; the railway line appears to have been carried over another line on a bridge [1]. By 1893, an extensive area of spoil heaps is shown, comprising three long lobes or fingers to the west, with a curving linear depression (probably a former railway/tramway cutting) to the north-east, leading to another spoil heap; no railway or tramway lines are marked in the spoil tipping area at this date [2]. By 1913, a railway line had been relaid, perhaps partly re-using the cutting shown in 1893. Re-working of the slag from the spoil heaps had evidently been underway for some time, as the pattern of tipping had changed markedly over 20 years, particularly in the central and eastern parts of the area [3]. By 1952, virtually all of the spoil heaps shown in 1893 had gone [4].</p>		
<p>Site description:</p> <p>In the intervening period since the last historic map was published, the spoil heaps in this area have been almost completely worked out. A steeply sloping bank, c.3m high and containing a high proportion of slag, has been left in place adjacent to the river, presumably to act partly as a flood defence. Away from the river, in the vicinity of the sewage treatment plant, the area is densely wooded but there appear to no significant surviving earthworks. A north-west facing scarp, standing some 2m to 3m high and containing a high proportion of shale, crosses the east end of the area [5].</p>		
<p>References:</p> <p>[1] OS amended 1853 6" to 1 mile map sheet 45          [2] OS 1893 25" to 1 mile map sheet 45/4          [3] OS 1913 25" to 1 mile map sheet 45/4          [4] OS 1952 6" to 1 mile map sheet 45NE          [5] Shaun Richardson EDAS site visit, 21/5/07</p>		

Site number: <b>024</b>	Site name: <b>Area of spoil tipping, south of trackway leading to sewage treatment plant</b>	NYMNPA SMR:
<p>Historical development:</p> <p>Spoil tipping from the ironworks had commenced in this area by the time that the amended 1853 6" map was published, with a single tip served by a railway line being marked; the railway line appears to have been carried over another line on a bridge. A long rectangular structure is also depicted at the west end of a railway track, close to the Grosmont Bridge road [1]. This structure is also shown on the 1864 plan [2]. By 1893, an extensive area of spoil heaps is shown, comprising three long lobes or fingers to the west, with a curving linear depression (probably a former railway/tramway cutting) to the north-east, leading to another spoil heap; no railway or tramway lines are marked in the spoil tipping area at this date and the structures noted above have been demolished [3]. By 1913, a railway line had been relaid, perhaps partly re-using the cutting shown in 1893. Re-working of the slag from the spoil heaps had evidently been underway for some time, as the pattern of tipping had changed markedly over 20 years, particularly in the central and eastern parts of the area [4]. By 1952, virtually all of the spoil heaps shown in 1893 had gone [5].</p>		
<p>Site description:</p> <p>In the intervening period since the last historic map was published, the spoil heaps in this area have been almost completely worked out and much of it is now occupied by the lower NYMNPA car park. The southern boundary of the area is formed by the steep 5m high north-west facing scarp upon which the upper car park and other remains of the ironworks complex stand. A number of linear earthworks survive in the densely wooded area to the west of the lower car park. They are conjoined, and aligned either east-west or north-south. The longest of the north-south aligned earthworks is formed by an c.2.5m wide bank, standing c.1.4m high and with near vertical sides revetted with slag blocks. Its form is reminiscent of a raised tramway bed, and it may represent one of the last phases of re-working to be undertaken in this area [6].</p>		
<p>References:</p> <p>[1] OS amended 1853 6" to 1 mile map sheet 45          [2] 1864 plan of the Grosmont ironworks          [3] OS 1893 25" to 1 mile map sheet 45/4          [4] OS 1913 25" to 1 mile map sheet 45/4          [5] OS 1952 6" to 1 mile map sheet 45NE          [6] Shaun Richardson EDAS site visit, 21/5/07</p>		

## APPENDIX 2

## DESCRIPTION OF THE NEW IRON WORKS AT GROSMONT.

BY MR. HIRAM C. COULTHARD, OF BLACKBURN.

In the Cleveland iron district, where the Grosmont Iron Works forming the subject of this paper are situated, there are at present 63 blast furnaces in full operation, 17 furnaces not in operation, standing for repairs or other causes, and 11 furnaces in various stages of progress. The Grosmont furnaces have been erected by Messrs. Bagnall, and the general working arrangements for them were made by the manager, Mr. Barnes, and the writer of the present paper; and upon the latter devolved the arrangement of engines and boilers, &c.

Grosmont near the coast of Yorkshire is situated about 7 miles from the port of Whitby, 20 miles from the Durham coalfield, and about the same distance from the lime district of Pickering, whence the supply of lime is derived. Fig. 1, Plate 61, is a general plan of the entire works, which are adjacent to the main line of railway from Whitby to Castleton, joining the North Yorkshire and Cleveland Railway, and thus in connexion with the Newcastle and Durham coal and coke districts. A siding from the main line runs into the works.

These blast furnaces are believed to be constructed on a very efficient and economical plan for the purposes intended. Each furnace is capable of producing 250 tons of pig iron per week, allowing for stoppages on Sunday. Fig. 2, Plate 62, is a vertical section of one furnace, and Fig. 3, Plate 63, shows an enlarged vertical section of the top and bottom of the furnace. Figs. 4 to 8, Plate 64, are transverse sections of the furnace at the tuyeres, tapping hole, and hearth, and through the body of the furnace.

Each furnace measures 18 feet diameter at the boshes, and a total height of 63 feet from ground line to level of charging floor. The foundations were dug out to a depth of about 9 feet, to rock on one side and hard blue clay on the other, the ground sloping in the direction of the dip of the rock. The stone foundations both for the hearth and casing of the furnace are shown in the vertical sections, Figs. 2 and 3, Plates 62 and 63, and consist of ring courses of masonry built on concrete, about 26 feet diameter, each course being bound by a wrought iron ring, 5 inches wide and  $\frac{7}{8}$  inch thick, Fig. 3. In the interior of the uppermost ring course is built the firebrick hearth A, Fig. 3; the blocks of which this is formed are shown in plan and vertical section in Figs. 6 and 7, Plate 64. These blocks are set in ground fireclay in a moist state, special care being taken to secure a perfectly homogeneous mass, as the whole of the superstructure of the furnace and its contents when in working order, weighing about 1200 tons, rest upon this foundation. On the top course of masonry the foundation plates of cast iron, 3 feet 6 inches square and 4 inches thick, are bedded in fireclay, to which are bolted the cast iron columns BB, Fig. 3, 17 inches diameter, for carrying the superstructure. These columns are united at the top by a cast iron ring or cornice C in segments,  $3\frac{1}{2}$  inches thick, each segment having a semicircular snug cast on its under side, which when the work is joined together fits into the top of the column B, thus binding the whole of the segments into one ring.

The entire lining of the furnace inside is of refractory firebrick D, Fig. 3, Plate 63; the furnace is cylindrical on the outside and entirely cased with wrought iron plates E,  $\frac{3}{8}$  inch thick at the bottom of the furnace, and towards the top of the furnace diminished in thickness to  $\frac{5}{16}$  inch. This casing weighs about 30 tons and costs about £400, and is now being generally used in place of the massive stack of masonry formerly used. There are ten cast iron pillars B for carrying the super-structure, placed at a distance of 7 feet apart, except where the tapping hole is situated, where the distance is increased to 10 feet, as seen in Fig. 4, Plate 64. Brackets are cast on these pillars, Fig. 3, for the

purpose of carrying the circular pipes that convey the blast and water round the furnaces for distribution to the various tuyeres. There are five tuyeres to each furnace, one of which is shown in longitudinal section in Fig. 9, Plate 64.

At the top of the furnace a wrought iron plate cornice F is fixed, Fig. 3, Plate 63, forming the charging floor; and the two furnaces are connected by means of two longitudinal wrought iron girders 4 feet and 3 feet deep respectively, the larger one prepared to receive the wrought iron beams that form the roadway of the incline up which the materials for smelting are drawn by means of a pair of fixed horizontal engines. These girders are united by nine intermediate cross girders of wrought iron, and when covered with plates form the roadway of the charging floor, having a screen 3 feet 6 inches high running round for protection.

The throat of the furnace, Fig. 3, Plate 63, is adapted for taking off the waste gas, which is collected in a wrought iron tube G, 5 feet diameter, which extends down the throat of the furnace about 5 feet and is lined inside and cased outside with refractory firebrick 6 inches in thickness. This tube is fixed to and supported by a crown or dome built in the throat of the furnace, of specially moulded lumps of fireclay, supported by six buttresses built of the same material. The crown has six openings formed at the sides for charging purposes, and one opening in the centre, through which the gas passes into the tube G. There is the usual brick chimney at the top of the furnace, with wrought iron swing doors corresponding with the openings in the crown. The gas is conveyed from the furnace top to the boilers, hot-blast stoves, &c., by a wrought iron tube 5 feet 6 inches diameter, large enough to take off the gas from two additional furnaces; and square boxes H, Fig. 1, Plate 61, are fixed at intervals along the tube to allow for expansion. A flap valve I, Fig. 3, Plate 63, opening outwards for cleaning purposes is fixed at the end of the tube over the furnace.

Figs. 10 and 11, Plate 65, show a vertical section and sectional plan of one of the hot-blast stoves. Three of these are built to each furnace, of common brick made on the estate, lined with

refractory firebrick, and externally bound firmly together by wrought iron hoops 4 inches wide and  $\frac{5}{8}$  inch thick, placed at intervals of 3 feet. The stoves are heated by the gas being admitted at the top J, and a small fire is kept on the grate at the bottom for the purpose of ensuring that the gas is always ignited. Four flues K K, Fig. 11, pass away from the bottom of the stove to the main chimney flue L, Fig. 10, which is in connexion with the chimney stack, Fig. 1, of 180 feet height. A simple disc valve J is fixed at the top of the stove where the gas enters, to cut off the supply of gas from the stove at any time. The pipes M, through which the blast passes, consist of ten pairs to each stove, 12 inches diameter, each pair being arched at the top and united at the bottom by connecting foot-boxes, thus forming one continuous course of pipes for the blast to pass along. The blast enters on one side of the oven, and after circulating through the pipes M passes out at the other side into the main pipe N for the service of the tuyeres, as shown by the arrows. A stop valve O serves to cut off the communication of each stove with the blast main, which is 5 feet 6 inches diameter and thus forms also the blast reservoir. The temperature of the blast is from 600° to 700° Fabr., and the quantity blown by each engine is 6000 cubic feet per minute at a pressure of 3 lbs. per square inch. These hot-blast stoves have been found most effective; from the enlarged capacity of the pipes, the blast is much longer in passing through them, and consequently they are not required to be kept at such a destructive heat. The writer understands that these stoves are extensively used in Staffordshire and with the best results.

The blast is supplied by three direct-acting high pressure engines, quick moving, having air cylinders  $57\frac{1}{2}$  inches diameter with a stroke of 3 feet. Fig. 12, Plate 66, is a transverse section of the boiler and engine house. Two engines P are sufficient for the work of two furnaces, a third one being provided in case of emergency. The reason for separate engines being used is that in the case of an accident to the blowing engine, when only one engine is used, the whole of the furnaces are thrown idle; moreover the cost of machinery for two furnaces is much less in these engines,

taking into consideration the expensive nature of the stonework &c. required for the foundation of one large beam engine. The only foundation required for these engines is about 3 feet depth of brickwork, with a framework of timber on which to bolt the foundation plates.

The engine house is of red brick with mouldings of white brick, and presents a good appearance; the roof is formed by the water tank R, Fig. 12, Plate 66, which contains the water supply for the tuyeres, pig beds, &c. In the engine house is fixed a travelling crane S for the convenience of examining any portion of the engines; this is found a most useful appendage. The water supply is derived from the river Esk by two lift pumps having trunk cylinders  $7\frac{1}{4}$  inches diameter. The boilers T, Fig. 12, Plate 66, are five in number, each 73 feet long by 5 feet diameter, of the plain egg-ended form, heated by the waste gas from the blast furnaces. They are suspended by means of cast iron bridges from the top of the boiler seats, and are fed by three donkey engines, all connected to one pipe over the boilers. The steam pressure is 60 lbs. per square inch above the atmosphere.

A steam lift is fixed in the works in the position shown in Fig. 1, Plate 61, for the purpose of raising the minerals from the line of railway to the top of the calcining kilns.

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Mr. SAMPSON LLOYD thought the new ironworks described in the paper were a good illustration of the modern improvements that were now being generally adopted in ironworks. The blast furnaces appeared to be built according to the construction now generally in use; but for taking off the gas from the open top of the furnace a variety of plans had been adopted, and the main peculiarity of the arrangement shown in the drawings appeared to be the use of a wrought iron tube for the purpose, inserted into the top of the furnace and lined inside and outside with firebrick. That plan had



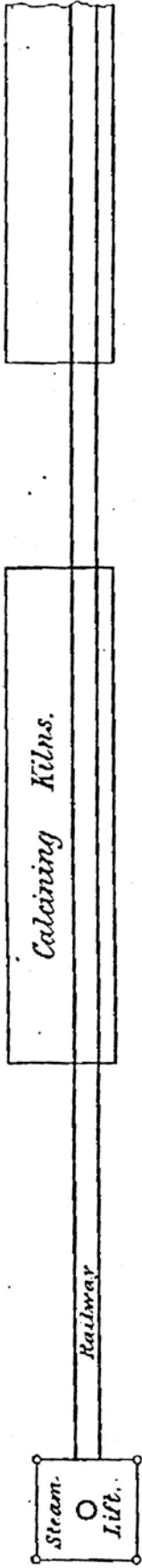
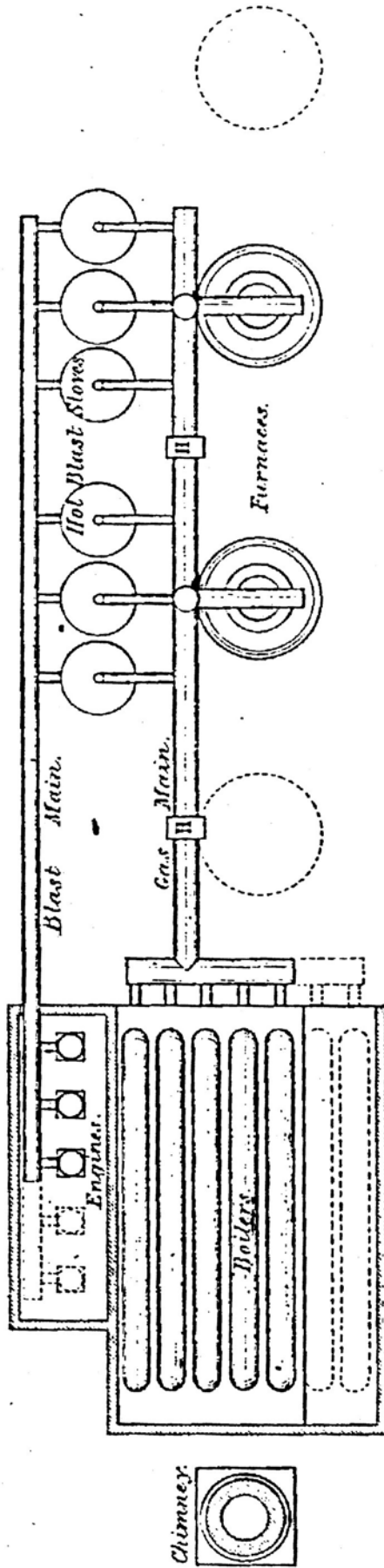


Fig. 1. General Plan of Works.



Scale 1/560<sup>th</sup>.

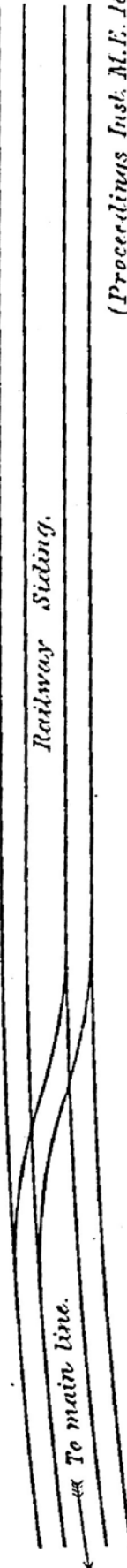
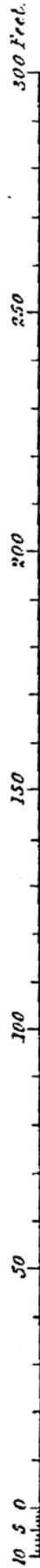
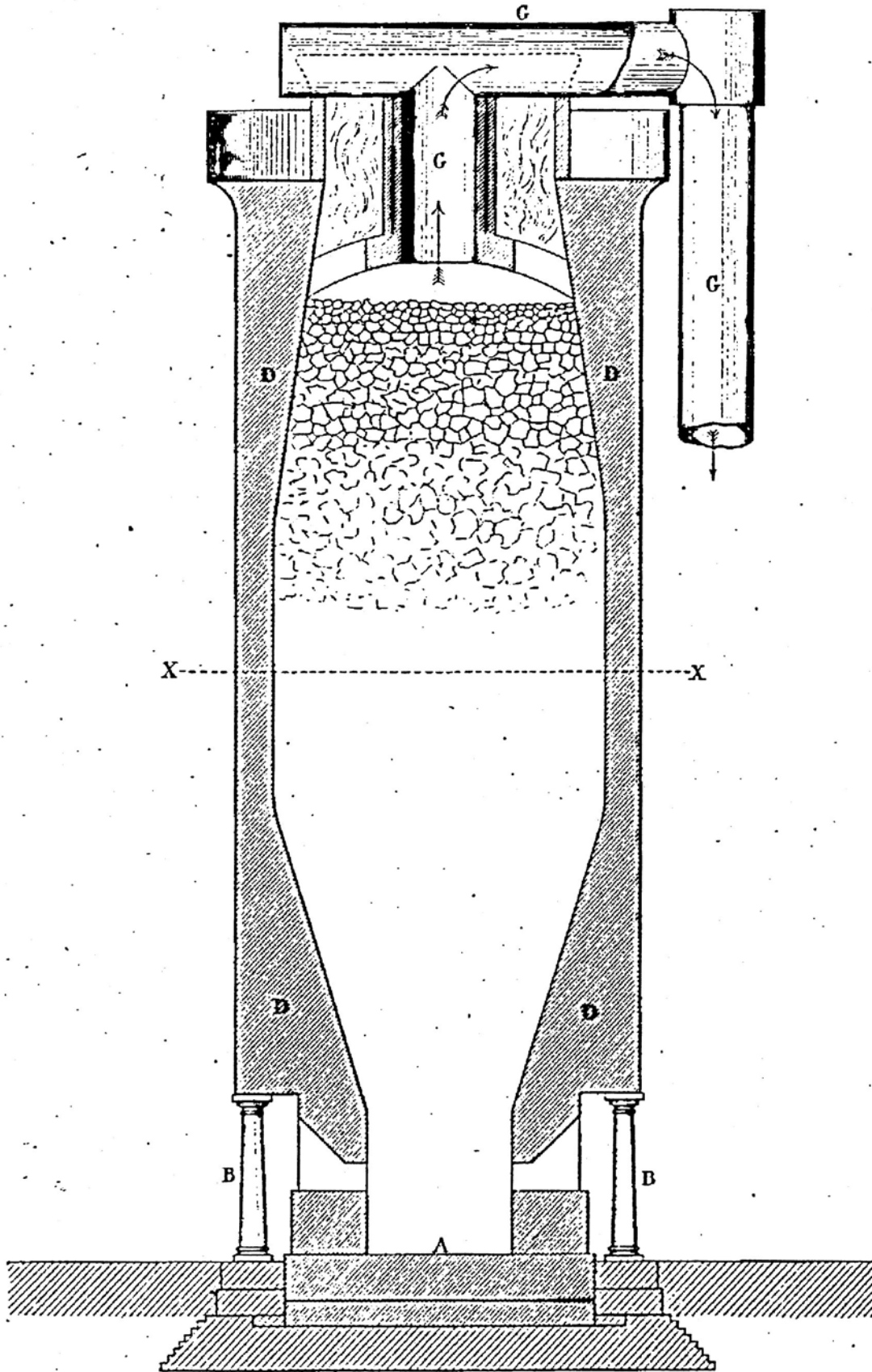


Fig 2. Vertical Section of Blast Furnace.

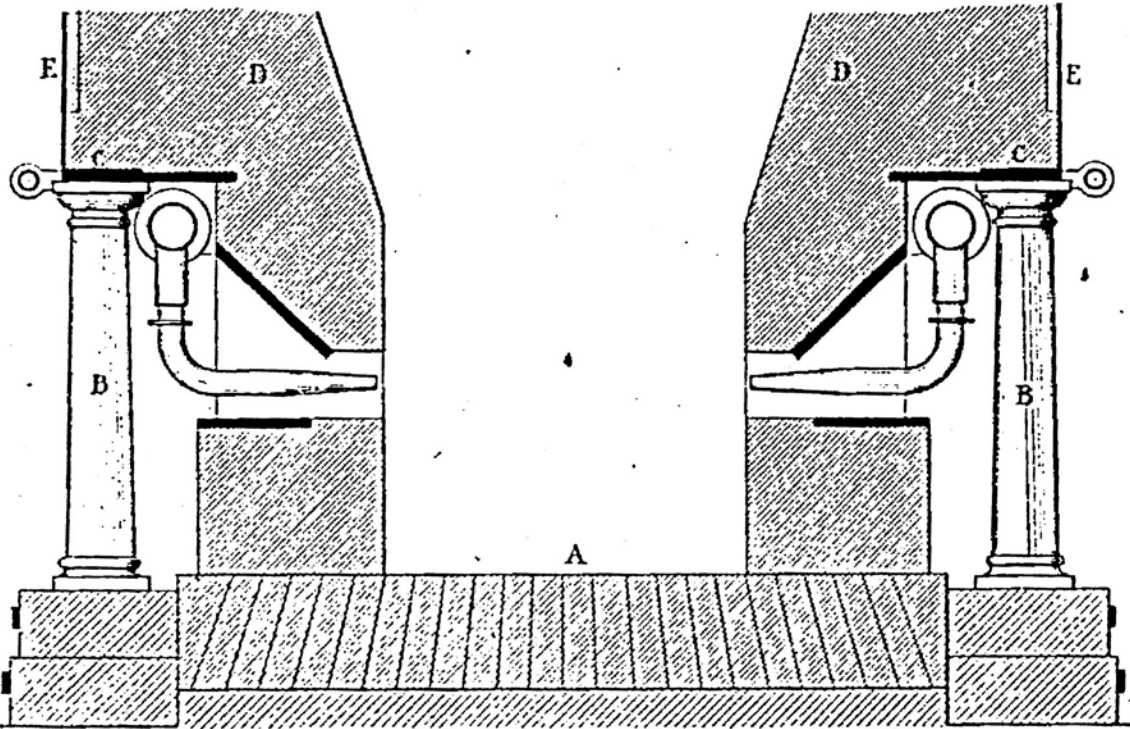
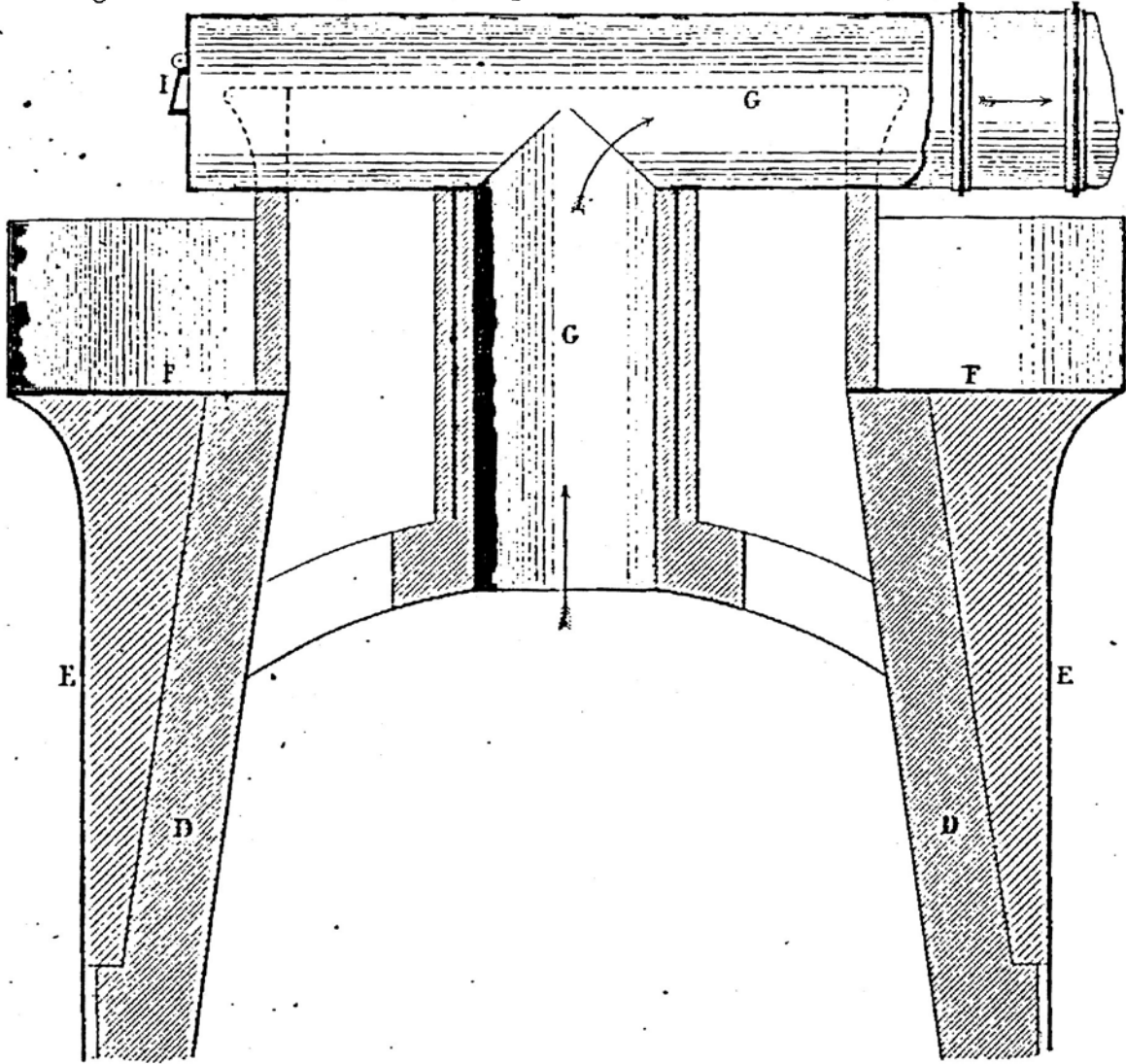


(Proceedings Inst. M.E. 1863. Page 225)

Scale  $\frac{7}{160}$  in.

0 10 20 30 40 Feet.

Fig. 3. Vertical Section of top and bottom of Blast Furnace.



(Proceedings Inst. M.E. 1863. Page 225)

Scale  $\frac{1}{70}$ <sup>th</sup>.

20 Feet.

Transverse Sections of Blast Furnace.

Fig. 4. At Tuyeres.

Fig. 8. At XX (Fig. 2)

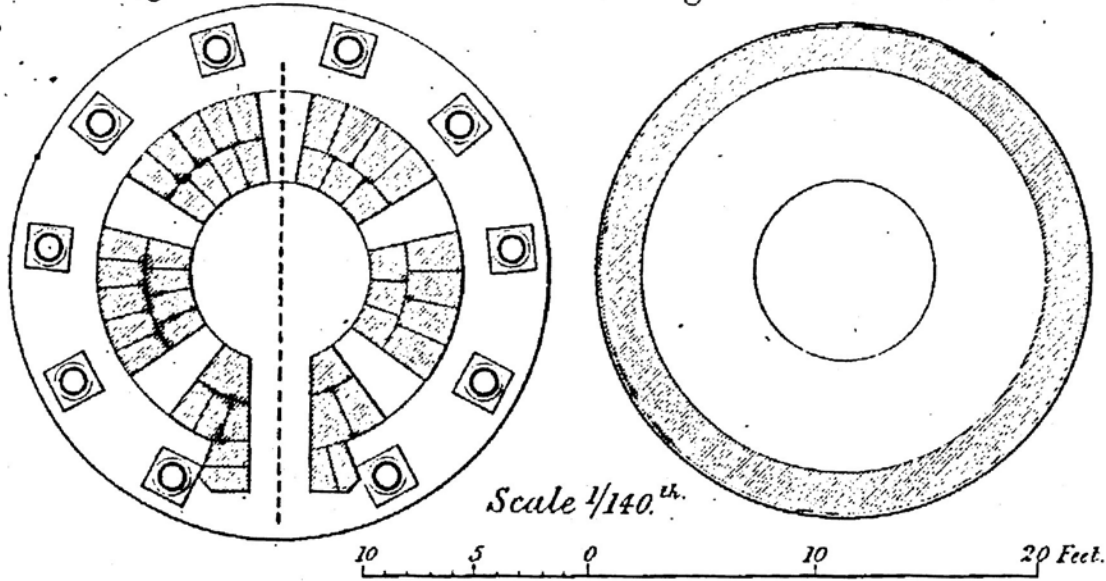


Fig. 5. At Tapping Hole.

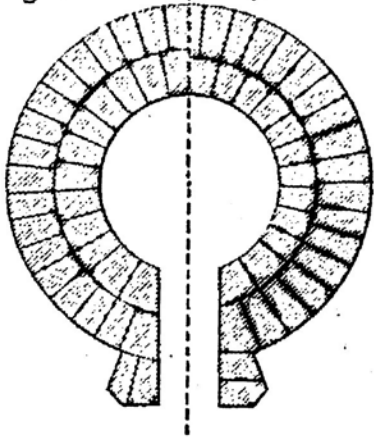


Fig. 9. Longitudinal Section of Tuyere Pipe.

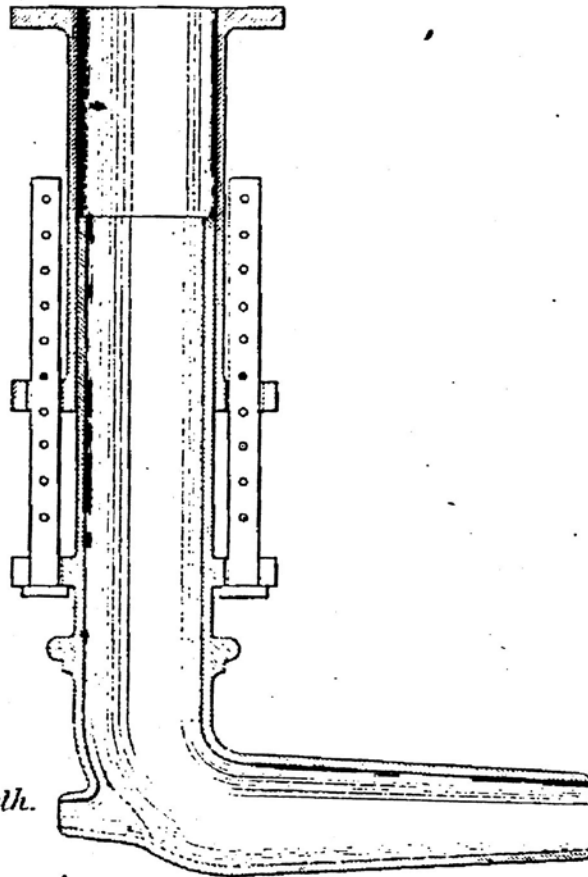


Fig. 6. At Hearth.

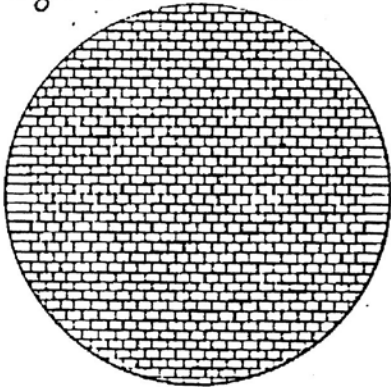
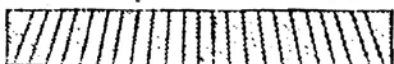


Fig. 7. Vertical Section of Hearth.



Scale  $\frac{1}{140}^{\text{th}}$ .

Scale  $\frac{1}{12}^{\text{th}}$ .

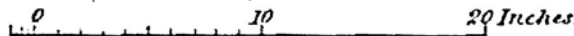


Fig 10.  
Vertical  
Section.

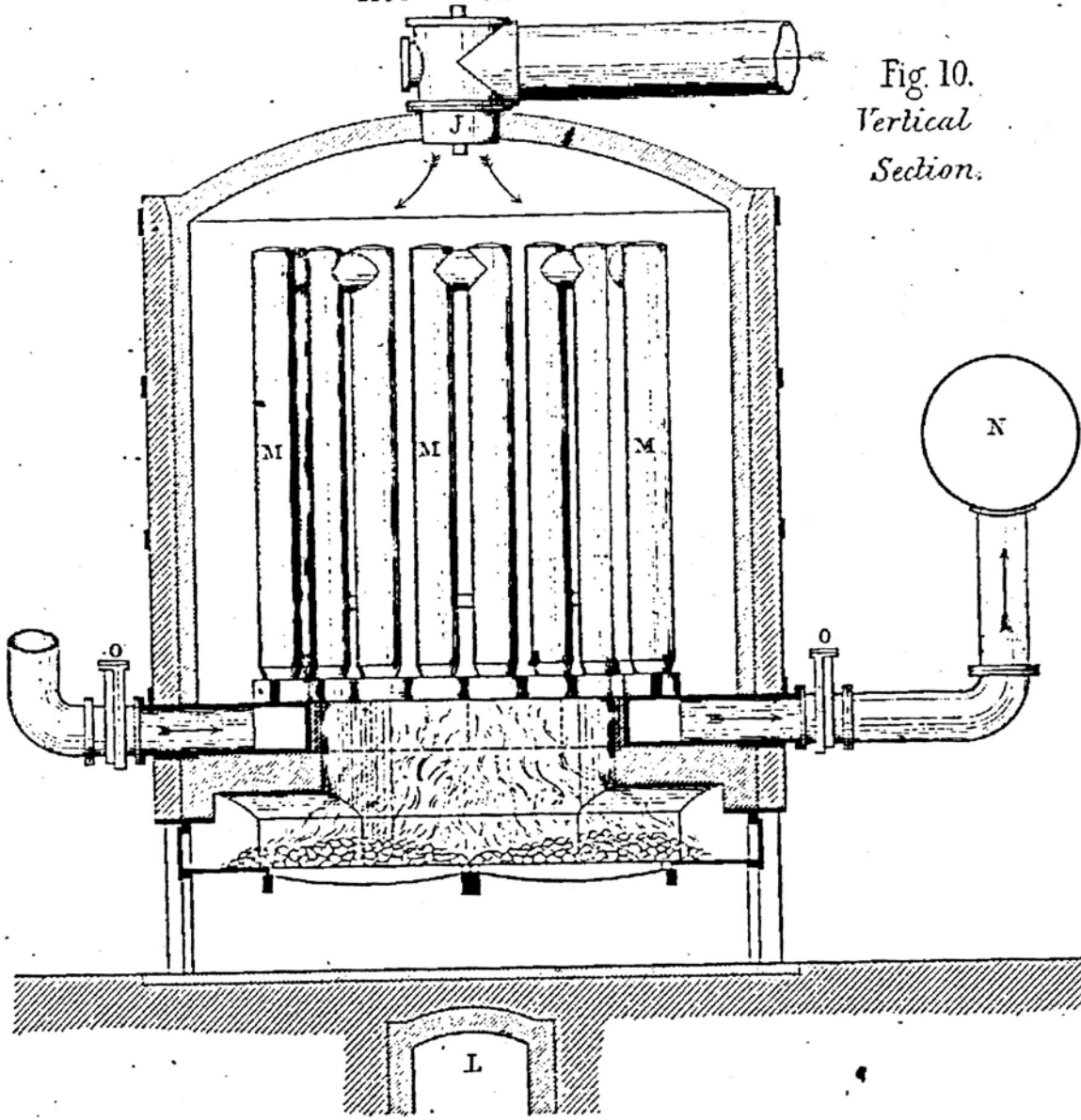
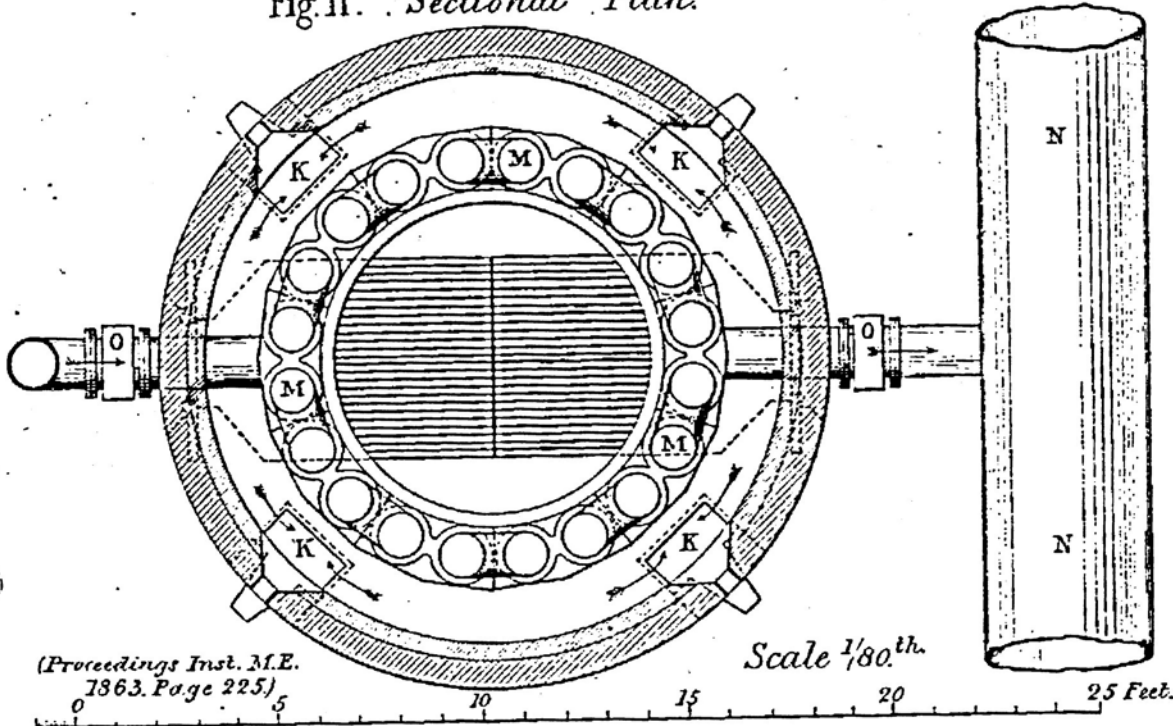
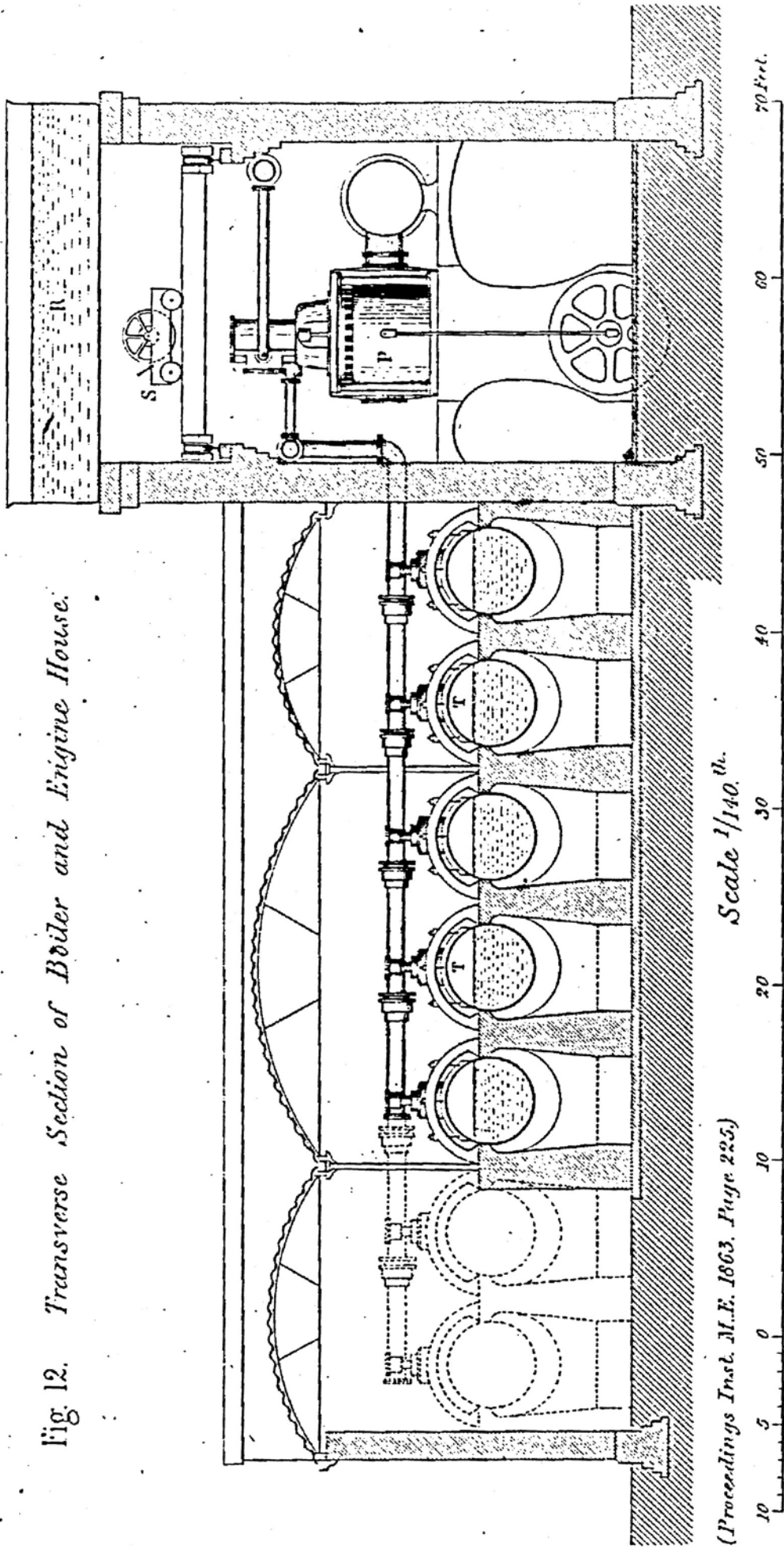


Fig 11. Sectional Plan.



(Proceedings Inst. M.E.  
1863. Page 225)

Fig. 12. Transverse Section of Boiler and Engine House.



(Proceedings Inst. M.E. 1863. Page 225.)

Scale 1/140. th.

10 5 0 10 20 30 40 50 60 70 feet.

## APPENDIX 3

## **APPENDIX 3: 1891 SALE NOTICE FOR GROSMONT IRONWORKS**

### **FOR SALE – GROSMONT IRONWORKS**

3rd November 1891. Three Blast Furnaces, Fixed Plant and Machinery, also 67 Cottages, 3 Villa Residences, Workmen's Institute, Offices, Butcher's Shop, etc.

The whole will be offered for sale by Public Auction in one lot, by Messrs Willman and Douglas, instructed by the Mortgagees at an Upset Price of £10,000, at the Board Room, Royal Exchange, Middlesbrough.

The Estate is freehold and comprises an area of 104 acres, 1 rood 4 perches with the mineral rights thereto.

The works are well situated and are supplied with ironstone brought direct from the mines in this and adjoining lands, into the works, the entrance being within 250 yards of the works etc.

**FURNACES** – There are 3 Blast Furnaces, each 80 feet high, two of which have a capacity of 15,000 cu. Ft and one of 16,300 cu. Ft. with the necessary hot and cold blast and gas mains and brick flues.

**STOVES** – There are 8 circular Pipe Stoves, 18' – 1" x 17'-6" for Nos 1 and 2 Furnaces and 4 Whitwell Stoves 29'-2" x 22' for no 3 Furnace.

**FURNACE LIFT** – The lift is worked by a double-acting winding engine, 12" Cylinder by 26" stroke with 9 ft diameter drum.

**BLOWING ENGINES** – There are 4 blowing engines comprising one Vertical Engine, 32" Steam Cylinder, 48" Stroke, 72" Blowing Cylinder and 3 Vertical Engines, each 21" Steam Cylinders, 36" Stroke, and 60" Blowing Cylinder.

**PUMPING ENGINES.** There is one 'Cameron' Pumping Engine, 20" Cylinder, 16" Stroke, and one Pumping Engine 7" Cylinder, 12" Stroke, and 2 'Cameron' double action pumps 7" cylinder and 6" stroke.

**BOILERS.** 5 Horizontal Boilers each 70' x 5' diameter also one 60' x 5' diameter, and one Lancashire Boiler 30' x 7'.

**KILNS AND GANTRY.** There are 2 Gjer's patent kilns 27' x 23', four brick kilns 33' x 24' square, these are capable of calcining 3,500 tons per week, 2 wooden Coke Hoppers, Gantry 380 feet long with Limestone and Coal Chutes, Steam Lift for Gantry, 32" Cylinder with feeding Donkey Engine, 2 ½ " ram. Brake drop with drum.

**WEIGHING MACHINES.** There are 2 Pooley's 20 ton Truck Weighing Machines and one Pooley's 2 ton Barrow Weighing Machines.

**BUILDINGS.** All are brick and slated except those mentioned otherwise and comprise: - Large Chimney Stack 180 feet high x 10 ft internal diameter, Blowing Engine House 67 ft x 20 ft with CI Tank overhead 5 feet deep, 2 Pumping Engine Houses each 13 ft x 12 ft, Pump House 15 ft x 9 ft. Lift Engine House 25 ft x 20ft. Weigh House and General and Oil Stores (under one roof) 52 ft x 12 ft, 2 Weigh Cabins, Locomotive Shed 32 ft x 26 ft, Small Engine House, Smiths Shop 50 ft x 26 ft with 4 hearths. Bolt Store 26 ft x 10 ft, Iron Store 24 ft by 14 ft, Fitting Shop 44 ft x 21 ft with Loft over, Chain, Steel and File Stores, Manager's Office, stone and slated.

**RAILWAYS.** These railways and sidings are complete in every respect.

**OFFICES, COTTAGES, ETC.** There is a well built Block of offices 44ft x 33ft with 4 principal rooms, lavatory, etc and 67 Workmen's Cottages, 3 Villa Residences, Workmen's Institute, Butcher's Shop and House and Farm Building.

**FIXED PLANT IN MINES.** There are about 65 tons of tram rails and turns etc in the mines underlying that part of the Grosmont estate now under cultivation.

(Source: Chapman 2002, 51-52).



## **APPENDIX D**

### **DUNELM CONDITIONS OF OFFER, NOTES ON LIMITATIONS & BASIS FOR CONTRACT**



## Dunelm Conditions of Offer, Notes on Limitations & Basis for Contract

These conditions accompany our tender and supercede any previous conditions issued. The firm will prepare a report solely for the use of the Client (the party invoiced) and its agent(s). No reliance should be placed on the contents of this report, in whole or in part by 3<sup>rd</sup> parties. The report, its content and format and associated data are copyright, and the property of the firm. Photocopying of part or all of the contents, transfer or reproduction of any kind is forbidden without written permission from the firm. A charge may be levied against such approval, the same to be made at the discretion of the firm.

Site investigation is a process of sampling. The scope and size of an investigation may be considered proportional to levels of confidence regarding the ground and groundwater conditions. The exploratory holes undertaken investigate only a small volume of the ground in relation to the overall size of the site, and can only provide a general indication of site conditions. The opinions provided and recommendations given in this report are based on the ground conditions as encountered within each of the exploratory holes. There may be different ground conditions elsewhere on the site which have not been identified by this investigation and which therefore have not been taken into account in this report. Reports are generally subject to the comments of the local authority and Environment Agency. The comments made on groundwater conditions are based on observations made at the time that site work was carried out. It should be noted that mobile contamination, soil gas levels and groundwater levels may vary owing to seasonal, tidal and/or weather related effects. Unrecorded ancient mining may occur anywhere where seams that have been worked and influence the rock and soil above. Dissolution cavities can occur where gypsum or chalk is present. Rotary drilling is the recommended technique to prove the integrity of the rock.

Where the scope of the investigation is limited via access to information, time constraints, equipment limitations, testing, interpretation or by the client or his agents budgetary constraints, elements not set out in the proposal and excluded from the report are deemed to be omitted from the scope of the investigation.

The firm cannot be held liable and do not warrant, or otherwise guarantee the validity of information provided by third parties and subsequently used in our reports. The firm are not responsible for the action negligent or otherwise of subcontractors or third parties.

Desk studies are generally prepared in accordance with RICS guidelines. Environmental site investigations are generally undertaken as 'exploratory investigations' in accordance with the definitions provided in paragraph 5.4 of BS 10175:2001 in order to confirm the conceptual assumptions. You are advised to familiarize yourself with the typical scope of such an investigation. No pumping of water will be undertaken unless a licence or facilities/equipment have been arranged by others.

Where the type, number or/and depth of exploratory hole is specified by others, the firm cannot and will not be responsible for any subsequent shortfall or inadequacy in data, and any consequent shortfall in interpretation of environmental and geotechnical aspects which may be required at a later date in order to facilitate the design of permanent or temporary works.

All information acquired by the firm in the course of investigation is the property of the firm, and, only also becomes the joint property of the Client only on the complete settlement of all invoices relating to the project. The firm reserves the right to use the information in commercial tendering and marketing, unless the Client expressly wishes otherwise in writing. The quoted rates do not include VAT, and payment terms are 30 days from dispatch of invoice from our offices. Quotes are subject to a site visit.

We have allowed for 1 mobilisation and normal working hours unless otherwise stated. The scope of the investigation may be reviewed following the desk study and/or fieldwork. We have not allowed for acquiring services information, and cannot be responsible for damage to underground services or pipes not shown to us or not clearly shown on plans. Costs incurred will be passed on to you, and in commissioning the firm, you understand and accept that you/your agent have a contractual relationship with the firm & you accept this. Our rates assume unobstructed, reasonably level and firm access to the exploratory positions and adequate clear working areas and headroom. We have priced on the basis that you or your client have the necessary permissions, wayleaves and approvals to access land. All boreholes and pits are backfilled with arisings except where gas monitoring pipes are installed with stopcock covers. Dunelm are not responsible for any uneven surfaces as a result of siteworks and rutting and backfilled excavations may require re-levelling and/or making good by others after fieldwork is complete. Dunelm have not allowed for subsequent reinstatement as a result of settlement. No price has been provided or requested for a return visit to remove pipework and covers. No price has been provided or requested for a return visit to remove pipework and covers. Hourly rates apply to consultancy only and do not include expenses unless otherwise shown. If warranties are required, legal costs incurred will be passed on to you assuming the firm agree to complete such warranties, modified or otherwise and you understand and agree to pay all costs.

We reserve the right to pursue full payment of the invoice prior to release of any information including reports. We advise you/your client that we may elect to pursue our statutory rights under late payment legislation, and will apply 8% to the base rate for unreasonably late payments. We will also apply the right to claim any associated legal costs incurred with recovery of late payments. The firm is exempt from the CIS Scheme. The firm offer to undertake work only in strict accordance with conditions covered by our current insurances, which are available for inspection. The company are not responsible for acts, negligent or otherwise of subcontractors and as a matter of policy cannot indemnify any other parties. Professional indemnity Insurance is limited to ten times the invoice net total except where stated otherwise by the firm, and we give notice that consequential loss as a direct or indirect result of the firms activities or omission of the same are excluded.