



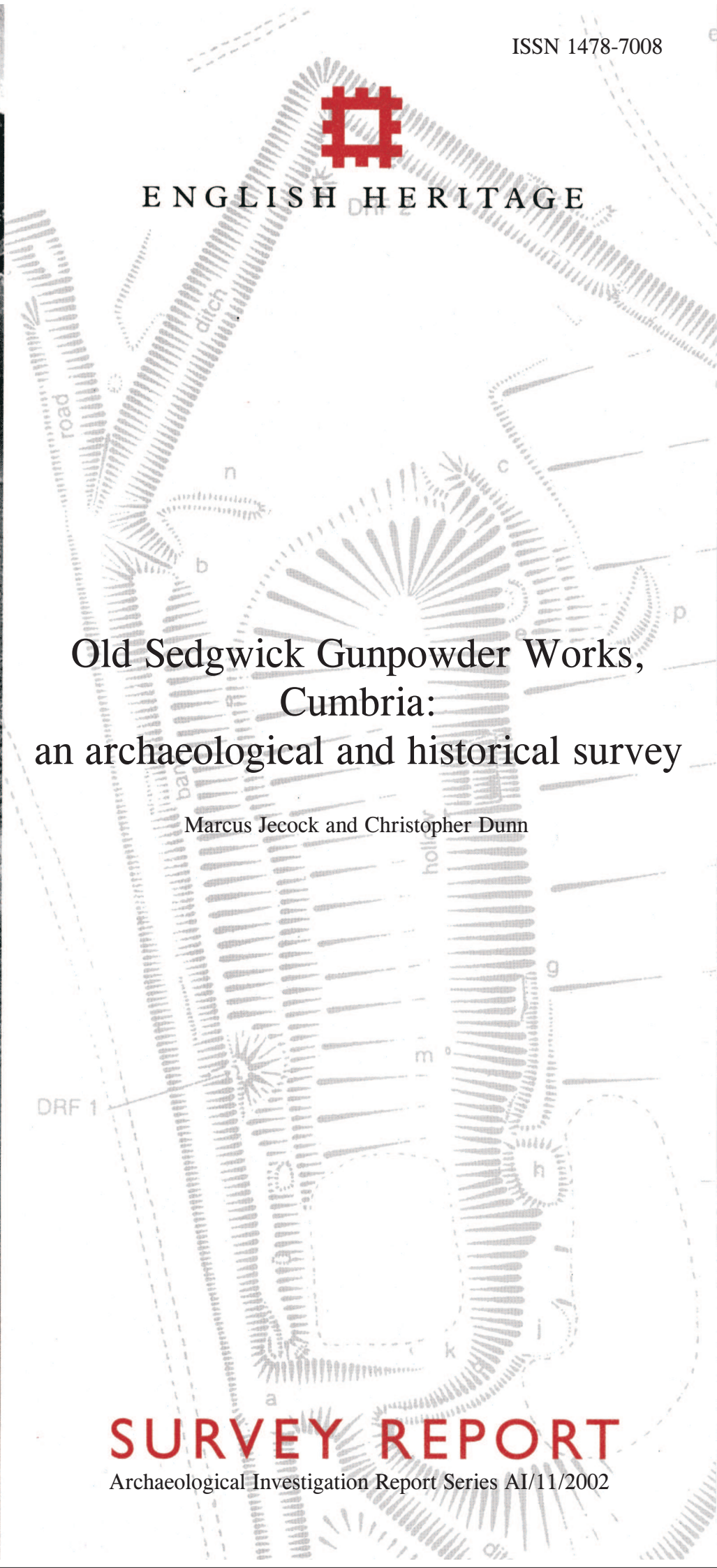
ENGLISH HERITAGE

Old Sedgwick Gunpowder Works,  
Cumbria:  
an archaeological and historical survey

Marcus Jecock and Christopher Dunn

**SURVEY REPORT**

Archaeological Investigation Report Series AI/11/2002





## **Old Sedgwick Gunpowder Works, Cumbria: an archaeological and historical survey**

**Archaeological Investigation Report Series AI/11/2002**

**NMR Nos: SD 58 NW 41, 39, 42-52 and LIN 126**

**NGR: SD 509 873**

**SAM/RSM No: -**

**SMR No: -**

Surveyed: November 2001

Surveyed by: Christopher Dunn and Marcus Jecock

Report by: Marcus Jecock

Drawings by: Philip Sinton

Photographs by: Christopher Dunn and Marcus Jecock

**English Heritage 2002**

**ISSN 1478-7008**

**Applications for reproduction should be made to English Heritage,  
NMR Services (01793 414600)**

**York Office: 37 Tanner Row, York YO1 6WP**

**Tel: 01904 601901 Fax: 01904 601998**

**National Monuments Record Centre, Great Western Village, Kemble Drive, Swindon. SN2 2GZ**

**Tel: 01793 414700 Fax: 01793 414707 World Wide Web: <http://www.english-heritage.org.uk>**

## CONTENTS

---

LIST OF ILLUSTRATIONS	iii
1. INTRODUCTION, SITE LOCATION AND SUMMARY	1
2. GEOLOGY, TOPOGRAPHY AND LAND USE	4
3. HISTORY OF RESEARCH	6
4. THE DOCUMENTARY HISTORY OF THE WORKS	8
5. DESCRIPTION OF THE FIELD REMAINS	17
6. DISCUSSION AND CONCLUSIONS	37
7. SURVEY METHODOLOGY	43
8. ACKNOWLEDGMENTS	44
9. BIBLIOGRAPHY	45
Appendix 1: The process of gunpowder manufacture	48
Appendix 2: List of recorded explosions at Old Sedgwick	50
Appendix 3: The archive and photographic record	51
Appendix 4: Concordance of NMR numbers linked to the survey	52

## LIST OF ILLUSTRATIONS

<i>Fig 1. General location diagram</i>	2
<i>Fig 2. Aerial view of the site of the Old Sedgwick gunpowder works from the north-east</i>	4
<i>Fig 3. The sale particulars for lot 10 (Old Sedgwick gunpowder works) in the 1854 auction catalogue</i>	9
<i>Fig 4. Detail from the map accompanying the 1854 auction catalogue (the 1854 map)</i>	10
<i>Fig 5. The map accompanying Henry Bainbridge's application to re-open the Old Sedgwick gunpowder works in 1857 (the Bainbridge map)</i>	11
<i>Fig 6. Detail of the central portion of the Bainbridge map showing the Old Sedgwick gunpowder works</i>	13
<i>Fig 7. The site of the Old Sedgwick gunpowder works and the wharf on the Lancaster Canal, as mapped at 1:2500 scale in 1857</i>	16
<i>Fig 8. English Heritage earthwork plan of the Old Sedgwick gunpowder works, reproduced at 1:1250 scale</i>	18
<i>Fig 9. The Bainbridge map overlaid against the English Heritage earthwork plan, reproduced at 1:2000 scale</i>	19
<i>Fig 10. 'Riverside' from the south</i>	20
<i>Fig 11. The northern end of the main leat, just south of the footbridge</i>	22
<i>Fig 12. 'Garden Cottage' from the north, showing the northern annex which probably incorporates the steam-boiler house</i>	26
<i>Fig 13. Interpretative diagram of the Bainbridge map set against the English Heritage earthwork plan, reproduced at 1:2000 scale</i>	30
<i>Fig 14. The possible magazine or storehouse at the canal wharf</i>	32
<i>Fig 15. The site of the Old Sedgwick gunpowder works as mapped at 1:2500 scale in 1896</i>	33
<i>Fig 16. The site of the Old Sedgwick gunpowder works as mapped at 1:2500 scale in 1912</i>	35

## **1. INTRODUCTION, SITE LOCATION AND SUMMARY**

In November 2001, English Heritage (EH) carried out archaeological survey and investigation of the site of the earliest recorded gunpowder works in Cumbria, established by John Wakefield I and partners *c* 1764 on the left bank of the River Kent, close to Sedgwick village. The works operated under a variety of company names, but seems to have been commonly known during its lifetime as the Sedgwick Gunpowder Mills. In the archaeological and historical literature, however, it is now universally referred to as ‘Old Sedgwick’, to distinguish it from a second mill established in 1857 a little upstream on the opposite bank of the river, usually known by the shorthand name of ‘New Sedgwick’. The survey was undertaken as part of a wider, thematic, project (Dunn 2000) investigating gunpowder manufactories across the whole of Cumbria, initiated in June 1999 as the logical progression to EH’s Monuments Protection Programme’s (MPP) Step 3 and Step 4 reports for the gunpowder industry nationally (Gould 1993; Chitty 1996). Although there has been considerable interest and research into the Cumbrian works in recent years, directed at both the group as a whole and individual sites (*eg* Wilson 1964; Marshall and Davies-Shiel 1969, 75-88; Crocker 1988, 36-41; Crocker and Crocker 1992; Patterson 1995; Palmer 1998), this has mostly concentrated on the documentary evidence with little formal examination, and certainly no detailed recording, of the physical remains. EH’s Cumbrian Gunpowder Industry Project is intended to rectify this omission, and will aid conservation management of those powder works which have been designated in whole or in part as protected monuments; the inclusion of all sites irrespective of their current level of designation will also enhance our overall understanding of what was an important regional industry.

The Old Sedgwick works is one of seven powder manufactories (eight if Gatebeck is treated as two sites), which operated in the historic counties of Westmorland and the Furness area of Lancashire (present-day south Cumbria), at various times between *c* 1764 and 1936. All produced gunpowder for the civilian, as opposed to the military, market. Geographically, the works are concentrated at four locales across the region: Old Sedgwick, New Sedgwick and Basingill lie in close proximity along the banks of the River Kent 5-6km south of Kendal; the Gatebeck High and Low Works are besides the Peasey Beck, south-south-east of Kendal; Blackbeck and Lowwood occupy neighbouring valleys close to Haverthwaite; whilst Elterwater forms an outlier at the foot of Great Langdale (Fig 1). The industry became established in Cumbria partly as a result of increasing demand nationally for blasting powder for mining and quarrying through the 18th century, but also because the southern Lake District provided a very suitable environment for powder manufacture. Besides having numerous fast-flowing and sizeable rivers whose waters could be harnessed to supply power, the rural and wooded riverside locations were commensurate with the need to site gunpowder works away from populous areas in order to minimise the consequences of accidental explosions. Later on, as more regard began to be paid to the safety of the workforce as well, several mills even incorporated trees and natural rock outcrops into their layouts as barriers to dampen and help contain blasts. In addition, timber was locally available both for charcoal manufacture and the making of barrels and packing crates, whilst proximity to the coast meant that other raw materials (sulphur and saltpetre) could be readily imported. As a result of these overseas contacts - mostly routed through Liverpool - the Cumbrian gunpowder industry was able to build up a healthy market for its products in parts of the British Empire, particularly West Africa, as well as at home. After *c* 1860, alternative forms of explosive based on the nitration of a variety of organic compounds began to appear. Other English powder works diversified into producing the new explosives, but the Cumbrian mills stuck with their traditional

stock-in-trade, now re-christened blackpowder to distinguish it from the newer forms. Despite this failure to diversify, the Cumbrian blackpowder industry continued to prosper until the end of World War I, when demand for the product collapsed catastrophically. The Cumbrian mills' response was to merge with their competitors as part of Nobel Industries (from 1926, itself incorporated into ICI); but by 1928, ICI had started the inevitable process of rationalisation, in order to concentrate blackpowder production at a single site: Ardeer in Scotland. Production in Cumbria finally ceased in 1936, with Gatebeck the last site to close (Crocker 1988, 1-2; Patterson 1995, 3).

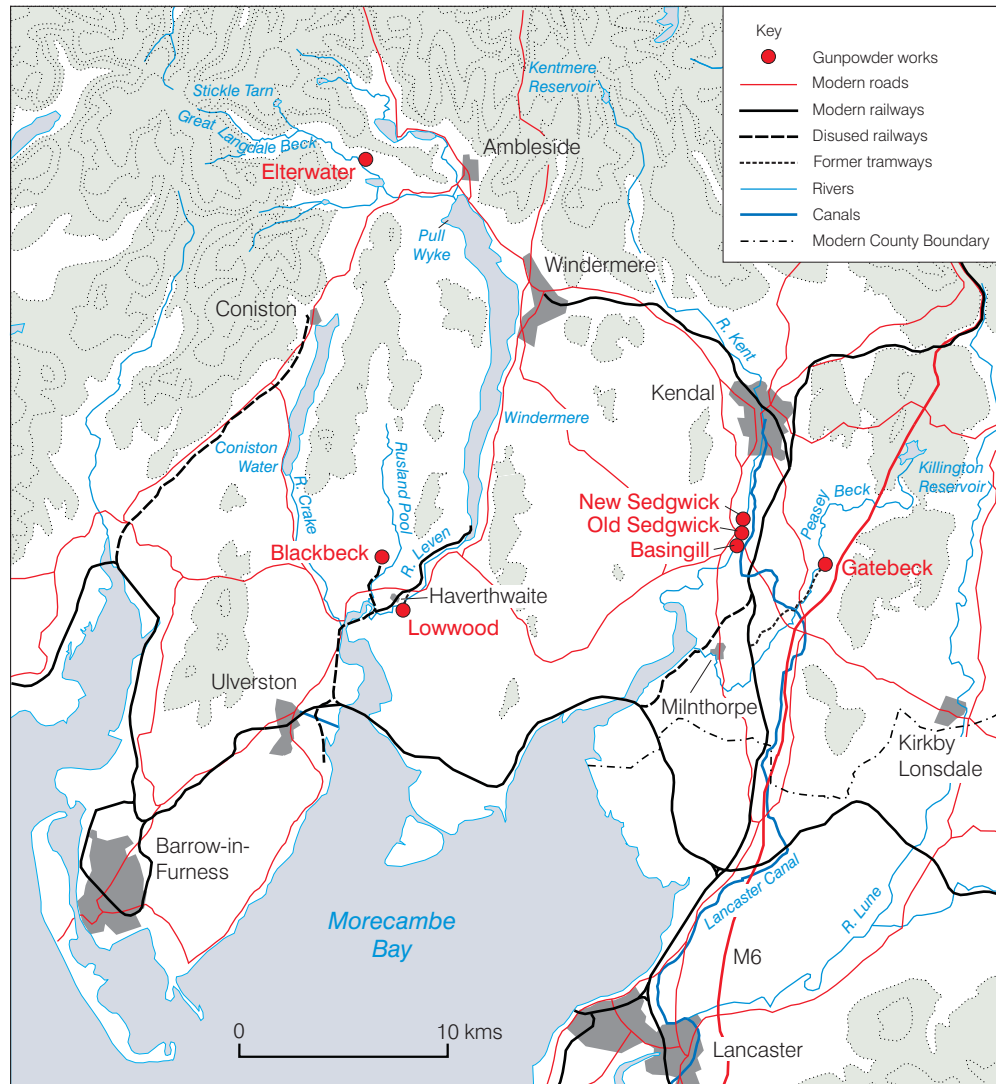


Figure 1.  
General location  
diagram

Old Sedgwick is the third of the Cumbrian sites to be investigated by English Heritage, although the first to reach publication in this report series due to interruptions in the fieldwork programme caused by the recent Foot and Mouth outbreak. Field survey was carried out to Level 3 standard (as defined in RCHME 1999, 3-5), backed up by less intensive documentary research confined to readily available published sources and limited search of historical archive material.

The works is located just over 5km south of Kendal, on the east bank of the River Kent, centred at National Grid Reference (NGR) SD 509 873 (Fig 1), where it occupies an area of *c* 2 hectares. As already stated, it was the earliest gunpowder mill in the region. Although 1764 is the date normally given for its inception, the present EH investigation has found evidence which suggests it was not built before 1768, and that

gunpowder production may have only begun *c* 1770. At that time there were few legal controls on the industry, and the works was constructed amidst a small pre-existing hamlet called Lakerigg Mill. It operated successfully until 1852, when it closed following the expiry of the lease of the land, and relocated to Gatebeck. However, the site at Old Sedgwick was always constricted, and as early as 1790 the Wakefield family, who by this time had become the sole owners, had had to resort to building additional incorporating mills on a separate site 0.5km downstream at Basingill in order to increase production. In the late 18<sup>th</sup> and early 19<sup>th</sup> centuries, the Wakefields also successfully lobbied for the route of the northern extension of the Lancaster Canal up to Kendal to pass close to their works, with the result that after 1819 they were able to bring in raw materials and ship out their finished product through a specially constructed canal wharf on the edge of Sedgwick village. The Basingill mills remained in use as part of the new Gatebeck complex after Old Sedgwick closed, and will form the subject of a separate EH investigation; however, a brief account of the canal wharf is included in the present report. After the closure of Old Sedgwick, the site was levelled and reverted to pasture and/or parkland. It is now mostly pasture, interspersed with a thin scatter of residential properties.

The site was not selected for evaluation at Step 3 of the MPP process (Gould 1993), presumably because of Crocker's statement (1988, 41) that no surface remains survived. However, the current EH field investigation has demonstrated that low earthworks are present across large parts of the site, and that these correlate with a number of buildings and structures depicted on contemporary maps. This suggests that there is scope (albeit unquantified) for the survival below ground of late 18<sup>th</sup>- and early 19<sup>th</sup>-century stratigraphy unencumbered by later phases of rebuilding. The survey has also identified that one building - the steam-boiler house - may still survive from the works, incorporated into one of the present-day cottages. In addition, a possible small magazine or store building may also survive at the canal wharf.

## 2. GEOLOGY, TOPOGRAPHY AND LAND USE

---

The majority of the Old Sedgwick gunpowder works occupies a level alluvial terrace immediately adjacent to the east bank of the River Kent, at a height of *c* 20m above sea level. Below Kendal, the Kent - which drains the southern fringe of the high Lakeland fells east of Ambleside south into Morecambe Bay (Fig 1) - flows through an undulating landscape of low hills and ridges of Carboniferous Limestone (Institute of Geological Sciences 1980). Although lower Kentdale has been smoothed and sculpted by successive glaciations, this stretch of the river valley is largely the product of the developing drainage pattern of the peri-glacial late Pleistocene and post-glacial Holocene periods; in consequence it lacks the U-shaped glaciated profile typical of many Cumbrian valleys, and is instead more V-shaped with sides which rise up in a series of irregular steps due to the effects of differential exposure and erosion of the limestone (Fig 2). A few of the more 'dangerous' buildings within the works, particularly those not requiring power such as magazines and the dust house, were situated on the first of these steps on the valley side in order to minimise the risk of explosions spreading across the site. The valley bottom is nowhere particularly broad, and the river either occupies a well-defined channel up to *c* 30m wide in between intermittent narrow terraces, or else is confined within even narrower rock-cut gorges.



*Figure 2.  
Aerial view of the site  
of the Old Sedgwick  
gunpowder works  
from the north-east  
(extract from NMR  
17668/34,  
photographed 12  
December 2001)*

Overall the river falls *c* 50m between Kentrigg to the immediate north of Kendal, and sea level at Levens Bridge 2.5km south of Old Sedgwick. This equates to an overall gradient of *c* 1:160, and in the early industrial period meant that the river was particularly suitable for the construction of weirs and leats to power watermills. Nevertheless, the Kent is not fed by a large lake - Kentmere close to the river's source is little more than a tarn, although dammed in the mid-19<sup>th</sup> century in order to increase its holding capacity (Wilson 1973) - and in consequence river levels are heavily dependent on rainfall; water flows can vary greatly as was witnessed at firsthand during survey at New Sedgwick in the very wet autumn of 2000, compared to survey at Old and New Sedgwick in the dry months of November/December 2001. Undoubtedly, periodic low water levels would have caused problems in the operation of the Old Sedgwick gunpowder works also. Conversely, the riverside terrace on



which the works sits is reasonably well drained, and also high enough to escape inundation during winter floods.

The site of the gunpowder mill is now mostly improved pasture, although a number of residential properties dating from the 18<sup>th</sup> to the 20<sup>th</sup> centuries, together with their gardens, lie close to the river either side of a small lane. In the 18<sup>th</sup> century, this lane provided access to a small hamlet associated with a water-powered corn mill (Lakerigg Mill - also spelled Lackrigg, or Larkrigg), tithe barn and drying kiln on the site later occupied by the gunpowder works, and continued to the north-east through Lakerigg Farm to join the Kendal road south of Natland (Jefferys 1770). It also historically formed part of a public footpath along the east side of the river between Hawes and Force Bridges, which remained open during the lifetime of the Old Sedgwick works and is still in use today. The hamlet survived closure of the works, and small areas of the site have since been developed for additional housing. Other parts of the site were destroyed or damaged in the late 19<sup>th</sup> and early 20<sup>th</sup> centuries by a gravel pit (Figs 15 and 16), and in the later 20<sup>th</sup> century by the construction of a sewage filter bed (aerial photograph OS/84091, frame 1); the former has recently been landscaped and incorporated into the garden of one of the newer residential properties, whilst the filter bed has been removed and replaced by a small sewage-pumping station. All land is in private ownership, and permission to visit areas away from the road must be sought from the individual owners.

### 3. HISTORY OF RESEARCH

---

Until the present EH investigation and survey, research into the Old Sedgwick gunpowder works has concentrated on the documentary record, with only cursory examination of the physical remains.

The earliest historical accounts are short descriptions of the Wakefield family and their varied business interests, including gunpowder, contained within two books by John Somervell dealing with aspects of Westmorland local history (Somervell 1928, 89-95; 1930, 71-2). Similar information was also published at the same time in a brief history of the Cumbrian gunpowder mills printed in the ICI company magazine (Anon 1929), suggesting that the author either used Somervell as his (unattributed) authority, or else had access to the same source(s). It was not until 1964 that Paul Wilson produced the first proper scholarly study of the Old Sedgwick works, in what is also the seminal study of the Cumbrian gunpowder industry as a whole (Wilson 1964). Since then, only Patterson (1995, 12-13) has published new research, drawing principally on the evidence of two plans of the works dating supposedly from 1857, deposited in the Cumbria Record Office, Kendal (CRO(K)). Wilson's main interest lay in elucidating the factors which drew the industry to Cumbria initially and governed its subsequent development, while Patterson's concern was solely with manufacturing process; both authors seem to have relied heavily on the earlier Somervell and ICI accounts for their historical information. Patterson's work is compromised anyway by errors of fact and simple omissions, which means it cannot be used uncritically. For example, he fails to give the full references to either of the mid-19<sup>th</sup>-century maps on which he bases his research. From photocopies in the Patterson collection at the NMRC in Swindon, however, it has been possible to identify the originals of both documents at Kendal. Comparison of these maps with Patterson's published description and sketch plan (Patterson 1995, 12-13 and plan facing p 12) shows he misinterpreted, or simply got wrong, several points of detail. It is likely that his misconceptions are also the source for Alan and Glenys Crocker's (erroneous) statement of a few years earlier, that the (original) corning house at Old Sedgwick was converted from the corn mill (Crocker and Crocker 1992, 8).

Almost no study has been made of the surviving physical aspects of the site. Glenys Crocker visited in 1985, and came away with the impression that nothing survived (1988, 41), although she and her husband did later identify traces of a leat surviving in the gardens of a cottage (Crocker and Crocker 1992, 8). It was presumably because of this assessment that the site was subsequently excluded from field inspection and evaluation at Step 3 of EH's MPP study of the Gunpowder Industry (Gould 1993).

The present EH investigation and survey of Old Sedgwick is, therefore, the first attempt to examine in detail the surviving physical evidence at the site, and also the first plan record of that survival. Fieldwork was accompanied by limited searches of both primary documents and the secondary literature. However, no attempt has been made to produce a detailed social and economic study of the works similar to that undertaken by Palmer (1998) for the early years of the Lowwood gunpowder mills; indeed, unless and until the company records for Old Sedgwick are located, this is unlikely to be possible. Instead, research into the primary documentary record has focused on identification of contemporary maps deposited in the Record Office at Kendal. As already stated, this research has identified the originals of both of the 19<sup>th</sup>-century maps used by Patterson. The larger-scale of these two maps is a very useful document, and forms the basis for much of the present report; it is reproduced here as Fig 5 (a diagrammatic interpretation is also included as Fig 13, and can be

compared to the sketch and key published by Patterson). Patterson's second plan is less useful (CRO(K) WDB/35/980), and also not securely dated; it has not been used in writing the present report. Several almost identical versions of it exist at Kendal, however, one of which can be securely dated to 1854 (although presumably a copy of an even earlier survey); it is reproduced here as Fig 4. Some use has also been made of contemporary newspapers, but this was targeted research and was by no means exhaustive. (Old Sedgwick closed before the 1875 Explosives Act, and there are no official Government accident reports as there are for the other Cumbrian gunpowder works). Despite these caveats, the limited primary documentation located usefully clarifies, and occasionally calls into question, much of what has hitherto been written about the Wakefields and Old Sedgwick. The results of the documentary and literature searches are presented in section 4 below.

#### 4. THE DOCUMENTARY HISTORY OF THE WORKS

---

Accepted wisdom (eg Somervell 1928, 93; 1930, 71; Anon 1929, 337-8; Wilson 1964, 55; Patterson 1995, 3-4) states that the Old Sedgwick works was founded in 1764 on the site of an existing water-powered corn mill, by John Wakefield I in partnership with Alderman Gurnall of Kendal and Edward Johnson of Old Hall. (Nevertheless, somewhat perversely, the business is frequently said to have traded initially as Wakefield, Strickland & Co). The partnership was governed by a tontine agreement, whereby the Company passed in its entirety to whichever of the partners outlived the others. In the event, this was Wakefield, so that by the time the company celebrated its centenary in 1864 (by then no longer based at Old Sedgwick, but operating from new premises at Gatebeck), it was wholly in the hands of Wakefield's great-grandson, William Henry, and was trading as W H Wakefield & Co.

EH have located a previously unremarked deed of co-partnership deposited with the Wakefield family papers at Kendal (CRO(K) WD/W/11.10), which throws new light on the circumstances of the company's inception whilst at the same time casting doubt on the actual year it was founded. The deed is dated 5 February 1770, and is a tontine agreement of co-partnership between William Gurnal (*sic*), Thomas Strickland, John Wakefield and John (*sic*) Johnson on the first part, and James Dowker on the second part, whereby Dowker was to be brought into full and equal partnership with the others to manufacture and sell gunpowder from premises at Lakerigg Mill. A gloss on the back of the deed describes the partners as forming the 'Lakerigg Mill Company'. The deed also recites the original partners' earlier lease (in association at that time with a certain James Hays, merchant of Liverpool), from Charles Strickland of Sizergh Hall, 'of the water corn-mill and kiln, messuages, dwelling houses and outbuildings, the close called Mill Close, all wastes, mill dams, mill wheels, weirs, banks, floodgates, waters and watercourses...commonly known as Lakerigg Mill.' This suggests that in the intervening period Hays had died or otherwise left the business; it also shows that 'partner' Thomas Strickland (who is described in the deed as an alderman and ironmonger of Kendal) was probably no relation of the Sizergh Stricklands. More importantly, however, the date of the lease is given as 12 May 1768. Thus, if Gurnall, Thomas Strickland, Wakefield, Johnson and Hays did indeed form their initial partnership as early as 1764 as is generally believed, they were unlikely to have been producing gunpowder until 1768 at the earliest. In fact, the Company was probably not producing powder before 1770, for a second document in the Wakefield family papers, dated 13 May 1770, records the purchase by the Company of lands and property at Sedgwick from John Fenton and wife for the princely sum of £498 13s (CRO(K) WD/W/11.4). This deal almost certainly involved the narrow strip of land in the centre of the site, which later maps show was owned by the Wakefield family (Figs 4 and 5). Without this strip it would have been impossible for the Company to complete the new leat which these same maps show ran for some 400m parallel to the river (see below), and which was necessary to power the gunpowder complex.

The initial term of the 1768 lease was for 21 years, with the rent set at £20, payable half-yearly. The corn mill and drying kiln were to be maintained in good working order, but the lease also gave the Company the right 'to erect buildings, mills *etc* for the purpose of manufacturing or finishing any goods.' It also gave the Company the automatic right to renew their tenure, on payment of an entry fine, for a further three terms, also of 21 years each. The options for the second and third terms in 1789 and 1810 were both exercised by John Wakefield I (died 1811), but irregularities in the payment of the fine and/or in the way the renewals were legally enacted, meant that by 1830, his grandson, John Wakefield III, was seeking legal opinion over whether he

could enforce the option for a fourth and final term, in the face of reluctance from Charles Strickland's descendants (CRO(K) WD/W/11.4). In the event the lease was renewed, but in 1850 John Wakefield III gained a licence to begin erecting new plant on land his family owned at Gatebeck some 4km to the east (Somervell 1930, 78), with a view to transferring gunpowder production there by the time the Old Sedgwick lease finally expired in 1852.

In April 1854, the site of the works was included in an auction of Sizergh estates (CRO(K) WDB/35/SP271) apparently with all its buildings intact, but a pencil note against lot 10 in the sales catalogue (Fig 3) indicates that no offer was at that time forthcoming. (The plan accompanying these sales particulars (Fig 4), will hereafter be referred to as the 1854 map, although it may well be based on a much earlier survey since several other versions of it exist in the Record Office). Less than three years later,

LOT 10.

*Tithe-free, Land-tax redeemed.*

A WATER MILL, with double Mill-race, upon the River Kent, formerly used as a Water Corn Mill, but many years ago converted into a Gunpowder Mill, with the necessary other Buildings attached. The Buildings comprise a Crushing Mill, Saw Mill, Corning Mill, and Retorts, &c., and two Cottages. The whole, together with several Closes of Land adjoining, contains 7A. 1r. 34r., or thereabouts, situate in the Township of Sedgwick, and are in the occupation of JOHN WAKEFIELD, Esq., as yearly Tenant, upon the terms of an expired lease.

No. on Plan.	Description.	State of Cultivation.	Quantity.		
			A.	R.	P.
165	Old Corn Mill.....		0	1	38
166	Cottage and Garden .....		0	0	9
167	Ditto ditto.....		0	0	15
168	Garden .....		0	0	21
170	Saw Mill.....		0	0	7
171	Green Saltpetre Works and Mills .....		1	3	7
175	Mill Field .....		4	1	10
186	Wharf.....		0	2	4
186a	Garden .....		0	0	7
186b	Cottage and Garden .....		0	0	26
			A.7	2	34

Mr. JOHN WAKEFIELD is under the terms of his expired Lease, bound to leave upon the Premises a good-going Water Corn Mill, and Drying Kiln, and to leave the Premises in good repair.

The counter-part Lease will be produced at the time of Sale.

A Right of Way for Horses, Carts, and Carriages is reserved to the Vendor and his Tenants through this Lot.

This Lot is Tithe-free and the Land-tax has been redeemed.

Figure 3. The sale particulars for lot 10 (Old Sedgwick gunpowder works) in the 1854 auction catalogue (extract from CRO(K) WDB/35/SP271, copyright reserved)

in December 1856, Henry Bainbridge (who apparently had been in partnership with Wakefield towards the end of the lease) was making application to the Kendal Quarter Sessions for a licence to re-open the works. His application was granted the following January, subject to certain conditions (Kendal Order Book 1839-76, CRO(K) WQ/O/15), namely the re-routing of part of the public footpath through the site, the construction of a new stove house in Mill Field, and seemingly the closure of the existing corning house and its transfer to the old corn mill (Lakerigg Mill). A large-scale plan of the works which accompanied the application also survives (CRO(K) WQ/A/H/15). It provides our best evidence of the detailed layout of the site, and almost our only source of information on the precise function of individual buildings. It will be hereafter referred to as the Bainbridge map (Figs 5 and 6), and is discussed in more detail below. It is also the original of one of the plans seen and sketched by Patterson (section 3 above). However, some of the information on the map appears confused and contradictory, and cannot be properly interpreted without understanding its role as supporting documentation in what was effectively the

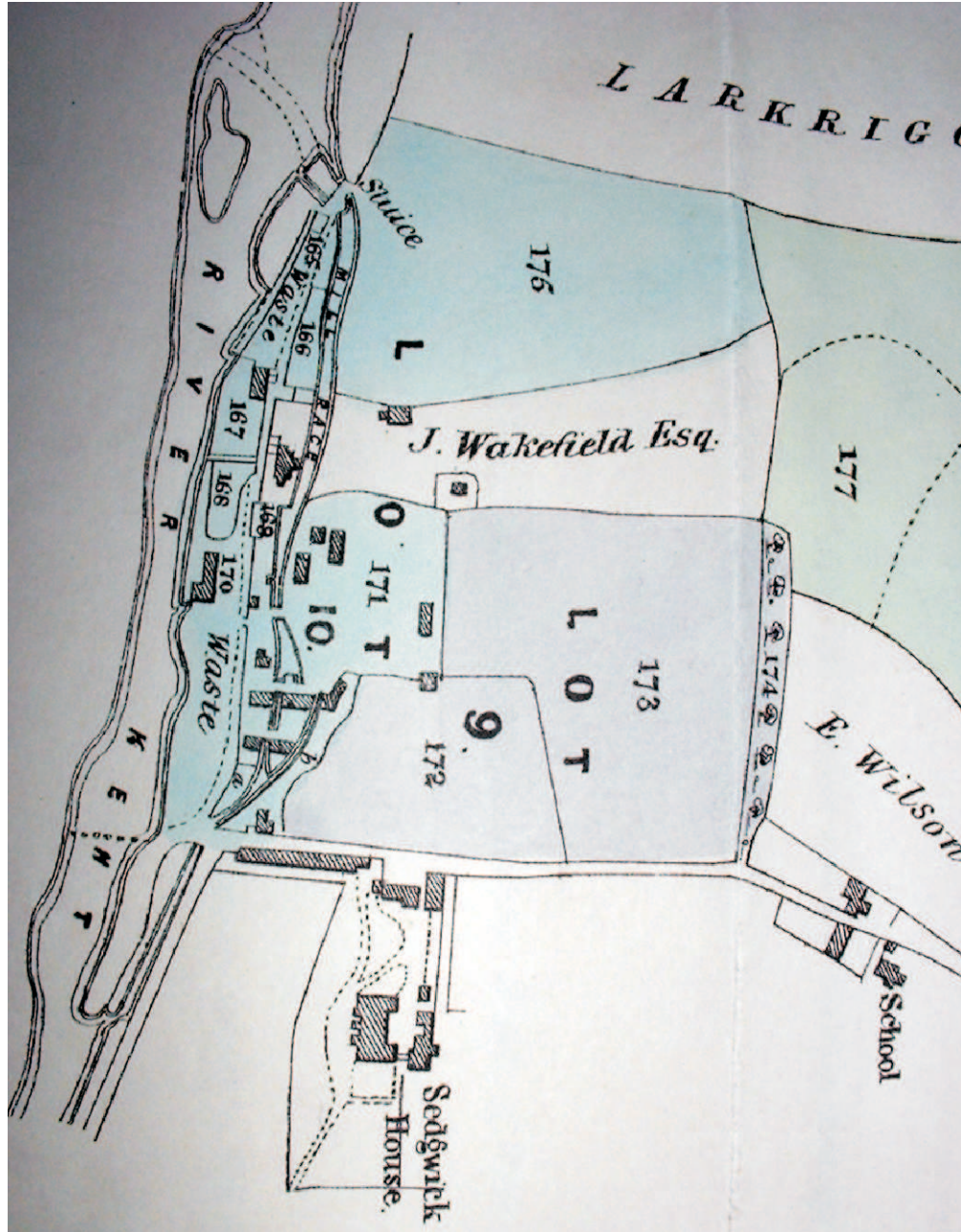


Figure 4. Detail from the map accompanying the 1854 auction catalogue (the 1854 map)  
 (extract from CRO(K) WDB/35/SP271, copyright reserved)



Figure 5. The map accompanying Henry Bainbridge's application to re-open the Old Sedgwick gunpowder works in 1857 (the Bainbridge map) (CRO(K) WQ/A/H/15, Crown copyright)

mid-19<sup>th</sup>-century equivalent of a modern-day planning enquiry. It seems likely that Patterson misinterpreted aspects of the map because he failed to read it in conjunction with the textual account contained in the Order Book.

Despite Bainbridge's success in gaining an operating licence, it would appear that his efforts to re-open the works faltered almost straightaway, for no further mention of the Old Sedgwick mills has been found. Furthermore, the first edition County Series 25" Ordnance Survey map (hereafter called the first edition OS), surveyed in 1857 (Ordnance Survey 1895), depicts only a minority of the buildings (Fig 7) - those situated on the strip of land at the centre of the site owned by the Wakefield family, and two cottages standing in Mill Field and the land to the south owned by the Stricklands. This suggests that at this point the Stricklands may have demolished as many of the buildings on their land as they could, including Lakerigg Mill, in order to sell the property more easily following the earlier failed attempt in 1854. The evidence of the first edition OS is contradicted by another map, which seems to depict Lakerigg Mill and the gunpowder buildings as still standing as late as 1860 (CRO(K) WDB/35/564), but since this accompanied an application to close or divert a footpath, it is possibly based on older surveys and should not be considered as necessarily up-to-date in all details. The works had certainly been totally demolished by 1868, as indicated by a third map (CRO(K) WD/W/11.13) which shows no buildings in the area of the works apart from three cottages. Somewhat ironically, it seems that the Wakefield family now owned the entire area; it had been purchased, we may imagine, in order to improve and control the setting of nearby Sedgwick House, the principal family residence, which W H Wakefield rebuilt that same year in the Gothic style (Fig 15).

Apart from the Bainbridge map, little information has been found concerning the layout of the works or the development of the business. This is particularly true of the early period. The index to the Wakefield family papers at Kendal lists a map of the Sedgwick estate belonging to J Wakefield surveyed in 1796 (CRO(K) WD/W/11.3), but the document has been mislaid and cannot at present be located; it is unclear anyway whether it relates to the gunpowder mill, or to the original Sedgwick House which John Wakefield I built in the late 18<sup>th</sup> century on the western edge of Sedgwick village (Fig 7). All surviving maps thus far located, date, ostensibly at least, to the ten years or so following closure of the works in 1852. They differ in minor detail, but all agree on the basic plan: a single mill race coming off the river immediately above Lakerigg/Larkrigg Weir, and running for *c* 420m before rejoining the Kent east of the present Sedgwick House, with some twenty or more buildings arranged on either side of the leat and by the river bank, but with three or four lying further east away from the main concentration. Only the Bainbridge map gives any real idea of the functions of individual structures, identifying a cluster of buildings at the centre of the site as various store houses, two others overlying a bifurcation in the leat close to the southern end as the mixing and incorporating mills, and another north of the storage area as the corning house: the smithy, charcoal-retort house, saw mill and site offices lay adjacent to the river, whilst the eastern buildings are identified as the dust house and magazines (Fig 6). The Bainbridge map also distinguishes between stone-built structures (shown in black outline) and those constructed in wood (red outline). Individual process buildings were almost certainly rebuilt, and even occasionally repositioned, during the 84 years the mill was in operation. For example, the 1830 brief seeking legal opinion over the terms of the 1768 lease mentions some rebuilding and rearrangement of the site *c* 1820. But it is unlikely that the basic layout of the site altered much if at all in this time. Indeed, in 1790 Wakefield had been obliged to expand the production capacity of the works by obtaining a licence to build additional incorporating mills on property he owned 0.5km downstream at Basingill (Curwen 1926, 235).



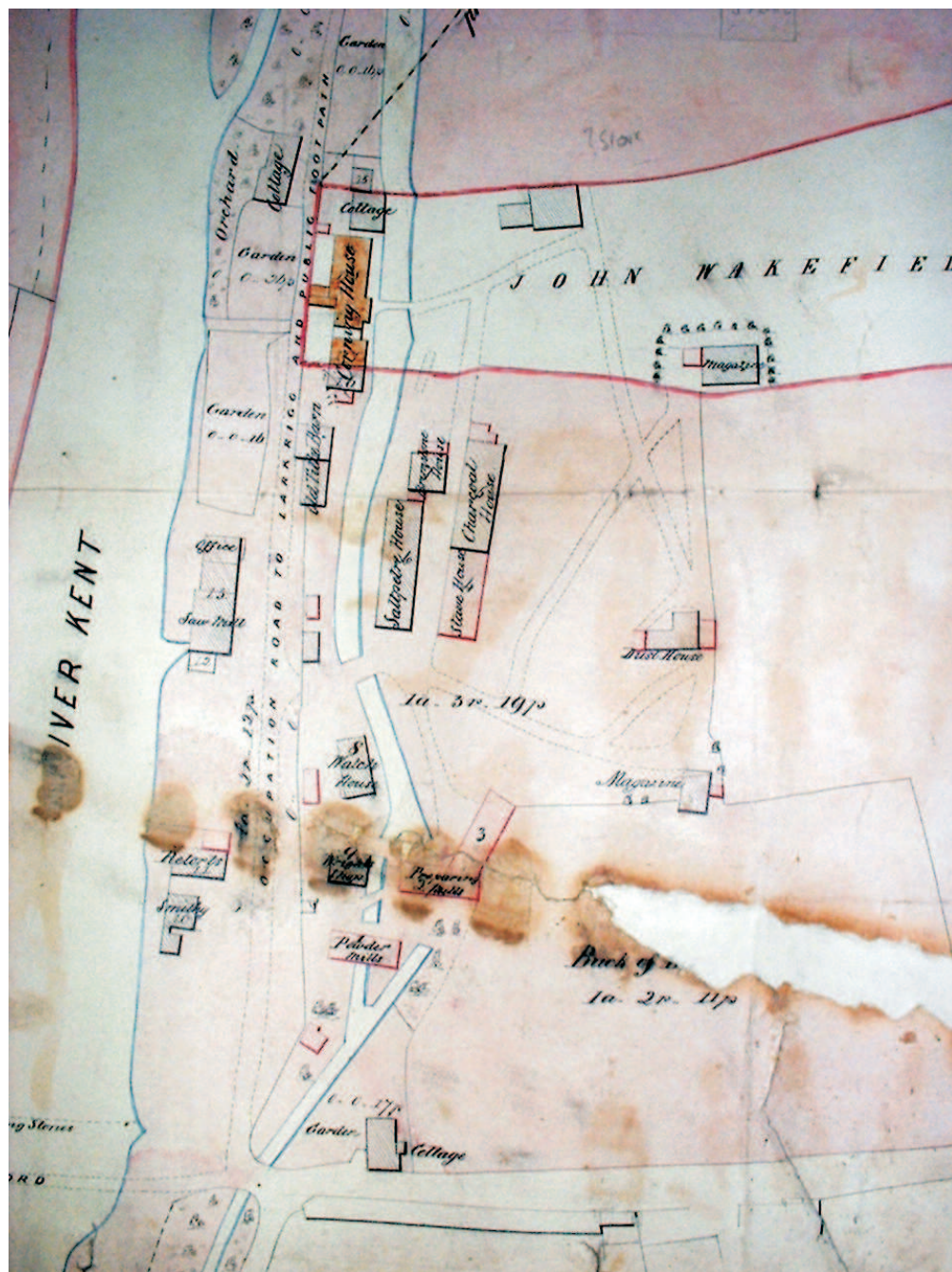


Figure 6. Detail of the central portion of the Bainbridge map, showing the Old Sedgwick gunpowder works (extract from CRO(K) WQ/A/H/15, Crown copyright)

Other archive sources have the potential to provide further useful information on Old Sedgwick, but either have not been searched systematically for the present report, or else have only been consulted *via* the secondary literature. The two principal such sources are local newspaper reports, and the business papers relating to the early years of the rival Lowwood Gunpowder Company, established near Haverthwaite in 1799. A mid-19<sup>th</sup>-century publication (Anon 1865) has been used as a quick index to selected issues of the Westmorland Gazette which feature coverage of events at Old Sedgwick, whilst Palmer's study of the Lowwood papers (which obviously deals first and foremost with what these papers tell us of the development of the Lowwood works) nevertheless contains useful passing references to John Wakefield I and Old Sedgwick

(Palmer 1998). When originally studied by Palmer in 1970, the Lowwood papers were housed at the Lancashire Record Office (LRO DDL0), but presumably have since been transferred to the Cumbria Record Office, Barrow.

These sources tell us that in 1802 a flood so damaged Lakerigg weir that no water was entering the main leat at Old Sedgwick, thus rendering the corning house and other buildings reliant on water power inoperative. Although the lower weir at Basingill was seemingly still intact and the incorporating mills there unaffected, the loss of power to the main site had a serious effect on the Wakefield Company's ability to manufacture powder in the first half of that year (Palmer 1998, 55). The weir was again damaged and the works left without power by flood in September 1830 (Westmorland Gazette, 2 October 1830), which may have been the catalyst for Wakefield's decision to construct a new weir at the beginning of 1832 (Westmorland Gazette, 28 April 1832; reference supplied by Mrs J Thompson). The opposite to flood - drought, resulting in insufficient volume of water in the river to drive the mills - could also be a problem, as indicated by a letter from John Wakefield II to William Wager, agent for Mandale Mine in Derbyshire in July 1826 (quoted by Wilson 1964, 53). These few recorded events are unlikely to have been the only occasions the works was adversely affected by flood or drought, however, for in 1844 John Wakefield III supported proposals to construct dams to regulate the flow of the Kent. Several dams and reservoirs were proposed, but only one - at Kentmere - was ever built, probably because by the time it was completed in 1848 many of the mill owners along the Kent were switching to steam power (Wilson 1973). Steam was not particularly well-suited to the manufacture of gunpowder, but shortly after this date the Wakefield Company moved from Old Sedgwick to Gatebeck anyway, and so reduced its reliance on the volume of flows along the Kent (the Company still retained Basingill as an outstation to Gatebeck). At Gatebeck, flows along the Peasey Beck were already controlled by the Killington reservoir, built to supply water to the Kendal section of the Lancaster Canal.

Several brief accounts published in various 18<sup>th</sup>- and 19<sup>th</sup>-century county histories and directories during the lifetime of the works, also provide information on levels of production. For example, in 1829 the works was reportedly producing about 80 barrels of powder weekly (Parson and White 1829, 627), whilst 20 years later just before the move to Gatebeck, production had increased threefold to some 250 barrels (Mannex 1849, 275). These figures undoubtedly represent the combined output of Old Sedgwick and Basingill.

Before the establishment of the Lowwood works, Old Sedgwick seems to have had very little competition for its product in the north of England. Many mines and quarries obtained their blasting powder directly from the works, including the Alston lead/silver mines and the Biloy Hill lead mines, but the Company also dealt with customers in other parts of England and overseas through agents at Liverpool (Palmer 1998, 41-2, 51 and 55). At this time, the price of gunpowder normally varied in relation to the price of saltpetre, which was imported through London and purchased by the various gunpowder manufacturers at great saltpetre auctions, and then carted or shipped round the coast to the different works (Palmer 1998, 15). However, in the years after 1799, Old Sedgwick was engaged in a trade war with Lowwood in an effort to try and drive its new northern rival out of business. As a result, for a while the price per barrel fell dramatically (Palmer 1998, 53-4).

In 1801, Old Sedgwick and Lowwood were both supplying powder to engineers constructing the Lancaster canal (Palmer 1998, 42), which was designed to connect

Lancaster and its hinterland, including Kendal, to the Leeds and Liverpool Canal south of Preston. By 1803, the canal was open as far north as Tewitfield, north of Carnforth, but there progress halted. The Wakefield family lobbied hard in subsequent years for the route of the proposed extension up to Kendal to pass close to their works, in order to benefit directly from reduced transport costs. In this they were eventually successful, for when work on the canal recommenced in 1813, it was the originally proposed western route passing through Sedgwick village only 0.5km from the mill, which was built. The northern extension finally opened to Kendal in 1819 (Hadfield and Biddle 1970, 182-93), with a wharf on the east bank serving Old Sedgwick (Fig 7).

There are no known photographs of the Old Sedgwick works, and only one illustration: a pencil sketch of 1802, entitled 'Powder Mill, Sizergh'. This has previously been thought to depict the old Lakerigg Mill (Wilson 1964, 55), but reference to the Bainbridge map suggests it may rather show the corning house and the cottage now known as Riverside, or alternatively the saw mill/works office complex plus some other unrecorded building. It is in private possession, but a copy is reproduced by Wilson (1964, plate XVIIb).

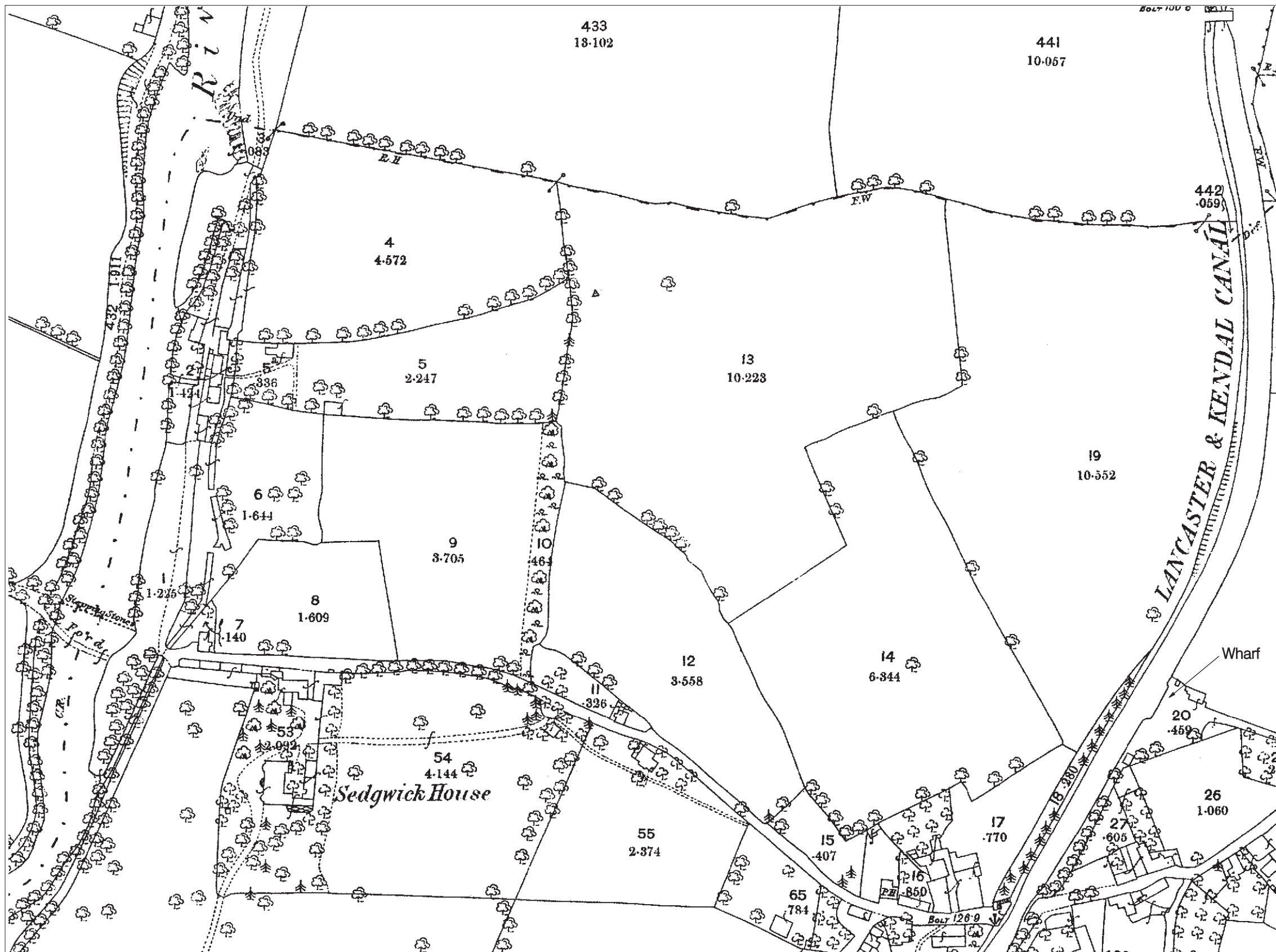


Figure 7. The site of the Old Sedgwick gunpowder works and the wharf on the Lancaster Canal, as mapped at 1:2500 scale in 1857 (reproduced from the 1895 Ordnance Survey map)

## 5. DESCRIPTION OF THE FIELD REMAINS

---

The main hachured site plan of the earthworks and other features recorded by EH at Old Sedgwick is shown in Fig 8. Although surveyed in the field at 1:1000 scale, the final drawing is included here at a scale of 1:1250 because of copyright restrictions in how Ordnance Survey Land-Line data may be reproduced (see section 7 below).

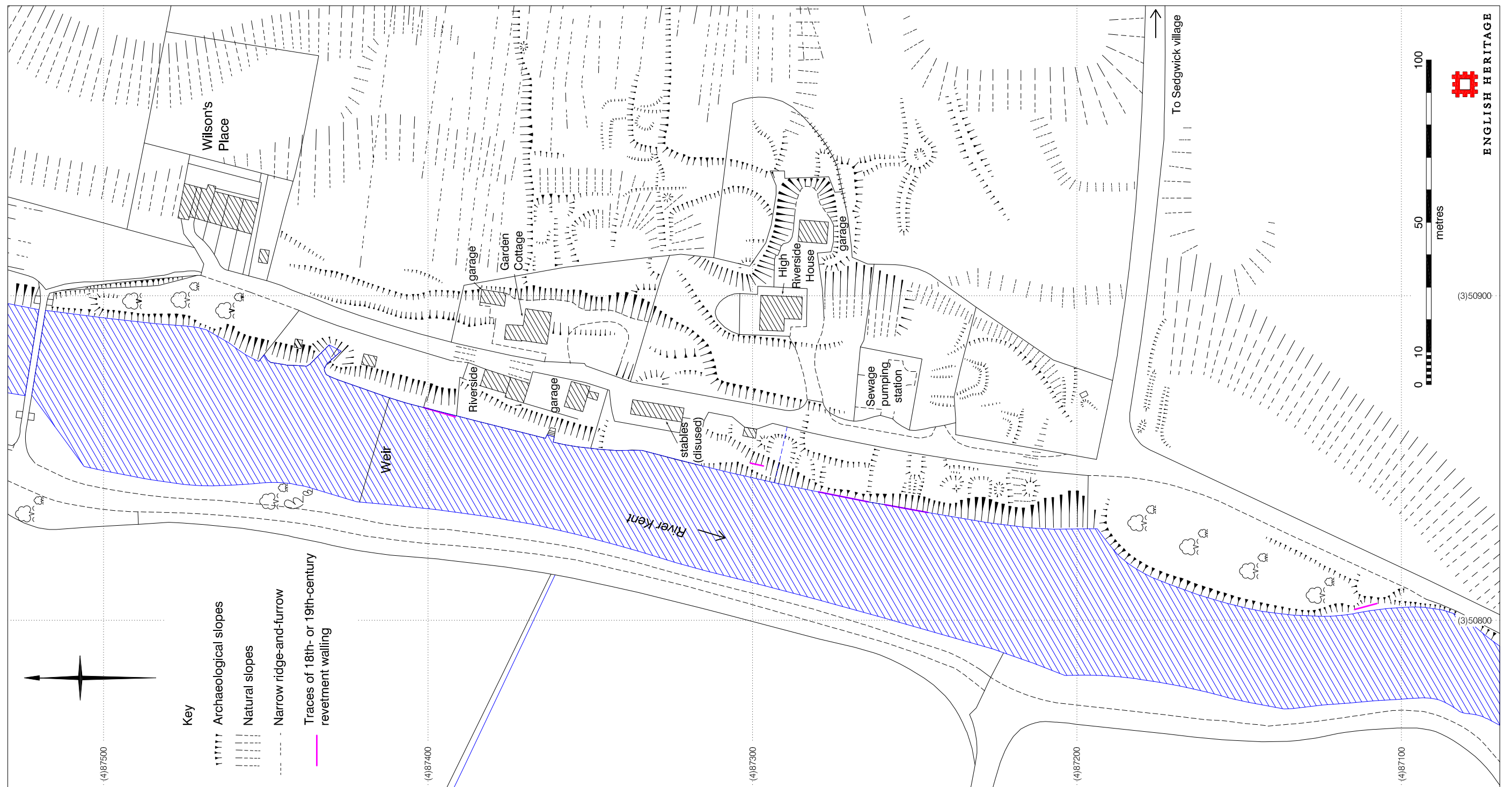
It will be seen straightaway that the earthworks are very degraded, and most are not capable of meaningful interpretation without reference to documentary evidence, in particular the Bainbridge map of 1857. Direct comparison of the plan with the map (Fig 9) also shows that about half the number of buildings depicted as standing in 1857 in fact have no modern earthwork correlates; conversely, the overall level of metrical correspondence between the two documents is good (slight mismatch between the two digital images showing details of the Bainbridge map is most probably due to photographic distortion; see section 7 below). Thus, otherwise rather amorphous earthwork features can be confidently associated with structures shown and named in 1857. A simplified version of Fig 9 is included as Fig 13 in order better to demonstrate the correlation, and also aid interpretation of the Bainbridge map.

So as to produce a meaningful narrative, therefore, the following account will be ordered first by phase, and secondly by process. The first part deals with those features likely to have originated before the site was taken over by John Wakefield and partners in the 1760s, the second with features attributable to the gunpowder mill, ordered by process, whilst the third describes a small number of miscellaneous or undated features. All structures shown on the Bainbridge map are discussed, regardless of whether they are still identifiable on the ground; in similar vein, a number of earthwork features seemingly not represented by the map are also described. Those readers unfamiliar with the way gunpowder was manufactured are advised to read the second part in conjunction with Appendix 1, which outlines the general method and explains the technical terms used.

### 5.1 Phase 1. The pre-gunpowder landscape: Lakerigg Mill and Weir, cottages and tithe barn

The 1768 lease (section 4 above) indicates that the gunpowder works was constructed around a small hamlet called Lakerigg Mill, comprising Lakerigg Mill itself (a water-powered corn mill), a drying kiln, and several ‘messuages, dwelling houses and outbuildings’. The Bainbridge map shows that the mill stood at *c* SD 5089 8745 (Building 14 on Fig 13), astride a short leat fed by a weir (Lakerigg Weir), but does not depict a separate drying kiln suggesting that this may have been integral with the mill. It also portrays three cottages, and in addition what is described as an ‘Old Tithe Barn’. Since the latter has no obvious connection with the gunpowder works, it must be associated with the mill and have existed by 1768 also.

No evidence has been found for the date when the weir, mill, barn or cottages were first constructed, but all survived until at least 1857 as shown by the Bainbridge map (Figs 5 and 6). Indeed, it was a condition of the lease of the site by Wakefield and partners that the mill (and drying kiln) were preserved in good working order (Fig 3). The map shows the mill as of irregular plan, but with dimensions of *c* 15m long by a maximum of 11m wide. However, the mill must have been demolished shortly after, as it is not depicted on the first edition OS map, surveyed the same year (Fig 7). The same must be true of the tithe barn, which the Bainbridge map shows stood at *c* SD 5089 8735, but



(This plan includes data taken from the OS map, and is reproduced by EH with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office, © Crown copyright. All rights reserved. Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings. Licence Number: GD03085G)

Figure 8. English Heritage earthwork plan of the Old Sedgwick gunpowder works, reproduced at 1:1250 scale.



Figure 9. The Bainbridge map overlaid against the English Heritage earthwork plan, reproduced at 1:2000 scale.

*(This plan includes data taken from the OS map, and is reproduced by EH with the permission of Ordnance Survey on behalf of The Controller of Her Majesty's Stationery Office, © Crown copyright. All rights reserved. Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings. Licence Number: GD03085G)*

which is not featured on the first edition OS; the former portrays it as measuring *c* 15m by 5m. Later map evidence shows that once the mill had gone, its leat was progressively infilled and had totally disappeared by 1896 (Fig 15). There are now no earthwork traces of either the mill or the leat. A slight depression visible in flower beds at the north-west corner of the grounds of the modern High Riverside House, coincides with the depicted site of the barn, but without the documentary evidence would not be interpretable with confidence as the site of a building. No extant remains of the weir were seen during survey, although reportedly traces are visible at times of low river levels immediately north of the footbridge's western abutment (David Willacy, pers comm).

Both of the 1857 maps (Bainbridge and the first edition OS) agree in showing two cottages with attached gardens close to the end of the tail race from the mill, at SD 5087 8737 and SD 5089 8737, and also a third cottage fronting the road into Sedgwick village at the southern end of the site, at SD 5087 8719. Although it cannot be proven, these presumably all existed by 1768 and are the messuages and dwelling houses referred to in the lease. The first two cottages still survive, albeit extended; they are



*Figure 10.  
'Riverside' from  
the south*

known today as Riverside and as Garden Cottage (Figs 10 and 12). It is likely that Garden Cottage incorporates what was originally the steam-boiler house to the gunpowder works (see section 5.2.3 below). The third cottage was demolished between 1868 (CRO(K) WD/W/11.13) and 1896 (Fig 15). Any surface or sub-surface remains which survived the demolition, however, are likely to have been completely destroyed *c* 1983 by a gas pipeline whose route is visible on aerial photographs (OS/84091, frame 1) passing straight through the small modern field adjacent to the road (see also section 5.3 below). A concrete slab (Fig 8) within the field is presumably an inspection chamber connected with the pipeline. A slight bank immediately north of the slab is probably the remnant of a field boundary shown at this location by the Ordnance Survey in 1896 and 1912 (Figs 15 and 16). Otherwise, the only certain earthwork remnant connected with the cottage is a slight bank and scarp halfway up the western edge of the field, which corresponds to the position of the northern boundary



of a small gore of land shown on the 1854 map sandwiched between the lane and the tail race from the gunpowder mill, and described as ‘garden’ in the accompanying sales particulars (land parcel no. 186a on Figs 3 and 4). (See also section 5.2.5 below).

## 5.2 Phase 2. The gunpowder works

The following account is ordered by process.

### 5.2.1 The water power system

Lakerigg Weir, and the leat coming off it powering Lakerigg Mill, have already been described (section 5.1 above). However, this original leat was only some 80m long, and too short to accommodate all the separate process buildings required for the gunpowder works intended by John Wakefield I and partners when they acquired the lease to the site in 1768. A new leat had to be constructed, which the Bainbridge map (Fig 5) shows originated at the weir, and ran for some 420m parallel to the River Kent at a distance of *c* 30m from it. The map depicts the northern third of this leat as in the order of 6m wide, but with a slight constriction immediately below the weir. The leat is shown narrowing down to *c* 4m once it reached the centre of the site, reflecting the fact that some water had already been taken off and returned to the river: the map seems to indicate two short cross leats running between the main leat and the river, the first driving a waterwheel in the middle of a building complex described as the corning house, the second providing power to the saw mills. The Bainbridge map shows only the tail race of the latter, although a slight indentation in the west side of the main leat on the 1854 map (Fig 4) most probably indicates the point at which the head race diverged. Once past the saw mill, the main leat curved gently east and bifurcated into two channels, each 2-3m wide, in order to deliver power to the preparing mills and powder (incorporating) mills. The two channels subsequently rejoined, and waste water exited the site along a single tail race which took it back into the Kent opposite Sedgwick House.

The Bainbridge map does not depict any sluices, but the 1854 map marks a sluice at the head of the leat below Lakerigg Weir (Fig 4). This would have been necessary in order to isolate the main leat for maintenance and repairs; in such circumstances the original leat to Lakerigg Mill could have doubled as a bypass channel around the weir if needed. At least two additional sluices would also have been required further along the leat to divert water into the cross leats feeding the corning house and saw mills; it is likely that sluices would also have been placed at the start to each of the two channels supplying the preparing and incorporating mills.

The majority of the course of the northern third of the main leat is still traceable on the ground as a broad but shallow depression (Fig 8). The initial 25m, between a point just south of the modern footbridge and Wilson’s Place, is now heavily overgrown and largely infilled with rubble, and for much of this distance only the eastern side survives as a scarp down from the modern hedgeline (Fig 11). The course becomes easier to follow in the section of pasture field between Wilson’s Place and Garden Cottage, where it is visible as a linear depression 7-12m wide and up to 0.3m deep. Its general location can be traced continuing on through the grounds of Garden Cottage as a very broad but shallow dip, steepest on its eastern side, now occupied by the drive to the house; indeed, the modern extension on the east side of the original core of the cottage was constructed across the course of the leat, which was located during excavation of the foundations (Mrs Kilshaw, Garden Cottage, pers comm). The course peters out as a surface feature beneath modern landscaping

in the grounds of High Riverside House to the south, and does not re-emerge apart from the slightest of traces in the small modern pasture field north of the road to Sedgwick village; the point where the tail race re-joins the river is also suggested by rather scrappy scarps and possible traces of stone revetments, heavily confused by dumping, at SD 5081 8711. The only trace of the cross leat to the corning house is a slight east-west scarp visible in the grounds of Riverside, which must represent the approximate position of the tail race. This is presumably the tail race noticed and reported by the Crockers in 1992 (Crocker and Crocker 1992, 8). It is reported that a few years ago, workmen repairing a service pipe encountered the leat's stone sides beneath the modern lane whilst digging their trench (Mrs Kilshaw, Garden Cottage, pers comm). No trace of the cross leat leading to the saw mill was located during field survey; the 1854 and Bainbridge maps both indicate that its head race was covered over anyway.



*Figure 11. The northern end of the main leat, just south of the footbridge*

### 5.2.2 The preparation and storage of raw materials

#### The Saltpetre House

The Bainbridge map (Fig 6) depicts the saltpetre house as standing at *c* SD 50885 87300, adjacent to the east side of the leat in approximately the centre of the works (Building 6 on Fig 13). It is shown as built in stone, and as measuring *c* 24m north-south by 6.5m. A building, unnamed but of very similar relative dimensions, is also portrayed at this general location on the 1854 map (Fig 4). The site now lies beneath the front garden of the present High Riverside House; the whole area has been heavily altered by modern landscaping, and no earthwork trace of any building was seen here during survey by EH.

#### The Brimstone (Sulphur) House

The Bainbridge map depicts the brimstone house as centred at *c* SD 50893 87317 (Building 7 on Fig 13), lying slightly offset from, but immediately north of, the saltpetre house. It was a much smaller building than its neighbour, measuring only *c* 7m square, but was likewise built in stone. The map shows a small wooden structure of

unknown function attached to its north side, whilst another sandwiched between it and the saltpetre house to the south is most likely to be a covered walkway or roofed passage connecting the two buildings; both these structures are omitted from Patterson's published sketch of the Bainbridge map (Patterson 1995, plan facing p 12). Again, the building would also seem to be portrayed on the 1854 map (Fig 4). However, as with the saltpetre house, the indicated site falls within the landscaped front garden of High Riverside House, and no earthwork traces survive.

## The Charcoal Retorts and Charcoal House

As shown on the Bainbridge map, the retorts (where charcoal was manufactured) were sited towards the southern end of the works adjacent to the River Kent, within a rectangular stone building, measuring *c* 9m east-west by 5m wide, centred at *c* SD 50843 87250 (Building 11 on Fig 13); a smaller, wooden, structure attached to the north-east corner possibly served as a wood store (Patterson erroneously shows the latter as detached). No building equivalent to the retort house is shown on the 1854 map (Fig 4), perhaps suggesting that it was only added at a fairly late stage in the development of the works. (It must be a possibility that the 1854 map is in fact based on a much earlier survey; see section 4 above). The site depicted by the Bainbridge map coincides with faint earthworks visible in an area of rough grassland now belonging to Riverside. These comprise a low platform adjacent to the road, and two shallow gullies running west from it to the river; it is possible that the latter are robber trenches marking the lines of the grubbed-out northern and southern walls of the retort house.

The charcoal house (where the charcoal was stored after manufacture) is portrayed on the Bainbridge map as lying immediately east of the brimstone house, at *c* SD 50901 87311 (Building 5 on Fig 13). It was stone-built, measuring *c* 20m by 7m, with a small wooden structure of unknown purpose attached to its northern gable end; a second wooden range tacked on to the southern end formed the stave house (see section 5.2.4 below). A building corresponding to the general size, shape and position of the charcoal house is also depicted on the 1854 map (Fig 4). The area now lies within the landscaped grounds of High Riverside House, and no earthwork traces remain.

### 5.2.3 The manufacture of gunpowder

#### The Preparing House

On the Bainbridge map, the preparing house is situated towards the southern end of the works. It actually comprised two wooden ranges of very similar dimensions, centred at *c* SD 50891 87246, set at an obtuse angle to each other. An east-west range measuring *c* 15m by 5m, and labelled 'preparing mills' (Fig 6) or 'ancient grinding mill' (Building 2 on Fig 13), lay across the eastern channel of the main leat. It probably housed two edge-runner mills, one either side of a central (undershot?) waterwheel, used to grind the separate ingredients to fine powder. The preparing house proper - where the ingredients were mixed after grinding - was attached to the north-east corner (Building 3 on Fig 13). Although both structures are also depicted on the 1854 map (Fig 4), that map differs slightly in showing the preparing mills as integral with a second building range to the west identified by the Bainbridge map as the millwright's shop (see section 5.2.4 below). The depicted area partly coincides on the ground with the site of a 20<sup>th</sup>-century sewage filter bed, visible on aerial photographs (OS/84091, frame 1), and presumably has been much damaged, if not totally destroyed, by it. The filter bed has latterly been dismantled, and the site graded; most if not all the earthworks now visible at this location seem attributable to this landscaping.

## The Green-Charge House

No green-charge house is identified on the Bainbridge map. However, the 1854 sale particulars describe the whole southern part of the site east of the main leat as 'Green Saltpetre Works and Mills' (land parcel no. 171, Figs 3 and 4), suggesting that the southernmost of the two 'magazines' on the Bainbridge map may have served this function (Building 19 on Fig 13). However, against this is the evidence of a very similar map contained in an (undated) terrier of Sizergh lands (CRO(K) WDB/22/68.7), which describes this land parcel as 'Green, Saltpetre, works and mills', which raises the possibility that the word 'Green' actually refers to an area known as 'The Green'. The building in question is described in more detail under 'magazines' below.

After 1790, a green-charge house allegedly existed at the Basingill outstation to the Old Sedgwick works (Patterson 1995, 14 and plan facing), but this will be described/discussed elsewhere (Hunt *et al*, forthcoming).

## The Incorporating Mill(s)

The incorporating mill at Old Sedgwick seems to have lain at the southern end of the works, at *c* SD 50871 87231. The evidence for this comes from the Bainbridge map, which shows a wooden building straddling the leat at this location, with the words 'powder mills' written against it on the plan (Fig 6), whilst it is further described as 'ancient powder grinding mill' in the accompanying key (Building 1 on Fig 13). Since the mill attached to the preparing house is described simply as 'ancient grinding mill' (this section above), the powder mills so-called must represent the incorporating mill. The wooden superstructure measured *c* 13m by 5m; a building of apparently similar dimensions is also shown at this location on the 1854 map (Fig 4). Since the building sat astride the leat, it probably actually housed two mills, one either side of a central (undershot?) waterwheel. Little earthwork trace survives, although a low, spread bank, partly enclosing an area sub-rectilinear in plan, at the northern end of the small modern pasture field adjacent to the road to Sedgwick village, is in the correct position to be the southern edge of the wooden superstructure.

This incorporating mill is likely to date from the inception of the works *c* 1768. After 1790, additional mills were constructed at Basingill (Patterson 1995, 14 and plan facing), but these will be described elsewhere (Hunt *et al*, forthcoming).

## The Wrought-Charge House

The Bainbridge map does not name a wrought-charge house at Old Sedgwick. It is known that one existed at Basingill (Patterson 1995, 14 and plan facing), but this will be described elsewhere (Hunt *et al*, forthcoming).

## The Press House

No press house can be identified at Old Sedgwick from the available documentary evidence. Patterson's suggestion (1995, 12) that it lay within the complex of buildings labelled 'corning house' on the Bainbridge map (Buildings 16, 17 and 18 on Fig 13) is plausible since the process often employed hydraulic power. If this is so, then it most probably occupied the southern end of building 18, immediately north of the waterwheel.

## The Corning House

The evidence for the position of the corning house is slightly confusing, since the Bainbridge map has 'corning house' written against buildings 16, 17 and 18, whilst in the key only the first two are described as parts of the corning house and building 18 is described as the stove house (Figs 6 and 13). It is argued in this report (*contra* Patterson 1995, 12-13) that it is the information in the key which is correct (the reasons for this are outlined in section 6 below). The corning house is therefore the stone building, measuring some 9m by 6m, centred at *c* SD 50881 87338. It is shown separated from building 18 to the north by a 2m wide gap (probably a waterwheel pit); a small wooden structure at the corning house's southern end is of unknown function. A building of broadly similar size and shape is also depicted on the 1854 map (Fig 4), although no wheel pit is visible separating it from building 18, which also seems to be substantially smaller than its portrayal on the Bainbridge map. The indicated site now lies mostly within the grounds of Garden Cottage; no earthwork traces survive.

## The Glaze House

No glaze house can be identified at Old Sedgwick from the available documentary evidence. However, since glazing followed on straight after corning, it is possible that it was undertaken in the corning house.

## The Stove House and Steam-Boiler House

As with the corning house, the evidence of the Bainbridge map for the position of the stove house requires interpretation. Patterson thought that the stove house should be equated with the building depicted as lying a little east of the corning house, which does indeed have the pencil emendation '?Stove' written close to it on the map (Fig 6). However, in the map's key, the stove house is identified as building 18, which equates to a building lying immediately north of the corning house (Fig 13). It is argued in this report (*contra* Patterson 1995, 12-13) that it is the information in the key which is correct (for the reasons given in section 6 below). The stove house, therefore, stood at *c* SD 50883 87353. As shown on the map, it was a large building with a central body some 17m long by 7m wide, and two short wings facing east and west. This somewhat irregular ground plan strongly suggests that the building comprised a smaller core which had subsequently been added to at different times. This itself raises the further possibility that some of the additions housed processes other than drying; it has already been suggested that the press house was accommodated at its southern end (this section above). This hypothesis of building 18 having many phases is supported by the evidence of the 1854 map, which if it shows any buildings here at all, depicts something a lot smaller and confined entirely to the southern end (Fig 4). (The unknown factor here is the true date of the survey on which the 1854 map is based). The indicated site now lies mostly within the grounds of Garden Cottage, and no earthwork traces survive.

The Bainbridge map shows the steam-boiler house (which supplied hot water to the pipes in the stove house) as lying a little north of the site suggested above for the stove house, at *c* SD 50887 87372 (Building 15 on Fig 13). It was separated from the latter by a cottage (the present Garden Cottage). This arrangement would have had the advantage of helping to shield the stove house and adjacent buildings - which all contained gunpowder at various stages of manufacture - from sparks emanating from the fire in the boiler house. The boiler house is shown as stone-built, and in the order of 4m square. However, no building is depicted at this location on the 1854 map (Fig 4).

Its position on the Bainbridge map coincides with the position on the ground today of a small annex tacked on to the north side of Garden Cottage. Although the annex is somewhat larger than the dimensions of the boiler house as taken from the map, it may well incorporate all or some of the original gunpowder building; a capped-off wall standing between the core of the cottage and the annex is particularly suggestive (Fig 12). However, no detailed architectural investigation of the annex has been made.



*Figure 12. 'Garden Cottage' from the north, showing the northern annex which probably incorporates the steam-boiler house*

### The Dust House

This building is portrayed on the Bainbridge map as situated on the eastern periphery of the site at *c* SD 50934 87282 (Building 21 on Fig 13). As shown on that map, it consists of an L-shaped, stone building, with maximum dimensions of *c* 10m east-west by 7m north-south; wooden additions to its east and west ends are both approached by roads, suggesting that they are canopies beneath which wagons could be loaded and unloaded whilst protected from the weather. However, the depiction on the 1854 map is somewhat different, showing what seems to be a substantially longer building at this location, orientated north-south (Fig 4), suggesting that it must have been rebuilt or remodelled at some point. The site lies wholly or partly within the area of a late 19<sup>th</sup>- and early 20<sup>th</sup>-century gravel pit, now landscaped as part of the garden of High Riverside House. No earthwork trace was found by EH; indeed, it is likely that the site will have been completely destroyed by the pit (but see section 5.3 below).

### Magazines

Two magazines are depicted on the Bainbridge map, both removed some distance from other buildings at the works, and situated above them on a step in the valley side, presumably as a precaution against explosions. The southern magazine is shown at *c* SD 50935 87253, the northern one at *c* SD 50950 87330 (Buildings 19 and 20 on Fig 13). Both were constructed in stone. The depictions of both buildings on the 1854 map (Fig 4) are very similar in size and shape to those shown on the Bainbridge map.

The southern magazine measured *c* 8m north-south by 5m; a small wooden structure shown appended to its east side is not described on the map, but is approached by a

road and was undoubtedly a canopy beneath which carts could be loaded/unloaded protected from the rain. No earthwork trace of the magazine was found during survey, but the accuracy of the depicted siting appears confirmed by the presence of a low, spread mound, no more than 0.2m high, surviving a few metres east of this point: this overlies the junction of three field banks, which can be correlated with the junction of field boundaries shown on the Bainbridge map immediately east of the magazine. The feature may be a tree mound, but is more likely simply the product of turning the plough approaching a field corner. It has been suggested above that this magazine may have been used to store the green charge prior to incorporation, but this can be no more than surmise.

The northern magazine is somewhat larger, measuring 10m east-west by 7m. As with the southern example, a wooden addition at its west end (the end approached by the intra-site road) was probably a canopy beneath which carts could be loaded/unloaded in the dry. The map also shows it surrounded by a belt of trees, perhaps intended as blast protection against accidental explosions rather than as a sight screen. This points to the magazine being the main store magazine for finished barrels of powder prior to shipment to customers. On the ground, a low mound surrounded by indications of an earthwork enclosure, coincides well with the depicted site of this building.

It is likely that a third magazine connected with the works existed at the nearby canal wharf at the edge of Sedgwick village, through which raw materials were imported and gunpowder exported after 1819. This would have been an expense magazine for temporary storage only. The wharf is outside the area covered by the Bainbridge map, but a small building survives within the residential garden that now occupies the site of the wharf. It is unclear if this is the magazine, or a temporary storehouse for imported sulphur and saltpetre. Both wharf and building are discussed in more detail in section 5.2.6 below.

#### 5.2.4 Ancillary buildings

##### Saw Mill

The saw mill is portrayed on the Bainbridge map as a rectangular stone building measuring some 12m north-south by 8m, situated adjacent to the river at *c* SD 50850 87295 (the southern half of Building 13 on Fig 13). The works office is shown attached to the north gable end, while a far smaller building attached to the southern gable is described as a bone mill (see below). Indications of a tail race emerging from the south-west corner of the mill suggest that it was powered by an internal waterwheel situated just inside the building's south end. The 1854 map also indicates the saw mill as situated at this location (land parcel no. 170, Figs 3 and 4), although the depiction differs slightly in showing a shorter building and a tail race seemingly situated just beyond the mill's southern wall: this suggests that the superstructure had been extended south to cover the wheel by the time of the Bainbridge map. The site is now part of an area of rough grassland belonging to Riverside; the few low earthworks that survive here do not reflect particularly well the plan of the buildings recorded by the map evidence, but suggest instead that the mill has been thoroughly demolished or robbed-out.

##### Stave House

The Bainbridge map describes a wooden building at *c* SD 50896 87294, attached to the southern end of the charcoal house, as the stave house (Building 4 on Fig 13); it is

further noted in the key to the plan as being for 'drying staves in'. The staves would have been used to make the powder barrels. As shown, the building measured *c* 16m by 7m. It is erroneously described by Patterson in his text as the 'store house', although correctly labelled by him as stave house on the key to his published sketch of the Bainbridge map (Patterson 1995, 12 and plan facing). The building is not shown on the 1854 map (Fig 4), suggesting it may have been constructed fairly late on. The indicated site now lies mostly beneath High Riverside House, and is likely to have been totally destroyed.

### Cart House and Watch House

As shown by the Bainbridge map (Fig 6), the watch house lay halfway between the incorporating mills and the saltpetre house, at *c* SD 50873 87264 (Building 8 on Fig 13). However, in the map's key, the building is labelled 'cart house and watch house'. It is depicted as a stone building, in the order of 11m north-south by 5m wide. The 1854 map also portrays a building at this general location, but since the portrayal on the latter is L-shaped it suggests the watch house was at some date remodelled. The site lies beneath the modern sewage-pumping station, and has probably been totally destroyed.

### Millwright's Shop

The millwright's house or shop is depicted by the Bainbridge map as situated at *c* SD 50870 87246, north of the incorporating mill and directly opposite the preparing mills (Building 9 on Fig 13). It was of stone construction, *c* 7m east-west by 6m wide, with the east gable fronting directly onto the western channel of the main leat, suggesting that the shop drew power from an undershot waterwheel sitting within the channel. A building of apparently similar dimensions is also shown at this location on the 1854 map (Fig 4). The site falls towards the edge of the small modern field associated with the sewage pumping station; although no trace is visible on the surface, the possibility of below-ground survival cannot be ruled out.

### Smithy

The Bainbridge map portrays the smithy at *c* SD 50838 87241, adjacent to the river and immediately south of the retort house (Building 10 on Fig 13). It was a stone building of irregular plan, measuring in the order of 11m north-south by a maximum of 5.5m wide, but nothing is shown at this location on the 1854 map (Fig 4) suggesting it was only built late on. Scrappy earthworks are visible on the ground, but nothing that is particularly indicative of a ruined building; however, small pieces of clinker and ash were seen during survey a few metres further south of the NGR cited above.

### Offices

According to the Bainbridge map, the works office stood adjacent to the river at *c* SD 50853 87305, immediately north of, and built against, the saw mill (the northern half of Building 13 on Fig 13). The Bainbridge map depiction shows the office building as constructed in stone, and *c* 10m long north-south by 6.5m wide, although the corresponding building on the 1854 map appears narrower (Fig 4). The earthworks which now survive at this location, which is an area of rough grassland belonging to Riverside, bear little resemblance to either of the map depictions, and probably result from the building's thorough demolition.



## Bone Mill

The Bainbridge map identifies a small, stone building tacked on to the southern end of the saw mill at *c* SD 50848 87287, as a bone mill (Building 12 on Fig 13). It measured in the order of 5m by 3.5m, and was well placed to draw power from the postulated waterwheel at the southern end of the saw mill (see this section above). It is unclear what the crushed bone was being used for. No corresponding building is shown on the 1854 plan (Fig 4). There are no earthwork remains of the mill building at the indicated site, which is now part of an area of rough grassland belonging to Riverside.

### 5.2.5 Unidentified buildings on the Bainbridge map

The Bainbridge map depicts seven buildings within the curtilage of the works whose function is not disclosed on the map, plus two small wooden shacks, each *c* 2m square, situated well away from any other gunpowder building but close to Lakerigg Mill. The latter are probably unassociated with the works, and will not be discussed further here. The seven unidentified buildings associated with the gunpowder works have been labelled Buildings 26-32 on Fig 13. The first six are all fairly small buildings situated close to the main road running the length of the works, and are described below in order from south to north. Building 32 on the other hand is much larger, and lies on the eastern periphery. An eighth unidentified building (Building 33) lying beyond the works is discussed in section 5.3 below.

Building 26 is a small, L-shaped, wooden building close to the very southernmost tip of the main works, at *c* SD 50860 87216; its maximum dimensions are *c* 4m by 4m. The 1854 map shows no building at this location, but describes the area as a small garden (Fig 4) - presumably belonging to the nearby cottage fronting the road to Sedgwick village (Building 24 on Fig 13). The purpose of the structure is unknown, but since it is the closest building to the works entrance it may have served as the clocking-in shed. A low earthwork scarp now exists at the indicated site, which is likely to be the garden boundary depicted on the 1854 map (see section 5.1 above), while a low bank which curves away north from it may represent the outline of this structure.

Building 27 is a small stone building, measuring only some 2m square, situated at *c* SD 50862 87241. It is not replicated on the 1854 map (Fig 4). Its size is compatible with it being a privy, although it is perhaps unusual for a privy to be built in stone. No earthworks now survive at this location.

Building 28 is a small, wooden affair, measuring about 6.5m by 2.5m, situated at *c* SD 50865 87262. It does not appear on the 1854 map (Fig 4). Although no function is ascribed to it on the Bainbridge map, its proximity to Building 8 which acted as both the watch house and cart house, suggests that it may be a small stable block. The indicated site lies mostly beneath the modern concrete apron surrounding the sewage pumping station, and no earthworks survive.

Building 29 is similar in size to Building 28, but constructed in stone, situated at *c* SD 50867 87288. It also appears on the 1854 map (Fig 4). Its proximity to the works office might support an interpretation as the change house. No earthworks survive at this location.

Building 30 is a smaller, wooden construction, situated only a few metres north of Building 29 at *c* SD 50868 87295. It measures some 4.5m by 2m. It is not shown on the

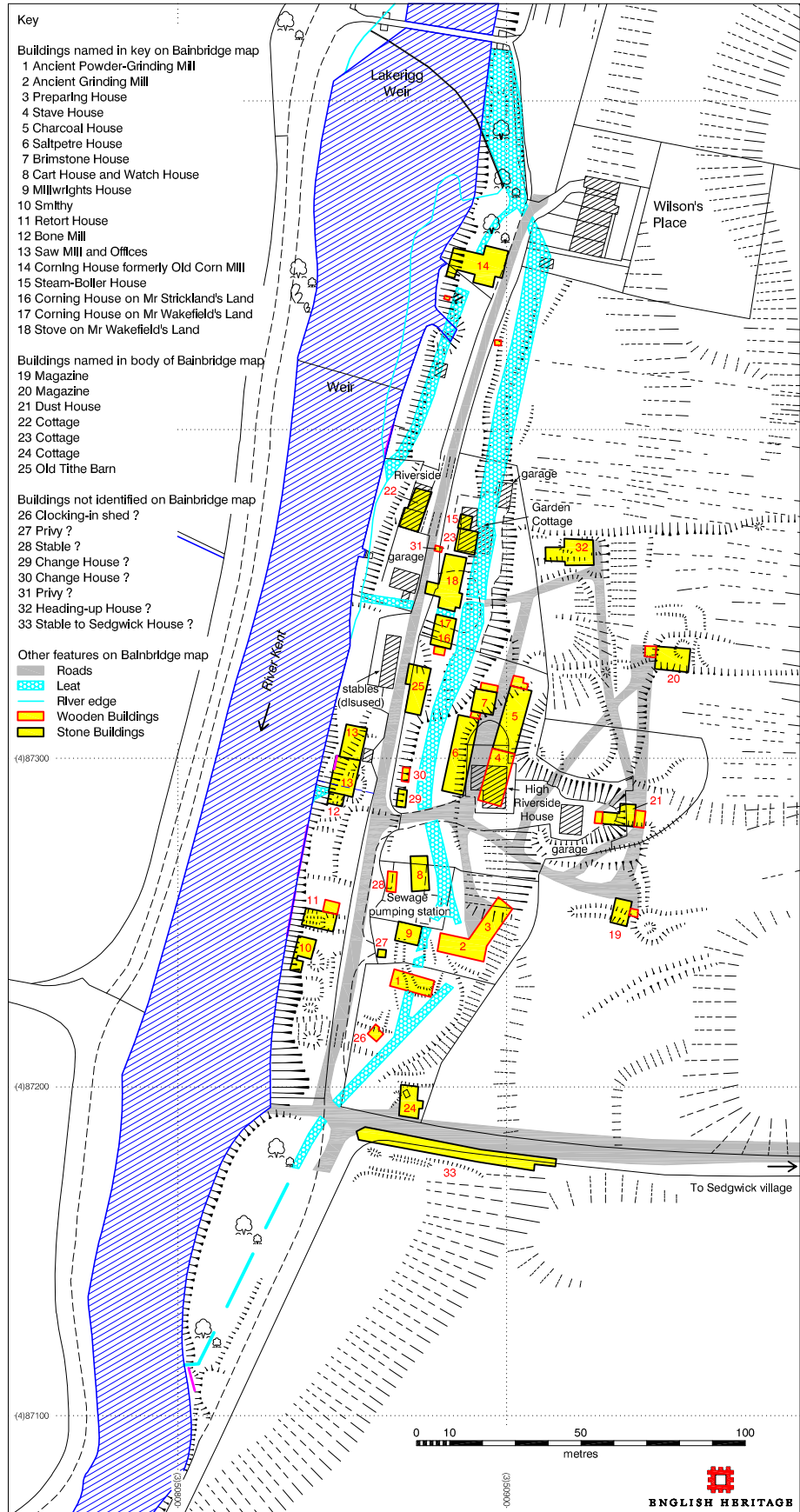


Figure 13. Interpretative diagram of the Bainbridge map set against the EH earthwork plan reproduced at 1:2000 scale.

(This plan includes data taken from the OS map, and is reproduced by EH with the permission of Ordnance Survey on behalf of The Controller of Her Majesty's Stationery Office, © Crown copyright. All rights reserved. Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings. Licence Number: GD03085G)

1854 map, and no function can be suggested for it unless it was a second change house, perhaps for female workers. No earthworks survive.

Building 31 is a wooden shack, c 2m square, situated at c SD 50879 87363 just by the north-west corner of the stove house. As with Building 27, it is probably a privy. No earthworks survive.

Building 32 is a stone building - or perhaps more correctly two stone buildings lying end to end - situated at c SD 50919 87362 on the northern edge of the strip of land in Wakefield ownership. Patterson (1995, plan facing p 12) thought it was the stove house, but it has already been argued (this section above) that he was mistaken in this, and that the stove house was located further west immediately north of the corning house (Building 18). A structure of almost identical size and shape to Building 32 also occurs on the 1854 map (Fig 4). Although we have no documentary evidence of its function, its remoteness and seclusion on the eastern periphery of the site tends to suggest it was a 'danger' building. A road connected it directly with the corning house/stove house complex, and with the dust house and magazines. It may have been the heading-up house. The earthwork evidence on the ground is sufficient to indicate a slight building platform at this location, but the surviving scarps do not reflect particularly well the size and shape of the building shown by the 19<sup>th</sup>-century maps.

### 5.2.6 Transport

#### To and from site

Before 1819, all transport of raw materials to and from Old Sedgwick was by a combination of sea and road. The closest port was Milnthorpe some 6km to the south (Fig 1), from where saltpetre and sulphur imported through London or Liverpool, and transported north in coastal-trading vessels, would have completed its journey to the works by cart. No doubt, finished gunpowder destined for the south of the country or the overseas market was exported *via* the same route, whilst sales to local customers in the north of England were delivered by road. By the late 18<sup>th</sup> and early 19<sup>th</sup> centuries, however, the Wakefields were lobbying hard for the proposed northern extension of the Lancaster Canal up to Kendal to pass close to their works. When this was finally completed in 1819, Old Sedgwick was linked not just with a number of alternative coastal ports, but potentially with the entire national canal network. After this date, we may presume that transport of raw materials and finished gunpowder became much faster and also cheaper.

After 1819, the gunpowder carts had only to travel 0.5km between the works and a specially constructed canal wharf on the edge of Sedgwick village. The wharf, which lay at SD 5142 8715, is shown on 19<sup>th</sup>-century maps (*eg* Fig 7). Although constructed with Old Sedgwick specifically in mind, after closure of the works it remained in use for offloading coal (Ordnance Survey 1898) until 1955 when the northern reaches of the canal beyond Tewitfield were closed to navigation. The canal has since been drained, and large parts infilled, including the site of the wharf. The latter's site has now been absorbed into the rear gardens of residential housing, and no trace of the wharf survives apart from a small stone building now in use as a garden shed. The building has only been viewed from the public footpath along the canal, and has not been investigated in any detail, but may be an original storehouse or small expense magazine (Fig 14).

*Figure 14. The possible magazine or storehouse at the canal wharf*



#### Around site

By the late 19<sup>th</sup> century, all of the Cumbrian gunpowder mills seem to have possessed tramways for transporting gunpowder around the works between the different process buildings; the bogies were mostly propelled by hand in order to minimise the risk of sparks and explosions. However, there is no evidence for such a system of tramways at Old Sedgwick. Instead, the Bainbridge map (Fig 6) shows a network of roads linking the various buildings forming the works. Given the topography of the site, with the dust house and magazines set on rising ground to the east, horse-drawn carts must have been employed to transport the product between buildings. No doubt the horses were soft-shod with copper or brass to prevent sparks. The modern lane perpetuates the line of the principal road down the spine of the works; the positions of some of the others are visible as slight scarps, particularly on the rising ground along the eastern edge of the site.

#### 5.2.7 Other gunpowder-related features

##### Revetment along river frontage

The survey identified slight traces of a stone wall revetting the river bank. This was most noticeable in the southern part of the works, particularly opposite and immediately north of the site of the charcoal retorts (Figs 8 and 13). It would have strengthened and protected the bank against erosion. A further short stretch of revetment to the north of Riverside is visible in the river when water levels are low, orientated at a slightly skew angle to the modern revetment walling.

##### Quarry near Lakerigg Farm

The 1768 lease of Lakerigg Mill (section 4 above) conveyed on Wakefield and his partners the right to quarry sand, clay and stone on any part of Lakerigg Farm owned by Charles Strickland. This provides the probable context for a stone quarry some 0.75km upstream of Old Sedgwick at SD 5103 8818, identified and surveyed by EH

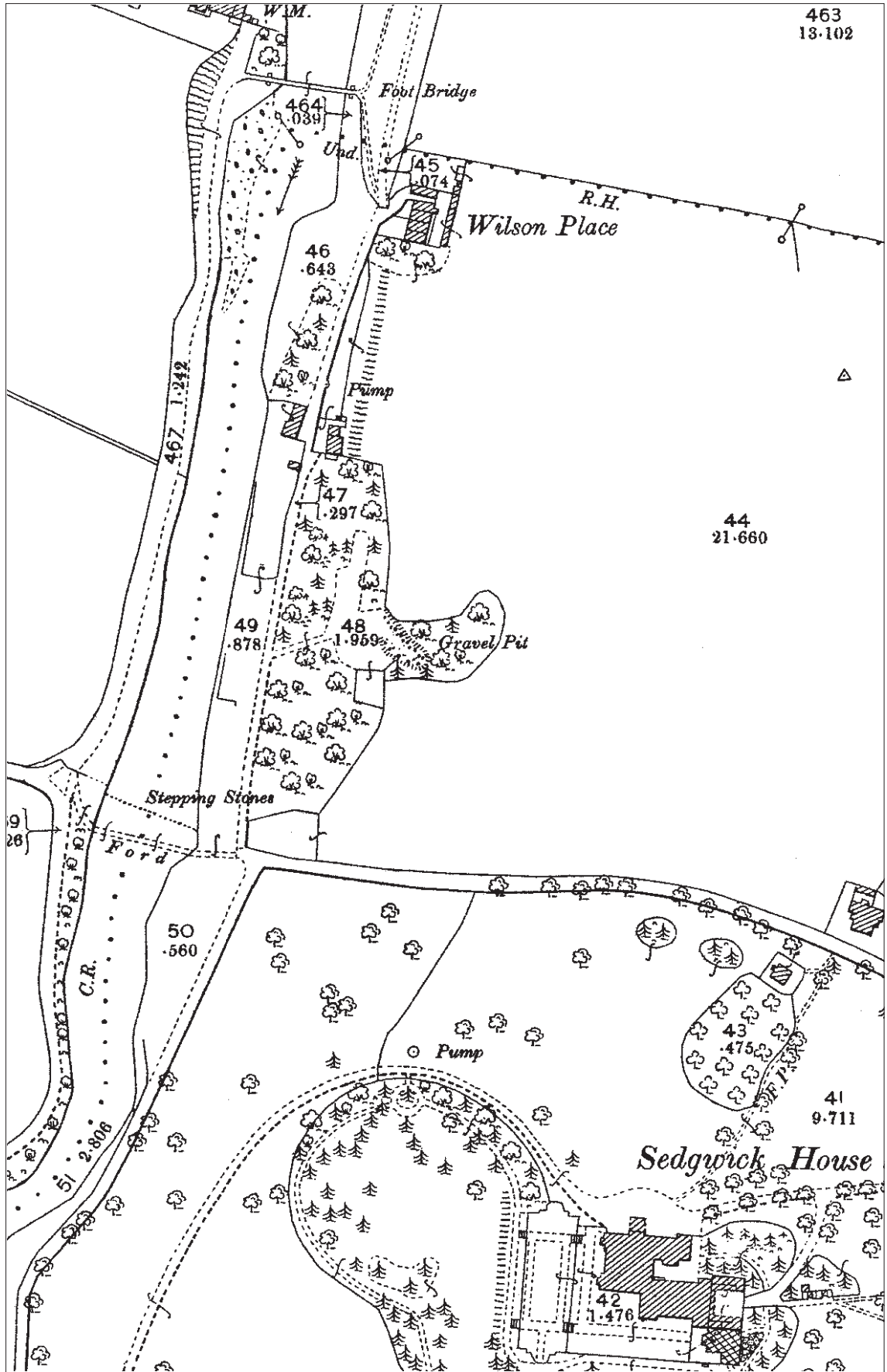


Figure 15. The site of the Old Sedgwick gunpowder works as mapped at 1:2500 scale in 1896 (reproduced from the 1898 Ordnance Survey map)

during its recent investigation of the New Sedgwick gunpowder works on the opposite bank of the river (Dunn *et al*, in prep). It was probably the principal, if not sole, source of stone used to construct buildings and to line leats at Old Sedgwick. The quarry is not depicted on any Ordnance Survey map, but is shown on an estate map dating to *c* 1850 (CRO(K) WDB/22/68.5).

### 5.3 Miscellaneous and/or undated features

#### Building remains

The 1854 and Bainbridge maps, and the first edition OS (Figs 4, 5 and 7), all agree in showing a long building range fronting the southern side of the road to Sedgwick village (Building 33 on Fig 13), centred at *c* SD 5088 8717. It is unlikely to be directly associated with the works, since the road runs in a cutting about 1m deep at this point with no obvious means of direct access up from it. Furthermore, the map evidence strongly indicates that the building lay within the grounds of the nearby Sedgwick House, and was connected to the original house by a short track (Fig 4). It was probably a stable block. It seems to have been demolished *c* 1868 when the first Sedgwick House was replaced by the present building. The survey identified two slight banks and also linear depressions surviving on the ground at the general location indicated by the maps; the former presumably mark the remains of the north and south walls, partly upstanding, the latter the sites of robber trenches.

#### Possible building platform

The survey identified a large platform-like feature at SD 50855 87272 (Fig 8), situated within the rough grassland area between the lane and the river, and just north of the sewage pumping station. No structure is shown at this location on either the 1854 or Bainbridge maps (Figs 4 and 6), and since the scarp defining the feature's northern edge seems to continue beneath the lane, it is a possibility that it is the site of a building pre-dating the gunpowder works. However, the feature is difficult to interpret satisfactorily.

#### Field boundaries

A number of grubbed-out field boundaries survive as low banks and scarps in the large pasture field in the east of the site (Fig 8). These can all be correlated with boundaries shown on the various 19<sup>th</sup>-century maps (see Figs 4, 5 and 13).

#### Ridge-and-furrow

Very slight traces of ridge-and-furrow are visible in the modern pasture field in the east of the site (Fig 8). The ridges are straight and run mostly parallel to each other about 3-5m apart, suggesting they date from the post-medieval period. The fact that they seem to cross the boundaries of the strip of land at the centre of the works shown belonging to the Wakefields in 1857, enables them to be dated to after the final sale of the rest of the site by the Sizergh Stricklands sometime after this date. It is likely the ploughing was undertaken by the new owners (the Wakefields – see section 4 above) in order to level the site and provide a more parkland-like setting for the nearby Sedgwick House.

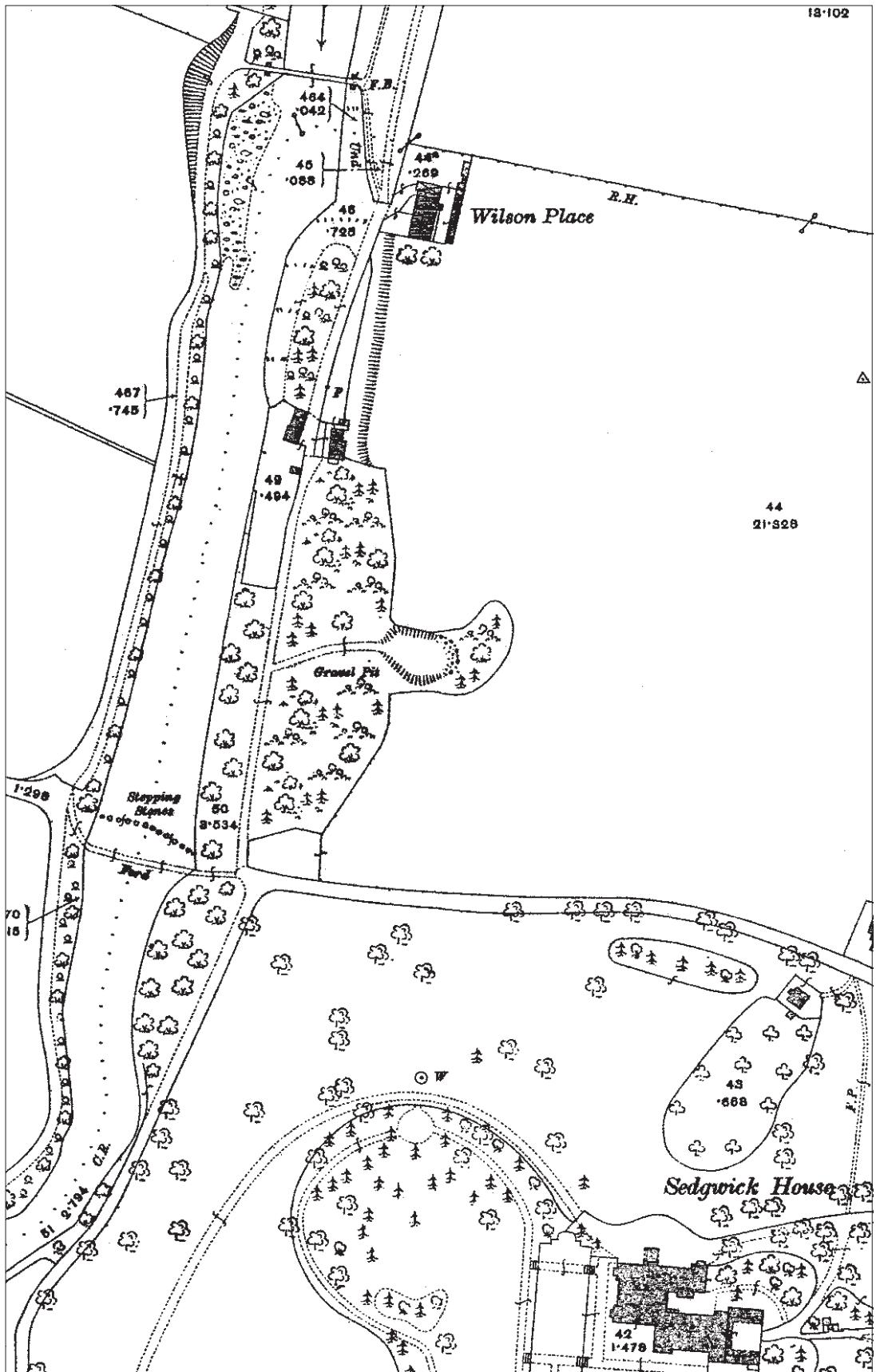


Figure 16. The site of the Old Sedgwick gunpowder works as mapped at 1:2500 scale in 1912 (reproduced from the 1914 Ordnance Survey map)

## Gravel pit

A small gravel pit is shown on maps of the late 19<sup>th</sup> and early 20<sup>th</sup> centuries (Figs 15 and 16), at SD 5092 8728 on the eastern edge of the site of the former gunpowder works. The pit has destroyed most of the site of the dust house as shown on the Bainbridge map (see section 5.2.3 above), although it is just possible that the very eastern end of that building still survives buried beneath upcast fringing the pit edge. The depicted area now forms part of the grounds of High Riverside House, and the sides of the pit have been landscaped and incorporated into the garden; a garage/shed occupies most of the eastern half of the pit's floor (Fig 8).

## Gas pipeline

A very slight, long mound oriented south-west/north-east some 40-50m north of the road to Sedgwick village (Fig 8), is probably upcast associated with the laying of a gas pipeline *c* 1983. The course of the pipeline is plainly visible on aerial photographs taken in early 1984 (OS/84091, frame 1), and corresponds well with the surveyed position of the mound.



## 6. DISCUSSION AND CONCLUSIONS

---

The present EH investigation has combined archaeological and documentary evidence to produce the first ever in-depth study of the Old Sedgwick gunpowder works. It has shown that contrary to previous opinion, slight earthwork traces do survive, and also that two minor buildings associated with the mill probably still stand: namely the steam-boiler house within the main works, and a small expense magazine or storehouse at the site of the nearby canal wharf. At the same time, however, it has had to draw heavily on documentary evidence, in particular 19<sup>th</sup>-century maps, in order to arrive at a meaningful interpretation of that physical survival. Nevertheless, the two sources of evidence corroborate and compliment each other well, and the fact that earthworks do survive raises the question of whether sub-surface stratigraphy of late 18<sup>th</sup>- and early 19<sup>th</sup>-century date might also survive, unencumbered by later phases of rebuilding as on many gunpowder sites. Furthermore, whereas previous writers have undertaken only very limited search of documentary and archival sources, the present study has identified a large body of new material. This material calls into question much of what has hitherto been written about the works.

Received wisdom states that the Old Sedgwick works was started in 1764, but the discovery of the initial lease of Lakerigg Mill - which did not begin until 1768 - suggests that this traditional date is either wrong, or instead relates to the year when John Wakefield I, William Gurnal, Thomas Strickland, John Johnson and James Hays first formed their partnership, and not when they actually began producing gunpowder. The evidence of the lease also reveals for the first time the true identity and number of partners in the business, which has not been properly appreciated until now; in addition, it offers a credible explanation for why the Company traded for a while as Wakefield and Strickland (section 4 above).

There is at present no evidence to suggest that the partners began their enterprise elsewhere before moving to Old Sedgwick/Lakerigg Mill in 1768. Such a scenario is inherently unlikely anyway, since it would have entailed the Company writing off substantial investment in specialist buildings and machinery after only a few years' production. But neither is there evidence that any of the partners had previous direct experience in the manufacture of gunpowder. It may well be, therefore, that they spent the years between 1764 and 1768 investigating what buildings and skills were needed, and looking for a suitable site to lease or buy. The likelihood is that they would also have had to hire a skilled overseer who had learned his craft in the mills of southern England, to run the works for them in the early years and teach them the particulars of the trade. This certainly happened at the Lowwood works near Haverthwaite which was set up in competition to Old Sedgwick in 1799; the partners here were in total ignorance of the art of gunpowder manufacture, and after various attempts at industrial espionage, finally had to resort to poaching James Pearce, one of John Wakefield's then more experienced employees, to operate the works for them (Palmer 1998, 1-3).

It has been suggested that it was John Wakefield I - born into a Kendal family of shearmandyers, and by the age of 18 running the family business in conjunction with his mother - who had the initial vision, drive and entrepreneurial spirit to branch out into gunpowder manufacture (Somervell 1928, 93; Marshall 1975, 221). This may well be so, for it is not clear what skills - other than a general familiarity with manufacture and trade - he could have brought to the venture otherwise. (The present author has been unable to establish whether water-powered gig mills were employed in the shearing trade in Westmorland in the mid-18<sup>th</sup> century). In contrast, however, his

four partners each brought very definite, transferrable skills, knowledge and/or contacts. Gurnal, Strickland and Johnson are described in the 1770 deed as ironmongers (they were already partners in the Force Mill Company which operated an iron forge a little downstream of Old Sedgwick, close to the site later to be occupied by the Basingill gunpowder mills (CRO(K) WD/W/11.11)), whilst Hays is described as a Liverpool merchant. Thus between them, these four could offer considerable experience in the erection and operation of water-powered mills, and also knowledge of trade routes and markets. Although the partners no doubt commenced the construction of the Old Sedgwick works immediately after signing the lease of Lakerigg Mill, it seems the loss of James Hays from the Company shortly afterwards meant that the remaining four had subsequently to try and raise additional capital by inviting James Dowker (described as gentleman of Kendal) to join their partnership in 1770.

The 1770 deed confirms that Wakefield and partners leased the site of an existing watermill - Lakerigg Mill. In effect, what they were doing was buying access to a head of water and potential source of power, with the right to alter and extend the site in order to adapt it for the manufacture of gunpowder. The existence of an earlier mill on the site has been noted before, principally by Somervell (1930, 71) and Patterson (1995, 12). But it is worth pointing out that Somervell seems not to have been aware of the existence of Lakerigg Mill, and thought that the earlier mill in question was sited on the opposite bank of the river, in Helsington parish. In fact, the 16<sup>th</sup>- and 17<sup>th</sup>-century inquests he cites in evidence probably relate to a mill situated further upstream (a possible site was identified during recent EH fieldwork at the New Sedgwick gunpowder works (Dunn *et al*, in prep), 0.5km upstream at *c* SD 5106 8803). But wherever this Helsington mill referred to in the inquests, was sited, it most definitely was not opposite Old Sedgwick, and furthermore had been abandoned and apparently replaced by Lakerigg Mill before 1768 (Jefferys 1770).

The explosives industry as a whole became increasingly regulated and safety-conscious through the 19<sup>th</sup> century, and from 1875 was overseen and policed by a newly-created government Explosives Inspectorate (Crocker 1988, 2; Cocroft 2000, 97-9). However, in 1768 when Old Sedgwick was under construction, there were no legal controls on the industry. In consequence, the Company was able to build the works around the existing hamlet of Lakerigg Mill, and to incorporate several cottages and other buildings within it; there was even seemingly a public right of way running the length of the site. Furthermore, because of the limited flat land available by the river and the leat, individual process buildings were also sited far too close to each other for safety if one happened to catch fire or blow up. But this could be seen as one of the features distinguishing the earliest gunpowder works in Cumbria (those started say prior to *c* 1850) from those constructed after that date. The earlier works seem to have taken over and adapted as best they could the sites of pre-existing watermills, with apparently little consideration of how the new gunpowder buildings could safely be fitted into the site. In effect, these works were slotted into, and constrained by, the landscape. If they continued operating into the second half of the 19<sup>th</sup> century, it was because they had room to expand and create greater safety margins between buildings as appreciation of the frequency and consequences of explosions grew. Works established after *c* 1850, such as New Sedgwick and Gatebeck, were able to select larger, virgin sites better suited to the safe spacing of the various process buildings right from the outset. Old Sedgwick probably only kept going for as long as it did through a combination of industrial inertia, and the fact that it was able to acquire additional incorporating capacity early on (1790) by opening the Basingill outstation.

The first attempt to regulate the gunpowder industry by statute, and so improve the safety of both the workforce in the mills and the general public living nearby, came in 1772. The 1772 Act laid down specifications for how magazines and storehouses were to be constructed, and for the first time established legal minimum distances (50yds or 45.7m) between buildings where explosives were stored and those where they were milled; it also outlawed a number of working practices, principally the storage of powder other than in magazines, and the use of pestle mills for incorporation (Cocroft 2000, 27-8). It is likely that at Old Sedgwick, incorporation was carried out using water-powered edge runners right from the outset, as no claim for compensation was forthcoming as provided for under the Act (Crocker and Fairclough 1998, 26). But it is possible that a number of buildings, especially the magazines and charcoal store, were rebuilt or re-sited as a consequence of it. If so, there is presently no evidence for where their original sites were.

Further reconstruction and re-arrangement of parts of the site is documented as taking place *c* 1820 (section 4 above). Although EH have not located written evidence describing the particular alterations carried out, we may in fact possess a record of them in the differences between the 1854 and Bainbridge map depictions of the site. (The possibility has already been raised (sections 3 and 4 above) that the 1854 map is in fact a copy of a much earlier survey). The reason for this re-organisation may have been an explosion known to have occurred in July 1821. However, this is the only explosion to which documentary reference has so far been found, and it is highly probable that there were other unrecorded blasts - and deaths - at the works. (See Appendix 2 at the end of this report for a more detailed discussion of accidents). By its very nature, any serious explosion would have necessitated a degree of reconstruction of the building(s) involved. It is perhaps strange, therefore, that the current investigation has failed to unearth any physical or documentary evidence of traverses or blast walls to minimise the consequences of fire and explosion at one building triggering secondary explosions elsewhere. The only suggestion of blast protection at the site is the belt of trees around the northern magazine (section 5.2.3 above) shown on the Bainbridge map.

In 1852 the Old Sedgwick works closed following expiry of the Company's lease of Lakerigg Mill, and John Wakefield III moved his gunpowder business to new premises at Gatebeck, although retaining the extra incorporating capacity of the Basingill outstation. The Strickland family who owned the majority of the land that the Old Sedgwick works stood on apparently attempted to sell the site as a going concern in 1854, but without success (section 4 above). Their failure to find a buyer was no doubt partly due to the constricted nature of the site, but perhaps was also influenced by the fact that part of the leat, and several of the buildings, lay on a strip of land owned by the Wakefield family who could, if they wished, deny a prospective operator - and potential rival to their own business - use of those facilities. It is against this background that the subsequent application by Henry Bainbridge to re-open the works in late 1856 and early 1857, and some of the detail on the map which accompanied that application (the Bainbridge map), must be viewed.

Taken on its own, the Bainbridge map is confusing in that it seems to show multiple corning houses. One is described in the key as standing partly on land owned by Mr Wakefield, and partly on land belonging to Mr Strickland (Buildings 16 and 17 on Fig 13) - although on the body of the map (Fig 9) the term corning house seems to apply to Building 18 to the north as well (described in the key as 'stove house on Mr Wakefield's land') - whilst the old corn mill (Lakerigg Mill; Building 14 on Fig 13) is also said to have been converted into a corning house. In addition to Building 18 being

named as the stove house in the key, the map seems to depict several other stove houses in Mill Field, although the sites are all sketched or annotated in pencil.

If the map is read in conjunction with the written judgment contained in the Kendal Order Book, however, all becomes clear. The application was granted on two main conditions: the re-siting of the corning house to the old corn mill, and the removal of the stove house to 'the spot marked by the letter A' in Mill Field (Fig 5). Since the existing corning house and stove house (Buildings 16/17 and 18 according to the key) both lay wholly or partly on Wakefield land, presumably Wakefield was refusing to let Bainbridge have use of them. Bainbridge must therefore have proposed to the Justices that the corning house should be re-sited to the old corn mill, whilst at the same time submitting the map marked-up with a number of possible locations for them to rule on the site for a new stove house. The map was then annotated as a record of the Justices' decisions. Thus, it is the descriptions in the map key which give the function of buildings when the works was operated by Wakefield; apparently contradictory information written on the body of the map records the change of use agreed to by the Justices. The failure of previous researchers to appreciate this has led to misunderstandings over the correct identity and position of several buildings.

Very little evidence has been found which sheds light on the precise method of gunpowder manufacture followed at Old Sedgwick, or the conditions of the workforce. Indeed, most of what is available has been gleaned from passing references in the Lowwood papers, and it may well be that a thorough search of that material would yield further useful clues. This is beyond the scope of the present study. Nevertheless, from the details already published by Palmer (1998), augmented by the findings of the present EH survey and a variety of other sources, the following rough outline of manufacturing process and working conditions can be sketched:

It is known that the workforce at Old Sedgwick were supplied with special leather clothing by their employer (Palmer 1998, 48), in order to reduce the risk of 'contraband' within the works (*eg* metal items which might induce sparks), and also the danger of wearing home work-clothes covered in gunpowder dust. It is therefore likely that a change house existed at the works from an early date. Although none is named on the Bainbridge map, two possible candidates have been suggested in section 5.2.5 above. It has also been suggested that one of the buildings may have been a female change house, but there is in fact no evidence that women were ever employed at Old Sedgwick; elsewhere, women were normally only taken on to pack cartridges - a process never carried out at Old Sedgwick which closed before the legislation prohibiting the preparation of cartridges at other than licensed premises was enacted. It must be a possibility that some of the workforce also lived on site. Since the cottages that existed around Lakerigg Mill prior to the erection of the works were never demolished or converted to industrial use, it is highly likely that they were used as tied houses for a number of the more privileged workers. Certainly when the experienced James Pearce was enticed away from Old Sedgwick to run the rival Lowwood mills in 1799, an offer of a dwelling house was made as part of the deal (Palmer 1998, 3).

Of the three raw ingredients necessary for gunpowder – saltpetre, sulphur and charcoal – the first two were always imported from abroad and refined at Old Sedgwick. Palmer (1998, 15) tells us that at the end of the 18<sup>th</sup> century the Wakefield Company was using both iron and copper vessels in the boiling, straining and evaporation of saltpetre. Although no details are available on how sulphur was refined at Old Sedgwick, it was probably similar to the method employed at Lowwood which involved simple melting and skimming (Palmer 1998, 17). Because the Bainbridge map does not name

separate, specialist, buildings where these refining processes were carried out, it seems reasonable to assume that they were undertaken within the same buildings where the substances were stored. Lowwood mostly imported its charcoal from outside producers, and also experimented with a variety of charcoal types, but in 1799 Old Sedgwick apparently used only savin-charcoal (savin is the local word for juniper) which was reputed to produce a higher grade of gunpowder. It seems that at this early time, Wakefield, too, was buying in his charcoal (Palmer 1998, 17-18), but later on, at least some charcoal was being manufactured on site, as shown by the depiction of a charcoal-retort house on the Bainbridge map (section 5.2.2 above).

Once prepared and refined, the three raw ingredients would have been milled to fine powder in the grinding mill attached to the preparing house, where they would subsequently have been weighed out and mixed in a rotating barrel in the standard ratio of 75 parts to 10 to 15. Both buildings (section 5.2.3 above) are shown as constructed in wood on the Bainbridge map, due to the risk of fire and explosion, and as lying *c* 40-50m south of the saltpetre/sulphur/charcoal store complex at the approximate centre of the site, with which they were directly connected *via* a short road. Power for the grinding mill and mixing barrel presumably came from an undershot, or possibly low-breastshot, waterwheel sitting within the leat channel which flowed beneath the grinding mill. (According to Wilson (1973, 327), the fall of the river at Old Sedgwick (Lakerigg Weir) was 10 feet, with an additional 11 feet at Basingill downstream, and topographically it is difficult to see how there could have been sufficient height difference between the two weirs to drive any overshot wheels).

The resulting green charge would then have been stored until required in a green-charge house (although no building is known to have served that specific purpose at Old Sedgwick), before travelling on to the incorporating mill, situated some 10m south of the preparing house. The Bainbridge map shows that this, too, had a wooden superstructure, presumably because it was designed to blow off in the event of an explosion, but if so, it is strange that the map does not also depict blast walls around the mill building which would have been far more effective in diverting the force of any explosion upwards rather than outwards. The building probably had stone foundations to bear the weight of the great bedstones used in the edge-runner mills. As with the preparing house, it is likely that power came from an undershot, or low-breastshot, wheel sitting directly within the leat. There is no evidence for the design of the gearing mechanism used to transfer power between the waterwheel and the edge-runners. It has already been observed (this section above) that it is likely that the method of incorporation at Old Sedgwick was always water-powered edge-runners, and that pestle mills were never employed.

After incorporation, the wrought charge needed to be stored and pressed. No wrought-charge house or press house is depicted on the Bainbridge map, but it has already been suggested (section 5.2.3 above) that pressing was carried out close to the corning house, which was the next stage in the process. The wrought charge would therefore have travelled back north through the works at this point, past the storehouse complex, to the area of the corning house. There is now no trace of the corning house on the ground, but it is possible that it is depicted in an illustration of 1802 (Wilson 1964, plate XVIIb) which shows a long, two-storeyed building standing not far from the river; however, this building is perhaps more likely to be the saw mill/works office complex (see also section 4 above).

After corning, the wrought charge would normally be glazed, dried, and dusted in order to size the grains, before being packed into barrels. There is no documentary

evidence that glazing was carried out at Old Sedgwick, although it could have been conducted within the buildings marked corning house or stove house on the Bainbridge map (see section 5.2.3 above). Otherwise, the works was laid out so that the corned charge only moved between buildings at the northern end, and along the higher eastern side, of the site, all well away from the mill buildings in the south as prescribed by the 1772 Act of Parliament.

## 7. SURVEY METHODOLOGY

---

The survey was conducted graphically using a copy of the Ordnance Survey's Land-Line data, plotted out at a scale of 1:1000. Tapes were laid between points of hard detail identifiable on both the map and the ground, and the observed archaeological detail added by hand using standard techniques of offset and radiation. This process identified a number of spatial errors of up to 2-3m within the existing OS mapbase, and accordingly the depiction of some archaeological detail had to be stretched or shrunk to fit. New detail was then scanned into an AutoCAD file containing the OS basemap, and hachures added electronically, resulting in a completely digital end-product. A hard-copy of the plan is reproduced in this report at a scale of 1:1250 in order to comply with the Ordnance Survey's copyright restrictions, which limit reproduction to a maximum of A3-size extracts.

The Bainbridge map was photographed at the Cumbria Record Office, Kendal, using a hand-held digital camera. The map had to be photographed lying flat on a table, with the camera held manually above it. This has resulted in a degree of distortion in the images, as can be seen in Fig 9. In order to produce Fig 9, individual frames showing sections of the map were imported into AutoCAD and scaled and rotated, but not stretched, to achieve the best fit with modern OS detail.

## 8. ACKNOWLEDGMENTS

---

Field survey was carried out by Christopher Dunn and Marcus Jecock. The report was researched by Marcus Jecock, aided by Christopher Dunn and Abby Hunt, and written by Marcus Jecock; Christopher Dunn commented on the text. Philip Sinton produced the drawn figures; Figs 8, 9 and 13 incorporate Ordnance Survey Land-Line data, and are reproduced with the permission of Ordnance Survey under licence no GD03085G. Fig 2 is from an air photograph taken by David McLeod and Peter Horne. Ground photographs were taken as slides by Christopher Dunn, and converted into digital format by Tony Perry; digital photography of documents in the Cumbria Record Office, Kendal, was taken by Marcus Jecock, and enhanced by Keith Buck. Danny Parker kindly copied papers in the Patterson collection held by EH at the National Monuments Record Centre (NMRC) in Swindon. Dr Margaret Nieke of the MPP assisted by providing access to the Step 4 report on the Gunpowder Industry.

EH would like to thank the Cumbria Record Office, Kendal, for permission to reproduce maps in their collections. EH also gratefully acknowledges the assistance of the various landowners at Old Sedgwick for permitting access to their properties, especially during the currency of the Foot and Mouth restrictions. Mrs Catherine Pottinger, John Wakefield I's great-great-great-great-granddaughter, and Mrs Janet Thompson, kindly shared their knowledge of, and research into, the Wakefield family, Mr David Willacy his knowledge of Sedgwick village.



## 9. BIBLIOGRAPHY

---

### Published sources

Anon 1865, *Local Chronology: being notes of the principal events published in the Kendal newspapers since their establishment* (London: Hamilton Adams)

Anon 1929, 'Short histories of ICI companies: the North of England Gunpowder Group', *ICI Mag*, October 1929, 337-48

Chitty, G 1996, *Monuments Protection Programme. The Gunpowder Industry: recommendations for protection (Step 4 report)* (Unpublished EH confidential internal document)

Cocroft, W 2000, *Dangerous Energy* (Swindon: English Heritage)

Crocker, G 1988, *Gunpowder Mills Gazetteer* (London: Soc Protection Ancient Buildings, Wind and Watermill Section, Occasional Publication 2)

Crocker, A and Crocker, G 1992, 'Gunpowder mills of south Cumbria', *Gunpowder Mills Study Group Newsletter*, **11**, September 1992, 8-14

Crocker, G and Fairclough, K R 1998, 'The introduction of edge-runner incorporating mills in the British gunpowder industry', *Ind Archaeol Rev*, **20**, 23-36

Curwen, J F 1926, *Records Relating to the Barony of Kendale, vol 111* (Kendal: Titus Wilson & Son)

Dunn, C J 2000, *English Heritage Archaeology and Survey Projects Division Step 4 Industrials Recording Programme Project Design. Project: The gunpowder industry module. Area: The Lake District* (Unpublished EH internal document)

Dunn, C *et al* in prep, *New Sedgwick Gunpowder Works, Cumbria: an archaeological and architectural survey* (York: EH Archaeological Investigation Report Series)

Gould, S 1993, *Monuments Protection Programme: The Gunpowder Industry. Combined Steps 1-3 Report* (Unpublished report for EH by The Cranstone Consultancy)

Hadfield, C and Biddle, G 1970, *The Canals of North West England, volume 1* (Newton Abbot: David & Charles)

Hunt, A *et al* forthcoming, *Basingill Gunpowder Works, Cumbria: an archaeological and architectural survey* (York: EH Archaeological Investigation Report Series)

Institute of Geological Sciences 1980, *IGS 1:250 000 series, Lake District sheet 54N 04W, solid edition* (Southampton: Ordnance Survey for IGS)

Jefferys, T 1770, *Map of the County of Westmoreland*. Surveyed 1768 (reprinted by the Cumberland Westmorland Antiq Archaeol Soc 2001: Record Series, vol XIV)

Mannex, P J 1849, *History of Westmorland with Furness and Cartmel in Lancashire* (London: Simpkin Marshall & Co)

Marshall, J D 1975, 'Kendal in the late seventeenth and eighteenth centuries', *Trans Cumberland Westmorland Antiq Archaeol Soc*, **75**, 188-257

Marshall, J D and Davies-Shiel, M 1969, *The Industrial Archaeology of the Lake Counties* (Newton Abbott: David & Charles)

Ordnance Survey 1895, *County Series 25*", *Westmorland sheet XLII.4*. Surveyed 1857 (Southampton: Ordnance Survey)

Ordnance Survey 1898, *County Series 25*", *Second Edition, Westmorland sheet XLII.4*. Revised 1896 (Southampton: Ordnance Survey)

Ordnance Survey 1914, *County Series 25*", *1914 Edition, Westmorland sheet XLII.4*. Revised 1912 (Southampton: Ordnance Survey)

Palmer, A 1998, *The Low Wood Gunpowder Company: its inception and early growth 1798-1808* (London: Gunpowder Mills Study Group/Soc Protection Ancient Buildings)

Parson, W and White, W 1829, *History, Directory and Gazetteer of Cumberland and Westmorland with Furness and Cartmel* (Republished by Michael Moon at Beckermet, Cumbria, nd)

Patterson, E M 1995, *Blackpowder Manufacture in Cumbria* (Faversham: Faversham Soc Paper 43)

RCHME 1999, *Recording archaeological field monuments: a descriptive specification* (Swindon: RCHME)

Somervell, J 1928, *Some Westmorland Wills 1686-1738* (Kendal: Titus Wilson & Son)

Somervell, J 1930, *Water-power Mills of South Westmorland* (Kendal: Titus Wilson & Son)

Wilson, P N 1964, 'The gunpowder mills of Westmorland and Furness', *Trans Newcomen Soc*, **36**, 47-65

Wilson, P N 1973, 'Kendal reservoirs', *Trans Cumberland Westmorland Antiq Archaeol Soc*, **73**, 325-47

## **Archival sources and newspapers**

Cumbria Record Office, Kendal (CRO(K)):

WD/W/11.3 Map of Sedgwick estate belonging to J Wakefield, 1796

WD/W/11.4 Sundry deeds of premises, mainly at Sedgwick, including Lakerigg Mill, 1723-1875.

WD/W/11.10 Deed of co-partnership of Lakerigg Mill Company 5 Feb 1770, reciting lease of Lakerigg Mill from Charles Strickland, 12 May 1768.

WD/W/11.13 Map showing exchange of lands at Sedgwick between WH Wakefield and Mrs M Wilson, 4 Jun 1868.

WDB/22/68 Maps in terrier, *c* 1850

WDB/35/564 Map showing closure of footpath at New Sedgwick, 1860.

WDB/35/980 Plan of Sedgwick House and gunpowder works, nd

WDB/35/SP271 Sales particulars of lands to be sold at auction, 8 April 1854

WQ/A/H/15 Map accompanying order to divert footpath at Old Sedgwick, 9 Jan 1857

WQ/O/15 Kendal Order Book 1839-76

Kendal Reference Library:

Westmorland Gazette, Saturday 28 July 1821

Westmorland Gazette, Saturday 2 October 1830

Westmorland Gazette, Saturday 28 April 1832

NMRC Swindon:

Patterson Collection. Box 2, item 5

Air Photos Library: OS/84091, frame 1, 26 Apr 1984

NMR 17668/34, 12 Dec 2001

## **Appendix 1: The process of gunpowder manufacture**

---

Given below is a brief outline of the process of gunpowder manufacture, and glossary of main terms.

The method of gunpowder manufacture has been described in detail elsewhere (Cocroft 2000; Crocker 1999; Patterson 1995) and only a brief outline of the main processes likely to have been employed at Old Sedgwick is given here. Manufacturing Method Books survive for a number of the Cumbrian mills, outlining in detail the manufacturing process as carried out in each during their final years of operation in the 1920s and 1930s, but no such book survives detailing the procedures used at Old Sedgwick just before it closed in 1852. The chief recorded output of the Old Sedgwick mills was blasting powder for mines and quarries, produced as a loose powder, and transported in wooden barrels to its destination. It was only after 1875, that it became a legal requirement for explosive cartridges to be prepared at licensed premises rather than by the end user, and so there were never any cartridge compressing or packing houses at Old Sedgwick, as there were eventually on the other Cumbrian sites. This part of the process is therefore omitted from the description below. Some of the terminology used to describe gunpowder manufacture in the Lake District appears to be regional vernacular; where this is the case, other terms commonly used are given in parentheses.

The three ingredients of gunpowder are saltpetre, charcoal and sulphur in the ratio 75:15:10. These constituents do not combine chemically but are simply blended together; the manufacturing process is therefore concerned with creating a thoroughly incorporated mixture in an evenly granulated form. The combined powder had to be compacted, before being broken down in to even-sized grains.

The first stage of manufacture was the preparation of the ingredients. Saltpetre, imported from abroad in its 'grough' or raw state, needed to be refined; this was achieved by gentle crystallisation which enabled the impurities to be skimmed off. Imported sulphur also contained impurities and was similarly refined at the works. Although charcoal was frequently bought in from local suppliers provided it was of sufficient quality, at Old Sedgwick some at least seems to have been made on site in sealed **retorts**. These three raw ingredients were all kept in separate stores, known, appropriately as the **saltpetre house**, **brimstone house** (sulphur house), and **charcoal house**. In the **preparing house** or **preparing mill** (mixing house), charcoal and sulphur were ground separately to a fine powder in an **edge-runner mill**, a pair of vertical cast-iron runners which rotated on a cast-iron bed plate. All the ingredients were then sieved to remove lumps or grit before being weighed out in the correct proportions and mixed in a rotating barrel. The mixed ingredients, called green charge, were transferred to the **green-charge house** to await incorporation.

In the **incorporating mills** the green charge was fed into a series of edge-runner mills that mixed and compacted the gunpowder into a denser mass known as **mill cake** or **wrought charge** (ripe charge). This process took 1½ - 2 hours, during which time the process was supervised from the comparative safety of the **watch house**, and the charge periodically dampened to help it meld together. Once incorporated, it was removed and stored in the **wrought-charge house** (ripe-charge house) until the next stage of manufacture.

The mill cake was then transferred to the **press house**. First it was broken down by hand using wooden beaters and combined with dust recycled from the corning house

(see below). The powder was then spread thinly onto a series of brass plates, one on top of the other to form a large ‘sandwich’ of 35 layers which was pressed for about 35 minutes in total. While one batch was being pressed another was being prepared.

By this stage the powder had reached a satisfactory mix and density but needed to be granulated into rounded and evenly sized grains. This was undertaken in the **corning house** where the press cake was broken into pieces by hand and fed into rollers which granulated it. The powder was passed through a sieve to remove dust, which was returned to the press house, whilst larger pieces went back through the rollers.

In the **glaze house** the grains of powder were tumbled in barrels with graphite in order to smooth them and make them less hygroscopic. After glazing, powder that was destined to be sold loose went straight to the **stove house** (drying house) to remove any residual moisture. In this building the powder was dried in racks with the aid of hot water pipes that radiated heat from the floor of the building. The water was heated in a separate building – the **steam-boiler house** – to minimise the risk of accidental explosions caused by sparks from the boiler. The powder was usually left to dry overnight. Dried powder then went to the **dust house** for final sizing of grains. The powder was sieved through different-sized meshes and anything that was too large or too small was returned to the preparing house to start the manufacturing process again.

Finally, loose powder ready for despatch to customers was packed into barrels in the **heading-up house** (‘heading-up’ referred to the closing of the barrel). Filled barrels were placed in the **store magazine** to await despatch; powder which was in between processes could be temporarily stored on site in smaller **expense magazines**.

By the 19<sup>th</sup> century, batches of powder were normally checked for quality and reliability on the proofing range before despatch. There is no evidence that Old Sedgwick possessed such a facility.

Other buildings found on gunpowder sites in the 19<sup>th</sup> century often included the **cooperage, cart house, millwright’s shop, smithy, saw mill, clocking-in shed, privies** and **change house**. The function of all these is fairly self-explanatory, with the possible exception of the last, which was where the workforce changed out of their everyday clothes, and donned special protective clothing before starting work. There were frequently separate buildings for men and women, although it is not known whether women were employed at Old Sedgwick.

## Appendix 2: List of recorded explosions at Old Sedgwick

Because Old Sedgwick closed before the 1875 Explosives Act, there are no official Government accident reports as there are for the other Cumbrian gunpowder works. The following table lists only one explosion because it is the only one to which reference has been found in the published secondary literature. It may be possible to produce a fuller list by systematic scrutiny of contemporary local newspapers, but the fact that there is a publication (Anon 1865) which claims to have done this already for the Westmorland Gazette, and apparently turned up only one report, suggests it may prove to be a futile exercise. Such a systematic search is beyond the remit of the present report.

It is most unlikely that the 1821 explosion was the only accident at Old Sedgwick. Patterson (1995, 41-2) has analysed the accident rates for the other Cumbrian gunpowder mills, and arrived at figures of two years per death for Blackbeck, six years for New Sedgwick, eight years for Lowwood and Elterwater, just over nine years for Gatebeck, and amazingly 48 years for Basingill. However, such statistics are likely to underestimate the true numbers of fatal accidents – particularly for Basingill - simply because of the uncertainty over how reliably accidents were reported in the press prior to 1875. If we were to settle on eight years per death as the industry average in Cumbria, we should predict in the order of ten deaths for Old Sedgwick during its lifetime, not to mention many more non-fatal accidents. Against this, it was reported of Old Sedgwick in 1849 that ‘an explosion occasionally takes place, which may be heard at a considerable distance, but without occasioning any loss of life (Mannex 1849, 275).

Date	Site	Cause	Damage	Casualties	References
23 July 1821	Incorporating mill?	Lightning strike?	Not specified	1 man badly burned	Anon 1865, 44; Curwen 1926, 235; Westmorland Gazette, 28 July 1821

### **Appendix 3: The archive and photographic record**

---

A survey archive consisting of the field plan, hard-copy print-out of the final electronic drawing, plus supporting background information such as the Project Design and correspondence, has been deposited with the NMRC in Swindon under Collections reference AF 00005, where it is available for public consultation upon request. The digital plan is currently retained at the EH York office, as are the digital photographic images contained in this report together with other images of maps in the Cumbria Record Office, Kendal; all are publicly available on request.

#### **Appendix 4: Concordance of NMR numbers linked to the survey**

SITE NAME	COUNTY	DISTRICT	PARISH
Old Sedgwick gunpowder works	Cumbria	South Lakeland	Sedgwick

SITE NAME	NGR	NMR No.
Old Sedgwick gunpowder works (site of)	SD 509 873	SD 58 NW 41
Sedgwick House	SD 5102 8701	SD 58 NW 39
Old Sedgwick House (site of)	SD 5092 8710	SD 58 NW 42
Stable (site of)	SD 5088 8717	SD 58 NW 43
Lakerigg Mill (site of)	SD 5089 8745	SD 58 NW 44
Lakerigg Weir (site of)	SD 5088 8751	SD 58 NW 45
Tithe barn (site of)	SD 5087 8732	SD 58 NW 46
Riverside	SD 5087 8737	SD 58 NW 47
Garden Cottage (including steam-boiler house)	SD 5089 8737	SD 58 NW 48
Cottage (site of)	SD 5087 8719	SD 58 NW 49
Canal wharf	SD 5142 8715	SD 58 NW 50
Possible canal building - gunpowder magazine/store?	SD 5141 8712	SD 58 NW 51
Lancaster Canal	N/a	LIN 126
Quarry nr Lakerigg Farm	SD 5103 8818	SD 58 NW 52