internal structure, such as a grate, within either the vault or the shaft, and there is an area of considerable collapse of the shaft lining on its north east side.

The fireboxes open into the shaft through eight narrow, arch-headed openings of slightly different sizes, but measuring on average 0.25m wide and 1.0m high. Although none of the fireboxes survive intact, and one on the south east side has been completely in filled, it is clear that they formed small chutes down which material could be fed into the shaft. The shaft lining has undergone vitrification above the firebox openings, to an increasingly intense level towards the top of the shaft.

2. THE FLUE

The means by which the flue connected with the top of the shaft is not now known, but it may have been achieved using material which has now perished, perhaps metal. The main flue structure begins some 3m from the top of the shaft, and comprises a linear tunnel with a flat floor 0.8m wide and vertical sides 1.4m high, formed from mortared limestone rubble. The external faces are not mortared however.

The flue is capped with massive, roughly hewn limestone blocks around 0.3m thick and 1.0m long. These are roughly placed on top of the flue, and there are obvious gaps between them. There is no evidence that these were sealed, although it is possible that they were covered with material which has not survived, perhaps turfs. There is however a complete lack of vegetation over the flue, so it seems unlikely that there was ever any significant depth of soil. The capping and sides of the flue have collapsed in various places, although overall an estimated 80% survives intact.

The flue has a total length of 70m, over which its base rises by 2.0m. In order to even out the undulating nature of the ground over which it passes (which includes the early 19th century quarry) the base is built up, its elevations have a strong batter, and in places there is a plinth to provide a wider footing, up to 4.0m across.

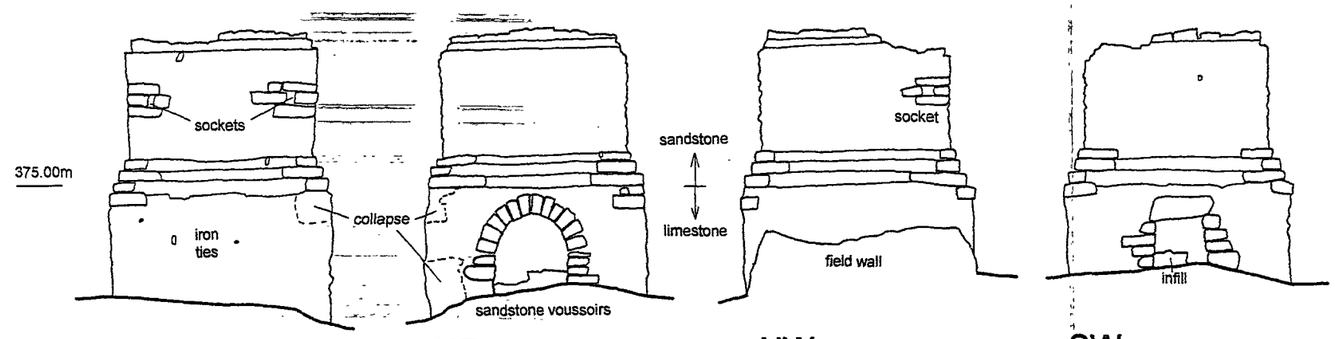
There are three openings in the south east side of the flue, two of them blocked. They are around 0.8m wide, but vary in height, from 0.5 to 1.1m high. They appear to have allowed access into the flue, presumably for maintenance purposes. At the south west end, the flue is more extensively collapsed, and there is a gap of 8m between it and the chimney where the form of the flue is not clear, there being no capping stones and only a vague indication of its inside faces. It is therefore not clear how the flue connected with the chimney.

3. THE CHIMNEY

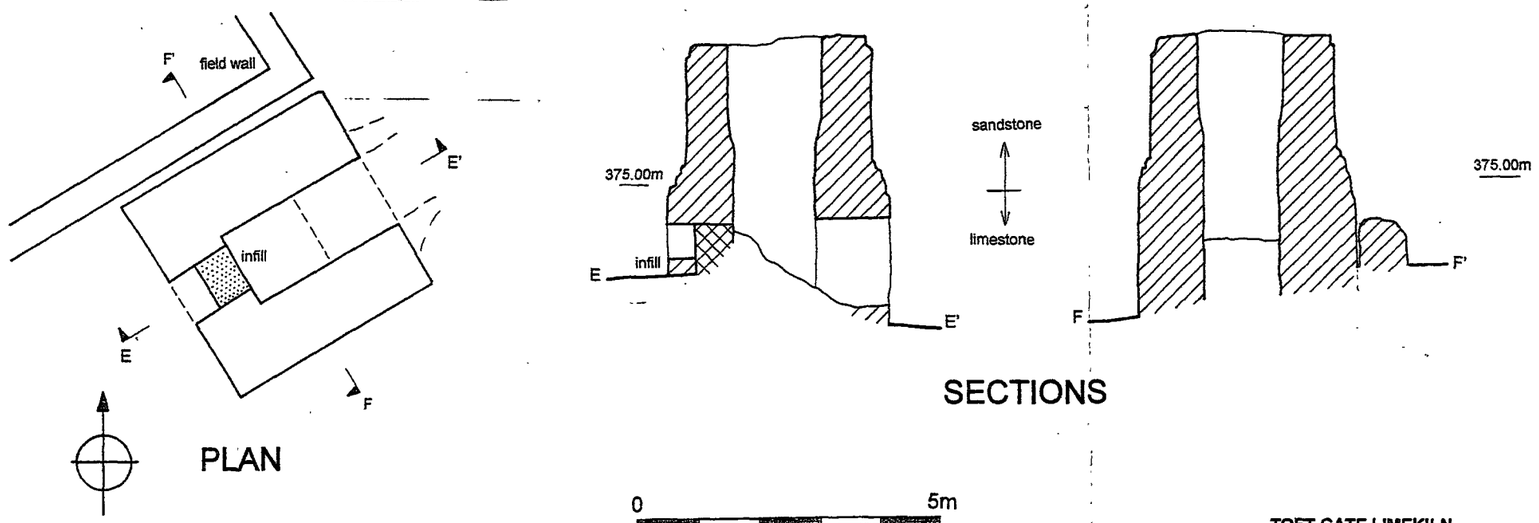
The chimney has a square plan. Its outer sides measuring 3.6m and its walls 1.2m thick at ground level. It now stands to a height of 4.5m. The lowest 1.5m or so is constructed of coursed limestone rubble. Above this, the outer walls are of coursed sandstone, and step in on both the internal and external faces, both at the change in

PLATE 5

FIGURE 7



ELEVATIONS



TOFT GATE LIMEKILN
BEWERLEY - 6059
NORTH YORKSHIRE
CHIMNEY - PLAN, ELEVATIONS, SECTIONS
NOVEMBER 1999

stone types and at the present top of the structure. The original height of the chimney is not clear but there is a small amount of rubble within the structure which may be derived from the wall tops. It is possible that if the walls at the top part of the structure were relatively thin they may have undergone collapse, while the surviving walls are thick enough to have survived. There are a few iron wall ties similar to those on the kiln, on the south west and south east faces. Additionally, three sockets, or putlog holes, are evident on the south east and north west faces.

The chimney has two openings at ground level. An arched opening, with sandstone voussoirs, faces towards the flue, and measures 1.2m wide and 1.1m high. The base of this opening has been blocked, probably following disuse. There is also a rectangular opening under a limestone lintel in the south west elevation, likewise partly blocked on the outside and in filled to the level of the lintel on the inside.

4. THE BUNKERS

The bunkers are poorly defined and in a much altered area lying to the south of the kiln. Essentially there appear to be two parts to the structure, which share a rear revetment wall, up to 4m high and built on top of exposed bedrock, facing east north east. The earthern embankment to the rear of the bunkers has been significantly disturbed during recent groundworks. This has resulted in the removal of upto 8m of its southern extent.

The northern extent of the bunkers measures 8m across and on the north side is unenclosed, continuing across to the top of the pit between here and the kiln arch. On the south side, the bunker is defined by a wall 1.5m high and projecting out from the revetment by 2.5m. The east end of this projecting wall is clearly original, indicating that it was simply a dividing wall rather than part of a more extensive structure. It appears to have been reduced in height, however, as stones projecting from the revetment indicate that it was formerly higher. This area is fed by the pipe which projects from the revetment wall by 0.1m (largely obscured by vegetation), 1.6m above ground level, and at 367.40m AOD.

The south part of the bunkers appears to have been open to the east, but enclosed on both south and north sides, where the base of a wall projecting 2.5m from the revetment survives. The revetment above this area is stepped back by 0.5m between 1.5m and 3.0m above ground level. South of here the revetment has been truncated. An opening in the revetment at ground level appears to result from collapse rather than being an original feature.

5. THE POND

The pond is located 60m to the south of the chimney. It is sub-circular in plan and measures 13m across, and lies on sloping ground which has been built up on the east side. It is lined with sloping limestone masonry. The present water level being 1.0m below the top of the sides, and an area of collapse at the eastern side suggests

PLATE 6

that this water level, at approximately 370.30m AOD, was formerly higher. The present water level would give a fall of over 2m to the other end of the pipe at the bunkers.

The pond is fed from the west by a stone-lined culvert which emerges beneath the field wall to the west. Beyond this the course of the water supply is not clear. There is also a stone-lined overflow channel running parallel to the wall in a south easterly direction for 20m. Both channels are partly collapsed and the means by which supply was controlled is not clear.

The outflow from the pond is now via a loose section of iron pipe which is located within the area of collapsed bank at the east end of the feature. However, the original outflow is almost certainly located in the north east part of the pond, probably below current water level, where the pipe identified as running between here and the bunkers probably emerges.

6. THE PIPE

The pipe is buried and is only evident at the north east end, where it emerges into the bunkers, and also approximately half-way between here and the pond, where it is visible at ground level. As a linear feature below the turf; parts of it appear to have been removed.

The pipe is of cast iron and is made up of sections with flanged ends, some 2.5m long and bolted together. It has an external diameter 90mm, and has a flattened upper face with square projections.

7. THE QUARRY

The principal quarry is situated to the immediate west north west of the kiln. The limestone quarry has a rectangular planform measuring 24 x 22 metres, with well defined north and east facing aspects, each with near vertical limestone faces that measure 7 metres in height. The southern aspect of the quarry is stepped and more gradually sloping. To the east the form and nature of the quarry has been obscured by recently tipped material which also obscures the access into the quarry. The base of the quarry has been reduced in a series of concentric working platforms.

The crinoidal limestone is naturally fractured and there is no indication that drilled charges have been used in the quarrying process. The surface geology is in places outcropping, elsewhere there is minimal coverage of overburden. The nature of the limestone varies across the quarry from the fine, evenly grained stone that is bedded in large blocks in the south of the quarry to the heavily fractured fist sized fragments in the east facing aspect.

The quarrying process has resulted in the removal of earthworks associated with late medieval / post medieval limestone quarrying and lead prospecting. The profiles of

a number of shallow quarry scoops that have been part excavated by the principal quarry survive on its east facing aspect.

8. THE TRACKWAYS

Access to the lime kiln complex is off the Grassington to Pateley Bridge road from the north eastern corner of the site via a principal track that forks towards its south western extent.

The principal track has a curvilinear planform, with a north eastern alignment. The track is surfaced in limestone "quarry bottoms". The track measures 2.4 metres wide and broadens to 14 metres to the south west to form a turning or storage area. The surface of the track rises on a very gentle gradient to the south west. Intermittent short lengths of the track are raised above adjacent ground levels. Towards the south western extent the surface of the track is approximately 0.6m below the adjacent ground levels, to the south and is elevated by 0.8m above a secondary access track to the north.

The construction of the principal track resulted in the truncation of a number of shallow earthworks associated with Late Medieval / Post Medieval extraction industries.

The secondary track forks off the centre section of the principal track on a western alignment, leading towards the general area of the quarry and the south east corner of the lime kiln. The western terminus of the track can not be established. The gradient of the track slopes gently down to the west. The surface of the track is part "quarry bottoms" giving way to outcropping limestone towards the west. The track measures 6 metres wide, broadening to 8 metres to the west where it forms a turning area / loading bay adjacent to the kiln. The track occupies an area of the site where the ground levels had been reduced by up to 2.4 metres in depth.

9. THE COMPLEX OF EARTHWORKS

The earthworks that have been selected for inclusion within the survey are largely contained within a wedge shaped area of ground contained to the north by the field boundary and to the south by the principal track to the south, extending as far west as the principal quarry. In addition, situated towards the western extent of the site, the south eastern extent of an earlier limestone quarry has been identified. Some minor features have also been recorded to the immediate south of the flue and chimney.

The earthworks consist of three, lozenge shaped quarry scoops that have been excavated into the natural fall of slope. The scoops have a flat bottomed V shaped profile, the average dimensions of which measure 40m x 18m and up to 2.4m in depth. Each of these excavations have a south facing aspect and are accessed from the principal and secondary trackways.

The internal aspect of each of the scoops consist of small worked faces, working platforms of unexcavated ground and small mounds of spoil.

The spurs of unexcavated ground separating each of these workings reflects the relief of the pre-industrial landscape. However these together with a strip of ground to the north, have been subjected to minor excavations. This complex of amorphous shaped scoops and spoil mounds have been cut by both the excavation of the larger workings and by the construction of the northern boundary wall. These structures have typically shallow rounded profiles, the average size of which measure 10m x 8m and upto 1.6m in depth.

The south eastern extent of the early 19th century limestone quarry has been recorded. The principal north facing aspect of this quarry originally passed beneath the flue. The steeply sloping quarry face, measures up to 2.5m in height and is largely overgrown with only intermittent sections of exposed limestone. The stone is heavily fractured, and outcrops near the surface with only minimal overburden. Little spoil has been identified with these workings.

A minor complex of quarry scoops and prospecting pits have been excavated to the south of the chimney and flue. These structures consist of quarry scoops with shallow south south east facing aspects. Which on average measure 8m x 3m and up to 0.30m deep. No spoil has been deposited within the near vicinity. Two prospecting pits have been identified. These sub circular features, with 4m diameters, have shallow rounded profiles, the depth of which measure 0.4m deep. These earthworks are contained to the west by the remains of a partially collapsed gallery or adit that appears to be directly related to a shaft (OS Map 1909) that is situated 8m to the north west of the chimney.

MONUMENT INTERPRETATION

Background

The Toft Gate Kiln is the product of the mid to late 19th century demand for large volumes of lime that was primarily used in the building industry and large scale civil engineering projects as well as a source of fertiliser for agriculture. In an attempt to meet this increased demand commercial or 'selling kilns' as they are otherwise known were constructed, the design and technology of which varied. Industrial archaeologists have recently recognised the importance of classifying the kilns according to the main criteria; namely function and structural design. The Toft Gate Kiln falls into the classification of a **continuous burn, dual feed vertical furnace**.

Lime Kiln Design

As with many other engineering projects of the mid 19th century the Toft Gate Limekiln appears to have been an experimental project that has drawn concepts from the latest developments in lime kiln technology and from other local processing industries. The realisation of this concept was ambitious to say the least, as there

was no guarantee to its designer/builder that the components would work as a single unit. The chemistry behind the lime burning process was well documented and understood, by the mid 19th century, but achieving the realisation of this in the field with a kiln was as much an art form as it was a science or a design concept.

The design of the Toft Gate Kiln was never patented, as to whether this was indicative of a failed project can not be established from this evidence alone. Griff Hollingshead's research suggested a German influence in the kiln design. Unfortunately this recent programme of investigation has failed to make this connection. However, Griff also indicated that elements of the design of the kiln do have similarities with the vertical feed process that was patented by Peter William Spencer (British Patent 767 (1870) Lime kilns etc. of Raygill in Lothersdale). This connection would seem plausible, but remains unproven. Spencer's kiln technology introduced fuel some distance down the sides of the shaft of the kiln, as it was hoped that by having a sufficient depth of cold limestone over the fuel, a low temperature could be achieved near the top of the kiln thus improving the circulation of gases through the kiln and its overall efficiency.

Similarities can also be drawn with the limeworks at Brockham, Surrey which operated from about 1867-1936. These works were patented by Alfred Bishop (Patent 14997 of 1889). Bishop's design relied on a series of eight feed-shafts by which fuel was supplied in small quantities in order that it would arrive and burn at the circumference of the burning zone. The design also incorporated a shaft / chimney pot with a side entrance that was used for the drying and storage of chalk.

A similar design was made by John Briggs of Clitheroe (Patent 7308 of 1892), with the exception that the shaft/chimney pot was removed and the kiln had less steeply sloping fire boxes. The importance of this local venture and its possible influence on the Toft Gate Kiln can not be underestimated.

The concept of utilising a horizontal flue and chimney for the improved efficiency of the draw and for the removal of noxious fumes has been utilised by commercial sized kilns elsewhere, such as the Hoffman Kiln at the Craven Limeworks, Ingleton. This incorporates a flue with a circular cross-section and a diameter of 5ft that was constructed in 1868 with a double skin of bricks and outer skin of hard grey concrete. The flue measures approximately 80m long, ending in a chimney. The Toft Gate design appears to be less sophisticated and shares close similarities with the flue / chimney configurations of the lead smelting industry of the Yorkshire Dales. Local examples include the Cockhill and Prosperous Smelt Mills

The recent survey would suggest that the kiln, flue and chimney were constructed in a single build, with only minor, later, modifications. No evidence has been found to indicate that the kiln was first built and then subsequently required the assistance of a horizontal flue and chimney.

It has been established that the kiln was built on the site of existing limestone quarries. The quarry to the west had been largely worked by the 1860's and as such is unlikely to have formed a component of the overall complex. Rather it would seem it was an obstacle to overcome when constructing the flue. The second and principal

quarry that is situated to the immediate north west of the limekiln was under excavation prior to the construction of the kiln. It is likely that the upper levels of stone from this quarry provided the building material for the kiln, flue and elements of the chimney. The kiln itself is sited in the base of this quarry and it would appear that the pit situated to the north east of the kiln was the eastern limit of this working.

The recent survey has enabled a more detailed understanding to be gained of the structure and how it originally functioned. However, the accumulated and tipped material within and immediately adjacent to the structure has hindered our investigations and as such a number points remain unresolved.

The source and conveyance of limestone

Our present understanding would suggest that the main source of limestone for feeding the kiln was extracted from the adjacent quarry. This may have been supplemented with stone extracted from the minor workings adjacent the principal trackway. Upon extraction the stone would have been broken into 'fist' sized lumps that were then transported from the base of the quarry and fed into the main body of the kiln via the stoking hole on its top surface. The method of conveying the raw material into the kiln has not been accurately established. The identification of metal fastenings on the top surface of the kiln indicate the location of a crane or other lifting device that could lift the limestone from the quarry to the top surface of the kiln from where it could be fed into the kiln. The exact type of lifting mechanism remains unclear but it is possible that a steam powered crane was installed. In support of this option a piped water supply to the kiln has been installed and secondly deposits of cinder/clinker of a type likely to have been produced by the generation of steam power has been identified on site, 14 metres to the north of the kiln at N.G.R. 41304 46440.

An alternative supply and feed process can not be completely ruled out. However it has not been satisfactorily established that a barrow/tramway ramp afforded access to the surface of the kiln from the south. The nature and form of the earthworks to the south of the kiln are not suitable for such access, the aspect of which is too steep. Any such access would require the construction of a wooden rampway. Whilst the existence of such a ramp can not be ruled out, two further considerations make it unlikely. Firstly the stone would have to be transported a distance of 174 metres from its source to the kiln, utilising a network of thoroughfares that do not directly service this route and secondly the quantity of stone required to feed a kiln of this size would make a barrowed supply unsuitable and inadequate.

The source and conveyance of the fuel

The fuel that supplied the kiln is suspected to have been coal as alternative fuels such as timber and peat would seem unlikely given the large scale nature of the operations. The source of the coal remains unclear but it seems most likely that it was transported to Pateley Bridge on the railway network from either the North East or the West Riding. From the railway sidings it was transported the 3.6 km journey by horse drawn coal wagons via the Grassington to Pateley Bridge road. Alternative

coal sources have been identified in the District of Craven, such as those near Appletreewick and Threshfield.

Site access was designed for wagon traffic as the termini of these tracks broaden to facilitate the turning of wagons and to store fuel and lime. From these storage areas, and possibly from the structures identified as bunkers (located to the south of the kiln), the coal would have been barrowed to the kiln and onto the wooden gantry that afforded direct access to the eight fireboxes.

The Lime Burning Process

The Chemistry of lime:-

Burning $CaCO_3$ - $CaO + CO_2$ (limestone - quicklime + carbon dioxide to atmosphere)

Slaking $CaO + H_2O$ - $Ca(OH)_2$ (burnt lime + water - hydrated lime)
(burnt lime + excess of water - lime putty)

Reversion $Ca(OH)_2 + CO_2$ - $CaCO_3 + H_2O$ (lime + sand + water = mortar)

The process of lime burning at Toft Gate appears to have involved feeding the limestone into the shaft from the top of the structure. It is possible that the prior to loading the kiln, the limestone was dowsed with water. The presence of a ready available water supply may support this possibility. The wetting of limestone prior to the burn resulted in the release of steam during the firing process. This reaction facilitated the movement of carbon dioxide through the charge and into the flue. This would have been further improved by the construction of the flue and chimney.

For the draw action of the flue to work effectively it would have been necessary for the flue to have continued to the shaft opening. However, it is unlikely that the flue structure projected over the shaft opening as this would have made the loading of the kiln difficult. Rather it would seem that the shaft opening was covered in a specially designed metal hood that could be lifted/ retracted for loading and yet could be repositioned to direct the noxious gases in to the flue. It has been suggested by Griff Hollingshead that the improved efficiency of the firing process, resulting from the increased draw of the flue, was an attempt by the kilns designers to achieve a exothermic reaction. This is when the heat generated by the firing process results in a perpetual burn with only a minimal amount of additional fuel being required.

The limestone charge was fired within the kiln by coal that was passed into the lower /mid section of the shaft, through the eight, surrounding, fireboxes. The resulting quicklime and burnt coal ash dropped towards the base of the kiln where it was extracted via the draw holes. It is usual in most limekilns for the charge to be held in place, until reduced to quicklime, above the draw chamber by a metal grate. As no evidence of such a plate has been identified at Toft Gate, it is likely that this metalwork has either been salvaged and removed from site or alternatively lies buried by the tipped material.

The removal and conveyance of the lime

The burnt lime that accumulated within the base of the kiln was raked out from draw holes. Two arched openings have been identified on the south east side of the kiln and it is likely that these would have been used for this purpose. It is also possible that a third draw arch is situated towards the base of the north east elevation of the kiln, an area of the structure now obscured by tipped material. Here the survey has identified a large, recently, backfilled pit, the function of which may have been to contain the lime. Alternatively it may have been used for slaking (Hydrating) the lime. It is interesting to note that in both of these instances the lime, once drawn out from the kiln would be held temporarily within deep pits. The pits have vertical, quarried sides that exceed 2.5m in depth. It has not been established how the lime was extracted but it is possible that a wooden ladder afforded access but this would be unsatisfactory for commercial levels of extraction. Rather it would seem likely that the lime was lifted out of these pits by the crane situated on the top of the lime kiln. Dependent on the span of the boom the crane could convey lime directly onto wagons or for temporary storage on the trackways.

Local tradition has it that such was the demand for the lime that the wagons queued down the road toward Toft Gate Farm awaiting loading. It is understood that some of the lime was transported down to Pateley Bridge for wider distribution by rail, the remainder being used locally as fertiliser. Unfortunately it has not been possible to verify these accounts, but given the size of this commercial operation it is likely that output exceeded local agricultural demand and the lime was used primarily in local building and civil engineering projects which may have included the construction of Gouthwaite Reservoir (built between 1893 -1901).

CONCLUSION

The recent programme of archaeological recording and research at the Toft Gate Limekiln Complex has established that it constitutes a unique example of a mid/late 19th century continuous burn dual feed vertical furnace.

It has been confirmed that the extant remains that include kiln, flue, chimney, quarry and pond are of a single phase of construction. This complex was built sometime during the 1860's on a site that had been intensively worked for limestone and lead extraction since the 16th century. The complex ceased being commercially operative at some time between 1900 and 1910.

This recent programme of research has a included a comprehensive consultation of available documentary, cartographic and aerial photographic evidence for the site and the immediate area, that has been supplemented with the recollections of long term residents of the locality.

Despite this intensive level of research some fundamental details concerning the monument have not been established.

It has not been possible to identify who built and worked the kiln or to establish the destination and function of the lime generated by this commercial operation.

This project has built on the earlier research of the late Griff Hollingshead whose great concern was that the deterioration of the monument might continue and the site would be lost for future generations. It is hoped that this report will raise the awareness of this monument both at a local, regional and national level and that steps will be taken to consolidate and maintain the monument. Hopefully these proposals will not come too late to safeguard its preservation.

RECOMMENDATIONS

- For English Heritage to recognise the value of the lime kiln complex by having it protected by legislation as a Scheduled Ancient Monument.

- To undertake a major programme of consolidation works on the monument in order to stabilise the structure and in so doing help preserve it for future generations.

- To ensure that any attempts to open the site to the public are monitored and advice given to ensure that any such proposals do not impact, detract or damage the monument.

- To complete the detailed drawn and photographic survey of the kiln structure as any further fabric or elements are exposed as a result of any consolidation works.

- To complete the 1:500 scale earthwork survey of the site, and extend the study area to incorporate those similar workings to the north of the Grassington to Pateley Bridge road.

- To engage the services of a specialist to analyse the vitrification residue identified on the internal aspect of the kiln pot, in order to establish a better understanding of the firing process.

- To investigate the process residues such as kiln waste and raw materials from the site in order to advance our understanding of the fuel used, stone type and the size of pieces.

- To research the lime kiln design by John Briggs of Clitheroe (Patent 7308 of 1892) and attempt to identify a surviving example, as it is suspected there may be connections with the Toft Gate kiln.

- To encourage further research to be undertaken on the lime kiln industry of Nidderdale.

BIBLIOGRAPHY

Sources supplied by Rob White, YDNPA Office Bainbridge

Brown, Jody L. The Limekilns within the Pembrokeshire Coast National Park. August 1997. Prepared for the National Trust and Pembrokeshire Coast National Park Authority. (Appendix C Data sheets bound separately).

Cleasby, Ingram. Limekilns and limeburning in Sedbergh, Garsdale and Dent. Report of a survey 1991-2. Sedbergh and District History Society 1993.

Cleasby, Ingram. Limekilns in Sedbergh, Garsdale and Dent (Current Archaeology 1995 145 (11) 16-20)

Cleasby, Ingram. (Sedbergh Historian 1994 3 (3) 2-9 and Sedbergh Historian 1995 3 (4) 2-8)

Hughes, Stephen. The Archaeology of the Montgomeryshire Canal; a guide and study in waterways archaeology. 4th ed. 1988. (Royal Commission on Ancient and Historical Monuments in Wales)

Johnson, David. (Wharfedale Field Society Bulletin 1997 18 29-31)

Lancaster University Archaeological Unit. Monuments Protection Programme. The Lime, cement and plaster industries. 2 vols. 1996-1997.
Step 1 Report (March 1996)
Step 3 Introduction to site assessments (October 1997)

Leach, John. A Proposed limekiln typology (Industrial Archaeology News 1999 (110) 5 - 7).

Leach, J.T. Burning Lime in Derbyshire Pye Kilns, Industrial Archaeology Review, XVII,2, 1995

Marshall, The Rural Economy of Yorkshire, 2 Vols, Manures & Management. 1786

Mawson, D. Agricultural limeburning - the Netherby example. Transactions of the Cumberland and Westmoreland Antiquarian Soc. Vol.80 1980

Morton J.C. A Cyclopedia of Agriculture, Practical and Scientific in which the theory, the art and the business of farming are thoroughly and practically tested. Vol.II, 1855

Rees, A, Cyclopedia or a New Universal Dictionary of Arts and Sciences. Kiln. 1819

Robertson, Alastair. Limekilns of the North Pennines. North Pennines Heritage Trust, 1999.

Searle, Alfred B. Limestone and its products; their nature, production and uses. Ernest Benn. 1935

Sowan, Paul W. Alfred Bishop's patent "Brockham" lime kilns at the "Old Dorking" limeworks at Brockham, Surrey. Croydon Nat. Hist. & Sci. Soc.Proceedings Vol 17. 1982

Toft, L.A., 1988 Lime Burning on the Gower Peninsula's Limestone Belt, Industrial Archaeology Review, Vol.XI, No.1. 1988

Trueman, M R G and Quartermaine, J. Meal Bank Quarry and Hoffman Kiln, Ingleton, North Yorkshire. Lancaster University Archaeological Unit. 1993.

West Sussex County Council. Limeburning and the Amberley chalk pits: a history. 1979.

Wilson, J.M. The Rural Cyclopedia of Agriculture, General Dictionary of Agriculture and of the Sciences, Instruments and Practice. Vol III. 1852

Williams, R. Limekilns and limeburning (Shire Album) Shire Publications 1989

General Literature Sources

Blacker, J.G. The Stone Industry of Nidderdale, British Mining No.57, Memoirs, 1996

White, R, Yorkshire Dales, Landscapes Through Times. 1997
A History of Nidderdale, Ed. B.Jennings, 1967/1983

Our Valley - A Landscape Study of the Valley of Moorhouses - The Moorhouses Residents Group 1999

Sources in Harrogate Library

Kendall P F and Wroot H E.Geology of Yorkshire. 2 vols, 1924.

Raistick, Arthur. Industrial archaeology: an historical survey. London, Eyre Methuen, 1972.

Raistrick, Arthur. Old Yorkshire Dales. David and Charles, 1967.

Raistrick, Arthur. Story of the limekiln (Dalesman 1960 22 (8) 545-554)

Rayner D H and Hemingway J E eds. Geology and mineral resources of Yorkshire. Yorkshire Geological Survey, 1974.

Sources in Nidderdale Museum

Bruff, Harald John Lexow. Character Sketches of Old Yorkshire Lead Miners. n.d.

Bruff, Harald John Lexow. T'ill an't 'Oade Uns upuv Greenho': an account of the traditions, life and work of the old lead miners of Greenhow Hill in Yorkshire. York, Waddington, 1920.

Hollingshead, Griff. Toft Gate Limekiln (Dalesman 1991 52 February 990-991).

Sources at Leeds Local Studies Library

Commercial Directories

Kelly's Directory of the West Riding of Yorkshire. 1857,1861,1877, 1881, 1889, 1893, 1897, 1901, 1904, 1908, 1917, 1922, 1927, 1936.

Directory of Yorkshire. Pigot, 1830.

National Commercial Directory. Pigot, 1834.

Royal National and Commercial Directory. Pigot, 1841.

Royal National and Commercial Directory. Slater, 1848.

Directory of the West Riding of Yorkshire. Slater, 1887.

Baines' Yorkshire, vol 1 West Riding, 1822.

Directory of the West Riding of Yorkshire. White, 1838.

Unpublished Sources

Hollingshead, Griff. *Archive at Skipton Museum.*

North Yorkshire County Council 1999 *Toft Gate Lime Kiln Survey: Tender Document*

Cale, K.J.1999, *Middle Tongue, Bewerley, Archaeological Landscape Assessment*

Sources not consulted

Bick, D, Limekilns on the Gloucestershire - Herefordshire border. Industrial Archaeological Review, Vol.7 No.1. 1984

Boynton, R S Chemistry and technology of lime and limestones. 1980.

Cowper, A D Lime and lime mortar. Donhead Publishing. 1998.

Davey, N. History of building materials. Phoenix House 1961.

Eckel, E C Cements and plasters. 1928.

Farey. A general view of the agriculture of Derbyshire with observations on the means of its improvement. London, 1813.

Harris, A, A Traffic in Lime Burning - Transactions of the Cumberland and Westmoralnd Antiquarian & Archaeological Society. Vol.77. 1978

Robinson, D.J. & Cooke, R,U Limekilns in Surrey. A reconstruction of a rural industry. Surrey Archaeological Collections. Vol.59 1962

Skinner, B The Archaeology of the Limekiln Industry in Scotland. Post Medieval Archaeology, Vol.9, 1975

Ure. Dictionary of arts manufactures and mines Vol 3 1828.

Wilson, R.E. Lime Burning in East Devon, Devon Historian, No.21, 1980

Wood, E.S. Mersthan Limeworks, Surrey Archaeological Collections, Vol.64 1967

Cartographic Sources

Jeffreys Map, 1779

OS 1" to mile 1st ed. 1848

Plan of the Eagle Level, Drawn by M.Colling (Varvill Collection), 1840

Skipton/Bradford Survey Map (replica by David and Charles), 1850

OS 6" to mile 1856

The Stafford Enclosure Map 1858

OS 6" to mile 1895 Yorkshire (West Riding) Sheet CXXXV (Surveyed in 1848 Revised in 1889-)

OS 1:2500 1909 Sheet CXXXV.10 and Sheet CXXXV.7 (Resurveyed in 1889-90 Revised in 1907)

OS 1:10,560, 1956

OS 1:25,000 1997, Explorer 26

Aerial Photographic Sources:

NYCC SMR - MERIDIAN AIRMAPS LTD 441, 68.123
HUNTING SURVEY LTD UK 73130 RUN 34, 2209

YDNPA SMR - ANY 310/6. 9
ANY 310/7.11
YDP 066/9.15, 22.01.92
YDP 066/10.16, 22.01.99

Oral Testimony:

Mr. Marshall (born 1907) interviewed on 26 November 1999.

THE PROJECT TEAM

Principal Archaeologist

Kevin John Cale
Well House
Stean
Pateley Bridge
North Yorkshire.

Buildings Archaeologist

Stephen Haigh
32 Chippendale Rise
Otley
West Yorkshire

Documentary Research

Barry Nuttall
1 Panorama Close
Pateley Bridge
North Yorkshire

APPENDIX A

CENSUS INFORMATION

1841 Census

There was no census for Bewerley.

Checked entries for Thornthwaite **(T)** and Thruscross **(WE)**

WE	Low Mill	Mark Dinsdale (27)	Linen Weaver
		Joseph Dinsdale (2)	son
T	Greenhowhill	Mark Newbould (48)	Lead Miner

1851 Census

Entries for the area are under several headings ie;
Dacre cum Bewerley (both sides of road from Toft Gate upwards) **D**
Bewerley **B**
Dacre cum Bewerley (south side of road below Toft Gate) **S**
Thornthwaite with Padside **T**

There are no house names or addresses.

The reason for checking Thornthwaite is that the boundary touches the Grassington road near to Keld Houses.

D		Christopher Daggit (35)	Innkeeper
		Henry Stockdale (35)	Lime Burner (born Hebden)
		(several Storeys Lead miners)	
B	St.Lane Hillside	John Daggett (44)	Farmer and Lime Burner
S	Bewerley	Mark Dinsdale (37)	Lime Burner
T	Greenhowhill	Mark Newbould (58)	Farmer 64 acres.

1861 Census

Entries for Bewerley (Toft Gate to Kell Houses) **D**
Bewerley (rest of parish) **B**
Thornthwaite **T**

T	Greenhowhill	Edw Whitehead (56)	Miner and Lime Merchant
T		Joseph Rhodes (35)	(Lime ?) Maker
T	Greenhowhill	Mark Newbould (77)	widower Miner of Lead born Hampsthwaite
T	Raddlish Top	Mark Dinsdale (47)	Lime burner and farmer of 9 acres born Fewston
		Joseph Dinsdale (22)	Lime burner born Fewston

1871 Census

T	High Ridlish	Mark Dinsdale (58)	Lime burner and Farmer of 9 acres
		Joseph Dinsdale (31)	Carrier and Farmer of 11 acres.
D	Greenhowhill	Henry Mackwell (39)	lived at Tewit Plain
T	Newboulds Houses	Elisha Newbould (40)	Miner and landowner and farmer of 4 acres.
		Moss Newbould (9)	son
D	Greenhowhill	William Storey (11)	son of John and Adah

1881 Census

B	Moscar	Abraham Baines (43)	Lime Burner
D	Greenhowhill	Henry Mackwell (49)	at Tewit Plain Leadminer
T	Newboulds Houses	Elisha Newbould (50)	Farmer of 4 acres, leadminer, Primitive Methodist Preacher
		Moss Newbould (19)	Leadminer
T	Little Redlish	Mark Dinsdale (68)	Farmer of 9 acres, Lime Burner.

1891 Census

Entries for Greenhowhill, Bewerley and Thornthwaite with Padside.

There are no lime burners listed in Greenhowhill or Bewerley. There are Newboulds at Iving Waite, Hollin Hill, Westfield Cottage, Markfield Plain, Bale Bank, West Cliffe and Bailey Gap.

High View Farm	Elisha Newbould (60)	Farmer.

But in Thornthwaite with Padside there are the following:-

Newboulds Houses	William Storey (31)	Limeburner and contractor for road stone (born GHH)
	Moss Newbould (boarder) (29)	Limeburner and contractor for road stone
Keld Dyke Farm	Henry Newbould (39)	Farmer and lime burner (born GHH)
	Thomas Newbould (17)	Carter to Lime kilns.

APPENDIX B

VALUATION BOOKS

1910

Entries for Bewerley:

Buildings & land Harry Walton (occupier) Stephen Gill Lothersdale (owner) valued at £5 Map 135-6-T.

Toft Gate Farm Benjamin Wellock (occupier) Ld Mountgarrett (owner) Map 135-6-T

Limeworks and quarries A Storey (Yorke Estates) value £10

APPENDIX C

BAPTISM REGISTER

Greenhow Hill

1892	(father)	Moss	Newbould	Lime Burner
1895	"	"	"	Lime Burner
1896	"	"	"	Lime Burner
1898	"	"	"	Lime Merchant
1903	"	"	"	Farmer and Lime Merchant
1907	"	"	"	Farmer

APPENDIX D

BURIAL REGISTER

Greenhow Hill

1906 Forest House, Thornthwaite.

Henry Newbould (1852-)	Lime Burner	1891 census Keld Dyke Farm
William Storey (1860-)	Lime Burner & Contractor	1891 census Newboulds Houses
Moss Newbould (1862-)	Lime Burner & Contractor	1891 census Newboulds Houses
	Lime Burner/ Merchant	1892-1903 Greenhow
	Lime Burner	1908 Kelly directory Greenhow Hill
Thomas Newbould (1874-)	Carter to lime Kilns	1891 census Son of Hnry Newbould
Newbould and Storey	Lime Burners	1887 Kelly directory Greenhow Hill
	Lime Burners	1901 Kelly directory Greenhow Hill

APPENDIX E

THE COMMERCIAL DIRECTORIES

The Directories list commercial undertakings, farmers, etc. by place and the places consulted were Pateley Bridge and Bewerley. From 1904 Kelly has a separate list under Greenhow Hill. Entries were checked for reference to lime burning, etc and the following names were found:-

1830 (Pigot) Ward Grange, Lime burner, (Pateley Bridge - no separate section for Bewerley).

1834 (Pigot) Ward Grange, Lime burner, Bridgehousegate.

1838 (White) John Daggitt, Lime burner, (Bewerley)

1841 (Pigot) James Bentham, Lime burner, Greenhow Hill.
William Brookes, Lime burner, Bewerley Road.
John Daggitt, Lime burner, Street Lane.

1848 (Slater) Christopher Daggitt, Lime burner, Greenhow Hill.
John Daggitt, Lime burner, Street Lane.

1861 (Kelly) No references.

1877 (Kelly) James Atkinson, Lime Merchant, Pateley Bridge.

1881 (Kelly) James Atkinson, Lime Merchant, Pateley Bridge.

1887 (Slater) Newbould and Storey, Lime burners, Greenhow Hill.

1889 (Kelly) Elisha Newbould, Farmer & Lime burner, Greenhow Hill.
John Storey, Farmer, Greenhow Hill.

1893 (Kelly) Elisha Newbould, Farmer & Lime burner, Greenhow Hill.
John Storey, Farmer, Greenhow Hill.

1897 (Kelly) Elisha Newbould, Farmer & Lime burner, Greenhow Hill.
John Storey, Farmer, Greenhow Hill.

1901 (Kelly) Newbould and Storey, Lime burners.
Elisha Newbould, Farmer and Lime burner, Greenhow Hill.
John Storey, Farmer & Guide to Stump Cross Caverns.

1904 (Kelly) Elisha Newbould, Farmer, Greenhow Hill.
John Storey, Guide to Stump Cross Caverns.

1908 (Kelly) Mrs E Newbould, Farmer, Greenhow Hill.
Moss Newbould, Lime burner & Farmer, Greenhow Hill.
John Storey, Guide to Stump Cross Caverns.

1917 (Kelly) Coldstones Quarries & Lime Works, Arthur Storey, proprietor.

1922 (Kelly) Coldstones Quarries & Lime Works, Arthur Storey, proprietor.

1927 (Kelly) Coldstones Quarries & Lime Works, Arthur Storey, proprietor.
(listed under private residents Arthur Storey Lilacs)

1936 (Kelly) Nidderdale Quarries Ltd (TA 'Coldstones, Pateley Bridge').