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Silkstone, South Yorkshire: Summary Report and Assessment of Evidence from Excavations in 2002

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Summary

This report describes the results and archive of excavations at the site of a 17th century glassworks and 18th century pottery at Silkstone. An assessment of the finds from the excavation is included.

Keywords

Excavation
Technology
Post-medieval
Glass
Pottery

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Contents

Introduction

Background

Historical documents indicate that glass was produced in Silkstone, South Yorkshire in the late 17th and early 18th centuries (Ashurst 1992a; 1992b) and MPP Step3 identified one building in Silkstone that might be related to this industry. Limited trial trenching and geophysical survey by Denis Ashurst in 1999 revealed evidence of glass making inside the building and a buried structure outside the south wall. In 2000 the current owner of the property (Tom Horsfield) expressed a desire to carry out work on the building and surrounding area. Denis Ashurst and Keith Miller (IAM Yorkshire Region) were granted permission to carry out a geophysical survey and trial excavation to determine if evidence for glass working activities survived. The excavation revealed evidence for 18th century pottery production overlying black layers that contained waste glass, but did not resolve the relationship of these layers to the building. In October 2001 the English Heritage Centre for Archaeology (CfA) was asked by Keith Miller to undertake a thorough evaluation (including excavation). Staff from CfA (Thomas Cromwell and David Dungworth) and Architectural Survey (Colum Giles and Garry Corbett) visited the site in November 2001 and concluded that the standing building probably post-dated the historically known phase of glass working based on architectural evidence. Excavation of a trench inside the building and one outside the building was carried out in two phases (2 weeks in January 2002 and 2 weeks in March 2002) both to clarify the building's relationship to the stratigraphy and to characterise the archaeology. The two trenches were excavated by hand and particular attention was devoted to the recovery of diagnostic evidence of glass working.

Glass Production in England during the 17th and 18th Centuries

The importance of the archaeological/architectural investigation of possible glass production at Silkstone arises from the surviving documentary evidence for the industry and the considerable technological changes that were taking place in the post-medieval period.

In the Middle Ages the finest clear glass was produced in Italy (*cristallo*) and imported to England. By comparison, medieval glass production in England was carried out on a fairly small scale employing wood-fired furnaces and produced poor quality glass. These furnaces were fairly simple structures comprising a single fire trench flanked by two 'sieges' on which were placed the crucibles containing glass. The whole furnace was covered by domed roof with openings ('glory holes') that allowed access to the crucibles and their contents. The furnaces were open at each end to allow air to flow in and allow the removal of ashes. The furnaces do not appear to have had any bellows to force air in, but operated by an 'induced' draught.

Glass is usually produced from silica (sand or flint) and fluxes that will lower the melting temperature of the silica. Typical early fluxes are natron (rich in sodium), which was extensively used in the manufacture of Roman glass, and plant ashes (rich in potassium), which were widely used in northern Europe in the medieval period.

The poor quality of English medieval glass has been explained by the use of simple furnaces, which were incapable of reaching sufficiently high temperatures to fully melt the glass, and the uncritical use of plant ashes (i.e. using ashes derived from different plants and making little attempt to remove unwanted impurities).

In 1567 immigrant glass workers from the Lorraine region of France set up glass production sites in England (Vose 1980: 106–110). These were initially in the Weald area of south-east England (Kenyon 1967) but the descendants of these immigrants produced glass in many other regions (Bristol, Newcastle-upon-Tyne, Manchester and South Yorkshire). The glass produced by the immigrant workers was of a better quality than that previously produced in England. This may be due, in part to the use of better quality fluxes or the better treatment of the available plant ashes (e.g. boiling solutions of ash), and in part to the introduction of new furnace forms. Excavations have revealed that late 16th and early 17th century furnaces (e.g. Hutton and Rosedale, Crossley & Aberg 1970) incorporated new design features, in particular 'wings'.

A significant change in English glass production occurred in 1614 when James I granted a patent (monopoly) to Sir Edward Zouch for the production of all types of glass using coal as a fuel, and banned the use of wood as a fuel for glass production. The use of coal posed several problems for glass workers. Coal burns with a shorter flame than wood, requiring the burning fuel to be closer to the crucibles as well as the introduction of larger volumes of air. In addition, the composition of coal is different to wood; it has a much higher inorganic (ash) content and contains more sulphur. The high ash content of coal could lead to the accumulation of large quantities of ash that could block the fire trench. Much of the sulphur in the coal would be carried with the smoke and fumes of the fire and could contaminate the glass in the crucibles and reduce its transparency.

The excavation of 17th and 18th century glass furnaces have revealed how the design features changed to alleviate some of these problems. The principal excavations of 17th and 18th century furnaces in England are:

- Kimmeridge, Dorset (Crossley 1987)
  1617–1623
- Haughton Green (Vose 1994)
  1621–1637?
- Gawber, Yorkshire (Ashurst 1970)
  Early 18th century?
- Bolsterstone, Yorkshire (Ashurst 1987)
  Early 18th century

These sites show the use of long underground flues which allowed a better flow of air into the furnace. The coal was supported on an iron grill which helped the coal to burn and kept it above the accumulating ash. These changes in furnace design culminated in the development of the cone. The cone was a brick cover building for the furnace itself which, with the underground flues, could induce very strong flows of air into the furnace.

An examination of the crucibles from Haughton Green, Gawber and Bolsterstone showed that changes were made to the form of the crucibles in an attempt to isolate the glass inside the crucible from the fumes and smoke of the coal. A V-shaped hole was cut into the rims of crucibles from Haughton Green (which were probably also lidded). Crucibles from Bolsterstone had fixed, domed tops and a small opening inclined at 45° that could be aligned flush with the 'glory hole'.

The late 17th century saw the development of new types of glass to compete with Italian *cristallo*. In 1676 George Ravenscroft succeeded in producing good quality clear glass using lead and potash as fluxes.

The investigation of the four glass production sites mentioned above included the chemical analysis of a number of samples of glass (9 from Kimmeridge, 5 from Haughton Green, 7 from Gawber and 15 from Bolsterstone). In addition, contemporary glass from London has been analysed by Mortimer (1991; 1993) and from Lincoln by Henderson (1998). Lead was not present in the glass from either of the two production sites which predate Ravenscroft's invention of lead glass (Kimmeridge and Haughton Green) but is present in some of the glass from both sites which post-date the invention.

Site Location and Description

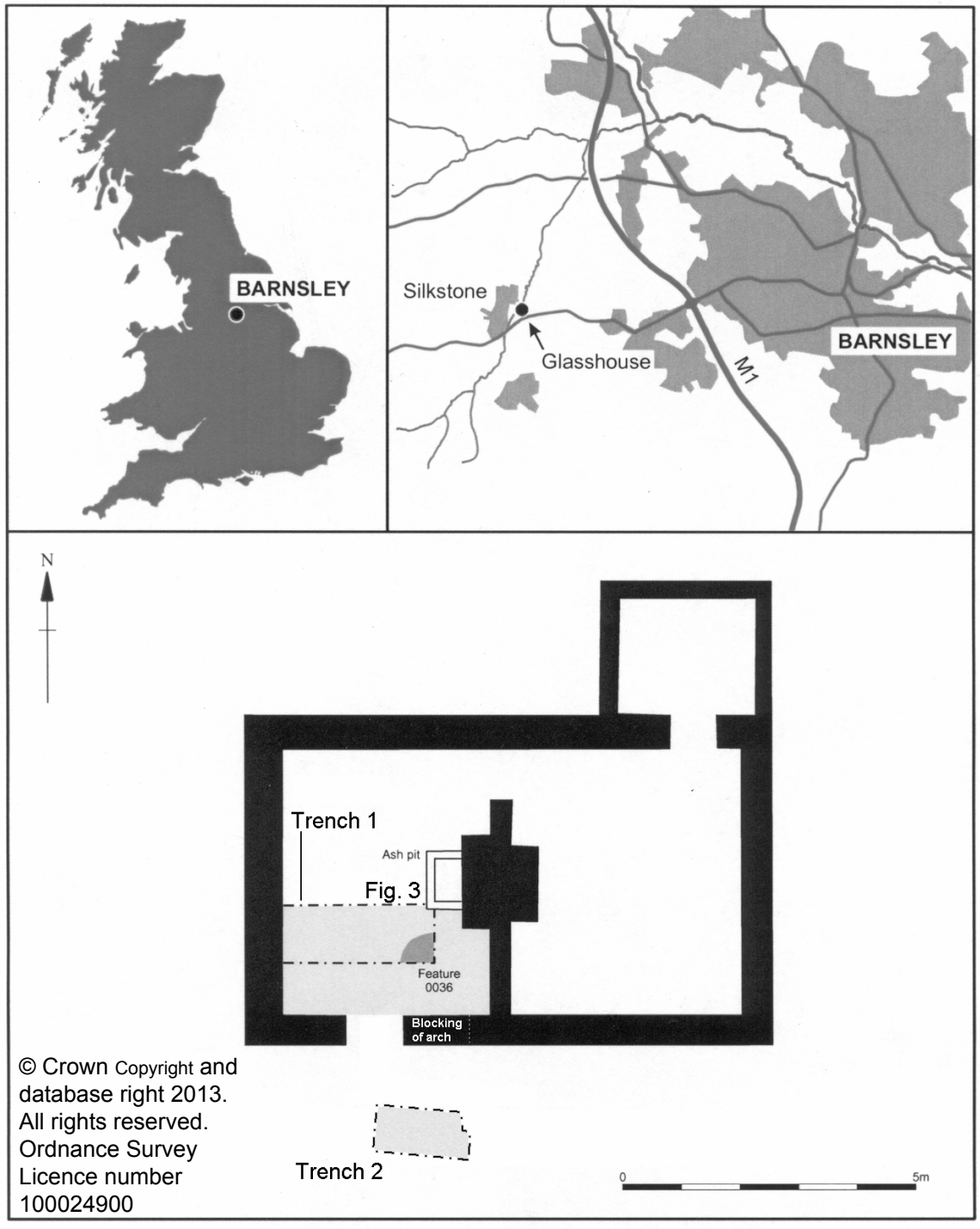

Figure 1. Site location plan

The site consists of a stone building (two floors, each with two rooms) located in the northwest corner of the Silkstone Pothouse Garden Centre car park. The garden centre lies on the western outskirts of Silkstone village on the west bank of a stream (NGR SE 2927 0584). The location matches that given in an early 18th century description of the Silkstone 'glass house' (Ashurst 1992a). The ground slopes uphill to the east.

Denis Ashurst excavated three small trenches inside the west room of the building, and one trench outside it to the south. The CfA's first trench took up the southern half of the west room in order to see the stratigraphy in a large enough area to make sense of it, and the second doubled the size of Denis Ashurst's outside trench to explore a stone structure he had noted (see figure 1).

Site History

The glass workers at Silkstone belonged to the Pilmay family who are believed to be among the French glass workers brought to England in the 16th century (Vose 1994: 5). The Pilmays are recorded in Gloucestershire in 1599 and Shropshire in the early 17th century. They were associated with the Haughton Green, Manchester glass furnace between 1621–1637. The first record of Pilmays in Silkstone (the marriage of John Pilmay to Abigail Scott) is in 1658 and occasional references are made to glass working at Silkstone until the early 18th century (Ashurst 1992a; 1992b). Abigail Scott's probate inventory of 1698 lists two separate glasshouses: a 'greenhouse' for window and lower quality vessel glass and a 'whitehouse' for flint or lead crystal glass (Ashurst 1992b: 18). The inventory also lists various raw ingredients for glass making: Breeley sand, rape ashes (rich in potassium), red lead, manganese, 'blew powder' (cobalt) as well as moulds, blowing irons and clay for crucibles (Ashurst 1992a: 23). It appears, therefore, that glass production occurred in Silkstone during the latter part of the 17th century and the early part of the 18th century.

Pottery Production

Silkstone is one of a number of potteries producing slipwares and other 'country pottery' known to have been active in South Yorkshire in the 18th and early 19th centuries. Those for which we have archaeological evidence are listed in Table 1.

Table 1. Archaeologically attested 18th century potteries in South Yorkshire

Site	**Date range**	**Reference**
Sheffield Manor	Post 1708–post 1715	Beswick, pers. comm., 1978
Midhope/Midhopestones	1720–c. 1845	Lawrence 1974, Ashurst 1987
Swinton	1745–68	Cox and Cox 2001
Silkstone	1754–1802	Brears 1971, Lawrence 1974
Bolsterstone	c. 1778–1796	Ashurst 1987

According to Heather Lawrence (1974), the first mention of a pottery at Silkstone occurs in deeds dated 1754 when potovens, a house and a cornmill are recorded as being owned by James Scott and occupied by John Bailey, Ralph Taylor, Joseph Goldthorpe and Michael Taylor. The estate is mentioned again in 1775 when it was bought by Richard Fenton and the same tenants, minus Michael Taylor, are mentioned again. Land Tax assessments refer to a John Taylor, a potter, in 1767 and he is mentioned as a tenant from 1781 to 1812. William

Taylor, described as a potter in the 1780s, ran the works from 1812 until 1821. The 1802 militia list mentions a second William Taylor and Edward Taylor (ages twenty-five and thirty-four) as potters. Lawrence has identified only two extant pieces from the pottery, a large dark red earthenware flagon with dark brown glaze and slip trailed inscription 'PE 1777' (Cawthorne Museum) and a cylindrical bottle in a similar fabric with the inscription 'RB 1779' (British Museum cat. no. D110). The latter was made for Richard Bradley and bought from his grand-daughter in 1898.

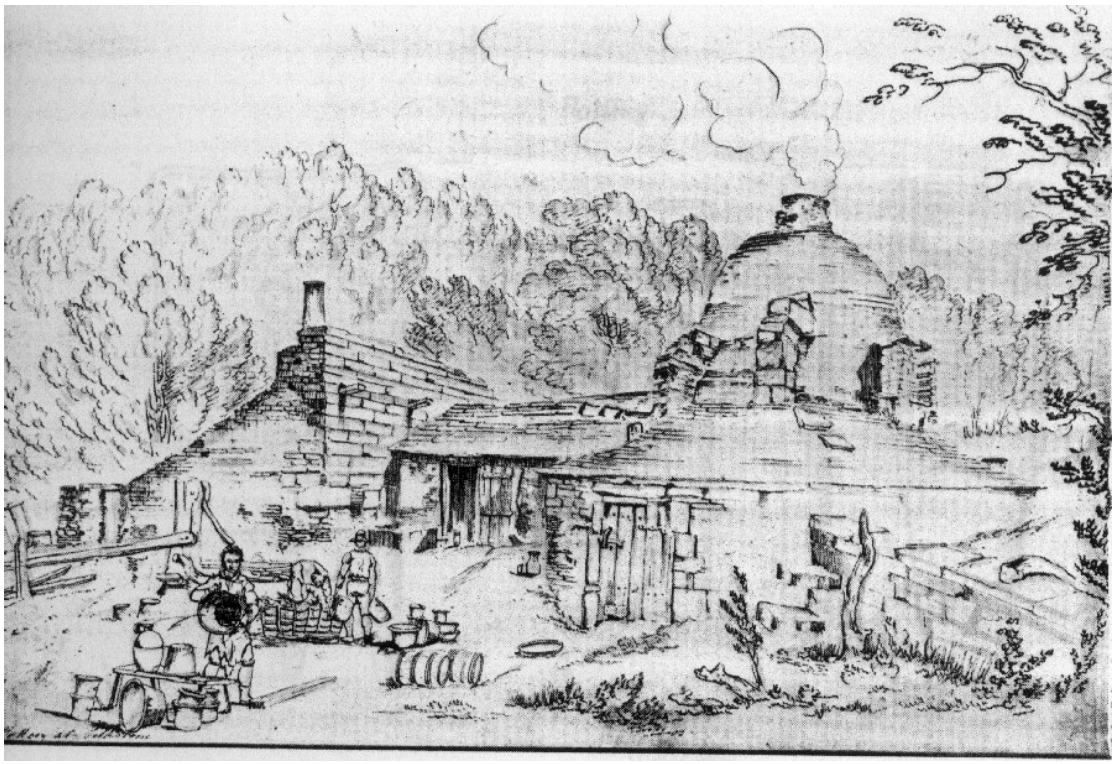

Figure 2. The Silkstone pottery c.1806

Peter Brears also mentions the pottery (1971) and notes that John Taylor is buried in Silkstone churchyard together with his wife. He also reproduces an illustration of the pottery, taken from Nattes *Views from Nature* and currently held by the Cannon Hall Museum and Art Gallery, Barnsley, which he describes as 'probably the most complete illustration of an urban pottery in operation'. Then clay preparation area, the workshop and a tall multi-flued kiln with its surrounding hovel can all be clearly seen (figure 2).

Archive Summary and Assessment Report

Site Summary

Description of the building fabric

The existing "cottage" building is rectangular in plan, measuring approximately 5 metres wide by 9 metres long, and has a small lean-to extension at the east end of the north wall that measures approximately 2 x 2.25 metres. It has gables at the east and west ends, a central square brick chimney stack, and only the brackets and downpipe on the south wall to suggest that there had been any guttering. The main structure is built of coursed slabs of local sandstone with mortar bonding, and has a stone-slate pitched roof. While the north and west walls are exposed stonework, the east wall and eastern half of the south wall were rendered, obscuring the stonework. The south wall has an arched opening in the west half that had been blocked up around 1900, according to anecdotal evidence, to provide a door and window with one fixed sash and one horizontally-sliding sash each of 8 panes. Located centrally above the arch is a vertically-sliding sash window of 8-over-8 design, whose frame forms part of the wall plate as seen from the inside. The east half has a ground-floor window of two side-hinged sashes of 6 panes each, and a first-floor vertical-sash window of two single panes located at the eastern end of the elevation. The east gable wall has a door and a blocked window opening at ground floor, and a vertical-sliding sash window of 8-over8 design located centrally at first floor. The west gable wall has a jagged hole that appears to have been a doorway at the junction with the south wall, and this is blocked at the inside with brick that forms an inner skin to the gable wall. The overall condition of the stonework is poor, with significant weathering out of soft beds within the sandstone.

Internally the building is divided into two halves by an inserted brick fireplace and coursed sandstone spine wall running from the east jamb of the blocked arch. This wall extends through the ceiling and floor above, terminating at first-floor ceiling level with only the brick chimney stack continuing up to the roof. On the ground floor the east half retains its floor of stone slabs over timber joists, while that of the west side had been removed prior to Denis Ashurst's investigations. A timber staircase along the north wall of the east room gives access to the upper level, and at its foot is a doorway into the lean-to. Upstairs the west half is a single room, lit by only the one window on the south face. The east half is divided to provide a bathroom along the south wall. The first-floor ceiling consists of laths nailed to sawn rectangular joists that span the building approximately 0.30m above the height of the wall head, and whose jointing with the rafters is uncertain. The result of this raised ceiling is that the principle rafters hang below the ceiling with a visible gap. The roof structure consists of two principle trusses of roughly hewn and squared tie beams with sawn timber rafters of rectangular section, placed to divide the roof into three equal sections. Visible through holes in the ceiling were two hewn-square side purlins on each side, and a ridge piece. All the rafters were sawn. Onto this there were battens on which the roof tiles appear to have been pegged.

Trench 1 — inside the building

Excavation began with a thin (0.05 m) deposit [context 0003] that extended over the western part of the trench. Below this was a rubble deposit [0001] that probably served to level up the joists of the flagstone floor of the cottage, and probably dated to around 1900. Next came a patchy clay deposit [0004] that was cut by the foundations of the internal dividing wall but ran up to the blocking of the archway, demonstrating that the arch must have been blocked up some time before the building was refitted as a cottage. Below this clay was another clay floor [0002] that ran under — and thus predated — the blocking, and which contained pottery waste. This in turn sat on a grey silty floor layer [0007].

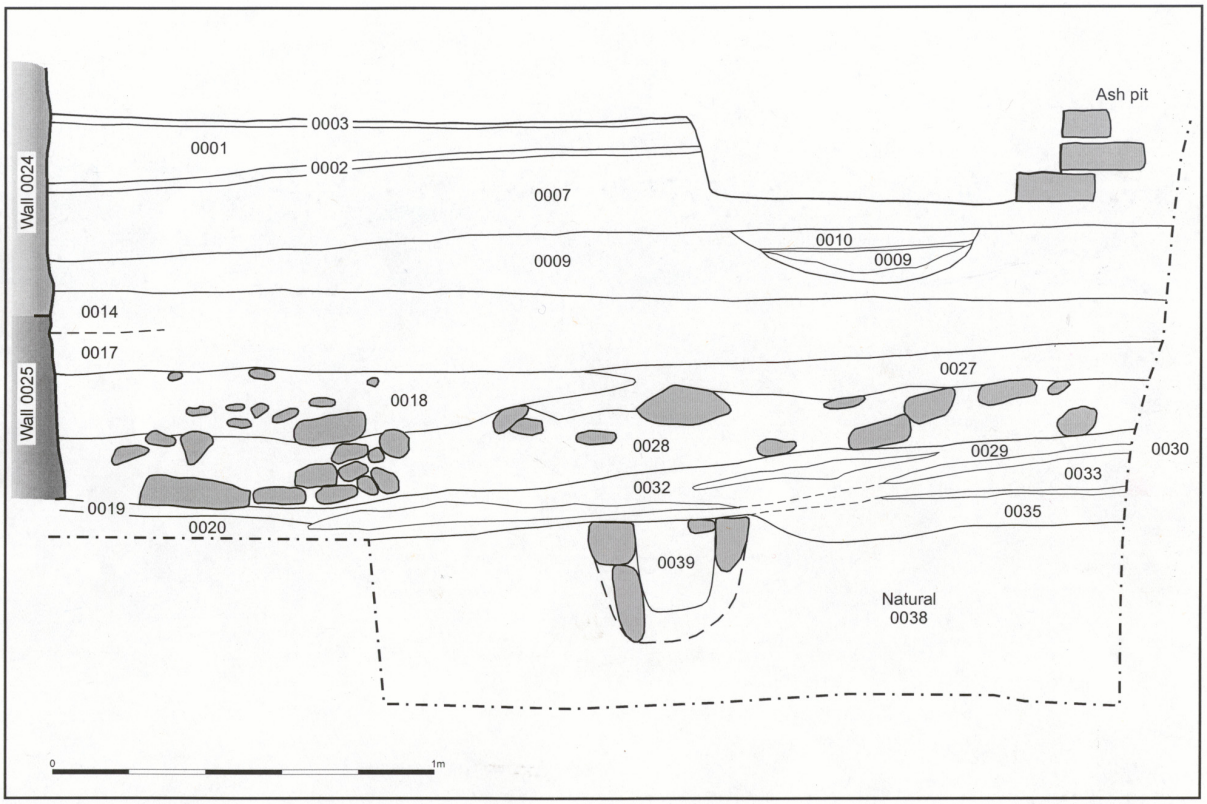

Figure 3. South facing section (see figure 1 for position)

Under the clay and silt floors, a 0.16m thick layer of reddish fly ash [0009] contained a large quantity of pottery and wasters, as well as possible kiln furniture. The implication is that it was dumped as floor make-up during the life of the pottery, since the deposit was clean and not mixed with soil, as would be expected if it had been transported from a disused ash-tip at a later date. This layer butted against the south and west wall footings, so the standing building was present when the layer was dumped. A shallow circular depression feature [0011] filled with lenses of grey silt [0010] was cut into the top of the red fly ash.

Below the pottery layer was a very compacted floor layer [0014] made up of black ash and coal dust, which contained fragments of glass and solidified drips of glass waste. This probable glass-working floor runs under the south wall [0026], demonstrating that the present building was built on top of the layer, and thus that the building post-dates the glass-works. However, the layer butts up against the west wall footings [0025], which appear to be the re-used stump of an earlier (glass house ?) wall onto which the rest of the west wall [0024] was built. The full extent of the possible earlier glass house represented by [0025] is unclear. In addition, it is not certain whether [0025] is an internal or external wall. A grey clay layer [0015] and a yellow sandy layer [0016] were found below the ash floor [0014]. Below these

was another black ash layer [0017] that represents an earlier glass-working floor. It is likely that these deposits represent floors laid down at some point in the lifespan of the works, and that the black ash layers represent a slow build-up of ash and working debris on top where the floor is not regularly cleaned.

Further excavation in March 2002 revealed a grey ash and cinder layer [0027] beneath these floor deposits. This layer was very loose, and contained large amounts of vitrified waste material. Contamination of [0027] is likely from the underlying deposits, which were similarly loose. This was possibly an attempt to level up the floor, and it is almost certainly related to the deposition of adjoining rubble layer [0018] that was found in January 2002 at the west end of the trench. Layer [0018] was a 0.35m thick deposit of building rubble that included waste glass and large burnt local sandstone fragments with glass on them. This deposit appears to be made up of the rubble from a demolished glass furnace. Layer [0018] butts up against the footings ([0025], see below) of the west wall. Below both the burnt rubble and the grey cinders was a thick (c.0.30m) layer of unburnt sandstone fragments in a matrix of clean yellow sand [0028] almost certainly from decayed local sandstone. This layer appears to be *in situ* demolition rubble from a building.

All of these floor and rubble layers abutted the base [0025] of the west wall. However, below the rubble was a thin grey clay layer [0019/0029] and a black coal-dust deposit [0020] that run under the footings of the west wall, and so are earlier than the wall and belong to a building that extended further west into the car park. Layer [0020] was comprised almost entirely of coal dust, and was very compact. It also sloped upwards at the east end, suggesting that the west wall was built over the west edge of a coal pile that occupied the area of the present building. This deposit contained large numbers of crucible fragments, and was thought in January to have been a working floor until excavation in March disproved the idea. Below the coal dust was a small deposit of sandstone fragments [0031] possibly representing a patch repair of the underlying surface, and a thin spread of ash and coal dust [0032] which was also lying on the surface of the layer below. These sat on layer [0030], a dump of burnt sandstone fragments in a silty clay matrix that was approximately 0.14m thick and formed a roughly level surface. Below this was a thin coal-dust layer [0033] at the east end of the trench that was slumping into a pit feature that appeared in the east section of the trench. [0033] overlay layer [0034], which was composed of burnt red sandstone fragments very similar to [0030] in nature. Deposit [0034] was definitely slumping into the top of pit [0036], but below it was the primary fill [0037], which was a mix of large sandstone fragments in a brown soil matrix. Pit [0036] was circular in plan (although only one quarter was seen, as the rest was in the east section), with a rounded top edge leading to vertical sides and a flat bottom (figure 1). This pit was cut through a thin layer of coal dust [0035], which in turn covered a layer of sandstone fragments [0042] that appeared to be laid out as a sort of pavement at the east end of the trench. Below [0042] was the natural silt [0038], into which pit [0036] was cut to a depth of 0.50m.

Also sealed by [0030] was a post hole whose cut is [0040]. The packing [0041] consisted of several large sandstone fragments in a clean silty matrix that appeared to be re-deposited natural. The post itself was absent, but the space it once occupied was filled by [0039], a mix of silt and coal dust with plentiful glass fragments including two bottle necks. In plan [0039] was rectangular, probably representing a post approximately 0.22m square that was seen in section (figure 3). The sides were vertical leading to a flat base. Below this feature and pit [0036] was the natural silt [0038], which was excavated to a depth of 0.50m across the whole trench.

Trench 2 — outside the building

Denis Ashurst's trench (from 2001) outside the building to the south was widened and examined (figure 1), revealing a stone wall and similar stratigraphy to that found inside in trench 1. It appears that the later glass-working floor [0014] as well as the later pottery dump [0009] continue south outside the present building almost to the retaining wall (approximately 0.6m south of trench 2), where they meet a low stone wall feature extending downward at least another 0.50m. The eastern half of the trench was disturbed by a 6" diameter drain pipe inserted during the lifetime of the cottage. Excavation stopped at the level of the glass-working floor, so it is not known if there are any other deposits or earlier glass-works floors still to be found outside the present building.

Interpretation

There were at least two phases of glass-working on the site, separated by at least one episode of demolition and rebuilding. Two cut features may predate the industrial use of the site, but their fill indicates that a coal-fired glass furnace was in operation by the time these features went out of use, so they may not predate the arrival of the Pilmays by very much. No earlier occupation was found, and it is even likely that the site was stripped of topsoil (along with pre-industrial occupation layers) as part of the establishment of the glass industry.

The earliest industrial deposits and rubble layers start over a meter below the present ground surface. They represent the demolition of buildings as well as furnaces, and also deposits of coal. However, they do not indicate the exact location of the early furnace. The lower portion of the west wall was built at this time, apparently without a foundation cut. The rubble effectively buried the footings to a depth of approximately 0.5m. When the identifiable glass works floors started to accumulate the levels had raised up to almost half a metre below the cottage floor level. The west wall of the later glass works was where the existing gable wall now stands, but it extended further south towards the retaining wall that supports the approach to the Garden Centre shop. It is not known if other structural elements of the former glass house (e.g. north or east wall footings) were re-used.

The existing building was built after the glass works finished, reusing part of the old footings of the west wall. It was built directly on top of the glass-working floor, with no foundation trench. Instead, waste ash from the pottery was dumped around the footings to make the ground level up to the new floor height. The original use of the building is uncertain, but it is similar to the much larger nearby barn, and may have been built at the same time as the barn in order to serve some domestic function such as storage for a small carriage and associated tack. Alternatively it may have had some use associated with the later pottery works. It appears on maps at the start of the 19th century, behind the large post-medieval house that has since been demolished. For most of the twentieth century it served as a pair of cottages, with the internal layout as described above. However, the raised ceiling, tie beam location, structural use of a window frame, and late spine wall suggest that the entire internal structure as well as the first-floor windows may well have been later insertions to a building that could have been open to the rafters as a single space when first constructed.

Statement of potential

The limited trench sizes and straight-forward stratigraphic sequence restrict the potential for further stratigraphic analysis. The dating will be revised in the light of the proposed analysis of artefacts. Further work will include the preparation of summary text and illustrations.

Archive contents

The site archive consists of the following.

Written/drawn/photographic records:

42	Context record sheets
23	Plan drawings
5	Section and elevation drawings
47	Black and white print photographs
47	Colour slide photographs
176	Finds records
19	Sample records

Material Summary

254g	Clay pipe
24.9kg	Pottery
31.3kg	Sagger
535g	Glass
7.0kg	Crucible
17.9kg	Slag
3.4kg	vitrified stone
2.0kg	Stone
2.4kg	Fired clay
6.8kg	Brick
3	Copper alloy objects
1	Lead object
2	Iron objects
425 litres	Soil samples

The Clay Pipe
(Based on an assessment report by David Higgins, the full text of which is held with the site archive)

Factual Summary:

The excavations produced a total of 93 fragments of clay tobacco pipe from eight different contexts. Several of these contexts produced bowl fragments, which provide good dating evidence, and three of the groups produced 10 or more pipe fragments, which increases the reliability of the date that can be obtained from them. The context groups appear to contain good proportions of bowl, stem and mouthpiece fragments, suggesting that there has not been any significant collecting bias in the sample. The overwhelming majority of the pipes recovered date from the late seventeenth century through to the mid-eighteenth century. Some of the context groups contain odd pieces of earlier seventeenth century material but there does not appear to be any obviously intrusive material. This means that most of the pipes can be directly related to the glass production or following pottery production phase. None of the pipe bearing contexts initially phased as 18th/19th centuries appear to contain any material dating from after *c*1750 (Contexts 002, 007 and 009). This may mean that the end date for this phase can be pushed considerably earlier than previously thought. Many of the fragments are nicely finished with burnished surfaces. The sample is large enough to enable a good assessment of local manufacturing and finishing techniques to be made. There are two stamped stems and two heels

with stamped marks on them. At least two of these marks appear to be previously unrecorded and so add to our knowledge of local mark types.

Statement of Potential:

The pipe fragments offer one of the most accurate and reliable classes of artefact for dating post-medieval deposits. The pipes from this site will make a valuable contribution to the dating and interpretation of the excavated contexts. Pipes also have two other significant attributes; their regional diversity allows them to be used to study trade and marketing contacts while differing qualities allow for an exploration of social status. The excavated pipes from this site should allow for an examination of the quality of pipes being consumed on an industrial site as well as for an assessment of the catchment area from which services and supplies were drawn. At least two of the marked pipes from this group are from previously unrecorded dies. These should be drawn and described in detail since they provide a particularly useful contribution from an area of Yorkshire where little previous work has been done.

In their *Research Priorities for Post-Medieval Archaeology* the *Society for Post-Medieval Archaeology* have identified the systematic collection of pipes as an area of particular importance where more work is needed (Anon 1988, 6). Although a current doctoral research project has catalogued all of the available pipes from Yorkshire, the Barnsley area is one from which no previous pipe collections are known. This group helps to fill a gap in the distribution map of known pipe groups. Yorkshire is a county where there has been quite a bit of previous pipe research. The *Bibliography of Clay Pipe Studies* lists over twenty published articles for the county (Atkin 1989) and several more have appeared since. This means that the pipes can be readily placed within a broader context.

An archive catalogue of all the fragments should be prepared. This should, so far as is possible, identify and date each piece. It should catalogue the various attributes of each piece (milling, burnishing, rim finish, etc) and present the information in a digital form so that can be sorted in a variety of ways for reference or future research, based on the draft guidelines prepared at the University of Liverpool (Higgins & Davey 1994). A context summary should be prepared. This should identify the number of pieces from each context and assess their overall date range. An assessment of the likely date of deposition should also be given if this is different from the overall date range. Illustrations for publication at 1:1 should be prepared of a representative range of bowl forms from the site. Twice life size details of the previously unrecorded stamp types should also be drawn as a reference source for future researchers. A publication report should be prepared. This should describe the work carried out and present a synthesis of the pipe evidence from this site. So far as is possible, it should describe the local pipe types represented and discuss the social status and consumption patterns evident from the excavated finds. Any evidence for trading connections with the site's hinterland should be presented and the pipes placed in their local and regional context.

The Pottery

(Based on an assessment report by Chris Cumberpatch, the full text of which is held with the site archive)

Factual Summary:

24.9kg of pottery were recovered during the excavation. Most (23.5kg) of this pottery consists of Slipwares, Manganese Mottled wares and Brown Glazed Coarsewares that were produced

on site during the later 18th century. The assemblage includes examples of wasters. A small (1.4kg) amount of pottery was recovered from deposits associated with the glass production industry

Statement of Potential:

Slipwares are ubiquitous on later post-medieval and early-modern sites and are a regular component of the assemblages recovered from excavations on both rural and urban sites. They also occur widely in fieldwalking collections and as stray finds. Like the majority of coarse earthenwares, they are known as a specific type with a relatively well established date range, but few attempts have been made to ascribe particular wares to known potteries and little or no analysis or description of the fabrics has been undertaken. Preliminary attempts to construct fabric series for sites in South and West Yorkshire have been made (Cumberpatch 1996, 2002) but the constraints of commercial archaeology have precluded extensive work on the subject.

The excavations at Silkstone have provided the opportunity to examine a medium sized assemblage of pottery of types typical of the 18th century. The analysis proposed here is intended to determine the range of vessel types manufactured, the technology employed and the extent to which the fabrics represented can be characterised as distinctive when compared to the products of other contemporary potteries.

The Saggers

Factual Summary:

31.3kg of sagger were recovered during the excavation.

Statement of Potential:

The saggars will contribute to an understanding of the late 18th century pottery production techniques.

The Glass Vessels

(Based on an assessment report by Hugh Willmott, the full text of which is held with the site archive)

Factual Summary:

The excavation methods allowed for a high rate of recovery of glass (the smallest fragment recovered by hand during the excavation weighed 0.03g). As one of the main aims of the excavation was the investigation of glass working, all of the hand recovered glass that might be identified typologically was given a small find number.

125 fragments of glass (including vessel and window) weighing 477.45g were recovered by hand. The glass fragments recovered from the soil samples processed for the assessment have not been included here. The glass can be divided into four broad categories;

Working waste
38 fragments of waste were found. These primarily consist of runs, drops and pulls, as well as some poorly refined lumps. Also included here are some vessel fragments that have been partially melted or show evidence of heat distortion. All the waste is green or brown glass with the exception of a single piece of clear, possibly lead crystal glass.

Moils
Nine fragments of moils were found. Six of these are in a light blue/green glass and three in a darker green or brown glass. There is also a differentiation in their size, the blue/green moils clearly show the use of a narrower blowpipe than the darker ones.

Window glass
30 fragments of window glass were found. All are green tinted and of good un-weathered quality. Given this, it seems likely that at least some might have been produced at the site.

Vessel glass
The remaining 48 fragments are all from vessels. Around 5 are clearly later 19th century vessels and must be intrusive. However the remainder are all contemporaneous with the working life of the furnace. Amongst the range of vessels in a green glass are dishes, phials and wine bottles. There are also four lead crystal vessels, one blue jug handle and a rim in so-called 'Nailsea' glass. Whilst it is not possible at this stage to suggest whether these are products or simply collected cullet, it is interesting to note that the glasses visually match those found in the moils and amongst the working waste.

Vessels, fragments and waste glass are found in contexts throughout the stratigraphic sequence — which begins with the glassworks phase — but lead glass and window glass are restricted to the later contexts (Midhope pottery dumping layers and later)[1]. There is no earlier residual material.

A variety of colours of glass were recovered. Most of this is green (due to the presence of iron as an impurity in the glass) with smaller quantities of clear glass (some modern soda-lime glass and some lead glass) and single fragments of blue (cobalt coloured) and pink/brown (manganese coloured) glass.

Statement of Potential:

Although the glass is highly fragmented and fairly limited in nature, this is an extremely important assemblage. Not only does it give the first indication of the range of vessels, as well as windows, that might have been produced at Silkstone, it also reflects the manufacturing techniques employed.

The glass from the 425 litres of soil sample will be examined and any glass fragments that may potentially be identified typologically will be given small finds numbers and included with the assemblage for examination by the glass specialist.

[1] The assessment of the glass working evidence (see page 15) shows that lead glass was recovered from contexts associated with the glass works.

Glass Working evidence

Factual Summary:

Evidence for glass working was recovered by hand during the excavation and consisted of crucibles, waste glass (threads, droplets and glass adhering to the insides of crucibles), slag and burnt and vitrified stone (remains of a furnace). In addition soil samples were taken in order to look for evidence of glass working that would have been difficult to recover and record during excavation (in particular threads).

- 7.0kg of crucible
- 57.25g/19 fragments of waste glass
- 18.0kg of slag
- 2.0kg of burnt stone and 3.4kg of vitrified stone
- 425litres of soil/sediment
- 6.8kg of brick (possibly used in the construction of the furnace)
- 2.4kg of fired clay were recovered during the excavation (possibly used in the construction of the furnace)

The crucibles are generally comparable with those recovered from other 17th and 18th century glass production sites (Ashurst 1970; 1987; Crossley 1987; Vose 1994). They are made from a pale aluminium-rich clay and have vitrified surfaces. The inner surfaces are usually transparent while the outer surfaces are dark red to black in colour and often have streaks of contrasting colour. No detailed study has yet been made of the size and form of the vessels.

The waste glass consists of lumps that had fallen to the ground and then solidified (rough under surfaces and convex smooth upper surfaces), as well as droplets and threads that had solidified before they fell to the ground and possible moils (fragments of glass that had been broken off from the blowing iron or pontil). Waste of this sort is likely to have been deposited close to a glass furnace.

Qualitative EDXRF analysis was carried out on several samples of glass during assessment. This helped identify lead glass (which was more common in later contexts but was recovered from most contexts, including those associated with the glass works) and shows that the remaining glass is predominantly potash-lime or high-lime low-alkali glass. Some glass also appears to have been formed from mixing lead and alkali glasses.

The slag comprises two types: the first consists of fairly large (typically 50–500g) black to dark grey-green lumps, and the second consists of small (typically <10g) light blue-grey to green-grey fragments of vitreous material. Qualitative chemical analysis (EDXRF) indicates that the former is the vitrified ash of the coal used to fire the furnace while the latter is waste glass.

The burnt and vitrified stone recovered during the excavation is assumed to have been parts of the furnace used to manufacture glass. None of the stone was recovered *in situ*, i.e. as part of a furnace structure, but was included in demolition deposits rich in ash and slag. The majority of the fired clay came from context [0018], i.e. associated with glass working, and may have been used in the construction and maintenance of the furnace.

The soil samples were taken from 8 contexts (details in Appendix 3) with 8 separate samples from context [0014] across the total extent of the deposit revealed by excavation (4m by 2m)

to investigate any spatial variation in the deposition of diagnostic fragments. Deposits that formed immediately adjacent to a furnace should contain high proportions of glass working waste, such as threads, lumps, moils, etc (Ashurst 1987: 173). 50 litres of soil (30 litres from context [0014], 10 litres from [0020] and 10 from [0035]) were sieved for the assessment to determine whether or not diagnostic glass working residues are present and could be recovered. The first 10 litre sample was floatation sieved first in order to recover any environmental residues. This yielded many fragments of coal and one root fragment (which may be recent) and so no flotation sieving was carried out for subsequent samples.

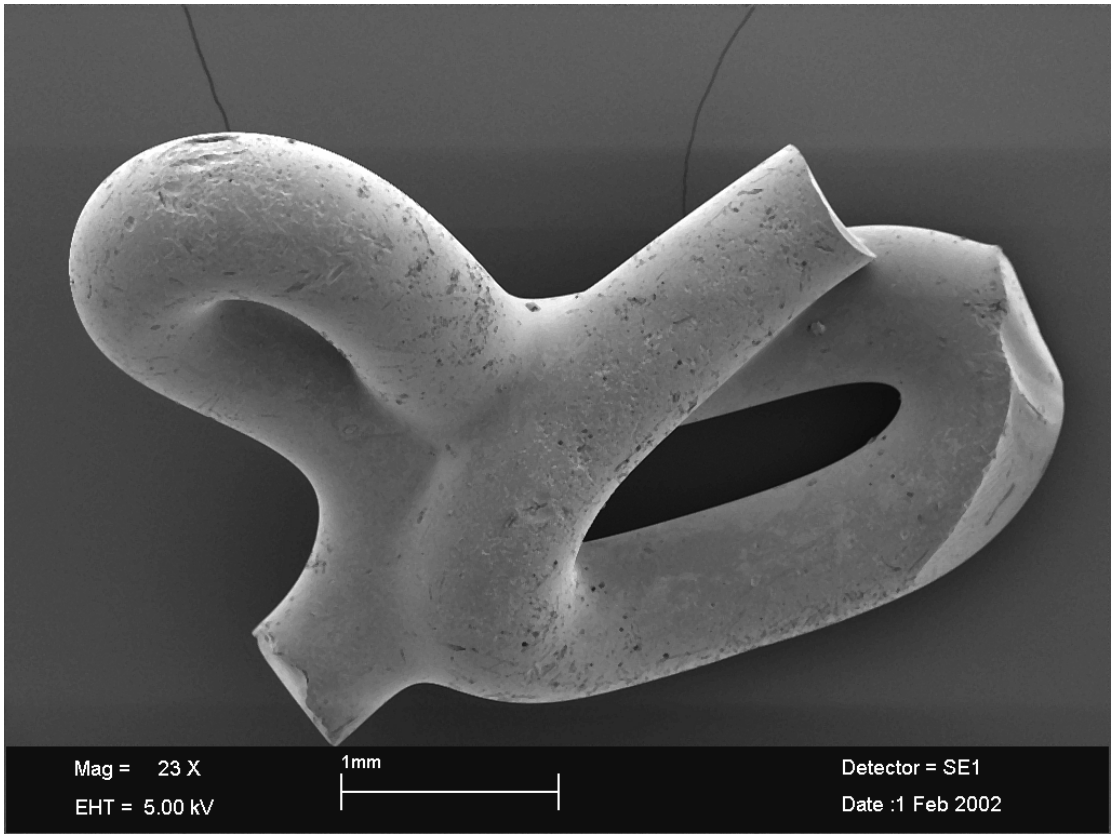

Figure 4. Scanning Electron Microscope photograph of a glass thread from context [0014].

Each sample was sieved through a stack of sieves (4mm, 2mm, 0.5mm) and the residues dried and examined. The >2mm fraction was sorted by hand. Most of the glass fragments recovered were fragments of vessel/window glass or were too small to allow any identification. Most of the waste glass comprised lumps of glass with very small quantities of threads (typically 0.1g per 10 litre sample). The threads consist of small filaments of glass (typically 0.2–1mm in diameter and 5–20mm in length) that may be straight or curved.

Table 2. Material recovered from sieving soil samples, >2mm fraction (weight in grammes)

Sample	Glass	Glass waste	Opaque cream-grey-blue waste	Crucible	Slag	Ceramic
3001	28	0.14	119	0	245	11
3003	74.5	2.5	73	0	171	5
3008	27.5	5.5	53	0	73	16
3010	39	85	77	814	54	5
3018	3.9	1.5	0.37	44.5	63	

Statement of Potential:

A thorough examination and reconstruction of the crucible fragments may provide information on the size and form of the crucibles. This will be compared with the evidence from Haughton Green (average base diameters of 0.3–0.4m), Gawber (some base diameters ~0.3m and some ~0.6m) and Bolsterstone (base diameter ~0.6–0.7m). It will also be possible to investigate whether or not the crucibles were of the open or closed type. Several crucible fragments contain thick layers of glass on the inside. The chemical analysis of this glass will provide direct evidence for the range of glass compositions worked at Silkstone. Specimens of crucible fabric will be examined using a scanning electron microscope to determine micromorphology. These results will be compared to test firings of crucible fabric (1100–1600°C) to determine the working temperature (and the maximum possible working temperature).

Chemical analysis of the glass, and of glass working waste, will provide information on the compositions of glass worked on site. The inclusion of lead in the glass will be of particular importance as the invention of lead glass occurred during the period of use of the site. The incidence of lead in the glass should also then be compared with the stratigraphic sequence. A wide range of samples (crucible, glassy layers inside and outside crucibles, glass vessels and glass waste) will be analysed to determine chemical composition. This will be carried out using the energy dispersive spectrometer attached to a scanning electron microscope at Fort Cumberland.

Chemical analysis of the slag would confirm whether or not the slag is the vitrified remains of the coal used to fire the furnace.

The soil samples do contain fragments of glass, including pieces that are diagnostic of glass working. The recovery of these from the remaining soil samples will provide glass that can be analysed to determine the range of glass compositions produced and the techniques used to manipulate them.

Other Materials

Factual Summary:

Six metal (3 copper alloy, 1 lead and 2 iron) objects were recovered during the excavation. These were either unstratified or from deposits containing waste from the production of pottery. 6.8kg of brick was recovered but none from layers contemporary with glass production.

Statement of Potential:

These objects do not provide significant information about glass or pottery production. All of the items will be catalogued (after appropriate conservation treatment).

Storage and Curation

The material assemblage is owned by Tom Horsfield, Silkstone Pot House Garden Centre, Silkstone, South Yorkshire who has agreed that the whole archive will be donated to Sheffield City Museum.

All records and materials will be retained until the completion of the analysis phase. Once this has been completed some material (but no records) may be disposed of (e.g. slag and saggers) but this should be negotiated between the excavators, Sheffield City Museum and the relevant specialist and a representative sample must be retained with the site archive.

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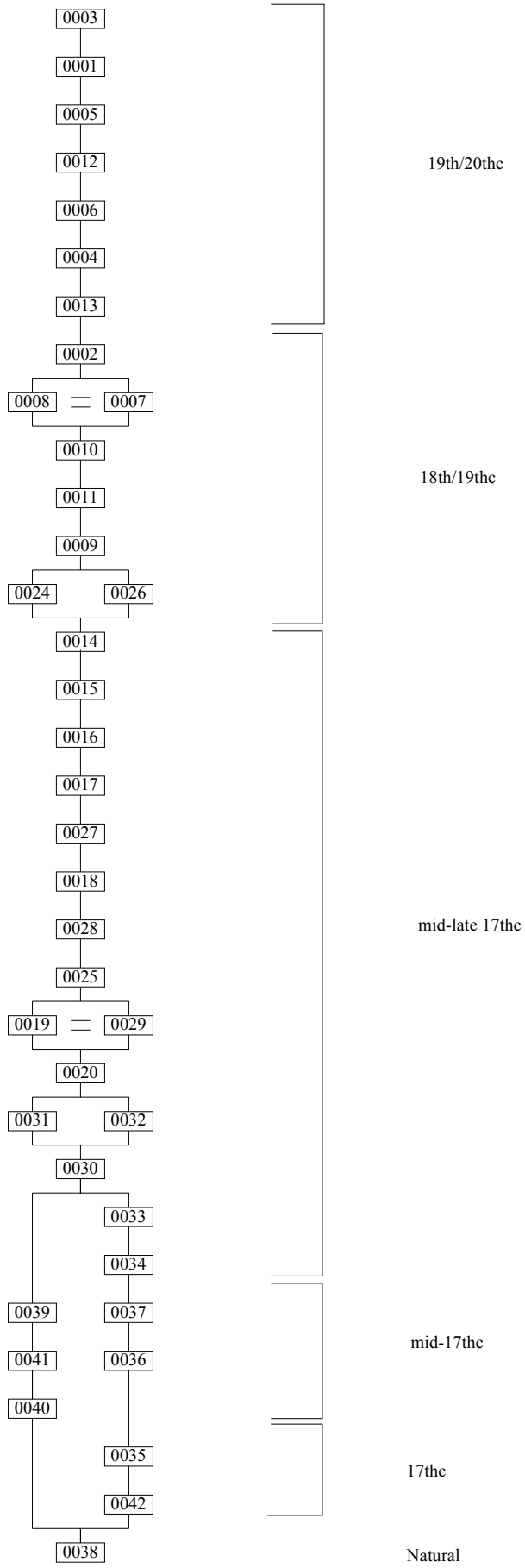
Appendix 1: Context Matrix



Appendix 2: Context Index

Context	SSD	Description	Provisional date
0001	1	Rubble floor layer	19th/20th
0002	1	Clay floor layer	18th/19th
0003	1	Sand levelling layer	19th/20th
0004	1	Clay make–up layer	19th/20th
0005	1	Fill of wall cut	19th/20th
0006	1	Wall cut for spine wall	19th/20th
0007	1	Silty floor layer	18th/19th
0008	1	Feature next to fireplace	18th/19th
0009	1	Red layer	18th/19th
0010	1	Grey silt lens in 0011	18th/19th
0011	1	Cut of pit on north edge of trench	18th/19th
0012	1	Spine wall	19th/20th
0013	1	Wall & window Infill of arch in south wall of building	19th/20th
0014	1	Black ash layer	mid–late 17th
0015	1	Grey layer	mid–late 17th
0016	1	Yellow sandy/stony layer	mid–late 17th
0017	1	Black ash layer	mid–late 17th
0018	1	Rubble layer	mid–late 17th
0019	1	Grey layer in sondage	mid–late 17th
0020	1	Black layer in sondage	mid–late 17th
0021	2	Overburden layer (tarmac, hardcore)	20th
0022	2	Red ash layer	18th/19th
0023	2	Ashy floor layer	mid–late 17th
0024	1	West (gable) wall, upper portion	18th/19th
0025	1	West wall, lower portion	mid–late 17th
0026	1	South wall with archway	18th/19th
0027	1	Grey cindery layer	mid–late 17th
0028	1	Yellow sandstone layer	mid–late 17th
0029	1	Grey layer	mid–late 17th
0030	1	Burnt rubble layer	mid–late 17th
0031	1	Yellow sandstone patch	mid–late 17th
0032	1	Grey ash patch	mid–late 17th
0033	1	Dark grey layer	mid–late 17th
0034	1	Burnt rubble layer	mid–late 17th
0035	1	Grey–black layer	17th *
0036	1	Circular pit cut	mid–17th
0037	1	Lower fill of cut 0036	mid–17th
0038	1	Yellow clay (natural)	N/A
0039	1	Fill of post pipe	mid–17th
0040	1	Cut of post hole	mid–17th
0041	1	Post hole packing	mid–17th
0042	1	Stone paving around cut 0036	17th *

*Note: contexts 0035 & 0042 may predate the glassworks, but otherwise cannot be accurately dated.

Appendix 3: Details of soil samples taken

Sample	Context	Volume (litres)
3001	0014	70
3002	0014	10
3003	0014	45
3004	0014	30
3005	0014	20
3006	0014	10
3007	0014	30
3008	0014	30
3009	0014	10
3010	0020	30
3011	0017	10
3012	0017	10
3013	0027	20
3014	0018	10
3015	0029	30
3016	0020	20
3017	0020	20
3018	0035	10
3019	0039	10