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AI/35/2002

Shipley Bridge China-Clay Works, South Brent, Devon

Phil Newman

SURVEY REPORT

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Shipley Bridge China-Clay Works, South Brent, Devon

An archaeological survey by English Heritage

County:	Devon
District:	South Hams
Parish:	South Brent
NGR:	SX 6800 6290
NMR no:	SX 66 SE 189
Surveyed:	April 2002
Report by:	Phil Newman
Surveyors:	Phil Newman

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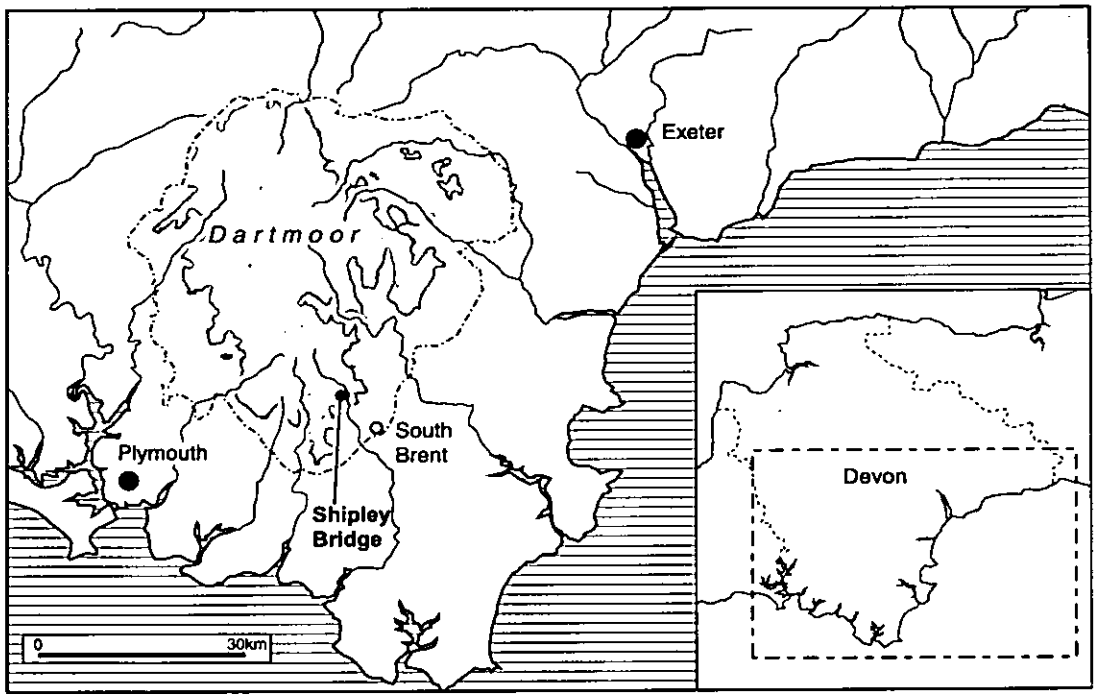
Summary

The remains of the china-clay processing works at Shipley Bridge, South Brent were surveyed by staff of the English Heritage (EH) Exeter office in the spring of 2002 at the request of Dartmoor National Park Authority. Although a previous survey had been undertaken at the site the EH survey is the first to include a high degree of earthwork detail and three-dimensional recording, which has allowed further interpretation. The following report provides a discussion of the field remains in the light of what little is known from documentation and information gleaned from similar published sites elsewhere in Devon and in Cornwall.



Fug. 1. Location.

INTRODUCTION

Compared with the exploitation of granite and metals, china-clay is a relative newcomer among Dartmoor's extractive industries. The first china-clay extraction began on Lee Moor in the 1830s, and marked the beginning of an industry which expanded rapidly and spread over much of the south-west fringes of Dartmoor altering the landscape forever. The industry survives to the present in Devon, although it has always been on a smaller scale than that of the St Austell district of Cornwall, and many of the major clay pits continue to be worked successfully. Several smaller ventures, which worked deposits probably of poorer quality existed also, though were often short lived leaving discrete remains. Redlake and Left Lake were such ventures dating from the early 20th century but Brent Moor, with its associated processing works at Shipley Bridge dates from the 1850s and 70s.

CHINA-CLAY AND THE REFINING PROCESS

The existence of china-clay results from the decomposition of granite, a process known as kaolinisation, which converts the feldspar in the granite into aluminium silicate accompanied by sands of mica and quartz. The separation of these sands from the kaolin is the essential basis of china-clay refining. It is also often the case that some refining of the material occurred at or near the extraction site; at Redlake for example, mica drags exist near the clay pit. From the clay works the raw material would be transported in a liquid suspension, via a channel or pipe to the processing or

drying works, which would be at a site chosen for its access to a transport system, to allow cheap removal of the finished product, rather than being close to the clay source. The first priority of the refining process was the removal of residual mica and quartz sand. The original method of achieving this was to dig three rectangular pits set at descending intervals down the hillside. The liquid clay/ sand mix would flow into the top pit where the coarse sands would be deposited. The liquid would then be allowed to overflow into the second pit where fine sands and mica would be separated; in the lower pit only mica remained to be trapped. The refined liquid clay would then be directed into settling pits or tanks to be de-watered. A later technique involved an installation known as the 'drag'. This consisted of a graded channel into which the liquid would flow, depositing the heavier sands as it passed through. Additional shallower drags with long partitions, to separate the flow, were used to refine the product further before it was deposited into deep settling tanks to begin the process of de-watering. When sufficient water had drained off, the clay was run into a further thickening tank.with hatched doors through which, when almost dry, it was shovelled onto a drying pan to be air dried, before being cut into blocks for sale. At Shipley Bridge remains from both the earlier and later forms of processing survive.

LOCATION

Shipley Bridge is located on south-east Dartmoor in the parish of South Brent at SX 6800 6290. The bridge spans the River Avon as it leaves the high moors and enters the enclosed agricultural areas of the hinterland and is the highest of the Avon bridges to give vehicular access across the river. Today the site is known by the public for its car park which provides walking access to the south Dartmoor uplands. On the steep slope to the west of the car park are the visible remains of the both the naphtha works and the clay drys, comprising ruined stone structures and earthworks. The Shipley Bridge works represents only the processing side of the Brent Moor clay industry; the extractive elements are spread over an area some way to the north at the head of the Balla Brook and do not form part of the EH survey. The current vegetation at the processing works is grazed grass with some bracken and gorse.

HISTORY

Historical aspects of industrial activity on Brent Moor and the works at Shipley Bridge have been researched by Robinson (1980, 3-5), Wade (1984) and Brewer (1989), though all have revealed that documentary evidence is somewhat fragmentary. The earliest recorded activity at the site was the naphtha distillation works and peat charcoal plant which was set up in 1847 by Totnes businessmen Davy and Wilkin. This aim of this venture was to cut peat from the moors near Redlake and transport it via the Zeal Tor Tramroad to a refining works at Shipley Bridge. The partnership was short-lived and was dissolved in 1850 (Wade 1984, 15). The major surviving field evidence associated with this episode is the tramway though it is also believed that buildings constructed by this concern were later adapted for clay drying purposes. Robinson's research also revealed that by 1858 a company known as 'The Clay Company Ltd' was working clay deposits on Brent Moor near the head of the Bala Brook. Clay was washed from the extraction site and transported as a liquid in open channels to the processing works at Shipley Bridge. A surviving map of 1855, shows that an area of the Shipley Bridge site had been designated as 'ground reserved for clay works', and delineated by boundary stones. This company was apparently short-lived due mainly to the poor quality of the product (Robinson 1980, 4). A further flurry of activity here commenced in 1872, under the Brent Moor Clay Co. and continued until 1880 when the company was forced to close due to the depressed price of clay (Wade 1984, 15). A final attempt at working the Brent Moor deposits occurred in 1923 when it was stated in a newspaper article that the promoters were reusing the existing facilities installed by the 1872 concern (Robinson 1980, 4).

FIELD EVIDENCE

THE 1847 NAPHTHA AND CHARCOAL WORKS

The Zeal Tor Tramway

The main evidence for this episode of activity is the Zeal Tor Tramway which was built to transport peat from the peat cutting areas on the higher moor down to the distillation plant at Shipley Bridge. Only the section of tramway in the vicinity of the clay drys has been recorded as part of the EH survey. It survives as a shallow scarp, cutting into the hillside to create a level trackbed which enters the site on the north side and curves gently down the hillside to a point 125m NNE of the large stone building. Here an acute turning point on the line allowed the trucks to change direction and travel south on a level track which terminates to the rear of the building. This last section of the tramway has a robust stone revetment on the downslope side which survives in patches and is particularly evident at the southern end where a return wall marks the terminal of the tramway. There is no trace of the rails, which are believed to have been wooden, though two granite sleeper blocks with iron spikes onto which the rails were fixed survive 60m north of the terminal.

Other buildings

Most writers who have discussed the Shipley Bridge works have considered that the large rectangular stone-built clay-thickening tank adjacent to the car park was adapted from a building which had served as part of the charcoal works, an idea originally promulgated by William Crossing (1888, 34). On the 1855 map of the China Clay Co Ltd's works, a rectangular building is shown in the same position as the thickening tank, annotated as 'charcoal works' (Robinson 1980). The present building however, appears to have been purpose built to a specification found at china-clay works elsewhere (ie Shaugh Bridge) and there has to be some doubt that any of the 1840s structure survives.

THE CHINA CLAY COMPANY LIMITED, 1858

The clay working area delineated on the 1855 map (Robinson 1980) is marked on the ground by a series of granite boundary stones and two of these survive (Fig. 3), though neither bears any inscription. The remains of the clay refining and drying tanks associated with this period are undoubtedly those on the south-west corner of the site. These earthworks conform to the earlier type of settling pits described above and fall within the area defined by the boundary stones.

Pits 1-3 (Figs 2 & 3; Pl. 4)

These three pits are aligned descending the hillslope, one below another and were the principal means of separating the sands and mica from the kaolin during the 1850s. The top two pits (1 & 2) consist of roughly rectangular level depressions covering an area of approximately 180 metres^2 each, with a substantial earthwork retaining bank on the downslope side. Pit 1 has a depth of 0.5m and Pit 2 is 0.7m deep, the floor of the pits have a slight incline of between 0.15m and 0.2m front to back, though it is not known if this is the original gradient. Pit 3 is longer and narrower than 1 and 2 and covers an area of approximately 100metres^2 with a maximum depth of only 0.2m. The height change between the floors of the three pits is (1-2) 2.64m and (2-3) 2.7m. On all three pits there are vestiges of a granite lining though much of this is likely to have been robbed, leaving only the earthwork remains now visible.

This arrangement of pits is exactly as described by Herring and Smith (1991, 51) for mica separating pits of the earliest type in Cornwall.

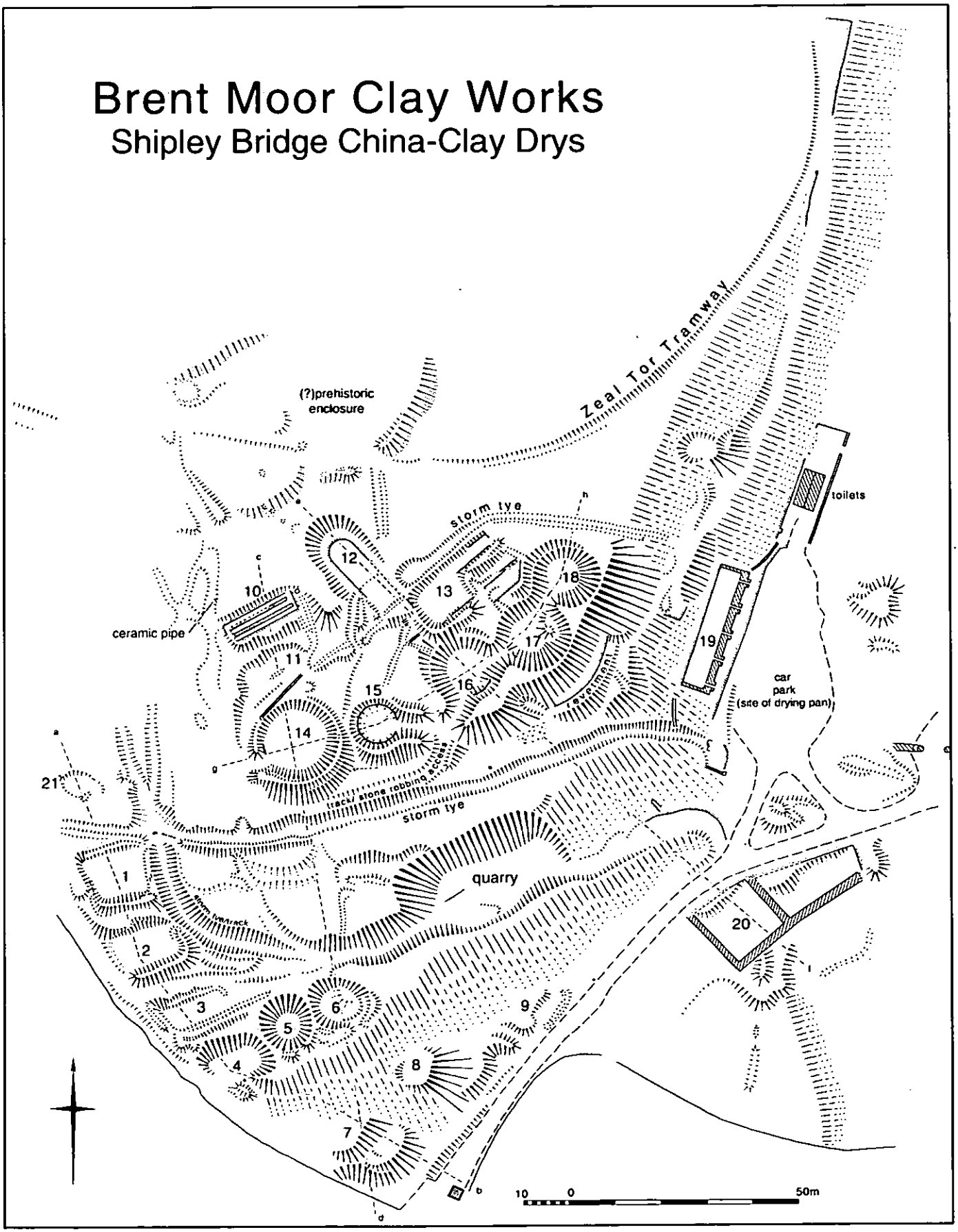


Fig.2. Earthwork plan of the clay processing works showing numbered items mentioned in text and section lines in Fig. 4.

A channel 1.3m deep by 6.4m wide with a sharp V profile, which runs downhill close to Pits 1 to 3 is likely to have originally served as a storm tye preventing hillside runoff from entering the settling pits. It may have served as a track at a later date. Uphill of the storm tye are vestiges of two channels which may have been the original means for the liquid clay to travel from the extraction pits to the drys.

Pits 4-6 (Figs 2 & 3)

At the foot of the rectangular pits is a terrace containing three deeper pits. Two of these earthworks (5 & 6) are roughly circular with an average diameter of 12m while Pit 4 is a sub-rectangle of 15m by 12m. They are all the same depth at 1.3m and the floors are all of the same level to within 0.2m. These are settling pits into which the refined clay slurry was piped from Pit 3, for de-watering. They would certainly have been lined with masonry when in use though this has been robbed, leaving the sides to partially collapse.

Downhill to the east of the pits are two mounds (7 & 8) which could have been formed by outflow from the pits containing residual waste material or, possibly, sands removed from pits 1-3 being dumped there. It is not known where, if anywhere, further drying of the product took place in the earlier period. A small rectangular structure (9) at the bottom of the slope by the road appears too small to have contained any such process.

THE BRENT MOOR CLAY COMPANY, 1872-1880

The majority of the clay processing remains, apart from those already described, are likely to date from the 1870s, though they may have been added to or altered during the 1920s. Robinson (1980) believed that the liquid clay was delivered to the Shipley Bridge works via open channels which survive across the moor from the clay source. The precise location of these channels in the vicinity of the processing works is not clear though a partially buried ceramic pipe is visible just to the north-west of the mica drags; Robinson traced this pipe back to the clay pits though was unconvinced as to its use for piping clay. Wade (1992, 17) however, believed that this pipe did indeed carry clay slurry.

The mica and sand drags (Figs 2 & 3; Pls 1-3)

The position of the pipe and the vestigial channels suggest that the slurry was first deposited into the western 'drag'(10). This consists of a level platform on top of which is a shallow, stone-lined depression of 17m by 4.5m. This is divided into three runs of approximately 1m wide by 20cm deep, two of which have curved terminals with narrow openings on the west end (Pl. 3). There is a manhole opening on the eastern end, from which two channels branch away to the south.

South of the drag is a level cutting (11) which may once have housed a structure or some apparatus though no evidence remains.

The larger drag (12) is a shallow pit with parallel sides and a rounded north-west end. Though the pit itself is shallow, the steep gradient of the hillside has meant that a substantial cutting was needed to obtain a level floor and the horseshoe-shaped scarp at the north-west end has a drop of 2.5m. The sides of the pit are lined with stone and brick, some of which has been robbed. Half way along the floor of the pit there is a change in height of 8cm, created by a single course of bricks. The south-east end of the pit is open and any components there were either of timber or have been robbed.

The settling tanks (Figs 2 & 3)

After separation of the bulk of the sand the next process in the sequence was settling the liquid in large tanks to de-water the clay, which was the first stage in drying. There are five circular settling tanks (14-18) and a fifth L-shaped example (13) just below the sand drag.

Pit 13

This tank measures 22.5 by 9.5m and up to 2m deep and has a substantial bank on the downslope side, to compensate for the slope. The interior was once lined with granite blocks but this facing now survives only in patches, the majority having been robbed. Channels on the ground leading off from this tank directed clay slurry into four of the circular tanks below (15-18) which suggests that some refining was also occurring in this tank before drying. A shallow channel runs parallel with the north-west side of the tank which would have served as a storm tye, directing rainwater away to the east.

Pits 14-18

Pits 16 – 18 form a cluster below Pit 13. They were built into an artificially embanked terrace to provide the depth required, and are all of similar size; Pits 14 and 15, the largest and the smallest, are separate and lie to the east. Originally all the tanks had dressed granite linings but this has been extensively robbed – almost totally in most cases – only Pit 15 has anything like its original stonework where removal, although started, was not completed. Access for carts or vehicles to remove the stone has also altered the earthworks leaving large openings in the sides causing Pits 16-18 to become conjoined.

Pit 14 (Pl. 6) has an overall diameter of 18m, though the diameter of the stone-lined tank was likely to be nearer 14m, and the depth of the earthwork is 2m. Its depth was established by cutting into the slope and building a semi-circular embankment on the downslope side. On the lip of the bank on the eastern side, two edge-set flat stones mark the position of an overflow sluice from which liquid would flow into the tank(15) below. At the base of the retaining bank is the opening for a ceramic pipe, since robbed, from which the settled slurry could have flowed.

The floor of Pit 15 (Pl. 5) is 2m lower than that of 14. The diameter of the tank is 8.8m and the granite blocks of the lining still stand to approximately 1m though the overall depth of the pit is 2.4m. The pit has been disturbed on the eastern end where ground has been dug away to rob the stone.

Pits 16-18, extensively disturbed when robbed, survive as three conjoined circular earthwork hollows with battered sides. They all have floors of similar elevation and the tanks were probably all of the same diameter judging by the size of the pits. There is little remaining stonework but that which is still *in situ* suggests a diameter of approximately 11m and the average depth of the earthwork is 2.3m.

Before demolition these tanks would probably have resembled the very fine, well-preserved pair of settling tanks at Crownhill Down (SX 5758 5979) on south-west Dartmoor. These examples have slightly battered interior stone linings whereas the only tank with lining surviving at Shipley (15) suggests that these did not.

The thickening tank (Pl. 7)

After initial settling out of the water the clay, by now a more viscous, semi-solid substance, was piped into the thickening tank (19) where even more water was extracted. This is an upstanding masonry building which past writers have speculated may have been adapted from an earlier structure associated with the naphtha works. Though this is difficult to prove from diagnostic features in the

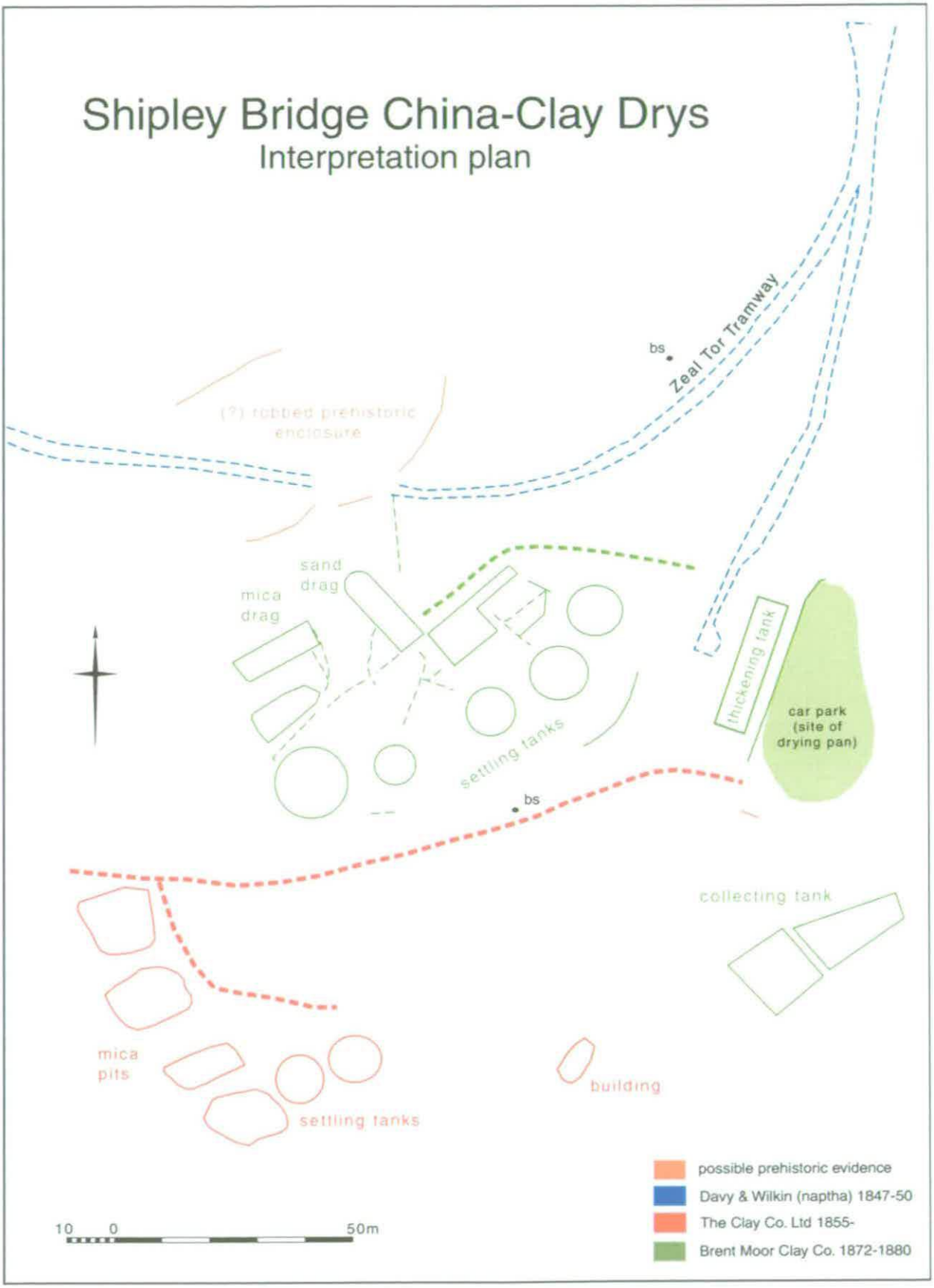


Fig. 3. Interpretation plan showing chronological elements of the site.

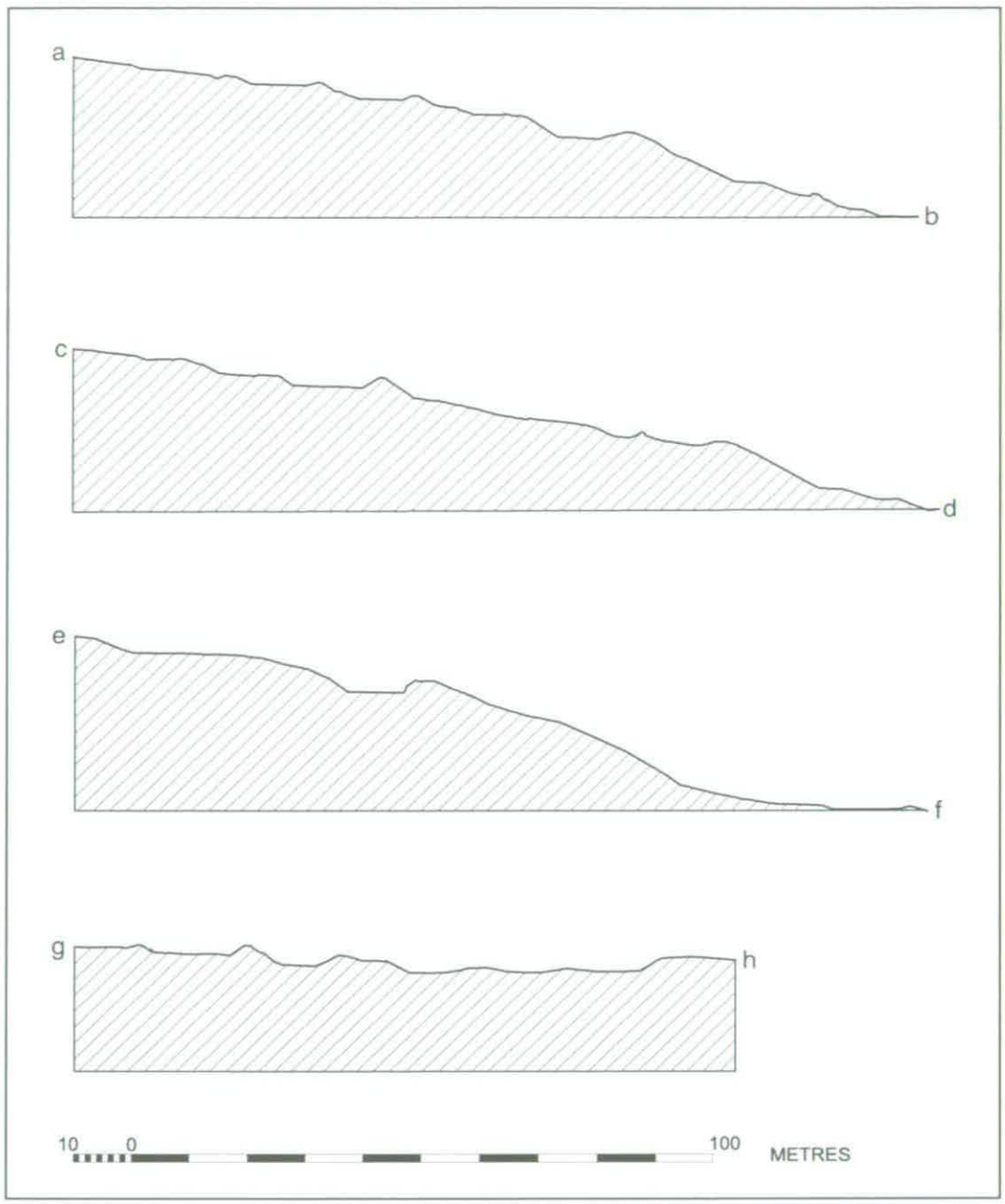


Fig.4. Sectional views across the clay drys.

standing fabric, one clue is that it is not made entirely from granite as the circular tanks appear to have been, and the majority of the stone is the metamorphic shale found in the immediate vicinity of Shipley Bridge and probably originates from the small quarry on the site (see below).

The building is cut into the base of the slope, the back wall acting as a revetment and the end walls are partially below surface. The external dimensions are 29m by 7.4m. The reinforced front wall is 2.1m thick giving an internal width to the structure of 5m. The floor is paved with brick and has a slight gradient to allow water to drain off. In the rear wall large pipes set near the top brought the clay into the structure. The eastern, front wall has five evenly spaced vertical openings which stand the full height of the wall and are on average 0.6m wide, with buttresses on the outside. The openings have iron fixings onto which hatches, probably of steel, were fixed so they could be opened to empty the clay, which was by now a moist powder, into the drying pan below. This thickening tank is similar to the example at Shaugh Bridge, which although used in combination with a heated drying pan, is of similar date (Smith and RCHME 1996).

Plate 1. The sand drag.

Plate 2. The mica drag.

Plate 3. Detail of mica drag.

Plate 4. Early sand and mica separating pits

Plate 5. Settling pit (15) with surviving masonry lining.

Plate 6. The larger settling pit (14).

Plate 7. The thickening tank and the site of the drying pan, now used as a car park

Plate 8. The collecting tanks.

The Drying Pan

The final drying of the clay was completed in an open pan where it was air dried. This pan is known to have been located on the site of the modern car park though its precise extent or appearance are not known.

Collecting Tank (Pl. 8)

A stone built structure of two cells sited south of the road is referred to by Robinson as a collecting tank (Robinson 1984). Its precise purpose is unclear but it was possibly for the collection of any remaining clay deposits suspended in the water before its return to the River Avon. The walls consist of earth banks with granite facings inside and out, measuring up to 2m thick and up to 0.8m high. The western cell is rectangular and measures 12.7 by 15m; the cell to the east is trapezium shaped with ends measuring 11.5 and 6.3m and an overall length of 20.5m.

OTHER FEATURES

Rectangular building (9)

A small rectangular earthwork sited beside the road appears to be a ruined building. It measures very approximately 9m by 4m and has traces of masonry within the south-east wall. Its function and date are uncertain.

(?)Building (20)

Faint foundations of a possible small building or shelter north of the early mica pits. The remains consist of a level platform of 9.5m by 5.3m surrounded by a low mound including some possible walling.

(?)Robbed prehistoric enclosure

An earth and stone feature which has been extensively robbed is a possible prehistoric enclosure with one hut base. The walls now consist of disconnected and spread earthworks containing rubble. The clearest section is that to the north-east which appears mostly undisturbed. The site has been bisected by the Zeal Tor Tramway and much stone has been removed, possibly for the building of the clay works. A possible hut base is located in the north-west corner consisting of a level area and slight bank.

Quarry

A small quarry from where metamorphic slate has been extracted. It may have been the source of building stone for the naphtha works in the 1840s.

Storm tye

A deep channel with steep sides of up to 3.5m wide and 0.8m deep transects the centre of site from east to west. It may have served as a the main storm tye or drain for collecting and diverting rainwater.

CONCLUSIONS

The clay drys at Shipley Bridge are a good example of the type of remains left by china-clay processing and drying in the 19th century. Although documentary evidence is somewhat sparse, enough survives to provide dates which may be applied to the various remains. The two periods of clay activity noted in the documentation may be confirmed by the field evidence where two distinct areas of remains each conform to types known from those periods. Unfortunately, no detailed general evaluation of the archaeology associated with the Devon china-clay industry has yet been attempted, so the importance of these remains at any level (national, regional or local) cannot presently be gauged. As to any buildings associated with the naphtha industry it is uncertain if fabric does survive within the later thickening tank or if earlier buildings were demolished and rebuilt in a more purpose-built manner more suited to china-clay processing; the latter seems most likely. The principal surviving evidence of naphtha production is the Zeal Tor Tramway.

Documentation does reveal that none of the enterprises here were very successful and were mostly short-lived. The 1870s venture was hit by a slump in the price of china-clay and was the only pit in Devon to close because of it (Wade 1984). Brent Moor also paid heavily for not having its processing works with easy access to the railway network, which was the key to cheap transportation of this bulky product.

It has not been possible to include the clay works and pipelines associated with the Brent Moor clay industry in this report and detailed survey of these features would no doubt reveal much of interest.

THE SURVEY

The majority of detail was surveyed using a Trimble dual-frequency GPS using a temporary base station within the confines of the site. Detail was recorded using a roving receiver in realtime mode. Data was downloaded into a computer to provide a 3-dimensional plan. A small amount of detail was added using tape measures and graphical survey methods.

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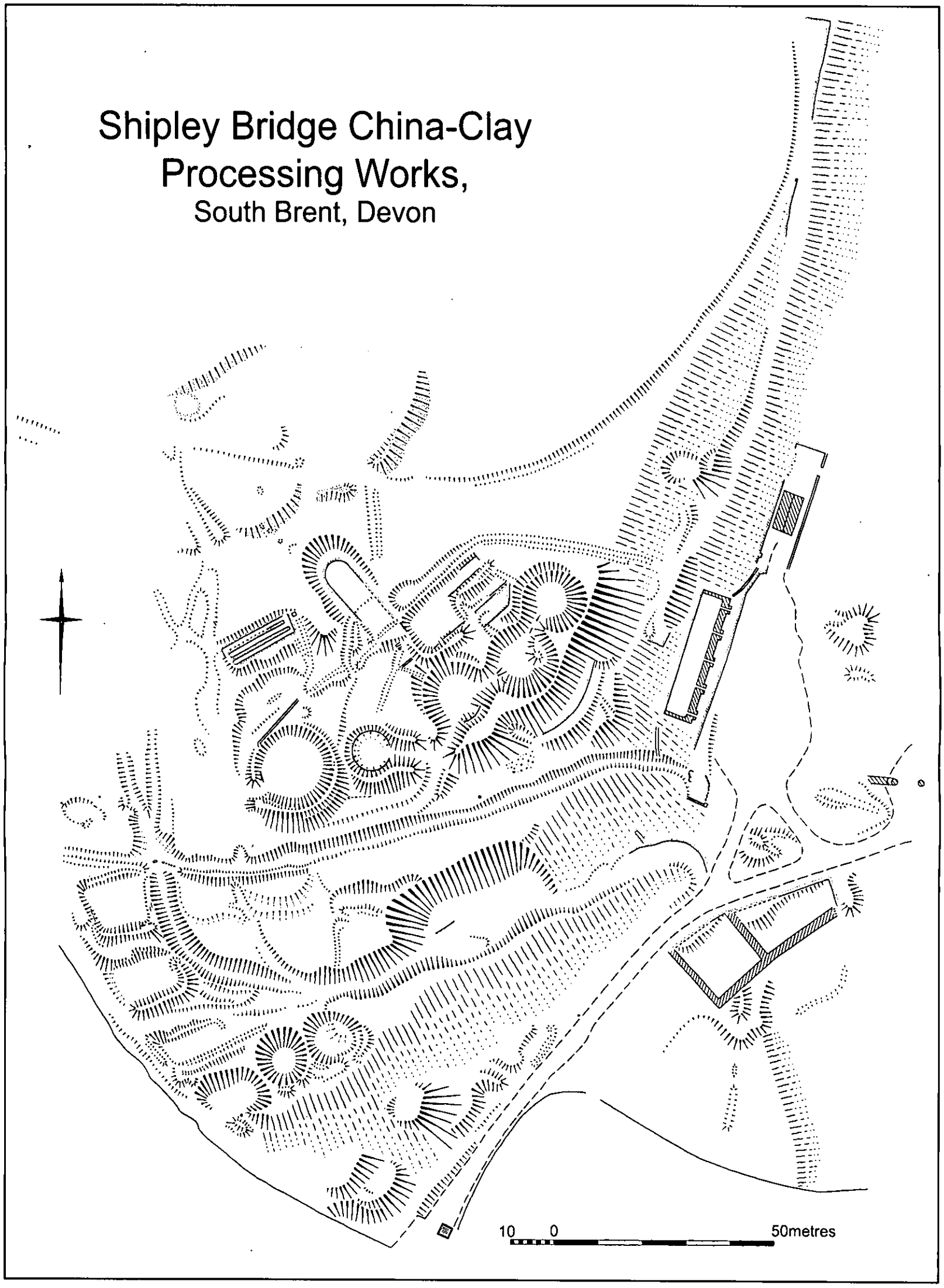
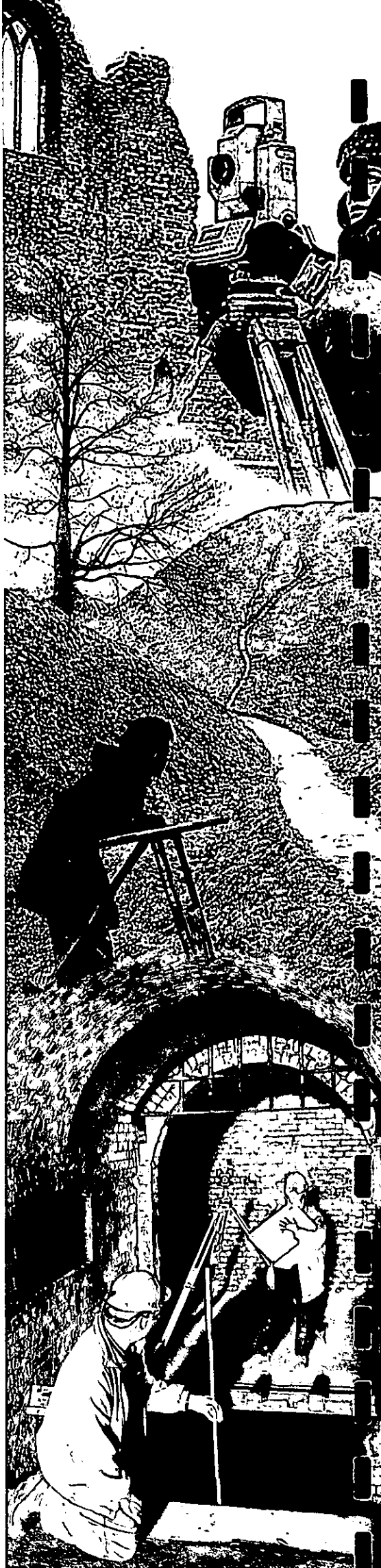


Fig. 5. EH 1:500 scale earthwork plan (50% reduction).



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