

THE SAND MINES OF NOTTINGHAM

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Abstract: Four old mines are known beneath the city of Nottingham. Weathered Sherwood Sandstone was extracted, mainly in the eighteenth century, to yield loose sand. The mines were shallow, sub-horizontal, pillar-and-stall workings with drift access; explosives were not needed. Rouse's mine was the largest, yielding nearly 10,000 tons of sand; it had workings on two levels, and is still stable and accessible. The three smaller mines are, respectively, filled with concrete, largely collapsed and very unstable.

THE NOTTINGHAM SANDSTONE

The city of Nottingham is built on the Triassic Sherwood Sandstone where it forms a low escarpment facing west and extending northwards from the edge of the Trent floodplain (Fig. 1). The upper part of this sandstone is known as the Nottingham Castle Formation (Charsley *et al.*, 1990) and consists of 60 metres of massive, weak, buff coloured, medium to coarse grained sandstone. This material is so soft that it is easily excavated with hand tools, yet it is so little fractured that it will safely span a mined opening. The sandstone is almost an ideal tunnelling medium.

There are hundreds of artificial caves beneath Nottingham's city centre (Waltham, 1992). Nearly all of these were excavated as underground storerooms, factories or cellars. Up until 1845, Nottingham's population increased dramatically while the town was surrounded by protected common land and therefore could not geographically expand. The desperate shortage of space encouraged downward expansion - into the easily excavated rock. Almost every town centre building dating from before 1845 had its own cave cellar. Widespread tales of a great cave system beneath Nottingham are pure fantasy, and very few of the caves interconnect. There are no natural caves in the sandstone, so the term is something of a misnomer, but the 'caves' of Nottingham are so well known that the nomenclature is unchangeable.

Just a few of Nottingham's sandstone caves originated as true mines. These were excavated to yield the sand, into which the sandstone disintegrated as it was extracted. All the other caves were excavated primarily to create space, though the sand produced was probably also valued as a resource material within the developing town.

Both the cellar caves and the mines owe their existence to the favourable mechanical properties of Nottingham's sandstone. The rock beneath the city is weak and friable, with an unconfined compressive strength (UCS) usually between 5 and 25 MPa. There has been minimal tectonic deformation since the Triassic, so the sandstone is almost horizontal, and sub-vertical joints are typically more than 10 metres apart. Bedding planes are not conspicuous except at isolated horizons of quartzite pebbles and mud flakes which originated in flood events. Overall the sandstone is massive. Though the sandstone is underlain by productive Coal Measures, there have been no deformations due to mining subsidence, as workings have never reached under the central part of Nottingham, containing the sand mines.

A significant feature of the sandstone under Nottingham is its variation through the weathering profile. At most sites in the city, the top metre of natural ground is weathered to a loose or dense sand soil. Beneath this, the material is a sandstone rock, whose strength increases with depth. The UCS may be as low as 1 MPa in the top metre, but may rise to over 30 MPa at

depths of over 10 metres (Waltham, 1993). This pattern influenced the excavation of the caves and mines, as the optimum workability was found at depths between about 2 and 6 metres. A cavity roof less than 2 metres thick in the weak rock was likely to be unstable; depths greater than 6 metres were generally unnecessary and could involve more arduous manual removal. At the right depth, blocks of the sandstone disintegrate into sand when they are dropped onto the floor, while the undisturbed rock is safe in the roof spans.

THE MINES

Sand required for general building was extracted from various open quarries and exposed scar edges around Nottingham, and may also have come from some of the mines. However, the material taken from the underground mines was of higher quality. Much of the mined sand appears to have been spread on household floors, in the times before carpets were in common use. People alive in the 1940s had childhood recollections of the cart men touring the town streets crying out 'buy my lily-white sand' (Hind, 1943). This involved a little sales talk, as even the best material was tinted a pale yellow or pale buff. In addition, some of the output probably supplied the glassworks which thrived in Nottingham before the nineteenth century; the cleaner sand from the mines would have been acceptable for the manufacture of bottle glass. These demands for a light coloured product provided a second good reason for the underground mining. Depths of 2 to 6 metres were below the effects of surface organic discolouration, and were also above the redder, less leached sandstones in the unweathered zone.

All the Nottingham sand mines were worked from almost level drifts into the natural slopes. Their locations were therefore dictated by topography, and all the known records of mines refer to sites along the Mansfield Road and Derby Road, north and west of the old town limits. Both these roads were hollow ways, following shallow natural valleys which had been deepened by centuries of hoof and wheel hammering and drainage scour.

Derby Road was a hollow way where it climbed from the old town gate at Chapel Bar up to the top of the Sand-hills (Fig. 2). Its south side was perforated by a number of small sand mines, but most of these were probably destroyed in 1740 when the Corporation graded the road by casting down the valley sides and raising the floor level (Blackner, 1815). The workmen of the time found several rock walls separating cave rooms, but there is now no trace of the mines. New rock faces, cut at the rear of some of the subsequent generation of houses, are in solid rock, except where later caves have been cut; they are behind or above any old mines.

Mansfield Road was a hollow way up the sandstone slope to the north (Fig. 2). It passed into open country between the Sandfield

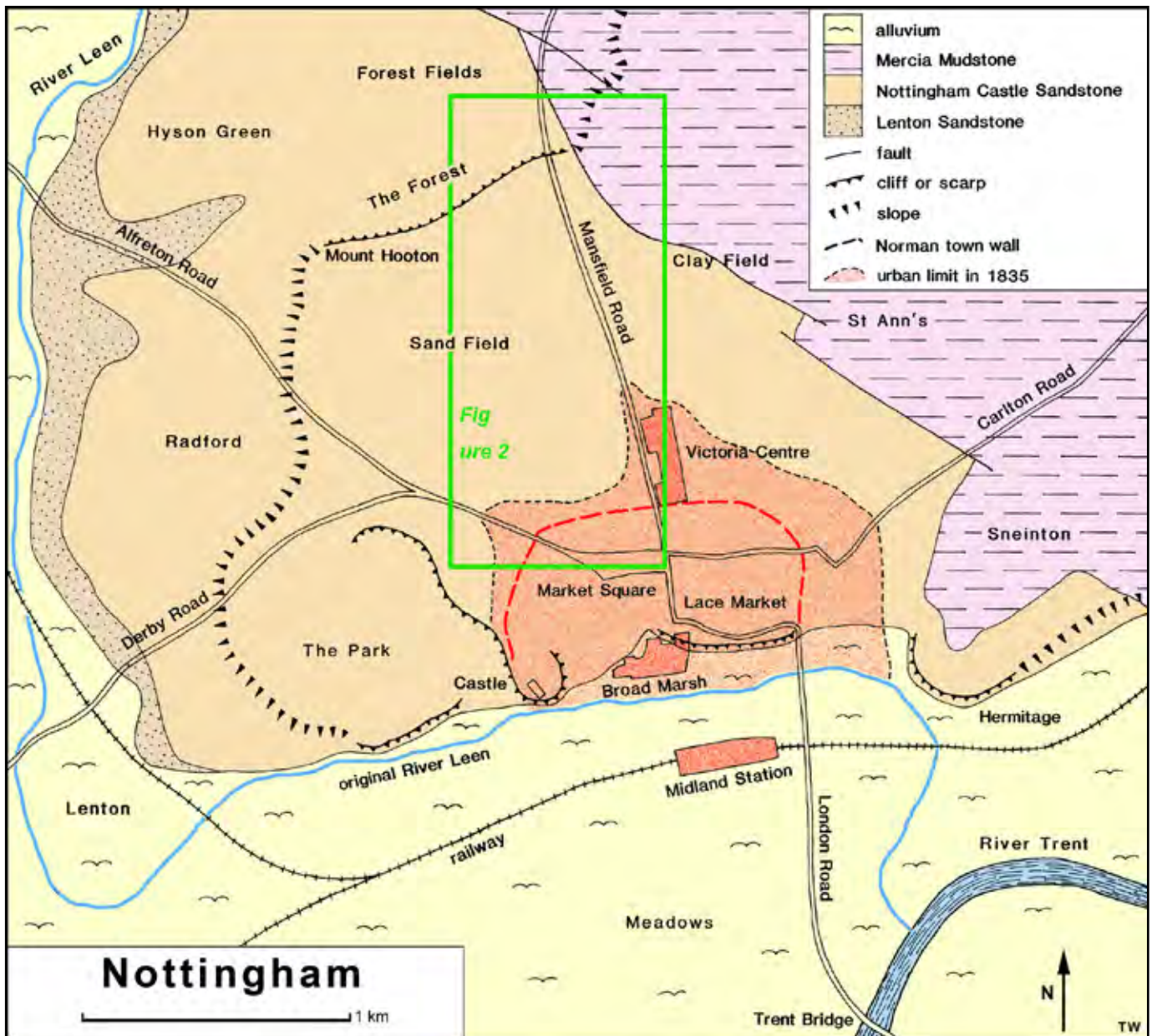


Fig. 1. The main geological and topographical features of the inner part of the city of Nottingham; the whole area shown on the map is now urbanized.

to the west and the Clayfield to the east. Both of these were Freemans' lands - effectively commons - where building was not possible until the Enclosure Acts opened them to new development in 1845. For two hundred years until then, they had been farmed, but the only houses were a few along the road frontage. The Nottingham town records refer to todeholes, caves and rock houses along the road at various times from 1335 to 1832 (Stapleton, 1904; Silkstone, 1978). Todeholes probably refer to lepers' dwellings, but there is no specific early reference to any mining of the sand for sale. All this early generation of sandstone caves would have been destroyed by both natural weathering and retreat of the rock bluffs, and also by artificial widening and regrading of the hollow way. It was probably a second set of cave houses along the Mansfield Road frontage that were recorded as inhabited in 1832 (Stapleton, 1904). Records of the sand mines date from in between the generations of rock houses.

Four sand mines, all of them along the Mansfield Road (Fig. 2), have survived into modern times. There may once have been more. One of the four has already been filled with concrete. Others could have been filled and forgotten. Others could even lie sealed behind brick walls in house basements, awaiting rediscovery - but the possibilities appear to be slim, and any

new finds are likely to be similar in style to those already known. The few known small caves between the mines are only storage cellars cut in the rock, as are the larger, more recent beer and wine storage vaults close to Mansfield Road further south. All the known caves and mines are marked on Figure 1, along with some of the multitude of caves beneath buildings within the old town site south of the modern Parliament Street (Waltham, 1992).

There are no known sand mines cut into the old river cliffs facing onto the Trent floodplain (Fig. 1). Closer to the heart of Nottingham, these sites were all crowded with rock houses, buried behind commercial premises and excavated for underground factories. Sand was quarried from various exposed rock faces and ditch bottoms in many parts of the town centre up until the eighteenth century, but there are no records of serious mining in the southern parts of town.

ROUSE'S MINE

The largest of the four known mines lies west of the Mansfield Road towards its lower end (Fig. 2), where it extended under the common land of the Sandfield. Surface diggings for sand would

have been forbidden by tight legal constraints on the common Sandfield, and the opportunity to work the sand in mine workings inwards from the Mansfield Road may have provided incentive to overcome the economic disadvantages of underground working.

It is generally accepted, but not known for certain, that this is the mine referred to by Blackner (1815) as having been worked for sand beneath Dog Kennel Hill by James Rouse or Ross. In 1815, Blackner wrote that Rouse had retired a few years earlier, due to old age and infirmities, after 30 years in the mine. This dates a period of working to around 1780 to 1810. The mine appears to have yielded a total of between 8000 and 10,000 tons of sand, with no wastage; this is based on a rough estimation of the volume of the mine as it is now known. These figures suggest a production of about 1 ton per day; this would have been well within the capability of two, three or four men working with a couple of donkeys.

The mine may well have been worked before 1780. A glass works operated on the east side of Mansfield Road until about 1760 (Blackner, 1815), and a sand mine on Rouse's site, just 300 metres up the hill, could have been a convenient asset. Either side of Rouse's entrance from Mansfield Road, there are workings at levels just above and just below the gently descending drive which leads into the main mine (Fig. 3). These appear quite separate from the main workings, as if the tunnel had been cut through them to allow access to greater resources further into the hill. There has been so much subsequent modification and added brickwork that the evidence is inconclusive. The mine roof is just below road level near the entrance (Fig. 4). The main galleries are roughly level (see below) so that the mine lies deeper under the hill and also deeper beneath the road as it climbs to the north.

After about 1810 the mine was closed and lost. The entrance was rediscovered in 1823 when houses along Mansfield Road were demolished (Hind, 1943). It was rediscovered again during building work in 1837, when a workman ventured in and was lost for five hours (Stapleton, 1904).

Dearden's map of 1844 shows houses along the Mansfield Road frontage, with a gap into a recessed yard at the site of the old mine entrance. These houses, and those that followed along the rest of the frontage, had brick basements with load-bearing walls extended down to sound rock. At the rear of many of the houses, the sandstone was excavated to breach the old mines and the brickwork was safely founded at the mine floor level (Fig. 4). Parts of the mine, therefore, became sub-basements, with steps and doorways from many of the houses and shops along Mansfield Road. Wider use of the underground storage space offered by the old mine is also indicated by a number of shafts which breach the mine roof and appear unrelated to the sand extraction.

By 1892 the mining was forgotten but the galleries were still accessible through some of the shop basements. They became 'Robin Hood's Mammoth Cave', advertised as one of the grandest sights in England, the most extensive cave in the Midland counties (Iliffe and Baguley, 1971). During the annual Goose Fair, the mine ('cave') was transformed into 'a scene in fairy land' illuminated with thousands of coloured lamps. It was probably at this time that the steps and handrails were added in the mine not far from the basement entrance. Access to the mine was still open through the shop basements in 1904, but the lighting details are unrecorded (Stapleton, 1904).

In the Second World War the mines were designated as air raid shelters, along with 75 other sandstone caves under Nottingham (Waltham, 1992). Two new entrances were cut to give alternative access routes to the deepest part of the mine at the

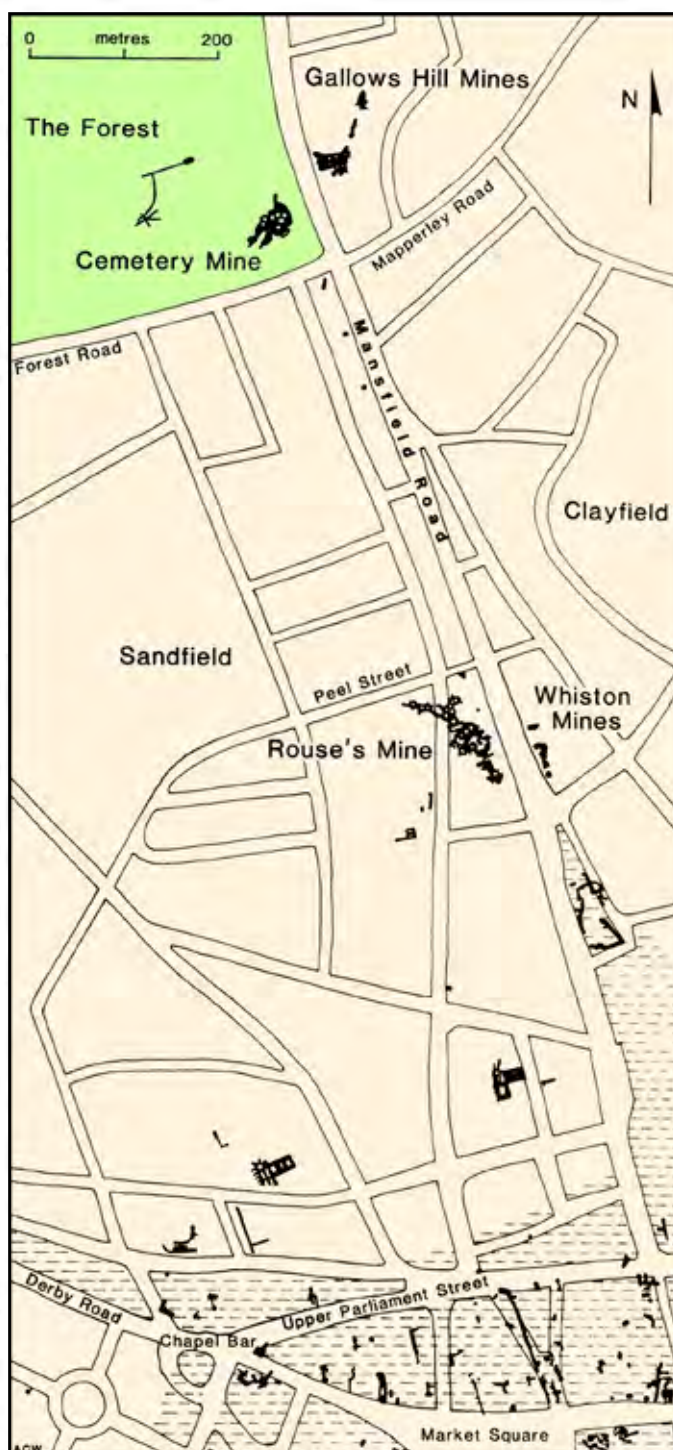


Fig. 2. The area of the sand mines along Mansfield Road, just north of the city centre of Nottingham. The mines are shown at their maximum known extent at the time of working, in relation to the modern configuration of roads. Shading marks the extent of the building cover in 1820 (after the map by Wild and Smith). In addition to the mines, all other known sandstone caves are marked in black; most underlie the 18th century town (roughly south of Upper Parliament Street), and the few larger cave systems north of the 1820 urban limit were cut as storage vaults in the 19th century.

northern end (Fig. 2). Both of these required new sloping tunnels cut in the sandstone and fitted with flights of steps. Newspaper reports of 1940 describe the 'caves' newly fitted with electric lights, where the Corporation had lowered the floor a few inches because of the low roof (Silkstone, 1978). Fresh tool marks on the roof of the northern part of the mine indicate how much trimming and cleaning of the old mine tunnels was carried

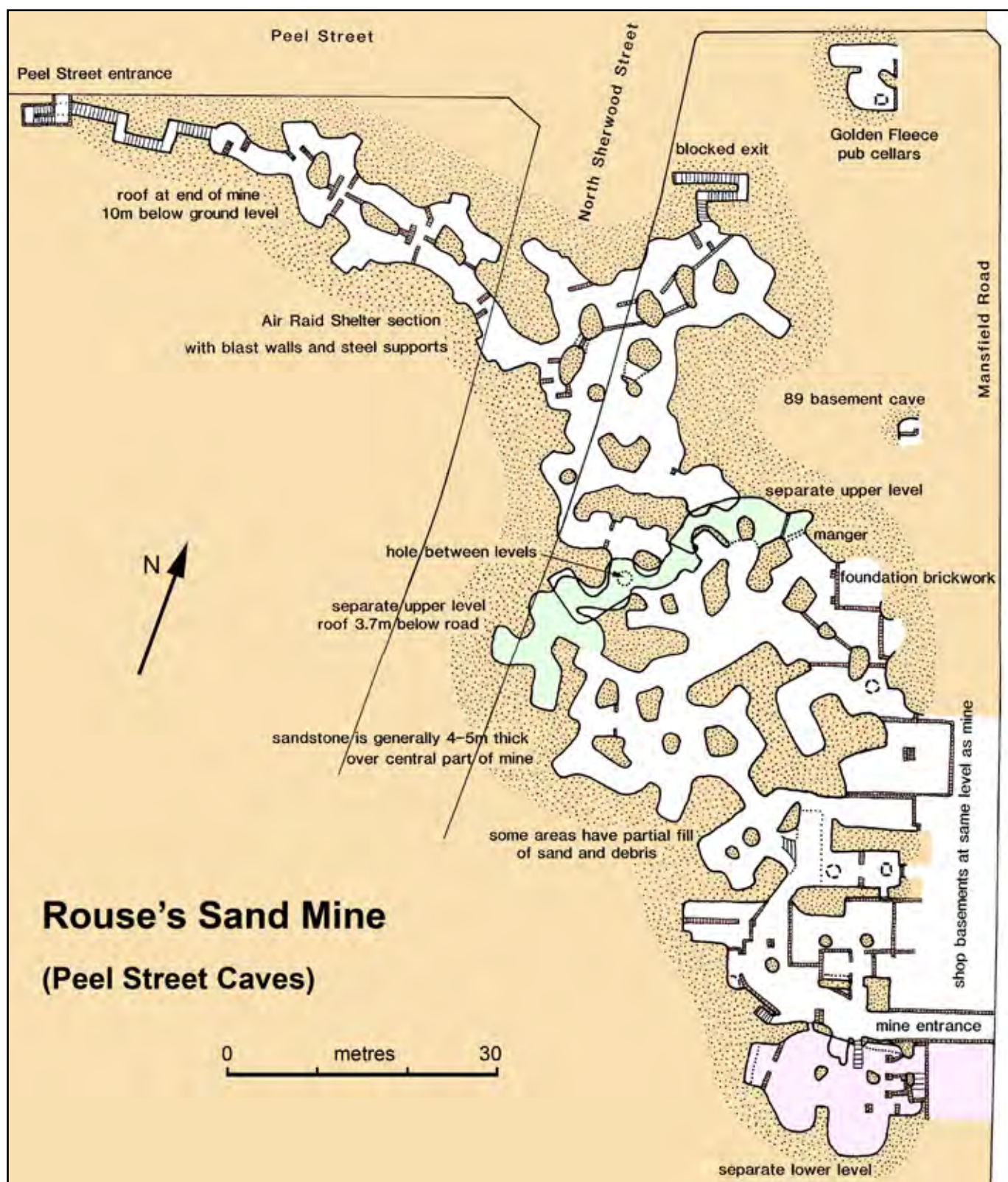


Fig. 3. Outline survey of Rouse's mine (a slightly modified and improved version of the map published in Waltham 1992).

out at the start of the war. Brick walls were also added in the mine, some as massive blast walls, others to separate rooms and hold toilets (which could have been much in demand by the thousand people packed in during an air raid!). As events turned out, air raids were hardly a feature of Nottingham's wartime.

After the war the mine was again almost forgotten, except that it was briefly used for burglaries of some of the Mansfield Road

shops via their basements. Subsequently all the shop cellar entrances have been bricked up, and the wartime entrance from North Sherwood Street now lies beneath a solid concrete slab in a car park.

The Peel Street entrance has been retained, and was secured by a new blockhouse when the road was widened in a recent stage of urban renewal. This entrance is in the hands of the city

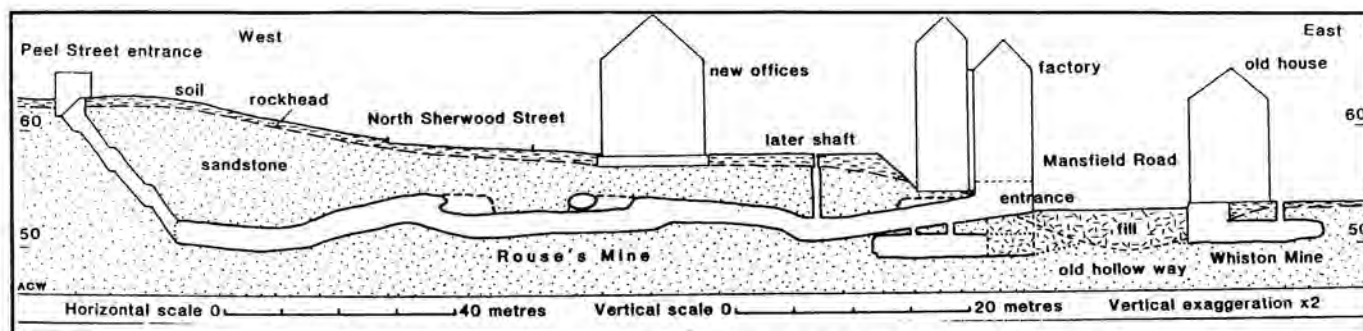
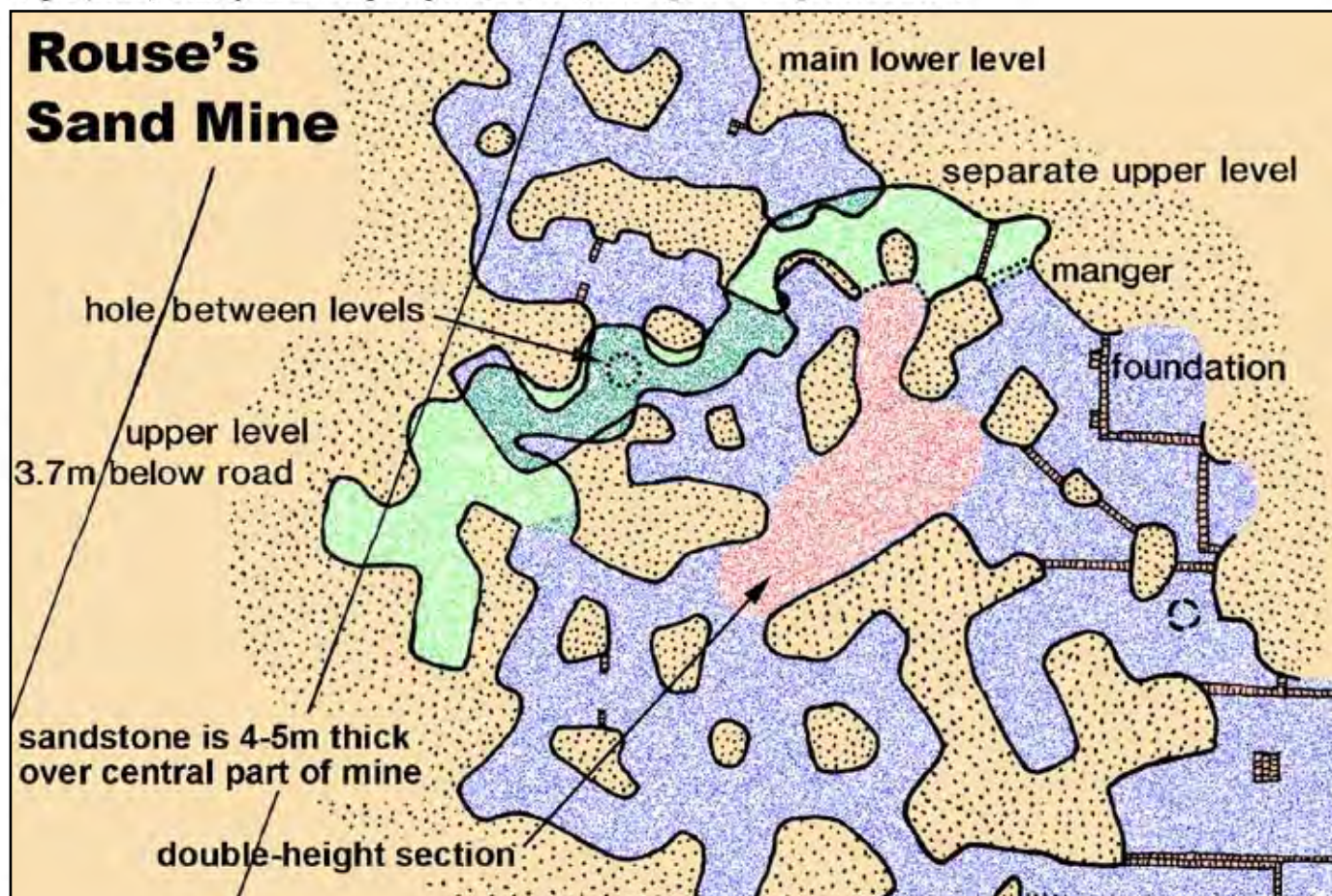


Fig. 4 (above). Semi-extended profile through Rouse's and Whiston Mines. Close to Mansfield Road, some features have been projected on to the line of section, and others have been omitted for clarity; the profile of the old hollow-way is conjectural.

Fig. 5 (below) Plan of the central part of Rouse's Mine, showing the workings on two levels.



council, and, as this has become the main point of access, the mine is now often referred to as the 'Peel Street caves'. The original entrance from Mansfield Road is now within a privately owned building, and is barred by a steel door directly beneath the property boundary (Fig. 3). One shaft entrance is accessible, though it is not normally used; it was recently rediscovered beneath a stone slab in the back room of a shop, when vandalism and jamming of the locks on the Peel Street door instigated a search for another way in.

The Style of Mining

The mine was a typical pillar-and-stall working, with no systematic pattern as the sand was extracted selectively by hand. Most of the mine galleries are 2-3 metres wide, though some have been broken out to widths of nearly 5 metres. The gallery profiles tend towards flattened ellipses, and there has been no attempt to square the corners. The rock pillars left in

are irregular in shape, and the thinnest are about 1.5 metres in diameter. There is no artificial roof support from the original mine, there was no stowing of waste and there are no built stone

pillars. Roof failure has never been a problem in the mine, and up to 80% extraction has been achieved in some areas.

The main galleries are 1.6-2.0 metres high (Plate 1). They roughly follow the bedding within a zone just under 4 metres thick in the nearly horizontal sandstone (Fig. 4). This zone contains very few pebble beds; it therefore avoids contamination of the sand from the red mud flakes which occur in the pebbly layers, and also the greater extent of roof breakdown associated with the weaker pebble horizons.

Within the 4 metre zone, the mine level varies. Individual sections of the mine are in just the lower 2 metres of this zone, and other sections are in the upper 2 metres only. In some sections, both upper and lower parts have been worked, either together or separately. There is no recognisable reason why the mining switched from one level to the other at so many points; the answer may lie in the workability of the material, only recognisable by the miner picking the softer rock as he worked into it.



Plate 1 (top left). In the heart of Rouse's sand mine pillars provide stable roof support and some galleries have been broken out to double height (all photos by Tony Waltham).



Plate 2 (middle left). A hole in the floor of Rouse's upper level reveals the thin rib of sandstone left between the levels and also the misalignment of the pillars.



Plate 3 (bottom left). A step in the floor profile between the two levels in Rouse's mine has been fashioned into a trough just over the rock lip, which may have been a manger for the mine ponies. The brickwork is part of the air raid shelter modifications.



Plate 4 (top right). The surviving galleries of the Cemetery Mine now open into the amphitheatre where most of the old mine was blown in, and which is now occupied by the Rock Cemetery. The tombstone crosses nearest to the camera stand on rock stumps remaining from the destroyed pillars of the old mine.



Plate 5 (bottom right). A fragment of the Cemetery Mine, now exposed to daylight, has a rock pillar considerably thinned by the combined action of subaerial weathering and abrasive, inquisitive, human hands.



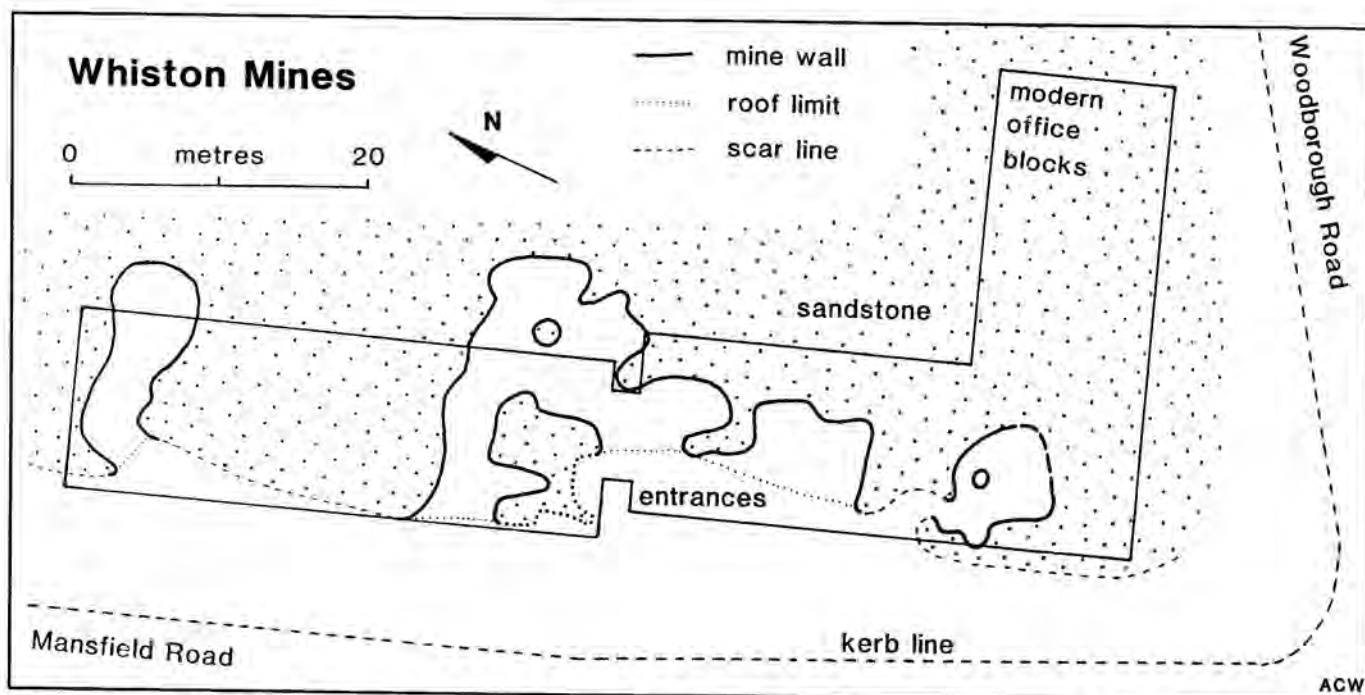


Fig. 6. Sketch Map of the Whiston Mines in relation to the office blocks which now occupy the site and stand on the concrete-filled remnants of the mines.

Where the two levels have been worked together, the galleries are now just over 3 metres high. The sequence of working is not known. Rounded ledges survive at mid-level in the waisted profile of the double-height galleries; these could indicate that the two levels were worked separately, followed by a breakout of most of the thin rock rib left between them. Only one section of the mine now has a separate upper level (Fig. 5), and, where the galleries cross over, sandstone rock only 0.25 metres thick remains in place. At one point there is a hole connecting the two levels (Plate 3); it is unclear as to whether this was an accidental failure of the very thin rock rib, or the start of a systematic breakout of the two levels over a small area. However, many galleries would have been very low if they had been worked initially as separate levels; even though the double-height passages do retain their mid-height ledges, it is likely that many were formed by a second phase merely removing the floor, or roof, of an earlier phase.

In the area of the two separate levels, the patterns of pillars and stalls are not superimposed (Fig. 5), so they could never all have been coalesced by breaking out the thin sandstone floor of the upper gallery. Other parts of the mine have an almost random combination of upper and lower levels, and there seems to have been no serious planning of the mine to allow efficient, systematic double-level extraction.

The sandstone in the mine has a strength (UCS) of around 5-10 MPa; this reduces to 2-6 MPa when the rock is saturated. Today the mine is essentially dry, though conditions could have been much wetter in the past when farmland overlay the site, before infiltration was effectively curtailed by the building of the roads and houses. The rock was hacked out with picks, and there was no need for explosives. Tool marks have suffered the ravages of weathering and visitors over time, and the most protected area at the northern end was all trimmed and cleaned for wartime use. No significant crushing of the sandstone was needed; blocks disintegrate to heaps of sand as they are dropped to the floor, and any survivors crumble beneath a few hammer blows. The mine produced no waste.

Sand was probably hauled out of the mine in donkey-drawn carts. There is no positive evidence of animals being used underground, but a trough cut in the rock on one ledge is

thought to be a feeding manger (Plate 3). Carts could be used in the mine as the exit was a gently rising drift out to the Mansfield Road. The slope on the road allowed various exits at slightly different levels, and the main drift appears to be a later cut inclined through an area of older workings (Fig. 3). New entries may have been necessitated by regrading of the Mansfield Road, as recorded by Blackner (1815).

Realms of Fantasy

Dark tunnels are hotbeds of fantastic stories, and Rouse's old mine has generated its share. They have been claimed as excavations by cavemen and primitive races 2000 to 5000 years old, inhabited as troglodyte fortresses, and used by outlaws in the Middle Ages. Individual galleries have been described as dormitories, chapels, commercial halls, stables and cattle barns; the ledges in the double height galleries have been designated as defensive lookouts; and the inner reaches are claimed to house an underground forest. All of this is pure fantasy, unfortunately gaining credence from misguided press reports and dubious 'popular' publications, best not referred to again. It is to be hoped that the wild stories can now finally be killed off.

Many of Nottingham's inhabitants willingly relate stories of great underground journeys through the city's 'cave system'. The most common accounts are of journeys from the basements of Mansfield Road through to the Castle on the other side of town, always made by someone other than the actual raconteur. None of the stories is founded in truth, and these underground links have never existed (Waltham, 1992). The longest possible underground journey is just 200 metres from end to end of Rouse's mine, but with a feeble torch and powerful imagination it may seem to be much longer.

THE WHISTON MINES

A small group of old sand mines has been recognised on the east side of Mansfield Road, almost opposite Rouse's mine (Fig. 2). In the 1980s they were all filled with concrete when a large office block replaced the Victorian houses on their site. Some residents from those houses remember the sandstone caves at the rear of their basements, but have no plans or maps. Rough outline locations were marked on the contractors' maps of the

1980s site redevelopments, and a few photographs of the unroofed caves survive from the demolition period (Barry Dolby, pers. comm.). Some sketch drawings were made at the same time by Peter Godley, a passing member of the Nottingham Historical and Archeological Society (Maureen Mahoney, pers. comm.). The sketch map (Fig. 6) has been compiled from these two sources.

The rounded plans and profiles of the caves, clearly visible on the contemporary sketches and photographs, are sound evidence of their origins as mines. Their morphology is in marked contrast to the more square-cut rooms of the typical Nottingham cave cellars. The central group of four connected rooms (Fig. 6) is also characteristic of part of an old pillar-and-stall mine; in every way they appear to be a smaller version of Rouse's mine across the road. Some brick walls and thralls were added to develop the storage space when the houses were built above. Of the three separate gallery fragments, the central and northern clearly exhibit the pattern of a mine working, but there may be doubt whether the southerly cavity was another mine or a cellar cave excavated for storage space.

The mines are known from along a 65 metre stretch of the Mansfield Road frontage. More may have existed. They were at basement level, just about 2 metres below the modern road level. They probably originated as excavations in the side of the old hollow way very close to the contemporary road level (Fig. 4). The age of the mines is unknown, and could be anything from about 150 to 700 years. Old maps show gardens on the site in 1844 (Dearden), and the houses in place by 1861 (Salmon).

With no previous documentation the mines have no name. They are referred to here as the Whiston mines to distinguish them from Rouse's mine across the Mansfield Road. Whiston was a medieval village on the site, and, though the houses ceased to exist after about 1330, the name survived for much longer (Alan MacCormick, pers. comm.).

THE GALLOWS HILL MINES

The highest point on Mansfield Road, before the dip down towards Sherwood, was the early site of the town gallows - conveniently welcoming travellers from the north. It is now the site of St Andrew's Church (Fig. 2). Mines were excavated on both sides of the road, and have been referred to collectively as the Mansfield Road Sand Mines (Waltham, 1992). It is convenient to refer to them separately as the Gallows Hill mines on the east side and the Cemetery mines to the west.

Records of the sand mines beneath Gallows Hill are sparse and generally do not distinguish between the workings east and west of Mansfield Road. The north-facing slopes on both sides of the road were waste land up until the mid-nineteenth century, and town records of the todeholes include reference to this area as early as 1335 (Silkstone, 1978). The sand mines appear to have been public sites, where anyone could come and dig his own sand, though the scale of workings suggests that there was at least some degree of organisation and mine planning.

East of the Mansfield Road, parts of an old quarry and three mines survive (Fig. 7). The original contours of the hillside are unknown, but the early phase of sand extraction dug into the slope and created a quarry wall facing north and west. Workings then followed the same sandstone beds, almost horizontally, as they continued underground in crude pillar-and-stall mines. The largest mine, at the south end of the quarry, extends under an area only 40 by 30 metres. Fourteen slim rock pillars were left in place, and the extraction was around 90%. Two other smaller mines, similar in style, open into the old quarry face just to the north. Total yield from the mines was about 3000 tons of sand.

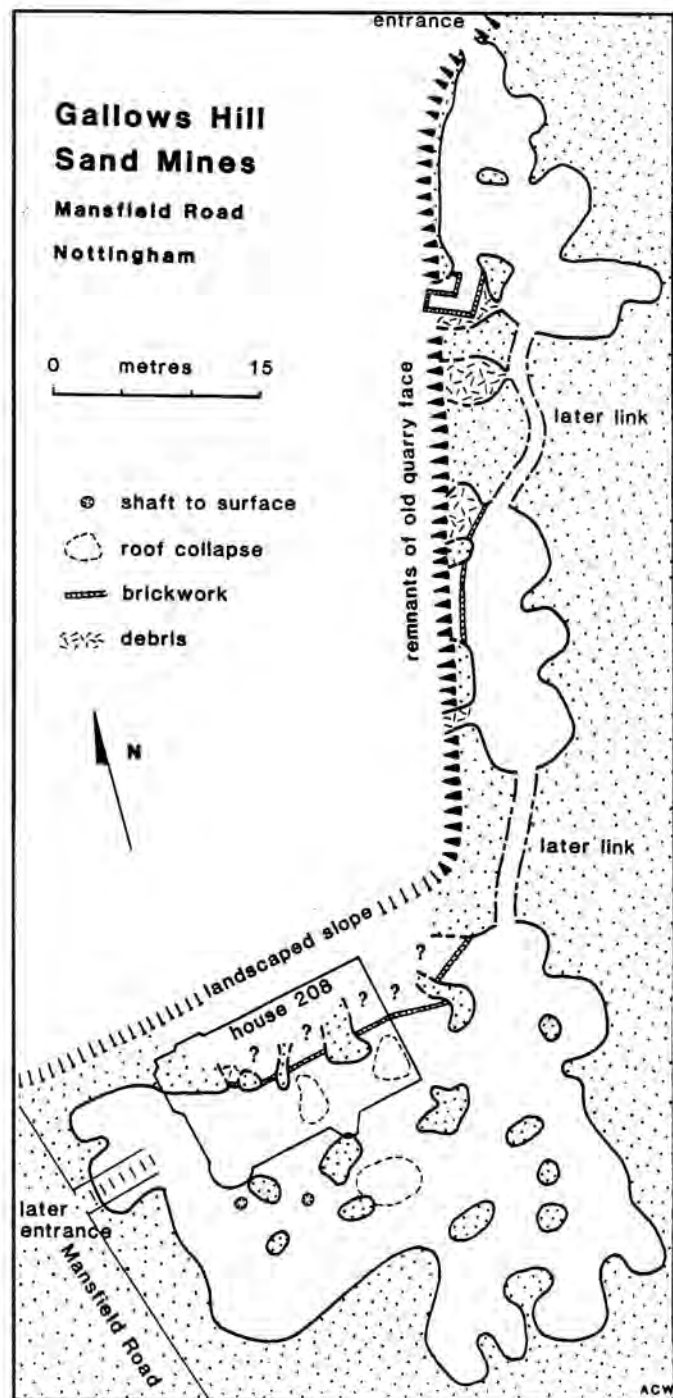


Fig. 7. Outline survey of the Gallows Hill Mines. All the original entrances to the main southerly mine are now lost behind debris, structural walls and landscaping fill beneath number 208 Mansfield Road. Load-bearing walls beneath 208 and partition walls installed for air raid shelter use have been omitted except where they form the currently accessible limits within the mines.

The sandstone is much weaker at this site than it is in Rouse's mine. Strengths (UCS) of around 1 MPa have been measured in the roof material (Waltham, 1993). This means that the mine must have been excavated very easily, but at the expense of long-term stability. The rock is so weak because it lies high in the weathering profile with a cover of only 2 metres. Furthermore, the mines are overlain by domestic gardens which permit rainfall infiltration. Saturation of the rock greatly reduces its already low strength, and the mine roofs are now unstable; a series of roof collapses has already occurred, but none has yet progressed to a crown hole breach of the surface.

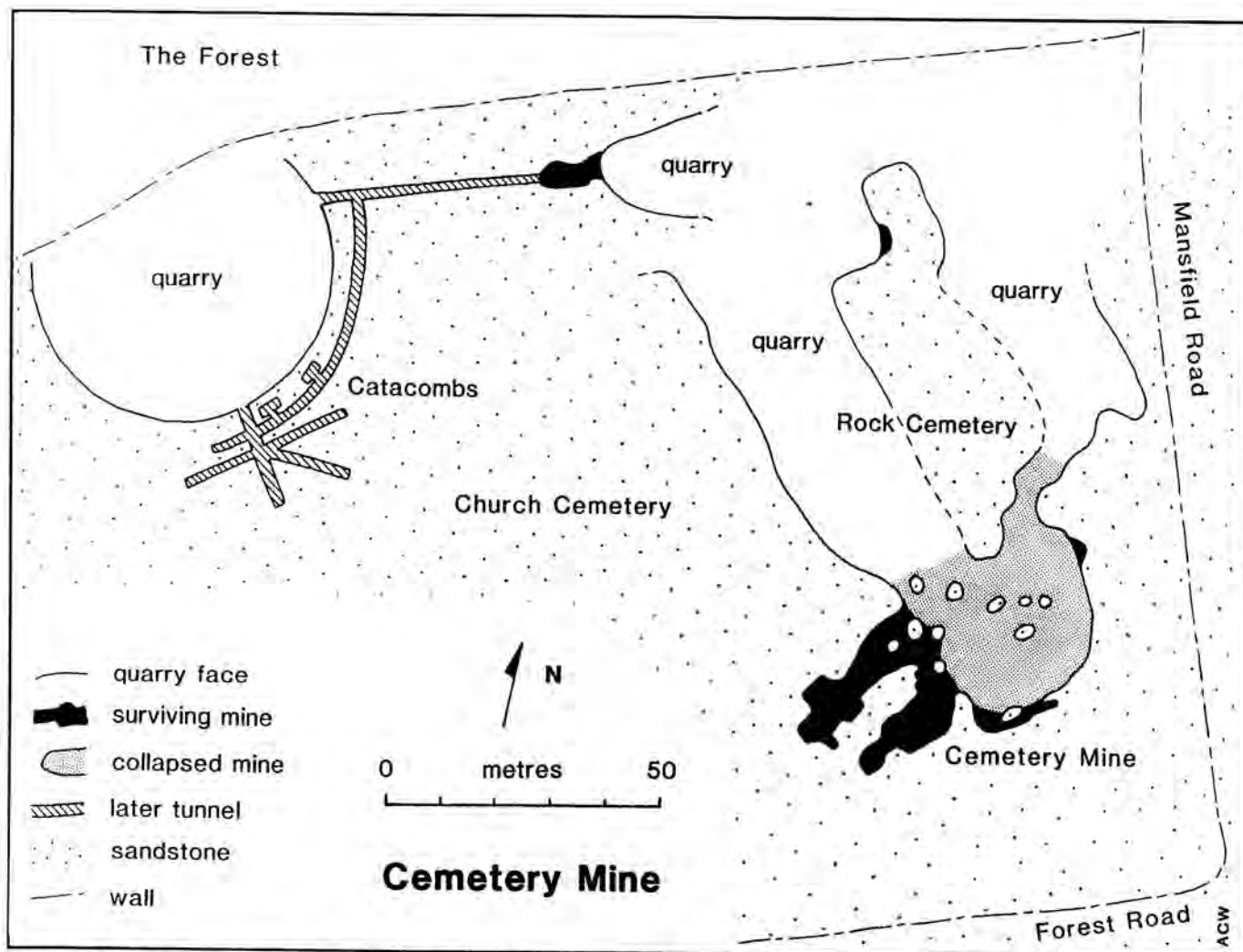


Fig. 8. Outline survey of the Cemetery Mine and the various old quarries which now lie within the Church Cemetery. The ground slopes down to the north, and more steeply into The Forest - which is now a cleared area with sports fields. The exact extent of the mines northwards into the quarried areas is conjectural as no records pre-date their collapse and partial unroofing. There would probably have been more pillars in the original mine, but the only ones mapped in the unroofed area are those whose stumps are now identifiable.

There are no known records of the early history of these mines in particular. It is likely that the main period of working was around 1800, contemporary with the mines on the west side of Mansfield Road (see below). Popular local stories of a link mined underneath the road are unfounded. By 1861 the quarried face lay in an area of open ground (Salmon, 1861). Both the quarry floor and the ground above the mines were covered by household gardens in late Victorian times. One house was built right across the main mine entries in the southern end of the quarry; parts of its foundations are a complex of brickwork extending into and through the mine. Around 1940, the mines were designated as air raid shelters; a new main entrance was cut with a flight of steps down from a blockhouse on Mansfield road, and the three old mines were linked by new sections of tunnel (Fig. 7) to create an emergency exit to the north.

THE CEMETERY MINE

West of Mansfield Road another sand mine, with its own associated sand quarries, was excavated in the ground now occupied by the Church Cemetery (Fig. 8). The eastern quarry has an irregular shape, considerably modified through its subsequent redevelopment as the Rock Cemetery. The main mine lay at the south end of this quarry, following the best bed

of sandstone horizontally into the hillside, almost matching its counterpart on the other side of the Mansfield Road (Plate 4).

This was another pillar-and-stall mine. Much of the mine was destroyed nearly 200 years ago, after it became unsafe. The remains now appear as an open quarry, except that bumps in its floor are the broken stumps of the old mine pillars (Plate 4); truncated segments of the mine galleries survive today as openings into the amphitheatre walls. Consequently the exact extent of the mine is now difficult to define. Figure 8 shows a best estimate of the mine extent, based on the distribution of the surviving pillar stumps and the recognisable ground profile. A mine of this extent would have produced about 3000 tons of sand; the open quarries probably yielded more. There is another small mine remnant at the northwest end of the quarry where the catacomb tunnel leads off; this may have been part of a larger mine working also subsequently destroyed.

There is some confusion in the literature on the mining at this site. Some refer to public sandpits and workings on the waste ground outside the town (Stapleton, 1904), while another refers to a great mine with underground railway and stabling for horses (Hamilton, undated). Either source could have been confused by old documents which make ambiguous references to mines which could be either the Cemetery mines or the nearby Rouse's mine. If the reference to the railway is correct, it implies working on a scale larger and more organised than an

uncontrolled public digging; if this was the case, the mine may have extended further north into the quarry than is shown on Figure 8.

In 1806, part of the mine collapsed and killed a miner, Edward Hughes. When the Coroner, Mr H. Enfield, viewed the site of the accident, he considered that "the excavations in these rocks have been extended so far horizontally underneath the surface of the ground, and in so unguarded a manner, as to cause the whole body of the rock to be in danger of falling in, and to render many of the cavities most imminently alarming" (Gray and Walker, 1952). The Coroner recommended "stopping future excavations, and securing the present cavities" and "to blow up with gunpowder the whole of these rock holes - and to oblige the sand getters in future to level as they proceed"; the Mayor was authorised "to take steps ... for completely removing the very dangerous nuisances"; and in 1811 the mines were removed (Blackner, 1815).

It is hardly surprising that the roof fall occurred. With 90% extraction in the very weak, weathered sandstone, the mines would have become only marginally stable - as has since been demonstrated by the roof falls in the similar mine across the Mansfield Road; furthermore, weakening of the rock pillars would have been accelerated by weathering close to the multiple open entrances of the mine.

After the demise of the mine and quarries, the whole area eventually became incorporated within the Church Cemetery. The site has been credited with a ropewalk in about 1850 (Hind, 1943), while the 1861 map (Salmon) shows the collapsed mine as a landscape scar within the cemetery. The catacomb caves were excavated in the period 1859-63, and wrap around the wall of the western quarry - which therefore appears to predate them (Fig. 8). Since then, the collapsed mine and the quarries have been adapted as the setting for the splendid Rock Cemetery where the graves have been carved into the rock. At two sites, gravediggers of the past have inadvertently broken through the roofs of the mines and tunnels beneath; the sandstone is so easily excavated that deep family graves are quite practicable.

THE MINES TODAY

Rouse's mine remains in excellent condition. A new office block has recently been built over it; some of the lightly loaded strip foundations stand on only 2 metres of rock above the mine roof level, and there is no sign of distress anywhere in the mine pillars or roof spans. The mine galleries are dry, stable, safe and spacious, and have even floors, giving the site some potential for visitor access and tourist development. This prospect has not passed unnoticed, but the Mansfield Road entrance would have to be used, and the commercial properties which contain this are currently on the market. Only when a sale is completed will any lease of the entrance become a possibility. The Peel Street entrance is gated, and access is controlled by the city council with assistance from various local interest groups.

The other three mines do not offer easy access. The Whiston mines are full of concrete. Roof falls in the Gallows Hill mine, east of Mansfield Road, have been so serious that access is severely discouraged. The various bits of mine, and the catacomb caves, in the Church Cemetery are all gated, and since the media inflated dubious stories of satanic abuse (all subsequently discredited) access permission has not been freely granted.

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REFERENCES

- Blackner, J., 1815. *The history of Nottingham*. Amethyst Press, Otley (1985 facsimile reprint), 459pp.
- Charsley, T. J., Rathbone, P. A. and Lowe, D. J., 1990. Nottingham: a geological background for planning and development. *Brit. Geol. Surv. Tech. Rpt.*, WA/90/1, 82pp.
- Dearden, W., 1844. *Plan of the town of Nottingham*. Dearden, Nottingham.
- Gray, D. and Walker, V. (eds), 1952. *Records of the Borough of Nottingham, volume VIII, 1800-1835*. Nottm. City Council.
- Hind, F., 1943. *The history of Nottingham - its defences, caves and rock rooms*. Nottm. Nat. Sci. Field Club, 23pp.
- Iliffe, R. and Baguley, W., 1971. *Victorian Nottingham, 4: Nottingham pubs and ale*. Nottm. Hist. Film Unit.
- Salmon, E. W., 1861. *Plan of the town of Nottingham and its environs*. Wyld, London.
- Silkstone, D., 1978. *Notes on old Nottingham*. Private publication, 34pp.
- Stapleton, A., 1904. *Nottingham caves and Nottinghamshire coal*. Notts. Guardian, 60pp.
- Waltham, A. C., 1992. The sandstone caves of Nottingham. *Merc. Geol.*, 13, 5-36.
- Waltham, A. C., 1993. Crown hole development in the sandstone caves of Nottingham. *Q. Jn. Eng. Geol.*, 26, 243-251.
- Wild, H. and Smith, T. H., 1820. *A new plan of the town of Nottingham*. Carr, Nottingham.

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