

# THE COPROLITE INDUSTRY IN BUCKINGHAMSHIRE

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*Only 120 years ago the landscape of a large area of eastern Buckinghamshire was transformed by an extractive industry whose impact, though smaller, was not unlike that of modern gravel digging. Fortunes were made by landowners and contractors, and the economy of local villages was changed for the better. Today hardly a trace remains of the coprolite industry, either on the ground or in folk memory. Mr O'Connor here rescues this important episode from oblivion.*

It was Charles Darwin's Cambridge professor, the Revd. John S. Henslow who, on a trip to the Suffolk seaside in the early 1840's, discovered in the Felixstowe cliffs what he took to be coprolites, the fossilised dung of prehistoric marine creatures. Later geologists proved them to be water-worn fossils of a variety of marine creatures including whales, shell fish and sponges, but the name 'coprolite' stuck.

The rivers draining the volcanic Scandinavian and Scottish mountains had so increased the phosphate content of the warmer sea about 120 million years ago, that the whole mass on the seabed ultimately became phosphatised. It was subsequently covered by sand and deep layers of calcareous marine organisms which ultimately compressed this mass into a hard rock-like bed. The locals had been aware of these phosphate-rich fossil beds in the 'Suffolk Crag' deposits for generations and had been using them to fill ruts along the roads. These fossils had also been used for making coade stone and they were burnt and spread on clayey fields to lighten and improve the soil.<sup>1</sup>

What stimulated the exploitation of this deposit on a larger scale was the discovery that the dust left over from grinding bones for the

handles of Sheffield cutlery proved a very effective fertiliser. As bone dust could not supply the needs of the many manure manufacturers, animal bones were acquired in greater and greater quantity. This was what the "rag and bone man" was interested in. After being boiled for their glue, the bones were dried, crushed and mixed with an assortment of other materials, including blood, soot, fish meal and animal manure, before being spread on the fields. The huge population increase in the early 1800s after the Napoleonic Wars, and the widespread enclosure of land, so increased farmers' demand for manure that manure manufacturers, finding there were not enough bones in Britain to satisfy their needs, began importing sun-bleached bones from the Egyptian desert. There were reports of a cargo of mummified cats and even of the contents of German cemeteries being added to the manufacturers' "dens". Such great quantities were imported that a German writer was prompted to say that, "Great Britain was like a ghoulish, searching the continents for bones to feed its agriculture".<sup>2</sup> The most effective fertiliser at that time was guano, phosphate-rich bird droppings which began being imported from the Pacific in 1838. It was sold at £12 per ton, very expensive for the ordinary farmer, so



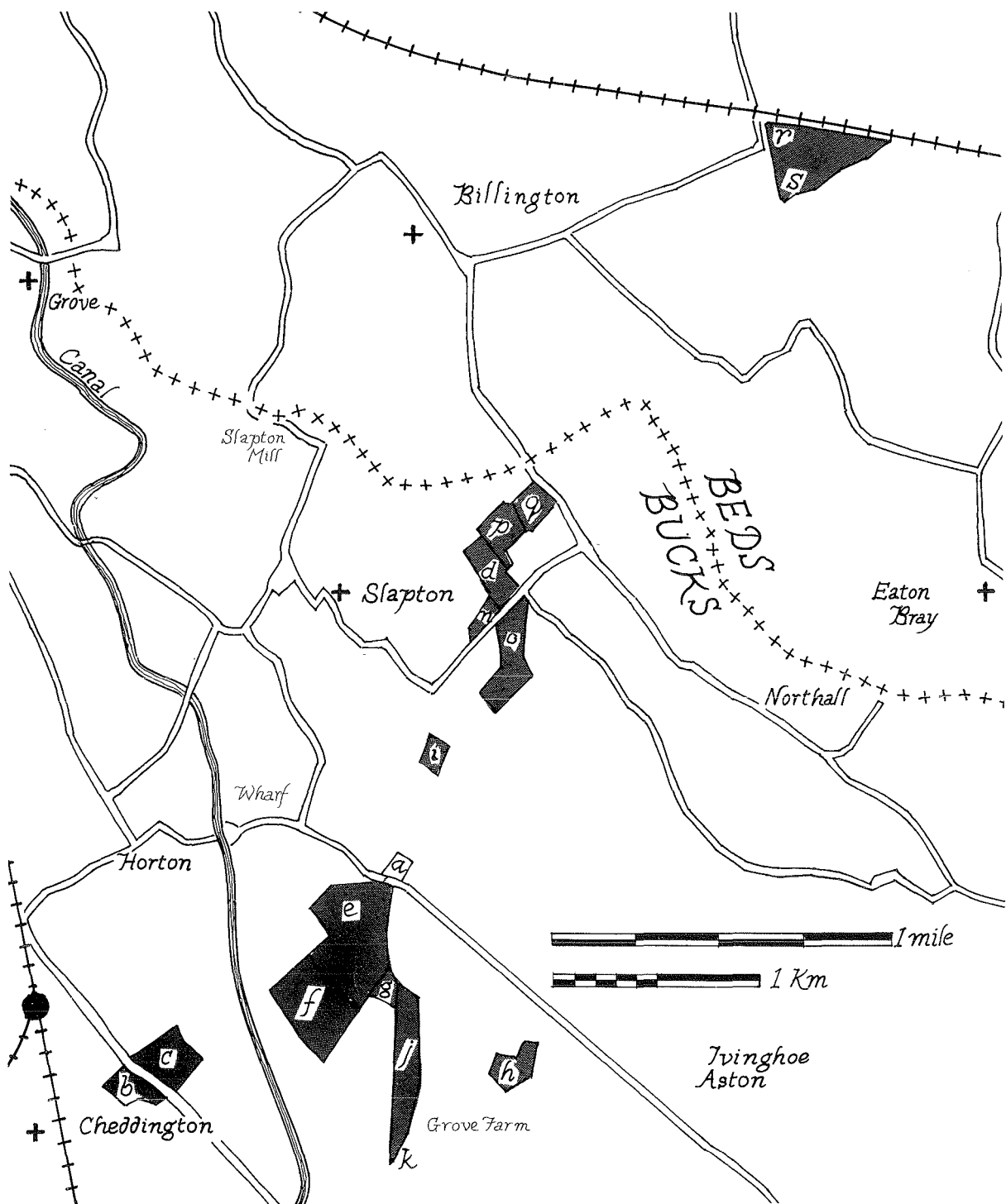


Figure 2. Coprolite workings in the Ivinghoe/Northall area of eastern Buckinghamshire. Features denoted by letters are referred to in the text.

cheaper alternatives, like the so-called "coprolites" were valuable minerals worth exploiting.

Farmers had noted that bones, not being soluble, took a long time to break down and be absorbed by the roots of crops. It was Justus Von Liebig, an analytical chemist who, whilst working on the composition of bones, thought of dissolving them in sulphuric acid. This method worked and the resulting mixture, once dried, was soluble in water. His discovery led John Bennet Lawes, a Hertfordshire landowner who was experimenting on different manures on his estate in Rothamsted, to try dissolving other phosphatic materials. These also dissolved, just like the animal bones, and the dried biscuit produced superphosphate, a new fertiliser, just as effective as guano but considerably cheaper. In 1842 he patented the method and started making his own in his laboratory at Rothamsted. He must have realised the fortune to be made from this new fertiliser so set up his own company, Lawes Artificial Manure Company, and bought land in Deptford on the Thames where he had a factory built. After initially rejecting the idea of using the Suffolk coprolites, he found that other manufacturers were using them successfully and he eventually made arrangements to buy whatever could be raised by some of the landowners near Felixstowe. They took on large gangs of former agricultural labourers and had the fossils raised and washed and sent by boat to be processed in his factory. The resulting superphosphate was sold for between £5 and £6 per ton, half the price of imported guano, and the demand for this cheaper artificial fertiliser prompted other manure manufacturers to use his patent. Given the prices, there were, understandably, cases of fake fertiliser being sold, and Lawes had to buy out several businesses to stop them pirating his discovery.<sup>3</sup>

When the same stratum of phosphatic nodules was discovered in Cambridgeshire in 1847 it stimulated their extraction on a massive scale, as they contained a higher percentage of phosphate of lime than the Suffolk nodules. This led to what has been described by the historian, Richard Grove, as, 'The Cambridgeshire Coprolite Mining Rush'.<sup>4</sup> Many

landowners made considerable fortunes by allowing these fossils to be raised from their land and some of them went into the coprolite business themselves. In the early days, royalties were paid ranging from 7/- (35p) to 21/- (£1.05) per ton but, because of the difficulties of accurate weighing, from the 1860's royalties were paid by the acre. Depending on the quality, depth, nearness to good roads, rail or canal, and even nepotism, these ranged from £30 to £200 per acre. The labourers were generally paid piece work, earning from 14/- (70p) to £2 per week, considerably higher than farm labourers' wages. This caused a drift to the diggings and forced farmers to raise their wages to ensure they kept their labourers. The coprolite contractors were able to sell the washed fossils to the manure manufacturers at between 28/- (£1.40) to 60/- (£3) a ton but averaging 42/- (£2.10), according to the fluctuations of the market. The manufacturers in turn sold this new artificial fertiliser, superphosphate, at 130/- (£6.50) per ton in its heyday and 50/- (£2.50) per ton when the industry fell into decline. Demand for the 'coprolites' in the early days came not just from manure manufacturers in the 'coprolite belt', but from all over the country, resulting in a massive demand for the fossils and the establishment of a unique industry of which most people are completely unaware.

Geologists were naturally particularly interested in the variety of fossils being unearthed and spent well over a decade locating and mapping the coprolite deposits, information valuable to contractors and landowners alike. The seam in the Cambridgeshire Greensand extended south-westwards through the south of the county and into Bedfordshire where it was similarly exploited on a large scale. Diggings are recorded in Arlesey, Shillington, Higham Gobion, Sharpenhoe and Barton-le-Clay during the 1860's but it was not until 1869 that there is any record of the deposit being exploited in Buckinghamshire.

The map on page 77 shows the distribution of the coprolite pits in Bucks., based on records found in the Bedford and Aylesbury record offices. From it, the northeast to southwest pattern emerges and the gaps may be ac-

counted for by the fact that many landowners' agreements have simply disappeared or, where small fields were to be dug, a cash payment may have been made and no record of it kept.

The first contractor in this area, according to these records, was Henry Wilkerson from Great Eversden in Cambridgeshire.<sup>5</sup> He had been working coprolite land in Steeple Morden, belonging to St John's College, Cambridge but had got into financial difficulties with them, not having paid the farmer compensation for his loss of land. It appears that he branched out into the Buckinghamshire area in 1869 before legal action was taken against him, no doubt when the Bedfordshire diggings suggested it worthwhile to follow the line of the greensand at the foot of the chalk escarpment where it outcropped in a seam above the gault clay. How his attention was drawn to the area is unknown but brickworks in the area would almost certainly have exposed the seam not far from the surface. He located the coprolite deposit around a slight chalk rise a couple of miles south of Slapton, and gained the landowner's agreement to his digging the fossils from Simeon and G. Brown's farm on the northeast side of the road from Horton Wharf to Ivinghoe Aston (marked *a* on Fig. 2). The landowner was Earl Brownlow, whose Ashridge estate covered several miles of the greensand belt. Wilkerson paid Lord Brownlow £65 per acre, not much less than the rates he was paying in Cambridgeshire but considerably less than the £200 per acre some contractors were paying. It is not certain where the coprolite was sold but he must have found his investment was worthwhile as the following year he leased a further 30 acres in Ivinghoe, on the opposite side of the road. By this time it seems the Earl's solicitors had discovered that the rates in Cambridgeshire were much higher, as Wilkerson was forced to pay almost double the previous rate, £112 per acre.<sup>6</sup>

His success must have prompted further exploration in the area and when it was realised that the coprolite seam extended to the southwest, other contractors wanted a share of the profits being made. Consequently, in 1870, Lord Brownlow leased another ten

acres of his land, this time on Mr Gales' farm at Ivinghoe (marked *b* on the map) to two Leicester coprolite merchants, Joseph Lee and Joseph Price, who may well have purchased Wilkerson's output. They paid the Earl £100 per acre, possibly because the fossils were less accessible than those worked by Wilkerson, incurring higher labour costs. Like Wilkerson, they had a wash mill set up to clean the fossils, by the stream at the corner of the field near the road. The agreement gave detailed operating instructions similar to those in Cambridgeshire.

*"The said Joseph William Lee and Joseph Price shall excavate the said lands in continuous and contiguous parallel lines and shall form proper banks or mounds and shall convey the wash or slush to some convenient spot to be pointed out by the agent of the said Earl Brownlow and shall carry on the workings in a proper and workmanlike manner to the reasonable satisfaction of the agent and shall use their utmost endeavours to prevent any nuisance or inconvenience from arising or being occasioned thereby to the Owners or Occupiers of any adjoining tenements or to the general public and shall complete the working of the whole ten acres within one year and a half from the date of this agreement."*<sup>7</sup>

This would have entailed work on a massive scale involving scores of labourers but they had only managed to dig 5a.0r.35p. by May 1871 and had another two acres or so yet to dig. Although no evidence shows they expanded their interest in the coprolites, maps show their workings were also used for brickmaking, using the clay found beneath the fossil bed, but it may have been that they were unwilling to expand their coprolite business with much of their capital tied up on Gale's Farm. As no further records of them have come to light, it seems the arrival of a bigger concern proved too great a competition, and so they stayed on in the brick trade.<sup>8</sup>

In the meantime, Wilkerson was still working the Slapton pits, 5a.2r.3p of which had been dug by June 1870. One cannot be certain, but Lord Brownlow's agent may well have felt that engaging other contractors would enable

the coprolites on other parts of his estate to be dug out more quickly, and thus not interrupt the tenants' farming for too long. They were, in fact, compensated, in some cases by up to £10 per acre for land out of cultivation as a result of the diggings.

In 1871 Lee and Price's coprolite work on Gale's farm seems to have been taken over by another company. The new contractors were Alfred Griffin and John Morris, two Coprolite merchants who owned the Ceres Manure Works in Wolverhampton. They had began as hemp, rope and twine manufacturers but by 1862 advertised as agricultural chemists. As well as being Wolverhampton's mayor, Morris was also the President of the London-based Superphosphate Company, a national body to which many of the manure manufacturers belonged and it was in this area of Buckinghamshire that his commercial interests were to be centred, away from the bigger companies working in Cambridgeshire and Bedfordshire. The attractions of exploiting existing and proven deposits must have been enhanced by the close proximity of the Grand Junction Canal. This would have provided cheap transport, by barge, to the Wolverhampton works, as would the nearby main London to Birmingham Railway with the Station at Cheddington.<sup>9</sup>

In the August of 1871 Henry Wilkerson had had all his coprolite plant and machinery in Cambridgeshire auctioned under a distress notice by St. John's College and he found himself in considerable financial difficulty. The following letter, which three weeks later was sent to Lord Brownlow's agent, revealed his solution:

*Morris and Griffin, Wolverhampton.*

*"Some time ago Mr. Henry Wilkerson applied to us to purchase his plant erected at Slapton for the purpose of raising Coprolite and also desired he should have assigned to us the transfer of his lease from Lord Brownlow dated 12th February 1870."*<sup>10</sup>

They subsequently took over his diggings but kept him on as the manager of the diggings near Slapton and Cheddington, and he stayed

on, living in a house in Leighton Buzzard.<sup>11</sup> Morris and Griffin then attempted to lease a further 40 acres of adjoining land towards Ivinghoe and Edlesborough. The draft agreement reveals they were to be given four years to dig the fossils, having to dig ten acres every year, which would have entailed a considerable increase in labour force. Subsequent map evidence shows they went on to dig further north towards Northall and southwest towards the Cheddington pits but the final agreement has not been found.

It appears that the Ashridge Estate had learned a lesson from the problems experienced by landlords in Cambridgeshire and Bedfordshire with gangs of labourers descending on the rural villages from outside. Without initial accommodation they had, in some villages, caused considerable social upheaval, with reports of drunkenness, brawling and theft. Lord Brownlow's lawyers included a special clause in the lease, interestingly only found in this county, which limited them to

*"employing no more than 12 labouring men or boys living more than 8 miles from the work."*<sup>12</sup>

This would have ensured predominantly locals being engaged and thus the influx of the "migrant" labourers was restricted. They were also compelled to,

*"give the tenant of the said lands the preference in carrying or carting the Coprolites to the neighbouring wharf or Railway Station."*<sup>13</sup>

The washed fossils could have been loaded at the canal side near the Brownlow Arms to the south, the lock side to the east or Horton Wharf to the north. Carting them in tumbrils would have incurred great costs when thousands of tons were being raised so where possible the men used horses or steam engines to haul truckloads of the fossils along a narrow gauge tramway. Such trucks can be clearly seen on the photograph on page \$\$\$ of the Brickhill pit which Morris and Griffin were also responsible for. Tumbrils taking the fossils from pits near Ampthill down to Millbrook station can similarly be seen in the photograph on page \$\$\$.

Morris and Griffin wanted to economise with their transport costs but in some areas had problems with the adjoining landowners over whose land they wanted to lay a tramway. They wrote to their agent regarding what they considered

*“ . . . a difficulty with Christ’s Hospital Committee, they object to our laying the tram from the diggings or water trough, which would have been a great advantage.”*<sup>14</sup>

They urged him to use his influence but the Hospital’s Estates committee was adamant and refused. This incurred extra costs, the men having to improvise with barrows and carts to get from fields *c* to the washmill to the east of what is now Foxons Farm. (GR.927183)

Details of the labour force have only been found for four villages in the area from 1871, when the census surprisingly revealed there were only sixteen involved. There were coprolite labourers from Great Billington, including an engine driver at the works, and two from Little Billington. The eldest was Joseph Stevens, 62 and the youngest, John Albon, 24. The average age was 33.1, showing it was mainly the older men that were involved yet with only 46% having been born in the parish it seems likely that a number had been attracted to the village to work, and three of them were, in fact, lodgers. Two unmarried fossil diggers from Shepreth, Cambs. were lodgers at Astrope, near Puttenham, 23 year old Frank Hopwood and 21 year old John Peters. Although no agreements or leases have emerged for these parishes it seems likely that Morris and Griffin could have been involved. There was only one other recorded coprolite labourer, James Dean from Cambridge who was a lodger in Slapton. There were many described simply as “labourers” as opposed to “agricultural labourers”, but it was normal for farm workers to do so, and nothing can be learned from this. Sixteen men would have been able to work the pits but not the amount of land that was dug over during the period of the diggings.<sup>15</sup>

The parish vestry minutes of 1872 reveal that there were works in Billington but not who was

running them. What had been discussed at the meeting was, “the matter of rating the land where the coprolite works are carried on in the parish”, and it was decided that, “Land and coprolite works to be rated after enquiries in parishes with similar works”. This was the result of a court case in early 1871 when a Cambridgeshire coprolite merchant appealed unsuccessfully against his works being rated.<sup>16</sup> Other parishes rated the coprolite mills at up to £50 for horse-driven mills and £100 for steam-powered mills. Whether these rates were paid in Buckinghamshire is not known but the workings generally would have contributed to parish relief. Later evidence suggests the workings were in the vicinity of the field of pasture known as Billington Great Mead from where the carts carrying the coprolites must have done considerable damage. In January 1872 the Dunstable District Highway Board noted that “more gravel was wanted in this parish, in consequence of the wear caused by Coprolite Works”.<sup>17</sup> A sketch map attached to Morris and Griffin’s account book for Northall, dated 1873–74, shows a coprolite bed west of the mill stream in the field south of Mr Bird’s meadow and south east of Mr Thorn’s meadow on the road from Billington to Eaton Bray, but as yet it has not been accurately located on the map.<sup>18</sup> It must have been a fairly extensive deposit as coprolites apparently continued to be dug from the Billington and Eggington area until at least 1890.<sup>19</sup>

Where the fossils were located in small fields the landowners may well have allowed the tenant farmers themselves to use their own farm labourers to raise them, paying a nominal rate per acre and then selling them to the manufacturers. This may explain the absence of further evidence as, apart from the Ashridge archive, only one written agreement has come to light.

In 1873, a visiting geologist, J. H. Teall, discovered the bed of phosphatic nodules at Great Brickhill, when he visited a sandy exposure on the slopes to the northeast of Brickhill Manor. They were found scattered through about 30 feet of sand, but more abundantly in its lower layers, which overlay the upper beds of the Oxford Clay and he took them to be cop-

rolites of a similar nature to those being worked at Potton in Bedfordshire.<sup>20</sup> (Fig. 3)

The following year Griffin and Morris made arrangements with the landowner, Sir Philip Duncombe, to work the deposit and took over 'The Firs' in Great Brickhill. Their licence allowed them to raise the fossils from 14 acres, part of two fields, High Thrift and Beggars Piece, on Galley Lane Farm which was tenanted by Thomas Belgrove. They were allowed seven years to work the deposit paying £100 per acre,<sup>21</sup> a better rate than their earlier agreements.

The undated photograph on page \$\$\$ shows a number of men and boys standing in the terraced pit with picks, shovels and spades.<sup>22</sup> Ladders and plankways were also used as well as two carts led by a horse on a tramway. Permission had been given to lay a tramway from the pits down the slope to Stoke Hammond Meadow, adjacent to the Grand Junction Canal, and the Aylesbury to Water Eaton Road. £5 per acre was paid for this land, part compensation to Mr. Goodsman, the tenant.<sup>23</sup> News about the new discovery spread and, following a visit to the workings, Walter Keeping, another geologist described the scene.

*"In a traverse through part of Buckinghamshire and Bedfordshire last vacation, with the object of tracing the extent of the Cambridge Greensand, I was informed of some recently opened Coprolite works at Brickhill, near Bletchley. On a further enquiry they proved to be the red coprolites, a term applied by the workmen to the phosphatic nodules of the Neocomian like those of Potton and Upware."*

The workings are seen on a hill near Gt. Brickhill, which is about three miles from Bletchley Junction, and the section exposed is about 30 feet deep. The deposit is a rather coarse sand. Unlike any workings known to me, there is no seam here, but the phosphatic nodules are scattered through the entire thickness of the section, and they are separated by sifting the whole of the thirty feet of sands, excepting where they are too much hardened by cementing substances. Thus separated, the cop-

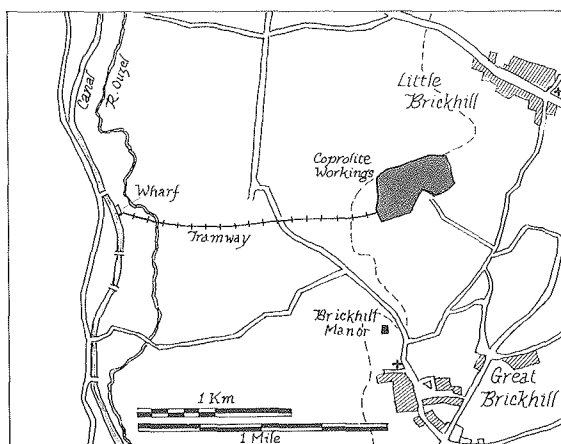


Figure 3. The Coprolite workings at Great Brickhill. The broken line denotes the limit of the lower greensand.

*rolites are washed in revolving perforated cylinders, and any pebbles of quartz, chert, lydian stone etc. are picked out when the material is ready for grinding. The whole process is the same as that carried on at Potton and Upware."*<sup>24</sup>

Although their lease was to expire in 1881 there is a reference which suggests Morris and Griffin continued the operation in that area until at least 1886 but no further documentation of this has emerged.<sup>25</sup> There is the account of two coprolite diggers who, in the late 1880's, so their story went,

*"... were farm labourers at Sheep Lane who joined the gang at the 'copperlite' pits when the works first started in 'Rammy mare' field. [probably Rammamere Heath] The work was hard but the money was good, and "anyway, better than risking the sack after harvest or 'turmut pulling', and being out of work all winter." They worked in the pits for some time, perhaps until the seams were worked out, but they returned to farm work and both lived to a ripe old age."*<sup>26</sup>

There were also coprolite workings just across the county boundary at at Rushmoor.<sup>27</sup>



Other geological reports show that there were certainly other workings in the county but only one was described as being ran by a Mr Wilkinson (*sic*) of Leighton Buzzard. This was at "the coprolite works on the top of the hill" at Dinton, just east of Ford (GR.789090), but there was no indication when it was in operation.<sup>28</sup> There were other workings reported between Puttenham and Buckland (I on map) which were in operation between 1874–5. On the road northwest from Buckland a coprolite pit was seen near the canal, varying between 8 and 10 feet deep with the seam about 18 inches thick but there was no indication whether Morris and Griffin were involved. Another was noticed on the other side of the canal near Puttenham where the interest for the geologist was the fact that

*"... the black phosphate nodules were never accumulated in hollows. The foreman of the works fully appreciated this fact, which unfortunately was not to his advantage, since the deeper working in the hollows did not repay him by a more abundant harvest of nodules, as it would have done near Cambridge, where he told me, he had seen the coprolites accumulated to a depth of two feet in some places."*<sup>29</sup>

People living in Leighton Buzzard at the time may well have been attracted to one of the many lectures that were given in the neighbourhood by the teacher, E. W. Lewis. He often spoke at the Leighton Working Men's Mutual Improvement Society in the Hockliffe Road Reading Rooms and at one in particular the audience would have heard the following description of the workings:

*"Transport yourselves, in imagination, to a claypit whence coprolites are dug. You observe a long straight trench, perhaps fifty yards in length, five or six feet wide, and eight or nine feet deep, on one side of which is a vertical 'face of clay'." The coprolites are not distributed throughout the clay; but are found towards the base of the "face", where in a layer of varying thickness you find them more or less thickly accumulated. This is the coprolite "vein". The workmen throw the overlying clay to the opposite side of the trench, till they come to the surface of the "vein", the clay of which, thrown into trucks, is conveyed to the*

*washing mill. Here it is placed in a large circular iron pan, called the "washing ring", where by means of water and a constant agitation the coprolites are thoroughly cleared from the clay. In some veins, the presence of stones not coprolitic, such as flints, pebbles, etc., makes it necessary to employ hand labour for their removal. They are now ready for the market as the raw material, and in this state are sent by rail or boat to the manufacturer, say, in this instance, Wolverhampton."*<sup>30</sup>

The first geological map of the area of 1874 and the subsequent 6 inch and 25 inch Ordnance survey maps show a considerable number of sand and clay pits in the area.<sup>31</sup> There is every likelihood that they developed at the same time when demand for building materials was at its height with the expansion of many of the local towns and industries. The speaker later pointed out that many of the fossils had been found,

*"in clay pits opened for their fossils. Regarded from an economical and commercial point of view they possess considerable interest and value. At Henlow, Standbridge [sic], Northall, Slapton, Billington and Cheddington, at Stone and Dinon near Aylesbury, as well as at Brickhill and Ampthill these fossils have been dug. Many tons are carted through our town every week, and some 30 or 40,000 tons have been raised in this district in the past ten years. You will understand that I am now referring to the Coprolites; or, as I once heard them called, "copperlites"; being solemnly assured at the same time that they were dug for the copper they contained. In fact I believe some persons thought they were productive of gold, which, however true it might be in a more remote sense, was certainly no more true literally and directly than the statement that they contained copper."*<sup>32</sup>

The washmills, where the fossils were cleaned before being sent to the manufacturers, were originally in the form of a horse-operated mill where a mound of earth was thrown up and a wide, circular metal trough was placed on top of a bed of bricks. Water was pumped in and then iron harrows were hauled round by a horse to separate the

clay or sand from the fossils. The mills had to be relatively close to the diggings so that the slurry, the muddy water left after the washing, could run back into the pit and be allowed to dry out before the topsoil was replaced. Afterwards, if the lease was adhered to, the topsoil would be replaced, drains installed and the land levelled, ready to be returned to agriculture. Where the washmill was some distance away, for example where the water supply was distant from the diggings, then slurry pans were used so that it could dry out before being taken back to be replaced. Several sites of such slurry pans can still be seen. One is quite noticeable in the field south west of Hall Farm on Slapton Lane (Marked *d* on the map, GR. 945206); another was just south-east of Bishopstone, about 100m from Little Marsh Farm, where there were also extensive workings. (GR. 20790966) It was not far from the Ford and Moreton works so there is every likelihood that Wilkerson hired men to work some of the fields in this area. According to a museum report on the site it was worked in 1885, much later than many of the others, and the dimensions of the washmill were 80 × 30 × 1.5m with a “settling bed” nearby and evidence of a tramway.<sup>33</sup>

Having an office in Leighton Buzzard, Morris and Griffin, as the only recorded coprolite merchants in the area, seem to have monopolised all the work and may have raised coprolites from other landowners’ estates. As yet, no records apart from those of the Ashridge and Brickhill Estates have come to light to show that other contractors were working in the area; one of the major Suffolk manure manufacturers, Edward Colchester, claimed to have workings in Buckinghamshire but gave no indication as to which parish or parishes were worked or when.<sup>34</sup>

Brownlow’s records show that by the September of 1874 9a.0r.12p of W. Burdett’s Farm in Ivinghoe had been dug (*e*), 9a.2r.24p. of Mr Buckmaster’s Arable field (*f*) and 4a.2r.20p. of his Meadow (*g*). 7a.2r.2p. of Mr Harrowdell’s Meadow beside the Ivinghoe to Cheddington Road was dug by 1875 (*c*) and a further 6a.0r.35p. of Harrowell’s Arable field (*h*) just north of the present Grove Farm were

dug by October. In Slapton, where Wilkerson first started, they had dug 10a.1r.31p. of Simeon and G. Brown’s Farm (*a* and *i*) and, by February 1875, 11a.2r.25p. of Jason Proctor’s Meadow in Ivinghoe Aston (*j*). An engine house (*k*) was marked on the map suggesting the fossils were washed by a steam-powered washmill, the water coming from the adjacent Whistle Brook.<sup>35</sup>

Obviously other landowners would have wanted to capitalise on the coprolites too, so the map may be incomplete. One can see that, with the exception of Brickhill and Rushmere, there is a northeast – southwest pattern of the diggings on either side of the Canal, maintaining a uniform distance from the line of the chalk escarpment, owing to the depth at which the coprolites were worked. The Company must have expanded considerably by 1875 as geological knowledge of the area increased. Wilkerson by that time was the manager of coprolite works in Cheddington, Northall Common and Billington as well as works around Harlington, Sharpenhoe, Brickhill and Bartonle-Clay. Mentmore has also been suggested as having workings (*m*) but its exact location is not known, nor whether Morris and Griffin were involved.<sup>36</sup>

By March 1876, Wilkerson’s gang of labourers had finished in Northall, having dug 5a. 2r. 22p. in one field of John Archer’s farm, (*n*) adjacent to the slurry pits (*d*) and 5a.1r.35p. of Jack’s Close on the other side of the road (*o*). Trams and machinery were in evidence on both surveyors’ maps, suggesting there were extensive workings in that area, maybe in fields belonging to other landowners. Morris and Griffin’s account books for Northall reveal that the 5a.2r.10p they had dug on Archer’s Home Meadow (*p*) yielded 683 tons and the 2a.3r.16p. of the field to the north on Northall Fen (*q*) yielded 448 tons 10 cwt., considerably less per acre than the Cambridgeshire average of 250 tons. With labour costs of £1,063 2 7d. for the eight and a half acres it meant they were paying about £124 for every acre dug. With royalties of about £100 per acre as well, this goes some way to explaining why Morris and Griffin’s Northall works eventually stopped; no further records

exist of their involvement in the area. The labour costs varied between 28s and 31s per ton and, with an estimated thirty to forty thousand tons raised in the first ten years, vast amounts of money must have changed hands. This must have been a welcome stimulus to the local economy, along with the demand for the associated tools, the spades, shovels, pickaxes, barrows, planks, pumps, washmills, trucks, rails, engines and horses. It is surprising that so little mention of it has been made in local history books.

The positive impact of the diggings on parishes in Cambridgeshire was noted by a clergyman who pointed out that

*"It has led to a manifest improvement in their condition in some respects, while it has had an unfavourable influence upon it in others. The introduction of a new kind of labour, which may be carried on all through the winter, brings the men plenty of work, and from the nature of that work, higher wages than they were formerly used to. And this is greatly to the advantage of those men who are steady and provident. Earning from 15s. to 20s. a week, – even young boys of fourteen years getting 10s. for barrow work, – they not only live better, and are visibly better clothed on Sundays, but they are able to save. Further, some of the more intelligent labourers have become good mechanics, and have got to having the charge of steam-engines and other machinery; while the genius of the men generally has been much stimulated by endeavouring from time to time to discover the best and most advantageous methods of digging out the nodules, washing them, and carrying on other operations.*

*The unfavourable result of these diggings is that drinking has increased. The men work very regularly their own time, and have their allotted beer – two or three pints a day – whilst engaged in it, which is not much more than the labour requires. But leaving work every day at four in the afternoon, and on Saturdays always at twelve at noon, they have much time at their disposal, inducing idle habits, and tempting them to sit long at public houses on their way home."<sup>37</sup>*

The superphosphate made from the coprolite sold in its heyday at 130s per ton but dropped to 50s per ton when foreign supplies led to competition between the manufacturers. Even with such prices Morris and Griffin must have made a considerable fortune, certainly a worthwhile return on their initial investment.

They had dug almost 90 acres of Lord Brownlow's land by 1876 which meant he must have received around £10,800. This would be the equivalent of about half a million pounds today.<sup>38</sup> When the seams gradually became exhausted and were found progressively deeper, the increased costs encouraged the manure manufacturers to look elsewhere for phosphate supplies and cheaper, better quality phosphates were found overseas, especially in America. Almost 200,000 tons a year started to be imported from Charleston, Carolina, which caused the bottom to fall out of the local market. Coupled with the very wet weather of the late 1870's which would have increased the pumping and labour costs, and the problems of the "Agricultural Depression", this led to the work all but ceasing and many coprolite labourers would have been thrown out of work, losing a valuable source of income and causing significant problems in many of the villages.

*The Leighton Buzzard Observer* had numerous advertisements appealing for agricultural labour in the States, Canada, South Africa, Australia and New Zealand and after the collapse of the Labourers Agricultural Union in 1874 funds were made available to encourage labourers to emigrate.<sup>39</sup> There are no records of any coprolite diggers at all in the 1881 census for any of the villages in this area which may well have been because all work had ceased but there were many who, as in 1871, simply described themselves as "labourers".

It was in 1882 that John Morris was knighted for his services to British agriculture, along with two of his major competitors, Edward Packard of Ipswich and John Bennett Lawes of Rothamsted. He was placed in a very awkward situation when the same year a sample of the superphosphate his firm sold in Ireland

was found by the analyst of Lawes Chemical Manure Company, one of his competitors, "not to be manufactured manure at all". They threatened to resign from the Superphosphate Manufacturers Association of which he was president but he acknowledged the adulteration, offered to resign himself and endeavoured to "ensure good practice" in the future which satisfied his competitor's complaint.<sup>40</sup>

In the mid 1880s however, although most of the work had died out, there was a slight resurgence in the industry, occasioned by intense competition between the manufacturers for the revived market after the worst years of the "agricultural depression". In early spring 1885 20 tons of "Blue Bucks Coprolites" were purchased by Lawes Chemical Manure Company, they paying an agent, Fred. Cornwell, 44/- a ton.<sup>41</sup> In order to provide cheap fertiliser that competed with the quality "super" which used the foreign phosphates, many of the inland manufacturers whose transport costs would have been greater for this overseas supply, lowered prices to get more of the market despite falling profits. Contractors were offered less per ton but covered this by employing fewer men and paying lower wages. Another factor was the growing demand for good fertiliser from local farmers who had ventured into market gardening as the traditional horse manure was in ever shorter supply as more of the transport system converted to steam. In fact, cases have been noted where superphosphate was made on the farm in wooden troughs; the locally ground coprolites were mixed with sulphuric acid with huge wooden ladles but the result was not necessarily of the professional quality of the manufacturers.<sup>42</sup> The proximity of the canal and railway, and continued availability of supplies in this area, meant that the workings managed to continue, albeit on a much smaller scale, later into the century.

In some parts of the coprolite belt the more philanthropic landowners, concerned at the poor state of the many unemployed labourers in the parish, allowed them to scrape out the remaining coprolite to provide them with at least some source of income. Whether this was the case in this area is uncertain but

land was still being advertised with the coprolite as an added advantage. In 1884 the sale particulars of land to be auctioned in Billington revealed, "a field of pasture known as Billington Great Mead - A valuable bed of coprolite exists under this lot".<sup>43</sup> The right to raise them may well have been bought by Henry Coningsby, from Melbourn in Cambridgeshire, who had been working the same fossil beds in Potton and Ashwell. He was reported in 1888 as having a coprolite mill and works in Stanbridge, leasing from T. S. Heley two fields, one of nineteen acres and the other one acre (*r*), on which L. Littleboy was the tenant. The actual pits were where the osier beds stood and in the corner of the field by the road (GR. 95752300).<sup>44</sup> In 1890 there were still workings going on in Billington but when they finished is uncertain. Work in Stanbridge, according to one record, apparently continued until the turn of the century as by 1900 it was stated there were only 540 tons raised nationally, at Stanbridge, Potton and Sandy.<sup>45</sup> Morris and Griffin by 1887 had set up a coastal manure works on the river Usk in Newport, South Wales where the firm continued into the 1920's but none of the company records have emerged.<sup>46</sup>

In spite of so many acres being dug over there is no record of anything of any archaeological interest being unearthed. There was a rumour that some bronze tools were found but this has not been documented.<sup>47</sup> In all probability the workmen would either have kept anything interesting themselves or sold them to the many keen collectors of the day. There has also been a story that there were attempts to use traditional mining techniques to extract the coprolites, given the high labour costs of removing so much overburden but no records of this development have come to light.<sup>48</sup>

When Thomas Heley died at the turn of the century his land in Stanbridge was auctioned and the sale document of 1901 showed 101a. 0r. 8p. was to be sold. The sale particulars referred to "a proved valuable deposit of Coprolites and Brick Earth, and the excellent Railway Siding facilities afford exceptional advantages for the economical development of

the land".<sup>49</sup> The map showed the actual plot was surrounded by W. Littleboy's land between the London and North Western Railway and the brook, and east of the road to Billington where it turned the corner (s). It was certainly dug over, as the 1903 *Kelly's Directory* reveals that it was one of only three works operating in the country, along with Potton and Sandy. When it eventually ceased is uncertain but by 1904 there had been a renewed surge in imports of foreign phosphates which meant the industry became too uneconomic. In some cases farmers or contractors left the pits unfilled, washmills and slurry pans unlevelled. The plant and machinery eventually would have gone as scrap but this little-known industry, which would have been a hive of activity in its day, has left few scars on the landscape and precious little to remind people that this profitable activity ever existed in this area of Buckinghamshire.

Interestingly, the work was resumed during the First World War when our foreign mineral phosphate supplies were under attack from the German navy. The Ministry of Munitions which had taken control of the supplies of almost all the nation's imports were in regular contact with the Fertiliser Manufacturers' Association, of whom Morris and Griffin had been members. This was to guarantee all producers with adequate supplies of phosphates, nitrates, etc. and farmers with adequate fertiliser supplies but also they needed to guarantee the Munitions industry a supply of sulphuric acid to make high explosives. By 1916 overseas supplies had almost halted and two members of the FMA were commissioned to question, "whether the possible cause of the abandonment of the use of the native source of phosphate was not due to foreign mineral phosphate having been obtainable at lower prices rather than by reason of the beds of coprolites becoming exhausted".<sup>50</sup> The Buckinghamshire and Bedfordshire deposits were found to be unremunerative and a large works was set up close to Cambridge but before any

coprolites were raised the Armistice was signed.

This survey was available to the Ministry during the Second World War when there was similar concern over the supply of phosphate. Another group was set up under a Mr. K. Oakley and what appeared to be a cursory examination of the Buckinghamshire deposits was undertaken as the only ones mentioned were at Bishopstone and Brickhill.

*"The Brickhill deposits outcrop within 1 mile of the Grand Junction Canal and within 3 miles of Bletchley Junction. The old workings have direct access to main roads. The coprolite bearing sands attain a maximum thickness of 30 feet at Brickhill. The occurrence of up to 6% iron and Aluminium Oxides would render it unsuitable for the manufacture of high quality superphosphate. Miss Bennett [Oakley's assistant] determined the available P<sub>2</sub>O<sub>5</sub> in this material, when ground to pass through a 90 mesh sieve, as 6.78% soluble in 2% citric acid; i. e. about a third of the phosphate is available.*

*". . . Large workings half a mile N. N. W. of Gt. Brickhill Church; worked 1875-86 (and later?) by Messrs Morse and Griffens [sic] of Wolverhampton, The Firs, Gt. Brickhill. The workings showed a 30 foot section: red sands 15-20 feet, passing down into greenish-grey shelly sands, 10 feet. Coprolites are dispersed through the entire thickness of the sands; they are more numerous towards the base; those from the red sand are red-brown in colour; those from the grey sands blackish."*<sup>51</sup>

The failure to refer to any of the other workings could suggest that the other deposits had been exhausted but he did mention that there were no precise records for Bishopstone but that much of the deposit around Brickhill still remained to be worked. However, the probable yield of nodules was too small in relation to the quantity of sand to be removed and it was therefore discounted as too uneconomic.

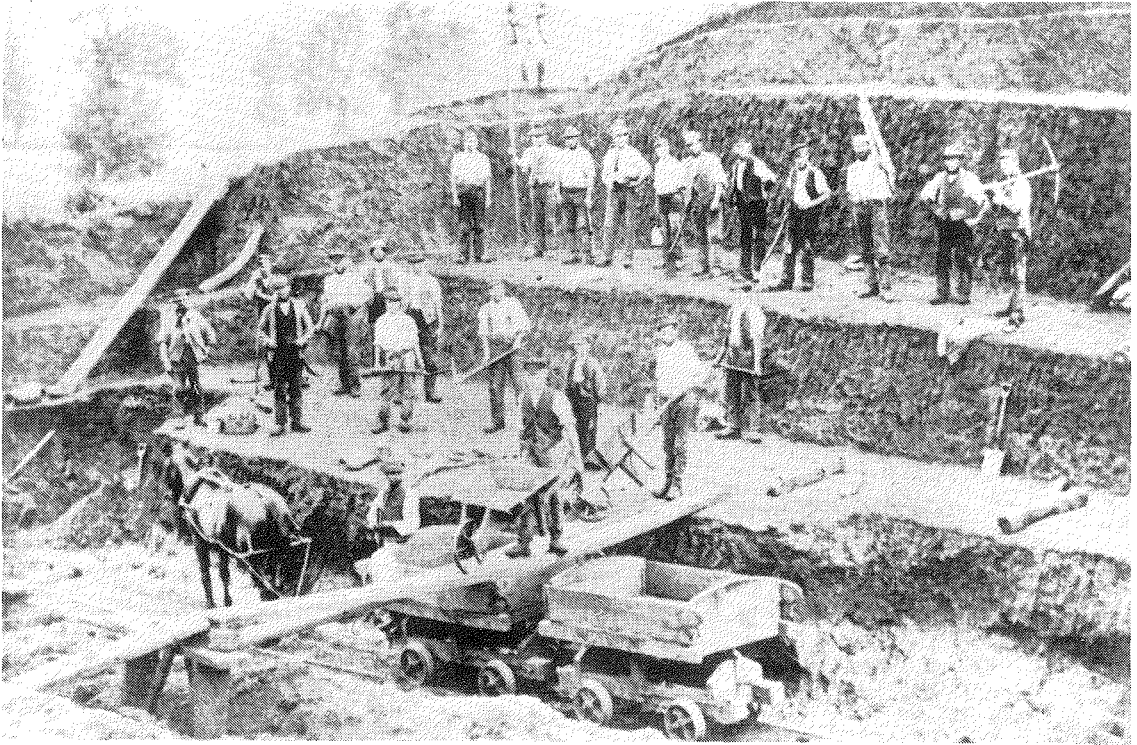


Plate I. Coprolite pit at Galley Farm, Great Brickhill, c. 1875. (By courtesy of Mr A. T. Bates).



Plate II. Farm tumbrells carrying washed coprolites to Milbrook, c. 1884.

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