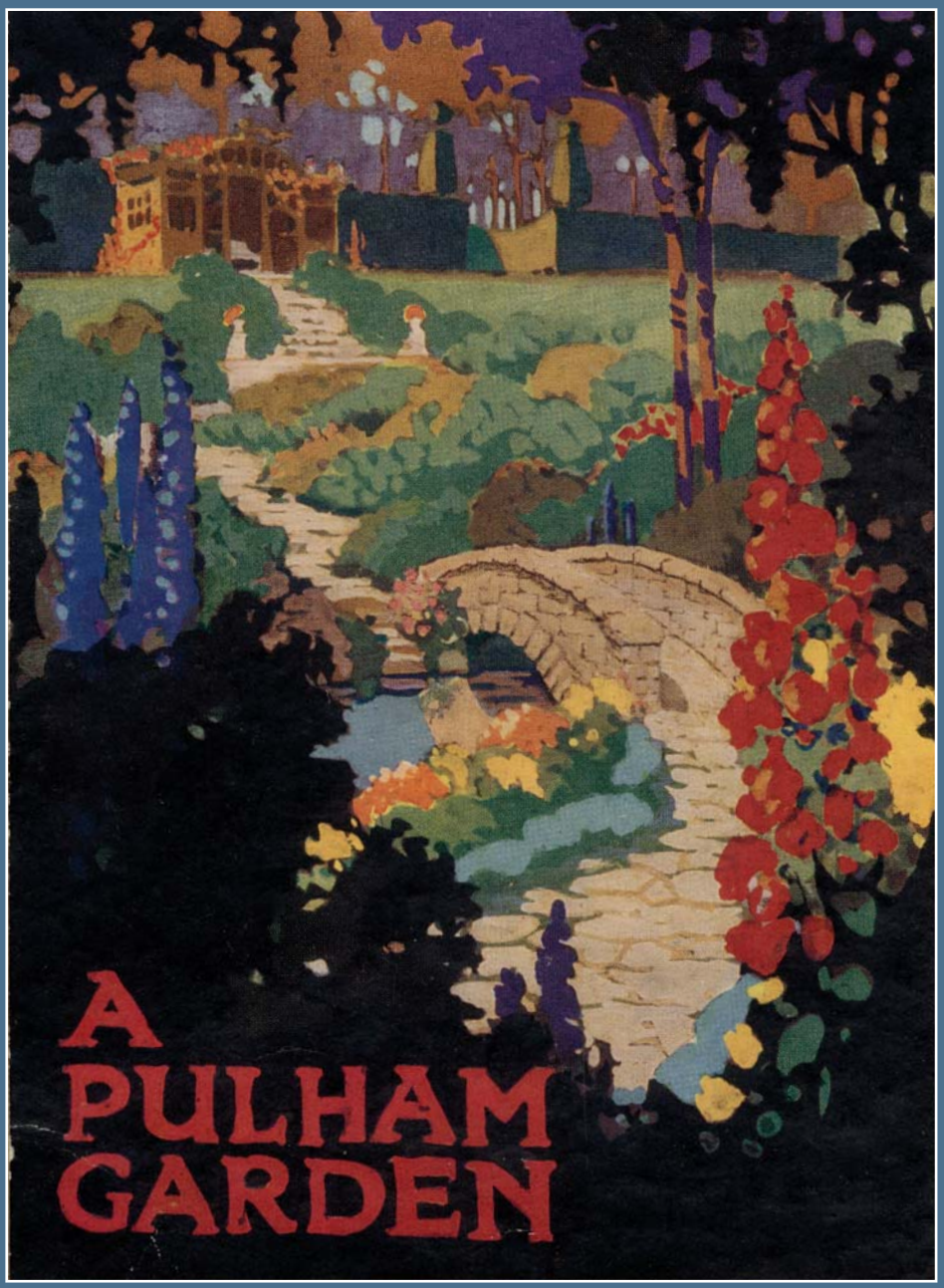
2008

Durability Guaranteed

Pulhamite rockwork – Its conservation and repair



ENGLISH HERITAGE

Contents

An early 20th-century postcard of the Pulham rockwork at Battersea Park and a contemporary view. (© EH PC06588; DP016938)

FRONT COVER: James Pulham & Son catalogue *c*1920s. (© RHS, Lindley Library)

Introduction

In the 19th and early 20th centuries, the Pulham family became renowned for creating a wide range of artificial landscapes, from small, exquisitely planted rockeries and ferneries to grottoes and temples, from elaborate water gardens, complete with chasms and cascades, to massive coastal cliffs. These fashionable bespoke landscapes brought together many of the hallmarks of 19th-century garden design, including the interplay of landscaping, botany and geology, engineering and architecture, and innovation in materials and techniques. Collectively, they gave tangible form to the Victorian passions for travel, for plant collecting and for gardening.

The Pulhams prided themselves on the strength and workmanship of their products – 'Durability Guaranteed' – and many gardens, ferneries and other features have survived, forming a living record of their work. While some features have been lost (more to vandalism and redevelopment than to deterioration), most of the structures are surprisingly robust. Many are, however, in urgent need of repair or restoration.

The Pulhams used both artificial and natural rocks, and also made garden architectural ornaments. Common to all of their work was a proprietary cement with a striking resemblance, in colour and durability, to natural stone, and which came to be known as Pulhamite.

This Technical Advice Note tells the story of James Pulham & Son and the building and planting of their rockeries and other features. It reviews common defects affecting this fascinating but ageing rockwork, and provides guidance on assessing its condition and undertaking appropriate repairs. This advice draws on the conservation expertise of consultants, both garden historians and building conservators, including those from local authorities and from English Heritage. Through grant aid, the Heritage Lottery Fund has helped to stimulate research and repair. A gazetteer of sites and places with Pulhamite rockwork is included at the end of this publication.

Rock Gardening

From as early as the 17th century British gardens included grottoes as ornamental features. In the 18th century rock displays were often added for their scientific interest, as at the Chelsea Physic Garden in London. Terms such as 'rock', 'artificial rock' and 'rockwork' were in use in this context by the 1770s and usually referred to a garden created as a specialised habitat for alpine and rock plants. In 1767, John Blackburne of Orford, Lancashire, wrote 'I am going to make a piece of rockwork for plants yet grow in rocks, viz: sedum, stonecrop, licopodiums, lichen, mosses etc' (Wright 1925). The Chelsea Physic Garden rockwork was made of 40 tons of stone, including flints, chalk and lava. It survives, although significantly changed in appearance. Illustrations of other early rock gardens are scarce. Early botanists and gardeners were creating rock gardens to imitate nature, even if their perspective on what was 'natural' was to be superseded by later designers.

Fig 1 The Chelsea Physic Garden rockery was made from volcanic stone from Mt Heccia in Iceland (brought back by Joseph Banks in 1772) and rubble from the Tower of London. It is probably the first rockery in Europe built for the purpose of displaying plants. (© EH/Ben Simpkins)

It was not until the early 19th century that the concepts of ornamental design and scientific interest were fused in the distinct genre of rock gardening. A growing passion for gardening was creating an expanding market in plants, seeds and tools, gardening services and design. Newly-discovered plants from the world's mountainous areas were being imported and cultivated.

Fig 2 Joseph Paxton's vast 1840s rock garden at Chatsworth. (© John Watkins)

The collection of rock plants had, by the 1830s, become a major branch of horticulture, with rock gardens the ideal place for their display. Initially only ferns were grown on the rocks themselves, with adjacent sheltered beds used for alpine plants. From the 1860s alpines were also cultivated in pockets on the rocks. Unheated alpine houses and indoor ferneries were designed to display specimens needing cooler conditions. Although the design and structure of rock gardens was variable, eminent landscape designers like Humphry Repton (1752–1818) and John Claudius Loudon (1783–1843) promoted the idea of picturesque, rugged and naturalistic formations on banks away from the main house, and more formal displays of alpine and rock plants in flower gardens. Loudon's *An Encyclopaedia of Gardening* (1822) includes a crescent-shaped design for rockwork.

What is Pulhamite?

The term 'Pulhamite' is associated with at least two different materials manufactured at different times by the Pulham family and firms associated with them.

One is a mortar for use as a render, described by the Pulhams as a 'cement', developed in the 1820s by the Lockwood and Pulham firms. This was used most famously by the Pulhams in their artificial rockwork from the late 1830s until the late 1870s. It was referred to variously as Lockwood's Portland Stone Cement, Pulham's Stone Cement and, later, Pulhamite. The render was applied to a masonry core or backing structure to produce texture and colour variations in imitation of natural rock. While its exact composition probably varied considerably over time, it consisted of an eminently hydraulic lime or natural cement binder, gauged with sand and other aggregates.

The other use of the term 'Pulhamite' is in reference to a stone-coloured terracotta material, rather like Coade Stone, which the Pulhams developed in the 1840s and used until the 1880s for pre-cast garden or architectural ornamentation. The term was applied in this latter sense well into the 20th century.

While this Technical Advice Note examines the historical background of both materials, it concentrates on the conservation of rockwork features, as their treatment has been largely neglected.

In the 1830s, many rock gardens used imported natural rock. Syon House, Hounslow, for example, had a rockery of granite. The famous rockwork at Hoole House, Cheshire, designed in geological imitation of the Savoy Alps, employed rock imported from Wales. Professional rock builders were commissioned to design the rockwork. An 1831 article titled 'An essay on rockwork in garden scenery' in *Gardener's Magazine* (S T P 1831) explained:

> The use of rockwork in gardens may either be as a distinct feature; as a situation for cultivating plants; [or] as a screen for concealing objects . . . few objects produce a more striking effect than immense masses of stones, piled together in such a way as at once to give a particular character of rocky mass, and to form a proper nidus for valuable plants.
>
> The grand difficulty in rockwork is to form and maintain a particular character or style in the disposition of the masses; and the only way to conquer this difficulty is to observe the manner in which masses of rock are disposed in nature, or rather in such natural scenes as are admired by men of taste, and especially painters. And here the study of geology will assist both the painter and gardener.

Some designers, such as Mr Gray (who worked on the Colosseum grotto in Regent's Park, London, and the rockery at Clumber Park, Worksop, Nottinghamshire), preferred to work with natural rock. The York nursery, Messrs James Backhouse & Son, who created rock gardens across the UK between 1864 and the 1920s, had invented a rock-lifting machine that enabled them to create their characteristic massive rock gardens. The Backhouses were also highly regarded naturalists and horticulturists, and specialised in alpines. Similarly, F M Meyer, at Veitch's Exeter-based nurseries, created rock gardens in the South-West.

The Pulhams, however, saw that artificial materials would permit the construction of large-scale rockwork at a significantly lower cost, allowing more money to be spent on expensive plants for the displays. In addition to the Pulhams, there were others who began experimenting with the use of cements for rockwork in the 1840s. William Newman's cement rockwork arch in Liverpool is described in *Gardener's Magazine* (Henderson 1843) as follows:

> The skeleton, or shell of the rockwork, being hollow and filled with soil, is formed of common walling stone, and the fused or vitrified masses from brick-kilns; these masses are afterwards covered with Roman cement, and formed into blocks, recesses, and projections, or overhanging crags … Apertures and interstices are left for receiving alpine shrubs and rock plants.

Fig 3 A path winding through the Backhouse rockery at Aysgarth in Yorkshire. (© Andrew Wimble)

Newman finished the cement with a coat of oil paint to give the appearance of 'veined or stratified granite'.

The Pulhams anticipated a change in aesthetics in the 1880s towards rockwork that looked geologically authentic. They created picturesque effects by using a single variety of stone laid in horizontal strata, with ledges and pockets for plants. They also coloured their artificial rockwork to imitate different rock types, including the indigenous rock of an area; constructed larger features that would otherwise require inordinate volumes of imported stone; and created realistic-looking stratifications. Perhaps aware that their artifice could not always be disguised, the Pulhams often made their smaller commissions more fanciful than nature, or created simple structures intended solely for the display of plants.

In the gardening magazines of the mid-19th century, Loudon and others mocked the artificial rockwork of many urban gardens, decorated with shells and broken porcelain. In *My Rock Garden* (Farrer 1907) the influential plant collector, horticulturalist and writer Reginald Farrer (1880–1920) poured ridicule on previous rockwork designs. This, in turn, stimulated a new generation of designers and rock-garden builders in the 20th century to adopt a more naturalistic style. They included John Wood of North Yorkshire, Capt B Symons-Jeune, George Dillingstone, Clarence Elliot (who trained with the Backhouses), Gavin Jones, George Whitelegg and William Wood and Son. From the 1900s most rock gardens built by the Pulhams were in natural stone.

Rock gardens and rock gardening remain very popular. The Alpine Garden Society was founded in 1929 with the aim of promoting an interest in all aspects of alpine plants, their cultivation in rock gardens and their conservation in their natural habitats. Today it is one of the largest specialist garden societies in the world. There is a wealth of contemporary handbooks for the home owner on creating rock gardens and rock gardening, although today's labour and transportation costs, along with environmental considerations, make massive-scale rock gardens unviable.

James Pulham & Son

The Pulham family business was set up by James Pulham I (1793–1838; C Hitching, *pers comm*), and the firm was developed in turn by the eldest sons, all called James, in three successive generations.

James Pulham I commenced his career with the Lockwoods, a family of builders in Woodbridge, Suffolk, manufacturing cements. Around 1806 James Pulham I created the architectural decorations for The Castle, a house built in Woodbridge for William Lockwood, and also built a grotto in its garden.

William Lockwood developed a lighter-coloured compound called Portland Stone Cement on account of its proximity in colour to Portland stone. He used hydraulic limes (primarily from Barrow-on-Soar, with a cheaper alternative from Swansea). This cement was used initially for architectural ornaments, vases, fountains and statues.

Quick-setting natural cements such as Parker's Roman Cement, made from calcined argillaceous limestones, had been available since the end of the 18th century. Medina Cement was produced in the 1840s. They were generally too dark in colour to imitate most natural stone, and were additionally of variable quality. Parker's Roman Cement was, however, expertly used by early generations of the Pulhams, notably in the manufacture of cast ornaments.

By the 1820s Lockwoods had a branch operating in Tottenham, London, and another run for them by James Pulham in Spitalfields, London.

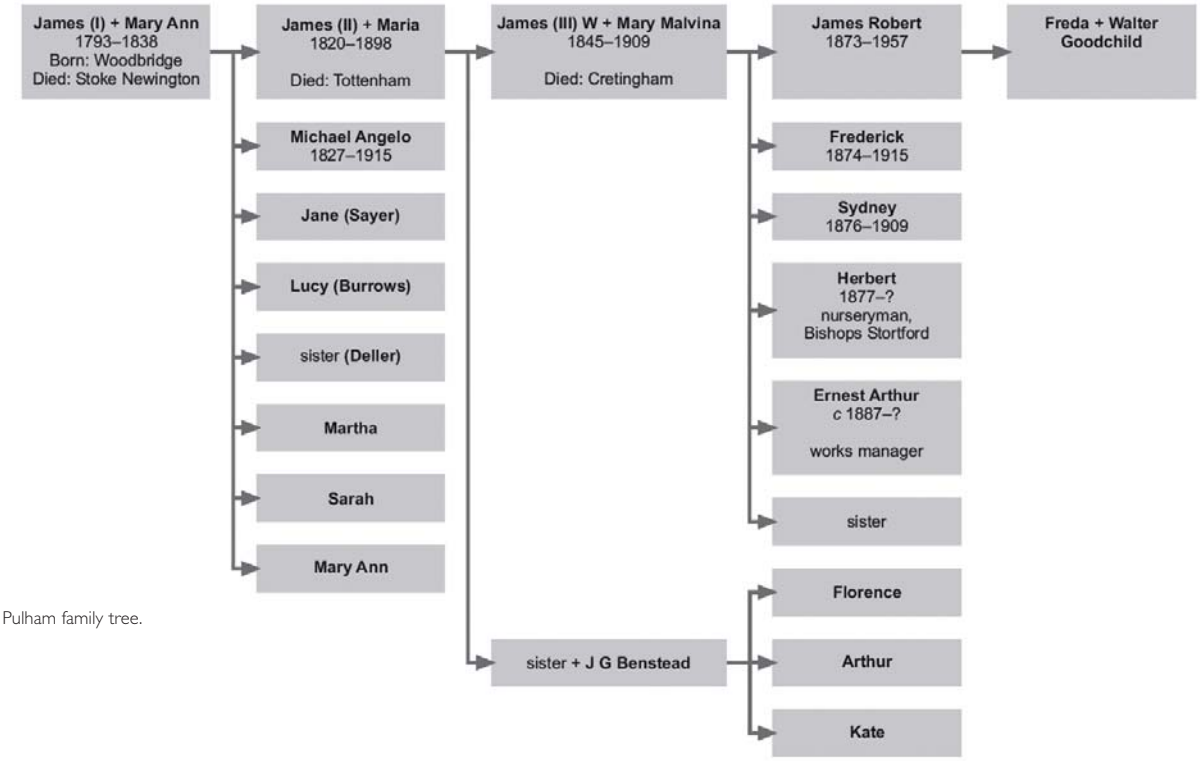


Fig 4 The Pulham family tree.

Fig 5 A Lockwood cement keystone head, Woodbridge, Suffolk. (© Simon Swann)

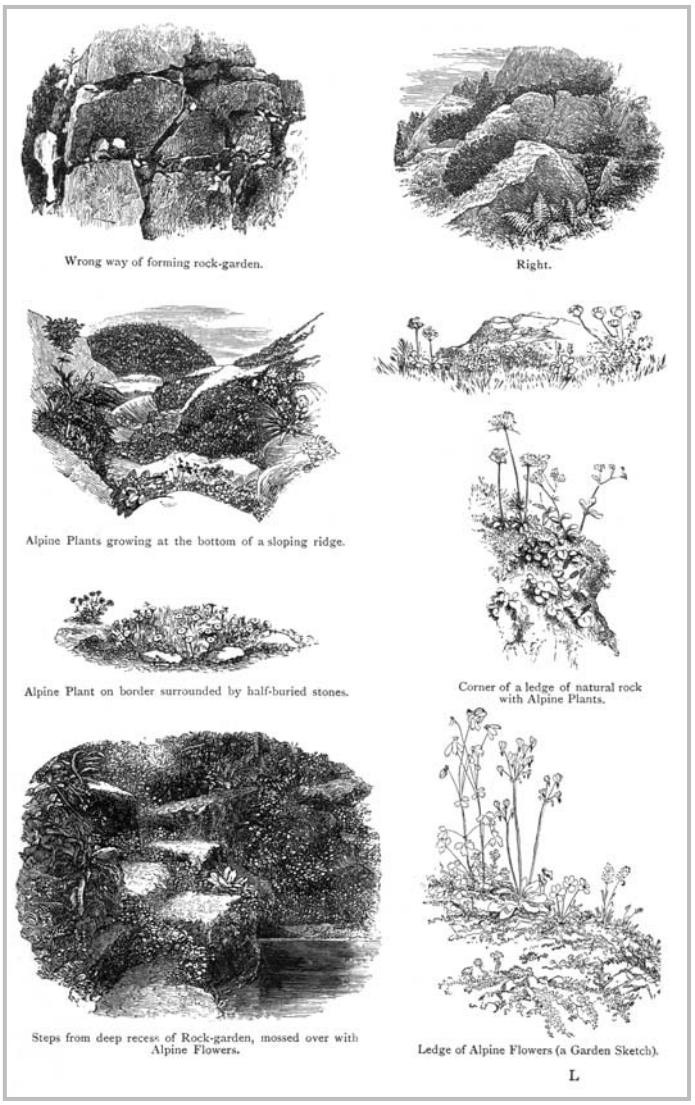


Fig 6 Robinson's examples of natural habitats to illustrate how to plant rock gardens (from Robinson 1906).

Fig 7a, b Contemporary and historic views of the Benington Lordship gatehouse showing the stone dressings modelled in cement to look like weathered cubical ashlar. (© Benington Lordship/A F Kersting; © RHS, Lindley Library (from Pulham *c*1877)).

In 1834 Pulham established his own business premises in Tottenham. Four years later, he had completed a mock-Norman castle, replete with artificial stone dressings and mouldings, for the Proctor family at Benington Lordship, Hertfordshire.

Fig 8a, b The fountain at Dunorlan Park is based on a design illustrated in the *Art Journal Illustrated Catalogue of the International Exhibition 1862*. (© EH DP016969)

James Pulham II (1820–98) was quick to diversify, capitalising on the market for this new material. By the 1840s it was being used not only in the repair of buildings but as a building material. Pulham moved to Hoddesdon, Hertfordshire, in *c*1838, and shortly afterwards started work on his first rock garden, for John Warner at Hoddesdon Hall (and Warner's new house on the property called Woodlands), Hoddesdon. Other early commissions were at Bayfordbury, Hertfordshire, for William Robert Baker, and at Highnam Court, Gloucester, for Baker's brother-in-law, Thomas Gambier Parry. By 1845, some time after Lockwood had retired, Pulham was referring to Lockwood's (or a similar) compound as Pulham's Stone Cement.

In *c*1848 the firm moved a short distance to Broxbourne, Hertfordshire, where James II built a house and a manufactory. One of the attractions of this location would have been the outcrops of clay for the manufacture of terracotta. The Pulhams' terracotta included stone-coloured as well as conventional red terracotta, and their product range included bridges, balustrades, fountains and garden ornaments. A number of these won prizes at the Great Exhibition of 1851 in London and the Exposition Universelle in Paris in 1867.

The construction of rock gardens was developing into a major landscaping enterprise, with large numbers of indoor and outdoor features completed from the 1860s. James Pulham III (1845–1909) joined the firm in 1865, from which time it became known as James Pulham & Son. It was during his tenure that the firm, operating from the Broxbourne manufactory and with depots in Brixton and Tottenham, was at its busiest.

By the mid-1870s, when the firm published a prospectus entitled *Picturesque Ferneries and Rock-Garden Scenery* (Pulham *c*1877), their landscaping business was thriving; they recorded a list of executed work running to over 170 sites. It was during this period that they ceased manufacturing their own cement. Local stone was the preferred medium, with stable joints left open and others sealed with cement. Where local natural rock was of limited availability, imported stone, artificial rock or a combination of the two materials was used.

For their work at Sandringham and later at Windsor Castle and Buckingham Palace, James Pulham & Son were granted a Royal Warrant in 1895. James Pulham II died three years later,


Pulhamite Rocks in Picturesque Natural Form

Ferneries, Conservatories, Alpinaries, Heathories, Waterfalls, Cliffs, Banks of Streams, Ponds, Lakes, Caves for Boat Houses, Aviaries, Aquaria, &c.

JAMES PULHAM & SON, BROXBOURNE, N.

THE BRIGHTON AQUARIUM TERRACE, ROOF GARDEN.

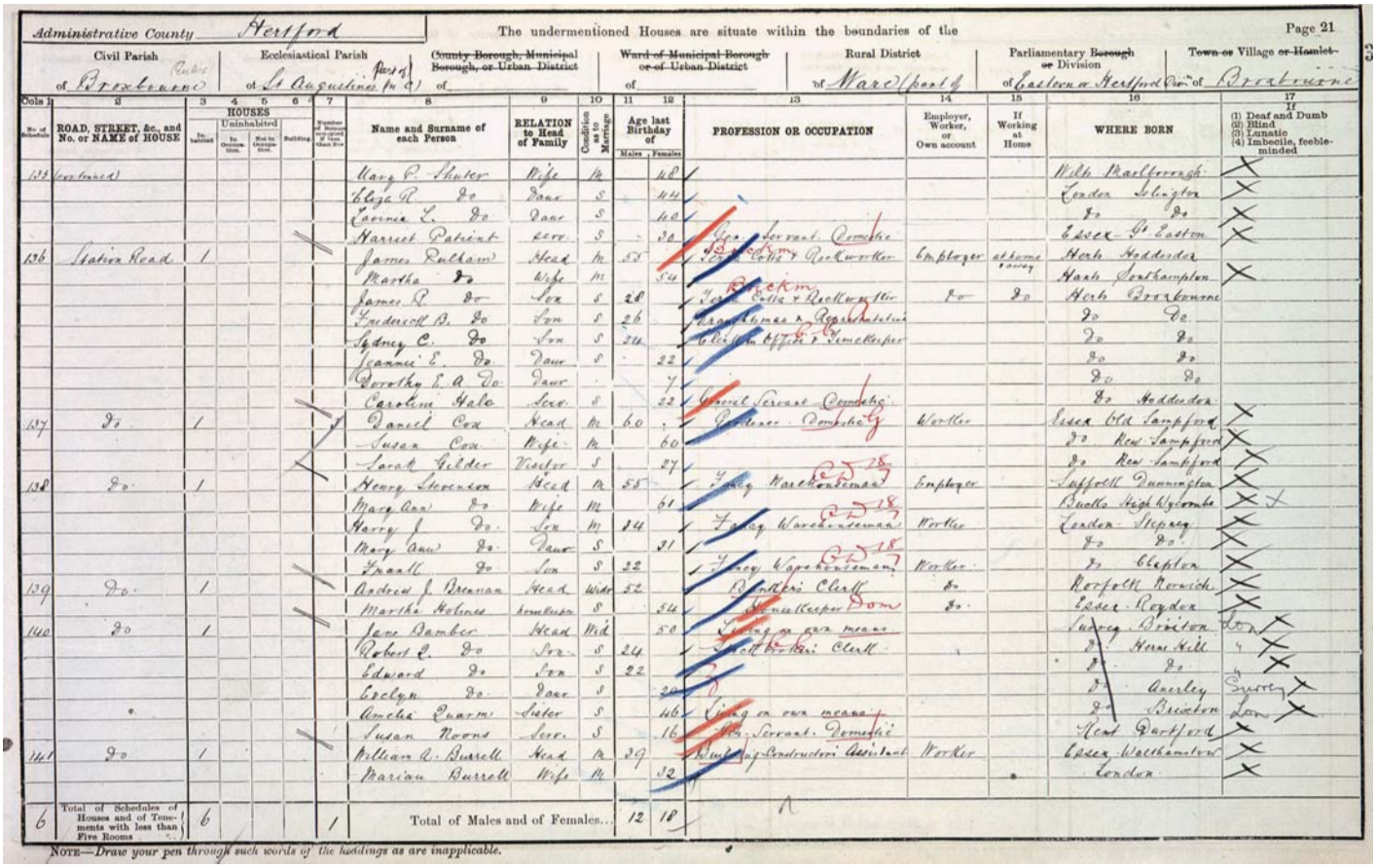
ROCKY WATERFALLS, FERNERY, CLIFFS, CAVES, &c.

JAMES PULHAM & SON, BROXBOURNE, HERTS.,

THE DEPOTS—BRIXTON AND HIGH CROSS, TOTTENHAM.

DURABILITY GUARANTEED.

Fig 9 James Pulham & Son's advertisement for their range of products, with the motto 'Durability Guaranteed' at the bottom. (© RHS, Lindley Library)



Administrative County Hertford — The undermentioned Houses are situate within the boundaries of the — Page 21

Civil Parish of Broxbourne (Public) — Ecclesiastical Parish of St Augustine (Part of) — County Borough, Municipal Borough, or Urban District of — Ward of Municipal Borough or of Urban District of — Rural District of Ware (Part of) — Parliamentary Borough or Division of Eastern Herts Div. — Town or Village or Hamlet of Broxbourne

Cols 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
No. of Schedule	ROAD, STREET, &c., and No. or NAME of HOUSE	HOUSES Uninhabited: Inhabited	Not in Occupation	Building	Number of Rooms with Five or more Windows		Name and Surname of each Person	RELATION to Head of Family	Condition as to Marriage	Age last Birthday of Males	Age last Birthday of Females	PROFESSION OR OCCUPATION	Employer, Worker, or Own account	If Working at Home	WHERE BORN	If (1) Deaf and Dumb (2) Blind (3) Lunatic (4) Imbecile, feeble-minded
134	(continued)						Mary P. Shuter	Wife	M		42				Wilts Marlborough	
							Eliza R. Do	Daur	S		44				London Islington	
							Fannie L. Do	Daur	S		40				Do Do	
							Harriet Patient	Serv	S		30	Gen Servant Domestic			Essex Gt Easton	
136	Station Road	1					James Pulham	Head	M	55		Terra Cotta & Rockworker	Employer	At home	Herts Hoddesdon	
							Martha Do	Wife	M		54				Hants Southampton	
							James R. Do	Son	S	28		Terra Cotta & Rockworker	Do	Do	Herts Broxbourne	
							Frederick B. Do	Son	S	26		Draughtsman & Rockwork Estimator			Do Do	
							Sydney C. Do	Son	S	24		Clerk Office & Timekeeper			Do Do	
							Jeannie E. Do	Daur	S		22				Do Do	
							Dorothy E. A. Do	Daur			7				Do Do	
							Caroline Hale	Serv	S		32	General Servant Domestic			Do Hoddesdon	
137	Do	1					Daniel Cox	Head	M	60		Gardener Domestic	Worker		Essex Old Sampford	
							Susan Cox	Wife	M		60				Do New Sampford	
							Sarah Gilder	Visitor	S		27				Do New Sampford	
138	Do	1					Henry Stevenson	Head	M	58		Foreman Warehouseman	Employer		Suffolk Dunningston	
							Mary Ann Do	Wife	M		61				Bucks High Wycombe	
							Harry J. Do	Son	M	24		Foreman Warehouseman	Worker		London Stepney	
							Mary Ann Do	Daur	S		21				Do Do	
							Frank Do	Son	S	22		Foreman Upholsterer	Worker		Do Clapton	
139	Do	1					Andrew J. Brennan	Head	Wid	52		Domestic Clerk	Do		Norfolk Norwich	
							Martha Holmes	Nurse	S		54	Housekeeper Dom	Do		Essex Royden	
140	Do	1					Jane Bamber	Head	Wid		50	Living on own means			Surrey Brixton	
							Robert C. Do	Son	S	24		Electrical Clerk			Do Herne Hill	
							Edward Do	Son	S	22					Do Do	
							Evelyn Do	Daur	S		20				Do Anerley	Surrey
							Amelia Charm	Sister	S		46	Living on own means			Do Brixton	Lon
							Susan Noons	Serv	S		16	Gen Servant Domestic			Kent Dartford	
141	Do	1					William R. Burrell	Head	M	39		Engineering Constructors Assistant	Worker		Essex Walthamstow	
							Marian Burrell	Wife	M		32				London	
6	Total of Schedules of Houses and of Tenements with less than Five Rooms	6				1	Total of Males and of Females...			12	18					

NOTE—Draw your pen through such words of the headings as are inapplicable.

Fig 11 An extract from the 1901 census record listing the Pulham family at 136 Station Road, Broxbourne. (Courtesy of The National Archives, ref RG13/1279)

by which time the company was being run by his son, James III, and his grandson, James Robert (1873–1957). The 1901 census identifies two James Pulhams, both living in Broxbourne, as 'Terra Cotta & Rock Workers'.

From the 1900s most Pulham rock gardens were built from natural stone. An article in *Gardener's Magazine* (Anon 1912) detailed their work on the rock-and-water garden at Wisley and referred to many of their more recent commissions, including rock, water and terrace gardens at Ardross Castle, Beaudesert, The Node, Stanmore Hall and Thornby Hall.

James Pulham & Son catalogues from the 1920s and 1930s illustrate the range of work carried out during this period. *Hardy Herbaceous and Alpine Plants* (Pulham c1930s) refers to gardens (rock gardens, alpine gardens, water gardens, Japanese, Dutch and Italian gardens) with lakes, bridges, summer houses, pergolas and ornaments. During this period, the firm had a head office at 71 Newman St, off Oxford St in London, as well as the works at Broxbourne and a landscaping practice at Elsenham, near Bishop's Stortford, Hertfordshire. Plants were supplied from the firm's own nursery at James Pulham & Son Hardy Plant Nurseries, Dunmow Rd, Bishop's Stortford, and stone was provided directly from the quarries.

By the end of the Second World War, James Robert Pulham was in his seventies, and in 1945 James Pulham & Son ceased to operate.

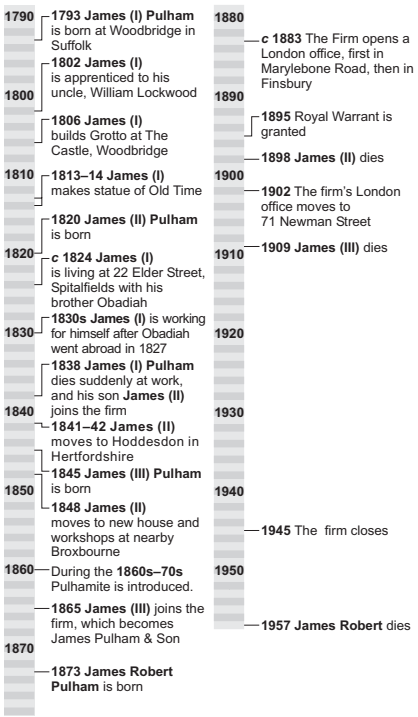


Fig 10 A time line for the Pulham business.

Pulhamite Rockwork

The aim of the Pulhams' gardens and landscapes was, as noted in *Picturesque Ferneries and Rock-Garden Scenery,* to replicate natural alpine scenery. The height and boldness of the work were intended to impress by mimicking

> stratified rock, with some bold projections and recesses, fissures, dip, cleavage, cracks, clefts, outliers, &c, so as to appear as if it had originally been naturally deposited … some broken into fragments, some cropping up, or out at various angles, degrees of elevation, or dip, and shewing more or less of an escarpment in irregular, rugged, picturesque, romantic form … [all] worked with numerous hollows between the strata, on the ledges, in the cracks and clefts of the rock, with plenty of space for soil, having good drainage for plants to grow freely about it … .

Fig 12 In his prospectus (Pulham c1877) Pulham quotes Wordsworth to describe this illustration of his naturalistic system of forming rocks.
…There is a spot, as you may know,
If ever you to Langdale go;
Into a chasm a mighty block
Hath fallen, and made a bridge of rock …
(from *The Idle Shepherd-Boys*). (© RHS, Lindley Library)

The best preserved examples of mid-19th-century Pulhamite rockwork show that its design – the massing and stratification of various types of rock, the banding of colours, the incorporation of vertical fault lines, the use of naturalistic surface textures – was carefully based on natural geology.

The 'Pulhamite system'

Artificial rockwork structure is essentially a masonry core of overburnt bricks, waste stone, slag or other cheap, locally available filling material, amassed and modelled in mortar or concrete to replicate natural contours. Quality bricks and stone were also used where structural strength was important. The Pulhams also added overhangs created from slate or sandstone slabs, and often incorporated plant pockets into their designs. All of these structural forms were then finished with two coats of render, each typically 6 to 15mm thick. The base coat commonly consisted of a cement, and the finish coat a proprietary compound such as Pulham's Stone Cement, providing the trademark natural finish.

The success of the rockwork's appearance depended on the ability of trained artisans to skillfully mimic the natural colours, textures, stratigraphy and lithology of the rock form. In the *c*1877 prospectus, James Pulham II explains that, although trained as an architectural modeller, he was also, since his days as a schoolboy, fascinated by geology: the 'making of rocks' combined these interests and skills. The firm recruited, trained and retained skilled workmen, including their own quarrymen. Pulham records that some of his men had 25 years' experience. The Madresfield Court rock garden includes the inscription: 'This work by Mr J Pulham, Broxbourne, AD 1878–79. Workmen R Pegram, Bos J Stracey, J Jonson Fini July 18'.

Fig 13 Profile of a head in the Highnam Court rockwork. (© Simon Swann)

A characteristic feature of Pulham rockwork is the use of intrinsically coloured aggregates and inorganic pigments such as ochres and iron oxides, crushed charcoal, chalk or lime to imitate natural colour variations in the finish render. Surfaces were worked and modelled while the material was wet, and various textures and inventive special effects were achieved using brushes, combs or damp sacking, and aggregates such as crushed stone or shells, pebbles or brick burrs. There is evidence of the mixing of peat into the render surface to give the appearance of tufa, with the peat rotting to create the rock's characteristic spongy finish (C Hitching, *pers comm*). Researchers have found examples at Madresfield Court and Ramsgate of the playful profiling of rock faces into the shapes of heads or faces (James Pulham I would have learnt to make decorative cement heads with the Lockwoods). The composition of the finish coat seems to have varied greatly between the 1840s and the 1870s, when the Pulhams finally ceased manufacturing their own proprietary 'cement'.

While the quality of the work varied over the decades according to the skill of foremen, rockworkers and labourers, it was generally geologically accurate. As planting matured and rockwork acquired a patina from weathering, moss or algae, some of it became very convincing. The best was good enough to deceive onlookers: James Pulham II boasts in the firm's prospectus that the naturalist Sir Roderick Impey Murchison believed the Pulham rockwork at Lockinge, Berkshire, to be made entirely of local stone.

One reason for the popularity of Pulham rockwork was that a modest construction could be incorporated into a very small space: some 80 commissions were simply for ferneries, dropping wells or rocky walls, mostly in suburban gardens. The purpose of *Picturesque Ferneries and Rock-Garden Scenery* was not only to advertise Pulham services and products but to serve as a manual, for the public unable to afford a Pulham structure, on creating their own. James Pulham II commented:

> Some [amateurs] have erroneous ideas of what good rock-work is or should be; many have not the least idea or notion of it, or the requirements of growing ferns, Alpines, or other rock-plants; and as there is an increasing taste and desire for picturesque scenery, even in small suburban gardens or pleasure-grounds, for the growth of ferns and Alpines, I hope this may . . . enable amateurs especially to proceed on the right principles, without wasting money in . . . fruitless uninteresting abortions (commonly seen and called rockery), bad both in taste and mode of construction . . . .

Materials could be bought at the firm's depots, and clients were invited to view examples at two Pulham residences: James Pulham II's house at The Orchard, High Cross, Tottenham, and James Pulham III's house at 136 Station Rd, Broxbourne.

Pulham's terracotta

In the 1840s James Pulham II developed both a granulated, pale red terracotta and a stone-coloured version for vases and other garden ornamentation, architectural objects and decorative interior and exterior panels. Pulham's terracotta was exhibited at the Great Exhibition of 1851 in London, in the form of a

Fig 14 Henry Taunt's 1895 photograph of Lord Wantage beside Pulham rockwork at Lockinge. The garden was demolished after the Second World War. (© English Heritage. NMR CC97/02314)

Fig 15 The Grade II* listed tomb of Victorian painter William Mulready (d 1863) was designed by Godfrey Sykes and made by James Pulham & Son. There are friezes with scenes from Mulready's paintings, and reliefs of palettes, brushes and diplomas. (© EH DP016956)

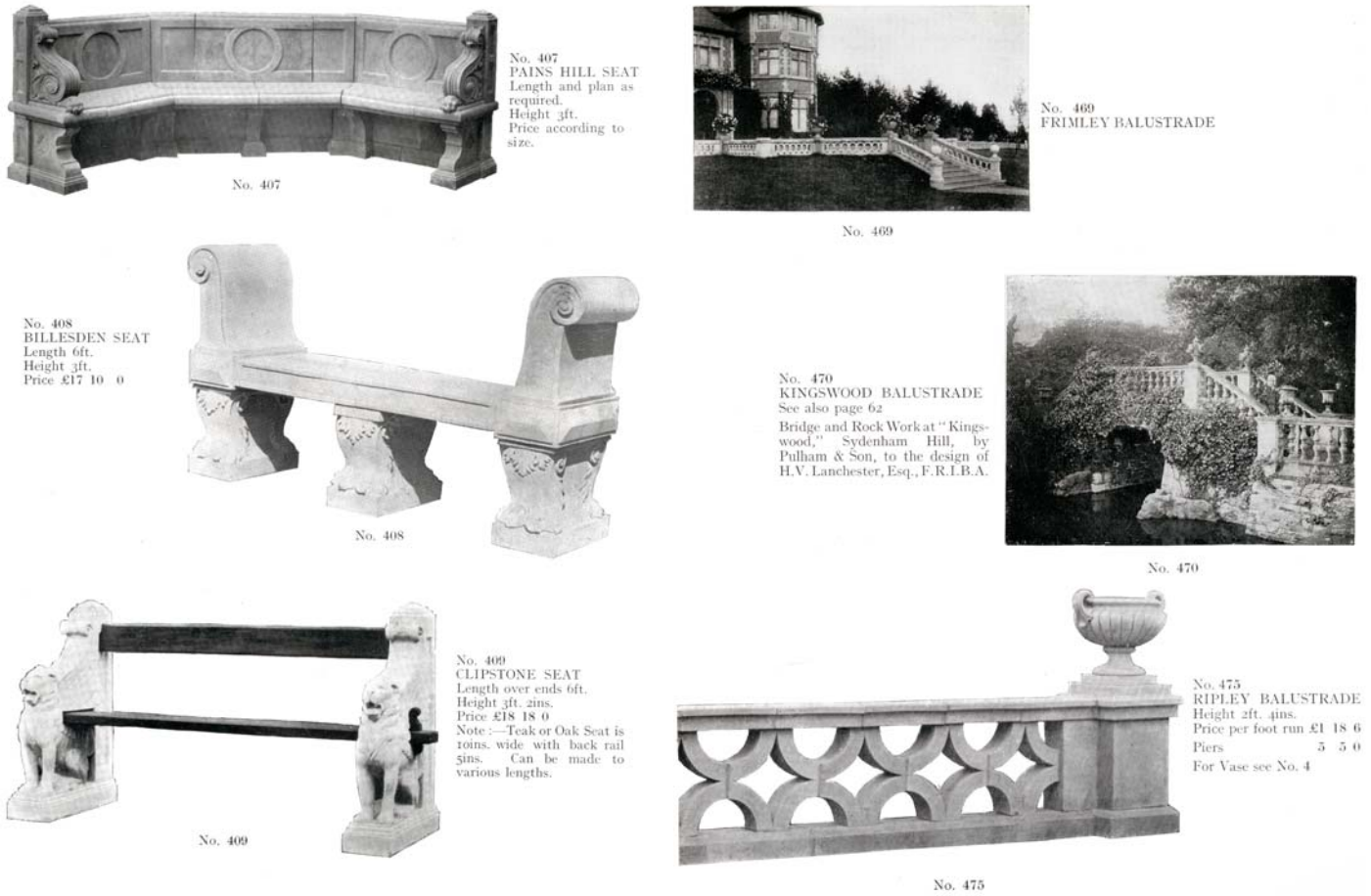


Fig 16 Examples of seats and balustrades manufactured by James Pulham & Son. (From Pulham 1915 © RHS, Lindley Library)

Gothic urn and pedestal known as the Broxbourne vase. At the 1867 Exposition Universelle in Paris, cement and terracotta products displayed by the firm included the so-called Preston vase (made for People's Park in Preston, Lancashire) and the Mulready monument (now at Kensal Green Cemetery, London). *Picturesque Ferneries and Rock-Garden Scenery* referred to the use of Pulham's terracotta at some 16 sites (see Appendix A).

The sale of these decorative pieces continued well into the 20th century. From the late 19th century onward the firm used 'Pulhamite' only in reference to their terracotta products. Their 1930s' catalogue *Hardy Herbaceous and Alpine Plants* featured sundials, vases, birdbaths, fountains, seats, balustrading and other garden ornaments 'in our well-known "Pulhamite" stone'.

Planting

The Pulhams carefully planted their rockwork with alpines, ferns and other rock-garden varieties, with ledges, fissures and pockets incorporated for this purpose. The appendix to *Picturesque Ferneries and Rock-Garden Scenery* offered advice on the plants and their management,

> the most choice hardy plants, shrubs, conifers and flowers, having either beautiful foliage, colour, or variegation – all hardy and suitable to grow on, or about, or between the rocks, either erect, drooping, creeping, or trailing down them, the shrubs being chiefly the dwarf kinds … also, of Alpine flowers, chiefly such as are attractive, or have variegated foliage, and bloom in the autumn or winter months, or for a long time … Most ferneries may have a sunny side or exposed parts, which enable us to have a greater diversity than is usually the case … .

Shrubs and climbers, though not always typical rock plants, could be used to crown the heights. Beneath these,

> in the ravines and glades, it is desirable to have apparently fallen masses or debris, at or about the base of the cliff. In this, many plants will thrive better than on the ledges above … a great number of small alpines may be thus grown near the eye for close inspection … imagine a broad rocky ledge, with a variegated Periwinkle, Cotoneaster, Carpet Savin (Juniper), or other trailers, drooping over the rocky brow, and some of the numerous evergreen or variegated climbers growing up the face of the rock, with golden and other Hollies or Shrubs; also, now and then, a small Weeping Birch, &c, which are all beautiful in mid-winter … .

Hardy heath plants were used in dry and exposed areas, and ferns in shady parts. Saxifrages, sedums and houseleeks could be grown alone on small rockworks.

A plan of Berry Hill published in *The Garden* (Anon 1872) shows a lake with an island, a sinuous path and a seat. Trees and shrubs – typical of the Pulhams' planting in that period – include elm, cherry, holly, willow, copper beech, tamarisk, heaths, juniper, *Kalmia*, spruce, deodar, *Cupressus* species, lilac, *Hypericum*, *Vinca*, ivy, chestnut, birch, ash, yew, poplar and oak, plus bullrushes and water lilies.

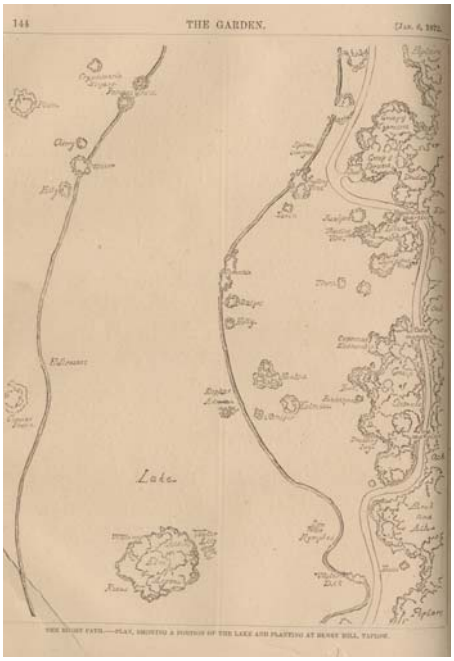


Fig 17 The planting plan for Berry Hill, Taplow. (© RHS, Lindley Library)

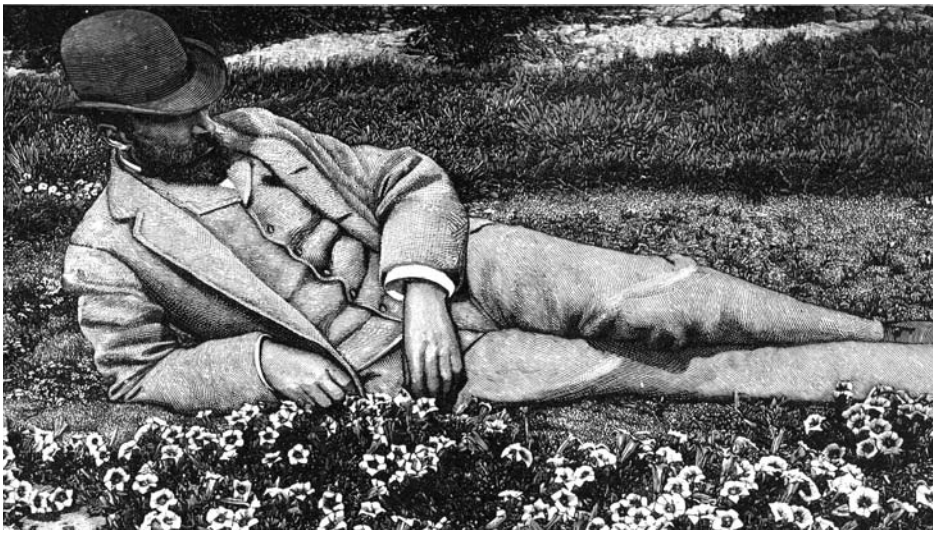
For further information the c1877 prospectus directed readers to William Robinson's *Alpine Flowers for English Gardens* (1870) and *Hardy Flowers* (1871), B S Williams's *Select Ferns and Lycopods* (1873) and David Wooster's *Alpine Plants* (1874). Recommended nurseries included B S Williams's Victoria and Paradise Nursery, Holloway, for ferns, orchids and palms; T S Ware's Hale Farm Nurseries, Tottenham, and the well-known Messrs James Backhouse and Son, York, for alpine flowers and other rock plants; and Richard Smith's St John's Nursery, Worcester, for conifers and variegated shrubs. Williams had started his career as a gardener at Hoddesdon Hall, site of the Pulhams' first rock garden. The Lindley Library of the Royal Horticultural Society (RHS) holds catalogues for all these nurseries. In later landscaping work, plants came directly from the Pulhams' own nursery at Elsenham; *Hardy Herbaceous and Alpine Plants* lists herbaceous varieties for sunny and shady borders, and plants suitable for dry walls. While the Pulhams were diversifying to raise and supply their own plants, other nurseries were in their turn expanding into rock-garden design.

Pulham Sites

Picturesque Ferneries and Rock-Garden Scenery listed over 170 sites where the 'Pulhamite System of Forming Rocks' had been employed since the 1840s, with others cited in a separate section on 'Pulham's Terracotta'. Additional sites were noted in an article on the Pulhams' work in *Gardener's Magazine* (Anon 1912). Some 70 further sites, dating from the late 19th and early 20th centuries, have also been identified. Almost all of the Pulham sites are in England – principally the Home Counties but with clusters in the Midlands, the North-East, the North-West, East Anglia and the South-West – with others in Scotland, Wales and Ireland, and one in Denmark.

With more than a century of bespoke Pulhamite commissions carried out for a range of clients by various craftsmen on a variety of sites, each Pulhamite feature was unique. They can, however, be broadly classified as either gardens and parks (numbering around 120) or smaller features such as ferneries, dropping wells, rocky walls and conservatories. Several commissions showcased the entire range of Pulham skills and products, including terracotta ornamentation, artificial and natural rockwork, buildings and dramatic water gardens; some were on a monumental scale, spreading over many hectares or rising up to 50m high.

Among the largest, most complex sites was Bessemer House (Denmark Hill, Camberwell, London), completed in 1871 for Henry Bessemer. It was described (Pulham c1877) as



Bridge on Rocks, Waterfalls, large fernery entirely built of Rock, forming Cliff outside a Moorish Temple in the Rock, a Boathouse entirely in Rock, Lake, Ponds concreted, also Rocky Islands and Streams. The Temple, highly decorated in colours and gold, is … topped with Heather, Shrubs, &c.

Fig 18 One of William Robinson's illustrations for the planting of rock gardens (Robinson 1906). He recommended grouping, rather than dotting, alpine plants such as these gentians.

Others include Berry Hill (Taplow, Buckinghamshire) for J Noble, completed in 1868; Dunorlan Park (Tunbridge Wells, Kent) for Henry Reed in 1864; and a property in Dunsdale (North Yorkshire) for J Kitchin in 1872.

Large commissions continued into the late 19th and early 20th centuries. These included rockwork pools, paths and a network of underground chambers at Dewstow House (Newport, Monmouthshire) in the 1890s; a series of projects in Bristol (Rayne Thatch, Abbots Pool and Bracken Hill) for Walter Melville-Wills in the early 20th century; and most of the Pulhams' seaside commissions: Bawdsey Manor (Bawdsey, Suffolk, 1900), Albion Place Gardens (Ramsgate, Kent, c1894) and Lower Leas (Folkestone, Kent, c1910s). The suite of rockwork at Ramsgate is interesting as it reflects the span of the family business in the 20th century.

Clients

The Pulhams' private clients ranged across the social spectrum, from a Miss Pipe of Clapham Park to the landscape painter and designer Edward William Cooke (1811–80), to the Prince of Wales. Some of the wealthiest were shipowners (including Sir Bache Cunard and the Ismay family) and industrialists. While the firm did publish a manual and place advertisements, it can be inferred – from the clustering of works in certain areas, and from the number of individuals and families such as Barclay, Brassey, Ismay, Pease, Platt, Wright and Melville-Wills for whom several sites were designed – that many commissions arose from personal recommendations.

Fig 19 York and Sons stereo view (1870–1900) of the Prince Consort's Rockery at Windsor Castle. (© English Heritage. NMR CC97/01825)

The Pulhams could provide letters of commendation from an impressive list of owners, including Thomas Gambier Parry of Highnam Court (where the Pulhams worked from 1849 to 1862). The Royal Warrant granted to the firm by the future King Edward VII in 1895, and renewed by George V, surely helped to secure clients.

Following a visit to a potential client, design concepts would be developed, probably in plans and drawings (although only a few plans have been found). Once commissioned, the project would be carried out by a group of workmen and craftsmen under the direction of a foreman. Although further research may reveal more original plans, these may in many cases have served only as guidelines, with much of the design work interpreted *in situ* by craftsmen and supervisors.

The Pulhams' work at St Fagan's Castle, Cardiff, is detailed in a series of letters, plans, bills and even a poem (Pulham *c*1870s). An early letter sets out terms: planning, travelling and superintendence, at 1½ guineas per day; work to be undertaken by a 'staff of men trained from their youth, so experienced in the work, who work by my plans & instructions'. A plan dated 1 April 1873 shows an area of water garden with watercourse, streams, rocks and planting. Details, set forth in letters, include a 1.4m-high waterfall and a smaller upper waterfall, a rustic footbridge, a rocky island and outcrops in a stream, alterations to existing ponds and suggestions for altering the planting. A bill dated 30 October 1876 lists the work carried out in that year: in March 'a Journey to St Fagan's to take a plan of the ground & its features'; in July 'Executing rockwork and groundwork in connection with it', with wages for a foreman for six days and a labourer for two days, and purchase of one ton of cement; in August and September, wages for a foreman, a 'Rockworker', an assistant and labourers. The total bill amounted to £196 11s 6d.

In addition to private garden commissions, the Pulhams designed several privately owned sites intended for public use, including aquaria at Brighton, Manchester, Scarborough and Southport and a pleasure garden at Rosherville Gardens, Kent. There were also important commissions for public parks, and a number of seafront gardens.

Associations with landscape designers, gardeners and architects

Most of the public parks and a number of private commissions were carried out in association with eminent landscape designers of the day, including Edward Kemp (1817–91), Edward William Cooke (1811–80), Robert Marnock (1800–89), Edward Milner (1819–84) and William Broderick Thomas (1811–98), and later Thomas H Mawson (1861–1933), Henry Ernest Milner (1845–1906) and Edward White (*c*1873–1952). Some of these are given as references in *Picturesque Ferneries and Rock-Garden Scenery*, and some, such as Cooke and Milner, were also clients. These designers did not supervise the Pulhams but worked alongside them; their joint projects are identified in Appendix A. A typical private site would feature terraces around the house and a formal garden designed by Milner or Marnock and, further from the house, a rock-and-water garden by the Pulhams.

The Pulhams also worked with some of the eminent and influential gardeners of the day, including John Gibson (1815–75), superintendent variously of Battersea Park, Victoria Park, Greenwich Park, Hyde Park and other royal parks in London, and William Gibson (1817–91), also at Battersea Park.

In the Brighton (1875) and Scarborough (1877) aquaria commissions the Pulhams collaborated with celebrated architect and designer Eugenius Birch (1818–84). Several Pulham sites are associated with other architects – including Alfred Waterhouse (1830–1905), noted for his use of terracotta – although it is not known whether they worked with the Pulhams or were just active on the sites at the same time.

Pulham's Hoddeson Hall and Woodlands commissions are interesting as John Warner was associated with John Warner and Sons, metal founders specialising in pumps and plumbing fittings for fountains and water features (C Hitching, *pers comm*).

Deterioration and Damage

Some Pulhamite rockwork structures have perished over the years, and many others – some in a ruinous condition – are in need of repair, or may even merit full restoration. Deterioration or damage may be superficial (affecting only the render coats) or it may be structural (affecting the core or backing). In either case the causes may lie in the nature of the materials, construction faults or previous repair techniques, external factors such as settlement, moisture or plant growth, or more usually a combination of these agents.

Defects in the render coats

Surface defects take many forms, of which the following are typical:

- Detachment of the render as a result of: inadequate keying of surfaces and poor application; a weak backing or undercoat layer; shear stresses from structural failure; water ingress and frost action; or re-crystallisation of soluble salts (from poorly selected core materials such as marine shingle or sand; from bricks with a high salt content; from rainwater or groundwater; or from cleaning or plant- control chemicals);
- Cracks resulting from: an excessively strong render mix (for example, too rich in cement) on a weaker backing; drying shrinkage; root damage or structural failure; small cracks (less than about 3mm wide) or crazing may also arise from poorly graded aggregate;

Fig 20a Loss of surface render (© J Stewart)

Fig 20b Salt efflorescence (© J Stewart)

Fig 20c Network cracking (© J Stewart)

- Spalling, granulation or blistering due to: deterioration or weathering of the cement binder; frost action; sulphation of lime binders (transformed by certain water borne sulphur compounds into partially soluble calcium sulphate); or the action of other soluble salts;
- Loss of surface detail or texture or the exposure of backing material, due to physical erosion from wind and rain, combined with chemical erosion;
- Black sulphate crusts on sheltered surfaces, an effect of atmospheric pollution which is occasionally associated with the detachment of sulphate-rich render layers;
- Staining due to iron or copper fixtures, organic matter or micro-organisms, or from unsuitable repairs;
- Vandalism, including graffiti.

Fig 21a Sulphation of surface (areas unwashed by rain) (© J Stewart)

Fig 21b Surface staining caused by iron corrosion (© J Stewart)

Fig 21c Iron corrosion and disruption of surface render (© J Stewart)

Fig 21d Cumulative graffiti (© J Stewart)

Certain surface defects are characteristic of Pulhamite rockwork. These include:

- Loss of thinly-applied or heavily-trowelled render coats through weathering, exposing the underlying core;
- Longitudinal cracks just above the return faces of overhanging features: these lack run-off detailing and are sometimes angled so that water trickles down the underside into the bed joint below, promoting excessive dampness in the render; where overhangs are created using slate slabs, detachment of the underside render is common because of poor adhesion;
- Preferential weathering of softer bands or 'strata' of render in the design, due to variations in the durability of mix types, binders or aggregates;
- 'Skirting', where altered soil levels at the base of a feature may expose the return edge of the render coat and the underlying core work;
- Rusting iron handrails and loss of Pulhamite coating.

Defects in the core or backing

General cracking may result from differential thermal movement (expansion and contraction) of building materials, from settlement or from ground subsidence (such as shrinkage in some clay soils). Localised cracking may occur as a result of water penetration and frost action, expansion of water-sensitive shales or clays in backing materials, corrosion and expansion of ferrous fixtures, penetration by tree roots, or inadequate design, construction or site management. Gardeners, workers or machinery may have inadvertently damaged rockwork in carrying out other tasks.

Fig 22a Weathered surface with exposure of aggregate (© J Stewart)

Fig 22b Erosion of structural core, preferential erosion of soft brick in the core (© J Stewart)

Fig 22c Erosion of structural core, loss of mortar and aggregate matrix (© J Stewart)

Previous repairs

Much repair work undertaken in the past has been handicapped by a poor understanding of rockwork materials, their design, colours, detailing and construction. Additionally, deterioration and erosion of the render often made it difficult to assess the intended character of the original surface. Ill-conceived repairs and cleaning may cause irreversible damage to original workmanship.

Fig 22d Surface repair distinct from original material (© J Stewart)

Fig 22e Surface covered with Gunnite (© J Stewart)

The repair of rendered surfaces at some sites has been carried out using gunnite, a Portland cement-based slurry adapted for spray application. This is particularly disfiguring, obscuring original colouration and texture, which were invariably applied with some sophistication. Gunnite mixes may contain bonding agents or other admixtures to improve adhesion or water repellency, and are impossible to remove without damage to the underlying material. Although the underlying render may itself be quite impermeable, this type of repair makes inspection of the substrate more difficult, and may cause other damage.

Some surface repairs can be distinguished from the original render owing to the custom of scraping back a partially set render coat, drawing out aggregate particles and creating a pitted finish on the surface of the repair. This differs from the granulated finish of weathered Pulhamite in which aggregate particles stand proud of the surface.

Paint was sometimes applied in an unsuccessful attempt to match original colours, refresh existing Pulhamite work or vary the colour of new work. Re-adhesion of broken fragments may have been carried out with iron, copper or steel pins or wire, which may cause cracking or staining.

Water features such as pools, fountains and cascades present particular difficulties. Where a lining has been introduced, a chase may have been cut into the Pulhamite. While modern polyurethane linings can take on the contours of underlying rockwork, they may still be visually disruptive.

Repairs to the original backing or core work, or partial rebuilding, may have been carried out using rough masonry, polystyrene, chicken wire and cement, or other techniques, often with little regard for the naturalistic rock formations of the original structure.

Site Assessment

Any large-scale, naturalistic rockwork features found in an historic garden or landscape should be examined to identify Pulham work. Close examination of surfaces will help to distinguish composite finishes from genuine rock, especially in cavities, fissures and at the base of rock elements.

The first priority in dealing with any potential Pulham site or feature is a survey to understand its history, original materials and construction techniques, and subsequent alterations and repairs. The types and extent of deterioration, damage and defects also need to be identified, and recommendations made for maintenance, repair, restoration and monitoring. These principles apply to all rockwork, whatever its scale, although the assessment must be adapted to the size and complexity of the rock feature, the nature of damage or deterioration and the ultimate objective of the work. The advice on site assessment below focuses on rockwork, but the same principles will apply to other Pulhamite materials.

Conservation-based research and analysis will typically be conducted in three stages for rockwork features (see boxed text). **Stage 1** combines research into the history, design and significance of the feature with a preliminary inspection to establish its construction, aesthetic characteristics and overall condition. This may be part of a broader assessment such as a conservation management plan or heritage impact assessment. **Stage 2** must be carried out by a professional conservator or surveyor with experience in the conservation of historic buildings, and includes a detailed assessment of materials, construction, previous repairs and present condition, causes and rates of deterioration, and health and safety issues. Recommendations should also be included for repair or restoration, further survey work or analysis, and interim maintenance and management. **Stage 3**, if required, will involve additional specialist diagnostic, analytical, recording or monitoring work.

Fig 23 James Pulham & Son were commissioned to 'rockify' the northern Blackpool seafront in the 1920s. The rockwork has since been sealed with a cement-based slurry. (© EH/Jenifer White)

Conservation-based research and analysis

The scope of a conservation-based research and analysis, including survey for Pulhamite rockwork is described below. Although these components would typically apply to significant and technically problematic features, the very basic tasks of Stage 1 and 2 – the identification and understanding of the causes of defects, and the correct specification of repair work – apply to any Pulhamite work.

Stage 1

Before a site visit it is essential to research relevant documentary or archival records, for example from local libraries and city or county record offices. These records may include landscape plans, Ordnance Survey or other published maps, illustrations (prints, drawings and especially photographs), manuscript or published descriptions, local guidebooks, and accounts and bills. From these it may be possible to infer aspects of construction, planting and maintenance history, any previous repairs and the rate or scale of degradation. The publication *Parks and Gardens: A Researcher's Guide to Sources for Designed Landscapes* (Lambert, Goodchild and Roberts 2006), sponsored by English Heritage, is a useful summary of printed and documentary materials.

The research should help establish the significance of the feature or site. Its value will depend on the type and scale of work, the survival of design features, the involvement of other designers and a comparison with similar sites. Other values such as nature conservation and geological interest may need to be considered as well.

The next step is a preliminary site visit to establish broadly the type of construction, materials and overall condition. This serves to identify the principal risks to the feature and to public safety, and to gauge the urgency of the need for a full survey. The preliminary survey will typically be limited to ground level, but may include judicious low-level access via a ladder. The examination should be done systematically, with observations recorded in the form of notes, drawings and photographs; any unexamined areas should also be identified. Useful tools include binoculars, hand lens, camera, soft brush, small knife, scalpel or other pointed tool, trowel or spatula, gloves and eye protection, labels, indelible marker, and polythene bags for collecting detached fragments.

The condition of Pulham structures can vary considerably from site to site, depending upon the choice and quality of original materials, the standard of construction, the degree of exposure and the level of maintenance (including of the soft landscape – especially trees, shrubs and creepers), among other factors. Large cracks may signal structural problems, and in any case are paths for the ingress of moisture and roots. Surface cracking or crazing may not appear serious, but this or the loss of render fragments or other elements could indicate other local defects.

Gentle tapping with a fingertip may reveal voids beneath detaching render. Fragments of render may also be found on the ground, demonstrating active loss. Where surfaces have weathered or become loose or detached, examination of exposed core work may reveal salt deposits (efflorescence). Inappropriate earlier repairs may also have encouraged the degradation of rendered areas.

The Stage 1 survey should also include an appraisal of the aesthetics of the rock feature, to develop an understanding of its design and character. An initial assessment of existing planting – including types (alpines, water plants, shrubs and so forth) and species, their location, extent and condition, and specific features such as plant pockets – should also be undertaken. This will allow the identification of self-seeded saplings, overgrown shrubs, mature woody plants and other species which may pose a threat to the rockwork. In cases where the contribution of a horticultural specialist is required, planting may also form part of the Stage 2 survey.

The approach to plant growth must be a balanced one. While dense, overgrown planting, particularly of woody species, may threaten a structure, much plant activity may be more benign. Of course the actual contribution of plants to the setting of the rockwork (notably the importance of lichens, mosses, grasses and creepers to its naturalistic character) must be considered as well.

Following the preliminary survey, a full condition (Stage 2) survey should be undertaken if cracking is extensive; render loss is evident or appears imminent or core or backing is exposed; there is active root damage; or there are unfavourable maintenance conditions (such as dense, overgrown planting, difficult access or a history of neglect). The urgency of a full survey is dependent upon the degree of deterioration and perceived risk.

The historical information on a feature should reveal its significance, and the assessment of its current condition should reveal its conservation requirements. For large or important Pulham sites this should be expressed in a formal statement.

Stage 2

A Stage 2 survey investigates all aspects of construction and the nature, extent and probable causes of deterioration. It should be undertaken by a professional conservator or an architect/surveyor with experience of historic buildings. Access to all parts of the structure, including elevated sections, is essential. It may be necessary to empty plant pockets or to remove mature vegetation to facilitate

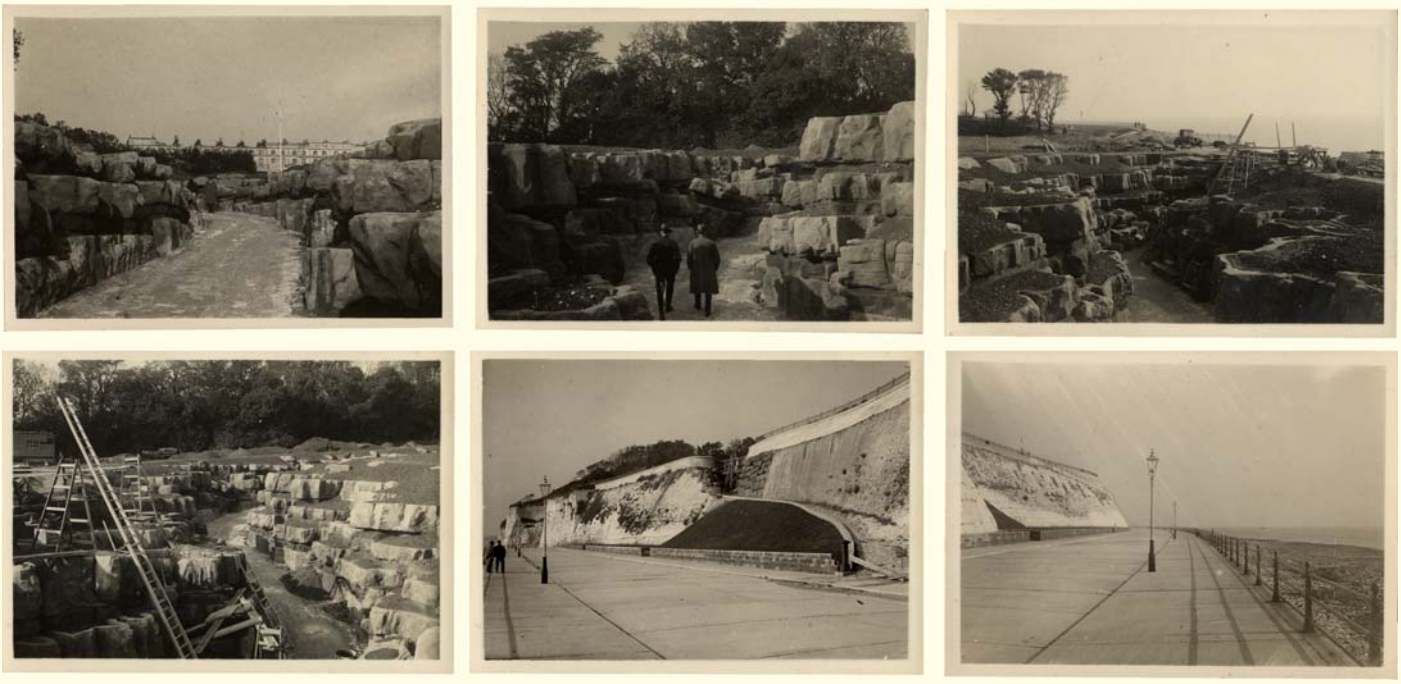


Fig 24 Photographs of Pulhamite rockwork being constructed at Ramsgate. (© East Kent Archives Centre)

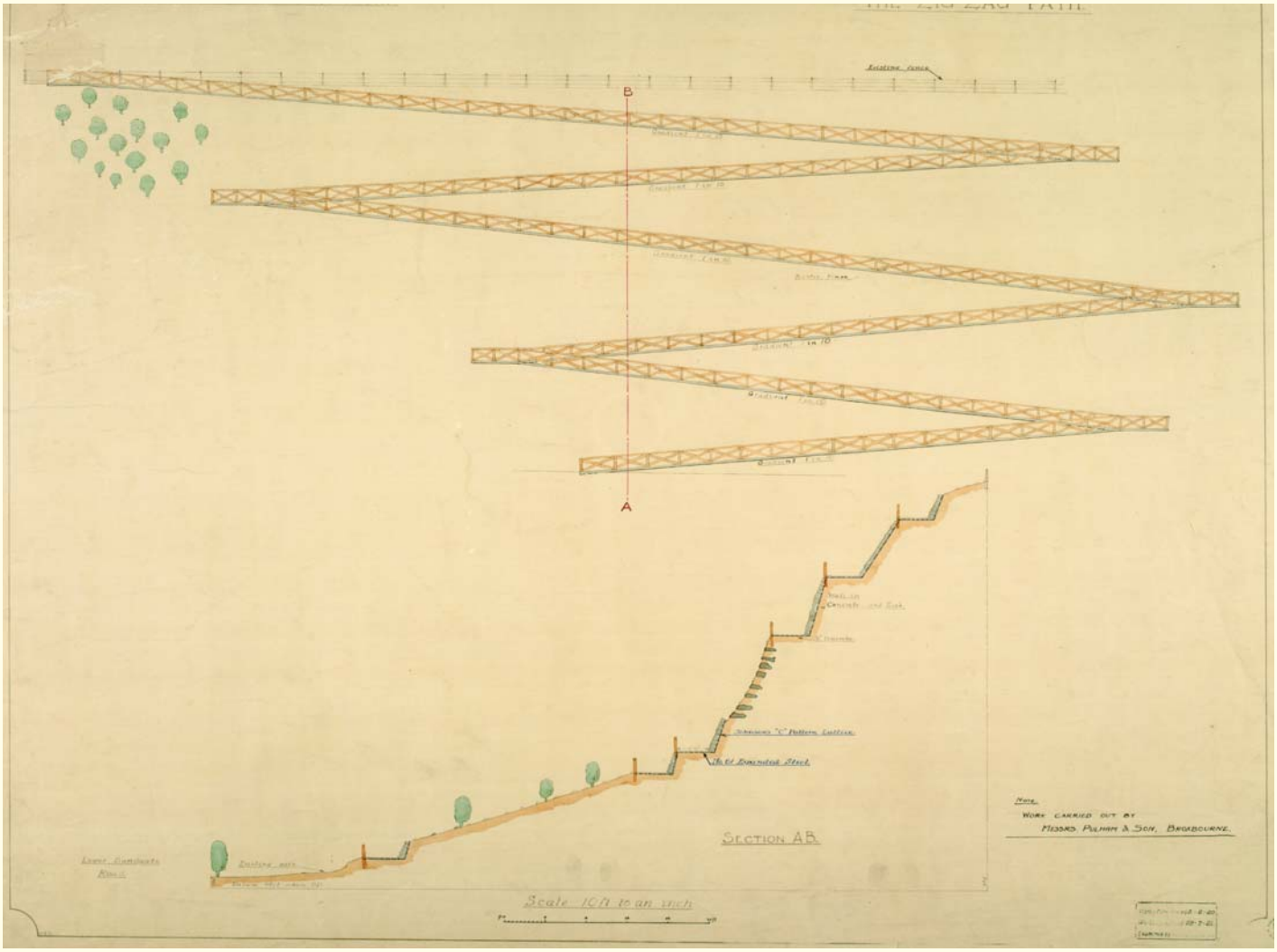


Fig 25 A cross-sectional drawing for Folkestone's Zig-Zag Path. (© East Kent Archives Centre)

inspection in areas of particular concern. All observations should be fully documented, including with graphic and photographic records. English Heritage's *Informed Conservation* (Clark 2001) offers guidance on surveys and commissioning specialists.

The choice of techniques for recording and assessing decay will depend upon the significance of the site and the severity of the defects. The most basic tools are conventional, stereo and digital photography; indeed previous photographic records of the site may provide the surveyor with important information about trends in deterioration. But while photography and regular inspections provide useful indicators and a body of visual data, some form of decay mapping is necessary. Simplest is the graphical recording of decay types using transparent overlays on large-format photographs. More advanced techniques are available at much greater expense.

The documentation for condition survey and monitoring need not be complex. However, it must be accurate, consistent, reliable and based upon sound observation and the systematic collection and organisation of data.

A condition report might be structured as follows:

Introduction

- The survey brief and the scope of the survey, including exclusions or limitations (for example, areas not surveyed for reasons of safety or access);
- A description of local weather conditions at the time of the survey;
- Survey methods, with specific reference to recording media or formats (photographs, plans, drawings or other means); marking or referencing procedures; and recording, damage mapping and sampling techniques.

Survey information

- The history of the site, supported where possible by documentary references;
- A description of the site or feature, its form, construction, materials, aesthetic character and obvious repairs or alterations; types of plant materials present;
- A systematic description of all forms of damage or deterioration, with their specific location, extent and classification of relative severity, including public safety hazards;
- An interpretation of the possible causes of deterioration;
- Plans, photographs and survey sheets as appropriate;
- Specific locations where samples have been taken for materials analysis (Stage 3).

Specific types of deterioration recorded would include:

- Water traps, areas of poor drainage and any signs of water penetration;
- Length, width and, if possible, depth of significant cracks;
- Areas of render loss and the condition of any exposed backing;
- Detachment of render layers;
- Locations of previous repairs, materials used and their effectiveness;
- Locations of metal fixtures and any associated damage;
- Types of soiling, and any adverse effects from previous cleaning operations;
- Damage caused by roots, ivy or other invasive organisms.

Survey recommendations

- Specification of any further monitoring or specialist investigation required for the diagnosis of defects;
- A five-year, prioritised schedule of suggested repairs, including removal or mitigation of safety hazards;
- Recommendations for maintenance and site management.

The report should identify any urgent work required, with a proposed timetable for repair. Where immediate intervention is not needed, the report should provide a schedule of vulnerable areas and make recommendations on the frequency of future inspections and the need for further specialist investigation (see Stage 3). If any metal components are of historic or architectural value, their repair or restoration might form the subject of a specialist survey and report by a metals conservator.

Data from the report could potentially be added to a Geographic Information System (GIS) database.

Stage 3

In order to diagnose more complex defects and inform the design of any repair or conservation treatments, the conservator or surveyor may recommend additional specialist studies. These may include:

- Chemical or physical analysis of render or backing materials, coatings, salts or soils by a chartered geologist, chartered chemist or other specialist, or by a UKAS-accredited laboratory with experience in the analysis of historic building materials (see Appendix B);
- A structural survey by a civil or geotechnical engineer with experience in historic structures, preferably using non-destructive diagnostic techniques (NDT) such as endoscopy, impulse radar, infrared thermography or magnetometry.

Monitoring

Before decisions can be made about the need for major interventions, it may be necessary to establish a monitoring programme, for example to determine structural stability. The scope of monitoring would be proposed in the Stage 2 or Stage 3 survey. The decay-mapping procedure adopted for the condition survey would be repeated, to determine the extent and severity of change in condition.

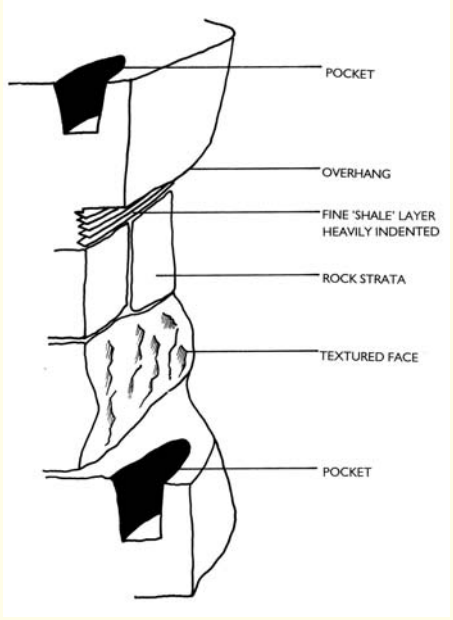
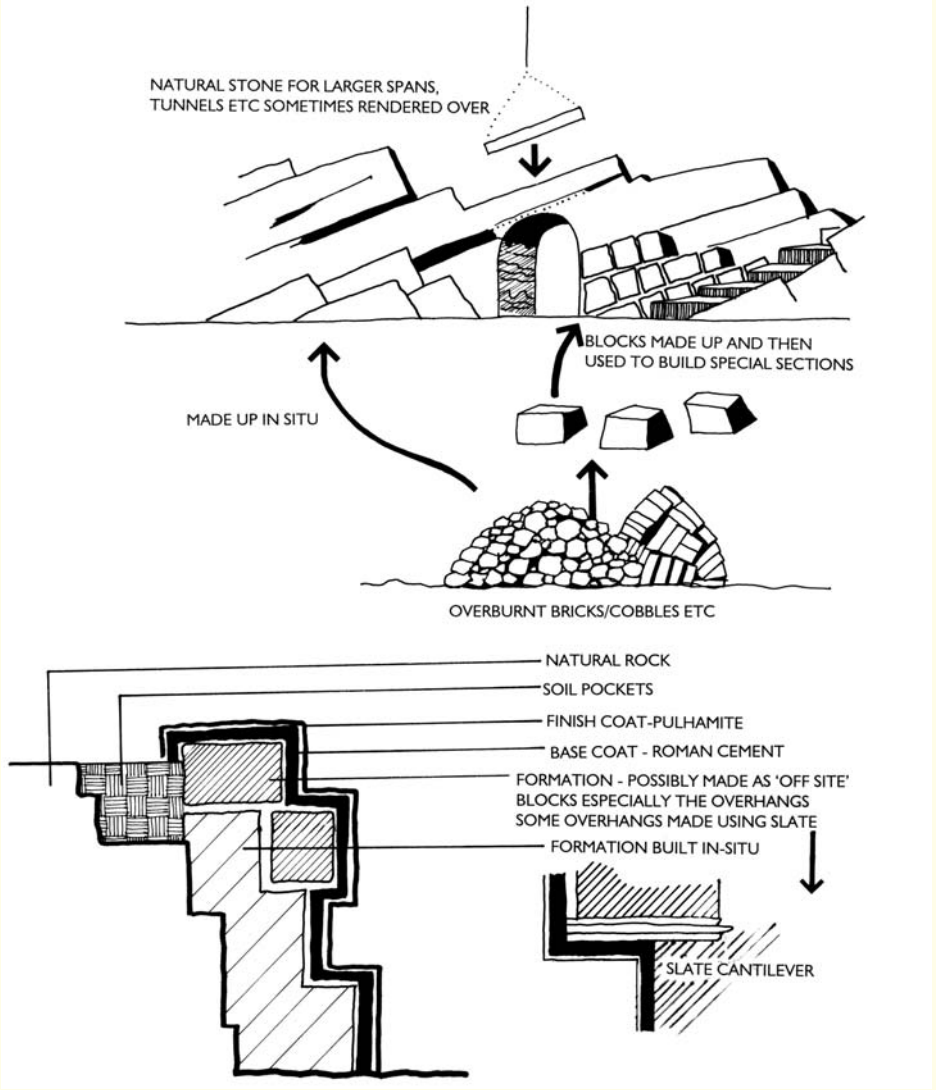
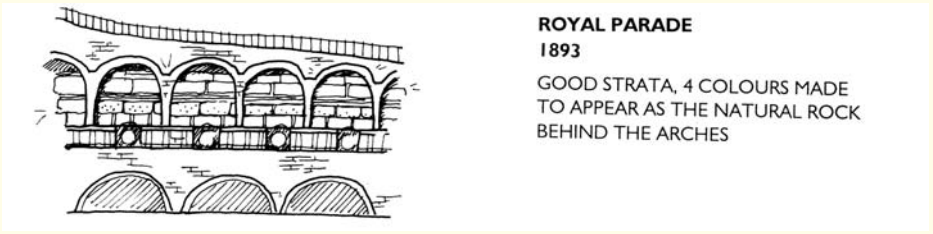
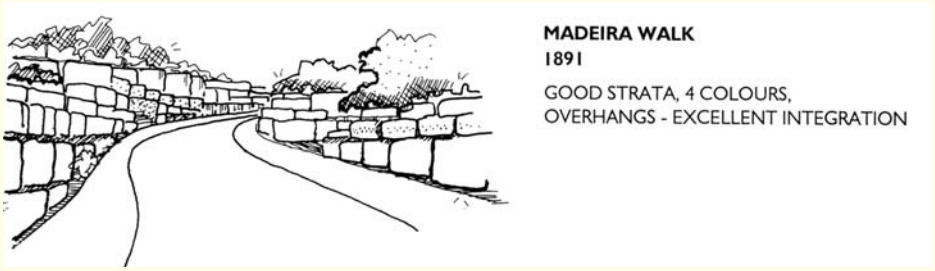


Fig 26 In planning the restoration of Pulhamite features at Ramsgate, consultants carried out an appraisal of various characteristics of the strata in three areas: Royal Parade, Winterstoke Undercliffe and Madeira Walk.
(© Land Use Consultants)







Conservation, Restoration and Maintenance

As well as developing an understanding of the significance of a site or feature, conservation management planning establishes policies for future management and maintenance for its conservation, as well as proposals for putting these policies into practice (see English Heritage 2007; Heritage Lottery Fund 2004).

Decisions concerning the treatment of a historic structure should be guided by standard conservation policies:

- Repairs must be kept to the minimum required to stabilise the site and to ensure its long-term survival, while preserving as much historic fabric and historic and aesthetic character as possible;
- As from October 2006, all public authorities have a duty to ensure due regard for the conservation of biodiversity;
- Any treatment should be based upon a thorough analysis of the fabric and its design, construction, materials and historical development;
- Removal of earlier repairs should be carried out only if there are compelling technical or aesthetic reasons for doing so, and must take account of the implications as regards loss of historical integrity;
- Restoration of lost or missing areas must be based on reliable information about their original character, and must not sacrifice surviving original material;
- All interventions should be fully recorded.

The wide variation in techniques used by the Pulham firm over nine decades, as well as variable current conditions, means that there can be no standard technical specification for repairs. Treatments need to be site-specific, although they are likely to include repairs to structure and surface render, steps, ornamentation and other features; restoration of altered landscaping (reinstatement of paths, bridges or rockwork along stream edges, for example); pruning, surgery or removal of trees and shrubs (due, for example, to inappropriate planting, regeneration of scrub or blocked views); screening of unsightly new features; and reinstatement of beds, borders, plant pockets and other planting.

Work should be carried out in favourable weather conditions, avoiding winter work in particular, and should include any protection necessary for the proper curing of renders or mortars.

Mortar analysis

Analysis of original render mortar is commonly a prerequisite for the design of repair renders for conservation. The objective is to identify original binders (cement or hydraulic lime), the type of aggregates (sand and/or crushed stone, shells or pebbles), their particle sizes and shapes. This will provide the basis for choosing materials for repair mortars, to match the colour and texture of original renders. Very skilled contractors may be able to match existing renders, with trials of a suitable palette of materials. Additional colour, if needed, should be achieved only with dry, stable pigments such as coloured iron oxides, charcoal or chalk whiting.

The analysis of original mortars used in the core is less essential. The aesthetic appearance of concealed material is not relevant, and the generic type of mortar binder will have been recorded in the condition survey (Stage 2).

Mortars for repair

Natural hydraulic lime and proprietary cements were used interchangeably throughout the 19th century, with grey Portland cement gradually overtaking the use of hydraulic lime.

Repair mixes for grouting, crack repairs and render patching can be based on either hydraulic lime or cement. Even though Pulhamite materials are relatively hard, dense and impervious, natural hydraulic lime has numerous advantages over cement. Firstly, a wide range of natural hydraulic limes with differing properties (including strength, hydraulicity, permeability and setting time) is available, providing flexibility in terms of repair options. Natural hydraulic lime is compatible with most known Pulhamite mixes, which themselves may contain hydraulic lime. Additionally, natural hydraulic lime is a low-shrinkage, flexible, vapour-permeable material, resistant to salts and frost and possessing good workability over a period of hours. In contrast, cement is stronger, less flexible and has poor vapour-permeable properties. These can be improved with the addition of non-hydraulic lime.

Mortar proportions are commonly 1 part natural hydraulic lime to 2–2.5 parts aggregate (by volume). Mixes of cement, non-hydraulic lime and aggregate range from 1:2:9 to 1:1:6. However, appropriate proportions depend on the types of aggregates and mortar properties required for any one application.

Non-hydraulic lime with reactive silica or alumina additives (called pozzolans; see Bibliography) produce a hydraulic set similar to that of hydraulic limes, and mortars with similar but weaker hydraulic characteristics. However, for hard and dense Pulhamite features, natural hydraulic lime mortars are more suitable.

Specification of a repair mortar should always consider the necessary performance requirements, based on the context of use, the local environment (eg if persistently damp) and the condition of the historical material subject to repair. Mortars that are much stronger than Pulhamite features are not appropriate. Specification should always be a matter of expert opinion.

Repair trials

Because of the surface texture, colour and modelling of Pulhamite render, sympathetic repair presents a technical challenge. For this reason repair trials are essential in order to establish suitable techniques, materials and standards. These should be undertaken as a prerequisite to the main repair contract and before a final specification for repair mixes is written. The approved exemplars are used as a standard to which all repairs must comply.

A programme of repair trials is likely to include crack filling, render patching and grouting, which may also require preliminary cleaning and the removal of plants or other biological growth. Subject areas should be representative of the main deterioration phenomena, but the choice should also reflect variations in site conditions (including, for example, especially sheltered areas or those subject to particularly heavy wetting). Repair trials should be limited in size and carried out in unobtrusive areas, with locations accurately recorded. They should be carried out in favourable weather conditions and should use reproducible materials and specifications. The performance of extensive trial repairs should, where feasible, be monitored for colour match and mechanical performance, ideally for around 12 months.

Render repairs

Where mechanical failure such as spalling or detachment of render faces, or cracking through the depth of a render coat, has occurred, repair is likely to involve small-scale grouting or injection of mortar, and cutting-out and patching using mortar mixes based on *in situ* trials. Cracked render and exposed backing masonry can only increase the potential for further damage, and repairs to such areas would be a priority. Fine surface cracking, crazing or soiling, and erosion that has not exposed core or backing, are not significant unless they occur in association with more severe render problems.

Tree roots which have caused damage or subsequently exploited cracks should, if possible, be removed before repairs are undertaken.

In areas where render has eroded to a very thin layer, core work may be visible beneath. Protection with fine surface 'shelter' coats

may be possible, again based on *in situ* trials, although it may be difficult to achieve a finish that matches original, weathered surfaces in terms of colour, texture, modelling and stratification effects. In all cases, sympathetic repair renders are essential to maintain the character of Pulham rock faces.

Grouting
Grouting is carried out to fill voids and cracks, and to re-adhere detached render. All areas to be grouted should be cleaned and flushed out with water and filled with a hydraulic binder, using small plastic syringes.

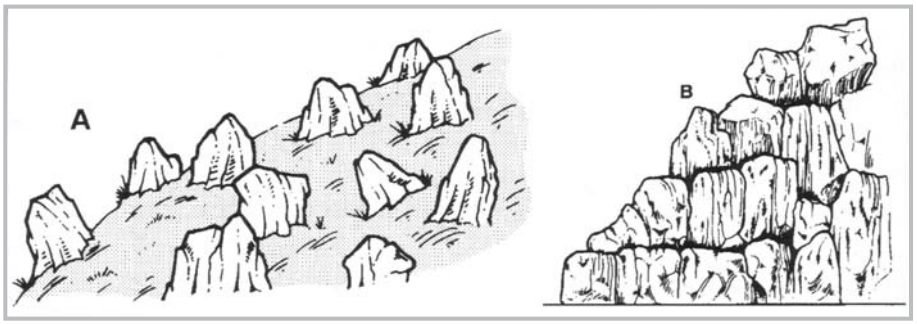
Repairs to cracks
Fine cracks (up to about 3mm wide) should be filled to stop water ingress and to control the risk of colonisation by ivy or other plants. Mixes should be slightly weaker than the surrounding render, to minimise the risk to original material in the event of movement.

For wider cracks, hydraulic mortar mixes of various strengths will be needed. Some undercutting (keying) or reinforcement with nylon or stainless steel pins or dowels may be necessary. A surface repair mortar, based upon in situ trials and matching surrounding areas in colour and texture, will form the final layer.

Surface patching
It is imperative that backing masonry be clean, dry and sound. All moss, plants and other organic debris must be removed, preferably by hand (see Vegetation control and replanting). The backing should be keyed by raking out brickwork joints, drilling holes in rubble masonry or concrete, applying a thin spatter coat, or a combination of these techniques.

Prior to patching, surfaces should be pre-wetted. Fills are built up in layers of 2 to 5mm thickness, allowing each to dry and partially harden before the next is applied. The Pulham stratification detail can be subtle and deliberately varied, so final coats need to be modelled carefully to match each local area, using tools like wire brushes and damp sacking, rather than applied uniformly across

Fig 27 Pulham detailing may include features such as this leaf imprint, or a buried shell. (© Simon Swann)



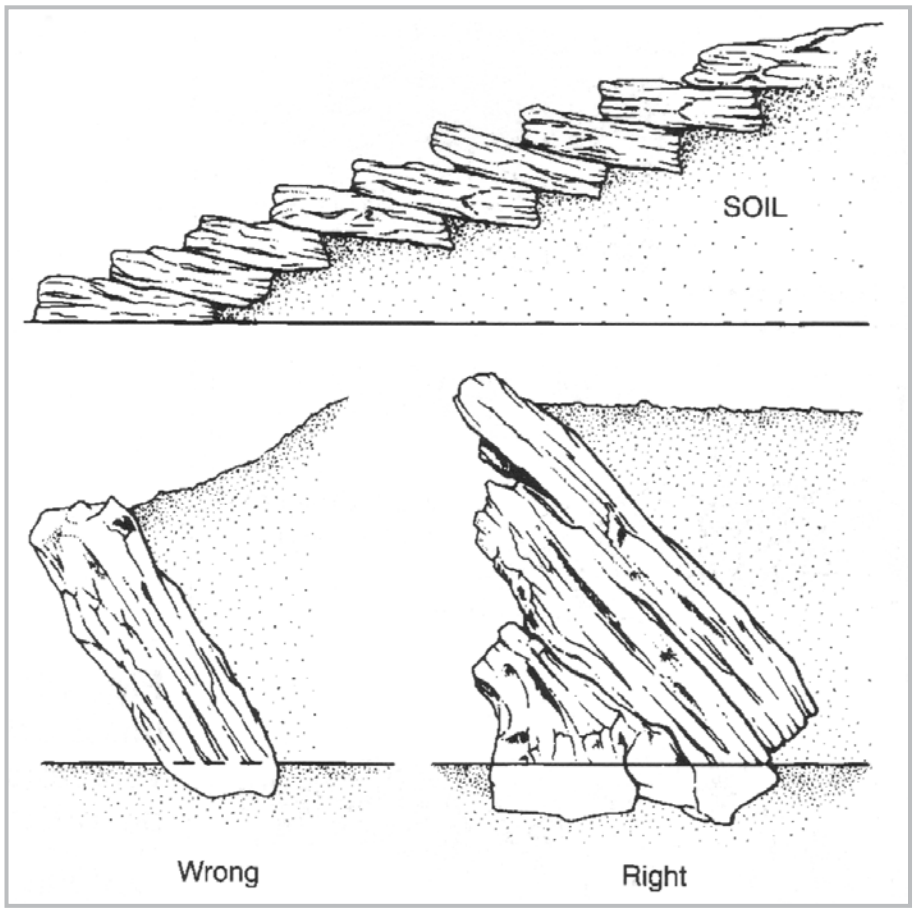
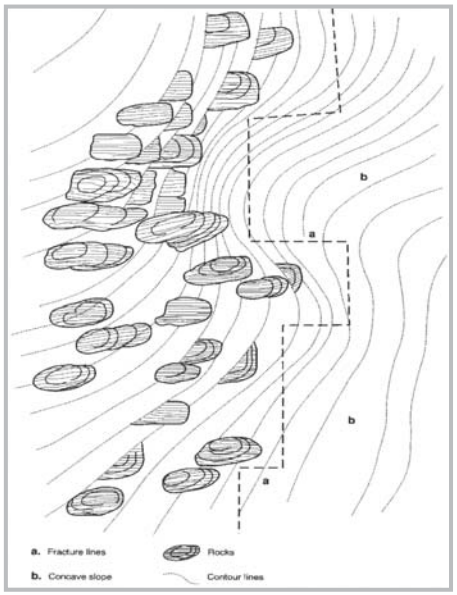


Fig 28 Diagrams from Doyle and Bennett (1996b) illustrate the construction of geologically realistic rockwork, taking account of massing, jointing, dipping and features such as fissures. (© The Geological Society)



whole stretches of rockwork. When the surface is dry but before it has cured, it should be given an appropriate finish using wooden tools such as small floats or spatulas. Rubbing or scraping back, which tends to lift out larger aggregate particles and produce an in appropriate surface, should be avoided. Any lime stains on adjacent surfaces should be removed immediately.

Metal fixtures
Where metal fixtures are embedded in masonry, rusting and expansion can cause major damage. Both ferrous and copper fixings may also cause staining; if this is visually disruptive it may require sensitive cleaning trials by a specialist. Important metalwork may require specialist treatment. For other metalwork there are two options: removal and *in situ* treatment. Factors affecting the choice include the type of metal and degree of corrosion or staining, the risk of further damage to original masonry or render, the risk of damage associated with removal, the design or structural importance of the component and the ease of access.

When severely rusted metal hardware is causing irreparable damage to historic fabric, there are few practical, cost-effective alternatives to removal. The metalwork should be cut out, using sharp chisels and/or masonry drills, in such a way as to minimise damage to sound render and masonry. New or replacement fixtures, if required, should be in stainless steel or phosphor bronze.

If removal is likely to cause severe damage to surrounding original material, *in situ* conservation may be possible. The component should be cleaned and prepared, and a protective coating applied. Ferrous components should also be de-rusted, and the coating should incorporate a rust-inhibiting primer. It is important to ensure that all rust and staining is removed and that the finished work contains no cracks, cavities or hollows that may trap water. Regular inspection of areas treated in this way is an essential part of continued maintenance.

A fairly common feature of publicly owned Pulhamite rockwork is the presence of handrails or safety barriers in hollow-section galvanised steel or other unsympathetic material, installed at a later date. Inspection will reveal whether such features pose a threat either to the Pulhamite render or to public safety. Where they are regarded as visually intrusive, detracting from the original character of the rockwork, their removal (and replacement with an alternative, if necessary on safety grounds) should be considered.

Structural repairs
If, as a last resort, it is necessary to rebuild damaged structures, these should first be recorded in sufficient detail to permit the reinstatement of the character and formation of the surface finish, including significant features such as brick burrs or textured banding. The design and construction of new faces needs to be as convincing as the original rockwork. As explained in Doyle and Bennett (1996b), this will involve considering the continuity of horizontal surfaces and their dip, the design of vertical joints, the relative size of the rocks within the scale of the slope, the massing of the rocks to form a new feature, and geological detailing.

To create a stable core, clean, salt-free bricks or blocks, or coursed masonry, should be used. It is important to ensure good bonding between old and new work, and to use stainless steel dowels and epoxy resin where necessary. Brickwork or stonework joints at the wall face should be cut back to provide a key for render.

Plant pockets
Plant pockets are especially vulnerable to root activity and moisture. Some may need only minor work such as crack filling, while others may have to be dismantled and partially rebuilt. In the latter case it will be necessary to clear them of plants and soil, mark each section with a reference number and make a photographic record of the dismantling process. Component parts should be inspected for damage, cleaned and safely stored. Reassembly is likely to entail re-fixing to the backing using stainless steel dowels or brackets and epoxy resin, and rebuilding using hydraulic lime mortar.

Plant pockets must have adequate drainage to prevent the accumulation of water. Where they are cleared of soil, drainage should be inspected and improved if necessary.

Underside repairs
Detaching render layers, as well as those on the undersides of tunnels, arches and caves, may be secured by grout injection followed by crack filling. Original slate backing is often problematic, as render does not adhere well to it. It may be necessary to remove poorly attached material, or to provide other protection adjacent to such features in public areas. Re-rendering may not be sufficiently secure to guarantee public safety. Feather edges of remaining render can be protected with mortar fillets.

Cleaning
Once soiling conditions have been surveyed and overall priorities established, cleaning may be considered necessary for aesthetic or technical reasons. Prior to cleaning, documented trials should be undertaken so that methods, materials and possible risks can be evaluated and standards agreed. Any contractor should be competent in the sensitive cleaning of historic structures. Where graffiti is encountered, a test-cleaning methodology should be devised, based upon the type of material applied. The range of cleaning techniques includes proprietary paint removers, air-abrasive systems and water-abrasive systems. These latter should be used at suitably low pressures, at safe application distances and with a soft abrasive medium.

Above all, cleaning must not physically abrade any surfaces, widen existing cracks, saturate the structure nor deposit harmful chemical residues. High-pressure water washing is not appropriate for Pulhamite because it is likely to abrade surfaces, affect render adhesion or bleach the original rockwork colours. During trials as well as actual cleaning work, cleaned areas should be reviewed both when wet and when dry. Heavy soiling (from soot or carbon deposits, for example) may be best left alone to avoid the risk of overcleaning, which can dramatically alter the appearance of rockwork by reversing the contrast between cleaned and soiled areas.

Fig 29 The 19th-century Pond Garden at Audley End was designed to be picturesque. The original planting scheme, with its succulents, shamrocks, ferns and evergreen Berberis shrubs, has been conserved by English Heritage. (© Andrew Widd)

Vegetation control and replanting

Control

Naturally established plants, fungi, lichens and algae can contribute as much to the aesthetic qualities of Pulhamite as the formal plantings. Most rockwork was meant to imitate natural geology, and the planting character was intended to be naturalistic as well (see below). Wild flowers and other plants that have colonised the rockwork may also be of interest from the point of view of nature conservation. However, if uncontrolled some of these can lead to deterioration of the Pulhamite, and overgrowth and natural plant succession can obscure the historic design and layout of the rock garden.

Vegetation management should be based on both an assessment of types and species and the risks they pose, as well as an understanding of their historical, aesthetic and design importance for the site. Any management strategy must distinguish areas where vegetation control is necessary for the protection of the Pulhamite substrate and supporting core, areas where it is desirable for aesthetic reasons and areas where it is unnecessary, uneconomical or even undesirable.

It should not automatically be assumed that climbing plants such as ivy pose a threat; any risk must be verified by inspection.
Even where the possibility exists of higher plants exploiting cracks and crevices in the render, their removal may pose its own problems. Deep woody roots should be treated with a suitable herbicide (but see below) and be allowed to die back before being extracted. A scalpel or stiff brush should be used to remove tendrils.

The impact of algae, liverworts and moss should be considered. Algae, while favouring damp, shady environments, are not intrinsically harmful to render or masonry and in any case will grow back even after treatment with biocides. Liverworts, which also require damp habitats, are unlikely to be harmful either. Moss, on the other hand, can trap moisture, which may lead to deterioration. Algal, liverwort and mossy surfaces can also pose slip hazards on paths.

Chemical herbicides and other biocides may contain salts or additives which could, with repeated use in the long term, adversely affect the render or its repair. As the effectiveness of biocides tends to be short-lived, retreatment will be likely, resulting in increasing salt concentrations. If biocide treatment is thought necessary, it is advisable to carry out the minimum treatment using minimum recommended doses, and the spot treatment of problem plants rather than blanket spraying of whole sections. This is not only more cost-effective, as the use of chemicals is reduced, but more environmentally sound. A second treatment can be applied if the first is not fully effective. The biocide approach is different for trees, shrubs and herbs and for mosses, lichens, algae and liverworts. Only approved biocides should be used.

Their use must comply with the 1994 Control of Substances Hazardous to Health Regulations (Environment Agency 1994) and be carried out by an appropriately qualified operator.

Physical removal of plants, roots and mosses should be done manually, using tools that will not damage Pulhamite surfaces. Maintenance cleaning by dry brushing or controlled washing are preferred where persistent and unsightly organic growth, such as algae, is present.

Replanting

The design of most Pulham sites included a unique planting scheme meant to enhance the 'natural' effect of its rockwork. Conservation may therefore need to include historically appropriate replanting. Such restoration should be based on the original design, as revealed by any surviving elements or by documentary or historical research, and should take account of the specific site conditions (including soil properties and character).

In *Picturesque Ferneries and Rock-Garden Scenery,* James Pulham II lists 'A few of the best hardy alpines and other plants', describing them as those 'adapted to grow on and about rocks, many of them variegated or evergreen, blooming in autumn or winter, and worthy of growing either for their beautiful foliage or flower, or long continuance in bloom; most of them perennial, and all hardy'.

As much original planting as possible should be retained, and a natural rather than a formal appearance preserved. Pulham's own suggestions in *Picturesque Ferneries and Rock-Garden Scenery* are worth bearing in mind:

- 'Rockwork should be made to appear natural to the place . . . raised where it is possible, so as not to be able to see over it, but so as to look up and see the planting on top . . .'
- '[There should be] trailing plants hanging down the face, e.g. woodbine, jasmine, etc.'
- 'The foliage about the rocks should have variegated kinds mixed judiciously with evergreen shrubs and choice trees, giving a more cheerful aspect, in the absence of flower in winter, as the golden yew, hollies, acubas, variegated rhododendrons, Japanese honeysuckle, periwinkle, etc.'
- 'Make a pool to water plants from, and for water lilies to grow in, also for the Osmunda ferns.'
- 'Shrubs should slope down to the water's edge and a variety of lilies and other aquatic plants at intervals, and ferns, especially hart's tongue …'

More recent planting which is in keeping in scale and species, well established and not deleterious, should also be retained. Climbing or trailing plants deemed to present no risk to the structure should be encouraged, but may be trimmed to allow some of the rockwork to show. Areas of overcrowding should be thinned and overgrown shrubs pruned or coppiced.

Replanting should be planned with the future maintenance requirements of the site in mind. Gaps that might tempt visitors to climb among the rocks can be minimised with sensitive, strategic replanting. Analysis of the composition and pH of existing soils will inform the selection of suitable species. A slow-release fertiliser may be needed.

Maintenance

For structural and surface repairs to rockwork, regular inspections are recommended for the assessment of stability and rates of deterioration, for example annually for two years and every five years thereafter. Major structural interventions may require more frequent inspections. Maintenance staff should be trained in basic techniques including cleaning, water feature management and responsible plant control. Where there has been replanting, annual mulching may be necessary for plant health. Weeds should be kept under control, and climbing or creeping plants managed in a manner that is sustainable, yet in keeping with the naturalistic feel of the rockwork. Above all, a natural effect should be maintained.

In an appendix on planting in *Picturesque Ferneries and Rock-Garden Scenery,* Pulham writes that 'There should be no trimming of shrubs with shears into conical, round or other formal shapes, but allow them to grow natural … When getting too large for the site, they should be cut with a knife so as not to shew having been cut, more than is possible.'

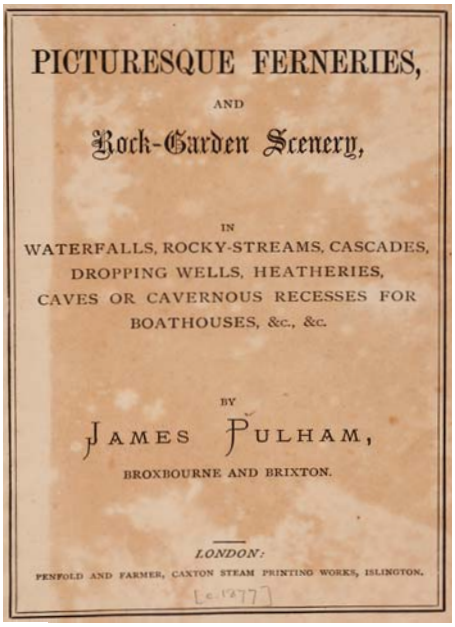

PICTURESQUE FERNERIES,
AND
Rock-Garden Scenery,
IN
WATERFALLS, ROCKY-STREAMS, CASCADES, DROPPING WELLS, HEATHERIES, CAVES OR CAVERNOUS RECESSES FOR BOATHOUSES, &c., &c.
BY
JAMES PULHAM,
BROXBOURNE AND BRIXTON.
LONDON:
PENFOLD AND FARMER, CAXTON STEAM PRINTING WORKS, ISLINGTON.
[c.1877]

Fig 30 The front cover of the Pulhams' prospectus, *Picturesque Ferneries and Rock-Garden Scenery* (Pulham c1877), which describes their rockwork and cites examples. (© RHS, Lindley Library)

Appendix A: A Gazetteer of Pulham Sites

This gazetteer is drawn from English Heritage's database on Pulham sites. The main sources of information on Pulham sites are the two Pulham prospectuses: *Picturesque Ferneries and Rock-Garden Scenery* (Pulham *c*1877) and *Hardy Herbaceous and Alpine Plants* (Pulham *c*1930s).

Further information on Pulham sites has come from a series of articles by Sally Festing, and from the many garden historians, landscape consultants and county gardens trusts who contributed to the English Heritage database when it was set up in 1998. Research for new entries for English Heritage's Register of Parks and Gardens of Special Historic Interest in England, and restoration projects, have identified more Pulham rockwork and features. Claude Hitching generously helped English Heritage update its records in 2006 based on his research for www.pulham.org.uk and his own planned book.

Sites are arranged by type: gardens and parks (including rock, water and formal); buildings; terracotta work; ferneries, rocky banks, alpineries and conservatories; dropping wells and pools; rocky recesses, grottoes and caves; and miscellaneous (including statues, gravestones and caves). All sites described by the Pulhams in *Picturesque Ferneries and Rock-Garden Scenery* are included, although some remain unidentified and are listed here only with the information (usually client name and approximate location) furnished in that publication. Some have since been demolished. Sites, and possible sites, listed in Pulham catalogues from the 1920s and 1930s are also identified. The gazetteer includes some sites considered possible but which remain to be verified.

Site information includes (where available) name and location, approximate completion date (or dates, where there was more than one phase of work), client name, references and, where known, additional details such as designer's name or designation status. An additional column indicates sites which are open to the public. Other properties can be visited by appointment, others are now hotels and conference centres, and many are private homes, schools, or businesses. Please check opening times and arrangements before visiting sites.

Site and client names (and spellings) are copied from the Pulhams' publications. Any references not corresponding to Bibliography entries are personal communications.

Suggestions for further sites to be included in the database can be sent to the Conservation Department (Gardens and Landscape), English Heritage, 1 Waterhouse Square, 138–142 Holborn, London EC1N 2ST. Please include any references which indicate that the rockwork or feature is Pulhamite.

Site name and location	Approximate completion date(s)	Client	References	Additional information	Open to the public?
Gardens and parks					
Abberley Hall, Worcs	by 1867	J L Moilliet	Festing 1997	Registered park and garden	
Abbots Pool, Abbots Leigh, Som	*c*1910s	W Melville-Wills	Festing 1984		Yes
Albion Place Gardens, Ramsgate, Kent	*c*1894	Borough of Ramsgate	Festing 1988	Registered park and garden	Yes
Apley Park, Bridgnorth, Salop	1873	W O Foster	Pulham *c*1877		
Ardross Castle, Ardross, Highland	*c*1900s	E White	Anon 1912 C Hitching *pers comm*	Inventory garden and landscape	
Ashton Court, Bristol	—	—	English Heritage register entry 2003	Registered park and garden	Yes
Ashton Gardens, Lytham St Anne's, Lancs	1916	Local authority	Francis 1977	F Harrison; Registered park and garden	Yes
Astley House, Shrewsbury, Salop	early 20C	Lt Col S H Gwyther	Pulham *c*1930s		
Audley End, Saffron Walden, Essex	1868	Lord Braybrooke	Pulham *c*1877	Registered park and garden	Yes (English Heritage)
Avenham Park, Preston, Lancs	1866; 1875	Preston Corporation (local authority)	Pulham *c*1877	Registered park and garden	Yes
(Site in) Barnet, now London EN5	1871	T Higgs	Pulham *c*1877		
Barrow Hills, nr Chertsey, Surrey	early 20C	—	Pulham *c*1930s		
Batsford Park, Moreton-in-Marsh, Glos	*c*1890s?; *c*1902	Lord Redesdale	Anon 1912 C Hitching *pers comm*	Registered park and garden	Yes

Site name and location	Approximate completion date(s)	Client	References	Additional information	Open to the public?
Battersea Park, London SW11	1866; 1870	HM Commissioner of Works	Pulham c1877 Anon 1873 Anon 1912 Festing 1984 R Stone *pers comm*	Registered park and garden	Yes
Bawdsey Manor, Bawdsey, Suff	1900	Cuthbert Quitter	Anon 1912 C Hitching *pers comm*	Registered park and garden	
Bayfordbury, Herts	1846	William Robert Baker	Anon 1885	Registered park and garden	Yes
13 Beach Lawn, Waterloo, Sefton, Lancs	1869; 1872	T H Ismay	Pulham c1877		
Bearwood, Wokingham, Berks	1879; 1885	John Walter	W G 1879 Festing 1984	James Tegg; Registered park and garden	
Beaudesert, Staffs	*c*1900s	Marquis of Anglesey	Anon 1912		
Bedwell Park, Essenden, Herts	1866	R C Hanbury	Pulham c1877		
Beechy Lees, Rochester, Kent	—	—	Festing 1997		
Berry Hill, Taplow, Bucks	1859; 1862; 1868	J Noble	Anon 1872 Pulham c1877 R Stone *pers comm*	Edward Kemp; Robert Marnock; Registered park and garden	
Bessemer House, Denmark Hill, Camberwell, London SE5	1871	Henry Bessemer	Pulham c1877 Elliott 1984		
Blackpool Seafront, Lancs	*c*1910s	Local authority	Francis 1977		
Blakesley Hall, Woodend, Northants	—	—	Thomas 1989		
Blankney Hall, Lincoln, Lincs	1866	Henry Chaplin	Pulham c1877		
Bodnant, Conwy, Caern	—	—	Festing 1997	Registered park and garden	Yes
Bracken Hill (Bristol Botanic Garden), Bristol	*c*1917; 1927	W Melville-Wills	Festing 1984	Registered park and garden	Yes
Brickendonbury, Herts	early 1900s	—	Kevin Jones		
Brighton Aquarium (Roof Garden), Brighton	1875	—	Pulham c1877 Elliott 1984		
Brockleton Court (probably Brockleton Hall), Brockleton, Worcs	1869	R Prescott Decie	Pulham c1877		
Brogyntyn, Oswestry, Salop	*c*1870s	J R Ormsby Gore	Pulham c1877	Registered park and garden	
Broomhill, Tunbridge Wells, Kent	1854; 1860	Sir D Salomons	Pulham c1877		
Bryn-y-Neuadd, Llanfairfechan, Conwy, Caern	1867	John Platt	Pulham *c* 1877	Registered park and garden	
Buckfield Keep Leominster, Herefs	1872	J Newman	Pulham c1877 C Hitching *pers comm*		
Buckhurst Park, Withyham, E Suss	late 19C	Earl de la Warr	Jan Woudstra *pers comm*	Registered park and garden	
Buckingham Palace, London	1904	HM Edward VII	Anon 1912 Festing 1984	Registered park and garden	

Site name and location	Approximate completion date(s)	Client	References	Additional information	Open to the public?
Burslem Park, Stoke-on-Trent, Staffs	1894	Local authority	Staffordshire Gardens Trust *pers comm*	Thomas H Mawson; Registered park and garden	Yes
Bushy House, Teddington, Mdx	—	—	Festing 1997	Registered park and garden	
Caen Wood Towers (now Athlone House), Highgate, London N6	1870	E Brook	Pulham c1877 Beresford 2005 *pers comm*	Edward Milner	
(Site in) Champion Hill, London SE5	1871	J C Im Thurn	Pulham c1877		
Cheshunt Cottage, Cheshunt, Herts	1858	J Levick	Pulham c1877		
Cliff Gardens and Town Hall Garden, Felixstowe, Suff	—	—	English Heritage register entry 2003	Registered park and garden	Yes
Clifton Hall Gardens, Clifton, Notts	—	—	Pulham c1877	Registered park and garden	
Colney House, Norwich, Norf	—	—	Festing 1997		
(Site in) Croydon, Surr (Coombe House?)	1848	R Sterry	Pulham c 1877 Sowan 2002		
(Site in) Cromer, Norf (probably Northrepp Hall, although other Buxton houses in Cromer are Colne House and Upton House)	1867	Sir Fowell Buxton	Pulham c1877		
Danesbury Park, Welwyn, Herts	1860	W J Blake	Pulham c1877		
The Dell, Egham, Surr	c1880s	Baron Schroder	Anon 1884 Anon 1891 Anon 1912 Festing 1984		
Dewstow House, Newport, Mon	1890s	Henry Oakley	www.pulham.org.uk	Registered park and garden	Yes
Donington Park, Castle Donington, Leics	1866; 1867	Marquis of Hastings	Pulham c1877		
Dunira, Comrie, Perth	early 20C	W G Macbeth	Pulham c1877	Inventory garden and landscape	
Dunorlan Park, Tunbridge Wells, Kent	1864	Henry Reed	Robson 1864 Luckhurst 1875 W H C 1881 Pulham c1877 C Hitching *pers comm*	Registered park and garden	Yes
Dunsdale, N Yorks (location unknown)	1866; 1872	J Kitchin	Pulham c1877		
Elm Bank, Arkley, Barnet, London	early 20C	E Hopkins	Pulham c1930s		
Fonthill Abbey, Fonthill Gifford, Wilts	1859; 1860	Marquis of Westminster	Pulham c1877		
Gatton Park, Reigate, Surr	c1912	Jeremiah Colman	Swann and Associates 1999 B Elliott *pers comm* C Hitching *pers comm*	Henry Ernest Milner; Registered park and garden	Yes
Gisselfeld, Denmark	1894	—	Festing 1988 Hayden 1987	Henry Ernest Milner	Yes

Site name and location	Approximate completion date(s)	Client	References	Additional information	Open to the public?
Glenart Castle, Arklow, Co Wicklow, Eire	1875	Lord Craysfoot	Pulham c1877 Anon 1912		
Gorddinog, Conwy, Caern	1869	Henry Platt	Pulham c1877		
The Grove, Craven Arms, Salop	early 20C	—	Pulham c1930s		
Gumley Hall, Gumley, Leic	1870	Capt Whitmore	Pulham c1877		
Gunnersbury Park, Hounslow, Mdx	1876	Baron L de Rothschild	Pulham c1877	Registered park and garden	Yes
Hanley Park, Stoke-on-Trent, Staffs	*c*1898	—	Staffordshire Gardens Trust *pers comm* C Hitching *pers comm*	Thomas H Mawson; Registered park and garden	Yes
The Hayes, Swanwick, Derb	1874	F Wright	Pulham *c* 1877		
Heatherden Hall, Iver, Bucks	early 20C	Col Grant Morden	Pulham c1930s		
The Hendre, Monmouth, Mon	—	Rolls family	Cadw 2001	Edward Milner; Registered park and garden	
Henley Hall, Tasley, Salop	*c*1910	—	Hussey 1946 Festing 1996	Registered park and garden	
High Leigh, Hoddesdon, Herts	1871	Robert Barclay	Festing 1988		
Highbury Hall and Park, Birmingham	1868; 1902	J Lamplough, J Chamberlain	Pulham c1877 Festing 1997	Edward Milner; Registered park and garden	Yes
Highnam Court, Gloucester, Glos	1862; 1884	Thomas Gambier Parry	Anon 1892 Anon 1899 B Elliott *pers comm* Pulham c1877 Festing 1984 Rockscapes Ltd nd (a)	Various Pulhamite features are listed; Registered park and garden	Yes
Hill Wood, Sydenham Hill, London SE26	1863; 1866	Alderman Stone	Pulham c1877 Festing 1988		
Hoddesdon Hall and Woodlands (now Rawdon Hall, Little Woodlands and The Orangery, Woodlands Close), Hoddesdon, Herts	1838; 1849; 1862	John Warner	Ayres 1842 Pulham c1877 Festing 1984		
Holly Hill Mansion , (now Holly Hill Woodland Park), Sarisbury, Hants	*c*1881	Quentin Hogg	Festing 1997 C Hitching *pers comm*	Edward Milner	Yes
Homestall, East Grinstead, W Suss	—	Lord Dewar	Pulham c1930s		
Hutton Hall, Guisborough, N Yorks	1869; 1874	J W Pease	Pulham c1877		
9 Hyde Park Gate, Kensington, London W8	1853	E W Cooke	Pulham c1877		
Iwerne Minster (now Blandford Clayesmore School), Forum, Dors	—	J H Ismay	Festing 1997	Edward Milner	
Kingswood Lodge, Egham, Surr	early 20C	—	Pulham c1930s		

Site name and location	Approximate completion date(s)	Client	References	Additional information	Open to the public?
Langley Park, Colnbrook, Bucks	1910	Sir Robert Harvey Bateson	H H T 1904 A C B 1915	Edward White; Registered park and garden	Yes
Leonardslee, Horsham, W Suss	1890s	Sir Edmund Loder	Festing 1984	Registered park and garden	Yes
(Site in) Lincoln, Lincs	*c*1870s	J Clayton	Pulham *c*1877		
(Site near) Liverpool	1870	G J Morris	Pulham *c*1877		
Lockinge, Wantage, Oxon	1864; 1871	F Lloyd Lindsay; Lady Overstone	Pulham *c*1877 Anon 1912	The house was demolished 1947	
London Zoo, London NW1	1910; 1913	Zoological Society	Festing 1988	Registered park and garden	Yes
Lower Leas, Folkestone, Kent	*c*1910s	Local authority	Francis 1977 Festing 1988	Listed Pulhamite caves	Yes
Luton Hoo, Luton, Beds	early 20C	Sir Julius Wernher	Pulham *c*1930s	Registered park and garden	
Madeira Walk, Ramsgate, Kent	—	—	Land Use Consultants 1998;1999; 2002	Listed rockwork	Yes
Madresfield Court, Great Malvern, Worcs	1880	Earl of Beauchamp	Pulham *c*1877 Ward 1888	Thomas H Mawson; Registered park and garden	Yes
Manley Hall, Manchester	1869	S Mendel	Pulham *c*1877		
Markham Brook, Abbots Leigh, Som	*c*1910s	W Melville-Wills	Festing 1984		
Marl House, Bexley, Kent	early 20C	Sir Robert Rogers	Pulham *c*1930s		
Merrow Grange, Merrow, Surr	1907	Francis Baring-Gould	Elliott 1984 Festing 1983	Listed rockwork, pond and other features; Registered park and garden	
Miller Park, New Park, Preston, Lancs	1864	Preston Corporation	Pulham *c*1877	Edward Milner; Registered park and garden	Yes
Moor Park, Preston, Lancs	1865; 1897	Preston Corporation	Pulham *c*1877	Edward Milner; Registered park and garden	Yes
Mount Coote, Limerick, Eire	early 20C	Lady Grenall	Pulham *c*1930s		
Mount Felix, Walton-on-Thames, Surr	1868	Mrs Ingram	Pulham *c*1877		
(Site in) Newport, Mon (probably Bellevue Park)	1893	Local authority	Anon 1912 C Hitching *pers comm*	Thomas Mawson	
The Node, Welwyn, Herts	*c*1911	Charles Nall-Cain, 1st Lord Brocket	Anon 1912 C Hitching *pers comm*		
Normanshurst Court, Battle, E Suss	1876	T H Brassey	Pulham *c*1877		
Oak Lodge, Kensington, London W8	1851; 1864	—	Pulham *c*1877	Robert Marnock	
Oakhill, Ipswich, Suff	*c*1910s	Sir D Ford-Goddard	Pulham *c*1930s	Rockwork is listed	
Orchardleigh, Frome, Som	1863	W Duckworth	Pulham *c*1877		
Osmaston Hall, Derby, Derb	1865	F Wright	Pulham *c*1877	Edward Milner	
The Palace, Bromley Civic Centre, Bromley, Kent	1870	Coles Child	Pulham *c*1877 Festing 1984		Yes

Site name and location	Approximate completion date(s)	Client	References	Additional information	Open to the public?
Park Hill (now known as St Michael's Convent, Park Hill), London SW4	1874	J Leaf	Pulham c1877	Folly is listed; Registered park and garden	
Promenade Gardens, Lytham St Anne's, Lancs	—	—	English Heritage register entry 2001	Registerd park and garden	Yes
Pavilion Gardens, Buxton, Derb	1870	Local authority	Pulham c1877	Edward Milner; Registered park and garden	Yes
Pierremont, Darlington, Co Durham	1869	H Pease	Pulham c1877 C Hitching *pers comm*		The fountain is now South Park, Darlington, which is open to the public.
Pierremont Park, Bradford, W Yorks	—	H Pease	Pulham c1877		
Poles Park (now Hanbury Manor Hotel), Hertford, Herts	1866	R Hanbury	Pulham c1877	Registered park and garden	
Ponsbourne Park, Hoddesdon, Herts	1858	—	Festing 1997 C Hitching *pers comm*		
Preston Hall, Maidstone, Kent	1875	H A Brassey	Pulham c1877		
Priory, Nutfield (now known as Nutfield Priory), Reigate, Surr	1873	J Fielden	Pulham c1877		
Rayne Thatch, Bristol	1910	W Melville-Wills	Festing 1984	Registered park and garden	
Rendcomb Park, Rendcomb, Glos	1866	Sir F Goldsmid	Pulham c1877		
River Gardens, Belper, Derbyshire	—	—	English Heritage register entry 2001	Registered park and garden	Yes
Rosherville Gardens, Gravesend, Kent	1869	—	Pulham c1877		
Ross Hall, Glasgow	1883	James Cowan	Festing 1997 C Hitching *pers comm*		
St Fagan's Castle, Cardiff	1876	Lady Mary Windsor Clive	Welsh Historic Gardens Trust 1996	Registered park and garden	Yes
St James's Park, London SW1	1895; 1899	Royal Parks	Festing 1984 Thomas 1989	Registered park and garden	Yes
St Stephen's Green, Dublin, Eire	1880	Lord Ardilaun	B Elliott *pers comm* Festing 1988 Francis 1977 C Hitching *pers comm* National Parks and Monuments Service 1980		Yes
Sandringham, Norf	1868; 1876	HRH The Prince of Wales	Pulham c1877 Festing 1984	William Broderick Thomas; Registered park and garden	Yes
Severn Grange, Worcester, Worcs	1875	E W Whinfield	Pulham c1877		
Sheffield Park Garden, Sheffield Park, E Suss	*c*1895	Earl of Sheffield	Festing 1984	Registered park and garden	Yes

Site name and location	Approximate completion date(s)	Client	References	Additional information	Open to the public?
Shipton Court, Shipton-under-Wychwood, Oxon	*c*1919	J G Thomson	Pulham c1930s C Hitching *pers comm*	Registered park and garden	
Smithills Hall, Bolton, Lancs	1875	H Ainsworth	Pulham c1877 R Stone *pers comm*	Registered park and garden	Yes
(Site in) Southgate, London N14 (Southgate House?)	1857	Mrs Walker	Pulham c1877		
Springfield Park, London E5	1871	C Jacomb	Pulham c1877	Registered park and garden	Yes
Stanmore Hall, Stanmore, Harrow, Mdx	*c*1900s	—	Anon 1912		
Staplehurst Hall, Staplehurst, Kent	1870	Henry Hoare	Pulham c1877		
Sundridge Park, Bromley, London	1874	S Scott	Pulham c1877	Registered park and garden	
Sunningdale Park, Sunningdale, Berks	*c*1899	Major W J Joicey	Wright 1899 C Hitching *pers comm*	Registered park and garden	
(Site in) Sydenham Hill, London SE26 (may be Kingswood House?)	1870	L Clark	Pulham c1877		
Swiss Garden, Old Warden, Beds	*c*1870s	—	Anon 1880	Registered park and garden	Yes
Thornby Hall, Thornby, Northants	*c*1900s	—	Anon 1912		
Thurnby Court, Thurnby, Leics	1871	J A Jackson	Pulham c1877		
Titsey Place, Titsey, Surr Festing 1997	1871	G L Gower	Pulham c1877	Registered park and garden	Yes
(Site in) Uxbridge, Mdx	1868	J H Cox	Pulham c1877		
Victoria Parade Gardens, Ramsgate, Kent	—	—	Land Use Consultants 1998; 1999; 2002	Listed rockwork	Yes
Waddesdon Manor, Waddesdon, Bucks	1874(?); 1892	Lord Rothschild	Anon 1912 Festing 1984 C Hitching *pers comm*	Registered park and garden	Yes (National Trust)
Warren House, Kingston-upon-Thames, Surr	early 20C	—	Pulham c1930s	Various garden features are listed	
Waverley Abbey, Farnham, Surr	1873	T Anderson	Pulham c1877		
Welbeck Abbey, Worksop, Notts	1863	—	Pulham c1877 Anon 1912 Festing 1997	Registered park and garden	
Welcombe Hall, Stratford-on-Avon, Warws	1870s	—	Pulham c1930s		
Westonbirt House, Tetbury, Glos	1875	R S Holford	Pulham c1877	Registered park and garden	Yes
Western Undercliffe, Ramsgate, Kent	—	—	Land Use Consultants 1998; 1999; 2002	Listed features	Yes
Winterstoke Gardens, Victoria Parade, Ramsgate, Kent	—	—	Land Use Consultants 1998; 1999; 2002	Listed sun shelter and rock garden	Yes
Wisley, Woking, Surr	1912	RHS	Anon 1912 Anon 1914 Hanger 1961 Festing 1984 Rulham 1913	Registered park and garden	Yes (RHS)

Site name and location	Approximate completion date(s)	Client	References	Additional information	Open to the public?
(Site in) Worcester, Worcs	1872	H Lee	Pulham c1877		
Worth Park (now known as Milton Mount Park), W Suss	c1895	Mountefiore	Anon 1912 C Hitching *pers comm*		Yes
Wotton House, Dorking, Surr	c1897	William John Evelyn	R Stone *pers comm* C Hitching *pers comm*	Registered park and garden	

Site name and location	Approximate completion date (s)	Client	References
Buildings			
Benington Lordship, Benington, Herts	1838	George Proctor	Pulham c1877 C Hitching *pers comm*
The Castle, Woodbridge, Suff	c1806	William Lockwood	Festing 1984 C Hitching *pers comm*
Royal Parade, Ramsgate, Kent	—	—	English Heritage listed building entry
Terracotta work			
The following sites with terracotta work are identified in *Picturesque Ferneries and Rock-Garden Scenery* (Pulham c1877). Starred (*) entries are also listed in the Gardens or Ferneries section.			
Botanic Gardens, Regent's Park, London	—	—	
*Brighton Aquarium (Roof Garden), Brighton	1875	—	Pulham c1877 Elliott 1984
*Clifton Hall Gardens, Clifton, Notts	—	—	Pulham c1877
*Dunorlan Park, Tunbridge Wells, Kent	1864	Henry Reed	Pulham c1877 C Hitching *pers comm*
Hartsholme Park, Lincs	—	—	English Heritage register entry 2002
Osborne House, IW	—	—	
*Pavilion Gardens, Buxton, Derb	1870	Local authority	Pulham c1877
*Pierremont Park, Bradford, W Yorks	—	H Pease	Pulham c1877 C Hitching *pers comm*
Preston Park, Brighton (or *Preston Hall, Maidstone, Kent?)	1875	H A Brassey	Anon 1912
Royal Summer and Winter Gardens, Westminster, London	—	—	
*Sandringham, Norf	1868; 1876	HRH The Prince of Wales	Pulham c1877 Anon 1912 Festing 1984
Scarborough Aquarium, Scarborough, N Yorks	c1877	—	
Southport Aquarium, Southport, Lancs	—	—	
Studley Royal, Ripon, N Yorks	1871	Earl de Grey	
South Kensington Museum (now Victoria and Albert Museum), South Kensington, London SW7	—	—	
Windsor Castle, Berks	—	—	
Wortley Hall, Wortley, Sheffield, S Yorks	—	—	

Site name and location	Approximate completion date (s)	Client	References
Ferneries, rocky banks, alpineries and conservatories			
Acacias, Reading	1891	George Palmer	Festing 1996 C Hitching *pers comm*
(Site in or near) Accrington, Lancs	*c*1870s	J Wilkinson	Pulham *c*1877
Aldenham Abbey, Aldenham, Herts	1876	F Durham	Pulham *c*1877 Anon 1912
Alscott Park, Stratford upon Avon, Warws	1870	G West	Pulham *c*1877
(fernery in or near) Alton, Hamps	1875	F Crowley	Pulham *c*1877
Ankerwycke House, Wraysbury, Mdx	1867	S J Anderson	Pulham *c*1877
(Site in) Beckenham, Kent	*c*1870s	Mason	Pulham *c*1877
(Site in) Beckenham, Kent	1873	H Austin	Pulham *c*1877
(fernery near) Berwick,-upon-Tweed, Northumb	1875	Earl of Durham	Pulham *c*1877
(Site near) Berwick-upon-Tweed, Northumb	*c*1870s	F Mather	Pulham *c*1877
(Site in or near) Bickley, Kent	1867	J Batten	Pulham *c*1877
(Site in or near) Birmingham	1870	F Osley	Pulham *c*1877
Blundeston Lodge, Lowestoft, Suff	1869	Mrs Johnson	Pulham *c*1877
(Site in) Brixton, London SW2	1876	J Kleinwort	Pulham *c*1877
Broxbourne, Herts, 136 Station Rd (James Pulham III's home)	*c*1860s	James Pulham III	Pulham *c*1877
Burlingham Hall, Acle, Norf	1873	Mrs Burroughes	Pulham *c*1877
(Site in) Champion Hill, London SE5	1871;1873	J Burbidge	Pulham *c*1877
(Site in or near) Chichester, W Suss	1869	Dubath	Pulham *c*1877
(Site near) Clapham Common, London SW4	1856	J P Gasiot	Pulham *c*1877
(Site in) Clapham Park, London SW4	1865; 1866	Miss Pipe	Pulham *c*1877
(Site in) Crouch Hill, London	*c*1870s	J Morris	Pulham *c*1877
(Site in) Croydon, Surr	1871	P Crowley	Pulham *c*1877
(Site in) Darlington, Co Dur	1869	E Pease	Pulham *c*1877
(Site in) Datchet, Berks	1865	J de Paricinni	Pulham *c*1877
(Site in) Downham, Bromley, Kent	1876	Sir T Hare	Pulham *c*1877
(Site in) Droitwich, Worcs	*c*1870s	J Corbett	Pulham *c*1877
(Site in) Dulwich, London SE21	1867	Miss Watkins	Pulham *c*1877
(Site in) Dulwich, London SE21	—	E Robinson	Pulham *c*1877
(Site in) Dulwich Wood, London SE19	1867	Edward Milner	Pulham *c*1877
(Site in) Forest Hill, London SE23	1865	J Fielding	Pulham *c*1877
(Site in) Forest Hill, London SE23	1869	H Moser	Pulham *c*1877
(Site near) Glasgow (Ross Hall)	1873	J Findlay	Pulham *c*1877
(fernery in) Goudhurst, Kent	1874; 1875	J Ridgway	Pulham *c*1877

Site name and location	Approximate completion date (s)	Client	References
(Site in) Grange Rd, Upper Norwood, London	1872	G F Neame	Pulham *c*1877
(Site in) Hailsham, E Suss	1872	Mrs Sinnock	Pulham *c*1877
Hallaton Hall, Hallaton, Leic	—	Sir Bache Cunard	Pulham *c*1877
Hampton Court House, Hampton, London	1875	Mrs Hewitly	Pulham *c*1877
(Site in) Handsworth, Birmingham	1870; 1871	S J Russel	Pulham *c*1877
Haydon Hall, Ruislip, Middx	1874	L J Baker	Pulham *c*1877 C Hitching *pers comm.*
(Site in) Hayes, Mdx	—	R Peill	Pulham *c*1877
(Site in) Hendon, London NW4	1872	F F Buffen	Pulham *c*1877
(Site in) Herne Hill, London SE24	1869	W Nicholson	Pulham *c*1877
(Site in) Hoddesdon, Herts	1874	A Manser	Pulham *c*1877
(Site in) Isleworth, Mdx	1869	H D Davies	Pulham *c*1877
Kelvingrove Park, Glasgow	—	J Findlay	C Hitching *pers comm.*
Kenyon Hall, Lancs	1873	J Johnson	Pulham *c*1877 C Hitching *pers comm.*
Knott's Green House, Leyton, London E10	*c*1870s	J G Barclay	Pulham *c*1877
Lamberhurst Court Lodge, Lamberhurst, Kent	1868	W C Morland	Pulham *c*1877
(Site in) Leek, Staffs	1875	Mrs Bradshaw	Pulham *c*1877
(Site in) Leicester	1822?	J Stafford	Pulham *c*1877
(Site in) Leicester	1870	J Thorpe	Pulham *c*1877
(Site in) Leicester	1872	A Turner	Pulham *c*1877
(Site in) Leicester	1874	H Snow	Pulham *c*1877
(Site in) Leicester	1871	A J Hamel	Pulham *c*1877
Leyswood House, Withyham, E Suss	1873	James Temple	Pulham *c*1877
(Site in) Lower Clapton, London E5	1861	F Berger	Pulham *c*1877
(Site in) Norbiton, Surr	1872	J Dunville	Pulham *c*1877
Norland House, East Dulwich, London SE22	1863	S H Mountain	Pulham *c*1877
(Site in) Nottingham	1876	J Patchet	Pulham *c*1877
(Site in) Nottingham	1872; 1874	J Booth	Pulham *c*1877
(Site in) Oldham, Lancs	1867	J Platt	Pulham *c*1877
The Orchard, High Cross, Tottenham, London N17	1860s	James Pulham II	Pulham *c*1877
(Site in) Peckham, London SE15	1869	E W Allen	Pulham *c*1877
Ribbleton Hall (now Grange Park), Preston, Lancs	1868	Lt Col Thomas Birchall	Pulham *c*1877 C Hitching *pers comm.*
Roydon Hall, Yalding, Kent	1871	T Collin	Pulham *c*1877
Ryston Hall, Downham Market, Norf	1875	J Pratt	Pulham *c*1877
St Albans Court, Nonington, Kent	—	W O Hammond	Pulham *c*1877
(Site in) Southend, Essex	—	Major Foster	Pulham *c*1877

Site name and location	Approximate completion date (s)	Client	References
(Site in) Streatham, London SW16	1866	T Hicks	Pulham *c*1877
(Site in) Sydenham, London SE26	1869	H Gover	Pulham *c*1877
(Site in) Sydenham, London SE26	1869	W J Mace	Pulham *c*1877
(Site in) Sydenham Hill, London SE26	1869	F Peek	Pulham *c*1877
(Site in) Thetford, Norf	1871	C H Fison	Pulham *c*1877
(Site in) Torquay, Devon	1873	J P Chatto	Pulham *c*1877
(Site in) Tunbridge Wells, Kent	1860	F Wilson	Pulham *c*1877
(Site in) Warrington, Lancs	1874	Mrs Crossfield	Pulham *c*1877
(Site in) West Wickham, Kent	1866	J Stewart	Pulham *c*1877
Wimbledon Park, Merton, London SW19	—	N C Tuley	Pulham *c*1877
(Site in) Winchmore Hill, London N21	1867	J Wigan	Pulham *c*1877
(Site in) Woodford, Essex	1868	H F Barclay	Pulham *c*1877
(Site in) Woodford, Essex	1873	E N Buxton	Pulham *c*1877
Woodseat, Uttoxeter, Staffs	1865	C Campbell	Pulham *c*1877
Wroxall Abbey, Wroxall, Warws	1868	J Dugdale	Pulham *c*1877

Dropping wells and pools

Barham Court, Canterbury, Kent	1870	R Leigh	Pulham *c*1877
(Site in) Brixton, London SW9	1873	J McArthur	Pulham *c*1877
(Site in) Sydenham Hill, London SE26	1874; 1875	Dr Barry	Pulham *c*1877
(Site in) Gipsey Hill, London SE19	1871	Aston	Pulham *c*1877

Rocky recesses, grottoes and caves

Clifton Hall, Nottingham	—	—	Pulham *c*1877
Henham Hall, Henham, Suff	1873	Earl of Stradbrooke	Pulham *c*1877
(Site in) Singleton, Lancs	*c*1870s	F Miller	Pulham *c*1877
Woolhampton Hall, Berkshire	*c*1870s	J B Blythe	Pulham *c*1877 C Hitching *pers comm*

Miscellaneous

Pulham family monument, Cheshunt Cemetery, Cheshunt, Herts	*c*1915	Pulham family	B Elliott *pers comm*
(Site in or near) Chislehurst, Kent	1867	J Green	Pulham *c*1877
(Site in) Enfield, Mdx	—	Revd J Harman	Pulham *c*1877
Hannaford Manor, Hannaford, Devon	—	—	
Mulready monument, Kensal Green Cemetery, London W10	1867	South Kensington Museum (now Victoria and Albert)	Francis 1977 Elliott 1984
(Site in) Isleworth, Mdx	1869	J Piggot	Pulham *c*1877
Manchester Aquarium, Manchester	1875	—	Pulham *c*1877
Wick Hill, Warfield, Berks	1876	Way	Pulham *c*1877

Site name and location	Approximate completion date (s)	Client

Sites listed in Pulham catalogues from the 1920s and 1930s

The following sites are listed in James Pulham & Son catalogues from the 1920s and 1930s.
Starred (*) entries are also listed in the Gardens, Terracotta or Ferneries section.

Vases, Corehouse, Lanark, S Lanarkshire	1858	M C Cunningham
Seat and Flower Stand (probably for *Northrepps), Cromer, Norf	1867	Lady Buxton
Vases, *Studley Royal, Ripon, N Yorks	1871	Earl de Grey
Vases, *Glenart Castle, Arklow, Co Wicklow, Eire	1876	Earl Carysfort
Jardiniere, Penshurst, Kent	1880	Sir James Nasmyth
Balustrade, *Severn Grange, Worcester, Worcs	1881	E W Whinfield
Unspecified Pulhamite, Normanhurst Court, Battle, E Suss	1886	T H Brassey
Unspecified Pulhamite, Juniper Hill, Dorking, Surr	1887	T H Bryant
Unspecified Pulhamite, *Madresfield Court, Great Malvern, Worcs	1890	Rt Hon Earl Beauchamp
Vases, *Welbeck Abbey, Worksop, Notts	1892	Duke of Portland
Vases, Trent Park, Barnet, London	1894	F A Bevan
Unspecified Pulhamite, Clonroche, Wexford, Eire	1915	Lady Carew
Fountain, Dutton Manor, Longridge, Preston, Lancs	1920	A Norman Dugdale
Vases, Sherborne House, Northleach, Glos	1922	Lady Sherbourne
Vase, Chetnole, Oatlands Ave, Weybridge, Surr	1925	Mrs A C Thompson
Vase, The Gables, The Parade, Monmouth, Mon	1925	Miss Steriett
Fountain, Leigh Wood, Combe Martin, Devon	1925	F King Snell
Birdbath, 626 Mansfield Rd, Nottingham, Notts	1925	Mrs Glover

Site name and location	Approximate completion date (s)	Client	References

Possible sites

In addition to the confirmed sites listed above, there are a number of rockwork features which look like Pulhamite, but for which documentary evidence has not to date been found.

Aldenham Park, Herts	—	—	
Allerton Priory, Allerton, Lancs	—	—	
Ardeley Bury, Herts	—	—	
Beechwood, Newport, Mon	1880s	George Fothergill	
Bushy House, Teddington, Mdx	—	—	
Cavenham Park, Cavenham, Suff	*c*1901	H E M Davies	
Colesdane, Harrietsham, Kent	—	—	
Cotham House (now Bristol Homeopathic Hospital), Bristol	—	W Melville-Wills	
Eythrope (The Pavilion), Waddesdon, Aylesbury, Bucks	—	Baron Ferdinand de Rothschild	R Stone *pers comm* C Hitching *pers comm*
Hardwick House, Whitchurch, Oxon	1880s	D T Fish	
Marine Park, South Shields, Co Dur	—	—	F Green *pers comm*
Nymans, West Suss	—	—	English Heritage register entry 2000
Polesden Lacey, Surr	—	—	
Talacre, Flints	—	—	
Winterbourne, Teignmouth, Devon	*c*1880s	—	W G 1886

Appendix B: Sources of Advice and Information

Parks and gardens of historic interest

In England, parks and gardens are recorded and protected through English Heritage's *Register of Parks and Gardens of Special Historic Interest in England.* There is a growing knowledge and recognition of these sites and an increasing number of complementary inventories of historic landscapes of local significance. There are over 40 Pulhamite rock gardens and structures included in the *Register,* and others which are designated as listed structures.

The designation systems are different in Wales, Scotland and Northern Ireland. In Wales, Cadw (Welsh Historic Monuments) has published a *Register of Landscapes of Outstanding Historic Interest in Wales* (Cadw 2001). The register includes other historic landscapes as well as parks and gardens. The Scottish *Inventory of Gardens and Designed Landscapes* (1997) is the responsibility of Historic Scotland. The *Northern Ireland Heritage Gardens Inventory* was championed by the Northern Ireland Heritage Gardens Committee (1992) and records significant extant or extinct sites. The English and Welsh designation systems are undergoing reform. Proposals include new unified registers, bringing together the systems of listed buildings, scheduled monuments and registered parks, gardens and battlefields.

Individual register entries and maps for parks and gardens in England can be obtained from:

National Monuments Record Centre
English Heritage
Kemble Drive
Swindon
SN2 2GZ
Tel: 01793 414600
Fax: 01793 414606
Email: nmrinfo@english-heritage.org.uk

More information about the registers and inventories is available online:

- **England** www.english-heritage.org.uk/heritageprotection
- **Wales** www.cadw.wales.gov.uk > legislation > parks and gardens
- **Scotland** www.historic-scotland.gov.uk/index/gardens.htm
- **Northern Ireland** www.ehsni.gov.uk/grdninvent.pdf

Terracotta

This publication concentrates on the Pulhams' rockwork rather than their terracotta products. The revival of terracotta in the 1850s and the fashion for brightly coloured façades is well documented in other publications such as Michael Stratton's *The Terracotta Revival* (Stratton 1993), and conservation of British terracotta is covered in John and Nicola Ashurst's *Practical Building Conservation, Vol 2: Brick, Terracotta and Earth* (Ashurst and Ashurst 1988).

There were many other manufacturers of terracotta products, including M H Blanchard and Co, Doulton and Co and A Wilson and Sons. The Pulhams were commissioned along with these three firms to supply decorative terracotta for the Victoria and Albert Museum, London.

Conservation specialists in the UK

The Conservation Register
(a register of professional conservators)
Institute of Conservation
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Downstream Building
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Tel: 020 7785 3804
Fax: 020 7785 3806
Website: www.conservationregister.com

The Building Conservation Directory
(a commercial and non-vetted directory of specialist contractors, products and services, plus articles on building conservation)
Cathedral Communications Ltd
High Street
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Tel: 01747 871717
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RICS Contact Centre
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Westwood Way
Coventry
CV4 8JE
Tel: 0870 333 1600
Fax: 020 7334 3811
Website: www.rics.org.uk

Accredited testing and analytical laboratories

United Kingdom Accreditation Service (UKAS)
21–47 High Street
Feltham
Middlesex
TW13 4UN
Tel: 020 8917 8400
Fax: 020 8917 8500
Email: info@ukas.com
Website: www.ukas.com

Glossary

Aggregate A term used for fragments of broken stone, gravel, sand, slag or similar inert material used as a filler in, and forming a substantial part of, materials such as plaster, mortar and concrete. The choice of grain size depends upon the use to which the aggregate is to be put, there being strict specifications for plaster, mortars, concrete and other materials. A mortar's performance will depend heavily on the quality and grading of its aggregate.

Argillaceous Containing clay minerals or clay-sized particles.

Artificial cement (see Cement)

Binder The medium or vehicle that binds together the particles of aggregate in a mortar, render or concrete, or the pigments and fillers in a coating (in a mortar or render the binder is usually lime or cement).
The binder coats each particle and fills the voids between them, and it is the drying or curing of the binder that causes a mortar or coating to set. Its drying or curing properties and the proportion of binder to aggregate are very important in determining the durability of a mortar.

Blistering Deformation of an outer layer of material, forming hollow blisters or swelling of a surface.

Bond In brickwork, the method of laying bricks so that they overlap and form a course.

Brick burr A lump of misshapen, fused or overburnt brick, discarded after burning.

Calcining Prolonged heating at high temperatures.

Cement A combination of argillaceous and calcareous (limestone) compounds, burned at a controlled temperature and pulverised to produce a powder that hardens by chemical reaction with water. Cements typically contain 25 to 40 per cent silica and alumina and will set very rapidly (15 minutes to one hour) under water.

Natural cements are a class of hydraulic materials distinguishable from eminently hydraulic limes (see Hydraulic limes) by their higher silica and alumina content. They are produced by burning argillaceous limestones with a high clay content, and their characteristics are somewhere between those of eminently hydraulic limes and modern artificial cements. Unlike hydraulic limes, calcined natural cements cannot slake in lump form (because there is no free lime) and must be ground before use (*see also* Parker's Roman Cement).

Artificial cements are very strong, extremely hydraulic materials made by blending limestone with other materials – shales,

clays, iron oxides and sometimes sands – that contain calcium and aluminium silicates and iron. The mixture is usually burned in a kiln at high temperature (over 1300°C) and cooled, producing a clinker which is then ground to a fine powder (see Portland cement). Older artificial cements were not fired at lower temperatures and therefore only have a strength similar to that of Roman Cement.

Coade Stone A type of stoneware made from clay, crushed flint, soda glass and other materials, fired slowly over several days to produce a very durable artificial stone with a hard surface finish. It was used in the 18th and early 19th centuries for monuments and other objects. A related material was the terracotta-like artificial stone developed in the 19th century by the Pulhams for cast ornamentation and decoration.

Conservation The process of managing change in ways that will best sustain the values of a place in its contexts, and which recognises opportunities to reveal and reinforce those values (English Heritage 2006).

Conservation management plan A document which sets out the significance of a site and how that significance is to be retained in any future use, alteration, repair, restoration, management or development. The plan includes a specific set of actions or proposals for the management and maintenance of the site (Heritage Lottery Fund 2004). A *Conservation statement* is a synopsis of the significance of the site, features and characteristics, to serve as a guide to management decisions.

Efflorescence Crystalline deposits (ranging from loose and powdery to hard and compact), resulting from the evaporation of water from a salt solution, which can form on the surface of a porous material exposed to air.

Endsocopy A non-destructive technique for localised visual examination of small hollows or cavities using an endoscope, which consists of a flexible tube attached to a light source and viewing system (a video monitor or eyepiece), through which images are transmitted via fibre-optic cables.

Gauging The use of a box ('gauging box') or bucket of standard volume to measure the precise quantities of material needed to make a given mortar; alternatively, the addition of a precise quantity of further material (for example, of Portland cement to a lime–sand mortar).

GIS (Geographic Information System) A general term for computer-based documentation systems which can accept a variety of inputs – including text, numerical data, charts, maps, graphs and photographs – to generate multidimensional digital maps or profiles of a site or surface. These profiles can then be viewed in terms of selected viewpoints or data, with 'layers' of data added or subtracted according to specific needs.

Granulation The disaggregration of material into loose powder or granules.

Gunnite A sprayed-on mortar of Portland cement and sand (typically in a ratio of around 1:3) used for repair and finishing, usually of vertical surfaces. It is mixed dry and applied through a hose with water added at the nozzle, and is commonly used for tunnel linings, swimming pool walls, tanks, columns and other situations where poured concrete would be impractical. A minimum 20mm thickness is usually specified.

Hydraulic lime A form of lime which will set and harden under water, primarily through chemical reaction with the water (in contrast to non-hydraulic limes, which harden by reaction with carbon dioxide in the air; see Non-hydraulic lime). Hydraulic limes contain varying amounts of calcium silicates, calcium aluminates and calcium hydroxide, produced either by the burning of clay-rich (argillaceous) limestones or by the addition of various hydraulic materials.

A commonly used system for the classification of hydraulic limes (Cowper 1927) grades hydraulicity by the total proportion of silica and alumina present. According to this system, the most hydraulic limes ('eminently' or 'very' hydraulic limes) have a silica and alumina content of 18 to 25 per cent (see Cement). Hydraulic limes are currently classified, in *Building Lime: Definitions, Specification and Conformity Criteria* (British Standards Institution 2001), by short-term compressive strength gain. They may consist entirely of natural materials or of a variety of unspecified materials, including cement. Hydraulic limes are only available in powder (hydrated) form.

Impulse radar A non-destructive imaging technique that interprets velocity variations of radio waves passed through a structure to reveal voids, discontinuities and buried features.

Infrared thermography A non-destructive imaging technique (also referred to as thermal imaging) which uses a 'thermal camera' to measure the amount of heat energy generated by various surfaces. The technique is useful for detecting dampness, voids, consolidations and hidden metals within a structure.

Keying The preparation of a surface to ensure that a render or mortar adheres securely to it, for example by raking out old joints or cracks prior to pointing or by applying a thin, strong, coarse mix (stipple, spatter or spatterdash coat) to otherwise smooth brickwork prior to rendering.

Lithology Description of rock structures in terms of characteristic features such as component parts and colour.

Lockwood's Portland Stone Cement A proprietary 'cement' used by the Pulhams, manufactured from an eminently hydraulic lime and so named because of its similarity in colour to Portland stone.

Magnetometry Metal detection, to locate buried ferrous components.

Maintenance A programme of actions taken to forestall damage or deterioration. The key to successful preventive maintenance is planning. The organisation and commitment of resources, the scheduling of inspections and tasks, and monitoring to ensure continued performance are key features of a planned preventive maintenance (PPM) programme. In practice this and corrective maintenance (for rectifying an existing problem) may overlap.

Mapping A procedure for recording and classifying the physical character and condition of a site or feature. In the survey and diagnostic phases of intervention, mapping facilitates the evaluation of materials and the distribution, type, intensity and (when applied over time) rate of their deterioration. As applied to monuments, its aim is to record and graphically express damage characteristics in the form of a damage map.

Medina Cement A light brown, quick-setting natural cement, similar to Parker's Roman Cement but stronger, manufactured from septaria (calcined nodules of argillaceous limestone) found on the Isle of Wight.

Natural cement (see Cement)

Non-hydraulic lime (also known as 'putty' lime) Lime which will not set by chemical reaction with water but requires exposure to carbon dioxide in the air in order to harden. Unlike hydraulic limes (see Hydraulic lime), it is derived from pure limestone. It is commercially available in powder (hydrated) or putty form.

Parker's Roman Cement A quick-setting natural hydraulic cement – also called Roman Cement – made from septaria (calcined nodules of argillaceous limestone) from the Thames estuary, typically combined with sand at 1:1 or 1:2, and patented in 1796 by James Parker.

Portland cement An artificial cement (see Cement) – stronger and more durable than Roman Cement – made from limestone mixed with clay or shale and water, and fired in a kiln at 1300–1500°C to produce a clinker which is cooled and ground. The name derives from its colour, similar to that of Portland stone from Dorset. Its invention is credited to Joseph Aspdin, who patented it in 1824. Large-scale production and use of Portland and similar artificial cements began in the 1850s, although the modern rotary-kiln process and standard specifications for Portland cement only date from the turn of the 20th century.

Pozzolans Materials consisting of silica and alumina which react with calcium hydroxide in the presence of moisture to produce a hydraulic set, with properties like hydraulic lime (see Hydraulic lime). Pozzolans are derived from natural sources such as volcanic earth or from manufactured ones such as low-fired clay products.

Pulhamite A term used for at least two different materials manufactured by the Pulhams, one a render material (described by the Pulhams as a 'cement') made from eminently hydraulic lime (or in some cases a natural cement) and aggregate and used from the late 1830s until at least the 1870s in rockwork features; and the other a stone-coloured terracotta material used from the 1840s into the 20th century for pre-cast garden and architectural ornaments.

Pulham's terracotta (see Pulhamite)

Render A durable, protective coating, usually of lime, cement or a combination of the two, gauged with sand and applied to an external wall or surface, generally in two or more coats.

Repair Along with routine maintenance, the process of sustaining the value of historic places which are subject to natural decay. Cyclical renewal – for example, Pulhamite plantings – will also be needed. Repair works must be sufficient to maintain sound structural condition and ensure long-term survival. Further guidance is given in *Conservation Principles for the Sustainable Management of the Historic Environment* (English Heritage 2006).

Restoration *Conservation Principles for the Sustainable Management of the Historic Environment* (English Heritage 2006) defines 'restoration' as 'to return to a known earlier state'. Principles underlying restoration work must include: that the value of what is to be revealed or recovered very clearly outweighs the value of what is to be lost; that the proposed work is justified by adequate evidence of the previous form; that the current state and the form in which it survives are not the result of an historically significant event; and that no obvious incongruity arises from the creation of something that has never previously existed as an entity. Further guidance is given in *Conservation Principles.*

Roman Cement (see Parker's Roman Cement)

Sampling The taking of material samples in order analyse or identify the physical and chemical properties of building materials, coatings, deposits, contaminants, colonising plants, micro-organisms or chemical treatments.

Septaria Calcined nodules of argillaceous limestone.

Spalling The detachment of surface layers as large flakes, scales or lenses. In the case of renders the term refers to the detachment of individual layers in the form of fragments of varying size but of more or less uniform thickness.

Stitching A repair technique using pins, ties or anchors of brick, tile, stainless steel, nylon or other relatively inert material, combined with grouting or mortar repair procedures to restore structural strength to cracks or weak joints in masonry or other construction.

Stratigraphy The layers, or bedding planes, of sedimentary or metamorphic rocks.

Terracotta A durable ceramic used in architecture and garden ornamentation, produced from high-grade clay mixed with fine sand and pulverised fired clay and fired at high temperature (see *also* Coade stone; Pulhamite); more generally, a low-fired, generally unglazed, ceramic clay or clay product.

Thermal imaging (see Infrared thermography)

Tufa A spongy, porous geological form created by the precipitation of calcareous material through rocks.

Bibliography

The bibliography is divided into historical magazines, catalogues and other documents, and contemporary publications.

Selected historical magazines, catalogues and other documents

A C B 1915 'Langley Park'. *The Gardeners' Chronicle i* **57** (2 January 1915), 7–8

Anon late 19th C, 25-stanza advertisement for a Pulham fernery (The Gerish Box on Broxbourne, Herts RO, Hertford)

Anon 1822 'Lockwood's Portland Cement: For fronts of houses and buildings' (advertisement). *Ipswich Journal*, (9 February 1822), 3

Anon 1859 'Visits to art-manufactories, No 1: The terra-cotta works of James Pulham, Broxbourne'. *Art Journal New Series* **5** (1859), 25–8

Anon 1872 'The planting and lake margin at Berry Hill'. *The Garden* **1** (6 January 1872), 143–5

Anon 1873 'Garden design: The new rock-work in Battersea Park'. *The Garden* **3** (15 March 1873), 206–7

Anon 1880 'A day in Bedfordshire, No I: Old Warden' (Swiss Garden). *Journal of Horticulture and Cottage Gardener, and Home Farmer* **1** (29 July 1880), 98–9

Anon 1884 'Baron Shroeder's Garden' (The Dell, Englefield). *The Gardeners' Chronicle i* **24** (14 June 1884), 764–6

Anon 1885 'Bayfordbury'. *The Gardeners' Chronicle ii* **24** (22 August 1885), 229–30

Anon 1886 'Flower garden: Rockwork at Winterbourne, Teignmouth'. *The Garden* **29** (19 June 1886), 584

Anon 1891 'The Dell, Egham'. *The Gardeners' Chronicle ii* **10** (29 August 1891), 244–5

Anon 1892 'Highnam Court'. *The Gardeners' Chronicle ii* **12** (13 August 1892), 177–8

Anon 1898 'Obituary: James Pulham'. *The Gardeners' Chronicle ii* **24** (20 August 1898), 151

Anon 1899 'Highnam Court, Gloucester: The seat of Sir Charles Hubert Hastings Parry'. *Country Life* (1 April 1899), 400–4

Anon 1912 'Note of the week: Mr James Pulham'. *Gardener's Magazine* **55** (10 February 1912), 105–6 (portrait page 105)

Anon 1914 'Notice to Fellows 14: Rock garden at Wisley'. *RHS Journal* **39** (1913–14), 273

Anon 1958 'James Robert Pulham' (obituary). *British Fern Gazette* **8**, 203–4

Art Journal 1852 *The Art Journal Illustrated Catalogue: The Industry of All Nations, 1851*. London: James S Virtue (published 1852)

Art Journal 1863 *The Art Journal Illustrated Catalogue of the International Exhibition, 1862.* (First pub 1863, London: James S Virtue), reprinted 1973. Wakefield: EP Publishing, 162, 303

Ayres, W P 1842 'Garden Memoranda' (Hoddesdon Hall). *The Gardeners' Chronicle & Agricultural Gazette* (10 September 1842), 606–7

Farrer, Reginald 1907 *My Rock Garden.* London: Arnold

H H T 1904 'Notable gardens: Langley Park, Bucks'. *The Garden* **66** (17 September 1904), 189–91

Hanger, F 1961 'A decade at the Wisley Rock Garden'. *Bulletin of the Alpine Garden Society* **29** (1961), 64–9

Henderson, William 1843 'Miscellaneous Intelligence Art I. General Notices. Rockwork in the Walton Nursery, Liverpool'. *Gardener's Magazine* **19** (8 July 1843), 452

Fig 31 Examples of Pulhamite vases and a fountain from *The Art Journal Illustrated Catalogue of the International Exhibition 1862.*

Hussey, Christopher 1946 'Henley Hall, Shropshire: I. The home of Lt-Col J N Price Wood'. *Country Life* (16 August 1946), 302–5

Lockwood, William 1890 *Woodbridge in the Olden Times, Being Rambling Reminiscences and Notes on Notable Persons Therein.* Privately published

Loudon, J C 1822 *An Encyclopaedia of Gardening.* London

Luckhurst, E C 1875 'Dunorlan: The seat of B H Collins, Esq'. *Journal of Horticulture and Cottage Gardener, and Home Farmer* **29** (21 October 1875), 364–6

Pulham, James 1845 'On cements, artificial stone and plastic compositions'. *The Builder* **3** (5 April 1845), 160

Pulham, James 1847 'Terra-cotta' (letter). *The Builder* **5** (23 January 1847), 37

Pulham, James 1848 'Use of cement in construction'. *The Builder* **6** (4 March 1848), 112–13

Pulham, James c1870s, Plans, bills, poem for St Fagan's Castle (Plymouth Estate Collection, Glamorgan RO, Cardiff)

Pulham, James 1875 'Domestic Aquaria' (letter). *Gardener's Magazine* **18** (9 October 1875), 524–6

Pulham, James c1877, *Picturesque Ferneries and Rock-Garden Scenery, in Waterfalls, Rocky-streams, Cascades, Dropping Wells, Heatheries, Caves or Cavernous Recesses for Boathouses, &c, &c.* Broxbourne and Brixton: James Pulham & Son (Lindley Library, RHS)

Pulham, James 1915 *Garden ornament. vases: terminals: pedestals: sundials: seats: fountains: balustrades: figures &c* (Lindley Library, RHS)

Pulham, James III c1930s, *Hardy Herbaceous and Alpine Plants.* Broxbourne and Brixton: James Pulham & Son (Lindley Library, RHS)

Redgrave, G R and Spackman, C 1924 *Calcareous Cements: Their Nature, Manufacture and Uses.* London: Griffin

Robinson, William 1870 *Alpine Flowers for English Gardens.* London: John Murray

Robinson, William 1871 *Hardy Flowers.* London: Frederick Warne

Robinson, William 1906 *The English Flower Garden and Home Grounds.* (First pub 1883 as The English Flower Garden. References are to the 10 edn.) London: John Murray

Robson, J 1864 'Dinurben House'. *Journal of Horticulture and Cottage Gardener, and Home Farmer* **7** (29 November 1864), 435–6

Rulham, J R 1913 'The Wisley rock and water garden'. *RHS Journal* **38** (1912–13), 225–33, figs 73–85

S T P 1831 'An essay on rockwork in garden scenery'. *Gardener's Magazine* **7** (7 February 1831), 443–4

W G 1879 'Bearwood'. *The Garden* **16** (19 July 1879), 53–4

W G 1886 'Park Hill, Streatham'. *The Garden* **29** (19 June 1886), 568

W H C 1881 'Dunorlan, Tunbridge Wells'. *The Gardeners' Chronicle ii* **16** (22 October 1881), 526–7, 532–3

Ward, H W 1888 'Madresfield Court, Malvern'. *The Garden* **33** (21 January 1888), 49–50

Williams, Benjamin Samuel 1873 *Select Ferns and Lycopods, British and Exotic.* (First pub 1868. References are to the 2 edn.) London: the author

Wooster, David 1874 *Alpine Plants: Figures and Descriptions of the Most Striking and Beautiful of the Alpine Flowers*. London: Driffield

Wright, H W 1899 'Sunningdale Park'. *Journal of Horticulture and Cottage Gardener, and Home Farmer* **39** (6 July 1899), 9–**11**

Wright, Letitia 1925 'Stenton'. *Bulletin of the Garden Club of America* **11** (May 1925), 18

Contemporary publications

Anon 1992 'Lewis Kennedy, landscape gardener, and his work at Buckhurst Park'. *Apollo* **135 (362)**, 215–21

Ashurst, John and Ashurst, Nicola 1988 *Practical Building Conservation, Vol 2: Brick, Terracotta and Earth* (English Heritage Technical Handbook). Aldershot: Gower Technical Press Ltd

Banister, Kate 2007 'The Pulham Family of Hertfordshire and their work', in Rowe, Anne (ed) *Hertfordshire Garden Histroy: A Miscellany*. Hatfield: Hertfordshire Publications, 134-54

Bisgrove, Richard 1982 'From grotto to mountain peak: Evolution of the rock garden'. *Country Life* (2 December 1982), 1821–3

British Standards Institution 2000 *Code of Practice for Cleaning and Surface Repair of Buildings* (BS 8221-1:2000). London: British Standards Institution

British Standards Institution 2001 *Building Lime: Definitions, Specification and Conformity Criteria* (BS EN 459-1:2001). London: British Standards Institution

Cadw 2001 *Register of Landscapes of Outstanding Historic Interest in Wales.* Cardiff: Cadw (Welsh Historic Monuments)

Clark, Kate 2001 *Informed Conservation: Understanding Historic Buildings and Their Landscapes for Conservation*. London: English Heritage

Cowper A D 1927 *Lime and Lime Mortars (Building Research Special Report)*. (First published 1927, London), reprinted 1998. Shaftesbury: Donhead Publishing

Davis, John 1991 *Antique Garden Ornament: 300 Years of Creativity*. Woodbridge: Antique Collectors' Club

Dove, Jane 1997 'Geology and art: Cross-curricular links'. *The International Journal of Art and Design Education* **16** (May 1997), 171–9

Doyle, Peter, Bennett, Matthew R and Robinson, Eric 1996a 'Creating urban geology: A record of Victorian innovation in park design', in Bennett, Matthew R, Doyle, Peter, Larwood, Jonathan G and Prosser, Colin D (eds) *Geology on your Doorstep: The Role of Urban Geology in Earth Heritage Conservation. London:* The Geological Society, 74–84

Doyle, Peter and Bennett, Matthew R 1996b 'The introduction of geology into the urban environment: Principles and methods', in Bennett, Matthew R, Doyle, Peter, Larwood, Jonathan G and Prosser, Colin D (eds) *Geology on your Doorstep: The Role of Urban Geology in Earth Heritage Conservation.* London: The Geological Society, 239–61

Elliott, Brent 1984 '"We must have the noble cliff": Pulhamite rockwork'. *Country Life* **175** (5 January 1991), 30–1

Elliott, Brent 1986 *Victorian Gardens.* London: Batsford

English Heritage 1999 *Graffiti on Historic Buildings and Monuments: Methods of Removal and Prevention*. London: English Heritage

English Heritage 2007 *Conservation Principles, Policies and Guidance for the Sustainable Management of the Historic Environment.* London: English Heritage

Environment Agency 1994 *Control of Substances Hazardous to Health Regulations 1994* (Statutory Instrument 1994 No 3246). London: HMSO

Festing, Sally 1983 'Cliffs, glades and grotto at Merrow Grange'. *Garden History* **11 (2)**, 157–66

Festing, Sally 1984 'Pulham has done his work well'. *Garden History* **12 (2)**, 138–58

Festing, Sally 1988 'Great credit upon the ingenuity and taste of Mr Pulham'. *Garden History* **16 (1)**, 90–102

Festing, Sally 1997 'Notes: James Pulham 3'. *Garden History* **25 (2)**, 230–7

Francis, A J 1977, *The Cement Industry, 1796–1914: A History.* Newton Abbot: David and Charles, 91–109

Hayden, Peter 1987 untitled (review of Christensen, Annie *Gisselfeld.* Copenhagen: Den Kongelige Veterinær og Landbohøjskole). *Garden History* **15 (2)**, 175–6

Heritage Lottery Fund (HLF) 2004 *Conservation Management Plans: Helping Your Application*. London: Heritage Lottery Fund (www.hlf.org.uk)

Historic Scotland and Scottish Natural Heritage 1997 *An Inventory of Gardens and Designed Landscapes in Scotland No 1: Summary Report,* plus four additional regional volumes. Edinburgh: Historic Scotland and Scottish Natural Heritage

Hitching, Claude 2001 'Preserving our Pulham heritage'. *Garden History Society News* **62** (Spring 2001), 23–5

Hitching, Claude 2002 'The hidden gardens of Dewstow'. *Heritage in Wales Magazine* **21**, (Spring 2001)

Hitching, Claude 2003a 'In search of Pulham's fountains'. *Garden History Society News* **67** (Spring 2003)

Hitching, Claude 2003b 'The special magic of a Pulham garden'. *Water Gardener* (April 2003); *Professional Gardener* (October 2003)

Hitching, Claude 2004a 'James Pulham in Hertfordshire'. *Hertfordshire Countryside,* 'Part 1: The Early Years' (January); 'Part 2: The Broxbourne Manufactory' (February); 'Part 3: Early Pulham Gardens' (March); 'Part 4: Into the 20th Century' (April); 'Some Rediscovered Treasures' (May).

Hitching, Claude 2004b 'Pulham in the Cotswolds'. *Professional Gardener*, 'Part 1: Westonbirt School and Abbotswood' (April), 'Part 2: Batsford Arboretum and Heythrop Park' (July).

Hitching, Claude 2005 'Written in (Artificial) Stone'. *Historic Gardens Review* **15**, (August 2005), 27–31

Kelly, Alison 1990 *Mrs Coade's Stone*. Upton-upon-Severn: Self Publishing Association

Lambert, D, Goodchild, P and Roberts J 2006 *Parks and Gardens: A Researcher's Guide to Sources for Designed Landscapes.* Reigate: Landscape Design Trust

Lambin, Denis 1994 'From the grottoes to the Alps: A contribution to a history of rock and alpine gardens'. *Journal of Garden History.* **14 (4)**, (October–December 1994), 236–56

Lawrence, Andrew 1989? *The Aldenham House Gardens: A Brief History of the School Grounds.* Cambridge?: the author, 24–5

Nara Document on Authenticity 1994, Nara Conference on Authenticity in Relation to the World Heritage Convention, Nara (Japan), November 1994, organised jointly by UNESCO, the Agency for Cultural Affairs

National Parks and Monuments Service 1980 *St Stephen's Green 1880–1980*. Dublin: Commissioner of Public Works

Northern Ireland Heritage Gardens Committee 1992 *The Northern Ireland Heritage Gardens Inventory*. Belfast: Northern Ireland Heritage Gardens Committee

Tresise, G 1994 'The mystery of Pulhamite and an "outcrop" in Battersea Park'. *Proceedings of the Geologists' Association* **105 (2)**, 141–3

Rothschild, Miriam, Garton, Kate and Rothschild, Lionel 1996 *The Rothschild Gardens*. London: Gaia, 44–7

Sowan, Paul W 2002 'Pulhamite found in Croydon' *Bulletin of the Croydon Natural History Society* **115**, 3–4

Stratton, Michael 1993 *The Terracotta Revival: Building Innovation and the Image of the Industrial City in Britain and North America.* London: Victor Golancz

Thomas, G S 1989 *The Rock Garden and its Plants*. London: Dent, 31–42

Wileman, Sally 2001 'Another call for a Pulhamite society'. *Garden History Society News* **63** (Autumn 2001), 25–6

Unpublished reports, manuscripts and notes

Babtie Group 2000 'Thanet District Council structural inspection report: Balustrading and Pulhamite rockwock, Albion Place Gardens, Ramsgate'

Concrete Society 1987 'Technical report No 29: Changes in the properties of ordinary Portland cement and their effects on concrete'

Gloucestershire Gardens and Landscape Trust nd 'Rendcomb Park' (conference notes)

Hampshire Gardens Trust 1996 'Holly Hill Woodland Park'

Hertfordshire Gardens Trust 1995 'Research Project 1994–5: Brickendonbury'

Land Use Consultants 1998 'Albion Place Gardens and Wellington Crescent, Ramsgate: Historic Landscape Survey and Restoration Management Plan', for Thanet District Council, with assistance from the Heritage Lottery Fund Urban Parks Programme

Land Use Consultants 1999 'The Rock Garden, Chelsea Physic Garden: Historical survey and restoration plan' (Heritage Lottery Fund application)

Land Use Consultants 2002 'Albion Place Gardens, Ramsgate: Restoration of Pulhamite rockwock and planting', part of Heritage Lottery Fund application, prepared for Thanet District Council, with Babtie Group and Swann and Associates

Rockscapes Ltd nd (a) 'Report and costing for the renovation of the Pulham rock feature at Highnam Court, Gloucestershire'

Rockscapes Ltd nd (b) 'Swiss Garden, Old Warden: Restoration of the "Pulham" artificial rockwork'

Sandberg Consulting Engineers 2000 'Albion Place Gardens, Ramsgate: Analysis of material from Pulhamite', Report 2118/9/C

Schnare, Susan E 1993 Rock Features and Gardens: A Theme Study (report for English Heritage)

Swann and Associates 1999 'Gatton Park: Analysis of cementitious material from Pulhamite pond wall'

Swann and Associates 2000 'Albion Place Gardens: Pulhamite condition survey report, Parts I, II and III'

Swann and Associates 2000 'Albion Place Gardens: Repair schedule for Pulhamite rockwork and the balustrade wall'

Swann and Associates 2000 'Previous repairs to Pulhamite: A conservation assessment of previous approaches to the repair of Pulhamite', for Thanet District Council

Swann and Associates 2000 'Specification for the repair of Pulhamite artificial rockwork at Albion Place Gardens'

Websites

The following is a selection of websites with information on the Pulhams, Pulhamite and Pulham sites.

General

Alpine Garden Society www.alpinegardensociety.net *and* www.abbotsleigh.org.uk
English Heritage www.english-heritage.org.uk/parksandgardens
The Lindley Library and Picture Library (RHS)
www.rhs.org.uk/learning/libraries/libraries_london.asp
The Pulham Legacy www.pulham.org.uk
The United Kingdom Database of Historic Parks and Gardens
www.gardenhistory.org.uk/ukpg
UK Regionally Important Geological and Geomorphological Sites (UKRIGS)
www.ukrigs.org.uk

Pulham Sites

Abbots Pool www.n-somerset.gov.uk *and www.abbotsleigh.org.uk*
Ashton Court www.bristol.gov.uk
Ashton Gardens (Lytham St Anne's) www.fredmoor.com/ashton
Ardeley Bury www.hertsdirect.org
Audley End www.english-heritage.org.uk
Batsford Park www.batsarb.co.uk
Battersea Park www.wandsworth.gov.uk
Bawdsey Manor www.bawdseymanor.co.uk
Benington Lordship www.beningtonlordship.co.uk
Bracken Hill www.bris.ac.uk
Brickendonbury www.brickendonbury.co.uk
Dewstow House www.dewstow.com
Dunorlan Park www.tunbridgewells.gov.uk/dunorlan
Gatton Park www.gattonpark.com
Holly Hill Woodland Park www.fareham.gov.uk
Langley Park www.buckscc.gov.uk
Leonardslee www.leonardsleegardens.com
Lower Leas Coastal Park, Folkestone www.shepway.gov.uk
Madresfield Court www.elmley.org.uk
St Fagan's Castle www.museumwales.ac.uk
Swiss Garden www.shuttleworth.org/swissgarden_home.asp
Titsey Place www.titsey.org
Waddesdon Manor www.waddesdon.org.uk
Wisley www.rhs.org.uk

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