Nob End

History Management and Development

Phil Sharples

Introduction

This former chemical works site, dating back to the mid 18th century Initially producing sulphuric acid, later producing a range of chemicals including sodium carbonate.

Sodium carbonate or washing soda was being manufactured here in the 19th century by the Leblanc process, a process which produced vast quantities of alkali waste material.

By the end of the 19th century the works had been demolished, but the waste remained, slowly weathering to allow plant growth. In the 1950's the site was found to contain a large population of plants normally only found on calcareous soils.

Today the site is a protected area containing no natural landforms, created by the dumping of this chemical waste.
Known locally as the 'Vats' or 'Vat Wastes'.

One of only four known surviving Leblanc waste sites in the world, all within a few miles of this site. This 8.8ha site is the largest and most species rich. The plateau of the waste tip is approximately 10m above the level of the rivers and at this point most of this depth is comprised of alkali waste.

Nob End c1961

Nob End c1974

Nob or Knob: old English for rounded promontory. The site takes its name from the area towards Wellfield house, seen to the rear of this photo

Situated on the outskirts of the village of Little Lever, approximately 4.5km South East of Bolton town centre. Grid ref. SD737074
The site is roughly triangular in shape, bounded by the river Irwell to the South and the river Croal to the North West.
The Manchester, Bolton and Bury canal runs alongside the North East edge of the site.

Nob End taken from the roof of Wellfield house, 26th October 2004 (Phil Sharples)

Past land use

The Nob End site has had a long and varied industrial history.

Oil of Vitriol to Alkali

In 1750, Benjamin Rawson senior started to manufacture Sulphuric acid in Bradford.
Benjamin Rawson senior is described in a Manchester directory in 1773 as a 'Vitriol manufacturer'. By 1788 as 'Gentleman, of Vitriol Building, Quay Street, Manchester.' *(The History of the British Chemical Industry)*

Sulphuric Acid had been known for many years, back to Roman times.
In the 15th century, Basilius Valentinus described two methods of producing sulphuric acid.
In one process sulphuric acid was made by burning brimstone (crude sulphur) and nitre (potassium nitrate 'saltpetre') imported from Sicily, in a bell shaped earthenware jar. The sulphur dioxide gas produced was condensed and absorbed in water.
In the other sulphuric acid was produced by heating hydrated iron sulphate, known as 'Green Vitriol', and as previously, the gas produced was condensed and absorbed in water, to be known as 'Oil of Vitriol'.
In the 17th Century it was used as a cure for venereal disease.
By the 1840's, due to the monopoly of the sulphur mines in Sicily and the cost of importing sulphur remaining very high, most acid producers where turning to use the much less expensive iron pyrite to obtain iron sulphate.

Benjamin Rawson senior was making sulphuric acid by methods evolved through trial and error just at the time that modern chemistry was emerging.
It was only in 1787 that chemical nomenclature was devised, so that specific names were given to particular substances with defined formulae. Although the chemical produced by Rawson and others became known as sulphuric acid, the term 'Oil of Vitriol' or simply 'Vitriol' continued to be used well into the 20th century

'They spoilt her looks. She lost one eye. They splashed vitriol on her face,
Rose whispered 'Vitriol? What's vitriol?' and the lightening showed a strut of tarred wood, a wave breaking and her pale, bony, terrified face.
'You never seen vitriol?' the boy said, grinning through the dark. He showed her the little bottle. 'That's vitriol'. He took the cork out and spilled a little on the wooden plank of the pier: it hissed like steam. 'It burns', the boy said. 'Smell it' and he thrust the bottle under her nose.
She gasped at him 'Pinkie, you wouldn't……'
Graham Greene. 'Brighton Rock' 1938

Until the 18th century, sulphuric acid was produced, primarily, by burning sulphur in bell-shaped earthenware jars. The sulphur dioxide produced being absorbed in water. In 1749 wide-necked glass jars were substituted for the fragile earthenware, but the process was still very dangerous.

'When the acid is sufficiently concentrated, the fire is taken out and the retorts allowed to remain in the sand until cool enough to be moved without cracking. A man then lifts the retorts one by one, each retort containing 50 to 60 pounds of hot, concentrated sulphuric acid, and this he pours into carboys that have been previously warmed to receive it. This is a frightful and dangerous task.'

In 1745 John Roebuck invented the 'Lead Chamber Process', after it had been discovered that Lead was not dissolved by sulphuric acid. This was much more robust than glass, and the acid could be produced in much greater volumes. Roebuck endeavoured to keep his process secret, but by the end of the century the process was being used throughout Britain. There was still of course the problem of transporting the glass carboys, used to carry the acid, over the rough and bumpy roads of Britain.

For many years the area surrounding Nob End was the site of many bleaching works and paper manufactures. Until the middle of the 18th century the bleaching process took several weeks to complete; the material had to be soaked several times in an acid of fermented sour milk, tentered on hooks to absorb sunshine and dew, boiled in alkali made from plant ashes. It could take months to bleach cotton and linen as it was so dependent on the weather and the supply of milk. Sulphuric acid became much in demand by the bleaching trade as a substitute for sour milk which had been the only acid liquor or 'sour' available. It was also essential in the manufacture of chemical bleaches once chlorine had been discovered. The dying industry needed it to render indigo soluble and in the preparation of mordents and the calico printing industry for producing citric acid and as a sour.

<u>Rawsons Chemical Works</u>

Records dating back to 1760's show Nob End as the site of a chemical works. In1785 Benjamin Rawson junior, married Elizabeth Plumbe, the daughter of Thomas Plumbe of Bolton, who made 'Oil of Vitriol at his works at Prestolee' manufacturing sulphuric acid for the local textile and paper industry. Rawson joined his father-in-law in partnership and improved the works. In a survey and valuation list of Great Bolton 1796, Plumbe and Rawson were listed as proprietors, and Rawson as occupier of a warehouse and stable at 48 Bradshawgate, Bolton. Also, by that year, Rawson is described as 'having a large fortune', also attaining social positions; the trusteeship of Bolton Grammar School.

Britain's competitive lead in the Industrial Revolution owed as much to the Chemical Industry as to iron, coal and textiles.
In 1820 there were 24 Oil of Vitriol works in England.
Closely allied to the textile trade, sulphuric acid production was a fair indicator of the degree of industrialisation of an area.

The manufacturing of sulphuric acid was carried out on the site between 1760's and 1834. The sulphur was imported as brimstone from Sicily with the final stage of its journey initially being carried by pack horse from the Bridgewater canal at Worsley near Manchester, later via the Manchester, Bolton and Bury canal, directly onto the works site.
The works caused considerable atmospheric pollution, due mainly to 'acid rain'. Historical accounts record trees and walls close to the works being damaged by the sites sulphurous emissions.

An observer at the time wrote

'*Mr. Rawson's Vitriol Works, the walls of which appeared blackened by the subtle acid; the trees around them are blighted and all things, for some distance, by their appearance acknowledge the terrible effect of this power.'*
TB Barton - History of Farnworth and Kearsley 1887

The river Irwell also suffered from extensive acid pollution.

'These waters are frequented by trout, chub, dace and gudgeon, we should really like to see a specimen, for they must be a species which can live in sulphuric acid – a race so rare as to have eluded our researches'
TB Barton - History of Farnworth and Kearsley 1887

At the same time, there were up to twelve coal mines in operation in the area, which probably supplied the early bleaching and paper works.

Rawson continued to live with his wife and an increasing number of children in Bolton. In 1806 he purchased an estate of 300 acres, partly in Farnworth and partly in Kearsley, quite close to his Vitriol works. On this estate he built Darley Hall, an elegant Regency building.
He remained there until about 1838, when the park was cut in half by the railway. He had previously sold the Vitriol works some time after 1834 to Edward Wilson, and he then retired to Nidd Hall, a large mansion with an extensive estate a few miles north of Harrogate.

Postcard of Darley Hall-Postmark 1905 (Phil Sharples collection)

Darley Hall, c1890.

Prestolee Alkali Works (also known as Wilson's Willow Works)

Although sulphuric acid had significantly improved the production rate of the bleaching industry, the remaining problem was to find a cheap base. By the 18th century probably one of the most important chemical products was Alkali, in the form of soda (sodium carbonate), used for the manufacture of textiles, mixed with lime and sand to make glass and mixed with fats to make soap. Until the late18thcentury, soda was extracted from wood and plant ashes (primarily Kelp and Barilla) which contained high levels of potash. But in Britain, thousands of Scottish Kelp harvesters were finding it hard to keep up with demand.

As these sources became scarce the price rose. By 1750 the demand for soda ash and potash exceeded the industrial capacity for producing it from these traditional sources, i.e. the leaching of ashes. So an alternative method of production was sought.

In 1790 a French doctor, Nicolas Leblanc, invented a process to make sodium carbonate (soda) from sodium chloride (salt)

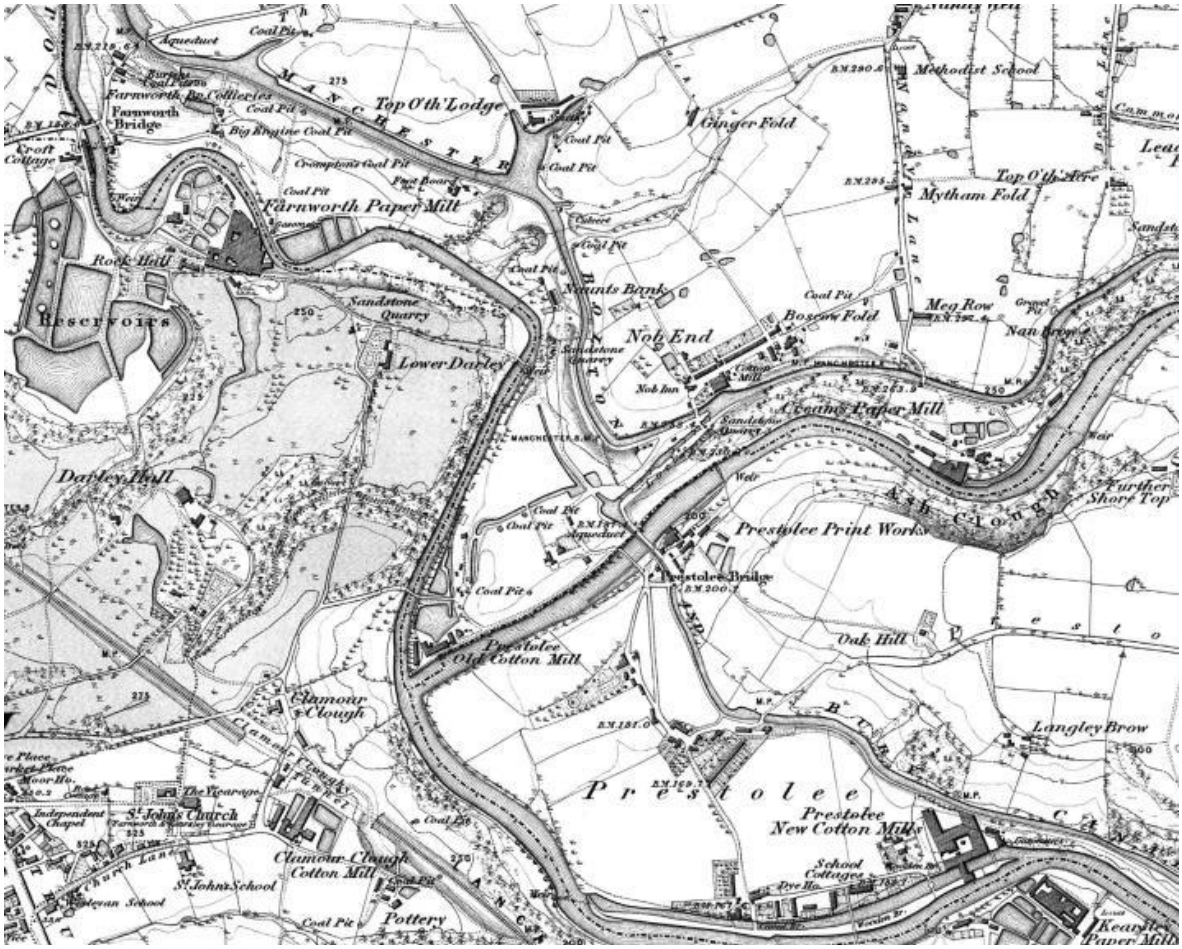
Nicolas Leblanc was born in 1742. He studied medicine and became physician and assistant in 1780 to Louis Philippe Joseph (who, as Duke of Orléans, would be guillotined 1793). Leblanc devised his method of producing soda ash to win a prize offered by the French Academy of Sciences, but the Revolutionary Government granted him only a patent (1791), which they seized along with his factory three years later. He had no money left to re-establish the process when the factory was handed back to him by Napoleon in 1802. A broken man, Leblanc committed suicide in 1806 The process though was soon adopted throughout Europe.

Over a number of years Wilson expanded and improved the works to make a range of chemicals including, vitriol (sulphuric acid) muriatic (hydrochloric acid) alkali (soda ash) and bleaching powder.
In 1844 to cope with the ever increasing demand for chemicals, work began to rebuild and expand the works.

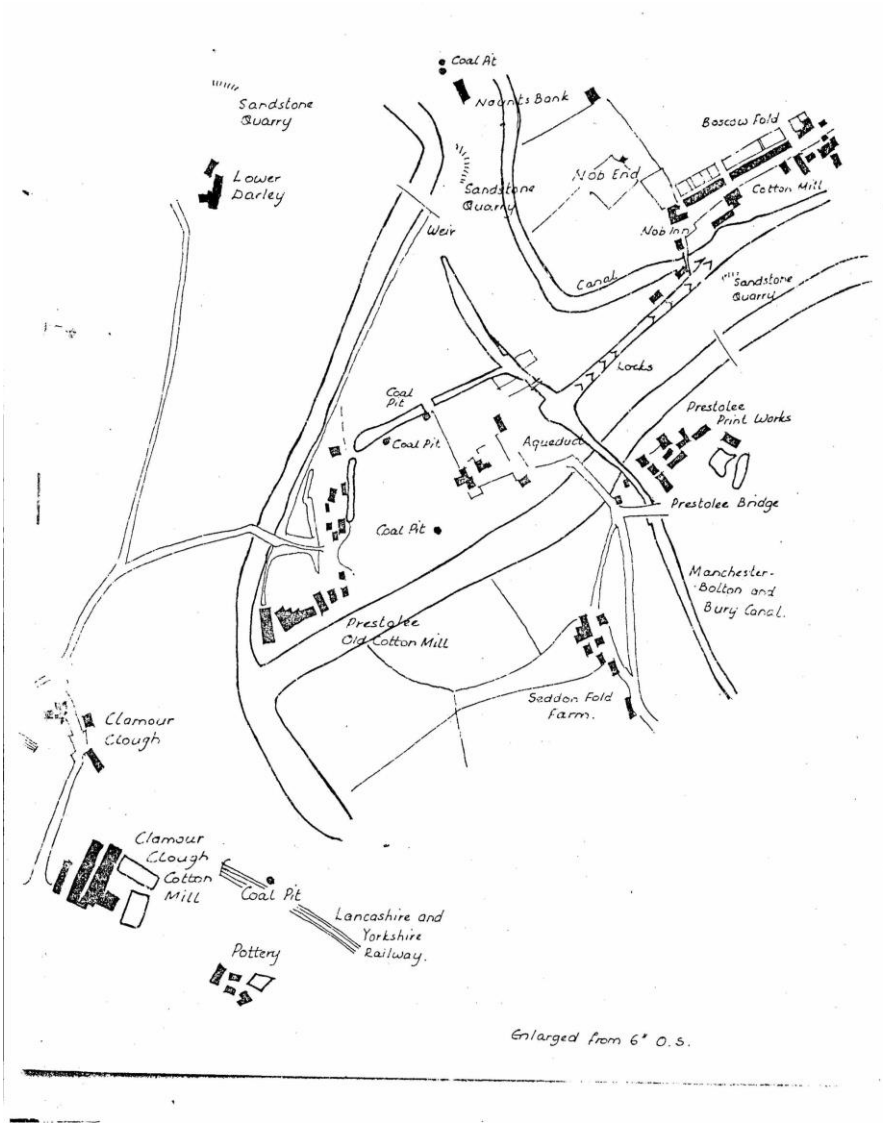
He introduced the Leblanc process for the production of sodium carbonate (soda) using sulphuric acid, chalk and salt in a multi stage process.

In the Leblanc process, salt was first converted into sodium sulphate or 'salt cake' by the action of sulphuric acid, at 800-900º. This 'salt cake' was then ground up and mixed with crushed chalk or limestone (calcium carbonate) and coal which was then roasted to produce a mixture of sodium carbonate and calcium sulphide with some unreacted calcium carbonate along with other impurities known as 'Black Ash'. The soluble carbonate was leached out with water and the solution crystallized. Leaving behind the solid calcium sulphide along with other impurities as a by-product.

The area around Nob End, 1845



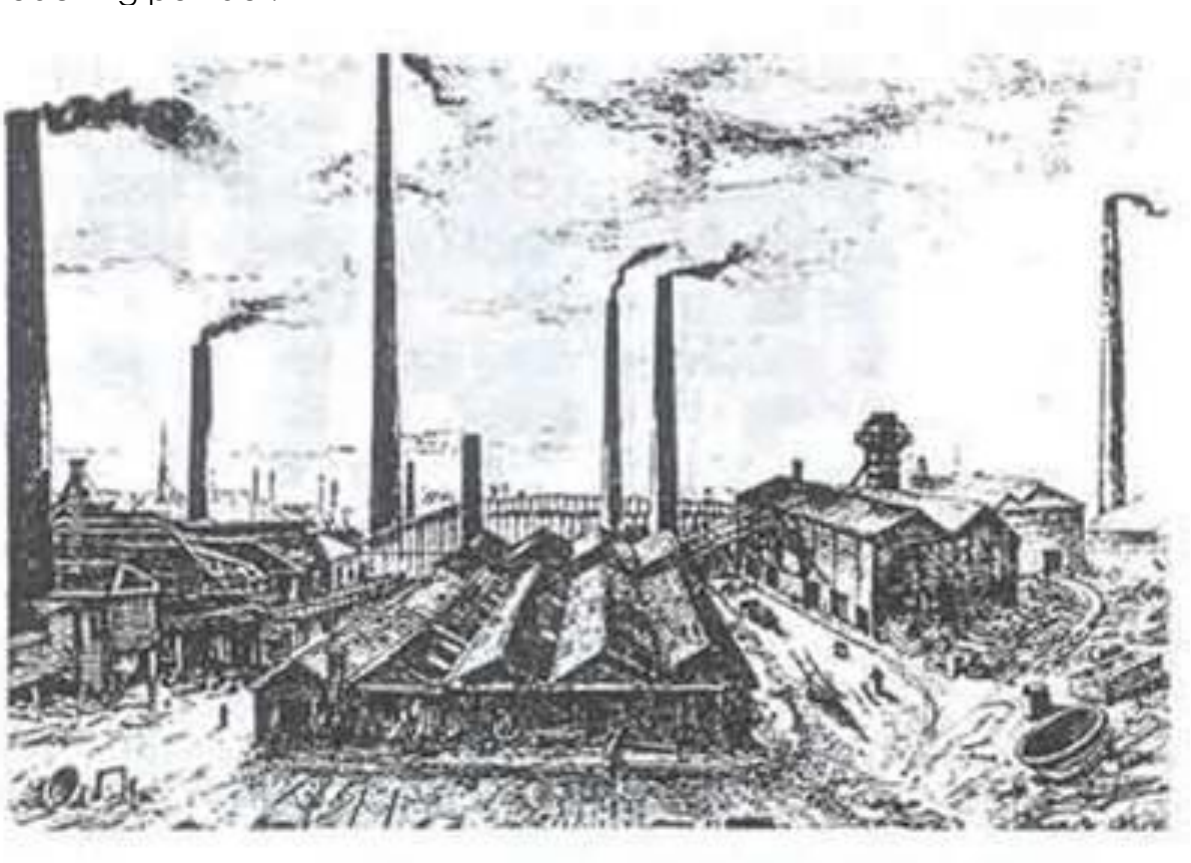
Ordnance Survey 1st Edition 6" map, 1845.



Nob End c1845, as it looked prior to Wilson expanding the works
Enlarged from the Ordnance Survey 1st Edition 6" map, 1845

The Leblanc process was not environmentally friendly. The manufacturing process produced hundreds of tons of waste material and created huge volumes of hydrogen chloride fumes, which were initially passed through chimneys into the atmosphere, wreaking havoc on vegetation, buildings and fabrics. Producers throughout the country were often faced with frequent lawsuits and a general public outcry regarding the damage these fumes inflicted on their neighbourhoods, to which they simply built taller chimneys. In 1842 at the St Rollox

chemical works in Glasgow one of it's chimneys was built to an incredible height of 132 m, the worlds tallest. One chimney at Nob End was said to be almost 70m tall. Later to further control these emissions, acid gases were passed through towers filled with coal or coke down which water trickled. The dilute hydrochloric acid at the bottom was often poured into a nearby river or stream, killing fish and other aquatic life. Later, this hydrochloric acid was oxidized with manganese dioxide to form chlorine, which could be reacted with quicklime to make bleaching powder.



St Rollox chemical works – Glasgow c1880.
A view, typical of 19th century Leblanc chemical works

The problem of emissions from industries throughout the country became so acute that in 1862, the House of Lords set up a select committee to look into what they called 'Noxious vapours', chaired by the Earl of Derby. The committee called a number of witnesses to testify on this subject. It is interesting to note that the Prestolee Chemical Works is named in the report.

Die Veneris, 30° Maii 1862.

LORDS PRESENT!

Earl of Derby.
Earl Graham.
Earl De la Warr.
Earl Grey.

Lord Wodehouse.
Lord Ravensworth.
Lord Stanley of Alderley.
Lord Chelmsford.

The Earl of DERBY in the Chair.

Order of Adjournment read.

The Proceedings of the Committee of Tuesday last are read.

The following Witnesses are called in, and examined:—(Vide the Evidence), viz., Mr. Peter Spence, John Percy, Esq., M.D., F.R. s., Thomas Statter, Esq., John Leigh,'Eisq.

THOMAS STATTER Esq. is called in, and examined as follows:……..

What follows is an abstract of what he had to say.

Chairman.'] You have for many years had the management of my property in the neighbourhood of Manchester and Bury ?

I have, for nearly 20 years.

Before that time, you acted under your father, who was land steward of my grandfather at Knowsley ?

Yes; your Lordship's grandfather was living when I first went into office at Knowsley.

Therefore, you have had the means of being perfectly acquainted, not only with the neighbourhood of Manchester and Bury, and that district, but also with Liverpool, St. Helens, and the country immediately around ?

I have; I know the whole districts well.

You are also, I believe, employed as land surveyor and civil engineer ?

I am.

Have you brought with you a map of the district?

I have brought the Ordnance sheet of the district in which I live. (Producing it.)

What is the distance between Manchester and Bury ?

Eight miles……..

……..The principal manufactories in that country are the cotton mills'

Yes; cotton-spinning, bleaching, dyeing, and chemical works are the principal manufactures.

'Which of those are, and which are not, injurious or offensive; injurious to vegetation or animal life, or offensive in their character ?

The chemical works are all injurious, and very injurious, to vegetable life. There are many districts in which we shall not have a tree left in the course of a few years unless something be done to stay the destruction which is ensuing.

What district do you refer to?

Those at ***Prestolee*** *have been exceedingly destructive; I remember them small, and they have now grown to a very large size. At those works sulphuric acid, muriatic acid, and ordinary bleaching powders are manufactured; and those works have grown into exceedingly large works. The timber in this district all along those ridges is dead ; the fences are all dying, the vegetation year by year is ceasing; and, in fact, planting is quite out of the question. On one side of the river here {pointing to the map) there are high banks which used to be entirely covered with timber.*

A great deal of young wood, and underwood ?

Yes; and which tree's, a few years ago, were exceedingly healthy, and flourishing……

……What are the other works which you have marked ?

Those works are all alkali works; Smith's works, at Lever, are exceedingly deleterious; and those of ***Wilson & Company, at Prestolee****, are also as bad as they well can be.*

Lord Ravensworth.] Do you find that the destruction of those pretty wooded banks is progressively going on from emanations from those works.

For five or six years we cut down the trees as they died; I then gave instructions that no further trees were to be cut down, but to remain as a memento, taking an account year by year, of the additional destruction. Year by year it is progressing; and I have no hesitation in saying, that unless some stop be put to it, either by legal means or otherwise, the whole country will become denuded altogether.

Lord Chelmsford.'} To what distance from the works has this destruction advanced?

The largest amount of destruction has been within some half mile of the works, but its influence is extending further; and though the trees are not absolutely dead, they are in a paralysed state ; you find the trees beginning to die, not from the root, but the top; and then it gradually ceases to produce leaves, year by year.

Earl Graham.} What is the utmost distance to which that destruction extends?

Three miles.

Earl De la Warr.} It has reached that already?

Yes, to a greater or less extent……..

The committee later stated,

...The majority of the witnesses, however, consider that the alkali and copper works are the principal causes of injury.

Similar effects to those above described, to a greater or less extent, are found to be produced in every district in which these works are established, and worked without proper precautions and attention.

But it is satisfactory to be able to state, not only upon the evidence of scientific men, but upon that of the manufacturers themselves (some of whom have adopted the best means of prevention with considerable success), that it is not only possible, but perfectly easy, with due care, to carry on the manufacture without causing any perceptible injury to the neighbourhood. The accompanying statement (A.) sets forth the views entertained by the majority of those connected with the trade.

There are various modes adopted, in the best conducted works of this description, for the prevention of nuisance ; but they are all modifications of one principle, viz., the condensation of the muriatic gas evolved, by passing through towers filled with coke, or other porous materials, and subjected to a constant flow of water. A similar process is made use of in the manufacture of sulphuric acid or oil of vitriol; the effects of which, if the gases are permitted to escape, are equally injurious to vegetation. But the sulphuric acid is of so much commercial value, that it is the well-understood interest of the manufacturer that the gases produced in its manufacture should be completely condensed; and evidence has been given to the Committee that in the neighbourhood of some of the most extensive works of this description, no appreciable injury is perceptible. On the other hand, although muriatic acid is largely used for the production of bleaching powder, and other purposes, the quantity produced exceeds threefold that for which there is an effective demand. There is therefore a less pecuniary inducement to effect a complete condensation; while a large portion of the water which has absorbed the gas is permitted to run to waste, producing most injurious effects on the streams into which it flows; and although this subject is not strictly within the scope of the Committee's inquiry, they think it one not undeserving the serious attention of the Legislature.

Of a similar nature is the question of the disposal of the alkali waste, or refuse from the manufacture. This contains a very large proportion of sulphur; but unfortunately chemical science has hitherto failed to discover any profitable mode of extracting the latter ingredient; and, as a necessary consequence, many thousands of tons are annually accumulating, which are liable to combustion, and in that case give out most offensive vapours; and when exposed to heavy rains, pollute the neighbouring streams, and destroy any vegetation with which they come in contact.....

(House of Lords Select Committee on Noxious Vapours (1862)

The introduction in 1863 of the Alkali Act required chemical works to cut acid gas emissions by 95%.

Chief inspector Robert Smith and four assistant inspectors worked with manufacturers to show them how to transform what would be pollution into marketable byproducts.

The Alkali Act was extended and amended in 1874 to require manufacturers to use the "best practicable means" of controlling the acid vapours.

In 1876 *things were still so bad that the Prime Minister Benjamin Disraeli, appointed the Royal Commission on Noxious Vapours. The commissioners visited industrial areas around England, inspecting "alkali works, cement works, chemical manure works, coke ovens, copper works of all descriptions, glass, lead and metal works, potteries and salt works."*

Having seemingly addressed the 'noxious vapours', what of the remaining residues, which no one seemed too concerned about, a great number of tons of a sludge known locally as 'vat waste' or 'Galligu', consisting of calcium sulphide, un-reacted calcium carbonate, calcium oxysulphide, calcium polysulphides and coal ash. A sludge, which would have been strongly alkaline, verging on caustic, and highly soluble. At the many chemical works throughout the country it was either tipped into the sea or dumped onto nearby land.

Here at Nob End, throughout the life of the factory, it was simply tipped on the adjacent land spilling into the adjacent rivers. Also, due to the acidic nature of the local rain, the emissions from the waste would have been very unpleasant. A Leblanc waste site at Harrison Blairs works in Kearsley, now the M61/M60 junction, was known locally as 'Stink bomb hill'.

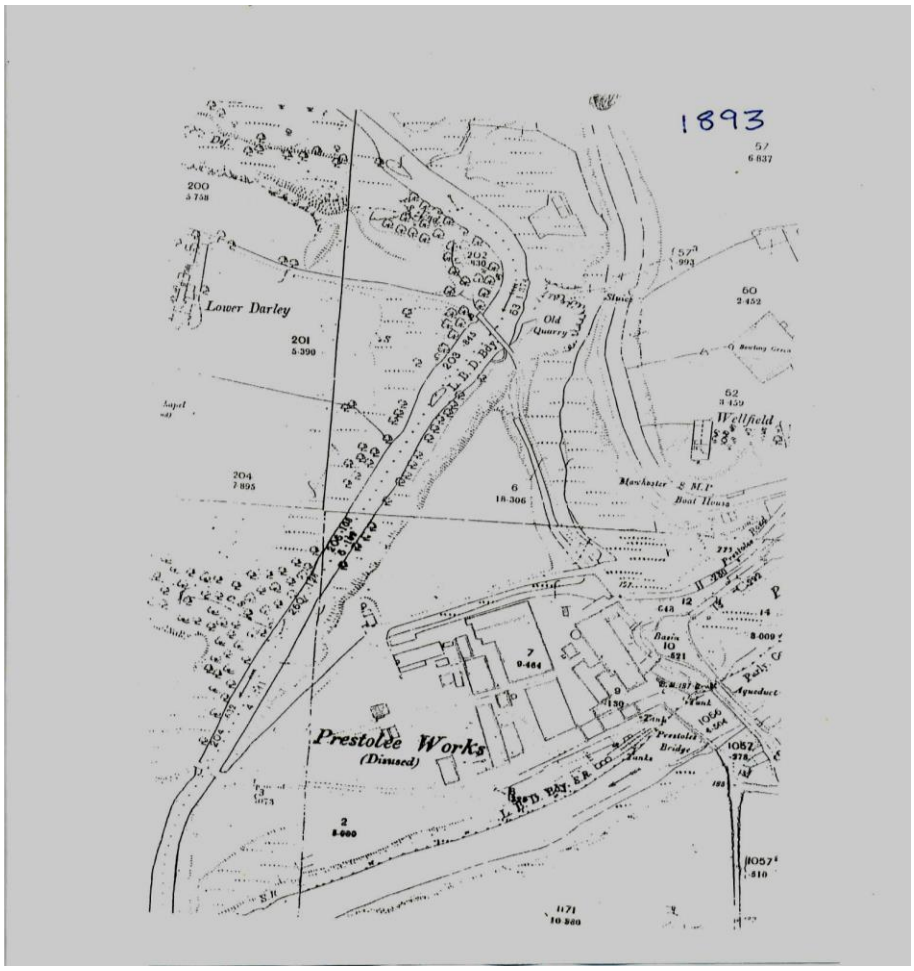
"For every ton of soda made approximately double its weight of galligu – as it was locally called – a thick and evil smelling mud, had to be dumped …. But even when laid out on a waste land, from this nauseating sludge seeped the continual odour of rotten eggs. Finally however, the stuff dried; and even then it remained a potential menace. For it was liable to heat in the sun, catch fire and give off the instant and corrosive gas sulphur dioxide."
J.M. Cohan, The life of Ludwig Mond 1956

To reduce this problem the dumped surface waste was compressed to create a hard, relatively impervious, outer crust which became weathered.
Later, the rising cost of sulphur created a demand for its recovery from the waste and in 1862 Ludwig Mond patented a process that could recover about half the sulphur. The Mond process created a residue that contained calcium sulphides and sulphates.

It is believed that a proportion of the surface waste here was removed for extraction of unburned sulphur by the Mond process before being redumped around 1890.
Therefore part of the waste at Nob End probably consists of Mond-process waste on the surface and 'galligu' underneath.
On exposure to air and rain, over a period of time the waste would have been converted to calcium sulphate, calcium hydroxide and calcium carbonate.

Wilson's factory was very large, with the buildings, showing on the 1895 map, covering about one third of the land area between the rivers and the canal.

Trade directory entries for the works first appear in 1861 as Manufacturing Chemists Prestolee under the ownership of Edward Wilson (Bolton Directory 1861, 100). Entries for the works continue through to 1871 when it is listed in the Bolton & District Directory under Manufacturing Chemists as 'Prestolee Alkali Works and 56 Cannon Street Manchester' (Bolton & District Directory 1870-71, 249).



Ordnance Survey 1:10,560 map, 1895

Employing many people; the wages bill in 1875 was £600 per week. The factory though was not without incidents as one news report shows.

'A serious accident occurred at the Prestolee Chemical Works of Mr Wilson, situated at Farnworth near Bolton. A floor, upon which had been erected a vitriol chamber 450 feet in depth, gave way, the bottom of the chamber burst, and the vitriol, of which the tank was full, flowed into the mechanics shop underneath. The lathes, engines and all the tools, were greatly damaged, and the loss is estimated at about $3000 (?). No person was upon the premises at the time'
Bruce Herald (New Zealand) 9th May 1873

Wilson made little if any profit, they say he spent a guinea for every pound he made. He almost went bankrupt three times saved each time through credit from friends and family, who never saw a penny of their money again. The factory was finally closed in 1875, thus ending over 100 years of chemical production at this site and was offered for sale on 18th May 1883, but a fire in 1885 gutted the factory and in 1887 the controlling firm went bankrupt. In about 1899 the factory was demolished, even that was not without incident as two workers where killed when a roof collapsed. Some of the buildings bricks where later used to build houses at the lower end of Cemetery road.

The collapse of the works in the late nineteenth century is supported by a number of documents held by the Bolton Archives which include a 'Sale of Particulars for Prestolee Alkali Works on the Bolton & Bury Canal' dated 18 May 1883. Items include: 'plant and machinery for the manufacture of soda ash and bleaching powder and liquor. Sulphuric, muriatic acids and caustic sodas'. Dated to the same month is a financial statement between 'Wakeman and Bleeck to Fuller, Horsey Sons and Cassell for the auction of the Prestolee Alkali Works in one lot' (19th May 1883). Evidence for the collapse of the Prestolee Alkali Works at this time is also shown on the Ordnance Survey map from 1895, which indicates the factory complex as 'disused'.
Bolton Museum Archive

At the height of production the factory was producing approximately 2000 tons of soda a month and 4000 tons of waste. During its years of operation the factory had built up vast amounts of alkaline residue waste, which form the main mass of the Nob End site today. Whilst the exact amount of waste on the site is not known, conservative estimates suggest over 250,000 cubic metres, covering parts of the site to a depth of between 5 and 10 metres.

In 2008 Wilson's footbridge was closed due to cracks in the abutments. Test bore drilling in 2012 found the alkali waste here to be 10 metres in depth.

Exposed chemical waste – 2005(Phil Sharples)

At the confluence of the rivers Croal and Irwell there exists an old spinning mill, shown on the 1845 map, 'Prestolee Old cotton Mill' owned by J Todd..

This mill was always devoted to fine spinning and was worked at the early portion of the third decade of the present century by Mr Todd, who then lived at Leigh house..... ..... After Mr Todd deceased, this mill was worked by three Scotch gentlemen, of the names Scott, Dalziel and McNairn.
'Rural Cogregationalism' – Simeon Dyson 1881

Trade records for Prestolee Old Mill begin in 1851 under the ownership of Thomas Barratt. Slater's Directory suggests the mill was closed by 1865.

The mill stood at river level at the confluence of the rivers and a tunnel carried water from a weir upstream on the river Croal to reservoirs close to the mill. The site is now obliterated, buried under tons of Leblanc waste although parts of the tunnel can still be seen along the river side. Stone work from mining activities can also be seen along the river edge.
When the Manchester, Bolton and Bury canal was opened in 1795, two canal branches led into the old factory site, one led directly to Oakes's bridge at the weir, the other in an arc towards the old cotton mill. When Wilson rebuilt the works, part of the canal towards the mill was filled in and a dry dock constructed at the end. In the 1940's and 1950's both of these canals were filled in, leaving buried up to around thirty to forty canal barges on site, the remnants of some can still be seen today. The old dry dock, used on the site, was not filled in and is

still visible along with the stone blocks used to support the beached canal barges.
Along with the chemical waste the site contains many tons of highly acidic boiler ash. Some exposed areas today, after over 100 years still will not support plant growth. Brambles can be seen criss-crossing but will not root

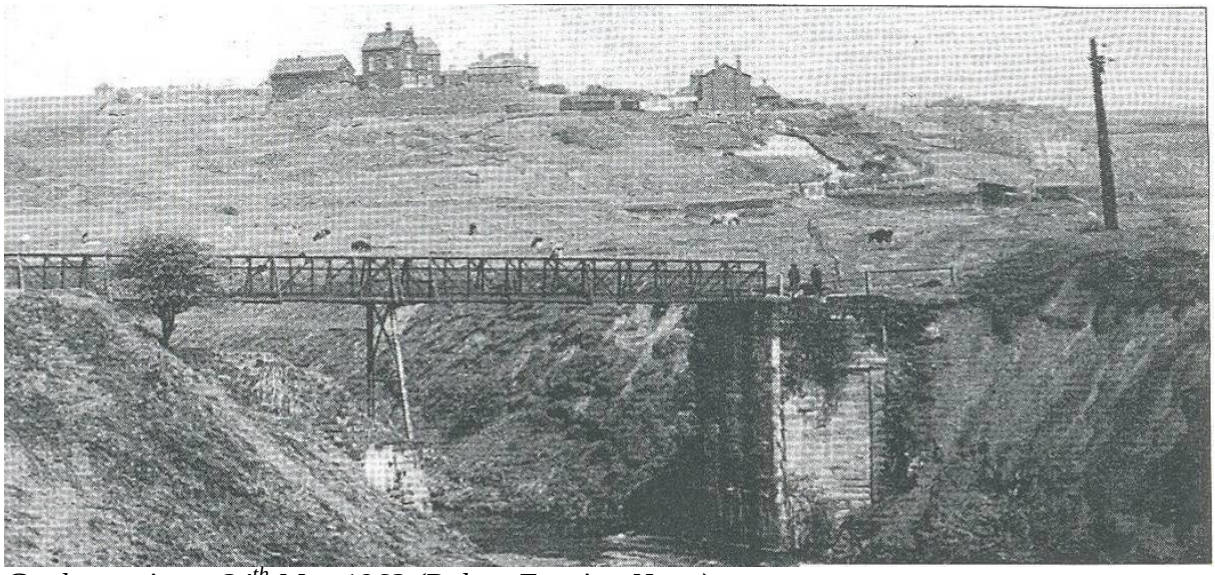
Boiler ash waste - 2013 (Phil Sharples)

Following demolition of the works the land was left derelict, bare with little if any vegetation. Over the years the waste weathered, calcium oxide converted back to calcium carbonate, soluble salts began to leach out allowing plants to slowly recolonise the site. Now the soil on the site resembles calcareous soils found on limestone or sand dunes.

Until the late 1970's when the land became part of Moses Gate Country Park the site had remained under private ownership. The farmer at Seddon Fold Farm had grazing rights to the site, photographs taken in the early 1960's show cattle grazing on the site.

'I remember boats in Oakes canal and in the dry dock. My dad and his brother tried to buy them from Mr Fred Coward who had bought the vat wastes for £225 so as to put his cows on it. That was in 1920 and my dad kept poultry on it. The works chimney was still standing then.'
H. Marsdale, Kearsley, Bolton 1980

The farmer relinquished these grazing rights around the time it became part of the country park.



Cattle grazing – 24th May 1962 (Bolton Evening News)

From Chemical waste to Floral haven.
Biological interest in the site

There are no records of anyone studying the site during the early years of the 20th century. Although research suggests that in 1915 there was very poor vegetation on the site although some scrub and trees were evident.

In July 1954, Common Spotted Orchid *Dactylorhiza fuchsii* and Fragrant Orchid *Gymnadenia conopsea* were displayed at a Botanical exhibition of local flora at Bolton School by some children. These had previously not been recorded in the Bolton area. Inquires as to where they had come from was revealed as Nob End. Further investigations showed this to be correct, also found at this time where other locally rare species; Blue Fleabane *Erigeron acer*, Fairy Flax *Linum catharticum*, Northern Marsh Orchid *D. purpurella*, Early Marsh Orchid *D. incarnate* and Common Broomrape *Orobanche minor*. This flora of the site was first recorded by Geoffrey Hind (1956).
Around this time the site was visited by the Vicar Charles Edward (Ted) Shaw and Roy Lancaster who talk of seeing tens of thousands of orchids. (Lancaster (1983) *In Search of the Wild Asparagus)*.

So where did these plants come from originally. We can only guess, maybe imported as seed or tubers with the limestone and chalk or from the iron pyrite. It has also been suggested that some seed may

have originated from the dunes around Formby, blown here by the wind.

Further investigations have been carried out over the years notably Ash (1983), Gemmell (1977), Ash, Gemmell and Bradshaw (1994), Burrows (1995)

In 1983 the site featured in the Granada TV programme 'In search of the wild asparagus' presented by Roy Lancaster.
Roy Lancaster also produced an article for the RHS magazine The Garden entitled 'A Natural Remedy' (RHS December 2007)
The site also featured in the production of a BBC Radio 4 documentary, 2011. 'The Botanical Vicar', looking at the life of the reverend Charles Edward Shaw. (Aired 18th February 2013 - Radio 4)

In recent years the site has been visited by researchers and students looking at both the flora and fauna.
Dr Kevin Butt from the University of Central Lancashire, investigating worm activities.
The increasing Banded snail population is being investigated by students from Manchester Metropolitan University as part of their MSc studies, led by Dr Lesley Lace.

Other colleges visit the site regularly, primarily for undergraduate study, notably; Manchester University, Manchester Metropolitan University, Edge Hill College, Lancaster University, Bolton University and The University of Central Lancashire.

Past Management for Nature Conservation

A large number of management activities are known to have taken place on the site. Unfortunately, not all activities have been recorded and therefore only those that can be confirmed are listed here.

Whilst in the 1960's and earlier, the site had ben used for grazing, in general, it appears that it had been unmanaged since the tipping ceased in the 1870's. During the 1950's some botanical surveys were carried out and some photographs taken.

The metal bridge at the south western end of the site, Wilson's Bridge, was erected in 1968, to replace an original structure.

In 1964 Bolton prepared a draft Town Centre Map, a report which made reference to the potential of the Croal / Irwell valley as a linier park stretching from Bolton to Salford.

View from Manchester, Bolton and Bury canal, mid1960s

In July 1965 the planning departments of Bolton County Borough, Salford County Borough and Lancashire County Council convened a meeting. This was followed in February 1966 by a joint meeting of elected representatives who set up a working party of officers to study the valley.
The conference had as its goal the complete transformation of the valley and set the following objectives.

Improve the physical environment of the valley.
Improve public access.
Improve the opportunities for recreational use.

With this the Croal / Irwell Environmental Study Area was established. The three objectives of the conference were pursued along the following lines.
Reclamation of derelict industrial areas, along the rivers, with a view to improving the physical environment: The acquisition of derelict sites for reclamation schemes was continued in order to attract the necessary government grants. In 1967 it was estimated that it would cost approximately £3000 to restore an acre of land in Farnworth. It is worth noting that the Department of the Environment would only give grants towards the restoration of certain kinds of derelict land, 'land so damaged by industrial or other development that it is incapable of a beneficial use without treatment'. The reclamation of land around Moses Gate was considered a high priority. Tree planting was given considerable emphasis as a means of improving the environmental quality of the valley. The scheme also included areas for large scale amenity and forest planting.

Increasing access and recreational opportunities: Formation of new footpaths, improved access to existing footpaths and increased public access on the river banks.
Waste disposal: The valley had long been an area where tipping had been carried out with little discrimination, it would have been viewed by some, including local authorities, as a large hole conveniently sited for the disposal of waste. Tipping was a significant land use and a consequence of the industrial way of life. The problems of tipping within the valley as numerous tips, many operating below acceptable standards, in addition to the many fly tip sites, were creating huge environmental problems. It was recommended that authorities should co-ordinate their tipping operations, improve standards and make the fullest use of treatment plants provided.

This was a major undertaking, resulting in some extremely large reclamation work. Areas of land where acquired, resulting in large scale landscape work, paths where improved and thousands of trees planted.

In 1973, Lancashire County Council, applied to the Department of the Environment for funding towards the cost of acquiring the Nob End site for recreational use. The site at this time was on the edge of the Lower Croal Development. An area which would later form a large part of the Moses Gate Country Park.

By 1974 the Croal / Irwell Environmental Study Area had become a joint reclamation team with the Nob End site becoming part of the Croal Irwell Valley reclamation scheme. The team at Nob End was tasked with formulating and managing plans for the reclamation of this derelict land for recreation and conservation. With the formation of Greater Manchester Council in 1975 the reclamation team was headed by the GMC Planning Department, later the Countryside Unit. Bolton Museum and Liverpool Museum along with Manchester University and a number of individuals advised the team on the Nob End sites scientific and botanical importance. This led to the management of the site being focused on its botanical importance. Initial reclamation work continued on the site until the mid 1980's

Since approximately the mid 1970's, the site became part of Moses Gate Country Park, owned and managed by Bolton Council. From 1977 there has been a warden/ranger with ad-hoc responsibility for the day to day management of the site, which included regular monitoring of species.

Chemical waste deposits from river bank to plateau 10m above c1973

Exposed chemical waste along bank of river Croal – 2005(Phil Sharples)

c1975

In 1975 as part of the reclamation of the site, an ecological report and recommendations for landscape improvements was produced by Dr Ray Gemmell (10th October 1975)
The report stated;

The site contains communities of plants which have arisen by natural colonisation of the waste over a period of approximately 80 years.
The plant communities contain many species which are rare in Greater Manchester County. One or two species have no known stations elsewhere in the county.
The composition of the plant communities is unique in two respects.
1. There are no known vegetation types of the same species composition elsewhere in Great Britain.
2. The site contains some of the densest colonies of wild orchids in Britain. 5 species of orchid grow on the site.

Through a Derelict Land Grant in 1981, reclamation work began at Nob End to 'improve the aesthetic value of the site and enhance the naturally established vegetation and wildlife interests'. Much of the site was still covered with a mix of demolition rubble, boiler ash and other debris which had been dumped on the site over the years, which supported a small amount of acidic flora but also tall weedy vegetation. The engineering work removed most of the boiler ash which was used to fill large holes on the site around where the factory used to stand. The removal of the waste ash revealed areas of Leblanc waste. Parts of the site not covered by alkali waste where heavily limed with 100 tons of limestone dust. An area of acidic ground and some pockets of boiler ash where left untreated to provide diversity and for study. Work was also carried out to cap the coal mine shafts on the site.

In 1981 Nob End was given Special Biological Interest (SBI) status.

On the 25th August 1988, Nob End was notified to Bolton Council as a Site of Special Scientific Interest (SSSI).

In winter 1988-89, to reduce motorbike activities on the site, post and rail fencing along with access points was erected along the North East boundary of the site, from the packhorse bridge to the footpath junction overlooking the River Croal at Oake's weir. The work was carried out by Bolton Council's Estate team with consent from the Nature Conservancy Council.

In January 1989, removal of fencing from mineshaft areas was carried out by the Croal Irwell Valley Warden Service. One former mine shaft, although securely capped, remains fenced as a reminder of the sites industrial past

Felling and removal of some scrub began in October 1991 and continued ad hoc for approximately one year. Material was cut across the whole site except the riverside slopes; the main plant cut was Hawthorn – *Crataegus monogyna*. Work was carried out by contractors and Croal Irwell Valley Warden Service with consent from English Nature. Unfortunately it would appear the solitary Oriental Hawthorn – *Crataegus laciniata,* found on the site in the mid 1950's, was lost at this time.

To prevent cattle and sheep entering the site from Seddon Fold farm via the river Irwell, in 1991, fencing was erected along part of the eastern boundary. Consent for this work was given by English Nature.

In 1995, as part of a student MSc project, a National Vegetation Classification survey was carried out, also as part of the MSc project, a soil survey was carried out.

On the 19th April 2000, Nob End was declared a Local Nature Reserve Local Nature Reserve Byelaws came into effect on 16th August 2001

2002, intensive removal of scrub was carried out, along with active management of the grasslands.

2002 to present, one ranger has been responsible for the active management of the grasslands.
Fixed point photos have been taken each year since 2002

During the period winter 2010-11. The post and rail fence on the north east boundary of the site was removed and replaced with a steel 'estate' fence along with new kissing and field gates.

In the late summer of 2013 work began on the replacement of Wilson's bridge, closed in 2008 due to cracks in the bridge abutments. Work is expected to continue until summer 2014

Today's Flora

From the initial investigations in the 1950's the flora of the site has changed significantly over the past 60 years. Scrub has encroached onto the site and the tens of thousands of orchids have reduced to a few hundred. Hybridisation of Orchids is rife across the site, due mainly to the sites isolation from other orchid sites. The identification of *Dactyloriza* species can be extremely challenging with so many variations in size, leaf spotting, flower colour, but true species can still be found, it just takes longer to search for them.
But all is not doom and disaster.
The site still supports a varying population of five species of orchid; Common Spotted Orchid – *Dactylorhiza fuchsia,* Northern Marsh Orchid – Dactylorhiza purpurella, Southern Marsh Orchid – *Dactylorhiza praetermissa,* Early Marsh Orchid - *Dactylorhiza incarnate-coccinea,* Fragrant Orchid – *Gymnadenia conopsea*. 'True' species of D. purpurella and D. praetermissa can still be found, but becoming extremely elusive. A single specimen of D. praetermissa was last found on the site in 2005.
Sightings of Common Twayblade – *Listera ovate,* wax and wane over the years, with no recordings of them being present in large numbers. Recent years have seen up to 23 plants growing in three different locations across the site.
Two species of Helleborine, Marsh Helleborine – *Epipactis helleborine* and Green-flowered Helleborine – *Epipactis phyllanthes*
are thriving, as are Carline Thistle - *Carlina vulgaris* and Adders Tongue Fern - *Ophioglossum vulgatum*. Blue Fleabane – *Erigeron acer* and Hairy Rockcress – *Arabis hirsute* have recently reappeared and Blue-eyed Grass - *Sisyrinchium bermundiana* has spread in profusion to all parts of the site. The site also supports 3 populations of Autumn Gentian - *Gentianella amarella*. Purging or Fairy Flax – *Linum catharticum* can be found in large numbers across parts of the site, flowering like a white mist on the ground. The site constantly throws up surprises, in the summer of 2012, after an absence of over 15 years, a solitary Bee Orchid – *Ophrys apifera* appeared. So whilst Common Broomrape – *Orobanche minor* once seen in large numbers across the site has been missing since 2005, who knows it might just be waiting for the right conditions to reappear.

A number of apple trees can also be found on the site, from which local people regularly pick the fruit.

Work should continue slowly to control the scrub and other undesirable invasive plants.

Notable flora found on the site:
Common Spotted Orchid – *Dactylorhiza fuchsia*
Northern Marsh Orchid – Dactylorhiza purpurella
Southern Marsh Orchid – *Dactylorhiza praetermissa*
Early Marsh Orchid - *Dactylorhiza incarnate-coccinea*
Fragrant Orchid – *Gymnadenia conopsea*
Marsh Helleborine – Epipactis helleborine
Green-flowered Helleborine – Epipactis phyllanthes
Common Twayblade – Listera ovata
Carline Thistle – Carlina vulgaris
Blue-eyed Grass – Sisyrinchium bermundiana
Autumn Gentian – Gentianella amarella
Adders Tongue Fern – Ophioglossum vulgatum
Common Broomrape – *Orobanche minor*
Common Centaury – *Centaurium erythraea*
Rough Hawkbit – *Leontodon hispidus*
Mouse-ear Hawkweed – *Hieracium pilosella*
Purging Flax – *Linium catharticum*
Eyebright – Euphrasia officinalis
Hairy Rockcress – *Arabis hirsuta*

In addition:
Black Knapweed – *Centaurea nigra*, Goatsbeard – *Tragopogon pratensis,* Tufted Vetch – *Vincia sylvatica* Red Bartsia – *Ordontites verna,* Devilsbit scabious – Succisa pratensis and Red Clover – *Trifolium pratense* including zigzag clover – *T. medium.*
To name but a few, can be found across the site.
Also small patches of Cowslips – *Primula veris* and Wild Strawberry – *Fragaria vesca*, planted during trials in 1979/1981 can be found.

View from top of St Johns - Farnworth and Kearsley parish church tower 25th July 2006 (Phil Sharples)

The Future

What does the future hold for this unique site. A small island of calcareous soil surrounded by an acidic landscape, the nearest naturally occurring calcareous soils being found in North Lancashire and Derbyshire.

Fragrant orchids - Gymnadenia conopsea – 23rd July 2013 (Phil Sharples)

The intrinsic nature of the site holds much to its isolation, many former Leblanc waste sites, seen as a blot on the landscape, have

disappeared, re-landscaped, built on, or bulldozed during the making of new roads. The site at Nob End bounded by two rivers and a canal, it would seem, was simply forgotten about during the major development of local housing and industry. Used for grazing of cattle; as recently as 1970; although how much nutrient they gained from the vegetation is questionable.

The sites isolation and uniqueness poses many management problems, not least in the fact that there is no other site to compare it with. The site requires constant management operations. Rosebay Willowherb – *Epilobium angusifolium*, and Bramble – *Rubus fruiticosus* form large patches across the site, managed by cutting, but the main problem on the site is scrub. Hawthorn – *Crataegus monogyna* is slowly marching across the site, left unchecked would take over completely. It would be easy to say eradicate the Hawthorn, but that presents other problems. The site today is a built up plateau which is very free draining containing plants which in their very name; Marsh orchids, Marsh Helleborine; suggest damp conditions. In the summer, areas of the site which are species rich dry out, the thin soils tuning to dust. Yet these plants which would normally be found in damp areas seem to thrive. The scrub on the site provides some shelter, it helps to prevent the site from drying out too much. But what is the balance between too much or less? In the winter the open areas which suffer from desiccation during the summer are covered with moss. The moss retains moisture, is this sufficient for the plants to survive and multiply. It would appear so, as the numbers of Marsh Helleborine – *Epipactis palustris* have increased dramatically over the past five years.

So what can be done ?
The grassland on the site is fragile as it is subject to the natural process of succession, and to a smaller extent, human influences such as trampling, fire lighting and cycling. Management must attempt to arrest succession and to reduce human impacts, in order to retain the species and communities associated with the significant grassland habitats.

The habitats on the site have developed from ground bare of vegetation. It may therefore be possible to re-instate desirable habitats where they have been lost through succession or human intervention, by removing vegetation and allowing succession to begin again. If this was attempted, recovery would depend on a degree of access restriction.

The viability of the notable grassland species mainly depends on the effective management of a large enough areas of suitable habitat. If the amount of open grassland on the site decreases any further than its

present areas, it is likely that some grassland species will no longer be able to survive.

On some nature reserves across the country Hawthorn scrub is managed by removing all plants over 5 years old and reducing the remaining amount, sometimes down to as little as 5%.
Here at Nob End, areas species rich have undergone major scrub clearance works, aiming for 5% scrub cover. In the dense scrub area close to the river Irwell, glades have been created. As plants recolonize these glades, then, these glades will be enlarged.
Another plan, quite radical and somewhat destructive, is to remove the top layer of soil in areas species poor and re-expose the waste. Effectively starting again. It is paramount that any such work undertaken is done with caution.
Active site management, monitoring and recording of species must continue on into the future.

In December 2013 all Bolton Council Ranger posts where disestablished ending over 35 years of work on the site. The future?

Aerial view above St Johns Church – Farnworth, 10th June 1989 (Jeffersons Air Photography)

Aerial view c2009

File ref: SD 70/2
County: Greater Manchester **Site Name: Nob End**
District: Bolton
Status: Site of Special Scientific Interest (SSSI) notified under Section 28 of the Wildlife and Countryside Act, 1981.
Local Planning Authority: Bolton Metropolitan Borough Council
National Grid Reference: SD 749063 **Area:** 8.8 (ha) 21.7 (ac)
Ordnance Survey Sheet 1:50 000 109 **1:10 000** SD 70 NW
SD 70 NE
Date Notified (Under 1949 Act): – Date of Last Revision: –
Date Notified (Under 1981 Act): 1988 **Date of Last Revision: –**
Other Information:
1. This is a new site.
Description and Reasons for Notification:
Nob End is situated on the outskirts of the village of Little Lever, approximately 4.5 km from Bolton town centre. It lies at the confluence of the Rivers Croal and Irwell and the site consists of a flattopped, steep-sided tip of alkali waste produced as a by-product of the Leblanc process for the making of sodium carbonate. The plateau of the tip is approximately 10 m above the level of the rivers.
It was built up between the years 1850 and 1870 and it would, initially, have been extremely toxic to all plant life (due to the high concentrations of calcium sulphide, calcium oxysulphide and calcium polysulphides present). Subsequent weathering of the surface, however, has converted these toxic salts to calcium carbonate, thus permitting the establishment of a calcicolous vegetation.
The most significant and extensive vegetation type found on the site closely resembles that occurring on eroding, base-rich clay cliffs typical of parts of the Durham, North Yorkshire and Humberside coastlines, and represented more locally on the Wirral coast of the Dee Estuary in Merseyside. It is the best example in Greater Manchester and Merseyside of the nationally rare species rich variant of the tall fescue–coltsfoot plant community and is of especial interest because of its development on an unusual and scientifically interesting substrate.
It is characterised by an open-structured sward in which grasses play a minor role and herbs typical of limestone grasslands predominate. As natural limestone grassland does not occur in Greater Manchester, many of the species found here are rare in the county. Examples include carline thistle *Carlina vulgaris*, blue fleabane *Erigeron acer*, purging flax *Linum catharticum*, rough hawkbit *Leontodon hispidus*, common centaury *Centaurium erythraea* and common broomrape *Orobanche minor*.
Orchids, too, are well represented and several species occur here in large numbers. Most notable amongst these are fragrant orchid *Gymnadenia conopsea*, northern marsh orchid *Dactylorhiza purpurella* and early marsh-orchid *D. incarnata*. Southern marsh-orchid *D. praetermissa* and common spotted-orchid *D. fuchsii* also occur and hybrid swarms between the *Dactylorhiza* species form large populations with considerable variability between individuals. Green-winged orchid *Orchis morio* has also been recorded here. In some areas a more neutral grassland has developed with a denser sward in which coarse grasses such as Yorkshire fog *Holcus lanatus*, cocksfoot *Dactylis glomerata* and false oat-grass *Arrhenatherum elatius* are abundant. Herbs, however, are not infrequent and common knapweed *Centaurea nigra*, tufted vetch *Vicia cracca* and meadow vetchling *Lathyrus pratensis* make a significant contribution to the sward. Adder's-tongue fern *Ophioglossum vulgatum*, devil's-bit scabious *Succisa pratensis* and eyebright *Euphrasia officinalis* also occur here.
A few small patches of acidic grassland are found where boiler-ash has been spread over the surface of the Leblanc waste. Mat-grass *Nardus stricta*, wavy hair-grass *Deschampsia flexuosa* and even heather *Calluna vulgaris* occur in these areas.

Nob End SSSI – Compartments

For the purpose of management, the site has been divided into 11 compartments. The compartments are based on a combination of habitat type, topography. Compartments 1,3 and 5,6 are combined to ease management operations and are represented on the site map.

Descriptions of compartments are as follows:

*1,3****Open calcareous grassland.*** The compartment comprises calcareous grassland with a very open structure, in the northern part of the site. The boundaries of this compartment are defined by compartments 5, 6, 8 and 10. A path marks the boundary between compartment 1 and compartment 3 and is quite distinct. The area is quite distinct as regards vegetation.

2 ***Calcareous grassland in the southern part of the site***. The compartment comprises all the calcareous grassland in the southern part of the site, below the central definitive footpath. The boundary of this compartment is further defined by compartments 4, 5, 7 and the fence line running along the north eastern boundary. The area is quite distinct as regards vegetation.

4 ***Tall herb grassland***. The compartment comprises most of the tall herb grassland in the northern part of the site. The boundaries of this compartment are defined by compartments 1, 8 and by the central definitive footpath. The western boundary of the compartment follows an arbitrary line across the western edge of the canal dry dock feature.

*5,6****Open mix of calcareous and acid grassland***. The compartment comprises mixtures of calcareous and acid grasses with some tall herbs. The boundaries of these compartments are defined by compartments 1, 2, 3, 4 and 8

7 ***Southern tip and eastern part of the site, including raised plateau***. The compartment comprises all the raised ground immediately south and east of Wilson's Bridge and extending east to Prestolee Old Bridge. At the time of writing, the southern tip of the area is well-used by cyclists, with the result that much if it is bare of vegetation. The remainder being dominated by Hawthorn scrub. The area is quite distinct as regards vegetation and topography. The compartment lies adjacent to compartment 2 and compartments 9 and 10.

8 ***Woodland in the north eastern part of the site***. The compartment comprises all the willow-dominated woodland along the eastern

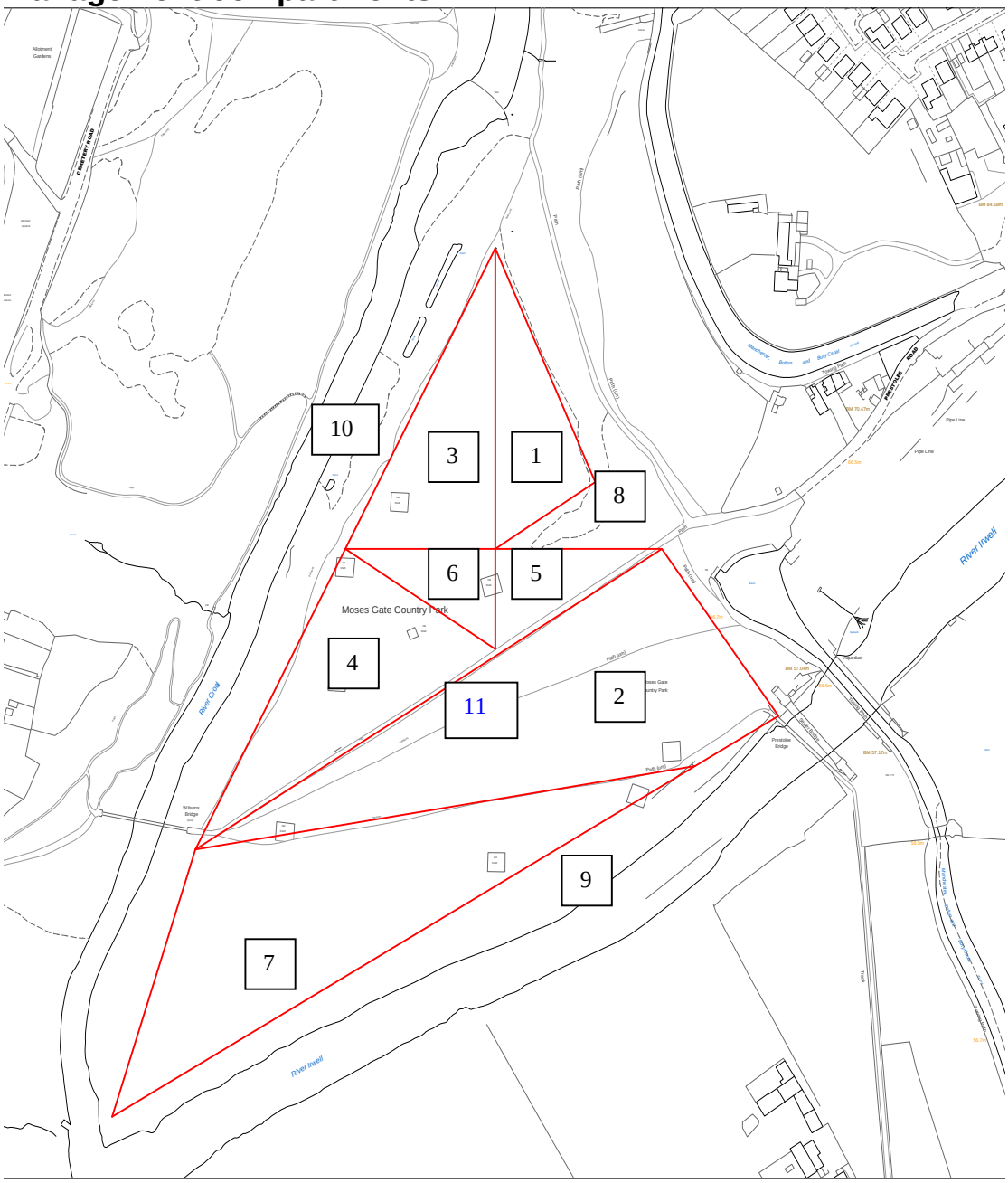
boundary, adjacent to the permissible bridle route. The area is quite distinct as regards vegetation. The compartment lies adjacent to compartments 1and 5.

9 ***Slopes above the River Irwell.*** The compartment consists of all the steeply sloping land above the River Irwell and the south-eastern boundary of the SSSI. At the time of writing, most of this area is quite inaccessible and covered with woody vegetation in the form of trees and shrubs. The area is quite distinct as regards both vegetation and topography. A fenceline demarcates part of the boundary of the compartment. The compartment lies adjacent to compartments 2 and 7.

10. ***Slopes above the River Croal.*** The compartment consists of all the steeply sloping land above the River Croal on the western boundary of the SSSI. At the time of writing, most of this area is quite inaccessible and covered with woody vegetation in the form of trees and shrubs. The area is quite distinct as regards both vegetation and topography. The compartment lies adjacent to compartments 3, 4 and 7.

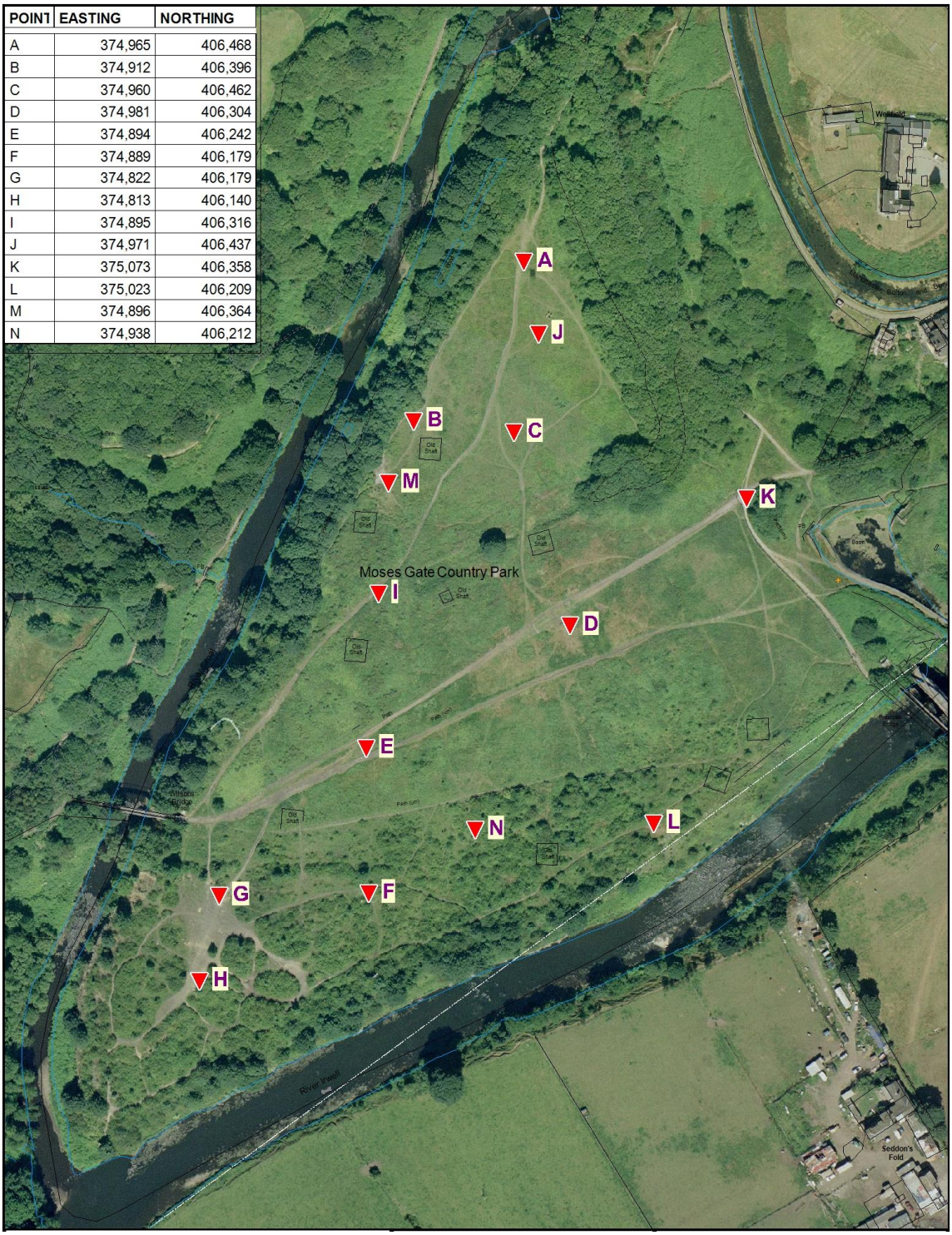
11 ***Acid grassland close to the centre of the site.*** The compartment comprises all the acid grassland in the centre part of the site, on either side of the central definitive footpath. The area is quite distinct as regards vegetation. The compartment lies within compartments 2, 4, 5 and 6 and contains part of the canal dry dock feature within it.

Management compartments



Nob End Fixed Point Photograph Locations

POINT	EASTING	NORTHING
A	374,965	406,468
B	374,912	406,396
C	374,960	406,462
D	374,981	406,304
E	374,894	406,242
F	374,889	406,179
G	374,822	406,179
H	374,813	406,140
I	374,895	406,316
J	374,971	406,437
K	375,073	406,358
L	375,023	406,209
M	374,896	406,364
N	374,938	406,212



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