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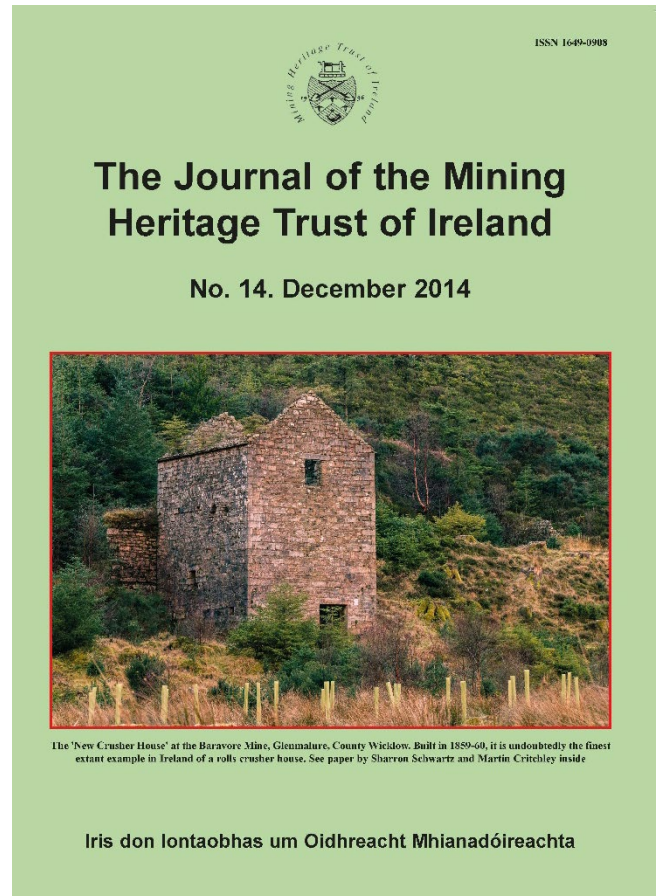
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SALT MINES IN THE CARRICKFERGUS AREA OF COUNTY ANTRIM

Caroline A. Nicholson

Abstract: During the nineteenth century, salt deposits in Carrickfergus, County Antrim, were mined for a variety of purposes, including in mineral processing and chemical industries; agriculture; de-icing road surfaces; as a food preservative and for human consumption. Using a range of documentary and empirical evidence, including oral testimony, this article explores and examines the little known discovery and subsequent development, of the salt deposits of County Antrim, and considers the environmental legacy of the industry. *Journal of the Mining Heritage Trust of Ireland* 14, 2014, 1-22.

THE FORMATION, DISCOVERY AND DEVELOPMENT OF THE ANTRIM HALITE DEPOSITS

During the Triassic period of earth's history, about 150 - 200 million years ago, the landmass that was to become Ireland lay far closer to the equator. A shallow sea that once covered parts of present day Britain and Ireland formed in a restricted basin on a shallow marine shelf which was surrounded by mountains. Over several millions of years, the ancient sea encroached many times into this basin. The climate was hot at the time which created deserts, and with searing temperatures and high winds the trapped seawater water evaporated leaving behind beds of rock salt known as halite. Dust blown in from these ancient deserts gives halite its different colours (Mitchell 2004, 266).

Large deposits of halite, the mineral form of sodium chlorite, in Northern Ireland are restricted to the southeast corner of County Antrim and were discovered by accident after the 4th Marquis of Downshire¹, who owned land in Carrickfergus, employed an engineer to look for coal in 1845 (Critchley and Schwartz 2011, 40-41). This search started in an area near Woodburn called Duncrue but by the end of several months there was some disappointment as no coal deposit had been found. A deep shaft, which was according to Miscampbell (1894, 546) 'circular, 9 feet in diameter, lined with brick to a depth of 750 ft.', had been dug at this stage and a 'further boring of 500 ft. was made'. Word spread quickly that coal had not been found, but at a 'depth of 550 ft. a workable seam of rock salt was discovered, about 120 ft. in thickness'.

The need to transport this salt quickly and cheaply from the mine was important so it was decided to try another borehole nearer the railway line, which had recently been built from

¹ Downshire lived at Hillsborough and owned vast amounts of land in Ireland.

Carrickfergus to Belfast in 1848. No salt was discovered here so the focus shifted back to the Woodburn area where two more shafts were sunk in a different part of the original field. Ludlow (1993, 245) states that the shafts were sunk under the recommendation of Thomas Phipps who was, '... brought over from Cheshire² at the end of 1852 for a fee of £10 to make a survey and to report the possibility of using the brick lined shaft to open out the salt mine'. To finance this exploration and to attract money to commence mining operations, the Marquis met with a number of prominent manufacturers, a committee was set up and visits made to English salt mining districts to learn more about the raising and preparation of salt (BNL 1852). This led to the formation of the Belfast Mining Company.

The shareholders of the company on 18th June 1885 are shown in Table 1, and contain some of the leading names in Belfast business and industry. However, 'On the 26th April 1886 the Belfast Mining Company went into voluntary liquidation' (Griffith and Wilson 1982, 98) and in the following year, Alexander Miscampbell bought the mining interests. Another change in ownership took place when the Salt Union, formed in 1888, bought up the company. 'The Salt Union', wrote Calvert, (1915, 550) 'became the greatest salt proprietors in the world'. The Salt Union itself was taken over by Imperial Chemical Industry (ICI) in 1937.

DUNCRUE SALT MINE, WOODBURN

The Duncrue Mine was the first to exploit the halite deposits.³ The Downshire papers contain the lease drawn up in '1854 from 1st July for 31 years' for the salt mine at Duncrue (Downshire papers). A pencil sketch of the Great Salt Quarry

² Rock salt mining started in 1670 in Cheshire, England, and the experienced miners were brought over to Carrickfergus to help with the opening of these mines.

³ The 1857 six inch OS map shows the location of the mine.

Names of Shareholders	Number of Shares
Victor Coates	3
Trustees of the Marquis of Downshire	5
Trustees of Geo. Fitzsimmons (G. McAuliffe)	5
W.A. Granger	6
Sir Jas. Hamilton	2
Thos. Montgomery	5
John Mulholland	5
Henry S. McClintock	5
Edward Bailey	1
W.A. Robinson and W.A. Granger jointly as Trustees for the company	5
H.H. McKeile	5
Northern Bank Company	10
W.A. Robinson	12
Wm. Valentine	15
Wm. Young	2
H.E. Cartwright and Helen Smith	9

Table 1: The shareholders of the Belfast Mining Company in 1885

of Carrickfergus (Fig.1) shows a beam engine behind what looks like a timber wall with gears and pulleys involved in the lifting operation of men and salt at the mine. This is probably the engine that was erected in the week prior to 8 February 1854 under the auspices of Mr. Phipps, the manager of the mine (BNL1854).

Eventually two shafts were completed, writes Miscampbell (1894, 546):

... each '4½ ft. square, 36 ft. apart, and lined with 3 inch pine timber. A separate water shaft of the same size was also sunk to a depth of 120 ft., from which the water was pumped by means of an ordinary 6 inch lift and force pump attached to the winding engine.

The main shaft was walled up the whole way down to the salt with bricks made on the spot and from the spoil bank. Maquire's book (1853, 411 *et seq.*) contains an account written by the Marquis of Downshire in 1853 which provides additional information about the layout of the workings:

An abundant and constant stream of clear cold water running past the engine, and to which it has proved itself to be an invaluable quality, the boilers not required to be cleaned out in six months. The drawing shaft is nine feet diameter: and the air or ventilation shaft four feet in diameter. This air shaft ... passes down the whole depth and works admirably keeping the bottom sweet, cool and healthy... This air shaft cut out at the same time as the shaft, and was first introduced by Mr. E. Pickering mining engineer. No water at all is passing down except surface water which

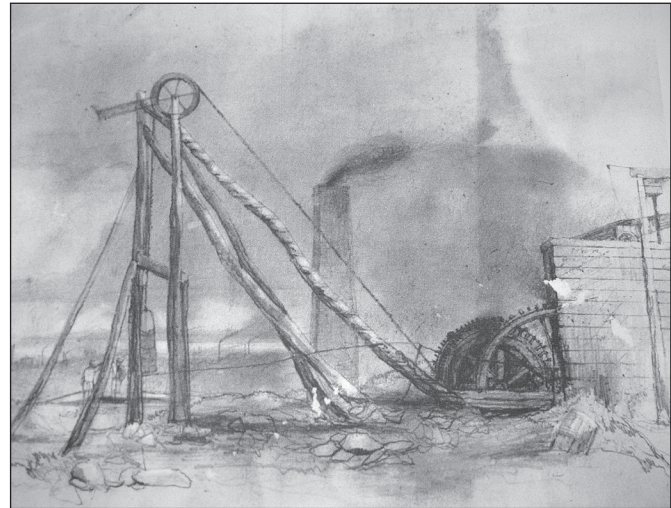


Fig. 1: The Great Salt Quarry of Carrickfergus. Trustees of the National Museums and Galleries of Northern Ireland

is pumped out by a small hand pump. Below twenty-five feet it is perfectly dry.

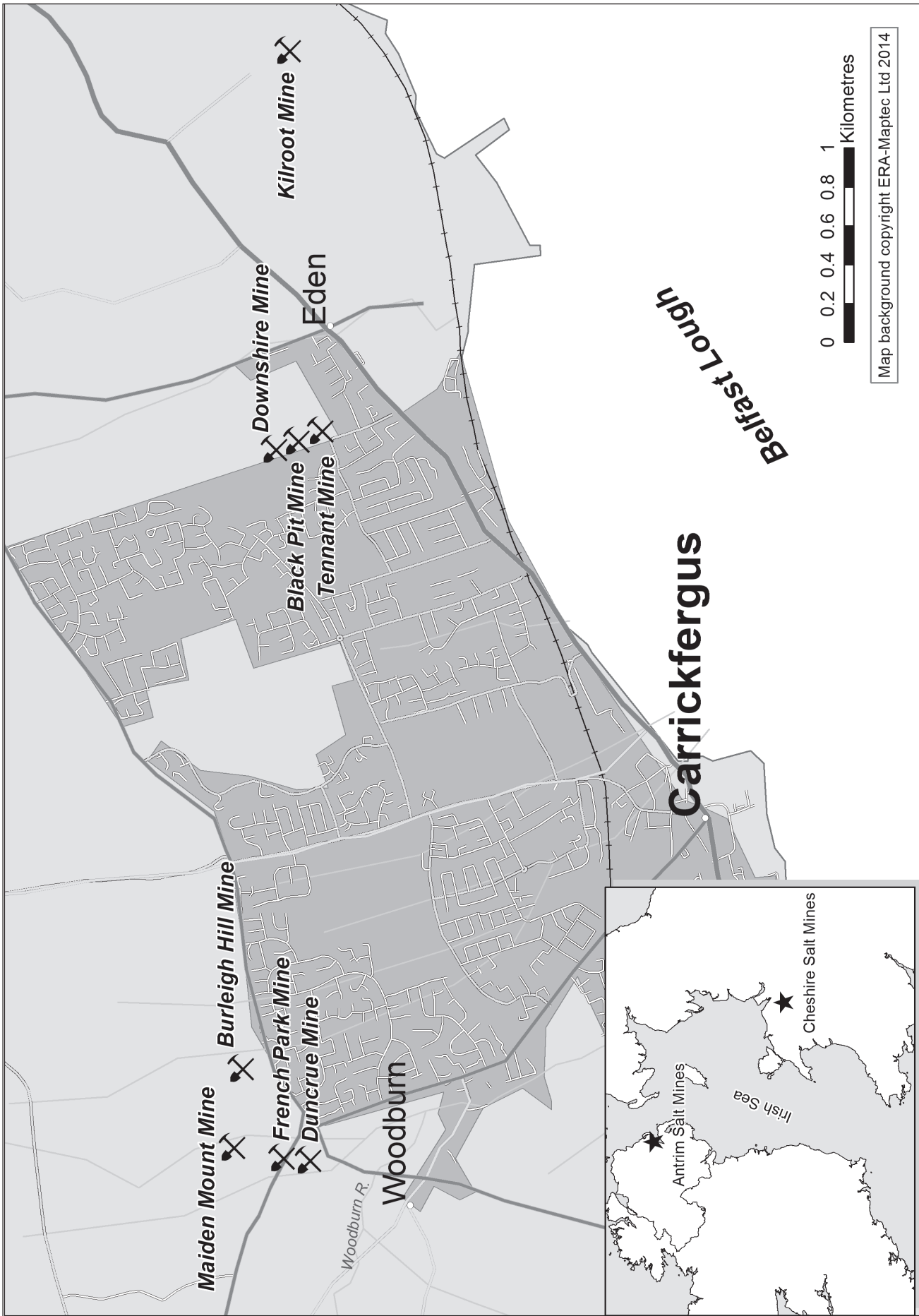
Indeed, Downshire appeared to take great interest in the mines, praising the local people whom he stated 'have learnt their business of mining and executed their work as well as any old experienced miner could have done'. The *Standard* further noted that 'The noble proprietor, the Marquis of Downshire, frequently visits the mines, and goes down the shaft. On a recent visit he presented the miners each with two suits of flannel' (S, 1853). Maquire writes that the Marquis also supervised the

... raising of a block of salt four feet by three feet square for the Dublin Exhibition. It looks splendid on its bed and I am not a little anxious about its coming to light. It will I fancy weigh about three tons and being so hard has given the blacksmith plenty to do to sharpen and even the picks with which it has been chiseled.

The Great Industrial Exhibition took place in Dublin from 12th May until 31st October 1853, in purpose built buildings funded entirely by William Dargan, builder of the Irish railways. The block of salt took up position in the Central Hall with a title 'Section of the beds of rock salt at the Hill of Duncrue, Co. Antrim'.

The *Belfast News-Letter* in 1852 reported that salt from the first bed at Duncrue was sent for analyses to 'Dr. Hodges and other eminent chemists. Dr. Hodges found the specimens sent to him to consist of ninety-nine parts of pure salt to one earthly matter; and the result of an analyses made by Dr. Andrews, Vice-President of Queen's College, is ninety-six parts salt to four parts earthly matter' (BN, 1852). Another testing proved to be the same as the results from Dr. Andrews and it was concluded that, 'this bed [of salt] will not yield less than 96 percent of the pure marketable commodity, or about 20 percent. More than any of the English mines' (BN, 1852).

Rock salt in the 1800s was obtained through sheer hard work as



Map 1: The location of the salt mines of Carrickfergus in County Antrim, Northern Ireland

no machines were ever used in the early mines. Miscampbell (1894, 547) describes how the salt was obtained:

... Round the bell-mouth of the shafts the rock was worked out, leaving a clear space of 60 feet in diameter. Outside this, four shaft pillars of solid rock salt were left, about 18 feet square, to support the roof and the overlying strata: the other pillars of the mine were set out about the same size and 48 feet apart... about 36 feet of the lower portion of the seam of rock-salt was worked.

The temperature underground ranged from 54-56 degrees fahrenheit all year round and, unlike their counterparts in collieries, the salt miners bore all the appearances of health and vigour. Their occupation was considerably cleaner and had none of the dangers encountered in coal mines, as no noxious gases were present (FJ 1855). In 1856 the *Standard* reported that, 'Nineteen men are occupied in the mine at Duncrue, excavating daily 80 tons of rock salt; eight or ten men assist in raising this quantity to the earth's surface; five or six horses and carts carry it to the tramway and 15 or 18 horses and carts carry part of the supply to Carrickfergus where it is shipped' (S, 1856).

Moreover, the *Belfast News-Letter* reported in 1852 on the skill of the Irishmen. Mr. Pickering found them, 'tractable, quick and intelligent; and the best proof of their aptitude for work requiring the exercise of quickness and intelligence is the fact, that for the eighteen months the works have been in operation there has not been a single accident, nor a life lost, not a man hurt, nor even a limb injured. The fact is almost unprecedented. Experience shows that few shafts of any size are sunk in England without loss of life, and none of the depth of the Duncrue shaft without some dreadful accident' (BNL 1852).

The miners descended into the workings via a bucket and then walked to the area where they worked. On 20th July 1867, a group from the Belfast Field Naturalist Club organised a trip to Duncrue and their report gives an insight into the environment below the ground (BFNC, 1867) The group was:

... let down some 620 ft., three at a time, in a bucket, and only laughed at their fears when they landed below... most extensive ...chambers, extending in every direction for hundreds of yards, and from fifteen to thirty feet high. One of the Directors of the Belfast Mining Company, Mr. W. Valentine had the mine all lit up with coloured lights, crackers, Roman candles and other fireworks to produce the most magical effect. The guests were then shown how salt was extracted from the seams by blasting which caused echoes throughout the mine.

A *Belfast News-Letter* reporter spent a day at the mine in 1927 and from him we obtain a detailed description of the process of extracting the salt (BNL 1927). He describes three main jobs. 'Roofers' made a cut of six feet by drilling into the salt bed horizontally and then filled the holes with gunpowder. The blasted rock was then shoveled over the edge. A ten foot ceiling

of rock salt was left above them to support the roof. 'Lynchers' were in charge of the layer below, drilling vertical holes which were charged and blasted. Finally 'Ferriers' loaded the wagons and carted them to the bottom of the shaft before being cable winched to the surface.

From the shaft head, horses and carts took the salt to the Woodburn corner where a tramway⁴ had been constructed by the Belfast Mining Company to carry the salt quickly to its destination. This tramway could not be built right to the mine owing to the topography of the Woodburn Valley where a small river created a deep valley, which was crossed by a road but with no extra space for a tramway which was to run from Woodburn to the main Belfast to Carrickfergus line. There are no references to this tramway or siding except in J. R. L. Currie's book (1973, 125) where he writes that an,

... incident took place near Carrickfergus on 23rd December 1878. A mixed train left for Belfast at 7.40 am; 1½ miles up the bank it stopped to carry out shunting at Duncrue siding. The train as a whole was too long for the siding and four carriages, behind the wagons, were left on the main line depending on the guard's van brake, which failed to hold them, and the coaches set off down the single line to Carrickfergus... Heavy snow had probably rendered the brake ineffectual.

From Duncrue, rock salt was railed to Jennymount salt works, Belfast, which was only a few hundred yards from the Northern Counties Railway Terminal in York Street. These works are shown on an 1877 Map of Belfast and remained in operation until 1878. This map shows the dissolving pond, reservoirs for the water and the salt works, which are now under the present M2 motorway. More information about the interior of the mine comes from an article from the *Carrickfergus Times* (undated newspaper clipping), written by David Hume, who refers to an original article in a series called 'Saturdays Not At Home' published in the *Belfast News-Letter* (date unknown), where the author and friends visited Duncrue mine in September 1869:

... light emitted from a contrivance resembling a goodly sized potato upon which white shoots were thrown out. This is the usual form of improvised candlestick used by the miners - a thin dip fixed in a lump of clay... The men were stripped to the waist and the air in the mine was dry and close... The men worked from 7 am until 3 pm and on Saturdays from 7 am until 1.30 pm.

Extracting salt can create large underground caverns leading to the bedrock collapsing and causing significant surface subsidence, as the following events confirm. In 1875, a moaning and groaning was heard coming from the vicinity of the Duncrue shafts. The weight of the earth above the caverns became too much for the pillars of salt to hold up the roof any

⁴ Clearly visible on the 1856 and 1931 six inch Ordnance Survey maps and visible today, although badly overgrown with brambles.

longer and the shafts collapsed. This created a huge depression, which gradually filled up with water. In 1899, wrote Rigby (1905, 568):

... there was an almighty eruption from this pond throwing water and fish into the air [which] covered an area of four acres of mowing grass with a coating of red marl ... and stones ... some stones killing chickens in a nearby yard... flattened the grass for a distance of 100 yards. The rush of water, mud and stones continues... for about four minutes, and accompanied by very loud rumbling noises. The sides of the hole afterwards commenced to fall in ... The timbers of the shafts seemed to have gone down into the mine, and the metals between the shafts also... The ground seemed to be continually on the move, falls taking place every three to four minutes, and, from the distance I [Rigby] should say the shafts were open to a depth of at least 300 ft.

A larger lake than before was created and aptly named the Borehole and this accumulation of water was to prove essential when French Park mine was flooded, for brine pumping. The lake also became the local swimming pool and fishing was also tried, although no fish were caught.

In the 1960s Larne Rural District Council decided that the area's rubbish could be dumped here. The depression was filled up by 1981 when it was closed and soil from the building of a local housing estate covered the field, which has reverted to grazing ground. Since early 2012 the area is completely out of bounds owing to possible subsidence. The production figures depicted in Table 2, in tons, shows the amount of recorded salt mined at Duncrue and has been obtained from the Geological Survey of Northern Ireland in Belfast.

Year	Tonnage
1853-4	15,000
1855	20,000
1856	16,263
1857	16,600 shipped, 5,798 used in manufacturing, 4,877 white salt refined
1858	None recorded
1859	None recorded
1860	18,443
1861	11,228
1862	11,725
1863	15,662
1864	17,245
1865	17,245
1866	17,245
1867	19,689
1868	17,472
1869	19,450

Table 2: Production figures in tons for the Duncrue Salt Mine



Fig. 2: 'Old Bill' Hodkinson, by kind permission of the Hodkinson family

FRENCH PARK MINE, WOODBURN

Before the closure of Duncrue another mine was started to the northeast that was known as French Park⁵. These acres were purchased by the Downshire family in 1864 and are first listed in the lease book of 1865 (Downshire papers). 'Old Bill' Hodkinson who hailed from Cheshire and worked for the Belfast Mining Company (later to leave and work for M.R. Dalway) as a winding engine driver, is thought to have been responsible for the opening of this mine. He, it is claimed, helped to sink the mineshaft at Maiden Mount and then later moved to work on another mine, Black Pit, in the Eden area. George Burgess, an elderly man living in Carrickfergus, was able to say that Hodkinson and William 'Old Bill' Burgess opened the mine (interview, Mr. G. Burgess). Fig. 2 shows William Hodkinson in 1890 and Figure 3 shows the plumb bob (GS March 1955) that was used to sink French Park, Maiden Mount and Black Pit⁶.

There were two levels to French Park Mine, the bottom level collecting seeping water and the next level for salt mining, as

5 French Park was also called Duncrue and still is by the local people today.
 6 The plumb bob had been in the Hodkinson family for over one hundred years, being handed down from father to son for at least three generations. The *Grains of Salt* magazine wrote that 'Mr. David Hodkinson has very kindly handed this interesting and historic object to Mr. S. A. Steele for its safe keeping.'



Fig. 3: Mr. Hodkinson's plumb-bob

seen in Fig. 4, although judging by this cross section, both levels were mined. Pillars were left to support the roof, but Joseph Dickinson advised in 1887 that they were, 'in future to be larger or left at shorter distances apart than 25 yards' - lessons obviously learnt from the crushing and eventual collapse of the pillars in Duncrue. One of the towers above the shaft had a glass roof and when Mr. Joseph Weatherup paid a visit, he looked up from the bottom of the shaft and recalled it was like 'seeing a star' (Interview, Mr. J. Weatherup). In Fig. 4, horses and carts can be seen to the right of the site and the small building beside them was probably the weighing bridge and house. Joseph Weatherup noted that the buildings on the surface were a crushing mill, engine house, workshop and stables and the metal parts were covered in tar to prevent them from rusting from the effects of the salt.

Figure 5 shows the plan of the surface workings, put together with the help of Messrs. George and Kenneth Burgess who were able to name various buildings on the 25 inch OS map (Interviews, Mr. G. Burgess and Mr. K. Burgess). Their family had worked in the salt industry almost from the time salt was discovered at Duncrue having come from Cheshire. George and Kenneth had been brought up beside the mine where their

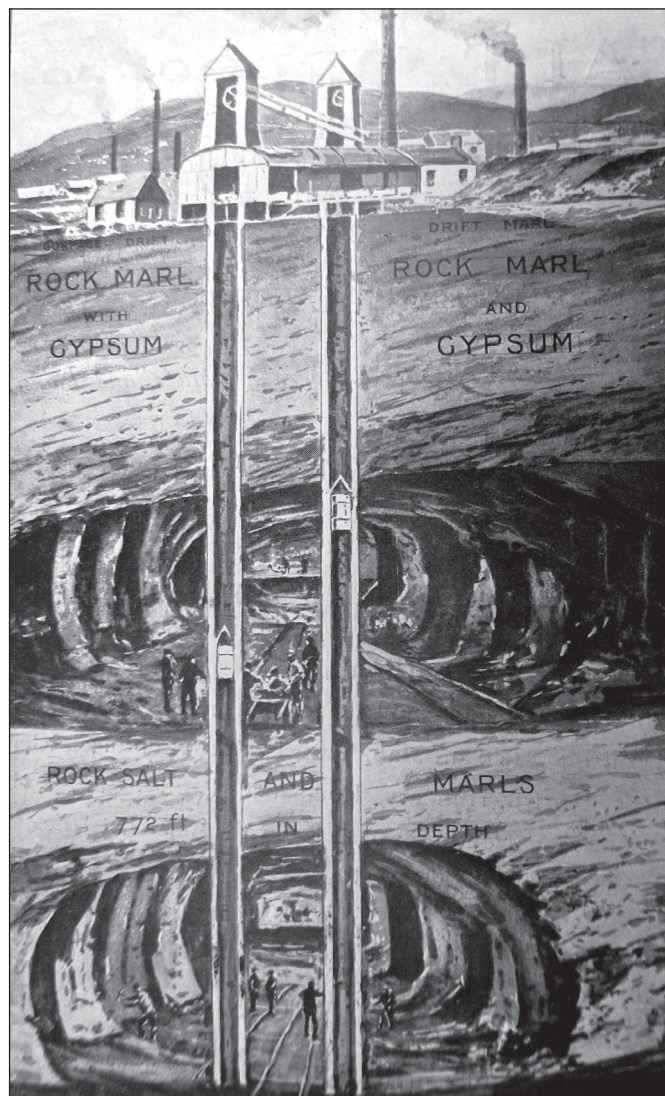


Fig. 4: Cross section of the Duncrue/French Park Mine from a photograph in possession of the Hodkinson family and reproduced with their kind permission

father was foreman. When George Burgess was interviewed he said, 'Twenty horses and carts carted salt to Clipperstown and were paid by weight. Then some cisterns were built on site so the salt could be melted [dissolved] and sent by pipe to the works as brine.' In 1873 there were 25 miners working here, but by 1896 there were only ten men below ground working and four above.

The Belfast Field Naturalist Club made several visits to the mine, the last time just before the mine was flooded in the 1940s. C. Douglas Deane (undated manuscript) described his descent into the mine:

... Slowly the great steam-driven winch turned, we grasped the chain and down we went through the trap door into the cool, clammy darkness lighted only by the vast disappearing square of light above, showing in relief the greasy wet walls of the pit-side. Only the swinging bucket broke the silence as it scraped the side of the shaft. It was a large square bucket capable of holding two people, standing close together... just fitted into the narrow shaft, and great care is needed to

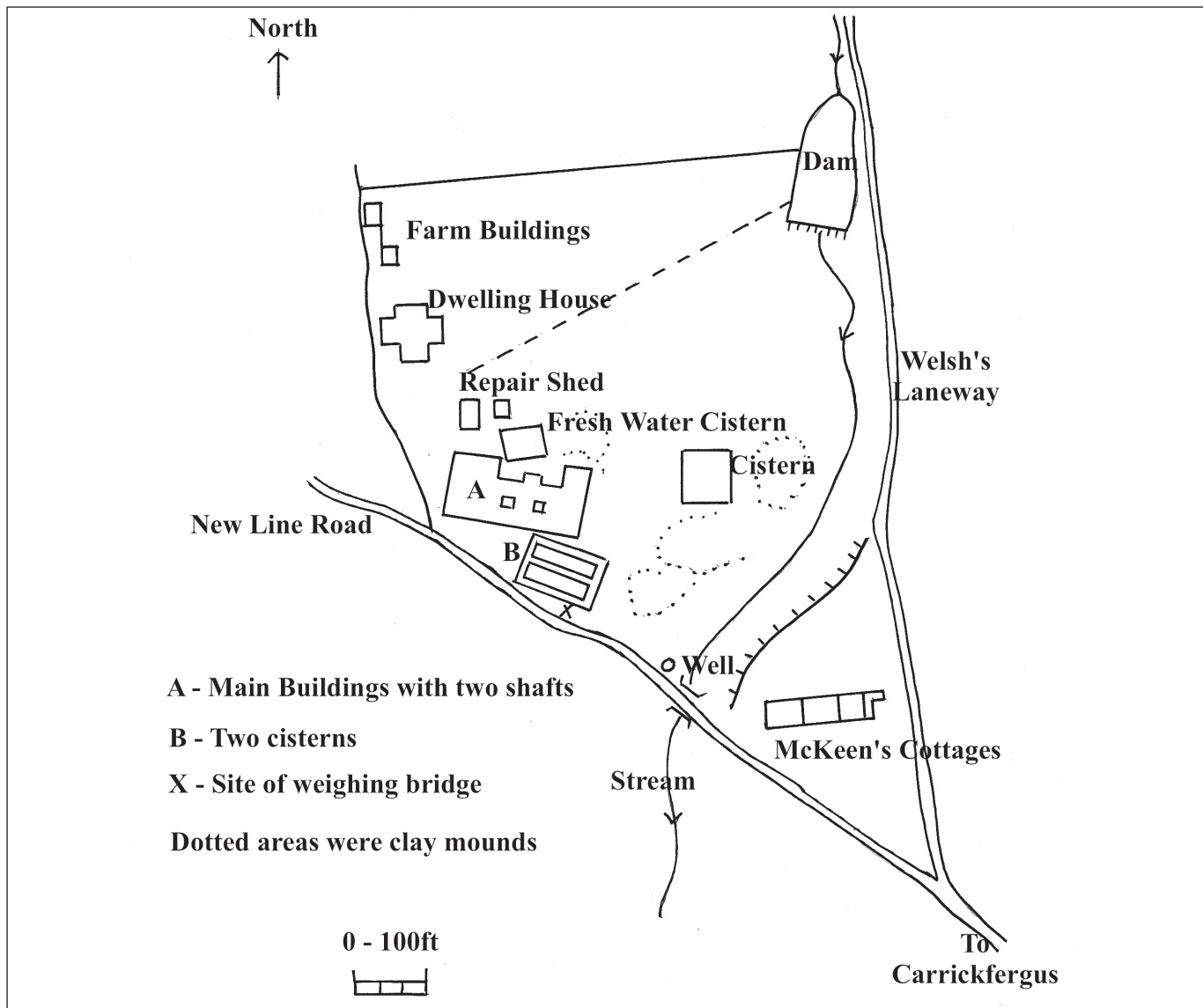


Fig. 5: Plan of the surface works at the French Park Mine in the 1940s

stand exactly in the centre of the bucket, away from the pit wall, which gleams horribly close.

The engine driving the winch was supposed to be over ninety years old and had been at the mine for sometime, so was probably the original brought up from Duncrue. Alexander Hogg, the well known photographer, took a series of photographs down the mine which are held in a collection at the Ulster Museum and a post card was produced in 1955 as a New Year card issued by St. Nicholas Church, showing six men working at the salt face.

George Burgess claimed that in the late 1930s 'the seam of salt was going too far back and men going to war meant there were no other workers. French Park was deemed unsafe (one of the shafts was in danger of collapse) for miners to descend and brine was already being pumped from the old Duncrue workings via pipes through a connecting wall'. Before French Park was finally abandoned, tail pipes were laid throughout the mine and connected to a main pipe. Water from the 'Borehole' (old Duncrue workings) was then pumped down one of French Park's shafts using a traction engine, which was later sold to

a scutch mill. In total, one and a half million gallons of water was pumped down one shaft and brine extracted from the second shaft. After a time, roof falls within the mine caused damage to the pipes and it was finally agreed that French Park had outlived its usefulness and was closed.

George was also able to name the miners who were the last to work in French Park including himself, who carted salt: David Hodgkinson responsible for maintenance and working the great engine; Billie and Alfie Burgess, both engine men, the former killed on the New Line by a lorry as he chased a hare down the road; Sam Black, whose job it was to feed the crusher with rock salt at the mine head; Tommy Armstrong and Willie Black, who later joined the army; John Burgess; Tom Martin Rene McQuitty; 'Red' Andy McAlester; Willie McAlister; Geordie McClellaghan and George Patterson, nicknamed 'turkey' because he had a long neck!

Mr. William Weatherup noted, 'when French Park was flooded, debris came up out of the shaft and floated down towards the Five Corners so the shafts had to be sealed when this continued' (Interview, Mr. W.J. Weatherup). The site was

eventually demolished with the firm ‘McClelland valuing the cottages [McKeen’s] and the Salt Union paying compensation and for knocking them down’ according to Mr. Johnston Connor (Interview, Mr. J. Connor).

There is no firm date for when French Park closed completely, but a few years later traffic lights were placed on the New Line. There was a sensor attached so if there was movement of the ground, pending a collapse, the lights would go red to stop any traffic at the time. Only once did this happen but not from natural causes. The Burgess brothers were playing Cowboys and Indians one evening when their parents were out visiting friends. The boys decided to lasso the lights to see what would happen. George Burgess said that the lights turned red, any traffic stopped and the boys got a good telling off by their father when he returned! The lights remained for a few years when they were finally dismantled (Interviews, Mr. G. Burgess and Mr. K. Burgess). Production figures are depicted in Table 3, in tons, for French Park from the Geological Survey of Northern Ireland. From 1889 the production figures were not recorded separately but added to the totals for all the mines.

Year	Tons
1871	18,260
1872	20,000
1873	19,392
1874	27,951
1875	25,750
1876	32,310
1877	2,479*
1878	12,707
1879	17,430
1880	17,593
1881	16,845
1882	17,176
1883	21,316
1884	6,634
1885	7,067
1886	5,308
1887	7,144
1888	Not recorded
*	1,200 was crushed, 1,279 rock salt

Table 3: Production figures in tons for the French Park Salt Mine (from 1889 totalled with other mines)

MAIDEN MOUNT MINE, WOODBURN

With the success of Duncrue, Mr. M. R. Dalway decided to try his luck on a piece of ground further up the hillside, having been unsuccessful in other areas. He discovered salt in 1869. The Downshire family owned this parcel of land and a lease in the late 1860s (Downshire papers) showed that M. R. Dalway Company Ltd. sank two shafts, one for salt, the other for water.

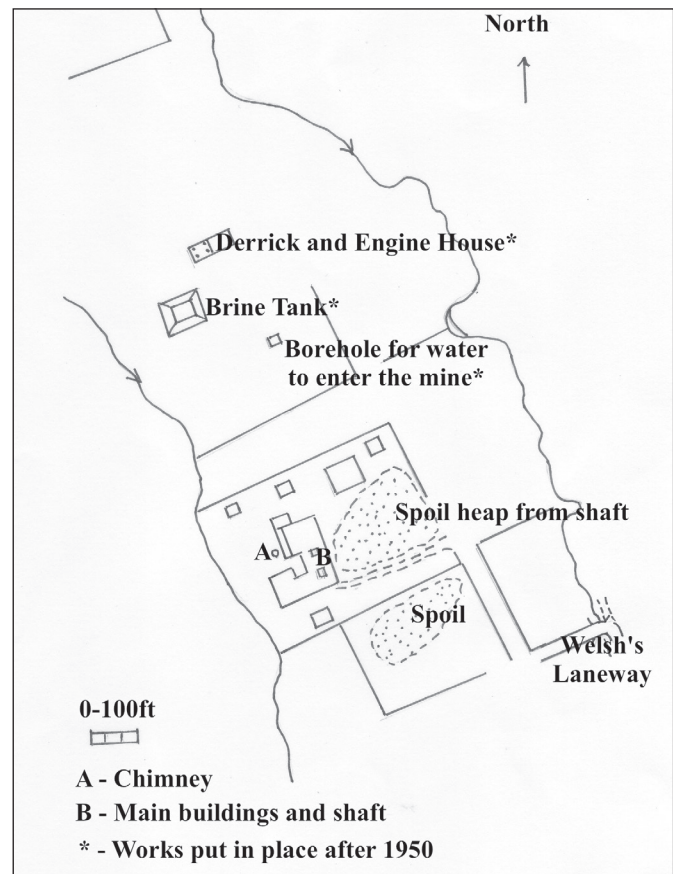


Fig. 6: Plan of the Maiden Mount Mine

There was also a winding engine, crushing mill and below the ground, 47 acres of salt and brine. Figure 6 shows the various buildings involved.

When in production this mine was claimed by Joseph Dickinson, HM Inspector of Mines, to be the ‘deepest rock salt mine in the kingdom with strata dipping steeply at over 900 feet deep’ (1873, 66). The method of mining was exactly the same as for Duncrue, the pillar and stall method, but the supporting pillars were ‘3 by 10 yards at the top and 14 to 12 yards at the bottom, future pillars to be larger and to be left at less distance than 25 yards apart.’ Dickinson also tables the geological section of the mine, reproduced in Table 4. Reading through the rest of the report, there were twenty miners working in this mine in 1873.

Very little is known about the early days of Maiden Mount; salt was being taken from the mine in 1870 but the amount per annum is not recorded until 1877 (see Table 5). Dalway, according to Dickinson, built some rock dissolving cisterns near the mine head from which brine was pumped to the salt pans erected by Dalway and Company at Carrickfergus Harbour. In 1896, Mines Inspector, John Gerrard, reported that eight men worked below ground and three on the surface (1896, 66).

There are no remains of the cisterns, but the original shaft is still visible and the foundations for some of the buildings could be seen until 2005 below brambles and other weeds. To the side was a large mound of soil removed when digging

Dip of Strata 1 in 7		Mr Dalway's Shaft		Comments
Depth		Thickness		
Ft	Inches	Ft	Inches	
1	6	1	6	Soil
63	0	61	6	Brown drift with boulders of chalk, limestone, flint etc.
735	0	672	0	Brown drift and a little blue marl with gypsum
750	0	15	0	Rock salt
756	0	6	0	Brown marl and marlstone
849	0	93	0	Rock salt
850	0	1	0	Brown marl and marlstone
895	0	45	0	Rock salt
900	0	5	0	Brown marl and marlstone with rock salt

Table 4: Geological section of the Maiden Mount Mine as provided by HM Inspector of Mines, J. Dickinson, 1873

the shafts and as Bill Hodkinson lived near Maiden Mount, I assume he probably had some input into the opening of this mine.

In 1889 the Salt Union Ltd. bought the interests in all the mines in the area and then they were taken over by Imperial Chemical Industries (ICI) that extracted brine from this mine in the 1950s. Competition from French Park may have led to the demise of Maiden Mount in 1895 when production ceased and it was abandoned altogether. The only further use was during the war years, when a local butcher used the main shaft to dispose of carcasses of slaughtered sheep and local children would also run boulders down the fields and let them fall down the shaft to hear the noise that followed.

By 1952, ICI conducted a survey of the mines and it was said French Park had ten years' worth of brine left (Interview, Mr. W.J. Weatherup). However, it was thought to be far more economical if brine was extracted from Maiden Mount if it was flooded. Mr. W.J. Weatherup explained how preparations were made for the reopening:

Welsh's' laneway was made wider to accommodate the construction traffic, soil from the big mound and from the laneway widening was unceremoniously dumped back into the main shaft which never seemed to refill. A large tree was eventually pushed into the shaft in the hope that it would form a platform on which the remaining soil would sit and the shaft head was capped with concrete to make it safe.

Drilling contractors John Tom Mineral, an Australian company already working in England, was employed by ICI to sink two boreholes at Maiden Mount. One was for the water to be pumped down into the mine and the other to extract the brine. During the drilling operation, the bit broke through the roof at 900 feet, sending up the foulest smelling air. Where the brine was to be pumped to the surface, a concrete base was built and on to this was erected a derrick to carry the pipe work and pumping equipment. A red brick building housed the pumping engine which was built to the east of the derrick and a large settling tank sited a few yards to the south into which the brine was pumped. At the base of this tank, a pipe carried the brine

to Clipperstown Salt Works. Mr. Weatherup continued:

To fill the mine, water from the dam at French Park was pumped up the hill to the lower borehole along with water diverted from the local streams. To monitor the water levels in the caverns below, a Megger was used. This was a meter with two wires, the positive wire connected to a copper bar lowered by winch. The cable was marked off in ten foot lengths and lowered down the upper borehole. The negative wire was attached to the winch frame to act as an earth. When the copper bar hit the water, a needle on the Megger's dial moved and this information allowed Willie Burgess, the man in charge, to see how much the water level in the mine had risen during the past twenty-four hours.

Extraction was started in 1953 when the Maiden Mount caverns were full. The water dissolved the salt strata, making brine. The ICI magazine, *Grains of Salt* (Feb 1954, 12) reported:

... First brine to come from Maiden Mount. Everyone is glad to see brine flowing again and nearly all those who had to leave us when production was interrupted have been reengaged. Messrs. D. McLaughland, J. Montgomery, W. Creighton, T. Hagan, H. J. Smyth, J. Beggs and T. Hamilton.

Apart from interruptions in supplies caused by roof falls in 1956 and 1957, brine was extracted until 1958 when ICI decided it was not financially viable to continue. Over the following few months, machinery was removed, boreholes capped and the mine again abandoned. The Chairman of ICI in his address to the 1958 Salt Division Council Meeting held at the Winsford works in Cheshire, stated that: 'one of the principle factors concerning salt making in Carrickfergus is that brine supply is uncertain; to provide a source of brine which could be relied on for a number of years would need heavy capital expenditure' (GS, Nov 1958). Thirty-eight employees lost their jobs at Hallowe'en 1958, not all from Maiden Mount but from Clipperstown Salt Works as well. It was suggested in the local paper (EAG 1958) that the brine should still be pumped, but to be used as brine baths to help

people suffering from rheumatism, but the idea never came to fruition. The mine's production figures, in tons, are presented in table 5 from information provided by the Geological Survey of Northern Ireland. From 1888 the figures were combined with other mines in operation.

Year	Tonnage
1877	1,868 of which 458 was crushed and 1,410 was rock salt. The total for here and French Park combined was 28,525
1878	17,394
1879	12,803
1880	13,705
1881	14,885
1882	12,482
1883	15,389
1884	12,403
1885	11,644
1886	10,305
1887	13,542

Table 5: Production figures for the Maiden Mount Mine, Woodburn (from 1888 totalled with other mines)

BURLEIGH HILL, WOODBURN

William Hodgkinson states that Mr. Dalway tried to find salt at Burleigh Hill, prior to his success at Maiden Mount, but the shaft was abandoned 'owing to faulty workmanship before anything was discovered' (Hodgkinson 1911/12). Some confusion now comes into being because Griffith and Wilson (1982, 99) quoted McCrum who noted that 'Dalway found salt on McKay's land in the Northeast division of Carrickfergus and worked it for a time as the Burleigh Hill Mine'. However Burleigh Hill is in the Middle Division and McCrum did not attribute a name to the mine, so did Dalway start it? In the *Carrickfergus Advertiser* (undated newspaper clipping 1890), it claimed that the 'Carrickfergus Salt Mining Company formed ten years ago' was working 'extensive seams of rock salt discovered on the property of Mr. Sam McKee Shannon at Burleigh Hill'. Mr. Shannon himself was very interested in the quality of salt and its uses in agriculture and he produced a pamphlet, *Ground Rock Salt and its uses in Agriculture* (undated library document), extolling the virtues of rock salt. He also advertised its sale and the following advert appeared in Bassett's book (1989, 358):

CARRICKFERGUS SALT MINING COMPANY
ROCK SALT MINE PROPRIETORS
 BURLEIGH HILL MINES, CARRICKFERGUS
 SPECIALITY - Ground Rock Salt for Agricultural Purposes
 Delivered at any Railway Station or Port in Ireland.
 Pamphlets and Full Particulars on application.

In 1888 there were 19 people working at the mine and on 5th June it was noted by Joseph Dickinson, Mining Inspector, that 'James Hamilton a miner was injured before he got out of the way by a piece of rock salt thrown by a shot, having allowed the fuse to ignite too near the powder' (1888, 35). Eight years later, only six people were working below the ground and four above ground. Apparently if you look into this mine today, equipment such as picks used in the mining of salt are still in situ. However, I have not been able to corroborate this fact. The production figures, in tons, are given in Table 6, from data supplied by the Geological Survey of Northern Ireland.

Year	Tonnage
1882	120
1883	700
1884	5,073
1885	4,500
1886	5,221
1887	7,543
1888	Totalled with other mines

Table 6: Production figures for Burleigh Hill Salt Mine, Woodburn

EDEN SALT MINES

To the east of Carrickfergus lies the small village of Eden and it was to the north of here that other areas of salt were discovered. The six inch Ordnance Survey map of 1834 shows a salt spring and *Eden Cottage*, where a trial shaft was sunk with no success. However, the area where the salt spring emerged later became the Eden Salt mines. William Hodgkinson (1911/12) claims that:

About 45 years ago Mr. M.R. Dalway tried for rock salt at Eden and discovered a small flow of natural brine. One pan for the manufacture of salt was erected and about 60 tons of salt was made before the brine ceased to flow. Tunnels were driven in three directions at the bottom of the shaft without any success. He then bored about a quarter of a mile to the north of this shaft but the boring rods broke on what was since found to be the rock salt bed... Rock salt was discovered at a depth of about 400 feet. This proved to be the forerunner of the three salt mines now working in the Eden area.

After the successful discovery of salt at Maiden Mount, Mr. Dalway decided to return to the Eden area and tried again near the original spot. The *Carrickfergus Freeman* (CF 1865) wrote that James Hodgkinson, '... went to work for Marriott R. Dalway in the Eden area when salt was discovered at Mile End Row'. 'A Carrickfergus Gentleman' wrote in the correspondence column of the *Carrickfergus Freeman* (CF 1865) how '... an attempt is now being made [to raise salt] by Mr. Dalway at Nine Mile Row ... three quarters of a mile from Carrickfergus on the lower side of the road.'

Information regarding these eventual mines is very confusing, as some mines had several names and it has not been as easy to

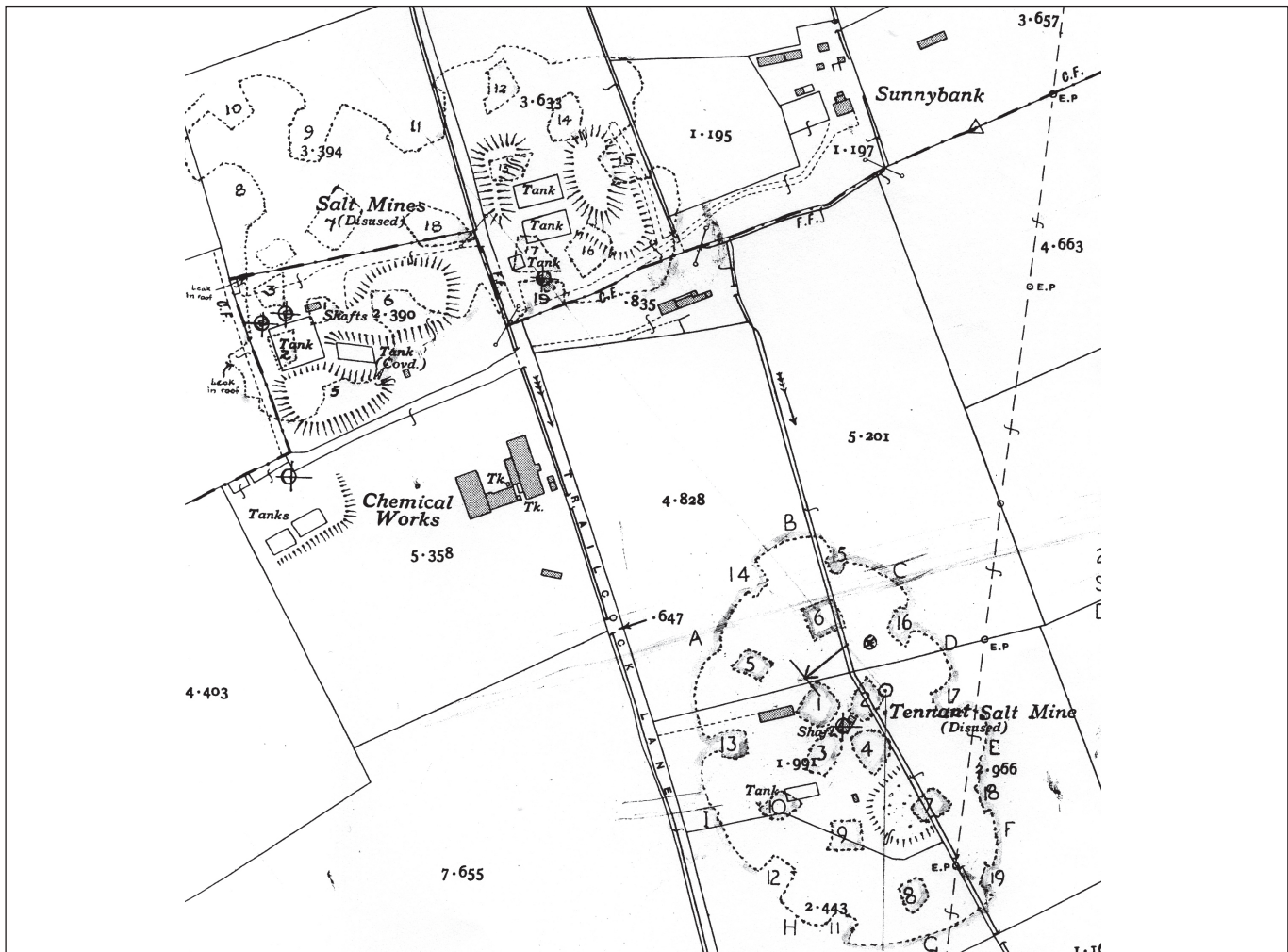


Fig. 7: The Eden Salt Mines in 1945. Crown Copyright Reserved

sort them out as it was with the Woodburn mines. Miscampbell (1894, 5) writes about the Eden Basin:

There are four rock salt mines clustered in a very small compass, round what has been referred to in Miskimmin's *History of Carrickfergus* as a salt spring; with valuable medicinal qualities. It is apparently the centre of a basin, and the seam dips towards it at a rate of 1 in 3 or 4. This basin also appears to be a small one, as unsuccessful boreholes have been put down to a great depth east, west and south of the mines which are now worked.

On the OS 25-inch map, which was surveyed in 1901-02, a salt works is identified just to the east of the present day Sewage Works and south east of Eden Cottage. A railway siding ran from it to the main line, but there is no evidence of this salt works today and there was no name for the works on the map. Figure 7 shows the Eden Salt Mines in 1945. The Tennant Salt Mine is shown as disused. To the north of this mine on the same side of the road is the Downshire/International mine and on the west side of the road is Eden No 2, Black Pit or McAllister's mine. There are no signs of either of these pits today, except scrub in fenced off ground.

The chemical works shown is probably the works mentioned

in a newspaper article in 1931 (BNL, 1931). Mr. Robert Finlay, Director of Alexander Finlay Ltd. Soap Manufacturers from Belfast, had developed plans to establish a factory in Eden to produce 'soda, bleaching powders and other chemicals from common salt. The site chosen for this enterprise is one of the disused salt mines at Eden'.

BLACK PIT, EDEN NO. 2 OR McALLISTER'S MINE, EDEN

Ludlow (1993, 252) states that:

This pit was sunk by M.R. Dalway in 1883 on land owned by Thomas McAllister... a 4 ft. square shaft was sunk 420 ft. to the rock salt. Dalway sold Black Pit to James Logan who formed the Carrickfergus Salt Company and erected two pans on the site of Mrs. Mann's bungalow. This salt works and the mine later reverted to Mr. Dalway and Co. from whom they were acquired by the Salt Union... In 1886 the Black Pit produced 175 tons and in 1887 - 1,926 tons. It was opened in 1884 and operated for four years during which around 60 tons of white salt was produced per week.

Dickinson writes in the *Mines Reports* (1887, 27) that in '1887

Messrs. J. and W. Logan commenced manufacturing white salt at Eden'. The brine was dissolved from rock salt at that mine and run in a pipe 2/3 mile, presumably to the salt pans; in 1896 the Eden mine was listed as discontinued. The Salt Union did not work the mine and it was 'finally abandoned in 1928'. One shaft collapsed in July 1951 leaving a hollow some 12m in diameter by 3.6m deep and the remaining shaft collapsed a few months later in December, according to Griffith and Wilson (1982, 99)⁷ Production figures are given, in tons, in Table 6 from data supplied by the Geological Survey of Northern Ireland.⁸

Year	Tonnage
1884	96
1885	Not recorded
1886	175
1887	1,926
1888	Combined with other mines in the area

Table 7: Production figures for Black Pit Eden No. 2

DOWNSHIRE MINE, ALSO CALLED EDEN NO.1 OR CARRICKFERGUS MINE

The Downshire Mine was first mentioned in the 1893 HM Inspector of Mines' report (1893, 51). It was formed, Ludlow (1993) noted, when 'two Belfast business men came together with a proposed share capital of £10,000' and worked it as the Carrickfergus Salt Works Company. He also notes that the company sank, 'two shafts to a depth of 430 ft. and built a refinery at Minorca' (Figure 8) in Carrickfergus.⁹ According to McCrum (1905, 515), 'The works covered an area of 2½ acres'. Griffith and Wilson (1982, 100) record that the mine had:

Two separate shafts each 1.2m square and were 6m apart and 152.4m deep. The top of the worked salt lay some 131m below the surface. In working this mine some 15m of salt was left to form a roof of the cavern and only the lower 14 m was worked... In 1952 the mines [this and the International] were accessible and inspected by two Civil Engineers, Messrs. Huss and McGuigan of the Chief Engineers' Branch, Ministry of Finance... "brine was flowing into the mines from behind a wooden stanking at a rate of some 10,000 gallons (455,000 litres)¹⁰ per week, which was removed by bailing".

7 H.E Wilson's report of 1974 states that the collapse took place in 1952 which is the year the area was flattened for industrial use.

8 The figures for 1884 contradict Ludlow's (1993) figure of 60 tons per week.

9 Ludlow mentions in his thesis that there was a salt works at the Old Distillery. McCrum (1909, 360) also writes that in October 1865 Mr. Nelson Boyd from Belfast took this old distillery to convert it to a chemical works, which subsequently become a salt works.

10 The conversion rate from imperial to metric is obviously incorrect and should read 45,460 litres.

McCrum (1909, 515) states that, 'the thickness of the bed of rock salt at Eden is 96 feet. Of this about 50 feet is kept intact to form the roof of the mine, and the lower 46 feet is worked in one face in a series of spacious chambers, 30 to 40 feet high'. A visit from the Belfast Naturalists' Field Club occurred in 1901 when Mr. T.A. Walker conducted a party through the workings and explained that the salt went to the industrial works in England and Scotland (BNFC, 1901, 577). According to Cole (1922, 136), the mine was working in 1918 and at a depth of 550 ft. In 1896, four men worked underground and two above ground, but unfortunately no record of the amount of salt recovered is recorded.

On 13th May 1908, William Burgess, 45, an engine man, lost his life when he was, 'crushed by the drum of the winding engine. He started the engine the wrong way; instead of lowering the skip he took it into the tower. In his anxiety to stop the engine in applying the brake, he in some way lost his balance and was carried over the fence onto the drum,' records Dickinson (1908, 37). No record has been found of when the mine closed, but fences were erected to keep the general public away and the area has returned to scrubland along with the other mines in this area.

NEW EDEN MINE OR INTERNATIONAL, EDEN

William Vint and Sons were responsible for starting this mine in 1890 and in 1894, the mine was listed as New Eden in the *Mineral Statistics* (1894, 93). The *Carrickfergus Advertiser* reports on the mine in 1891, the year after it opened:

The shaft was sunk on Edgar's Land where rock salt was found at about 250 feet - 23 feet thick, then a band of marl 12 ins thick and succeeded by rock salt, evidently unlimited in quantity for already 40 feet has been cut through. It is believed to be the same vein found in a mine opened on W.D.D. Wilson's land fifty years ago (CA 1891).

The only plan of the International Salt Mine I could find is from the Geological Survey of Northern Ireland, but the date of the plan is unknown. It shows the relative extent of the workings with two shafts marked in relation to the other two pits lying contiguous to it.

Griffith and Wilson (1982, 100) note that 'Vint sold the mine to Mr. Dundas Simpson who formed the Salt Mines Syndicate in Edinburgh, which worked the mine until March 1903 when it was taken over by James Hodkinson.'¹¹ McCrum (1909, 516) records that, '... Mr. Simpson had erected four steam pans, which proved unsuccessful. He substituted six furnace pans of the ordinary type but the whole business worked at a loss'. In 1909 the company became the International Salt Company. This was started with 'an authorized capital of £250,000 buying two mines and erecting furnaces', reported

11 James Hodkinson only worked the mine for a few months until his death in July, but left the company to his four sons, William and David Hodkinson being listed as Mine Managers in the 1911 Census.

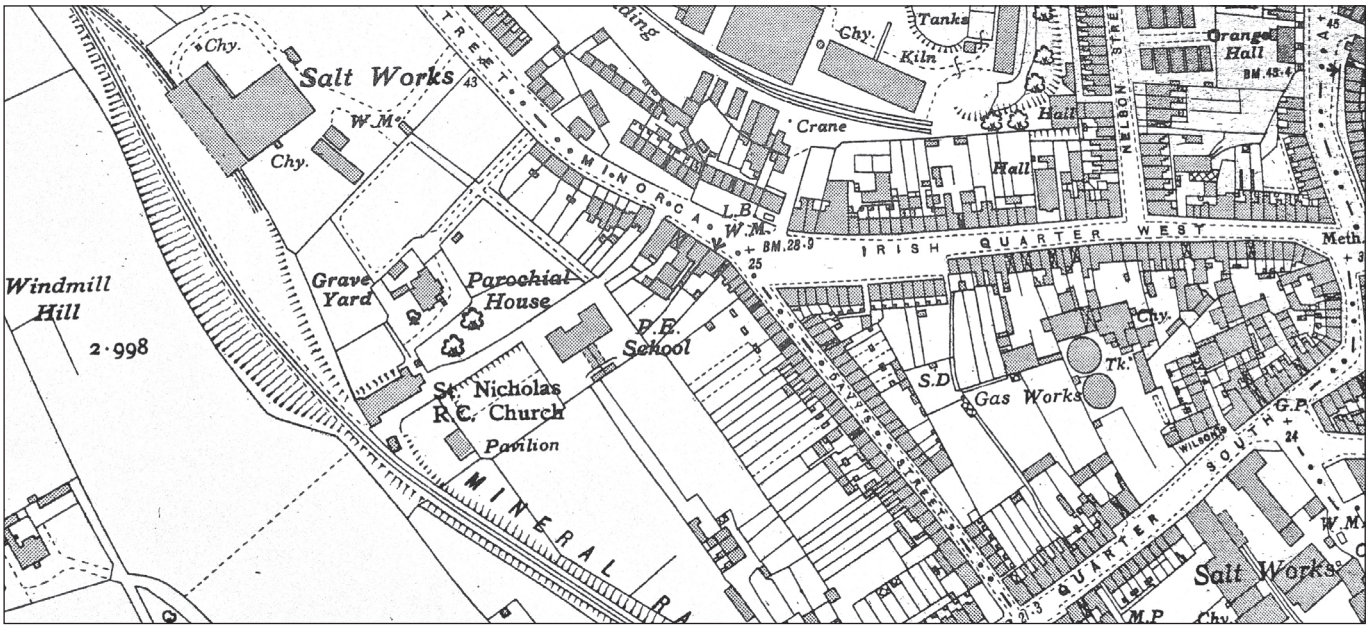


Fig. 8: The Salt Works at Minorca. Crown Copyright Reserved



Fig. 9: Some of the men, women and children who worked at the International Salt Mine. The man in the bowler hat was one of the Hodkinson family, a worker, who, on hearing that a photograph was to be taken, went home and changed to his 'Sunday best'

the local newspaper of 1973 (CAEAG, 1973).

In 1915 when Calvert wrote *Salt in Cheshire*, the International mine had ‘... 12 acres with the right for a further 80 acres. It was being mined at a depth of 500 ft. and working at a deposit of 60 ft. of which two-thirds was being excavated, the other third left for the roof’ (1915, 994). This was obviously extended, as Cole (1922, 136) reports that ‘Two beds of rock-salt occur, 36 feet and 80 feet thick respectively...depths of the shafts is 550 feet. Working in 1918’. The International Mine’s claim to fame was the process by which it was making salt using the Tees Method, invented by Mr. Harry Tees, who took out a master patent on 8 April 1903. The following paragraphs are quoted directly from Calvert’s book (1915, 995) explaining the Tees system operated:¹²

The mine is about three quarters of a mile away from the works, the salt being conveyed to the latter by an aerial ropeway. Apart from feeding the furnaces and a little shovelling where the human factor is in evidence, the “Tee” process is mechanical, continuous, and simplicity itself. Salt fuses at a temperature of about 1,750 degrees¹³, and immediately it assumes a fluid state compressed air is blown into it, the effect being the deposition of all impurities at the bottom of the furnace. The molten material runs into rotating pans and gradually overflows; it is then shovelled into another receptacle and raised by small buckets to a certain height - cold air being blown on it the while - when it travels down inclined screens and grades automatically. From the time of casting the rude material into the furnace until the perfect white article appears only fifteen minutes elapse. It is claimed that the rock can be broken in the mine, transported, fused, and packed ready for the table in less than two hours. This one, continuous process, and the brief period of treatment, compare with two separate treatments and a time factor of several days requisite in the evaporation of brine. Another very important consideration is that of fuel consumption, for according to the claim officially made, one ton of coal is sufficient for an output of 12 tons of salt, whereas in evaporation the ratio is nearer 1 to 2. At present three furnaces are in operation at Carrickfergus, each of two tons per hour capacity. Three shifts of eight hours each are worked, continuity being found to prevent cooling and consequent incrustation of the pans. The works are stopped for twelve hours once every week.

Unfortunately I can find nothing more about the system in Carrickfergus or for how long it was to last¹⁴.

James Hodkinson had been awarded a patent on 11 April

12 Calvert has written this having read a newspaper account where a journalist was shown round the works and had the process described to him.

13 The melting point of salt is 801 C.

14 A newspaper report in 1913 (LTWT) shows a photograph of the aerial runway and the condenser for gas used in connection with the process of purification, but is too poor for reproduction.

1894 for an invention for producing white salt, which is now in the possession of the Hodkinson family. The patent and accompanying drawing, states:

... he is in possession of an invention for a new and improved method of heating brine or similar substances by utilizing the heat of the vertical flue pipe of the ordinary salt pan by the erection of a cistern round the outside of the flue pipe and inserting in the flue pipe cross tubes at equal intervals open so as to permit of the free passage of the brine from one side of the cistern to the other (Patent in private possession).

I do not know whether James Hodkinson used this method at his previous mines or at the International, as I can find no further reference. Figure 9 shows some workers at the International Salt Mine. The man in the bowler hat was one of the Hodkinson family, a worker, who on hearing that a photograph was to be taken went home and changed to his ‘Sunday best’ unlike his fellow workers.

TENNANT MINE, EDEN

In 1890 the Chemical Salt Co. Ltd. opened the Tennant Mine (previously known as the Eden Shaft) named for one of the main shareholders, Sir Charles Tennant (1823-1906) of Glasgow, owner of chemical works in Scotland.¹⁵ Salt was required in the treatment of Iberian pyrites which were calcined with 10-15 per cent common salt. The soluble chlorides of copper etc. left a residue of iron oxide on filtration through brushwood which was followed by precipitation of the copper by scrap iron. Patented in 1858, the Henderson wet process was the most important foundation for the nascent European pyrites industry.¹⁶

While developing the shaft at the mine, a fatal accident took place and was recorded by Joseph Dickinson (1890, 55):

Malcolm McGill, 41, an assistant sinker, was killed by being precipitated down the shaft, one of the four ropes of the scaffold having broken by the strain caused by the scaffold becoming jammed in the sheathing or skating boards near the top of the shaft as he and others were incautiously ascending on it after finishing shaft work.

The mine does not appear in the Inspectors of Mines Reports until 1893 and by 1896, twenty people worked underground and four at the surface.

15 His Grandfather, Charles Tennant (1768 -1838), founded several chemical works, the largest being the St. Rollox works in Glasgow. The works brought in over 5,000 tons of salt from Carrickfergus. Charles Tennant’s father, John (1796-1878), had organised a close alliance between the alkali makers in Britain, which became the basis for the Tharsis Sulphur & Copper Co Ltd., incorporated in Edinburgh, Scotland, in 1862, which took over the copper mines in the Sierra de Tharsis, Andalusia, Spain.

16 The brainchild of Glaswegian, William Henderson (1827-1881), this three-stage process involved the burning off of the sulphur content by acid manufacturers, the wet process, involving the addition of salt, to make the copper soluble, and the leaching out of the copper solution. By 1870, there were 20 wet process works in Britain.

Year	Rock Salt in Tons	Brine in Tons	Total in Tons	Notes
1853-1862			119,994	1858-59, No data
1863-1872			178,692	
1873-1882			287,069	
1883-1892			292,636	
1893-1902	380,554	58,736	439,290	1897. Rock salt and brine recorded separately
1903-1912	365,667 or 372,667	94,723	460,390 or 467,390	7,000 tons discrepancy between the GSNI and HM Inspector's figures for 1905
1913-1922	271,747	9,834	281,581	1912/13 brine figures added to Cheshire and Staffordshire's amounts. 1914-20, no brine produced
1923-1932	41,054	85,470	126,524	1927. No data
1933-1942	18,418	107,149	125,567	1939. No rock salt recorded from the date
1943-1952		122,634	122,634	
1953-1958		45,269	45,269	1953. No salt produced

Table 8: Production figures for the Carrickfergus Salt Mines, 1853-1958

In 1924, on 11 February, the mine was transferred to the Tharsis Sulphur and Copper Co. Ltd. which a week later started to run the mine again. This company was located at St. Rollox Chemical Works, Glasgow and had extensive pyrite mines in Andalusia, Spain (Checkland, 1967). The late Charles Tennant had held a large shareholding in the company, which was looking no doubt, to secure a source of salt for the treatment of the company's Spanish pyrites. There is no date when the Tennant Mine ceased rock salt production, but the University of Glasgow hold the archives of this company (UG, Tharsis Sulphur and Copper Co. Ltd.), so undoubtedly by trawling through these records, additional information could be found.

In 1942 and 1944, H.T. Foster, Inspector of Mines and Quarries for Northern Ireland, inspected the mine with the possibility of using it for storing munitions (GE 1991, 19). This article also (1991, 20) notes that:

In 1952, P.D. Huss and J.H. McGuigan, assistant engineers in the Ministry of Finance, recorded Foster's memory of the mine. "Tennant mine - Single shaft 338 ft. deep with two cage compartments, each having a floor dimension of 4 ft. 4 ins by 3 ft. 6 ins. Mine in good condition except for arch supporting the bottom of the shaft which shows signs of local crushing and would require some attention." The extent of the mine as recorded on the only mine plan available and updated 18th October 1920, gives maximum dimensions of 213 m from north to south, and 143 m east to west; the height of working ranged from 13.4m near the shaft to around 6 m towards the edge. The floor of the mine sloped at 20 per cent to 14.3 per cent towards the WSW.

In 1963 two clubs, the Stranmillis Field Studies Society and the Belfast Naturalists' Field Club, visited the mine with permission of the owner, Mr. J. Cobain. Manning (1965, 16) reports that, 'The eastern half is dry underfoot, but the remainder has a depth of water about 18 inches. Mushroom rigs and plastic greenhouses are the remains of the temporary

occupation of the mine by a mushroom company' (the Monlough Mushroom Company).¹⁷

In 1965 the Irish Salt Mining and Exploration Co. Ltd. bought the mine, but no more salt was brought up from the depths, even though the winding gear remained. Just before 11 am on 19th October 1990, the mine collapsed after several weeks of complaints from local residents about noises heard around the area. The seismic wave from the collapse of Tennant was picked up by seismographs in southwestern Scotland and Northern Ireland, but there had been evidence of ground movement before, as utility companies were constantly repairing pipe-work in a field nearby. As the Tennant mine was supposed to be the safest mine in the area of Carrickfergus, the Department of Economic Development appointed consultants to look at all the other abandoned mines in Carrickfergus (GE, 1991).

THE MANUFACTURE OF ROCK SALT AND BRINE AT CLIPPERSTOWN SALT WORKS

In 1887, Alexander Miscampbell built salt pans at Clipperstown on the Woodburn Road from Carrickfergus. Running beside the works was the Belfast to Carrickfergus railway line so a siding was constructed to divert wagons needed to rail salt to all areas of Ireland. Figure 10 shows a plan of the Clipperstown works which stood until the 1960s. Inside the works were huge open salt pans made from iron measuring '... 40 feet by 20 feet and 1½ feet deep' and riveted' (undated ICI document). In the early days, rock salt was brought down from the mine by horse and cart, crushed and mixed with water. When brine was pumped from French Park and Maiden Mount, it was piped directly to a huge tank, by the roadside, which held 100,000 gallons. This tank was sited at a high level and the brine flowed to each salt evaporating pan for processing.

Below the pans were furnaces and here coal, imported through

¹⁷ This company was in County Down near Newtownards and is no longer in operation.



SALT MINES IN THE CARRICKFERGUS AREA OF COUNTY ANTRIM

Caroline A. Nicholson

Abstract: During the nineteenth century, salt deposits in Carrickfergus, County Antrim, were mined for a variety of purposes, including in mineral processing and chemical industries; agriculture; de-icing road surfaces; as a food preservative and for human consumption. Using a range of documentary and empirical evidence, including oral testimony, this article explores and examines the little known discovery and subsequent development, of the salt deposits of County Antrim, and considers the environmental legacy of the industry. *Journal of the Mining Heritage Trust of Ireland* 14, 2014, 1-22.

THE FORMATION, DISCOVERY AND DEVELOPMENT OF THE ANTRIM HALITE DEPOSITS

During the Triassic period of earth's history, about 150 - 200 million years ago, the landmass that was to become Ireland lay far closer to the equator. A shallow sea that once covered parts of present day Britain and Ireland formed in a restricted basin on a shallow marine shelf which was surrounded by mountains. Over several millions of years, the ancient sea encroached many times into this basin. The climate was hot at the time which created deserts, and with searing temperatures and high winds the trapped seawater water evaporated leaving behind beds of rock salt known as halite. Dust blown in from these ancient deserts gives halite its different colours (Mitchell 2004, 266).

Large deposits of halite, the mineral form of sodium chlorite, in Northern Ireland are restricted to the southeast corner of County Antrim and were discovered by accident after the 4th Marquis of Downshire¹, who owned land in Carrickfergus, employed an engineer to look for coal in 1845 (Critchley and Schwartz 2011, 40-41). This search started in an area near Woodburn called Duncrue but by the end of several months there was some disappointment as no coal deposit had been found. A deep shaft, which was according to Miscampbell (1894, 546) 'circular, 9 feet in diameter, lined with brick to a depth of 750 ft.', had been dug at this stage and a 'further boring of 500 ft. was made'. Word spread quickly that coal had not been found, but at a 'depth of 550 ft. a workable seam of rock salt was discovered, about 120 ft. in thickness'.

The need to transport this salt quickly and cheaply from the mine was important so it was decided to try another borehole nearer the railway line, which had recently been built from

¹ Downshire lived at Hillsborough and owned vast amounts of land in Ireland.

Carrickfergus to Belfast in 1848. No salt was discovered here so the focus shifted back to the Woodburn area where two more shafts were sunk in a different part of the original field. Ludlow (1993, 245) states that the shafts were sunk under the recommendation of Thomas Phipps who was, '... brought over from Cheshire² at the end of 1852 for a fee of £10 to make a survey and to report the possibility of using the brick lined shaft to open out the salt mine'. To finance this exploration and to attract money to commence mining operations, the Marquis met with a number of prominent manufacturers, a committee was set up and visits made to English salt mining districts to learn more about the raising and preparation of salt (BNL 1852). This led to the formation of the Belfast Mining Company.

The shareholders of the company on 18th June 1885 are shown in Table 1, and contain some of the leading names in Belfast business and industry. However, 'On the 26th April 1886 the Belfast Mining Company went into voluntary liquidation' (Griffith and Wilson 1982, 98) and in the following year, Alexander Miscampbell bought the mining interests. Another change in ownership took place when the Salt Union, formed in 1888, bought up the company. 'The Salt Union', wrote Calvert, (1915, 550) 'became the greatest salt proprietors in the world'. The Salt Union itself was taken over by Imperial Chemical Industry (ICI) in 1937.

DUNCRUE SALT MINE, WOODBURN

The Duncrue Mine was the first to exploit the halite deposits.³ The Downshire papers contain the lease drawn up in '1854 from 1st July for 31 years' for the salt mine at Duncrue (Downshire papers). A pencil sketch of the Great Salt Quarry

² Rock salt mining started in 1670 in Cheshire, England, and the experienced miners were brought over to Carrickfergus to help with the opening of these mines.

³ The 1857 six inch OS map shows the location of the mine.

Names of Shareholders	Number of Shares
Victor Coates	3
Trustees of the Marquis of Downshire	5
Trustees of Geo. Fitzsimmons (G. McAuliffe)	5
W.A. Granger	6
Sir Jas. Hamilton	2
Thos. Montgomery	5
John Mulholland	5
Henry S. McClintock	5
Edward Bailey	1
W.A. Robinson and W.A. Granger jointly as Trustees for the company	5
H.H. McKeile	5
Northern Bank Company	10
W.A. Robinson	12
Wm. Valentine	15
Wm. Young	2
H.E. Cartwright and Helen Smith	9

Table 1: The shareholders of the Belfast Mining Company in 1885

of Carrickfergus (Fig.1) shows a beam engine behind what looks like a timber wall with gears and pulleys involved in the lifting operation of men and salt at the mine. This is probably the engine that was erected in the week prior to 8 February 1854 under the auspices of Mr. Phipps, the manager of the mine (BNL1854).

Eventually two shafts were completed, writes Miscampbell (1894, 546):

... each '4½ ft. square, 36 ft. apart, and lined with 3 inch pine timber. A separate water shaft of the same size was also sunk to a depth of 120 ft., from which the water was pumped by means of an ordinary 6 inch lift and force pump attached to the winding engine.

The main shaft was walled up the whole way down to the salt with bricks made on the spot and from the spoil bank. Maquire's book (1853, 411 *et seq.*) contains an account written by the Marquis of Downshire in 1853 which provides additional information about the layout of the workings:

An abundant and constant stream of clear cold water running past the engine, and to which it has proved itself to be an invaluable quality, the boilers not required to be cleaned out in six months. The drawing shaft is nine feet diameter: and the air or ventilation shaft four feet in diameter. This air shaft ... passes down the whole depth and works admirably keeping the bottom sweet, cool and healthy... This air shaft cut out at the same time as the shaft, and was first introduced by Mr. E. Pickering mining engineer. No water at all is passing down except surface water which

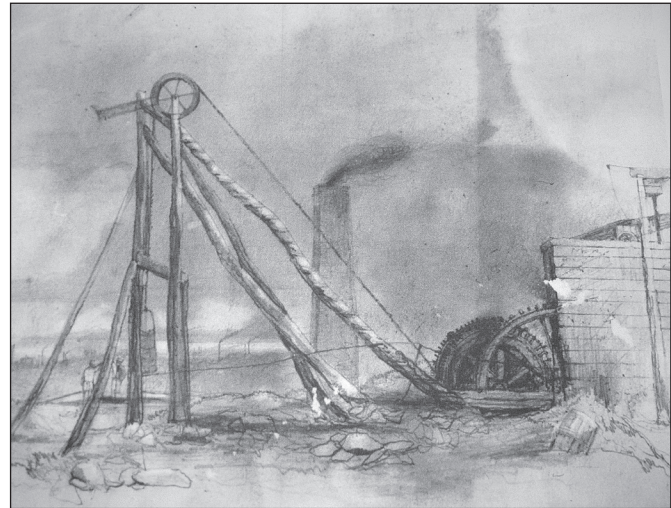


Fig. 1: The Great Salt Quarry of Carrickfergus. Trustees of the National Museums and Galleries of Northern Ireland

is pumped out by a small hand pump. Below twenty-five feet it is perfectly dry.

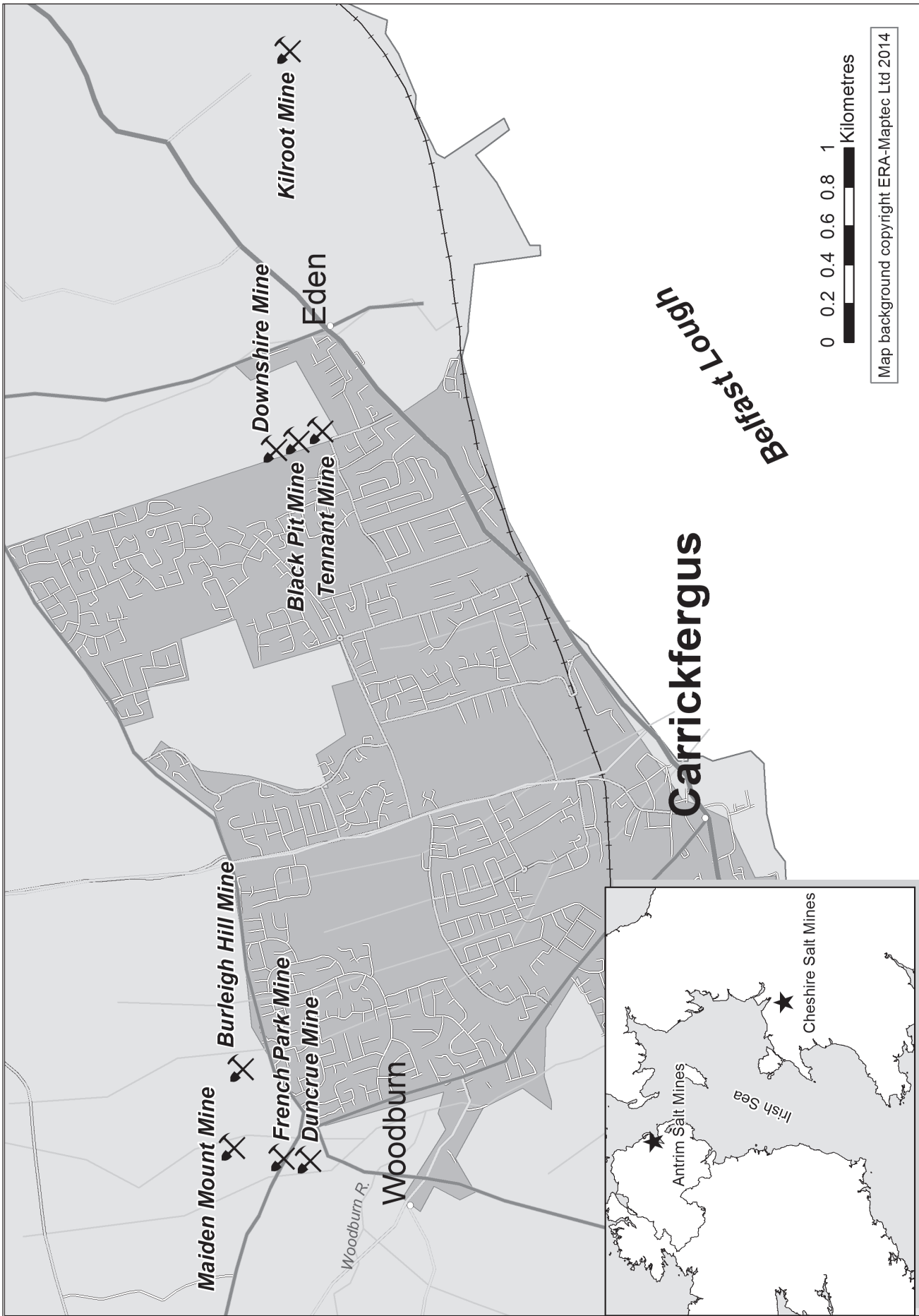
Indeed, Downshire appeared to take great interest in the mines, praising the local people whom he stated 'have learnt their business of mining and executed their work as well as any old experienced miner could have done'. The *Standard* further noted that 'The noble proprietor, the Marquis of Downshire, frequently visits the mines, and goes down the shaft. On a recent visit he presented the miners each with two suits of flannel' (S, 1853). Maquire writes that the Marquis also supervised the

... raising of a block of salt four feet by three feet square for the Dublin Exhibition. It looks splendid on its bed and I am not a little anxious about its coming to light. It will I fancy weigh about three tons and being so hard has given the blacksmith plenty to do to sharpen and even the picks with which it has been chiseled.

The Great Industrial Exhibition took place in Dublin from 12th May until 31st October 1853, in purpose built buildings funded entirely by William Dargan, builder of the Irish railways. The block of salt took up position in the Central Hall with a title 'Section of the beds of rock salt at the Hill of Duncrue, Co. Antrim'.

The *Belfast News-Letter* in 1852 reported that salt from the first bed at Duncrue was sent for analyses to 'Dr. Hodges and other eminent chemists. Dr. Hodges found the specimens sent to him to consist of ninety-nine parts of pure salt to one earthly matter; and the result of an analyses made by Dr. Andrews, Vice-President of Queen's College, is ninety-six parts salt to four parts earthly matter' (BN, 1852). Another testing proved to be the same as the results from Dr. Andrews and it was concluded that, 'this bed [of salt] will not yield less than 96 percent of the pure marketable commodity, or about 20 percent. More than any of the English mines' (BN, 1852).

Rock salt in the 1800s was obtained through sheer hard work as



Map 1: The location of the salt mines of Carrickfergus in County Antrim, Northern Ireland

no machines were ever used in the early mines. Miscampbell (1894, 547) describes how the salt was obtained:

... Round the bell-mouth of the shafts the rock was worked out, leaving a clear space of 60 feet in diameter. Outside this, four shaft pillars of solid rock salt were left, about 18 feet square, to support the roof and the overlying strata: the other pillars of the mine were set out about the same size and 48 feet apart... about 36 feet of the lower portion of the seam of rock-salt was worked.

The temperature underground ranged from 54-56 degrees fahrenheit all year round and, unlike their counterparts in collieries, the salt miners bore all the appearances of health and vigour. Their occupation was considerably cleaner and had none of the dangers encountered in coal mines, as no noxious gases were present (FJ 1855). In 1856 the *Standard* reported that, 'Nineteen men are occupied in the mine at Duncrue, excavating daily 80 tons of rock salt; eight or ten men assist in raising this quantity to the earth's surface; five or six horses and carts carry it to the tramway and 15 or 18 horses and carts carry part of the supply to Carrickfergus where it is shipped' (S, 1856).

Moreover, the *Belfast News-Letter* reported in 1852 on the skill of the Irishmen. Mr. Pickering found them, 'tractable, quick and intelligent; and the best proof of their aptitude for work requiring the exercise of quickness and intelligence is the fact, that for the eighteen months the works have been in operation there has not been a single accident, nor a life lost, not a man hurt, nor even a limb injured. The fact is almost unprecedented. Experience shows that few shafts of any size are sunk in England without loss of life, and none of the depth of the Duncrue shaft without some dreadful accident' (BNL 1852).

The miners descended into the workings via a bucket and then walked to the area where they worked. On 20th July 1867, a group from the Belfast Field Naturalist Club organised a trip to Duncrue and their report gives an insight into the environment below the ground (BFNC, 1867) The group was:

... let down some 620 ft., three at a time, in a bucket, and only laughed at their fears when they landed below... most extensive ...chambers, extending in every direction for hundreds of yards, and from fifteen to thirty feet high. One of the Directors of the Belfast Mining Company, Mr. W. Valentine had the mine all lit up with coloured lights, crackers, Roman candles and other fireworks to produce the most magical effect. The guests were then shown how salt was extracted from the seams by blasting which caused echoes throughout the mine.

A *Belfast News-Letter* reporter spent a day at the mine in 1927 and from him we obtain a detailed description of the process of extracting the salt (BNL 1927). He describes three main jobs. 'Roofers' made a cut of six feet by drilling into the salt bed horizontally and then filled the holes with gunpowder. The blasted rock was then shoveled over the edge. A ten foot ceiling

of rock salt was left above them to support the roof. 'Lynchers' were in charge of the layer below, drilling vertical holes which were charged and blasted. Finally 'Ferriers' loaded the wagons and carted them to the bottom of the shaft before being cable winched to the surface.

From the shaft head, horses and carts took the salt to the Woodburn corner where a tramway⁴ had been constructed by the Belfast Mining Company to carry the salt quickly to its destination. This tramway could not be built right to the mine owing to the topography of the Woodburn Valley where a small river created a deep valley, which was crossed by a road but with no extra space for a tramway which was to run from Woodburn to the main Belfast to Carrickfergus line. There are no references to this tramway or siding except in J. R. L. Currie's book (1973, 125) where he writes that an,

... incident took place near Carrickfergus on 23rd December 1878. A mixed train left for Belfast at 7.40 am; 1½ miles up the bank it stopped to carry out shunting at Duncrue siding. The train as a whole was too long for the siding and four carriages, behind the wagons, were left on the main line depending on the guard's van brake, which failed to hold them, and the coaches set off down the single line to Carrickfergus... Heavy snow had probably rendered the brake ineffectual.

From Duncrue, rock salt was railed to Jennymount salt works, Belfast, which was only a few hundred yards from the Northern Counties Railway Terminal in York Street. These works are shown on an 1877 Map of Belfast and remained in operation until 1878. This map shows the dissolving pond, reservoirs for the water and the salt works, which are now under the present M2 motorway. More information about the interior of the mine comes from an article from the *Carrickfergus Times* (undated newspaper clipping), written by David Hume, who refers to an original article in a series called 'Saturdays Not At Home' published in the *Belfast News-Letter* (date unknown), where the author and friends visited Duncrue mine in September 1869:

... light emitted from a contrivance resembling a goodly sized potato upon which white shoots were thrown out. This is the usual form of improvised candlestick used by the miners - a thin dip fixed in a lump of clay... The men were stripped to the waist and the air in the mine was dry and close... The men worked from 7 am until 3 pm and on Saturdays from 7 am until 1.30 pm.

Extracting salt can create large underground caverns leading to the bedrock collapsing and causing significant surface subsidence, as the following events confirm. In 1875, a moaning and groaning was heard coming from the vicinity of the Duncrue shafts. The weight of the earth above the caverns became too much for the pillars of salt to hold up the roof any

⁴ Clearly visible on the 1856 and 1931 six inch Ordnance Survey maps and visible today, although badly overgrown with brambles.

longer and the shafts collapsed. This created a huge depression, which gradually filled up with water. In 1899, wrote Rigby (1905, 568):

... there was an almighty eruption from this pond throwing water and fish into the air [which] covered an area of four acres of mowing grass with a coating of red marl ... and stones ... some stones killing chickens in a nearby yard... flattened the grass for a distance of 100 yards. The rush of water, mud and stones continues... for about four minutes, and accompanied by very loud rumbling noises. The sides of the hole afterwards commenced to fall in ... The timbers of the shafts seemed to have gone down into the mine, and the metals between the shafts also... The ground seemed to be continually on the move, falls taking place every three to four minutes, and, from the distance I [Rigby] should say the shafts were open to a depth of at least 300 ft.

A larger lake than before was created and aptly named the Borehole and this accumulation of water was to prove essential when French Park mine was flooded, for brine pumping. The lake also became the local swimming pool and fishing was also tried, although no fish were caught.

In the 1960s Larne Rural District Council decided that the area's rubbish could be dumped here. The depression was filled up by 1981 when it was closed and soil from the building of a local housing estate covered the field, which has reverted to grazing ground. Since early 2012 the area is completely out of bounds owing to possible subsidence. The production figures depicted in Table 2, in tons, shows the amount of recorded salt mined at Duncrue and has been obtained from the Geological Survey of Northern Ireland in Belfast.

Year	Tonnage
1853-4	15,000
1855	20,000
1856	16,263
1857	16,600 shipped, 5,798 used in manufacturing, 4,877 white salt refined
1858	None recorded
1859	None recorded
1860	18,443
1861	11,228
1862	11,725
1863	15,662
1864	17,245
1865	17,245
1866	17,245
1867	19,689
1868	17,472
1869	19,450

Table 2: Production figures in tons for the Duncrue Salt Mine



Fig. 2: 'Old Bill' Hodkinson, by kind permission of the Hodkinson family

FRENCH PARK MINE, WOODBURN

Before the closure of Duncrue another mine was started to the northeast that was known as French Park⁵. These acres were purchased by the Downshire family in 1864 and are first listed in the lease book of 1865 (Downshire papers). 'Old Bill' Hodkinson who hailed from Cheshire and worked for the Belfast Mining Company (later to leave and work for M.R. Dalway) as a winding engine driver, is thought to have been responsible for the opening of this mine. He, it is claimed, helped to sink the mineshaft at Maiden Mount and then later moved to work on another mine, Black Pit, in the Eden area. George Burgess, an elderly man living in Carrickfergus, was able to say that Hodkinson and William 'Old Bill' Burgess opened the mine (interview, Mr. G. Burgess). Fig. 2 shows William Hodkinson in 1890 and Figure 3 shows the plumb bob (GS March 1955) that was used to sink French Park, Maiden Mount and Black Pit⁶.

There were two levels to French Park Mine, the bottom level collecting seeping water and the next level for salt mining, as

5 French Park was also called Duncrue and still is by the local people today.
 6 The plumb bob had been in the Hodkinson family for over one hundred years, being handed down from father to son for at least three generations. The *Grains of Salt* magazine wrote that 'Mr. David Hodkinson has very kindly handed this interesting and historic object to Mr. S. A. Steele for its safe keeping.'



Fig. 3: Mr. Hodkinson's plumb-bob

seen in Fig. 4, although judging by this cross section, both levels were mined. Pillars were left to support the roof, but Joseph Dickinson advised in 1887 that they were, 'in future to be larger or left at shorter distances apart than 25 yards' - lessons obviously learnt from the crushing and eventual collapse of the pillars in Duncrue. One of the towers above the shaft had a glass roof and when Mr. Joseph Weatherup paid a visit, he looked up from the bottom of the shaft and recalled it was like 'seeing a star' (Interview, Mr. J. Weatherup). In Fig. 4, horses and carts can be seen to the right of the site and the small building beside them was probably the weighing bridge and house. Joseph Weatherup noted that the buildings on the surface were a crushing mill, engine house, workshop and stables and the metal parts were covered in tar to prevent them from rusting from the effects of the salt.

Figure 5 shows the plan of the surface workings, put together with the help of Messrs. George and Kenneth Burgess who were able to name various buildings on the 25 inch OS map (Interviews, Mr. G. Burgess and Mr. K. Burgess). Their family had worked in the salt industry almost from the time salt was discovered at Duncrue having come from Cheshire. George and Kenneth had been brought up beside the mine where their

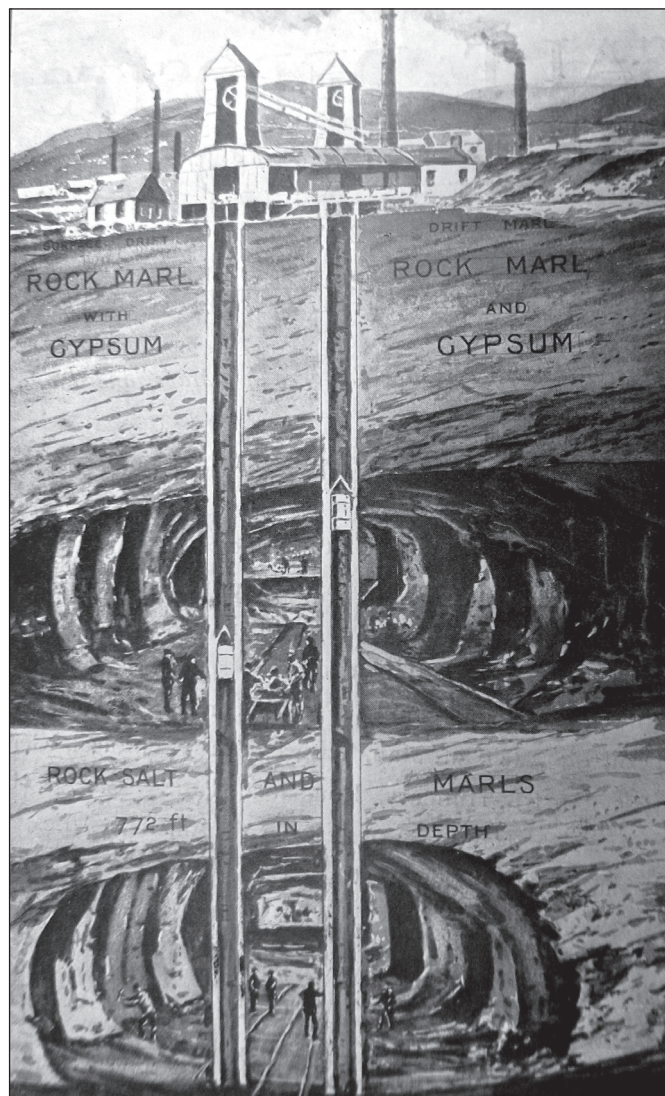


Fig. 4: Cross section of the Duncrue/French Park Mine from a photograph in possession of the Hodkinson family and reproduced with their kind permission

father was foreman. When George Burgess was interviewed he said, 'Twenty horses and carts carted salt to Clipperstown and were paid by weight. Then some cisterns were built on site so the salt could be melted [dissolved] and sent by pipe to the works as brine.' In 1873 there were 25 miners working here, but by 1896 there were only ten men below ground working and four above.

The Belfast Field Naturalist Club made several visits to the mine, the last time just before the mine was flooded in the 1940s. C. Douglas Deane (undated manuscript) described his descent into the mine:

... Slowly the great steam-driven winch turned, we grasped the chain and down we went through the trap door into the cool, clammy darkness lighted only by the vast disappearing square of light above, showing in relief the greasy wet walls of the pit-side. Only the swinging bucket broke the silence as it scraped the side of the shaft. It was a large square bucket capable of holding two people, standing close together... just fitted into the narrow shaft, and great care is needed to

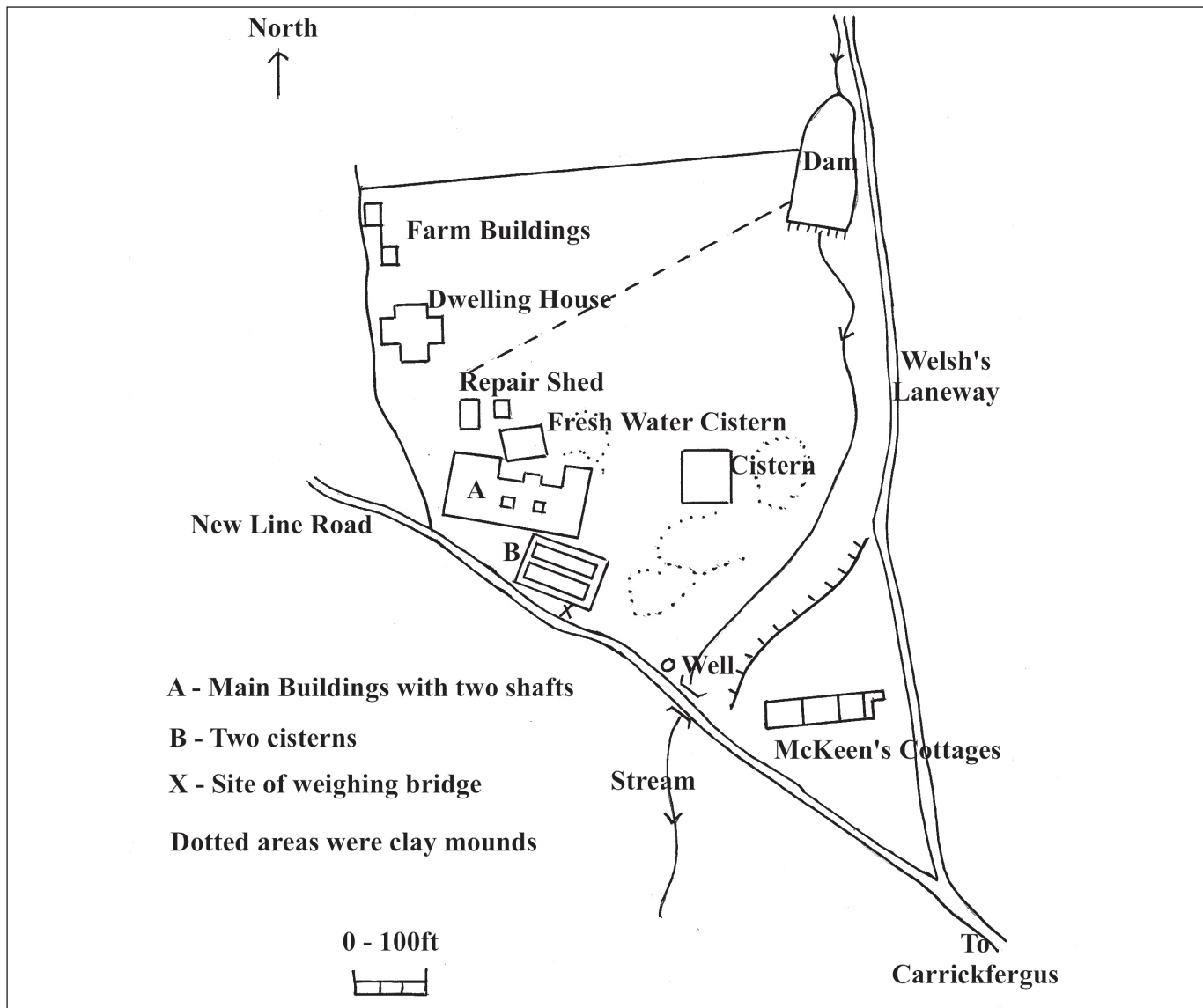


Fig. 5: Plan of the surface works at the French Park Mine in the 1940s

stand exactly in the centre of the bucket, away from the pit wall, which gleams horribly close.

The engine driving the winch was supposed to be over ninety years old and had been at the mine for sometime, so was probably the original brought up from Duncrue. Alexander Hogg, the well known photographer, took a series of photographs down the mine which are held in a collection at the Ulster Museum and a post card was produced in 1955 as a New Year card issued by St. Nicholas Church, showing six men working at the salt face.

George Burgess claimed that in the late 1930s 'the seam of salt was going too far back and men going to war meant there were no other workers. French Park was deemed unsafe (one of the shafts was in danger of collapse) for miners to descend and brine was already being pumped from the old Duncrue workings via pipes through a connecting wall'. Before French Park was finally abandoned, tail pipes were laid throughout the mine and connected to a main pipe. Water from the 'Borehole' (old Duncrue workings) was then pumped down one of French Park's shafts using a traction engine, which was later sold to

a scutch mill. In total, one and a half million gallons of water was pumped down one shaft and brine extracted from the second shaft. After a time, roof falls within the mine caused damage to the pipes and it was finally agreed that French Park had outlived its usefulness and was closed.

George was also able to name the miners who were the last to work in French Park including himself, who carted salt: David Hodgkinson responsible for maintenance and working the great engine; Billie and Alfie Burgess, both engine men, the former killed on the New Line by a lorry as he chased a hare down the road; Sam Black, whose job it was to feed the crusher with rock salt at the mine head; Tommy Armstrong and Willie Black, who later joined the army; John Burgess; Tom Martin Rene McQuitty; 'Red' Andy McAlester; Willie McAlister; Geordie McClellaghan and George Patterson, nicknamed 'turkey' because he had a long neck!

Mr. William Weatherup noted, 'when French Park was flooded, debris came up out of the shaft and floated down towards the Five Corners so the shafts had to be sealed when this continued' (Interview, Mr. W.J. Weatherup). The site was

eventually demolished with the firm ‘McClelland valuing the cottages [McKeen’s] and the Salt Union paying compensation and for knocking them down’ according to Mr. Johnston Connor (Interview, Mr. J. Connor).

There is no firm date for when French Park closed completely, but a few years later traffic lights were placed on the New Line. There was a sensor attached so if there was movement of the ground, pending a collapse, the lights would go red to stop any traffic at the time. Only once did this happen but not from natural causes. The Burgess brothers were playing Cowboys and Indians one evening when their parents were out visiting friends. The boys decided to lasso the lights to see what would happen. George Burgess said that the lights turned red, any traffic stopped and the boys got a good telling off by their father when he returned! The lights remained for a few years when they were finally dismantled (Interviews, Mr. G. Burgess and Mr. K. Burgess). Production figures are depicted in Table 3, in tons, for French Park from the Geological Survey of Northern Ireland. From 1889 the production figures were not recorded separately but added to the totals for all the mines.

Year	Tons
1871	18,260
1872	20,000
1873	19,392
1874	27,951
1875	25,750
1876	32,310
1877	2,479*
1878	12,707
1879	17,430
1880	17,593
1881	16,845
1882	17,176
1883	21,316
1884	6,634
1885	7,067
1886	5,308
1887	7,144
1888	Not recorded
*	1,200 was crushed, 1,279 rock salt

Table 3: Production figures in tons for the French Park Salt Mine (from 1889 totalled with other mines)

MAIDEN MOUNT MINE, WOODBURN

With the success of Duncrue, Mr. M. R. Dalway decided to try his luck on a piece of ground further up the hillside, having been unsuccessful in other areas. He discovered salt in 1869. The Downshire family owned this parcel of land and a lease in the late 1860s (Downshire papers) showed that M. R. Dalway Company Ltd. sank two shafts, one for salt, the other for water.

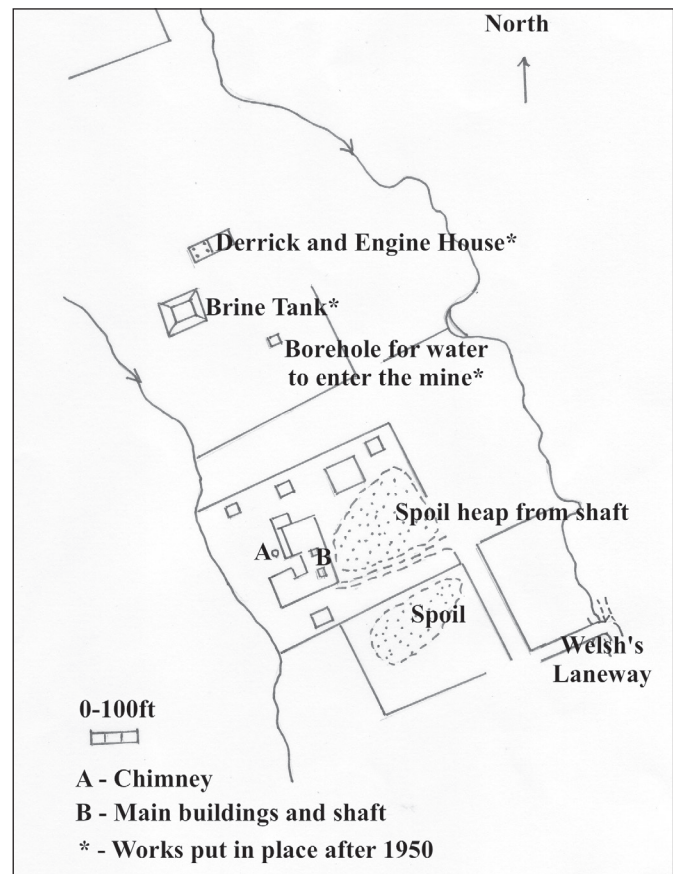


Fig. 6: Plan of the Maiden Mount Mine

There was also a winding engine, crushing mill and below the ground, 47 acres of salt and brine. Figure 6 shows the various buildings involved.

When in production this mine was claimed by Joseph Dickinson, HM Inspector of Mines, to be the ‘deepest rock salt mine in the kingdom with strata dipping steeply at over 900 feet deep’ (1873, 66). The method of mining was exactly the same as for Duncrue, the pillar and stall method, but the supporting pillars were ‘3 by 10 yards at the top and 14 to 12 yards at the bottom, future pillars to be larger and to be left at less distance than 25 yards apart.’ Dickinson also tables the geological section of the mine, reproduced in Table 4. Reading through the rest of the report, there were twenty miners working in this mine in 1873.

Very little is known about the early days of Maiden Mount; salt was being taken from the mine in 1870 but the amount per annum is not recorded until 1877 (see Table 5). Dalway, according to Dickinson, built some rock dissolving cisterns near the mine head from which brine was pumped to the salt pans erected by Dalway and Company at Carrickfergus Harbour. In 1896, Mines Inspector, John Gerrard, reported that eight men worked below ground and three on the surface (1896, 66).

There are no remains of the cisterns, but the original shaft is still visible and the foundations for some of the buildings could be seen until 2005 below brambles and other weeds. To the side was a large mound of soil removed when digging

the local newspaper of 1973 (CAEAG, 1973).

In 1915 when Calvert wrote *Salt in Cheshire*, the International mine had ‘... 12 acres with the right for a further 80 acres. It was being mined at a depth of 500 ft. and working at a deposit of 60 ft. of which two-thirds was being excavated, the other third left for the roof’ (1915, 994). This was obviously extended, as Cole (1922, 136) reports that ‘Two beds of rock-salt occur, 36 feet and 80 feet thick respectively...depths of the shafts is 550 feet. Working in 1918’. The International Mine’s claim to fame was the process by which it was making salt using the Tees Method, invented by Mr. Harry Tees, who took out a master patent on 8 April 1903. The following paragraphs are quoted directly from Calvert’s book (1915, 995) explaining the Tees system operated:¹²

The mine is about three quarters of a mile away from the works, the salt being conveyed to the latter by an aerial ropeway. Apart from feeding the furnaces and a little shovelling where the human factor is in evidence, the “Tee” process is mechanical, continuous, and simplicity itself. Salt fuses at a temperature of about 1,750 degrees¹³, and immediately it assumes a fluid state compressed air is blown into it, the effect being the deposition of all impurities at the bottom of the furnace. The molten material runs into rotating pans and gradually overflows; it is then shovelled into another receptacle and raised by small buckets to a certain height - cold air being blown on it the while - when it travels down inclined screens and grades automatically. From the time of casting the rude material into the furnace until the perfect white article appears only fifteen minutes elapse. It is claimed that the rock can be broken in the mine, transported, fused, and packed ready for the table in less than two hours. This one, continuous process, and the brief period of treatment, compare with two separate treatments and a time factor of several days requisite in the evaporation of brine. Another very important consideration is that of fuel consumption, for according to the claim officially made, one ton of coal is sufficient for an output of 12 tons of salt, whereas in evaporation the ratio is nearer 1 to 2. At present three furnaces are in operation at Carrickfergus, each of two tons per hour capacity. Three shifts of eight hours each are worked, continuity being found to prevent cooling and consequent incrustation of the pans. The works are stopped for twelve hours once every week.

Unfortunately I can find nothing more about the system in Carrickfergus or for how long it was to last¹⁴.

James Hodkinson had been awarded a patent on 11 April

12 Calvert has written this having read a newspaper account where a journalist was shown round the works and had the process described to him.

13 The melting point of salt is 801 C.

14 A newspaper report in 1913 (LTWT) shows a photograph of the aerial runway and the condenser for gas used in connection with the process of purification, but is too poor for reproduction.

1894 for an invention for producing white salt, which is now in the possession of the Hodkinson family. The patent and accompanying drawing, states:

... he is in possession of an invention for a new and improved method of heating brine or similar substances by utilizing the heat of the vertical flue pipe of the ordinary salt pan by the erection of a cistern round the outside of the flue pipe and inserting in the flue pipe cross tubes at equal intervals open so as to permit of the free passage of the brine from one side of the cistern to the other (Patent in private possession).

I do not know whether James Hodkinson used this method at his previous mines or at the International, as I can find no further reference. Figure 9 shows some workers at the International Salt Mine. The man in the bowler hat was one of the Hodkinson family, a worker, who on hearing that a photograph was to be taken went home and changed to his ‘Sunday best’ unlike his fellow workers.

TENNANT MINE, EDEN

In 1890 the Chemical Salt Co. Ltd. opened the Tennant Mine (previously known as the Eden Shaft) named for one of the main shareholders, Sir Charles Tennant (1823-1906) of Glasgow, owner of chemical works in Scotland.¹⁵ Salt was required in the treatment of Iberian pyrites which were calcined with 10-15 per cent common salt. The soluble chlorides of copper etc. left a residue of iron oxide on filtration through brushwood which was followed by precipitation of the copper by scrap iron. Patented in 1858, the Henderson wet process was the most important foundation for the nascent European pyrites industry.¹⁶

While developing the shaft at the mine, a fatal accident took place and was recorded by Joseph Dickinson (1890, 55):

Malcolm McGill, 41, an assistant sinker, was killed by being precipitated down the shaft, one of the four ropes of the scaffold having broken by the strain caused by the scaffold becoming jammed in the sheathing or skating boards near the top of the shaft as he and others were incautiously ascending on it after finishing shaft work.

The mine does not appear in the Inspectors of Mines Reports until 1893 and by 1896, twenty people worked underground and four at the surface.

15 His Grandfather, Charles Tennant (1768 -1838), founded several chemical works, the largest being the St. Rollox works in Glasgow. The works brought in over 5,000 tons of salt from Carrickfergus. Charles Tennant’s father, John (1796-1878), had organised a close alliance between the alkali makers in Britain, which became the basis for the Tharsis Sulphur & Copper Co Ltd., incorporated in Edinburgh, Scotland, in 1862, which took over the copper mines in the Sierra de Tharsis, Andalusia, Spain.

16 The brainchild of Glaswegian, William Henderson (1827-1881), this three-stage process involved the burning off of the sulphur content by acid manufacturers, the wet process, involving the addition of salt, to make the copper soluble, and the leaching out of the copper solution. By 1870, there were 20 wet process works in Britain.

Year	Rock Salt in Tons	Brine in Tons	Total in Tons	Notes
1853-1862			119,994	1858-59, No data
1863-1872			178,692	
1873-1882			287,069	
1883-1892			292,636	
1893-1902	380,554	58,736	439,290	1897. Rock salt and brine recorded separately
1903-1912	365,667 or 372,667	94,723	460,390 or 467,390	7,000 tons discrepancy between the GSNI and HM Inspector's figures for 1905
1913-1922	271,747	9,834	281,581	1912/13 brine figures added to Cheshire and Staffordshire's amounts. 1914-20, no brine produced
1923-1932	41,054	85,470	126,524	1927. No data
1933-1942	18,418	107,149	125,567	1939. No rock salt recorded from the date
1943-1952		122,634	122,634	
1953-1958		45,269	45,269	1953. No salt produced

Table 8: Production figures for the Carrickfergus Salt Mines, 1853-1958

In 1924, on 11 February, the mine was transferred to the Tharsis Sulphur and Copper Co. Ltd. which a week later started to run the mine again. This company was located at St. Rollox Chemical Works, Glasgow and had extensive pyrite mines in Andalusia, Spain (Checkland, 1967). The late Charles Tennant had held a large shareholding in the company, which was looking no doubt, to secure a source of salt for the treatment of the company's Spanish pyrites. There is no date when the Tennant Mine ceased rock salt production, but the University of Glasgow hold the archives of this company (UG, Tharsis Sulphur and Copper Co. Ltd.), so undoubtedly by trawling through these records, additional information could be found.

In 1942 and 1944, H.T. Foster, Inspector of Mines and Quarries for Northern Ireland, inspected the mine with the possibility of using it for storing munitions (GE 1991, 19). This article also (1991, 20) notes that:

In 1952, P.D. Huss and J.H. McGuigan, assistant engineers in the Ministry of Finance, recorded Foster's memory of the mine. "Tennant mine - Single shaft 338 ft. deep with two cage compartments, each having a floor dimension of 4 ft. 4 ins by 3 ft. 6 ins. Mine in good condition except for arch supporting the bottom of the shaft which shows signs of local crushing and would require some attention." The extent of the mine as recorded on the only mine plan available and updated 18th October 1920, gives maximum dimensions of 213 m from north to south, and 143 m east to west; the height of working ranged from 13.4m near the shaft to around 6 m towards the edge. The floor of the mine sloped at 20 per cent to 14.3 per cent towards the WSW.

In 1963 two clubs, the Stranmillis Field Studies Society and the Belfast Naturalists' Field Club, visited the mine with permission of the owner, Mr. J. Cobain. Manning (1965, 16) reports that, 'The eastern half is dry underfoot, but the remainder has a depth of water about 18 inches. Mushroom rigs and plastic greenhouses are the remains of the temporary

occupation of the mine by a mushroom company' (the Monlough Mushroom Company).¹⁷

In 1965 the Irish Salt Mining and Exploration Co. Ltd. bought the mine, but no more salt was brought up from the depths, even though the winding gear remained. Just before 11 am on 19th October 1990, the mine collapsed after several weeks of complaints from local residents about noises heard around the area. The seismic wave from the collapse of Tennant was picked up by seismographs in southwestern Scotland and Northern Ireland, but there had been evidence of ground movement before, as utility companies were constantly repairing pipe-work in a field nearby. As the Tennant mine was supposed to be the safest mine in the area of Carrickfergus, the Department of Economic Development appointed consultants to look at all the other abandoned mines in Carrickfergus (GE, 1991).

THE MANUFACTURE OF ROCK SALT AND BRINE AT CLIPPERSTOWN SALT WORKS

In 1887, Alexander Miscampbell built salt pans at Clipperstown on the Woodburn Road from Carrickfergus. Running beside the works was the Belfast to Carrickfergus railway line so a siding was constructed to divert wagons needed to rail salt to all areas of Ireland. Figure 10 shows a plan of the Clipperstown works which stood until the 1960s. Inside the works were huge open salt pans made from iron measuring '... 40 feet by 20 feet and 1½ feet deep' and riveted' (undated ICI document). In the early days, rock salt was brought down from the mine by horse and cart, crushed and mixed with water. When brine was pumped from French Park and Maiden Mount, it was piped directly to a huge tank, by the roadside, which held 100,000 gallons. This tank was sited at a high level and the brine flowed to each salt evaporating pan for processing.

Below the pans were furnaces and here coal, imported through

¹⁷ This company was in County Down near Newtownards and is no longer in operation.

EXPORTING AND IMPORTING SALT

Most salt left Carrickfergus by way of the local harbour, but there is one report where salt was taken by a sailing ship from White Harbour, near Whitehead. This ship sailed to Iceland where some of the salt was sold. The owner used the remaining salt to pack Icelandic fish, which he bought, and continued to sail south to the Iberian Peninsula, selling the cargo in Portugal. 'He counted it a bad trip if he did not make the cost of his ship out of it,' reported a local newspaper (undated newspaper clipping EAG, 1958). Salt also left the Port of Belfast and by train wagons throughout the whole of Ireland. Unfortunately none of these records can be found.

The Carrickfergus Harbour Book of Vessels and Rates are lodged in the Carrickfergus Museum Community Archives (CCA) and are a fascinating record of all the ships bringing goods to and from the harbour. They date from 1862, but unfortunately there is a break between the years 1913 and 1929 and again from 1941 to 1949. Salt went as far as United States of America and the Baltic areas including Riga. Small amounts were transported to Lamlash on the Isle of Arran, to ports in the Inner and Outer Hebrides and to Douglas on the Isle of Man, which later had its own supply of salt from the north of the island. The Scottish ports took the largest amount with Port Dundas in Glasgow leading the field.

In order to maintain production, raw salt was imported on a few occasions when the local mines had ceased, owing to rock falls or damaged equipment. All imports came from the mines in Cheshire and continued to be imported after ICI closed the works in Carrickfergus in 1958. Manufactured salt from Cheshire would have been included in the import records, although this was packed at Clipperstown Salt Works as 'Stella' Salt.

THE LEGACY OF THE CARRICKFERGUS MINES

Today, the historic mines have all closed and just one salt mine is in operation. This was started by the Irish Salt Mining and Exploration Co. Ltd. in 1965 at Kilroot, but there are no records available to the public. From the 14,500 tonnes mined in its inaugural year, it now produces half a million tonnes of de-icing rock salt per annum for the domestic and export markets (Irish Salt Mining website). I was invited to visit the underground workings of the mine in 2003, which I accepted. The works are on a much smaller scale than the Meadowbank Mine I visited in Cheshire the previous year, but it was still an experience that I would not have missed. The company employs a number of people, especially during the winter months when demand for de-icing salt is highest, and has recently been given permission to expand.

The collapse of Duncrue Mine in 1875 and subsidence at French Park Mine were mentioned earlier, and in 1990 the Tennant Mine also collapsed, creating a sense of panic within the Department of Trade and Enterprise who were responsible for all the mines after ICI closed their salt operations in 1958. All were thought to have been safe. Specialists were brought

over from England in 1991 to survey all the mines and each was drilled into and cameras inserted to ascertain the extent of the erosion below the surface. Fixed monitoring stations were installed in the fields, on roads and in buildings to measure any movement. The French Park Mine was found to be in a worse condition than was thought and was undermining the New Line, B58, which was closed to all traffic creating an annoying diversion!

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On 20th August 2000 Maiden Mount collapsed leaving a small hole in the field. Mr. Tommy Hamilton, who had animals grazing on the field at the time, heard a rumble and a splashing noise and saw the hole open. Figure 13 was taken on 21st August 2000 from the top of the original spoil heap. By placing my ear against a wooden post near the hole I could hear rumbling and splashing taking place beneath the ground so it did not take a great deal of imagination to realise what was happening below and having experienced this once, I was not in any hurry to go near the opening hole again until the mine had settled a little. After this collapse, higher fences

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Fig.13: The collapse at the site of the Maiden Mount Salt Mine, as seen from the top of the original spoil heap, August 2000. Photograph taken by the author

were erected around the mine and across the New Line and no access was permitted to Maiden Mount.¹⁹

As Maiden Mount collapsed, the old brine pipe was exposed and the small hole expanded to a large lake that had two mallards swimming on it for a time. In the meantime, in the fields opposite French Park Mine, brine and other substances were making their way to the surface resulting in Mr. Robert Robertson's land being unusable. He had earlier reported that salt water was emerging from a field drain into the stream and the Authorities were alerted. As Maiden Mount and French Park were only separated originally by a wall of rock and salt, it can be assumed that this salt had been dissolved during brine extraction and damaged by the use of explosives in an attempt to collapse the Maiden Mount Mine, allowing salty water to make its way to the surface. In 2003, contractors were brought in to clean the polluted land and place drains throughout the area. These then drained the contaminated water directly into the stream nearby, the ground was restored and sheep were able to graze again.

A student from Queen's University, who undertook a seismic survey of the top part of the field near the original Duncrue Mine air shaft, showed me the result of one part of the field on her laptop and there was very little distance between the

ground surface and a inverted conical void underneath.

There is a nature reserve in the East Riding of Yorkshire which, during the Second World War, was a munitions storage facility. This supplied bombs and other munitions to all the local airfields. By chance a friend met an elderly gentleman fishing in the small lake on the reserve. During the conversation, he explained the post war use of the site where he himself had worked. It was used for decommissioning the munitions. The explosive content of the bombs was steamed away and the liquid residue was cast into blocks and according to him, was shipped to Ireland for disposing down the disused salt mines. Was this residue part of the brown, glutinous 'gunge' re-emerging in Mr. Robert Robinson's fields in the early 2000s with the collapse at Maiden Mount?

More drilling took place around Maiden Mount in case it could be collapsed, under controlled conditions, by explosives, but yet again this never materialised. A newspaper account (EAG 2002) indicated that fly ash from Kilroot power station could be used to infill the mine, but in 2005 contractors were brought in and started the job of infilling by using the mound of spoil from the original excavation and from the around the edges of the area. The old building foundations were also cleared into the hole, leaving a flat level piece of ground that slowly sank in the centre, creating a small depression. Only one of the original mine shafts was left with the original concrete cap, but even that shaft had been slowly sinking.

¹⁹ There was an old right of way beside the mine from Carrickfergus to the old Great Commons for turbarry rights.

Duncrue, French Park and Maiden Mount Mines were fenced off completely, with the area still being monitored. When I last saw the site in 2012, no livestock was on the land at Duncrue grazing the luscious looking grass. It remains to be seen whether the mines at Woodburn cease to cause problems in the future.

ACKNOWLEDGMENTS

I wish to thank all those people who have helped me in this piece of work, especially Mr. William Weatherup, who was so enthusiastic about the Woodburn Mines.

REFERENCES

PRIMARY SOURCES

- CCA Carrickfergus Community Archives, Antrim Street, Carrickfergus
Carrickfergus Harbour Book of Vessels and Rates 1862 (August) -1913 (July); 1930-1939 and 1950-1958.
- CL Carrickfergus Library:
Ordnance Survey 6 and 25 inch maps of the Carrickfergus area;
Carrickfergus Council Minutes for March 1993; Abandoned Mines Committee Minutes, 1998.
- GSNI Geological Survey of Northern Ireland Archives, Belfast Salt Production figures from 1853-1958
- NCM National Coal Mining Museum, Wakefield, West Yorkshire. *HM Inspector of Mines Reports for District No. 6, Manchester and Ireland*, Dickinson, Joseph:
1873, HMSO 1874.
1887, HMSO 1888.
1888, HMSO 1889.
1890, HMSO, 1891.
Gerrard, John:
1893, HMSO 1894.
1896, HMSO, 1897.
1908, HMSO, 1909.
- Mineral Statistics of the UK of Great Britain and Ireland with the Isle of Man*, 1894, HMSO 1895.
- Patent of James Hodkinson in the private possession of the Hodkinson family in Eden, Carrickfergus.
- PRONI Public Record Office of Northern Ireland, Belfast, Downshire Papers D671/A4/3 lease, D671/A4/51, D671/R3/47.
Ordnance Survey Sheets OS10/1/52/3/4, OS10/1/53/3/3
- UG University of Glasgow, Records of Tharsis Sulphur & Copper Co Ltd, miners and chemical engineers, Glasgow, Scotland, gb 248 GB UGD 057.

SECONDARY SOURCES

Books and Articles

- Anon, *A Guide to the Lion Salt Works*, Marston, 2000, Lion Salt Works Trust.
- Anon, *Ground Rock Salt and its uses in agriculture*, Pamphlet, U/A-CAR914, Undated unpublished paper.
- Bassett, G. H., *County Antrim One Hundred Years Ago, A Guide and Directory 1888*, Belfast, 1989.
- Calvert, A.F., *Salt in Cheshire*, 2 Vols. London, 1915.
- Checkland, S.G., *The Mines of Tharsis*, London 1967.
- Cole, G.A.J., *Memoir of Localities of Minerals of Economic Importance and Metalliferous Mines in Ireland*, Dublin, 1922.
- Critchley, M.F. and Schwartz, S.P. 'Unearthing the Past: The Rediscovery of Blundell's Mine(s), Edenderry, County Offaly', *Journal of the Mining Heritage Trust of Ireland*, 2011, pp. 35-46.

- Currie, J.R.L., *The Northern Counties Railway*, Vol. 1, 1845-1903, David and Charles, 1973.
- Deane, C.D., 'Down the Eerie Depths of an Ulster Salt Mine', Unpublished paper given to the author by Miss Margaret Hodkinson, 1933.
- Fielding, A. and Fielding, A., *The Salt Industry*, Princes Risborough, 2006.
- Griffith, A. E. and Wilson, H.E., *Geology of the County Around Carrickfergus and Bangor*, HMSO, 1982.
- Hodkinson, W., 'Notes from a talk given to the Wesley Guild Methodist Church, Carrickfergus', Unpublished paper, 1911/12.
- Imperial Chemical Industry, a collection of unpublished, undated papers.
- Ludlow, C., 'History of Salt in Ireland with special reference to the salt manufacturing industry', Unpublished PhD Thesis, Queen's University, 1993.
- Manning, P. I., 'A Visit to the Tennant Salt Mine Eden Carrickfergus', *Irish Naturalists' Journal*, Vol. XV, No. 1, January, 1965, pp. 16-19.
- Maquire, J.F., *The Industrial Movement in Ireland as Illustrated by the National Exhibition of 1852*, Cork, 1853.
- McCrum, E.J. (ed.). *The History and Antiquities of the County of the Town of Carrickfergus* by Samuel McSkimin, Belfast, 1909.
- Miscampbell, A., 'The Salt Industry of Carrickfergus', *Transactions of the Federated Institution of Mining Engineers*, Vol. 7., 1894, pp. 546-552.
- Mitchell, W.I (ed.), *The Geology of Northern Ireland: Our Natural Foundation*, Second Edition, Geological Survey of Northern Ireland, Belfast, 2004.
- Rigby, J., 'Outburst from the Duncrue Old Salt Mine after being tapped for brine', *Transactions of the Manchester Geological Society*, Vol. 28., 1905, pp. 565-570.
- Rochester, M., *Salt in Cheshire Part 1 Salt Making*, Cheshire Libraries and Museums, 1975.
- The Salt Union a pamphlet, Salt Museum Publication, undated publication.
- Wilson, H.E. 'The South Antrim Salt Field' Open File report No. 48, Geological Survey of Northern Ireland, August 1974.
- GS *Grains of Salt Magazine Supplement to the ICI Magazine*, February 1954; March 1954; April 1954; April 1955; May 1955; July 1955; September 1955; October 1955 and November 1958.
- LTWT *The Larne Times and Weekly Telegraph*, 1 November 1913.
- S *The Standard*, 28 February 1853; 18 September 1856.

Quoted Oral History Interviews

- Mr. G. Burgess 1 November 1999.
Mr. K. Burgess, 8 September 1999.
Mr. J. Connor, 26 August 1999.
Mr. E. Hunter, 1 September 1999.
Mr. M. McDowell, DATE? 1999.
Mr. J. Weatherup, 5th June 1997.
Mr. W.J. Weatherup, 10 October 1999.
Mrs. Creighton, 8 January 2003.

Additional, unquoted interviews

- Mr. P. Mason.
Mr. S. McCamley.
Miss M. Hodkinson.
Miss Wharry.
Mrs. S. Speers.

Internet Sites

- National Archives Census for 1911 <http://www.census.nationalarchives.ie/> Accessed 10 October 2009.
- Official Catalogue of the Great Industrial Exhibition (Royal Dublin Show) 1853 www.archive.org/stream/officialcatalogue00exhib/ Accessed 12th June 2012.
- Tennant family www.gdl.cdlr.strath.ac.uk. Memoirs and Portraits of 100 Glasgow men, No. 91 John Tennant. Accessed 12 June 2012.
- The Irish Salt Mine and Exploration Company Ltd. www.irishsaltmining.com/home Accessed 9 November 2013.

Newspapers and Periodicals

- BFNC Belfast Field Naturalist Club Reports; 1876-1883 Summer Session; 1901 Summer Session.
- BNL *Belfast News-Letter*, 17 September 1852; 8 February 1854; 27 October 1921; 10 April 1931.
- CACG *Carrickfergus Advertiser and County Gazette*, 6 June 1891; undated article, 1883.
- CAEAG *Carrickfergus Advertiser and East Antrim Gazette*, 26 January 1973.
- CF *Carrickfergus Freeman*, undated article, September 1865.
- EAG *East Antrim Gazette*, 8 August 1958; 10 October 1958; 23 October 2002.
- EAT *East Antrim Times* (Carrickfergus Edition), undated, October 1990 and 2002.
- FJ *Freeman's Journal*, 15 May 1855.
- GE *Ground Engineering*, undated, November 1991.

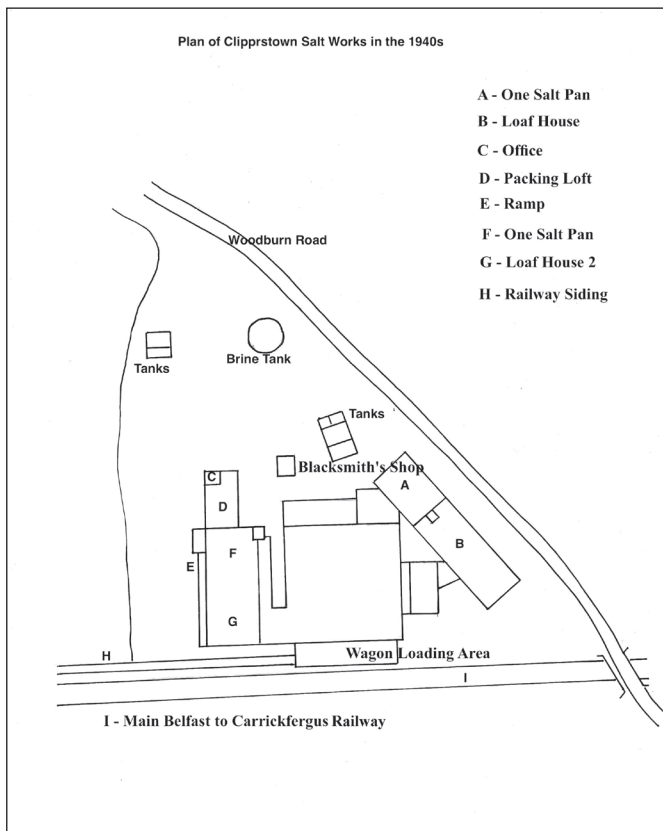


Fig. 10: Plan of the Clippirstown Works in the 1940s

the harbour and transported by horse, cart and lorries, was burnt to create the heat needed for evaporation. It took 11¼ cwt. of coal to make 1 ton of salt from 900 gallons of brine. The roof of the building had open slats for the steam to disperse, which could be seen rising from the works for some distance - especially on cold winter days. Figure 11 shows an evaporating pan with the furnaces beneath at the Lion's Salt Works in Cheshire, 2002. To the right of the picture, behind a pipe with double flange joints is a 'jigger' arm, used for lifting the saltpan for furnace maintenance.

Two men, on eight hour shifts, operated each pan producing approximately seven tons of salt in a twenty-four hour period. In a demonstration at the Lion Salt Works, Cheshire, by Andrew Fielding (July 2002) brine was heated in a small open pan over a wood fire and after twenty minutes crystals formed readily when the brine was heated. The furnace heat was critical as this produced the different coarseness of crystal. A typed ICI paper (undated ICI document) stated that a '... High temperature produced finer crystals and slower boiling, at lower temperatures makes a coarser grain. Fine salt was usually produced at a temperature between 200 and 220 degrees, medium salt from 180 to 210 degrees and finally coarse salt between 160 and 180 degrees'. The coarse salt was known as 'unstoved' salt whereas the fine-grained was 'stoved' salt. The stokers feeding the furnaces wore little upper clothing owing to the heat and it would have been very skilled at their job to judge the correct temperature needed to create the correct salt crystal size.



Fig. 11: An evaporating pan with the furnaces beneath at the Lion's Salt Works in Cheshire, 2002. Top right behind the pipe with the double flange joints, is a 'jigger' arm, used for lifting the saltpan for furnace maintenance

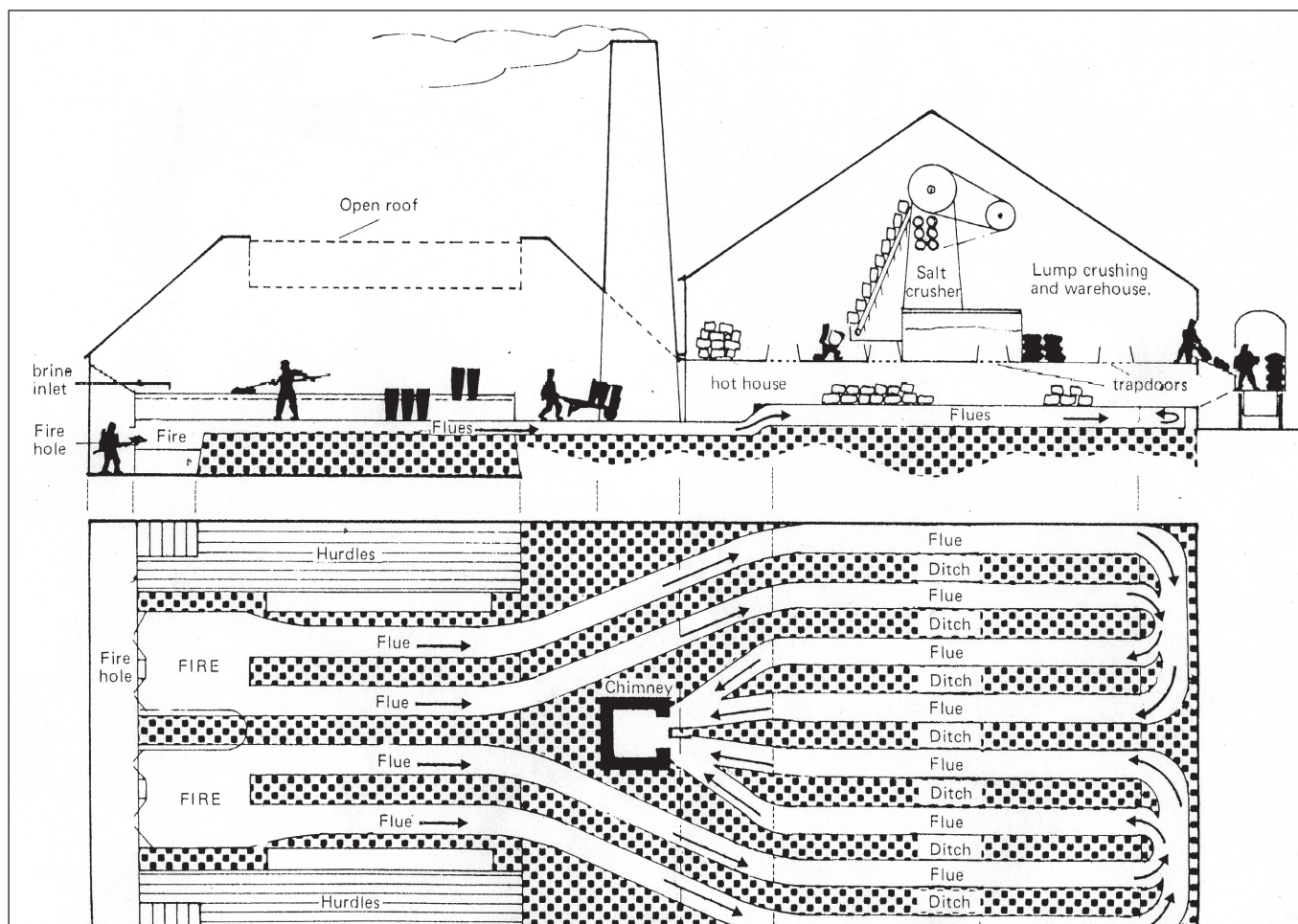


Fig. 12: Elevation of an open pan salt works, depicting how the hot air from the furnaces was used to dry the salt. Reproduced by kind permission of Cheshire County Council

When the salt crystals formed, a man would stand on the platform at the side of the pan and rake them to the side. A tool called a 'skimmer', a flat ladle with holes in it, was used to lift the salt onto the pan's sides where the water was allowed to drain back into the pan. The salt was then put into wooden tubs. The tubs as seen in 2002 at the Salt Museum, Northwich, Cheshire, were made from elm and were known as 40, 60 and 80s, indicating how many dry lumps there were to the ton. To make a heavier lump, the salt was packed more closely in the tub by ramming it down with a 'punner' or 'mundling' stick. The tubs were tapered at one end with chamfered corners, which made the removal of the salt block easier - a block of salt was known as a 'loaf' at Clipperstown.

Once into the tubs, the salt was left on the side for a further half hour for more water to drain and then the salt lump was carefully removed from the moulds and wheeled, using wooden barrows, to the 'stove' or hot room for stacking and drying for twenty-four hours. A further day was needed after they were stacked in yet another area, before being finally moved to a great pile extending the length of the whole room. The hot room was naturally heated as the flues from the furnaces ran nearby and heat was transferred. It took two weeks to dry salt lumps before they could be 'lofted' through the hatches to the second floor for storage. Figure 12 from *Salt in Cheshire* (Rochester 1975) shows a plan of a typical salt works showing

how the hot air from the furnaces was put to good use.

When the salt blocks were completely dry they were wheeled up an alleyway to a crusher to be reduced to fine powder. Below the crusher stood a box on four wheels which, when full, was taken to the packing shed where cooking and table salt was packed. 'Dirty salts' were the sweepings from the floor and these went to the farmers. Ordinary salt was transported by wagons each holding six tons, the salt being tipped loose down chutes straight into the railway wagons. The meat curers used to send their own bags for salt packing, but often these were rotten and full of maggots, so the Salt Union decided for health reasons to buy their own bags and charge 1s 6d a bag to the curers. Fishermen from Ardglass and Portaferry would also call for coarse salt, bringing with them herring for the workers. Mrs. Creighton was a packer for a time in the works before she was married and was very helpful when I interviewed her:

In the packing room salt was packed into cartons and these packed into two dozen parcels. Occasionally there was a bigger order, a box that took four dozen. The 7 lb. order bags went to the country farmers two at a time, parceled. Other weights included 1½ lbs. packed into cartons and 3½ lbs. packed into paper bags. The packing ladies had to wear a hat which was a square piece of material folded into triangle, placed

over the hair and knotted at the top. They also had two white starched overalls and had to wear old shoes as the salt ate into them rotting the sole and the stitching. Starting time was 8 am with a ten to fifteen minute break at 10.30 am. At 12.30 pm there was an hour for lunch and everyone went home. At 3.30 pm there was the afternoon fifteen-minute break and at 5.45 pm the workers finished for the day. On a Saturday the work time was from 8 am until 12.30 pm. In 1937 the wages were 7s 6d for five and a half days. In summer it was so hot that you needed to be near a door or window for air. The packers did not pack all the time as it was monotonous, so after packing two batches of seventy-two the person was moved to start parceling salt. A change of tables (there were five of them) happened every week so that fresh air and draughts were shared between everyone. The loose salt was brought to the tables in a wheeled container where the packing took place. No one minded handling the salt as it had a lovely feel about it. Micky Malone also packed a substance known as 'whiting', like chalk, at one time. Whiting was used to paint ceilings' (Interview, Mrs Creighton).

Fine Saxa salt was also brought from Cheshire. An ICI paper (undated ICI document) noted:

This salt was vacuum salt made from brine heated by steam in closed evaporators. To this salt is added a very small percentage of magnesium carbonate (0.75%), which is designed to reduce the clogging tendency of salt when exposed to the damp atmosphere... the magnesium carbonate coats the salty crystals with fine powdery film. This stops immediate contact with moisture and creates a free-flowing salt.

Mr. E. Hunter remembered that 'four people worked at the bagging. One man held a sack open while another shoveled in the salt. A third weighed the sack and the last person sewed it up. The sacks weighing 1-2 cwt. were finally loaded onto lorries' (Interview, Mr. E. Hunter). Salt from Winsford, under the brand name STELLA, was brought to Clipperstown in 1 cwt. bags and packed, according to *Grains of Salt* (1955, 4), into 'attractive Stella cartons'.

The furnaces obviously had to be cleaned out daily and the clinker and ashes were stored on site so farmers could come with their carts and collect what they needed for their laneways. The pans also had to be cleaned out, but at the end of each week, according to the guide book to the Lion's Salt Work (2000, 22), 'to remove concentrated impurities, which would cause the salt to become bitter' and as the pans cooled towards the end of the week, the coarser salt was then made. On a Saturday, the area of Clipperstown and beyond, according to Mr. M McDowell, reverberated with loud noises as the pans were descaled by chipping the caked salt away from their sides (Interview, Mr. M McDowell). If the pans needed to be repaired, as cracks did appear quite regularly, '... lime was added to the brine. This settled into the cracks and sealed it for a time' until general repairs could take place, according to Mr. E. Hunter (Interview Mr. E. Hunter).

In the early 1950s, the brine failed and the works, making salt from brine, closed down. However I think salt was still packed, as for eleven months in 1953 salt was being imported from Winsford and Weston Point. The ICI magazine *Grains of Salt* reported in 1954 that:

Smoke and steam can now be seen around Carrickfergus and we are glad to see the wheels turning again after over a year out of production. Nearly all our men came back to us (one of them from as far away as Middlewich) [Cheshire] and among the last contingent were E. R. McClean, W. Haggan together with newcomers R. Stewart, W. Elliot and S. Cameron (GS 1954).

Having been closed for two years, the formal reopening of the works by the Rt. Hon. Lord Glentoran HML, MP Minister of Commerce Northern Ireland, took place on 4th March 1954, with all employees attending a party in Jubilee Hall.

In early 1955, bulk crystal salt was being exported again by the *Puffer Kaffir* and according to *Grains of Salt* was the first exported since before World War Two. ICI was hoping this 'cargo is the forerunner of many more' but this was not to be the case. *Grains of Salt* of November 1955 includes the Chairman's Address regarding the existence of the works:

Till a few years ago because of the cost of carriage, open pan salt could be produced in Northern Ireland more cheaply than vacuum salt could be imported from England. In recent years this has changed, in spite of Northern Ireland's subsidy for coal. Because of this Northern Ireland people have been buying more and more English vacuum salt. The demand for open pan salt from Carrickfergus has fallen rapidly even though we could not offer Granular salt as an alternative at Carrickfergus... the brine supply is uncertain... at the present prices for open pan salt Carrickfergus is losing money... total demand is too small to make it worth while to build a vacuum plant in Northern Ireland. In short, salt production from the Irish deposits cannot compete economically today with English salt (GS Nov 1958).

In November 1958 the buildings were closed although they were not demolished until the 1960s. On the site now stands a BP garage and small shop units. Nothing remains as a reminder of this business except memories and it is unlikely today that the families living in the new housing estates in the area know anything about the industry that took place near their homes so many years ago.

The whole salt industry employed many people. Looking at the 1901 and 1911 census for the Carrickfergus area only, there were one hundred and twenty-one and one hundred and forty-four persons respectively employed within the salt industry, ranging from the managers of the mines to the salt miner and 'boiler'. In 1911 there was a noticeable increase in females listed as packers. The closure of the mines and salt works undoubtedly had a significant impact on the local economy.

EXPORTING AND IMPORTING SALT

Most salt left Carrickfergus by way of the local harbour, but there is one report where salt was taken by a sailing ship from White Harbour, near Whitehead. This ship sailed to Iceland where some of the salt was sold. The owner used the remaining salt to pack Icelandic fish, which he bought, and continued to sail south to the Iberian Peninsula, selling the cargo in Portugal. 'He counted it a bad trip if he did not make the cost of his ship out of it,' reported a local newspaper (undated newspaper clipping EAG, 1958). Salt also left the Port of Belfast and by train wagons throughout the whole of Ireland. Unfortunately none of these records can be found.

The Carrickfergus Harbour Book of Vessels and Rates are lodged in the Carrickfergus Museum Community Archives (CCA) and are a fascinating record of all the ships bringing goods to and from the harbour. They date from 1862, but unfortunately there is a break between the years 1913 and 1929 and again from 1941 to 1949. Salt went as far as United States of America and the Baltic areas including Riga. Small amounts were transported to Lamlash on the Isle of Arran, to ports in the Inner and Outer Hebrides and to Douglas on the Isle of Man, which later had its own supply of salt from the north of the island. The Scottish ports took the largest amount with Port Dundas in Glasgow leading the field.

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Fig.13: The collapse at the site of the Maiden Mount Salt Mine, as seen from the top of the original spoil heap, August 2000. Photograph taken by the author

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A student from Queen's University, who undertook a seismic survey of the top part of the field near the original Duncrue Mine air shaft, showed me the result of one part of the field on her laptop and there was very little distance between the

ground surface and a inverted conical void underneath.

There is a nature reserve in the East Riding of Yorkshire which, during the Second World War, was a munitions storage facility. This supplied bombs and other munitions to all the local airfields. By chance a friend met an elderly gentleman fishing in the small lake on the reserve. During the conversation, he explained the post war use of the site where he himself had worked. It was used for decommissioning the munitions. The explosive content of the bombs was steamed away and the liquid residue was cast into blocks and according to him, was shipped to Ireland for disposing down the disused salt mines. Was this residue part of the brown, glutinous 'gunge' re-emerging in Mr. Robert Robinson's fields in the early 2000s with the collapse at Maiden Mount?

More drilling took place around Maiden Mount in case it could be collapsed, under controlled conditions, by explosives, but yet again this never materialised. A newspaper account (EAG 2002) indicated that fly ash from Kilroot power station could be used to infill the mine, but in 2005 contractors were brought in and started the job of infilling by using the mound of spoil from the original excavation and from the around the edges of the area. The old building foundations were also cleared into the hole, leaving a flat level piece of ground that slowly sank in the centre, creating a small depression. Only one of the original mine shafts was left with the original concrete cap, but even that shaft had been slowly sinking.

¹⁹ There was an old right of way beside the mine from Carrickfergus to the old Great Commons for turbarry rights.

Duncrue, French Park and Maiden Mount Mines were fenced off completely, with the area still being monitored. When I last saw the site in 2012, no livestock was on the land at Duncrue grazing the luscious looking grass. It remains to be seen whether the mines at Woodburn cease to cause problems in the future.

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REFERENCES

PRIMARY SOURCES

- CCA Carrickfergus Community Archives, Antrim Street, Carrickfergus
Carrickfergus Harbour Book of Vessels and Rates 1862 (August) -1913 (July); 1930-1939 and 1950-1958.
- CL Carrickfergus Library:
Ordnance Survey 6 and 25 inch maps of the Carrickfergus area;
Carrickfergus Council Minutes for March 1993; Abandoned Mines Committee Minutes, 1998.
- GSNI Geological Survey of Northern Ireland Archives, Belfast Salt Production figures from 1853-1958
- NCM National Coal Mining Museum, Wakefield, West Yorkshire. *HM Inspector of Mines Reports for District No. 6, Manchester and Ireland*, Dickinson, Joseph:
1873, HMSO 1874.
1887, HMSO 1888.
1888, HMSO 1889.
1890, HMSO, 1891.
Gerrard, John:
1893, HMSO 1894.
1896, HMSO, 1897.
1908, HMSO, 1909.
- Mineral Statistics of the UK of Great Britain and Ireland with the Isle of Man*, 1894, HMSO 1895.
- Patent of James Hodkinson in the private possession of the Hodkinson family in Eden, Carrickfergus.
- PRONI Public Record Office of Northern Ireland, Belfast, Downshire Papers D671/A4/3 lease, D671/A4/51, D671/R3/47.
Ordnance Survey Sheets OS10/1/52/3/4, OS10/1/53/3/3
- UG University of Glasgow, Records of Tharsis Sulphur & Copper Co Ltd, miners and chemical engineers, Glasgow, Scotland, gb 248 GB UGD 057.

SECONDARY SOURCES

Books and Articles

- Anon, *A Guide to the Lion Salt Works*, Marston, 2000, Lion Salt Works Trust.
- Anon, *Ground Rock Salt and its uses in agriculture*, Pamphlet, U/A-CAR914, Undated unpublished paper.
- Bassett, G. H., *County Antrim One Hundred Years Ago, A Guide and Directory 1888*, Belfast, 1989.
- Calvert, A.F., *Salt in Cheshire*, 2 Vols. London, 1915.
- Checkland, S.G., *The Mines of Tharsis*, London 1967.
- Cole, G.A.J., *Memoir of Localities of Minerals of Economic Importance and Metalliferous Mines in Ireland*, Dublin, 1922.
- Critchley, M.F. and Schwartz, S.P. 'Unearthing the Past: The Rediscovery of Blundell's Mine(s), Edenderry, County Offaly', *Journal of the Mining Heritage Trust of Ireland*, 2011, pp. 35-46.

- Currie, J.R.L., *The Northern Counties Railway*, Vol. 1, 1845-1903, David and Charles, 1973.
- Deane, C.D., 'Down the Eerie Depths of an Ulster Salt Mine', Unpublished paper given to the author by Miss Margaret Hodgkinson, 1933.
- Fielding, A. and Fielding, A., *The Salt Industry*, Princes Risborough, 2006.
- Griffith, A. E. and Wilson, H.E., *Geology of the County Around Carrickfergus and Bangor*, HMSO, 1982.
- Hodkinson, W., 'Notes from a talk given to the Wesley Guild Methodist Church, Carrickfergus', Unpublished paper, 1911/12.
- Imperial Chemical Industry, a collection of unpublished, undated papers.
- Ludlow, C., 'History of Salt in Ireland with special reference to the salt manufacturing industry', Unpublished PhD Thesis, Queen's University, 1993.
- Manning, P. I., 'A Visit to the Tennant Salt Mine Eden Carrickfergus', *Irish Naturalists' Journal*, Vol. XV, No. 1, January, 1965, pp. 16-19.
- Maquire, J.F., *The Industrial Movement in Ireland as Illustrated by the National Exhibition of 1852*, Cork, 1853.
- McCrum, E.J. (ed.). *The History and Antiquities of the County of the Town of Carrickfergus* by Samuel McSkimin, Belfast, 1909.
- Miscampbell, A., 'The Salt Industry of Carrickfergus', *Transactions of the Federated Institution of Mining Engineers*, Vol. 7., 1894, pp. 546-552.
- Mitchell, W.I (ed.), *The Geology of Northern Ireland: Our Natural Foundation*, Second Edition, Geological Survey of Northern Ireland, Belfast, 2004.
- Rigby, J., 'Outburst from the Duncrue Old Salt Mine after being tapped for brine', *Transactions of the Manchester Geological Society*, Vol. 28., 1905, pp. 565-570.
- Rochester, M., *Salt in Cheshire Part 1 Salt Making*, Cheshire Libraries and Museums, 1975.
- The Salt Union a pamphlet, Salt Museum Publication, undated publication.
- Wilson, H.E. 'The South Antrim Salt Field' Open File report No. 48, Geological Survey of Northern Ireland, August 1974.
- GS *Grains of Salt Magazine Supplement to the ICI Magazine*, February 1954; March 1954; April 1954; April 1955; May 1955; July 1955; September 1955; October 1955 and November 1958.
- LTWT *The Larne Times and Weekly Telegraph*, 1 November 1913.
- S *The Standard*, 28 February 1853; 18 September 1856.

Quoted Oral History Interviews

- Mr. G. Burgess 1 November 1999.
Mr. K. Burgess, 8 September 1999.
Mr. J. Connor, 26 August 1999.
Mr. E. Hunter, 1 September 1999.
Mr. M. McDowell, DATE? 1999.
Mr. J. Weatherup, 5th June 1997.
Mr. W.J. Weatherup, 10 October 1999.
Mrs. Creighton, 8 January 2003.

Additional, unquoted interviews

- Mr. P. Mason.
Mr. S. McCamley.
Miss M. Hodgkinson.
Miss Wharry.
Mrs. S. Speers.

Internet Sites

- National Archives Census for 1911 <http://www.census.nationalarchives.ie/> Accessed 10 October 2009.
- Official Catalogue of the Great Industrial Exhibition (Royal Dublin Show) 1853 www.archive.org/stream/officialcatalogue00exhib/ Accessed 12th June 2012.
- Tennant family www.gdl.cdlr.strath.ac.uk. Memoirs and Portraits of 100 Glasgow men, No. 91 John Tennant. Accessed 12 June 2012.
- The Irish Salt Mine and Exploration Company Ltd. www.irishsaltmining.com/home Accessed 9 November 2013.

Newspapers and Periodicals

- BFNC Belfast Field Naturalist Club Reports; 1876-1883 Summer Session; 1901 Summer Session.
- BNL *Belfast News-Letter*, 17 September 1852; 8 February 1854; 27 October 1921; 10 April 1931.
- CACG *Carrickfergus Advertiser and County Gazette*, 6 June 1891; undated article, 1883.
- CAEAG *Carrickfergus Advertiser and East Antrim Gazette*, 26 January 1973.
- CF *Carrickfergus Freeman*, undated article, September 1865.
- EAG *East Antrim Gazette*, 8 August 1958; 10 October 1958; 23 October 2002.
- EAT *East Antrim Times* (Carrickfergus Edition), undated, October 1990 and 2002.
- FJ *Freeman's Journal*, 15 May 1855.
- GE *Ground Engineering*, undated, November 1991.