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SILICA SAND QUARRYING ON MUCKISH MOUNTAIN, COUNTY DONEGAL

by Alastair Lings

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Abstract: Silica sand was quarried near the summit of Muckish, intermittently from the late eighteenth century until 1954. At the end of the Second World War the quarrying was described as probably "the most outstanding example of the economic use of our natural mineral resources in recent years". Working conditions in the quarry became part of the local folklore. The earliest record of quarrying on the mountain relates to the extraction of stone in the sixth century. *Journal of the Mining Heritage Trust of Ireland*, **8**, 2008, 13-26.

LOCATION

Muckish Mountain lies in the far north-west of Ireland. At a height of 666 metres above Ordnance Datum, it is the fifth highest hill in Co. Donegal, and the 98th highest in Ireland (Wall 1976). The name Muckish derives from the irish muc-ais, meaning pigs back (Lynam 1982).

The main quarries on Muckish are 300 m west of the summit triangulation pillar, at 590 m altitude. The workings lie on common land at the junction of the Ray (Electoral District Crossroads), Carrowtrasna (ED Creenasmear) and Gortnaleck townlands. The description "Sand Hole" appears twice on the third edition six inch to the mile (1:10560) scale map, Donegal sheet 34, north-east quarter (Ordnance Survey of Ireland).

Muckish was previously described as an Area of Scientific Interest, and classified as a geological site of regional importance due to its sand deposits (Young 1973). It is now designated as a Special Area of Conservation, because of its habitats, and the presence of rare plants. The minerals at Muckish Quarry are now owned by the State (*Personal communication* Wayne Cox 2008).

CLIMATE

The climate on Muckish has been described as "dominated by extreme wetness and strong winds" (Wilson 1989, p159). Rain gauges nearby on low ground give mean annual rainfall totals of 1380 - 1760 mm. The mean annual temperature at 650 m on Muckish has been estimated as around 4.9 Celsius (Wilson 1989), suggesting a mean temperature of 5.3 C at the quarry. Wind maps indicate an average wind speed of around 9.6 metres/second (Ordnance Survey Ireland), at exposed parts of the quarry: a fresh breeze.

"The severity of working conditions in the quarry became part of Donegal folklore for ... its working life" (Sweeney 2006,

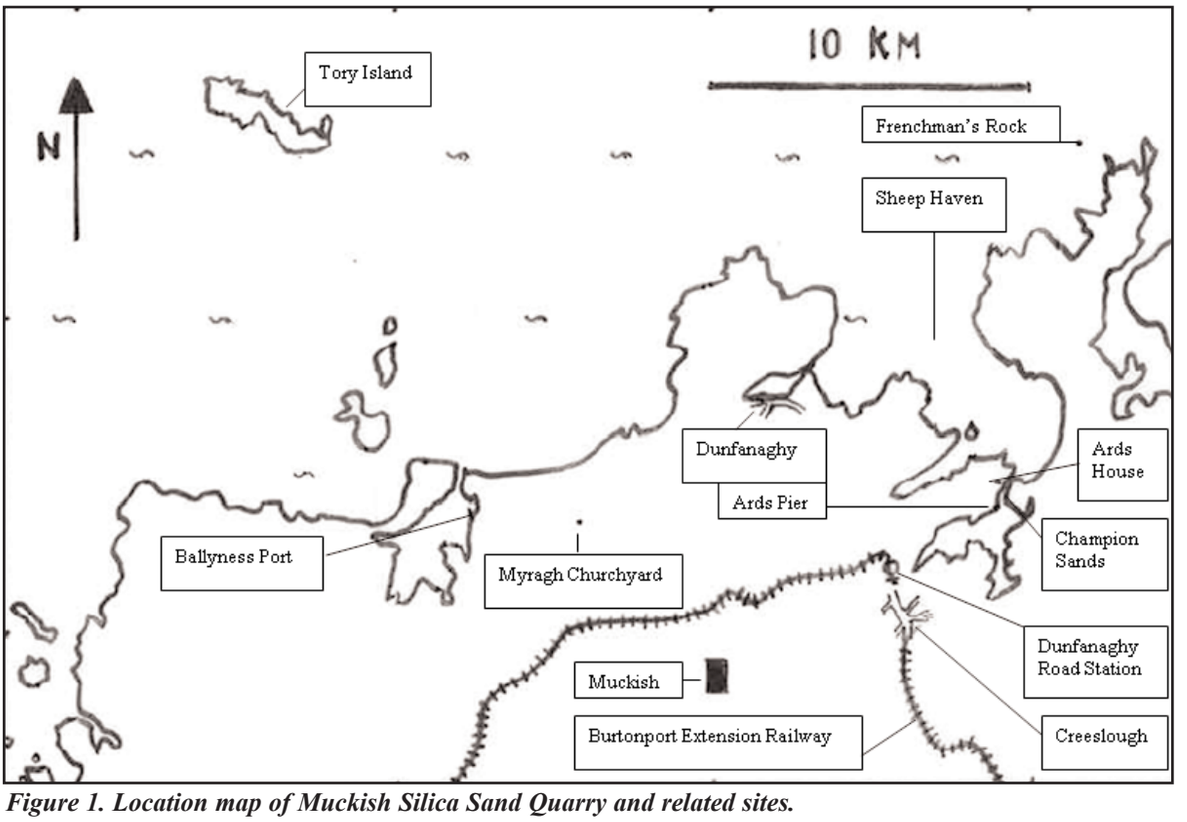

Figure 1. Location map of Muckish Silica Sand Quarry and related sites.

p332). "Fog, frequent rain, piercing winds and snow in winter made for hazardous working conditions" (McStay 2004, p64). The difficulties of the working environment were raised in Dail Eireann by Deputy O'Leary in March 1949. He sought to have the Insurance (Intermittent Unemployment) Act 1942 extended to cover quarry workers, especially employees at Muckish Mountain. The Minister for Social welfare, Mr Norton, rejected the suggestion of extending the wet-time scheme to all quarry workers, and had no powers to specify workers in any particular part of the country (Oireachtas Official Report 1949).

GEOLOGY

The quarries worked rock of the Ards Quartzite Formation which is of lower Dalradian age, approximately 700 million years old. The formation consists mainly of "well-bedded and massive feldspathic quartzites of variable grain size" (Long & McConnell 1997, p15). Original sedimentary structures such as cross-bedding and ripple marks may still be identifiable. In places the quartz grains are held together with a calcareous cement (Long & McConnell 1997).

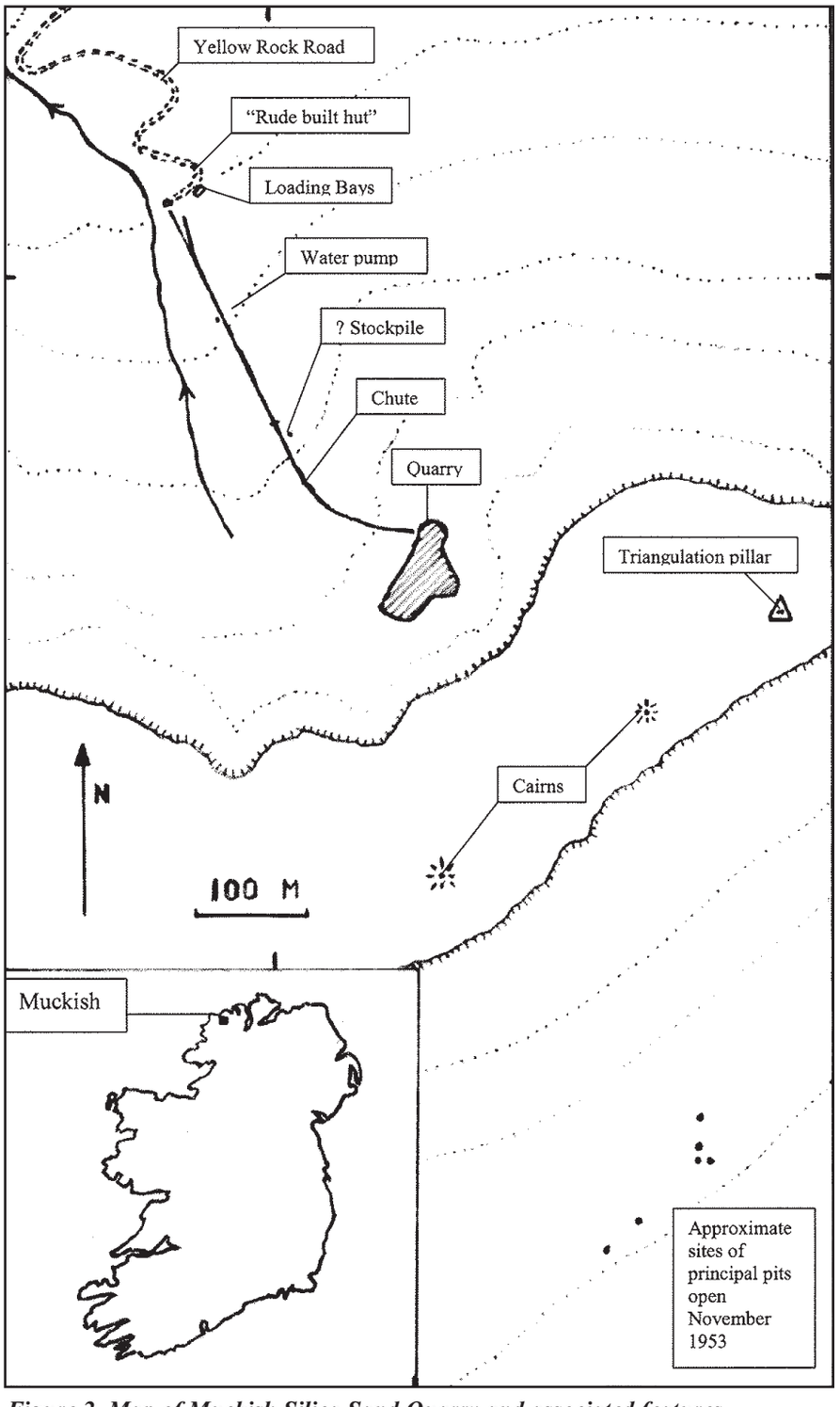

Figure 2. Map of Muckish Silica Sand Quarry and associated features.

On Muckish this calcareous cement has been removed by deep weathering probably during the Tertiary Period (Flegg 1987), from 65 to 1.6 million years ago. Removal of the cement reduced the strength of the rock, liberating the quartz grains. Glacial action during the Quaternary Period, 1.6 million to 10000 years ago, has shaped the landscape that we see today. Recent geological activity includes debris flows, one of which has extended across the access track to the processing plant and quarry (see Figure 15).

MINERALOGY

Boswell (1918, p81) provides a chemical analysis of a bulk sample of the rock, which demonstrates that it is almost pure quartz.

SiO_2 (silica)	99.55 %
Al_2O_3 (alumina)	0.17
Fe_2O_3 (ferric oxide)	0.02
CaO (lime)	0.20
MgO (magnesia)	trace
Loss on ignition	0.16
Total	100.10 %

The rock contains a very low proportion of heavy minerals, mainly zircon. Weathered mica is present in layers between the beds. The brown colour of much of the sand is due to peat staining, rather than elevated iron content (Bishopp and McCluskey 1948). Flegg (1987, p13) summarises the mechanical analyses as "72 % falls in the size range 0.25 - 0.5 mm, 92 % in the range 0.1 - 0.5."

QUARRYING AND MINERAL PROCESSING

The sand beds occur on the north side of Muckish, dip gently south-eastwards into the mountain, and in total are about 24 m thick. The individual beds vary in thickness and hardness. Between the beds are mica-rich layers (Bishopp and McCluskey 1948). During the quarrying process great care was required to remove any micaceous material. This material and any waste rock was dumped down the mountainside.

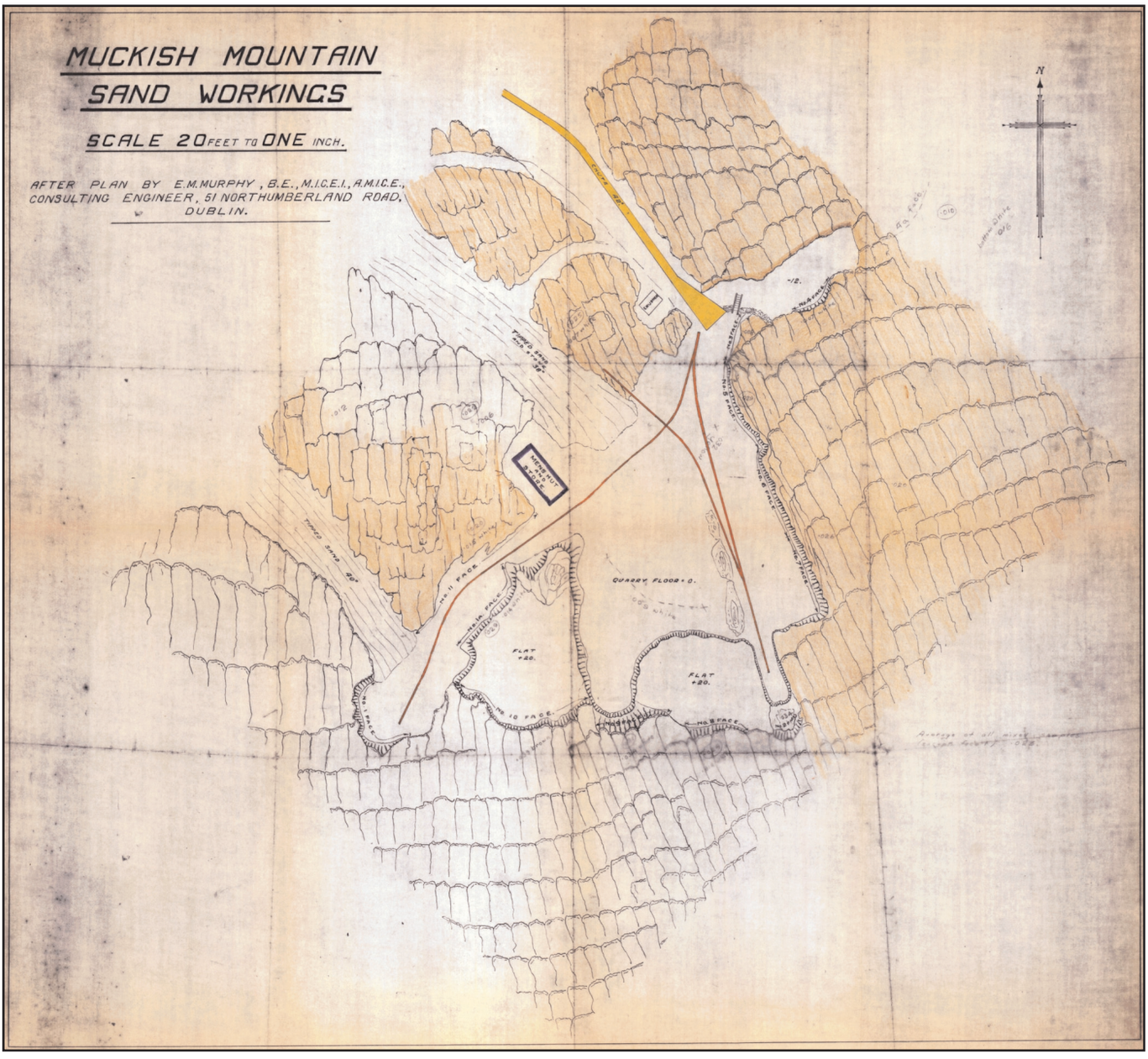

Figure 3. 20' to 1" scale Colour plan- Muckish Mountain Sand Workings, Reproduced with permission from the Geological Survey of Ireland (05/11/2008). File ML001375.

In the early days of quarrying picks and shovels would have been used to extract the sand (McStay 2004), with handbarrows or wheelbarrows used to move the excavated material around the quarry. In 1798 Stewart noted that the sand "quarrys in large blocks but easy broke small" (MacArthur 1987, p42).

Although "a trough to run sand from the top to the bottom of the mountain" had been proposed as early as 1802 (McParlan 1802), in 1827 Otway (1827, p89) states that sand was rolled "down the side of the hill in canvas bags". In 1902 it was still being carried "down the mountain in sacks" (Department of Agriculture 1904). By 1918 "shoots" for conveying the sand down the hill were in place (Boswell 1918, p81).


Glass Sand Quarrying

This picture, on Muckish Mountain, Donegal, shows men engaged in excavating sand for glass-making, which is sent down the mountain by chute and sent to Dublin.

Figure 4. Newspaper (B&W) photo- Glass Sand Quarrying from the Irish Independent 19th July 1941, Reproduced with permission.

Figure 5. Muckish Quarry Face. From Bishopp (1948). Reproduced with permission from the Geological Survey of Ireland (05/11/2008)

Figure 6. Remains of the wooden chutes just below the quarry floor. Photo by Matthew Parkes.

In 1948 pneumatic picks were in use to break the rock, along with drilling and blasting where necessary. It was trammed in mine cars to a screen and crusher. The crushed sand then dropped down a wooden chute from 590 m down to 360 m altitude. From the chute the sand was washed and screened and then delivered by a bucket elevator to concrete storage bins where it drained (Bishopp and McCluskey 1948). At a later stage a loading shovel was provided for the quarry, and further washing equipment installed.

In 1952 it was "estimated that the amount of sand immediately available from the present quarry face by present quarrying methods might be under 50,000 tons (O Brien 1952b).

Geological problems faced during quarrying included the rapidly thickening overburden, as the beds dipped into the mountain, and lateral changes in the beds from soft to hard, micaceous or iron stained (O Brien 1952a).

The climate has already been mentioned as a problem. Surprisingly another difficulty was a shortage of available water in the summer (Boswell 1918), for conveying the sand down shallower sections of the chutes. The latter problem was solved by collecting water from springs into a reservoir at about 430 m, and then pumping it up to the chute when required (Bishopp and McCluskey 1948). Also two drainage channels were excavated on the summit plateau to bring rain water into the quarry (Wilson 1989).

Long and McConnell (1997, p63) state that the quarry's "remote location, limited reserves and environmental considerations make future development unlikely."

TRANSPORT

Sand is a high bulk, low value commodity, so transport costs would be critical for the financial viability of the quarry. McParlan (1802, p23) proposes shipping the sand from "two safe and deep harbours, namely Sheephaven and Dunfanaghy". Elsewhere the port at Ballyness is proposed (Boswell 1918). In the end most of the shipping was from Ards Pier at the south end of Sheep Haven.

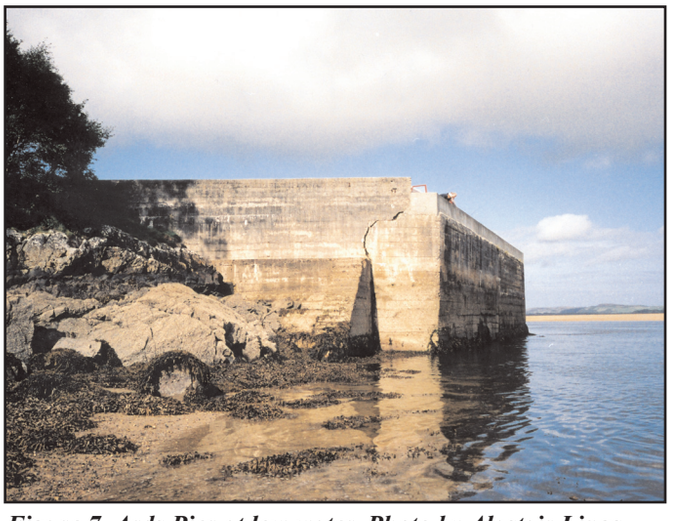

Figure 7. Ards Pier at low water. Photo by Alastair Lings.

In 1902 the Burtonport Extension to the Londonderry & Lough Swilly Railway was completed, skirting around Muckish Mountain. Part of the justification for the railway was to transport sand to Derry and beyond (Sweeney 2006), but no siding was provided near the quarry. Bishopp and McCluskey (1948, p12) states that sand was "transported by rail from Dunfanaghy Road Station". The Burtonport Extension Railway closed west of Letterkenny in 1947.

PRODUCT UTILISATION

From the earliest days the sand was used to make glass. In describing these sands, Boswell (1918, p145) says "The best Irish material is undoubtedly from Muckish Mountain. If the rock ... is properly treated ... much of it will be of service for the best optical glass and tableware; the material generally will be of use for all qualities of glass."

Otway (1827, p89) states that it was "manufactured into the purest crown and plate glass". It was also used in the production of high grade glass for the British Admiralty, and for light bulbs (Anon 1941a). Apart from its use for glass making the sand was used locally as builders sand in the construction industry (*Personal communication* James Cannon 2007).

HISTORY

The Industrial Revolution in Britain at the end of the eighteenth century must have stimulated interest in mineral exploration in Ireland (Herries Davies 1995).

Quarrying on Muckish may have started before 1798 when Donald Stewart, Itinerant Mineralogist to the Dublin Society, noted "fine white sand from Muckish near the Bay of Ards and Dunfanaghy, in the Estate of Alexr Stewart Esq. Great abundance of it. Appears on the north side of this Large high and steep mountn on both sides. That great stratum of white sand or free stone, as it Quarrys in Large Blocks but easy broke small, it most assuredly forms a bed from one side to the other of the Mountn which is Broad and Long" (MacArthur 1987, p42).

A more comprehensive report is given in the Statistical Survey of the County of Donegal, in 1802. "On Mr Stuart of Ards' estates, the following discourse have been made: siliceous sand - on Muckish Mountain, within four miles of two safe and deep harbours, namely Sheephaven and Dunfanaghy; it is there in inexhaustible abundance. It has for some time been sent to the Belfast glass manufactory. There is now in the bay of Ards a brig almost ready freighted with it, for Mr Edwards of Belfast, who has already proved and approved of it. He now imports none from England, and uses no other but this. William Brennan of Ards supplies it at the bay of Ards, for two guineas a ton. Next year, by means of roads, which are to be made, and a trough to run sand from the top to the bottom of the mountain, he will be enabled to sell it at half that price" (McParlan 1802, p23-24).

In July 1806 Sir Humphry Davy, inventor of the miners safety lamp, visited the area, and described the geology: "Mucrish, said to be composed of quartz-rock. The quartzose sand belonging to it has probably resulted from decomposition of a compound rock of quartz and feldspar" (Davy 1840, p158-159).

Sand was still being supplied to glass works in Belfast in 1812 (Wakefield 1812) but by 1827 the sand was being sent to the major glass works in Dumbarton. Otway (1827, p 88-89) describes an ascent of Muckish and notes " that on the north-western side of the elevation where it stands exposed to the driving sleet and tempest and saline spray of the great Atlantic, that even the white silicious stone of which it is composed, is decomposed and has been converted by the agency of the elements into beds of minute fine sand, as pure as the driven snow - this the proprietor of the mountain rolls down the side of the hill in canvas bags, and exports to Dunbarton in Scotland, where it is manufactured into the purest crown and plate glass." At this time the "proprietor" would have been Alexander Robert Stewart, Member of Parliament for Co. Londonderry.

The quarry probably closed during the 1830s and 1840s, as only one commentator, Lewis (1837) describes the quarrying in the present tense (e.g. Society for the Diffusion of Useful Knowledge 1837, p82, Wilkinson 1845, p330).

After describing the nature of Muckish sand, Kane (1845, p238) comments that "If the approaches to that mountain were more easy, and that this kind of sand were brought into the market upon fair terms, there is no doubt but that it would be preferred to the sands of the south of England, none of which can at all compete with it in purity of colour and composition."

Quarrying may have restarted by 1851 as sand was exhibited at the London Great Exhibition, by Reverend Alexander Nixon of Nathfield, Dunfanaghy, who was described as the "Producer" (Ellis 1851, p120). In the Dublin Exhibition of 1853 W.A. Ross & Company of Belfast exhibited glass objects made from Irish sand. Westropp (1920) believed that the sand came from Muckish. No production for Muckish is listed in the mineral statistics for 1858 by Hunt (1860).

In 1863 The Irish Times reported that "A mining company is at present making arrangements for the exportation of the well known white sand of Muckish Mountain, and we understand that two steamers are to be employed in conveying it from the port of Ballyness, Crossroads" (Anon 1863).

The quarry was not working in 1889 when Kinahan (1889, p250-251) described the sand bed: "Only the washed and weathered-out crop can be seen and examined. How far it extends into the hill, and its quality when followed in, cannot be known unless a level was driven in on the bed". At this stage "The best Belgian sand ... can be delivered in Dublin for 15s a-ton".

The quarry was in production at the end of the nineteenth century (Wilson 1989). In 1898 the Edel Catherine a Belfast schooner of 68 tons was wrecked on the Champion Sands, near Ards. She was carrying coal from Garston (Merseyside) to Ards (www.irishwrecksonline.net 2008a). Much closer sources of coal would have been available, for example from the west of Scotland, so this and her port of origin suggests that she may have carried silica sand on her return voyage.

During the Cork Exhibition of 1902 glass was manufactured from Muckish Sand (Westropp 1920). The glassware was later

Figure 8. Examples of glass made at the Cork Exhibition from Muckish sand. From Westropp (1920).

exhibited at the Imperial Institute in London by the Department of Agriculture and Technical Instruction for Ireland (Anon 1903). An exhibition organised by the same department at the World's Fair, St. Louis in 1904 displayed samples of Muckish Sand. The material was exhibited by Stuart, A.J.R., Agent and H. Burke Murphy of the Estate Office, Dunfanaghy. The guide describes the necessary transport arrangements as being "to carry the sand down the mountain in sacks, cart it some miles to a small shipping port, send it to Greenock and thence by direct steamer to Cork. Now there is a railway at the base of the mountain, and connection with all the railways in Ireland and principal ports is available" (Department of Agriculture 1904).

The outbreak of the First World War led to the loss of access to sand supplies from Belgium and France. In response Sir Pieter Stewart-Bam, of Ards House, reopened the quarries (Anon 1915a). By April 1915 Muckish sand was being blended with sand from Coalisland, County Tyrone, to make soda water bottles, and two Belgian glass blowers had been sent to St. Helens (Merseyside) in an attempt to make sheet glass from Irish sand (Anon 1915b). It seems that labour troubles during the early part of the war led to closure of the quarry (Anon 1937).

In 1918 Boswell (1918, p81) described the quarry as being worked by Messrs. Arkwright & Rapaport, of 22 Bank Buildings, Kingsway W.C.2, in London. They were carrying out exploration work and "many pits and trenches, including one driven twenty feet into the hillside, have now been made, and a considerable area of rock cleared of grass, peat and rubble". "shoots" were in place to run the sand down the mountainside, and the sand would need crushing, screening and washing to prepare it for sale.

In April 1920 the West Donegal Sand & Mineral Syndicate Limited was formed with a registered office at 237/8 Moorgate Station Chambers, London E.C.2 (West Donegal Sand & Mineral Syndicate Limited). The company acquired options of a lease on "lands in the County of Donegal", and a lease made between Sir Pieter Stewart-Bam and Harpur Cyril Nixon (Stewart-Bam and Woods 1920). This latter agreement of 30th August 1919 probably relates to the Ray and Ballyboe Mountain sections of Muckish, part of the Nixon Estate.

A draft lease dated 9th August 1920 between Dame Ena D.T. Stewart-Bam and others, and the company, covered the lease of lands in the townlands of Carrownamaddy and Gortnaleck, with "the right to search for and dig for raise make merchantable and carry away all glass sand silica sand stone and silica quartz". The draft provided for an initial lease of ten years from 1st May 1920 at an annual rent of £25, rising to £150, with a royalty of 3d

Figure 9. Sir Pieter von Blommenstein Bam, c.1900, From "A history of Ards", Reproduced with permission from Ard Mhuire Capuchin Friary.

per ton on every ton of sand raised. The draft also granted a wayleave for the erection of an aerial rope or tramway to Dunfanaghy Road Station, or elsewhere (Stewart-Bam and others 1920).

It is unlikely that there was any quarrying by this company as the Stewart-Bams left Ireland following the War of Independence and the signing of the Anglo Irish Treaty in December 1921 (Whaley 1985). The Stewart-Bam Estate was gradually sold off, with the Muckish portion transferred to the Land Commission in 1930 (*Personal communication* Wayne Cox 2008).

In 1939 the outbreak of the Second World War led to a loss of silica sand supplies from mainland Europe. Furthermore glassware could no longer be imported from Czecho-Slovakia, Germany and Sweden (Anon 1943).

On the 15th November 1940 a State mining lease was granted for quarrying (O Brien 1957a), and a year later the Irish Times could report "The second best optical glass in the world is now being obtained from the top of Muckish Mountain, C. Donegal, and is materially helping the Irish glassware industry. The cost of bringing the sand down the mountain and then to Dublin is considerable; but now there is also a ready export market for this product" (Anon 1941b).

The Irish Independent (Anon 1952b) describes the wartime and subsequent development of the quarry. "Just after the outbreak of the last war, a company named Irish Minerals Ltd was formed for the exploitation of these sand deposits on Muckish by Arklow man, Mr L O'Toole. Machinery and equipment were procured from England, and the crushers and compressors were located at the mountain top, which is 2200 feet above sea-level. The sandstone is quarried from the mountain and after being crushed is then washed 600 feet down the mountainside.

"From there it is loaded into trucks and brought seven miles by road to a private pier which the company built on Sheephaven Bay in the grounds of Ards House, which is now a Franciscan monastery. It is shipped from here in small coastal steamers to Garston, Liverpool, where it is used in the big glass-making concern of Pilkington's at St Helens. Mr L.H.A. Pilkington is one of the principal directors of Irish Minerals Ltd and his firm has the right to appoint an English resident manager at Creeslough in Donegal".

Laurence O'Toole, Managing Director, was also known as "Baron Muckish" to his friends (Anon 1941c).

Sheep Haven was dredged to allow ships of up to 600 tons to use the pier (McStay 2004). Markers with lights for night navigation were erected along the channel, and ships took on board a pilot at Downings (David 1991).

At one time Irish Minerals Ltd were exporting 1000 tons per month, creating work for 100 local men (Anon 1944).

In the Republic the sand was used by Solus Teoranta for the production of light bulbs and tumblers (Anon 1943). Other users included The Hammond Lane Foundry and a bottle factory (Anon 1944). At the end of the war in Europe the Irish Times claimed "The war-time use of silica sand from Muckish Mountain in Donegal probably is the most outstanding example of the economic use of our natural mineral resources in recent years" (Anon 1945).

After the war imports of silica sand from Europe resumed, but Muckish continued to supply sand to Pilkingtons. From 1945 the companys agent was Jack Smith, who "was very successful in his work locally and the project generated much needed employment" (Anon 1983).

In 1951 the Department of Industry and Commerce declined to issue an export licence for the sand, potentially jeopardising the jobs of the quarrymen. The unionised workforce asked their shop stewards to ask the union organiser to get an explanation from the Minister (Anon 1951).

The licence must have been issued because on the 27th February 1952 the Irish Times reported that "The oil-driven schooner Gaelic with a cargo of Muckish sand on board, en route from Ards, near Creeslough, Co. Donegal, to Garston, in Lancashire, struck a rock while rounding Melmore Point, off Downings on Monday night and sank. The skipper and crew of four were uninjured and were able to come ashore. It was impossible to save any of the sand being carried. The Gaelic set out from Ards on Monday evening and had only gone a few miles when she struck the rock. Yesterday the crew returned to their homes at Arklow, Co. Wicklow" (Anon 1952a). The Gaelic was commanded by Captain James Hagan of Ramelton. She now lies at a depth of 23 m at the foot of a gully at Frenchman's Rock (www.irishwrecksonline.net 2008a,b).

By April 1952 output was up to 600 tons a week, and "about three or four boats are loaded from the dumps at Ards pier every month. In favourable weather conditions about 50 men would be employed in quarrying the sand and loading it on to ships (Anon 1952b); they were paid £3 per week (McStay 2004).

The company hoped to expand quarrying operations if assistance was available through the Undeveloped Areas Act (Anon 1952b). In July 1952 M.V. O Brien, Director of the Geological Survey of Ireland visited the quarry, meeting Mr Redmond of Irish Minerals Ltd and the foreman, Mr Brogan. O Brien made a rough estimate of reserves of 20 000 tons (O Brien 1952a). In a letter to a Mr Agnew in December 1952 he estimated the reserves as under 50 000 tons at the existing quarry face, using the existing quarrying methods. In discussing potential underground development O Brien comments "Further the mining of an 80' thick and irregular sand body from below a roof generally hard but with some softened sandy patches is a problem for which we cannot assume an easy solution" (O Brien 1952b).

O Brien again visited Muckish in November 1953, meeting Mr P.A. O'Toole. During the summer Irish Minerals had dug exploration pits on the southern side of Muckish, deepening some of the pits dug in 1942. At the time of this visit production was still running at 1000 tons per month, "being limited by (a) installed equipment (b) exposure shortening working time" (O Brien 1953). By July 1954 the quarry had ceased production (McStay 2004).

Figure 10. Trolley mounted compressor in remains of shed at edge of quarry. Photo: Alastair Lings.

Figure 11. The upper crusher and remains of the wooden chute for washing sand down to loading bays at the roadhead. Photo: Alastair Lings.

Figure 12. The lower crusher and gearbox and engine, with Rupert Fabby examining the crusher. Photo: Alastair Lings.

Figure 13. Remains of a water-pump to pump water up to the sand chute when required. Photo: Alastair Lings.

Figure 14. Remains of washing equipment at the loading bays. Ewan Duffy for scale. Photo: Alastair Lings.

Figure 15. The loading bays at the roadhead. The remains of a wall supporting a sand chute are visible above the bays. On the left a recent debris flow has partly buried a loading bay and the access road. Photo: Alastair Lings.

One of the problems of quarrying at Muckish was the high cost of transport. To reduce this cost the company conceived an idea to run the sand down pipelines layed along the old railway line, which had shut in 1947. The ideal location for a processing plant would be under the old railway viaduct, by the Faymore River. Irish Minerals made attempts to acquire this land from the summer of 1956, and in 1957 proposed to seek an Ancillary Rights Licence under the Minerals Development Act 1940 (O Brien 1957b).

In 1959 O Brien (1959, p17) described work at the quarry as "at present suspended for re-equipment". The quarry remained closed, and the pipeline and processing plant were never built. In 1963 a local development group approached the Industrial Development Authority for support in reopening the quarry, but this was rejected (Oireachtas Official Report 1963).

As part of their commitment to developing jobs in Gaeltacht areas, Gaeltarra Eireann carried out a study of Muckish sand in 1973 (Anon 1974). By 1987 the Geological Survey of Ireland were advising "The remote situation and limited reserves may preclude development" (Flegg 1987, p13).

Developments in mineral processing technology have reduced the need for high purity sources of silica sand, making it highly unlikely that Muckish will ever produce commercial quantities of sand again.

CULTURAL CONNECTIONS

Muckish is a prominent feature of the landscape and inevitably features in poems, songs and legends. The *Weekly Irish Times* recounts a legend relating to sixth century quarrying on Muckish.

> "About a mile from Ballyconnell House, in the old Churchyard of Myragh, there is a large and very ancient stone cross, called St. Columbkill's Cross, about which a romantic legend is told. It is all one piece of rock, measuring 24 feet 7 inches in height, 7 feet 6 inches in breadth at the arms, and 2 feet in width, and is said to have been brought from a place called Mamcross, in Muckish Mountain.
>
> "Tradition says that when St. Columbkill, with those who conveyed the cross, had got as far as Myragh Churchyard, the saint recollected having left his book behind him at Muckish where they had cut out the cross; and, as the evening turned out wet and stormy, it was determined not to venture over to Tory Island, but to rest at Myragh, and send a messenger back for the book.
>
> "When the messenger approached Muckish he saw a beautiful eagle ascend from the spot where Columbkill had left the book, and on taking it up he found it perfectly dry, the noble bird having been watching over it, and protecting it with outstretched wings. Although the saint had intended the cross to be an ornament at his collegiate establishment on Tory Island, yet in honour of the incident and to mark his gratitude, he erected it at Myragh" (Anon 1940).

Poetry that refers to the sands of Muckish includes Sir Humphry Davy's six verse poem on "Muckrish and Arokil". Verse four runs:

> Not e'en the purple heath expands
> Its foliage o'er your blanched sands;
> Your rocks alone the yellow lichen covers,
> In palest tints, and o'er the space ye own,
> No shapes of life are known,
> Save where the eagle hovers.
> (Davy 1840, p 160-161)

In the 1940s local musician and singer Frank McHugh composed his best known ballad called "Muckish Sand".

> Come all you honest farmer's sons you veterans of the soil,
> Who for an honest living with your weary hands must toil,
> I'll use no high-class language but in words you'll understand,
> I'll relate my own experience of the work on Muckish sand.
>
> To get started you must register as most of you do know,
> And on my rusty bicycle to Dunfanaghy I did go.
> A large crowd had assembled there, they came from far and near,
> 0! give me a card for the Muckish job was all that you could hear.
>
> Ross Boyle did interview me then and a curious look she cast,
> And in a voice that was rather loud saying: 'where were you working last?'
> This question nearly puzzled me for an answer in return,
> Till at last I thought, I would tell her I was threshing with Paddy Curran.
>
> I think she smiled but I got my card and came whistling up Jack's Brae,
> And headed off for Muckish at the dawn of the next day,
> I could see the workers gathering there from Cashel and Feymore,
> From Myra, Ray and Derryreel, and likewise from Doonmore.
>
> We stood beside a rude built hut till twenty-five past nine,
> When Hughie Coyle in his usual style came smoking up the line.
> Each man got his number then and headed off right fast,
> Some carried a spade or shovel with an overgrown shaft.
>
> 'Twould remind you of some great big job you'd see in a foreign land,
> But when you're told to bring your spade from home, it's then you'll understand.
> 0'Toole was the next I saw coming up, he was in a smiling mood,

And just at the very place I worked sure that was the place he stood.

He stood for about two hours there and watched us separately,
Then he tapped me on the shoulder saying 'Sonny come with me',
I was afraid to ask should I bring my piece or questions of any kind,
But like a little lap dog I followed on behind.

He seemed to think I was coming too slow for he pointed with his hand,
'Go down to that Dublin ganger there, to that crowd that is lifting sand'.
Now this was a curious ganger, the truth I'll tell to you,
Although he was always watching, he would not tell us what to do.

I think he was afraid himself, at least that's what I'm told,
He's like the man that buys the pigs, but hardly just as old.
There is a ganger on the top sometimes he has eighteen men,
They are nearly all from Gortnalake except John Hughie Den.

His orders must be carried out his commands must be obeyed,
He is the highest ganger that I know, but not the highest paid.
The feats of strength I saw performed will never leave my mind,
When four strong men were sent to lift that little railway line.

Charley the Post I know is strong, but a stronger man by far,
Was Johnny Friel from Kilult for he bent a new steel bar.
We worked for about eleven weeks there till our job came to an end,
We were told we would be suspended till the weather it would mend.
So now I'm unemployed again that's nothing new to me,
With seven fast days in every week and my brave half ounce of tea.
(Harkin 1996, p29-30)

SURFACE REMAINS

The highest remains associated with the workings are a line of seven cairns on the summit plateau, which were probably constructed to help quarrymen get to the test pits on the southern slopes of the mountain. Also above the workings are two shallow drainage channels, dug to bring water into the quarry (Wilson 1989).

Figure 16. Dave Fabby on the plateau top, next to one of the drainage channels. Photo: Matthew Parkes.

The quarry is well described in Lynam (1982, p216): "the eeriness of the desolate workings, surrounded by the silence of the encircling ochre-coloured cliffs, is enhanced by the occasional croak of ravens which haunt these high places."

Within the quarry area, at 590 m altitude, are the remains of a shed with a loading shovel, trolley mounted compressor, and mine cars.

Just downhill from the quarry are two crushers, and remains of the wooden chute that transported sand down to the processing plant. The upper crusher is a Goodwin Barsby & Co. No 3188. The lower crusher is an "Improved Stonebreaker" from the Farrel Foundry, which was belt driven from a Blackstone gearbox, powered by a Ruston engine.

A drystone built terrace at about 450 m altitude, just to the east of the chute, may have been used for stockpiling sand in times of dry weather.

Figure 17. An overview of Muckish Mountain from the north west. The quarry is situated above the main cliff face, just below the 'V'. Photo: Alastair Lings.

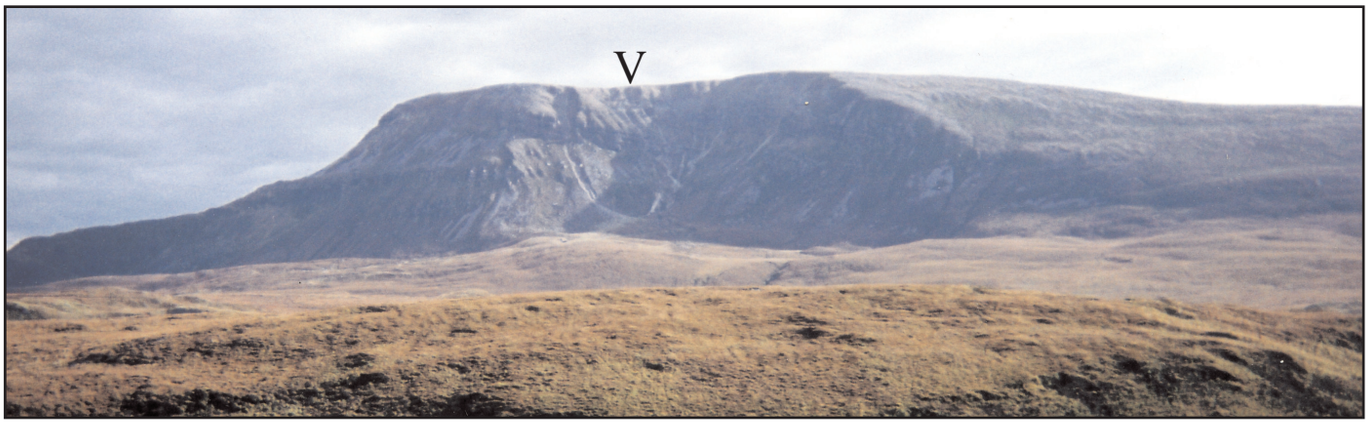

Figure 18. Remains of a mine car in the Quarry. Photo: Alastair Lings.

Above the processing plant at about 400 m altitude are the remains of a National water pump, with a six-inch cylinder. This pump supplied water to the chute, to keep the sand moving downhill during dry weather.

At the processing plant are the remains of washing equipment and loading bays. Immediately above the loading bays are terraced constructions on the hillside: these carried branches of the chute, delivering sand to the loading bays.

Figure 19. Matthew Parkes by the (probable) temporary stockpile site, adjacent to the main chute. Photo: Alastair Lings.

On the west side of the access track, just below the processing plant is a hollow cut in to the hill, which contains the remains of a concrete collar from around a chimney flue. These may be the remains of the "rude built hut", mentioned in McHughs ballad.

A wheel from a mine car and other artefacts lie on the slopes and in the gullies below the quarry.

Ards pier survives, but without any buildings or equipment. Just a single gatepost is all that remains of Dunfanaghy Road Station.

FUTURE RESEARCH

This study has mainly used the internet to find published information on the quarry. Little use been made of archive material. The Stewart-Bam estate papers, D2784/19, at the Public Record Office of Northern Ireland may contain useful data, as may any documents surviving from the Nixon estate.

A priority should be to record the memories of the last generation of quarrymen, while they remain clear.

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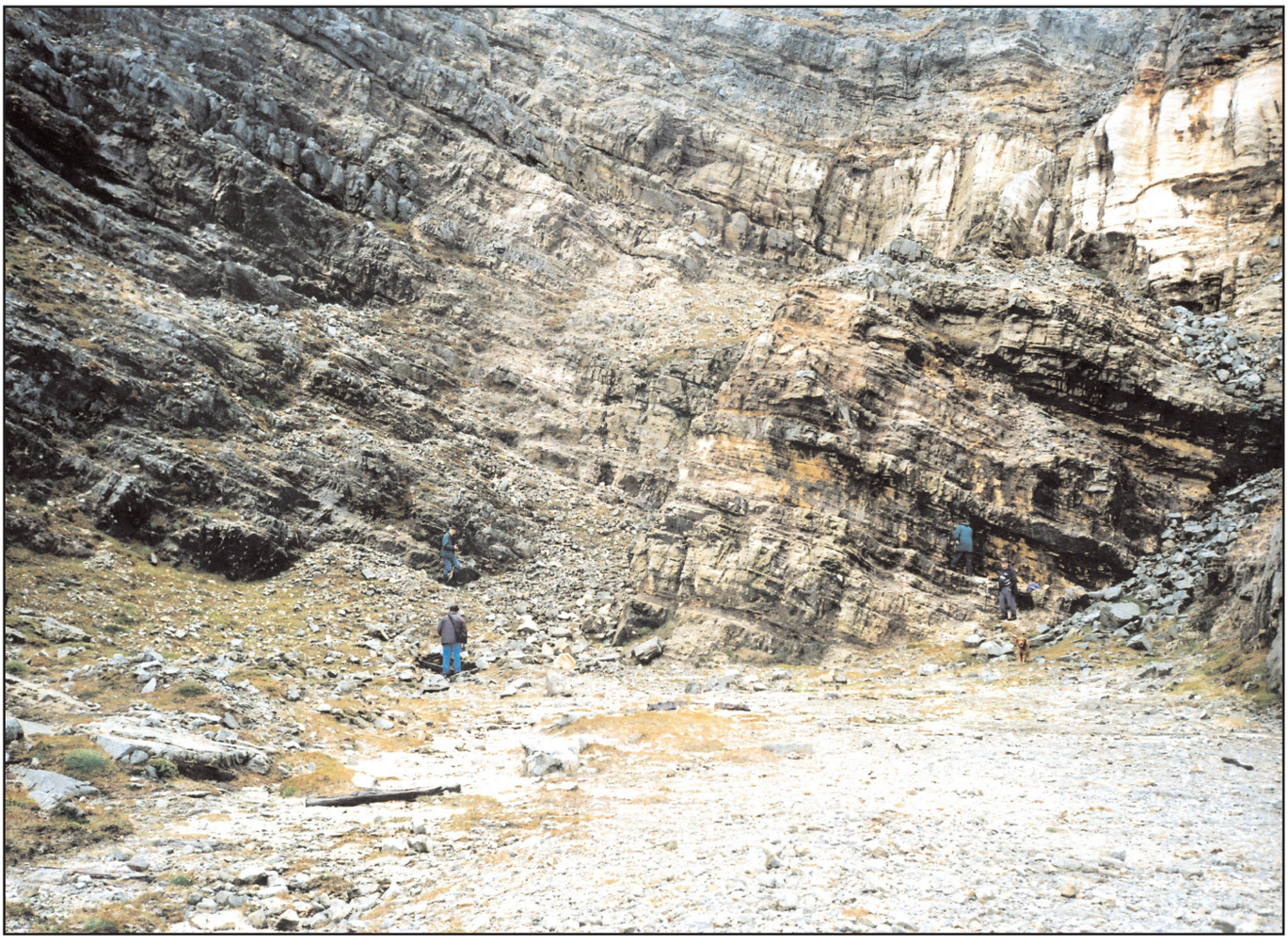

Figure 20. A general view into Muckish Silica Sand Quarry. Photo Alastair Lings

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Figure 22. Water pipe clamp in foreground, a part of water pumping system on the slope up to Muckish Silica Sand Quarry, with Dave and Rupert Fabby. Photo Matthew Parkes