Derbyshire and Derby Minerals Local Plan 2022 – 2038

Background Paper: Vein Minerals

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Derby City Council

DERBYSHIRE County Council

Contents

1. Introduction and Background

1.1 This is one of a series of papers providing background information to accompany the preparation of the new Minerals Local Plan. The new Plan will include strategies and policies concerning the extraction of vein minerals. This paper provides detailed information regarding the economic considerations of working the mineral; national and local planning policy considerations; the way in which the mineral is worked and existing resource and future supply implications.

1.2 The majority of vein mineral resources in Derbyshire are found outside the Plan Area in the Peak District National Park (PDNP). In the Plan area, deposits lie within the areas bordering the PDNP, mainly in a line along the eastern edge of the Carboniferous Limestone deposit around Matlock, Wirksworth and Brassington.

What are Vein Minerals?

1.3 In geological terms a vein mineral is a distinct sheet-like body of crystallised minerals within a host rock. Veins are narrow bands of one type of rock/mineral set inside a wider band of the main type of rock. Veins are formed when mineral constituents, carried by an aqueous solution within the rock mass, are deposited through precipitation.

1.4 Veins are considered to be the result of growth on the walls of planar fractures in rocks, with the crystal growth in the walls of the cavity, and the crystal protruding into the open space. Whilst this is true for some veins, it is rare for significant open spaces to remain open in large volumes of rock. There are two main mechanisms likely to cause the formation of veins, open-space filling and crack-seal growth.

1.5 Vein fissures may be straight, with few side passages, and are usually found in joined granite, or other rock with a high structural integrity. They are often narrow with respect to their vertical and horizontal extents. Other veins can be in the form of interlacing fissures often found in rocks such as schist or slate, which are easily fractured. The mineral veins with which we are most familiar are quartz and carbonate of lime, which often form lenticular masses of limited extent, traversing both hypogene strata and fossiliferous rocks.

Why are they Important?

1.6 Veins are of prime importance because they are the source of mineralisation, either in, or proximal to the veins. Mineralised veins in the Carboniferous Limestone of Derbyshire have long been of economic importance. Historically, lead was the major vein mineral worked, but in recent years this has been fluorspar. A number of other vein minerals are common in the limestone deposits of Derbyshire. Barytes is often obtained from fluorspar workings, in varying proportions, as a secondary material. A lead ore (Galena) may also be found in these deposits and was sometimes used as a by-product. Calcite (calcium carbonate) is a common rock forming mineral and is the main constituent of all limestones, including chalk.

1.7 Fluorspar is the current critically important vein mineral. There are two main grades, acid and metallurgical. Acid grade fluorspar is used in the production of hydrofluoric acid (HF) the starting point for the manufacture of a wide range of fluorine bearing chemicals. Historically fluorspar was important in chlorofluorocarbon (CFC) production, widely used in aerosols and refrigeration. CFC production was halted in 1996 because of its ozone depleting effects. It has been replaced with the production of hydrofluorocarbons (HFCs) which have no impact on the ozone layer. Fluorocarbons have two main applications, firstly in foam blowing a technique for treating plastics to improve their insulation properties and secondly, in cooling, freezing or other heat transfer processes including domestic and industrial refrigeration and air conditioning.

1.8 Fluorocarbons are also used as a feedstock in the production of fluoropolymers which are generally increasing globally. Fluoropolymers are used for a variety of coatings due to their properties such as fire resistance, resistance to chemical attack, insulation and low resistance to movement. Consequently, they are used for insulating wires and cables, in non-stick cookware and for waterproofing tiles. Growth areas for fluoropolymers include the production of Teflon, solar panels and Lithium-ion batteries.

1.9 Metallurgical grade fluorspar is used as a flux (to reduce melting temperature and remove impurities) in steel making. This is a minor market in the UK.

1.10 Barytes, due to its relatively high density, is used in the offshore oil and gas industries as a weighting agent in drilling fluid. It is also used as a

high-quality filler and extender in the plastics, rubber and paint industries and in the nuclear industry as radiation shielding.

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2. National Planning Policy and Guidance

2.1 The National Planning Policy Framework (NPPF)[1] , specifically relating to the preparation of local plans, requires Mineral Planning Authorities (MPAs) to identify strategic priorities including any relevant cross-boundary issues and to develop strategic policies to address them. Such policies should set out an overall strategy for the pattern, scale and quality of development and make sufficient provision for strategic matters which includes the supply of minerals. The policies should also provide a clear strategy for bringing sufficient land forward, and at a sufficient rate, to address objectively assessed needs over the plan period, in line with the presumption in favour of sustainable development.

2.2 The NPPF[2] recognises that it is essential that there is a sufficient supply of minerals to provide the infrastructure, buildings, energy and goods that the country needs. It also recognises that since minerals are a finite resource, and can only be worked where they are found, it is important to make best use of them to secure their long-term conservation. Fluorspar, amongst others, is identified as an important mineral for which provision should be made in the local plan for its extraction.

2.3 Vein minerals fall into the category of 'industrial' minerals. Paragraph 214 of the NPPF requires MPAs to plan for their steady and adequate supply to support their likely use in industrial and manufacturing processes by co-operating with neighbouring and more distant authorities.

Duty to Co-operate

2.4 Local Planning Authorities and County Councils (in two tiers areas) are under a duty to co-operate with each other and with other prescribed bodies on strategic matters which cross administrative boundaries. Joint working is particularly important in identifying whether development needs that cannot be met within a particular plan area could be met elsewhere.

2.5 Strategic policy making authorities should collaborate to establish cross border matters which they need to address in their plans and in accordance with the NPPF produce one or more statements of common ground. These should document the cross-boundary matters being addressed and progress in cooperating to address these. Vein minerals

[1] National Planning Policy Framework, July 2021 Paragraph 21
[2] National Planning Policy Framework, July 2021 Paragraph 209

has been identified as a duty to cooperate issue with the Peak District National Park Authority (PDNPA) due to the location of the cross-boundary Carboniferous Limestone resources and associated vein mineral deposits.

Planning Practice Guidance

2.6 Planning Practice Guidance (PPG)[3] sets out that the local plan should make it clear what is intended to happen in the area over the life of the plan, where and when this will occur and how it will be delivered. It adds that this can be done by setting out broad locations and specific allocations of land for different purposes; through designations where particular considerations apply; and through criteria-based policies to be taken into account when considering development. Local Plans are required to meet the objectively assessed development needs of the area including the unmet needs of neighbouring areas where this is consistent with policies in the NPPF as a whole.

2.7 PPG[4] sets out that MPAs should plan for the steady and adequate supply of minerals in one or more of the following ways (in order of priority):

- designating Specific Sites – where viable resources are known to exist, landowners are supportive of minerals development and the proposal is likely to be acceptable in planning terms. Such sites may also include essential operations associated with mineral extraction.
- designating Preferred Areas, which are areas of known resources where planning permission might reasonably be anticipated. Such areas may also include essential operations associated with mineral extraction, and/or
- designating Areas of Search – areas where knowledge of mineral resources may be less certain but within which planning permission may be granted, particularly if there is a potential shortfall in supply.

2.8 PPG[5] provides specific advice on how MPAs should plan for industrial minerals. It suggests that recognition should be given to any marked differences in geology, physical and chemical properties, markets and supply and demand between different industrial minerals which can have different implications for their extraction. Such differences include:

[3] PPG, Paragraph: 002 Reference ID: 12-002-20140306
[4] PPG, Paragraph: 008 Reference ID: 27-008-20140306
[5] PPG, Paragraph: 086 Reference ID: 27-086-20140306

- geology influencing the size of a resource, how it may be extracted and the amount of mineral waste generated
- the market demand for minerals to be of consistent physical and/or chemical properties, resulting in the fact that industrial minerals are often not interchangeable in use
- the potential for the quality of a mineral extracted from a single site varying considerably
- the economic importance of the mineral as a raw material for a wide range of downstream manufacturing industries
- some industries are dependent on several industrial minerals and the loss of supply of one mineral may jeopardise the whole manufacturing process.

Adopted saved local planning policy - Derby and Derbyshire Minerals Local Plan, 2000

2.9 The current minerals local plan was adopted when vein mineral mining was more active in the Plan area, although the industry had declined to a few sites and with limited output. It referred to the former Mineral Planning Guidance Note 1 which recognised the comparatively high level of demand for vein minerals (at the time), but also acknowledged their limited occurrence. The local plan stated that, within Derbyshire, the majority of deposits were within the Peak District National Park, or other areas of high landscape value bordering the National Park, and that their national importance had to be balanced against the environmental effect of working in such sensitive locations.

2.10 The Plan was based on the expectation that demand in the UK would not rise significantly over the Plan period and, due to limited occurrence elsewhere, Derbyshire would be expected to contribute towards meeting national demand. Due to the variable nature of the deposits, and limited information about commercial viability at that time, it was not possible to identify specific sites for future working.

2.11 As most vein minerals in Derbyshire occur with limestone, extraction can necessitate its removal. In some cases this has been regarded as a by-product with a commercial use and value. In recognition of the sensitivity of where vein minerals are found, the Plan sought to control the volume of host limestone extracted.

2.12 The relevant policy in the adopted Minerals Local Plan is Policy MP33; Vein Minerals, which states that:

'Proposals for the working and processing of vein minerals will be permitted only where:

- the duration and scale of operations is limited to the minimum necessary to meet a proven need for the vein mineral;
- the development can be carried out in an environmentally acceptable way and the least damaging means of production are employed;
- the proposals are designed to avoid damage in the form of subsidence or landslips, and
- the waste disposal arrangements are acceptable particularly in relation to slurry from processing plants.'

Peak District National Park Core Strategy, 2011

2.13 The Peak District National Park Core Strategy, adopted in 2011, includes the following policy for fluorspar production.

MIN1: Minerals development

A. Proposals for new mineral extraction or extensions to existing mineral operations (other than fluorspar proposals and local small-scale building and roofing stone which are covered by MIN2 and MIN3 respectively) will not be permitted other than in exceptional circumstances in accordance with the criteria set out in National Planning Policy in MPS1.

MIN2: Fluorspar Proposals

In order to secure an appropriate supply of fluorspar, the National Park Authority will:

A. Encourage and support the continued extraction of fluorspar ore by underground mining at locations where economically workable deposits have been proven in advance and where the environmental impacts can be appropriately mitigated. This will include the already permitted Milldam and Watersaw Mines;

B. Support proposals for recycling tailings from existing lagoons where the environmental impacts can be appropriately mitigated;

C. Support proposals for the retention and continued operation of existing tailing lagoons associated with the Cavendish Mill Plant, where the

environmental impact can be appropriately mitigated and where it can be demonstrated that no realistic and viable alternative method of treatment is available; and

D. Not permit proposals for the opencast mining of fluorspar ore.

3. Method of Working/ Processing/ Transportation/ Restoration

Method of Extraction

3.1 Vein minerals can be worked by both surface and underground methods depending on the location of the deposit in the host rock. Historically, working moved along the rakes extracting shallower veins using a hydraulic machine or dragline. As these have become worked out the remaining ore is now likely to be found at greater depths often inter-mixed with limestone and therefore, within the Plan area, vein minerals are mainly worked alongside aggregate minerals resulting in operations more akin to hard rock quarries with longer timescales and similar impacts. Potential impacts of working vein minerals alongside aggregates in hard rock quarries include the visual impacts of quarry benches, including any impacts on the setting of the PDNP where sites are located close to its boundary. Other impacts include noise and dust generated by machinery and blasting. Underground working has largely been confined to the PDNP and this is likely to continue in the future. Historically, the small scale working of fluorspar/barytes from old lead-zinc workings and waste dumps, has also taken place.

Processing

3.2 Once worked the vein mineral is transported to a processing plant, usually by road, although it may be initially crushed on site. Processing the ore involves crushing, washing and heavy media separation, and finally froth flotation to produce a high purity acid-grade fluorspar. The main central processing plant for vein minerals is located at Cavendish Mill, at Stoney Middleton in the PDNP and therefore a particular issue is the impact of HGV traffic on the National Park, as the plant receives material to be processed, and then distributes it afterwards .Additionally fine grade waste material remaining after processing must be stored in tailings dams. These relatively large, visually intrusive structures are essential to allow the tailings to dewater over a number of years.

Transportation

3.3 Transport of vein mineral ore in the Plan area and the PDNP is by road. There are no rail facilities within, between, or outside relevant sites serving this industry. In view of the limited scale of the local vein mineral

industry, combined with uncertainty over its future and the availability of imports, it is unlikely that operators will invest in rail freight facilities.

Restoration

3.4 Within the Plan area vein mineral working is carried out in association with limestone working and therefore sites are restored progressively as part of the overall programme for quarry restoration.

4. Vein Mineral Resources

4.1 Fluorspar occurs in only two areas in the UK. The Southern Pennines is the main resource area where the ore deposits are found mainly in the Peak District National Park. Fluorspar production in the Northern Pennines has been much lower, and extraction ceased in 1999 following the closure of mines around Durham.

4.2 British Geological Survey (BGS) has in the past published a series of mineral planning factsheets. Published in 2010, the Fluorspar factsheet noted that, '*in the Peak District, mineralisation is largely confined to the eastern half of the limestone outcrop. The fluorspar-barytes-lead mineralisation occurs in major east-west veins (rakes) and stratabound replacement deposits (flats) together with some cave infill deposits (pipes). The richest mineralisation is concentrated in the uppermost limestones (Monsal Dale Limestones) beneath the overlying cover of mudstones (Millstone Grit) which acted as a cap rock to the mineralising fluids. Although mineralisation extends under cover to the east, deposits can only be accessed by underground mining.*'

4.3 The Factsheet suggested that future exploitation is likely to be directed to finding larger, concealed orebodies in receptive horizons within the Monsal Dale Limestones. An alternative source is to review old sites that have not been fully exploited or restored. Fluorspar-bearing veins typically have varying widths and exhibit variable grades and mineralogy. Individual deposits can range from as little as 5,000 tonnes to 1 million tonnes. These factors make it difficult when carrying out an economic assessment of fluorspar deposits.

4.4 BGS published a factsheet on Barytes in 2006. It noted that barytes had been worked in many parts of the UK; the most important resource areas being near Aberfeldy in Scotland and in the Southern and Northern Pennine Orefields. In England barytes occurs as vein infillings in faults found in a number of rock types; the most important source being the Carboniferous Limestones. Intense alteration of limestone wall rocks has led locally to the formation of replacement deposits adjacent to major veins in the Northern and Southern Pennines. However, vein and replacement deposits tend to be small. In England, barytes production ceased in the Northern Pennines in 2002 and has only been worked as a by-product of fluorspar production in the Southern Pennines. In contrast, the bedded or strata-bound deposits in Scotland have proved

to contain much larger sources of barytes and nowadays this is the main source of indigenous barytes production.

4.5 Within the South Pennine Orefield in Derbyshire, the majority of vein mineral deposits occur within the Peak District National Park area. However, the Plan area has some vein mineral deposits, predominantly within areas bordering the Peak Park, limited mainly to a line along the eastern edge of the Carboniferous Limestone, around Matlock, Wirksworth and Brassington.

5. Need

5.1 There is no national assessment of need for vein mineral production. The vein mineral industry is market-led and production is related to the economic circumstances of several large industries and it is difficult to predict how they will perform in the future. The supply of vein minerals from indigenous, local sources is also subject to competition from imports. The choice of supply will be determined by the type and quality of the mineral, together with the price differential from alternative suppliers.

6. Supply

6.1 Information about the production of vein minerals in the United Kingdom is limited. The most recent figures dating from 2020[6] estimate that 12,000 tonnes of fluorspar were produced and 50,000 tonnes of barytes. Historically, significant production of fluorspar began at the start of the twentieth century, where demand came mostly from steelmaking and the demand for fluorine-bearing chemicals. From a relatively buoyant market in the late 1970's early 1980's when production topped 235,000 tonnes in 1975, need has declined progressively, due largely to the decline of indigenous chemical and steel industries and indigenous supplies.

6.2 Prior to the mid-1980s the UK was a net exporter of fluorspar but subsequently has become a net importer mainly from China and Mexico. The recent growth in new markets for fluoro-polymers has resulted in the inclusion of fluorspar and barytes on the European Union's (EU) fourth list of critical raw materials for 2020. The main parameters used to determine the criticality of the material for the EU are economic importance and supply risk[7] .Following the departure of the UK from the EU the UK Government has published its Critical Minerals Strategy in 2022[8] which did not include Fluorspar or Barytes.

6.3 The PDNP is now the focal point of the fluorspar production in the UK; there is no existing or likely future interest in exploiting barytes, lead or calcite in the PDNP[9]. The PDNP Core Strategy, adopted in 2011, has a positive approach to development proposals for fluorspar working. There are currently, at 2021, only two active vein mineral sites within the PDNP, Milldam Mine (Fluorsid British Fluorspar Ltd (FBFL)) and Smalldale Head Quarry. (High Peak Spar Limited, Furness Brothers and Ernest Hinchliffe Limited). Ancillary vein minerals are also worked in conjunction with Hope Cement Works Limestone Quarry (Breedon Cement) although no commercial deposits of fluorspar have been worked since 2010-2011. There is one current proposal which is to resume underground vein mineral working at Watersaw Mine (FBFL) which, if permitted, would result in 300-600 tonnes of fluorspar being mined each day. Cavendish Mill, Stoney Middleton (operated by FBFL) operates as the main

[6] United Kingdom Minerals Year Book 2021
[7] EU Fourth List of Critical Raw Materials 2020
[8] HM Government: Resilience for the future - The United Kingdom's Critical Minerals Strategy 2022
[9] Information supplied by PDNPA, letter dated 7/9/2021

processing site for vein minerals. Vein minerals from Smalldale Head Quarry are processed on site at the quarry.[10]

6.4 Within the Plan area there is one operational site at Slinter Top (Slinter Mining Company), near Cromford where vein minerals are quarried as secondary minerals alongside limestone aggregates with the resulting void infilled with inert, non-hazardous materials. A planning application has been submitted, in 2017 for a lateral southwest extension to the existing quarry for limestone and vein mineral extraction. The proposal is to extract 1.3 million tonnes of mineral over the period to 2033 with a further 3 years to complete infilling and restoration.[11]

6.5 The planning statement[12] in support of the application states that, both fluorspar and barytes have been extracted from Slinter Top quarry and sold to the operator of Cavendish Mill processing works near Stoney Middleton in the PDNP. Since 1978 approximately 80,000 tonnes of fluorspar/barytes has been delivered to Cavendish Mill with peaks of supply occurring in the 1980s and 2000s. The likely quantity of vein mineral that may be extracted from the proposed extension is not quantified in the Planning Statement but it states that, the Geological Assessment accompanying the planning application has concluded that it is highly likely that veins will occur within the extension area as experienced in the existing quarry.

6.6 A non-operational site at Ball Eye Quarry, Bonsall is also present within the Plan area. Some vein mineral working has taken place historically in association with limestone extraction by both surface and underground methods. There has been no extraction since 2014 and the quarry has recently, in 2022, been sold. Figure 7.4.1 shows these sites along with vein mineral resources.

[10] Information supplied by PDNPA, letter dated 7/9/2021
[11] EIA Addendum in support of planning application CM3/0817/40 May 2020
[12] Planning statement by Slinter Mining Company in support of planning application CM3/0817/40 July 2017

Figure 7.4.1 Vein Mineral Sites and Resources