

MINING ITINERARIES: OLD ABANDONED MINES USED WITH TOURIST AND EDUCATIONAL ENDS

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ABSTRACT

Berguedà is a pre-Pyrenees Area with a long mining tradition, currently undergoing severe recession. Copper, baryta, oil, iron, manganese ... have been extracted in the area, although the main resource has been coal. This intense mining activity gave way to some specific problems: unemployment, environmental effects ... but it also provided some aspect that can be perfectly rationalised under a tourist scope. The present survey sees into the main questions to be born in mind before setting up those type of itineraries, their use and application in the Berguedà Mining Area, Spain.

CRITERIA TO SET UP THE MINING- GEOLOGIC ITINERARY

Materials

It is believed that a variety in resources and types of extractions helps the itinerary's educational and leisure values improve.

Management

The second item in the agenda was how to manage the itinerary once it was created. We believe it is basic to have a geographically close managing body, capable of overseeing all visits and activities. Local corporations, nature parks and associations related to the territory must be considered with regards to such managing body.

The non-existence of such body was a possibility out of the question. Through experience, we know that beyond personal safety matters, the degradation of outcrops would have been fast and severe.

The need to bring heritage preservation into line with legitimate aspirations from mineral collectors (a very extended hobby in Catalonia) has led to set up what has been called "snack" areas where mineralising process samples can be taken without compro-

mising the outcrop. Any mining-geologic itinerary not allowing sample taking has much lesser didactic and participation value.

Accessibility

In the third place, it was necessary to consider accessibility to selected spots. It is important to look for easily accessible spots, close to roads, tracks or similar ways. Hence, accessibility does not imply any major problem as it can be adjusted to any kind of person.

Didactics

An effort was made to go beyond the specific outcrop - extraction concept and to make the visitor aware of what the resource accounts for. That is, the social significance of oil, baryta, manganese or iron, their varieties, the type of extraction performed, the historical context within which this took place, the technical progress and the decline experienced when these lost interest and economic value.

Tourism

With didactics alone, the itinerary would fail. It is necessary to attract people with tourist, leisure and participation values which, in addition, help to afford the extraction-related

economic costs. Therefore, explanations on biology, architecture, culture, history, tales and curiosities about the closest areas to the itinerary are included to become an indispensable complement of great value to visitors.

SETTING UP A MINING ITINERARY

Catalonia has always been a country with a large amount of exploitable resources thanks to its geological variability. Such diversity has provoked the extraction of many types of products with many different mineralising processes.

It must be born in mind that most mining zones are currently in economically depressed areas. Therefore, the said itineraries can help nourish the economy of such areas.

On the basis that any country needs to know its history as well as the resources that have been exploited, the spots where extractions have taken place and the mineralising processes undergone by the extractable substances, the Deputy Directorate General of Mines has set up a large research and mining history project that should be developed in the long term.

So far, the results obtained through proposals made have been highly positive. Since the first itinerary was created, the Berguedà Area one, the following itineraries are being prepared in co-operation with the corresponding Local Area Councils:

- Pallars Sobirà
- Baix Empordà
- La Selva
- Val d'Aran

AN ITINERARY EXAMPLE: BERGUEDÀ

It includes old extractions of:

- Oil: Brocà Oil Mine (Guardiola de Berguedà)
- Baryta: La Bòfia de Bagà Mine (Bagà)
- Iron and manganese: Tossa d'Alp Mines (Bagà)
- Marls: Clot del Moro (Castellar de n'Hug)

THE MINING AND GEOLOGIC ENVIRONMENT IN THE BERGUEDÀ AREA

The Berguedà Area has two differentiated physic and graphic representations: a highly mountainous one in the North, mainly comprising calcareous land: from Axial and Palaeozoic Pyrenees (Tossa d'Alp, Castellar de n'Hug, Moixeró) and from Mesozoic pre-Pyrenees (Saldes, Vallcebre, Bagà, Sant Julià de Cerdanyola, la Pobla de Lillet, Castell de l'Areny); and one with a more even orography in the South, already reaching the Central Depression, with Tertiary and Oligocene sedimentary land (conglomerates, sandstone, shale), and alluvial Quaternary land, mainly appearing horizontal and shaped by the Llobregat's river erosion, thus forming a series of stepped plateaux.

Extraction Fields: For a long time, the main extraction fields in the Berguedà Area have been the lignite ones from the

large Berguedà's Garumniensis valley. At present, these are extracted in Saldes (Carbones Pedraforca, S.A.).

Following the Llobregat river course we find aggregate removals which benefit recent alluvial terraces and depositions or Oligocene conglomerates. In the same period, clay is used in la Espunyola. There still is an underground Garumniensis marl extraction field in Guardiola de Berguedà and Cretaceous limestone is removed in Cercs. In the North-East corner of the area, Eocene gypsum is extracted within the municipal boundaries of la Pobla de Lillet.

Mining background: Great benefits have been gained from the lignite valley in the Berguedà Area throughout the present century, with significant extraction sites, which have played a key role in the economics of the whole area. Many mines were opened, the most important of them in Fígols. Other municipalities with extraction sites were Vallcebre, Saldes, Cercs, Peguera, La Nou, Malanyeu, la Pobla de Lillet, Sant Jaume de Frontanyà, etc.

Sandstone was extracted in Avià as well as marls and limestone in la Pobla de Lillet for concrete production. Baryta, iron and manganese from Devonian limestone were extracted in Bagà while oil from Eocene marls was extracted in Brocà.

EXTRACTION FIELDS

Oil mine in Riutort (Brocà)

Location

This is located near the town of Brocà, within the municipal boundaries of Guardiola de Berguedà. The extraction licence corresponds to number 2,002 under the name of "Tres Hermanos" (Three brothers). The mine is found on the right margin of Riutort's streambed.

Geology

Riutort's mine drew on the Armangite Formation (Oligocene, Eocene, Paleocene) as country rock, one of the most prolific ones in the world with an H/C balance that may reach up



Figure 1. Main drift image.

to 15. According to tests carried out, Riutort's oil density is 0.941 g/cm³ and 16% of the products were extracted below 300 degrees Celsius, thus obtaining a mean amount of 70 litres of oil per tonne of rock.

History

Around 1910, they started to extract bituminous marls in Brocà by means of an inner drift. In 1916, Mr. Jules León Claviez Gossolet and Mr. Philippe Petit Brice founded the corporation "Compañía Minera de Riutort" (Riutort's Mining Company) and applied for the operation licence "Tres Hermanos" under number 2,002, within the municipality of Brocà, at the spot known as "Bauma dels Gitanos" (Gypsies Cave). The company that later exploited these products in the area was "Cía. Española de Aceites de Esquisto" (Spanish Shale Oil Company).

Current situation

The main drift is 134 metres long and is open on a bituminous marl layer with an 8 to 9 metre power. On its south side, there is another drift in parallel to the above which is 90 metres long and arranged from East to West, following the layers direction. Towards the West, we have a 75-metre long drift arranged in cross-section to the main drift, heading South-North. This drift includes another four minor galleries, in parallel to the main one and heading West.

The whole mine includes a total number of 385 metres of drifts. The secondary drift group, perpendicular to the main one was opened to look into the layer power, which ranges between 55 and 60 metres.

The current state of preservation should be considered good. The weathering condition is low, except in materials placed at the entrance of the mine where these are found fractured.

Itinerary description

Among others, the itinerary inside the mine can provide the following curiosities:

Carbonated figures: These structures are shaped due to the precipitation of calcium carbonate from the water running

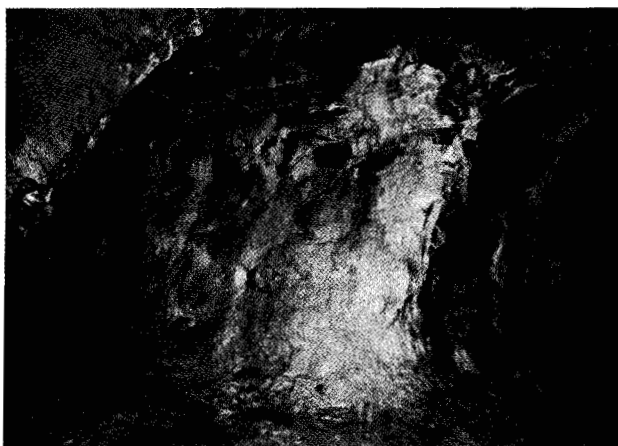


Figure 2. Some spectacular carbonated formations due to water circulation.

along the drift floor, ceiling and walls. The outcome is some rather beautiful and outstanding figures.

Stalactites and stalagmites: These are hanging formations from the drift ceiling and columns which increase from the floor, shaped by water dripping from which CO₂ evaporates and CaCO₃ precipitates.

Oil impregnation: The mine marl materials are impregnated by oil and cause wall bleedings, which turn into black and brown shades. Such crude oil settles on the water puddles formed on the drift floor, thus originating liquid oil stains floating on the water.

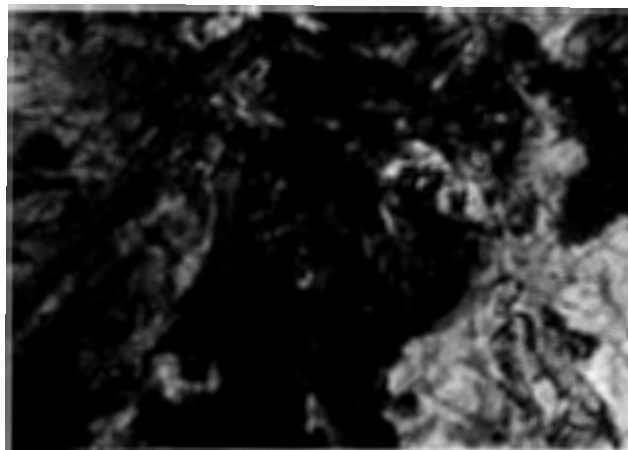


Figure 3. Oil impregnation in the mine.

La Bòfia de Bagà baryta mine

Location

Many people know about this mine since it is placed at a close spot from the "Coll de Pal" Refuge Hut, at about 2,000 metres above sea level.

Geology

Its mineralising process is of karstic origin. Baryta and other minerals have filled the paleo-karstic cavities developed among Devonian calcareous stones. This type of mineralising process can be seen outside the extraction field where it is easy to spot several of these spectacular bags due to their colours and the shapes they have evolved into. The age of these rocks is estimated to be between 375 and 400 million years.

Among the minerals that can be found in the field, the following should be referred to: baryta (the most common one), calcite, azurite, malachite, chalcopryrite and grey copper ores. The less common ones are cervantite and stibiconite.

History

The history of this mine seems to date back in 1942 when Mr. Marcelino Duart and Mr. Miguel Rusiñol Mora from the town of Bagà requested the purchase of a mining estate in the area known as La Bòfia in order to extract baryta. The licence was called "Juanita" (Joanne) and it was numbered under 2,983.

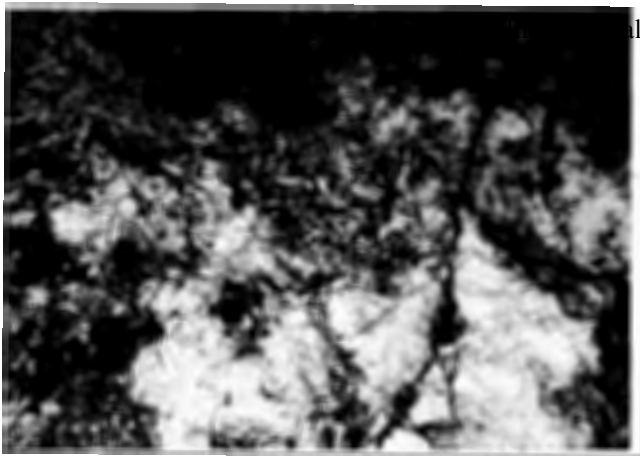


Figure 4. Detail of some mineralising process sections of the mine.

Current situation

This mine is preserved in a very good condition since it is excavated in reasonably hard Devonian limestone. This keeps it in good condition and guarantees a balanced stability in its whole length and depth.

The inside is reached through a small entrance, which is presently closed and disguised with rocks. It is semicircular, just like the actual drift, measuring 2 metres at the base and 1.5 metres high, which is enough to operate the dump car used to take the mineral out of the mine on the still intact rail tracks. Such tracks lead to the glory hole, still in its original place, or by means of a diversion, to the dump, where the dry was evacuated. At present, this is a perfect place to look for such minerals.

The main drift is arranged N 10° W and is 9 metres long. The section is about 3 square metres. Perpendicular to it, there is a cross section drift arranged N 30° E, which is also 9 metres long. This drift ends in a vertical well of some 17 metres deep. There is another drift inside the well. The mineral was extracted by means of explosives and this is still evident throughout the drift.



Figure 5. Section leading from the main drift to the well, at the end of the tracks. This is where the ventilation hole is found.

At the end of the main drift, where this makes a junction with the cross section one, there is a ventilation hole, the same size of the drifts. This hole provides enough light and ventilation to inner drifts. Until reaching the outside surface, it is 4 metres high.

Itinerary description

The itinerary of this mine is very short inside but it still contains excellent samples of baryta pockets. On the other hand, samples of the same type can be found outside in addition to the remaining minerals quoted above. The surroundings also provide a large amount of geologic phenomena, karstic formations, overlapping, etc. along with the flora and fauna in the area, as part of the "Cadi-Moixeró" Nature Park.

Tossa d'Alp's iron and manganese mines (Bagà)

Location

Tossa d'Alp's iron and manganese mines are located within the municipality of Bagà in a very mountainous area just below the Tossa d'Alp peak in the Moixeró Range and these become part of the "Cadi-Moixeró" Nature Park.

Geology

The mineralising process in Tossa d'Alp's mines corresponds to cavity fillings of karstic origin placed in Devonian limestone and, on the other hand, they appear stratified. Thus, it may be assumed that part of the deposit is sedimentary and that, the above mentioned cavities were filled through weathering (linked to karstic phenomena).

Among the minerals submitted, the following ones deserve special attention: pyrolusite (the most common one) todorokite, birnessite, psilomelane, calcite, rhodochrosite, manganocalcite, siderite and dolomite.

History

The history of this mine is not at all as clear as that of previous ones.

At least 7 mining licences can be found in the area. The oldest of them is known as "Diana", under number 1,856. Through a research licence requested by Mr. Carlos Noguera Coma and Mr. Francisco Planas Serra from Torruella de Montgrí in 1954 to prospect iron and manganese, this was later ascribed to "La Feixa" (The Patch), numbered under 3,491.

Current situation

All mines in this area are presently demolished. The main reason for this is that they are located on a highly steep hillside and all rubble fall on the mine entrances. Furthermore, the layer arrangement makes them unstable and have all disappeared. In fact, it seems that such mines were definitively abandoned when they remained in very bad condition after some collapsing.

At present, it is possible to use a mine entrance to reach 20 metres of drift before reaching a collapsed area. It must be



Figure 6. Image of the three existing mine entrance.

said though that it is advisable to make any visit due to the risk involved, which affects almost all drifts.

Itinerary description

Although the actual mines cannot be visited, the itinerary bestows great geologic, historical, industrial and environmental value. This itinerary would start from the Tossa d'Alp's peak, which can be reached by 4-wheel drive vehicles, motorcycles, bicycles, on foot or on the chair-lifts provided by La Masella ski resort facilities open in Summer to reach such point.

From there, after admiring the vast and magnificent landscape, it is possible to descend to the mines following a sign-posted trail. These are several rock-excavated cavities, most of them unfruitful extraction field attempts where a large variety of iron and manganese minerals can be found. It is also possible to see some old facilities, a hut and some aerial cable, which rose the extracted mineral. Some metres below, one can see the remains of some more important mines from which manganese was extracted. This is the point where there is still a non-collapsed mine section, but it is not advisable to go inside.

These two areas provide many mineral samples, especially iron and manganese in various forms such as pyrite, hematite or pyrolusite, among others. Fossils can also be found, especially in the overlapped red limestone.

Clot del Moro quarry and the concrete factory (La Pobla de Lillet)

Location

Clot del Moro quarry is located within the municipality of la Pobla de Lillet, at kilometre 2 of road BV-4031, from la Pobla to Castellar de n'Hug.

Geology

The outcrops date back from the Eocene and are layered by limestone rocks in high-power layers with clay layers in between. Their pitch is 55° South and heading East-West.

Paleontology: Marl and limestone layers contain large amounts of significant fossils such as "Alveolines", which belong to the Ilerdiensis epoch (Lower Marine Eocene).

Brief historical background

The history of this quarry is closely linked to the concrete manufacturing developed by Asland Co. at their Clot del Moro plant right from early this century.

The reason for extracting this limestone was to supply the Clot del Moro concrete plant located in the quarry's vicinity. This plant is one of the most interesting examples of Art Nouveau architecture in the Berguedà Area.

Clot del Moro was an experimental centre for concrete manufacturing by Portland in Catalonia. It was a first rank industrial centre gathering the best state-of-the-art machinery at the time of its foundation and from 1914 it kept a railway line. Today, Clot del Moro is totally abandoned and lost in the memory of those who worked there for so many years.

Itinerary description

The itinerary would start at the actual quarry where the raw material for the plant was obtained. The old concrete plant facilities would be depicted by means of a photographic exhibition. Conditioning and refurbishment works are presently under way to return the plant to its past Art Nouveau splendour.

In addition, this interesting early-century itinerary would include the "Font de la Magnèsia" Gardens, a magnificent work attributed to Antoni Gaudí, which has been recently restored. The Railway Museum would also be included to portray what this work implied for the High Llobregat Area. The group of visits would be completed with the mine train used to carry passengers between la Pobla de Lillet, the actual quarry and the concrete plant, also going through the said gardens.

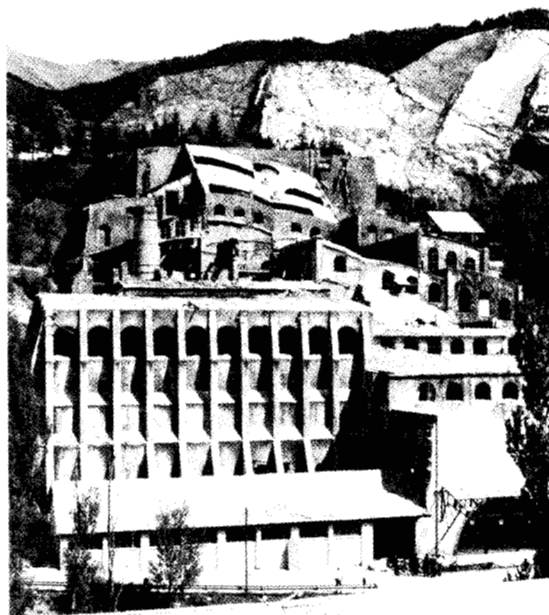


Figure 7. General view of Clot del Moro concrete plant in its present state. The quarry from which raw material was extracted can be seen at the back.