

## Bream Land Stabilisation, Forest of Dean, Gloucestershire Phases 1& 2

<b>Client:</b>	Gloucestershire County Council
<b>Engineer:</b>	Halcrow Consultants
<b>Value:</b>	£1.01m
<b>Date:</b>	Phase 2 Mar – Nov 2002 (Phase 1 -1999)

Infilling of abandoned and dangerous mines in the village of Bream, Forest of Dean.

A large network of tunnels, roadways, passages, adits and mine galleries exists in the area from previous mining of ironstone from the limestone strata. The infilling work was undertaken to remove the risk of settlement or collapse to overlying property from the relatively small mines, and thus a significant part of the work was to construct barriers to infill areas. These barriers were contractor designed. Two main mine areas were treated.

### **Rough winds/Bannock Tree Cottage.**

This area required access to be made via an existing adit to the mine which was re-supported with timber frames. Continuous ventilation was required due to the recorded presence of (low levels of) radon. Personal monitors were carried to record exposure levels and working time was limited to 8 hours.

The mine was surveyed to provide accurate topographical information for establishing infill quantities and barrier positions. Ecological surveys were also carried out to record the presence of bats.

Barriers to infill areas were created by using shuttering and filling with high strength grout. Barriers were stepped and raised in steps with 1.2m lifts, using dowls drilled in the previous step to key-in-and support the next step. Care was taken to prevent loss of grout into, or bursting of grout through discard by placing a geotextile membrane, onto the existing floor prior to grout filling.

Once the barriers had been completed and tied into the mine roof, the infilling of the (updip) galleries was carried out using PFA / cement grout (1700m<sup>3</sup>)



Access adit to Rough Winds Mine



Shuttered barrier and grout infill area

## Bream Land Stabilisation, Forest of Dean, Gloucestershire Phases 1& 2 (contd)

### (ii) Brooklyn Mine

A number of site investigation holes were first drilled to accurately locate the mine.

A new access was provided to the Brooklyn Mine by constructing an 18m deep x 2.4m diameter shaft onto a roadway area, which was constructed in the garden of the property overlying the mine. Once access was gained, topographical, geotechnical, environmental and radon surveys were carried out.

A number of barriers were required to roadways leading off the mine, which were constructed using in-situ concrete placed from within the mine or via large diameter holes drilled into non accessible areas.

In addition a permanent roadway access was required to be left in place for drainage and future access and monitoring to other mine areas. This was provided by lining an existing 20m section of mine roadway with standard mine arches, with bulkhead walls at each end formed from in-situ concrete, together with a structural concrete surround. 250m<sup>3</sup> of high strength concrete was pumped underground for this work.

The mine void was infilled with 800m<sup>3</sup> of foamed concrete which was pumped underground into the gallery in 1m lifts to prevent foam degradation. Foamed concrete was used, following discussions with the Environment Agency, to provide a low leaching risk material due to this section of the mine having fluctuating groundwater levels. A further section of the mine adjacent to the Old Winding Wheel pub was stabilised by filling with 1000m<sup>3</sup> of crushed rock placed via surface boreholes. Granular material was used to allow a continuous drainage path through the mine.

On completion of infilling works the shaft was fitted with permanent ladder access and cover slab.

Further site investigation works were also carried out on other areas of the mines network by drilling a number of cored boreholes and using down hole geophysics.

The contract had a high public impact as it was undertaken in and around residential property areas. Our commitment to proactive customer care and to philosophy of protection rather than damage and reinstate led to commendations being received from the residents concerned.



Permanent roadway through infilled mine



Access shaft to Brooklyn Mine