

Step Shaft Mine Gallery Temporary Infilling, Dudley.

Client: Dudley MBC. **Designer:** Geodesign

Date: June—August 2009

Value: £700k

The Step Shaft Mine Gallery was formed by mining the near vertical seam of Lower Wenlock Limestone more than 200 years ago. Although it has remained generally undisturbed since then, the condition of the 18m high gallery had deteriorated to such an extent that it had suffered a number of rock falls and was in a dangerous condition. Dudley MBC secured funding to temporarily fill and stabilize the mine and so prevent further degradation and possible collapse. Dudley are hoping to secure funding to include the mine and linked underground canal system as part of a major heritage tourist attraction and the temporary infill materials would be removed as part of a full mine stabilisation and canal restoration scheme.

The location of the mine is in the Wrens Nest area of The Dudley Nature Reserve and therefore surface access to the location of the mine was severely restricted due to protected vegetation, trees, steeply sloping terrain and the general requirement to minimise disturbance.

The contract was let as a design & construct contract and our submitted proposals were to infill the 80m x 10m wide x 15m high mine with sand from surface drilled large diameter boreholes. The sand was to be pumped or moved by conveyor to injection points thus significantly reducing the environmental impact of the substantial site clearance that would be required for drilling rig and vehicle access to all borehole positions.



A 56m deep access shaft - 'Step Shaft' which was sunk by Forkers in 1998 onto the mines and canal system, was available to re-open to use for access, ventilation, inspection of the mine and to construct a headwall, an access tunnel and shaft in the mine prior to infilling in order to facilitate future access and inspection of the mine.



Work involved:

- Opening up and ventilating the 3.66m ID x 56m deep shaft
- Establishing emergency and rescue facilities (MASHAM Regs) including use of mines rescue personnel
- Establishing craneage and attendance at the shaft to mine regulations requirements
- Access, inspection and gas testing of the canal wharf and mine gallery
- Establishment of power, lighting and communications to the underground works
- Construction of steel arch supported access adit and shaft in the gallery prior to infilling
- Constructing a bulkhead wall to the mouth of the gallery

Step Shaft Mine Gallery Temporary Infilling (cont'd)

- Setting up sand mixing and pumping equipment – Bellmix CM80 continuous mixer and Schwing BPE 4000 trailer concrete pump in the main compound area
- Establishing pumping pipelines in agreed routes through the nature reserve
- Drilling 10 nr 300mm diameter high tolerance fully cased holes into the roof of the mine gallery (approx 40m deep) for infill material placement. Holes drilled at varying angles up to 30° due to surface terrain and working area restrictions and our aim to use the versatility of the drilling equipment to avoid accessing areas unnecessarily so avoiding clearance and reinstatement costs.
- Drilling carried out by Casgrande 'dual head' drill rigs allowing simultaneous casing of holes with steel casing ensuring one-pass drilling and immediate use of hole for infilling, monitoring or other use.
- Infilling the base area of mine and a partially buried, inaccessible brick tramway tunnel with pumped flowable sand.



- Infilling the full depth of the mine with pumped sand was not possible due to the high loadings which the wet sand would apply to the bulkhead, steel arch tunnel and shaft, so the sand mixing and pumping plant were removed and replaced with conveyors to allow the majority of the mine to be filled with as-dug dry sand.
- A 3 stage x 100m long conveyor system running from the compound area to infill hole locations was established.
- Filling remainder of the mine with dry sand conveyed to targeted boreholes—6000 m³ of sand infilling in total
- The conveyers are from our own plant fleet and are ex coal mine conveyors with rated outputs of 300tonnes per hour. They have been successfully used to transport materials on a number of previous contracts with difficult or restricted access, steep terrain or as alternative methods to allow high output materials transfer in mine infilling and ground engineering schemes. We have also used the conveyors instead of dumpers or lorries to transport materials to/from critical work areas inside factories e.g. car assembly plants, where vehicle movements were not allowed.



All work was carried out under the control of Dudley MBC's appointed Mines Manager.