

Excavation of Early Lead Smelting Site at Hagg Farm, Fremington

Introduction

It is proposed to undertake an excavation of an early lead smelting site, probably medieval, at Hagg Farm, Fremington, Swaledale, North Yorkshire (SE 05946 99141 ca. 335m OD). The work will be done by members of SWAAG and Northern Mine Research Society and will take 5-14 working days using hand tools and survey equipment. Equipment will be transported to site by vehicle and then manually for a distance of about 1 km.

Safety

Hazards - The work consists of removal of grass and shallow overburden and excavation to less than 0.5 metre where necessary – shoring will not be necessary in view of shallow depth and will be reviewed if proceeding to 1 metre depth or more.

The remainder of work is of very low risk with main hazards being presented by ergonomic factors such as lifting of relatively light weights (<15 kg), bending and general exertion by members of working party who are mainly retired.

Control measures – the work to be undertaken requires no additional control measures other than stout boots, gloves to handle overburden and large stones and clothing appropriate to the prevailing weather. Hard hats and general eye protection is not required. Care should be taken to protect against exposure to the sun.

Hygiene

Hazards and exposure assessment - As this is a known lead smelting site with copious slag scatters, exposure to heavy metals is possible and the following assessment considers: elements likely to be present, chemical form of the elements, physical form, amounts present, duration of exposure.

- (a) The principal heavy elements likely to be present are: lead, zinc and barium. Arsenic, cadmium, mercury, nickel, antimony etc are known to be absent from the suite of minerals normally found in Swaledale. Evidence for this comes from many slag analyses by scanning electron microscope/energy dispersive X-ray analysis from ca. 30 lead bale and mill sites in Swaledale and geological studies (Dunham K.C., 'Geology of the North Pennine Orefield, Volume 2 – Stainmore to Craven', British Geological Survey).

Lead is regarded as the principal hazard and control of exposures for this element is considered to be more than sufficient for control of zinc, barium and unlikely arisings of copper.

Barium is present as insoluble sulphate or silicate and because of this presents a very low risk.

- (b) A preliminary survey of the site indicates that lead will be mainly present as lead slag where lead is encapsulated as a complex insoluble silicate. Very small amounts of lead sulphide (galena ore or matte), lead metal (produced in smelting), lead sulphate or basic sulphate (produced by weathering of lead sulphides) will be present but all of these are insoluble in water and when ingested. Lead carbonate, basic carbonate or oxide, produced by weathering, are also likely to be present in small amounts but will present the main hazard as these dissolve in the gut when ingested.
- (c) The main hazard presented by lead or zinc will occur once the top surface of grass has been removed and if dusting takes place in dry and windy conditions. Experience suggests that an exposure risk will be presented only if dusting occurs to the point where a sustained dust cloud is produced. At this point, exposure to silica dust from sand will also need to be considered.

- (d) The amounts of lead or zinc will be trivial compared with those normally present in the lead smelting industry where codes of practice and control measures have been used for guidance.
- (e) The duration of exposure is expected to be for up to 10 hours per day, for a maximum of 14 days and is most unlikely to be repeated.

Risk assessment and control measures - the main risks to health, together with measures for their control are:

1. Ingestion of lead-containing materials while eating. Hands and fingers should be washed before food is eaten. If this is impracticable on site, alternative precautions should be taken such as the use of paper napkins to hold sandwiches. These measures should be used even if gloves are worn for work.
2. Transport of lead to the home environment – boots should be brushed clean at the exit from the site using scrubbing brushes which should be disposed of or washed clean at the end of the dig. Diggers should shower or bath on returning home, although this is a recommendation rather than a mandatory requirement.
3. In the event that dusty and windy conditions produce clouds of dust, work should be temporarily abandoned if damping down with water proves to be ineffective. This is preferable to the use of dust masks as the types normally found in DIY stores are not adequate for protection against lead and other factors such as contamination of clothes and skin will introduce other risks.
4. Workers should be made aware that smoking presents a disproportionate risk by transferring lead to cigarette where it is volatilised and transferred directly as fume to the lungs.

Environment

No significant releases of contaminated water to the environment are likely. The only natural water source is a very small stagnant spring which is not a source of moving water. No additional contribution to the heavy metals burden of natural rainfall is expected from these activities.

Even in the event of dusty and windy conditions, transfer of contaminants to the environment will be small.

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