MPG

Hydrogeological Risk Assessment
Technical Note
Waddington Fell Quarry
Armstrongs Aggregates Ltd.

Document Reference: 200/19--R1.2 - HRA

MPG

Minerals
Waste
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1. Introduction

1.1 *The Mineral Planning Group Ltd.* (MPG) have been instructed by *Armstrongs Aggregates Ltd.* to prepare a planning application and supporting statement to facilitate the improvement of Waddington Fell Quarry's (The Site) approved restoration scheme.

1.2 The revised restoration scheme would incorporate some 1.5 million tonnes of tunnel arisings from the proposed Bowland and Marl Hill sections of the wider Haweswater Aqueduct Resilience Programme (HARP). The tunnel is some 109km long and will provide drinking water to people and businesses in the North West of England.

1.3 Formal pre-application advice received from Lancashire County Council in November 2020 indicated that a Hydrogeological Risk Assessment may be necessary to demonstrate that the proposals would not give rise to any unacceptable risk to groundwater.

1.4 This document is presented in the form of a technical note rather than a comprehensive Hydrogeological Risk Assessment.

2. Site Description

2.1 Waddington Fell Quarry (WFQ) is a 25ha sandstone quarry located some 4km north of the village of Waddington, Lancashire.

2.2 The site has the benefit planning permission ref: 03/06/0095 for the extraction of sandstone and restoration to biodiverse habitats by 2023.

2.3 The Site is accessed off Slaidburn road and is comprised of a weighbridge / site office, parking area, mineral processing area, some 10ha of naturally regenerated habitats, water bodies and an active 10ha extraction area.

2.4 The Site is surrounded by open moorland and is located within The Forest of Bowland Area of Outstanding Natural Beauty (AONB).

2.5 The Site produces both building (dimension) stone and aggregates. The building stone products are used in the maintenance of heritage assets and to preserve / protect the local distinctiveness of the nearby, stone-built, towns and villages where new development is consented. The aggregates produced at WFQ are primarily used in building and construction projects.

3. Proposed Operations

3.1 The proposed amendments to The Site's restoration scheme do not necessitate any changes to the current mineral extraction operations or day-to-day ancillary mineral processing / handing operations.

3.2 The proposals seek to diversify and improve the final habitats and landforms at WFQ upon restoration through the importation of suitable engineering material from the HARP tunnel arisings to create topographically diverse landforms.

3.3 Therefore, the principles of the current, approved, restoration scheme will be carried forward (biodiverse habitat creation) but with less emphasis being placed on forming one large water body in the base of the site surrounded by bare ground.

3.4 Naturally regenerated areas which have been populated by locally appropriate vegetation will remain in-situ.

3.5 The HARP Bowland and Marl Hill tunnel will be excavated in close proximity to WFQ (<3km) from which the arisings will be brought to surface at 3 No. local UU compounds before being loaded into HGVs and brought to site for emplacement.

3.6 The arisings will be transported directly to the base of The Site where they will be deposited in phases and compacted by tracked excavator or dozer. The process is then repeated in 'lifts' until the final approved restoration profile is achieved.

4. Risk Assessment

4.1 LCC's pre-application advice indicated that a Hydrogeological Risk Assessment may be necessary in order to establish the impact of the proposals upon local groundwater regimes. Therefore, this risk assessment considers only the potential impact on groundwater from the emplacement of HARP tunnel arisings at WFQ.

4.2 This risk assessment is based upon the SOURCE→PATHWAY→RECEPTOR principle. For the purposes of this assessment the following definitions are applied:

SOURCE: Potentially polluting substance
PATHWAY: Viable route for the movement / transmission of a pollutant
RECEPTOR: Life (human and animal), a sensitive location, or, land use

4.3 In this instance, there is no viable Source. Therefore, the SPR model is, immediately, 'incomplete'. Table 1 is a generic SPR assessment and succinctly demonstrates the risk to groundwater – None.

Table Ref:	Source	Likelihood of pollutant presence	Pathways	Receptor	Risk
1	None	N/A	Permeable Geological Horizons	Groundwater	None

Table 1 – Generic SPR Assessment

4.4 Unlike an inert landfill, which would accept wastes primarily from construction and demolition sites (e.g. site clearances and brownfield excavations) where there is an inherent risk of anthropogenic contamination and the presence of 'rogue' loads containing non-inert material; the proposed restoration operations at WFQ utilise a single source of 'virgin' as-dug mineral from, principally, the same geological horizons that the quarry is situated in.

4.5 In brief, the proposals would see the HARP tunnel boring machine excavate minerals (underground) from the Millstone Grit and Bowland High Group and have them emplaced back into the Millstone Grit and Bowland High Group horizons exposed at WFQ.

4.6 There are no intermediary steps between winning the mineral underground, it being conveyed to surface and being placed into HGVs for transport to WFQ.

4.7 The HARP tunnel would be advanced, at depth, underground, away from anthropogenic influence and sources of potential contamination. Nevertheless, ground investigations have been undertaken by UU and the

resulting lab data confirms that there are no potential pollutants / contaminants within the geological horizons to be worked.

4.8 Where the mechanical processing, by means of crushing or sawing, of minerals takes place, mineral 'fines' can often be produced (clay and silt particles <0.6mm) which may, if poorly managed, ultimately become a pollutant in the form of suspended solids in watercourses.

4.9 No mechanical processing of the tunnel arisings will take place between the tunnel face and emplacement on the quarry floor. It is anticipated that the tunnel boring machine will produce a consistent range of 'grain' sizes between 5mm – 40mm. These grain sizes are not readily held in suspension and are, geologically, considered to be 'pebble' sized.

4.10 The pathways by which mineral fines reach watercourses are, generally, either by 'fissure flow' through fractures in the bedrock that are greater in diameter than the grain size of the mineral fines, or, through suspension in surface water run-off. The imported grain sizes do not constitute mineral fines and as such these transportation mechanisms do not apply at WFQ.

5. Summary and Conclusions

5.1 It is proposed to amend and improve WFQ's restoration scheme through the importation of as-dug tunnel arisings from the UU HARP scheme.

5.2 The tunnel arisings are won underground and transported directly to WFQ.

5.3 Any risk to groundwater can be discounted at the SOURCE stage of the SPR model as the tunnel arisings are demonstrably free from potential pollutants.

5.4 The geological horizons that the HARP tunnel is to be advanced into are the same at those exposed at WFQ.

5.5 The emplacement of tunnel arisings at WFQ from the UU HARP scheme does not present any unacceptable risk to groundwater.