GWP Experience in De-watering & Groundwater Control

Reference: CS-21

GWP Consultants has more than 35 years of investigating, assessing and designing mine and quarry water management schemes and their impacts on the water environment. This experience covers hard rock quarries, sand and gravel pits, and highly permeable limestone quarries throughout the UK, Europe and further afield.

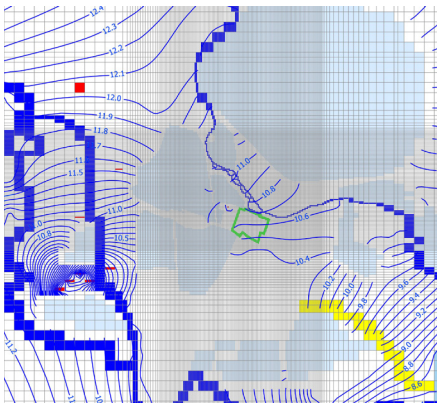
We have a specialist team of hydrogeologists and hydrologists, supported by geologists, geotechnical engineers, quarry designers and land surveyors, who routinely assess de-watering requirements and impacts, and design de-watering systems and mitigation measures to protect groundwater receptors (private and public bores and wells, eco-systems and water bodies, as well as built infrastructure) from level and flow derogation and/or water quality deterioration.

Our work routinely includes desk studies and water features surveys, ground investigations (boreholes and piezometers installations), single bore permeability testing (variable head tests, packer tests), multiple bore pumping tests (step tests, constant rate tests, constant drawdown tests), spring and stream flow gauging, rain gauge and weather station installation, water quality sampling and testing. We have a suite of analytical and numerical modelling software codes for data analysis, aquifer simulation and de-watering prediction, run-off and attenuation facility design.

Recent Projects:

De-watering aspects of environmental impact assessments for 4 sand and gravel sites in the densely urbanised area of the Lower Thames Gravel aquifer

De-watering was required not for mineral excavation but for subsequent inert fill placement. The heterogeneity in the aquifer brought about by historic landfill disturbance and the number of sensitive receptors including wetlands, low flows in streams and a public water supply groundwater pumping station, necessitated the development of a 3 dimensional numerical model of the aquifer to accurately predict de-watering impacts and to demonstrate successful mitigation measures design (e.g. de-watering water supply, stream flow augmentation, recharge trenches and cut-offs).



De-watering feasibility study of 10km² of carbonate sequence in West Africa

Design and implementation of a 6 month groundwater investigation to assess the feasibility of de-watering a 10km² 55m deep quarry in a dipping carbonate deposit, underlain by a highly pressurized sandstone sequence, and bounded on three sides by rivers. Investigations included 25 boreholes, 12 multi-level piezometer nests, 75 packer tests, 40 variable head tests, 2 production bores, 2 pumping test programmes, surface and downhole geophysics, well surveys and hydrochemical sampling. Analysis included geological modelling and groundwater modelling to assess quarry inflows, blow-out depressurisation risks, and impacts on local water courses and village water wells.

Compliance monitoring of de-watering of a Carboniferous Limestone quarry

Preparation of quarterly and annual groundwater monitoring reports comparing groundwater levels with agreed trigger levels and re-evaluating potential for impact on local domestic water wells.

Quarry deepening impact assessment of a Cotswold Stone Quarry

An existing quarry operator wanted to exploit stone deeper into the Cotswold Jurassic limestone formation. The regulator and local landowners were concerned about derogation of farmhouse wells and boreholes as well as nearby water courses.

Careful geological modelling of the site and groundwater level monitoring in each of 4 separate limestone units enabled a method of working to be developed that captured up-gradient groundwater and routed it around the quarry void upon the interbedded clay units, thus sustaining down gradient groundwater flows within each limestone unit and not impacting upon groundwater users. Planning permission for the extension was granted.

De-watering aspects of environmental impact assessments for 2 proposed sand and gravel sites in the upper Thames Gravel aquifer

De-watering was required for mineral excavation of two small sites adjacent to the River Thames upstream of Oxford. Limited operator budgets necessitated careful negotiation with the regulator to minimise additional site investigation activities whilst providing adequate information to the regulator. Existing monitoring data augmented with trial pits, boreholes, stream gauging and topographic surveying enabled the assessment of de-watering impacts using analytical equations to approximate the de-watering impact. Few nearby groundwater receptors and re-use of de-watering discharge to augment local stream flows was used to confirm impacts could be adequately mitigated.

De-watering impact assessment of a Chalk Quarry extension

A de-watering impact assessment of Chalk fed springs and streams around a major chalk quarry in England. The study involved using existing site monitoring data and geological data to conceptualise the hydrogeology of the extension area. Water balances and analytical flow equations were used to assess the extent of any groundwater lowering and consequences for spring flows.

Mitigation measures were developed to recharge groundwater on the down dip side of the void as well as direct flow augmentation of water courses by pump discharge. Project was halted pre-application for non-groundwater reasons.

Groundwater impact assessment of a proposed Terrace Gravel pit and inert landfill planning application

Our client sought to obtain planning permission for a proposed gravel pit surrounded by highly sensitive spring fed ecosystems. Geological and hydrogeological investigations (including multi-level piezometer installations) and 2 years of groundwater and surface water level, flow and quality monitoring, enabled a robust understanding of the aquifer and its relationship to the springs to be determined. The assessment confirmed de-watering on the site could be avoided through seasonal phasing of excavation on the site and that groundwater truncation from restoration infilling could be mitigated through artificial enhancement of rainwater run-off infiltration. Planning permission was granted despite well organised local pressure groups.

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