Acid mine drainage studies
Acid mine drainage is a serious problem accompanying any metal and coal mining activities where sulphides are present in ore and/or the waste material. Worldwide, several billions of dollars are spent to minimise the impacts of acid mine drainage. RWE draws on more than 20 years research into acid mine drainage, conducted in association with a renowned university institute and the mining/environmental authorities.

Our services include:
- inspection of your deposit by our geologists
- investigation of the acid generation and drainage potential
- development of a mitigation programme
- layout and basic design for acid minimising projects
- development of monitoring systems and programmes
- calculation of capital and operating costs for mitigating programmes
- assistance with obtaining permits and discussions with the relevant mining and environmental authorities.

Hydrochemical investigations
Besides the availability of groundwater, it is also its quality which is of vital importance, especially with respect to the public water supply. To this end RWE analyses 2,000 groundwater samples each year for its own operations at its own laboratories using cutting-edge technology.

Our services include:
- set up of hydrochemical investigation programmes
- selection of qualified laboratories for quality testing
- evaluation of the groundwater quality
- benchmarking and evaluation of groundwater against national and internationally accepted water quality standards and norms.

Dewatering and groundwater abstraction
Safe opencast mine operations require lowering of the groundwater level prior to and during the time of excavation. A series of tube wells have to be drilled, equipped with pumps and pipes and operated on a specific pumping schedule. In step with the advance of the mine, new tube wells have to be drilled and brought into operation and existing wells have to be progressively shortened. RWE routinely drills and equips wells of up to 1,500mm in diameter down to depths of 500m in unconsolidated material.

Our services cover:
- selection of appropriate drilling method for the rock to be drilled
- performance of pump tests
- evaluation of aquifer characteristics
- groundwater model setup
- development of a dewatering programme
- design of well discharge capacity and pumping schedule
- environmental and aquifer impact assessment
- drafting of permit applications to water authorities.

Hydrology
Groundwater management and groundwater protection
Groundwater is becoming an increasingly precious resource. The demand for groundwater is steadily growing, while contamination from human activities is placing ever higher pressure on groundwater supplies.

To ensure a sustainable supply of groundwater in the short and long-term, groundwater resources have to be carefully managed, balancing the needs of individual water users with the needs of society. Opencast mining potentially endangers aquifers through lowering of the water table and potentially generating acid mine drainage. RWE Power International can assist you in managing groundwater resources.

As a result of mining 100 million tonnes of lignite each year, RWE needs to pump and dispose of about 600 million cubic metres of groundwater, making RWE one of the world’s largest water producers.

Aquifers in the vicinity of RWE’s deep opencast mines have to be dewatered to depths of more than 400 metres to ensure the stability of mine slopes. A cone of groundwater depression extends 50km from mines, potentially affecting ecologically sensitive wetlands, causing ground depression and compromising the drinking water supplies of numerous cities and villages in densely populated areas. RWE has developed special measures to prevent contamination of groundwater with acid which is produced by oxidation of naturally-occurring pyrite in the overburden. As compensation for the loss of drinking water supplies, RWE produces and distributes some of the groundwater as drinking and industrial water and stabilises ecologically valuable wetlands and stream flow near the opencast mines, using a large groundwater re-infiltration scheme.

This large-scale interference with the water balance can only be managed on the basis of ongoing and detailed model investigations into the impact of groundwater lowering, and the planning and implementation of groundwater recharges in ecologically sensitive areas.

RWE Power International’s consulting services in groundwater management and groundwater protection are based on decades of experience.

Groundwater modelling
An important instrument in the planning of groundwater abstraction and its environmental impact is the numerical groundwater model. Over the last 20 years, RWE has developed and continuously perfected one of the world’s most sophisticated groundwater models. Through the model, the changes of the water table and groundwater flow in numerous aquifers are taken into account, along with any proposed groundwater extraction and re-infiltration programme. The model is a tool for the development of detailed ground management programmes based on the amount of water to be pumped over time, the locations and capacity of pump wells, re-infiltration wells and trenches and their changes with time to accommodate the advance of opencast mines.

Our customers benefit from the modelling software and staff training in:
- the use of the RWE software
- obtaining and interpreting the necessary hydrogeological data
- modelling hydrology, including multiple interconnected aquifers
- calibrating the model
- modelling tube wells
- modelling sensitive wetland areas
- modelling groundwater re-infiltration and injection
- ongoing updates to the model.

Groundwater infiltration
In many areas of the world, artificial recharge of groundwater can help replenish drained aquifers that are often found in urbanised areas, to avoid ground subsidence or force back advancing sea water. Such measures can also improve groundwater quality where the water has deteriorated through the use of agricultural fertilisers or other man-made impacts.

RWE has set up the world’s largest artificial groundwater recharge system, with an annual capacity of 50 million cubic metres to assure the integrity of water supplies and ecologically sensitive areas in close proximity to RWE’s deep opencast lignite mines.

Our experience in designing and managing such systems includes:
- hydrological baseline studies
- developing a hydrologic groundwater model
- modelling mining and dewatering activities
- developing and simulating a groundwater recharge programme
- planning ancillary equipment and plant (water treatment plant, storage reservoirs)
- planning the groundwater pumping and recharge system (pumps, pipes, infiltration systems)
- installation and operation of the long-term hydrological monitoring systems required for control and quality assurance
- determining and optimising the capital and operation costs of the groundwater recharge system
- assistance with procurement
- assistance with construction and commissioning supervision
- training in monitoring.

Groundwater management
The world-wide scarcity of groundwater means its effective management is vital. RWE has more than 50 years experience in all aspects of groundwater management. This includes tube well construction, abstraction of groundwater by permanently operating 1,200 tube wells, monitoring of groundwater tables within 8,000 piezometres, delivery of groundwater to industry and public consumers, minimising impacts to the environment and groundwater quality control.

Our groundwater services include:
- hydrological and hydrogeological investigations
- supervision of well drilling and pump tests
- development of dewatering and surface water control programmes
- development of ground and surface water monitoring programmes
- layout and basic design of ground and surface water control systems
- calculation of capital and operating costs
- assistance with obtaining permits and discussions with the relevant mining and environmental authorities
- training of operating and maintenance staff.