

COAL EXPLORATION SERVICES

SGS offers a broad range of industry services to the mineral exploration industry to reduce risk and enhance value. Using professionals with a blend of geological and engineering expertise, along with the latest computer and software technology, we are able to assist you with all aspects of your exploration program from drill program management through to geological interpretation and resource modeling. Partner with SGS and allow us to assist your exploration program with the following services:

- Exploration program management.
- Drill program and core logging.
- Orebody modeling and reserve estimation.
- Conditional simulations.
- Environmental baseline studies.
- Laboratory analysis.

EXPLORATION PROGRAM MANAGEMENT

From the initial planning to the logging and testing of core samples, exploration programs require specialized expertise to increase their odds of achieving success. SGS has provided expert geological exploration services and successful exploration management for coal projects. Having completed consulting projects on five continents from tropical to arctic climates, our geologists and engineers have the expertise to assist you with all aspects of your exploration project.

Depending on your mandate, experienced SGS geologists can provide turnkey professional services for your exploration program or act as your technical advisor. As your trusted technical partner, we can provide you with the geological consulting and exploration management services you need including:

- Supervision of drilling and core logging.
- Determination of drill hole and trench locations.
- Logging and sampling of core.
- Layout of reference grids.
- Trenching and sampling.
- Sampling for metallurgical purposes.

Our goal is to ensure that in all sampling work, either by us, or a subcontractor, that your samples are representative and advance your project in a cost-efficient manner. Rest assured that the entire chain-of-custody for your samples and core will be managed with SGS efficiency and integrity to ensure timely, accurate results.

DRILL PROGRAM AND CORE LOGGING

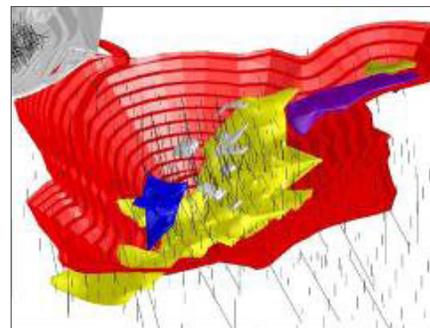
Properly planned drill programs are the primary exploration tool of the coal industry. Drill programs provide most of the raw data upon which resource maps are generated and they are the framework upon which crucial mining decisions are based. It is essential that the initial drill program is designed by professional geologists with an understanding of the complexity of the geology. Ideal drill-hole placement, orientation and density optimize your drilling budget. SGS has the expertise and knowledge to properly design your drill program. We have knowledgeable geologists in all major coal regions to support you in this activity.

SGS can assist you with all aspects of core logging. Whether your program includes fully cored, part cored or open holes, SGS personnel will use its international expertise to ensure that all the logging data is collected systematically and accurately. We will ensure that the entire hole is thoroughly logged for geotechnical as well as current and future exploration purposes. Logged core is boxed and securely routed to accredited SGS laboratories for analysis. SGS will ensure that the entire chain of custody is managed efficiently so that you receive the results from your drilling program in a timely fashion.

OREBODY MODELLING AND RESERVE ESTIMATION

As your exploration project advances into the resource development phase, SGS offers you complete orebody modeling and resource estimation services using geostatistical techniques. We are global leaders in this field and have provided these services since 1981 to companies involved in the development and extraction of:

- Coal
- Gold, precious metals and diamonds
- Base metals, uranium and iron ore
- Industrial minerals



At SGS, an orebody-modeling project starts with a critical review of existing drill hole and surface or underground sample data as well as maps and plans with current geological interpretation. Drill hole and/or sample databases are established to suit all the quantitative and qualitative information necessary to build a reliable resource model. Typically we will construct a geological and resource model from various data sources using the following steps:

- Database creation, standardization and validation
- Section plotting and interactive geological modeling
- Geostatistical analysis and block modeling
- Resource estimation and classification

CONDITIONAL MINING SIMULATIONS

Conditional mining simulations are computerized simulations that virtually mine your coal reserve. Calculating block-by-block based on the anticipated mine plan, simulations not only determine the run-of-mine quality, but also generate data that will enable you to:

- Determine storage requirements.
- Design an optimized mine-plan.
- Optimize and design a preparation plant.
- Determine preparation plant yield.
- Understand future resource requirements.

Useful conditional simulations are the result of a valid drill program design, reliable core analysis and effective geostatistical modeling. Each step in the process must be done with care and precision by professionals with years of experience, and who have access to the right technological services. SGS can provide both the personnel and the technologies to do the job right.

BASELINE STUDIES

We use our global network to provide the best possible service to you, regardless of your location. Our environmental experts have extensive expertise in the coal environmental sector. They speak your language and know the local conditions, business practices, legislation and traditions.

TYPICAL WORK PROGRAMS FOR ENVIRONMENTAL BASELINE STUDIES INCLUDE:

- Collection, summarization and analysis of all applicable laws, regulations and guidelines.
- Inventory and analysis of all available natural environment and human resources information including:
 - Climate and meteorology.
 - Air quality.
 - Surface water.
 - Biological and ecological environment.
 - Land use.
 - Contaminant transport mechanisms characterization.
 - Determination of environmental and health impacts.

LABORATORY ANALYSIS

Core analysis is an essential component of resource definition and is the basis of your economic model and mine plan. SGS has complete coal analysis capabilities at laboratories around the globe. Our qualified technicians operate from independent facilities using recognized global standards such as ASTM and ISO to provide you with accurate, impartial coal analysis. Our labs use concepts of Total Quality Management (TQM) to ensure consistent operation on a daily basis. We provide accurate, cost effective chemical analysis to minimize the risks associated with reserve evaluation and mine planning.

The following SGS chemical analysis will provide the foundation for rank determination and toxicity summation for later use in satisfying environmental standards:

- Proximate analysis (total moisture, ash, sulfur, calorific value, volatiles, fixed carbon)
- Ultimate analysis (total moisture, ash, carbon, hydrogen, nitrogen, sulfur, oxygen by difference)
- Elemental analysis.
- Heating value.
- Toxicity testing (arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver).
- TCLP extraction (used to determine the amount of leachable metal).

The ash component of the proximate and ultimate analysis refers to the non-combustible residue left after carbon, oxygen, sulfur and water have been volatilized. While the volatile matter pertains to the components of coal, except for moisture, which are liberated at high temperature in the absence of air.

COAL PETROGRAPHY

Coal petrography is used to determine a coal's rank (degree of coalification) and type (amount and type of macerals). Macerals in coal are analogous to minerals and are determined by examining polished specimens of minus 20 mesh prepared coal. Petrography is mainly used as a tool to evaluate bituminous coals in terms of their ability to produce blast furnace coke. Rank is determined by measuring the percent light reflectance of the maceral vitrinite. Type is determined using a point count procedure to obtain the volume percent of the various coal macerals, or fossilized plant remains. Coal petrography can also be used to determine whether contaminants are present in the coal and to detect oxidized coal in the sample.

RHEOLOGICAL PROPERTIES

Coking coals possess the ability, when heated in the absence of air, to soften, swell, and then resolidify to form a coherent, porous, hard coke structure. The Gieseler Plastometer and Arnu Dilatometer tests are used to evaluate the rheological, or plastic, properties of a coal. The Arnu Dilatometer Test is used to determine the swelling properties of coal when heated under standard conditions in a dilatometer, while the Gieseler Plastometer Test is useful in determining the temperature at which: initial softening, maximum fluidity, and solidification occurs for specific coals. This data is valuable in determining the suitability of your samples for use as coking coals. Country specific tests are also available if required.



COAL WASHABILITY STUDIES

Washability characteristics of coal are generated from float/sink analysis of core samples, mined samples, or from preparation plant feed samples. In addition to the float/sink analysis, SGS can perform froth recovery testing on finer size material. If a coal contains a high percentage of middlings material, SGS can perform the crushing studies required to determine if additional yield can be obtained by crushing and liberating this coal from the host rock.

SGS coal washability studies, including float/sink analysis, can be done on samples ranging in size from bulk washability samples (over 1 ton) to bench-scale size samples (2-10kg). These analysis can be done over a range of densities (S.G.1.30 to 2.20) and on coarse and fine coals. Data from a washability test will determine:

- Potential for recovery and quality of coal reserves.
- Preparation plant efficiency.
- Preparation plant design.
- Optimum operating parameters for preparation plant circuits.
- Characterizing types and amounts of impurities.
- Determining optimum size range of a specific coal for cleaning.



GEOTECHNICAL SERVICES

STABILITY STUDIES

SGS uses the latest methods and sophisticated equipment to examine the stability of the subsoil. For marshy or uneven land, and for spaces with restricted access, we make use of adapted probing installations and caterpillar vehicles to carry out mechanical and electrical cone penetration tests (CPT). By installing piezometers and taking undisturbed samples, we get insight into the local geology and hydrology.

The results of such geotechnical research are translated into usable physical quantities and effective foundation advice. The information is gathered through a geographic information collection system. Our expertise includes:

- Destructive drilling and coring (ROTAP).
- Geographic information systems (GIS).
- Mechanical and electrical cone penetration tests.
- Undisturbed sampling (MOSTAP).
- Parameter acquisition using mechanical or electrical manometers.
- Installation of piezometers.
- Slope stability tests.
- Geotechnical on-site supervision.
- Earthworks supervision, consulting, solution designs.
- Evaluation of the feasibility of materials and ground treatment methods to be applied.

CONTACT INFORMATION

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WHEN YOU NEED TO BE SURE

SGS