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PERSPECTIVES

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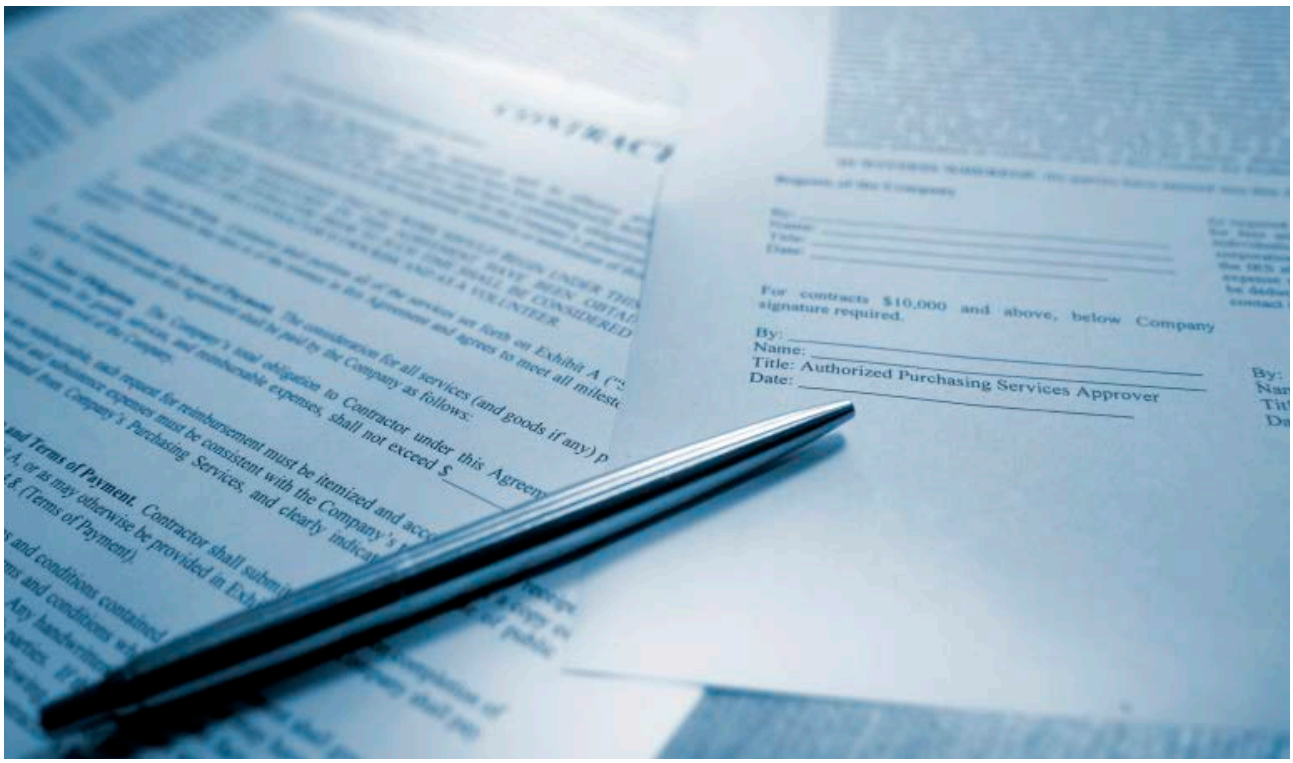

INDEPENDENT ENGINEER/ DUE DILIGENCE REVIEWS

Introduction

The majority of Independent Engineer (IE) assignments for due-diligence reviews of mining projects are performed for financial institutions considering the lending of funds for new or expanding mine projects. Due-diligence work is also carried out for firms sponsoring or underwriting public offerings, mergers, and acquisitions. In many project-finance cases, IE assistance is provided to the lending institutions by developing reasonable project-completion covenants. In these cases, the IE must always keep in mind that the lender must be protected, while the borrower (usually a mining company) must be able to reasonably complete construction and satisfy physical- and production-completion requirements.

As a truly independent participant, the IE frequently becomes a facilitator for major mining projects by bridging the gap between the financial and operating entities. By working with both sides, the IE can help keep small problems small and flag large problems so they can be addressed early in project development.

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Due Diligence

The due-diligence process for a new or expanding mine project normally involves the review of a bankable-level feasibility study which has been prepared by a mining company, a mineral-engineering company, or alternatively a mining company working in concert with a mineral-engineering company. This work is carried out under the direction of a project manager assisted by a multi-disciplinary review team consisting of professionals selected with a focus on matching specific backgrounds and experience to the particular project to be reviewed.

Completeness Review

The first step in a due-diligence review is to ensure that all the major elements normally associated with mine project feasibility work are fully addressed. These elements are:

- Geology and Resource Estimate
- Mining and Reserve Estimate
- Processing
- Environmental/Social Evaluation and permitting
- Infrastructure and Administration
- Project Schedule
- Economics

A sample due diligence checklist is shown on page 4.

Site Visit

The next step in the due-diligence process usually consists of a site visit. In the case of a grassroots project, the site-visit team will engineer, and an environmental specialist. A process engineer will normally arrange a visit to the metallurgical laboratory where the testwork has been carried out. In the case of an ongoing mining operation, the process engineer would normally be part of the site-visit team.

During the site visit, the technical team will review local infrastructure, carry out a general inspection of the property, examine exploratory drifts and available core, check for adequacy and review sampling methods (geologic, metallurgical, geotechnical, etc.), discuss environmental management, and collect all relevant data. It is always desirable for the diligence-review team to meet with the sponsoring company's technical team during or shortly after the site visit.

Technical Review

After the site visit, a technical review is carried out to confirm that the level of engineering and accuracy of cost estimates are consistent with feasibility ("bankable") requirements.

Geology and Resource Estimate

Sound geological interpretation and appropriate sampling are the foundations of a successful mining project. Geological and geostatistical methodology, assumptions, and resource calculations will be reviewed, and requisite statistical checks will be performed.

Mining and Reserve Estimate

Project economics will be reviewed to determine that appropriate cutoff grades have been calculated in the preparation of the mine plan and reserve estimate. Opinions will be developed as to the suitability of the proposed mining method, equipment selection, and capital- and operating cost forecasts. Mine plans will be reviewed to confirm that the production schedule is feasible and accurately reflected in the cash flow.

Process Plant Engineering and Construction

Metallurgical testwork, mass balances, reagent requirements, plant flowsheet and process design, recovery estimates, plant construction and operation, as well as forecast capital and operating costs will be reviewed.

Geotechnical and Hydrological Engineering

Geotechnical investigations and designs for mine and plant construction; mine-waste design including tailings-dam structures, heap-leach pads, impoundments and waste rock disposal areas; and overall water-balance requirements will be reviewed for conformance with appropriate design standards.

Environment and Social Impact Assessment

Analysis of the potential environmental and social impacts of a mining project are an important consideration in the due diligence process. Typically the identification of potential environmental and social impacts, and appropriate mitigation measures to offset these impacts, are articulated in an Environmental and Social Impact Assessment (ESIA), or in other documentation that captures this same intent. Often this documentation has been prepared to demonstrate compliance with environmental and social regulatory requirement contained in host country law. As such it is important for the IE to verify the current permitting status of the project within the context of host country law, and to identify potential obstacles that may prevent the timely obtainment of all required permits to implement the project.

In addition to an evaluation of a project's permit status, the following items are typically addressed in the due diligence review:

- An evaluation of the thoroughness and quality of available environ-mentally and socially related documentation, including appropriateness of methodology used and summary interpretations; An evaluation of the comprehen-siveness and suitability of baseline data;
- Investigation of any legacy contam-ination from past mining practices; An opinion on the adequacy of waste disposal methods;
- An appraisal of the potential for the project to give rise to

adverse community or regional reaction;

- An appraisal of the appropriateness and reasonability of closure/reclamation planning and costs;
- An appraisal of the appropriateness and reasonability of project environmental management system, management and monitoring plans, and environmental and community relations staffing; and
- A high level opinion of the project's alignment with identified international standards.

The nature of the environmental and social analysis for a given project depends largely on the financial institution requesting the IE assessment. For example, there are currently 73 financial institutions that are signatories to the Equator Principles (EPs), a common baseline and framework for the implementation of social and environmental policies, procedures and standards related to its project financing activities. The EPs, in turn, are largely based on the International Finance Corporation (IFC) Performance Standards and World Bank Group sector-specific Environmental, Health and Safety Guidelines.

Infrastructure & Administration

Mine and plant infrastructure will be reviewed to determine if necessary services such as communications, fire control, industrial and potable water, power, roads, safety and medical facilities, security, and sewage treatment are adequate and that capital and operating costs reflect these services. Mine and plant administrative, supervisory and technical personnel, and organization structure will be reviewed. General and administrative costs will be checked. Additional proposed facilities such as maintenance shops, warehouses, employee housing, camp facilities, and explosive storage will be assessed.

Logistics and Constructability

Many mining projects are being built in remote locations in developing countries. Whether the site is in the frozen tundra of Far East Russia or the jungles of Indonesia, the logistics and constructability of new projects require careful scrutiny to make certain that project scheduling and capital allotments are adequate.

Management and Organization

Review and comment on the level of management expertise available to the facility, and provide an opinion on possible shortcomings in the management/organization structure.

Material Contracts

Material contracts relating to the development / operation of the mine are reviewed.

Economic Analysis

The detailed cash-flow analysis prepared by the owners or client will be reviewed or, alternatively, an independent cash-flow analysis will be prepared. Should it be necessary, revisions in the cash-flow and sensitivity studies will be completed to represent alternative scenarios requested by the client.

Report Preparation

A professional technical due-diligence report will be prepared at the conclusion of the work. The report will summarize all the results and work done including data, pertinent assumptions, and methodologies used. Risks and concerns regarding the project will be clearly identified and quantified where possible.

Project Completion

Under a true project-finance scenario, lending institutions universally include project completion covenants as part of their loan agreements. Completion requirements under these covenants typically focus separately on 1) physical and/or mechanical completion followed by 2) the performance and/or production completion. Lending institutions frequently request assistance in defining these covenants with specific and measurable requirements. In addition, a client may request a review of proposed engineering and construction contracts at this time.

Construction Monitoring

The role of the IE during the construction period depends on the complexity of the project and the needs of the financing entity. Typically, an IE is retained to monitor construction progress to ensure that construction keeps pace with the capital outlays and that construction matches the feasibility study or accepted development plan. Any revisions to the approved plan are generally reviewed and approved by the IE before implementation. Construction-related reports are reviewed monthly and periodic site trips are a common requirement.

Physical or Mechanical Completion

Physical or mechanical completion occurs when all infrastructure is in place, the mine is developed to a point where it can produce ore on a continuous basis at the required tonnage and grade, and the process plant is built to design specifications. Typically, the IE will verify that the major components are in place, operational, and consistent with the development plan approved by the financial institution.

Performance or Production Completion

A typical performance or production completion test is performed over a 90- to 180-day period depending on the covenants of the loan agreement. During the test period, the mine and process plant must operate at agreed-upon minimum capacities, ore grades, and recoveries, with unit costs and consumption rates not exceeding agreed-upon levels. Often completion requirements include performance tests of major process circuits such as crushers, grinding mills, conveyors, and flotation cells as well as the reconciliation of ore produced against the geologic model used in the feasibility study.

Monitoring of the production test period by the independent

consultant requires close cooperation with the sponsor company. As with the physical completion test, once the production test is successfully completed, an appropriate certification document will be executed.

Production Monitoring

It is not uncommon for the IE to monitor project operations until completion of the payback of the loan. This work may include a review of monthly reports and annual or quarterly site visits.

Table 1: Due Diligence Checklist

Geology	Mining	General Mining	Environmental
Regional Geology	**All Mines**	Equipment Selection	Site Background / Baseline
Mining District History-Property Ownership &	Existing Project Description	Operating Parameters	Climate
Property Geology	Ore Type Descriptions	Special Considerations	Vegetation
Ore Genesis	Cutoff Grade Assumptions	Mechanical Parameters	Seismology
Mineralization	Grade Control Method	Drilling	Special Conditions
Weathering and Post Mineralization	BEDO and IPCO Calculation	Blasting	Air Quality
Summary of Controlling Geology	Metallurgical Impacts	Loading	Hydrology - Surface
Exploration and Database Compilation	Stockpiling	Hauling	Hydrology - Subsurface
Exploration History	Stockpile Aging	Support	Biota
Regional Mapping	Dilution and Recovery	Operating Hour Summary	Acid Generation Potential
Topography	Hydrology and Water Management	Manpower	Waste Dump Chemistry
Drilling and Sampling	**Surface Mining**	Training	Endangered Species
Drillhole Location Map	Whittle / LG Pit Optimization	Engineering and Survey	Local Population
Geotechnical Logging	Pit Design Parameters	Management	Regulatory Agencies
Bulk Density Determinations	Artificial Pit Restrictions	**Milling**	Permit Requirements / Status
Geological Logging	Tonnage Optimization Curve	Metallurgical Background	Site Impacts
Hydrological modeling	Pit Shell Check	Metallurgical Sample Locations	Reclamation
Sampling and Sample Prep	Geotechnical Analysis - Pit Slopes	Metallurgical Test Work	Structure Foundation Characterization
Assaying	Pit Design Basis from Cones / LG	Crushing Test Work	Regulatory History
QA / QC Procedures - Check assays	Slope and Road Design	Grinding Test Work	**Capital Costs**
Twinned Holes or Samples	Ultimate Pit Design	Metallurgical Recovery	General Cost Summary
Assays By Size Fractions, Sampling Protocol	Ultimate Pit Reserves	Metallurgical Trouble Spots	Mining
Surface Trenching, Pit Samples or Channel	Phase Plans	Flow sheet	Processing
Excluded Samples and Reasons	Phased Pit Resources	Capacity	Infrastructure
Chain of Custody Program	Production Schedule	Operating Parameters	Sustaining Capital
Database Description	Schedule Optimization	Special Considerations	Working Capital
Checks of Duplicates, Repeats, etc.	Pit Advance Maps with Dumps	Mill Production Schedule	Owner's Costs
Check Randomly Selected Samples	Pit Water Control and Hydrology	Mechanical Parameters	EPCM Costs
Downhole Bias Contamination Checks	Project Specific Conditions	Manpower	**Operating Costs**
Database Adjustments	Dump Design - Geotechnical, Geochemical	Training	Mining
Resource Estimation	Dump Design - Geometry	Management	Processing
Geological Model Development	Dump Reclamation Considerations	**Infrastructure**	Infrastructure
Identification of Controlling Lithology	**Underground Mining**	Access Roads	Assessed Charges
Construction of Rock/Lithology Model	Primary Access (Shaft / Decline / Adit)	Power Supply	Capitalized component breakout
Data Declustering	Primary Development (Main Haulage)	Water Supply	**Marketing**
Block Model Definition	Secondary Development (Stope Access)	Housing	Market Analysis
Modelling Method	Mining Method	Logistics, Warehousing for supplies	Concentrate Sales Agreements
Block Statistics	Stope Design	Port Facilities	Dore Sales Agreements
Basic Statistics and Cum.Freq.	Ventilation Problems (CO, Radon, Methane, etc)	Product Transport	Freight and Insurance
Population Identification	Ventilation Design	Air Service	**Material Contracts**
Correlation	Power Distribution	Medical Care	Construction Contracts
Compositing	Water Distribution	Communications	Power Supply
Composite Statistics	Compressed Air Distribution	Security	Off-take/Refining
Variography	Emergency Evacuation	Administrative Staffing	Fuel and Consumables
Capping	Pumping	Accounting	**Management/Organization**
Confidence Limits	Rock Mechanics and Ground Support Methods	Personnel	Organization Structure
Existing Workings	Backfill Type and Design	Government Relations	Labor Relations
Model Validation	Development Schedule	Purchasing	Manning Levels
Reconciliation against Production	Stope Production Capacities	Information Management	Adequacy of Training
Constrained Pit Resources	Stope Extraction Schedule	Site Layout & Facilities	**Project Schedule**
Resource Statement			Site Background / Baseline
			Task List
			Critical Path Chart
			Economic Analysis
			Project Revenues
			Exclusions
			Taxes and Customs
			Royalties
			Financing
			Discount Rate
			Cash Flow Projection
			Sensitivity