1.0. PREAMBLE

A mineral may be defined as any naturally occurring substance with a definite chemical composition and predictable and consistent properties. Minerals form the part of the corpus of the Earth. A mineral resource is a volume of the Earth's crust in which an abnormally high concentration of a specific mineral or fuel occurs It becomes an ore reserve when that mineral, or the content of interest, such as a metal. There is a vast variety of materials that may be recovered from such deposits. These can be classified as follows. These are only a small selection of the innumerable materials that are mined.

1. **Industrial minerals** - quartz, salt, potash, asbestos, talc, feldspar, sulphur, phosphates;
2. **Base metals**- copper, lead, tin, and zinc; the light metals, magnesium, aluminium
3. **Fuels** - coal, lignite, peat, and oil and gas (though the latter are often not thought of as being the products of mines). Uranium is often included among the fuels.
4. **Gemstones** - diamonds, rubies, sapphires, emeralds
5. **Specialty metals**- lithium, germanium, gallium, and arsenic;
6. **Nuclear** metals- uranium, radium, thorium;
7. **Precious metals**- gold, silver, and the platinum group metals;
8. **Steel industry metals**- iron, nickel, cobalt, titanium, vanadium, and chromium
9. **Construction materials** - sand, gravel, aggregates, brick clays, limestone, shale. Also included in this group - slate for roofing, polished stones, such as limestone, granite, travertine and marble, collectively known as dimension stones.

2.0. MINING

The terminology Mining, is called, the selective recovery of minerals and materials, other than recently formed organic materials, from the crust of the Earth. It is one of the oldest activities of mankind. An ore reserve when that mineral, or the content of interest, such as a metal, can be recovered with current technology at a cost that allows a reasonable return to be

made on the investment in the mine. The mining products include the ore and the usable and unusable waste. The material classified as **ore** is transported to the recovery plant, while material classified as **waste** goes to the waste dumps, stockpiled for possible future treatment.

3.0. TYPE OF MINES

3.1. Mining methods are of four basic types.

Firstly, materials may be mined from surface mines, open pits, quarries, or other diggings open to the atmosphere. This group constitutes by far the greatest number of mines in the world.

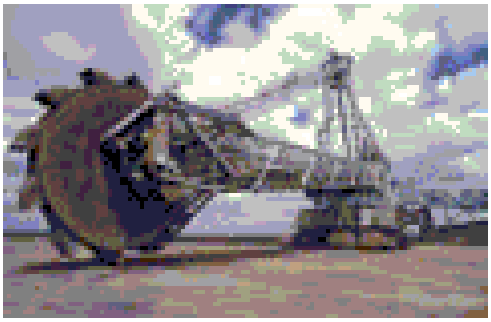
Secondly, there are underground mines, entered through shafts or tunnels. Thirdly, there is the recovery of minerals and fuels through boreholes.

Finally, there is underwater mining or dredging, which is now extending to the potential mining of the deep oceans.

3.2. Mining processes involved in the recovery of minerals and materials from the crust of the Earth resources which are termed as the mineral deposits are:

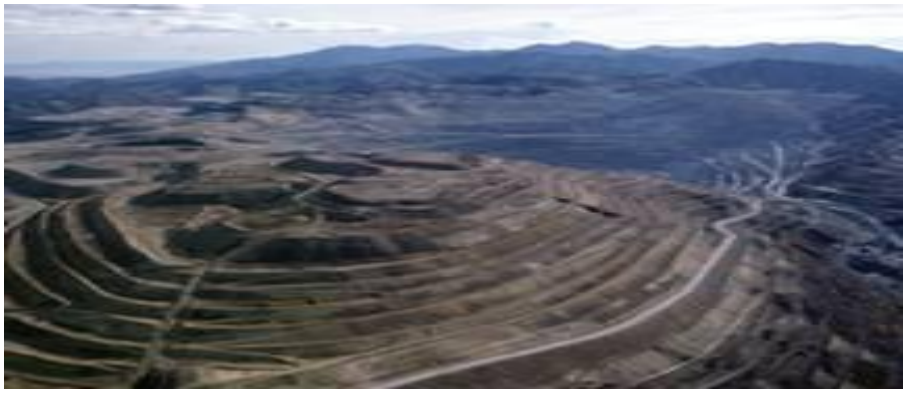
3.2.1. Surface mining
3.2.2. Open pit mining
3.2.3. Strip mining
3.2.4. Hard rock mines
3.2.5. Placer mining
3.2.6. Underground mining for soft rock and hard rock
3.2.7. Dredge mining
3.2.8. Ocean mining
3.2.9. Extraction of boreholes
3.2.10. Sulphur mining
3.2.11. Solution mining
3.2.12. In-situ Leaching

3.2.1. Surface mining, a common term for mining, is the largest single sector of mining, being used for more than 60 per cent of all materials mined. It may be used for any material required. There are a number of names for the various types of surface mine, which generally indicate their purpose. This process is undertaken from the surface and limited to the depth of the contents of the mineral ore. Depending upon the nature and chemical



composition of the mineral ore, surface mining activity may be changed to other types of mines.

3.2.2. An open pit mine is usually for metals. These are surface mines that take the form of large, terraced pits, going ever deeper into the earth and enlarging as they do so. The classic examples of such open pits are the diamond mines of South Africa. These mines are ore-bodies in the shape of a cylindrical mass of rock rising through the Earth's crust. The mines are often more or less circular in shape. The mining starts with drilling and blasting. Many mines start off as surface mines and, when they reach the point where too much waste must be mined for each tonne of ore recovered, change over to underground mining methods.



3.2.3. A strip mine is usually to dug coal or lignite. The main difference between these mines and the open pits is that the waste material mined to uncover the coal seam, instead of being taken to remote dumping areas, is replaced in the cavity created by recent mining. These mines therefore move across the country, always filling in behind themselves and restoring the surface to look as nearly as possible as it did before mining took place.

So unlike an open pit, which normally grows ever larger, a strip mine reaches its full size very quickly. On completion, the remaining hole may be made into a lake, or it may be refilled with the material that came out of the original excavation when the mine was started. Strip mines use some of the same equipment as the open pits, particularly for the recovery of the coal, but for the removal of the overlying waste rock, the overburden, they use the largest mining equipment of all.

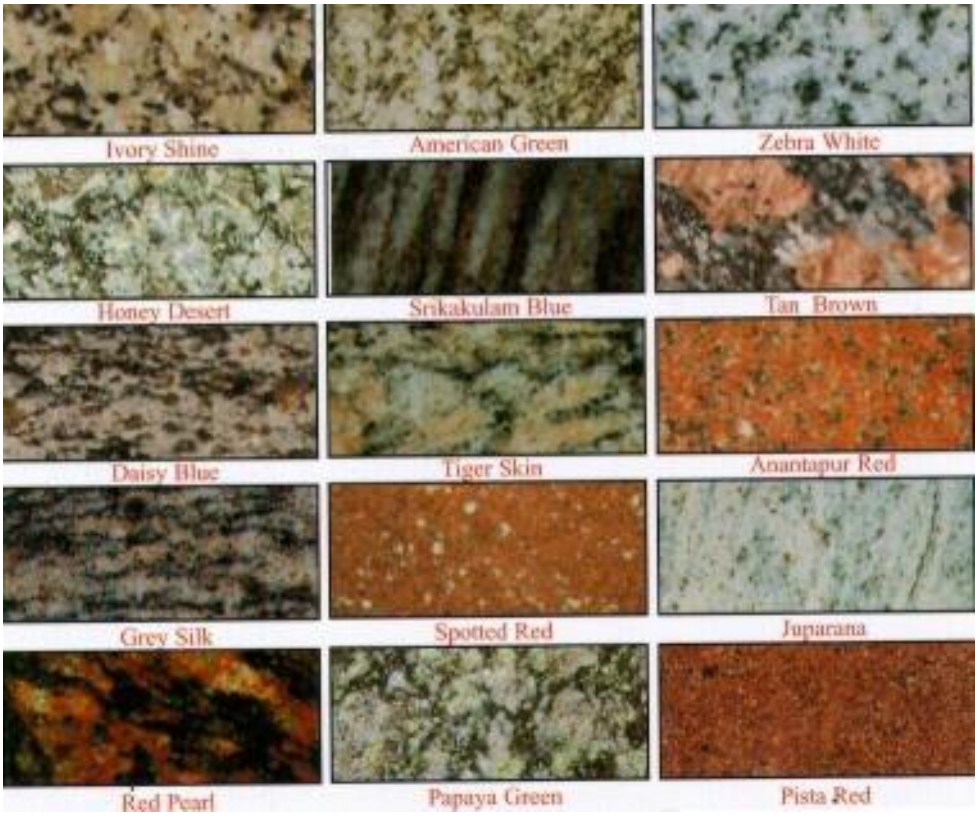
3.2.4. Hard rock mines

Hard rock mining process is for metals and minerals and further classified as Quarries for construction materials and dimension stone quarries used in quarrying marble, sandstone, limestone, and other softer rocks.

3.2.4.1. A quarry is normally for the recovery of industrial and construction materials. Quarries are similar in most ways to open pits, and the equipment used is the same. The difference is that the materials mined are normally industrial minerals and construction materials. Usually, virtually everything mined in the quarry is turned into some product and so there is significantly less waste material to dispose of. This in turn means that at the end of the life of the quarry there will be a large excavation left behind. However, owing to the low prices realizable for the products of most quarries, they have to be situated relatively close to their markets.

The two principal branches of this type of industry are the so-called **dimension-stone** and **crushed-stone** quarrying. In the **dimension stone** quarrying, blocks of stone, such as marble and slate, are extracted in different shapes and sizes for different purposes. In the **crushed-stone** industry, granite, limestone, sandstone, or basaltic rock are crushed for use principally as cement concrete aggregate or stone jelly. Limestone for making lime and China clay for making ceramics are also quarried.

3.2.4.2. Dimension-stone Quarrying is carried out by different methods and equipment, such as hand tools, explosives, or power wire saws, and by channeling and wedging, according to the purpose for which the stone is extracted. The channeling and wedging process of quarrying is extensively used in quarrying marble, sandstone, limestone, and other softer rocks.



Hand tools alone may be used for quarrying stone that lies in easily accessible beds. The principal hand tools are the drill, hammer, and wedge. A row of holes apart is made

with the jack hammer drill and the hand hammer, partly through the layer, or stratum, perpendicular to its plane of stratification and along the line at which it is desired to break the stone. Each hole in a long row is filled with three wedges, shaped so that one may be driven down through the others, the method being known as plug and feathers; by striking each plug a sharp blow with a hammer, hitting them in succession, and by repeating the operation several times, the combined splitting force of the plugs and feathers finally becomes great enough to rupture the rock. Channeling is the process of cutting long, narrow channels in rock to free the sides of large blocks of stone. Channeling machines move a cutting edge back and forth along the line on a rock bed on which the channel cut is to be made. The channel cut is sunk deep enough to permit the insertion of wedges by which the rock is split, the cut or groove guiding the fracture. The method of cutting in slate, granite, and limestone quarries is by the combination of a power saw, an abrasive, and water as a lubricant and a coolant. The saw cuts a narrow channel, the primary or initial cut, which is then either expanded by a wedge or blasted. China clay is extracted using powerful jets of water.

3.2.4.3. For the crushed-stone quarrying (hard rock mining), explosives are most commonly employed for detaching large blocks of stone. In most hard-rock mines rock is broken by drilling and blasting. Holes are drilled with rock drills, normally powered by compressed air or hydraulic fluids. In this method of quarrying, the drill holes are put down to the depth to which it is required to break the rock and are then partly filled with some explosive that is discharged by the usual methods of blasting.

The rock is split and broken into smaller stones by wedges or by the plug-and-feathers method, or crushed by jaw crushers or by heavy steel ball weighing several tons as used in the cement manufacturing industry. To obtain finely crushed stones for concrete, primary crushers, of the jaw or gyratory type, and secondary crushers are used to reduce the size of the rocks. Special loading machines, are then used to load out the broken rock and deliver it to specially dug, steeply dipping ore passes. The rock falls down these ore passes, is collected at the shaft. It is loaded into special conveyances called skips, and is then taken out of the mine and delivered to the plant if it is ore or to the dumps if it is waste.

3.5. A placer mine is usually for heavy metals and minerals—frequently gold, but also platinum, tin, and gems such as diamonds and rubies. A placer deposit is a deposit of mineral particles mixed with sand or gravel. Placer mines are generally located on or near to river beds, as the majority of placer deposits are either gravels of existing rivers or fossil gravels of former rivers. However, beach deposits, offshore seabed sediments, and glacial outflow deposits also fall into this category. Placer mining involves excavating loose or alluvial, deposits such as sand, gravel, silt, or clay. Valuable minerals are separated from the alluvial materials through a system of screens, jigs, and sluices. The nature of the concentrating processes that result in a placer deposit is such that placer mines recover materials that are dense and already liberated from their surrounding rock. The mining process is therefore a relatively simple earth-moving exercise and simple, non-chemical physical recovery systems can be used to recover the valuable content. The mined material can be replaced in previously mined areas as the mine progresses, and concurrent restoration is possible. Land-based placer mines use equipment like that of other surface mines. However, many placer mines are mined by dredging also.

3.6. Underground mining may be subdivided into soft-rock and hard-rock mining. Mining engineers classify rock as "soft" to indicate that it does not require the use of explosives in the mining process. In other words, soft rock can be cut with the tools of modern technology. The most common soft rock is coal, but this term also includes salt, potash, bauxite and other minerals. Hard-rock mining is likely to be based on the use of explosives as the breaking method. Underground mines are established in areas with promising ore deposits. The shaft is the primary vertical channel through which people and ore are transported in and out of the mine. The miners' elevator is called a cage, and the ore reaches the surface via a car called a skip. A ventilation system near the main shaft ensures that miners receive fresh air and prevents the accumulation of dangerous gases. A system of crosscuts connects the ore body to the main shaft at several levels, and these levels are, in turn, connected by openings called raises. Stopes, (steps like working in a mine) are the chambers where the ore is broken and mined. In this method, two tunnels, called the gates, are cut in the coal seam

parallel to each other and about 300 m (1,000 ft) apart. A connecting tunnel is driven between them and one wall of this becomes the working coalface. The face is equipped with very powerful hydraulic support systems which create a canopy over the heads of the men and machinery, supporting the rock roof above. At the front of these support systems is a chain conveyor. The sides of the conveyor support a mining machine, the shearer, which cuts the coal by means of a cylindrical drum with picks mounted on it, which rotates against the coal on the face. The pieces of coal that are cut off fall on to the chain conveyor, which transports them to the end of the long wall face. There the coal is delivered on to a conveyor belt for transport to the shaft or out of the mine directly. When the whole length of the face has been cut, the whole support system is moved forwards. And the shearer cuts in the opposite direction, taking another slice of coal off the face. Behind the hydraulic supports the roof collapses and caves in. This system of mining therefore always results in subsidence of the surface above.

3.7. In Dredge mining, Shallow-water dredging is probably the least expensive method of mining available. By shallow water is meant water up to about 65 m (215 ft) deep. In such waters dredges using cutter heads on the end of suction pipe columns or a chain of digging buckets running round a boom or ladder can be used to recover the loose sediments.

3.8. Ocean mining is a new departure. At present all ocean mining takes place on the continental shelves, in relatively shallow water. This includes mining for aggregates, for diamonds off the coasts of Namibia and Australia, and for gold at various placer sites around the world.

3.9. For extraction of Boreholes, a wide variety of materials can be recovered from below ground through a borehole without the need for shafts and tunnels. This applies to those materials that are liquid: oil and water (for water is indeed a mineral) are the obvious examples. Methods are also now available for recovering soluble and insoluble materials through boreholes. Materials that are soluble in water can be recovered by pumping water through them from the borehole, so that they can dissolve, which is called solution mining. Alternatively, a solvent other than water can be used to dissolve a specific mineral out of the rock, in which case the method is generally known as in situ leaching. Some solids, such as coal and bauxite are soft enough or sufficiently fractured, to be cut by a high-pressure water jet. If they break up into small enough pieces, these

can be pumped as slurry up a borehole to the surface. Of course, any solids that are already in loose, fine particles can also be recovered this way.

3.10. Sulphur mining is a special case. Sulphur melts at a fairly low temperature (108° C/226° F), by heating it to a point above that temperature, it can be liquefied and the resulting molten sulphur can be pumped to the surface. Salt water is used, as it has a higher boiling point and so can be heated above the melting point of the sulphur. The sulphur then melts and is pumped up an inner pipe within the first one. A third and innermost pipe introduces compressed air to assist with the pumping of the sulphur to the surface. Sulphur does not dissolve in water and so there is no problem of losing the sulphur in solution.

3.11. In Solution mining, many substances, the two most common being salt and potash, are soluble in water. The system for mining these is to drill boreholes to the deposit, insert a network of piping like that used for sulphur, pump water down the hole, allowing it to dissolve the salt, pump the resulting brine back up the borehole, and recover the salt from it at the surface. In this case, though, whether the outer annulus is used for putting the clean water down or pumping the brine up depends on the system the mine has chosen to use and the innermost pipe is for compressed air to bring the brine to the surface.

3.12. In-situ Leaching is one method of mining. Uranium and copper have been successfully mined by this method. In this case separate boreholes are always used for injecting the solvent and for recovering the "pregnant" solutions. The mineral deposit must be porous, so that the solvent can flow through it from one borehole to the other, while dissolving the desired mineral or metal. Preferably, the rock surrounding the ore-body should be impervious to allow for easier control of the solvent. The solvent is pumped down one borehole, through the rock, to another borehole up which it is recovered. There are significant environmental benefits from this type of mining, as much less of the rock is disturbed and the clearing-up operation afterwards is very much simpler to perform.

4.0. Mining and Earth Moving Equipments

4.1. Mining Equipments are the machineries used in mining required for the extraction of overburden earth and the ore from the mines. The mining equipments will vary depending upon the nature of mineral to be mined. The drilling rigs, bucket wheel excavators, electric power

shovels, hydraulic shovels, waters dredges, wire saw machines for dimension stones are some of the equipments used. The equipments also include the hand or machine tools of modern technology, wedges, explosives, pneumatic or hydraulic fluid rock drills, power saw, abrasives, water as a lubricant and a coolant and compressors, according to the purpose for which the ore is extracted depending upon the nature of the ores and the volume of the mines.

In India, the main organization involved in exploration of minerals is the Geological Survey of India. It undertakes mining operations and its drilling rigs of make- Joy (USA), Crealius (Sweden), Longyear (Canada), Ziff and 1BQ-15H (Russian) Larsen-Toubro (India), Voltas and Greaves (India) and highly sophisticated deep drilling rigs from BRGM, France for undertaking specific sub-surface evaluation, mineral targeting and multi-sensor geophysical loggers. Apart from conventional wet drilling, GSI has developed expertise in dry drilling for iron ore for exploration of iron ore dust zones and also developed foam drilling methods for better core recovery in dusty ores. GSI has drilling machines of capacity 1200-1750m with hydraulic and hydro-mechanical transmission system are used in mineral exploration. Facilities are also being developed for wire line and reverse circulation drilling with the State of Art Technology. The rock is broken and then loaded into trucks by huge electric power shovels, hydraulic shovels, or front-end loaders, cranes of different type and removed from the mine. A modern development is to have the shovels load directly into a mobile crushing plant, from which the crushed rock is transported on conveyor belts. A bucket wheel excavator can mine 250,000 cu m (9 million cu ft) of earth per day. This machine is mounted on crawlers and is self-mobile. Another large machine type used mainly in strip mines is the dragline. A dragline has a capacity of mining the overburden in 50 cubic metre per operation. Draglines and power shovels are the primary forms of excavation equipment. A dragline is fitted with an open scoop supported from the end of a long boom by a wire cable. The scoop is dragged along the ground by the cable until it is filled with ore, which is then dumped elsewhere. Draglines are used primarily to excavate deep holes. Power shovels are fitted with buckets called clamshells, which dig into the earth and shovel it up. The bottom of the clamshell opens to dump the dirt into a truck for removal.

4.2. Earth Moving Equipments are used in transporting the ore from the mine zones to the processing zones. The primary earth-moving machines are the heavy-duty tractors, tippers,

dumpers, trailers, dozers, loaders and trucks. They are fitted with endless tracks to grip the ground and with a large, movable blade attached in front, are called bulldozers. Bulldozers are used to clear brush or debris, remove boulders, and level the ground. A self-powered scraper is a machine and consists of a blade and a box or container. Dirt is scraped by the blade into the container; the dirt may then be released so as to form an even layer of a predetermined thickness, or be carried off for disposal elsewhere. Scrapers are used to level and contour mine. Similar to scrapers are graders, self-propelled, wheeled machines with a long, inclined, vertically adjustable steel blade. Graders are primarily finishing equipment; they level earth already moved into position by bulldozers and scrapers. Equipped with a backhoe, which is an open scoop attached rigidly to a hinged boom, such a vehicle can dig shallow trenches; equipped with a front-end loader, a scoop shovel affixed to the front of the tractor, it can lift and carry the ore materials. The removal of earth or ore from the bottoms of bodies of water is performed by dredges.

In this picture, a mammoth earth-mover prepares to hoist ore in an iron mine. The machine uses tank-like tracks to traverse the floor of the mine, and its shovel is capable of lifting heavy loads of rock into trucks for transport.

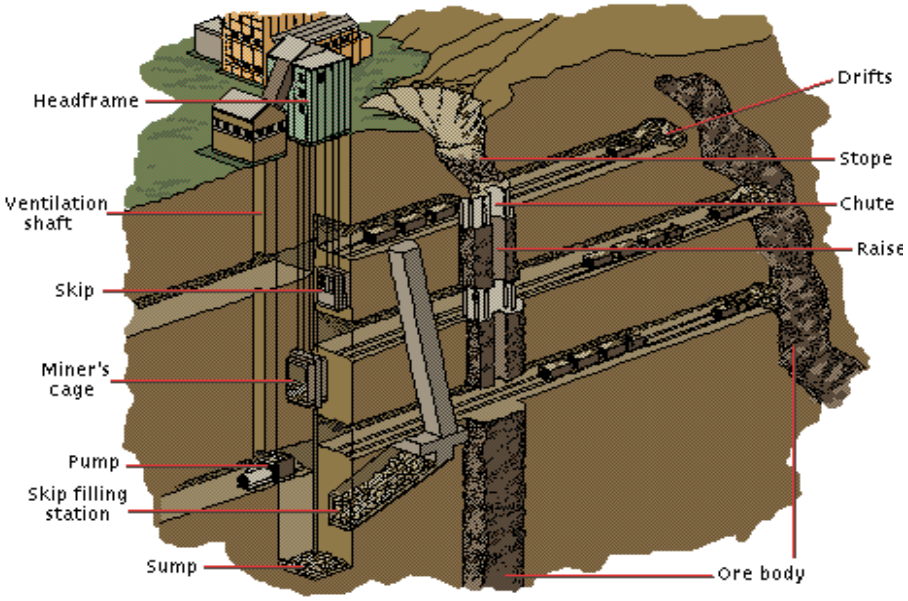
Graders are used to level the earth for mining. This grader has a laser leveling unit mounted on its blade; the leveling device constantly adjusts the height of the blade to ensure that the ground is made precisely flat.

Excavation is in progress at an Angolan diamond mine. The quarry sits on a pipe of peridotite, a column of material believed to be of volcanic origin.

In this picture a Giant Coal Bucket is put into operation. Strip miners often use extremely large buckets to level or move land. The buckets have sharp, slanted teeth on the front edge and are dragged along the surface of the ground by powerful machines. This bucket, used in the Big Muskie coal mine in Ohio, is the size of a small house.

4.3. Underground Mine Shaft

Shaft- primary vertical channel Miners' elevator- A cage Skip- a car through which the ore reaches the surface. A ventilation system to receive fresh air and prevents the accumulation of dangerous gases. A system of crosscuts connects the ore body to the main shaft at several levels, and these levels are, in turn, connected by openings called raises. Stopes are the chambers where the ore is broken and mined.



4.4. Deep Mine Shaft

A miner operates a jack-leg drill more than 1,500 m (5,000 ft) below the surface. These miners face the same dangers encountered in all deep shafts: potential buildup of hazardous gases, explosive coal dust, and possible roof collapse. Good ventilation systems, rock-dusting with limestone, and extensive steel reinforcement are used to reduce the likelihood of these accidents.

Machineries in mining operation in an Open Pit Mine

Drilling operation in an underground mine

5.0. MINING ECONOMICS

The economics of the mining industry is dominated by the fact that, as producers of a primary product, most mining companies have very little control over the price of the things that they sell. The prices are subject to local distortion, particularly in the case of low-cost, bulk minerals, such as building materials, where transport costs are significant. However, increasing use is being made by mining companies of financial derivatives, which can provide temporary protection against fluctuations in price. The economic performance of a mining company is therefore largely determined by the volume of output and the cost of production.

The cost of mining and treating a tonne of ore varies according to such factors as

1. Depth and Hardness of ore
2. Accessibility of location
3. Size of operation

4. Grade is also the key parameter in determining whether a block of ground is ore (that is, profitable to mine and treatment) or waste.

5. The key additional variables for a surface operation are the ratio of
6. Waste that must be moved in order to mine a tonne of ore
7. The size of equipment that can be employed
8. The distance the ore must be transported for processing
9. Those for an underground operation are
10. The geometry of the ore body
11. The mechanical characteristics of the rocks
12. The amount of water that must be pumped from the mine
13. The cost of labour (of which underground mining is a more intensive user)

6.0. MINING ORGANISATIONS IN INDIA

In India in the assessment of realistic resource potential of the deposits in this country the following organizations have a larger role.

- Geological Survey of India (G S I)
- Ground Water Board (Central & State)
- Atomic Mineral Division
- Indian Bureau of Mines
- Director of Mines and Geology
- Coal India Limited
- ONGC
- GAIL
- Mineral Exploration Corporation

6.1. ANALYSIS DONE BY THESE ORGANISATIONS

The analysis done by them on all mineral wealth including coal, petroleum crude, natural gas, iron ore, gold, limestone and granite.

6.2. SURVEYS DONE BY THESE ORGANISATIONS

The above organizations make a detailed study on the earth by

1. Gravity Survey

2. Magnetic Survey
3. Electrical Magnetic Survey
4. Inner Penetration Survey
5. Resistivity Survey - resisting power to the flow of an electric current
6. Borehole Logging
7. Seismic Survey

6.3. ACTIVITIES OF THESE ORGANISATIONS

Their analysis conducted by them includes the following activities like:

1. Mineral investigation and exploration
2. Geological mapping
3. Geochemical mapping
4. Ground geophysical surveys
5. Airborne surveys
6. Marine surveys
7. Laboratory data analysis
8. Development of village economy through mineral appraisal programme
9. Discover, assess and augment natural resources through exploration
10. Monitor the demands for natural resources and re-orient activities
11. Continuously update geological database of the land and offshore areas
12. Creation of databases in the fields of environment, water resource development, natural hazards, etc.
13. Active role in natural and anthropogenic (chiefly of pollution originating in human activity), hazard assessment and mitigation
14. Geo-scientific advice for water resource, power, communication and urban development projects
15. Specialised thematic mapping and regional level assessment of mineral resources and standardize methods of exploration
16. Integration of resource in geological, geophysical and geochemical data and improvement of geo-scientific database
17. Systematic coverage of the country through ground geophysical and geochemical survey
18. Delineate sub-alluvial and sub-trap geology through ground and airborne geophysical surveys to increase possible target areas

19. Induct high-resolution offshore surveys for assessment of marine resources
20. Studies on quaternary climatic changes
21. Develop viable interaction in collaborative activities with sister organizations, research institutes and universities to focus on exploration strategies in priorities
22. Develop, monitor and Creation of comprehensive geo-environmental database for usage in impact assessment on natural resources
23. Map the country and commensurate with changing concepts
24. Establish and maintain a comprehensive earth science database
25. Studies on hazards both natural (earthquake, landslides, floods etc.) and anthropogenic (pollution, waste disposal etc.) focused on impact on the earth system
26. Enhanced studies in the field of solid earth geology and geophysics as Inter-institutional venture including seismic and geodetic (land surveying) monitoring.
27. Geotechnical consultancy services for power, irrigation, transportation and various construction projects

6.4. NATURE OF ACTIVITES

Explorations regarding all the above said minerals are taking place and the above said organizations have a detailed analysis in every classification, which includes

1. The shape of mine
2. Location of mine
3. Penetration of the minerals below earth
4. Minerals chemical compositions
5. Structural strength
6. Standardize methods of exploration
7. Viability report on the regional level assessment of mineral resources

7. 0. MINES SAFETY

Because of the hazardous nature of the work, the government has extremely tight legislation and regulations governing mine safety. These cover the quality of the air, the support of mine workings, explosives, lighting, noise, and all other hazards that may be encountered in the mines. And every mining company must comply with all legislations and must obtain a licence for mining complying with all safety legislations. The Local Governing bodies issue such type of ordinance for pollution control and safety regulations.

8.1. PROCEDURE FOR ESTIMATION OF MINERAL DEPOSITS

The valuation of mineral deposits in production will be usually estimated, in the cost of mining, cost of exploration carried out to identify the reserves and cost of opening up and developing the deposits. Further to this the following factors are also taken into consideration

1. Volume of deposits available
2. Quality of the deposits
3. Recoverable deposits
4. Saleable deposits
5. The likely rate of future outputs
6. The cost of operation with regard to current and potential profitability
7. Location advantage proximity to the areas of demand
8. Transport facilities
9. Infrastructural facilities

This basic knowledge of the mineral structure to estimate the mineral wealth in a mine or quarry is done with the help of Qualified Engineers regarding the realistic resource potential of the deposits in a property. The Competent Valuers before arriving at a proper valuation of the mineral deposits must have through knowledge about the following

1. Quantum of mineral deposit and its nature of formation
2. Its structural details and Chemical analysis
3. Method of mining

8.2. VALUATION OF MINES

The mineral deposits in a mine can be valued by two methods.

8.2.1. Quantitative analysis by weight basis or by volume basis

8.2.2. Profit analysis or the tentative potential of mining land

This special adoptability of the land for mining purposes is important for fixing the value of the land. Whenever a Valuer is appointed for fixing the Value of the property for assessing the mineral wealth in the property, the guidance of the Qualified and Competent Geologist is always required.

8.2.1. QUANTITATIVE ANALYSIS BY WEIGHT BASIS OR BY VOLUME BASIS

The procedure for the total volume of mineral ore extracted from the mine and the cost of the mineral ore by quantitative method is explained briefly. It is done by two methods by weight or by volume basis depending upon the nature of sale of the ore.

Step.1. The total extent of land purchased is considered.

Step.2. Adopting suitable percentage depending upon the shape and size of the land, the mining area is ascertained.

Step.3. Depth of persistence or the depth of the mineral ore available in the land as reported by the geologist is found out.

Step.4. The volume of recoverable mineral deposit is arrived, on multiplying the extent of land taken for mining with depth of ore available.

Step.5. The core recovery percentage of mineral ore in the land as reported by the geologist is referred.

Step.6. The total quantity of volume of salable mineral ore deposit is arrived at by multiplying the volume of mineral deposit with the core recovery percentage.

This forms the basis of calculation to find out the total volume of mineral deposit with the core recovery percentage by volume basis.

Up to this it is common for both quantitative analysis by weight basis or by volume basis.

Step.7. The bulk density of the mineral ore available in the land is referred based on the chemical composition as reported by the geologist.

Step.8. In calculating the quantitative analysis by weight basis, the total volume of the mineral by weight basis is arrived by multiplying the bulk density of the mineral ore with the volume of ore with core recovery percentage.

Step.9. The cost of the mineral ore through market survey is determined.

Step.10. The value of mineral deposit in the mine is determined by multiplying the cost of mineral with the total volume of the mineral by weight basis or by volume basis.

8.2.2. PROFIT ANALYSIS OR THE TENTATIVE POTENTIAL OF MINING LAND

The above steps are repeated here to arrive at the total volume of the mineral by weight basis or by volume basis. The mining cost or the expenditure towards mining including the overheads is calculated per metric tonne of ore for weight basis or by cubic metre by volume basis as detailed below:

1. The market value of the property as agricultural land
2. Royalty paid to the Government
3. Mining charges including drilling & blasting
4. Cost for Removal of over burden (mines development charges)

5. Cost of removal of waste material after core recovery of the mineral
6. Loading and Unloading charges
7. Transport within the mine site
8. Dewatering charges
9. Cost of minerals
10. Overhead expenses

The cost of the mineral added to the expenditure involved in mining operations will be the production cost of mineral ore. The selling price of the ore is determined through market survey. The difference between the mineral ore cost and the selling price will fetch the profit expected from the mine. By multiplying the expected profit with the total quantity of deposit of ore after adjusting for the core recovery percentage will be the Profit or the tentative potential of mining land.

9.0. PURPOSE OF VALUATION

The purpose of valuation demands the nature of security offered to the financial Institutions and the property can be offered as

1. Primary security

2. Collateral security

If the mining land is offered as security to the financial Institutions, the valuer has to ascertain from the financial institution about the nature of security offered. The following observations have to be borne in mind by the valuer.

9.1. If the property can be treated as a **Primary Security** for the following developments of mines for which the valuation of mineral deposits can be considered.

1. Extraction of ore from the property
2. Procurement plant & machineries for the ore extraction operation

9.2. On the other hand, if the property is offered as **collateral security**, then the valuation of mineral deposits can be ignored and need not be considered. The mineral wealth valuation has relevance only if the mineral is mined out as ore. The value of the after-use may often be a significant proportion of the valuation. After the mineral has been mined out, the market value of the land will get considerably reduced. In any assessment of after use value, proper consideration

must be given to restoration of the land. In other words, mineral extraction consumes the land over a period of time and the mineral bearing land comes to an end of its useful life. Hence, for all practical purpose, the land has to be treated as a dry land and valued accordingly with the prevailing market trend in that area.

In case if the borrower insists a higher value taking into consideration the mineral wealth, a mutual discussion with the financial institution along with the borrower may be carried out. The financial institution may be advised of the fact that the mineral wealth cannot be considered if the property is offered as collateral security.

9.3. DATA REQUIREMENT

The valuer must have the following particulars or documents to be referred for scrutiny

1. The market value of the land as per local survey as agricultural lands
2. Title Deeds referring to the mine lands
3. Extent of mine land
4. Shape of the land
5. Classification, Survey sketch of the land as per Revenue Records
6. The Geological expert opinion by the Geologist about the nature of mineral in the land
7. The location map showing the bore-well details
8. The mine area purchased in relevant to the GSI bore well
9. Mining licence obtained from the concerned District Forum
10. The report given by Geological Survey of India, which includes the chemical analysis of mineral deposit in that area
11. Quality of mineral deposit
12. Viability of the selling the minerals in the open market as ore
13. Clearance from Pollution Control Board

9.4. FACTORS INVOLVED IN COSTING

1. The market value of the land as per local survey will be land value as agricultural lands. The market potential of the land is based on the profit it can fetch on selling the product. The above value is realistic if only mining licence is obtained from the Government. After obtaining mining licence and after complying with all mining regulations the market trend of value of the land will increase with respect the mineral wealth, its quality and the viability of the selling the minerals in the open market as ore.

2. The entire area of land purchased may not be the area of mining that can be done. The entire area of land purchased cannot be mined as such.

The mining area available will be about 80% if the land purchased is more than 25 acres. It will get reduced if the land is less than 25 acres.

3. In certain cases depending on the shape and extent of land, the mining area percentage may vary.

4. The depth of persistence, hardness of the ore at the particular mine, the Bulk density of the mineral and the core recovery has to be determined according to the Geological Survey of India report and it varies from mine to mine depending on the physical and chemical composition of the mineral deposit.

5. The type of machineries, the nature of work done by the machineries required for mining that particular mine, number of machineries deployed and the manpower requirement determine the mine's life. These are in proposition to the hardness of ore, bulk density and depth of persistence of the ore. The machineries and the labour force to be deployed have to be ascertained according to the above factors.

6. The expenditure towards the cost of machineries, dewatering required during mining operation, transportation of ore from the mines, royalty to be paid to Government, labour and transporation involved for the removal of overburden, mining charges including drilling and blasting, cost of removal of waste material after core recovery of the mineral, determine the cost of the mineral.

7. The volume of the core recovery of resources in the mine is ascertained normally depending upon the overburden and its chemical composition. The GSI report gives this recovery percentage according to mine's chemical analysis.

8. The life of the quarry or mine is arrived based on the factors involved in the mining operations, which includes the labour component, machineries deployed and other consumable items envisaged during mining process utilised per day and number of working days in a calendar year. The time schedule is also one of the factors that determine mine's life. The mines life is assumed against the total quantity of available resources, mining rate and the number of working days in a calendar year.

9. The volume of overburden and the removal of waste material after core recovery of the mineral will be added to the cost of mining of the mineral. This is one of the major components for arriving at the mining cost of the ore.

10.0. CASE STUDY-I

10.1. VALUATION OF A LIMESTONE MINE

A model valuation report of mining of limestone is given as a case study. The report is done both by **Quantitative Analysis by weight basis** along with the **profitability of the mine** is ascertained.

10.1.1. PURPOSE OF VALUATION

The valuation of this mine is done is to

1. Estimate the present market value of the land as agricultural land
2. Estimate the value of mineral deposit
3. Ascertain the tentative profitability of the mine on extraction of ore

10.1.2. INTRODUCTION

Pursuant to the request from ------Cements, Ariyalur, the Mine property at S F Nos-------, Karuppur Sanapathy Village, in Ariyalur Taluk, Tamil Nadu, reported to be owned by ------ Cements, Ariyalur, to be offered as **Primary security**, was inspected by me on 03rd January 2007 for the purpose of

1. Valuing the **present market value** as agricultural land
2. To assess the **value of mineral deposits** on quantitative or by **weight basis.**
3. Ascertain the **tentative profitability** of the mine on extraction of ore.

10.2. PRESENT VALUE OF LAND

10.2.1. LOCATION

This is a dry land of 8.665 acres in a Village in Ariyalur Taluk and District, Tamilnadu nearer to Trichy - Chidambaram State Highway, purchased by a party in 1998 as agricultural lands. This land is in Ariyalur Taluk, Tamilnadu, where many cement industries have purchased lands for their mine purpose. The demand for cement and production by cement Industries is increasing by about 8-10% per annum in Tamilnadu.

The existing cement manufacturing groups and many Industrial Groups diversifying their activities in the manufacture of cement like, Birlas, Gujarat Ambujas are looking for new limestone deposits in Tamilnadu.

10.2.2. DOCUMENTS REFERRED

The documents to be scrutinised are the Title Deeds pertaining to the lands, Survey Sketch (FMB Sketch, Topo sketch), Encumbrance certificates and other revenue records

10.2.3. PRESENT MARKET VALUE

The present prevailing market value is ranges from Rupees 2.00 lakhs to Rupees 3.50 lakhs per acre depending upon the location of the property. If the land is used for mining purpose, disturbance is caused towards blasting and mining activities. The Pollution is more and hence though the land value is more, the mining companies prefer properties situated in the interior or remote area than that abutting the road. The value of the land in the remote or interior area is less. Based on this factor, the minimum land value is taken for valuation purpose.

So, the rate adopted for present market value is Rupees 2.50 lakhs.

1. Total extent of mine land as per document	=	8.665 acres
2. Adopted market rate of land per acre	=	Rs. 2,50,000/-
3. Present market value of the land	=	8.665 x Rs. 2,50,000/-
	=	Rs. 21,66,250 /-
	=	say Rs. 21.66 lakhs

10.3. ASSESSMENT OF THE VALUE OF MINERAL DEPOSITS BASED ON QUANTITATIVE ANALYSIS BY WEIGHT BASIS

10.3.1. NATURE AND LOCATION OF MINE

The nature of the land is with uneven surface with surface stones. As per Geological Survey of India Report, this land has abundant resource of lime stone deposit. The lands have deposits of lime stones. The quality of limestone is suited for cement manufacturing.

The mines location is 3 to 4 Kms. radius from the bore well points done by Geological Survey of India as shown in the location plans. KP6, KP7 in Karuppur Sanapathy Village, in Ariyalur Taluk, Tamil Nadu are the nearest bore-wells and their Chemical Analysis taken as reference. It has been noted that the nearest bore-well is KP6 their Chemical Analysis taken as reference.

10.3.2. DOCUMENT REFERED

Pollution Control Board Order, Mining Licence from the Local Governing Body, The report given by Geological Survey of India, which includes the chemical analysis of lime stone deposit in that area, Geological expert opinion on the nature of the mineral , The location map showing the bore-well details, The area of mine purchased and location with respect or in relevant to the GSI bore well,

Nature and Volume of overburden as reported by the Geologist and the type of mining operation of overburden

10.3.3. GSI REPORT PERTAINING TO THESE MINES

Viability Report of Geological Survey of India at Ariyalur Taluk, Tamil Nadu envisages 31 million tons at the rate of core recovery of 6 lakhs tons per year for a period of mine life of 35 years.

OVERBURDEN-From the report of G.S.I. bore wells, it has been inferred the over burden above the limestone deposits varies from 3.95 in KP6. For estimation purpose, the average depth of over burden can be taken as 3.95m.

CORE RECOVERY- Based on the above results from the Chemical Analysis of the bore wells enclosed herewith; it may be noted that the core recovery of lime stone deposits ranges from 65% to 87%. Hence it is assessed as 65% for the core recovery of the lime stone deposits (superior and inferior grade).

BULK DENSITY- The bulk density of limestone is 2.5 (2500 Kgs per cubic metre)

DEPTH OF CORE- The depth of lime stone deposits is taken as 8.50 metres depth based on the report of the Geological survey of India. This depth is the average depth taken for estimation purpose though the lime stone deposit is available beyond this depth and maneuvering beyond 8.50 metres is cumbersome and cost escalation is anticipated for mining operations.

10.3.4. PARAMAETERS

With respect to this property that no bore wells has been drilled in the above property by the GSI. The nearest bore well bearing KP No. 6 is the bore well taken as reference for details from the Geological Survey of India report. The chemical analysis of bore well details is from G.S.I. and no specific analysis done within the above area. It is assumed that the mine has a quarry life of 35 years with a daily quarrying life of 2000 metric tonne per day.

10.3.5. COST OF LIMESTONE

The cost of cement grade limestone ranges from Rupees 160/- to Rupees 200/- per metric tonne (inferior and superior grade) as on date in 2006. Hence, the cost of limestone at Rupees 160/- per metric tonne at mines as on 2006 can be taken as average value of limestone for the entire quarry life.

The overhead expenses and the other expenditures will be about Rupees 140/- per metric tonne as per the Geologist.

The total cost of production of one metric tonne of limestone ore will be Rupees 160/- + Rupees 140/- =Rupees 300/- per metric tonne of ore at the mine land. The selling price of limestone for cement manufacturing grade in the present market in 2006 is ranging from Rupees 360/- per metric tonne to Rupees 450/- per metric tonne depending on the grade of limestone. The total selling cost can be (the cost including the production cost, overheads and profit etc.) taken as at the average rate of Rupees 360/- per metric tonne for the entire mine life. It is also inferred that the TAMIN, a State Government Body, is currently in 2006 selling limestone at Rupees 360/- per metric tonne at Mines, at Ariyalur.

10.3.6. CHEMICAL ANALYSIS OF BOREWELL No KP-6 BY GEOLOGICAL SURVEY OF INDIA IN KILAPALUVUR BAND, ARIYALUR DISTRICT, TAMILNADU

Depth in metres	Core recovery in metres	Core recovery in %age	Thickness	LOI	Fe_2O_3	Al_2O_3	CaO	MgO	SiO_2
3.95-5.36	1.23	87%	1.41	42.53	0.68	1.53	53.20	0.25	1.44
6.20-7.69	1.00	87%	1.49	42.68	1.67	5.45	39.10	0.50	10.48
7.69-9.25	1.05	87%	1.56	38.10	1.94	4.07	46.10	0.25	9.47
9.25- 10.96	1.16	87%	1.71	38.20	2.08	4.33	47.60	0.25	7.07
10.96-12.30	0.91	68%	1.34	35.23	3.25	44.10	44.10	0.50	10.08

10.3.7. LOCATION MAP OF BOREWELL

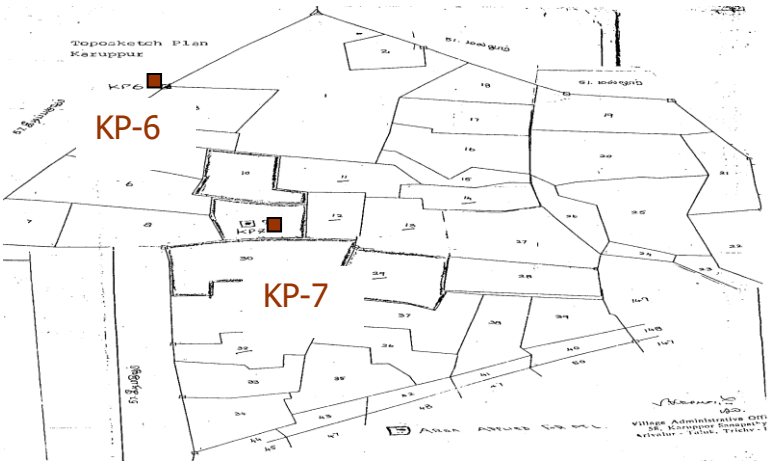
KP6 & KP7

BY GEOLOGICAL SURVEY OF INDIA

IN KILAPALUVUR BAND,

ARIYALUR DISTRICT,

TAMILNADU



10.3.8. VALUATION OF LIME STONE DEPOSITS ON A QUANTITATIVE ANALYSIS BY WEIGHT BASIS

1	Total extent of land	8.665 acres = 35078 sq m
2	Total extent taken for mining purpose	35078 sq m X 80% = 28062 sq m
3	Depth of persistence	as per GSI: 8.50m (average)
4	Total volume of lime stone deposits in the above property	28062 x 8.5 =2,38,527 cu m
5	Bulk density of lime stone	2.50(average)(tonne per cum)
6	Core recovery percentage	65%
7	Total quantity of limestone deposits with core recovery percentage	2,38,527 x 2.5 x 65% =3,87,606 metric tonne
8	Adopted Cost of lime Stone	Rupees 300/- per metric tonne (average cost throughout the mine's life)
9	Total value of lime stone deposits	3,87,606 M T x Rupees 300/- = Rupees 11,62,81,800/- Say Rupees 1162 lakhs

10.4. PROFITABLITY OR POTENTIAL VALUE OF THE MINE ON A EXPECTED PROFIT ANALYSIS

10.4.1. The cost of limestone at Rupees 160/- per metric tonne (average cost) as on 2006 is the average value of limestone.

10.4.2. The overhead expenses and the other mining expenditures will be about Rupees 140/- per metric tonne as per the Geologist detailed report on expenditure towards extraction of ore.

10.4.3. The total cost of production of one metric tonne of limestone ore will be Rupees 160/- + Rupees 140/- =Rupees 300/- per metric tonne of ore at mine land. This is inclusive of the mining cost or the expenditure towards mining including the overheads.

10.4.4. The **Tentative Profitability** or Market Potential for the mine Land at the Village, Ariyalur Taluk, Tamil Nadu is worked out as mentioned below

I) Selling Price	Rupees 400/- per metric tonne
II) Mining expenditure (inclusive of all expenditures stated above)	Rupees 340/- per metric tonne
III) Profit	Rupees 60/- per metric tonne
IV) Total quantity of lime stone deposits estimated For 8.665 acres based on Quantitative analysis as Core recovery	3, 87,606 metric tonne
V) Tentative Profitability or Potential Value for 8.665 acres of Mine land in the Village	3,87,606 M T x Rupees 60 /- = Rupees 2,32,56,360/- = Say Rupees 232 lakhs

10.5. OPINION

1. Based on the above details and also particulars provided, this valuation report has been prepared and furnished.

10.5.1. Property offered as Collateral Security

If the property is to be offered as **collateral security**, then the present market value of the land as dry land only has to be taken.

Hence, I am of the opinion that the **Present market value of land (As dry agricultural land**) is **Rupees 21.66 lakhs.**

10.5.2. Property offered as Primary Security

After careful considerations to the important factors like the present condition, age of the mine, potential for marketability, I am of the opinion that the estimated cost prepared on above lines is as assessed as per the statements attached herein

1. Total value of the mineral deposit is **Rupees 1162 lakhs/-(for 8.665 acres**)

2. Tentative Profitability or **Potential Value** of **mine** is **Rupees 232 lakhs/-(for 8.665 acres)**

REMARKS:

1. The value of minerals deposits can be referred if the property is offered as Primary Security. If the property is offered as collateral security, only the present market value of the land is to be considered. 2. It may be noted the mining operation has not commenced in the property as on date of inspection. 3. No legal aspects were considered while arriving at the mineral worth. 4. This property can be offered as security and the concerned financial institutions are requested to verify the extent shown in the Valuation Certificate with respect to the latest legal opinion. 5. For this property, the extent of land mentioned in the title deed registered as documents in the Registrar's Office, Ariyalur bearing registration numbers---------- are considered for valuation purpose. 6. The property was inspected in the presence of Mr.----------, General Manager, --------Cements, Ariyalur. 7. The mining operations and cost details as referred by the Geologist and the Geological Survey of India bore well analysis are taken as reference. 8. The adopted market value rate is based on the guideline rate as per Registration department and the prevailing selling market rate ascertained by local enquiries. 9. The property is in an interior of the village-1.00 KM from the main Road. The approach road from the main road is a mud road. No civic facility is available nearby. 10. Value varies with the purpose and time. This value should not be referred for any purpose other than mentioned.

11.0. CASE STUDY -2

11.1. VALUATION OF A CRUSHED STONE QUARRY

A model valuation report of mining of crushed stone quarry is given as a case study.

The report is done both by **Quantitative Analysis by volume basis** along with the **profitability of the mine** is ascertained.

11.1.1. PURPOSE OF VALUATION

The valuation of this mine is done is to

1. Estimate the present market value of the land as agricultural land
2. Estimate the value of mineral deposit by volume basis
3. Ascertain the tentative profitability of the mine

11.1.2. INTRODUCTION

Pursuant to the request from ------Construction Company, Trichy, the Stone Quarry property at S F Nos-------, Varadarajapuram Village, Namakkal Taluk, Namakkal District, reported to be owned by ------ Construction Company, Trichy, to be offered as **Primary security**, was inspected by me on 03rd January 2007 and for the purpose of valuing

1. Valuing the **present market value** as agricultural land
2. To assess the **value of mineral deposits** based on quantitative analysis by volume basis
3. Ascertain the **tentative profitability** of the mine on extraction of ore.

11.2. PRESENT VALUE OF LAND

11.2.1. LOCATION

The mine property is in Varadarajapuram Village, Namakkal Taluk, Namakkal District is 5 kms from Erumaipatti village & 35 KMs from Namakkal Town Limits, in Namakkal- Thuraiyur Highway. The property has been acquired in a remote area on a hilly terrain. The property is at the foot of a hillock. The demand for stone jelly increases every year by around 10%, as the development of roads by the National Highways Department and the construction industry has a fast growth.

11.2.2. DOCUMENTS REFERRED

The documents to be scrutinised are the Title Deeds, Survey Sketch (FMB Sketch, Topo sketch), Encumbrance certificates and other revenue records

10.2.3. PRESENT MARKET VALUE

The present prevailing market value is ranges from Rupees 2.00 lakhs to Rupees 2.50 lakhs per acre depending upon the location of the property. If the land is used for mining purpose, disturbance is caused towards blasting and mining activities. The Pollution is more and hence though the land value is more, the mining companies prefer properties situated in the interior or remote area than that abutting the road. The value of the land in the remote or interior area is less. Based on this factor, the minimum land value is taken for valuation purpose. So, the rate adopted for present market value is Rupees 2.00 lakhs.

1. Total extent of mine land as per document	=	6.25 acres
2. Adopted market rate of land per acre	=	Rs. 2,00,000/-
3. Present market value of the land	=	6.25 x Rs. 2,00,000/-
	=	Rs. 12,50,000 /-
	=	say Rs. 12.50 lakhs

11.3. ASSESSMENT OF THE VALUE OF MINERAL DEPOSITS BASED ON QUANTITATIVE ANALYSIS BY VOLUME BASIS

11.3.1. NATURE AND LOCATION OF MINE

This is a dry land purchased by the party as agricultural lands. The property is on a hilly terrain with rock appearing on the surface. This land has abundant resource of Granite stone deposit used in construction industry. The quality of stone jelly available in this area is very good for the construction activities like roads and building construction. In and around this mine there lots of mining operation is under progress.

11.3.2. DOCUMENT REFERED

Pollution Control Board Order, Mining Licence from the Local Governing Body, The report given by Geological Survey of India, Geological expert opinion on the nature of the mineral , Nature and Volume of overburden as reported by the Geologist, the type of mining operation of overburden

11.3.3. GSI REPORT PERTAINING TO THESE MINES

Viability Report of Geological Survey of India at Namakkal Taluk and District envisages Granite stone deposit (CHARNOKITE GNEISS Variety) used as materials for concreting works and road works in construction industry. The assessed quantity of granite as per GSI for the Mining land of 6.25 acres with the existing license is about 6, 07,260 cubic metres up to a depth of 30 metres. With an average quarrying of 425 cubic metres of stone deposits daily, 250 days as working days in a calendar year, the life of mine is assessed as 8 years. The process is extracting big boulder stone from the mine through blasting. The boulder or soling stone is fed in to the jaw crusher unit through the bunker and crushed. Generally, boulder soling stones are crushed to various sizes depending on the nature of stones required for construction activities like 25 mm stone jelly, 20mm stone jelly, 6mm stone chips and the balance residue as crusher dust.

OVERBURDEN-From the report of G.S.I., it has been inferred the over burden above the stone deposits varies from the surface to 1.00 metre. At the mine site overburden of earth is seen at 0.75 metre. For estimation purpose, the average depth of over burden can be taken as 0.75 metre.

CORE RECOVERY-The core recovery of stone deposits ranges from 65% to 80%. The core recovery of these boulder soling stones removed from the mines on the basis of output after crushing. It has been assessed a core recovery percentage of 65% of the granite stone deposits

of required sizes can be envisaged. The 35% balance residue as quarry dust is wasted in most of the quarries as this product has very meager demand and frequent sales is not envisaged.

DEPTH OF CORE- The mine's depth ranging from 1metre to 100metres depth and in certain areas even at the surface itself. The depth of stone deposits can be taken as 30 metre depth. Beyond this depth, mining cost will be more due dewatering charges and transportation cost involved in getting the broken soling stone from the quarry.

11.3.4. PARAMETERS

The details are taken from the Geological Survey of India report for the above property. The classification of the property is mining land as per Revenue records and Agricultural lands as per Registration department records.

The volume of the core recovery of resources in the property is assumed as a quarry life of 8 years with a daily quarrying life of 425 cubic metres of soling per day with 250 days as working days in a calendar year. Since the depth of persistence is up to 100 metres from the surface, the quarry life may be increased according to the demand and cost involved in mining.

11.3.5. COST

The mining cost for soling that is removed from the quarry as boulder stone before it is fed in to the jaw crusher unit ranges from Rupees 45/- per cubic metre to Rupees 52/- per cubic metre by volume inclusive of all at quarry site as on date in 2006.

So, the mining cost of granite stone resource used in construction industry can be taken as Rupees 52/- per cubic metre for the soling stone by volume that is removed from the quarry as boulder stone as the average cost for the entire quarry life. The overhead expenses and the other expenditures will be about Rupees 15/- per cubic metre as per the Geologist. The total cost of production of one cubic metre volume of boulder stone will be Rupees 52/- + Rupees 15/- =Rupees 67/- per cubic metre by volume. The selling price of boulder stone used in construction industry in the present market in 2006 is ranging from Rupees 80/- per cubic metre to Rupees 85/- per cubic metre. The total selling cost of this particular quarry will fetch about (the cost including the production cost, overheads and profit etc.) the selling price at the average rate of Rupees 85/- per cubic metre for all the entire mine life.

11.3.6. VALUATION OF GRANITE STONE DEPOSITS ON A QUANTITATIVE ANALYSIS BY VOLUME BASIS

1	Total extent of land	6.25 acres = 25302 sq m
2	Extent taken for mining purpose	25302 sq m X 80% = 20242 sq m
3	Depth of persistence	Adopted 30 m (As per GSI:100 m)
4	Total volume of stone deposits	20242 x 30 =6,07,260 cu m
5	Core recovery percentage	65%
6	Total quantity of stone deposits with core recovery percentage	6,07,260 cu m x 65% =3,94,719cu m
7	Cost of granite Stone as used in construction activity	Rupees 67/- per cu m ((average cost throughout the mine's life)
8	Total value of granite stone deposits	3,94,719cu m x Rupees 67/- = Rupees 2,64,46,173 /- Say Rupees 264 lakhs

11.4.0. PROFITABLITY OR POTENTIAL VALUE OF THE MINE ON A EXPECTED PROFIT ANALYSIS

11.4.1. The cost of granite boulder stone as used in construction activity at Rupees 52/- per cubic metre at mines (average cost) as on 2006 is the average cost of stone.

11.4.2. The overhead expenses and the other mining expenditures will be about Rupees 15/- per cubic metre as per the Geologist.

11.4.3. The total cost of production of per cubic metre of granite boulder stone will be Rupees 52/- + Rupees 15/- =Rupees 67/- per cubic metre. This is inclusive of all mineral cost, mining expenditure and the overheads.

11.4.4. The **Tentative Profitablity** or the **Market Potential** for the Land at the Village, Namakkal Taluk and District, Tamil Nadu for granite boulder stone as used in construction activity is worked out as mentioned below

I) Selling Price	Rupees 85/- per cu m
II) Mining expenditure (inclusive of all)	Rupees 67/- per cu m
III) Profit	Rupees 18/- per cu m
IV) Quantity of granite boulder Stone deposits	3,94,719cu m
VII) Tentative Profitability or	3,94,719cu m x Rs 18/-
Potential Value for 6.25 acres	= Rupees 71,04,942 /-
of Mine land in the Village	= Say Rupees 71 lakhs

11.5.0. OPINION

Based on the above details and also particulars provided, the valuation report has been prepared and furnished.

11.5.1. Property offered as Collateral Security

If the property is to be offered as **collateral security**, then the present market value of the land as dry land only has to be taken. Hence, I am of the opinion that the

Present market value of land (As dry agricultural land) is **Rupees 12.50 lakhs.**

11.5.2. Property offered as Primary Security

After careful considerations to the important factors like the present condition, age of the mine, potential for marketability, I am of the opinion that the estimated cost prepared on above lines is as assessed as per the statements attached herein

1. Total value of the mineral deposit is **Rupees 264 lakhs/-(for 6.25 acres**)

2. Tentative Profitability or **Potential Value** of **mine** is **Rupees 71 lakhs/-(for 6.25 acres)**

REMARKS:

1. The value of minerals deposits can be referred if the property is offered as Primary Security. If the property is offered as collateral security, only the present market value of the land is to be considered. 2. It may be noted the mining operation has not commenced in the property as on date of inspection. 3. This property can be offered as security and the concerned financial institutions are requested to verify the extent shown in the Valuation Certificate with respect to the latest legal opinion. 4. No legal aspects were considered while arriving at the value of the

property. 5. For this property, the extent of land mentioned in the title deed registered as documents in the Registrar's Office, Erumapatti bearing registration numbers---------- are considered for valuation purpose. 6. The property was inspected in the presence of Mr.----------, Manager, --------Construction Company, Trichy. 7. The mining operations and cost details as referred in the report by the Geologist and the Geological Survey of India are taken as reference. 8. The adopted market value rate is based on the guideline rate as per Registration department and the prevailing selling market rate ascertained by local enquiries. 9. The property is in an interior of the village-2.50 KM from the main Road on a hilly terrain. Only jelly Crushing units and mines are nearby. No civic facility is available nearby. 10. Value varies with the purpose and time. This value should not be referred for any purpose other than mentioned.

12.0. CONCLUSION

In this paper two valuation case studies are prepared, one on weight basis and the other on volume basis for mines, for the benefit of the valuers. The valuers have to ascertain before preparing the report regarding the nature of security offered.

This case study report is prepared for a mine property offered as primary security. The property can be treated as a **Primary Security** for the developments of mines in the Extraction of ore from the property and Procurement plant & machineries for the ore extraction operation in this mine for which the valuation of mineral deposits can be considered.

If the property is offered as **collateral security**, then the valuation of mineral deposits can be ignored and need not be considered. The mineral wealth valuation has relevance only if the mineral is mined out as ore. After the mineral has been mined out, the market value of the land will get considerably reduced. Since the mineral extraction consumes the land over a period of time and the mineral bearing land comes to an end of its useful life. Hence, for all practical purpose, the land has to be treated as a dry land and valued accordingly with the prevailing market trend in that area.

In some cases, the mining land may belongs to Government and a specific extraction license may be issued by the Concerned Local District Forum or Collector for the purpose of mining for a specific period of 3 or 5 years to various agencies with nominal fees with seignorage charges. The borrower thus enjoying the possession of the mining area by the mining license may approach the financial institution for financial assistance for the developments of mines in the Extraction of ore from the property and Procurement plant & machineries for the ore extraction operation, for

which the valuation of mineral deposits can be considered up to the specific period as stated in the mining license.

In that case, though the mining area has a vast resource of ore for extraction, since the borrower has valid license only for a specific period, the mineral wealth has to be ascertained only for that period. In other words, the volume of ore extraction by the borrower within the stipulated time, in which he can extract the ore, has to be derived with the machineries and labour inputs that he can deploy during the stated period.

It is the duty of the Valuer to enrich the knowledge before arriving at a realistic value of the mineral wealth. He must enhance his knowledge about the mineral and the mining activity. He must give more importance to the Geological report. This has to be necessarily in coordination with the Geologist. The valuer has to ascertain the mineral wealth of the property in conjunction with the Geologist about Nature of the land, Shape of land, Area of land, Location, Mineral specification, Grade and composition, Chemical analysis, Processing cost, Government regulations prevailing in that area, Marketing value of the mineral and 11) Transportation cost.

The purpose of valuation, the revenue records, present market trend of the lands nearer to the mines, mining licence, pollution control approval from the Government and viability of profitability on mining operation are to be thoroughly verified before the preparation of the valuation of mineral deposits.