Exploration: Disclosure—Commentary

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THE EXPLORATION PROCESS

The exploration process is the first step of a three-step process or continuum toward developing a new mine.

In the case of mineral exploration it is the least expensive of the three, often amounting to less than 20 per cent of the pre-decision to mine expenditure.

Exploration can be divided into four substeps. These too form a continuum and are:

- project generation;
- prospect identification;
- prospecting testing; and
- resource definition.

Each of the four steps can be further subdivided. It is not my intention to laboriously describe each one of these phases except to note that the

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project generation phase ends with tenement application. It is generally a regional approach—covering thousands of square kilometres. It involves acquisition of all available data, compilation of that data and an interpretation of it seeking to recognise critical features or patterns that confirm that either a mineralised system or the environment capable of hosting a mineralised system is present.

This first phase may include remote sensing surveys such as aerial geophysical surveys or aerial photography. Although lack of tenement leaves the explorer vulnerable, possibly to charges of trespass or by being unable to obtain tenement and thereby to have wasted valuable exploration funds. No "on the ground" work is carried out in this project.

It is a "desk-top" study. There are a number of sources of available data which may be used to identify the area of interest.

Note it is the *data* which is the building block. The geoscientists interpret it and convert it to information as part of a progression from data to information to knowledge.

Note this process is different to prospecting, which essentially was searching for a mineral deposit following hunches or as opportunity arose.

The role of the prospector has diminished as Australia has become explorationally mature with most of the near-surface, obvious deposits having been discovered.

During the desk-top study it will have become apparent that critical data is missing. With "tenement" now granted the mineral explorer, subject to agreement with the holder of the surface rights, may enter upon the land to collect that missing data and to explore below the surface.

Having collected the missing data and interpreted it, targets are selected for follow up. The project has evolved to a series of prospects. It is over those prospects that grids are usually established to provide control for the detailed, focused ground exploration techniques. This phase culminates in reconnaissance drilling which is aiming to confirm that the target sought is in fact present.

MINERAL EXPLORATION TECHNIQUES

The mineral exploration technologies used today measure the physical or chemical characteristics of rocks, soils, stream sediments, water, gas and plants and are based on fundamental scientific principles. It is the specific application, adaptation and refinement of these principles which leads to the development of the unique technologies used to locate mineral or hydrocarbon deposits.

As George McKenzie has pointed out, it is the rate at which these developments, refinements and improvements in data collection and analysis have occurred which allow us to double our efficiencies and our effectiveness every ten years or so (and which is outstripping developments in the legislation).

The prospector's technology of gold pan, dolly pot and an old sugar bag to put strange rocks in to take back to the government assay laboratory for analysis has been superseded.

Essentially four fields of geoscience, and possibly a fifth, exist. These are:

- geology;
- geochemistry;
- geophysics;
- geobotany; and
- geozoological?

The medium sampled and the data collected varies markedly.

A description of a few of these and the trespass issues associated with them follow.

Satellite images

Satellites collect UV, visible and IR spectral data from the earth's surface from heights of 180 to 200 km.

These data are stored in digital form and when coverage of areas a few hundred kilometres square (a scene) is completed these data are then transmitted back to earth. They can be purchased as a whole scene by anyone and with suitable computer equipment can be converted to images made up of tiny pixels—rather like a television image. Because various wavelengths of "light" are measured these can be manipulated to produce a range of images depending on what is required.

Depending on the size of land holdings and mineral tenements, the number of parties with "property" covered by any one image may number in the thousands.

If this data is purchased and processed to identify patterns which may reflect or lead to an orebody on another party's tenements, has trespass occurred?

Drilling

Drilling is carried out to test for subsurface mineralisation. A range of techniques is available but the most important one is diamond drilling. An annular diamond studded bit is used to grind away the rock leaving a cylinder of rock core which is collected in a tube and brought to the surface.

The core obtained is logged by the geologist, split in half longitudinally using a diamond saw, with one half being despatched for analysis and the other half being retained for reference.

Drills commonly operate in the depths range of 200m to 500m, less commonly between 500m and 1,000m and infrequently beyond 1,000m. Depths to 4,000m have been drilled, however. What is

generally not understood is that these drill holes deviate or can be made to deviate from a straight path, especially if they are inclined holes.

Should the hole have deviated outside of the tenement boundary into unclaimed land, has trespass occurred?

Stream sediment sampling

As rocks weather and erode they are broken into smaller and smaller particles which are eventually washed into the streams and rivers. The composition of the clays, silts and sands in the streams and rivers must reflect the composition of the weathering rocks in the catchment.

Should a large mineral deposit exist within that catchment then it too will be eroding into the drainages.

By collecting samples (ten grams) of the clays, silts or sands and analysing these it is possible to identify anomalous catchments and assume that these should contain a mineral deposit.

It is possible to determine if a competitor's tenement has mineral deposits upon it by collecting samples outside of the borders of that tenement. Would this constitute trespass?

What if the situation is reversed and a sample is collected just inside the boundary of a competitor's tenement but which is clearly representative of material from tenement held by the collector?

Airborne magnetics

The earth has a magnetic field and some mineral occurrences are directly magnetic (iron ore for example) or have magnetic minerals associated with them. Using a magnetometer the location and intensity of the magnetic field produced by the earth and the mineralised features can be measured.

By mounting a magnetometer in an aircraft and flying it at low altitudes (usually 80-100 metres) in a pattern of closely-spaced, parallel lines the magnetic field can be measured quickly and cheaply over large areas. This is a passive technique—measuring what is already there.

The data is stored digitally and after appropriate processing can be converted to contoured plans or more commonly to an image.

Interpretation of this may indicate targets for drill testing.

By collecting such data over untenemented ground or ground held by other parties, such as when the aircraft is turning to commence a new flight line, has trespass been committed?

Are multi-client surveys covering whole mineral provinces multi-trespass surveys?

Electromagnetic surveys

An electromagnetic field passing through a conductive body, and many mineral orebodies are good conductors, will induce a secondary electromagnetic field in the conductive body.

Commonly an aircraft is specially equipped with a large generator which is connected to a large coil wrapped around the nose, wing tips to tail perimeter of the aircraft. A current is passed through the coil and induces an electromagnetic field which passes downward into the ground. The aircraft flies at low altitude (80-200 metres) and slow speeds along closely-spaced, parallel flight lines to cover an area. Towed behind the plane on a cable is another smaller coil which measures the return electromagnetic field which will deviate from a regular response as a result of a distortion by a sub-surface conductor. However, the location of the conductor may be off line. Commonly this technique has a ground penetration capacity of 100 to 200 metres.

As for the airborne magnetic survey by collecting electromagnetic data over untenemented ground or ground held by other parties, has trespass been committed?

Is passing an electromagnetic field through land interfering with another person's exclusive possession of that land?

TENEMENT TYPES

There are more than 30 "tenement" types in Australia which permit mineral prospecting and exploration.

These range, at their most secure, from mineral freehold leases in which the surface and mineral rights are owned by the individual to a miner's right which allows entry upon a property to carry out a limited range of prospecting and exploration but which provides no right to any minerals discovered.

As George McKenzie points out, which prospecting and exploration techniques are permitted on these tenements is not always clear and is not always consistent from State to State to Territory.

Complications can arise when tenements are stacked. In one State it is theoretically possible to have a number of separate parties holding separate tenements over the same area, but for different groups of commodities. Who is trespassing on whose ground now?

TENEMENT PROBLEMS

Some tenements, especially old mining leases may be incorrectly defined or marked out on the ground, or plotted on maps in a position not relating to that which is pegged. In some cases they are impossible to locate.

An example is provided. A lease was described in the application and granting documents and plotted on Mines Department maps in a position abutting an existing lease. The lease had not been worked or maintained for over 40 years and was part of an inherited estate. An exploration company held a surrounding exploration title and after a search of the Mines Department documents and the surface found a lease peg in the position described as the datum. The company then planned and executed a program of sampling and surveying along grid lines south of the lease in question.

During the course of the exploration work two grid pegs were accidentally located. It was deduced that they were the southern two pegs of the lease and through careful follow-up the other two corner points were reasonably confidently located—although fire had burnt the two pegs, one of which was the datum post.

It transpired the lease was approximately 800 metres south of its described and plotted position and trended magnetic north and south rather than true north and south.

No reasonable search would have found the corner pegs of that valid lease. Did the exploratiom company commit trespass?

TRESPASS

George McKenzie has defined Trespass as "direct and voluntary interference with another person's exclusive possession of land". He goes on to state that a "mistake is no defence in trespass".

In the first four examples given to you it could be argued that no interference with another person's exclusive possession of the land took place. Nor were their privacy or rights interfered with. Nothing was removed from or left on their land.

In the last case a genuine mistake and technical trespass occurred.

The notion that remote sensing using data from a satellite orbiting the earth 180-200km above its surface constitutes trespass makes no sense to the mineral explorer.

Similarly, why should acquisition of geophysical data using fixed wing aircraft or helicopters at heights typically 80 to 400 metres above the earth constitute trespass, whether it be a passive or active technique? Does the land holder own part of the earth's magnetic field too? In the case of the electromagnetic survey the company's equipment creates the response which is transitory, being present for only fractions of a second.

It would seem to the mineral explorer the issue of trespass in remote sensing surveys can be addressed by adding the following amendments to all Mining Acts:

> "Nothing in this Act has the effect of restricting or preventing the obtaining of data in respect of any land by means of remote sensing aerial surveys."

DISCLOSURE

If data is acquired as a result of remote sensing and aerial surveys over, or trespass upon, tenement held by another then disclosure of this is required prior to and during negotiations to acquire an interest in that tenement.

As George McKenzie points out, failure to do so may be misleading and deceptive conduct under s 52 of the *Trade Practices Act*.

CODE OF CONDUCT

A Code of Conduct, if adopted and followed by mineral explorers and contractors, should reduce the incidence of trespass and breaches of s 52 of the *Trade Practices Act*.

Such a Code should include the following key elements:

Code of Conduct principles

1. Determine the boundaries and holders of tenement or property.
2. Advise tenement/property holders of proposed remote sensing surveys.
3. Obtain agreement to enter on a tenement or property of another person/company.
4. Enquire of a third party which provides data from another party's tenement if that data was obtained with permission or by trespass.
5. Disclose data from another party's tenement before entering into an agreement to earn an interest in that tenement.

CONCLUSIONS

Modern exploration technologies include remote sensing exploration.

The trend will be for remote sensing to increase (but physical access will always be needed).

Should Mining Acts permit remote sensing without "licence"? Remote sensing over tenements/land held by other parties should not constitute trespass.

A Code of Conduct should be established and implemented.

The paper by George McKenzie (see above, p 308) provides an excellent synopsis of the current Mining Acts, and addresses fully the issues of trespass and disclosure.

He rightly points out that the development of new technologies has outstripped the development of legislation.

The operators, the exploration geoscientists and the prospectors should be remembered when contemplating changes to the legislation. They have to work with it.