

GEOCHEMICAL WORK ON FINDONS AREA

LYELL E.Z. EXPLORATIONS

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LYELL - E.Z. - EXPLORATIONS

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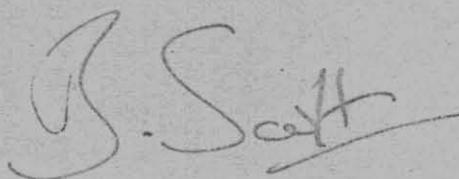
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Memorandum to

16th July 1957

Mr. G. F. Hudspeth,
Manager,
Lyell - E.Z. Explorations.

Attached is the report covering the geochemical work recently
completed by D. Sampey (Report GC6).



Geologist-in-Charge.

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8th July, 1957

1. INTRODUCTION(a) Background

Geochemical prospecting is the application of certain rapid methods of chemical analysis for the detection of very small amounts of some elements (say, lead, zinc and copper) which may be present in the earth's crust. These techniques are commonly used for the testing of suspected, but hidden, mineralised zones, but it must be emphasised that geochemical prospecting is but one technique of exploration and its best application has been made when used in conjunction with geophysics, and under strict geological control.

(b) Techniques Available

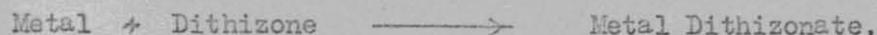
Geochemical prospecting, as does geophysics, presents several varied techniques. The metal content can be determined from soils, stream sediments, stream or lake waters or, less commonly, vegetation. However, recent work in Canada and England shows that greater use is being made of soils/stream sediments rather than stream/lake waters, or vegetation.

Similarly, the method of taking the metal content of the sample into solution can be varied according to the severity of chemical attack used: obviously the more rigorous the attack the greater the completeness of solution of the metal content of the soils etc. The three main methods of attack are compared in Table I; column three is a breakdown of the distribution of the metal content of a soil/stream sediment, and its availability to the method described. Column four shows the sensitivity of the method.

TABLE I.

Technique	Method of Attack	Availability of Heavy Metal Content	Sensitivity of the Method	Cost/Time of Each Analysis
A. Cold Technique	Cold, slightly acid solutions. Usually "total metals" determined (Pb + Zn + Cu).	A. Free metal ions. B. Metal ions loosely bonded to clay. C. Secondary oxides or carbonates.	2 p.p.m.	Lowest cost, quickest method.
B. Hot Acid Technique	Hot, acid solutions. Usually individual metals determined (Pb. or Zn or Cu).	A + B + C + D. Metal ions tightly bonded to clay. E. Some primary oxides and sulphides.	10-15 p.p.m.	Medium cost, medium speed of analysis.
C. Fusion Technique	Fusion with bisulphate, solution in hot acid. Individual metals.	A + B + C + D + E. All oxides and sulphides. F. Metal silicates	15-20 p.p.m.	Highest cost, slowest method.

Once the metal is in solution the quantity is determined by the use of dithizone according to the following reaction:



The metal dithizonate is coloured (pink - red) with the intensity of the colour bearing a direct arithmetical relationship to the metal content. Consequently, the metal concentration can be readily estimated by reference to a set of standards.

(c) General Discussion of Techniques

Some confusion may arise over the use of the term "total metal".

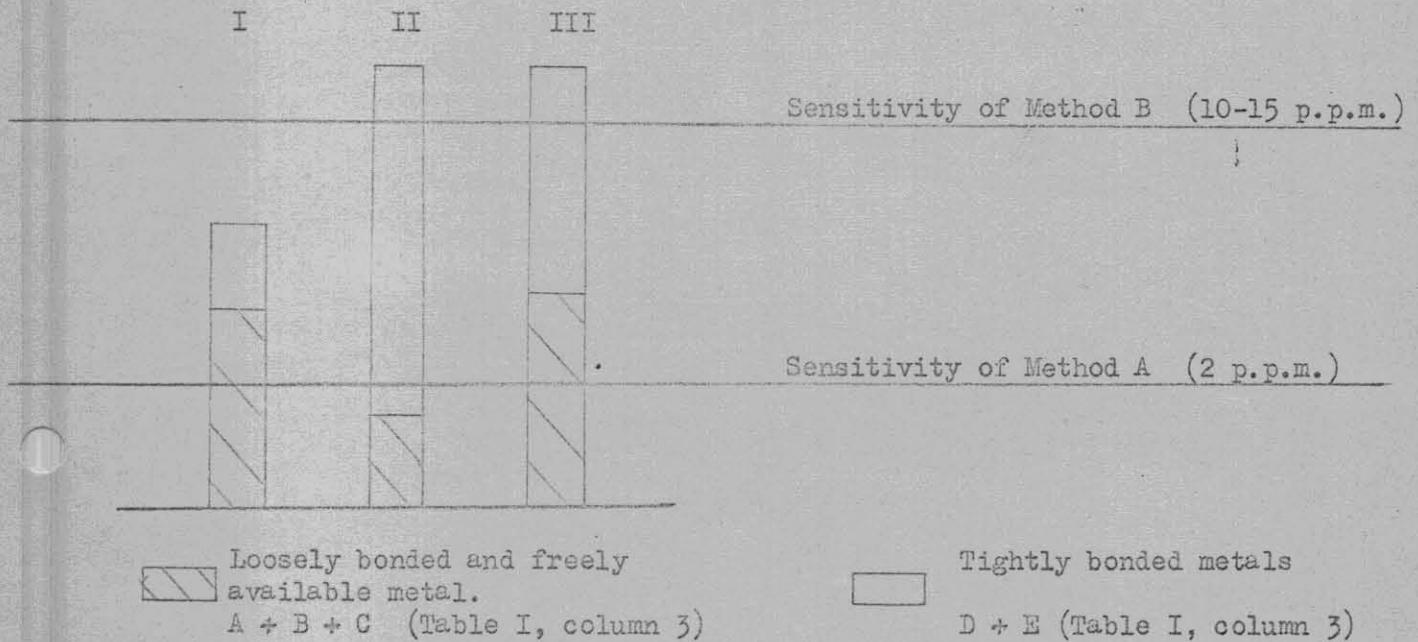
The term "total" refers to the extraction of lead and zinc and copper (i.e. "total metals" as against "individual metals") and does not mean the 100% metal content of the sample.

A further feature worth emphasising here is that this "total metal" content of the sample, as determined by method A., may well be below the content of an individual metal as determined by method B or C. This is obviously due to the different method of attack used in each technique which, as the severity of attack increases, draws upon increasing quantities of the metallic content of the sample.

Referring to Table I again, it is an established fact that the quantity of metals extractable under each of the three methods do not bear a constant relationship to each other - this relationship may even vary within a single area of several hundred square miles although not usually more than a factor of 5. The reasons for this are not clearly established although they may obviously be related to any of the variable factors in geochemical prospecting such as pH, grain size variation in samples, oxidation/reduction potential or other factors not yet evaluated. However, solving this problem would mean research involving

considerable time and expenditure and as long as this variation is appreciated it is a feature which can be allowed for in the interpretation of results given by different methods of analysis. Three examples relevant to the above discussion are given in Table 2.

TABLE 2



In example I, no metals would be detected under method B (Hot Acid extraction) since the metal content is less than the sensitivity of the method. Method A (cold, slightly acid) would show results since the concentration of the loosely bonded and freely available metals is above the sensitivity. In example II method A would show no results whilst method B would, for the reverse reasoning as in Example I.

In Example III both methods A and B would give detectable results.

2. DISCUSSION OF RESULTS

The bisulphate fusion method (method C) was used on only a few test samples as it was found it did not give any better results than the hot acid extraction method B.

(a) Findons

The results from the analytical methods A and B, as outlined by Sampey, indicate that the metal content of the soils here correspond to the first histogram in Table 2.

The anomalies are extremely sharp and very low in value and bear out the weak, restricted zone (6-9') of sulphide mineralisation which is known at Findons. There is no evidence on the surface that the mineralisation found in the Main Trench, at the south end of the prospect, connects up with that found in the north in the Adit; unfortunately the samples at the two traverses (10220 and 102100 N) which could have tested this point were destroyed in a fire. However, taking each exposure separately the anomalies are consistent with the known NW-SE (325-330°) trend of mineralisation.

Findons was taken as a test area for it was considered that if the very weak mineralisation could be detected it would serve to indicate the sensitivity of the technique.

(b) Pinnacles

It would appear from the results outlined that the metal content of the soils corresponds to the third type of histogram in Table 2.

The results do not plot at all well on a plan due to the low metal content (i.e. 5 to 10 p.p.m.) of some of the samples and the results can best be appreciated by studying the graph of each traverse.

(i) Traverse 110150N

The interpretation of these results in terms of primary mineralisation is masked by the downhill contamination from the dump immediately to the west. However, attempting to allow for this the results show that the mineralisation is outlined by "total metals" and zinc with much poorer definition by the more insoluble lead. It is interesting to note that the lead peak is in front (i.e. nearer the orebody)

than the zinc peak, as would be expected from the comparison of the solubilities of the two metals. The displacement of the anomalies downhill is consistent with the downhill creep of the residual soil and is a common feature.

(ii) Traverse 110300N

The "total metals" show an anomaly of similar nature to that in 110150N, but of a slightly weaker nature (8 p.p.m. as against 9-10 p.p.m.). Lead gives a much clearer definition than in 110150N, with a clear peak downhill from the ore-zone, but it is of the same general order of magnitude. Zinc is inconsistent and it would have been expected to have the same order of anomaly as 110150N or 110450N.

(iii) Traverse 110350N

The samples from this traverse were taken from the bank of a creek and from a different soil type in the southern portion of the line. It is obvious that the traverse is badly placed and it would have been better at 110250N or 110275N. The inconsistent results bear out the above observations and this traverse is best disregarded.

(iv) Traverse 110450N

Each of the three give a well marked anomaly, again with the lead peak in front of the zinc peak. The results here are near-perfect and are practically a text-book example of what geochemical profiles should look like.

(v) Traverse 110500N

The lack of any reliable downslope anomaly is most likely due to the pinching out of the ore-zone to the west.

(vi) Conclusions

The work suffers from the lack of adequate sample coverage: to be ideal traverses should have been run from 110550N every 50 feet to 110000N. However, disregarding traverse 110350N for the reasons already stated the remaining work obviously indicates the presence and the approximate trend of the main belt of mineralisation.

A point to emphasise is that the magnitude of a geochemical anomaly bears no direct relationship to the strength of mineralisation: this is somewhat similar to the case in geophysics where the size and strength of an anomaly bears no similar direct relationship.

3. GENERAL CONCLUSIONS AND DISCUSSION

At both localities the work suffers through the lack of adequate sample coverage, although the fact is appreciated that part of the samples collected were inadvertently destroyed in a fire before they were analysed. Also the results in detail do show some inconsistencies, however, in broad outline the work has definitely indicated the presence and approximate trend of mineralisation at both Findons and Pinnacles. These results are of particular interest at Findons where the mineralisation is very feeble.

The results must be viewed in the light of the proposed use of geochemistry. It is not intended to use it as a regional prospecting tool, airborne geophysics will provide a far more efficient method of locating areas of mineralisation, but as a means of testing geophysical anomalies and investigating restricted areas of, say, up to 4 to 5 square miles through soil, stream sediment and water testing, depending upon the local circumstances. Primarily then it is to be used to distinguish between geophysical anomalies which are due to mineralisation and those which are covered by other features such as unmineralised faults, contact effects, dykes and, in the case of electromagnetic work, graphitic shales. In the latter case, the B.M.R. have made good use of geochemical prospecting at Zeehan where very strong electromagnetic anomalies did not give a corresponding geochemical anomaly. Later work by drilling or costeaning has supported the geochemical work in that the geophysical anomalies were due to graphitic shales.

It is considered that the results of the present investigation indicate that geochemical prospecting could be relied upon to fill a role as outlined above.

The list of equipment in report GC6 (4/6/1957) is to test approximately 1000 samples a week. Samples will have to be collected at 25 feet intervals in traverses 50-150 feet apart. Ten traverses 50 feet apart with a line continuation of 250 feet should be adequate for most anomalies. This is 300 samples. Not every geophysical anomaly will require testing by geochemistry but assuming at least two are tested per week this, plus retesting of positive values, (all positives are rechecked) gives an estimate of 750 samples per week. In addition, owing to the extreme delay in the delivery of equipment to the WestCoast a reasonable stock of spare equipment and chemicals must be carried. The estimated cost of equipment and chemicals to treat 750 samples per week is given in Table 3.

However, it must be emphasised that this estimate of 750 samples per week may never be required. This estimate can only be accurately assessed if the number and magnitude of geophysical anomalies are known. It is anticipated that the first magnetometer results will not be available until November of this year and the first electromagnetic/radioactive results until late February, 1958. Therefore, to wait until these results are available would mean that the necessary equipment and chemicals could not be collected together in time for the coming field season. This would result in the loss of this technique for the testing of geophysical anomalies as the equipment at present available, at Rosebery, can only test 150-180 samples per week.

B. Scott

Geologist-in-Charge.

TABLE 3COST ESTIMATE

750 samples per week for 12, 16 and 20 week field season.

	<u>12 week</u>	<u>16 week</u>	<u>20 week</u>
Field Equipment	£ 85	£ 100	£ 110
Sieving Room Equipment	67	67	67
Laboratory Equipment	290	290	290
Laboratory Furniture	60	60	60
Chemicals	227	240	262
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	£ 729	£ 757	£ 789
Labour Cost @ £100 per week	1200	1600	2000
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TOTAL:	£ 1929	£ 2357	£ 2789
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