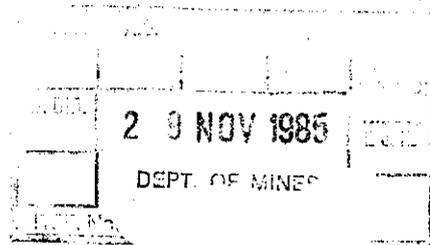


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EL 2/74 • ANNUAL REPORT • 1985

KING RIVER DELTA PROJECT
MACQUARIE HARBOUR TASMANIA

MICROFILMED

26 November 1985

S R M Harvey, for
Elisna Pty Ltd
19 Paterson Street
Launceston 7250

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SUMMARY

In 1985 more samples were collected from the King Delta, mainly to enable the extent of gold concentrations we have discovered there to be established. Samples come from sites spread evenly over an area of nine square kilometres and represent about 75% of the entire top surface of the Delta, exposed and submerged.

Our lab services contractor, Amdel, was appointed to examine this material. Results of the first two investigations have since been received, with data stemming from a third study commissioned last year. The study involves bulk material obtained by a former collaborator, Cities Services, apparently from the Delta surface near the King River mouth. Collected results of investigations of Delta sediment made over a period of some years by the Department of Mines also arrived.

Overall, laboratory data continue to provide encouragement. Amdel's analyses of the new samples show that gold concentration is indeed Delta-wide and that gold present is for the most part probably metallic and quite well liberated, as we averred. The average grade of 154 mg Au per tonne discerned matches that of our initial estimate closely.

As gold grade and sediment density rise towards shore and fall on passage away from it, localised grades expressed volumetrically lie above and below the average. Grade is approximately 100 mg/Au/tonne over the Delta toe, west of the licence. Grade increases eastward reaching 200 to 400 mg Au/tonne near the Delta coast.

The latest analyses show levels of sulphur and barium encountered offshore to be higher than those found inshore. Sediment of the Delta's submerged surface runs about 0.75% barite. In a recent test the Department of Mines concentrated Delta barite successfully by froth flotation. Mines estimates that 50 to 60% of the barite ultimately may be recoverable by flotation.

In another test using a shaking table to simulate recoveries possibly attainable with spirals or other gravity apparatus Mines isolated major fractions of cobalt, sulphur and barium present in sediment examined, plus 40% of its copper. Higher recoveries should be feasible if feed is sized first and some products are recycled.

During 1985 the head of Cottesloe Corporation, a US company we brought into the Delta project as partner last year, came to Australia to view the deposit and meet the Director of Mines.

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a domestic group Elisna had interested in the chance of participating in the venture. Planet's staff and consultants examined technical records of the project. The Group then confirmed its desire to join in. An agreement was signed recently by Elisna, Cottesloe, and Planet's subsidiary, Constellation Mining NL providing for co-operative work.

The programme proposed for 1986 calls for: new drilling to allow the vertical distribution of gold to be explored; lab research on gold and cobalt to learn how they occur and best can be recovered; scout surveys concerning production and sale of elemental sulphur.

Expenditure on EL 2/74 for 1985 should reach A\$50,000 by year-end. The corresponding figure for 1986 is expected to be considerably more.

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I

SAMPLING

Results of studies commissioned by Aberdare/Elisna since Cities Service withdrew from the project indicate that the Delta contains gold, barium, tin and tungsten, possibly in recoverable quantities, and that the pyritic component of Delta sediment holds potential as a source of cobalt and elemental sulphur.

New sample representative of both exposed and submerged portions of the Delta surface was needed to allow the extent to which the surface is enriched in these elements to be determined, and to permit tests to be run with the objective of separating the sediment's valuable components.

A van Veen grab was built for the sampling. Twenty-two samples weighing about 14 kg each were collected from fourteen sites offshore and five inshore. The Strahan vessel Cape Martin was used for offshore sampling, and the boat's dinghy to reach inshore stations.

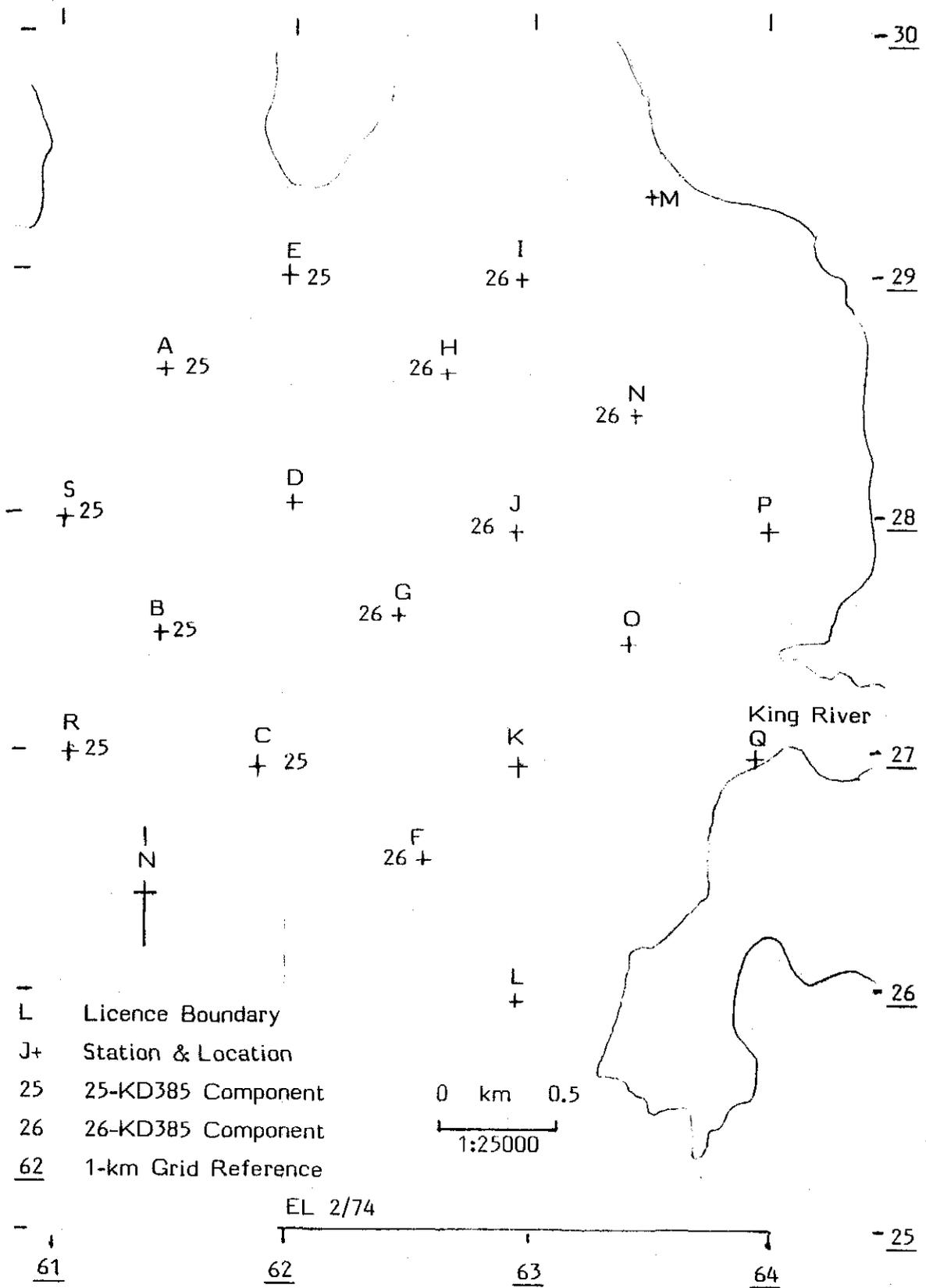
Sites lie approximately 700m apart on a square grid oriented NE/SW NW/SE. The grid covers all of the Delta except its inner sector and southern margin. Parts of the grid covering the Delta toe lie west of the exploration licence. Location of sample stations is illustrated in Figure 1.

Duplicate samples were taken at three stations to permit us to gain an idea of localised grade difference or uniformity. A composite sample was prepared from the 23 individual samples, and another specimen, a few hundred grammes in weight, was cut from one of the large duplicate samples to provide for a further check on grade and assay variation. Relevant information is tabulated.

Table 1 King River Delta Sampling: March, 1985

<u>Station</u>	<u>Fathoms</u>	<u>Sample</u>	<u>Station</u>	<u>Fathoms</u>	<u>Sample</u>
A	17	1-KD385	K	0	13-KD385
A	17	2-KD385	L	0	14-KD385
B	14	3-KD385	M	0	15-KD385
C	17	4-KD385	N	6	16-KD385
D	?	5-KD385	O	1	17-KD385
E	17	6-KD385	P	0	18-KD385

Figure 1 Stations: March 1985 Sampling: King Delta



- L Licence Boundary
- J+ Station & Location
- 25 25-KD385 Component
- 26 26-KD385 Component
- 62 1-km Grid Reference

0 km 0.5
1:25000

EL 2/74

61 62 63 64 -25

5 cm

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Station	Fathoms	Sample	Station	Fathoms	Sample
F	12	7-KD385	Q	0	19-KD385
G	11	8-KD385	R	19	20-KD385
G	11	9-KD385	S	18	21-KD385
<hr/>					
H	11	10-KD385	S	18	22-KD385
I	8	11-KD385	A thru' S	0 - 19	23-KD385
J	8	12-KD385	S,split	18	24-KD385

The large samples were sent to Amdel in Adelaide for storage and future testwork. Two small portions were removed from each before shipment: one set of these has been retained in Launceston for reference; the other was consigned to Amdel's chemistry division. Resultant analyses are reproduced at Appendix C and discussed in following pages.

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II

RESEARCH

During 1985 results of three investigations commissioned by Elisna were received from the investigator concerned, Australian Mineral Development Laboratories. The final report on a series of studies conducted on Delta sediment by the Chief Chemist and Metallurgist, Tasmania Department of Mines, arrived. In London further discussions were held with staff of the British Sulphur Corporation.

Amdel's data are attached to this report as Appendices A, B, C and D. The study by Mines already is on file at the Department's lab in Launceston so is not reproduced here.

Contents of the first three Amdel submissions are discussed in some detail in Elisna's quarterly reports for the year. Summaries appear below. Results of Amdel's most recent investigation are described at greater length. Mines study includes new results which also are commented on.

Parts I and II of Amdel Report GS 6171/85 (Appendix A and Appendix B respectively) present data from tests Elisna designed first to allow grades arrived at by different analytical methods to be compared and, second, to show whether or not a percentage of gold higher than that separated in an earlier study can be concentrated.

Sample analysed derives from drums of Delta sediment collected by Cities Service, inherited by Elisna, and stored at Amdel's Adelaide labs.

Though ostensibly this material was cut from all Cities' drillhole specimens and thus represents the entire deposit, a reliable Strahan source involved as ancillary contractor throughout the drilling programme claims drums were filled from a single point about midway along the right bank of the Delta's principal distributary. Grain-size characteristics, low cobalt grade typical of the King River and of nearshore material from the Delta's exposed top, as well as grades of other elements support the contention.

On this basis results of Cities' main processing tests, all run on drum sample, are invalidated to the extent they represent the Delta as a whole. The explanation accounts for the difference between the percentage of copper recovered in Cities' preliminary and later tests. Sample used first, collected offshore where sediment is fine-grained and contains more secondary copper, gave encouraging results: subsequent tests, run on material now considered of surface, inshore origin recovered only a quarter of total copper.

Results in Appendices A and B and those of all previous tests of drum

sample commissioned by Cities and by Aberdare/Elisna remain useful, but probably they should be regarded as representative only of the coarser, fresher end of the range of sediment comprising the Delta, the end at which secondary mineralisation, responsible for much of the cobalt and copper (and silver, lead and molybdenum) found in the deposit, plays a minor role and does not operate. Most surface sediment is too young to have been enriched appreciably and, where exposed, lies in the wrong environment. Secondary mineralisation takes place below the freshwater/brine interface where oxidising conditions give way to reducing ones, deeper water of Macquarie Harbour being partly stagnant.

Grade variations depicted in Appendix B suggest that past results produced by standard rather than high quality analyses undervalue the Delta's cobalt content by some 6%. Silver, also, is undervalued. Barium contents measured previously appear to be about 3% too high. Fire assay indicates more gold is present than the AAS method used alone does: the degree of difference cannot be quantified because results are too few. In future, all gold assays of Delta material should include a fusion stage first. The standard, lower cost AAS procedure may continue to be used for cobalt as long as it is borne in mind that true contents probably are slightly higher.

Partial grinding, and heavy liquid separation carried out centrifugally rather than statically do improve mechanical recovery of gold as expected. Results in Appendix B show that approximately 50% of the total gold reports to the densest seventh of sediment tested. The same fraction contains about two-thirds of the sample's sulphur, over half its cobalt, and 37% of its copper. Grinding was undertaken to indicate recovery rates possibly achievable when treating naturally fine-grained sediment from submerged parts of the Delta.

Amdel Report AC 3846/85, reproduced in Appendix C, lists contents of six elements found in material I collected at the Delta in March '85. Sample localities are given in the previous section of this report and illustrated in Figure 1.

Average elemental contents in ppm are: Ag 1, Au 0.16, Ba 5,018, Co 143, Sn 11.4, W 27. Contents of a composite embracing 22 of the 24 samples assayed match these figures, running Ag 1, Au 0.16, Ba 5,100, Co 160, Sn 16, W 25. Similar uniformity exists between Sample 1-KD385 and Sample 2, between 8 and 9, and between 21 and 22, each pair collected at a single site. Contents of Sample 24, a split of Same 22, also resemble those of 22 and 21.

Cobalt and silver grades of Delta sediment have been known for some time, but figures in Appendix C for barium, tin, tungsten and gold are new.

Gold data show small concentrations do occur all over the Delta surface, as we had claimed is likely to be the case. Grade varies from an average of approximately 175 mg/tonne for most exposed and submerged parts of the surface lying within boundaries of the exploration licence to one of about 110 mg/tonne for peripheral parts, mainly outside the licence area.

The former value, adjusted for density, equals some 200 mg/m³. This is low, but as there are at least 100,000,000 cubic metres of sediment in the Delta, the quantity of gold likely to be present is large and thus of interest. It would be uneconomic to mine gold alone, but extracted with cobalt, copper and sulphur it should constitute an attractive target. If grade at depth equals that of the surface, and half the gold present is recovered, the Delta should yield one-third of a million ounces.

The cobalt grade betokens a reserve in 100,000,000m³ sediment of 40,000,000lbs Co. Fifty percent of this is worth A\$330,000,000 at current exchange rate and cobalt price.

Amel's Report G 6457/86 (Appendix D) presents assays and distribution figures illustrating the manner in which each of nine elements, Ag, Au, Ba, Co, Cu, Mo, S, Sn and W is partitioned between four size fractions of composite sample 25-KD 985 and of composite 26-KD.

The composites are made up of splits of some of the samples taken at the Delta surface in March: analyses of the latter appear in Appendix C. Composite 25 represents samples from six sites having an average depth of 17 fathoms. Composite 26 represents samples from six sites having an average of 9 fathoms. Components are:

25-KD 985: 2 - KD 385, 3-, 4-, 6-, 20, and 21-
26-KD 985: 7 - KD 385, 8-, 10-, 11-, 12- and 16-

Material of 25-KD comes from the outermost part of the deposit, the Delta toe, lying just west of the exploration licence area. Material composing 26-KD is derived from the Delta face, situated between its toe and top. Localities from which samples comprising each composite were collected are shown in Figure 1.

Elemental contents of the composites lie close to those obtained by averaging contents of the six samples forming each composite.

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Table 2 Grade comparison based on assays of Appendices C and D
Delta surface samples. Values in ppm. Analyst, Amdel.

	Ag	Au	Ba	Co	Sn	W
25-KD						
Averaged head	1	.110	5,715	132	13	26
Calculated head	1	.190	5,213	141	23	25
Measured head	1	.150	5,750	145	15	30
		.100				
26-KD						
Averaged head	1	.158	4,912	160	11	21
Calculated head	1	.190	4,778	170	18	23
Measured head	1	.150	5,000	180	8	30
		.150				

The gold average for all twelve determinations made on samples and composite splits of the first group above, representing material from deeper water, is 140 mg/tonne, that for group II material, from intermediate depth, is 168 mg/tonne.

Gold content of the two finer-grained fractions of Delta sediment analysed in Amdel's sizing test is 210 mg/tonne. These fractions account for three-quarters of sediment derived from the twelve sites at which sample comprising the composites was collected. The twelve sites are representative of most submerged parts of the Delta surface, so the grade increase is noteworthy. By confining gold recovery to these fractions, head grade apparently can be raised 30 to 40%. The factor should be greater when sample from inshore parts of the Delta where overall grades are highest is included. The six inshore samples, not yet sized, average 240 mg/tonne whole, that is, 300 mg/m³ or better, depending upon density factor used. Besides containing the Delta's highest gold grades and densest sediment, inshore and other exposed sections overlie its thickest parts. Combined, these factors mean the zone holds a major part of the Delta's gold and total sediment reserve.

The coarser of the two finest-grained sediment fractions discussed above, comprising an average 28% of the sediment mass at sites sampled and at underwater parts of the Delta they represent, contains 52% of the sediment's total sulphur and 50% of its cobalt.

Grades indicate that 15% of this sediment fraction consists of pyrite. Each tonne of the sulphide carries about 4lbs cobalt. Such a quantity now is worth A\$65.

The Delta contains at least 8,000,000 tonnes pyrite. There are indications that approximately half its associated cobalt is of

cobalt sulphide film on pyrite particles. If this is so the secondary fraction plus primary cobalt resident in finer-grained pyrite should be recoverable at low cost by simple leaching.

If alternatively all or most cobalt proves to be contained in the pyrite lattice, the amount of this element present still appears large enough to support profitable extraction by more complex, expensive procedures, including preliminary pulverising.

Comparing distribution of elements between each of the four size fractions Amdel produced shows that several other associations exist, besides that of cobalt and sulphur. These relationships are displayed graphically in Figure 2.

Silver and copper and, to a lesser extent, tin and barium exhibit similar distribution patterns, weight percentage of each rising in successively finer-grained fractions of Delta sediment. Tungsten aligns more with the cobalt-sulphur distribution pattern, the finest-grained sediment fraction being relatively impoverished in each of the latter three elements.

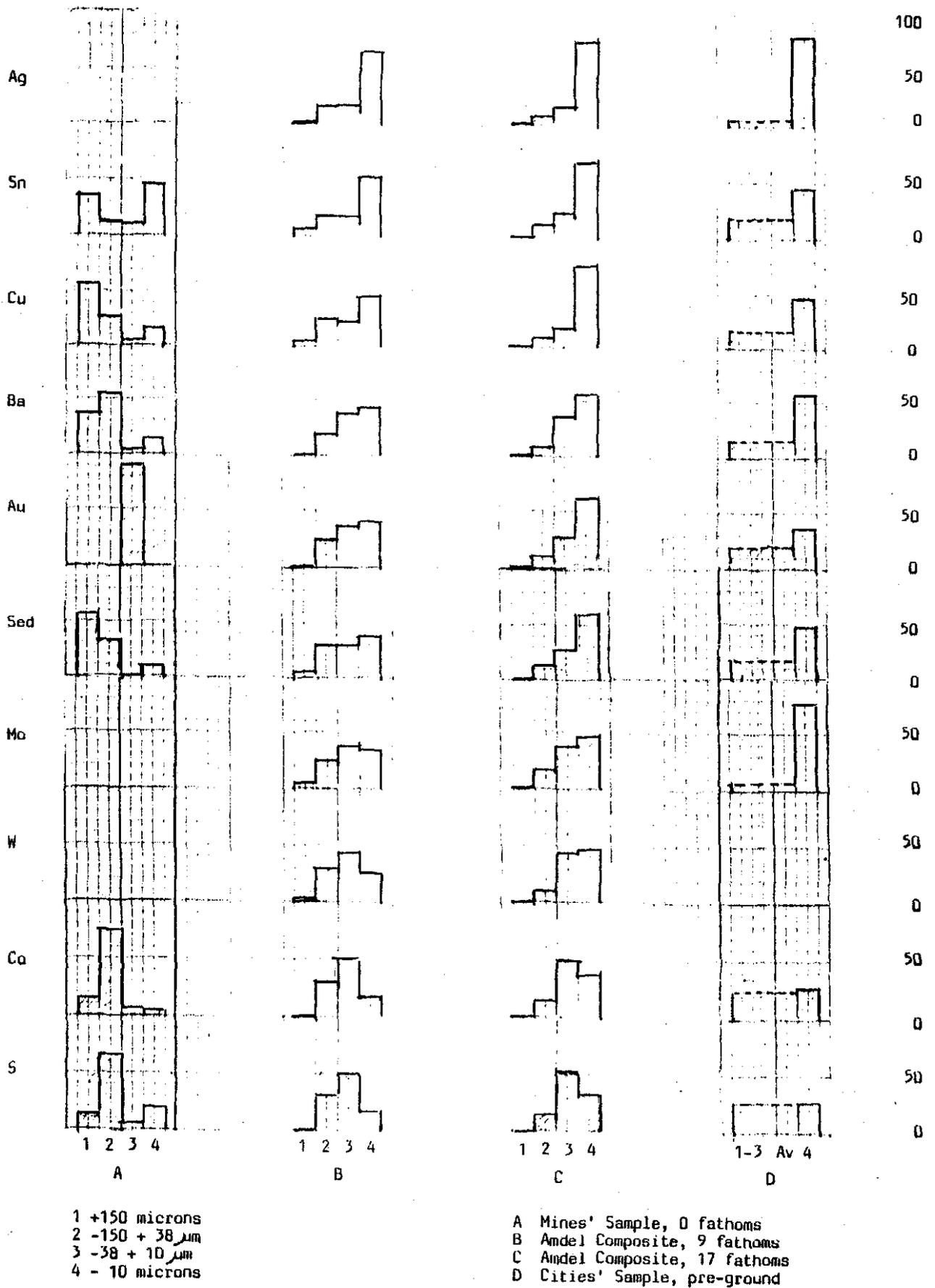
The distribution pattern of gold is akin to that of the sediment's size fractions, lying between patterns representing silver and copper on one hand and cobalt and sulphur on the other. This implies that most gold probably occurs independently of sulphur and copper, most likely in free, native state. Concentrations of 700 and 640 mg/tonne, well above average, found in isolated samples collected at inner parts of the Delta tend to support this view. If gold occurred chiefly in iron or copper sulphide, greater uniformity of grade would be expected, even inshore.

Results of studies conducted at Mines Department laboratories and submitted in Reports 683, 690 and 784 are summarised in the labs' latest and final report, Number 797. The report also presents the outcome of new work, notably results of a gravity separation and a flotation test.

The gravity separation, made on a Deister table, confines about 74% of total cobalt, 64% of the sulphur, 59% of the barium and 41% of the copper to a 22% fraction of Delta sediment. These recovery rates are promising. With preliminary sizing and some recycling of products higher rates should be attainable.

The slime fraction separated in the test also may be of interest, supposing tin grades determined are correct and widespread. Slimes, take to be -10 microns comprise 12.5% of the sediment mass and allegedly contain 40% of total tin: slimes are said to run 570ppm Sn.

Figure 2 Elemental Distribution in Weight Percent, King Delta Sediment



Although some of this tin would be too fine to retrieve (West Coast mines float cassiterite down to 5 microns in particle size) recovery of half, even a third, could prove economic. The Delta contains several tens of millions of tonnes of -10 microns sediment.

Reservations arise on two counts. Tin contents arrived at by Amdel have consistently been low, generally between 5 and 30ppm Sn for head sediment, as opposed to contents of 50 to 400ppm Sn recorded by Mines. Secondly, material investigated may be insufficiently representative of the Delta as a whole. Sediment forming this body is sandy inshore but becomes silty, then clay-like towards outer margins. Chemical reaction between sediment and river and Harbour-water introduces further variation.

At Amdel all but investigations reported upon at Appendix C and Appendix D were run on sample which, as mentioned, now appears to have come from a single point inshore on the Delta's exposed top rather than from an extensive drillhole array.

Sample studied by Mines was collected from points where the Delta surface submerges. Sample is typical of that zone but probably should not be regarded as much more.

In Mines' barite test, sediment was first deslimed, sulphide was separated, and barite was floated off tailings of the separation, using 3,000 g/t sodium cetyl sulphate and 500 g/t sodium silicate at pH 10.5. This single test confines 31% of the sediment's barite to 1.6% of the sediment mass. Concentrate runs 6% Ba; computed head is 0.31% Ba. Concentrate recovers 42% of barium present in the sulphide flotation tailing. Mines consider that with more work it may be possible to increase recovery to between 50 and 60%.

Barium content of the sector of Delta surface sampled in March is 5,000ppm. If this grade prevails at depth and half the total amount of barium present in 100,000,000 tonnes Delta sediment is retrieved, yield will be approximately 400,000 tonnes barite worth some A\$60,000,000, assuming an average price of US \$100/tonne. The value could be substantially higher because fine-grained barite, normally produced by grinding, commands two to three times the average price. Delta barite is naturally fine-grained and would not require grinding.

III

PARTICIPATION

In 1984 Elisna made arrangements for Cottesloe Corporation, a US exploration company with an Australian subsidiary, to join the King Delta enterprise. Elisna also approached the Victorian group, Planet Resources, as a possible third venturer. Planet appeared keen to participate.

At the start of the current reporting period late last year, Cottesloe's chief executive Dr George Taylor came to Australia so we could further matters. He was taken to visit the Delta deposit, the Director of Mines, Tasmania, and the Planet board in Melbourne.

The Melbourne meetings allowed general agreement concerning structure of the venture and terms for participating in it to be reached.

After reviewing all technical records of the project the Victorians confirmed their desire to join in and a document providing for this was drafted. Reorganisation within the Planet group interrupted proceedings, but the finished version of the agreement was completed recently and has since been signed by the three parties.

Planet's interest in the project is represented by Constellation Mining NL, a new corporation established to handle all the parent group's resource activities except those involving petroleum or natural gas.

Constellation takes over several gold mining operations in Victoria, gold, platinum and diamond exploration properties in Western Australia, rights to mercury production in New Zealand, and other ventures. The company appears to have the financial and technical backing needed to advance our King Delta project capably and fast.

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IV

EXPENDITURE

Exact sums spent on the King Delta project will not be known until next year when total amounts of time devoted to each of various ventures during 1985 become available, permitting general expenses such as overseas airfares to be divided between them proportionally. Fairly close estimates of total expenditure anticipated have been made however: these follow

	Australian dollars				1985
	Q1	Q2	Q3	Q4	
Travel	2,299	176	926	1,170	4,571
Services	16,541	6,498	6,645	11,282	40,966
Office	698	245	261	387	1,591
Supplies	305				305
Rents	1,687			316	2,003
Miscellaneous	243	82	65	107	497
Total	21,773	7,001	7,897	13,262	49,933

Demonstration over the past nine months that gold enrichment discerned at the King River Delta extends across its entire surface warrants intensified study of the deposit with respect to both gold and other valuable components.

The programme envisaged for 1986 calls for more drilling, for two more investigations regarding sulphur, for further examination of potentially applicable processing methods and, possibly, for preparation of mining plans and an environmental impact statement.

Drilling The deposit has been drilled fully, but the company then responsible did not have samples assayed for gold, nor did it take and retain splits of drillhole samples. To investigate gold contents of the Delta interior, new test holes are needed. }

Provided the uniformity in gold distribution observed at the Delta surface persists at depth, one drillhole in each square kilometre of the deposit should allow a reasonable estimate of overall grade to be made. Volume and configuration of sediment in the Delta are known accurately from the earlier, much closer-spaced drilling.

The twelve new holes planned, each to be drilled through the whole thickness of the Delta, will vary in length from approximately 3 to 33 metres. }

One or two of the larger holes probably will be drilled first. If grades prove uninteresting remaining holes, defining smaller volumes of sediment, may be dispensed with. In all likelihood though, interior grades will equal surface grade. They well may be higher, first because river sediment, the material with which most gold is thought to be introduced, should increase at depth in proportion to Lyell tailings, second, because other gold may have come from Mt Lyell itself, in older tailings produced when gold recovery at the mine was less efficient or had not begun. ✓

If, alternatively, grades encountered are encouraging but rather variable, more than twelve holes may be drilled.

Sulphur studies We expect to invite The British Sulphur Corporation to undertake a scout survey for us of market prospects and attendant economics confronting possible production of elemental sulphur in Australia. As the world's leading statistician on the subject of sulphur and all other fertilizer raw materials and derivatives, the Corporation is better qualified and equipped to produce a dependable review and forecast than anyone else.

A reconnaissance by Elisna/Aberdare has shown that there appears to be a highly attractive future for sulphur production based in Tasmania, with mainland imports of the commodity from North America now costing the equivalent of about A\$100,000,000 per year and New Zealand's imports, from the same source, an additional A\$50,000,000 to \$60,000,000. Neither country produces any significant quantity of sulphur or has appreciable reserves of brimstone, or of sour natural gas, from which much sulphur is derived.

The two countries' foreign bill for imported sulphur has increased seven to eight-fold within the last decade because of a three- to four-fold rise in sulphur price, a large increase in shipping costs, and because of the countries' weakening currencies abroad. Averaged over ten years the total increase amounts to more than 70% per annum, a growth rate far outstripping inflation.

It should be possible to undercut the landed price - equivalent to A\$225 per tonne in the Commonwealth and about \$250 in New Zealand - quite substantially, by producing sulphur locally from pyrites.

Sulphur present in pyrites of the King Delta totals some 6,000,000 tonnes, a quantity great enough to meet a quarter of Australia and New Zealand's combined current annual demand for the next twenty years, even at a mere 50% recovery rate.

The projected survey by British Sulphur should come to similar conclusions. It also should provide an estimate of the cost ceiling under which Tasmanian sulphur would need to be produced for sale on the mainland and in New Zealand at acceptable profit levels.

On the technical front we may ask the Corporation, or if necessary a different investigator, to collect data on the Westcott and other methods formerly used to produce elemental sulphur from pyrites.

A report the Corporation prepared for us in 1984 investigated newer, potential methods, none of which would be directly applicable in treating Delta sulphide. Processes described in the report are with one exception semi-developed, and several refer to sulphides of copper, lead or zinc, not iron sulphide.

Beneficiation For effective work, labs examining ways in which valuable components of Delta sediment may be upgraded and recovered will need substantial quantities of pre-concentrate. Plans call for use of a small plant, on-site or nearby, to produce such material. Plant should consist of hopper and screen, jig, pump and test cyclone: required capacity, approximately 0.5 tonnes headfeed to yield 0.1 tonnes pre-concentrate per hour. The apparatus should be assembled on skids so that it may be mounted as a unit on lorry, trailer or sampling vessel, or be switched between these.

Besides producing material for beneficiation tests elsewhere, the plant itself should be able to generate some information on applicability of gravity concentration techniques.

Lab studies are to focus primarily on means of extracting cobalt from pyrite, and on gold and barium recovery.

Most effort will be directed toward mechanical extraction and concentration of gold and barite. Cyanidation and amalgamation of gold concentrate, with and without a preliminary roast stage to eliminate arsenic and antimony, also will be explored; barite flotation will be too.

Cobalt recovery is to be investigated by leaching host pyrite with ferric sulphate, ammoniacal and other potential solvents, initially at high concentrations and elevated temperature for relatively long periods. If this approach extracts significant fractions of the cobalt, experiments will continue under less severe conditions with an eye to development of an economic process.

Mining plan & EIS An outline of probably procedures and of rates likely to be adopted in exploiting the Delta deposit is required to allow an environmental impact statement or a preliminary version of such a statement to be drafted.

These studies will be embarked upon towards the end of 1986, assuming research above proceeds on schedule and that results justify our continuing the venture.

Cost Expenditure on investigations outlined is expected to be approximately as follows:

drilling and vessel	\$12,500
sulphur studies	\$ 7,500
plant and vessel	\$15,000
lab work	\$10,000
environmental report	\$15,000
	<hr/>
	\$60,000

The total excludes costs of administration and work by the venturers' own staff in running the programme, reporting, and in designing mine plan.

Note that any item in the programme may be enlarged, reduced, postponed or eliminated, depending upon the nature of results obtained and upon overall progress. So far however, Elisna's annual expenditure on the project has consistently exceeded minima given in budgets accompanying applications for renewal of the exploration licence. This pattern is likely to continue.

APPENDICES

020



The Australian
Mineral Development
Laboratories

Flemington Street, Frewville,
South Australia 5063
Phone Adelaide (08) 79 1662
Telex AA82520

Please address all
correspondence to
P.O. Box 114 Eastwood
SA 5063
In reply quote:

amdel

068021

APPENDIX A

22 February 1985

GS 6/625/0

Mr R. Harvey
C/- L.R. Wastell and Company
19 Paterson Street
LAUNCESTON TASMANIA 7250

REPORT G 6171/85

YOUR REFERENCE:	Letters of 11, 14, 20 and 23 November 1984
IDENTIFICATION:	D, E, F
MATERIAL:	Sediment
LOCALITY:	Maquarie Harbour, Tasmania
DATE RECEIVED:	11 November 1984
WORK REQUIRED:	Separation and chemical analyses

Investigation and Report by: Dr Keith J. Henley

Chief - Geological Services Section: Dr Keith J. Henley

for Dr William G. Spencer
Manager, Mineral and Materials Sciences Division

Head Office:
Flemington Street, Frewville
South Australia 5063
Telephone (08) 79 1662
Telex: Amdel AA82520

Pilot Plant:
Osman Place
Thebarton, S.A.
Telephone (08) 43 5733
Telex: Amdel AA82725

Branch Laboratories:
Melbourne, Vic.
Telephone (03) 645 3093
Perth, W.A.
Telephone (09) 325 7311
Telex: Amdel AA94893

Sydney, N.S.W.
Telephone (02) 439 7735
Telex: Amdel AA20053

Townsville
Queensland 4814
Telephone (077) 75 1377

cc. Mr R. Harvey
Box 2211
PRINCETON NJ 08540
USA

INVESTIGATION OF MAQUARIE HARBOUR SEDIMENTS

1. INTRODUCTION

A request was received from Mr R. Harvey for further work on Maquarie Harbour sediment material held at AMDEL. The initial request of 11 November 1984 was modified in letter of 14, 20 and 23 November 1984. Instructions were as follows:

- (1) Combine some of any liquid present in Drums D, E and F to form a composite - Sample I.
- (2) Spear 1 kg of sediment, ideally combining material from various depths, from each of Drums D, E and F.
- (3) Abstract 100 g of Step 2 spear specimens of D, E and F drum material and combine to form a 300 g composite.
- (4) Abstract 50 g of Step 3 composite head as Sample II.
- (5) Sieve remaining 250 g of Step 4 at 38 μm .
- (6) Grind +38 μm product of Step 5 to pass 38 μm and combine this -38 μm material with -38 μm material of Step 5.
- (7) Remove and retain as Sample III -10 μm fines from the combined -38 μm material of Step 6.
- (8) Centrifuge -38 μm + 10 μm product of Step 7 in heavy liquid of 2.85 sp.gr. (4 x 40 g charges). Low density float fraction resulting constitutes Sample IV, high density sink fraction constitutes Sample V.
- (9) Remove 200 g of each of Step 2 spear specimen.

Samples I-VIII were to be analysed in various ways for selected elements.

2. PROCEDURE

The sample preparation procedure specified was followed as far as possible. However, no water was present in the drums and hence no Sample I was available for analysis.

3. RESULTS

Available analytical results on Samples II-VIII are given in Table 1. Weight distributions for Samples III-V were as follows:

Sample	Size (μm)	Sp.Gr.	Weight %
IV	-38+10	2.85	38.3
V	-38+10	2.85	13.9
III	-10	Total	47.8
			100.0

Partial results are given in Table 1 and full results (mainly ICP) will be given as soon as available.

TABLE 1: ANALYSES OF SAMPLES II - VIII

Element	Method	Code*	II	III	IV	V	VI	VII	VIII
Ag, ppm	ICP	I3							
Ag, ppm	AAS	C2					<1	<1	<1
Ag, ppm	AAS	01	2	4	1	<1	<1	2	1
Co, ppm	ICP	I3							
Co, ppm	AAS	C6					78	70	71
Co, ppm	AAS	01	80	45	30	315	80	75	75
Cu, %	ICP	I3							
Cu, %	AAS	C6					0.19	0.21	0.21
Cu, %	AAS	01	0.15	0.15	0.05	0.39	0.14	0.16	0.15
Ba, ppm	ICP	I3							
Ba, ppm	XRF	B2					2700	2600	2650
Ba, ppm	XRF	02							
Sn, ppm	ICP	I3							
Sn, ppm	XRF	B1/1					12	10	12
Sn, ppm	XRF	02							
Au, ppm	AAS	K3/2	0.05	0.66	<0.02	0.34			
Au, ppm	Fire	K4/2	0.7	0.3	0.2	1.3			
Mo, ppm	ICP	I3							
SO ₃ , %	ICP	I3							
S, %	LECO	E4	3.65	1.70	0.92	15.3			
Ce, ppm	ICP	I3	Not available by ICP because of interference by iron						
W, ppm	ICP	I3							
Zr, ppm	ICP	I3							
Te, ppm		E2							
Se, ppm		E2							

*Codes from 1982 Analytical Services Price List; replaced by new Price List.

023



The Australian
Mineral Development
Laboratories

Flemington Street, Frewville,
South Australia 5063
Phone Adelaide (08) 79 1662
Telex AA82520

Please address all
correspondence to
P.O. Box 114 Eastwood
SA 5063
in reply quote:

amdel

24 April 1985

GS 6/625/0

Mr R. Harvey
PO Box 2211
PRINCETON NJ 08540
USA

REPORT G 6171/85 - PART II (FINAL)

YOUR REFERENCE: Letters of 11, 14, 20 and 23 November 1985
IDENTIFICATION: D, E, F
MATERIAL: Sediment
LOCALITY: Macquarie Harbour, Tasmania
DATE RECEIVED: 11 November 1984
WORK REQUIRED: Separation and chemical analyses

Investigation and Report by: Dr Keith J. Henley
Chief - Geological Services Section: Dr Keith J. Henley

Keith Henley

for Dr William G. Spencer
Manager, Mineral and Materials Sciences Division

Head Office:
Flemington Street, Frewville
South Australia 5063
Telephone (08) 79 1662
Telex: Amdel AA82520
Pilot Plant:
Osman Place
Thebarton, S.A.
Telephone (08) 43 5733
Telex: Amdel AA82725
Branch Laboratories:
Melbourne, Vic.
Telephone (03) 645 3093
Perth, W.A.
Telephone (09) 325 7311
Telex: Amdel AA94893
Sydney, N.S.W.
Telephone (02) 439 7735
Telex: Amdel AA20053
Townsville
Queensland 4814
Telephone (077) 75 1377

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INVESTIGATION OF MACQUARIE HARBOUR SEDIMENTS

Table 1 gives the completed analytical data on Samples II to VII, only some of which were given in Part I.

TABLE 1: ANALYSES OF SAMPLES II - VIII

Element	Method	Code*	II	III	IV	V	VI	VII	VIII
Ag, ppm	ICP	I3	<10	<10	<10	<10	<10	<10	<10
Ag, ppm	AAS	C2					<1	<1	<1
Ag, ppm	AAS	O1	2	4	1	<1	<1	2	1
Co, ppm	ICP	I3	80	40	<20	60	70	70	70
Co, ppm	AAS	C6					78	70	71
Co, ppm	AAS	O1	80	45	30	315	80	75	75
Cu, %	ICP	I3	0.153	0.184	0.066	0.182	0.172	0.185	0.180
Cu, %	AAS	C6					0.19	0.21	0.21
Cu, %	AAS	O1	0.15	0.15	0.05	0.39	0.14	0.16	0.15
Ba, ppm	ICP	I3	2600	3270	1120	2560	2630	2550	2570
Ba, ppm	XRF	B2					2700	2600	2650
Ba, ppm	XRF	O2	2600	2480	1050	3520	2600	2540	2540
Sn, ppm	ICP	I3	<100	<100	<100	<100	<100	<100	<100
Sn, ppm	XRF	B1/1					12	10	12
Sn, ppm	XRF	O2	13	14	10	34	8	14	9
Au, ppm	AAS	K3/2	0.05	0.06	<0.02	0.34			
Au, ppm	Fire	K4/2	0.7	0.3	0.2	1.3			
Mo, ppm	ICP	I3	60	40	<20	40	40	50	40
S, % ⁺⁺	ICP	I3	2.80	1.45	0.95	2.20	2.60	2.00	2.20
S,	LECO	E4	3.65	1.70	0.92	15.3			
Ce, ppm	ICP	I3	Not available by ICP because of interference by iron						
W, ppm	ICP	I3	<50	90	50	<50	<50	<50	<50
Zr, ppm	ICP	I3	370	230	160	240	340	440	230
Te, ppm		E2				<0.5			
Se, ppm		E2				3.5			

*Codes from 1982 Analytical Services Price List; replaced by new Price List.

⁺⁺ Not accurate at values above 1.

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The Australian
Mineral Development
Laboratories

Flemington Street, Frewville,
South Australia 5063
Phone Adelaide (08) 79 1662
Telex AA82520

Please address all
correspondence to
P.O. Box 114 Eastwood
SA 5063
In reply quote:

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APPENDIX C

6/625/0 - AC 3846/85

21 May 1985

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NATA CERTIFICATE

Mr. R. Harvey,
Box 2211,
PRINCETON NJ 08540
UNITED STATES OF AMERICA

REPORT AC 3846/85

YOUR REFERENCE:	Letter dated 16 March 1985
REPORT COMPRISING:	Cover Sheet Page G1 - G2
DATE RECEIVED:	20 March 1985

D. Patterson
Chief Chemist
Analytical Chemistry Division

Head Office:
Flemington Street, Frewville
South Australia 5063
Telephone (08) 79 1662
Telex: Amdel AA82520

Pilot Plant:
Osman Place
Thebarton, S.A.
Telephone (08) 43 5733
Telex: Amdel AA82725

Branch Laboratories:

Melbourne, Vic.
Telephone (03) 645 3093

Perth, W.A.
Telephone (09) 325 7311
Telex: Amdel AA94893

Sydney, N.S.W.
Telephone (02) 439 7735
Telex: Amdel AA20053

Townsville
Queensland 4814
Telephone (077) 75 1377

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amndksh

068028

Analysis code A1/1.2.X1

Report AC 3846/85

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NATA Certificate

Results in ppm

Sample	Co	Ag	Sn	Ba	W
1-KD 385	150	1	8	6650	35
2-KD 385	145	1	16	6900	35
3-KD 385	160	1	12	6250	30
4-KD 385	140	1	12	5100	15
5-KD 385	150	1	10	3800	25
6-KD 385	135	1	10	5300	30
7-KD 385	150	1	10	6150	25
8-KD 385	170	1	14	4440	15
9-KD 385	105	1	14	4380	30
10-KD 385	175	1	8	4860	25
11-KD 385	150	1	14	5400	25
12-KD 385	170	1	10	3220	20
13-KD 385	74	<1	6	3160	40
14-KD 385	175	1	8	3740	25
15-KD 385	550	2	<4	5400	55
16-KD 385	145	1	10	5400	15
17-KD 385	145	1	12	4860	30
18-KD 385	96	1	6	2980	25
19-KD 385	155	1	14	4760	30
20-KD 385	115	1	10	4440	20
21-KD 385	120	1	18	6300	25
22-KD 385	115	1	10	5700	20
23-KD 385	160	1	16	5100	25
24-KD 385	120	1	12	6150	30
Detn limit	(5)	(1)	(4)	(10)	(10)

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Analysis code A7/2

Report AC 3846/85

Page G1

Results in ppm

Sample	Au
KDV 385 01	0.100
KDV 385 02	0.120
KDV 385 03	0.120
KDV 385 04	0.100
KDV 385 05	0.160
KDV 385 06	0.100
KDV 385 07	0.090
KDV 385 08	0.160
KDV 385 09	0.160
KDV 385 10	0.160
KDV 385 11	0.140
KDV 385 12	0.220
KDV 385 13	0.120
KDV 385 14	0.200
KDV 385 15	0.64
KDV 385 16	0.180
KDV 385 17	0.120
KDV 385 18	0.120
KDV 385 19	0.180
KDV 385 20	0.100
KDV 385 21	0.090
KDV 385 22	0.090
KDV 385 23	0.160
KDV 385 24	0.120

Detn limit (0.005)

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The Australian
Mineral Development
Laboratories

Flemington Street, Frewville,
South Australia 5063
Phone Adelaide (08) 79 1662
Telex AA82520

Please address all
correspondence to
P.O. Box 114 Eastwood
SA 5063
In reply quote:

amdel

29 October 1985

GS 6/625/0

Mr. R. Harvey,
C/- Pritchard and Francis,
3 Kimberley Street,
WEST LEEDERVILLE, W.A. 6007

REPORT G 6457/86

IDENTIFICATION:	25-KD985: 26-KD985
MATERIAL:	Sediments
LOCALITY:	Maquarie Harbour
DATE RECEIVED:	9 September 1985
WORK REQUIRED:	Sizing and chemical analysis of composites.

Investigation and Report by: Dr Keith J Henley
Chief - Geological Services Section: Dr Keith J Henley

Keith Henley

for Dr William G Spencer
Manager
Mineral & Materials Sciences Division

Head Office:
Flemington Street, Frewville
South Australia 5063
Telephone (08) 79 1662
Telex: Amdel AA82520
Pilot Plant:
Osman Place
Thebarton, S.A.
Telephone (08) 43 5733
Telex: Amdel AA82725
Branch Laboratories:
Melbourne, Vic.
Telephone (03) 645 3093
Perth, W.A.
Telephone (09) 325 7311
Telex: Amdel AA94893
Sydney, N.S.W.
Telephone (02) 439 7735
Telex: Amdel AA20053
Townsville
Queensland 4814
Telephone (077) 75 1377

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PREPARATION AND ANALYSIS OF COMPOSITES 25-KD985 AND 26-KD985

1. INTRODUCTION

In early 1985 a number of bulk samples of Maquarie Harbour sediment were submitted by Mr R Harvey and were stored at AMDEL for future work. Subsequently (letter of 1 September 1985) instructions were received from Mr Harvey for preparation of two composites from the bulk samples, and sizing and chemical analysis of the two composites.

2. PROCEDURE

The procedure used was that laid down in Mr Harvey's letter of 1 September 1985 and was as follows.

Two kg of material was riffled from samples 2-, 3-, 4-, 6-, 20- and 21-KD385, mixed and labelled 25-KD985. Similarly, two kg of material was riffled from samples 7-, 8-, 10-, 11-, 12- and 16-KD385, mixed and labelled 26-KD985.

750 g was riffled out from each composite and the remaining 11.25 kg was stored. 150 g was riffled out from the 750 g and the remaining 600 g was wet screened and cyclosized to give the following size fractions: +150 μ m, -150+38 μ m, -38+10 μ m and -10 μ m.

Portions of the unseparated head sample and the four size fractions were analysed according to the following AMDEL codes.

<u>Element</u>	<u>Code</u>	<u>Method</u>
Au	A7/2	Fire assay on 20 g plus solvent extraction and AAS finish
Ag, Mo	A1/2	Perchloric acid digestion plus AAS
Co, Cu	A4	HF digestion plus AAS
Ba, Sn, W	X1	XRF
S	Z	Leco furnace

3. RESULTS

The size analyses, chemical analyses and distributions of the elements are given in Tables 1 and 2. It can be seen that agreement between the assays calculated from the size fractions and the actual head assays are generally very good.

TABLE 1: COMPOSITE 25-KD985

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FRACTION (μM)	DIST. WT. %	AU		AG		MO		CO	
		ASSAY ppm	DIST. %	ASSAY PPM	DIST. %	ASSAY PPM	DIST. %	ASSAY PPM	DIST. %
+150	.26	.40	.5	1	.2	38	.2	90	.2
-150+38	12.97	.15	10.0	1	8.1	78	17.0	145	13.3
-38+10	27.56	.20	28.4	1	17.3	78	36.1	255	49.7
-10	59.21	.20	61.0	2	74.4	47	46.7	88	36.0
CALC. TOTAL HEAD	100.00	.19 .15 .10	100.0	1 1	100.0	60 60	100.0	141 145	100.0

FRACTION (μM)	DIST. WT. %	CU		BA		SH		W	
		ASSAY PPM	DIST. %	ASSAY PPM	DIST. %	ASSAY PPM	DIST. %	ASSAY PPM	DIST. %
+150	.26	1320	.2	4500	.2	20*	.2	20**	.2
-150+38	12.97	1000	8.0	3450	8.6	20	11.3	20	10.2
-38+10	27.56	1060	18.0	6400	33.8	18	21.6	40	43.2
-10	59.21	2020	73.8	5050	57.4	26	66.9	20	46.4
CALC. TOTAL HEAD	100.00	1621 1120	100.0	5213 5750	100.0	23 15	100.0	25 30	100.0

FRACTION (μM)	DIST. WT. %	S	
		ASSAY %	DIST. %
+150	.26	2.20	.2
-150+38	12.97	3.90	14.0
-38+10	27.56	6.95	53.0
-10	59.21	2.00	32.8
CALC. TOTAL HEAD	100.00	3.61 3.85	100.0

* Estimated. Actual value <300 ppm

** Estimated. Actual value <400 ppm

TABLE 2: COMPOSITE 26-KD985

FRACTION (μM)	DIST. WT. %	AU		AG		MO		CO	
		ASSAY ppm	DIST. %	ASSAY PPM	DIST. %	ASSAY PPM	DIST. %	ASSAY PPM	DIST. %
+150	4.46	.05	1.2	1	2.5	34	2.6	20	.5
-150+38	28.39	.15	22.0	1	16.0	52	25.2	180	30.1
-38+10	28.52	.25	36.9	1	16.1	78	38.0	300	50.3
-10	38.63	.20	40.0	3	65.4	52	34.3	84	19.1
CALC. TOTAL HEAD	100.00	.19 .15 .15	100.0	1 1	100.0	59 60	100.0	170 180	100.0

FRACTION (μM)	DIST. WT. %	CU		BA		SH		W	
		ASSAY PPM	DIST. %	ASSAY PPM	DIST. %	ASSAY PPM	DIST. %	ASSAY PPM	DIST. %
+150	4.46	1780	5.4	2000	1.9	35	8.8	20	3.8
-150+38	28.39	1300	25.1	3250	19.3	12	19.3	25	29.9
-38+10	28.52	1180	22.9	6300	37.6	12	19.4	35	42.0
-10	38.63	1780	46.7	5100	41.2	24	52.5	15	24.4
CALC. TOTAL HEAD	100.00	1473 1360	100.0	4778 5000	100.0	18 8	100.0	23 30	100.0

FRACTION (μM)	DIST. WT. %	S	
		ASSAY %	DIST. %
+150	4.46	.41	.4
-150+38	28.39	5.30	31.5
-38+10	28.52	8.55	51.1
-10	38.63	2.10	17.0
CALC. TOTAL HEAD	100.00	4.77 4.90	100.0